US Army Corps of Engineers®
Northwestern Division

Missouri River Basin
Water Management Division

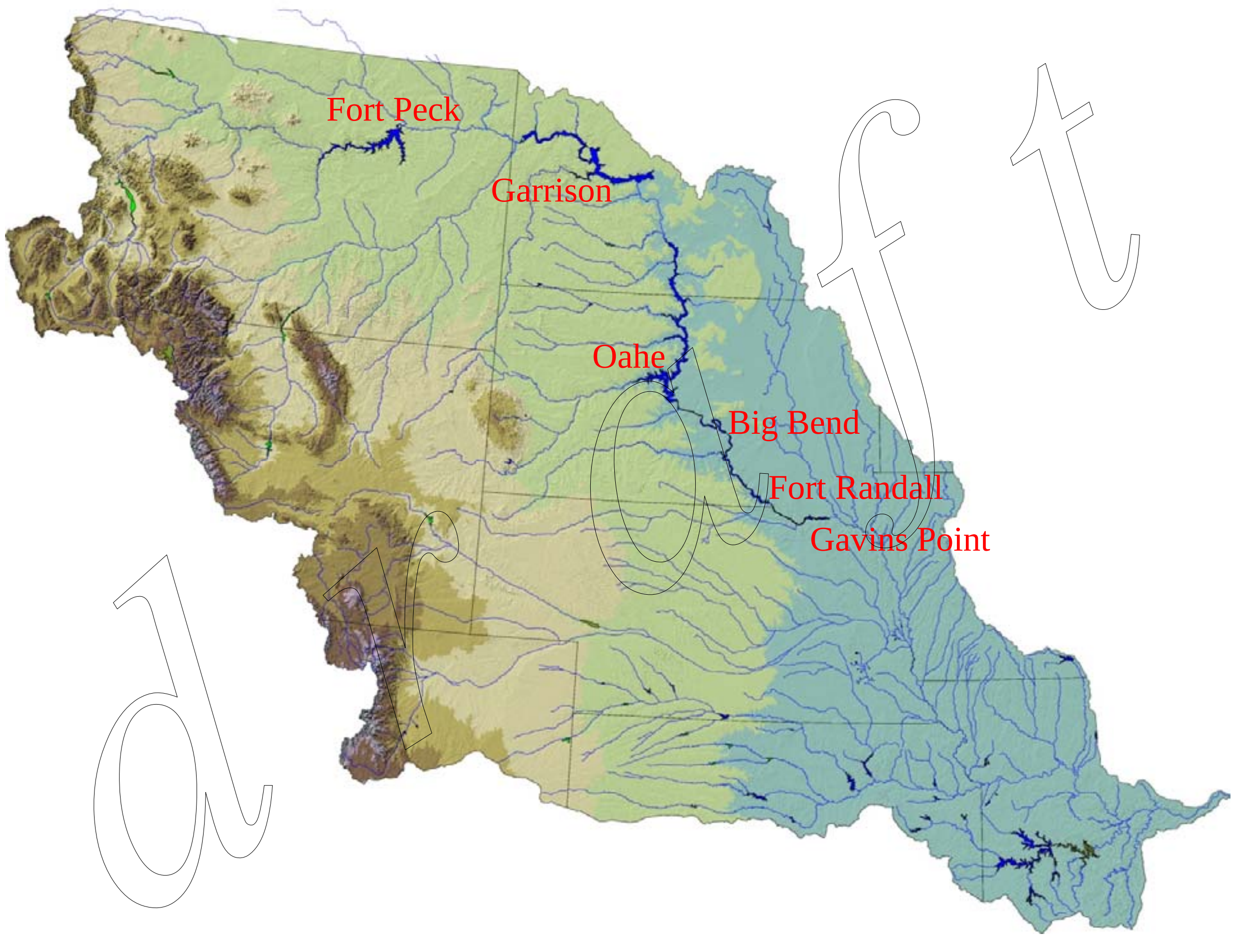
Draft

AOP

2016-2017

Missouri River Mainstem System

2016-2017 Annual Operating Plan



Annual Operating Plan Process
64 Years Serving the Missouri River Basin

September 2016

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NORTHWESTERN DIVISION
PO BOX 2870
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September 2016

This draft Annual Operating Plan (AOP) presents pertinent information regarding water management in the Missouri River Mainstem Reservoir System through December 2017. The information provided in this draft AOP is based upon water management guidelines designed to meet the reservoir regulation objectives of the 2006 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 2011. 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 2015 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/

Five public meetings to discuss this draft AOP are scheduled: October 5 in Smithville, Missouri and Council Bluffs, Iowa; October 6 in Pierre, South Dakota, and Bismarck, North Dakota; and October 7 in Fort Peck, Montana. We ask that any comments be provided by November 11, 2016. The final AOP is scheduled for publication in December 2016.

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

Jody S. Farhat, P.E.
Chief, Missouri River Basin Water
Management Division

MISSOURI RIVER MAINSTEM RESERVOIR SYSTEM

Draft Annual Operating Plan
2016 - 2017

TABLES

PLATES

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
2016 – 2017

I. FOREWORD

This draft Annual Operating Plan (AOP) presents pertinent information and plans for regulating the Missouri River Mainstem Reservoir System (System) through December 2017 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 Division (MRBWMD), 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 November 2007 or the "Summary of Actual 2015 Regulation," dated June 2016. Both reports are currently available at the "Reports and Publications" link on our website at: **www.nwd-mr.usace.army.mil/rcc**, or you may contact 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 2016 Regulation" will be available at the same site in late spring or early summer of 2017.

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 7, 2016 was sent to the

Tribes offering consultation on the 2016-2017 AOP. Meeting times and locations of the five fall public meetings were also provided. Separate 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 2016 spring public meetings were held at the following locations and dates: April 12 at Smithville, Missouri and Nebraska City, Nebraska; April 13 at Fort Peck, Montana and Bismarck, North Dakota; and April 14 at Pierre, South Dakota. The attendees were given an update regarding the outlook for 2016 runoff and projected System regulation for the remainder of 2016. Five fall public meetings on the draft 2016-2017 AOP are planned at the following locations: October 5 in Smithville, Missouri and Council Bluffs, Iowa; October 6 in Pierre, South Dakota, and Bismarck, North Dakota; and October 7 in Fort Peck, Montana. In the spring of 2017, 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 2016-2017 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 revised in March 2004 to include more stringent drought conservation measures. A 2000 Biological Opinion issued by the U. S. Fish and Wildlife Service (USFWS), while the Corps was revising the Master Manual, concluded that the operation and regulation of the System would jeopardize the continued existence of three endangered or threatened species: the pallid sturgeon, the interior least tern and the piping plover. In 2003 the USFWS amended the BiOp (2003 Amended BiOp) and provided a Reasonable and Prudent Alternative (RPA) to avoid jeopardy to the endangered pallid sturgeon that included a provision for the Corps to develop a plan to implement a bimodal spring pulse from Gavins Point Dam. Working with the USFWS, Tribes, states and basin stakeholders, the Corps developed technical criteria for the bimodal spring pulse releases. In March 2006 the Master Manual was revised to include technical criteria for a spring pulse. 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. The Corps does not store water in the reservoirs specifically for the endangered species and the Master Manual storage allocations were not altered to facilitate the spring pulses. In years when water is released for endangered species reservoir storage levels are not adjusted.

Current regulation of the System in accordance with the Master Manual to serve authorized project purposes is dependent on successful implementation of the 2003 Amended BiOp. The Missouri River Recovery Program (MRRP), together with the MRBWMD, works to ensure implementation of the following BiOp elements: habitat construction including emergent sandbar habitat and shallow water habitat, flow modifications, propagation/hatchery support, research, monitoring and evaluation, and adaptive management. 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 modifications 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.

On November 30, 2011 the MRRP Independent Science Advisory Panel (ISAP) released its Final Report on Spring Pulses and Adaptive Management. This report, commissioned by the Missouri River Recovery Implementation Committee (MRRIC), evaluated the Gavins Point spring pulses that have been implemented to date in regards to the biological outcomes the USFWS sought in the 2003 Amended BiOp. The ISAP concluded that spring pulses as currently implemented are not accomplishing their intended outcomes and provided recommendations towards achieving a new management paradigm for the Missouri River.

Since the release of that report, the Corps and USFWS, in coordination with MRRIC, have been aggressively pursuing completing the recommendations laid out by the ISAP. At the center of this effort is the development of a Missouri River Recovery Management Plan/EIS that will establish an overarching adaptive management process for implementation of Corps actions required to avoid jeopardizing all of the listed species in the Missouri River basin. The draft EIS is expected to be released for public comment in December 2016. Since the Corps is consulting with the USFWS as this plan is being developed about what management actions are required, the agencies believe it is prudent to forego a spring pulse during the 2017 Missouri River operating season and that this suspension is not likely to have an adverse effect on the listed species.

Additional information on other efforts undertaken through the MRRP to meet the requirements of the 2003 Amended BiOp can be found in the Annual Report on the Biological Opinion which can be found on the "MRRP Documents" page of the MRRP website at: www.moriverrecovery.org. The ISAP report is also available at this website.

IV. ON-GOING COORDINATION, STUDIES AND REPORTS

As committed to following the 2011 Flood, the Corps communicated more broadly and frequently in 2016 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 2017 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 "Determination and Analysis of Upper Basic and Lower Basic Forecasts" and the "Hydrologic Statistics on Inflows" reports were completed last year. Additional reports that are expected to be completed in the next year include long-term runoff forecasting, which includes an analysis of the relationship of hydrologic factors as they relate to plains snowmelt, and an analysis of releases needed to support navigation.

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 plains snowpack. This will require a collaborative effort to improve both data collection (i.e. plains snowpack water equivalent, soil moisture and frost depth) and hydrologic modeling. In 2013 a proposal for the Missouri River basin plains snow and basin condition network was prepared by subject matter experts from various Federal and State agencies. This proposal outlined timelines, costs, and agency responsibilities. The 2014 Water Resources and Reform Development Act (WRRDA 2014, Section 4003a) included authorization, but not funding, for the establishment of the basin monitoring network. Implementation guidance was provided in October 2015, which stated that activities under Section 4003(a) may not be undertaken until funds are specifically appropriated for such purpose. The Government Accountability Office (GAO) submitted a report to Congress in June 2015 stating that the progress has been limited, primarily due to lack of funding.

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. NOAA and the University of Colorado's Cooperative Institute for Research in Environmental Sciences recently completed the third part of the study, "Climate Assessment Report: Causes for Hydrologic Extremes in the Upper Missouri River Basin." This study revealed that the increased frequency of high annual runoff events in the last 40-year period, as measured by naturalized runoff at Sioux City, Iowa, resulted mainly from the land surface response to increased precipitation falling over the upper Missouri River basin. All three reports are available at https://www.drought.gov/drought/dews/missouri-river-basin/reports-assessments-and-outlooks.

V. FUTURE RUNOFF: SEPTEMBER 2016 - DECEMBER 2017

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 2016 through February 2017. The August 1 runoff forecast for 2016 was 22.7 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 new 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, 2017 to February 28, 2018 time period use five statistically derived runoff scenarios based on an analysis of historic water supply. The report detailing the development of these runoff scenarios, "Runoff Volumes for Annual Operating Plan Studies", was updated in August 2013 to include five additional years of runoff data that now extends from 1898 to 2011. In addition to the five runoff scenarios, the updated analysis added 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 (34.5 MAF) has a 1 in 10 chance of being exceeded, Upper Quartile runoff (30.6 MAF) has a 1 in 4 chance of being exceeded, and Median runoff (24.6 MAF) has a 1 in 2 chance of being exceeded. Lower Quartile runoff (19.3 MAF) has a 1 in 4 chance of the occurrence of less runoff, and Lower Decile runoff (16.1 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 (40.1 MAF) has a 1 in 50 chance of being exceeded; the 98 percent exceedance (11.4 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 2017 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 2018. 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 2018.

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 2016 through February 2018. The natural water supply for calendar year (CY) 2015 totaled 25.8 MAF.

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

	Natural 1/	Post-1949 Depletions	Net 2/
August 2016 through February 2017 (Basic Runoff Scenario)			
Basic	6,500	700	7,200
Upper Basic	8,300	800	9,100
Lower Basic	5,000	400	5,400
Runoff Year March 2017 through February 2018 (Statistical Analysis of Past Records)			
Upper Decile	34,500	-3,100	31,400
Upper Quartile	30,600	-3,000	27,600
Median	24,600	-3,100	21,500
Lower Quartile	19,300	-2,800	16,500
Lower Decile	16,100	-2,700	13,400

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 2016-2017

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 2016-2017 AOP includes 13 years of regulation at Fort Peck (1940) as the sole Mainstem project, plus 63 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 previous record runoff of 49.0 MAF in 1997, and the record runoff of 61.0 MAF in 2011. 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. 2016-2017 AOP Simulations. Reservoir simulations for the Upper Basic, Basic, and Lower Basic runoff scenarios, which span the period of August 2016 through February 2017, 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 2017 through February 2018 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 Median and above runoff scenarios and reduced flow support for Lower Quartile and Lower Decile runoff to start the navigation season; full service flow support for Median and above runoff scenarios after the July 1 System storage check and reduced flow support for Lower Quartile and Lower Decile runoff; a full length navigation season for all runoff scenarios; near normal winter releases for Median runoff, minimum winter releases for Lower Quartile and Lower Decile runoff, and above normal winter releases for Upper Decile and Upper Quartile 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 2017 runoff season. In addition, under the Basic and Lower Basic simulations, system storage will begin the runoff season below the base of the Annual Flood Control and Multiple Use Zone. Although the March 1 and May 1 System storage is above the Gavins Point spring pulse precludes of 40.0 MAF, as discussed in Chapter III, spring pulses will not be conducted in 2017. The Corps will continue to work closely with the USFWS to ensure the AOP will meet the intent of the 2003 Amended BiOp and comply with the ESA.

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 2017. Full service navigation flows or more are provided for Median and above runoff throughout the navigation season. Service levels for Lower Quartile and Lower Decile start the season slightly below full service, and drop to an intermediate service level 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 two runoff scenarios including a 10-day extension to the navigation season. Upper Quartile and Upper Decile simulations reach the desired 56.1 MAF System storage level on March 1,

2018. Storage is below the base of the Annual Flood Control and Multiple Use Zone for Median and lower 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 2017 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 our best estimate of required releases during 2017, 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 16,500 cfs to 17,500 cfs during the 2016-2017 winter season and range from 12,500 cfs to 20,000 cfs during the 2017-2018 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 2017 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 and Lower Decile simulations, the Fort Peck reservoir level declines slightly in April but rises in May. In the Lower Quartile and Lower Decile simulations the Garrison reservoir level declines in April. The Lower Quartile simulation shows the Oahe reservoir level steady in April but declining in May, and nearly steady in April but declining in May under the Lower Decile simulation.

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, 2016 and the simulated regulating plans for each project through CY 2017 using the five runoff scenarios described on Page 4 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 2015 through July 2016. ***Plate 13*** presents past and simulated gross average monthly power generation and gross peaking capability for the System.

C. Regulation Plan for the Balance of the 2016 Navigation Season and Fall of 2016. The regulation of the System for the period of August through November 2016 is presented in the following paragraphs.

Fort Peck. Releases will average about 8,000 cfs through mid-September and then be lowered to 5,000 cfs as irrigation ceases. Releases will be held near that level through the end of November. The Fort Peck pool will slowly decline through mid-September before nearly leveling off during October and November. The reservoir will end November at 2232.5 feet msl or 2.6 feet below the August 1 elevation of 2235.1 feet msl.

Garrison. The threatened least terns and endangered piping plovers were fledged by September 3 on the reach downstream of Garrison and hydropower peaking restrictions were discontinued at that time. Releases will be maintained at 20,000 cfs through mid-September, before slowly decreasing to 14,000 cfs and then held steady in October and through most of November. The Garrison pool will steadily drop throughout the fall and end the month of November at 1838.2 feet msl or 3.1 feet below the August 1 elevation of 1841.3 feet msl.

Oahe. The reservoir started the month of August at elevation 1611.6 feet msl. Releases will average 24,700 cfs in August and 27,900 cfs in September in support of navigation and to evacuate the annual flood control pool. Releases will be reduced to 20,500 cfs in October and 19,000 cfs in November, respectively to accommodate the fall drawdown of the Fort Randall pool and to continue evacuation of stored water. At the end of November, the Oahe pool will be at elevation 1605.8 feet msl or 5.8 feet below the August 1 elevation.

Big Bend. 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.

Fort Randall. Releases will average 24,800 cfs in August, 29,000 cfs in September, and 30,200 cfs in October 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.

Gavins Point. Releases will be scheduled to support downstream full service flows in reaches with scheduled commercial navigation throughout the 2016 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 navigation 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 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 to December 11 at the mouth near St. Louis 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 fall. The pool level will remain near that elevation during the winter months.

D. Regulation Plan for Winter 2016-2017. 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 2016-2017 will be at least 16,500 cfs. Under the Upper Basic forecast releases are set at 17,500 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.

Fort Peck. Releases are expected to average 7,500 cfs in December and 9,000 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 0.9 foot from December through February to near elevation 2231.6 feet msl by March 1. At the beginning of March, the Fort Peck pool will be 2.4 feet below the base of its Annual Flood Control and Multiple Use Zone.

Garrison. Releases are scheduled to be 18,000 cfs in December increasing to 19,000 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 2.7 feet from elevation 1838.2 feet msl at the end of November to near elevation 1835.5 feet msl by March 1, 2.0 feet below 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 17,500 cfs and 20,500 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 slowly decline from 1605.8 feet msl at the end of November to 1605.5 feet msl at the end of February, 2.0 feet below the base of its Annual Flood Control and Multiple Use Zone.

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

Fort Randall. Releases will average about 15,000 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 msl at the end of November or early December to near elevation 1350.0 feet msl, 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 msl by March 1. It is likely that a pool level as high as 1355.0 feet msl 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 msl until late February when it will be lowered to elevation 1206.0 feet msl to create additional capacity to store spring runoff.

System storage for all runoff conditions will range between 52.4 and 56.1 MAF by the beginning of next year's runoff season, approximately March 1, 2017. The base of the Annual Flood Control and Multiple Use Zone is 56.1 MAF.

E. Regulation During the 2017 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, 2017, 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 2017 navigation season there is no commercial navigation scheduled to use the upper reaches of the navigation channel, MRBWMD 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 2017 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 2017 navigation season for Median and above runoff conditions. Lower Quartile and Lower Decile runoffs indicate reductions below full service flow support of 1,700 cfs and 1,900 cfs, respectively, to start the season. Following the July 1 System storage check, full service would be provided for Median and above runoff scenarios. The service level would be 2,400 cfs below full service for Lower Quartile runoff and 3,600 cfs below full service for Lower Decile runoff. The normal 8-month navigation season is provided for Median runoff scenarios and below as shown in ***Table IV***. A 10-day extension to the navigation season is provided for the upper two runoff scenarios.

TABLE IV
NAVIGATION SERVICE SUPPORT
FOR THE 2017 SEASON

	Runoff Scenario (MAF)	System Storage March 15 (MAF)	System Storage July 1 (MAF)	Flow Level Above or Below Full Service (cfs) Spring	Flow Level Above or Below Full Service (cfs) Summer/Fall	Season Shortening (Days)
U.D.	34.5	57.4	63.8	0	+18,500	0*
U.Q.	30.6	57.1	63.0	0	+11,500	0*
Med.	24.6	55.2	58.9	0	0	0
L.Q.	19.3	52.9	54.4	-1,700	-2,400	0
L.D.	16.1	52.8	53.1	-1,900	-3,600	0

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

As previously stated, the modeled regulation for the 2017 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 30,000 cfs over the last several 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 2017 navigation season but are expected to range from 26,000 to 50,500 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, 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 T&E 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 2017 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 Fort Peck pool levels drop slightly in April for both the Lower Quartile and Lower Decile runoff scenarios but then rise from May through June for both runoff scenarios. Oahe pool levels hold steady or nearly steady for April, but decline in May and June for both the Lower Quartile and Lower Decile runoff scenarios. Garrison pool levels decline in April for both lower runoff scenarios. 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 2017 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 Median and above runoff scenarios, but declines slightly in April under both lower 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. Releases are scheduled to be 1,000 cfs lower in July and early August than the June releases to enhance conditions for the fledging of chicks. High elevation nesting habitat is expected to be sufficient below Garrison Dam during the 2017 nesting season.

During 2017, 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, but declines in April under both lower runoff scenarios.

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 April and May, dropping 0.6 and 1.4 feet, respectively.

Fort Randall. To the extent reasonably possible, Fort Randall will be regulated to provide for a pool elevation near 1355.0 feet msl 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 msl 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. As detailed in Section III of this report, the Corps does not plan to implement the bimodal spring pulse from Gavins Point for the benefit of the endangered pallid sturgeon under any runoff scenarios in 2017.

While less habitat is available than the previous few years, 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 the record releases in 2011 and the resultant habitat observed yet in 2016. 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 msl 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 msl 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 or slightly below normal in 2017 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 2017 could result in a Fort Peck pool elevation variation from a high of 2243 feet msl to a low of 2218 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 1847 and 1825 feet msl during 2017. Based on a review of existing information, approximately 39 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 1591 feet msl (see ***Plate 10*** and the studies included at the end of this report). Based on a review of existing information, approximately 169 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 2017. 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 2017 (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, no known sites will 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 2017. 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 2017

With regulation of the System in accordance with the 2016-2017 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 2016-2017 AOP Studies

Decision Points	2017 Runoff Condition				
	Upper Decile	Upper Quartile	Median	Lower Quartile	Lower Decile
March 1 System Storage March 23-31 GP Release	56.1 MAF 26.7 kcfs	56.1 MAF 26.7 kcfs	54.4 MAF 26.7 kcfs	52.4 MAF 28.1 kcfs	52.4 MAF 27.9 kcfs
March 15 System Storage Spring Service Level	57.4 MAF Full service	57.1 MAF Full service	55.2 MAF Full service	52.9 MAF 1.7 kcfs blw Full service	52.8 MAF 1.9 kcfs blw Full service
May 1 System Storage May Early/Late May Avg GP Release	60.0 MAF Not applicable 36.0 kcfs	59.4 MAF 28.0/31.6 kcfs 29.9 kcfs	55.9 MAF 28.0/31.6 kcfs 29.9 kcfs	52.7 MAF 29.6/32.6 kcfs 31.0 kcfs	52.5 MAF 29.4/32.4 kcfs 31.0 kcfs
Fish Spawn Rise (Apr-Jun) FTPK Pool Elev Change GARR Pool Elev Change OAHE Pool Elev Change	 +7.1 feet +6.3 feet +5.0 feet	 +6.4 feet +5.7 feet +5.0 feet	 +5.1 feet +4.7 feet +2.1 feet	 +3.5 feet +3.0 feet -0.9 feet	 +1.5 feet +1.8 feet -2.2 feet
July 1 System Storage Sum-Fall Service Level (kcfs) Nav Season Length	63.8 MAF Full Service 10 Day extension	63.0 MAF Full Service 10 Day extension	58.9 MAF Full Service 0 Days shortening	54.4 MAF 2.4 kcfs blw Full Service 0 Days shortening	53.1 MAF 3.6 kcfs blw Full Service 0 Days shortening
September 1 System Storage Winter 2017-18 GP Release	61.9 MAF 20.0 kcfs	61.3 MAF 20.0 kcfs	57.3 MAF 15.8 kcfs	51.9 MAF 12.5 kcfs	50.0 MAF 12.5 kcfs
February 28 System Storage End-Year Pool Balance Percent Pool	56.1 MAF Balanced 100%	56.1 MAF Balanced 100%	53.9 MAF Balanced 94%	47.9 MAF Balanced 78%	45.7 MAF Balanced 72%

A. <u>Flood Control</u>. 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, 2017 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 Exclusive Flood Control Zone) will be available to store runoff. Under the Basic Runoff scenario, an additional 1.7 MAF of the Carryover Multiple Purpose Zone will be available to store runoff. Under the Lower Basic runoff scenario, an additional 3.7 MAF of the Carryover Multiple Purpose 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 2017, 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 2016-2017, 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 2017 runoff that is stored in the flood control zones will be evacuated prior to the start of the 2018 runoff season.

B. <u>Water Supply and Water Quality Control</u>. 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 2017 would be at least 18 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 2016-2017 will range from 16,500 cfs to 17,500 cfs. As shown in ***Table V***, 2017-2018 winter releases of 20,000 cfs would be made for the Upper Decile and Upper Quartile runoff scenarios, 15,800 cfs for Median, and 12,500 cfs under Lower Quartile and Lower Decile runoff scenarios. The additional 500 cfs on Lower Quartile and 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. Irrigation. 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 2017 from the beginning of the navigation season through the July 1 storage check will be at full service for Median and above runoff scenarios. For the Lower Quartile and Lower Decile runoff scenarios, the navigation service level will be at 1,700 cfs and 1,900 cfs below full service. After the July 1 storage check, Median and higher runoff scenarios indicate at least full service to navigation. The July 1 storage check indicates 2,400 cfs below full service for the Lower Quartile runoff scenario and 3,600 cfs below full service for the Lower Decile runoff scenario. In addition, the Upper Decile and Upper Quartile runoff scenarios indicate a 10-day extension to the navigation season based on the July 1 storage check. Median and below 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 2017 navigation season will be based on actual System storage on March 15 and July 1, 2017.

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 2016 through December 2017. 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 2017 is estimated to be 9.4 million MWh, 101 percent of the 1967-2015 average.

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

2016	Estimated Committed Sales*	Expected Corps Generation					Expected Bureau Capability**					Expected Total System Capability				
			U.B.	Basic	L.B.			U.B.	Basic	L.B.			U.B.	Basic	L.B.	
Aug	2201		2345	2341	2337			196	194	194			2541	2535	2531	
Sep	2021		2339	2330	2327			196	194	194			2535	2524	2521	
Oct	1879		2324	2310	2298			197	196	194			2521	2506	2492	
Nov	1986		2290	2274	2259			196	195	194			2486	2469	2453	
Dec	2114		2290	2275	2256			192	193	192			2482	2468	2448	
2017																
Jan	2128		2311	2294	2273			189	191	191			2500	2485	2464	
Feb	2111		2320	2300	2276			185	189	190			2505	2489	2466	
		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	2046	2342	2336	2309	2280	2279	184	184	189	190	190	2526	2520	2498	2470	2469
Apr	1918	2361	2353	2313	2273	2269	184	184	190	190	190	2545	2537	2503	2463	2459
May	1881	2382	2369	2317	2271	2264	184	184	193	194	194	2566	2553	2510	2465	2458
Jun	2084	2399	2393	2342	2286	2271	198	198	200	197	197	2597	2591	2542	2483	2468
Jul	1805	2390	2386	2346	2277	2253	201	201	201	196	196	2591	2587	2547	2473	2449
Aug	2203	2377	2374	2322	2256	2231	199	199	200	195	195	2576	2573	2522	2451	2426
Sep	2025	2368	2367	2313	2248	2216	200	199	201	196	196	2568	2566	2514	2444	2412
Oct	1880	2334	2335	2296	2222	2196	199	199	201	198	198	2533	2534	2497	2420	2394
Nov	1986	2294	2298	2261	2186	2160	198	198	199	197	197	2492	2496	2460	2383	2357
Dec	2113	2251	2254	2226	2150	2123	196	195	197	195	195	2447	2449	2423	2345	2318

* 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)

2016	Estimated Committed Sales*	Expected Corps Generation					Expected Bureau Generation **					Expected Total System Generation				
			U.B.	Basic	L.B.			U.B.	Basic	L.B.			U.B.	Basic	L.B.	
Aug			804	820	836			58	59	58			862	879	894	
Sep	741		822	827	779			58	53	43			879	880	822	
Oct	737		713	713	803			60	51	43			773	763	847	
Nov	806		694	633	638			63	49	42			757	682	679	
Dec	913		622	604	579			65	53	43			687	656	622	
2017																
Jan	927		676	667	642			68	52	43			744	719	685	
Feb	902		584	584	565			60	46	38			644	630	603	
		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	813	649	654	612	638	642	79	79	52	42	42	728	733	664	681	685
Apr	767	764	690	735	786	782	94	94	53	38	38	858	783	788	824	819
May	718	1063	909	892	935	912	118	118	81	44	44	1180	1026	972	979	956
Jun	783	1245	1105	923	936	923	114	114	88	42	42	1358	1219	1010	977	964
Jul	867	1445	1308	997	992	950	117	117	75	50	49	1563	1425	1071	1042	999
Aug	860	1447	1312	1033	990	948	97	93	69	53	48	1544	1405	1103	1043	997
Sep	744	1338	1191	907	803	828	86	85	65	52	46	1423	1276	973	855	873
Oct	738	1225	1057	757	762	680	80	79	74	54	45	1306	1136	831	816	725
Nov	807	1201	1045	670	601	578	77	76	73	53	44	1278	1120	743	654	622
Dec	913	835	806	634	533	531	79	78	75	58	45	914	884	709	591	577
CY TOT		12472	11336	9410	9182	8979	1069	1060	804	566	524	13541	12396	10214	9748	9503

* 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 or slightly below normal levels in 2017. If Lower Quartile or Lower Decile runoff were to occur in 2017, 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 2017 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 2016 and 2017 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 affects 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 2016 and 2017. 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 2016-2017 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 2014.

Second, mitigation or protection of sites that are being adversely impacted continues. During the reporting period for the 2015 Annual Report by the Corps on the implementation of the Programmatic Agreement, four 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. In addition the Corps completed a contract to develop an erosion model that will compare modeling data against actual erosion data, collected by the monitoring team, to assist in the prioritization of sites for protection. Work on the erosion model was completed in June 2011.

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 2016-2017 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, 2016 Basic runoff forecast verifies, System storage will decline to 54.4 MAF by the end of 2016. This would be 20.5 MAF higher than the record low System storage of 33.9 MAF set on February 9, 2007 and 2.5 MAF less than the 2015 end-of-year storage of 56.9 MAF. This end-of-year storage is 1.7 MAF more than the 1967-2015 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, 2017 is presented in ***Table VIII*** for the runoff scenarios simulated.

TABLE VIII
ANTICIPATED DECEMBER 31, 2017 SYSTEM STORAGE

Water Supply Condition	Total (12/31/17)	Carryover Storage Remaining 1/	Unfilled Carryover Storage 2/	Total Change CY 2017
(Volumes in 1,000 Acre-Feet)				
Upper Decile	56,300	38,500	0	500
Upper Quartile	56,500	38,500	0	700
Median	54,000	36,400	2,100	-400
Lower Quartile	47,900	30,300	8,200	-4,900
Lower Decile	45,900	28,300	10,200	-6,900

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 2016, 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 2017 also is shown in ***Table IX.*** Actual water use data for CY 2015 are included for information and comparison.

TABLE IX
MISSOURI RIVER MAINSTEM SYSTEM
WATER USE FOR CALENDAR YEARS 2015, 2016, AND 2017 ABOVE SIOUX CITY, IOWA
in Million Acre-Feet (MAF)

		CY 2015 Actual	CY 2016 Basic Simulation	Simulations for Calendar Year 2017: Upper Decile	Upper Quartile	Median	Lower Quartile	Lower Decile
Upstream Depletions	(1)							
Irrigation, Tributary Reservoir Evaporation & Other Uses		2.8	2.8					
Tributary Reservoir Storage Change		-0.3	0.0					
Total Upstream Depletions		2.5	2.8	3.1	2.9	3.0	2.9	2.6
System Reservoir Evaporation	(2)	3.1	2.5	1.2	1.2	1.7	2.0	1.9
Sioux City Flows								
Navigation Season								
Unregulated Flood Inflows Between Gavins Point & Sioux City	(3)	0.0	0.0					
Navigation Service Requirement	(4)	14.9	14.9	16.6	16.3	15.9	15.3	14.6
Supplementary Releases								
T&E Species	(5)	0.6	0.9	0.3	0.3	0.3	0.3	0.3
Flood Evacuation	(6)	0.0	0.0	8.1	4.7	0.0	0.0	0.0
Non-navigation Season								
Flows		4.1	4.1	4.2	4.1	4.1	3.7	3.7
Flood Evacuation Releases	(7)	0.0	0.0	0.5	0.4	0.0	0.0	0.0
System Storage Change		0.6	-2.5	0.5	0.7	-0.4	-4.9	-7.0
Total		25.8	22.7	34.5	30.6	24.6	19.3	16.1
Project Releases								
Fort Peck		4.9	4.9	8.0	7.3	6.2	5.9	5.9
Garrison		12.5	12.7	20.3	18.3	15.9	14.7	14.1
Oahe		14.2	14.2	23.3	20.6	16.9	17.3	17.1
Big Bend		13.5	13.6	23.2	20.5	16.8	17.2	17.0
Fort Randall		15.3	15.1	24.6	21.6	17.6	17.4	17.1
Gavins Point		17.0	16.7	26.7	23.5	19.0	18.6	18.2

(1) Tributary uses above the 1949 level of development including agricultural depletions and tributary storage effects.
(2) Net evaporation is shown for 2017.
(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 2023

(Not completed until final plan is adopted.)

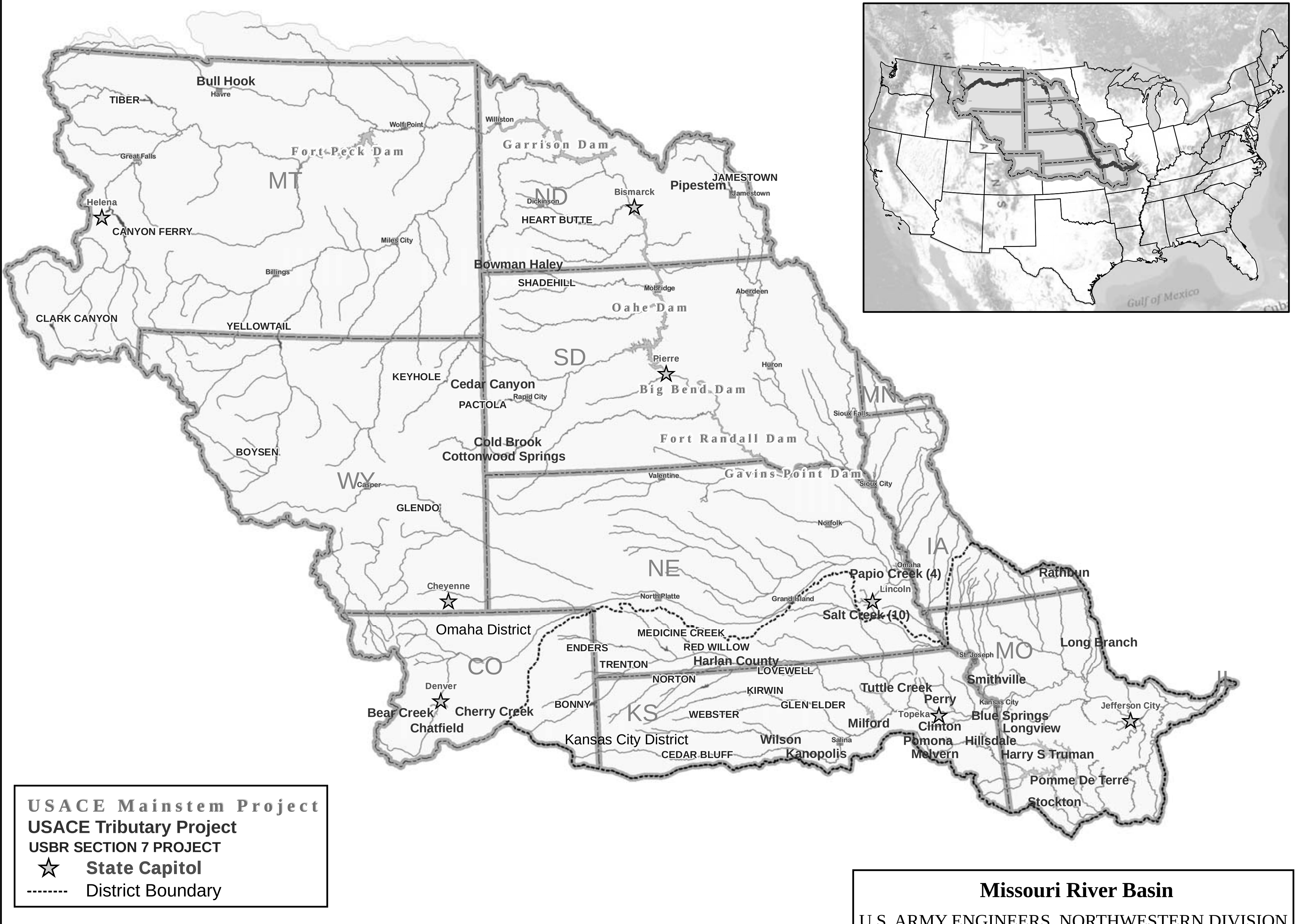


PLATE 1. Missouri River Basin Map.

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., 25' 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	2,254	2,622
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.
	21 miles upstream Chamberlain, SD	Near Lake Andes, SD	Near Yankton, SD		1
	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
	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
	28,900	30,000 1,100	32,000 2,000		6
	440,000 (April 1952)	447,000 (April 1952)	480,000 (April 1952)		7
	1959	1946	1952		8
	1964	1953	1955		9
	1440	1395	1234		10
	10,570 (including spillway)	10,700 (including spillway)	8,700 (including spillway)	71,596	11
	78	140	45	863 feet	12
	95	165	74		13
	1200, 700	4300, 1250	850, 450		14
	Pierre shale & Niobrara chalk	Niobrara chalk	Niobrara chalk & Carlile shale		15
	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
	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
	1385	1346	1180		21
	376 gated	1000 gated	664 gated		22
	8 - 40' x 38' Tainter	21 - 40' x 29' Tainter	14 - 40' x 30' Tainter		23
	390,000 at elev 1433.6	620,000 at elev 1379.3	584,000 at elev 1221.4		24
	270,000	508,000	345,000		25
	1423 msl 61,000 acres	1375 msl 102,000 acres	1210 msl 29,000 acres	1,206,000 acres	26
	1422 msl 60,000 acres	1365 msl 94,000 acres	1208 msl 25,000 acres	1,146,000 acres	27
	1420 msl 57,000 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
	5,300 a.f./year 430 yrs.	15,800 a.f./year 334 yrs.	2,700 a.f./year 159 yrs.	77,400	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 32,000 cfs - 128,000 cfs			43
	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
	3 - 67,276, 5 - 58,500	40,000	44,100		51
	494,320	320,000	132,300	2,501,200 kw	52
	497,000	293,000	74,000	1,967,000 kw	53
	980	1,726	725	9,342 million kWh	54
	October 1964 - July 1966	March 1954 - January 1956	September 1956 - January 1957	July 1943 - July 1966	55
	$107,498,000	$199,066,000	$49,617,000	$1,166,404,000	56

Remarks

(1) Includes 4,280 square miles of non-contributing areas.
(2) Includes 1,350 square miles of non-contributing areas.
(3) With pool at base of flood control.
(4) Storage first available for regulation of flows.
(5) Damming height is height from low water to maximum operating pool. Maximum height is from average streambed to top of dam.
(6) Based on latest available storage data.
(7) River regulation is attained by flows over low-crested spillway and through turbines.
(8) Length from upstream face of outlet or to spiral case.
(9) Based on 8th year (1961) of drought drawdown (From study 8-83-1985).
(10) Affected by level of Lake Francis case. Applicable to pool at elevation 1350.
(11) Spillway crest.
(12) 1967-2015 Average
(13) Source: Annual Report on Civil Works Activities of the Corps of Engineers. Extract Report Fiscal Year 1999.
(14) Based on Study 8-83-1985

Corps of Engineers, U.S. Army
Compiled by
Northwestern Division
Missouri River Region
August 2016

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

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

RESERVOIR UNBALANCING SCHEDULE

	Fort Peck		Garrison		Oahe	
Year	*March 1*	*Rest of Year*	*March 1*	*Rest of Year*	*March 1*	*Rest of Year*
1	High	Float	Low	Hold Peak	Raise & hold during spawn	Float
2	Raise & hold during spawn	Float	High	Float	Low	Hold peak
3	Low	Hold peak	Raise & hold during spawn	Float	High	Float

Notes: **Float year:** Normal regulation, then unbalance 1 foot during low pool years or 3 feet when System storage is near 57.0 MAF on March 1.

Low year: Begin low, then hold peak the remainder of the year.

High year: Begin high, raise and hold pool during spawn, then float.

MRNRC RECOMMENDED RESERVOIR ELEVATION GUIDELINES FOR UNBALANCING

	Fort Peck	Garrison	Oahe
Implement unbalancing if March 1 pool is above this level.	2234 feet msl	1837.5 feet msl	1607.5 feet msl
Implement unbalancing if March 1 pool level is in this range **and** the pool is expected to raise more than 3 feet after March 1.	2227-2234 feet msl	1827-1837.5 feet msl	1600-1607.5 feet msl
Scheduling Criteria	Avoid pool level decline during spawn period which ranges from April 15 – May 30	Schedule after spawn period of April 20 – May 20	Schedule after spawn period of April 8 – May 15

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

TECHNICAL CRITERIA FOR SPRING PULSES FROM GAVINS POINT DAM

Criteria Applicable to Both the March and May Spring Pulses

Flood Control Constraints	No change from current levels

Criteria Applicable to the March Spring Pulse

Drought Preclude	40.0 MAF or below measured on March 1.
Drought Proration of Pulse Magnitude*	None, 5 kcfs added to navigation releases, but no greater than 35 kcfs.
Initiation of Pulse	Extend the stepped System release increases that precede the beginning of the navigation season.
Rate of Rise before Peak	Approximately 5 kcfs for 1 day.
Duration of Peak	Two days.
Rate of Fall after Peak	Drop over 5 days to navigation target release.

Criteria Applicable to Time Period Between the Bimodal Pulses

Release	Existing Master Manual Criteria

Criteria Applicable to the May Spring Pulse

Drought Preclude	40.0 MAF or below measured on May 1.
Proration of Pulse Magnitude Based On System Storage*	Prorated from 16 kcfs based on a May 1 System Storage check; 100% at 54.5 MAF; straight line interpolation to 75% at 40.0 MAF.
Proration of Pulse Magnitude Based On Projected Runoff*	After the proration of the spring pulse magnitude for System Storage, the resultant magnitude would be further adjusted either up or down based on the May CY runoff forecast; 100% for Median; straight-line interpolation to 125% at Upper Quartile runoff; 125% for runoff above Upper Quartile; straight-line interpolation to 75% at Lower Quartile runoff; 75% for runoff below Lower Quartile.
Initiation of Pulse	Between May 1 to May 19, depending on Missouri River water temperature immediately below Gavins Point Dam. If possible, pulse will be initiated after the second daily occurrence of a 16 degree Celsius water temperature; however, the decision will be informed by the potential for 'take' of Threatened and Endangered bird species.
Rate of Rise before Peak	Approximately 6 kcfs per day.
Duration of Peak	Two days.
Rate of Fall after Peak	Approximately 30% drop over 2 days followed by a proportional reduction in releases back to the existing Master Manual criteria over an 8-day period.

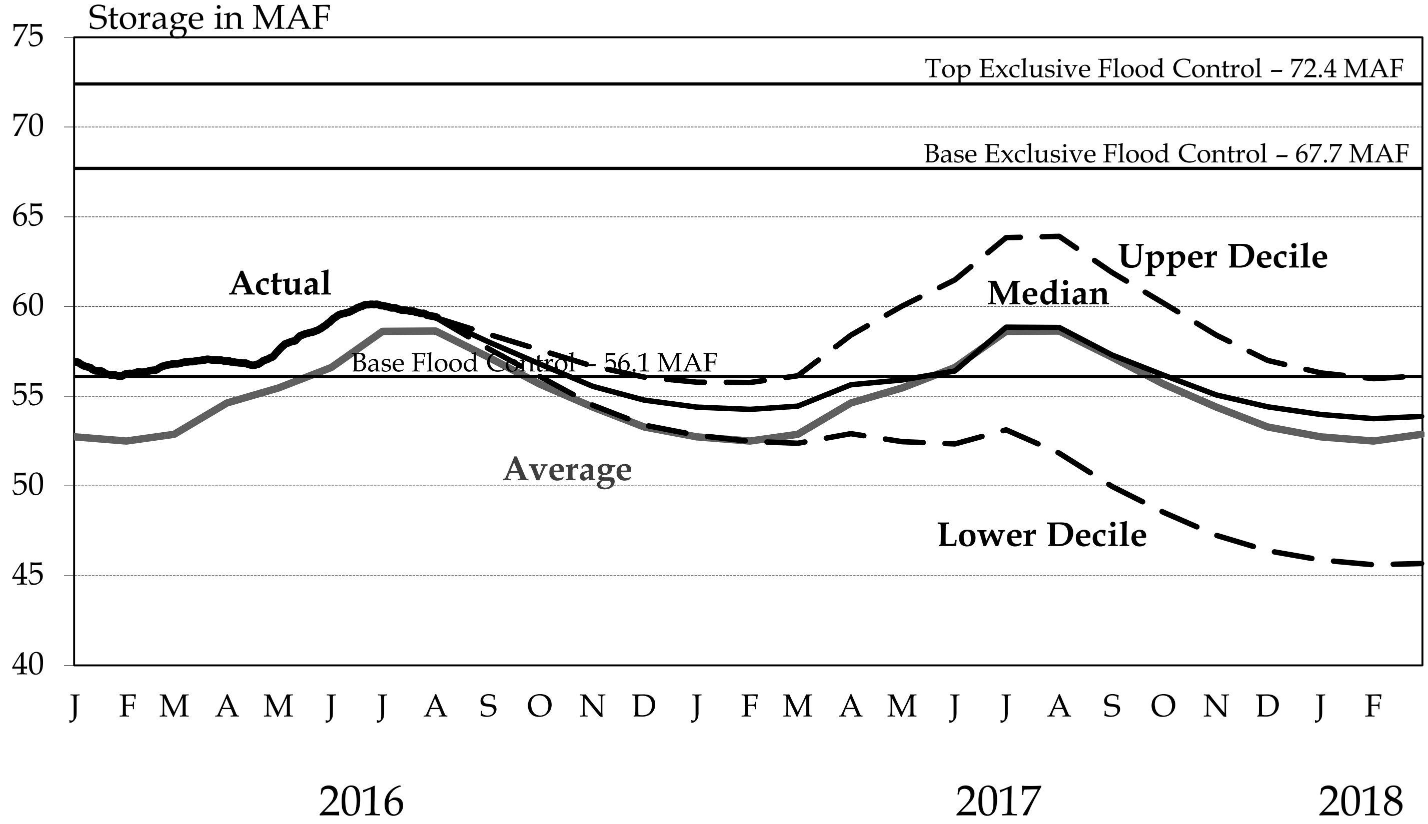
Spring Pulse Downstream Flow Limits

Omaha	41,000 cfs
Nebraska City	47,000 cfs
Kansas City	71,000 cfs

* Spring pulse magnitudes will be determined by taking the difference between pre-pulse Gavins Point releases and the peak pulse Missouri River flows measured just downstream of the mouth of the James River.

System Storage

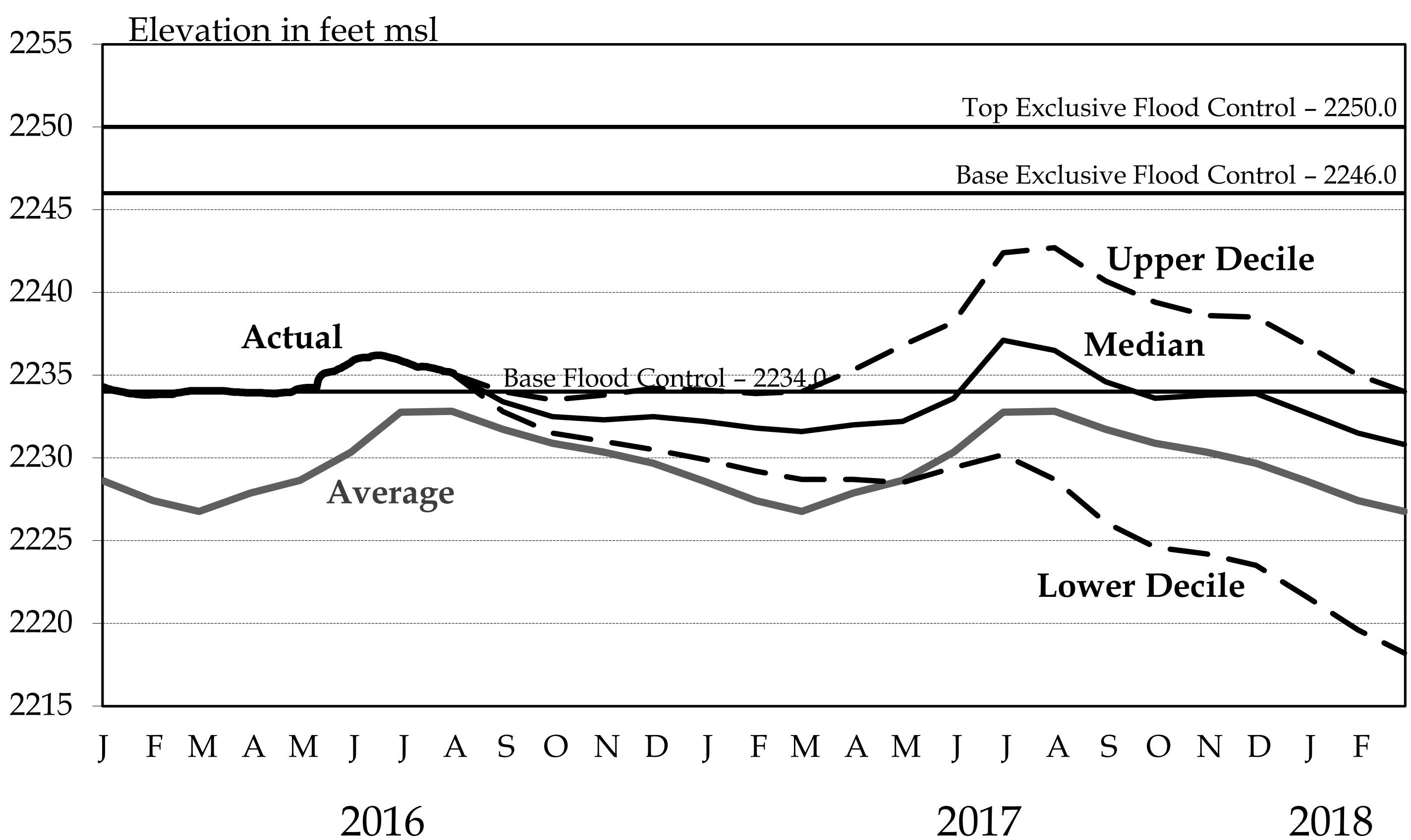
2016-2017 Draft AOP



Average 1967-2015

Fort Peck

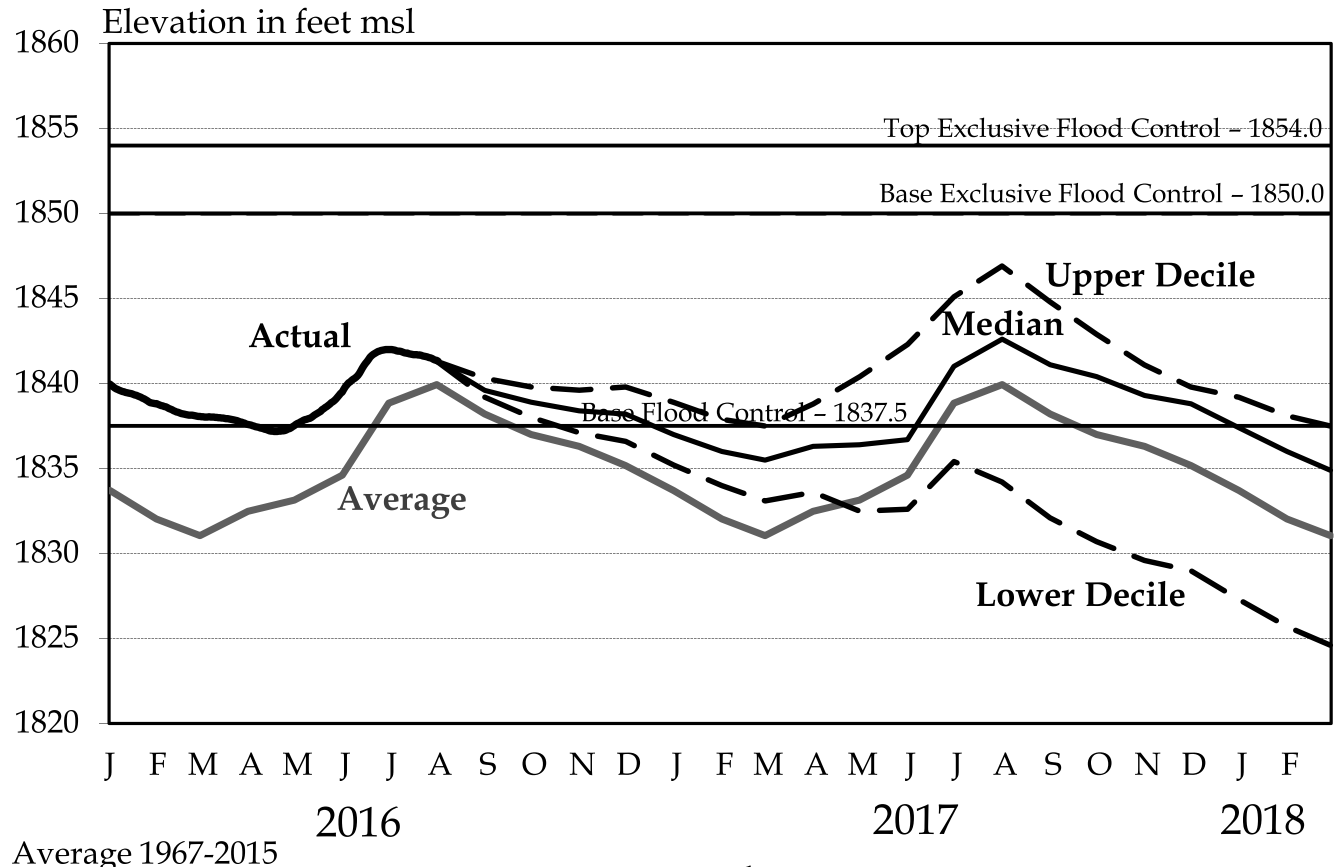
2016-2017 Draft AOP



Average 1967-2015

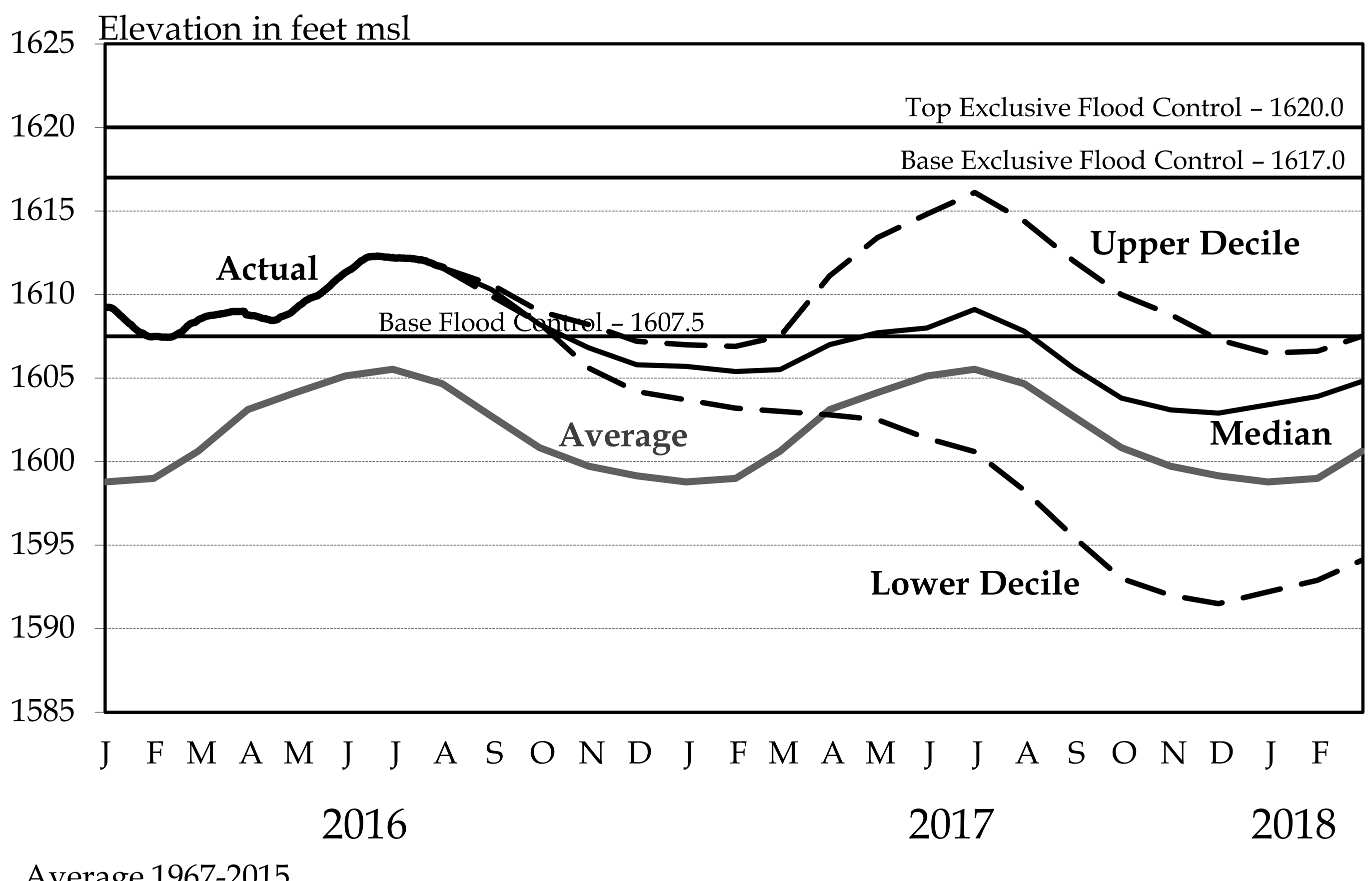
Garrison

2016-2017 Draft AOP

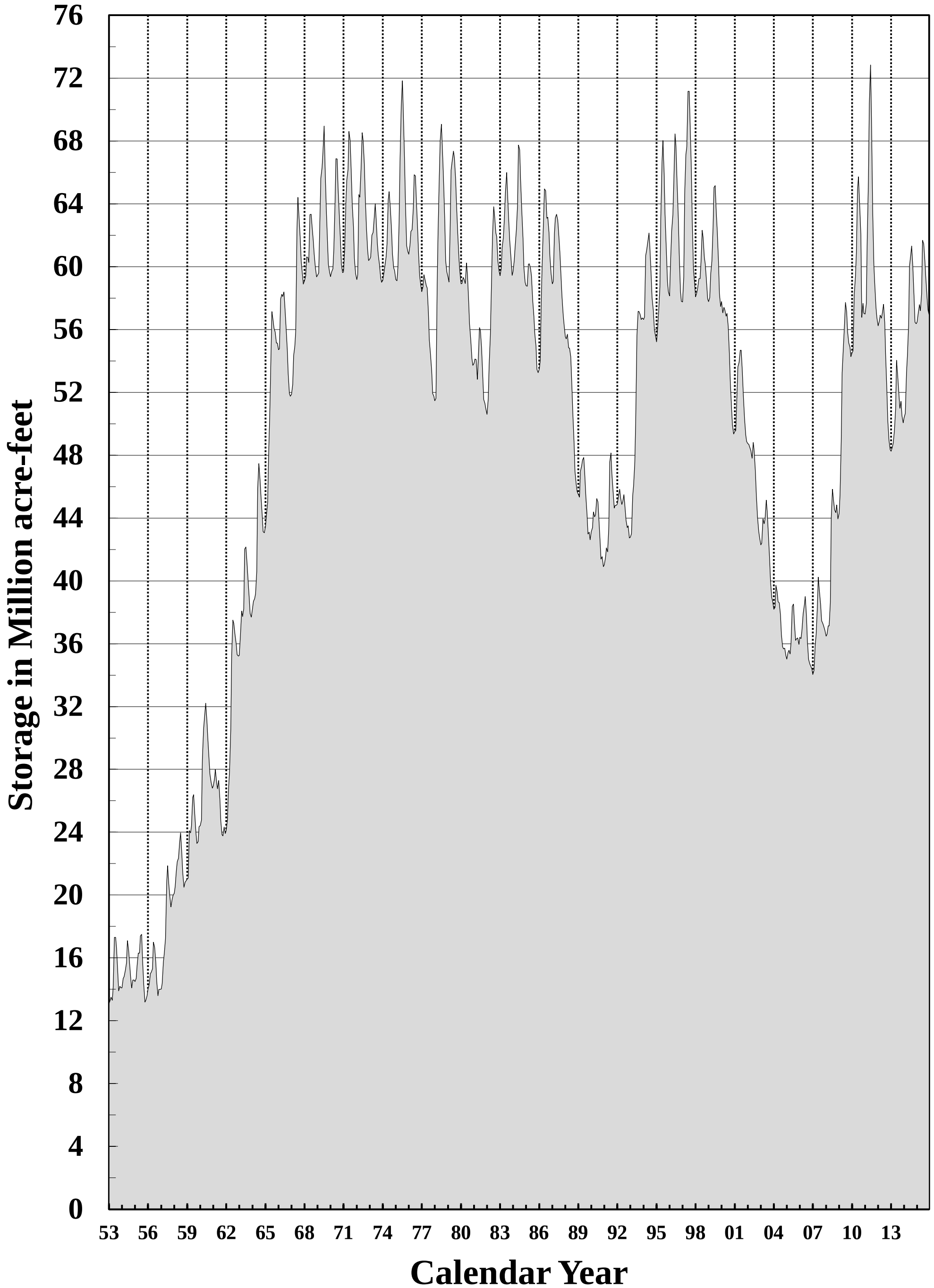


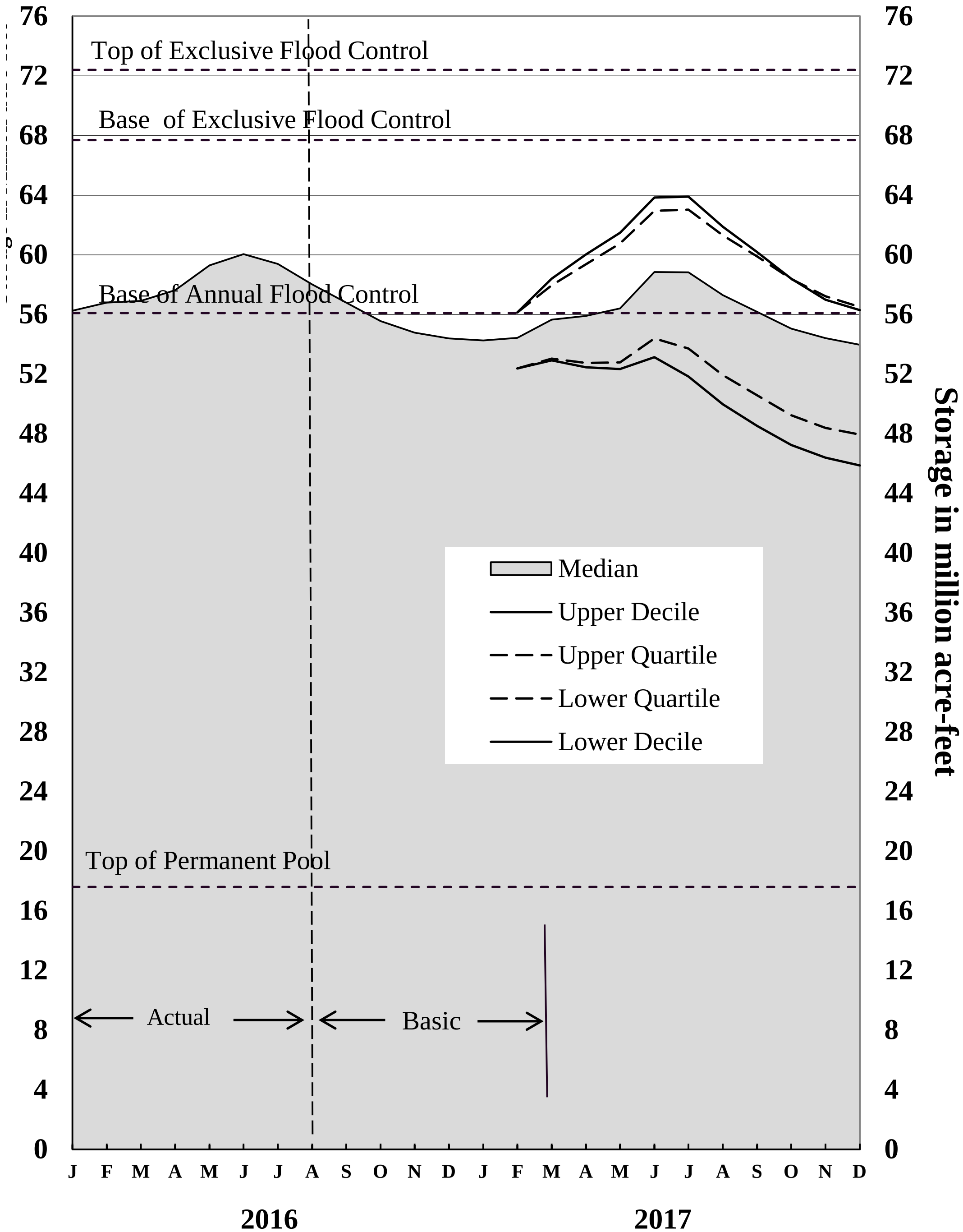
Oahe

2016-2017 Draft AOP

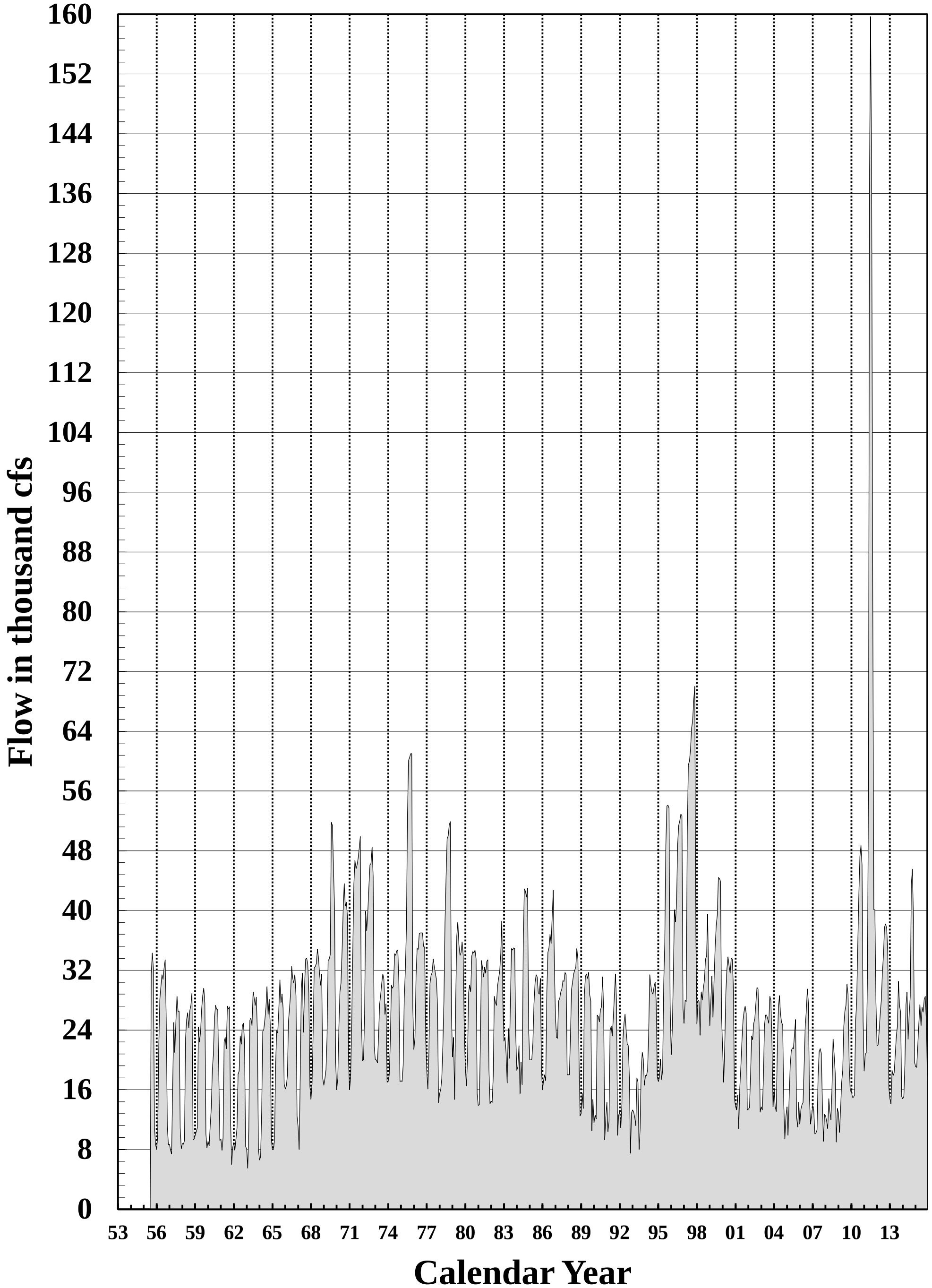


System Storage





Gavins Point Releases



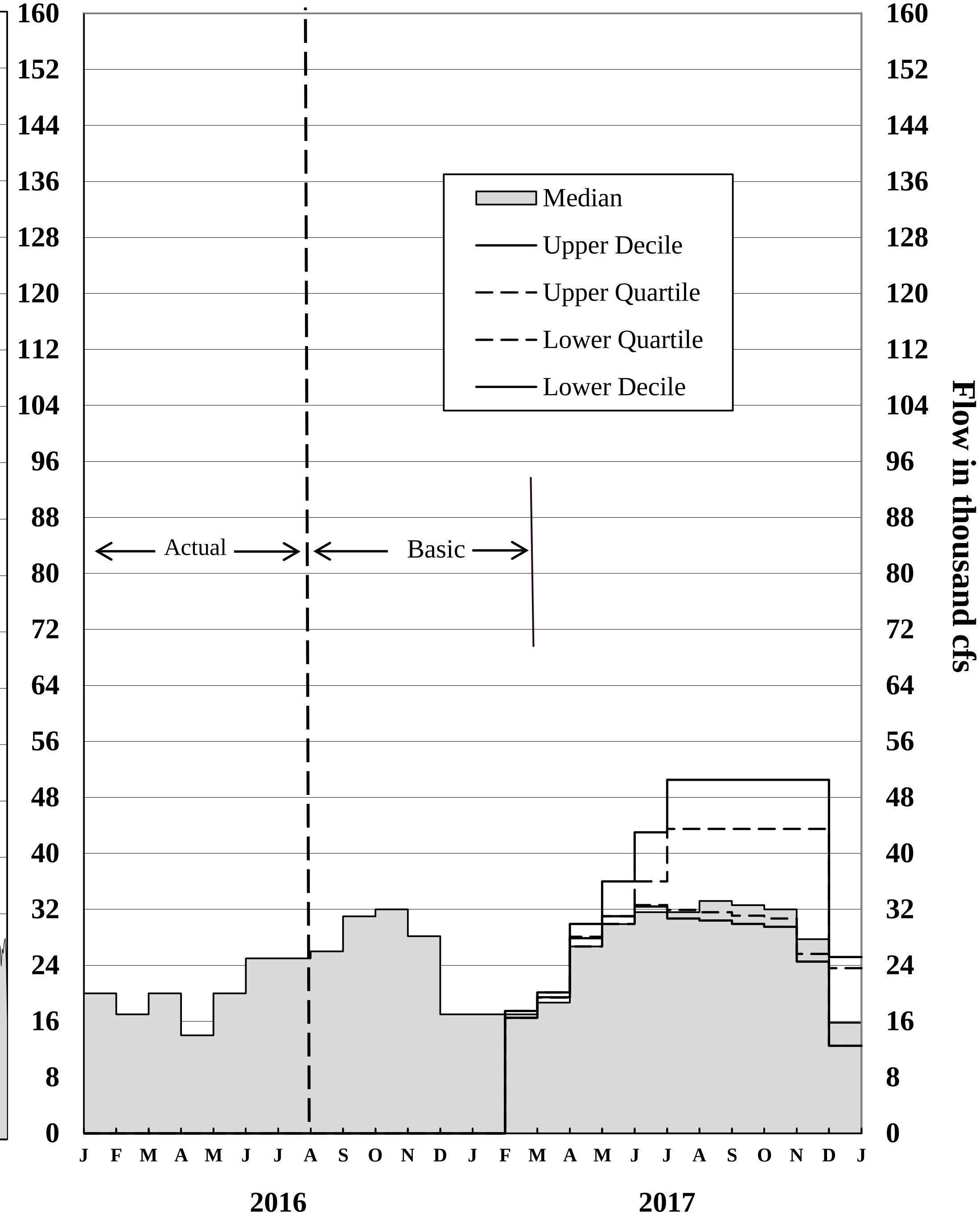


Plate 7

Fort Peck
Elevations and Releases

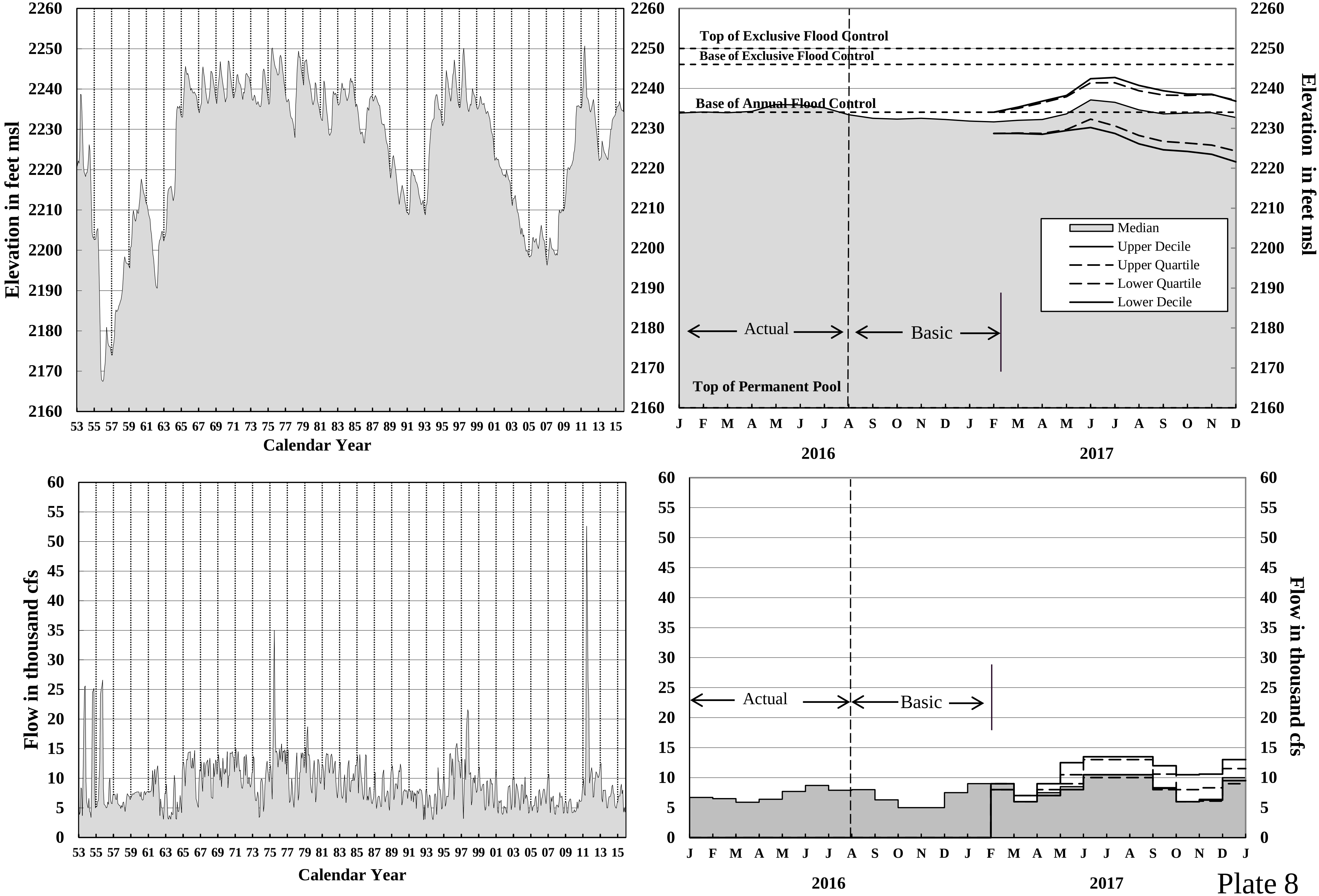


Plate 8

Garrison
Elevations and Releases

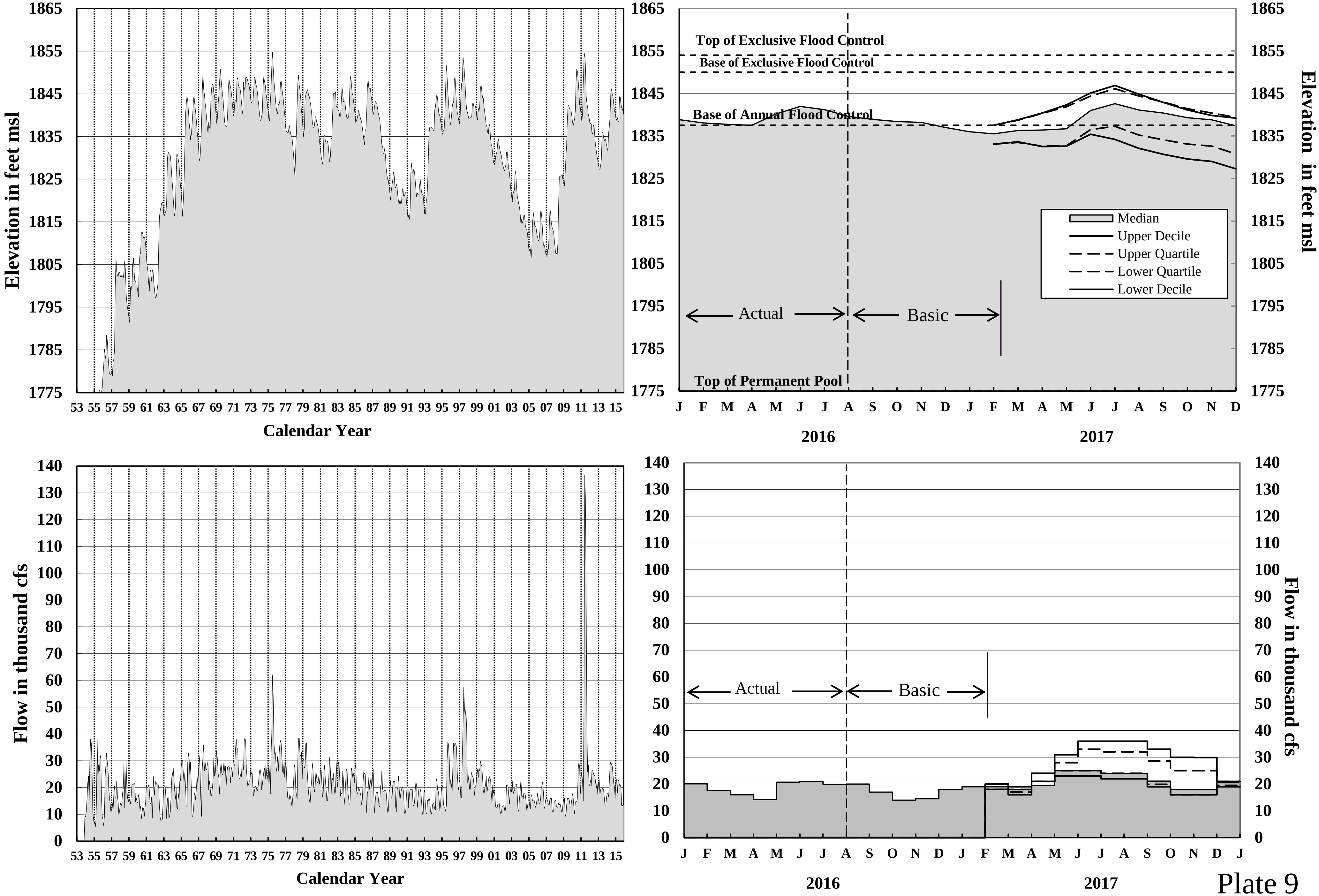


Plate 9

Oahe
Elevations and Releases

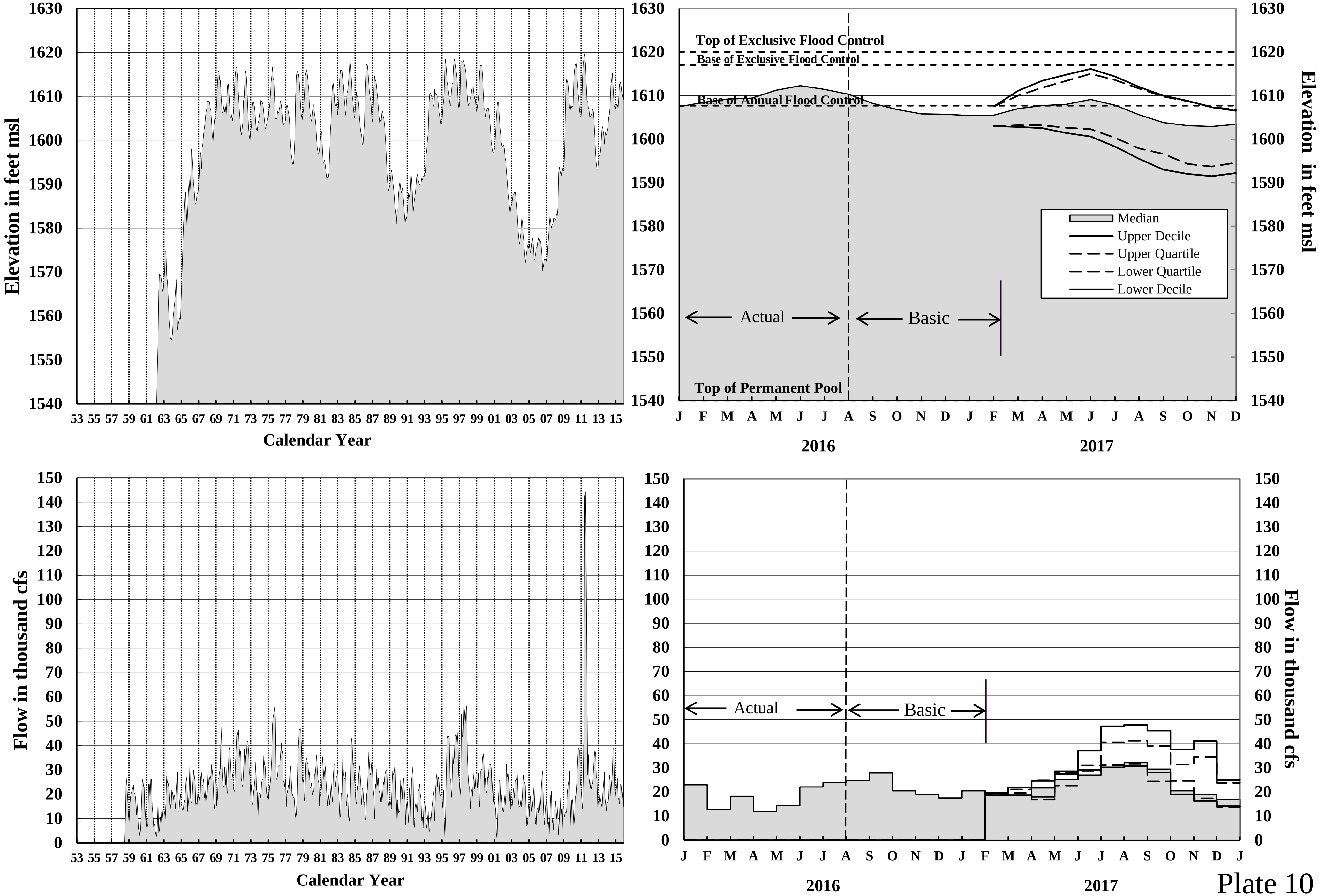


Plate 10

Fort Randall
Elevations and Releases

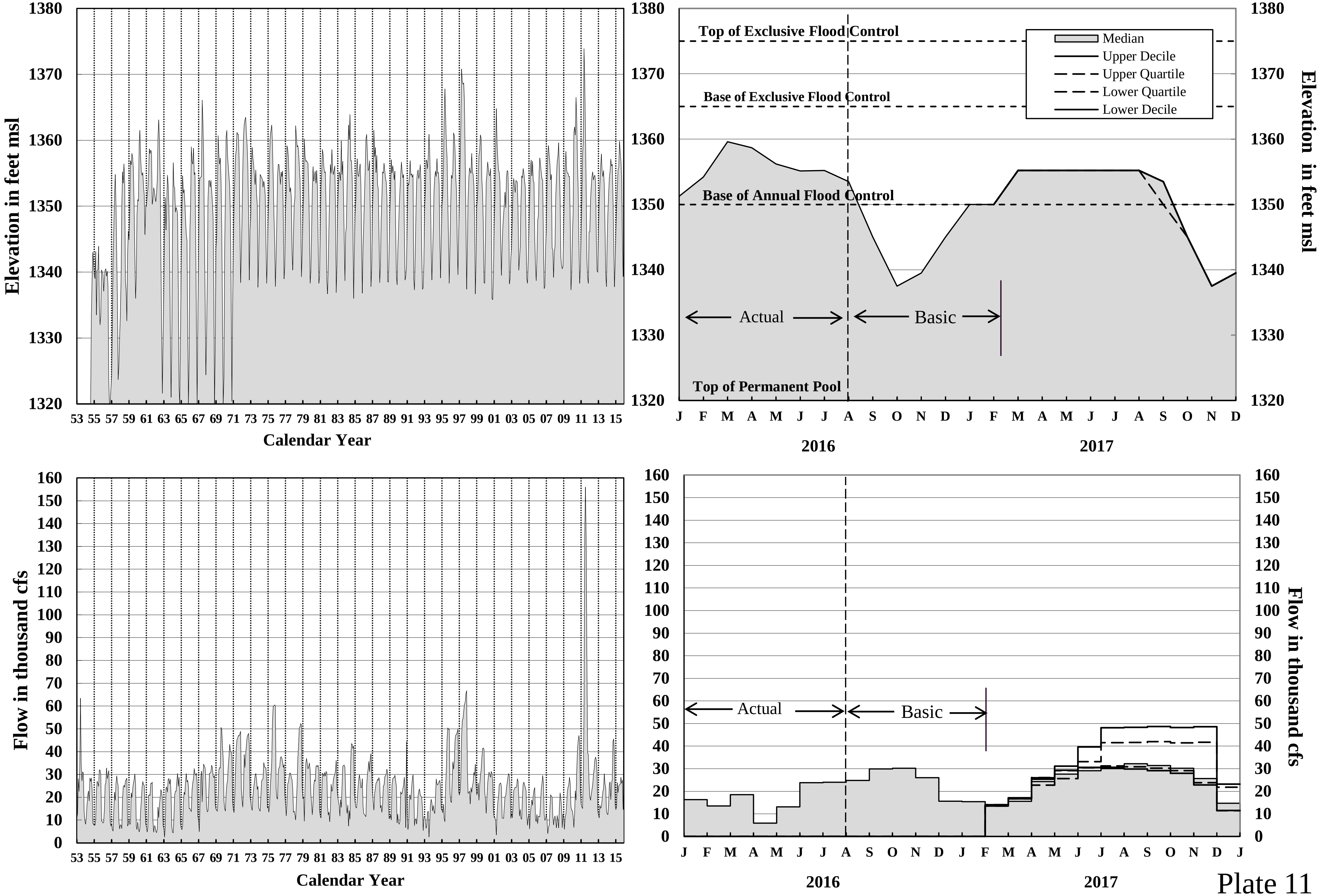
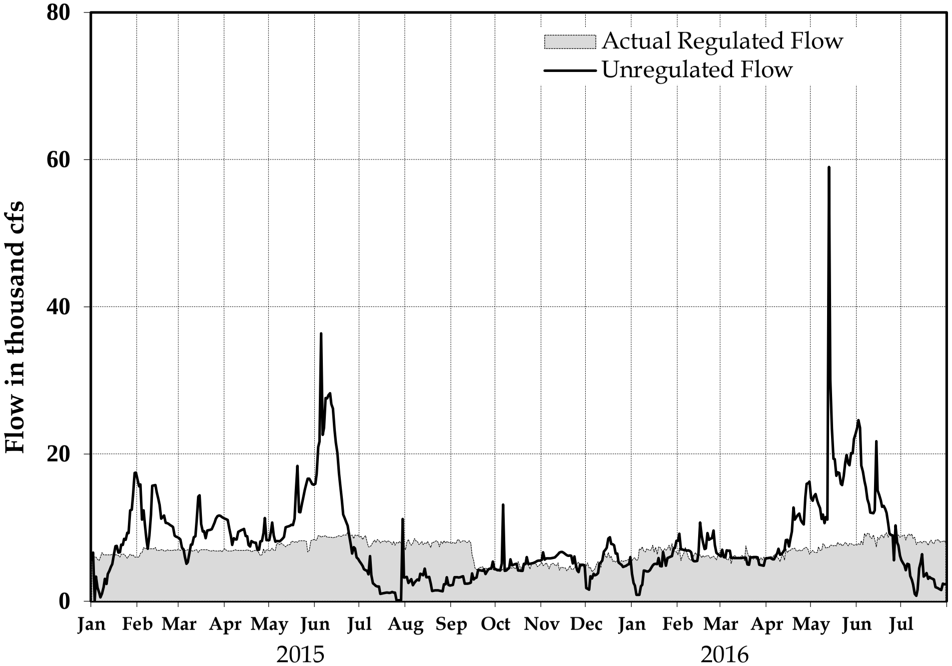


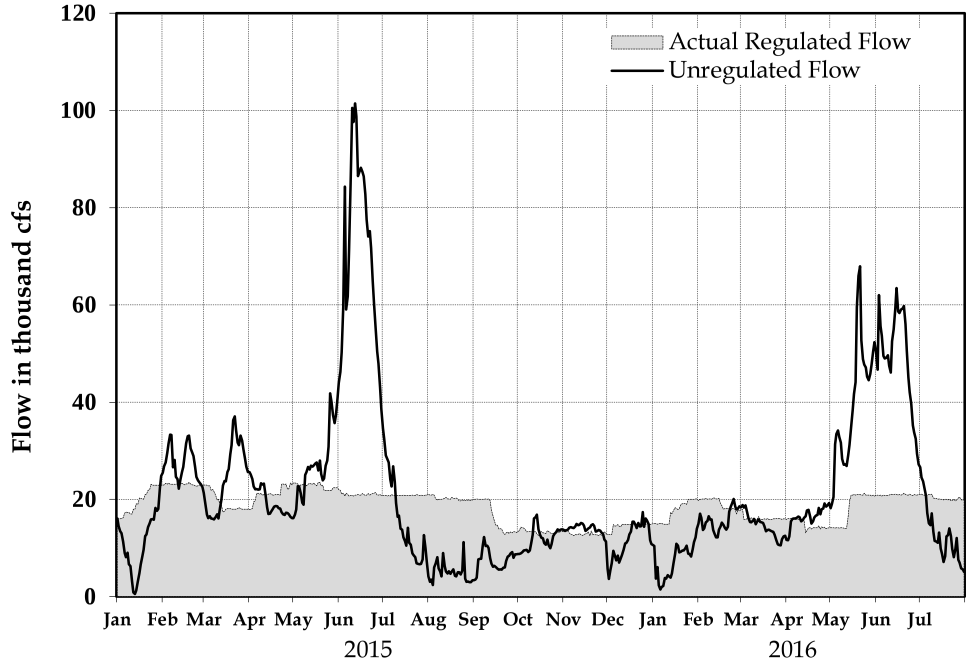
Plate 11

Reservoir Release and Unregulated Flow

Fort Peck



Garrison



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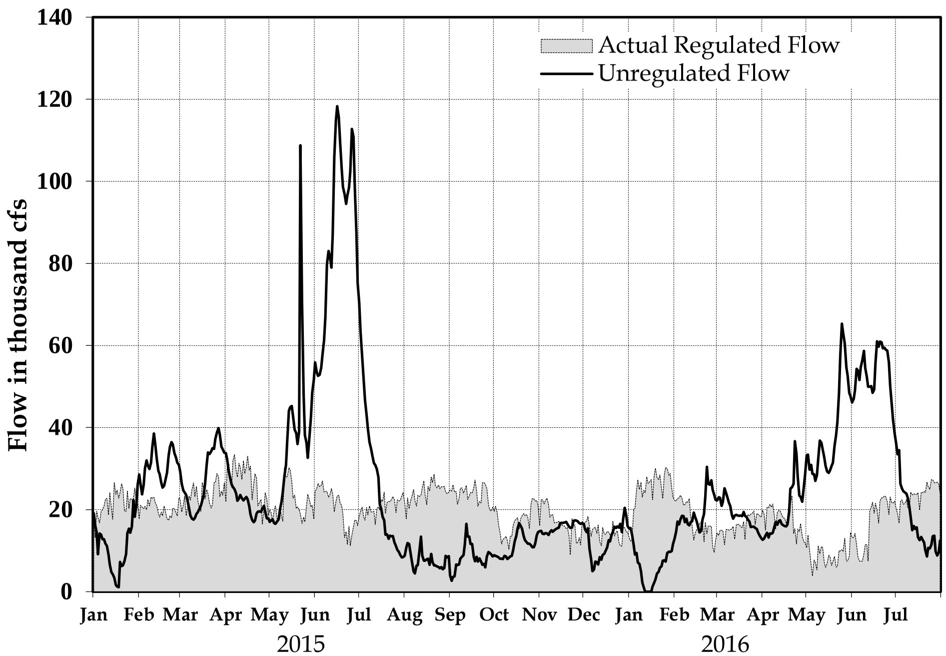


Gavins Point

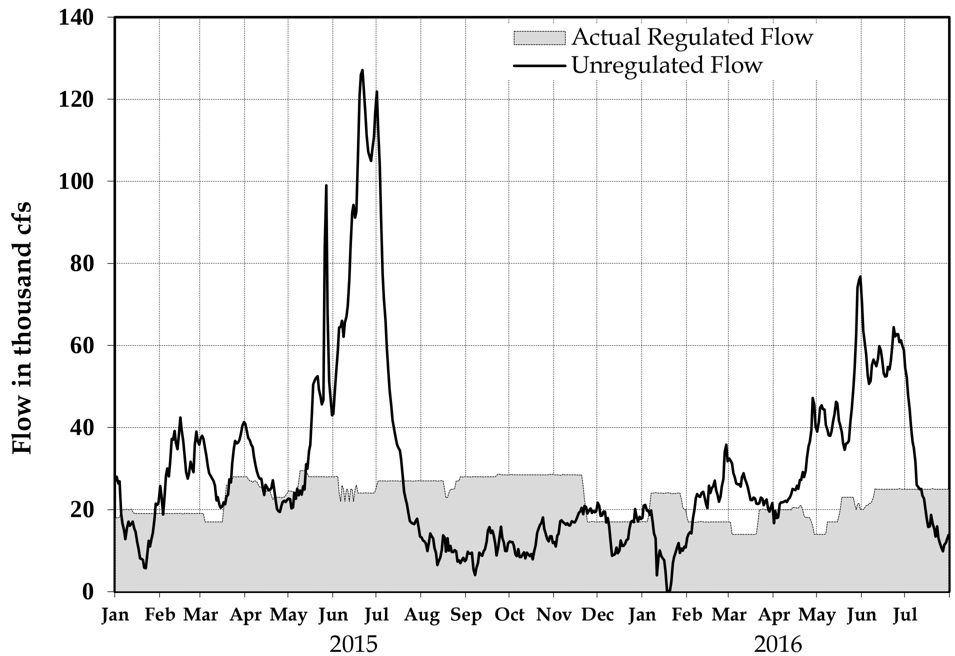
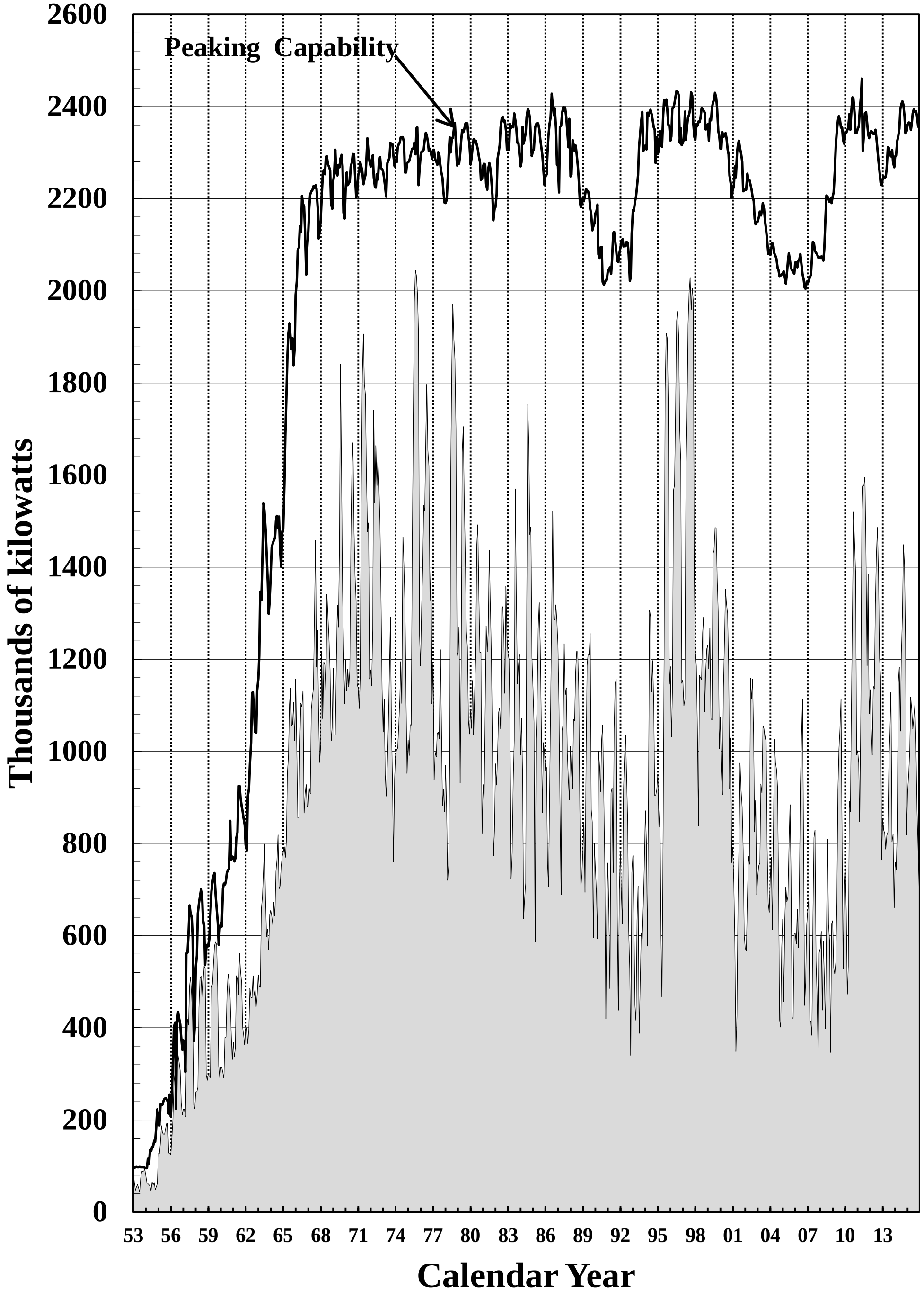


Plate 12

System Gross Capability and Average Monthly Generation



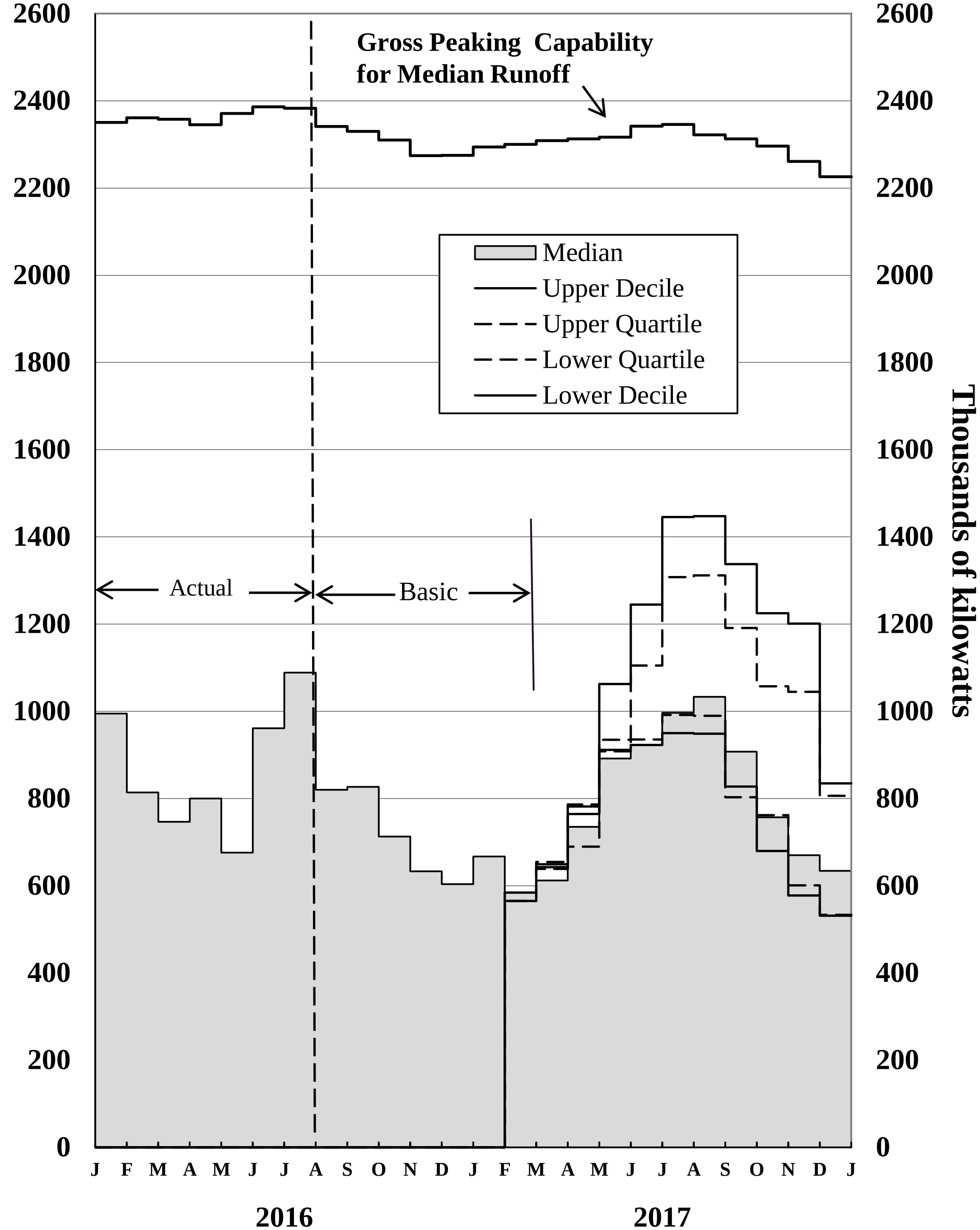
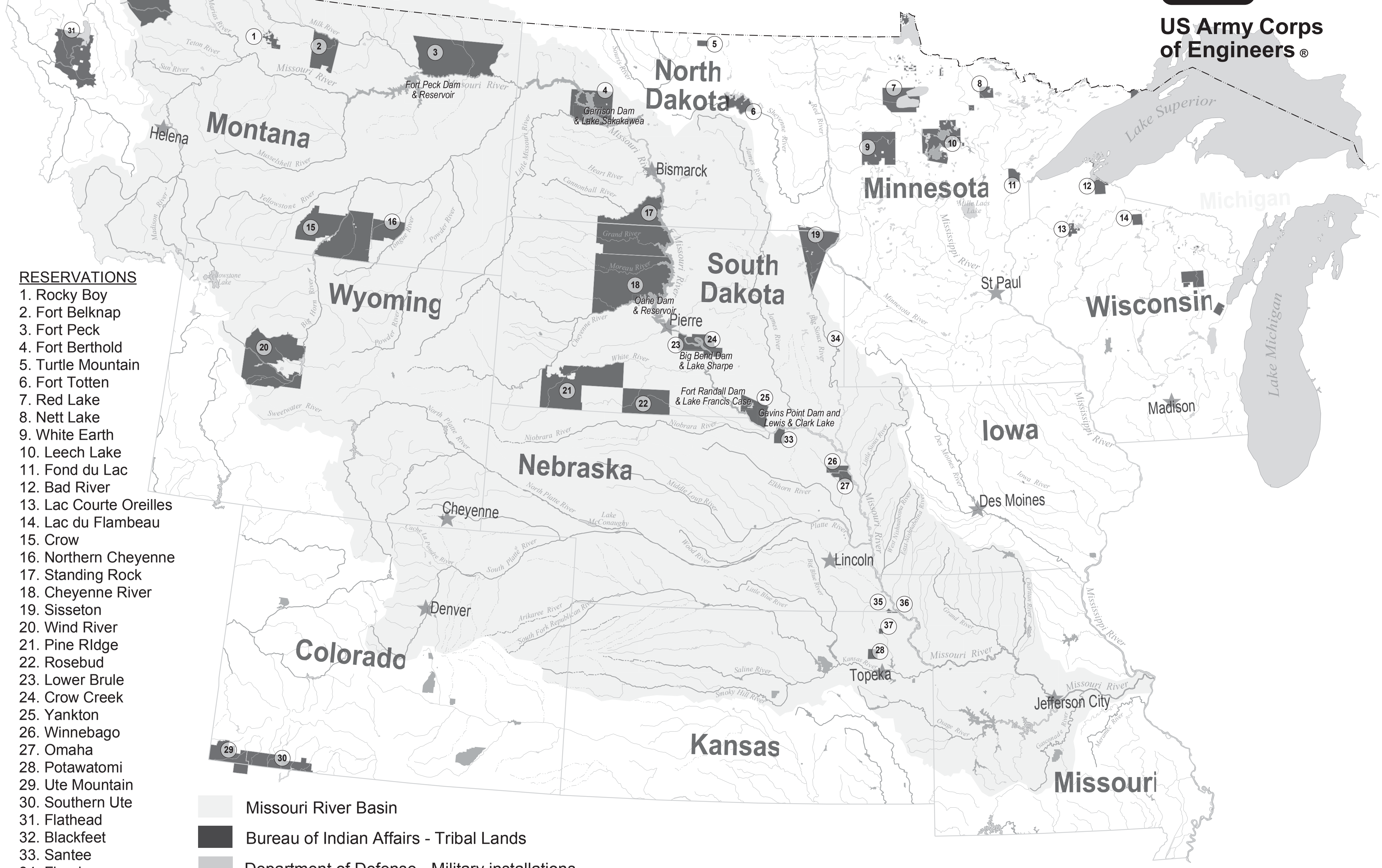


Plate 13

Tribal Lands of the Missouri River Basin

US Army Corps of Engineers ®



Missouri River Basin

Bureau of Indian Affairs - Tribal Lands

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

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

Plate 14

VALUES IN 1000 AF EXCEPT AS INDICATED

	31JUL16		2016							2017
	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--										
NAT INFLOW	2088	250	230	300	163	76	87	310	312	361
DEPLETION	-582	36	-76	-59	-44	-20	-23	-133	-157	-106
EVAPORATION	417	86	107	93	42	20	22	48		
MOD INFLOW	2253	128	199	266	164	77	88	395	469	467
RELEASE	2984	492	373	307	149	69	79	461	553	500
STOR CHANGE	-731	-363	-173	-41	15	7	8	-67	-84	-33
STORAGE	15022.	14659	14485	14444	14460	14467	14475	14408	14324	14291
ELEV FTMSL	2235.1	2233.4	2232.5	2232.3	2232.4	2232.5	2232.5	2232.2	2231.8	2231.6
DISCH KCFS	8.300	8.0	6.3	5.0	5.0	5.0	5.0	7.5	9.0	9.0
POWER										
AVE POWER MW		109	85	68	68	68	68	102	122	122
PEAK POW MW		162	161	161	161	161	161	161	161	160
ENERGY GWH	490.2	81.2	61.3	50.6	24.5	11.4	13.0	75.7	90.7	81.8
--GARRISON--										
NAT INFLOW	2422	430	350	450	175	82	93	225	262	355
DEPLETION	-573	130	-148	-44	-135	-63	-72	-115	-78	-48
CHAN STOR	-7	3	17	12		0	0	-25	-15	
EVAPORATION	479	99	123	106	48	22	26	55		
REG INFLOW	5492	696	765	707	411	192	219	722	878	903
RELEASE	7300	1230	1014	861	417	194	254	1107	1168	1055
STOR CHANGE	-1808	-534	-250	-153	-6	-3	-35	-385	-290	-152
STORAGE	18951.	18417	18167	18014	18008	18005	17971	17585	17296	17143
ELEV FTMSL	1841.3	1839.6	1838.9	1838.4	1838.3	1838.3	1838.2	1837.0	1836.0	1835.5
DISCH KCFS	20.300	20.0	17.0	14.0	14.0	14.0	16.0	18.0	19.0	19.0
POWER										
AVE POWER MW		253	214	176	175	175	200	224	235	234
PEAK POW MW		476	473	471	471	471	471	466	463	461
ENERGY GWH	1102.2	188.1	154.3	130.7	63.1	29.5	38.4	166.6	174.6	156.9
--OAHE--										
NAT INFLOW	441	78	112	72	34	16	18	4	12	95
DEPLETION	213	131	31	-13	1	0	1	13	19	30
CHAN STOR	4	1	11	12			-8	-8	-4	
EVAPORATION	484	103	126	107	47	22	25	54		
REG INFLOW	7049	1075	981	851	402	188	238	1035	1157	1120
RELEASE	8997	1520	1662	1262	577	305	251	1076	1262	1082
STOR CHANGE	-1948	-444	-681	-410	-175	-117	-13	-40	-105	38
STORAGE	19996.	19552	18871	18460	18285	18168	18155	18115	18010	18048
ELEV FTMSL	1611.6	1610.3	1608.2	1606.8	1606.3	1605.9	1605.8	1605.7	1605.4	1605.5
DISCH KCFS	23.500	24.7	27.9	20.5	19.4	22.0	15.8	17.5	20.5	19.5
POWER										
AVE POWER MW		324	363	265	250	281	203	224	262	249
PEAK POW MW		723	711	704	701	699	699	698	696	697
ENERGY GWH	1405.3	241.4	261.4	197.2	89.8	47.3	38.9	166.7	195.2	167.4
--BIG BEND--										
EVAPORATION	99	20	25	22	10	5	5	12		
REG INFLOW	8898	1500	1637	1240	567	300	246	1064	1262	1082
RELEASE	8931	1533	1637	1240	567	300	246	1064	1262	1082
STORAGE	1664.	1631	1631	1631	1631	1631	1631	1631	1631	1631
ELEV FTMSL	1420.6	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	20.900	24.9	27.5	20.2	19.1	21.6	15.5	17.3	20.5	19.5
POWER										
AVE POWER MW		117	130	99	96	108	78	87	101	93
PEAK POW MW		509	517	538	538	538	538	538	538	529
ENERGY GWH	524.7	87.1	93.9	73.6	34.5	18.2	15.0	64.8	74.9	62.8
--FORT RANDALL--										
NAT INFLOW	173	30	38	5	3	1	1	13	28	54
DEPLETION	34	15	7	1	1	0	1	3	3	3
EVAPORATION	108	25	31	24	9	4	4	9		
REG INFLOW	8962	1522	1636	1219	560	297	243	1065	1287	1133
RELEASE	9390	1524	1780	1858	873	408	269	956	946	774
STOR CHANGE	-428	-2	-144	-639	-313	-111	-26	108	341	359
STORAGE	3427.	3425	3281	2641	2328	2217	2191	2299	2640	2999
ELEV FTMSL	1355.2	1355.2	1353.5	1345.0	1340.0	1338.0	1337.5	1339.5	1345.0	1350.0
DISCH KCFS	23.900	24.8	29.9	30.2	29.3	29.4	16.9	15.6	15.4	13.9
POWER										
AVE POWER MW		209	250	242	222	215	124	114	117	111
PEAK POW MW		356	350	319	296	287	285	294	319	339
ENERGY GWH	902.3	155.8	180.1	180.1	79.8	36.1	23.7	85.1	87.0	74.7
--GAVINS POINT--										
NAT INFLOW	769	100	100	119	59	28	31	100	100	132
DEPLETION	28	10	-5	2	5	2	3	10	1	
CHAN STOR	18	-2	-10	-1	2	0	23	3	0	3
EVAPORATION	32	6	8	7	3	2	2	4		
REG INFLOW	10118	1607	1868	1968	925	432	319	1045	1045	909
RELEASE	10122	1599	1845	1968	925	432	319	1045	1045	944
STOR CHANGE	-4	8	23							-35
STORAGE	331.	339	362	362	362	362	362	362	362	327
ELEV FTMSL	1206.2	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	25.000	26.0	31.0	32.0	31.1	31.1	20.1	17.0	17.0	17.0
POWER										
AVE POWER MW		89	105	108	106	106	71	60	60	60
PEAK POW MW		115	117	117	117	117	117	117	117	114
ENERGY GWH	422.1	66.5	75.7	80.6	38.3	17.9	13.6	44.7	44.7	40.1
--GAVINS POINT - SIOUX CITY--										
NAT INFLOW	654	160	110	90	42	19	22	60	50	101
DEPLETION	132	38	25	12	7	3	3	14	15	15
REGULATED FLOW AT SIOUX CITY										
KAF	10644	1721	1930	2046	960	448	338	1091	1080	1030
KCFS		28.0	32.4	33.3	32.3	32.3	21.3	17.7	17.6	18.5
--TOTAL--										
NAT INFLOW	6547	1048	940	1036	475	221	253	712	764	1098
DEPLETION	-748	360	-166	-101	-165	-77	-88	-208	-197	-106
CHAN STOR	15	2	19	24	1	0	16	-30	-19	3
EVAPORATION	1618	339	420	360	160	74	84	182		
STORAGE	59391.	58022	56797	55553	55074	54850	54785	54401	54263	54439
SYSTEM POWER										
AVE POWER MW		1102	1148	958	916	955	743	811	897	869
PEAK POW MW		2341	2330	2310	2285	2274	2271	2275	2294	2300
ENERGY GWH	4846.9	820.0	826.7	712.7	329.9	160.4	142.7	603.6	667.0	583.7
DAILY GWH		26.5	27.6	23.0	22.0	22.9	17.8	19.5	21.5	20.8
	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

VALUES IN 1000 AF EXCEPT AS INDICATED

31JUL16	INI-SUM	31AUG	2016 30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	2017 31JAN	28FEB
--FORT PECK--										
NAT INFLOW	2529	325	276	360	195	91	104	372	374	432
DEPLETION	-600	1	-116	-92	-30	-14	-16	-115	-134	-85
EVAPORATION	287	64	81	71	17	8	9	37		
MOD INFLOW	2842	260	311	381	208	97	111	450	508	517
RELEASE	3079	492	408	338	164	76	87	461	553	500
STOR CHANGE	-237	-232	-96	43	44	21	23	-11	-45	17
STORAGE	15022.	14790	14693	14736	14781	14801	14824	14813	14768	14785
ELEV FTMSL	2235.1	2234.0	2233.5	2233.8	2234.0	2234.1	2234.2	2234.1	2233.9	2234.0
DISCH KCFS	8.300	8.0	6.8	5.5	5.5	5.5	5.5	7.5	9.0	9.0
POWER										
AVE POWER MW		109	93	75	75	75	75	102	123	123
PEAK POW MW		162	162	162	162	162	162	162	162	162
ENERGY GWH	508.1	81.3	67.2	55.8	27.0	12.6	14.4	76.1	91.2	82.4
--GARRISON--										
NAT INFLOW	2951	559	420	540	210	98	112	270	316	426
DEPLETION	-621	86	-158	-39	-131	-61	-70	-115	-83	-50
CHAN STOR	-7	3	11	13				-20	-15	
EVAPORATION	332	75	94	82	19	9	10	43		
REG INFLOW	6313	893	903	849	485	226	259	784	938	976
RELEASE	7524	1230	1044	922	446	208	238	1094	1230	1111
STOR CHANGE	-1211	-337	-141	-74	39	18	21	-310	-292	-135
STORAGE	18951.	18614	18473	18400	18439	18457	18477	18167	17875	17740
ELEV FTMSL	1841.3	1840.3	1839.8	1839.6	1839.7	1839.8	1839.8	1838.9	1837.9	1837.5
DISCH KCFS	20.300	20.0	17.5	15.0	15.0	15.0	15.0	17.8	20.0	20.0
POWER										
AVE POWER MW		253	222	189	189	189	190	224	250	249
PEAK POW MW		478	477	476	476	476	477	473	470	468
ENERGY GWH	1144.4	188.1	159.6	140.9	68.2	31.8	36.4	166.5	185.8	167.1
--OAHE--										
NAT INFLOW	602	105	151	97	46	21	25	5	18	134
DEPLETION	213	131	31	-13	1	0	1	13	19	30
CHAN STOR	1	1	9	10				-11	-9	0
EVAPORATION	336	78	96	82	19	9	10	42		
REG INFLOW	7577	1127	1078	960	472	220	252	1033	1220	1215
RELEASE	8911	1460	1598	1204	542	289	432	1113	1240	1034
STOR CHANGE	-1334	-332	-520	-244	-70	-69	-180	-80	-20	181
STORAGE	19996.	19664	19143	18899	18829	18760	18581	18501	18481	18662
ELEV FTMSL	1611.6	1610.6	1609.0	1608.2	1608.0	1607.8	1607.2	1607.0	1606.9	1607.5
DISCH KCFS	23.500	23.7	26.8	19.6	18.2	20.8	27.2	18.1	20.2	18.6
POWER										
AVE POWER MW		312	350	255	236	269	351	234	260	240
PEAK POW MW		724	716	712	711	709	706	705	705	708
ENERGY GWH	1399.8	232.2	252.2	189.4	85.1	45.3	67.3	173.8	193.2	161.4
--BIG BEND--										
EVAPORATION	67	15	19	17	4	2	2	9		
REG INFLOW	8844	1445	1579	1188	538	287	429	1105	1240	1034
RELEASE	8877	1478	1579	1188	538	287	429	1105	1240	1034
STORAGE	1664.	1631	1631	1631	1631	1631	1631	1631	1631	1631
ELEV FTMSL	1420.6	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	20.900	24.0	26.5	19.3	18.1	20.7	27.1	18.0	20.2	18.6
POWER										
AVE POWER MW		113	126	95	91	104	135	90	99	89
PEAK POW MW		509	517	538	538	538	538	538	538	529
ENERGY GWH	522.0	84.0	90.5	70.5	32.8	17.4	26.0	67.2	73.6	60.0
--FORT RANDALL--										
NAT INFLOW	240	41	51	7	4	2	2	18	39	77
DEPLETION	34	15	7	1	1	0	1	3	3	3
EVAPORATION	74	19	24	18	4	2	2	7		
REG INFLOW	9009	1485	1599	1175	537	287	429	1114	1276	1108
RELEASE	9436	1487	1743	1814	850	398	454	1005	935	749
STOR CHANGE	-427	-2	-144	-639	-313	-111	-26	109	341	359
STORAGE	3427.	3425	3281	2642	2328	2217	2191	2300	2641	3000
ELEV FTMSL	1355.2	1355.2	1353.5	1345.0	1340.0	1338.0	1337.5	1339.5	1345.0	1350.0
DISCH KCFS	23.900	24.2	29.3	29.5	28.6	28.6	28.6	16.3	15.2	13.5
POWER										
AVE POWER MW		204	245	236	216	210	207	120	116	108
PEAK POW MW		356	350	319	296	287	285	294	319	339
ENERGY GWH	904.6	152.0	176.4	175.9	77.7	35.2	39.8	89.3	86.0	72.3
--GAVINS POINT--										
NAT INFLOW	1050	135	135	161	80	37	42	135	140	185
DEPLETION	28	10	-5	2	5	2	3	10	1	
CHAN STOR	19	-1	-10	0	2	0	0	23	2	3
EVAPORATION	22	5	6	5	1	1	1	3		
REG INFLOW	10455	1607	1868	1968	925	432	493	1150	1076	937
RELEASE	10459	1599	1845	1968	925	432	493	1150	1076	972
STOR CHANGE	-4	8	23							-35
STORAGE	331.	339	362	362	362	362	362	362	362	327
ELEV FTMSL	1206.2	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	25.000	26.0	31.0	32.0	31.1	31.1	31.1	18.7	17.5	17.5
POWER										
AVE POWER MW		89	105	108	106	106	106	66	62	61
PEAK POW MW		115	117	117	117	117	117	117	117	114
ENERGY GWH	435.8	66.5	75.7	80.6	38.3	17.9	20.4	49.1	46.0	41.3
--GAVINS POINT - SIOUX CITY--										
NAT INFLOW	892	216	149	122	56	26	30	81	71	141
DEPLETION	132	38	25	12	7	3	3	14	15	15
REGULATED FLOW AT SIOUX CITY										
KAF	11219	1777	1969	2078	975	455	520	1217	1132	1098
KCFS		28.9	33.1	33.8	32.8	32.8	32.8	19.8	18.4	19.8
--TOTAL--										
NAT INFLOW	8264	1381	1182	1287	590	275	315	881	958	1395
DEPLETION	-814	281	-216	-129	-147	-69	-78	-190	-179	-87
CHAN STOR	13	4	11	23	1	0	-1	-7	-21	3
EVAPORATION	1118	256	319	275	64	30	34	140		
STORAGE	59391.	58462	57584	56670	56369	56228	56067	55774	55757	56145
SYSTEM POWER										
AVE POWER MW		1081	1141	958	914	954	1064	836	908	870
PEAK POW MW		2345	2339	2324	2300	2290	2286	2290	2311	2320
ENERGY GWH	4914.7	804.0	821.6	713.1	329.1	160.2	204.3	622.1	675.9	584.4
DAILY GWH		25.9	27.4	23.0	21.9	22.9	25.5	20.1	21.8	20.9
	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

VALUES IN 1000 AF EXCEPT AS INDICATED

	31JUL16		2016						2017	
	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--										
NAT INFLOW	1616	175	173	240	130	61	69	248	250	270
DEPLETION	-407	54	-75	-80	-18	-8	-9	-99	-104	-68
EVAPORATION	514	106	132	114	51	24	27	59		
MOD INFLOW	1509	15	116	206	96	45	51	288	354	338
RELEASE	2834	492	389	307	149	69	79	412	492	444
STOR CHANGE	-1325	-477	-273	-101	-53	-24	-28	-124	-138	-106
STORAGE	15022.	14545	14272	14170	14118	14093	14065	13941	13804	13697
ELEV FTMSL	2235.1	2232.8	2231.5	2231.0	2230.8	2230.6	2230.5	2229.9	2229.2	2228.7
DISCH KCFS	8.300	8.0	6.5	5.0	5.0	5.0	5.0	6.7	8.0	8.0
POWER										
AVE POWER MW		109	89	68	68	68	68	90	108	107
PEAK POW MW		161	160	160	160	160	160	159	159	158
ENERGY GWH	463.3	81.1	63.8	50.4	24.3	11.4	13.0	67.2	80.0	72.1
--GARRISON--										
NAT INFLOW	1860	301	263	360	140	65	75	180	210	266
DEPLETION	-445	122	-131	-17	-124	-58	-66	-89	-52	-31
CHAN STOR	3	3	14	15		0	0	-17	-13	0
EVAPORATION	595	124	153	132	59	28	31	68		
REG INFLOW	4546	549	644	568	353	165	188	597	741	741
RELEASE	7073	1230	1010	861	417	194	222	1033	1107	1000
STOR CHANGE	-2527	-680	-366	-293	-63	-30	-34	-436	-366	-258
STORAGE	18951.	18271	17905	17612	17548	17519	17485	17049	16683	16424
ELEV FTMSL	1841.3	1839.2	1838.0	1837.1	1836.9	1836.8	1836.6	1835.2	1834.0	1833.1
DISCH KCFS	20.300	20.0	17.0	14.0	14.0	14.0	14.0	16.8	18.0	18.0
POWER										
AVE POWER MW		253	213	174	174	174	174	207	220	218
PEAK POW MW		474	470	467	466	465	465	460	455	452
ENERGY GWH	1060.0	187.9	153.0	129.8	62.6	29.2	33.3	154.0	163.5	146.7
--OAHE--										
NAT INFLOW	325	51	84	54	26	12	14	3	10	72
DEPLETION	213	131	31	-13	1	0	1	13	19	30
CHAN STOR	8	1	12	12				-12	-5	
EVAPORATION	602	129	158	133	58	27	31	66		
REG INFLOW	6591	1022	917	807	383	179	205	945	1093	1042
RELEASE	9282	1579	1430	1654	658	257	262	1078	1263	1101
STOR CHANGE	-2691	-556	-513	-848	-275	-78	-57	-133	-170	-59
STORAGE	19996.	19440	18927	18079	17803	17725	17668	17535	17365	17305
ELEV FTMSL	1611.6	1609.9	1608.3	1605.6	1604.7	1604.4	1604.2	1603.7	1603.2	1603.0
DISCH KCFS	23.500	25.7	24.0	26.9	22.1	18.5	16.5	17.5	20.5	19.8
POWER										
AVE POWER MW		337	313	346	282	236	210	222	260	250
PEAK POW MW		721	712	698	693	691	690	688	685	684
ENERGY GWH	1440.8	250.5	225.1	257.3	101.5	39.6	40.3	165.4	193.2	168.0
--BIG BEND--										
EVAPORATION	123	25	31	28	12	6	7	14		
REG INFLOW	9159	1554	1398	1627	646	251	255	1063	1263	1101
RELEASE	9192	1587	1398	1627	646	251	255	1063	1263	1101
STORAGE	1664.	1631	1631	1631	1631	1631	1631	1631	1631	1631
ELEV FTMSL	1420.6	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	20.900	25.8	23.5	26.5	21.7	18.1	16.1	17.3	20.5	19.8
POWER										
AVE POWER MW		121	113	129	108	91	81	87	101	95
PEAK POW MW		509	529	538	538	538	538	538	538	529
ENERGY GWH	541.0	90.2	81.1	96.3	39.0	15.3	15.6	64.8	75.0	63.9
--FORT RANDALL--										
NAT INFLOW	129	20	29	4	2	1	1	10	21	41
DEPLETION	34	15	7	1	1	0	1	3	3	3
EVAPORATION	132	32	38	29	12	5	5	12		
REG INFLOW	9155	1560	1383	1601	635	247	251	1059	1281	1139
RELEASE	9583	1562	1807	1960	889	417	277	951	940	780
STOR CHANGE	-428	-2	-424	-359	-254	-170	-26	108	341	359
STORAGE	3427.	3425	3001	2641	2387	2217	2191	2299	2640	2999
ELEV FTMSL	1355.2	1355.2	1350.0	1345.0	1341.0	1338.0	1337.5	1339.5	1345.0	1350.0
DISCH KCFS	23.900	25.4	30.4	31.9	29.9	30.0	17.4	15.5	15.3	14.0
POWER										
AVE POWER MW		214	250	251	227	221	127	114	116	112
PEAK POW MW		356	339	319	301	287	285	294	319	339
ENERGY GWH	915.9	159.6	180.1	186.9	81.6	37.1	24.4	84.5	86.5	75.2
--GAVINS POINT--										
NAT INFLOW	567	65	75	89	45	21	24	75	75	99
DEPLETION	28	10	-5	2	5	2	3	10	1	
CHAN STOR	18	-3	-9	-3	4	0	23	4	0	2
EVAPORATION	40	8	10	9	4	2	2	5		
REG INFLOW	10101	1607	1868	2035	928	433	319	1015	1015	881
RELEASE	10105	1599	1845	2035	928	433	319	1015	1015	916
STOR CHANGE	-4	8	23							-35
STORAGE	331.	339	362	362	362	362	362	362	362	327
ELEV FTMSL	1206.2	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	25.000	26.0	31.0	33.1	31.2	31.2	20.1	16.5	16.5	16.5
POWER										
AVE POWER MW		89	105	111	107	107	71	58	58	58
PEAK POW MW		115	117	117	117	117	117	117	117	114
ENERGY GWH	420.4	66.5	75.7	82.5	38.3	17.9	13.6	43.4	43.4	38.9
--GAVINS POINT - SIOUX CITY--										
NAT INFLOW	476	104	83	68	31	14	17	45	38	76
DEPLETION	132	38	25	12	7	3	3	14	15	15
REGULATED FLOW AT SIOUX CITY										
KAF	10449	1665	1903	2091	953	445	332	1046	1038	977
KCFS		27.1	32.0	34.0	32.0	32.0	20.9	17.0	16.9	17.6
--TOTAL--										
NAT INFLOW	4973	716	707	815	373	174	199	561	604	824
DEPLETION	-445	370	-148	-95	-128	-60	-68	-148	-118	-51
CHAN STOR	28	1	17	24	4	0	23	-25	-18	2
EVAPORATION	2005	424	522	445	197	91	103	224		
STORAGE	59391.	57650	56097	54495	53849	53547	53402	52817	52484	52384
SYSTEM POWER										
AVE POWER MW		1123	1082	1079	965	895	730	779	862	841
PEAK POW MW		2337	2327	2298	2274	2259	2255	2256	2273	2276
ENERGY GWH	4841.4	835.7	778.9	803.1	347.3	150.3	140.2	579.4	641.6	564.9
DAILY GWH		27.0	26.0	25.9	23.2	21.5	17.5	18.7	20.7	20.2
	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

VALUES IN 1000 AF EXCEPT AS INDICATED

28FEB17		2017												2018			
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	9450	341	159	205	825	1400	2355	1205	440	385	480	288	134	153	350	310	420
DEPLETION	616	1	0	1	-36	309	607	284	2	-113	-75	-28	-13	-15	-111	-116	-82
EVAPORATION	327							22	70	87	75	18	8	9	39		
MOD INFLOW	8507	340	159	204	861	1091	1748	899	368	411	480	297	139	159	422	426	502
RELEASE	8507	208	97	125	536	769	803	830	830	713	646	312	146	171	799	799	722
STOR CHANGE	0	132	62	79	325	322	945	69	-462	-302	-165	-15	-7	-13	-377	-373	-220
STORAGE	14785.	14917	14978	15057	15383	15705	16650	16719	16257	15955	15790	15775	15768	15755	15378	15005	14785
ELEV FTMSL	2234.0	2234.6	2234.9	2235.3	2236.8	2238.2	2242.4	2242.7	2240.7	2239.4	2238.6	2238.6	2238.5	2238.5	2236.8	2235.0	2234.0
DISCH KCFS	9.000	7.0	7.0	7.0	9.0	12.5	13.5	13.5	13.5	12.0	10.5	10.5	10.5	10.8	13.0	13.0	13.0
POWER																	
AVE POWER MW		96	96	96	123	165	167	168	168	163	144	144	144	148	165	164	163
PEAK POW MW		163	163	163	164	165	168	168	167	166	166	166	166	166	164	163	162
ENERGY GWH	1335.3	34.4	16.1	20.7	88.8	122.6	120.1	125.3	124.8	117.4	107.3	51.9	24.2	28.4	122.6	121.7	109.2
--GARRISON--																	
NAT INFLOW	14000	530	247	318	1355	1840	3460	2715	835	570	645	248	116	132	260	315	415
DEPLETION	1222	-18	-8	-11	-57	41	1152	700	111	-142	-33	-132	-61	-70	-114	-84	-52
CHAN STOR	-39	20			-20	-34	-10			15	14			-3	-22		0
EVAPORATION	371							25	80	99	84	20	9	10	43		
REG INFLOW	20875	776	353	454	1928	2533	3102	2820	1474	1341	1254	672	314	360	1109	1198	1189
RELEASE	20875	565	264	339	1428	1906	2142	2214	2214	1965	1845	893	417	468	1291	1537	1388
STOR CHANGE	0	211	89	114	500	627	959	606	-740	-624	-591	-221	-103	-108	-182	-339	-199
STORAGE	17740.	17951	18040	18154	18654	19281	20240	20846	20107	19483	18892	18671	18568	18460	18278	17939	17740
ELEV FTMSL	1837.5	1838.2	1838.4	1838.8	1840.4	1842.3	1845.1	1846.9	1844.8	1842.9	1841.1	1840.4	1840.1	1839.8	1839.2	1838.1	1837.5
DISCH KCFS	20.000	19.0	19.0	19.0	24.0	31.0	36.0	36.0	36.0	33.0	30.0	30.0	30.0	29.5	21.0	25.0	25.0
POWER																	
AVE POWER MW		237	237	238	301	392	451	458	457	420	380	378	377	370	264	312	310
PEAK POW MW		471	472	473	479	491	500	501	499	498	481	479	478	477	474	470	468
ENERGY GWH	3182.7	85.2	39.9	51.3	216.9	291.5	325.1	340.5	340.1	302.5	282.4	136.1	63.4	71.1	196.2	232.1	208.5
--OAHE--																	
NAT INFLOW	3900	569	265	341	510	390	710	310	125	185	145	118	55	63	15	10	90
DEPLETION	760	25	12	15	52	77	163	199	134	32	-13	1	0	0	14	19	30
CHAN STOR	-17	4			-19	-26	-18			11	12			2	34	-16	
EVAPORATION	368							26	80	98	83	20	9	10	42		
REG INFLOW	23630	1113	517	665	1867	2193	2671	2298	2124	2031	1931	990	462	522	1284	1512	1448
RELEASE	23630	526	281	338	1071	1693	2211	2906	2946	2705	2318	1140	567	749	1536	1460	1184
STOR CHANGE	1	587	236	327	796	500	460	-607	-822	-675	-387	-150	-104	-227	-251	52	265
STORAGE	18662.	19249	19485	19812	20609	21109	21569	20962	20140	19466	19078	18928	18824	18597	18346	18398	18663
ELEV FTMSL	1607.5	1609.3	1610.1	1611.1	1613.4	1614.8	1616.1	1614.4	1612.0	1610.0	1608.8	1608.3	1608.0	1607.3	1606.5	1606.6	1607.5
DISCH KCFS	18.613	17.7	20.3	18.9	18.0	27.5	37.2	47.3	47.9	45.5	37.7	38.3	40.8	47.2	25.0	23.8	21.3
POWER																	
AVE POWER MW		230	265	249	238	367	497	628	629	593	489	495	525	603	321	305	275
PEAK POW MW		718	721	727	739	746	753	744	732	721	715	712	711	707	702	703	708
ENERGY GWH	3742.0	82.7	44.5	53.7	171.6	273.0	357.9	467.5	468.0	427.1	363.9	178.1	88.3	115.7	238.8	226.8	184.5
--BIG BEND--																	
EVAPORATION	72							5	15	19	17	4	2	2	9		
REG INFLOW	23558	526	281	338	1071	1693	2211	2901	2931	2686	2302	1136	565	747	1527	1460	1184
RELEASE	23558	526	281	338	1071	1693	2211	2901	2931	2686	2302	1136	565	747	1527	1460	1184
STORAGE	1631.	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631
ELEV FTMSL	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	18.613	17.7	20.3	18.9	18.0	27.5	37.2	47.2	47.7	45.1	37.4	38.2	40.7	47.1	24.8	23.8	21.3
POWER																	
AVE POWER MW		84	95	89	84	129	174	221	223	214	182	189	201	232	124	116	102
PEAK POW MW		517	509	509	509	509	509	509	509	517	538	538	538	538	538	538	529
ENERGY GWH	1360.1	30.1	15.9	19.1	60.7	95.9	125.2	164.1	165.8	153.7	135.4	68.2	33.8	44.6	92.5	86.5	68.6
--FORT RANDALL--																	
NAT INFLOW	1500	150	70	90	440	230	155	80	70	100	40				15		60
DEPLETION	80	1	1	1	4	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	80							6	19	24	18	4	2	2	7		
REG INFLOW	24900	674	351	427	1507	1914	2354	2957	2967	2756	2323	1132	563	744	1534	1457	1241
RELEASE	24899	393	207	427	1507	1914	2354	2957	2967	2900	2962	1445	674	770	1425	1116	882
STOR CHANGE	1	281	144				0	0	0	-144	-639	-313	-111	-26	109	341	359
STORAGE	3000.	3281	3425	3425	3425	3425	3425	3425	3425	3281	2642	2329	2218	2192	2301	2642	3001
ELEV FTMSL	1350.0	1353.5	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1353.5	1345.0	1340.0	1338.0	1337.5	1339.5	1345.0	1350.0
DISCH KCFS	13.481	13.2	14.9	23.9	25.3	31.1	39.6	48.1	48.3	48.7	48.2	48.6	48.5	48.5	23.2	18.2	15.9
POWER																	
AVE POWER MW		109	126	202	214	262	326	356	356	353	336	308	291	286	169	138	126
PEAK POW MW		350	356	356	356	356	356	356	356	350	319	296	287	285	294	320	339
ENERGY GWH	2249.9	39.4	21.1	43.7	153.9	194.8	234.8	264.9	264.9	254.2	250.2	110.7	49.0	54.9	126.1	102.5	84.9
--GAVINS POINT--																	
NAT INFLOW	2250	111	52	67	280	330	245	205	165	130	150	65	30	35	90	105	190
DEPLETION	114	0	0	0	5	19	24	39	10	-5	2	5	2	3	10	1	
CHAN STOR	-7	0	-3	-17	-3	-11	-16	-16	0	-1	1	-1	0	0	47	9	4
EVAPORATION	23							1	5	6	5	1	1	1	3		
REG INFLOW	27005	506	256	477	1779	2214	2559	3105	3117	3028	3105	1503	701	801	1550	1230	1076
RELEASE	27005	506	256	477	1779	2214	2559	3105	3105	3005	3105	1503	701	801	1550	1230	1111
STOR CHANGE									12	23							-35
STORAGE	327.	327	327	327	327	327	327	327	339	362	362	362	362	362	362	362	327
ELEV FTMSL	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	17.500	17.0	18.4	26.7	29.9	36.0	43.0	50.5	50.5	50.5	50.5	50.5	50.5	50.5	25.2	20.0	20.0
POWER																	
AVE POWER MW		59	64	91	101	114	113	112	113	115	115	115	115	115	79	70	69
PEAK POW MW		114	114	114	114	114	113	112	114	115	115	115	115	115	78	78	76
ENERGY GWH	866.0	21.2	10.7	19.7	72.5	84.8	81.6	83.1	83.8	82.5	85.8	41.5	19.4	22.2	58.6	52.0	46.6
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	3400	189	88	113	470	890	550	290	225	165	85	50	23	27	60	35	140
DEPLETION	283	7	3	4	24	37	32	40	39	26	12	7	3	3	14	15	16
REGULATED FLOW AT SIOUX CITY																	
KAF	30122	687	340	586	2225	3067	3077	3355	3291	3144	3178	1546	721	825	1596	1250	1235
KCFS		23.1	24.5	32.8	37.4	49.9	51.7	54.6	53.5	52.8	51.7	52.0	52.0	52.0	25.9	20.3	22.2
--TOTAL--																	
NAT INFLOW	34500	1890	882	1133	3880	5080	7475	4805	1860	1535	1545	768	358	409	790	775	1315
DEPLETION	3075	16	8	10	-8	492	1990	1280	311	-195	-106	-146	-68	-78	-184	-162	-85
CHAN STOR	-61	24	-3	-17	-41	-71	-44	-16	0	25	27	-1	0	-2	62	-7	4
EVAPORATION	1241							86	269	332	283	66	30	35	141		
STORAGE	56145.	57355	57886	58406	60028	61478	63842	63910	61898	60178	58395	57696	57370	56997	56296	55976	56146
SYSTEM POWER																	
AVE POWER MW		814	882	964	1062	1428	1728	1943	1945	1858	1647	1629	1655	1754	1122	1104	1045
PEAK POW MW		2333	2336	2342	2361	2382	2399	2390	2377	2368	2334	2306	2294	2287	2251	2272	2282
ENERGY GWH	12736.1	293.0	148.1	208.2	764.3	1062.5	1244.5	1445.4	1447.4	1337.5	1225.1	586.5	278.0	336.7	834.9	821.7	702.4
DAILY GWH		19.5	21.2	23.1	25.5	34.3	41.5	46.6	46.7	44.6	39.5	39.1	39.7	42.1	26.9	26.5	25.1
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

VALUES IN 1000 AF EXCEPT AS INDICATED

28FEB17		2017											2018			
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	8650	310	144	186	755	1285	2155	1105	405	350	440	263	123	140	320	285	385
DEPLETION	558	1	0	1	-36	309	607	282	-10	-124	-95	-31	-14	-17	-116	-121	-78
EVAPORATION	324							22	69	85	74	18	8	9	39		
MOD INFLOW	7768	309	144	185	791	976	1548	801	346	389	461	276	129	147	397	406	463
RELEASE	7769	208	97	125	476	646	774	799	799	629	492	238	111	146	707	799	722
STOR CHANGE	-1	101	47	60	315	330	774	2	-453	-241	-31	38	18	1	-310	-393	-259
STORAGE	14785.	14885	14932	14992	15307	15638	16412	16414	15961	15720	15689	15727	15745	15746	15436	15043	14784
ELEV FTMSL	2234.0	2234.5	2234.7	2235.0	2236.4	2237.9	2241.4	2241.4	2239.4	2238.3	2238.2	2238.3	2238.4	2238.4	2237.0	2235.2	2234.0
DISCH KCFS	9.000	7.0	7.0	7.0	8.0	10.5	13.0	13.0	13.0	10.6	8.0	8.0	8.0	9.2	11.5	13.0	13.0
POWER																	
AVE POWER MW		96	96	96	110	143	166	168	167	145	110	110	110	127	156	164	163
PEAK POW MW		163	163	163	164	165	168	168	166	165	165	165	165	165	164	163	162
ENERGY GWH	1241.4	34.4	16.1	20.7	78.9	106.7	119.7	124.7	124.1	104.5	82.2	39.8	18.6	24.4	115.8	121.8	109.3
--GARRISON--																	
NAT INFLOW	12750	482	225	289	1230	1675	3200	2475	760	520	555	215	100	115	235	295	380
DEPLETION	1186	-18	-8	-11	-57	41	1153	700	107	-160	-43	-135	-63	-72	-116	-83	-50
CHAN STOR	-40	20			-10	-24	-24			23	25		0	-12	-23	-15	0
EVAPORATION	370							25	80	99	85	20	9	10	43		
REG INFLOW	18923	728	330	424	1753	2255	2796	2549	1373	1234	1030	568	265	310	993	1163	1152
RELEASE	18922	536	250	321	1250	1722	1964	1968	1968	1704	1537	744	347	397	1291	1537	1388
STOR CHANGE	1	192	80	103	504	533	833	582	-595	-470	-507	-176	-82	-87	-299	-375	-236
STORAGE	17740.	17932	18012	18115	18619	19152	19985	20567	19972	19502	18995	18819	18737	18650	18352	17977	17741
ELEV FTMSL	1837.5	1838.1	1838.4	1838.7	1840.3	1841.9	1844.4	1846.1	1844.4	1843.0	1841.4	1840.9	1840.6	1840.4	1839.4	1838.3	1837.5
DISCH KCFS	20.000	18.0	18.0	18.0	21.0	28.0	33.0	32.0	32.0	28.6	25.0	25.0	25.0	25.0	21.0	25.0	25.0
POWER																	
AVE POWER MW		224	225	225	264	354	419	411	411	365	317	316	316	315	264	312	310
PEAK POW MW		470	471	473	478	485	499	500	499	498	482	480	480	479	475	471	468
ENERGY GWH	2898.0	80.7	37.8	48.6	189.9	263.3	301.5	306.0	306.0	263.1	236.0	113.8	53.1	60.6	196.8	232.4	208.6
--OAHE--																	
NAT INFLOW	3200	457	213	274	430	310	640	250	95	150	120	95	44	51	-10		80
DEPLETION	760	25	12	15	52	77	163	199	134	32	-13	1	0	0	14	19	30
CHAN STOR	-18	8			-12	-26	-19	4		13	14				16	-16	
EVAPORATION	366							26	80	97	83	20	9	10	42		
REG INFLOW	20978	976	452	581	1616	1928	2422	1996	1849	1737	1601	819	382	437	1241	1502	1438
RELEASE	20976	558	296	357	1005	1397	1843	2505	2540	2329	1933	939	473	642	1463	1478	1219
STOR CHANGE	2	418	156	224	611	531	579	-508	-691	-592	-332	-120	-91	-205	-222	24	219
STORAGE	18662.	19080	19236	19459	20070	20602	21181	20673	19981	19390	19058	18938	18847	18642	18420	18444	18664
ELEV FTMSL	1607.5	1608.8	1609.3	1610.0	1611.8	1613.4	1615.0	1613.6	1611.6	1609.8	1608.7	1608.4	1608.1	1607.4	1606.7	1606.8	1607.5
DISCH KCFS	18.613	18.7	21.3	20.0	16.9	22.7	31.0	40.7	41.3	39.1	31.4	31.6	34.1	40.4	23.8	24.0	21.9
POWER																	
AVE POWER MW		243	277	261	222	301	412	541	544	511	408	408	440	520	306	309	283
PEAK POW MW		715	717	721	731	739	747	740	729	720	714	712	711	707	704	704	708
ENERGY GWH	3318.8	87.5	46.6	56.4	160.0	223.9	297.0	402.6	404.7	367.7	303.8	147.1	73.9	99.8	227.9	229.8	190.1
--BIG BEND--																	
EVAPORATION	72							5	15	19	17	4	2	2	9		
REG INFLOW	20904	558	296	357	1005	1397	1843	2500	2525	2310	1916	935	471	640	1454	1478	1219
RELEASE	20904	558	296	357	1005	1397	1843	2500	2525	2310	1916	935	471	640	1454	1478	1219
STORAGE	1631.	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631
ELEV FTMSL	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	18.613	18.7	21.3	20.0	16.9	22.7	31.0	40.7	41.1	38.8	31.2	31.4	33.9	40.3	23.7	24.0	21.9
POWER																	
AVE POWER MW		89	100	94	79	106	145	190	192	184	152	157	169	200	118	118	105
PEAK POW MW		517	509	509	509	509	509	509	509	517	538	538	538	538	538	538	529
ENERGY GWH	1208.6	32.0	16.8	20.2	56.9	79.1	104.3	141.5	142.9	132.3	113.1	56.4	28.3	38.3	88.1	87.6	70.7
--FORT RANDALL--																	
NAT INFLOW	1200	123	58	74	350	185	140	75	65	75	10	-3	-1	-1	5	-5	50
DEPLETION	80	1	1	1	4	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	80							6	19	24	18	4	2	2	7		
REG INFLOW	21945	680	353	430	1351	1573	1971	2551	2556	2354	1907	928	468	636	1451	1470	1266
RELEASE	21944	399	209	430	1351	1573	1971	2551	2556	2498	2546	1241	579	662	1342	1129	907
STOR CHANGE	1	281	144		0	0		0	0	-144	-639	-313	-111	-26	109	341	359
STORAGE	3000.	3281	3425	3425	3425	3425	3425	3425	3425	3281	2642	2329	2218	2192	2301	2642	3001
ELEV FTMSL	1350.0	1353.5	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1353.5	1345.0	1340.0	1338.0	1337.5	1339.5	1345.0	1350.0
DISCH KCFS	13.481	13.4	15.0	24.1	22.7	25.6	33.1	41.5	41.6	42.0	41.4	41.7	41.7	41.7	21.8	18.4	16.3
POWER																	
AVE POWER MW		111	127	203	192	216	278	334	335	334	317	295	283	278	160	139	130
PEAK POW MW		350	356	356	356	356	356	356	356	350	319	296	288	285	294	320	339
ENERGY GWH	2095.3	39.9	21.3	43.9	138.2	160.6	200.4	248.8	249.0	240.4	235.6	106.3	47.5	53.4	118.8	103.7	87.4
--GAVINS POINT--																	
NAT INFLOW	2000	106	50	64	240	290	210	180	145	115	135	60	28	32	85	95	165
DEPLETION	114	0	0	0	5	19	24	39	10	-5	2	5	2	3	10	1	
CHAN STOR	-7	0	-3	-17	3	-6	-14	-16	0	-1	1	-1	0	0	37	6	4
EVAPORATION	23							1	5	6	5	1	1	1	3		
REG INFLOW	23800	506	256	477	1589	1839	2142	2675	2687	2611	2675	1294	604	690	1451	1230	1076
RELEASE	23800	506	256	477	1589	1839	2142	2675	2675	2588	2675	1294	604	690	1451	1230	1111
STOR CHANGE									12	23							-35
STORAGE	327.	327	327	327	327	327	327	327	339	362	362	362	362	362	362	362	327
ELEV FTMSL	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	17.500	17.0	18.4	26.7	26.7	29.9	36.0	43.5	43.5	43.5	43.5	43.5	43.5	43.5	23.6	20.0	20.0
POWER																	
AVE POWER MW		59	64	91	91	101	114	113	114	115	116	116	116	116	79	70	69
PEAK POW MW		114	114	114	114	114	114	113	114	116	116	116	116	116	78	78	76
ENERGY GWH	853.2	21.2	10.7	19.7	65.6	74.9	82.1	84.2	84.8	83.0	86.4	41.8	19.5	22.3	58.5	52.0	46.6
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	2800	165	77	99	390	730	435	240	180	135	70	43	20	23	50	30	115
DEPLETION	283	7	3	4	24	37	32	40	39	26	12	7	3	3	14	15	16
REGULATED FLOW AT SIOUX CITY																	
KAF	26317	663	329	571	1955	2532	2545	2875	2816	2697	2733	1330	621	709	1487	1245	1210
KCFS		22.3	23.7	32.0	32.8	41.2	42.8	46.8	45.8	45.3	44.4	44.7	44.7	44.7	24.2	20.2	21.8
--TOTAL--																	
NAT INFLOW	30600	1643	766	985	3395	4475	6780	4325	1650	1345	1330	673	314	359	685	700	1175
DEPLETION	2981	16	8	10	-8	492	1991	1278	295	-224	-136	-153	-71	-81	-191	-166	-79
CHAN STOR	-64	28	-3	-17	-19	-56	-57	-12	0	35	40	-1	0	-12	32	-24	4
EVAPORATION	1236							85	266	330	282	66	30	35	142		
STORAGE	56145.	57136	57563	57950	59380	60775	62961	63036	61309	59886	58377	57806	57539	57223	56502	56099	56147
SYSTEM POWER																	
AVE POWER MW		821	888	970	958	1221	1535	1758	1763	1654	1421	1403	1434	1556	1083	1112	1060
PEAK POW MW		2330	2331	2336	2353	2369	2393	2386	2374	2367	2335	2309	2298	2291	2254	2274	2282
ENERGY GWH	11615.4	295.7	149.2	209.5	689.5	908.5	1105.0	1307.8	1311.7	1190.9	1057.0	505.1	240.8	298.7	805.9	827.3	712.6
DAILY GWH		19.7	21.3	23.3	23.0	29.3	36.8	42.2	42.3	39.7	34.1	33.7	34.4	37.3	26.0	26.7	25.4
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

VALUES IN 1000 AF EXCEPT AS INDICATED

	28FEB17		2017											2018			
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	7200	227	106	136	560	1145	1830	840	365	290	385	205	96	109	295	260	350
DEPLETION	578	11	5	7	71	336	458	288	32	-90	-121	-38	-18	-20	-122	-135	-87
EVAPORATION	451							28	87	108	94	43	20	23	49		
MOD INFLOW	6171	216	101	130	489	809	1372	524	246	272	412	200	93	107	368	395	437
RELEASE	6334	179	83	107	446	523	625	646	646	486	369	179	83	119	615	646	583
STOR CHANGE	-163	38	18	23	43	286	747	-121	-399	-214	43	21	10	-12	-247	-251	-146
STORAGE	14291.	14329	14347	14369	14412	14698	15445	15324	14925	14710	14753	14775	14785	14772	14525	14275	14129
ELEV FTMSL	2231.6	2231.8	2231.9	2232.0	2232.2	2233.6	2237.1	2236.5	2234.6	2233.6	2233.8	2233.9	2234.0	2233.9	2232.7	2231.5	2230.8
DISCH KCFS	9.000	6.0	6.0	6.0	7.5	8.5	10.5	10.5	10.5	8.2	6.0	6.0	6.0	7.5	10.0	10.5	10.5
POWER																	
AVE POWER MW		81	81	81	102	115	142	143	143	111	82	82	82	102	136	141	140
PEAK POW MW		161	161	161	161	162	164	164	163	162	162	162	162	162	161	160	160
ENERGY GWH	1038.7	29.3	13.7	17.6	73.2	85.9	102.5	106.5	106.1	80.2	60.9	29.5	13.8	19.6	100.9	104.8	94.3
--GARRISON--																	
NAT INFLOW	10900	479	223	287	780	1300	3120	2100	580	480	445	180	84	96	180	255	310
DEPLETION	1268	18	8	11	40	185	876	708	135	-147	-48	-138	-64	-74	-116	-78	-48
CHAN STOR	-15	30			-15	-10	-20			23	21			-15	-25	-5	
EVAPORATION	520							32	101	126	109	49	23	26	55		
REG INFLOW	15431	670	298	384	1171	1628	2849	2006	990	1010	775	448	209	248	831	974	941
RELEASE	15626	536	250	321	1160	1537	1488	1476	1476	1253	1107	536	250	286	1261	1414	1277
STOR CHANGE	-196	134	49	62	11	90	1361	530	-486	-243	-332	-88	-41	-38	-430	-441	-336
STORAGE	17143.	17277	17326	17388	17399	17490	18851	19381	18895	18652	18320	18232	18192	18154	17724	17284	16948
ELEV FTMSL	1835.5	1836.0	1836.1	1836.3	1836.4	1836.7	1841.0	1842.6	1841.1	1840.4	1839.3	1839.1	1838.9	1838.8	1837.4	1836.0	1834.9
DISCH KCFS	19.000	18.0	18.0	18.0	19.5	25.0	25.0	24.0	24.0	21.1	18.0	18.0	18.0	18.0	20.5	23.0	23.0
POWER																	
AVE POWER MW		221	222	222	240	308	312	304	304	266	227	226	226	226	256	284	281
PEAK POW MW		463	463	464	464	465	481	493	481	479	475	474	473	473	468	463	458
ENERGY GWH	2357.8	79.7	37.3	48.0	173.2	229.0	224.8	226.1	226.2	191.6	168.9	81.4	37.9	43.3	190.1	211.1	189.2
--OAHE--																	
NAT INFLOW	2300	259	121	155	405	220	625	170	70	95	45	45	21	24	-15	-10	70
DEPLETION	760	25	12	15	52	77	163	199	134	32	-13	1	0	0	14	19	30
CHAN STOR	-16	4			-6	-22		4		12	13				-10	-10	0
EVAPORATION	485							31	95	116	100	45	21	24	52		
REG INFLOW	16666	773	359	462	1507	1658	1950	1420	1317	1211	1077	535	250	285	1169	1375	1317
RELEASE	16868	470	306	360	1293	1543	1609	1849	1983	1754	1263	587	309	227	1037	1241	1037
STOR CHANGE	-203	303	53	101	215	116	340	-430	-666	-543	-186	-52	-59	58	132	134	281
STORAGE	18048.	18352	18404	18505	18720	18836	19176	18746	18080	17538	17352	17300	17241	17299	17431	17565	17846
ELEV FTMSL	1605.5	1606.5	1606.6	1607.0	1607.7	1608.0	1609.1	1607.8	1605.6	1603.8	1603.1	1602.9	1602.7	1602.9	1603.4	1603.9	1604.8
DISCH KCFS	19.491	15.8	22.1	20.2	21.7	25.1	27.0	30.1	32.2	29.5	20.5	19.7	22.3	14.3	16.9	20.2	18.7
POWER																	
AVE POWER MW		203	283	260	280	324	351	389	413	374	260	249	280	181	213	255	237
PEAK POW MW		702	703	705	709	711	716	709	698	688	685	684	683	684	686	689	694
ENERGY GWH	2610.3	73.0	47.6	56.1	201.8	241.2	252.4	289.5	307.3	269.1	193.1	89.6	47.1	34.7	158.5	189.9	159.4
--BIG BEND--																	
EVAPORATION	105							6	20	25	22	10	5	5	12		
REG INFLOW	16763	470	306	360	1293	1543	1609	1843	1963	1729	1241	577	305	222	1025	1241	1037
RELEASE	16763	470	306	360	1293	1543	1609	1843	1963	1729	1241	577	305	222	1025	1241	1037
STORAGE	1631.	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631
ELEV FTMSL	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	19.491	15.8	22.1	20.2	21.7	25.1	27.0	30.0	31.9	29.1	20.2	19.4	21.9	14.0	16.7	20.2	18.7
POWER																	
AVE POWER MW		75	103	95	102	117	127	140	149	138	99	97	110	70	84	99	90
PEAK POW MW		517	509	509	509	509	509	509	509	517	538	538	538	538	538	538	529
ENERGY GWH	968.1	26.9	17.3	20.4	73.2	87.4	91.1	104.4	111.1	99.1	73.7	35.1	18.5	13.5	62.5	73.7	60.2
--FORT RANDALL--																	
NAT INFLOW	900	121	56	73	160	165	135	70	60	35		-5	-2	-3		-10	45
DEPLETION	80	1	1	1	4	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	116							8	25	31	24	9	4	4	9		
REG INFLOW	17468	590	362	432	1449	1699	1732	1887	1982	1725	1216	562	298	215	1013	1228	1079
RELEASE	17466	307	218	432	1449	1699	1732	1887	1982	1869	1855	875	409	241	904	887	720
STOR CHANGE	2	282	144	0			0	0	0	-144	-639	-313	-111	-26	108	341	359
STORAGE	2999.	3281	3425	3425	3425	3425	3425	3425	3425	3281	2642	2329	2218	2192	2300	2641	3000
ELEV FTMSL	1350.0	1353.5	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1353.5	1345.0	1340.0	1338.0	1337.5	1339.5	1345.0	1350.0
DISCH KCFS	13.945	10.3	15.7	24.2	24.3	27.6	29.1	30.7	32.2	31.4	30.2	29.4	29.5	15.2	14.7	14.4	13.0
POWER																	
AVE POWER MW		86	132	204	206	233	245	258	271	262	242	222	215	111	108	110	103
PEAK POW MW		350	356	356	356	356	356	356	356	350	319	296	287	285	294	320	339
ENERGY GWH	1726.7	30.8	22.3	44.2	148.1	173.3	176.5	192.1	201.7	188.9	179.7	79.9	36.2	21.3	80.5	81.7	69.5
--GAVINS POINT--																	
NAT INFLOW	1500	102	47	61	145	165	175	100	90	95	120	58	27	31	80	85	120
DEPLETION	114	0	0	0	5	19	24	39	10	-5	2	5	2	3	10	1	
CHAN STOR	1	7	-10	-16	0	-6	-3	-3	-3	2	2	1	0	26	1	1	3
EVAPORATION	34							2	6	8	7	3	2	2	4		
REG INFLOW	18819	417	255	477	1588	1839	1880	1943	2053	1963	1968	925	432	294	971	972	842
RELEASE	18819	417	255	477	1588	1839	1880	1943	2041	1940	1968	925	432	294	971	972	877
STOR CHANGE									12	23							-35
STORAGE	327.	327	327	327	327	327	327	327	339	362	362	362	362	362	362	362	327
ELEV FTMSL	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	17.000	14.0	18.4	26.7	26.7	29.9	31.6	31.6	33.2	32.6	32.0	31.1	31.1	18.5	15.8	15.8	15.8
POWER																	
AVE POWER MW		49	64	91	91	101	105	105	109	109	108	106	106	65	56	56	56
PEAK POW MW		114	114	114	114	114	114	114	115	117	117	117	117	117	78	78	76
ENERGY GWH	770.7	17.6	10.7	19.7	65.6	74.9	75.3	77.8	80.9	78.3	80.6	38.3	17.9	12.5	41.6	41.6	37.3
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	1800	162	76	97	280	345	190	165	130	110	60	30	14	16	25	25	75
DEPLETION	283	7	3	4	24	37	32	40	39	26	12	7	3	3	14	15	16
REGULATED FLOW AT SIOUX CITY																	
KAF	20336	571	328	570	1844	2147	2038	2068	2132	2024	2016	949	443	306	982	982	936
KCFS		19.2	23.6	31.9	31.0	34.9	34.3	33.6	34.7	34.0	32.8	31.9	31.9	19.3	16.0	16.0	16.9
--TOTAL--																	
NAT INFLOW	24600	1350	630	810	2330	3340	6075	3445	1295	1105	1055	513	239	273	565	605	970
DEPLETION	3083	62	29	37	196	663	1565	1292	365	-177	-167	-163	-76	-87	-197	-175	-86
CHAN STOR	-30	41	-10	-16	-21	-38	-23	1	-3	36	36	1	0	12	-34	-15	3
EVAPORATION	1709							107	334	415	356	159	73	84	181		
STORAGE	54439.	55197	55460	55646	55914	56407	58855	58835	57295	56175	55061	54629	54428	54411	53974	53758	53880
SYSTEM POWER																	
AVE POWER MW		715	886	953	1021	1198	1282	1339	1389	1260	1017	982	1020	755	852	945	908
PEAK POW MW		2307	2307	2309	2313	2317	2342	2346	2322	2313	2296	2271	2261	2259	2226	2247	2256
ENERGY GWH	9472.3	257.3	148.8	205.9	735.0	891.7	922.8	996.5	1033.2	907.4	756.9	353.7	171.3	145.0	634.1	702.9	609.9
DAILY GWH		17.2	21.3	22.9	24.5	28.8	30.8	32.1	33.3	30.2	24.4	23.6	24.5	18.1	20.5	22.7	21.8

INI-SUM 15MAR 22MAR 31MAR 30APR 31MAY 30JUN 31JUL 31AUG 30SEP 31OCT 15NOV 22NOV 30NOV 31DEC 31JAN 28FEB

TIME OF STUDY: 10:17:07 STUDY NO 7

VALUES IN 1000 AF EXCEPT AS INDICATED

	28FEB17		2017											2018			
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	5950	201	94	120	460	945	1510	645	290	240	320	168	78	89	240	240	310
DEPLETION	630	9	4	5	71	185	377	355	60	-74	-76	-14	-7	-7	-91	-106	-61
EVAPORATION	517							33	101	124	107	48	23	26	55		
MOD INFLOW	4803	192	90	115	389	760	1133	257	129	190	289	133	62	71	276	346	371
RELEASE	6096	179	83	107	417	553	595	615	615	478	369	179	83	100	553	615	555
STOR CHANGE	-1293	14	6	8	-28	207	538	-358	-486	-288	-80	-45	-21	-29	-278	-269	-184
STORAGE	13697.	13711	13717	13725	13698	13904	14442	14085	13599	13311	13230	13185	13164	13135	12857	12588	12404
ELEV FTMSL	2228.7	2228.7	2228.8	2228.8	2228.7	2229.7	2232.3	2230.6	2228.2	2226.7	2226.3	2226.0	2225.9	2225.8	2224.3	2222.8	2221.8
DISCH KCFS	8.000	6.0	6.0	6.0	7.0	9.0	10.0	10.0	10.0	8.0	6.0	6.0	6.0	6.3	9.0	10.0	10.0
POWER																	
AVE POWER MW		81	81	81	94	121	135	135	134	107	80	80	80	84	119	131	130
PEAK POW MW		158	158	158	158	159	161	160	158	157	157	156	156	156	155	153	152
ENERGY GWH	983.2	29.0	13.5	17.4	67.6	89.9	97.0	100.3	99.7	77.3	59.5	28.8	13.4	16.1	88.7	97.6	87.6
--GARRISON--																	
NAT INFLOW	9150	404	189	242	640	1150	2600	1700	475	395	395	160	75	85	150	210	280
DEPLETION	967	23	11	14	56	137	564	556	140	-128	-16	-122	-57	-65	-80	-43	-22
CHAN STOR	-21	20			-10	-20	-10			20	21			-3	-27	-10	0
EVAPORATION	600							37	117	145	125	56	26	30	64		
REG INFLOW	13658	580	261	336	990	1546	2621	1722	833	876	675	404	189	218	692	858	857
RELEASE	15224	506	236	303	1250	1537	1488	1476	1476	1184	984	476	222	254	1199	1383	1250
STOR CHANGE	-1565	74	25	32	-259	9	1133	246	-643	-308	-308	-72	-33	-36	-507	-526	-392
STORAGE	16424.	16499	16524	16556	16297	16306	17439	17685	17042	16734	16425	16354	16320	16284	15777	15251	14859
ELEV FTMSL	1833.1	1833.3	1833.4	1833.5	1832.6	1832.7	1836.5	1837.3	1835.2	1834.1	1833.1	1832.8	1832.7	1832.6	1830.8	1828.9	1827.5
DISCH KCFS	18.000	17.0	17.0	17.0	21.0	25.0	25.0	24.0	24.0	19.9	16.0	16.0	16.0	16.0	19.5	22.5	22.5
POWER																	
AVE POWER MW		206	206	206	253	300	304	296	295	243	194	194	193	193	233	266	263
PEAK POW MW		453	453	454	450	450	465	467	460	456	452	451	451	450	444	437	431
ENERGY GWH	2224.8	74.1	34.6	44.5	182.5	223.4	218.9	220.5	219.6	174.8	144.6	69.7	32.5	37.1	173.7	197.7	176.7
--OAHE--																	
NAT INFLOW	1350	177	82	106	285	130	315	110	50	55	15	13	6	7	-35	-15	50
DEPLETION	760	25	12	15	52	77	163	199	134	32	-13	1	0	0	14	19	30
CHAN STOR	-19	4			-17	-17		4		18	17		0	0	-16	-14	
EVAPORATION	543							35	107	132	112	50	23	26	58		
REG INFLOW	15251	661	307	394	1466	1574	1640	1356	1284	1094	917	438	205	234	1076	1336	1270
RELEASE	16864	524	354	417	1476	1735	1719	1920	1949	1449	1510	591	226	212	852	1058	874
STOR CHANGE	-1613	138	-47	-23	-10	-161	-79	-564	-664	-356	-593	-153	-21	22	225	278	396
STORAGE	17305.	17443	17396	17373	17363	17202	17123	16559	15895	15539	14946	14793	14772	14794	15019	15296	15692
ELEV FTMSL	1603.0	1603.4	1603.3	1603.2	1603.2	1602.6	1602.3	1600.3	1597.9	1596.6	1594.3	1593.7	1593.6	1593.7	1594.6	1595.7	1597.2
DISCH KCFS	19.825	17.6	25.5	23.4	24.8	28.2	28.9	31.2	31.7	24.4	24.6	19.9	16.3	13.3	13.9	17.2	15.7
POWER																	
AVE POWER MW		222	321	295	313	355	362	389	389	297	297	238	195	160	167	208	192
PEAK POW MW		686	685	685	685	682	681	670	658	651	640	637	637	637	641	647	654
ENERGY GWH	2517.1	80.1	53.9	63.6	225.0	263.8	260.6	289.1	289.8	213.8	220.6	85.8	32.8	30.7	124.0	154.7	128.7
--BIG BEND--																	
EVAPORATION	131							8	25	31	28	12	6	7	14		
REG INFLOW	16733	524	354	417	1476	1735	1719	1912	1924	1418	1483	579	220	205	837	1058	874
RELEASE	16733	524	354	417	1476	1735	1719	1912	1924	1418	1483	579	220	205	837	1058	874
STORAGE	1631.	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631
ELEV FTMSL	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	19.825	17.6	25.5	23.4	24.8	28.2	28.9	31.1	31.3	23.8	24.1	19.5	15.8	12.9	13.6	17.2	15.7
POWER																	
AVE POWER MW		83	119	109	116	132	135	146	146	114	118	97	80	65	69	85	75
PEAK POW MW		517	509	509	509	509	509	509	509	529	538	538	538	538	538	538	529
ENERGY GWH	965.8	30.0	20.0	23.6	83.6	98.3	97.3	108.3	108.9	82.2	87.8	35.0	13.4	12.5	51.1	62.9	50.7
--FORT RANDALL--																	
NAT INFLOW	450	77	36	46	80	65	110	35	25		-20	-8	-4	-4	-10	-20	40
DEPLETION	80	1	1	1	4	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	142							10	32	38	29	12	5	5	12		
REG INFLOW	16962	600	389	463	1552	1791	1817	1919	1902	1373	1433	559	211	196	813	1035	911
RELEASE	16960	318	245	463	1552	1791	1817	1919	1902	1797	1792	813	381	221	704	694	552
STOR CHANGE	2	282	144		0	0		0	0	-424	-359	-254	-170	-26	109	341	359
STORAGE	2999.	3281	3425	3425	3425	3425	3425	3425	3425	3001	2642	2388	2218	2192	2301	2642	3001
ELEV FTMSL	1350.0	1353.5	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1350.0	1345.0	1341.0	1338.0	1337.5	1339.5	1345.0	1350.0
DISCH KCFS	14.046	10.7	17.6	25.9	26.1	29.1	30.5	31.2	30.9	30.2	29.1	27.3	27.4	14.0	11.4	11.3	9.9
POWER																	
AVE POWER MW		88	149	219	220	245	257	263	260	249	230	207	202	102	84	86	79
PEAK POW MW		350	356	356	356	356	356	356	356	339	319	301	287	285	294	319	339
ENERGY GWH	1677.8	31.8	25.0	47.2	158.5	182.5	185.0	195.4	193.6	179.2	171.1	74.7	33.9	19.6	62.8	64.1	53.4
--GAVINS POINT--																	
NAT INFLOW	1300	92	43	55	125	140	150	85	70	80	105	50	23	27	75	75	105
DEPLETION	114	0	0	0	5	19	24	39	10	-5	2	5	2	3	10	1	
CHAN STOR	7	6	-13	-16	0	-6	-3	-1	1	1	2	3	0	25	5	0	3
EVAPORATION	42							2	8	10	9	4	2	2	5		
REG INFLOW	18110	417	275	502	1672	1906	1940	1961	1955	1874	1888	857	400	268	769	769	659
RELEASE	18110	417	275	502	1672	1906	1940	1961	1943	1851	1888	857	400	268	769	769	694
STOR CHANGE									12	23							-35
STORAGE	327.	327	327	327	327	327	327	327	339	362	362	362	362	362	362	362	327
ELEV FTMSL	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	16.500	14.0	19.8	28.1	28.1	31.0	32.6	31.9	31.6	31.1	30.7	28.8	28.8	16.9	12.5	12.5	12.5
POWER																	
AVE POWER MW		49	68	96	96	103	107	105	105	105	105	101	101	60	44	44	44
PEAK POW MW		114	114	114	114	114	114	114	115	117	117	117	117	117	78	78	76
ENERGY GWH	743.5	17.6	11.5	20.7	68.8	76.8	76.9	78.3	78.2	75.9	78.4	36.3	16.9	11.5	33.0	33.0	29.6
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	1100	121	56	73	145	185	115	100	80	65	35	23	11	12	10	20	50
DEPLETION	283	7	3	4	24	37	32	40	39	26	12	7	3	3	14	15	16
REGULATED FLOW AT SIOUX CITY																	
KAF	18927	530	328	570	1793	2054	2023	2021	1984	1890	1911	873	407	277	765	774	728
KCFS		17.8	23.6	31.9	30.1	33.4	34.0	32.9	32.3	31.8	31.1	29.3	29.3	17.4	12.4	12.6	13.1
--TOTAL--																	
NAT INFLOW	19300	1072	500	643	1735	2615	4800	2675	990	835	850	405	189	216	430	510	835
DEPLETION	2834	65	30	39	212	464	1172	1207	398	-142	-90	-123	-57	-66	-130	-111	-34
CHAN STOR	-33	31	-13	-16	-27	-43	-13	3	1	39	40	3	0	22	-39	-24	3
EVAPORATION	1975							125	389	480	410	182	84	96	208		
STORAGE	52384.	52891	53020	53038	52741	52795	54387	53712	51931	50577	49236	48712	48467	48398	47947	47771	47914
SYSTEM POWER																	
AVE POWER MW		729	944	1005	1092	1256	1300	1333	1330	1115	1024	917	851	664	717	820	784
PEAK POW MW		2280	2277	2277	2273	2271	2286	2277	2256	2248	2222	2200	2186	2183	2150	2172	2182
ENERGY GWH	9112.2	262.6	158.6	217.1	786.0	934.6	935.7	991.9	989.8	803.1	762.1	330.2	142.9	127.5	533.3	610.1	526.8
DAILY GWH		17.5	22.7	24.1	26.2	30.1	31.2	32.0	31.9	26.8	24.6	22.0	20.4	15.9	17.2	19.7	18.8
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

VALUES IN 1000 AF EXCEPT AS INDICATED

28FEB17	INI-SUM	15MAR 2017	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV 2018	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	5300	194	90	116	440	850	1180	595	260	230	310	145	68	77	220	230	295
DEPLETION	496	9	4	5	70	185	377	222	32	-100	-90	-24	-11	-13	-73	-60	-38
EVAPORATION	504							32	98	121	105	47	22	25	54		
MOD INFLOW	4300	185	86	111	370	665	803	341	130	209	295	121	57	65	239	290	333
RELEASE	6242	179	83	107	417	492	625	646	646	494	369	179	83	111	584	646	583
STOR CHANGE	-1942	6	3	4	-47	173	178	-305	-516	-285	-74	-57	-27	-46	-345	-356	-250
STORAGE	13697.	13704	13707	13710	13664	13837	14015	13711	13195	12910	12836	12779	12752	12706	12361	12005	11755
ELEV FTMSL	2228.7	2228.7	2228.7	2228.7	2228.5	2229.4	2230.2	2228.7	2226.1	2224.6	2224.2	2223.9	2223.7	2223.5	2221.6	2219.6	2218.2
DISCH KCFS	8.000	6.0	6.0	6.0	7.0	8.0	10.5	10.5	10.5	8.3	6.0	6.0	6.0	7.0	9.5	10.5	10.5
POWER																	
AVE POWER MW		81	81	81	94	107	140	140	138	110	79	79	79	92	124	134	133
PEAK POW MW		158	158	158	158	159	159	158	156	155	155	154	154	154	152	150	148
ENERGY GWH	994.6	29.0	13.5	17.4	67.6	79.9	100.6	103.8	103.0	79.2	59.1	28.5	13.3	17.7	92.6	99.9	89.5
--GARRISON--																	
NAT INFLOW	7400	382	178	229	580	1100	2165	935	325	215	385	150	70	80	140	195	270
DEPLETION	976	23	11	14	56	137	564	556	114	-133	-13	-118	-55	-63	-69	-32	-16
CHAN STOR	-26	20			-10	-10	-25			22	23			-10	-26	-10	
EVAPORATION	577							36	112	139	120	54	25	29	61		
REG INFLOW	12063	558	251	323	930	1445	2200	988	744	725	670	392	183	215	706	862	869
RELEASE	14414	476	222	286	1250	1414	1369	1353	1353	1130	984	476	222	254	1168	1291	1166
STOR CHANGE	-2350	82	29	37	-319	31	832	-364	-609	-405	-313	-84	-39	-39	-462	-429	-297
STORAGE	16424.	16507	16535	16573	16253	16284	17116	16751	16143	15738	15424	15340	15301	15262	14800	14371	14074
ELEV FTMSL	1833.1	1833.4	1833.5	1833.6	1832.5	1832.6	1835.4	1834.2	1832.1	1830.7	1829.6	1829.3	1829.1	1829.0	1827.3	1825.7	1824.6
DISCH KCFS	18.000	16.0	16.0	16.0	21.0	23.0	23.0	22.0	22.0	19.0	16.0	16.0	16.0	16.0	19.0	21.0	21.0
POWER																	
AVE POWER MW		194	194	194	253	276	279	268	266	227	190	189	189	189	222	243	241
PEAK POW MW		453	453	454	450	450	461	456	448	443	439	438	437	437	431	425	421
ENERGY GWH	2079.0	69.8	32.6	42.0	182.4	205.6	200.9	199.6	197.5	163.5	141.4	68.1	31.7	36.2	165.4	180.6	161.7
--OAHE--																	
NAT INFLOW	1150	169	79	102	200	110	305	105	40	45	5	8	4	4	-45	-20	40
DEPLETION	760	25	12	15	52	77	163	199	134	32	-13	1	0	0	14	19	30
CHAN STOR	-13	8	0	0	-21	-8		4		14	14		0	0	-14	-9	
EVAPORATION	524							34	104	126	108	48	23	26	56		
REG INFLOW	14267	629	289	372	1377	1439	1511	1229	1155	1031	908	435	203	232	1039	1243	1176
RELEASE	16689	546	372	425	1464	1761	1736	1859	1895	1669	1168	502	270	202	868	1068	884
STOR CHANGE	-2422	82	-82	-53	-87	-322	-226	-630	-740	-639	-260	-67	-67	30	171	175	293
STORAGE	17305.	17387	17305	17252	17166	16844	16618	15988	15248	14609	14349	14282	14215	14245	14416	14590	14883
ELEV FTMSL	1603.0	1603.2	1603.0	1602.8	1602.5	1601.4	1600.6	1598.3	1595.5	1593.0	1592.0	1591.7	1591.4	1591.5	1592.2	1592.9	1594.1
DISCH KCFS	19.825	18.4	26.8	23.8	24.6	28.6	29.2	30.2	30.8	28.1	19.0	16.9	19.5	12.7	14.1	17.4	15.9
POWER																	
AVE POWER MW		232	337	299	309	358	363	372	374	336	226	200	230	151	168	207	191
PEAK POW MW		685	684	683	681	675	671	659	646	633	628	627	626	626	630	633	639
ENERGY GWH	2466.6	83.4	56.6	64.7	222.5	266.2	261.1	277.0	278.4	242.0	168.2	72.0	38.7	29.0	124.8	154.0	128.1
--BIG BEND--																	
EVAPORATION	131							8	25	31	28	12	6	7	14		
REG INFLOW	16558	546	372	425	1464	1761	1736	1851	1870	1638	1141	489	264	195	854	1068	884
RELEASE	16558	546	372	425	1464	1761	1736	1851	1870	1638	1141	489	264	195	854	1068	884
STORAGE	1631.	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631
ELEV FTMSL	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	19.825	18.4	26.8	23.8	24.6	28.6	29.2	30.1	30.4	27.5	18.5	16.4	19.0	12.3	13.9	17.4	15.9
POWER																	
AVE POWER MW		87	125	111	115	134	137	141	142	130	91	83	96	62	70	85	76
PEAK POW MW		517	509	509	509	509	509	509	509	517	538	538	538	538	538	538	529
ENERGY GWH	954.5	31.3	21.1	24.1	82.9	99.7	98.3	104.8	105.9	93.9	67.7	29.8	16.1	12.0	52.1	63.5	51.3
--FORT RANDALL--																	
NAT INFLOW	350	68	32	41	85	50	95	25	15	-5	-25	-10	-5	-5	-20	-25	35
DEPLETION	80	1	1	1	4	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	145							10	32	39	31	12	5	5	12		
REG INFLOW	16683	613	403	465	1545	1802	1819	1848	1838	1587	1084	466	255	185	819	1040	916
RELEASE	16682	331	259	465	1545	1802	1819	1848	1838	1731	1723	779	366	211	710	699	557
STOR CHANGE	2	282	144					0	0	-144	-639	-313	-111	-26	109	341	359
STORAGE	2999.	3281	3425	3425	3425	3425	3425	3425	3425	3281	2642	2329	2218	2192	2301	2642	3001
ELEV FTMSL	1350.0	1353.5	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1353.5	1345.0	1340.0	1338.0	1337.5	1339.5	1345.0	1350.0
DISCH KCFS	14.046	11.1	18.6	26.0	26.0	29.3	30.6	30.1	29.9	29.1	28.0	26.2	26.3	13.3	11.5	11.4	10.0
POWER																	
AVE POWER MW		92	157	220	219	247	257	253	252	243	225	198	193	97	85	87	80
PEAK POW MW		350	356	356	356	356	356	356	356	350	319	296	287	285	294	319	339
ENERGY GWH	1655.5	33.1	26.3	47.4	157.7	183.6	185.3	188.2	187.3	175.2	167.2	71.4	32.4	18.7	63.4	64.6	53.9
--GAVINS POINT--																	
NAT INFLOW	1200	80	37	48	120	130	135	80	60	75	100	48	22	25	70	70	100
DEPLETION	114	0	0	0	5	19	24	39	10	-5	2	5	2	3	10	1	
CHAN STOR	6	6	-14	-14	0	-6	-2	1	0	2	2	3	0	24	3	0	2
EVAPORATION	42							2	8	10	9	4	2	2	5		
REG INFLOW	17732	417	282	499	1660	1906	1928	1888	1881	1802	1814	821	383	256	769	769	659
RELEASE	17732	417	282	499	1660	1906	1928	1888	1869	1779	1814	821	383	256	769	769	694
STOR CHANGE									12	23							-35
STORAGE	327.	327	327	327	327	327	327	327	339	362	362	362	362	362	362	362	327
ELEV FTMSL	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.0	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	16.500	14.0	20.3	27.9	27.9	31.0	32.4	30.7	30.4	29.9	29.5	27.6	27.6	16.1	12.5	12.5	12.5
POWER																	
AVE POWER MW		49	70	95	95	103	106	103	102	103	102	97	97	57	44	44	44
PEAK POW MW		114	114	114	114	114	114	114	115	117	117	117	117	117	78	78	76
ENERGY GWH	731.8	17.6	11.8	20.5	68.4	76.8	76.6	76.3	76.1	73.8	76.2	34.8	16.2	10.9	33.0	33.0	29.6
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	700	87	41	52	90	120	65	70	40	30	30	18	8	9	5	15	20
DEPLETION	283	7	3	4	24	37	32	40	39	26	12	7	3	3	14	15	16
REGULATED FLOW AT SIOUX CITY																	
KAF	18149	496	319	547	1726	1989	1961	1918	1870	1783	1832	832	388	261	760	769	698
KCFS		16.7	23.0	30.6	29.0	32.4	33.0	31.2	30.4	30.0	29.8	28.0	28.0	16.5	12.4	12.5	12.6
--TOTAL--																	
NAT INFLOW	16100	980	457	588	1515	2360	3945	1810	740	590	805	358	167	191	370	465	760
DEPLETION	2709	65	30	39	211	464	1172	1074	344	-173	-101	-128	-60	-68	-101	-54	-5
CHAN STOR	-32	34	-14	-14	-31	-25	-28	5	0	37	39	3	0	14	-37	-19	2
EVAPORATION	1923							122	378	467	400	178	82	93	202		
STORAGE	52384.	52837	52930	52918	52466	52348	53132	51833	49981	48531	47244	46723	46479	46397	45870	45601	45670
SYSTEM POWER																	
AVE POWER MW		734	964	1000	1085	1225	1282	1277	1275	1149	914	846	884	648	714	801	765
PEAK POW MW		2279	2275	2275	2269	2264	2271	2253	2231	2216	2196	2170	2160	2157	2123	2143	2152
ENERGY GWH	8882.1	264.3	161.9	216.1	781.5	911.7	922.7	949.8	948.3	827.5	679.8	304.6	148.5	124.5	531.3	595.6	514.1
DAILY GWH		17.6	23.1	24.0	26.0	29.4	30.8	30.6	30.6	27.6	21.9	20.3	21.2	15.6	17.1	19.2	18.4
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB