

# Drought Operations – St Paul District

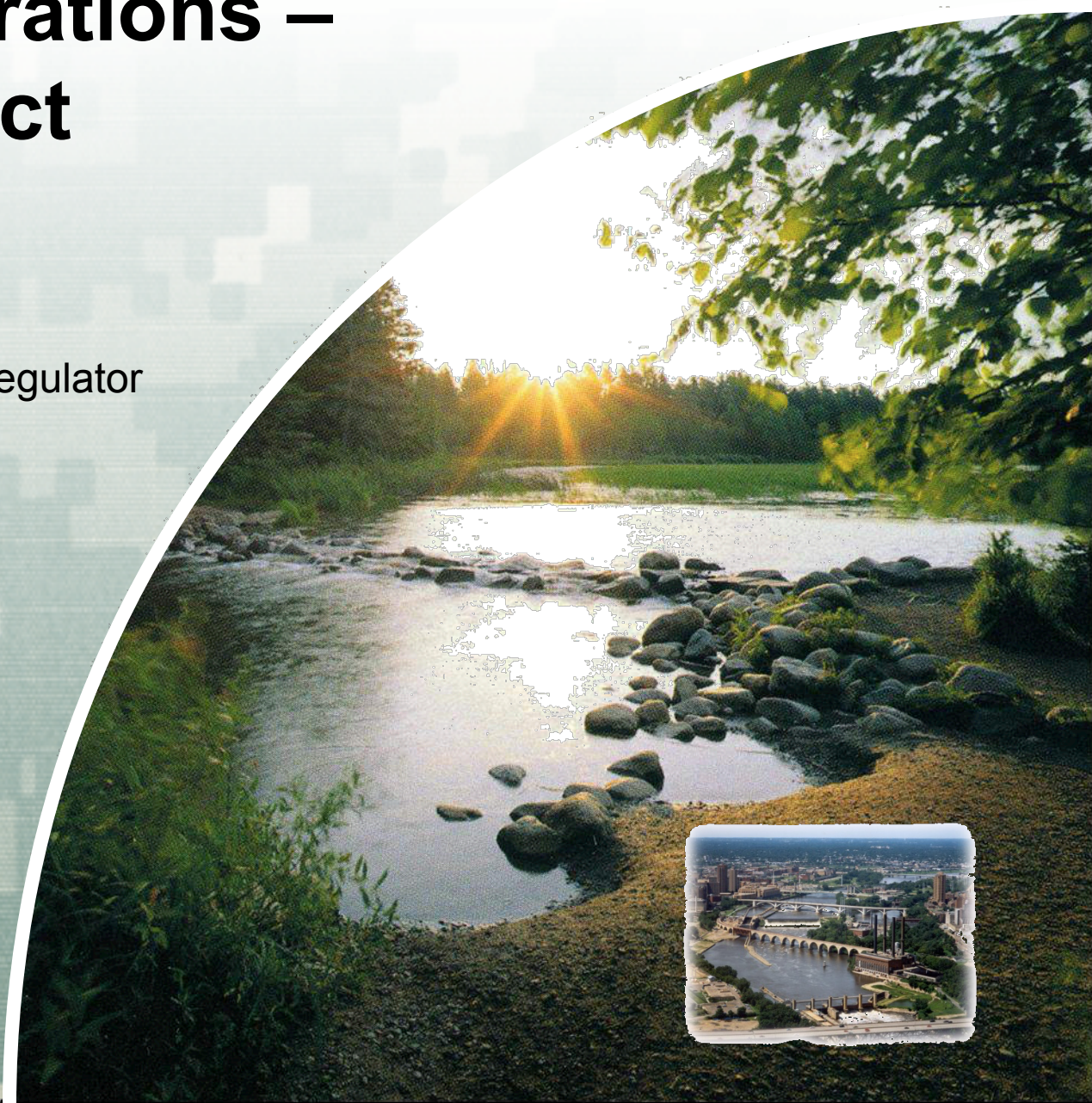
**Brian K. Johnson, PE**

Civil Engineer / Miss HW Regulator

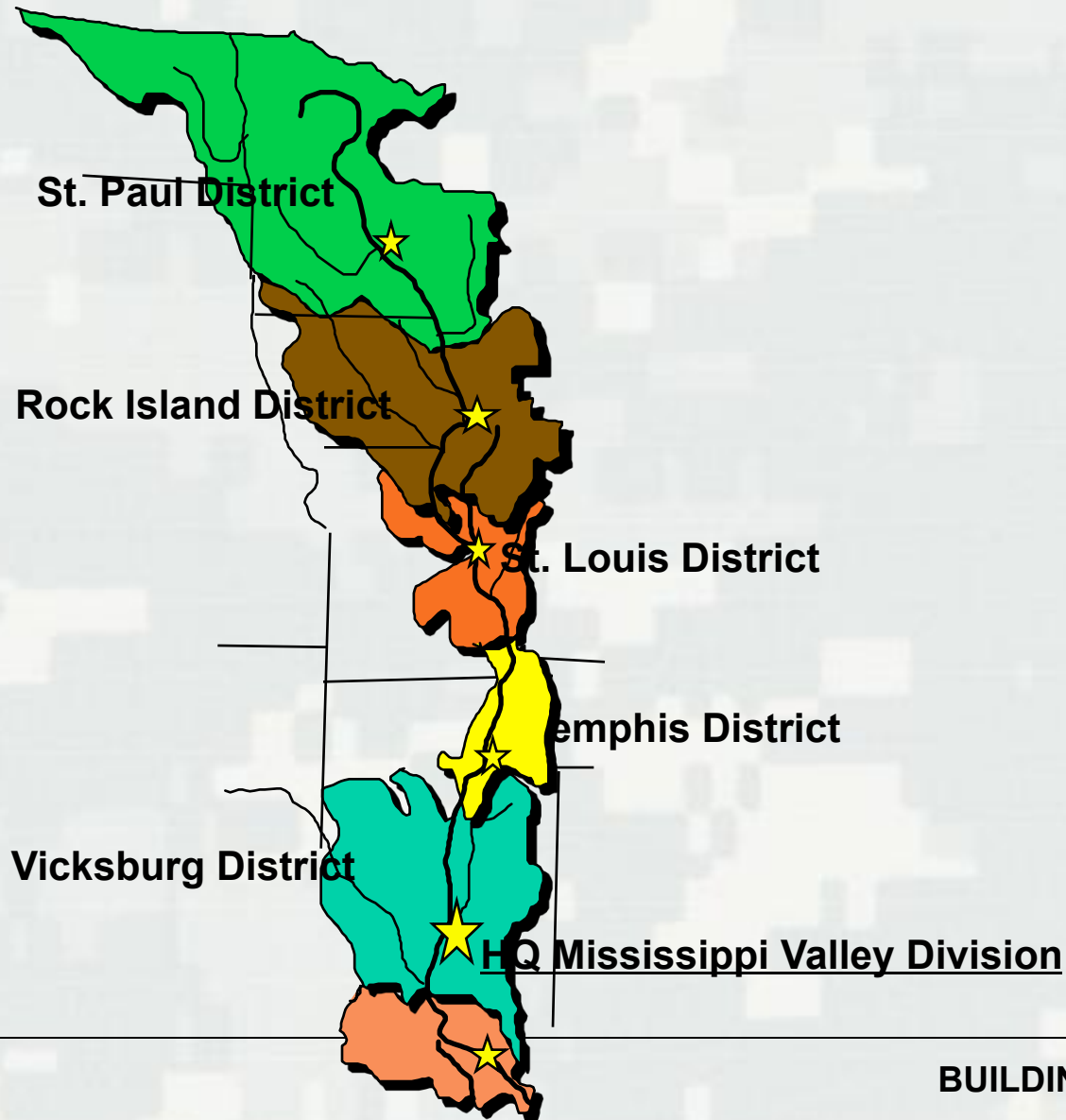
7-8 November 2016



US Army Corps of Engineers  
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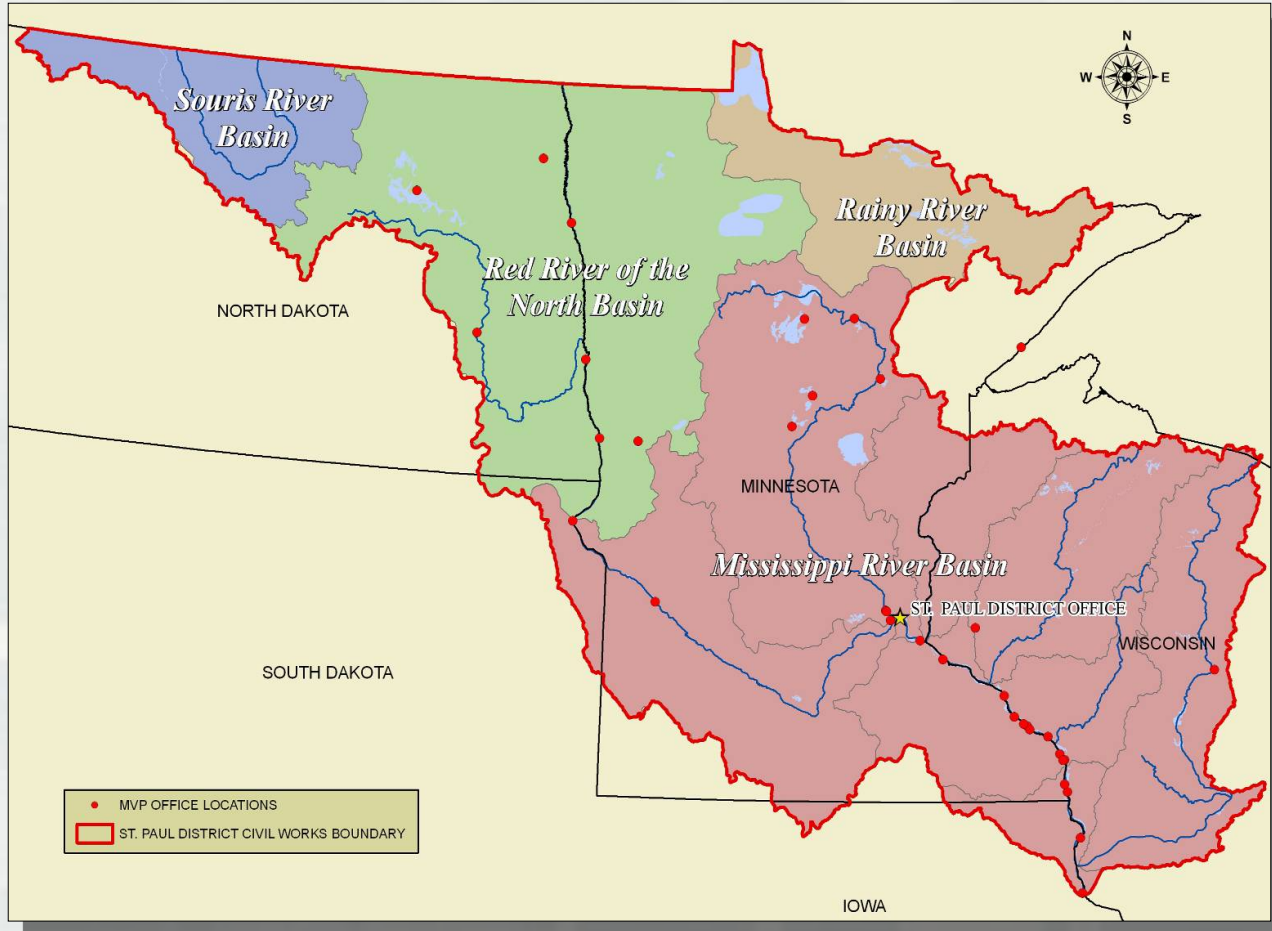


# *Mississippi Valley Division...*



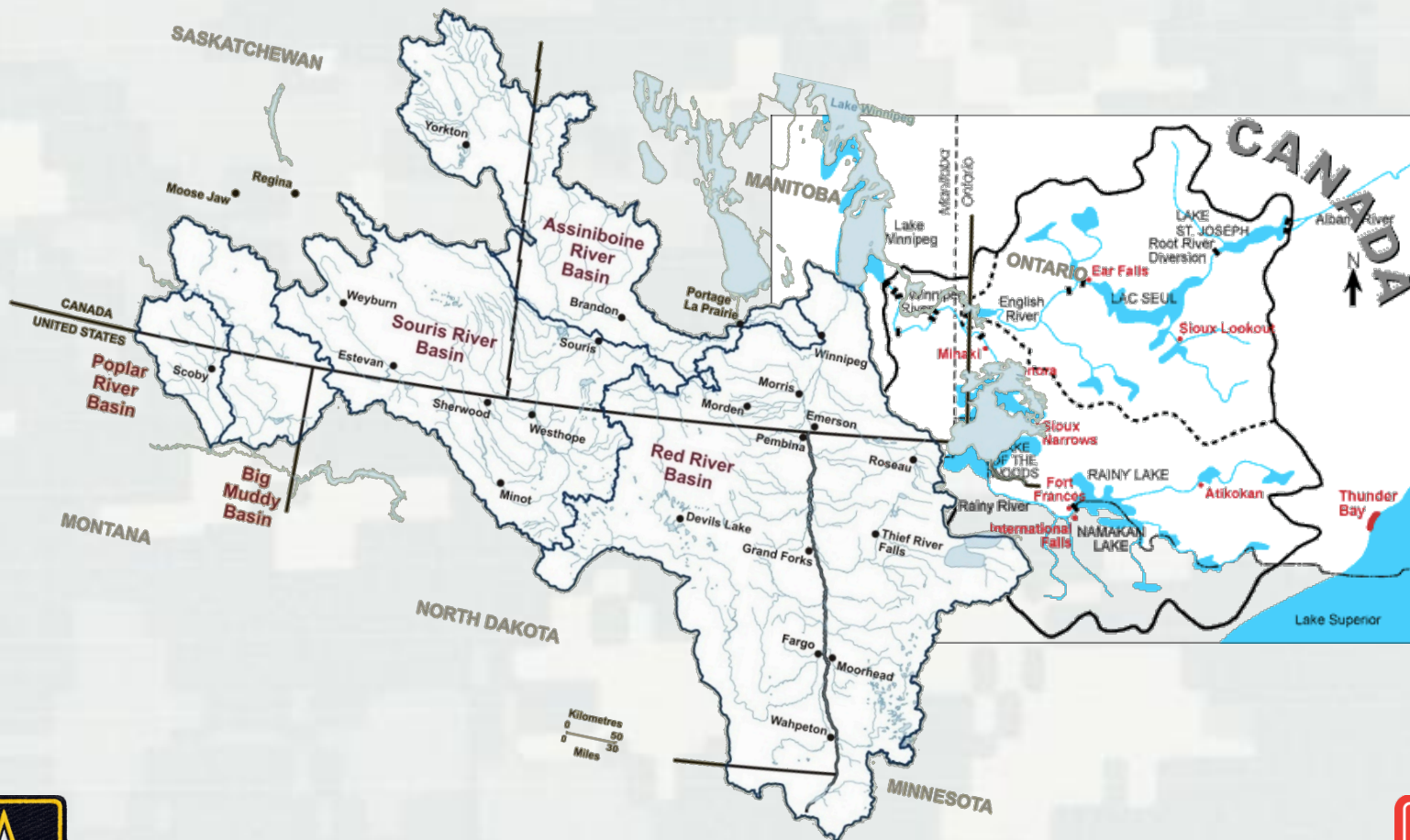
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# District Boundaries ...



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# Support to International Joint Commission



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# ***District Missions ...***

- Support to navigation
- Flood risk management
- Environmental restoration
- Emergency operations
- Regulatory permits
- Recreation
- Support U.S. Army and other federal & international agencies



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# Navigation ...

- Operate 13 of 29 locks and dams on the Upper Mississippi
- Maintain 297 miles of channel
- Average of 16 million tons of cargo shipped out of district annually



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# Recent Droughts

- 1988  
Drought  
Contingency  
Plans – 1992
- Miss River Low  
Flow Plan - 1997
- 2006, 2007
- 2012  
Deviation & Plan



# Drought Triggers

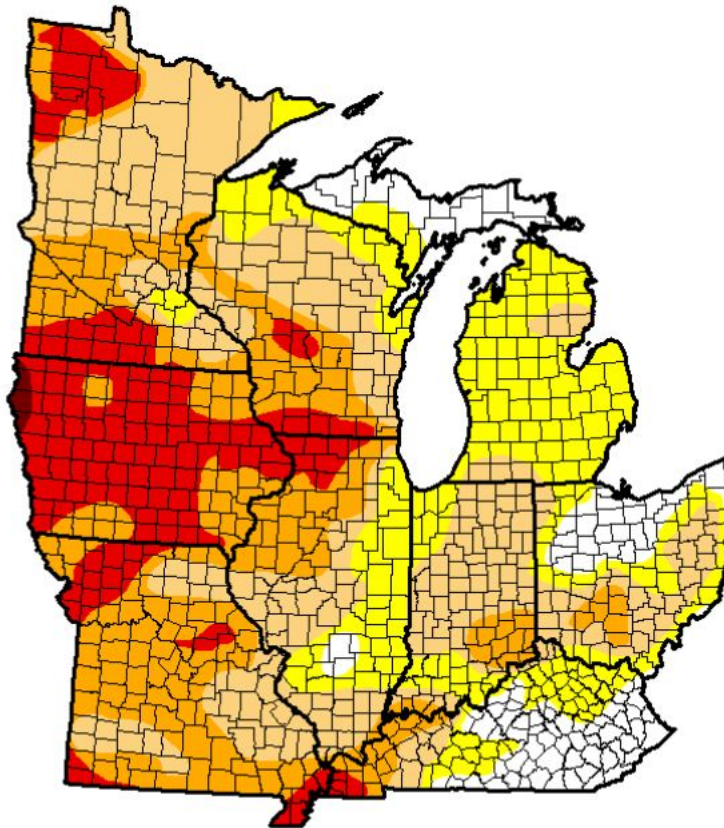
- USAF – based on flow at Anoka
  - 2,500 cfs – lock filling restriction – now NA
  - 2,000 cfs – drought watch
  - 554 cfs – Governor automatic request
- Winni – 400 cfs – Low Flow Plan; 100 cfs min; less than 1294.94, cut to 50 cfs
- Leech – 120 cfs min; less than 1292.70, cut to 60 cfs
- Pokegama – 400 cfs – Low Flow Plan; 200 cfs min; less 1273.17, cut to 110 cfs
- Sandy – 20 cfs min; less than 1214.31, cut to 10 cfs
- Cross – 30 cfs min; less than 1225.32, cut to 15 cfs
- Gull – 20 cfs min; less than 1192.75, cut to 10 cfs
- Homme – 5 cfs – drought watch; can go to zero, conservation phase
- Highway 75 – 2 cfs min.
- Baldhill – 13 cfs min and falling pool
- Lac qui Parle – 20 cfs min; at 932 reduce to 15 cfs, at 930 reduce to 10 cfs
- Red Lake – 50,000 ac-ft/year; between 5 and 15 cfs when below 1171.0





# Widespread Drought Condition

## U.S. Drought Monitor Midwest



**October 2, 2012**

*(Released Thursday, Oct. 4, 2012)*

Valid 7 a.m. EST

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	9.48	90.52	69.86	39.43	15.92	0.28
<b>Last Week</b> <i>9/25/2012</i>	8.75	91.25	67.48	41.58	14.88	0.28
<b>3 Months Ago</b> <i>7/3/2012</i>	25.55	74.45	52.56	24.76	5.60	0.00
<b>Start of Calendar Year</b> <i>1/3/2012</i>	71.84	28.16	13.47	6.80	0.00	0.00
<b>Start of Water Year</b> <i>9/25/2012</i>	8.75	91.25	67.48	41.58	14.88	0.28
<b>One Year Ago</b> <i>10/4/2011</i>	57.08	42.92	16.33	6.12	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

**Author:**

Anthony Artusa  
NOAA/NWS/NCEP/CPC



<http://droughtmonitor.unl.edu/>



# October 1, 2012 HW Conditions

- Gull: 1193.86, bottom of summer band, 20 cfs, min. outflow
- Cross: 1229.18, 0.11 ft above bottom, 33 cfs, min. outflow
- Sandy: 1215.95, 0.11 ft below bottom, 23 cfs, min. outflow
- Pokegama: 1273.11, 0.06 ft below bottom, 395 cfs
- Leech: 1294.27, 0.23 ft below bottom, 122 cfs, min. outflow
- Winni: 1297.70, 0.24 ft below bottom, 100 cfs, min. outflow
- Drawdowns Start



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# October 1, 2012 Conditions

Anoka:	2,360 cfs		Sep / Oct
L/D No. 2:	1,950 cfs	19%	9,400 / 11,000
L/D No. 4:	7,800 cfs	31%	24,100 / 26,200
L/D No. 10:	13,200 cfs	33%	38,200 / 41,300



# Directive to Deviate

- Dated 26 October 2012
- “...increase storage up to 10% above the approved guide curves for all the District’s reservoirs...”
- “At the appropriate time..., any additional storage gained will be released to minimize drought impacts.”
- Had not been done since 1940’s.

 **DEPARTMENT OF THE ARMY**  
MISSISSIPPI VALLEY DISTRICT, OFFICE OF ENGINEERS  
FOR THE  
VICTORIANA, MISSISSIPPI 39204  
26 OCT 2012  
CEMVO-88-W

MEMORANDUM FOR

Commander, St. Paul District  
Commander, Rock Island District  
Commander, St. Louis District

SUBJECT: Directive to Deviate from the Approved Water Control Plans at MVP, MVR & MVS Lakes/Reservoirs

1. References:

- ER 1110-2-1400, Reservoir/Water Control Centers, 30 Sep 93
- ER 1110-2-1941, Drought Contingency Plans, 18 Sep 81
- DIRK 1110-2-284, Reporting Current Conditions, 5 Aug 92
- DIRK 1110-2-240, Preparation of Water Control Plans and Manuals, 1 Jan 92

2. The current drought conditions and forecasts within this region project that ensuring authorized 9-foot navigation depths along the middle Mississippi River may not be possible beginning as early as mid-December 2012. The duration of this drought and of lower than required navigation depths is uncertain, but it is clear that actions to mitigate this scenario must be taken immediately.

3. As such, the St. Paul, Rock Island, and St. Louis Districts are directed to perform deviations from the approved water control plans to increase storage up to 10 percent above the approved guide curves for all of the Districts’ reservoirs by using every opportunity to store future runoff and by continuing to ensure minimum releases from these reservoirs are maintained. To date, there has been insufficient runoff to accomplish these storage levels and it is recognized that, depending on future precipitation and runoff amounts, individual reservoirs may not attain the 10 percent storage level. At the appropriate time and in full coordination with WPD’s Watershed Division, any additional storage gained will be released to minimize drought impacts. It


CEMVO-88-W  
SUBJECT: Directive to Deviate from the Approved Water Control Plans at MVP, MVR & MVS Lakes

is noted that these deviations have recently been initiated and that this directive will formalize these requirements.

4. While these measures are necessary to minimize drought impacts to navigation, it is critical to ensure that such measures do not transfer risks or adverse impacts to the authorized missions of the reservoirs. Analysis to date has indicated that these actions will not transfer risks or adverse impacts to the reservoirs. The Districts should continuously monitor and assess impacts of maintaining any increased storage on the reservoirs and related stakeholders and communicate such impacts to the Watershed Division and the WPD’s Regional Technical Division (Dam Safety Office).

5. In summary, the extreme drought event occurring on the upper Mississippi, Ohio, and middle Mississippi Rivers has created record or near record low flows (stages) which have and will have significant impacts to navigation by early to mid-December. This extreme drought is placing tremendous pressure on navigation, requiring water management measures to be taken beyond the approved Water Control Plans. Continuous monitoring, assessments and, if necessary, modification of these measures, however, must ensure that risk is not transferred from the river to these structures.

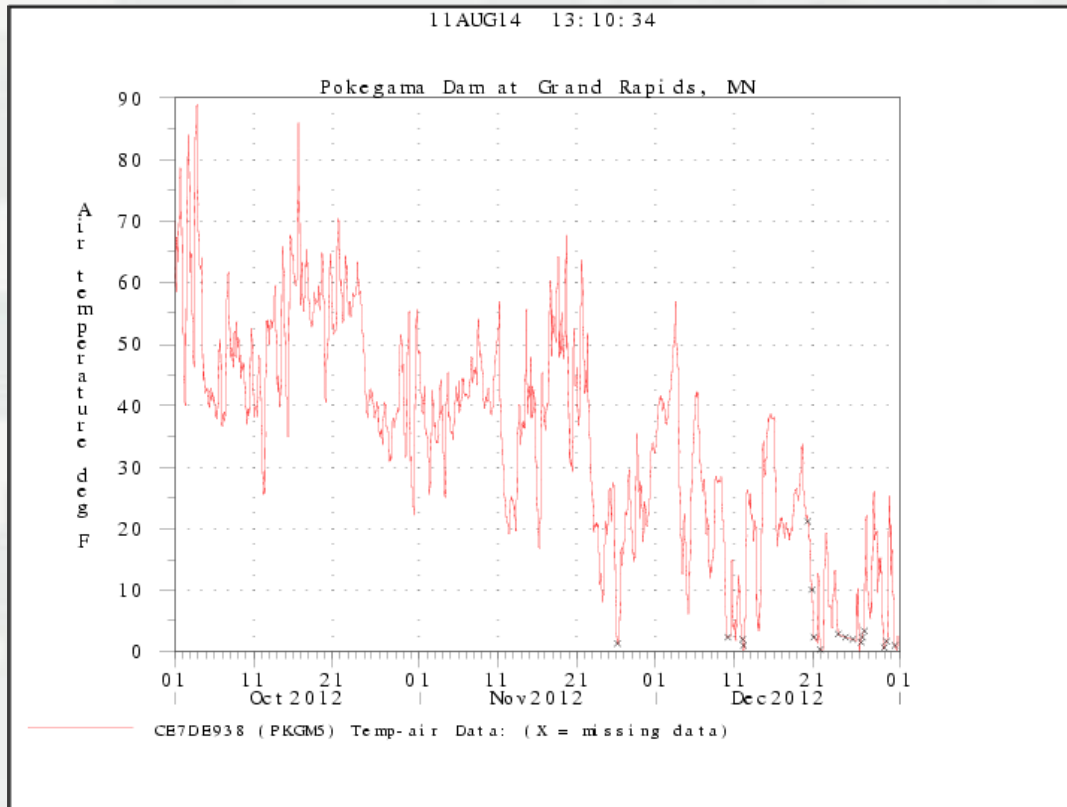
6. Please refer any questions concerning this directive to Chuck Shade, Chief, Watershed Division, at 601-624-5937.

  
JOHN W. PEARSON  
Major General, USA (Ret.)  
Commanding



# Getting Colder / Ice-up Issues

- CG authorizes release for MVP on 15 November
- 30% ramping per ROPE study
- Expect 4" to 6" additional stage in middle Miss. - ?



Jeff Kleinert, operations, takes a snow survey at Pokegama Dam, near Grand Rapids, Minn., Jan. 23. Park rangers at the Corps' Headwaters parks take snow measurements throughout the winter and provide that information to the National Weather Service, so they have more data to help determine the flood forecast for the spring snowmelt.

*Photo by Patrick Moes*



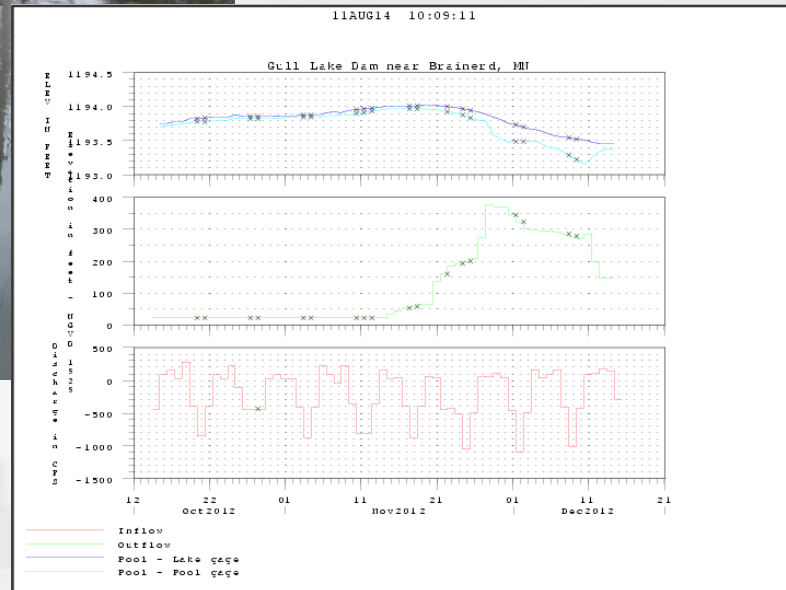
Tammy Johnson, operations, prepares to adjust a gate at the Big Sandy Lake Dam, near McGregor, Minn., Jan. 23. Despite freezing temperatures, Corps park rangers ensure the recreation areas are maintained and ready for the upcoming camping season.

*Photo by Patrick Moes*

# Gull Lake



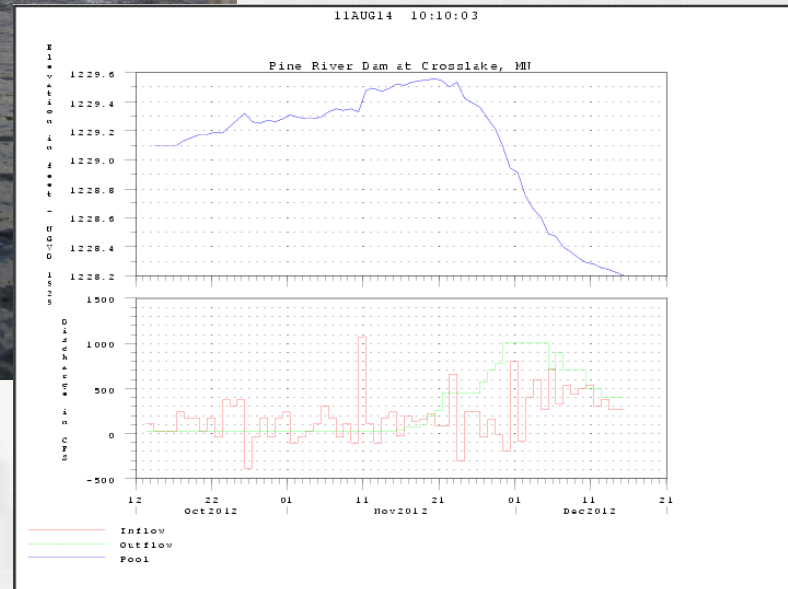
- Oct 26: 1193.86
- Nov 20: 1194.03 +0.17 ft.
- 2,209 ac-ft.
- Max outflow: 376 cfs



# Cross Lake / Pine River Dam



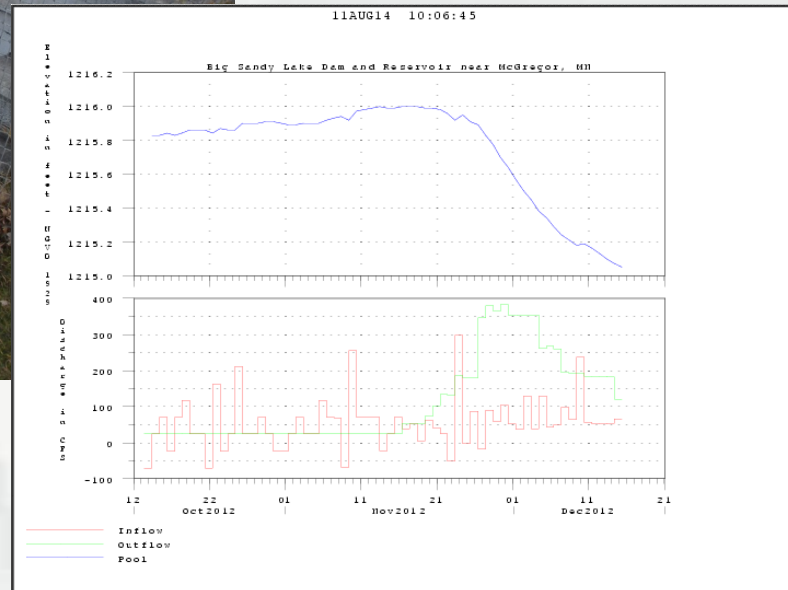
- Oct 26: 1229.32
- Nov 20: 1229.56 +0.24 ft
- 3,268 ac-ft.
- Max outflow: 1,007 cfs
- Resident writes to CG



# Big Sandy Lake

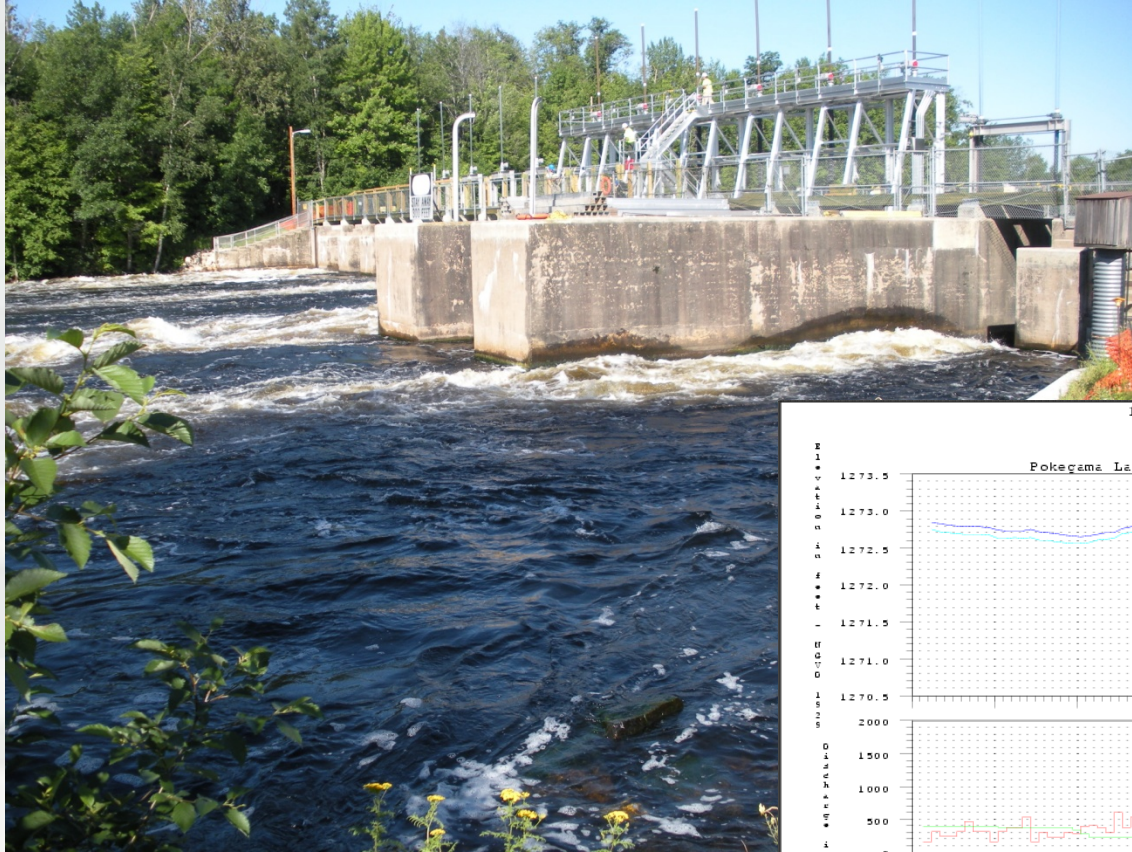


- Oct 26: 1215.90
- Nov 18: 1216.01 +0.11 ft
- 1,013 ac-ft.
- Max outflow: 383 cfs

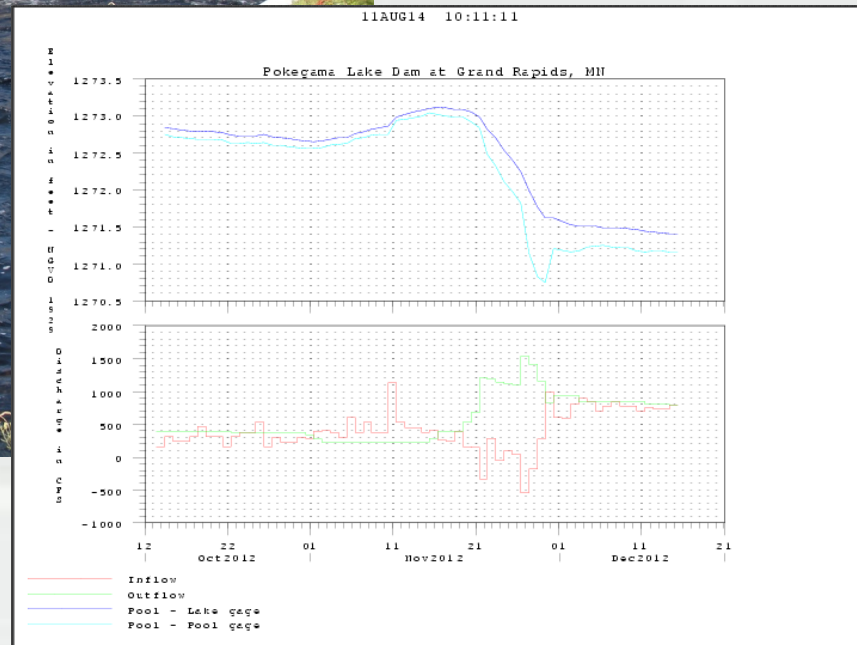




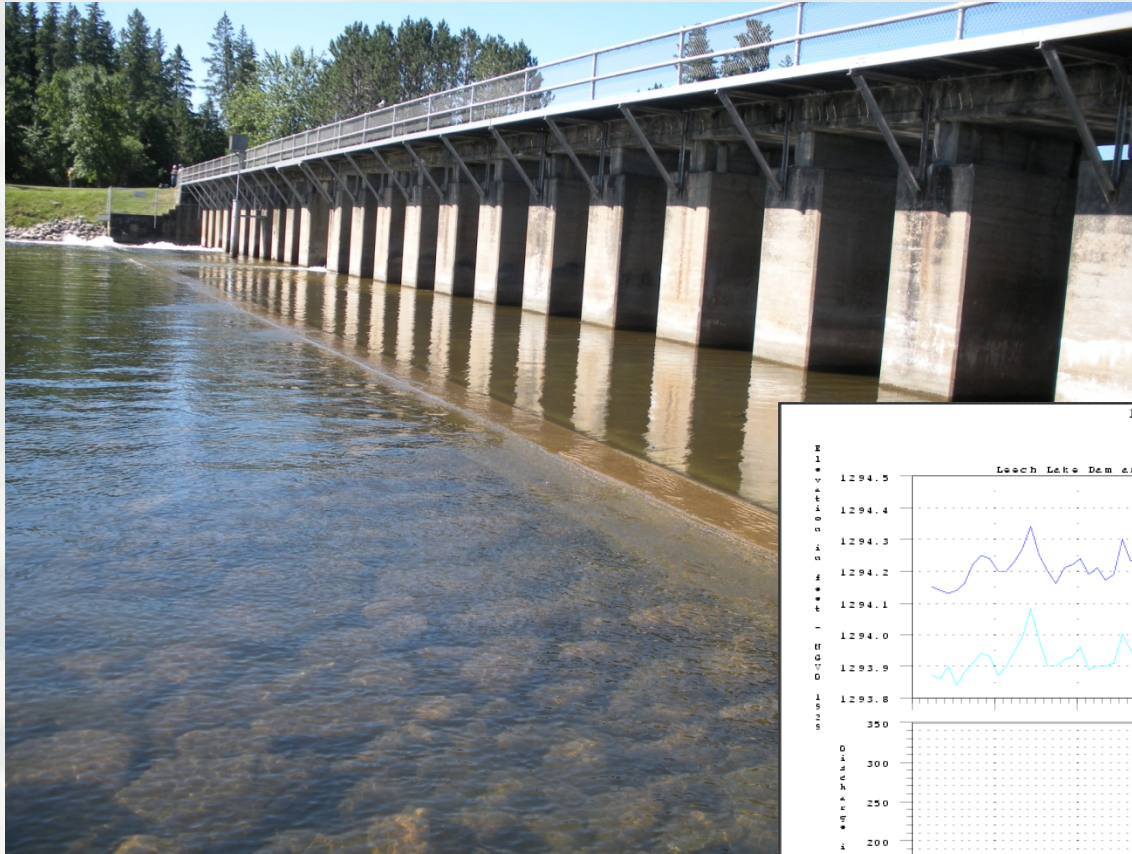
# Pokegama Dam



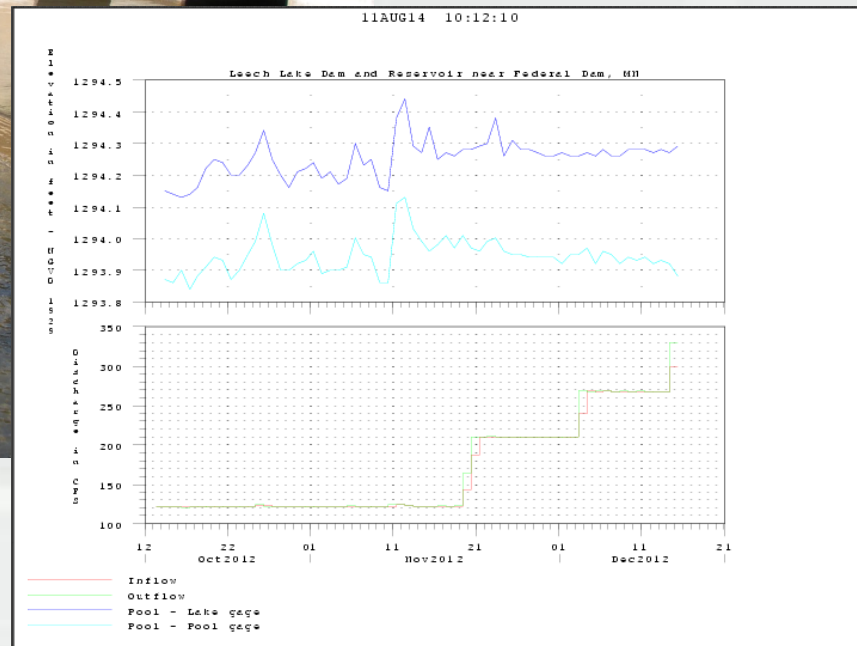
- Oct 26: 1272.72
- Nov 16: 1273.12 +0.40 ft.
- 5,950 ac-ft.
- Max outflow: 1,530 cfs



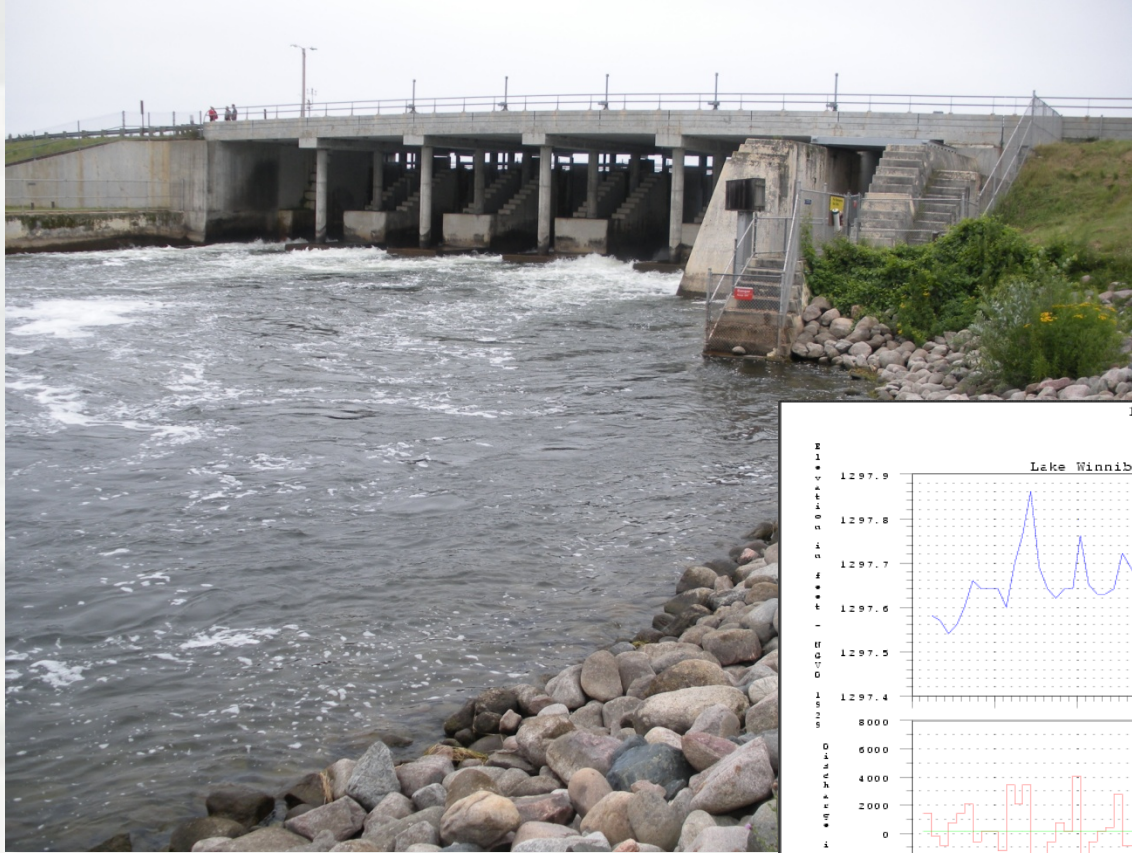
# Leech Lake



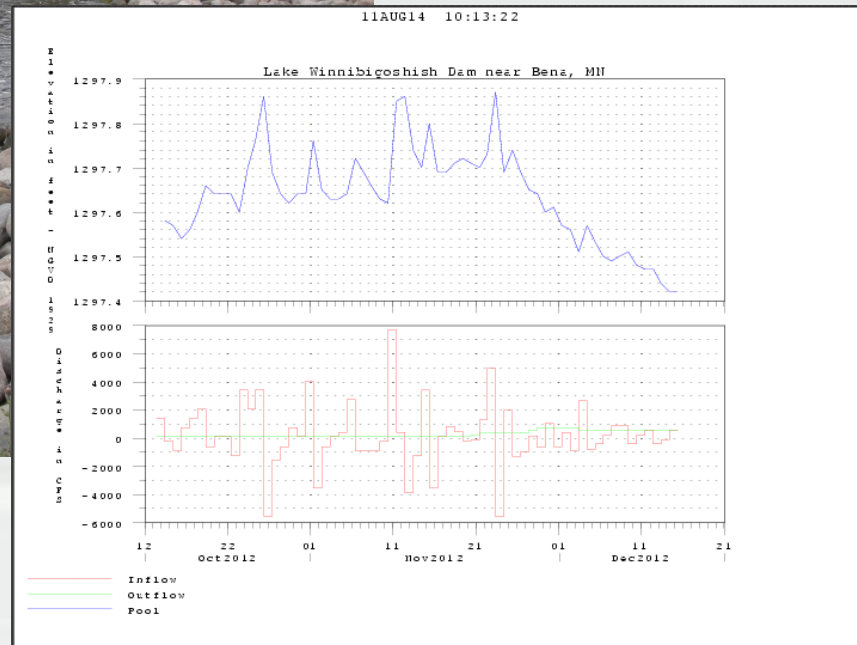
- Oct 26: 1294.34
- Ineffective.
- Late, wet snowfall
- Max outflow: 440 cfs in Dec.



# Winnibigoshish Lake

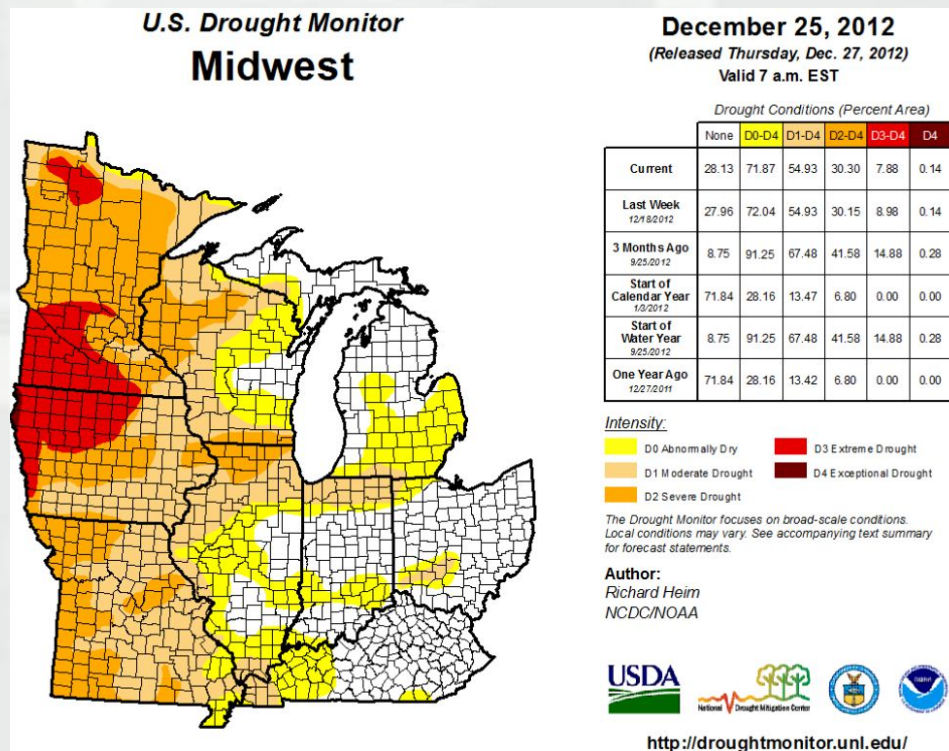


- Oct 26: 1297.86
- Any increase?
- Max outflow: 750 cfs

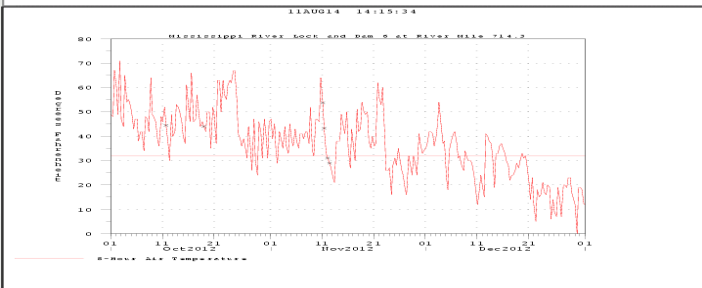
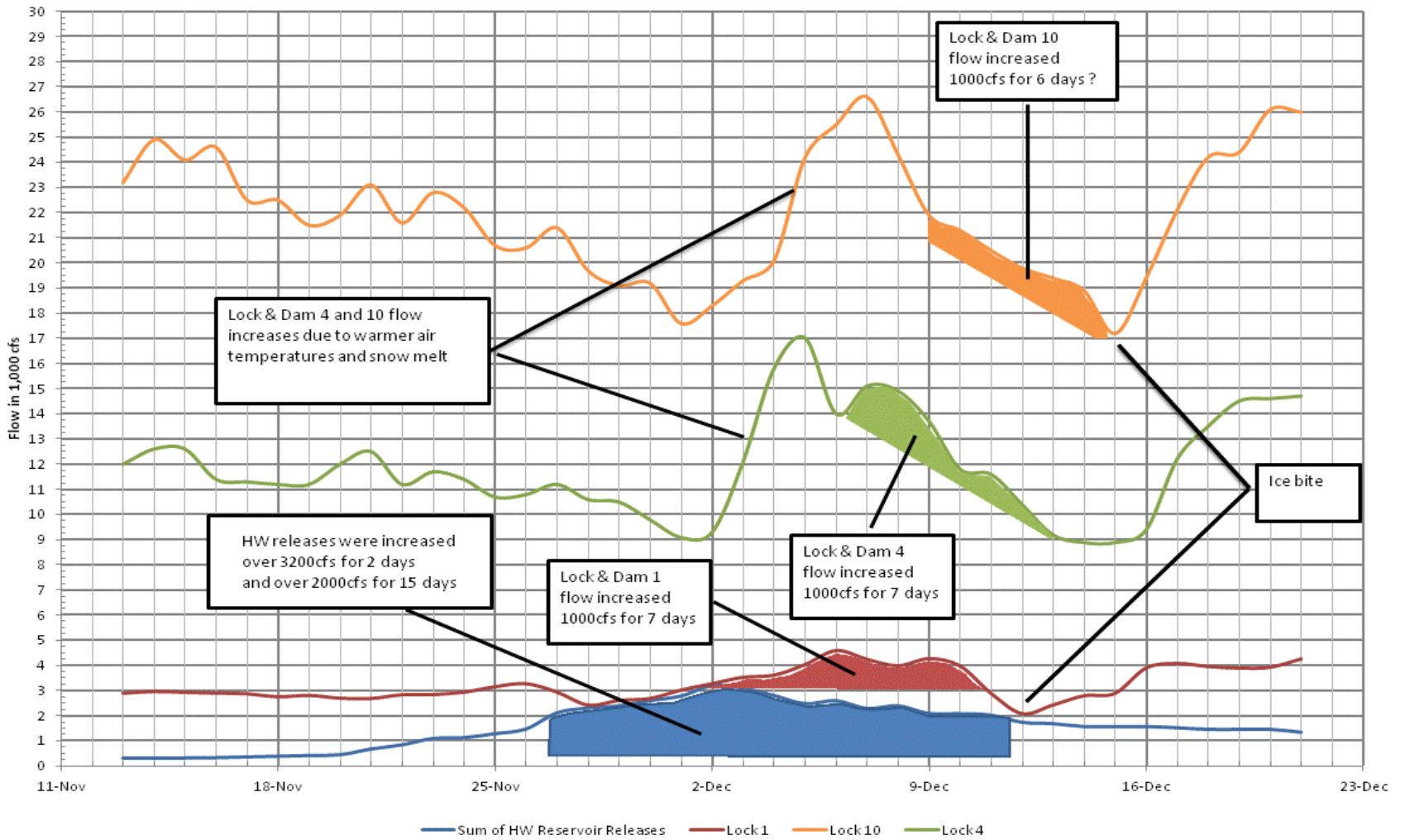


# Release Plan / Results

- Estimated 6 days over 3,200 cfs and 11 days over 2,000 cfs
- Actual 2 days and 15 days
- Additional 2,000 cfs for 2 days at L/D No. 10
- St Paul's last daily reporting on 21 December 2012

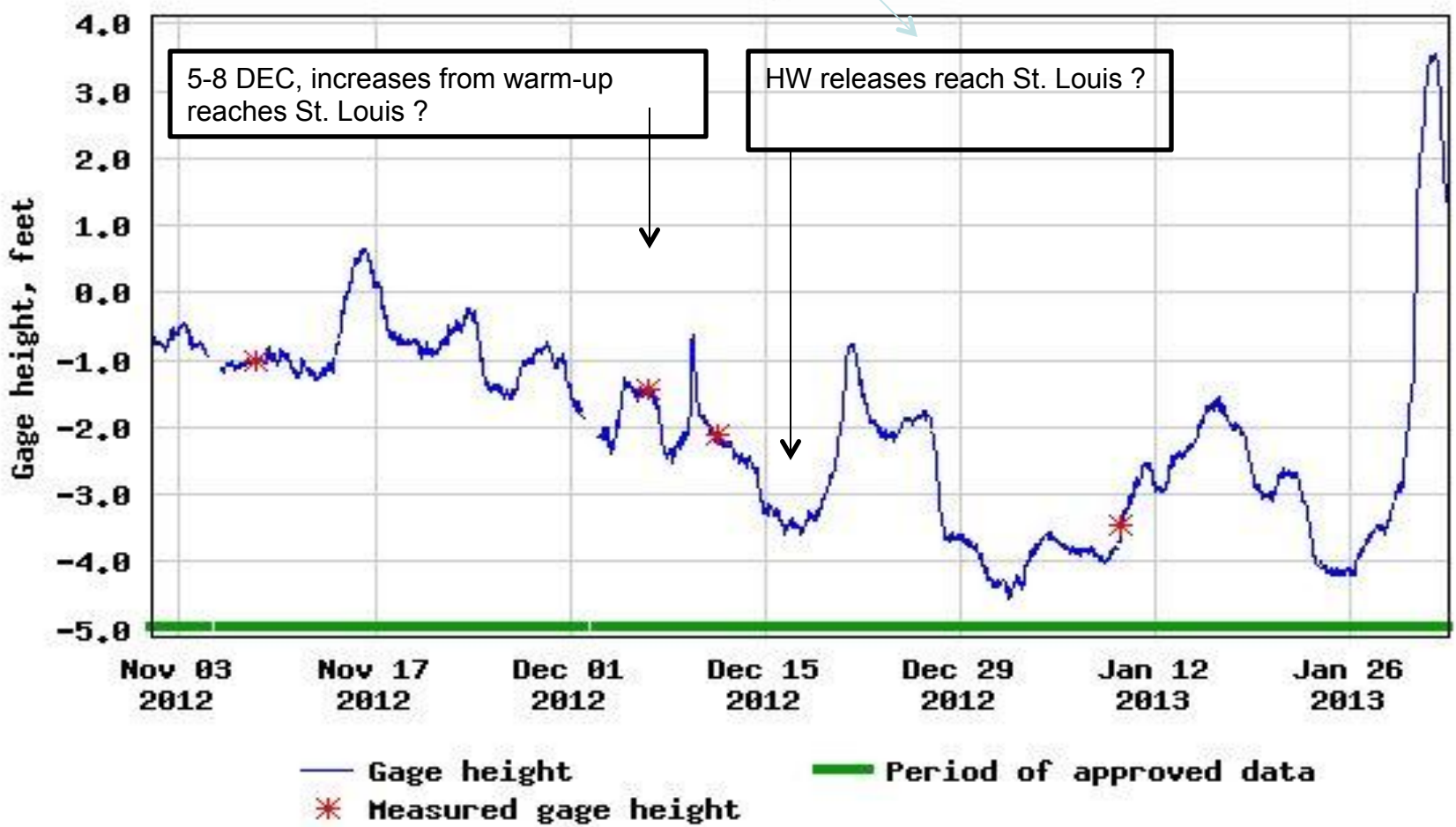


MVP 2012 Mississippi Headwater Reservoir releases to support navigation



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USGS 07010000 Mississippi River at St. Louis, MO



Graph courtesy of the U.S. Geological Survey



# Additional questions?



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