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Northwestern Division

Missouri River Basin
Water Management Division

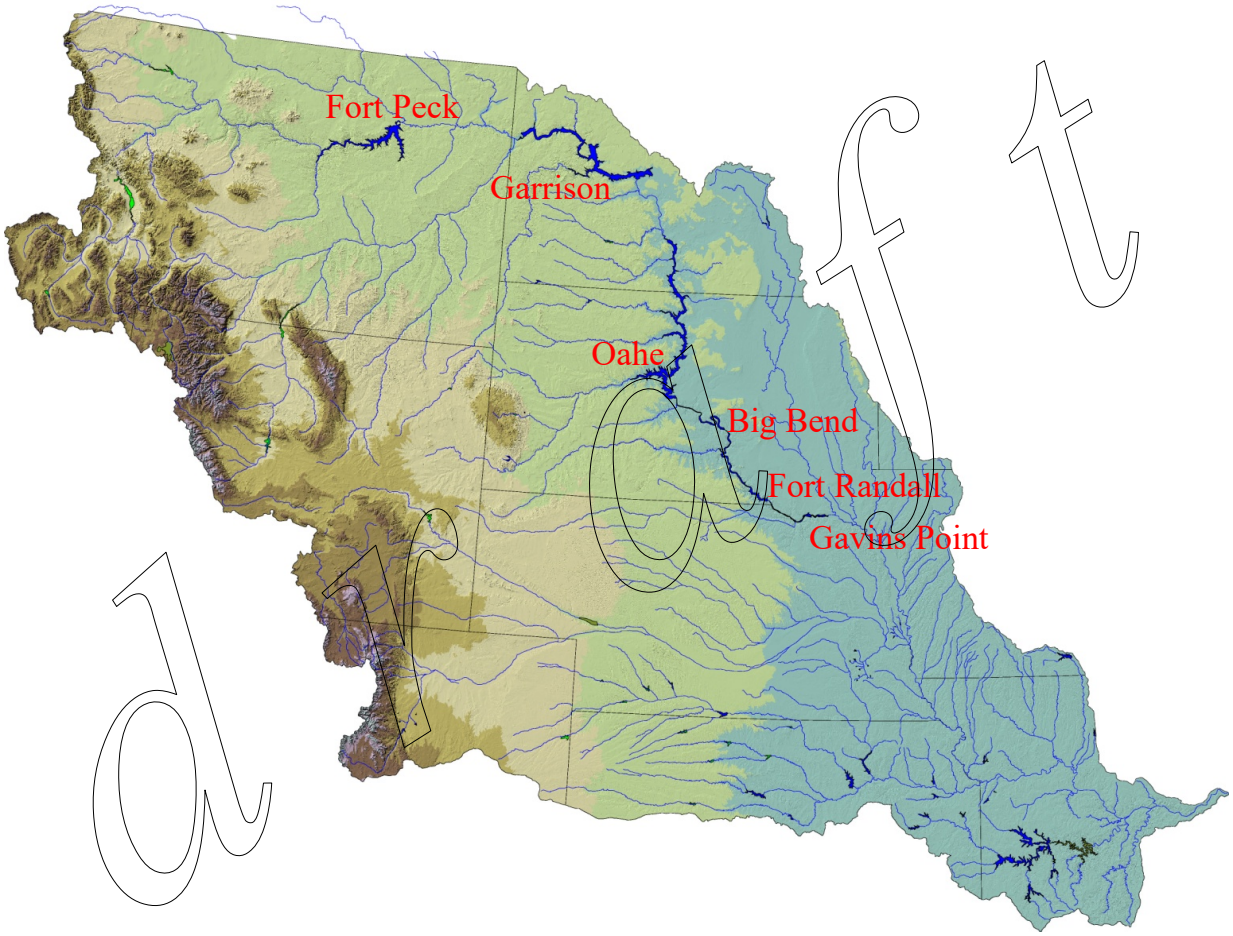
Draft

AOP

2020-2021

Missouri River Mainstem System

2020-2021 Annual Operating Plan



Annual Operating Plan Process
68 Years Serving the Missouri River Basin

September 2020

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NORTHWESTERN DIVISION
PO BOX 2870
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September 2020

This draft Annual Operating Plan (AOP) presents pertinent information regarding water management in the Missouri River Mainstem Reservoir System through December 2021. The information provided in this draft AOP is based upon water management guidelines designed to meet the reservoir regulation objectives of the 2018 Missouri River Master Water Control Manual (Master Manual). Regulation of the mainstem reservoir system is provided by my office, the Missouri River Basin Water Management Division, Northwestern Division, U. S. Army Corps of Engineers, located in Omaha, Nebraska.

The draft AOP presents plans for the regulation of the reservoir system under widely varying water supply conditions. The AOP is not intended to be a forecast for the coming year; rather the guidelines included in the Master Manual are applied to computer simulations of System regulation assuming five statistically derived runoff scenarios based on an analysis of water supply records from 1898 to 2019. This approach provides a good range of water management simulations for dry, average, and wet conditions. The AOP provides a framework for the development of detailed monthly, weekly, and daily regulation schedules for the mainstem reservoir system's six individual projects during the upcoming year to serve its Congressionally-authorized project purposes.

In addition to the AOP, two separate documents are also available entitled: "System Description and Operation" and "Summary of Actual 2019 Regulation." To receive copies of those documents, contact the Missouri River Basin Water Management Division at 1616 Capitol Avenue, Suite 365, Omaha, Nebraska 68102-4909, phone (402) 996-3841. Both reports are available at the "Reports and Publications" link on our web site at:
www.nwd-mr.usace.army.mil/rcc/

Due to on-going COVID-19 concerns, public meetings on this draft AOP will be held virtually this fall. The meeting schedule for the virtual question and answer sessions will be announced later. We ask that any comments on this draft AOP be provided by November 20, 2020. The final AOP is scheduled for publication in December 2020.

We thank you for your interest in the regulation of the mainstem reservoir system and look forward to your participation in this process.

John I. Remus II, P.E.
Chief, Missouri River Basin Water Management Division

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MISSOURI RIVER MAINSTEM RESERVOIR SYSTEM

Draft Annual Operating Plan
2020 - 2021

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List of Abbreviations

AOP	-	annual operating plan
ACHP	-	Advisory Council on Historic Preservation
AF	-	acre-feet
B	-	Billion
BiOp	-	Biological Opinion
BOR	-	Bureau of Reclamation
cfs	-	cubic feet per second
Corps	-	Corps of Engineers
CY	-	calendar year (January 1 to December 31)
elev	-	elevation
ESA	-	Endangered Species Act
ft	-	feet
FTT	-	Flow-to-Target
FY	-	fiscal year (October 1 to September 30)
GWh	-	gigawatt hour
ISAP	-	Independent Science Advisory Panel
KAF	-	1,000 acre-feet
kcfs	-	1,000 cubic feet per second
kW	-	kilowatt
kWh	-	kilowatt hour
MAF	-	million acre-feet
MRNRC	-	Missouri River Natural Resources Committee
MRBWMD	-	Missouri River Basin Water Management Division
msl	-	mean sea level
MW	-	megawatt
MWh	-	megawatt hour
NEPA	-	National Environmental Policy Act
plover	-	piping plover
PA	-	Programmatic Agreement
P-S MBP	-	Pick-Sloan Missouri Basin Program
RCC	-	Reservoir Control Center
RM	-	river mile
RPA	-	Reasonable and Prudent Alternative
SHPO	-	State Historic Preservation Officers
SR	-	Steady Release
System	-	Missouri River Mainstem System
tern	-	interior least tern
T&E	-	Threatened and Endangered
THPO	-	Tribal Historic Preservation Officers
USFWS	-	United States Fish and Wildlife Service
WY	-	water year
yr	-	year

Definition of Terms

Acre-foot (AF, ac-ft) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or 325,850 gallons.

Cubic foot per second (cfs) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to approximately 7.48 gallons per second or 448.8 gallons per minute. The volume of water represented by a flow of 1 cubic foot per second for 24 hours is equivalent to 86,400 cubic feet, approximately 1.983 acre-feet, or 646,272 gallons.

Discharge is the volume of water (or more broadly, volume of fluid plus suspended sediment) that passes a given point within a given period of time.

Drainage area of a stream at a specific location is that area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the river above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise noted.

Drainage basin is a part of the surface of the earth that is occupied by drainage system, which consists of a surface stream or body of impounded surface water together with all tributary surface streams and bodies of impounded water.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

Runoff in inches shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

MISSOURI RIVER MAINSTEM RESERVOIR SYSTEM

Draft Annual Operating Plan
2020 – 2021

I. FOREWORD

This draft Annual Operating Plan (AOP) presents pertinent information and plans for regulating the Missouri River Mainstem Reservoir System (System) through December 2021 under widely varying water supply conditions. It provides a framework for the development of detailed monthly, weekly, and daily regulation schedules for the System's six individual projects during the coming year to serve the Congressionally authorized project purposes; to fulfill the Corps' responsibilities to Native American Tribes; and to comply with environmental laws, including the Endangered Species Act (ESA). Regulation of the System is directed by the Missouri River Basin Water Management (MRBWM) Division, Northwestern Division, U. S. Army Corps of Engineers (Corps) located in Omaha, Nebraska. A map of the Missouri River basin is shown on ***Plate 1*** and the summary of engineering data for the six individual mainstem projects and System is shown on ***Plate 2***.

It is important to note that the AOP is not intended to be a forecast for the coming year; rather it examines a range of potential runoff scenarios which span 80 percent of the historic record. There is still a 10 percent chance that runoff will be higher than shown in the AOP and a 10 percent chance that it will be lower. The studies included in the AOP provide an array of reservoir levels and releases that may be expected under the various runoff scenarios. Actual real-time regulation of the System is accomplished using the best information and tools available and is adjusted to respond to changing conditions on the ground. As the runoff season unfolds, there is a possibility that real-time regulation plans will indicate runoff volumes, reservoir levels and releases outside those anticipated in this report. Should that occur, the Corps will appreciably increase its communication and outreach efforts to convey that information to stakeholders throughout the basin so that other Federal, state and local agencies, Tribes, communities, and local residents can take appropriate actions.

This plan may require adjustments such as when substantial departures from expected runoff occur; to meet emergencies including short-term intrasystem adjustments to protect human health and safety, to maintain minimum river or reservoir levels to keep intakes operational during periods of extended drought, and to prevent loss of historic and cultural properties; or to meet the provisions of applicable laws, including the ESA. These adjustments would be made to the extent possible after evaluating impacts to all System uses, would generally be short-term in nature, and would continue only until the issue is resolved.

This document provides the plan for future regulation of the System. Other documents that may be of interest include the "System Description and Regulation" report dated April 2020 or the "Summary of Actual 2019 Regulation," dated May 2020. Both reports are currently available at the "Reports and Publications" link on the MRBWM website at: www.nwd-mr.usace.army.mil/rcc, or by contacting the Missouri River Basin Water Management Division at 1616 Capitol Avenue, Suite 365, Omaha, Nebraska 68102-4909, phone (402) 996-3841 for copies. The "Summary of Actual 2020 Regulation" will be available at the same site in late spring or early summer of 2021.

II. BACKGROUND AND AOP PROCESS

Beginning in 1953, projected System reservoir regulation for the year ahead was developed annually as a basis for advance coordination with the various interested Federal, state, and local agencies and private citizens. Also beginning in 1953, a coordinating committee was organized to make recommendations on each upcoming year's System regulation. The Coordinating Committee on Missouri River Mainstem Reservoir Operations held meetings semiannually until 1981 and provided recommendations to the Corps. In 1982, the Committee was dissolved because it did not conform to the provisions of the Federal Advisory Committee Act. Since 1982, to continue providing a forum for public participation, one or more open public meetings are held semiannually in the spring and fall. The fall public meetings are conducted to take public input on the draft AOP, which typically is published in mid-September each year. The spring meetings are conducted to update the public on the current hydrologic conditions and projected System regulation for the remainder of the year as it relates to implementing the final AOP.

Under the terms of Stipulation 18 of the March 2004 "Programmatic Agreement for the Operation and Management of the Missouri River Main Stem System for Compliance with the National Historic Preservation Act, as amended" (PA) the Corps has agreed to consult/meet with the affected Tribes and Tribal Historic Preservation Officers (THPOs), State Historic Preservation Officers (SHPOs), the Advisory Council on Historic Preservation (ACHP) and other parties on the draft AOP. The purpose of this consultation/meeting is to determine whether operational changes are likely to cause changes to the nature, location or severity of adverse effects to historic properties or to the types of historic properties affected and whether amendments to the Corps Cultural Resources Management Plans and Five-Year Plan are warranted in order to better address such effects to historic properties. During 2006 the Corps worked with the affected Tribes to establish processes for consultation on AOPs under 36 CFR Part 800, the PA, and Executive Order 13175. The process consists of a series of informational meetings with the Tribes and/or government-to-government consultation with Tribes, as requested. A letter dated September 15, 2020 was sent to the Tribes offering consultation on the 2020-2021 AOP. Separate virtual meetings will

be scheduled for all Tribes requesting government-to-government consultation. All tribes, whether signatory to the PA or not, may request government-to-government consultation on this and all future AOPs. In addition, the Tribes have reserved water rights to the Missouri River and its major tributaries. In no way does this AOP attempt to define, regulate or quantify water rights or any other rights that the Tribes are entitled to by law or treaty.

The 2020 spring public meetings were originally scheduled to be held at the following locations and dates: April 6 at Fort Peck, Montana; April 7 at Bismarck, North Dakota and Fort Pierre, South Dakota; April 8 at Smithville, Missouri and Peru, Nebraska; and April 14 at Jefferson City, Missouri and St. Louis, Missouri. Due to COVID-19 concerns these in-person meetings were canceled, and virtual question and answer sessions were conducted. Video presentations were posted to the Corps' website prior to the sessions. The videos provided an update regarding the outlook for 2020 runoff and projected System regulation for the remainder of 2020. Five calls were held April 20-23. Due to on-going COVID-19 concerns, in-person meetings will not be conducted in the fall and will again be replaced with virtual meetings. A meeting schedule will be provided later. In the spring of 2021, public meetings will be held to discuss the basin's hydrologic conditions and the effects those conditions are expected to have on the implementation of the final 2020-2021 AOP.

III. MAINSTEM MASTER MANUAL AND ESA CONSULTATIONS

The System is comprised of six dam and reservoir projects authorized by the Rivers and Harbors Act of 1935 and the Flood Control Act of 1944. Section 9 of the 1944 Flood Control Act authorized the System to be operated for the purposes of flood control, navigation, irrigation, hydropower, water supply, water quality control, recreation and fish and wildlife. In addition, operation of the System must also comply with other applicable Federal statutory and regulatory requirements, including the ESA. The System is regulated using guidelines published in the Master Manual. The Master Manual presents the water control plan and operational objectives for the integrated regulation of the System. Annual water management plans (Annual Operating Plans) are prepared each year, based on the water control criteria contained in the Master Manual, in order to describe potential reservoir regulation of the System for the current operating year under a variety of runoff conditions.

First published in 1960 and subsequently revised during the 1970s, the Master Manual was again revised in March 2004, primarily to include more stringent drought conservation measures. In March 2006 the Master Manual was again revised to include technical criteria for a spring pulse to comply with a 2003 USFWS Amended Biological Opinion (BiOp). Neither the 2004 Master Manual, nor the 2006 revisions to the Master

Manual, changed the volume of storage in the System reserved for flood risk reduction or the basic principles of how that storage is regulated.

In November 2018 a Record of Decision (ROD) was signed for the Missouri River Recovery Management Plan and Environmental Impact Statement (MRRMP-EIS), that established an overarching adaptive management process for implementation of actions required to avoid jeopardizing the listed species in the Missouri River basin as a result of Corps projects. The selected alternative no longer called for the spring pulse and reservoir unbalancing criteria contained in the 2006 Master Manual, therefore following the ROD, in 2018 the Master Manual was revised to remove these provisions.

Concurrent with the MRRMP-EIS process, the Corps conducted consultation with the USFWS, as required by Section 7 of the Endangered Species Act, resulting in a new BiOp being issued in April 2018. Current regulation of the System in accordance with the Master Manual to serve authorized project purposes is dependent on successful implementation of the 2018 BiOp. The Missouri River Recovery Program (MRRP), together with MRBWM, works to ensure implementation of the BiOp elements as described in the preferred alternative. Simply put, the Corps must comply with environmental laws including the ESA, and the MRRP is the vehicle used to accomplish this. This AOP identifies flow operations at Garrison, Fort Randall and Gavins Point for the benefit of the endangered interior least tern (tern) and the threatened piping plover (plover) while maintaining flood control and navigation as primary authorized purposes.

Additional information on other efforts undertaken through the MRRP to meet the requirements of the 2018 BiOp can be found on the MRRP website at: https://www.nwo.usace.army.mil/MRRP/.

IV. ONGOING COORDINATION, STUDIES AND REPORTS

As committed to following the 2011 Flood, the Corps communicated more broadly and frequently in 2020 by holding monthly conference calls from January to June with Federal, state, county and local officials, Tribes, emergency management officials, independent experts and the media to discuss conditions on the ground and the current release plans and forecasts. Recordings of the conference calls were made available to the public. Outreach calls will be re-initiated in January 2021 or as needed if basin and/or weather conditions change dramatically.

The Corps continues to update a number of technical reports used in the regulation of the reservoir system. The report "Runoff Volumes for Annual Operating Plan studies" is being updated and is discussed in Chapter V.

The Corps continues to collaborate with other federal, state and local agencies and our field offices to improve runoff forecasts, particularly as it relates to soil moisture and plains snowpack. This will require a collaborative effort to improve both data collection (i.e., plains snowpack, soil moisture and soil temperature at five depths, precipitation, and frost depth) and hydrologic modeling. Refer to previous AOPs for details regarding the history of the Upper Missouri Basin Monitoring Network for Soil Moisture and Plains Snow (UMB MN). The establishment of the UMB MN, which is expected to include about 540 sites in the 270,000-square mile plains area of the Upper Missouri River basin, will likely take five to seven more years beyond 2020 to be fully implemented. When completed, the network will be comprised of approximately 180 retrofitted Mesonet sites and 360 new sites in Montana, North Dakota, Wyoming, South Dakota and Nebraska. The MRBWM office regularly updates the ongoing progress of the UMB MN via the MRBWM website (home page, UMB Monitoring Network).

The Water Management office continues to participate in a variety of regional and national climate change teams. The National Oceanic and Atmospheric Administration (NOAA) also collaborated with the Corps and other agencies on a three-part study. The first part was a climate attribution effort focusing on the 2011 event. The second part of the study was an assessment of the skill and reliability of predictions of seasonal climate and the ability to predict rapid transitions of cycles from wet to dry and dry to wet. The third part was a climate assessment of the causes for hydrologic extremes in the upper Missouri River basin which was completed by NOAA and the University of Colorado's Cooperative Institute of Research in Environmental Sciences. All three reports are available at https://www.drought.gov/drought/dews/missouri-river-basin/reports-assessments-and-outlooks.

V. FUTURE RUNOFF: AUGUST 2020 - DECEMBER 2021

Runoff into the six System reservoirs is typically low and relatively stable during the August through February period. The August 1 calendar year runoff forecast is used as input to the basic reservoir regulation simulation (Basic) in the AOP studies for the period August 2020 through February 2021. The August 1 runoff forecast for 2020 was 30.9 million acre-feet (MAF). Two other runoff scenarios based on the August 1 runoff forecast were developed for the same period. These are the Upper Basic (wetter than forecast) and Lower Basic (drier than forecast) simulations. The Upper and Lower Basic simulations are based on a percentage of the Basic runoff. The adjusted Upper and Lower Basic values for each month and reach are shown as percentages in ***Tables I*** and ***II***. The percentages shown are used for the August through February period in the AOP simulations. These percentages are also used in the regularly updated monthly reservoir simulations. The report detailing the computation of these runoff factors was posted to the Corps' website in January 2015.

TABLE I
UPPER BASIC RUNOFF PERCENTAGES

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fort Peck	120	120	135	145	135	145	145	130	120	120	120	120
Garrison	120	120	135	145	135	145	145	130	120	120	120	120
Oahe	140	140	150	155	155	145	140	135	135	135	135	135
Fort Randall	140	140	150	155	155	145	140	135	135	135	135	135
Gavins Point	140	140	150	155	155	145	140	135	135	135	135	135
Sioux City	140	140	150	155	155	145	140	135	135	135	135	135

TABLE II
LOWER BASIC RUNOFF PERCENTAGES

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fort Peck	80	75	65	65	70	65	65	70	75	80	80	80
Garrison	80	75	65	65	70	65	65	70	75	80	80	80
Oahe	75	75	55	50	50	50	55	65	75	75	75	75
Fort Randall	75	75	55	50	50	50	55	65	75	75	75	75
Gavins Point	75	75	55	50	50	50	55	65	75	75	75	75
Sioux City	75	75	55	50	50	50	55	65	75	75	75	75

Simulations for the March 1, 2021 to February 28, 2022 time period use five statistically derived runoff scenarios based on an analysis of historic water supply. The runoff scenarios used in this draft AOP were updated to include eight additional years of runoff data that now extends from 1898 to 2019. The report detailing the development of these runoff scenarios, "Runoff Volumes for Annual Operating Plan Studies", will be finalized at a later date and will be available on the Corps' website. The updated analysis incorporates the recent wet years including 2018, which was the fourth highest runoff on record, and 2019, which was the second highest runoff year on record. In addition to the five runoff scenarios, the analysis includes two runoff scenarios, one each at the upper and lower end, to span 96 percent of the historic record. Using statistically derived runoff scenarios for the AOP provides a good range of simulation for dry, average, and wet conditions, and eliminates the need to forecast future precipitation months in advance. As noted in the second NOAA study (see Chapter IV), for the lead times (one to six months) and times of year of interest (January-February-March and April-May-June) in the Missouri River basin, there is no useful skill and reliability of precipitation forecasts. Real-time regulation of the System is based on all available and relevant hydrometerological information including, but not limited to, observed runoff volumes, National Weather Service short- and long-range outlooks, plains and mountain snow water equivalent data, observed base flows, soil moisture, and soil frost depths.

The five statistically derived runoffs used in the AOP are identified as the Upper Decile, Upper Quartile, Median, Lower Quartile and Lower Decile runoff conditions. Upper Decile runoff (35.2 MAF) has a 1 in 10 chance of being exceeded, Upper Quartile runoff (30.9 MAF) has a 1 in 4 chance of being exceeded, and Median runoff (24.7 MAF) has a 1 in 2 chance of being exceeded. Lower Quartile runoff (19.5 MAF) has a 1 in 4 chance of the occurrence of less runoff, and Lower Decile runoff (16.2 MAF) has a 1 in 10 chance of the occurrence of less runoff. There is still a 20 percent chance that a runoff condition may occur that has not been simulated; i.e., a 10 percent chance runoff could be lower than Lower Decile and a 10 percent chance runoff could be greater than Upper Decile.

The two additional runoff volumes included in the updated "Runoff Volumes for Annual Operating Plan Studies" report are the 2 percent and 98 percent exceedance levels. Annual runoff at the 2 percent exceedance (46.0) MAF) has a 1 in 50 chance of being exceeded; the 98 percent exceedance (11.6) MAF) has a 1 in 50 chance of the occurrence of less runoff. Although these runoff volumes were not included as scenarios in this year's AOP, additional monthly studies could be performed based on these runoff volumes, or any prior year's runoff volume and distribution, as the 2020 runoff season unfolds should the runoff forecast exceed the Upper Decile runoff scenario or be lower than the Lower Decile runoff.

The Upper Decile and Upper Quartile simulations extend from the end of the Upper Basic simulation through February 2022. Likewise, the Median simulation extends from the end of the Basic simulation, and the Lower Quartile and Lower Decile simulations extend from the end of the Lower Basic simulation through February 2022.

The estimated natural flow at Sioux City, the corresponding post-1949 water use effects, and the net flow available above Sioux City are shown in ***Table III,*** where water supply conditions are quantified for the period August 2020 through February 2022. The natural water supply for calendar year (CY) 2019 totaled 60.9 MAF.

TABLE III
NATURAL AND NET RUNOFF AT SIOUX CITY
(Volumes in 1,000 Acre-Feet)

	Natural[1]	Post-1949 Depletions	Net[2]
August 2020 through February 2021 (Basic Runoff Scenario)			
Basic	7,500	800	8,300
Upper Basic	9,600	900	10,500
Lower Basic	5,700	800	6,500
Runoff Year March 2021 through February 2022 (Statistical Analysis of Past Records)			
Upper Decile	35,200	-1,100	34,100
Upper Quartile	30,900	-1,100	29,800
Median	24,700	-1,100	23,600
Lower Quartile	19,500	-1,100	18,400
Lower Decile	16,200	-1,000	15,200

[1] The word "Natural" is used to designate runoff adjusted to the 1949 level of basin development, except that regulation and evaporation effects of the Fort Peck reservoir have also been eliminated during its period of regulation prior to 1949.

[2] The word "Net" represents the total runoff after deduction of the post-1949 irrigation, upstream storage, and other use effects.

VI. ANNUAL OPERATING PLAN FOR 2020-2021

A. General. The anticipated regulation described in this AOP is designed to meet the regulation objectives presented in the current Master Manual. While some aspects of System and individual project regulation are clearly defined by technical criteria in the Master Manual, for example navigation service level and season length, others such as minimum releases for irrigation and water supply in the reaches between the reservoirs are based on regulation experience and may be adjusted as needed to respond to changing conditions. Consideration has been given to all of the authorized project purposes, to historic and cultural resources and to the needs of threatened and endangered (T&E) species. The "System Description and Regulation" report provides a concise summary of the primary aspects of System regulation and should be referred to for further information. For ease of use, a summary of the frequently used technical criteria included in the Master Manual is presented on Plate 3.

The plan relies on a wealth of regulation experience. Reservoir regulation experience available for preparation of the 2020-2021 AOP includes 13 years of

regulation at Fort Peck (1940) as the sole Mainstem project, plus 67 years of System experience as Fort Randall (1953), Garrison (1955), Gavins Point (1955), Oahe (1962), and Big Bend (1964) were brought progressively into System regulation. This regulation experience includes lessons learned during two major droughts of six and eight years (1987-1992 and 2000–2007) that have occurred since the System filled in 1967. It also includes the high runoff period 1993–1999 during which five of the seven years experienced runoff greater than Upper Quartile (including the third highest runoff on record in 1997), record runoff of 61.0 MAF in 2011, and back-to-back high runoff years in 2018 and 2019 (fourth highest and second highest runoff on record, respectively). In addition to the long period of actual System reservoir regulation experience, many background regulation studies for the completed System are available for reference.

B. 2020-2021 AOP Simulations. Reservoir simulations for the Upper Basic, Basic, and Lower Basic runoff scenarios, which span the period of August 2020 through February 2021, are shown in the final section of this AOP as studies 1 through 3. AOP simulations for the five statistically derived runoff scenarios, which span the period of March 2021 through February 2022 are shown in the final section of this AOP as studies 4 through 8. As previously stated, the simulations use five statistically derived runoff scenarios and reflect 80 percent of the historic annual runoff volumes (between Upper Decile and Lower Decile). The simulations provide information for planning purposes on a range of future reservoir levels and release rates, and are not meant to represent a particular forecast. The simulations shown use a monthly time-step, and thus do not provide the level of detail necessary to address specific flood control regulations. Detailed routing of specific flood flows is accomplished using daily and hourly time-step models which incorporate real-time information including observed precipitation, and these situations are handled individually during real-time regulation.

The AOP studies, in summary, provide the following: the full flood control capacity of the reservoir system will be available at the start of the runoff season; use of the Exclusive Flood Control Zone is not anticipated under any of the five runoff scenarios covered in the AOP; full service flow support for all runoff scenarios to start the navigation season; full service flow support for Lower Quartile and above runoff scenarios after the July 1 System storage check and reduced flow support for Lower Decile runoff; a full length navigation season for all runoff scenarios; minimum winter releases for Lower Decile runoff, slightly above minimum releases for Lower Quartile runoff, and above normal winter releases for Median and above runoff; a steady release-flow to target regulation during the tern and plover nesting season for Median and below runoff and nearly steady releases for Upper Decile and Upper Quartile runoff with flood water evacuation; emphasis on Fort Peck and Oahe for steady to rising reservoir levels during the forage fish spawn; and reservoir releases and pool levels sufficient to keep all intakes operational under all runoff scenarios. Water conservation measures may be implemented if runoff conditions indicate that it would

be appropriate including cycling releases from Gavins Point during the early part of the nesting season, only supporting flow targets in reaches being used by commercial navigation, and utilization of the Kansas River projects authorized for Missouri River navigation flow support. Additional details about the studies are provided in the following paragraphs. Results of the simulations are shown in ***Plate 4*** and ***Plate 5*** for the System storage and the Fort Peck, Garrison and Oahe pool elevations.

Under all runoff scenarios modeled for the AOP, the full flood control capacity of the System is available at the start of the 2021 runoff season. In addition, under the Lower Basic simulation, system storage will begin the runoff season slightly below the base of the Annual Flood Control and Multiple Use Zone. The Basic and Upper Basic scenarios begin the runoff season at the base of the Annual Flood Control and Multiple Use Zone.

The March 15 and July 1 System storage checks were used to determine the level of flow support for navigation and other downstream purposes as well as the navigation season length in 2021. Full service navigation flows or more are provided for Lower Quartile and above runoff throughout the navigation season. Service levels for Lower Decile start the season at full service, and drop slightly following the July 1 System storage check (see ***Plate 3***). Application of the July 1 System storage check indicated that a full length navigation season would be provided for all five runoff conditions, with the upper three runoff scenarios including a 10-day extension to the navigation season. Median and above simulations reach the desired 56.1 MAF System storage level on March 1, 2022. Storage is below the base of the Annual Flood Control and Multiple Use Zone for Lower Quartile and Lower Decile runoff conditions.

For modeling purposes in this AOP, the Steady Release – Flow-to-Target (SR-FTT) regulation scenario for Gavins Point is shown during the 2021 tern and plover nesting season for Median and lower runoff conditions. For these simulations, the monthly average May release used in the simulations was determined by using the long-term average May release (see ***Plate 3***), based on the service level, for the first third of the month, followed by the July table values for the remainder of the month to reflect a steady release regulation at the start of the nesting season. The modeled June release was set equal to the long-term average release for July (see ***Plate 3***) based on the service level for the first half of the navigation season. The long-term average releases (see ***Plate 3***) were used for July and August to indicate flowing to target. The Upper Decile and Upper Quartile runoff simulations follow the Master Manual, with much above normal runoff requiring release increases mid-year to evacuate flood water from the reservoirs. Although these modeled Gavins Point releases represent the best estimate of required releases during 2021, actual releases will be based on hydrologic conditions and the availability of habitat at that time. To the extent reasonably possible, measures to minimize incidental take of the protected species will be utilized. These may include not meeting flow targets in reaches without commercial navigation and utilizing the

Kansas River tributary reservoirs for navigation flow support when appropriate. It may also be necessary to cycle releases for flood control regulation during the T&E species' nesting season or for water conservation if drought conditions develop.

The long-term average Gavins Point releases to meet target flows were used in the AOP studies for navigation support during the spring and fall months with the exception of Upper Decile and Upper Quartile. Under these runoff scenarios, releases were based on flood water evacuation. Based on the September 1 storage checks and flood evacuation criteria, modeled Gavins Point winter releases range from 17,000 cfs to 20,000 cfs during the 2020-2021 winter season and range from 12,500 cfs to 20,000 cfs during the 2021-2022 winter season depending on the runoff scenario. Gavins Point releases will be increased to meet downstream water supply requirements in critical reaches, to the extent reasonably possible, if downstream incremental runoff is low.

The Gavins Point releases shown in this and previous AOPs are estimates based on historic averages and experience. Adjustments are made as necessary in real-time based on hydrologic conditions.

Intrasystem releases are adjusted to best serve the multiple purposes of the projects with special emphasis placed on regulation for non-listed fisheries starting in early April and for T&E bird species beginning in early May and continuing through August. As part of the overall plan to rotate emphasis among the upper three reservoirs during low runoff years, Fort Peck and Oahe are scheduled to be favored during the 2021 forage fish spawn while also attempting to maintain rising water levels at Garrison. The Median, Upper Quartile, and Upper Decile simulations show that it is possible to provide steady-to-rising pool levels in each of the three large upper reservoirs during the spring forage fish spawn period. Insufficient runoff is available in the Lower Quartile and Lower Decile simulations to keep all three reservoirs rising. In the Lower Quartile simulation, the Garrison reservoir levels decline in April and May. In the Lower Decile simulation, the Garrison reservoir level declines in April, but rises slightly in May. The Oahe reservoir level declines in April and May in the Lower Quartile and Lower Decile simulations.

Intrasystem releases are also adjusted so that the upper three reservoirs are shown in a balanced condition each year on March 1, the approximate start of the runoff season. This balancing is computed based on the percent of storage in the respective Carryover Multiple Use Zones.

Actual System regulation from January 1 through July 31, 2020 and the simulated regulating plans for each project through CY 2021 using the five runoff scenarios described on Page 7 are presented on ***Plate 6*** through ***Plate 11***, inclusive. Big Bend regulation is omitted since storage at that project is relatively constant and average

monthly releases are essentially the same as those at Oahe. These plates also show, on a condensed scale, actual regulation since 1953.

Plate 12 illustrates Fort Peck, Garrison, Oahe, and Gavins Point actual releases (Regulated Flow) as well as the Missouri River flows that would have resulted if the reservoirs were not in place (Unregulated Flow) during the period January 2019 through July 2020. ***Plate 13*** presents past and simulated gross average monthly power generation and gross peaking capability for the System.

C. <u>Actual Regulation for the Balance of the 2020 Navigation Season and Fall of 2020</u>. The regulation of the System for the period of August through November 2020 is presented in the following paragraphs.

<u>Fort Peck</u>. Releases will average 9,000 cfs through mid-September and will then be lowered to 7,500 cfs as irrigation ceases. The releases will be held near that level through the end of November. The Fort Peck pool will recede through the fall, ending the month of November at 2237.2 feet or 2.9 feet below the August 1 elevation of 2240.1 feet.

<u>Garrison</u>. Releases will be maintained near 26,000 cfs until mid-September when releases will be decreased to 14,500 cfs and held steady until the end of November. The Garrison pool will steadily drop through the fall and end the month of November at 1839.6 feet or 3.9 feet below the August 1 elevation of 1843.5 feet.

<u>Oahe</u>. The reservoir started the month of August at elevation 1612.2. Releases will average 24,500 cfs in August and 26,100 cfs in September in support of navigation. Releases will be reduced in October and November to 20,500 cfs and 21,600 cfs, respectively to accommodate the fall drawdown of the Fort Randall pool. At the end of November, the Oahe pool is forecast to be at elevation 1608.8 feet or 3.4 feet below the August 1 elevation.

<u>Big Bend</u>. Releases generally parallel those from Oahe. The Big Bend pool generally fluctuates between 1420.0 feet msl and 1421.0 feet msl for weekly cycling during high power load periods.

<u>Fort Randall</u>. Releases will average 27,400 cfs in August and 29,200 cfs in September to back up the releases from Gavins Point. The fall pool drawdown of Fort Randall will start after Labor Day in early September and will be completed near the end of November. Releases will be reduced after the navigation season ends to the level required to back up Gavins Point winter releases.

<u>Gavins Point</u>. Releases will be scheduled to support full service flows in reaches with scheduled commercial navigation throughout the 2020 navigation season. A full

length navigation season, will be provided in accordance with the technical criteria for the July 1 System storage check presented in the Master Manual. The closing dates for the commercial navigations season will range from November 22 at Sioux City, Iowa to December 1 at the mouth near St. Louis, Missouri. Releases will be reduced by approximately 3,000 cfs per day beginning on about November 21, working toward the target winter release. Under the Basic and Upper Basic forecast the navigation season is extended 10 days. In accordance with the Master Manual, during years of greater than normal water supply, the navigation season is extended as both an additional evacuation measure and to provide an increased benefit to navigation while striving to reach the base of the Annual Flood Control and Multiple Use Zone by March 1 the following season. If this were to occur, the closing dates would range from December 2 at Sioux City, Iowa to December 11 at the mouth near St. Louis, Missouri and releases would be reduced beginning on approximately December 3. The Gavins Point pool level will be raised 1.5 feet to elevation 1207.5 feet msl in the late fall. The pool level will remain near that elevation during the winter months.

D. <u>Regulation Plan for Winter 2020-2021</u>. The regulation of the System presented in the following paragraphs is based on the previously discussed AOP simulations. Actual real-time regulation of the System is adjusted to respond to changing conditions on the ground. The latest long-term reservoir regulation forecasts, which are updated monthly, can be found on the Corps' website. The September 1 System storage check is used to determine the winter release rate from Gavins Point. A winter release of 12,000 cfs is scheduled if System storage is less than 55.0 MAF on September 1; 17,000 cfs is scheduled when System storage is above 58.0 MAF; and the release is prorated for System storages between 55.0 and 58.0 MAF. A modification to the winter release rate from Gavins Point dam may occur when the evacuation of System flood control storage cannot be accomplished by providing a full-service navigation season with a 10-day extension of the navigation season. With an excess annual water supply, the winter season Gavins Point release may be scheduled at a rate of up to 25,000 cfs to continue to evacuate the remaining excess water in System flood control storage. Based on the studies included in this AOP, the scheduled winter System release for 2020-2021 will range from 17,000 to 20,000 cfs. It is anticipated that this year's winter release will be adequate to complete evacuation of stored flood waters and serve all downstream water intakes. Water supply is discussed in more detail in Chapter VII, Section B.

<u>Fort Peck</u>. Releases are expected to average 9,000 cfs in December and 11,000 cfs in January and February to serve winter power loads and to help balance System storage. The Fort Peck pool level is expected to decline about 4.4 feet from December through February to near elevation 2234.0 feet by March 1. At the beginning of March, the Fort Peck pool will be at the base of its Annual Flood Control and Multiple Use Zone.

Garrison. Releases are scheduled to average 17,400 cfs in December increasing to 20,500 cfs for January and February to serve winter power loads and to help balance System storage. Releases will be held steady or lowered, most likely in December, to prevent ice-induced flooding at the time of freeze-in and then gradually increased as river conditions permit. These temporary reductions in the releases may be scheduled to prevent exceedance of a 13-foot stage at the Missouri River at Bismarck streamgaging station. The Bismarck flood stage is 14.5 feet. Water Management staff will coordinate closely with other Federal, state and local agencies during periods of freeze-in and ice-out to reduce flood risk and ensure communities and local residents are aware of the rapidly changing conditions and are prepared to take appropriate actions. The Garrison pool level will decline 2.2 feet from elevation 1839.6 feet at the end of November to near elevation 1837.5 feet by March 1, the base of its Annual Flood Control and Multiple Use Zone.

Oahe. Releases for the winter season will provide backup for the Fort Randall and Gavins Point releases as well as refill the recapture space available in the Fort Randall reservoir consistent with anticipated winter power loads. Monthly average releases may vary substantially with fluctuations in power loads occasioned by weather conditions but, in general, are expected to average between 20,100 cfs and 23,300 cfs. Daily and hourly releases will vary widely to best meet power loads. Peak hourly and minimum hourly releases, as well as daily energy generation, will be constrained to prevent urban flooding in the Pierre and Fort Pierre areas if severe ice conditions develop downstream of Oahe Dam. This potential reduction is coordinated with the Western Area Power Administration (Western). The Oahe pool level is expected to decline from 1608.8 feet at the end of November to near 1607.5 feet, the base of its Annual Flood Control and Multiple Use Zone, at the end of January and then hold steady through February.

Big Bend. The Big Bend pool level will be maintained in the normal 1420.0 feet to 1421.0 feet range during the winter.

Fort Randall. Releases will average about 18,000 cfs during the winter season to support Gavins Point winter releases. The Fort Randall pool level is expected to rise from its fall drawdown elevation of near 1337.5 feet near the end of November or early December to near elevation 1350.0 feet, the seasonal base of flood control, by March 1. However, if the plains snowpack flood potential downstream of Oahe Dam is lower than normal, the Fort Randall pool level will be raised to near 1353.0 feet by March 1. It is likely that a pool level as high as 1355.0 feet could be reached by the end of March if spring runoff has commenced. The Fort Randall pool level above the White River delta near Chamberlain, South Dakota will remain at a higher elevation than the pool level below the delta from early October through December, due to the damming effect of this delta area.

Gavins Point. Gavins Point winter releases are discussed in the first paragraph of this section. The Gavins Point pool level will be near elevation 1207.5 feet until late February when it will be lowered to elevation 1206.0 feet to create additional capacity to store spring runoff.

System storage for all runoff conditions will range between 55.3 and 56.1 MAF by the beginning of next year's runoff season, approximately March 1, 2021. The base of the Annual Flood Control and Multiple Use Zone is 56.1 MAF.

E. Regulation During the 2021 Navigation Season. All five runoff scenarios modeled for this year's AOP follow the technical criteria presented in the current Master Manual for downstream flow support. Beginning in mid-March, Gavins Point releases will be gradually increased to provide navigation flow support at the mouth of the Missouri near St. Louis, Missouri by April 1, 2021, the normal navigation season opening date. The corresponding dates at upstream locations are Sioux City, March 23; Omaha, March 25; Nebraska City, March 26; and Kansas City, March 28. However, if during the 2021 navigation season there is no commercial navigation scheduled to use the upper reaches of the navigation channel, MRBWM will consider not providing navigation flow support in those reaches to conserve water in the System, reduce flood risk, and/or minimize incidental take of the protected species during the nesting season.

Navigation flow support for the 2021 season will be determined by actual System storage on March 15 and July 1. Runoff scenarios modeled indicate full service flow support at the start of the 2021 navigation season for all runoff conditions. Following the July 1 System storage check, full service would be provided for Lower Quartile and above runoff scenarios. The service level would be 900 cfs below full service for Lower Decile runoff. The normal 8-month navigation season is provided for Lower Quartile Lower Decile runoff scenarios as shown in ***Table IV***. A 10-day extension to the navigation season is provided for Median and above runoff scenarios.

TABLE IV
NAVIGATION SERVICE SUPPORT
FOR THE 2021 SEASON

	Runoff Scenario (MAF)	System Storage		Flow Level Above or Below Full Service (cfs)		Season Shortening (Days)
		March 15 (MAF)	July 1 (MAF)			
				Spring	Summer/Fall	
Upper Decile	35.2	57.4	64.2	0	+21,500	0*
Upper Quartile	30.9	57.3	63.8	0	+15,500	0*
Median	24.7	56.9	61.2	0	0	0*
Lower Quartile	19.3	56.0	57.5	0	0	0
Lower Decile	16.2	55.9	56.0	0	-900	0

*Includes 10-day extension for Median, Upper Quartile and Upper Decile.

As previously stated, the modeled regulation for the 2021 nesting season below Gavins Point is SR-FTT. When the SR-FTT release scenario is used, the initial steady release, which has ranged from 24,000 cfs to 33,000 cfs in the several years just prior to recent high runoff years, will be based on hydrologic conditions and the availability of habitat at that time. Model runs included in this AOP have a Gavins Point release which is higher during the last 20 days of May to keep birds from nesting at low elevations. Gavins Point releases will be adjusted to meet downstream targets as tributary flows recede, but ideally the initial steady release will be sufficient to meet downstream targets until the majority of the birds have nested. The purpose of this regulation is to continue to meet the project purposes while minimizing the loss of nesting T&E species. A Gavins Point peaking cycle of two days down and one day up may be used for flood control regulation or to conserve water in the upper three reservoirs, if required. Gavins Point releases for the Upper Decile and Upper Quartile runoff simulations are much above normal to evacuate flood water from the reservoirs. Releases from Garrison and Fort Randall will follow repetitive daily patterns from early May, at the beginning of the T&E species' nesting season, to the end of the nesting season in late August. In addition to the intra-day pattern, Fort Randall releases may also be cycled with two days of lower releases and one day of higher releases during the early part of the nesting season to maintain release flexibility in that reach while minimizing the potential for take. If higher daily releases are required later in the nesting season, the daily peaking pattern may be adjusted, reduced or eliminated resulting in a steady release to avoid increased stages at downstream nesting sites.

Gavins Point releases may be quite variable during the 2021 navigation season but are expected to range from 26,000 to 54,500 cfs under the five modeled runoff scenarios. Release reductions necessary to minimize downstream flooding are not reflected in the monthly averages shown in the simulations but will be implemented as conditions

warrant. Reductions in System releases to integrate the use of downstream Missouri River flow support from the designated Kansas River projects (Milford, Tuttle Creek and Perry) authorized to provide Missouri River navigation flow support have not been modeled since they are based on downstream hydrologic conditions. However, this storage will be utilized to the extent possible as a water conservation measure, or to minimize incidental take of protected species during the nesting season if conditions indicate it is prudent to do so. Simulated storages and releases for the System and individual reservoirs within the System are shown on ***Plate 6*** through ***Plate 11.*** As experienced in 2011 and 2019, runoff above or below simulated levels can occur and result in releases beyond those modeled for the AOP. As previously stated, should that occur, the Corps will increase its efforts to convey that information throughout the basin so that state, Tribal, and local agencies, communities, and local residents can take appropriate action.

F. Regulation Activities for Threatened and Endangered Species and Fish Propagation Enhancement. The ability to provide steady-to-rising pool levels in the upper three reservoirs in low runoff years is very dependent on the volume, timing, and distribution of runoff. The reservoir regulation simulations presented in this AOP for the Upper Decile, Upper Quartile, and Median runoff scenarios show that steady-to-rising pool levels would occur during the spring fish spawn period for the upper three reservoirs. As part of the overall plan to rotate emphasis among the upper three reservoirs during low runoff years, Fort Peck and Oahe are scheduled to be favored during the 2021 forage fish spawn if runoff is below the Median runoff scenario. This will be accomplished by setting releases at Fort Peck and Garrison at a level that would attempt to maintain a rising Fort Peck and Oahe pool, but no less than the minimum required for downstream water supply requirements, including irrigation. These adjustments may be restricted when the terns and plovers begin nesting in May. The studies show that Garrison pool levels decline in April for both the Lower Quartile and Lower Decile runoff scenarios. The studies show that inflows are sufficient to maintain a steady to rising pool at Fort Peck from April through June for the Lower Quartile and Lower Decile runoff scenarios. The Oahe pool declines slightly during April and May for the Lower Quartile runoff, before rising slightly in June. The Oahe pool declines during the April to June period for the Lower Decile runoff scenario. If drought conditions develop, emphasis during the fish spawn will be rotated among the upper three reservoirs and may also be adjusted to be opportunistic in regard to runoff potential. The upper three reservoirs will be managed to benefit forage fish to the extent reasonably possible, while continuing to serve the other Congressionally authorized project purposes.

Fort Peck. The repetitive daily pattern of releases from Fort Peck has not been implemented since the 2004 tern and plover nesting season. This adaptive management decision was made based on data collected during previous nesting seasons. In recent years, birds in this reach have nested on available high elevation habitat, and thus were

not expected to be impacted by the potential range of releases from Fort Peck during the summer. Releases during the 2021 nesting season will not be restricted by the repetitive daily pattern unless habitat conditions or nesting patterns warrant a change.

If high tributary flows enter the Missouri River below the project during the nesting season, hourly releases will generally be lowered to no less than 3,000 cfs in order to keep traditional riverine fish-rearing areas continuously inundated, while helping to lower river stages at downstream nesting sites. In rare instances releases below 3,000 cfs may be scheduled for flood damage reduction. April releases are expected to be adequate for trout spawning below the project.

Maintaining a rising Fort Peck pool level will be dependent upon the daily inflow pattern to the reservoir. The reservoir rises in April and May for all runoff scenarios.

Garrison. As in previous years, releases from Garrison will follow a repetitive daily pattern during the T&E nesting season to limit peak stages below the project for nesting birds. High elevation nesting habitat is expected to be sufficient below Garrison Dam during the 2021 nesting season for all runoff scenarios.

During 2021, coldwater habitat in Garrison should be adequate for all runoff scenarios. Coldwater habitat will continue to be monitored during the year and adjustments will be considered if conditions warrant.

A steady-to-rising pool at Garrison during the fish spawn in April and May will be dependent upon the daily inflow pattern to the reservoir. The reservoir rises in April and May for Median and above runoff scenarios. The reservoir declines in April and slightly in May for Lower Quartile runoff, and declines in April before rising in May under the Lower Decile runoff scenario.

Oahe. Releases in the spring and summer will back up those from Gavins Point. The pool level should be steady to rising in the spring during the fish spawn for Median and above runoff scenarios. Under the Lower Quartile and Lower Decile runoff scenarios, the Oahe pool would decline in the April through May period, dropping 0.4 and 1.6 feet, respectively.

Fort Randall. To the extent reasonably possible, Fort Randall will be regulated to provide for a pool elevation near 1355.0 feet during the fish spawn period, provided water can be supplied from other reservoirs for downstream uses. The pool will not be drawn down below elevation 1337.5 feet in the fall to ensure adequate supply for water intakes. As a measure to minimize take while maintaining the flexibility to increase releases during the nesting season, hourly releases from Fort Randall will follow a repetitive daily pattern to limit peak stages below the project for nesting birds. Daily average flows may be increased every third day to preserve the capability of increasing

releases later in the summer with little or no incidental take if drier downstream conditions occur. If higher daily releases are required later in the nesting season, the daily peaking pattern may be adjusted, reduced or eliminated resulting in a steady release to avoid increased stages at downstream nesting sites. Periods of zero release will be minimized to the extent reasonably possible during the nesting season given daily average releases, real-time hydrologic conditions, and System generating constraints as defined in coordination with Western.

Gavins Point. It is anticipated that a sufficient amount of habitat to provide for successful nesting will be available at elevations above the planned release rates for all runoff conditions. This expectation is based on the high elevation habitat resulting from high flows experienced in 2018 and 2019. Releases from Gavins Point may follow the flow-to-target (FTT) release scenario or the SR-FTT scenario. The FTT scenario limits releases from Gavins Point to those needed to meet downstream targets. The actual release scenario will be evaluated when birds begin nesting in early May. If monitoring determines that nests are likely to be initiated at a lower elevation which would be inundated later in the summer, a SR-FTT release scenario may be implemented. A full description of these release scenarios can be found in the Master Manual. Actual releases will be based on hydrologic conditions and the availability of habitat at that time.

All reasonable measures to minimize the loss of nesting T&E bird species will be used. While not anticipated because of the quantity of high elevation habitat available, these measures include, but are not limited to, a relatively high initial steady release during the peak of nest initiation, the use of the three designated Kansas River basin reservoirs for Missouri River navigation flow support, moving nests to higher ground, and monitoring nest fledge dates to determine if delaying an increase a few days might allow threatened chicks to fledge. The location of navigation tows and river conditions at intakes would also be monitored to determine if an increase could be temporarily delayed without impact. Cycling releases every third day may be used to conserve water early in the nesting season if extremely dry conditions develop. In addition, cycling may be used during downstream flood control regulation.

The Gavins Point pool will be regulated near 1206.0 feet in the spring and early summer, with minor day-to-day variations due to incremental inflows between Fort Randall and Gavins Point resulting from rainfall runoff. Several factors can limit the ability to protect nests from inundation in the upper end of the Gavins Point pool. First, because there are greater numbers of T&E bird species nesting below Gavins Point, regulation to minimize incidental take usually involves restricting Gavins Point releases, which means that the Gavins Point pool can fluctuate significantly due to increased runoff from rainfall events. Second, rainfall runoff between Fort Randall and Gavins Point can result in relatively rapid pool rises because the Gavins Point project has a smaller storage capacity than the other System reservoirs. And third, the

regulation of Gavins Point for downstream flood control may necessitate immediate release reductions to reduce downstream damage. When combined, all these factors make it difficult, and sometimes impossible, to prevent inundation of nests in the upper end of the Gavins Point reservoir. However, because of the quantity of habitat expected we do not anticipate a large number of nests being inundated. The pool will be increased to elevation 1207.5 feet late in August or early September when it is determined that there are no terns or plovers nesting along the reservoir.

G. Regulation Activities for Historic and Cultural Properties. As acknowledged in the 2004 Programmatic Agreement (PA) for the Operation and Management of the Missouri River Main Stem System, wave action and fluctuation in the level of the reservoirs results in erosion along the banks of the reservoirs. The Corps will work with the Tribes utilizing 36 CFR Part 800 and the PA to address the exposure of historic and cultural sites. The objective of a programmatic agreement is to deal "…with the potential adverse effects of complex projects or multiple undertakings…" The PA objective was to collaboratively develop a preservation program that would avoid, minimize and/or mitigate adverse effects along the System reservoirs. All tribes, whether signatory to the PA or not, may request government-to-government consultation on the regulation of the System and the resulting effect on historic and cultural properties and other resources.

Pool levels at the upper three reservoirs will likely be near normal in 2021 but will vary depending on runoff conditions. Continuing exposure of cultural sites along the shoreline is still possible. Actions to avoid, minimize or mitigate adverse impacts and expected results of the actions are covered under Chapter VII of this AOP. ***Plate 14*** shows the locations of the Tribal Reservations.

Fort Peck. Depending on runoff in the Missouri River basin, System regulation during 2021 could result in a Fort Peck pool elevation variation from a high of 2245 feet msl to a low of 2224 feet msl. This is based on the Upper and Lower Decile runoff scenarios (see ***Plate 8*** and the studies included at the end of this report). Based on a review of existing information, approximately 13 known sites could be affected during this period.

Garrison. Based on the Upper and Lower Decile runoff scenarios (see ***Plate 9*** and the studies included at the end of this report), Garrison pool elevations could range between 1848 and 1830 feet msl during 2021. Based on a review of existing information, approximately 24 known sites could be affected during this period.

Oahe. At the Oahe reservoir, the System regulation under the Upper and Lower Decile runoff scenarios could result in pool elevations ranging from 1616 to 1596 feet msl (see ***Plate 10*** and the studies included at the end of this report). Based on a review

of existing information, approximately163 known sites could be affected during this period.

Big Bend. System regulation will be adjusted to maintain the Big Bend pool level in the normal 1420 to 1421 feet msl range during 2021. Short-term increases above 1421 due to local rainfall may also occur. Based on a review of existing information, no known sites will be affected during this period.

Fort Randall. As part of the normal System regulation, the Fort Randall pool elevations will vary between 1350 and 1355 feet msl during the spring and summer of 2021 (see ***Plate 11*** and the studies included at the end of this report). Short-term increases above 1355 feet msl due to local rainfall may occur. The annual fall drawdown of the reservoir to elevation 1337.5 feet msl will begin prior to the close of the navigation season and will be accomplished by early December. The reservoir will then be refilled during the winter to elevation 1350 feet msl. Based on a review of existing information, approximately 20 known sites could be affected during this period.

Gavins Point. System regulation will be adjusted to maintain the Gavins Point pool level in the normal 1206 to 1207.5 feet msl range during 2021. Short-term increases above 1207.5 feet msl may occur due to local rainfall. Based on a review of existing information, one known site could be affected during this period.

VII. SUMMARY OF RESULTS EXPECTED IN 2021

With regulation of the System in accordance with the 2020-2021 AOP outlined in the preceding pages, the following results can be expected. ***Table V*** summarizes the critical decision points throughout the year for all runoff conditions.

TABLE V
Summary of 2020-2021 AOP Studies

Decision Points	2021 Runoff Condition				
	Upper Decile	**Upper Quartile**	**Median**	**Lower Quartile**	**Lower Decile**
March 15 System Storage Spring Service Level	57.4 MAF Full service	57.3 MAF Full service	56.9 MAF Full service	56.0 MAF Full service	55.9 MAF Full service
May Releases May Early/Late May Avg GP Release	Not applicable 40.0 kcfs	28.0/31.6 kcfs 29.9 kcfs	28.0/31.6 kcfs 29.9 kcfs	31.3/34.3 kcfs 32.9 kcfs	31.3/34.3 kcfs 32.9 kcfs
Fish Spawn Rise (Apr-Jun) FTPK Pool Elev Change GARR Pool Elev Change OAHE Pool Elev Change	 +8.6 feet +6.5 feet +4.7 feet	 +7.4 feet +6.0 feet +5.7 feet	 +5.2 feet +4.5 feet +3.7 feet	 +3.1 feet +2.3 feet -0.3 feet	 +1.2 feet +1.6 feet -2.2 feet
July 1 System Storage Sum-Fall Service Level (kcfs) Nav Season Length	64.2 MAF Full Service 10 Day extension	63.8 MAF Full Service 10 Day extension	61.1 MAF Full Service 10 Day extension	57.5 MAF Full Service 0 Days shortening	56.0 MAF 0.9 kcfs blw Full Service 0 Days shortening
September 1 System Storage Winter 2021-22 GP Release	63.0 MAF 20.0 kcfs	62.8 MAF 20.0 kcfs	60.8 MAF 20.0 kcfs	56.1 MAF 13.8 kcfs	53.9 MAF 12.5 kcfs
February 28 System Storage End-Year Pool Balance Percent Pool	56.1 MAF Balanced 100%	56.1 MAF Balanced 100%	56.1 MAF Balanced 100%	51.8 MAF Balanced 92%	49.7 MAF Balanced 89%

A. Flood Control. Flood control is the only authorized project purpose that requires the availability of empty storage space rather than impounded water. Actual flood events, especially those that are a result of rainfall runoff, are difficult to predict with much advance notice; therefore, detailed routing of specific major flood flows is accomplished when floods occur. There is a recurring pattern of high-risk flood periods during each year: a season when snowmelt, ice jams, and protracted heavy rains will almost surely occur with or without generating consequent floods; and a season when these situations are less likely and the flood threat is correspondingly low. The high-

risk flood season begins about March 1 and extends through the summer. As a consequence, regulation of the System throughout the fall and winter months is predicated on the achievement of a March 1 System storage level at or below the base of the Annual Flood Control and Multiple Use Zone. All runoff scenarios studied for this AOP will begin the March 1, 2021 runoff season with System storage at or below the desired 56.1 MAF base of the Annual Flood Control and Multiple Use Zone. Therefore, the entire System flood control storage of 16.3 MAF, (11.6 MAF in the Annual Flood Control and Multiple Use Zone and 4.7 MAF in the Exclusive Flood Control Zone) will be available to store runoff. Under the Lower Basic runoff scenario, an additional 0.8 MAF of the Carryover Multiple Use Zone will be available to store runoff.

To the extent practical, the System is regulated to prevent damaging flows in the river reaches between and below the Mainstem dams. In 2021, the full capacity of the System will be available to capture a significant volume of runoff originating from the upper basin and meter it out over an extended period of time at a rate that does not contribute to flooding in the river reaches between and below the reservoirs. Additionally, the reservoir system will have the capacity to reduce releases and hold back water during periods of high runoff below the System to reduce peak stages and discharges on the lower river. The ability to significantly reduce peak stages on the lower river diminishes at locations further downstream due to the large uncontrolled drainage area and travel time from the dam.

The base of the Exclusive Flood Control Zone defines the maximum level of storage that will be accumulated for purposes other than flood control. When the Exclusive Flood Control Zone at a particular reservoir is encroached upon, the control of subsequent flood inflows becomes the dominant factor. During such periods, releases may substantially exceed the powerplant release capacity with the evacuation rate of any project dependent upon existing flood conditions, the potential for further inflows, and conditions of other reservoirs in the System. Maximum release rates at such times are based upon the Master Manual flood control criteria, the flood control status of the System, and the critical need to preserve the integrity of the dams. Detailed information regarding the adjustments of releases for flood control evacuation and downstream flood control constraints can be found in Chapter 7 of the Master Manual.

Due to release limitations imposed by the formation of downstream ice cover, a major portion of the required flood control space must be evacuated prior to the winter season. Higher releases may be made on occasions when the downstream channel conditions permit. If plains and/or mountain snowpack accumulations are much above normal during the winter of 2020-2021, and studies indicate that available storage in the Carryover Multiple Use Zone as well as the Annual Flood Control and Multiple Use Zone will be fully utilized, releases may be adjusted to the extent reasonably possible to evacuate water from the reservoir system early in the runoff season. High releases

during the late winter and early spring periods may exacerbate localized flooding if coincident with plains snowmelt or spring rains, and may also contribute to significant ice jam flooding. Therefore, if higher than normal releases are indicated, local conditions will need to be closely monitored. In addition, all 2021 runoff that is stored in the flood control zones will be evacuated prior to the start of the 2022 runoff season.

B. Water Supply and Water Quality Control. Water supply problems at intakes located in the river reaches both between and below the Mainstem dams and in the reservoirs are related primarily to intake elevations or river access rather than inadequate water supply. In emergency situations, short-term adjustments to protect human health and safety would be considered to keep intakes operational.

Low reservoir levels during the 2000-2007 drought contributed to both intake access and water quality problems for intakes on Garrison and Oahe reservoirs, including several Tribal intakes. A return to more normal reservoir elevations has eliminated concern over many of these intakes. If the drought conditions return, reservoir pool levels and releases may decline renewing the potential for intake access and water quality problems at both river and reservoir intakes. Under the Lower Decile runoff scenario, minimum reservoir levels in 2021 would be at least 23 feet higher than the record lows set in the 2000-2007 drought. Although not below the critical shut-down elevations for any intake, a return to lower reservoir levels would require extra monitoring to ensure the continued operation of the intakes.

Winter releases are determined based on the September 1 System storage check. The winter season extends from December through February and flows are provided during this time to support the Congressionally authorized project purposes of hydropower production and downstream water supply and water quality. Per the Master Manual, if September 1 System storage is 55.0 MAF or less, the winter release from Gavins Point will be 12,000 cfs. Planned winter release rates of 12,000 cfs may be less than required for downstream water supply intakes without sufficient incremental tributary flows below the System. Should that occur, releases may need to be set higher to ensure that downstream water supply intakes are operable. In 2012-2013, winter releases were set at 14,000 cfs rather than 12,000 cfs due to channel degradation and low incremental tributary flows below the System. Improved tributary flows in future winters would facilitate releases reaching the target level of 12,000 cfs. While the Master Manual indicates that the water control plan's purpose is to meet water supply requirements in river reaches downstream of the reservoirs to the extent reasonably possible, the Corps believes the minimum winter release of 12,000 cfs presented in the Master Manual represents a reasonable long-term goal for water intake operability and for owners to strive for as they make improvements to their facilities. A letter was sent to intake owners in the spring of 2013 informing them of the Master Manual criteria and encouraging them to take necessary action to ensure their intakes are able to operate at reduced release rates. Coordination with intake owners will continue prior to and

during the low release periods. In addition, it may be necessary at times to temporarily increase Gavins Point releases to provide adequate downstream flows during periods when excessive river ice formation is forecast or if ice jams or blockages form which temporarily restrict flow. Based on past experiences, these events are expected to occur infrequently and be of short duration.

Based on the studies included in this AOP, the scheduled winter System release for 2020-2021 will range from 17,000 cfs to 20,000 cfs. As shown in ***Table V***, 2021-2022 winter releases of 20,000 cfs would be made for Median, Upper Decile and Upper Quartile runoff scenarios, 13,800 cfs for Lower Quartile, and 12,500 cfs under the Lower Decile runoff scenario. The additional 500 cfs on Lower Decile reflects how the Corps, when conditions warrant, temporarily increases Gavins Point releases during extreme cold periods to inhibit the formation of ice jams in the lower river reach.

During non-navigation open water periods in the spring and fall the Master Manual includes System releases as low as 9,000 cfs as a water conservation measure provided that enough downstream tributary flow exists to allow for continued operation of downstream water intakes. If a non-navigation year would occur in the future, summer releases (May through August) could average around 18,000 cfs from the System. However, it should be noted that System releases will be set at levels that meet the operational requirements of water intakes to the extent reasonably possible. Problems have occurred at several downstream intakes in the past, however in all cases the problems have been associated with access to the river or reservoir rather than insufficient water supply. In addition, the low summer release rate would likely result in higher water temperatures in the river, which could impact a powerplant's ability to meet their thermal discharge permits. Again, it should be noted that System releases will be set at levels that allow the downstream powerplant to meet their thermal discharge permit requirements to the extent reasonably possible. This may mean that actual System releases in the hottest part of the summer period may be set well above the 18,000 cfs level. The Corps continues to encourage intake operators between and below the mainstem dams to make necessary modifications to their intakes to allow efficient operation over the widest possible range of hydrologic conditions. While the current level of System storage should allow adequate access for all intakes during the coming year, intake operators that have experienced difficulty with access during the past drought years should continue to make adjustments to improve access and flexibility when drought returns to the basin.

C. <u>Irrigation</u>. Scheduled releases from the System reservoirs will be sufficient to meet the volumes of flow required for irrigation diversions from the Missouri River. Some access problems may be experienced, however, if Lower Quartile or Lower Decile runoff conditions return. Below Fort Peck, localized dredging may once again be required in the vicinity of irrigation intakes in order to maintain access to the water if releases are low next summer. Intake access problems are the responsibility of the

intake owner and the Corps will not guarantee access, only that the supply of water in the Missouri River is adequate to meet this project purpose. Fort Peck releases may be adjusted during the irrigation season to provide more consistent flows at downstream locations as tributary flows vary. Tributary irrigation water usage is fully accounted for in the estimates of water supply.

D. Navigation. The anticipated service level and season length for all runoff conditions simulated are shown in ***Table V***. Service to navigation in 2021 from the beginning of the navigation season through the July 1 storage check will be at full service for all runoff scenarios. After the July 1 storage check, Lower Quartile and higher runoff scenarios indicate at least full service to navigation. The July 1 storage check indicates 900 cfs below full service for the Lower Decile runoff scenario. In addition, Median and above runoff scenarios indicate a 10-day extension to the navigation season based on the July 1 storage check. Lower Quartile and Lower Decile runoff indicates a full length navigation season. Although the AOP simulations provide a comparison of typical flow support under varying runoff conditions, the actual rate of flow support for the 2021 navigation season will be based on actual System storage on March 15 and July 1, 2021.

E. Power. ***Table VI*** and ***Table VII*** indicate the estimated monthly System load requirements and hydropower supply of the Eastern Division, Pick-Sloan Missouri Basin Program (P-S MBP), from August 2020 through December 2021. Estimates of monthly peak demands and energy include customer requirements for firm, short-term firm, summer firm, peaking, and various other types of power sales, System losses, and the effects of diversity. Also included in the estimated requirements are deliveries of power to the Western Division, P-S MBP, to help meet its firm power commitments. Under the Median runoff scenario, annual generation in 2021 is estimated to be 10.2 million MWh, 109 percent of the 1967-2019 average.

TABLE VI
PEAKING CAPABILITY AND SALES
(1,000 kW at plant)

2020	Estimated Committed Sales*	Expected C of E Capability					Expected Bureau Capability**					Expected Total System Capability				
		U.B.	Basic	L.B.			U.B.	Basic	L.B.			U.B.	Basic	L.B.		
Aug	2207	2523	2522	2519			200	197	197			2723	2720	2716		
Sep	2016	2500	2508	2499			201	197	197			2701	2705	2696		
Oct	1876	2477	2490	2479			201	198	197			2677	2688	2676		
Nov	1979	2435	2451	2438			199	196	196			2634	2647	2634		
Dec	2106	2417	2425	2420			196	193	194			2613	2617	2613		
2021																
Jan	2121	2428	2432	2427			192	189	192			2620	2621	2619		
Feb	2104	2446	2446	2440			188	186	190			2634	2632	2630		
		U.D.	U.Q.	Med	L.Q.	L.D.	U.D.	U.Q.	Med	L.Q.	L.D.	U.D.	U.Q.	Med	L.Q.	L.D.
Mar	2038	2487	2483	2477	2465	2463	189	188	189	189	190	2676	2671	2666	2654	2653
Apr	1907	2509	2509	2490	2464	2459	186	184	186	189	190	2695	2693	2676	2653	2649
May	1875	2516	2522	2493	2460	2452	188	188	187	193	193	2704	2710	2680	2653	2645
Jun	2083	2524	2530	2508	2465	2452	200	200	195	198	198	2724	2730	2703	2663	2650
Jul	2191	2533	2537	2519	2470	2449	200	200	198	198	197	2733	2737	2717	2668	2646
Aug	2204	2524	2528	2515	2462	2436	199	198	196	197	195	2723	2726	2711	2659	2631
Sep	2012	2505	2510	2506	2447	2418	199	197	197	196	196	2704	2707	2703	2643	2614
Oct	1876	2478	2484	2491	2427	2397	198	197	197	196	197	2676	2681	2688	2623	2594
Nov	1978	2430	2439	2455	2386	2355	196	195	196	196	196	2626	2634	2651	2582	2551
Dec	2105	2416	2420	2429	2374	2344	190	190	194	194	194	2606	2610	2623	2568	2538

* Estimated sales, including system reserves. Power in addition to hydro production needed for these load requirements will be obtained from other power systems by interchange or purchase.
** Total output of Canyon Ferry and 1/2 of the output of Yellowtail powerplant.

TABLE VII
ENERGY GENERATION AND SALES
(Million kWh at plant)

2020	Estimated Committed Sales*	Expected C of E Generation					Expected Bureau Generation **					Expected Total System Generation				
		U.B.	Basic	L.B.			U.B.	Basic	L.B.			U.B.	Basic	L.B.		
Aug	858	955	921	918			80	67	64			1035	988	982		
Sep	748	1022	868	882			80	63	51			1102	930	933		
Oct	743	952	752	747			82	63	51			1033	815	798		
Nov	809	911	726	646			75	61	45			987	787	692		
Dec	914	708	685	610			77	63	47			785	748	656		
2021																
Jan	930	773	767	677			76	66	47			849	833	724		
Feb	903	678	679	602			67	58	41			745	737	643		
		U.D.	U.Q.	Med	L.Q.	L.D.	U.D.	U.Q.	Med	L.Q.	L.D.	U.D.	U.Q.	Med	L.Q.	L.D.
Mar	814	665	674	668	642	650	78	77	66	59	55	743	751	734	701	705
Apr	767	888	746	770	856	852	96	95	80	55	53	984	841	850	911	905
May	717	1148	916	910	976	959	100	99	93	55	55	1248	1015	1003	1031	1014
Jun	778	1373	1181	957	1016	988	92	91	81	65	58	1465	1272	1038	1081	1046
Jul	844	1519	1369	1064	1102	1053	77	77	73	60	58	1596	1446	1137	1162	1111
Aug	858	1524	1401	1097	1089	1035	94	90	74	59	57	1618	1491	1171	1148	1092
Sep	748	1407	1294	937	937	901	92	85	69	56	54	1499	1379	1006	993	955
Oct	746	1282	1163	787	754	735	92	84	70	55	53	1374	1247	857	809	788
Nov	810	1216	1108	765	630	610	88	82	67	53	52	1304	1190	832	683	662
Dec	914	802	795	740	568	544	90	84	68	54	53	892	879	808	622	597
CY TOT		13275	12098	10141	9848	9605	1042	1006	864	659	636	14318	13105	11005	10507	10241

* Estimated sales including system reserves and losses. Power in addition to hydro production needed for these load requirements will be obtained from other systems by interchange or purchase.
** Total output Canyon Ferry and 1/2 output of Yellowtail powerplant.

F. Recreation, Fish and Wildlife. The regulation of the System will continue to provide recreation and fish and wildlife opportunities in the project areas and along the Missouri River as well as other benefits of a managed system. Recreation access is expected to be near normal levels in 2021. If Lower Quartile or Lower Decile runoff were to occur in 2021, boat ramps that were lowered and low water ramps that were constructed during the two recent drought periods will provide adequate reservoir access. Special regulation adjustments incorporating specific objectives for these purposes will be made to the extent reasonably possible. Overall conditions should be favorable for the many visitors who enjoy the camping, boating, fishing, hunting, swimming, picnicking, and other recreational activities associated with the System reservoirs.

The effects of the simulated System regulation during 2021 on fish and wildlife are included in Chapter VI, Section F, entitled, "Regulation Activities for T&E Species and Fish Propagation Enhancement."

G. Historic and Cultural Properties. As mentioned in Chapter VI of this AOP, the regulation of the System during 2020 and 2021 will expose cultural sites due to erosion from the normal fluctuation of pool elevations. The Corps will work with the Tribes utilizing 36 CFR Part 800 and the PA to address the exposure of these sites. The objective of a programmatic agreement is to deal "…with the potential adverse effects of complex projects or multiple undertakings…" The PA objective was to collaboratively develop a preservation program that would avoid, minimize and/or mitigate the adverse effects of the System operation. All tribes, whether signatory to the PA or not, may request government-to-government consultation on the regulation of the System and the resulting effect on historic and cultural properties and other resources.

The planned preservation program for this AOP is outlined by multiple stipulations in the PA. One of the stipulations, or program components, is the Five-Year Plan. This plan outlines how the Corps will accomplish its responsibilities under the PA and the National Historic Preservation Act. The "Cultural Resource Program Final Five Year Plan, dated February 2012" (see http://www.nwo.usace.army.mil/Missions/CivilWorks/CulturalResources.aspx) is currently being implemented. The plan includes inventory, testing and evaluation, mitigation and other specific activities that will allow the Corps to avoid, minimize and/or mitigate the adverse effects to cultural sites on Corps lands within the System. Many of the actions listed in the plan are within the elevation ranges that will occur with the implementation of the Master Manual criteria in 2020 and 2021. Two critical components of the Five-Year Plan that are applicable to this AOP are monitoring and mitigation, which will be briefly discussed in the following paragraphs.

First, a collaboratively developed plan, entitled "Final Cultural Resource Monitoring Plan, dated June 2014" (see http://www.nwo.usace.army.mil/Missions/CivilWorks/CulturalResources.aspx) is in place. This monitoring plan outlines the sites that require monitoring and specifies a frequency for monitoring. The Corps is strategically monitoring sites, including those sites within the potential operating pool elevations, to document the effects of the implementation of the 2020-2021 AOP. Specific sites are identified in the draft Monitoring and Enforcement Plan for the monitoring team, comprised of Corps rangers and Tribal monitors, to visit and document impacts. This focused monitoring is resulting in more accurate data on the current impacts to sites along the river plus it is assisting with the identification of sites for mitigation. The most recent training for the monitoring teams was held in July 2019, and the most recent Archeological Resources Protection Act training was held in April 2018.

Second, mitigation or protection of sites that are being adversely impacted continues. During the reporting period for the 2019 Annual Report by the Corps on the implementation of the Programmatic Agreement, 7 sites were either completed, started, or in the design phase. The annual report is available at http://www.nwo.usace.army.mil/Missions/CivilWorks/CulturalResources.aspx.

Results expected from the proposed monitoring and mitigation actions include more accurate horizontal and vertical data on existing cultural sites, detailed impact data, proactive protection and preservation of sites. The effects of the simulated System regulation during 2020-2021 on cultural sites are included in the Chapter VI, section G., entitled, "Regulation Activities for Historic and Cultural Properties."

H. System Storage. If the August 1, 2020 Basic runoff forecast verifies, System storage will decline to 56.4 MAF by the end of 2020. This would be 22.5 MAF higher than the record low System storage of 33.9 MAF set on February 9, 2007 and 0.1 MAF less than the 2019 end-of-year storage. This end-of-year storage is 3.4 MAF more than the 1967-2019 average. The lowest storage during the 1988-1992 drought was 40.8 MAF in January 1991, and the record low storage was set during the 2000-2007 drought at 33.9 MAF in February 2007. The end-of-year System storages have ranged from a maximum of 60.9 MAF in 1975 to the 2006 minimum of 34.4 MAF. Forecasted System storage on December 31, 2021 is presented in ***Table VIII*** for the runoff scenarios simulated.

TABLE VIII
ANTICIPATED DECEMBER 31, 2021 SYSTEM STORAGE

Water Supply Condition	Total 12/31/2021	Carryover Storage Remaining[1]	Unfilled Carryover Storage[2]	Total Change CY2021
	(Volumes in 1,000 Acre-Feet)			
Upper Decile	56,100	38,500	0	100
Upper Quartile	56,300	38,500	0	300
Median	56,500	38,500	0	100
Lower Quartile	51,900	36,100	4,200	-4,000
Lower Decile	49,700	32,100	6,400	-6,200

[1] Net usable storage above 17.6 MAF System minimum pool level established for power, recreation, irrigation diversions, and other purposes.
[2] System base of Annual Flood Control and Multiple Use Zone containing 56.1 MAF.

I. Summary of Water Use by Functions. Anticipated water use in CY 2020, under the regulation plan with the Basic forecast of water supply is shown in Table IX. Under the reservoir regulation simulations in this AOP, estimated water use in CY 2021 is also shown in Table IX. Actual water use data for CY 2019 are included for information and comparison.

TABLE IX
MISSOURI RIVER MAINSTEM SYSTEM
WATER USE FOR CALENDAR YEARS 2019, 2020, AND 2021 ABOVE SIOUX CITY, IOWA
in Million Acre-Feet (MAF)

		CY 2019 Actual	CY 2020 Basic Simulation	Simulations for Calendar Year 2021 Upper Decile	Upper Quartile	Median	Lower Quartile	Lower Decile
Upstream Depletions	(1)							
Irrigation, Tributary Reservoir Evaporation & Other Uses		2.7	0.4					
Tributary Reservoir Storage Change		0.1	-0.1					
Total Upstream Depletions		2.9	0.3	1.1	1.1	1.2	1.1	1.1
System Reservoir Evaporation	(2)	3.2	2.5	1.8	1.8	1.8	1.7	1.6
Sioux City Flows								
Navigation Season								
Unregulated Flood Inflows Between Gavins Point & Sioux City	(3)	2.7	0.0					
Navigation Service Requirement	(4)	15.9	15.5	17.8	17.1	16.3	16.2	15.7
Supplementary Releases								
T&E Species	(5)	0.0	0.0	0.3	0.3	0.3	0.3	0.3
Flood Evacuation	(6)	27.9	4.8	8.8	5.2	0.0	0.0	0.0
Non-navigation Season								
Flows		4.9	5.7	4.5	4.4	4.3	4.0	3.8
Flood Evacuation Releases	(7)	3.4	2.5	0.8	0.7	0.6	0.0	0.0
System Storage Change		0.0	-0.4	0.1	0.3	0.1	-4.0	-6.2
Total		60.9	30.9	35.2	30.9	24.7	19.3	16.2
Project Releases								
Fort Peck		8.5	6.8	8.6	7.9	6.7	6.3	6.4
Garrison		22.9	16.5	22.1	19.9	16.3	15.5	14.7
Oahe		30.2	18.4	25.4	22.4	18.1	18.4	18.2
Big Bend		29.6	18.6	25.3	22.3	18.0	18.3	18.1
Fort Randall		35.2	19.9	27.3	24.0	18.7	18.6	18.3
Gavins Point		40.3	22.7	28.8	25.2	20.0	19.6	19.3

(1) Tributary uses above the 1949 level of development including agricultural depletions and tributary storage effects.
(2) Net evaporation is shown for 2021.
(3) Incremental inflows to reach which exceed those usable in support of navigation at the target level, even if Gavins Point releases were held to as low as 6,000 cfs.
(4) Estimated requirement for downstream water supply and water quality is approximately 6.0 MAF.
(5) Increased releases required for threatened and endangered species regulation.
(6) Includes flood control releases for flood control storage evacuation and releases used to extend the navigation season beyond the normal December 1 closing date at the mouth of the Missouri River.
(7) Releases for flood control storage evacuation in excess of a 17,000 cfs Gavins Point release.

VIII. TENTATIVE PROJECTION OF REGULATION THROUGH FEBRUARY 2027

(Not completed until final plan is adopted.)

USACE Mainstem Project

USACE Tributary Project

USBR SECTION 7 PROJECT

☆ **State Capitol**

-------- District Boundary

Missouri River Basin

U.S. ARMY ENGINEERS, NORTHWESTERN DIVISION
CORPS OF ENGINEERS, OMAHA, NEBRASKA
AUGUST 2011

PLATE 1. Missouri River Basin Map.

Summary of Engineering Data -- Missouri River Mainstem System

Item No.	Subject	Fort Peck Dam - Fort Peck Lake	Garrison Dam - Lake Sakakawea	Oahe Dam - Lake Oahe
1	Location of Dam	Near Glasgow, Montana	Near Garrison, ND	Near Pierre, SD
2	River Mile - 1960 Mileage	Mile 1771.5	Mile 1389.9	Mile 1072.3
3	Total & incremental drainage areas in square miles	57,500	181,400 (2) 123,900	243,490 (1) 62,090
4	Approximate length of full reservoir (in valley miles)	134, ending near Zortman, MT	178, ending near Trenton, ND	231, ending near Bismarck, ND
5	Shoreline in miles (3)	1520 (elevation 2234)	1340 (elevation 1837.5)	2250 (elevation 1607.5)
6	Average total & incremental inflow in cfs	10,200	25,600 15,400	28,900 3,300
7	Max. discharge of record near damsite in cfs	137,000 (June 1953)	348,000 (April 1952)	440,000 (April 1952)
8	Construction started - calendar yr.	1933	1946	1948
9	In operation (4) calendar yr.	1940	1955	1962
	Dam and Embankment			
10	Top of dam, elevation in feet msl	2280.5	1875	1660
11	Length of dam in feet	21,026 (excluding spillway)	11,300 (including spillway)	9,300 (excluding spillway)
12	Damming height in feet (5)	220	180	200
13	Maximum height in feet (5)	250.5	210	245
14	Max. base width, total & w/o berms in feet	3500, 2700	3400, 2050	3500, 1500
15	Abutment formations (under dam & embankment)	Bearpaw shale and glacial fill	Fort Union clay shale	Pierre shale
16	Type of fill	Hydraulic & rolled earth fill	Rolled earth filled	Rolled earth fill & shale berms
17	Fill quantity, cubic yards	125,628,000	66,500,000	55,000,000 & 37,000,000
18	Volume of concrete, cubic yards	1,200,000	1,500,000	1,045,000
19	Date of closure	24 June 1937	15 April 1953	3 August 1958
	Spillway Data			
20	Location	Right bank - remote	Left bank - adjacent	Right bank - remote
21	Crest elevation in feet msl	2225	1825	1596.5
22	Width (including piers) in feet	820 gated	1336 gated	456 gated
23	No., size and type of gates	16 - 40' x 25' vertical lift gates	28 - 40' x 29' Tainter	8 - 50' x 23.5' Tainter
24	Design discharge capacity, cfs	275,000 at elev 2253.3	827,000 at elev 1858.5	304,000 at elev 1644.4
25	Discharge capacity at maximum operating pool in cfs	230,000	660,000	80,000
	Reservoir Data (6)			
26	Max. operating pool elev. & area	2250 msl 245,000 acres	1854 msl 383,000 acres	1620 msl 386,000 acres
27	Max. normal op. pool elev. & area	2246 msl 240,000 acres	1850 msl 365,000 acres	1617 msl 362,000 acres
28	Base flood control elev & area	2234 msl 211,000 acres	1837.5 msl 308,000 acres	1607.5 msl 311,000 acres
29	Min. operating pool elev. & area	2160 msl 89,000 acres	1775 msl 125,000 acres	1540 msl 115,000 acres
	Storage allocation & capacity			
30	Exclusive flood control	2250-2246 971,000 a.f.	1854-1850 1,495,000 a.f.	1620-1617 1,107,000 a.f.
31	Flood control & multiple use	2246-2234 2,704,000 a.f.	1850-1837.5 4,211,000 a.f.	1617-1607.5 3,208,000 a.f.
32	Carryover multiple use	2234-2160 10,700,000 a.f.	1837.5-1775 12,951,000 a.f.	1607.5-1540 13,353,000 a.f.
33	Permanent	2160-2030 4,088,000 a.f.	1775-1673 4,794,000 a.f.	1540-1415 5,315,000 a.f.
34	Gross	2250-2030 18,463,000 a.f.	1854-1673 23,451,000 a.f.	1620-1415 22,983,000 a.f.
35	Reservoir filling initiated	November 1937	December 1953	August 1958
36	Initially reached min. operating pool	27 May 1942	7 August 1955	3 April 1962
37	Estimated annual sediment inflow	17,200 a.f./year 1073 yrs.	21,600 a.f./year 1,086 yrs.	14,800 a.f./year 1553 yrs.
	Outlet Works Data			
38	Location	Right bank	Right Bank	Right Bank
39	Number and size of conduits	2 - 24' 8" diameter (nos. 3 & 4)	1 - 26' dia. and 2 - 22' dia.	6 - 19.75' dia. upstream, 18.25' dia. downstream
40	Length of conduits in feet (8)	No. 3 - 6,615, No. 4 - 7,240	1529	3496 to 3659
41	No., size, and type of service gates	1 - 28' dia. cylindrical gate 6 ports, 7.6' x 8.5' high (net opening) in each control shaft	1 - 18' x 24.5' Tainter gate per conduit for fine regulation	1 - 13' x 22' per conduit, vertical lift, 4 cable suspension and 2 hydraulic suspension (fine regulation)
42	Entrance invert elevation (msl)	2095	1672	1425
43	Avg. discharge capacity per conduit & total	Elev. 2250 22,500 cfs - 45,000 cfs	Elev. 1854 30,400 cfs - 98,000 cfs	Elev. 1620 18,500 cfs - 111,000 cfs
44	Present tailwater elevation (ft msl)	2032-2036 5,000 - 35,000 cfs	1669-1677 15,000- 60,000 cfs	1422-1427 20,000-55,000 cfs
	Power Facilities and Data			
45	Avg. gross head available in feet (14)	194	161	174
46	Number and size of conduits	No. 1-24'8" dia., No. 2-22'4" dia.	5 - 29' dia., 24' penstocks	7 - 24' dia., imbedded penstocks
47	Length of conduits in feet (8)	No. 1 - 5,653, No. 2 - 6,355	1829	From 3,280 to 4,005
48	Surge tanks	PH#1: 3-40' dia., PH#2: 2-65' dia.	65' dia. - 2 per penstock	70' dia., 2 per penstock
49	No., type and speed of turbines	5 Francis, PH#1-2: 128.5 rpm, 1-164 rpm , PH#2-2: 128.6 rpm	5 Francis, 90 rpm	7 Francis, 100 rpm
50	Discharge cap. at rated head in cfs	PH#1, units 1&3 170', 2-140' 8,800 cfs, PH#2-4&5 170'-7,200 cfs	150' 41,000 cfs	185' 54,000 cfs
51	Generator nameplate rating in kW	1&3: 43,500; 2: 18,250; 4&5: 40,000	3 - 121,600, 2 - 109,250	112,290
52	Plant capacity in kW	185,250	583,300	786,030
53	Dependable capacity in kW (9)	181,000	388,000	534,000
54	Avg. annual energy, million kWh (12)	1,035	2,296	2,662
55	Initial generation, first and last unit	July 1943 - June 1961	January 1956 - October 1960	April 1962 - June 1963
56	Estimated cost September 1999 completed project (13)	$158,428,000	$305,274,000	$346,521,000

Summary of Engineering Data -- Missouri River Mainstem System

Big Bend Dam - Lake Sharpe	Fort Randall Dam - Lake Francis Case	Gavins Point Dam - Lewis & Clark Lake	Total	Item No.	Remarks
21 miles upstream Chamberlain, SD	Near Lake Andes, SD	Near Yankton, SD		1	(1) Includes 4,280 square miles of non-contributing areas.
Mile 987.4	Mile 880.0	Mile 811.1		2	
249,330 (1) 5,840	263,480 (1) 14,150	279,480 (1) 16,000		3	(2) Includes 1,350 square miles of non-contributing areas.
80, ending near Pierre, SD	107, ending at Big Bend Dam	25, ending near Niobrara, NE	755 miles	4	
200 (elevation 1420)	540 (elevation 1350)	90 (elevation 1204.5)	5,940 miles	5	(3) With pool at base of flood control.
28,900	30,000 1,100	32,000 2,000		6	
440,000 (April 1952)	447,000 (April 1952)	480,000 (April 1952)		7	(4) Storage first available for regulation of flows.
1959	1946	1952		8	(5) Damming height is height from low water to maximum operating pool. Maximum height is from average streambed to top of dam.
1964	1953	1955		9	
1440	1395	1234		10	
10,570 (including spillway)	10,700 (including spillway)	8,700 (including spillway)	71,596	11	(6) Based on latest available storage data.
78	140	45	863 feet	12	
95	165	74		13	(7) River regulation is attained by flows over low-crested spillway and through turbines.
1200, 700	4300, 1250	850, 450		14	
Pierre shale & Niobrara chalk	Niobrara chalk	Niobrara chalk & Carlile shale		15	(8) Length from upstream face of outlet or to spiral case.
Rolled earth, shale, chalk fill	Rolled earth fill & chalk berms	Rolled earth & chalk fill		16	
17,000,000	28,000,000 & 22,000,000	7,000,000	358,128,000 cu. yds	17	(9) Based on 8th year (1961) of drought drawdown (From study 8-83-1985).
540,000	961,000	308,000	5,554,000 cu. yds.	18	
24 July 1963	20 July 1952	31 July 1955		19	
Left bank - adjacent	Left bank - adjacent	Right bank - adjacent		20	(10) Affected by level of Lake Francis case. Applicable to pool at elevation 1350.
1385	1346	1180		21	
376 gated	1000 gated	664 gated		22	(11) Spillway crest.
8 - 40' x 38' Tainter	21 - 40' x 29' Tainter	14 - 40' x 30' Tainter		23	(12) 1967-2019 Average
390,000 at elev 1433.6	620,000 at elev 1379.3	584,000 at elev 1221.4		24	(13) Source: Annual Report on Civil Works Activities of the Corps of Engineers. Extract Report Fiscal Year 1999.
270,000	508,000	345,000		25	
1423 msl 62,000 acres	1375 msl 102,000 acres	1210 msl 29,000 acres	1,206,000 acres	26	(14) Based on Study 8-83-1985
1422 msl 60,000 acres	1365 msl 94,000 acres	1208 msl 25,000 acres	1,146,000 acres	27	(15) 67,275 kW on per unit basis 64,684 kW on facility basis
1420 msl 58,000 acres	1350 msl 76,000 acres	1204.5 msl 21,000 acres	984,000 acres	28	
1415 msl 51,000 acres	1320 msl 36,000 acres	1204.5 msl 21,000 acres	437,000 acres	29	
1423-1422 61,000 a.f.	1375-1365 986,000 a.f.	1210-1208 54,000 a.f.	4,674,000 a.f.	30	
1422-1420 118,000 a.f.	1365-1350 1,306,000 a.f.	1208-1204.5 79,000 a.f.	11,626,000 a.f.	31	
	1350-1320 1,532,000 a.f.		38,536,000 a.f.	32	
1420-1345 1,631,000 a.f.	1320-1240 1,469,000 a.f.	1204.5-1160 295,000 a.f.	17,592,000 a.f.	33	
1423-1345 1,810,000 a.f.	1375-1240 5,293,000 a.f.	1210-1160 428,000 a.f.	72,428,000 a.f.	34	
November 1963	January 1953	August 1955		35	
25 March 1964	24 November 1953	22 December 1955		36	
3,445 a.f./year 525 yrs.	15,800 a.f./year 334 yrs.	2,700 a.f./year 159 yrs.	75,545	37	
	Left Bank			38	
None (7)	4 - 22' diameter	None (7)		39	
	1013			40	
	2 - 11' x 23' per conduit, vertical lift, cable suspension			41	
1385 (11)	1229	1180 (11)		42	
	Elev 1375			43	
	32,000 cfs - 128,000 cfs				
1351-1355(10) 25,000-100,000 cfs	1228-1237 10,000-60,000 cfs	1153-1161 15,000-60,000 cfs		44	
70	117	48	764 feet	45	
None: direct intake	8 - 28' dia., 22' penstocks	None: direct intake		46	
	1,074		55,083	47	
None	59' dia, 2 per alternate penstock	None		48	
8 Fixed blade, 81.8 rpm	8 Francis, 85.7 rpm	3 Kaplan, 75 rpm	36 units	49	
67' 103,000 cfs	112' 44,500 cfs	48' 36,000 cfs		50	
67,275 (15)	40,000	44,100		51	
517,470	320,000	132,300	2,524,350 kw	52	
497,000	293,000	74,000	1,967,000 kw	53	Corps of Engineers, U.S. Army
993	1,729	725	9,439 million kWh	54	Compiled by
October 1964 - July 1966	March 1954 - January 1956	September 1956 - January 1957	July 1943 - July 1966	55	Northwestern Division
				56	Missouri River Region
$107,498,000	$199,066,000	$49,617,000	$1,166,404,000		August 2020

Plate 2

Plate 3
Summary of Master Manual Technical Criteria

NAVIGATION TARGET FLOWS

Location	Minimum Service (kcfs)	Full Service (kcfs)
Sioux City	25	31
Omaha	25	31
Nebraska City	31	37
Kansas City	35	41

RELATION OF SYSTEM STORAGE TO NAVIGATION SERVICE LEVEL

Date	System Storage (MAF)	Navigation Service Level
March 15	54.5 or more	35,000 cfs (full-service)
March 15	49.0 to 31	29,000 cfs (minimum-service)
March 15	31.0 or less	No navigation service
July 1	57.0 or more	35,000 cfs (full-service)
July 1	50.5 or less	29,000 cfs (minimum-service)

RELATION OF SYSTEM STORAGE TO NAVIGATION SEASON LENGTH

Date	System Storage (MAF)	Final Day of Navigation Support at Mouth of the Missouri River
July 1	51.5 or more	November 30 (8-month season)
July 1	46.8 through 41.0	October 31 (7-month season)
July 1	36.5 or less	September 30 (6-month season)

RELATION OF SYSTEM WINTER RELEASE TO SYSTEM STORAGE

September 1 System Storage (MAF)	Average Winter Release for Gavins Point
58.0 or more	17,000 cfs
55.0 or less	12,000 cfs

Plate 3 (cont'd)
Summary of Master Manual Technical Criteria

GAVINS POINT RELEASES NEEDED TO MEET TARGET FLOWS
1950 to 1996 Data (kcfs)

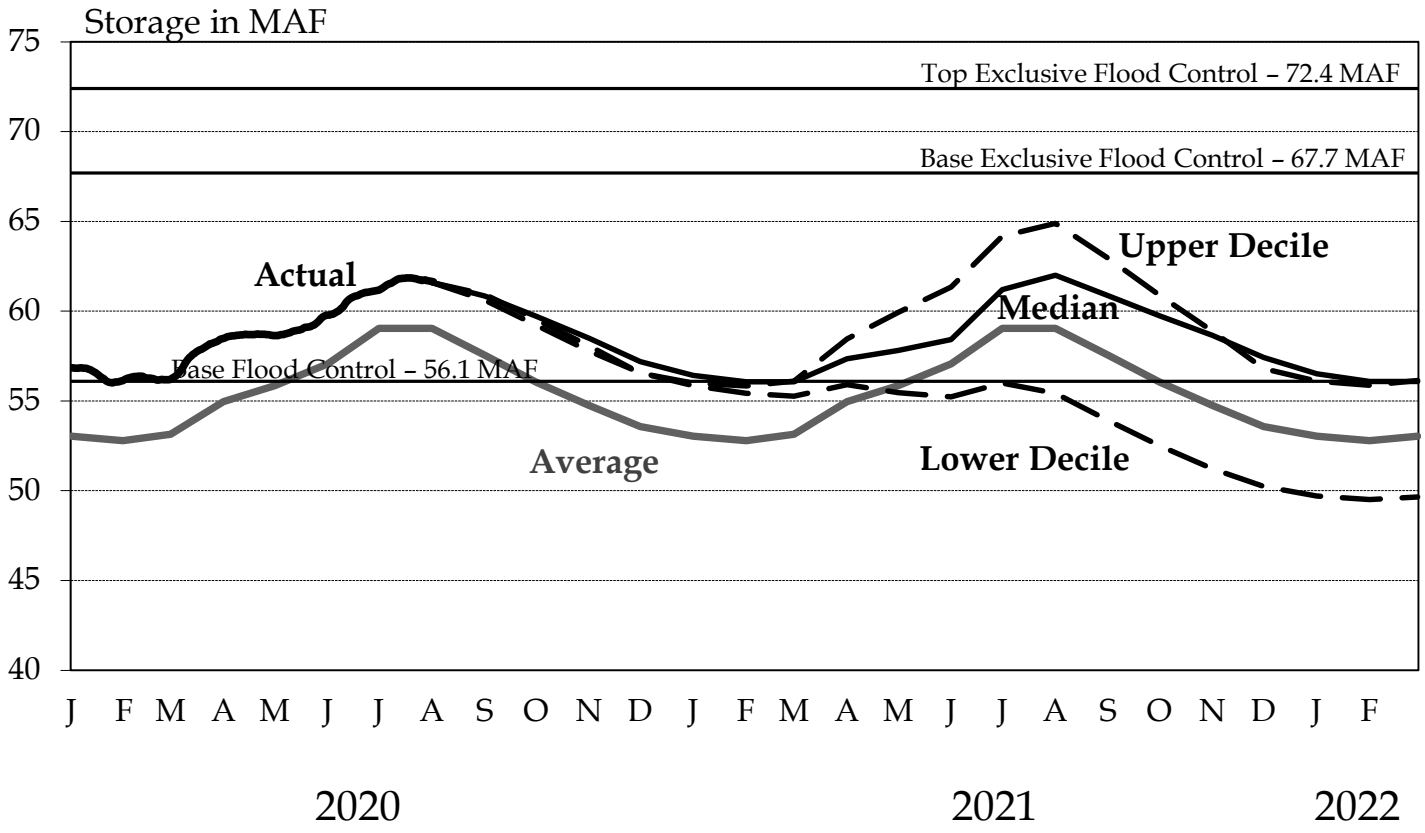
Median, Upper Quartile, Upper Decile Runoff

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Full Service	26.7	28.0	27.9	31.6	33.2	32.6	32.0	31.1
Minimum Service	20.7	22.0	21.9	25.6	27.2	26.6	26.0	25.1

Lower Quartile, Lower Decile Runoff

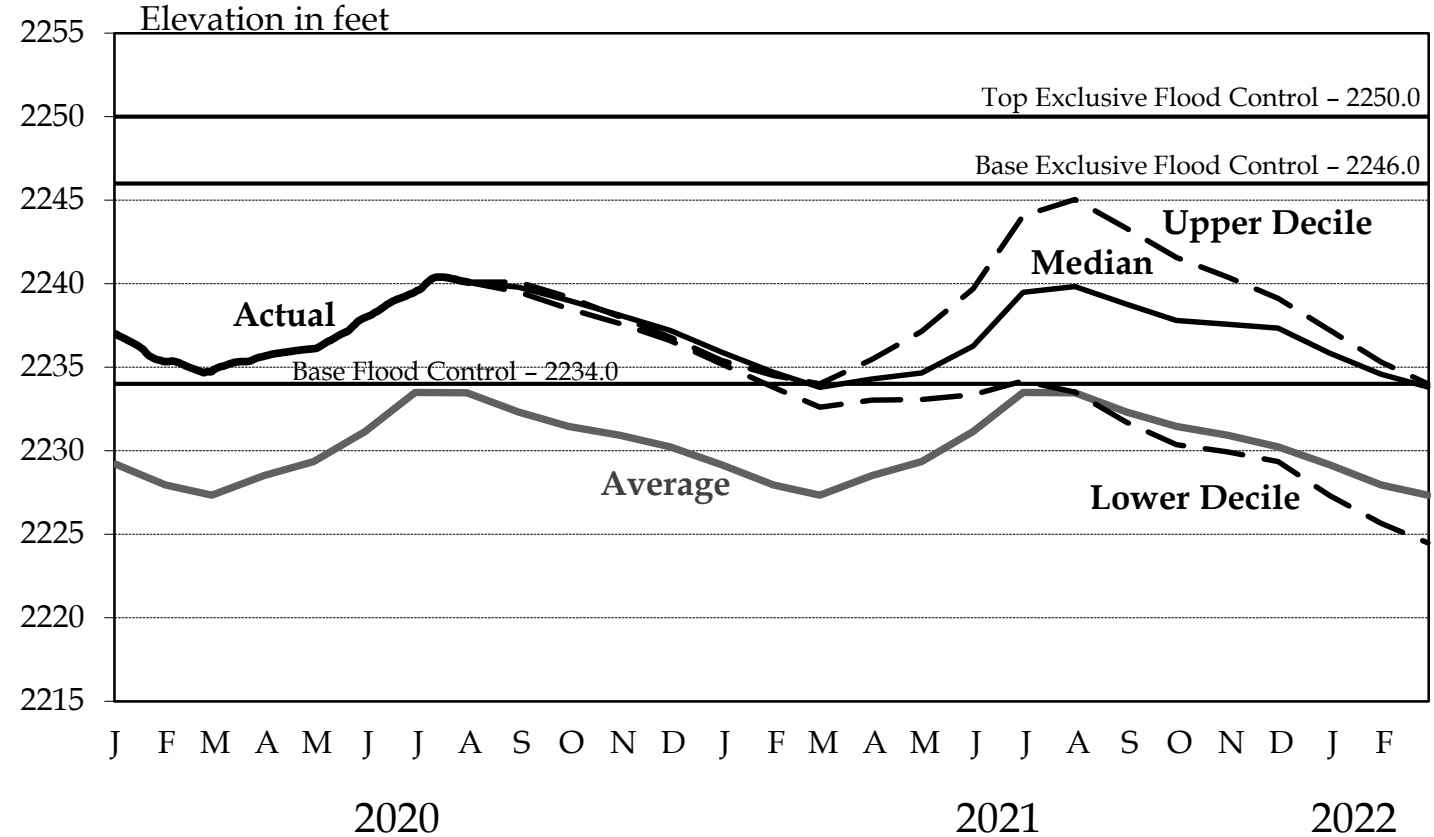
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Full Service	29.8	31.3	31.2	34.3	34.0	33.5	33.1	31.2
Minimum Service	23.8	25.3	25.2	28.3	28.0	27.5	27.1	25.2

System Storage
2020-2021 Draft AOP



Average 1967-2019

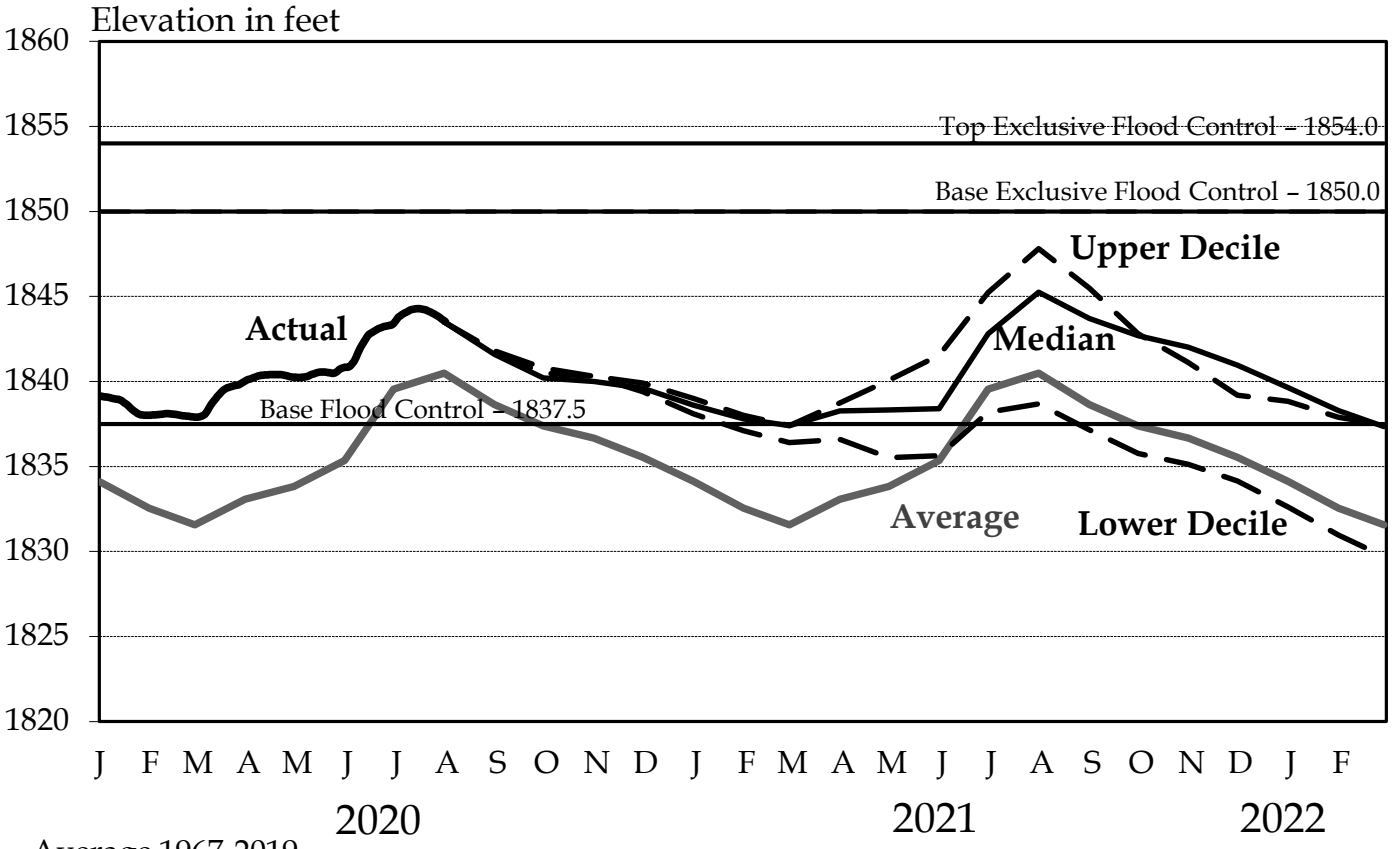
Fort Peck
2020-2021 Draft AOP



Average 1967-2019

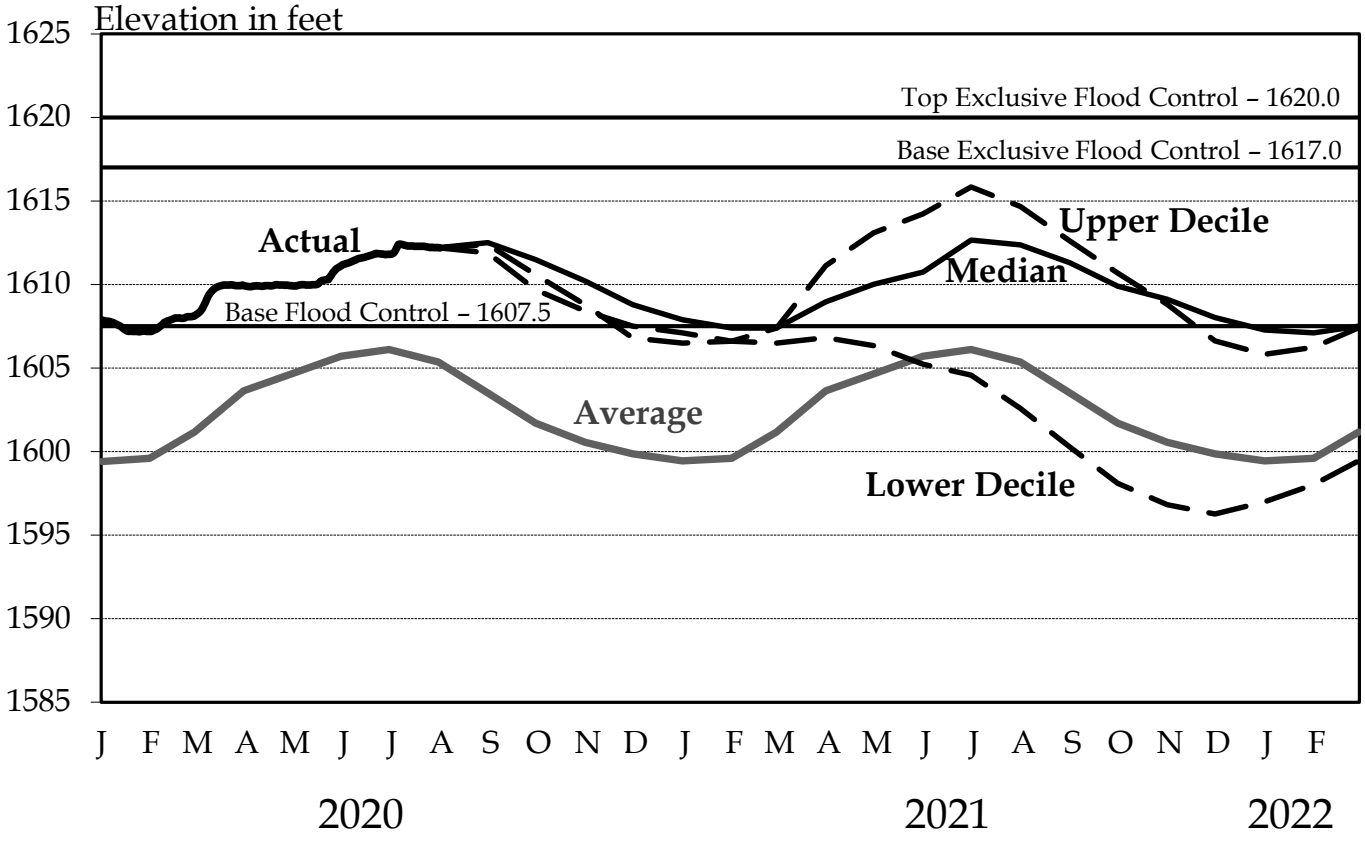
Plate 4

Garrison
2020-2021 Draft AOP



Average 1967-2019

Oahe
2020-2021 Draft AOP



Average 1967-2019

Plate 5

System Storage

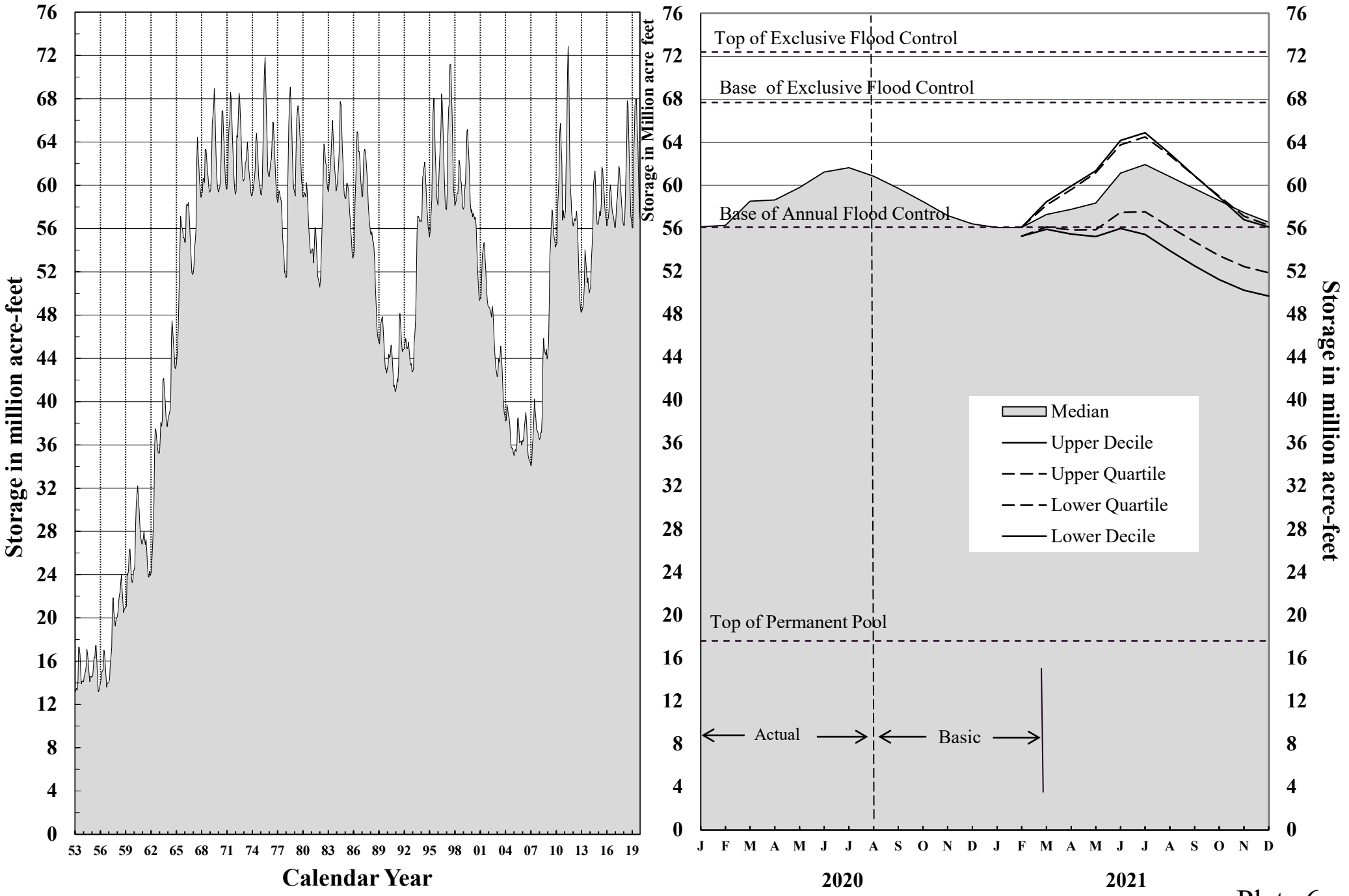


Plate 6

Gavins Point Releases

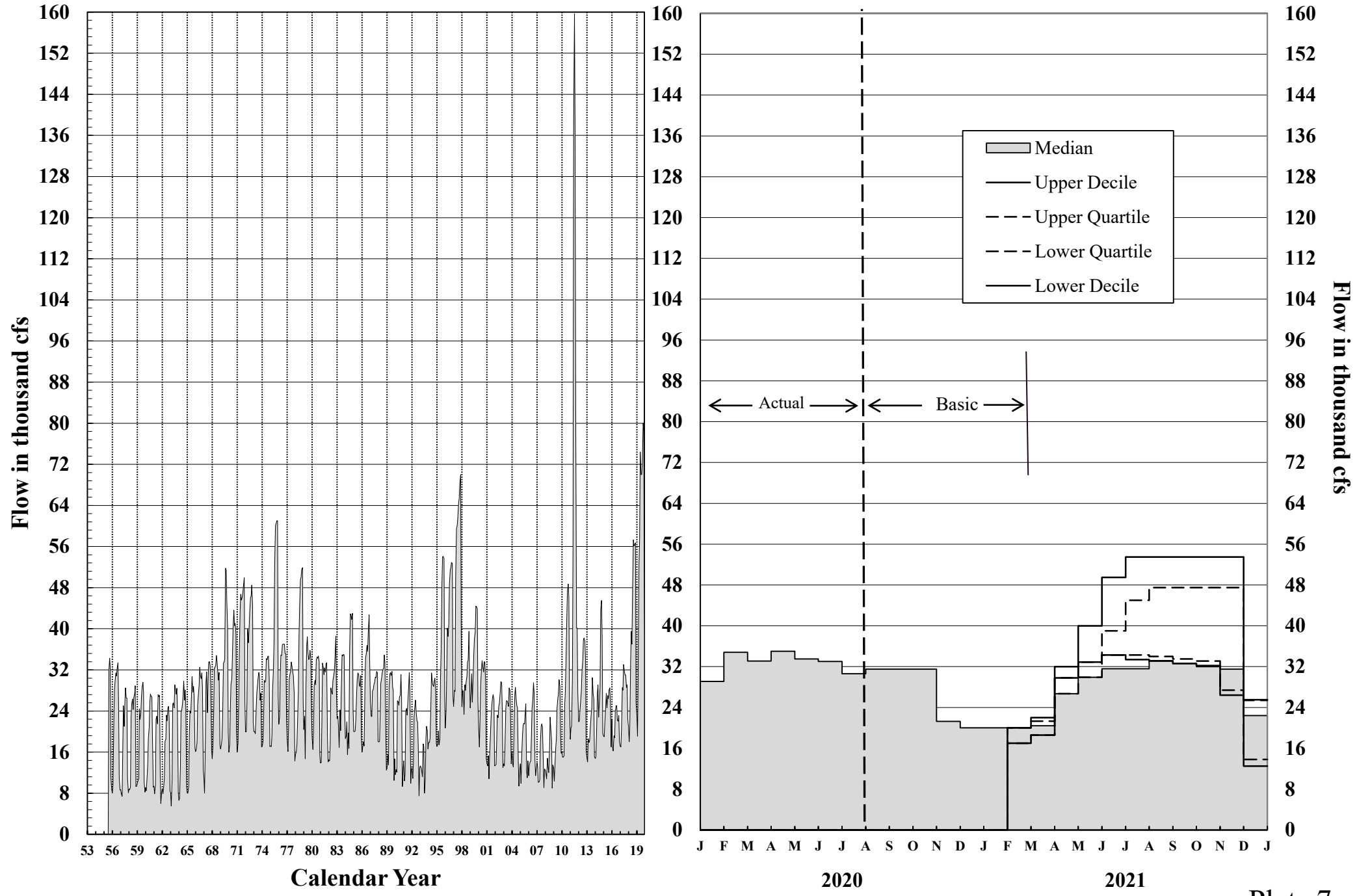
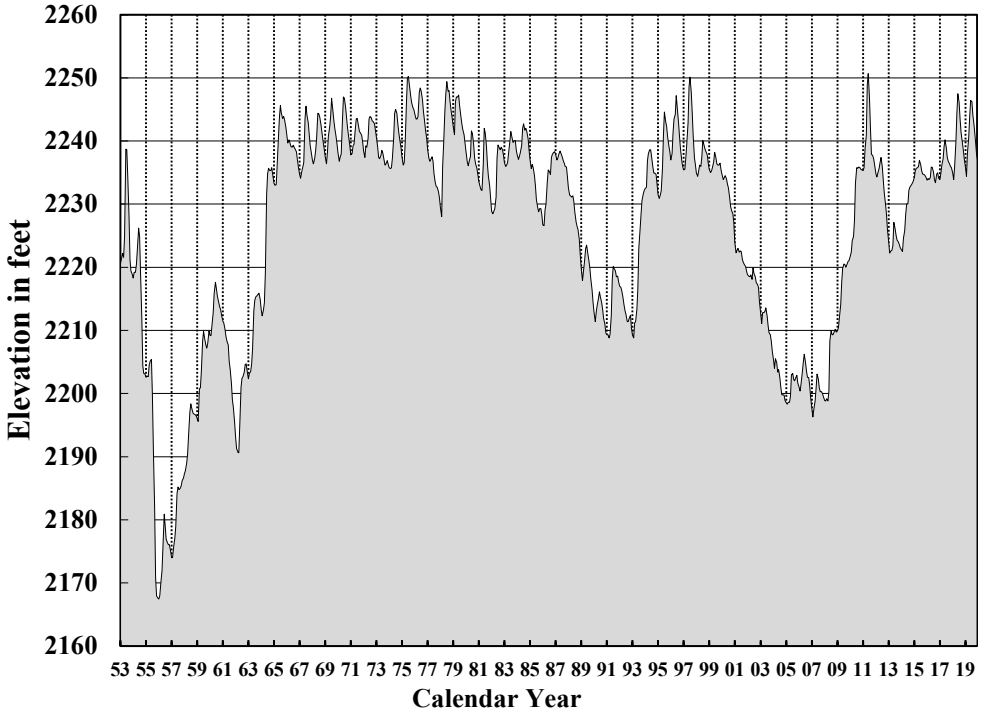
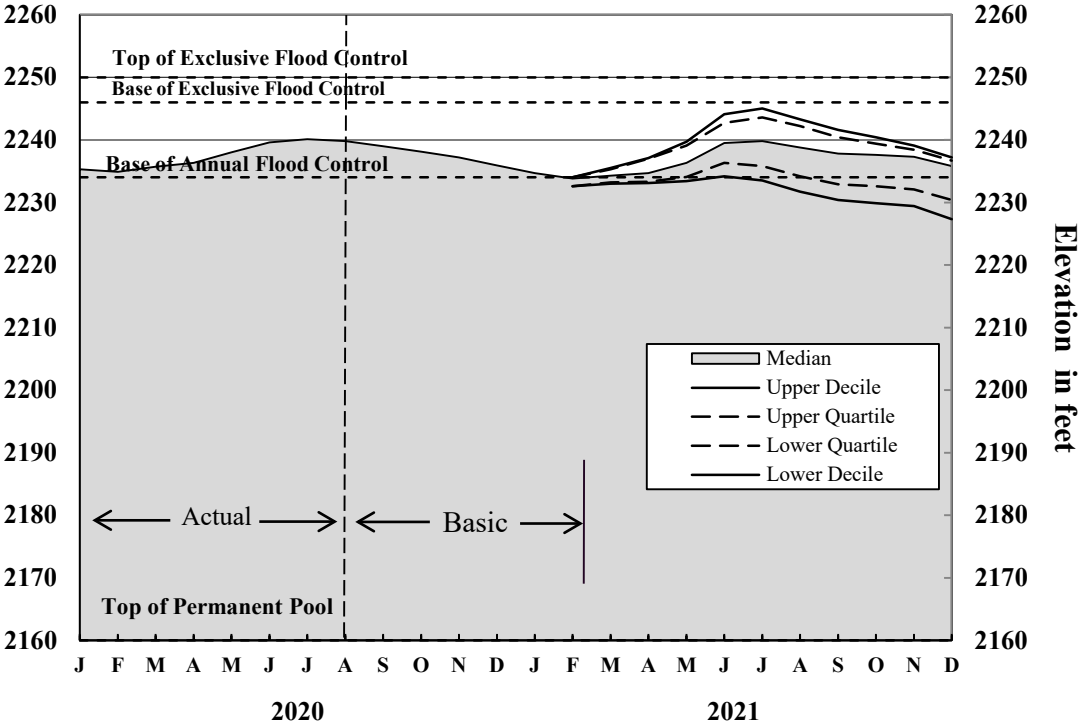
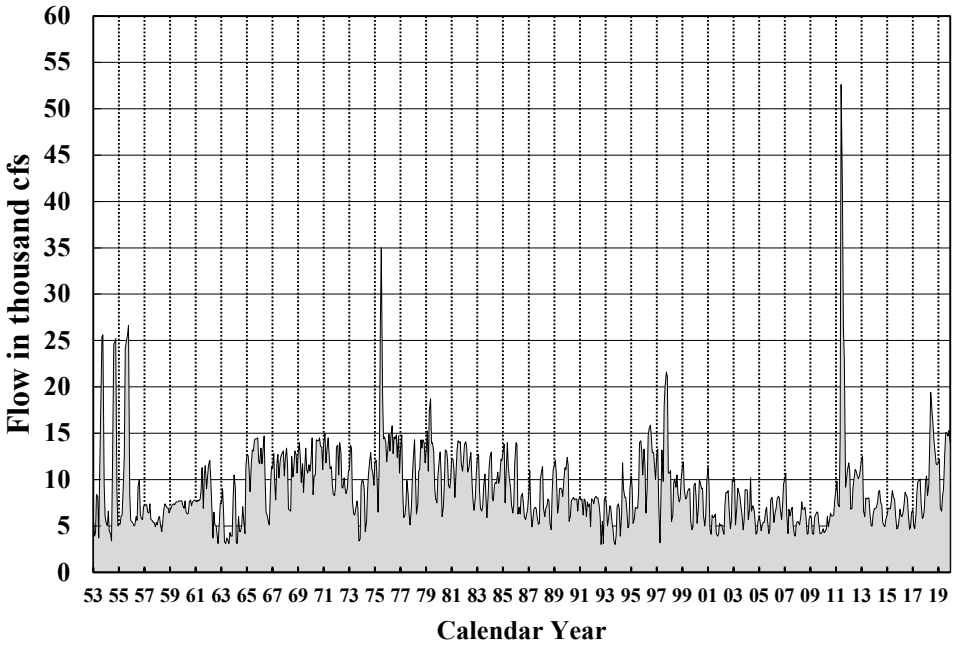


Plate 7

Fort Peck
Elevations and Releases







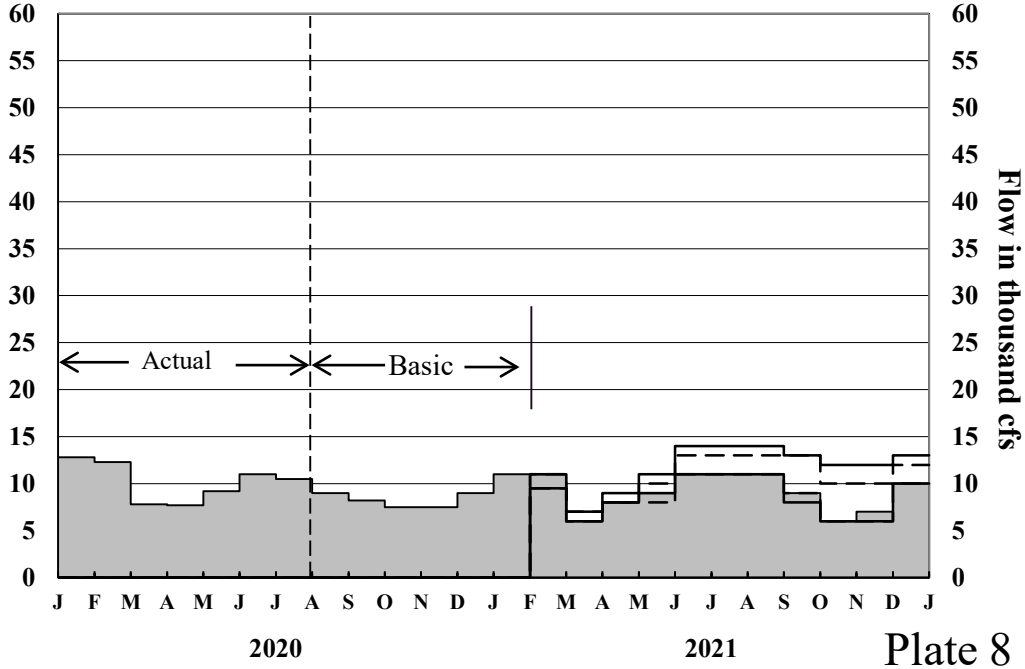
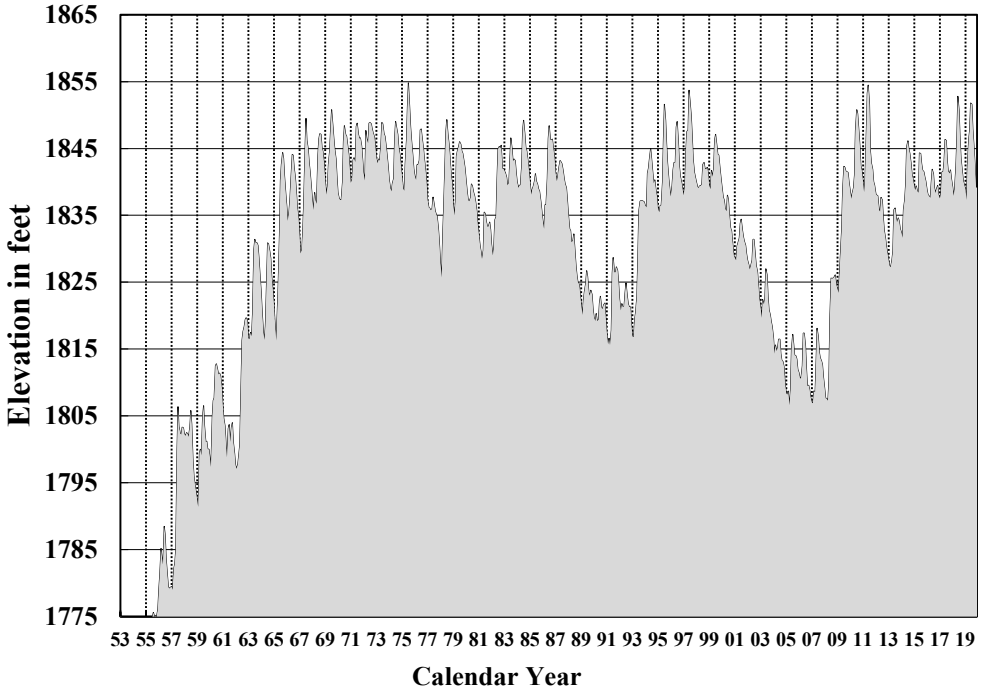
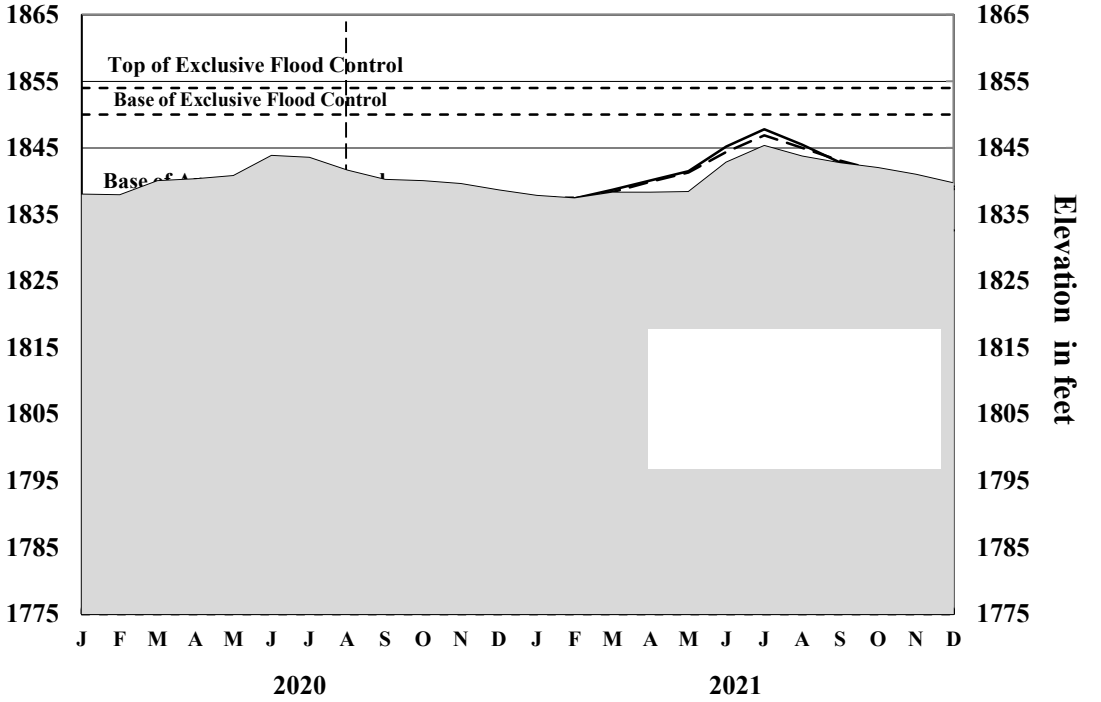
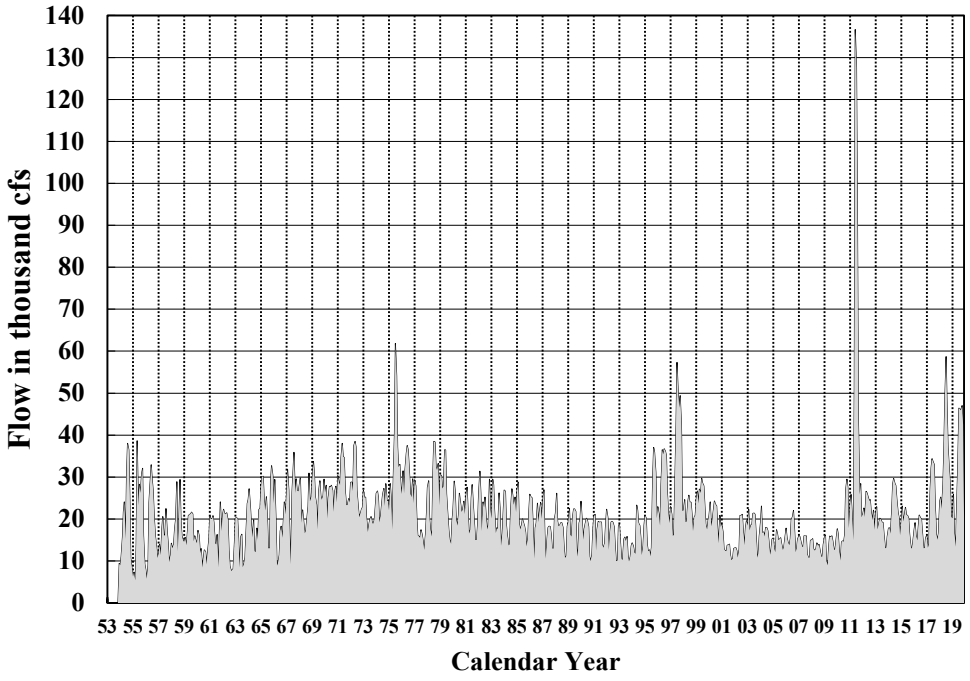


Plate 8

Garrison
Elevations and Releases







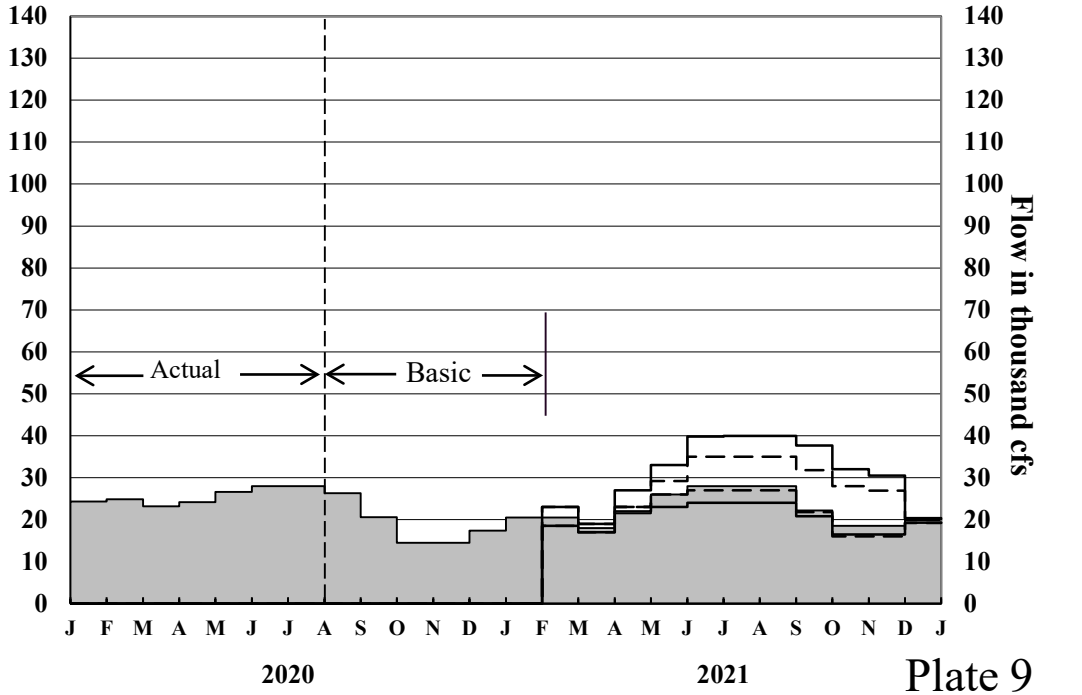
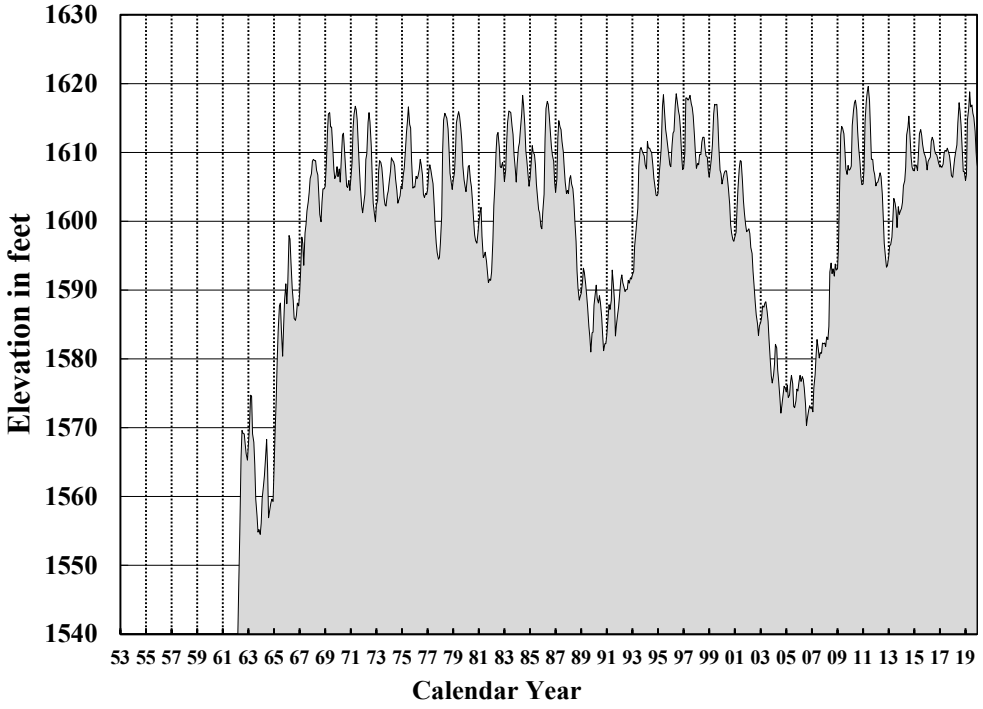
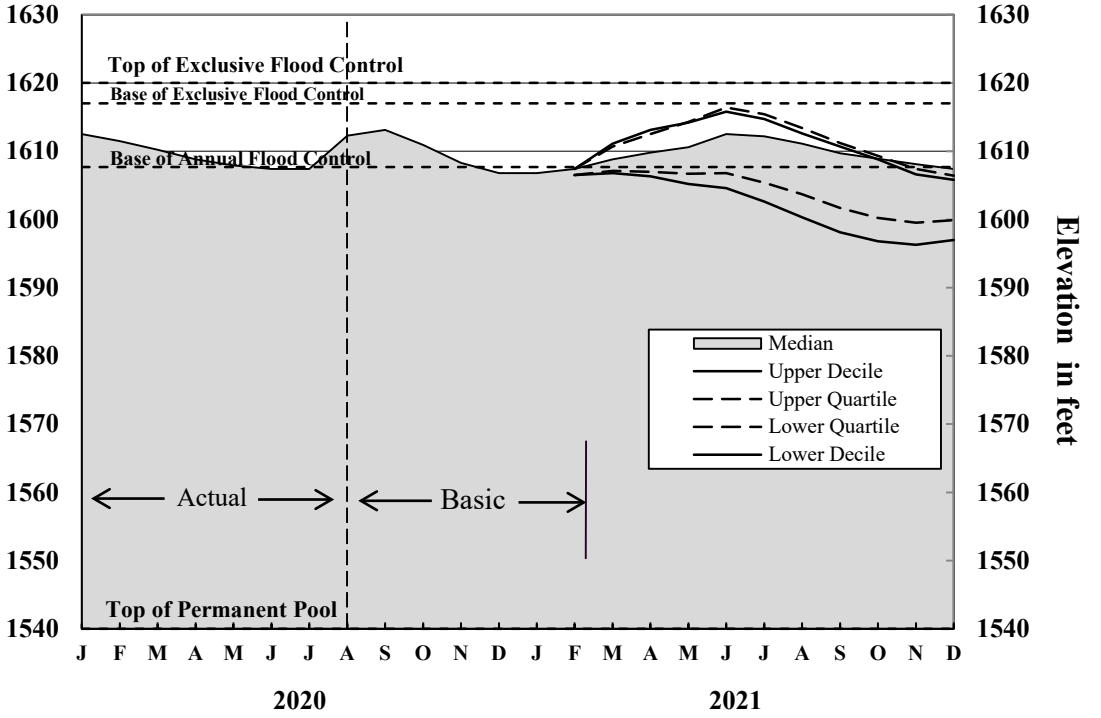
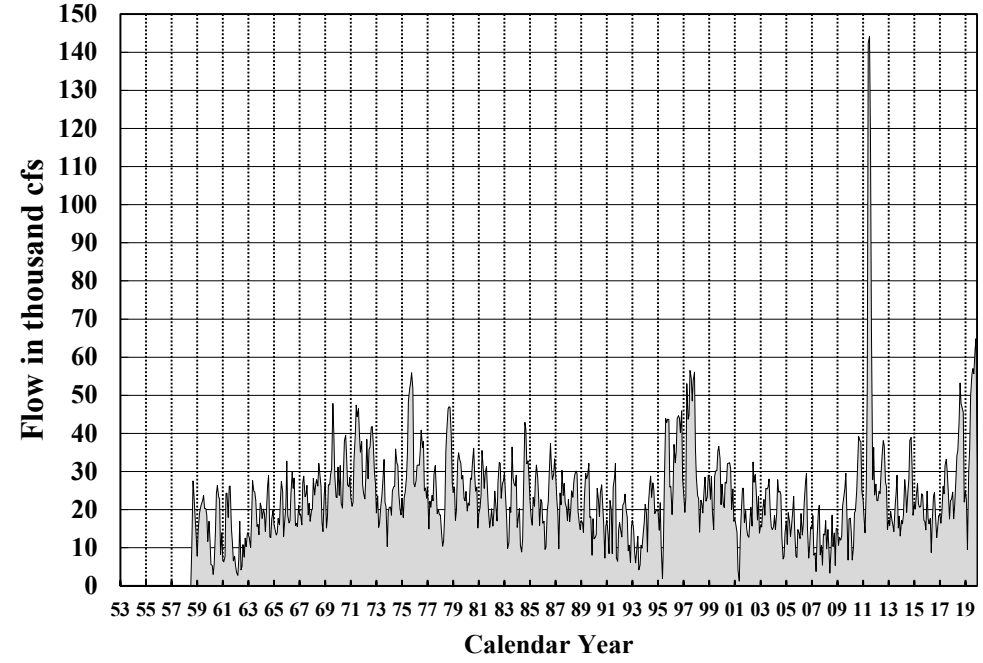


Plate 9

Oahe
Elevations and Releases







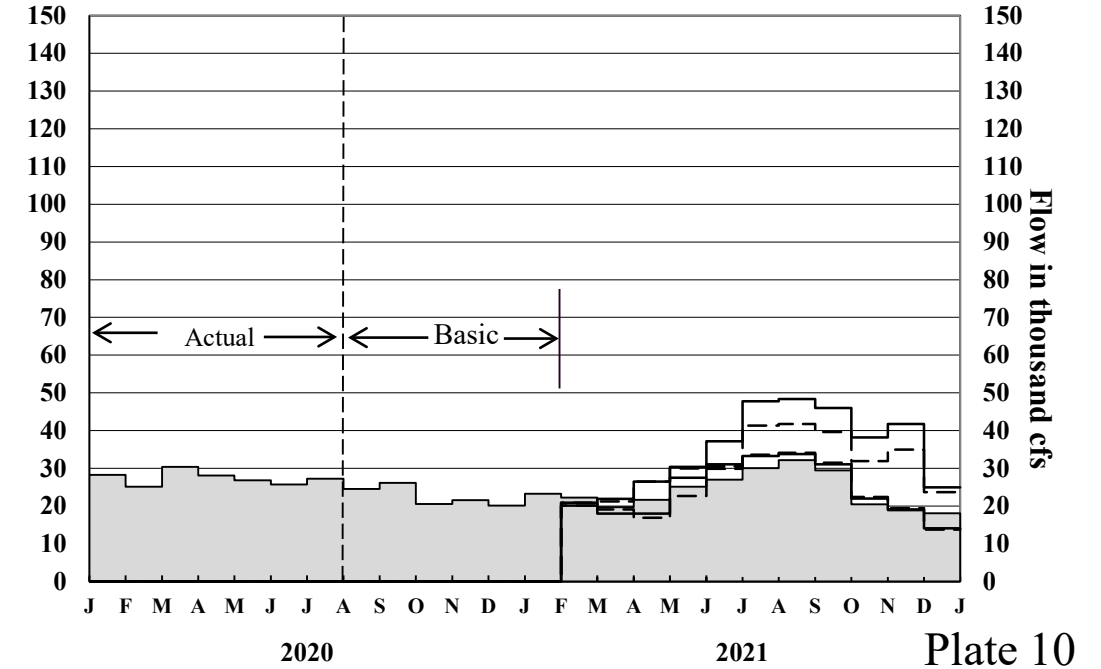
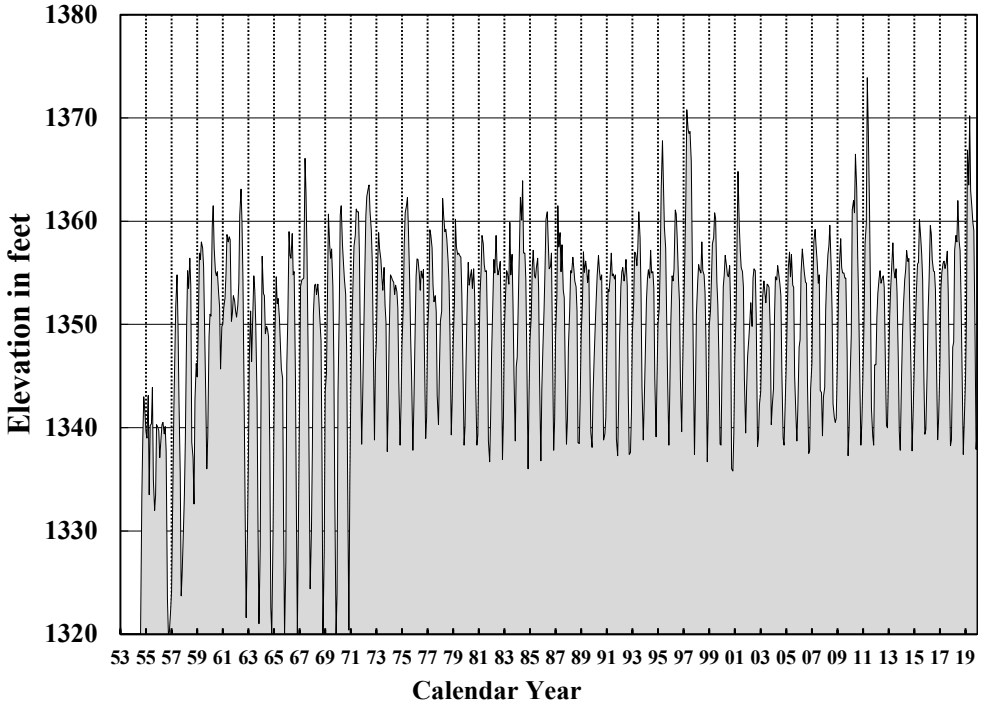
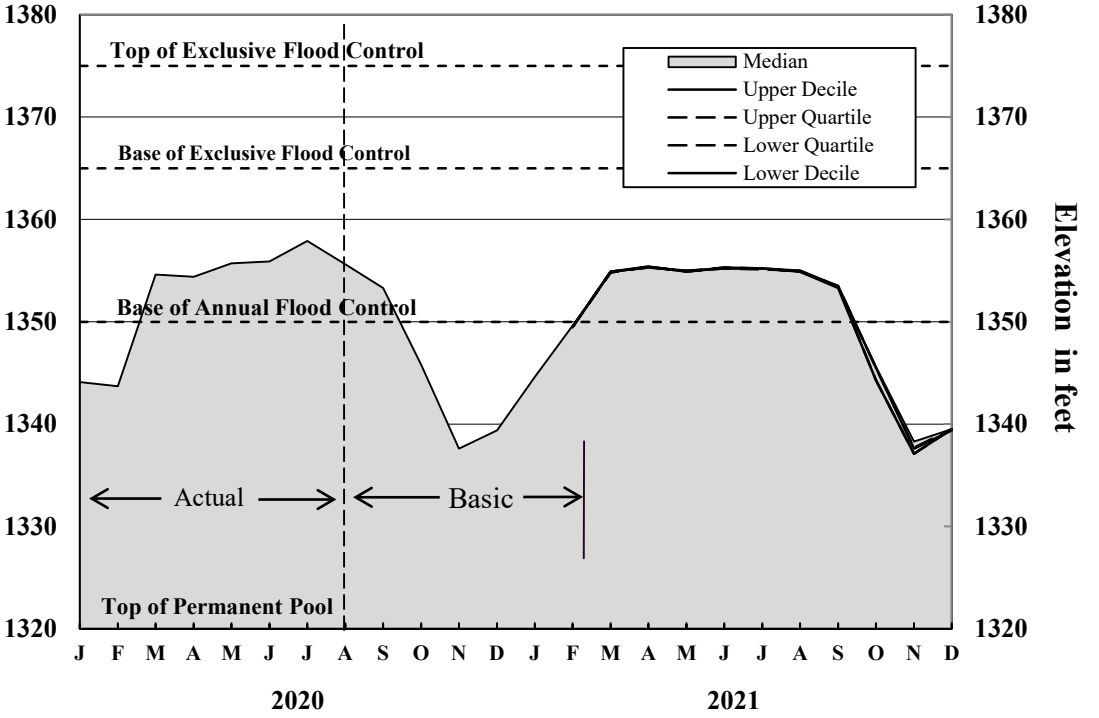
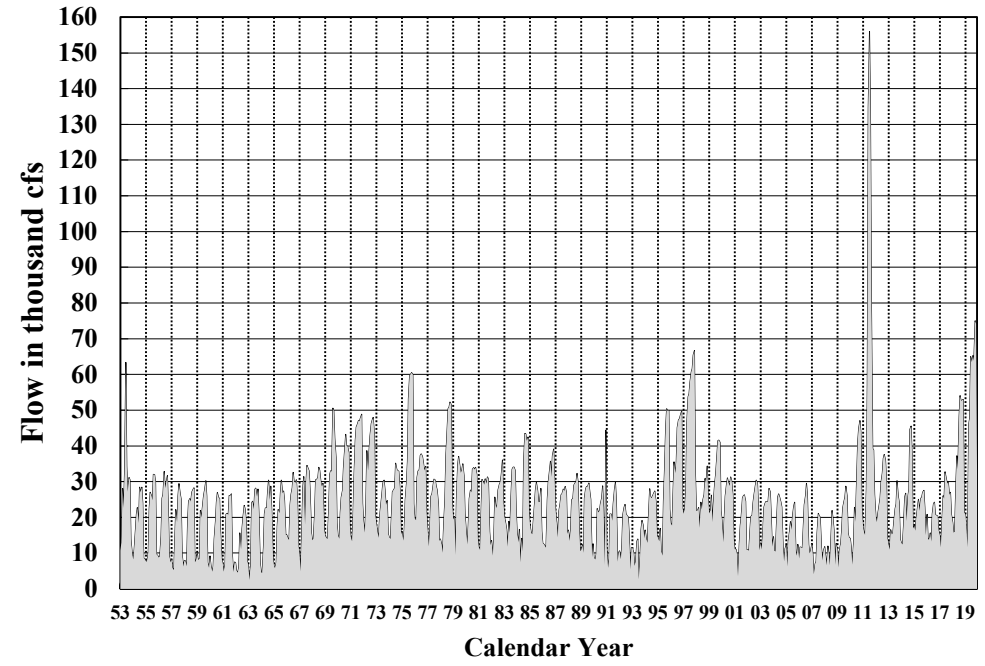


Plate 10

Fort Randall
Elevations and Releases







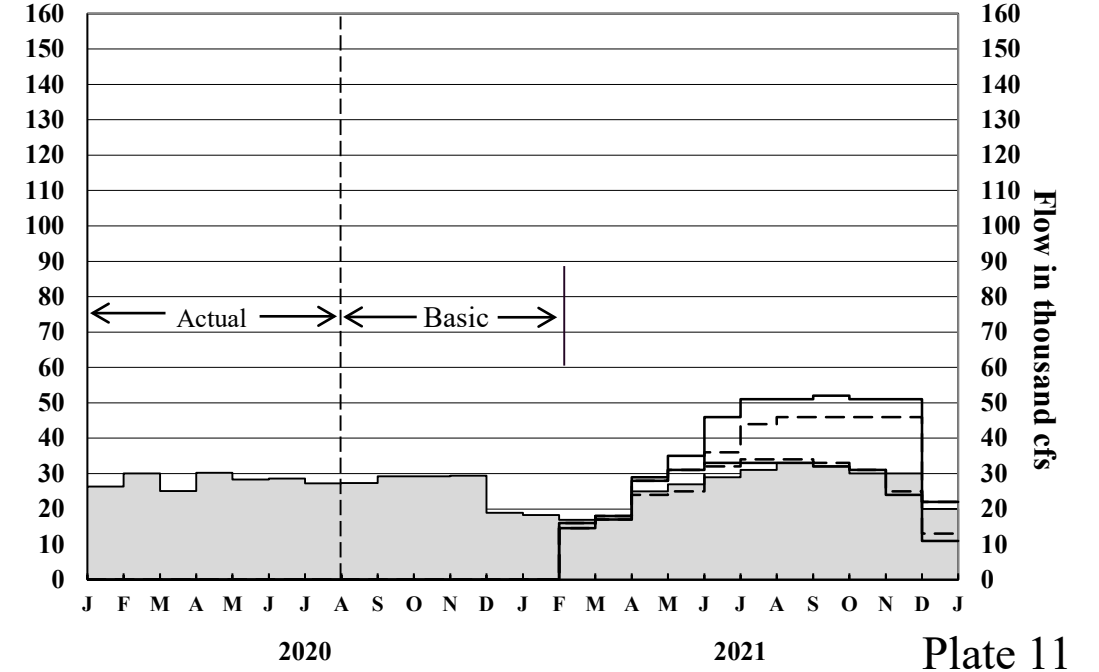
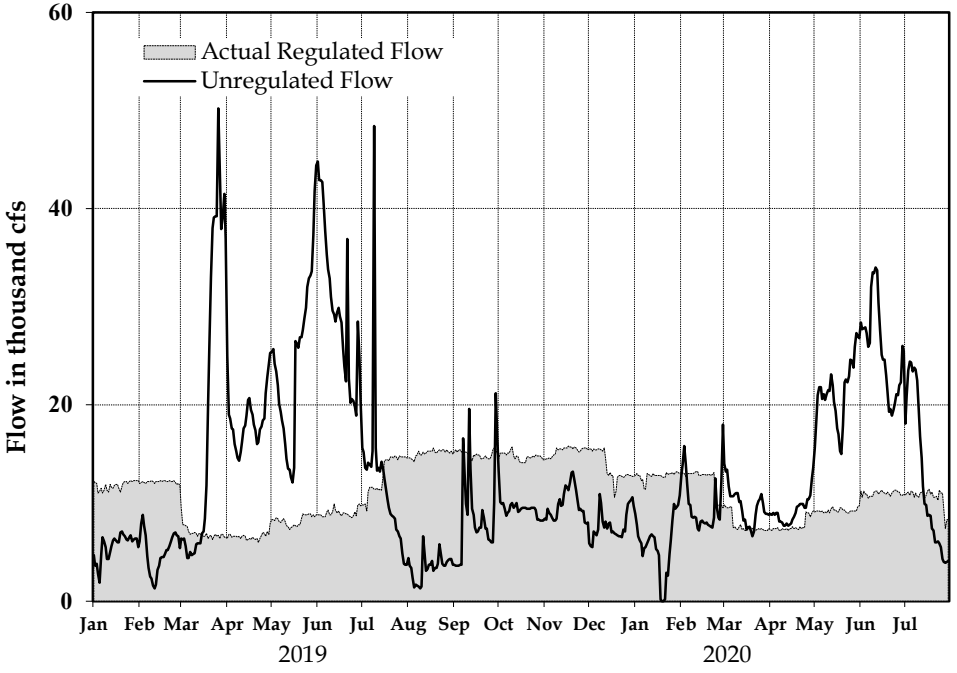


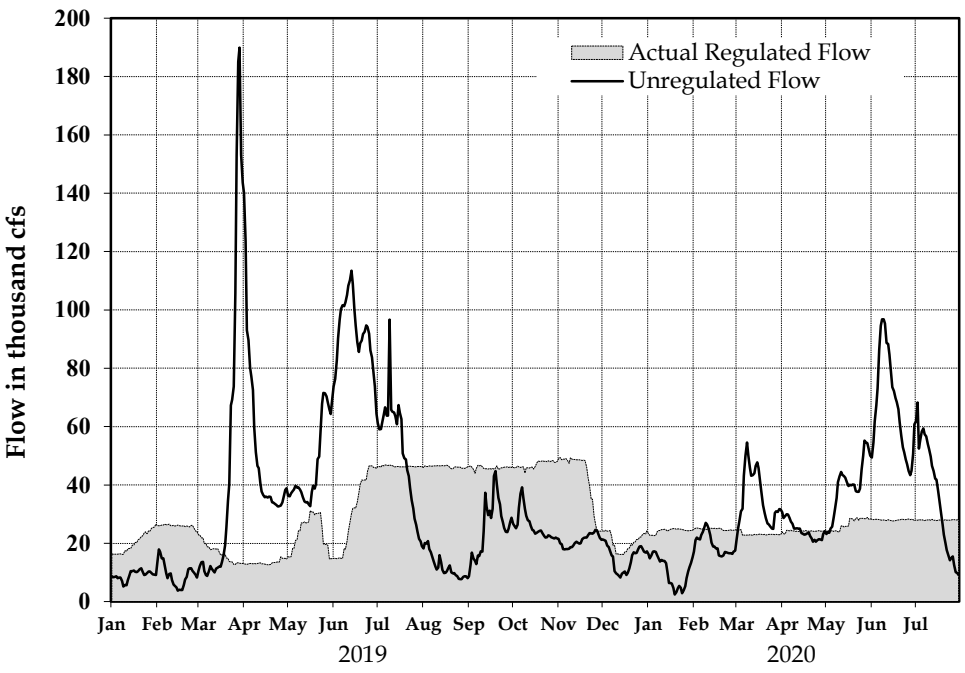
Plate 11

Reservoir Release and Unregulated Flow

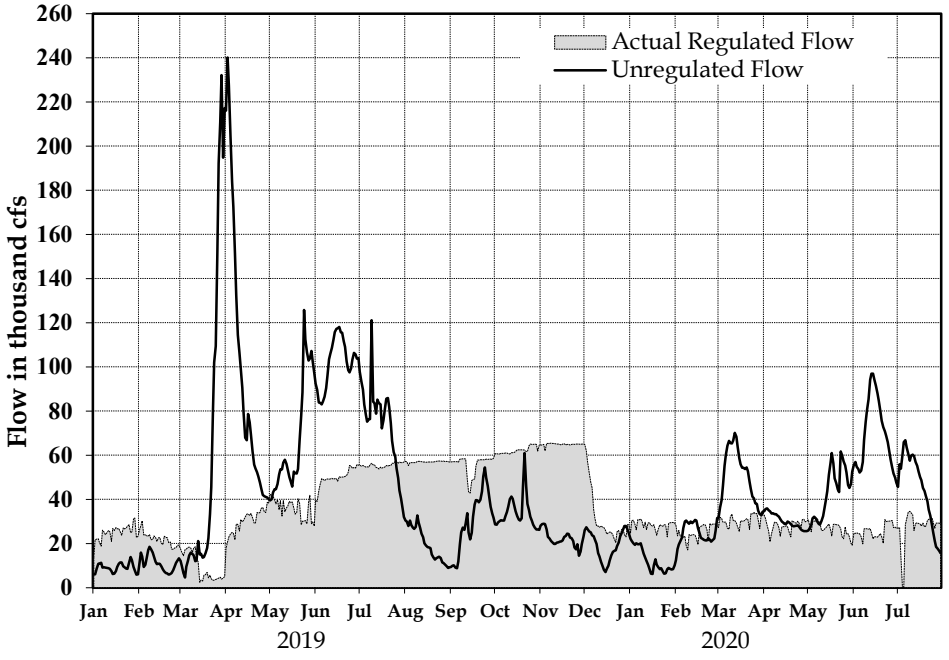
Fort Peck



Garrison



Oahe



Gavins Point

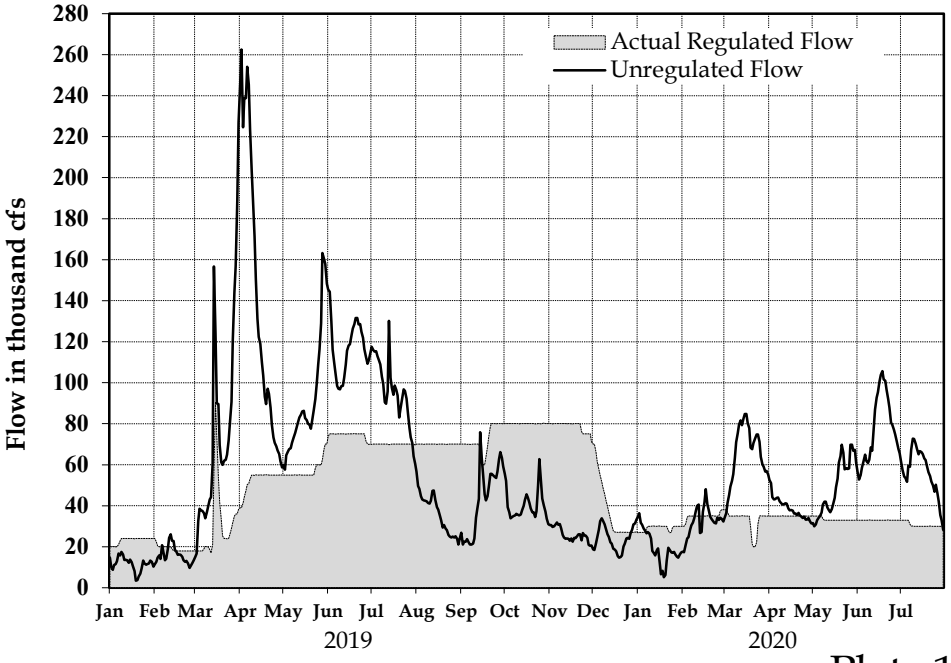
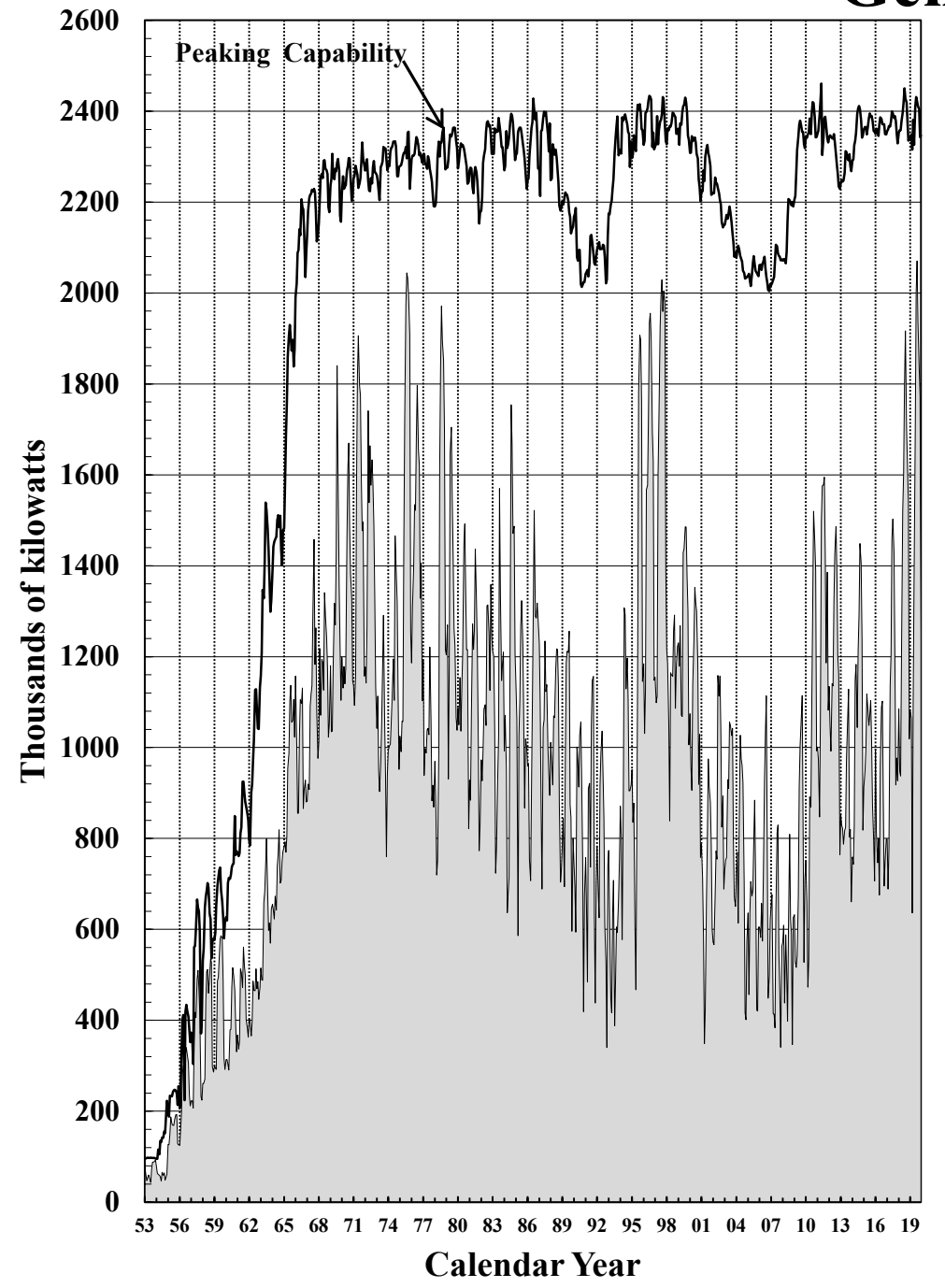


Plate 12

System Gross Capability and Average Monthly Generation



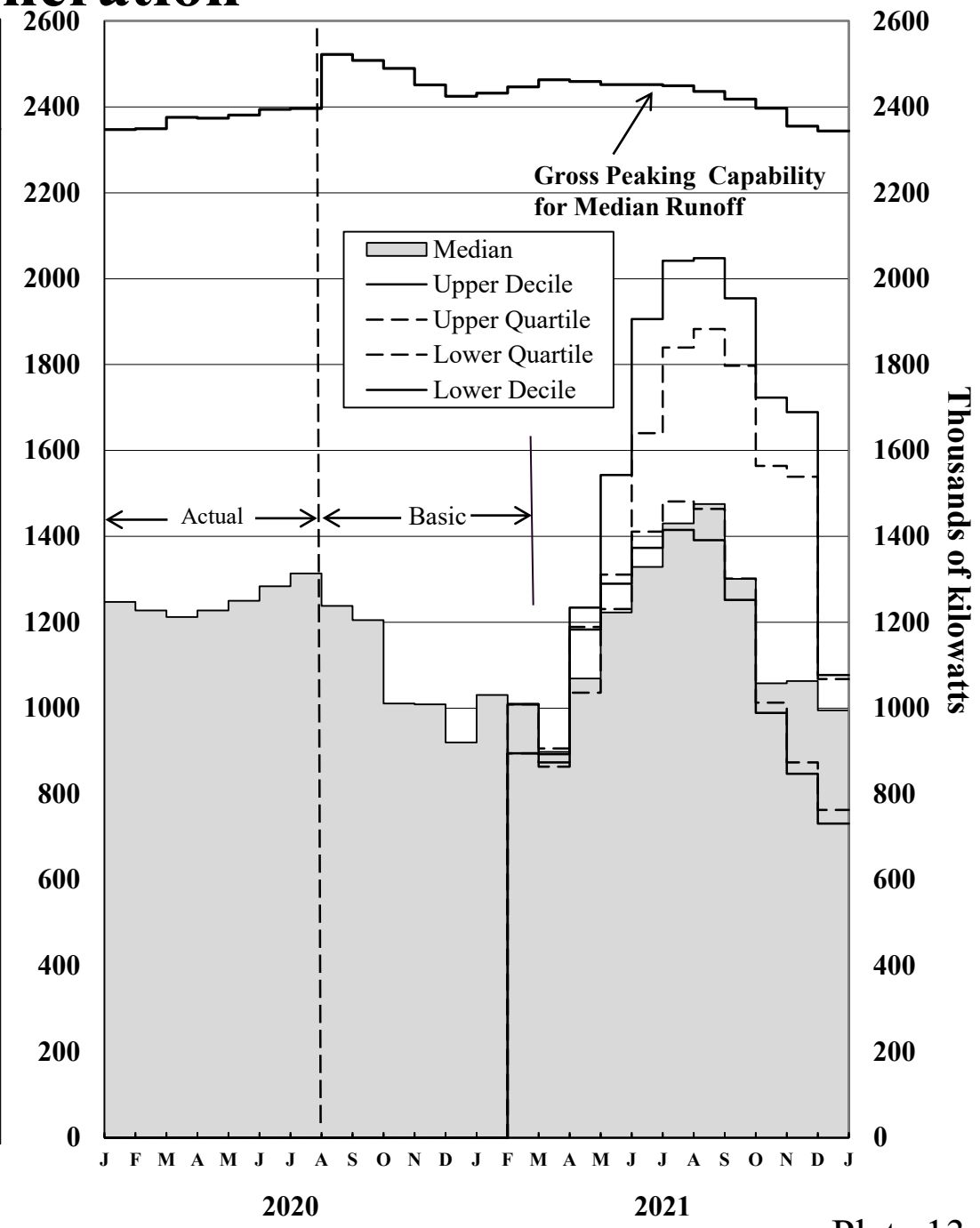


Plate 13

Tribal Lands of the Missouri River Basin

US Army Corps of Engineers ®

RESERVATIONS

1. Rocky Boy
2. Fort Belknap
3. Fort Peck
4. Fort Berthold
5. Turtle Mountain
6. Fort Totten
7. Red Lake
8. Nett Lake
9. White Earth
10. Leech Lake
11. Fond du Lac
12. Bad River
13. Lac Courte Oreilles
14. Lac du Flambeau
15. Crow
16. Northern Cheyenne
17. Standing Rock
18. Cheyenne River
19. Sisseton
20. Wind River
21. Pine RIdge
22. Rosebud
23. Lower Brule
24. Crow Creek
25. Yankton
26. Winnebago
27. Omaha
28. Potawatomi
29. Ute Mountain
30. Southern Ute
31. Flathead
32. Blackfeet
33. Santee
34. Flandreau
35. Iowa
36. Sac and Fox
37. Kickapoo

Missouri River Basin

Bureau of Indian Affairs - Tribal Lands

Department of Defense - Military installations and U.S. Army Corps of Engineers Lands and Reservoirs

Plate 14

	2020 *31Jul F-Sum	31Aug	30Sep	31Oct	30Nov	31Dec	2021 31Jan	28Feb
Fort Peck								
Reach Inflow	2261	320	295	340	340	290	312	364
Depletion	-589	-257	-120	-12	20	-41	-108	-70
Reg Inflow	2850	577	415	352	320	331	420	434
Evap	414	89	106	79	76	53	7	4
Release	3792	553	491	461	446	553	676	611
Stor Change	-1360	-68	-182	-188	-203	-275	-263	-181
Storage	*16115	16048	15865	15677	15475	15200	14937	14756
Elev NGVD29	*2240.1	2239.8	2239.0	2238.1	2237.2	2235.9	2234.7	2233.8
Disch kcfs	*10.5	9.0	8.2	7.5	7.5	9.0	11.0	11.0
Ave Power MW		126	115	105	104	124	151	150
Ave Cap MW		225	224	223	222	221	220	219
Energy GWh	635.7	93.9	83.1	77.9	75.1	92.5	112.3	100.9
Garrison								
Reach Inflow	2439	400	350	475	360	230	263	361
Depletion	-427	-123	-75	-14	-29	-68	-68	-49
Reg Inflow	6636	1071	928	950	836	839	991	1021
Evap	541	99	130	126	111	75	-2	0
Release	8067	1619	1225	892	863	1070	1260	1139
Stor Change	-1975	-650	-426	-68	-139	-306	-268	-118
Storage	*19682	19032	18605	18537	18398	18092	17824	17707
Elev NGVD29	*1843.5	1841.6	1840.2	1840.0	1839.6	1838.6	1837.8	1837.4
Disch kcfs	*28.0	26.3	20.6	14.5	14.5	17.4	20.5	20.5
Ave Power MW		342	267	189	189	225	263	262
Ave Cap MW		583	578	576	575	573	569	567
Energy GWh	1261.7	254.7	192.0	140.5	135.8	167.3	195.4	176.0
Oahe								
Reach Inflow	441	90	100	70	60	9	12	100
Depletion	7	16	0	-8	-5	-3	-1	8
Reg Inflow	8528	1700	1365	970	928	1061	1273	1231
Evap	568	90	139	126	110	89	9	5
Release	9519	1508	1555	1263	1285	1238	1432	1237
Stor Change	-1562	99	-329	-420	-468	-266	-168	-11
Storage	*20187	20286	19957	19537	19069	18803	18636	18625
Elev NGVD29	*1612.2	1612.5	1611.5	1610.2	1608.8	1607.9	1607.4	1607.4
Disch kcfs	*27.3	24.5	26.1	20.5	21.6	20.1	23.3	22.3
Ave Power MW		318	338	265	277	257	295	282
Ave Cap MW		735	734	726	720	713	710	709
Energy GWh	1477.1	236.6	243.6	197.3	199.4	191.0	219.7	189.5
Big Bend								
Reg Inflow	9522	1511	1554	1266	1285	1237	1432	1237
Evap	76	23	21	15	10	5	1	0
Release	9405	1453	1547	1248	1263	1252	1405	1237
Storage	*1649	1683	1668	1671	1682	1663	1690	1690
Elev NGVD29	*1420.3	1420.9	1420.6	1420.7	1420.9	1420.5	1421.0	1421.0
Disch kcfs	*27.9	23.6	26.0	20.3	21.2	20.4	22.9	22.3
Ave Power MW		105	115	91	95	91	102	99
Ave Cap MW		470	467	473	472	473	470	471
Energy GWh	506.4	77.8	82.6	67.5	68.2	67.8	75.7	66.7
Fort Randall								
Reach Inflow	250	100	41	3	2	15	31	58
Depletion	35	31	12	-2	-2	-1	-1	-1
Reg Inflow	9635	1529	1573	1263	1263	1265	1446	1296
Evap	113	27	33	30	15	6	1	1
Release	10192	1682	1737	1796	1748	1162	1126	941
Stor Change	-671	-181	-197	-563	-500	97	319	354
Storage	*3640	3459	3262	2699	2199	2296	2615	2968
Elev NGVD29	*1357.7	1355.6	1353.3	1345.8	1337.6	1339.4	1344.6	1349.6
Disch kcfs	*27.2	27.4	29.2	29.2	29.4	18.9	18.3	16.9
Ave Power MW		245	258	248	231	146	147	144
Ave Cap MW		384	379	363	334	317	335	355
Energy GWh	1033.0	182.3	185.5	184.6	166.4	108.3	109.4	96.5
Gavins Point								
Reach Inflow	1015	200	170	150	140	120	101	134
Depletion	61	35	2	3	9	10	1	-1
Reg Inflow	11171	1831	1903	1943	1878	1310	1229	1077
Evap	23	5	6	6	4	2	0	0
Release	11179	1845	1874	1937	1874	1308	1230	1111
Stor Change	-31	-19	22	1	-0	-0	-1	-34
Storage	*359	340	362	363	363	362	362	328
Elev NGVD29	*1207.4	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
Disch kcfs	*30.6	30.0	31.5	31.5	31.5	21.3	20.0	20.0
Ave Power MW		101	112	113	113	78	73	73
Ave Cap MW		126	127	127	127	127	127	126
Energy GWh	483.3	75.4	80.8	84.1	81.4	57.9	54.7	49.0
Sioux City								
Reach Inflow	1132	310	240	180	140	100	57	105
Depletion	71	74	10	-5	-4	-2	-1	-1
Reg Flow	12261	2081	2101	2122	2018	1435	1288	1216
Reg Flow kcfs		33.8	35.3	34.5	33.9	23.3	20.9	21.9
Total								
Reach Inflow	7538	1420	1196	1218	1042	764	776	1122
Depletion	-841	-224	-171	-38	-11	-106	-178	-113
Evap	1735	334	437	382	327	229	16	11
Storage	*61631	60846	59719	58484	57186	56417	56063	56073
Ave Power MW		1238	1205	1011	1009	920	1031	1010
Ave Cap MW		2522	2508	2489	2451	2425	2432	2446
Energy GWh	5397.2	920.8	867.7	751.9	726.2	684.8	767.1	678.7
Daily GWh		29.7	28.9	24.3	24.2	22.1	24.7	24.2

	2020 *31Jul F-Sum	31Aug	30Sep	31Oct	30Nov	31Dec	2021 31Jan	28Feb
Fort Peck								
Reach Inflow	1744	224	221	272	272	232	250	273
Depletion	-522	-285	-134	-26	-0	-26	-40	-11
Reg Inflow	2266	509	355	298	272	258	290	284
Evap	412	89	106	78	76	53	7	4
Release	3466	553	462	430	417	492	584	528
Stor Change	-1615	-136	-213	-211	-220	-286	-301	-247
Storage	*16115	15979	15766	15555	15335	15049	14748	14500
Elev NGVD29	*2240.1	2239.5	2238.5	2237.6	2236.6	2235.2	2233.8	2232.6
Disch kcfs	*10.5	9.0	7.8	7.0	7.0	8.0	9.5	9.5
Ave Power MW		126	109	97	97	110	130	129
Ave Cap MW		225	224	223	222	220	219	218
Energy GWh	579.9	93.9	78.2	72.5	69.9	82.0	96.7	86.8
Garrison								
Reach Inflow	1876	280	263	380	288	184	210	271
Depletion	-449	-208	-104	-36	-4	-38	-37	-22
Reg Inflow	5781	1036	845	847	708	705	819	820
Evap	542	99	131	127	112	75	-2	0
Release	7502	1492	1045	892	863	1046	1138	1027
Stor Change	-2267	-558	-331	-172	-266	-416	-317	-207
Storage	*19682	19123	18792	18620	18354	17938	17621	17414
Elev NGVD29	*1843.5	1841.8	1840.8	1840.3	1839.4	1838.1	1837.1	1836.4
Disch kcfs	*28.0	24.3	17.6	14.5	14.5	17.0	18.5	18.5
Ave Power MW		316	229	189	189	220	237	236
Ave Cap MW		583	579	577	575	572	567	564
Energy GWh	1175.1	235.2	165.0	140.8	135.8	163.4	176.3	158.5
Oahe								
Reach Inflow	322	59	75	52	45	7	9	75
Depletion	7	16	0	-8	-5	-3	-1	8
Reg Inflow	7851	1559	1143	952	913	1042	1147	1095
Evap	556	89	136	122	107	87	9	5
Release	9109	1560	1728	1242	1091	1091	1279	1119
Stor Change	-1817	-93	-721	-411	-285	-136	-141	-29
Storage	*20187	20094	19373	18961	18676	18540	18399	18370
Elev NGVD29	*1612.2	1611.9	1609.7	1608.4	1607.5	1607.1	1606.6	1606.5
Disch kcfs	*27.3	25.4	29.0	20.2	18.3	17.7	20.8	20.1
Ave Power MW		328	372	258	233	225	262	254
Ave Cap MW		734	727	717	711	708	706	704
Energy GWh	1404.2	243.8	267.8	191.9	167.8	167.3	195.2	170.4
Big Bend								
Reg Inflow	9113	1559	1730	1245	1091	1091	1280	1119
Evap	76	23	21	15	10	5	1	0
Release	8996	1504	1720	1226	1073	1102	1253	1119
Storage	*1649	1679	1668	1671	1679	1663	1690	1690
Elev NGVD29	*1420.3	1420.8	1420.6	1420.7	1420.8	1420.5	1421.0	1421.0
Disch kcfs	*27.9	24.5	28.9	19.9	18.0	17.9	20.4	20.1
Ave Power MW		108	127	89	81	81	91	90
Ave Cap MW		469	464	473	476	476	473	473
Energy GWh	484.9	80.4	91.3	66.4	58.3	60.0	67.8	60.6
Fort Randall								
Reach Inflow	177	65	31	2	2	11	23	43
Depletion	35	31	12	-2	-2	-1	-1	-1
Reg Inflow	9156	1541	1739	1242	1076	1110	1285	1163
Evap	112	27	33	30	14	5	1	1
Release	9720	1758	1843	1861	1512	967	967	811
Stor Change	-677	-245	-137	-648	-451	137	316	350
Storage	*3640	3395	3258	2609	2159	2296	2613	2963
Elev NGVD29	*1357.7	1354.8	1353.2	1344.5	1336.9	1339.4	1344.6	1349.5
Disch kcfs	*27.2	28.6	31.0	30.3	25.4	15.7	15.7	14.6
Ave Power MW		255	273	255	198	122	127	124
Ave Cap MW		383	378	361	326	317	335	355
Energy GWh	987.5	189.8	196.4	189.9	142.6	90.8	94.5	83.5
Gavins Point								
Reach Inflow	741	130	127	112	105	90	76	101
Depletion	61	35	2	3	9	10	1	-1
Reg Inflow	10428	1831	1968	1973	1656	1047	1045	909
Evap	23	5	6	6	4	2	0	0
Release	10438	1845	1940	1968	1651	1045	1045	944
Stor Change	-33	-19	23	-1	1	-0	-1	-35
Storage	*359	340	362	361	362	362	361	326
Elev NGVD29	*1207.4	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
Disch kcfs	*30.6	30.0	32.6	32.0	27.8	17.0	17.0	17.0
Ave Power MW		101	116	115	100	62	62	62
Ave Cap MW		126	127	127	127	127	127	126
Energy GWh	449.2	74.8	83.3	85.3	71.7	46.1	46.4	41.6
Sioux City								
Reach Inflow	818	202	180	135	105	75	43	79
Depletion	71	74	10	-5	-4	-2	-1	-1
Reg Flow	11213	1972	2104	2109	1793	1122	1089	1024
Reg Flow kcfs		32.1	35.4	34.3	30.1	18.2	17.7	18.4
Total								
Reach Inflow	5678	959	897	954	816	599	611	842
Depletion	-796	-337	-213	-75	-6	-60	-79	-27
Evap	1721	333	434	378	322	226	16	11
Storage	*61631	60610	59219	57779	56566	55849	55432	55263
Ave Power MW		1234	1225	1004	897	819	910	895
Ave Cap MW		2519	2499	2479	2438	2420	2427	2440
Energy GWh	5080.8	918.0	882.0	746.8	646.1	609.6	676.8	601.5
Daily GWh		29.6	29.4	24.1	21.5	19.7	21.8	21.5

Date of Study: 03Aug2020

01Aug2020 / Upper Basic Condition / 32.4 MAF / Balanced
Values in 1000 acre-ft Except as Indicated
F-Sum: Sum of Forecasted Values. *: Previous Month's Data

	2020 *31Jul F-Sum	31Aug	30Sep	31Oct	30Nov	31Dec	2021 31Jan	28Feb
Fort Peck								
Reach Inflow	2745	416	354	408	408	348	374	437
Depletion	-637	-251	-134	-22	9	-68	-105	-65
Reg Inflow	3382	667	488	430	399	416	480	502
Evap	414	89	107	79	76	53	7	4
Release	4301	563	595	615	595	646	676	611
Stor Change	-1336	12	-214	-264	-272	-282	-203	-113
Storage	*16115	16127	15913	15649	15377	15095	14892	14779
Elev NGVD29	*2240.1	2240.1	2239.2	2238.0	2236.8	2235.4	2234.5	2234.0
Disch kcfs	*10.5	9.2	10.0	10.0	10.0	10.5	11.0	11.0
Ave Power MW		129	140	139	139	145	151	150
Ave Cap MW		225	225	223	222	221	219	219
Energy GWh	720.6	95.7	100.8	103.7	99.8	107.6	112.1	100.9
Garrison								
Reach Inflow	2967	520	420	570	432	276	316	433
Depletion	-390	-47	-48	-10	-49	-91	-89	-57
Reg Inflow	7637	1117	1063	1194	1076	1008	1076	1102
Evap	543	100	130	127	112	76	-2	0
Release	9062	1619	1315	1138	1101	1199	1414	1277
Stor Change	-1972	-604	-382	-70	-137	-266	-336	-176
Storage	*19682	19077	18695	18625	18488	18221	17885	17710
Elev NGVD29	*1843.5	1841.7	1840.5	1840.3	1839.9	1839.0	1838.0	1837.4
Disch kcfs	*28.0	26.3	22.1	18.5	18.5	19.5	23.0	23.0
Ave Power MW		342	286	240	240	252	294	293
Ave Cap MW		583	579	577	576	575	571	568
Energy GWh	1415.6	254.8	206.2	178.8	172.7	187.3	219.0	196.9
Oahe								
Reach Inflow	601	121	135	94	81	12	17	140
Depletion	7	16	0	-8	-5	-3	-1	8
Reg Inflow	9675	1731	1476	1240	1187	1198	1432	1410
Evap	558	90	138	124	107	86	9	5
Release	10657	1583	1935	1704	1703	1198	1375	1160
Stor Change	-1544	56	-596	-587	-623	-86	48	244
Storage	*20187	20243	19646	19059	18436	18350	18399	18643
Elev NGVD29	*1612.2	1612.4	1610.6	1608.8	1606.8	1606.5	1606.6	1607.4
Disch kcfs	*27.3	25.7	32.5	27.7	28.6	19.5	22.4	20.9
Ave Power MW		332	417	353	360	245	281	264
Ave Cap MW		736	731	720	710	704	704	707
Energy GWh	1638.1	247.2	300.1	262.7	259.4	182.5	208.9	177.2
Big Bend								
Reg Inflow	10661	1583	1933	1706	1705	1198	1375	1161
Evap	76	23	21	15	10	5	1	0
Release	10544	1524	1928	1687	1681	1215	1349	1160
Storage	*1649	1683	1667	1671	1685	1664	1689	1689
Elev NGVD29	*1420.3	1420.9	1420.6	1420.7	1420.9	1420.6	1421.0	1421.0
Disch kcfs	*27.9	24.8	32.4	27.4	28.2	19.8	21.9	20.9
Ave Power MW		109	141	121	124	89	98	93
Ave Cap MW		469	461	465	465	474	471	473
Energy GWh	563.5	81.1	101.7	89.9	89.5	65.9	72.8	62.8
Fort Randall								
Reach Inflow	342	135	55	4	3	20	43	81
Depletion	-35	-31	-12	2	2	1	1	1
Reg Inflow	10939	1692	1991	1699	1681	1233	1400	1242
Evap	113	27	33	30	15	6	1	1
Release	11503	1841	2153	2236	2164	1134	1084	891
Stor Change	-678	-176	-196	-566	-497	93	314	350
Storage	*3640	3463	3267	2701	2204	2297	2611	2961
Elev NGVD29	*1357.7	1355.6	1353.3	1345.9	1337.7	1339.4	1344.5	1349.5
Disch kcfs	*27.2	29.9	36.2	36.4	36.4	18.4	17.6	16.0
Ave Power MW		267	317	306	283	142	142	136
Ave Cap MW		384	379	363	334	317	335	354
Energy GWh	1160.6	198.8	228.1	227.5	203.5	105.7	105.6	91.5
Gavins Point								
Reach Inflow	1382	270	230	202	189	162	141	188
Depletion	61	35	2	3	9	10	1	-1
Reg Inflow	12847	2035	2380	2434	2353	1340	1229	1076
Evap	23	5	6	6	4	2	0	0
Release	12857	2050	2350	2429	2350	1337	1230	1111
Stor Change	-33	-20	24	-0	-1	1	-1	-35
Storage	*359	339	363	363	361	362	361	326
Elev NGVD29	*1207.4	1206.5	1207.5	1207.5	1207.5	1207.5	1207.4	1205.9
Disch kcfs	*30.6	33.3	39.5	39.5	39.5	21.7	20.0	20.0
Ave Power MW		104	118	120	120	79	73	73
Ave Cap MW		126	127	127	127	127	127	126
Energy GWh	500.9	77.5	85.1	89.3	86.4	58.9	54.7	49.0
Sioux City								
Reach Inflow	1536	418	324	243	189	135	80	147
Depletion	71	74	10	-5	-4	-2	-1	-1
Reg Flow	14344	2373	2664	2677	2543	1517	1311	1258
Reg Flow kcfs		38.6	44.8	43.5	42.7	24.7	21.3	22.7
Total								
Reach Inflow	9573	1881	1518	1522	1302	953	971	1426
Depletion	-924	-204	-182	-40	-37	-152	-194	-116
Evap	1727	334	436	380	324	226	16	11
Storage	*61631	60932	59552	58068	56552	55990	55838	56109
Ave Power MW		1284	1419	1279	1266	952	1039	1009
Ave Cap MW		2523	2500	2476	2435	2417	2428	2446
Energy GWh	5999.3	955.1	1022.0	951.8	911.3	707.9	773.0	678.3
Daily GWh		30.8	34.1	30.7	30.4	22.8	24.9	24.2

	2021 *28Feb F-Sum	31Mar	30Apr	31May	30Jun	31Jul	31Aug	30Sep	31Oct	30Nov	31Dec	2022 31Jan	28Feb
Fort Peck													
Reach Inflow	9500	705	825	1500	2360	1200	430	400	540	500	350	300	390
Depletion	138	-61	-63	250	487	28	-152	-96	-8	-8	-84	-92	-62
Reg Inflow	9362	766	888	1250	1873	1172	582	496	548	508	434	392	452
Evap	490	8	-6	4	1	53	96	110	81	78	54	7	4
Release	8859	435	536	682	863	892	892	788	738	714	799	799	722
Stor Change	12	323	359	564	1009	227	-406	-403	-271	-284	-419	-414	-274
Storage	*14779	15102	15461	16025	17034	17262	16856	16453	16182	15898	15479	15065	14791
Elev NGVD29	*2234.0	2235.5	2237.1	2239.7	2244.1	2245.0	2243.3	2241.6	2240.4	2239.1	2237.2	2235.3	2234.0
Disch kcfs	*11.0	7.1	9.0	11.1	14.5	14.5	14.5	13.2	12.0	12.0	13.0	13.0	13.0
Ave Power MW		96	123	153	202	205	204	185	167	166	178	177	176
Ave Cap MW		219	221	223	227	230	230	228	226	225	223	221	219
Energy GWh	1483.0	71.3	88.4	113.7	145.7	152.3	152.0	133.5	124.2	119.5	132.8	131.6	118.0
Garrison													
Reach Inflow	14250	1100	1410	1945	3570	2700	840	560	640	420	285	325	455
Depletion	242	-33	-88	87	855	215	-23	-97	-166	-172	-138	-117	-82
Reg Inflow	22850	1598	2019	2499	3574	3376	1754	1466	1544	1306	1214	1241	1259
Evap	536	10	-12	-3	-34	15	109	136	130	112	75	-2	0
Release	22288	1168	1607	2029	2366	2460	2460	2241	1968	1813	1252	1537	1388
Stor Change	26	420	425	472	1241	901	-814	-911	-553	-619	-112	-295	-130
Storage	*17710	18130	18554	19027	20268	21169	20355	19444	18891	18272	18160	17865	17735
Elev NGVD29	*1837.4	1838.7	1840.1	1841.5	1845.2	1847.8	1845.5	1842.8	1841.1	1839.2	1838.8	1837.9	1837.5
Disch kcfs	*23.0	19.0	27.0	33.0	39.8	40.0	40.0	37.7	32.0	30.5	20.4	25.0	25.0
Ave Power MW		234	331	405	492	502	503	468	396	374	251	306	305
Ave Cap MW		569	574	578	585	594	594	587	581	576	573	570	568
Energy GWh	3335.8	174.0	238.5	301.5	354.2	373.7	374.0	337.2	294.5	269.0	186.9	227.5	204.7
Oahe													
Reach Inflow	3900	1170	510	395	790	310	100	150	120	145	30	10	170
Depletion	145	21	17	25	38	49	19	0	-10	-7	-6	-4	2
Reg Inflow	26036	2331	2071	2378	3094	2721	2540	2419	2097	2012	1265	1551	1556
Evap	524	8	-13	-18	-33	17	94	138	124	107	85	9	5
Release	25514	1138	1416	2004	2564	3116	3158	2923	2579	2586	1423	1419	1189
Stor Change	-3	1185	668	392	563	-413	-712	-642	-605	-681	-244	123	362
Storage	*18643	19828	20496	20888	21451	21038	20327	19685	19080	18398	18155	18278	18640
Elev NGVD29	*1607.4	1611.1	1613.1	1614.2	1615.8	1614.7	1612.6	1610.7	1608.8	1606.6	1605.8	1606.2	1607.4
Disch kcfs	*20.9	18.5	23.8	32.6	43.1	50.7	51.4	49.1	41.9	43.5	23.1	23.1	21.4
Ave Power MW		238	309	423	559	656	659	625	530	541	290	290	270
Ave Cap MW		720	733	741	748	749	741	731	721	710	700	702	705
Energy GWh	3942.4	177.1	222.3	315.0	402.7	487.9	490.6	450.1	394.3	389.8	215.5	215.5	181.7
Big Bend													
Reg Inflow	25518	1134	1416	1997	2562	3116	3157	2923	2582	2587	1430	1419	1194
Evap	106	1	3	3	3	19	24	21	15	10	5	1	0
Release	25414	1153	1426	1974	2569	3093	3130	2916	2538	2588	1445	1393	1189
Storage	*1690	1669	1656	1677	1667	1671	1674	1660	1689	1678	1658	1683	1688
Elev NGVD29	*1421.0	1420.7	1420.4	1420.8	1420.6	1420.7	1420.7	1420.5	1421.0	1420.8	1420.5	1420.9	1421.0
Disch kcfs	*20.9	18.8	24.0	32.1	43.2	50.3	50.9	49.0	41.3	43.5	23.5	22.7	21.4
Ave Power MW		84	107	141	186	214	217	209	178	187	105	101	96
Ave Cap MW		481	474	467	458	453	453	454	459	458	475	476	477
Energy GWh	1334.5	62.7	77.0	104.7	133.8	159.3	161.2	150.5	132.5	134.8	78.0	75.4	64.5
Fort Randall													
Reach Inflow	1500	440	310	150	210	100	70	80	20	5	20	40	55
Depletion	113	-0	-0	6	24	48	31	12	-2	-2	-1	-1	-1
Reg Inflow	26801	1579	1736	2108	2746	3151	3161	2985	2577	2588	1480	1435	1253
Evap	119	2	-7	-2	-1	13	27	33	30	15	5	1	1
Release	26683	1136	1700	2152	2719	3145	3154	3078	3145	3056	1374	1120	903
Stor Change	-1	441	43	-42	28	-7	-20	-127	-599	-482	100	314	349
Storage	*2961	3402	3445	3403	3431	3424	3404	3278	2679	2197	2298	2612	2961
Elev NGVD29	*1349.5	1354.9	1355.4	1354.9	1355.3	1355.2	1355.0	1353.5	1345.5	1337.6	1339.4	1344.5	1349.5
Disch kcfs	*16.0	18.5	28.6	35.0	45.7	51.2	51.3	51.7	51.2	51.4	22.3	18.2	16.3
Ave Power MW		162	253	307	358	357	357	354	338	306	168	146	137
Ave Cap MW		372	381	381	381	381	381	378	363	334	317	335	355
Energy GWh	2372.2	120.8	182.1	228.7	257.8	265.6	265.4	254.7	251.3	220.5	124.6	108.4	92.2
Gavins Point													
Reach Inflow	2300	250	230	335	290	215	190	135	155	130	105	105	160
Depletion	161	-1	6	5	27	63	36	3	3	9	10	1	-1
Reg Inflow	28836	1355	1905	2461	2947	3292	3306	3212	3296	3186	1571	1228	1075
Evap	33	0	1	2	1	6	5	6	6	4	2	0	0
Release	28804	1350	1904	2460	2945	3290	3290	3183	3290	3183	1568	1230	1111
Stor Change	-1	4	-0	-0	0	-3	11	23	1	-1	1	-2	-35
Storage	*326	331	330	330	330	327	339	362	363	361	362	361	325
Elev NGVD29	*1205.9	1206.1	1206.1	1206.1	1206.1	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.4	1205.9
Disch kcfs	*20.0	22.0	32.0	40.0	49.5	53.5	53.5	53.5	53.5	53.5	25.5	20.0	20.0
Ave Power MW		79	111	113	109	108	108	112	114	114	86	73	73
Ave Cap MW		125	125	125	125	125	125	127	127	127	127	127	126
Energy GWh	877.9	58.6	79.9	84.4	78.4	80.4	80.7	80.9	85.1	82.4	63.7	54.5	48.9
Sioux City													
Reach Inflow	3750	460	950	545	620	300	230	170	100	100	60	45	170
Depletion	265	-1	5	17	51	121	75	10	-5	-4	-2	-1	-1
Reg Flow	32288	1796	2837	2970	3494	3460	3445	3343	3395	3287	1704	1276	1281
Reg Flow kcfs		29.2	47.7	48.3	58.7	56.3	56.0	56.2	55.2	55.2	27.7	20.7	23.1
Total													
Reach Inflow	35200	4125	4235	4870	7840	4825	1860	1495	1575	1300	850	825	1400
Depletion	1064	-73	-124	389	1481	524	-14	-168	-188	-184	-221	-214	-144
Evap	1808	29	-34	-15	-62	124	356	445	386	325	226	16	11
Storage	*56109	58462	59942	61350	64182	64892	62954	60882	58883	56805	56112	55863	56141
Ave Power MW		893	1234	1543	1906	2042	2048	1954	1723	1689	1077	1093	1057
Ave Cap MW		2487	2509	2516	2524	2533	2524	2505	2478	2430	2416	2431	2450
Energy GWh	13345.8	664.5	888.2	1147.9	1372.6	1519.3	1523.8	1406.9	1281.9	1216.0	801.5	813.0	710.1
Daily GWh		21.4	29.6	37.0	45.8	49.0	49.2	46.9	41.4	40.5	25.9	26.2	25.4

	2021 *28Feb F-Sum	31Mar	30Apr	31May	30Jun	31Jul	31Aug	30Sep	31Oct	30Nov	31Dec	2022 31Jan	28Feb
Fort Peck													
Reach Inflow	8650	640	780	1345	2155	1100	405	350	440	450	320	285	380
Depletion	151	-83	-52	252	573	26	-166	-109	-30	-14	-87	-100	-61
Reg Inflow	8500	723	832	1093	1582	1074	571	458	470	464	407	385	441
Evap	485	8	-6	4	1	52	95	109	80	77	54	7	4
Release	8019	430	476	615	774	799	799	774	615	595	738	738	666
Stor Change	-5	284	362	475	807	222	-324	-424	-225	-208	-385	-360	-229
Storage	*14779	15063	15425	15900	16707	16929	16605	16181	15957	15748	15364	15003	14775
Elev NGVD29	*2234.0	2235.3	2237.0	2239.1	2242.7	2243.6	2242.2	2240.4	2239.4	2238.4	2236.7	2235.0	2233.9
Disch kcfs	*11.0	7.0	8.0	10.0	13.0	13.0	13.0	13.0	10.0	10.0	12.0	12.0	12.0
Ave Power MW		95	109	137	181	183	182	181	139	138	164	163	162
Ave Cap MW		219	221	223	226	228	228	226	225	224	222	220	219
Energy GWh	1338.1	70.6	78.5	102.2	130.1	135.8	135.7	130.4	103.1	99.3	122.3	121.3	108.8
Garrison													
Reach Inflow	12850	995	1260	1750	3200	2440	750	505	555	410	250	315	420
Depletion	262	-33	-88	87	861	212	-50	-99	-170	-160	-120	-104	-73
Reg Inflow	20599	1491	1816	2261	3088	3027	1600	1378	1365	1165	1091	1157	1159
Evap	537	9	-12	-3	-34	15	108	136	131	113	76	-2	0
Release	20040	1168	1369	1795	2083	2152	2152	1892	1722	1603	1238	1506	1361
Stor Change	21	313	459	469	1039	860	-660	-650	-487	-550	-222	-347	-202
Storage	*17710	18023	18482	18951	19990	20849	20189	19539	19052	18502	18280	17933	17731
Elev NGVD29	*1837.4	1838.4	1839.9	1841.3	1844.4	1846.9	1845.0	1843.1	1841.6	1839.9	1839.2	1838.1	1837.5
Disch kcfs	*23.0	19.0	23.0	29.2	35.0	35.0	35.0	31.8	28.0	26.9	20.1	24.5	24.5
Ave Power MW		234	283	360	434	440	440	397	348	333	249	300	299
Ave Cap MW		569	573	578	584	591	592	587	582	578	575	571	568
Energy GWh	3006.8	173.8	203.9	267.8	312.2	327.1	327.5	286.0	259.2	239.5	185.4	223.5	200.9
Oahe													
Reach Inflow	3200	1090	410	315	680	240	75	90	40	115	-10	0	155
Depletion	145	21	17	25	38	49	19	0	-10	-7	-6	-4	2
Reg Inflow	23089	2251	1747	2043	2725	2343	2208	2007	1771	1763	1207	1510	1513
Evap	530	8	-13	-18	-33	18	95	140	125	108	86	9	5
Release	22532	1213	1151	1426	2037	2660	2833	2603	2244	2265	1442	1438	1219
Stor Change	27	1029	609	635	721	-334	-721	-736	-598	-610	-321	64	290
Storage	*18643	19673	20281	20916	21637	21303	20582	19846	19248	18637	18317	18380	18670
Elev NGVD29	*1607.4	1610.7	1612.5	1614.3	1616.4	1615.4	1613.4	1611.2	1609.3	1607.4	1606.4	1606.6	1607.5
Disch kcfs	*20.9	19.7	19.4	23.2	34.2	43.3	46.1	43.8	36.5	38.1	23.5	23.4	21.9
Ave Power MW		253	251	302	447	564	595	561	465	478	295	294	277
Ave Cap MW		718	730	738	750	753	745	734	723	714	704	704	707
Energy GWh	3497.6	188.5	180.7	224.9	322.0	419.5	443.0	403.9	345.9	344.4	219.3	219.0	186.5
Big Bend													
Reg Inflow	22535	1211	1153	1420	2035	2659	2832	2604	2248	2264	1448	1438	1224
Evap	106	1	3	3	3	19	24	21	15	10	5	1	0
Release	22432	1228	1163	1397	2042	2637	2805	2596	2205	2266	1462	1411	1220
Storage	*1690	1671	1658	1677	1667	1670	1674	1660	1688	1676	1658	1684	1687
Elev NGVD29	*1421.0	1420.7	1420.4	1420.8	1420.6	1420.7	1420.7	1420.5	1421.0	1420.8	1420.4	1420.9	1421.0
Disch kcfs	*20.9	20.0	19.6	22.7	34.3	42.9	45.6	43.6	35.9	38.1	23.8	23.0	22.0
Ave Power MW		90	88	102	150	185	195	188	156	165	106	103	98
Ave Cap MW		479	479	476	465	458	456	457	463	462	475	476	477
Energy GWh	1188.0	66.7	63.4	75.6	107.9	137.3	145.4	135.1	116.2	119.0	78.9	76.3	66.1
Fort Randall													
Reach Inflow	1200	320	275	135	160	80	55	70	15	0	10	30	50
Depletion	113	-0	-0	6	24	48	31	12	-2	-2	-1	-1	-1
Reg Inflow	23518	1535	1441	1519	2168	2675	2820	2657	2238	2258	1486	1444	1278
Evap	119	2	-7	-2	-1	13	27	33	30	15	5	1	1
Release	23403	1103	1399	1559	2134	2675	2816	2746	2805	2721	1381	1131	931
Stor Change	-4	430	49	-38	35	-14	-24	-123	-597	-478	99	311	345
Storage	*2961	3392	3440	3402	3437	3424	3400	3277	2680	2201	2301	2612	2957
Elev NGVD29	*1349.5	1354.8	1355.4	1354.9	1355.3	1355.2	1354.9	1353.5	1345.5	1337.7	1339.5	1344.5	1349.4
Disch kcfs	*16.0	17.9	23.5	25.4	35.9	43.5	45.8	46.1	45.6	45.7	22.5	18.4	16.8
Ave Power MW		158	210	225	315	358	359	356	340	309	168	147	141
Ave Cap MW		372	381	381	381	381	381	378	363	334	317	335	354
Energy GWh	2257.2	117.4	150.9	167.6	226.5	266.4	266.9	256.5	252.7	222.5	125.3	109.4	95.0
Gavins Point													
Reach Inflow	2000	230	200	305	250	175	160	110	125	120	100	95	130
Depletion	161	-1	6	5	27	63	36	3	3	9	10	1	-1
Reg Inflow	25255	1314	1590	1843	2322	2770	2937	2855	2927	2830	1564	1229	1075
Evap	33	0	1	2	1	6	5	6	6	4	2	0	0
Release	25223	1312	1589	1838	2321	2767	2921	2826	2921	2826	1562	1230	1111
Stor Change	-1	2	0	3	-0	-3	11	23	1	0	-0	-1	-36
Storage	*326	328	328	331	331	328	339	362	362	362	362	361	325
Elev NGVD29	*1205.9	1206.0	1206.0	1206.2	1206.2	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1205.9
Disch kcfs	*20.0	21.3	26.7	29.9	39.0	45.0	47.5	47.5	47.5	47.5	25.4	20.0	20.0
Ave Power MW		77	95	105	114	111	110	114	116	116	86	73	73
Ave Cap MW		125	125	125	125	125	125	127	127	127	127	127	126
Energy GWh	869.0	57.0	68.2	78.0	81.8	82.6	82.1	82.2	86.4	83.6	63.7	54.5	48.9
Sioux City													
Reach Inflow	3000	420	880	460	350	220	175	135	65	90	45	40	120
Depletion	265	-1	5	17	51	121	75	10	-5	-4	-2	-1	-1
Reg Flow	27958	1718	2464	2275	2600	2853	3015	2951	2991	2920	1670	1271	1231
Reg Flow kcfs		27.9	41.4	37.0	43.7	46.4	49.0	49.6	48.6	49.1	27.2	20.7	22.2
Total													
Reach Inflow	30900	3695	3805	4310	6795	4255	1620	1260	1240	1185	715	765	1255
Depletion	1096	-95	-113	391	1573	519	-55	-183	-214	-178	-206	-209	-134
Evap	1809	29	-33	-15	-62	123	355	445	386	327	227	16	11
Storage	*56109	58149	59614	61177	63769	64504	62789	60866	58987	57127	56281	55973	56145
Ave Power MW		906	1036	1231	1640	1840	1883	1797	1564	1539	1068	1081	1051
Ave Cap MW		2483	2509	2522	2530	2537	2528	2510	2484	2439	2420	2433	2451
Energy GWh	12156.7	674.0	745.7	916.1	1180.5	1368.6	1400.7	1294.0	1163.5	1108.4	794.8	804.0	706.3
Daily GWh		21.7	24.9	29.6	39.4	44.1	45.2	43.1	37.5	36.9	25.6	25.9	25.2

	2021 *28Feb F-Sum	31Mar	30Apr	31May	30Jun	31Jul	31Aug	30Sep	31Oct	30Nov	31Dec	2022 31Jan	28Feb
Fort Peck													
Reach Inflow	7150	470	560	1130	1795	835	365	290	385	410	300	260	350
Depletion	56	-31	11	227	432	36	-172	-122	-43	-9	-73	-122	-77
Reg Inflow	7094	501	549	903	1363	799	537	412	428	419	373	382	428
Evap	471	8	-6	4	1	50	91	105	78	76	53	7	4
Release	6628	400	476	553	655	676	676	527	400	391	646	646	583
Stor Change	-4	93	79	346	708	73	-230	-220	-50	-48	-325	-271	-159
Storage	*14756	14849	14928	15274	15981	16054	15823	15604	15554	15506	15181	14910	14751
Elev NGVD29	*2233.8	2234.3	2234.7	2236.3	2239.5	2239.8	2238.8	2237.8	2237.6	2237.3	2235.8	2234.6	2233.8
Disch kcfs	*11.0	6.5	8.0	9.0	11.0	11.0	11.0	8.8	6.5	6.6	10.5	10.5	10.5
Ave Power MW		88	108	122	151	152	152	122	89	90	143	142	142
Ave Cap MW		218	219	220	223	225	224	223	222	222	221	220	219
Energy GWh	1096.1	65.4	77.9	90.9	108.7	113.2	113.0	87.7	66.5	65.0	106.6	105.9	95.2
Garrison													
Reach Inflow	10850	940	765	1240	3150	2070	570	475	500	355	180	255	350
Depletion	378	-17	-57	165	734	176	-49	-77	-145	-132	-83	-83	-55
Reg Inflow	17104	1394	1285	1620	3054	2570	1296	1116	1045	874	879	983	988
Evap	537	9	-12	-3	-33	15	106	134	130	114	77	-2	0
Release	16574	1109	1279	1599	1666	1722	1722	1322	1138	1101	1226	1414	1277
Stor Change	-7	275	18	24	1420	834	-532	-340	-223	-341	-423	-429	-290
Storage	*17707	17982	18000	18024	19444	20278	19746	19406	19183	18842	18419	17989	17700
Elev NGVD29	*1837.4	1838.3	1838.3	1838.4	1842.8	1845.3	1843.7	1842.7	1842.0	1841.0	1839.7	1838.3	1837.4
Disch kcfs	*20.5	18.0	21.5	26.0	28.0	28.0	28.0	22.2	18.5	18.5	19.9	23.0	23.0
Ave Power MW		222	264	318	345	351	352	279	233	232	248	283	281
Ave Cap MW		568	570	570	577	587	588	584	582	580	577	572	568
Energy GWh	2487.9	165.1	190.1	236.3	248.6	261.3	261.9	200.9	173.1	166.8	184.3	210.5	189.0
Oahe													
Reach Inflow	2350	625	390	225	600	170	65	80	30	90	-15	-10	100
Depletion	145	21	17	25	38	49	19	0	-10	-7	-6	-4	2
Reg Inflow	18770	1719	1642	1783	2221	1843	1767	1435	1177	1198	1201	1408	1375
Evap	524	8	-12	-17	-31	17	91	136	123	108	88	9	5
Release	18146	1269	1317	1562	1610	1928	2036	1754	1311	1359	1307	1454	1239
Stor Change	100	441	337	238	643	-102	-360	-455	-257	-269	-194	-54	131
Storage	*18625	19066	19403	19641	20284	20183	19823	19368	19111	18842	18647	18593	18724
Elev NGVD29	*1607.4	1608.8	1609.8	1610.6	1612.5	1612.2	1611.1	1609.7	1608.9	1608.1	1607.4	1607.3	1607.7
Disch kcfs	*22.3	20.6	22.1	25.4	27.1	31.4	33.1	29.5	21.3	22.8	21.3	23.6	22.3
Ave Power MW		263	284	326	349	405	426	378	273	291	270	299	283
Ave Cap MW		714	718	723	730	734	730	725	718	714	709	708	709
Energy GWh	2811.9	196.0	204.2	242.7	251.5	301.4	316.9	272.5	203.4	209.8	200.9	222.7	190.0
Big Bend													
Reg Inflow	18150	1267	1318	1561	1608	1928	2036	1756	1315	1356	1309	1453	1244
Evap	106	1	3	3	3	19	24	21	15	10	5	1	0
Release	18046	1285	1328	1533	1619	1907	2007	1747	1272	1360	1321	1427	1239
Storage	*1690	1670	1657	1682	1668	1670	1675	1661	1688	1675	1658	1683	1688
Elev NGVD29	*1421.0	1420.7	1420.4	1420.9	1420.6	1420.7	1420.7	1420.5	1421.0	1420.7	1420.4	1420.9	1421.0
Disch kcfs	*22.3	20.9	22.3	24.9	27.2	31.0	32.6	29.4	20.7	22.9	21.5	23.2	22.3
Ave Power MW		93	100	111	121	136	143	129	93	102	96	104	100
Ave Cap MW		479	476	474	471	467	466	469	478	476	477	475	476
Energy GWh	970.5	69.5	72.0	82.6	86.8	101.4	106.4	93.2	69.1	73.6	71.7	77.1	67.1
Fort Randall													
Reach Inflow	900	260	170	110	135	65	45	50	10	-5	0	15	45
Depletion	113	-0	-0	6	24	48	31	12	-2	-2	-1	-1	-1
Reg Inflow	18833	1533	1500	1638	1723	1931	2014	1788	1301	1343	1326	1444	1292
Evap	119	2	-7	-2	-1	13	27	33	30	15	6	1	1
Release	18726	1108	1459	1675	1702	1922	2006	1882	1860	1778	1255	1138	942
Stor Change	-12	423	48	-35	23	-4	-20	-128	-589	-450	66	305	349
Storage	*2968	3391	3439	3404	3426	3422	3403	3275	2686	2236	2302	2607	2956
Elev NGVD29	*1349.6	1354.8	1355.4	1354.9	1355.2	1355.2	1354.9	1353.4	1345.6	1338.3	1339.5	1344.5	1349.4
Disch kcfs	*16.9	18.0	24.5	27.2	28.6	31.3	32.6	31.6	30.2	29.9	20.4	18.5	17.0
Ave Power MW		158	218	242	253	276	287	277	255	235	156	148	143
Ave Cap MW		372	381	381	381	381	381	378	363	336	317	335	354
Energy GWh	1936.4	117.9	157.1	179.7	182.3	205.2	213.8	199.6	190.1	168.9	116.0	110.0	96.1
Gavins Point													
Reach Inflow	1500	170	145	175	215	95	85	85	115	110	95	90	120
Depletion	161	-1	6	5	27	63	36	3	3	9	10	1	-1
Reg Inflow	20075	1254	1591	1839	1883	1948	2056	1969	1975	1878	1378	1229	1075
Evap	33	0	1	2	1	6	5	6	6	4	2	0	0
Release	20045	1254	1589	1838	1880	1943	2041	1940	1968	1874	1377	1230	1111
Stor Change	-2	-0	2	-1	1	-1	9	24	1	-0	-0	-1	-36
Storage	*328	328	329	328	329	328	338	361	362	362	362	361	325
Elev NGVD29	*1206.0	1206.0	1206.1	1206.0	1206.1	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1205.9
Disch kcfs	*20.0	20.4	26.7	29.9	31.6	31.6	33.2	32.6	32.0	31.5	22.4	20.0	20.0
Ave Power MW		73	95	105	110	110	115	115	114	113	81	73	73
Ave Cap MW		125	125	125	125	125	125	127	127	127	127	127	126
Energy GWh	860.0	54.5	68.2	78.0	79.1	81.7	85.3	83.0	85.0	81.1	60.6	54.5	48.9
Sioux City													
Reach Inflow	1950	400	320	270	300	160	130	90	65	50	20	35	110
Depletion	265	-1	5	17	51	121	75	10	-5	-4	-2	-1	-1
Reg Flow	21729	1639	1904	2085	2126	1982	2093	2021	2039	1929	1424	1266	1221
Reg Flow kcfs		26.7	32.0	33.9	35.7	32.2	34.0	34.0	33.2	32.4	23.2	20.6	22.0
Total													
Reach Inflow	24700	2865	2350	3150	6195	3395	1260	1070	1105	1010	580	645	1075
Depletion	1117	-28	-18	445	1305	492	-61	-174	-202	-145	-155	-210	-132
Evap	1789	29	-33	-14	-59	120	345	436	382	327	229	16	11
Storage	*56073	57286	57756	58352	61133	61935	60807	59675	58585	57463	56569	56144	56144
Ave Power MW		898	1069	1223	1329	1430	1475	1301	1058	1063	995	1049	1021
Ave Cap MW		2477	2490	2493	2508	2519	2515	2506	2491	2455	2429	2438	2453
Energy GWh	10162.7	668.4	769.5	910.2	956.9	1064.3	1097.3	936.8	787.2	765.1	740.1	780.7	686.3
Daily GWh		21.6	25.6	29.4	31.9	34.3	35.4	31.2	25.4	25.5	23.9	25.2	24.5

	2021 *28Feb F-Sum	31Mar	30Apr	31May	30Jun	31Jul	31Aug	30Sep	31Oct	30Nov	31Dec	2022 31Jan	28Feb
Fort Peck													
Reach Inflow	5950	415	460	945	1500	650	285	240	335	330	240	240	310
Depletion	65	-72	-7	244	373	39	-135	-104	-41	-9	-69	-95	-59
Reg Inflow	5885	487	467	701	1127	610	420	343	376	339	309	335	369
Evap	447	8	-6	3	1	48	87	100	74	72	50	7	3
Release	6426	369	446	523	655	676	676	510	369	359	615	646	583
Stor Change	-989	110	26	174	471	-114	-343	-266	-66	-92	-356	-317	-217
Storage	*14500	14610	14637	14811	15282	15169	14825	14560	14493	14401	14045	13729	13511
Elev NGVD29	*2232.6	2233.2	2233.3	2234.1	2236.3	2235.8	2234.2	2232.9	2232.6	2232.1	2230.4	2228.8	2227.7
Disch kcfs	*9.5	6.0	7.5	8.5	11.0	11.0	11.0	8.6	6.0	6.0	10.0	10.5	10.5
Ave Power MW		81	101	114	149	150	149	115	81	81	133	138	137
Ave Cap MW		217	218	218	220	221	219	218	217	217	215	213	212
Energy GWh	1043.0	60.1	72.6	85.2	107.3	111.3	110.8	83.0	60.1	58.3	98.9	103.0	92.4
Garrison													
Reach Inflow	9200	835	640	1180	2525	1700	475	395	455	335	160	220	280
Depletion	337	9	22	153	498	95	-48	-60	-115	-103	-50	-42	-22
Reg Inflow	15281	1224	1052	1542	2660	2282	1200	1006	939	795	793	904	885
Evap	503	9	-11	-3	-31	14	100	126	122	107	72	-2	0
Release	15984	1045	1369	1599	1607	1660	1660	1297	984	952	1179	1383	1250
Stor Change	-1207	169	-306	-54	1085	607	-560	-416	-166	-264	-457	-478	-365
Storage	*17414	17583	17278	17223	18308	18915	18355	17939	17772	17508	17051	16573	16208
Elev NGVD29	*1836.4	1837.0	1836.0	1835.8	1839.3	1841.2	1839.5	1838.1	1837.6	1836.7	1835.2	1833.6	1832.3
Disch kcfs	*18.5	17.0	23.0	26.0	27.0	27.0	27.0	21.8	16.0	16.0	19.2	22.5	22.5
Ave Power MW		208	279	313	328	333	333	268	197	197	233	270	268
Ave Cap MW		564	562	560	567	577	577	571	568	565	561	553	547
Energy GWh	2356.1	154.9	201.0	233.1	236.1	247.6	247.7	192.7	146.8	141.6	173.5	201.0	180.0
Oahe													
Reach Inflow	1400	440	250	140	310	130	35	70	15	10	-45	-15	60
Depletion	145	21	17	25	38	49	19	0	-10	-7	-6	-4	2
Reg Inflow	17225	1469	1580	1704	1875	1742	1676	1405	1008	969	1117	1372	1307
Evap	461	8	-12	-16	-29	15	81	119	108	95	78	8	5
Release	18057	1303	1601	1816	1871	2144	2110	1851	1320	1091	911	1112	926
Stor Change	-1292	158	-9	-96	33	-418	-515	-565	-420	-217	127	253	376
Storage	*18370	18528	18519	18423	18455	18038	17522	16958	16538	16321	16448	16701	17078
Elev NGVD29	*1606.5	1607.1	1607.0	1606.7	1606.8	1605.4	1603.7	1601.7	1600.2	1599.5	1599.9	1600.8	1602.2
Disch kcfs	*20.1	21.2	26.9	29.5	31.4	34.9	34.3	31.1	21.5	18.3	14.8	18.1	16.7
Ave Power MW		267	339	371	393	433	422	379	260	221	179	219	204
Ave Cap MW		708	706	706	705	702	694	686	676	669	669	673	678
Energy GWh	2696.7	199.0	243.8	275.7	283.3	322.1	313.7	272.9	193.7	159.0	133.4	163.1	137.2
Big Bend													
Reg Inflow	18059	1298	1602	1814	1870	2145	2111	1852	1324	1093	911	1111	929
Evap	106	1	3	3	3	19	24	21	15	10	5	1	0
Release	17958	1315	1613	1787	1880	2123	2084	1844	1281	1097	923	1085	926
Storage	*1690	1672	1658	1682	1669	1671	1674	1661	1688	1674	1657	1683	1685
Elev NGVD29	*1421.0	1420.7	1420.4	1420.9	1420.6	1420.7	1420.7	1420.5	1421.0	1420.7	1420.4	1420.9	1420.9
Disch kcfs	*20.1	21.4	27.1	29.1	31.6	34.5	33.9	31.0	20.8	18.4	15.0	17.6	16.7
Ave Power MW		95	120	128	139	151	148	136	94	83	68	80	76
Ave Cap MW		478	471	470	467	464	465	467	478	481	485	482	483
Energy GWh	963.2	70.5	86.5	95.5	100.0	112.1	110.2	98.0	69.6	59.8	50.8	59.4	50.8
Fort Randall													
Reach Inflow	450	160	70	80	95	15	35	10	-20	-15	-10	-10	40
Depletion	113	-0	-0	6	24	48	31	12	-2	-2	-1	-1	-1
Reg Inflow	18294	1457	1685	1861	1946	2098	2081	1844	1281	1080	914	1077	971
Evap	118	2	-7	-2	-1	13	27	33	30	14	5	1	1
Release	18175	1022	1653	1893	1925	2092	2070	1942	1928	1490	780	765	615
Stor Change	2	433	39	-29	22	-7	-16	-131	-677	-424	128	311	354
Storage	*2963	3396	3434	3405	3427	3420	3404	3272	2595	2172	2300	2611	2965
Elev NGVD29	*1349.5	1354.9	1355.3	1355.0	1355.2	1355.1	1355.0	1353.4	1344.3	1337.1	1339.5	1344.5	1349.5
Disch kcfs	*14.6	16.6	27.8	30.8	32.4	34.0	33.7	32.6	31.4	25.0	12.7	12.4	11.1
Ave Power MW		146	246	272	285	299	296	286	263	194	99	101	94
Ave Cap MW		372	381	381	381	381	381	378	361	326	317	335	354
Energy GWh	1888.9	108.6	177.3	202.2	205.2	222.6	220.3	205.6	195.7	140.0	73.4	74.8	63.3
Gavins Point													
Reach Inflow	1300	165	130	150	150	85	70	80	110	95	80	80	105
Depletion	161	-1	6	5	27	63	36	3	3	9	10	1	-1
Reg Inflow	19339	1148	1774	2026	2043	2114	2107	2023	2041	1634	850	848	731
Evap	33	0	1	2	1	6	5	6	6	4	2	0	0
Release	19307	1146	1773	2026	2041	2109	2091	1993	2035	1629	849	849	766
Stor Change	-0	2	0	-1	1	-1	11	24	0	1	-0	-1	-36
Storage	*326	328	328	327	328	327	338	361	361	363	362	361	326
Elev NGVD29	*1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1205.9
Disch kcfs	*17.0	18.6	29.8	32.9	34.3	34.3	34.0	33.5	33.1	27.4	13.8	13.8	13.8
Ave Power MW		66	105	113	116	116	117	118	118	98	51	51	51
Ave Cap MW		126	125	125	125	125	125	127	127	127	127	127	126
Energy GWh	819.0	49.4	75.2	84.0	83.6	86.4	86.7	85.0	87.7	70.9	38.0	38.0	34.2
Sioux City													
Reach Inflow	1200	250	100	190	220	85	135	50	55	30	15	20	50
Depletion	265	-1	5	17	51	121	75	10	-5	-4	-2	-1	-1
Reg Flow	20249	1368	1868	2189	2210	2073	2151	2034	2096	1706	865	870	817
Reg Flow kcfs		22.3	31.4	35.6	37.1	33.7	35.0	34.2	34.1	28.7	14.1	14.1	14.7
Total													
Reach Inflow	19500	2265	1650	2685	4800	2665	1035	845	950	785	440	535	845
Depletion	1086	-43	43	449	1011	415	-23	-138	-171	-116	-118	-143	-81
Evap	1667	29	-32	-13	-55	115	325	406	354	302	212	15	10
Storage	*55264	56117	55854	55871	57470	57540	56119	54750	53449	52439	51864	51657	51772
Ave Power MW		864	1189	1311	1411	1481	1464	1302	1013	874	763	859	830
Ave Cap MW		2465	2464	2460	2465	2470	2462	2447	2427	2386	2374	2383	2401
Energy GWh	9767.0	642.5	856.4	975.6	1015.6	1102.1	1089.3	937.3	753.5	629.6	568.0	639.3	557.9
Daily GWh		20.7	28.5	31.5	33.9	35.6	35.1	31.2	24.3	21.0	18.3	20.6	19.9

	2021 *28Feb F-Sum	31Mar	30Apr	31May	30Jun	31Jul	31Aug	30Sep	31Oct	30Nov	31Dec	2022 31Jan	28Feb
Fort Peck													
Reach Inflow	5350	400	450	865	1180	600	260	230	310	300	225	230	300
Depletion	38	-62	4	245	352	20	-129	-100	-42	-11	-69	-100	-69
Reg Inflow	5312	462	446	620	828	580	389	330	352	311	294	330	369
Evap	434	8	-6	3	1	47	85	97	72	70	48	6	3
Release	6482	369	446	553	655	676	676	506	369	357	646	646	583
Stor Change	-1604	85	6	63	173	-143	-372	-273	-88	-116	-399	-321	-218
Storage	*14500	14585	14591	14654	14827	14684	14312	14039	13951	13835	13436	13114	12896
Elev NGVD29	*2232.6	2233.0	2233.1	2233.4	2234.2	2233.5	2231.7	2230.4	2229.9	2229.4	2227.3	2225.6	2224.5
Disch kcfs	*9.5	6.0	7.5	9.0	11.0	11.0	11.0	8.5	6.0	6.0	10.5	10.5	10.5
Ave Power MW		81	101	121	148	148	147	113	80	79	137	136	135
Ave Cap MW		217	217	218	218	218	217	215	214	214	212	209	208
Energy GWh	1041.1	60.1	72.6	89.9	106.6	110.2	109.5	81.3	59.3	57.2	102.3	101.3	90.8
Garrison													
Reach Inflow	7450	720	565	1055	2040	1050	350	310	440	320	145	190	265
Depletion	249	9	22	153	498	86	-73	-78	-134	-115	-60	-39	-20
Reg Inflow	13675	1109	977	1443	2180	1641	1099	935	943	792	813	875	869
Evap	485	9	-11	-2	-31	14	96	122	118	103	69	-2	0
Release	15138	1045	1309	1414	1428	1476	1476	1235	1015	982	1186	1353	1220
Stor Change	-1948	54	-321	32	782	151	-472	-421	-190	-293	-443	-476	-352
Storage	*17414	17468	17147	17179	17961	18112	17640	17219	17029	16736	16293	15817	15466
Elev NGVD29	*1836.4	1836.6	1835.5	1835.6	1838.2	1838.7	1837.2	1835.8	1835.1	1834.1	1832.6	1831.0	1829.7
Disch kcfs	*18.5	17.0	22.0	23.0	24.0	24.0	24.0	20.8	16.5	16.5	19.3	22.0	22.0
Ave Power MW		208	267	278	292	294	293	252	201	200	231	260	258
Ave Cap MW		563	561	558	564	570	568	562	558	554	549	542	535
Energy GWh	2214.3	154.7	192.1	206.7	210.0	218.8	218.2	181.7	149.4	143.9	172.0	193.7	173.2
Oahe													
Reach Inflow	1150	400	190	110	275	110	25	60	10	0	-60	-20	50
Depletion	145	21	17	25	38	49	19	0	-10	-7	-6	-4	2
Reg Inflow	16132	1429	1464	1496	1662	1537	1481	1321	1034	989	1112	1337	1269
Evap	437	8	-12	-16	-28	14	78	114	102	90	74	8	4
Release	17751	1338	1621	1844	1882	2105	2060	1803	1279	1040	848	1051	879
Stor Change	-2057	83	-146	-332	-193	-583	-656	-596	-348	-142	190	278	386
Storage	*18370	18453	18308	17976	17783	17200	16544	15948	15601	15459	15649	15927	16314
Elev NGVD29	*1606.5	1606.8	1606.3	1605.2	1604.6	1602.6	1600.3	1598.1	1596.8	1596.3	1597.0	1598.0	1599.4
Disch kcfs	*20.1	21.8	27.2	30.0	31.6	34.2	33.5	30.3	20.8	17.5	13.8	17.1	15.8
Ave Power MW		274	342	373	391	418	403	360	246	205	163	203	190
Ave Cap MW		708	704	701	696	689	678	668	658	652	653	658	665
Energy GWh	2609.5	204.0	246.1	277.7	281.3	310.8	299.5	259.0	183.0	147.9	121.4	151.1	127.6
Big Bend													
Reg Inflow	17754	1332	1623	1842	1882	2106	2060	1804	1284	1042	848	1050	881
Evap	106	1	3	3	3	19	24	21	15	10	5	1	0
Release	17653	1350	1633	1815	1891	2085	2033	1796	1241	1048	858	1024	879
Storage	*1690	1672	1658	1682	1669	1671	1674	1661	1689	1673	1657	1683	1685
Elev NGVD29	*1421.0	1420.7	1420.4	1420.9	1420.6	1420.7	1420.7	1420.5	1421.0	1420.7	1420.4	1420.9	1420.9
Disch kcfs	*20.1	22.0	27.4	29.5	31.8	33.9	33.1	30.2	20.2	17.6	14.0	16.7	15.8
Ave Power MW		97	122	130	140	148	145	133	91	79	64	75	72
Ave Cap MW		478	471	469	467	465	466	468	478	482	486	483	484
Energy GWh	947.3	72.3	87.6	96.9	100.5	110.2	107.7	95.7	67.5	57.2	47.3	56.2	48.3
Fort Randall													
Reach Inflow	350	135	60	75	90	10	30	5	-25	-20	-20	-25	35
Depletion	113	-0	-0	6	24	48	31	12	-2	-2	-1	-1	-1
Reg Inflow	17889	1467	1696	1883	1953	2054	2026	1792	1235	1026	839	1001	918
Evap	118	2	-7	-2	-1	13	27	33	30	14	5	1	1
Release	17763	1032	1664	1913	1937	2040	2020	1893	1879	1436	705	692	553
Stor Change	8	433	39	-28	17	0	-21	-135	-673	-424	129	308	364
Storage	*2963	3395	3434	3406	3423	3423	3403	3268	2595	2171	2299	2607	2971
Elev NGVD29	*1349.5	1354.9	1355.3	1355.0	1355.2	1355.2	1354.9	1353.3	1344.3	1337.1	1339.5	1344.5	1349.6
Disch kcfs	*14.6	16.8	28.0	31.1	32.5	33.2	32.8	31.8	30.6	24.1	11.5	11.2	9.9
Ave Power MW		147	248	275	287	292	289	279	257	188	89	91	85
Ave Cap MW		372	381	381	381	381	381	378	361	326	317	335	354
Energy GWh	1849.2	109.6	178.4	204.3	206.4	217.3	215.2	200.7	190.9	135.1	66.5	67.8	57.0
Gavins Point													
Reach Inflow	1200	155	120	130	135	80	65	75	105	90	75	75	95
Depletion	161	-1	6	5	27	63	36	3	3	9	10	1	-1
Reg Inflow	18831	1148	1774	2026	2043	2058	2052	1970	1986	1577	770	768	658
Evap	33	0	1	2	1	6	5	6	6	4	2	0	0
Release	18799	1146	1773	2026	2041	2054	2035	1940	1980	1572	769	769	694
Stor Change	-0	2	0	-1	1	-1	11	24	-0	1	-0	-1	-36
Storage	*326	328	328	327	328	327	338	362	361	362	362	362	326
Elev NGVD29	*1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1205.9
Disch kcfs	*17.0	18.6	29.8	32.9	34.3	33.4	33.1	32.6	32.2	26.4	12.5	12.5	12.5
Ave Power MW		66	105	113	116	115	114	115	115	95	46	46	46
Ave Cap MW		126	125	125	125	125	125	127	127	127	127	127	126
Energy GWh	799.8	49.4	75.2	84.0	83.6	85.6	85.1	83.0	85.5	68.5	34.4	34.4	31.0
Sioux City													
Reach Inflow	700	180	90	120	65	75	40	35	30	50	-20	15	20
Depletion	265	-1	5	17	51	121	75	10	-5	-4	-2	-1	-1
Reg Flow	19243	1298	1858	2119	2055	2010	2001	1966	2016	1670	750	785	715
Reg Flow kcfs		21.1	31.2	34.5	34.5	32.7	32.5	33.0	32.8	28.1	12.2	12.8	12.9
Total													
Reach Inflow	16200	1990	1475	2355	3785	1925	770	715	870	740	345	465	765
Depletion	970	-33	54	449	989	386	-42	-153	-190	-130	-127	-145	-89
Evap	1612	29	-32	-12	-54	113	315	393	342	291	204	14	10
Storage	*55264	55901	55465	55224	55992	55418	53911	52497	51226	50236	49697	49511	49657
Ave Power MW		874	1183	1290	1373	1415	1391	1252	989	847	731	812	786
Ave Cap MW		2463	2459	2452	2452	2449	2436	2418	2397	2355	2344	2355	2372
Energy GWh	9461.1	650.2	851.9	959.5	988.4	1052.8	1035.1	901.4	735.5	610.0	543.8	604.5	528.0
Daily GWh		21.0	28.4	31.0	32.9	34.0	33.4	30.0	23.7	20.3	17.5	19.5	18.9