

# SPRING 2011 FLOOD BRIEFING

*March 3, 2011 Update*

Mike Welvaert  
National Weather Service  
La Crosse, WI

March 3, 2011

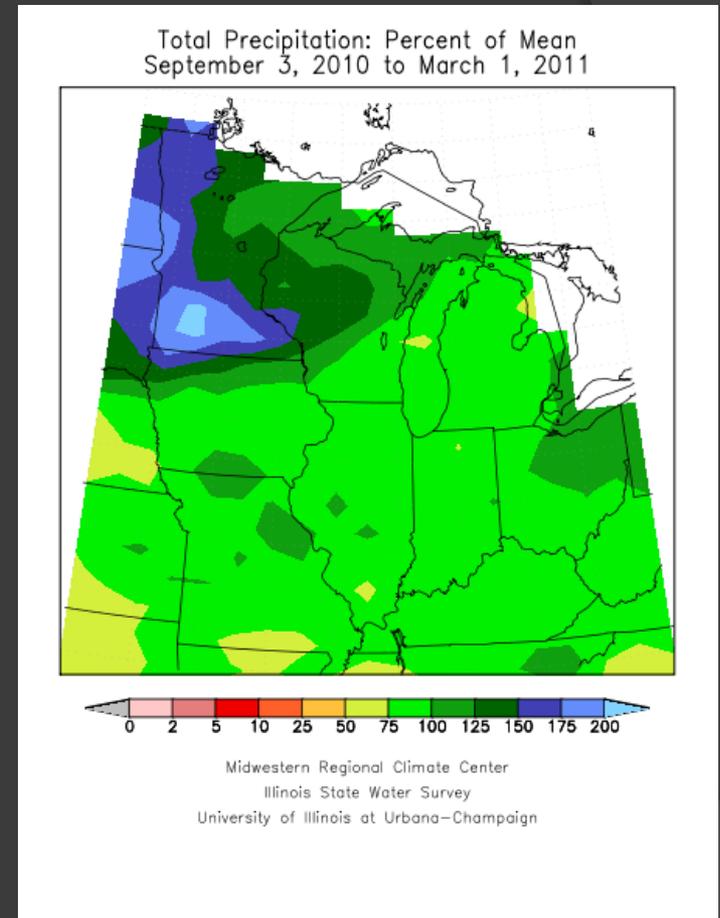
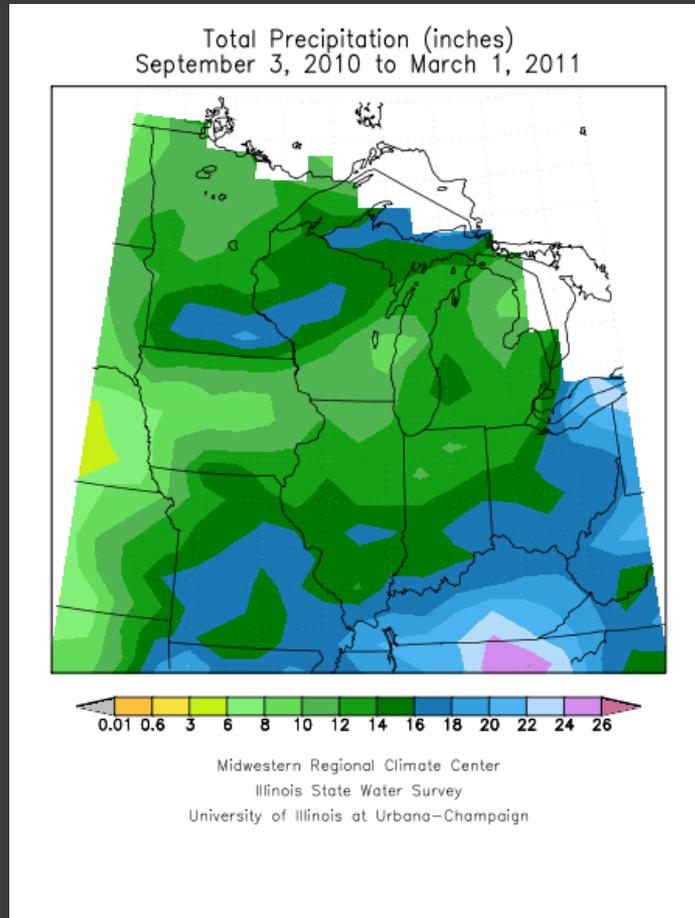


# Discussion Points

- Flood Setup – A Wet Fall and Snowy Winter
- 2011 Spring Flood Outlooks

# Precipitation: Sept 3 2010 – March 1<sup>st</sup> 2011

- Much of southern Minnesota is 150% to 200%+ of Normal

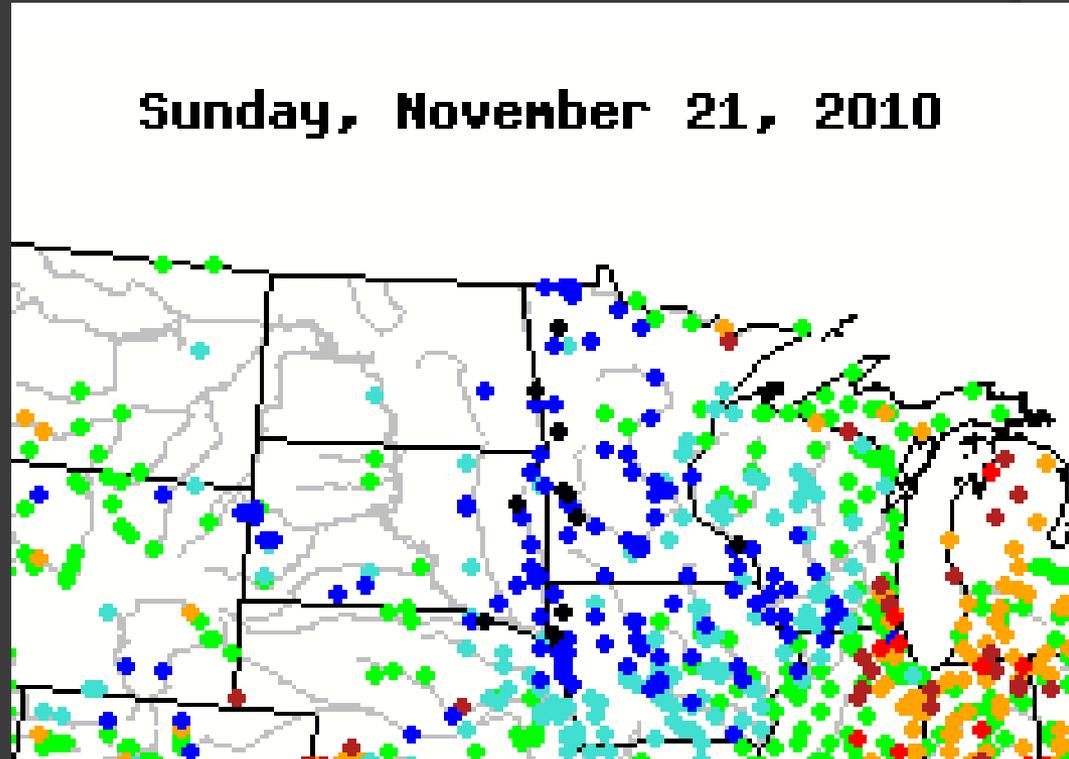


***Fall 2010 was very wet, mainly from the September and October storms.  
Winter was very snowy, (#1 at Rochesterr)***

# Streamflow Prior to Freeze

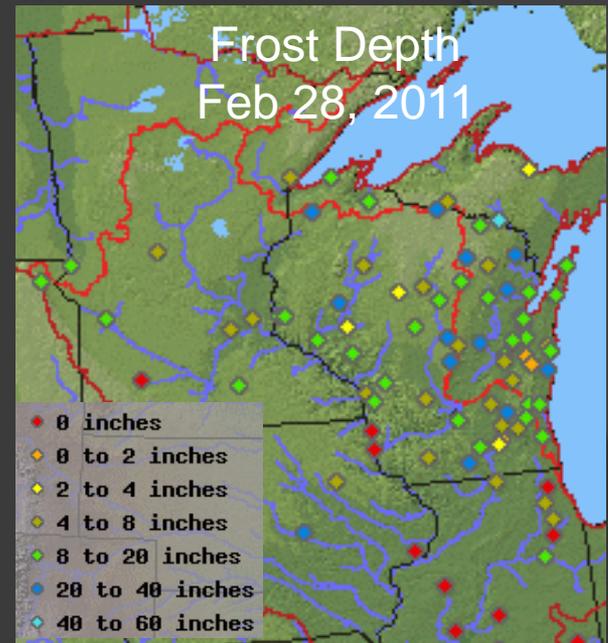
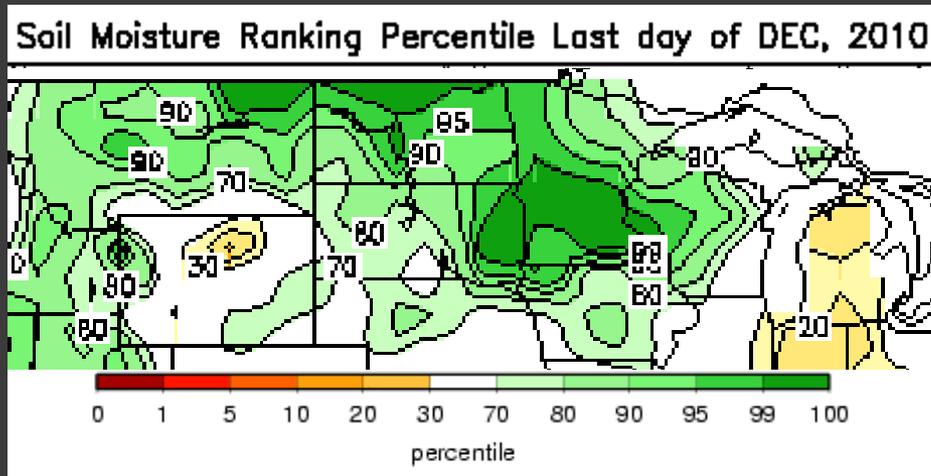
Most Rivers in MN were running above or much above normal

- Reservoirs and lowland areas are full.
- Ice jams are possible.

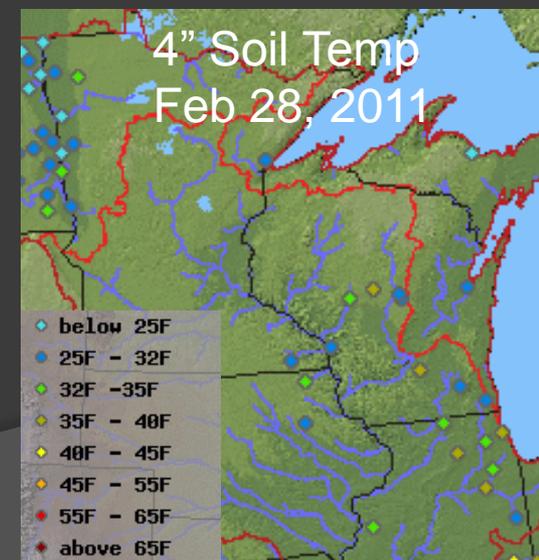


Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

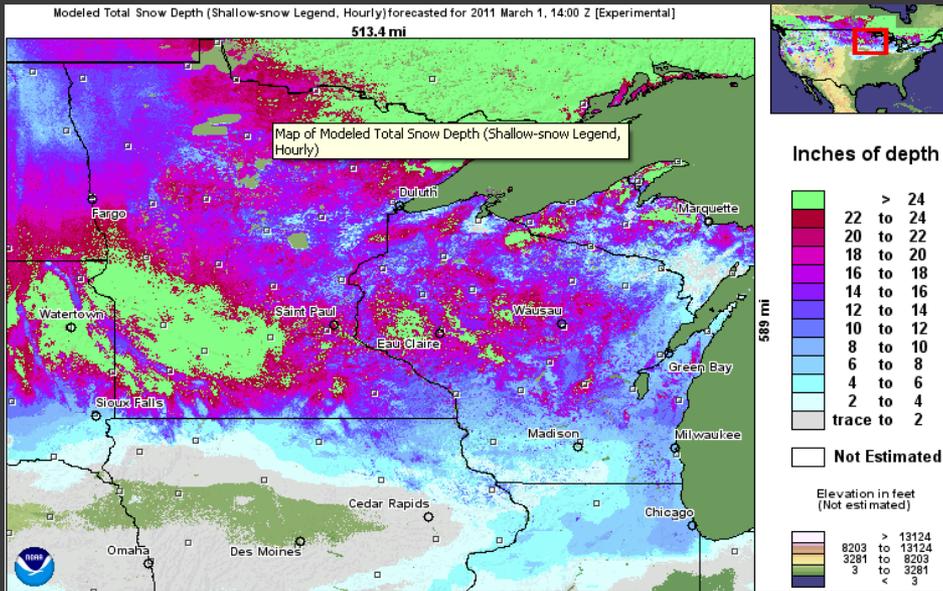
# Soil Information



- Soils were wet prior to the freeze.
- Frost depths were shallow all winter (1.5 ft or less)
  - Snow arrived around the same time as the cold weather
- Frost is virtually all gone now



# Water in the Snow Pack

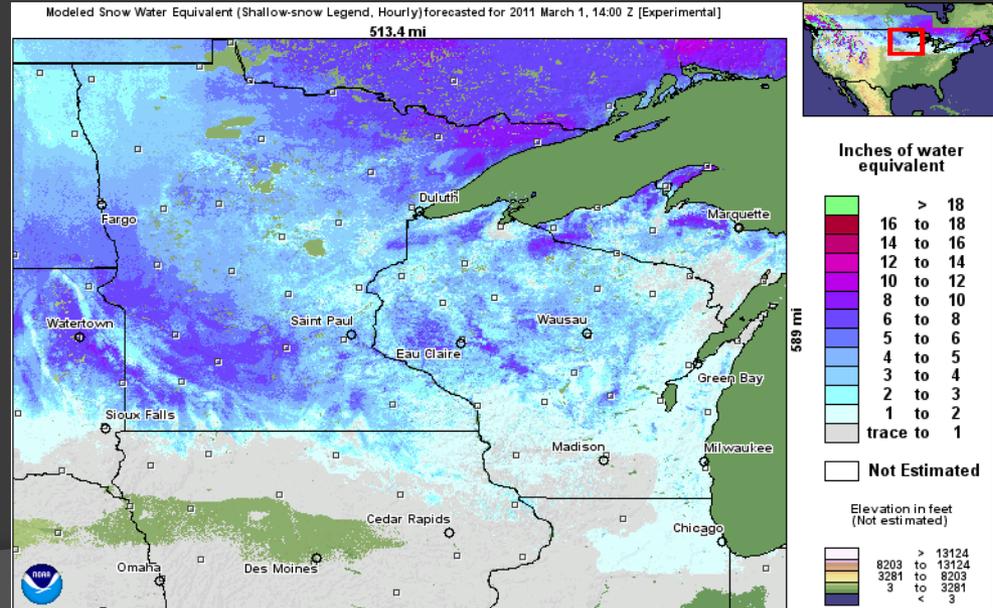


After losing a great deal of snow in late January, recent storms have returned snow depth to over 2 ft in western MN, and isolated spots in western WI. Not much remains in IA.

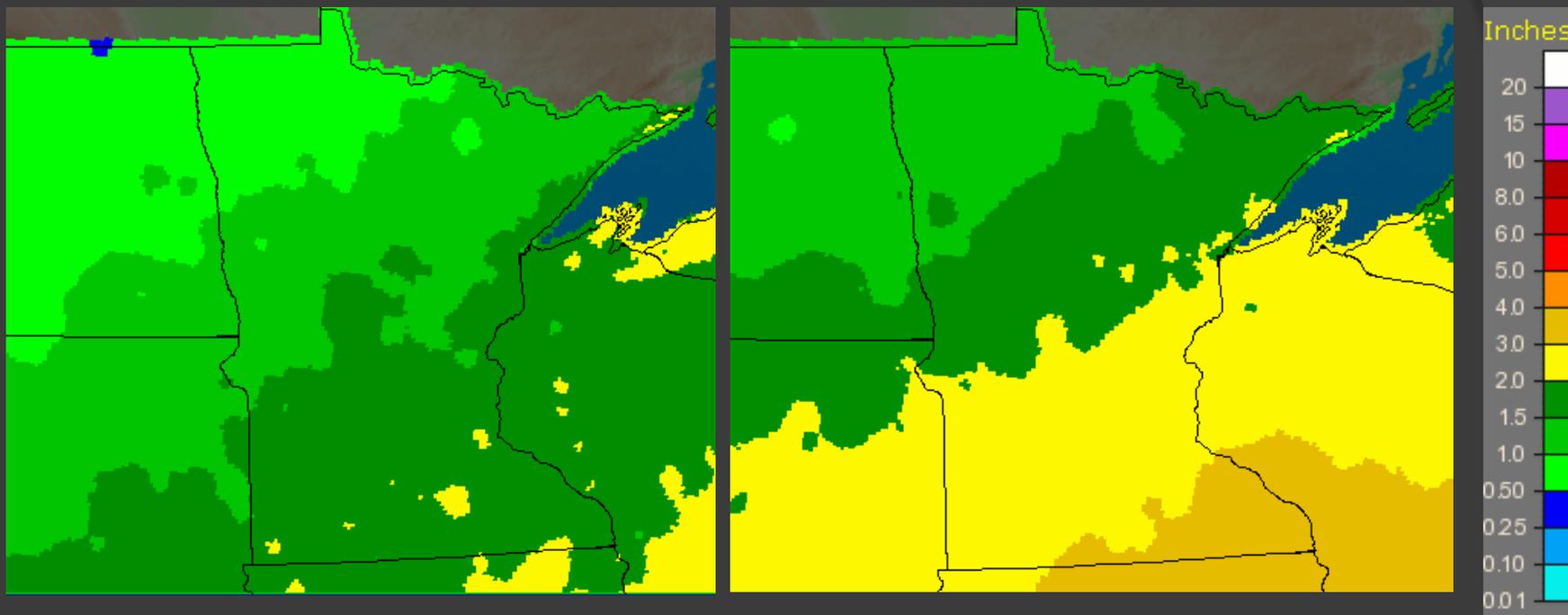
Still widespread amounts of 10-20" in WI/MN

Liquid water in the snowpack (SWE) is generally in the 2 to 4 inch range, with some spots slightly higher. Lowest water content in IA and southwest WI.

Parts of western MN have as much as 6 to 8 inches SWE!  
A general 3-6 inch range over much of MN/WI.



# Normal Liquid Precipitation



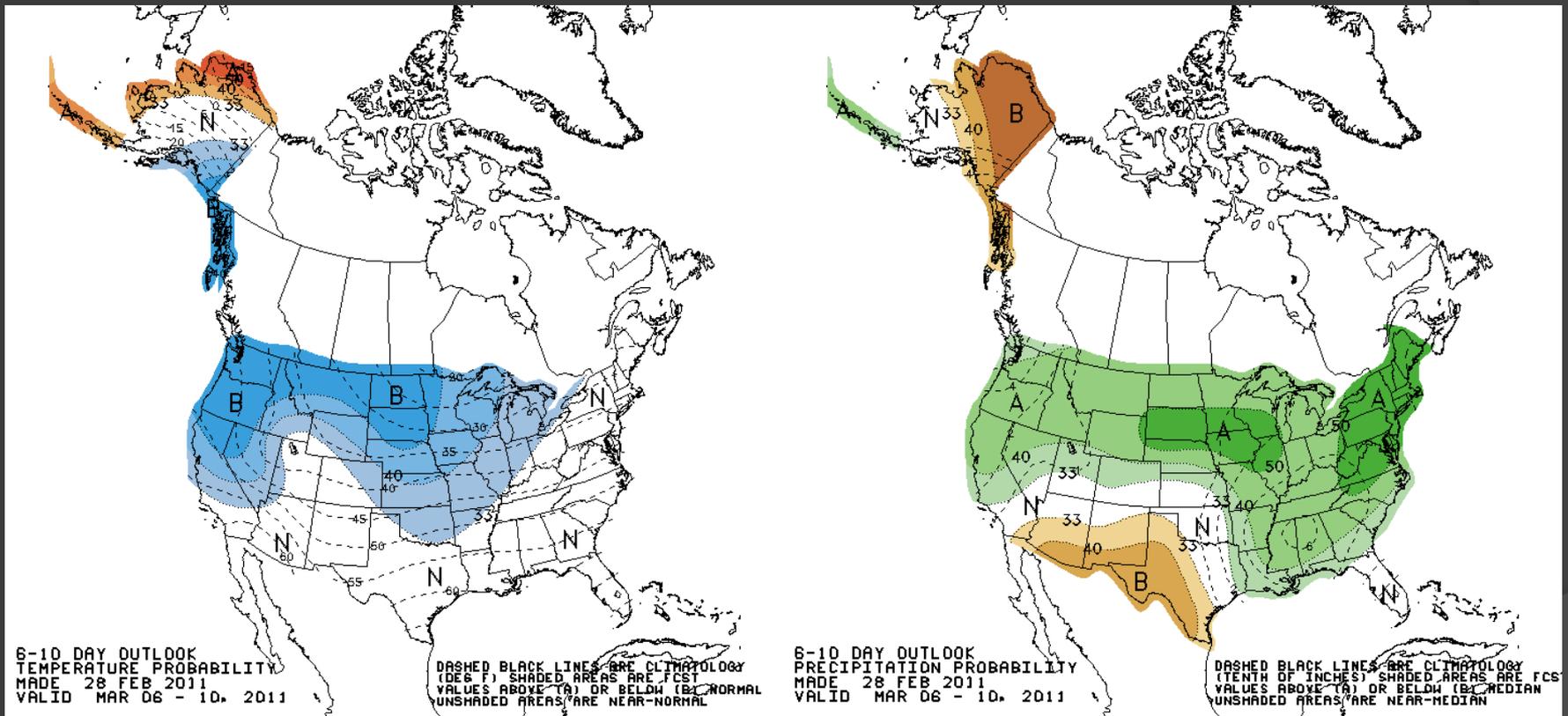
## March

Roughly 0.5 in to  
nearly 2 inches

## April

Roughly 1 inch to  
around 3 inches

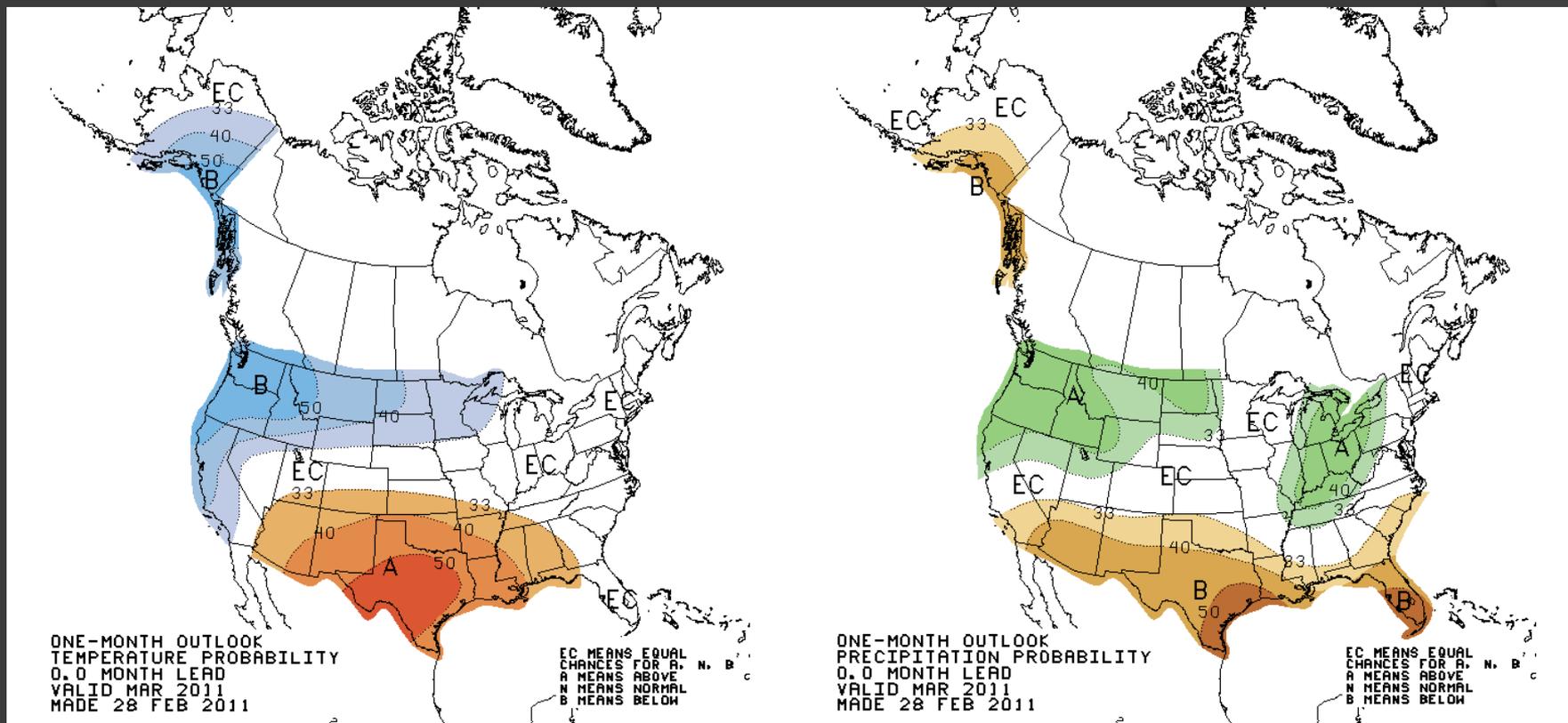
# 6-10 Day Outlook



Temperatures

Precipitation

# 30-Day Outlook



**Temperatures**

**Precipitation**

# Flood Potential ... Above Average Threat

- Above average fall moisture
- Above average winter precipitation
- Above average water already in the rivers
- Cool and Wet March Expected

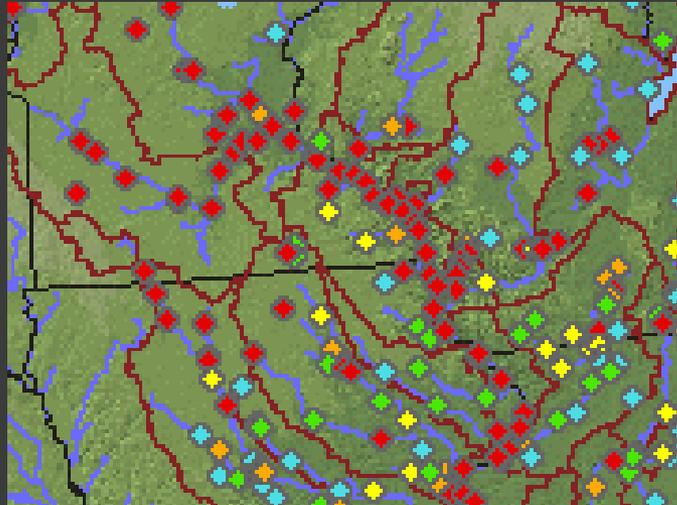
**Greatest concern – Mississippi River**

***But areas that received severe flooding last fall  
are also of concern (Zumbro basin)***

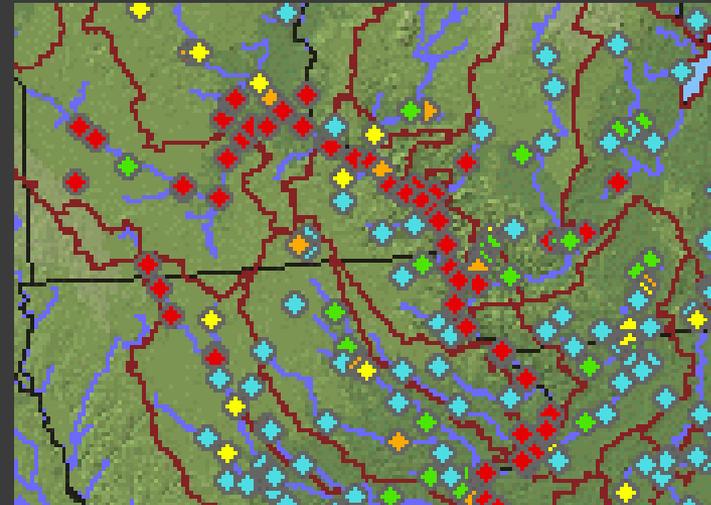
# Probabilistic Outlooks

# Overview of Flooding Potential

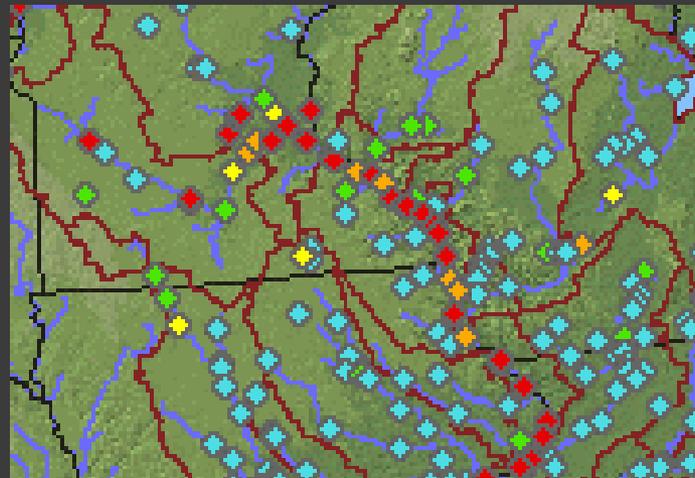
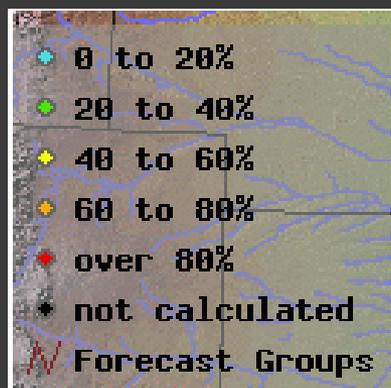
## Minor Flood



## Moderate Flood



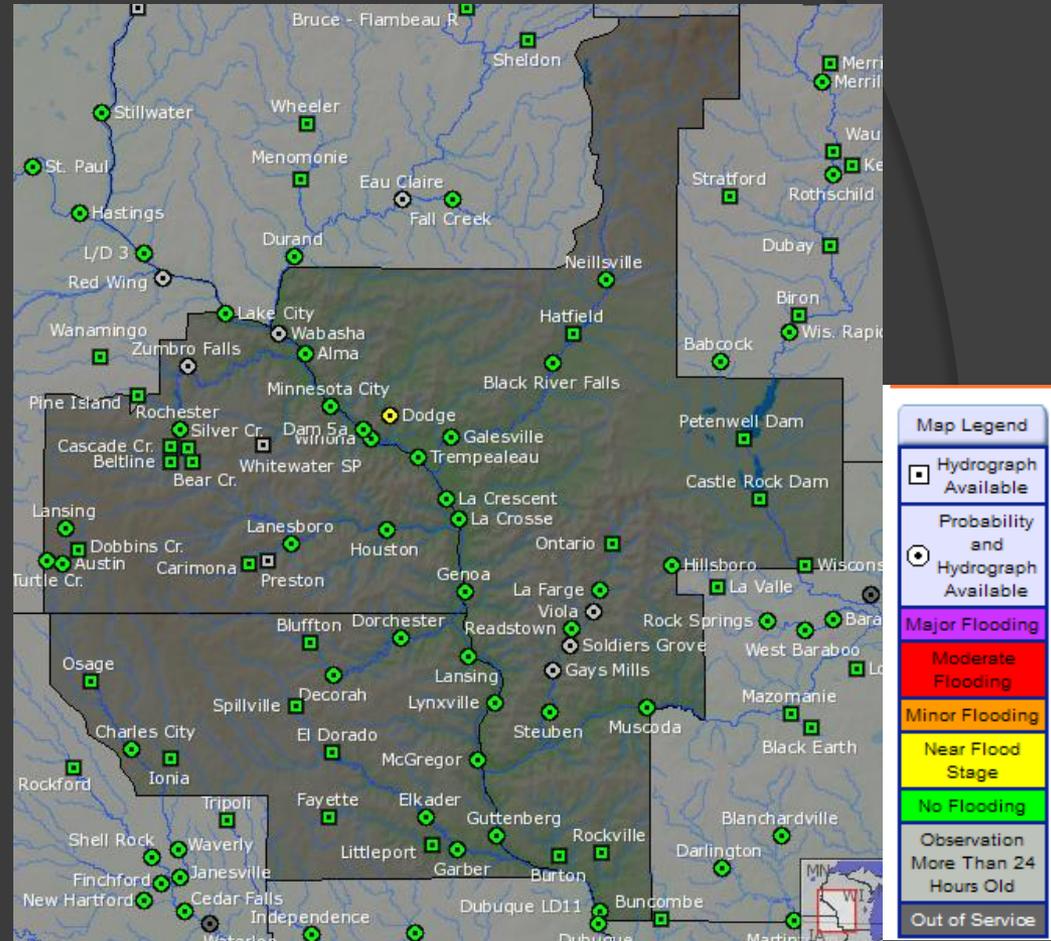
## Major Flood



*Graphics  
are from  
the forecasts  
released on  
March 3<sup>rd</sup>*

# Probabilistic Outlooks

- Soil Conditions Based on 2/28/11
- Model run from 3/4/11 – 6/5/11
- 60 year statistical analysis  
*(Does not include 2009 or 2010 data.)*



**La Crosse AHPS webpage**

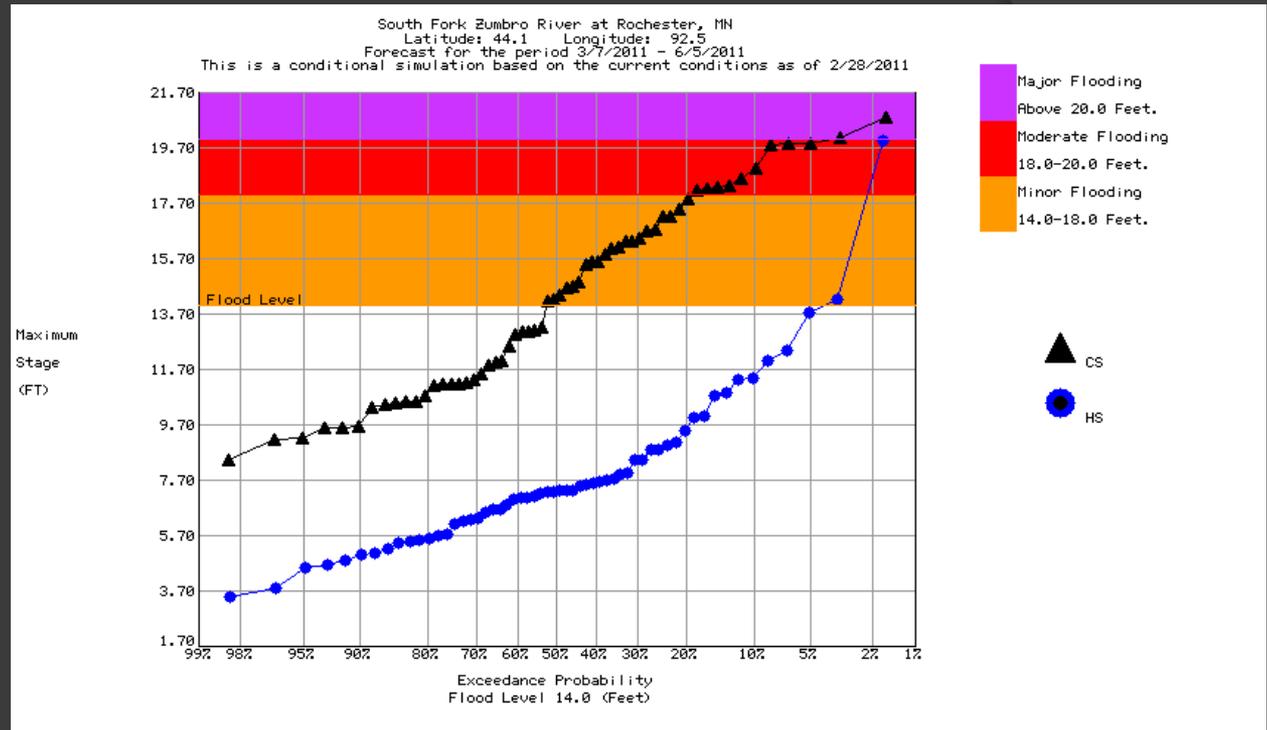
<http://water.weather.gov/ahps2/index.php?wfo=arx>

# Zumbro River Basin



# Rochester 37<sup>th</sup> Street Zumbro River

1978 level = 23.36 ft  
 1986 level = 20.77 ft  
 1965 level = 19.12 ft  
 2010 level = 17.16 ft



## Percent chance that the river will exceed various levels.

**Blue Line** – 60 year history of river stages for this period (Flood Climatology).  
**Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 3% – **20 ft Major** Flood
- 18% – **18 ft Moderate** Flood
- 52% -- **14 ft Minor** Flood

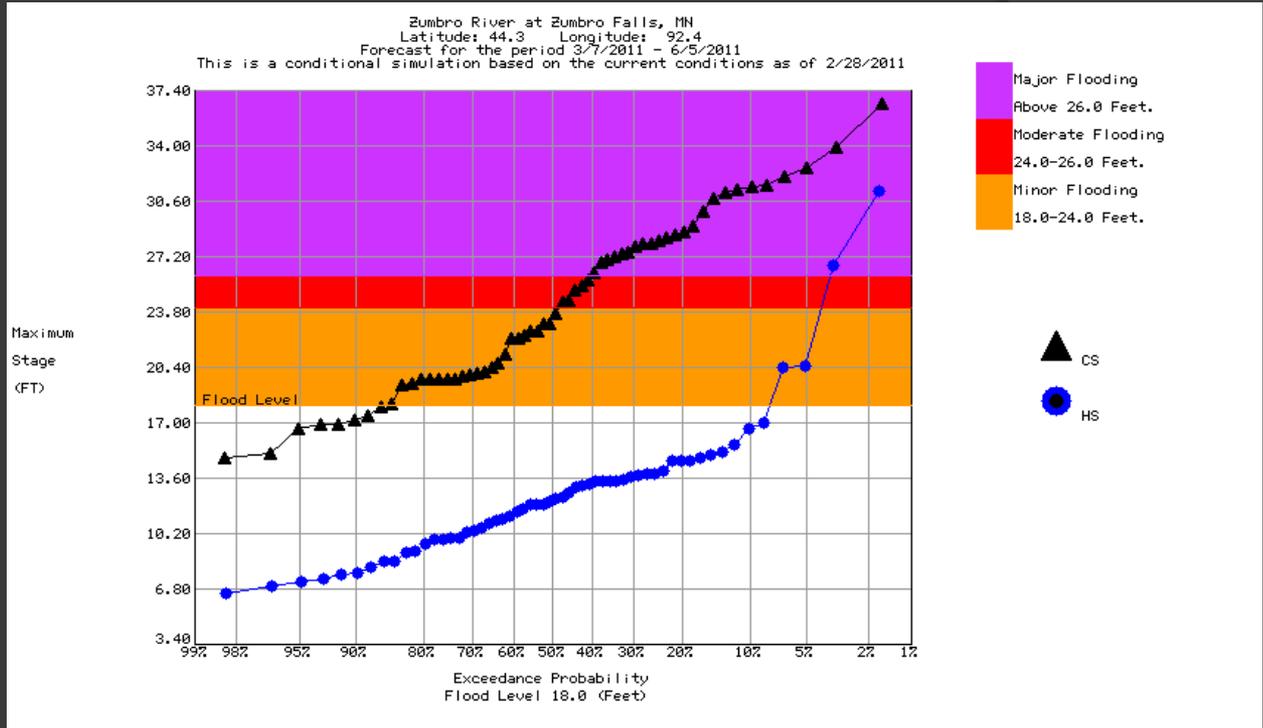
### Likelihood of Some Impacts

- 37% – **16 ft**— Flooding occurs in West River Park, and West River Parkway may be closed to traffic
- 52% – **14 ft**— Minor flooding begins along the river near the gauge



# Zumbro Falls Zumbro River

2010 level = E35.80 ft  
 1951 level = 30.80 ft  
 1965 level = 28.40 ft  
 1978 level = 24.26 ft



## Percent chance that the river will exceed various levels.

**Blue Line** – 60 year history of river stages for this period (Flood Climatology).  
**Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 39% – **26 ft Major** Flood
- 47% – **24 ft Moderate** Flood
- 85% -- **18 ft Minor** Flood

### Likelihood of Some Impacts

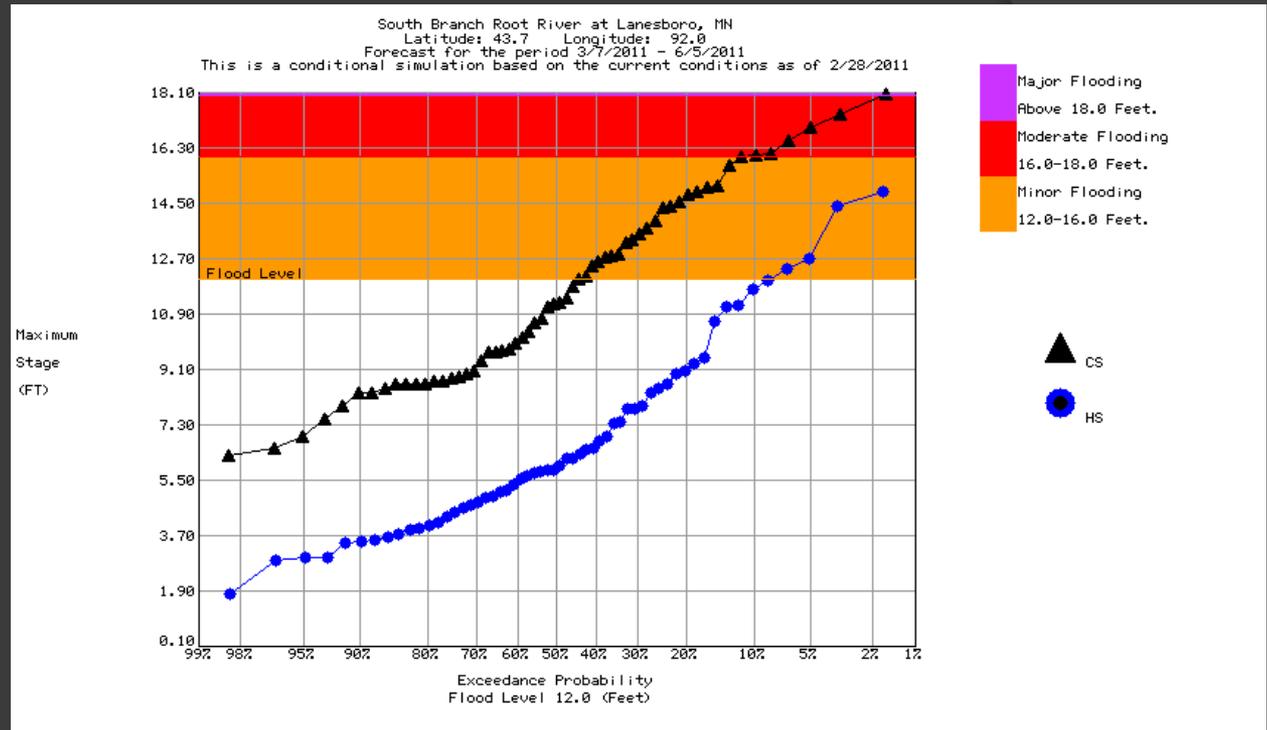
- 3% – **35.8 ft** – Record Flood Level
- 30% – **27.5 ft** – Highway 60 in Zumbro Falls is flooded
- 39% – **26 ft** – Residential flooding begins in Zumbro Falls
- 43% – **25 ft** – Flooding may occur in the town of Hammond
- 45% – **24.5 ft** – Highway 63 may begin to flood north of the bridge
- 85% – **18 ft** – Minor flooding begins along the river near the gauge

# Root River Basin



# Lanesboro South Branch Root River

1950 level = 19.20 ft  
2008 level = 14.17 ft



## Percent chance that the river will exceed various levels.

**Blue Line** – 60 year history of river stages for this period (Flood Climatology).

**Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 1% – **18 ft Major** Flood
- 9% – **16 ft Moderate** Flood
- 44% -- **12 ft Minor** Flood

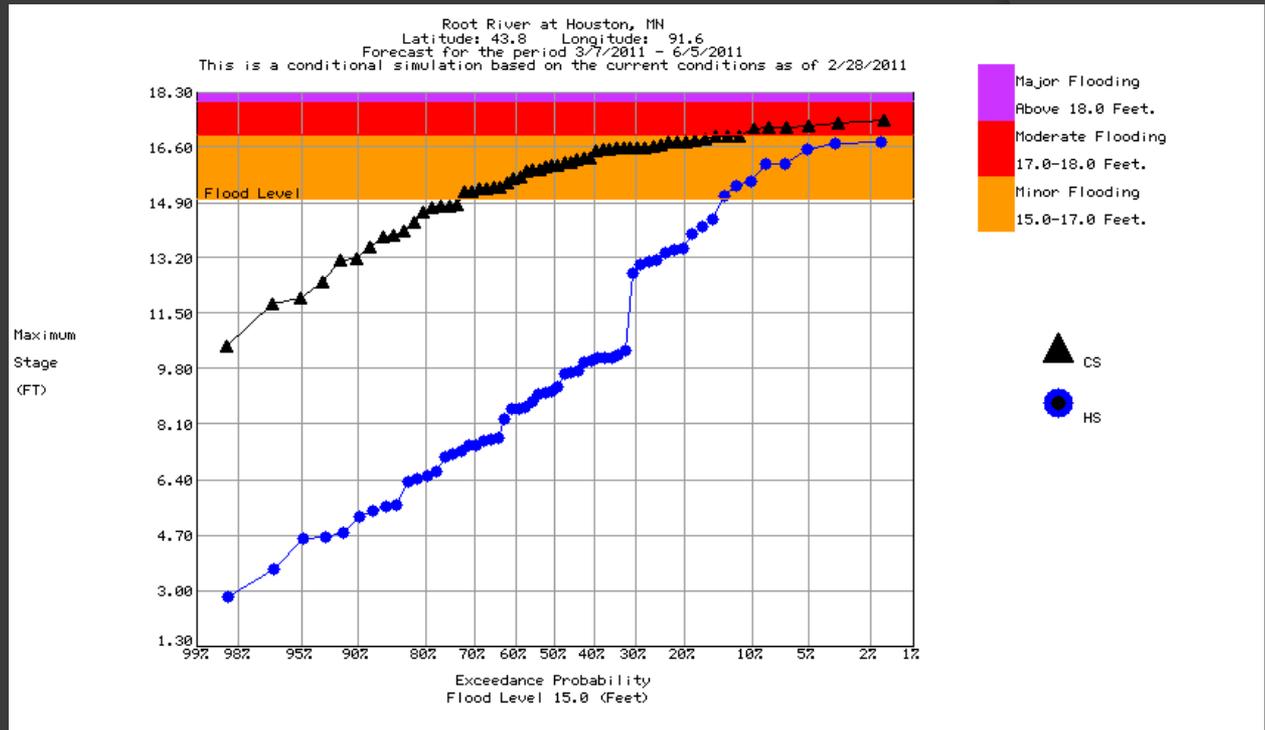
### Likelihood of Some Impacts

- 27% – **14 ft** – High water threatens “the flat” area and the ball field is flooding
- 44% – **12 ft** – The river begins to overflow the left bank downstream of the foot bridge



# Houston Root River

- 1965 level = 18.32 ft
- 2007 level = 18.15 ft
- 2000 level = 17.59 ft
- 2004 level = 16.56 ft



## Percent chance that the river will exceed various levels.

- Blue Line** – 60 year history of river stages for this period (Flood Climatology).
- Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 1% – **18 ft Major** Flood
- 9% – **17 ft Moderate** Flood
- 72% -- **15 ft Minor** Flood

### Likelihood of Some Impacts

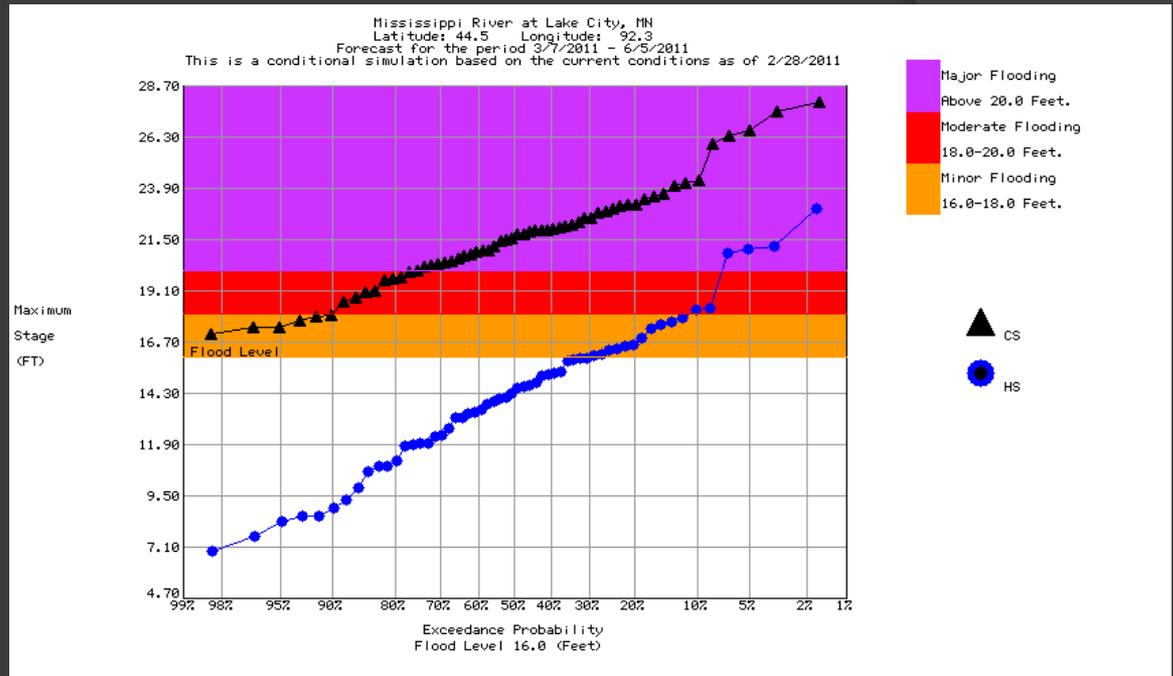
- <1% – **20 ft** – Water my top the protective levee
- 72% – **15 ft** – Minor lowland flooding near the river occurs

# Mississippi River System



# Lake City Mississippi River

1965 level = 22.18 ft  
 1969 level = 20.20 ft  
 2001 level = 20.13 ft



## Percent chance that the river will exceed various levels.

**Blue Line** – 60 year history of river stages for this period (Flood Climatology).  
**Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 75% – 20 ft Major Flood
- 87% – 18 ft Moderate Flood
- >98% -- 16 ft Minor Flood

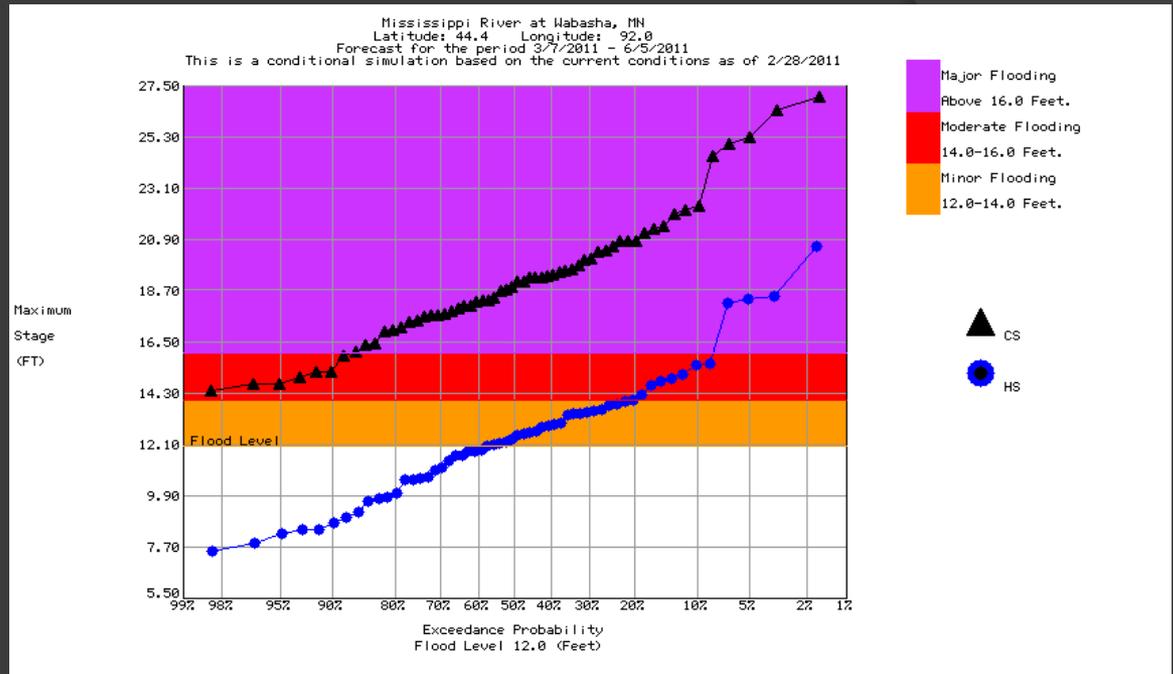
### Likelihood of Some Impacts

- 31%- 22.18 ft – **\*\* Flood of Record \*\***
- 39%- 21.9 ft – Water overtops the temporary dikes
- 75% – 20 ft – Sewer problems begin and the boat harbor overflows
- >98% – 16 ft – Minor lowland flooding occurs and some residential sections near the river are evacuated



# Wabasha Mississippi River

1965 level = 20.05 ft  
 2001 level = 18.22 ft  
 1969 level = 17.63 ft



## Percent chance that the river will exceed various levels.

**Blue Line** – 60 year history of river stages for this period (Flood Climatology).  
**Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 86% – **16 ft Major Flood**
- >98% – **14 ft Moderate Flood**
- >98% – **12 ft Minor Flood**

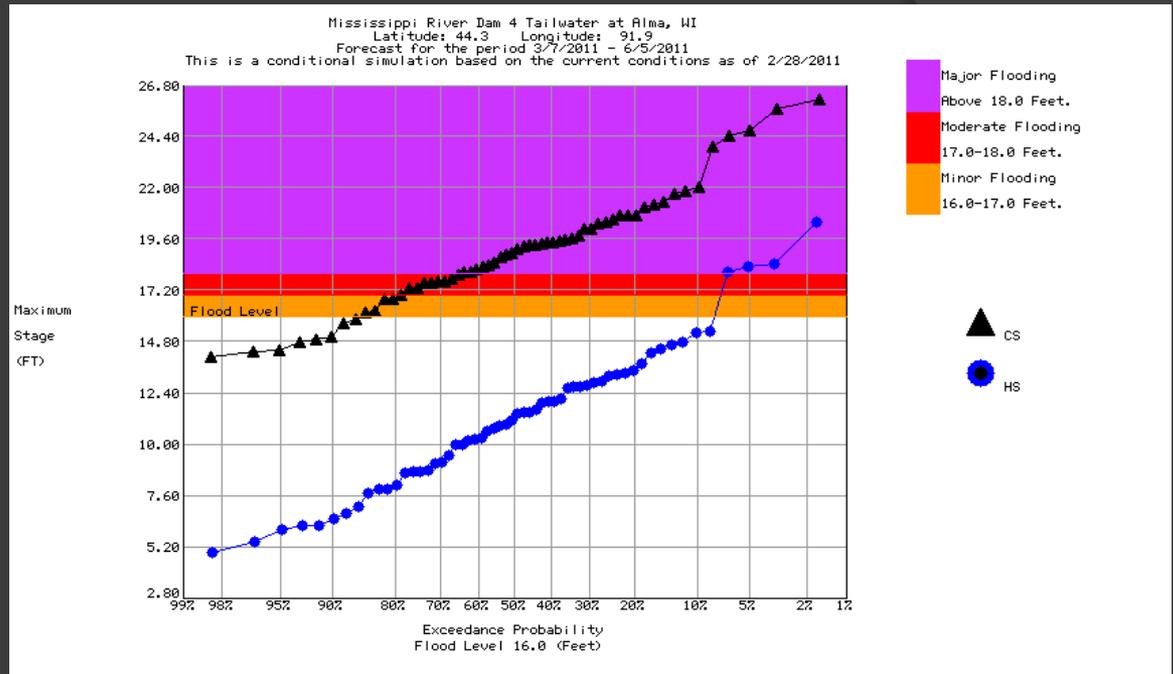
### Likelihood of Some Impacts

- 30% - **20.05 ft – \*\* Flood of Record \*\***
- 31% -- **20 ft** – Dairyland Power Cooperative plant may become inoperative
- 86% -- **16 ft** – Pumping operations along the riverside are underway. Railroad tracks may be flooded.
- >98% – **14 ft** – Water begins to go over Highway 60. Wisconsin Highway 35 between Maiden Rock and Stockholm may flood
- >98% – **13 ft** – Flooding occurs along Hiawatha Ave and Lawrence Blvd. Railroad underpass for Hwy 60 may be flooded.



# L&D 4 Alma Mississippi River

- 1965 level = 19.78 ft
- 2001 level = 18.15 ft
- 1969 level = 17.53 ft
- 1997 level = 15.60 ft



## Percent chance that the river will exceed various levels.

**Blue Line** – 60 year history of river stages for this period (Flood Climatology).  
**Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 63% – **18 ft Major Flood**
- 77% – **17 ft Moderate Flood**
- 85% -- **16 ft Minor Flood**

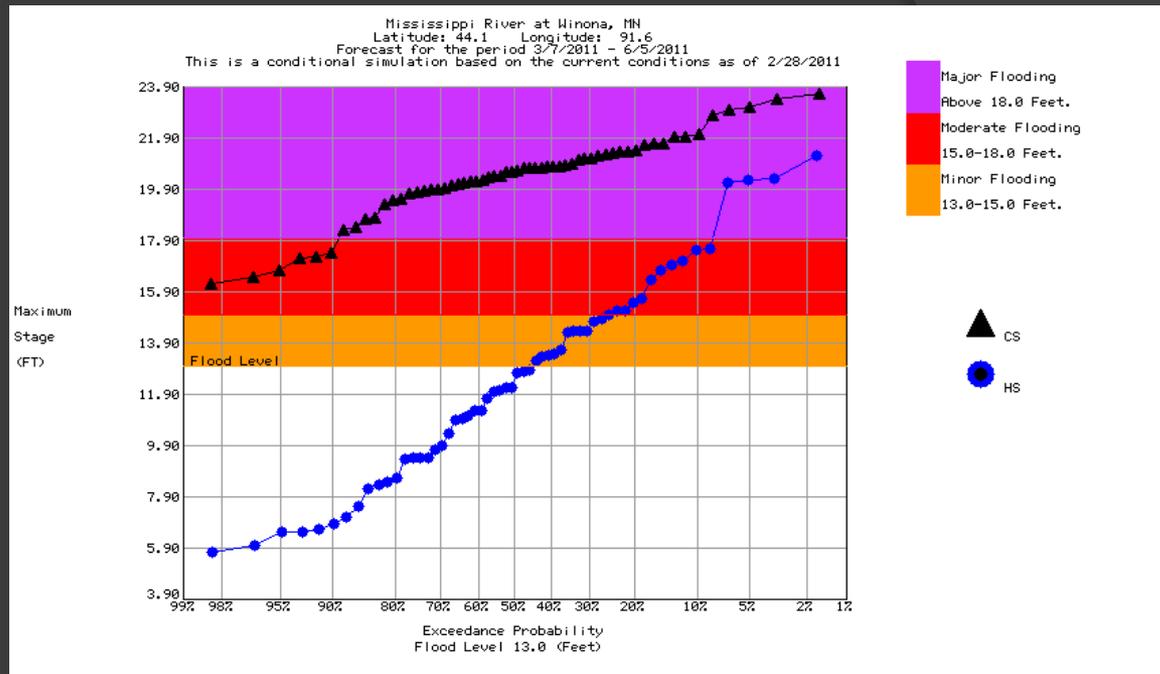
### Likelihood of Some Impacts

- 31% – **20 ft** – Water reaches the top of the protective dikes
- 33%- **19.78 ft** – **\*\* Flood of Record \*\***
- 82% – **16.5 ft** – Agricultural and recreational land is flooded
- 85% – **16 ft** – Lock & Dam goes out of operation and gates under water



# Winona Mississippi River

1965 level = 20.77 ft  
 2001 level = 20.07 ft  
 1969 level = 19.44 ft  
 1997 level = 18.27 ft



## Percent chance that the river will exceed various levels.

**Blue Line** – 60 year history of river stages for this period (Flood Climatology).

**Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 88% - **18 ft Major Flood**
- >95% - **15 ft Moderate Flood**
- >98% - **13 ft Minor Flood**

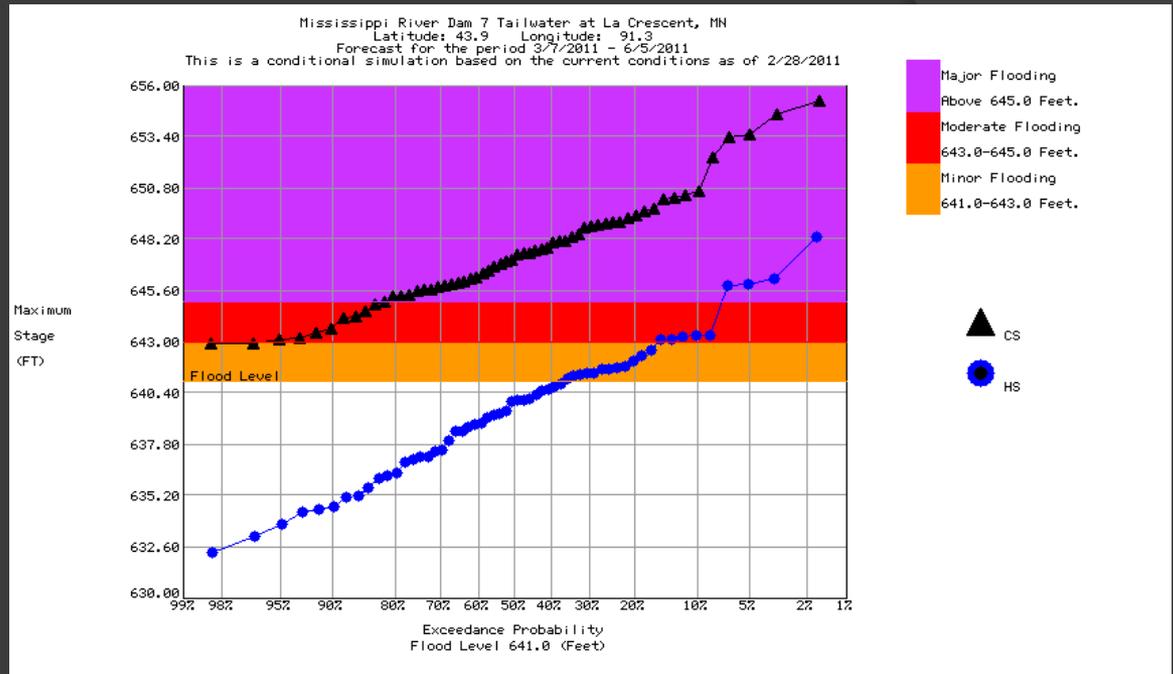
### Likelihood of Some Impacts

- 1% - **24 ft** – Water may overtop the downtown levee
- 9% - **22 ft** – Water reaches the designed dike protection level
- 39% - **20.77 ft** – **\*\* Flood of Record \*\***
- 90% - **17 ft** – Some railroad lines go under water.



# L&D 7 La Crescent Mississippi River

- 1965 level = 647.48 ft
- 2001 level = 645.20 ft
- 1969 level = 644.87 ft
- 1997 level = 643.76 ft



## Percent chance that the river will exceed various levels.

**Blue Line** – 60 year history of river stages for this period (Flood Climatology).  
**Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 82% – 645 ft Major Flood
- 95% – 643 ft Moderate Flood
- >98% -- 641 ft Minor Flood

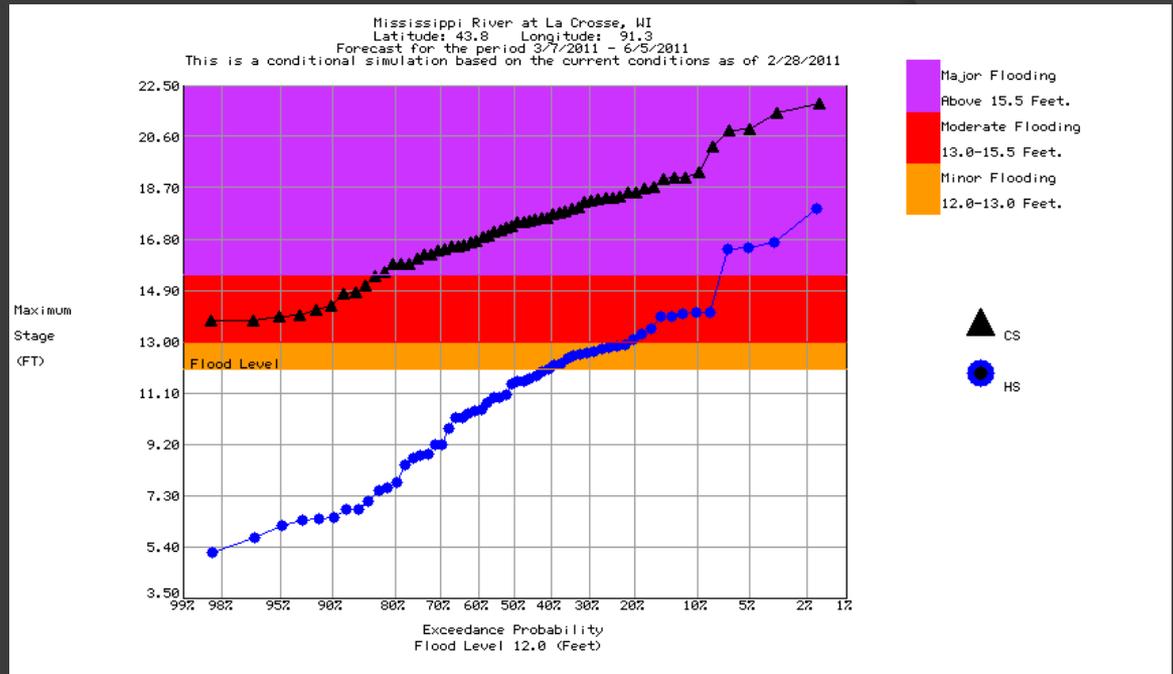
### Likelihood of Some Impacts

- 10% – 649 ft – Water begins to go over the protective earthen dikes
- 42% – 647.48 ft – **\*\* Flood of Record \*\***
- 61% – 646 ft – Lock & Dam goes out of operation



# La Crosse Mississippi River

1965 level = 17.90 ft  
 2001 level = 16.41 ft  
 1969 level = 15.70 ft  
 1997 level = 15.01 ft



## Percent chance that the river will exceed various levels.

**Blue Line** – 60 year history of river stages for this period (Flood Climatology).  
**Black** - Range of possible stages given current soil moisture and Snow pack

### Flood Stages

- 82% – **15.5 ft Major Flood**
- >98% – **13 ft Moderate Flood**
- >98% – **12 ft Minor Flood**

### Likelihood of Some Impacts

- 36% -- **17.9 ft** – **\*\* Flood of Record \*\***
- 64% – **16.5 ft** – Road Closures at Rose St. near I-90 and the eastbound exit of I-90. Riverside Park is flooded
- 93% – **14 ft** – Flooding impacts homes in Shore Acres and along Bainbridge Street on French Island. Water goes into ball fields at Copeland Park and is over the road at Houska Park near the water treatment plant
- >98% – **13 ft** – Access road to Shore Acres is impacted by flooding
- >98% – **12 ft** – Pettibone Campground and RV Park is flooded

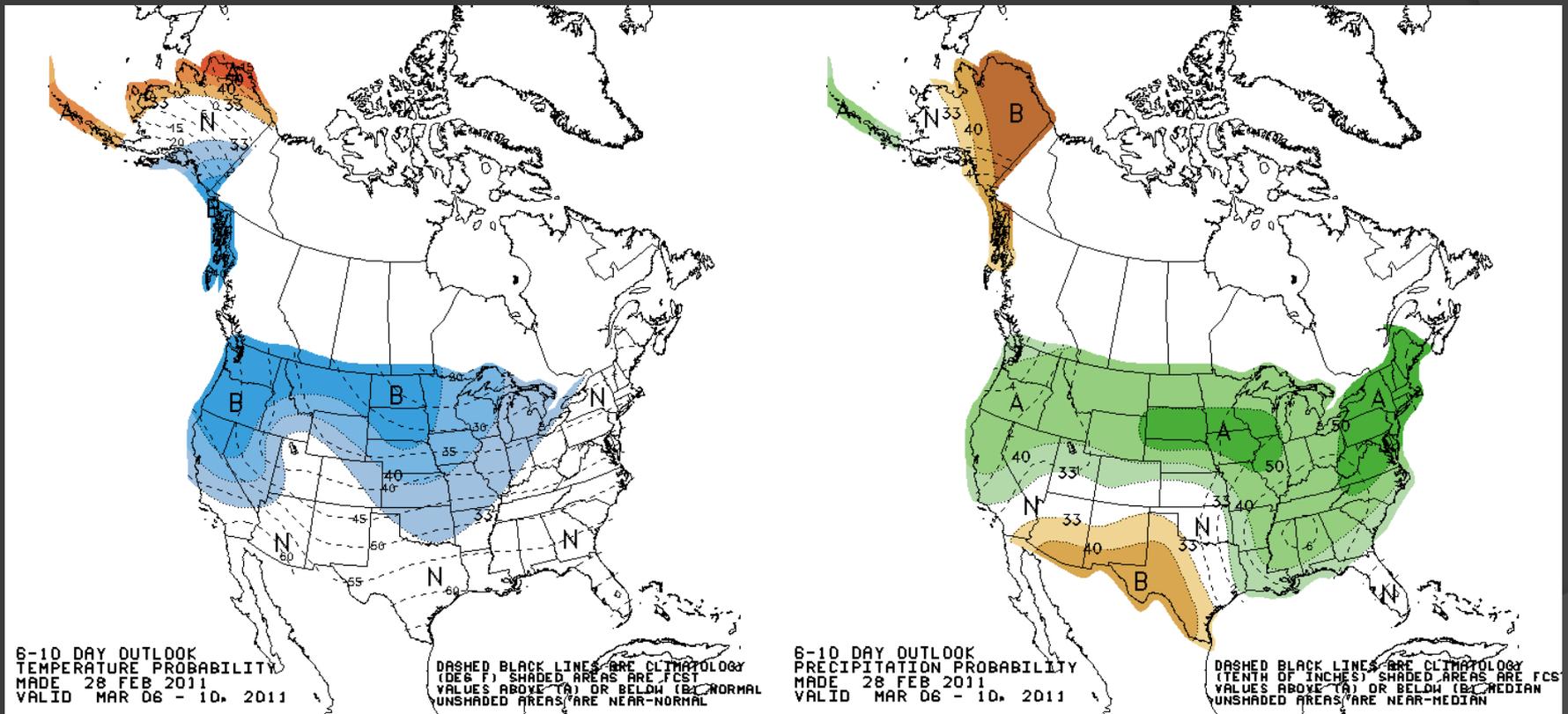
# Other Factors that Will Impact The Spring Flood

- Additional precipitation which occurs prior to the melt?
- Type of Melt
  - Slow (optimal)
    - little to no rain/snow and dryer Relative Humidity.
    - temperatures – highs mid 30s to lower 40s, overnight lows 20's(or colder)
  - Rapid (increases flooding threat)
    - Rain on snow increases melt rate and adds more water to the situation.
    - Temperatures – Highs mid 40s and warmer, lows around 30 and warmer (Colder overnight lows slows down or shuts off the melting process)

*...HOWEVER...*

*A delayed thaw increases the possibility of a faster melt and the likelihood that a rain on snow event would occur.*

# 6-10 Day Outlook



Temperatures

Precipitation

# Summary

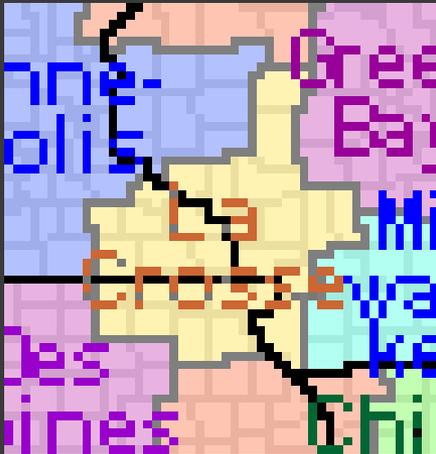
*Ingredients are there for the possibility of flooding this spring, ESPECIALLY along the Mississippi.*

## Spring Flood Outlook Updates:

- March 3<sup>rd</sup>
- March 10<sup>th</sup> & March 24<sup>th</sup>

*(If the melt has not already started and deterministic or hydrograph forecasts are not already being issued.)*

# Contact Information



**Mike Welvaert**  
**NWS La Crosse**  
**(608) 784-8275 ext 493**  
**[Mike.Welvaert@noaa.gov](mailto:Mike.Welvaert@noaa.gov)**

# Links

<b>NWS WebPages</b>	<a href="http://www.weather.gov">www.weather.gov</a>
<b>RSS Feed</b>	<a href="http://www.weather.gov/rss/">http://www.weather.gov/rss/</a>
<b>River Information</b>	<a href="http://www.weather.gov/ahps/">http://www.weather.gov/ahps/</a>
<b>New Radar</b>	<a href="http://radar.srh.noaa.gov/">http://radar.srh.noaa.gov/</a>
<b>Radar</b>	<a href="http://www.weather.gov/radar_tab.php">http://www.weather.gov/radar_tab.php</a>
<b>Precipitation Information (National - 24 hour data.)</b>	<a href="http://water.weather.gov/">http://water.weather.gov/</a>
<b>Precipitation Information (East of Rockies – Near Real-time hourly data)</b>	<a href="http://www.srh.noaa.gov/ridge2/RFC_Precip">http://www.srh.noaa.gov/ridge2/RFC_Precip</a>
<b>Mobile/Cell phone</b>	<a href="http://www.srh.noaa.gov/cte.htm">http://www.srh.noaa.gov/cte.htm</a>
<b>Services NWSChat</b>	<a href="https://nwschat.weather.gov/">https://nwschat.weather.gov/</a>



**NCRFC**

<http://www.facebook.com/pages/NOAA-NWS-North-Central-River-Forecast-Center/111945998874873?v=wall>

# Appendix A:

*Where to find the Probabilistic  
Outlooks on NWS Web pages.*

# Finding the Probabilistic River Outlooks

City, ST  Go

choose a specific point or river to get the details for that location.

Weather Forecast Office Twin Cities/Chanhassen, MN

River Observations River Forecasts Within 48 Hours Precipitation Download

02/04/2010 09:15 AM CST

Map Legend

- Hydrograph Available
- Probability and Hydrograph Available
- Major Flooding
- Moderate Flooding
- Minor Flooding
- Near Flood Stage
- No Flooding
- Observation More Than 24 Hours Old
- Out of Service

83 Total Gauges Zero Locations In Flood

1) From the “*Rivers and Lakes Tab Page,*” Click on one of the River Forecast points of interests (the Circles)

2) From the “*Hydrograph Page,*” Select either the “*Weekly Chance of Exceeding Levels*” or “*chance of Exceeding Levels in an Entire Period.*”

Home News Organization Search for:  NWS

Weather Forecast Office Twin Cities/Chanhassen, MN North Central River Forecast Center

Hydrograph River at a Glance Download **Weekly Chance of Exceeding Levels** **Chance of Exceeding Levels During Entire Period**

**MINNESOTA RIVER AT SAVAGE**

Universal Time (UTC)

12Z Feb 1	12Z Feb 2	12Z Feb 3	12Z Feb 4	12Z Feb 5	12Z Feb 6	12Z Feb 7	12Z Feb 8	12Z Feb 9	12Z Feb 10	12Z Feb 11
694										
693										
692										
691										
690										
689										
688										

Stage (ft) Flow (kcs)

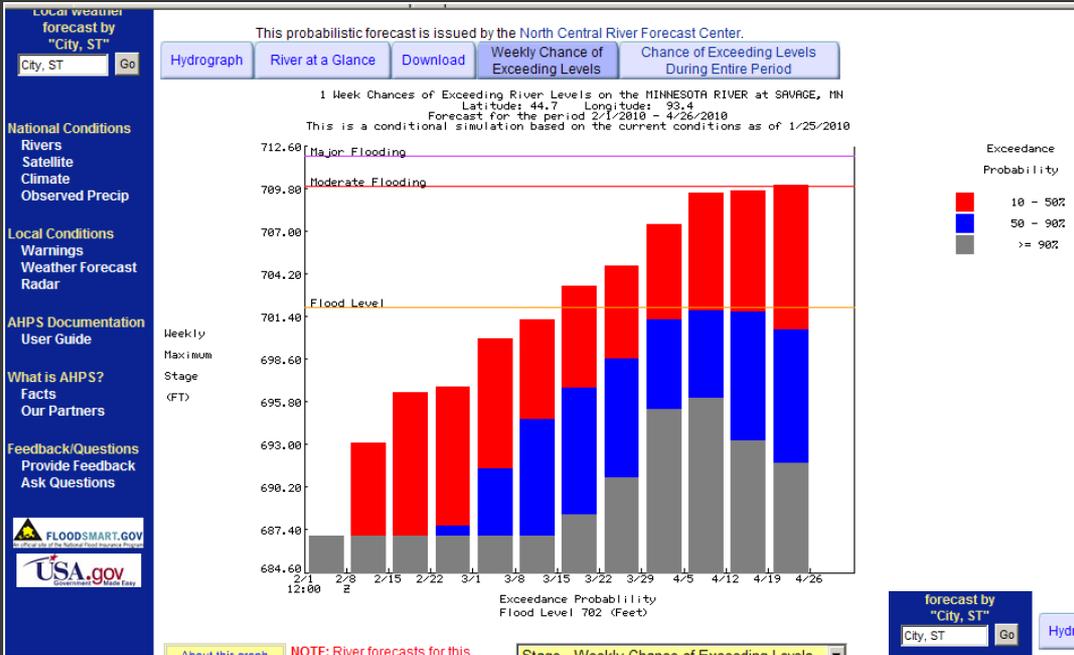
688.8 ft

Latest observed value: 688.71 ft at 10:00 AM CST 4-Feb-2010. Flood Stage is 702.0 ft.

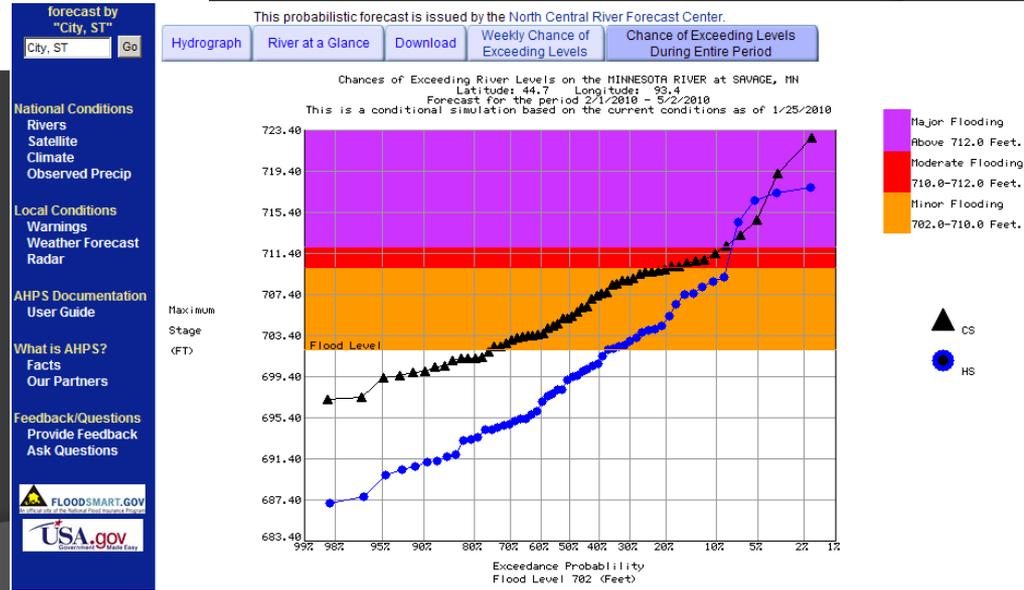
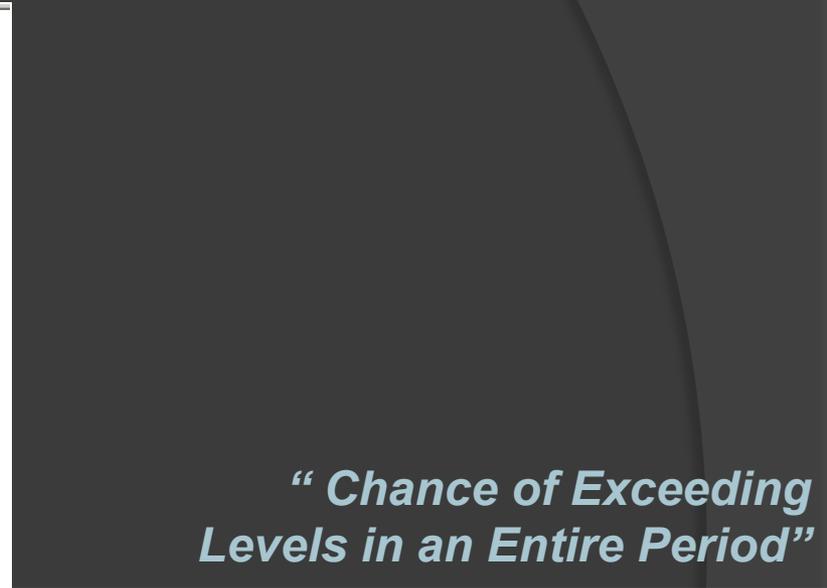
Site Time (CST)

Printable Image NOTE: River forecasts for this location take into Default Hydrograph

# Finding the Probabilistic River Outlooks



*“Weekly Chance of Exceeding Levels”*



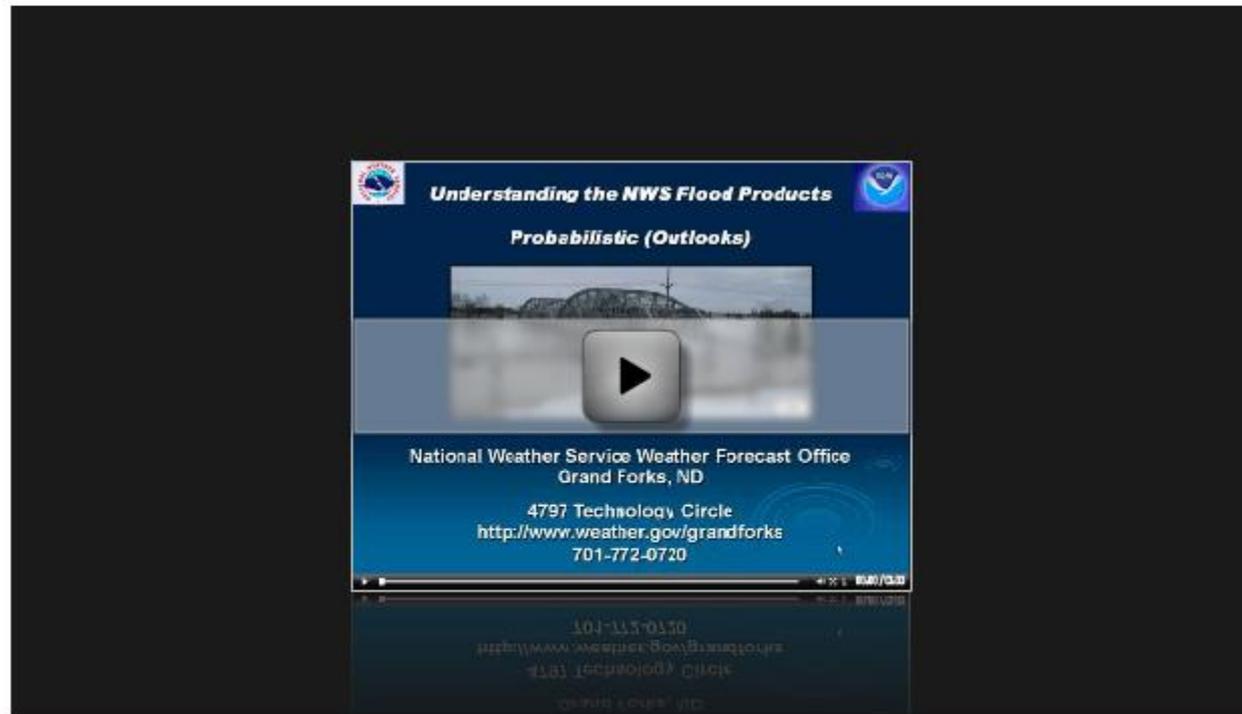
# Appendix B:

## *How to Read the Probabilistic Graphics.*

# Understanding River Flood Outlooks Video Tutorial

## NWS Probabilistic Flood Outlook Tutorial

This briefing uses the Flash Player from [Macromedia/Adobe](http://www.adobe.com).  
You can [download the Flash Player](#) for free.



[http://test.crh.noaa.gov/fgf/?n=webinar\\_probabilistic\\_outlook](http://test.crh.noaa.gov/fgf/?n=webinar_probabilistic_outlook)

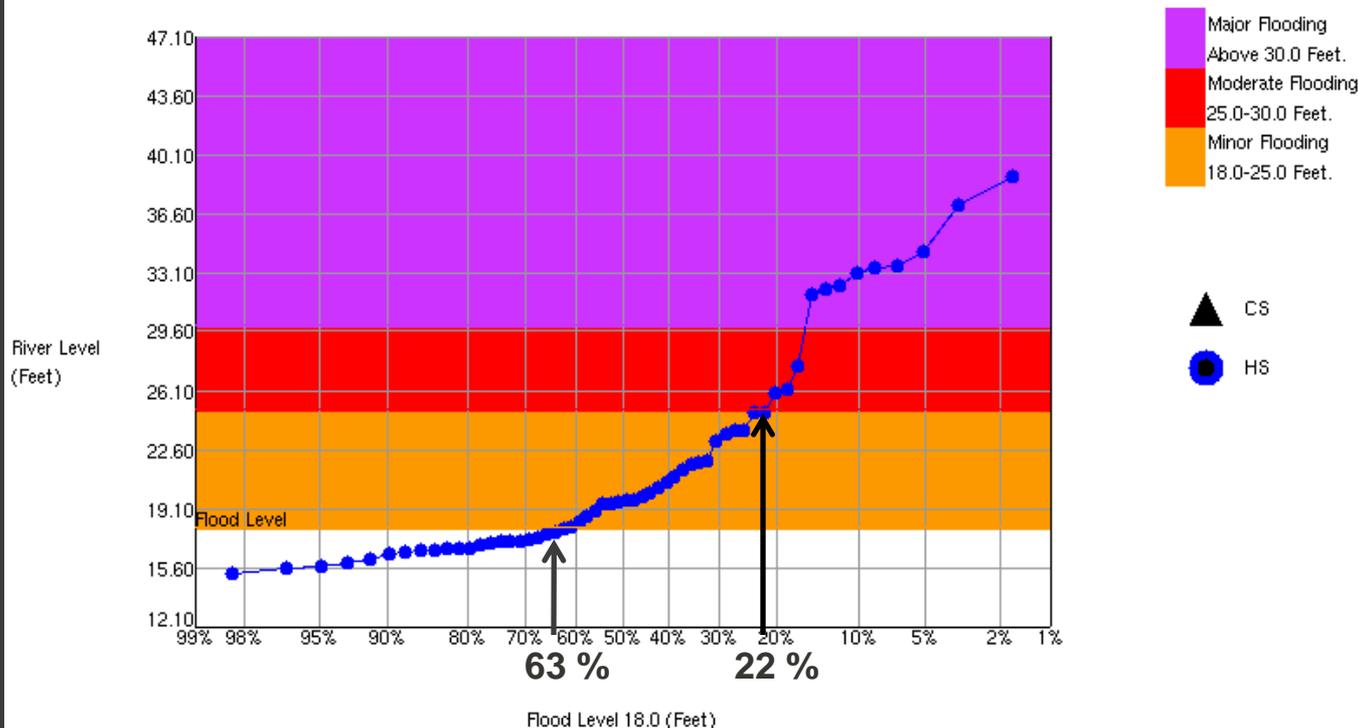
# “Normal” Flood Risk

Chances of Exceeding River Levels on the RED R at FARGO ND

Latitude: 46.5 Longitude: 96.7

Forecast for the period 2/3/2010 - 5/1/2010

This is a conditional simulation based on the current conditions as of 1/27/2010



- The blue line can be considered “the normal” for the risk of flooding or Flood Climatology.

- Fargo reaches Minor Flood stage 63% of the time or the 37.8 out of the last 60 years.

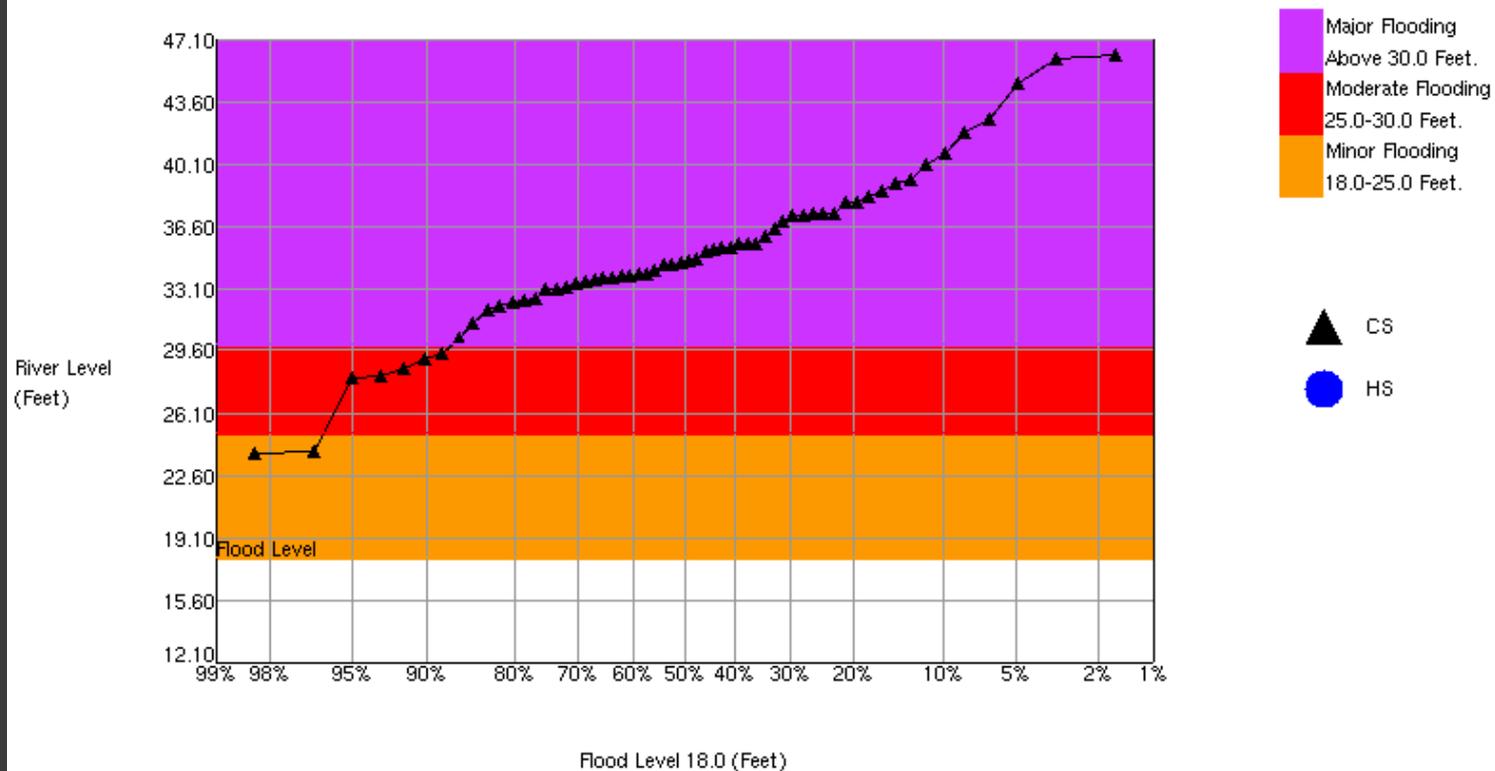
- Moderate flood stage 22% if the time or 13.2 of the past 60 years.

# “Conditional” Flood Risk

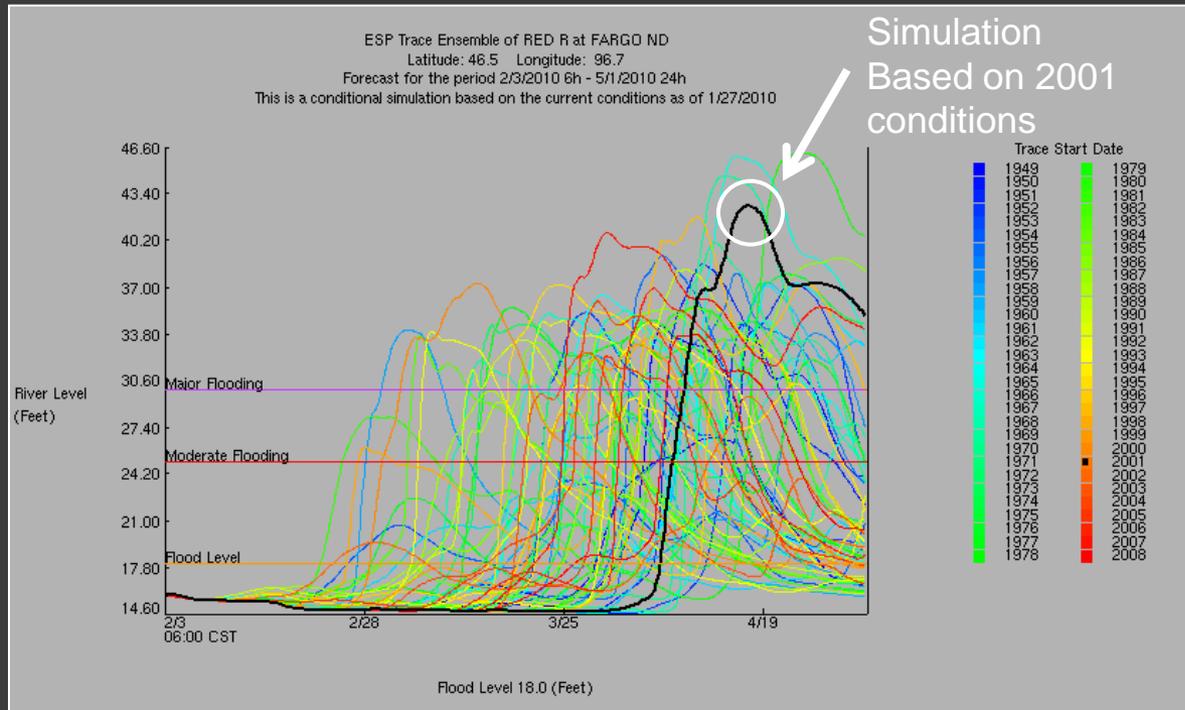


*Outlooks based on the current soil moisture and snowpack.*

Chances of Exceeding River Levels on the RED R at FARGO ND  
Latitude: 46.5 Longitude: 96.7  
Forecast for the period 2/3/2010 - 5/1/2010  
This is a conditional simulation based on the current conditions as of 1/27/2010



# Condition Traces (CS)

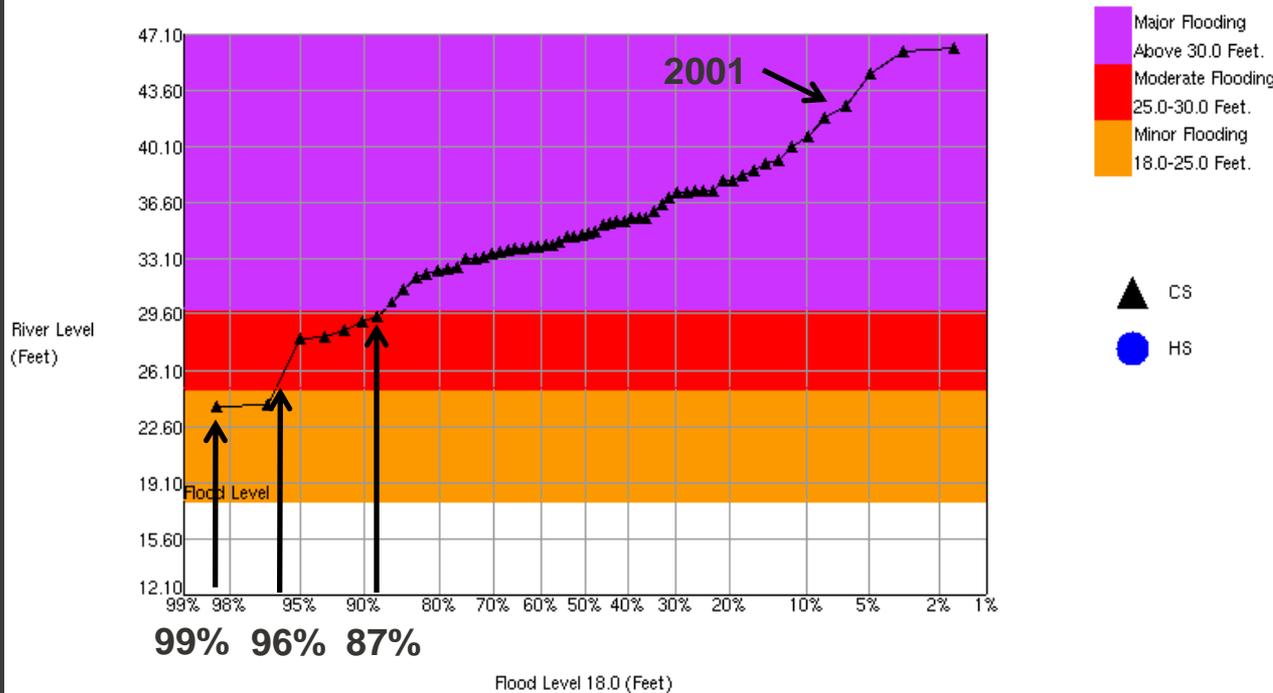


- 60 years of Temperature and Precipitation information included. (1949 – 2008)
- Each line represents what a flood this year may look like if the temperatures and Precipitation in Feb, Mar and April were the same as XX year.
- For example, the simulation highlighted used “current” snow and soil moisture as of 1/27 and the “2001 repeat “of temperatures and precipitation for Feb through April, a crest of around 42ft would be possible.

# “Conditional” Flood Risk



Chances of Exceeding River Levels on the RED R at FARGO ND  
Latitude: 46.5 Longitude: 96.7  
Forecast for the period 2/3/2010 - 5/1/2010  
This is a conditional simulation based on the current conditions as of 1/27/2010



- As of 1/27, Fargo had a 99% confidence to reach/exceed Minor Flood .

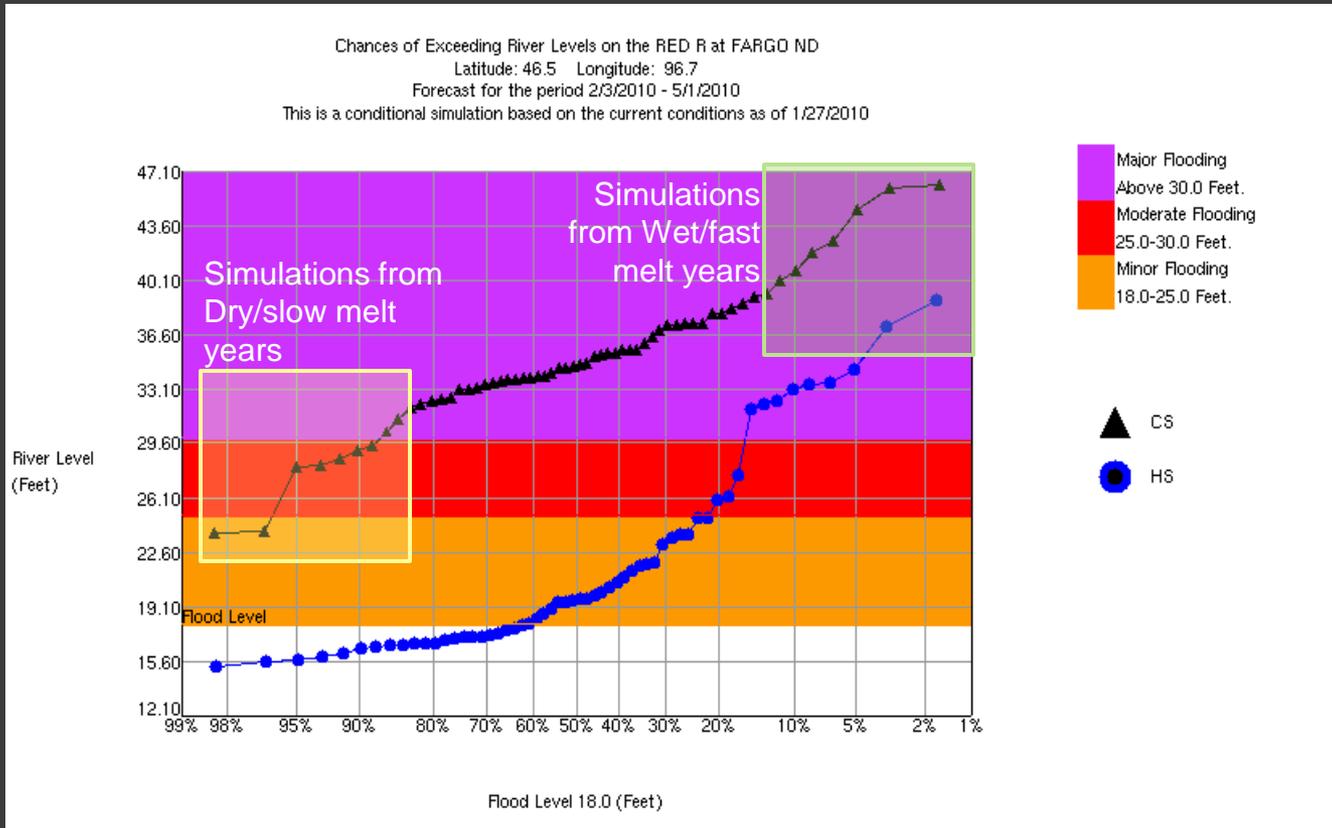
- 96% confidence to reach Moderate Flood.

- 87% confidence to reach Major Flood

- The 2001 what if scenario is the 4<sup>th</sup> highest crest.

**Black line plot of all the “peaks” from the “what if” scenarios based on the past 60 years.**

# Flood Risk



- Rule of thumb – when the Black line is to the Left of the blue, Much above normal flooding Risk.

- Historically the dryer and or slower melt years are driving the “higher” CS probabilities.

- Historically the wetter and faster melt years are driving the “lower” CS probabilities.

Combined plot of the “Normal or Historical Simulation (HS)” and the Conditional Simulation (CS) or outlook based on the current soil moisture and snow pack.