Missouri River Mainstem Reservoir System

2011 Flood Regulation and Plans for 2012

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December 15 2011

US Army Corps of Engineers
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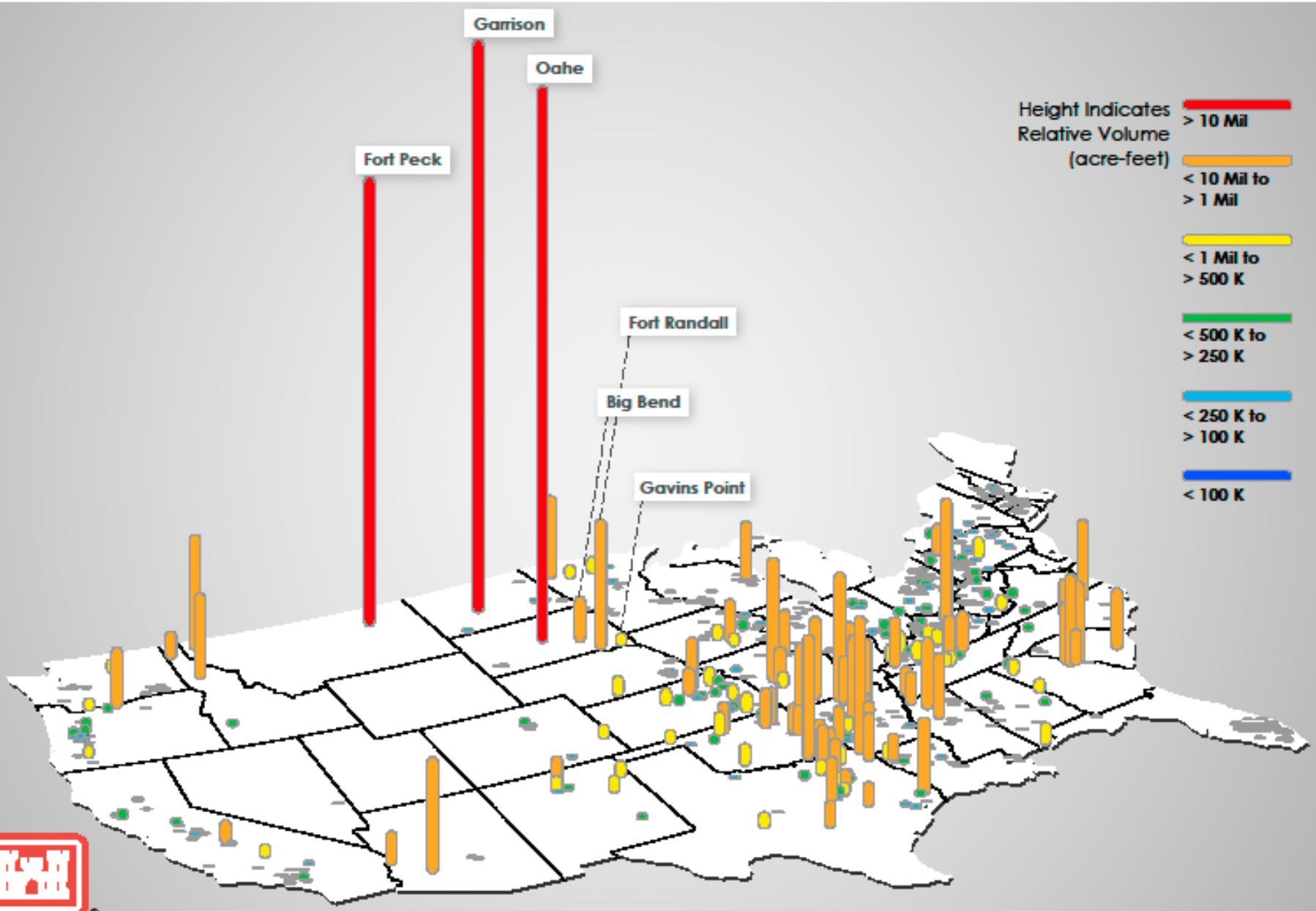
Missouri River Mainstem Reservoir System

Congressionally Authorized
Project Purposes

- Flood Control
- Navigation
- Hydropower
- Irrigation
- Recreation
- Water Supply
- Water Quality
- Fish and Wildlife
  (Including endangered species)

Storage Capacity of Corps Reservoirs



US Army Corps of Engineers
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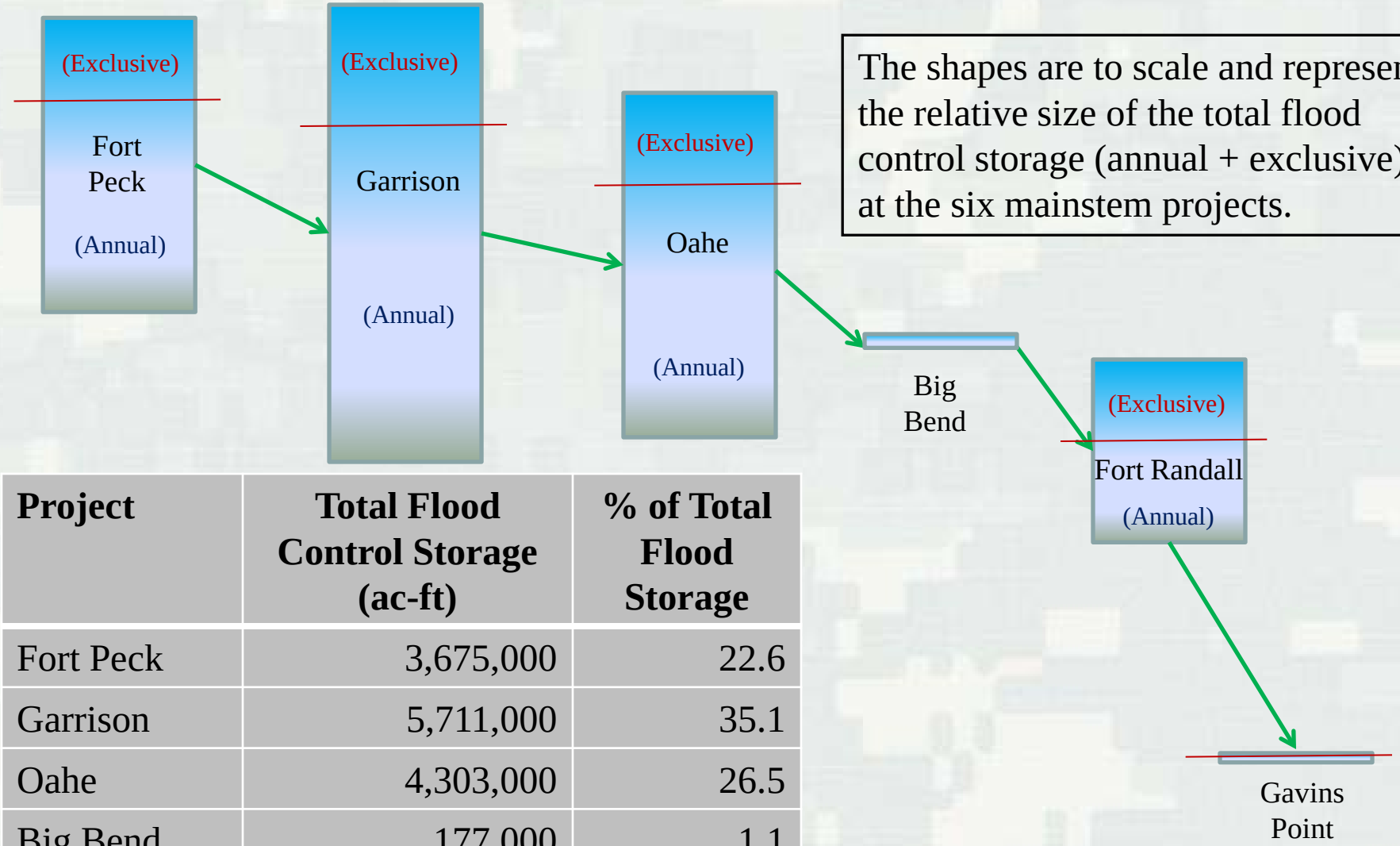
Prepared and Produced by the U.S. Army Corps of Engineers Omaha District 2010

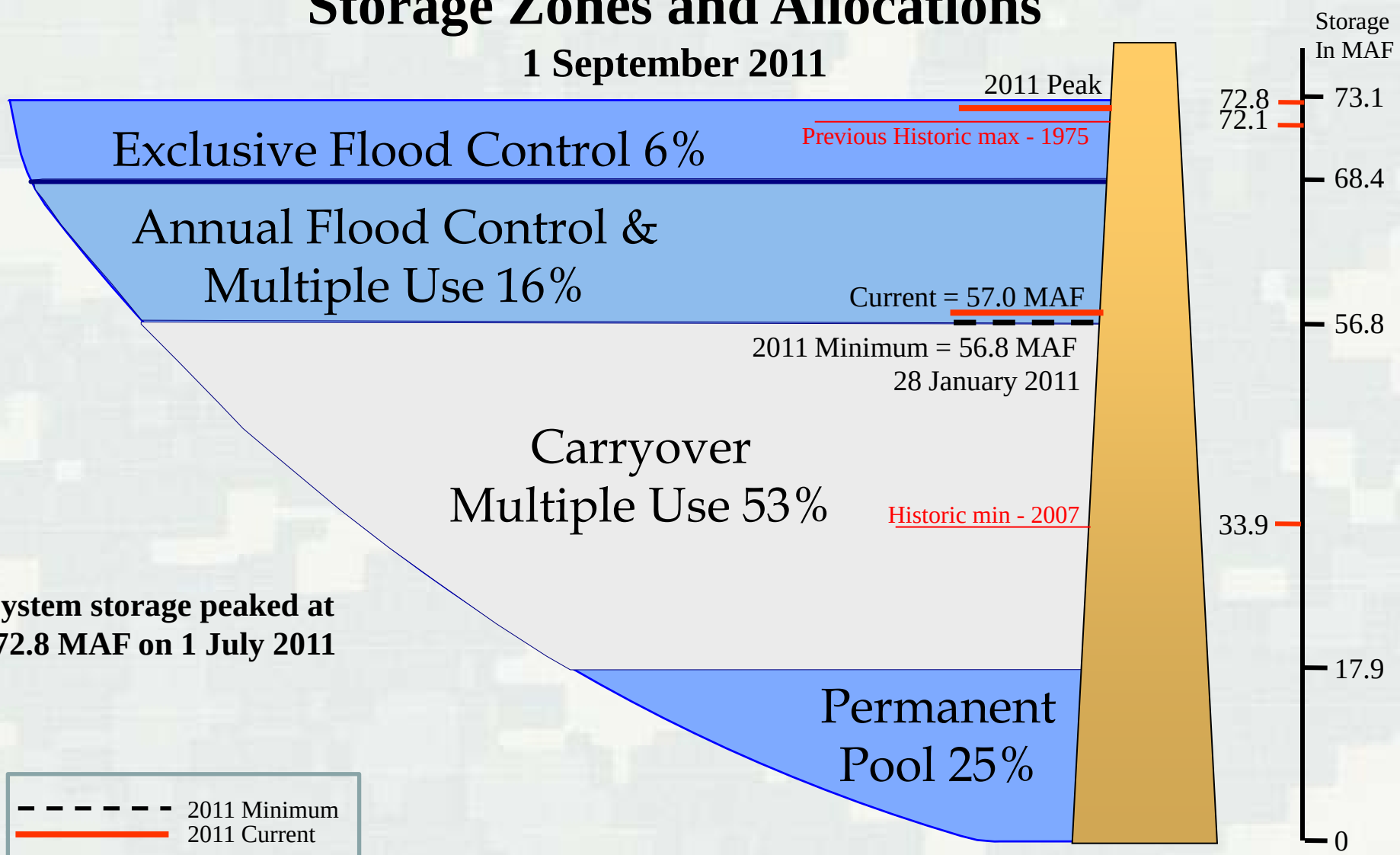
Flood Control Storage



The shapes are to scale and represent the relative size of the total flood control storage (annual + exclusive) at the six mainstem projects.

Project	Total Flood Control Storage (ac-ft)	% of Total Flood Storage
Fort Peck	3,675,000	22.6
Garrison	5,711,000	35.1
Oahe	4,303,000	26.5
Big Bend	177,000	1.1
Fort Randall	2,294,000	14.1
Gavins Point	108,000	0.7

Missouri River Mainstem System
Storage Zones and Allocations
1 September 2011

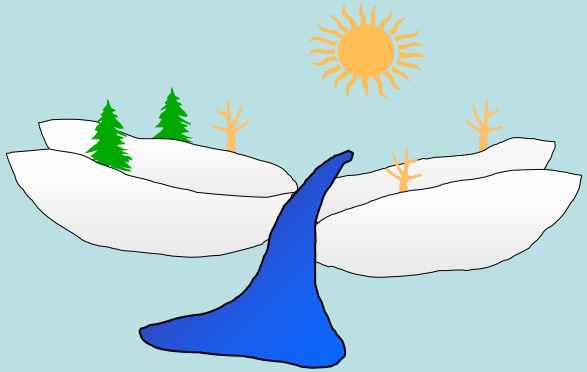


System storage peaked at 72.8 MAF on 1 July 2011

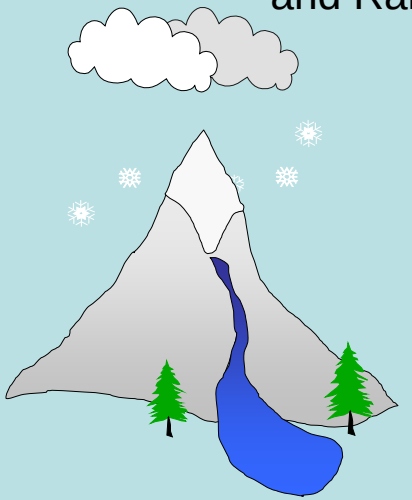
2011 Minimum
2011 Current

Runoff Components

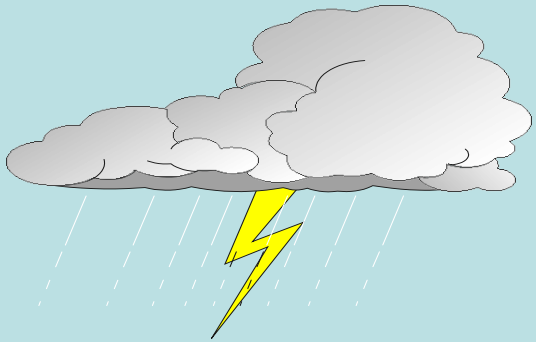
Plains Snowpack
and Rainfall



Mountain Snowpack
and Rainfall



Rainfall



March and April	May, June and July	March through October

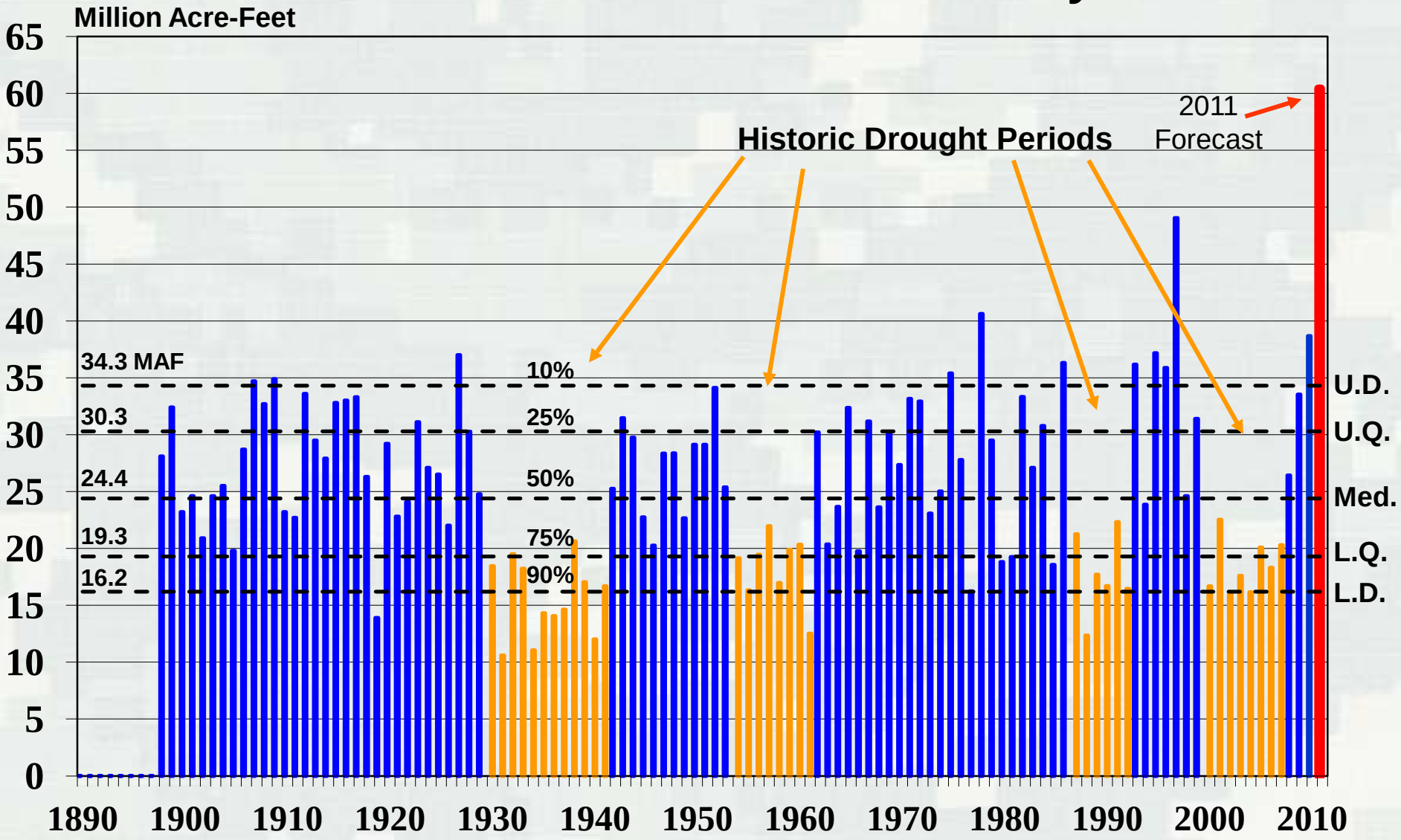
2011 Forecast* = 60.8 MAF

Highest runoff since 1898

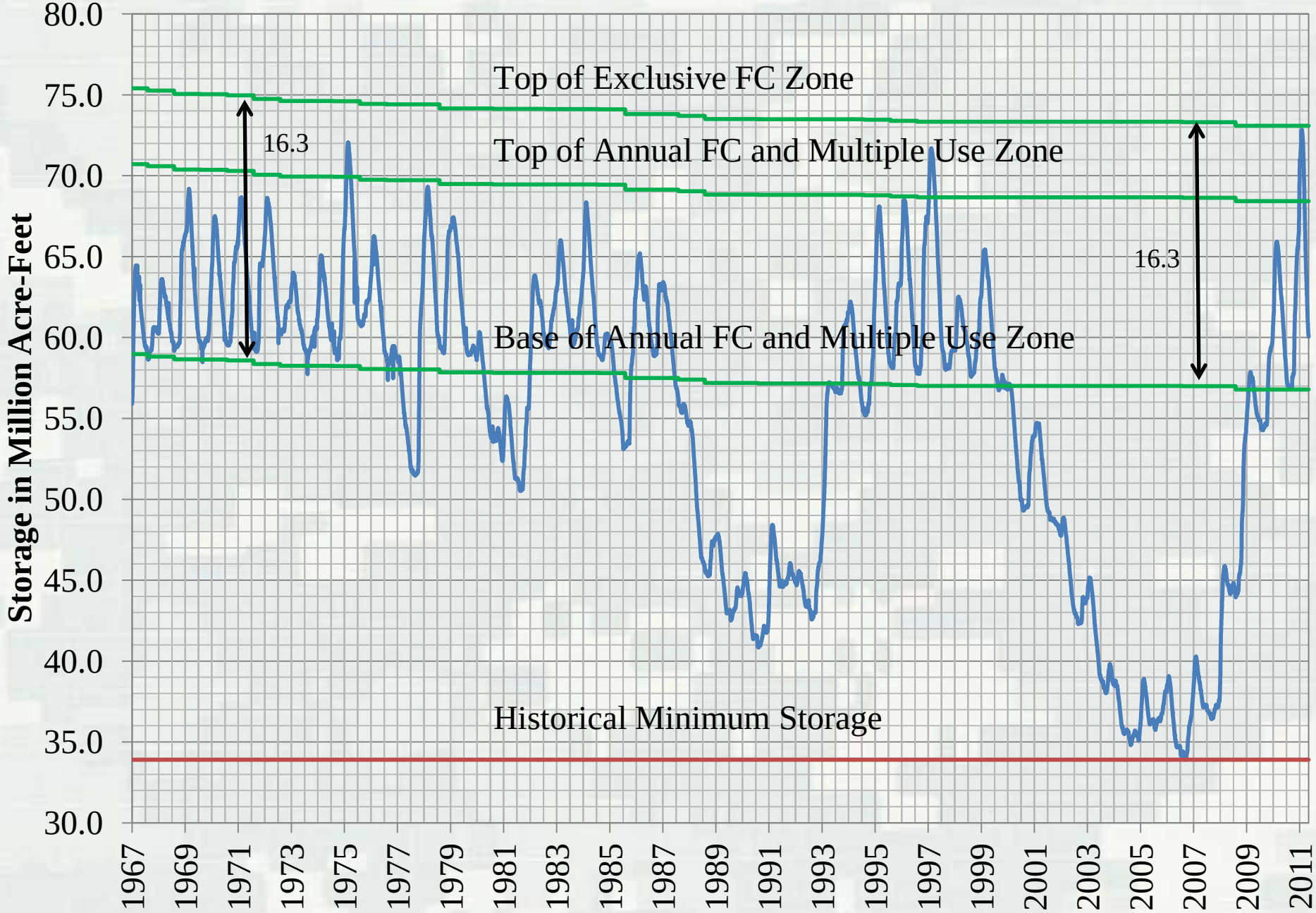
Previous Record was 49.0 MAF in 1997

* December 1 Forecast

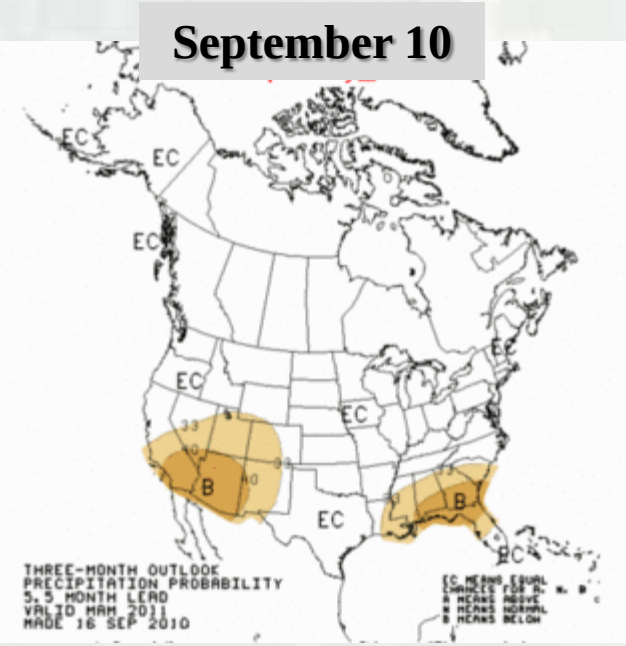
Missouri River Mainstem System
Annual Runoff above Sioux City, IA

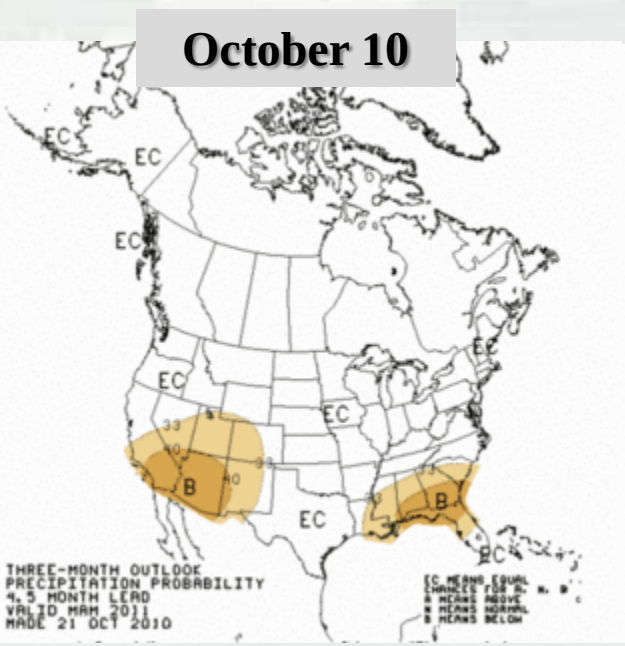


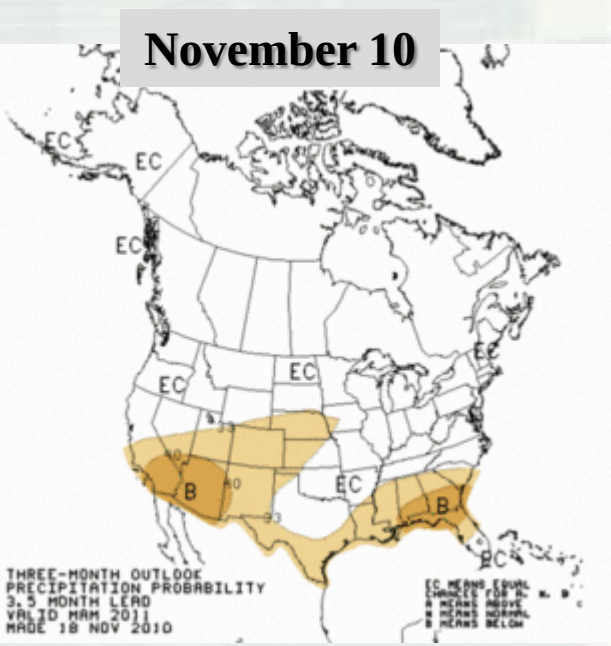
Missouri River Mainstem Reservoir System

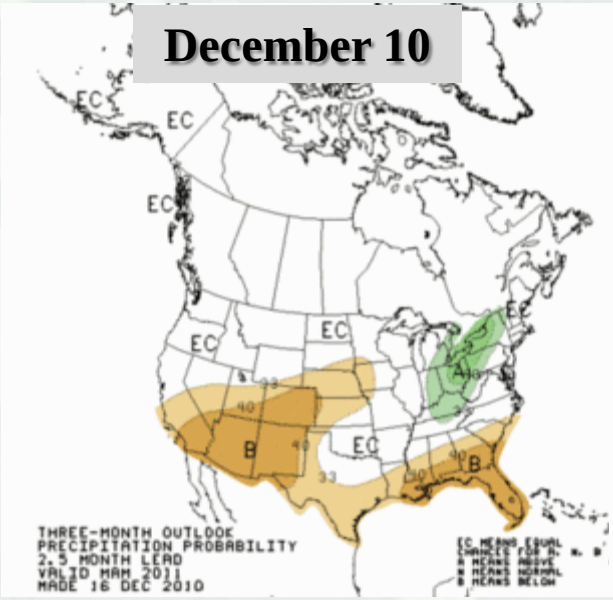


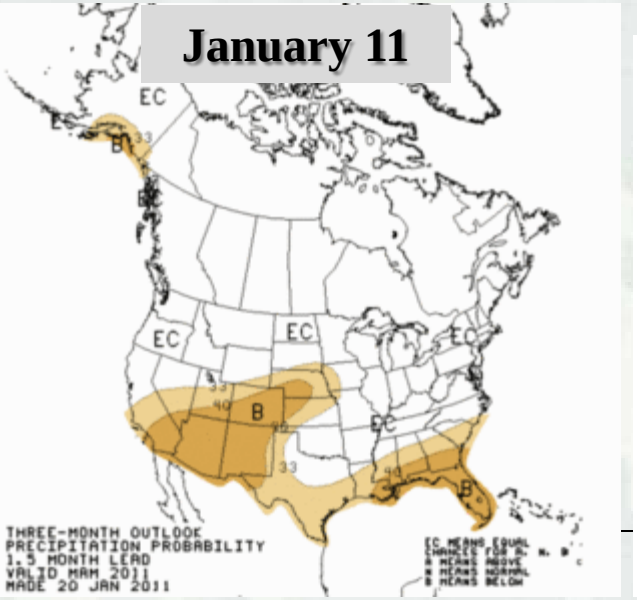
NOAA CPC Precipitation Forecast for MAM 2011

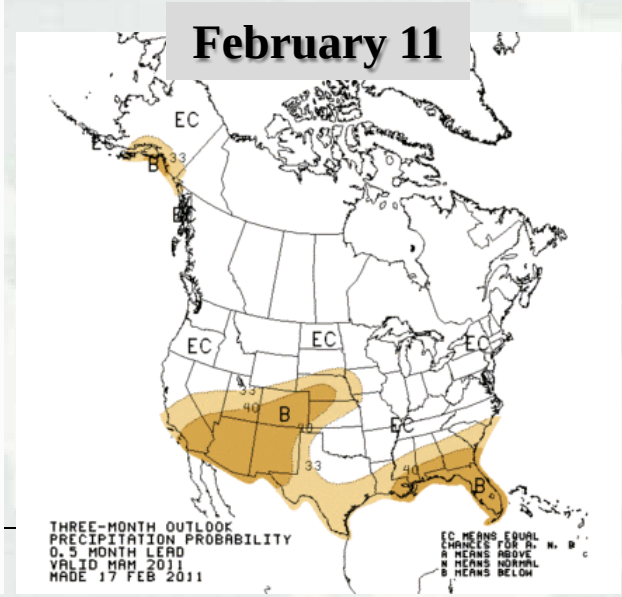






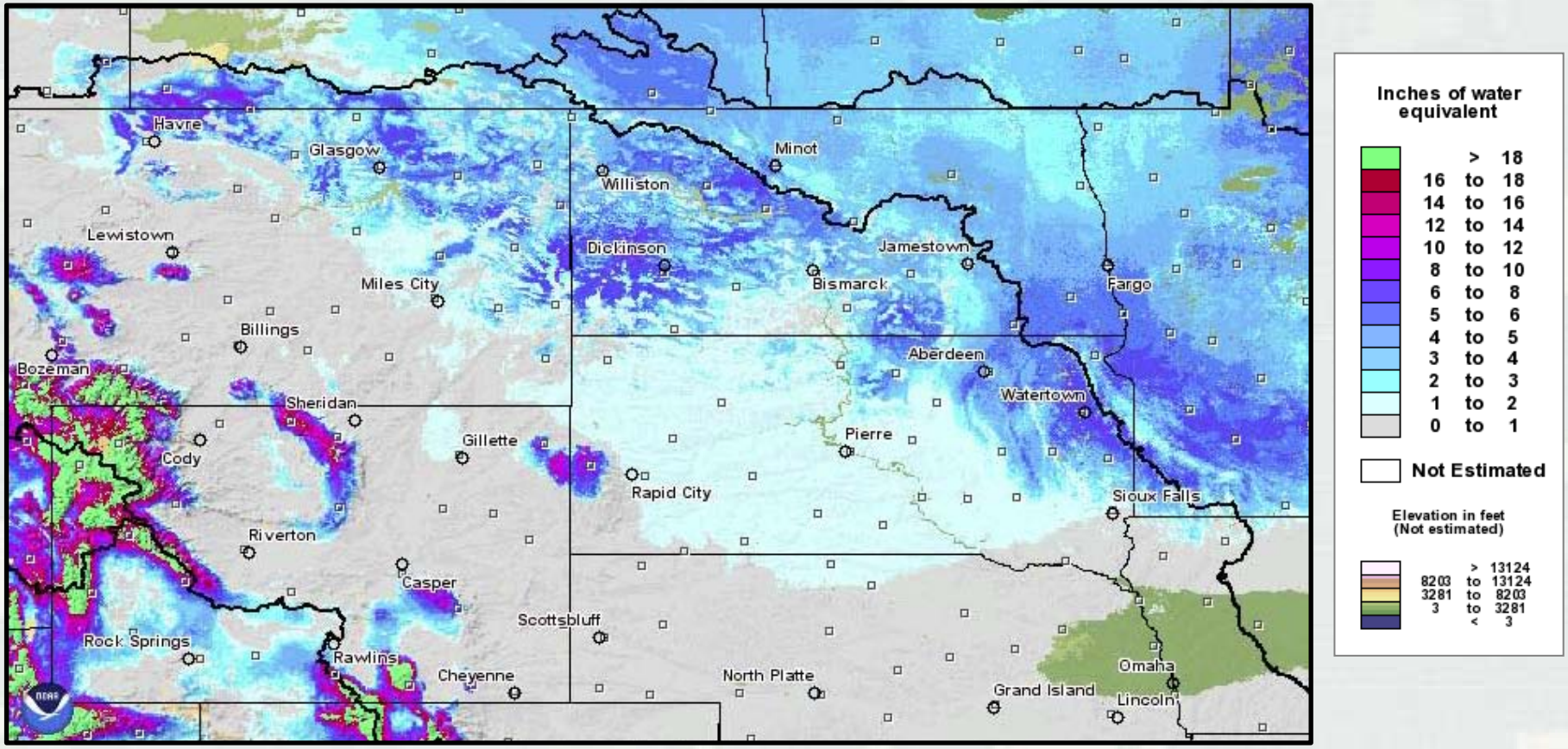






Plains Snowpack

25 February 2011



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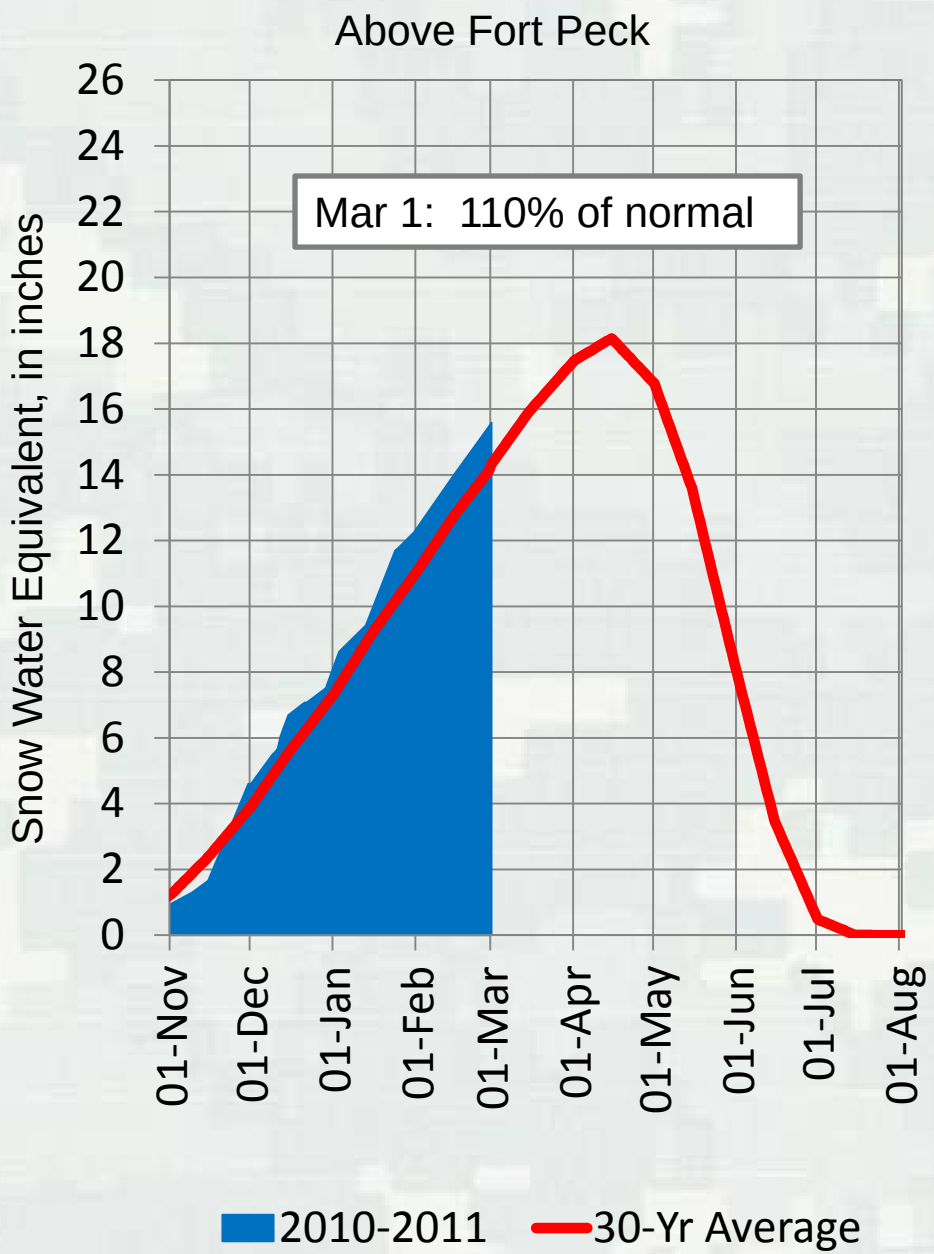
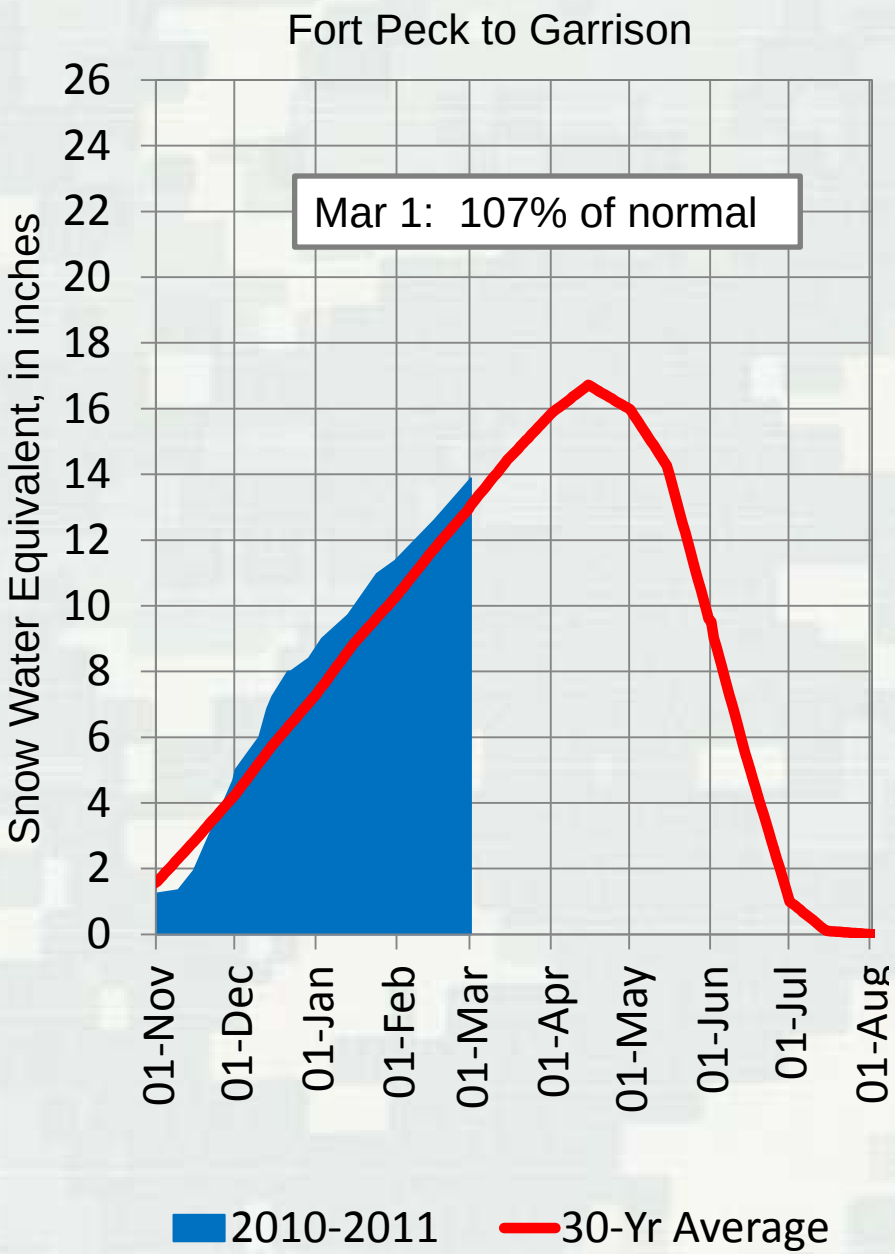
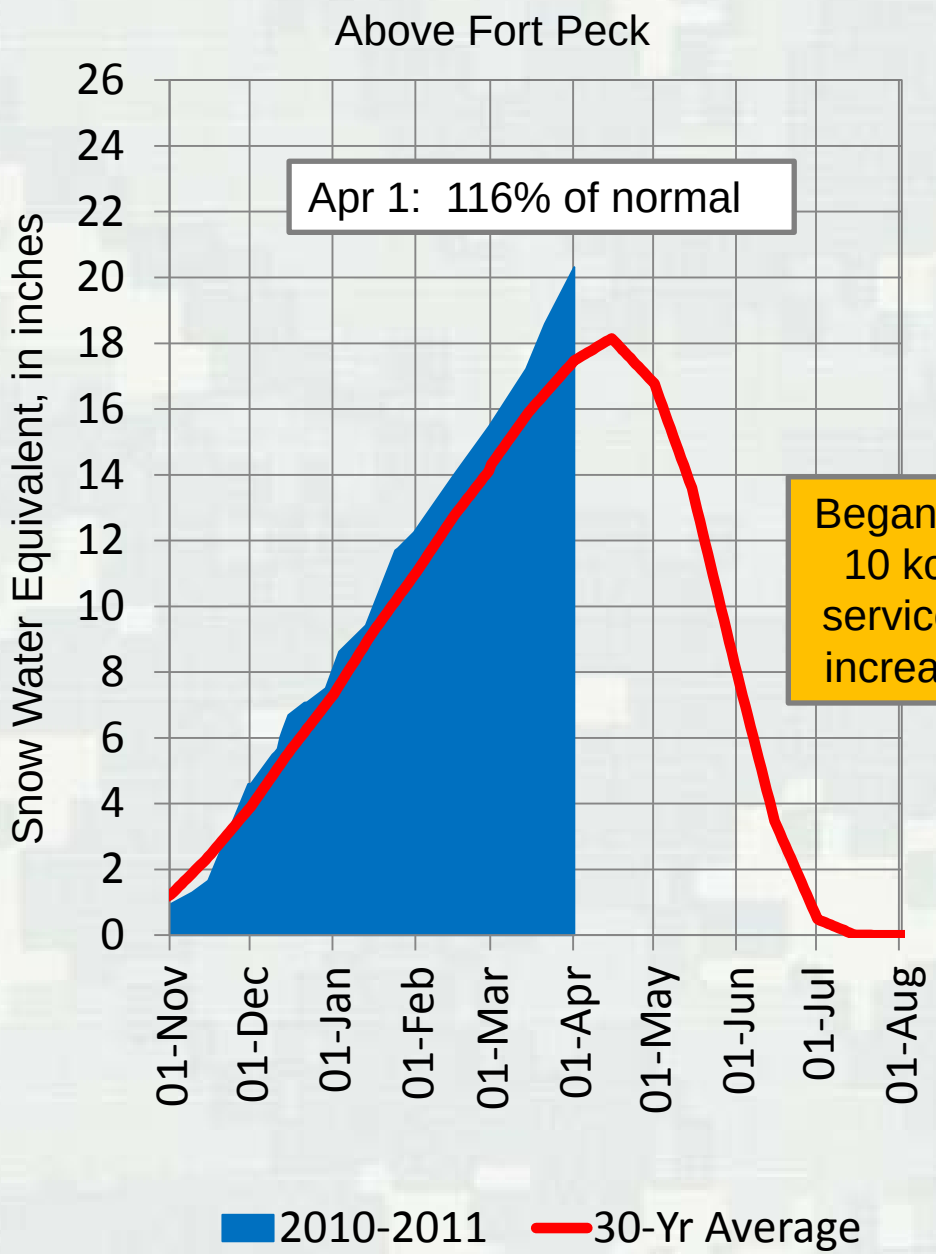
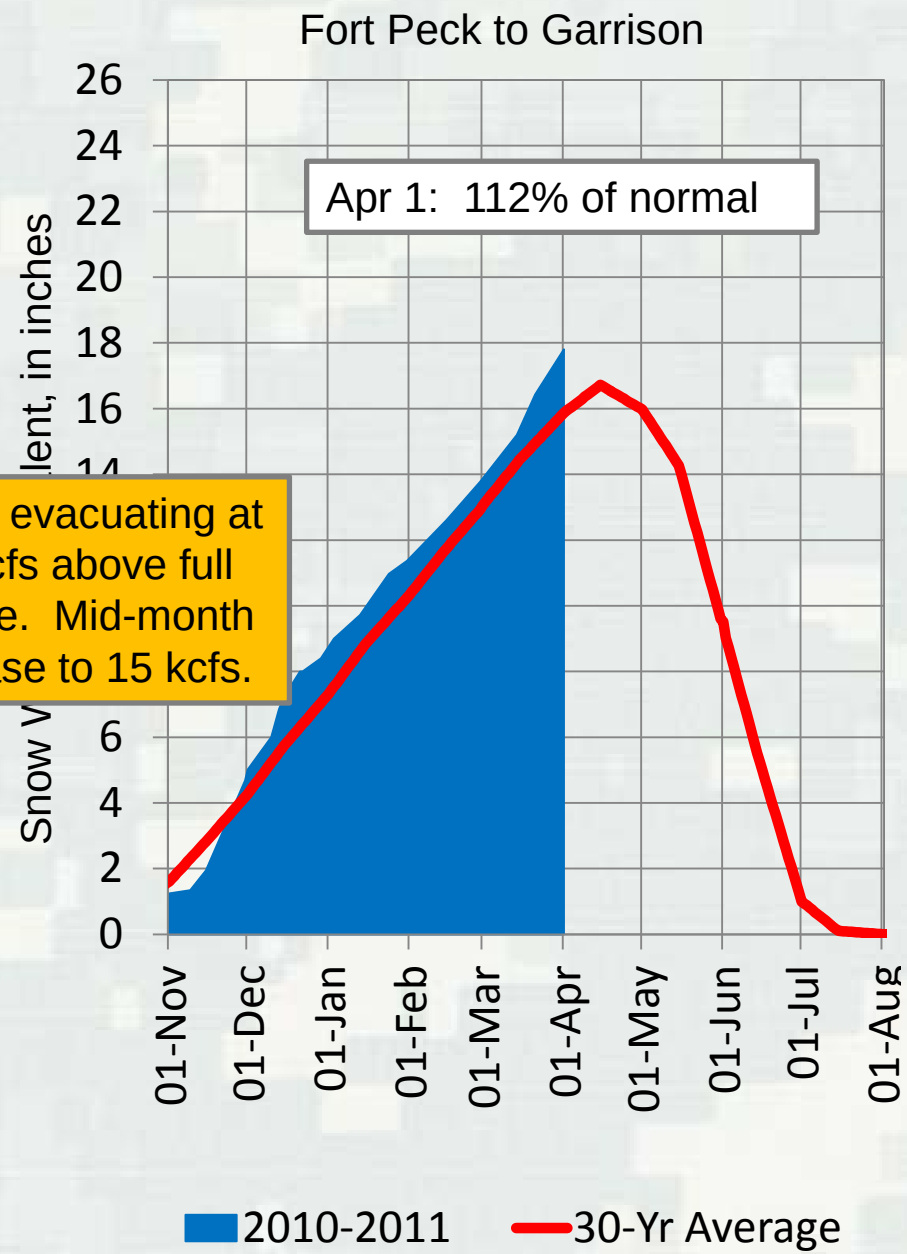
2010 – 2011 Mountain Snowpack





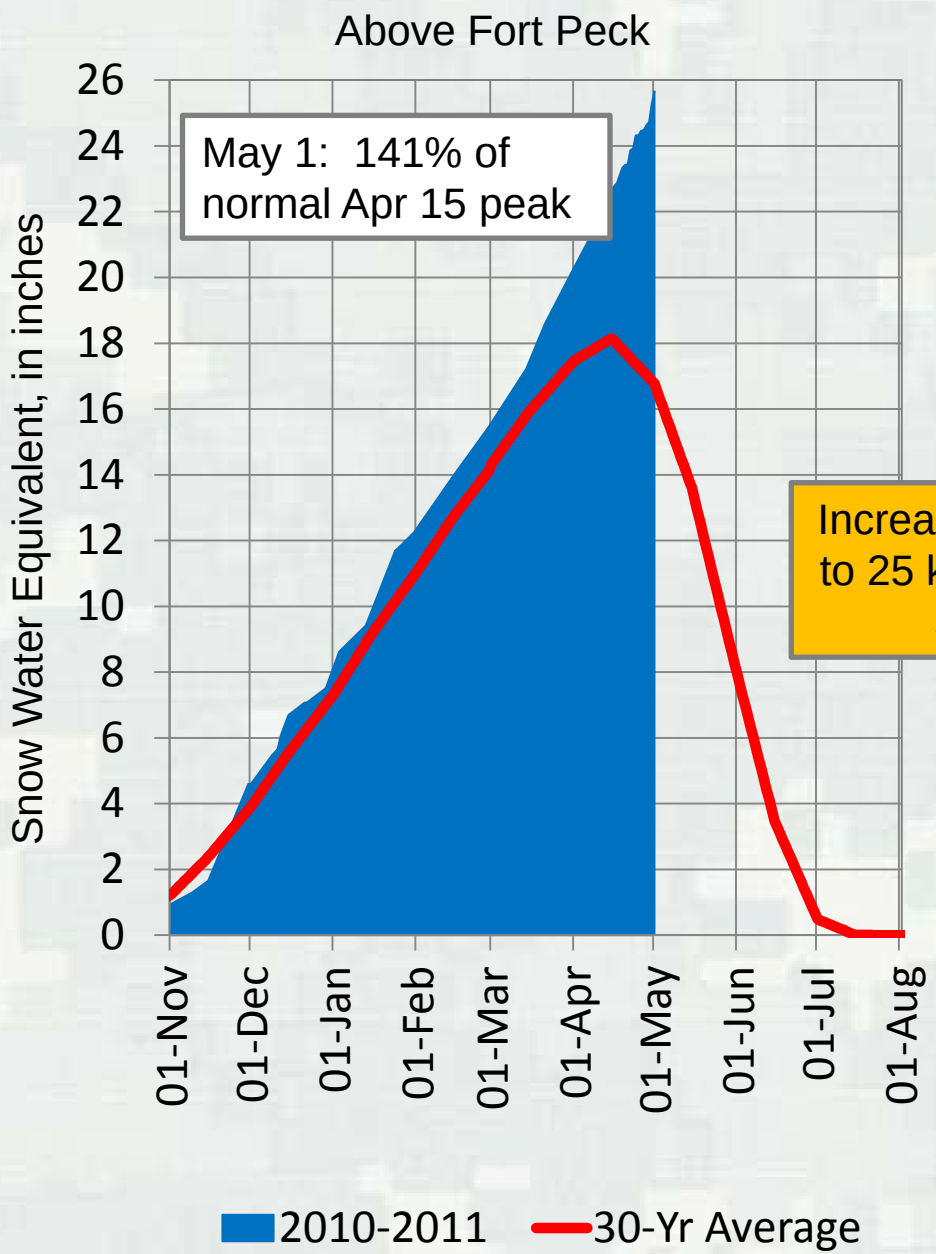
2010 – 2011 Mountain Snowpack



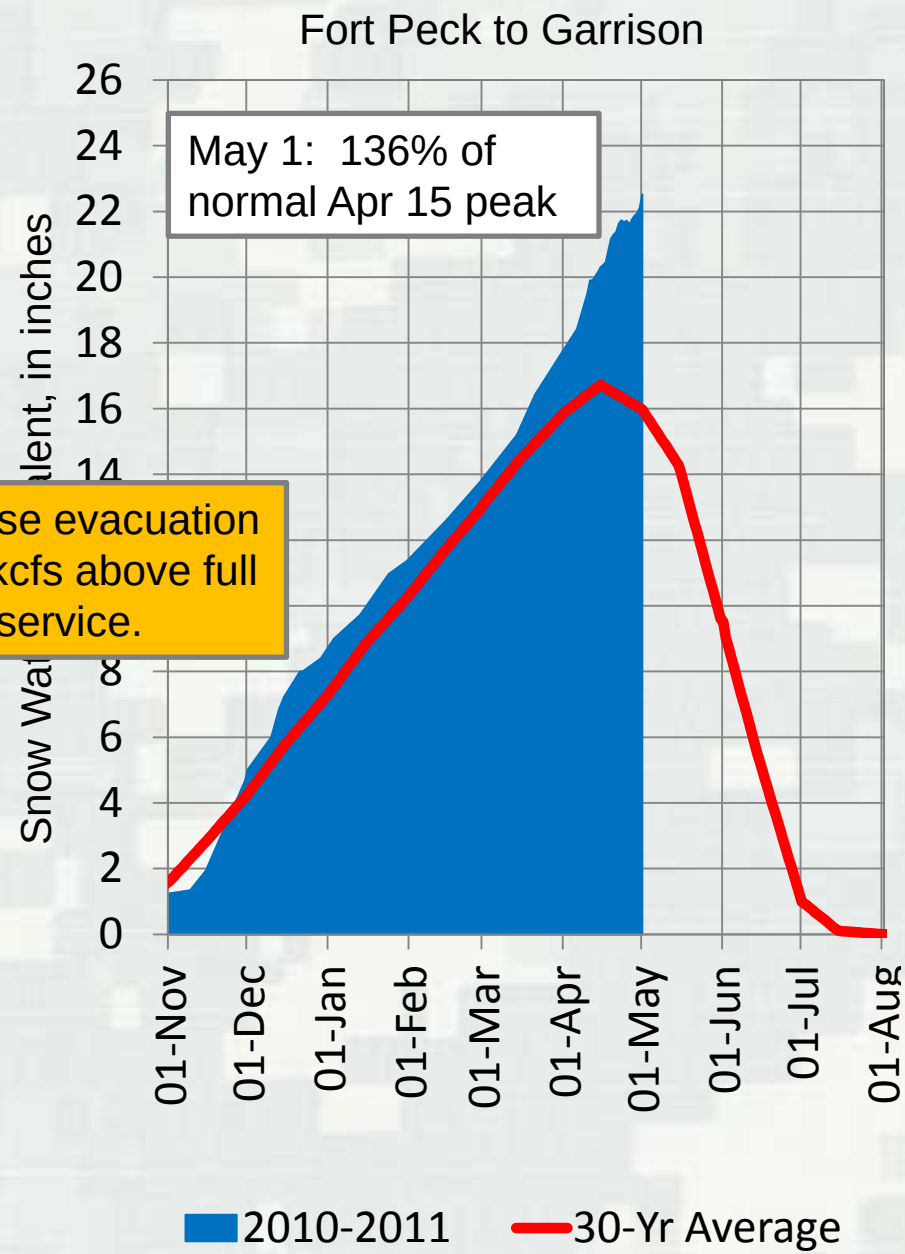


Began evacuating at 10 kcfs above full service. Mid-month increase to 15 kcfs.

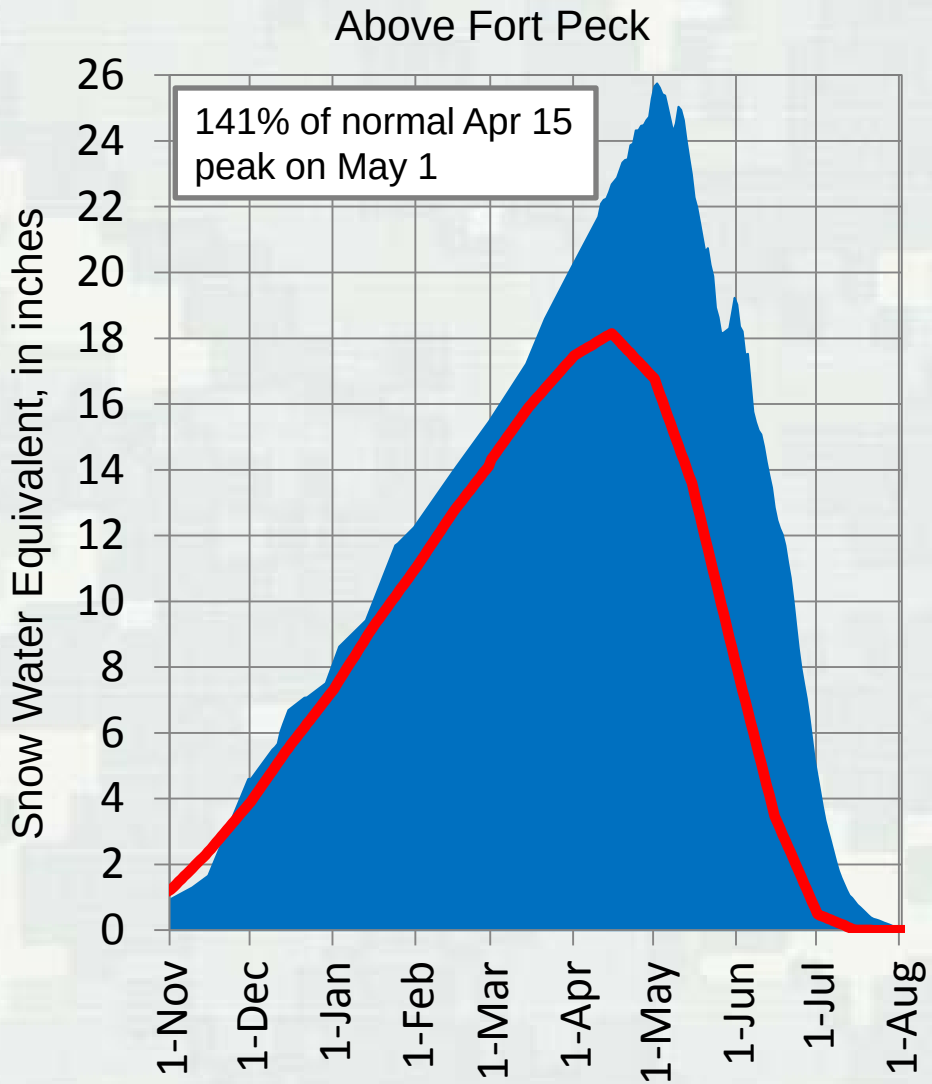
2010 – 2011 Mountain Snowpack

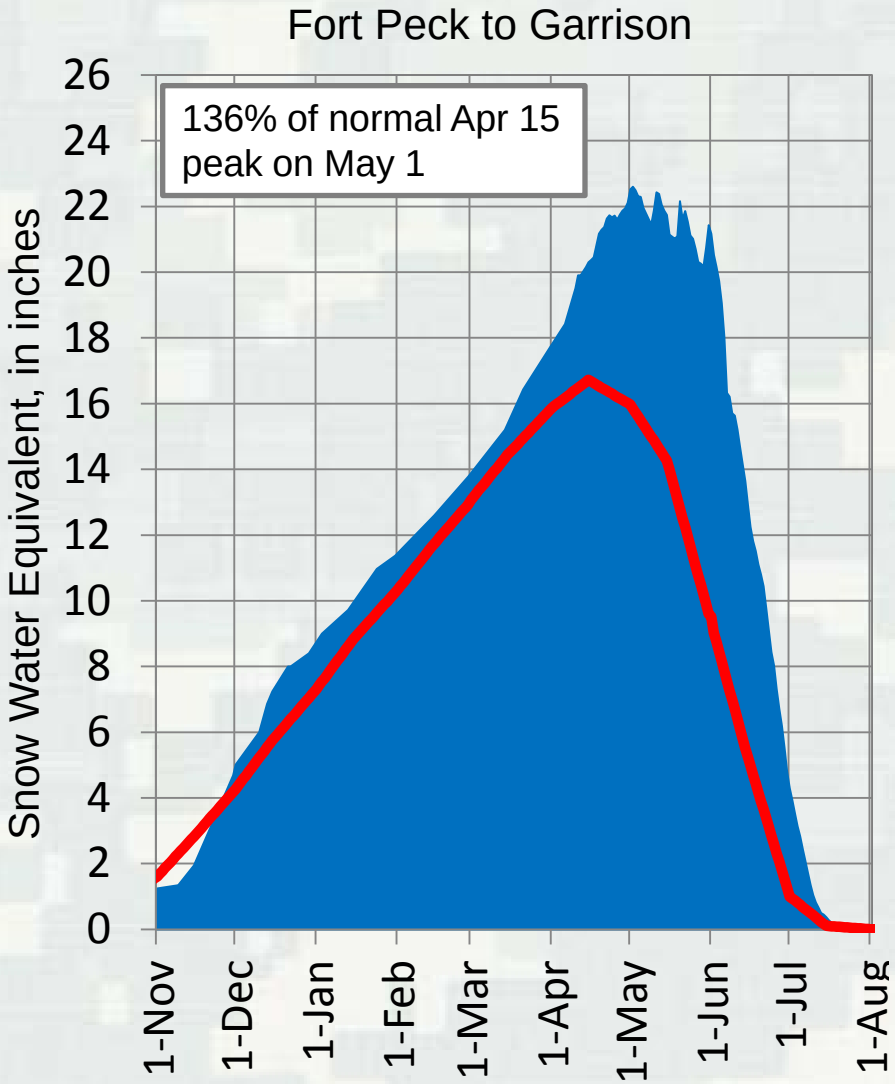


Increase evacuation to 25 kcfs above full service.



2010 – 2011 Mountain Snowpack

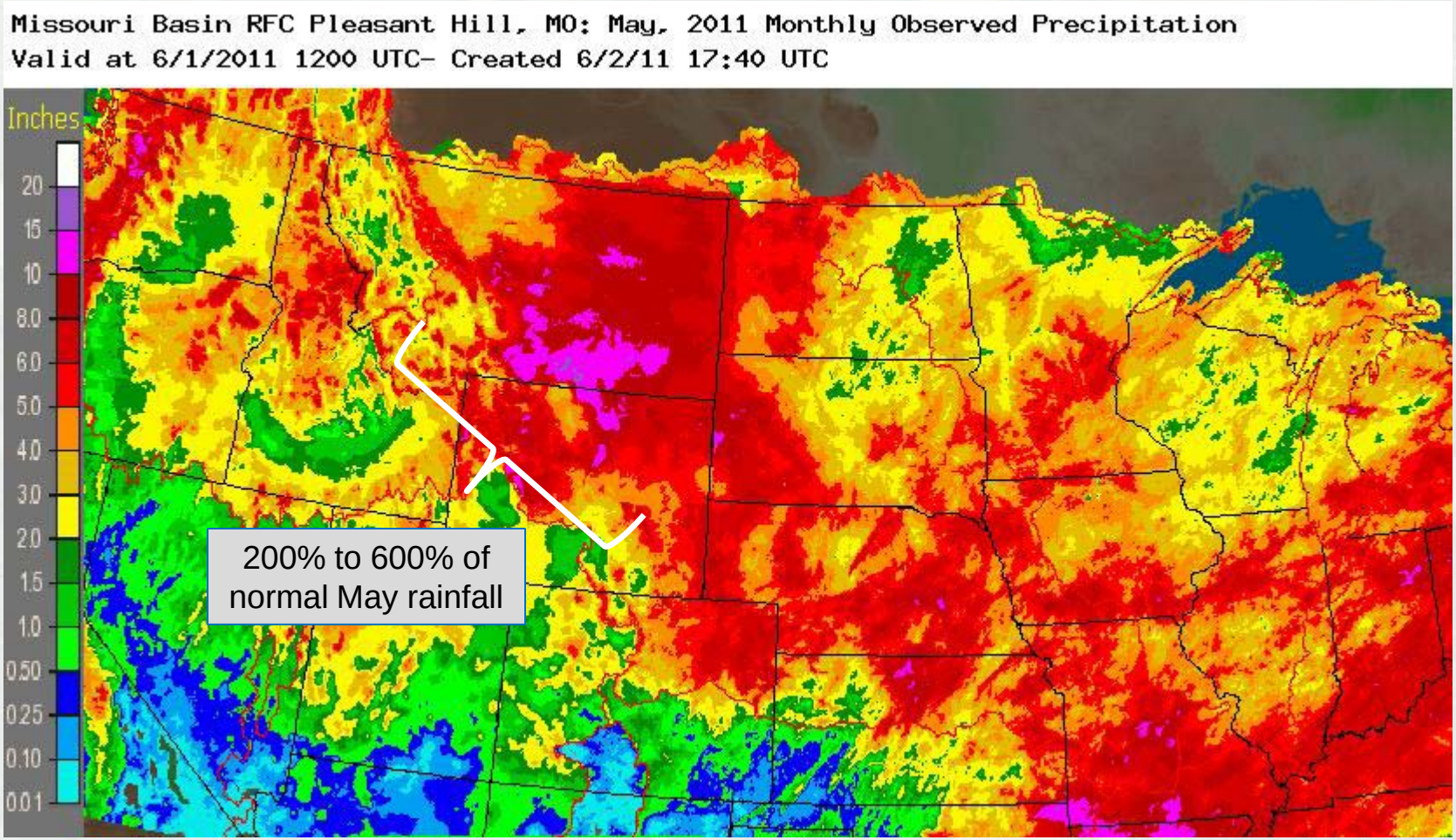




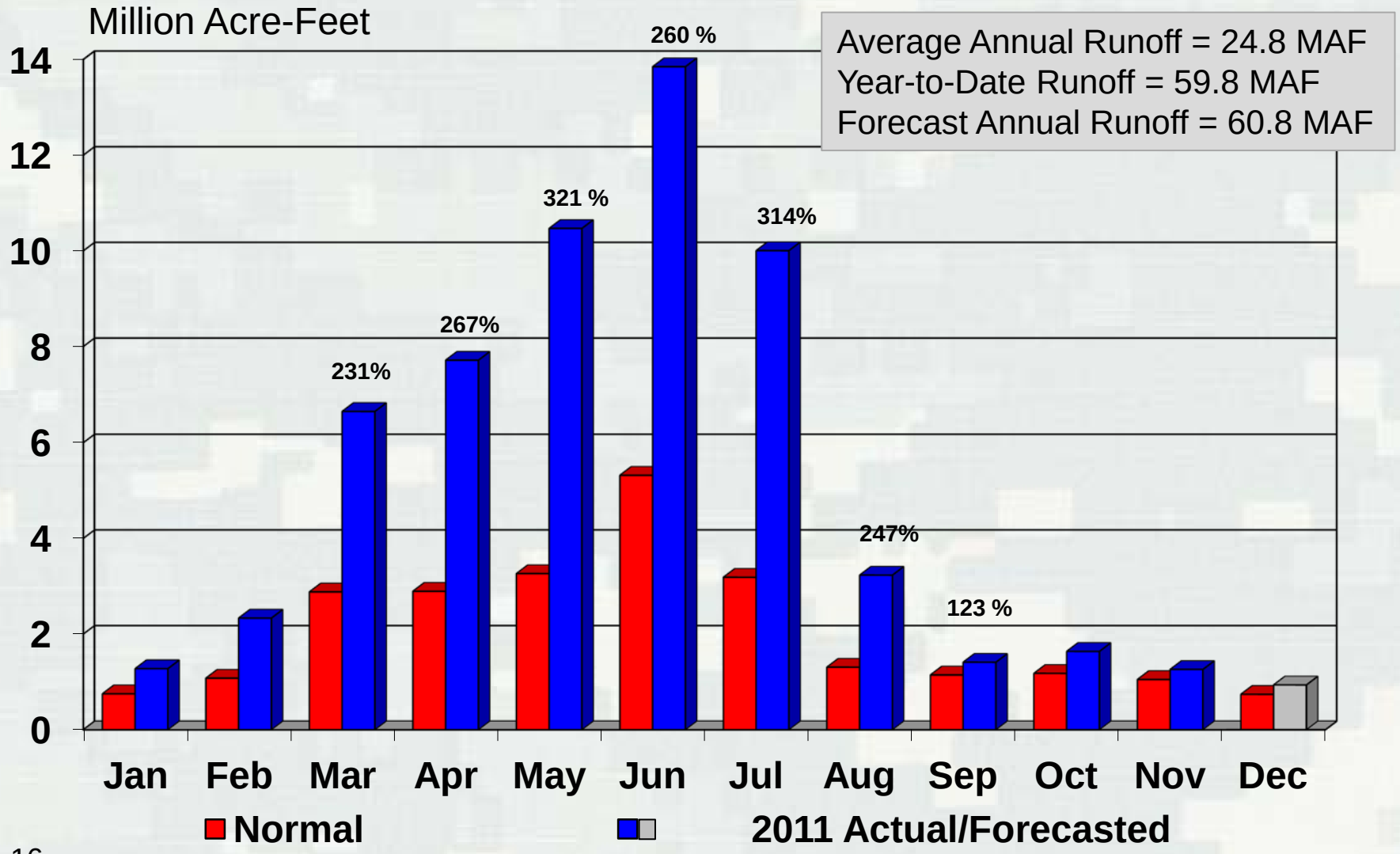
2010-2011 30-Yr Average

2010-2011 30-Yr Average

May 2011 Precipitation (inches)



Missouri River Runoff above Sioux City 2011 Actual/Forecasted versus Normal



2011 Mainstem System Regulation

- Full flood control capacity (16.3 MAF) of the system was available as the 2011 runoff season began
- Calendar Year Runoff Forecasts

Forecast Date	Annual Runoff Volume Million acre feet	Gavins Point Release Cubic feet / second
Apr 1	33.8	39,000 – 45,000
May 1	44.0	57,500
Jun 1	54.6	150,000 *
Jul 1	57.7	160,000 *
Sept 1	61.0	90,000 – 40,000
Oct 1	60.4	40,000
* Peak release		

2011 Mainstem System Runoff

- 114 years of monthly records (1898-2011)
  1. **June 2011 (13.8 MAF)**
  2. April 1952 (13.2 MAF)
  3. **May 2011 (10.5 MAF)**
  4. June 1909 (10.3 MAF)
  5. **July 2011 (10.0 MAF)**
- 2011 May-Jun-Jul runoff of 34.3 MAF exceeded ANNUAL runoff from 102 of 113 years.
- 2011 Mar-Jul runoff (48.7 MAF) exceeded the reservoir system design flood (40.0 MAF in Mar-Jul 1881)

2011 Missouri River – Unregulated and Regulated Peak Flows

Missouri River at	Unregulated Peak Inflow			Regulated Crest			Stage / Flow Reductions	
	Date	Flow kcfs	Stage* feet	Date	Flow ** kcfs	Stage feet	**Stage Reduction feet**	**Flow Reduction kcfs**
Bismarck, ND	03-Jun	261	24.5	26-Jun	160	19.3	**5.2**	**101**
Sioux City, IA	30-Jun	285	38.5	20-Jul	192	35.3	**3.2**	**93**
Omaha, NE	01-Jul	321	40.0	02-Jul	217	36.2	**3.8**	**104**
St. Joseph, MO	04-Jul	361	33.5	28-Jun	276	29.9	**3.6**	**85**

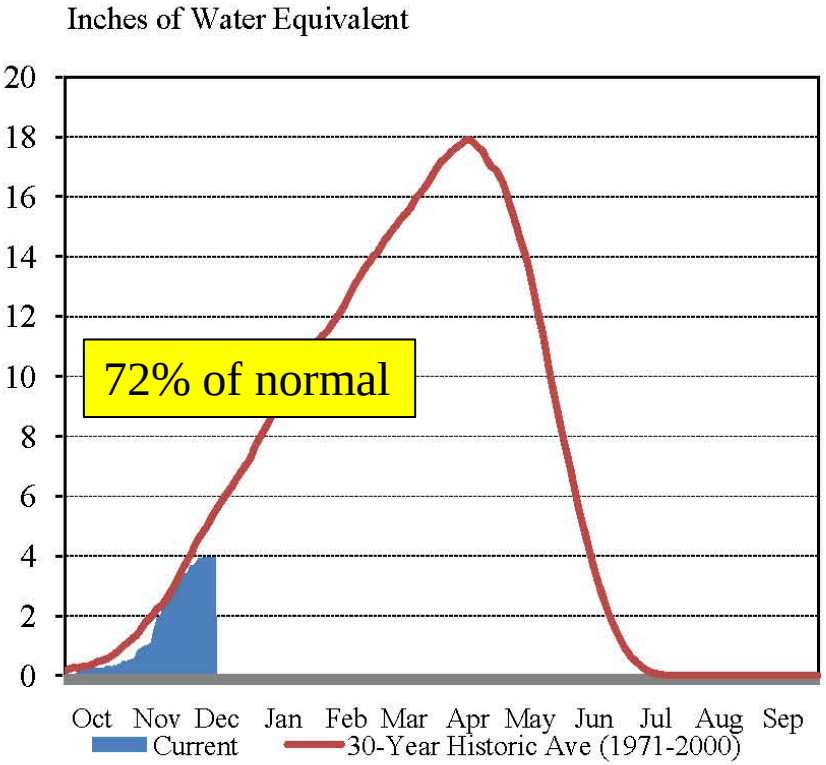
* Unregulated stage values are based on current USGS flow rating curves.
** Regulated flows will be verified with the final USGS flow determination.

Levee Damage & Rehabilitation

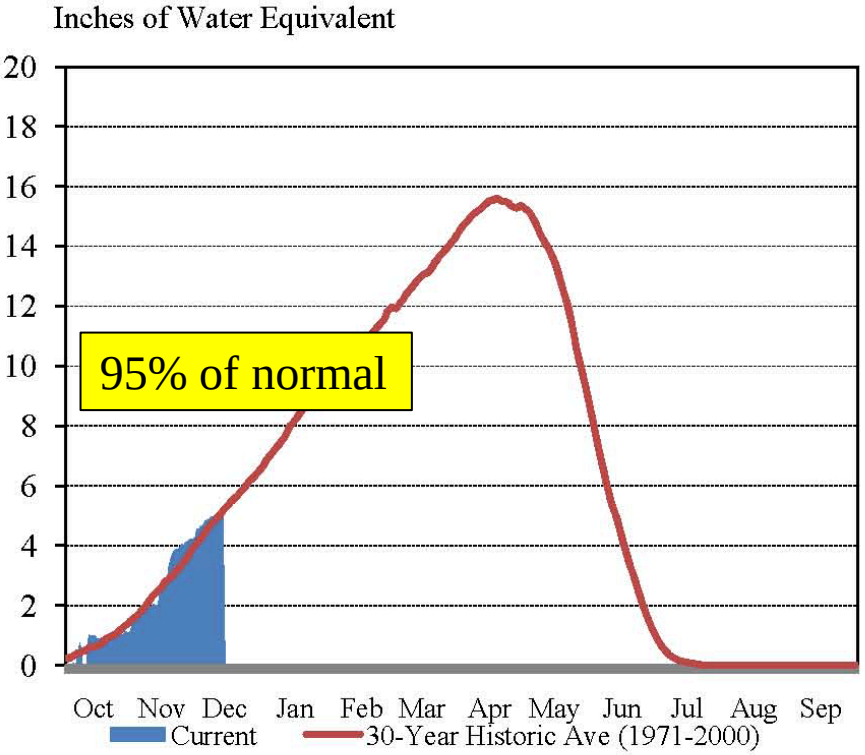
- Levee damage caused by erosion, seepage, overtopping and breaching
- PL 84-99 Rehabilitation and Inspection Program
- Available funding will be key
- Rehab will take a significant amount of time and not likely that all levees will be repaired by the Spring flood season.

Missouri River Basin
Mountain Snowpack Water Content
2011-2012

Total above Fort Peck



Total Fort Peck to Garrison

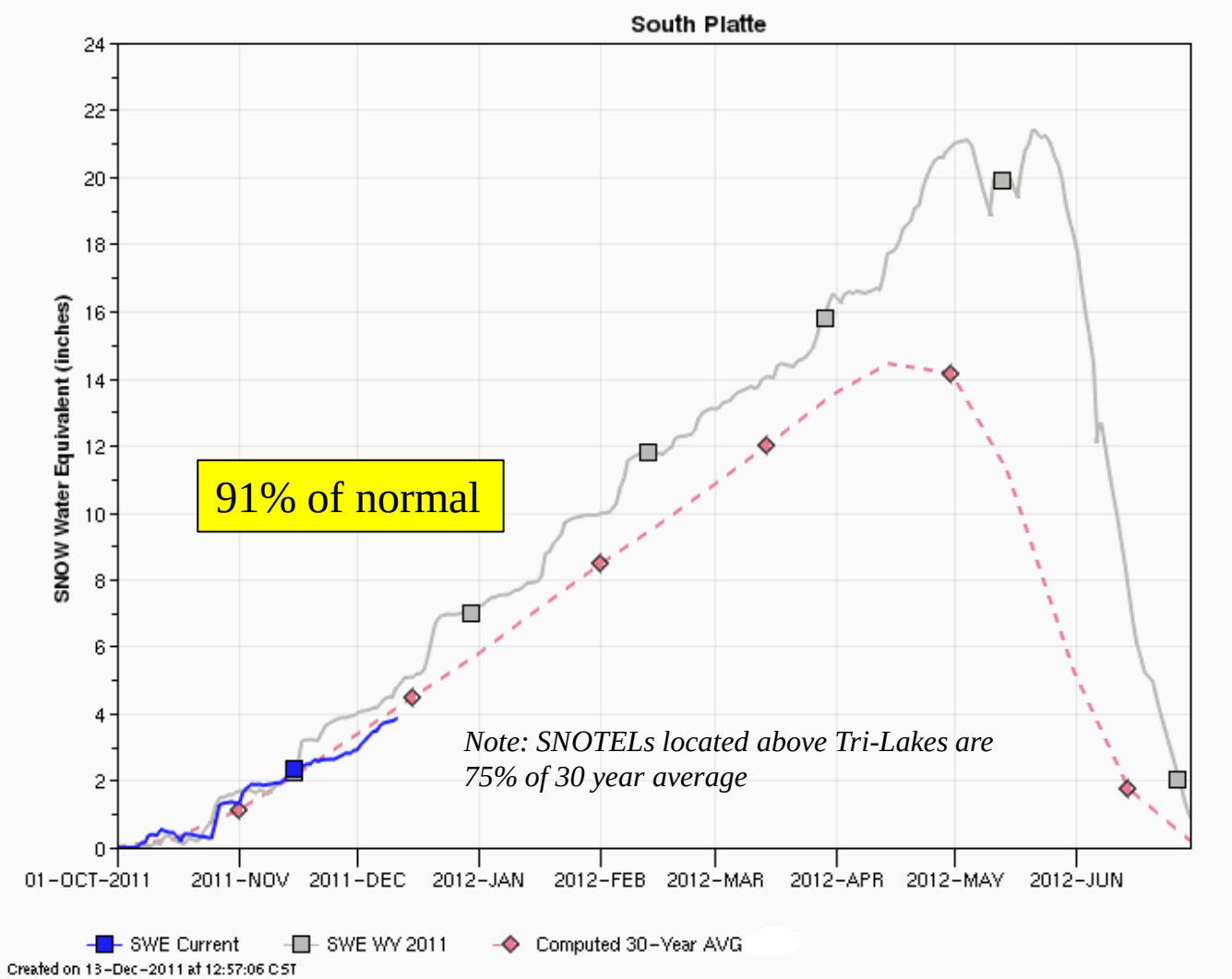


The Missouri River Basin mountain snowpack normally peaks near April 15. Normally, 32 percent of the peak accumulation has occurred by December 15. On December 12, the mountain snowpack in the "Total above Fort Peck" reach is currently 72 percent of normal and the "Total Fort Peck to Garrison" reach is currently 95 percent of normal.

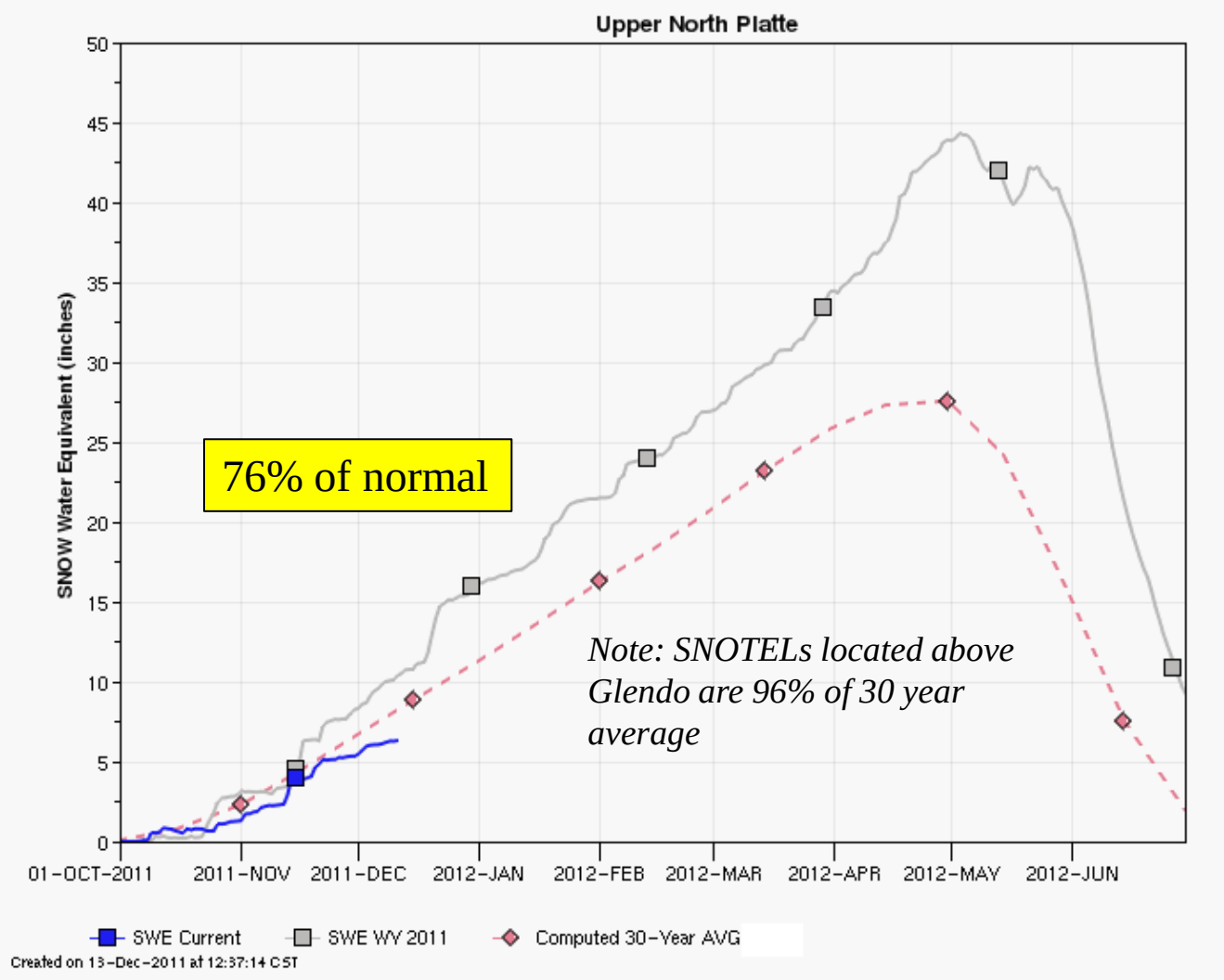
December 12, 2011

Provisional data. Subject to revision.

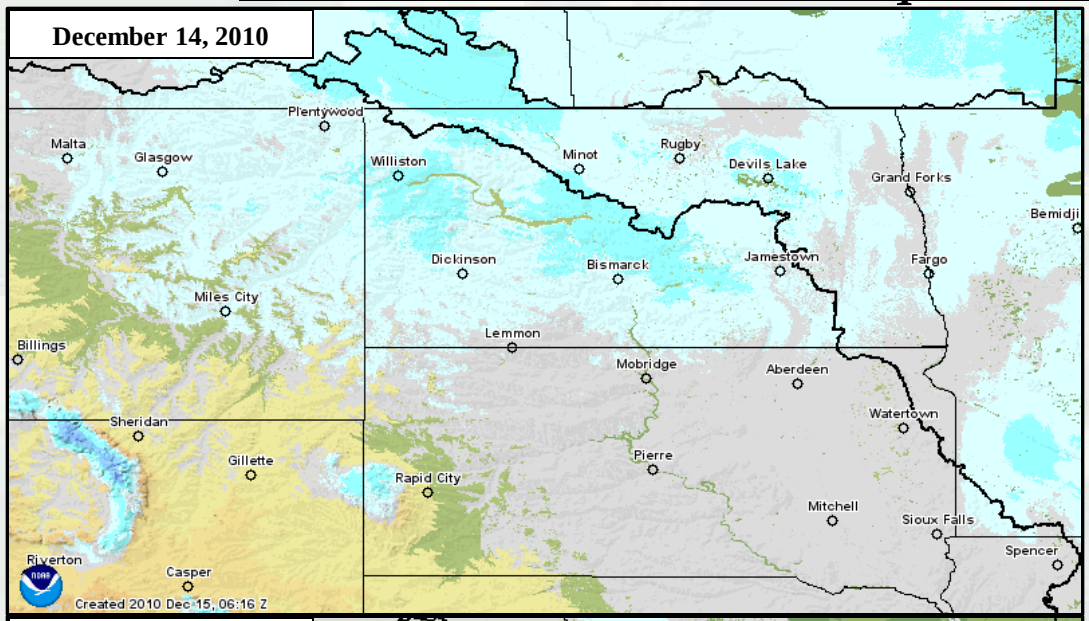
South Platte Basin Mountain Snowpack

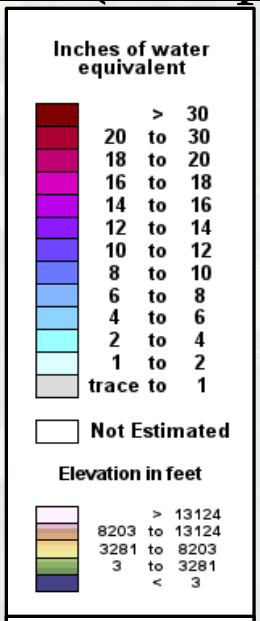


North Platte Basin Mountain Snowpack



Plains Snow Water Equivalent (comparison)

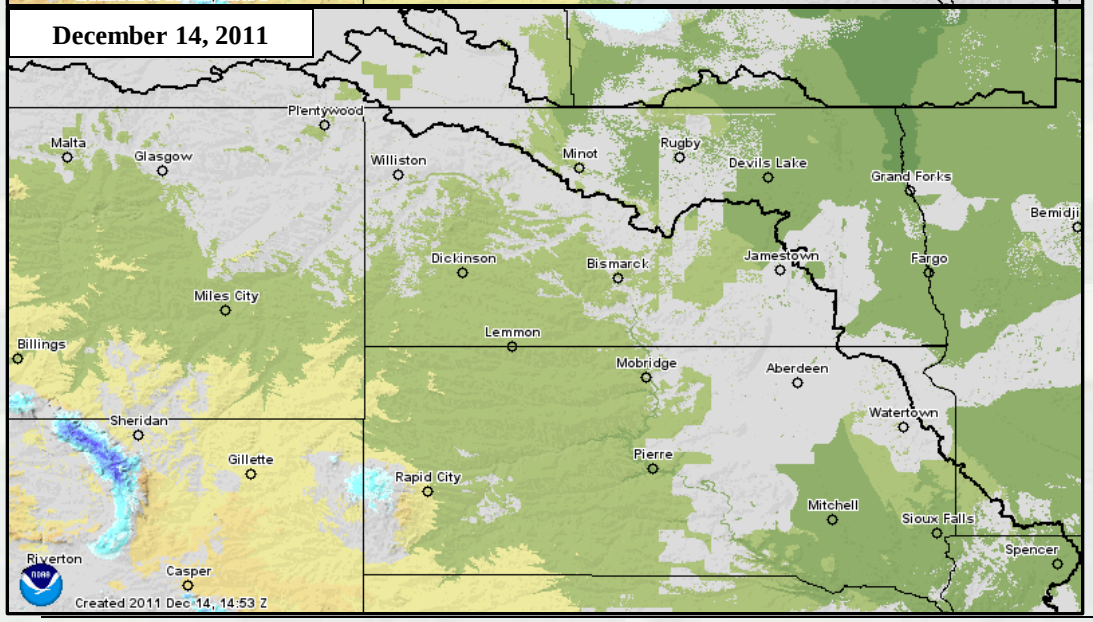


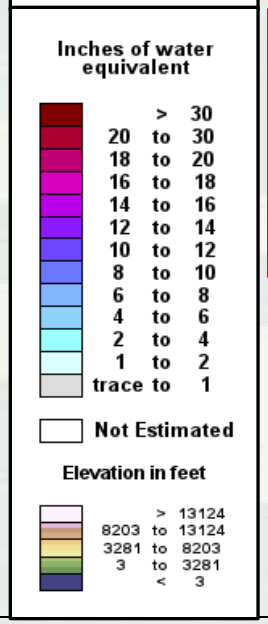


December 2010 Notes

- 2-4 Inches: Central North Dakota
- 1-2 Inches: Eastern MT & ND
- Trace-1": Almost all upper basin

An extensive plains snowpack





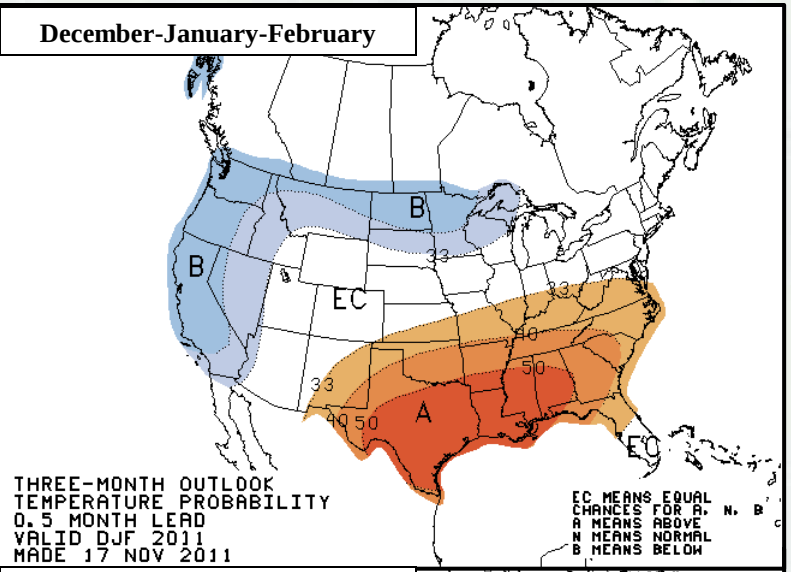
December 2011 Notes

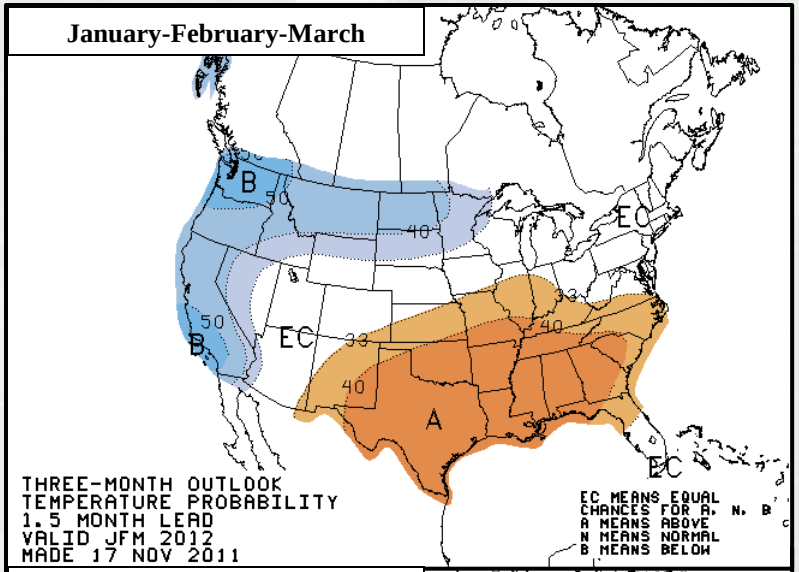
- 2-4 Inches: None
- 1-2 Inches: None
- Trace-1": Eastern MT & patchy

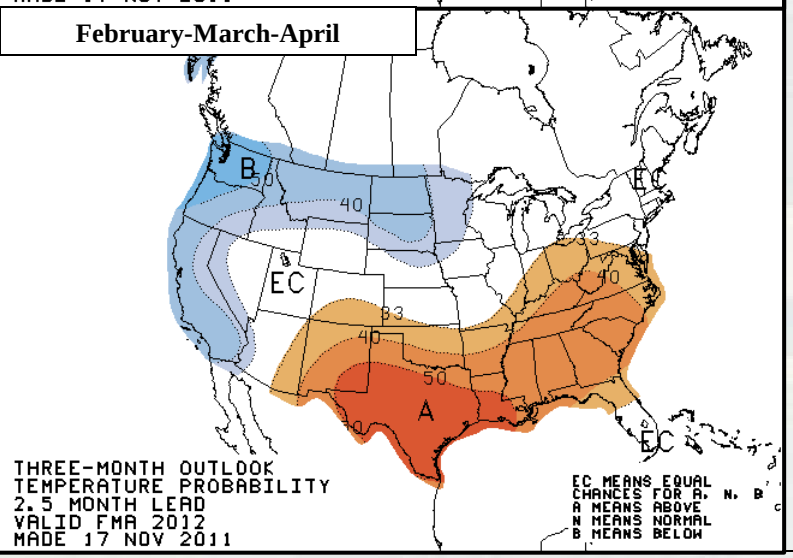
Very limited plains snowpack

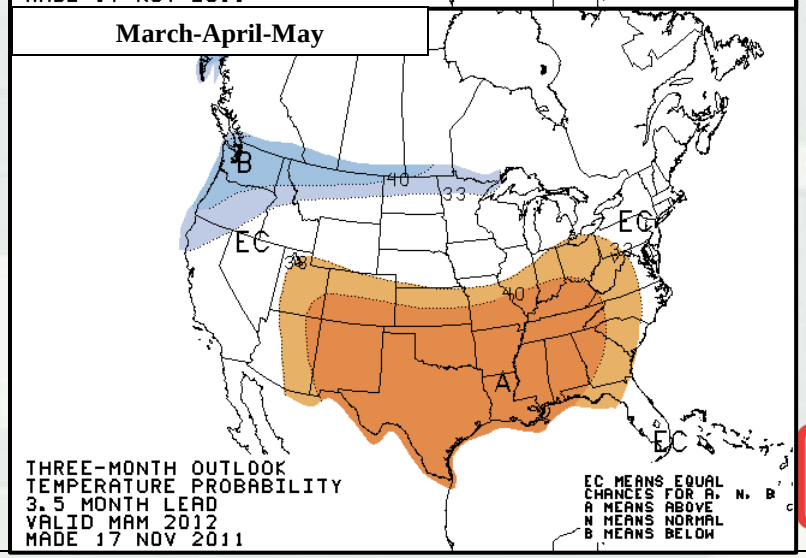
CPC 3-Month Temperature Outlooks

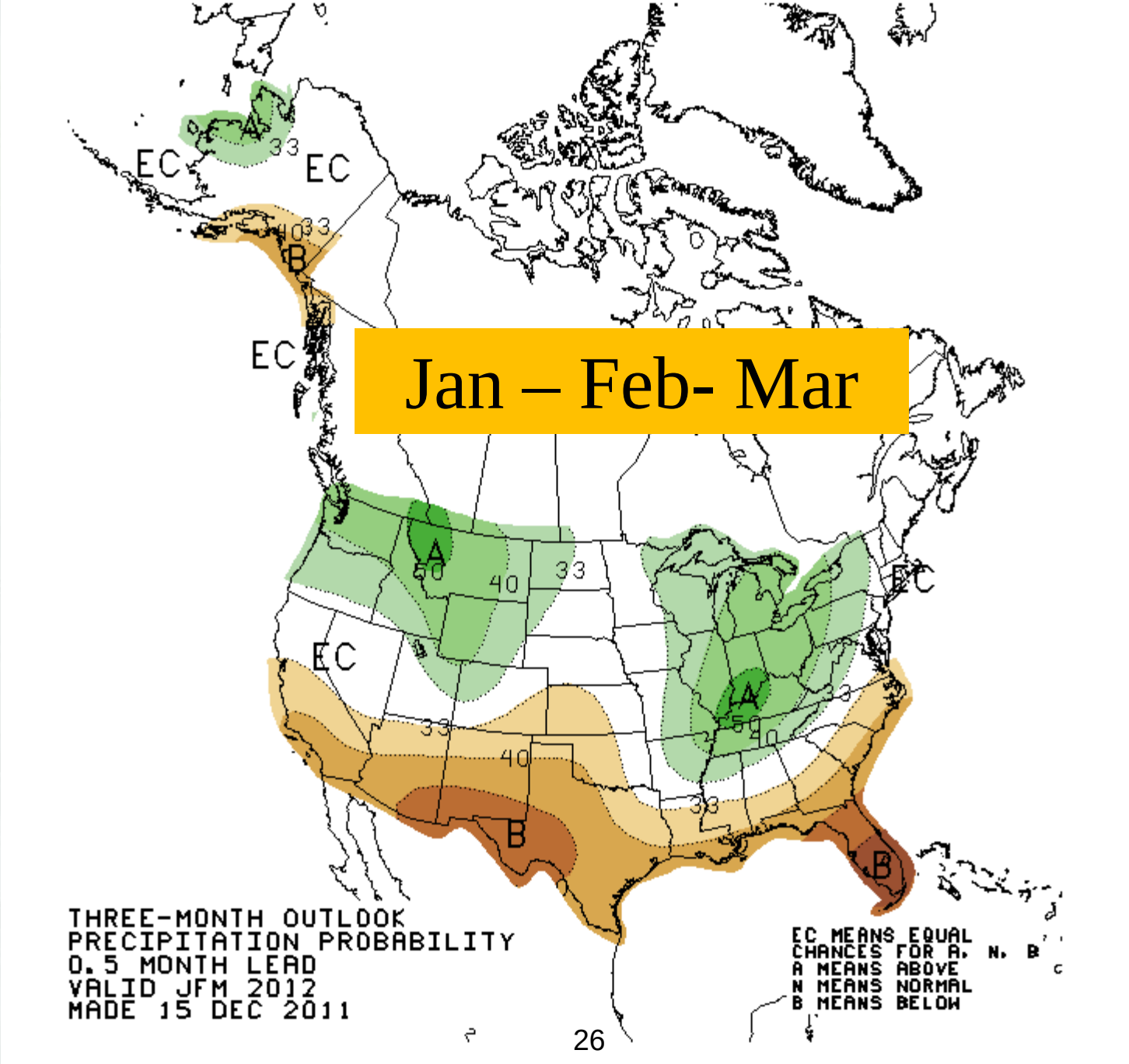
(17 November 2011)

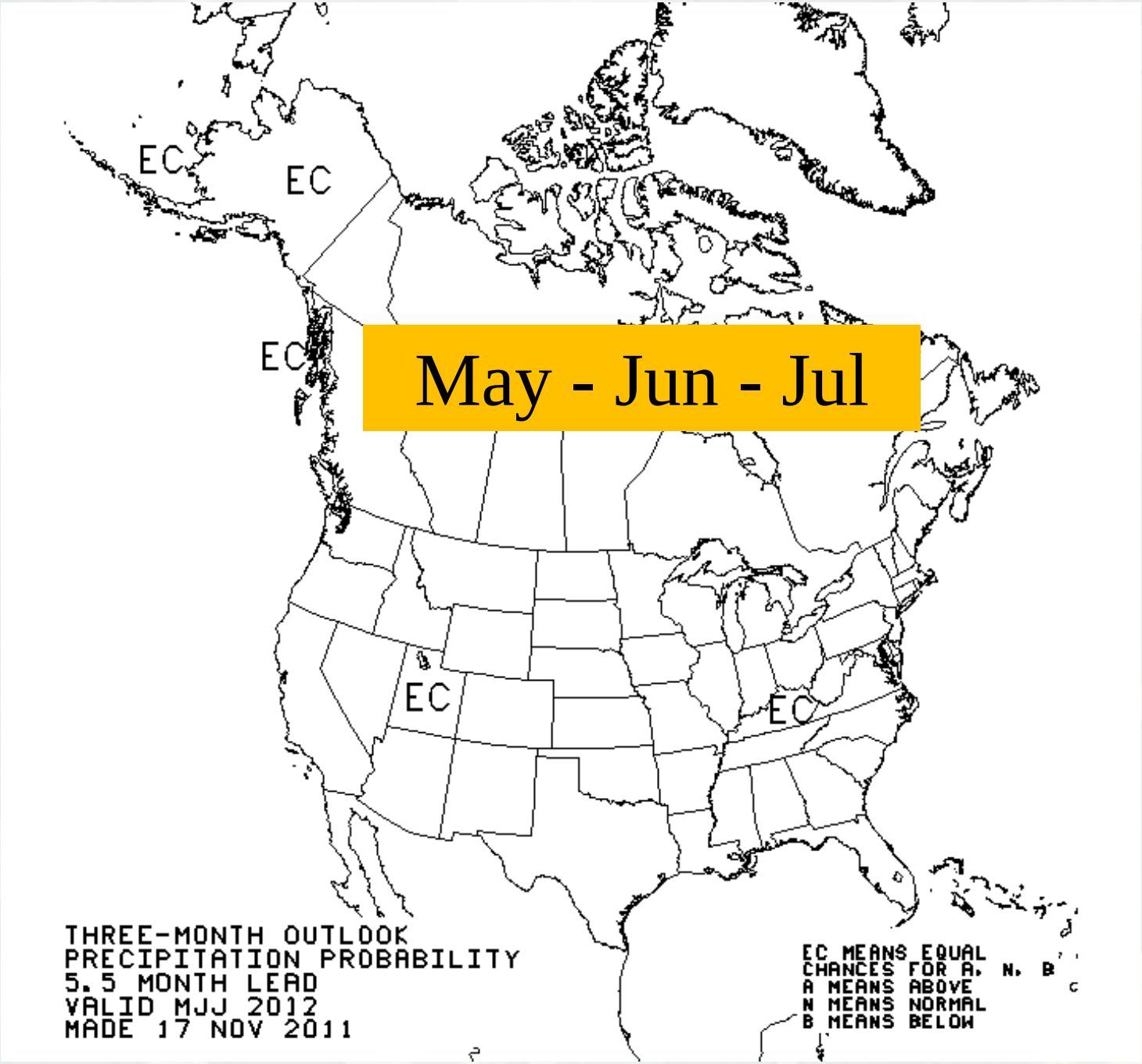




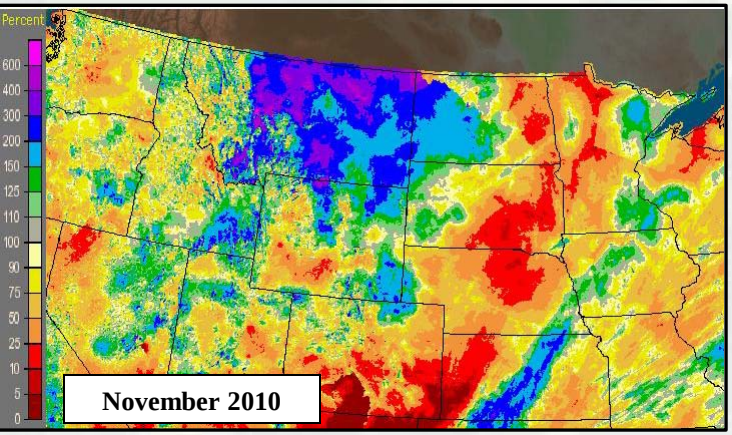


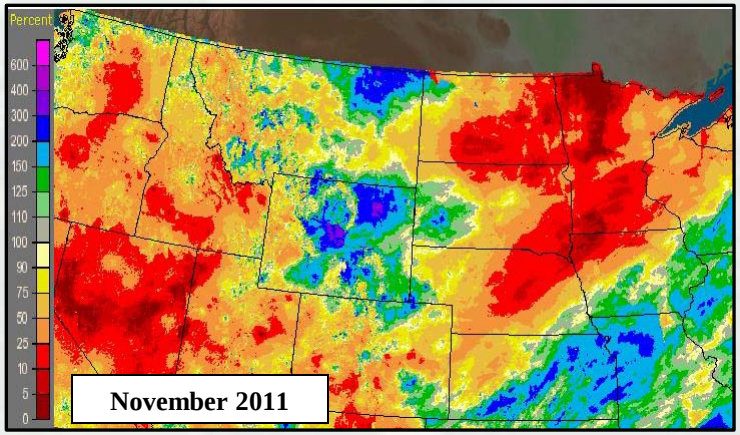



Jan – Feb- Mar
EC
EC
EC
EC
EC
A
33
40
B
A
50
40
33
A
50
40
33
40
33
B
B
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
VALID JFM 2012
MADE 15 DEC 2011
EC MEANS EQUAL
CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW


May - Jun - Jul
EC
EC
EC
EC
EC
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
5.5 MONTH LEAD
VALID MJJ 2012
MADE 17 NOV 2011
EC MEANS EQUAL
CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW

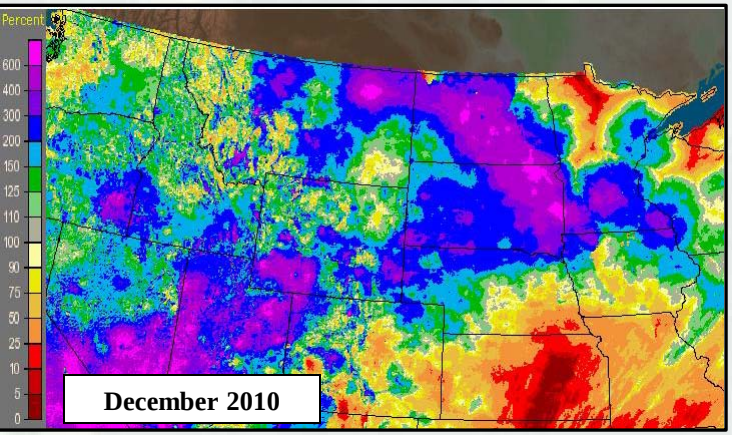
Percent of Normal Precipitation (comparison)

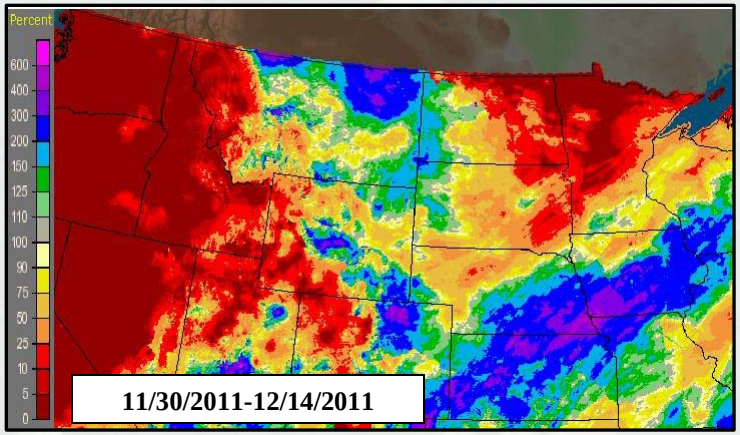




2011 Notes

- Mountain snowstorms
  (Wyoming-Colorado area)
  (November 1st-2nd and 30th)
- Localized northeastern MT
- Very moist far lower basin
- Elsewhere VERY dry…



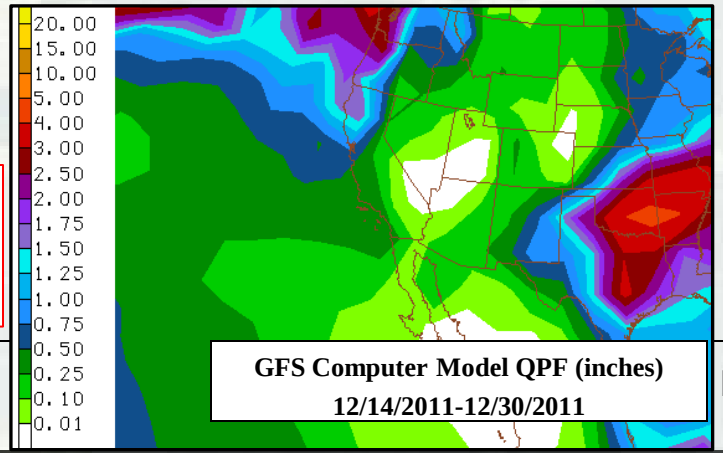


2011 Notes

- Nov. 30th – northern MT
- Mountain snowstorms
  (Wyoming-Colorado area)
  (December 1st-2nd)
- Lower basin showers
  (December 3rd and 14th)
- VERY dry eastern Dakotas

Missouri River Basin Notes

- Localized mountain snow (far upper basin)
- More rain showers (far lower basin)
- VERY dry (and relatively mild) elsewhere…



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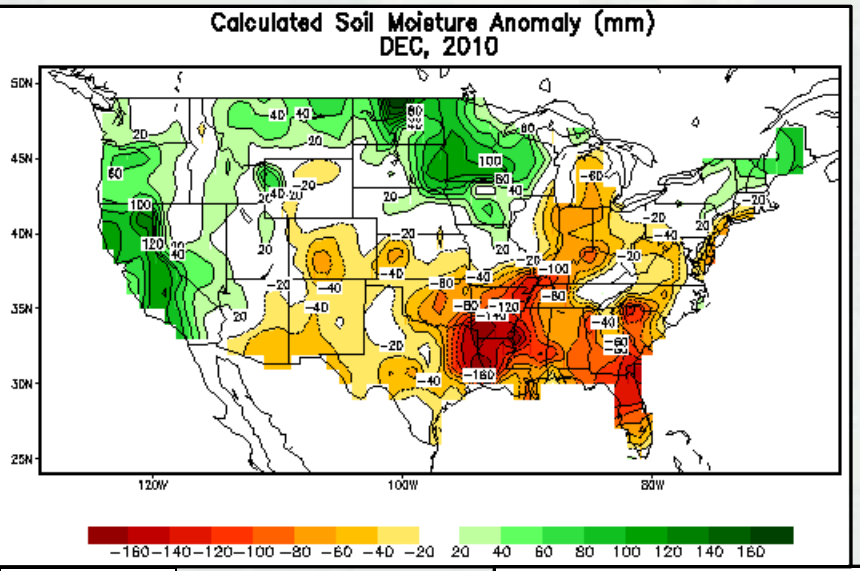
Soil Moisture Anomaly (comparison)



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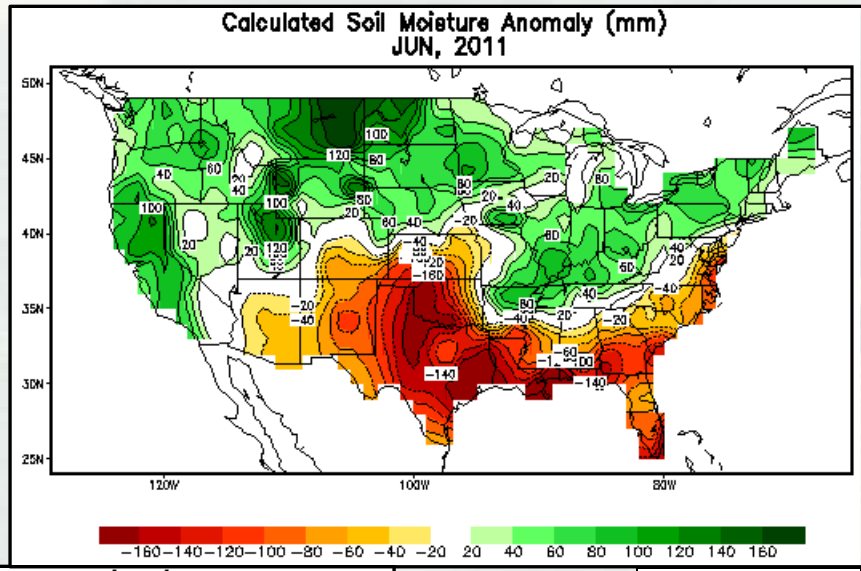
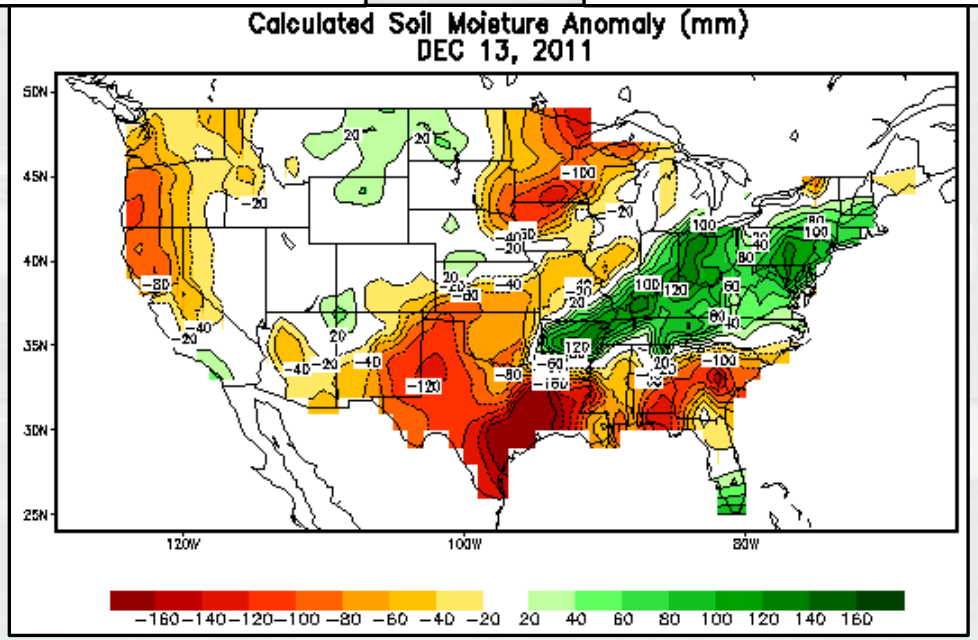


6 Months ago



Most recent…

Much Drier Basin-Wide Year-to-Year And (especially) Since Summer 2011

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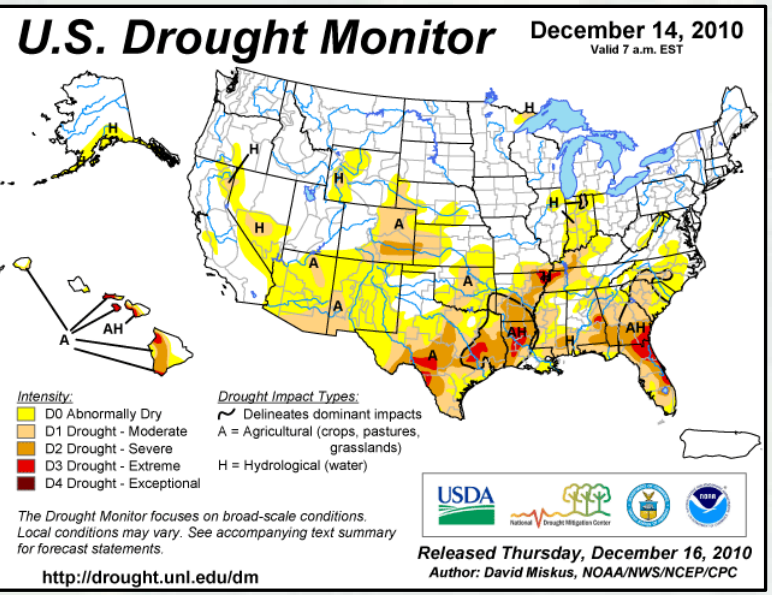
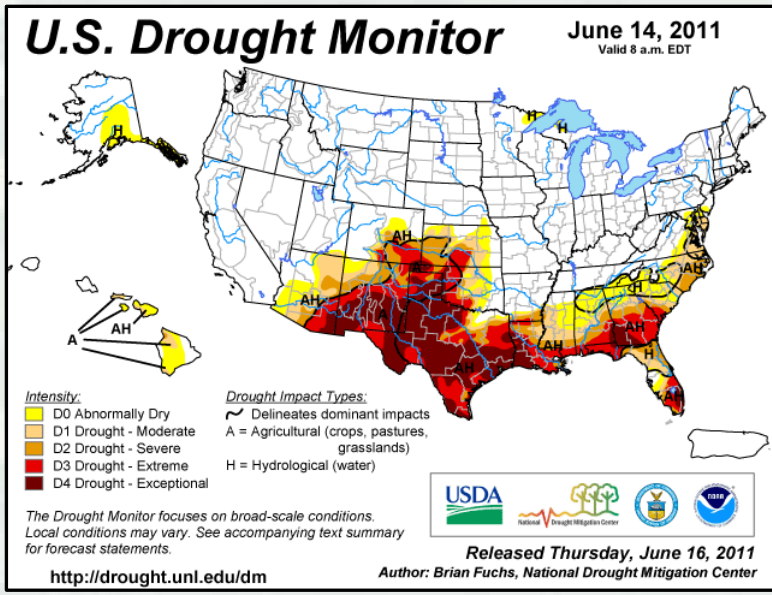
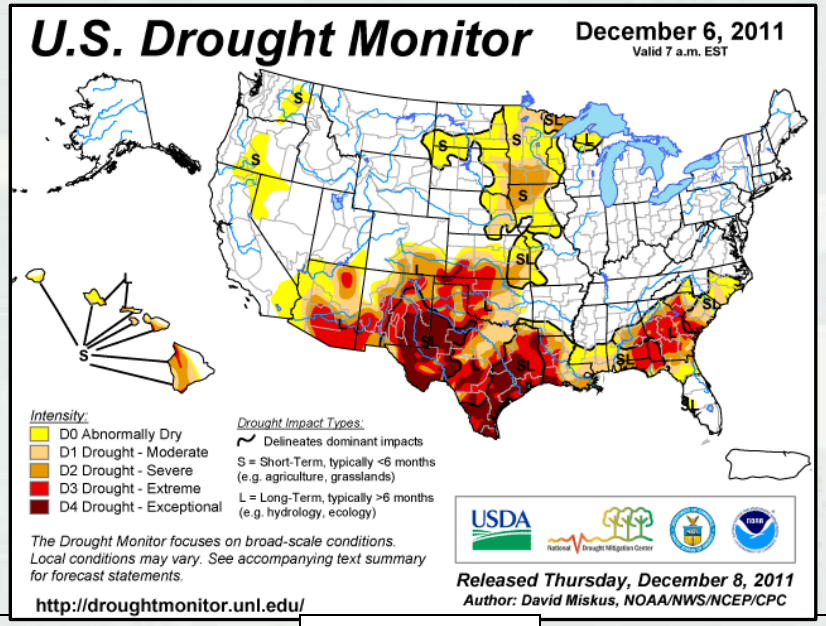
U.S. Drought Monitor (comparison)



1 Year ago



6 Months ago



Most recent…

Drought Conditions have developed across parts of eastern Nebraska and northwestern Iowa since Summer 2011

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2011 Mainstem System Regulation

(The Way Ahead)

- Post Flood Assessment
  - Water Management Review (Internal / External)
  - Flood Fight Review
  - Infrastructure Damage Assessments
  - Basin Impact Assessments
- Missouri River Flood Task Force
- Technical Analysis of 2011 Event
- All 16.3 MAF will be available (and possibly more) at start of 2012 runoff season.
- Flexible – Aggressive - Communication
- 2012 Annual Operating Plan (AOP – Released in early January)

Questions

US Army Corps of Engineers
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