U.S. Army Corps of Engineers
Northwestern Division

Missouri River Basin Water Management

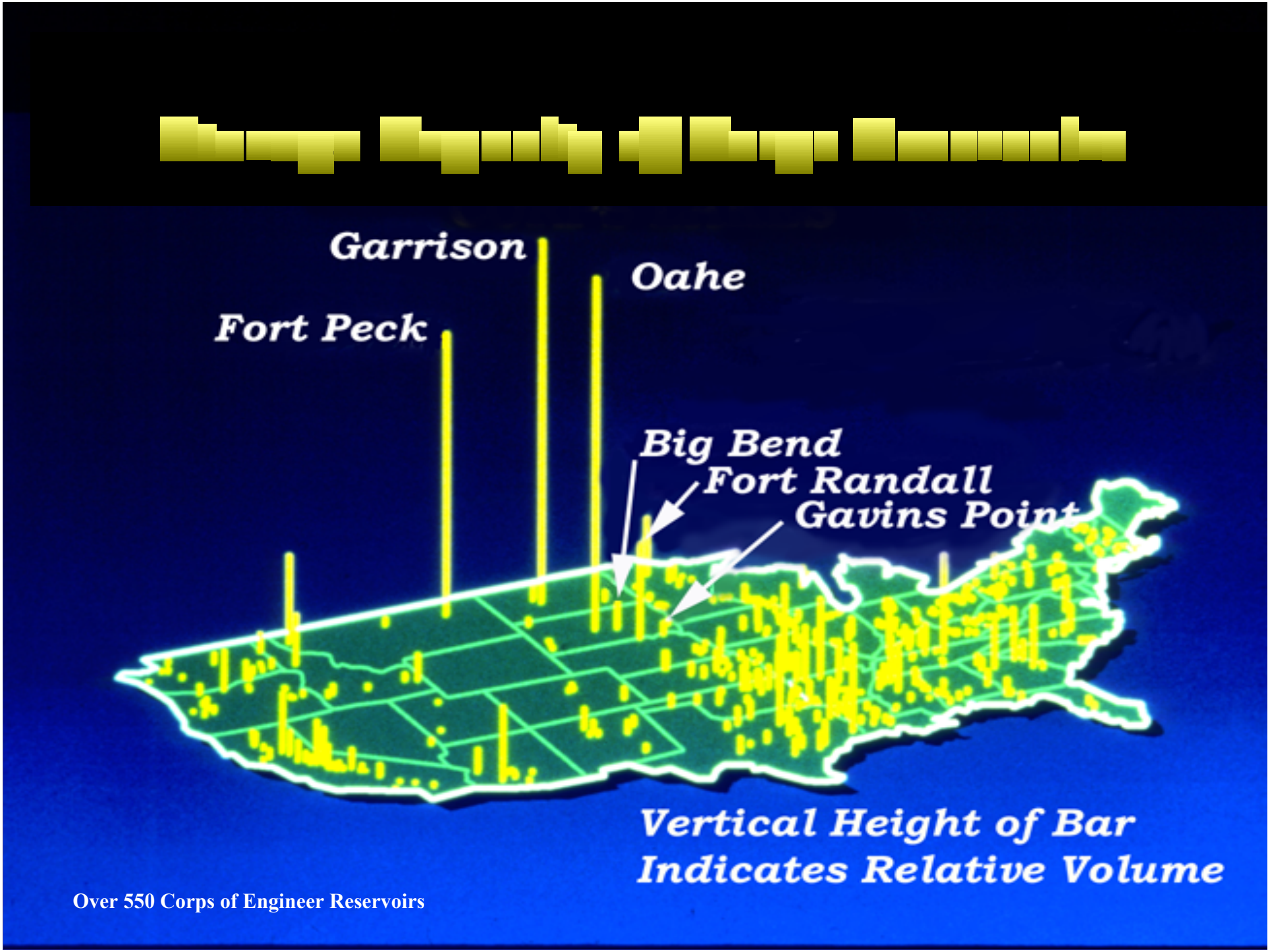
Infrastructure Conference

Missouri River Mainstem Reservoir System

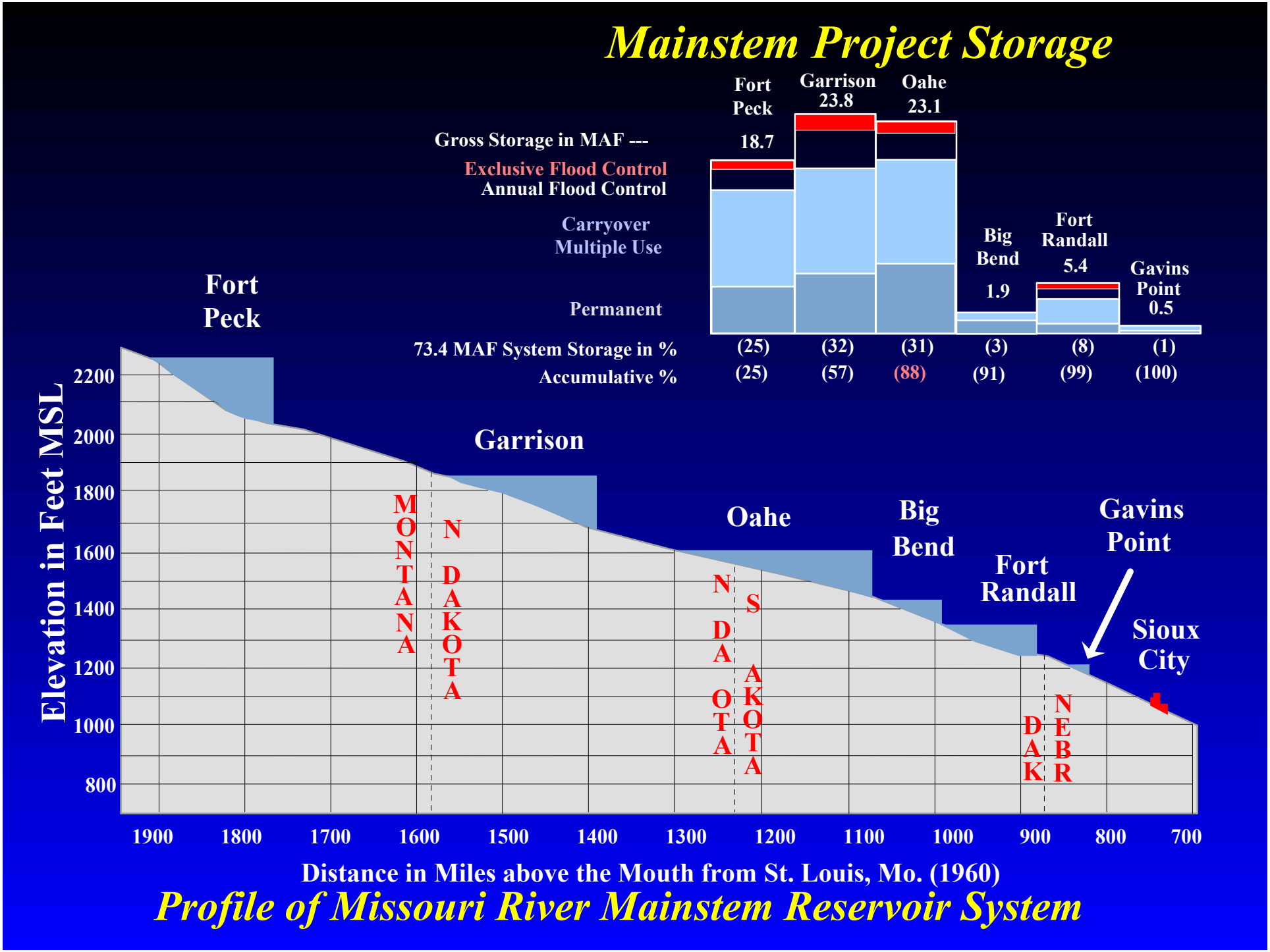
Congressionally Authorized
Project Purposes

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

Bank Stabilization and Navigation Project
Sioux City, IA – St. Louis, MO

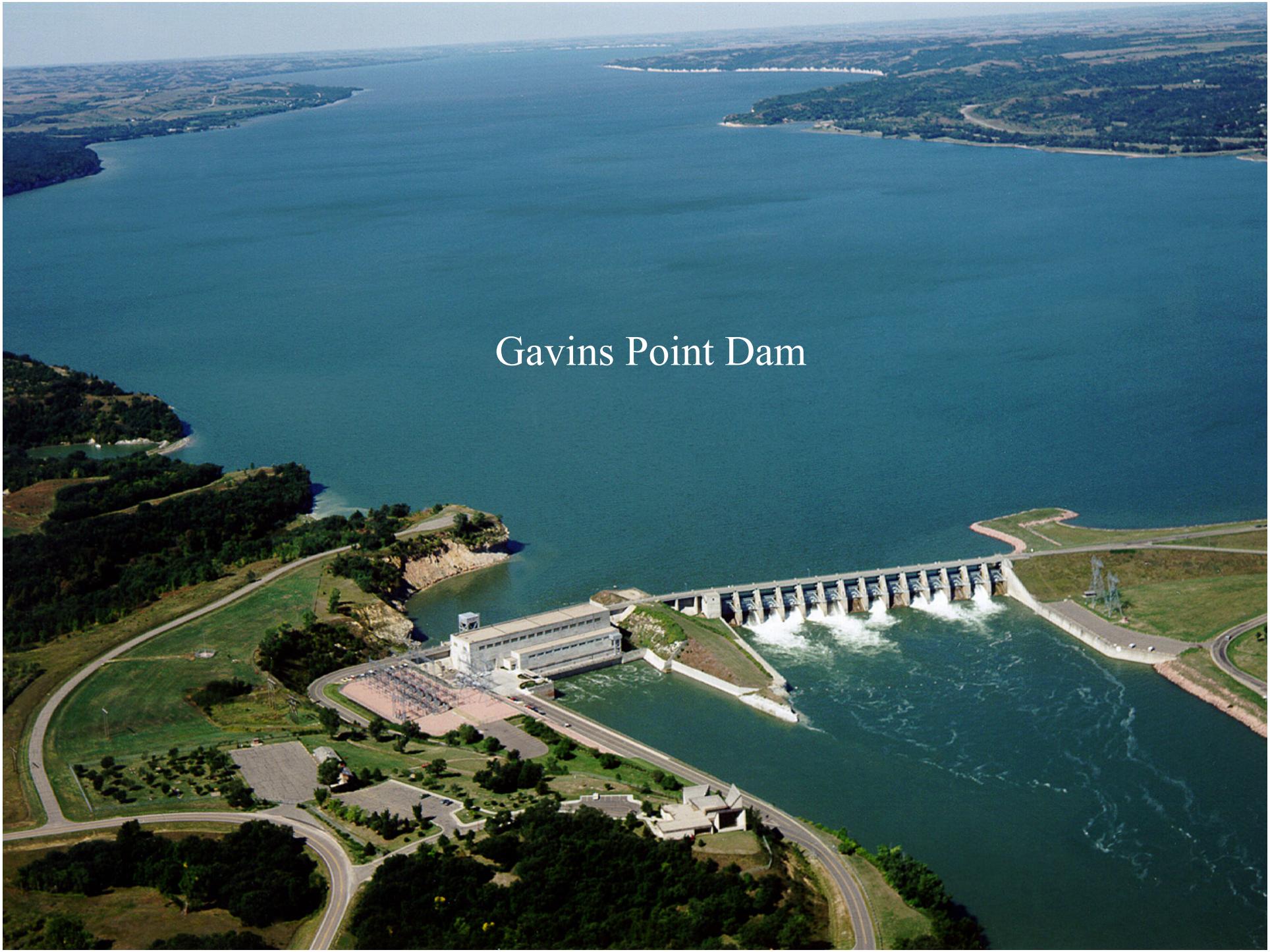

Garrison
Oahe
Fort Peck
Big Bend
Fort Randall
Gavins Point
Vertical Height of Bar
Indicates Relative Volume
Over 550 Corps of Engineer Reservoirs

Mainstem Project Storage



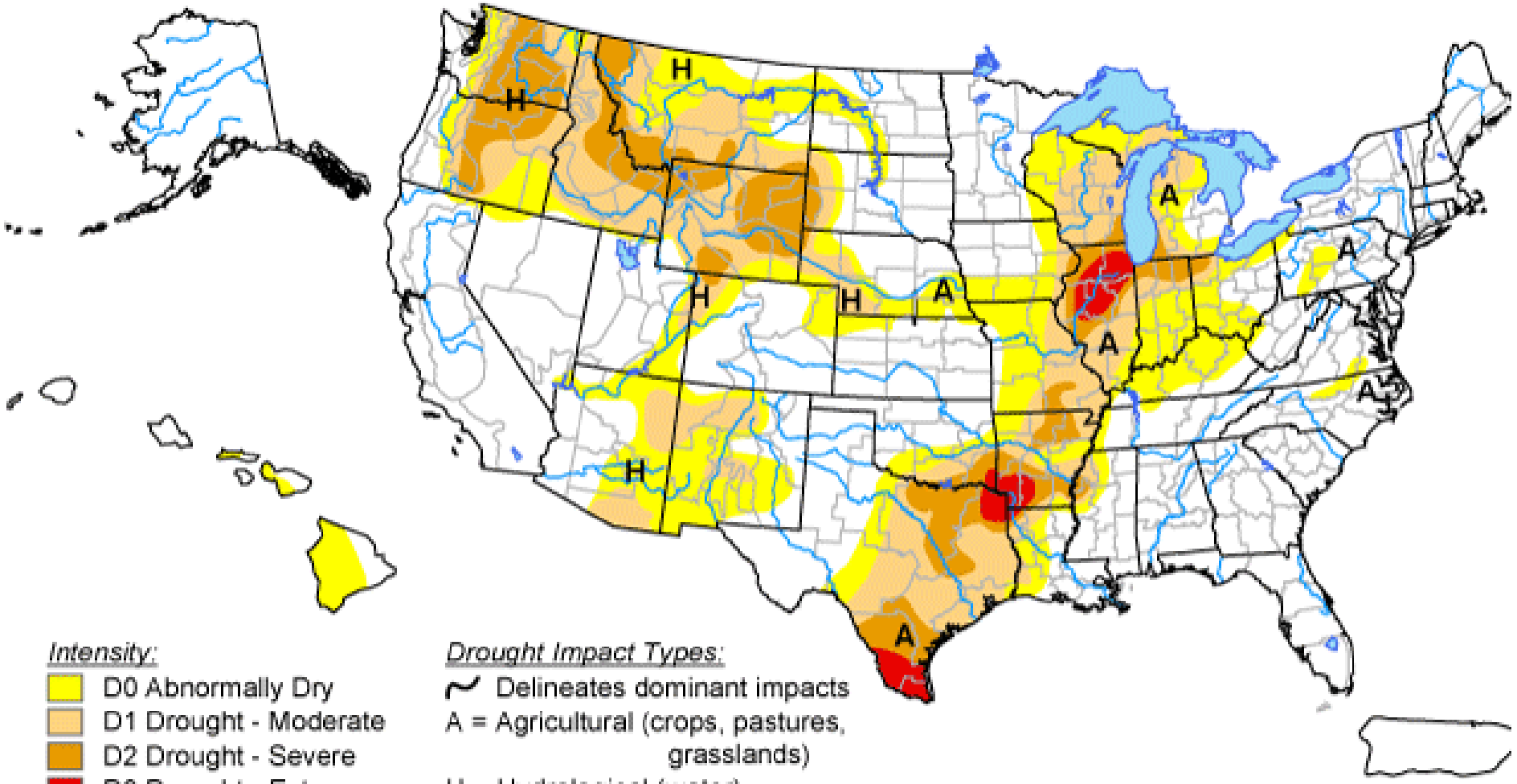
Profile of Missouri River Mainstem Reservoir System


Garrison Dam


Gavins Point Dam

U.S. Drought Monitor

July 12, 2005
Valid 8 a.m. EDT



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

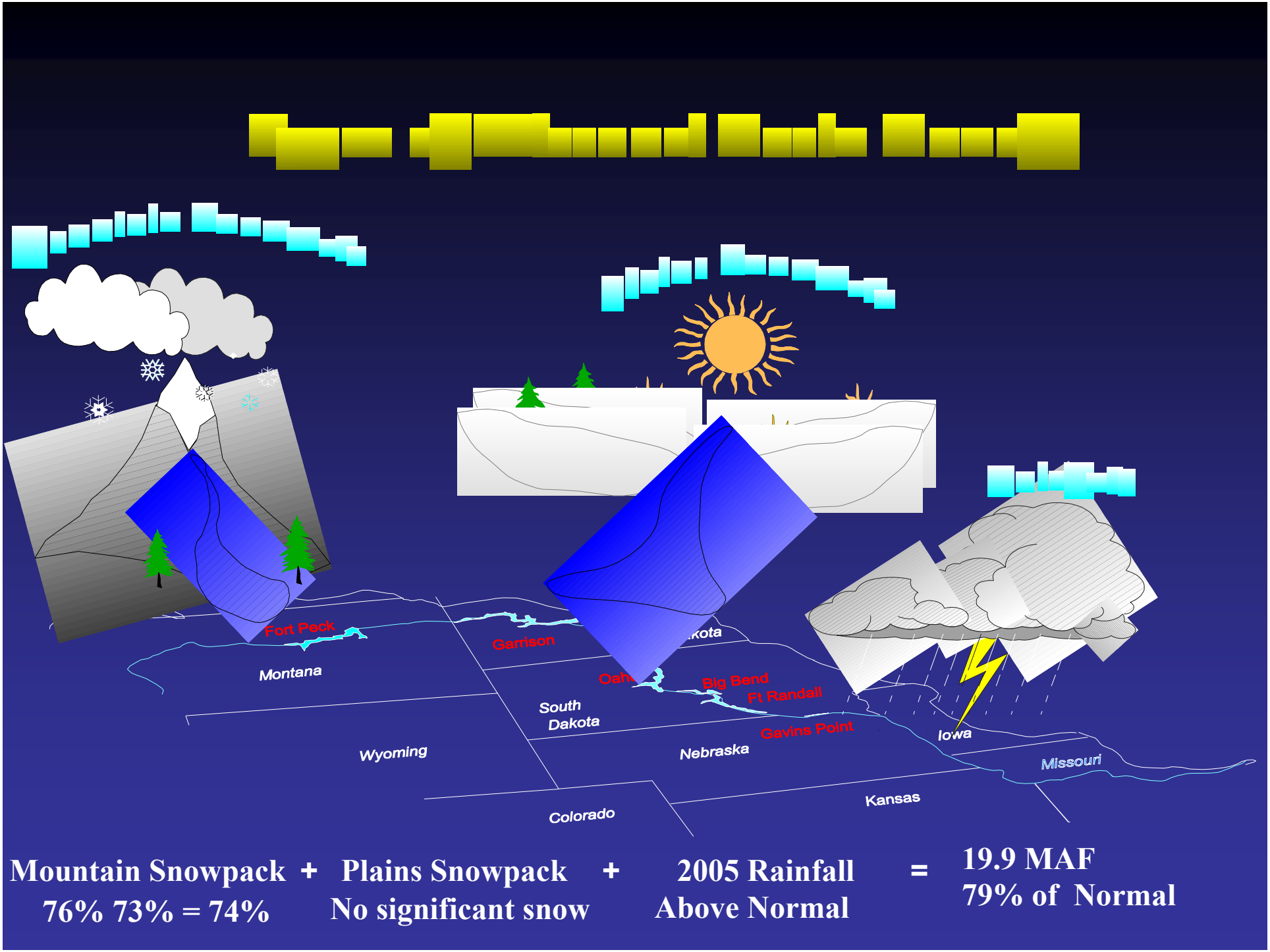
Drought Impact Types:
- ~ Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)
- (No type = Both impacts)

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

USDA National Drought Mitigation Center

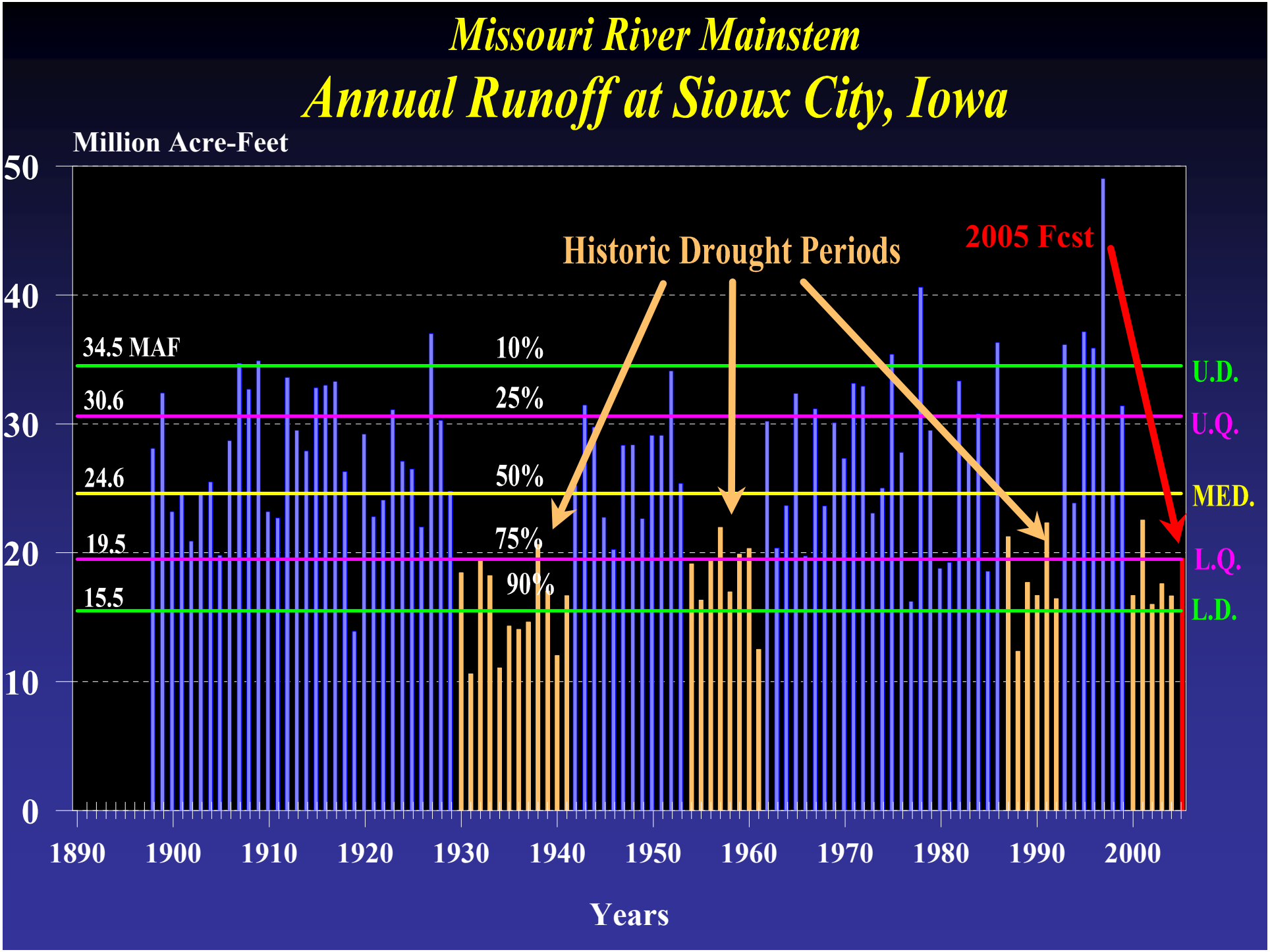
Released Thursday, July 14, 2005

Author: Richard Tinker, NOAA/NWS/NCEP/CPC

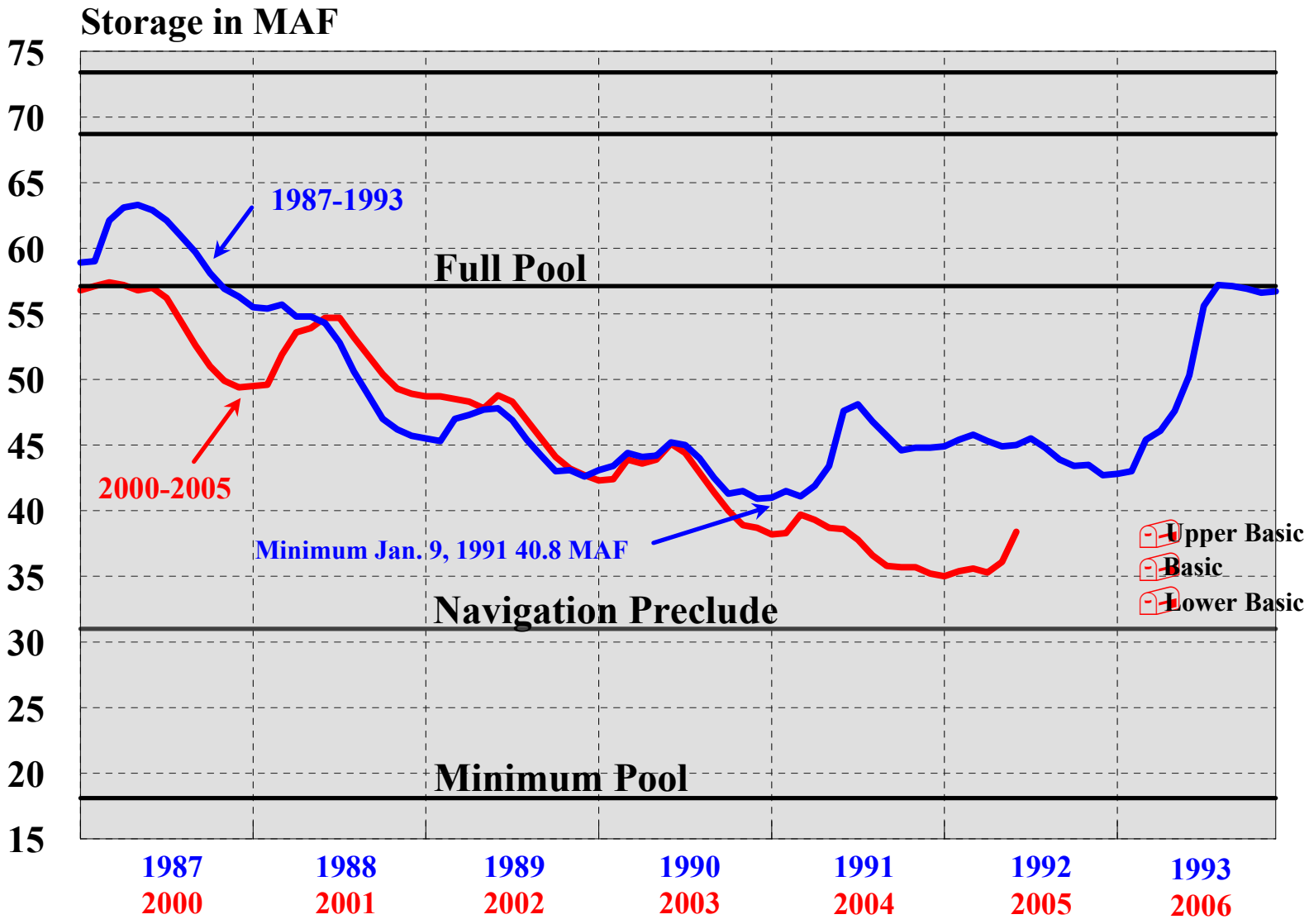


Mountain Snowpack + Plains Snowpack + 2005 Rainfall = 19.9 MAF

76% 73% = 74% No significant snow Above Normal 79% of Normal


Missouri River Mainstem
Annual Runoff at Sioux City, Iowa
Million Acre-Feet
50
40
30
20
10
0
34.5 MAF
30.6
24.6
19.5
15.5
10%
25%
50%
75%
90%
Historic Drought Periods
2005 Fcst
U.D.
U.Q.
MED.
L.Q.
L.D.
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Years

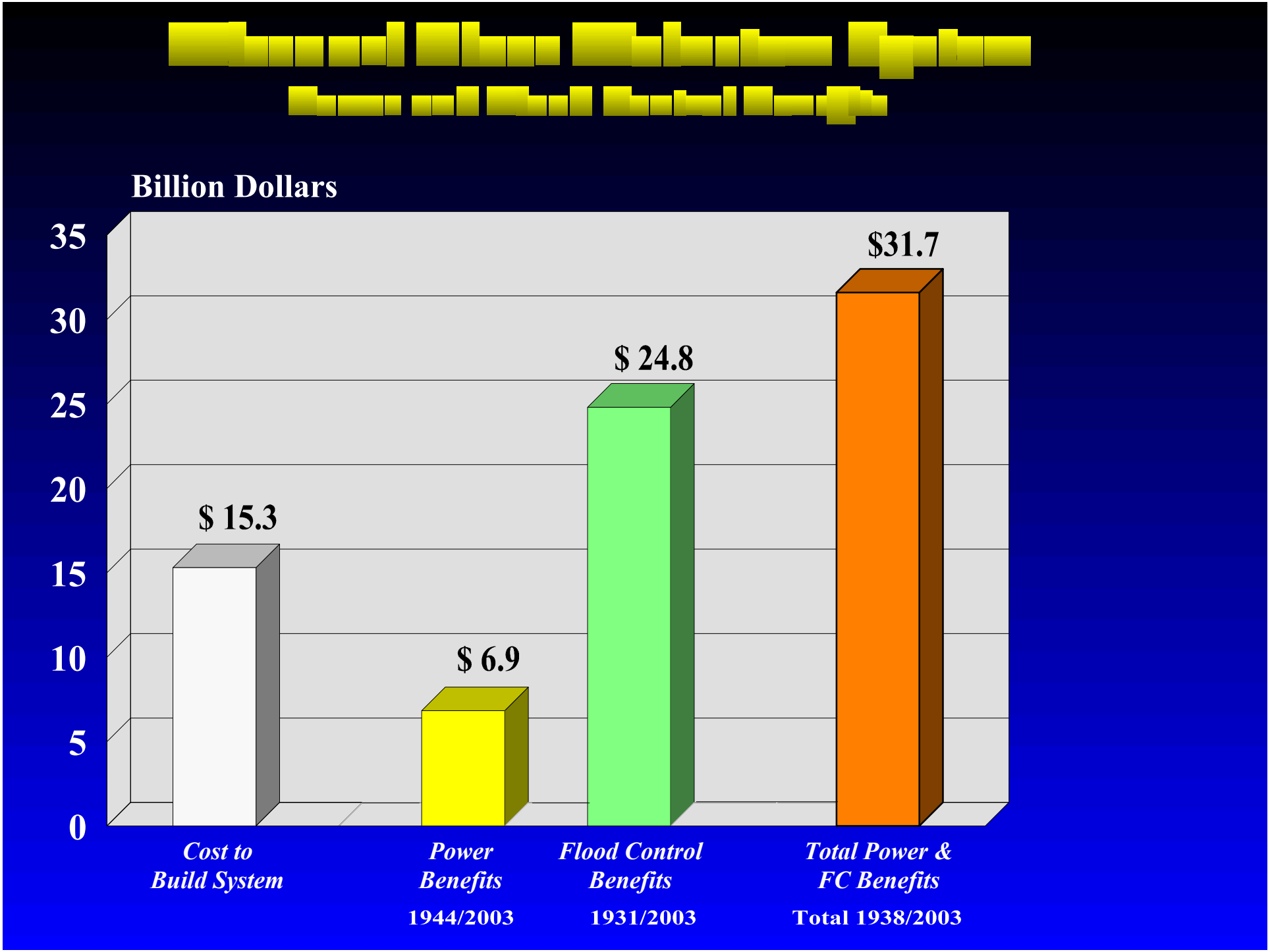
Missouri River Mainstem
System Storage 1987-1993 & 2000-2006



Interior Least Tern

Piping Plover

Pallid Sturgeon


Billion Dollars
35
30
25
20
15
10
5
0
$ 15.3
$ 6.9
$ 24.8
$31.7
Cost to Build System
Power Benefits
1944/2003
Flood Control Benefits
1931/2003
Total Power & FC Benefits
Total 1938/2003

Missouri River Mainstem Master Manual

Update Study


MISSOURI RIVER:
MULTIPLE PURPOSES, MULTIPLE INTERESTS
IRRIGATION
RESERVOIR FISH
HISTORIC PROPERTIES
M&I WATER SUPPLY
Fort Peck
RECREATION
North Dakota
TERNS AND PLOVERS (Endangered & Threatened)
Garrison
Montana
HYDROPOWER
South Dakota
WETLAND HABITAT
Oahe
Big Bend
ENVIRONMENTAL JUSTICE
Wyoming
Fort Randall
TREATY AND TRUST
Gavins Point
Iowa
RIPARIAN HABITAT
WATER QUALITY
Nebraska
Navigation Channel
Missouri
FLOOD CONTROL
Colorado
Kansas
WATER RIGHTS
INTERESTS
ECONOMIC
ENVIRONMENTAL
TRIBAL
NAVIGATION (Missouri River & Mississippi River)
RIVERINE FISH (Endangered Pallid Sturgeon)

Master Manual & ESA Consultation History

- 1985 – Interior Least Tern Listed
- 1986 – Piping Plover Listed
- Nov 1989 – Master Manual Review initiated
  Why? MM 1960, updated 1975 and 1979
- 1990 – Pallid Sturgeon Listed & Final BiOp for terns and Plovers
- 1993 – Preliminary Draft EIS (Agency Review)
- 1994 – Draft EIS (DEIS) published (PA identified) & Draft BiOp on the PA completed

Master Manual & ESA Consultation History (Cont'd)

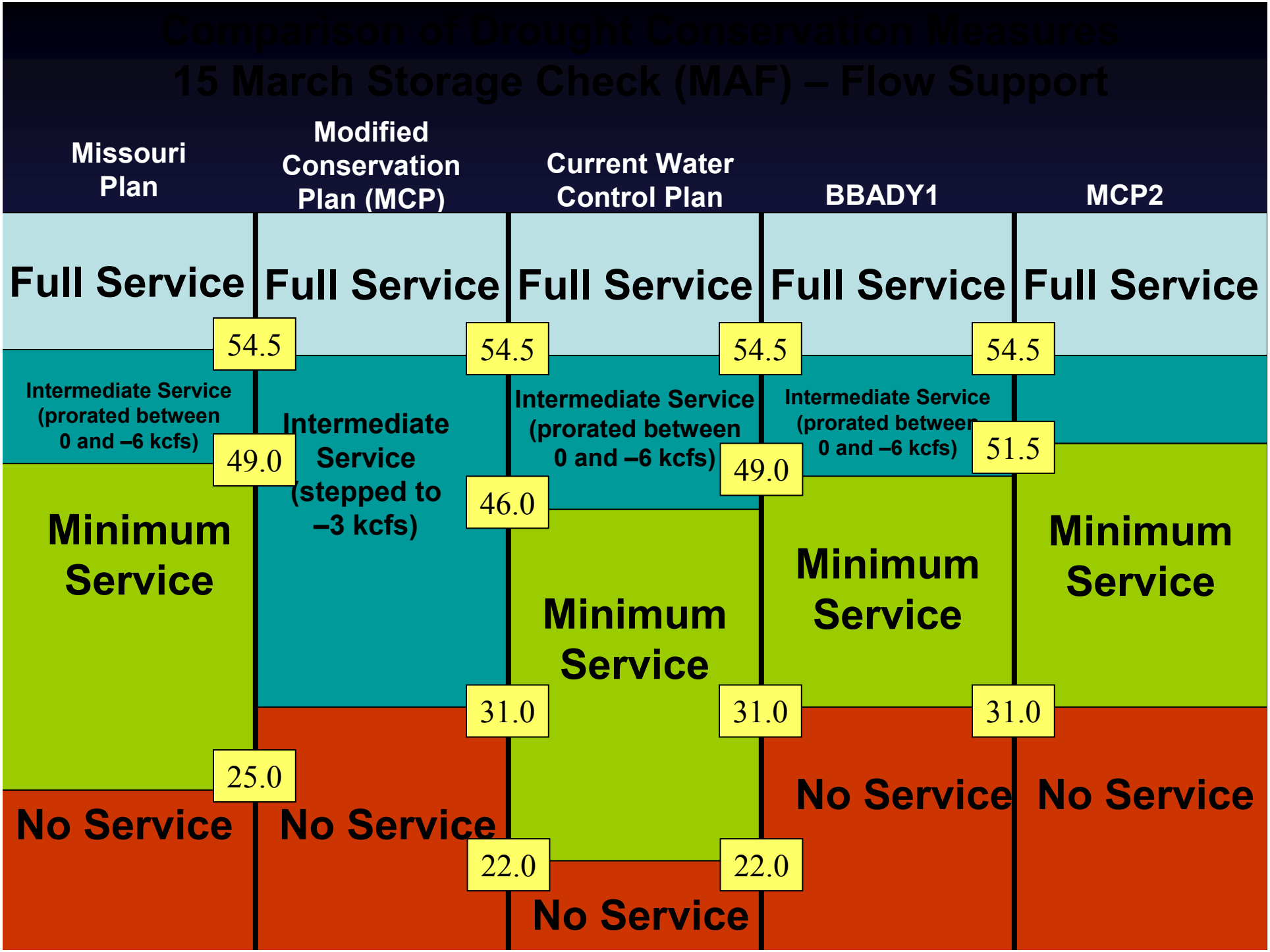
- 1998 – Preliminary Revised DEIS (8 alternatives)
- Feb 1999 – Formal Government-to-Government consultation initiated with Basin Tribes
- Nov 1999 – Basin submitted alternatives
- Apr 2000 – Formal consultation with Service on current water control plan initiated
- Nov 2000 – Final BiOp on current water control plan
- Aug 2001 – RDEIS published (No PA identified)
- Dec 2003 – Amendment to the Nov 2000 BiOp

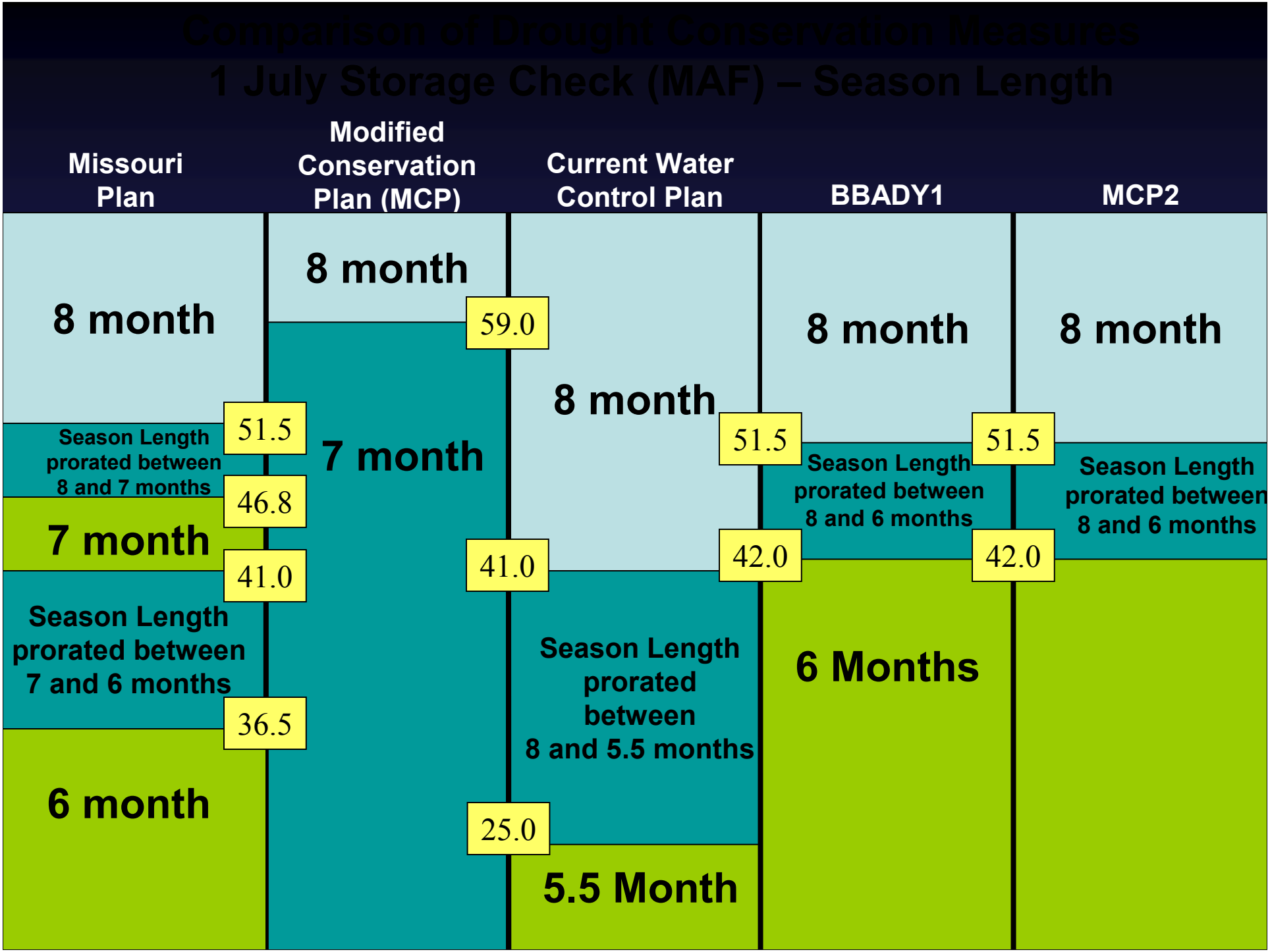
Master Manual & ESA Consultation History (Cont'd)

- February 2004 – FEIS, Draft Final AOP & Draft Master Manual Released for Public Review
- 5-19 March 2004 – Comment Period / Review of FEIS
- March 19, 2004 – Record of Decision, Master Manual and 2004 AOP completed
- August 2005 - Facilitated Spring Rise Process
- Fall 2005 – Draft and Final AOP reflect Spring Rise
- Winter 2005 – Master Manual Updated with Spring Rise

Master Manual

- In house Mainstem Model developed for long term planning LRS model modified for Master Manual Study.
- Daily Routing Model developed and used primarily for flood control, interior drainage and ESA determinations.
- 100 years of historic data (1898 to present) modeled on alternatives
- Interior drainage and other detailed models developed for critical or representative reaches.
- Value Functions developed for Economic Purposes based on dollars.
- Value Functions developed for Environmental Considerations based on special units or indices.
- Purposes modeled in a certain order.
- Mississippi River effects considered in alternatives.
- Model results presented to public and specific interests for comment.


Comparison of Drought Conservation Measures
15 March Storage Check (MAF) – Flow Support
Missouri Plan
Modified Conservation Plan (MCP)
Current Water Control Plan
BBADY1
MCP2
Full Service
Full Service
Full Service
Full Service
Full Service
54.5
54.5
54.5
54.5
Intermediate Service (prorated between 0 and –6 kcfs)
Intermediate Service (stepped to –3 kcfs)
Intermediate Service (prorated between 0 and –6 kcfs)
Intermediate Service (prorated between 0 and –6 kcfs)
49.0
49.0
51.5
46.0
Minimum Service
Minimum Service
Minimum Service
Minimum Service
31.0
31.0
31.0
25.0
No Service
No Service
No Service
No Service
22.0
22.0
No Service


Comparison of Drought Conservation Measures
1 July Storage Check (MAF) – Season Length
Missouri Plan
Modified Conservation Plan (MCP)
Current Water Control Plan
BBADY1
MCP2
8 month
8 month
8 month
8 month
8 month
59.0
51.5
51.5
51.5
Season Length prorated between 8 and 7 months
7 month
46.8
7 month
41.0
41.0
42.0
42.0
Season Length prorated between 8 and 6 months
Season Length prorated between 8 and 6 months
Season Length prorated between 7 and 6 months
36.5
Season Length prorated between 8 and 5.5 months
6 Months
6 month
25.0
5.5 Month

Missouri River Mainstem Master Manual

Missouri River Mainstem Master Manual

- Master Manual available in electronic format, text hyperlinked to plates and other pertinent information.
- All plates in electronic format.
- Manual format changed from USACE recommended format. More of a story format followed.
- Final manual requested by Courts to be completed by 1 April 2004.
- Final Product was Missouri River Mainstem Master Manual - cost $30 million 14 years.

Missouri River Mainstem Master Manual

Changes made in Master Manual

- Drought Conservation Measures were increased there by reducing service level and season length during drought.
- Intra System Unbalancing of Upper Three Reservoirs added as a formal feature for improved reservoir fishery.
- Non-navigation flow period minimums stated. Minimum flows for downstream flow support formally provided as a guideline for power plants, intakes etc.
- Adaptive Management process adopted.
- Fulfilled ESA along with Missouri River Recovery Plan.

Missouri River Mainstem Master Manual

Changes not made in Manual Update

- Spring Rise - Controversial flows during spring for pallid sturgeon spawning queue.
- Summer Low flows - Controversial flows during mid summer that would cause split navigation season for ESA items concerning pallid and bird nesting issues.
- The adaptive management formal process and framework is outside of the master manual update but discussed as an adopted method to providing guidance for future regulation.

Missouri River Mainstem Master Manual

Binding Resolution Discussion

This Master Manual and the selected water control plan are intended to be non-binding guidelines to be used by the Corps in regulating and operating the Mainstem System. In South Dakota v. Ubbelohde, 330 F. wd. 1014, the Eighth Circuit Court of Appeals held that the Corps' prior manual was a binding regulation. This was not the Corps' intent and accordingly, the Master Manual has been amended to clearly reflect the Corps' intent that it not be considered a binding regulation. This is consistent with Corps' regulations that allow for both updates for changes in normal regulations as well as for deviations to the approved water control plan. ***This information was written on the first page of the March 2004 Master Manual.***

Missouri River Mainstem Master Manual

Inconsistencies Discussion

In the event of any inconsistencies between the provisions of this Chapter VII and any other provisions of this Master Manual, this Chapter VII shall take precedence.

Missouri River Mainstem Master Manual

Flexibility Discussion

Several attorney's spent a considerable amount of time reviewing and making suggested changes to add additional flexibility to the master manual. The attorney's suggested changes such as "the Corps will make release increases to evacuate accumulated flood storage" and they suggested we change it to "the Corps may make release increases to evacuate accumulated flood storage". All this effort resulted in a manual that contains a lot of flexibility to deal with the wide range of conditions that the System must be regulated to meet.

Missouri River Mainstem Master Manual

Appendix Additions

Perhaps the most significant change to the manual format was in the area of the addition of appendices.

Appendix A – includes Historic Floods and Flood Control regulation examples. Plus we are going to add drought history and examples.
Appendix B – includes Recreation
Appendix C – includes Water Quality
Appendix D – includes Fish and Wildlife, including ESA
Appendix E – includes Water Supply and Irrigation

Missouri River Mainstem Master Manual

Appendix Additions

Appendix F – includes Hydropower
Appendix G – includes Navigation
Appendix H – includes Continuing Studies
Appendix I – Adaptive Management

This concept allows one to easily change significant portions of the manual. Items that can be expected to change over time but are not part of the water control plan can be put in an appendix and updated as required.

Missouri River Basin

Since 1954

Water Management Division

US Army
Corps of Engineers

Missouri River Basin

Since 1953

Water Management Division

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