Missouri River Mainstem Reservoir System

2011 Flood Regulation

1 October 2011

US Army Corps of Engineers

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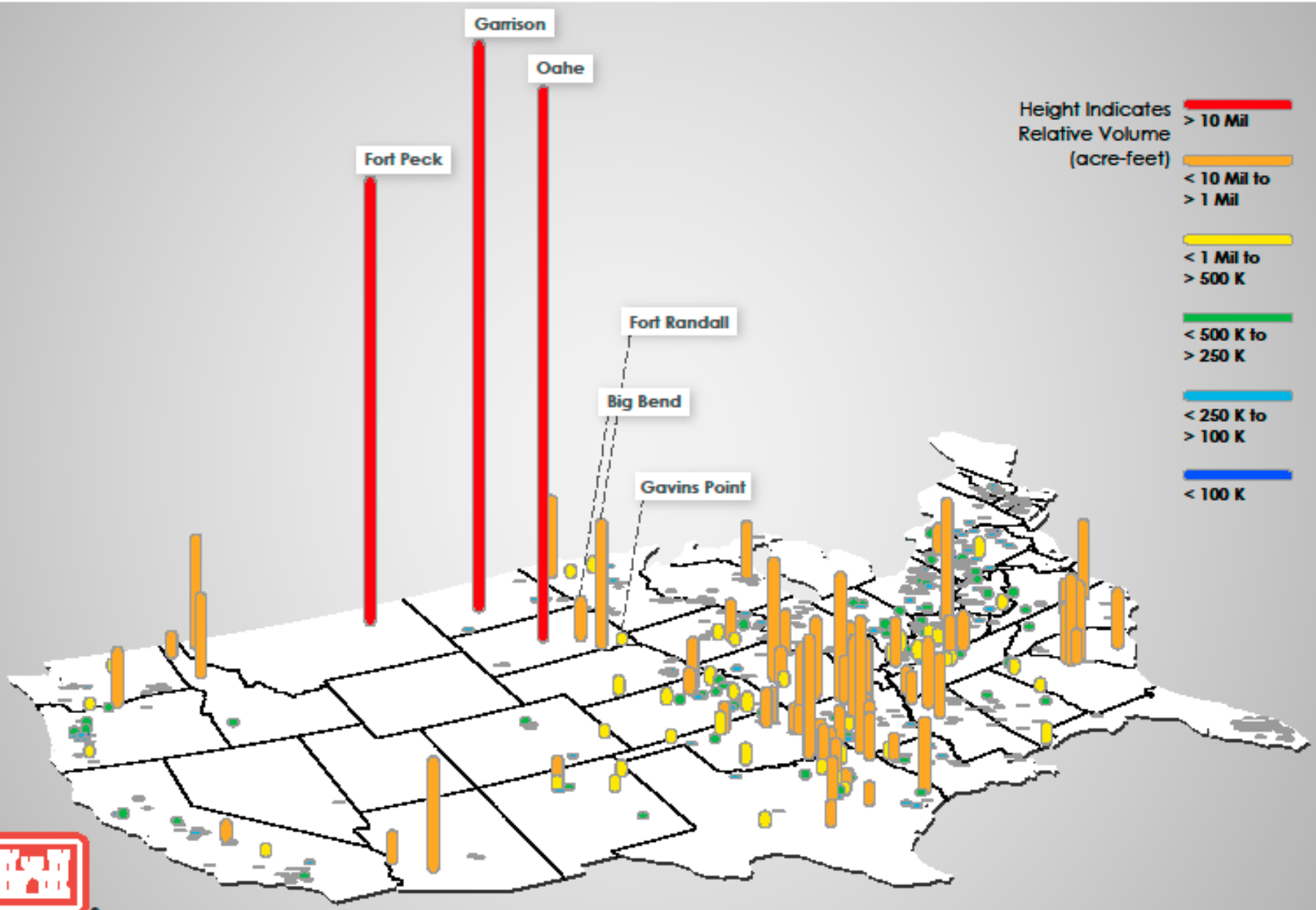
Storage Capacity of Corps Reservoirs



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

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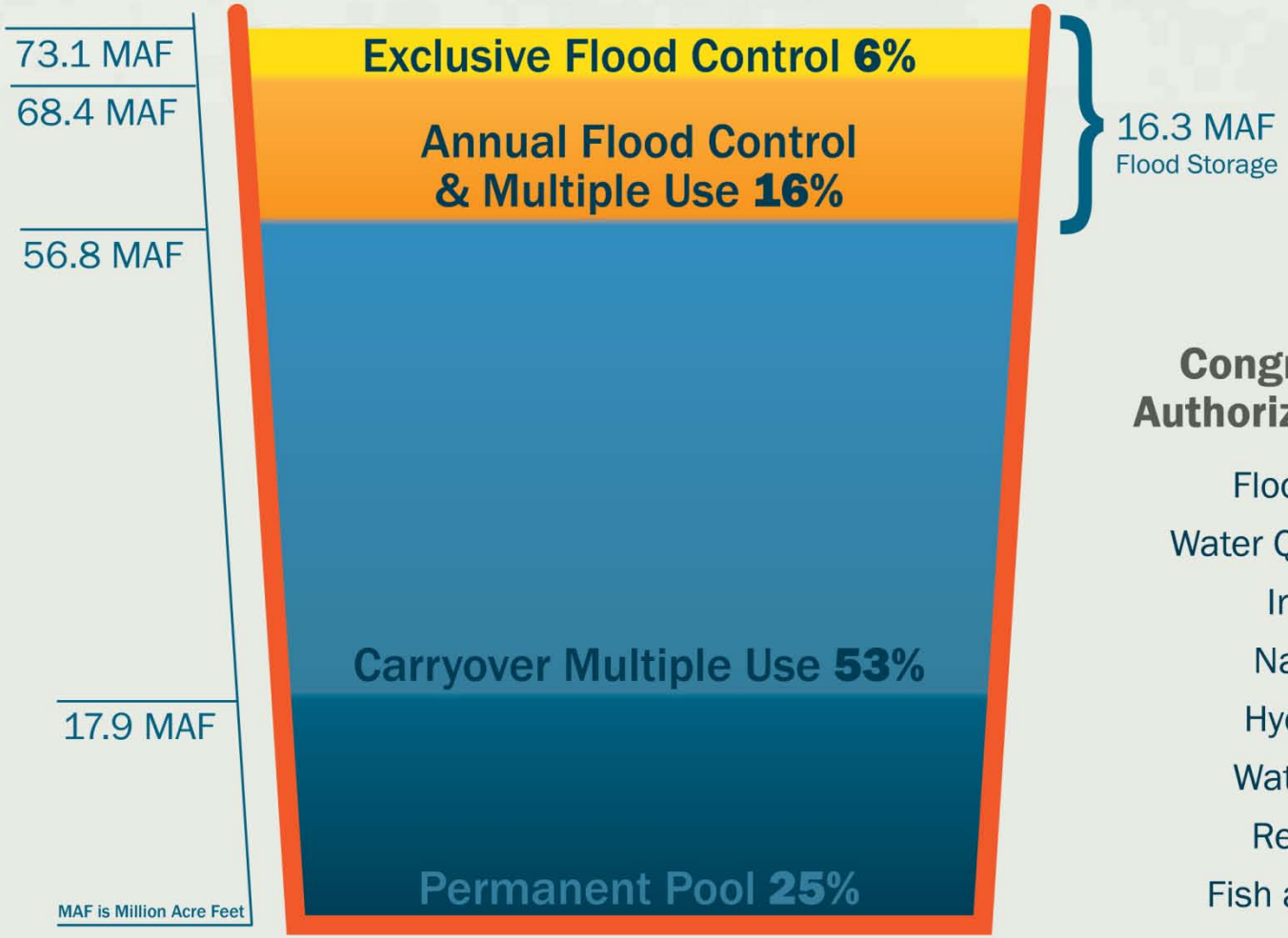
Missouri River Mainstem Reservoir System

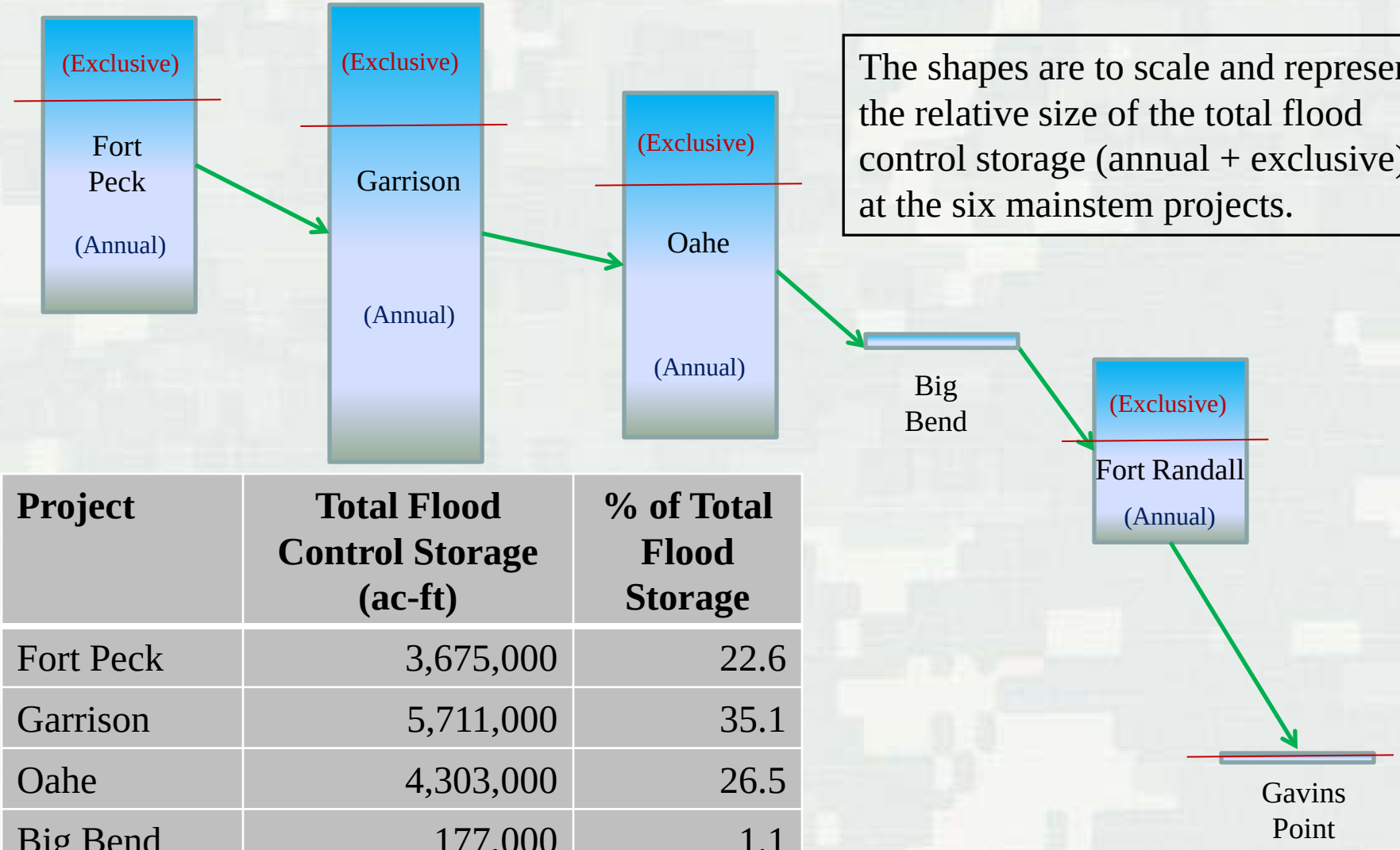
Zones & Allocations of the Total Storage Capacity



Congressionally Authorized Purposes

- Flood Control
- Water Quality Control
- Irrigation
- Navigation
- Hydropower
- Water Supply
- Recreation
- Fish and Wildlife

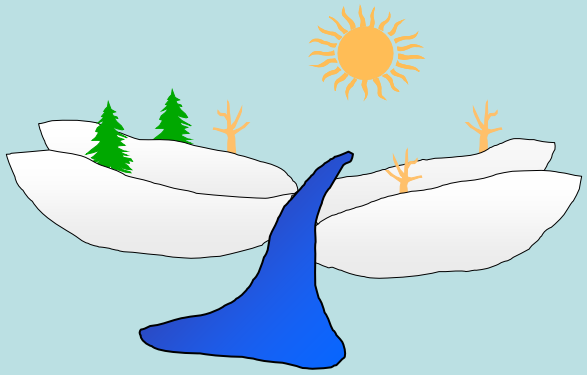
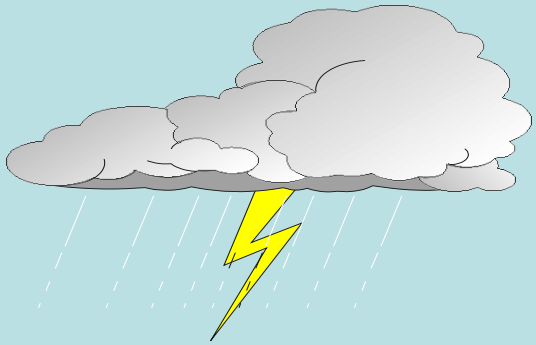
Flood Control Storage



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

Runoff Components

Plains Snowpack	Mountain Snowpack	Rainfall
		
March and April	May, June and July	March through October

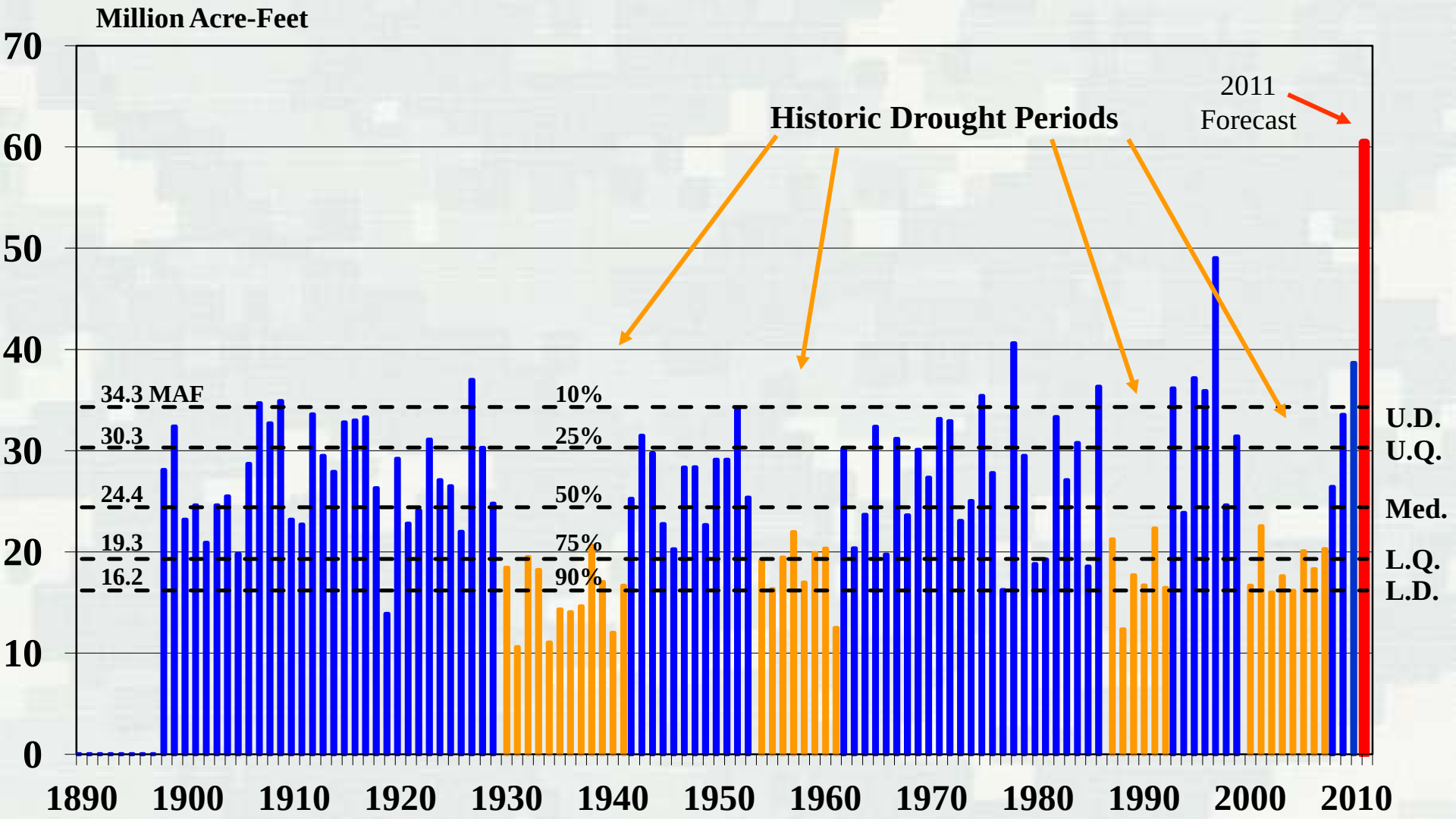
2011 Forecast* = 60.4 MAF

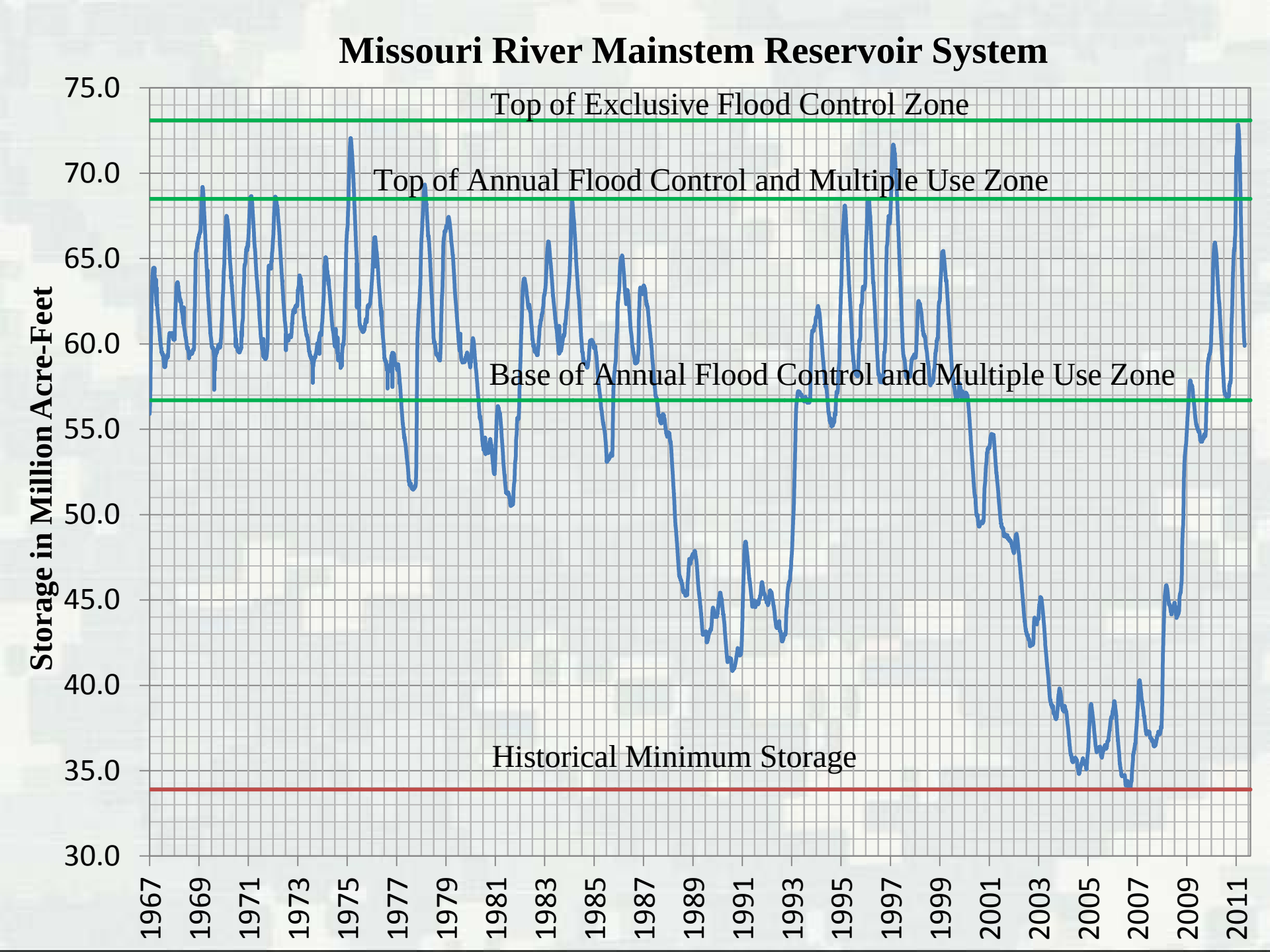
Highest runoff since 1898

Previous Record was 49.0 MAF in 1997

*October 1 Forecast

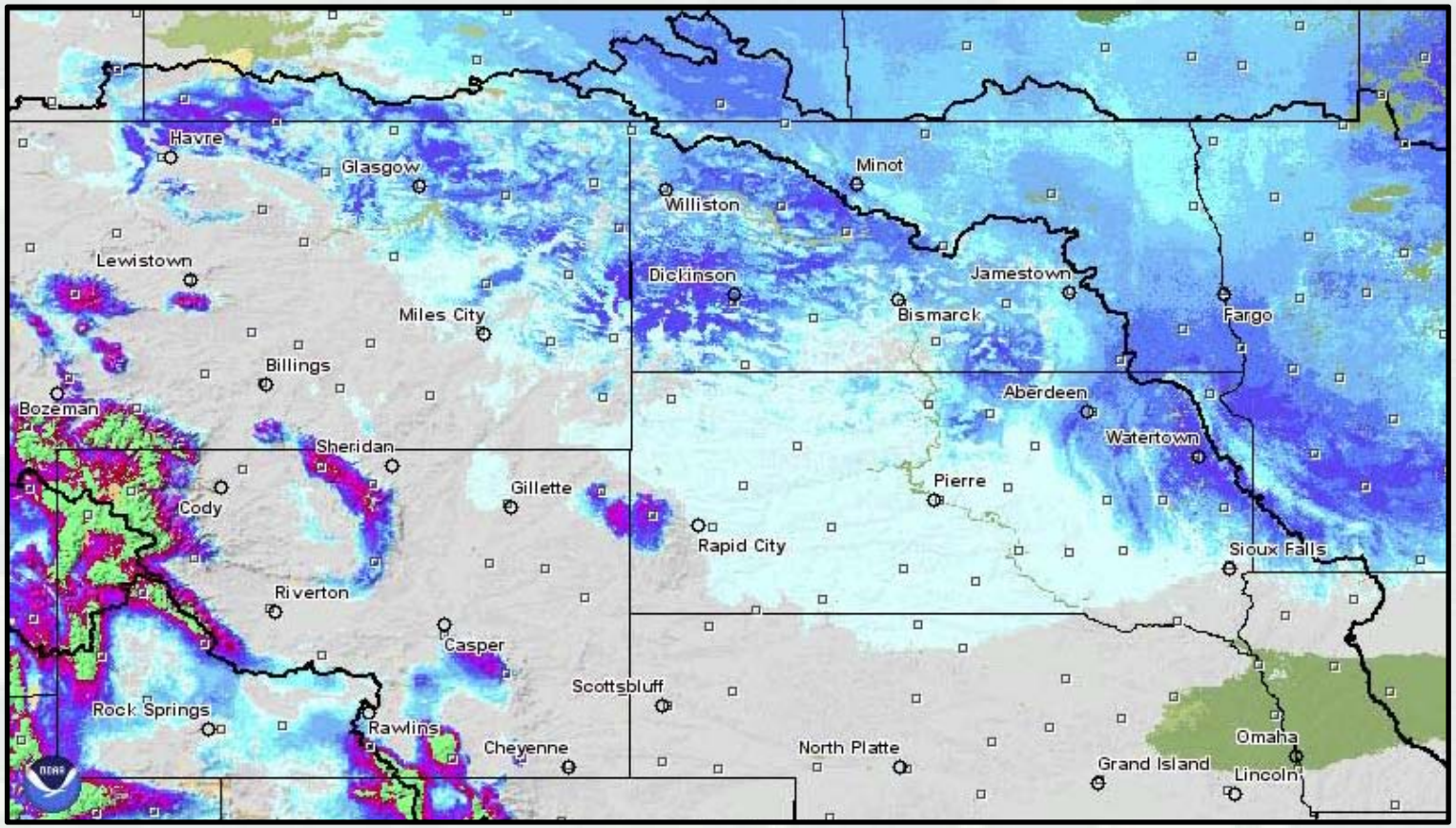
Missouri River Mainstem System
Annual Runoff above Sioux City, IA




Missouri River Mainstem Reservoir System
Storage in Million Acre-Feet
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
Top of Exclusive Flood Control Zone
Top of Annual Flood Control and Multiple Use Zone
Base of Annual Flood Control and Multiple Use Zone
Historical Minimum Storage
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011

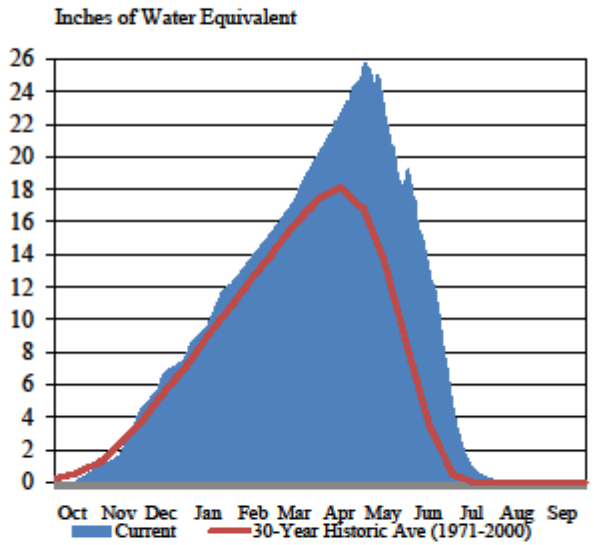
Plains Snowpack

25 February 2011

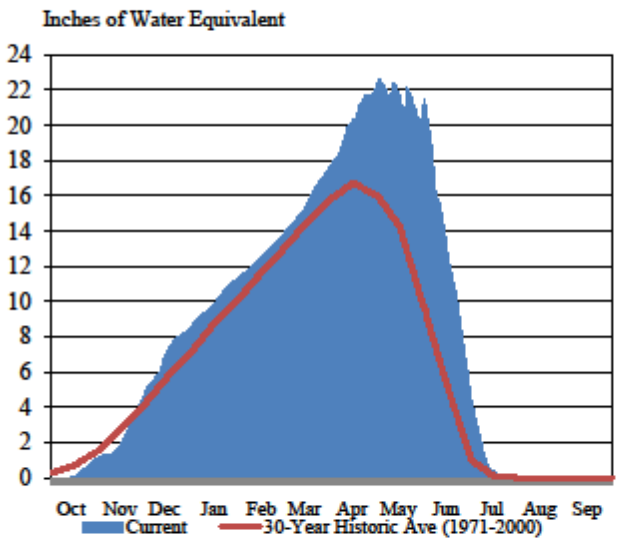


Missouri River Basin
Mountain Snowpack Water Content
2010-2011

Total above Fort Peck



Total Fort Peck to Garrison

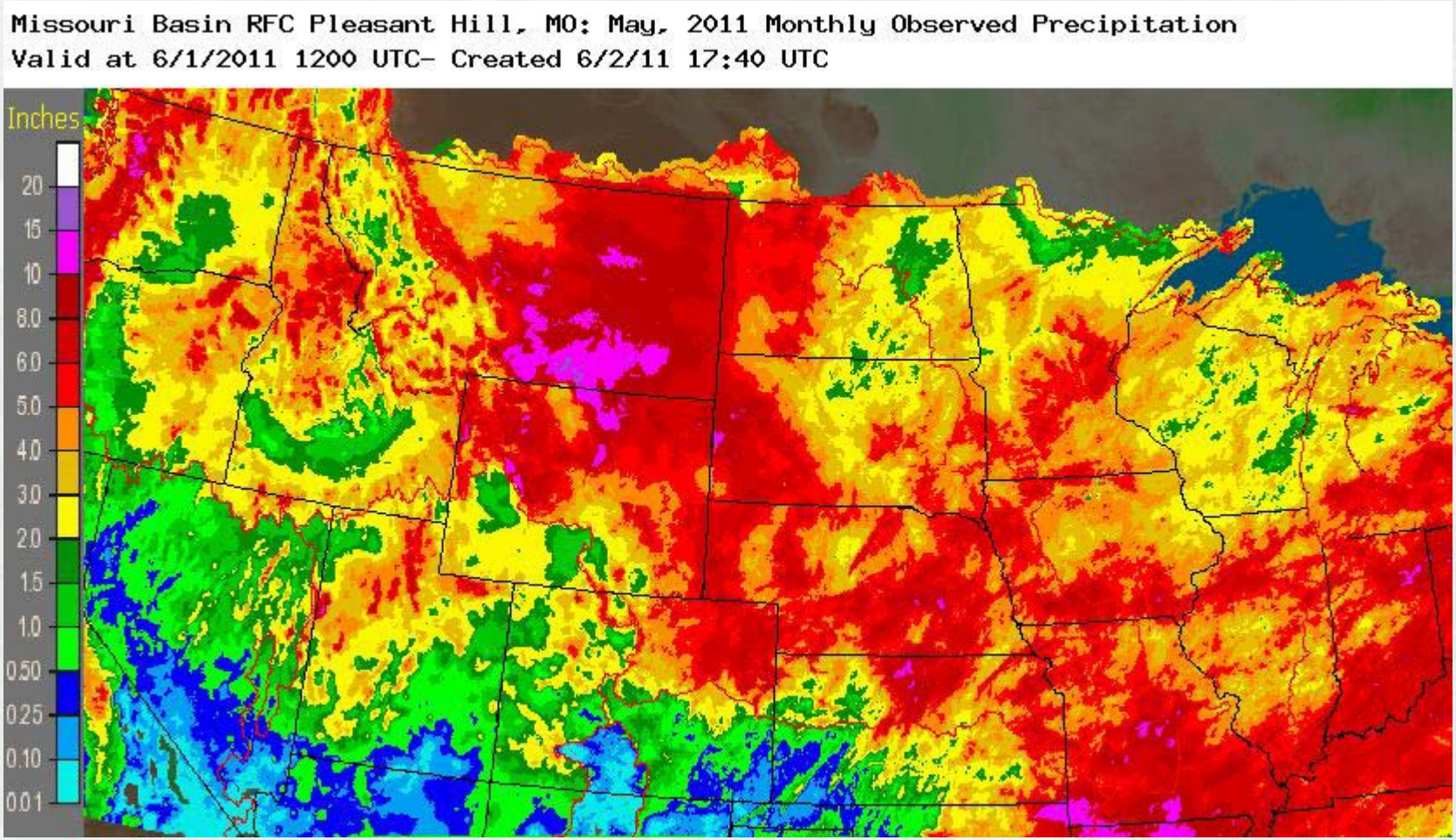


The Missouri River Basin mountain snowpack normally peaks near April 15. The mountain snowpack in both the "Total above Fort Peck" and the "Total Fort Peck to Garrison" reaches peaked on May 2 at 141 percent and 136 percent of the normal April 15 peak, respectively. As of August 1, the mountain snowpack has melted in both reaches .

August 1, 2011

Provisional data. Subject to revision.

May 2011 Precipitation

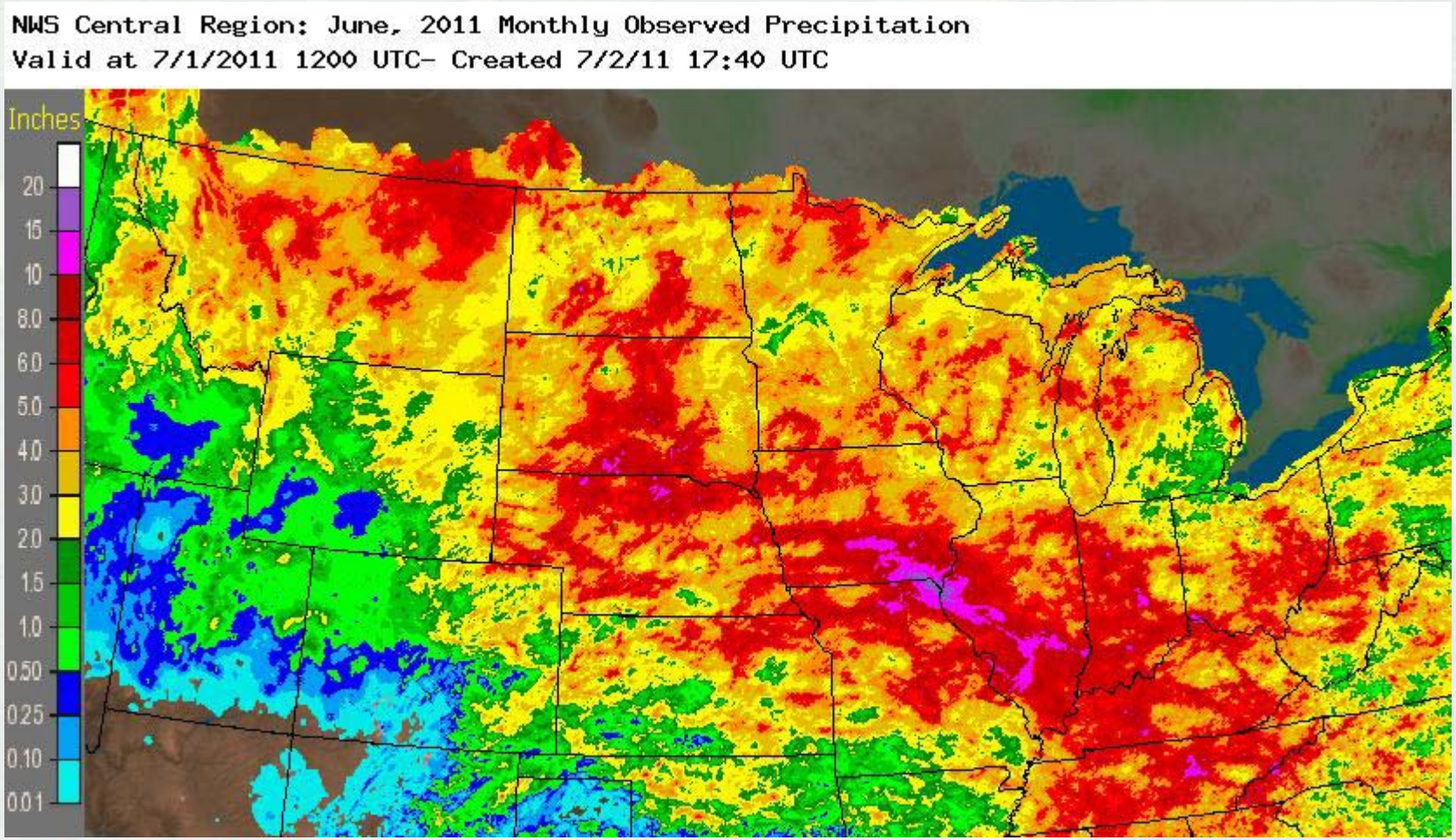


Missouri River Mainstem Reservoir May 2011 Runoff

Total runoff above Sioux City = 10.5 MAF
Wettest May on record
Second (now third) highest single month on record

	2011	Previous May Record
Fort Peck	2.9 MAF	2.6 MAF(1975)
Garrison	4.4 MAF	2.8 MAF(1978)
Fort Peck and Garrison	7.3 MAF	6.7 MAF(1952)
Total Above Sioux City	10.5 MAF	7.2 MAF(1995)

June 2011 Precipitation

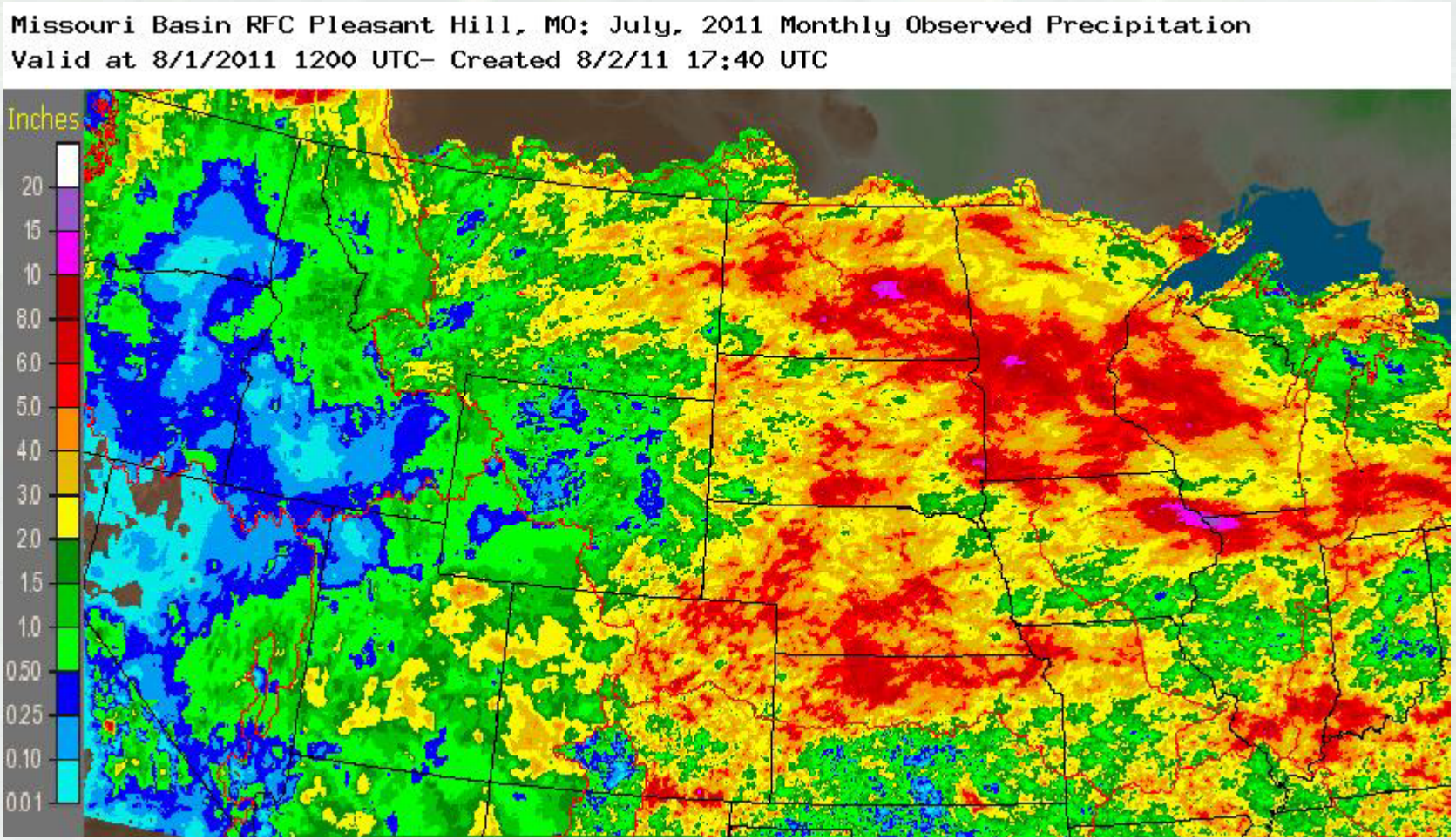


Missouri River Mainstem Reservoir June 2011 Runoff

Total runoff above Sioux City = 13.8 MAF
Wettest June on record
Highest single month on record
Previous record was 13.2 MAF in April 1952

	2011	Previous June Record
Garrison	6.2 MAF	5.1 MAF(1909)
Fort Randall	0.9 MAF	0.7 MAF(1962)
Total Above Sioux City	13.8 MAF	10.3 MAF(1909)

July 2011 Precipitation

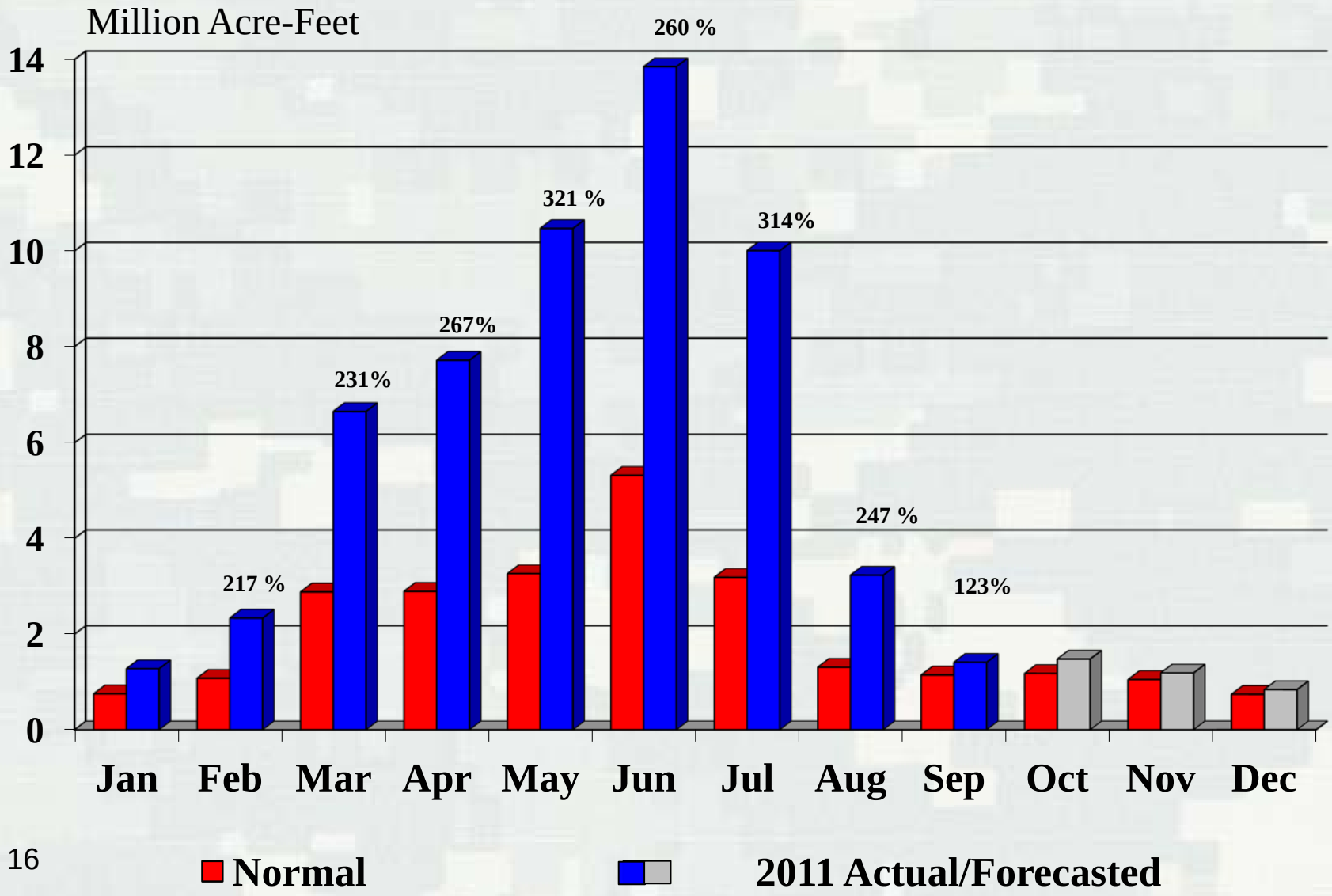


Missouri River Mainstem Reservoir
July 2011 Runoff

Total runoff above Sioux City = 10.0 MAF
Wettest July on record
Fifth highest single month on record

	2011	Previous July Record
Garrison	5.6 MAF	4.1 MAF(1907)
Total above Sioux City	10.0 MAF	8.2 MAF (1993)

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



2011 Mainstem System Regulation
(What We Forecast)

- Full flood control capacity of the mainstem reservoir system was available at the start of the 2011 runoff season
  - 2010 was 3rd highest runoff year on record
  - All flood water was evacuated prior to start of runoff
- Until rain events in May, there was no need to evacuate water at historic levels
  - April 1 runoff forecast = 33.8 MAF; Gavins Point peak releases = 39 to 45 kcfs
  - May 1 runoff forecast = 44.0 MAF; Gavins Point peak releases = 57.5 kcfs
  - June 1 runoff forecast = 54.6 MAF; Gavins Point peak releases = 150 kcfs

2011 Mainstem System Regulation
(What Actually Happened)

- Unprecedented runoff occurred in the Missouri River Basin above Sioux City, Iowa during May, June and July
  - June was the single wettest month on record with 13.8 MAF of runoff, surpassing the old record of 13.2 MAF set in April 1952.
  - May was the third wettest single month on record, with 10.5 MAF of runoff shattering the previous May record of 7.2 MAF set in May 1995
  - July was the fifth wettest single month on record with 10.0 MAF
  - Combined May through July runoff of 34.3 MAF is higher than the total annual runoff in 102 of 113 years in the period of record

2011 Mainstem System Regulation
(Dispelling Rumors and Myths)

- Mainstem Reservoir System has been operated in accordance with the Master Manual, with flood control as the highest purpose.
- Release schedules have been coordinated with Corps Divisions along the Mississippi River, but we do not have authority to regulate the mainstem reservoir system solely for the benefit of the Mississippi River.
- No operational decisions have been driven by Endangered Species Act (nesting least terns and piping plovers or pallid sturgeon); reservoirs have been operating for flood risk reduction.
- The dams are safe and we're monitoring them closely.
- We released water when we should have; we could not have evacuated earlier.

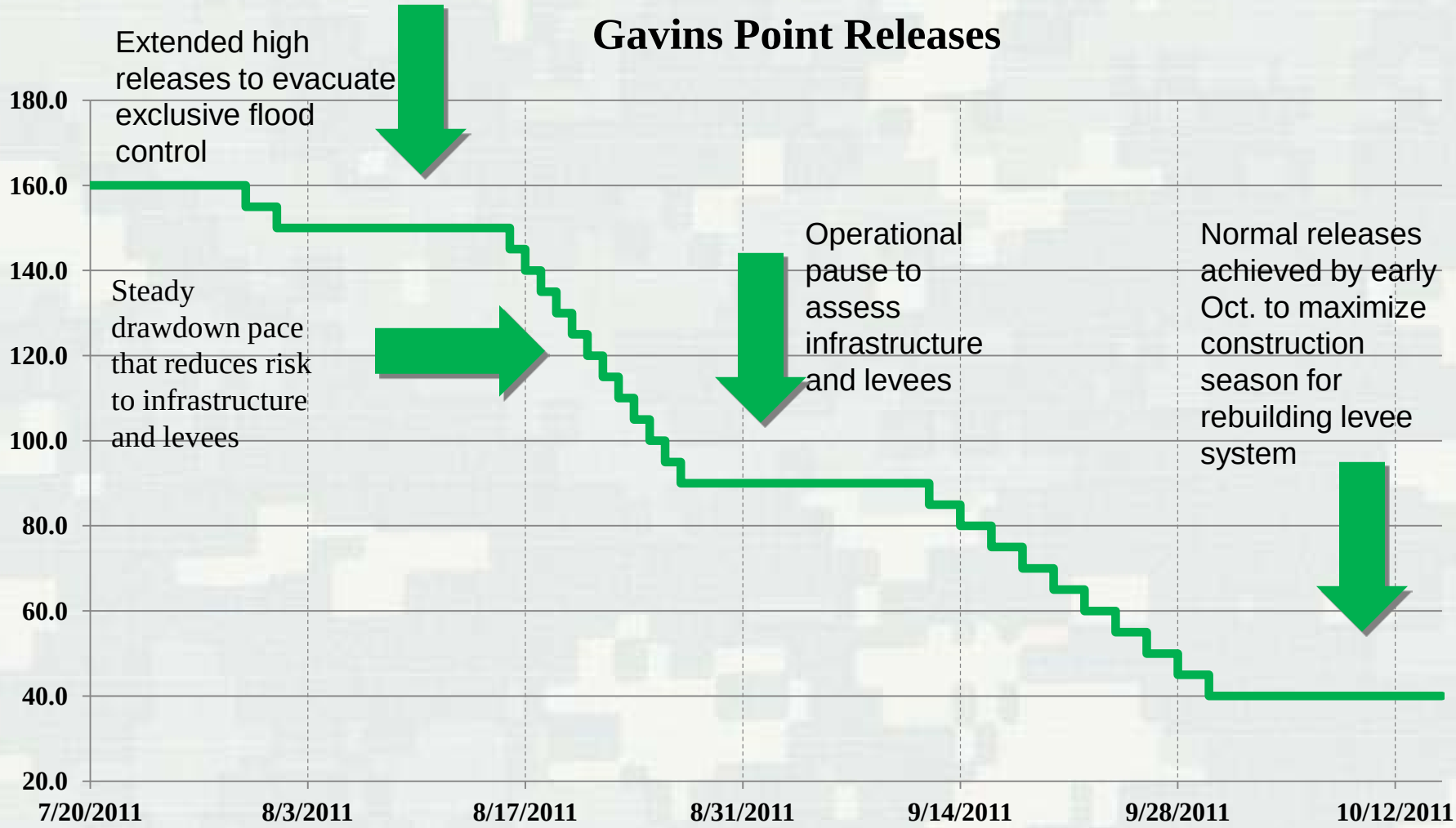
2011 Mainstem System Regulation
(The Way Ahead)

- **Desired end state:** Restore the System infrastructure and levees to pre-2011 event condition and ensure adequate storage for the 2012 runoff season—be READY for 2012
- Determine the best strategy to evacuate remaining 2011 runoff
- Assess risks related to achieving end state via multiple evacuation strategies
- Evacuate the water out of the system as fast as possible in a responsible way to enable:
  - Return of citizens to homes, farms and businesses to begin recovery
  - Inspection, assessment and repair of infrastructure and levees
  - Engender public confidence with Governor and Congressional support
- Reduce known risks where we can and anticipate other risks, both known and unknown

Key Engineering Considerations

- Evacuate exclusive flood control zones of all reservoirs as soon as possible—gain back our flexibility.
- Ensure fall releases are low enough to facilitate damage assessment and repair of infrastructure and levees (<40k cfs).
- Ensure winter releases are low enough to permit winter construction and minimize the risk of ice jam flooding (<20k cfs).
- Ensure rates of change in releases and reservoir levels are acceptable.
- Consider releases that take water off critical infrastructure.
- Consider releases that avoid continued use of various project features such as spillways and outlet tunnels.
- Consider releases that allow temporary measures to be removed.

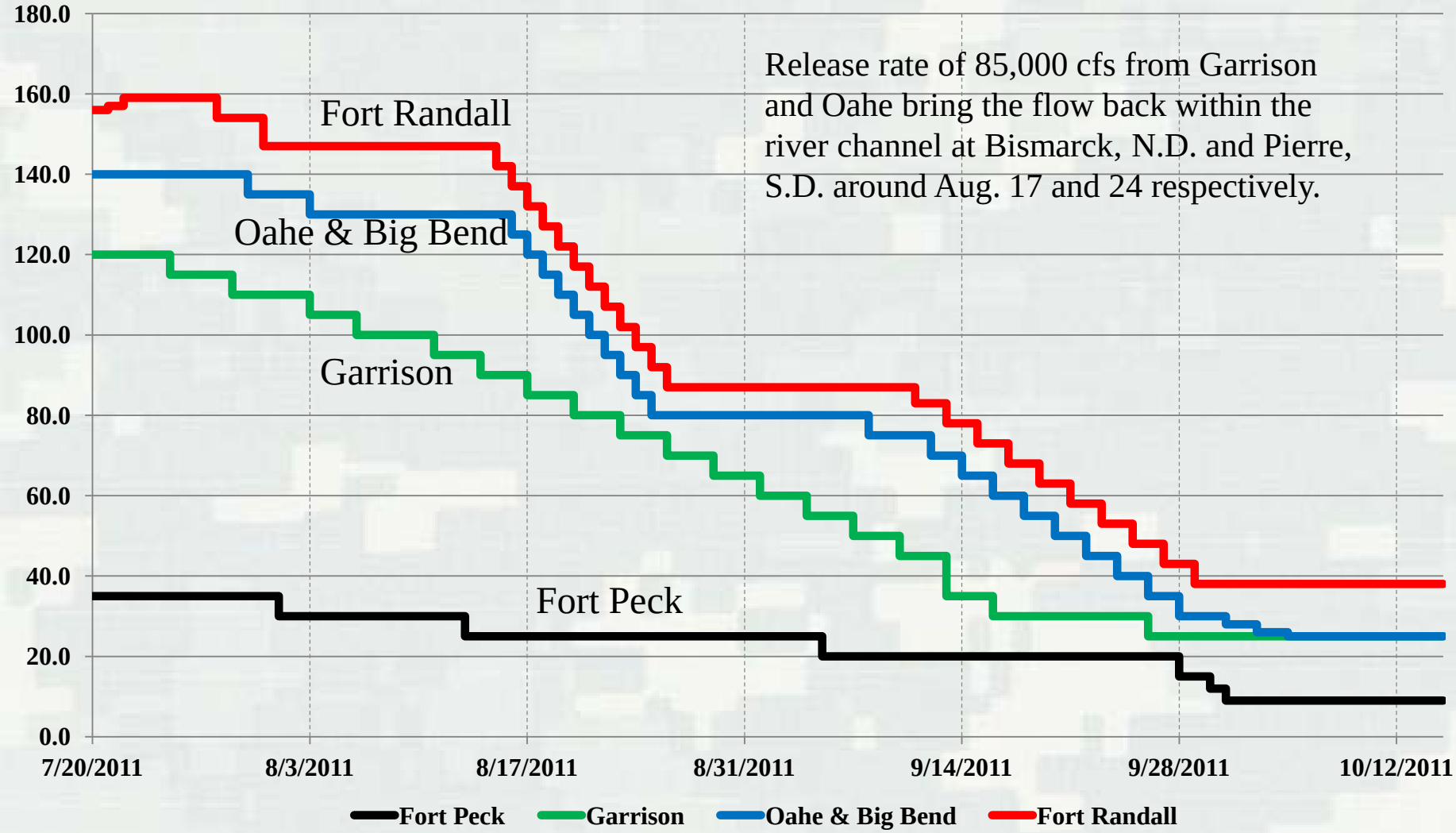
Drawdown Strategy



All dates provided above are best approximations, based on current forecast conditions and the best available information at the time. Adjustments to the release schedule may be necessary if conditions change.

Drawdown Strategy

Fort Peck, Garrison, Oahe/Big Bend, and Fort Randall Releases



All dates provided above are best approximations, based on current forecast conditions and the best available information at the time. Adjustments to the release schedule may be necessary if conditions change.

Questions?

Background slides

Fort Peck

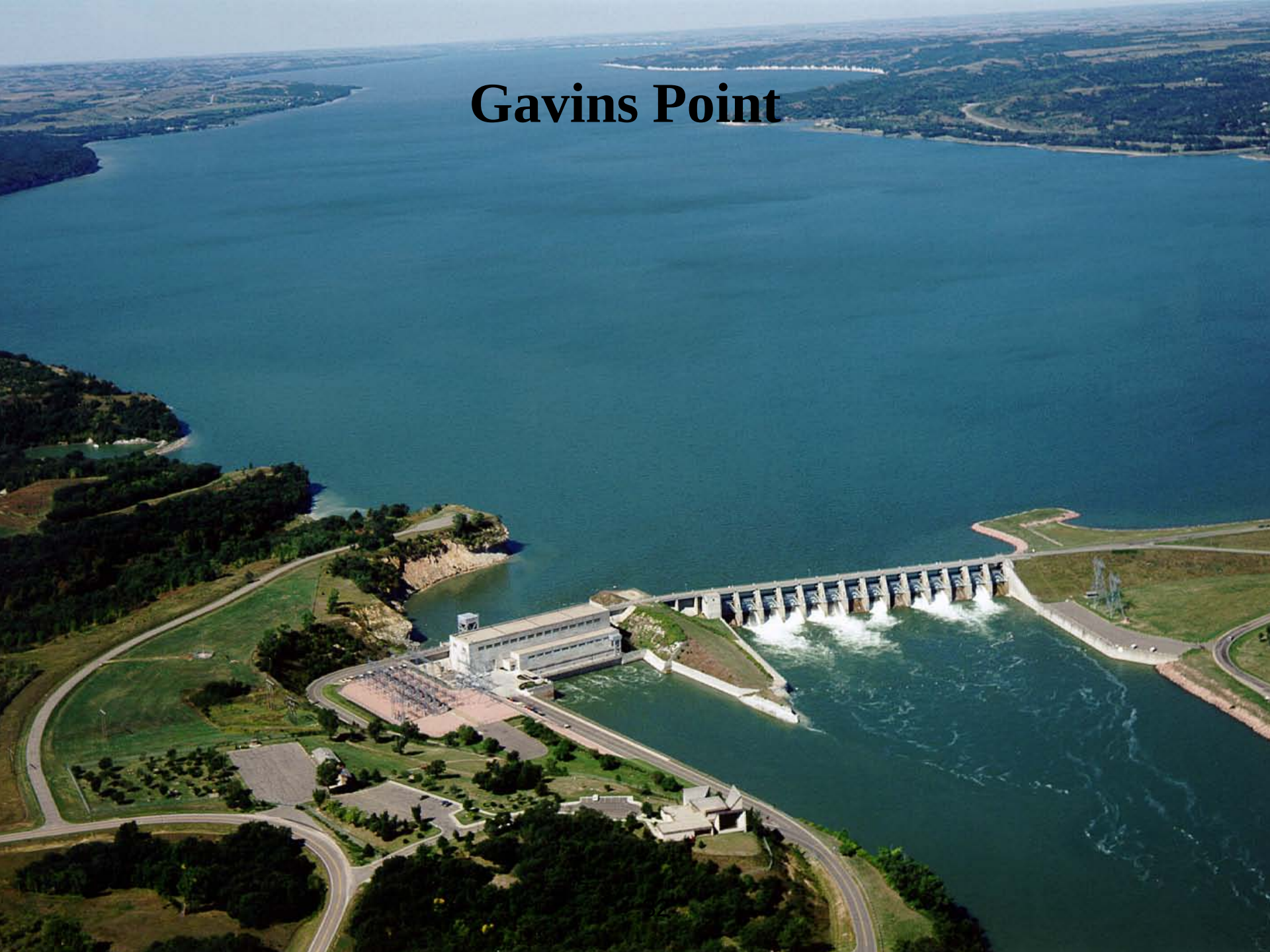
Garrison

Oahe

Big Bend

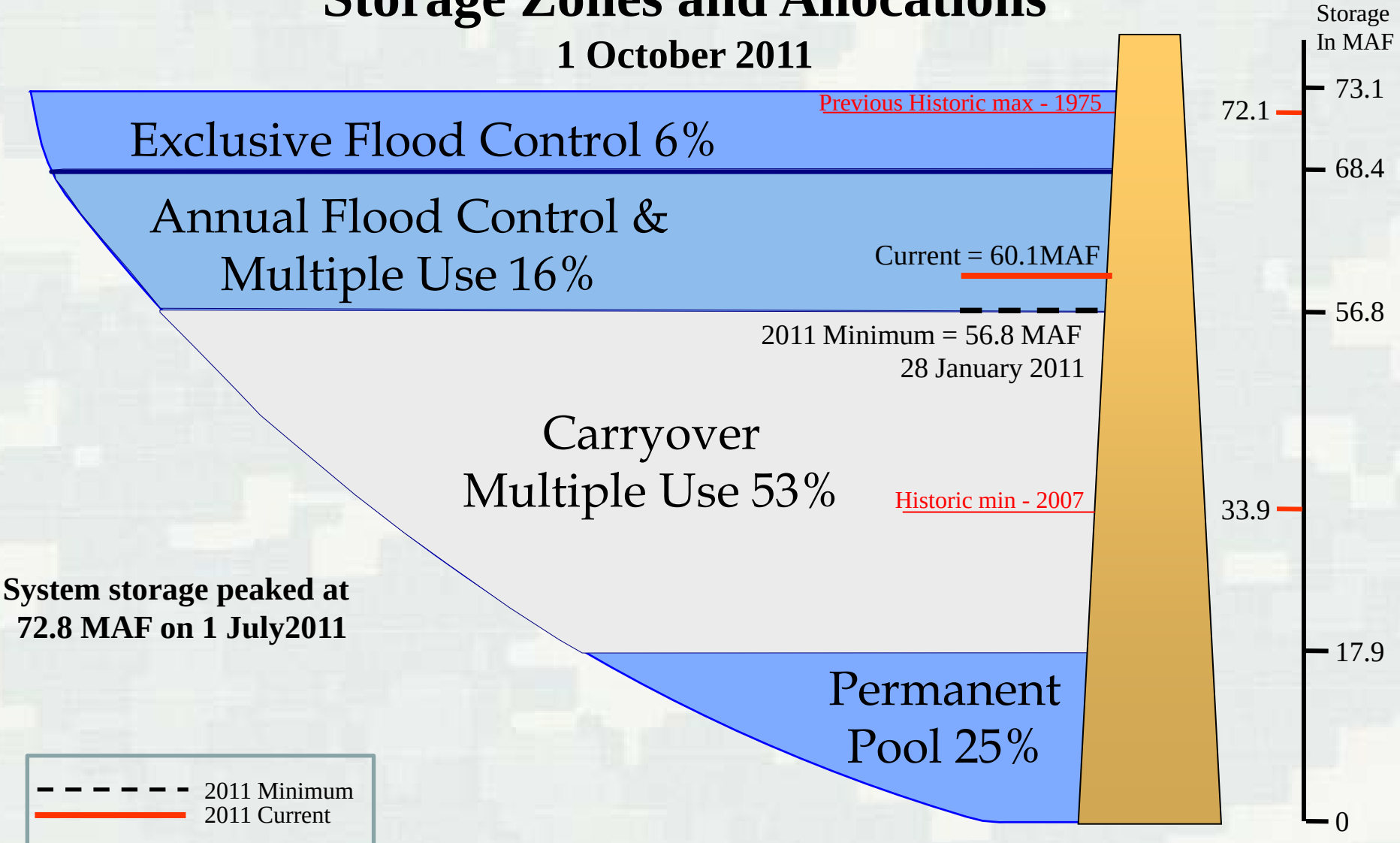
Fort Randall

Gavins Point

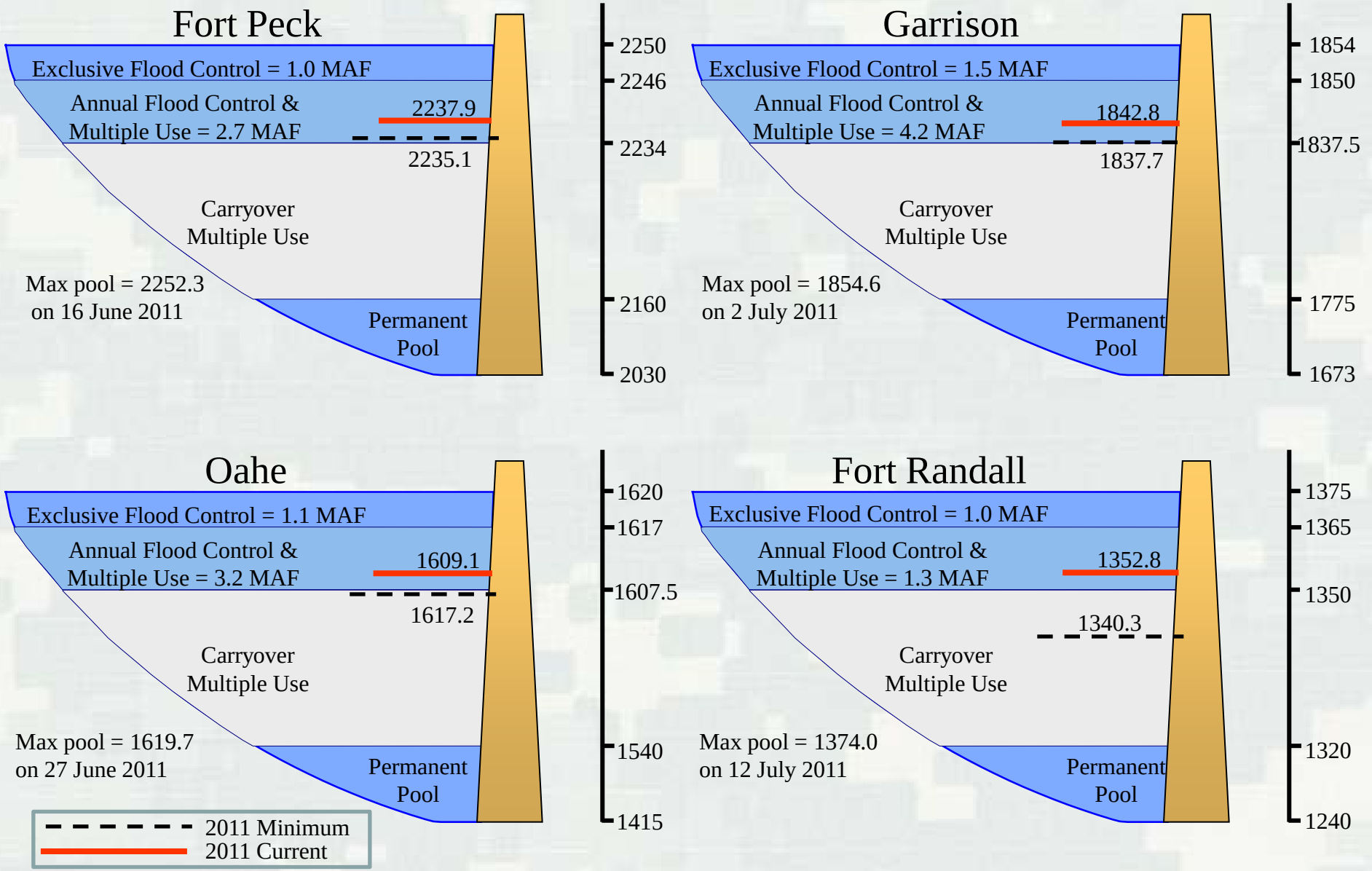


Missouri River Mainstem System Storage Zones and Allocations

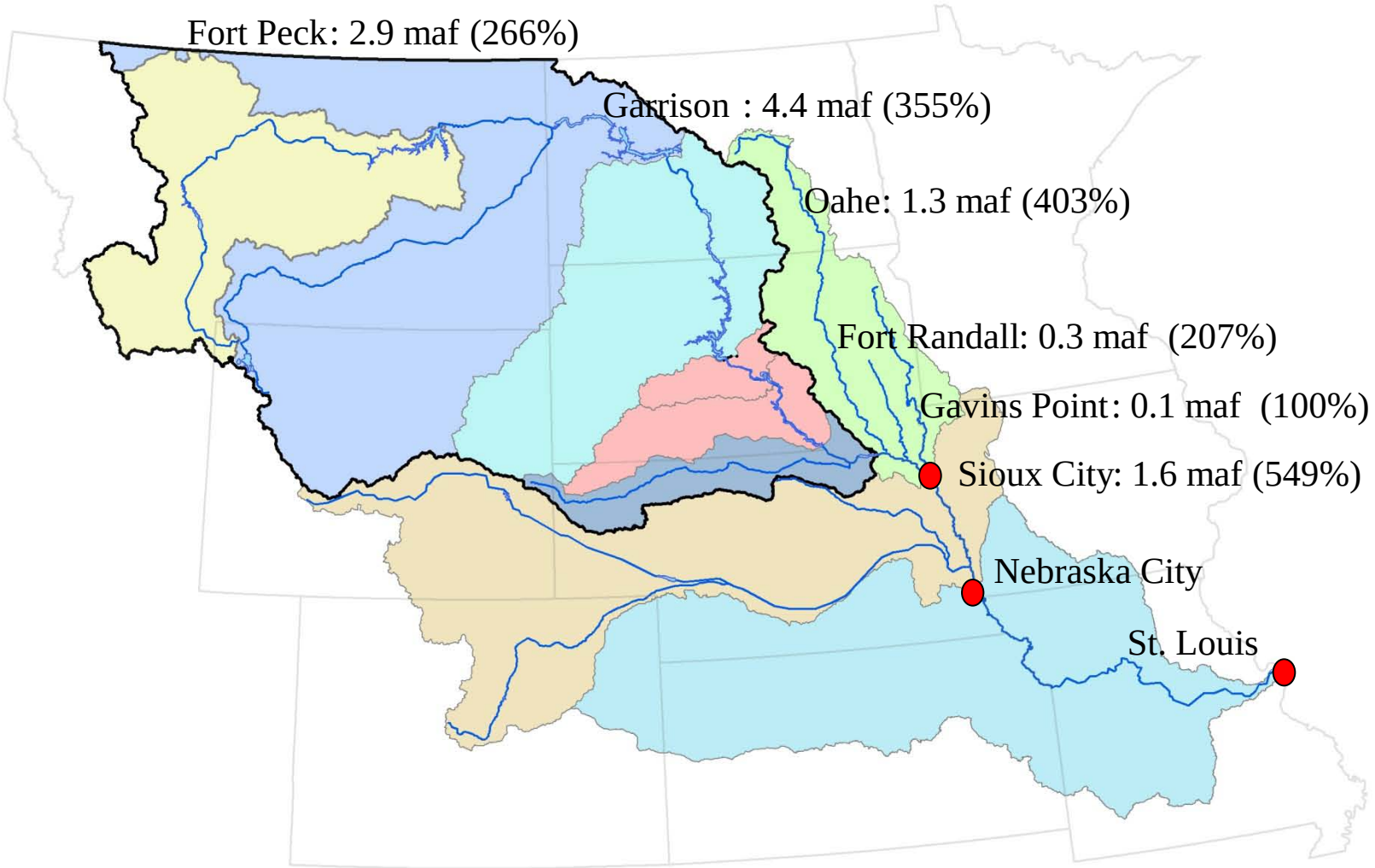
1 October 2011



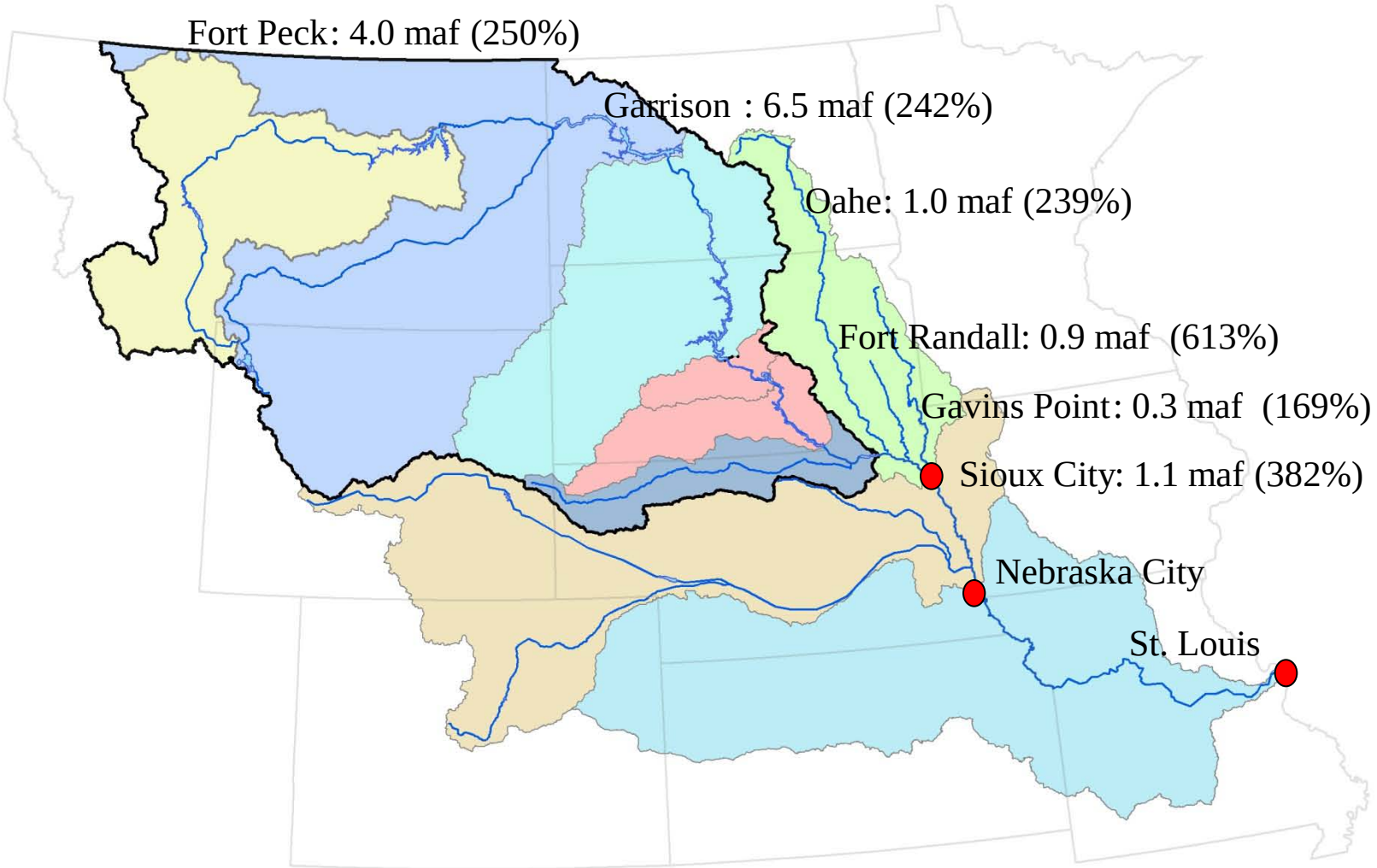
Mainstem Reservoir Levels
1 October 2011



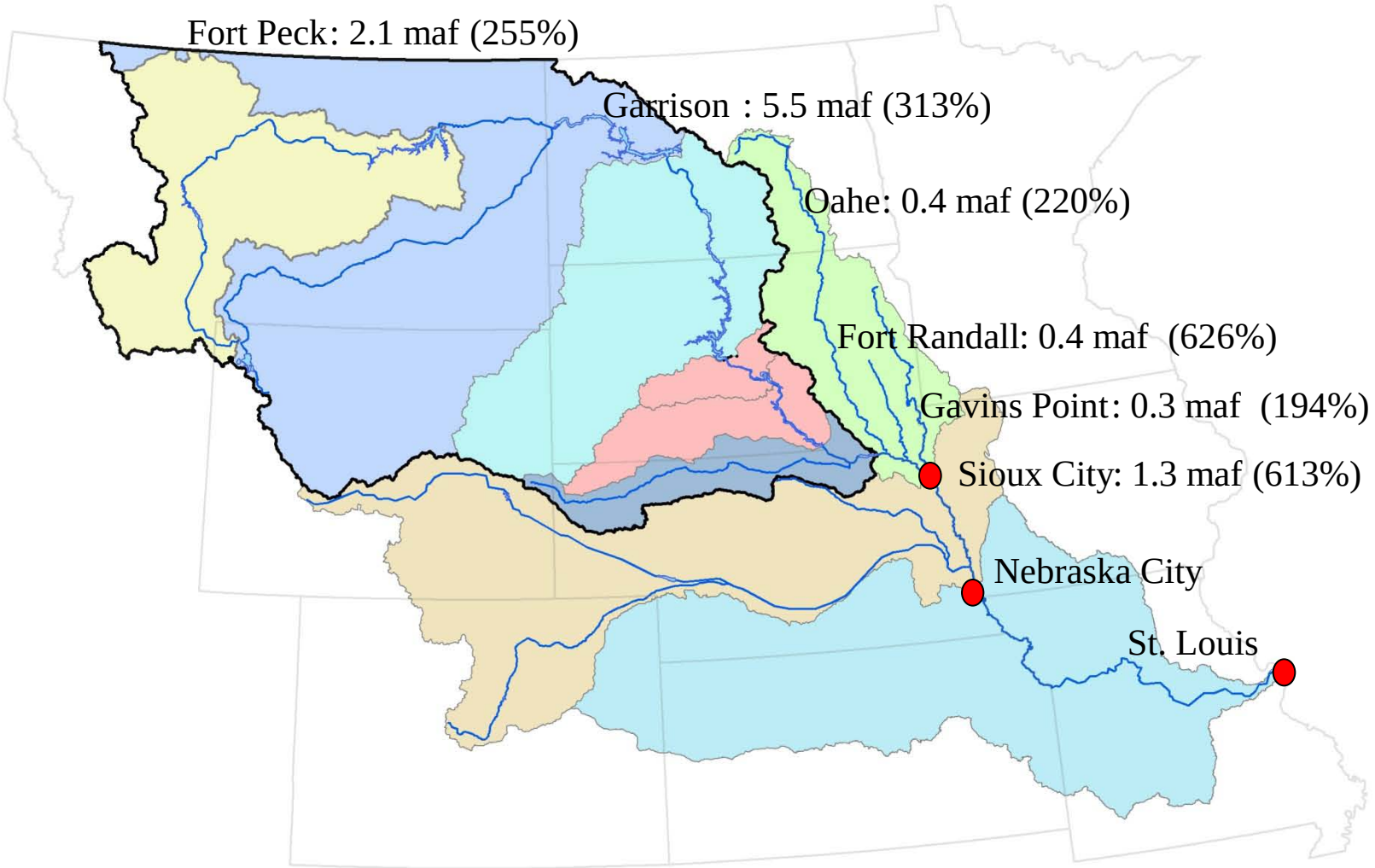
Missouri River Basin – May 2011 Runoff



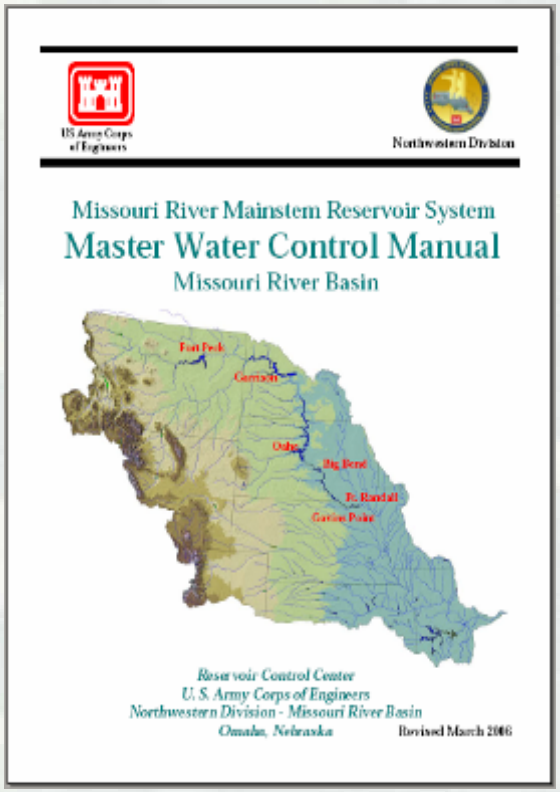
Missouri River Basin – June 2011 Runoff



Missouri River Basin – July 2011 Runoff



Missouri River Mainstem Reservoir System Master Manual



- First published in 1960
- Updated in 1975 and 1979
- Master Manual Review and Update began in November 1989 in response to late 1980's / early 1990's drought
- Amended Biological Opinion received from USFWS in December 2003
- Manual was revised for drought conservation in March 2004
- Again revised in March 2006 for Gavins Point spring pulse
- Annual Operating Plan (AOP) developed annually in accordance with Master Manual