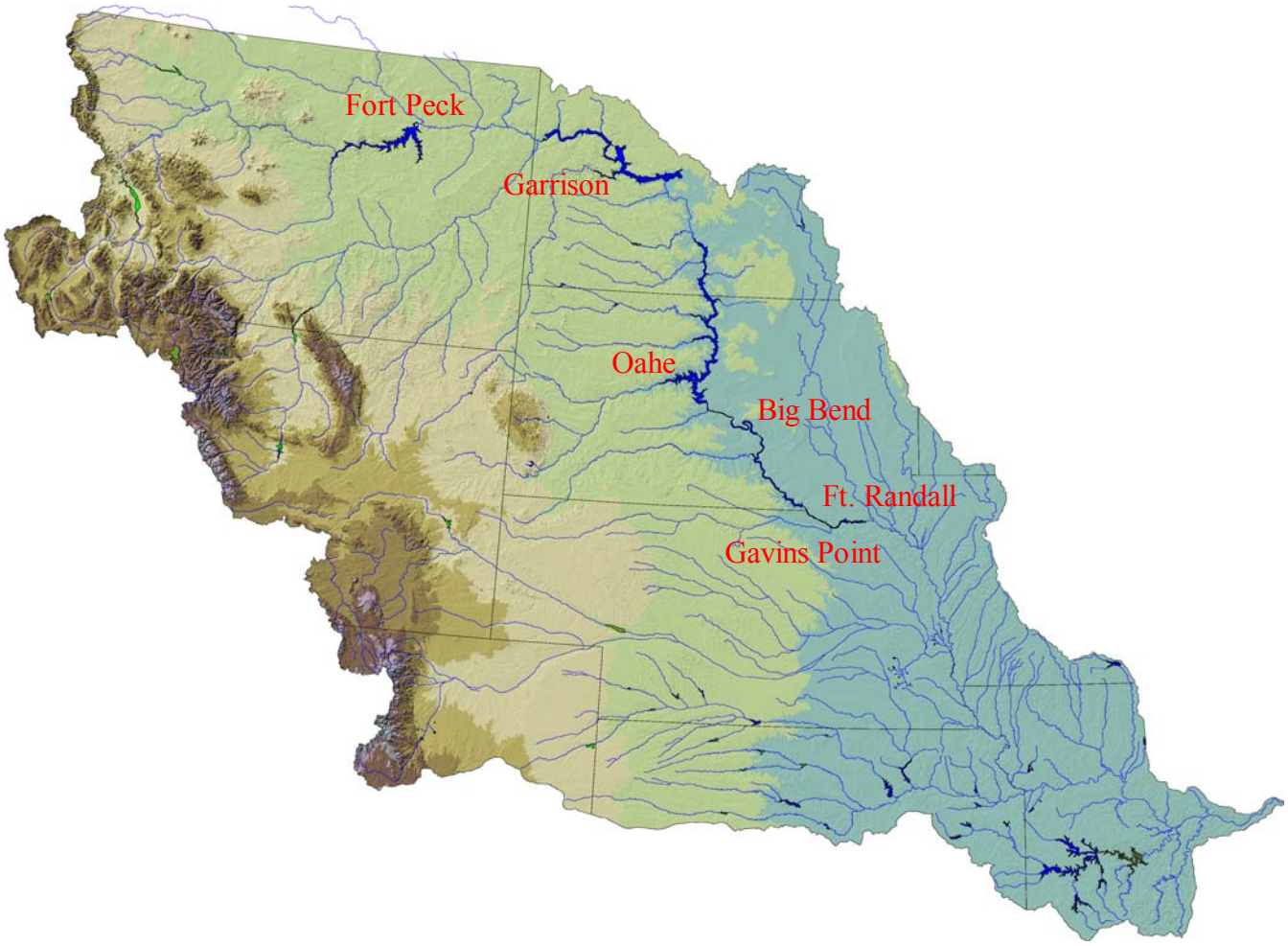
US Army Corps
of Engineers

Northwestern Division

Missouri River Mainstem Reservoir System

Summary of Actual 2003 Operations

Missouri River Basin



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

April 2004

MISSOURI RIVER MAINSTEM RESERVOIRS

Summary of Actual 2003 Operations

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF ABBREVIATIONS

AOP -	annual operating plan
ac.ft. -	acre-feet
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 1978
ft -	feet
FWS -	U.S. Fish and Wildlife Service
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
SWE -	snow water equivalent
tern -	interior least tern
tw -	tailwater
T&E -	threatened and endangered
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.

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

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

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

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

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

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

MISSOURI RIVER MAINSTEM RESERVOIR SYSTEM

Summary of Actual 2003 Operations

I. FOREWORD

This document contains a summary of the actual regulation of the Missouri River Mainstem Reservoir System (System) for the 2003 Calendar Year (CY). Two other reports related to System regulation are also available. All three reports, this "Summary of Actual Calendar Year 2003 Operation," "System Description and Operation," and "2004 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 will also be 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 2003

A. GENERAL

During the 2003 Calendar Year (CY), the System was regulated in accordance with the applicable provisions of the 2002-2003 AOP, which was made available for review and comment by representatives of State and Federal agencies, 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 2003

The 2003 runoff year was the fourth consecutive drought year experienced in the Missouri River Basin. ***Table 1*** shows the calendar year runoff totals for CY 2003 above Sioux City, Iowa as well as runoff in reaches from Sioux City to Hermann, Missouri. ***Table 2*** shows the 2003 CY monthly runoff for selected reaches.

1. Plains Snowpack

The months of November and December 2002 were very dry across the Missouri River basin plains areas. Three locations, Faith (0.00 inch) and Winner (trace), South Dakota and Miles City, Montana (0.02 inch) recorded their lowest November precipitation totals since the 1950's and 1960's. A very dry pattern persisted across the northern and central High Plains during December. Kansas City, Missouri endured a 41-day dry spell from November 15 to December 26. West central Iowa and southwest Iowa were below normal with respect to precipitation for the month of December. West central Iowa averaged 0.03 inch of precipitation or a departure from normal of a –0.98 inch. Average December snowfall across west central Iowa was 0.6

inch. In the Norfolk, Nebraska area, the month of December was the driest since 1943 and the 4 driest December on record. The monthly snowfall total was 0.5 inch, with tied for the 8 lowest.

TABLE 1
2003 CALENDAR YEAR RUNOFF FOR SELECTED REACHES

Reach	1898 – 1998 Average Runoff Volume (in 1000 AF)	Calendar Year 2003 Runoff Volume (in 1000 AF)	Percent of Average Runoff
Above Fort Peck	7,395	4,713	64
Fort Peck to Garrison	10,840	8,028	74
Garrison to Oahe	2,430	1,466	60
Oahe to Fort Randall	910	580	64
Fort Randall to Gavins Point	1,675	1,305	78
Gavins Point to Sioux City	1,940	1,502	77
TOTAL ABOVE SIOUX CITY	25,190	17,594	70
Sioux City to Nebraska City	7,800	4,870	62
Nebraska City to Kansas City	12,530	3,290	26
Kansas City to Hermann	24,460	8,810	36
TOTAL BELOW SIOUX CITY*	44,790	16,970	38

* 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 1967-2003.

The new year began similar to how 2002 ended with continued dry and warm temperatures in the northern and central High Plains. Kansas City, Missouri completed its third-driest 3-month period on record. Kansas City totaled just 0.82 inch (16 percent of normal) from November to January. In central Nebraska, the snowfall was about 9 inches, near normal for January. On January 27, snow depths over the plains of South Dakota and Nebraska varied from 1-3 inches. Snow depths over the North Dakota, Montana and Wyoming plains varied from 3-5 inches. There was no plains snow accumulation in Kansas and Colorado.

The dry conditions persisted through the month of February. On February 24, snow depths over the Nebraska, Kansas, and South Dakota plains measured 1-2 inches. In the North Dakota, Montana, Wyoming and Colorado plains, snow depths varied from 3-5 inches.

Early March brought snowfall to the plains area. March 5-8 snowfall in Montana included 15.4 inches in Billings and 5.8 inches in Glasgow. As of March 10 plains snow depths in eastern Montana had risen to the 10-15 inch range. Snow depths in North Dakota were 4-7 inches and 1-5 inches in the South Dakota plains area. Eastern and central Nebraska totaled 1-2 inches for March. There was very little plains snow evident in western Nebraska, eastern Wyoming, eastern Colorado or the entire state of Kansas. By March 17 very warm weather had melted all the plains snow in the basin. From March 17-19 snow fell in the Rockies and western plains. Denver, Colorado recorded 31.8 inches in the 3-day period, Cheyenne, Casper and Lander, Wyoming recorded totals of 18.3 inches, 13.3 inches and 12.0 inches, respectively.

TABLE 2

Missouri River Basin
Final Calendar Year 2003 Runoff
Historic

2-Jan-04

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					
	(History)								
JAN 2003	211	184	-13	-1	46	59	427	486	486
NORMAL	315	260	10	20	100	35	705	740	740
DEPARTURE	-104	-76	-23	-21	-54	24	-278	-254	-254
% OF NORM	67%	71%	-130%	-5%	46%	169%	61%	66%	66%
FEB 2003	173	147	44	104	128	104	596	700	1,186
NORMAL	365	360	90	50	125	85	990	1,075	1,815
DEPARTURE	-192	-213	-46	54	3	19	-394	-375	-629
% OF NORM	47%	41%	49%	208%	102%	122%	60%	65%	65%
MAR 2003	620	1,489	490	76	134	176	2,809	2,985	4,171
NORMAL	610	1,010	580	220	205	300	2,625	2,925	4,740
DEPARTURE	10	479	-90	-144	-71	-124	184	60	-569
% OF NORM	102%	147%	84%	35%	65%	59%	107%	102%	88%
APR 2003	531	691	102	84	114	156	1,522	1,678	5,849
NORMAL	665	1,115	500	145	180	340	2,605	2,945	7,685
DEPARTURE	-134	-424	-398	-61	-66	-184	-1,083	-1,267	-1,836
% OF NORM	80%	62%	20%	58%	63%	46%	58%	57%	76%
MAY 2003	787	900	380	129	154	244	2,350	2,594	8,443
NORMAL	1,120	1,280	320	145	185	275	3,050	3,325	11,010
DEPARTURE	-333	-380	60	-16	-31	-31	-700	-731	-2,567
% OF NORM	70%	70%	119%	89%	83%	89%	77%	78%	77%
JUN 2003	1,097	2,672	175	77	152	247	4,173	4,420	12,863
NORMAL	1,655	2,715	435	160	180	270	5,145	5,415	16,425
DEPARTURE	-558	-43	-260	15	-28	-23	-972	-995	-3,562
% OF NORM	66%	98%	40%	48%	84%	91%	81%	82%	78%
JUL 2003	274	988	105	57	116	220	1,540	1,760	14,623
NORMAL	835	1,815	180	60	135	215	3,025	3,240	19,665
DEPARTURE	-561	-827	-75	-3	-19	5	-1,485	-1,480	-5,042
% OF NORM	33%	54%	58%	95%	86%	102%	51%	54%	74%
AUG 2003	144	87	43	38	71	32	383	415	15,038
NORMAL	360	625	65	40	115	130	1,205	1,335	21,000
DEPARTURE	-216	-538	-22	-2	-44	-98	-822	-920	-5,962
% OF NORM	40%	14%	66%	95%	62%	25%	32%	31%	72%
SEP 2003	139	118	62	18	75	83	412	495	15,533
NORMAL	345	470	115	40	110	95	1,080	1,175	22,175
DEPARTURE	-206	-352	-53	-22	-35	-12	-668	-680	-6,642
% OF NORM	40%	25%	54%	45%	68%	87%	38%	42%	70%
OCT 2003	213	233	50	-17	69	26	548	574	16,107
NORMAL	400	525	70	10	120	75	1,125	1,200	23,375
DEPARTURE	-187	-292	-20	-27	-51	-49	-577	-626	-7,268
% OF NORM	53%	44%	71%	-170%	58%	35%	49%	48%	69%
NOV 2003	217	186	-17	1	130	54	517	571	16,678
NORMAL	390	410	65	10	120	75	995	1,070	24,445
DEPARTURE	-173	-224	-82	-9	10	-21	-478	-499	-7,767
% OF NORM	56%	45%	-26%	10%	108%	72%	52%	53%	68%
DEC 2003	307	333	45	14	116	101	680	916	17,594
NORMAL	335	255	0	10	100	45	700	745	25,190
DEPARTURE	-28	78	45	4	16	56	-20	171	-7,596
% OF NORM	92%	131%	11250%	140%	116%	224%	97%	123%	70%
				Calendar Year Totals					
	4,713	8,028	1,466	580	1,305	1,502	16,092	17,594	
NORMAL	7,395	10,840	2,430	910	1,675	1,940	23,250	25,190	
DEPARTURE	-2,682	-2,812	-964	-330	-370	-438	-7,158	-7,596	
% OF NORM	64%	74%	60%	64%	78%	77%	69%	70%	

2. Mountain Snowpack

a. Fall 2002

In Montana, the snowfall season got off to a very slow start, even slower than in 2001. The mountain snowpack distribution consisted of low and mid-elevation mountain snowpack that was generally less than the high elevation mountain snowpack. For the first part of the winter season, the El Nino-influenced forecast for above average temperatures and below average precipitation held true. Mountain snowpack amounts in Montana were quite variable across the state and totaled generally 20 to 30 percent below the previous year's totals for this time of the year. Mountain snow water content statewide was 63 percent of average and 77 percent of Fall 2001. Snowpack in Montana in the headwaters of the Missouri River was 66 percent of average and 88 percent of last year.

In Wyoming, snow water equivalent (SWE) across the state was below normal in the beginning of the snowpack season. The northwest portion of the state was 73 percent of normal. Northeast Wyoming was 79 percent of normal, and the southeast part of the state was 76 percent of average. Although the state received quite a bit of snow early this fall, little snowfall occurred in November and December 2002. SWE was generally below average for the entire State.

b. January 2003

Montana had several storms move across areas of the state during January adding much needed mountain snow. Regions with the largest gains were in the southern half of the state. There were several rain events during January but there was no significant snowpack loss from the rains. January average temperature departures state-wide were generally 5 to 6 degrees above normal. Mountain snowpack statewide was 73 percent of average and 81 percent of the previous year. In the headwaters of the Missouri River basin, snowpack was 74 percent of average and 95 percent of the previous year.

In Wyoming, SWE across the state was generally below normal for this time of the year, about 76 percent of normal. Precipitation for December varied from 18 to 74 percent below average for the State. Year-to-date precipitation was also below average for the year. Although the state received quite a bit of snow in the early fall, little snowfall had occurred in January. SWE was generally below average for the entire State.

c. February 2003

February storm activity in the southern half of Montana added significant amounts of mountain snow. After a slow start in mountain snow accumulation, February snowpack increases were observed in many river basins by 10 to 15 percent. Storms in the first half of February were associated with warm and very moist air. Towards the end of the month, record cold air pushed across Montana and the associated snowfall had much less moisture, but improvements still occurred. By March 1 there are normally about four to six weeks remaining in the annual snowfall accumulation season. Statewide, mountain snow water content was 79 percent of

average and 91 percent of last year. In the headwaters of the Missouri River basin, snowpack was 84 percent of average and 109 percent of last year. Snow accumulation in the Upper Clark Fork, Jefferson, and Gallatin River basins had improved significantly, reaching into the 80 percent of average, or more, after having a snowpack at or below 60 percent on January 1. In comparative years, this level of accumulation has occurred about one third of the time. On the other hand, when the March 1 snowpack is 60 percent of average, or less, recovery to 80 percent or greater by April has occurred only 8 percent of the time. Unfortunately, this is what the Sun, Teton, and Marias River basins were facing.

In Wyoming, SWE amounts for the Deer, LaPrelle, North Platte, Laramie, and Little Laramie River basins all remained below normal, ranging from 59 to 81 percent of normal.

d. March 2003

In Montana, March was the second consecutive month in which mountain snowfall made significant increases in the snow water content. March mountain precipitation was generally above to well above average with several basins about twice of normal. Temperatures were somewhat variant causing low land flooding during a warm spell the second week of March. Valley temperatures generally near to below average in the Missouri River headwaters. By the end of the month, mountain snow water contents statewide were 93 percent of average and 97 percent of last year. In the headwaters, snowpack was 96 percent of average and 115 percent of last year.

In Wyoming, precipitation, generally in the form of snow, fell at an above average rate during March. However, the SWE of 96 percent of normal across the state was below normal for this time of the year. Precipitation for the month was above average. Precipitation varied from 1 percent above normal to 104 percent above normal. Except for the northwest and north central part of the State, basins reported year-to-date precipitation below average. Reservoir levels varied for this time of year from below average to average in the northeast. Many of the larger reservoirs were below average. Forecasted runoff varied from 24 to 101 percent of average. There were concerns that some reservoirs would not fill with the spring runoff, especially in the eastern portion of the State. Snowfall had occurred at an above average rate during March. Although conditions did improve greatly, SWE was below normal for some portions of the State. SWE in the northwestern portion of the State was at 94 percent of average (103 percent of last year). Northeast Wyoming SWE was currently about 105 percent of average (131 percent of last year). March precipitation was generally very good across the State. The entire State received above average precipitation for the month. The northeast and the southwest were just above average while the rest of the State received well above average precipitation.

e. April 2003

In Montana, April precipitation varied across the state. The Missouri River basin experienced 126 percent of average precipitation and the Yellowstone River basin experienced 76 percent of average precipitation. April temperatures were generally near average in the southwest portion of the state and above average across other areas of Montana. Mountain snowmelt that occurred during April was near average and most low elevation snow melted

during April. Higher mountain areas did receive additional snow through the month. Mountain snow water contents ranged from a low of 60 percent of average in the Teton River basin to a high of 118 percent of average in the West Fork Bitterroot River basin. Statewide, mountain snow water content was 92 percent of average and 91 percent of last year. Snowpack in the Missouri River basin was 91 percent of average and 101 percent of last year. Snowpack in the Yellowstone River basin was 87 percent of average and 111 percent of last year.

In Wyoming, SWE across the state was below normal for this time of the year, about 83 percent of normal. Precipitation for the month was mixed, with some better than average and some well below average. Generally, the south and south central portion of the state faired better than the remaining. All basins, except the Shoshone, Clarks Fork, and upper North Platte River, reported water year-to-date precipitation below average. Many of the larger reservoirs still had reservoir levels that were below average. Forecasted runoff varied from 38 to 88 percent of average, with the average for the state being about 68 percent. It was forecasted that some irrigated areas would be short of water. In some cases, reservoirs were not expected to fill with the spring runoff, especially in the southern portion of the State. April precipitation was generally below average. Most of the State received well below average precipitation over the past month. The Upper North Platte and Little Snake were the only basins in the State with above average precipitation for the month. The southwest portion of Wyoming received less than 40 percent of normal for April. Year to date precipitation was generally below average across the State.

f. May 2003

In Montana, May was a month of extremes. Early in the month, snow was accumulating in the mountains and record low temperatures were experienced in southwest Montana. By the end of the month, temperatures rebounded to record highs with snowmelt well above average. The cold temperatures early in the month held on to snow that melted rapidly with the high temperatures later in the month. With above average temperatures there were several areas that had flooding. Flooding was generally minor and occurred mainly on farmland. With the rapid snowmelt, most streams and rivers had reached their snowmelt peaks for this year. As of June 1, the remaining mountain snow water contents generally ranged from near average to severely below average. Statewide, the mountain snow water content was 85 percent of average and 75 percent of the previous year. In the Missouri River headwaters, snowpack was 73 percent of average and 93 percent of last year.

In Wyoming, SWE amounts for the Deer, LaPrelle, North Platte, Laramie, and Little Laramie River basins were all below normal. The SWE totals ranged from 0 percent in the Deer and LaPrelle Creek basins to 88 percent in the Laramie River basin.

g. Summary

Overall snow water content totals recorded during the entire snow season ending July 1, 2003 were near normal. The mountain snowpack in the reach above Fort Peck peaked on April 8 at 92 percent of the normal peak accumulation. The mountain snowpack in the reach between Fort Peck and Garrison peaked on April 9 at 101 percent of the normal peak accumulation. The

2002-2003 mountain snow accumulation and melt above Fort Peck and Garrison are illustrated in ***Figure 1***.

3. Weather Conditions

The following weather summaries are from the USDA Weekly Weather and Crop Bulletins.

a. January 2003

Mild, dry weather prevailed on the Plains, where weekly temperatures averaged 4 to 16°F above normal. Drought-related concerns on the northern and central High Plains included soil moisture shortages and no protective snow cover. Warmth overspread the Plains and Midwest on January 7-8, boosting the national tally of daily-record highs to nearly 200 for the week. Omaha, Nebraska missed their monthly record high temperature by 1°F. By mid-month, from Montana to Nebraska, low temperatures that ranged from 0 to –30°F. On January 19, daily records were posted at Valentine, Nebraska (low of 23 °F), Salina, Kansas (high of 68°F) and Sheridan, Wyoming (high of 61°F). A day later, temperatures as low as –20°F were reported across the upper Midwest. Kansas City, Missouri ended January as the third driest 3-month period (November 2002 – January 2003) with just 0.82 inches of precipitation. The end of January saw high temperatures in the High Plains. On January 26, Great Falls, Montana noted a low of 0°F and a high of 56°F. In Nebraska, North Platte attained a daily-record high of 67°F on January 27, just days after their lowest reading of the month of –3°F on January 23.

b. February 2003

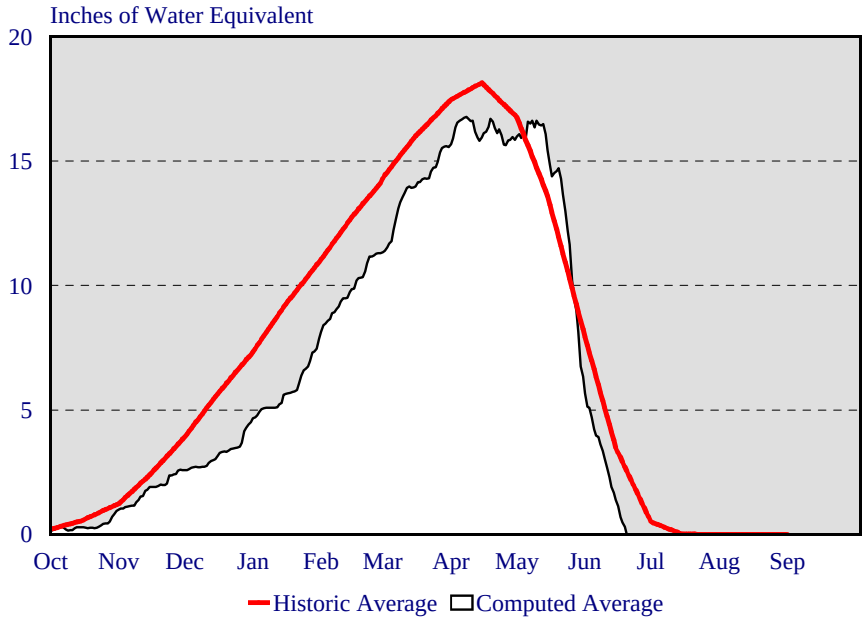
In early February, some of the coldest air of the season (temperatures as low as –10°F) spread over the drought-affected central High Plains. The second week of February produced beneficial showers on the eastern Plains, especially across the eastern half of Kansas. By the middle of February mild weather prevailed across the Plains and Midwest. However, the end of the month saw the Plains and Midwest affected by the last Arctic outbreak of the year. On February 24, cold conditions emerged in the northern and central Plains and upper Midwest as temperature readings ranged from 0 to –30°F. Weekly temperatures ranging from 10 to 24°F below normal were observed. Some locations in Montana and Wyoming noted their lowest temperatures in 4 to 6 years.

c. March 2003

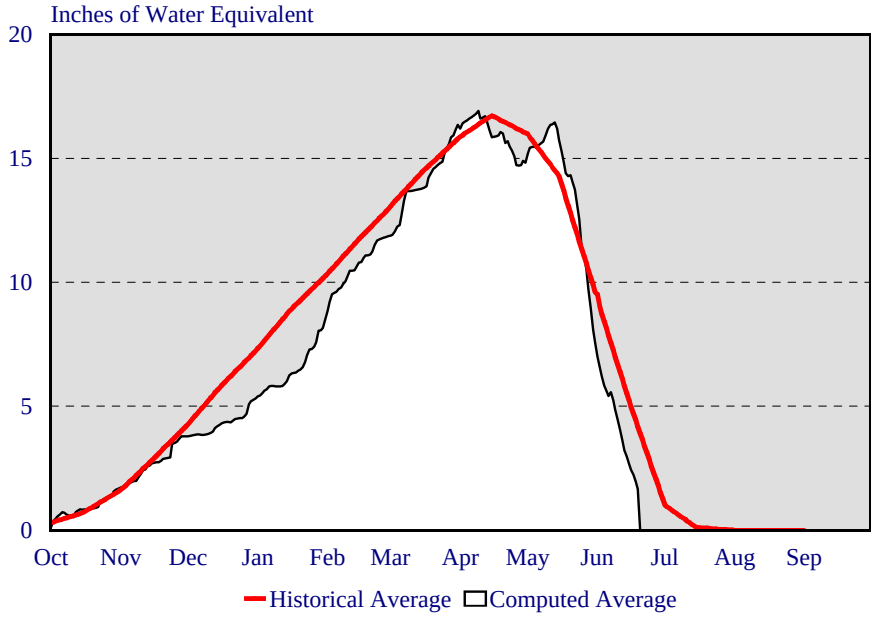
The month began as another strong push of frigid air swept across the Plains. The southward and eastward push of Arctic air kept weekly temperatures more than 6°F below normal throughout the Plains. From March 5-8 highly beneficial snow accumulation occurred on the northern Plains. Snowfall totals in Montana included 15.4 inches at Billings and 5.8 inches in Glasgow. During the second week of March spring-like weather suddenly replaced a wintery pattern from the Plains into the Midwest, as very warm conditions in the West expanded to encompass much of the Nation. Temperatures were boosted to 80°F as far north as South

Missouri River Basin
Mountain Snowpack Water Content
2002-2003

Total Above Fort Peck



Total Fort Peck to Garrison



The Mountain snowpack in the reach above Fort Peck peaked at 92% of the normal peak accumulation on April 8.
Currently 0.2% of this year's peak accumulation remains.
The Mountain snowpack in the reach between Fort Peck and Garrison peaked at 101% of the normal peak accumulation on April 9.
Currently 9% of this year's peak accumulation remains.
Missouri River basin Mountain Snowpack normally peaks near April 15 and 25% normally remains on June 15.

June 20, 2003

Dakota. These higher temperatures further reduced soil moisture reserves across the Plains. The warm weather resulted in more than 100 daily-record highs across the Plains and Front Range. Valentine, Nebraska posted highs of 74 and 82°F on March 13 and 14, respectively. Salina, Kansas posted highs of 81°F on both March 14 and 15. A major spring storm system produced heavy snow in parts of the West and central High Plains and severe thunderstorms in portions of the Plains and Midwest from March 17-20. On the Plains, rain and snow improved soil moisture reserves, although local dry pockets persisted. Rainfall was heaviest in portions of south-central Kansas (in excess of 4 inches) while more than 2 feet of snow blanketed part of the Colorado High Plains. On March 16, a daily-record precipitation of 0.48 inches was recorded in Kalispell, Montana. On March 17, a rainfall total of 1.39 inches in Williston, North Dakota represented their wettest March day of record. The March 17-19 storm ended Denver, Colorado's streak of below-normal monthly precipitation at 19 (August 2001 – February 2003), dropping 2.80 inches of water equivalent in the form of 31.8 inches of snow. This snowfall marked Denver's second-greatest storm total on record, behind 45.7 inches from December 1-6, 1913.

d. April 2003

The month started with generally light precipitation, which provided an improvement to topsoil moisture. This precipitation provided little relief from long-term drought conditions in the northern and central Plains. April opened with consecutive daily-record highs in Omaha, Nebraska (90 and 87°F). A few days later cooler air spread over the West and Plains and was accompanied by rain and snow. Snowfall in Omaha totaled 0.2 on April 4 and 2.2 inches on April 6. In Grand Island and Kearney, Nebraska, April 6 snowfalls totaled 7.3 and 8.0 inches, respectively. Sioux City, Iowa received 9.5 inches on April 6-7, breaking the daily snowfall record on both days (6.3 and 3.2 inches, respectively). Even with this snow, long-term drought and subsoil moisture shortages remained a concern on the northern and central Plains. Within a few days, record warmth developed across the Intermountain West and spread onto the northern and central Plains. Daily-record highs on April 12 included 86°F in Rapid City, South Dakota, 85°F in Chadron, Nebraska and 83°F in Miles City, Montana. By mid-month widespread showers maintained generally favorable conditions in the northern and central Plains. The heaviest rain (2 inches or more) fell across northern Missouri and in a band from eastern South Dakota to central Wisconsin. Record warmth spread from the Plains to the Northeast, resulting in well over 100 daily-record highs. With a high of 92°F on April 13, Bismarck, North Dakota marked its earliest 90-degree heat on record. The Nation's highest recorded temperature on April 13 was 93°F in Mobridge, South Dakota. On April 16 snowfall totaled 3.5 inches in Williston, North Dakota. On April 19 a daily-record rain total of 2.5 inches was recorded at Kansas City, Missouri. On April 30, at least 2 inches of rain soaked eastern Nebraska.

e. May 2003

Heavy rains and locally severe thunderstorms returned to portions of the Plains and Midwest on May 4. Weekly rainfall totaled at least 2 inches across large portions of the northern Plains and Midwest. A late-season snowfall blanketed some areas of the west. In Colorado, Denver received 7.0 inches in a 24-hour period on May 9-10. On May 18, snow accumulated at Great Falls, Montana to a daily-record of 4.3 inches. By May 20, cold weather overspread areas as far

south as Nebraska, where Valentine (24°F) collected a daily-record low. By the end of the month high temperature returned to the basin. The Western and High Plains heat wave peaked from May 28-30, resulting in several monthly record highs. Scottsbluff, Nebraska saw a record high 103°F on May 29.

f. June 2003

Local heavy showers hit several areas of the basin in the first half of the month. In Missouri, St. Louis netted 6.65 inches (354 percent of normal) during the first half of the month, aided by total of 2.68 inches on June 10 and 2.09 inches on June 12. Also on June 12, Lincoln, Nebraska recorded a daily-record high of 3.01 inches. During the second half of the month, diminishing topsoil reserves were a concern in a broad belt from South Dakota to area bordering Lake Michigan. In Montana, record highs for June 18 included 97°F in Missoula and 93°F in Great Falls. Elsewhere on the High Plains, Denver, Colorado noted consecutive daily-record totals on June 18-19, with totals of 1.50 and 0.95 inches of rain, respectively. On June 21, Aberdeen, SD (1.74 inches) collected a daily-record total. Severe thunderstorms erupted across the Plains and upper Midwest from June 22-25, resulting in more than 75 tornadoes and dozen of reports of damaging winds and large hail. Some of the largest U.S. hailstones on record fell in Aurora, Hamilton County, Nebraska on June 22. Preliminary tests indicated that the largest stone measured 7.0 inches in diameter and had a circumference of 18.75 inches. A slightly smaller stone nearby had a diameter of 6.5 inches and a circumference of 17.3 inches, and weight 1.33 pounds, compared with the U.S. record (observed in Coffeyville, Kansas on September 3, 1970) of 1.67 pounds. A graphic of the storm is shown as ***Plate 3***. St. Louis, Missouri observed a monthly rainfall total of 12.35 inches (328 percent of normal) surpassing its June 1875 record of 10.84 inches.

g. July 2003

Record heat reached North Dakota on July 1 and resulted in daily-record highs in locations such as Williston (98°F) and Dickinson (97°F). In Kansas, daily-record highs on July 3 included 109°F in Hill City, 108°F in Hays, and 106°F in Concordia. Local heavy showers and thunderstorms persisted for most of the first week. Rainfall totals for July 8 in Mobridge, South Dakota totaled 1.41 inches. In the west, Grand Junction, Colorado tied its daily-record high of 105°F on July 12 and 13. During the middle of July temperatures averaged at least 2 to 10°F above normal throughout the Plains. Conditions were especially harsh in the central Plains where high temperatures peaked from 100 to 110°F. Denver, Colorado (100°F on July 13 and 101°F on July 16) reached triple digits for the first time since August 16, 2002. On July 14, the high of 113°F in Ashland, Kansas tied its July record set on July 31, 1922 and 1934. Cheyenne, Wyoming observed 8 consecutive days of 90°F or higher temperatures, nearly breaking the 9-day record set in July 2002. Cheyenne did reach 90°F or higher on 22 of the 26 days of July, breaking its all-time monthly record of 18 days established in July 1936 and 1966. The oppressive heat in the west was balanced with some unusually cool weather in the Plains. On July 23-24, St. Joseph, Missouri observed highs of 53 and 54°F. Near the boundary between the cool and hot air, Kansas City, Missouri followed consecutive daily record-tying lows (57 and 59°F) on July 23-24 with its first triple-digit reading of the year (102°F) on July 26. The end of

the month brought hot, dry weather across the western Dakotas and Montana High Plains, where weekly temperatures averaged up to 8°F above normal. In contrast, favorable temperatures (as much as 4°F below normal) accompanied isolated showers in eastern Nebraska and the Dakotas.

h. August 2003

Hot weather persisted on the northern High Plains. In Montana, Billings' dry spell stretched to 52 days (June 26 - August 16), breaking the record of consecutive days with no measurable precipitation of 51 days, from October 31 – December 20, 1939. Billings also observed minimum temperatures of 60°F or higher on 38 consecutive days from July 11 – August 17, obliterating its former record of 19 days, set from August 4-22, 1982. Billings also experience 18 consecutive days with high temperatures of 90°F or greater from July 30 – August 16, edging its July 1960 record of 17 days. In Great Falls, Montana a high of 100°F was posted on August 10. It was Great Falls' eighth triple-digit reading of the year, tying its annual record established in 1919. Meanwhile, Glasgow, Montana posted highs of 100°F or greater on 6 consecutive days from August 11-16, breaking its July 1936 record of 5 days in a row. Farther east, Bismarck, North Dakota experienced four consecutive triple-digit readings from August 14-17 – including a high of 106°F on the final day – eclipsing its August record of 3 such days, set from August 17-19, 1959. Farther south, high temperatures in Kansas City, Missouri reached or exceeded 100°F on 6 consecutive days from August 16-21, its longest such streak since June 20-25, 1988. Cheyenne, Wyoming reported 32 days this year of high temperature 90°F or higher eclipsing its former annual standard of 31 days, set in 1936. On August 23, a daily-record high of 107°F was observed in Huron, South Dakota and 108°F in Mobridge, South Dakota. It was the highest temperature on record so late in the summer at Huron, where the previous latest observance of a reading of 107°F or higher had been August 15, 1937. August did see some rain showers in the western portion of the basin. On August 17, daily-record totals in Casper and Riverton, Wyoming totaled 1.00 and 0.40 inches, respectively. On the last day of August a daily-record total of 2.97 inches fell at St. Joseph, Missouri. Farther north, however, extremely dry conditions persisted in the upper Midwest, where Waterloo, Iowa (0.08 inch, or 2 percent of normal), completed its driest August on record. ***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.

i. September 2003

The month began with continued hot weather in the northern High Plains tying or breaking daily-record highs. Miles City, Montana had a record-tying high of 97°F on September 6. During the second week of the month a slow-moving storm and its attendant cold front moved across the western two-thirds of the Nation. Denver, Colorado noted a low of 29°F on September 14. Denver's low represented its earliest autumn reading below 30°F, previously established with a minimum of 23°F on September 18, 1971. On September 10, daily-record totals in the Dakotas included 2.63 inches in Sioux Falls, South Dakota, and 2.41 inches in Dickinson, North Dakota. On September 17, Casper, Wyoming (0.75 inch, including 2.5 inches of snow) netted a daily-record precipitation. A day later, Cut Bank, Montana (23°F) posted a

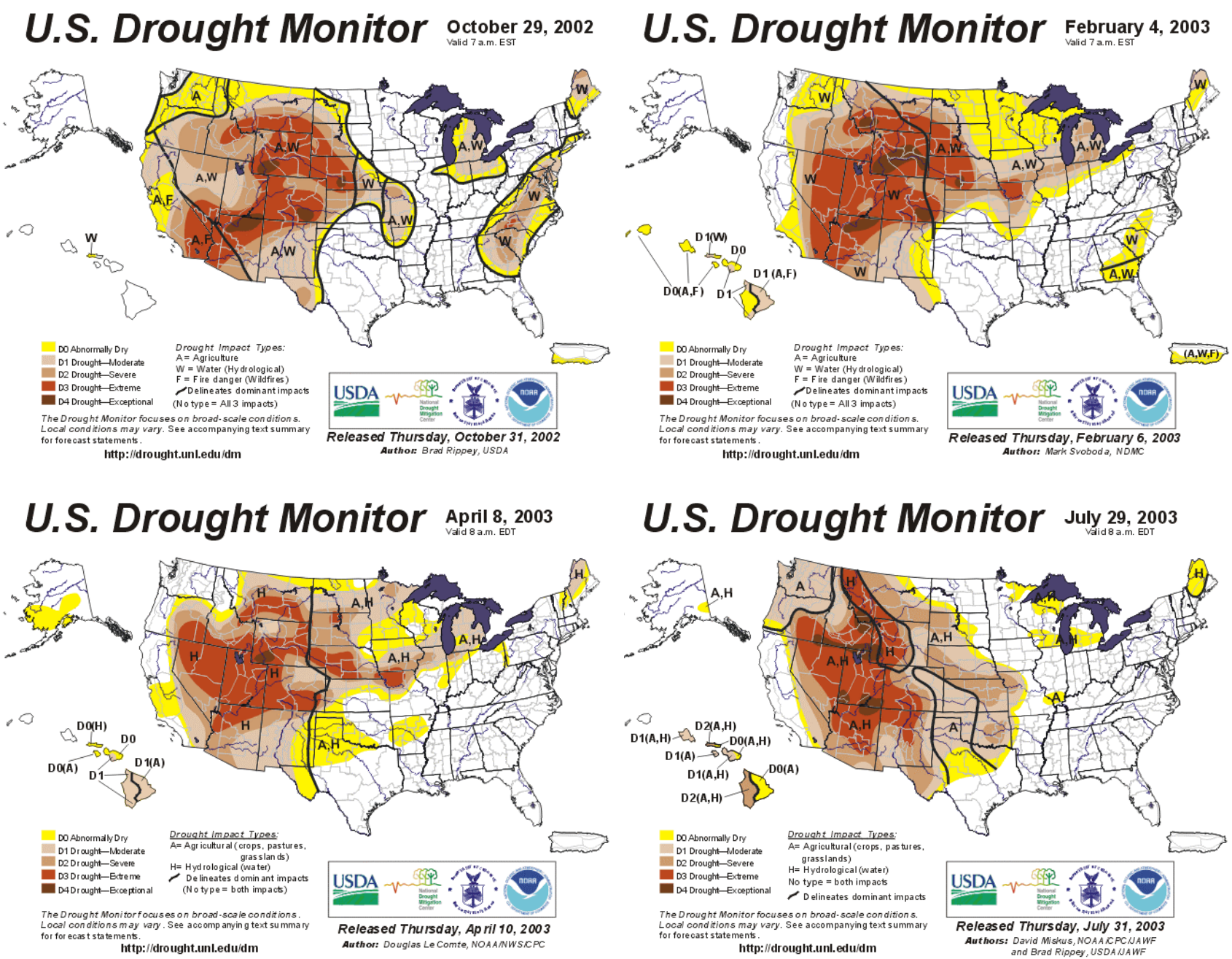

U.S. Drought Monitor
October 29, 2002
Valid 7 a.m. EST
D0 Abnormally Dry
D1 Drought—Moderate
D2 Drought—Severe
D3 Drought—Extreme
D4 Drought—Exceptional
Drought Impact Types:
A= Agriculture
W = Water (Hydrological)
F = Fire danger (Wildfires)
Delineates dominant impacts
(No type = All 3 impacts)
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
Released Thursday, October 31, 2002
Author: Brad Rippey, USDA
U.S. Drought Monitor
February 4, 2003
Valid 7 a.m. EST
D1(W)
D0
D1 (A,F)
D0(A,F)
D1
(A,W,F)
Released Thursday, February 6, 2003
Author: Mark Svoboda, NDMC
U.S. Drought Monitor
April 8, 2003
Valid 8 a.m. EDT
D0(H)
D0
D0(A)
D1
D1(A)
Drought Impact Types:
A= Agricultural (crops, pastures, grasslands)
H= Hydrological (water)
Released Thursday, April 10, 2003
Author: Douglas LeComte, NOAA/NWS/CPC
U.S. Drought Monitor
July 29, 2003
Valid 8 a.m. EDT
D2(A,H)
D1(A,H)
D0(A,H)
D1(A)
D1(A,H)
D0(A)
D2(A,H)
No type = both impacts
Released Thursday, July 31, 2003
Authors: David Miskus, NOAA/CPC/IAWF and Brad Rippey, USDA/IAWF

Figure 2

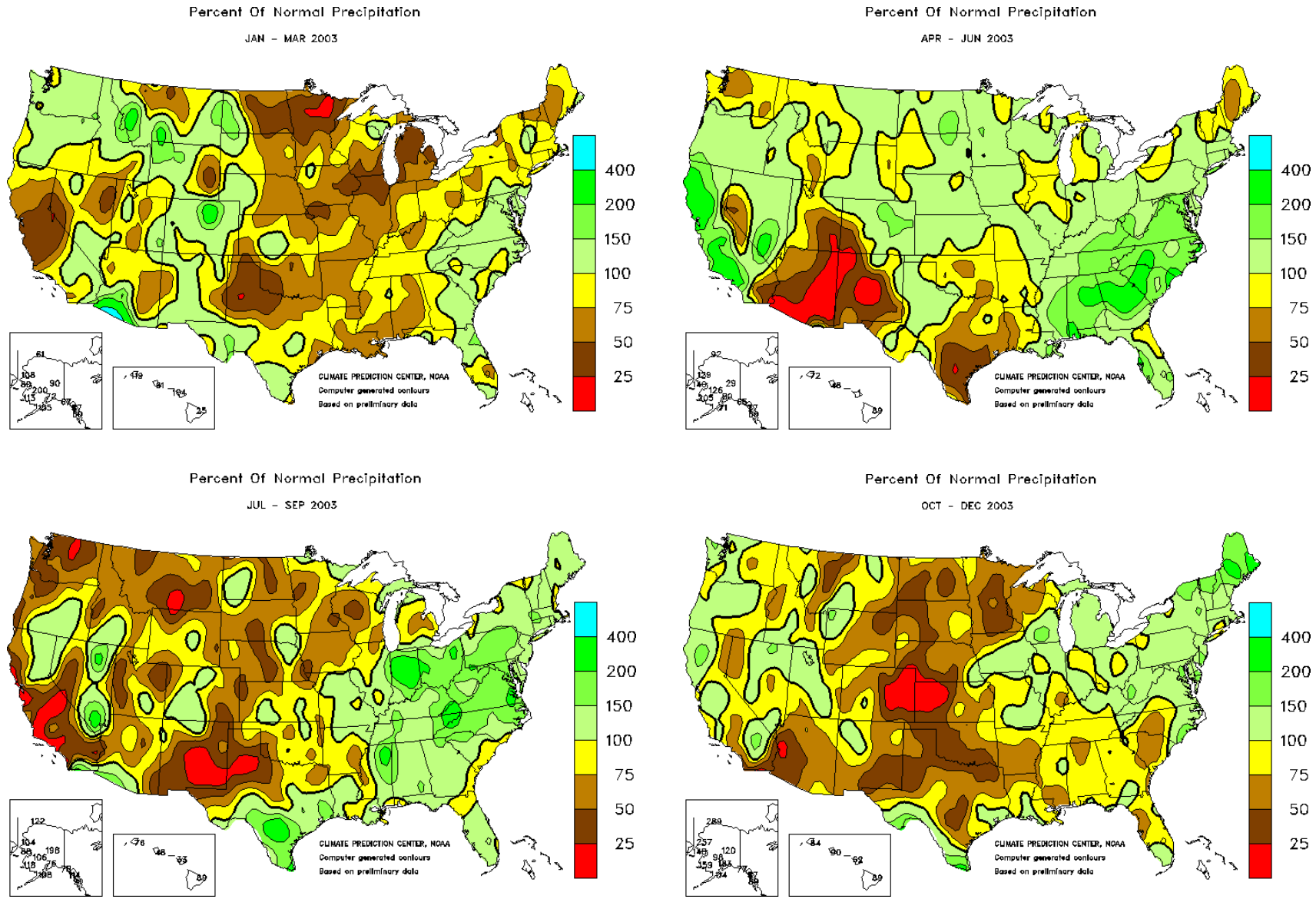

Percent Of Normal Precipitation
JAN - MAR 2003
400
200
150
100
75
50
25
CLIMATE PREDICTION CENTER, NOAA
Computer generated contours
Based on preliminary data
Percent Of Normal Precipitation
APR - JUN 2003
400
200
150
100
75
50
25
CLIMATE PREDICTION CENTER, NOAA
Computer generated contours
Based on preliminary data
Percent Of Normal Precipitation
JUL - SEP 2003
400
200
150
100
75
50
25
CLIMATE PREDICTION CENTER, NOAA
Computer generated contours
Based on preliminary data
Percent Of Normal Precipitation
OCT - DEC 2003
400
200
150
100
75
50
25
CLIMATE PREDICTION CENTER, NOAA
Computer generated contours
Based on preliminary data

Figure 3

daily-record low. On September 19, daily-record lows on the central High Plains included 31°F in McCook, Nebraska and 33°F in Hill City, Kansas. Although no records were broken, low temperature on September 25 included 28°F in Fargo, North Dakota, 29°F in Broken Bow, Nebraska and 32°F in Sioux City, Iowa. Farther west, Billings, Montana completed its driest June 21 – September 21 period on record (0.60 inch), breaking the 1936 standard of 0.87 inch. By the end of the month Billings had completed its driest water year (October 1 – September 30) on record (8.71 inches, or 59 percent of normal), breaking its 1988 record of 8.80 inches.

j. October 2003

The month began with continued unfavorably dry conditions from eastern Colorado and western Kansas northward into Montana. Farther east, the temperature in Huron, South Dakota rebounded to 90°F October 7, up from 20°F on October 1. Both of Huron's readings were daily records. Although precipitation was spotty, Billings, Montana received a daily-record total (0.71 inch) on October 10, which exceeded the city's rainfall during the preceding 111 day (0.60 inch fell from June 21 – October 9). It was also Billings' greatest daily rainfall since 2.27 inches fell on June 13, 2001. As mid-month approached on the northern and central High Plains, weekly temperatures average as much as 6°F above normal. Soil moisture conditions were most critical from eastern Colorado and western Kansas northward into Montana. As the month ended highly beneficial rain showers preceded a cold outbreak across the northern Plains. Light snow followed the arrival of cold weather in parts of Montana. Late-October snowfall in Wyoming totaled 21.0 inches in Casper and 18.5 inches in Lander. On October 31, the 6-inch snow depth in Great Falls, Montana was a record for the date. Elsewhere, snow depths on the final day of October included 5 inches in Rapid City (Ellsworth AFB), South Dakota, and 3 inches in Billings, Montana. Elsewhere in Montana, Cut Bank closed the month with lows of -7°F on October 31. Also on October 31, Williston, North Dakota featured a daily-record low of -2°F.

k. November 2003

The month began with heavy rain falling in parts of the Midwest in advance of a strong cold front. On November 3, a daily-record 2.05 inches fell in Lincoln, Nebraska. Farther north and west, a November 3 snowfall totaled 5.8 inches in Huron, South Dakota. A few days later, at least 250 daily-record lows were set or tied in the North and West. Cut Bank, Montana posted a trio of daily-record lows (-12, -17 and -8°F) from November 4-6, then notched another record low (-10°F) on November 8. Elsewhere in Montana, daily-record lows on November 5 included -22°F in West Yellowstone, -19°F in Butte, -15°F in Jordan, -12°F in Havre, and -10°F in Great Falls. Temperatures plunged to 0°F or lower as far east as the upper Midwest, where daily-record lows were established in locations such as Aberdeen, South Dakota (-6°F on November 5) and Grand Forks, North Dakota (-9 and -13°F on November 7-8). During the next few days a gradual increase in temperatures melted most of the north High Plains' snow cover. On the Plains, November 19 high reached 72°F in Miles City, Montana, Kennebec, South Dakota and Grand Island, Nebraska, resulting in daily records at all three locations. On November 19, colder air and high winds swept across the Northern Plains. Winds were clocked to 72 m.p.h. in Great Falls, Montana, where it was the highest November wind gust since December 12, 1995. Snow

spread over the northern Plains and upper Midwest from November 21-23 totaling 16.5 inches in Watertown, South Dakota, 14.8 inches in East Rapid City, South Dakota and 4.0 inches in Valentine, Nebraska. On November 23, temperatures as low as -20°F in Montana and -5°F as far south as eastern Colorado were recorded. The chilly conditions resulted in more than 50 daily-record lows in the Midwest and Plains westward. In Colorado, records established on November 23 included -6°F in Pueblo. Farther east, daily-record lows on November 24 included -13°F in Valentine, Nebraska and -10°F in Mobridge, South Dakota. A daily-record snowfall of 2.5 inches in Huron, South Dakota boosted its November 22-23 total to 8.0 inches. A day later, record highs on central High Plains reached 75°F in Goodland, Kansas and 73°F in McCook, Nebraska. The last day of November resulted in a smattering of daily-record highs. Ashland, Kansas recorded a high of 77°F on November 30.

l. December 2003

The month began with warm weather producing several daily-record highs on the Plains in advance of an approaching storm. On December 7, Valentine, Nebraska recorded a high of 66°F. The first storm sparked heavy precipitation in the Midwest beginning on December 9. Sioux Falls, South Dakota netted 8.0 inches on December 9, a record for the date. The warm weather continued to mid-month. A record high for December 20 included 68°F in McCook, Nebraska and 54°F in Cut Bank, Montana. On December 26 heavy snow blanketed parts of western and central Montana, including 20 inches in Lewistown. The year ended with two winter storms that dumped heavy snows in parts of Montana. Weekly temperatures in Montana averaged as much as 16°F below normal. Glasgow, Montana noted its snowiest December on record of 18.8 inches. The previous record was 16.5 inches in 1929. Most of Glasgow's snow was observed from December 26-28, when 14.4 inches fell.

4. 2003 Calendar Year Runoff

Calendar Year runoff for the period January through December 2003 for the area above Sioux City, Iowa, totaled 17.6 MAF, 70 percent of normal runoff based on the historical period of 1898-1998, as shown in ***Table 1***. The 17.6 MAF in 2003 represents a runoff midway between the lower decile and the lower quartile runoff as shown on ***Figure 4***. This runoff was in the lower quartile of historical runoff above Sioux City, Iowa, in the 105 years of runoff recorded in the basin, as shown in ***Figure 4***. Monthly runoff during 2003 above Sioux City, Iowa varied from a low of 31 percent of normal in August to approximately 123 percent of normal in December. ***Figure 5*** indicates the monthly variation of runoff for CY 2003.

The historic and forecasted monthly runoffs for CY 2003 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 intrasystem 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 through July and the monthly forecasts through December are shown under the "Summation above Sioux City" column. As the season progresses and the actual runoff accumulates, the forecast becomes more

Missouri River Main Stem
Annual Runoff at Sioux City, Iowa

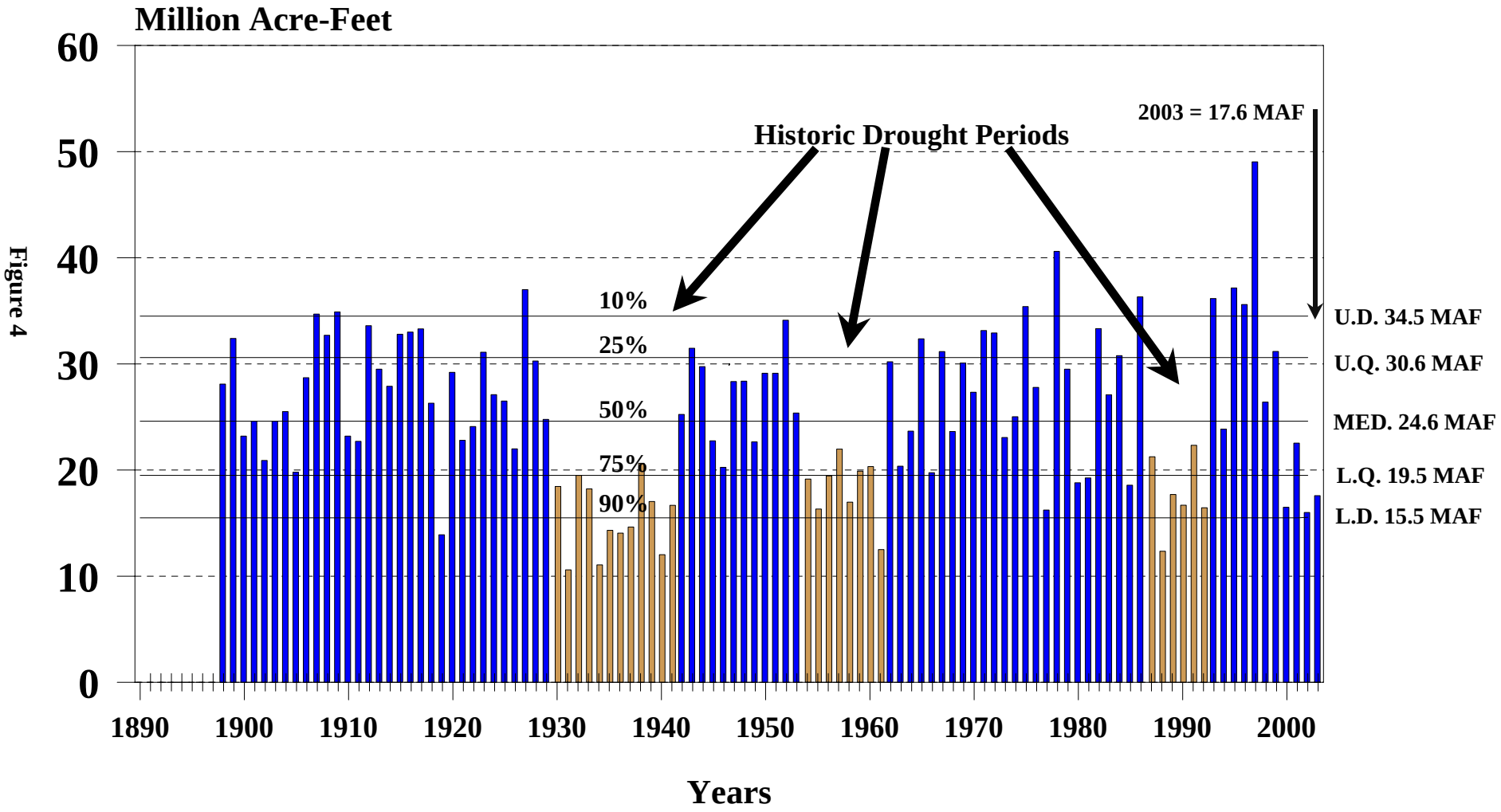


Figure 4
16

2003 Missouri River Runoff

Above Sioux City, Iowa

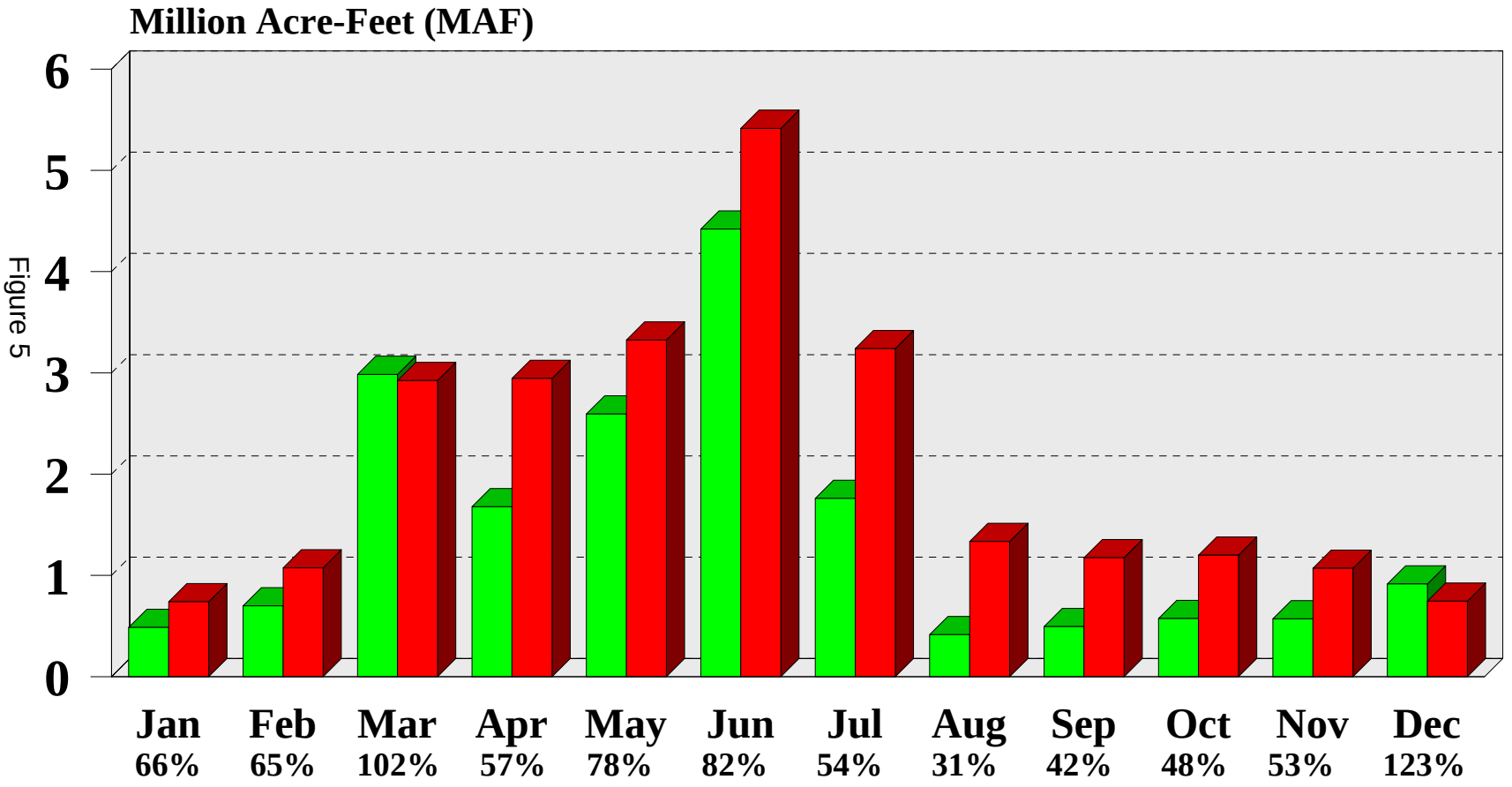


Figure 5
17

2003 Runoff : 17.6 MAF - 70% of normal
Normal Runoff : 25.2 MAF

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 2003

System storage on January 1, 2003 was 42.7 MAF, 6.1 MAF less than the System storage on January 1, 2002. Winter System releases were established at 13,000 cfs, the minimum releases necessary to provide adequate water supply downstream of the System. The System storage dropped slightly during January, with storage of 42.4 MAF on February 1. The System storage on March 1 was 42.4 MAF, 14.7 MAF below the desired 57.1 MAF top of carryover multiple use zone level.

The plan for System releases to support 2003 navigation season was the result of a consultation between the Corps and U.S. Fish and Wildlife Service in response to the Service's 2003 Biological Opinion. This steady release-flow-to target plan is discussed in detail in Section II.D.4 of this report. Based on 2002 nesting season results, it was anticipated that sufficient habitat would be available above the release rates to provide for successful nesting. An analysis of previous drought years indicated a 30,000 cfs Gavins Point Dam release would provide minimum service or greater flows at Kansas City 90 percent of the time.

Flow support for the 2003 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 23,500 cfs in order to meet minimum service flow targets at the four downstream target locations of Sioux City and Omaha (25,000 cfs), Nebraska City (31,000 cfs) and Kansas City (35,000 cfs). Releases were increased to 26,000 cfs on April 28th when the interior least terns and piping plovers began to initiate nesting activities below Gavins Point Dam.

On April 1st System storage was 44.0 MAF, 7.9 MAF less than the previous year's April 1 System storage (51.9 MAF). The plains snowmelt produced a March-April runoff of 4.7 MAF above Sioux City, which is 80% of normal. Runoff volumes above Sioux City for May, June and July were 2.6, 4.4, and 1.7 MAF, respectively. Normal runoff for those months is 3.3, 5.4, and 3.2 MAF. The actual May-July runoff above Sioux City was 73% of normal.

For the 2003 calendar year, System storage peaked on June 28 at 45.2 MAF. The System storage peak for the previous year was 48.9 MAF. The end-of-July System storage was 44.4 MAF, 16.8 MAF less than average (61.2 MAF). System storage began a steady decline through the late summer and fall months. End-of-month storages were: August, 42.9 MAF; September, 41.4 MAF; October, 40.0 MAF; November, 38.9 MAF; and December, 38.7 MAF. The end of December System storage was 4.0 MAF less than the previous year and 16.2 MAF less than average. The end of month water storage for December was 38.7 MAF, the lowest end of year System storage since the system filled in 1967. The lowest System storage during the calendar year occurred on December 23 at 38.7 MAF.

Energy generation at the six mainstem powerplants totaled 7.6 billion kilowatt hours (kWh) for the period January 1, 2003 to December 31, 2003, 2.4 billion kWh hours below the average since the System first filled in 1967. The below normal generation was due to the drought conservation during the winter and low system releases to support minimum service downstream flows during the navigation season.

2. Fort Peck Regulation – January to December 2003

a. General

Fort Peck, the third largest Corps of Engineers (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.

b. Winter 2003

Fort Peck releases averaged 9,800 cfs for January and 10,100 cfs for February. These were 4,800 and 5,000 cfs above last years' record low winter releases for January and February respectively, and 1,500 and 1,700 cfs below average. The Fort Peck reservoir level began 2003 at elevation 2214.5 feet mean sea level (msl), 19.5 feet below the annual flood control zone and 4.7 feet below the elevation for this same date the previous year. By the end of February, the reservoir elevation declined to 2211.1 feet msl, which was 7.5 feet lower than on the same date the previous year. The reservoir reached the season low of 2209.6 feet msl on September 28, 2003, 24.4 feet below the base of the annual flood control zone and the lowest September pool elevation.

c. Winter River and Ice Conditions Below Fort Peck

No special release reductions were required to prevent ice-jam flooding, because it was not a threat with the low flows downstream from Fort Peck. Ice cover formation on the Missouri River began on January 13, 2003, when the Missouri River stage rose over 5.0 feet in the Wolf Point, Montana area. The stage peaked near 9.0 feet on January 29, 2003, which is 2.0 feet below flood stage. The Missouri River at Culbertson, Montana rose over 3.0 feet as the ice cover formed in this portion of the Missouri River during December 25-26, 2002. The Missouri River stage peaked at 10.4 feet on December 30, 2002 at Culbertson, which was 4.2 feet above the previous year's peak stage. No reports of ice-affected flooding on the Missouri River below Fort Peck Dam were recorded during the 2002-2003 winter season.

d. Spring 2003

Releases from Fort Peck averaged 5,100 and 7,000 cfs in March and April, respectively. These were less than average (March – 8,400, April – 7,700 cfs) but more than the previous year (March - 4,600, April 4,100 cfs). Fort Peck March and April average inflows of 10,000 and 7,000 cfs, respectively, were less than average (March - 12,400, April – 10,700 cfs).

The releases were increased to 6,000 cfs on April 1 for intrasystem reservoir balancing purposes. The reservoir level at the beginning of the navigation season (April 1) was 2212.8 feet msl, 5.8 feet lower than the level at the start of the 2002 navigation season.

Average release in May was 9,100 cfs. This release was near the average May release of 9,400 cfs. However, the average inflow for May of 9,900 cfs was significantly less than the historic average May inflow of 15,800 cfs.

e. Summer 2003

Average releases in June, July and August were 8,700, 8,100 and 7,100 cfs, respectively. The average inflows for these same three months were 11,000, 5,700 and 4,500 cfs. The pool level on June 1 was 2213.04 feet msl; on September 1 it was 2210.68 feet msl.

f. Fall 2003

The average release in September was 6,300 cfs. The average inflow for September was 4,600 cfs. The releases were lowered to approximately 4,500 cfs for the months of October. The average releases for November was 9,000 cfs.

g. Summary

The highest Fort Peck reservoir level during 2003 occurred on January 1, 2003 at 2214.5 feet msl. The lowest reservoir level during 2003, which was also a new record low, occurred on December 31, 2003 at 2206.8 feet msl. The previous record low was 2208.7 feet msl in April 1991. The average monthly inflow of 6,500 cfs during calendar year 2003 was 62% of normal (1967-2003). The average monthly release of 10,800 cfs during calendar year 2003 was 72% of normal. In 2003, Fort Peck did not rise into the annual flood control zone, which extends from 2234.0 to 2250.0 feet msl.

3. Garrison Regulation – January to December 2003

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.

b. Winter 2003

Releases from Garrison were below normal for a fourth consecutive winter season, but not record low as occurred the previous year. The daily releases ranged from 17,400 to 19,800 cfs in January and from 19,600 to 23,500 cfs in February 2003. Early March releases were near 22,000 cfs and ended the month near 14,000 cfs to conserve water. Garrison monthly average releases of 18,400 and 22,300 cfs for January and February 2003 were below the historic monthly averages by 5,400 and 2,800 cfs, respectively. Garrison began 2003 near elevation 1822.55 feet msl, 15.0 feet below the annual flood control zone and 6.6 feet below the reservoir level on the same date the previous year. The reservoir declined throughout the winter season to an elevation of 1819.7 feet msl by February 28, 2003, which was 17.8 feet below the base of the annual flood control zone.

c. Winter River and Ice Conditions Below Garrison

The Missouri River in the Bismarck, North Dakota area was free of ice problems in the winter months at the beginning of 2003. The ice-cover conditions were stable and continuous from January 10 – 13 through March 26 when the Missouri River channel was completely free of ice. Missouri River stages at Bismarck rose over 5 feet during the formation of the ice cover over a 2- to 3-day period from January 10 -13, 2003. The peak ice-affected Missouri River stage at Bismarck was 10.8 feet on February 14, 2003. This was well below both the established Bismarck flood stage of 16 feet and the Corps' winter freeze-in stage target of 14 feet.

d. Spring 2003

Releases from Garrison averaged 17,300 and 18,600 cfs in March and April, respectively. These are slightly less than average (March – 20,200, April 19,600 cfs) but more than the previous year (March - 12,500, April – 10,800 cfs). The March average inflows of 28,600 cfs were near average (28,300 cfs) and April average inflows of 16,100 cfs were significantly less than average (23,500 cfs). The reservoir level at the beginning of the navigation season (April 1) was 1822.5 feet msl, 4.5 feet lower than the level at the start of the 2002 navigation season.

For calendar year 2003, the average release in May was 18,700 cfs. Historically, average releases for May are 21,900 cfs. The May releases from Garrison were made in conjunction with Fort Peck and Oahe releases in order to balance the three upper reservoir levels.

Refer to Section II-D for additional information regarding non-routine regulation of Garrison due to lawsuits.

e. Summer 2003

Average releases in June, July and August for the 2003 calendar year were 21,300, 21,400 and 21,100 cfs, respectively. Historically, the releases for these three months are 23,800, 25,300 and 25,000 cfs, respectively. The average monthly inflows for the June-July-August time period of the 2003 calendar year are were 41,800, 18,400 and 9,600 cfs, respectively. These inflows were significantly less than the averages of 46,700 (June), 33,500 (July) and 18,900 (August) cfs. The pool level on June 1 was 1822.71 feet msl and on September 1 it was 1822.81 feet msl.

f. Fall 2003

The average releases for the months of September, October and November during the 2003 calendar year were 16,900, 10,800 and 11,700 cfs, respectively. These releases were significantly less than the historical averages for September, October and November of 21,300, 19,800 and 20,800 cfs, respectively. Inflows for the September, October and November months followed a similar pattern. The average inflow for September in 2003 was 10,600 cfs (historic average = 17,200 cfs); the average inflow for October in 2003 was 9,400 cfs (historic average = 17,900 cfs); and the average inflow for 2003 in November was 9,300 cfs (historic average = 16,400 cfs).

g. Summary

No water was transferred to Lake Audubon during the period. From August 31, 2002 to December 31, 2003 Buford-Trenton pumping costs totaled $23,132. Of that total, $18,192 occurred during the 2003 calendar year. The total pumping costs up to December 31, 2003 are $225,332. The highest reservoir level during the 2003 calendar year occurred on July 7 at 1827.3 feet msl. The lowest reservoir level during the 2003 calendar year occurred on December 31 at 1818.4 feet msl, only 3.4 feet higher than the record low. The average monthly inflow of 17,500 cfs was 75% of normal (1967-2003). The average monthly release of 17,900 cfs during calendar year 2003 was 81% of normal. In 2003, Lake Sakakawea did not rise into the annual flood control zone, which extends from 1837.5 to 1850.0 feet msl.

4. Oahe and Big Bend Regulation – January to December 2003.

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.

b. Winter 2003

Oahe began 2003 at elevation 1585.0 feet msl and then fluctuated between 1585.0 and 1587.2 feet msl. In January, the Oahe reservoir level was around 13.5 feet lower than the previous year. Oahe's daily average releases varied from 7,700 to 25,100 cfs during the January through February 2003 period. The January and February Oahe average monthly releases of 16,000 and 15,400 cfs, respectively, were both below historic averages by 5,800 and 3,500 cfs, respectively.

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 as needed, to prevent flooding at other locations. No flooding problems were experienced in this area during the winter of 2003.

Big Bend was regulated to follow power peaking requirements with hourly releases varying widely. The daily average flow varied between 0 and 24,300 cfs. The reservoir level varied in a narrow range from elevation 1420.3 to 1420.9 feet msl.

c. Spring 2003

Oahe Reservoir began the spring period on March 1, 2003 near elevation 1587.2 feet msl, 11.7 feet lower than the previous year. March releases from Oahe and Big Bend averaged 19,700 and 18,000 cfs, respectively. The March releases were at or near 90% of average. March inflows to Oahe averaged 24,200 cfs, about 75% of average. The majority of the inflow to the Big Bend Project is from the upstream Oahe releases.

April releases from Oahe and Big Bend averaged 22,600 and 21,300 cfs, respectively, while inflows to Oahe averaged 19,600 cfs, 71% of average. The releases for both projects were close to the historic average.

May releases from Oahe and Big Bend averaged 18,500 and 17,700 cfs, respectively. Releases for both projects were about 80% of normal. During the same month, the inflows for Oahe averaged 23,800 cfs or 82% of average.

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 2003, 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 capability. Multiple lawsuits during the spring also made it difficult to manage releases for weekend recreation.

d. Summer 2003

In June, releases from Oahe and Big Bend averaged 25,600 and 23,700 cfs, respectively. Releases for both projects were at or near 90% of average. June inflows to Oahe averaged 22,600 cfs, 78% of average. Average releases for Oahe and Big Bend in July and August were below normal (Oahe – 83% and 77%, respectively; Big Bend – 80% and 71%, respectively). Average inflows to Oahe in July and August were also all below normal – 77% and 79%, respectively.

e. Fall 2003

In late November, the low reservoir levels on Lake Oahe, coupled with the low releases from Garrison Dam, affected the community of Fort Yates' water supply intake. Fort Yates' water supply intake is located on the western side of the reservoir. Further details of the regulation and work on the intake can be found in Section II-4 of this report.

Average releases for Oahe and Big Bend in September, October and November were all below normal (Oahe – 67%, 74% and 64%, respectively; Big Bend – 65%, 70% and 57%, respectively). Average inflows to Oahe in September, October and November were also all below normal – 79%, 56% and 50%, respectively.

f. Summary

The highest Oahe reservoir level during the 2003 calendar year occurred on May 21 at 1588.9 feet msl. The lowest reservoir level during the 2003 calendar year, which is also the new record low, occurred on December 16 at 1576.2 feet msl. The previous record low was 1580.7 feet msl in November 1989. The average monthly inflow to Oahe of 19,200 cfs was 74% of average. The average monthly release from Oahe and Big Bend were 82% and 77% of average, respectively. In 2003, 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 1420.25 feet msl, within the normal operating range.

5. Fort Randall Regulation – January to December 2003

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.

b. Winter 2003

Fort Randall daily releases ranged from 9,900 to 12,000 cfs in December 2002, 10,900 to 15,200 cfs in January 2003, and 9,600 to 13,800 cfs in February 2003. These were the releases necessary to maintain the reservoir elevation at Gavins Point near 1208 feet msl.

Fort Randall releases averaged 12,900 and 11,000 cfs during January and February, respectively, which are well below the normal winter release of 15,700 cfs and 14,100 cfs. These releases were below the historic average by 2,800 and 3,100 cfs for January and February, respectively. Fort Randall rose from an elevation of 1342.4 feet msl on the first of January to 1349.7 feet msl by the end of February.

c. Spring 2003

Average inflows to Fort Randall for March through May were all below normal: March – 20,400 cfs, 91% of normal; April – 24,000 cfs, 96% of normal and May – 20,600 cfs, 79% of normal. Average releases from Fort Randall for March through May all slightly below or near normal: March – 15,100 cfs, 90% of normal; April – 22.8, 101% of normal and May – 91% of normal.

d. Summer 2003

Average inflows to Fort Randall for June through August were also all below normal: June – 26,000 cfs, 90% of normal; July – 37,000 cfs, 77% of normal and August – 75% of normal. Average releases from Fort Randall for the same three months were all below normal: June – 24,400 cfs, 87% of normal; July – 24,300 cfs, 76% of normal and August – 24,500 cfs, 71% of normal.

e. Fall 2003

Average inflows to Fort Randall for September through November were significantly below normal: September – 28,000 cfs, 91% of normal; October – 18,300 cfs, 73% of normal and November – 14,700 cfs, 61% of normal. Average releases from Fort Randall for the same three months were also significantly below normal: September – 28,100 cfs, 80% of normal; October – 27,100 cfs, 78% of normal; November – 20,300 cfs, 65% of normal.

f. Summary

The highest Fort Randall reservoir level during the 2003 calendar year occurred on April 25 at 1354.7 feet msl. The lowest reservoir level during the 2003 calendar year occurred on November 18 at 1337.3 feet msl. The average monthly inflow to Fort Randall of 45,000 cfs was 79% of average. The average monthly release from Fort Randall of 31,000 cfs was 76% of average. In 2003, Fort Randall did rise into its annual flood control zone, which extends from 1350.0 to 1365.0 feet msl. However, the normal summer operating pool level at Fort Randall is 1355.0 feet msl. For the first time least terns nested along the shorelines of Fort Randall Reservoir, which prevented the reservoir from being operated at its normal summer level of 1355.0 feet msl. The reservoir was maintained near 1352.0 to 1353.0 feet msl until the birds were done nesting in mid-July.

6. Gavins Point Regulation – January to December 2003

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 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 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.

b. Winter 2003

On January 1, 2003, the Gavins Point release rate was at 13,000 until January 16 when releases were stepped up to 15,000 cfs by the 17th due to cold temperatures. System release was reduced by 1,000 cfs on January 27 and 28 to 13,000 cfs, where it was held through February 4, 2003. Following another round of cold weather, the release was increased to 15,000 on February 4 and remained at that rate through the February 7. The Gavins Point release was decreased by 2,000 cfs to 13,000 cfs on February 8 and held at the 13,000 cfs level until February 26 when the release was increased to 14,000 cfs for a couple of days and then returned to the 13,000 cfs level on February 28.

The Gavins Point average daily release was below the normal winter release rate for the entire winter season. Average monthly releases were 13,700 cfs for January (4,200 cfs below average) and 13,300 cfs for February (5,00 cfs below average).

During the winter period, the level of Gavins Point was near 1207 feet msl, which is 1 foot lower than the 1208 feet msl target used during the previous winter season. The target elevation was lowered to 1206 feet msl at the end of February for future flood control purposes. The

maximum pool level reached during the winter period was 1207.3 feet msl on January 9, 2003. The minimum reservoir level of the winter period occurred on January 24, 2003, when Gavins Point reached 1205.3 feet msl.

c. Winter River and Ice Conditions Below Gavins Point

The Gavins Point winter release rate was varied between 13,000 and 15,000 cfs in January and February 2003. Cold temperatures in early December were accompanied with ice formation on the Missouri River. The first report of ice occurring on the Missouri River was made on December 6, 2002, with about 10-40 percent floating ice with 2- to 4-foot pads in the Sioux City, Iowa to Decatur, Nebraska reach. There was very little ice reported again, until December 23, to 27, when 10-30 percent floating ice with pads ranging from 2-4 feet in the Sioux City, Iowa to Nebraska City, Nebraska reach. January arrived with warmer temperatures and the river ice melted and the Missouri River was ice free until mid-January. Another round of cold weather created ice in the Missouri River from Sioux City downstream to Nebraska City, Nebraska, on January 13 the ice report showed 10 to 40 percent floating ice with 5-10 foot pads. The largest volume of floating ice for January was made on January 24, with 50-75 floating ice and ice pads in the 10-25 foot range. Following another cycle of warm temperatures, in the late January-early February period, the ice melted on the Missouri River downstream from Gavins Point. Ice reports indicated that the Missouri River was an open channel, free of floating ice, for about 5 days. The cold air returned on February 4, and through February 13 the Missouri River had floating ice reports ranging from 5-50 percent with ice pads ranging from 5-15 feet in size. As February 24 approached a combination of record-near record low temperatures and building of shore ice resulted in the formation of an ice bridge just above the mouth of the Big Sioux River, Iowa. The ice bridge, once formed stacked ice behind it for several miles, nearly to the Ponca State Park as noted from an aerial reconnaissance made over the Missouri River ice bridge. The stage at Ponca, Nebraska, rose over 10 ft from the ice bridge while Sioux City, Iowa dropped about a 1.6 feet over two days to its season low stage of 7.6 feet on February 25, 2003. This was the first freeze-up for the Missouri River during the 2002-2003 winter season and occurred quite late in the season as the river normally freezes over in late December or early January or else not at all. This ice bridge remained until March 12 when the stage at Ponca, Nebraska began its 6-foot drop as warm spring weather returned to the Missouri River Basin.

This was a roller-coaster winter with cycles of Arctic cold periods separated by abnormal warm spells. The winter freeze up below Gavins Point was unusually late arriving near the end of February and remaining until mid-March. The greatest volumes of floating ice occurred in January and February, while December was noted with less than normal ice formation. In January, the Kansas City, and Glasgow, Missouri, municipal water intakes experienced difficulties accessing water from the Missouri river due to a combination of low tributary inflows, the loss of river water with the formation of ice on the Missouri and the Platte Rivers around January 13 and a delayed recovery on the Platte River following the ice formation. Eight days later, the effects were observed at the Kansas City, Missouri River gage breaking a record low stage on January 22, 2003. The actual Missouri River flow was only slightly below normal and Gavins Point releases were above the normal winter water supply releases. Channel degradation was the cause of lower stages at these flow levels. The river stage dropped again during a cold snap in early March; however, it stayed above the January levels.

d. Spring 2003

Flow support for the 2003 navigation season began on 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. By March 25, the releases from Gavins Point were increased to 25,000 cfs, the minimum service navigation target at Sioux City. Normally, during the first few months of the navigation season Sioux City is the target location. Downstream tributary inflows normally exceed the target flows at Omaha, Nebraska City and Kansas City, the other three target locations. However, this year existing and forecasted downstream inflows were so low that is was expected that Kansas City would be the target location very quickly into the navigation season.

The first boat of the season, The Omaha, came into the Missouri River on March 18. By the end of March three boats were in the river. By the first week of April there had been five groundings reported by the boats. In addition, on April 3 a fertilizer barge hit a rock ledge and was damaged. The Corps Project Office in Napoleon, Missouri sent out a reconnaissance with the assistance from the U.S. Coast Guard, to help locate a channel. By April 14, eight towboats were in the river. Some problems were still being experienced due to the 7.5-foot draft.

On April 28 releases were increased to 26,000 cfs to begin the summer Threatened and Endangered (T&E) species nesting regulation. A consultation agreement had been made with the Fish and Wildlife Service to maintain the flow at 26,000 cfs. The System flow would either be maintained at that rate or increased to meet downstream navigation flow targets. The sand bar islands below Gavins Point were evaluated by the Omaha District field staff to determine the extent of poor low water habitat at the 26,000 cfs release rate. They determined that the 26,000 cfs release rate was sufficient for a System release.

e. Summer 2003

The release of 26,000 cfs was maintained from April 28 to July 12. On July 13 the release was reduced to 25,000 cfs to comply with a lawsuit filed by American Rivers. A System release of 25,000 cfs still allowed downstream flow navigation targets to be met. Further details of the lawsuit can be found in Section II-D of this report.

On July 29 the System release was increased to 26,000 cfs in order to meet downstream flow targets. On August 11 the System releases were decreased to 21,000 to comply with an August 4 U.S. District Court ruling. Further details of the ruling can be found in Section II-4 of this report. On August 15 the System releases were increased to 25,000 cfs as per the 2000 BiOp. On September 3 System releases were increased to 30,500 cfs, the maximum release made during the navigation season, in order to meet the navigation flow target at Kansas City.

f. Fall to End of 2003

System releases were maintained in the 27,000 to 29,000 cfs range for October and the first half of November in order to meet downstream navigation flow targets. Starting November 17, the System releases were decreased by 3,000 cfs each day until it reached 12,000 cfs on November 22. Navigation season support ended at the mouth of the Missouri River on

November 26. The System release was maintained in the 12,000 to 15,000 cfs range for the remainder of the 2003 calendar year.

g. Summary

The highest Gavins Point reservoir level during the 2003 calendar year occurred on November 23 at 1208.0 feet msl. The lowest reservoir level during the 2003 calendar year occurred on January 24 at 1205.3 feet msl. The average monthly inflow to Gavins Point of 22,100 cfs was 77% of average. The average monthly release from Gavins Point of 22,000 cfs was 77% of average.

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

The following paragraphs summarize the litigation cases which either were resolved by means of a final ruling or settlement agreement or which had a direct impact on the regulation of the System in 2003.

a. 8 Circuit Court Ruling

In a June 4, 2003 ruling the Eighth Circuit, U.S. Court of Appeals, resolved conflicting opinions by the District Courts of North Dakota, South Dakota and Nebraska concerning the Corps regulation of the System in 2002. The Eighth Circuit Court ruled as follows: 1) The dominant functions for the 1944 Flood Control Act were to avoid flooding and to maintain navigation. 2) The expirations of the preliminary injunctions did not render the appeals moot because the questions were likely to recur. 3) The Corps actions are constrained by both the Flood Control Act and by the Master Manual. 4) The Corps' decision to adopt the prioritization presented in the current Master Manual was not impermissible. 5) The Courts can assess whether Corps actions run afoul of either the Flood Control Act or the Master Manual. 6) The Corps' yearly rotation during extended droughts of the drawdown of one of the upper three reservoirs during the spring forage fish spawn was "eminently rationale". 7) The District Courts in North and South Dakota erred in enjoining the Corps from lowering reservoirs to maintain navigation, and that the District Court in Nebraska correctly ordered the Corps to follow the Master Manual.

b. Settlement Agreement with Lower Brule and Crow Creek Sioux Tribes

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 operating 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 Reservoir Control Center 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.

c. Multi-district Litigation Panel

A hearing was held in Portland, Maine on July 24, 2003 to consider the motion of the State of Nebraska for transfer of actions to the District of Nebraska for coordinated or consolidated pretrial proceedings. By order dated August 12, 2003 the Multi-district Litigation Panel granted Nebraska's request and transferred six District Court cases to the District Court of Minnesota (Judge Paul A. Magnuson). The six cases are as follows: American Rivers February 2003, North Dakota 2003, North Dakota 2002, Blaske Marine 2003, South Dakota 2002, and Nebraska 2002.

d. North Dakota Water Quality

On April 29, 2003 the State of North Dakota filed suit against the Corps alleging that the Corps was not complying with the state's water quality standards for Lake Sakakawea. The state alleged that their cold-water fishery (consisting of Chinook salmon and forage smelt) was dependent on the amount of cold-water habitat in the reservoir and that the Corps regulation of the reservoir would entirely deplete the cold-water habitat by late summer, which would threaten the survival of most or all of the cold-water fishery. The State District Court issued an ex parte temporary restraining order against the Corps limiting the outflow from Garrison dam to approximately 17,000 cfs and requiring the Corps not to reduce the level of Lake Oahe. The case was removed to the US District Court of North Dakota and the States of South Dakota and Nebraska were granted intervention status. In early May, in anticipation of the start of the tern and plover nesting season, the Corps requested that the TRO be modified to allow releases to be increased to 21,500 cfs. The Court modified the TRO allowing releases of 21,500 cfs until May 26, 2003, at which time the Court anticipated it would be able to issue a ruling on the Corps' motion to dissolve. Subsequently the Court dissolved the TRO and set a hearing date was set for June 4, 2003. In two separate decisions issued on July 14, 2003, the Court denied both South Dakota's and North Dakota's Motions for a Preliminary Injunction. This case has now been

transferred to the District Court for the District of Minnesota based on the transfer opinion and order by the Multi-district Litigation Panel on August 12, 2003.

e. American Rivers

American Rivers and other environmental groups filed this case on February 13, 2003 challenging the actions of the Corps and the USFWS under the Endangered Species Act (ESA). The plaintiffs allege that the actions of the Corps and the USFWS subsequent to the 2000 Biological Opinion on the Missouri River Mainstem regulation that reduce requirements for a "spring rise" and "low summer flows" violate the ESA and are arbitrary and capricious under the Administrative Procedures Act (APA). On July 12, 2003 the District Court for the District of Columbia issued an opinion and order granting the plaintiffs' request for a preliminary injunction. The Court enjoined the Corps from implementing the 2003 Biological Opinion (BiOp) and from taking any action that would be inconsistent with the 2000 BiOp. The Federal defendants requested the DC District Court to stay this order on July 14, and an appeal was taken to the U.S. Court of Appeals for the District of Columbia Circuit on July 15, 2003. The District Court on July 15, and the Court of Appeals on July 18 denied the requests for a stay pending appeal. On July 18 the plaintiffs filed a motion for an Order to Show Cause Why Defendants Should Not Be Held In Contempt and Sanctioned. A hearing was held on July 21, and on July 22 the District Court granted the plaintiffs' Motion and found the Corps and the Secretary of the Army conditionally in civil contempt of the July 12, 2003 order for failing to reduce flows as specified in the 2000 BiOp. The Court order the Secretary of the Army to reduce the flows to the level specified by 9:00 a.m. on Friday, July 25, 2003, or pay a fine of $500,000 per day of noncompliance.

On July 24 the Multi-district Panel issued its order transferring this case and five others to the U.S. District Court for the District of Minnesota (Judge Paul A. Magnuson). On this same date the District Court for the District of Minnesota stayed all orders for a period of 14 days. After another round of motions and cross motions, on August 7, 2003 the District of Minnesota denied the latest set of motions and stated that the July 1, 2003 preliminary injunction is and remains the law of this case and contains specific requirements as to flow volume, not only until August 15, but thereafter.

To comply with the ruling issued on August 7, the flows from Gavins Point were reduced from 26,000 cfs to 25,000 cfs at midnight on Sunday, August 10. The delay from August 7 to August 10 was necessary in order to notify the public and to allow them, specifically barge traffic, enough time to get off the river, if necessary. Releases were further reduced to 23,000 cfs at midnight on Monday, August 11, and to 21,000 cfs on August 12, 2003, at 8 p.m. CDT. The Gavins Point release remained at 21,000 cfs through midnight on August 14, 2003. Just after midnight, releases were increased from 21,000 cfs in 500 cfs per hour increments until a release rate of 23,000 cfs was reached. This rate was held through the day. At midnight on August 15, releases were increased from 23,000 cfs at a rate of 500 cfs per hour until a release rate of 25,000 cfs was reached. The release then remained at 25,000 cfs through September 1, 2003. After September 1, releases were increased to the rate required to meet minimum service flows downstream.

2. Fort Peck Mini-Test and Intrasystem Unbalancing

The Fort Peck "mini-test" and the unbalancing of the three large upper reservoirs described in last year's (2002-2003) AOP were not implemented due to low runoff in the upper basin in 2003. The endangered species modified flow "mini-test," which was designed to monitor the effects of higher spring releases and warmer water released from the spillway, required reservoir elevations of approximately 2229 feet msl to avoid unstable flows over the spillway. The "mini-test" was cancelled as reservoir elevations during May and June were approximately 12 feet below the spillway crest elevation of 2225 feet msl. The MRNRC provided recommended guidelines (Table V, 2002-2003 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, low reservoir elevations, and below normal mountain snow pack on March 1, the guidelines did not recommend implementation measures to unbalance the reservoirs.

3. Water Supply Issues

Two special regulation activities at Garrison related to water supply were performed in the fall of 2003. The first occurred in early September when Garrison releases were scheduled to be reduced from their summer rate of 21,000 cfs to the fall rate of 10,000 cfs. The Corps was notified by the Montana-Dakota Utilities Co. (MDU) that the planned reduction in Garrison releases would likely result in a loss of water flow at the intakes used by MDU's Heskett Station power plant, the City of Mandan and the Tesoro Refinery. The intake operators applied for and received an emergency permit to dredge the river in front of the intakes to assure an adequate water supply. Releases were reduced to 14,000 cfs in mid-September and held at that level until sufficient dredging progress had been made, and then were reduced to the fall rate of 10,000 cfs in early October.

The second regulation occurred in November when the Fort Yates, North Dakota Rural Water System (RWS) intake became silted in. On November 25, 2003 the Omaha District Emergency Management office was informed that the intake, which serves the Standing Rock Sioux Tribe, had failed the previous weekend. As a result the community of Fort Yates had closed the hospital and schools, and had no reliable fire protection due to the shortage of water. The RWS also supplies the communities of Cannonball and Porcupine. Because it is a RWS, the Bureau of Reclamation (BOR) (rather than the Corps) has the primary authority to assist both in an emergency repair and a permanent fix because, by law, the BOR manages rural water systems along the Missouri River.

In the summer of 2003, the BOR had installed a submersible pump at the end of the intake to push water to the wet well on shore. In response to the pump failure in November the BOR installed redundant temporary overland water pipelines to provide relief until a more permanent repair could be made. The Corps, working with the Tribe and BOR, delayed the planned increase of Garrison releases to their winter release rate until a reliable water supply had been ensured. Once the situation at Fort Yates had been stabilized, releases were gradually increased later in December. Under normal hydrologic conditions the Fort Yates RWS intake is located in Lake Oahe. However, due to the low reservoir level, the stage at Fort Yates is currently influenced primarily by Garrison releases rather than the level of Lake Oahe.

Two additional intakes were modified this fall and early winter to ensure adequate water supply through the winter. The Omaha District let an emergency contract in December 2003 to construct a temporary water intake extension for the city of Parshall, ND on the Van Hook Arm of Lake Sakakawea. And, in South Dakota, the Bureau of Reclamation modified the intake at Wakpala, South Dakota to ensure the intake would be able to draw water during the winter when an ice cover formed.

If the drought continues, these and other water supply difficulties are bound to occur as releases are reduced for conservation purposes and the reservoirs fall to levels not seen since the System first filled in 1967. Intake operators need to closely monitor river and reservoir conditions and take necessary steps to ensure their intakes can maintain access to the water through a wide range of river flows and reservoir levels.

4. Consultation on the 2003 AOP and Regulation during the Tern and Plover Nesting Season

In March and April of 2003, representatives of the Corps and USFWS participated in ESA consultation meetings in Shepherdstown, West Virginia to explore alternative regulation for the 2003 AOP. The goal of the consultation was to come to an agreement on a water management plan for the 2003 tern and plover nesting season that was based on the best available science, complied with the Endangered Species Act (ESA), and, simultaneously, provided sufficient operational flexibility to operate the System for all the authorized project purposes under a moderate to severe drought condition.

The agreed upon plan, which combines elements of a "steady flow" and a "flow-to-target" regulation, minimizes the loss of interior least tern and piping plover habitat and loss of eggs and chicks, provided water conservation in the upper three reservoirs, and minimizes regulation uncertainty for navigation. The plan, called the Steady Release – Flow-to-Target alternative, called for an initial steady release to ensure that tern and plovers did not nest at low levels on the sandbars below Gavins Point and Fort Randall Dams. If downstream tributary runoff conditions permit, that initial steady release would be maintained throughout the nesting season. If downstream flow targets could not be met at that initial release level, System releases will be increased as needed to meet minimum service.

Based on discussions held between the Corps and the USFWS, the plan was to provide a release of 26,000 cfs or higher (if releases to meet downstream targets is greater than 26,000 cfs) from Gavins Point Dam, beginning when the least terns and piping plovers initiate nesting, usually in early to mid-May. Immediately following the stabilization of the river stage at the 26,000 cfs release level, a field survey was to be conducted to determine if certain known low-lying sandbars were inundated at the 26,000 cfs level. It was preferable to inundate these known low-lying sandbars to minimize the loss of nests/eggs/chicks, in case it would be necessary to increase releases later in the nesting season. If the low-lying sandbars in question were not inundated by the 26,000 cfs release, an increase to no-more-than 27,000 cfs would be initiated and held steady until increases above that level were needed to support downstream flow targets. Further release increases throughout the summer to "flow-to-target" could be necessary as

tributary contributions dry up; however, this plan differed from an actual "flow-to-target" regulation because releases would not be decreased during the nesting season. Decreases can allow the birds to nest at low levels that are likely to be flooded if higher flows are necessary later in the nesting season to meet downstream targets.

The steady release was initiated on April 28, 2003 when the Omaha District, Threatened and Endangered Species Section notified the Reservoir Control Center that birds had begun nesting activities. The habitat survey result indicated that there were several low islands exposed at 26,000 cfs, but releases of greater than 27,000 cfs would have been required to inundate them so the initial steady release was maintained at 26,000 cfs.

Gavins Point releases were maintained at 26,000 from April 28 through July 12. The 26,000 cfs release in combination with good tributary inflow below the System was sufficient to meet or exceed minimum service navigation flow targets throughout this period. Every-other-day coordination calls were held in conjunction with the USFWS in Bismarck and Manhattan, and Corps personnel in Kansas City, Omaha and Yankton. Updates were provided on nesting progress, release forecasts and other issues as needed during the calls.

On July 13, Gavins Point releases were reduced from 26,000 cfs to 25,000 cfs to comply with the initial court order in the American Rivers lawsuit. The preliminary injunction required the Corps to implement the flows prescribed in the 2000 BiOp. This BiOp identifies prescriptive low flows in the summer months as follows: 25,000 cfs from June 15 to July 15; 21,000 cfs from July 15 to August 15; and 25,000 cfs from August 15 to September 1. Flows at the four target locations continued to meet or exceed minimum service with the 25,000 cfs release until near the end of the month. Releases were increased to 25,500 cfs on July 29, and to 26,000 cfs on July 30 to meet the Nebraska City target as tributary inflows declined. The release increase was coordinated with the Endangered Species Section in Yankton and the USFWS in Bismarck, and was made without impact to the nesting birds.

Throughout this period, flood water that accumulated in Tuttle Creek reservoir was being evacuated slowly so as not to adversely impact nests on the Kansas River. This evacuation of floodwater provided an incidental benefit to the Missouri by helping to meet the Kansas City flow target without further increases from Gavins Point Dam.

Following the August 7 ruling in the American Rivers lawsuit, the flows from Gavins Point were reduced from 26,000 cfs to 25,000 cfs at midnight on August 10. Releases were further reduced to 23,000 cfs at midnight on August 11, and to 21,000 cfs on August 12, 2003. The Gavins Point release remained at 21,000 cfs through midnight on August 14, 2003. Prior to increasing releases back to 25,000, the Corps and USFWS coordinated a release come-up schedule and bird-monitoring plan to ensure that the release increase would not adversely impact young chicks on the sandbars below Gavins Point. Releases were increased early on August 15 from 21,000 cfs to 23,000 cfs in 500 cfs per hour increments and maintained at that rate through the remainder of the day. The second 2,000 cfs increase, from 23,000 cfs to 25,000 cfs was accomplished in a similar manner on August 16. The release then remained 25,000 cfs through September 1, 2003. Targets at Nebraska City and Kansas City were missed by 2,000 to 7,000

cfs during this period. After September 1, releases were increased to the rate required to meet minimum service flows downstream.

E. RESERVOIR RELEASES AND STORAGE

Reservoir elevations and storage contents of the System reservoirs at the end of July 2003 are presented in ***Table 3*** and the same information for CY 2003 is presented as ***Table 4***.

TABLE 3
RESERVOIR LEVELS AND STORAGES – July 31, 2003

	Reservoir Elevation – feet msl		Water in Storage – 1,000 AF		
	Elevation	12-Month Change	Total	Above Min. Level*	12-Month Change
Fort Peck	2212.3	-6.7	10,950	6,739	-1,297
Garrison	1826.1	-5.3	14,857	9,877	-1,379
Oahe	1586.5	-4.3	13,137	7,764	-1,054
Big Bend	1419.8	+0.2	1,682	0	14
Fort Randall	1353.9	-1.5	3,434	1,917	-138
Gavins Point	1206.4	+1.2	368	47	28
			44,428	26,344	-3,826

*Net usable storage above minimum reservoir levels established for power, recreation, irrigation diversions, and other purposes.

TABLE 4
RESERVOIR LEVELS AND STORAGES – December 31, 2003

	Reservoir Elevation – feet msl		Water in Storage – 1,000 AF		
	Elevation	12-Month Change	Total	Above Min. Level*	12-Month Change
Fort Peck	2206.8	-7.8	10,049	5,838	-1,287
Garrison	1818.4	-4.1	12,881	7,901	-1,036
Oahe	1576.9	-7.9	11,049	5,676	-1,741
Big Bend	1420.3	-0.3	1,705	23	-17
Fort Randall	1343.2	+1.0	2,643	1,126	66
Gavins Point	1207.4	+0.4	395	74	11
			38,722	20,638	-4,004

*Net usable storage above minimum reservoir levels established for power, recreation, irrigation diversions, and other purposes.

F. SUMMARY OF RESULTS

1. Flood Control

Releases during 2003 were directed at a continuation of the drought conservation measures and were implemented to conserve System water in storage. The water-in-storage crest was less than the base of the annual flood control zone, and mountain snowpack was below average. The expectation was, therefore, for a much below normal runoff, and water conservation measures were implemented to conserve the remaining storage as much as possible.

The estimated total flood damages prevented by the System reservoirs during 2003 was $49.7 million. The $49.7 million total damages prevented in the Missouri River basin by the System was entirely in the Corps' Omaha District, which is unusual except during significant downstream drought such as occurred in 2003. The same thing occurred in the previous year. 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 to construct the System dams. Although the System prevents enormous amounts of damage, it is not capable of totally eliminating flooding along the Missouri River. The estimated actual flood damages incurred in the Omaha District along the Missouri River from Fort Peck to Rulo, Nebraska for 2003 totaled $708,300. The bulk of the actual damages incurred were in Nebraska and Missouri at $259,800 each.

The Kansas City District tributary reservoirs prevented some 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 $26,000. This low value was due largely in part to the extreme drought conditions that pervaded the lower basin during the entire runoff season during 2003.

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 have been granted permits to pump directly from the reservoir or river reaches. Releases from the reservoirs during 2003 generally met the needs of irrigators.

3. Water Supply and Water Quality Control

Daily flows generally exceeded minimum requirements for water supply throughout the System during 2003. Except for Fort Yates, which is discussed in detail in Section II.D of this

Missouri River Main Stem

Cumulative Flood Damages Prevented

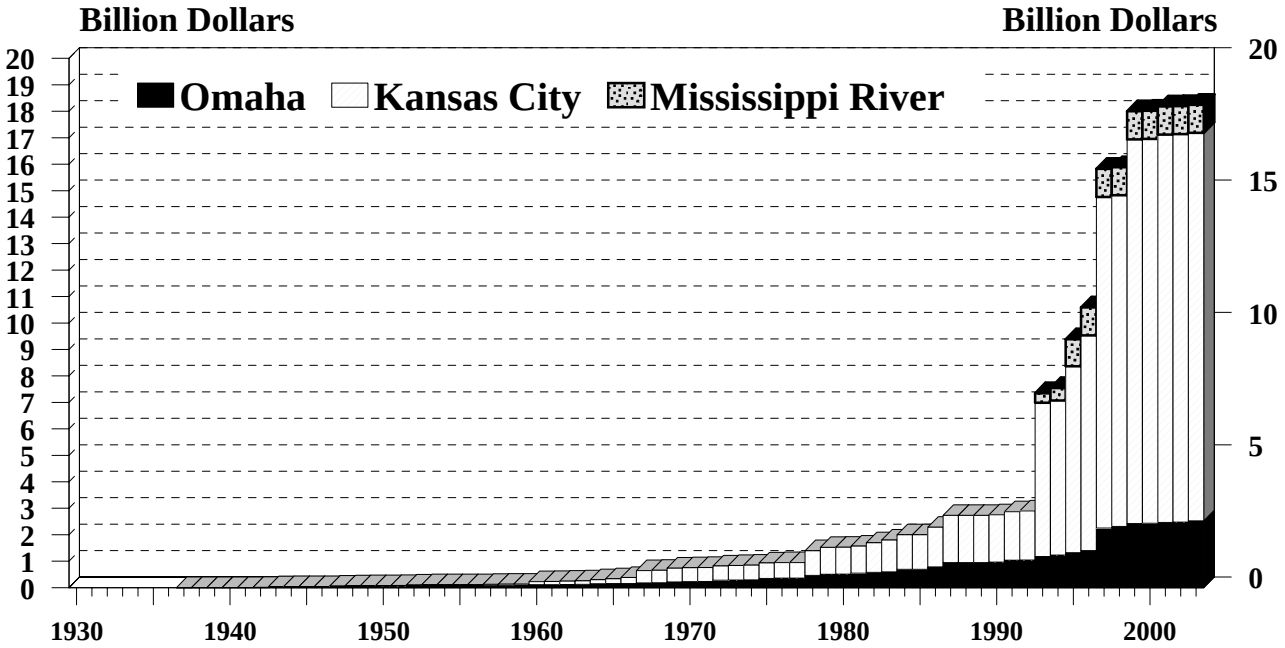


Figure 6A

Annual Flood Damages Prevented

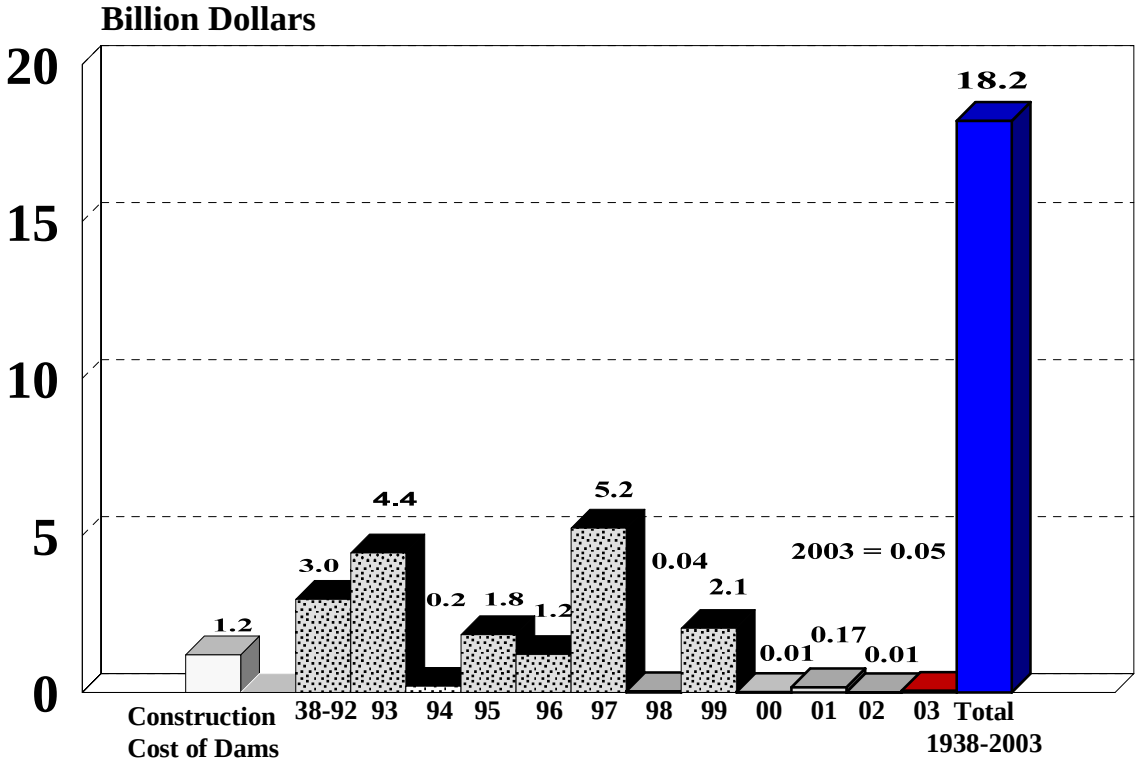
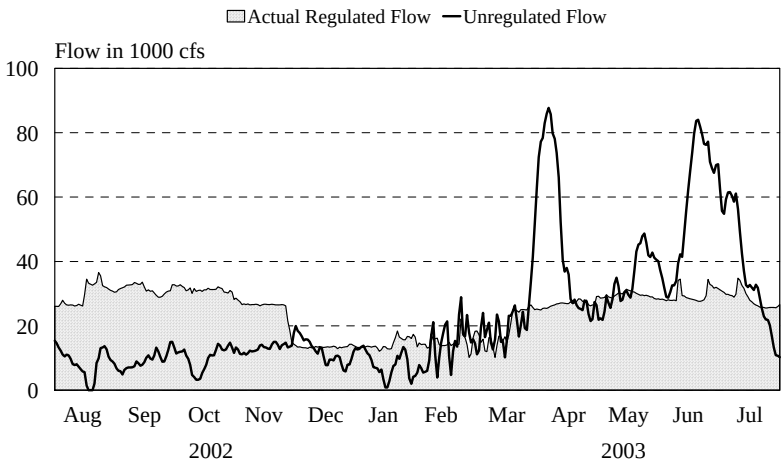


Figure 6B

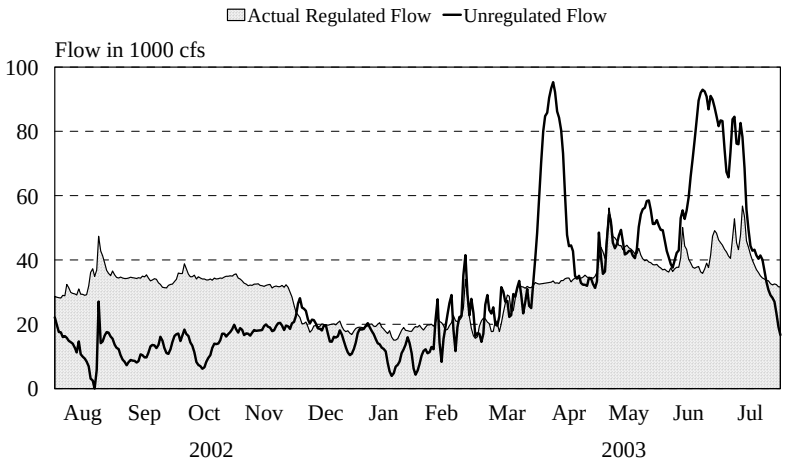
Sioux City

Regulated and Unregulated Flows



Nebraska City

Regulated and Unregulated Flows



St. Joseph

Regulated and Unregulated Flows

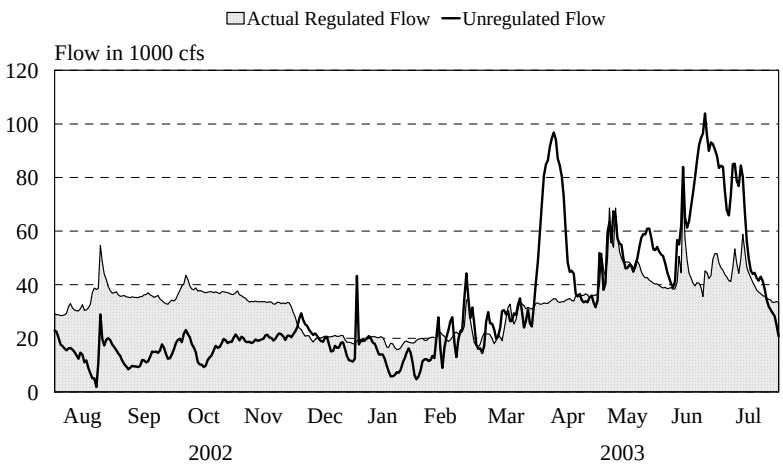


Figure 7

report, all water intakes, both along the open river and in the reservoirs, were adequately served during 2003. During 2003, the most significant water supply access problems occurred in the Kansas City area. The court-ordered reduction of System releases to 21,000 cfs in mid-August caused the Nearman Powerplant to reduce their power generation due to low water levels in the Missouri River. While winters flows are lower than the reduced mid-August flow, this reduction was significant as cost of replacement power is typically lower in winter than in summer. Based on experience gained during the 1987-1992 drought, intake owners today are generally better prepared to handle periods of low water due to adjustments made to intakes or regulation 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 low river stages.

Figure 8 shows the end-of-July pool elevations for Fort Peck, Garrison, and Oahe plus total System end-of-July storage for 2001 through 2003. An individual table with the maximum, average, and minimum end-of-July pool elevations for each reservoir is also shown on ***Figure 8***. Each of the three large reservoirs has shown a steady decline in storage over the last three years. Both Fort Peck and Oahe experienced their minimum pools of record during 2003. Lake Sakakawea ended the year only three feet higher than its record low pool level. On July 31, 2003 Fort Peck Lake was at elevation 2212.3 feet msl, 7.6 and 10.2 feet lower than at the same time in 2002 and 2001, respectively. On July 31, 2003 Lake Sakakawea was at elevation 1826.1 feet msl, 5.3 and 8.3 feet lower than at the same time in 2002 and 2001, respectively. Lake Oahe was at elevation 1586.5 feet msl on July 31, 2003, 4.3 and 22.1 feet lower than at the same time in 2002 and 2001, respectively.

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

<u>General Water Quality Priorities:</u>

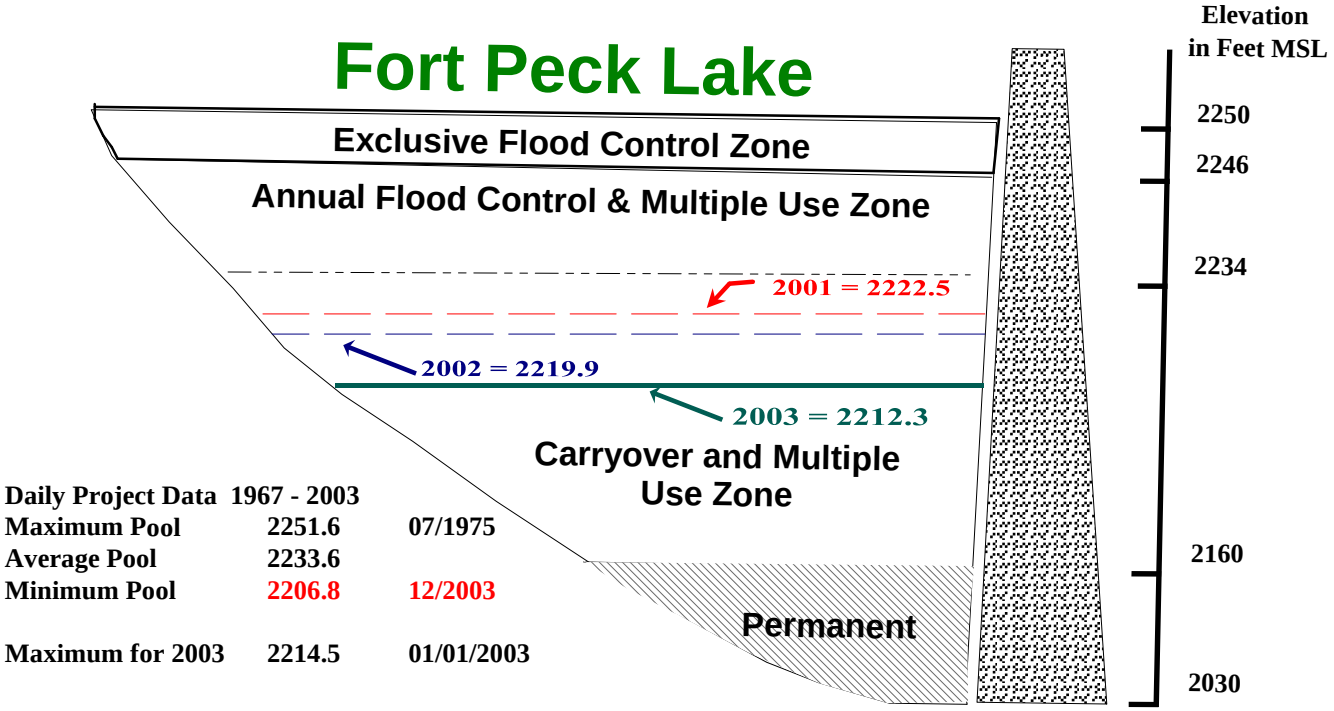
(7) Evaluate water quality conditions and trends at Corps projects.

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

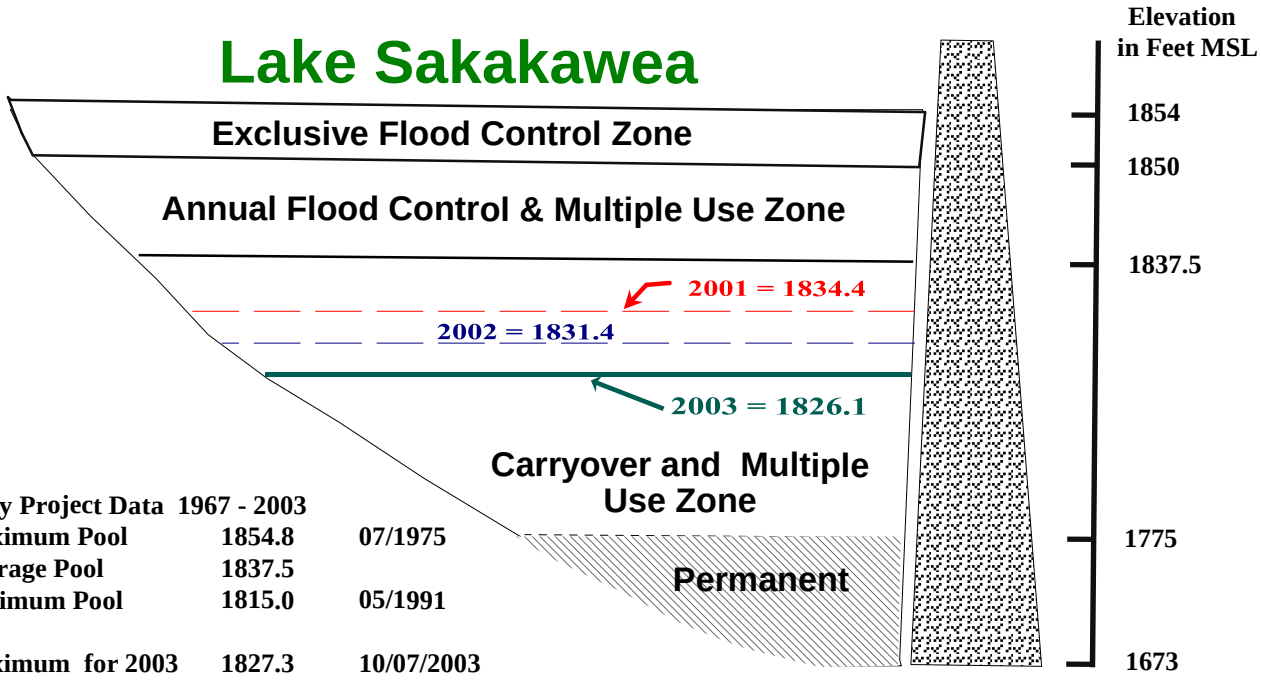
(4) Provide water quality information to support Corps reservoir regulation elements for effective water quality and aquatic habitat management.

(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 Corps projects.

Missouri River Main
End-of-July Lake Elevations and



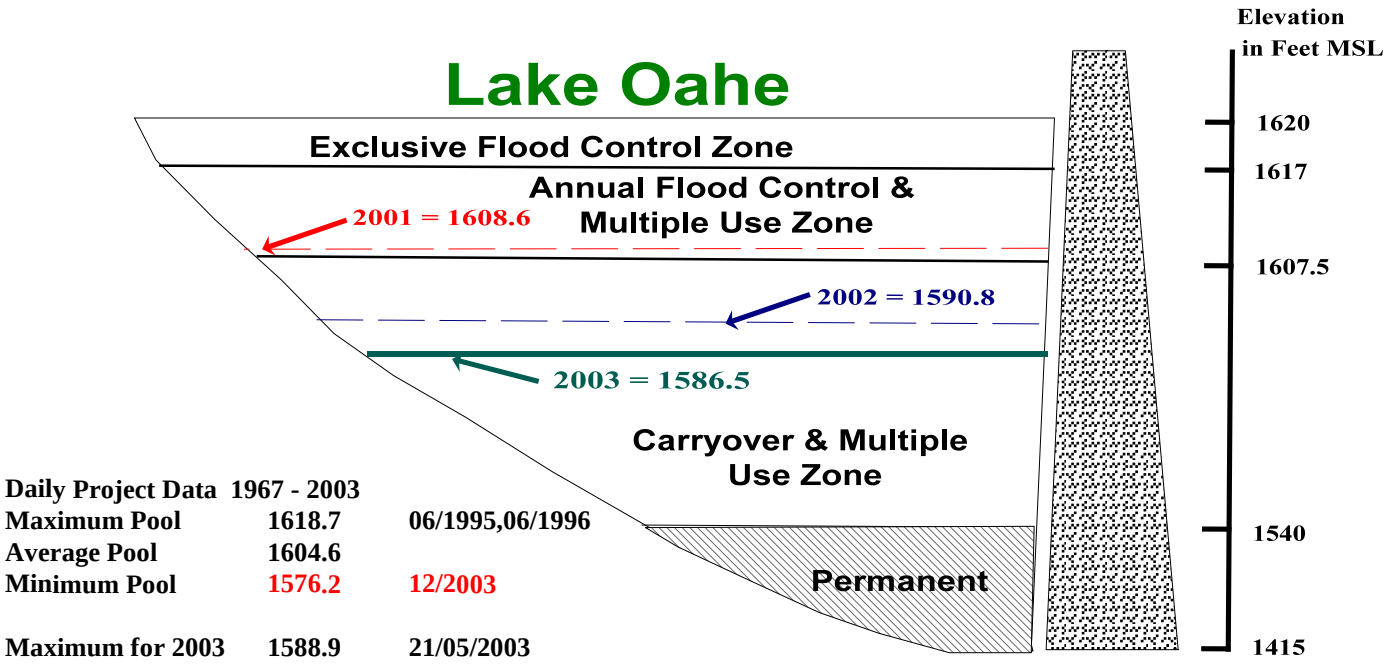
Daily Project Data 1967 - 2003		
Maximum Pool	2251.6	07/1975
Average Pool	2233.6	
Minimum Pool	2206.8	12/2003
Maximum for 2003	2214.5	01/01/2003



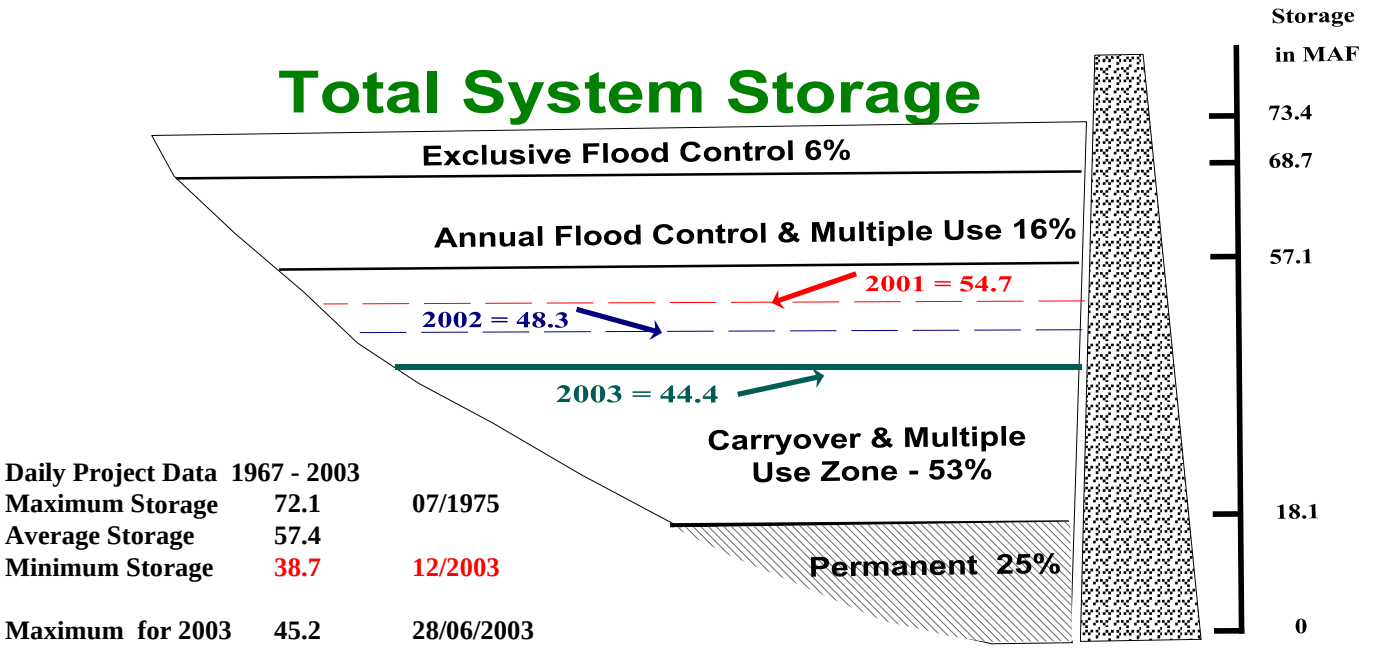
Daily Project Data 1967 - 2003		
Maximum Pool	1854.8	07/1975
Average Pool	1837.5	
Minimum Pool	1815.0	05/1991
Maximum for 2003	1827.3	10/07/2003

Figure 8A

Stem Reservoirs
Total System Storage



Daily Project Data 1967 - 2003		
Maximum Pool	1618.7	06/1995,06/1996
Average Pool	1604.6	
Minimum Pool	1576.2	12/2003
Maximum for 2003	1588.9	21/05/2003



Daily Project Data 1967 - 2003		
Maximum Storage	72.1	07/1975
Average Storage	57.4	
Minimum Storage	38.7	12/2003
Maximum for 2003	45.2	28/06/2003

Figure 8B

Specific Water Quality Priorities:

Missouri River Issues:

(3) "Define" how flow regime, including Corps project releases, affects water quality in the Missouri River.

(8) "Define" how current water quality conditions (i.e., water temperature and turbidity) may be affecting pallid sturgeon populations.

Mainstem Reservoir Issues:

(1) "Define" how Corps regulation of the System affects water quality in the impounded reservoir and downstream river. An immediate concern is the coldwater fishery habitat of Lake Sakakawea.

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

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

The Omaha District collected water quality data at each of the System projects and the Missouri River in 2003. A water quality intensive survey was conducted at the Garrison Project. Water quality data was collected at eight in-reservoir sites, two inflow sites (Missouri River and Little Missouri River), and an outflow site at the Garrison powerhouse. Biweekly monitoring was conducted from June through September. The intensive survey information is being used to evaluate the presence of cold-water habitat in Lake Sakakawea, and to apply the CE-Qual-W2 (Version 3.1) " Hydrodynamic and Water Quality Model" to the reservoir. Water quality monitoring at the other five System projects consisted of monthly samples collected from May to September. Sites sampled included a deepwater site on the reservoir near the dam and a site immediately below the dam in the tailwaters. Currently, the collected data is stored and managed on a local District database (i.e. DASLER). Efforts are ongoing to upload this information to the Environmental Protection Agency's "STORET" national water quality database. Collected water quality data are assessed by the District's Water Quality Unit to identify any water quality concerns, including compliance with State water quality standards. Other water quality information, including State 303(d) and 305(b) Reports, are also reviewed for indications of water quality concerns at the projects.

A significant water quality concern that can occur in reservoirs that thermally stratify in the summer is the depletion of dissolved oxygen levels in the hypoliminion. This is a natural process attributed to the differing density of water with temperature, and the utilization of in-reservoir dissolved oxygen in the decomposition of organic matter and the oxidation of reduced inorganic substances. When density differences become significant, the deeper cooler water is isolated from the surface and re-oxygenation from the atmosphere. In thermally stratified reservoirs, the deeper, quiescent waters can become anoxic and result in the release of sediment bound substances (e.g., phosphorus, metals, sulfides, etc.) as the reduced conditions increase.

Anoxic conditions can also result in the production of toxic and caustic substances (e.g., hydrogen sulfide, etc.). These conditions can impact aquatic life in the reservoir and also in waters downstream of the reservoir if its releases are from a bottom outlet. Most fish cannot inhabit water with less than 4 to 5 milligrams per liter (mg/l) dissolved oxygen for extended periods.

To evaluate hypolimnetic oxygen depletion at each of the System reservoirs, dissolved oxygen depth profiles were constructed from the dissolved oxygen measurements taken during 2001 through 2003 at near-dam deepwater sites. The late-summer profile that reflected the most severe oxygen depletion at each project was identified and plotted, as shown on ***Plate 4***. The Fort Peck, Oahe, and Big Bend plots exhibit an orthograde vertical dissolved oxygen distribution (i.e., fairly constant dissolved oxygen concentrations from the reservoir surface to the bottom). The Garrison, Fort Randall, and Gavins Point Plots exhibit more of a clinograde vertical dissolved oxygen distribution (i.e., decreasing dissolved oxygen concentrations with increasing depth). Fort Peck, Oahe, and Big Bend appear to be more oligotrophic than the other three reservoirs. Gavins Point is the shallowest of the project reservoirs evaluated and shows the sharpest dissolved oxygen decline, approaching 2 mg/l near the bottom. Of the reservoirs evaluated, Gavins Point and Fort Randall show the lowest hypolimnetic dissolved oxygen levels. In both reservoirs, it appears to be a "near-bottom" condition - only the bottom 1 to 2 meters is below 4 mg/l. The dissolved oxygen situation at Gavins Point appears to be the most serious for possible stronger reduction conditions and any associated problems. It is noted that corrosion problems have been experienced in pumps at the Gavins Point powerhouse and could be an indication of possible hydrogen sulfide concerns. The lower dissolved oxygen concentrations in the deeper waters of Garrison could present a fisheries management concern if a coldwater (i.e., salmonid) fisheries is to be maintained.

Table 5 provides a summary of water quality issues and concerns at each of the System reservoirs, based on Omaha District monitoring and a review of current State water quality reports.

The District's Water Quality Unit has initiated a more intensive water-quality monitoring program for the System projects. The monitoring program consists of long-term fixed station monitoring and intensive survey monitoring. Long-term fixed stations are to be located at: 1) representative in-reservoir deepwater sites, 2) a powerhouse site, and 3) inflow sites. Monitoring at the deepwater sites will be monthly from May through September. The powerhouse sites are to be monitored continuously with automated equipment, and monthly water quality samples are to be collected. Inflow sites will generally be monitored from April to September at a frequency that will allow for estimating “pollutant” loadings. A special effort is being undertaken to apply the CE-QUAL-W2 model to System reservoirs and targeted reaches of the Missouri River. The current schedule for applying the CE-QUAL-W2 model is as follows:

- Gavins Point (2007)
- Fort Randall (2006)
- Big Bend (2008)
- Oahe (2005)
- Garrison (2003)

TABLE 5
WATER QUALITY ISSUES AND CONCERNS

Project	TMDL Considerations*					Fish Consumption Advisories		Other Potential Water Quality Concerns**
	On 303(d) List	Impaired Uses	Pollutant/Stressor	Probable Pollutant/Stressor Source	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	Agriculture Resource Extraction Abandoned Mining Atmospheric Deposition Debris & Bottom Deposits	No	Yes	Mercury	Algal Blooms
• ***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	Hydromodification Upstream Impoundment Flow Regulation/Modification	No	No	---	---
Garrison • Lake Sakakawea	Yes	Fish and Other Aquatic Biota Fish Consumption	Low Dissolved Oxygen Water Temperature Methyl-Mercury	---	No	Yes	Mercury	Algal Blooms Hypolimnetic Dissolved Oxygen Levels
• ***Missouri River immediately below Garrison Dam***	No	---	---	---	---	Yes	Mercury	---
Oahe • Lake Oahe	No	---	---	---	---	No	---	---
Big Bend • Lake Sharpe	Yes	No Specific Use Identified	Accumulated Sediment	Bad River Watershed	Yes	No	---	---
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	Pathogens	Agriculture	No	No	---	---

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

** Includes significant fish kills and algal blooms.

- Fort Peck (2004)
- Missouri River downstream of Gavins Point Dam (2009)

Collected water quality data and application of the CE-QUAL-W2 model will be used to prepare project-specific reports and water quality management plans, as identified in ER 1110-2-8154, "Water Quality and Environmental Management for Corps Civil Works Projects."

4. Navigation

The first towboat to enter the Missouri River from the Mississippi River in 2003 was the Omaha, which is owned by Blaske Marine Services. The towboat entered on March 25, 2003. On April 1, the first official day of flow support for the 2003 navigation season at St. Louis, Missouri, two tows were operating on the river. The first tow to arrive in Sioux City was The Omaha on April 29, 2003. The Jack Flahaut, owned by MEMCO, arrived later the same day. April was a tough month for navigation. Short-term groundings were reported in April at river miles 140, 136.5, 130, 122, 107, 106, 51 and 26.2.

Navigation was challenging all season because of the minimum service target flows and the extremely low tributary inflows. During 2003 navigation season, the Kansas River projects were utilized to support Missouri River navigation. A lawsuit requiring the Corps to follow the 2000 Biological Opinion caused a termination of navigation. From August 11 to September 1 the Corps followed the 2000 BiOp court-ordered releases from Gavins Point. The low flows to meet the court order caused tows to leave the river in mid- August and not return until September 10. One towing company diverted 60 barges to the Mississippi River for unloading and shipment by rail. The fall navigation also saw two groundings, one at river mile 147.3 in October and one at river mile 7.5 in November. The navigation season progressed to the normal conclusion, ending 6 days early on November 24 at the mouth.

The Waterborne Commerce Statistics Center (WCSC) final data for CY 2002 is 8.27 million tons of which 7.13 million tons was sand and gravel. The values for CY 2003 have not yet been finalized. 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 2000, 2001 and 2002 are shown in ***Table 6.*** ***Figure 9*** shows tonnage of commodities since 1960.

Navigation season target flows for past years are given in ***Table 7***. ***Table 8*** shows the scheduled lengths of past navigation seasons with total tonnage and ton-miles for each year. An 8-month season less 6 days was provided in 2003. During the six-week period from mid-July to September 1, flows were at less than minimum service due to a lawsuit requirement for the Corps to follow the Gavins Point releases schedule as presented in the 2000 Biological Opinion as previously discussed in this report. The commercial tonnage figure for 2003 is a preliminary estimate and will change once final WCSC tabulations are available late in 2004 or early 2005. Missouri River commercial tonnage in 2003 is currently estimated to total about 1.0 million tons, based on estimates from daily reports of towboat activity.

TABLE 6
MISSOURI RIVER TONNAGE BY COMMODITIES (In Thousands of Tons)

Commodity Classification Group	2000	2001	2002
Farm Products	488	471	352
Corn	198	151	126
Wheat	21	39	28
Soybeans	153	164	167
Nonmetallic Minerals	7254	8435	7145
Sand/Gravel	7225	8410	7129
Food and Kindred	42	37	36
Pulp and Paper	1	0	0
Chemicals	289	334	246
Fertilizer	281	328	241
Petroleum (including coke)	256	217	173
Stone/Clay/Glass	163	193	189
Primary Metals	69	5	13
Waterway Materials	165	34	112
Other	6	4	0
Total Commercial	8733	9730	8266
Total Long Haul Commercial	1343.6	1287.6	1009.0

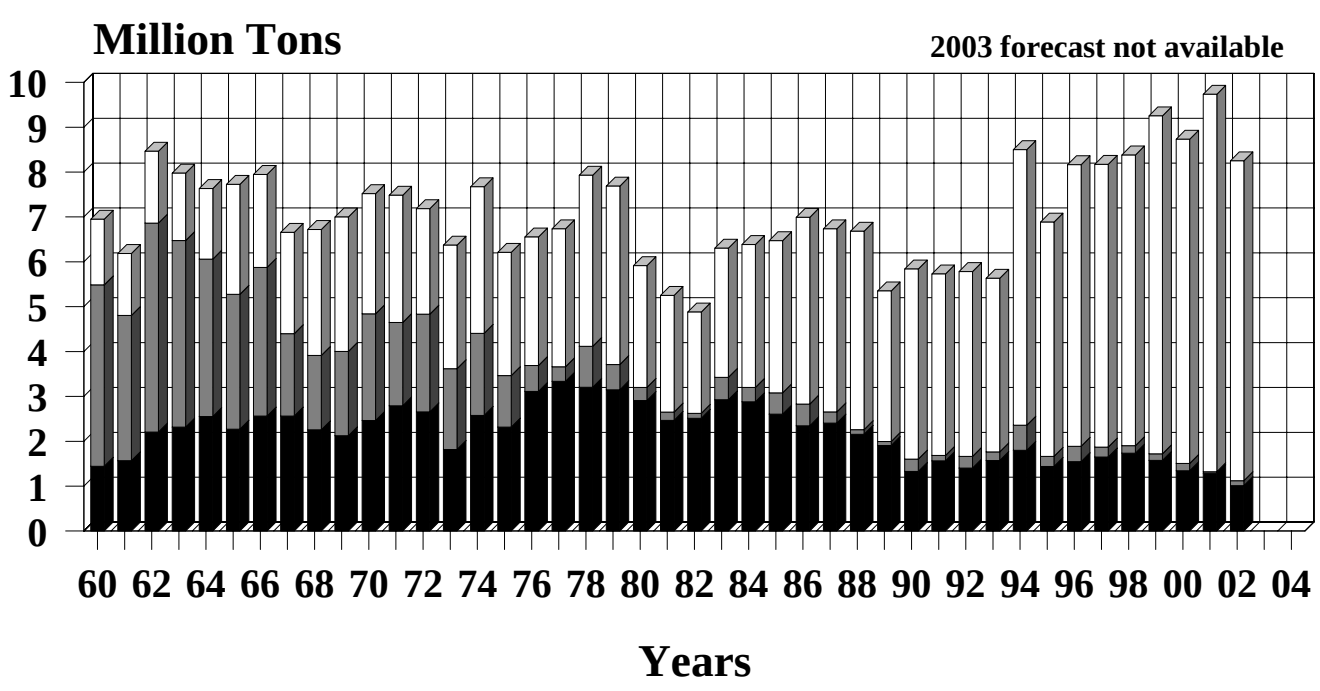
Figure 10 presents discharge data at Sioux City, Iowa; Nebraska City, Nebraska; and Kansas City, Missouri for the August 2002 through December 2003 period. The three graphs demonstrate that actual flows at these locations are influenced considerably by System releases. During the first half of the 2003 navigation season, System releases were set at 26,000 cfs. Downstream tributaries did not provide much inflow during the navigation season. Refer to Section II.C for further discussion on System releases during the 2003 Navigation season.

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

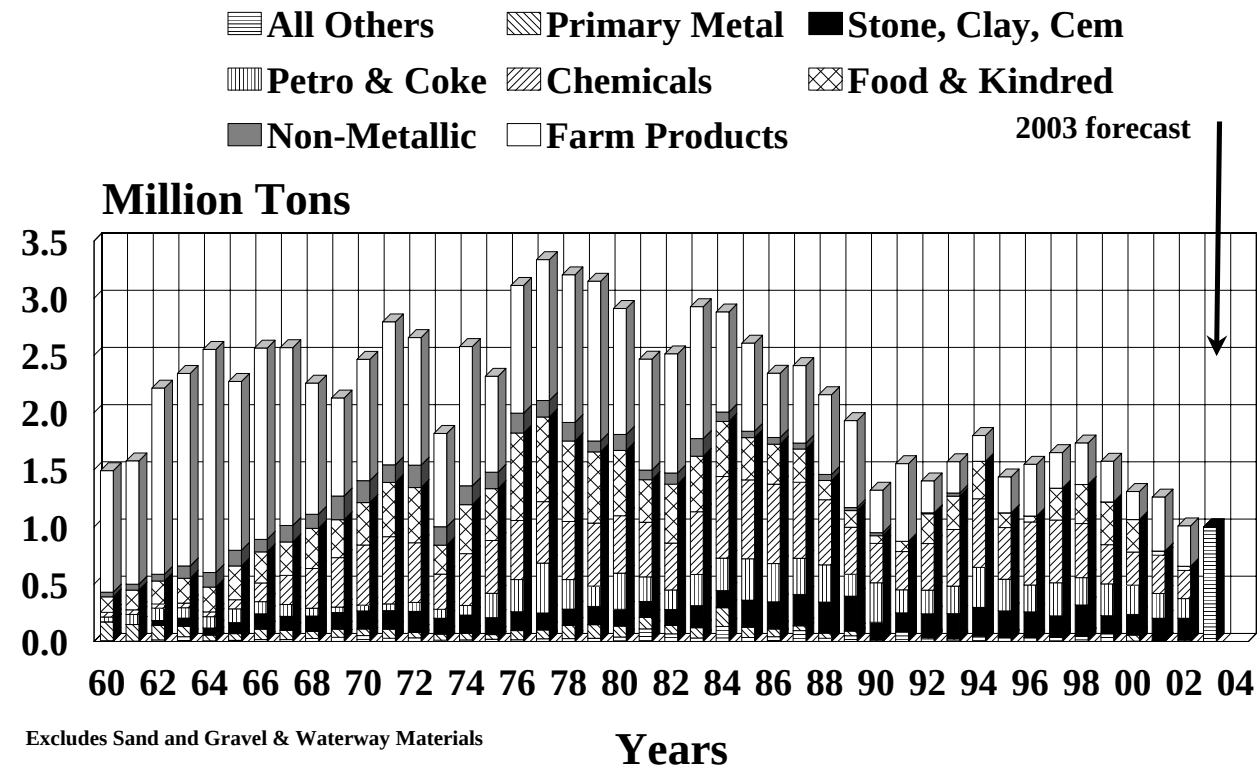
The CY 2003 energy generated by basin hydropower units was transmitted over a Federal transmission system traversing 7,745 circuit miles. This past year, service was provided to 368 customers in a 6-state area. Those receiving direct service include 195 municipalities, 1 Federal agency, 33 state agencies, 31 U.S. Bureau of Reclamation projects, 3 irrigation districts, 35 rural electric cooperatives, 7 public utility districts, 35 private utilities, 25 Native American Service Areas, and 2 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 these numbers, the energy generated in CY 2003 by the portion of the Federal power

Missouri River

Total Navigation Tonnage



Commercial Navigation Tonnage



Excludes Sand and Gravel & Waterway Materials

Figure 9

TABLE 7
NAVIGATION SEASON TARGET FLOWS
Target Flows, 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

(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.

TABLE 8
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	data not available
1992	6 3/4	1,403,000	5,783,000	data not available
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)	1,000,000 (11)	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) Preliminary estimate.

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

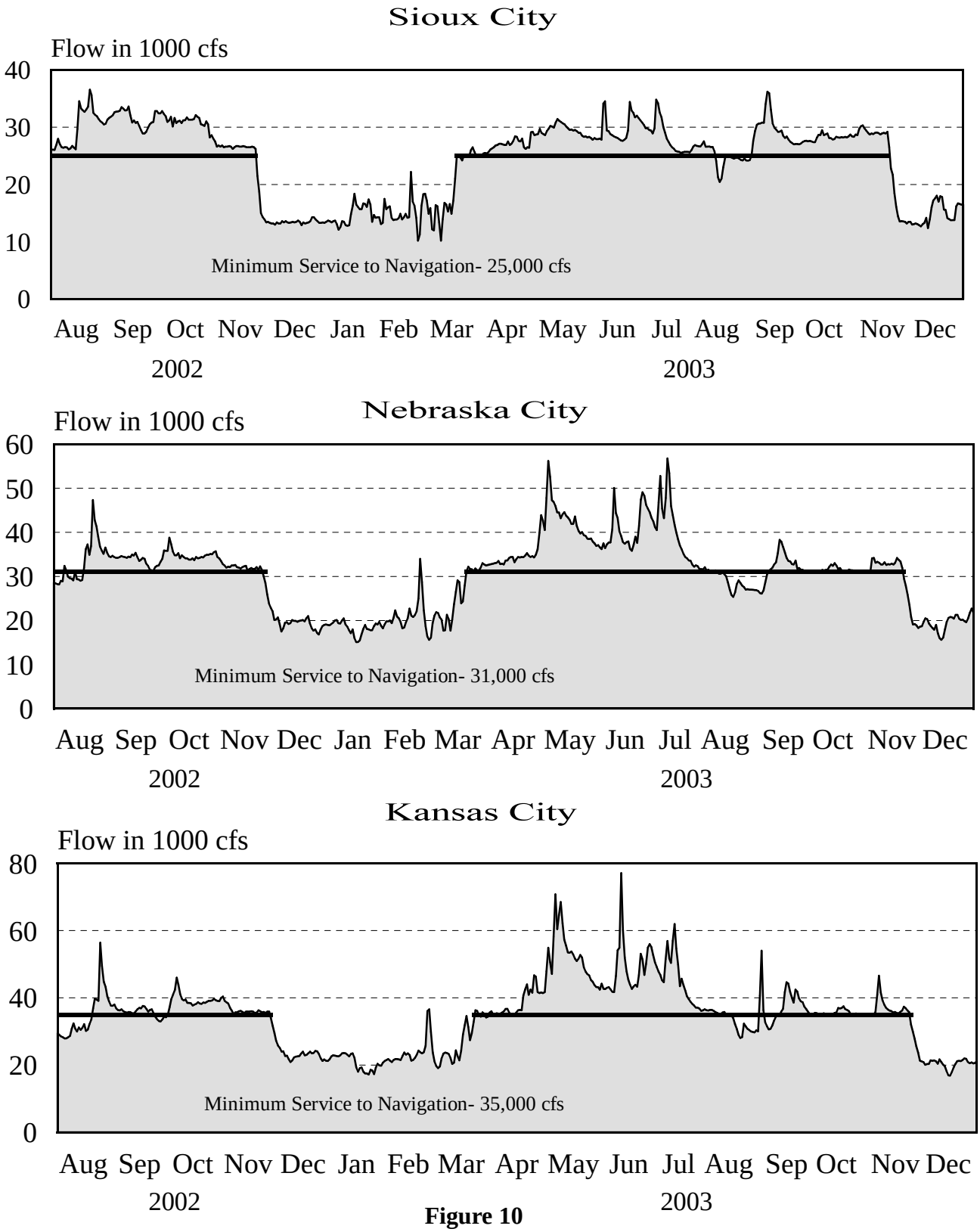


Figure 10

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 2003 generation was 76 percent of average since the System first filled in 1967. Energy generation was below normal due to below normal runoff and below normal releases at all powerplants. Western purchased about 3.9 billion kWh between January 1, 2003 and December 31, 2003 at a cost of $124.3 million to supplement main stem 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 2003 is shown in ***Table 9***. The tabulations in ***Table 10*** and ***Table 11*** 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 9
GROSS FEDERAL POWER SYSTEM GENERATION
(January 2003 through December 2003)

	Energy Generation 1,000 kWh	Peak Hour kWh	Generation Date
Corps Power Plants - Mainstem			
Fort Peck	817,794	154,000	8/7/2003
Garrison	1,745,685	332,000	8/28/2003
Oahe	1,967,664	589,000	6/27/2003
Big Bend	830,540	447,000	7/23/2003
Fort Randall	1,502,472	340,000	8/27/2003
Gavins Point	705,922	110,000	9/10-11/2003
Corps Subtotal	7,570,077	1,848,000	6/19/2003
USBR Powerplants			
Canyon Ferry	315,710	57,000	5, 6 & 7/2003
Yellowtail*	164,384	88,000	6/2003
USBR Subtotal	480,094		
Federal System Total	8,050,171		

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

TABLE 10

HISTORICAL GENERATION AND LOAD DATA
EASTERN DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM*
Data at plant - 1,000 kW
January 1, 2003 through December 31, 2003

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	1,430		36		1,466		695		2,161
February	1,338		36		1,374		747		2,121
March	1,492		36		1,528		547		2,075
April	1,539		34		1,573		492		2,065
May	1,611		56		1,667		684		2,351
June	1,848		57		1,905		604		2,509
July	1,799		53		1,852		602		2,454
August	1,837		25		1,862		797		2,659
September	1,766		24		1,790		530		2,320
October	1,380		27		1,407		611		2,018
November	1,269		29		1,298		395		1,693
December	1,217		34		1,251		494		1,745

* This tabulation summarizes the total gross generation and power operations for the Eastern Division marketing area system shown on Table 9.
** During hour of Federal peak hour generation.

TABLE 11

HISTORICAL GENERATION AND LOAD DATA
EASTERN DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM*
Data at plant - 1,000 kWh
January 1, 2003 through December 31, 2003

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	543,515		39,895		583,410		422,000		1,005,410
February	505,544		36,069		541,613		376,000		917,613
March	563,756		38,934		602,690		326,000		928,690
April	669,181		36,840		706,021		233,000		939,021
May	677,084		47,057		724,141		208,000		932,141
June	760,258		56,132		816,390		220,000		1,036,390
July	780,374		49,101		829,475		234,000		1,063,475
August	763,389		37,761		801,150		357,000		1,158,150
September	750,510		32,500		783,010		370,000		1,153,010
October	589,331		31,690		621,021		376,000		997,021
November	483,018		33,050		516,068		287,000		803,068
December	484,117		41,068		525,185		546,000		1,071,185

*Powerplants from Table 9

Main Stem Power Generation
1954 - 2003

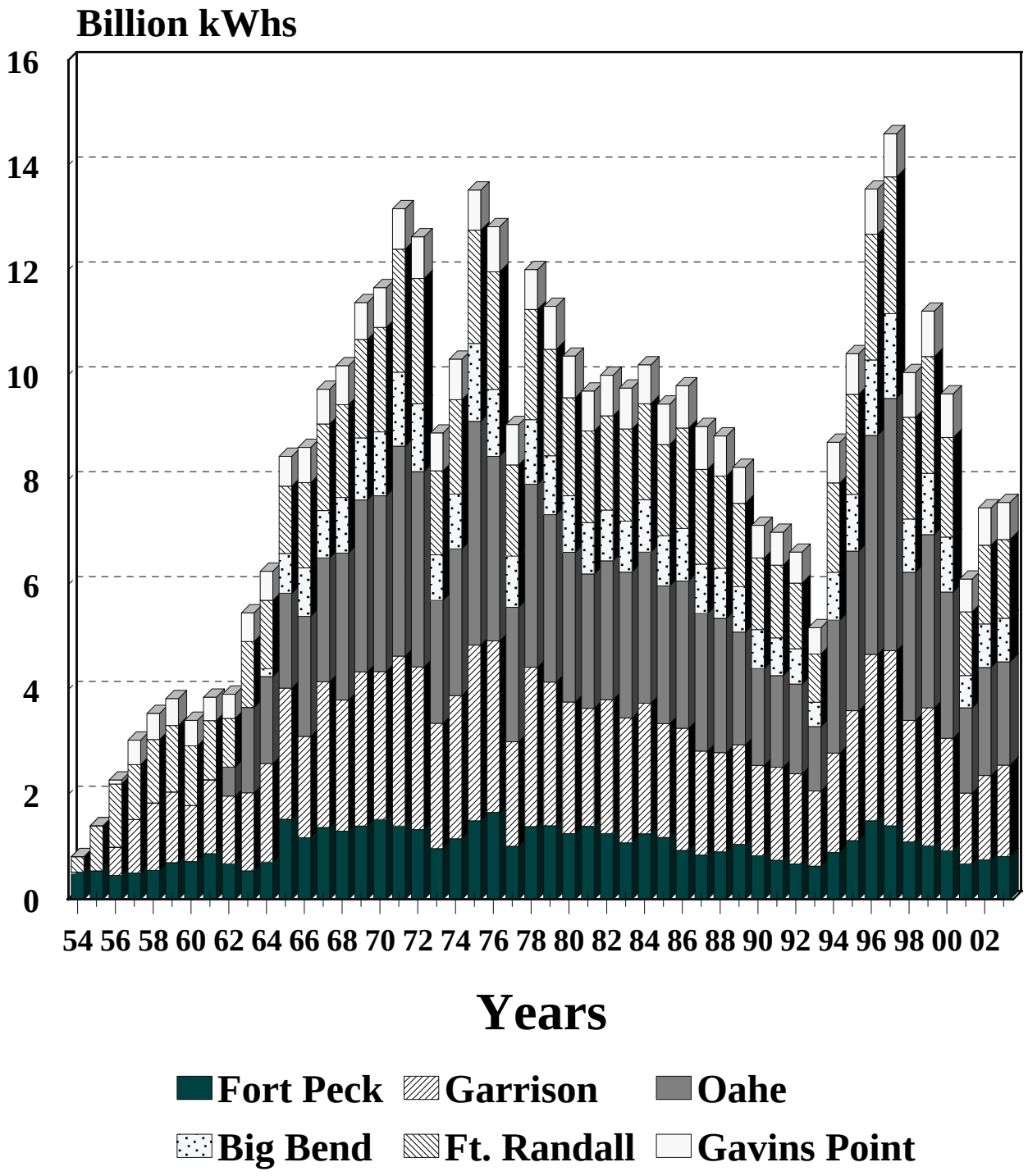


Figure 11

6. Fish Management

Rainbow smelt are the primary forage species in both Garrison and Oahe. Successful rainbow smelt reproduction is highly dependent on stable reservoir levels. 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. Reservoir levels rose in the spring of 2003 in both Garrison and Oahe reservoirs during the rainbow smelt spawning period. The Oahe smelt hatch was the highest since 1997.

7. Threatened and Endangered Species

This is the 18th year of regulation since the piping plover and interior least tern were Federally listed as threatened and endangered species, respectively. Both the least tern and piping plover 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 2003 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 fledge ratios achieved since then can be attributed to the large amount of habitat created by the high flows of 1997. The creation of additional habitat has also allowed greater flexibility in the release levels at the lower two System projects.

For 2003, the majority of piping plovers found again found on Garrison reservoir, below Gavins Point Dam and Oahe Reservoir. Excellent shoreline habitat existed due to the lower reservoir levels caused by the reduced runoff. A record number of piping plover adults, 1338, were found on the Missouri River System this year yielding a fledge ratio of 1.5 chicks per pair of adults. A total of 741 adult terns nested on the System in 2003. This was the second highest total since surveys began in 1988. The majority of least terns were found on the Missouri River reaches below Garrison and Gavins Point and on Oahe Reservoir. Tern nesting also was very successful. The fledge ratio for naturally raised terns was 0.87 fledglings per pair.

Table 12 shows the population distribution and productivity for terns and plovers for 1991 through 2003. Productivity estimates for these birds on the Missouri River in 2003 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" means 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 mainstem. 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 operated in a consistent manner year-to-year and are not impacted by the drought. The low pool levels 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 2003 the Corps spent approximately $1.2 million extending and relocating Category 1 and 2 boat ramps (ramps that are owned by the Corps and are operated either by the Corps or other party) to maintain public access where such work was feasible. Of the 10 Corps boat ramps on Fort Peck Lake, 8 were in operation for all or most of the 2003 recreation season. At Garrison, 7 of the total 10 Corps boat ramps were available in 2003. In 2002, many of the Federal recreation areas and boat ramps were turned over in fee title to the State of South Dakota through the Title VI process, thus the Corps no longer owns many boat ramps on Oahe Reservoir. In an effort to maintain consistency with the other projects the Corps transferred $635,000 to the State of South Dakota in 2003 for the extension and/or relocation of boat ramps that the Corps would have maintained had the title transfer not occurred. Of the 30-plus current or former Corps boat ramps on Oahe Reservoir, 17 were usable throughout all or most of the 2003 recreation season. All three reservoirs also have other private, Tribal and/or State owned boat ramps that have been impacted by the drought. 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 2003, public use at these reservoirs totaled 43,399,400 visitor hours, a 12 percent decrease from 2002. Visitor attendance figures at the reservoir projects from 2001 through 2003 are shown in ***Table 13***. ***Figure 12*** displays recreation related visitor hours at each of the six projects for the years 1954 through 2003. Although the drought has had an impact on visitation during the past two years, much of the drop shown is attributed to 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 2003 visitation in South Dakota presented reflects use on the reservoirs but not the visitation at the campgrounds that were turned over to the State of South Dakota.

Table 12
Missouri River Main Stem
Least Tern and Piping Plover Survey Data

Interior Least Tern

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Fort Peck Lake														
Adults	6	10	0	7	9	2	0	0	4	0	0	0	0	2
Fledglings/Pair	-	0.40	{}	0	0.44	0	0	0	0	0	0	0	0	0
Fort Peck to Lake Sakakawea														
Adults	92	66	110	31	58	95	128	162	25	40	13	39	34	38
Fledglings/Pair	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
Lake Sakakawea														
Adults	6*	8	29+	17	35	7	27	2	23	9	10	34	21	25
Fledglings/Pair	-	-	0.83+	0.12+	0	0	0.15	0	1.04	0.67	0.20	0.76	0.86	0.56
Garrison to Lake Oahe														
Adults	174	195	198	145	217	284	105	41	141	105	105	125	126	144
Fledglings/Pair	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
Lake Oahe														
Adults	100	143	124	125	160	84	74	101	110	57	85	94	106	70
Fledglings/Pair	-	-	0.42	0	0.06	0	0.24	0.16	1.29	0.88	1.01	1.34	1.32	1.20
Ft. Randall to Niobrara														
Adults	26	32	13	38	43	10	2	0	64	124	72	71	84	50
Fledglings/Pair	0.31+	0.63	0.46	0	0	0	0	0	0.94	1.03	1.26	0.14	0.71	0.92
Lake Lewis and Clark														
Adults	63	55	29	76	44	16	28	60	120	76	44	58	46	46
Fledglings/Pair	0.35+	0	1.59	0.97	0	0	0	1.57	2.33	0.21	0.38	1.17	1.04	0.39
Gavins Point to Ponca														
Adults	167	193	187	272	211	93	82	115	148	161	149	232	314	366
Fledglings/Pair	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
Total Adults	634	702	690	711	777	591	446	481	635	572	551	653	731	741
Fledglings/Pair	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

Ten Year Interior Least Tern Fledge Ratio Goal = 0.70 (2000 Biological Opinion)

Piping Plover

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Fort Peck Lake														
Adults	22	25	26	30	4	5	0	0	4	2	0	4	2	17
Fledglings/Pair	3.18	1.20	1.00	0.60	1.50	1.20	0	0	0	2.00	0	1	2	0.35
Fort Peck to Lake Sakakawea														
Adults	17	13	0	4	9	20	24	23	4	5	4	3	2	6
Fledglings/Pair	0	0	{}	0+	0	3.50	1.00	0.87	1.00	0	0	1.33	0	2.67
Lake Sakakawea														
Adults	132	150	108	8	45	24	70	3	119	83	277	424	469	528
Fledglings/Pair	-	-	1.50	8.5+	1.24	0	0.57	0.67	1.24	1.25	1.61	1.25	1.65	1.06
Garrison to Lake Oahe														
Adults	71	124	77	127	119	261	45	6	74	139	99	149	119	149
Fledglings/Pair	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
Lake Oahe														
Adults	88	87	143	66+	85	30	21	31	98	46	141	184	203	301
Fledglings/Pair	-	-	0.97+	0.33	0.09	0.93	0.29	1.29	1.06	0.30	1.45	1.41	2.16	1.84
Ft. Randall to Niobrara														
Adults	12	25	8	12	17	0	3	0	33	51	62	38	35	37
Fledglings/Pair	0.67*	0.48	0.75	0	0	0	0	0	1.27	1.02	0.87	0.74	1.03	1.46
Lake Lewis and Clark														
Adults	30	33	6	32	12	4	6	32	84	67	28	34	44	14
Fledglings/Pair	0.67+	0	0	0.06	0.33	0	0	1.25	2.45	0.30	0.5	0.71	1.68	1.57
Gavins Point to Ponca														
Adults	148	166	112	109	62	63	22	22	49	141	186	218	260	286
Fledglings/Pair	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
Total Adults	521	623	480	388	353	407	191	117	465	534	797	1054	1134	1338
Fledglings/Pair	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

Fifteen Year Piping Plover Fledge Ratio Goal = 1.13 (2000 Biological Opinion)

- 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 1990 to 2000 the Ten Year Least Tern Fledge Ratio was 0.70 (1990 Biological Opinion).

Data in this table may differ from previous reports. As information becomes available, this table is updated.

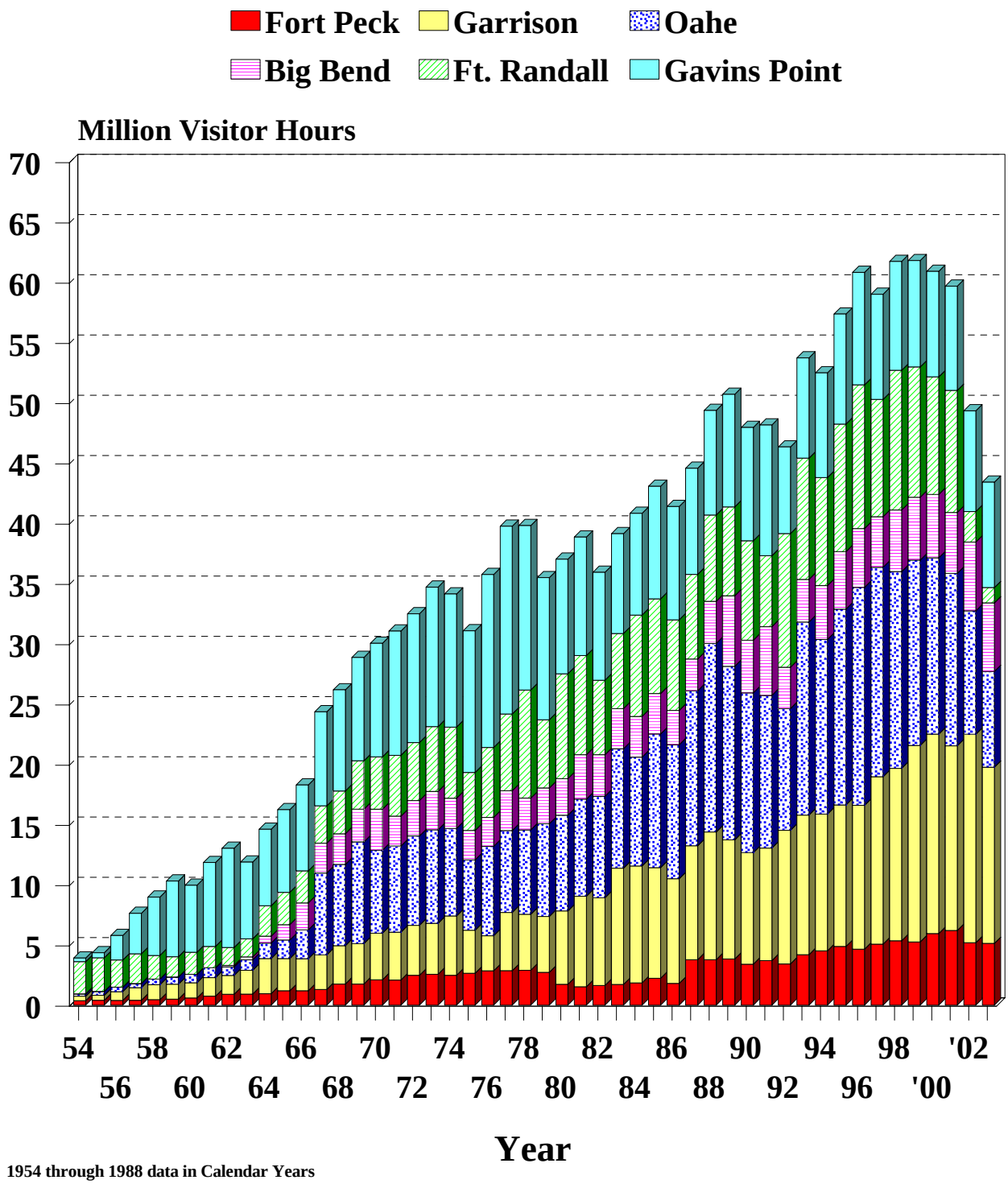
The reporting method was changed from recreation days to visitor hours in 1987, and the reporting period was changed from calendar year to fiscal year in 1989 for all Corps projects. All Corps projects, including those on the Missouri River mainstem, are now reporting visitation using the Visitation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

TABLE 13
VISITATION AT SYSTEM RESERVOIRS IN VISITOR HOURS

Mainstem Project	2001	2002	2003	Percent Change 2002-2003
Fort Peck	6,206,400	5,183,100	5,128,000	-1.1
Garrison	15,318,200	17,303,600	14,626,600	-15.5
Oahe	14,308,300	10,242,100	7,933,300	-22.5
Big Bend	5,057,400	5,706,800	5,701,600	-0.1
Fort Randall	10,128,400	2,529,800	1,265,500	-50.0
Gavins Point	8,647,200	8,358,200	8,744,400	+4.6
System Total	59,665,900	49,323,600	43,399,400	-12.0

Beginning in January 2003 and running through 2006, the nation will commemorate the 200th anniversary of the Lewis and Clark Expedition. A significant 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 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.

Missouri River Main Stem
Project Visitor Hours
1954 to 2003



1954 through 1988 data in Calendar Years
1989 to 1991 in Fiscal Years
1992 to present in VERS System.

Figure 12