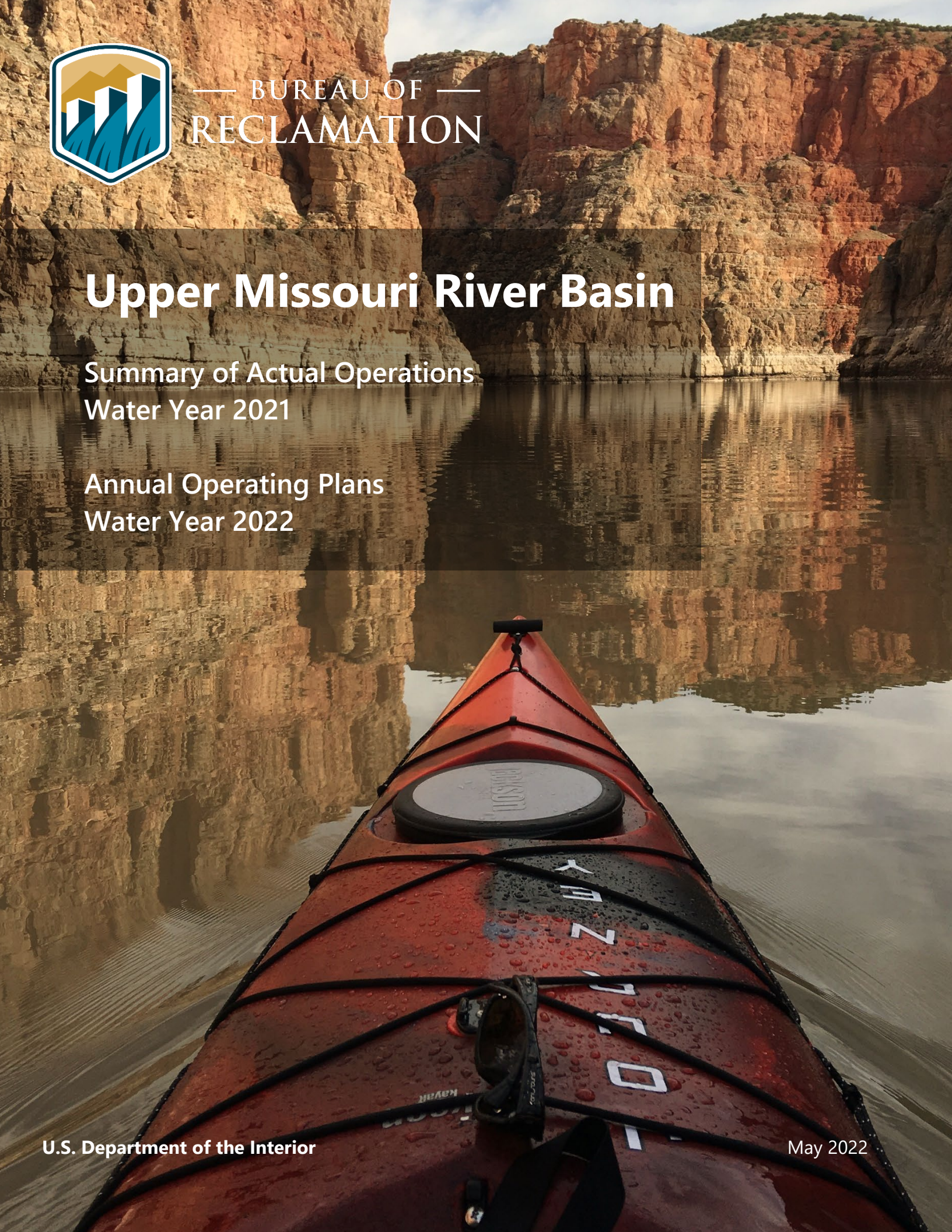

BUREAU OF RECLAMATION

Upper Missouri River Basin

Summary of Actual Operations
Water Year 2021

Annual Operating Plans
Water Year 2022

U.S. Department of the Interior

May 2022

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

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.

Upper Missouri River Basin

Summary of Actual Operations
Water Year 2021

Annual Operating Plans
Water Year 2022

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

Cover Photo: Spring paddling through Bighorn Canyon in 2017. (Reclamation/Jack Connor)

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Annual Operating Plans for Water Year 2021 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 (P S MBP) on September 25, 1970. Major facilities of this unit are Bull Lake Reservoir, Wind River Diversion Dam, Wyoming Canal, Pilot Butte Powerplant, Pilot Butte Reservoir, and Pilot Butte Canal. The major facilities provide irrigation water to approximately 73,000 acres on the Midvale Irrigation District (Midvale). The water supply comes partly from the natural flow of the Wind River and partly from water stored in Bull Lake and Pilot Butte Reservoirs.

Bull Lake Reservoir
Bull Lake Reservoir is located on Bull Lake Creek, a tributary of the Wind River near Crowheart, Wyoming. Bull Lake has an active capacity of 151,737 acre-feet (AF) and is above all unit land. It is the principal storage facility for the unit and is operated by Midvale under contract with Reclamation. A small amount of flood control benefit is provided by normal operation for other purposes. However, when the Bull Lake Spillway is not operational the peak releases are limited to that of the outlet works (approximately 2,400 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, Midvale 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 2021 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 2021 Operations

Bull Lake Reservoir carried 74,716 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 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 (30 years of historical data) are also shown.

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

Month	Inflow (KAF)	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-20	3.4	54%	2	29%	76.3	99%	5777.95	0	0%
Nov-20	2.7	81%	1	61%	77.9	100%	5778.63	0.4	31%
Dec-20	2.1	85%	2	77%	78.5	101%	5778.87	1.55	50%
Jan-21	1.7	80%	2	77%	78.7	101%	5778.95	2.35	49%
Feb-21	1.5	86%	1	83%	78.8	101%	5778.99	3.5	55%
Mar-21	2.2	111%	2	85%	79.5	101%	5779.26	4.7	59%
Apr-21	3.1	74%	1	43%	81.1	103%	5779.89	7.92	79%
May-21	28.4	96%	3	21%	106.5	113%	5789.52	7.7	85%
Jun-21	68.9	107%	25	85%	150.4	116%	5804.33	1.67	56%
Jul-21	25.4	56%	46	107%	129.9	98%	5797.65	0	0%
Aug-21	16.0	82%	45	94%	100.7	97%	5787.39	0	0%
Sep-21	9.0	95%	35	96%	74.7	97%	5777.32	0	0%
WY 2021	**164.5**	**84%**	**165.0**	**72%**	-	-	-	-	-

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, streamflows, etc) forecasts of the April through July inflow volume are made each month between January and June. Table WYT 2 shows the forecast amounts that were made in WY2021. For each forecast, Table WYT 2 shows the percent of average of the forecast compared to 30 years of historical inflow data.

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

Forecast Issue Month	April-July Inflow Forecast (KAF)	% of 30-yr Average Inflow
Jan-21	115	80%
Feb-21	105	73%
Mar-21	120	83%
Apr-21	120	83%
May-21	125	87%
Jun-21	125	87%

Midvale 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 2021 can be found in Tables WYT 3, 4, and 5 and Figure WYG1.

Table WYT 3: Reservoir allocations for Bull Lake Reservoir

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	5,739.00	722	722
TOP OF ACTIVE CONSERVATION	5,805.00	152,459	151,737

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

STORAGE-ELEVATION DATA	ELEVATION (FEET)	STORAGE (AF)	DATE
BEGINNING OF YEAR	5777.34	74,765	10/1/2020
END OF YEAR	5777.32	74,716	9/30/2021
ANNUAL LOW	5776.89	73,667	9/24/2021
HISTORIC LOW*	5,743.03	6,228	9/2/1950
ANNUAL HIGH	5804.55	151,043	7/2/2021
HISTORIC HIGH	5,805.70	154,677	8/10/1965

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

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

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	164,548	Oct '20-Sep '21	165,019	Oct '20-Sep '21
DAILY PEAK (cfs)	2,489	6/6/2021	1,289	7/28/2021
DAILY MINIMUM (cfs)	0	9/9/2021	24	5/17/2021
PEAK SPILLWAY FLOW (cfs)	N/A	N/A	0	N/A
TOTAL SPILLWAY FLOW (AF)	N/A	N/A	0	N/A

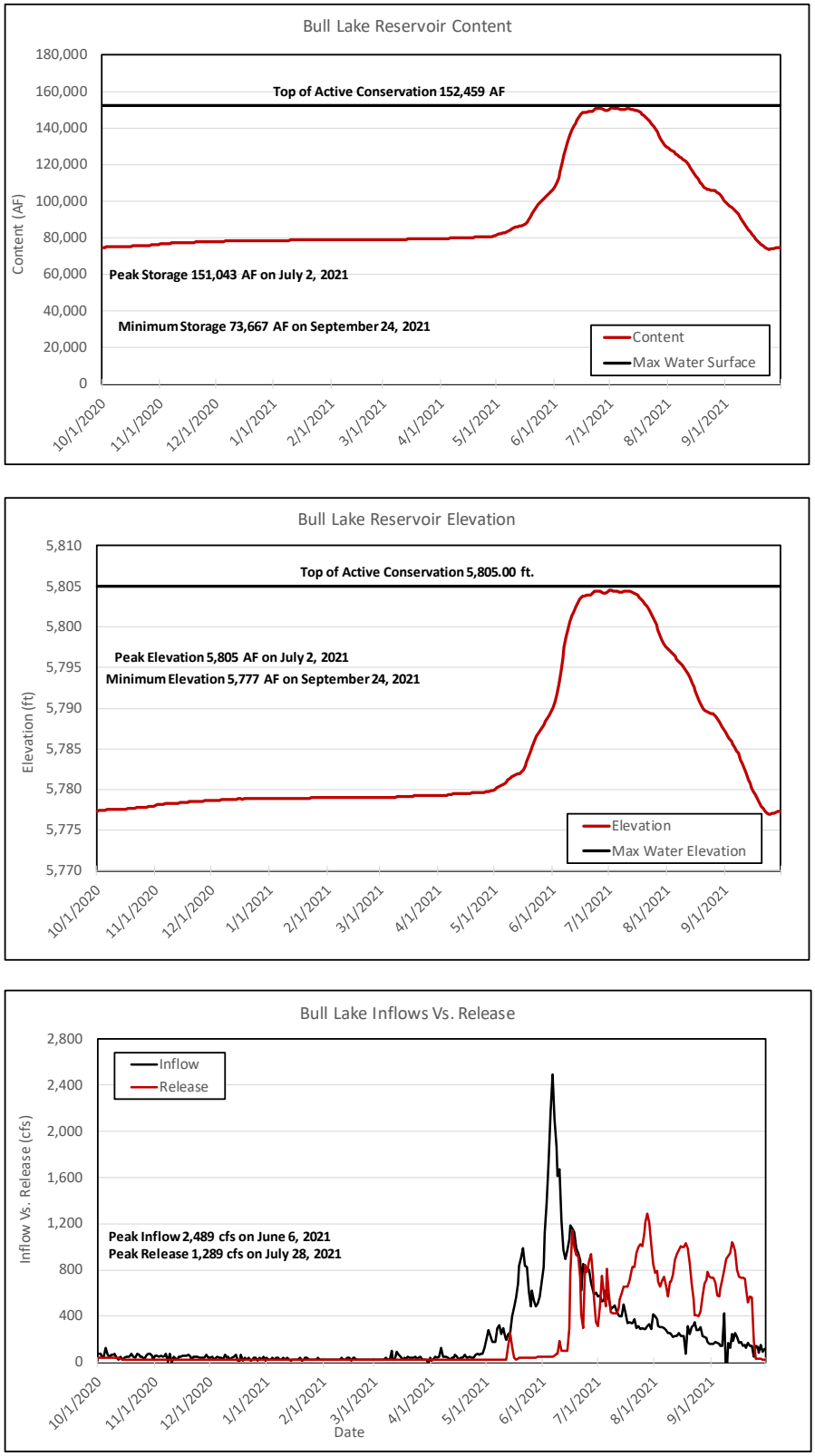


Figure WYG 1: Water Year 2021 storage, forebay elevation, inflow, and release at Bull Lake Reservoir.

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 Midvale Irrigation District (MID) under contract with Reclamation. The turbines at the inlet of the Wyoming canal are currently in inactive status.

Summary of 2021 Operations

Pilot Butte Reservoir began WY 2021 with a total storage content of approximately 19,644 AF, which is a pool elevation of 5,442.51 feet above sea level. Irrigation deliveries for the Wyoming Canal and Pilot Canal ended the WY 2021 irrigation season on September 24 and September 27, respectively. MID began a maintenance project on the inlet works to Pilot Butte Reservoir which requires Pilot Butte Reservoir to be completely drained. Pilot Butte Reservoir was empty from approximately September 28, 2021 through November 11, 2021, 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 Water Year 2022. The agreement allows Midvale irrigation district 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 ensures 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-19	9.2	68%	0.0	N/A	28.1	104	5453.56
Nov-19	0	N/A	0.0	N/A	28.1	101	5453.55
Dec-19	0	N/A	0.0	N/A	28.1	100	5453.45
Jan-20	0	N/A	0.0	N/A	27.9	100	5453.32
Feb-20	0	N/A	0.0	N/A	27.8	99	5453.18
Mar-20	0	N/A	0.0	N/A	27.6	96	5452.88
Apr-20	3.1	55%	2.9	58%	27.8	94	5453.13
May-20	22.3	103%	23.3	94%	26.8	102	5451.88
Jun-20	39.7	114%	38.8	122%	27.7	95	5453

Jul-20	30.5	82%	38.5	90%	19.7	83	5442.6
Aug-20	32.1	100%	33.4	95%	18.3	95	5440.63
Sep-20	14.5	64%	27.3	108%	5.5	34	5415.64
WY 2021	**151.4**	**84%**	**164.2**	**94%**	-	-	-

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 Water Year 2021 can be found in Tables WYT 7, 8, and 9 and Figure WYG2.

Table WYT 7: Reservoir allocations for Pilot Butte Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	5,410.00	3,803	3,803
TOP OF ACTIVE CONSERVATION	5,460.00	33,721	29,918

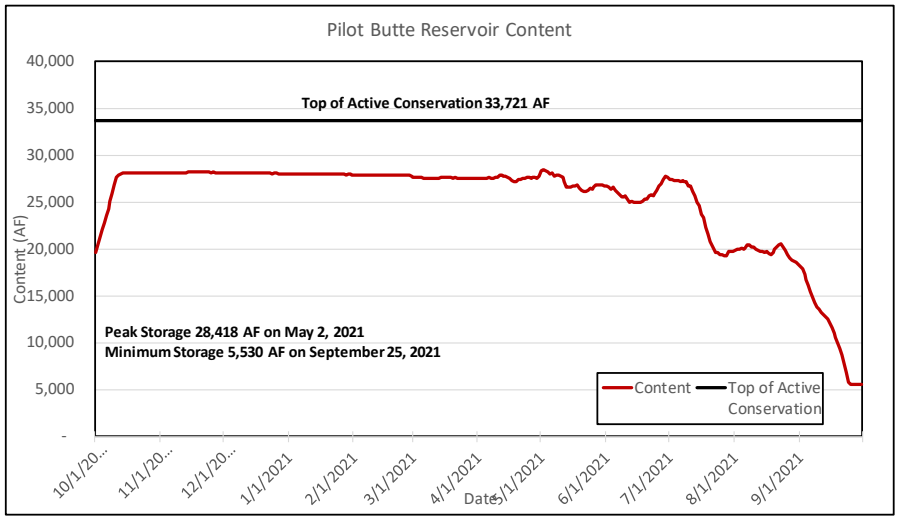
Table WYT 8: Storage and elevation data for Pilot Butte Reservoir.

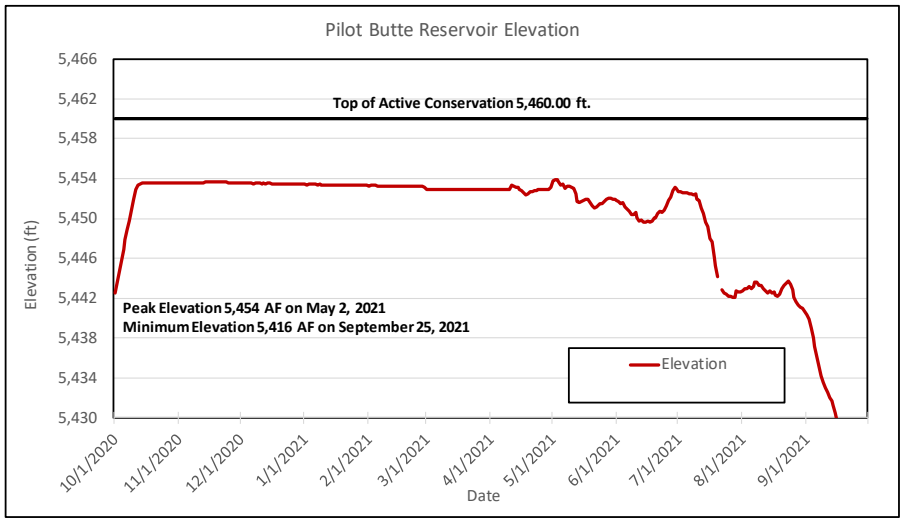
STORAGE-ELEVATION DATA	ELEVATION (FEET)	STORAGE (AF)	DATE
BEGINNING OF YEAR	5442.51	19,644	10/1/2020
END OF YEAR	5,409.00 (approximate)*	0 (approximate)*	9/30/2021
ANNUAL LOW	5,409.00 (approximate)*	0 (approximate)*	9/25/2021
HISTORIC LOW	5,409.00 (approximate)*	0 (approximate)*	9/25/2021
ANNUAL HIGH	5,453.89	28,418	5/2/2021
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)	150,804	Oct '20-Sep '21	164,160	Oct '20-Sep '21
DAILY PEAK (cfs)	891	7/29/2021	731	06/14/2021
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





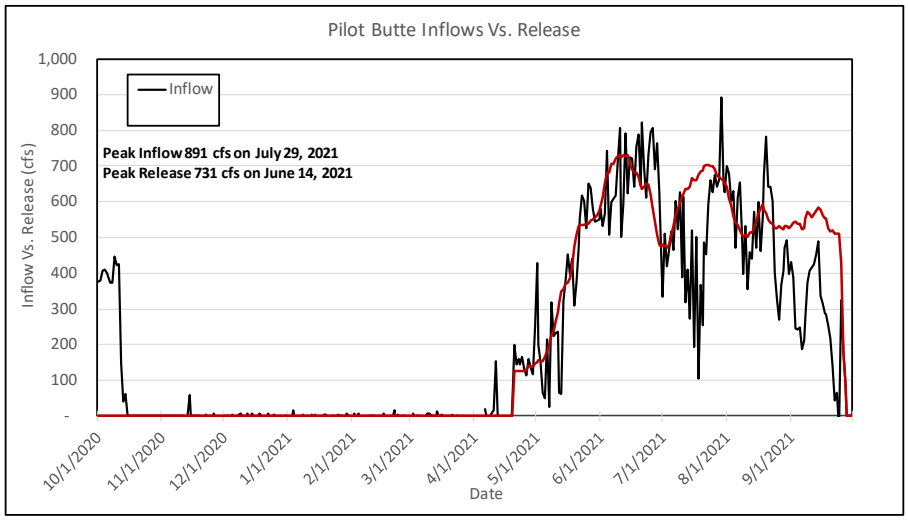


Figure WYG 2: Water Year 2021 storage, forebay elevation, inflow, and release at Pilot Butte Reservoir.

Boysen Reservoir and Powerplant

Boysen Reservoir (P-S MBP) is located on the Wind River above Thermopolis, 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. The reservoir space reserved for the joint-use pool is 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 6 inches of clearance above the reservoir level for prevention of over-topping the gates. When all flood control space is filled, releases cannot be controlled to less than 14,000 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 (P-S MBP) and 3,400 acres on the Lucerne Canal in the Owl Creek Unit (P S MBP). Supplemental water is furnished to other irrigation districts and to a number of 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 2021 Operations

Boysen Reservoir storage at the beginning of WY2021 was 570,006 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, in	percent of 30-yr Average
Oct-20	32.4	58%	43.2	58%	560.5	97%	4714.66	0	0
Nov-20	43.8	88%	41.7	88%	562.6	96%	4714.8	1.06	71
Dec-20	36.3	93%	38.9	93%	560.0	98%	4714.63	2.74	76
Jan-21	32.8	86%	36.8	86%	556.1	99%	4714.37	3.79	67
Feb-21	28.6	74%	33.6	74%	551.1	99%	4714.04	4.85	63
Mar-21	48.9	91%	37.5	91%	562.5	101%	4714.79	7.05	73

Apr-21	41.7	82%	37.1	82%	567.1	106%	4715.09	10.25	86
May-21	102.0	71%	63.2	71%	605.9	109%	4717.52	10.37	89
Jun-21	196.9	68%	77.6	68%	725.3	110%	4724.16	2.18	48
Jul-21	39.7	29%	73.4	29%	691.5	109%	4722.38	0	0
Aug-21	39.1	78%	69.5	78%	661.2	111%	4720.72	0	0
Sep-21	37.5	80%	63.5	80%	635.2	110%	4719.25	0	0
WY 2021	**679.9**	**68%**	**616.0**	**62%**	-	-	-	-	-

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, streamflows, 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 WY2021. 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-21	440	71%
Feb-21	325	52%
Mar-21	400	64%
Apr-21	450	72%
May-21	450	72%
Jun-21	375	60%

During water year 2021, the powerplants associated with Boysen Reservoir had a gross generation of approximately 47,600 MWh (77 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 WYG3.

Important Events – WY2021

October 13, 2020: Winter flow rate was set at 600 cfs.

June 21, 2021: Reservoir releases peak at 1,413 cfs.

June 30, 2021: Peak end of day forebay elevation observed with a pool elevation of 4,724.16 feet (725,266 acre-feet).

Table WYT 12: Reservoir allocations for Boysen Reservoir

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	4,685.00	219,181	219,181
TOP OF ACTIVE CONSERVATION	4,717.00	597,365	378,184
TOP OF JOINT USE	4,725.00	741,594	144,229
TOP OF EXCLUSIVE FLOOD CONTROL	4,732.20	892,226	150,632

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

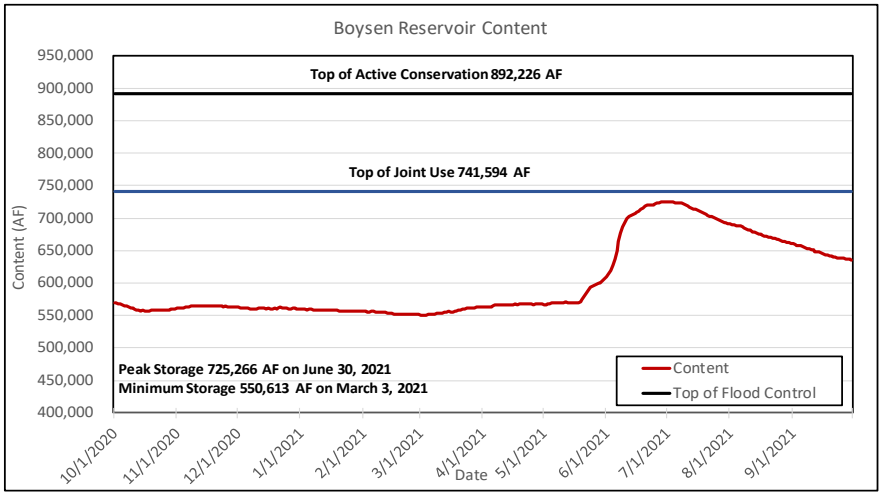
STORAGE-ELEVATION DATA	ELEVATION (FEET)	STORAGE (AF)	DATE
BEGINNING OF YEAR	4715.28	570,006	10/1/2020
END OF YEAR	4,719.25	635,218	9/30/2021
ANNUAL LOW	4,714.01	550,613	3/3/2021
HISTORIC LOW ELEVATION *	4,684.18	N/A	3/18/1956
HISTORIC LOW CONTENT *	N/A	235,737	9/24/2002
ANNUAL HIGH	4,724.16	725,266	6/30/2021
HISTORIC HIGH	4,730.83	922,406	7/6/1967

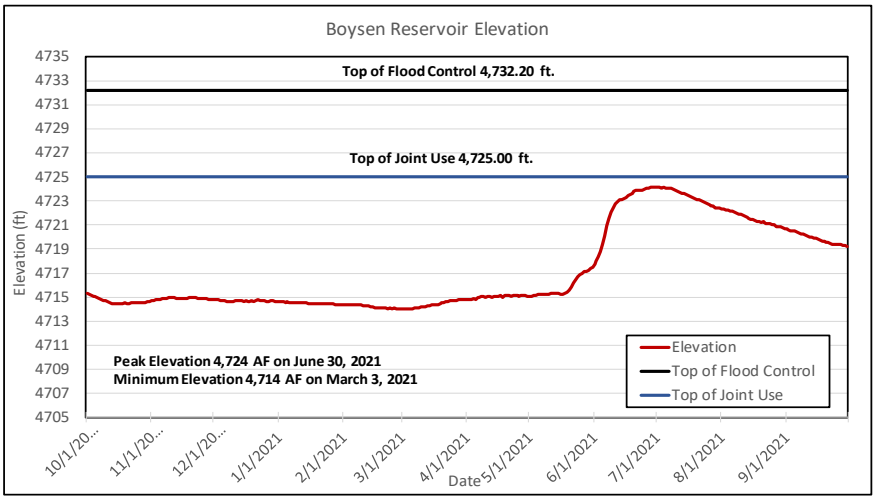
*Because storage space is affected as sediment collects behind the dam, reservoirs are resurveyed periodically to determine actual capacity. Based on the 1994 resurvey of Boysen Reservoir, the historic low content of 235,737 AF occurred at an elevation that was 2.69 feet higher than the historic low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

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

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	679,929	Oct '20-Sep '21	615,960	Oct '20-Sep '21
DAILY PEAK (cfs)	8,523	6/7/2021	1,413	6/21/2021
DAILY MINIMUM (cfs)	0	4/18/2021	563	10/27/2020
PEAK SPILLWAY FLOW (cfs)	N/A	N/A	641	11/4/2020
TOTAL SPILLWAY FLOW (AF)	N/A	N/A	17,496	Oct '20-Sep '21

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





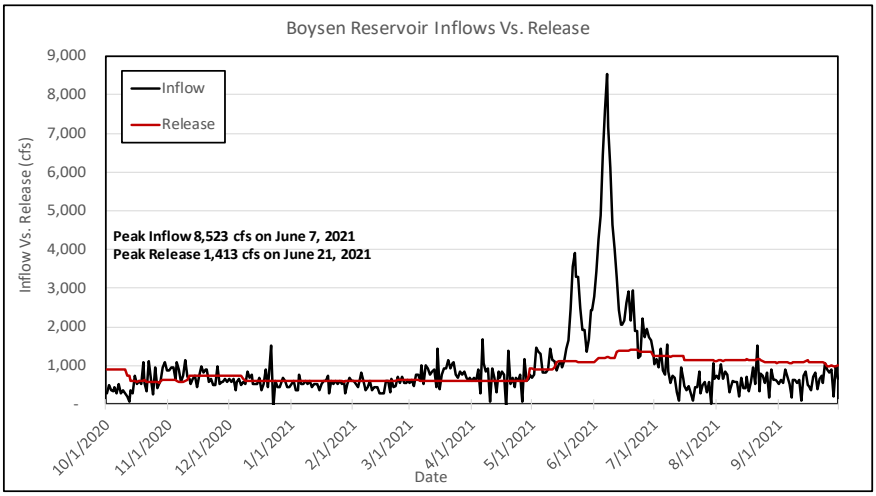


Figure WYG 3: Water Year 2021 storage, forebay elevation, inflow, and release at Boysen Reservoir.

Anchor Reservoir

Anchor Reservoir (P S MBP) is located on the South Fork of Owl Creek, a tributary of the Bighorn River near Thermopolis, 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 (P S MBP). The dam was completed in November 1960. However, several major sinkholes developed in the lower portion of the reservoir after it began to fill, and corrective work to plug the sinkholes has not been successful. Two dikes, in service since 1979, partition off the portions of the reservoir with high seepage losses. The top of the two dikes are 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 an elevation of 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 will be directed by Wyoming Area Office (WYAO) staff to avoid overtopping of the dikes.

Summary of 2021 Operations

The storage content of Anchor Reservoir at the beginning of WY 2021 was 472 AF. Storage in the reservoir peaked on June 9 at a storage content of 3,401 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 in addition to the normal seepage from the reservoir. For each monthly inflow, outflow, and storage value the corresponding percentage of average (30 years of historical data) are also shown.

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

Month	Inflow, KAF	percent of 30-yr Average	Outflow, KAF	percent of 30-yr Average	Storage, KAF	percent of 30-yr Average	Elevation, ft
Oct-20	0.19	33%	0.13	24%	0.53	137	6362.81
Nov-20	0.03	16%	0.01	5%	0.55	165	6363.28
Dec-20	-0.07	-61%	0.00	N/A	0.48	N/A	6361.63
Jan-21	0.00	-8%	0.00	N/A	0.47	N/A	6361.53
Feb-21	0.01	16%	0.00	N/A	0.49	N/A	6361.89
Mar-21	-0.01	-6%	0.00	N/A	0.47	N/A	6361.53
Apr-21	0.34	58%	0.00	N/A	0.81	141	6368.39
May-21	2.98	77%	1.75	69%	2.05	107	6383.23
Jun-21	4.58	64%	5.82	109%	0.81	22	6368.38
Jul-21	1.70	82%	1.97	59%	0.54	22	6363.03
Aug-21	0.64	270%	0.68	34%	0.49	81	6362.01
Sep-21	0.26	46%	0.26	34%	0.49	125	6361.91
WY 2021	**10.6**	**(68%)**	**10.6**	**(68%)**	-	-	-

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 2021 can be found in Tables 16, 17, and 18 and Figure WYG4.

Table WYT 16: Reservoir allocations for Anchor Reservoir

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	6,343.75	68	68
TOP OF ACTIVE CONSERVATION*	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.

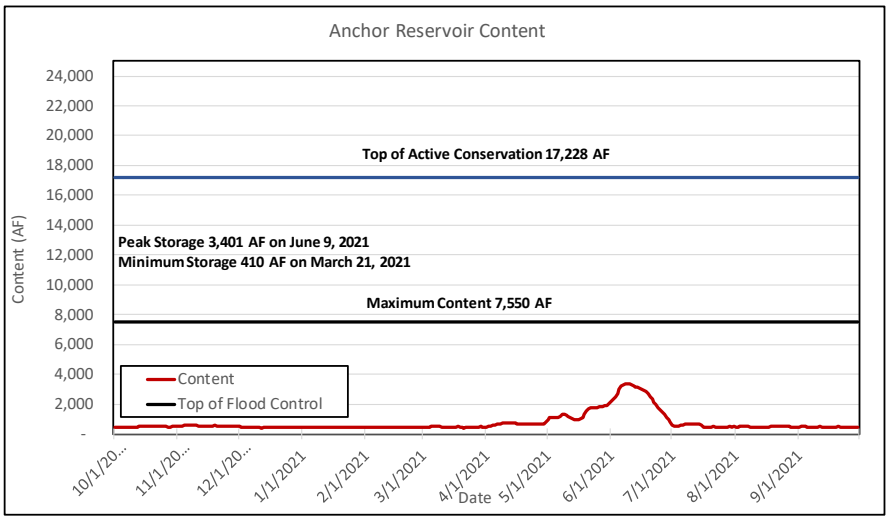
Table WYT 17: Storage and elevation data for Anchor Reservoir.

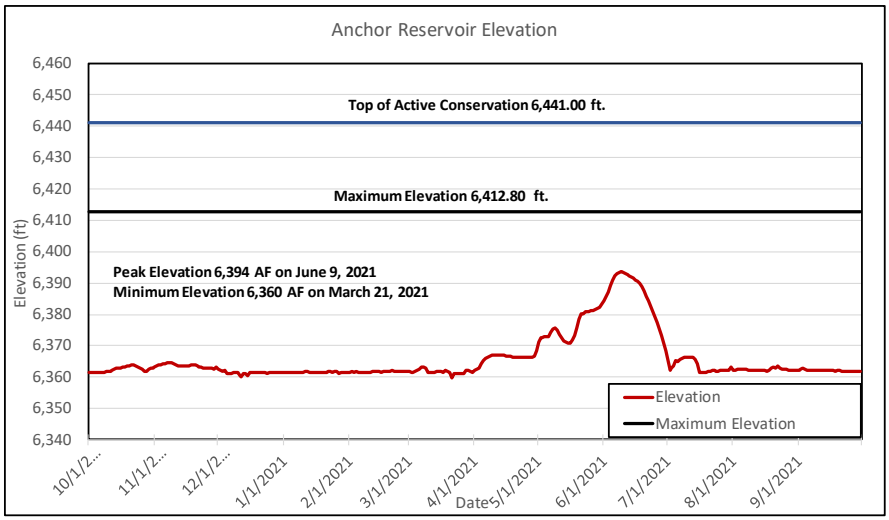
STORAGE-ELEVATION DATA	ELEVATION (FEET)	STORAGE (AF)	DATE
BEGINNING OF YEAR	6361.50	472	10/1/2020
END OF YEAR	6,361.91	488	9/30/2021
ANNUAL LOW	6,359.89	410	3/21/2021
HISTORIC LOW	-	-	-
ANNUAL HIGH	6,393.58	3,401	6/9/2021
HISTORIC HIGH	6,418.52	9,252	7/3/1967

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

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW*	DATE
ANNUAL TOTAL (AF)	10,646	Oct '20-Sep '21	10,629	Oct '20-Sep '21
DAILY PEAK (cfs)	228	6/5/2021	114	6/20/2021
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 6412.80 feet, water flows through a notch in one of the dikes into the sinkhole area. This water is neither measured nor accounted for.





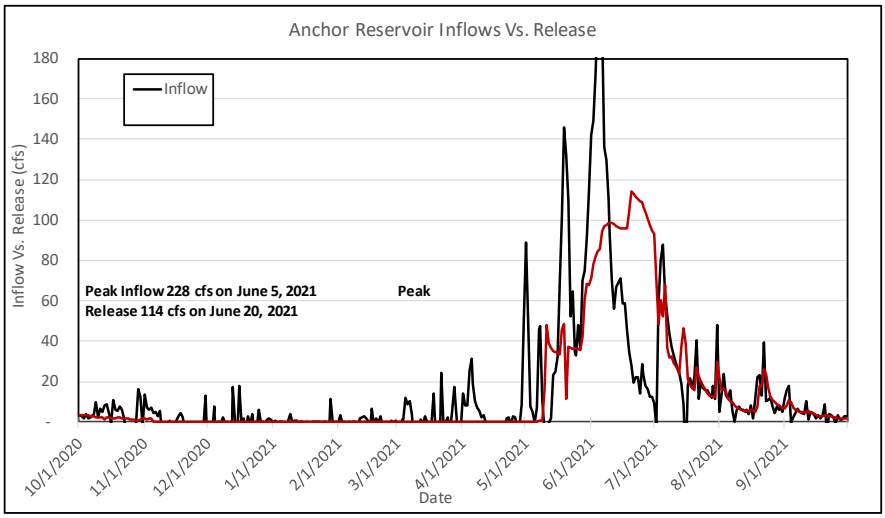


Figure WYG 4: Water Year 2021 storage, forebay elevation, inflow, and release at Anchor Reservoir.

Shoshone Project and Buffalo Bill Unit

The primary features of the original Shoshone Project included Buffalo Bill Dam and Reservoir, Shoshone and Heart Mountain Powerplants, and the canal and lateral systems for the Willwood, Frannie, Garland, and Heart Mountain Divisions. In 1982, The Buffalo Bill Dam and Reservoir Modifications, Shoshone Project, Wyoming, was authorized as the Buffalo Bill Unit (P-S MBP). The principal modifications 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 (P-S MBP), is located on the left bank of the Shoshone River at the toe of Buffalo Bill Dam and releases water directly into the Shoshone River. After 56 years of continuous 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 by the use of the Shoshone Powerplant. A maximum release of approximately 200 cfs can be made through the Shoshone Powerplant.

Buffalo Bill Powerplant, Buffalo Bill Unit (P-S MBP), with a nameplate capability of 18,000 kW, is located about 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 (P-S 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 2021 Operations

Buffalo Bill began WY 2021 with 448,077 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, end of month storage, and forebay elevation at Buffalo Bill Reservoir. First of month SWE values, as represented by the SNOTEL sites within the basin above Buffalo Bill Reservoir, are also shown. For each monthly inflow, outflow, storage, and SWE value the corresponding percentage of average (30 years of historical data) are also shown.

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

Month	Inflow, KAF	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-20	32.8	114%	56.2	133%	426.7	97%	5364.06	0	N/A
Nov-20	27.9	117%	12.4	61%	442.2	100%	5366.34	2.72	154
Dec-20	17.6	103%	12.0	65%	447.8	102%	5367.14	5.64	116
Jan-21	14.5	92%	11.8	68%	450.4	104%	5367.52	7.36	93
Feb-21	11.7	86%	10.7	62%	451.4	105%	5367.67	8.92	81
Mar-21	19.6	91%	13.8	52%	457.3	108%	5368.51	13.68	100
Apr-21	40.0	86%	79.0	113%	418.3	105%	5362.83	15.08	91
May-2	165.6	87%	121.9	88%	462.1	103%	5369.17	12.08	71
Jun-21	278.5	83%	125.3	63%	615.4	105%	5389.6	6.42	68
Jul-21	63.3	36%	123.8	70%	554.8	95%	5381.78	0	N/A
Aug-21	31.5	72%	104.2	92%	482.0	94%	5371.95	0	N/A
Sep-21	16.8	65%	93.2	106%	405.6	90%	5360.89	0	N/A
WY 2021	**719.9**	**(77%)**	**764.3**	**(82%)**					

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, streamflows, 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 WY2021. For each forecast, Table WYT 20 shows the percent of average of the forecast compared to 30 years of historical inflow data.

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

Month Forecast Made	April-July Inflow Forecast, KAF	% of 30-yr Average
Jan-21	675	90%
Feb-21	650	87%
Mar-21	700	93%
Apr-21	700	93%
May-21	600	80%
Jun-21	550	73%

During water year 2021, the powerplants associated with Buffalo Bill Reservoir had a gross generation of approximately 111,600 MWh.

Important Events – WY2021

October 18, 2021: End of 2021 irrigation diversions by the Shoshone Projects.

October 18, 2021: Releases to the Shoshone River reduced to the winter outflow rate of 200 cfs.

April 19, 2021: Irrigation diversions by the Shoshone Project were initiated for the WY 2021 irrigation season.

June 29, 2021: Buffalo Bill Reservoir reached a peak pool elevation for the water year of 5,389.6 ft.

Table WYT 21: Reservoir allocations for Buffalo Bill Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	5,259.60	41,748	41,748
TOP OF ACTIVE CONSERVATION	5,393.50	646,565	604,817

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

STORAGE-ELEVATION DATA	ELEVATION (FEET)	STORAGE (AF)	DATE
BEGINNING OF YEAR	5367.17	448,077	10/1/2020
END OF YEAR	5,360.89	405,647	9/30/2021
ANNUAL LOW	5,360.89	405,647	9/30/2021
HISTORIC LOW*	-	19,080	1/31/1941
ANNUAL HIGH	5,389.60	615,358	6/29/2021
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 Bull Lake Reservoir.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW*	DATE
ANNUAL TOTAL (AF)	719,874	Oct '20-Sep '21	764,348	Oct '20-Sep '21
DAILY PEAK (cfs)	9,189	6/6/2021	3,775	4/8/2021
DAILY MINIMUM (cfs)	48*	3/30/2021	189	2/14/2021
PEAK SPILLWAY FLOW (cfs)	-	-	24	4/7/2021
TOTAL SPILLWAY FLOW (AF)	-	-	48	Oct '20-Sep '21

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

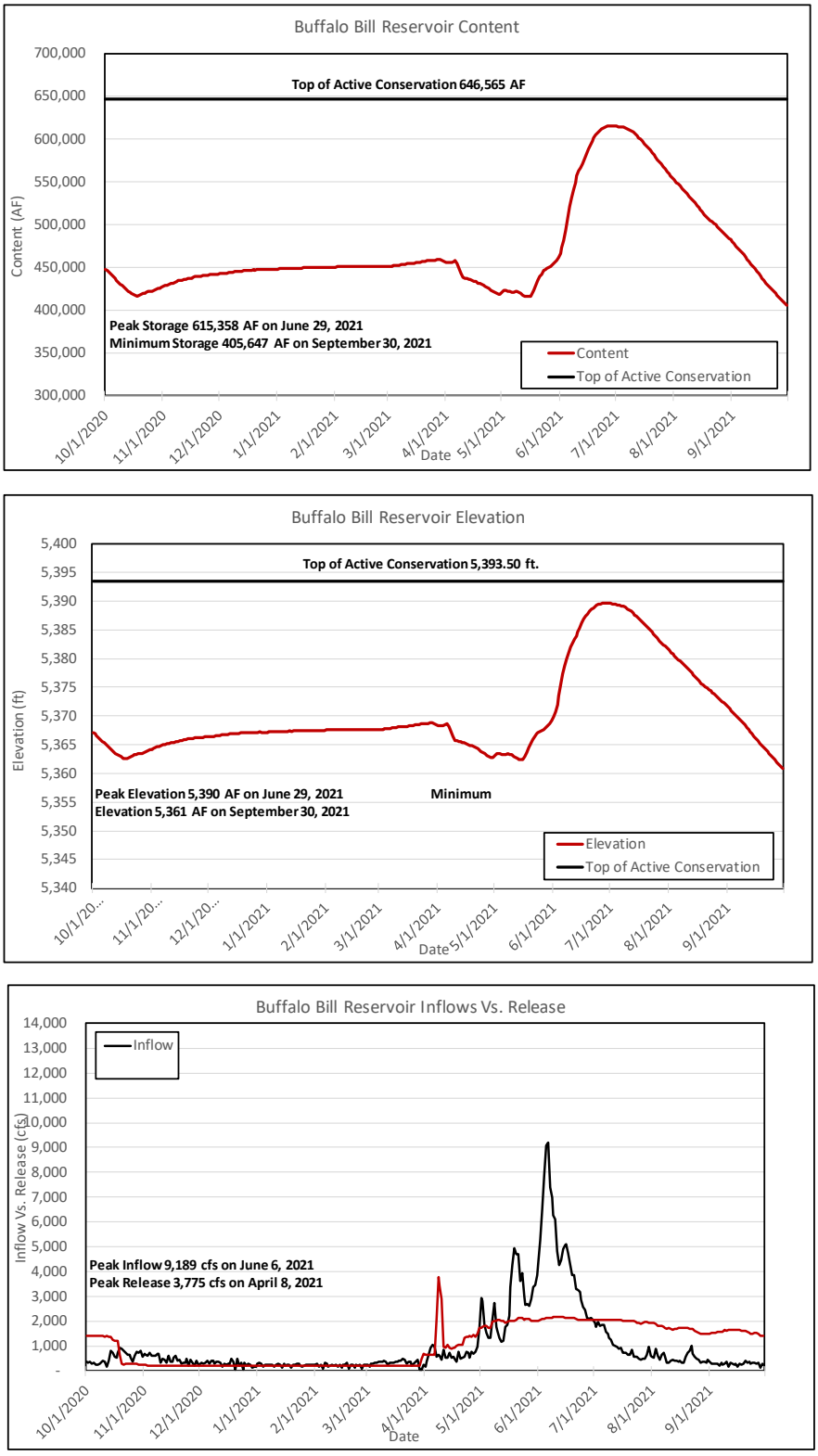


Figure WYG 5: Water Year 2021 storage, forebay elevation, inflow, and release at Buffalo Bill Reservoir.

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

Flushing flow from Boysen Reservoir are often performed in the Spring (when possible given other demands) to support the downstream fisheries. The Wyoming Game and Fish Department (WGF) did not request a flushing flow in WY 2021.

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 WY 2021, 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 Feet. 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 feet 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 WY2021 were adequate for recreational activities on Buffalo Bill Reservoir.

Water Year 2021 Flood Benefits

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

Reservoir	Local	Main Stem	2021 Total	Previous Accumulation[3]	1950 - 2021 Accumulation Total
Bull Lake[2]	0	0	0	$4,120,100	$4,120,100
Boysen	0	$2,243,800	$2,243,800	$365,994,600	$368,238,400
Buffalo Bill[2]	$647,800	0	$647,800	$67,858,600	$68,506,400

1/ This data is received from the Army Corps of Engineers Omaha District Office and is revised every October. The period of assessment is 1950 - 2021.
2/ No space is allocated to flood control, but some flood protection is provided by operation for other purposes.
3/ Adjusted in 2006 by 0.1 to 0.5 to account for previous rounding of cumulative total to nearest 1.0.
4/ In 2012, flood damages prevented in 2011 at Boysen Reservoir were revised. The accumulated total for Boysen Reservoir has been corrected to reflect the revision.

Outlook and Annual Operating Plans for Water Year 2022 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 2021 to project operations under various runoff conditions for WY 2022. 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 Midvale Irrigation District (Midvale). Under normal operation, the reservoir also provides flood control benefits and a water resource for fish, wildlife, and recreation. Bull Lake is operated under the following criteria and limitations:

(1) Based on forecasted inflows, March-June releases are scheduled with the objective of filling the lake to a content of 151,000 AF at elevation 5,804.50 feet during July while eliminating or minimizing any spill.

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

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

(4) Reclamation identified deficiencies in the existing spillway at Bull Lake Dam and determined the preferred corrective action was to construct a new labyrinth spillway and remove the existing spillway (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 due to unforeseen groundwater issues near the new Spillway the project has been delayed at least a year (completion in 2023). Heavy equipment to use alternate access south side Bull Lake Creek. Normal access route along Bull Lake Creek will remain open for non-construction traffic. USFWS/Tribes asked us to avoid using to reduce disturbance to wintering trumpeter swans which will not interfere with normal reservoir operations. Reservoir will be lowered to 5,777 feet (74,000 acre-feet) for cofferdam installation/removal in fall 2022 of the construction period of 2022–2023. Access across dam will be closed during bridge removal/relocation and cofferdam completion at existing spillway; alternate access to east side of dam will be provided, no dam crest closure in the month of April. Access to left abutment of dam may experience up to 15-minute delays. Access to creek below construction areas will remain open. Contract specifications requires Contractor to meet Tribal Employment Rights Office (TERO) requirements 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.

2022 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 Midvale lands directly or routed through Pilot Butte Reservoir and delivered to district lands via the Pilot Canal.

Table WYT 25: Monthly Operating Plans for Water Year 2022 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	5.3	3.3	2.2	2.6	1.8	2	4.3	29.5	68.9	38.7	18.9	7.9	185.4
Total Dam Release	kaf	1.5	1.5	1.5	1.5	1.4	1.5	1.5	32.6	31.5	7.7	52.8	51	186.1
Total Dam Release	cfs	25	25	25	25	25	25	25	530	530	125	858	858	-
Excess Release	kaf	0	0	0	0	0	0	0	31	30	6.2	10.5	18	95.8
End-month Content	kaf	78.5	80.3	80.9	82	82.4	82.9	85.7	82.6	120	151	117.1	74	-
End-month Elevation	ft	5778.8	5779.6	5779.8	5780.3	5780.4	5780.6	5781.7	5780.5	5794.3	5804.5	5793.3	5777	-
BLR Net Change	kaf	3.8	1.8	0.7	1.1	0.4	0.5	2.8	-3.1	37.4	31	-33.9	-43.1	-0.7
Wind River														
Flow abv BL Creek	kaf	34.9	25	19.1	18	16.6	19.6	29.2	100.6	184.9	120.6	51.4	35.6	655.5
Crowheart Gage Flow	kaf	36.4	26.5	20.6	19.5	18	21.1	30.7	133.2	216.4	128.3	104.2	86.6	841.6
Flow Below Div Dam	kaf	36.2	19.3	20.6	19.5	18	21.1	4.7	69.3	151.7	47.4	40.3	23	471.2
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	0	0	0	0	0	0	1.8	6.1	6	6.1	5.5	4.5	30
LeClair/Riverton	kaf	0	0	0	0	0	0	3.5	18.8	24.2	27.2	21.1	15	109.8
LeC/Riv Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverton Gage Flow	cfs	589.3	324.1	335.6	317.7	323.9	343.8	70	840.8	2163	348.5	321.5	150.3	-
Wyoming Canal														
Total Diversion	kaf	0.2	7.2	0	0	0	0	26	63.9	64.7	80.9	63.9	63.6	370.4
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	0.2	7.2	0	0	0	0	16.2	37.5	33.5	44.4	27.8	33.6	200.4

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
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	0	0	0	0	0	0	0
Pilot Canal Shortage	kaf	0	0	0	0	0	0	6.7	28	33.1	43.9	37.4	33.3	182.4
End-month Content	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
PBR Net Change	kaf	3	10	9.9	9.8	9.7	9.5	18.8	28	28	28	18	18	-
End-month Elevation	ft	0	7	-0.1	-0.1	-0.1	-0.2	9.3	9.2	0	0	-10	0	15

Based on Most Probable April-July runoff of: Bull Lake – 141.4 kaf / Wind River ab Bull Lake Creek – 435.3 kaf. This plan assumes an annual demand of 170 KAF for the North Canal and 200 KAF for the Pilot Canal

Table WYT 26: Monthly Operating Plans for Water Year 2022 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	26	36.7	23.9	13.9	5	121.7
Total Dam Release	kaf	1.5	1.5	1.5	1.5	1.4	1.5	6.4	3.4	14.8	42.3	65.5	5	146.4
Total Dam Release	cfs	25	25	25	25	25	25	107	56	248	688	1066	84	-
Excess Release	kaf	0	0	0	0	0	0	0	1.6	13.3	0	0	0	14.9
End-month Content	kaf	77.5	78.6	79.1	79.3	79.1	79.1	75.5	98.1	120	101.6	50	50	-
End-month Elevation	ft	5778.4	5778.9	5779.1	5779.2	5779.1	5779.1	5777.6	5786.4	5794.3	5787.7	5766.5	5766.5	-
BLR Net Change	kaf	2.8	1.1	0.6	0.2	-0.2	0	-3.6	22.6	21.9	-18.4	-51.6	0	-24.7
Wind River														
Flow abv BL Creek	kaf	28.6	21.4	17.2	15	13.7	16.5	20.5	74.8	102.8	58.9	36.1	27	432.5
Crowheart Gage Flow	kaf	30.1	22.9	18.7	16.5	15.1	18	26.9	78.2	117.6	101.2	101.6	32	578.9
Flow Below Div Dam	kaf	26.5	15.7	18.7	16.5	15.1	18	4.7	21.9	41.5	30.3	24.8	18.3	252
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	0	0	0	0	0	0	1.8	6.1	6	6.1	5.5	4.5	30
LeClair/Riverton	kaf	0	0	0	0	0	0	3.5	18.8	24.2	27.2	21.1	15	109.8

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LeC/Riv Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverton Gage Flow	cfs	431.6	263.6	304.7	269	271.7	293.3	70	70	310.9	70	70	70	-
Wyoming Canal														
Total Diversion	kaf	3.6	7.2	0	0	0	0	22.2	56.3	76.1	70.9	76.8	13.7	326.9
North Canal Flow	kaf	0	0	0	0	0	0	9.8	26.4	31.2	36.5	50	7.6	161.5
North Canal Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	25.4	25.4
Pilot Butte Reservoir (Initial content: 18.9 KAF)														
Reservoir Inflow	kaf	3.6	7.2	0	0	0	0	12.4	29.9	44.9	34.4	26.8	6.1	165.4
Power Generated	mwh	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot Canal Release	kaf	3.4	0	0	0	0	0	6.7	28	33.1	43.9	37.4	12.9	165.4
Pilot Canal Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	20.4	20.4
End-month Content	kaf	3	10	9.9	9.8	9.7	9.5	15	16.6	28	18	7	0	-
PBR Net Change	kaf	0	7	-0.1	-0.1	-0.1	-0.2	5.5	1.6	11.4	-10	-11	-7	-3
End-month Elevation	ft	5419.2	5433.5	5433.3	5433.2	5433	5432.6	5441.3	5443.6	5457.8	5445.5	5428.2	5410	-

Based on Minimum April-July runoff of: Bull Lake – 89.4 kaf / Wind River ab Bull Lake Creek – 257 kaf. This plan assumes an annual demand of 162 KAF for the North Canal and 165 KAF for the Pilot Canal

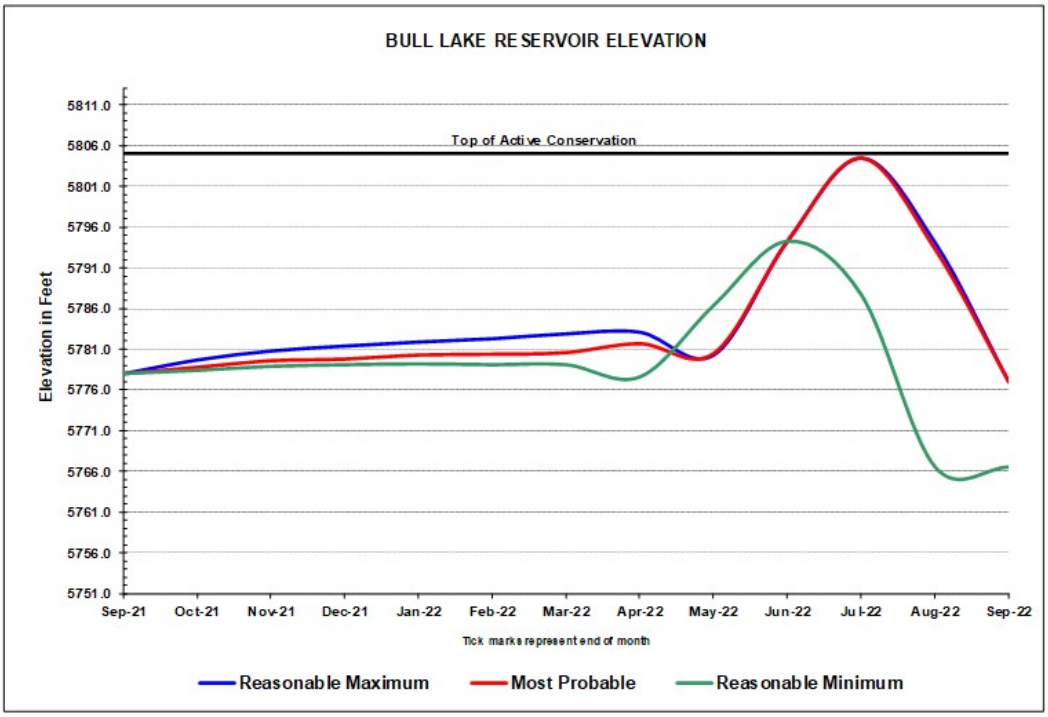
Table WYT 27: Monthly Operating Plans for Water Year 2022 for Bull Lake Reservoir and other Riverton Unit features based on the Maximum Probable runoff scenario.

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	34.5	77.9	51.5	30	14.1	236.6
Total Dam Release	kaf	1.5	1.5	1.5	1.5	1.4	1.5	4.7	41.5	40.1	20.5	61.5	59.6	236.9
Total Dam Release	cfs	25	25	25	25	25	25	78	675	675	333	1001	1001	-
Excess Release	kaf	0	0	0	0	0	0	0	39.9	38.7	19	50.4	19.5	167.5
End-month Content	kaf	80.7	83.5	85	86.2	87.2	88.7	89.2	82.2	120	151	119.5	74	-
End-month Elevation	ft	5777	5777	5777	5777	5777	5777	5777.1	5777	5794.3	5804.5	5794.5	5777	-

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
BLR Net Change	kaf	6.4	2.8	1.6	1.2	1	1.5	0.5	-7	37.8	31	-31.5	-45.5	-0.3
Wind River														
Flow abv BL Creek	kaf	35.8	25.7	21.3	18.7	15.6	21.5	27	132	188.3	196.6	77.3	43.6	803.4
Crowheart Gage Flow	kaf	37.3	27.2	22.8	20.2	17	23	31.7	173.5	228.4	217.1	138.8	103.2	1040.3
Flow Below Div Dam	kaf	36.4	20	22.8	20.2	17	23	9.5	105.8	163.7	136.2	80.1	60.6	695.4
Gain/Return Flow	kaf	0	0	0	0	0	0	4.8	7.4	7.1	7.4	6.1	5.4	38.2
Indian Irrigation	kaf	0	0	0	0	0	0	1.8	6.1	6	6.1	5.5	4.5	30
LeClair/Riverton	kaf	5	0	0	0	0	0	3.5	18.8	24.2	27.2	21.1	15	114.8
LeC/Riv Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverton Gage Flow	cfs	511.3	335.9	371.4	329.1	305.9	374.7	150	1434.6	2365.1	1792.7	970.2	780.6	-
Wyoming Canal														
Total Diversion	kaf	0.9	7.2	0	0	0	0	22.2	67.7	64.7	80.9	58.7	42.6	344.9
North Canal Flow	kaf	0	0	0	0	0	0	9.8	26.4	31.2	36.5	30.9	27	161.8
North Canal Shortage	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot Butte Reservoir (Initial content: 18.9 KAF)														
Reservoir Inflow	kaf	0.9	7.2	0	0	0	0	12.4	41.3	33.5	44.4	27.8	15.6	183.1
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
End-month Content	kaf	3	10	9.9	9.8	9.7	9.5	15	28	28	28	18	0	-
PBR Net Change	kaf	0.7	7	-0.1	-0.1	-0.1	-0.2	5.5	13	0	0	-10	-18	-2.3
End-month Elevation	ft	5419.2	5433.5	5433.3	5433.2	5433	5432.6	5441.3	5457.8	5457.8	5457.8	5445.5	5410	-

Based on Maximum April-July runoff of: Bull Lake – 169.1 kaf / Wind River ab Bull Lake Creek – 543.9 kaf. This plan assumes an annual demand of 162 KAF for the North Canal and 183 KAF for the Pilot Canal

BULL LAKE RESERVOIR



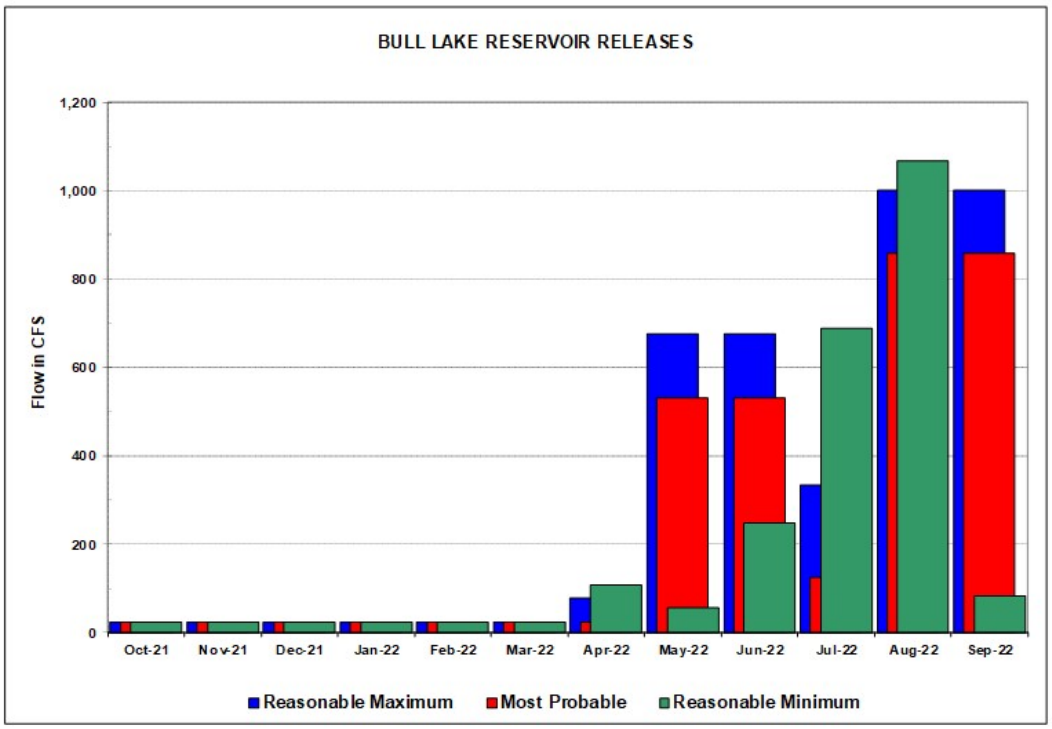


Figure WYG 6: Water Year 2022 forebay elevation and inflow at Bull Lake Reservoir under a Minimum, Expected, and Maximum runoff forecast.

Boysen Reservoir and Powerplant

Three operating plans were prepared in October 2021 to project water operations under various inflow conditions during WY 2022. The operations for the three runoff conditions are shown in Tables WYT 28, 29 and 30, and Figure WYG7. These plans are presented only to show the probable limits of operations and therefore, actual conditions and operations could vary widely from the most probable plan.

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

Irrigation Season Release

During the irrigation season, water releases from Boysen Reservoir are made to satisfy all downstream senior water rights and storage contract commitments. Generally, demands for downstream senior water rights are met with a reservoir release between 900 and 1,200 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 Wyoming Game and Fish Department considers 800 cfs to be the preferred fishery flow from October - 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

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

(2) March - July: Based upon monthly water supply forecasts and as soon as river ice conditions allow, releases are scheduled to meet the irrigation demand as a minimum. Greater releases may be made if necessary, to eliminate or minimize a spill, with the objective of filling the reservoir to elevation 4,724.50 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 2 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.

(3) August - September: As soon as storage has peaked, water releases are scheduled to meet the irrigation demand and generate power. Releases above what is needed to meet irrigation demand may be made to generate power and prevent the need to release water through the spillway gates if inflow conditions warrant.

2022 Operating Plans

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

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

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

Table WYT 28: Monthly Operating Plans for Water Year 2022 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	61.4	49.6	40.3	38.7	38.7	50.5	44	163.8	314.7	129.6	52.4	43.9	1027.6
Monthly Inflow	cfs	999	834	655	629	697	821	739	2664	5289	2108	852	738	-
Turbine Release	kaf	52.3	41.7	43	43	38.9	61.5	133.9	142	134.4	122.7	83.4	80.7	977.5
Bypass/Spill/Waste	kaf	0	0	0	0	0	0	0	4.7	16.5	0	0	0	21.2
Total Release	kaf	52.3	41.7	43	43	38.9	61.5	133.9	146.7	150.9	122.7	83.4	80.7	998.7
Total Release	cfs	851	701	699	699	700	1000	2250	2386	2536	1996	1356	1356	-
End-Month Content	kaf	644.3	652.2	649.5	645.2	645	634	544.1	561.2	725	731.9	700.9	664.1	-
End-Month Elevation	ft	4719.77	4720.21	4720.06	4719.82	4719.81	4719.18	4713.57	4714.71	4724.15	4724.5	4722.88	4720.88	-
Net Change Content	kaf	9.1	7.9	-2.7	-4.3	-0.2	-11	-89.9	17.1	163.8	6.9	-31	-36.8	28.9
Boysen Power Plant														
Turbine Release	kaf	52.3	41.7	43	43	38.9	61.5	133.9	142	134.4	122.7	83.4	80.7	977.5
Turbine Release	cfs	851	701	699	699	700	1000	2250	2309	2259	1996	1356	1356	-
Generation	gwh	4.574	3.674	3.794	3.787	3.422	5.363	11.155	11.54	11.517	11.041	7.52	7.157	84.544
Max Generation	gwh	10.237	5.76	11.904	5.952	10.752	11.904	11.52	11.904	11.52	11.904	11.904	11.52	126.781
Percent Max Generation	%	45	64	32	64	32	45	97	97	100	93	63	62	-
Ave	kwh/af	87	88	88	88	88	87	83	81	86	90	90	89	86
End-Month Power Cap	mw	16	16	16	16	16	16	15	16	16	16	16	16	-

Based on Most Probable April-July inflow of 652 KAF.

Table WYT 29: Monthly Operating Plans for Water Year 2022 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	24.2	36.3	443.3
Monthly Inflow	cfs	564	627	509	483	497	670	528	992	986	486	394	610	-
Turbine Release	kaf	55.3	35.7	36.9	36.9	33.3	36.9	41.7	67.6	74.4	76.9	70.7	65.5	631.8
Bypass/Spill/Waste	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Release	kaf	55.3	35.7	36.9	36.9	33.3	36.9	41.7	67.6	74.4	76.9	70.7	65.5	631.8
Total Release	cfs	899	600	600	600	600	600	701	1099	1250	1251	1150	1101	-
End-Month Content	kaf	614.6	616.2	610.6	603.4	597.7	602	591.7	585.1	569.4	522.4	475.9	446.7	-
End-Month Elevation	ft	4718.04	4718.14	4717.8	4717.37	4717.02	4717.28	4716.65	4716.24	4715.24	4712.1	4708.77	4706.54	-
Net Change Content	kaf	-20.6	1.6	-5.6	-7.2	-5.7	4.3	-10.3	-6.6	-15.7	-47	-46.5	-29.2	-188.5
Boysen Power Plant														
Turbine Release	kaf	55.3	35.7	36.9	36.9	33.3	36.9	41.7	67.6	74.4	76.9	70.7	65.5	631.8
Turbine Release	cfs	899	600	600	600	600	600	701	1099	1250	1251	1150	1101	-
Generation	gwh	4.793	3.097	3.197	3.186	2.864	3.173	3.571	5.716	6.233	6.314	5.627	5.005	52.776
Max Generation	gwh	10.237	5.76	11.904	5.952	10.752	11.904	11.52	11.904	11.52	11.904	11.904	11.52	126.781
Percent Max Generation	%	47	54	27	54	27	27	31	48	54	53	47	43	-
Ave	kwh/af	87	87	87	86	86	86	86	85	84	82	80	76	84
End-Month Power Cap	mw	16	16	16	16	16	16	16	16	16	15	15	14	-

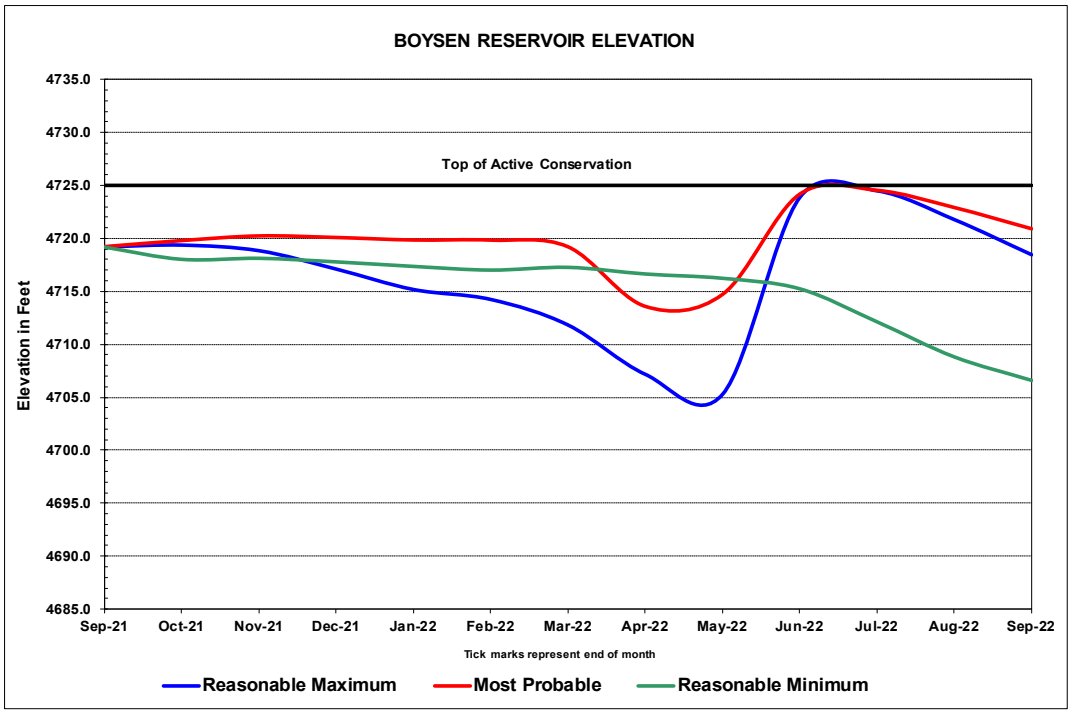
Based on reasonable minimum April-July inflow of 181 kaf.

Table WYT 30: Monthly Operating Plans for Water Year 2022 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	75.9	62.3	44.7	43.1	52.1	62.7	70.2	245	549.7	317.9	74.3	63	1660.9
Monthly Inflow	cfs	1234	1047	727	701	938	1020	1180	3985	9238	5170	1208	1059	-
Turbine Release	kaf	73.8	66.5	73.8	70.7	66.6	98.4	133.9	134.9	137.2	135.7	125.8	121.7	1239
Bypass/Spill/Waste	kaf	0	4.9	0	3.1	0	0	0	134	123.1	170.3	0	0	435.4
Total Release	kaf	73.8	71.4	73.8	73.8	66.6	98.4	133.9	268.9	260.3	306	125.8	121.7	1674.4
Total Release	cfs	1200	1200	1200	1200	1199	1600	2250	4373	4374	4977	2046	2045	-
End-Month Content	kaf	637.3	628.2	599.1	568.4	553.9	518.2	454.5	430.6	720	731.9	680.4	621.7	-
End-Month Elevation	ft	4719.37	4718.84	4717.1	4715.17	4714.23	4711.81	4707.15	4705.27	4723.89	4724.5	4721.78	4718.46	-
Net Change Content	kaf	2.1	-9.1	-29.1	-30.7	-14.5	-35.7	-63.7	-23.9	289.4	11.9	-51.5	-58.7	-13.5
Boysen Power Plant														
Turbine Release	kaf	73.8	66.5	73.8	70.7	66.6	98.4	133.9	134.9	137.2	135.7	125.8	121.7	1239
Turbine Release	cfs	1200	1118	1200	1150	1199	1600	2250	2194	2306	2207	2046	2045	-
Generation	gwh	6.404	5.759	6.324	5.952	5.528	7.984	10.279	9.543	11.117	11.901	11.193	10.528	102.512
Max Generation	gwh	10.237	5.76	11.904	5.952	10.752	11.904	11.52	11.904	11.52	11.904	11.904	11.52	126.781
Percent Max Generation	%	63	100	53	100	51	67	89	80	97	100	94	91	-
Ave	kwh/af	87	87	86	84	83	81	77	71	81	88	89	87	83
End-Month Power Cap	mw	16	16	16	16	16	15	14	13	16	16	16	16	-

Based on reasonable maximum April-July inflow of 1183 kaf.

BOYSEN RESERVOIR



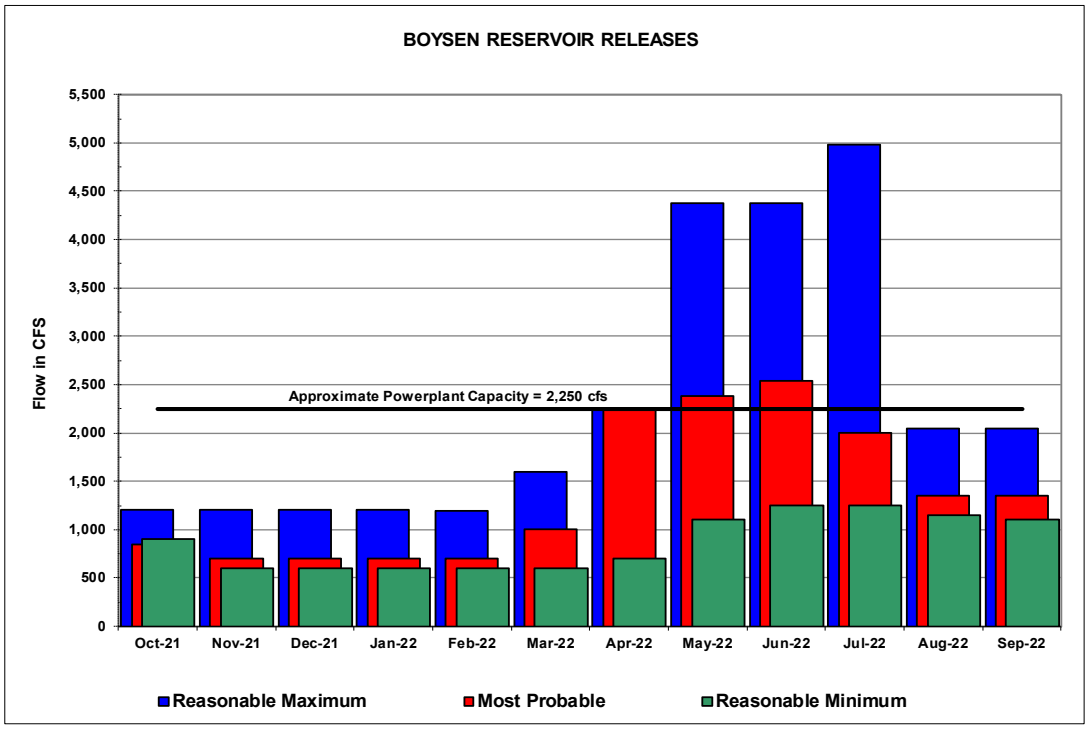


Figure WYG 7: Water Year 2022 forebay elevation and inflow at Boysen Reservoir under a Minimum, Expected, and Maximum runoff forecast.

Buffalo Bill Reservoir and Powerplants

Three operating plans were prepared for WY 2022 to show the operations of Buffalo Bill Reservoir that could occur under various runoff conditions. The operations for the three runoff conditions are shown in Tables WYT 31, 32, and 33 and Figure WYG 8. These plans were prepared only to show the probable limits of operations; therefore, actual conditions and operations could vary widely from the most probable plan.

Normal Operating Procedures

At the end of the irrigation season, releases will be adjusted with the objective of filling the reservoir to elevation 5,393.50 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, and municipal and industrial demand. If snow conditions, inflow, and reservoir content indicate an assured fill of the reservoir, additional releases may be required after the start of the spring runoff to provide flood control and make optimum use of the water for power generation. An attempt is made to maintain a release of 7,000 cfs or less during the runoff season and assures that outflow is less than inflow at all times of flood rate inflow.

2022 Operating Plans

Under most probable inflow conditions, projected inflows for October, November, and December of WY 2022 have been adjusted to reflect the recent trends for the basin. Inflows for January through September of WY 2022 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 WY 2022. 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 WY 2022 in the reasonable maximum inflows operating plan.

At the beginning of WY 2022, storage in Buffalo Bill Reservoir was 403,231 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 2022 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 WY 2022 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 Water Year 2022 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	26.8	20.4	16.3	16.3	13.4	21.9	41.7	157.2	299.1	157.4	42	19.7	832.2
Shoshone Release	kaf	6.2	6	6.2	6.2	5.6	6.2	6	11.2	11.3	11.2	6.2	6	88.3
Non-Power Release	kaf	0	0	0	0	0	0	0	0	12.3	15	0	0	27.3
Total Flow Below Dam	kaf	6.2	6	6.2	6.2	5.6	6.2	6	11.2	23.6	26.2	6.2	6	115.6
Buffalo Bill Release	kaf	15.3	5.9	6.1	6.1	5.5	6.1	9.4	55.4	51.6	51.5	49.6	49	311.5
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	13	0	0	0	0	0	18	18.6	18	18.6	6.6	0.9	93.7
Heart Mtn Delivery	kaf	8	0	0	0	0	0	7	36	42	48	41	33	215
Total Outflow	kaf	42.8	12.2	12.6	12.6	11.4	12.6	40.7	121.5	135.5	144.6	103.7	89.2	739.4
Spill/Waste	kaf	0	0	0	0	0	0	0	0	10.5	10.8	0	0	21.3
End-Month Targets	kaf		463.9					463.9			626.2			-
End-Month Content	kaf	386.2	394.4	398.1	401.8	403.8	413.1	414.1	449.8	613.4	626.2	564.5	495	-
Est Total Storage	kaf	389.6	397.8	401.5	405.2	407.2	416.5	417.5	453.2	616.8	629.6	567.9	498.4	-
End-Month Elevation	ft	5358.49	5359.77	5360.34	5360.91	5361.21	5362.63	5362.78	5368.01	5389.89	5391.5	5383.6	5374.31	-
Net Change Content	kaf	-16	8.2	3.7	3.7	2	9.3	1	35.7	163.6	12.8	-61.7	-69.5	92.8
Flow Below BB Pwr	kaf	21.5	11.9	12.3	12.3	11.1	12.3	15.4	66.6	75.2	77.7	55.8	55	427.1
Flow Below BB Pwr	cfs	350	200	200	200	200	200	259	1083	1264	1264	908	924	
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	38.2	15.5	16	16	14.4	16	37	88.9	96.8	100	66.1	59.5	564.4
Passing Cody Gage	cfs	621	260	260	260	259	260	622	1446	1627	1626	1075	1000	
Shoshone Power Plant														
Shoshone Release	kaf	6.2	6	6.2	6.2	5.6	6.2	6	11.2	11.3	11.2	6.2	6	88.3
Generation	gwh	1.094	1.055	1.095	1.098	0.993	1.104	1.072	2.021	2.152	2.231	1.226	1.147	16.288
Max Generation	gwh	2.232	1.08	1.116	2.232	2.016	2.232	2.16	2.232	2.16	2.232	2.232	2.16	24.084
Percent Max Generation	-	49	98	98	49	49	49	50	91	100	100	55	53	-
Ave	kwh/af	176	176	177	177	177	178	179	180	190	199	198	191	184
End-Month Power Cap	mw	3	2	2	3	3	3	3	3	3	3	3	3	-
Buffalo Bill Power Plant														
Buffalo Bill Release	kaf	15.3	5.9	6.1	6.1	5.5	6.1	9.4	55.4	51.6	51.5	49.6	49	311.5
Generation	gwh	4.022	1.568	1.626	1.629	1.471	1.636	2.501	13.393	12.969	13.399	13.267	12.951	80.432
Max Generation	gwh	13.392	10.368	10.714	10.714	9.677	10.714	10.368	13.392	12.96	13.392	13.392	12.96	142.043
Percent Max Generation	-	30	15	15	15	15	15	24	100	100	100	99	100	-
Ave	kwh/af	263	266	267	267	267	268	266	242	251	260	267	264	258
End-Month Power Cap	mw	18	14	14	14	14	14	14	18	18	18	18	18	-

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Spirit Mountain Power Plant														
Spirit Mtn Release	kaf	21	0	0	0	0	0	25	34.4	33.3	34.4	33.1	33.1	214.3
Generation	gwh	1.967	0	0	0	0	0	2.413	2.576	2.828	3.236	3.35	3.243	19.613
Max Generation	gwh	3.348	2.592	2.678	3.348	3.024	3.248	3.013	3.348	3.24	3.348	3.348	3.24	37.775
Percent Max Generation	-	59	0	0	0	0	0	80	77	87	97	100	100	-
Ave	kwh/af	94						97	75	85	94	101	98	92
End-Month Power Cap	mw	3	0	0	0	0	0	3	4	5	5	5	4	-
Heart Mountain Power Plant														
Heart Mtn Release	kaf	13	0	0	0	0	0	18	18.6	18	18.6	6.6	0.9	93.7
Generation	gwh	3.112	0	0	0	0	0	4.309	4.453	4.309	4.453	1.58	0.215	22.431
Max Generation	gwh	3.571	0	0	0	0	0	4.32	4.464	4.32	4.464	4.464	4.32	29.923
Percent Max Generation	-	87	0	0	0	0	0	100	100	100	100	35	5	-
Ave	kwh/af	239						239	239	239	239	239	239	239
End-Month Power Cap	mw	5	0	0	0	0	0	6	6	6	6	6	6	-
Total Generation														
Total Generation	gwh	10.195	2.623	2.721	2.727	2.464	2.74	10.295	22.443	22.258	23.319	19.423	17.556	138.764
End-month Power Cap	mw	29	16	16	17	17	17	26	31	32	32	32	31	-

Based on Most Probable inflow of 655.4 kaf.

Table WYT 32: Monthly Operating Plans for Water Year 2022 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	17.5	31.9	148.6	160	71.6	22	17.4	547.5
Shoshone Release	kaf	6.2	6	6.2	6.2	5.6	6.2	6	6.2	6	6.2	6.2	6	73
Non-Power Release	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Flow Below Dam	kaf	6.2	6	6.2	6.2	5.6	6.2	6	6.2	6	6.2	6.2	6	73
Buffalo Bill Release	kaf	13.4	5.9	6.1	6.1	5.5	6.1	9.4	54.3	51.9	54.2	55.6	49.6	318.1
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	14.9	0	0	0	0	0	18	12.7	12.9	12.8	0.6	0.3	72.2
Heart Mtn Delivery	kaf	8	0	0	0	0	0	7	36	42	48	41	33	215
Total Outflow	kaf	42.8	12.2	12.6	12.6	11.4	12.6	40.7	109.5	113.1	121.5	103.7	89.2	681.9
Spill/Waste	kaf	0	0	0	0	0	0	0	0	0	0	0	0	0
End-Month Targets	kaf		463.9					463.9	550	626.2	626.2		475	-
End-Month Content	kaf	380.4	386.2	388.4	388.7	389.1	394	385.2	424.3	471.2	421.3	339.6	267.8	-
Est Total Storage	kaf	383.8	389.6	391.8	392.1	392.5	397.4	388.6	427.7	474.6	424.7	343	271.2	-
End-Month Elevation	ft	5357.59	5358.49	5358.84	5358.88	5358.95	5359.7	5358.34	5364.32	5371.02	5363.87	5351.05	5338.32	-
Net Change Content	kaf	-21.8	5.8	2.2	0.3	0.4	4.9	-8.8	39.1	46.9	-49.9	-81.7	-71.8	-134.4
Flow Below BB Pwr	kaf	19.6	11.9	12.3	12.3	11.1	12.3	15.4	60.5	57.9	60.4	61.8	55.6	391.1
Flow Below BB Pwr	cfs	319	200	200	200	200	200	259	984	973	982	1005	934	-
Spring Inflow	kaf	3.7	3.6	3.7	3.7	3.3	3.7	3.6	3.7	3.6	3.7	3.7	3.6	43.6
Passing Cody Gage	kaf	38.2	15.5	16	16	14.4	16	37	76.9	74.4	76.9	66.1	59.5	506.9
Passing Cody Gage	cfs	621	260	260	260	259	260	622	1251	1250	1251	1075	1000	-
Shoshone Power Plant														
Shoshone Release	kaf	6.2	6	6.2	6.2	5.6	6.2	6	6.2	6	6.2	6.2	6	73
Generation	gwh	1.091	1.05	1.088	1.089	0.984	1.092	1.055	1.101	1.095	1.131	1.083	0.99	12.849
Max Generation	gwh	2.232	1.08	1.116	2.232	2.016	2.232	2.16	2.232	2.16	2.232	2.232	2.16	24.084
Percent Max Generation	-	49	97	97	49	49	49	49	49	51	51	49	46	-
Ave	kwh/af	176	175	175	176	176	176	176	178	183	182	175	165	176
End-Month Power Cap	mw	3	2	2	3	3	3	3	3	3	3	3	2	-
Buffalo Bill Power Plant														
Buffalo Bill Release	kaf	13.4	5.9	6.1	6.1	5.5	6.1	9.4	54.3	51.9	54.2	55.6	49.6	318.1
Generation	gwh	3.519	1.562	1.619	1.62	1.461	1.622	2.47	13.114	12.655	13.082	13.374	11.621	77.719
Max Generation	gwh	13.392	10.368	10.714	10.714	9.677	10.714	10.368	13.392	12.96	13.392	13.392	12.96	142.043
Percent Max Generation	-	26	15	15	15	15	15	24	98	98	98	100	90	-
Ave	kwh/af	263	265	265	266	266	266	263	242	244	241	241	234	244
End-Month Power Cap	mw	18	14	14	14	14	14	14	18	18	18	17	17	-

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Spirit Mountain Power Plant														
Spirit Mtn Release	kaf	22.9	0	0	0	0	0	25	34.4	33.3	34.4	34.4	33.3	217.7
Generation	gwh	2.135	0	0	0	0	0	2.328	2.56	2.557	2.555	2.53	2.216	16.881
Max Generation	gwh	3.348	2.592	2.678	3.348	3.024	3.248	3.013	3.348	3.24	3.348	3.348	3.24	37.775
Percent Max Generation	-	64	0	0	0	0	0	77	76	79	76	76	68	-
Ave	kwh/af	93						93	74	77	74	74	67	78
End-Month Power Cap	mw	3	0	0	0	0	0	3	4	4	4	3	3	-
Heart Mountain Power Plant														
Heart Mtn Release	kaf	14.9	0	0	0	0	0	18	12.7	12.9	12.8	0.6	0.3	72.2
Generation	gwh	3.567	0	0	0	0	0	4.309	3.04	3.088	3.064	0.144	0.072	17.284
Max Generation	gwh	3.571	0	0	0	0	0	4.32	4.464	4.32	4.464	4.464	4.32	29.923
Percent Max Generation	-	100	0	0	0	0	0	100	68	71	69	3	2	-
Ave	kwh/af	239						239	239	239	239	240	240	239
End-Month Power Cap	mw	5	0	0	0	0	0	6	6	6	6	6	6	-
Total Generation														
Total Generation	gwh	10.312	2.612	2.707	2.709	2.445	2.714	10.162	19.815	19.395	19.832	17.131	14.899	124.733
End-month Power Cap	mw	29	16	16	17	17	17	26	31	31	31	29	28	-

Based on reasonable minimum April-July inflow of 412.1 kaf.

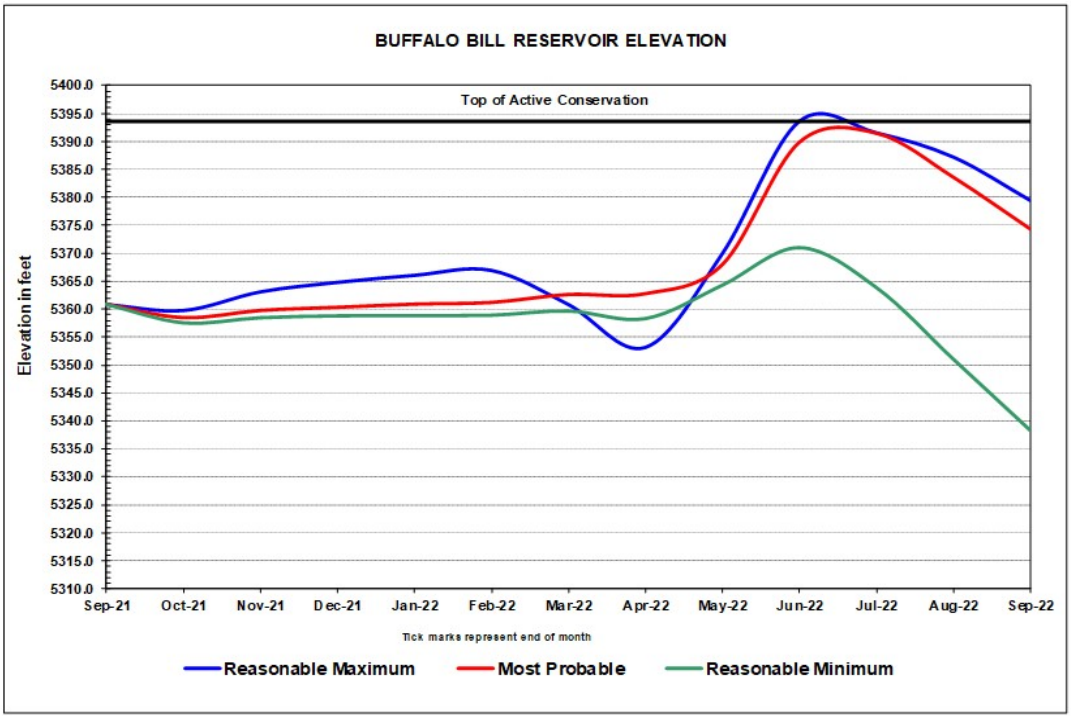
Table WYT 33: Monthly Operating Plans for Water Year 2022 for Buffalo Bill Reservoir based on the Maximum Probable runoff scenario.

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	35.3	33.9	23.9	21.3	17.5	32.6	62.1	275	556.7	314.8	74.2	36	1483.3
Shoshone Release	kaf	6.2	6	6.2	6.2	5.6	12.5	12.5	12.7	11.4	11.3	6.2	6	102.8
Non-Power Release	kaf	0	0	0	0	0	20.1	31.7	40	254.3	202	0	0	548.1
Total Flow Below Dam	kaf	6.2	6	6.2	6.2	5.6	32.6	44.2	52.7	265.7	213.3	6.2	6	650.9
Buffalo Bill Release	kaf	15.3	5.9	6.1	6.1	5.5	40.6	41.3	56.4	51.5	51.5	49.3	48.2	377.7
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	13	0	0	0	0	0	18	18.6	18	18.6	11.5	7.7	105.4
Heart Mtn Delivery	kaf	8	0	0	0	0	0	7	36	42	48	41	33	215
Total Outflow	kaf	42.8	12.2	12.6	12.6	11.4	73.5	110.8	164	377.5	331.7	108.3	95.2	1352.6
Spill/Waste	kaf	0	0	0	0	0	0	0	8.4	252.5	197.9	0	0	458.8
End-Month Targets	kaf		463.9					463.9	463.9		626.2			
End-Month Content	kaf	394.7	416.4	427.7	436.4	442.5	401.6	352.9	463.9	643.1	626.2	592.1	532.9	
Est Total Storage	kaf	398.1	419.8	431.1	439.8	445.9	405	356.3	467.3	646.5	629.6	595.5	536.3	
End-Month Elevation	ft	5359.81	5363.13	5364.83	5366.09	5366.97	5360.88	5353.22	5370	5393.59	5391.5	5387.18	5379.42	
Net Change Content	kaf	-7.5	21.7	11.3	8.7	6.1	-40.9	-48.7	111	179.2	-16.9	-34.1	-59.2	130.7
Flow Below BB Pwr	kaf	21.5	11.9	12.3	12.3	11.1	73.2	85.5	109.1	317.2	264.8	55.5	54.2	1028.6
Flow Below BB Pwr	cfs	350	200	200	200	200	1190	1437	1774	5331	4307	903	911	
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	38.2	15.5	16	16	14.4	76.9	107.1	131.4	338.8	287.1	70.7	65.5	1177.6
Passing Cody Gage	cfs	621	260	260	260	259	1251	1800	2137	5694	4669	1150	1101	
Shoshone Power Plant														
Shoshone Release	kaf	6.2	6	6.2	6.2	5.6	12.5	12.5	12.7	11.4	11.3	6.2	6	102.8
Generation	gwh	1.097	1.066	1.114	1.121	1.017	2.231	2.161	2.241	2.165	2.241	1.235	1.167	18.856
Max Generation	gwh	2.232	1.08	1.116	2.232	2.016	2.232	2.16	2.232	2.16	2.232	2.232	2.16	24.084
Percent Max Generation	-	49	99	100	50	50	100	100	100	100	100	55	54	
Ave	kwh/af	177	178	180	181	182	178	173	176	190	198	199	195	183
End-Month Power Cap	mw	3	2	2	3	3	3	3	3	3	3	3	3	
Buffalo Bill Power Plant														
Buffalo Bill Release	kaf	15.3	5.9	6.1	6.1	5.5	40.6	41.3	56.4	51.5	51.5	49.3	48.2	377.7
Generation	gwh	4.031	1.58	1.647	1.655	1.498	10.703	10.356	13.394	12.957	13.386	13.168	12.814	97.189
Max Generation	gwh	13.392	10.368	10.714	10.714	9.677	10.714	10.368	13.392	12.96	13.392	13.392	12.96	142.043
Percent Max Generation	-	30	15	15	15	15	100	100	100	100	100	98	99	
Ave	kwh/af	263	268	270	271	272	264	251	237	252	260	267	266	257
End-Month Power Cap	mw	18	14	14	14	14	14	14	18	18	18	18	18	

Item	Unit	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Spirit Mountain Power Plant														
Spirit Mtn Release	kaf	21	0	0	0	0	0	25	34.4	33.3	34.4	33.2	32.6	213.9
Generation	gwh	1.979	0	0	0	0	0	2.092	2.446	2.919	3.294	3.346	3.245	19.321
Max Generation	gwh	3.348	2.592	2.678	3.348	3.024	3.248	3.013	3.348	3.24	3.348	3.348	3.24	37.775
Percent Max Generation	-	59	0	0	0	0	0	69	73	90	98	100	100	
Ave	kwh/af	94						84	71	88	96	101	100	90
End-Month Power Cap	mw	3	0	0	0	0	0	3	4	5	5	5	5	
Heart Mountain Power Plant														
Heart Mtn Release	kaf	13	0	0	0	0	0	18	18.6	18	18.6	11.5	7.7	105.4
Generation	gwh	3.112	0	0	0	0	0	4.309	4.453	4.309	4.453	2.753	1.843	25.232
Max Generation	gwh	3.571	0	0	0	0	0	4.32	4.464	4.32	4.464	4.464	4.32	29.923
Percent Max Generation	-	87	0	0	0	0	0	100	100	100	100	62	43	
Ave	kwh/af	239						239	239	239	239	239	239	239
End-Month Power Cap	mw	5	0	0	0	0	0	6	6	6	6	6	6	
Total Generation														
Total Generation	gwh	10.219	2.646	2.761	2.776	2.515	12.934	18.918	22.534	22.35	23.374	20.502	19.069	160.598
End-month Power Cap	mw	29	16	16	17	17	17	26	31	32	32	32	32	

Based on reasonable maximum April-July inflow of 1208.6 kaf.

BUFFALO BILL RESERVOIR



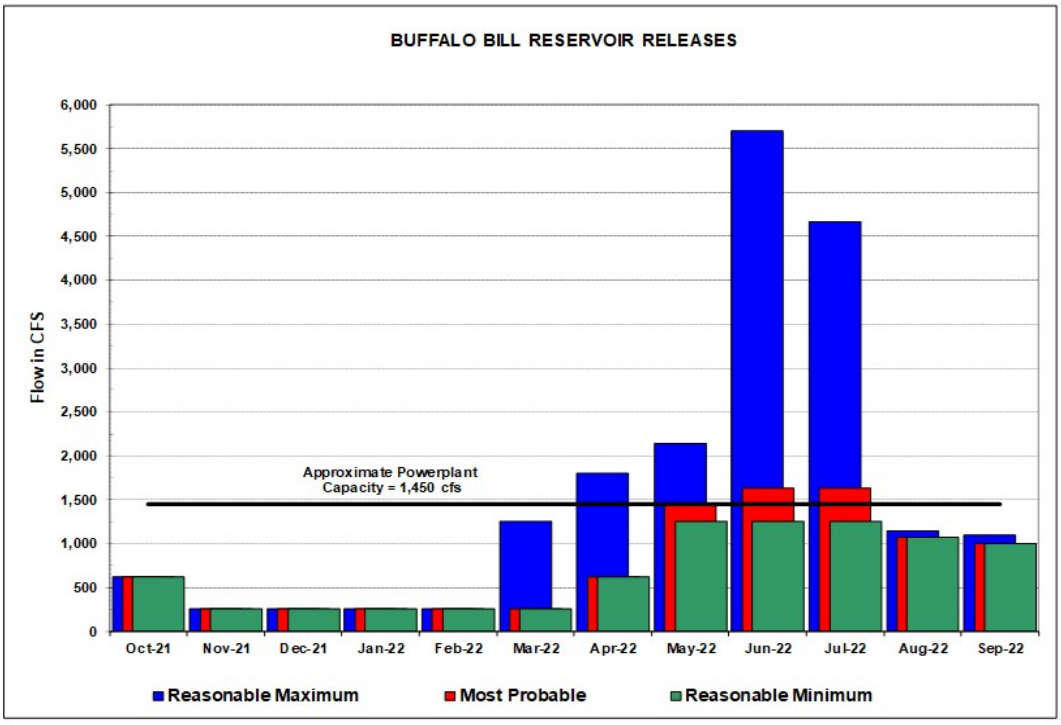


Figure WYG 8: Water Year 2022 forebay elevation and inflow at Buffalo Bill Reservoir under a Minimum, Expected, and Maximum runoff forecast.

Power Plant	Task Name	Start	Finish	Outage Hours	Notes
Buffalo Bill Unit One	6 Year Major Annual	1/3/2021	2/16/2021	1032	6 Year Major Annual
Buffalo Bill Unit One	Heat Run	2/16/2021	2/17/2021	24	Heat Run
Buffalo Bill Unit One	KZ1A, KW3A & Bus 1	3/21/2022	4/5/2022	360	BB1 Unavailable due to KZ1A Clearance
Buffalo Bill Unit Two	Run Year - No Annual Outage	N/A	N/A	0	
Buffalo Bill Unit Two	KZ1A, KW3A & Bus 1	3/21/2022	3/31/2022	360	BB2 Unavailable due to KZ1A Clearance
Spirit Mountain Unit One	Remove Old Exciter & Install New One	10/21/2021	12/22/2021	1296	Exciter Clearance
Spirit Mountain Unit One	Test & Commission New Exciter	04/18/2021	4/27/2021	240	TSC & L&S Electric Onsite - Unit Unavailable
Spirit Mountain Unit One	Heat Run	4/27/2021	4/28/2021	24	
Spirit Mountain Unit One	2 Year Minor Annual	2/28/2022	3/15/2021	360	Minor Annual Package
Spirit Mountain Unit One	SCC Walk-Through Inspection - Fall	10/18/2021	10/19/2021	24	One day clearance for Inspection
Shoshone Unit Three	Run Year - No Annual Outage	N/A	N/A	0	
Heart Mountain Unit One	Run Year - No Annual Outage	N/A	N/A	0	
Heart Mountain Unit One	SCC Walk-Through Inspection - Fall	10/18/2021	10/19/2021	24	One day clearance for Inspection
Heart Mountain Unit One	SCC Walk-Through Inspection - Spring	4/18/2022	4/18/2022	24	One day clearance for Inspection
Heart Mountain Unit One	Penstock Inspection	3/7/2022	3/10/2022	36	Rope Team Inspection
Heart Mountain Unit One	Seasonal Plant - No Water	10/18/2021	4/15/2021	0	Seasonal Plant - No water
Boysen Unit One U1 Annual	U1 Annual	10/19/2021	12/16/2021	1416	
Boysen Unit One	Alternate Feed Plant Offline	10/19/2021	11/5/2021	415	
Boysen Unit One Alternate Feed Plant Offline	K1A 4.16KV ISE Phase Bus HiPot Test	10/21/2021	10/28/2021		
Boysen Unit One Alternate Feed Plant Offline	Ring Seal Gate 2 Inspection	10/19/2021	11/5/2021		Annual

Power Plant	Task Name	Start	Finish	Outage Hours	Notes
Boysen Unit One Alternate Feed Plant Offline	K1A Generator Transformer	10/21/2021	10/28/2021		Annual
Boysen Unit One Alternate Feed Plant Offline	U2 Penstock Ultrasonic Thickness Survey & Stress Analysis	11/2/2021	11/6/2021		Boysen rehab
Boysen Unit One Alternate Feed Plant Offline	Runner Crack Inspection	10/21/2021	11/4/2021		Annual
Boysen Unit One Alternate Feed Plant Offline	Wicket Gate Alignment	12/6/2021	12/9/2021		
Boysen Unit One Alternate Feed Plant Offline	LGB Cooling Piping	11/29/2021	12/2/2021		
Boysen Unit One	U2 On-Line	11/5/2021			
Boysen Unit One U2 On-Line	Unit Two CO2 Nozzles	10/19/2021	11/25/2021		
Boysen Unit One U2 On-Line	Breaker 5 Maintenance	10/19/2021	11/25/2021		
Boysen Unit One U2 On-Line	Stator	10/19/2021	10/21/2021		
Boysen Unit One U2 On-Line	Station Service	10/19/2021	11/4/2021		
Boysen Unit One U2 On-Line	U1 Temperature Recorder Testing	11/2/2021	11/4/2021		
Boysen Unit One U2 On-Line	U1 Transducer Inspection & Calibration - 3 YEAR	11/2/2021	11/4/2021		
Boysen Unit One U2 On-Line	SS Annual	10/19/2021	11/4/2021		Annual
Boysen Unit One U2 On-Line	Change the next scheduled maintenance outage for U2A	10/19/2021	11/4/2021		
Boysen Unit One U2 On-Line	SS Relay Testing	10/19/2021	11/4/2021		2 year
Boysen Unit Two	U2 Annual	1/4/2022	2/10/2022	912	
Boysen Unit Two	Stator	1/31/2022	2/3/2022		
Boysen Unit Two	Rotor	1/4/2022	2/4/2022		
Boysen Unit Two	Breaker 3 Maintenance	1/4/2022	2/4/2022		
Boysen Unit Two	Breaker 4 Maintenance	1/4/2022	2/4/2022		

Power Plant	Task Name	Start	Finish	Outage Hours	Notes
Boysen Unit Two	U2 Temperature Recorder Testing	1/4/2022	2/4/2022		Annual
Boysen Unit Two	U2 Transducer Inspection & Calibration	1/4/2022	2/4/2022		
Boysen Unit Two	U2 Exciter Relay Testing	1/4/2022	2/4/2022		2 year
Boysen Unit Two	U2 CT Testing	1/4/2022	2/4/2022		6 year
Boysen Unit Two	U2 PT Testing	1/4/2022	2/4/2022		6 year
Boysen Unit Two	U2 11G2 Relay Settings Changes and Test	1/4/2022	2/4/2022		
Boysen Unit Two	BUS 2 PT Testing	1/4/2022	2/4/2022		5 year

Figure WYG 9: Water Year 2022 Scheduled Outages for Bighorn Powerplants.

Annual Operating Plans for Water Year 2021 for Missouri Basin Units Under the Responsibility of the Montana Area Office (MTAO)

Water Year 2021 Hydrologic Conditions

Reclamation's Montana Area Office 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 off-stream 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 along the high-line; and Bighorn Reservoir near the Montana-Wyoming border. Each reservoir will describe specific operations for water year 2021 in the following sections. Below is an overview of the hydrologic conditions.

October through December

Water year 2021 started in October 2020 with cool weather across all basins in October while above average precipitation amounts prevailed, except for southwestern Montana and Wyoming. The Missouri River headwaters only received 5 to 25 percent of average precipitation. November temperatures returned to normal while precipitation was scattered throughout Montana with the heaviest precipitation occurring along the Rocky Mountain front and northern high line. November resulted in near to above average inflows and reservoir storage content.

Warmer temperatures and below normal precipitation returned during December. Monthly data on valley and mountain precipitation per basin during water year 2021 can be found in Tables MTT 2 and 3 and Figures MTG 1 and 2. The October through December timeframe resulted in varying inflows, releases, and storage content, Table MTT 1.

Table MTT 1: Montana reservoir statistics for October through December

Reservoir	Average Inflow Oct - Dec (cfs)	Percent of Average	Average Release Oct – Dec (cfs)	Percent Of Average	Content Dec. 31, 2021 (KAF)	Percent of Average
Clark Canyon	209	76	52	40	120.9	116
Canyon Ferry	3,514	93	3,570	91	1,523.4	99
Gibson	302	140	209	149	30.4	120
Pishkun	---	---	---	---	34.3	119
Willow Creek	---	---	---	---	22.3	98
Lake Elwell	369	90	576	99	790.3	106
Sherburne	124	126	---	---	55.3	204
Fresno	108	174	39	60	28.9	68
Nelson	---	---	---	---	51.3	95
Bighorn Basin	2,125	86	2,172	85	892.7	106

Table MTT 2: 2021 Annual monthly precipitation data for valleys of interest in Montana and Wyoming

PRECIPITATION IN INCHES AND PERCENT OF AVERAGE
2021 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	0.61	56	0.60	79	0.33	47	0.67	104	1.10	180	0.63	77	0.59	42	2.15	102	0.26	11	0.60	52	1.39	140	0.13	12
Year-to-Date Precip and % of Average	0.61	56	1.21	65	1.54	60	2.21	69	3.31	87	3.94	85	4.53	75	6.67	82	6.93	66	7.53	65	8.93	70	9.05	66
Jefferson																								
Monthly Average Precip	0.91		0.59		0.52		0.41		0.42		0.58		1.15		1.81		2.25		1.17		0.97		1.01	
Monthly Precip and % of Average	0.52	57	0.52	89	0.28	54	0.49	120	0.92	218	0.43	74	0.54	47	2.11	117	0.18	8	0.74	63	1.59	165	0.12	12
Year-to-Date Precip and % of Average	0.52	57	1.05	70	1.33	66	1.81	75	2.73	96	3.16	92	3.69	81	5.80	91	5.98	69	6.72	69	8.31	77	8.43	72
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	1.37	78	1.48	93	0.98	54	1.58	101	2.01	139	1.11	63	1.25	58	3.69	140	0.20	7	1.09	84	2.49	211	0.50	37
Year-to-Date Precip and % of Average	1.37	78	2.85	85	3.82	74	5.40	80	7.41	91	8.52	86	9.77	81	13.46	91	13.66	79	14.75	79	17.25	87	17.75	84
Gallatin																								
Monthly Average Precip	1.37		0.84		0.64		0.55		0.58		0.93		1.90		2.48		2.80		1.23		1.13		1.25	
Monthly Precip and % of Average	1.34	98	0.39	46	0.31	48	0.66	120	1.21	210	0.51	55	1.21	64	2.82	114	0.54	19	0.64	52	2.29	203	0.13	10
Year-to-Date Precip and % of Average	1.34	98	1.72	78	2.03	71	2.69	79	3.90	98	4.42	90	5.63	83	8.45	91	8.99	74	9.62	72	11.91	83	12.03	77
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	0.95	78	0.74	81	0.46	52	0.79	106	1.31	183	0.62	64	0.85	55	2.64	121	0.27	11	0.78	63	1.93	181	0.21	18
Year-to-Date Precip and % of Average	0.95	78	1.69	80	2.15	72	2.94	78	4.25	95	4.87	90	5.73	82	8.37	91	8.63	74	9.41	73	11.34	81	11.54	76
Sun-Teton																								
Monthly Average Precip	0.93		0.55		0.45		0.42		0.48		0.62		1.52		2.31		2.82		1.05		1.13		1.33	
Monthly Precip and % of Average	1.52	163	0.76	140	0.19	43	0.16	38	0.63	133	0.34	55	1.19	78	3.81	165	0.87	31	0.52	49	1.91	169	0.16	12
Year-to-Date Precip and % of Average	1.52	163	2.29	155	2.48	129	2.64	112	3.27	116	3.61	105	4.80	97	8.61	119	9.48	94	10.00	90	11.91	97	12.08	89
Marias																								
Monthly Average Precip	1.02		0.99		0.71		0.74		0.69		0.82		1.37		1.96		2.86		1.15		1.03		1.16	
Monthly Precip and % of Average	1.48	146	1.58	159	0.43	61	0.39	53	1.20	173	0.31	38	0.91	67	2.95	150	0.61	21	0.84	73	2.30	224	0.29	25
Year-to-Date Precip and % of Average	1.48	146	3.06	152	3.49	128	3.89	112	5.09	122	5.40	108	6.31	99	9.25	111	9.86	88	10.70	87	13.00	97	13.30	92
Milk																								
Monthly Average Precip	0.89		0.53		0.38		0.41		0.34		0.48		1.10		2.01		2.85		1.56		1.20		1.21	
Monthly Precip and % of Average	1.05	118	0.84	158	0.06	15	0.04	11	0.28	82	0.14	29	0.48	44	2.36	117	0.63	22	0.67	43	2.42	202	0.20	17
Year-to-Date Precip and % of Average	1.05	118	1.88	133	1.94	108	1.98	90	2.26	89	2.40	79	2.88	70	5.24	85	5.87	65	6.54	62	8.95	76	9.16	71
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	3.60	138	4.09	127	1.79	70	1.84	72	3.01	133	1.13	44	1.88	81	2.75	94	1.34	35	0.35	24	2.59	189	0.86	48
Year-to-Date Precip and % of Average	3.60	138	7.68	132	9.47	113	11.30	104	14.31	109	15.44	98	17.32	96	20.07	95	21.40	86	21.75	83	24.34	88	25.20	86
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	0.78	71	0.24	38	0.31	67	0.16	37	0.90	176	0.78	106	1.36	98	1.49	68	0.46	32	0.61	76	1.37	223	0.31	27
Year-to-Date Precip and % of Average	0.78	71	1.02	59	1.33	61	1.49	57	2.40	76	3.17	82	4.53	86	6.02	81	6.47	73	7.08	74	8.46	83	8.76	77

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

PRECIPITATION IN INCHES AND PERCENT OF AVERAGE
2021 VALLEY PRECIPITATION

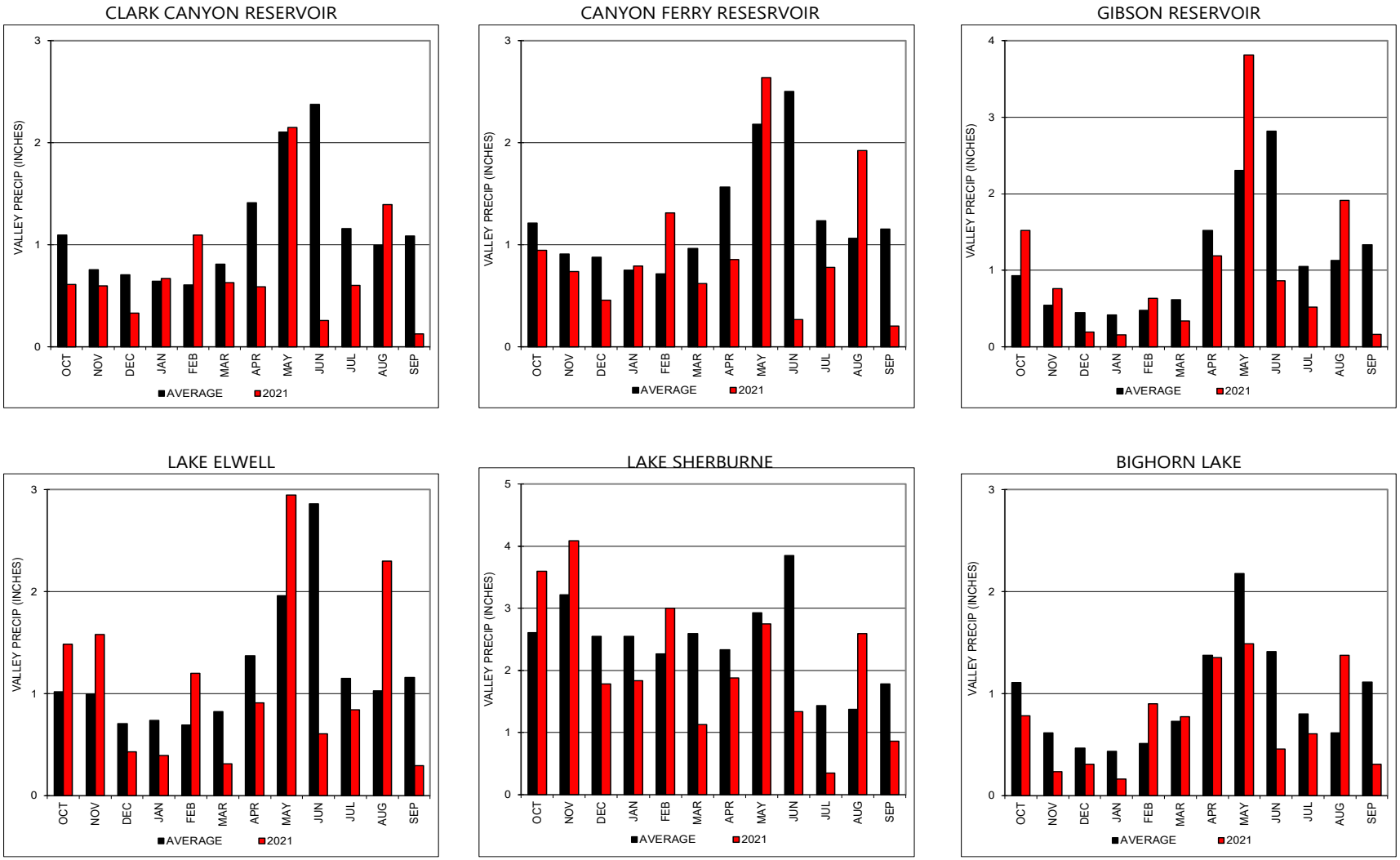


Figure MTG 1: WY 2021 monthly precipitation in valleys above selected reservoirs in Montana and Wyoming.

Table MTT 3: 2021 Annual monthly precipitation data for mountains of interest in Montana and Wyoming

TABLE MTT1B
PRECIPITATION IN INCHES AND PERCENT OF AVERAGE
2021 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	0.82	41	2.26	106	1.42	54	3.14	141	1.86	101	1.68	76	1.18	47	3.10	104	0.22	8	1.00	104	3.02	328	1.06	70
Year-to-Date Precip and % of Average	0.82	41	3.08	75	4.50	67	7.64	85	9.50	88	11.18	86	12.36	79	15.46	83	15.68	74	16.68	75	19.70	85	20.76	84
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	1.76	79	1.81	76	1.74	69	2.40	106	3.04	163	1.81	79	1.31	43	3.43	103	0.64	21	0.74	76	1.84	184	0.36	24
Year-to-Date Precip and % of Average	1.76	79	3.57	78	5.31	75	7.71	82	10.76	96	12.57	93	13.89	84	17.31	87	17.96	78	18.70	78	20.54	82	20.90	79
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	2.72	125	1.98	81	1.79	67	2.10	87	3.72	183	1.71	73	1.40	46	3.42	104	0.60	20	0.95	85	2.24	211	0.44	30
Year-to-Date Precip and % of Average	2.72	125	4.69	101	6.49	89	8.59	88	12.31	105	14.02	100	15.42	90	18.84	92	19.44	83	20.39	83	22.63	88	23.07	85
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	2.58	88	3.34	91	2.34	59	3.69	98	4.46	143	2.76	75	2.11	54	4.84	125	0.30	9	0.96	75	3.44	288	1.05	60
Year-to-Date Precip and % of Average	2.58	88	5.91	90	8.25	78	11.94	83	16.40	94	19.16	91	21.28	85	26.11	90	26.41	82	27.38	82	30.81	89	31.86	88
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	4.67	143	2.07	62	2.27	66	3.17	98	5.87	182	2.70	74	3.17	68	5.23	115	0.60	16	1.13	72	3.37	230	0.70	34
Year-to-Date Precip and % of Average	4.67	143	6.73	102	9.00	90	12.17	92	18.03	110	20.73	103	23.90	96	29.13	99	29.73	90	30.87	89	34.23	95	34.93	91
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	2.90	117	2.35	82	2.02	65	2.61	90	4.17	170	2.05	73	1.70	50	3.90	110	0.56	18	0.93	79	2.59	231	0.57	36
Year-to-Date Precip and % of Average	2.90	117	5.26	99	7.27	86	9.89	87	14.06	102	16.11	97	17.82	89	21.72	92	22.28	84	23.21	83	25.80	89	26.38	86
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	5.41	226	3.14	132	1.48	62	1.38	57	3.05	140	0.72	35	1.41	55	4.63	135	2.46	69	0.21	19	1.94	147	0.30	16
Year-to-Date Precip and % of Average	5.41	226	8.55	179	10.03	140	11.40	119	14.45	123	15.17	110	16.58	101	21.21	107	23.67	101	23.88	97	25.82	100	26.12	94
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	6.42	204	5.54	147	2.78	72	2.14	53	4.66	135	1.20	37	2.10	61	4.66	118	2.22	55	0.08	6	2.14	147	0.70	30
Year-to-Date Precip and % of Average	6.42	204	11.96	173	14.74	137	16.88	114	21.54	118	22.74	106	24.84	100	29.50	102	31.72	96	31.80	93	33.94	95	34.64	91
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	7.15	142	9.35	137	6.35	93	5.50	78	5.95	112	3.35	58	2.75	66	3.55	90	2.45	49	0.15	9	2.85	178	2.60	102
Year-to-Date Precip and % of Average	7.15	142	16.50	139	22.85	122	28.35	110	34.30	110	37.65	102	40.40	98	43.95	98	46.40	93	46.55	90	49.40	93	52.00	93
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	2.63	114	1.91	85	1.33	61	1.34	65	2.96	151	2.87	115	2.84	91	3.50	105	1.17	52	1.23	105	2.44	217	0.83	45
Year-to-Date Precip and % of Average	2.63	114	4.55	100	5.88	87	7.22	82	10.18	95	13.06	98	15.90	97	19.40	98	20.57	94	21.79	94	24.23	100	25.06	96

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 MTT1B-1
PRECIPITATION IN INCHES AND PERCENT OF AVERAGE
2021 MOUNTAIN PRECIPITATION

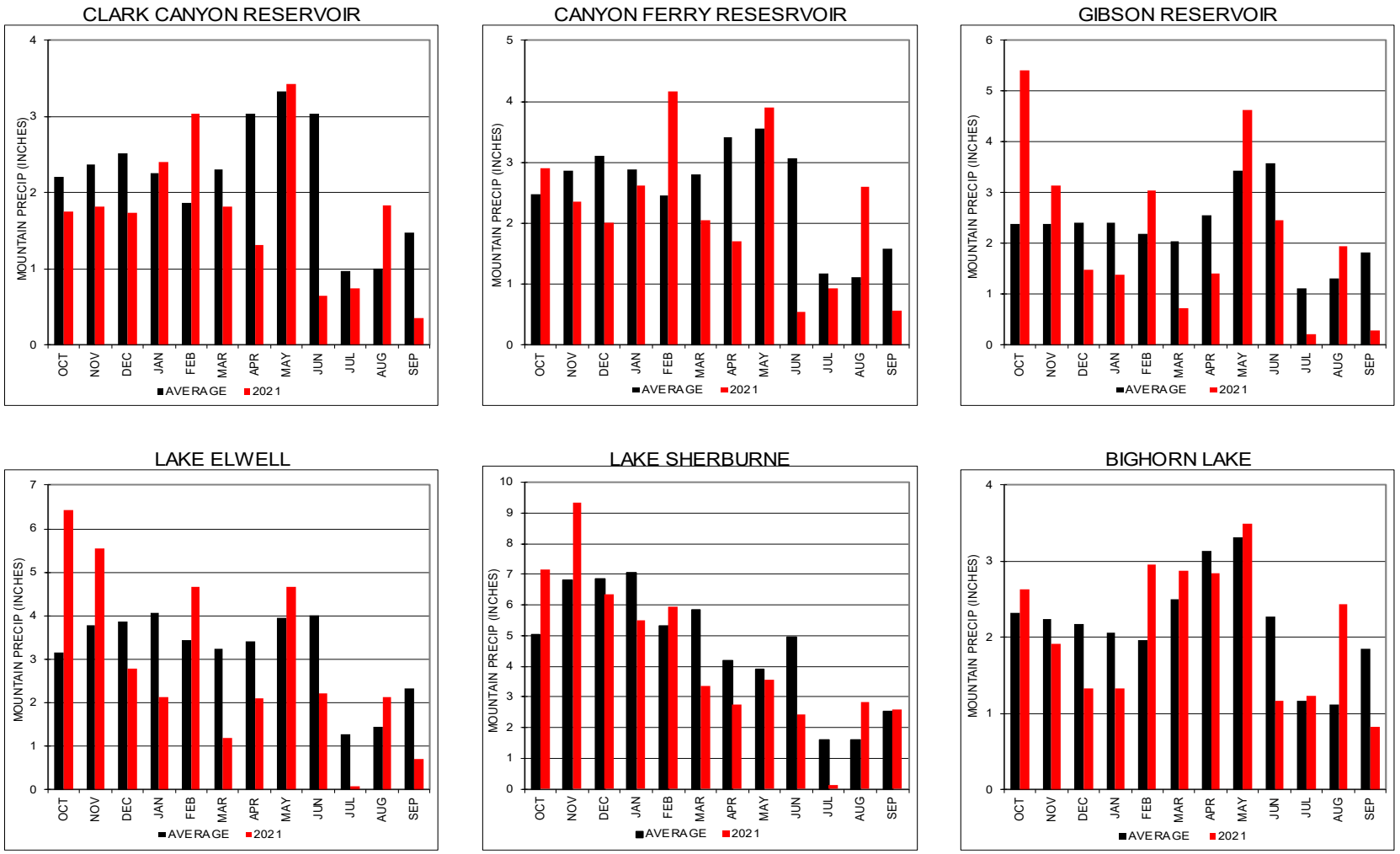


Figure MTG 2: WY 2021 monthly precipitation in mountains above selected reservoirs in Montana and Wyoming.

January through March

On January 1, the NRCS reported mountain snowpack or snow water equivalents throughout Montana and parts of Wyoming ranging from 69 percent of normal in the Madison basin to 155 percent of normal in the Milk River basin, Figure MTG 3. A tabular report of the snow water content is also shown on Table MTT 4. Also on January 1, Reclamation began forecasting the April through July spring runoff volumes for Reclamation reservoirs east of the Continental Divide. The water supply forecasts prepared on January 1 indicated April through July runoff volumes varied from 51 percent of average at Clark Canyon Dam to 105 percent of average at Gibson Dam, Table MTT 5.

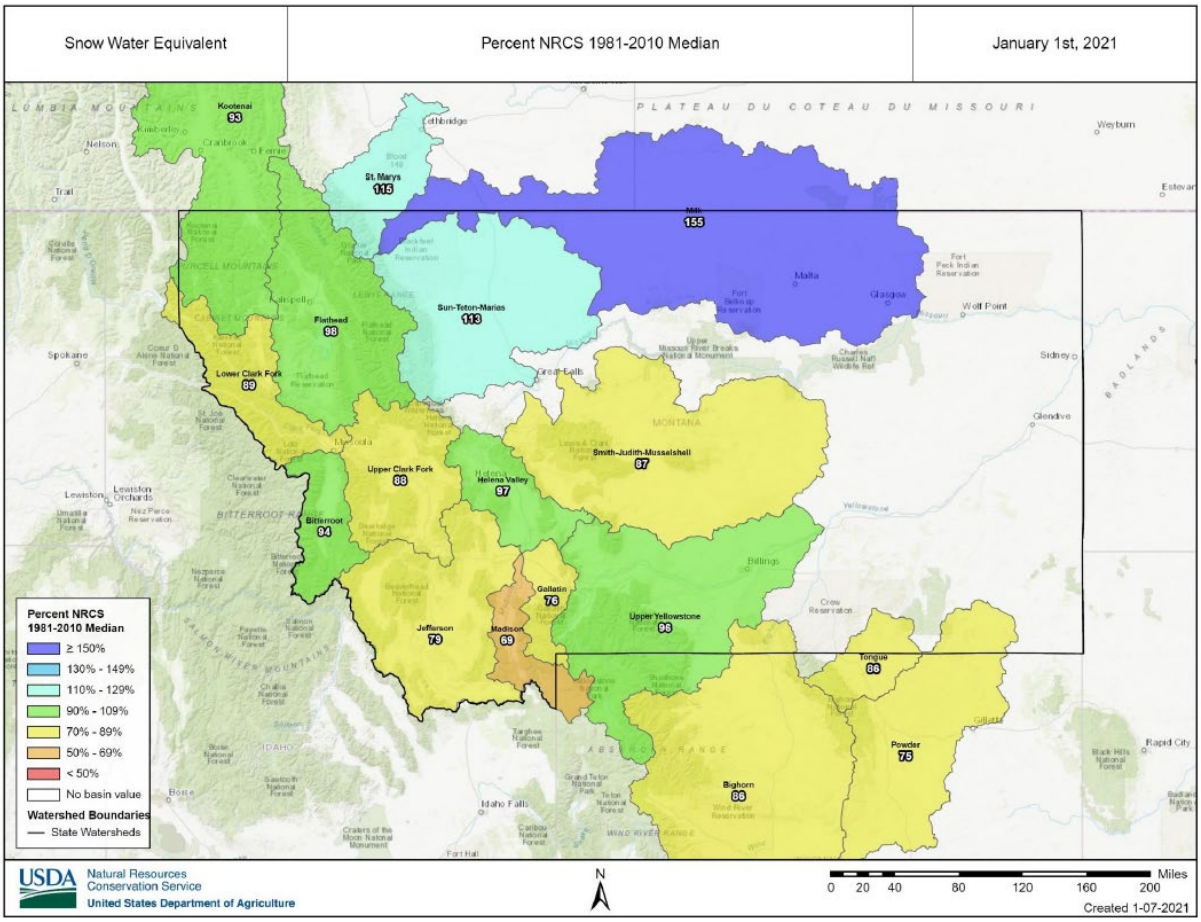


Figure MTG 3: January 1, 2021 Snow Water Equivalent, Percent of Normal (NRCS).

Montana temperatures continued to be above normal along the high-line in January, while precipitation was 25 to 50 percent of normal across much of the state.

Table MTT 4: 2021 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	75	80	96	89	76
Sun	97	92	95	90	91
Teton - Marias	113	83	99	85	93
St. Mary	115	100	108	98	105
Milk River	155	98	127	138	137
Lower Yellowstone (Bighorn Basin)	86	76	96	93	104

Table MTT 5: 2021 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	April-July, KAF[5]	Percent of Average	Percent of April Forecast[6]
Clark Canyon	40	51	36	46	43	54	39	50	28	43	18	32	34	43	86
Canyon Ferry	1,496	82	1,351	75	1,689	92	1,381	75	958	64	480	49	939	51	68
Gibson	438	105	384	92	409	99	362	87	348	95	188	87	387	94	94
Tiber	401	104	317	82	370	95	328	85	311	94	143	73	262	67	80
Sherburne	100	100	100	100	100	100	88	88	78	87	55	95	78	79	89
Fresno[7]	87	107	81	100	80	98	48	94	41	93	27	113	39	49	61
Yellowtail	803	64	711	56	922	73	939	74	835	77	334	43	607	78	65

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

A cold front brought snow on February 5 and 6 and then bitterly cold air. A low temperature of at least -40°F or colder was observed over six consecutive nights from February 9 through 14. Averages were as much as 50°F below normal in some areas. Snow continued to accumulate throughout the month and as a result, the March 1 water supply forecasts (April through July) increased. March averaged below normal temperatures in Southwestern Montana, while 8-10 degrees above normal temperatures occurred in Northeastern Montana. Precipitation across the entire state was in the 25 to 50 percent of normal. Reservoir storage content by the end of March and the monthly inflows and releases are shown in Table MTT 6.

Table MTT 6: Montana reservoir statistics for January through March 2021.

Reservoir	Average Inflow Jan - Mar (cfs)	Percent of Average	Average Release Jan - Mar (cfs)	Percent of Average	Content Mar 31, 2022 (KAF)	Percent of Average
Clark Canyon	167	74	50	46	141.8	112
Canyon Ferry	3,482	92	3,963	90	1,437.6	101
Gibson	185	95	195	130	32.7	92
Pishkun	---	---	---	---	33.8	113
Willow Creek	---	---	---	---	23.5	98
Lake Elwell	390	88	602	110	752.5	103
Sherburne	29	55	16	57	57.3	185
Fresno	91	54	40	45	37.9	71
Nelson	45	430	---	---	59.4	108
Bighorn Basin	1,702	81	2,196	82	818.7	107

April through June

The April 1 month to date snow water equivalent was near normal, except for the Milk River basin, Figure MTG 4. The April through July forecasted runoff volumes slightly declined from the March 1 forecasts. The April 1 forecasts ranged from 50 percent of average into Clark Canyon Dam to 88 percent of average into Sherburne Dam. All of Reclamation's reservoirs reached their peak snowpack for the year between April 1 and 28, Figure MTG 1.

April was near normal temperatures but trending towards cooler rather than warmer. Below normal precipitation prevailed over most of Montana, however, very localized above normal precipitation did occur in a scattered pattern across the state. By the end of April, the year-to-date mountain precipitation varied from a low of 87 percent of average above Clark Canyon Reservoir to 97 percent of average above Bighorn Lake. The year-to-date valley precipitation varied from a low at 70 percent of average in the Milk River Basin to 99 percent of average in the Marias River

Basin. Due to the below average precipitation in April, many reservoirs cut back on river releases or remained steady to conserve storage and limit reservoir drafting.

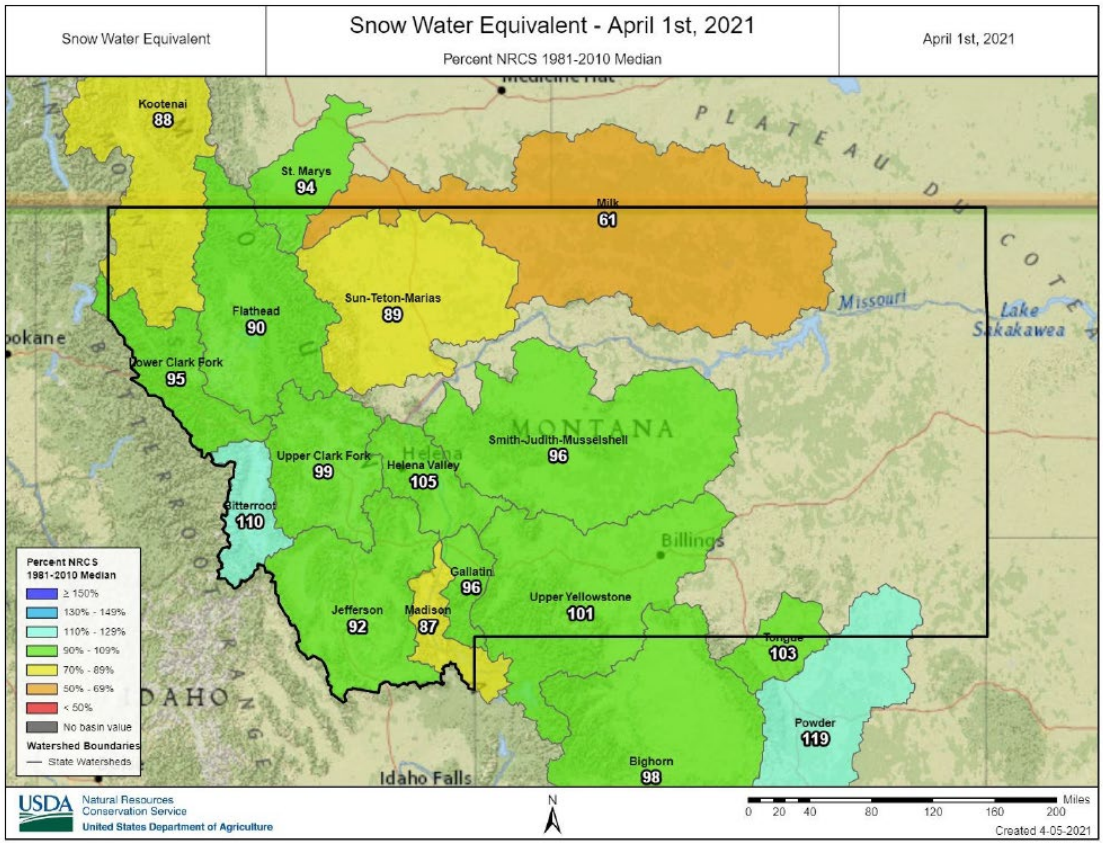


Figure MTG 4: NRCS Snow Water Equivalent, April 1, 2021

May continued with cooler temperatures, 2 to 5 degrees below normal and much needed precipitation occurred along the rocky mountain front and southwestern Montana. Unfortunately, dry conditions persisted throughout the rest of the state and into northern Wyoming in the Bighorn basin. May is typically one of the highest precipitation months and when deficits occur during this time, reservoir storage and river release impacts are likely. Drought conditions started forming across parts of Montana and Wyoming because of the low precipitation during April and May.

A temperature swing took place during June which resulted in temperatures 6 to 10 degrees above normal. The southern portion of the state was the warmest with persistent dryness, and with no precipitation during what is typically the highest rainfall period, conditions deteriorated even more. Precipitation was 25 percent of normal over the entire state. The dryness and above normal temperatures dried out the soils and therefore much of the precipitation and snowmelt runoff that did occur was absorbed into the soils, producing little to no runoff. Many reservoirs did not fill, and river releases were significantly reduced. The lack of springtime rainfall took its toll on the region.

Figures MTG 6 and 8 the show the above normal temperature departures for Montana and Wyoming for the April through June period. Figures MTG 7 and 9 show the much below normal precipitation percentages for the same locations and time frames.

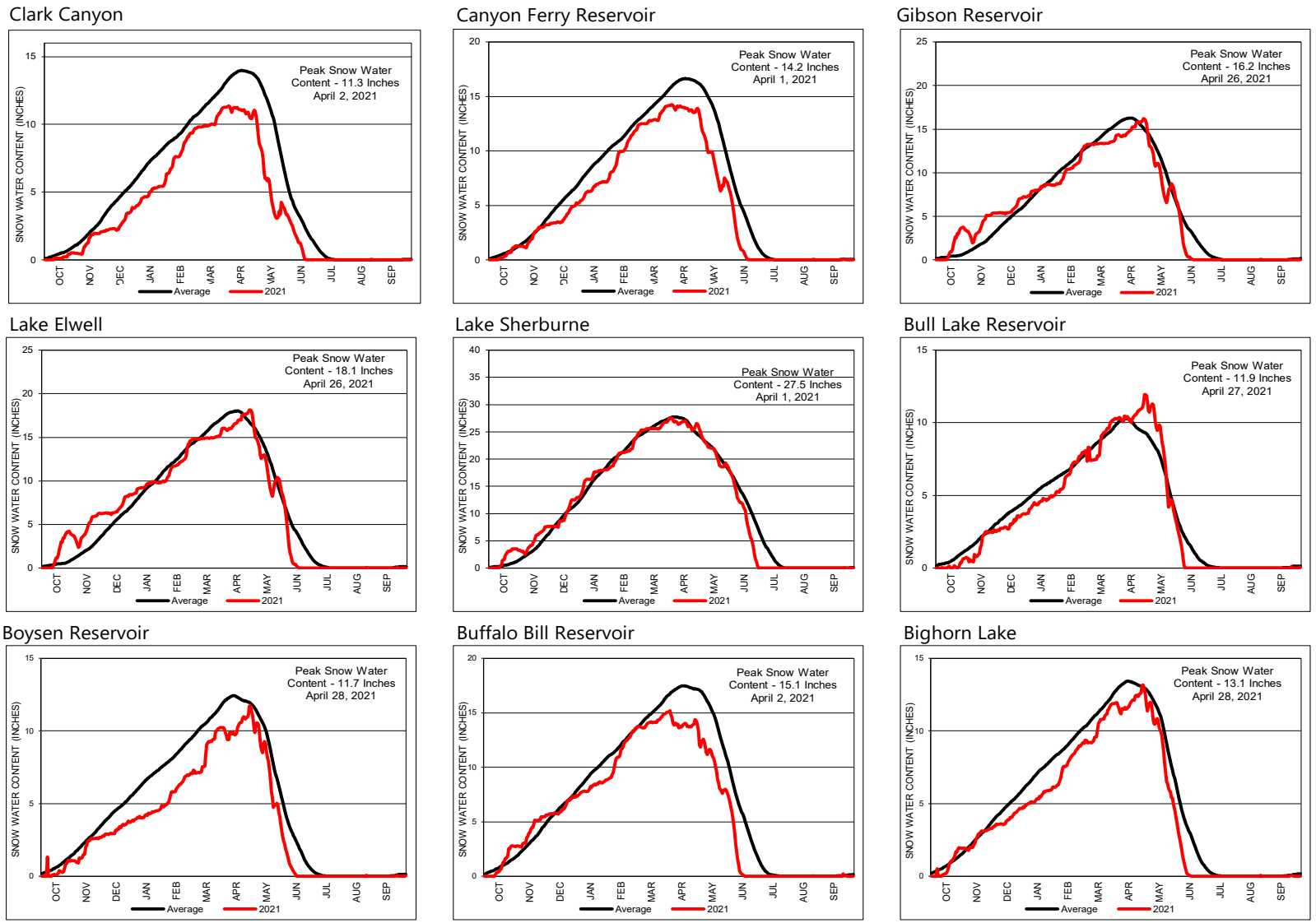


Figure MTG 5: 2021 Snow Water Equivalent and average SWE in mountains above selected reservoirs in Montana and Wyoming.

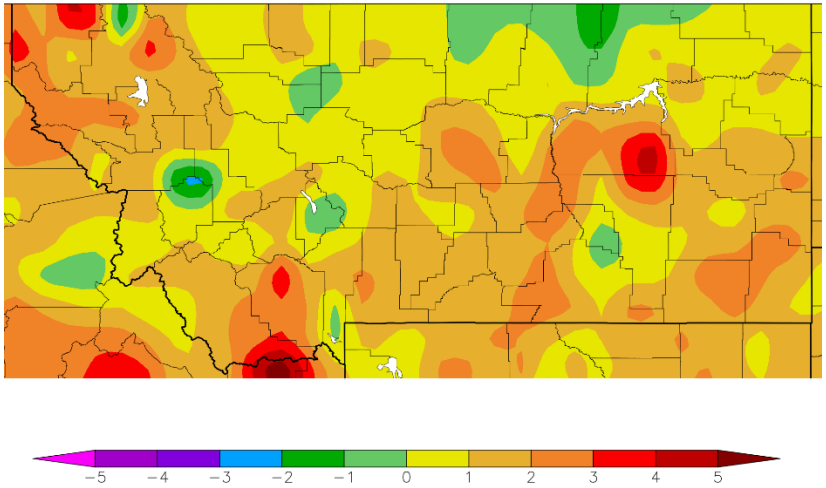


Figure MTG 6: Montana Apr-Jun 2021 temperature departures from normal (°F) (NOAA Regional Climate Center).

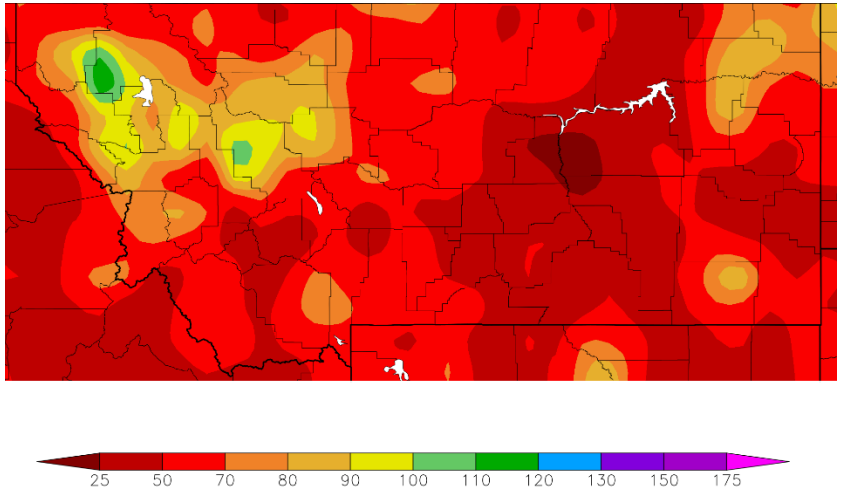


Figure MTG 7: Montana Apr-Jun 2021 percent of normal precipitation (NOAA Regional Climate Center).

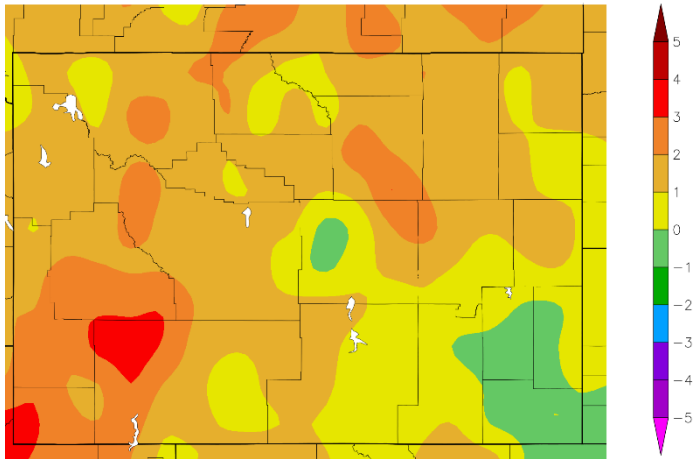


Figure MTG 8: Wyoming Apr-Jun 2021 temperature departures from normal (°F) (NOAA Regional Climate Center).

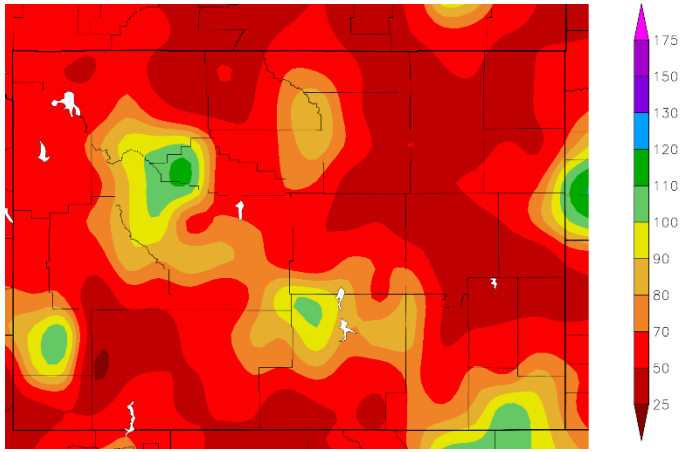


Figure MTG 9: Wyoming Apr-June 2021 percent of normal precipitation (NOAA Regional Climate Center).

Inflows, releases, and reservoir storage content were all below average due to much below normal precipitation during April, May, and June, Table MTT 7.

Table MTT 7: Montana reservoir statistics for April through June 2021.

Reservoir	Average Inflow Apr - Jun cfs	Percent of Average	Average Release Apr - Jun cfs	Percent of Average	Content Jun 30, 2021 KAF	Percent of Average
Clark Canyon	118	36	368	104	96.8	82
Canyon Ferry	4,716	55	3,327	55	1,644.1	89
Gibson	1,958	98	964	86	97.1	106
Pishkun	575	94	575	102	33.8	84
Willow Creek	52	105	---	---	31.5	108
Lake Elwell	1,380	73	608	64	891.7	100
Sherburne	369	83	352	115	60.3	104
Fresno	605	87	501	85	56.4	29
Nelson	83	50	169	144	43.9	69
Bighorn Basin	2,823	52	2,355	56	877.2	94

July through September

July delivered another month of hot temperatures. Irrigation continued to draw on reservoir storage. By the end of July, the actual April through July runoff volumes for water year 2021 ranged from 43 percent of average into Clark Canyon Dam to 94 percent of average into Gibson Dam, Table MTT3. August however brought much needed precipitation, which historically doesn't happen during this month. The extra rainfall did help dry land irrigation and had some benefits to irrigators using stored water but was too little and too late.

Irrigation projects leaned heavily on reservoir storage for its water supply during the summer months causing most reservoirs to draft below average levels. By the end of the water year, all of Wyoming and Montana were designated as abnormally dry to exceptional drought, Figure MTG 10.

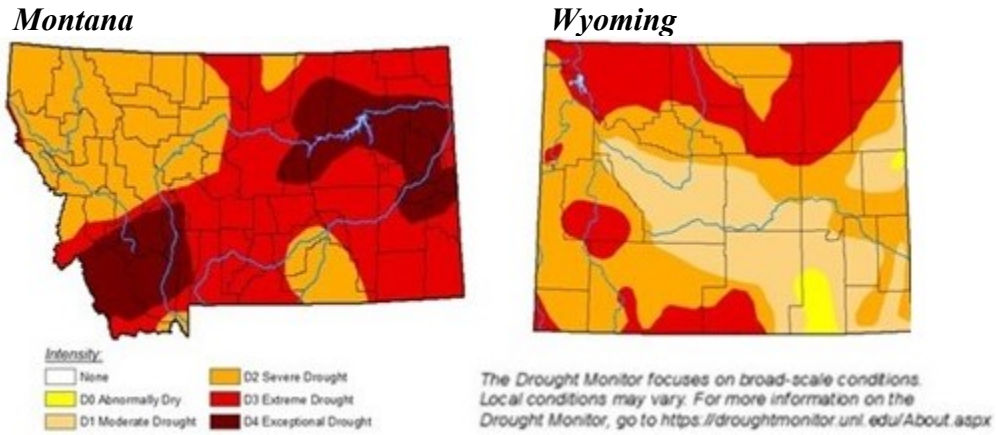


Figure MTG 10: Drought Monitor Maps for Montana and Wyoming, September 28, 2021.

Water year 2021 was an impactful drought year with negative impacts to many stakeholders. The water year ended with varying inflows, release, and storage content as shown in Table MTT 8.

Table MTT 8: Montana reservoir statistics for July through September 2021.

Reservoir	Average Inflow Jul - Sept cfs	Percent of Average	Average Release Jul - Sept cfs	Percent of Average	Content Sep 30, 2021 KAF	Percent of Average
Clark Canyon	153	54	397	78	52.3	68
Canyon Ferry	1,513	47	2,806	64	1,348.7	86
Gibson	339	67	164	75	5.5	38
Pishkun	706	98	694	89	36.2	130
Willow Creek	10	90	110	178	13.1	66
Lake Elwell	156	43	568	63	891.7	102
Sherburne	134	74	402	99	11.3	72
Fresno	423	96	514	84	39.8	94
Nelson	93	73	87	52	45.1	80
Bighorn Lake	2,090	63	1,795	54	866.7	98

Water Year 2021 Flood Benefits

The U.S. Army Corps of Engineers (Corps) evaluated reservoir regulation data pertaining to Reclamation reservoirs within the jurisdiction of the MTAO and indicated that three reservoirs provided flood relief during WY 2021. Three reservoirs provided flood relief to the Missouri River mainstem during water year 2021 include Canyon Ferry Lake on the Missouri River near Helena, Lake Elwell on the Marias River near Chester, and Bighorn Lake on the Bighorn River near Fort Smith. The most notable examples of peak flows regulated by Reclamation reservoirs during spring runoff are shown in Table MTT 9.

Table MTT 9: Water year 2021 peak flows regulated at Reclamation reservoirs.

Reservoir	Peak Inflow cfs	River Discharge cfs	Date
Canyon Ferry Lake	9,841	3,333	06/06/21
Lake Elwell	3,504	610	06/07/21
Bighorn Lake	5,957	2,317	06/08/21

The Corps estimated the operations of MTAO reservoirs reduced flood damages by $8,465,500 in water year 2021. 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 water year 2021 are listed in Table MTT4 and Figure MTG2 shows the annual flood damages prevented by MTAO reservoirs since 1950. For additional information refer to the individual reservoir operation summaries in this report.

Table MTT 10: Water year 2021 flood damages prevented (thousands of dollars).

Reservoir	Local	Mainstem	2021 Total	Prev. Accum.	Total Accum.
Clark Canyon Reservoir	0	0	0	19,224	19,224
Canyon Ferry Lake	0	3,777	3,777	277,456	281,233
Lake Elwell	0	2,002	2,002	102,686	104,688
Fresno Reservoir	0	0	0	19,959	19,959
Gibson Reservoir[1]	0	0	0	3,103	3,103
Bighorn Lake	0	2,687	2,687	206,922	209,609
Lake Sherburne[2]	0	0	0	10,412	10,412
Total	0	8,466	8,466	639,762	648,228

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

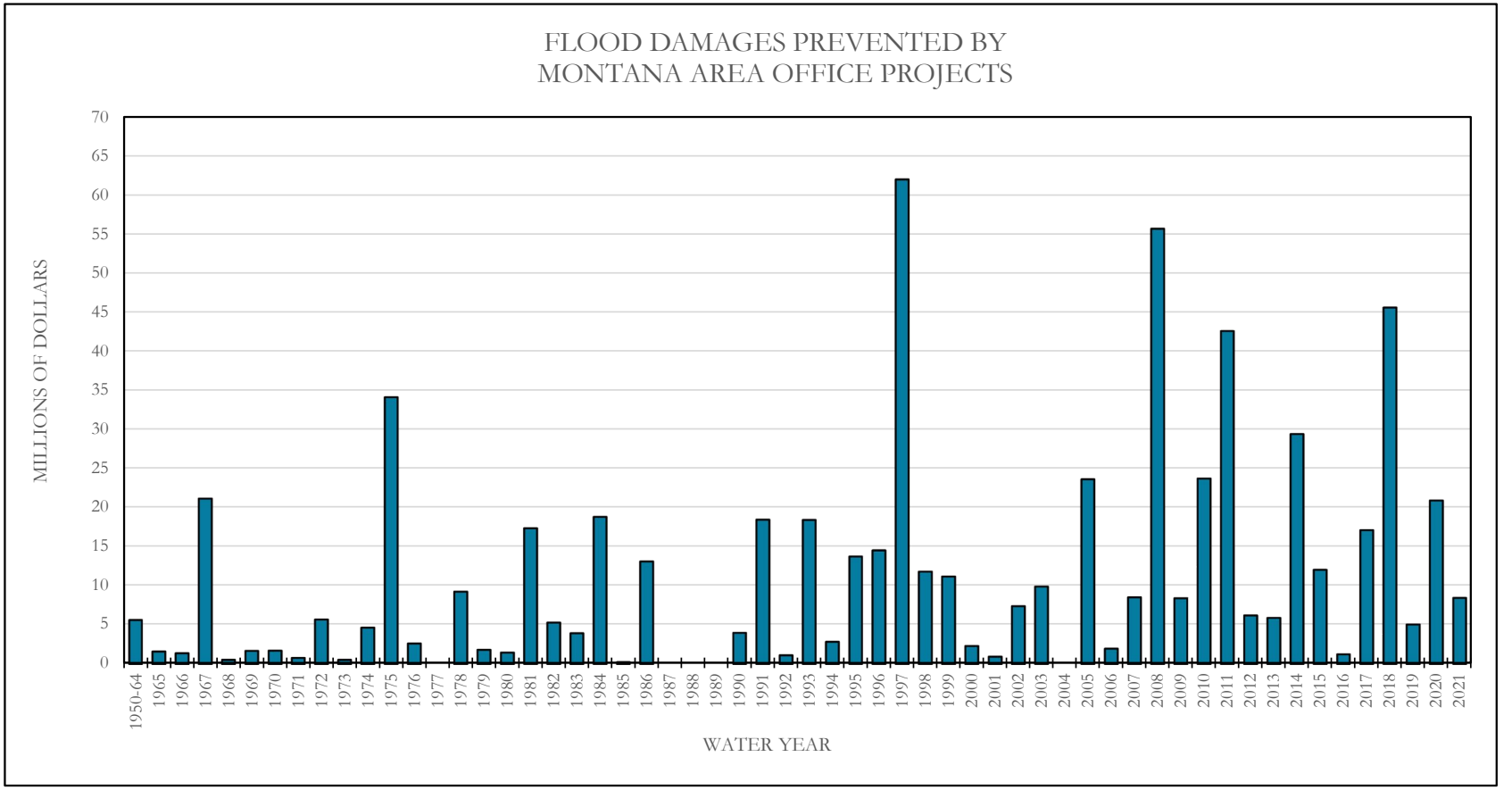


Figure MTG 11: Flood damages prevented by Montana Area Office Projects for each water year since 1964.

Unit Operational Summaries for Water Year 2021

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.

Figure MTG 12: Aerial view of Clark Canyon Reservoir.

Summary of 2021 Operations

October through December

Water year 2021 started in October with a winter release rate of 50 cfs, which was set by the East Bench Joint Board (Joint Board) with concurrence by Reclamation. Climatic conditions during October through December exhibited normal temperatures while below normal rain and snow amounts fell in the Red Rock and Beaverhead basins, Figure MTG 13. Even though precipitation was scarce during this time, groundwater return-flows from upstream irrigation projects kept inflows into Clark Canyon high enough to continue to store water. See Table MTT 8 for specific data related to Clark Canyon Reservoir's inflows, releases, and storage content.

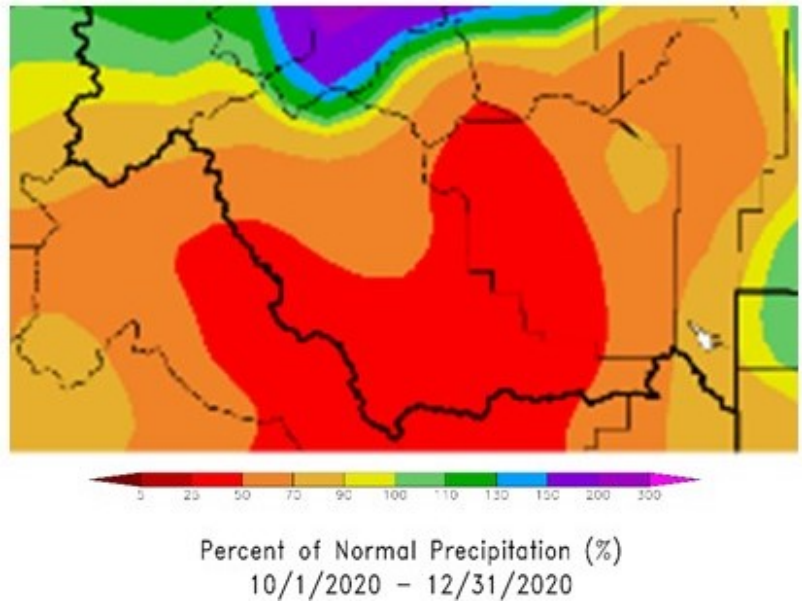


Figure MTG 13: Southwestern Montana, Percent of normal precipitation Oct through Dec 2021.

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 51 percent of average, see Table MTT3 for monthly forecasted runoff volumes. January exhibited mixed temperature and precipitation patterns throughout the Beaverhead and Red Rock basins, while the month of February brought cold temperatures and much-needed snow. Temperatures were 6 to 15 degrees below normal in Southwestern Montana while an 18 percent gain in snow brought the snow water equivalent to 91 percent of average above Clark Canyon Reservoir.

The Joint Board, consisting of three representatives from the East Bench Irrigation District and three representatives from Clark Canyon Water Supply Company, met in March 2021 to discuss the water supply outlook for the 2021 irrigation season. The projected storage content prepared and presented by Reclamation was approaching levels that could 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. By the end of March, the Beaverhead and Red Rock Basins were designated as moderately dry according to the Montana drought monitor map.

April through July

The April 1 forecasted runoff volume into Clark Canyon was 39,000 AF, 50 percent average. The volume was high enough to show storage projections above drought management implementation guidelines. By mid-April the Joint Board met again to determine irrigation allotments. Even though projections were above guidelines, the Joint Board voluntarily set allotments at the first-tier reduction due to unknown future drought implications. The first tier reduced allotment means Clark Canyon Water Supply Company would receive 3.5 acre-feet per acre (AF/acre) and the East Bench Irrigation District would receive 2.7 AF/acre.

A memorandum of understanding (MOU) was created between the Joint Board, Reclamation, and the Montana Fish, Wildlife, and Parks in November 2020. The MOU outlines the option of using 2,100 acre-feet (AF) out of Clark Canyon Reservoir for the purpose of delivering a flushing flow if a sediment event occurs on Clark Canyon Creek, a tributary to the Beaverhead River, prior to the onset of the 2021 irrigation season. The parties monitored the creek conditions and determined that a sediment event did not occur, and the flushing flow was not needed. The volume of water which was set aside was used for irrigation purposes. Irrigation releases began to ramp up during the first week of May.

On May 1, Reclamation's May through July forecasted inflow volume declined to 43 percent of average. May and June are historically the highest months in the year to receive rainfall and augment the snowmelt runoff volume. Rain did come sporadically throughout the Beaverhead and Red Rock basins and provided some relief to local irrigators. Releases from Clark Canyon were reduced in late May for several days to conserve as much water as possible for later use.

Conditions only degraded during June as temperatures were 6 to 10 degrees above normal and little to no precipitation occurred. The snow didn't last long with the hot temperatures and melted out earlier than normal (Table MTG1). By the end of June, the Montana drought status map, figure MTG 14, designated the Beaverhead and Red Rock basin drought conditions as severe drought. Release changes from Clark Canyon Dam during June were based upon irrigation demands.

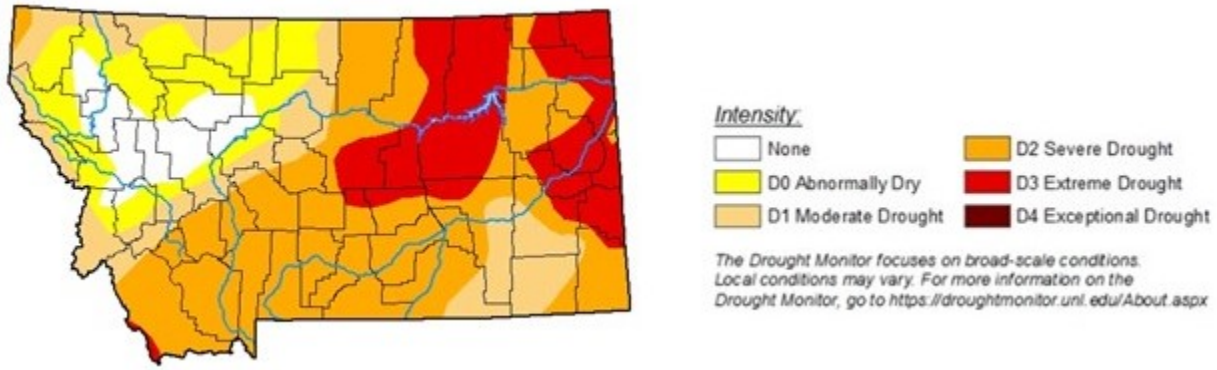


Figure MTG 14: Montana Drought Monitor Map June 29, 2021

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 runoff into Clark Canyon.

The April through July runoff volume into Clark Canyon was 33,700 AF, 43 percent of average. Water Year 2021 was fifth lowest on record with 2004 being the lowest on record, Table MTT 11.

Table MTT 11: Historic Runoff into Clark Canyon Reservoir

Water Year	April – July Runoff Volume (acre-feet)
2021	33,685
2002	33,351
1989	31,614
2003	31,013
2004	19,588

August through September

August temperatures returned to near normal and much needed precipitation fell in the basin. Even though precipitation was above average, it did not relieve the drought situation. Clark Canyon Reservoir continued to draft even as irritation demands began to decrease. On August 25, the Joint Board held a meeting to discuss winter releases as per Contract 069D670009 and Contract 069D670010. Reclamation provided a most probable reservoir operational plans with a winter release of 25 cfs, which is the minimum release. The Joint Board determined a 25 cfs rate was appropriate due to drought conditions in the basin and Reclamation concurred. Releases were reduced to the winter rate by September 27. September was again hot and dry leaving southwestern Montana in an exceptional drought by the end of the water year.

Most of the storage water released from Clark Canyon Reservoir during Water Year 2021 was released from May 1 through September 23 for meeting downstream irrigation demands. The EBID water users received approximately 60,500 AF at the point of diversion, leaving 760 AF of their allotment in the reservoir. The CCWSC received supplemental water along with their water rights of 86,192 AF, leaving 4,515 of their supplemental water in the reservoir. The total May 1 through September 30 irrigation deliveries recorded by the river commissioner for the "non-signer" users on the Beaverhead River was 38,350 AF on approximately 8,000 acres.

Important Events – Water Year 2021

April 2021: East Bench Joint Board set reduced irrigation allotments at the first tier. Clark Canyon Water Supply Company would receive 3.5 AF/acre and the East Bench Irrigation District would receive 2.7 AF/acre.

Table MTT 12: Reservoir allocations for Clark Canyon Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	5,470.60	1,115	1,115
TOP OF ACTIVE CONSERVATION	5,535.70	125,016	123,901
TOP OF JOINT USE	5,546.10	174,300	49,284
TOP OF EXCLUSIVE FLOOD CONTROL	5,560.40	251,436	77,136

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

Table MTT 13: Storage and elevation data for Clark Canyon Reservoir.

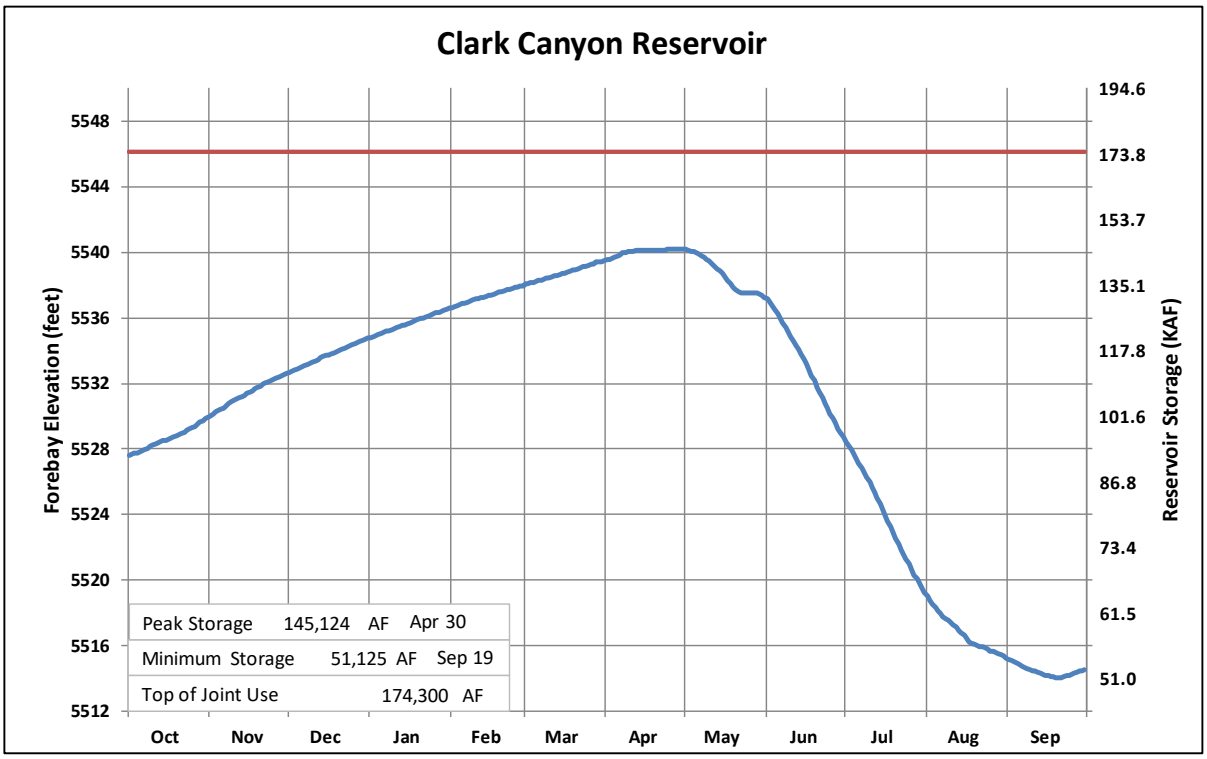
STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	5,527.56	92,385	10/1/2020
END OF YEAR	5,514.54	52,290	9/30/2021
ANNUAL LOW	5,514.07	51,125	9/19/20201
ANNUAL HIGH	5,540.20	145,124	4/30/20201
HISTORIC HIGH	5,564.70	283,073	6/25/1984

Table MTT 14: Inflow and discharge data for Clark Canyon Reservoir.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	117,063	Oct '20-Sep '21	157,243	Oct '20-Sep '201
DAILY PEAK (CFS)	331	11/9/2020	837	6/18/20201
DAILY MINIMUM (CFS)	15	6/5/2020	27	9/24/20201
PEAK SPILL (CFS)			0	N/A
TOTAL SPILL (AF)			0	N/A

Table MTT 15: Water Year 2021 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	12.5	71	3.4	39	101.5	119
NOVEMBER	13.7	78	3.1	40	112.1	117
DECEMBER	11.9	80	3.1	40	121.0	116
JANUARY	10.9	83	3.1	46	128.9	115
FEBRUARY	8.9	74	2.8	47	135.0	114
MARCH	9.9	66	3.1	45	141.8	112
APRIL	6.4	42	3.1	37	145.1	109
MAY	6.8	41	20.1	88	131.9	104
JUNE	8.1	30	43.1	133	96.8	82
JULY	12.3	57	44.0	103	65.1	69
AUGUST	9.2	60	20.1	63	54.1	70
SEPTEMBER	6.4	42	8.2	48	52.3	68
ANNUAL	117.0	58	157.2	79		
APRIL-JULY	33.7	42				



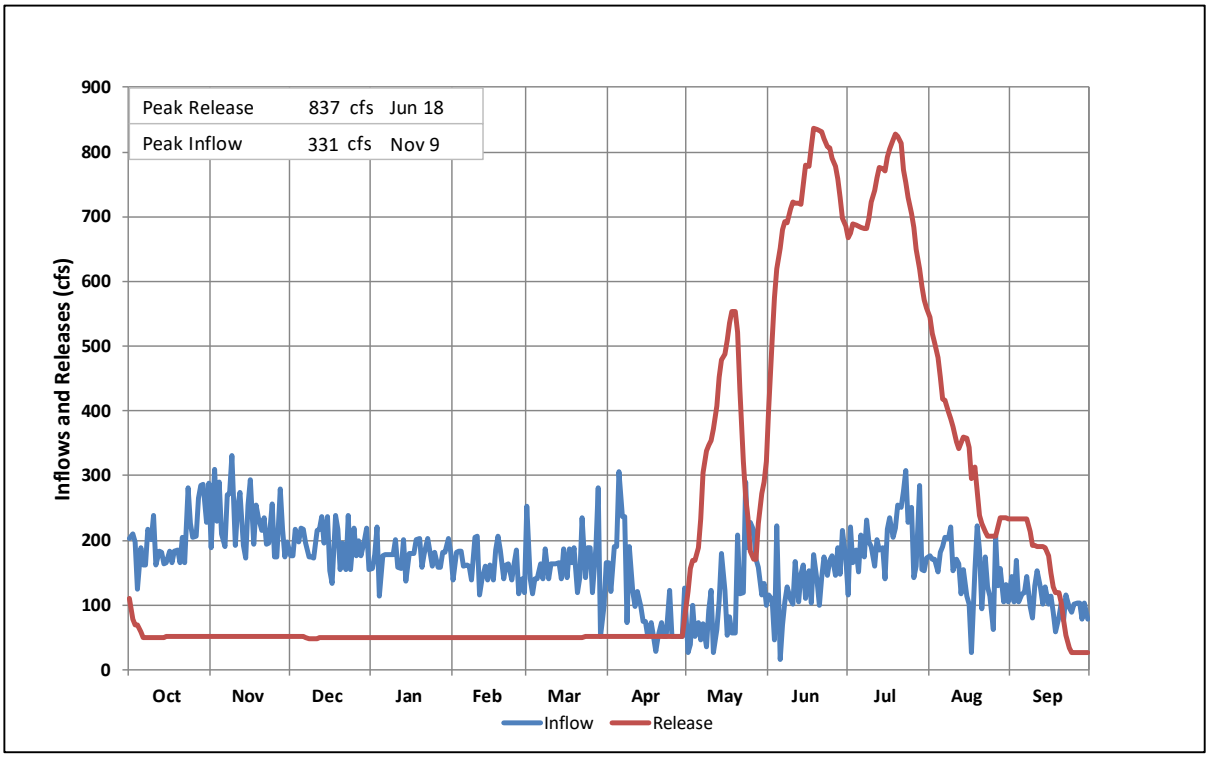


Figure MTG 15: Water year 2021 hydrologic data for Clark Canyon Reservoir.

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.

Figure MTG 16: Canyon Ferry Dam and Powerplant.

Summary of 2021 Operations

October through December

Climatic conditions during October through December were near normal 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, therefore releases were also reduced to 3,400 cfs in October to recover reservoir storage. It's typical during October and November to see increases in reservoir elevation before the start of elevation decline in December due to cold weather. Inflows were slightly higher than forecasts therefore operational plans were adjusted, and releases were increased to 3,600 cfs in November and 3,700 cfs in December. The desired fishery flows below Holter Dam on the Missouri River is 4,100 cfs. By December 31, the Montana drought monitor map showed most of the basin above Canyon Ferry as moderately dry. See Table MTT 8 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 snow content and other basin parameters. The January 1 forecasted runoff was 82 percent of average,

see Table MTT3 for monthly forecasted runoff volumes.

Northwestern Energy has a volume of water in Canyon Ferry that can be used to supplement river flows during cold winter months. Northwestern Energy requested a base flow increase in accordance with operational agreements, and therefore releases were increased to 4,000 cfs in January.

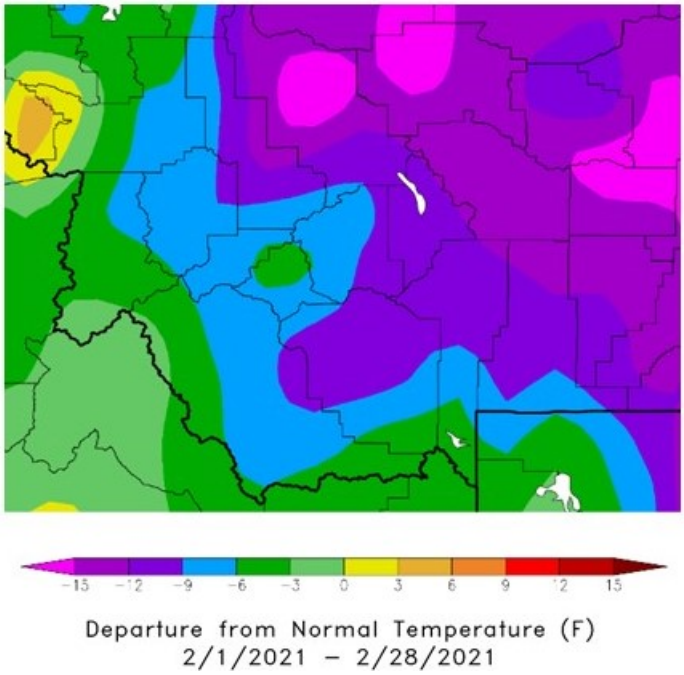


Figure MTG 17: From NOAA Regional Climate Center

The month of February brought cold temperatures while
the mountains gained much-needed snow. Figure MTG 17 shows temperatures reaching 6 to 15 degrees below normal in Southwestern Montana. During the first week of February, Northwestern Energy requested that flows be increased to 5,300 cfs in response to reduced river flows resulting from ice formation. Once the bitter cold temperatures (lows to negative 30-degrees Fahrenheit) returned to normal and the Northwestern Energy's volume of water was used, releases from Canyon Ferry were reduced to 3,600 cfs. Canyon Ferry Reservoir dropped 2 feet in elevation during Feburay as releases far exceeded inflows.

The March 1 runoff forecast increased to 92 percent of average as the snowpack approached average levels. In accordance with Reclamation's most probable operational plan, releases were increased to 3,700 cfs. March exhibited mixed temperatures with below-average precipitation returning to the Gallatin, Jefferson, and Madison basins.

April through June

On April 1, the Montana drought monitor map still had the watershed above Canyon Ferry designated as abnormally dry and moderate drought. Reclamation's April through July forecasted inflow volume declined to 75 percent of average in response to lower snowpack and dry soil conditions. The plan was to start filling Canyon Ferry Reservoir while releases remained near 3,700 cfs. Diversions for the Helena Valley Irrigation District to the Helena Valley Reservoir began the first week of April.

Snow during April did not accumulate, resulting in an April 1 peak (Figure MTG 5). As April progressed, inflows did not rise as the soils soaked up any runoff from the remaining low elevation snow. The rain deficit continued to build throughout the month resulting in 25 to 70 percent of normal precipitation. Releases were decreased to 3,500 cfs in response to the low inflows. The reservoir elevation remained level and did not rise as originally anticipated.

On May 1, Reclamation's May through July forecasted inflow volume declined to 64 percent of average. May and June are historically the most productive months of the year for rainfall to augment the snowmelt runoff volume. Rain did come sporadically throughout the basin in May and did provide some relief to local irrigators; however, it was not enough to sustain then-current release rates. Releases from Canyon Ferry were reduced to near 3,200 cfs by the month's end to conserve as much water in storage as possible.

By June 1, the reservoir was projected not to fill to full pool but would be 5 -7 feet below full. Releases were also planned to be reduced to minimum release of 3,000 cfs below Holter Dam around mid-month. Only the highest elevation snowpack remained, and weather outlooks were for little rainfall and hot temperatures. These forecasts held true. Canyon Ferry reached a peak reservoir elevation of 3790.27 feet on June 18 (6.7 feet below full pool) and releases out of Canyon Ferry were reduced to 2,750 cfs to maintain 3,000 cfs below Holter Dam. The graphics in Figures MTG 18 and 19 depicts how June's temperature departures and lack of precipitation affected this basin and all of Montana. This runoff year was comparable to the early 2000's drought.

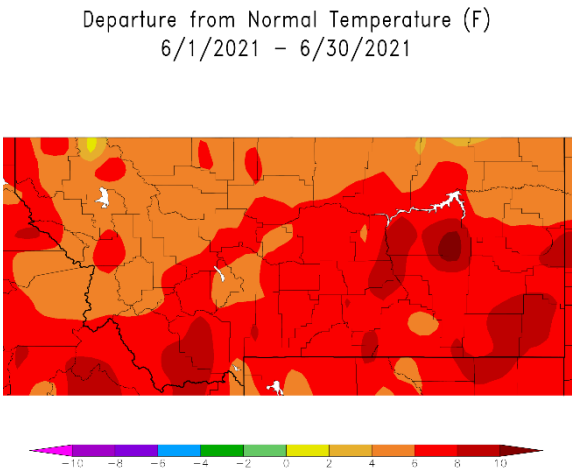


Figure MTG 18: From NOAA Regional Climate Center.

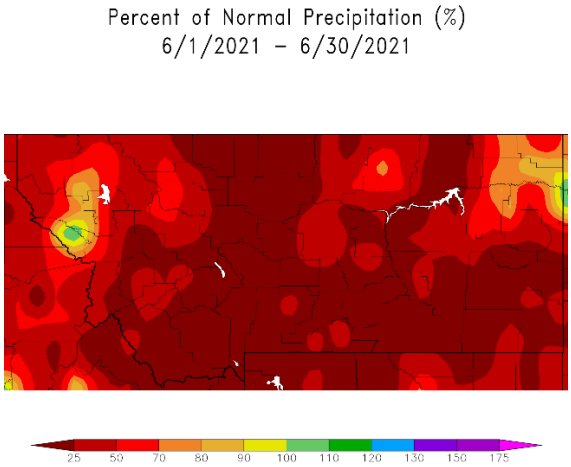


Figure MTG 19: From NOAA Regional Climate Center.

The hot, dry weather in June resulted in severe to extreme drought conditions in the drainage area above Canyon Ferry Reservoir, Figure MTG 20. Hot temperatures continued through July. The April through July runoff into Canyon Ferry during water year 2021 was 51 percent of average, totaling 938,800 AF, ranking seventh lowest of 67 years of record.

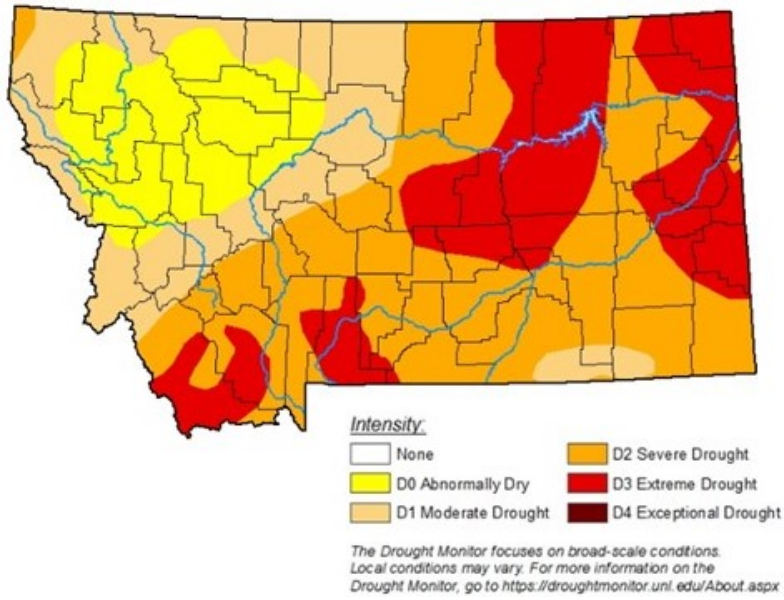


Figure MTG 20: Montana Drought Monitor Map July 8, 2021

July through September

Releases from Canyon Ferry were managed to maintain flows below Holter Dam near the minimum flow of 3,000 cfs. Storage in Canyon Ferry continued to decline throughout July, August, and September as releases could not be reduced any further. Some rain fell in August to give brief relief to the area, but again, not enough to overcome the extreme heat and change the drought status.

Most of the inflows during the summer came from the Madison Basin. Hebgen Dam is located on the Madison River and provides steady and reliable water into Canyon Ferry. The Jefferson and Gallatin do not have storage facilities to supplement the river therefore those tributaries were near or at record lows. Inflow into Canyon Ferry during September was the lowest on record. Southwestern Montana was designated as being in exceptional drought by the water year's end.

Important Events -Water Year 2021

January 2021: In coordination with Northwestern Energy, base flow releases were increased by 300 cfs. The volume delivered was in accordance with the operation agreement.

February 2021: In coordination with Northwestern Energy, releases were increased by 1,600 cfs to meet power needs as cold weather decreased river flows. The entire volume of 47,500 AF was delivered between January and February.

April 7, 2021: Helena Valley Irrigation District started pumping water to the Helena Valley Reservoir. Diversion from Canyon Ferry Reservoir were adjusted throughout the season to meet irrigation demands from the Helena Valley Reservoir.

May 2021: Canyon Ferry releases were decreased from 3,500 cfs to 3,200 cfs to conserve storage.

June 2021: Canyon Ferry releases were decreased from 3,200 cfs to 2,750 cfs to conserve storage. This release achieved minimum flows below Holter Dam of 3,000 cfs. Canyon Ferry Reservoir filled 6.3 feet below full pool.

September 2021: Reservoir elevation was 3,779.8 msl, the lowest since 1988 while September inflows were the lowest out of 67 years of record.

October 1, 2021: HVID discontinued all diversions to Helena Valley Reservoir.

Table MTT 16: Reservoir allocations for Canyon Ferry Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	3,728.00	388,641	387,542
TOP OF ACTIVE CONSERVATION	3,770.00	1,087,216	698,575
TOP OF JOINT USE	3,797.00	1,886,950	799,734
TOP OF EXCLUSIVE FLOOD CONTROL	3,800.00	1,993,036	106,086

*2016 reservoir survey and revised area-capacity table was implemented on October 1, 2021.

Table MTT 17: Storage and elevation data for Canyon Ferry Reservoir.

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	3,786.24	1,533,618	10/1/2020
END OF YEAR	3,780.07	1,348,744	9/30/2021
ANNUAL LOW	3,780.07	1,348,744	9/30/2021
ANNUAL HIGH	3,790.27	1,660,435	6/18/2021
HISTORIC HIGH	3,800.00	2,050,900	6/23/1964

Table MTT 18: Inflow and discharge data for Canyon Ferry Reservoir.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	2,835,978	Oct '20-Sep '21	2,467,401	Oct '20-Sep '21
DAILY PEAK (CFS)	9,841	6/6/2020	5,335	2/8/2020
DAILY MINIMUM (CFS)	1,028	7/24/2020	2,719	9/2/2020
PEAK SPILL (CFS)			1,802	2/6/2020
TOTAL SPILL (AF)			67,600	Oct '20-Sep '21

Table MTT 19: Water year 2021 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	205.6	89	0.2	63	210.1	91	1,529.3	97
NOVEMBER	230.5	94	0.0	---	213.1	93	1,546.7	98
DECEMBER	204.0	97	0.0	---	227.3	89	1,523.4	99
JANUARY	203.2	95	0.0	---	240.7	91	1,485.8	100
FEBRUARY	174.9	86	0.0	---	239.3	97	1,421.4	98
MARCH	242.4	95	0.0	---	226.2	82	1,437.6	101
APRIL	229.0	73	5.2	66	217.8	75	1,443.6	100
MAY	338.0	63	16.6	101	206.2	58	1,558.8	97
JUNE	282.8	40	21.9	121	175.5	39	1,644.2	89
JULY	89.0	31	26.1	130	170.7	50	1,536.4	87
AUGUST	99.3	72	20.7	103	172.3	73	1,442.4	88
SEPTEMBER	87.3	55	12.8	110	168.2	76	1,348.7	86
ANNUAL	2,836.0	68	103.5	109	2,467.4	73		
APRIL-JULY	938.8	51						

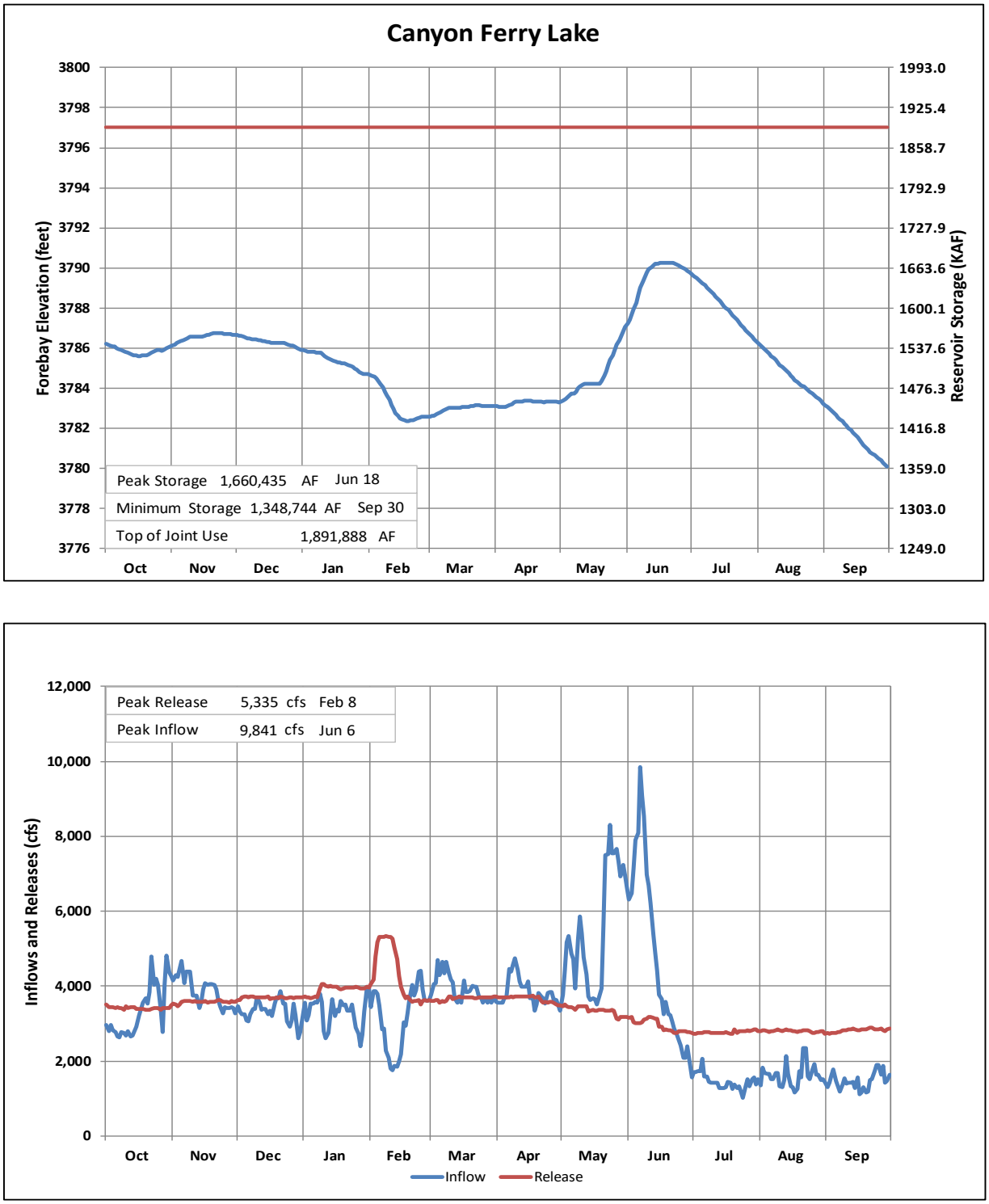


Figure MTG 21: Water year 2021 hydrologic data for Canyon Ferry Reservoir.

Helena Valley Reservoir

Helena Valley Reservoir is a regulating off-stream reservoir for Helena Valley Unit (P-S 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.

Figure MTG 22: View of Helena Valley Reservoir and Dam.

Summary of 2021 Operations

At the beginning of the water year, storage in Helena Valley Reservoir was approximately 13 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 7. 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 2021 season on October 1, 2021. 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 20 through 23.

Table MTT 20: Reservoir allocations for Helena Valley Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
Top of Inactive Storage	3,805.00	4,554	4,554
Top of Active Conservation Storage	3,820.07	10,451	5,897

Table MTT 21: Storage and elevation data for Helena Valley Reservoir.

STORAGE ELEVATION DATA	ELEVATION (FEET)	STORAGE (AF)	DATE
Beginning of Year	3,816.73	8,815	10/01/20
End of Year	3,815.82	8,403	09/30/21
Annual Low	3,812.46	7,009	04/06/21
Annual High	3,819.92	10,363	06/01/21
Historic High	3,820.60	10,738	6/02/75

Table MTT 22: Inflow and discharge data for Helena Valley Reservoir.

INFLOW-OUTFLOW DATA	ANNUAL (AF)
Pumped from Canyon Ferry to Helena Valley Unit	103,459
Released from reservoir for irrigation	72,173
Delivered to the City of Helena for municipal use	1,650

Table MTT 23: Water year 2021 monthly elevation and storage data for Helena Valley Reservoir.

Month	Forebay Elevation (Feet)	Storage Content (KAF)	Pumped to Helena Valley (KAF)
OCTOBER	3816.12	8.5	0.3
NOVEMBER	3815.37	8.2	0.0
DECEMBER	3814.52	7.8	0.0
JANUARY	3813.76	7.5	0.0
FEBRUARY	3813.20	7.3	0.0
MARCH	3812.58	7.1	0.0
APRIL	3817.21	9.0	5.2
MAY	3819.89	10.4	16.6
JUNE	3817.27	9.1	21.9
JULY	3813.17	7.3	26.1
AUGUST	3818.17	9.5	20.7
SEPTEMBER	3815.82	8.4	12.8
ANNUAL			103.5

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. 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. In 2009, a new hydrographic and topographic survey was conducted to measure reservoir volume, resulting an updated elevation-area capacity table and curve. The revised area-capacity table was placed into Reclamation's Hydromet database effective January 1, 2013.


Figure MTG 23: Gibson Reservoir and Dam.

Summary of 2021 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, however, high amounts of precipitation occurred causing inflows to rise much above average. Storage levels rose quickly while releases were used to meet any remaining downstream irrigation demands while also providing beneficial flows for the fall brown trout spawn. See Table MTT 8 and for specific data related to Gibson Reservoir's inflows, releases, and storage content.

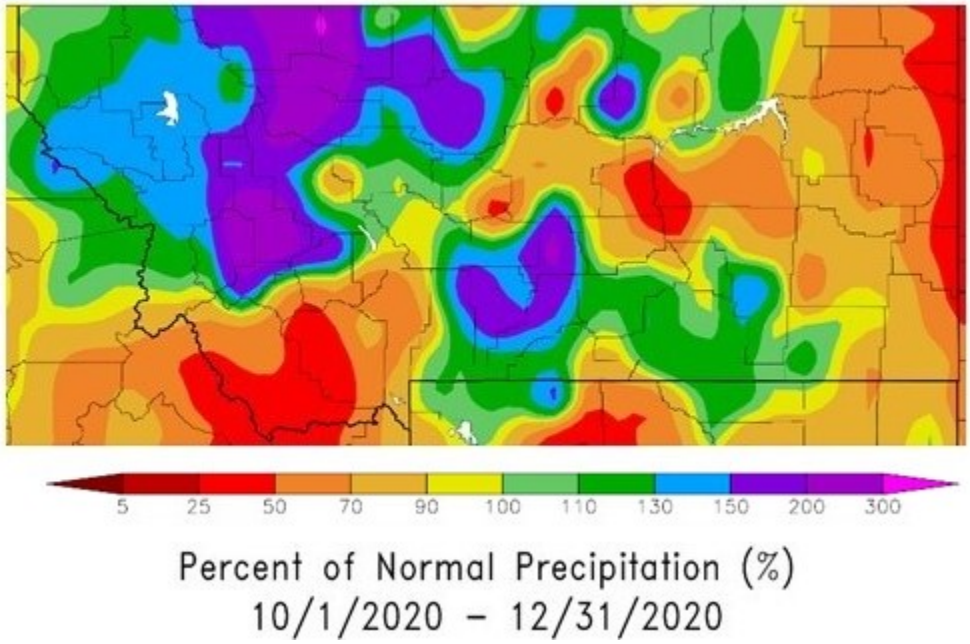


Figure MTG 24: From NOAA Regional Climate Center

November and December continued the trend of above average precipitation in the Sun River drainage. Figure MTG 24 shows 130 – 300 percent of normal precipitation in the Sun River drainage for the October through December timeframe. Gibson Reservoir continued to fill while higher releases persisted to the Sun River. The cumulative valley precipitation for October through December was at 129 percent of average while the cumulative mountain precipitation was 114 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. The January 1 forecasted runoff was 105 percent of average. Snowfall in the Sun River Basin in January was weak and by the month's end fell below average while temperatures were warmer than normal. February brought above normal precipitation allowing the snowpack to achieve average conditions. Bitter cold temperatures prevailed across the Sun River basin causing inflows to freeze and decline. Inflows during February averaged near 190 cfs and releases were reduced to match the inflows. Dry conditions prevailed again during March and the snowpack remained constant. Gibson Reservoir storage remained constant, ending March at elevation 4,660.9 feet or 32,750 AF.

April through June

The April through July spring forecast for Gibson Reservoir was 362,000 AF, 87 percent of average. April temperatures were below normal while snow continued to accumulate resulting in an April 26 peak snowpack. By the month's end, diversions to Willow Creek Reservoir via the Willow Creek Feeder Canal and diversions to Pishkun Reservoir via the Pishkun Supply Canal were initiated. Both 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 348,000 AF or 95 percent of average. The snow melted exceptional fast during the first half of May; however, additional precipitation mid-month brought the snowpack back up to normal. As the snowmelt runoff continued, storage in Gibson slowly filled to the spillway crest, elevation 4,712.0 feet 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 progressively closed to fill the reservoir another 12 feet to the top of the conservation pool at elevation 4,724.0 feet.

In early June, in coordination with Greenfield Irrigation District, the spillway gates were gradually closed to reduce releases to the Sun River as inflows into Gibson peaked near 6,300 cfs. The temperatures in June were hot and melted the remaining mountain snow quickly. Inflows rose to 3,500 cfs by mid-June while releases over the Sun River Diversion Dam also peaked near 3,500 cfs. Gibson's outflows were gradually reduced as inflows receded, until a constant release near 120 cfs was achieved over the Sun River Diversion Dam to the Sun River by the month's end.

July through September

July temperatures were 4 to 6 degrees above normal, and precipitation was below normal across the Sun River drainage. The hot and dry weather caused increased irrigation requirements sooner than normal. This was the case across the entire Sun River system. Even though hot and dry conditions were present, the actual April through July runoff totaled 387,000 AF, 94 percent of average.

The Montana drought monitor map designated the Sun River area drought conditions as moderate to severe by August 3. Although August exhibited near normal temperatures and above average precipitation, it was not enough to relieve the drought situation. 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 20 as Gibson Reservoir reached the minimum content of 5,000 AF.

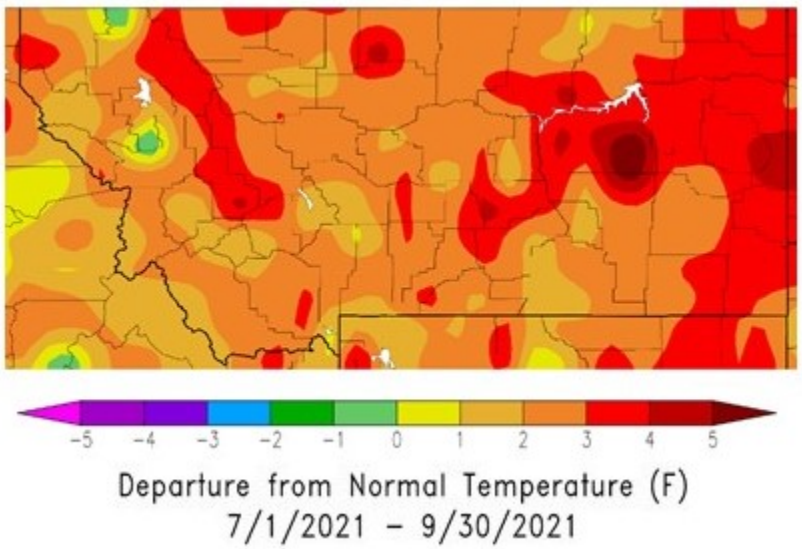


Figure MTG 25: From NOAA Regional Climate Center

Releases from Gibson during late August and September were designed to pass all inflows for downstream users. Therefore, Gibson reservoir remained at minimum content for the rest of the water year. Temperatures in September were 2-4 degrees above normal while drought conditions persisted. Figure MTG 25 shows the temperature patterns from July through September. By the end of September, the Montana drought monitor map designated the Sun River area drought conditions as severe.

Pishkun Reservoir

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


Figure MTG 26: Aerial view of Pishkun Reservoir.

Summary of 2021 Operations

The content in Pishkun Reservoir at the beginning of the water year 2021 was 35,295 AF at elevation 4362.01 feet. Storage during the fall and winter was maintained between 35,300 AF and 33,800 AF due to evaporation and ice storage. Diversions from the Sun River started refilling the reservoir on April 29, 2021.

The reservoir slowly filled and reached near the top of active conservation pool at elevation 4,370.0 feet on May 20. Irrigation releases from Pishkun Reservoir began on May 13. Pishkun releases from May through September were designed to meet irrigation demands. Greenfields Irrigation District (GID) delivered a reduced allotment of 1.5 AF per acre (full allotment is 2.0 AF per acre) to its water users in 2021 due to drought conditions in the basin. Approximately 200,000 AF of water was released from Pishkun Reservoir from May 13 through August 25 to help meet irrigation demands on the Sun River Project. All diversions from the Sun River into Pishkun Reservoir were discontinued on August 20.

Additional hydrologic and statistical data pertaining to Pishkun Reservoir can be found in Table MTT 8.

Willow Creek Reservoir

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

Figure MTG 27: View of Willow Creek Dam and Reservoir.

Summary of 2021 Operations

Typically Willow Creek Reservoir begins to refill during the fall through the Willow Creek Feeder canal, however, this was not needed as the storage content was sufficient. Natural inflows into Willow Creek Reservoir did increase storage by approximately 2,820 AF of storage or 2.2 feet by March 30.

On May 4, GID initiated diversions from the Sun River via the Willow Creek Feeder Canal to assist in filling the reservoir another 6 feet. Diversions via the canal were discontinued on June 19 as the reservoir reached full pool. On June 27, releases from Willow Creek Reservoir were initiated for meeting downstream demands. These releases continued to fluctuate throughout the summer until releases ceased on August 20.

Additional hydrologic and statistical data pertaining to Willow Creek Reservoir can be found in Tables MTT 32 through 35.

Important Events – Water Year 2021

April 29, 2021: Diversions to the Pishkun Supply Canal were initiated.

May 3, 2021: Began to refill Willow Creek Reservoir via Willow Creek Feeder Canal.

June 27, 2021: Releases from Willow Creek Reservoir were initiated to supplement the Sun River.

August 25, 2021: Releases from Pishkun Reservoir for irrigation deliveries were discontinued for the season.

Table MTT 24: Reservoir allocations for Gibson Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	4,557.50	0	0
TOP OF ACTIVE CONSERVATION	4,724.00	98,687	98,687

Table MTT 25: Storage and elevation data for Gibson Reservoir.

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	4,614.96	7,212	10/1/2020
END OF YEAR	4,610.34	5,547	9/30/2021
ANNUAL LOW	4,610.31	5,537	9/29/2021
ANNUAL HIGH	4,724.06	98,767	6/15/2021
HISTORIC HIGH	4,732.23	116,400	6/8/1964

Table MTT 26: Inflow and discharge data for Gibson Reservoir.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	502,411	Oct '20-Sep '21	504,074	Oct '20-Sep '21
DAILY PEAK (CFS)	6,321	6/05/2021	5,096	6/05/2021
DAILY MINIMUM (CFS)	55	1/09/2021	114	10/09/2020

Table MTT 27: Water year 2021 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	15.0	110	0.0	---	11.2	153	13.4	70
NOVEMBER	25.6	181	0.0	---	12.2	146	29.0	130
DECEMBER	14.5	125	0.0	---	14.7	149	30.4	120
JANUARY	11.8	115	0.0	---	14.0	159	29.7	106
FEBRUARY	8.8	92	0.0	---	10.4	128	29.5	97
MARCH	12.3	84	0.0	---	10.5	107	32.7	92
APRIL	36.8	83	0.2	3	12.0	64	59.0	109
MAY	148.8	95	31.7	68	88.8	108	82.9	91
JUNE	167.1	106	73.8	116	73.1	73	97.1	106
JULY	34.3	62	80.3	100	7.7	39	45.5	99
AUGUST	17.1	77	47.6	118	11.4	105	5.7	31
SEPTEMBER	10.4	72	1.8	15	10.8	117	5.5	38
ANNUAL	502.4	89	235.5	91	276.7	94		
APRIL-JULY	387.0	94						

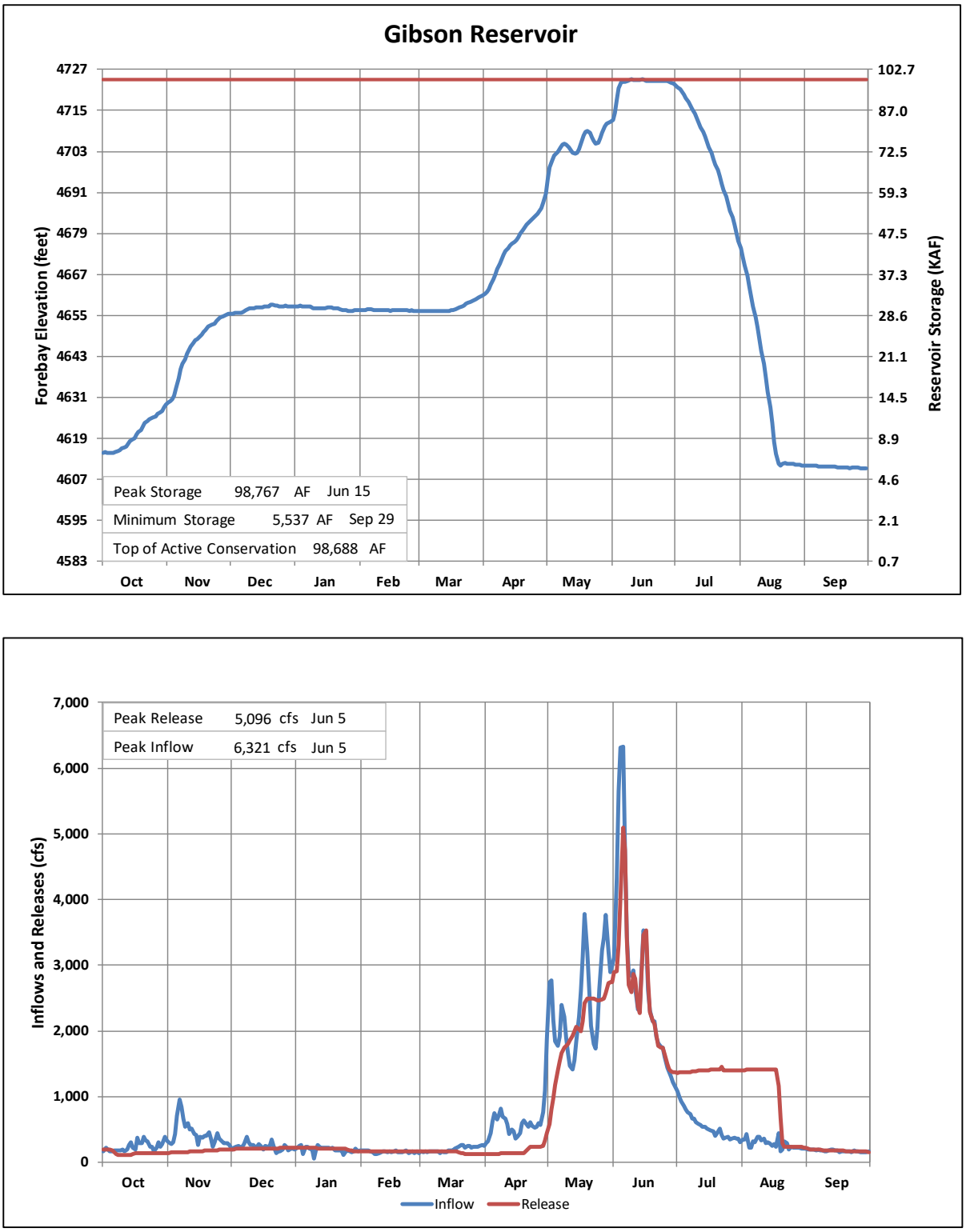


Figure MTG 28: Water year 2021 hydrologic data for Gibson Reservoir.

Table MTT 28: Reservoir allocations for Pishkun Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	4,342.00	16,008	16,008
TOP OF ACTIVE CONSERVATION	4,370.00	46,694	30,686

Table MTT 29: Storage and elevation data for Pishkun Reservoir.

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	4,362.01	35,295	10/1/2020
END OF YEAR	4,362.69	36,199	9/30/2019
ANNUAL LOW	4,356.11	28,278	7/19/2021
ANNUAL HIGH	4,370.11	46,861	5/21/2021
HISTORIC HIGH	4,371.40	48,950	7/4/1953

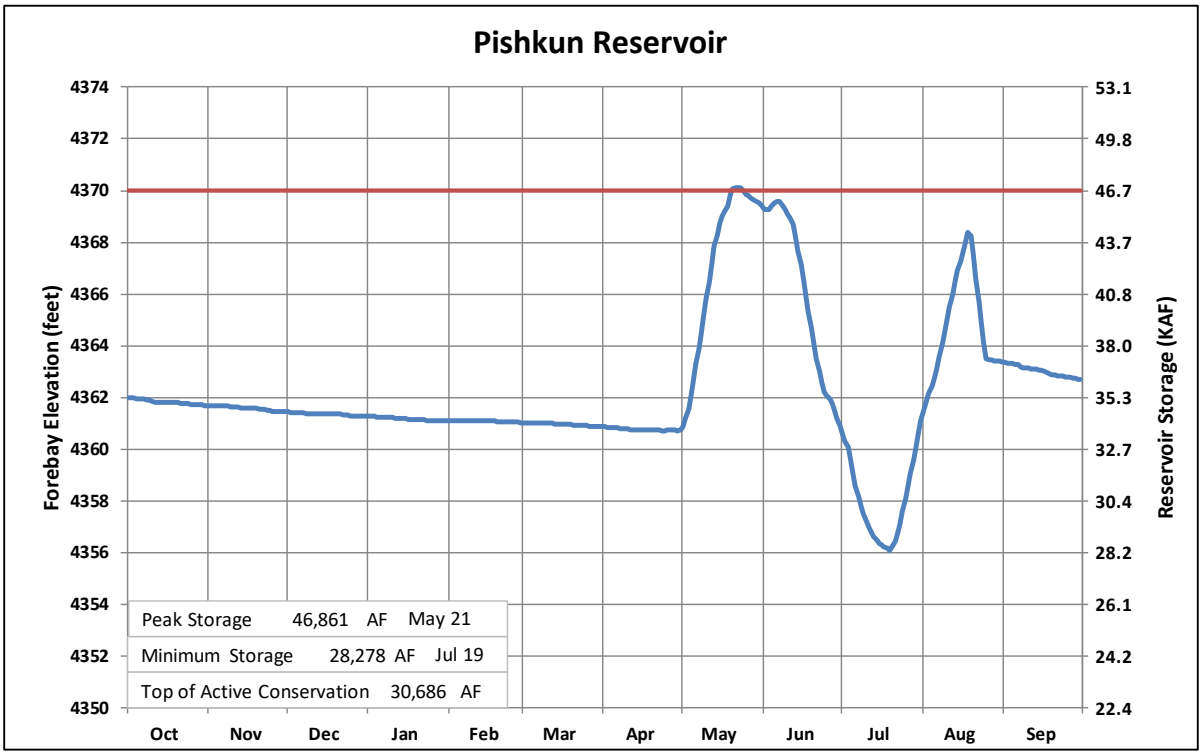
Table MTT 30: Inflow and discharge data for Pishkun Reservoir.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	230,978	Oct '20-Sep '21	230,074	Oct '20-Sep '21
DAILY PEAK (CFS)	1,357	8/8/2020	1,722	6/16/2020
DAILY MINIMUM (CFS)	0	*	0	*

* During nonirrigation season

Table MTT 31: Water year 2021 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 28-yr Avg
OCTOBER	-0.4	---	0.0	---	34.9	124
NOVEMBER	-0.3	---	0.0	---	34.6	119
DECEMBER	-0.2	---	0.0	---	34.3	119
JANUARY	-0.2	---	0.0	---	34.1	118
FEBRUARY	-0.1	---	0.0	---	34.0	118
MARCH	-0.2	---	0.0	---	33.8	113
APRIL	-0.2	---	0.0	---	33.6	92
MAY	31.2	72	19.0	55	45.9	100
JUNE	72.7	118	84.7	127	33.8	84
JULY	79.8	104	79.4	100	34.1	91
AUGUST	49.9	121	46.9	108	37.1	108
SEPTEMBER	-0.9	---	0.0	0	36.2	130
ANNUAL	231.0	95	230.1	94		



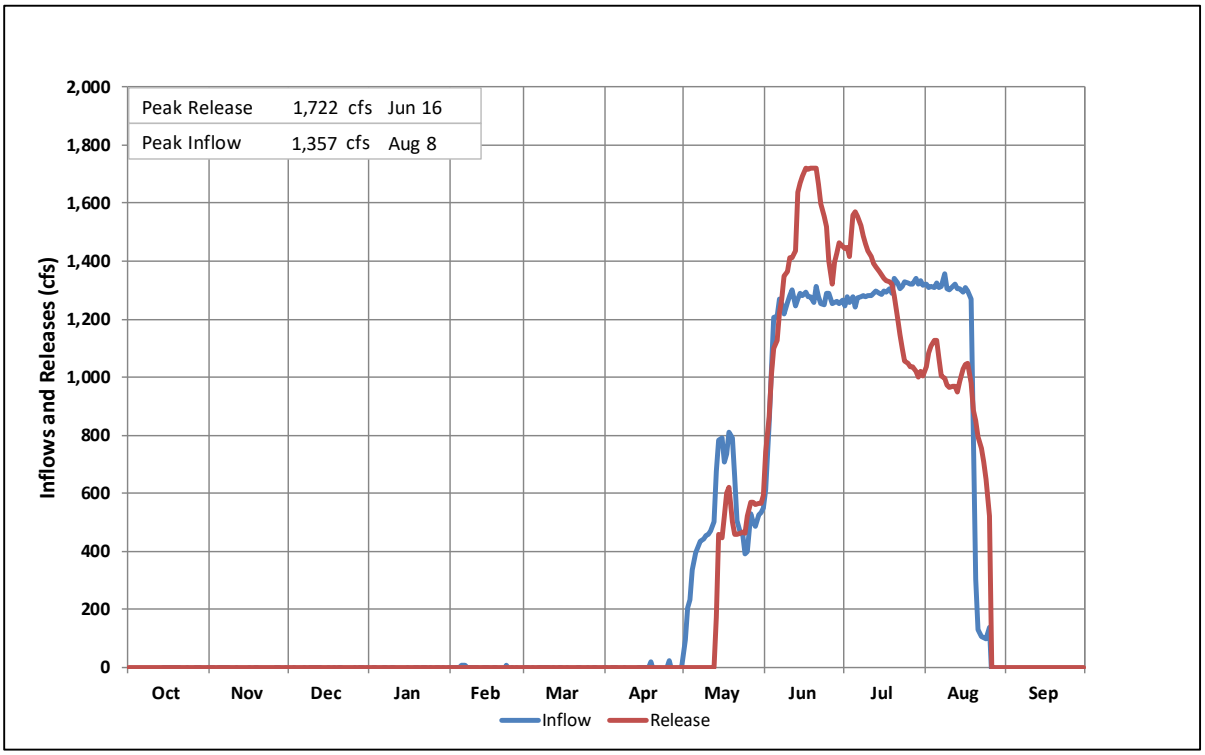


Figure MTG 29: Water year 2021 hydrologic data for Pishkun Reservoir.

Table MTT 32: Reservoir allocations for Willow Creek Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	4,085.28	1	1
TOP OF ACTIVE CONSERVATION	4,142.00	31,848	31,847

Table MTT 33: Storage and elevation data for Willow Creek Reservoir.

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	4,133.81	20,649	10/1/2020
END OF YEAR	4,126.78	13,080	9/30/2021
ANNUAL LOW	4,125.89	12,264	8/20/2021
ANNUAL HIGH	4,142.21	32,155	6/26/2021
HISTORIC HIGH	4,144.80	36,033	6/22/2018

Table MTT 34: Inflow and discharge data for Willow Creek Reservoir.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	13,990	Oct '20-Sep '21	21,507	Oct '20-Sep '21
DAILY PEAK (CFS)	246	5/26/2021	282	7/05/2021
DAILY MINIMUM (CFS)	0	*	0	*

*During non-irrigation season

Table MTT 35: Water year 2021 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	0.6	34	0.0	---	21.3	105
NOVEMBER	0.6	38	0.0	---	21.9	99
DECEMBER	0.5	87	0.0	---	22.3	98
JANUARY	0.4	108	0.0	---	22.7	98
FEBRUARY	0.4	118	0.0	---	23.1	98
MARCH	0.4	81	0.0	---	23.5	98
APRIL	0.4	23	0.0	---	23.9	93
MAY	5.2	134	0.0	---	29.1	102
JUNE	3.8	111	1.4	50	31.5	108
JULY	0.1	14	14.3	217	17.3	75
AUGUST	0.9	545	5.8	141	12.4	63
SEPTEMBER	0.7	105	0.0	0	13.1	66
ANNUAL	14.0	87	21.5	135		

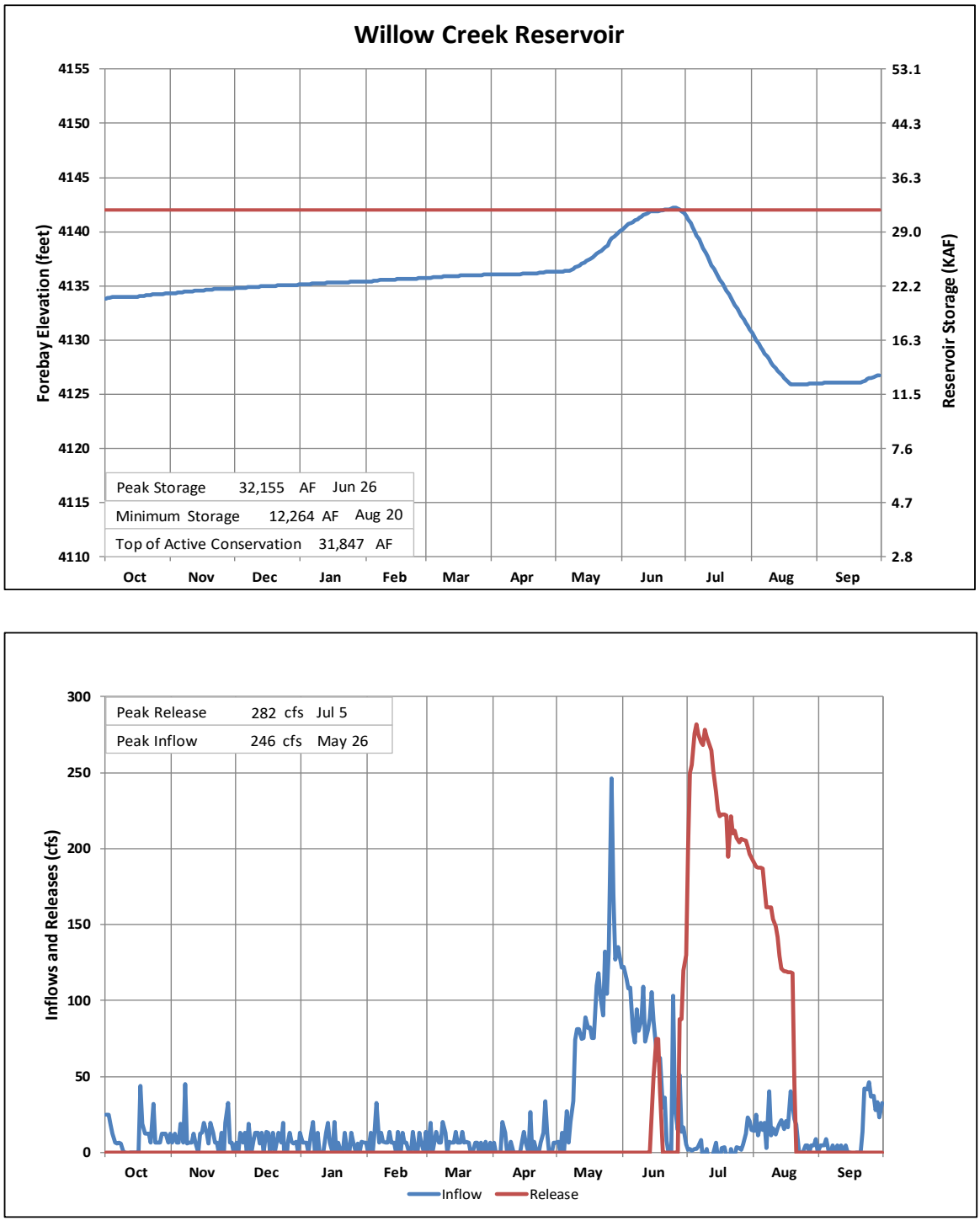


Figure MTG 30: Water year 2021 hydrologic data for Willow Creek Reservoir.

Lake Elwell (Tiber Dam)

Tiber Dam P-S 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 several individual operators by water service contracts and provides about 1,500 AF to the Tiber County Water District for municipal, industrial, rural domestic, and livestock use. The city of Chester, Montana receives a small amount of water from the reservoir annually for municipal use. Approximately 3,000 acres are irrigated by contract from Lake Elwell storage. Reclamation has a storage allocation agreement with the Chippewa Cree Tribe for 10,000 AF of water.

The river outlet works underwent extensive modification to incorporate the addition of a 7.5 megawatt powerplant, privately owned by Tiber Montana, LLC. A bifurcation pipe was installed in the downstream end of the river outlet works tunnel to divert flow from the existing 72-inch outlet pipe through a bifurcation and 96-inch butterfly valve to the powerplant. Construction of the powerplant was completed and brought on-line in June 2004.

Summary of 2021 Operations

The hydrologic conditions in the Marias River Basin varied during WY 2021, beginning near normal then becoming dry. The reservoir was drafted to a low point of 2,982.1 feet at the end of April and filled to 2,991.1 feet at the end of June. River releases were close to 600 cfs for most of the year. This is a summary of WY 2021 hydrology and corresponding operations of Lake Elwell and Tiber Dam.

Figure MTG 31: View of Tiber Dam and Lake Elwell.

October through December

Storage in Lake Elwell started the year near normal at 104 percent of average. Conditions were wetter than average during October through December. Inflow during this period totaled 125 percent of average. Releases were decreased to 550 cfs for about a month and half before being returned to 600 cfs. Releases were returned to 600 cfs because of the higher inflows and wetter conditions. By the end of December 2020, Lake Elwell storage was at 2,984.9 feet, 106 percent of average.

January through March

Snowpack was 114 percent of average at the start of January and runoff was forecasted to be 104 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 600 cfs during March.

April through July

April precipitation was also below average. April inflow was only 58 percent of average. Snowpack peaked on April 26 at 101 percent of the average peak snowpack. Releases remained at 600 cfs as storage levels did not change for the month.

On May 1, inflows were forecasted to be near average with releases expected to increase during June as the reservoir neared full pool. Although precipitation was near average during May, by June 1, inflow forecasts decreased, and releases were expected to remain at 600 cfs for the remainder of the summer.

Precipitation was much below average during June and July. Storage peaked on June 29 at 891,921 AF, at elevation 2,991.13 feet. As forecasted, releases remained at 600 cfs. April through July inflow ended up being only 67 percent of average.

August through September

Releases were decreased to 550 cfs in August and 500 cfs in September to conserve storage. An efficiency test of the powerplant turbine was conducted on September 24 which required varied releases between 500 and 600 cfs. Precipitation was above average in August but turned dry toward the end of the water year.

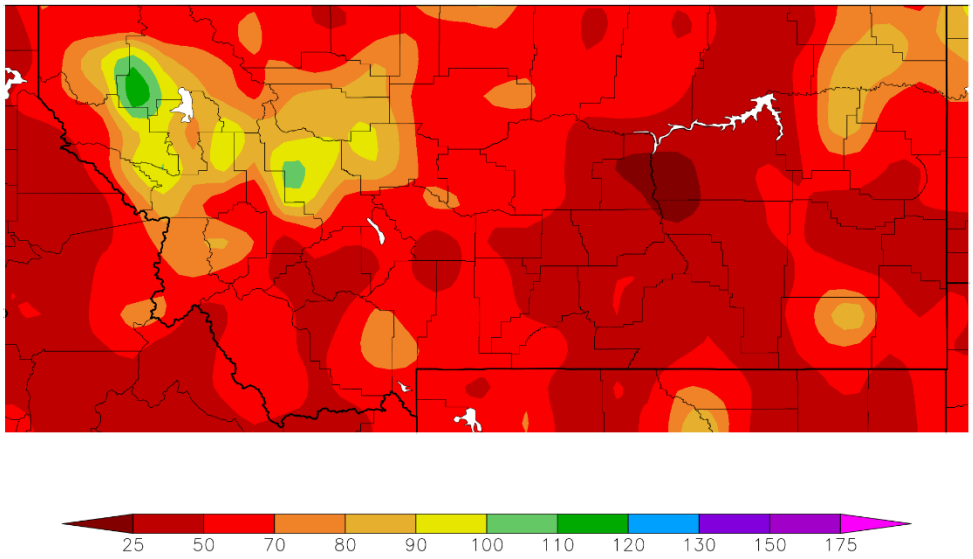


Figure MTG 32: Percent of Normal Precipitation from April through June from NOAA Regional Climate Centers

Important Events – WY2021

On September 24, 2021, an efficiency test was conducted on the powerplant turbine. Releases were briefly fluctuated between 500 and 600 cfs for the test. Releases returned to 500 cfs following the efficiency test.

Additional hydrologic and statistical information pertaining to the operation of Lake Elwell during WY 2021 can be found in Tables MTT 36 through 39 and Figure MTG 33.

Table MTT 36: Reservoir allocations for Lake Elwell.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	2,966.40	554,330	554,330
TOP OF ACTIVE CONSERVATION	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 37: Storage and elevation data for Lake Elwell.

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	2,987.35	828,178	10/1/2020
END OF YEAR	2,986.63	816,767	9/30/2021
ANNUAL LOW	2,982.11	749,528	4/30/2021
ANNUAL HIGH	2,991.13	891,921	6/29/2021
HISTORIC HIGH	3,011.42	1,303,858	7/19/2011

Table MTT 38: Inflow and discharge data for Lake Elwell.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	413,797	Oct '20-Sep '21	425,208	Oct '20-Sep '21
DAILY PEAK (CFS)	3,504	6/7/2021	622	1/23/2021
DAILY MINIMUM (CFS)	-55	9/19/2021	509	9/15/2021
PEAK SPILL (CFS)	-	-	0	NA
TOTAL SPILL (AF)	-	-	0	NA

Table MTT 39: Water year 2021 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	13.1	83	35.7	88	805.6	104
NOVEMBER	31.9	157	32.4	99	805.1	105
DECEMBER	22.1	128	36.9	115	790.3	106
JANUARY	19.2	119	36.9	115	772.6	105
FEBRUARY	15.7	75	33.4	112	754.8	104
MARCH	34.6	82	36.9	103	752.5	103
APRIL	33.0	58	36.0	92	749.5	100
MAY	118.9	88	37.2	66	831.2	101
JUNE	96.8	65	36.3	48	891.7	100
JULY	12.8	28	37.9	56	866.7	99
AUGUST	10.4	87	34.5	66	842.6	101
SEPTEMBER	5.2	53	31.1	69	816.8	102
ANNUAL	413.8	76	425.2	79	-	-
APRIL-JULY	261.5	67	-	-	-	-

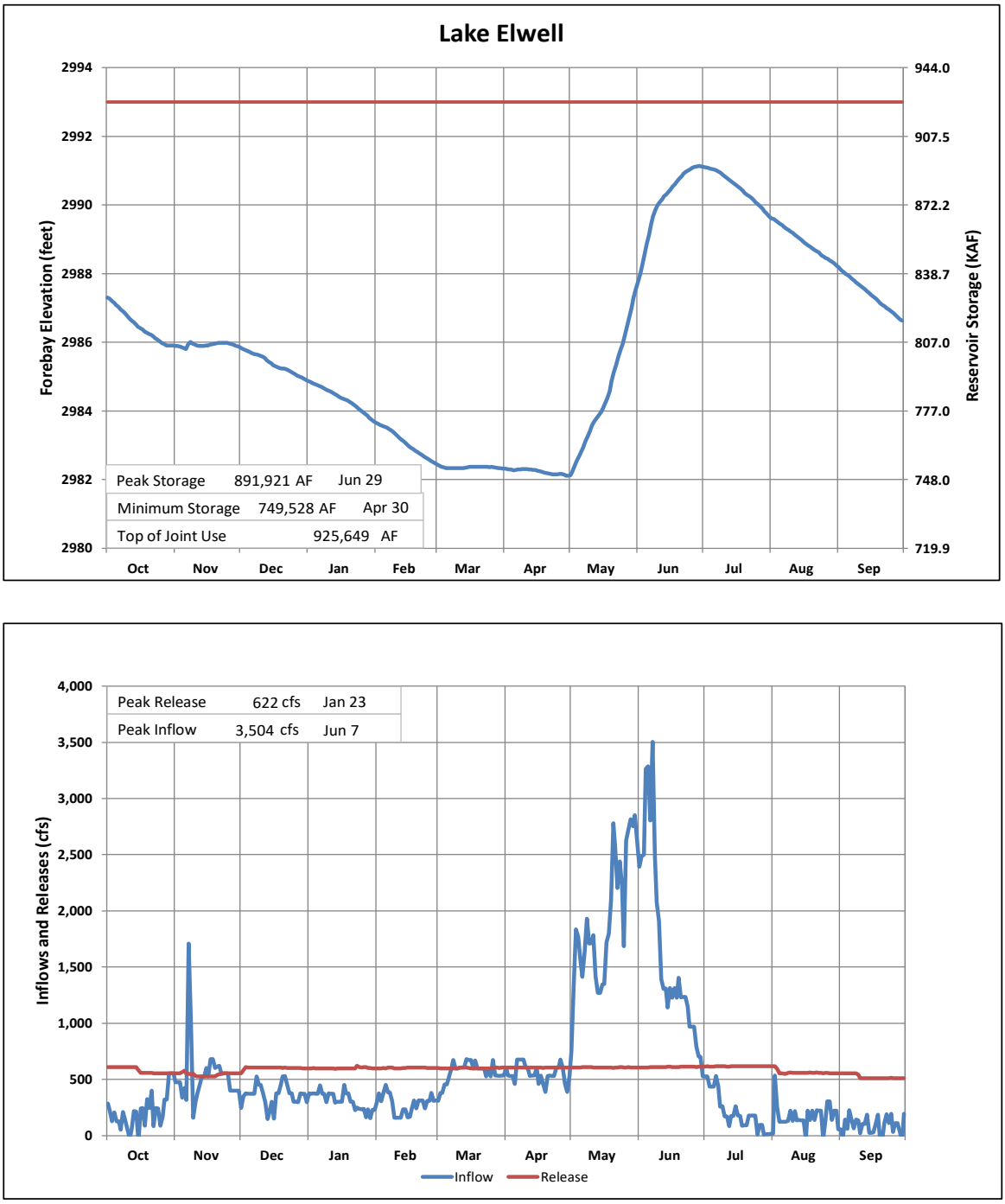


Figure MTG 33: Water year 2021 hydrologic data for Lake Elwell.

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.

Figure MTG 34: Lake Sherburne's outlet works.

Summary of 2021 Operations

The hydrologic conditions in the St. Mary River Basin in WY 2021 started off with above average storage in Lake Sherburne. Snowpack was average but dry conditions starting in March resulted in drought conditions and a shortened season for the St Mary Canal.

October through December

At the start of WY 2021, storage content in Lake Sherburne was at much above average due to the failure of the St. Mary Canal in 2020. Storage was being conserved for transfer following the completion of repairs to the drop structures.

Releases from Lake Sherburne were maintained at the minimum releases until October 5 when releases were increased to start moving water through the repaired St. Mary Canal. Diversions into the canal were started on October 8 and continued until November 2. Canal diversions reached the 600 cfs capacity during October. Releases from Lake Sherburne peaked near 1,000 cfs to evacuate storage before the winter season. The water moved during October was captured in Fresno Reservoir located in the Milk River Basin. More information about Fresno and Nelson Reservoir operations is in the next sections.

Releases from Lake Sherburne were shutoff for the season on November 3. Storage was near the approximate target of 4,770 feet going into the winter. As soon as releases were shut off, a weather system moved through the St. Mary River Basin bringing high precipitation and well above average inflows. This resulted in higher-than-planned storage by the end of November. Storage was at 4,779.1 feet at the end of November which was 212 percent of average.

By the end of December, Lake Sherburne storage was 204 percent of average.

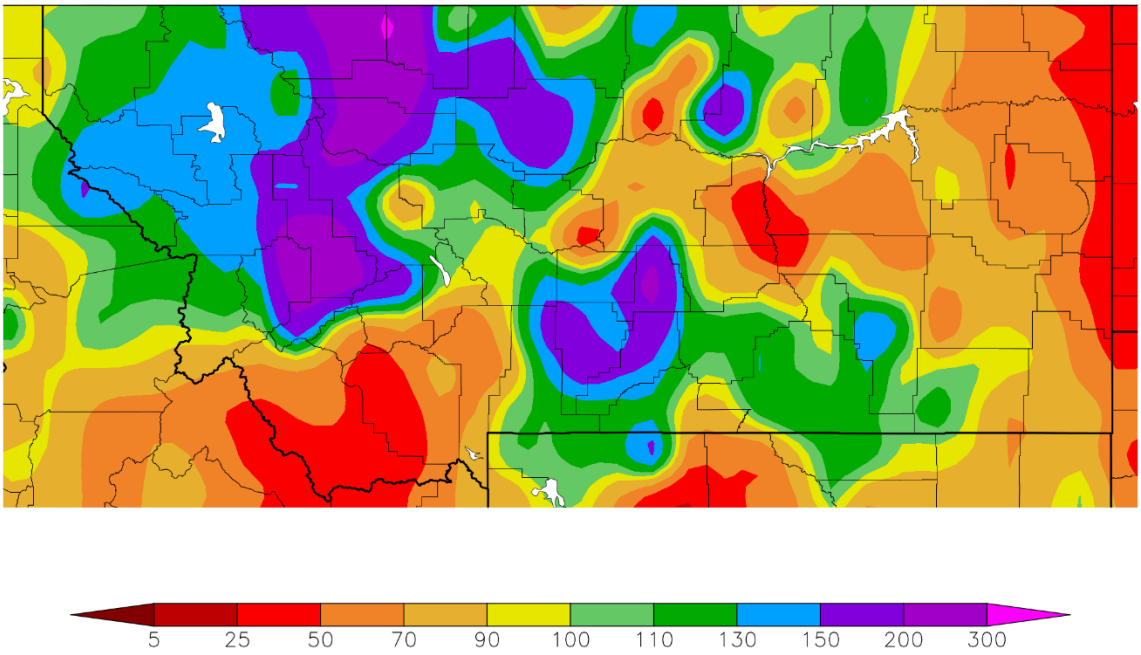


Figure MTG 35: Percent of Normal Precipitation from October through December from NOAA Regional Climate Centers

January through March

On January 1, 2021, the NRCS reported mountain snowpack SWE in the St. Mary Basin was 106 percent of average. Precipitation varied during January and February.

Temperatures were much below average during February. Due to the cold weather, inflows ended up at 39 percent of average. Snowpack was at 102 percent of average by the end of February.

Because storage was very high, releases from Lake Sherburne were started on March 15-17 with releases being ramped up to 100 cfs. Starting releases before starting diversions in the St. Mary Canal also allowed the St. Mary River to become fully watered as there is some storage space to fill in Lower St. Mary Lake and behind the St. Mary Diversion Dam each season.

Diversions to the St. Mary Canal started on March 22 at an initial amount of approximately 50 cfs. The canal was shutoff on March 23 after it was discovered that one of the turnout gates was broken and releasing water. Repairs were made to the gate and the canal was diverting water

again on March 27. Diversions to the canal were ramped-up over the next several days to reach the 600 cfs capacity by April 7.

A deficit delivery is allowed under the Letter of Intent which is part of the International Joint Commission (IJC) Procedures Manual for the natural flow calculations of the St. Mary and Milk River Basins (Procedures Manual). The U.S. can create a deficit delivery to Canada during March, April, and May in the St. Mary River Basin. 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 forecast, a deficit delivery to Canada in the St. Mary River Basin was not expected in WY2021. No deficits occurred during March through May.

April through July

Mountain snowpack SWE peaked on April 1 at 99 percent of the average peak SWE. St. Mary Canal diversions were maintained at 600 cfs. Releases from Lake Sherburne were designed to maintain U.S. use of St. Mary water within the U.S.'s share during April, May, and June.

Precipitation and resulting inflows were below average during April through June. Drought conditions were worsening in the St. Mary River Basin. However, runoff in the St. Mary Basin was high enough to allow storage to increase in Lake Sherburne during part of May and all of June.

Precipitation remained well below average in July. Inflow was only 64 percent of average. Releases from Lake Sherburne were gradually increased during July as natural runoff in the St. Mary River basin receded.

A deficit in the delivery of St. Mary River water to Canada was created during July. Part of this deficit was unintentional and was caused by adjustments made to the streamgages. The adjustments affected the water accounting. The other part of the deficit was intentional to offset a deficit created by the Canadians in the Milk River Basin. Natural flow in the Milk River basin went to zero during June which created a deficit delivery to the U.S.

August through September

Releases from Lake Sherburne remained high to support St. Mary Canal diversions until storage decreased to approximately 10,000 af during September. St. Mary Canal diversions were decreased to 500 cfs in August as storage levels in Lake Sherburne declined. Canal diversions and releases from Sherburne started ramping down on September 8. The canal was shut off on September 17 and releases from Lake Sherburne were shut off on October 1. Releases had to continue 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 184,595 AF. The limiting factor was the available water supply in the St. Mary River Basin. If more water could have been moved during September, the canal would have operated longer.

During the 2021 irrigation season several conference calls were conducted with the IIJC Field Representatives due to the drought conditions. Special provisions were made to deal with deficit deliveries outside of the allowed periods of time.

Additional hydrologic and statistical information pertaining to the operation of Lake Sherburne during 2021 can be found in Tables MTT 40 through 43 and Figure MTG 38.

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.

Figure MTG 36: Aerial view of Fresno Reservoir and Dam.

Summary of 2021 Operations

Overall reservoir storage in the Milk River Basin started off the year below average due to the failure of the St. Mary Canal along with the dry conditions in 2020. Lack of plains snowpack in 2021 exacerbated the dry conditions. Irrigation allotments were reduced, and the 2021 irrigation season ended early because of persistent dry conditions.

October through December

Releases from Fresno Reservoir were reduced to 40 cfs at the end of previous water year. This is the minimum amount of water that can be released from Fresno Reservoir given 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.

Since no water was diverted from the St. Mary River basin since May 2020, inflows were very low for the first half of October. Diversions were initiated following repairs to the canal at the

start of October, finally reaching Fresno Reservoir on October 21. In addition, precipitation upstream of Fresno Reservoir caused inflows to peak at 1,125 cfs on November 2. The last of the St. Mary River basin water entered Fresno during the first half of November.

Conditions remained wet during November. Inflows remained above average through end of December, at which point storage had increased to 68 percent of average.

January through February

Snowpack in the Bear Paw Mountains was 147 percent of average. However, plains snowpack throughout the Milk River basin was nearly non-existent. January precipitation was well below average while temperatures were above average. The dry conditions did not affect inflow into Fresno Reservoir until temperatures turned much colder in February, decreasing Fresno inflows.

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 98 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 slightly.

March precipitation was below average. Inflows increased slightly during March from snowmelt runoff but remained much below average. Storage in Fresno Reservoir at the end of March was only 71 percent of average.

April was also very dry. The Milk River Joint Board of Control set the initial irrigation allotment for the 2021 irrigation season at 1.7 AF/acre at their April 27 meeting based on the minimum inflow forecast. Water had to be transferred from Fresno Reservoir to Nelson Reservoir to balance storage for the irrigation season. It was decided to move the water during the irrigation season in addition to Malta Irrigation District's water order.

Water from the St. Mary River Basin reached Fresno Reservoir at about the middle of April. Releases from Fresno Dam remained at the minimum release rate of 50 cfs until April 27 when releases were increased in response to the initial water order from Malta Irrigation District.

Precipitation was above average in May, increasing storage in Fresno Reservoir until early June, when inflows progressively decreased, triggering release increases to supply increasing irrigation demands. Fresno Reservoir storage peaked at elevation 2,571.1 feet, with a content of 73,484 AF on June 2. June was dry and irrigation demands stayed high through the end of the month even with the normal mid-season shutdown by Malta Irrigation District for demossing of the canals.

July through September

Conditions were generally dry during July but some precipitation did help keep inflows above average during the second half of the month. Fresno Reservoir instrumentation equipment failed

on July 5. The equipment failure required manual readings by the dam operator for forebay elevation and river outlet works gate opening. Releases were manually calculated based on the average reservoir elevation and river outlet works gate opening. The instrumentation was repaired on September 23 after the replacement parts order arrived.

Irrigation releases from Fresno Reservoir were ramped down starting August 3 based on remaining water supply projections. Releases were decreased to the release required for Fort Belknap Indian Irrigation Project and the downstream municipalities, 100 cfs, on August 8, and remained at 100 cfs until September 13. Storage in Fresno Reservoir reached its annual minimum at 11,970 AF on August 4.

Conditions during August were wetter than average. The continued inflow of St. Mary River basin water helped Fresno Reservoir storage recover to approximately 42,000 AF. Because of very low storage in Nelson Reservoir, approximately 6,000 AF was transferred from Fresno to Nelson Reservoir during September. Fresno Reservoir storage ended the season at 94 percent of average.

Additional hydrologic and statistical information pertaining to the operation of Fresno Reservoir during 2021 can be found in Tables MTT 44 through 47 and Figure MTG 39.

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 supply for the lower portion of the Malta Irrigation District. Nelson Reservoir also serves the Glasgow Irrigation District when water is not available from Fresno Reservoir.

Figure MTG 37: Aerial view of Nelson Reservoir.

Summary of 2021 Operations

October through March

Storage in Nelson Reservoir at the start of Water Year 2021 was 99 percent of average. Storage slowly decreased through seepage and evaporation until diversions through the Dodson South Canal reached Nelson Reservoir on March 13. Storage in Nelson Reservoir on March 31 was 108 percent of average.

April through July

Releases through the Nelson North Canal started on April 27 to meet Glasgow Irrigation District's irrigation demand because there was not enough natural flow in the Milk River to meet it. Due to the shortened irrigation season and lack of storage water in Nelson Reservoir, all irrigation releases were shut off on July 26. Storage in Nelson Reservoir by the end of July was only 58 percent of average.

August through September

Malta Irrigation District continued to operate the Dodson South Canal into October 2021 to capture natural runoff and irrigation return flows. In addition, approximately 6,000 AF of water

was transferred from Fresno to Nelson Reservoir in September. Storage in Nelson Reservoir was still only 80 percent of average by the end of WY 2021.

Additional hydrologic and statistical information pertaining to the operation of Nelson Reservoir during 2021 can be found in Tables MTT 48 through 51 and Figure MTG 40.

Important Events – WY2021

March 13, 2021: Diversions to Dodson South Canal reach Nelson Reservoir.

March 15, 2021: Releases begin from Lake Sherburne due to high carryover storage.

March 22, 2021: Diversion to St. Mary Canal were started to move water to the Milk River Basin.

April 14, 2021: 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 27, 2021: MRJBC set the irrigation allotment at 1.7 AF/acre. This approximately 0.6 AF/acre lower than a full water supply.

April 27, 2021: Fresno Reservoir releases were increased to meet irrigation demand. Nelson Releases were initiated from Nelson Reservoir for irrigation demands.

June 23, 2021: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments.

July 21, 2021: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments. There was discussion of creating a deficit on the St. Mary River basin and shutting off irrigation districts.

July 26, 2021: Releases from Nelson Reservoir were discontinued.

August 8, 2021: Releases from Fresno Reservoir are set at approximately 100 cfs to serve the municipalities and Fort Belknap Irrigation District.

September 8, 2021: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments.

September 17, 2021: St. Mary Canal diversions were discontinued for the season.

October 1, 2021: Lake Sherburne releases were discontinued. Releases from Fresno Reservoir are set at the winter release rate of approximately 40 cfs.

October 20, 2021: A conference call was held with the IJC Field Representatives to discuss St. Mary and Milk River apportionments.

Table MTT 40: Reservoir allocations for Lake Sherburne.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	4,729.30	1,899	1,899
TOP OF ACTIVE CONSERVATION	4,788.00	66,147	64,248

Table MTT 41: Storage and elevation data for Lake Sherburne.

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	4,785.90	62,576	10/1/2020
END OF YEAR	4,743.67	11,345	9/30/2021
ANNUAL LOW	4,741.35	9,513	9/15/2021
ANNUAL HIGH	4,785.91	62,594	10/1/2020
HISTORIC HIGH	4,788.30	68,371	6/30/1986

Table MTT 42: Inflow and discharge data for Lake Sherburne.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	118,230	Oct '20-Sep '21	169,452	Oct '20-Sep '21
DAILY PEAK (CFS)	1,156	6/4/2021	1,170	10/23/2021
DAILY MINIMUM (CFS)	-26	3/31/2021	0	*

*During non-irrigation season

Table MTT 43: Water year 2021 monthly inflow, outflow, and storage data for Lake Sherburne.

Month	Inflow, KAF	Percent of 30-yr Avg	Outflow, KAF	Percent of 30-yr Avg	Content, KAF	Percent of 30-yr Avg
OCTOBER	5.2	75	29.6	1,241	38.1	201
NOVEMBER	13.6	185	0.1	7	51.6	212
DECEMBER	3.7	106	0.0	---	55.3	204

JANUARY	2.7	101	0.0	---	58.1	195
FEBRUARY	0.9	39	0.0	---	59.0	184
MARCH	1.2	32	2.9	58	57.3	185
APRIL	5.6	56	34.5	196	28.5	122
MAY	26.4	84	22.9	129	32.1	86
JUNE	34.4	88	6.1	31	60.3	104
JULY	12.0	64	25.9	102	46.5	92
AUGUST	7.4	86	35.2	113	18.7	67
SEPTEMBER	4.9	89	12.2	69	11.3	72
ANNUAL	118.2	84	169.5	122		
APRIL-JULY	78.5	79				

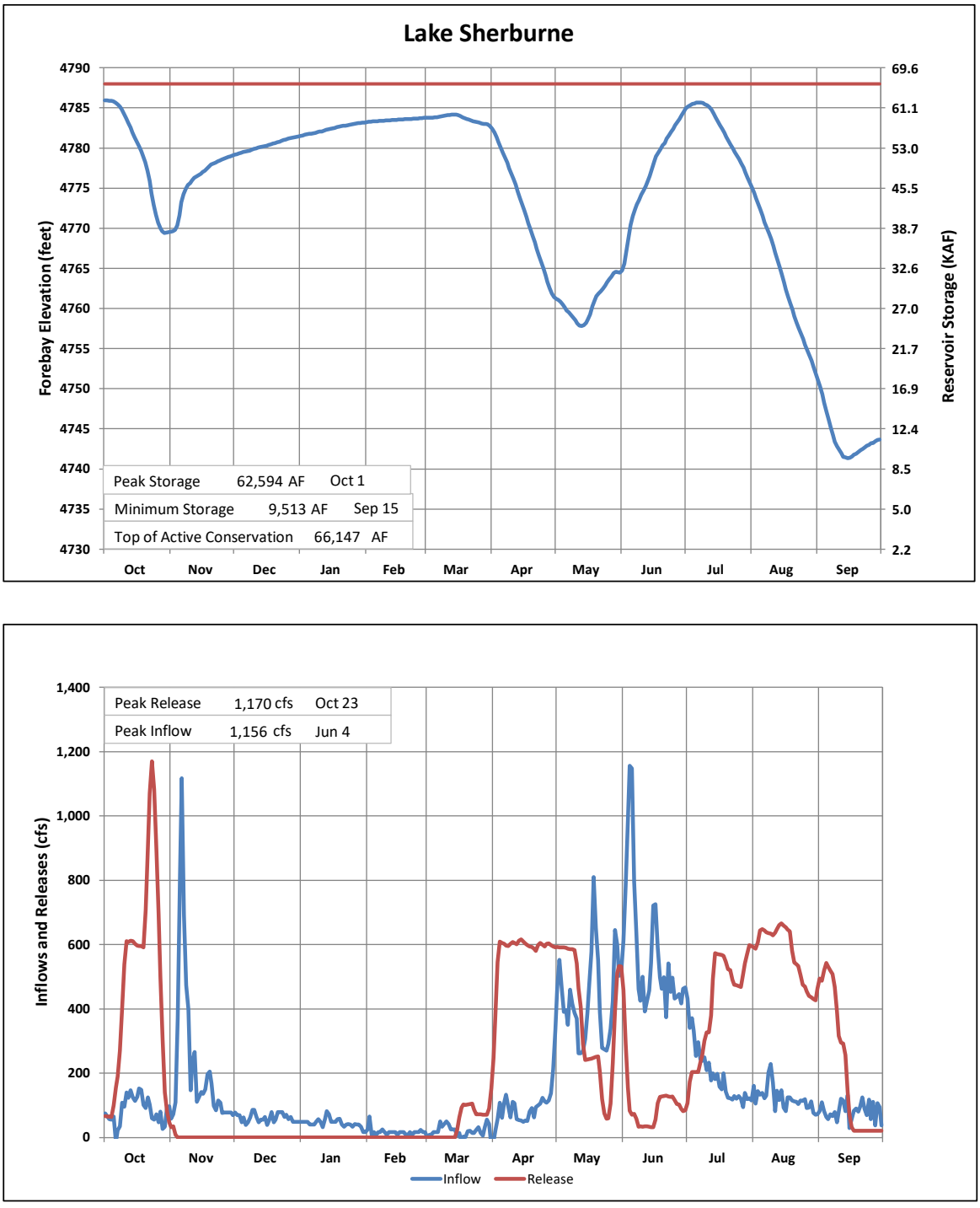


Figure MTG 38: Water year 2021 hydrologic data for Lake Sherburne.

Table MTT 44: Reservoir allocations for Fresno Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	2,530.00	158	158
TOP OF ACTIVE CONSERVATION	2,567.00	57,905	57,747
TOP OF JOINT USE	2,575.00	91,746	33,841

Table MTT 45: Storage and elevation data for Fresno Reservoir.

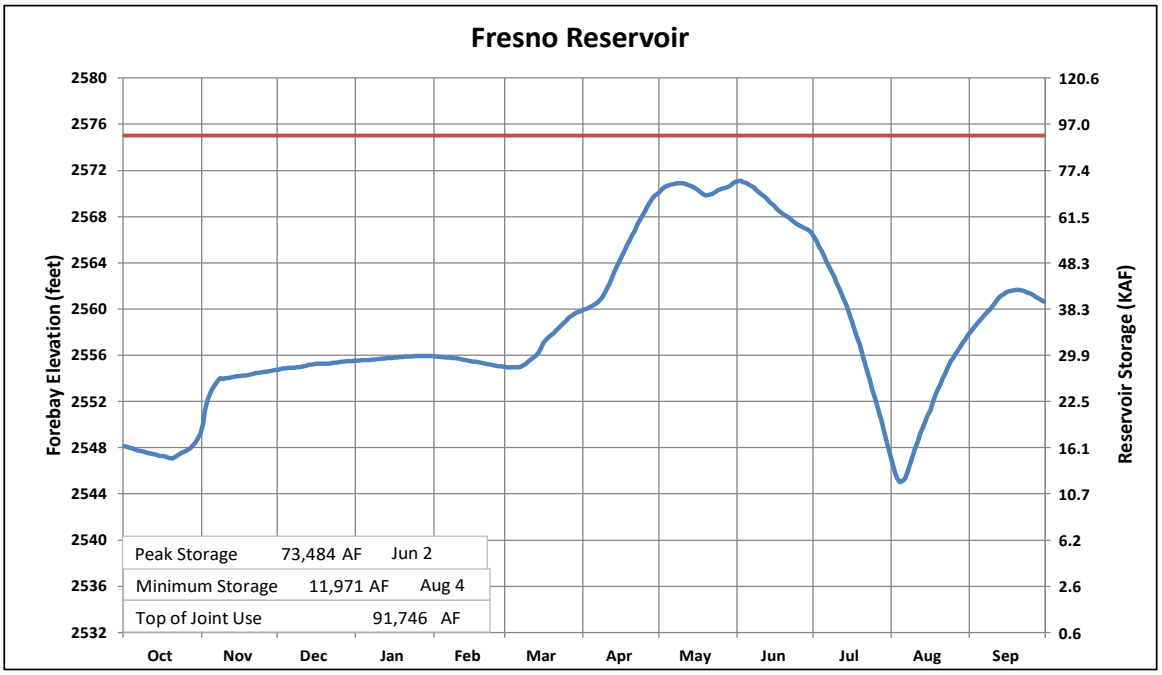
STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	2,548.16	16,291	10/1/2020
END OF YEAR	2,560.65	39,831	9/30/2021
ANNUAL LOW	2,545.04	11,971	8/4/2021
ANNUAL HIGH	2,571.10	73,484	6/2/2021
HISTORIC HIGH	2,579.30	153,694	4/2/1952

Table MTT 46: Inflow and discharge data for Fresno Reservoir.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	221,965	Oct '20-Sep '21	198,425	Oct '20-Sep '21
DAILY PEAK (CFS)	1,125	11/2/2020	1,275	7/18/2021
DAILY MINIMUM (CFS)	-21	10/6/2020	37	10/15/2020

Table MTT 47: Water year 2020 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	3.9	59	2.3	39	17.8	40
NOVEMBER	12.0	405	2.4	80	27.4	63
DECEMBER	3.9	231	2.4	79	29.0	68
JANUARY	3.3	249	2.5	83	29.7	73
FEBRUARY	0.4	9	2.2	70	27.9	68
MARCH	12.5	51	2.5	26	37.9	71
APRIL	34.5	109	3.5	20	69.0	100
MAY	45.9	109	41.7	96	73.1	108
JUNE	28.5	58	45.2	98	56.5	78
JULY	27.9	95	69.0	141	15.3	29
AUGUST	33.4	115	15.4	36	33.4	82
SEPTEMBER	15.7	75	9.3	46	39.8	94
ANNUAL	222.0	90	198.4	80		
APRIL-JULY	136.8	88				



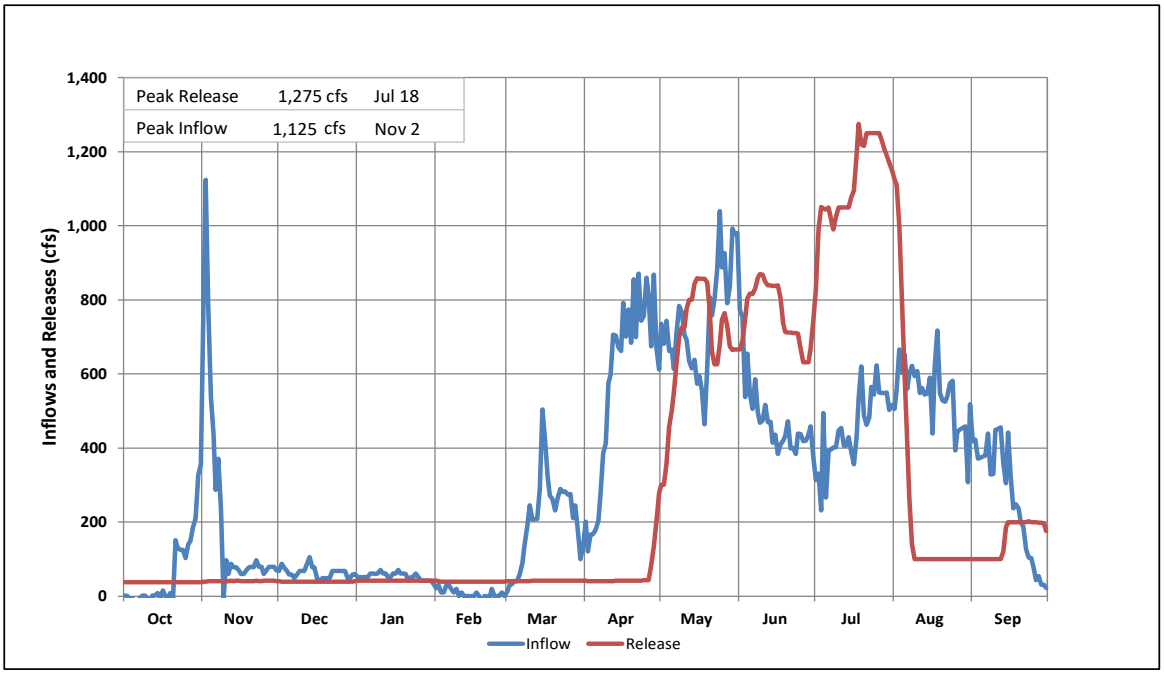


Figure MTG 39: Water year 2021 hydrologic data for Fresno Reservoir.

Table MTT 48: Reservoir allocations for Nelson Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	2,200.00	18,140	18,140
TOP OF ACTIVE CONSERVATION	2,221.60	78,950	60,810

Table MTT 49: Storage and elevation data for Nelson Reservoir.

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	2,215.88	56,383	10/1/2020
END OF YEAR	2,212.52	45,165	9/30/2021
ANNUAL LOW	2,207.14	31,647	7/26/2021
ANNUAL HIGH	2,217.45	62,187	4/27/2021
HISTORIC HIGH	2,221.68	79,297	6/1/2007

Table MTT 50: Inflow and discharge data for Nelson Reservoir.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	34,654	Oct '20-Sep '21	45,893	Oct '20-Sep '21
DAILY PEAK (CFS)	518	8/8/2021	399	7/12/2021
DAILY MINIMUM (CFS)	0	*	0	*

*During non-irrigation season

Table MTT 51: Water year 2021 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	-2.2	---	0.0	---	54.2	94
NOVEMBER	-1.4	---	0.0	---	52.8	95
DECEMBER	-1.4	---	0.0	---	51.4	95
JANUARY	-1.6	---	0.0	---	49.8	95
FEBRUARY	-1.3	---	0.0	---	48.5	94
MARCH	11.0	288	0.0	---	59.5	108
APRIL	3.1	30	0.7	53	61.9	96
MAY	8.5	92	15.3	143	55.1	88
JUNE	3.3	33	14.5	150	44.0	69
JULY	4.2	61	15.9	113	32.3	58
AUGUST	10.8	112	0.0	0	43.1	80
SEPTEMBER	2.1	29	0.0	0	45.2	80
ANNUAL	35.1	65	46.3	85		

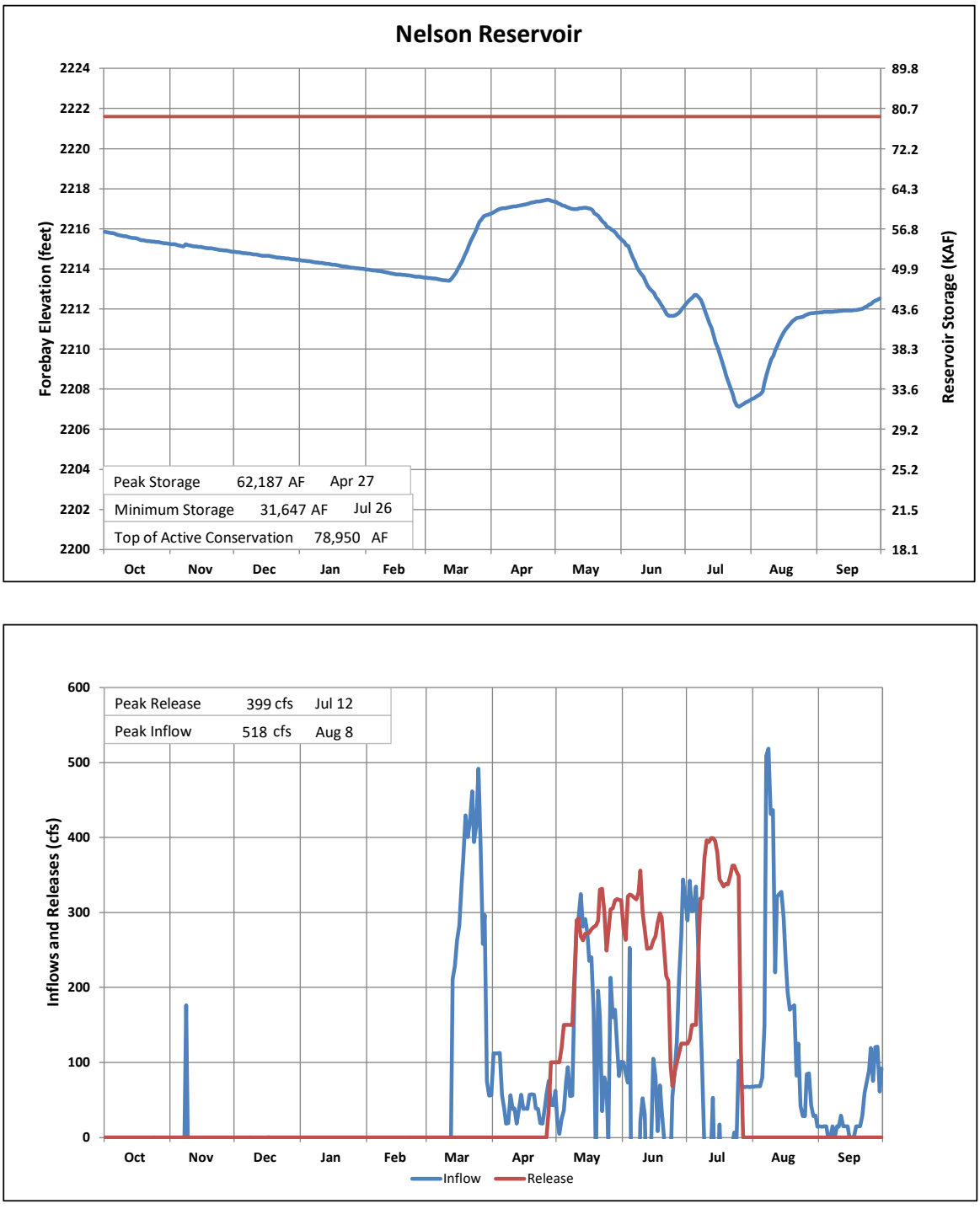


Figure MTG 40: Water year 2021 hydrologic data for Nelson Reservoir.

Bighorn Lake and Yellowtail Powerplant

Bighorn Lake P-S, 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 Wyoming Area Office (WYAO) and all reservoir and river operations in the Bighorn River Basin are closely coordinated between the MTAO and WYAO.

Figure MTG 41: View of Yellowtail Dam and Powerplant.

A sediment survey of Bighorn Lake was conducted during the summer of 2017. The accompanying report and new capacity tables were completed in May 2020. The new capacity tables were implemented into operations on October 1, 2020.

Summary of 2021 Operations

The hydrologic conditions in the Bighorn River Basin varied during WY 2021. Snowpack conditions were near normal by mid-April, but conditions turned and stayed dry until August. The reservoir was drafted to a low point of 3,613.1 feet near mid-May and filled to elevation 3,627.1 near mid-June. River releases fluctuated between a low of 1,750 cubic feet per second (cfs) and a high of 3,250 cfs. This is a summary of WY 2021 hydrology and corresponding operations of Bighorn Lake and Yellowtail Dam.

October

Storage in Bighorn Lake started WY2021 at elevation 3,633.1 feet, which is 105 percent of the 30-year average. Bighorn River releases started WY2021 at 2,400 cfs. Dry conditions, below average inflow and storage in Bighorn Lake resulted in the below average release.

Releases to the Bighorn River were reduced to 2,100 cfs on October 19 to conserve storage and match expected winter releases. Storage ended the month at elevation 3,633.5 feet.

November through February

Winter river releases are set during the early part of November, applying 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 2,080 cfs. This change was made on November 10 which was a slight decrease from the previous release of 2,100 cfs.

Releases were slightly increased during the winter months, but no major changes were needed due to near average snowpack and forecasts. By the end of February, river releases were 2,220 cfs while storage was at elevation 3622.1 feet.

March

On March 1, the operational focus shifts from March 31 to April 30 for the storage target in accordance with established operating criteria. River releases were maintained at 2,220 cfs. Inflows remained below releases during March allowing storage to be evacuated through the month. There was a lack of low elevation snowmelt and releases from Boysen and Buffalo Bill Reservoir stayed the same for most of the month. The storage target for April 30 was 3,616.2 feet based on the March 1 April through July inflow forecast of 922,000 AF, 73 percent of average. Storage on March 31 was 3,620.3 feet. Snowpack was 93 percent of average on April 1.

April through June

The April 1 runoff forecast was nearly the same at 939,000 AF therefore the end of April storage target was nearly the same at 3,616.1 feet. Releases were increased to 2,500 cfs during the first part of April based on April 30 storage target. There was a flushing flow from Buffalo Bill Reservoir during the first part of the month that contributed to a peak inflow just above 5,000 cfs. Storage in Bighorn Lake was at 3,619.0 feet on April 30 and river releases were increased to 3,250 cfs by the end of the month. Bighorn Canal diversions started on April 28 for the irrigation season.

Snowpack continued to accumulate during April and peaked on April 28 at 98 percent of the average peak. Conditions during the latter half of April turned dry and actual inflows were less than forecasted.

The May 1 April through July inflow forecast increased to 984,300 AF which included actual April inflow volume. Releases were decreased to 3,000 cfs on May 6 in response to storage and forecasted inflow conditions. Conditions for the month were drier than average. Actual inflows continued to come in lower than forecasted due to the drier conditions and irrigation diversions upstream of Bighorn Lake. The minimum elevation of Bighorn Lake was 3613.4 feet on May 20 which was approximately 5.4 feet below the operating criteria target for May 20. Releases were reduced several times during May and reached 2,000 cfs by May 21 to conserve and increase storage in Bighorn Lake.

The June 1 April through July inflow forecast, which included actual April and May inflow volume, decreased considerably to 649,900 AF as a result of the dry conditions prevailing since

the latter part of April. Conditions remained dry and warmer than average through most of June causing snowpack to melt out sooner than normal - 61 percent of average on June 1 and gone on June 16. Inflows decreased from a high of 5,960 cfs on June 8 to 2,095 cfs by June 30. At this time, Bighorn Lake was not expected to fill to normal full pool of 3640.0 feet during the runoff season.

Releases were reduced to 1,750 cfs on June 9 to conserve storage. This closely matched the release needed to hit the carryover storage target of 3,617.0 feet on March 31, 2022, based on forecasted inflows. Storage in Bighorn Lake peaked at 3,628.1 feet on June 22. Figure MTG 42 shows precipitation as a percent of average for April through June which was well below average.

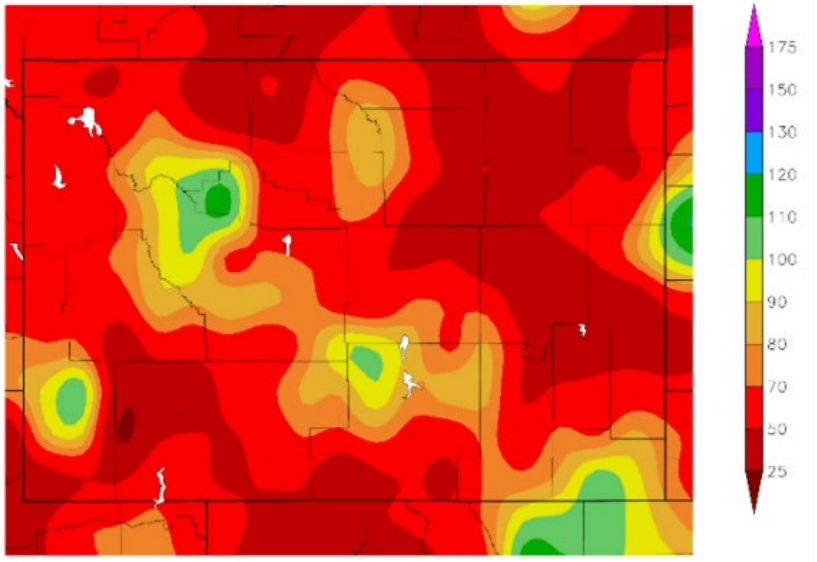


Figure MTG 42: Percent of Normal Precipitation from October through December from NOAA Regional Climate Centers

July through September

Conditions remained dry through July until after more than 3 months of dry conditions, August was wetter than average, improving inflows. The higher inflows helped keep the reservoir high enough for Horseshoe Bend to stay open through Labor Day weekend. However, dry conditions returned in September. Releases remained at 1,750 cfs until September 8 when releases were increased to 1,900 cfs. Storage ended WY2021 at elevation 3,626.7 feet, 866,800 AF.

The water levels of Bighorn Lake during WY 2021 allowed for full-service recreation at all marinas for most of the recreation season, from Memorial Day through Labor Day. The exception to this is Horseshoe Bend which was not open during Memorial Day weekend due to the reservoir elevation being lower than needed to launch boats, elevation 3,620 feet.

Total generation produced at Yellowtail Powerplant during WY 2021 was 535,246 megawatt-hours, 68 percent of average. All water released from Yellowtail Dam during WY 2021 was released through the powerplant.

Important Events – WY2021

October 1, 2020 through September 30, 2021: Yellowtail Powerplant was limited to three units for most of the year while a major rewind project on Unit 3 was underway.

April 2021: Releases to the Bighorn River are increased to 3,250 cfs to control the rate of fill and forecasted inflows.

April 28, 2021: The Bighorn Canal was started for the irrigation season.

May 12-19, 2021: The Bighorn Canal was shut off for repairs to a check structure. After May 19, the canal remained in operation and diversions fluctuated to meet irrigation demands for the remainder of the season.

May and June 2021: Releases to the Bighorn River were decreased to conserve storage as forecasted inflows continued to drop due to the dry conditions.

October 4, 2021: The Bighorn Canal was shut down for the irrigation season.

Additional hydrologic and statistical information pertaining to the operations of Bighorn Lake during WY 2021 can be found on Tables MTT 52 through 55 and MTG 43.

For more detailed information on the operations of Boysen and Buffalo Bill Reservoirs during WY 2021, refer to the narratives for Boysen Reservoir and Powerplant and Shoshone Project under the responsibility of the WYAO.

Table MTT 52: Reservoir allocations for Bighorn Reservoir.

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	3,547.00	467,473	467,473
TOP OF ACTIVE CONSERVATION	3,614.00	778,317	310,844
TOP OF JOINT USE	3,640.00	1,011,052	232,735
TOP OF EXCLUSIVE FLOOD CONTROL	3,657.00	1,263,682	252,630

Table MTT 53: Storage and elevation data for Bighorn Reservoir.

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	3,633.05	940,905	10/1/2020

END OF YEAR	3,626.65	866,789	9/30/2021
ANNUAL LOW	3,613.42	774,869	5/20/2021
ANNUAL HIGH	3,633.55	932,212	10/27/2020
HISTORIC HIGH	3,656.36	1,363,994	7/6/1967

Table MTT 54: Inflow and discharge data for Bighorn Reservoir.

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW*	DATE
ANNUAL TOTAL (AF)	1,546,092	Oct '20-Sep '21	1,538,482	Oct '20-Sep '21
DAILY PEAK (CFS)	5,957	6/8/2021	3,389	5/5/2021
DAILY MINIMUM (CFS)	1,065	2/10/2021	1,856	6/15/2021
PEAK SPILL (CFS)			0	NA
TOTAL SPILL (KAF)			0	NA

*Discharge to the Bighorn River

Table MTT 55: Water year 2020 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	144.8	87	4.2	173	140.8	74	931.7	105
NOVEMBER	110.5	88	0.0	---	124.6	71	921.1	105
DECEMBER	98	92	0.0	---	130.3	73	892.7	106
JANUARY	96.4	89	0.0	---	133.7	74	860	107
FEBRUARY	89.8	80	0.0	---	122.4	71	831.3	107
MARCH	117.1	75	0.0	---	135.3	65	818.7	107
APRIL	149.1	84	0.8	56	160.0	70	810	108
MAY	166.8	53	10.5	91	155.8	61	814.5	100
JUNE	192.8	39	26.0	120	108.4	31	877.2	94
JULY	98.2	35	31.4	115	108.0	36	840	92
AUGUST	140.7	91	27.7	104	107.9	53	849.6	97
SEPTEMBER	141.8	84	17.5	107	111.2	61	866.8	98
ANNUAL	1,546.1	65	118.1	110	1,538.5	59		
APRIL-JULY	606.9	48						

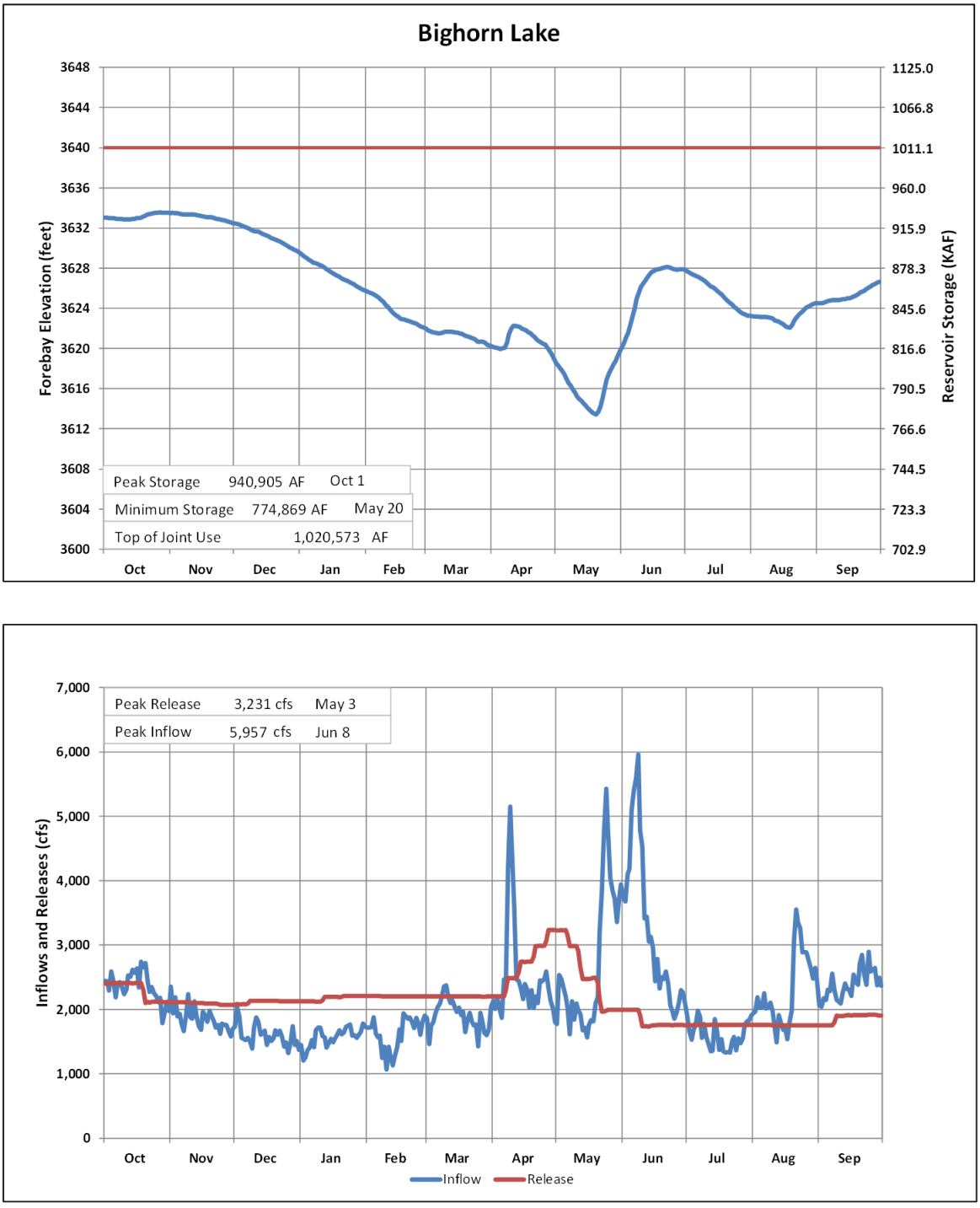


Figure MTG 43: Water year 2021 hydrologic data for Bighorn Reservoir.

Summary of Operations for Water Year 2021 for Reservoirs Under the Responsibility of the Dakotas Area Office

(Angostura, Belle Fourche, Deerfield, E.A. Patterson,Lake Tschida, Jamestown, Keyhole, Pactola, and Shadehill)

Weather Summary for North and South Dakotas: Water Year 2021

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

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

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

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

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

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

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

May precipitation was very much above normal at Dickinson reservoir; much above normal at Hearth Butte reservoir; above normal at Angostura reservoir; normal at Belle Fourche and Deerfield reservoirs; below normal at Jamestown and Pactola reservoirs; and very much below normal at Keyhole and Shadehill Reservoirs.

June precipitation was normal at Angostura reservoir; below normal at Belle Fourche and

Jamestown reservoirs; much below normal at Deerfield, Dickinson, Heart Butte, Pactola, and Shadehill reservoirs; and very much below normal at Keyhole reservoir.

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

August precipitation was very above normal at Deerfield and Shadehill reservoirs; normal at Dickinson, Heart Butte, Jamestown, and Keyhole reservoirs; below normal at Pactola reservoir; much below normal at Belle Fourche reservoir; and very much below normal at Angosutra reservoir.

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

Total annual precipitation for Reclamation facilities in North Dakota, South Dakota, and northeastern Wyoming are shown on Table DKT1.

Table DKT 1: Precipitation

TABLE DKT1
Total Annual Precipitation for Reclamation Reservoirs in North Dakota, South Dakota, and Northeastern Wyoming in Inches

Reservoir	2021 Total	Average Total	Percent
Angostura 1/	15.04	18.18	83
Belle Fourche 2/	11.88	16.70	71
Deerfield 3/	16.48	20.30	81
Keyhole 4/	10.55	18.75	56
Pactola	17.15	21.32	80
Shadehill 5/	14.77	17.88	83
Dickinson	10.18	15.77	65
Heart Butte	10.49	16.27	64
Jamestown	10.05	18.77	54

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: Storage

TABLE DKT2 Comparison of End-of-Water-Year Storage Content for Reservoirs in North Dakota, South Dakota, and Northeastern Wyoming in AF			
Reservoir	**Storage September 30, 2020**	**Storage September 30, 2021**	**Change in Storage**
Angostura	80,380	75,485	-4,895
Belle Fourche	97,695	69,244	-28,451
Deerfield	15,015	15,048	33
Keyhole	153,944	128,144	-25,800
Pactola	53,262	52,676	-586
Shadehill	107,019	74,319	-32,700
Dickinson	5,733	4,192	-1,541
Heart Butte	52,016	43,586	-8,430
Jamestown	28,302	20,742	-7,560

Table DKT2 displays the changes in storage content between September 30, 2020, and September 30, 2021, at reservoirs in North and South Dakota and eastern Wyoming.

Flood Benefits

Reservoirs in North and South Dakota and Northeastern Wyoming

One Bureau of Reclamation reservoir in North Dakota and two Bureau of Reclamation reservoirs in South Dakota provided flood relief during WY 2021.

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

FLOOD DAMAGE PREVENTED IN 2021
ACCUMULATED TOTAL 1950-2021

Table DKT 3: Flood Damages

	Local	Main-Stem	2021 Total	Previous Accumulations	1950-2021 Cumulative Totals
Heart Butte	$0	$31,200	$31,200	$17,008,700	$17,039,900
Shadehill	$0	$24,200	$24,200	$14,120,200	$14,144,400
Angostura	$0	$0	$0	$22,900	$22,900
Pactola	$0	$0	$0	$4,945,800	$4,945,800
Keyhole	$0	$31,200	$31,200	$4,900,800	$4,932,000
Jamestown	$0	$0	$0	$220,762,800	$220,762,800
Total	$0	$0	$86,600	$261,761,200	$261,847,800

Flood damages prevented by Dakotas Area Office reservoirs between Garrison and Gavins Point Dams are shown on Figure DKG1

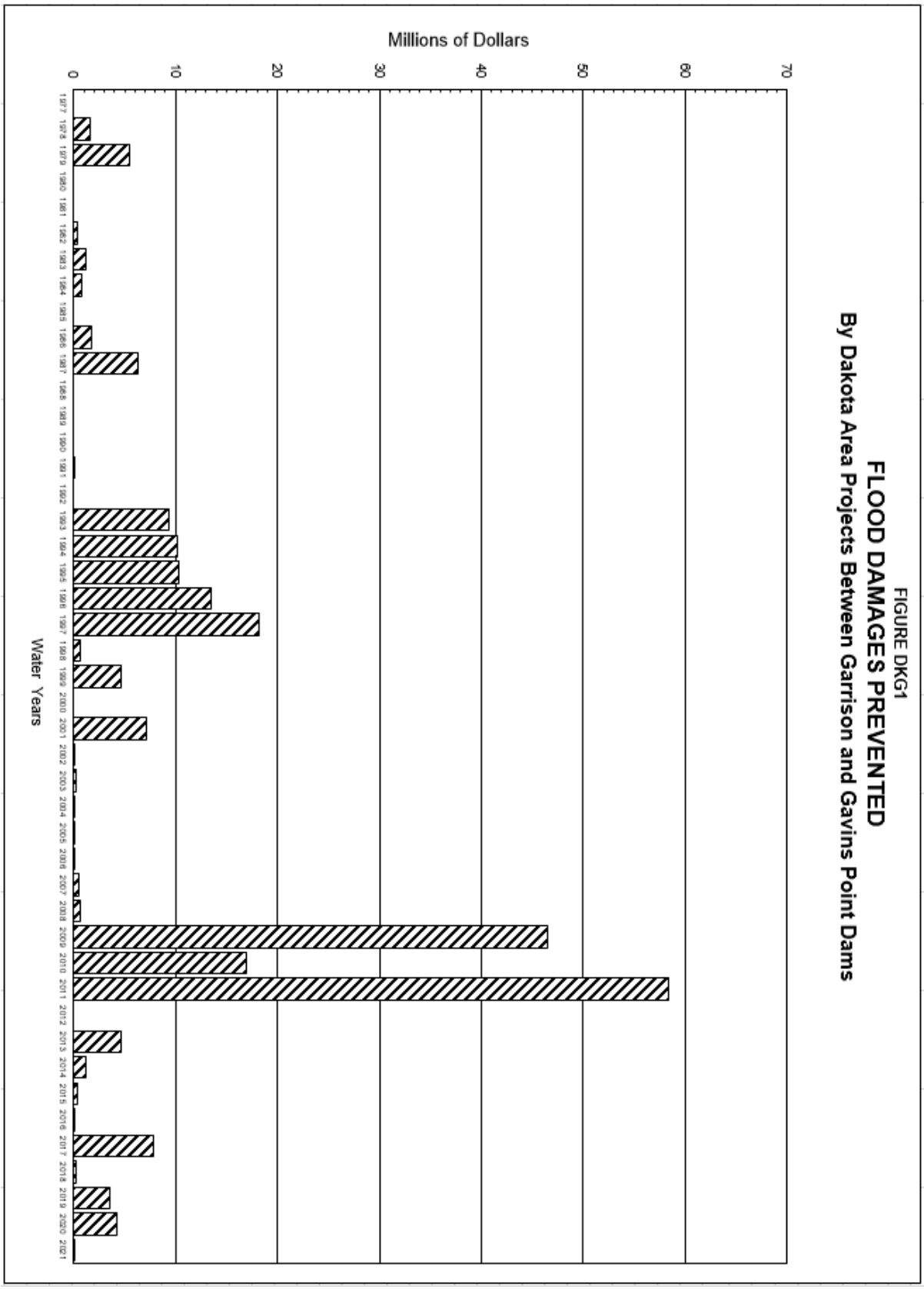


Figure DKG 1: Flood Damages

Unit Operational Summaries for Water Year 2021

Dickinson Reservoir

BACKGROUND

Dickinson Dam and Edward Arthur Patterson Lake (Dickinson Reservoir) is 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 2420.00). 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.

WY 2021 OPERATIONS SUMMARY

Dickinson Reservoir started WY 2021 at elevation 2417.23 and storage of 5,715 AF, which is 2.77 feet, and 2,764 AF below the top of the conservation pool (elevation 2420.00 and storage 8,612 AF). Dickinson Reservoir peaked at elevation 2417.23 on October 1, 2020, with 2,764 AF of storage. The minimum reservoir elevation for WY 2021 was 2415.37 with storage of 4,192 AF occurred on September 30, 2021. The reservoir elevation on September 30, 2021, was 2,415.37 with storage of 4,192 AF, which is 4.77 feet, and 4,287 AF below the top of conservation pool.

The maximum instantaneous discharge of 54 cfs occurred on October 30, 2020. Reservoir net inflows for WY 2021 totaled 368 AF, 2 percent of average. The maximum 24 hour computed inflow occurred on March 24, 2021, with 86 cfs. Precipitation for the water year totaled 10.18 inches, which is 65 percent of average.

798 AF of water was released specifically for downstream irrigation.

An Emergency Management program, orientation seminar and communications drill were conducted on March 24, 2021.

E.A. Paterson Reservoir (Dickinson Dam) started WY 2021 in normal operations and remained in normal operations for the entire water year.

An Annual Site Inspection Review (ASI) was conducted on May 12, 2021, by personnel from the Dakotas Area Office.

MONTHLY STATISTICS FOR WY 2021

Record and near record monthly inflows in 70 years of record keeping were recorded in the following months: December had its tenth highest inflow, February had its tenth lowest inflow, March had its fifth lowest inflow, and April had its and July had its eighth lowest inflow.

Record or near record monthly end of month content in 70 years of record keeping were recorded in the following months: June had its ninth lowest storage, August had its ninth lowest storage, and September had its tenth lowest storage.

Additional statistical information on Dickinson Reservoir and its operations during 2021 can be found on Table DKT3 and Figure DKG2.

Table DKT 4: Hydrologic Data for 2021 - Dickinson Reservoir

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE	2,405.00	438	438
TOP OF ACTIVE CONSERVATION	2,420.00	8,452	8,014
TOP OF JOINT USE			
TOP OF EXCLUSIVE FLOOD CONTROL			

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	2,417.23	5,715	OCT 01, 2020
END OF YEAR	2,415.37	4,192	SEP 30, 2021
ANNUAL LOW	2,415.37	4,192	SEP 30, 2021
ANNUAL HIGH	2,417.23	5,715	OCT 01, 2021
HISTORIC HIGH	2,422.19	***9,348	MAR 21, 1997

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	368	OCT 20-SEP 21	1,909	OCT 20-SEP 21
DAILY PEAK (CFS)*	86	MAR 29, 2021	54	OCT 30, 2020
DAILY MINIMUM (CFS)**	0	**	0	**

MONTH	INFLOW		OUTFLOW		CONTENT	
	AF	% OF AVG	AF	% OF AVG	AF	% OF AVG
OCTOBER	8	1	364	46	5,377	96
NOVEMBER	316	183	966	408	4,727	86
DECEMBER	113	81	0	0	4,840	88
JANUARY	114	40	0	0	4,954	88
FEBRUARY	8	1	0	0	4,962	83
MARCH	150	2	0	0	5,112	72
APRIL	-25	NA	0	0	5,087	71
MAY	440	18	0	0	5,527	77
JUNE	-158	NA	223	10	5,146	72
JULY	-145	NA	210	16	4,791	73
AUGUST	-208	NA	144	18	4,439	73
SEPTEMBER	-247	NA	0	0	4,192	72
ANNUAL	366	2	1,907	10		
APRIL-JULY	112	0				

* 24-hour daily inflow and 15-minute instantaneous discharge
** Frequently observed during fall and winter months
*** 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 @ Elevation 2421.08 on June 9, 1982)

Figure DKG2

Dickinson Reservoir

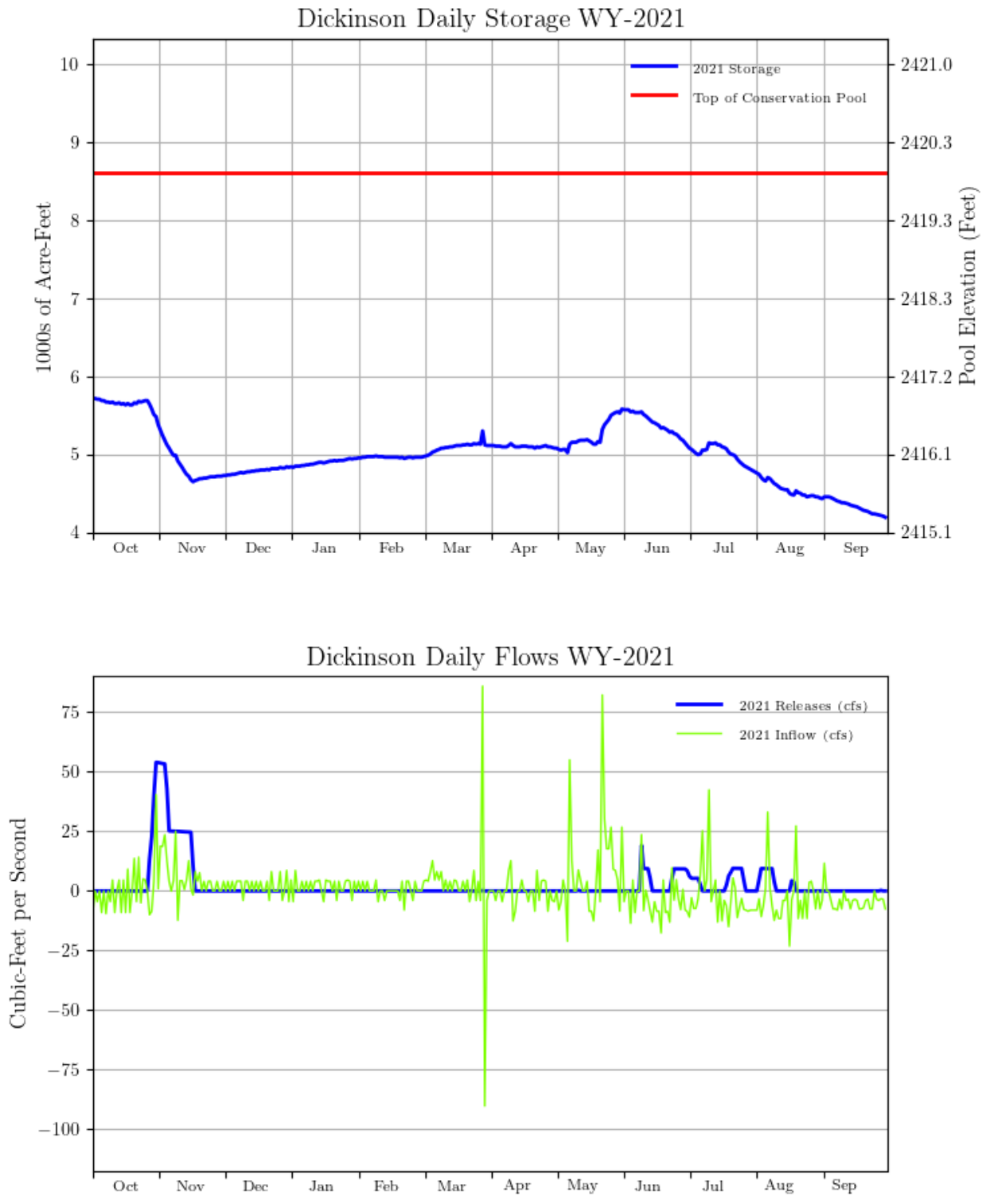


Figure DKG 2: Dickinson Reservoir Daily Storage and Flows - WY 2021

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 2064.50), 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.

WY 2021 OPERATIONS SUMMARY

Heart Butte Reservoir started WY 2021 at elevation 2059.55 and storage of 51,873 AF, which is 4.95 feet, and 13,218 AF below the top of conservation pool (elevation 2064.50 and storage 67,142 AF). Heart Butte Reservoir peaked at elevation 2063.25 on June 11 with 63,086 AF of storage. The minimum reservoir elevation was 2056.49 and storage of 43,586 AF occurred on September 30, 2021. The reservoir elevation on September 30, 2021, was 2056.49 with storage of 43,586 AF, which is 8.01 feet and 21,505 AF below the top of conservation pool.

A maximum discharge of 100 cfs occurred on July 10. Reservoir net inflows for WY 2021 totaled 14,486 AF, 16 percent of average. The maximum 24 hour computed inflow occurred on May 24, 2021, with 1,271 cfs. Precipitation for the water year totaled 10.49 inches, which is 64 percent of average.

13,583 AF was released specifically for downstream irrigation.

An Emergency Management program, orientation seminar and communications drill were conducted on March 10, 2021.

Lake Tschida Reservoir (Heart Butte Dam) started WY 2021 in normal operations with a reservoir elevation under 2064.50 and remained there for the rest of the water year.

An Annual Site Inspection (ASI) was conducted on May 19, 2021, by personnel from the Dakotas Area Office.

MONTHLY STATISTICS FOR WY 2021

Record and near record monthly inflows in 72 years of record keeping were recorded in the following months: November had its sixth highest inflow, March had its tenth lowest inflow, and April had its sixth lowest inflow.

Record or near record monthly end of month content in 72 years of record keeping were recorded in the following months: April had its seventh lowest storage, June had its eighth lowest storage, July had its seventh lowest storage, August had its sixth lowest storage, and September had its sixth lowest storage.

Additional statistical information on Heart Butte Reservoir and its operations during 2021 can be found on Table DKT4 and Figure DKG3.

Table DKT 5: Hydrologic Data for Heart Butte Reservoir WY 2021

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	2,030.00	4,328	4,328
TOP OF ACTIVE CONSERVATION	2,064.50	65,091	60,763
TOP OF JOINT USE			
TOP OF EXCLUSIVE FLOOD CONTROL	2,094.50	212,696	147,605

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	2,059.55	51,873	OCT 01, 2020
END OF YEAR	2,056.49	43,586	SEP 30, 2021
ANNUAL LOW	2,056.49	43,586	SEP 30, 2021
ANNUAL HIGH	2,063.25	63,086	JUN 11, 2021
HISTORIC HIGH	2,086.23	173,203	APR 09, 1952

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	14,486	OCT 20-SEP 21	22,916	OCT 20-SEP 21
DAILY PEAK (CFS)	1,271	MAY 24, 2021	100	JUL 10, 2021
DAILY MINIMUM (CFS)	0	*	0	*

MONTH	INFLOW		OUTFLOW		CONTENT	
	AF	% OF AVG	AF	% OF AVG	AF	% OF AVG
OCTOBER	282	17	1,421	60	50,877	87
NOVEMBER	2,124	162	582	40	52,419	90
DECEMBER	1,241	130	604	46	53,056	92
JANUARY	1,218	103	606	52	53,688	93
FEBRUARY	489	13	584	28	53,609	90
MARCH	1,867	6	8	0	55,468	79
APRIL	1,018	4	0	0	56,486	81
MAY	7,051	71	897	8	62,640	91
JUNE	1,637	16	4,711	50	59,566	86
JULY	-554	NA	6,015	80	52,997	81
AUGUST	-1,117	NA	5,345	97	46,535	75
SEPTEMBER	-770	NA	2,179	74	43,586	73
ANNUAL	14,486	16	22,952	26		
APRIL-JULY	9,152	19				

* Frequently observed during fall and winter months

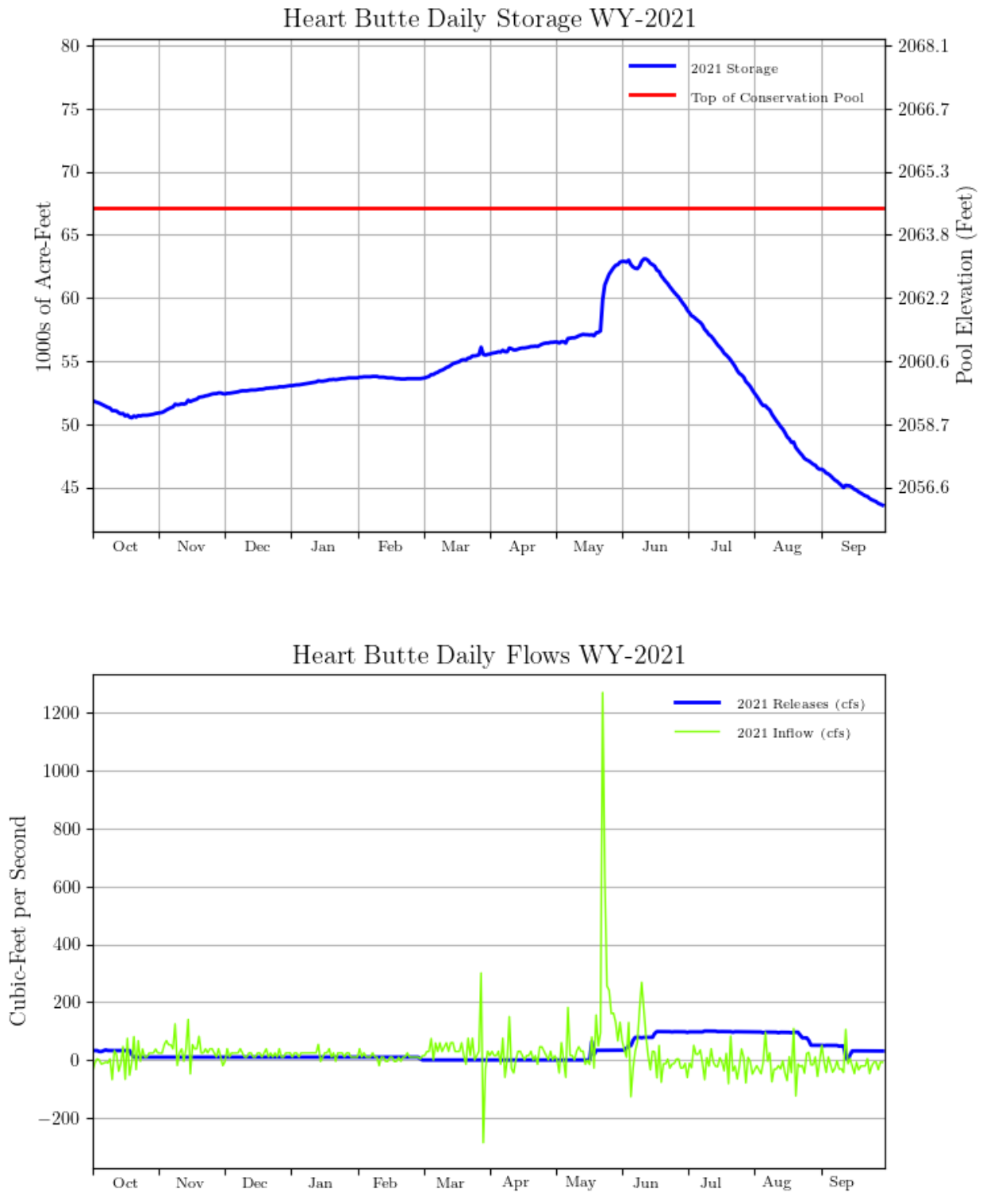


Figure DKG 3: Heart Butte Daily Storage and Flows - WY 2021

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), 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.

WY 2021 OPERATIONS SUMMARY

Jamestown Reservoir started WY 2021 at elevation 1429.93 with a storage of 28,086 AF, which is 3.41 feet, and 7,258 AF below the top of the conservation pool (elevation 1428.00 and storage 24,226 AF). Jamestown Reservoir peaked at elevation 1430.02 on March 23, 2021, with 28,280 AF of storage. The minimum reservoir elevation was 1425.96 feet and storage of 20,607 AF occurred on September 28, 2021. The reservoir elevation on September 30, 2021, was 1426.04 with storage of 20,740 AF, which is 4.96 feet, and 8,983 AF below the top of active conservation pool.

The maximum instantaneous discharge of 43 cfs occurred on October 1, 2020. Reservoir net inflows were less than zero, totaling -1,393 AF. The maximum 24 hour computed inflows occurred on August 4 with 167 cfs. Precipitation for the water year totaled 10.05 inches at 54 percent of average.

4,050 AF of water was released specifically for downstream irrigation.

An Emergency Management program, orientation seminar and communications drill were conducted on March 5, 2021.

Jamestown Reservoir started WY 2021 in normal operations and remained there for the entire water year.

An Annual Site Inspection (ASI) was conducted on August 4, 2021, by personnel from the Dakotas Area Office.

MONTHLY STATISTICS FOR WY 2021

Record and near record monthly inflows in 68 years of record keeping were recorded in the following months: April had its second lowest inflow, May had its ninth lowest inflow, June had its fifth lowest inflow, and July had its fifth lowest inflow.

Record and near record monthly end of month content in 68 years of record keeping were recorded in the following months: July had its tenth lowest storage, and September had its tenth lowest storage.

Additional statistical information on Jamestown Reservoir and its operations during 2021 can be found on Table DKT5 and Figure DKG4.

Table DKT 6: Hydrologic Data for Jamestown Reservoir - WY 2021

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	1,400.00	292	292
TOP OF ACTIVE CONSERVATION	1,428.00	24,226	23,934
TOP OF JOINT USE	1,431.00	30,488	6,262
TOP OF EXCLUSIVE FLOOD CONTROL	1,454.00	220,990	190,502

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE
BEGINNING OF YEAR	1,429.93	28,086	OCT 01, 2020
END OF YEAR	1,426.04	20,742	SEP 30, 2021
ANNUAL LOW	1,425.96	20,607	SEP 28, 2021
ANNUAL HIGH	1,430.02	28,280	MAR 23, 2021
HISTORIC HIGH	1,454.10	222,318	APR 26, 2009

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	-1,392	OCT 20-SEP 21	5,706	OCT 20-SEP 21
DAILY PEAK (CFS)	167	AUG 04, 2021	43	OCT 01, 2020
DAILY MINIMUM (CFS)	0	*	0	*

MONTH	INFLOW		OUTFLOW		CONTENT	
	AF	% OF AVG	AF	% OF AVG	AF	% OF AVG
OCTOBER	111	4	391	10	28,022	106
NOVEMBER	38	2	17	1	28,043	108
DECEMBER	428	64	599	75	27,872	108
JANUARY	500	218	649	117	27,723	109
FEBRUARY	4	1	0	0	27,723	109
MARCH	436	7	0	0	28,043	91
APRIL	-320	NA	0	0	27,723	59
MAY	43	0	0	0	27,766	68
JUNE	-789	NA	536	5	26,441	76
JULY	-1,207	NA	2,060	31	23,174	71
AUGUST	-305	NA	1,396	28	21,132	67
SEPTEMBER	-332	NA	58	1	20,742	74
ANNUAL	-1,393	-2	5,706	9		
APRIL-JULY	-2,273	-19				

* Frequently observed during fall and winter months

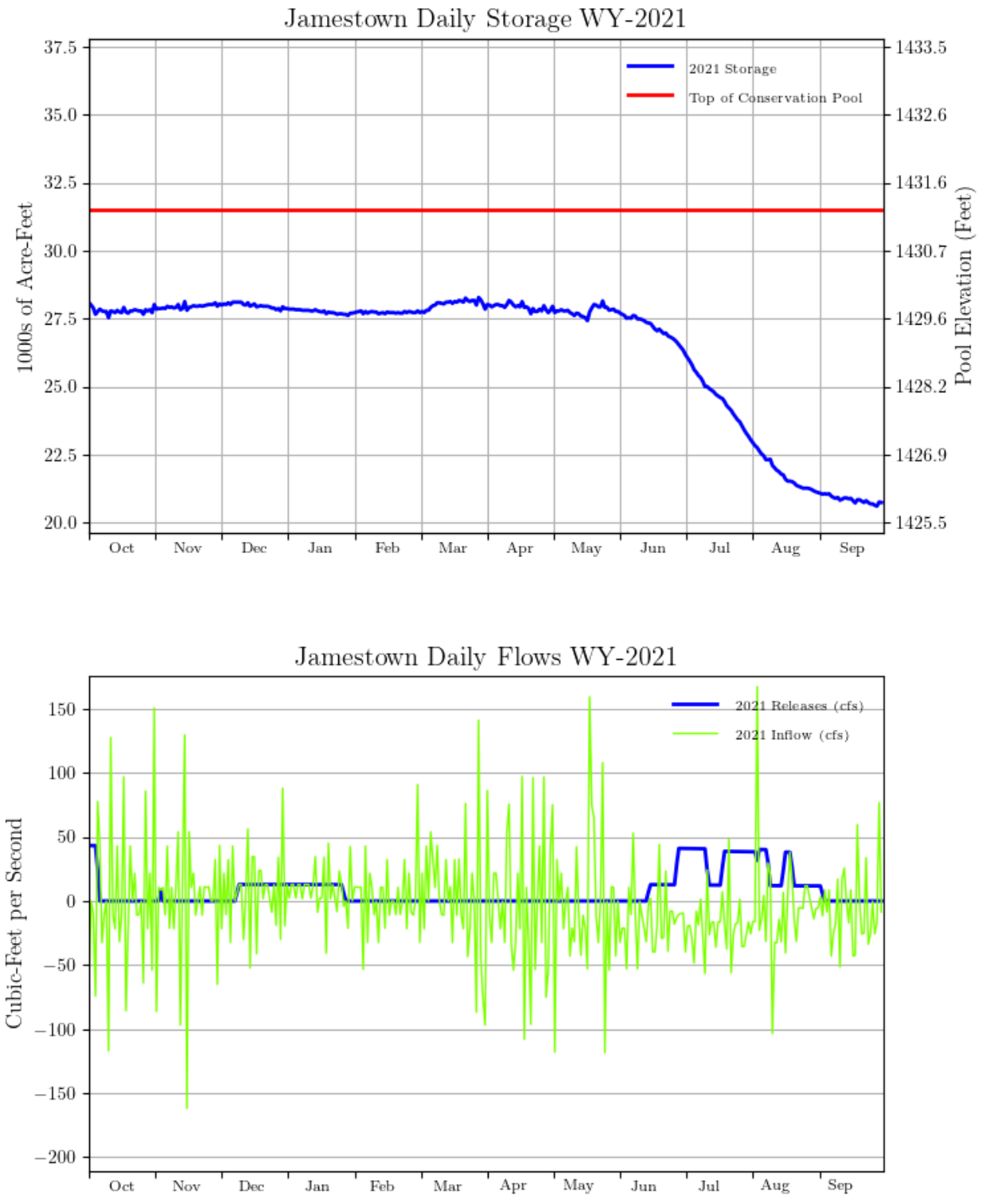


Figure DKG 4: Daily Storage and Flows for Jamestown Reservoir - WY 2021

Angostura Reservoir

BACKGROUND

Angostura Reservoir (P-S MBP), located on the Cheyenne River above Hot Springs, South Dakota, was built to service about 12,200 acres in the Angostura Unit (P-S 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 of 2005. The previous survey was done in 1979. Angostura Reservoir accumulated 7,716 AF of sediment since the last survey. Since construction in 1949, Angostura has accumulated 36,867 AF of sediment. The sedimentation rate from 1949- 2004 has averaged 670 AF per year. The new Area and Capacity Tables were first used in WY 2006.

WY 2021 OPERATIONS SUMMARY

Angostura Reservoir started WY 2021 at elevation 3,176.58 feet and with a storage of 80,414 AF, which is 10.62 feet and 42,634 AF below the top of the conservation pool. Precipitation for WY 2021 was 83 percent of average. Inflows for WY 2021 totaled 36,634 AF (43 percent of average). Peak inflows occurred in March, totaling 6,305 AF for the month. The peak reservoir elevation for WY 2021 was 3,183.49 feet, storage of 106,716 AF and occurred on June 1, 2021. The minimum elevation for WY 2021 was 3,175.05 feet, storage of 75,289 AF, and occurred on September 23, 2021. WY 2021 ended at elevation 3,175.11 feet, and storage of 75,485 AF, which is 12.09 feet and 47,563 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 full water allotment for its irrigators. The canal use was initiated on May 10, 2021, with deliveries beginning on May 12, 2021. Releases reached a peak of 250 cfs on July 21, 2021. The irrigation release was terminated on September 22, 2021. Total irrigation releases for the 2021 season were 41,535 AF with 27,557 AF delivered.

Normal operations: no emergency levels activated.

An Emergency Action Plan Orientation Meeting was held on March 11, 2021.

The annual site inspection for Angostura Dam was conducted on September 1, 2021.

There were no large construction contracts at Angostura in 2021.

MONTHLY STATISTICS FOR WY 2021

Record and near record monthly inflows in 70 years of record keeping were recorded in the following months: No inflow records were achieved.

Record and near record monthly end of month content in 70 years of record keeping were recorded in the following months: No storage records were achieved.

Additional statistical information on Angostura Reservoir and its operations during WY 2021 can be found on Table DKT6 and Figure DKG5.

Table DKT 7: Hydrologic Data for Angostura Reservoir - WY 2021

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	3,163.00	42,205	42,205
TOP OF ACTIVE CONSERVATION	3,187.20	123,048	80,843
TOP OF JOINT USE			
TOP OF EXCLUSIVE FLOOD CONTROL			

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE (end-of-day)
BEGINNING OF YEAR	3,176.58	80,414	SEP 30, 2020
END OF YEAR	3,175.11	75,485	SEP 30, 2021
ANNUAL LOW	3,175.05	75,289	SEP 23, 2021
ANNUAL HIGH	3,183.49	106,716	JUN 01, 2021
HISTORIC HIGH	3,189.37	**152,228	MAY 20, 1978

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	36,633	OCT 20-SEP 21	41,528	OCT 20-SEP 21
DAILY PEAK (CFS)	633	MAY 25, 2021	252	JUL 22, 2021
DAILY MINIMUM (CFS)	0	JUL 29, 2021	0	OCT 26, 2020

MONTH	INFLOW		OUTFLOW		EOM CONTENT***	
	AF	% OF AVG	AF	% OF AVG	AF	% OF AVG
OCTOBER	1,410	63	64	6	81,726	84
NOVEMBER	2,730	115	25	2	84,431	86
DECEMBER	2,680	131	20	3	87,091	87
JANUARY	2,916	130	49	8	89,958	89
FEBRUARY	3,180	71	58	7	93,080	89
MARCH	6,305	46	71	1	99,314	89
APRIL	4,611	59	74	2	103,851	90
MAY	6,103	34	3,280	23	106,674	89
JUNE	1,269	6	7,508	37	100,435	84
JULY	387	5	12,453	78	88,369	80
AUGUST	3,313	106	12,632	99	79,050	78
SEPTEMBER	1,730	165	5,295	99	75,485	78
ANNUAL	36,634	44	41,529	49		
APRIL-JULY	12,370	23				

** 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 @ Elevation 3189.0 on June 18, 1962)
*** EOM Content – End of Month Content

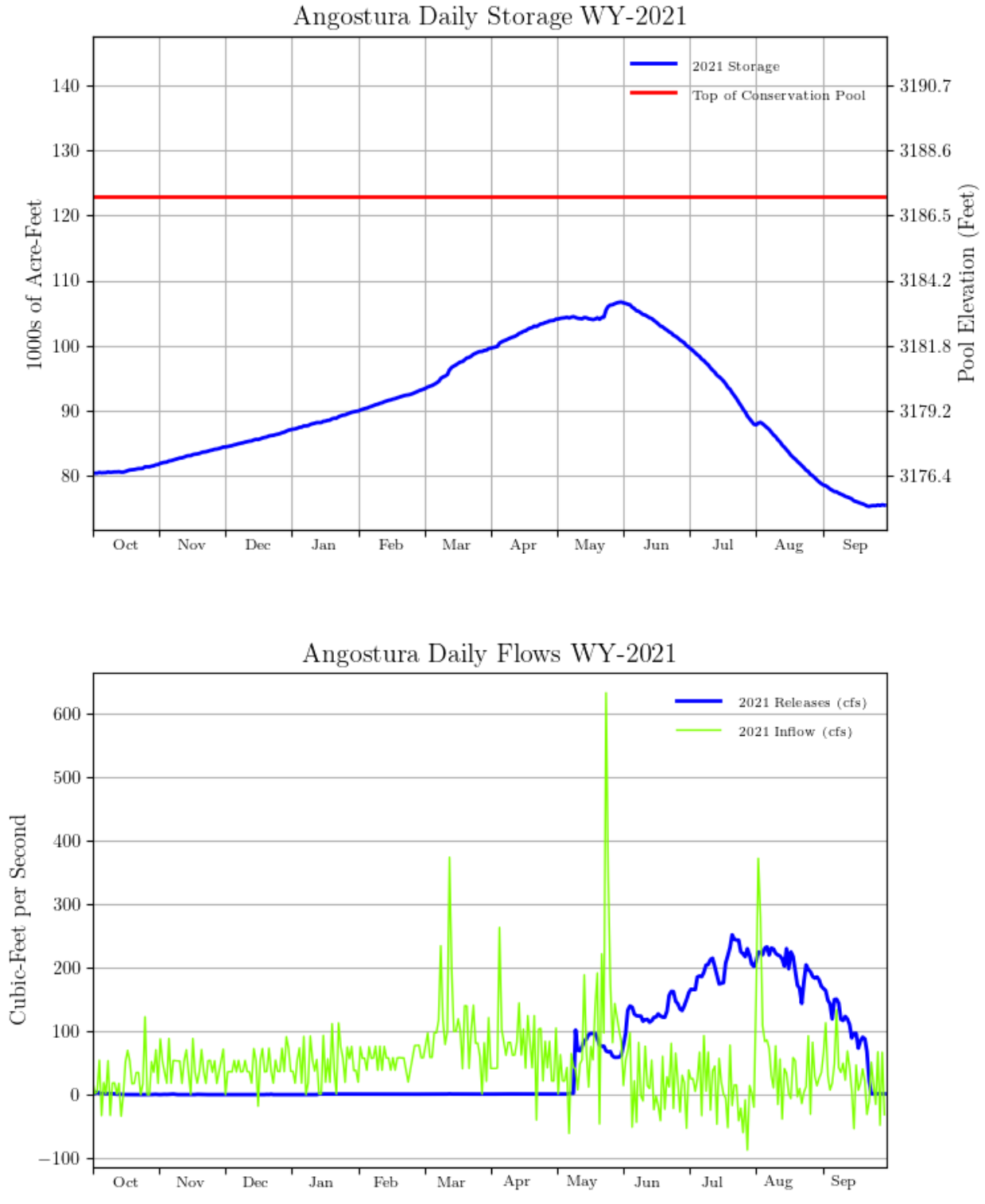


Figure DKG 5: Daily Storage and Flows for Angostura Reservoir - WY 2021

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 District 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.

WY 2021 OPERATIONS SUMMARY

Belle Fourche Reservoir started WY 2021 at elevation 2,964.20 feet and with a storage of 97,695 AF of storage, which is 10.80 feet and 75,178 AF below top of conservation pool. Precipitation for WY 2021 was 71 percent of average. Inflows for WY 2021 totaled 93,259 AF (81 percent of average). Peak inflows occurred in October, totaling 13,482 AF for the month. The peak reservoir elevation for 2021 was 2,974.67 feet, storage of 170,229 AF, and occurred on May 1, 2021. The minimum elevation for WY 2021 was 2,958.49 feet, storage of 67,619 AF, and occurred on September 21, 2021. WY 2021 ended at elevation 2958.83 feet and storage of 69,244 AF, which is 16.17 feet and 103,629 AF below the top of the conservation pool. Belle Fourche Reservoir ended the water year with 66,161 AF in active storage.

The Belle Fourche Irrigation District (BFID) had a water allotment of 21 inches for its irrigators. The North Canal and South Canals were turned on April 26, 2021, with deliveries beginning on May 3, 2021. Releases reached a peak of 360 cfs on August 14, 2021, for North Canal and a peak of 275 cfs on June 25, 2021, for South Canal. The South Canal was shut off September 15, 2021. The North Canal was shut off September 21, 2021. Total irrigation releases for Belle Fourche Irrigation District for the 2021 season were 124,581 AF with 79,000 AF delivered.

Belle Fourche Dam went into Internal Alert on April 19, 2021, after reaching reservoir elevation 2,974.0 (2,975.0 is the top of conservation and 2,977.25 is the spillway crest elevation). The reservoir elevation was at 2,974.25 and inflows were approx. 220 cfs. The Belle Fourche

Irrigation District was not making a release at that time from either North Canal or South Canal since the goal was to continue filling the reservoir.

The highest elevation for 2021 was 2,974.67 on May 1, 2021. Belle Fourche Dam left Internal Alert on June 3, 2021, after reaching reservoir elevation of 2,973.67 and low precipitation forecasted. The Belle Fourche Irrigation District was making irrigation deliveries to North Canal and South Canal for a combined release of 270 cfs.

Belle Fourche Road Maintenance is a three-year contract that was awarded to Bachman Construction LLC from Fruitdale, SD for $117,993.40 in 2020. The contractor will gravel, water, blade, and mow 13 miles of government managed gravel roads at Belle Fourche Reservoir three times during the summer recreation season. This contract will extend into FY2022. Middle Point Shoreline Protection is an embankment and riprap contract that was awarded to J W Services out of Sundance, WY for $306,028.50 in 2021. The contractor will slope the shoreline, place geofabric and place riprap material to protect the shoreline, natural resources, and facilities at Middle Point peninsula.

Gaden's Point Boat Ramp is a boat ramp project under construction by Reclamation's Provo, Utah office's construction crew. Work is to build a boat ramp and parking area on the eastern tip of Gaden's Point at Belle Fourche Reservoir in South Dakota. It is expected this work will continue through the winter. Crews will shape and stabilize approximately 500 feet of shoreline, construct a double lane boat ramp and a 40-unit parking area, and install a vault toilet. The project is funded through a federal transportation grant. Belle Fourche Lake is a very popular destination, and this new boat ramp will help relieve congestion and improve access.

An Emergency Action Plan Orientation Meeting and functional exercise was held on March 3, 2021.

A comprehensive review for Belle Fourche Dam was conducted May 25, 2021.

MONTHLY STATISTICS FOR WY 2021

Record and near record monthly inflows in 70 years of record keeping were recorded in the following months: No inflow records were achieved.

Record and near record monthly end of month content in 70 years of record keeping were recorded in the following months: No storage records were achieved.

Additional statistical information on Belle Fourche Reservoir and its operations during WY 2021 can be found on Table DKT7 and Figure DKG6.

Table DKT 8: Hydrologic Data for Belle Fourche Reservoir - WY 2021

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	2,927.00	3,083	3,083
TOP OF ACTIVE CONSERVATION	2,975.00	172,873	169,790
TOP OF JOINT USE			
TOP OF EXCLUSIVE FLOOD CONTROL			

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE (end-of-day)
BEGINNING OF YEAR	2,964.20	97,695	SEP 30, 2020
END OF YEAR	2,958.83	69,244	SEP 30, 2021
ANNUAL LOW	2,958.49	67,619	SEP 21, 2021
ANNUAL HIGH	2,974.67	170,229	MAY 01, 2021
HISTORIC HIGH	2,975.92	196,792	MAY 30, 1996

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	93,260	OCT 20-SEP 21	121,711	OCT 20-SEP 21
DAILY PEAK (CFS)	593	OCT 11, 2020	595	JUN 26, 2021
DAILY MINIMUM (CFS)	0	MAR 29, 2021	0	OCT 03, 2020

MONTH	INFLOW		OUTFLOW		EOM CONTENT**	
	AF	% OF AVG	AF	% OF AVG	AF	% OF AVG
OCTOBER	13,482	130	401	66	110,776	144
NOVEMBER	12,867	132	0	0	123,643	144
DECEMBER	12,535	143	0	0	136,178	144
JANUARY	10,680	121	0	0	146,858	142
FEBRUARY	75	1	0	0	146,933	131
MARCH	11,909	76	0	0	158,842	124
APRIL	12,863	94	1,636	367	170,069	121
MAY	9,057	63	16,634	222	162,492	110
JUNE	-153	-1	25,224	150	137,115	96
JULY	1,281	32	32,144	90	106,252	96
AUGUST	4,047	144	31,561	91	78,738	100
SEPTEMBER	4,616	91	14,110	82	69,244	103
ANNUAL	93,259	82	121,710	107		
APRIL-JULY	23,048	53				

* Frequently observed during fall and winter months
** EOM Content – End of Month Content

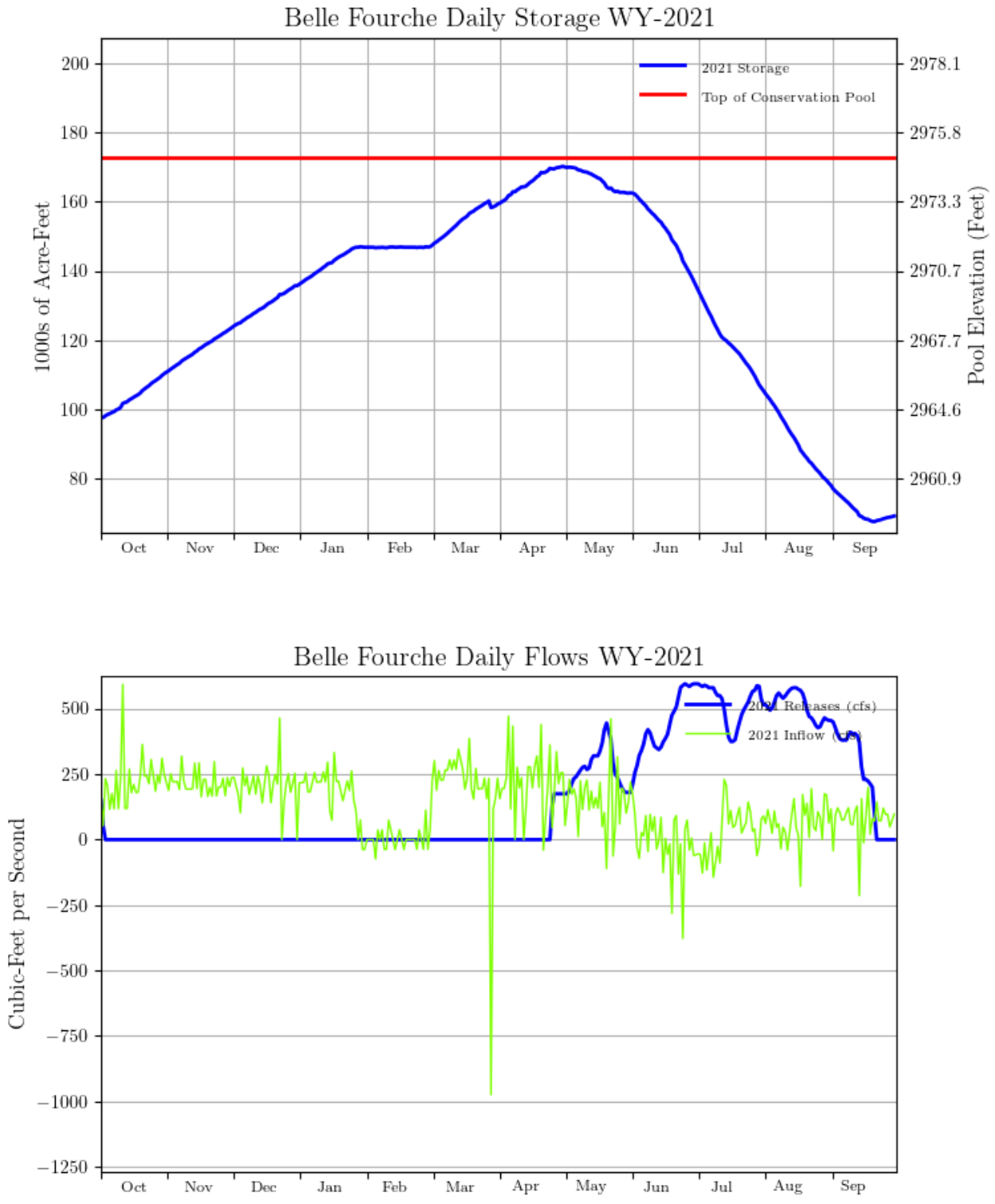


Figure DKG 6: Daily Storage and Flows for Belle Fourche Reservoir - WY 2021

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, P-S MBP), furnish a supplemental irrigation supply to about 8,900 acres in the Rapid Valley Water Conservancy District (District) and furnish replacement water for a portion of the water used from Rapid Creek by Rapid City. A contract is in place between the United States, Rapid City, South Dakota, and the District for the storage space at Deerfield Reservoir. 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, Bureau of Reclamation, US 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.

WY 2021 OPERATIONS SUMMARY

Deerfield Reservoir started WY 2021 at elevation 5906.44 feet and with a storage of 15,010 AF, which is 1.56 feet to full and 645 AF below the top of the conservation pool. Precipitation for WY 2021 was 81 percent of average. Inflows for WY 2021 totaled 15,746 AF (151 percent of average). Peak inflows occurred in May, totaling 1,833 AF for the month. The peak reservoir elevation for WY 2021 was 5,908.04 feet, storage of 15,681 AF and occurred on May 23, 2021. The minimum elevation for WY 2021 was 5,905.32 feet, storage of 14,550 AF, and occurred on January 15, 2021. WY 2021 ended at elevation 5,906.53 feet and with a storage of 15,048 AF, which is 1.47 feet to full and 607 AF below the top of the conservation pool. Deerfield ended the water year with 14,897 AF in active storage.

Natural flows in Rapid Creek were high throughout the water season. Rapid Valley Water Conservation District and the City of Rapid City did not need to order water in 2021 due to enough natural flows to meet the water demands.

An emergency Action Plan Orientation Meeting was held on March 25, 2021.

An annual site inspection was performed July 16, 2021.

Deerfield Reservoir remained in normal operation throughout WY2020.

Normal operations: no emergency levels activated.

No construction contracts occurred at Deerfield Dam in 2021.

MONTHLY STATISTICS FOR WY 2021

Record and near record monthly inflows in 69 years of record keeping were recorded in the following months: No inflow records were achieved.

Record and near record monthly end of month content in 69 years of record keeping were recorded in the following months: No storage records were achieved.

Additional statistical information on Deerfield Reservoir and its operations during WY 2021 can be found on Table DKT8 and Figure DKG7.

Table DKT 9: Hydrologic Data for Deerfield Reservoir - WY 2021

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	5,839.00	151	151
TOP OF ACTIVE CONSERVATION	5,908.00	15,654	15,503
TOP OF JOINT USE			
TOP OF EXCLUSIVE FLOOD CONTROL			

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE (end-of-day)
BEGINNING OF YEAR	5,906.44	15,010	OCT 01, 2020
END OF YEAR	5,906.53	15,048	SEP 30, 2021
ANNUAL LOW	5,905.32	14,550	JAN 15, 2021
ANNUAL HIGH	5,908.04	15,681	MAY 23, 2021
HISTORIC HIGH	5,909.05	16,157	FEB 25, 1985

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	15,394	OCT 20-SEP 21	15,334	OCT 20-SEP 21
DAILY PEAK (CFS)	72	MAY 23, 2021	65	MAY 25, 2021
DAILY MINIMUM (CFS)	6	JAN 14, 2021	15	JAN 15, 2021

MONTH	INFLOW		OUTFLOW		EOM CONTENT**	
	AF	% OF AVG	AF	% OF AVG	AF	% OF AVG
OCTOBER	1,466	207	1,537	200	14,944	117
NOVEMBER	1,284	201	1,498	332	14,730	113
DECEMBER	1,065	161	1,196	292	14,599	110
JANUARY	1,029	157	1,045	260	14,583	108
FEBRUARY	1,083	179	833	209	14,833	108
MARCH	1,441	160	922	143	15,352	110
APRIL	1,585	128	1,349	128	15,588	110
MAY	1,738	119	1,911	137	15,415	108
JUNE	1,334	104	1,393	105	15,356	108
JULY	1,256	133	1,230	104	15,356	110
AUGUST	1,050	142	1,230	102	15,176	113
SEPTEMBER	1,062	162	1,190	104	15,048	116
ANNUAL	15,393	147	15,334	148		
APRIL-JULY	5,913	83				

* Frequently observed during fall and winter months

** EOM Content – End of Month Content

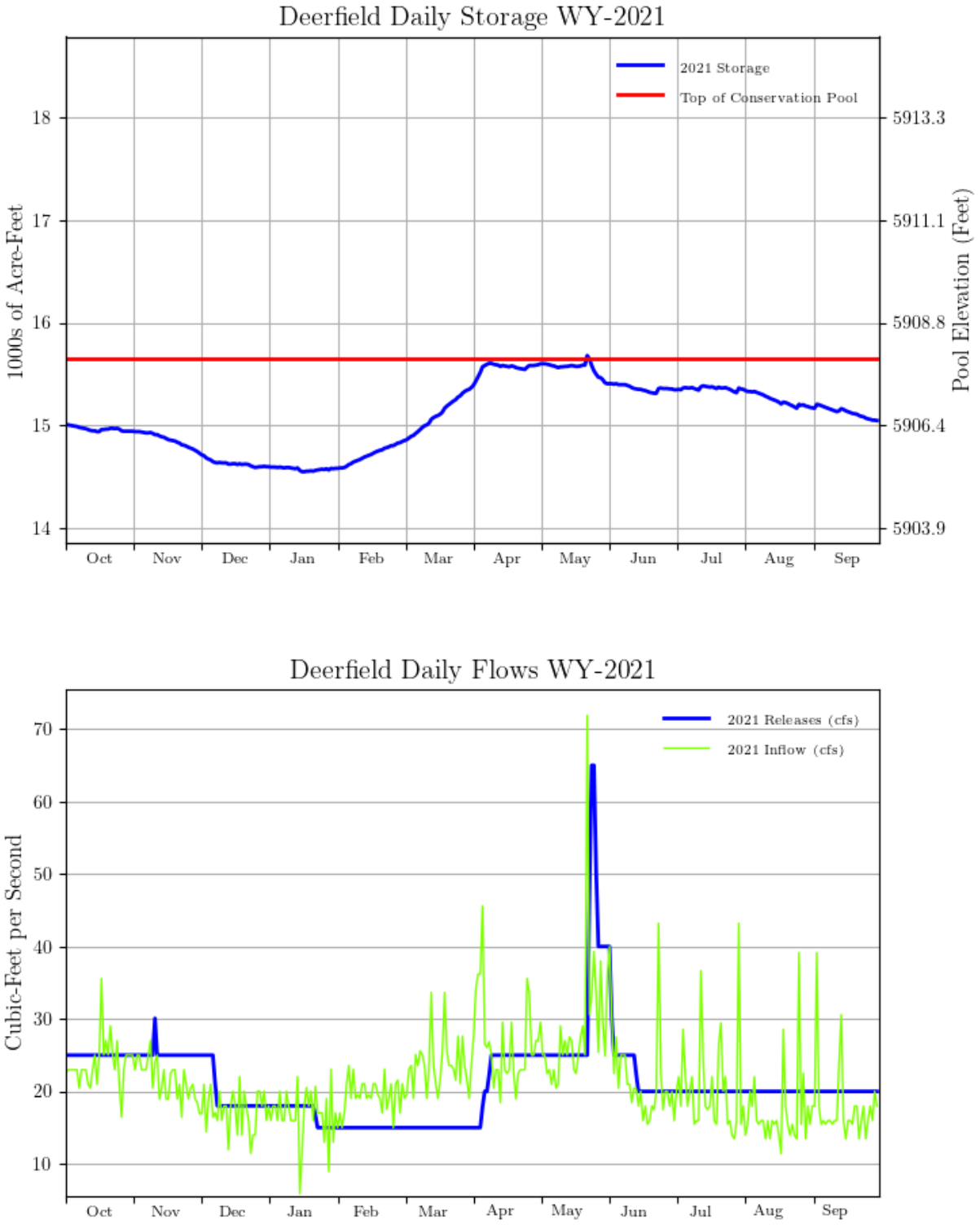


Figure DKG 7: Daily Storage and Flows for Deerfield Reservoir - WY 2021

Keyhole Reservoir

BACKGROUND

Keyhole Reservoir (P-S 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 Belle Fourche Irrigation District executed a long-term contract for the use of 7.7 percent of active storage space in the reservoir. This space will be used to store water belonging to the irrigation district under its prior water right along with the District's pro rata share of storable inflows to Keyhole Reservoir. On January 1, 1985, the Crook County Irrigation District's contract for 18,080 AF of space in Keyhole Reservoir became effective. The allocated space is used by each organization to store its pro rata share of inflows to Keyhole Reservoir. The flood control space at Keyhole Reservoir is all located above an ungated spillway. The spillway capacity is 11,000 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 - 1994 show that inflow forecasting to Keyhole Reservoir is not reliable since there is no consistent snowpack and precipitation is highly cyclical. No further efforts to develop forecast models are planned.

Reclamation's Sedimentation and River Hydraulics Group of the Technical Service Center in Denver conducted a sedimentation survey of Keyhole Reservoir in 2003 and provided a survey report and new area and capacity tables in July of 2005. The previous survey was done in 1978. Keyhole Reservoir accumulated 5,082 AF of sediment since the previous survey. Since construction in 1952, Keyhole has accumulated 12,495 AF of sediment. The sedimentation rate from 1952-2003 has averaged 240 AF per year. The new Area and Capacity Tables were first used in WY 2006.

WY 2021 OPERATIONS SUMMARY

Keyhole Reservoir started WY 2021 at elevation 4,095.30 feet and storage of 153,701 AF, which is 4.00 feet and 34,970 AF below the top of the conservation pool. Precipitation for WY 2021 was 56 percent of average. Inflows for WY 2021 were less than zero and totaled -13,734 AF (Evaporation was greater than inflow). Peak inflows occurred in February, totaling 801 AF for the month. The peak reservoir elevation for WY 2021 was 4,095.35 feet, storage of 154,106 AF, and occurred on Oct 3, 2020. The minimum elevation for WY 2021 was 4,091.89 feet, storage of 128,144 AF, and occurred on September 30, 2021. WY 2021 ended at elevation 4,091.89 feet, storage of 128,144 AF, which is 7.41 feet and 60,527 AF below the top of the conservation pool. Keyhole Reservoir ended the water year with 121,552 AF in active storage.

Belle Fourche Irrigation District (BFID) ordered 8,480 AF and the Crook County Irrigation District (CCID) ordered 3,416 AF for WY 2021.
Normal operation: no emergency levels activated.

There were no construction contracts at Keyhole in 2021.

An Emergency Action Plan Orientation Meeting was held on March 17, 2021.

An Annual Site Inspection (ASI) was performed June 23, 2021.

MONTHLY STATISTICS FOR WY 2021

Record and near record monthly inflows in 70 years of record keeping were recorded in the following months: No inflow records were achieved.

Record and near record monthly end of month content in 70 years of record keeping were recorded in the following months: No storage records were achieved.

Additional statistical information on Keyhole Reservoir and its operations during WY 2021 can be found on Table DKT9 and Figure DKG8.

Table DKT 10: Hydrologic Data for Keyhole Reservoir - WY 2021

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	4,051.00	6,592	6,592
TOP OF ACTIVE CONSERVATION	4,099.30	188,671	182,079
TOP OF JOINT USE			
TOP OF EXCLUSIVE FLOOD CONTROL	4,111.50	329,134	140,463

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE (end-of-day)
BEGINNING OF YEAR	4,095.30	153,701	SEP 30, 2020
END OF YEAR	4,091.89	128,144	SEP 30, 2021
ANNUAL LOW	4,091.89	128,144	SEP 30, 2021
ANNUAL HIGH	4,095.35	154,106	OCT 03, 2020
HISTORIC HIGH	4,100.38	210,222	MAY 21, 1978

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	13,734	OCT 20-SEP 21	12,066	OCT 20-SEP 21
DAILY PEAK (CFS)	767	NOV 08, 2020	158	JUL 21, 2021
DAILY MINIMUM (CFS)	0	JUL 07, 2021	0	OCT 01, 2020

MONTH	INFLOW		OUTFLOW		EOM CONTENT**	
	AF	% OF AVG	AF	% OF AVG	AF	% OF AVG
OCTOBER	-1,690	-438	0	0	152,254	156
NOVEMBER	-561	-180	0	0	151,693	156
DECEMBER	480	259	0	0	152,173	156
JANUARY	-80	-16	0	0	152,093	156
FEBRUARY	801	30	0	0	152,894	152
MARCH	726	9	0	0	153,620	143
APRIL	-323	-13	0	0	153,297	143
MAY	-1,284	-26	0	0	152,013	138
JUNE	-3,569	-116	0	0	148,444	133
JULY	-2,945	-344	7,046	178	138,453	130
AUGUST	-2,636	-141	5,020	140	130,797	129
SEPTEMBER	-2,653	-153	0	0	128,144	130
ANNUAL	-13,734	-82	12,066	82		
APRIL-JULY	-8,121	0				

* Frequently observed during fall and winter months
** EOM Content – End of Month Content

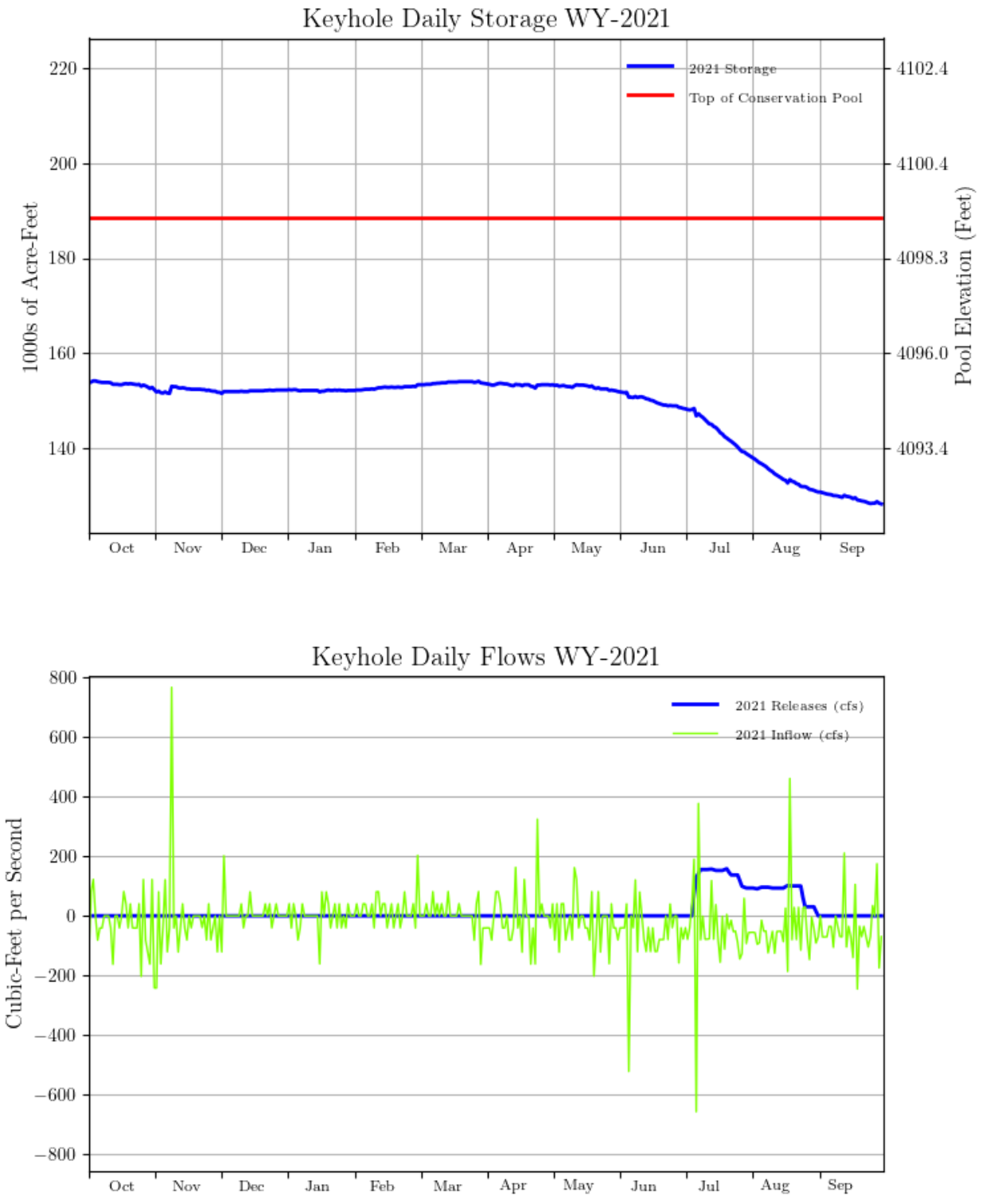


Figure DKG 8: Daily Storage and Flows for Keyhole Reservoir - WY 2021

Pactola Reservoir

BACKGROUND

Pactola Reservoir, Rapid Valley Unit (P-S 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 Snowtel (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 the city of Rapid City. The contract provides storage space of 49,000 AF for the city and 6,000 AF was retained by Reclamation.

WY 2021 OPERATIONS SUMMARY

Pactola Reservoir started WY 2021 at elevation 4,576.99 feet and with a storage of 53,262 AF, which is 3.21 feet and 2,710 AF below the top of the conservation pool. Precipitation for WY 2021 was 80 percent of average. Inflows for WY 2021 totaled 40,026 AF (102 percent of average). Peak inflows occurred in May, totaling 5,632 AF for the month. The peak reservoir elevation for WY 2021 was 4,580.18 feet, storage of 55,958 AF, and occurred on April 28, 2021. The minimum elevation for WY 2021 was 4,576.28 feet, storage of 52,676 AF, and occurred on September 30, 2021. WY 2021 ended at elevation 4,576.28 feet and storage of 52,676 AF, which is 3.92 feet and 3,296 AF below the top of the conservation pool. Pactola Reservoir ended the water year with 51,659 AF in active storage.

Natural flows in Rapid Creek were high throughout the water season. The city of Rapid City purchased 30 AF for WY2021. Otherwise, there were enough natural flows to meet the water demands.

Normal operations: no emergency levels activated.

No construction contracts occurred at Pactola Dam 2021. Elevator refurbishment is being performed by the City of Rapid City and is ongoing until completion.

Emergency Action Plan Orientation Meeting was held on March 25, 2021.

An Annual Site Inspection (ASI) was performed May 12, 2021.

MONTHLY STATISTICS FOR WY 2021

Record and near record monthly inflows in 66 years of record keeping were recorded in the following months: No inflow records were achieved.

Record and near record monthly end of month content in 66 years of record keeping were recorded in the following months: No storage records were achieved.

Additional statistical information on Pactola Reservoir and its operations during WY 2021 can be found on Table DKT10 and Figure DKG9

Table DKT 11: Hydrologic Data for Pactola Reservoir - WY 2021

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	4,456.10	1,017	1,017
TOP OF ACTIVE CONSERVATION	4,580.20	55,972	54,955
TOP OF JOINT USE			
TOP OF EXCLUSIVE FLOOD CONTROL	4,621.50	99,029	43,057

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE (end-of-day)
BEGINNING OF YEAR	4,576.99	53,262	SEP 30, 2020
END OF YEAR	4,576.28	52,676	SEP 30, 2021
ANNUAL LOW	4,576.28	52,676	SEP 30, 2021
ANNUAL HIGH	4,580.18	55,958	APR 28, 2021
HISTORIC HIGH	4,589.43	64,246	JUN 29, 2015

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	39,178	OCT 20-SEP 21	39,764	OCT 20-SEP 21
DAILY PEAK (CFS)	160	MAY 14, 2021	124	MAY 05, 2021
DAILY MINIMUM (CFS)	0	APR 29, 2021	36	JAN 27, 2021

MONTH	INFLOW		OUTFLOW		EOM CONTENT*	
	AF	% OF AVG	AF	% OF AVG	AF	% OF AVG
OCTOBER	3,264	142	3,248	166	53,278	117
NOVEMBER	3,132	179	3,189	204	53,221	116
DECEMBER	2,919	196	3,052	195	53,088	116
JANUARY	2,734	177	2,618	177	53,204	116
FEBRUARY	2,362	154	2,030	152	53,536	116
MARCH	3,533	137	2,350	126	54,719	117
APRIL	4,230	97	3,301	109	55,648	116
MAY	5,403	77	5,574	97	55,477	113
JUNE	3,305	46	3,961	59	54,821	110
JULY	3,355	78	3,685	63	54,491	113
AUGUST	2,473	84	3,735	87	53,229	116
SEPTEMBER	2,467	106	3,020	103	52,676	116
ANNUAL	39,177	100	39,763	104		
APRIL-JULY	16,293	71				

* EOM Content – End of Month Content

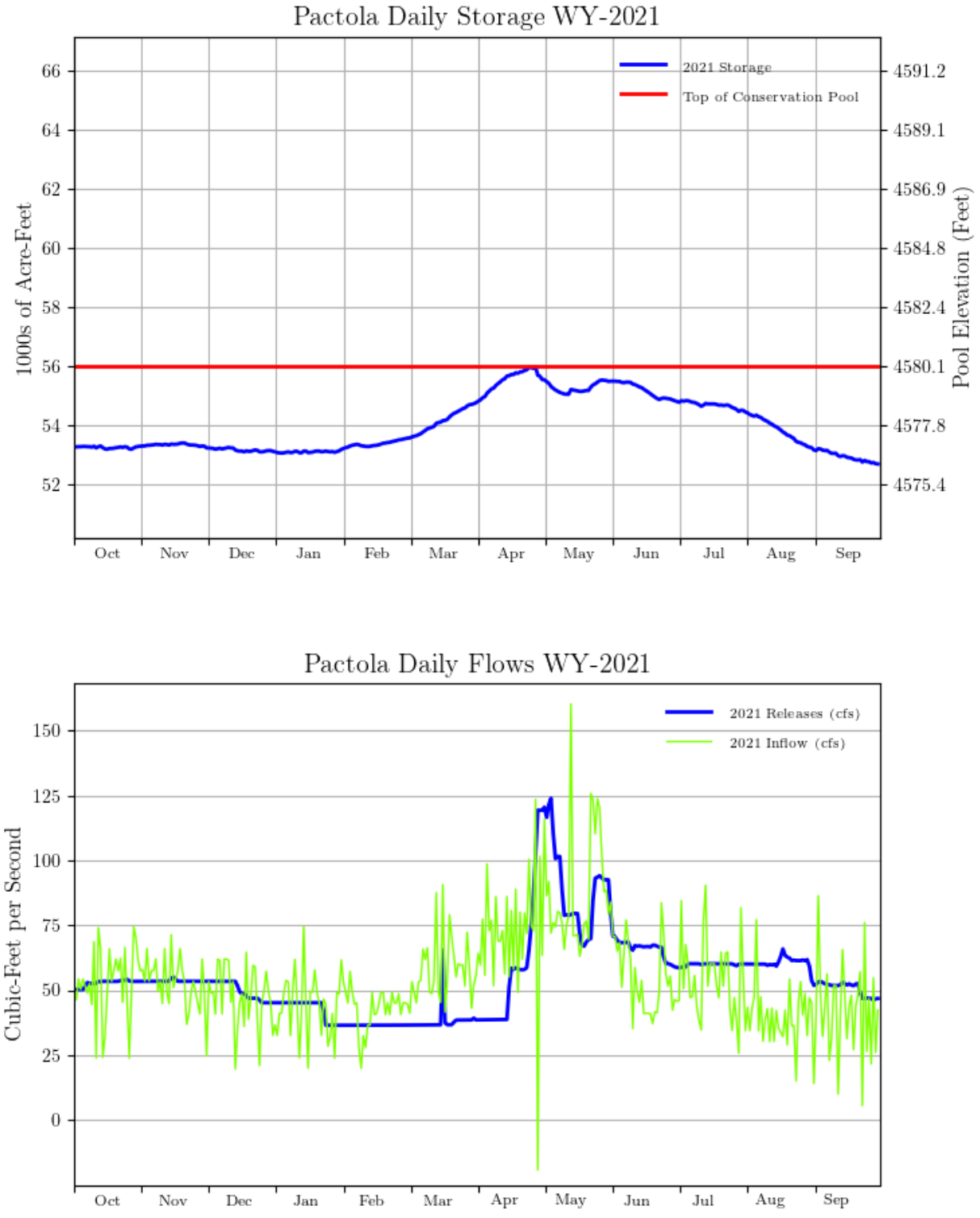


Figure DKG 9: Daily Storage and Flows for Pactola Reservoir - WY 2021

Shadehill Reservoir

BACKGROUND

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

After further study, it was concluded that water from Shadehill Reservoir can be used for sustained irrigation if certain limitations of soils, leaching water, soil amendments, and drainage are met. A definite plan report covering 6,700 acres which meets these limitations has been completed, approved by the Commissioner, and released for distribution. On December 17, 1963, landowners within the area voted 24 to 21 against formation of an irrigation district. Further action on development of the area was deferred until the attitude of the landowners was more favorable. Pending more extensive irrigation development, an additional 51,500 AF of space between elevations 2260 and 2272 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 of 1975, the West River Conservancy Sub-District was formed combining all but one of the old individual contracts for water supply from the reservoir into one. Acreage contracted for by the District was 5,000 acres; however, only 3,064 acres were developed. On March 18, 1986, the contract between Reclamation and the West River Conservancy Sub-District was assigned to the Shadehill Water User District, an organization, which succeeded the Sub-District under South Dakota law. This contract has expired and presently conservation releases are meeting irrigation demands. Should irrigation releases be required a temporary water service contract will need to be executed with the Shadehill Water User District.

Because certain release criteria reduced the effectiveness of flood control operations in the zone between elevation 2260 and 2272, and because the Corps of Engineers 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 2260 and 2272 revert to Reclamation. By a revised field working agreement dated May 15, 1972, it was agreed that the space between elevation 2260 and 2272 (51,500 AF) be reallocated to conservation use. However, space below elevation 2272 will continue to be evacuated before the start of the spring runoff, but to a lesser extent than in the past.

WY 2021 OPERATIONS SUMMARY

Shadehill Reservoir started WY 2021 at elevation 2,269.26 feet and with a storage of 106,925 AF, which is 2.74 feet and 13,247 AF below the top of the conservation pool. Precipitation for WY 2021 was 83 percent of average. Inflows for WY 2021 were less than zero and totaled -11,121 AF (Evaporation was greater than inflow). Peak inflows occurred in May, totaling 1,114 AF for the month. The peak reservoir elevation for WY 2021 was 2,269.26 feet, storage of 106,925 AF, and occurred on Oct 1, 2020. The minimum elevation for WY 2021 was 2261.30 feet, storage of 74,319 AF, and occurred on September 30, 2021. WY 2021 ended at elevation 2261.30 feet, storage of 74,319 AF, which is 10.70 feet and 45,853 AF below the top of the conservation pool. Shadehill Reservoir ended the water year with 30,450 AF in active storage.

All irrigation demands were met from river natural flow releases. There were no storage releases for irrigation needed during WY 2021.

Normal operations: no emergency levels activated.

The Shadehill Spillway Stabilization contract was awarded to Street Construction Company from Big Stone, SD for $43,520.00 and was completed in November of 2020. The contractor repaired the embankment, installed geofabric and repaired and replaced the riprap revetment for approximately 130 feet of the right and left bank.

An Emergency Action Plan Orientation Meeting was held on March 23, 2021.

A Comprehensive Review (CR) for Shadehill Dam was conducted May 27, 2021.

MONTHLY STATISTICS FOR WY 2021

Record and near record monthly inflows in 70 years of record keeping were recorded in the following months: No inflow records were achieved.

Record and near record monthly end of month content in 70 years of record keeping were recorded in the following months: No storage records were achieved.

Additional statistical information on Shadehill Reservoir and its operations during WY 2021 can be found on Table DKT11 and Figure DKG10.

Table DKT 12: Hydrologic Data for Shadehill Reservoir - WY 2021

RESERVOIR ALLOCATIONS	ELEVATION (FEET)	TOTAL RESERVOIR STORAGE (AF)	STORAGE ALLOCATION (AF)
TOP OF INACTIVE AND DEAD	2,250.80	43,869	43,869
TOP OF ACTIVE CONSERVATION	2,272.00	120,172	76,303
TOP OF JOINT USE			
TOP OF EXCLUSIVE FLOOD CONTROL	2,302.00	350,176	230,004

STORAGE-ELEVATION DATA	ELEVATION (FT)	STORAGE (AF)	DATE (end-of-day)
BEGINNING OF YEAR	2,269.26	106,925	SEP 30, 2020
END OF YEAR	2,261.30	74,319	SEP 30, 2021
ANNUAL LOW	2,261.30	74,319	SEP 30, 2021
ANNUAL HIGH	2,269.26	106,925	OCT 01, 2020
HISTORIC HIGH	2,297.90	318,438	APR 10, 1952

INFLOW-OUTFLOW DATA	INFLOW	DATE	OUTFLOW	DATE
ANNUAL TOTAL (AF)	-11,130	OCT 20-SEP 21	22,958	OCT 20-SEP 21
DAILY PEAK (CFS)	281	MAY 23, 2021	49	OCT 01, 2020
DAILY MINIMUM (CFS)	0	JUL 16, 20219	17	SEP 12, 2020

MONTH	INFLOW		OUTFLOW		EOM CONTENT**	
	AF	% OF AVG	AF	% OF AVG	AF	% OF AVG
OCTOBER	313	25	2,944	76	104,388	96
NOVEMBER	-1,101	-120	2,784	83	101,891	96
DECEMBER	-12	-2	2,797	110	99,082	95
JANUARY	-234	-25	2,738	116	96,110	93
FEBRUARY	-782	-24	2,425	115	92,903	89
MARCH	486	2	2,291	21	91,098	77
APRIL	-1,961	-10	1,329	7	87,808	73
MAY	1,114	10	1,195	12	87,727	73
JUNE	-1,011	-11	1,155	14	85,561	70
JULY	-3,003	-89	1,155	21	81,403	68
AUGUST	-3,098	-10	1,099	26	77,206	67
SEPTEMBER	-1,841	-306	1,046	29	74,319	66
ANNUAL	-11,130	-15	22,958	31		
APRIL-JULY	-4,861	0				

* Frequently observed during fall and winter months
** EOM Content – End of Month Content

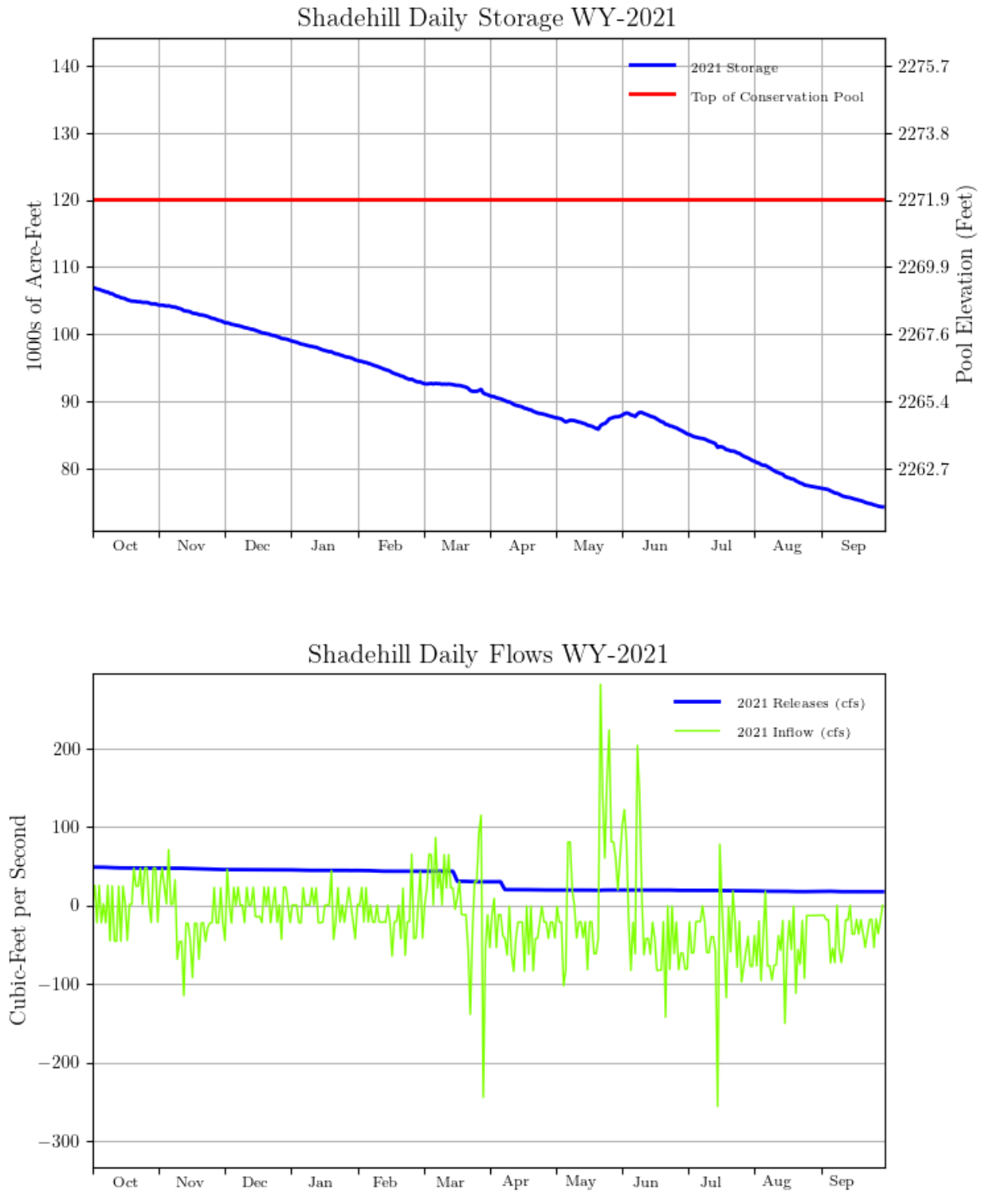


Figure DKG 10: Daily Storage and Flows for Shadehill Reservoir - WY 2021

Outlook and Operating Plans for Water Year 2021 for Reservoirs Under the Responsibility of the Dakotas Area Office

(E.A. PATTERSON, HEART BUTTE, JAMESTOWN, DEERFIELD, PACTOLA, ANGOSTURA, KEYHOLE, SHADEHILL, AND BELLE FOURCHE)

Operating Plans for Water Year 2022

Dickinson Reservoir

At the beginning of WY 2022, Dickinson Dam and E. A. Patterson Lake (Dickinson Reservoir) had an elevation of 2415.23 with a storage of 4,192 AF, which is 4.77 feet and 4,287 AF below the top of the active conservation pool (elevation 2,420.00 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 triggers the need for flood protection.

Heart Butte Reservoir

At the beginning of WY 2022, Heart Butte Dam and Lake Tschida (Heart Butte Reservoir) had an elevation of 2,056.49 with a storage of 43,586 AF, which is 8.01 feet and 21,505 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 2064.50, the river releases will be maintained at about 10 cfs to ensure a live stream flows 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 WY 2022, Jamestown Reservoir had an elevation of 1,426.04 with a storage of 20,742 AF, which is 4.96 feet and 8,983 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 1,429.60 and will continue shut throughout the winter until spring runoff causes 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:

Flood Control Regulation of Joint-Use Pool at Jamestown Reservoir

The joint space between elevations 1,428 feet and 1,431 feet 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 feet at the beginning of spring runoff period. That portion of the joint-use pool between elevations 1,429.8 feet and 1,431.0 feet will be used for storage and regulation of the spring runoff and summer rainstorms. In addition, water stored in this zone may be used during the summer months for conservation purposes. Storage remaining in the joint-use pool above elevation 1,429.8 feet msl after September 1 will be evacuated as directed by the Corps of Engineers.

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

SEASON: BEGNNING OF SPRING RUNOFF TO SEPTEMBER 1

El. 1429.80 msl (Base of flood control zone) to El. 1,431.00 msl (Top of Joint Use Pool)

Release greater of:

a. Conservation releases

b. 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 msl at the time inflows cease.

SEASON: SEPTEMBER 1 TO NOVEMBER 1

Make releases necessary to evacuate reservoir to elevation 1,429.80 msl prior to November 1.

SEASON: NOVEMBER 1 TO BEGINNING OF SPRING RUNOFF

Make releases necessary to maintain elevation 1,429.80 msl.

Angostura Reservoir

Angostura Reservoir started WY 2022 at elevation 3,175.11 feet, and storage of 75,485 AF, which is 12.09 feet and 47,563 AF below the top of the conservation (elevation 3,187.2 msl 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 always operated as full as possible. Water may be released from the facility if the reservoir is expected to fill to meet irrigation demands; ergo, 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 not expected unless precipitation events occur to fill the reservoir.

Belle Fourche Reservoir

Belle Fourche Reservoir started WY 2022 at elevation 2,958.83 feet and storage of 69,244 AF, which is 16.17 feet and 103,629 AF below the top of the conservation (elevation 2,975.0 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 Belle Fourche Irrigation District will establish allotments of water to each irrigator and the storage will be used accordingly. The Standing Operating Procedures for Belle Fourche Dam limit the maximum drawdown of the reservoir to 0.3 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 WY 2022 at elevation 5,906.53 feet and with a storage of 15,048 AF, which is 1.47 feet to full and 607 AF below the top of the conservation (elevation 5,908.0 feet at 15,654 AF). The reservoir winter draw down was at 14,730 AF at December 1, 2020. 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 WY 2020. The City of Rapid City did not release water from Deerfield for municipal use in WY 2021.

A release of around 13 cfs will be maintained until the spring runoff brings the need for higher releases in late March or early April. Excess water is normally released only when the reservoir is full or assured of filling. Since no inflow forecasts are available, the reservoir is normally operated as full as possible. Two Snotel sites (North Rapid Creek and Blind Park) are operated in the Pactola and Deerfield drainage basin. Deerfield storage may be required to meet District irrigation needs in WY 2022.

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

Storage at the end of WY 2022 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 account for downstream ice conditions in Castle Creek.

Keyhole Reservoir
Keyhole Reservoir started WY 2022 at elevation 4,091.89 feet and storage of 128,144 AF, which is 7.41 feet and 60,527 AF below the top of conservation (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 - May. Flood control releases are not expected unless significant precipitation fills the reservoir. Discharges from toe drains of the dam and downstream inflows normally satisfy downstream requirements for stock water and other minor uses during this period.

Releases from storage accounts will be made during the summer in response to irrigation demand from the Belle Fourche Irrigation District in South Dakota and the Crook County Irrigation District in Wyoming. Each organization maintains a storage account in Keyhole Reservoir and the contract with the Belle Fourche Irrigation District also includes provisions for the annual purchase of additional unsold South Dakota storage. Peak irrigation demand releases are normally between 125 and 175 cfs.

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

Pactola Reservoir

Pactola Reservoir started WY 2022 at elevation 4,576.28 feet and storage of 52,676 AF, which is 3.92 feet and 3,296 AF below the top of the conservation pool (elevation 4,580.2 msl at 55,972). 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 and releases of 15 cfs from October 1-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 at all reservoir contents.

1. 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

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

1. 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

2. 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 the Bureau 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 Bureau of 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 WY 2022 is approximately 40 cfs and has been coordinated with the City of Rapid City, South Dakota Department of Game, Fish, and Parks, local water users, Forest Service, and Corps of Engineers. 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 msl will be cleared with the Corps of Engineers. 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 - 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 WY 2022 at elevation 2,261.30 feet and storage of 74,319 AF, which is 10.70 feet and 45,583 AF below the top of the conservation (elevation 2272.0 msl 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 comes out of the channel in the spring to prevent ice jams at crossings. In the spring, after ice comes 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 which consist primarily of ranchers.

System Description and Annual Operating Plans for Water Year 2020 for Reservoirs Under the Responsibility of the U.S. Army Corps of Engineers

Overview

The Missouri River main stem reservoir system, consisting of six reservoirs located in Montana, North Dakota, South Dakota, and Nebraska, provides for the following beneficial uses: flood control, irrigation, navigation, power, municipal and industrial water supply, water quality control, fish and wildlife, and recreation. Based on information from the Corps' 2021-22 AOP, the capacity and storage allocations of the main stem system were updated to current values and are shown in upstream to downstream order as follows:

Table CET 1: U.S. Army Corps reservoir storage allocations (in KAF).

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

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

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

Powerplant	Units	Capacity (Kilowatts)
Fort Peck, MT	5	185,250
Garrison, ND	5	583,300
Oahe, SD	7	786,030
Big Bend, SD	8	494,320
Fort Randall, SD	8	320,000
Gavins Point, NE	3	132,300
Totals	36	2,501,200

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

Operation of the Missouri River main stem reservoir system provides the following eight beneficial uses: flood control, irrigation, navigation, power, municipal and industrial water supply, water quality control, fish and wildlife, and recreation. Table CET3 presents the regulation benefit for most of those uses as recorded in 2020-2021, 2019-2020, and the average. Benefits are defined as the tons of produce shipped, dollars of damages prevented, kilowatt hours of electricity produced, and reservoir elevation and river stages maintained. For the shipping information, estimates also were provided this year which included the sand, gravel, and waterway material shipped. Table CET3 shows damages prevented at September 2021 price levels.

Table CET 3: Flood damages prevented by the Missouri River main stem reservoir system.

Use of Regulated Water	Period of Use or Season	Totals (WY 2020)	Totals (WY 2019)	Long-Term
Navigation[1]	Apr. - Dec.[2]	0.587 million tons[3] (2021)	0.773 million tons (2020)	1.58 million tons[4]
Flood Damages Prevented	Oct. – Sept.	$0.18 billion (2021)	$ 0.30 billion (2020)	$ 89.4 billion[5]
Energy	Aug. - Jul.	8.9 billion kWh (Aug. 20-July 21)	12.9 billion kWh (Aug. 19-July 20)	9.4 billion kWh[6]

[1]If sand, gravel, and waterway material are included:
4.74 million tons (2021)(estimated)
5.66 million tons (2020)
6.48 million tons (1967-2021 average)
[2]End of navigation season extended 0 days in 2020 and 0 days in 2021
[3]2021 tonnages are estimated.
[4]1967-2021 average. Peak tonnage shipped in 1977 (3.336 million tons)
[5]Total damages prevented (1938-2021)
[6]1968-2021 Average

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

Energy Generation

There are 14 Federal powerplants located in the Upper Missouri River Basin that are currently operating. Eight of the power plants are owned and operated by Reclamation and have a total capacity of 348,100 kilowatts. The other six are owned and operated by the Corps and have a total

capacity of 2,501,200. Energy generated by the 14 power plants is marketed by the Department of Energy.

Total generation in the combined system in WY 2021 was 9831.324 million kilowatt hours, 3400.414 million kilowatt hours less than in WY 2020. A summary of the past 10 years of energy generation within the Upper Missouri River Basin is shown below.

Table CET 4: USBR and USACE Energy Generation (Million Kilowatt-Hours)

Year	USBR	USACE	TOTAL
2021	957.399	8873.925	9831.324
2020	1470.049	11772.247	13231.738
2019	1488.146	12506.578	14076.594
2018	1790.992	11355.764	13146.777
2017	1560.628	9092.514	10652.142
2016	1164.801	7652.158	8816.969
2015	1316.344	9323.682	10640.026
2014	1559.297	8729.714	10289.197
2013	840.209	8183.967	9024.176
2012	1141.904	10779.032	11920.936

A comparison of 2020 and 2021 generation and other data from Missouri Basin Region powerplants is shown on Table CET5. Tables CET6 through CET11 show the monthly generation, power releases, and total downstream releases, respectively, for all Federal plants in the Missouri Basin Region. The annual energy generation for each of the last several years for all Reclamation, Corps, and combined plants is shown graphically on Figures CEG1, CEG3, and CEG5, respectively. Monthly generation during the past several years is shown graphically on Figures CEG2, CEG4, and CEG6.

For a more detailed account of powerplants operation at Reclamation facilities during the year, refer to the 2021 operation summaries. Information on the Corps' powerplants operations can be obtained from the annual operating reports prepared by and available for distribution from the Missouri River Basin Water Management Division, U.S. Army Corps of Engineers, Northwestern Division, Omaha, Nebraska.

Table CET 5: Powerplant generation statistics for Missouri Basin facilities.

Reclamation Powerplants	Installed Capacity (KW)	Million KWh Generated **2020**	Million KWh Generated **2021**	Water Used for Generation (KAF)	Percent of Total Water Released	KWh per AF	River Release (KAF)	Total Release (KAF)
Canyon Ferry	50,000	367.841	262.951	2,289.480	89.06	114.85	2,467.4	2,570.9
Pilot Butte[1]	1,600	0.000	0.000	0.000	0.00	N/A	164.2	164.2
Boysen	15,000	72.035	47.560	575.915	93.50	82.58	616.0	616.0
Shoshone	3,000	21.482	18.298	128.128	16.76	142.81	See below for	total.
Buffalo Bill	18,000	87.814	61.683	2,246.087	293.86	27.46	See below for	total.
Heart Mountain	6,000	21.588	15.222	75.199	9.84	202.42	See below for	total.
Spirit Mountain [2]	4,500	16.305	16.439	158.942	20.79	103.43	See below for	total.
Total for Buffalo Bill Reservoir[3]	31,500	147.189	111.642	2,608.356	341.25	42.80	2,481.7	764.3
Yellowtail	250,000	872.426	535.246	1,605.851	100.00	333.31	1,538.5	1,605.9
Subtotal	**348,100**	**1,459.491**	**957.399**	**7,079.602**	**123.74**	**135.23**	**7,267.7**	**5,721.2**
Corps of Engineers Powerplants								
Fort Peck	185,250	1,251.411	999.077	6,134.00	100.00	162.88	6,134.0	6,134.0
Garrison	583,300	2,919.492	2,008.947	13,552.00	100.00	148.24	13,552.0	13,552.0
Oahe	786,030	3,390.310	2,518.660	16,769.00	100.00	150.20	16,769.0	16,769.0
Big Bend	494,320	1,349.511	922.858	16,660.00	100.00	55.39	16,660.0	16,660.0
Fort Randall	320,000	2,151.454	1,741.018	16,834.00	99.99	103.42	16,835.0	16,835.0
Gavins Point	132,300	710.069	683.365	15,563.00	81.68	43.91	19,053.0	19,053.0
Subtotal	**2,501,200**	**11,772.247**	**8,873.925**	**85,512.00**	**96.08**	**103.77**	**89,003.0**	**89,003.0**
TOTAL MISSOURI BASIN	**2,849,300**	**13,231.738**	**9,831.324**	**92,591.60**	**97.75**	**106.18**	**96,270.7**	**94,724.2**

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

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

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

Table CET 6: Monthly Generation at Bureau of Reclamation Power powerplants (in Million Kilowatt-hours).

WY 2021 MONTH	CANYON FERRY	PILOT BUTTE	BOYSEN	HEART MOUNTAIN	SPIRIT MOUNTAIN	BUFFALO BILL	SHOSHONE	YELLOWTAIL	TOTAL
October	23.815	0.000	2.359	1.737	1.724	2.354	1.603	50.767	**84.359**
November	24.614	0.000	3.055	0.000	0.000	0.000	0.755	42.813	**71.237**
December	26.408	0.000	3.143	0.000	0.000	0.000	0.865	44.262	**74.678**
January	27.961	0.000	2.912	0.000	0.000	0.000	1.762	43.796	**76.431**
February	21.442	0.000	2.644	0.000	0.000	0.000	1.604	38.360	**64.050**
March	24.843	0.000	2.880	0.000	0.000	0.461	1.775	42.010	**71.969**
April	23.418	0.000	2.826	0.400	0.259	9.092	1.671	54.145	**91.811**
May	21.175	0.000	4.680	3.665	2.443	10.634	1.716	54.355	**98.668**
June	17.968	0.000	6.596	2.460	2.944	11.756	1.824	42.719	**86.267**
July	17.198	0.000	6.325	2.329	3.183	11.969	1.711	49.389	**92.104**
August	17.301	0.000	5.149	2.322	3.122	8.483	1.546	38.571	**76.494**
September	16.808	0.000	4.991	2.309	2.764	6.934	1.466	34.059	**69.331**
TOTAL	**262.951**	**0.000**	**47.560**	**15.222**	**16.439**	**61.683**	**18.298**	**535.246**	**957.399**

Table CET 7: Monthly Generation at U.S. Army Corps Power powerplants (in Million Kilowatt-hours).

MONTH	FORT PECK	GARRISON	OAHE	BIG BEND	FORT RANDALL	GAVINS POINT	TOTAL	BASIN TOTAL
October	59.091	122.241	213.755	75.486	187.614	74.144	**732.331**	**816.690**
November	58.851	116.285	178.912	67.627	148.669	57.713	**628.057**	**699.294**
December	103.133	143.076	141.428	54.001	81.607	48.443	**571.688**	**646.366**
January	107.151	145.933	170.201	62.900	83.473	48.355	**618.013**	**694.444**
February	92.567	176.264	172.242	64.279	86.403	45.932	**637.687**	**701.737**
March	72.215	170.835	167.156	63.719	97.512	49.920	**621.357**	**693.326**
April	72.054	185.698	215.521	79.391	159.791	53.588	**766.043**	**857.854**
May	84.877	199.132	237.505	86.438	170.257	53.904	**832.113**	**930.781**
June	91.746	197.983	248.280	88.637	171.166	54.851	**852.663**	**938.930**
July	94.816	206.529	258.338	92.303	175.226	50.429	**877.641**	**969.745**
August	93.550	196.544	295.439	106.560	199.372	74.020	**965.485**	**1,041.979**
September	69.026	148.427	219.883	81.517	179.928	72.066	**770.847**	**840.178**
TOTAL	**999.077**	**2,008.947**	**2,518.660**	**922.858**	**1,741.018**	**683.365**	**8,873.925**	**9,831.324**

Table CET 8: Water used (in KAF) for power generation at Bureau of Reclamation powerplants.

WY 2021 MONTH	CANYON FERRY	BOYSEN	PILOT BUTTE	SHOSHONE	BUFFALO BILL	HEART MOUNTAIN	SPIRIT MOUNTAIN[1]	YELLOWTAIL	TOTAL
October	209.882	28.381	0.000	11.171	16.999	8.343	16.720	139.972	**431.468**
November	213.096	36.074	0.000	6.497	0.000	0.000	0.000	121.138	**376.805**
December	227.260	38.940	0.000	5.809	0.000	0.000	0.000	126.046	**398.056**
January	240.716	36.768	0.000	11.667	0.000	0.000	0.000	129.190	**418.341**
February	190.712	33.632	0.000	10.142	0.000	0.000	0.000	118.460	**352.946**
March	215.515	37.492	0.000	12.141	1.498	0.000	0.000	129.691	**396.336**
April	203.344	37.065	0.000	11.791	36.624	1.971	2.720	157.938	**451.453**
May	186.755	63.204	0.000	12.117	48.580	17.037	24.511	162.294	**514.497**
June	153.446	77.576	0.000	12.871	47.688	12.383	28.181	130.044	**462.189**
July	147.258	73.394	0.000	12.289	2,024.556	12.009	30.228	135.487	**2,435.221**
August	150.080	56.728	0.000	11.103	36.411	11.912	29.774	131.063	**427.072**
September	151.415	56.662	0.000	10.530	33.729	11.543	26.809	124.528	**415.217**
TOTAL	**2,289.480**	**575.915**	**0.000**	**128.128**	**2,246.087**	**75.199**	**158.942**	**1,605.851**	**7,079.602**

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

Table CET 9: Water used (in KAF) for power generation at U.S. Army Corps powerplants.

WY 2021 MONTH	FORT PECK	GARRISON	OAHE	BIG BEND	FORT RANDALL	GAVINS POINT	**TOTAL**
October	370.000	826.000	1,374.000	1,336.000	1,875.000	1,762.000	**7,543.000**
November	376.000	791.000	1,180.000	1,181.000	1,565.000	1,328.000	**6,421.000**
December	623.000	983.000	940.000	942.000	852.000	1,046.000	**5,386.000**
January	646.000	1,008.000	1,125.000	1,095.000	837.000	1,046.000	**5,757.000**
February	565.000	1,181.000	1,145.000	1,140.000	841.000	1,018.000	**5,890.000**
March	447.000	1,155.000	1,116.000	1,149.000	880.000	1,114.000	**5,861.000**
April	443.000	1,267.000	1,431.000	1,442.000	1,463.000	1,260.000	**7,306.000**
May	516.000	1,349.000	1,601.000	1,557.000	1,587.000	1,266.000	**7,876.000**
June	554.000	1,303.000	1,654.000	1,657.000	1,633.000	1,269.000	**8,070.000**
July	578.000	1,355.000	1,714.000	1,699.000	1,673.000	1,153.000	**8,172.000**
August	577.000	1,317.000	2,007.000	1,969.000	1,898.000	1,698.000	**9,466.000**
September	439.000	1,017.000	1,482.000	1,493.000	1,730.000	1,603.000	**7,764.000**
TOTAL	**6,134.000**	**13,552.000**	**16,769.000**	**16,660.000**	**16,834.000**	**15,563.000**	**85,512.000**

Table CET 10: Total Water Releases (in KAF) for water year 2021 at Bureau of Reclamation powerplants.

MONTH	FERRY	BOYSEN	BUTTE	BILL	LAKE	ANCHOR	YELLOWTAIL	**TOTAL**
October	210.273	43.211	0.000	56.187	1.918	0.130	139.972	**451.690**
November	213.096	41.705	0.000	12.447	1.469	0.014	121.138	**389.869**
December	227.260	38.940	0.000	12.022	1.528	0.000	126.046	**405.796**
January	240.716	36.768	0.000	11.839	1.532	0.000	129.190	**420.045**
February	239.346	33.632	0.000	10.691	1.385	0.000	118.460	**403.515**
March	226.219	37.497	0.000	13.808	1.537	0.000	129.691	**408.752**
April	222.977	37.065	2.884	78.960	1.493	0.000	157.938	**501.316**
May	222.782	63.204	23.292	121.892	2.970	1.745	162.294	**598.179**
June	197.407	77.576	38.820	125.268	25.100	5.823	130.044	**600.039**
July	196.795	73.394	38.454	123.831	45.896	1.973	135.487	**615.830**
August	193.059	69.459	33.431	104.224	45.207	0.681	131.063	**577.123**
September	180.930	63.510	27.280	93.180	34.984	0.263	124.528	**524.675**
TOTAL	**2,570.860**	**615.960**	**164.161**	**764.348**	**165.020**	**10.629**	**1,605.851**	**5,896.829**

Table CET 11: Total Water Releases (in KAF) for water year 2021 at U.S. Army Corps powerplants.

MONTH	PECK	GARRISON	OAHE	BEND	RANDALL	POINT	**TOTAL**
October	370.000	826.000	1,374.000	1,336.000	1,875.000	2,036.000	**7,817.000**
November	376.000	791.000	1,180.000	1,181.000	1,565.000	1,865.000	**6,958.000**
December	623.000	983.000	940.000	942.000	852.000	1,046.000	**5,386.000**
January	646.000	1,008.000	1,125.000	1,095.000	837.000	1,046.000	**5,757.000**
February	565.000	1,181.000	1,145.000	1,140.000	841.000	1,018.000	**5,890.000**
March	447.000	1,155.000	1,116.000	1,149.000	880.000	1,241.000	**5,988.000**
April	443.000	1,267.000	1,431.000	1,442.000	1,463.000	1,702.000	**7,748.000**
May	516.000	1,349.000	1,601.000	1,557.000	1,587.000	1,809.000	**8,419.000**
June	554.000	1,303.000	1,654.000	1,657.000	1,633.000	1,764.000	**8,565.000**
July	578.000	1,355.000	1,714.000	1,699.000	1,674.000	1,796.000	**8,816.000**
August	577.000	1,317.000	2,007.000	1,969.000	1,898.000	1,925.000	**9,693.000**
September	439.000	1,017.000	1,482.000	1,493.000	1,730.000	1,805.000	**7,966.000**
TOTAL	**6,134.000**	**13,552.000**	**16,769.000**	**16,660.000**	**16,835.000**	**19,053.000**	**89,003.000**

Table CET 12: Total water storage (in KAF) for water years 2020 and 2021.

RECLAMATION RESERVOIRS	TOP OF CONSERVATION CAPACITY [3]	DEAD AND INACTIVE CAPACITY	2020 TOTAL STORAGE	2021 TOTAL STORAGE	2020 PERCENT OF AVERAGE	2021 PERCENT OF AVERAGE
Clark Canyon	174.4	1.1	107.6	52.3	105%	55%
Canyon Ferry	1,891.9	396.0	1,624.5	1,348.7	95%	83%
Helena Valley	10.5	4.6	8.9	8.4	120%	112%
Gibson	96.5	0.0	7.7	5.5	24%	23%
Willow Creek	31.8	1.0	0.0	13.1	86%	65%
Pishkun	46.7	16.0	27.9	36.2	61%	112%
Lake Elwell	925.6	554.3	858.6	816.8	103%	103%
Sherburne	66.1	1.9	5.1	11.3	66%	67%
Fresno	92.9	0.4	59.1	39.8	93%	86%
Nelson	79.0	18.1	77.1	45.2	89%	79%
Bull Lake	152.5	0.7	86.1	74.7	159%	99%
Pilot Butte	33.7	3.8	16.1	5.5	100%	31%
Boysen	741.6	219.2	647.6	635.2	120%	106%
Anchor[1]	17.2	0.1	0.4	0.5	358%	149%
Buffalo Bill[2]	646.6	41.7	487.0	405.6	119%	91%
Bighorn Lake	1,020.6	469.9	999.3	866.8	107%	91%
E. A. Patterson	8.6	0.5	8.9	4.2	95%	67%
Lake Tschida	67.1	5.2	62.4	43.6	90%	77%
Jamestown Reservoir	31.5	0.8	31.2	20.7	102%	72%
Shadehill Reservoir	120.2	43.9	113.1	74.3	81%	70%
Angostura Reservoir	123.0	42.2	104.3	75.5	98%	89%
Deerfield Reservoir	15.7	0.2	15.0	15.0	116%	113%
Pactola Reservoir	56.0	1.0	53.6	52.7	111%	113%
Keyhole Reservoir	188.7	6.6	167.3	128.1	138%	145%
Belle Fourche Reservoir	172.9	3.1	137.5	69.2	79%	94%
Subtotal	**6,811.2**	**1,832.3**	**5,706.3**	**4,849.2**	---	---
U.S. ARMY CORPS RESERVOIRS						
Fort Peck	17,578.0	4,073.0	16,719.0	15,582.0		
Garrison	22,332.0	4,980.0	20,466.0	18,433.0		
Oahe	22,035.0	5,373.0	21,112.0	19,489.0		
Big Bend	1,738.0	1,621.0	1,668.0	1,677.0		
Fort Randall	4,433.0	1,517.0	3,746.0	3,281.0		
Gavins Point	393.0	307.0	332.0	363.0		
Subtotal	**68,509.0**	**17,871.0**	**64,043.0**	**58,825.0**		
TOTAL UPPER MISSOURI BASIN	**75,320.2**	**19,703.3**	**69,749.3**	**63,674.2**		

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

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

[3] Includes joint-use space.

Table CET 13: Water year 2021 end of month reservoir contents (in KAF).

RECLAMATION RESERVOIRS	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
CLARK CANYON RESERVOIR	101.5	112.1	121.0	128.9	135.0	141.8	145.1	131.9	96.8	65.1	54.1	52.3
% of Average	98.1%	100.0%	102.6%	104.9%	105.7%	104.5%	101.7%	95.5%	73.6%	58.9%	57.7%	55.5%
CANYON FERRY RESERVOIR	1,529.3	1,546.7	1,523.4	1,485.8	1,421.4	1,437.6	1,443.6	1,558.8	1,644.2	1,536.4	1,442.4	1,348.7
% of Average	93.5%	93.5%	95.1%	96.7%	95.6%	98.3%	97.2%	94.8%	88.8%	86.0%	86.1%	83.2%
HELENA VALLEY RESERVOIR	8.5	8.2	7.8	7.5	7.3	7.1	9.0	10.4	9.1	7.3	9.5	8.4
% of Average	122.4%	122.1%	121.1%	123.3%	127.0%	123.9%	98.0%	113.3%	101.3%	98.0%	117.4%	112.2%
GIBSON RESERVOIR	13.4	29.0	30.4	29.7	29.5	32.7	59.0	82.9	97.1	45.5	5.8	5.5
% of Average	45.6%	87.0%	83.4%	74.4%	68.4%	68.4%	94.2%	92.3%	107.6%	88.6%	21.5%	23.4%
WILLOW CREEK	21.3	21.9	22.3	22.7	23.1	23.5	23.9	29.1	31.5	17.3	12.4	13.1
% of Average	0.1%	101.6%	101.8%	102.0%	102.0%	100.1%	94.1%	102.1%	108.0%	71.5%	60.4%	64.8%
PISHKUN RESERVOIR	34.9	34.6	34.3	34.1	34.0	33.8	33.6	45.9	33.8	34.1	37.1	36.2
% of Average	0.1%	100.8%	100.8%	101.3%	100.9%	99.0%	84.4%	99.9%	80.8%	92.0%	103.6%	111.7%
LAKE ELWELL (TIBER DAM)	805.6	805.1	790.3	772.6	754.8	752.5	749.5	831.2	891.7	866.7	842.6	816.8
% of Average	105.9%	107.2%	107.2%	107.0%	105.5%	104.6%	101.6%	101.7%	101.6%	101.1%	102.5%	103.0%
SHERBURNE LAKE	38.1	51.6	55.3	58.1	59.0	57.3	28.5	32.1	60.3	46.5	18.7	11.3
% of Average	191.4%	205.3%	198.5%	188.0%	178.3%	199.4%	140.2%	93.3%	107.2%	95.0%	66.5%	66.9%
FRESNO RESERVOIR	17.8	27.4	29.0	29.7	27.9	37.9	69.0	73.1	56.5	15.3	33.4	39.8
% of Average	39.3%	60.6%	66.3%	70.4%	64.0%	64.1%	91.1%	100.9%	74.5%	26.4%	73.2%	86.1%
NELSON RESERVOIR	54.2	52.8	51.4	49.8	48.5	59.5	61.9	55.1	44.0	32.3	43.1	45.2
% of Average	92.0%	91.5%	91.8%	91.6%	91.2%	109.2%	100.8%	90.7%	72.4%	58.6%	79.2%	79.4%
BULL LAKE	76.3	77.9	78.5	78.7	78.8	79.5	81.1	106.5	150.4	129.9	100.7	74.7
% of Average	102.0%	103.3%	103.5%	103.5%	103.6%	104.4%	107.0%	119.7%	119.3%	100.8%	97.7%	98.6%
PILOT BUTTE RESERVOIR	28.1	28.1	28.1	27.9	27.8	27.6	27.8	26.8	27.7	19.7	18.3	5.5
% of Average	105.9%	101.6%	101.2%	100.4%	99.5%	93.6%	90.6%	99.5%	93.0%	77.6%	86.0%	30.7%
BOYSEN RESERVOIR	560.5	562.6	560.0	556.1	551.1	562.5	567.1	605.9	725.3	691.5	661.2	635.2
% of Average	94.1%	95.3%	97.8%	99.9%	100.8%	104.2%	107.8%	110.4%	110.6%	106.5%	107.1%	106.0%
ANCHOR RESERVOIR	0.53	0.55	0.48	0.47	0.49	0.47	0.81	2.05	0.81	0.54	0.49	0.49
% of Average[1]	185.5%	222.6%	201.3%	204.0%	186.8%	130.0%	163.1%	134.0%	24.0%	24.5%	82.8%	148.9%
BUFFALO BILL RESERVOIR	426.7	442.2	447.8	450.4	451.4	457.3	418.3	462.1	615.4	554.8	482.0	405.6
% of Average[2]	100.9%	103.8%	105.5%	106.6%	107.9%	110.5%	106.1%	105.5%	108.4%	96.5%	94.8%	91.1%
BIGHORN LAKE	931.7	921.1	892.7	860.0	831.3	818.7	810.0	814.5	877.2	839.9	849.6	866.8
% of Average	96.9%	98.4%	100.5%	102.2%	102.2%	101.9%	102.6%	94.3%	87.8%	85.5%	90.0%	91.3%
E. A. PATTERSON LAKE	5.4	4.7	4.8	5.0	5.0	5.1	5.1	5.5	5.1	4.8	4.4	4.2
% of Average	90.0%	80.1%	82.4%	83.6%	76.9%	65.2%	64.3%	71.1%	67.2%	67.2%	67.1%	67.3%
LAKE TSCHIDA	50.9	52.4	53.1	53.7	53.6	55.5	56.5	62.6	59.6	53.0	46.5	43.6
% of Average	89.0%	91.2%	92.3%	93.5%	89.8%	81.7%	85.8%	95.7%	91.1%	85.6%	79.9%	76.8%
JAMESTOWN RESERVOIR	28.0	28.0	27.9	27.7	27.7	28.0	27.7	27.8	26.4	23.2	21.1	20.7
% of Average	104.2%	106.0%	104.9%	103.8%	102.7%	77.0%	48.9%	61.1%	71.0%	68.2%	64.7%	72.2%
SHADEHILL RESERVOIR	104.4	101.9	99.1	96.1	92.9	91.1	87.8	87.7	85.6	81.4	77.2	74.3
% of Average	101.8%	100.6%	99.1%	97.4%	92.0%	79.1%	75.0%	74.9%	73.8%	71.4%	70.4%	70.4%
ANGOSTURA RESERVOIR	81.7	84.4	87.1	90.0	93.1	99.3	103.9	106.7	100.4	88.4	79.1	75.5
% of Average	94.5%	96.6%	97.7%	98.5%	97.2%	97.0%	98.2%	97.5%	92.4%	89.3%	89.0%	88.9%
DEERFIELD RESERVOIR	14.9	14.7	14.6	14.6	14.8	15.4	15.6	15.4	15.4	15.4	15.2	15.0
% of Average	111.6%	108.9%	106.2%	104.5%	105.1%	107.2%	108.4%	106.5%	106.6%	108.7%	111.3%	112.7%
PACTOLA RESERVOIR	53.3	53.2	53.1	53.2	53.5	54.7	55.6	55.5	54.8	54.5	53.2	52.7
% of Average	114.4%	113.7%	114.0%	114.3%	114.8%	115.5%	114.3%	111.1%	108.7%	112.0%	113.1%	113.5%
KEYHOLE RESERVOIR	152.3	151.7	152.2	152.1	152.9	153.6	153.3	152.0	148.4	138.5	130.8	128.1
% of Average	172.3%	172.4%	172.5%	171.5%	167.5%	157.5%	155.0%	149.5%	146.2%	144.3%	144.2%	144.5%
BELLE FOURCHE RESERVOIR	110.8	123.6	136.2	146.9	146.9	158.8	170.1	162.5	137.1	106.3	78.7	69.2
% of Average	134.5%	134.0%	134.5%	133.0%	123.0%	119.0%	117.7%	104.7%	91.9%	90.0%	91.7%	93.6%
CORPS RESERVOIRS	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
FORT PECK RESERVOIR	15,495.0	15,468.0	15,180.0	14,852.0	14,617.0	14,658.0	14,571.0	14,579.0	14,484.0	14,122.0	13,773.0	13,512.0
GARRISON RESERVOIR	18,216.0	18,179.0	18,073.0	17,974.0	17,534.0	17,525.0	17,077.0	17,015.0	17,452.0	16,911.0	16,241.0	15,874.0
OAHE RESERVOIR	18,896.0	18,437.0	18,485.0	18,364.0	18,377.0	18,572.0	18,343.0	18,160.0	17,867.0	17,427.0	16,627.0	16,115.0
BIG BEND RESERVOIR	1,686.0	1,681.0	1,667.0	1,694.0	1,695.0	1,674.0	1,656.0	1,680.0	1,680.0	1,667.0	1,678.0	1,670.0
FORT RANDALL RESERVOIR	2,640.0	2,206.0	2,295.0	2,685.0	3,042.0	3,407.0	3,403.0	3,425.0	3,380.0	3,416.0	3,456.0	3,232.0
GAVINS POINT RESERVOIR	370.0	338.0	350.0	350.0	370.0	338.0	340.0	339.0	337.0	333.0	358.0	356.0

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

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

Table CET 14: Water year 2021 monthly inflows into Bureau of Reclamation Reservoirs (in KAF).

RECLAMATION RESERVOIRS	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
CLARK CANYON RESERVOIR	12.5	13.7	11.9	10.9	8.9	9.9	6.4	6.9	8.1	12.4	9.2	6.4	117.1
% of Average	59.6%	68.6%	71.4%	76.5%	70.0%	60.9%	37.6%	32.3%	25.5%	47.7%	48.8%	35.5%	50.1%
CANYON FERRY RESERVOIR	205.6	230.5	204.0	203.2	174.9	242.4	229.0	338.0	282.8	89.0	99.3	87.3	2,386.0
% of Average	80.7%	87.0%	93.9%	95.1%	84.6%	95.8%	74.8%	67.8%	41.2%	30.3%	64.7%	47.8%	67.6%
HELENA VALLEY RESERVOIR	-0.3	-0.3	-0.4	-0.3	-0.2	-0.2	3.7	7.7	16.1	17.5	17.5	12.6	73.4
% of Average	N/A	N/A	N/A	N/A	N/A	N/A	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
GIBSON RESERVOIR	15.0	25.6	14.5	11.8	8.8	12.3	36.8	148.8	167.1	34.3	17.1	10.4	502.4
% of Average	92.6%	154.9%	106.5%	97.8%	81.6%	84.2%	87.8%	101.3%	110.4%	61.0%	71.4%	60.0%	96.4%
WILLOW CREEK	0.6	0.6	0.5	0.4	0.4	0.4	0.4	5.2	3.8	0.1	0.9	0.7	14.0
% of Average	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.1%	0.1%	0.0%	N/A	0.2%	0.1%
PISHKUN RESERVOIR	-0.4	-0.3	-0.2	-0.2	-0.1	-0.2	-0.2	31.2	72.7	79.8	49.9	-0.9	231.0
% of Average	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.1%	0.1%	0.1%	0.1%	N/A	0.1%
LAKE ELWELL (TIBER DAM)	13.1	31.9	22.1	19.2	15.7	34.6	33.0	118.9	96.8	12.8	10.4	5.2	413.8
% of Average	78.1%	149.5%	130.2%	120.8%	72.2%	89.7%	62.6%	95.9%	72.1%	30.6%	84.5%	45.4%	81.4%
SHERBURNE LAKE	5.2	13.6	3.7	2.7	0.9	1.2	5.6	26.4	34.4	12.0	7.4	4.9	118.2
% of Average	79.7%	195.8%	110.5%	91.3%	40.9%	34.3%	51.9%	85.8%	92.9%	64.4%	84.2%	81.1%	85.7%
FRESNO RESERVOIR	3.9	12.0	3.9	3.3	0.4	12.5	34.5	45.9	28.5	27.9	33.4	15.7	222.0
% of Average	54.1%	545.0%	470.7%	361.6%	9.8%	52.7%	116.1%	106.7%	58.4%	82.4%	111.1%	76.1%	90.6%
NELSON RESERVOIR	-2.2	-1.4	-1.4	-1.6	-1.3	11.0	3.1	8.5	3.3	4.2	10.8	2.1	35.1
% of Average	N/A	N/A	N/A	N/A	N/A	0.8%	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	0.1%
BULL LAKE	3.4	2.7	2.1	1.7	1.5	2.2	3.1	28.4	68.9	25.4	16.0	9.0	164.5
% of Average	61.4%	85.9%	86.1%	80.7%	92.8%	122.0%	82.1%	101.6%	111.9%	55.0%	76.7%	95.0%	88.1%
PILOT BUTTE RESERVOIR[1]	9.2	0.0	-0.1	-0.1	-0.1	-0.2	3.1	22.3	39.7	30.5	32.1	14.5	150.8
% of Average	82.8%	N/A	N/A	N/A	N/A	N/A	44.0%	94.6%	106.8%	74.0%	98.8%	61.8%	84.2%
BOYSEN RESERVOIR	32.4	43.8	36.3	32.8	28.6	48.9	41.7	102.0	196.9	39.7	39.1	37.5	679.9
% of Average	55.0%	89.4%	96.6%	89.5%	76.7%	94.0%	85.2%	85.1%	76.9%	30.3%	68.4%	71.8%	72.6%
ANCHOR RESERVOIR	0.19	0.03	-0.07	0.00	0.01	-0.01	0.34	2.98	4.58	1.70	0.64	0.26	10.65
% of Average[2]	0.0%	0.0%	N/A	N/A	0.0%	N/A	0.1%	0.1%	0.1%	0.1%	0.3%	0.0%	0.1%
BUFFALO BILL RESERVOIR	32.8	27.9	17.6	14.5	11.7	19.6	40.0	165.6	278.5	63.3	31.5	16.8	719.9
% of Average	127.5%	130.6%	112.1%	98.9%	90.0%	103.7%	97.7%	104.4%	92.5%	39.4%	70.2%	67.7%	85.7%
BIGHORN LAKE	144.8	110.5	98.0	96.4	89.8	117.1	149.1	166.8	192.8	98.2	140.7	141.8	1,546.1
% of Average	86.2%	85.6%	89.5%	87.3%	80.3%	79.3%	104.9%	65.4%	47.2%	38.6%	93.0%	85.6%	71.8%
E. A. PATTERSON LAKE	0.0	0.3	0.1	0.1	0.0	0.2	0.0	0.4	-0.2	-0.1	-0.2	-0.2	0.4
% of Average	1.9%	138.6%	74.8%	50.7%	0.5%	2.3%	N/A	39.1%	N/A	N/A	N/A	N/A	2.1%
LAKE TSCHIDA	0.3	2.1	1.2	1.2	0.5	1.9	1.0	7.1	1.6	-0.6	-1.1	-0.8	14.5
% of Average	18.9%	141.5%	129.3%	144.3%	10.1%	6.4%	6.0%	128.9%	22.5%	N/A	N/A	N/A	19.6%
JAMESTOWN RESERVOIR	0.1	0.0	0.4	0.5	0.0	0.4	-0.3	0.0	-0.8	-1.2	-0.3	-0.3	-1.4
% of Average	6.9%	2.9%	69.2%	178.0%	0.9%	4.0%	N/A	0.5%	N/A	N/A	N/A	N/A	-1.8%
SHADEHILL RESERVOIR	0.3	-1.1	0.0	-0.2	-0.8	0.5	-2.0	1.1	-1.0	-3.0	-3.1	-1.8	-11.1
% of Average	29.8%	N/A	N/A	N/A	N/A	1.9%	N/A	8.8%	N/A	N/A	N/A	N/A	-14.6%
ANGOSTURA RESERVOIR	1.4	2.7	2.7	2.9	3.2	6.3	4.6	6.1	1.3	0.4	3.3	1.7	36.6
% of Average	58.5%	86.1%	134.9%	128.0%	62.8%	55.4%	54.7%	45.8%	8.2%	11.8%	197.8%	162.4%	52.6%
DEERFIELD RESERVOIR	1.5	1.3	1.1	1.0	1.1	1.4	1.6	1.7	1.3	1.3	1.0	1.1	15.4
% of Average	191.9%	187.7%	152.8%	150.8%	174.7%	144.9%	119.5%	112.5%	95.6%	126.2%	129.8%	149.4%	137.1%
PACTOLA RESERVOIR	3.3	3.1	2.9	2.7	2.4	3.5	4.2	5.4	3.3	3.4	2.5	2.5	39.2
% of Average	151.2%	168.3%	193.8%	173.8%	151.7%	126.3%	92.9%	78.3%	49.0%	88.7%	85.0%	115.3%	101.8%
KEYHOLE RESERVOIR	-1.7	-0.6	0.5	-0.1	0.8	0.7	-0.3	-1.3	-3.6	-2.9	-2.6	-2.7	-13.7
% of Average	N/A	N/A	252.6%	N/A	30.9%	11.6%	N/A	N/A	N/A	N/A	N/A	N/A	-102.9%
BELLE FOURCHE RESERVOIR	13.5	12.9	12.5	10.7	0.1	11.9	12.9	9.1	-0.2	1.3	4.0	4.6	93.3
% of Average	117.1%	130.2%	140.2%	115.8%	0.8%	83.9%	109.9%	53.6%	N/A	26.2%	186.8%	96.8%	82.2%

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

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

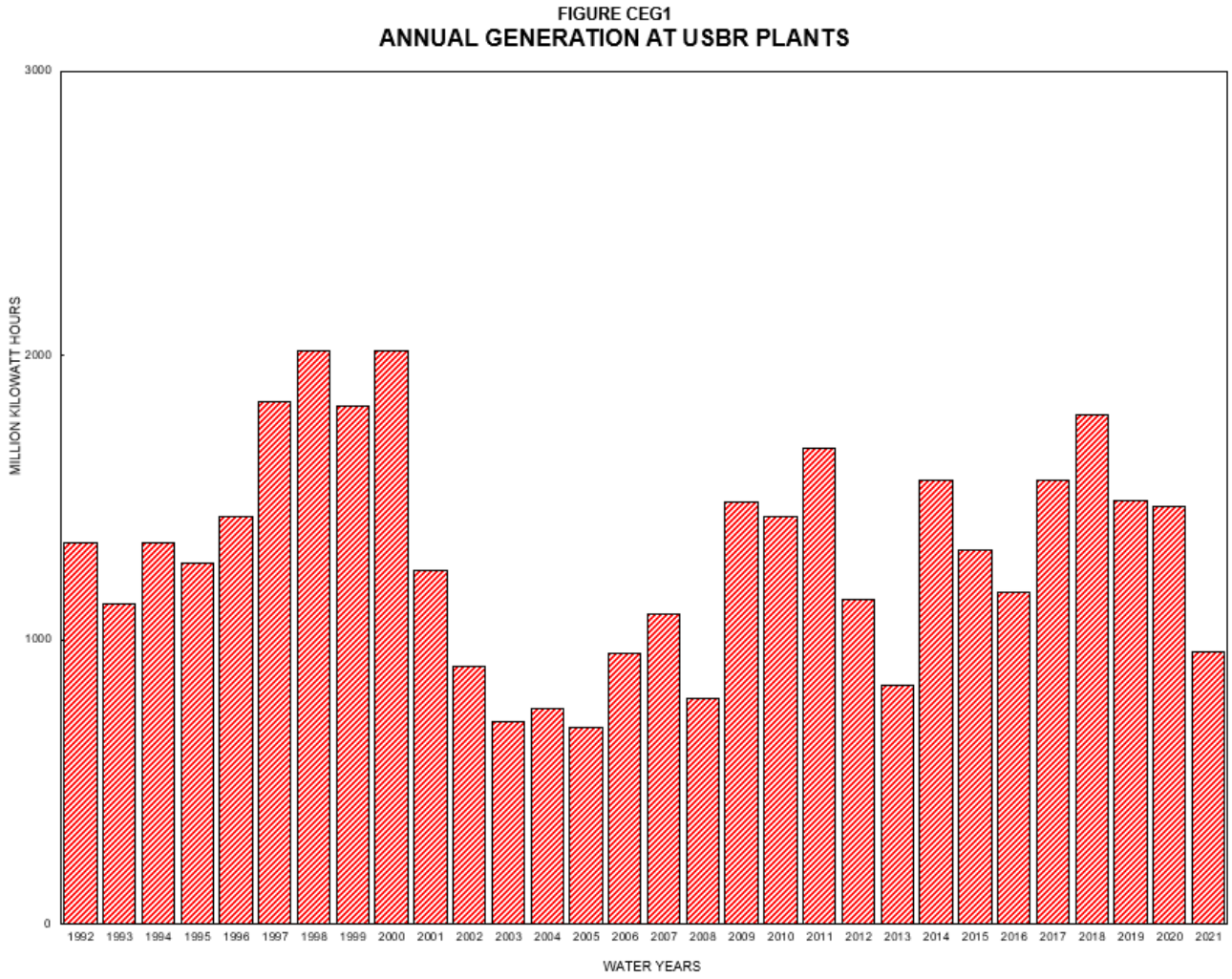


Figure CEG 1: Annual generation at Bureau of Reclamation powerplants.

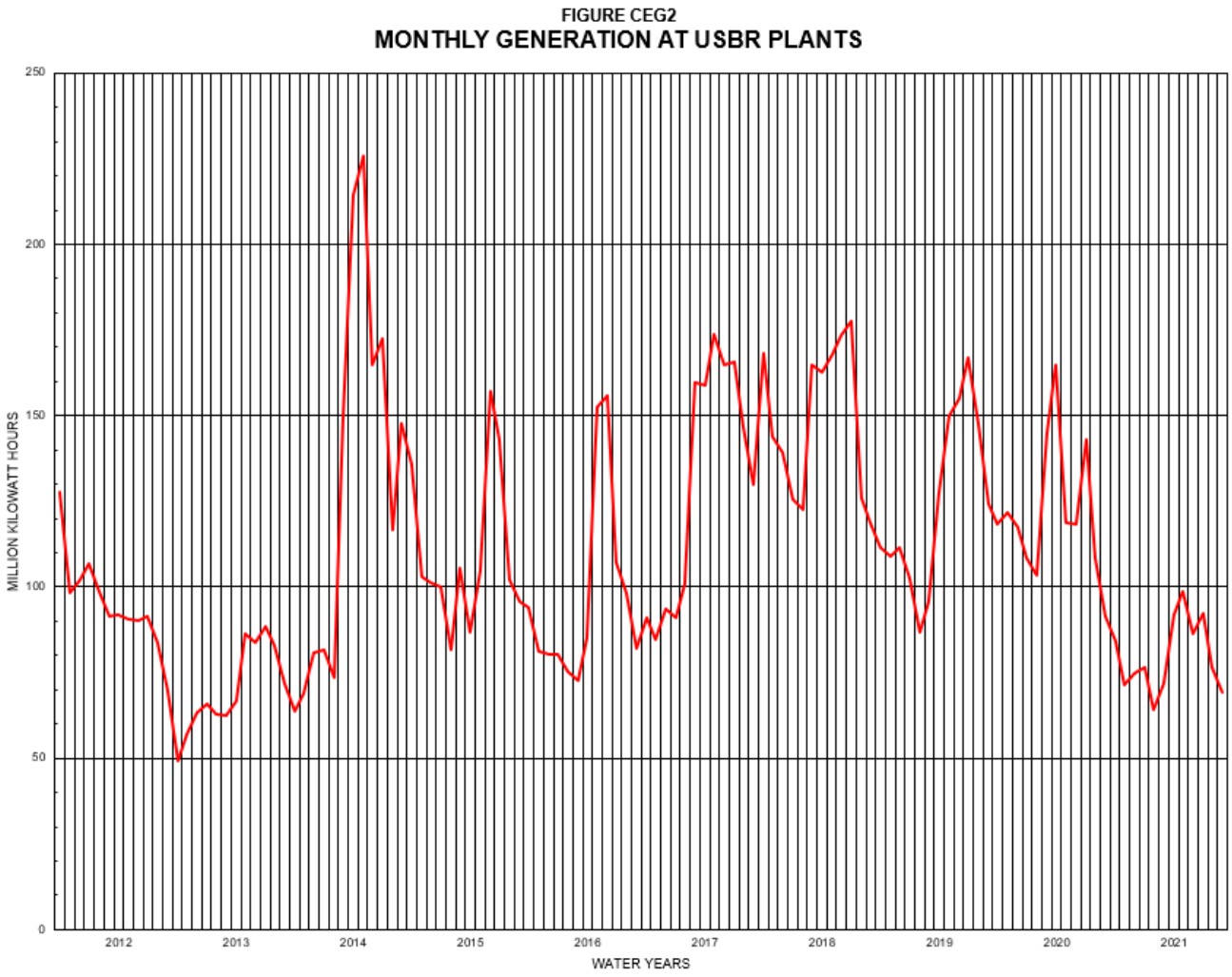


Figure CEG 2: Monthly power generation at Bureau of Reclamation powerplants.

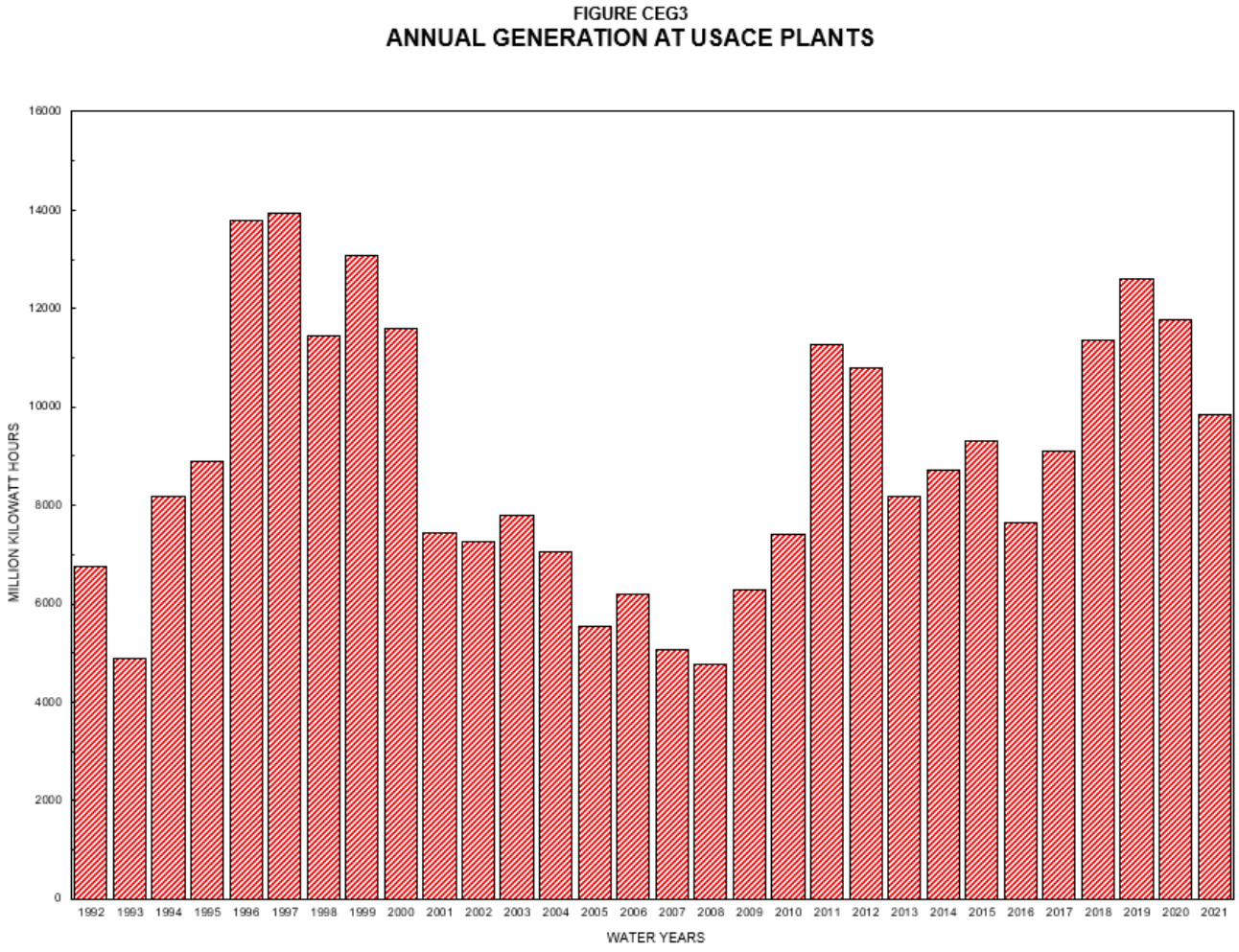


Figure CEG 3: Annual generation at U.S. Army Corps plants.

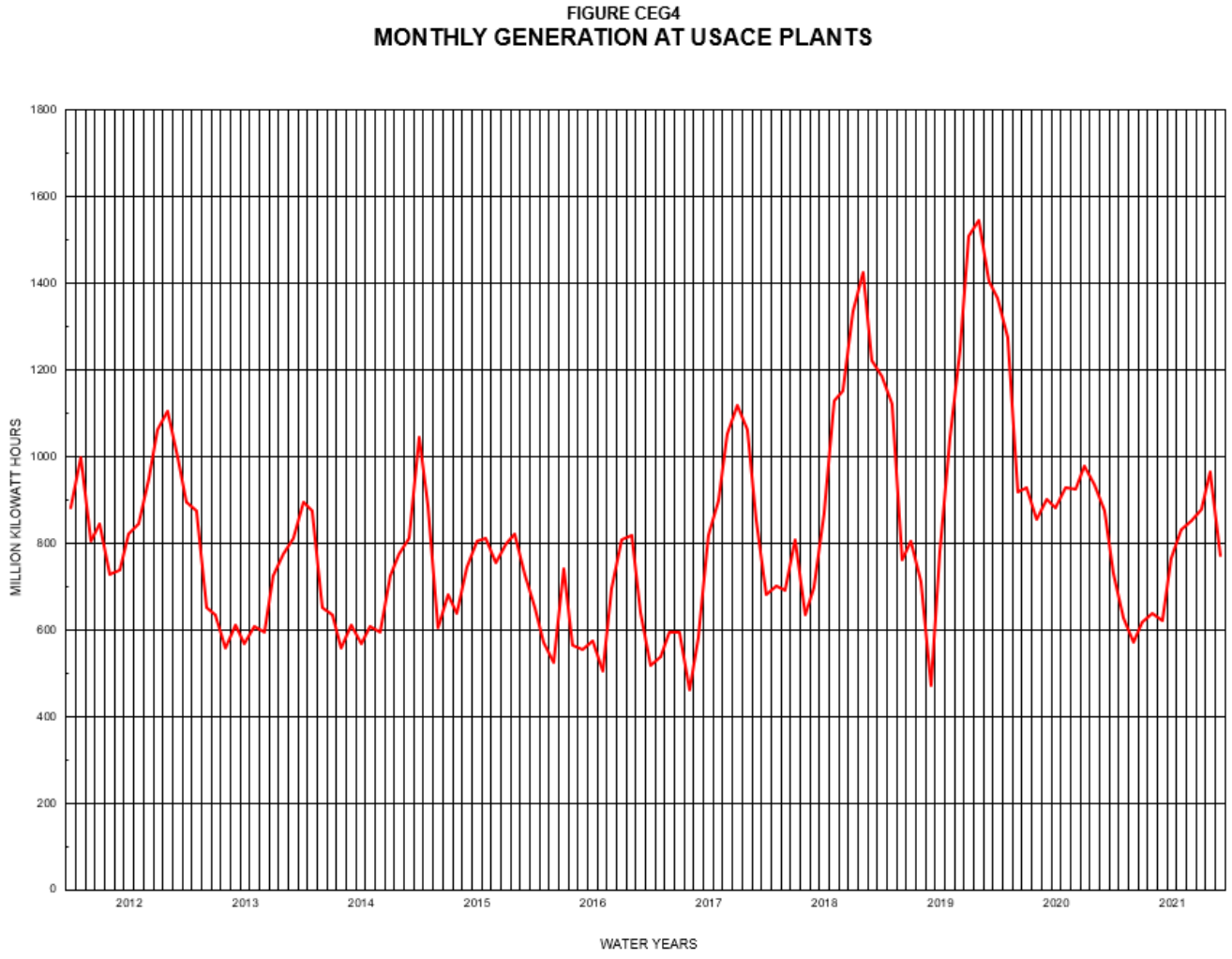


Figure CEG 4: Monthly power generation at U.S. Army Corps powerplants.

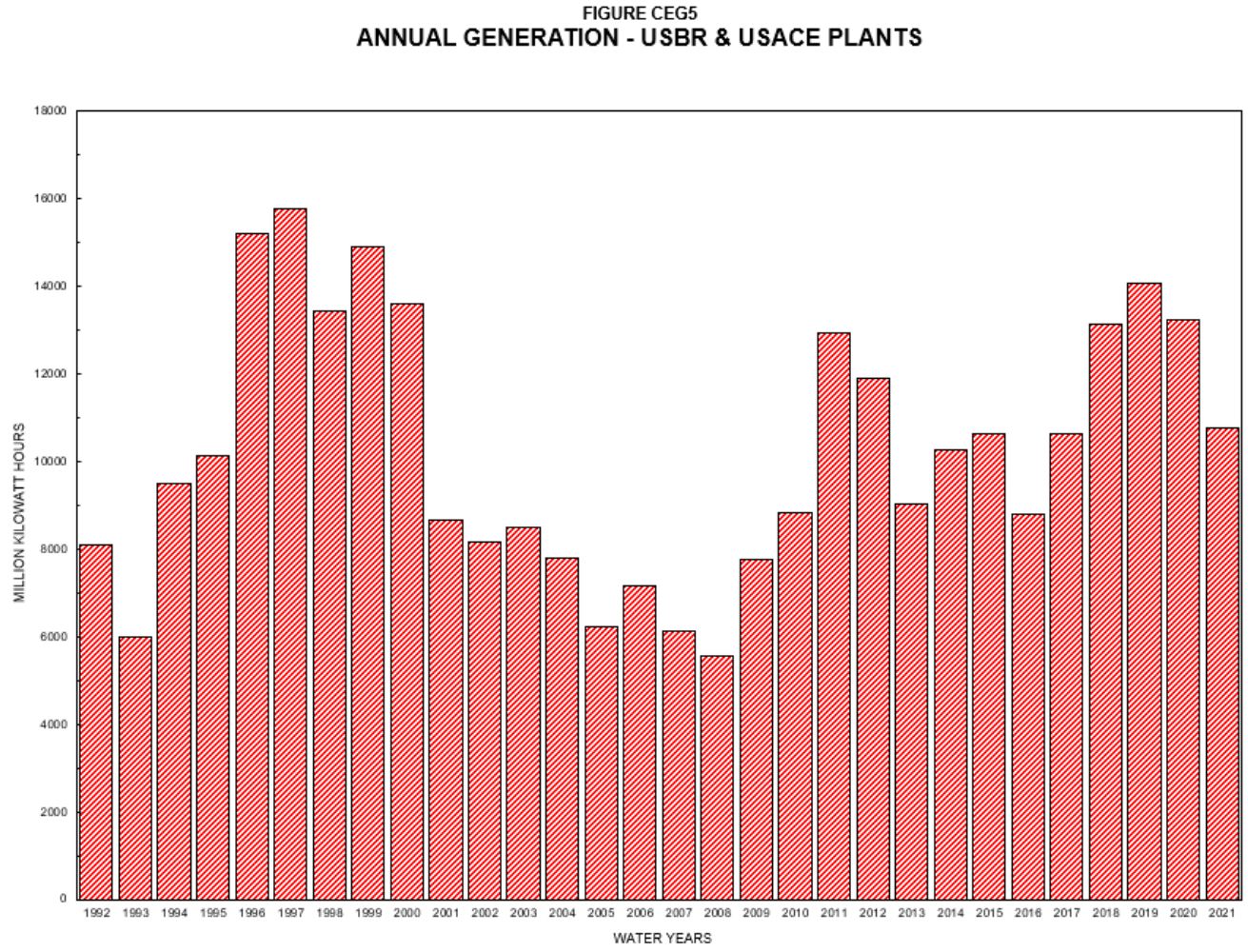


Figure CEG 5: Annual generation at Reclamation and U.S. Army Corps powerplants.

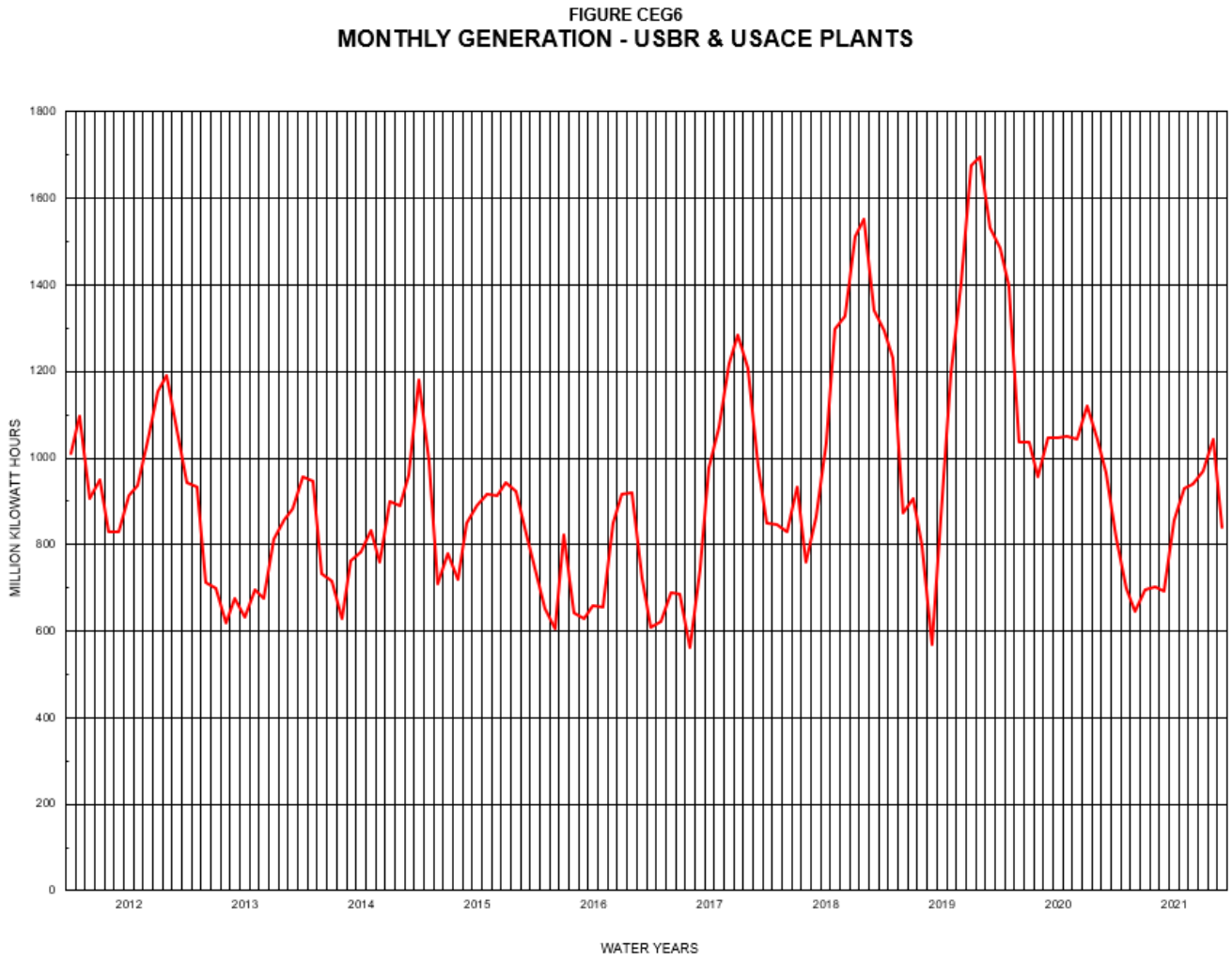


Figure CEG 6: Monthly power generation at Reclamation and U.S. Army Corps powerplants.