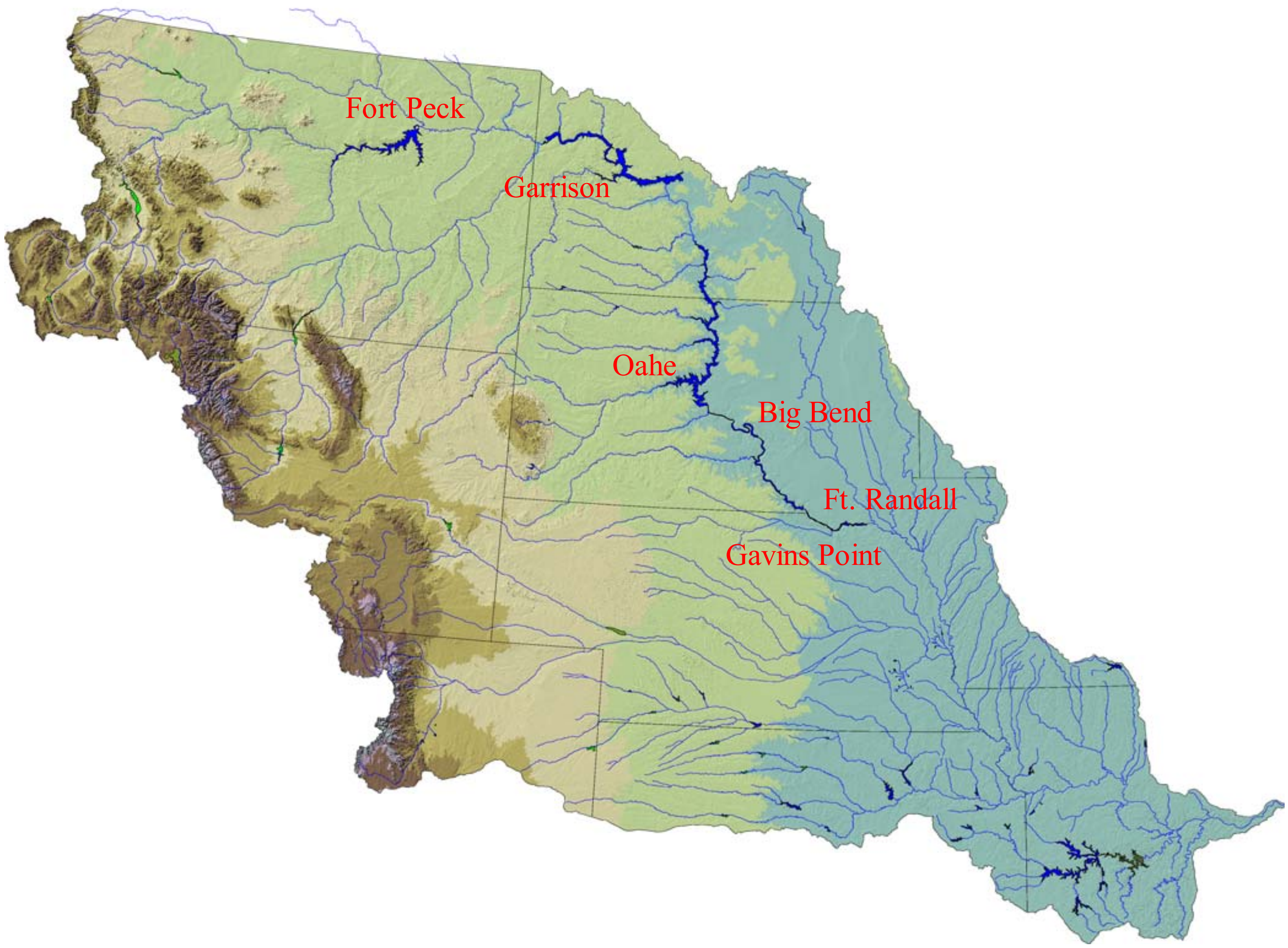
US Army Corps
of Engineers

Northwestern Division

Missouri River Mainstem Reservoir System

Summary of Actual 2005 Regulation

Missouri River Basin



Reservoir Control Center
U. S Army Corps of Engineers
Northwestern Division - Missouri River Basin
Omaha, Nebraska

April 2006

MISSOURI RIVER MAINSTEM RESERVOIRS

Summary of Actual 2005 Regulation

LIST OF FIGURES

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LIST OF ABBREVIATIONS AND ACRONYMS

AOP -	annual operating plan
AF -	acre-feet
B -	Billion
cfs -	cubic feet per second
COE -	Corps of Engineers
CY -	calendar year (January 1 to December 31)
EA -	Environmental Assessment
EIS -	Environmental Impact Statement
elev -	elevation
ESA -	Endangered Species Act of 1973
ft -	feet
ft msl -	feet above mean sea level
FY -	fiscal year (October 1 to September 30)
GIS -	Geographic Information System
GWh -	gigawatt hour
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
RM -	river mile
Service -	U.S. Fish and Wildlife Service
tern -	interior least tern
tw -	tailwater
USGS -	United States Geological Survey
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. Conversely, 1.5 cfs for 24 hours is approximately 1 million gallon per day (MGD)

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

Summary of Actual 2005 Regulation

I. FOREWORD

This document contains a summary of the actual regulation of the Missouri River Mainstem Reservoir System (System) for the 2005 Calendar Year (CY). Two other reports related to System regulation are also available. All three reports, this "Summary of Actual Calendar Year 2005 Regulation," "System Description and Operation," and "2004-2005 Annual Operating Plan" can be obtained by contacting the Missouri River Basin Water Management Division at 12565 West Center Road, Omaha, Nebraska 68144-3869, phone (402) 697-2676. The reports are also available on the Northwestern Division website at www.nwd-mr.usace.army.mil/rcc <http://www.nwd-mr.usace.army.mil/rcc>.

A basin map is presented on ***Plate 1*** and the pertinent data for the Missouri River System is shown on ***Plate 2A*** and ***Plate 2B*.**

II. REVIEW OF REGULATION – JANUARY-DECEMBER 2005

A. General

During CY 2005 the System was regulated in accordance with the applicable provisions of the 2004-2005 Annual Operating Plan (AOP), which was made available for review and comment by representatives of State and Federal agencies, Tribes, the general public and specific interest groups. A summary of the significant events during this past year is given in the following paragraphs.

B. Precipitation and Water Supply Available in 2005

The 2005 runoff year was the sixth consecutive drought year experienced in the Missouri River basin. ***Table 1*** shows the total runoff for CY 2005 above Sioux City, Iowa as well as runoff in reaches from Sioux City to Hermann, Missouri. ***Table 2*** shows the CY 2005 monthly runoff for selected reaches.

1. Plains Snowpack

November began with mild weather across most of the Missouri River basin. Mid-November brought rain in some areas of, or very close to, the basin, including record daily rainfalls at Waterloo, IA, Hastings, NE, and Dodge City, KS. In contrast, no measurable snow fell in Rapid City or Huron, SD approaching or surpassing record late dates for the first snow fall. As of November 27, Huron, SD awaited its first snow, surpassing the previous record-late snow of November 26. By the end of November, only areas of Wyoming had significant snowfall, with record amounts in Casper and Lander, WY.

Table 1
2005 Calendar Year Runoff for Selected Reaches

Reach	1898 – 1998 Average Runoff Volume (in 1000 AF)	Calendar Year 2005 Runoff Volume (in 1000 AF)	Percent of Average Runoff
Above Fort Peck	7,395	5,219	71
Fort Peck to Garrison	10,840	8,392	77
Garrison to Oahe	2,430	1,370	56
Oahe to Fort Randall	910	551	61
Fort Randall to Gavins Point	1,675	1,719	103
Gavins Point to Sioux City	1,940	3,185	164
TOTAL ABOVE SIOUX CITY	**25,190**	**20,436**	**81**
	1967–2005 Average Runoff		
Sioux City to Nebraska City*	7,500	5,610	75
Nebraska City to Kansas City*	11,730	7,800	66
Kansas City to Hermann*	23,750	19,960	84
TOTAL BELOW SIOUX CITY*	**42,980**	**33,370**	**78**

** Runoff in the reaches from Sioux City to Hermann is not adjusted to 1949 depletion levels. Averages are taken from USGS Water Data Reports for the period 1967-2005.*

Mild weather continued in December with weekly temperatures averaging 5 to 10 degrees above normal, and record high temperatures occurring in Montana and Colorado. Above normal temperatures and dry conditions continued across most of the basin into mid-December. Wintry conditions were also largely absent across the northern plains, including South Dakota. Aberdeen's season-to-date snowfall of 0.6 inch was its second lowest on record through December 18, behind only 0.2 inch in 1923. Montana's shallow, patchy snow cover continued into late December. Through year's end, season-to-date snowfall totaled 0.5 inch (all of which fell in November) in Sioux City, IA. Sioux City also achieved a record for least snowy December, tying the 1913 standard of a trace (6.3 inches below normal). In Sioux Falls, the first measurable snow fell on December 20, easily breaking the record of December 7. Sioux Falls also experienced a record setting period of 279 days without measurable snow (March 16 to December 19). A period without measurable precipitation stretched to 21 days in North Platte, NE (December 6-31). Monthly precipitation totals were less than 10 percent of normal in parts of Montana and Colorado.

In late December and early January, snow blanketed much of North and South Dakota, and Montana, followed by an invasion of sharply colder air. In North Dakota, Williston's 10.5 inches of snowfall on New Year's Day was a single-day January record (previously 10.3 inches on January 16, 1995). In Omaha, NE, January 4-6 snowfall totaled 14.1 inches, marking its third-highest single storm total. The outbreak of cold weather that followed extended into Kansas and Colorado. Heavy snow spread as far south as the South Dakota Black Hills, where

Table 2

Missouri River Basin

Calendar Year 2005

Actual Runoff

4-Jan-06

Reach Above	Fort Peck	Garrison	Oahe	Fort Randall	Gavins Point	Sioux City	Summation above Gavins Point	Summation above Sioux City	Accumulated Summation above Sioux City
Values in 1000 Acre Feet									
	Historic								
JAN 2005	209	197	16	41	83	178	546	724	724
NORMAL	315	260	10	20	100	35	705	740	740
DEPARTURE	-106	-63	6	21	-17	143	-159	-16	-16
% OF NORM	66%	76%	160%	205%	83%	509%	77%	98%	98%
FEB 2005	308	395	93	46	165	112	1,007	1,119	1,843
NORMAL	365	360	90	50	125	85	990	1,075	1,815
DEPARTURE	-95	35	3	-4	40	27	17	44	28
% OF NORM	84%	110%	103%	92%	132%	132%	102%	104%	102%
MAR 2005	319	557	116	6	116	144	1,114	1,258	3,101
NORMAL	610	1,010	580	220	205	300	2,625	2,925	4,740
DEPARTURE	-291	-453	-464	-214	-89	-156	-1,511	-1,667	-1,639
% OF NORM	52%	55%	20%	3%	57%	48%	42%	43%	65%
APR 2005	305	405	73	57	169	265	1,009	1,274	4,375
NORMAL	665	1,115	500	145	180	340	2,605	2,945	7,685
DEPARTURE	-360	-710	-427	-88	-11	-75	-1,596	-1,671	-3,310
% OF NORM	46%	36%	15%	39%	94%	78%	39%	43%	57%
MAY 2005	646	1,238	237	164	175	367	2,460	2,827	7,202
NORMAL	1,120	1,280	320	145	185	275	3,050	3,325	11,010
DEPARTURE	-474	-42	-83	19	-10	92	-590	-498	-3,808
% OF NORM	58%	97%	74%	113%	95%	133%	81%	85%	65%
JUN 2005	1,340	2,347	396	230	318	712	4,631	5,343	12,545
NORMAL	1,655	2,715	435	160	180	270	5,145	5,415	16,425
DEPARTURE	-315	-368	-39	70	138	442	-514	-72	-3,880
% OF NORM	81%	86%	91%	144%	177%	264%	90%	99%	76%
JUL 2005	749	1,926	194	-15	124	288	2,978	3,266	15,811
NORMAL	835	1,815	180	60	135	215	3,025	3,240	19,665
DEPARTURE	-86	111	14	-75	-11	73	-47	26	-3,854
% OF NORM	90%	106%	108%	-25%	92%	134%	98%	101%	80%
AUG 2005	219	203	90	-15	88	205	585	790	16,601
NORMAL	360	625	65	40	115	130	1,205	1,335	21,000
DEPARTURE	-141	-422	25	-55	-27	75	-620	-545	-4,399
% OF NORM	61%	32%	138%	-38%	77%	158%	49%	59%	79%
SEP 2005	218	46	87	8	110	191	469	660	17,261
NORMAL	345	470	115	40	110	95	1,080	1,175	22,175
DEPARTURE	-127	-424	-28	-32	0	96	-611	-515	-4,914
% OF NORM	63%	10%	76%	20%	100%	201%	43%	56%	78%
OCT 2005	303	535	24	-1	129	233	990	1,223	18,484
NORMAL	400	525	70	10	120	75	1,125	1,200	23,375
DEPARTURE	-97	10	-46	-11	9	158	-135	23	-4,891
% OF NORM	76%	102%	35%	-10%	108%	311%	88%	102%	79%
NOV 2005	379	389	69	-24	99	202	912	1,114	19,598
NORMAL	390	410	65	10	120	75	995	1,070	24,445
DEPARTURE	-11	-21	4	-34	-21	127	-83	44	-4,847
% OF NORM	97%	95%	106%	-240%	83%	269%	92%	104%	80%
DEC 2005	224	154	-25	54	143	288	550	838	20,436
NORMAL	335	255	0	10	100	45	700	745	25,190
DEPARTURE	-111	-101	-25	44	43	243	-150	93	-4,754
% OF NORM	67%	60%	-6250%	540%	143%	640%	79%	112%	81%
Calendar Year Totals									
FORECAST	5,219	8,392	1,370	551	1,719	3,185	17,251	20,436	
NORMAL	7,395	10,840	2,430	910	1,675	1,940	23,250	25,190	
DEPARTURE	-2,176	-2,448	-1,060	-359	44	1,245	-5,999	-4,754	
% OF NORM	71%	77%	56%	61%	103%	164%	74%	81%	

Rapid City (7.3 inches on Jan. 4) reported its fourth highest daily total recorded in January. However, little snow fell the remainder of the month and warmer than normal temperatures after mid-month melted most of the snow cover. Areas of Montana recorded less than 10 percent of normal precipitation during January.

Cold weather returned briefly the first few days of February, before giving way to record setting temperatures in some areas. More normal conditions returned quickly, and several rounds of snow followed, including 10.4 inches at Hastings, NE, over a 3-day period from February 6-8. For the most part, dry weather prevailed later in February and snow depths in most areas were less 5 inches at the end of the month. Some locations reported little or no snow cover.

Much above normal temperatures continued into early March, with little or no snowfall. In mid-March, winter conditions returned. Sioux Falls, SD, reported 12.2 inches of snow on March 17-18, the city's fifth-highest March total in a 24-hour period. Several rounds of precipitation pushed up snowfall amounts across Montana. Great Falls, MT, noted a monthly record snowfall of 27.8 inches (252 percent of normal), raising its season-to-date total to 101 percent. All of the snow fell from March 12-24. March snowfall also accounted for half of the season-to-date total in Havre, MT, where the October-March sum was 21.7 inches. In contrast, Huron, SD measured less than one inch of snow in March, keeping the season-to-date total at 31 percent of normal.

In early April, mild weather accompanied by little precipitation melted most of the snow cover on the northern and central plains. However, the occasional snowstorm brought additional snow. Valentine, NE, reported 5.6 inches on snow on April 11. Wet snow fell across parts of Nebraska, Wyoming, and Montana in mid-April. Billings, MT, measured 20 inches from April 18-20. Late April snows of 4.5 inches and 5.3 inches at Casper, WY were record amounts for April 27 and 28, while 5.5 inches at Cheyenne, WY and 5.4 inches at Scottsbluff, NE shattered April 28 standards.

Surprisingly, some snow continued to fall in May. Rapid City, SD had 9.5 inches of snowfall on May 11-13, helping the city achieve its snowiest May since 1950. By mid-May warmer than normal temperatures melted the remainder of the snow cover.

2. Mountain Snowpack

a. Fall 2004

The snowfall season got off to a poor start, and in Montana, averaged about 30 percent below the previous year. November and December moisture was generally below average. Mountain snow water content was only 66 percent of average.

In Wyoming, snow water equivalent (SWE) across the state was below normal for that time of year. Early storms covered the state with snow, but very little snow fell during late November and early December. The SWE average for the state was about 90 percent of normal. In December, precipitation was generally below normal, with some areas experiencing as little as 35 percent of normal.

The 2004 year ended with 70 percent of normal mountain snowpack in the reach above Fort Peck and 77 percent of normal in the reach from Fort Peck to Garrison.

b. January 2005

January was a record breaking month for both low snowpack and high overnight temperatures in Montana. Several sites set new record low snow water contents and record high overnight temperatures. Due to the warmer temperatures, some low elevation snow sites melted out during January. In Montana, snowpack was 75 percent of the previous year.

In Wyoming, SWE across the state was below average for that time of year. The SWE in the northwestern portion of the state was about 73 percent of normal and the northeastern portion 65 percent of normal. The southeast and southwest areas were 90 and 99 percent of normal, respectively. January's precipitation was well below average across most of the state, and ranged from 49 to 114 percent of normal.

The month of January ended with the mountain snowpack 70 percent of normal in the reach above Fort Peck and 73 percent of normal in the reach from Fort Peck to Garrison.

c. February 2005

February was the fifth month in a row with below normal to well below normal precipitation. Mountain precipitation in the Missouri River headwaters was 33 percent of normal and the Yellowstone was 56 percent of normal. Unlike January, February did not have the warm temperatures that melted snow. In Montana, snowpack was 65 percent of the previous year.

In Wyoming, SWE amounts across the state were below average for February. The snowpack varied from 65 percent of normal in the northeastern portion of the state to 96 percent in southwestern Wyoming. Precipitation for February was well below average across all of Wyoming.

The month of February ended with the mountain snowpack 62 percent of normal in the reach above Fort Peck and 69 percent of normal in the reach from Fort Peck to Garrison.

d. March 2005

Mountain precipitation in Montana during March was 9 percent above average and the best monthly average since October 2004. March mountain snowpack increased an average of 7 percent, with the greatest increase in the Missouri River mainstem reach (Three Forks to Fort Peck reservoir) where the gain averaged 19 percent. Even with the March snowpack gains, several major river basins tied or set new record lows for the end of March. Unlike the previous year, the mountain snowpack did not melt significantly and continued to accumulate.

During March the SWE across Wyoming was about 82 percent of normal. It ranged from 72 percent of normal in northwestern and northeastern Wyoming to 95 percent of normal in the southwestern portion. Precipitation was below average across most of Wyoming during March.

The month of March ended with the mountain snowpack 71 percent of normal in the reach above Fort Peck and 73 percent of normal in the reach from Fort Peck to Garrison.

e. April 2005

The mountain precipitation during April was near normal. In the Missouri River basin upstream of Fort Peck it was 100 percent of normal and in the Yellowstone River basin it was 84 percent of normal. April precipitation was 24 percent above the previous year. Temperatures were near to below average and kept snow melt near average for that time of year.

The SWE across Wyoming was about 75 percent of normal during April. Snow in March raised overall SWE slightly, but lack of adequate snow in April lowered it. April's precipitation was below average across most of Wyoming.

The month of April ended with the mountain snowpack 71 percent of normal in the reach above Fort Peck and 68 percent of normal in the reach from Fort Peck to Garrison.

f. May 2005

In Montana, May remained cool and stormy, especially in south central Montana. Precipitation in the Missouri River basin above Fort Peck was 100 percent of average and precipitation in the Yellowstone River basin was 132 percent of average. During May snowpack was well below average.

Generally, the SWE across Wyoming was well below average. May precipitation in the form of rain accelerated the rate of snowmelt. SWE across the state dropped to 67 percent of average. May's precipitation was above average across all of Wyoming, with the Big Horn and Tongue River basins with the highest amounts at 165 and 161 percent of average respectively.

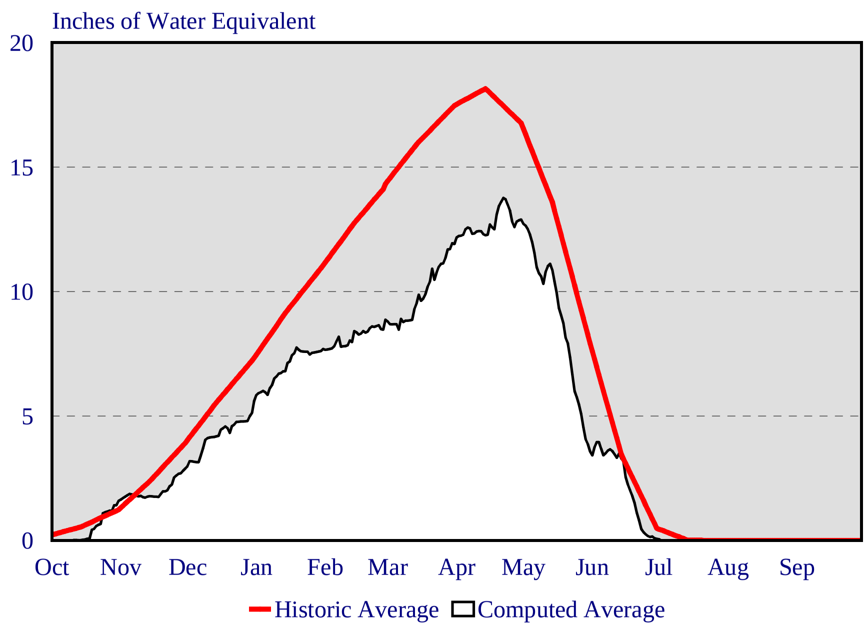
As the month of May ended, the mountain snowpack was 22 percent of normal in the reach above Fort Peck and 32 percent of normal in the reach from Fort Peck to Garrison, representing an early melt of the snowpack as well as a below normal snowpack .

g. Summary

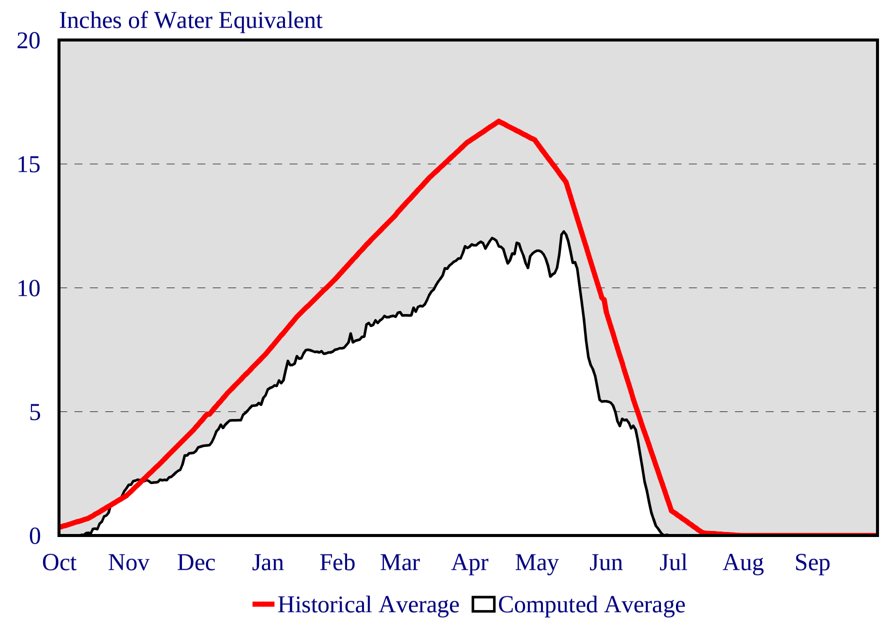
Overall snow water content totals recorded during the entire snow season ending July 1, 2005 were much below normal. The mountain snowpack in the reach above Fort Peck peaked on April 22 at 76 percent of the normal peak accumulation. The mountain snowpack in the reach between Fort Peck and Garrison peaked on May 13 at 73 percent of the normal peak accumulation. The normal date for snow accumulation to peak is April 15. The 2004-2005 mountain snow accumulation and melt for the reaches above Fort Peck and Fort Peck to Garrison are illustrated in ***Figure 1***.

Missouri River Basin
Mountain Snowpack Water Content
2004-2005

Total Above Fort Peck



Total Fort Peck to Garrison



The Mountain Snowpack in the reach above Fort Peck peaked at 76% of the normal peak accumulation on April 22.
The Mountain Snowpack in the reach between Fort Peck and Garrison peaked at 73% of the normal peak accumulation on May 13.
The Missouri River basin Mountain Snowpack normally peaks near April 15

July 1, 2005

Provisional data subject to revision.

Figure 1

3. Weather Conditions

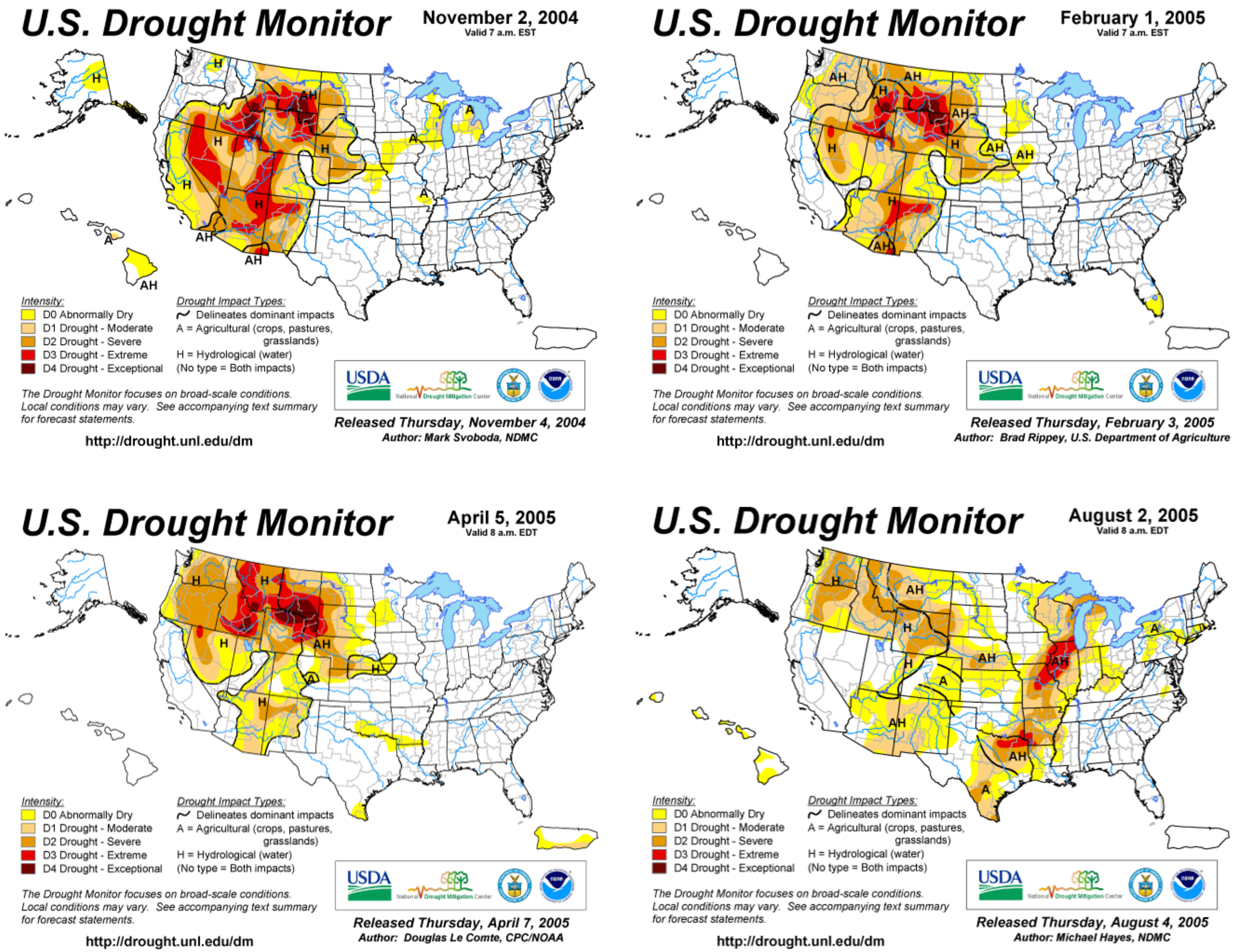
The following weather summaries are from the USDA Weekly Weather and Crop Bulletins. ***Figure 2*** displays the drought magnitude and ***Figure 3*** displays percent of normal precipitation experienced by the basin at 3-month increments during the calendar year.

a. January 2005

The year started with bitterly cold air remaining entrenched across the northern Plains, where daily-record lows on January 5 included -39°F in Grand Forks, ND and -37°F in Williston, ND. Enough cold air slipped southward into Colorado to hold Denver's high to 6°F on January 5. It was Denver's first maximum temperature below 10°F since December 22, 1998. Record-setting snows fell from parts of the central Plains into the western Corn Belt. January 4-6 snowfall totaled 14.1 inches in Omaha, NE. The only greater storm totals in Omaha were 18.9 inches on March 14-15, 1923, and 18.5 inches on February 11-12, 1965. Heavy snow spread as far north as South Dakota's Black Hills, where Rapid City (7.3 inches on January 4) reported its fourth-highest daily total on record during January. In Montana, Billings' temperature fell 30°F (from 33 to 3°F) in 2 hours on January 12, then plunged below -17°F on January 15. The last time Billings' temperature fell below -17°F was in January 1997. Miles City, MT collected four consecutive daily-record lows (-32, -34, -30, and -27°F) from January 13-16. In Missouri, St. Louis collected 2.78 inches of rain on January 12-13, boosting its total during the first half of the month to 8.78 inches. St. Louis' former January precipitation record of 8.53 inches was established in 1916. In contrast, 2004 ended with a sixth consecutive year of below-normal precipitation in Billings, MT. Although Billings' 6-year precipitation totaled only 11.08 inches (75 percent of normal), it was the city's wettest year since 1999. The later part of the month saw record warmth replacing the earlier cold weather. On January 20, daily-record highs included 70°F in Denver, CO and 66°F in Cheyenne, WY. Cheyenne's maximum also tied its monthly record, previously set with a high of 66°F on January 26, 1982. Throughout the northern Plains, temperatures ranged from 10 to 24°F above normal. In Montana, Billings reported high temperatures of 40°F or higher on 12 consecutive days from January 17-28, its fourth-longest such January streak on record. Elsewhere in Montana, Butte reached or exceeded 50°F on 6 days during the month, tying its January 1971 record.

b. February 2005

Record highs were set on 2 consecutive days (February 3-4) in Butte, MT (56 and 57°F) and Huron, SD (56 and 63°F). On February 4, temperatures soared to 70°F or higher and reached daily-record levels in South Dakota locations such as Rapid City (73°F) and Yankton (70°F). Consecutive daily-record highs were observed in Sioux City, IA (66 and 61°F on February 4-5). A streak of daily temperatures averaging at least 10°F above normal ended at 19 days (January 17 – February 4) in Cut Bank, MT. Cut Bank's temperature fell from a daily-record high of 58°F on February 4 to 0°F on the morning of February 6. In Nebraska, Hastings measured daily-record snow totals on February 6 (4.4 inches) and 8 (5.1 inches) en route to a 3-day snowfall of 10.4 inches. Warmer weather returned to the central Plains during the middle of the month. February 12-13 rainfall reached 2.48 inches in Nebraska City, NE, representing one of its wettest


U.S. Drought Monitor
November 2, 2004
Valid 7 a.m. EST
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)
(No type = Both impacts)
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
USDA
National Drought Mitigation Center
Released Thursday, November 4, 2004
Author: Mark Svoboda, NDMC
http://drought.unl.edu/dm
U.S. Drought Monitor
February 1, 2005
Valid 7 a.m. EST
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
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H = Hydrological (water)
(No type = Both impacts)
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
USDA
National Drought Mitigation Center
Released Thursday, February 3, 2005
Author: Brad Rippey, U.S. Department of Agriculture
http://drought.unl.edu/dm
U.S. Drought Monitor
April 5, 2005
Valid 8 a.m. EDT
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)
(No type = Both impacts)
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
USDA
National Drought Mitigation Center
Released Thursday, April 7, 2005
Author: Douglas Le Comte, CPC/NOAA
http://drought.unl.edu/dm
U.S. Drought Monitor
August 2, 2005
Valid 8 a.m. EDT
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
Delineates dominant impacts
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USDA
National Drought Mitigation Center
Released Thursday, August 4, 2005
Author: Michael Hayes, NDMC
http://drought.unl.edu/dm

Figure 2

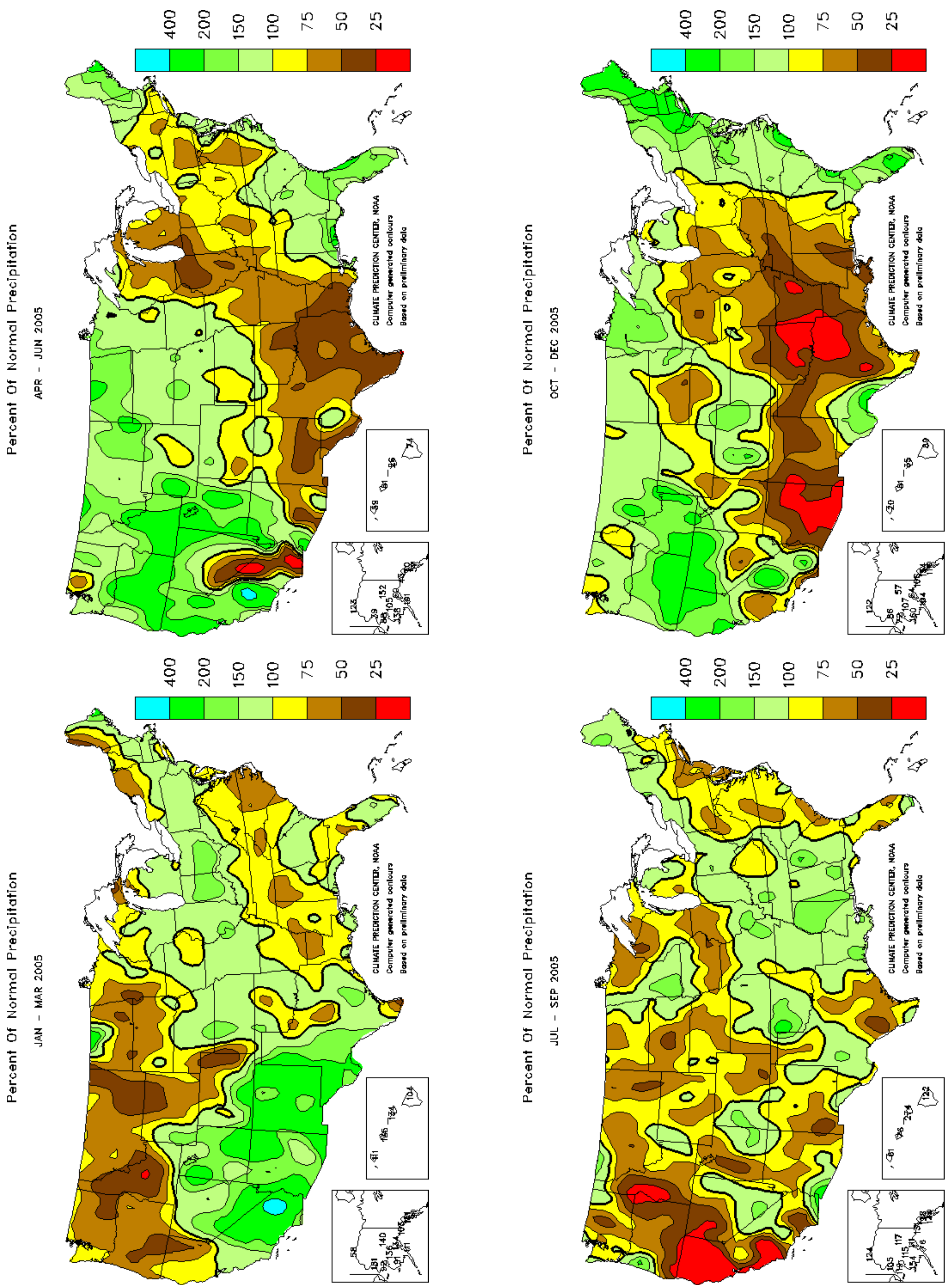

Percent Of Normal Precipitation
JAN - MAR 2005
Percent Of Normal Precipitation
APR - JUN 2005
Percent Of Normal Precipitation
JUL - SEP 2005
Percent Of Normal Precipitation
OCT - DEC 2005
400
200
150
100
75
50
25
CLIMATE PREDICTION CENTER, NOAA
Computer generated contours
Based on preliminary data

Figure 3

winter storms on record. Nebraska City's normal winter (December to February) precipitation is 3.17 inches.

c. March 2005

The month began with warm, windy weather overspreading the Plains in advance of a strong cold front. On March 10, wind gusts topped 60 m.p.h. in many locations including Kennebec, SD (67 m.p.h.) and Kearney, NE (62 m.p.h.). Record highs in Montana for March 11 rose to 72°F in Miles City and 69°F in Helena. Also in Montana, precipitation included a daily-record total (0.39 inch on March 12) in Helena and more than 10 inches of snow at a few locations in the western part of the state. By mid-month cool weather prevailed throughout the Plains. Snowfall in the amount of 12.2 inches blanketed Sioux Falls, SD on March 17-18, the city's fifth-highest march total in a 24-hour period. Daily-record precipitation totals were established on March 21 at Concordia, KS (1.74 inches) and Kearney, NE (1.44 inches). Valentine, NE netted 9.3 inches of snow during the week (March 20-26). Heavy snow also blanketed the northern High Plains, where Great Falls, MT measured 11.5 inches from March 22-24. Great Falls' month-to-date snowfall reached 27.8 inches, breaking its March 1982 record of 26.1 inches and accounting for 54 percent of its season-to-date total of 51.2 inches. The month ended with local heavy showers erupting on the central Plains. On March 30, daily-record totals in Nebraska included 1.05 inches in Ord and 0.64 inch in Hastings. Meanwhile, Casper, WY received 2.1 inches of snow, a record for March 30.

d. April 2005

Warmth expanded across the Plains and the Midwest, resulting in daily-record highs in Kansas City, MO (82°F on April 3). Farther west, daily-record highs for April 7 in Montana included 83°F in both Havre and Miles City. Williston, ND posted consecutive daily-record highs (82 and 86°F on April 7 and 8, respectively). On April 4, Miles City, MT received rainfall totaling 0.29 inch, representing its highest 1-day sum since October 29, 2004, when 0.60 inch fell. Five days later, another 0.35 inch dampened Miles City. In Colorado, storm-total (April 9-11) snowfall reached 9.9 inches at the site of the former Stapleton Airport in Denver and 14.6 inches at nearby Wheat Ridge. Denver, CO collected a daily-record precipitation total (1.09 inches on April 10) and measure 9.9 inches of snow on April 10-11. Storm-total snowfalls in excess of 2 feet were noted in the nearby Colorado Rockies. Farther north, Valentine, NE (5.6 inches) observed a daily-record snowfall for April 11, while Bismarck, ND (0.84 inch), reported its rainiest day since September 23, 2004 when 0.93 inch fell. Record high for April 17 included 86°F in Rapid City, SD. A slow-moving storm brought several days of locally heavy precipitation to the interior Northwest. In Montana, Billings measured three consecutive daily-record precipitation totals (0.97, 0.82, and 0.55 inch) from April 18-20. Billings' 4-day total (through April 21) reached 2.62 inches, including 20.0 inches of snow. At least 5 inches of snow blanketed Billings on 3 consecutive days (April 18-20) for only the second time on record (previously, April 10-12, 1991). Meanwhile, storm-total rainfall locally topped 4 inches at a few locations in western South Dakota, including Norris (Mellette County) and Harrington (Bennett County). A daily-record rainfall total was report at Valentine, NE (1.95 inches on April 21). Temperature lows on April 23 in western Kansas dipped to 26°F in Goodland and 30°F in Dodge City. Hastings, NE (29°F) tied its record for April 23. A day later, record lows for April 24 included 21°F in Huron, SD. A stalled front over the Rockies and entrenched cold air produced enhanced, upsloping snows in Wyoming and Montana. Record daily totals of 4.5 and 5.3 inches blanketed Casper, WY on April 27 and 28, while Cheyenne, WY (4.5 inches), and Scottsbluff, NE (5.4 inches), shattered April 28 standards. In northern Montana, Arctic air plunged April 28 readings to 12°F and 16°F at Butte and Havre, respectively. The snow cover and cold air combined to produce record lows highs on April 28 (23°F at Rawlins, 25°F at Cheyenne, and 28°F at Laramie), and record minimums on April 29 (6°F at Laramie, WY, 9°F at Rawlins, WY, and 10°F at Drummond, MT).

e. May 2005

From May 2-4, more than a dozen monthly record lows were set or tied across the Plains and Midwest. In Nebraska, monthly records were established on May 2 in locations such as Alliance (12°F), Chadron (15°F), and North Platte (18°F). Records in Alliance and Chadron were originally set in May 1954. On May 3, additional monthly records included 10°F in Williston, ND and 13°F in Aberdeen, SD. By May 7, however, the temperature in Aberdeen, SD rebounded to 82°F, just 4 days after its monthly record low. Pacific storms blew their way into the basin dumping 2.45 inches in Sheridan, WY on May 7, its fifth-highest daily sum on record and greatest 1-day amount since 2.76 inches fell on April 27, 1963. By May 10, heavy precipitation associated with the Western storm moved farther inland, resulting in daily-record totals in Wyoming locations such as Sheridan (1.48 inches) and Riverton (0.92 inch). Sheridan also netted a daily-record sum (1.52 inches) the following day, boosting its 5-day (May 7-11) total to 5.84 inches, which is nearly 40 percent of its normal annual precipitation of 14.72 inches. Meanwhile, May 11-13 snowfall totaled 9.5 inches in Rapid City, SD helping the city achieve its snowiest May since 1950, when 11.6 inches fell. Most (7.5 inches) of Rapid City's snow fell on May 11, representing its snowiest May day since May 3, 1905, when 9.0 inches fell. Farther west, high-elevation storm totals in Montana included 25 inches at Barker Lakes and 38 inches near Red Lodge. In Montana, Miles City collected a daily-record low (27°F) on May 14. Torrential rainfall erupted on May 11 across the east-central Plains. On May 11-12, Grand Island, NE, set records for 6-, 12-, and 24-hour rainfall (6.38, 7.16, and 7.21 inches, respectively), eclipsing standard (5.65, 5.65, and 5.88 inches) established on September 1-2, 1977. Storm totals in excess of 10 inches were reported in the vicinity of Grand Island, Hastings and Kearney, NE, resulting in flash flooding. Downstream, the South Loup River at St. Michael, NE, crested almost a foot above flood stage on May 12. Refer to ***Plate 3*** for a radar graphic of the storm. Chilly weather lingered across the northern Plains and upper Midwest. Daily-record lows were established in locations such as Pierre, SD (29°F) on May 15, and Ottumwa, IA (36°F) on May 16. In North Dakota, Dickinson's weekly rainfall of 1.58 inches boosted its May 1-21 total to 4.11 inches (291 percent of normal). In western Nebraska, Alliance closed the month with consecutive daily-record lows of 32 and 27°F on May 27 and 28, respectively. On May 30, Shelby, MT, collected a daily-record low (32°F) and Goodland, KS, featured a high of only 52°F, its lowest maximum temperature on record for the date.

f. June 2005

The first 4 days of June featured 3.49 inches of rain in Great Falls, MT, including a 2.1-inch deluge on June 2. It was Great Falls' tenth-highest daily total during the 113-year period of record. Meanwhile in western Nebraska, 2.75 inches of rain pounded Scottsbluff on June 3-4, representing its highest 2-day total since May 19-20, 1988, when 3.15 inches fell. During the same period, 2.60 inches of rain soaked Cheyenne, WY, marking its wettest 2-day spell since 6.06 inches fell on August 1-2, 1985. Elsewhere, daily-record totals in excess of 2 inches included 2.95 inches (on June 3) in Topeka, KS and 2.17 inches (on June 4) in Kansas City, MO. Kansas City's 2-day (June 3-4) sum reached 3.81 inches. On June 7 daily record totals were established throughout the Midwest. See ***Plate 4*** for a radar graphic of storm totals for June 7-8. By June 10, daily-record lows in Wyoming included 31°F in Rawlins and 35°F in Sheridan. Precipitation daily-record totals for June 11 reached 1.52 inches in Aberdeen, SD. On June 12, the month-to-date rainfall in Denver CO, climbed to 3.60 inches (563 percent of normal), representing its sixth-highest June total on record and just 1.36 inches shy of its June 1882 standard. Records for June 12 included 3.52 inches in St. Joseph, MO, 1.51 inches in Cheyenne, WY, and 1.46 inches in Alliance, NE. Alliance's 3-day (June 11-13) rainfall reached 2.47 inches. Similarly, Sisseton, SD, netted a daily-record total of 2.35 inches on June 13 en route to a 3-day (June 11-13) sum of 3.14 inches. Meanwhile, 10 inches of snow blanketed Gothic, CO, on June 12-13. Billings, MT, reached 80°F for the first time this year on June 16, posting a high of 83°F. Billings' previous latest date for the year's first 80°F warmth was June 10, 1991. Billings then measured consecutive daily-record highs (97 and 99°F) on June 21-22. Elsewhere in Montana, Great Falls' high of 82°F on June 20 ended a record-tying string of days with high temperatures below 80°F. Great Falls' 281-day streak, from September 12, 2004 – June 19, 2005, tied a record originally established in 1906-07. Near the end of the month, heavy rain soaked part of the northern Plains causing local flooding. Daily-record rainfall totals were observed in Kansas City, MO (3.26 inches on June 30).

g. July 2005

On July 8, Montana locations setting record highs included Stanford (96°F), Bozeman (93°F), Dillon (93°F), and Neihart (91°F), while the following day saw more maximum records broken, spreading eastward into the northern Great Plains. Former July 9 record highs fell at Rapid City (106°F), Sheridan, WY (103°F), Williston, ND (100°F), Billings, MT (100°F), Casper, WY (99°F), and Riverton, WY (97°F). While cooler weather, along with scattered showers, came into some areas - Billings, MT netted a daily-record rainfall total of 1.26 inches on July 10 – the heat wave persisted in others. Casper, WY (104°F on July 16) tied the record set on July 12, 1954. Rapid City, SD collected a daily-record high of 109°F on July 16. Rapid City's heat wave capped near-record dryness during the first half of the summer. From June 1 – July 16, rainfall in Rapid City totaled just 1.24 inches, the fifth-lowest value on record. July 1-23 rainfall totaled just 0.09 inch in Columbia, MO. Columbia's 40-day (June 14-July 23) rainfall of 0.09 inch represented its lowest 40-day total since 1984, when just 0.01 inch fell from July 12 – August 20. Columbia also weathered 6 consecutive days of triple-digit heat (100, 102, 103, 105, 105, and 102°F) from July 20-25, its longest such streak since there were 14 straight days of 100°F heat from July 7-20, 1980. Denver, CO posted a high of 105°F on July 20 to tie a standard originally set on August 8, 1878. On the same day Goodland, KS (109°F) experienced its hottest day since August 4, 1947 when the high was 110°F. Large temperature variations affected the Plains and the Midwest. For example, North Platte, NE posted a daily-record high (104°F) on July 23, followed by consecutive daily-record lows (52 and 43°F, respectively) on July 26-27. North Platte notched another record high on July 30, when the high soared to 105°F. As shown on ***Plate 5***, heavy showers spread into previously dry parts of the Midwest on July 26, where daily-record amounts were recorded from Nebraska to Illinois. Elsewhere in the North, it was the driest July on record in Helena, MT (previously, 0.08 inch in 1973), with a monthly total of 0.07 inch (5 percent of normal).

h. August 2005

Moisture spread northeastward across the Plains in advance of a cold front, contributing to daily record totals on August in locations such as Huron, SD (1.73 inches), and North Platte, NE (1.30 inches). In late July and early August, record-setting heat baked the northern and central Plains. Record highs for July 31 included 106°F in Russell, KS, and 103°F in Havre, MT. A day later, Russell again reached 106°F to post another daily-record high and McCook, NE (108°F) collected its first of two records. McCook attained 109°F on August 2. In contrast, Denver's high temperature climbed to 61°F on August 4, down from 97°F just 2 days earlier. A reading of 49°F (on August 5) was measured at North Platte, NE, which was a daily-record low. Hot weather lingered across the northern Plains, where Pierre, SD (105°F on August 7), posted a daily-record high. On August 13, daily-record rainfall totals included 3.60 inches in Topeka, KS and 2.71 inches in Kansas City, MO. Elsewhere in Missouri, Columbia netted a 3-day (August 12-14) sum of 4.09 inches, following a 59-day (June 14 – August 11) period with rainfall totaling just 0.81 inch. Maximum temperatures remained below 60°F on August 13 as far south as western Nebraska, where highs climbed only to 56°F in Alliance, Chadron, and Scottsbluff. In Montana, daily-record lows for August 13 included 35°F in Cut Bank. Daily record lows were established in locations such as Boulder, MT (33°F on August 14 and 15), and Sheridan, WY (39°F on August 14). Heavy showers erupted across the North Central Plains where daily-record totals for August 17 included 3.18 inches in Sisseton, SD and 3.78 inches in St. Joseph, MO (on August 18). Hot weather lingered for the rest of the month.

i. September 2005

On September 3, daily-record highs were set in northern Plains locations such as Pierre, SD (104°F) and Miles City, MT (102°F). On September 9, daily-record highs in Montana reached 96°F in Glasgow and 95°F in Billings. Daily-record rainfall totals in Montana for September 10 included 1.35 inches in Cut Bank and 1.14 inches in Kalispell. Huron, SD measured 3.77 inches of rain from September 5-8. The end of the month saw some stifling heat still in the basin. A daily record was set on September 27 at North Platte, NE (93°F) and also in Miles City, MT on October 1 (94°F).

j. October 2005

On October 3-4, Midwestern minimum temperatures were as much as 30°F above normal and in many cases were the highest on record for October, such as the October 4 low of 74°F in Lincoln, NE. In Omaha, NE, the high of 92°F on October 4 marked its 52nd day in 2005 with 90-

degree heat. That was the most since 1976, when there were 57 such days. Lincoln, NE posted a high of 94°F on October 2. In Montana, Billings' 10.8-inch snowfall storm total included a daily-record amount (9.9 inches) on October 4. Billings' previous earliest daily snowfall in excess of 8.0 inches occurred on October 15, 1980, when 9.5 inches fell. In South Dakota, Rapid City went just 145 days between 1-inch snowfalls (1.7 inches on May 12 and 1.0 inch on October 4), its third-shortest such span behind 130 days in 1965 and 139 days in 1903. Unofficial storm-total snowfalls for October 4 in North Dakota included 15 inches in Beach, Bowman, Dickinson, and Richardton. Billings, MT recorded a daily-record low of 20°F on October 6. It was Billings' earliest autumn reading of 20°F or lower, displacing the record set on October 7, 1985. Daily-record rainfall totals for October 9 included 0.83 inch in Williston, ND and 0.52 inch in Miles City, MT. Farther south, Sidney, NE measured daily-record rainfall totals (0.66 and 1.27 inches) on October 9 and 10. In Colorado, Denver also netted consecutive daily-record totals (0.62 and 0.99 inch on October 9 and 10, respectively) while the city's official snow observation site near the former Stapleton Airport received 9.6 inches of snow. Denver's high temperature reached 34°F on October 10, just 2 days after a high of 83°F. On October 23, daily-record lows in Nebraska included 11°F in Alliance and 13°F in Chadron.

k. November 2005

Record warmth expanded across the Plains and the Midwest in the early part of the month. On November 2, Norfolk, NE (83°F) tied its monthly record high originally set on November 4, 1909, while Sioux City, IA (80°F) noted its second-highest November temperature on record behind 81°F on November 3, 1978 and November 8, 1999. Further north, light snow fell in the northern Plains and totaled 2.4 inches (on November 3) in Glasgow, MT. North Dakota reported seven new daily record high temperatures on November 11, with a pair of 100 year-old records broken at Jamestown (69°F) and the Grand Forks National Weather Service Office (65°F). Nebraska noted eight new entries into the record book on November 11 with North Platte's daily high of 82°F shattering the previous standard of 75°F set in 1913. Numerous daily record highs were set in South Dakota as well with Academy, Mitchell, Mobridge, and Yankton all reaching 77°F on November 11 for the first time since recordkeeping began. On November 20 record highs were established in locations such as Cut Bank, MT (62°F). Additional records were set in Cut Bank on November 22, 23, and 25 (67, 62, and 58°F). The end of the month (November 27 and 28) saw freezing rain and wind-driven snow paralyzing travel across parts of the northern and central Plains. Freezing rain caused widespread electrical disruptions in parts of northern Nebraska, the eastern Dakotas, and western Minnesota. November 27-28 precipitation totaled 3.54 inches in Huron, SD, where a period of heavy freezing rain was followed by 14.8 inches of snow. Elsewhere in South Dakota, storm-total snowfall reached 20.0 inches in Kennebec. Meanwhile, November 27-28 wind gusts were clocked to 79 m.p.h. in Flagler, CO and 74 m.p.h. in Broken Bow, NE. Great Falls, MT received 19.8 inches of snow during the last 5 days of November, nudging the monthly total (23.2 inches) past its November 1955 record sum of 22.1 inches. Great Falls also set a 3-day (November 26-28) snowfall record of 18.1 inches, surpassing its 1973 (April 19-21) mark of 17.6 inches. Elsewhere in Montana, Billings collected measurable snowfall on 10 consecutive days (totaling 10.0 inches) from November 25 – December 5, breaking its record of 8 days in a row set in December 1989 and 1996. Additional snow fell across the northern Plains and Midwest on November 30, when South Dakota totals reached 6.6 inches in Sioux Falls and 5.0 inches in Huron.

l. December 2005

In Montana, daily-record snowfall totals for December 5 reached 7.1 inches in Kalispell and 4.8 inches in Havre. Billings, MT received measurable snow on 11 consecutive days (November 26 – December 6), totaling 11.1 inches, breaking its record of 9 days in a row set in December 1989 and 1996. Between storms, very cold weather settled across the Plains and the Midwest. On December 5, daily-record lows dipped to -25°F in Aberdeen, SD. On December 7 the daily-record snowfall totaled 7.3 inches in Kansas City, MO and 6.2 inches fell in Topeka, KS. On December 7, West Yellowstone, MT registered a daily-record low of -45°F, followed the next day by a record of -39°F in Crested Butte, CO. The month and year ended with heavy, wet snow blanketing parts of the upper Midwest on December 29. Watertown, SD posted daily records for precipitation (0.89 inch) and snowfall (6.0 inches) on the 29th.

4. 2005 Calendar Year Runoff

Calendar Year runoff for the period January through December 2005 for the area above Sioux City, Iowa, totaled 20.4 MAF, 81 percent of normal runoff based on the historical period of 1898-1998, as shown in ***Table 1***. The 20.4 MAF in 2005 represents a runoff slightly higher than the lower quartile (19.5 MAF) runoff as shown on ***Figure 4***. Monthly runoff during 2005 above Sioux City, Iowa varied from a low of 43 percent of normal in March and April to a high of 112 percent of normal in December. ***Figure 5*** indicates the monthly variation of runoff for CY 2005.

The observed monthly runoffs for CY 2005 from Fort Peck downstream to Sioux City, Iowa by major river reach are presented in ***Table 2***. The table describes the annual runoff by month and is the basic compilation of the month-by-month runoff into the System. This forecast forms a basis for intra-system balancing of storage accumulated in the projects and is updated by the Reservoir Control Center on the first of each month to forecast the runoff for the remainder of the year. The monthly accumulation of actual runoff is shown under the "Accumulated Summation above Sioux City" column. As the season progresses and the actual runoff is accumulated, the forecast becomes more reliable. The majority of the annual runoff has usually occurred by the end of July, and the remainder of the year can be estimated with a greater degree of accuracy.

C. System Regulation

1. System Regulation – January to December 2005

System storage on January 1, 2005 was 35.2 MAF, 3.5 MAF less than the System storage on January 1, 2004. Winter System releases were established at 12,000 cfs, the minimum releases necessary to provide for adequate water supply downstream of the System. The System storage dropped slightly during January. February 1 System storage was 35.0 MAF. The System storage on March 1 was 35.4 MAF, 21.6 MAF below the desired 57.0 MAF top of carryover multiple use zone level.

Missouri River Mainstem
Annual Runoff at Sioux City, Iowa

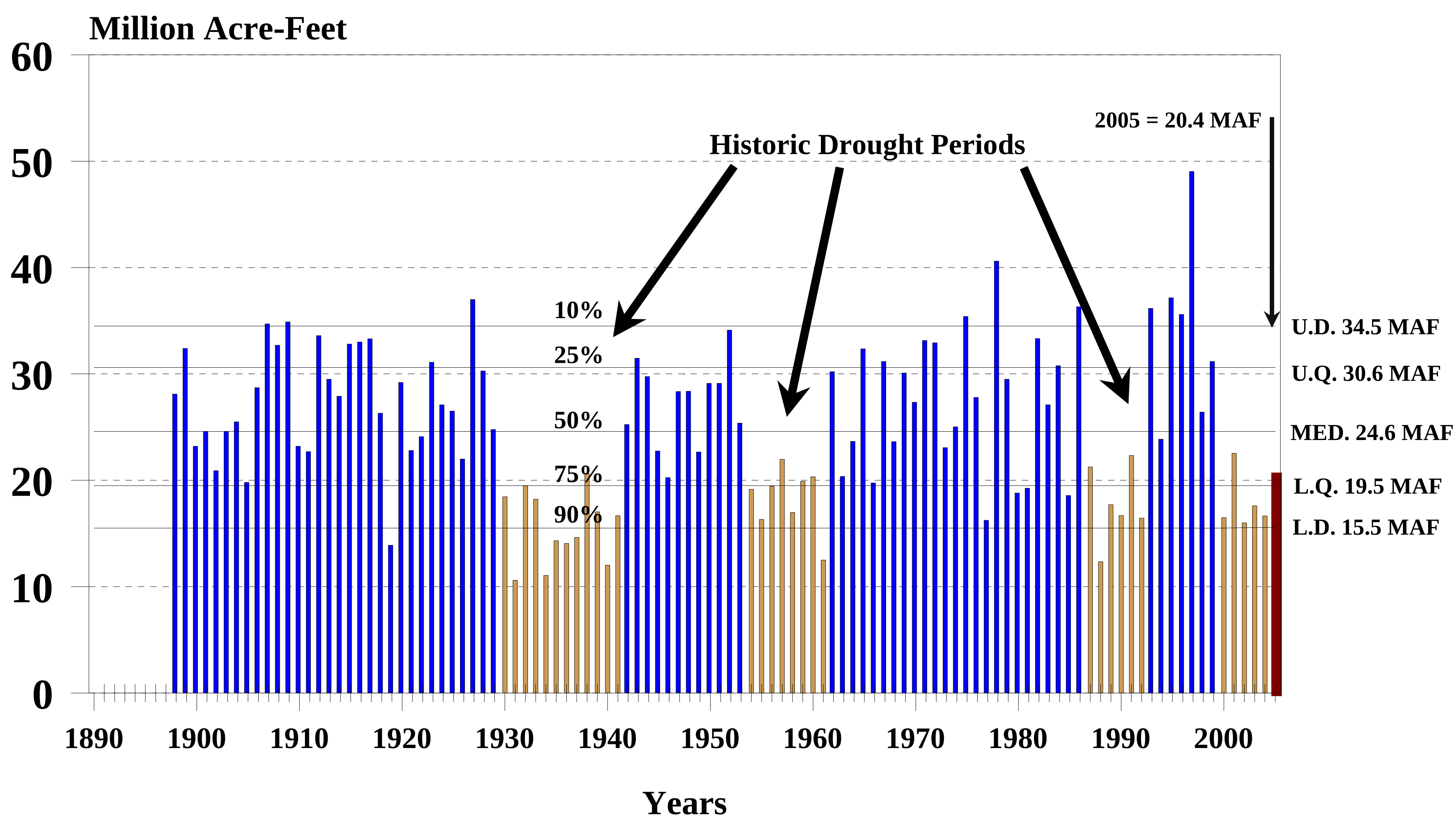
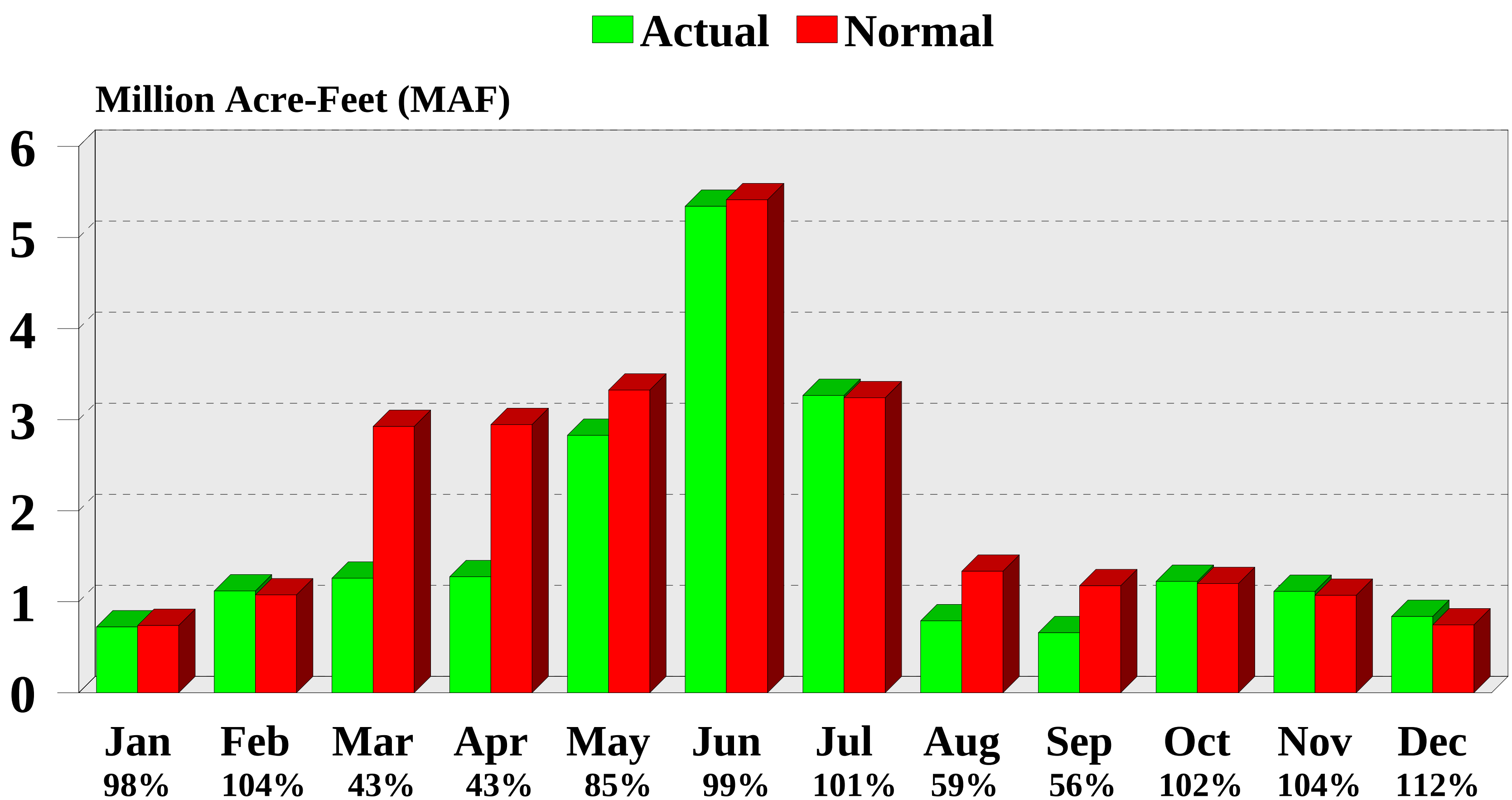


Figure 4

Figure 5

2005 Missouri River Runoff
Above Sioux City, Iowa



2005 Runoff : 20.4 MAF - 81% of normal
Normal Runoff: 25.2 MAF

The plan for System releases to provide downstream flow support during the 2005 navigation season for the tern and plover nesting season was a steady release-flow-to target (SR-FTT) plan, which is discussed in detail in the 2004-2005 AOP. Based on previous years nesting season results, it was anticipated that sufficient habitat would be available above the anticipated release rates to provide for successful nesting. Due to relatively moist lower basin conditions and Omaha District-planned deterrent measures to prevent nesting on low elevation habitat, an initial steady release of 23,000 cfs was selected, in coordination with the Service, for the 2005 nesting season.

Flow support for the 2005 navigation season began on March 23 at Sioux City, Iowa; March 25 at Omaha, Nebraska; March 26 at Nebraska City, Nebraska; March 28 at Kansas City, Missouri; and April 1 at the mouth of the Missouri River near St. Louis, Missouri. System releases on March 21 were 24,000 cfs in order to meet minimum service flow targets at the downstream target locations of Nebraska City (31,000 cfs) and Kansas City (35,000 cfs). As a water conservation measure the flow targets at Sioux City (25,000 cfs) and Omaha (25,000) were not met in late March and early April since there was no barge traffic those reaches.

On April 1st System storage was 35.6 MAF, 4.1 MAF less than the previous year's April 1 System storage (39.7 MAF). The plains snowmelt produced a March-April runoff of 2.5 MAF above Sioux City, which is 42% of normal. Runoff volumes above Sioux City for May, June and July were 2.8, 5.3, and 3.3 MAF, respectively. Normal runoff for those months is 3.3, 5.4, and 3.2 MAF, respectively. Although the mountain snowpack was much below normal, significant rain during May and June pushed the May-July runoff above Sioux City to 95% of normal.

For the 2005 calendar year, System storage peaked on July 17 at 38.9 MAF. The System storage peak for the previous year was 39.8 MAF. The end-of-July System storage was 38.5 MAF, 21.7 MAF less than 1967-2004 average (60.2 MAF). System storage began a steady decline through the late summer, then held nearly steady during the fall. End-of-month storages were: August, 37.3 MAF; September, 36.2 MAF; October, 36.3 MAF; November, 36.4 MAF; and December, 36.0 MAF. The end of December System storage was 0.7 MAF more than the previous year and 18.0 MAF less than 1967-2004 average. The end of month water storage for December was the second lowest end of year System storage since the System filled in 1967. The lowest System storage during the calendar year occurred on January 20 at 34.8 MAF. Due to low storages, the navigation season was shortened by 48 days from the normal ending date of December 1st at St. Louis, Missouri.

As per Section 7-03.6.1 of the Master Manual, the "seasons" are as follows: Winter (December, January and February); Non-summer open water, Spring (March and April), Summer open water (May, June, July and August); and Non-summer open water, Fall (September, October and November).

2. Fort Peck Regulation – January to December 2005

a. General

Fort Peck, the third largest Corps storage reservoir, serves all authorized purposes. Fort Peck's primary functions are: (1) to capture the mountain and plains snow and localized rainfall runoff from the large drainage area above Fort Peck, which are metered out at controlled release rates to meet the System-authorized purposes while reducing flood damages in the Fort Peck to Garrison reach; (2) to serve as a secondary storage location for water accumulated in the System from reduced System releases due to major downstream flood control regulation, thus helping to alleviate large pool increases in Garrison, Oahe, and Fort Randall; and (3) to provide the extra water needed to meet all System authorized purposes that draft storage during low-water years.

Table 3 lists the average monthly releases and inflows in cfs and the end-of-month (EOM) pool elevation in feet msl for Fort Peck for the 2005 and 2004 as well as the averages since the System first filled in 1967.

b. Winter Season 2005

The Fort Peck reservoir level began 2005 at elevation 2198.9 feet msl, 35.1 feet below the annual flood control zone and 7.9 feet below the elevation for this same date the previous year. The reservoir elevation declined to 2198.25 feet msl on January 22, its lowest elevation since the System first filled in 1967.

c. Winter River and Ice Conditions Below Fort Peck

No special release reductions were required to prevent ice-jam flooding. Ice jams were not a threat in 2005 due to the low flows downstream from Fort Peck. December, January and February discharges where the second lowest since the System filled in 1967. Ice cover formation on the Missouri River began on December 23-24, 2004, when the Missouri River stage rose over 3.5 feet in the Wolf Point, Montana area. The stage peaked near 6.8 feet on January 8, 2005, which is over 4 feet below flood stage and 1.55 feet higher than last year's peak. The Missouri River at Culbertson, Montana had a steady rise from early January 4 to peak at a stage of 7.14 feet on January 8, 2005. No reports of ice-affected flooding on the Missouri River below Fort Peck Dam were recorded during the 2005 winter season. The Fort Peck reservoir was free of ice on March 25th.

d. Non-Summer Open Water Season, Spring 2005

The releases were increased from 4,500 cfs in March to 5,000 cfs in April and to 5,500 cfs in May and June. These record low releases in May and June were scheduled to provide a rising reservoir level at Fort Peck during the fish spawn while still meeting the minimum flow requirements for downstream irrigation. The reservoir level at the beginning of the navigation season (April 1) was 2198.5 feet msl, 7.0 feet lower than the level at the start of the 2004 navigation season.

e. Open Water Season 2005

Summer release rates, which are generally higher than spring releases due to the increased demand for hydropower, were well below average, but similar to 2004.

f. Non-Summer Open Water Season, Fall 2005

Releases were reduced in mid-September when irrigation ceased for the season. Releases were maintained near the minimum level during October and November, then increased to the winter release rate in December when power demands increase.

g. Summary

The highest Fort Peck reservoir level during 2005 occurred on July 13 at 2203.7 feet msl. The lowest reservoir level during 2005, which was also a new record low, occurred on January 22nd at 2198.25 feet msl. The previous record low before the current 6-year drought was 2208.7 feet msl in April 1991. The average annual inflow of 6,900 cfs during calendar year 2005 was 68% of normal (1967-2005). The average annual release of 5,600 cfs during calendar year 2005 was 59% of normal. In 2005, Fort Peck did not rise into the annual flood control and multiple use zone, which extends from 2234.0 to 2250.0 feet msl.

Table 3
Fort Peck – Inflows, Releases and Elevations

Month	Ave Monthly Inflow (cfs)			Ave Monthly Release (cfs)			EOM Elevation (ft msl)		
	2005	2004	1967-2005	2005	2004	1967-2005	2005	2004	1967-2005
January	4,900	5,200	7,300	6,000	8,900	11,100	2198.5*	2205.3	2229.9
February	5,200	5,400	8,900	5,400	8,800	11,500	2198.3*	2204.0	2229.1
March	5,400	9,700	12,200	4,500	5,700	8,300	2198.6*	2205.5	2230.2
April	5,300	5,300	10,400	5,200	6,800	7,700	2198.6*	2204.9	2230.9
May	8,300	6,700	15,400	5,400*	10,200	9,300	2199.6*	2203.4	2232.4
June	14,500	8,200	19,000	5,400*	6,600	10,000	2203.0*	2203.8	2234.7
July	7,900	4,500	12,500	6,600	7,200	10,300	2203.2	2202.4*	2234.9
August	5,900	4,200	8,000	7,000	6,900	10,200	2202.2	2200.9*	2233.7
September	6,400	5,100	7,900	5,600	6,100	9,100	2202.0	2199.8*	2232.9
October	6,700	5,400	7,400	4,200	4,100	8,300	2202.6	2199.8*	2232.3
November	6,700	5,400	7,300	4,600	4,300	8,700	2202.9	2199.8*	2231.5
December	5,100	4,100	6,700	7,800	5,500	9,800	2201.6	2198.9*	2230.3

* monthly minimum of record

3. Garrison Regulation – January to December 2005

a. General

Garrison, the largest Corps storage reservoir, is another key player in the regulation of the System. Its primary functions are (1) to capture the snowmelt runoff and localized rainfall runoff from the large drainage area between Fort Peck and Garrison, which are metered out at controlled release rates to meet the System authorized purposes, while reducing flood damages in the Garrison to Oahe reach, particularly the urban Bismarck area; (2) to serve as a secondary storage location for water accumulated in the System from reduced System releases due to major downstream flood control regulation, thus helping to alleviate large pool increases in Oahe and Fort Randall; and (3) to provide the extra water needed to meet all mainstem authorized purposes that draft storage during low water years.

Table 4 lists the average monthly releases and inflows in cfs and the EOM pool elevation in feet msl for Garrison for 2005 and 2004 as well as the averages since the System filled in 1967.

b. Winter Season 2005

Releases from Garrison were below normal for a fifth consecutive winter season. Garrison began 2005 at a record low elevation of 1810.0 feet msl, over 27 feet below the base of the annual flood control and multiple use zone and 8.4 feet below the reservoir level a year earlier. The reservoir declined throughout the winter and spring season to a record low elevation of 1805.8 feet msl on May 11. This elevation is nearly 32 feet below the base of the annual flood control and multiple use zone (1837.5 ft msl).

c. Winter River and Ice Conditions Below Garrison

The Missouri River in the Bismarck, North Dakota area rose over 2 feet on January 2-7, 2005 during river ice cover formation. The ice-cover conditions were stable and continuous from January 2nd through March 5th. The peak ice-affected Missouri River stage at Bismarck was 9.95 feet on January 17, 2005. This was well below the Bismarck flood stage of 16 feet and the Corps' winter freeze-in stage target of 13 feet. Garrison reservoir was free of ice on April 11.

d. Non-Summer Open Water Season, Spring 2005

The releases were increased from 12,000 to 19,500 cfs on April 4 to provide a steady to rising pool at Oahe during the forage fish spawn. The reservoir level at the beginning of the navigation season (April 1) was 1808.7 feet msl, 6.9 feet lower than the level at the start of the 2005 navigation season.

e. Open Water Season 2005

The Garrison reservoir pool level fell during the critical early portion of its forage fish spawn bottoming out at a new record low of 1805.8 feet msl on May 11. Beneficial rains and the melting of snowpack increased the pool over 9 feet by the end of June. The Garrison reservoir peaked in July 1817.7 feet msl, nearly 12 feet above the low, which was set earlier in the year in May. Releases during the summer were maintained in the 15,000 to 15,500 cfs range through mid-September when irrigation below the project ceased. A daily peaking pattern was established at Garrison during the nesting season to protect birds nesting below the project.

f. Non-Summer Open Water Season, Fall 2005

Releases in October and November were maintained in the 12,000 to 13,000 cfs range, followed by slightly higher December releases to provide hydropower during winter demand increases.

g. Summary

No water was transferred to Lake Audubon during the 2005 calendar year. Buford-Trenton pumping costs totaled $13,634.69 for 2005. The highest Garrison reservoir level during 2005 occurred on July 17th at 1817.7 feet msl. The lowest reservoir level during 2005, which was also a new record low, occurred on May 11th at 1805.8 feet msl. The previous record low before the current drought was 1815.0 feet msl in May 1991. The average annual inflow of 16,100 cfs during calendar year 2005 was 70% of normal (1967-2005). The average annual release of 14,600 cfs during calendar year 2005 was 67% of normal. In 2005, Garrison did not rise into the annual flood control zone, which extends from 1837.5 to 1850.0 feet msl.

Table 4
Garrison – Inflows, Releases and Elevations

Month	Ave Monthly Inflow (cfs)			Ave Monthly Release (cfs)			EOM Elevation(ft msl)		
	2005	2004	1967-2005	2005	2004	1967-2005	2005	2004	1967-2005
January	9,700	12,300	15,500	15,400	19,200	23,300	1808.4*	1816.7	1833.4
February	12,400	13,600	19,300	13,000*	23,100	24,700	1808.2*	1814.3	1832.4
March	13,900	21,900	27,800	12,100	16,700	19,900	1808.7*	1815.6	1833.9
April	10,200*	13,600	22,900	17,400	16,900	19,500	1806.6*	1814.7	1834.4
May	24,600	18,300	28,500	16,500	15,800	21,600	1808.8*	1815.3	1835.6
June	38,400	23,600	45,900	15,000	18,000	23,400	1814.9*	1816.5	1839.6
July	25,200	18,300	32,900	15,200	17,900	24,900	1817.2	1816.5*	1840.8
August	11,200	11,100	18,500	15,500	17,200	24,600	1815.8	1814.3*	1839.1
September	10,200	12,600	16,900	14,100	15,000	21,000	1814.1	1813.3*	1837.9
October	14,000	12,400	17,600	12,600	11,500	19,400	1814.0	1813.1*	1837.2
November	12,900	11,600	16,200	13,400	12,700	20,400	1813.5	1812.3*	1836.0
December	11,000	8,400*	14,100	15,400	15,200	20,700	1812.0	1810.0*	1834.5

* monthly minimum of record

4. Oahe and Big Bend Regulation – January to December 2005

a. General

Oahe, the second largest Corps storage reservoir, serves all authorized purposes. The Oahe Project's primary functions are (1) to capture plains snow and localized rainfall runoff from the large drainage area between Garrison and Oahe, which are metered out at controlled release rates to meet the System authorized purposes, while reducing flood damages in the Oahe to Big Bend reach, especially in the urban Pierre and Fort Pierre areas; (2) to serve as a primary storage location for water accumulated in the System from reduced System releases due to major downstream flood control regulation, thus helping to alleviate large reservoir level increases in Big Bend, Fort Randall and Gavins Point; and (3) to provide the extra water needed to meet all System authorized purposes that draft storage during low-water years, particularly downstream water supply and navigation. In addition, hourly and daily releases from Big Bend and Oahe fluctuate widely to meet varying power loads. Over the long term, their release rates are geared to back up navigation releases from Fort Randall and Gavins Point in addition to providing storage space to permit a smooth transition in the scheduled annual fall drawdown of Fort Randall. Big Bend, with less than 2 MAF of storage, is primarily used for hydropower production, so releases from Oahe are generally passed directly through Big Bend.

Table 5 lists the average monthly releases and inflows in cfs and the EOM pool elevations in feet for Oahe for 2005 and 2004 as well as the averages since the System first filled in 1967.

Table 6 lists the average monthly releases and inflows in cfs and the EOM pool elevations in feet for Big Bend for 2005 and 2004 as well as the averages since the System first filled in 1967.

b. Winter Season 2005

Flooding in the Pierre-Fort Pierre area, especially at street intersections in the Stoeser Addition, has been a recurring problem since 1979. High Oahe releases, coupled with the formation of river ice cover in the LaFrambois Island area, have historically caused water to back up into a storm sewer outlet flooding street intersections. The city of Pierre installed a valve on the Stoeser Addition storm sewer in the fall of 1998 to prevent winter flooding; however, Oahe releases will continue to be constrained at times to prevent flooding at other locations. No flooding problems were experienced in this area during the winter of 2005. A period of single digit high air temperatures from January 13-16 produced conditions ideal for ice formation on the Missouri River in the Pierre-Fort Pierre area. On January 13 the Oahe project office located the head of an ice formation on the Missouri River at River Mile (RM) 1055, near Antelope Creek (just downstream of Farm Island). The head of ice was approaching a critical location and the RCC monitored the situation. By January 14, the head of the ice cover had advanced upstream to RM 1057.5, the lower end of Farm Island, which was 2.5 miles further upstream than a day earlier. As a precaution, a minimum of 70 MW was set at the Oahe powerplant from January 14-18, 2005 and the Oahe project office coordinated with the City of Pierre to remind them to close the gate on the outlet structure. No damages were reported from the ice formation. Oahe reservoir was free of ice throughout the winter season.

Big Bend was regulated to follow power peaking requirements with hourly releases varying widely. The daily average flow varied between 0 and 36,200 cfs.

A settlement agreement was approved in an order of dismissal by the United States District Court, District of South Dakota on August 8, 2003, in the case of Lower Brule Sioux Tribe et al. v. Rumsfeld, et al. (Civil No. 02-3014 (D.S.D.)). The agreement provides that the Corps will consult with the Lower Brule Tribe and the Crow Creek Sioux Tribe during any review and revision of the Missouri River Master Water Control Manual. This agreement also provides that the Corps will coordinate the regulation of the Big Bend Project and the water level of Lake Sharpe with the two Tribes to include the following: the Corps will normally strive to maintain an reservoir level at Lake Sharpe between elevation 1419 feet msl and 1421.5 feet msl; when the level of Lake Sharpe drops below elevation 1419 feet msl or exceeds elevation 1421.5 feet msl, the Chief of the Water Management Division will provide notice to such persons as the Tribes shall designate in writing; when it is anticipated that the water level will drop below 1418 feet msl or rise above 1422 feet msl, or in the event the water level falls below 1418 feet msl or rises above 1422 feet msl, the Commander, Northwestern Division, or his designee, shall immediately contact the Chairpersons of the Tribes or their designees to notify them of the situation and discuss proposed actions to remedy the situation. During 2005, the Big Bend reservoir level varied in a narrow range from elevation 1419.5 to 1421.3 feet msl. As per the settlement agreement no additional coordination was necessary.

c. Non-Summer Open Water Season, Spring 2005

Lake Sharpe was free of ice on March 12th. Releases from Oahe are generally set lower during weekends than on weekdays. The normal regulation is to maintain Oahe's releases above 3,000 cfs during weekend daylight hours beginning in early April. This minimum release is scheduled to enhance downstream fishing and boating use during the recreation season. During the spring of 2005, no minimum release rate criteria were established for Oahe. Due to the ongoing drought conditions and ensuing low reservoir levels, making large releases during shorter periods of the day rather than a constant lower release maximized power-producing revenues.

In 2005 Oahe and Fort Peck were given priority during the forage fish spawn. As a result, while Oahe's releases were adjusted to back up System releases for downstream flow support, Garrison's releases were increased to provide a steady to rising pool during the forage fish spawn from April through May. After reaching a minimum of 1573.5 feet msl in early April, the Oahe reservoir rose steadily through June ending the period at 1577.6 feet msl.

The reservoir level at the beginning of the navigation season (April 1) was 1574.3 feet msl, almost 8 feet lower than the level at the start of the 2004 navigation season.

d. Open Water Season 2005

After remaining nearly level through July, the Oahe reservoir elevation declined in August. The pool level at the end of August was 1573.1 feet msl, more than 30 feet below the 1967-2005 average of 1603.2 feet msl.

e. Non-Summer Open Water Season, Fall 2005

The Oahe reservoir elevation continued to drop in September and reached its annual minimum in early September at 1572.2 feet msl, just 0.2 feet higher than the record low elevation, which was set in 2004. Releases were reduced in September to initiate the annual fall drawdown of the Fort Randall reservoir prior to the close of the navigation season. Low releases were maintained in October and November to facilitate the Fort Randall drawdown. Higher releases were scheduled in December for winter energy production.

f. Summary

The highest Oahe reservoir level during the 2005 calendar year occurred on July 2nd at 1578.4 feet msl. The lowest reservoir level during the 2005 calendar year, which was 0.2 feet above the record low (set in 2004), occurred on September 4 at 1572.2 feet msl. The previous record low before the current 6-year drought was 1580.7 feet msl in November 1989. The average annual inflow to Oahe of 15,900 cfs was 62% of average. The average annual release from Oahe (15,000 cfs) was 61% of average. In 2005, Oahe did not rise into its annual flood control zone, which extends from 1607.5 to 1617.0 feet msl. Big Bend ended the year at 1420.5 feet msl, within the normal regulating range.

Table 5
Oahe – Inflows, Releases and Elevations

Month	Ave Monthly Inflow (cfs)			Ave Monthly Release (cfs)			EOM Elevation (ft msl)		
	2005	2004	1967-2005	2005	2004	1967-2005	2005	2004	1967-2005
January	15,500	18,200	23,800	17,000	15,400	21,500	1575.2*	1577.6	1600.1
February	14,900	23,900	28,200	10,900*	18,400	18,700	1576.2*	1579.2	1601.9
March	13,700*	24,800	31,500	19,200	14,700	19,000	1574.4*	1582.1	1604.4
April	17,800	18,700	27,100	16,900	19,300	21,800	1574.7*	1581.6	1605.2
May	19,600	16,600	28,300	12,900	27,800	22,700	1576.5*	1578.4	1606.0
June	19,900	20,200	28,700	15,400	24,600	25,900	1577.6	1576.8*	1606.0
July	16,100*	17,500	27,500	19,500	24,800	30,000	1576.4	1574.3*	1605.1
August	15,800	19,500	25,900	23,500	23,900	33,100	1573.1	1572.1*	1603.2
September	15,600	18,400	22,400	14,900	12,900	29,900	1572.9*	1573.2	1601.2
October	13,200	13,300	20,800	7,800	7,000*	24,700	1573.9*	1574.8	1600.0
November	14,100	13,500	21,700	7,400	7,700	23,500	1575.6*	1576.0	1599.4
December	14,800	14,300	21,000	14,700	13,900	21,500	1575.3*	1575.8	1599.0

* monthly minimum of record

Table 6
Big Bend – Inflows, Releases and Elevations

Month	Ave Monthly Inflow (cfs)			Ave Monthly Release (cfs)			EOM Elevation (ft msl)		
	2005	2004	1967-2005	2005	2004	1967-2005	2005	2004	1967-2005
January	16,000	14,100	21,300	15,500	13,900	21,200	1420.8	1420.6	1420.5
February	10,400*	17,400	18,800	10,900*	16,800	18,800	1420.2	1421.1	1420.4
March	17,900	13,700	19,700	17,900	14,300	19,700	1420.0	1420.4	1420.3
April	16,200	17,900	22,300	15,400	18,100	22,000	1420.6	1420.0	1420.5
May	13,000	26,100	23,100	12,800	25,200	23,000	1420.6	1420.8	1420.4
June	14,900	22,800	26,200	15,100	23,500	26,000	1420.0	1419.7*	1420.3
July	17,400	23,300	29,500	15,900	22,200	29,100	1421.1	1420.5	1420.3
August	21,500	22,500	32,600	21,700	22,100	32,200	1420.5	1420.3	1420.3
September	13,900	12,700	29,600	13,400	12,400	29,200	1420.4	1420.1	1420.3
October	7,200	6,600*	24,700	6,300	5,600*	24,100	1421.0	1421.0	1420.5
November	7,100	7,200	25,200	7,200	7,200	23,300	1420.5	1421.0	1420.4
December	13,700	12,900	21,400	13,800	13,300	21,200	1420.5	1420.3	1420.5

* monthly minimum of record

5. Fort Randall Regulation – January to December 2005

a. General

Fort Randall, the fourth largest Corps storage reservoir, serves all authorized purposes. Fort Randall's primary functions are: (1) to capture plains snow and localized rainfall runoffs in the drainage area from Big Bend to Fort Randall, which are metered out at controlled release rates to meet the System authorized purposes while reducing flood damages in the Fort Randall reach, where several areas have homes and cabins in close proximity to the river; (2) to serve as a primary storage location along with Oahe for water accumulated in the System when System releases are reduced due to major downstream flood control regulation, thus helping to alleviate large pool increases in the very small Gavins Point Project; (3) to provide a location to store the water necessary to provide increased winter energy to the basin by allowing an annual fall drawdown of the reservoir to occur with a winter reservoir refilling that is unique to Fort Randall; and (4) to provide the extra water needed to meet all System authorized purposes, particularly navigation and downstream water supply, that draft storage during low water years.

Table 7 lists the Fort Randall average monthly releases and inflows in cfs and the EOM pool elevation in feet msl for 2005 and 2004 as well as the averages since the System was first filled in 1967.

b. Winter Season 2005

The February releases were reduced when Gavins Point releases were set at a 9,000 cfs open water release rate prior to the start of the navigation season.

c. Non-Summer Open Water Season, Spring 2005

The March releases were maintained at reduced levels as Gavins Point releases were also maintained on the 9,000 cfs open water release rate prior to the start of the navigation season. Releases were adjusted as needed to back up System releases from Gavins Point and to maintain the Gavins Point pool in the desired range. A daily peaking pattern was established at Fort Randall during the nesting season to provide flexibility to regulate over a range of releases while minimizing impact to birds nesting below the project. The Fort Randall reservoir was free of ice by March 10th.

d. Open Water Season 2005

Due to the 48-day shortening of the navigation season, the annual fall drawdown of Fort Randall was begun after Labor Day.

e. Non-Summer Open Water Season, Fall 2005

The 48-day shortened navigation season resulted in earlier than normal reduced flows in October 2005. The System release was lowered to 11,000 cfs on October 9th and then lowered to 9,000 cfs by October 15th.

f. Summary

The highest Fort Randall reservoir level during the 2005 calendar year occurred on April 24th at 1357.4 feet msl. The lowest reservoir level during the 2005 calendar year occurred on December 7th at 1337.8 feet msl. The average annual inflow to Fort Randall of 15,700 cfs was 61% of average. The average annual release from Fort Randall of 15,300 cfs was 60% of average. In 2005, Fort Randall did rise into its annual flood control zone, which extends from 1350.0 to 1365.0 feet msl. However, the normal summer regulating pool level at Fort Randall is 1355.0 feet msl. Normal regulation of Fort Randall includes the lowering of the pool level at the end of the navigation season to 1337.5 feet msl, 17 feet below the top of the flood control zone, to make room for winter generation releases from the upper reservoirs. The navigation season was shortened by a record 48 days in the 2005 season, as per the new Master Manual. As in 2004, this earlier-than-normal drawdown of the Fort Randall reservoir caused some concern that the city of Oacoma's water supply intake may be "out of the water". Once again, these concerns were not realized; the Oacoma water supply intake levels are affected by Big Bend releases and by the "upper pool" created by the White River delta rather than the pool levels at the Fort Randall dam.

Table 7
Fort Randall – Inflows, Releases and Elevations

Month	Ave Monthly Inflow (cfs)			Ave Monthly Release (cfs)			EOM Elevation (ft msl)		
	2005	2004	1967-2005	2005	2004	1967-2005	2005	2004	1967-2005
January	17,200	15,100	22,600	12,300	14,600	15,500	1346.3	1343.8	1347.3
February	12,500*	19,400	20,500	6,200	10,600	13,700	1350.9	1350.6	1352.2
March	19,300	15,800	22,300	13,300	10,400	16,500	1355.4	1354.6	1356.2
April	18,800	19,600	24,600	16,100	19,900	22,400	1357.0	1354.3	1357.6
May	15,800	27,900	25,800	18,800	25,700	26,000	1354.6	1355.7	1357.4
June	19,900	26,100	28,500	16,500	26,600	27,900	1356.8	1355.0	1357.5
July	17,300	24,000	30,400	20,800	25,400	31,400	1353.8	1353.9	1356.4
August	23,100	23,700	33,300	23,100	24,300	34,100	1353.6	1352.8	1355.4
September	14,500	14,500	30,100	24,200	22,900	34,500	1345.0	1345.5	1351.5
October	6,900	5,800*	24,000	10,400*	12,000	33,400	1341.2	1339.0	1343.2
November	7,100	7,300	23,100	9,300	7,700	30,000	1338.7	1338.3	1336.4
December	15,600	14,700	22,300	12,400	11,200	17,600	1341.9	1341.8	1341.1

* monthly minimum of record

6. Gavins Point Regulation – January to December 2005

a. General

Gavins Point, the most downstream of the System dams, is primarily used as a re-regulating dam to level out the release fluctuations of the upper dams to better serve downstream purposes. With a total storage of only 500,000 acre-feet, it provides very little flood control and is generally maintained in a narrow reservoir elevation band between 1205.0 and 1208.0 feet msl. Due to the limited storage, releases from Gavins Point must be backed up with releases out of the upper reservoirs. Gavins Point is the key location in the initiation of release reductions for downstream System flood control. Even though it has only a small amount of storage space for flood control, this volume is usually adequate to perform significant downstream flood control by coordinating Gavins Point release reductions with Fort Randall's. Releases greater than the powerplant capacity, near 35,000 cfs, are passed through the spillway.

Table 8 lists the Gavins Point average monthly releases and inflows in cfs and the EOM pool elevation in feet msl for 2005 and 2004 as well as the averages since the System was filled in 1967.

b. Winter Season 2005

The Gavins Point average daily release was below the normal winter release rate for the entire winter season. The average February inflow of 9,100 cfs and the average February release of 9,900 cfs were record minimums.

c. Winter River and Ice Conditions Below Gavins Point

The Gavins Point winter release rate was varied between 12,000 cfs and 15,000 cfs in January and between 9,000 cfs and 12,000 cfs in February. The first 2005 ice reports were made on January 4; the reports indicated 15 to 35 percent floating ice with pans ranging from 0 to 35 feet in the Missouri River from Sioux City, IA to Omaha, NE. Another round of sub-zero temperatures from January 14-18 produced the largest volumes and the greatest extent of floating ice reported for the winter season. The reports showed from 10 to 85 percent floating ice with pads ranging from 5 to 25 feet in the Sioux City to Nebraska City reach of the Missouri River. Also, the Missouri River from Kansas City to RM 117 had reports of floating ice ranging from 20 to 40 percent. From January 26 through February 7, the Missouri River was free of floating ice as a period of much above normal temperatures ranging from 31°F to 65°F were recorded in the Omaha, NE area. From February 8-11 the last reports were made of floating ice on the Missouri River ranging from 5 to 50 percent floating ice and pads from 1 to 6 feet in the Sioux City to Omaha reach. The floating ice diminished over the next couple days and by February 14 no more floating ice was reported on the Missouri River below Sioux City.

d. Non-Summer Open Water Season, Spring 2005

Flow support for the 2005 navigation season began on the normal dates: March 23 at Sioux City, March 25 at Omaha, March 26 at Nebraska City, March 28 at Kansas City and April 1 at the mouth near St. Louis. The decision was made, for water conservation purposes, not to provide flow for support for commercial navigation at Sioux City and Omaha in early April since there was no barge traffic in those reaches. System releases ranged from 20,000 to 24,000 cfs in late March and early April. System releases were lowered to as low as 15,000 cfs (April 22) due to high incremental runoff downstream of Gavins Point. The flows at Sioux City ranged from 20,000 cfs to 29,000 cfs during this time. The flows at Omaha ranged from 25,000 cfs to 42,000 cfs during this time. The minimum service levels of 25,000 cfs, 31,000 cfs and 35,000 cfs at Omaha, Nebraska City and Kansas City, respectively, were met for the entire navigation season.

e. Open Water Season 2005

On May 2 System releases were increased to 23,000 cfs. From May 1 to May 23 System releases were varied – 23,000 cfs for one day and then 17,000 for two days – to entice the nesting Threatened and Endangered (T&E) species to form their nests on higher ground while conserving as much water as possible while meeting downstream flow support targets. This release pattern was continued through the rest of May. On May 23 a steady release of 23,000 cfs was maintained.

f. Non-Summer Open Water Season, Fall 2005

Releases to support navigation stopped on October 4, 2005, a 48-day shortening of the navigation season. This was the earliest that support for navigation was stopped. In 2004 releases to support navigation stopped on October 5, 2004, a 47-day shortening.

g. Summary

The highest Gavins Point reservoir level during the 2005 calendar year occurred on December 29 at 1208.5 feet msl. The lowest reservoir level during the 2005 calendar year occurred on July 5-8 at 1205.5 feet msl. The average annual inflow to Gavins Point of 17,500 cfs was 62 percent of average. The average annual release from Gavins Point of 17,400 cfs was 62 percent of average.

Table 8
Gavins Point – Inflows, Releases and Elevations

Month	Ave Monthly Inflow			Ave Monthly Release			EOM Elevation		
	2005	2004	1967-2005	2005	2004	1967-2005	2005	2004	1967-2005
January	13,900	15,400	17,700	13,700	16,100	17,600	1207.8	1205.8*	1207.6
February	9,100*	14,300	16,900	9,900*	13,700	17,800	1206.2	1207.1	1205.6
March	15,000	12,800	20,500	14,800	13,100	20,500	1206.6	1206.3	1205.5
April	19,000	21,600	26,400	19,200	21,600	26,200	1206.0	1205.8	1205.6
May	21,300	27,800	29,800	21,200	27,000	29,600	1205.9	1207.2	1205.9
June	22,000	28,200	31,200	21,600	28,600	30,900	1206.3	1205.8	1206.2
July	21,900	27,000	33,700	21,500	26,100	33,200	1206.7	1207.2	1206.8
August	24,000	25,300	35,800	23,400	25,000	35,400	1207.4	1207.3	1207.4
September	25,800	24,800	36,600	25,400	24,700	36,300	1207.6	1207.1	1207.7
October	12,500*	14,500	35,600	12,300*	14,100	35,500	1207.6	1207.5	1207.8
November	11,000	9,400	32,400	11,000	9,400	32,400	1207.3	1207.6	1207.6
December	14,800	12,400	19,800	14,300	12,400*	19,800	1208.2	1207.4	1207.4

* monthly minimum of record

D. Non-Routine Regulation and Other Items Pertaining to System Regulation

Numerous regulation activities are performed each year that, although at one time may have been considered special, are now considered routine. These include release restrictions from a particular project for a period of time to permit soundings, to facilitate limited construction within or adjacent to the downstream channel and to pattern releases to facilitate measurements of downstream discharges and water surface profiles. Events that occurred in connection with regulation activities during the past year that may be considered unusual, or recently have come to the attention of the Missouri River Basin Water Management Division, are discussed in the following paragraphs.

1. Lawsuits

On April 11, 2005, consolidated oral arguments were heard in two of the three Missouri River cases that were then pending before the Eighth Circuit Court of Appeals. These cases involved: (1) challenges to the Corps Master Manual and the USFWS Biological Opinion on regulation of the Missouri River Mainstem System; (2) litigation by the State of North Dakota to enforce state water quality standards at Lake Sakakawea that would limit releases from that reservoir for downstream navigation and other purposes; and, (3) a challenge to the Corps creation of 1200 acres of shallow water habitat. On August 16, 2005 the Eight Circuit Court issued decisions in the first two cases which are summarized below. After issuance of the two decisions, the remaining pending appeal challenging the creation of 1,200 acres of shallow water habitat under the provisions of the 2003 Supplemental Biological Opinion was dismissed by stipulation of the parties.

a. Clean Water Act Litigation

In this Clean Water Act case, the State of North Dakota had filed suit to enjoin the Corps from releasing water from the Garrison Project on the grounds that lowering the level of the reservoir would violate state-law water-quality standards. The district court had dismissed this complaint holding that the CWA preserves the sovereign immunity on behalf of the Corps when the Corps' authority to maintain navigation is at issue. The Eighth Circuit affirmed the District Court's dismissal of North Dakota's complaint. Subsequent to that decision the State of North Dakota has submitted a petition for U.S. Supreme Court review. That petition is currently under review by the Supreme Court.

b. Master Manual/Biological Opinion Litigation

The second of the two cases decided by the Eight Circuit involved consolidated appeals by various parties challenging the new manual issued by the Corps for regulation of the Missouri River mainstem reservoir system and biological opinions by the Service concerning those regulations. The District Court had granted summary judgment to the Corps and Service. The Eighth Circuit dismissed three claims as moot and affirmed the judgment of the district court on all remaining claims. Subsequent to this decision, three petitions for review have been submitted to the U.S. Supreme Court. These petitions are currently under review by that Court.

2. Gavins Point Spring Pulse

The Service's 2003 Amended Biological Opinion (Amended BiOp) called for a bimodal spring pulse releases from Gavins Point Dam for the benefit of the endangered pallid sturgeon, among other actions. Under the terms of the Amended BiOp, a plan for the bimodal spring pulse releases was to be implemented by March 2006.

The Corps, in coordination with the Service and with the assistance of the United States Institute for Environmental Conflict Resolution, coordinated with basin Tribal representatives, States, and stakeholders during the summer of 2005 in an attempt to develop a basin consensus for bimodal spring pulse release criteria meeting the requirements of the Amended BiOp. While this process was not successful in developing a basin consensus, it did assist the Corps in developing spring pulse release technical criteria for inclusion in the Master Manual. Recognizing the unique government-to-government relationship between American Indian Tribes and the United States, and in light of the Corps' Trust responsibilities and commitments pursuant to the March 2004 "Programmatic Agreement for the Regulation and Management of the Missouri River Mainstem System for Compliance with the National Historic Preservation

Act", additional consultation/meetings were held with Tribal representatives and members regarding the spring pulse release technical criteria to address Tribal issues.

An Environmental Assessment (EA) was prepared that addressed the purpose and need for the bimodal spring pulse releases from Gavins Point Dam. It concluded that the impacts associated with the bimodal spring pulse releases technical criteria were within the range of impacts identified for spring pulse alternatives analyzed in the earlier Master Manual Review and Update NEPA process, or less than the impacts identified by those alternatives. In addition, the Service confirmed that the technical criteria for bimodal spring pulse releases from Gavins Point Dam, if implemented in conjunction with a comprehensive adaptive management strategy, meet the intended purposes outlined in the 2003 Amended BiOp for 2006 and beyond. A Memorandum of Decision revising the Master Manual to include spring pulse technical criteria was signed on 28 February 2006. The technical criteria include sufficient safeguards to minimize impacts to authorized project purposes, basin Tribes, and both upstream and downstream river uses while providing potential benefits to the endangered pallid sturgeon. The bimodal spring pulse releases, as described in the technical criteria, would not be implemented in extreme drought conditions, thereby protecting upstream reservoir uses. The technical criteria do not modify existing downstream flow limits, thereby providing the same level of protection to downstream rivers users, who are concerned about interior drainage and groundwater issues.

The Corps is committed to monitoring both the physical and biological impacts of the bimodal spring pulse releases, including the response of the pallid sturgeon to the pulses, further evaluation of interior drainage and groundwater concerns, and potential impacts to cultural resources. Within an overall adaptive management strategy, results of monitoring will be used to develop future modifications to the criteria. If information becomes available through the research, monitoring and evaluation processes that indicates a change to the spring pulse technical criteria, then the adaptive management process, including any NEPA work required, will be followed to revise the Master Manual.

3. Fort Peck Mini-Test and Intrasystem Unbalancing

As described in last year's (2004-2005) AOP, the Fort Peck "mini-test" and the unbalancing of the three large upper reservoirs were not implemented due to low System storage. When System storage recovers sufficiently, the Corps anticipates that both these regulation plans will be implemented. The endangered species modified flow "mini-test," which was designed to monitor the effects of higher spring releases and warmer water released from the Fort Peck spillway, requires a reservoir elevation of approximately 2229 feet msl to avoid unstable flows over the spillway. The "mini-test" was not possible in 2005 because reservoir elevations during May and June were approximately 20 feet below the spillway crest elevation of 2225 feet msl.

The MRNRC previously has provided recommended guidelines (Table VII, 2004-2005 AOP) for unbalancing the upper three reservoirs to benefit reservoir fishery and the endangered interior least tern and threatened piping plover. As a result of the continuing drought conditions and low reservoir elevations, the guidelines did not recommend implementation measures to unbalance the reservoirs.

4. Summary of Drought Impacts

Calendar year 2005 was the sixth consecutive year of drought in the Missouri River basin. After falling below the previous record low in October 2003, System storage continued its downward trend in 2004 and early 2005 setting a new record low of 34.8 MAF on January 21, 2005, 6.0 MAF below the previous record low of 40.8 MAF set back in January 1991. System storage ended 2005 at 36.0 MAF, 0.8 MAF higher than the previous year. Because the bulk of the carryover multiple use storage is in the upper three reservoirs, Fort Peck, Garrison and Oahe reservoirs have also set new record low pool levels during the current drought: Fort Peck reservoir at elevation 2198.3 feet msl on January 23, 2005; Garrison reservoir at elevation 1805.8 feet msl on May 12, 2005; and, Oahe reservoir elevation at 1572.0 feet msl on August 29, 2004. Impacts of the drought have been felt across the basin. Municipal, rural, industrial, and irrigation water intakes in the reservoirs and along the river reaches have been forced to make modifications to maintain access to the water. Boat ramps have been extended, relocated or closed as the reservoir levels declined. Cold water habitat in the reservoirs has been dramatically reduced threatening the viability of the cold water fisheries. Cultural resources, once covered by water, are now exposed and vulnerable to additional erosion and looting. Noxious weeds have become even more problematic as thousands of acres of bare shoreline appear. Hydropower generation in 2005 was the second lowest on record since the System first filled in 1967, and the 2005 navigation season was shortened a record 48 days.

The only authorized purpose that is not adversely impacted by the drought is flood control, which is actually enhanced during drought conditions. The negative impacts of drought will be felt even after runoff returns to normal because of the time that will be required to refill the evacuated storage. Full service project releases to all purposes will not resume until the System storage has recovered to near normal levels, however, as System storage increases, improved service would be provided. On the contrary, if the drought persists, further reductions in service to authorized purposes will occur, and the lower the System storage declines, the more stringent the conservation measures become. Users who rely on the Missouri River need to closely monitor current and forecasted river and reservoir conditions and take necessary steps to ensure they can function through a wide range of river flows and reservoir levels.

E. Reservoir Releases and Storage

Reservoir elevations and storage contents of the System reservoirs at the end of July 2005 are presented in ***Table 9*** and the same information for CY 2005 is presented as ***Table 10***.

Table 9
Reservoir Levels and Storages – July 31, 2005

Project	Reservoir Elevation – feet msl		Water in Storage – 1,000 AF		
	Elevation	12-Month Change	Total	Above Min. Level*	12-Month Change
Fort Peck	2203.2	+0.8	9,472	5,261	115
Garrison	1817.2	+0.7	12,591	7,611	190
Oahe	1576.4	+2.1	10,958	5,585	418
Big Bend	1421.1	+0.6	1,687	66	-23**
Fort Randall	1353.8	-0.1	3,436	1,919	8
Gavins Point	1206.7	-0.5	376	55	-14
			38,520	20,497	694

*Net usable storage above minimum reservoir levels established for power, recreation, irrigation diversions, and other purposes.
**Big Bend area-capacity table revised May 2005.

Table 10
Reservoir Levels and Storages – December 31, 2005

Project	Reservoir Elevation – feet msl		Water in Storage – 1,000 AF		
	Elevation	12-Month Change	Total	Above Min. Level*	12-Month Change
Fort Peck	2201.6	+2.7	9,223	5,012	394
Garrison	1812.0	+2.0	11,368	6,388	432
Oahe	1575.3	-0.5	10,750	5,377	-74
Big Bend	1420.5	+0.1	1,649	28	-52**
Fort Randall	1341.9	+0.1	2,557	1,040	8
Gavins Point	1208.2	+0.8	418	97	23
			35,965	17,942	731

*Net usable storage above minimum reservoir levels established for power, recreation, irrigation diversions, and other purposes.
**Big Bend area-capacity table revised May 2005.

F. Summary of Results

1. Flood Control

Releases during 2005 were directed by continuation of the drought conservation measures and were implemented to conserve System water in storage. The storage crest was much less than the base of the annual flood control zone, and mountain snowpack was much below average. The expectation was, therefore, for a much below normal runoff, and water conservation measures were implemented to conserve the remaining storage according to master manual criteria.

The estimated total flood damages prevented by the System during 2005 was $109.2 million. The $109.2 million total damages prevented in the Missouri River basin includes $57.3 million in the Omaha District and $51.9 million in the Kansas City District. The damages prevented by the System along the Mississippi River are not yet available. The unindexed flood damages prevented by the System since construction now totals $18.3 billion, the bulk of which was prevented between 1993 and 1999 (see ***Figure 6A***). ***Figure 6B*** indicates the $1.2 billion cost in current dollars to reconstruct the System. Although the System prevents enormous amounts of damage, it is not capable of totally eliminating flooding along the Missouri River. No flood damages were incurred along the Missouri River in the Omaha District in CY2005.

The Kansas City District tributary reservoirs prevented significant flood damages during this past calendar year. The total damages prevented in the Kansas City District, exclusive of those prevented by the Missouri River System, was $60.4 million.

Figure 7 shows the actual regulated flows that were experienced at Sioux City, Iowa; Nebraska City, Nebraska; and St. Joseph, Missouri and the unregulated flows that would have been experienced if the System and tributary reservoirs had not been in regulation.

2. Irrigation

Federally developed irrigation projects are not being served directly from System reservoirs. Releases from the reservoirs, however, are being utilized by numerous private irrigators as well as Federally financed projects that take water from the river. Over 400 private irrigators pump directly from the reservoir or river reaches. Releases from the reservoirs during 2005 generally met the needs of irrigators.

3. Water Supply and Water Quality Control

Problems at intakes located in the river reaches and Mainstem reservoirs are related primarily to intake or river access problems rather than inadequate water supply. In emergency situations, short-term adjustments to protect human health and safety would be considered to keep intakes functioning.

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

Missouri River Mainstem

Cumulative Flood Damages Prevented

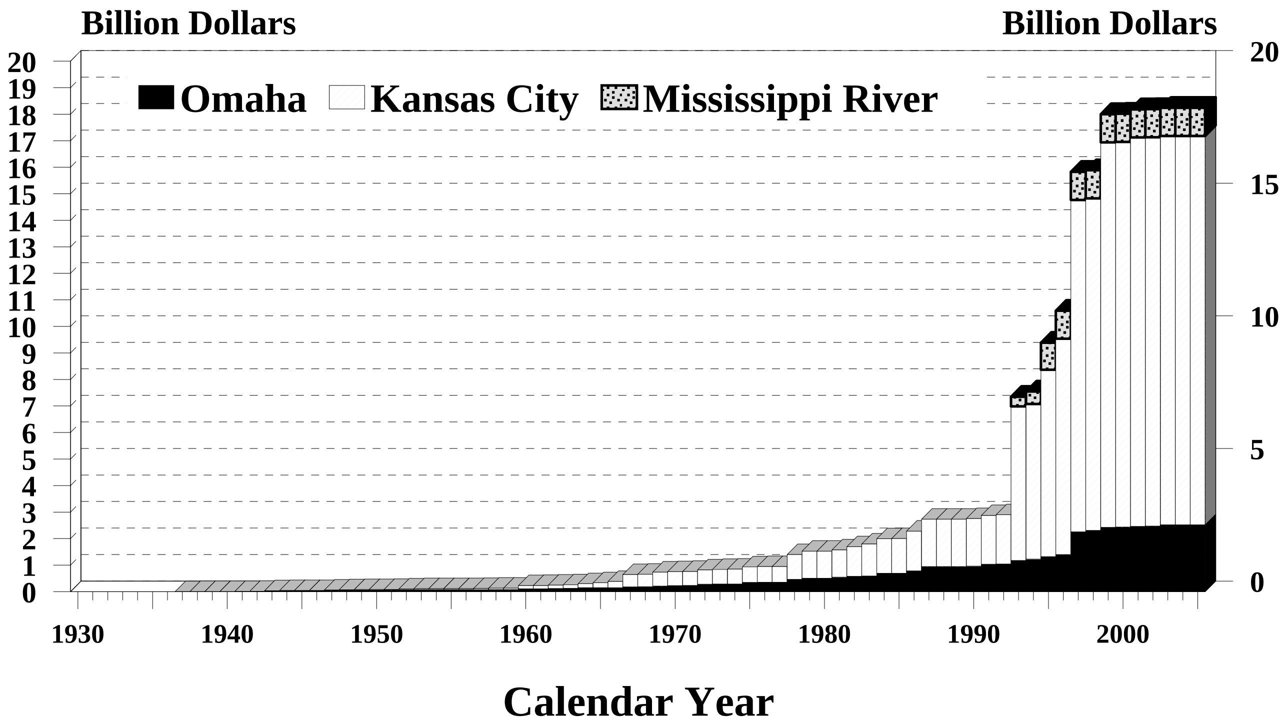


Figure 6A

Annual Flood Damages Prevented

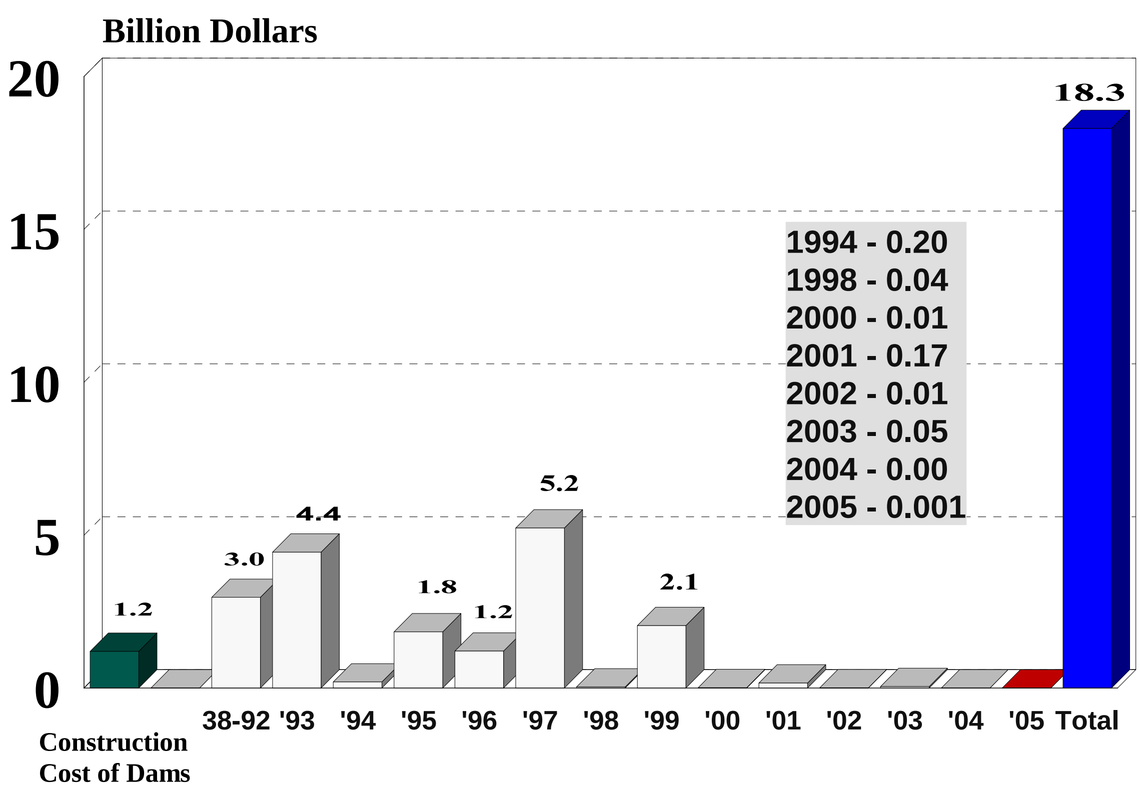
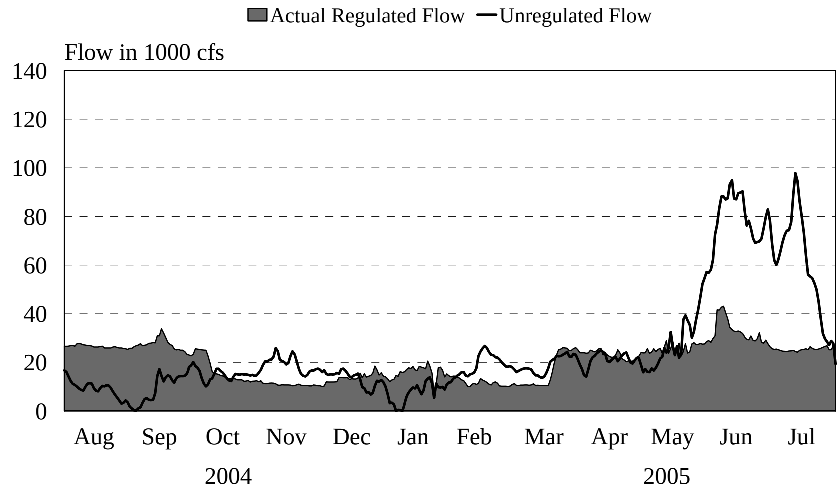


Figure 6B

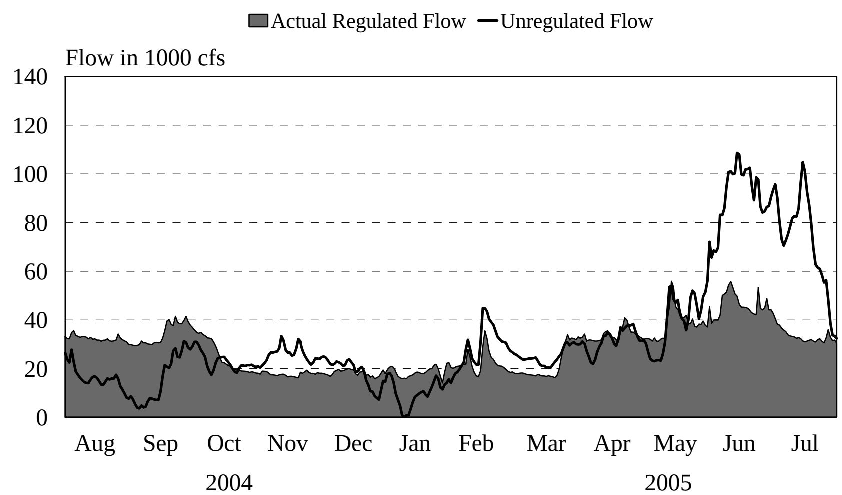
Sioux City

Regulated and Unregulated Flows



Nebraska City

Regulated and Unregulated Flows



St. Joseph

Regulated and Unregulated Flows

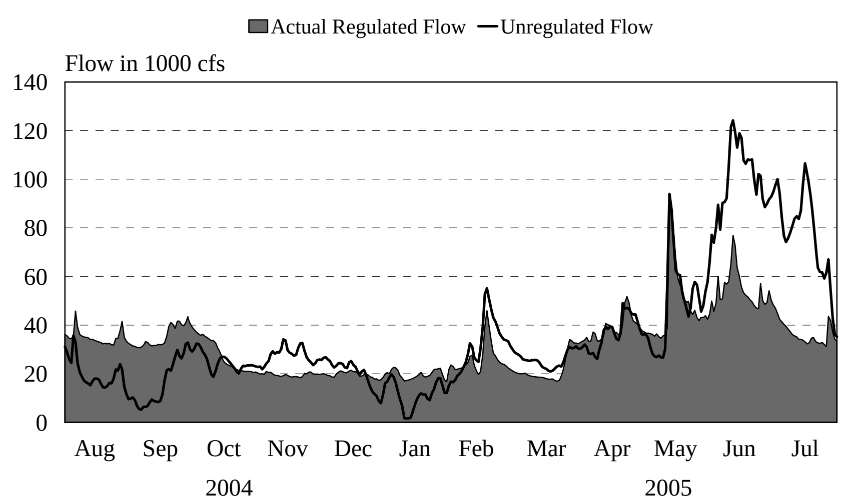


Figure 7

intakes. The Standing Rock Sioux Tribe's intake at Fort Yates failed in November 2003 leaving the community without water for several days. The intake, which under normal circumstances is in Oahe reservoir, is presently in an open river situation due to Oahe reservoir receding as the pool level declined. The Bureau of Reclamation (BOR) has installed a temporary intake and drilled a well to ensure continued water supply for that community. The BOR has also lowered the intake at Wakpala on the Oahe reservoir. The Corps has used its emergency authority to lower the intake at Parshall on Garrison reservoir. Other intakes that have been identified as having problems or potential problems include Mandaree and Twin Buttes on Garrison reservoir, and the Mni Waste' intake on Oahe reservoir. The Corps is working with the Cheyenne River Sioux Tribe to relocate the Mni Waste' water intake, which serves over 14,000 residents of and near the Cheyenne River Indian Reservation in Dewey, Ziebach, and Meade Counties in South Dakota. If the drought continues, reservoir pool levels and releases may continue to fall below their previous historic lows creating the potential for additional intake access and water quality problems at both river and reservoir intakes.

The 48-day shortened navigation season resulted in earlier than normal reduced flows in October 2005. The System release was lowered to 11,000 cfs on October 9th and then lowered to 9,000 cfs by October 15th.

Intake owners today are generally better prepared to handle periods of low water due to adjustments made to intakes or regulations procedures. The intake owners have made various adjustments to their operations to account for low water levels. Some of these adjustments involve using warm water to keep ice formation from building up on intake screens, installing new pumps, lowering intakes, installing sediment redirection vanes and ice deflectors, obtaining, or arranging to obtain, alternate sources of water; and cleaning screens more thoroughly and frequently. While these remedial actions were expensive, they have significantly improved the ability of the intakes to operate at lower river stages.

Figures 8A and ***8B*** show the end-of-July pool elevations for Fort Peck, Garrison, and Oahe plus total System end-of-July storage for 2001 through 2005. An individual table with the historic maximum, average and minimum pool elevations for each reservoir is also shown on ***Figures 8A*** and ***8B***. While each of the three large reservoirs has shown a steady decline in storage over the four previous years, all three upper reservoir had higher July 31st pool levels in 2005 than they did in 2004. All three reservoirs experienced their historical minimum record pool levels during 2004 or 2005. On July 31, 2005 Fort Peck Lake was at elevation 2203.2 feet msl, 0.8 feet higher than at the same time in 2004. On July 31, 2005 Lake Sakakawea was at elevation 1817.2 feet msl, 0.7 feet higher than at the same time in 2004. Lake Oahe was at elevation 1576.4 on July 31, 2005, 2.1 feet higher than at the same time in 2004.

During 2005, the Omaha District conducted long-term, fixed station ambient monitoring at the System reservoirs and the lower Missouri River. Water quality conditions of the water discharged through each of the System dams was continuously monitored (i.e., hourly data-logging and monthly sampling). Intensive water quality surveys were conducted at Garrison, Fort Peck, and Oahe. A water quality special study was conducted at Garrison.

The Omaha District has identified seven priority water quality issues that have relevance to the System projects. These identified priority issues and their relative ranking are:

(1) Determine how regulation of the System dams effects water quality in the impounded reservoir and downstream river. Utilize the CE-QUAL-W2 hydrodynamic and water quality model to facilitate this effort.

(2) Evaluate how eutrophication is progressing in the System reservoirs, especially regarding the expansion of anoxic conditions in the hypolimnion during summer stratification.

(3) Determine how flow regime, especially the release of water from System projects, affects water quality in the Missouri River.

(4) Provide water quality information to support Corps reservoir regulation elements for effective water quality and aquatic habitat management.

(5) Provide water quality information and technical support to the States in the development of their Section 303(d) lists and development and implementation of TMDLs at District projects.

(6) Identify existing and potential water quality problems at District projects, and develop and implement appropriate solutions.

(7) Evaluate water quality conditions and trends at District projects.

Note: Relative ranking of priority in parentheses (1 = highest priority).

Table 11 provides a summary of water quality issues and concerns at each of the System projects, based on Omaha District monitoring and a review of current State water quality reports.

Maintaining coldwater habitat in Garrison reservoir during late summer is becoming a challenge due to the continuing drought in the western United States. If the drought persists and reservoir levels continue to drop, it will become increasing more probable that coldwater habitat will not be maintainable in the Garrison reservoir. The pool elevation of the Garrison reservoir is reaching a point where the reduced hypolimnetic volume of cold water, in concert with the degradation of dissolved oxygen in the deeper water of the reservoir, likely will not allow for the maintenance of coldwater habitat through the end of the summer, thermal lake stratification period. Water temperature and dissolved oxygen levels are primary water quality factors that determine the suitability of water for coldwater aquatic life.

The State of North Dakota has defined optimal coldwater fish habitat in the Garrison reservoir as being ≤15°C and having dissolved oxygen levels ≥ 5 mg/l. The measured water temperature and dissolved oxygen concentration depth profiles, that were obtain through the intensive surveys conducted at the Garrison reservoir during 2003, 2004, and 2005 were used to estimate the volume of water in the reservoir that meets the coldwater habitat conditions as defined by the State of North Dakota. ***Plates 6*** and ***7*** shows the reservoir and optimal coldwater habitat volumes for 2003, 2004, and 2005 and indicates less optimal coldwater habitat present in the Garrison reservoir in 2005 as compared to 2003 and 2004.

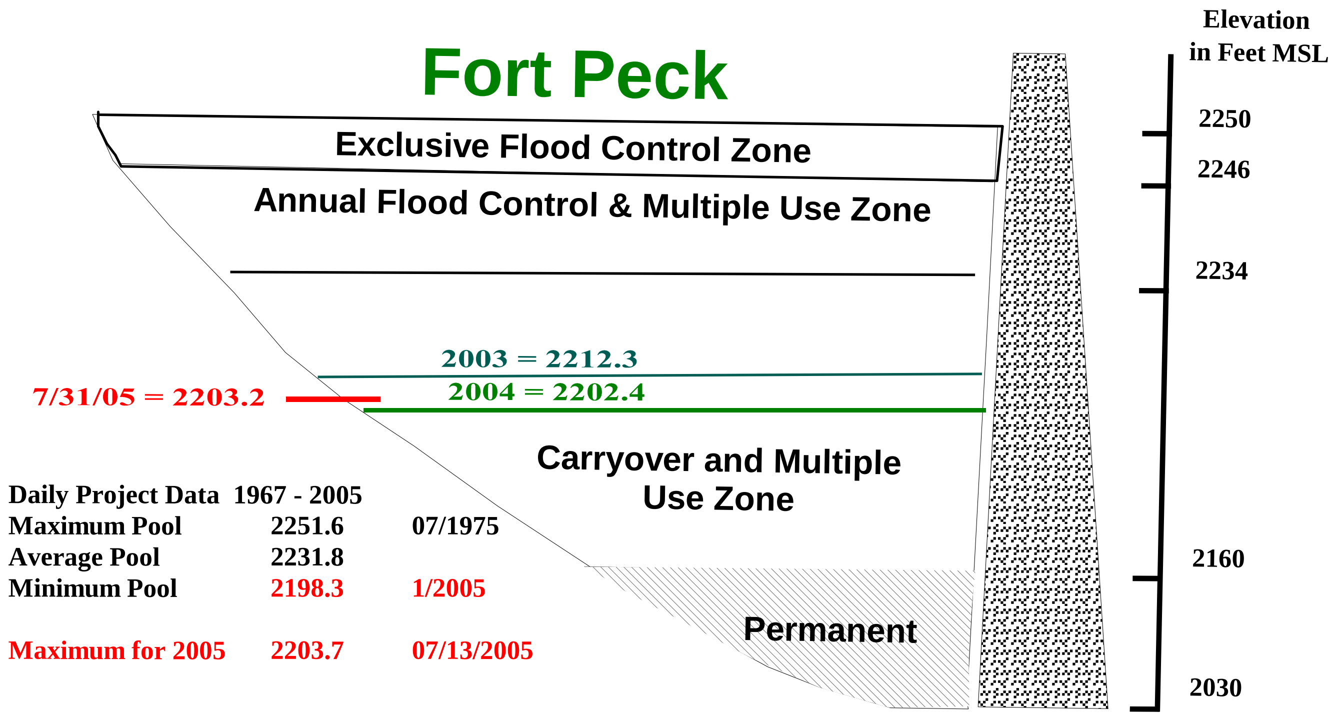
As drought conditions persisted in early 2005, water levels in the Garrison reservoir had fallen to a record low pool elevation of 1805.8 feet-msl on May 12, 2005. At that time it was felt that, unless emergency water quality management measures were implemented in 2005 to preserve the coldwater habitat in the Garrison reservoir, the recreational sport fishery would likely be adversely impacted. The reduction of coldwater habitat is exacerbated by the releases from the Garrison Dam intake structure. Because the invert elevation of the intake portals to the Garrison Dam power tunnels (i.e., penstocks) is 2 feet above the reservoir bottom, water drawn through the penstocks comes largely from the lower depths of the reservoir. Thus, during the summer thermal stratification period, water is largely drawn from the coldwater habitat volume of the Garrison reservoir. Three short-term water quality management measures were identified for implementation in an effort to preserve the coldwater habitat in the reservoir. These measures, which were implemented at the Garrison Dam, included: 1) modification of the dam's intake trash racks, 2) utilization of head gates to restrict the opening to the dam's power tunnels, and 3) modification of the daily flow cycle and minimum flow releases from the dam. The three implemented water quality management measures were targeted at drawing water into the dam from higher elevations within the reservoir.

Based on water quality monitoring of the water discharged through Garrison Dam, it appears that up to 379,390 acre-feet of water meeting optimal coldwater habitat criteria were prevented from being discharged through Garrison Dam and retained in the reservoir due to the implementation of the short-term water quality management measures. Implementation of the short-term water quality management measures warmed the water that was discharged through Garrison Dam in the late summer by 2 to 4°C. How far downstream the Missouri River this warming was detectable and any possible consequences have not been determined at this time. The implemented water quality management measures also had the effect of raising dissolved oxygen concentrations in the water discharged through Garrison Dam in late summer under minimum flow releases. Although the short-term water quality management measures were implemented to preserve coldwater habitat in the Garrison reservoir, they also had the probable benefit of allowing water quality standards criterion established by the State of North Dakota for dissolved oxygen to be met in the Missouri River immediately below Garrison Dam during late summer minimum flow releases.

4. Navigation

The first towboat to enter the Missouri River from the Mississippi River in 2005 was the JAMIE LEIGH, owned by Jefferson City River Terminal. The towboat entered on March 25, 2005 with 6 loads of cement for Jefferson City, Missouri. On April 1, the first official day of flow support for the 2005 navigation season at St. Louis, Missouri, two tows were operating on the river. The first towboats to arrive in Omaha, NE/Council Bluffs, IA area was a dual vessel tow CLAUDE R and DAVID H, of McDonough Marine Service, arriving on April 16, 2005 delivering one barge of construction equipment to the MidAmerican Energy Power Station. There were no tows that delivered to Sioux City, IA during 2005. The most upstream tow was

Missouri River
End-of-July Pool Elevations



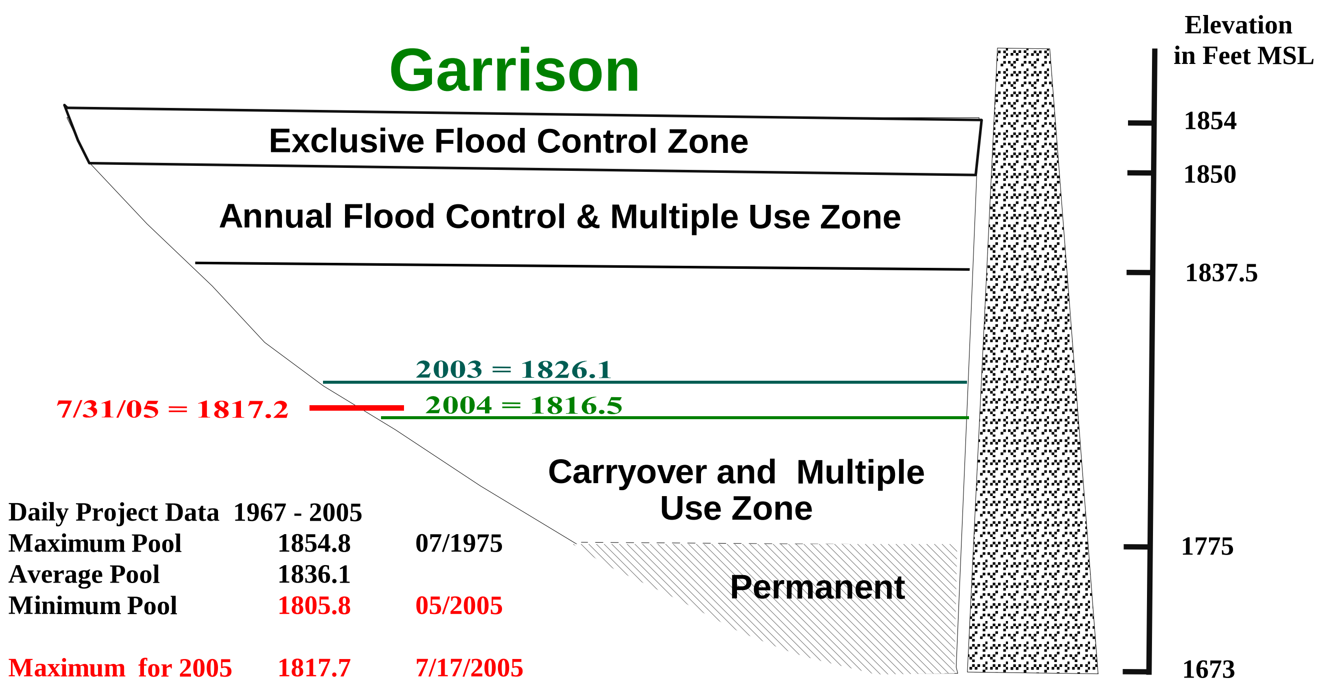
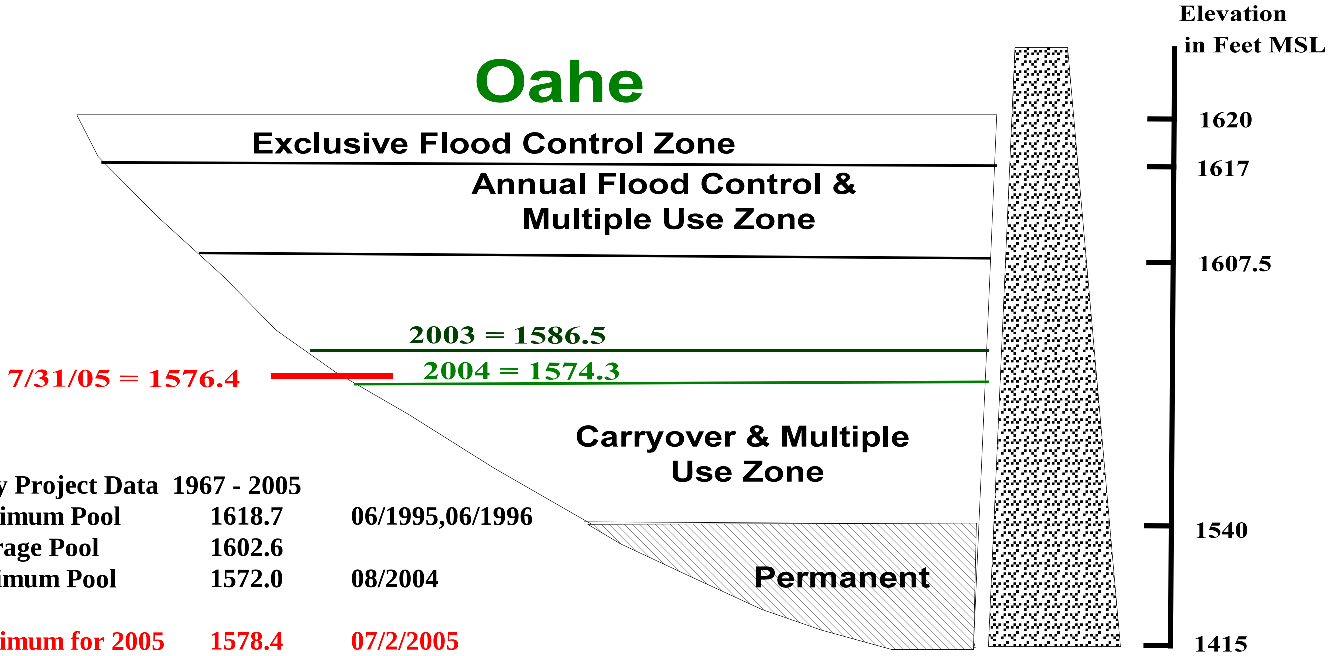
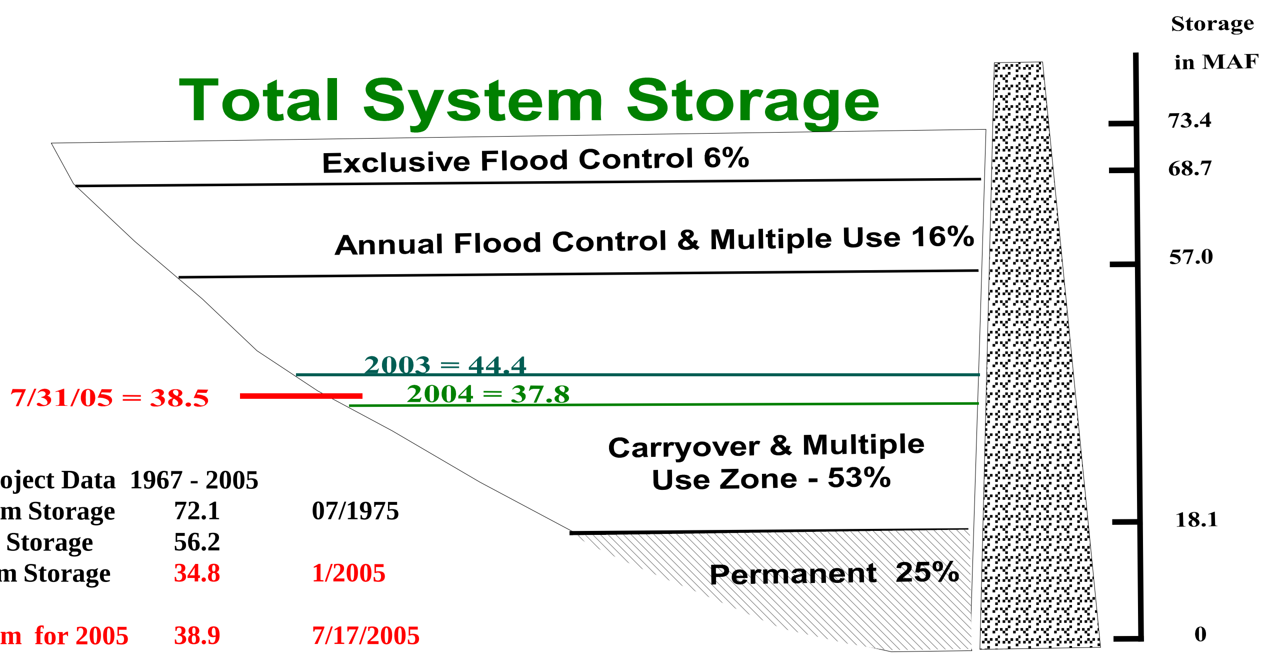


Figure 8A

Mainstem Reservoirs
and Total System Storage



Daily Project Data	1967 - 2005	
Maximum Pool	1618.7	06/1995,06/1996
Average Pool	1602.6	
Minimum Pool	1572.0	08/2004
Maximum for 2005	1578.4	07/2/2005



Daily Project Data	1967 - 2005	
Maximum Storage	72.1	07/1975
Average Storage	56.2	
Minimum Storage	34.8	1/2005
Maximum for 2005	38.9	7/17/2005

Figure 8B

Table 11
Water Quality Issues and Concerns

Project	TMDL Considerations*				Fish Consumption Advisories		Other Potential Water Quality Concerns
	On 303(d) List	Impaired Uses	Pollutant/Stressor	TMDL Completed	Advisory in Effect	Identified Contamination	
Fort Peck • Fort Peck Lake	Yes	Drinking Water Supply Primary Contact Recreation	Lead Mercury Metals Noxious Aquatic Plants	No	Yes	Mercury	---
• Missouri River immediately below Fort Peck Dam	Yes	Aquatic Life Support Cold Water Fishery – Trout Drinking Water Supply Warm Water Fishery	Flow Alteration Metals Other Habitat Alterations Riparian Degradation Thermal Modifications	No	No	---	---
Garrison • Lake Sakakawea	Yes	Fish and Other Aquatic Biota Fish Consumption	Low Dissolved Oxygen Water Temperature Methyl-Mercury	No	Yes	Mercury	Hypolimnetic Dissolved Oxygen Levels
• Missouri River immediately below Garrison Dam	No	---	---	---	Yes	Mercury	Dissolved oxygen in Garrison Dam tailwaters (associated with late summer hypolimnetic lake withdrawals)
Oahe • Lake Oahe	No	---	---	---	No	---	---
Big Bend • Lake Sharpe	No	---	---	Yes	No	---	TMDL completed for sediment. A nonpoint source management project is being implemented in the Bad River watershed.
Fort Randall • Lake Francis Case	No	---	---	---	No	---	---
• Missouri River immediately below Fort Randall Dam	No	---	---	---	No	---	---
Gavins Point • Lewis and Clark Lake	No	---	---	---	No	---	Sedimentation Emergent Aquatic Vegetation Hydrogen Sulfide
• Missouri River immediately below Gavins Point Dam	Yes	Recreation Aquatic Life	Pathogens Dieldrin PCBs	No	Yes	Dieldrin PCBs	Summer ambient water temperature (NPDES limitations regarding cooling water discharges)

* Information taken from published state Total Maximum Daily Load (TMDL) 303(d) reports and listings.

the AM THOMPSON, owned by Contract Marine Carriers, arriving Blair, NE on August 8, 2005 to take on 4 barge loads of alphalfa pellets for Consolidated Blenders.

The continuation of the drought that resulted in minimum navigation flow support since 2001 and the changes to planned System regulation in 2002 and 2003 due to lawsuits and nesting T&E species below Gavins Point impacted reliability for navigation on the Missouri River. The finalization of the Missouri River Master Water Control Manual in 2004 and the construction of 1200 acres of shallow water habitat early in 2004 to comply with the 2003 Amended Biological Opinion improved reliability. With the drought continuing in 2005, the navigation industry was again impacted by minimum service flow support. Although 2004 saw no commercial products such as grains, cement or asphalt moved upstream of Kansas City, during 2005 there were two agricultural tow movements above Kansas City. These movements included one drop off load to the Omaha Municipal Dock and two trips to Consolidated Blenders in Blair, Nebraska. As during 2004, a substantial number of specialized tow movements of power plant equipment continued to the Council Bluffs, Iowa MidAmerican Energy Power Station during 2005 from April through September. A total of 25 individual barge movements of oversized construction equipment were delivered for construction of the new power station.

The Waterborne Commerce Statistics Center (WCSC) preliminary data for 2004 has total Missouri River tonnage at 8.192 million tons of which 7.667 million tons is sand and gravel and the long haul commercial tonnage is 0.525 million tons. The 2004 data should be finalized later in 2006 as the WCSC office is in New Orleans recovering from the lengthy hurricane impacted delays. The largest total tonnage year is 2001 at 9.73 million tons. The largest commercial tonnage year, excluding sand, gravel and waterway material, occurred in 1977 when 3.3 million tons were moved on the Missouri River. Tonnages of commodities shipped during 2001 through 2004 are shown in ***Table 12***. ***Figure 9A*** shows the value of the commodities since 1960 using 2005 present worth. ***Figure 9B*** shows tonnage value of commercial commodities since 1960. The commercial tonnage figure for 2005 is an estimate and will change once final WCSC tabulations are available late in 2006 or early 2007. Missouri River commercial tonnage in 2005 is currently estimated to total about 0.5 million tons, based on daily reports of towboat activity.

Navigation season target flows for past years are given in ***Table 13***. ***Table 14*** shows the scheduled lengths of past navigation seasons with total tonnage and ton-miles for each year. The 2005 navigation season was shortened a record 48 days in accordance with the Master Manual.

Figure 10 presents discharge data at Sioux City, Iowa; Nebraska City, Nebraska; and Kansas City, Missouri for the August 2004 through December 2005 period. The three graphs demonstrate that actual flows at these locations are influenced considerably by System releases. Downstream tributaries upstream of Kansas City did not provide much inflow during the navigation season. Between Sioux City and Nebraska City, however, tributary flows did provide additional flow, especially in the months of May and June. Refer to Section II.C. of this report for further discussion on System releases during the 2004 navigation season.

Table 12
Missouri River Tonnage by Commodities (In Thousands of Tons)

Commodity Classification Group	2001	2002	2003	2004*
Farm Products	471	352	105	**41**
Corn	151	126	70	32
Wheat	39	28	15	5
Soybeans	164	167	19	1.5
Misc Farm Product	117	31	1	2.5
Nonmetallic Minerals	8435	7145	7381	**7606**
Sand/Gravel	8410	7129	7375	7606
Misc Nonmetallic	25	16	6	0
Food and Kindred	37	36	23	**0**
Pulp and Paper	0	0	0	**0**
Chemicals	334	246	118	**48**
Fertilizer	328	241	114	41
Other Chemicals	6	5	4	7
Petroleum (including coke)	217	173	213	**216**
Stone/Clay/Glass	193	189	203	**221**
Primary Metals	5	13	2	**0**
Waterway Materials	34	112	5	**60**
Other	4	0	0	**0**
Total Commercial	9730	8266	8050	**8192**
Total Long Haul Commercial	1288	1009	670	**526**

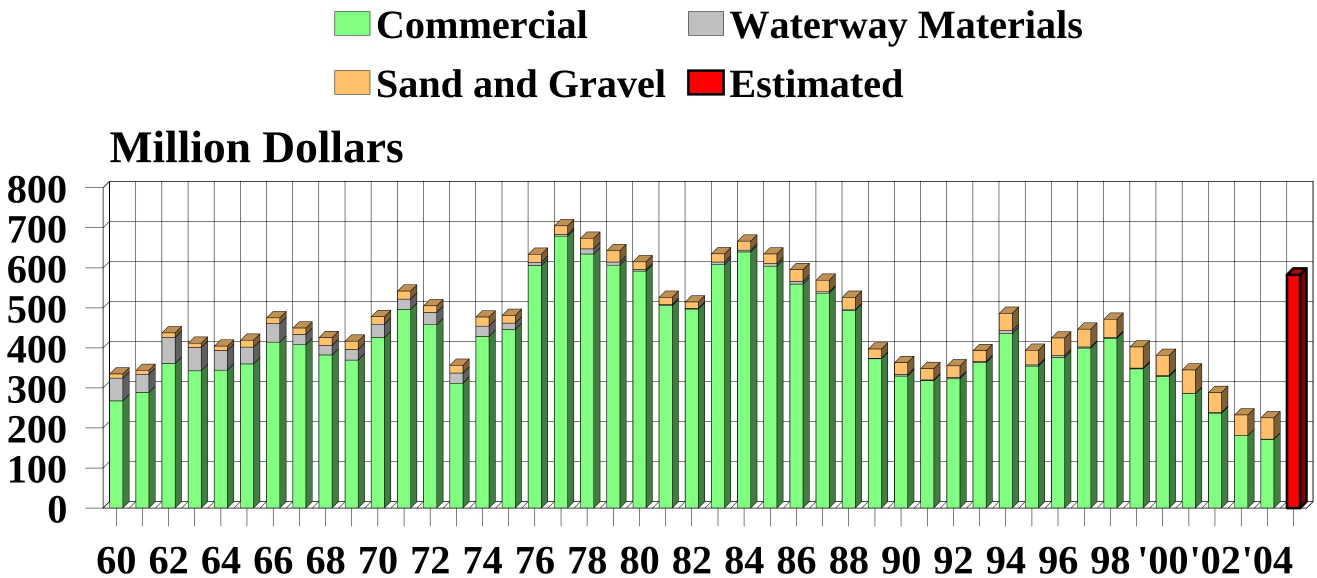
* All 2004 data is preliminary

5. Power-Eastern Division, Pick-Sloan Missouri Basin Program (P-S MBP)

The CY 2005 energy generated was transmitted over a Federal transmission system that traverses 7,745 circuit miles. This past year, service was provided to 360 customers. Customers in a six state area receiving direct service include 194 municipalities, 2 Federal agencies, 33 state agencies, 28 U.S. Bureau of Reclamation projects, 5 irrigation districts, 36 rural electric cooperatives, 7 public utility districts, 30 private utilities, 27 Native American Services and 1 inter-project sale. Additional benefits were provided by the interconnections to the Southwestern and Bonneville Power Administrations and other areas of the Western Area Power Administration (Western). Statistics from the Omaha Public Power District (OPPD) show that the average customer uses approximately 11,000 kilowatt hours (kWh) of energy annually. Based upon the total System generation of 5,612,660,000 kWh, the energy generated in CY 2005 by the portion of the Federal power system could have supplied all of the yearly needs of 510,000 residential OPPD customers.

Missouri River

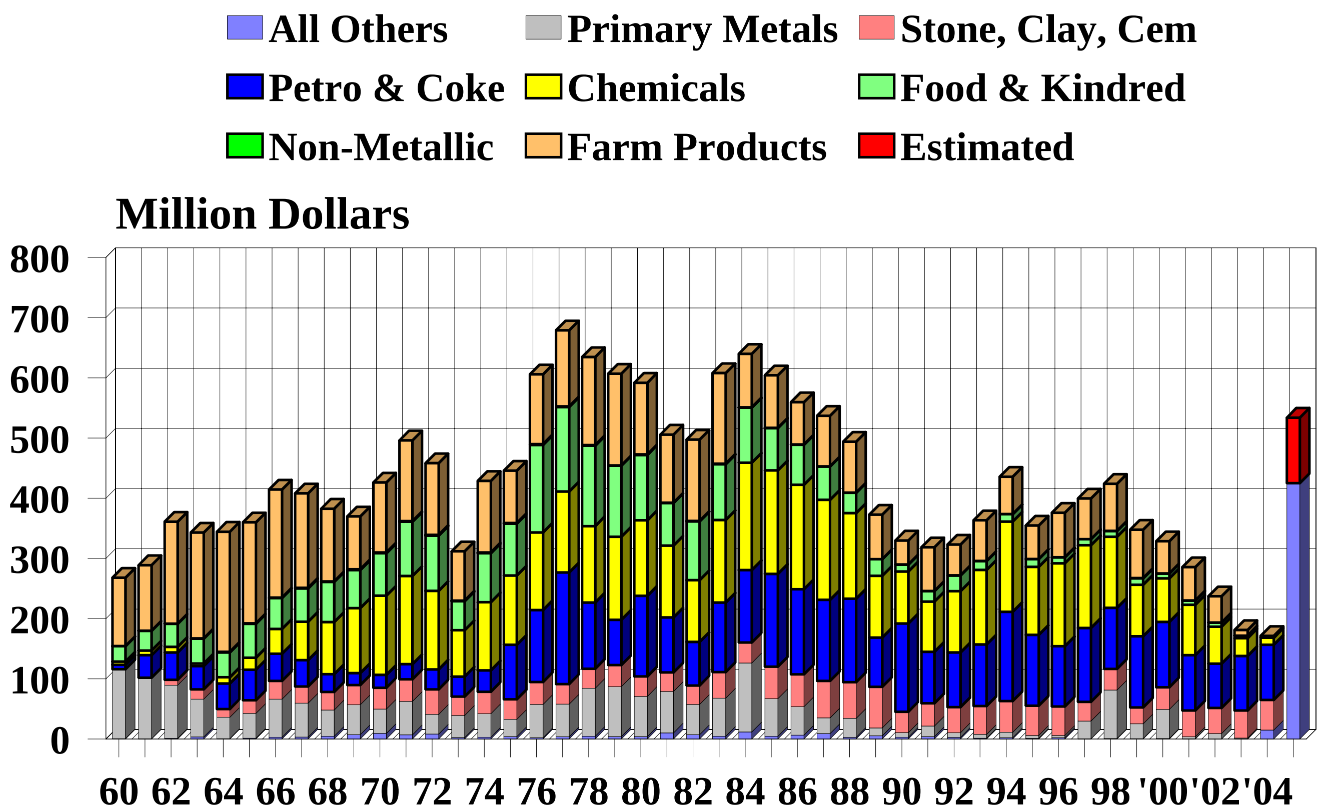
Total Navigation Tonnage Value - 2005 Present Worth



Years

Figure 9A

Commercial Navigation Tonnage Value - 2005 Present Worth



Years

Commercial Value Excludes Sand, Gravel & Waterway Materials

Figure 9B

Table 13
Navigation Season Target Flows
in 1,000 cfs

Year	Months	Sioux City	Omaha	Nebraska City	Kansas City
1967	Apr-Jun	28	28	34	38
	Jul-Nov	31	31	37	41
1968	Apr-Nov	31	31	37	41
1969	Apr-Jun(1)	35.0-40.0	35.0-40.0	41.0-46.0	45.0-50.0
	Jul(1)	36	36	42	46
	Aug-Sep(1)	50.0-55.0	50.0-55.0	55.0-60.0	55.0-60.0
	Oct-Nov(1)	40.0-45.0	40.0-45.0	45.0-50.0	50.0-55.0
1970	Apr-May	31	31	37	41
	May-Sep(1)	36	36	42	46
	Oct-Nov(1)	40	40	46	50
1971	Apr-May(1)	36	36	42	46
	May-Nov(1)	45.0-50.0	45.0-50.0	50.0-55.0	55.0-60.0
1972	Apr-Nov(1)	40.0-50.0	40.0-50.0	45.0-55.0	50.0-60.0
1973-74	Apr-Nov	31	31	37	41
1975	Apr	31	31	37	41
	May-Nov(1)	35.0-60.0	35.0-60.0	41.0-66.0	45.0-70.0
1976	Apr-Jul(1)	34.0-38.0	34.0-38.0	40.0-44.0	44.0-48.0
	Aug-Dec(1)	31.0-34.0	31.0-34.0	37.0-40.0	41.0-44.0
1977	Apr-Nov	31	31	37	41
1978	Apr	31	31	37	41
	May-Jul(1)	35.0-46.0	35.0-46.0	41.0-52.0	45.0-56.0
	Aug-Nov(1)	46.0-51.0	46.0-51.0	52.0-57.0	56.0-61.0
1979	Apr-Jul(1)	36.0-42.0	36.0-42.0	42.0-48.0	46.0-52.0
	Aug-Nov(1)	31.0-36.0	31.0-36.0	37.0-42.0	41.0-46.0
1980	Apr-Nov	31	31	37	41
1981	Apr-Nov(2)	31	31	37	41
1982	Apr-Sep	31	31	37	41
	Oct	31.0-36.0	31.0-36.0	37.0-42.0	41.0-46.0
	Nov-Dec(1)	36.0-46.0	36.0-46.0	42.0-52.0	46.0-56.0
1983	Apr-Jun	31	31	37	41
	Jul	31.0-36.0	31.0-36.0	37.0-42.0	41.0-46.0
	Aug-Nov(1)	36	36	42	46
1984	Apr-Jun	31	31	37	41
	Jul-Dec(1)	31.0-44.0	31.0-44.0	37.0-50.0	41.0-54.0
1985	Apr-Dec	31	31	37	41
1986	Apr(1)	36.0-41.0	36.0-41.0	42.0-47.0	46.0-51.0
	May-Dec(1)	41.0-46.0	41.0-46.0	47.0-52.0	51.0-56.0
1987	Apr-Nov	31	31	37	41
1988	Apr-Nov(2)	31	31	37	41
1989	Apr-Aug(3)	28	28	34	38
	Sep-Oct(3)	28	28	34	35
1990-93	Apr-Oct(4)	25	25	31	35
1994	Apr-Dec	31	31	37	41
1995	Apr-May	31	31	37	41
	Jun-Dec(1)	46.0-56.0	46.0-56.0	52.0-62.0	56.0-66.0
1996	Apr(1)	41	41	47	51
	May(1)	41.0-51.0	41.0-51.0	47.0-57.0	51.0-61.0
	Jun-Dec(1)	56	56	62	66
1997	Apr-Dec(5)	*	*	*	*
1998	Apr-Dec(5)	31	31	37	41
1999	Apr-Dec(1)	31.0-43.0	31.0-43.0	37.0-49.0	41.0-53.0
2000	Apr-Jun	31	31	37	41
	Jul-Dec(3)	29.5	29.5	35.5	39.5
2001	Apr-Dec(3)	28	28	34	38
2002	Apr-Jun(3)	27	27	33	37
	Jul-Dec(3)	25	25	31	35
2003	Apr-Nov(4)	25	25	31	35
2004	Apr-Oct(6)	25	25	31	35
2005	Apr-Oct(6)	25	25	31	35

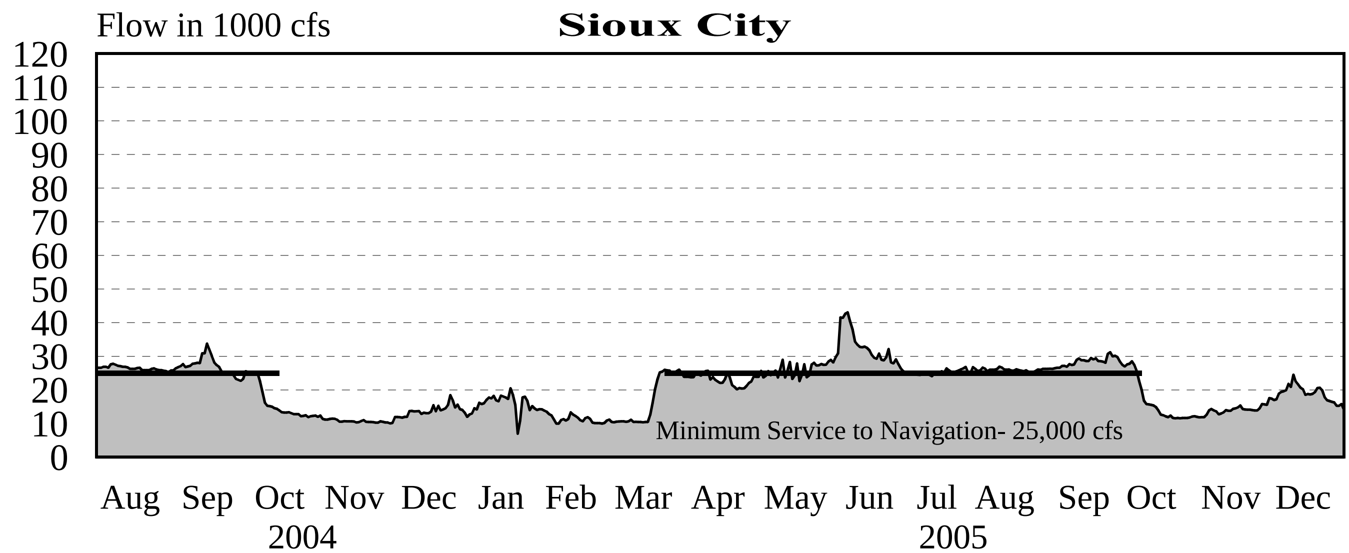
(1) Downstream flow targets above full-service navigation level as a flood control storage evacuation measure.
(2) Full service flows provided for shortened season.
(3) Navigation targets below full service as a water conservation measure.
(4) Navigation targets at minimum service as a water conservation measure.
(5) Releases determined by flood control storage evacuation critiera and not adjusted to meet specific navigation targets.
(6) Minimum service targets at Sioux City and Omaha not met in April and a few days in September due to no commerical navigation in those reaches.

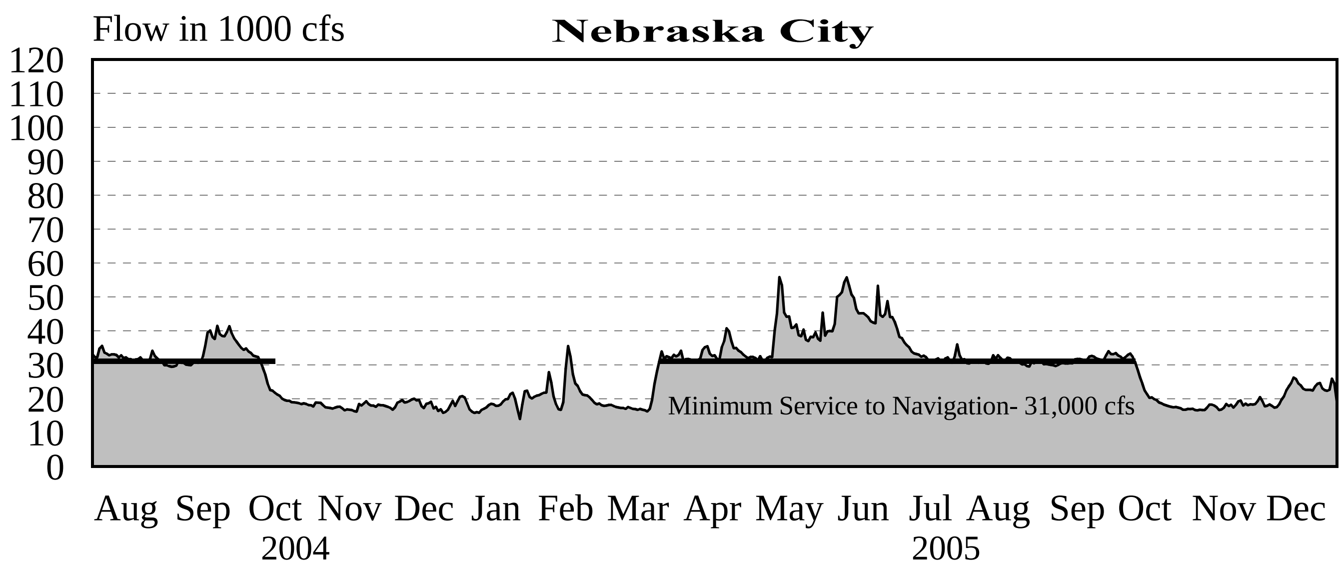
Table 14
Missouri River Navigation
Tonnage and Season Length

Year	Scheduled Length of Season (Months)	Commercial (Tons) (1)	Total Traffic (Tons) (2)	Total Traffic (1000 Ton-Miles) (2)
1967 (3)	8	2,562,657	6,659,219	1,179,235
1968	8 (4)	2,254,489	6,724,562	1,047,935
1969	8 (4)	2,123,152	7,001,107	1,053,856
1970	8 (5)	2,462,935	7,519,251	1,190,232
1971	8 (4)	2,791,929	7,483,708	1,329,899
1972	8 (4)	2,665,579	7,182,841	1,280,385
1973	8	1,817,471	6,370,838	844,406
1974	8	2,576,018	7,673,084	1,227,525
1975	8 (4)	2,317,321	6,208,426	1,105,811
1976	8 (4)	3,111,376	6,552,949	1,535,912
1977	8	3,335,780	6,734,850	1,596,284
1978	8 (4)	3,202,822	7,929,184	1,528,614
1979	8 (4)	3,145,902	7,684,738	1,518,549
1980	8	2,909,279	5,914,775	1,335,309
1981	7 1/4 (6)	2,466,619	5,251,952	1,130,787
1982	8 (4)	2,513,166	4,880,527	1,131,249
1983	8 (4)	2,925,384	6,301,465	1,300,000
1984	8 (4)	2,878,720	6,386,205	1,338,939
1985	8 (4) (7)	2,606,461	6,471,418	1,201,854
1986	8 (4) (7)	2,343,899	6,990,778	1,044,299
1987	8	2,405,212	6,735,968	1,057,526
1988	7 1/2	2,156,387	6,680,878	949,356
1989	6 3/4	1,906,508	5,352,282	796,799
1990	6 3/4	1,329,000	5,841,000	552,509
1991	6 3/4	1,563,000	5,729,000	537,498
1992	6 3/4	1,403,000	5,783,000	593,790
1993	8 (8)	1,570,000	5,631,000	615,541
1994	8	1,800,000	8,501,000	774,491
1995	8 (4)	1,439,000	6,884,000	604,171
1996	8 (4)	1,547,000	8,165,000	680,872
1997	8 (4)	1,651,000	8,172,000	725,268
1998	8 (4)	1,735,000	8,379,000	777,727
1999	8 (4)	1,576,000	9,252,000	699,744
2000	8	1,344,000	8,733,000	628,575
2001	8	1,288,000	9,732,000	566,150
2002	8 (9)	1,009,000	8,266,000	409,980
2003	8 (10)	667,000	8,050,000	256,788
2004	6 1/2 (11)	525,498 (13)	8,192,219 (13)	250,000 (13)
2005	6 1/2 (12)	data not available	data not available	data not available

(1) Includes commercial tonnage except for sand and gravel or waterway materials. Tonnage compiled by Waterborne Commerce Statistics Center (WCSC).
(2) Includes commodities; sand, gravel and crushed rock; and waterway improvement materials. Tonnage by WCSC.
(3) Mainstem reservoir system reached normal operating storage level in 1967.
(4) 10-day extension of season provided.
(5) 10-day extension and 10-day early opening provided.
(6) Full service flows for shortened season in preference to reduced service.
(7) 10-day extension provided for 1985 season in trade for 10-day delayed support of 1986 season.
(8) Lower Missouri River closed: 57 days in 1993, 20 days in 1995, and 18 days in 1999.
(9) To protect endangered shore birds below Gavins Point Dam the Corps did not support navigation from 3 July to 14 August 2002. Average days towing industry off the river was 23 days.
(10) 6-day shortening of season to follow CWCP. From 11 Aug to 1 Sep Corps did not support navigation flows to comply with lawsuit to follow 2000 Biological Opinion. Navigation industry left the river during this period.
(11) 47-day shortening of season.
(12) 48-day shortening of season.
(13) Preliminary Data from WCSC. Final data expected spring of 2006.

Missouri River Flows at Sioux City, Nebraska City and Kansas City





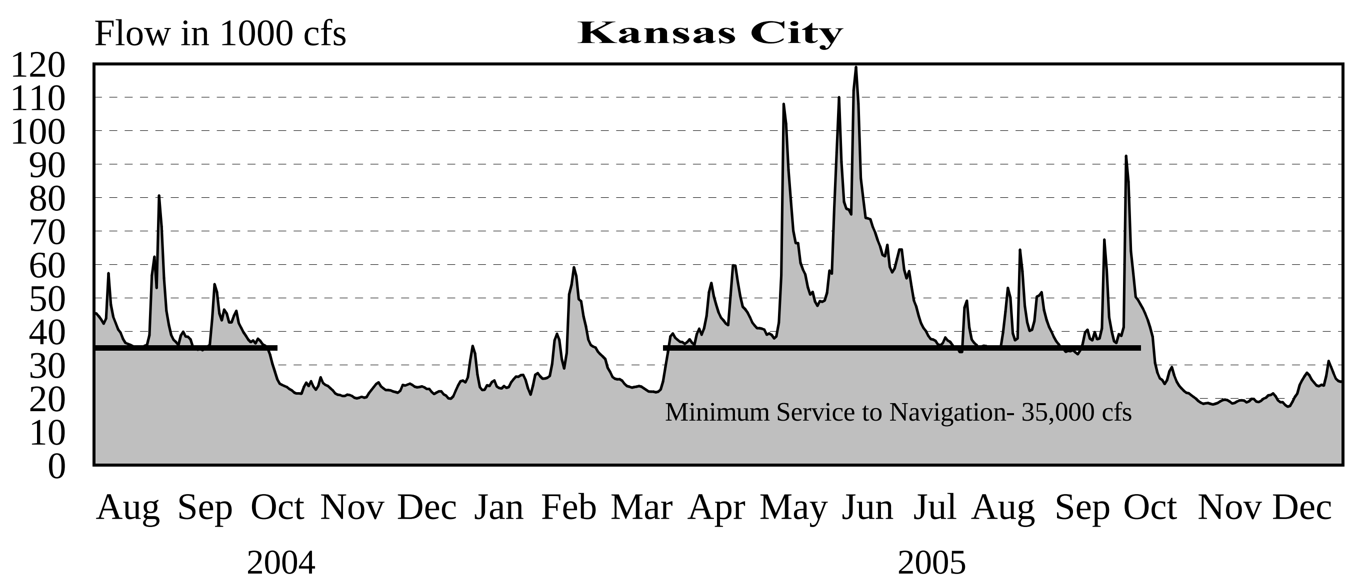


Figure 10

In addition to the clean, renewable energy transmitted to the Midwest area, the hydropower system provides an added measure of stability to the regional power system with the ability to meet full load in 5 seconds or less. Large coal-fired and nuclear units are reinforced by idle hydropower units, typically in 30 seconds. Outside utilities can have access to the hydropower capability within several minutes of a known problem. The reliability of the hydropower system is indicated by having to maintain a 10 percent reserve, while thermal power must maintain a 15 percent reserve. Although the Federal hydropower system that serves the Missouri River region accounts for only 9 percent of the region's energy, it is large enough to fill gaps and provide a positive benefit to the integrated system.

Calendar Year 2005 generation was 56 percent of average since the System first filled in 1967. Energy generation was below normal due to reduced heads, below normal runoff and below normal releases at all powerplants. Western purchased about 5.0 billion kWh between January 1, 2005 and December 31, 2005, at a cost of $247.3 million to supplement mainstem hydropower production.

Mainstem generation with individual project distribution for each calendar year since 1954 is shown on ***Figure 11***. The gross generation from the Federal system (peak capacity and energy sales) for 2005 is shown in ***Table 15***. The tabulations in ***Table 16*** and ***Table 17*** summarize the total gross generation and power regulation for the Eastern Division, P-S MBP, marketing area system for the past operating year. Actual settlement figures at the end of the billing periods differ somewhat from the calendar month figures shown.

Table 15
Gross Federal Power System Generation – January 2005 through December 2005

	Energy Generation 1,000 kWh	**Peak Hour kWh**	**Generation Date**
Corps Power Plants – Mainstem			
Fort Peck	562,957	128,000	7/28/2005
Garrison	1,361,769	332,000	11/30/2005
Oahe	1,356,854	525,000	8/1/2005
Big Bend	606,167	480,000	9/26/2005
Fort Randall	1,133,790	355,000	5/2/2005
Gavins Point	591,123	106,000	9/26/2005
Corps Subtotal	5,612,660	1,620,000	8/30/2005
USBR Powerplants			
Canyon Ferry	392,307	54,000	7/2005
Yellowtail*	363,948	127,000	7/2005
USBR Subtotal	756,255		
Federal System Total	6,368,915		

* Includes only half of total Yellowtail generation, which is marketed by the Eastern Division, P-S MBP.

Mainstem Power Generation
1954 - 2005

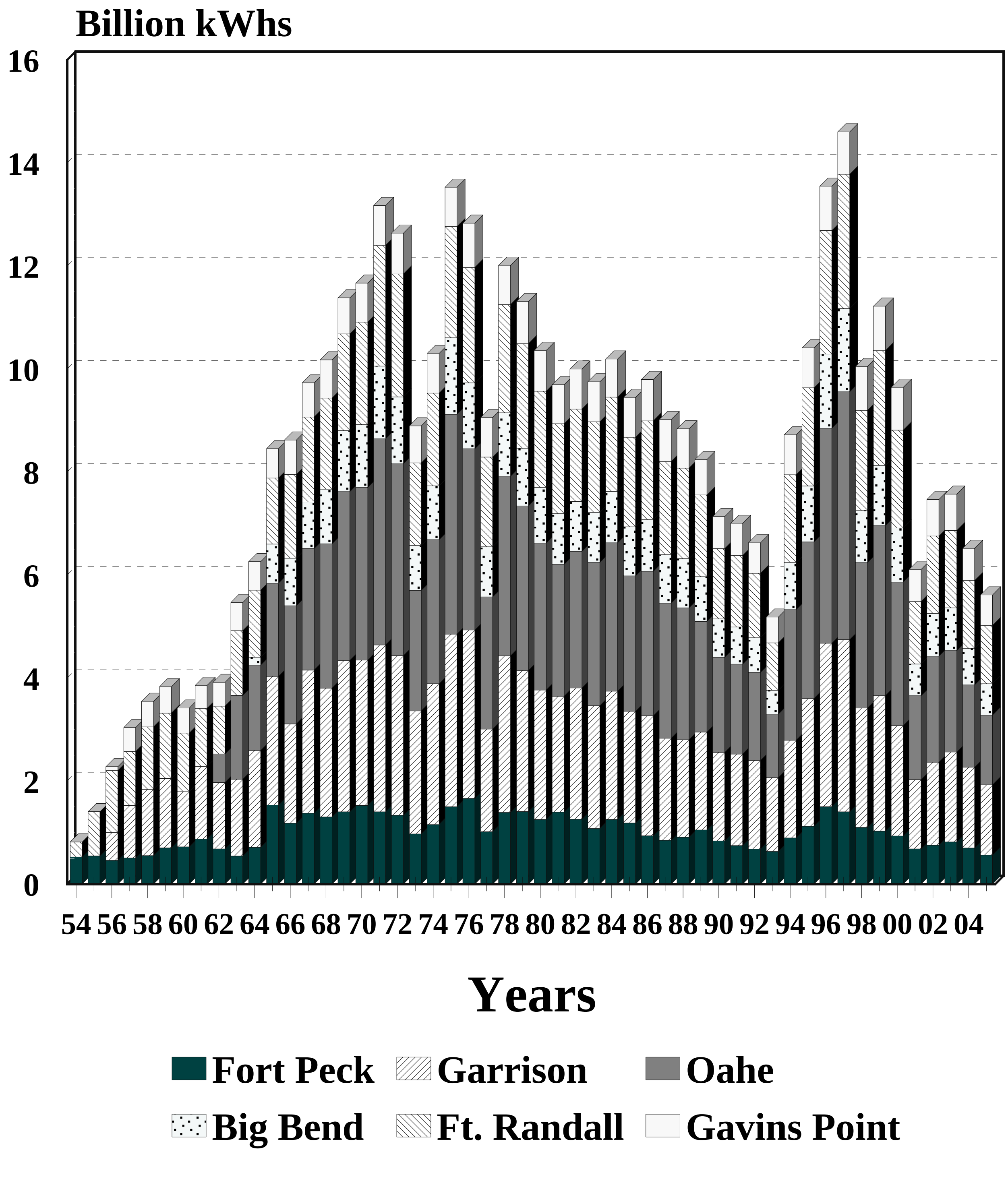


Figure 11

Table 16

Historical Generation and Load Data - Peaks
Eastern Division, Pick-Sloan Missouri River Program*
Data at plant - 1,000 kW
January 1, 2005 through December 31, 2005

Period	Corps of Engineers Peak Hour Generation (Gross)	(plus)	USBR Hourly Generation (Gross)	(equals)	Federal Peak Hour Generation (Gross)	(plus)	Interchange and Purchases Received**	(equals)	Total System Load**
January	1,434		33		1467		1325		2,792
February	1,216		30		1246		610		1,856
March	1,417		25		1442		598		2,040
April	1,393		28		1421		476		1,897
May	1,209		26		1235		564		1,799
June	1,385		20		1405		468		1,873
July	1,519		38		1557		820		2,377
August	1,620		38		1658		789		2,447
September	1,533		36		1569		675		2,244
October	1,055		45		1100		697		1,797
November	1,099		40		1139		833		1,972
December	1,191		41		1232		970		2,202

* This tabulation summarizes the total gross generation and power operations for the Eastern Division marketing area system shown on Table 33.
** During hour of Federal peak hour generation.

Table 17

Historical Generation and Load Data - Total
Eastern Division, Pick-Sloan Missouri Basin Program*
Data at plant - 1,000 kWh
January 1, 2005 through December 31, 2005

Period	Corps of Engineers Generation (Gross)	(plus)	USBR Generation (Gross)	(equals)	Federal Generation (Gross)	(plus)	Scheduled Interchange and Purchases Received	(equals)	Total System Load
January	473,382		36,555		509,937		548,328		1,058,265
February	306,967		32,426		339,393		503,414		842,807
March	473,998		33,702		507,700		412,043		919,743
April	507,636		31,970		539,606		348,412		888,017
May	501,016		30,083		531,099		280,464		811,562
June	493,617		77,864		571,481		311,965		883,446
July	589,472		85,992		675,464		345,100		1,020,564
August	658,061		54,553		712,614		364,601		1,077,215
September	523,534		47,113		570,647		351,564		922,211
October	314,333		58,343		372,676		472,755		845,431
November	302,635		58,479		361,114		571,885		932,999
December	468,009		57,231		525,240		510,423		1,035,663

*Powerplants from Table 33

6. Fish Management

Rainbow smelt are the primary forage species in both Garrison and Oahe. Successful rainbow smelt reproduction is dependent on many factors including stable reservoir levels during the smelt spawning period generally in April and early May. Most eggs are laid in water less than 1 foot deep and are subject to desiccation through wave action and slight drops in water level. In the Fort Peck reservoir, the forage fish spawn normally occurs between April 15 and May 30. As per the 2004-2005 AOP, if runoff is not sufficient to keep all pool levels rising during the fish spawn in 2005, the Corps will, to the extent reasonably possible, set releases to result in a steady to rising pool level in Oahe during April and May and a steady to rising pool level in Fort Peck during May and June. Reservoir levels rose in the spring of 2005 in Fort Peck, Garrison and Oahe reservoirs. However, the rise in Lake Sakakawea did not commence until around the 14th of May. The rise in Oahe started approximately 1 month earlier. The state of North Dakota reported the smelt spawn in Lake Sakakawea was only marginal due to very little suitable substrate being inundated during the late spring spawning period.

7. Threatened and Endangered Species

This was the 20th year of regulation since the piping plover and interior least tern were Federally listed as threatened and endangered species, respectively. Both the least terns and piping plovers nest on sparsely vegetated sandbars, islands, and shoreline of the Missouri River and System reservoirs. Stream gages have been installed on the Missouri River to monitor stream flows during the nesting season. These gages provide a check, as well as a stage history, throughout the season to help relate the effects of regulation and natural events at intervals along the river. The gaging data must be supplemented with observations of nesting activities and conditions to provide the information that is needed for regulation. A dynamic flow routing model has been developed to closely predict maximum river stages along the river for different combinations of daily discharge and hourly power peaking characteristics.

Beginning in 1999, the Omaha District created a computerized Threatened and Endangered Species Data Management System. Report data, which is updated daily, includes nest records, census and productivity data, site descriptions, field journals, and messages. This database provided vital information again during the 2005 nesting season and proved to be a valuable tool in aiding release decisions benefiting threatened and endangered birds.

Although the Corps prevented inundation of nests following the listing, where possible, and accomplished habitat creation, fledging continued to be lower than predicted by the USFWS 1990 Biological Opinion until 1998 when fledge ratios exceeded the goal for both species. Predation, habitat degradation, severe weather, nest inundation, recent record runoff, and other factors contributed to the previously disappointing low fledging. The record fledging that occurred for both species in 1998 and the subsequent above average and new record fledge ratios achieved since then can be attributed to the large amount of habitat created by the high flows of 1997 and the declining reservoir levels during the current drought. The creation of additional habitat has also allowed greater flexibility in the release levels at the lower two System projects.

During CY2005, the majority of piping plovers were again found on the Garrison reservoir, below Gavins Point Dam and on the Oahe reservoir. Excellent shoreline habitat existed due to the lower reservoir levels caused by the reduced runoff. A record number of piping plover adults, 1,764, were found on the Missouri River System this year, which yielded a fledge ratio of 1.15 chicks per pair of adults. A record total of 904 adult terns nested on the System in 2005. The majority of least terns were found on the Missouri River reaches below Gavins Point and Garrison Dams. Tern nesting also was very successful. The fledge ratio for naturally raised terns was 1.09 fledglings per pair. One hundred and nineteen piping plover eggs were inundated at Lake Sakakawea as a result of rising pools during the nesting season.

Tables 18 and ***19*** show the population distribution and productivity for terns and plovers for 1986 through 2005. Productivity estimates for these birds on the Missouri River in 2005 include only natural nesting. Adult birds in this table are considered breeders even though they may not have had nesting success. The term "fledglings/pair" refers to the number of young birds produced per breeding pair. This ratio is an estimate, as the fate of every single fledgling is impossible to obtain.

8. Recreation and Resource Management

The Missouri River System reservoirs provide outstanding opportunities for boating, fishing, swimming, camping, and other outdoor recreation pursuits. Tourism related to the reservoirs is a major economic factor in all of the states adjoining the System. However, during extended drought periods, such as the Missouri River basin is currently experiencing, recreation is adversely affected. The pool levels at the upper three large-storage reservoirs, Fort Peck, Garrison and Oahe, have been the most affected by the drought. Due to their relatively small size, the lower three reservoirs are regulated in a consistent manner year-to-year and are not impacted by the drought. The low pool levels at the upper three reservoirs make boat ramps unusable, expose large areas of beach and sometimes make areas of the reservoirs unreachable. Thus, the low pools adversely affect recreation activities such as boating, fishing, swimming and camping.

During 2005 the Corps spent approximately $800,000 extending and relocating boat ramps to maintain public access where such work was feasible. Of the 11 reservoir access areas located on the Fort Peck reservoir, 8 were in operation for all or most of the 2005 recreation season; at Garrison, 25 of the total 35 reservoir access areas were available. At Oahe, 10 of 13 access areas were available on the North Dakota portion of the reservoir although all 10 of these were in river conditions; and 18 of 27 were available on the South Dakota portion in 2005. Access areas at the upper three reservoirs include Corps owned as well as Tribal, State and privately owned facilities. In 2002, many of the Federal recreation areas and boat ramps in South Dakota were turned over in fee title to the State of South Dakota through the Title VI process. Considerable effort has been required by all parties involved to maintain recreation access to the reservoirs as the drought progresses. However, in some locations it is impossible to extend or relocate boat ramps due to the local topography.

During 2005, public use at these reservoirs totaled 38,729,800 visitor hours, a 3 percent decrease from 2004. Visitor attendance figures at the mainstem projects from 2002 through

Table 18
Missouri River Mainstem
Interior Least Tern Survey Data

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Fort Peck Lake																				
Adults	-	4	3	4	6	10	0	7	9	2	0	0	4	0	0	0	0	2	0	0
Fledglings/Pair	-	-	0	3.00	-	0.40	{}	0	0.44	0	0	0	0	0	0	0	0	0	0	0
Fort Peck to Lake Sakakawea																				
Adults	-	-	18	48	92	66	110	31	58	95	128	162	25	40	13	39	34	38	48	34
Fledglings/Pair	-	-	0.33	0	0.17+	0.55+	0.25+	0.45+	1.41+	0.99+	0.33	0.53	.1.52	1.70	0.15	0.97	0.59	0.63	0.50	2.18
Lake Sakakawea																				
Adults	-	-	7	15	6*	8	29+	17	35	7	27	2	23	9	10	34	21	25	16	26
Fledglings/Pair	-	-	0	0	-	-	0.83+	0.12+	0	0	0.15	0	1.04	0.67	0.20	0.76	0.86	0.56	0.88	0.31
Garrison to Lake Oahe																				
Adults	171	175	142	121	174	195	198	145	217	284	105	41	141	105	105	125	126	144	142	157
Fledglings/Pair	-	-	0.93	0.43	0.44+	0.58	0.48	0.28	0.54	0.91	0.08	0.39	1.52	1.50	1.03	1.26	1.83	1.28	1.13	0.73
Lake Oahe																				
Adults	16*	21*	82	97	100	143	124	125	160	84	74	101	110	57	85	94	106	70	73	131
Fledglings/Pair	0.75	1.62	0	0	-	-	0.42	0	0.06	0	0.24	0.16	1.29	0.88	1.01	1.34	1.32	1.20	1.26	0.87
Ft. Randall to Niobrara																				
Adults	25	60	0	4	26	32	13	38	43	10	2	0	64	124	72	71	84	50	71	76
Fledglings/Pair	0.48	0.43	0	0	0.31+	0.63	0.46	0	0	0	0	0	0.94	1.03	1.26	0.14	0.71	0.92	0.37	0.47
Lake Lewis and Clark																				
Adults	0	0	45	29	63	55	29	76	44	16	28	60	120	76	44	58	46	46	13	4
Fledglings/Pair	-	-	0.13	0.62	0.35+	0	1.59	0.97	0	0	0	1.57	2.33	0.21	0.38	1.17	1.04	0.39	0.00	0.00
Gavins Point to Ponca																				
Adults	181	232	252	210	167	193	187	272	211	93	82	115	148	161	149	232	314	366	359	476
Fledglings/Pair	0.26	0.46	0.49	0.55	0.46+	0.26	0.21	0.83	0.48	0.49	0.27	0.90	2.27	2.41	1.72	1.09	1.32	0.75	1.04	1.34
Total Adults	393	492	549	528	634	702	690	711	777	591	446	481	635	572	551	653	731	741	722	904
Fledglings/Pair	0.26	0.46	0.59	0.54	0.38	0.41	0.42	0.50	0.41	0.67	0.21	0.66	1.73	1.42	1.22	1.04	1.27	0.87	0.95	1.09

Five Year Running Average Interior Least Tern Fledge Ratio Goal = 0.94

- Data not collected
* Partial Survey Results
{} No Birds Found
\+ Subsamplng of Selected Nesting Areas

The data does not include least terns and piping plovers raised in captivity. The data represents only wild fledged birds.
From 1990 to 2003 the Ten Year Least Tern Fledge Ratio was 0.70 (1990 and 2000 Biological Opinions).
From 2004 to current 5-Year running average goal is 0.94 (2003 Amended Biological Opinion)
Data in this table may differ from previous reports. As information becomes available, this table is updated.

Table 19
Missouri River Mainstem
Piping Plover Survey Data

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Fort Peck Lake																				
Adults	16	10	20	12	22	25	26	30	4	5	0	0	4	2	0	4	2	17	9	26
Fledglings/Pair	-	-	1.70	1.50	3.18	1.20	1.00	0.60	1.50	1.20	0	0	0	2.00	0	1	2	0.35	2.22	1.08
Fort Peck to Lake Sakakawea																				
Adults	-	-	5	11	17	13	0	4	9	20	24	23	4	5	4	3	2	6	0	2
Fledglings/Pair	-	-	0	0.18	0	0	{}	0+	0	3.50	1.00	0.87	1.00	0	0	1.33	0	2.67	0	4
Lake Sakakawea																				
Adults	-	-	143	57	132	150	108	8	45	24	70	3	119	83	277	424	469	528	738	746
Fledglings/Pair	-	-	0	0	-	-	1.50	8.5+	1.24	0	0.57	0.67	1.24	1.25	1.61	1.25	1.65	1.06	1.5	0.89
Garrison to Lake Oahe																				
Adults	139	160	113	84	71	124	77	127	119	261	45	6	74	139	99	149	119	149	164	220
Fledglings/Pair	-	-	0.97	0.26	1.04+	1.13+	1.06+	0.54+	0.87	0.87	0.09	0	1.84	0.88	1.41	1.53	2.03	1.66	1.16	0.8
Lake Oahe																				
Adults	4*	4*	55	140	88	87	143	66+	85	30	21	31	98	46	141	184	203	301	372	364
Fledglings/Pair	-	2.50*	0	0	-	-	0.97+	0.33	0.09	0.93	0.29	1.29	1.06	0.30	1.45	1.41	2.16	1.84	1.41	1.21
Ft. Randall to Niobrara																				
Adults	11	16	0	0	12	25	8	12	17	0	3	0	33	51	62	38	35	37	42	42
Fledglings/Pair	0.18	0.13	0	0	0.67*	0.48	0.75	0	0	0	0	0	1.27	1.02	0.87	0.74	1.03	1.46	0.71	0.81
Lake Lewis and Clark																				
Adults	0	0	31	18	30	33	6	32	12	4	6	32	84	67	28	34	44	14	0	24
Fledglings/Pair	-	-	0.06	0.56	0.67+	0	0	0.06	0.33	0	0	1.25	2.45	0.30	0.5	0.71	1.68	1.57	0	0.17
Gavins Point to Ponca																				
Adults	172	177	212	122	148	166	112	109	62	63	22	22	49	141	186	218	260	286	262	340
Fledglings/Pair	0.05	1.13	0.62	0.21	0.39+	0.35	0.34	1.06	0.61	0.16	0	0	2.20	1.60	2.17	1.85	2.29	1.9	1.87	1.97
Total Adults	342	367	579	444	521	623	480	388	353	407	191	117	465	534	797	1054	1134	1338	1587	1764
Fledglings/Pair	0.06	1.08	0.73	0.32	0.76	0.62	0.94	0.76	0.61	0.84	0.39	0.87	1.61	1.01	1.58	1.41	1.91	1.5	1.49	1.15

Ten Year Running Average Piping Plover Fledge Ratio Goal = 1.22

- Data not collected
* Partial Survey Results
{} No Birds Found
\+ Subsamplng of Selected Nesting Areas

The data does not include least terns and piping plovers raised in captivity. The data represents only wild fledged birds.
From 1990 to 2000 the Fifteen Year Piping Plover Fledge Ratio Goal was 1.44 (1990 Biological Opinion).
From 2001 to 2003 the goal was 1.13 (2000 Biological Opinion)
From 2004 to current the 10-year running average goal is 1.22 (2003 Amended Biological Opinion)
Data in this table may differ from previous reports. As information becomes available, this table is updated.

2005 are shown in ***Table 20***. ***Figure 12*** displays recreation related visitor hours at each of the six mainstem projects for the years 1954 through 2005. Although the drought has had an impact on visitation during the past five years, much of the reduction shown is attributed to the data collection changes associated with the South Dakota land transfer mentioned previously. Since the title transfer occurred, the Corps has not collected visitation data consistent with previous years at the recreation sites in South Dakota. The 2005 visitation in South Dakota presented reflects water-related use on the reservoirs but not the visitation at the campgrounds that were turned over to the State of South Dakota.

The reporting method was changed from recreation days to visitor hours in 1987, and the reporting period was changed from calendar year to fiscal year in 1989 for all Corps projects. All Corps projects, including those on the Missouri River mainstem, are now reporting visitation using the Visitation Estimation Reporting System (VERS).

Table 20
Visitation at System Reservoirs in Visitor Hours

Mainstem Project	2002	2003	2004	2005	Percent Change 2004-2005
Fort Peck	5,183,100	5,128,000	5,252,800	5,445,900	+4
Garrison	17,303,600	14,626,600	13,894,500	12,698,600	-9
Oahe	10,242,100	7,933,300	7,140,000	7,700,600	+8
Big Bend	5,706,800	5,701,600	3,433,500	2,980,900	-13
Fort Randall	2,529,800	1,265,500	1,275,400	1,103,600	-13
Gavins Point	8,358,200	8,744,400	8,907,900	8,800,200	-1
System Total	**49,323,600**	**43,399,400**	**39,904,100**	**38,729,800**	**-3**

Beginning in January 2003 and running through 2006, the nation will commemorate the 200th anniversary of the Lewis and Clark Expedition. An increase in visitation is expected at points of interest along the entire route taken by the Captains and the expedition members. Because the Corps has management responsibilities on more of the route than any other entity (90%) and because of its Army heritage of exploring and mapping the western United States, the Corps will continue to play a key leadership role in the observance of the Lewis and Clark Expedition Bicentennial. The Corps is working with other Federal, Tribal, State, and local governments; the National Bicentennial Council, and the Lewis and Clark Trial Heritage Foundation to ensure that adequate facilities and information are available to accommodate the increased visitation, to ensure a safe visitor experience, to protect the natural and cultural resources, and to plan and coordinate commemorative activities.

In 2000, the National Council for the Lewis and Clark Bicentennial decided to highlight some of the more nationally significant festivals and events commemorating the journey of Lewis and Clark and the members of the Expedition. The Council designated these significant events as "Signature Events". These Signature Events are those commemorations that are of nationwide historical significance, have the potential of high visitation, and are multicultural in nature. The year 2004 saw the beginning of the Lewis and Clark Bicentennial Commemorations in the Missouri River basin. There were seven Lewis and Clark Signature Events held, each with a different theme and focus. These events continued in 2005 with two additional Signature Events.

The only Signature Events in the Missouri Basin in 2005 was “Explore the Big Sky” (Great Falls, MT; June 29-July 4). “Destination the Pacific” (Astoria, OR/Long Beach WA; November 7-15) was held in the Columbia River Basin.

These events were all very well attended with visitation occurring from all over the United States, Canada, and Europe. Visitation to these multi-day events ranged between 20,000 and 50,000 per event. The Corps participated in these events by offering a variety of venues. The Corps National Lewis and Clark team provided school programs, recreated a Lewis and Clark camp complete with period-uniformed re-enactors, set up and manned several different displays, as well as performances and lectures by numerous individuals.

The 2006 calendar year will mark the end of the Lewis and Clark Bicentennial. There are four Signature Events scheduled – three of which will be in the Missouri Basin. The “Nez Perce Summer of Peace” will be held June 3-17 in Lewiston, ID in the Snake River Basin. There will be three additional Signature Events in the Missouri Basin in 2006: “Clark on the Yellowstone” (Billings, MT; July 21-25); “Reunion at the Home of Sakakawea” (New Town, ND; August 17-20); and “Lewis & Clark: Currents of Change” (St. Louis, MO. September 20-24).

9. Cultural Resources.

As acknowledged in the 2004 Programmatic Agreement for the Operation and Management of the Missouri River Main Stem System (PA), the fluctuation of the water has erosion effects under normal regulation. With the recent drought conditions additional sites have become exposed as the waters have receded. The Corps will continue to work with the Tribes utilizing 36 CFR Part 800 and the PA to address the exposure of these sites. The objective of writing a programmatic agreement is to deal “…with the potential adverse effects of complex projects or multiple undertakings…” The PA objective was to collaboratively develop a preservation program that would avoid, minimize and/or mitigate the adverse effect of System regulation.

The planned preservation program 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 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 the Corps’ lands within the System.

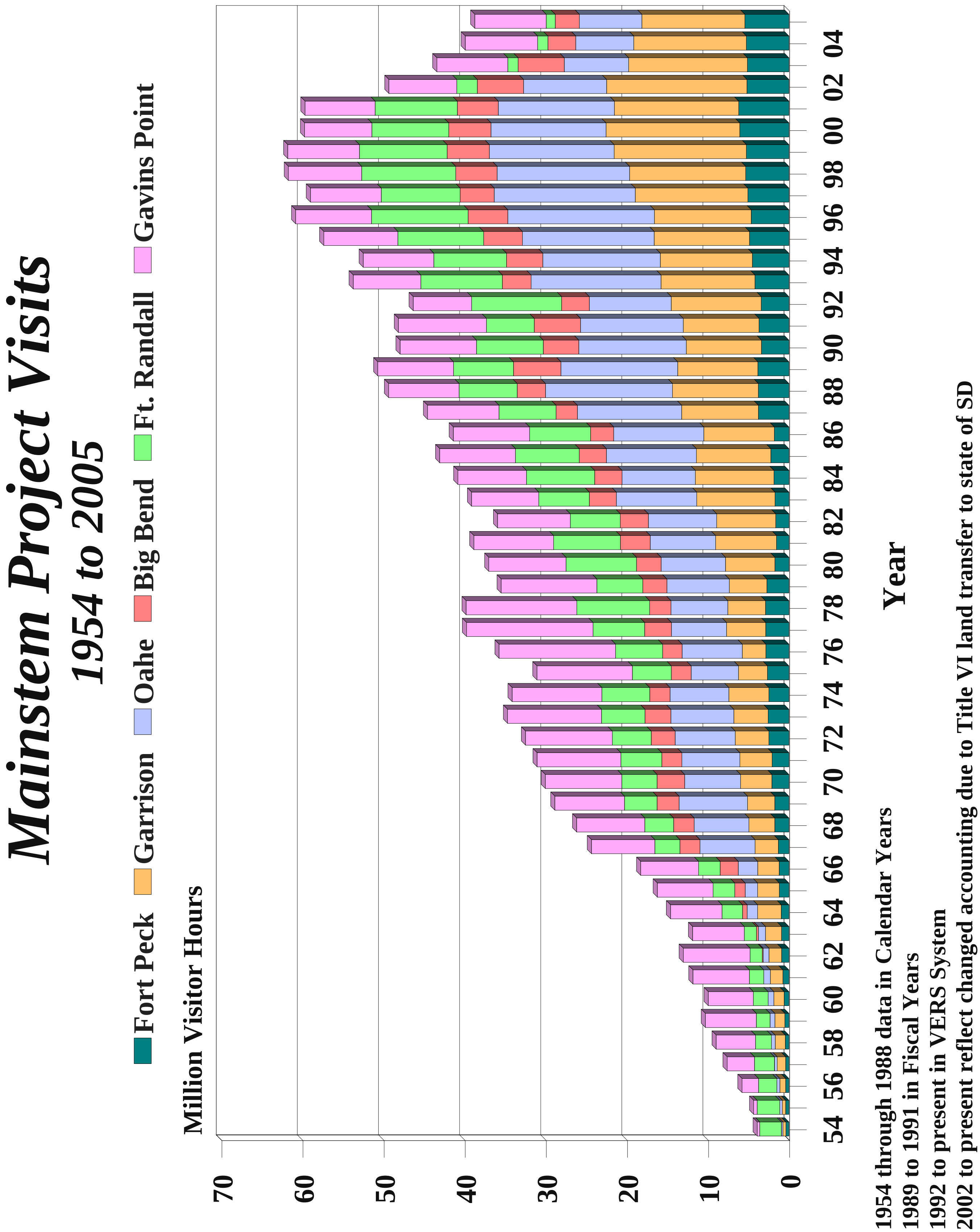

Mainstem Project Visits
1954 to 2005
Fort Peck
Garrison
Oahe
Big Bend
Ft. Randall
Gavins Point
Million Visitor Hours
70
60
50
40
30
20
10
0
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
86
88
90
92
94
96
98
00
02
04
Year
1954 through 1988 data in Calendar Years
1989 to 1991 in Fiscal Years
1992 to present in VERS System
2002 to present reflect changed accounting due to Title VI land transfer to state of SD

Figure 12

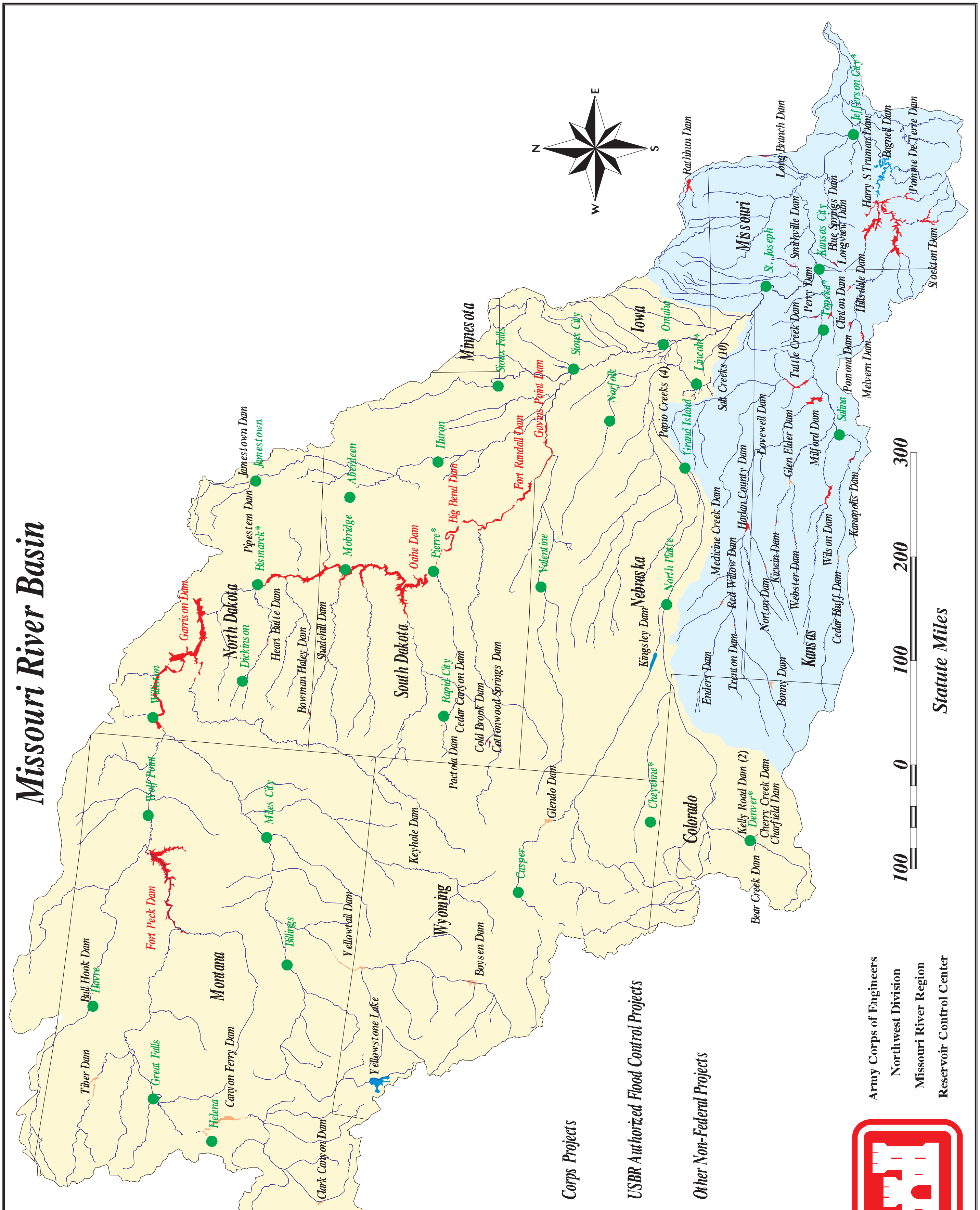

Missouri River Basin
N
E
S
W
Montana
Wyoming
North Dakota
South Dakota
Nebraska
Iowa
Minnesota
Missouri
Kansas
Colorado
Tiber Dam
Bull Hook Dam
Havre
Great Falls
Helena
Canyon Ferry Dam
Clark Canyon Dam
Fort Peck Dam
Wolf Point
Williston
Garrison Dam
Miles City
Billings
Yellowtail Dam
Yellowstone Lake
Boysen Dam
Keyhole Dam
Casper
Glendo Dam
Cheyenne*
Denver*
Kelly Road Dam (2)
Cherry Creek Dam
Chatfield Dam
Bear Creek Dam
Dickinson
Heart Butte Dam
Bismarck*
Pipestem Dam
Jamestown Dam
Jamestown
Bowman Haley Dam
Shadehill Dam
Mobridge
Aberdeen
Oahe Dam
Pierre*
Big Bend Dam
Fort Randall Dam
Gavins Point Dam
Huron
Sioux Falls
Sioux City
Rapid City
Cedar Canyon Dam
Cold Brook Dam
Cottonwood Springs Dam
Pactola Dam
Valentine
Norfolk
Omaha
Papio Creeks (4)
Lincoln*
Salt Creeks (10)
Grand Island
North Platte
Kingsley Dam
Enders Dam
Trenton Dam
Medicine Creek Dam
Red Willow Dam
Harlan County Dam
Norton Dam
Kirwin Dam
Webster Dam
Bonny Dam
Lovewell Dam
Glen Elder Dam
Wilson Dam
Cedar Bluff Dam
Milford Dam
Kanopolis Dam
Salina
Tuttle Creek Dam
Perry Dam
Topeka*
Clinton Dam
Pomona Dam
Melvern Dam
Hillsdale Dam
St. Joseph
Kansas City
Smithville Dam
Blue Springs Dam
Longview Dam
Harry S Truman Dam
Stockton Dam
Pomme De Terre Dam
Bagnell Dam
Jefferson City*
Long Branch Dam
Rathbun Dam
0
100
200
300
Statute Miles
Corps Projects
USBR Authorized Flood Control Projects
Other Non-Federal Projects
Army Corps of Engineers
Northwest Division
Missouri River Region
Reservoir Control Center

Plate 1

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	18,100 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	1,097	2,339	2,749
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

Plate 2A

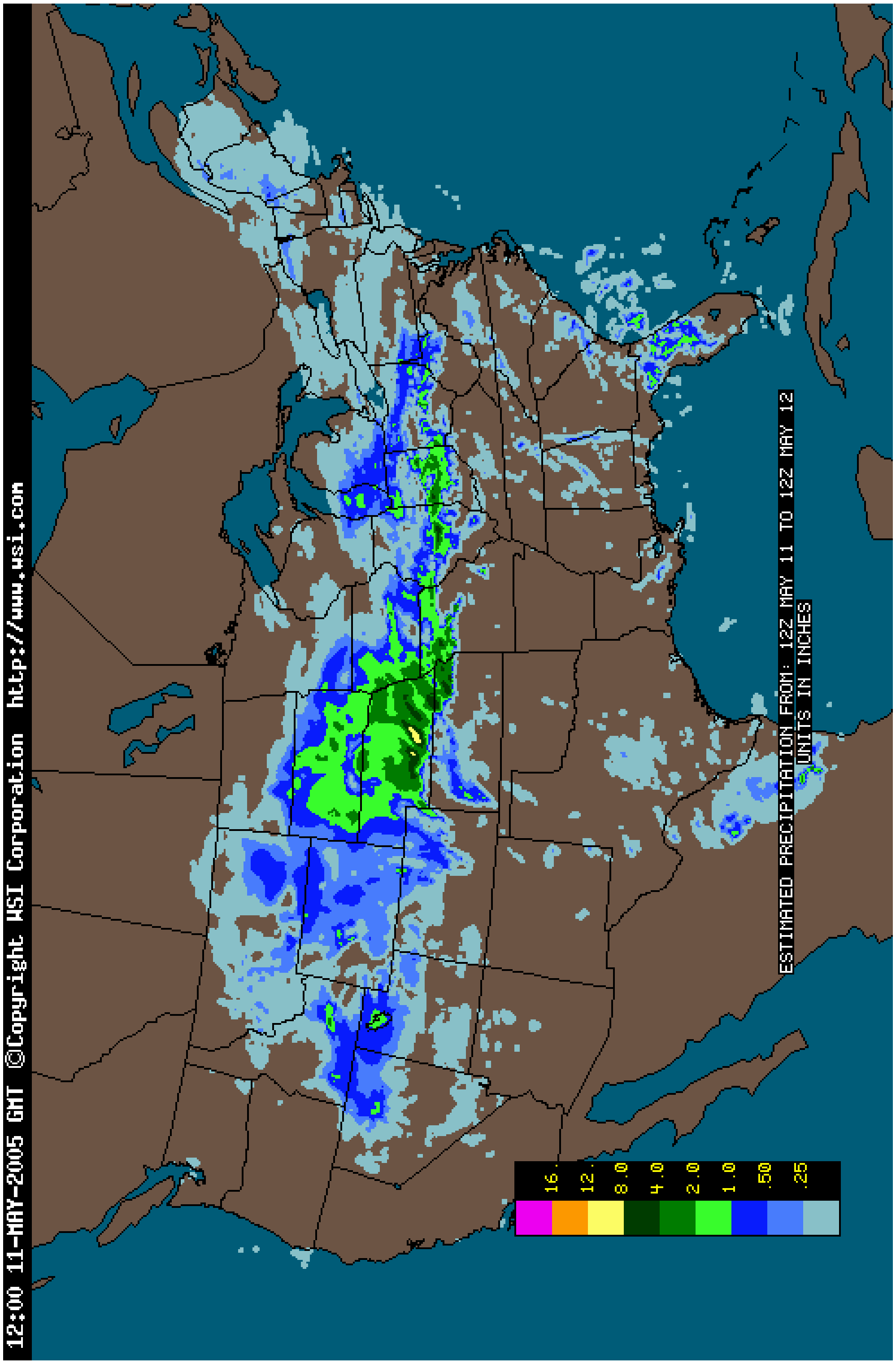
Summary of Engineering Data -- Missouri River Mainstem System

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
4,300 a.f. 430 yrs.	18,300 a.f. 250 yrs.	2,600 a.f. 180 yrs.	92,500 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 32,000 cfs - 128,000 cfs			43
1351-1355(10) 25,000-100,000 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	2,435,650 kw	52
497,000	293,000	74,000	1,967,000 kw	53
1,010	1,793	744	9,731 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) 1967-2005 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
February 2006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UNITS IN INCHES
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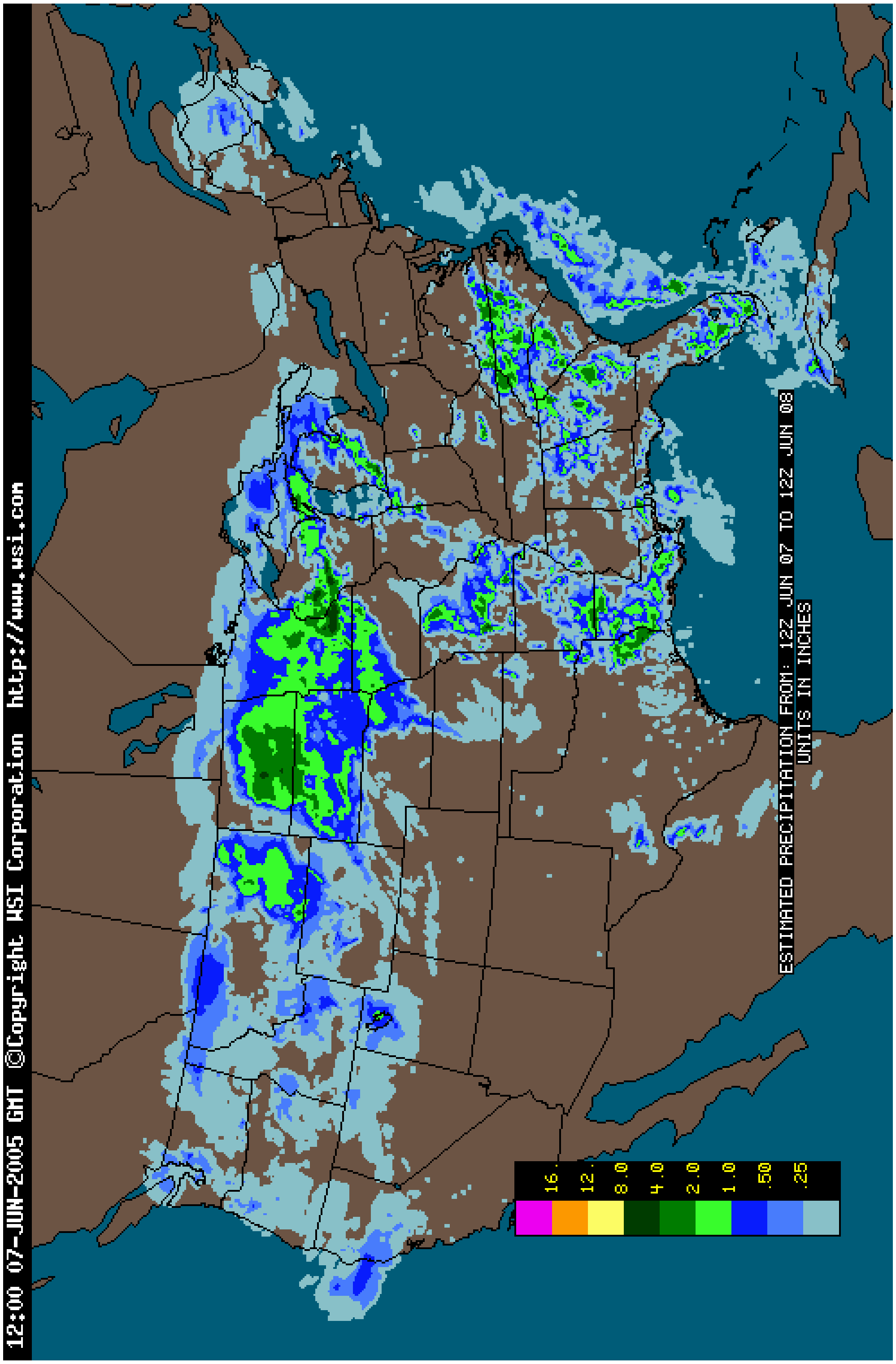
12.
8.0
4.0
2.0
1.0
.50
.25

Plate 3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UNITS IN INCHES
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12.
8.0
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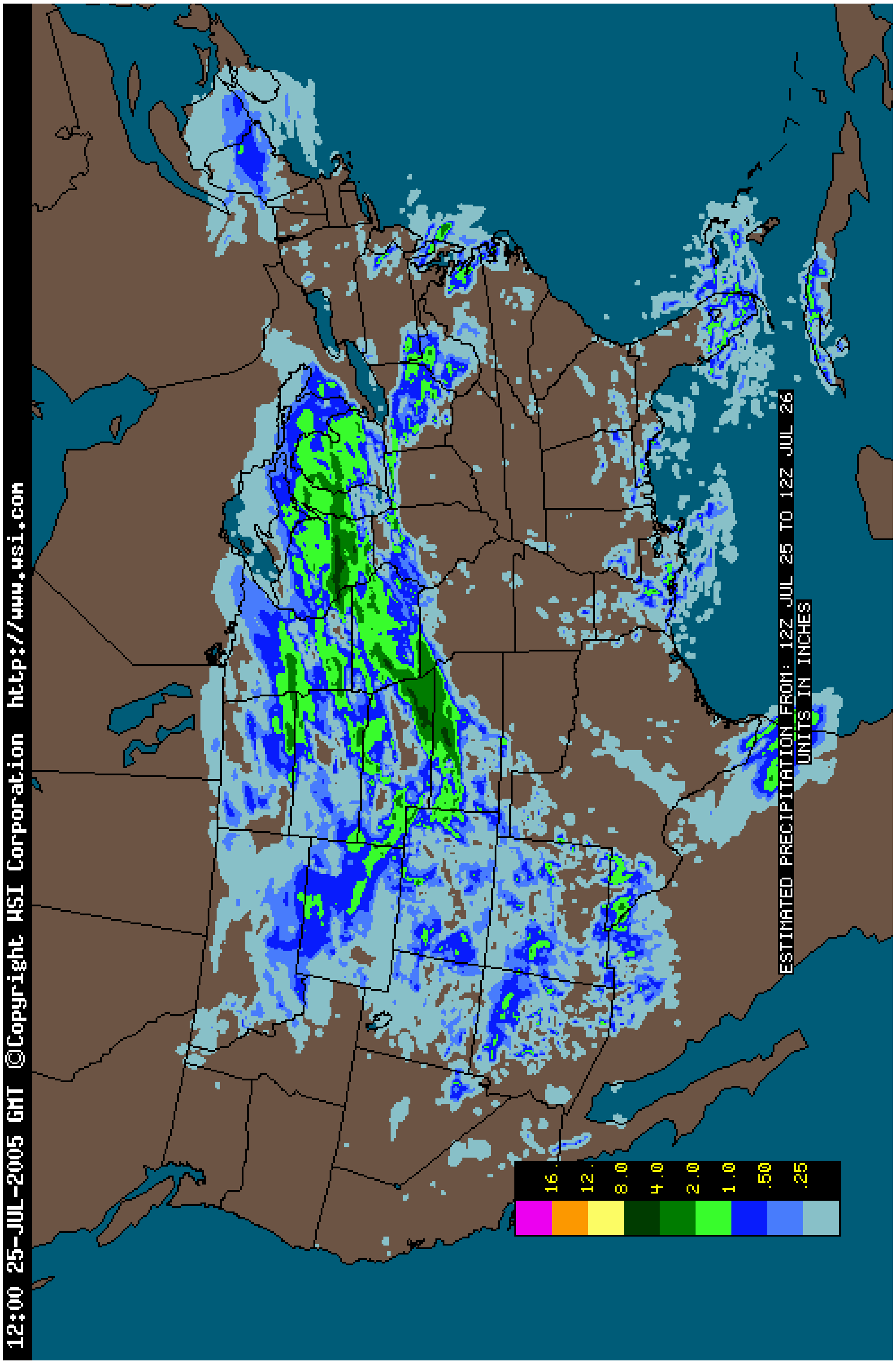
Plate 4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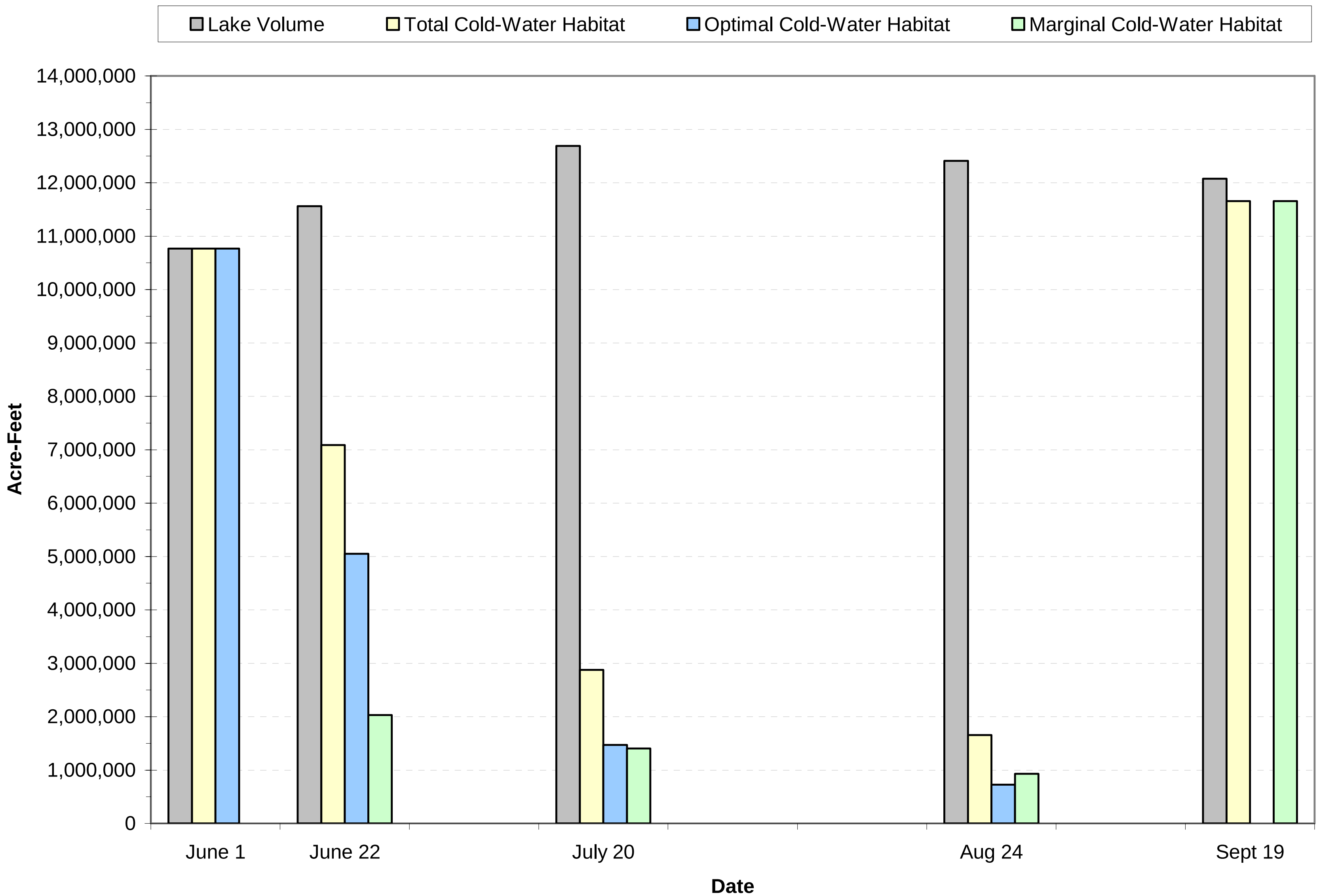
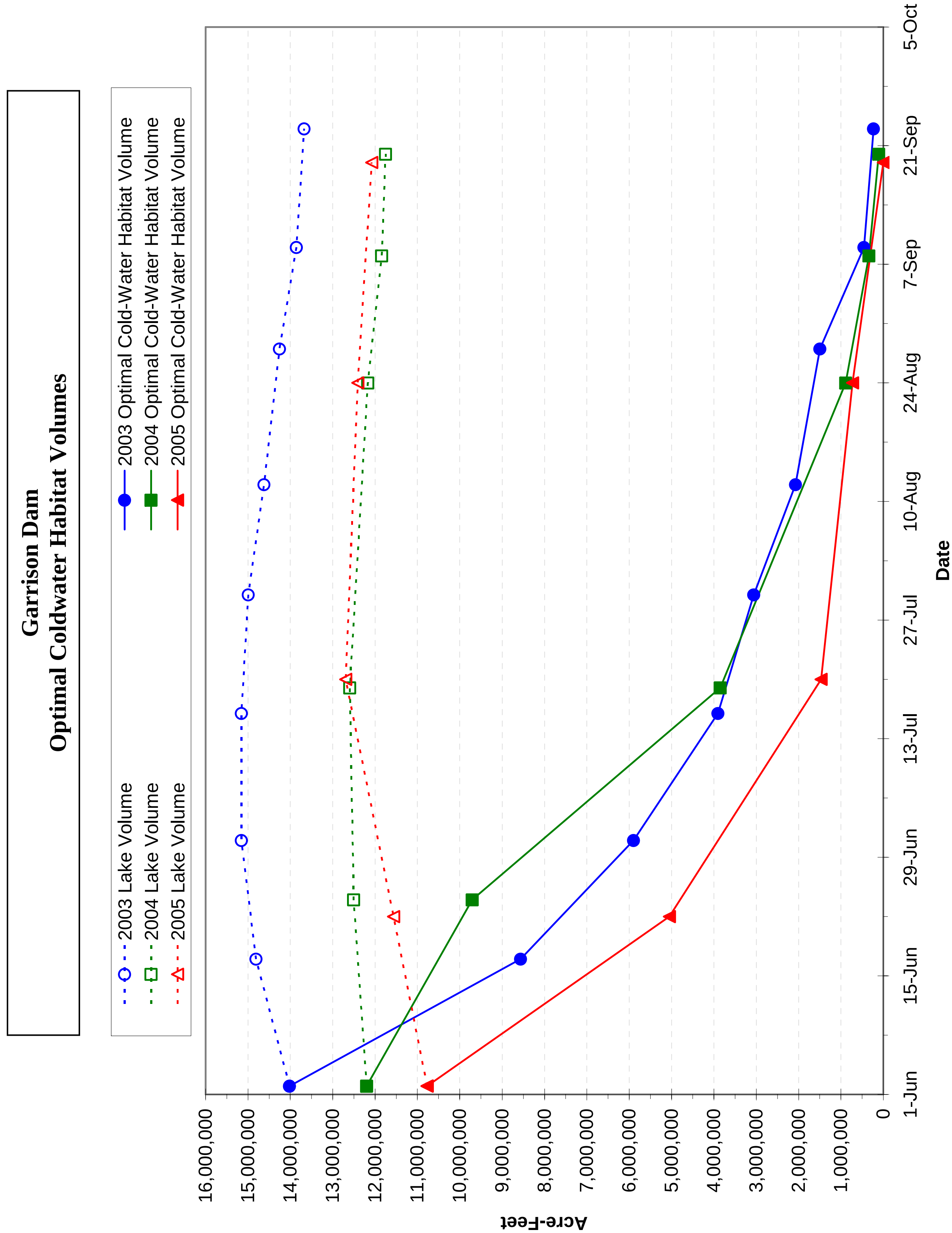
UNITS IN INCHES
16.
12.
8.0
4.0
2.0
1.0
.50
.25

Plate 5

Coldwater Habitat Estimated in Lake Sakakawea during 2005





Garrison Dam
Optimal Coldwater Habitat Volumes
2003 Lake Volume
2004 Lake Volume
2005 Lake Volume
2003 Optimal Cold-Water Habitat Volume
2004 Optimal Cold-Water Habitat Volume
2005 Optimal Cold-Water Habitat Volume
Acre-Feet
16,000,000
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Date

Plate 7