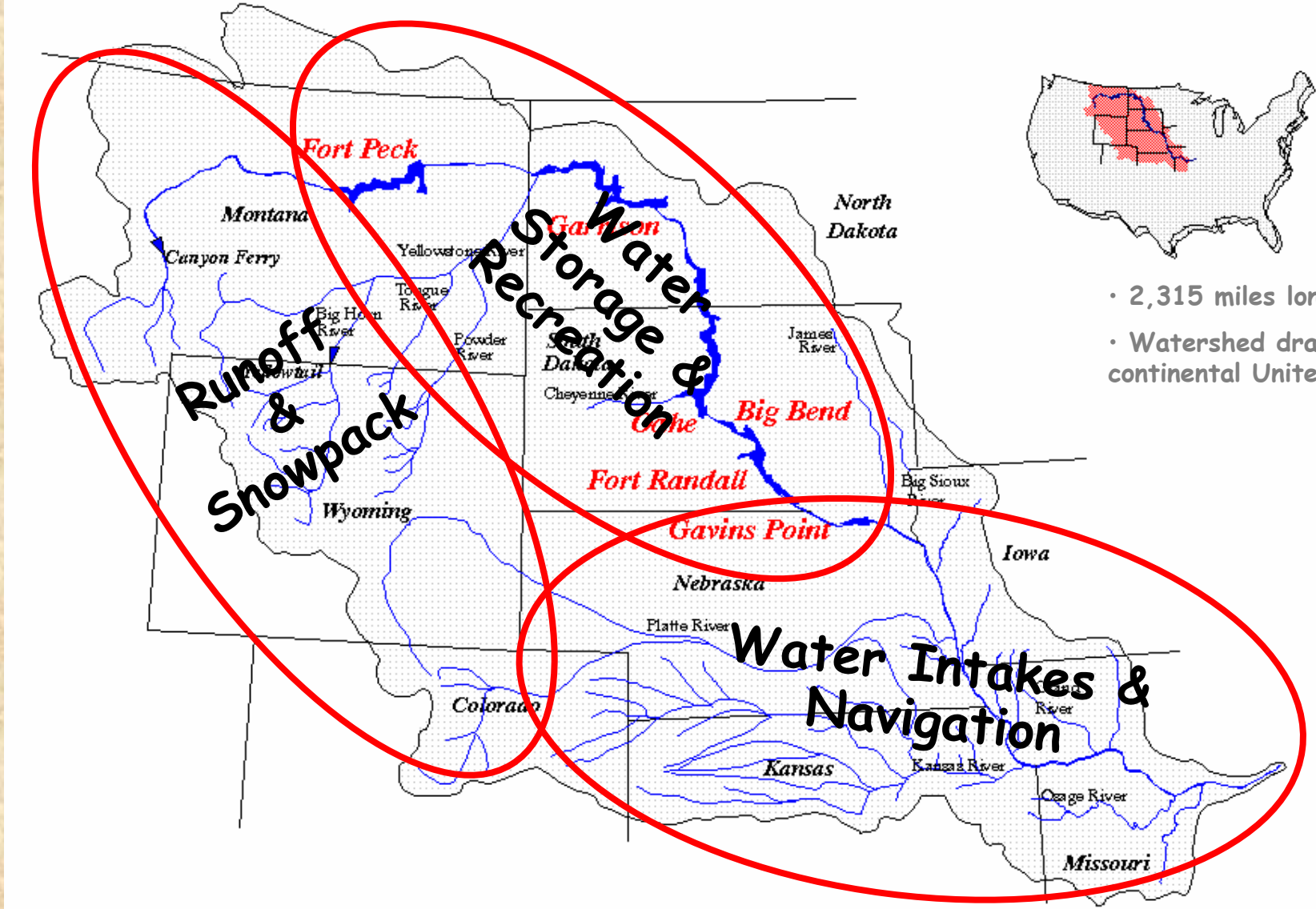
Missouri River

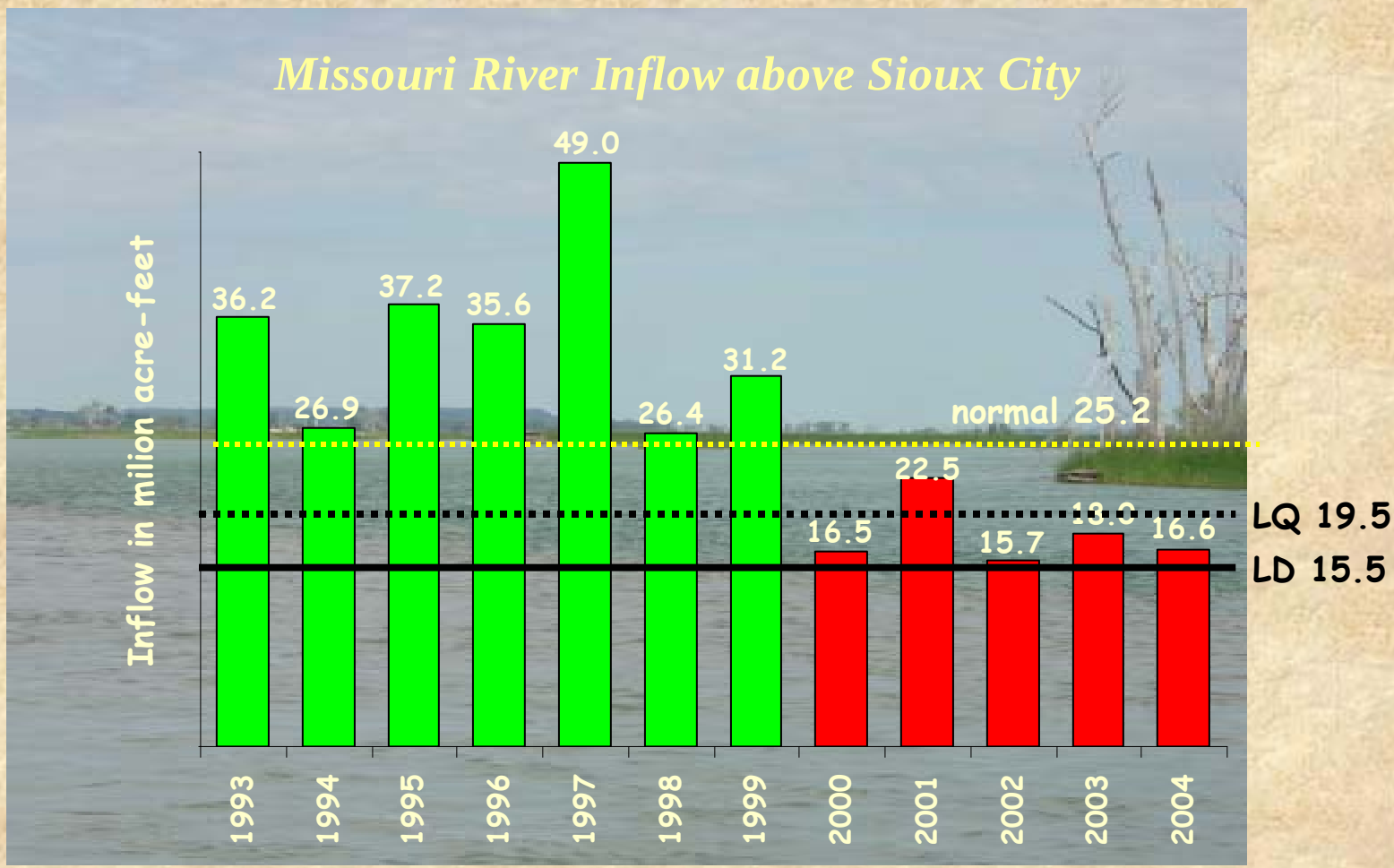
Drought and the Impacts to Authorized Uses

Missouri River Basin

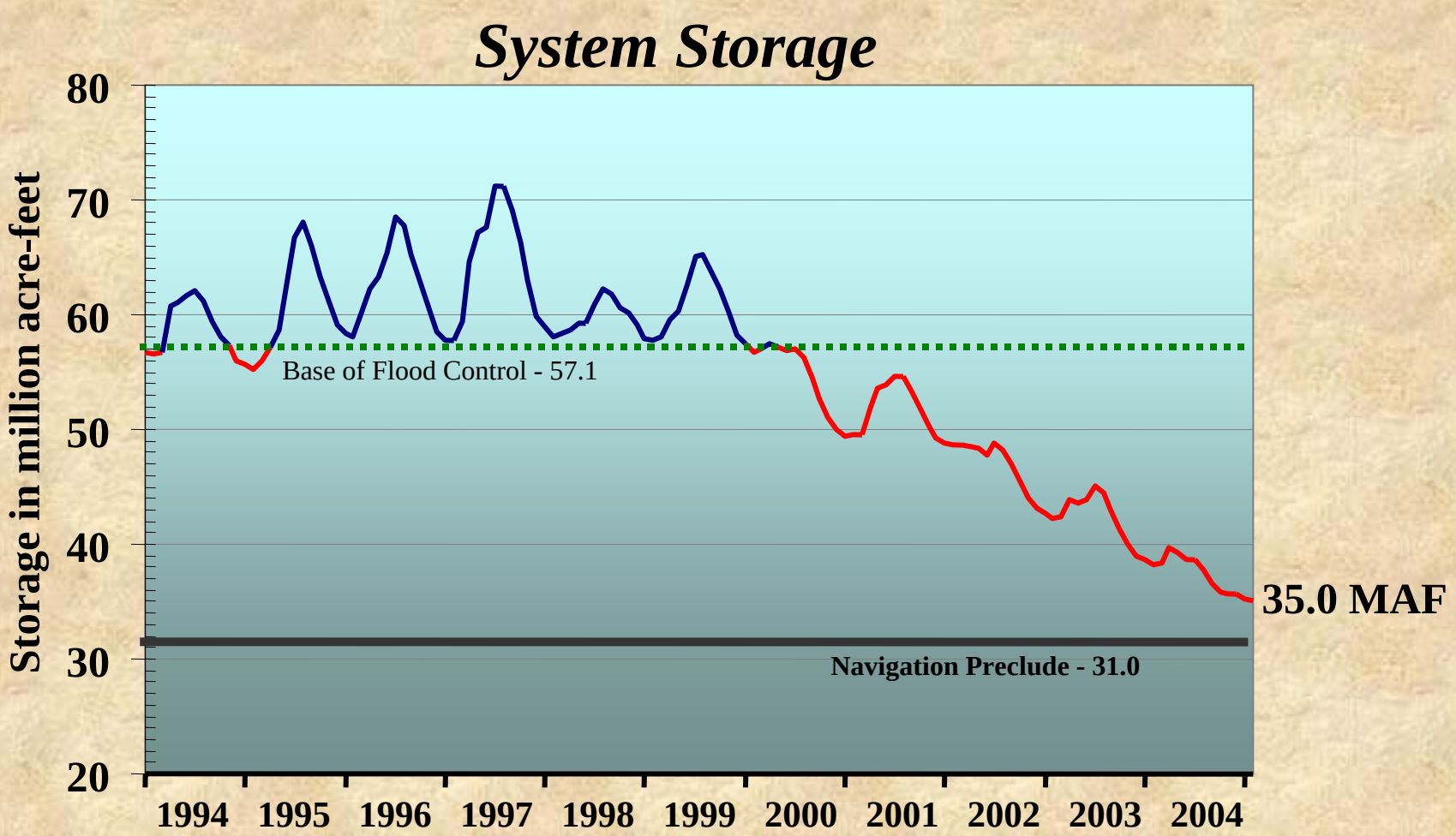


- 2,315 miles long
- Watershed drains 1/6 of continental United States.

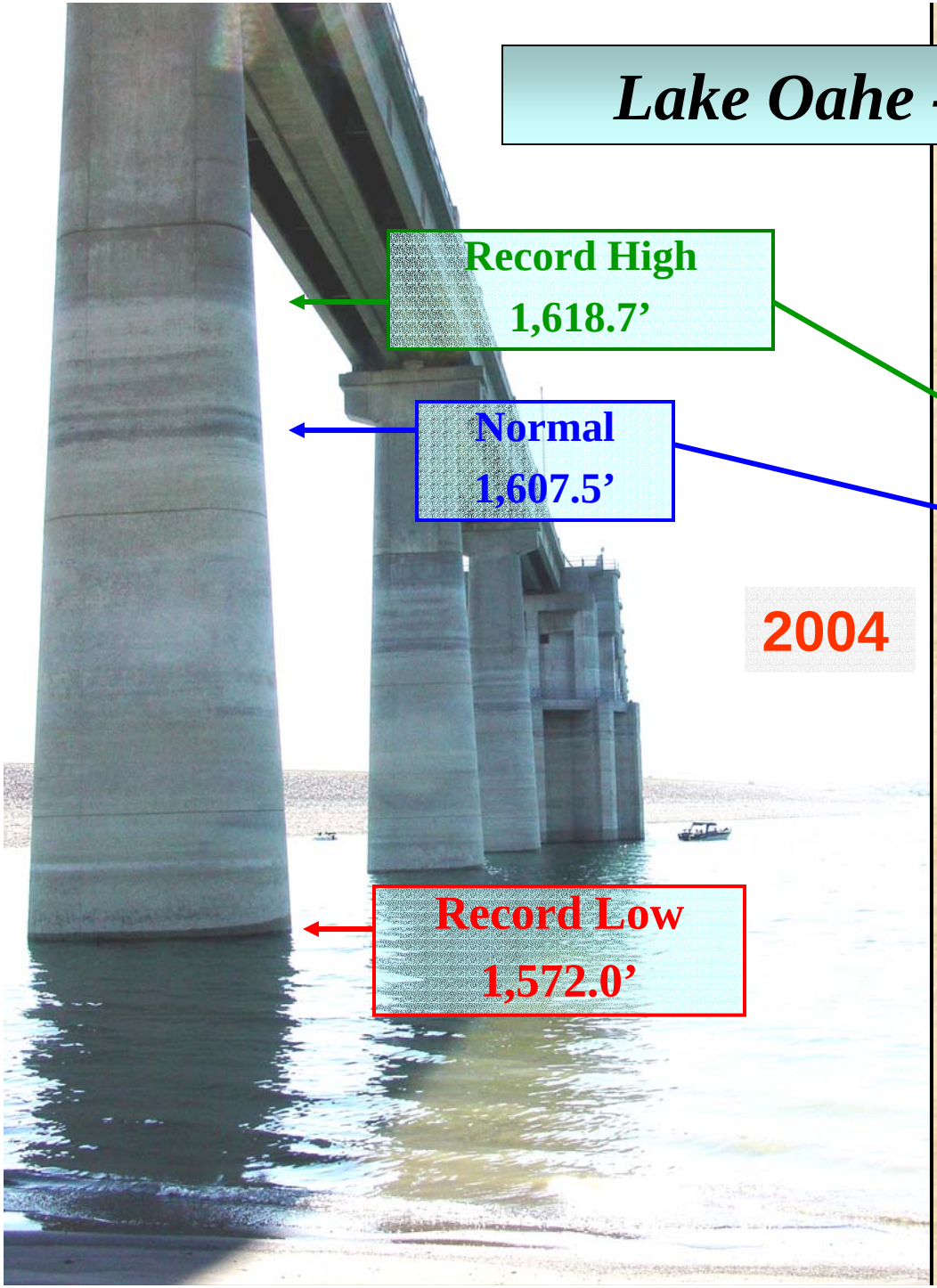
The Missouri River basin has experienced five consecutive years of below normal runoff. Four of the five years were between Lower Quartile and Lower Decile.



System storage is at a record low due to the combined impact of the drought and water allocation decisions during the drought.



Lake Oahe - Elevation

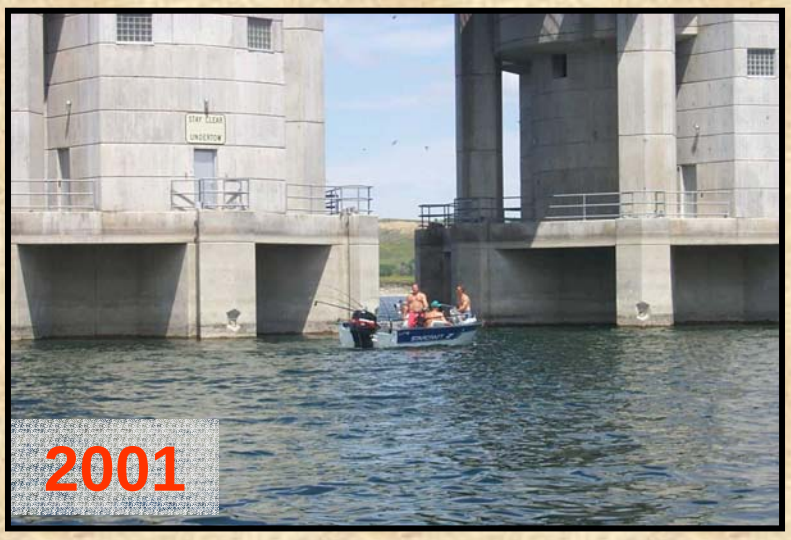


Record High
1,618.7’

Normal
1,607.5’

2004

Record Low
1,572.0’



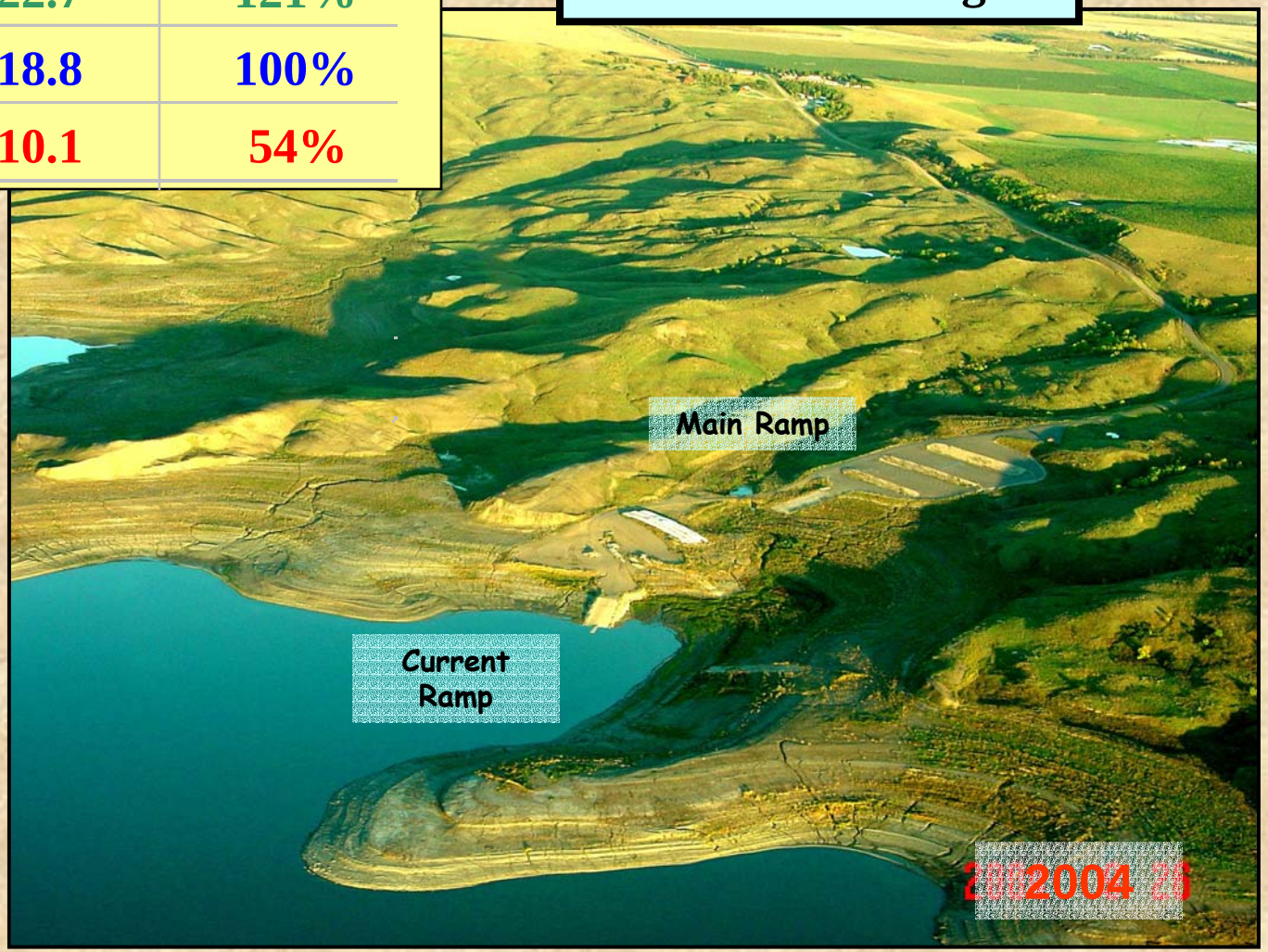
2001

The loss of head at the three largest mainstem dams has reduced hydropower production.
(-30% at the Oahe powerhouse)

Lake Oahe - Volume

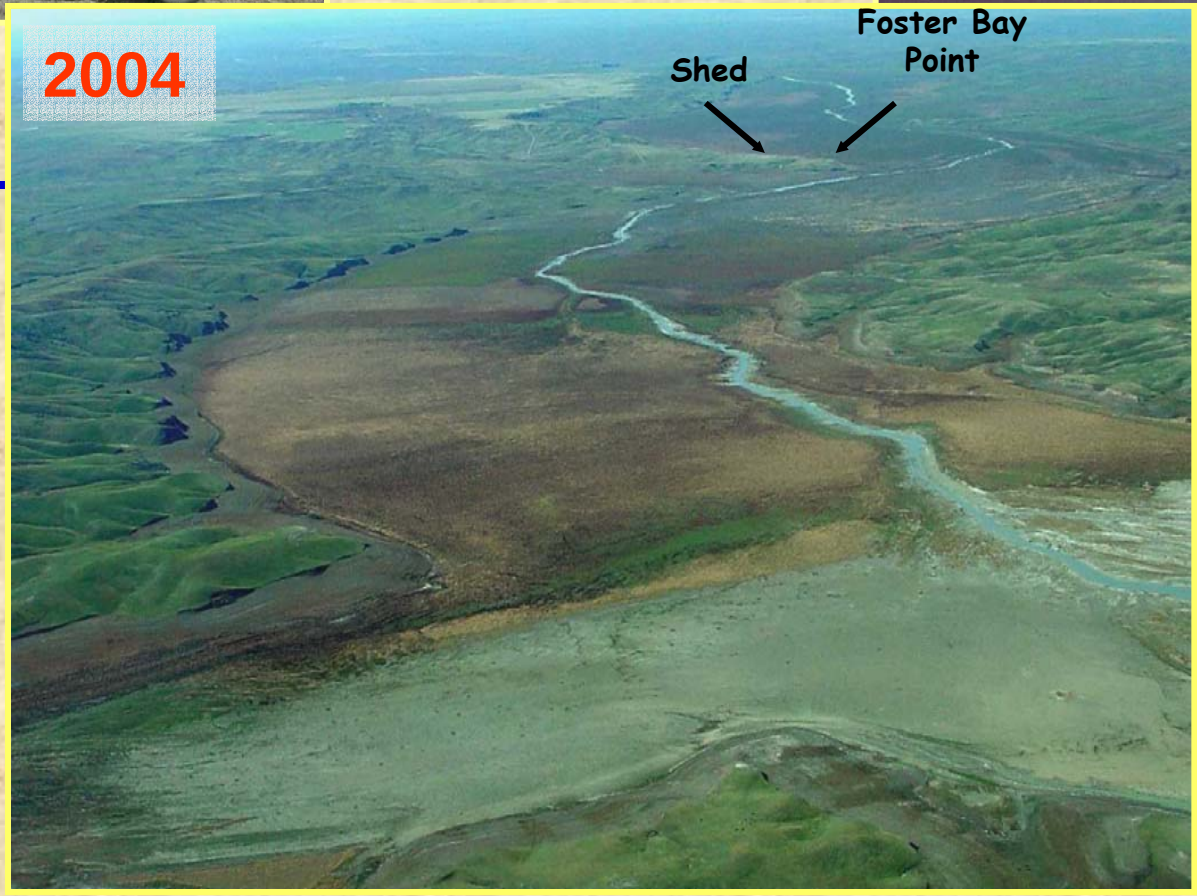
Volume - million acre feet	(MAF)	(% of normal)
Record High	22.7	121%
Normal	18.8	100%
Record Low	10.1	54%

Bush's Landing



Foster Bay Walleye Spawning Shed

Cheyenne Arm of Lake Oahe



Impacts to Recreation

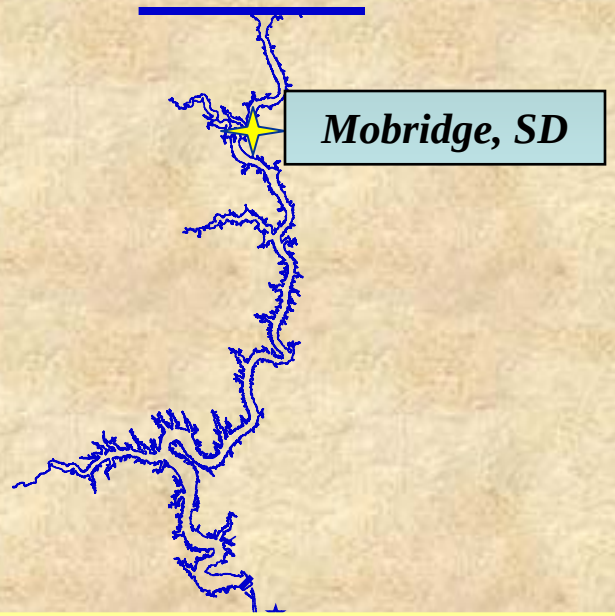
Unusable Boat Ramps

Loss of Fish Production

Dewatered/Dead Fish Eggs

- **From 2002-2004 SDGF&P has spent $3.1 million to extend and build new ramps on Lake Oahe.**

- **No ramps would be available today without these expenditures.**



- **At current lake levels 13 of 32 ramps are usable.**

- **Only 9 of 13 ramps can be extended to handle more than an additional 6 feet of lake level drop.**

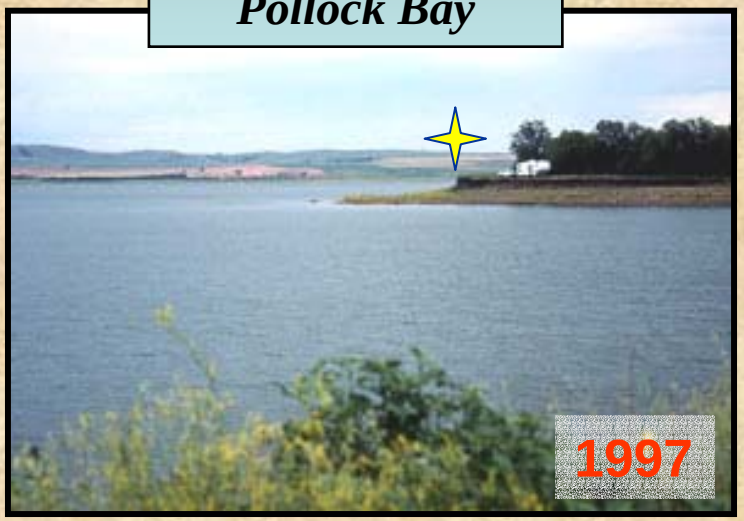
- **In 2005, the projected costs to maintain access on Lake Oahe will be between $1 million - $1.8 million.**

- **Without increased water conservation and/or extensions, all of Lake Oahe's boat ramps would be out of service by July or August in 2005.**

- **The fishery in Lake Oahe yielded an economic impact of more than $20 million/year in the mid-90's, it now produces less than $10 million/year.**

- **Increased water conservation will lessen the impacts to lake access and would enhance fish production.**

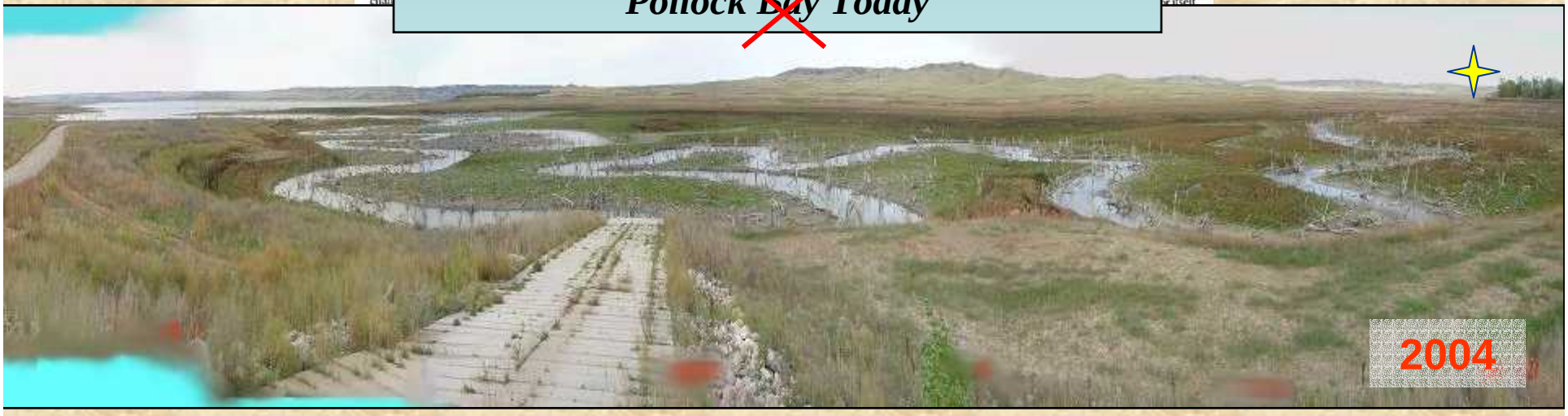
Pollock Bay



Low water woes force resort to close

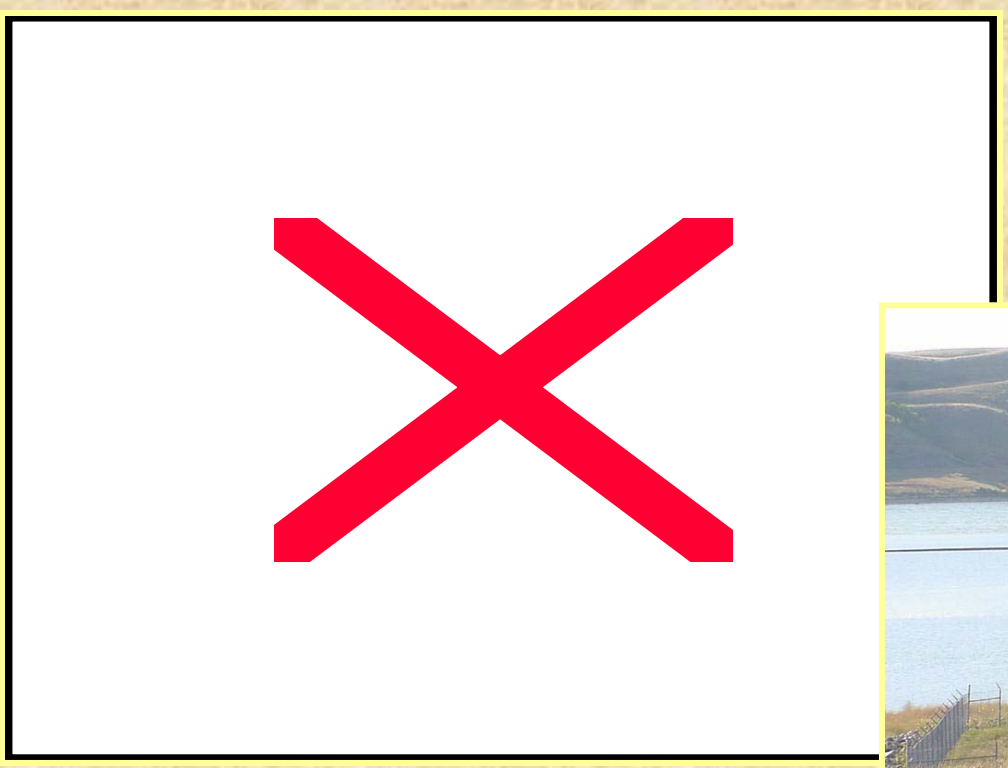
Denny Jensen has decided that the accessibility of the water and a job. Jensen said at the peak times, they keep horsing around with the keep the barges moving. All this
hunting and fishing season, he em- water levels, they are hurting the done by the Corps of Engineers.
fishing." "The Corps is a perfect example

Pollock Bay Today



Upper Basin Water Supply Problems

Irrigation and Drinking Water Systems



Irrigation Water Supply Problems

Approximately 45,000 acres are irrigated from Lake Oahe in South Dakota.

- In 2002, 15% reported no irrigation due to low water.
- In 2003, 36% of acres were reported to be not irrigated.
- In 2004, Approximately 50% of irrigated acreage dry land farmed.

•Many irrigators along the mainstem reservoirs in North Dakota and Montana are experiencing similar impacts.

Drinking Water Supply Problems

Parshall Water Supply Problem

Lake Sakakawea

Temporary relocation of intake

- Falling reservoir level required installation of a temporary intake.
- Extended intake 3,700 ft.
- Lowered operational intake level 19 ft.
- Total Cost - $2.3 Million

Ft. Yates Water Supply Problem

Lake Oahe

Conversion from reservoir intake to river intake

- **Reservoir receded, now back to natural river conditions.**
- **Built access berm to river channel.**
- **Constructed coffer dam and installed pump station.**
- **Total Cost - $3.2 Million**

Mni Waste' Water Supply Problem

Lake Oahe

Emergency relocation of intake

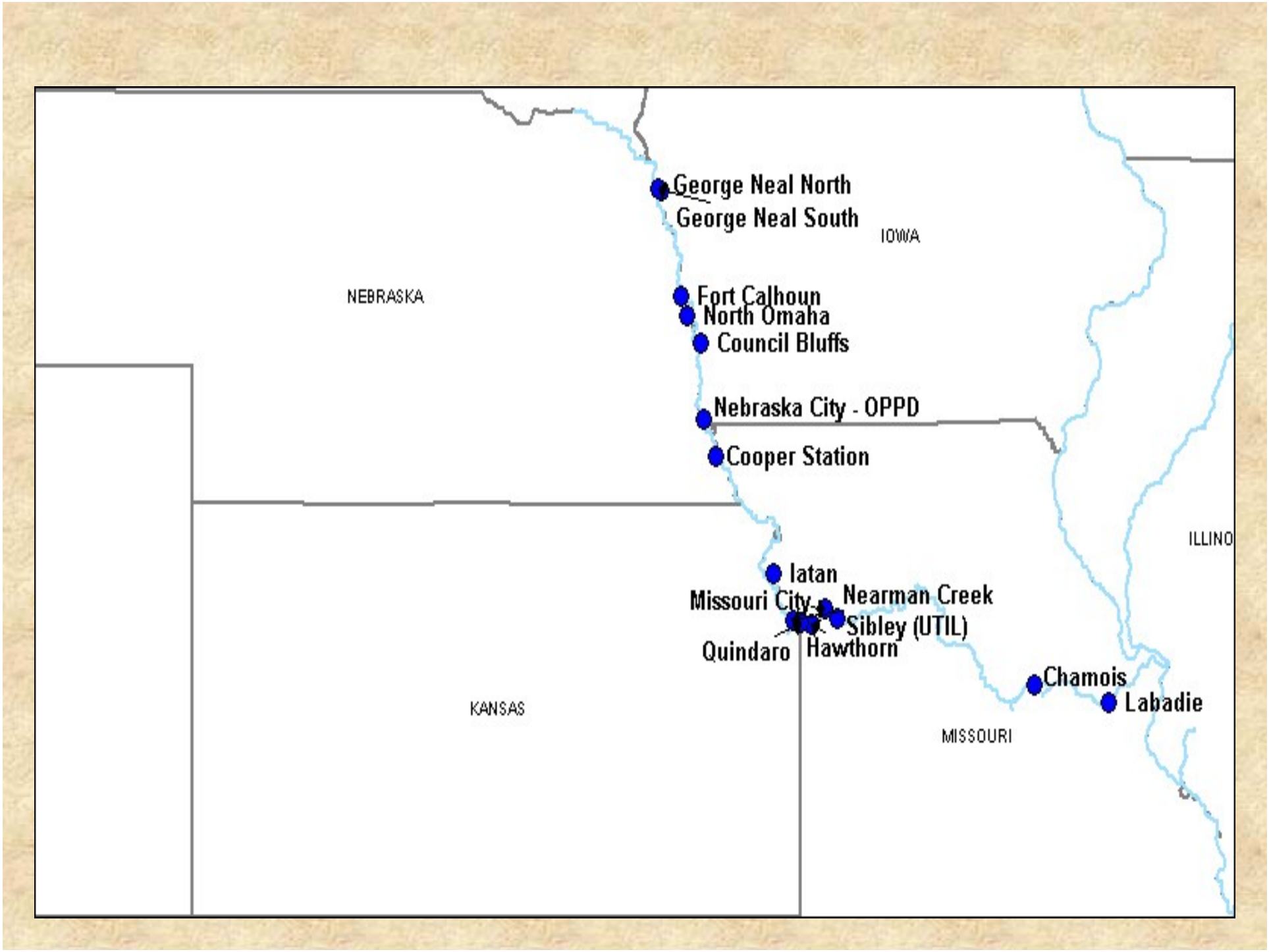
- During the drought of the late 80's the system was forced to relocate the intake.
- Possible reservoir level drop calls for installation of emergency intake.
- Requires 4 miles of pipeline and an emergency pump station.
- The operational intake level to be lowered 27 ft.
- Total Estimated Cost - $4.0 Million

The Effects of Missouri River Flows on Power Generation

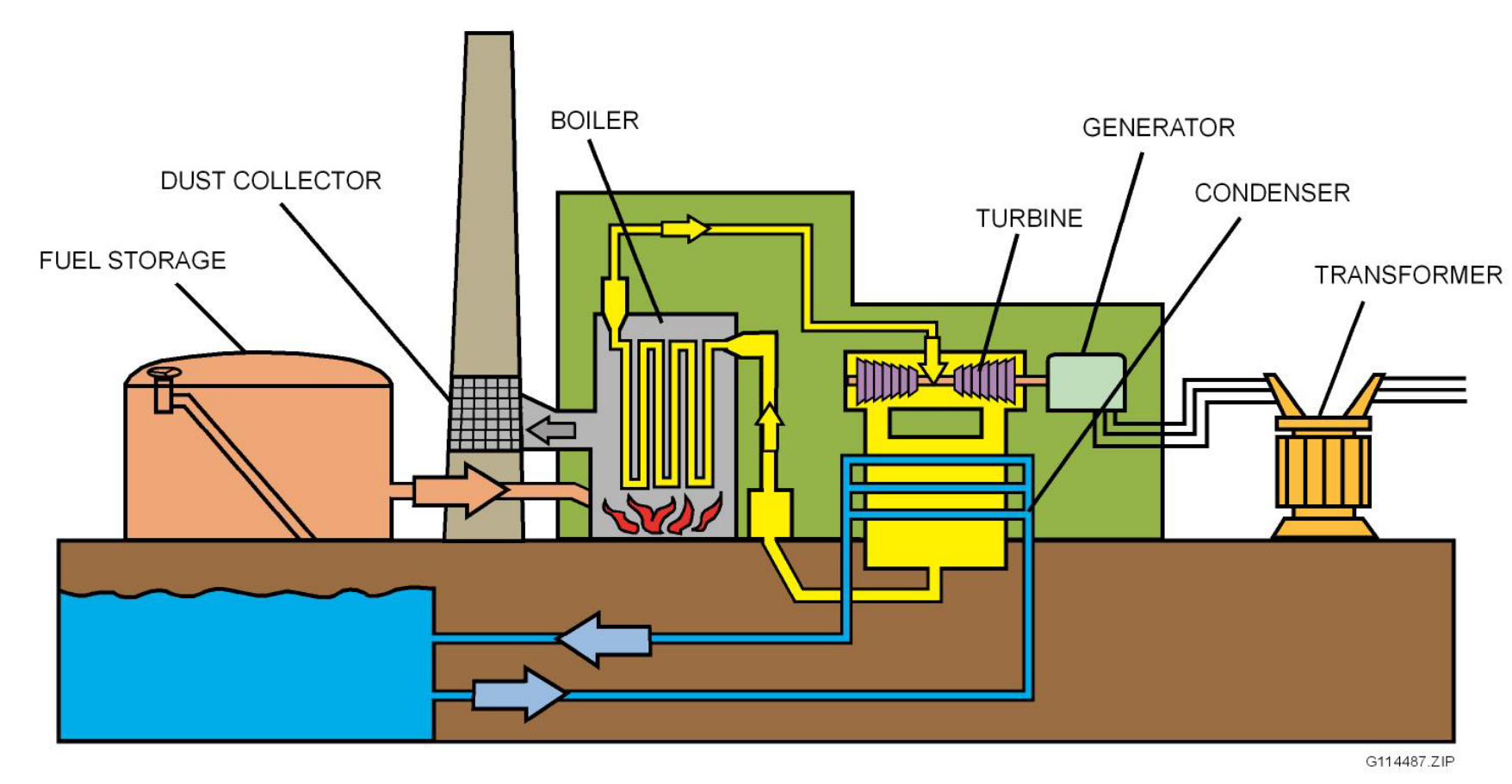
Brian Barels
Water Resource Manager
Nebraska Public Power District

Darrell Dorsey
Project Engineer
Kansas City Board of Public Utilities

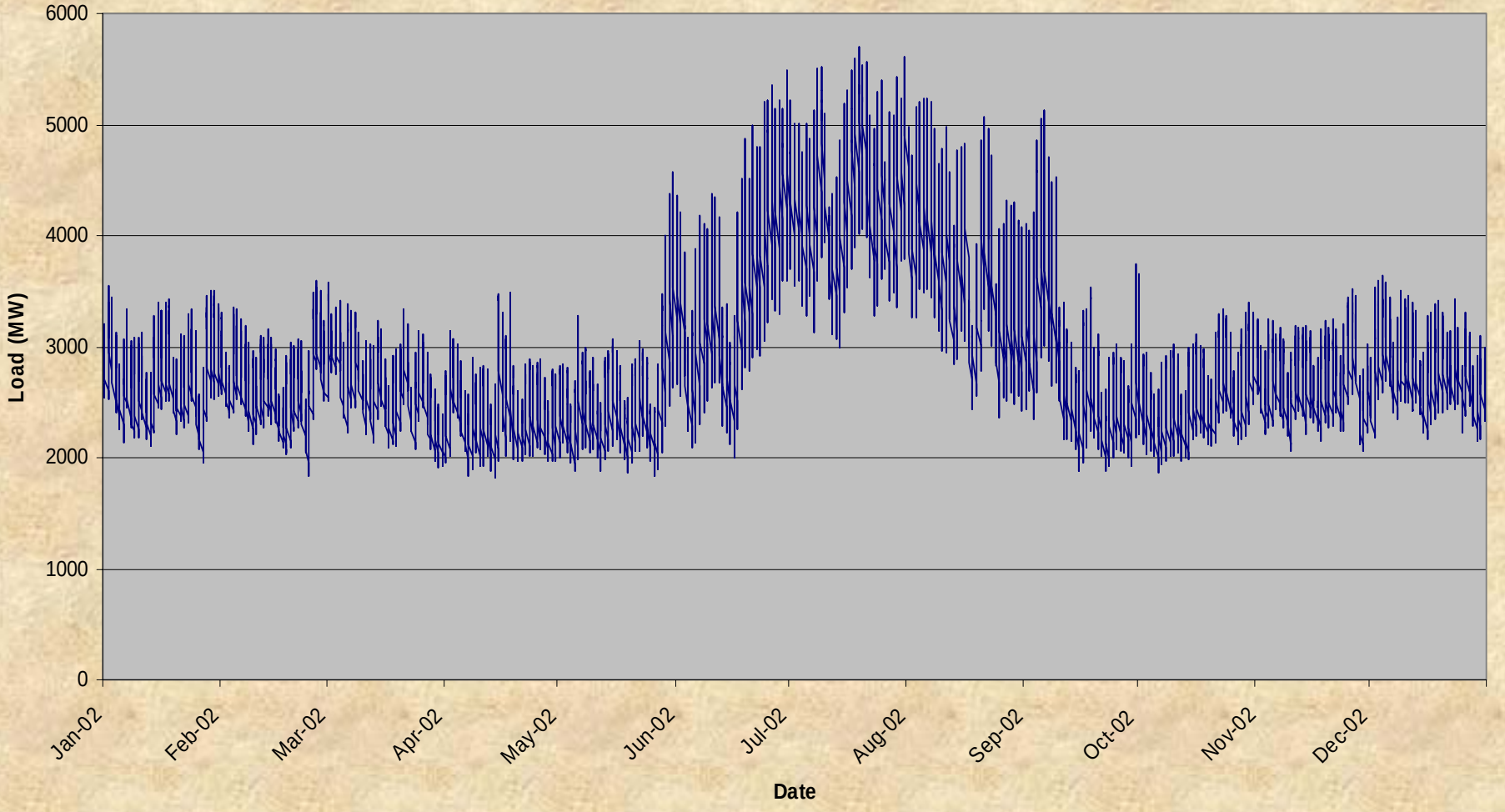
Cooper Nuclear Power Plant on the Missouri River


George Neal North
George Neal South
IOWA
NEBRASKA
Fort Calhoun
North Omaha
Council Bluffs
Nebraska City - OPPD
Cooper Station
ILLINO
Iatan
Missouri City
Nearman Creek
Sibley (UTIL)
Quindaro
Hawthorn
Chamois
Labadie
KANSAS
MISSOURI

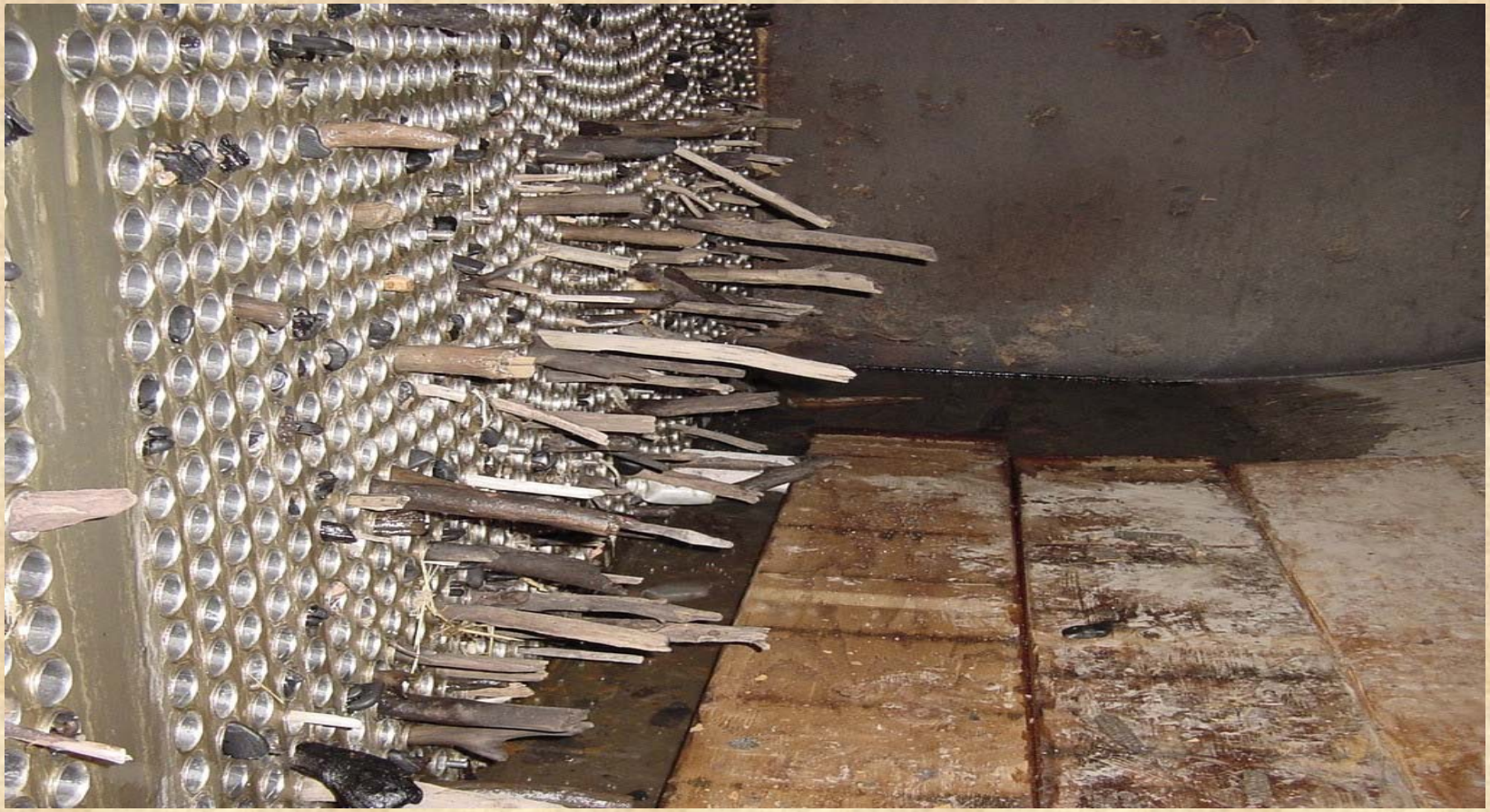
How Electricity is Produced from Steam



Electric Power Demand
Nebraska Load



Items That Plug the Condenser



Winter of 2000/2001

-Low flows create icing problems with intakes, barges used to deflect floating ice

Kansas City Board of Public Utilities


B2
OCT 13 2004

Lower Missouri River Power Generation

- *Reduction in River stage results in loss of generation*
- *Replacement power cannot always be transmitted into the region due to transmission constraints*
- *Regional problem with blackout potential*
- *Without power, everyone is effected*
- *Drinking water intakes are also at risk*

Kansas City Board of Public Utilities

Outlook

What can the Missouri River basin expect in 2005?

Entertainment | Weekly Features

World • Nation • Business • Financial • Health • Opinion • Obituaries

Last modified January 28

State

Low snowpack approaching record of '77, feds say

Associated Press

BOZEMAN -- The thin snowpack in Montana's mountains is approachi

federal official said Thursday.

"It's all the (high) temperatures we've seen, the chinooks, the not free

specialist for the U.S. Natural Resources Conservation

drainage, as o

constants, in the equation.

See **Algebra,** Page C4

Snow near record low on O'Neil Pass

By Tim Velder
Northern Hills Bureau

Local foresters and ranchers were probably wishing Craig Lundorff would have to trudge through waist-deep snow Thursday when he measured its depth at O'Neil Pass near Lead. But it only went past his ankles.

Lead

Lundorff, a forester for the U.S. Forest Service Northern Hills Ranger District in Spearfish, made his first snow course reading of the year Thursday morning. Lun-

"We've actually got a little more water (this year)."

The measuring process involves pushing one end of a calibrated aluminum pipe into the snow until it hits the ground. Lundorff pulled the pipe out, with the snow still in it, and weighed it to determine the water content.

There are 10 stations across the 200-yard course where the readings are taken; then, an average is calculated. At station 6, an open area surrounded by towering pine and aspen trees, Lundorff said, "Sometimes, this one has been 4 foot

> "If you round up, we're right on the record."
> — Craig Lundorff, forester for the U.S. Forest Service Northern Hills Ranger District in Spearfish

gauge the overall growing condition of the forest. If Thursday's reading is any indication, the Northern Hills are entering a sixth consecutive year of drought conditions.

The alpine countryside above Lead varied from snow-covered meadows to bare hillsides.

Weather conditions the past week have been above normal temperatures with no precipitation, and the forecast is for more of the same next week.

Hills-wide snow readings are expected to be released next week.

Contact Tim Velder at 642-8822, ext. 17, or tim.velder@rapidcityjournal.com

Steve McEnroe

Craig Lundorff, a forester with the U.S. Forest Service, weighs an aluminum tube with a snow core measurement to determine the water content of the snow at one of 10 specific measurement locations. The depth of the snow and its weight give a measure of water content in the snow. The scale is held by Laurie Walkinshaw, an information assistant at the USFS office in Spearfish.

...e? Call Ron Bender at 394-8402. Toll free: 1-800-843-2300 ext. 8402.

Saturday, January 29, 2005 www.rapidcityjournal.com RAPID CITY JOURNAL

Study predicting more drought

By The Associated Press

Great Plains states could face a widespread drought in the next few decades, a new study reports.

A three-year-long study of past climate cycles points to a significant drought in the coming years, according to a study released this week by the Energy and Environmental Research Center, which is based in North Dakota.

Center director Gerald Groenewold said that the drought's economic impact will be magnified if water management strategies are not implemented. It could even jeopardize the sustainability of living conditions in the area, he said.

"The public and decision-makers need to recognize the magnitude, severity and urgency of this issue," Groenewold, of Grand Forks, N.D., said "Our greatest challenge is to admit we have a problem."

The study looked at lake bottom sediments in North Dakota and western Minnesota, but the findings apply to Nebraska and other states, he said.

Efforts to deal with limited water resources have been in the works for years, David Aiken, a natural resources water law specialist at the University of Nebraska, said. These efforts will require a transition for water users and will be felt by farmers who irrigate, Aiken said.

If local laws are not developed, federal mandates will be, Aiken said. He envisions water becoming a top commodity in the next few years, with water rights being bought and sold.

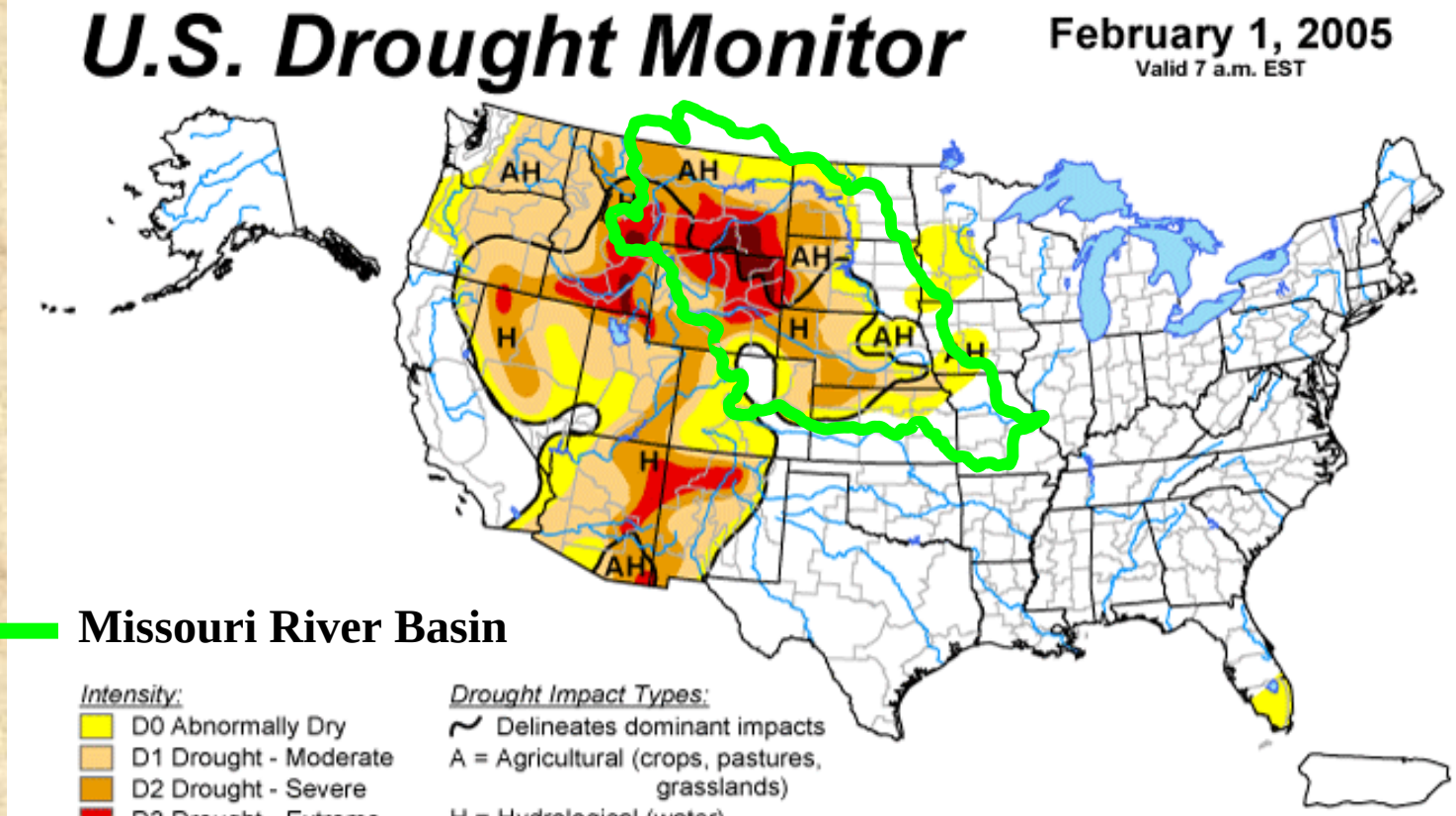
"We'll start to see what water is worth in the marketplace," Aiken said.

Aiken said fights for water will become simpler as water becomes more of a commodity, which Groenewold referred to as the "petroleum of the 21st century."

Groups ranging from communities who want a water basin to environmental groups who want to protect endangered species could compete to buy water, he said.

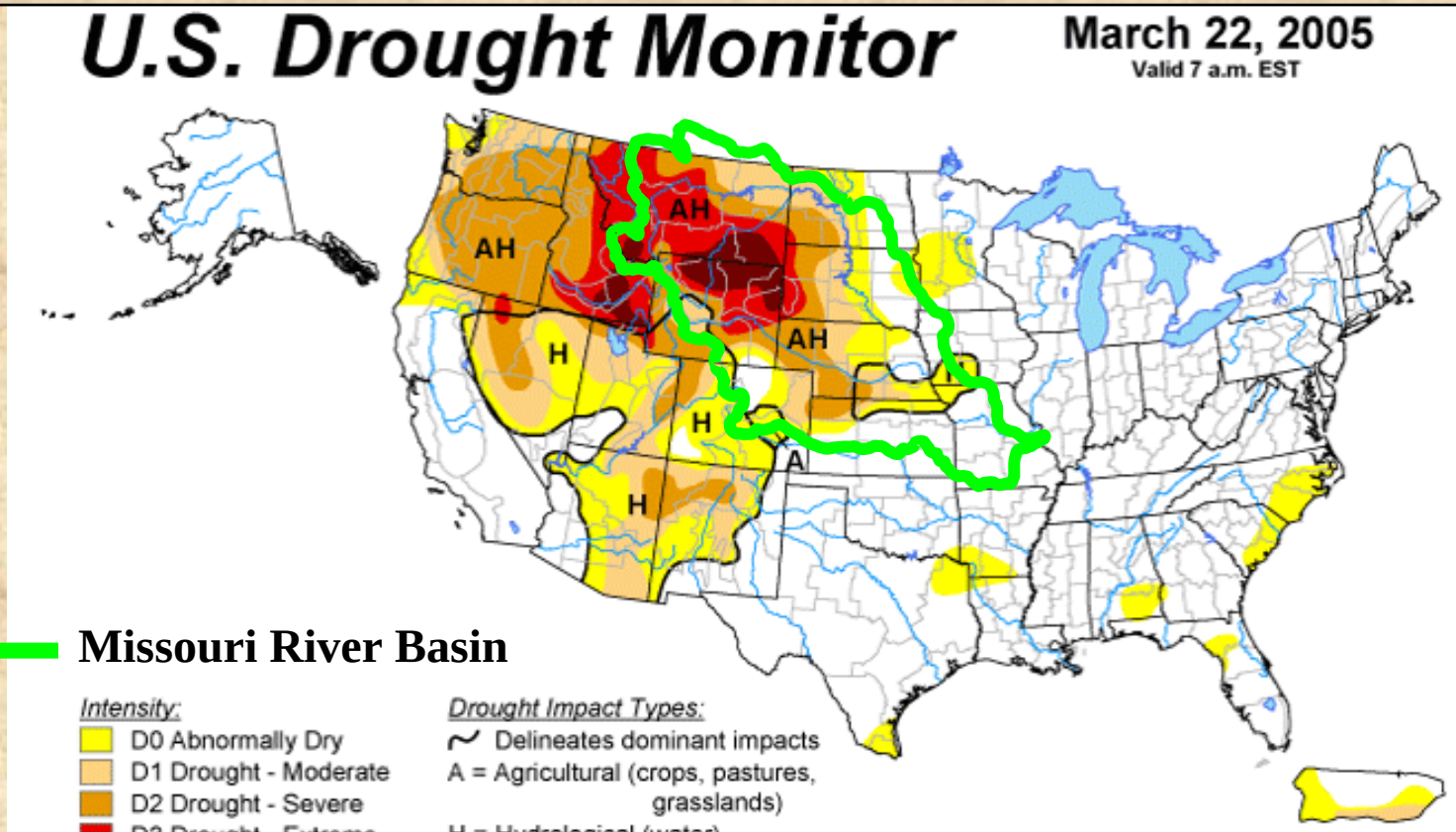
In areas west of the Missouri River where all of the mountain snowpack and a large portion of the plains snow is located, drought conditions range from "severe" to "extreme" up to "exceptional" - the highest classification of drought intensity.

"The Plains and Midwest: …long-term drought remained deeply entrenched across the northern half of the High Plains, where warm, windy weather eliminated winter wheat's protective snow cover…" Brad Rippey, U.S. Department of Agriculture

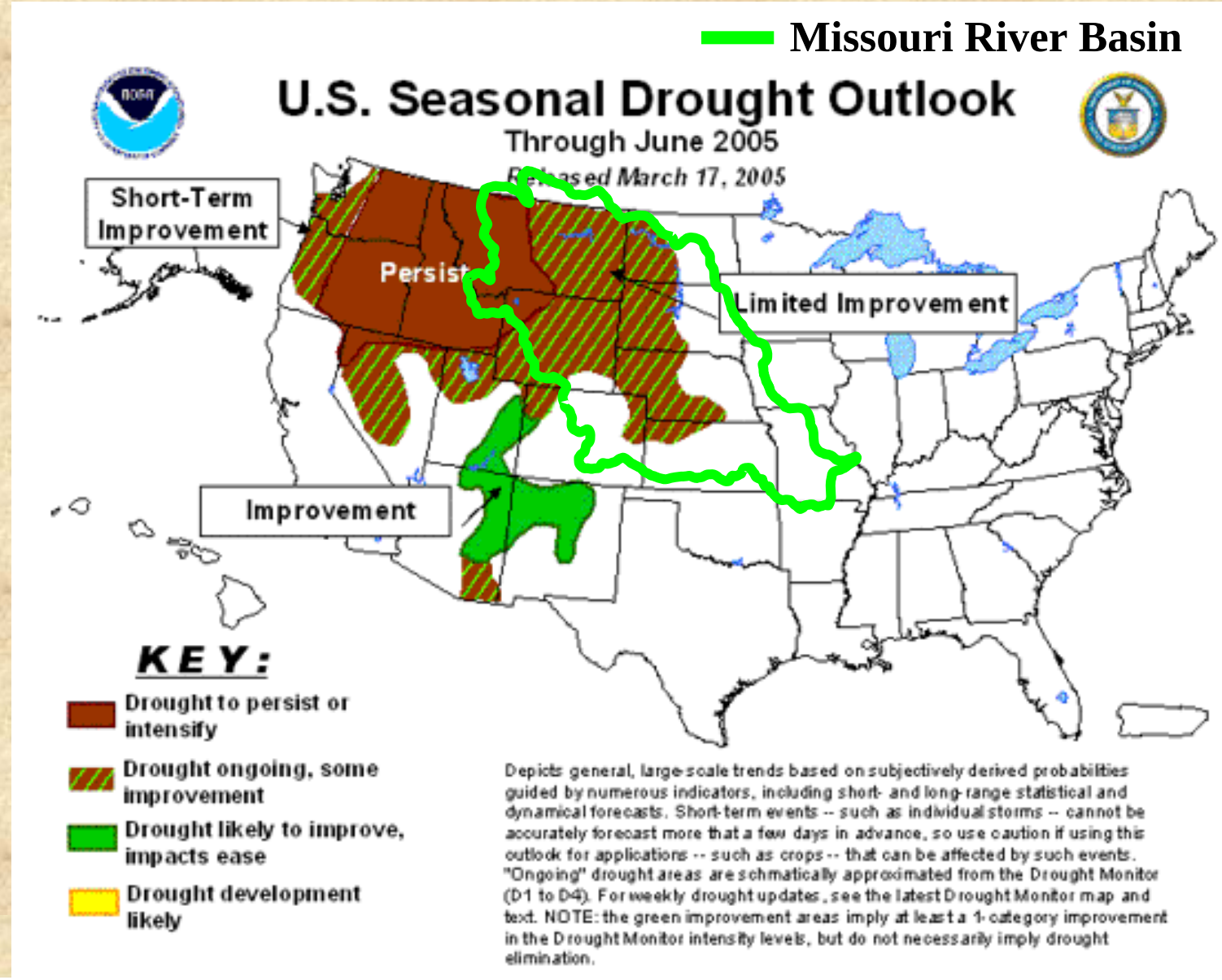


In areas west of the Missouri River where all of the mountain snowpack and a large portion of the plains snow is located, drought conditions range from "severe" to "extreme" up to "exceptional" - the highest classification of drought intensity.

"The situation is not any better in Idaho and Montana, where some basins would need three to five times their normal amount of precipitation in the next month just to get some basins merely back to average. Although not impossible, this isn't likely to happen…-" Mark Svoboda, National Drought Mitigation Center

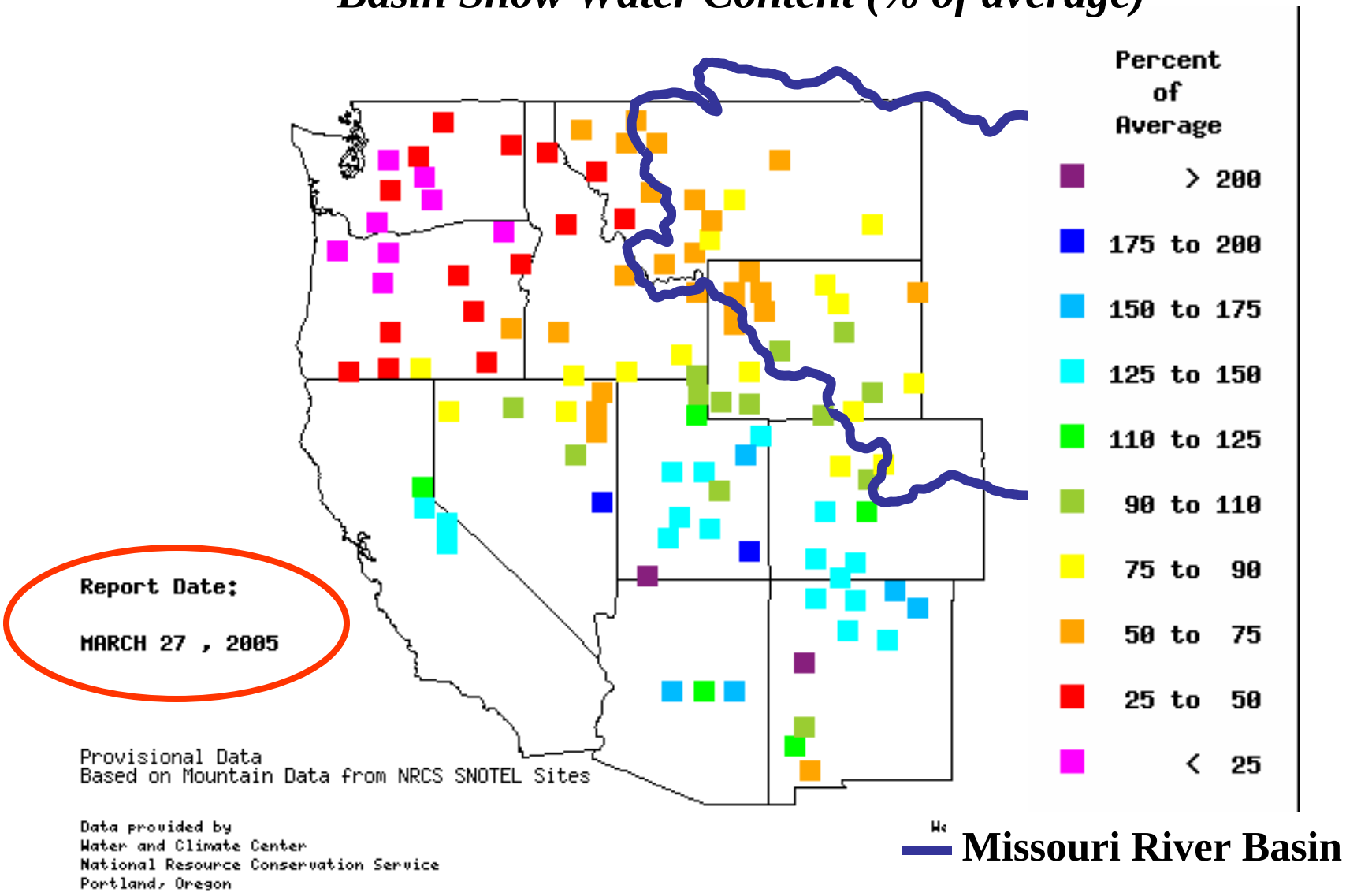


"... In the northern High Plains, including the upper Missouri River basin, below-normal mountain snowpacks will mean that hydrological drought will be ongoing." - NOAA Climate Prediction Center

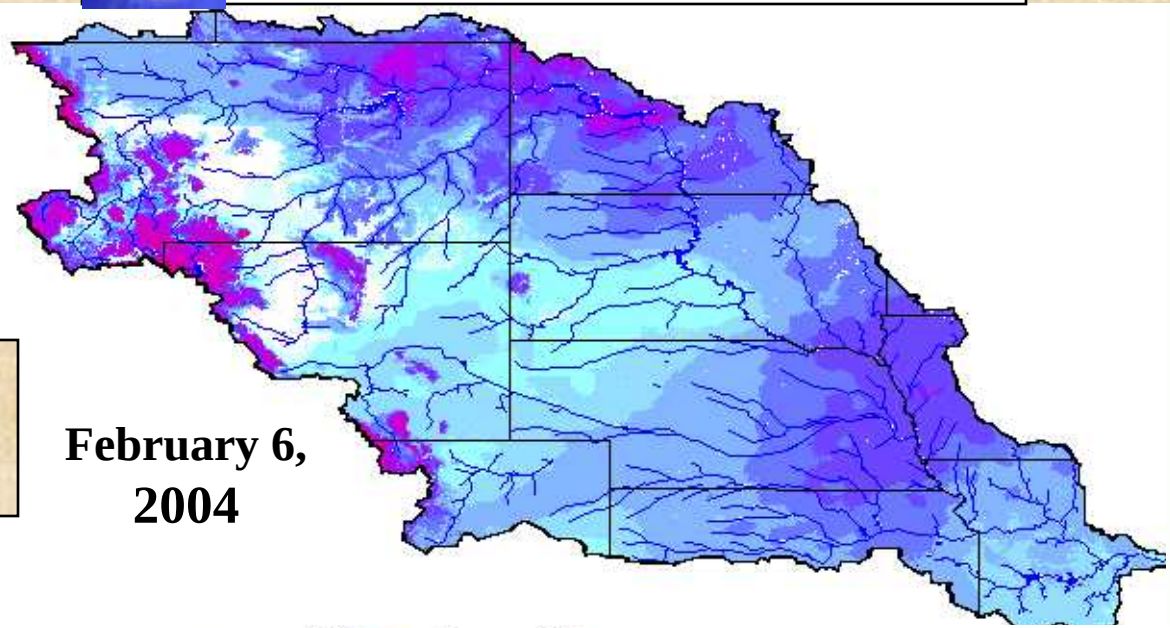


Snowpack water content is well below average for the portion of the basin supplying the majority of Missouri River runoff.

Basin Snow Water Content (% of average)

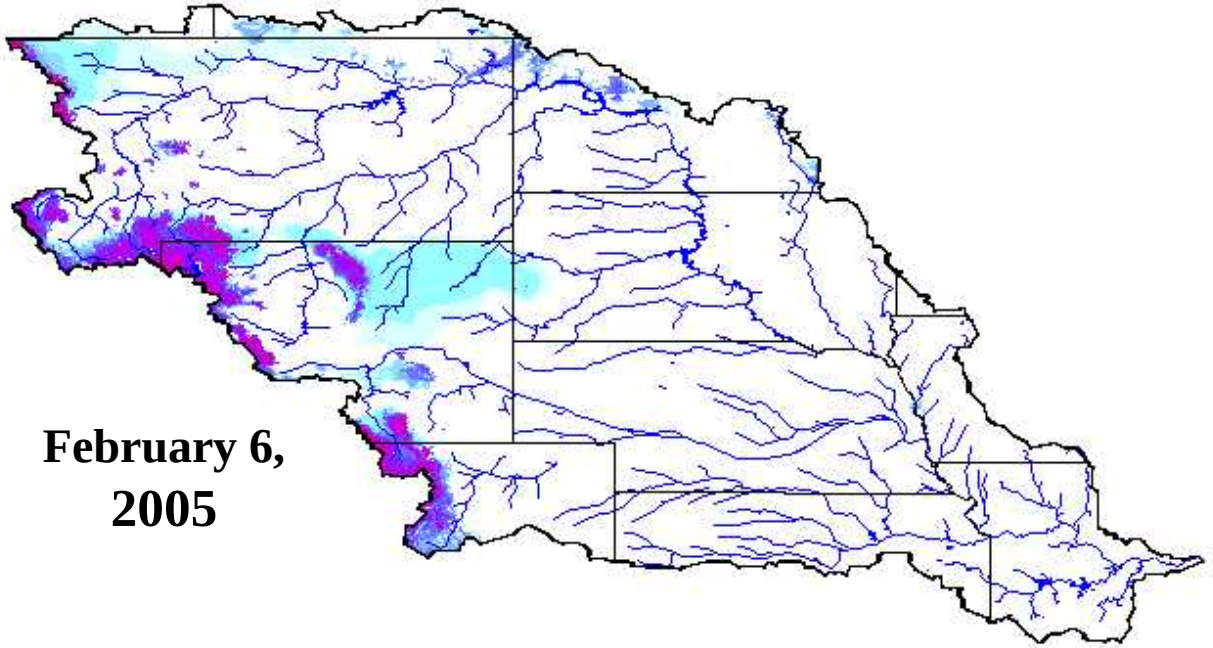


Inches of Snow Water Equivalent
Missouri River Basin



February 6, 2004

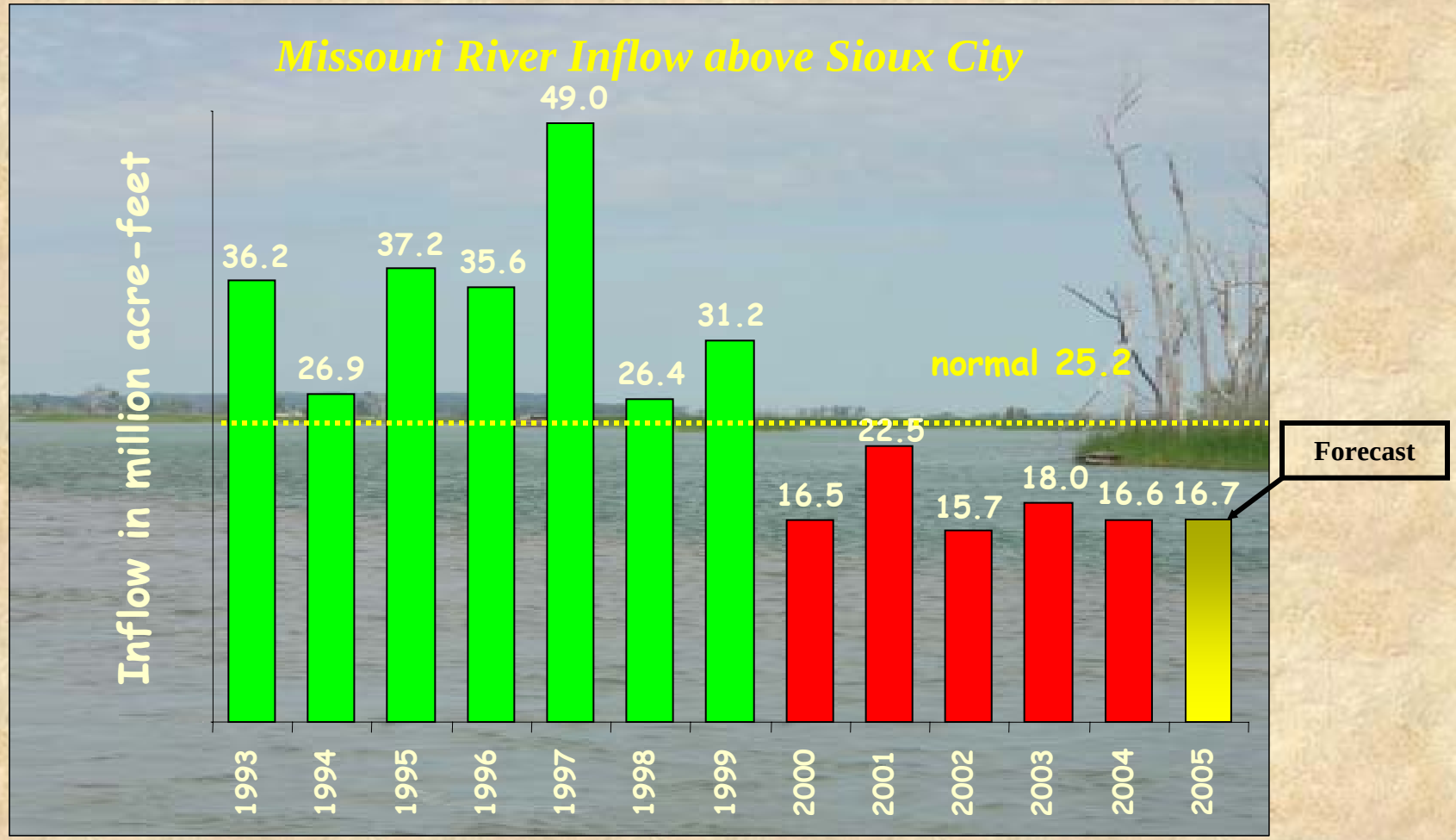
In 2004, runoff above Sioux City was only 66% of normal.

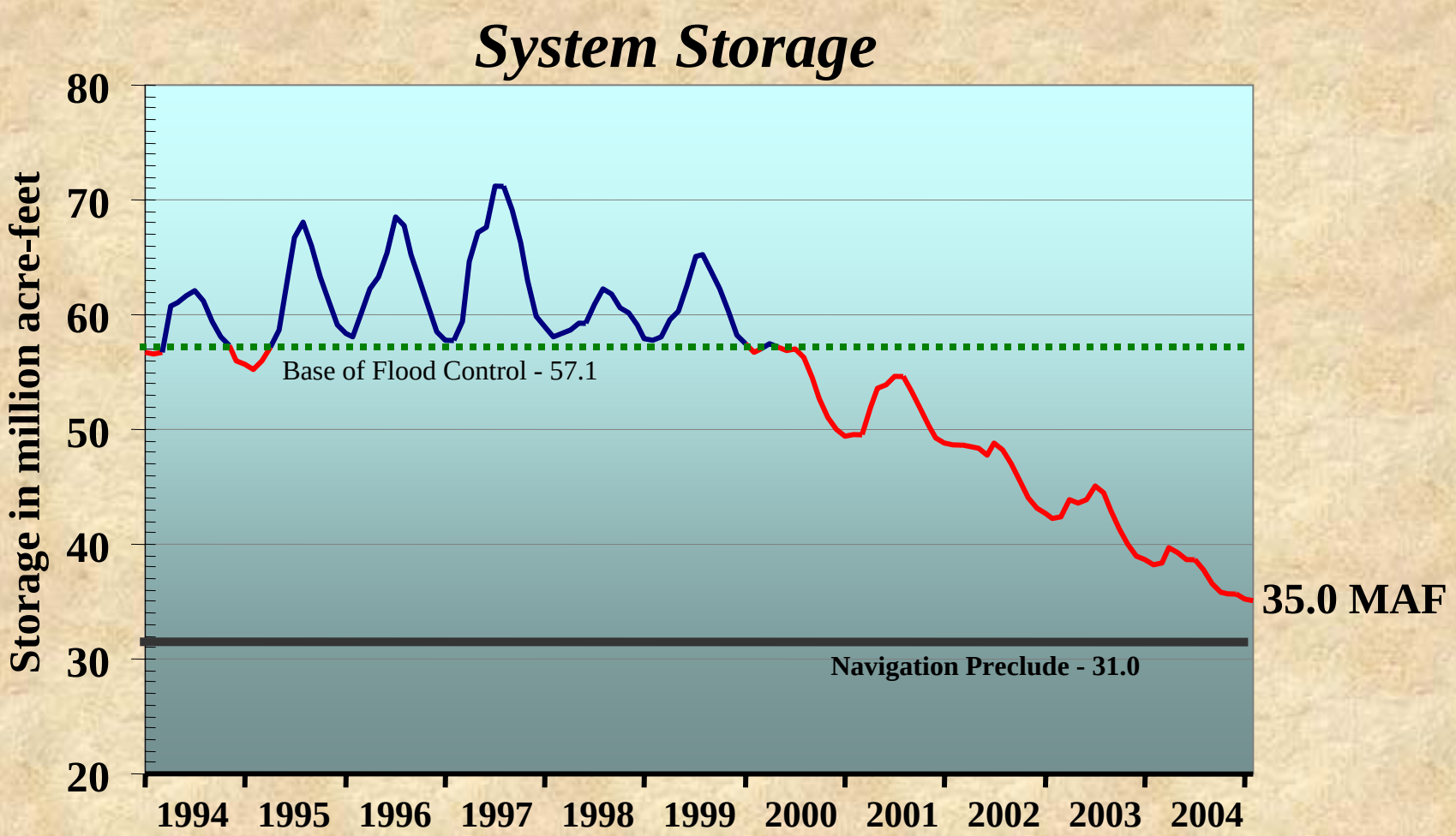


February 6, 2005

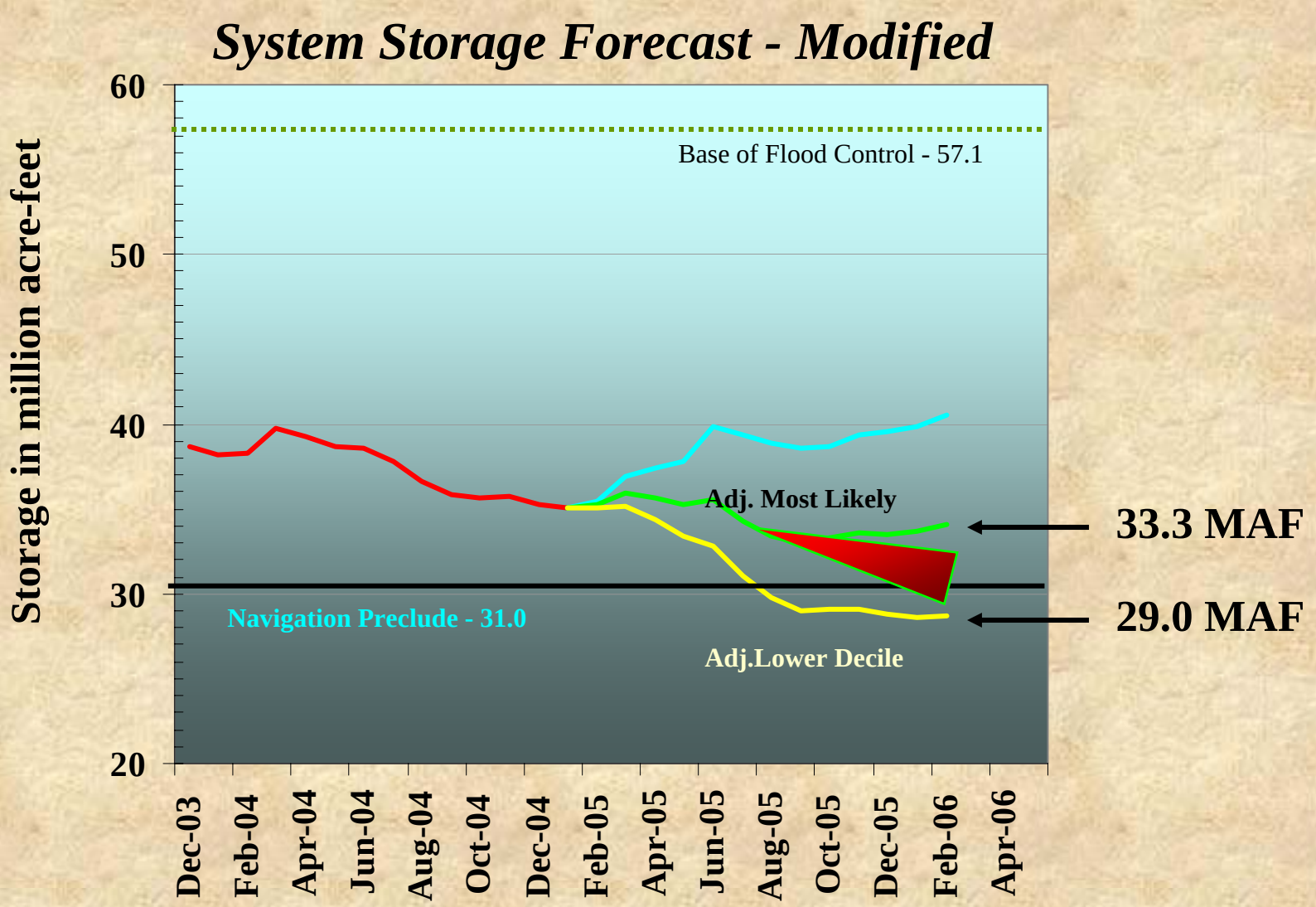
"Snowpack is '*critically*' low, the current Missouri River mainstem snow water equivalent is only 52% of that measured at the same time in 2004. "
-Roy Kaiser, Water Supply Specialist, NRCS

As of March 1, the USACE runoff forecast for 2005 is 16.7 MAF, 66 % of normal.




System Storage
Storage in million acre-feet
80
70
60
50
40
30
20
Base of Flood Control - 57.1
Navigation Preclude - 31.0
35.0 MAF
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004

If the drought doesn't end this year and storage declines similar to last year, system storage will be very close or below the navigation preclude level by March 1, 2006.

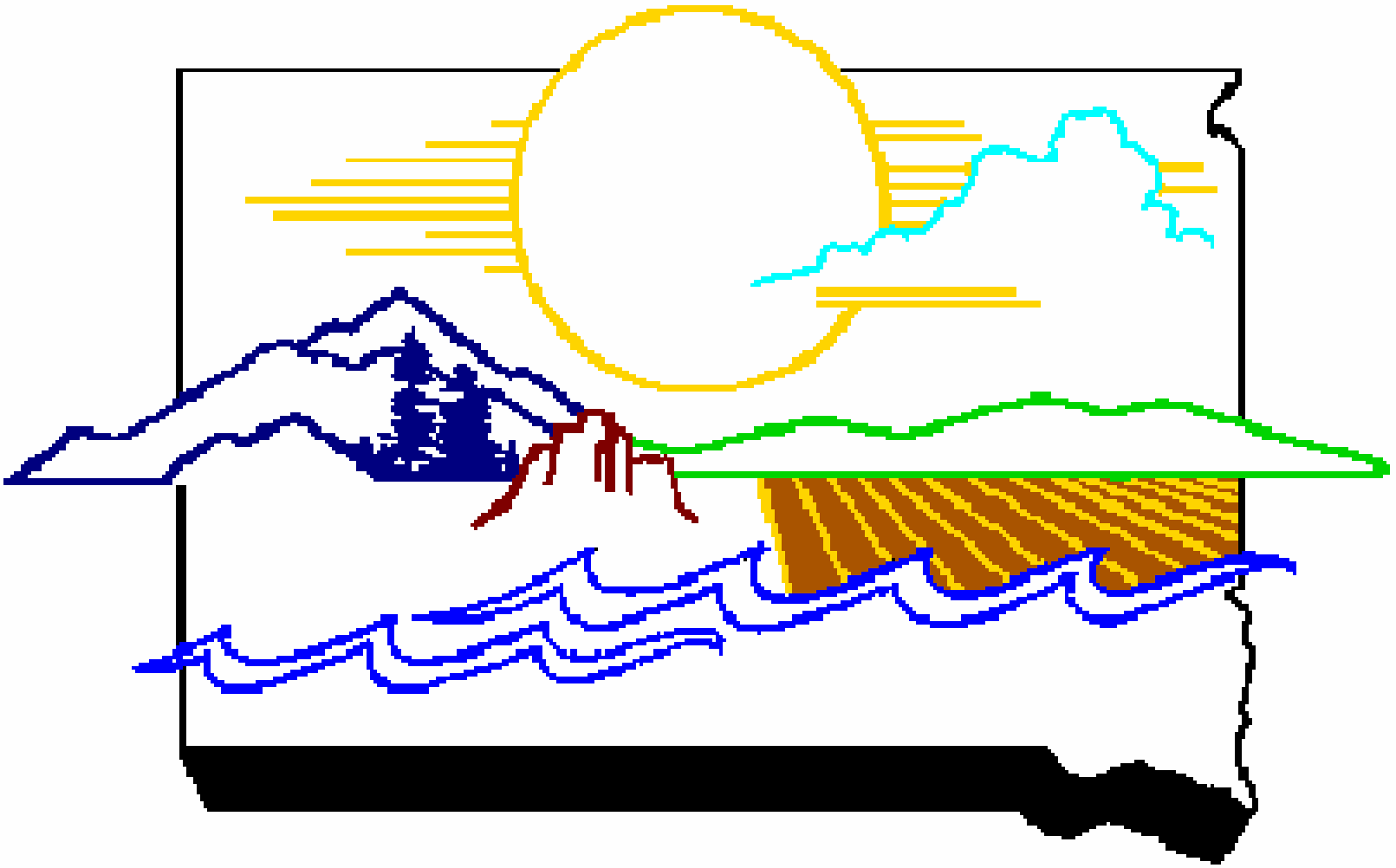


Lake Oahe Elevation

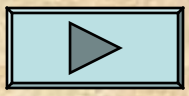
Summary

- Drought is a basin-wide concern. All states will benefit by implementing conservation measures during a period of drought to avoid reaching the navigation preclude in 2006. We believe the potential exists for building support from other states to implement more stringent conservation measures.

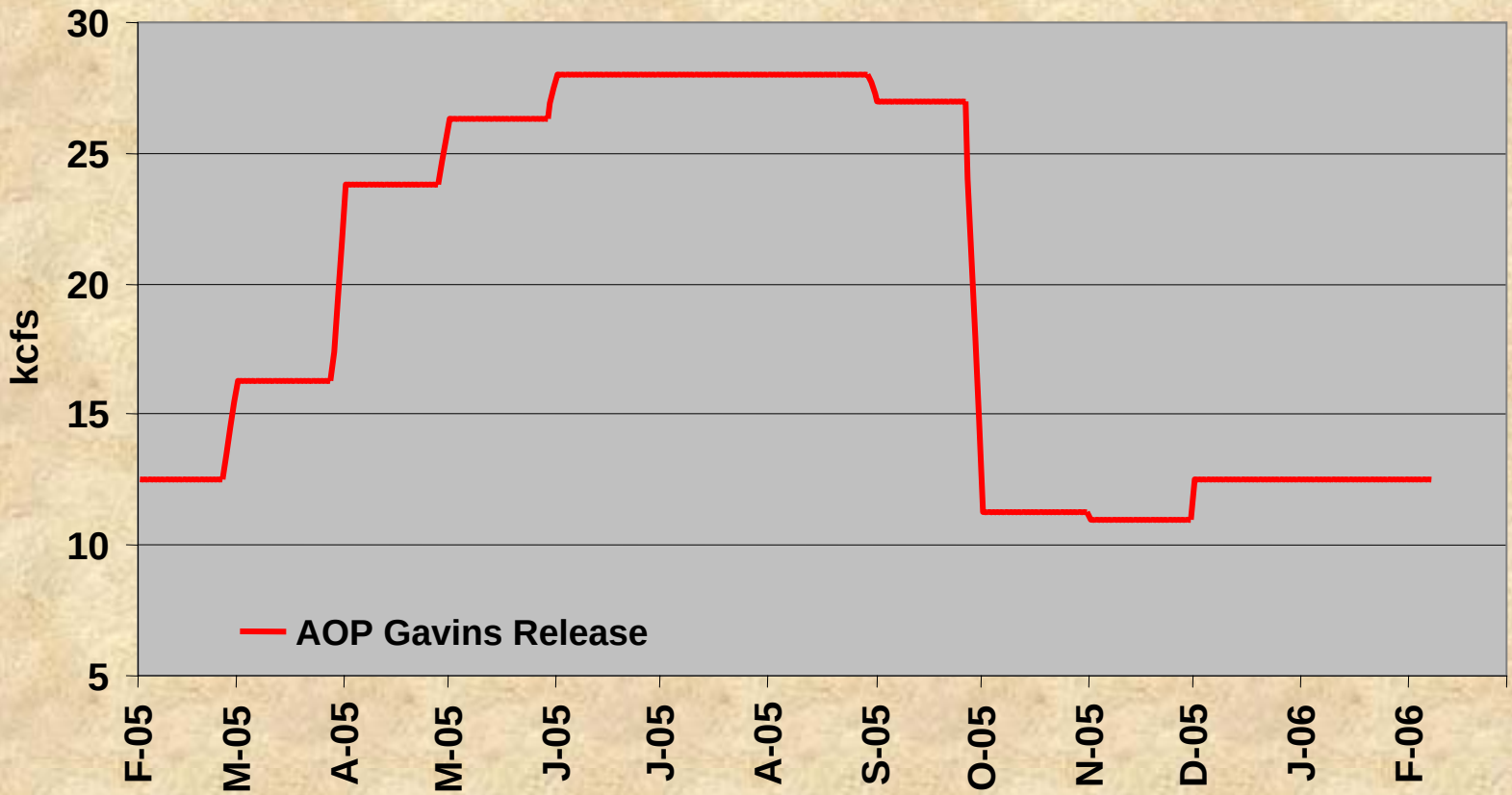
- If we reach the navigation preclude:
  - Flows to support navigation on the lower river will be discontinued.
  - Power generation from coal-fired and nuclear power plants will be reduced significantly.
  - Mainstem power generation will experience further declines.
  - Main street businesses that rely on the sport fishing industry will feel additional impacts.
  - Public drinking water systems face potential loss of water supply.
  - Increased costs of "chasing-the-water" will result in more irrigated acreage being dry land farmed.



Protecting South Dakota's Tomorrow ... Today

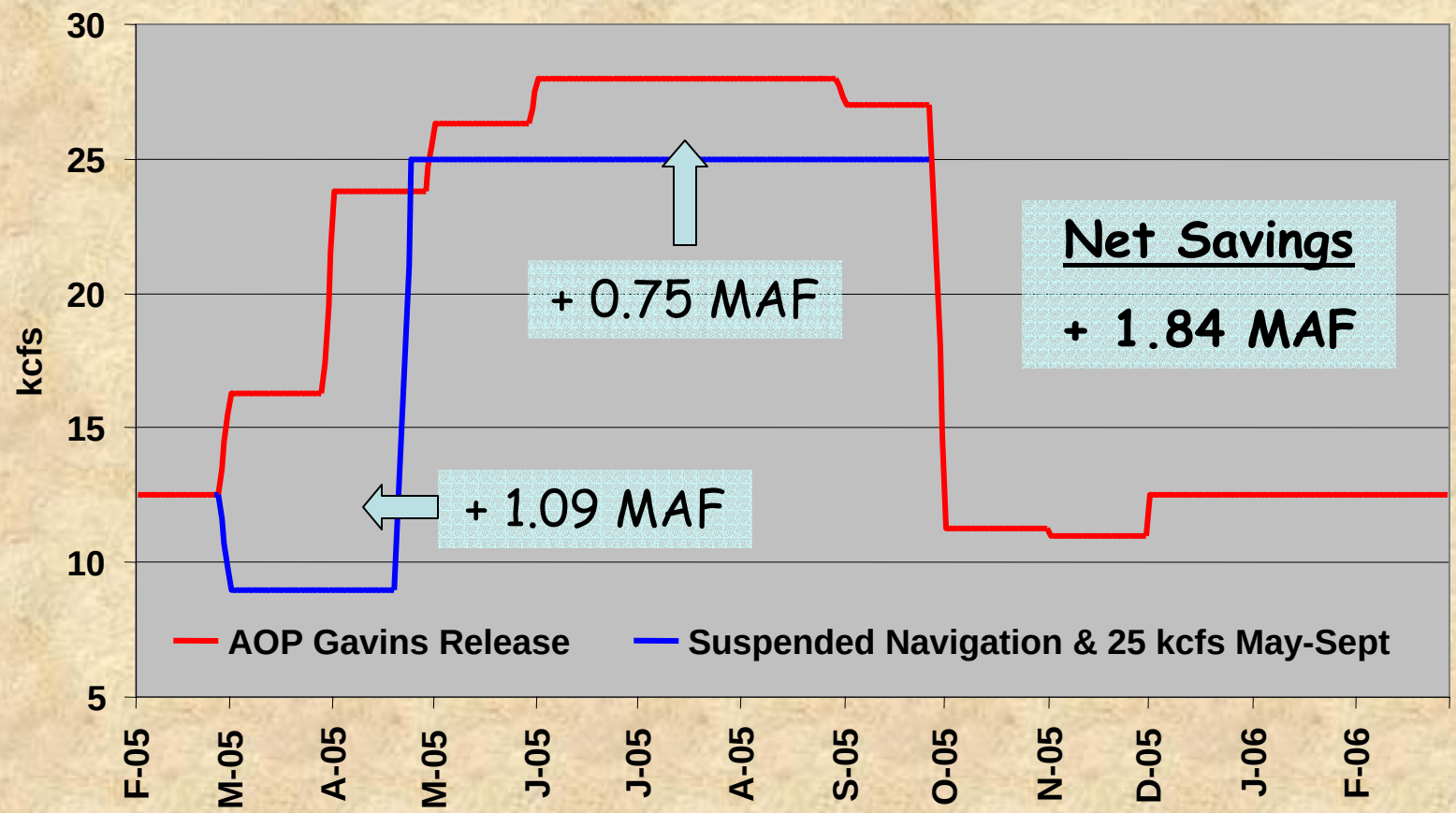


Annual Operating Plan
Gavins Point Release



Conservation Measures Neccessitated by Continuation of Severe Drought

- **If the snowpack outlook remains poor through March, the navigation season should be suspended until May 1.**
- **Steady release set at 25 kcfs from May-September.**



Essential Conservation Measures

- **At a minimum navigation support should be limited to Kansas City and down river until May 1, similar to operations in 2004.**
- **Steady release flows should be set at 25 kcfs in early May (providing a 65% assurance of uninterrupted navigation service during the summer).**