U.S. Army Corps of Engineers

Omaha District

Monthly Drought Report

September 2005

US Army Corps
of Engineers
Omaha District

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Missouri River Basin Drought Overview

Historic records dating back several hundred years indicate drought in the Missouri River Basin is a regular occurrence causing changes in lake levels, streamflow, and vegetation growth. Long-term records of precipitation, snowpack, and mainstem reservoir system inflow, clearly show major droughts occurring from 1930-41, 1954-61, and 1987-92, and a recent drought that began in 2000. These droughts varied some in severity and coverage of the Missouri River basin, with the 1930s drought covering the greatest areal extent of the Missouri River basin. The Upper Missouri River basin is experiencing 10 to 20 inch long-term precipitation deficits and continued short-term deficits in rain and mountain snowpack. The U.S. Drought Monitor (Figure 1) places most of the Missouri River Basin in an "abnormally dry" category (D0), with some areas exhibiting "moderate drought" (D1). The Drought Outlook (Figure 2), based on the three-month climate outlook and runoff forecasts predicts drought impacts to be alleviated in the majority of Montana, North and South Dakota, and Nebraska; with improvement expected in parts of Wyoming.

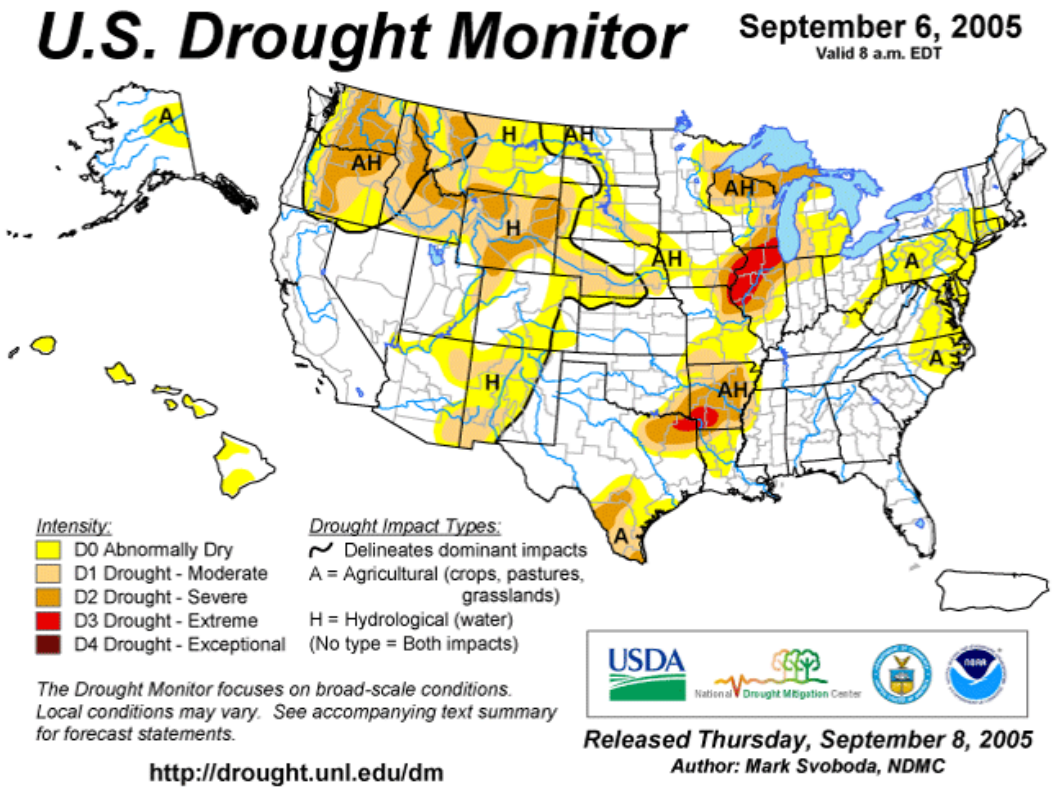


Figure 1 – U.S. Drought Monitor September 6, 2005
http://drought.unl.edu/dm/monitor.html

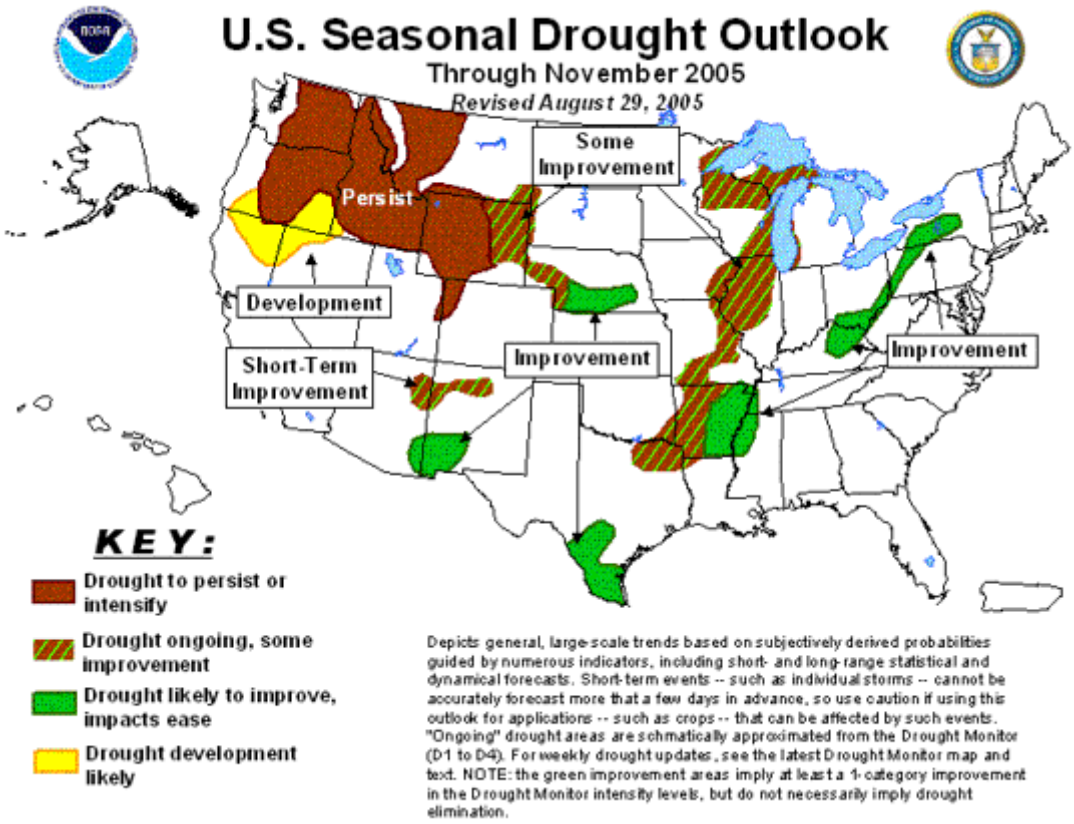


Figure 2 – U.S. Seasonal Drought Outlook Through November 2005
http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html

PRE-SETTLEMENT DROUGHT

Paleo-climatic research in portions of the Missouri River Basin reveals that severe and protracted drought is a common occurrence in the current climate. South Platte Basin headwaters region in Park County, Colorado, and the Waubay Lakes area near Watertown, South Dakota, reveals that severe and periodic droughts have occurred in a time span ranging from 600 to 800 years ago. More recent tree-ring chronologies suggest a severe drought that took place in the western Great Plains and Colorado Front Range.

South Platte Basin

Tree-ring studies of the South Platte headwaters in Park County, Colorado, indicated a good correlation between moderately reduced annular tree ring growth and drought (Potts, 1962). In addition, growth deviations indicated that three to four severe or protracted drought periods occurred each century. Periods of reduced growth ranged from six to nineteen years in length. Precipitation and drought records were compared to tree ring records during the Great Depression Drought of the 1930s. Assuming that tree ring width and drought were strongly correlated, characteristics of 1930s Drought tree ring growth were used to infer other periods of severe and protracted drought. Drought

periods according to this hypothesis of the tree ring records could include 1348-1362, 1411-1426, 1478-1485, 1541-1556, 1663-1677, 1729-1745, and 1848-1867.

Recent tree-ring chronologies and streamflow reconstruction support a severe drought occurring in the western Great Plains and Colorado Front Range from 1845 to 1856. This drought experienced very severe periods from 1845-48, 1851, and 1854-56. Had it occurred in the modern day, this drought would have had dire consequences on the Colorado Front Range urban corridor and Colorado agriculture (Woodhouse et al., 2002).

Waubay Lakes

Tree-ring and lake sediment research in the Waubay Lakes near Watertown, SD, also indicate that drought periods occurred between pro-longed periods of moderately high lake levels (Johnson and others, 2000). These low water periods may have occurred over several decades centered on the years 1330, 1480, 1600, and 1740.

DROUGHT SINCE 1895

Better precipitation and streamflow records have allowed climatologists and hydrologists to identify drought more effectively during the last century. Since 1895 Palmer Drought Severity Indices were constructed for the Missouri River Basin from 1895 to 2004. Figure 3 represents the percent of area affected by severe and extreme Palmer drought in the Missouri River basin. From 1895 to 2004, drought has occurred somewhere in the Missouri River basin in a majority of years. Periods in which more than 50% of the basin was affected by drought include the 1930s, late 1940s to early 1950s, the mid-1980s, and the early 2000s. Historic droughts in the Omaha District occurred from 1930-41, 1954-61, and 1987-92.

Precipitation

Precipitation records dating back to 1900 were compiled throughout the Omaha District to illustrate precipitation departures. Weather stations were chosen for this precipitation analysis based on completeness and length of record, and prominence of location in the District. Average annual precipitation and departures, as well as periods of record average precipitation, were determined from each weather station. Average annual departures were computed for the Omaha District Missouri River basin, and two subsets including the Missouri River basin tributary to Gavin's Point Dam, and the basin from Rulo, NE, to Gavin's Point Dam. In addition, five-year average departures were computed from the average annual departure data. Drought occurring in the Omaha District was determined by below-normal annual precipitation departures and through the five-year average especially from the late 1920s through 1930s, and the late 1940s through 1950s. By the five-year average, shorter droughts occurred in the 1910s, 1970s, and 1980s. The five-year average also indicates that a precipitation drought began in 2000.

Precipitation departures in the Missouri River basin above Gavin's Point Dam also indicate that major droughts occurred from the mid-1920s through the 1930s, and the late 1940s through the 1950s. In addition, droughts also occurred in the early 1900s, the late 1910s, the late 1980s, and since the year 2000.

Through observation of the precipitation records, it is clear that the 1930s, 1950s, and present day droughts impacted the entire Omaha District while other droughts were more regionalized throughout the period of record.

Mountain Snowpack

Mountain snowpack in the Missouri River Basin provides roughly 50% of the water to the Missouri River Mainstem Reservoir system. Snow water equivalents (SWE) of mountain snow pack are monitored by a network of SNOTEL gages maintained by the USDA Natural Resources Conservation Service. Basin averaged peak annual SWE was computed from a record of subbasin peak SWE values obtained from the NRCS SNOTEL file transfer protocol site.

Most years during the 1987-92 drought had below basin average SWE; however, all four basins had one or two years of above average peak SWE. Also, the 1987-92 drought is positioned between periods of generally above-average peak SWE. The current drought in its sixth consecutive year is apparent because peak basin SWE is below normal in most years.

Mainstem Reservoir Inflows

Long-term Missouri River streamflow records are an indicator of upper basin drought. Total Missouri River runoff volumes above Sioux City, IA, normalized to 1949 depletion development records indicate three historic drought periods and the current Upper Missouri River Basin drought. The three historic droughts in the Upper basin include the 1930s drought, the mid-1950s to early 60s drought, and the mid-1980s to early 90s drought.

After each drought, a period of mostly above-median runoff occurred in the Missouri River basin above Sioux City including some years in which runoff volumes fell just within lower quartile and lower decile runoff classifications. The 1930s drought extended from 1930 to 1941 for a total of 12 years, the 1950s drought extends from 1954 to 1961 for eight years, the 1980s drought extended from 1987 to 1992 for six years. Since 2000, the District has experienced five full years and likely a sixth year (2005) of below-median runoff.

Tributary Runoff

Streamflow records from several tributaries downstream of Gavin's Point Dam were evaluated to show evidence of the historic district droughts and the current Omaha District drought. The data was not adjusted for streamflow depletions that have occurred due to development and regulation.

The 1930s Drought resulted in very low mean annual discharges on the James and Elkhorn Rivers. The 1950s drought did reduce discharges on all four rivers; however, above average discharges occurred on both the James and Platte Rivers. All rivers exhibit high mean annual discharges during a period from 1993 to 1999 followed by reduced

discharges beginning in 2000. The year 2001 is an exception during the current drought period because the Central and Northern Plains received well-above average snowfall during the 2001 Water Year winter season.

CURRENT CONDITIONS

The current Omaha District drought has impacted parts of the Missouri River Basin including the entire Upper Missouri River Basin in Montana and Wyoming since 2000. Longterm (72-month) precipitation departures range from 5 to 10 inches below normal in Montana to 15 to 20 inches below normal in parts of Nebraska; while during the present 12-month period, precipitation is less than three inches below normal. Water year 2005 snow pack was severely limited as in years past. Current drought indicators including the Palmer Drought Severity Index and the Drought Monitor reflect short-term water deficits and long-term drought impacts.

Precipitation Departures

Precipitation accumulations in the Western U.S. have largely affected the severity and extent of the drought since 2000. Precipitation departures from normal during the last 72-months for the United States are shown in Figure 3. Precipitation departures or deficits in the Western U.S. have shown significant improvement due to Spring and Summer moisture. In much of western and southwestern Montana, accumulated precipitation during the last 72 months had been 15 to 20 inches below normal, compared to the current departure of 5 to 10 inches below normal. Wyoming accumulated precipitation remains 10 to 15 inches below normal during the observation period. Southeast Nebraska and southwest Iowa have received 5 to 10 inches less than normal precipitation. The Dakotas have largely received a surplus (10 to 15 inches) of precipitation in the central and eastern regions, while western regions are normal to 5 inches below normal. The South Platte River Basin in Colorado shows precipitation deficits of 5 to 10 inches during a majority of the 72-month period.

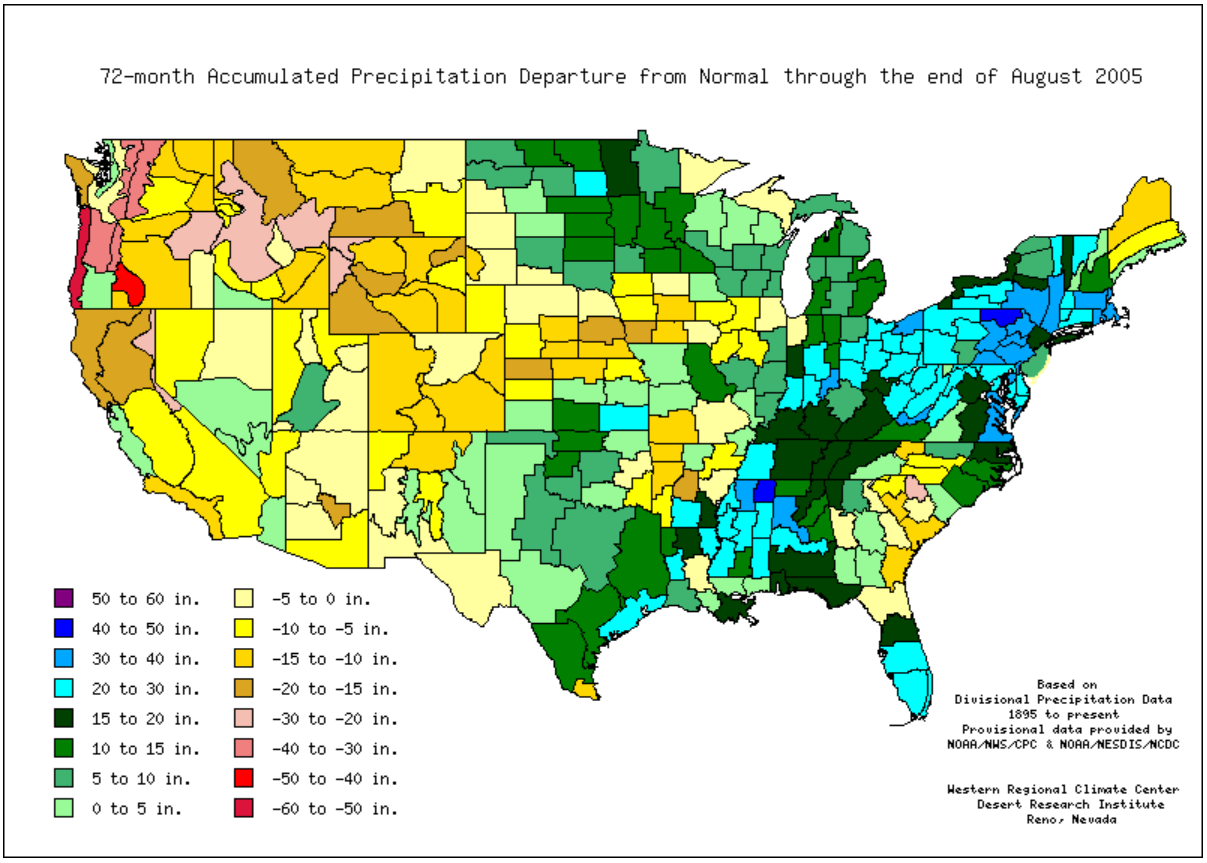


Figure 3 – 72 month Precipitation Departure From Normal
http://www.wrcc.dri.edu/cgi-bin/spiFmap.pl?dep72

The 12-month precipitation accumulation in Figure 4 indicates that precipitation throughout much of the western and northwestern District is three-inches above or below normal.

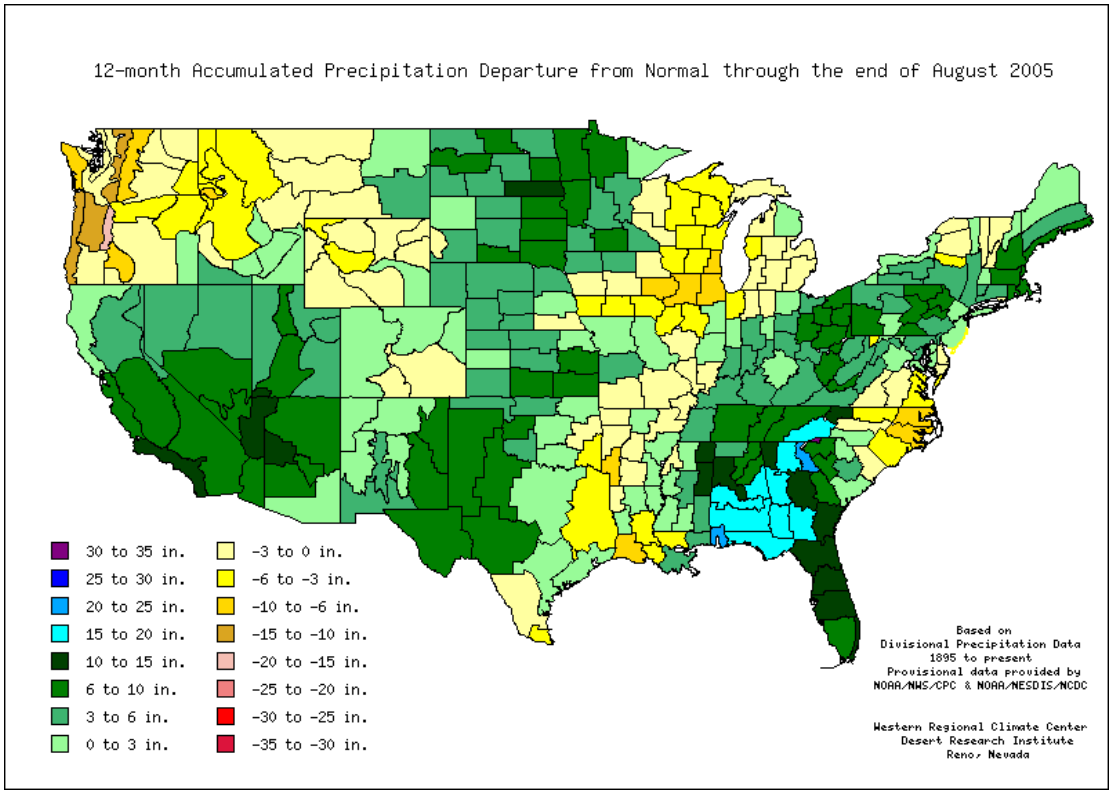


Figure 4 – 12 month Precipitation Departure From Normal
http://www.wrcc.dri.edu/cgi-bin/spiFmap.pl?dep12

The three-month period (Figure 5) shows precipitation ranges from 2 inch deficits in Montana to 4 to 6 inch surpluses in the Dakotas. Elsewhere in the District precipitation accumulations are two to four-inches above normal for the three-month period.

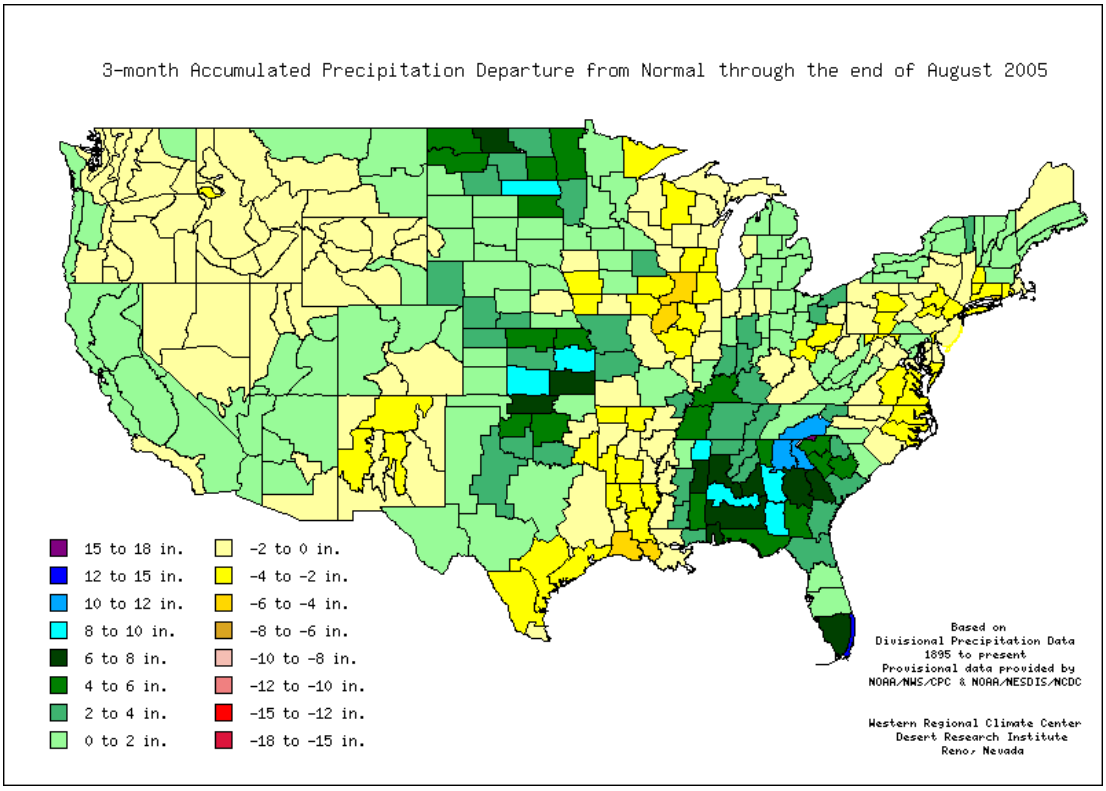


Figure 5 – 3 month Precipitation Departure From Normal
http://www.wrcc.dri.edu/cgi-bin/spiFmap.pl?dep03

During July, the majority of the basin received normal to 3 inch rainfall deficits (Figure 6).

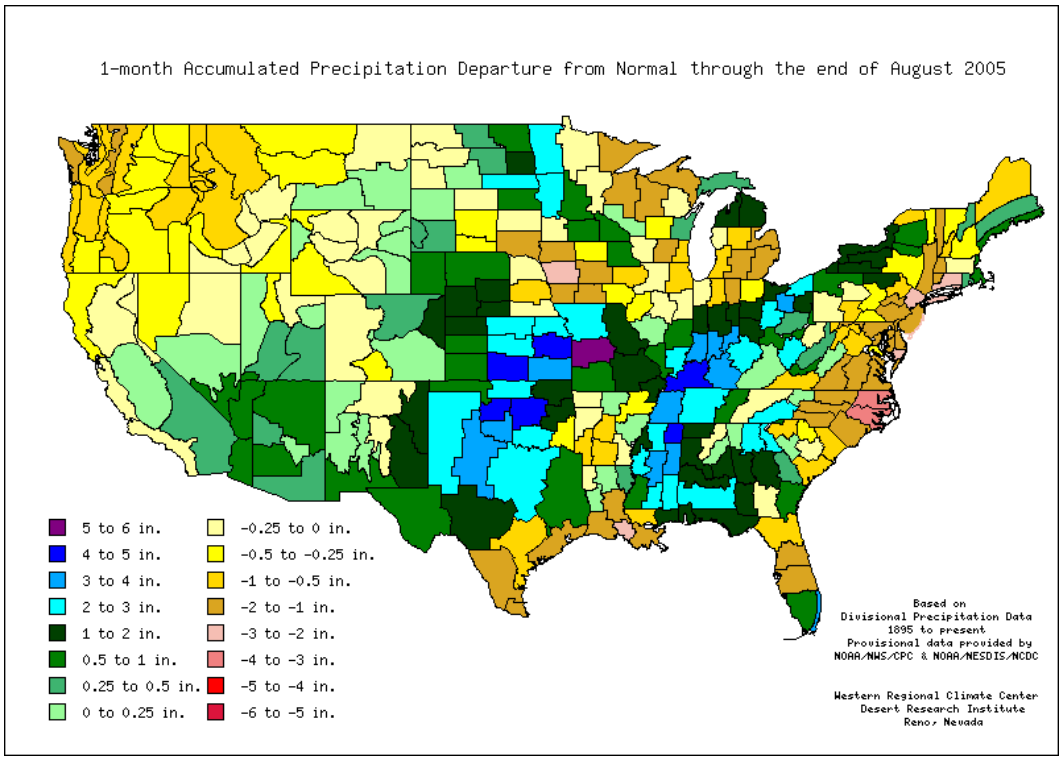


Figure 6 – 3 month Precipitation Departure From Normal
http://www.wrcc.dri.edu/cgi-bin/spiFmap.pl?dep01

Water Year 2005 Mountain Snow

The depth and snow water equivalent (SWE) of mountain tributary basin snow pack in Water Year 2005 was poor over most of the Missouri River basin mountain basins as a result of a mild and waivering El Nino phenomenon. This mild El Nino phenomenon increased the inflow of Pacific moisture to the southwestern U.S. which produced abundant rain in California, Arizona, and New Mexico, along with heavy snowfall in the Sierra Nevadas and Southern Rocky Mountains. At the same time conditions were not favorable to develop winter storms with normal mountain snowfall in the Central and Northern Rockies.

Areas most severely impacted include the Northern Rockies of Montana and Wyoming. As of April 1, 2005, Missouri River headwaters in Montana and Yellowstone River headwaters in Wyoming contained 50 to 69 % of normal SWE in the poorest areas, and 70 to 89 % of normal SWE in most other areas. Additionally northwest portions of Missouri River basin tributary headwaters in Montana and the Belle Fourche River basin in northeastern Wyoming and west-central South Dakota held at best 50 % of normal SWE. Both the North and South Platte River basins contained between 70 and 89% of normal SWE with some subbasins slightly better or worse.

Drought Indicators
The Palmer Drought Severity Index and the Drought Monitor are two commonly used drought indicator products that convey both short-term and long-term drought conditions and impacts. Both the Palmer Index and Drought Monitor depict Moderate to Severe Drought regions in Montana and Wyoming, which have been suffering from drought since 2000.

Palmer Drought Severity Index
The Palmer Drought Severity Index (PDSI) is a meteorological drought index that monitors the hydrologic water balance including the basic terms such as precipitation, evapotranspiration, soil recharge, runoff, and moisture loss. The purpose of this index is to provide standardized measurements of the moisture balance in a region without taking into account streamflow, lake and reservoir levels, and other hydrologic impacts. PDSI is a multi-month drought index; therefore, it responds well and is more suitable for short-term droughts.

Changes to the PDSI are more immediate in response to heavy precipitation over short periods. The PDSI shown in Figure 7 reflects near normal to very moist spells in Nebraska, South Dakota, and North Dakota. Large portions of both Montana and Wyoming are still being affected by Severe and Extreme Palmer droughts.

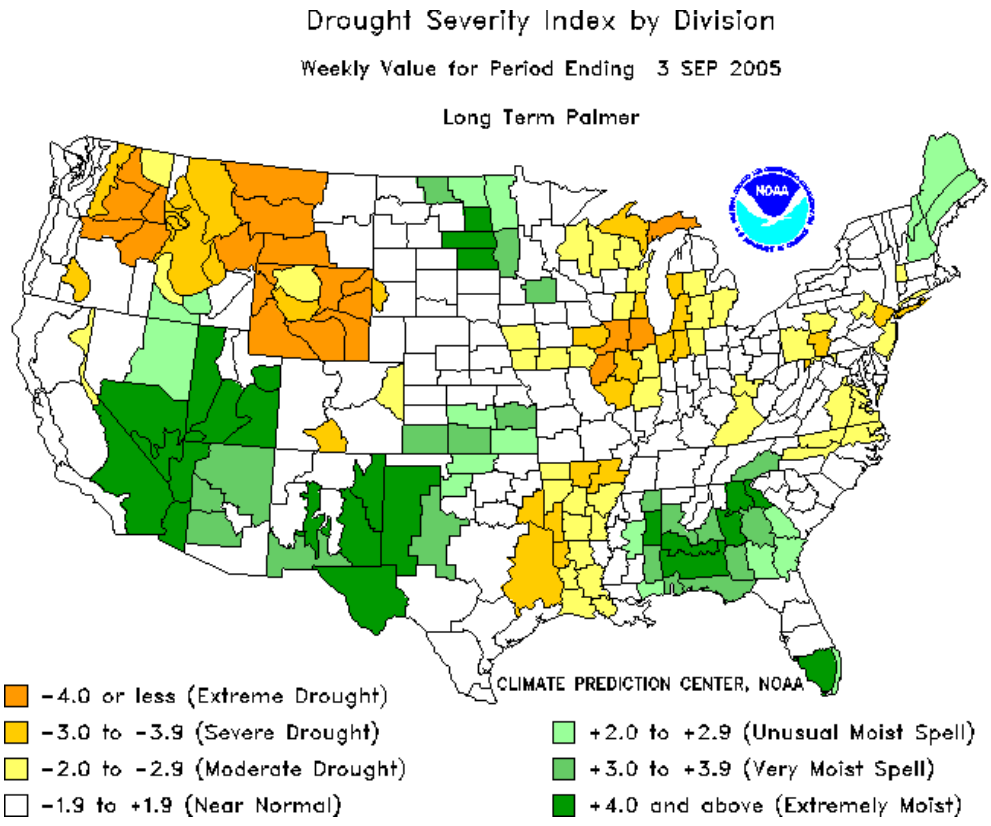


Figure 7 – Long-Term Palmer Drought Indicator Ending 3 SEP 2005
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif

Drought Monitor

The Drought Monitor is a multi-agency comprehensive drought classification scheme updated weekly by the National Drought Mitigation Center. The Drought Monitor combines information from the Palmer Drought Index, the Climate Prediction Center's soil moisture model, USGS weekly streamflow percentiles, the standard precipitation index, the crop moisture index, and during the snow season basin snow water content, basin average precipitation, and the surface water supply index. Since this product considers streamflow conditions and reservoir water supply, and it allows manual adjustment; it is a good depiction of long-term drought impacts to the affected areas. The Drought Monitor uses four levels of drought classification (moderate, severe, extreme, and exceptional), and it notes the type of impact caused by the drought (agricultural and hydrologic).

Omaha District drought has steadily improved throughout the spring and summer . Above-normal rainfall and increased pool levels in Oahe Reservoir, Lake Sakakawea, and Ft. Peck reservoir have helped reduce the drought. Portions of Nebraska, South Dakota, Montana and Wyoming are currently classified as Severe (D2). However, the vast majority of North and South Dakota currently exhibit Abnormally Dry (D0) or normal conditions.

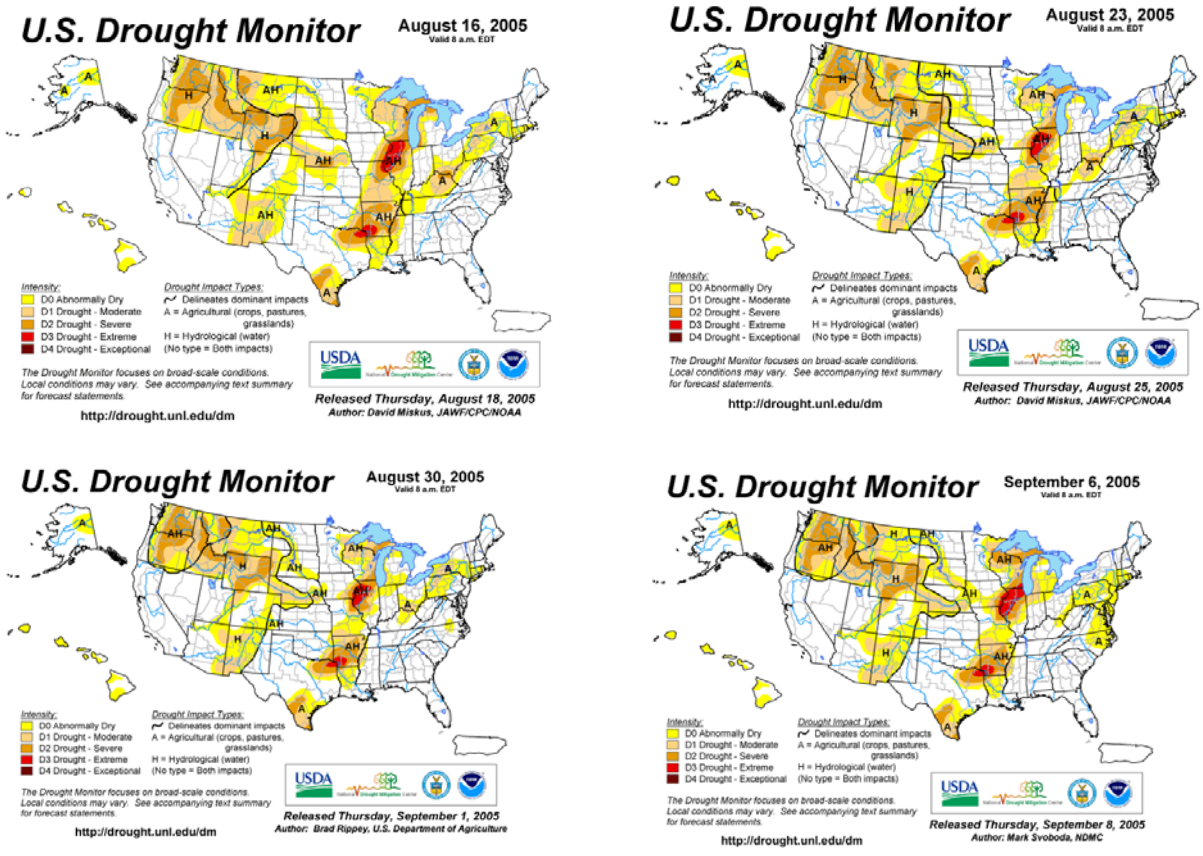


Figure 8 – U.S. Drought Monitor Through September 2005

DROUGHT OUTLOOK

The basin drought outlook uses several expert products that indicate precipitation needs to reduce the Palmer Drought to normal conditions, a one- and three-month climate outlook, and the impacts that future climate predictions could have on the current drought situation. The three-month Drought Outlook (Figure 9) indicates that the majority of the basin is returning to normal moisture conditions with the exception south-central and western Nebraska and western Montana.

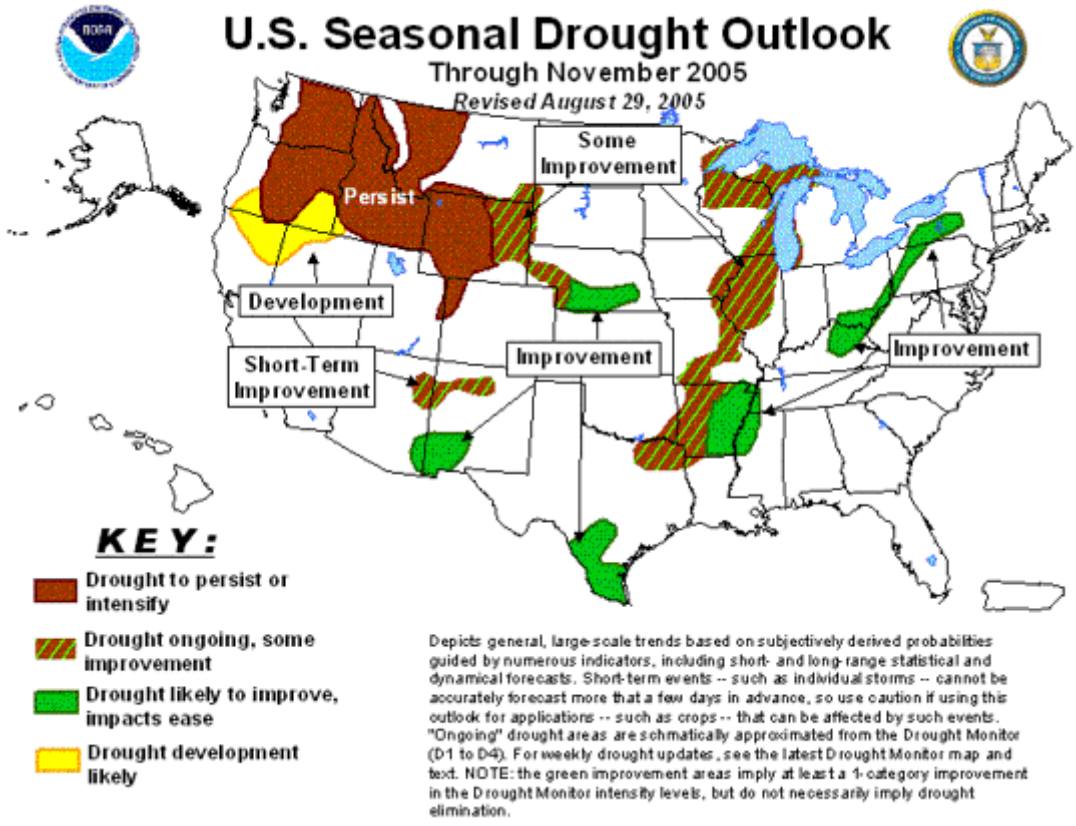


Figure 9 – Three-Month Seasonal Drought Outlook Through November 2005
http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html

Weekly Precipitation Need

Figure 10 is the weekly precipitation needed to reduce the current Palmer Drought Severity Index value to -0.5 or near normal conditions. According to the PDSI (Figure 7) drought currently is affecting portions of Montana, Wyoming, western South Dakota, and northern North Dakota

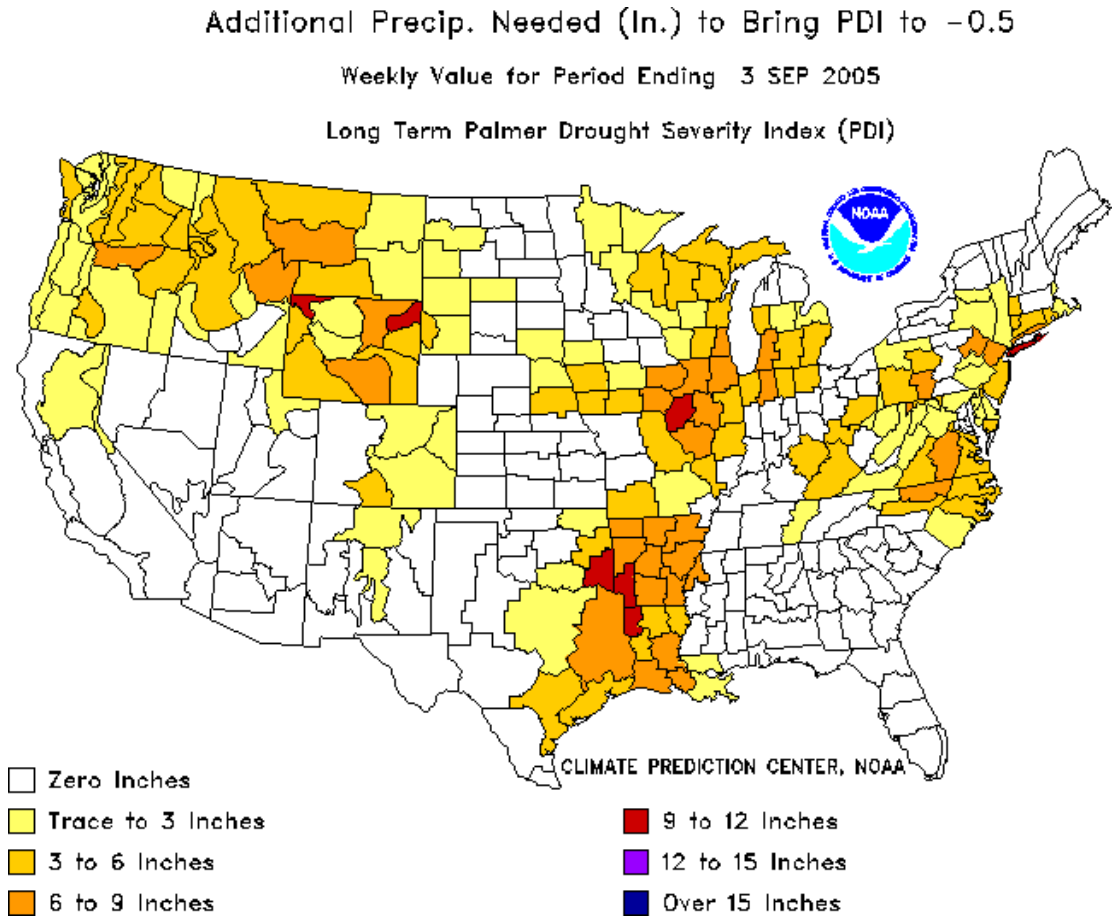


Figure 10 – Weekly Precipitation Need to Bring PDI to -0.5
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/addpcp.gif

In order to reach near normal Palmer Drought conditions, Montana would need 3 to 9 inches of precipitation across the state, the North Platte River basin in Wyoming would require 3 to 12 inches of precipitation and the western portion of South Dakota would require 3 to 6 inches in a week. Water supply deficits in large reservoirs, groundwater reserves, and possibly subsoil moisture reserves would receive limited benefit from the weekly Palmer precipitation needs. Mitigation of a multi-year drought would likely require multiple years of normal and above-normal water inflow conditions.

Temperature and Precipitation Forecast
Monthly and seasonal climate outlooks made by the Climate Prediction Center are based on a blend of current weather trends, climate simulations, and climate indicators such as the Southern Oscillation. The three-month climate forecast (August-Sept-Oct) is predicting equal chances of normal temperatures and equal chances of normal precipitation across the Missouri River Basin.

Three-Month Drought Outlook
A three-month drought outlook is assembled by the Climate Prediction Center every month and is based on 30- and 90-day climate probabilities, existing drought conditions, projected mountain snow melt runoff, and many other factors. The outlook predicts areas of persistent or intensifying drought, areas where short-term improvement is likely, areas where one-category improvement is likely, and areas where drought is likely to develop. The current forecast (Figure 2) calls for drought to persist in central and western Montana and western Wyoming; and some improvement in eastern Wyoming and southeast Montana. The remainder of the District looks favorable that the drought conditions will continue to subside, however, low stream flow trends and reservoir shortages will likely allow drought to persist in the Omaha District through this water year.

Mainstem Reservoir Information

Runoff and water conservation measures helped to sustain the current reservoir elevations on Ft. Peck, Garrison, and Oahe to just slightly below their elevations at this time last year. The water intakes on the reservoirs still appear to be safe this year and access to the reservoirs remains better than anticipated at the beginning of the season.

Recent above-average temperatures coupled with very windy conditions has begun to deplete the soil moisture gained with the June/July runoff. Based on the current U.S. Drought Monitor, Nebraska, South Dakota, North Dakota, and Montana all have areas classified as “Abnormally Dry” with some areas exhibiting conditions of “Drought-Moderate” to “Drought-Severe”. Overall, however, the basin is generally considered to be in better condition than anticipated at the beginning of Spring.

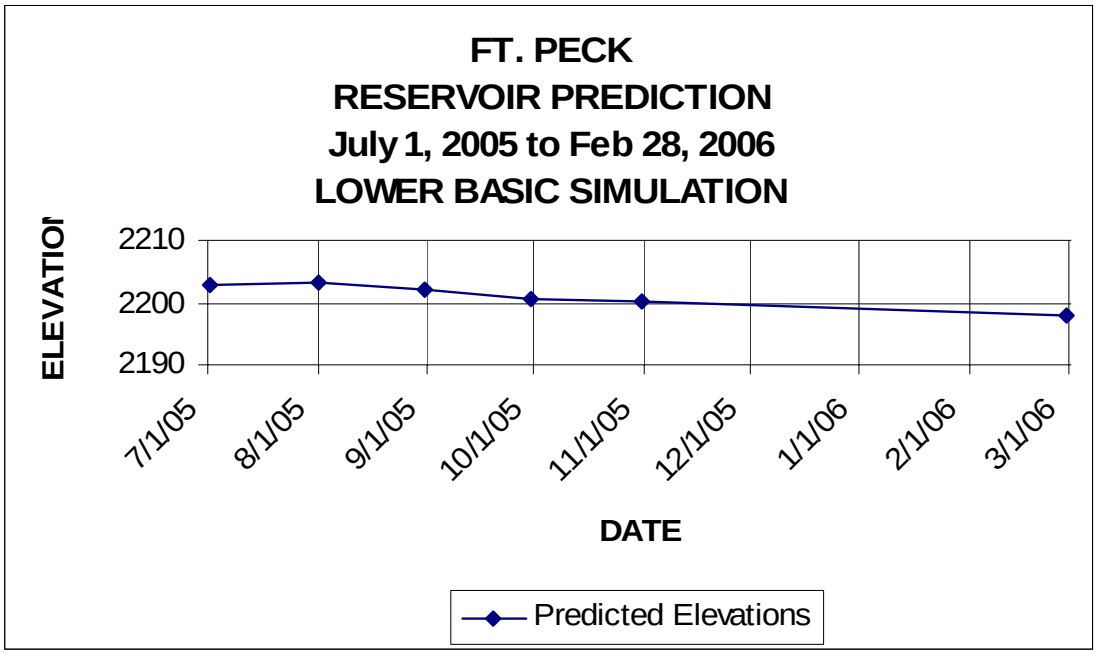
Fort Peck, Montana

Reservoir Elevation Overview

Lake Elevation 7/01/2005 (ft. msl)	Current Lake Elevation 8/31/2005 (ft. msl)	30-Day Projected Elevation* (9/30/2005) (ft. msl)	60-Day Projected Elevation* (10/31/2005) (ft. msl)	180-Day Projected Elevation* (2/28/2006) (ft. msl)
2203.0	2202.2	2200.5	2200.2	2197.8

Comments:

1. Current reservoir elevation is 31.8-feet below the top of conservation pool (elevation 2234.0 ft. msl).
2. *Projections provided are based upon the Lower Basic Simulation prepared by the Reservoir Control Center.
3. Current elevation is 0.2-ft. lower than elevation on 8/1/2004 (2202.4).



Water Intake Overview

Intake	Comments
Hell Creek State Park	No issues. Well completed 22 NOV 2004

Access Overview

1. 1,800 cubic yards of stockpiled for extension of boat ramps in FY 05.
2. Ramp to Rock Creek Marina has been installed to ensure access to the reservoir (UPDATED 5/30/05).
3. 9 temporary ramps in service; 3 ramps unusable. No permanent ramps operational.
4. Remaining concessionaires marginal.

Noxious Weeds Overview

1. As the reservoir elevation dropped, the noxious weeds spread along the shoreline. The project has $40,000 available in FY 05 for weed control.
2. Main concern is Saltcedar, which thrives along the shoreline as the reservoir elevation declines.

Cultural Resources Overview

1. No issues to date.

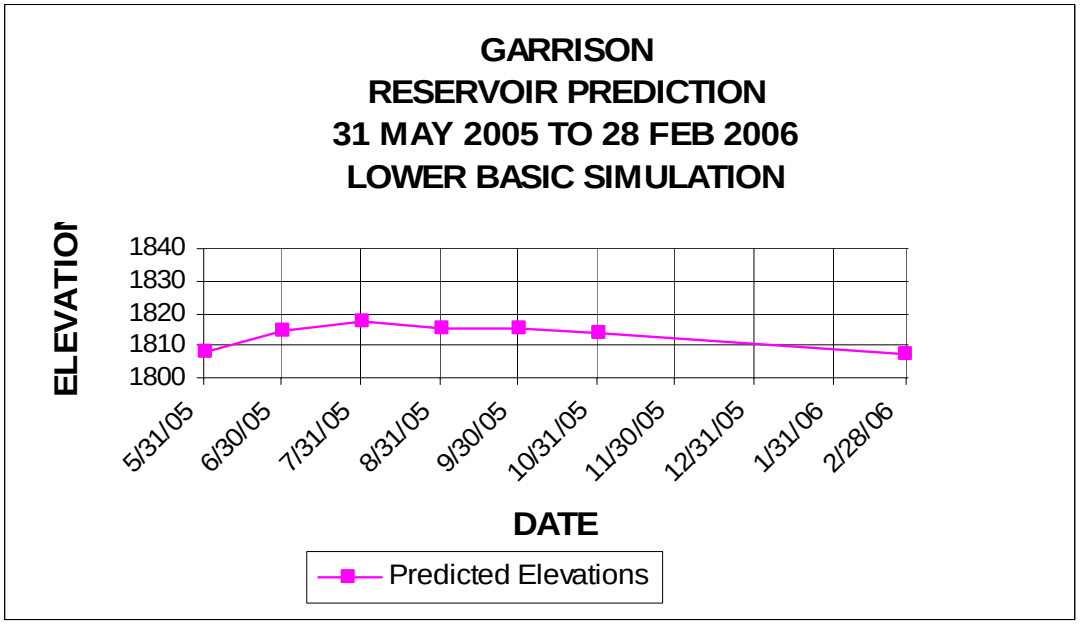
Garrison, North Dakota

Reservoir Elevation Overview

Lake Elevation 5/31/2005 (ft. msl)	Current Lake Elevation (8/31/2005) (ft. msl)	30-Day Projected Elevation* (9/30/2005) (ft. msl)	60-Day Projected Elevation* (10/31/2005) (ft. msl)	180-Day Projected Elevation* (2/28/2006) (ft. msl)
1808.08	1815.6	1815.2	1814.1	1807.6

Comments:

1. Current reservoir elevation is 21.9-feet below the top of conservation pool (elevation 1837.5 ft. msl).
2. *Projections provided are based upon the Lower Basic Simulation prepared by the Reservoir Control Center.
3. Current reservoir elevation is 0.9 ft. lower than elevation on 8/1/04.



Water Intake Overview

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Whiteshield	Operational	1817.17	1787	1805	1787	1792	720	N	TAT/BOR

Comments:

1. The intake screen has been raised approximately 4-feet.
2. Rock from the adjacent shoreline was used to stabilize the shoreline near the intake.
3. An additional 375 cubic yards of rock was hauled in by the operator to stabilize the shoreline from the water's edge to the high water line.
4. Erosion due to low reservoir levels have caused increased sediment in the intake piping. This has increased maintenance cost to remove the sediment and increased the cost of treating the water.

Future Plans:

1. Ft. Berthold Rural Water System is seeking funding through USDA Emergency Community Water Assistance Grant Program for:
    a. Exploration and mapping of the intake area.
    b. Extending approximately 400 to 500 feet from the current intake screen with 8" to 12" casing pipe. The new intake screen elevation would be approximately 1780 (or lower).
    c. Estimated cost: $1.16 million.
    d. Estimated time of completion: Late 2005/Early 2006.

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Twin Buttes	Operational	1817.17	1784.4	1805	1788	1790	425	N	TAT/BOR

Comments:

1. The current intake line consists of 2-8" lines. One line tees into the other.
2. Two submersible pumps are located in the lines. One pump is inoperable and is being repaired.
3. Erosion due to low reservoir levels have caused increased sediment in the intake piping. This has increased maintenance cost to remove the sediment and increased the cost of treating the water.

Future Plans:

1. Ft. Berthold Rural Water System is seeking funding through USDA Emergency Community Water Assistance Grant Program to extend and lower the existing intake line and screen. Their plans are to:
    a. Install a new casing approximately 450-feet into the lake.
    b. Install a new 10" to 12" supply line, approximately 300- to 400-feet beyond the current location to approximate elevation 1780.0.
    c. Provide bank stabilization and erosion control over the new line.
2. The Corps is currently staffing a request from FBRWS to amend the existing water line right-of-way.

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Mandaree	Operational	1817.17	1795.4	1805	1798	1800	780	N	TAT/BOR

Comments:

1. Bartlett and West has awarded a contract to install a new intake at Mandaree.
2. The new intake will lower the screen to elevation 1786.
3. The project will include directional drilling.
4. Grant monies for the project were secured from USDA Rural Utilities Service and Indian Health Services.
5. Erosion due to low reservoir levels have caused increased sediment in the intake piping. This has increased maintenance cost to remove the sediment and increased the cost of treating the water.

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Four Bears	Operational	1817.17	1789.9	1801.5	1792	1794	900	N	TAT/BOR

Comments:

1. The intake has been previously been extended. The screen has been checked by divers and it was confirmed that approximately 20-feet of water is over the intake.
2. Erosion due to low reservoir levels have caused increased sediment in the intake piping. This has increased maintenance cost to remove the sediment and increased the cost of treating the water.

Future Plans:

1. Ft. Berthold Rural Water System is seeking funding through USDA Emergency Community Water Assistance Grant Program for the following:
    a. Exploration and mapping of the intake area.
    b. Replacement/extension approximately 200- to 250-feet from the current intake screen with 8" to 12" casing pipe. The new intake screen would be at approximate elevation 1780 (or lower).
    c. Estimated cost: $942,500
    d. Estimated time of completion: Late 2005/early 2006.

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Parshall	Inoperable*	1817.17	1795.3	1808	1797.5	1801.5	1000	N	Parshall

*Currently using the City well. Turbidity is currently causing problems/issues with the intake.

Comments:

1. The City had a telescoping riser attached to the intake by 30 July 2005. The riser extended the intake to within 3- to 4-feet of the water's surface.
2. The City began using the intake for municipal water supply 11 July 2005.

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Pick City	Operational	1814.8	1795	1800	1796	1800			Pick City

Comments:

1. At least 5-feet of water is necessary to operate this intake. If continued usage is planned, the intake will have to be lowered.

Future Plans:

1. The City has voted to join the rural water system. The intake will be abandoned in the near future.

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Garrison	Operational	1817.17	1787.2	1810	1795	1793	1830	N	Garrison

Comments:

1. The City plans to extend the existing intake during the Fall of 2005.
2. The existing line has been exposed as water levels have dropped. A portion of the line was covered with soil and the pumps cycled last December (2004) to prevent freezing. Continuation of this practice is not a feasible alternative.
3. Directional boring will be used to extend the water line.

Access Overview

1. Project personnel estimate that 14 to 19 access sites will have usable boat ramps throughout the summer.
2. A $625,000 Congressional add for boat ramps is being utilized to extend low water ramps.
3. Project personnel would like to establish a plan for continuing boat ramp extensions, including expected costs for FY 06 budget considerations.
4. Project personnel are working with partners to establish shoreline access for day-use activities.
5. Lake Sakakawea State Park/Kit's Marina has been modified for low water operation by the vendor. The marina will be usable to approximate elevation 1802. Project personnel have established a low water ramp in the state park. Unfortunately, if it becomes necessary to use the low water ramp, the marina will be inoperable.
6. Ft. Stevenson State Park continues to operate their low water ramp. A meeting was held between the State of North Dakota and the Corps of Engineers 7 July 2005 to discuss the current design of the new marina. The State requested that the design be modified to a target elevation of 1790 in lieu of the Corps' proposed elevation of 1780. It was explained by the Corps that a more "usable" project over the long term life of the project will be achieved with the lower design elevation. Several other minor design changes were requested at the meeting (i.e. retaining walls instead of riprap, etc.). Final design scheduled to be complete by October 2005.
7. Remaining 6 marinas on the reservoir will not be operable in 2005.
8. A $900,000 Congressional add for boat ramp extensions was proposed by Senator Dorgan for FY 06. The add is for non-Corps owned facilities, but will be administered through the project office.

Updated 7/27/2005

Reservoir Elevation 8/1/05 – 1817.17

Location	Type	Top Elevation	Bottom Elevation	Comments	Managing Agency	Contact Person	Phone
Beaver Bay (low-water-COE)	poured concrete	1829	1808	**Usable**	Corps of Engineers	Linda Phelps	654-7411
Beulah Bay	poured concrete	1852.4	1799	**Usable**	Beulah Park Board	Greg Logan	870-5852
Charging Eagle Bay (2nd low water)	poured concrete, planks	1816	1806	**Unusable**	Three Affiliated Tribes	Jim Mossett	880-1203
Charging Eagle Bay (1st low water)	poured concrete	1835	1810.6	**Usable**	Three Affiliated Tribes	Jim Mossett	880-1203
Dakota Waters Resort (low-water)	poured concrete, planks	1853.1	1797	**Usable**	Beulah Park Board	Kelvin Heinsen	873-5800
Deepwater Creek (2nd low water)	poured concrete, planks	1818	1802	**Usable**	Corps of Engineers	Linda Phelps	654-7411
Deepwater Creek (1st low water)	poured concrete	1838	1809	**Usable**	Corps of Engineers	Linda Phelps	654-7411
Douglas Creek (low water)	poured concrete, planks	1828	1801	**Usable**	Corps of Engineers	Linda Phelps	654-7411
Fort Stevenson State Park (low water)	poured concrete	1851	1797	**Usable**	ND Parks & Rec	Dick Messerly	337-5576
Four Bears Park (south low water)	concrete planks	1824	1803	**Usable**	Three Affiliated Tribes	Alan Chase	627-4018
Garrison Creek Cabin Site	poured concrete	1849.2	1802	**Usable**	Garrison Cabin Assc.		
Government Bay (low water)	slide-in metal sections	1812	1803	**Unusable**	Corps of Engineers	Linda Phelps	654-7411
Government Bay (main ramp)	poured concrete	1857	1810	**Usable**	Corps of Engineers	Linda Phelps	654-7411
Hazen Bay (2nd low water)	poured concrete	1829	1810	**Usable**	Hazen Park Board	Hazen City Hall	748-2550
Indian Hills (3rd low water)	slide-in metal sections	1810	1801	**Unusable**	Parks & Rec/Tribes	Kelly Sorge	743-4122
Indian Hills (2nd low water)	concrete planks	1818.3	1807	**Usable**	Parks & Rec/Tribes	Kelly Sorge	743-4122
Indian Hills (1st low water)	concrete planks	1826.4	1811.8	**Usable**	Parks & Rec/Tribes	Kelly Sorge	743-4122
McKenzie Bay (east ramp)	poured concrete	1855	1796	**Usable**	McKenzie Marine Club	Rhonda Logan	579-3366

Location	Type	Top Elevation	Bottom Elevation	Comments	Managing Agency	Contact Person	Phone
Parshall Bay (3rd low-water)	slide-in metal sections	1818.4	1808.5	**Usable**	Mountrail County Park Board		628-2145
Pouch Point (3rd low-water)	slide-in metal sections	1820	1809	**Usable**	Three Affiliated Tribes	Royce Wolf	627-3553
Pouch Point (2nd low-water)	poured concrete	1829	1813	**Usable**	Three Affiliated Tribes	Royce Wolf	627-3553
Reunion Bay (2nd low water)	concrete planks	1825.8	1808	**Usable**	Corps of Engineers	Linda Phelps	654-7411
Sakakawea State Park (main)	poured concrete	1850	1800	**Usable**	ND Parks & Rec	John Tunge	487-3315
Sanish Bay (Aftem) (low water)	poured concrete	1831.1	1807.4	**Usable**	Aftem Lake Development	Gerald Aftem	852-2779
Skunk Creek Recreation Area (main)	poured concrete	1850	1806.5	**Usable**	Three Affiliated Tribes	Ken Danks	290-2841
Sportsmen's Centennial Park	poured concrete	1831.2	1808.5	**Usable**	McLean County	Marlin Hvinden	462-8541
Van Hook (Gull Island south low-water)	metal bridge deck sections	1823	1805	**Usable**	Mountrail County Park Board	Clarence Weltz	627-3377
Van Hook (Gull Island north low-water)	metal bridge deck sections	1823.1	1805	**Usable**	Mountrail County Park Board	Clarence Weltz	627-3377
Van Hook (lst low water)	poured concrete	1822	1807	**Usable**	Mountrail County Park Board	Clarence Weltz	627-3377
White Earth Bay (low-water)	concrete plank & PSP	1833	1801	**Usable**	Mountrail County Park Board	Greg Gunderson	755-3277
Wolf Creek Recreation Area (2nd low water)	concrete planks & metal sec	1830	1802.5	**Usable**	Corps of Engineers	Linda Phelps	654-7411

Noxious Weeds Overview

1. Project personnel continue to battle noxious weeds and invasive species as the reservoir declines. The major difficulty is trying to control/eradicate saltcedar.
2. $560,000 allocated for noxious weed control in FY 05.

Cultural Resources Overview

1. Project personnel continue to monitor the shoreline for the protection of cultural resources. As the reservoir elevation falls, more opportunities are uncovered for looters, which collect artifacts and sell them on the open market.

Other Areas of Interest/Concern

1. Garrison National Fish Hatchery – Three issues exist and are of concern to the State of North Dakota and the U.S. Fish and Wildlife Service.
    a. Addition of a fifth boiler and necessary power for operation.
    b. Ability to fill 40 rearing ponds.
    c. Adequacy of the existing 20-inch water supply line from the penstocks.
2. Fact sheets for the hatchery issues exist. OP-TM is preparing a response to the U.S. Fish and Wildlife Service.
    a. Garrison Cold Water Fishery – The modification to the trashracks of intakes 2 and 3, was completed 22 July 2005. The modified units are operating as predicted. There has been a temperature increase in the discharge water downstream from the dam, however, the impacts of this increase are still being investigated. Preliminary data indicate that the modification conserves approximately 15,000 ac-ft/day of cold water habitat.

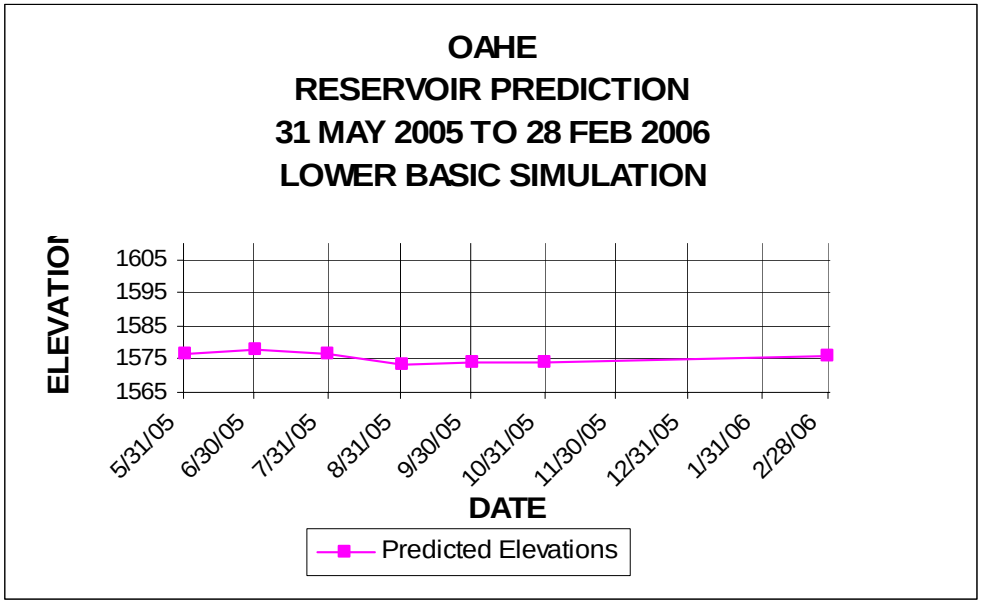
Oahe, South Dakota

Reservoir Elevation Overview

Lake Elevation 5/31/2005 (ft. msl)	Current Lake Elevation (8/31/2005) (ft. msl)	30-Day Projected Elevation* (9/30/2005) (ft. msl)	60-Day Projected Elevation* (10/31/2005) (ft. msl)	180-Day Projected Elevation* (2/28/2006) (ft. msl)
1576.5	1573.3	1574.2	1574.0	1576.2

Comments:

1. Current reservoir elevation is 34.2-feet below the top of conservation pool (elevation 1607.5 ft. msl).
2. *Projections provided are based upon the Lower Basic Simulation prepared by the Reservoir Control Center.
3. Current reservoir elevation is 1.0-ft. below the elevation 8/1/2004.
4. The Oahe project office has received a request from the Standing Rock Sioux Tribe for the Corps of Engineers to participate in the construction of lake access at the Walker Bottom Recreation Area Marina. The marina is currently dry and the area is in riverine conditions. A preliminary design for constructing a channel from the river to the boat ramp has been completed by an engineering consultant. Project personnel have committed to reviewing the design for the SRST and providing comments/recommendations. No commitment has been made or discussed for performing construction or cost sharing in the construction costs.



Water Intake Overview

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Ft. Yates	Operational	1573.3	1571.2	1573	1572.2	1575.2	3,400	Y	SRST/BOR

Comments:

1. A backup well has been drilled and tested.
2. A Contingency Action Plan has been completed by the Corps.
3. A Table Top Exercise for the Contingency Action Plan, coordinated by the State of North Dakota, was held on 31 August 2005. The exercise went well, positive comments were received by the participants. Minor updates to the plan will be incorporated, as discussed during the exercise.

Future Plans:

1. Connection of new well to existing water distribution system. The intake at Fort Yates remains in a river condition and may continue to have sedimentation problems as long as Oahe remains below elevation 1580. Sediment levels in the sump are measured weekly and the river channel is monitored. A backup well was drilled, and pump tested at 800gpm. The backup pump will be plumbed into the existing distribution lines to supply water if the river intake would fail. Contingency plans are in place and have been exercised.

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Wakpala	Operational	1573.3	1561	1563	1561	1564	>500	N	SRST/BOR

Comments:

1. With the Corps of Engineers July reservoir projections for Oahe, the Wakpala intake will remain operational through the winter of 2005 with all reservoir projections over 1570. The existing intake screen is being replaced with a lower profile screen to increase the operational range of the intake. Contingency plans are being drafted to respond to an intake failure. Initial response to an intake failure at Wakpala would be hauling water from the city of Mobridge to the treatment plant to be distributed using the existing transmission lines.

Intake	Status	Current Reservoir Elev.	Top of Screen Elev.	Operational Concern Elev.	Shutdown Elev.		Population Supported	Contingency Plan? (Y/N)	Resp. Agency
					Summer	Winter			
Mni Wasté	Operational	1573.3	1555.4	1580	1561.9	1560.4	14,000	Y(DRAFT)	CRST

Comments:

1. "Option 2", Phase 1 – Design, moving forward.
2. Trigger Points for the implementation of construction are being closely monitored.
3. Work is to begin soon on construction of hard surface road, and routing of power to the selected site.
    a. Current schedule uses August, 2006 as having the new system "on-line" and works backwards to determine design and construction schedule.
4. Approval of funding to proceed with construction received from HQUSACE 8 AUG 05.
5. CRST is continuing effort to acquire grant money to cover funding gap between Corps' assistance and project budget.
6. A cooperative agreement between the Corps and the CRST has been sent to the tribe for review.

Access Overview

1. The State of South Dakota is responsible for maintaining recreational areas and access to the reservoir.
2. The State has committed to keeping at least four boat ramps accessible through 2005.

Noxious Weeds Overview

1. Project personnel continue to battle the noxious weeds as the reservoir declines.

Cultural Resources Overview

1. Project personnel continue to monitor the shoreline for the protection of cultural resources. As the reservoir elevation falls, more opportunities are uncovered for looters, which collect artifacts and sell them on the open market.

Mainstem Reservoir Information Monthly Comparison

4 JULY 2005	Project Information		Reservoir Elevation			Reservoir Storage		
Project	Multi-Purpose Pool Elev.	Flood Control Pool Elev.	Current Elevation (7/4/05)	Previous Elevation (6/27/05)	Change	Current Storage (MAC-FT) (7/4/05)	Previous Storage (MAC-FT) (6/27/05)	Change (MAC-FT)
Ft. Peck, MT	2160 - 2246	2246 – 2250	2203.2	2202.55	0.65	9.487	9.377	0.110
Garrison, ND	1775 – 1850	1850 – 1854	1815.9	1813.48	2.42	12.275	11.675	0.600
Oahe, SD	1540 - 1617	1617 – 1620	1577.9	1577.47	0.43	11.263	11.164	0.099
Big Bend, SD	1415 – 1422	1422 – 1423	1420.5	1420.54	-0.04	1.650	1.655	-0.005
Ft. Randall, SD	1320 – 1365	1365 – 1375	1355.8	1356.97	-1.17	3.604	3.704	-0.100
Gavins Point, SD	1204.5 - 1208	1208 - 1210	1205.7	1206.79	-1.09	0.351	0.378	-0.027

11 JULY 2005	Project Information		Reservoir Elevation			Reservoir Storage		
Project	Multi-Purpose Pool Elev.	Flood Control Pool Elev.	Current Elevation (7/11/05)	Previous Elevation (7/4/05)	Change	Current Storage (MAC-FT) (7/11/05)	Previous Storage (MAC-FT) (7/4/05)	Change (MAC-FT)
Ft. Peck, MT	2160 - 2246	2246 – 2250	2203.59	2203.2	0.39	9.533	9.487	0.046
Garrison, ND	1775 – 1850	1850 – 1854	1817.04	1815.9	1.14	12.520	12.275	0.245
Oahe, SD	1540 - 1617	1617 – 1620	1577.76	1577.9	-0.14	11.245	11.263	-0.018
Big Bend, SD	1415 – 1422	1422 – 1423	1420.7	1420.5	0.2	1.663	1.650	0.013
Ft. Randall, SD	1320 – 1365	1365 – 1375	1354.51	1355.8	-1.29	3.498	3.604	-0.106
Gavins Point, SD	1204.5 - 1208	1208 - 1210	1205.66	1205.7	-0.04	0.349	0.351	-0.002

18 JULY 2005	Project Information		Reservoir Elevation			Reservoir Storage		
Project	Multi-Purpose Pool Elev.	Flood Control Pool Elev.	Current Elevation (7/18/05)	Previous Elevation (7/11/05)	Change	Current Storage (MAC-FT) (7/18/05)	Previous Storage (MAC-FT) (7/11/05)	Change (MAC-FT)
Ft. Peck, MT	2160 - 2246	2246 – 2250	2203.62	2203.59	0.03	9.543	9.533	0.010
Garrison, ND	1775 – 1850	1850 – 1854	1817.66	1817.04	0.62	12.685	12.520	0.165
Oahe, SD	1540 - 1617	1617 – 1620	1577.38	1577.76	-0.38	11.179	11.245	-0.066
Big Bend, SD	1415 – 1422	1422 – 1423	1420.56	1420.7	-0.14	1.653	1.663	-0.010
Ft. Randall, SD	1320 – 1365	1365 – 1375	1354.72	1354.51	0.21	3.505	3.498	0.007
Gavins Point, SD	1204.5 - 1208	1208 - 1210	1206.08	1205.66	0.42	0.359	0.349	0.010

25 JULY 2005	Project Information		Reservoir Elevation			Reservoir Storage		
Project	Multi-Purpose Pool Elev.	Flood Control Pool Elev.	Current Elevation (7/25/05)	Previous Elevation (7/18/05)	Change	Current Storage (MAC-FT) (7/25/05)	Previous Storage (MAC-FT) (7/18/05)	Change (MAC-FT)
Ft. Peck, MT	2160 - 2246	2246 – 2250	2203.38	2203.62	-0.24	9.516	9.543	-0.027
Garrison, ND	1775 – 1850	1850 – 1854	1817.43	1817.66	-0.23	12.640	12.685	-0.045
Oahe, SD	1540 - 1617	1617 – 1620	1576.51	1577.38	-0.87	11.015	11.179	-0.164
Big Bend, SD	1415 – 1422	1422 – 1423	1420.94	1420.56	0.38	1.676	1.653	0.023
Ft. Randall, SD	1320 – 1365	1365 – 1375	1354.66	1354.72	-0.06	3.504	3.505	-0.001
Gavins Point, SD	1204.5 - 1208	1208 - 1210	1206.53	1206.08	0.45	0.371	0.359	0.012

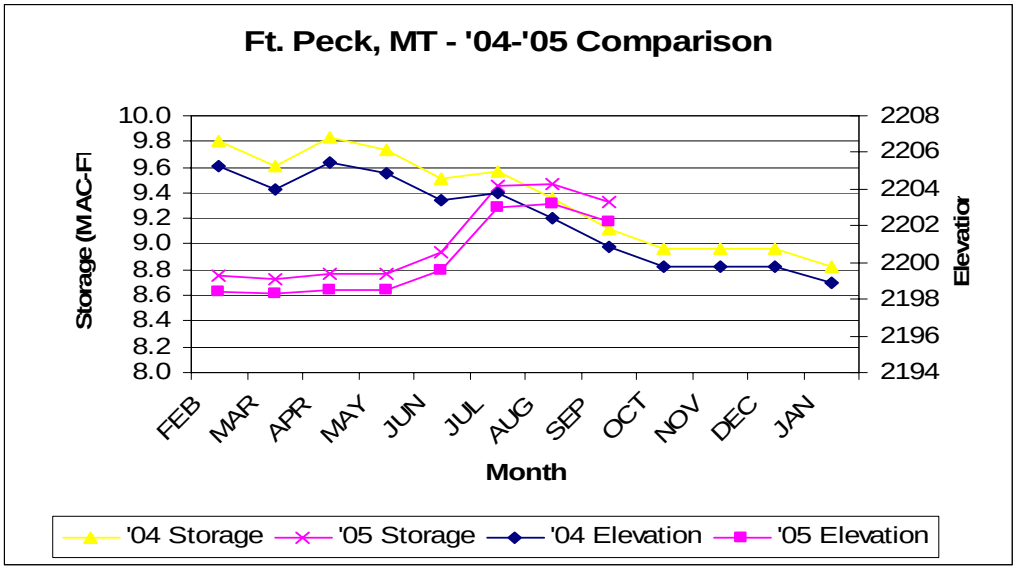
1 AUGUST 2005	Project Information		Reservoir Elevation			Reservoir Storage		
Project	Multi-Purpose Pool Elev.	Flood Control Pool Elev.	Current Elevation (8/1/05)	Previous Elevation (7/25/05)	Change	Current Storage (MAC-FT) (8/1/05)	Previous Storage (MAC-FT) (7/25/05)	Change (MAC-FT)
Ft. Peck, MT	2160 - 2246	2246 – 2250	2203.2	2203.38	-0.18	9.472	9.516	-0.044
Garrison, ND	1775 – 1850	1850 – 1854	1817.17	1817.43	-0.26	12.591	12.640	-0.049
Oahe, SD	1540 - 1617	1617 – 1620	1576.38	1576.51	-0.13	10.958	11.015	-0.057
Big Bend, SD	1415 – 1422	1422 – 1423	1421.14	1420.94	0.20	1.687	1.676	0.011
Ft. Randall, SD	1320 – 1365	1365 – 1375	1353.82	1354.66	-0.84	3.436	3.504	-0.068
Gavins Point, SD	1204.5 - 1208	1208 - 1210	1206.71	1206.53	0.18	0.376	0.371	0.005

1 SEPT 2005	Project Information		Reservoir Elevation			Reservoir Storage		
Project	Multi-Purpose Pool Elev.	Flood Control Pool Elev.	Current Elevation (8/31/05)	Previous Elevation (8/1/05)	Change	Current Storage (MAC-FT) (8/31/05)	Previous Storage (MAC-FT) (8/1/05)	Change (MAC-FT)
Ft. Peck, MT	2160 - 2246	2246 – 2250	2202.2	2203.2	-1.0	9.325	9.472	-0.147
Garrison, ND	1775 – 1850	1850 – 1854	1815.6	1817.17	-1.57	12.216	12.591	-0.375
Oahe, SD	1540 - 1617	1617 – 1620	1573.3	1576.38	-3.08	10.363	10.958	-0.595
Big Bend, SD	1415 – 1422	1422 – 1423	1420.4	1421.14	-0.74	1.647	1.687	-0.040
Ft. Randall, SD	1320 – 1365	1365 – 1375	1353.4	1353.82	-0.42	3.400	3.436	-0.036
Gavins Point, SD	1204.5 - 1208	1208 - 1210	1207.3	1206.71	+0.59	0.393	0.376	+0.017

Mainstem Reservoir Storage Comparison – Water Year 2004 vs. Water Year 2005

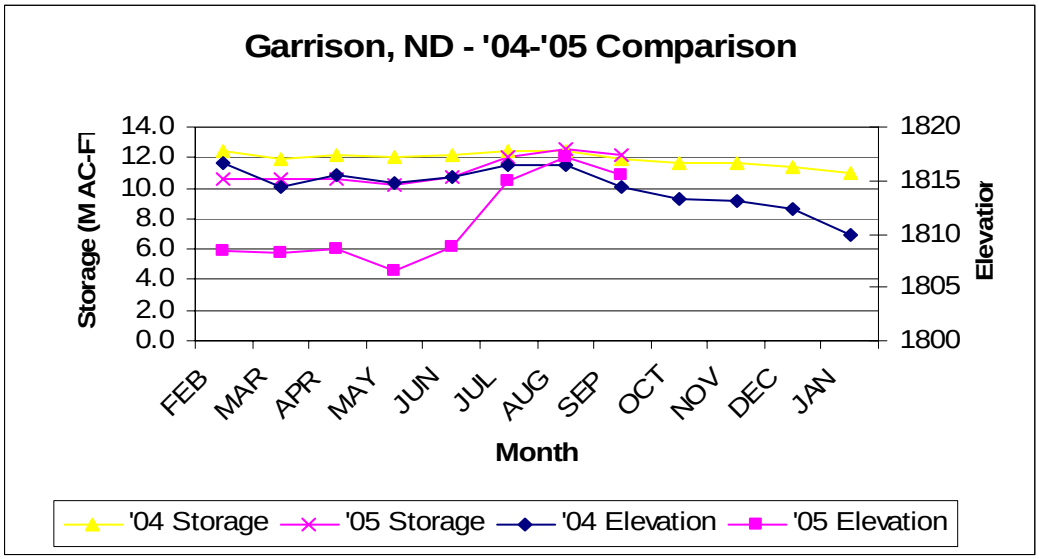
Ft. Peck, MT

Water Year 2004 (FEB 2004 - JAN 2005)			Water Year 2005 (FEB 2005 - JAN 2006)		
Date	Elevation	Storage (MAC-Ft.)	Date	Elevation	Storage (MAC-Ft.)
FEB	2205.3	9.806	2/1/05	2198.4	8.749
MAR	2204	9.603	3/1/05	2198.3	8.732
APR	2205.5	9.837	4/1/05	2198.52	8.773
MAY	2204.9	9.740	5/1/05	2198.53	8.773
JUN	2203.4	9.507	6/1/05	2199.61	8.935
JUL	2203.8	9.565	7/1/05	2203	9.448
AUG	2202.4	9.357	8/1/05	2203.2	9.472
SEP	2200.9	9.121	9/1/05	2202.2	9.325
OCT	2199.8	8.969			
NOV	2199.8	8.963			
DEC	2199.8	8.961			
JAN	2198.9	8.829			



Garrison, ND

Water Year 2004 (FEB 2004 - JAN 2005)			2005 (FEB 2005 - JAN 2006)		
Date	Elevation	Storage (MAC-Ft.)	Date	Elevation	Storage (MAC-Ft.)
FEB	1816.7	12.446	2/1/05	1808.4	10.574
MAR	1814.3	11.891	3/1/05	1808.2	10.537
APR	1815.6	12.110	4/1/05	1808.65	10.632
MAY	1814.7	11.989	5/1/05	1806.47	10.189
JUN	1815.3	12.121	6/1/05	1808.8	10.665
JUL	1816.5	12.426	7/1/05	1814.9	12.026
AUG	1816.5	12.401	8/1/05	1817.17	12.591
SEP	1814.3	11.914	9/1/05	1815.6	12.216
OCT	1813.3	11.645			
NOV	1813.1	11.589			
DEC	1812.3	11.422			
JAN	1810	10.936			



Oahe, SD

Water Year 2004 (FEB 2004 - JAN 2005)			2005 (FEB 2005 - JAN 2006)		
Date	Elevation	Storage (MAC-Ft.)	Date	Elevation	Storage (MAC-Ft.)
FEB	1577.6	11.204	2/1/05	1575.2	10.715
MAR	1579.2	11.504	3/1/05	1576.2	10.924
APR	1582.1	12.110	4/1/05	1574.29	10.568
MAY	1581.6	12.056	5/1/05	1574.82	10.608
JUN	1578.4	11.338	6/1/05	1576.47	10.980
JUL	1576.8	11.045	7/1/05	1577.6	11.214
AUG	1574.3	10.540	8/1/05	1576.38	10.958
SEP	1572.1	10.112	9/1/05	1573.3	10.363
OCT	1573.2	10.316			
NOV	1574.8	10.608			
DEC	1576	10.866			
JAN	1575.8	10.824