US Army Corps
of Engineers

Northwestern Division
Missouri River Basin
Water Management Division

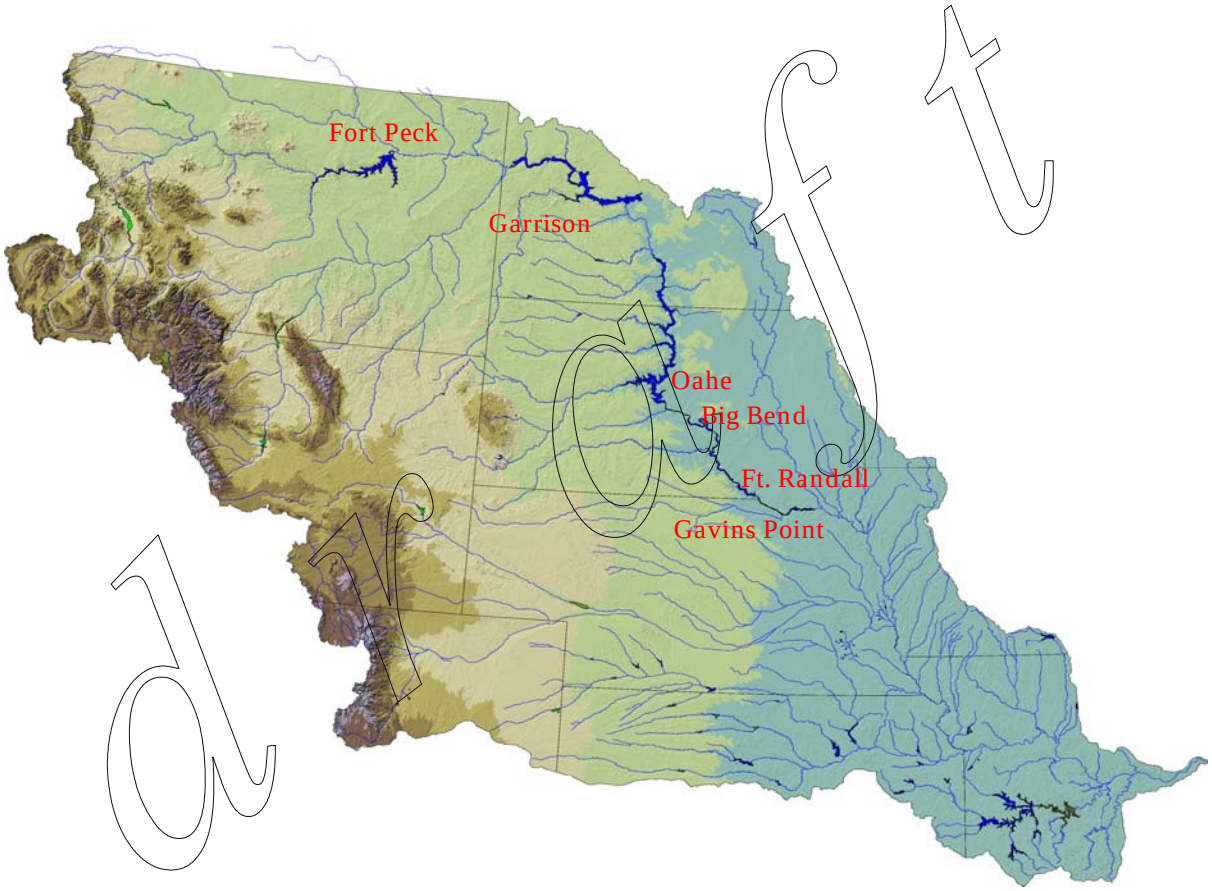
Draft

AOP

2008-2009

Missouri River Mainstem System

2008-2009 Annual Operating Plan



draft

Annual Operating Plan Process
56 Years Serving the Missouri River Basin

September 2008

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NORTHWESTERN DIVISION
PO BOX 2870
PORTLAND OR 97208-2870

REPLY TO
ATTENTION OF

September 10, 2008

Missouri River Basin Water Management Division

This Draft Annual Operating Plan (AOP) presents pertinent information regarding water management in the Missouri River Mainstem Reservoir System (System) through December 2009. The information provided in this Draft AOP is based upon water management guidelines designed to meet the reservoir regulation objectives of the existing Missouri River Master Water Control Manual (Master Manual). The Master Manual was updated in March of 2006 to include technical criteria used in implementing a bimodal spring pulse under various water supply conditions.

The guidelines included in the Master Manual, including the spring pulse technical criteria, are applied to computer simulations of System regulation assuming five statistically derived inflow scenarios based on an analysis of water supply records from 1898 to 2006. This approach provides a good range of water management simulations for dry, average, and wet conditions. The AOP information provides a framework for the development of detailed monthly, weekly, and daily regulation schedules for the System's six individual dams during the upcoming year to serve its Congressionally-authorized project purposes. System water management is provided by my staff at the Missouri River Basin Water Management Division, Northwestern Division, U.S. Army Corps of Engineers, located in Omaha, Nebraska.

In addition to the AOP, two separate documents are also available entitled: "System Description and Operation" and "Summary of Actual 2007 Regulation." To receive copies of those documents, you may contact the Missouri River Basin Water Management Division at 1616 Capitol Avenue, Suite 365, Omaha, Nebraska 68102-4909, phone (402) 996-3841. Both reports will also be available at the "Reports and Publications" link on our web site at: **www.nwd-mr.usace.army.mil/rcc/**.

Six public meetings to discuss this Draft AOP are scheduled as follows: October 14 in Nebraska City, Nebraska; October 15 in Kansas City and Jefferson City, Missouri; October 16 in Fort Peck, Montana and Bismarck, North Dakota; and October 17 in Pierre, South Dakota. We ask that any comments be provided by November 21, 2008. The Final AOP is scheduled for publication in December 2008. Copies of the written comments and a report summarizing the comments received at the six public meetings will be available upon request.

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

William E. Rapp, P.E.
Brigadier General, US Army
Division Commander

MISSOURI RIVER MAINSTEM RESERVOIR SYSTEM

Draft Annual Operating Plan
2008 - 2009

List of Tables ii
List of Plates ii
List of Abbreviations iii
Definition of Terms v

I. FOREWORD 1

II. PURPOSE AND SCOPE 2

III. MAINSTEM MASTER MANUAL AND ESA CONSULTATIONS 3

IV. FUTURE RUNOFF: AUGUST 2008 – DECEMBER 2009 3

V. ANNUAL OPERATING PLAN FOR 2008-2009 5

A. General 5
B. 2008-2009 AOP Simulations 5
C. Regulation for the Balance of 2008 Nav. Season and Fall of 2008 9
D. Regulation Plan for Winter 2008-2009 10
E. Regulation During the 2009 Navigation Season 12
F. Regulation Activities for T&E Species and Fish Propagation 14
G. Regulation Activities for Historical and Cultural Properties 17

VI. SUMMARY OF RESULTS EXPECTED IN 2009 19

A. Flood Control 19
B. Water Supply and Water Quality Control 20
C. Irrigation 21
D. Navigation 21
E. Power 22
F. Recreation, Fish and Wildlife 22
G. Historic and Cultural Properties 22
H. System Storage 24
I. Summary of Water Use by Functions 25

TABLES

I Natural and Net Runoff at Sioux City 4
II Navigation Service Support for the 2009 Season.....13
III Summary of 2008-2009 Draft AOP Studies 19
IV Peaking Capability and Sales 23
V Energy Generation and Sales 23
VI Anticipated December 31, 2009 System Storage.....25
VII Missouri River Mainstem System Water Use for Calendar Years 2007, 2008, and 2009 Above Sioux City, Iowa.....26

PLATES

1 Missouri River Basin Map
2 Summary of Engineering Data
3 Summary of Master Manual Criteria
4 System Storage and Fort Peck Elevations
5 Garrison and Oahe Elevations
6 System Storage
7 Gavins Point Releases
8 Fort Peck Elevations and Releases
9 Garrison Elevations and Releases
10 Oahe Elevations and Releases
11 Fort Randall Elevations and Releases
12 Reservoir Release and Unregulated Flow
13 System Gross Capability and Average Monthly Generation
14 American Indian Reservations

ABBREVIATIONS

AOP	-	annual operating plan
ac.ft.	-	acre-feet
ACHP	-	Advisory Council on Historic Preservation
AF	-	acre-feet
B	-	Billion
BiOp	-	Biological Opinion
BOR	-	Bureau of Reclamation
cfs	-	cubic feet per second
COE	-	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)
GIS	-	Geographic Information System
GWh	-	gigawatt hour
ISP	-	initial starting point
KAF	-	1,000 acre-feet
Kcfs	-	1,000 cubic feet per second
kW	-	kilowatt
kWh	-	kilowatt hour
M	-	million
MAF	-	million acre-feet
MRBA	-	Missouri River Basin Association
MRNRC	-	Missouri River Natural Resources Committee
msl	-	mean sea level
MW	-	megawatt
MWh	-	megawatt hour
NEPA	-	National Environmental Policy Act
plover	-	piping plover
pp	-	powerplant
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
tern	-	interior least tern

T&E	-	Threatened and Endangered
THPO	-	Tribal Historic Preservation Officers
tw	-	tailwater
USFWS	-	United States Fish and Wildlife Service
USGS	-	United States Geological Survey
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.

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MISSOURI RIVER MAINSTEM RESERVOIR SYSTEM

Draft Annual Operating Plan
2008 – 2009

I. FOREWORD

This draft Annual Operating Plan (AOP) presents pertinent information and plans for regulating the Missouri River Mainstem Reservoir System (System) through December 2009 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 dams 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 is directed by the Reservoir Control Center in the Missouri River Basin Water Management Division, Northwestern Division, U. S. Army Corps of Engineers (Corps). 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**.

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 during periods of extended drought to maintain minimum river or reservoir levels to keep intakes operational, and adjustments in reservoir releases or reservoir levels 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 recently revised "System Description and Regulation" report dated November 2007 or the "Summary of Actual Calendar Year 2007 Regulation," dated April 2008. Both reports are currently available at the "Reports and Publications" link on our web site 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 Calendar Year 2008 Regulation" will be available at the same site in April of 2009.

II. PURPOSE AND SCOPE

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 meeting is conducted to take public input on a draft of the AOP, which typically is published in early October 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 (THPO's), State Historic Preservation Officers (SHPO's), 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 AOP's 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 August 27, 2008, was sent to the Tribes offering consultation on the 2008-2009 AOP. Meeting times and locations of the six fall public meetings were also provided. Separate meetings will be scheduled for all Tribes requesting government-to-government consultation.

The 2008 spring public meetings were held at the following locations and dates: April 15 at Jefferson City and Kansas City, Missouri; April 16 at Nebraska City, Nebraska and Fort Peck, Montana; April 17 at Bismarck, North Dakota and Pierre, South Dakota. The attendees were given an update regarding the outlook for 2008 runoff and projected System regulation for the remainder of 2008. Six fall public meetings on the Draft 2008-2009 AOP are planned: October 14 in Nebraska City,

Nebraska; October 15 in Kansas City and Jefferson City, Missouri; October 16 in Fort Peck, Montana and Bismarck, North Dakota; and October 17 in Pierre, South Dakota.

In the spring of 2009, 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 2008-2009 AOP.

III. MAINSTEM MASTER MANUAL AND ESA CONSULTATIONS

The Missouri River Mainstem Reservoir System Master Water Control Manual (Master Manual) presents the water control plan and operational objectives for the integrated regulation of the System. First published in 1960 and subsequently revised during the 1970's, the Master Manual was revised in March 2004 to include more stringent drought conservation measures. The 2003 Amendment to the 2000 Biological Opinion (2003 Amended BiOp) presented the USFWS' opinion that the regulation of the System would jeopardize the continued existence of the endangered pallid sturgeon. The USFWS provided a Reasonable and Prudent Alternative (RPA) to avoid jeopardy to the 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.

IV. FUTURE RUNOFF: AUGUST 2008 - DECEMBER 2009

Runoff into the six System reservoirs is typically low and relatively stable during the August-to-February period. The August 1 calendar year runoff forecast is used as input to the Basic reservoir regulation simulation in the AOP studies for the period August 2008 to February 2009. The August 1 runoff forecast for 2008 was 26.3 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 and Lower basic simulations, which are based on 120 percent and 80 percent of the August 1 runoff forecast, respectively.

Simulations for the March 1, 2009 to February 28, 2010 time period use five statistically derived inflow scenarios based on an analysis of historic water supply. The report that presents the details of the calculations used to develop these inflow scenarios was updated in July 2008 to include 9 additional years of inflow data, which now extends from 1898 to 2006. Using statistically derived inflow scenarios provides a good range of simulation for dry, average, and wet conditions, and eliminates the need to forecast future precipitation, which is very difficult.

The five statistically derived inflows are identified as the Upper Decile, Upper Quartile, Median, Lower Quartile and Lower Decile runoff conditions. Upper Decile runoff (34.3 MAF) has a 1 in 10 chance of being exceeded, Upper Quartile (30.3 MAF) has a 1 in 4 chance of being exceeded, and Median (24.4 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 (16.2 MAF) has a 1 in 10 chance of the occurrence of less runoff. There is still a 20 percent chance that a runoff condition may occur that has not been simulated; i.e., a 10 percent chance runoff could be lower than Lower Decile, and a 10 percent chance runoff could be greater than Upper Decile.

The Upper Decile and Upper Quartile simulations extend from the end of the Upper Basic simulation through February 2010. 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 2010.

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 I,*** where water supply conditions are quantified for the period August 2008 through February 2010. The natural water supply for calendar year (CY) 2007 totaled 21.1 MAF.

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

	Natural 1/	Post-1949 Depletions	Net 2/
August 2007 through February 2008 (Basic Runoff Scenario)			
Basic	6,900	700	7,600
120% Basic	8,200	800	9,000
80% Basic	5,500	600	6,100
Runoff Year March 2008 through February 2009 (Statistical Analysis of Past Records)			
Upper Decile	34,300	-2,400	31,900
Upper Quartile	30,300	-2,600	27,700
Median	24,400	-2,400	22,000
Lower Quartile	19,300	-2,500	16,800
Lower Decile	16,200	-2,500	13,700

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.

V. ANNUAL OPERATING PLAN FOR 2008-2009

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 will 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 recently revised "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 2008-2009 AOP includes 13 years of regulation at Fort Peck (1940) by itself, plus 55 years of System experience as Fort Randall (1953), Garrison (1955), Gavins Point (1955), Oahe (1962), and Big Bend (1964) have been brought progressively into System regulation. This regulation experience includes lessons learned during the six consecutive years of drought from 1987 through 1992, the high runoff period that followed, and the current nine-year drought that began in 2000. Runoff during the period 1993 to 1999 was greater than the Upper Quartile level in five of those seven years, including the record 49.0 MAF of runoff in 1997. 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. 2008-2009 AOP Simulations. AOP simulations for the five runoff scenarios are shown in the final section of this AOP as studies 4 through 8. Due to the ongoing drought, service to all authorized project purposes except flood control will be reduced in the coming year and all water conservation measures available under the Master Manual will be utilized. In summary, the studies provide the following: minimum service flow support during the first part of the navigation season under all runoff scenarios; slightly above minimum to full service flow support after the July 1 System storage check for Median runoff and above; a full length navigation season for Upper Decile and Upper Quartile runoff; a shortened navigation season for Median runoff or below; low winter releases for all but the Upper Decile runoff scenario; low releases in the spring and fall before and after the navigation season; March and May spring pulses from Gavins Point dam; a steady release-flow to target regulation during the tern and plover nesting season; emphasis on Garrison for a steady to rising reservoir level during the forage fish spawn; and reservoir releases and pool levels sufficient to keep all

intakes operational under all runoff scenarios. Numerous other water conservations measures will be implemented if conditions allow 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 ***Plates 4 and 5*** for the System storage and the Fort Peck, Garrison and Oahe pool elevations.

Under all runoff scenarios modeled for the AOP, the March 1 and May 1 System storage is above the spring pulse precludes of 40.0 MAF. The peak magnitude of the March pulse is 5,000 cfs over navigation flows. The peak magnitude of the May pulse would be 16,000 cfs under the Upper Decile and Upper Quartile runoff scenarios, 13,900 for Median runoff, 9,800 cfs for Lower Quartile runoff and 9,700 cfs for Lower Decile runoff. The actual peak magnitude of the May pulse will be determined based on the actual System storage and the May 1 runoff forecast. The Master Manual technical criteria includes safeguards to minimize the risk of flooding associated with the spring pulses. Both spring pulses may be reduced or eliminated due to the downstream flow limits, shown on Plate 3, which are well below the channel capacity of the Missouri River. These flow limits are identical to the most restrictive flood control constraints presented in the previous Master Manual and provide a very similar level of flood protection. An additional safeguard is the incorporation of observed and anticipated precipitation into the daily river forecast to provide greater assurance that flows will remain below the downstream flow limits during the duration of the spring pulses. As in 2006, primary consideration will be given to withdrawing the water needed for the May spring pulse from Fort Randall reservoir in 2009, rather than from one or more of the upper three reservoirs. This would avoid further declines at Fort Peck, Garrison and Oahe reservoirs, which are already drawn down substantially due to the ongoing drought. If using Fort Randall in this manner is not feasible, the Corps would then give consideration to distributing the upstream storage reductions due to the May pulse equally among the upper three reservoirs. The Corps will also avoid cycling releases on the declining limb of the May spring pulse if the anticipated level of take of the two protected bird species is not excessive. Prior to implementing the May pulse, the Corps will coordinate with the affected Tribes and States to evaluate the options and determine the best course of action to minimize adverse impacts, including those associated with water quality due to low reservoir levels, water intakes, historic and cultural sites and reservoir fisheries.

It is possible that the 2009 spring pulses from the System could be reduced or eliminated as they travel downstream if there are significant releases being made from downstream Corps tributary reservoir projects. If the releases at these downstream Corps tributary reservoirs can be reduced without undue increased risk to other areas, it will be possible to reduce or eliminate the increase in flows on the Missouri River due

to the spring pulses. This type of regulation was actually implemented in conjunction with the March 2008 spring pulse, which eliminated the pulse as it passed by Kansas City, MO. However, it should be noted that the conditions that would allow for such a regulation are experienced very infrequently, because significant releases from the tributary reservoirs are fairly rare during the spring of the year. This is especially true for the May pulse, which would require more of an adjustment because of the higher magnitude of that pulse.

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. Minimum service navigation flows are provided for all runoff conditions at the start of the navigation season due to low System storage, however a higher service level is provided for Median runoff and above based on the July 1 System storage check. Application of the July 1 System storage check (***see Plate 3***) also indicated that a full length navigation season would be provided for Upper Decile and Upper Quartile runoff. The lower runoff scenarios show a navigation season shortening ranging from 5 days for Median runoff to 30 days for Lower Quartile and Lower Decile runoff. None of the simulations reach the desired 57.0 MAF System storage level on March 1, 2010.

For modeling purposes in this AOP, the SR-FTT regulation scenario is shown during the 2009 tern and plover nesting season. The monthly average May release used in the simulations was determined by adding the May spring pulse hydrograph to the minimum service release, followed by cycling between the May and June minimum service releases for the remainder of the month to reflect an every third day peaking cycle from Gavins Point. The June release was modeled as a steady release due to the presence of chicks along the river at that time. The long-term average releases (see ***Plate 3***) were used for July and August to indicate flowing to target and to reflect an increase in navigation service level for Median runoff and above. Although these modeled Gavins Point releases represent our best estimate of required releases during 2009, actual releases will be based on hydrologic conditions and the availability of habitat at that time. It may also be necessary to cycle releases for flood control regulation during the T&E species' nesting season.

The long-term average Gavins Point releases to meet target flows were used in all the AOP studies for navigation support during the spring and fall months. Based on the September 1 storage check, Gavins Point winter releases were modeled at 12,500 cfs during the 2008-2009 winter season for all runoff scenarios. Prior to 2004, higher winter releases were required for downstream powerplants and water supply intakes, but completed and on-going modification of intakes now permit lower winter releases as a conservation measure when System storage is low. Based on the September 1, 2009 storage check, higher winter releases would be provided only for the Upper Decile runoff scenario during the winter of 2009-2010. Non-winter, non-navigation Gavins

Point releases were modeled at 9,000 cfs as a further water conservation measure as described in the Master Manual, provided downstream tributary flows are adequate to serve water supply requirements. 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 to meet the Missouri River target flows presented in the Master Manual.

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 were scheduled to be favored during the 2009 forage fish spawn if runoff is not sufficient to keep all three reservoirs rising. However, in response to a request from the Missouri River Association of States and Tribes (MoRAST), emphasis will be given to Garrison from April 20 to May 20, 2009 while also attempting to maintain rising water levels in Fort Peck and Oahe. The Median, Upper Quartile, and Upper Decile simulations show that it is possible to provide steady-to-rising pool level in each of the three large upper reservoirs during the spring forage fish spawn period. Releases in the Lower Quartile and Lower Decile simulations are adjusted to maintain a steady-to-rising pool level at Garrison.

Two modified reservoir regulation plans shown in previous AOPs, the Fort Peck "mini-test" and unbalancing the upper three reservoirs, will not be implemented in 2009 due to low System storage. Both of these plans may be implemented when System storage recovers to more normal levels.

Actual System regulation from January 1 through July 31, 2008 and the regulating plans for each project through CY 2009 using the five runoff scenarios described on Page 4 are presented on ***Plates 6 through 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 for Fort Peck, Garrison, Oahe, and Gavins Point the 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 2007 through July 2008. ***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 2008 Navigation Season and Fall of 2008. The regulation of the System for the period of August though November 2008 is presented in the following paragraphs.

Fort Peck Dam. Releases averaged 7,000 cfs during August and the first half of September. In mid-September they will be gradually reduced to 4,000 cfs. The releases will be held near that level until late November. The Fort Peck pool will remain essentially steady through the period and is forecast to end November at 2210.0 ft msl. The record low pool elevation of 2196.2 feet msl was set in March 2007. The previous record low pool elevation was 2208.7 feet msl set in April 1991.

Garrison Dam. Releases averaged 13,900 cfs during August. They will continue at 14,000 cfs until mid-September when irrigation ceases and then be reduced to 11,000 cfs. Releases will be held at 10,500 to 11,000 cfs during October and November as a water conservation measure. The Garrison pool level will decline to 1825.8 feet msl by the end of November. The record low pool elevation of 1805.8 feet msl was set in May 2005. The previous record low pool elevation was 1815.0 feet msl set in May 1991.

Oahe Dam. Releases averaged 18,500 cfs in August, and will be reduced in early September to initiate an early fall drawdown of the Fort Randall pool, as the navigation season closed early in 2008. Low releases will continue in September, October, and November to complete the annual fall draw of Fort Randall. Releases will be increased in December for winter power production. The Oahe pool will end November at elevation 1592.5 feet msl. The record low Oahe pool elevation of 1570.2 feet msl was set in August 2006. The previous record low pool elevation was 1580.7 feet msl set in November 1989.

Big Bend Dam. Releases will parallel those from Oahe. Big Bend will generally fluctuate between 1420.0 feet msl and 1421.0 feet msl for weekly cycling during high power load periods.

Fort Randall Dam. Releases averaged 21,900 cfs in August and will be scheduled in September to back up the releases from Gavins Point Dam. After the navigation season ends in late-October, releases will gradually be reduced to as low as 7,000 cfs in November. The majority of the Fort Randall fall pool draw down will occur in September and October with the remaining drawdown accomplished by mid-November if necessary.

Gavins Point Dam. Releases will be scheduled to support downstream minimum service flows in reaches with commercial navigation throughout the remainder of the 2008 navigation season, which will be shortened 30 days in accordance with the technical criteria for the July 1 System storage check presented in the Master Manual.

The last day of flow support for the commercial navigation season will range from October 22 at Sioux City to October 31 at the mouth near St. Louis. Releases will be reduced by 3,000 cfs per day in mid-October until they reached 10,000 cfs, assuming there is sufficient downstream tributary inflow. The 10,000 cfs release will maintained for 5 days to allow sufficient travel time for the release changes to reach the critical downstream locations and then the release will be stepped down to the fall non-navigation season rate of 9,000 cfs. The 9,000 cfs fall non-navigation season release rate is contingent on the presence of sufficient incremental tributary flows to meet the operational requirements of downstream water intakes. We believe that this 9,000 cfs minimum spring-fall release represents a reasonable long-term goal for water intake owners to strive for as they make improvements to their facilities. The Gavins Point pool level will be raised 1.5 feet to elevation 1207.5 feet msl in September. The pool level will remain near that elevation during the fall and winter months.

D. <u>Regulation Plan for Winter 2008-2009</u>. The September 1 System storage check is used to determine the amount of the winter System release. A winter System release of 12,000 cfs is scheduled if System storage is less than 55 MAF on September 1; 17,000 cfs is scheduled when System storage is above 58 MAF; and the release is prorated for System storages between 55 and 58 MAF. During the winter of 2008-2009, we will strive to average a 12,000 cfs System release. If mild weather conditions prevail, System releases may be set lower than 12,000 cfs, but only if downstream water supply intakes can remain operable at those levels. Conversely, 12,000 cfs may be less than is required for downstream water supply intakes without sufficient incremental tributary flows below the System, and therefore, releases may need to be set at levels higher than 12,000 cfs at times to ensure downstream water supply intakes are operable. However, we believe that this minimum winter flow represents a reasonable long-term goal for water intake operability and for owners to strive for as they make improvements to their facilities. It may be necessary at times to increase Gavins Point releases to provide adequate downstream flows due to the forecast of excessive river ice formation or if ice jams or blockages form which temporarily restrict flows. Based on past experiences, these events are expected to occur infrequently and be of short duration. Given these infrequent temporary release increases above the 12,000 cfs level, the winter System release will likely average around 12,500 cfs. It is anticipated that this year's winter release will be adequate to serve all downstream water intakes except for very short periods during significant river ice formation or ice jamming.

<u>Fort Peck Dam</u>. Releases are expected to average 6,000 cfs to serve winter power loads and help balance System storage from December through February. Average winter release rates are about 11,000 cfs. The Basic simulation shows that the Fort Peck pool level will rise slightly to near 2211.4 feet msl during the winter period, ending February about 22.6 feet below the base of the annual flood control storage zone. Carryover multiple purpose storage in the three large upper reservoirs will slightly out of balance on March 1, 2009 due to minimum release requirements below the dam

throughout the year. Fort Peck will end February 2009 about 3.6 feet low, Garrison about 1.8 feet high, and Oahe about 0.6 feet high. The pool level is expected to rise during March to near elevation 2213 feet msl.

Garrison Dam. Releases will be scheduled at a very low rate, 15,000 cfs, this winter to help balance System storage. This low release rate is normally sufficient to prevent ice induced flooding at the time of freeze-in, but temporary reductions in the releases may be scheduled to prevent exceedence of a 13-foot stage at the Bismarck gage. Flood stage is 16 feet. Average winter release rates for Garrison are 20,400 cfs in December, 23,000 cfs in January and 24,200 cfs in February. The Garrison pool level is expected to decline about two feet from near elevation 1825.8 feet msl to near elevation 1823.7 feet msl by March 1, 13.8 feet below the base of the annual flood control storage zone. The Median simulation indicates the pool level will rise to elevation 1825.6 feet msl by March 31.

Oahe Dam. Releases for the winter season will provide backup for the Fort Randall and Gavins Point releases plus fill 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 15,000 cfs. Daily releases will vary widely to best meet power loads. Peak 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 problems develop downstream of Oahe Dam. This potential reduction has been coordinated with the Western Area Power Administration. The Oahe pool level is expected to decline about one-half foot from elevation 1592.5 feet msl at the end of November to elevation 1592.0 feet msl by the beginning of March, 15.5 feet below the base of the annual flood control storage zone. The pool is expected to rise to elevation 1593 feet msl by the end of March.

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

Fort Randall Dam. Releases will average near 10,500 cfs during the winter season. The Fort Randall pool level is expected to rise from its fall drawdown elevation of 1337.5 feet msl 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 remains quite low, 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 1355.2 feet msl could be reached by the end of the winter period on March 31 if runoff conditions permit. The Fort Randall pool level above the White River delta near Chamberlain, South Dakota will likely 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 Dam. 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 be substantially below the base of the annual flood control zone by March 1, 2009, the beginning of next year's runoff season.

E. Regulation During the 2009 Navigation Season. The Upper Decile, Upper Quartile, Median, Lower Quartile, and Lower Decile runoff scenarios modeled for this year's AOP follow the technical criteria presented in the current Master Manual for downstream flow support. All five runoff scenarios studied for this year's AOP provide gradually increasing Gavins Point releases to provide Missouri River navigation season flow support at the mouth of the Missouri near St. Louis by April 1, 2009, 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 2009 navigation season there is no commercial navigation scheduled to use the upper reaches of the navigation channel, we will consider eliminating navigation flow support for targets in those reaches to conserve water in the System, as has been done since 2003.

Navigation flow support for the 2009 season will be determined by actual System storage on March 15 and July 1. All runoff scenarios modeled indicate minimum service flow support at the start of the 2009 navigation season, but following the July 1 System storage check a higher service level is provided for the Median runoff scenario and above. If the July 1 System storage check indicates an increase in service level, any increase may be delayed until the end of the T&E bird species' nesting season, depending on the potential for 'take' of those species. The normal 8-month navigation season is shortened as a water conservation measure for all but the Upper Quartile and Upper Decile runoff scenarios as shown in ***Table II***.

TABLE II
NAVIGATION SERVICE SUPPORT
FOR THE 2009 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.*	34.3	47.5	57.2	-6,000	0	0
U.Q.*	30.3	47.4	55.2	-6,000	-1,700	0
Med *	24.4	45.5	50.7	-6,000	-5,800	5
L.Q.*	19.3	43.6	45.7	-6,000	-6,000	30
L.D.*	16.2	43.5	44.5	-6,000	-6,000	30

*Includes both March and May Spring Pulses

As previously stated, the planned regulation for the 2009 nesting season will be SR-FTT. The initial steady release, which is estimated to be 25,000 to 28,000 cfs, 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 peaking cycle of 2 days down and 1 day up following the May pulse 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 and conserving water in the upper three 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 in late August. In addition to the intra-day pattern, Fort Randall releases may also be cycled with 2 days of low releases and 1 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.

As discussed previously, System storage will be above the storage precludes for both spring pulses under all runoff scenarios modeled. Both spring pulses may be reduced or eliminated due to the downstream flow limits. It also possible that the spring pulses could be reduced or eliminated as they travel downstream if there are significant releases being made from downstream Corps tributary reservoir projects. If the releases at these downstream Corps tributary reservoirs can be reduced without undue increased risk to other areas, it will be possible to reduce or eliminate the increase in flows on the Missouri River due to the spring pulses. However, it should be noted that the conditions that would allow for such a regulation are experienced very infrequently, because significant releases from the tributary reservoirs are fairly rare

during the spring of the year. This is especially true for the May pulse, which would require more of an adjustment because of the higher magnitude of that pulse.

Gavins Point releases may be quite variable during the 2009 navigation season but are expected to range from 18,000 to 35,000 cfs. 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 Kansas Reservoir System have not been included since they are based on downstream hydrologic conditions but this storage will be utilized to the extent possible to provided basin water conservation. Simulated storages and releases for the System and individual reservoirs within the System are shown on ***Plates 6 through 11.*** Ample storage space exists in the System to control flood inflows under all scenarios simulated for this AOP.

F. <u>Regulation Activities for T&E Species and Fish Propagation Enhancement.</u> 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 System reservoirs. The studies show that inflows are sufficient to maintain steady to rising pools at Fort Peck and Garrison from April through June for Lower Quartile and Lower Decile runoff scenarios, however, the Oahe pool level may fall during this period. As part of the overall plan to rotate emphasis among the upper three reservoirs during low runoff years, Fort Peck and Oahe were scheduled to be favored during the 2009 forage fish spawn, however, in response to a request from MoRAST, emphasis will be given to Garrison from April 20 to May 20, 2009. This will be accomplished by setting releases at Fort Peck and Garrison at a level that would maintain a rising Garrison pool, but no less than the minimum required to supply downstream irrigation. These adjustments may be restricted when the terns and plovers begin nesting in May. If the drought continues, 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.

As discussed in the previous section, the 2008-2009 AOP does not include provisions for unbalancing the Fort Peck, Garrison, and Oahe reservoirs for the benefit of the endangered species and reservoir fishery on March 1, 2009 for any of the runoff scenarios. The criteria for unbalancing are based on recommendations provided by the MRNRC and the USFWS. Under all simulations, System storage will be below the

minimum levels under which unbalancing is recommended by either the MRNRC or the USFWS.

Fort Peck Dam. The repetitive daily pattern of releases from Fort Peck Dam 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 habitat, and thus were not expected to be impacted by the potential range of releases from Fort Peck during the summer. Releases during the 2009 nesting season will not be restricted by the repetitive daily pattern unless habitat conditions or nesting patterns change. This regulation should result in habitat conditions for nesting terns and plovers that are similar to those that were available in 2008.

If flood 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 should 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, but appears possible under all the runoff scenarios. The Fort Peck "mini-test" would not be run under any runoff scenario. The Fort Peck pool level must be at elevation 2229 feet msl to allow releases required for the "mini-test" via the spillway.

Garrison Dam. Daily average releases from Garrison will be much less than full powerplant capacity during the tern and plover nesting season under all runoff scenarios. Hourly peaking will be restricted during the nesting season to limit peak stages below the project for nesting birds.

Although the Garrison pool level during the summer of 2009 will be considerably higher than in the past several years, steps will again be taken to conserve the volume of cold-water habitat. In 2005 plywood was attached to the lower 50 feet of the trash racks on two of the penstocks to allow water to be drawn from a higher, and therefore warmer, region of the reservoir. In 2007 plywood was installed on one additional trash rack. During 2009, releases from Garrison during the summer months will be made through the three hydropower units with modified intakes, to the extent reasonably possible. In addition, the manner in which the other hydropower units are operated will be adjusted to run them at or near full capacity when in use, which also has the effect of drawing water off the upper, warmer, portion of the reservoir. In combination, these two efforts are expected to save several hundred thousand acre-feet of coldwater habitat for the benefit of the coldwater fishery.

If runoff is not sufficient to keep all the pool levels rising during the fish spawn in 2000, the Corps will, to the extent reasonably possible while serving other Congressionally authorized project purposes, set releases to result in a steady to rising pool at Garrison from April 20 to May 20. Adjustments to Garrison's releases, however, may be restricted when the terns and plovers begin nesting in May. A rising pool at Garrison during the fish spawn in April and May will be dependent upon the daily inflow pattern to the reservoir but appears possible with all runoff simulations.

Oahe Dam. Releases in the spring and summer will back up those from Gavins Point Dam. The pool level should be steady to rising in the spring during the fish spawn under median and above runoff scenarios, but it will be dependent on the timing and distribution of runoff as well as the need to adjust releases from Garrison to prevent that reservoir from declining.

Fort Randall Dam. Primary consideration will be being given to staging or storing extra water in Fort Randall reservoir for the May spring pulse from Gavins Point. This will reduce the risk of impacts at the upper three reservoirs including those associated with water quality due to lower reservoir levels, water intake access problems and historic and cultural site exposure.

To the extent reasonably possible, Fort Randall will be regulated to provide for a pool elevation near 1355 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 during the 2009 nesting season will be restricted 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.

Gavins Point Dam. March and May spring pulses from Gavins Point Dam for the benefit of the endangered pallid sturgeon would be implemented under all runoff scenarios in 2009. Details related to the spring pulses, including the specific technical criteria for the 2009 pulses, are presented in Plate 3. Details of the spring pulses included in the AOP simulations are provided in Chapter V, Section B, entitled "**2008-2009 AOP Simulations**".

Based on 2003 through 2007 nesting season results with the SR-FTT regulation and planned habitat development activities, it is anticipated that sufficient habitat will be available above the planned release rates to provide for successful nesting. All reasonable measures to minimize the loss of nesting T&E bird species will be used. These measures include, but are not limited to, such things as a relatively high initial SR

during the peak of nest initiation, the use of the Kansas River basin reservoirs, moving nests to higher ground when possible, 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 inflows 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 the Gavins Point project, regulation to minimize '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 Dam and Gavins Point Dam 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. Planned habitat creation projects in Lewis and Clark Lake will reduce the inundation risk to T&E bird species by providing higher habitat for nesting. The pool will be increased to elevation 1207.5 feet msl when it is determined that there are no terns or plovers nesting along the reservoir.

G. <u>Regulation Activities for Historic and Cultural Properties</u>. As acknowledged in the 2004 Programmatic Agreement for the Operation and Management of the Missouri River Main Stem System (PA), wave action and fluctuation in the level of the System reservoir pools results in erosion along the banks of the reservoirs. With the recent drought conditions additional sites have become exposed as the pool levels have declined. 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 adverse effects along the System reservoirs. Pool levels at the upper three reservoirs improved significantly in 2008 and are currently 9 to 12 feet higher than one year ago, but will remain below normal in 2009 continuing to expose cultural sites along the shorelines. Actions to avoid, minimize or mitigate adverse impacts and expected results of the actions are covered under Chapter VI of this AOP. ***Plate 14*** shows the locations of the Tribal Reservations.

Fort Peck Dam. Depending on runoff in the Missouri River basin, System regulation during 2009 could result in a Fort Peck pool elevation variation from a high of 2233 feet msl to a low of 2206 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 10 to 25 known sites could be affected during this period.

Garrison Dam. 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 1842 and 1814 feet msl during 2009. Based on a review of existing information, approximately 25 to 50 known sites could be affected during this period.

Oahe Dam. At the Oahe reservoir, the System regulation under the Upper and Lower Decile runoff scenarios could result in pool elevations between 1608 and 1580 feet msl (see ***Plate 10*** and the studies included at the end of this report). Based on a review of existing information, approximately 125 to 175 known sites could be affected during this period.

Big Bend Dam. System regulation will be adjusted to maintain the Big Bend pool level in the normal 1420 to 1421 feet msl range during 2009. Short-term increases above 1421 due to local rainfall may also occur. Based on a review of existing information, approximately 50 to 75 known sites could be affected during this period.

Fort Randall Dam. 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 2009. 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 refill during the winter to elevation 1350 feet msl. Based on a review of existing information, approximately 25 to 50 known sites could be affected during this period.

Gavins Point Dam. System regulation will be adjusted to maintain the Gavins Point pool level in the normal 1206 to 1207.5 feet msl range during 2009. Short-term increases above 1207.5 feet msl may occur due to local rainfall. Based on a review of existing information, approximately 10 to 25 known sites could be affected during this period.

VI. SUMMARY OF RESULTS EXPECTED IN 2009

With regulation of the System in accordance with the 2008-2009 Draft AOP outlined in the preceding pages, the following results can be expected. Table III summarizes the critical decision points throughout the year for all runoff conditions.

Table III
Summary of 2008 -2009 Draft AOP Studies

Decision Points	2009-2010 Runoff Condition				
	Upper Decile	Upper Quartile	Median	Lower Quartile	Lower Decile
March 1 System Storage March Spring Pulse? Pulse Magnitude March 23-31 GP Release	46.4 MAF Yes 5 kcfs 22.9 kcfs	46.4 MAF Yes 5 kcfs 22.9 kcfs	44.6 MAF Yes 5 kcfs 22.9 kcfs	42.9 MAF Yes 5 kcfs 26.0 kcfs	42.9 MAF Yes 5 kcfs 26.0 kcfs
March 15 System Storage Spring Service Level	47.5 MAF Minimum	47.4 MAF Minimum	45.5 MAF Minimum	43.6 MAF Minimum	43.5 MAF Minimum
May 1 System Storage May Spring Pulse? Pulse Magnitude May Cycling May GP Release	50.6 MAF Yes 16.0 kcfs 22.0/25.0 kcfs 26.0 kcfs	49.9 MAF Yes 16.0 kcfs 22.0/25.0 kcfs 26.0 kcfs	46.9 MAF Yes 13.9 kcfs 22.0/25.0 kcfs 25.7 kcfs	43.8 MAF Yes 9.8 kcfs 25.3/28.3 kcfs 27.9 kcfs	43.5 MAF Yes 9.7 kcfs 25.3/28.3 kcfs 27.9 kcfs
Fish Spawn Rise (Apr-Jun) FTPK Pool Elev Change GARR Pool Elev Change OAHE Pool Elev Change	 +13.4 feet +10.5 feet +11.0 feet	 +11.4 feet +8.1 feet +8.9 feet	 +8.8 feet +7.2 feet +4.2 feet	 +5.2 feet +4.9 feet -1.5 feet	 +2.8 feet +3.5 feet -2.4 feet
July 1 System Storage Sum-Fall Service Level (kcfs) Nav Season Shortening	57.2 MAF Full Serv 0 Days	55.2 MAF Full Serv – 1.7 0 Days	50.7 MAF Full Serv – 5.8 5 Days	45.7 MAF Min Service 30 Days	44.5 MAF Min Service 30 Days
September 1 System Storage Winter GP Release	57.9 MAF 16.8 kcfs	55.4 MAF 12.5 kcfs	50.0 MAF 12.5 kcfs	44.1 MAF 12.5 kcfs	42.2 MAF 12.5 kcfs
February 28 System Storage End-Year Pool Balance Percent Pool	56.2 MAF Balanced 99%	54.0 MAF Balanced 95%	48.3 MAF Balanced 85%	41.9 MAF Balanced 74%	39.2 MAF Balanced 69%

A. Flood Control. All runoff scenarios studied will begin the March 1, 2009 runoff season substantially below the desired 57.0 MAF base of the annual flood control

and multiple use zone. Therefore, the entire System flood control zone, plus an additional 10.6 to 14.1 MAF of the carryover multiple use zone, will be available to store runoff. The System will be available to significantly reduce peak discharges and store a significant volume of water for all floods that may originate above the System.

Remaining storage in the carryover multiple use zone will be adequate to provide support for all of the other multiple purposes of the System, though at reduced levels.

B. Water Supply and Water Quality Control. Problems at intakes located in the river reaches and Mainstem 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 current drought have contributed to both intake access and water quality problems for intakes on Garrison and Oahe reservoirs, including several Tribal intakes; however better runoff in 2008 eliminated concern over many of these intakes. Gains in the Oahe pool level required modification of the Standing Rock Sioux Tribe's temporary intake at Fort Yates to protect it from the risng water levels. The Bureau of Reclamation (BOR) installed the temporary intake after the primary intake failed in November 2003 leaving the community without water for several days. If the drought continues 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 2009 would be approximately 10 feet higher than the record lows set in the current drought. Although not below the critical shut-down elevations for any intake, return to lower levels would require extra monitoring to ensure the continued operation of the intakes.

Although below normal winter releases are being provided in the winter of 2008-2009 and in the winter of 2009-2010 for all but the Upper Decile runoff scenario, all water supply and water quality requirements on the Missouri River both below Gavins Point Dam and between System reservoirs should be met for all flow conditions studied. Due to the low reservoir levels and releases many intake operators have experienced, and will continue to experience, additional water treatment costs. It is possible with the low winter releases that ice formation or ice jams may temporarily reduce river stages to levels below which some intakes can draw water. Therefore, during severe cold spells, experience has shown that for brief periods it may be necessary to increase Gavins Point releases to help alleviate downstream water supply problems.

During the non-navigation periods in the spring and fall, System releases as low as 9,000 cfs are likely if enough downstream tributary flow exists to allow for continued

operation of downstream water intakes. It has been possible to reduce System releases to 9,000 cfs in the spring and fall of each season since the fall of 2004. If a non-navigation year would occur in the future, summer releases (May thru 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 downstream 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 power plant'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 power plant 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 throughout the System and along the lower river reach to make necessary modifications to their intakes to allow efficient operation over the widest possible range of hydrologic conditions.

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 drought conditions persist. Below Fort Peck, localized dredging may once again be required in the vicinity of irrigation intakes in order to maintain access the water if releases are low next summer. Tributary irrigation water usage is fully accounted for in the estimates of water supply.

D. Navigation. Service to navigation in 2009 for all runoff scenarios will be at minimum service flow support from the beginning of the navigation season through the July 1 storage check. Minimum service flow support will continue throughout the entire navigation season for Lower Quartile and Lower Decile runoff scenarios. Simulation of Median runoff resulted in only a slightly higher service level, 200 cfs above minimum service, for the second half of the 2009 navigation season. The service level would rise to 1,700 cfs below full service following the July 1 System storage check for Upper Quartile runoff, and to full service for Upper Decile runoff. Although the AOP simulations provide a comparison of typical flow support under varying runoff conditions, the actual rate of flow support for the 2009 navigation season will be based on actual System storage on March 15 and July 1, 2009.

While the Upper Decile and Upper Quartile simulations show no reduction in the normal 8-month navigation season length, the Median runoff simulation shows a 5- day shortening of the navigation season, and the Lower Quartile and Lower Decile simulations show 30 days of shortening. The anticipated service level and season length for all runoff conditions simulated are shown in ***Table II***.

E. <u>Power</u>. ***Tables IV and V*** give the estimated monthly System load requirements and hydropower supply of the Eastern Division, Pick-Sloan Missouri Basin Program (P-S MBP), from August 2008 through December 2009. 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.

F. <u>Recreation, Fish and Wildlife</u>. 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. Improved runoff resulted in higher pool levels and better recreation access at the upper three reservoirs during 2008, however access in 2009 may remain limited at several locations. Special regulation adjustments incorporating specific objectives for these purposes will be made to the extent reasonably possible. Conditions in the lower three reservoirs 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.

Boat ramps that were lowered and low water ramps that were constructed during the drought of the late 1980's to early 1990's and the further improvements made in 2003 through 2008 should provide adequate reservoir access in 2009 for all runoff conditions.

The effects of the simulated System regulation during 2009 on fish and wildlife are included in Chapter V, Section F, entitled, "Regulation Activities for T&E Species and Fish Propagation Enhancement."

G. <u>Historic and Cultural Properties</u>. As mentioned in Chapter V of this AOP, the regulation of the System during 2008 and 2009 will expose cultural sites due to erosion from the normal fluctuation of pool elevations as well as the recent drought conditions which has exposed previously inundated sites as the waters have receded. 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 PA 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.

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

	Estimated Committed Sales*	Expected C of E Capability					Expected Bureau Capability**					Expected Total System Capability				
2008			120%	Basic	80%			120%	Basic	80%			120%	Basic	80%	
Aug	2115		2185	2181	2177			211	211	210			2396	2392	2387	
Sep	1686		2176	2165	2156			211	212	210			2387	2377	2366	
Oct	1649		2141	2130	2118			211	211	210			2352	2341	2328	
Nov	1766		2151	2135	2120			209	209	208			2360	2344	2328	
Dec	1958		2172	2145	2124			205	205	205			2377	2350	2329	
2009																
Jan	2112		2188	2160	2139			200	201	202			2388	2361	2341	
Feb	1867		2192	2169	2144			196	198	199			2388	2367	2343	
		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	1774	2214	2210	2180	2148	2146	194	194	195	194	196	2408	2404	2375	2342	2342
Apr	1664	2244	2235	2190	2146	2140	194	190	194	190	198	2438	2425	2384	2336	2338
May	2416	2270	2254	2199	2145	2137	200	197	202	197	203	2470	2451	2401	2342	2340
Jun	2417	2322	2297	2237	2164	2149	213	213	213	213	211	2535	2510	2450	2377	2360
Jul	2444	2334	2305	2240	2158	2135	213	213	213	213	211	2547	2518	2453	2371	2346
Aug	4653	2324	2295	2227	2144	2118	209	210	210	210	208	2533	2505	2437	2354	2326
Sep	2444	2319	2289	2222	2127	2094	209	209	209	209	208	2528	2498	2431	2336	2302
Oct	2443	2305	2274	2201	2087	2052	208	208	210	208	209	2513	2482	2411	2295	2261
Nov	2376	2272	2239	2175	2091	2055	206	206	207	206	207	2478	2445	2382	2297	2262
Dec	2377	2238	2214	2147	2056	2019	202	202	203	202	205	2440	2416	2350	2258	2224

* 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 V
ENERGY GENERATION AND SALES
(Million kWh at plant)

	Estimated Committed Sales*	Expected C of E Generation					Expected Bureau Generation **					Expected Total System Generation				
2008			120%	Basic	80%			120%	Basic	80%			120%	Basic	80%	
Aug	846		529	540	551			99	78	72			628	618	623	
Sep	725		540	538	567			87	68	62			627	606	629	
Oct	723		477	497	504			85	74	61			562	571	565	
Nov	791		263	273	281			87	78	60			350	351	341	
Dec	897		476	446	433			89	79	62			565	525	495	
2009																
Jan	913		462	462	457			87	78	61			549	540	518	
Feb	886		378	418	409			76	69	54			454	487	463	
		U.D.	U.Q.	Med	L.Q.	L.D.	U.D.	U.Q.	Med	L.Q.	L.D.	U.D.	U.Q.	Med	L.Q.	L.D.
Mar	814	469	483	442	491	506	83	83	75	59	59	552	566	517	550	565
Apr	752	492	532	492	630	596	103	93	73	44	44	595	625	565	674	640
May	696	707	721	745	777	800	132	125	92	48	48	839	846	837	825	848
Jun	754	727	717	715	771	769	149	147	105	50	50	876	864	820	821	819
Jul	841	956	901	811	848	841	155	140	85	63	52	1111	1041	896	911	893
Aug	820	996	936	849	808	802	104	97	77	63	51	1100	1033	926	871	853
Sep	725	865	800	666	620	583	90	87	74	60	49	955	887	740	680	632
Oct	723	700	658	558	531	530	90	87	73	60	52	790	745	631	591	582
Nov	791	646	614	503	295	295	86	83	82	61	57	732	697	585	356	352
Dec	897	627	548	524	511	511	88	84	84	68	53	715	632	608	579	564
CY TOT		8025	7750	7185	7148	7099	1243	1189	966	690	631	9268	8939	8151	7838	7730

* 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.

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 "Draft Five Year Plan, dated February 2005" (see https://www.nwo.usace.army.mil/CR/) 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 2008 and 2009. 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 "Draft Monitoring and Enforcement Plan, dated April 2005" (see https://www.nwo.usace.army.mil/CR/) 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 2008-2009 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. Training for the monitoring teams was held in June 2006, July 2007, March 2008, April 2008 and again in July 2008.

Secondly, mitigation or protection of sites that are being adversely impacted continues. During the reporting period for the 2007 Annual Report by the Corps on the implementation of the Programmatic Agreement twelve sites were either completed, started, or in the design phase. The annual report is available at https://www.nwo.usace.army.mil/CR/. In addition the Corps has awarded 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. The model is expected to be complete by December 2008.

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 2008-2009 on cultural sites are included in the Chapter V, section G., entitled, "Regulation Activities for Historic and Cultural Properties."

H. System Storage. If August 1, 2008 Basic runoff forecast verifies, System storage will decline to 44.1 MAF by the close of CY 2008. This would be 10.2 MAF

higher than the all-time record low storage of 33.9 MAF set on February 9, 2007 and nearly 7.3 MAF higher than last year's storage of 36.8 MAF. This end-of-year storage is 8.6 MAF less than the 1967 to 2007 average. The record low storage during the 1988-1992 drought was 40.8 MAF in January 1991. 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, 2009 is presented in ***Table VI*** for the runoff scenarios simulated.

I. Summary of Water Use by Functions. Anticipated water use in CY 2008, under the regulation plan with the Basic forecast of water supply is shown in ***Table VII***. Actual water use data for CY 2007 are included for information and comparison. Under the reservoir regulation simulations in this AOP, estimated water use in CY 2009 also is shown in ***Table VII.***

TABLE VI
ANTICIPATED DECEMBER 31, 2009 SYSTEM STORAGE

Water Supply Condition	Total (12/31/09)	Carryover Storage Remaining 1/	Unfilled Carryover Storage 2/	Total Change CY 2009
	(Volumes in 1,000 Acre-Feet)			
Upper Decile	55,900	37,900	1,100	10,400
Upper Quartile	53,400	35,400	3,600	7,900
Median	47,900	29,900	9,100	3,800
Lower Quartile	41,900	23,900	15,100	-900
Lower Decile	39,400	21,400	17,600	-3,400

1/ Net usable storage above 18.0 MAF System minimum pool level established for power, recreation, irrigation diversions, and other purposes.

2/ System base of annual flood control zone containing 57.0 MAF.

TABLE VII
MISSOURI RIVER MAINSTEM SYSTEM
WATER USE FOR CALENDAR YEARS 2007, 2008, AND 2009 ABOVE SIOUX CITY, IOWA
in Million Acre-Feet (MAF)

		CY 2007 Actual	CY 2008 Basic Simulation	Simulations for Calendar Year 2009 Upper Decile	Upper Quartile	Median	Lower Quartile	Lower Decile
Upstream Depletions	(1)							
Irrigation, Tributary Reservoir Evaporation & Other Uses		2.3	1.7					
Tributary Reservoir Storage Change		-0.1	0.6					
Total Upstream Depletions		2.2	2.3	2.5	2.5	2.5	2.5	2.4
System Reservoir Evaporation	(2)	2.5	2.1	1.2	1.1	1.6	1.8	1.7
Sioux City Flows								
Navigation Season								
Unregulated Flood Inflows Between Gavins Point & Sioux City	(3)	0.0	0.0					
Navigation Service Requirement	(4)	9.8	10.7	16.2	15.0	12.8	11.9	11.5
Supplementary Releases								
T&E Species	(5)	0.3	0.3	0.5	0.4	0.4	0.4	0.4
Flood Evacuation	(6)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-navigation Season								
Flows		3.8	3.4	3.5	3.2	3.2	3.6	3.6
Flood Evacuation Releases	(7)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
System Storage Change		2.5	7.3	10.4	8.1	3.9	-0.9	-3.4
Total		21.1	26.1	34.3	30.3	24.4	19.3	16.2
Project Releases								
Fort Peck		4.6	4.2	5.2	4.9	4.5	4.6	4.7
Garrison		10.2	9.5	14.0	13.5	12.5	12.3	11.8
Oahe		8.7	8.8	13.7	13.6	13.2	13.9	14.1
Big Bend		7.9	8.4	13.6	13.5	13.1	13.8	13.9
Fort Randall		8.9	9.4	15.2	14.7	13.9	14.0	14.1
Gavins Point		10.6	11.0	17.4	16.6	15.2	15.2	15.2

(1) Tributary uses above the 1949 level of development including agricultural depletions and tributary storage effects.
(2) Net evaporation is shown for 2008.
(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 in 2008 is approximately 6.0 MAF.
(5) Increased releases required for 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 15,000 cfs Fort Randall release.

VII. TENTATIVE PROJECTION OF REGULATION THROUGH MARCH 2015

(Not Completed Until Final Plan is Adopted.)

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MISSOURI RIVER BASIN

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 246,000 acres	1854 msl 380,000 acres	1620 msl 374,000 acres
27	Max. normal op. pool elev. & area	2246 msl 240,000 acres	1850 msl 364,000 acres	1617 msl 360,000 acres
28	Base flood control elev & area	2234 msl 212,000 acres	1837.5 msl 307,000 acres	1607.5 msl 312,000 acres
29	Min. operating pool elev. & area	2160 msl 90,000 acres	1775 msl 128,000 acres	1540 msl 117,000 acres
	Storage allocation & capacity			
30	Exclusive flood control	2250-2246 975,000 a.f.	1854-1850 1,489,000 a.f.	1620-1617 1,102,000 a.f.
31	Flood control & multiple use	2246-2234 2,717,000 a.f.	1850-1837.5 4,222,000 a.f.	1617-1607.5 3,201,000 a.f.
32	Carryover multiple use	2234-2160 10,785,000 a.f.	1837.5-1775 13,130,000 a.f.	1607.5-1540 13,461,000 a.f.
33	Permanent	2160-2030 4,211,000 a.f.	1775-1673 4,980,000 a.f.	1540-1415 5,373,000 a.f.
34	Gross	2250-2030 18,688,000 a.f.	1854-1673 23,821,000 a.f.	1620-1415 23,137,000 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	17,700 a.f. 1030 yrs.	25,900 a.f. 920 yrs.	19,800 a.f. 1170 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	1670-1680 15,000- 60,000 cfs	1423-1428 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)	1,075	2,293	2,677
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 31,000 acres	1,194,000 acres	26
1422 msl 60,000 acres	1365 msl 95,000 acres	1208 msl 28,000 acres	1,147,000 acres	27
1420 msl 57,000 acres	1350 msl 77,000 acres	1204.5 msl 24,000 acres	989,000 acres	28
1415 msl 51,000 acres	1320 msl 38,000 acres	1204.5 msl 24,000 acres	450,000 acres	29
1423-1422 60,000 a.f.	1375-1365 985,000 a.f.	1210-1208 59,000 a.f.	4,670,000 a.f.	30
1422-1420 117,000 a.f.	1365-1350 1,309,000 a.f.	1208-1204.5 90,000 a.f.	11,656,000 a.f.	31
	1350-1320 1,607,000 a.f.		38,983,000 a.f.	32
1420-1345 1,621,000 a.f.	1320-1240 1,517,000 a.f.	1204.5-1160 321,000 a.f.	18,023,000 a.f.	33
1423-1345 1,798,000 a.f.	1375-1240 5,418,000 a.f.	1210-1160 470,000 a.f.	73,332,000 a.f.	34
November 1963	January 1953	August 1955		35
25 March 1964	24 November 1953	22 December 1955		36
5,300 a.f. 430 yrs.	18,400 a.f. 250 yrs.	2,600 a.f. 180 yrs.	89,700 a.f.	37
	Left Bank			38
None (7)	4 - 22' diameter	None (7)		39
	1013			40
	2 - 11' x 23' per conduit, vertical lift, cable suspension			41
1385 (11)	1229	1180 (11)		42
	Elev 1375			43
1351-1355(10) 25,000-100,000 cfs	32,000 cfs - 128,000 cfs 1228-1239 5,000-60,000 cfs	1155-1163 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
988	1,757	734	9,524 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) 1967-2006 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
January 2008

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)

GAVINS POINT RELEASES NEEDED TO MEET TARGET FLOWS

1950 to 1996 Data (kcfs)

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Median, Upper Quartile, Upper Decile Runoff								
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	36.5 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

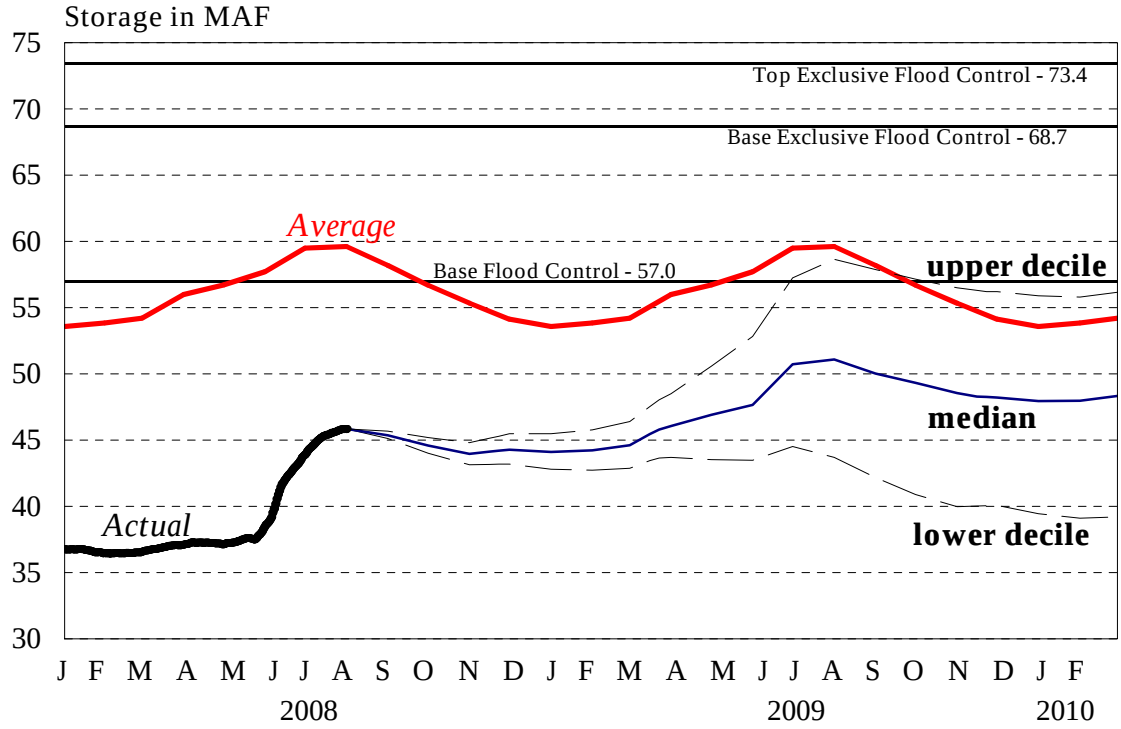
Drought Preclude	40.0 MAF or below measured on May 1.
Proration of Pulse Magnitude Based On System Storage*	Prorated from 16 kcfs based on a May 1 System Storage check; 100% at 54.5 MAF; straight line interpolation to 75% at 40.0 MAF.
Proration of Pulse Magnitude Based On Projected Runoff*	After the 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

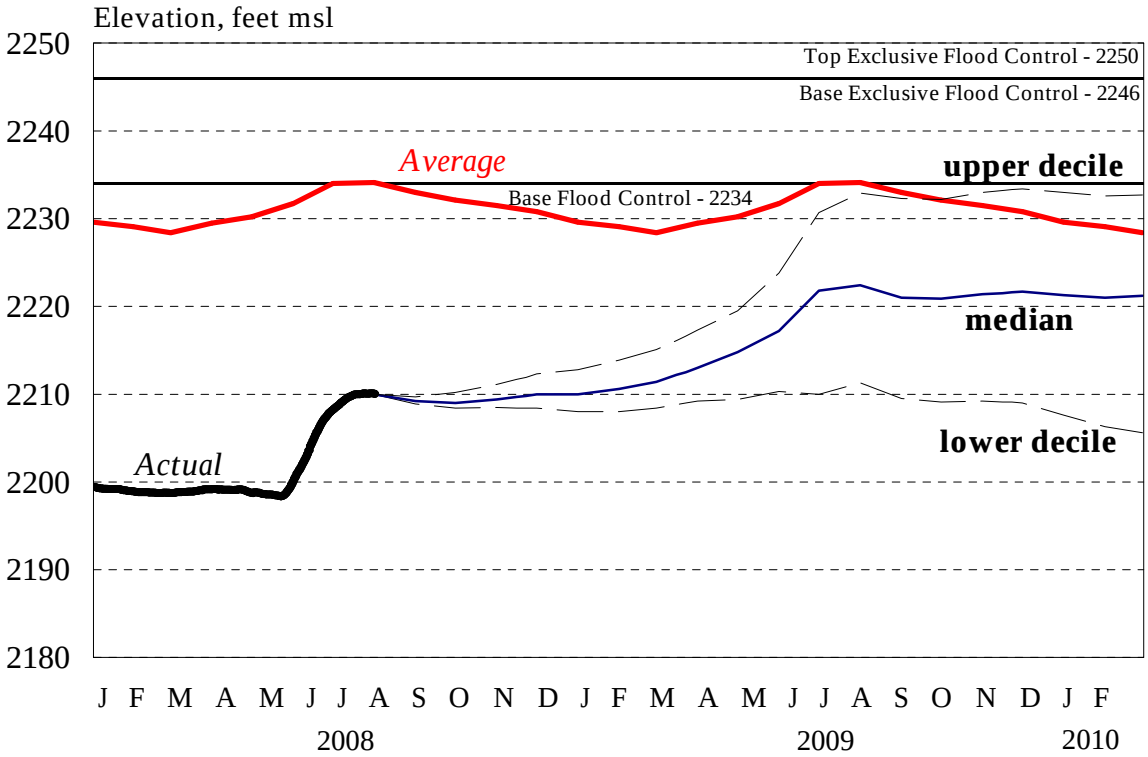
* Spring pulse magnitudes will be determined by taking the difference between pre-pulse Gavins Point releases and the peak pulse Missouri River flows measured just downstream of the mouth of the James River.

System Storage
2008-2009 Draft AOP



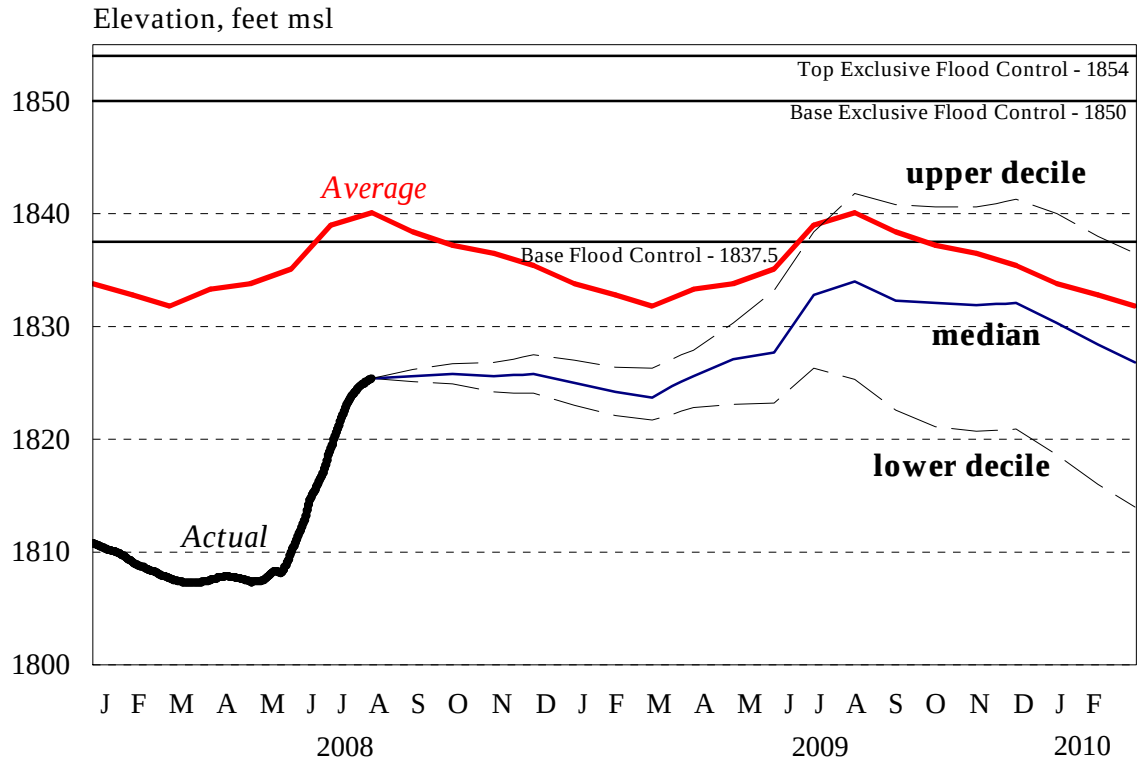
Average: 1967-2006

Fort Peck
2008-2009 Draft AOP



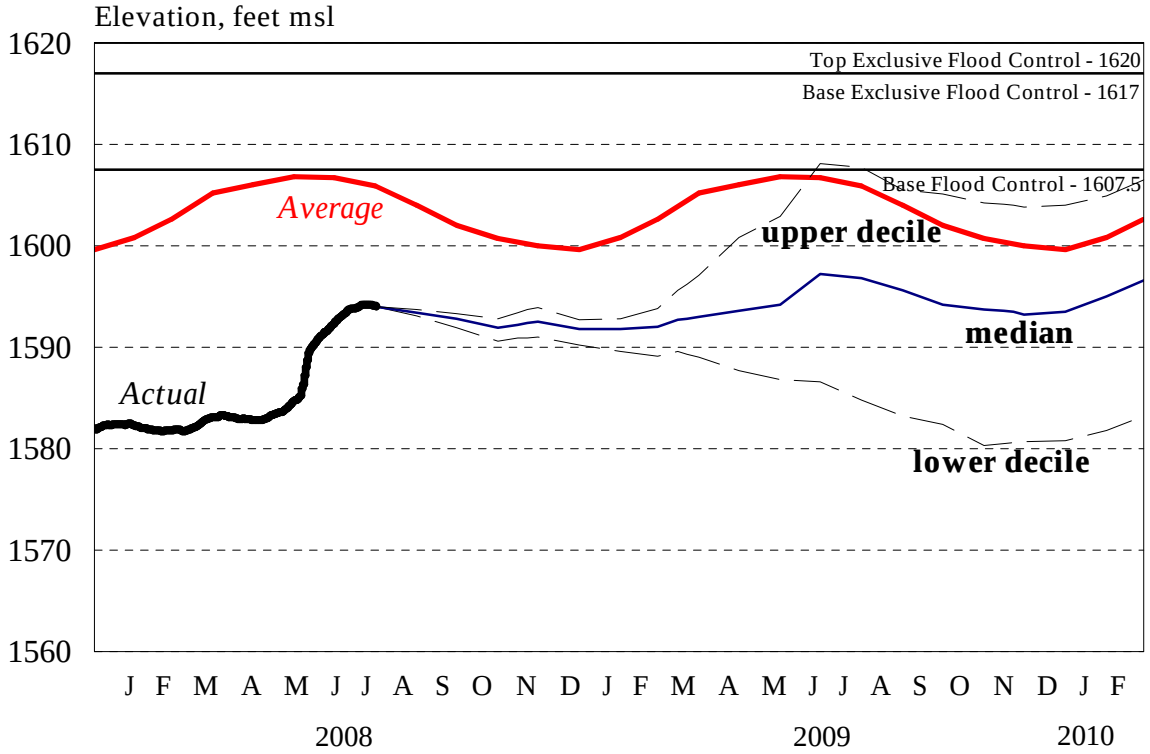
Average: 1967-2006

Garrison
2008-2009 Draft AOP



Average: 1967-2006

Oahe
2008-2009 Draft AOP



Average: 1967-2006

System Storage

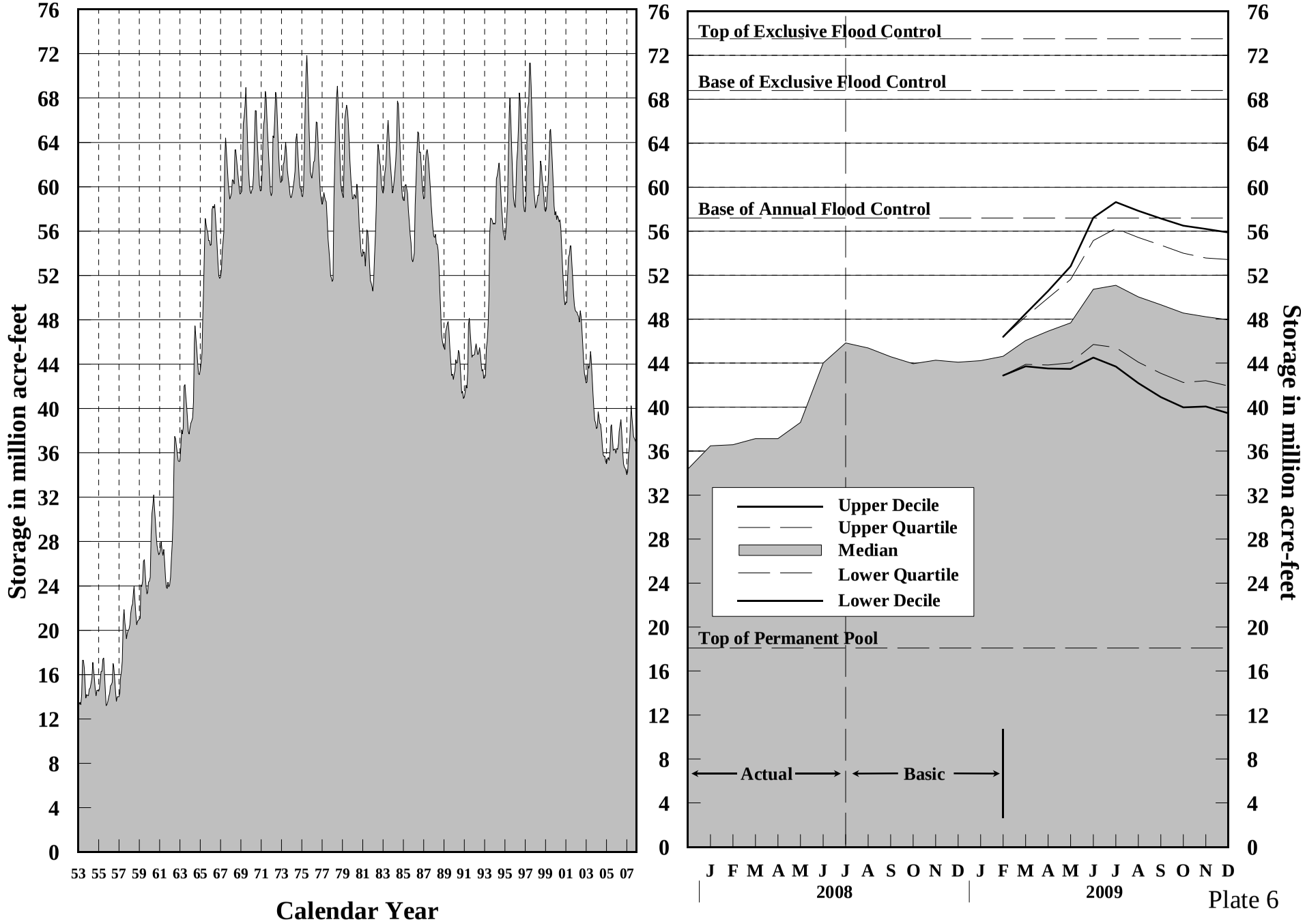


Plate 6

Gavins Point Releases

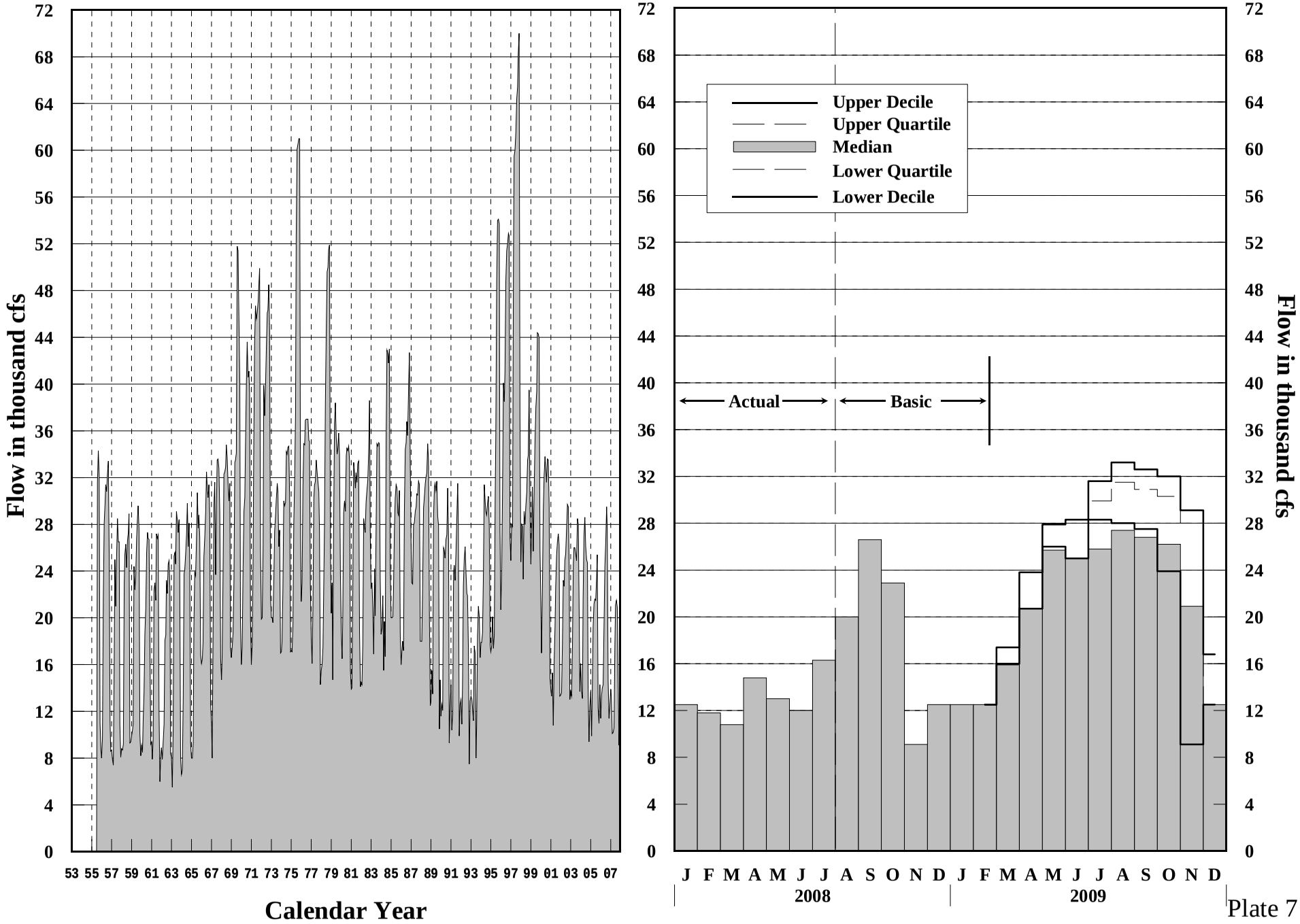


Plate 7

Fort Peck
Elevations and Releases

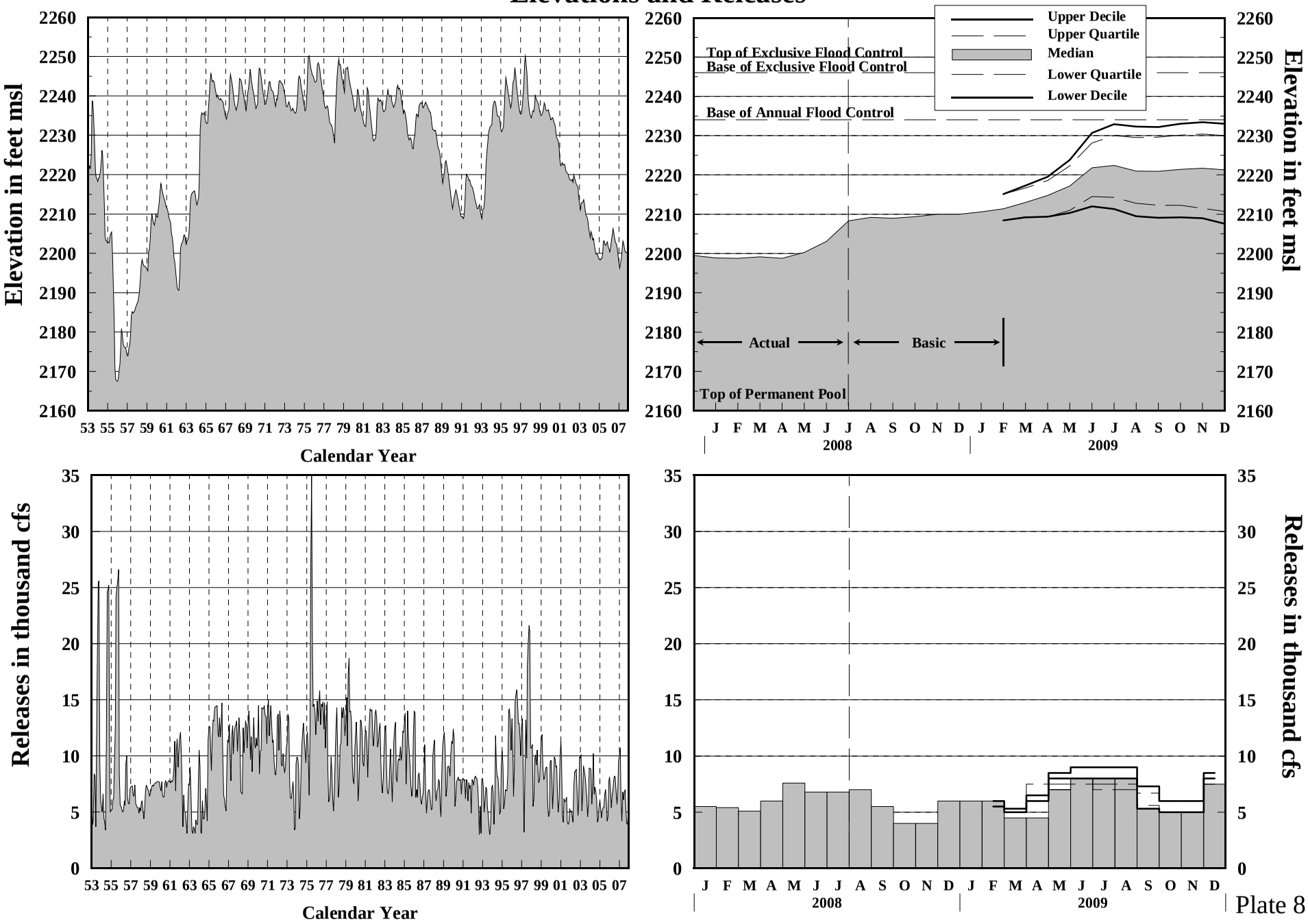
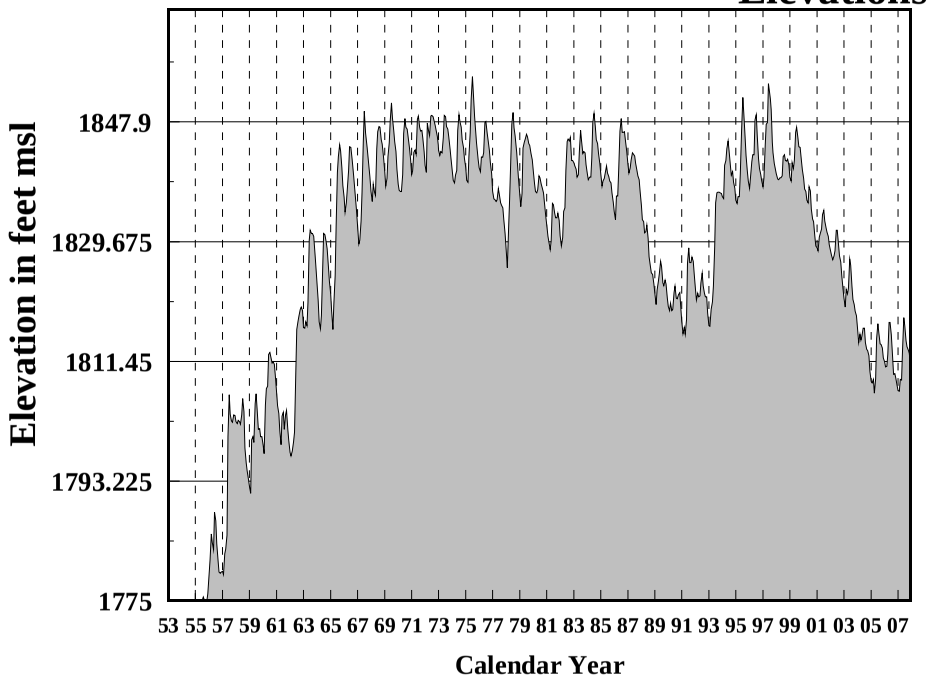
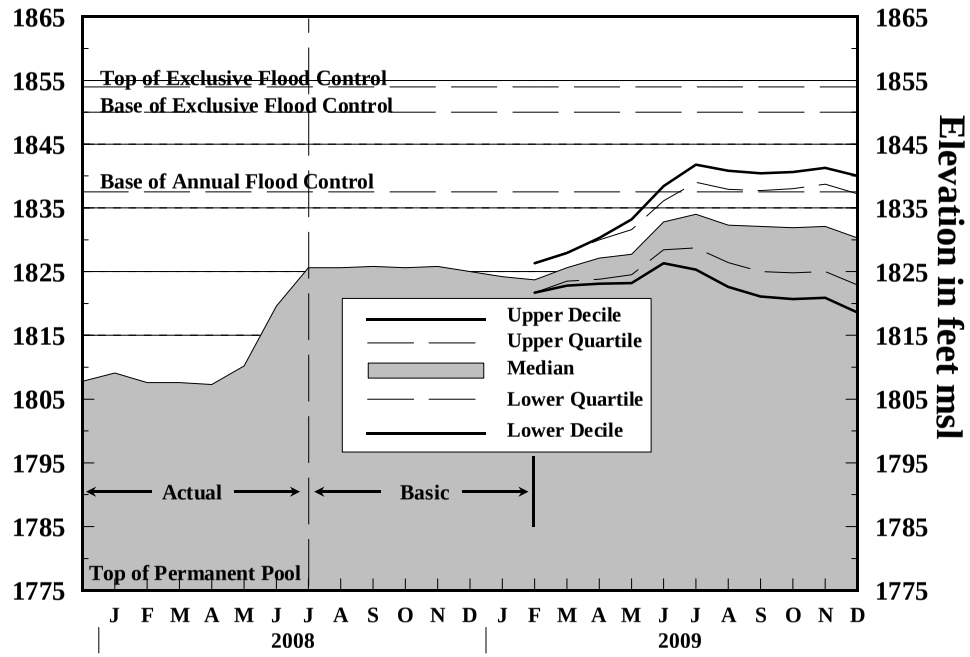
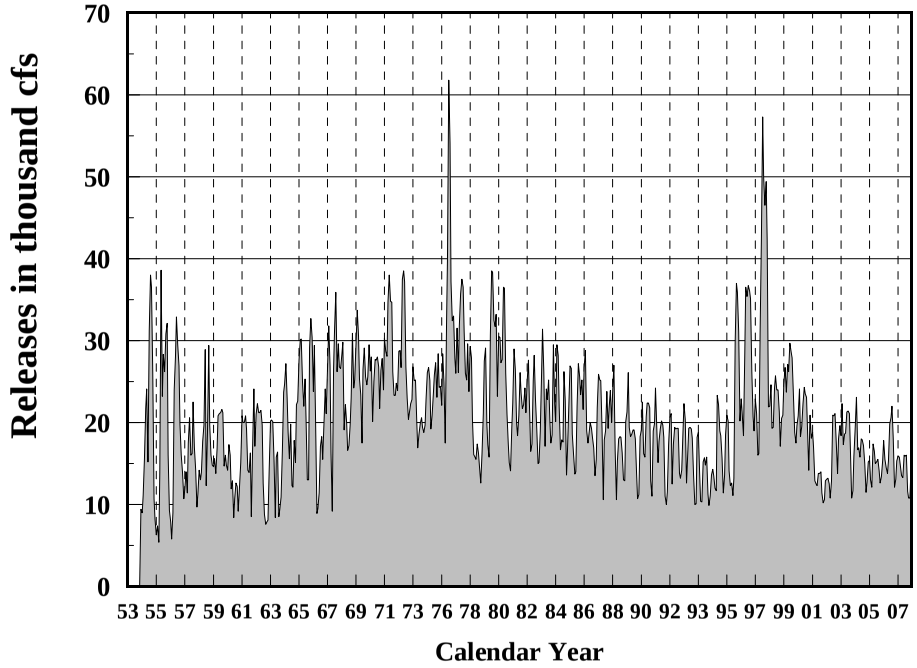


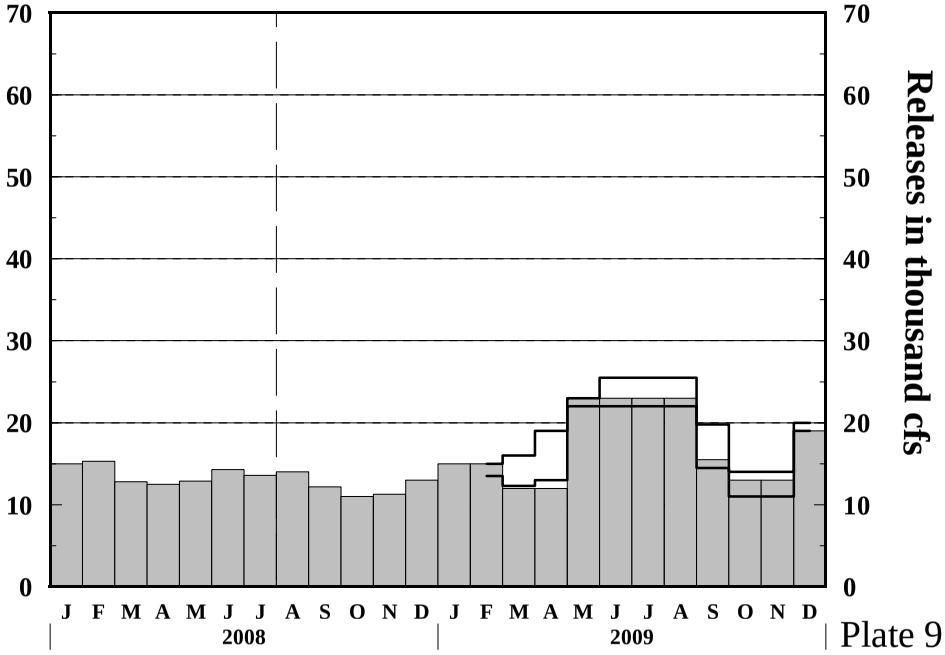
Plate 8

Garrison
Elevations and Releases

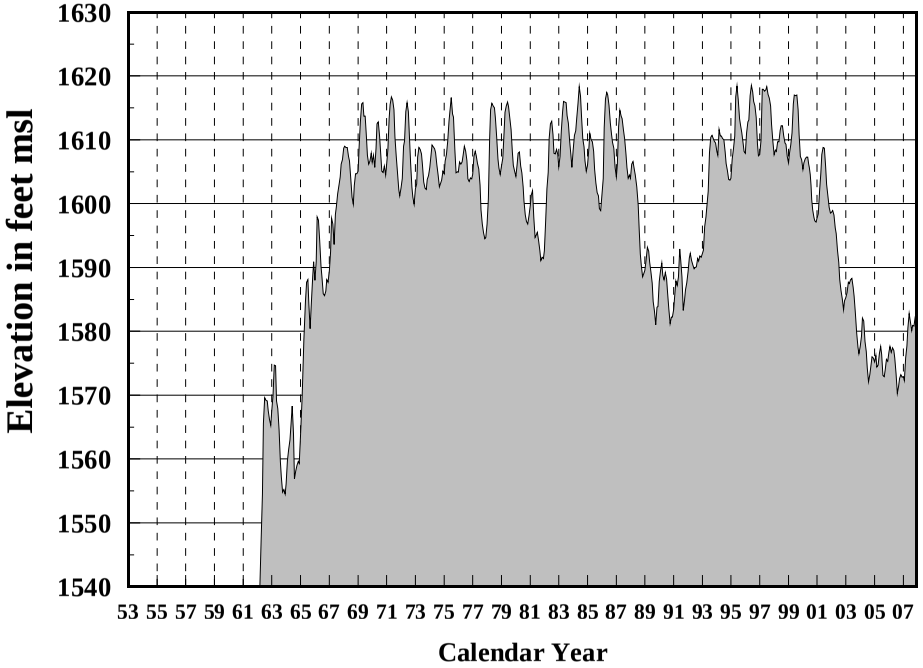


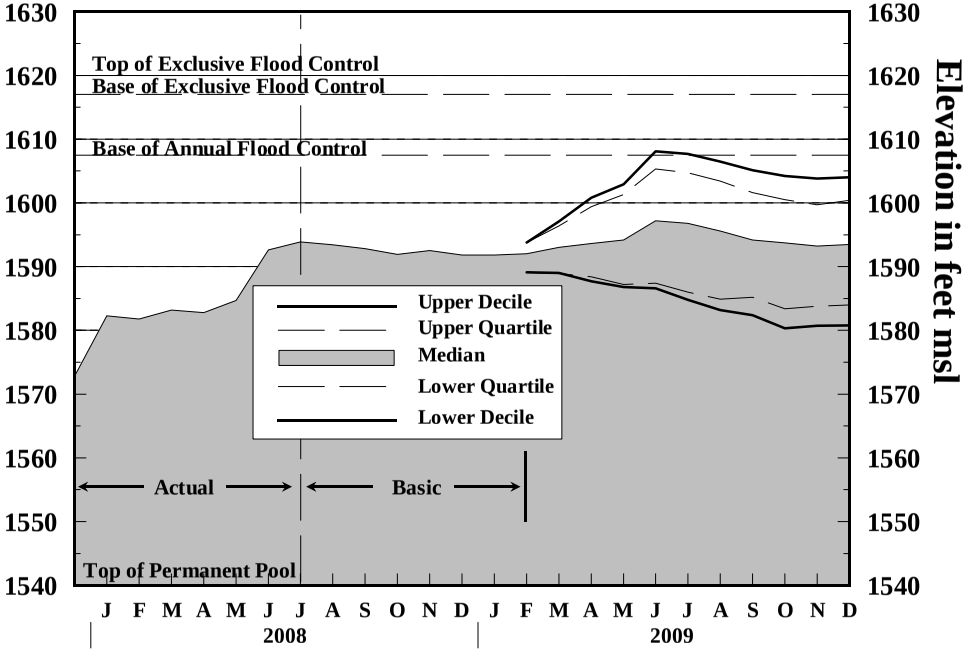


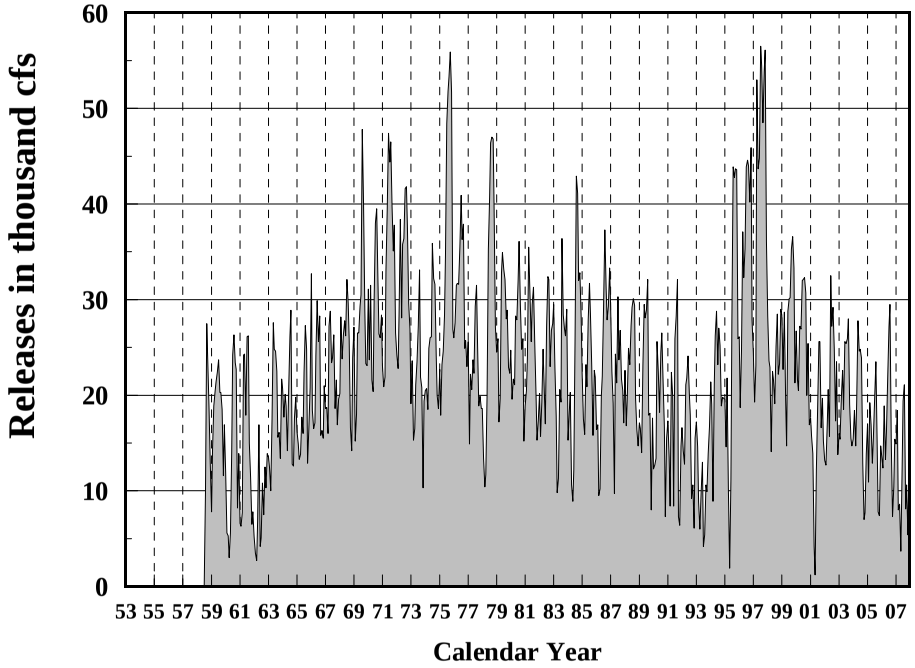




Oahe
Elevations and Releases







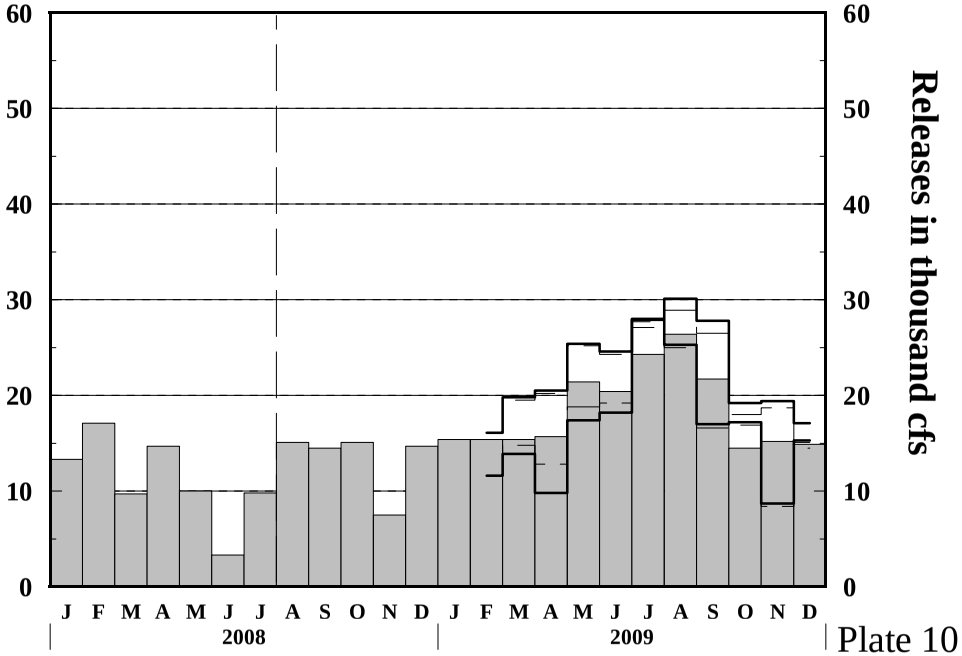


Plate 10

Fort Randall
Elevations and Releases

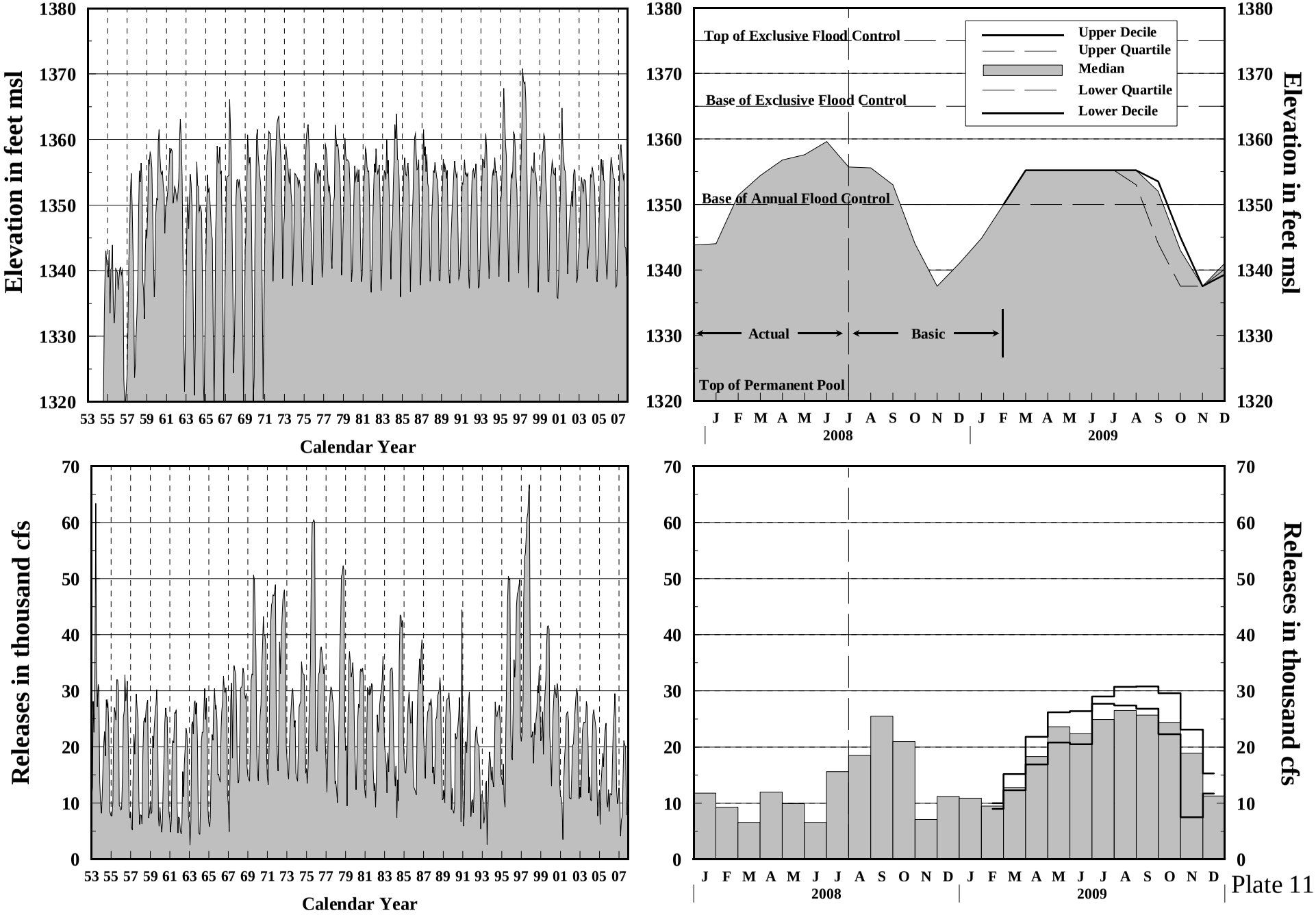
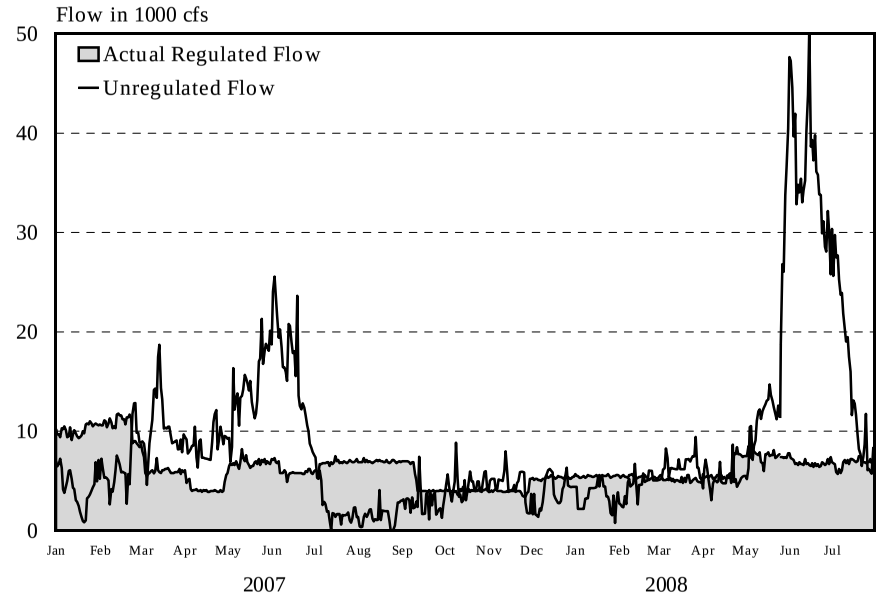


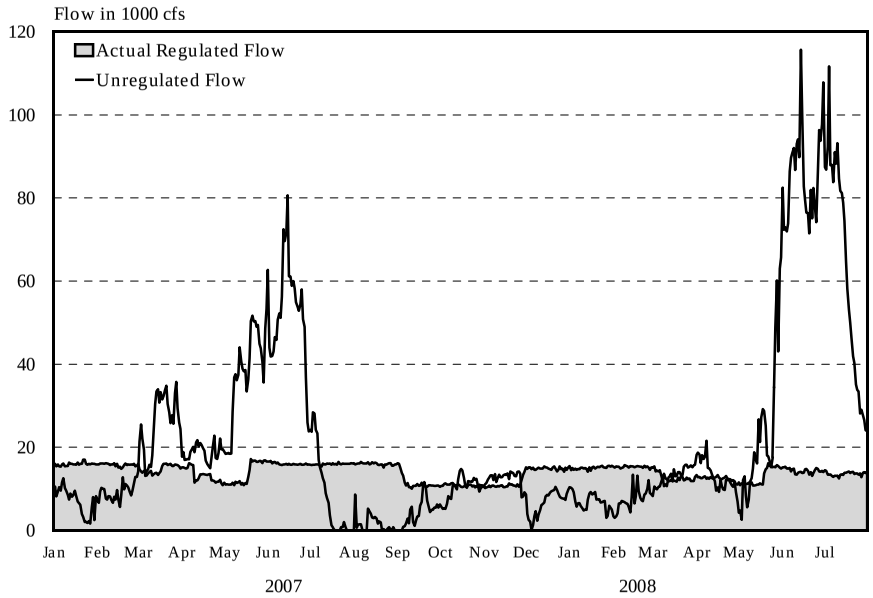
Plate 11

Reservoir Release and Unregulated Flow

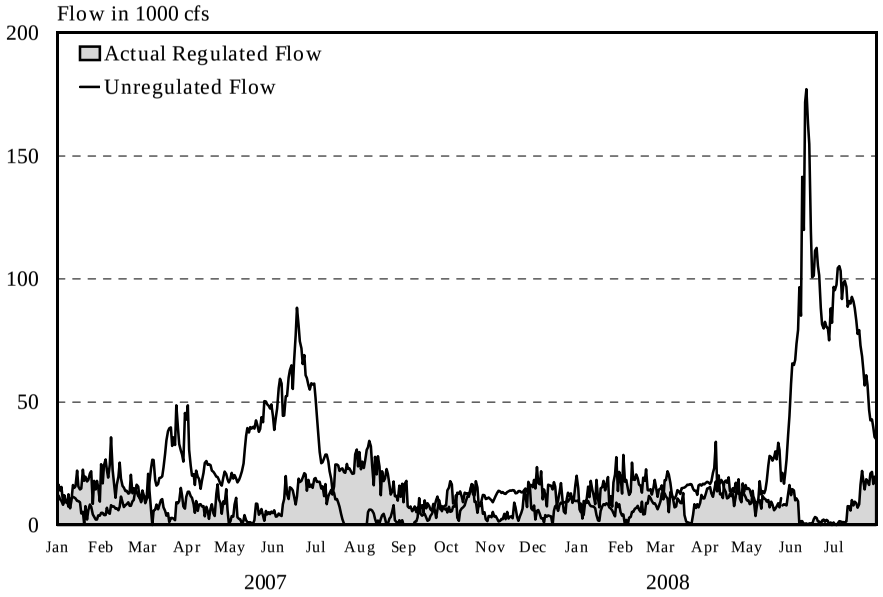
Fort Peck



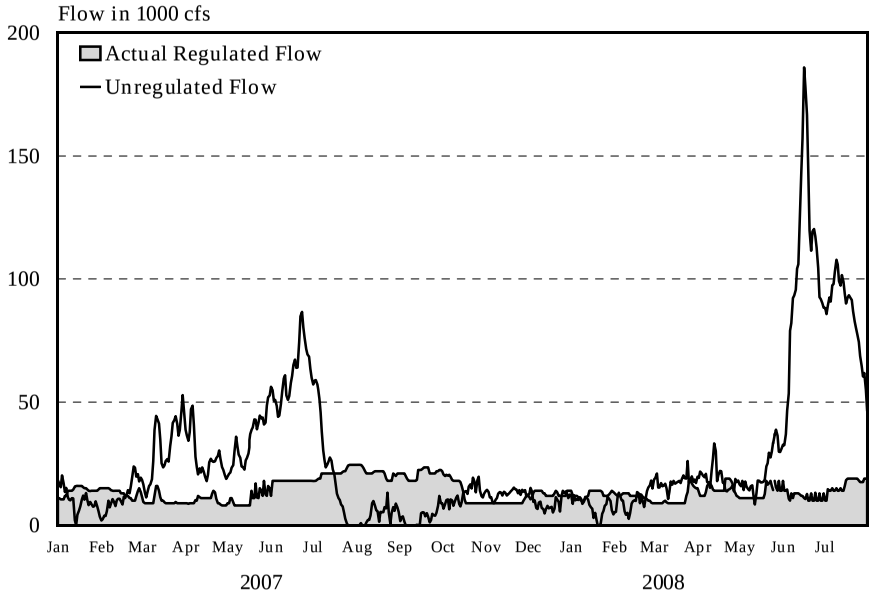
Garrison



Oahe



Gavins Point



System Gross Capability and Average Monthly Generation

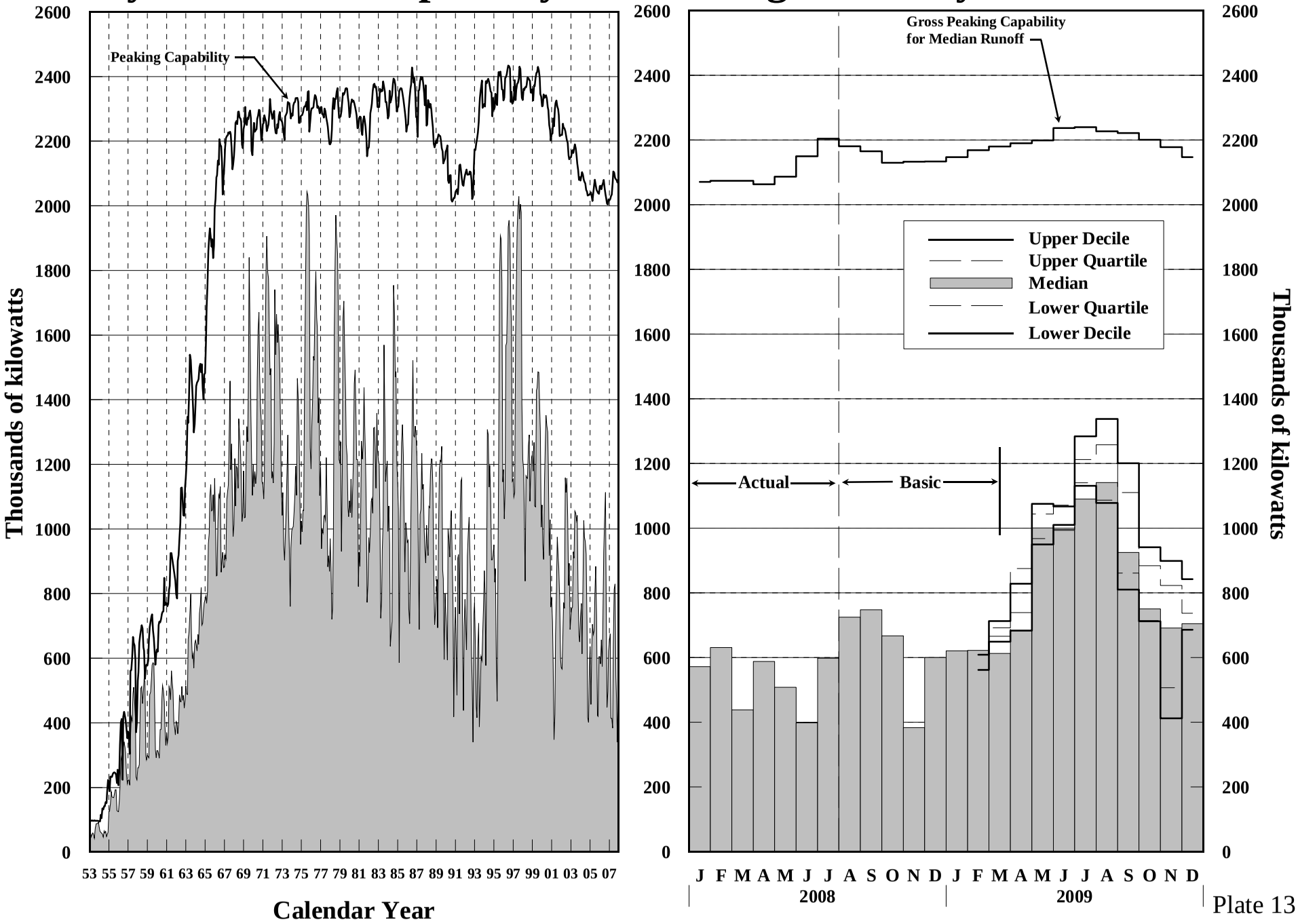
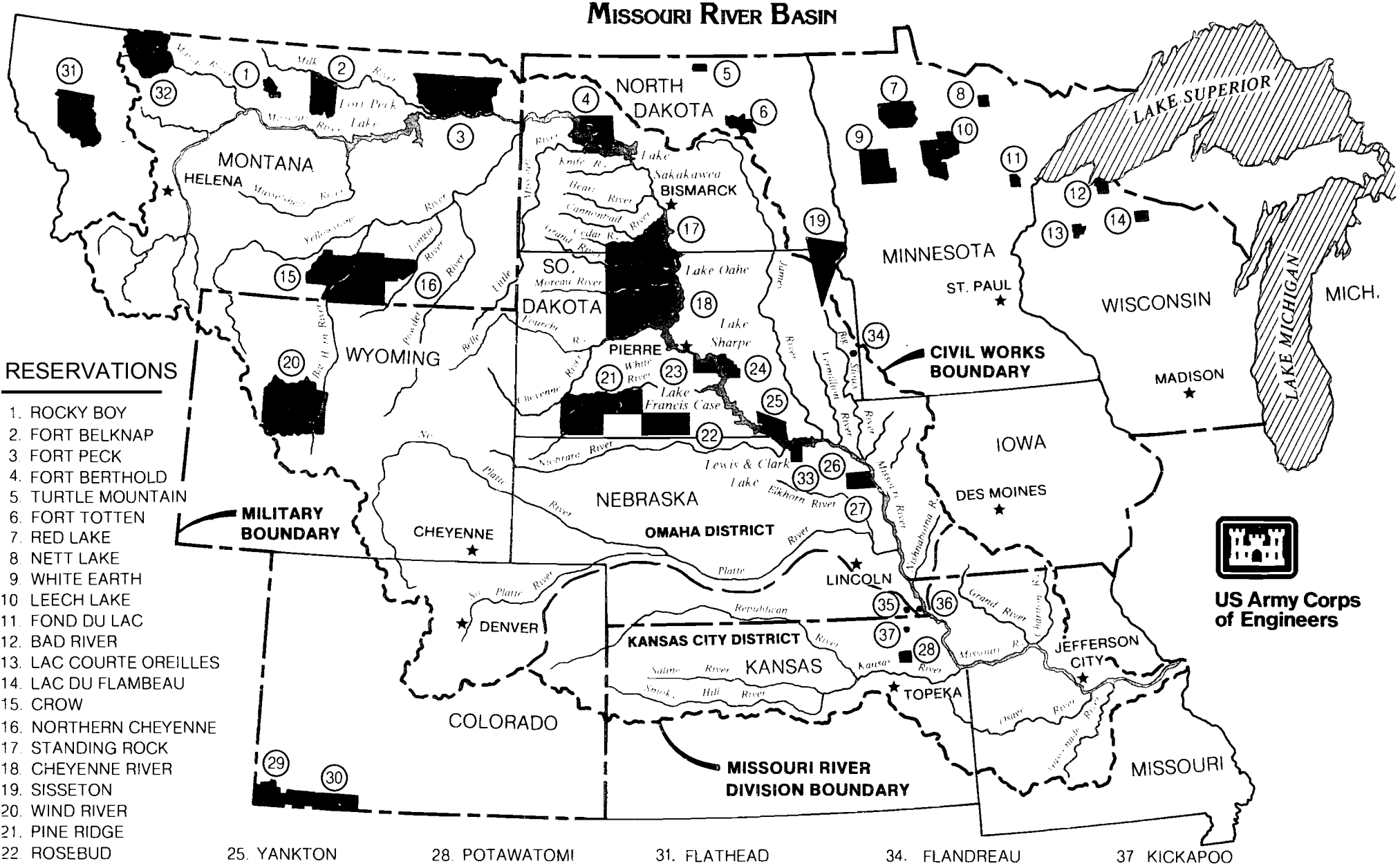


Plate 13

AMERICAN INDIAN RESERVATIONS

MISSOURI RIVER BASIN



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

For illustrative purposes. No legal boundaries are implied.

TIME OF STUDY 11:25:41 SH NV SS 30 DAYS, Unbal FP -3.6 GR +1.8 OA +0.6 STUDY NO 1
VALUES IN 1000 AF EXCEPT AS INDICATED

31JUl08		2008							2009
	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--										
NAT INFLOW	2260	360	290	330	160	75	85	280	315	365
DEPLETION	-614	-1	-87	-57	-39	-18	-21	-131	-154	-107
EVAPORATION	329	67	84	73	33	16	18	39		
MOD INFLOW	2545	294	293	314	165	77	88	372	469	472
RELEASE	2313	430	327	246	119	56	63	369	369	333
STOR CHANGE	233	-136	-34	68	46	22	25	3	100	139
STORAGE	10568	10432	10398	10466	10512	10534	10558	10562	10662	10801
ELEV FTMSL	2210.0	2209.2	2209.0	2209.4	2209.7	2209.8	2210.0	2210.0	2210.6	2211.4
DISCH KCFS	6.8	7.0	5.5	4.0	4.0	4.0	4.0	6.0	6.0	6.0
POWER										
AVE POWER MW		86	68	49	50	50	50	74	74	75
PEAK POW MW		138	138	138	139	139	139	139	140	141
ENERGY GWH	346.4	64.3	48.8	36.8	17.8	8.3	9.5	55.3	55.4	50.2
--GARRISON--										
NAT INFLOW	2615	625	390	430	170	79	91	210	260	360
DEPLETION	-463	60	-135	-19	-96	-45	-51	-83	-63	-32
CHAN STOR	8	-2	16	16				-21		
EVAPORATION	405	82	103	90	41	19	22	47		
REG INFLOW	4994	912	765	620	344	160	183	594	692	725
RELEASE	5443	861	726	676	312	146	167	799	922	833
STOR CHANGE	-448	51	39	-56	31	15	17	-206	-230	-108
STORAGE	14677	14728	14766	14710	14741	14756	14772	14567	14337	14229
ELEV FTMSL	1825.4	1825.6	1825.8	1825.6	1825.7	1825.7	1825.8	1825.0	1824.2	1823.7
DISCH KCFS	13.6	14.0	12.2	11.0	10.5	10.5	10.5	13.0	15.0	15.0
POWER										
AVE POWER MW		162	141	127	122	122	122	150	172	171
PEAK POW MW		425	425	424	425	425	425	422	419	418
ENERGY GWH	758.5	120.2	101.6	94.7	43.7	20.4	23.4	111.6	127.9	115.0
--OAHE--										
NAT INFLOW	450	100	115	70	33	15	17		10	90
DEPLETION	192	103	26	-8	2	1	1	15	20	32
CHAN STOR	-7	-2	8	6	2			-12	-9	
EVAPORATION	388	79	100	86	39	18	21	45		
REG INFLOW	5306	777	724	674	306	142	162	728	903	891
RELEASE	5824	930	862	926	211	109	123	906	903	855
STOR CHANGE	-518	-153	-139	-252	96	33	39	-178	0	36
STORAGE	15006	14853	14714	14462	14558	14591	14630	14452	14452	14488
ELEV FTMSL	1594.0	1593.4	1592.8	1591.9	1592.2	1592.4	1592.5	1591.8	1591.8	1592.0
DISCH KCFS	9.8	15.1	14.5	15.1	7.1	7.8	7.7	14.7	14.7	15.4
POWER										
AVE POWER MW		181	173	179	84	93	92	175	174	183
PEAK POW MW		635	633	628	630	630	631	628	628	628
ENERGY GWH	840.0	134.9	124.8	133.4	30.4	15.7	17.7	130.4	129.8	122.8
--BIG BEND--										
EVAPORATION	97	20	25	22	10	5	5	11		
REG INFLOW	5727	910	838	904	201	104	117	895	903	855
RELEASE	5737	920	838	904	201	104	117	895	903	855
STORAGE	1631	1621	1621	1621	1621	1621	1621	1621	1621	1621
ELEV FTMSL	1420.2	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	9.3	15.0	14.1	14.7	6.8	7.5	7.4	14.5	14.7	15.4
POWER										
AVE POWER MW		71	70	74	34	38	38	73	72	74
PEAK POW MW		518	538	538	538	538	538	538	538	529
ENERGY GWH	341.5	52.6	50.1	55.2	12.3	6.4	7.2	54.3	53.8	49.6
--FORT RANDALL--										
NAT INFLOW	180	40	40	10	5	2	3	10	20	50
DEPLETION	34	15	7	1	1	0	1	3	3	3
EVAPORATION	99	25	28	20	8	4	4	10		
REG INFLOW	5785	920	843	894	198	102	115	892	920	902
RELEASE	6245	1138	1516	1289	198	102	115	689	670	528
STOR CHANGE	-460	-218	-673	-395	0	0	0	203	250	374
STORAGE	3583	3365	2692	2296	2296	2296	2296	2499	2749	3123
ELEV FTMSL	1355.6	1353.0	1344.0	1337.5	1337.5	1337.5	1337.5	1341.0	1344.8	1350.0
DISCH KCFS	15.6	18.5	25.5	21.0	6.6	7.4	7.3	11.2	10.9	9.5
POWER										
AVE POWER MW		156	203	157	49	54	53	83	84	76
PEAK POW MW		349	314	285	285	285	285	301	319	339
ENERGY GWH	590.9	115.9	146.4	116.5	17.6	9.1	10.2	61.9	62.3	51.0
--GAVINS POINT--										
NAT INFLOW	790	115	110	120	60	28	32	100	100	125
DEPLETION	27	10	-5	1	5	2	3	10	1	
CHAN STOR	11	-6	-13	8	27	-1	0	-7	1	3
EVAPORATION	36	7	9	8	4	2	2	4		
REG INFLOW	6983	1231	1609	1408	276	125	143	767	770	655
RELEASE	6995	1230	1583	1408	276	125	143	767	770	694
STOR CHANGE	-12	1	26							-39
STORAGE	370	371	397	397	397	397	397	397	397	358
ELEV FTMSL	1206.5	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	16.3	20.0	26.6	22.9	9.3	9.0	9.0	12.5	12.5	12.5
POWER										
AVE POWER MW		70	92	81	33	32	32	44	44	44
PEAK POW MW		115	117	117	117	117	117	117	117	114
ENERGY GWH	297.4	51.8	66.6	59.9	11.9	5.4	6.2	33.0	33.1	29.6
--GAVINS POINT - SIOUX CITY--										
NAT INFLOW	560	150	95	75	38	18	20	45	35	85
DEPLETION	118	35	23	10	6	3	3	12	13	14
REGULATED FLOW AT SIOUX CITY										
KAF	7437	1345	1655	1473	308	140	160	800	792	765
KCFS		21.9	27.8	24.0	10.3	10.1	10.1	13.0	12.9	13.8
--TOTAL--										
NAT INFLOW	6855	1390	1040	1035	465	217	248	645	740	1075
DEPLETION	-706	222	-171	-72	-121	-56	-64	-174	-180	-90
CHAN STOR	14	-9	11	30	30	-1	0	-40	-9	3
EVAPORATION	1353	279	348	300	135	63	72	156		
STORAGE	45835	45370	44589	43952	44125	44194	44275	44098	44217	44620
SYSTEM POWER										
AVE POWER MW		725	748	667	372	389	387	600	621	622
PEAK POW MW		2181	2165	2130	2133	2134	2135	2145	2160	2169
ENERGY GWH	3174.7	539.7	538.3	496.5	133.8	65.3	74.2	446.4	462.1	418.3
DAILY GWH		17.4	17.9	16.0	8.9	9.3	9.3	14.4	14.9	14.9
	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

TIME OF STUDY 13:15:12 SH NV SS 30 DAYS, FP -2.8 GR +2.0 OA -0.2 STUDY NO 2
VALUES IN 1000 AF EXCEPT AS INDICATED

31JUL08	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
			2008							2009
--FORT PECK--										
NAT INFLOW	2712	432	348	396	192	90	102	336	378	438
DEPLETION	-688	-5	-112	-56	-39	-18	-21	-153	-172	-112
EVAPORATION	225	50	63	56	13	6	7	30		
MOD INFLOW	3175	387	397	396	218	102	116	459	550	550
RELEASE	2313	430	327	246	119	56	63	369	369	333
STOR CHANGE	862	-44	69	150	99	46	53	91	181	217
STORAGE	10568	10524	10594	10744	10843	10889	10942	11032	11213	11430
ELEV FTMSL	2210.0	2209.7	2210.2	2211.1	2211.7	2211.9	2212.3	2212.8	2213.9	2215.1
DISCH KCFS	6.8	7.0	5.5	4.0	4.0	4.0	4.0	6.0	6.0	6.0
POWER										
AVE POWER MW		87	68	50	50	50	50	75	76	76
PEAK POW MW		139	139	140	141	141	142	142	144	145
ENERGY GWH	349.7	64.4	49.0	37.0	18.0	8.4	9.6	56.0	56.2	51.0
--GARRISON--										
NAT INFLOW	3138	750	468	516	204	95	109	252	312	432
DEPLETION	-486	66	-125		-103	-48	-55	-100	-82	-39
CHAN STOR	8	-2	16	16				-21		
EVAPORATION	279	62	79	69	16	8	9	36		
REG INFLOW	5666	1051	857	709	410	191	218	664	763	804
RELEASE	5443	861	726	676	312	146	167	799	922	833
STOR CHANGE	224	190	131	32	97	45	52	-136	-159	-29
STORAGE	14677	14867	14998	15030	15127	15173	15224	15089	14929	14901
ELEV FTMSL	1825.4	1826.2	1826.7	1826.8	1827.1	1827.3	1827.5	1827.0	1826.4	1826.3
DISCH KCFS	13.6	14.0	12.2	11.0	10.5	10.5	10.5	13.0	15.0	15.0
POWER										
AVE POWER MW		162	142	128	123	123	123	152	174	174
PEAK POW MW		427	428	429	430	431	431	430	427	427
ENERGY GWH	765.7	120.4	102.1	95.4	44.1	20.6	23.6	112.9	129.7	116.9
--OAHE--										
NAT INFLOW	540	120	138	84	39	18	21		12	108
DEPLETION	192	103	26	-8	2	1	1	15	20	32
CHAN STOR	-6	-2	8	6	2			-11	-9	
EVAPORATION	267	60	75	66	16	7	8	35		
REG INFLOW	5517	816	771	708	336	156	178	738	905	909
RELEASE	5559	885	875	830	185	97	109	1043	888	647
STOR CHANGE	-41	-69	-105	-122	151	59	69	-305	17	262
STORAGE	15006	14937	14832	14710	14862	14921	14990	14685	14702	14965
ELEV FTMSL	1594.0	1593.7	1593.3	1592.8	1593.4	1593.7	1593.9	1592.7	1592.8	1593.8
DISCH KCFS	9.8	14.4	14.7	13.5	6.2	7.0	6.9	17.0	14.4	11.6
POWER										
AVE POWER MW		173	176	161	75	84	83	203	172	140
PEAK POW MW		637	635	633	636	637	638	632	632	638
ENERGY GWH	805.6	128.6	127.0	120.2	26.8	14.1	15.9	151.1	128.2	93.8
--BIG BEND--										
EVAPORATION	66	15	19	16	4	2	2	9		
REG INFLOW	5493	870	857	814	181	95	107	1035	888	647
RELEASE	5503	880	857	814	181	95	107	1035	888	647
STORAGE	1631	1621	1621	1621	1621	1621	1621	1621	1621	1621
ELEV FTMSL	1420.2	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	9.3	14.3	14.4	13.2	6.1	6.8	6.7	16.8	14.4	11.6
POWER										
AVE POWER MW		68	71	67	31	35	34	83	70	56
PEAK POW MW		518	538	538	538	538	538	538	538	529
ENERGY GWH	326.4	50.3	51.0	49.7	11.1	5.8	6.6	61.9	52.4	37.6
--FORT RANDALL--										
NAT INFLOW	216	48	48	12	6	3	3	12	24	60
DEPLETION	34	15	7	1	1	0	1	3	3	3
EVAPORATION	69	19	21	15	3	1	2	8		
REG INFLOW	5617	895	877	810	183	96	108	1036	909	704
RELEASE	6076	1113	1492	1263	183	96	108	670	652	500
STOR CHANGE	-460	-218	-615	-453	0	0	0	366	257	204
STORAGE	3583	3365	2750	2297	2297	2296	2296	2662	2919	3123
ELEV FTMSL	1355.6	1353.0	1344.8	1337.5	1337.5	1337.5	1337.5	1343.5	1347.2	1350.0
DISCH KCFS	15.6	18.1	25.1	20.5	6.2	6.9	6.8	10.9	10.6	9.0
POWER										
AVE POWER MW		152	201	154	45	51	50	82	83	73
PEAK POW MW		349	318	285	285	285	285	313	330	339
ENERGY GWH	578.7	113.3	144.6	114.6	16.3	8.5	9.6	60.9	61.9	48.9
--GAVINS POINT--										
NAT INFLOW	948	138	132	144	72	34	38	120	120	150
DEPLETION	27	10	-5	1	5	2	3	10	1	
CHAN STOR	12	-5	-13	8	27	-1	0	-8	1	3
EVAPORATION	24	5	7	6	1	1	1	3		
REG INFLOW	6985	1231	1609	1408	276	125	143	769	771	653
RELEASE	6997	1230	1583	1408	276	125	143	769	771	692
STOR CHANGE	-12	1	26							-39
STORAGE	370	371	397	397	397	397	397	397	397	358
ELEV FTMSL	1206.5	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	16.3	20.0	26.6	22.9	9.3	9.0	9.0	12.5	12.5	12.5
POWER										
AVE POWER MW		70	92	81	33	32	32	44	45	44
PEAK POW MW		115	117	117	117	117	117	117	117	114
ENERGY GWH	297.5	51.8	66.6	59.9	11.9	5.4	6.2	33.1	33.2	29.5
--GAVINS POINT - SIOUX CITY--										
NAT INFLOW	672	180	114	90	45	21	24	54	42	102
DEPLETION	118	35	23	10	6	3	3	12	13	14
REGULATED FLOW AT SIOUX CITY										
KAF	7551	1375	1674	1488	315	143	164	811	800	780
KCFS		22.4	28.1	24.2	10.6	10.3	10.3	13.2	13.0	14.0
--TOTAL--										
NAT INFLOW	8226	1668	1248	1242	558	260	298	774	888	1290
DEPLETION	-803	224	-186	-52	-129	-60	-69	-213	-217	-102
CHAN STOR	14	-9	11	29	30	-1	0	-40	-9	3
EVAPORATION	930	210	264	228	54	25	29	120		
STORAGE	45835	45685	45192	44800	45147	45297	45471	45486	45782	46398
SYSTEM POWER										
AVE POWER MW		711	750	641	356	374	372	640	620	562
PEAK POW MW		2185	2176	2141	2147	2149	2151	2172	2188	2192
ENERGY GWH	3123.6	528.9	540.3	476.8	128.3	62.8	71.4	475.9	461.5	377.7
DAILY GWH		17.1	18.0	15.4	8.6	9.0	8.9	15.4	14.9	13.5
	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

	31JUl08 INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
			2008							2009
--FORT PECK--										
NAT INFLOW	1808	288	232	264	128	60	68	224	252	292
DEPLETION	-552	-44	-110	-91	-28	-13	-15	-91	-94	-66
EVAPORATION	408	83	104	91	41	19	22	47		
MOD INFLOW	1952	249	238	264	115	54	61	268	346	358
RELEASE	2224	430	327	246	119	56	63	338	338	305
STOR CHANGE	-271	-181	-89	18	-4	-2	-2	-71	8	53
STORAGE	10568	10387	10297	10316	10311	10309	10307	10237	10244	10297
ELEV FTMSL	2210.0	2208.9	2208.4	2208.5	2208.4	2208.4	2208.4	2208.0	2208.0	2208.4
DISCH KCFS	6.8	7.0	5.5	4.0	4.0	4.0	4.0	5.5	5.5	5.5
POWER										
AVE POWER MW		86	68	49	49	49	49	68	67	68
PEAK POW MW		138	137	137	137	137	137	137	137	137
ENERGY GWH	330.9	64.3	48.7	36.6	17.7	8.3	9.5	50.2	50.2	45.4
--GARRISON--										
NAT INFLOW	2092	500	312	344	136	63	73	168	208	288
DEPLETION	-425	47	-130	1	-92	-43	-49	-72	-53	-35
CHAN STOR	14	-2	16	16				-16		0
EVAPORATION	503	103	129	112	50	24	27	58		
REG INFLOW	4251	779	656	492	296	138	158	504	599	628
RELEASE	5236	861	726	676	312	146	167	769	830	750
STOR CHANGE	-985	-82	-70	-184	-16	-8	-9	-264	-231	-121
STORAGE	14677	14595	14525	14341	14325	14317	14308	14044	13813	13692
ELEV FTMSL	1825.4	1825.1	1824.9	1824.2	1824.1	1824.1	1824.1	1823.0	1822.1	1821.7
DISCH KCFS	13.6	14.0	12.2	11.0	10.5	10.5	10.5	12.5	13.5	13.5
POWER										
AVE POWER MW		161	140	126	120	120	120	142	153	152
PEAK POW MW		423	422	419	419	419	419	415	412	410
ENERGY GWH	723.5	120.0	101.1	94.0	43.3	20.2	23.1	106.0	113.6	102.2
--OAHE--										
NAT INFLOW	360	80	92	56	26	12	14		8	72
DEPLETION	192	103	26	-8	2	1	1	15	20	32
CHAN STOR	0	-2	8	6	2			-9	-5	
EVAPORATION	483	100	124	107	48	23	26	56		
REG INFLOW	4922	736	676	639	291	134	154	689	813	790
RELEASE	6135	974	963	963	229	117	132	888	976	892
STOR CHANGE	-1213	-238	-287	-324	61	17	21	-199	-162	-103
STORAGE	15006	14768	14481	14157	14219	14236	14257	14058	13896	13793
ELEV FTMSL	1594.0	1593.1	1591.9	1590.6	1590.9	1590.9	1591.0	1590.2	1589.6	1589.1
DISCH KCFS	9.8	15.8	16.2	15.7	7.7	8.4	8.3	14.4	15.9	16.1
POWER										
AVE POWER MW		190	193	185	91	100	99	170	186	188
PEAK POW MW		634	628	622	623	623	624	620	616	614
ENERGY GWH	878.1	141.3	138.8	137.8	32.8	16.8	19.0	126.7	138.6	126.4
--BIG BEND--										
EVAPORATION	121	25	31	27	12	6	7	14		
REG INFLOW	6013	950	932	936	217	112	126	874	976	892
RELEASE	6023	960	932	936	217	112	126	873	976	892
STORAGE	1631	1621	1621	1621	1621	1621	1621	1621	1621	1621
ELEV FTMSL	1420.2	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0	1420.0
DISCH KCFS	9.3	15.6	15.7	15.2	7.3	8.0	7.9	14.2	15.9	16.1
POWER										
AVE POWER MW		74	77	77	37	41	40	72	78	77
PEAK POW MW		518	538	538	538	538	538	538	538	529
ENERGY GWH	358.6	54.8	55.7	57.1	13.3	6.8	7.7	53.3	58.1	51.8
--FORT RANDALL--										
NAT INFLOW	144	32	32	8	4	2	2	8	16	40
DEPLETION	34	15	7	1	1	0	1	3	3	3
EVAPORATION	123	31	35	25	10	5	5	12		
REG INFLOW	6011	946	922	918	211	108	122	866	989	929
RELEASE	6471	1164	1596	1313	211	108	122	713	689	555
STOR CHANGE	-460	-218	-673	-395	0	0	0	153	300	374
STORAGE	3583	3365	2692	2296	2296	2296	2296	2449	2749	3123
ELEV FTMSL	1355.6	1353.0	1344.0	1337.5	1337.5	1337.5	1337.5	1340.1	1344.8	1350.0
DISCH KCFS	15.6	18.9	26.8	21.4	7.1	7.8	7.7	11.6	11.2	10.0
POWER										
AVE POWER MW		159	214	160	52	57	56	86	86	80
PEAK POW MW		349	314	285	285	285	285	297	319	339
ENERGY GWH	611.5	118.5	153.9	118.7	18.7	9.6	10.8	63.8	63.7	53.7
--GAVINS POINT--										
NAT INFLOW	632	92	88	96	48	22	26	80	80	100
DEPLETION	27	10	-5	1	5	2	3	10	1	
CHAN STOR	10	-6	-15	10	26	-1	0	-7	1	2
EVAPORATION	45	9	11	10	5	2	2	5		
REG INFLOW	7041	1231	1662	1408	276	125	143	771	768	658
RELEASE	7053	1230	1636	1408	276	125	143	771	768	697
STOR CHANGE	-12	1	26							-39
STORAGE	370	371	397	397	397	397	397	397	397	358
ELEV FTMSL	1206.5	1206.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1207.5	1206.0
DISCH KCFS	16.3	20.0	27.5	22.9	9.3	9.0	9.0	12.5	12.5	12.5
POWER										
AVE POWER MW		70	95	81	33	32	32	45	44	44
PEAK POW MW		115	117	117	117	117	117	117	117	114
ENERGY GWH	299.8	51.8	68.7	59.9	11.9	5.4	6.2	33.1	33.0	29.7
--GAVINS POINT - SIOUX CITY--										
NAT INFLOW	448	120	76	60	30	14	16	36	28	68
DEPLETION	118	35	23	10	6	3	3	12	13	14
REGULATED FLOW AT SIOUX CITY										
KAF	7383	1315	1689	1458	300	136	156	795	783	751
KCFS		21.4	28.4	23.7	10.1	9.8	9.8	12.9	12.7	13.5
--TOTAL--										
NAT INFLOW	5484	1112	832	828	372	174	198	516	592	860
DEPLETION	-606	166	-189	-86	-106	-49	-57	-123	-110	-52
CHAN STOR	24	-10	9	31	30	-1	0	-32	-4	2
EVAPORATION	1682	349	434	372	167	78	89	193		
STORAGE	45835	45107	44013	43128	43169	43176	43187	42805	42720	42884
SYSTEM POWER										
AVE POWER MW		740	788	678	383	400	397	582	615	609
PEAK POW MW		2177	2156	2118	2119	2119	2120	2124	2139	2144
ENERGY GWH	3202.5	550.6	567.0	504.1	137.8	67.1	76.3	433.2	457.3	409.2
DAILY GWH		17.8	18.9	16.3	9.2	9.6	9.5	14.0	14.8	14.6
	INI-SUM	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

TIME OF STUDY 11:29:13 SHTN NAV SEAS 0 DAYS, SP MAR 5 MAY 16.0 STUDY NO 4
VALUES IN 1000 AF EXCEPT AS INDICATED

	28FEB09	2009										2010					
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	9500	315	147	189	790	1590	2465	1205	450	375	525	208	97	111	345	295	395
DEPLETION	358	-34	-16	-20	47	280	594	197	-51	-114	-83	-30	-14	-16	-131	-155	-97
EVAPORATION	303							20	63	80	70	17	8	9	37		
MOD INFLOW	8839	348	163	209	743	1310	1871	988	438	409	538	220	103	117	439	450	492
RELEASE	5537	179	69	89	357	523	536	553	553	434	369	179	83	95	523	523	472
STOR CHANGE	3302	170	93	120	386	787	1335	435	-116	-25	169	42	19	22	-84	-73	20
STORAGE	11430	11600	11693	11813	12199	12986	14322	14756	14641	14616	14785	14826	14846	14868	14784	14712	14732
ELEV FTMSL	2215.1	2216.1	2216.6	2217.3	2219.5	2223.8	2230.7	2232.9	2232.3	2232.2	2233.0	2233.2	2233.3	2233.4	2233.0	2232.6	2232.7
DISCH KCFS	6.0	6.0	5.0	5.0	6.0	8.5	9.0	9.0	9.0	7.3	6.0	6.0	6.0	6.0	8.5	8.5	8.5
POWER																	
AVE POWER MW		76	64	64	77	111	120	122	122	99	82	82	82	82	116	115	115
PEAK POW MW		146	147	147	150	154	160	161	161	161	161	162	162	162	161	161	161
ENERGY GWH	898.3	27.5	10.7	13.8	55.7	82.6	86.4	90.6	90.8	71.3	60.7	29.4	13.7	15.7	86.0	85.9	77.5
--GARRISON--																	
NAT INFLOW	14000	528	246	316	1355	1840	3425	2715	835	570	645	258	120	137	270	325	415
DEPLETION	984	6	3	3	-83	82	899	579	70	-109		-106	-49	-56	-108	-94	-53
CHAN STOR	-26		10		-10	-26	-5			17	13				-24		0
EVAPORATION	360							23	76	95	83	20	9	11	44		
REG INFLOW	18167	700	323	402	1785	2255	3056	2666	1243	1035	944	522	243	278	833	942	940
RELEASE	15266	476	222	286	1131	1414	1517	1568	1568	1176	861	417	194	222	1230	1568	1416
STOR CHANGE	2901	224	101	117	654	841	1539	1098	-325	-141	83	105	49	56	-397	-626	-476
STORAGE	14901	15125	15226	15342	15996	16837	18376	19474	19149	19008	19091	19196	19245	19301	18904	18278	17802
ELEV FTMSL	1826.3	1827.1	1827.5	1827.9	1830.3	1833.2	1838.4	1841.8	1840.8	1840.4	1840.6	1840.9	1841.1	1841.3	1840.0	1838.0	1836.5
DISCH KCFS	15.0	16.0	16.0	16.0	19.0	23.0	25.5	25.5	25.5	19.8	14.0	14.0	14.0	14.0	20.0	25.5	25.5
POWER																	
AVE POWER MW		186	187	187	224	275	312	321	322	250	177	177	177	178	253	319	315
PEAK POW MW		430	431	433	442	453	471	484	480	478	479	480	481	481	477	470	464
ENERGY GWH	2284.3	66.9	31.3	40.4	161.1	204.6	225.0	238.6	239.9	179.8	131.8	63.8	29.8	34.1	188.1	237.2	211.9
--OAHE--																	
NAT INFLOW	3800	358	167	215	545	360	1265	215	110	150	95	108	50	57	-45	25	125
DEPLETION	652	23	11	14	48	69	138	164	109	27	-9	1	0	1	12	17	27
CHAN STOR	-46	-5			-13	-17	-10	0		23	23			0	-25	-23	
EVAPORATION	339							23	73	90	77	18	9	10	40		
REG INFLOW	18028	806	378	486	1614	1688	2634	1596	1496	1232	911	505	236	269	1108	1553	1514
RELEASE	14473	347	211	267	583	1069	1083	1724	1851	1656	1180	528	281	320	1050	1282	1042
STOR CHANGE	3555	459	167	220	1031	619	1551	-128	-355	-424	-269	-24	-45	-50	58	272	472
STORAGE	14965	15424	15592	15811	16843	17462	19013	18885	18530	18106	17837	17813	17768	17718	17776	18048	18520
ELEV FTMSL	1593.8	1595.6	1596.2	1597.1	1600.8	1602.9	1608.1	1607.7	1606.5	1605.1	1604.2	1604.1	1604.0	1603.8	1604.0	1604.9	1606.5
DISCH KCFS	11.6	11.7	15.2	14.9	9.8	17.4	18.2	28.0	30.1	27.8	19.2	17.8	20.2	20.1	17.1	20.8	18.8
POWER																	
AVE POWER MW		141	184	182	121	218	233	362	387	355	244	226	256	255	217	265	240
PEAK POW MW		646	649	653	673	684	711	709	703	695	690	690	689	688	689	694	702
ENERGY GWH	2225.6	50.7	31.0	39.3	87.3	162.3	167.6	269.2	287.8	255.8	181.7	81.2	43.1	49.0	161.1	197.0	161.4
--BIG BEND--																	
EVAPORATION	71							5	15	19	16	4	2	2	9		
REG INFLOW	14403	347	211	267	583	1069	1083	1719	1837	1637	1164	525	279	317	1041	1282	1042
RELEASE	14403	347	211	267	583	1069	1083	1719	1837	1637	1164	525	279	317	1041	1282	1042
STORAGE	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621
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	11.6	11.7	15.2	14.9	9.8	17.4	18.2	28.0	29.9	27.5	18.9	17.6	20.1	20.0	16.9	20.8	18.8
POWER																	
AVE POWER MW		55	71	70	46	81	85	131	140	130	93	89	101	100	85	102	90
PEAK POW MW		517	509	509	509	509	509	509	509	517	538	538	538	538	538	538	529
ENERGY GWH	834.5	19.9	11.9	15.1	33.0	60.6	61.4	97.3	104.0	93.9	69.1	31.9	16.9	19.3	63.4	76.1	60.5
--FORT RANDALL--																	
NAT INFLOW	1500	148	69	89	425	220	150	90	85	80	30	20	9	11	15		60
DEPLETION	79	1	1	1	3	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	81							6	19	24	18	4	2	2	7		
REG INFLOW	15743	493	279	354	1005	1280	1221	1785	1888	1687	1174	540	286	326	1046	1279	1099
RELEASE	15742	202	145	354	1005	1280	1221	1785	1888	1833	1817	861	402	352	944	929	725
STOR CHANGE	1	292	134					0	0	-146	-643	-321	-116	-26	103	350	374
STORAGE	3123	3415	3549	3549	3549	3549	3549	3549	3549	3403	2760	2439	2323	2297	2400	2750	3124
ELEV FTMSL	1350.0	1353.6	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1353.5	1345.0	1340.0	1338.0	1337.5	1339.3	1344.8	1350.0
DISCH KCFS	9.0	6.8	10.4	19.8	16.9	20.8	20.5	29.0	30.7	30.8	29.6	28.9	29.0	22.2	15.3	15.1	13.1
POWER																	
AVE POWER MW		56	89	168	143	176	174	245	258	257	237	218	212	161	113	115	104
PEAK POW MW		351	356	356	356	356	356	356	356	350	319	296	287	285	293	319	339
ENERGY GWH	1550.8	20.3	14.9	36.3	103.2	131.1	125.1	181.9	192.2	185.3	176.1	78.6	35.6	30.9	83.9	85.3	70.0
--GAVINS POINT--																	
NAT INFLOW	2300	121	56	73	225	345	290	215	185	135	155	70	33	37	90	105	165
DEPLETION	112	0	0	0	4	19	24	39	10	-5	1	5	2	3	10	1	
CHAN STOR	-9	4	-7	-18	6	-8	1	-16	-3	0	2	1	0	13	13	0	4
EVAPORATION	26							2	5	7	6	1	1	1	3		
REG INFLOW	17895	327	195	409	1232	1599	1488	1943	2054	1966	1968	925	432	398	1033	1033	894
RELEASE	17895	327	195	409	1232	1599	1488	1943	2041	1940	1968	925	432	398	1033	1033	933
STOR CHANGE									13	26							-39
STORAGE	358	358	358	358	358	358	358	358	371	397	397	397	397	397	397	397	358
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	12.5	11.0	14.0	22.9	20.7	26.0	25.0	31.6	33.2	32.6	32.0	31.1	31.1	25.1	16.8	16.8	16.8
POWER																	
AVE POWER MW		39	49	79	71	89	86	105	109	109	108	106	106	88	59	59	59
PEAK POW MW		114	114	114	114	114	114	114	115	117	117	117	117	117	78	78	76
ENERGY GWH	736.8	13.9	8.2	17.0	51.4	66.1	61.6	77.8	80.8	78.3	80.6	38.2	17.8	16.9	44.2	44.2	39.6
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	3200	165	77	99	515	915	395	265	210	155	80	48	22	25	60	35	135
DEPLETION	258	6	3	4	21	35	31	38	36	23	10	6	3	3	12	14	14
REGULATED FLOW AT SIOUX CITY																	
KAF	20837	486	269	504	1726	2479	1852	2170	2215	2072	2038	967	451	421	1081	1054	1054
KCFS		16.3	19.3	28.2	29.0	40.3	31.1	35.3	36.0	34.8	33.1	32.5	32.5	26.5	17.6	17.1	19.0
--TOTAL--																	
NAT INFLOW	34300	1633	762	980	3855	5270	7990	4705	1875	1465	1530	710	331	379	735	785	1295
DEPLETION	2443	2	1	1	40	494	1698	1035	189	-171	-80	-123	-57	-65	-202	-214	-106
CHAN STOR	-81	0	3	-18	-18	-50	-15	-16	-3	39	38	1	0	13	-36	-22	4
EVAPORATION	1180							79	251	313	271	64	30	34	139		
STORAGE	46398	47543	48038	48495	50566	52813	57239	58644	57860	57151	56491	56293	56200	56202	55883	55805	56156
SYSTEM POWER																	
AVE POWER MW		553	644	750	683	950	1010	1284	1338	1201	941	898	935	864	842	975	924
PEAK POW MW		2205	2207	2214	2244	2270	2322	2334	2324	2319	2305	2283	2274	2272	2238	2260	2272
ENERGY GWH	8530.3	199.2	108.1	162.0	491.7	707.1	727.0	955.6	995.6	864.5	700.0	323.2	157.0	165.9	626.7	725.8	621.0
DAILY GWH		13.3	15.4	18.0	16.4	22.8	24.2	30.8	32.1	28.8	22.6	21.5	22.4	20.7	20.2	23.4	22.2
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

TIME OF STUDY 11:30:08 SHTN NAV SEAS 0 DAYS, SP MAR 5 MAY 16.0 STUDY NO 5
VALUES IN 1000 AF EXCEPT AS INDICATED

	28FEB09	2009										2010					
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	8640	288	134	173	705	1445	2245	1100	410	340	480	188	88	100	315	270	360
DEPLETION	514	-6	-3	-3	16	336	691	206	-52	-136	-60	-35	-16	-18	-144	-155	-107
EVAPORATION	291							19	61	77	67	16	8	9	35		
MOD INFLOW	7835	294	137	176	689	1109	1554	875	401	399	473	206	96	110	424	425	467
RELEASE	5135	179	69	89	357	430	476	492	492	396	369	179	83	95	492	492	444
STOR CHANGE	2700	115	68	87	332	679	1078	383	-91	3	104	27	13	15	-68	-67	23
STORAGE	11430	11545	11613	11700	12032	12710	13788	14171	14081	14084	14188	14215	14228	14243	14174	14107	14130
ELEV FTMSL	2215.1	2215.8	2216.2	2216.7	2218.6	2222.3	2228.1	2230.0	2229.5	2229.6	2230.1	2230.2	2230.3	2230.4	2230.0	2229.7	2229.8
DISCH KCFS	6.0	6.0	5.0	5.0	6.0	7.0	8.0	8.0	8.0	6.7	6.0	6.0	6.0	6.0	8.0	8.0	8.0
POWER																	
AVE POWER MW		76	64	64	77	91	106	107	108	90	81	81	81	81	108	108	108
PEAK POW MW		146	146	147	149	153	158	159	159	159	159	159	159	160	159	159	159
ENERGY GWH	826.9	27.5	10.7	13.8	55.5	67.7	76.4	79.9	80.1	64.5	60.1	29.1	13.6	15.5	80.2	80.1	72.3
--GARRISON--																	
NAT INFLOW	12800	484	226	290	1240	1685	3130	2480	760	520	590	235	110	125	245	300	380
DEPLETION	961	-46	-21	-28	-97	160	864	574	58	-119		-99	-46	-53	-89	-69	-29
CHAN STOR	-20		10		-10	-10	-10			13	6				-20		
EVAPORATION	344							23	72	90	79	19	9	10	42		
REG INFLOW	16609	708	327	407	1684	1945	2732	2375	1121	958	886	493	230	263	765	861	853
RELEASE	14483	476	222	286	1131	1476	1428	1476	1476	1019	799	387	180	206	1230	1414	1277
STOR CHANGE	2126	232	105	121	553	469	1304	900	-354	-61	87	106	50	57	-465	-553	-424
STORAGE	14901	15133	15238	15359	15912	16382	17686	18585	18231	18170	18257	18363	18413	18470	18004	17451	17027
ELEV FTMSL	1826.3	1827.2	1827.5	1828.0	1830.0	1831.6	1836.1	1839.0	1837.9	1837.7	1838.0	1838.3	1838.5	1838.7	1837.2	1835.3	1833.9
DISCH KCFS	15.0	16.0	16.0	16.0	19.0	24.0	24.0	24.0	24.0	17.1	13.0	13.0	13.0	13.0	20.0	23.0	23.0
POWER																	
AVE POWER MW		186	187	187	224	285	291	298	299	213	162	163	163	163	249	283	280
PEAK POW MW		430	432	433	441	447	463	474	470	469	470	471	472	472	467	460	455
ENERGY GWH	2140.7	66.9	31.4	40.4	161.0	212.1	209.3	221.4	222.6	153.6	120.8	58.6	27.4	31.3	185.3	210.5	188.2
--OAHE--																	
NAT INFLOW	3100	302	141	181	520	305	1010	185	95	125	65	55	26	29	-65	10	115
DEPLETION	652	23	11	14	48	69	138	164	109	27	-9	1	0	1	12	17	27
CHAN STOR	-37	-5			-13	-22				29	17				-30	-13	
EVAPORATION	323							22	69	86	74	17	8	9	38		
REG INFLOW	16571	751	352	453	1589	1690	2300	1475	1393	1060	817	423	198	226	1085	1394	1365
RELEASE	13815	377	221	285	763	1154	1143	1665	1776	1580	1106	488	262	330	894	932	839
STOR CHANGE	2756	374	132	169	826	536	1157	-191	-384	-520	-288	-64	-64	-105	191	462	526
STORAGE	14965	15339	15470	15639	16465	17000	18157	17967	17583	17063	16774	16710	16646	16541	16732	17194	17720
ELEV FTMSL	1593.8	1595.3	1595.8	1596.4	1599.4	1601.3	1605.3	1604.7	1603.4	1601.6	1600.5	1600.3	1600.1	1599.7	1600.4	1602.0	1603.8
DISCH KCFS	11.6	12.7	15.9	15.9	12.8	18.8	19.2	27.1	28.9	26.5	18.0	16.4	18.9	20.8	14.5	15.2	15.1
POWER																	
AVE POWER MW		153	193	194	158	233	243	344	365	333	224	204	234	258	181	190	191
PEAK POW MW		645	647	650	665	675	696	693	686	676	671	670	669	667	670	679	688
ENERGY GWH	2091.7	55.0	32.3	41.8	113.5	173.7	174.8	256.2	271.6	239.7	167.0	73.5	39.3	49.5	134.4	141.1	128.2
--BIG BEND--																	
EVAPORATION	71							5	15	19	16	4	2	2	9		
REG INFLOW	13745	377	221	285	763	1154	1143	1661	1762	1561	1089	484	260	328	885	932	839
RELEASE	13745	377	221	285	763	1154	1143	1661	1762	1561	1089	484	260	328	885	932	839
STORAGE	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621
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	11.6	12.7	15.9	15.9	12.8	18.8	19.2	27.0	28.6	26.2	17.7	16.3	18.7	20.7	14.4	15.2	15.1
POWER																	
AVE POWER MW		60	74	75	60	88	90	126	134	124	87	82	94	104	72	75	72
PEAK POW MW		517	509	509	509	509	509	509	509	517	538	538	538	538	538	538	529
ENERGY GWH	795.0	21.6	12.5	16.1	43.3	65.4	64.8	94.0	99.8	89.5	64.7	29.5	15.8	19.9	53.8	55.5	48.7
--FORT RANDALL--																	
NAT INFLOW	1200	131	61	78	285	180	140	80	75	70	15	15	7	8	10	-5	50
DEPLETION	79	1	1	1	3	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	81							6	19	24	18	4	2	2	7		
REG INFLOW	14784	506	281	362	1045	1325	1271	1717	1803	1601	1085	494	265	334	885	924	886
RELEASE	14783	214	147	362	1045	1325	1271	1717	1803	1747	1728	815	381	360	682	674	512
STOR CHANGE	1	292	134						0	-146	-643	-321	-116	-26	203	250	374
STORAGE	3123	3415	3549	3549	3549	3549	3549	3549	3549	3403	2760	2439	2323	2297	2500	2750	3124
ELEV FTMSL	1350.0	1353.6	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1353.5	1345.0	1340.0	1338.0	1337.5	1341.0	1344.8	1350.0
DISCH KCFS	9.0	7.2	10.6	20.3	17.6	21.6	21.4	27.9	29.3	29.4	28.1	27.4	27.4	22.7	11.1	11.0	9.2
POWER																	
AVE POWER MW		60	90	172	149	182	181	235	247	245	225	207	201	165	82	84	74
PEAK POW MW		351	356	356	356	356	356	356	356	350	319	296	287	285	301	319	339
ENERGY GWH	1463.3	21.6	15.1	37.1	107.3	135.7	130.1	175.1	183.7	176.7	167.6	74.5	33.8	31.6	61.3	62.6	49.6
--GAVINS POINT--																	
NAT INFLOW	2000	109	51	65	185	300	240	175	165	120	140	65	30	35	85	95	140
DEPLETION	112	0	0	0	4	19	24	39	10	-5	1	5	2	3	10	1	
CHAN STOR	-2	3	-6	-19	5	-8	0	-13	-3	0	2	1	0	9	21	0	3
EVAPORATION	26							2	5	7	6	1	1	1	3		
REG INFLOW	16644	327	191	409	1232	1599	1488	1839	1950	1865	1863	875	408	400	775	769	655
RELEASE	16644	327	191	409	1232	1599	1488	1839	1937	1839	1863	875	408	400	775	769	694
STOR CHANGE									13	26							-39
STORAGE	358	358	358	358	358	358	358	358	371	397	397	397	397	397	397	397	358
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	12.5	11.0	13.8	22.9	20.7	26.0	25.0	29.9	31.5	30.9	30.3	29.4	29.4	25.2	12.6	12.5	12.5
POWER																	
AVE POWER MW		39	48	79	71	89	86	101	105	105	104	102	102	88	45	44	44
PEAK POW MW		114	114	114	114	114	114	114	115	117	117	117	117	117	78	78	76
ENERGY GWH	690.9	13.9	8.1	17.0	51.4	66.1	61.6	74.9	78.0	75.5	77.6	36.8	17.2	17.0	33.3	33.0	29.6
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	2550	145	68	87	410	705	315	215	155	125	65	38	18	20	50	30	105
DEPLETION	258	6	3	4	21	35	31	38	36	23	10	6	3	3	12	14	14
REGULATED FLOW AT SIOUX CITY																	
KAF	18936	466	256	492	1621	2269	1772	2016	2056	1941	1918	907	423	417	813	785	785
KCFS		15.7	18.5	27.6	27.2	36.9	29.8	32.8	33.4	32.6	31.2	30.5	30.5	26.3	13.2	12.8	14.1
--TOTAL--																	
NAT INFLOW	30290	1459	681	875	3345	4620	7080	4235	1660	1300	1355	595	278	317	640	700	1150
DEPLETION	2576	-21	-10	-13	-5	628	1760	1039	176	-203	-57	-121	-56	-64	-196	-189	-92
CHAN STOR	-59	-1	4	-19	-19	-40	-10	-13	-3	42	26	1	0	9	-28	-13	3
EVAPORATION	1137							76	241	302	261	62	29	33	134		
STORAGE	46398	47411	47849	48226	49937	51621	55159	56251	55435	54738	53997	53745	53628	53568	53429	53520	53980
SYSTEM POWER																	
AVE POWER MW		573	655	770	739	968	996	1212	1258	1110	884	839	875	859	737	783	769
PEAK POW MW		2203	2205	2210	2235	2254	2297	2305	2295	2289	2274	2252	2242	2239	2214	2233	2246
ENERGY GWH	8008.5	206.5	110.1	166.3	531.9	720.6	716.9	901.4	935.8	799.5	658.0	302.0	147.1	164.9	548.2	582.9	516.6
DAILY GWH		13.8	15.7	18.5	17.7	23.2	23.9	29.1	30.2	26.6	21.2	20.1	21.0	20.6	17.7	18.8	18.4
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

TIME OF STUDY 11:31:14 SHTN NAV SEAS 5 DAYS, SP MAR 5 MAY 13.90 STUDY NO 6
VALUES IN 1000 AF EXCEPT AS INDICATED

28FEB09		2009											2010			
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	7200	230	107	138	600	1180	1810	840	315	295	430	180	84	96	300	250	345
DEPLETION	426	-30	-14	-18	18	329	512	220	-1	-90	-37	-39	-18	-21	-130	-151	-104
EVAPORATION	386							23	74	92	81	37	17	20	42		
MOD INFLOW	6388	260	121	156	582	851	1298	597	242	293	386	182	85	97	388	401	449
RELEASE	4692	134	62	80	268	430	476	492	492	313	307	149	69	79	461	461	417
STOR CHANGE	1696	127	59	76	314	421	822	105	-249	-21	79	33	15	18	-74	-60	32
STORAGE	10801	10927	10986	11062	11376	11797	12619	12723	12474	12453	12532	12565	12581	12598	12525	12464	12497
ELEV FTMSL	2211.4	2212.2	2212.5	2213.0	2214.8	2217.2	2221.8	2222.4	2221.0	2220.9	2221.4	2221.5	2221.6	2221.7	2221.3	2221.0	2221.2
DISCH KCFS	6.0	4.5	4.5	4.5	4.5	7.0	8.0	8.0	8.0	5.3	5.0	5.0	5.0	5.0	7.5	7.5	7.5
POWER																	
AVE POWER MW		56	56	57	57	89	103	105	104	69	65	65	65	65	98	98	98
PEAK POW MW		142	142	142	145	147	152	153	151	151	152	152	152	152	152	151	152
ENERGY GWH	735.8	20.3	9.5	12.2	40.9	66.3	74.5	77.9	77.7	49.5	48.6	23.5	11.0	12.6	72.8	72.7	65.7
--GARRISON--																	
NAT INFLOW	10800	460	214	276	870	1325	3095	1860	595	460	495	195	91	104	180	260	320
DEPLETION	900	10	5	6	20	158	751	550	77	-152	-30	-117	-54	-62	-117	-90	-54
CHAN STOR	-15	16				-26	-10			28	3			0	-25		
EVAPORATION	465							28	89	111	97	44	21	23	51		
REG INFLOW	14112	600	272	350	1118	1571	2810	1774	921	842	738	416	194	222	682	811	791
RELEASE	13299	357	167	214	714	1414	1369	1414	1414	920	799	387	180	206	1168	1353	1222
STOR CHANGE	813	243	106	136	404	157	1441	359	-493	-78	-61	30	14	16	-486	-542	-431
STORAGE	14229	14472	14577	14713	15117	15274	16715	17075	16581	16503	16442	16471	16485	16501	16015	15473	15042
ELEV FTMSL	1823.7	1824.7	1825.1	1825.6	1827.1	1827.7	1832.8	1834.0	1832.3	1832.1	1831.9	1832.0	1832.0	1832.1	1830.3	1828.4	1826.8
DISCH KCFS	15.0	12.0	12.0	12.0	12.0	23.0	23.0	23.0	23.0	15.5	13.0	13.0	13.0	13.0	19.0	22.0	22.0
POWER																	
AVE POWER MW		137	138	138	139	267	272	278	278	186	157	157	157	157	227	259	256
PEAK POW MW		421	423	424	430	432	451	456	449	448	447	448	448	448	442	435	429
ENERGY GWH	1907.9	49.5	23.2	29.9	100.4	198.8	196.0	206.8	206.5	134.0	116.5	56.3	26.3	30.1	168.8	192.8	172.1
--OAHE--																	
NAT INFLOW	2300	232	108	139	405	195	780	160	75	95	35	30	14	16	-80		95
DEPLETION	652	23	11	14	48	69	138	164	109	27	-9	1	0	1	12	17	27
CHAN STOR	-33	14				-50				34	11				-28	-14	0
EVAPORATION	423							26	82	102	88	40	18	21	46		
REG INFLOW	14491	580	264	340	1071	1490	2011	1384	1298	920	767	376	176	201	1003	1322	1290
RELEASE	13293	394	227	295	934	1318	1211	1494	1622	1293	889	407	200	276	914	947	870
STOR CHANGE	1198	187	37	45	137	171	799	-110	-324	-373	-122	-30	-25	-76	89	375	420
STORAGE	14488	14675	14712	14756	14893	15064	15864	15753	15429	15056	14933	14903	14878	14803	14891	15266	15686
ELEV FTMSL	1592.0	1592.7	1592.8	1593.0	1593.6	1594.2	1597.2	1596.8	1595.6	1594.2	1593.7	1593.6	1593.5	1593.2	1593.5	1595.0	1596.6
DISCH KCFS	15.4	13.2	16.4	16.5	15.7	21.4	20.4	24.3	26.4	21.7	14.5	13.7	14.4	17.4	14.9	15.4	15.7
POWER																	
AVE POWER MW		158	195	197	188	257	247	296	320	262	174	164	173	208	178	185	190
PEAK POW MW		632	633	634	636	640	655	652	646	639	637	636	636	634	636	643	651
ENERGY GWH	1938.0	56.7	32.8	42.6	135.3	191.1	177.5	220.2	237.8	188.5	129.3	59.0	29.0	40.0	132.5	137.9	127.7
--BIG BEND--																	
EVAPORATION	103							6	20	25	22	10	5	5	11		
REG INFLOW	13190	394	227	295	934	1318	1211	1488	1603	1268	867	397	195	271	903	947	870
RELEASE	13190	394	227	295	934	1318	1211	1488	1603	1268	867	397	195	271	903	947	870
STORAGE	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621
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	15.4	13.2	16.4	16.5	15.7	21.4	20.4	24.2	26.1	21.3	14.1	13.3	14.1	17.1	14.7	15.4	15.7
POWER																	
AVE POWER MW		63	77	77	74	100	95	113	122	101	70	67	71	86	74	76	75
PEAK POW MW		517	509	509	509	509	509	509	509	521	538	538	538	538	538	538	529
ENERGY GWH	762.6	22.6	12.9	16.7	52.9	74.7	68.6	84.3	90.8	72.6	52.1	24.2	11.9	16.5	54.8	56.4	50.5
--FORT RANDALL--																	
NAT INFLOW	900	119	55	71	155	140	135	70	65	30		10	5	5	5	-10	45
DEPLETION	79	1	1	1	3	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	115							8	25	31	24	9	4	4	10		
REG INFLOW	13895	511	282	365	1086	1449	1334	1532	1628	1260	843	397	196	271	895	934	912
RELEASE	13895	219	148	365	1086	1449	1334	1532	1628	1528	1498	700	222	271	692	684	538
STOR CHANGE	1	292	134					0	0	-268	-655	-303	-26	0	203	250	374
STORAGE	3123	3415	3549	3549	3549	3549	3549	3549	3549	3281	2626	2323	2297	2297	2500	2750	3124
ELEV FTMSL	1350.0	1353.6	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1355.2	1352.0	1343.0	1338.0	1337.5	1337.5	1341.0	1344.8	1350.0
DISCH KCFS	9.5	7.3	10.6	20.5	18.3	23.6	22.4	24.9	26.5	25.7	24.4	23.5	16.0	17.1	11.3	11.1	9.7
POWER																	
AVE POWER MW		61	90	173	155	199	190	210	223	214	193	175	117	124	84	85	77
PEAK POW MW		351	356	356	356	356	356	356	356	345	310	287	285	285	301	319	339
ENERGY GWH	1375.1	22.0	15.1	37.4	111.4	148.2	136.5	156.5	166.1	154.0	143.4	63.0	19.6	23.9	62.2	63.6	52.0
--GAVINS POINT--																	
NAT INFLOW	1500	104	49	62	145	160	175	100	90	95	120	60	28	32	80	85	115
DEPLETION	112	0	0	0	4	19	24	39	10	-5	1	5	2	3	10	1	
CHAN STOR	-1	4	-6	-19	4	-10	2	-5	-3	1	2	2	14	-2	11	0	3
EVAPORATION	38							2	7	9	8	4	2	2	4		
REG INFLOW	15243	327	190	409	1232	1580	1488	1586	1698	1621	1611	753	260	297	769	769	655
RELEASE	15243	327	190	409	1232	1580	1488	1586	1685	1595	1611	753	260	297	769	769	694
STOR CHANGE									13	26							-39
STORAGE	358	358	358	358	358	358	358	358	371	397	397	397	397	397	397	397	358
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	12.5	11.0	13.7	22.9	20.7	25.7	25.0	25.8	27.4	26.8	26.2	25.3	18.7	18.7	12.5	12.5	12.5
POWER																	
AVE POWER MW		39	48	79	71	88	86	88	94	93	92	89	66	66	44	44	44
PEAK POW MW		114	114	114	114	114	114	114	115	117	117	117	117	117	78	78	76
ENERGY GWH	639.4	13.9	8.0	17.0	51.4	65.3	61.6	65.6	69.8	67.1	68.3	32.0	11.1	12.7	33.0	33.0	29.6
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	1700	138	64	83	325	295	150	180	120	105	55	30	14	16	25	25	75
DEPLETION	258	6	3	4	21	35	31	38	36	23	10	6	3	3	12	14	14
REGULATED FLOW AT SIOUX CITY																	
KAF	16685	459	252	488	1536	1840	1607	1728	1769	1677	1656	777	271	310	782	780	755
KCFS		15.4	18.1	27.3	25.8	29.9	27.0	28.1	28.8	28.2	26.9	26.1	19.5	19.5	12.7	12.7	13.6
--TOTAL--																	
NAT INFLOW	24400	1283	598	769	2500	3295	6145	3210	1260	1080	1135	505	236	269	510	610	995
DEPLETION	2427	10	5	6	114	619	1468	1029	246	-190	-64	-143	-67	-76	-210	-206	-114
CHAN STOR	-50	34	-6	-19	4	-87	-8	-5	-3	63	16	1	14	-2	-42	-14	3
EVAPORATION	1529							94	296	370	320	143	66	76	164		
STORAGE	44620	45467	45803	46060	46914	47664	50726	51080	50025	49311	48551	48280	48259	48217	47948	47971	48328
SYSTEM POWER																	
AVE POWER MW		514	604	721	684	1001	993	1090	1141	925	750	717	648	707	705	748	740
PEAK POW MW		2177	2177	2180	2190	2199	2237	2240	2227	2222	2201	2178	2176	2175	2147	2164	2176
ENERGY GWH	7358.8	184.9	101.5	155.8	492.4	744.5	714.8	811.3	848.8	665.7	558.2	258.1	108.9	135.7	524.2	556.4	497.5
DAILY GWH		12.3	14.5	17.3	16.4	24.0	23.8	26.2	27.4	22.2	18.0	17.2	15.6	17.0	16.9	17.9	17.8
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

TIME OF STUDY 11:31:51 SHTN NAV SEAS 30 DAYS, SP MAR 5 MAY 9.8 STUDY NO 7

VALUES IN 1000 AF EXCEPT AS INDICATED

	28FEB09	2009										2010					
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	6000	203	95	122	485	955	1480	665	285	255	340	165	77	88	260	220	305
DEPLETION	349	-22	-10	-13	43	217	441	213	-7	-99	-75	-31	-14	-16	-100	-105	-72
EVAPORATION	447							27	86	107	94	42	20	23	49		
MOD INFLOW	5204	226	105	135	442	738	1039	425	206	247	321	153	71	82	311	325	377
RELEASE	4861	149	69	89	446	461	446	461	461	333	307	149	69	79	461	461	417
STOR CHANGE	343	77	36	46	-4	277	593	-36	-255	-86	14	4	2	2	-150	-136	-40
STORAGE	10297	10374	10410	10456	10451	10728	11321	11284	11030	10943	10957	10962	10964	10966	10816	10680	10640
ELEV FTMSL	2208.4	2208.8	2209.0	2209.3	2209.3	2211.0	2214.5	2214.3	2212.8	2212.3	2212.3	2212.4	2212.4	2212.4	2211.5	2210.7	2210.4
DISCH KCFS	5.5	5.0	5.0	5.0	7.5	7.5	7.5	7.5	7.5	5.6	5.0	5.0	5.0	5.0	7.5	7.5	7.5
POWER																	
AVE POWER MW		62	62	62	92	93	94	95	94	70	63	63	63	63	94	93	93
PEAK POW MW		138	138	138	138	140	144	144	142	142	142	142	142	142	141	140	140
ENERGY GWH	733.7	22.2	10.4	13.3	66.5	69.0	67.7	70.5	70.2	50.6	46.6	22.6	10.5	12.0	69.7	69.4	62.5
--GARRISON--																	
NAT INFLOW	9200	423	198	254	705	1110	2635	1585	505	390	420	165	77	88	150	220	275
DEPLETION	1013	13	6	8	76	156	666	505	89	-122	1	-93	-43	-50	-93	-65	-41
CHAN STOR	-21	5			-26					20	6			0	-26		
EVAPORATION	543							34	106	130	113	51	24	27	58		
REG INFLOW	12484	565	261	335	1049	1415	2415	1507	772	735	620	356	166	190	620	746	733
RELEASE	13375	327	153	196	982	1230	1369	1414	1414	1100	676	327	153	175	1168	1414	1277
STOR CHANGE	-892	237	108	139	67	185	1047	93	-643	-365	-56	29	13	15	-549	-668	-545
STORAGE	13692	13929	14037	14176	14243	14429	15475	15569	14926	14561	14505	14533	14547	14562	14013	13345	12800
ELEV FTMSL	1821.7	1822.6	1823.0	1823.5	1823.8	1824.5	1828.4	1828.7	1826.4	1825.0	1824.8	1824.9	1825.0	1825.0	1822.9	1820.3	1818.1
DISCH KCFS	13.5	11.0	11.0	11.0	16.5	20.0	23.0	23.0	23.0	18.5	11.0	11.0	11.0	11.0	19.0	23.0	23.0
POWER																	
AVE POWER MW		124	125	125	188	228	266	269	268	213	127	127	127	127	216	257	253
PEAK POW MW		413	415	417	418	421	435	436	427	422	422	422	422	422	415	405	397
ENERGY GWH	1848.4	44.7	21.0	27.1	135.1	169.4	191.2	200.4	199.0	153.2	94.2	45.6	21.3	24.3	160.9	191.2	169.8
--OAHE--																	
NAT INFLOW	1300	203	95	122	180	130	275	140	65	75	15	13	6	7	-90	-10	75
DEPLETION	652	23	11	14	48	69	138	164	109	27	-9	1	0	1	12	17	27
CHAN STOR	-46	12	0	0	-26	-17	-15			22	37		0	0	-40	-20	
EVAPORATION	467							29	90	113	98	44	20	23	51		
REG INFLOW	13510	519	237	304	1087	1274	1491	1361	1281	1057	640	295	138	157	975	1367	1325
RELEASE	13914	426	295	408	1203	1547	1445	1700	1536	990	1040	236	121	136	929	1012	890
STOR CHANGE	-404	93	-58	-104	-116	-273	46	-339	-255	67	-400	59	17	21	46	355	436
STORAGE	13793	13886	13828	13724	13609	13336	13382	13043	12788	12855	12455	12514	12531	12552	12598	12954	13389
ELEV FTMSL	1589.1	1589.5	1589.3	1588.9	1588.4	1587.2	1587.4	1586.0	1584.9	1585.2	1583.4	1583.7	1583.7	1583.8	1584.0	1585.6	1587.5
DISCH KCFS	16.1	14.3	21.2	22.9	20.2	25.2	24.3	27.7	25.0	16.6	16.9	7.9	8.7	8.6	15.1	16.5	16.0
POWER																	
AVE POWER MW		168	248	266	235	291	280	317	285	190	192	90	99	98	171	188	184
PEAK POW MW		616	615	613	611	604	606	598	592	594	584	586	586	587	588	596	606
ENERGY GWH	1933.3	60.4	41.7	57.5	169.4	216.4	201.7	236.1	211.9	136.7	142.9	32.4	16.6	18.7	127.5	139.6	124.0
--BIG BEND--																	
EVAPORATION	129							8	24	31	27	12	6	7	14		
REG INFLOW	13785	426	295	408	1203	1547	1445	1693	1511	959	1013	224	115	130	915	1012	890
RELEASE	13785	426	295	408	1203	1547	1445	1693	1511	959	1013	224	115	130	915	1012	890
STORAGE	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621
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	16.1	14.3	21.2	22.9	20.2	25.2	24.3	27.5	24.6	16.1	16.5	7.5	8.3	8.2	14.9	16.5	16.0
POWER																	
AVE POWER MW		68	100	107	95	118	114	129	116	80	83	38	42	41	75	81	77
PEAK POW MW		518	510	509	509	509	509	509	519	538	538	538	538	538	538	538	529
ENERGY GWH	799.6	24.4	16.7	23.1	68.2	87.6	81.9	95.9	86.5	57.3	61.7	13.7	7.0	8.0	55.8	60.2	51.7
--FORT RANDALL--																	
NAT INFLOW	450	73	34	44	90	65	125	35	25		-20	-8	-4	-4	-30	-15	40
DEPLETION	79	1	1	1	3	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	133							10	31	35	25	10	5	5	12		
REG INFLOW	14024	498	328	451	1290	1603	1558	1700	1490	917	967	206	106	120	869	994	927
RELEASE	14023	236	180	434	1290	1603	1558	1700	1678	1588	1362	206	106	120	717	694	553
STOR CHANGE	0	262	148	17				0	-187	-670	-395	0	0	0	153	300	374
STORAGE	3123	3384	3532	3549	3549	3549	3549	3549	3362	2692	2296	2296	2296	2296	2449	2749	3123
ELEV FTMSL	1350.0	1353.2	1355.0	1355.2	1355.2	1355.2	1355.2	1355.2	1353.0	1344.0	1337.5	1337.5	1337.5	1337.5	1340.1	1344.8	1350.0
DISCH KCFS	10.0	7.9	13.0	24.3	21.7	26.1	26.2	27.6	27.3	26.7	22.2	6.9	7.7	7.6	11.7	11.3	10.0
POWER																	
AVE POWER MW		66	110	205	183	220	221	233	228	213	165	51	56	55	86	86	80
PEAK POW MW		350	355	356	356	356	356	356	349	314	285	285	285	285	297	319	339
ENERGY GWH	1380.4	23.7	18.4	44.3	132.0	163.6	159.1	173.4	169.6	153.2	123.1	18.3	9.4	10.6	64.1	64.2	53.5
--GAVINS POINT--																	
NAT INFLOW	1300	87	41	52	125	140	150	85	75	80	110	53	25	28	75	75	100
DEPLETION	112	0	0	0	4	19	24	39	10	-5	1	5	2	3	10	1	
CHAN STOR	-1	4	-10	-22	5	-8	0	-3	1	1	8	28	-1	0	-8	1	2
EVAPORATION	47							3	9	11	10	5	2	2	5		
REG INFLOW	15163	327	211	464	1416	1716	1684	1740	1735	1662	1470	277	125	143	769	769	655
RELEASE	15163	327	211	464	1416	1716	1684	1740	1722	1636	1470	277	125	143	769	769	694
STOR CHANGE									13	26							-39
STORAGE	358	358	358	358	358	358	358	358	371	397	397	397	397	397	397	397	358
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	12.5	11.0	15.2	26.0	23.8	27.9	28.3	28.3	28.0	27.5	23.9	9.3	9.0	9.0	12.5	12.5	12.5
POWER																	
AVE POWER MW		39	53	89	82	95	96	96	96	95	84	33	32	32	44	44	44
PEAK POW MW		114	114	114	114	114	114	114	115	117	117	117	117	117	78	78	76
ENERGY GWH	634.0	13.9	8.9	19.2	58.7	70.7	69.3	71.6	71.3	68.7	62.5	12.0	5.4	6.2	33.0	33.0	29.6
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	1050	121	56	73	140	170	90	105	75	60	35	25	12	13	10	20	45
DEPLETION	258	6	3	4	21	35	31	38	36	23	10	6	3	3	12	14	14
REGULATED FLOW AT SIOUX CITY																	
KAF	15955	442	265	533	1535	1851	1743	1807	1761	1673	1495	297	134	153	767	775	725
KCFS		14.9	19.1	29.9	25.8	30.1	29.3	29.4	28.6	28.1	24.3	10.0	9.7	9.7	12.5	12.6	13.1
--TOTAL--																	
NAT INFLOW	19300	1111	518	666	1725	2570	4755	2615	1030	860	900	413	193	220	375	510	840
DEPLETION	2463	21	10	13	195	505	1312	977	252	-169	-71	-111	-52	-59	-156	-135	-69
CHAN STOR	-68	21	-10	-22	-48	-25	-15	-3	1	43	52	29	-1	0	-74	-19	2
EVAPORATION	1766							110	345	427	366	164	77	88	190		
STORAGE	42884	43552	43786	43884	43832	44021	45706	45424	44097	43069	42231	42323	42355	42394	41894	41746	41932
SYSTEM POWER																	
AVE POWER MW		526	697	854	875	1044	1071	1140	1087	861	714	401	418	416	687	749	731
PEAK POW MW		2149	2148	2148	2146	2145	2164	2158	2144	2127	2087	2089	2090	2091	2056	2075	2086
ENERGY GWH	7329.5	189.3	117.0	184.5	630.0	776.8	770.8	847.8	808.4	619.7	531.1	144.5	70.2	79.9	511.0	557.5	491.0
DAILY GWH		12.6	16.7	20.5	21.0	25.1	25.7	27.3	26.1	20.7	17.1	9.6	10.0	10.0	16.5	18.0	17.5
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB

TIME OF STUDY 13:20:29 SHTN NAV SEAS 30 DAYS, SP MAR 5 MAY 9.7 STUDY NO 8

VALUES IN 1000 AF EXCEPT AS INDICATED

	28FEB09	2009										2010					
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB
--FORT PECK--																	
NAT INFLOW	5400	194	90	116	470	845	1195	610	270	245	320	158	74	84	230	210	290
DEPLETION	414	-22	-10	-13	43	217	441	201	-13	-111	-86	-22	-10	-12	-77	-67	-44
EVAPORATION	437							27	84	105	91	41	19	22	48		
MOD INFLOW	4549	216	101	129	427	628	754	382	199	251	315	138	64	74	259	277	334
RELEASE	4996	149	69	89	387	492	476	492	492	317	307	149	69	79	492	492	444
STOR CHANGE	-446	67	31	40	40	136	278	-110	-292	-65	7	-11	-5	-6	-232	-215	-110
STORAGE	10297	10364	10395	10436	10476	10612	10890	10780	10488	10422	10430	10419	10414	10408	10176	9961	9851
ELEV FTMSL	2208.4	2208.8	2209.0	2209.2	2209.4	2210.3	2212.0	2211.3	2209.5	2209.1	2209.2	2209.1	2209.1	2209.0	2207.6	2206.3	2205.6
DISCH KCFS	5.5	5.0	5.0	5.0	6.5	8.0	8.0	8.0	8.0	5.3	5.0	5.0	5.0	5.0	8.0	8.0	8.0
POWER																	
AVE POWER MW		62	62	62	80	99	99	100	99	66	62	62	62	62	98	97	97
PEAK POW MW		138	138	138	138	139	141	141	139	138	138	138	138	138	136	135	134
ENERGY GWH	744.7	22.2	10.4	13.3	57.7	73.5	71.6	74.2	73.7	47.3	45.9	22.2	10.4	11.8	73.0	72.4	65.1
--GARRISON--																	
NAT INFLOW	7400	365	170	219	575	1055	2205	1080	360	160	390	148	69	79	135	135	255
DEPLETION	990	13	6	8	76	156	566	461	100	-97	14	-103	-48	-55	-60	-31	-17
CHAN STOR	-27	5			-16	-16				28	3			0	-32		
EVAPORATION	520							33	101	125	108	49	23	26	56		
REG INFLOW	10860	506	234	301	870	1375	2115	1078	651	477	579	350	163	187	599	658	716
RELEASE	12714	357	167	232	774	1353	1309	1353	1353	860	676	327	153	175	1168	1291	1166
STOR CHANGE	-1854	149	67	68	96	22	806	-274	-702	-383	-98	23	11	12	-569	-633	-450
STORAGE	13692	13841	13908	13977	14073	14096	14902	14627	13925	13542	13445	13468	13478	13490	12921	12288	11838
ELEV FTMSL	1821.7	1822.2	1822.5	1822.8	1823.1	1823.2	1826.3	1825.3	1822.6	1821.1	1820.7	1820.8	1820.8	1820.9	1818.6	1816.0	1814.0
DISCH KCFS	13.5	12.0	12.0	13.0	13.0	22.0	22.0	22.0	22.0	14.5	11.0	11.0	11.0	11.0	19.0	21.0	21.0
POWER																	
AVE POWER MW		135	136	147	148	249	251	253	250	163	123	123	123	123	210	228	224
PEAK POW MW		412	413	414	415	416	427	423	413	408	406	407	407	407	399	389	382
ENERGY GWH	1723.4	48.7	22.8	31.8	106.2	185.0	180.9	188.2	185.9	117.1	91.7	44.3	20.7	23.7	156.2	169.5	150.7
--OAHE--																	
NAT INFLOW	1150	196	91	118	170	115	255	125	50	65	5	8	4	4	-100	-20	65
DEPLETION	652	23	11	14	48	69	138	164	109	27	-9	1	0	1	12	17	27
CHAN STOR	-37	7		-5		-44				38	18		0	0	-41	-10	
EVAPORATION	452							28	88	109	94	42	20	22	49		
REG INFLOW	12723	537	247	331	896	1355	1426	1285	1206	827	614	292	136	156	966	1244	1204
RELEASE	14113	436	299	414	1218	1562	1465	1715	1556	1010	1060	246	125	142	944	1022	900
STOR CHANGE	-1390	101	-51	-83	-322	-207	-39	-430	-350	-183	-446	46	11	14	23	222	305
STORAGE	13793	13894	13842	13760	13437	13230	13191	12761	12411	12228	11782	11828	11839	11853	11876	12098	12403
ELEV FTMSL	1589.1	1589.6	1589.3	1589.0	1587.7	1586.8	1586.6	1584.8	1583.2	1582.4	1580.3	1580.5	1580.6	1580.7	1580.8	1581.8	1583.2
DISCH KCFS	16.1	14.7	21.5	23.2	20.5	25.4	24.6	27.9	25.3	17.0	17.2	8.3	9.0	8.9	15.3	16.6	16.2
POWER																	
AVE POWER MW		172	251	270	238	293	283	318	286	191	192	92	101	99	171	185	182
PEAK POW MW		616	615	614	607	602	601	591	583	579	568	569	570	570	571	576	583
ENERGY GWH	1941.7	61.8	42.2	58.4	171.2	217.7	203.7	236.7	212.8	137.6	143.1	33.2	16.9	19.1	127.0	138.0	122.4
--BIG BEND--																	
EVAPORATION	129							8	24	31	27	12	6	7	14		
REG INFLOW	13984	436	299	414	1218	1562	1465	1707	1532	979	1033	234	120	135	930	1022	900
RELEASE	13984	436	299	414	1218	1562	1465	1707	1532	979	1033	234	120	135	930	1022	900
STORAGE	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621
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	16.1	14.7	21.5	23.2	20.5	25.4	24.6	27.8	24.9	16.5	16.8	7.9	8.6	8.5	15.1	16.6	16.2
POWER																	
AVE POWER MW		69	101	109	96	119	115	130	118	81	85	40	44	43	76	82	78
PEAK POW MW		518	510	509	509	509	509	509	519	538	538	538	538	538	538	538	529
ENERGY GWH	811.2	25.0	16.9	23.4	69.0	88.5	83.0	96.7	87.6	58.4	62.9	14.4	7.3	8.3	56.7	60.8	52.2
--FORT RANDALL--																	
NAT INFLOW	350	68	32	41	85	60	115	25	15	-10	-30	-13	-6	-7	-40	-20	35
DEPLETION	79	1	1	1	3	9	12	18	15	7	1	1	0	1	3	3	3
EVAPORATION	133							10	31	35	25	10	5	5	12		
REG INFLOW	14123	503	330	454	1300	1613	1568	1704	1501	927	977	211	108	122	874	999	932
RELEASE	14123	241	182	437	1300	1613	1568	1704	1688	1598	1372	211	109	122	721	699	558
STOR CHANGE	0	262	148	17		0		0	-187	-670	-395	0	0	0	153	300	374
STORAGE	3123	3384	3532	3549	3549	3549	3549	3549	3362	2692	2296	2296	2296	2296	2449	2749	3123
ELEV FTMSL	1350.0	1353.2	1355.0	1355.2	1355.2	1355.2	1355.2	1355.2	1353.0	1344.0	1337.5	1337.5	1337.5	1337.5	1340.1	1344.8	1350.0
DISCH KCFS	10.0	8.1	13.1	24.5	21.8	26.2	26.4	27.7	27.4	26.8	22.3	7.1	7.8	7.7	11.7	11.4	10.0
POWER																	
AVE POWER MW		67	110	206	185	221	222	234	229	214	167	52	57	57	87	87	80
PEAK POW MW		350	355	356	356	356	356	356	349	314	285	285	285	285	297	319	339
ENERGY GWH	1390.0	24.2	18.6	44.6	133.0	164.7	160.1	173.8	170.6	154.1	124.0	18.8	9.6	10.9	64.5	64.7	53.9
--GAVINS POINT--																	
NAT INFLOW	1200	82	38	49	115	130	140	80	65	70	100	48	22	25	70	70	95
DEPLETION	112	0	0	0	4	19	24	39	10	-5	1	5	2	3	10	1	
CHAN STOR	-1	4	-10	-22	5	-8	0	-3	1	1	8	28	-1	0	-7	1	2
EVAPORATION	47							3	9	11	10	5	2	2	5		
REG INFLOW	15162	327	211	464	1416	1716	1684	1740	1735	1662	1470	277	125	143	769	769	655
RELEASE	15162	327	211	464	1416	1716	1684	1740	1722	1636	1470	277	125	143	769	769	694
STOR CHANGE									13	26							-39
STORAGE	358	358	358	358	358	358	358	358	371	397	397	397	397	397	397	397	358
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	12.5	11.0	15.2	26.0	23.8	27.9	28.3	28.3	28.0	27.5	23.9	9.3	9.0	9.0	12.5	12.5	12.5
POWER																	
AVE POWER MW		39	53	89	82	95	96	96	96	95	84	33	32	32	44	44	44
PEAK POW MW		114	114	114	114	114	114	114	115	117	117	117	117	117	78	78	76
ENERGY GWH	634.0	13.9	8.9	19.2	58.7	70.7	69.3	71.6	71.3	68.7	62.5	12.0	5.4	6.2	33.0	33.0	29.6
--GAVINS POINT - SIOUX CITY--																	
NAT INFLOW	700	87	41	52	90	120	65	70	40	35	25	18	8	9	5	15	20
DEPLETION	258	6	3	4	21	35	31	38	36	23	10	6	3	3	12	14	14
REGULATED FLOW AT SIOUX CITY																	
KAF	15604	408	249	513	1485	1801	1718	1772	1726	1648	1485	289	131	149	762	770	700
KCFS		13.7	17.9	28.7	25.0	29.3	28.9	28.8	28.1	27.7	24.1	9.7	9.4	9.4	12.4	12.5	12.6
--TOTAL--																	
NAT INFLOW	16200	992	463	595	1505	2325	3975	1990	800	565	810	365	170	195	300	390	760
DEPLETION	2505	21	10	13	195	505	1212	921	257	-156	-69	-112	-52	-60	-100	-63	-17
CHAN STOR	-64	16	-10	-27	-11	-68	0	-3	1	67	29	29	-1	0	-81	-10	2
EVAPORATION	1717							108	336	416	355	159	74	85	184		
STORAGE	42884	43463	43657	43700	43514	43466	44511	43697	42178	40903	39971	40029	40046	40066	39440	39114	39193
SYSTEM POWER																	
AVE POWER MW		544	713	883	828	1075	1067	1131	1078	810	712	402	418	416	686	724	705
PEAK POW MW		2148	2147	2146	2140	2137	2149	2135	2118	2094	2052	2054	2055	2055	2019	2035	2043
ENERGY GWH	7245.0	195.7	119.8	190.7	595.9	800.0	768.6	841.2	801.9	583.3	530.1	144.8	70.3	79.9	510.5	538.5	474.0
DAILY GWH		13.0	17.1	21.2	19.9	25.8	25.6	27.1	25.9	19.4	17.1	9.7	10.0	10.0	16.5	17.4	16.9
	INI-SUM	15MAR	22MAR	31MAR	30APR	31MAY	30JUN	31JUL	31AUG	30SEP	31OCT	15NOV	22NOV	30NOV	31DEC	31JAN	28FEB