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Managing Water in the West

The Colorado River: Operations and Current Conditions

March 2005

U.S. Department of the Interior
Bureau of Reclamation

The Colorado River Operation and Current Conditions

- Overview of the Basin
- Operation of the Lakes Powell and Mead
- Where we are today (and how we got here)
- Where we think we are going
- Current issues

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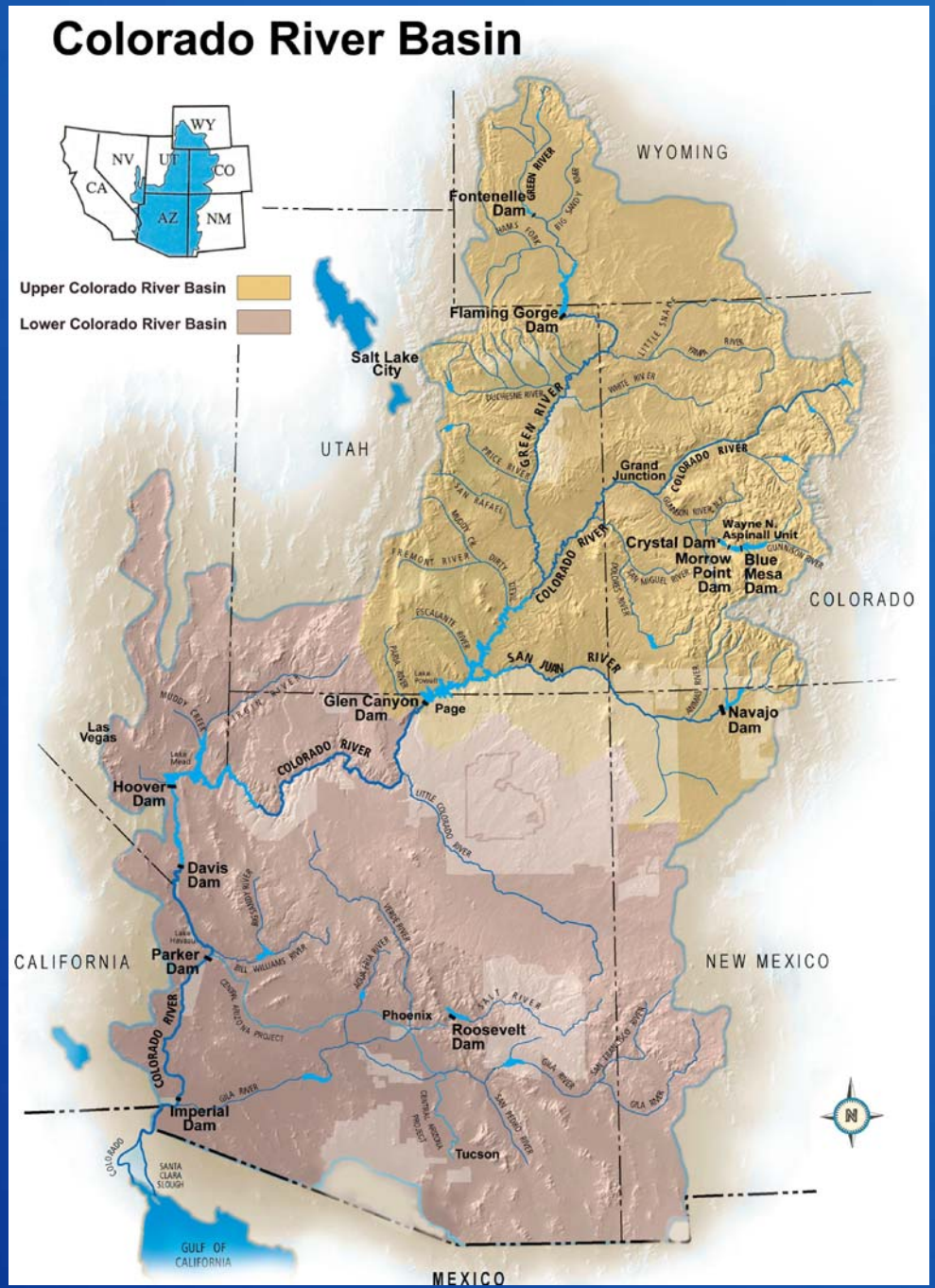
Colorado River Basin

- 1,450 miles in length
- 15.1 million acre-feet average “natural flow” at Lee Ferry Az
- 16.5 maf allocated per year
- 14.5 maf current use per year
- 60 maf of storage
- Irrigates 3 million acres
- Serves 30 million people



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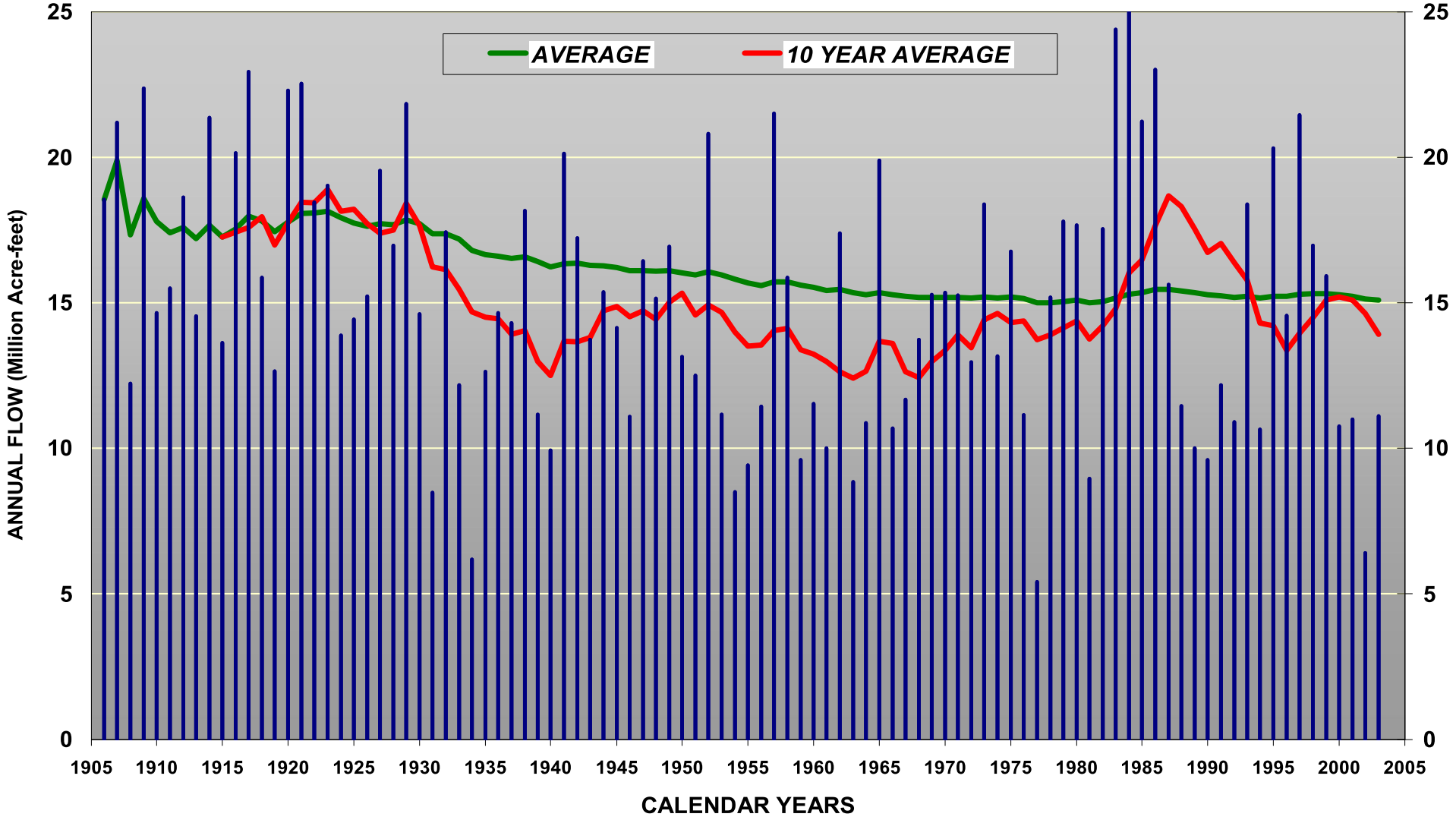
NATURAL FLOW
Colorado River at Lees Ferry, AZ
Calendar Year 1906-2003



1996 to 2003: Provisional data, subject to change.

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Operation of Lake Powell

- Three modes of governing annual releases from Lake Powell
  - Minimum objective release – 8.23 maf
  - Equalization (if Powell storage > Mead and the 602(a) storage criteria is met)
  - Spill avoidance
- For 2005, minimum objective release will most likely govern the operation

Operation of Lake Mead

- Two modes of governing releases from Lake Mead
  - Flood control operations
  - Meet downstream requirements (or demands)
- For 2005, meeting downstream demands will govern the operation

Operation of Lake Mead Downstream Requirements

- Downstream demands include:
  - California 4.4 maf
  - Arizona 2.8 maf
  - Nevada 0.3 maf
  - Mexico 1.5 maf
  - Regulation of Lakes Mohave and Havasu
  - System gains and losses
- Deliveries can be larger or smaller under "surplus" or "shortage" conditions

Why is equalization important?

- Given current demands in the Lower Basin (including Mexico), and minimum objective release from Lake Powell, Lake Mead storage will continue to decline

  - Inflow = 9.0 maf
    (release from Powell + side inflows)
  - Outflow = - 9.5 maf
    (LB and Mexico apportionments
    + downstream regulation, gains and losses)
  - Mead evaporation loss = - 0.8 maf
  - Balance = - 1.3 maf

Colorado River Basin Storage
(as of March 31, 2005)

Current Storage	Percent Full	1000 Ac-Ft	Elev. (Ft)
Lake Powell	33%	8,023	3556.00
Lake Mead	63%	16,218	1147.65
Total System Storage	53%*	31,201	NA

- Total system storage was 31,809 kaf or 54% this time last year

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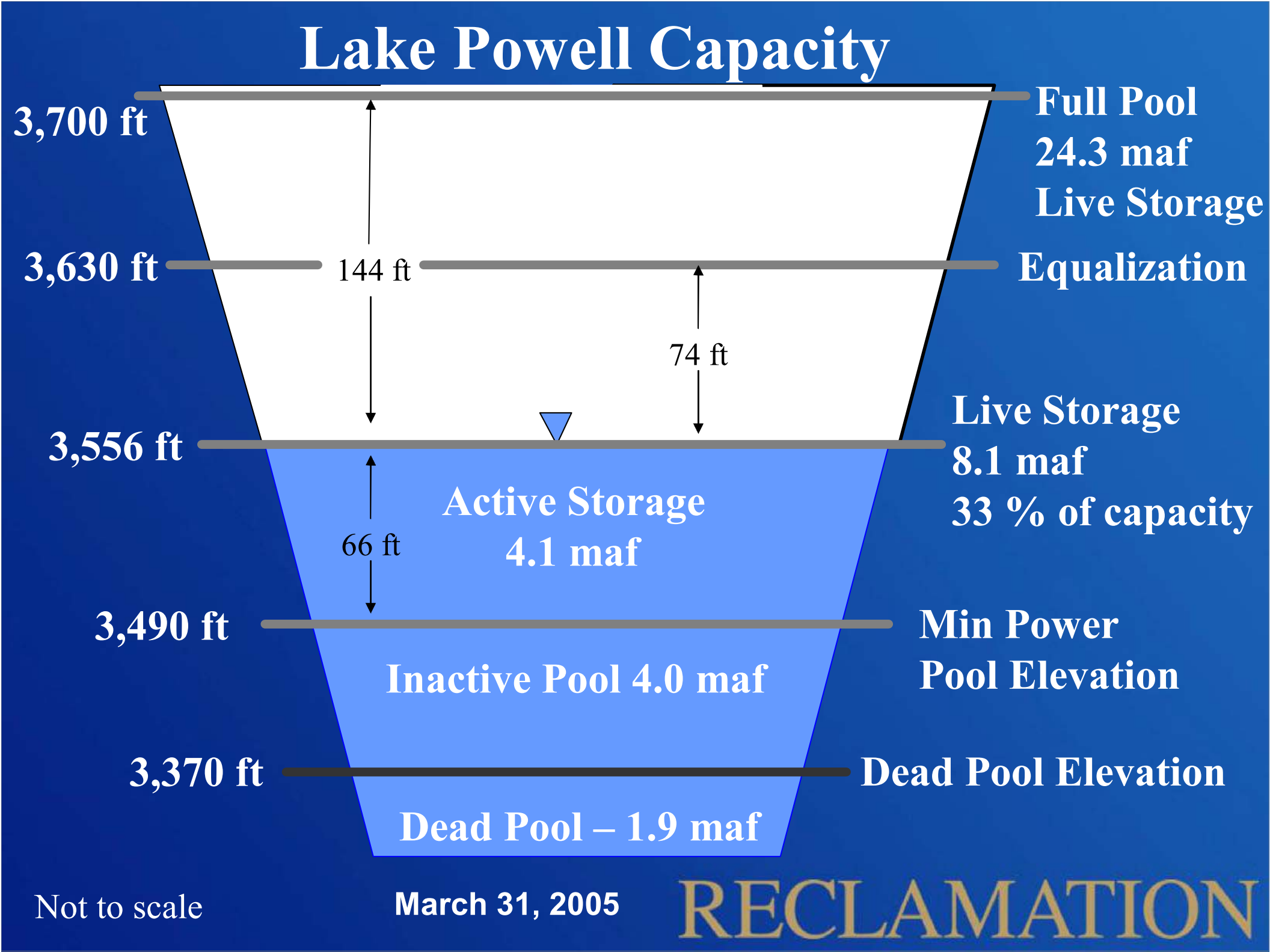
Lake Powell Capacity



Not to scale

March 31, 2005

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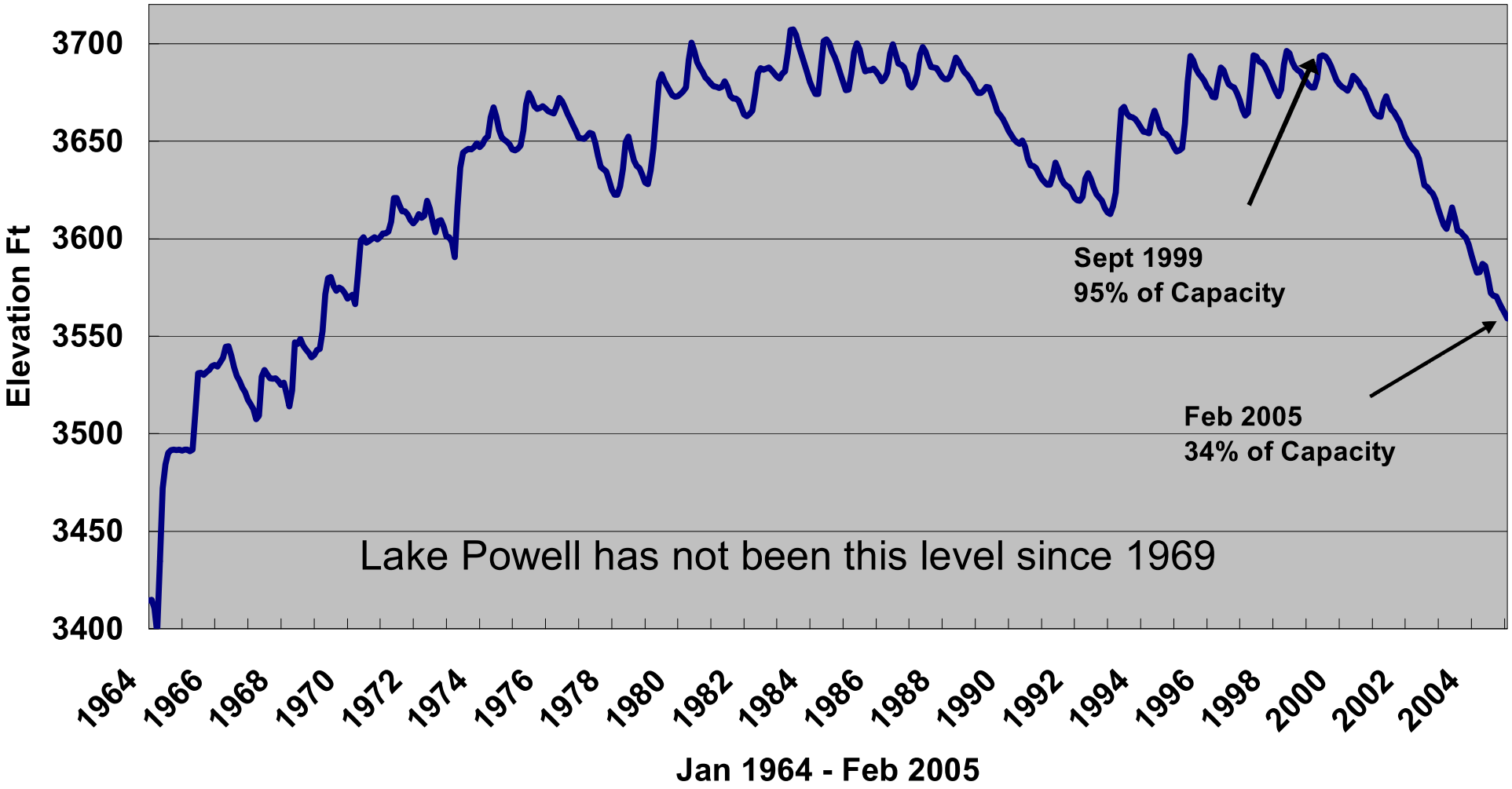
Lake Powell End of Month Elevation
1964 through Present



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Lake Powell at Hite Bay
Circa 1999

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Lake Powell at Hite Bay
March, 2003

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Lake Powell at Hite Bay
March, 2004

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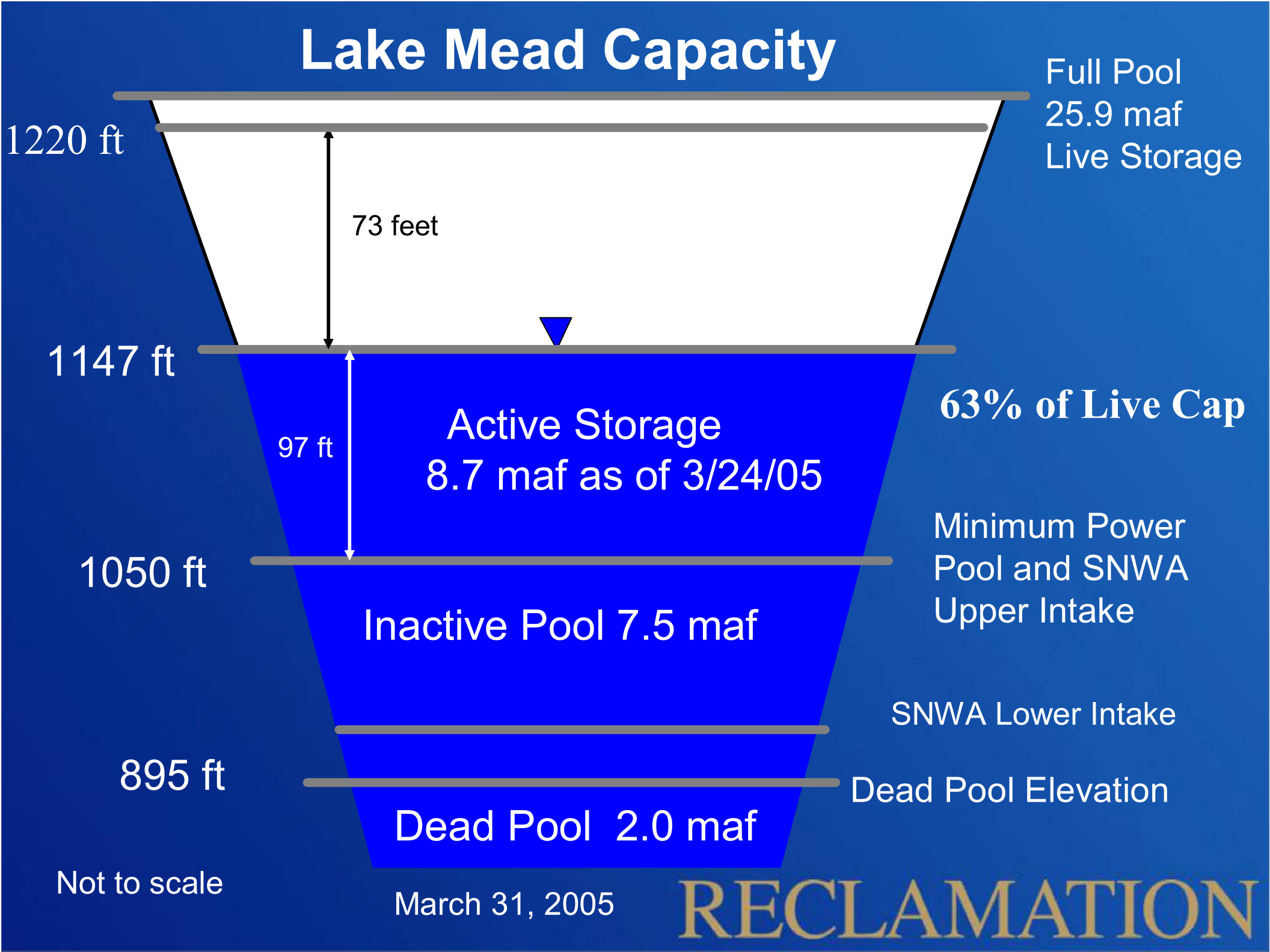
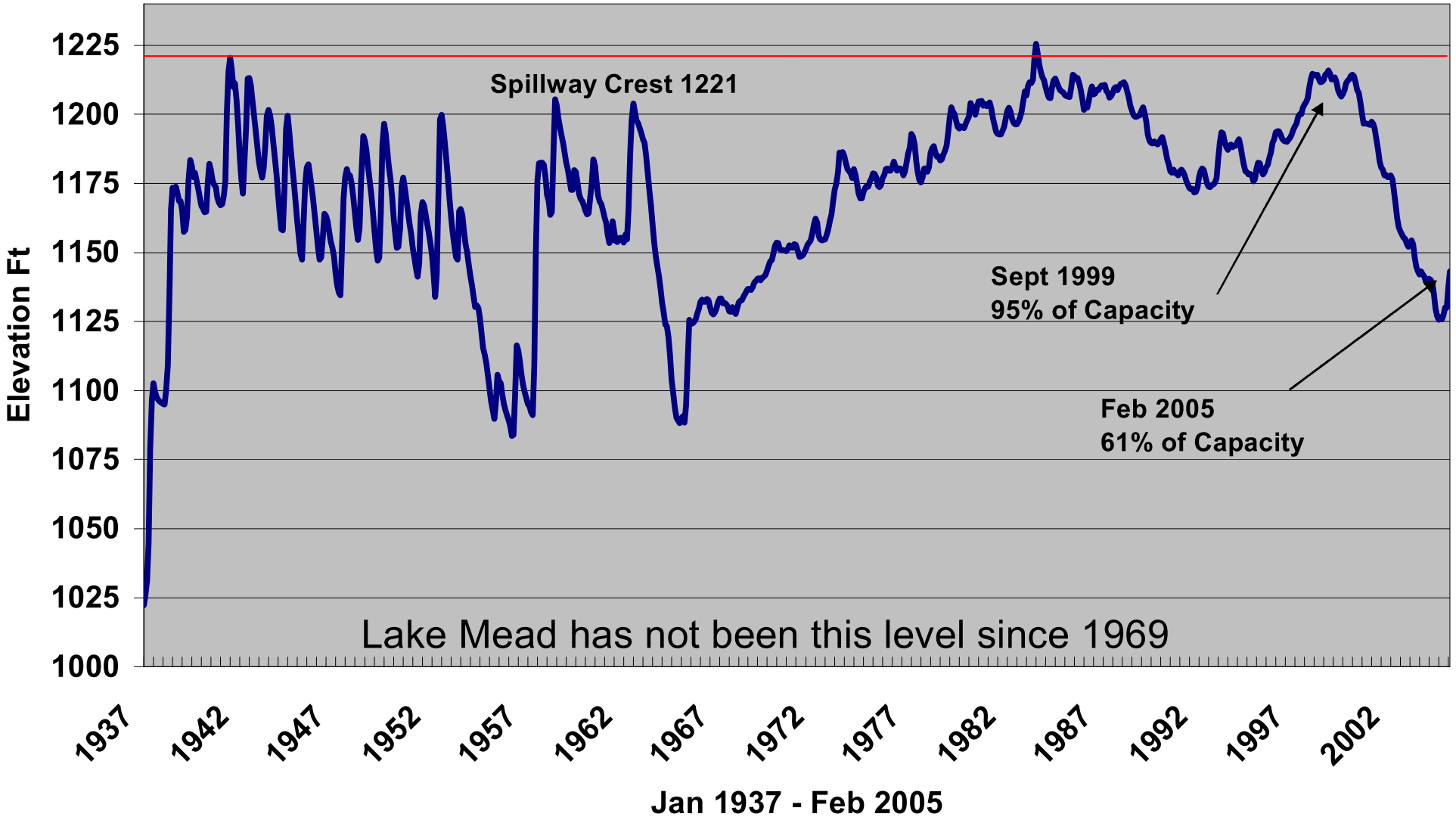
Lake Mead Capacity



Lake Mead End of Month Elevation



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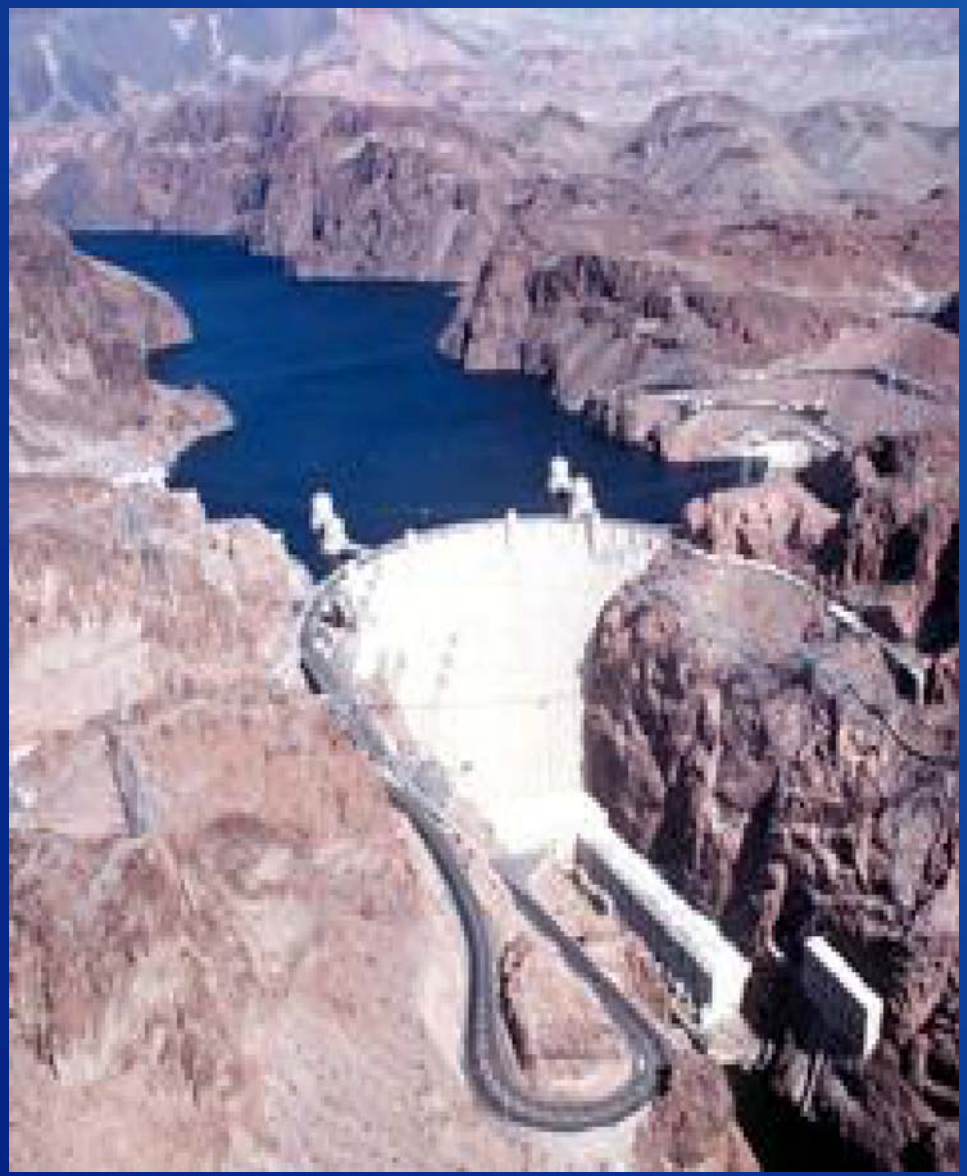
Lake Mead's "Bathtub Ring"



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Lake Mead's Delta Area
Circa 1999

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Lake Mead's Delta Area
November, 2003

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Water Year Unregulated Inflow to Lake Powell, 1999-2004

- 1999 109 % of average
- 2000 62 % of average
- 2001 59 % of average
- 2002 25 % of average
- 2003 53 % of average
- 2004 51 % of average

Mid-Term Droughts - Colorado River
(Average 100 year natural flow 15.1 maf)

Years	Duration	Average Flow
1931-1935	5 years	11.4 maf
1953-1956	4 years	10.2 maf
1959-1964	6 years	11.4 maf
1988-1992	5 years	10.9 maf
2000-2004	5 years	9.9 maf *

* Estimated

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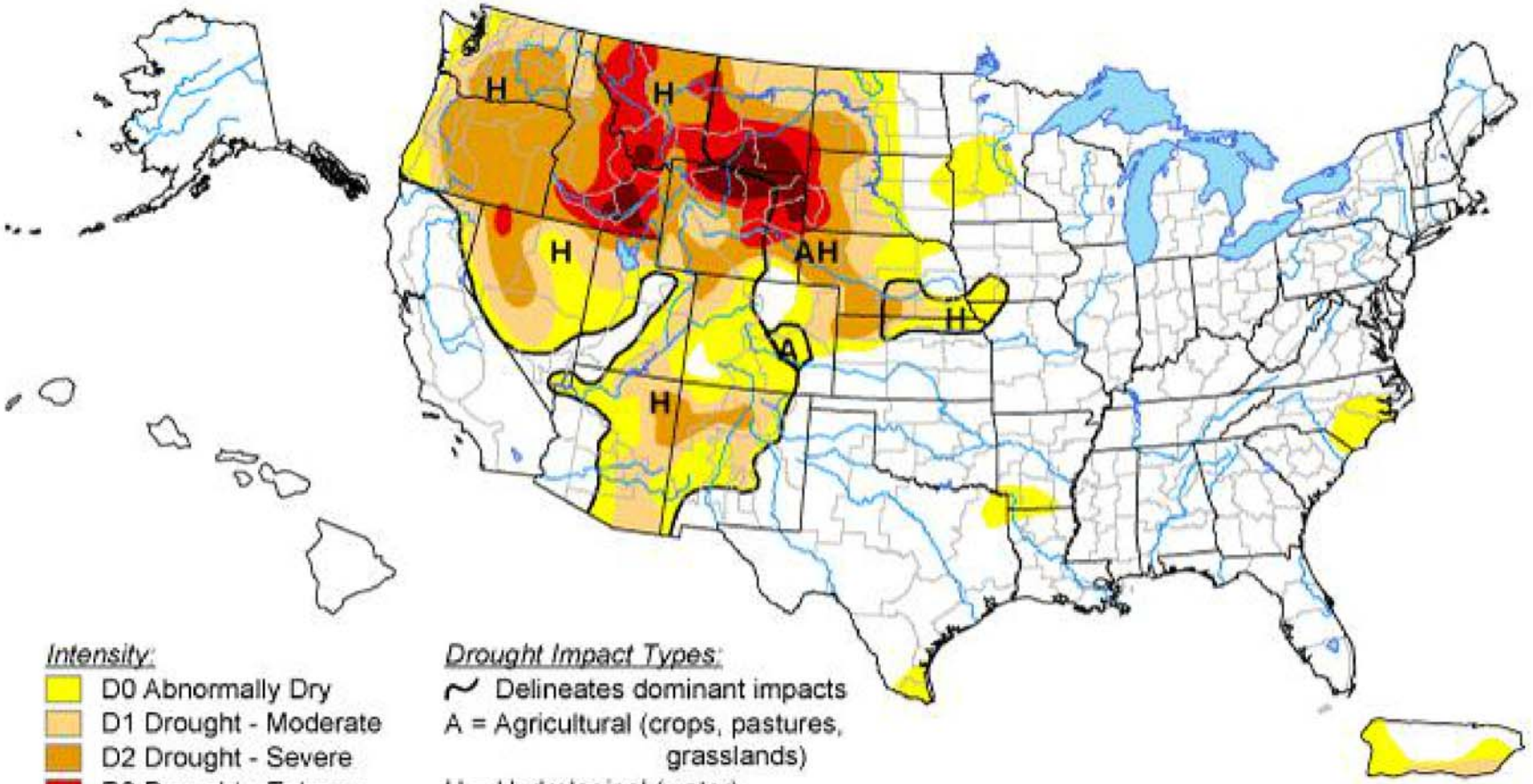
U.S. Drought Monitor

March 29, 2005
Valid 7 a.m. EST



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.

http://drought.unl.edu/dm

USDA National Drought Mitigation Center

Released Thursday, March 31, 2005
Author: Douglas Le Comte, CPC/NOAA

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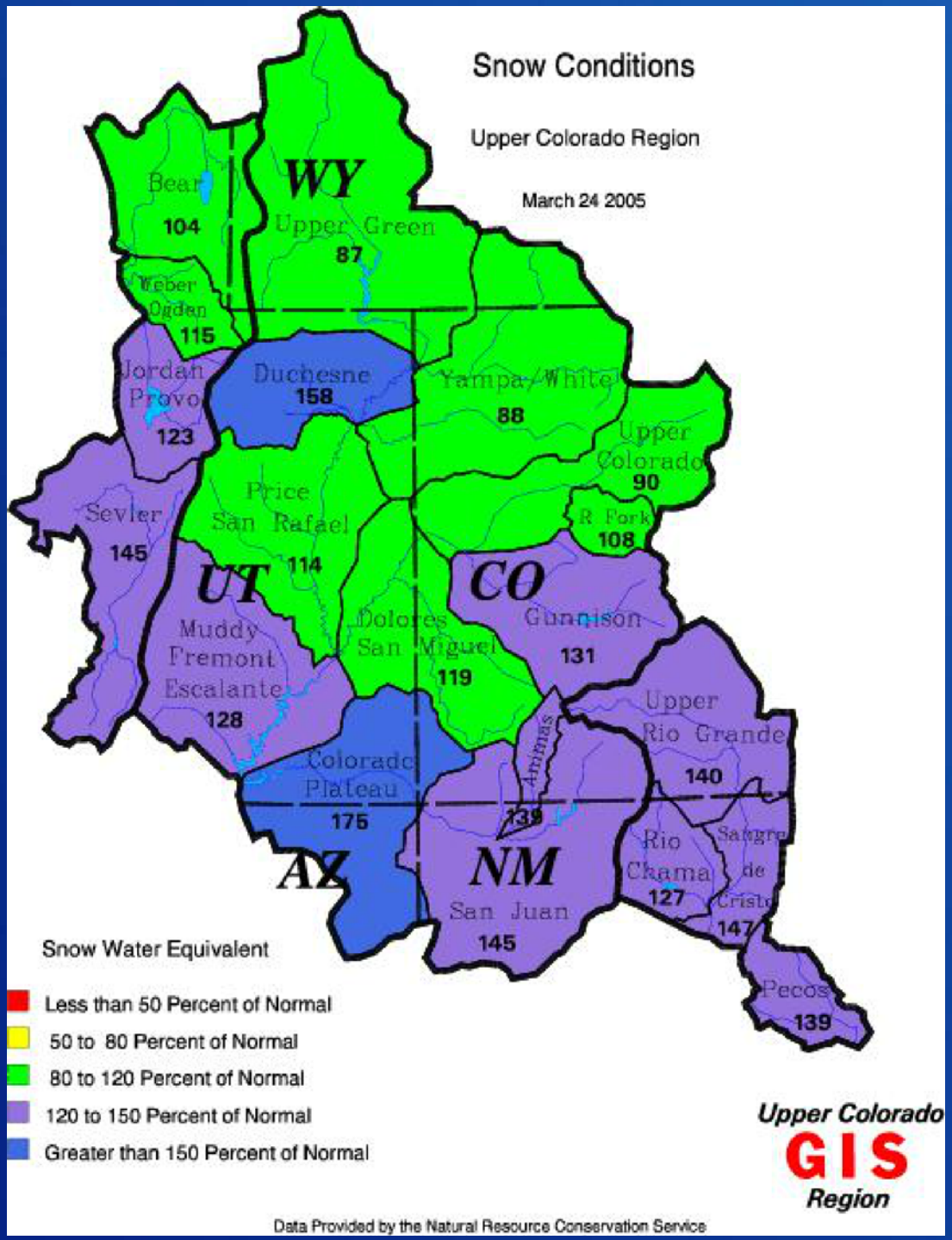

Basinwide Snowpack in the Upper Colorado River Basin Is 115 % of Average March 28, 2005

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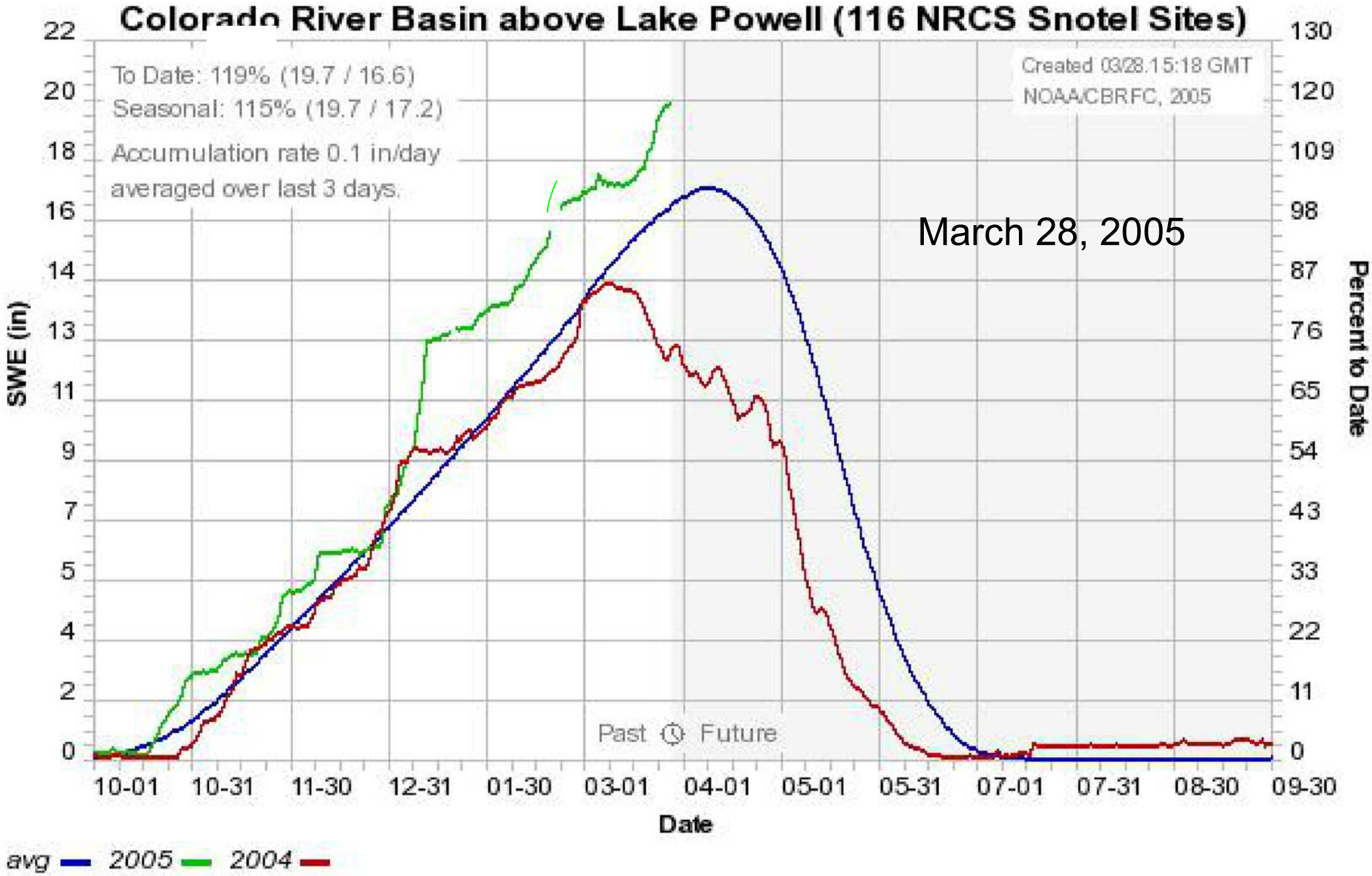

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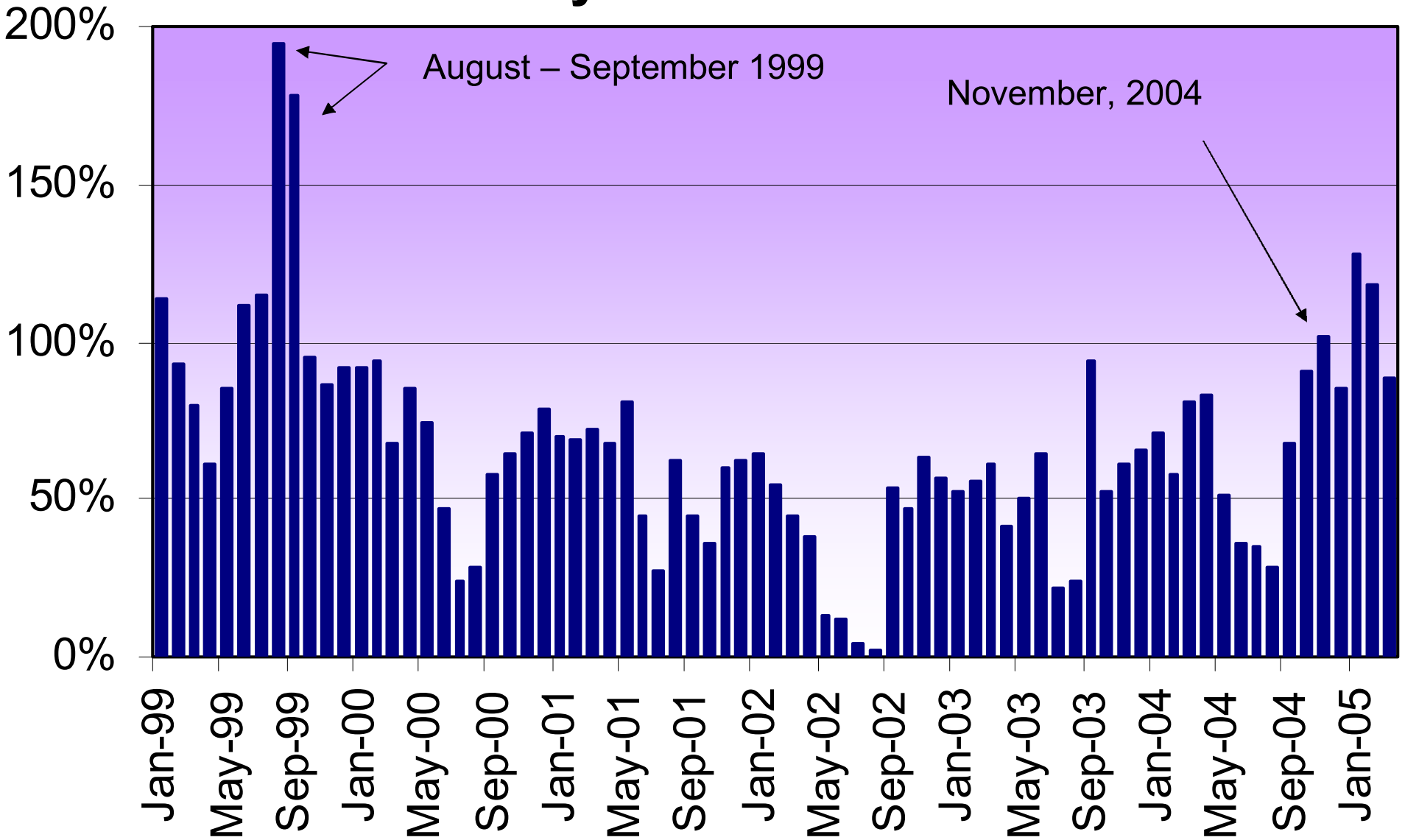
Unregulated Inflow to Lake Powell
January 1999 - March 2005



March 2005 Estimated

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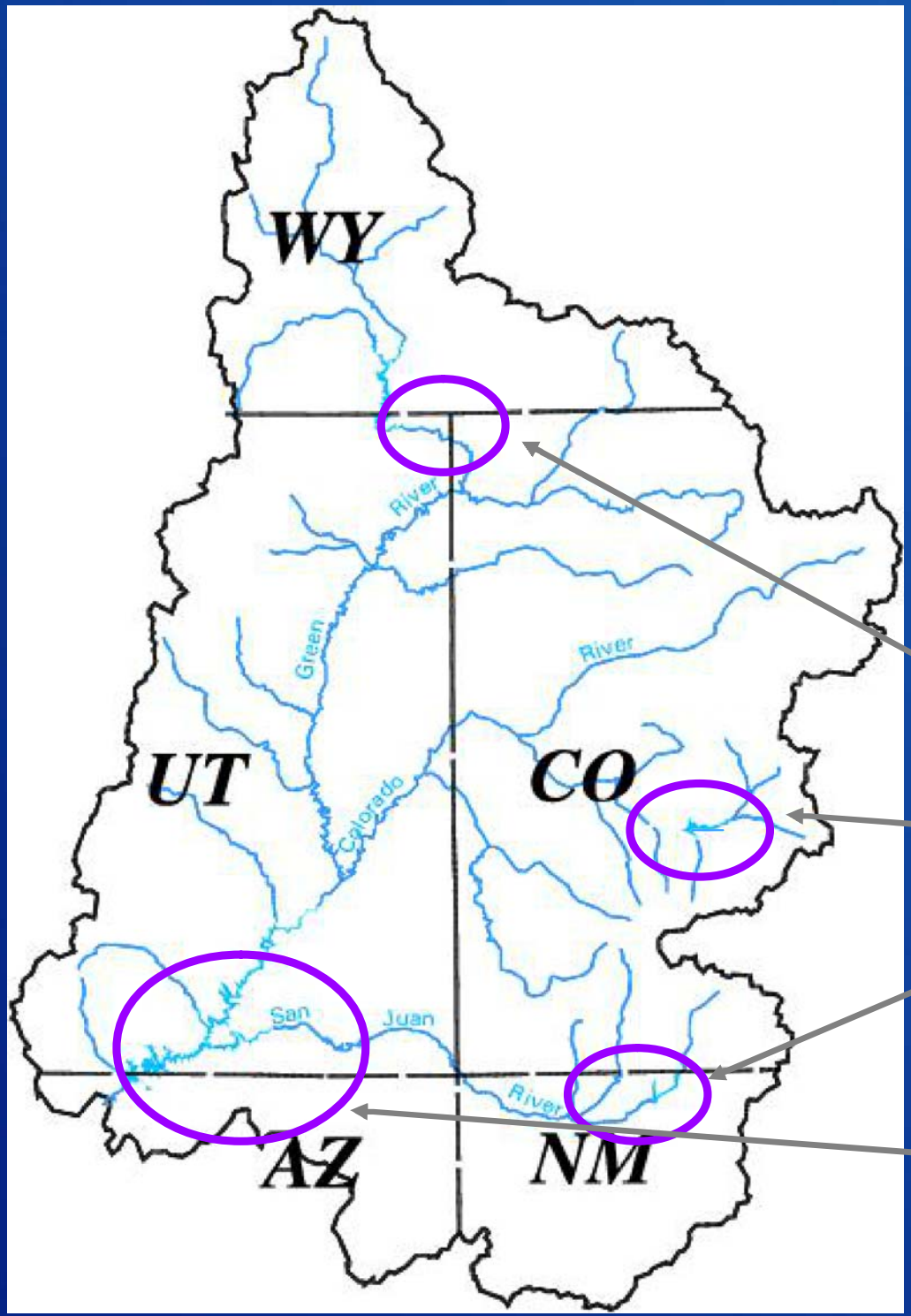

2005 Upper Colorado Apr–Jul Inflow

March mid-month 2005 Forecasts

Flaming Gorge – 76 %

Blue Mesa – 106 %

Navajo – 152 %

Lake Powell – 101 %

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Recent Lower Basin Inflows

- Total LB tributary inflow (October 1 through March 27) approximately 1.91 maf
- Long-term average is 1.3 maf per year
- Excess flows to Mexico (October 1 through March 27) approximately 112.5 kaf (57.9 kaf since January 1)
- Lake Mead is nearly 31 feet higher now than projected in October

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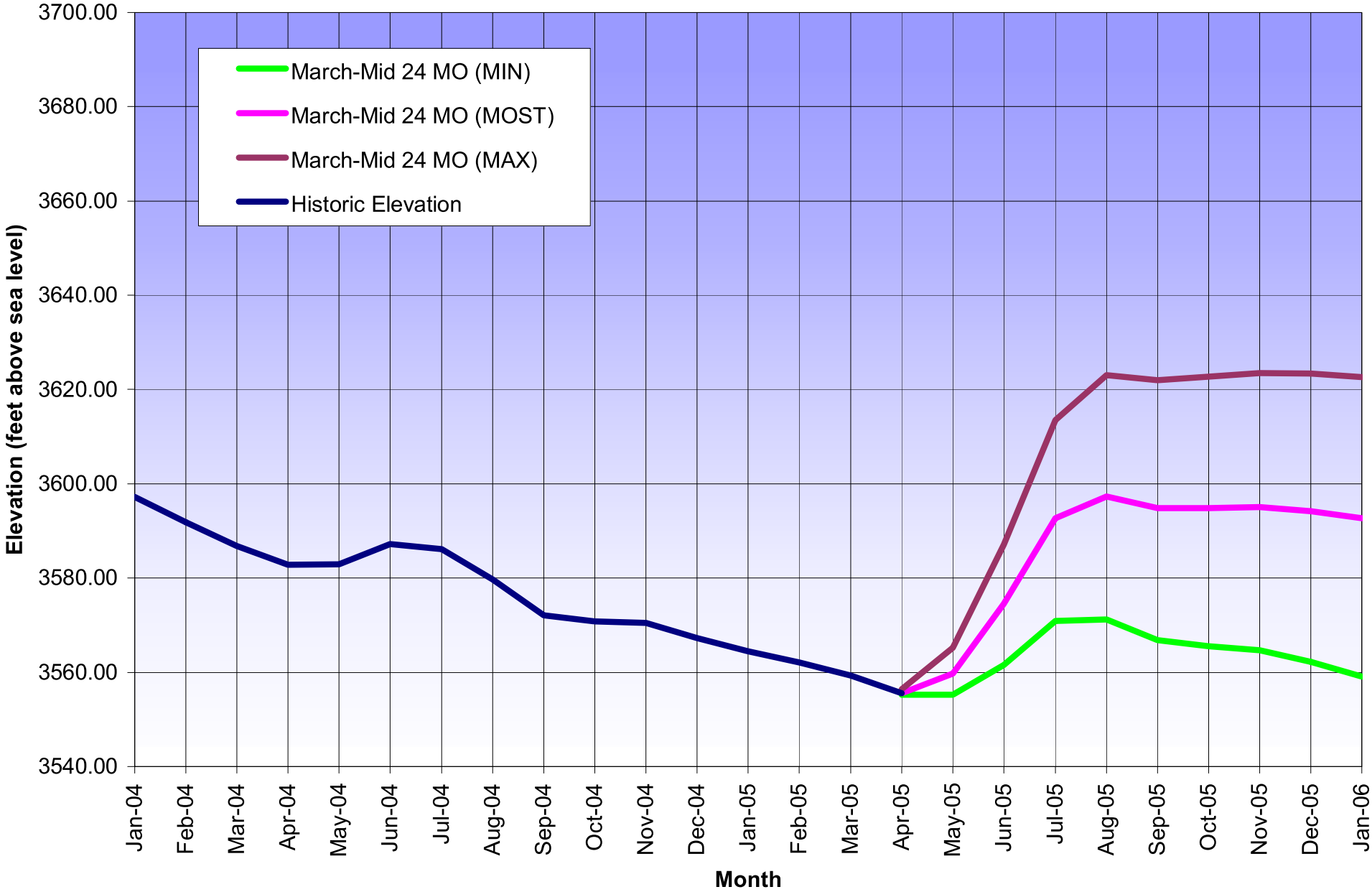
Lake Powell Reservoir Elevations

March Mid-Month 24 Month Study Minimum, Most and Maximum Probable Scenarios



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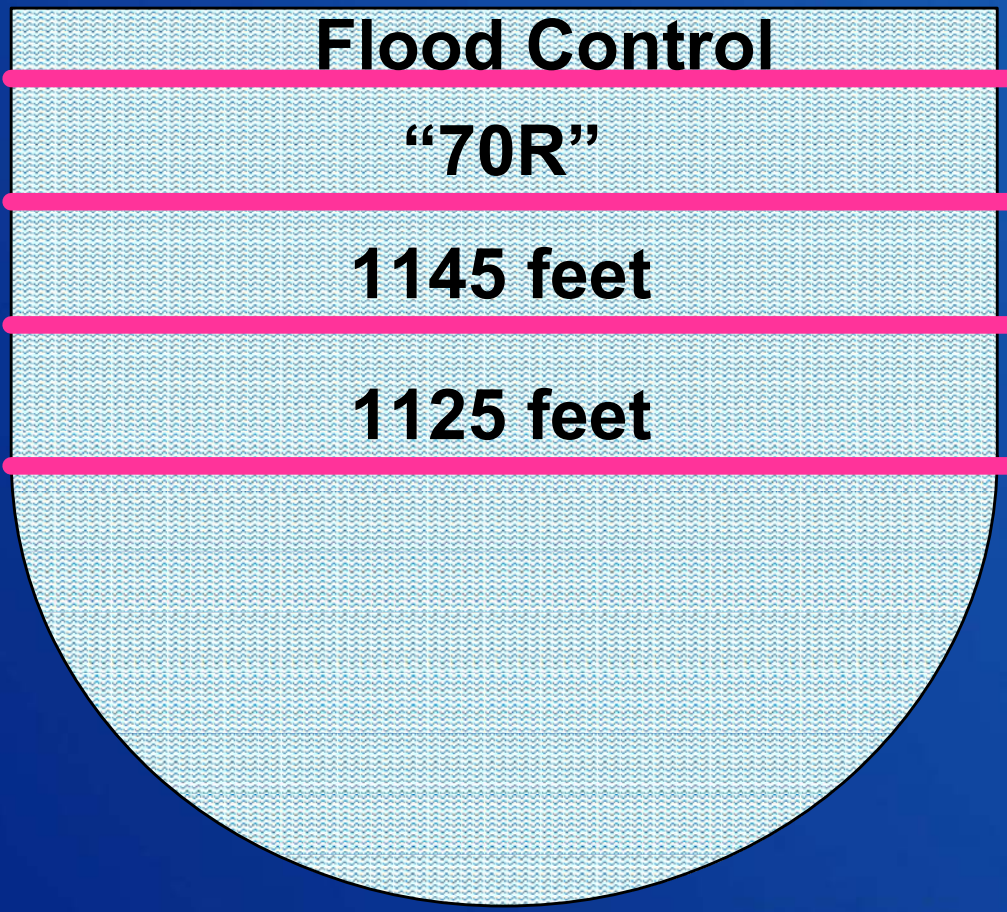
Is the drought over?

- In 100 years of record keeping there has never been 6 consecutive years of below average flow in the Colorado
- Longer-term droughts typically have some above average years
- It will take a ‘cycle’ of wet hydrology to refill Lake Powell and Lake Mead
- 1983-1984 hydrology would refill to 88 percent of capacity

Interim Surplus Guidelines

LAKE MEAD LEVEL



Unlimited + Mexico

Domestic + Banking

Full Domestic Use

Partial Domestic

No Surplus – either normal (7.5maf) or shortage

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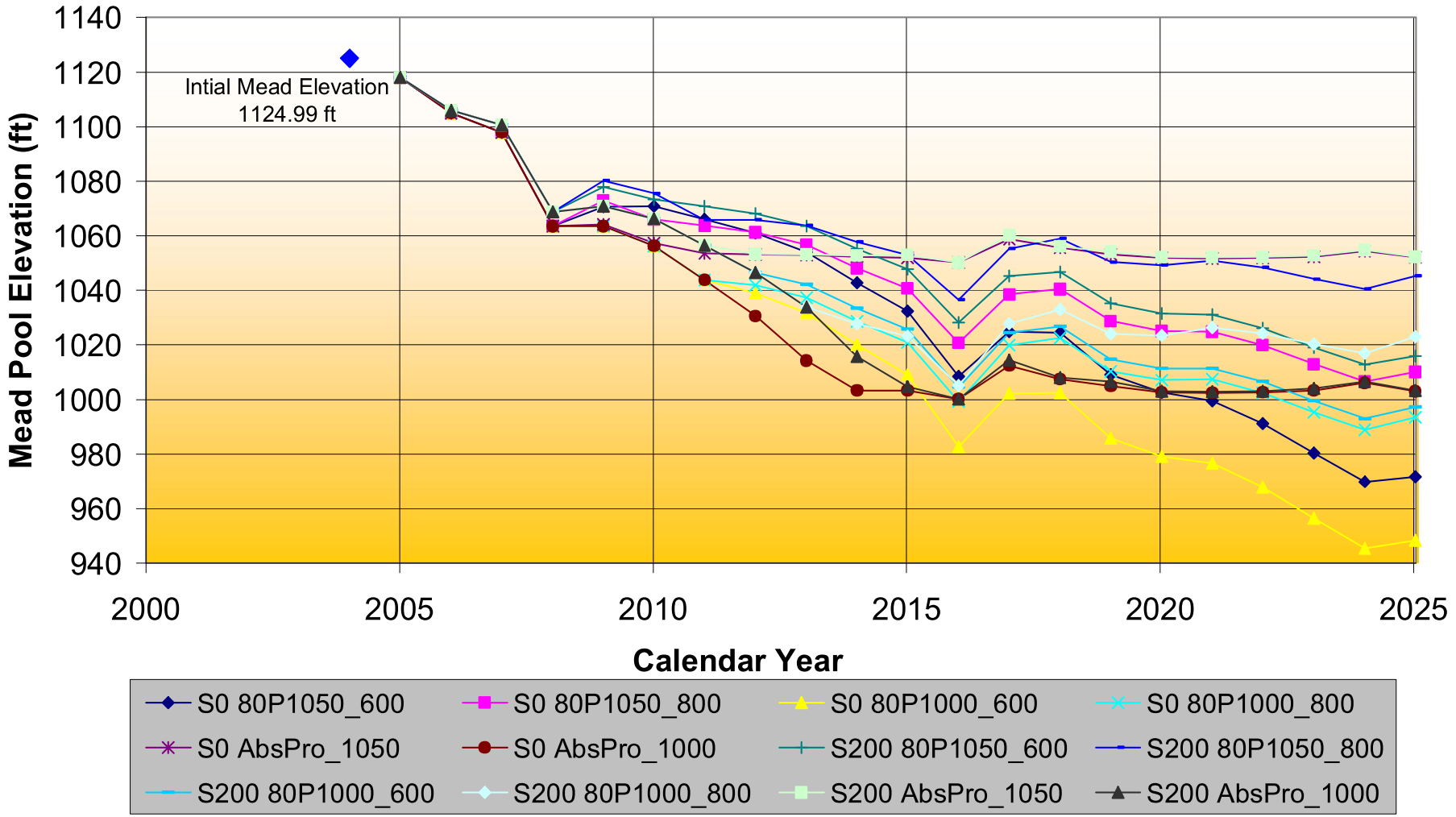
Shortage in the Lower Basin

- There has never been a shortage in the Lower Basin and there are currently no shortage guidelines
- Secretary announced in December, 2004, that the Department will initiate a public process to adopt shortage guidelines for the Lower Basin before the end of her term.

Mead End-of-Calendar Year Elevation
"Worst case" Inflow (1953-1973)



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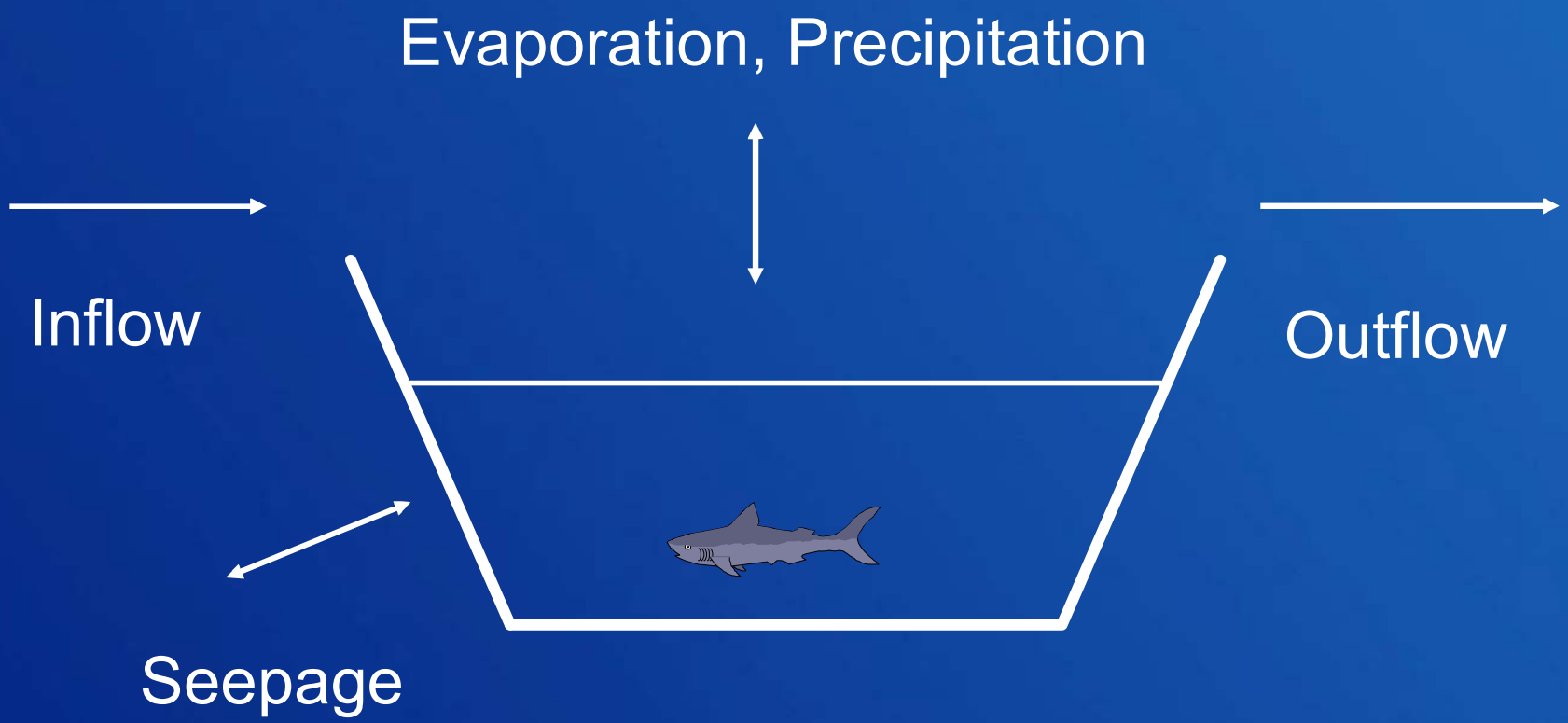
What determines the water elevation in a reservoir?



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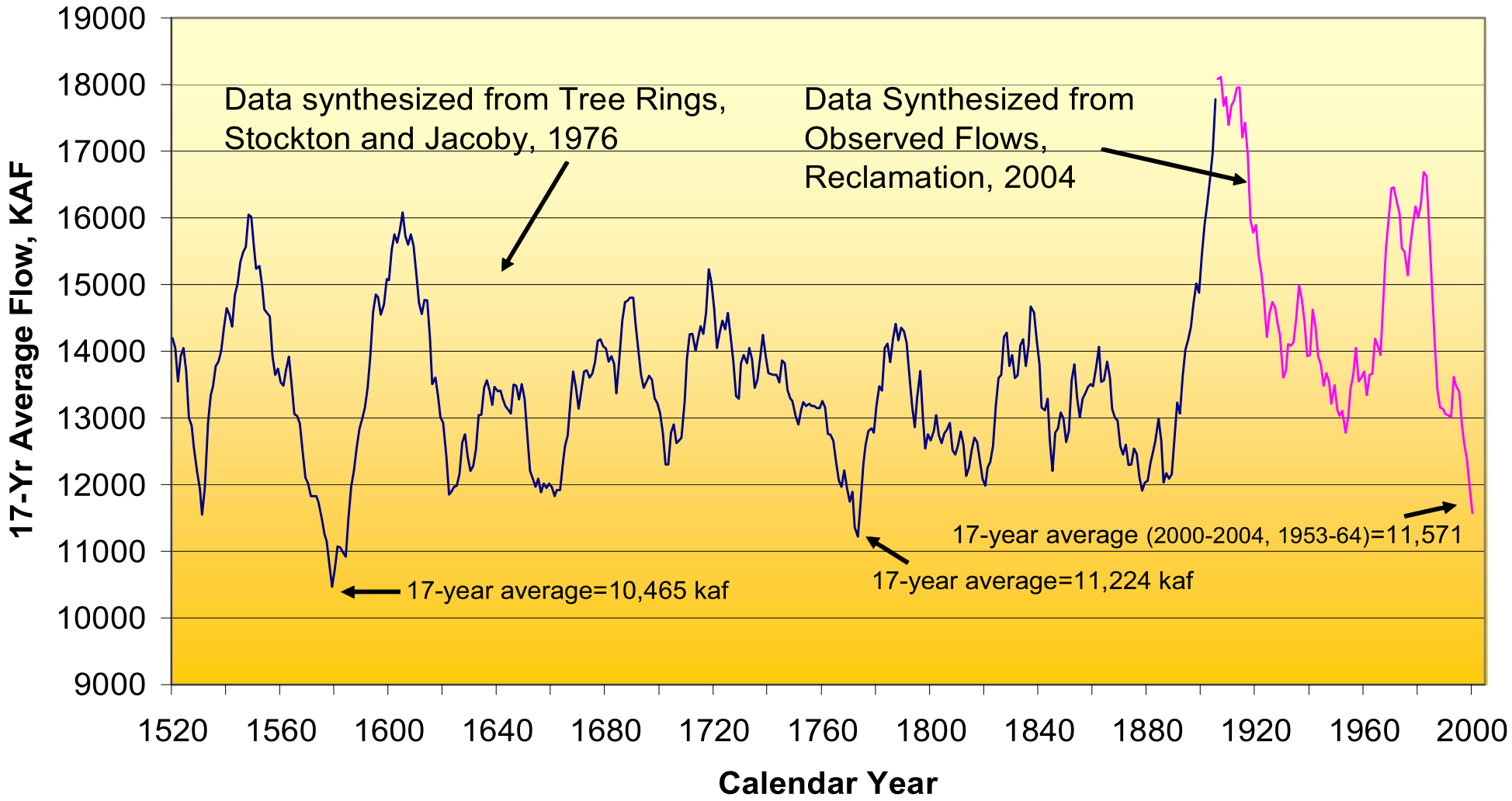
Natural Flow at Lee Ferry

17-Year Running Averages



The year represents the first year of the 17 year average.

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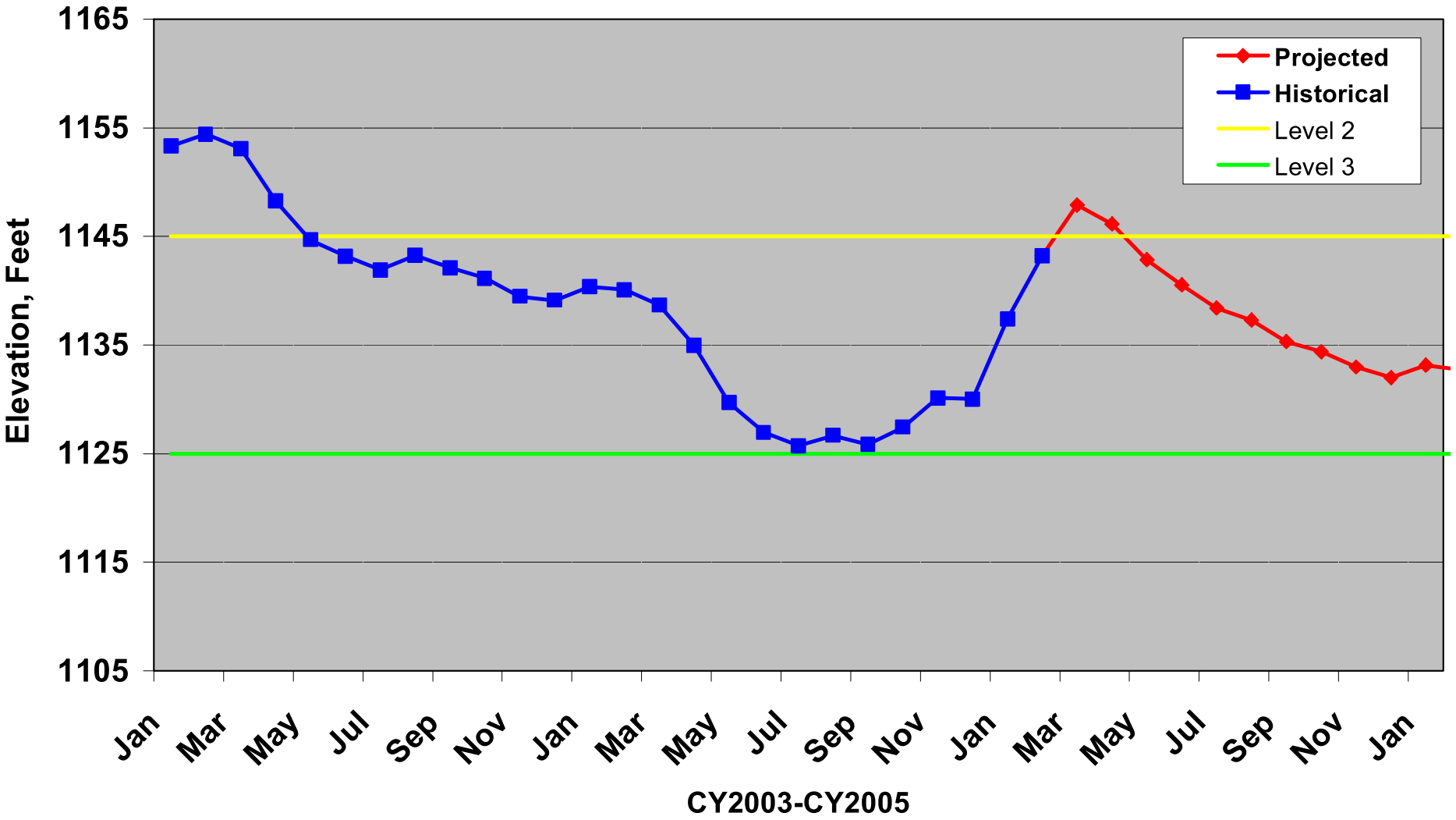
Lake Mead EOM Elevation



Based on the March 2005, 24 Month Study

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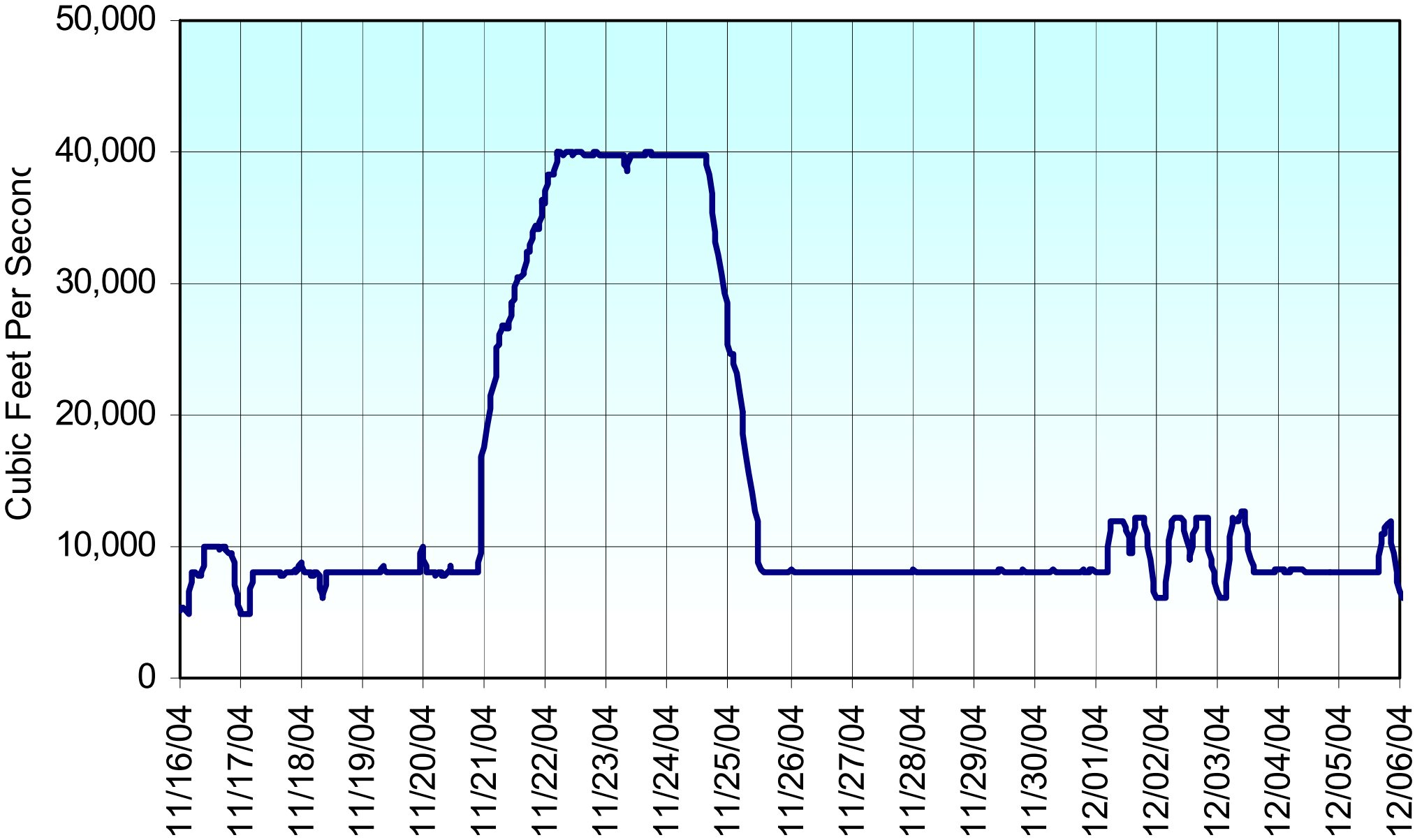
2004 Glen Cayon Dam High Flow Experiment



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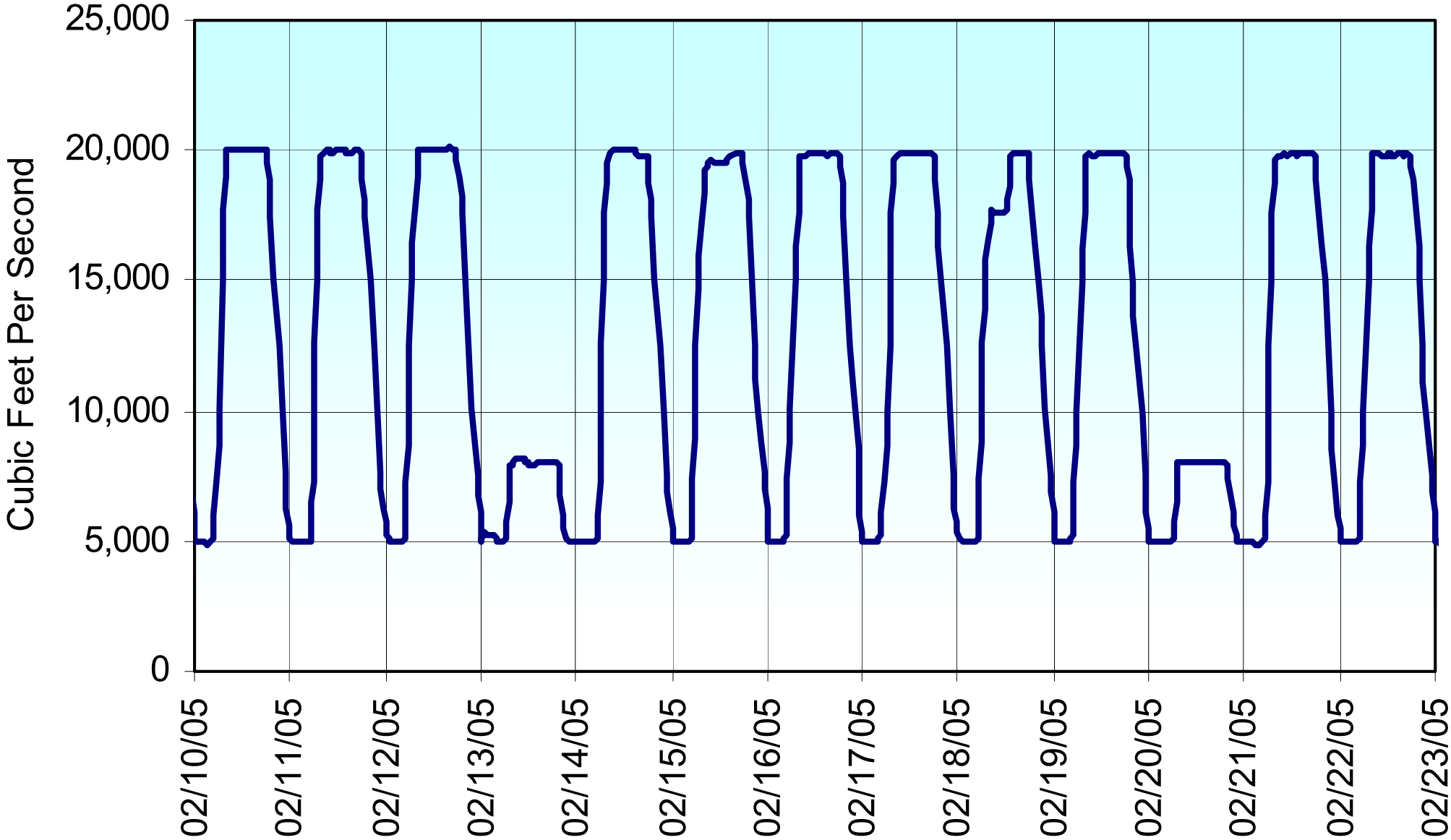
2005 Glen Cayon Dam High Flucutating Flows

Scheduled from January 2 through April 8, 2005



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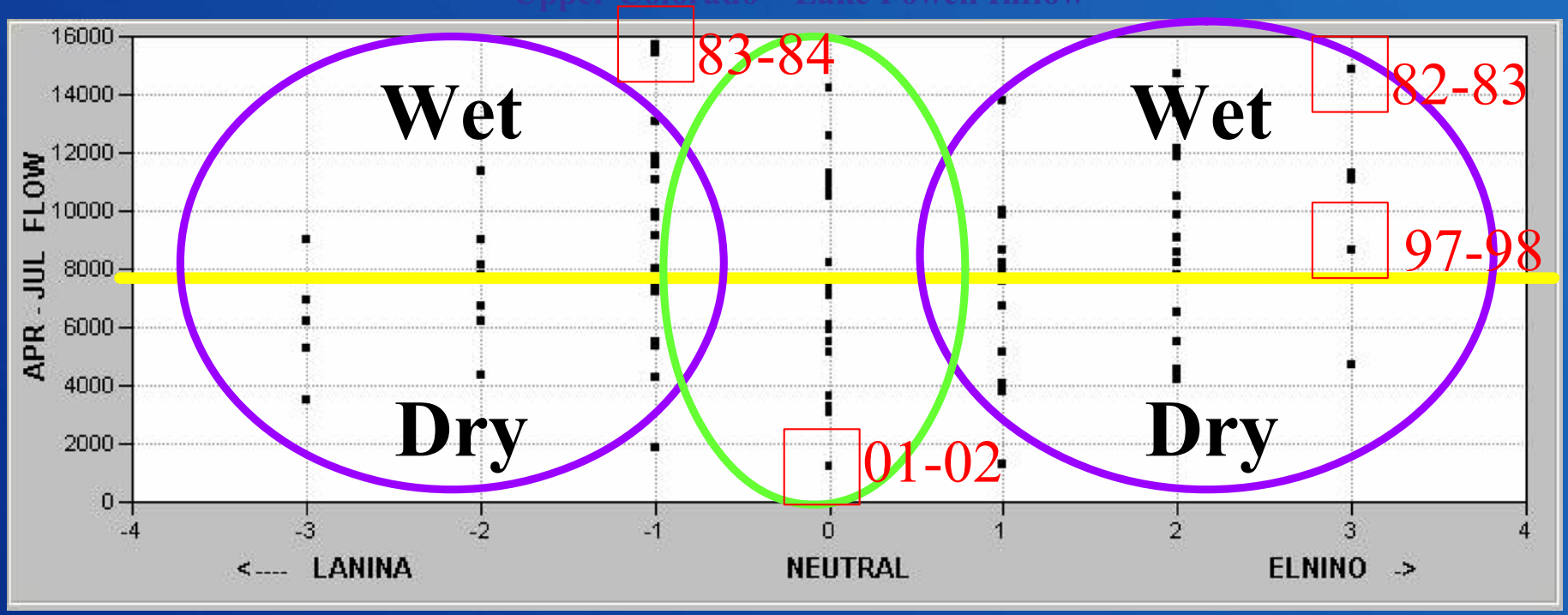

LaNina ElNino

Each dot on the graph represents a runoff year.

When you hear 'ElNino' do not always assume high runoff in the Upper Colorado Basin Above Lake Powell. But…

Extremely strong ElNino's are usually wetter and Extremely strong LaNina's are usually dryer.

Information provided by CBRFC, Salt Lake City, UT.

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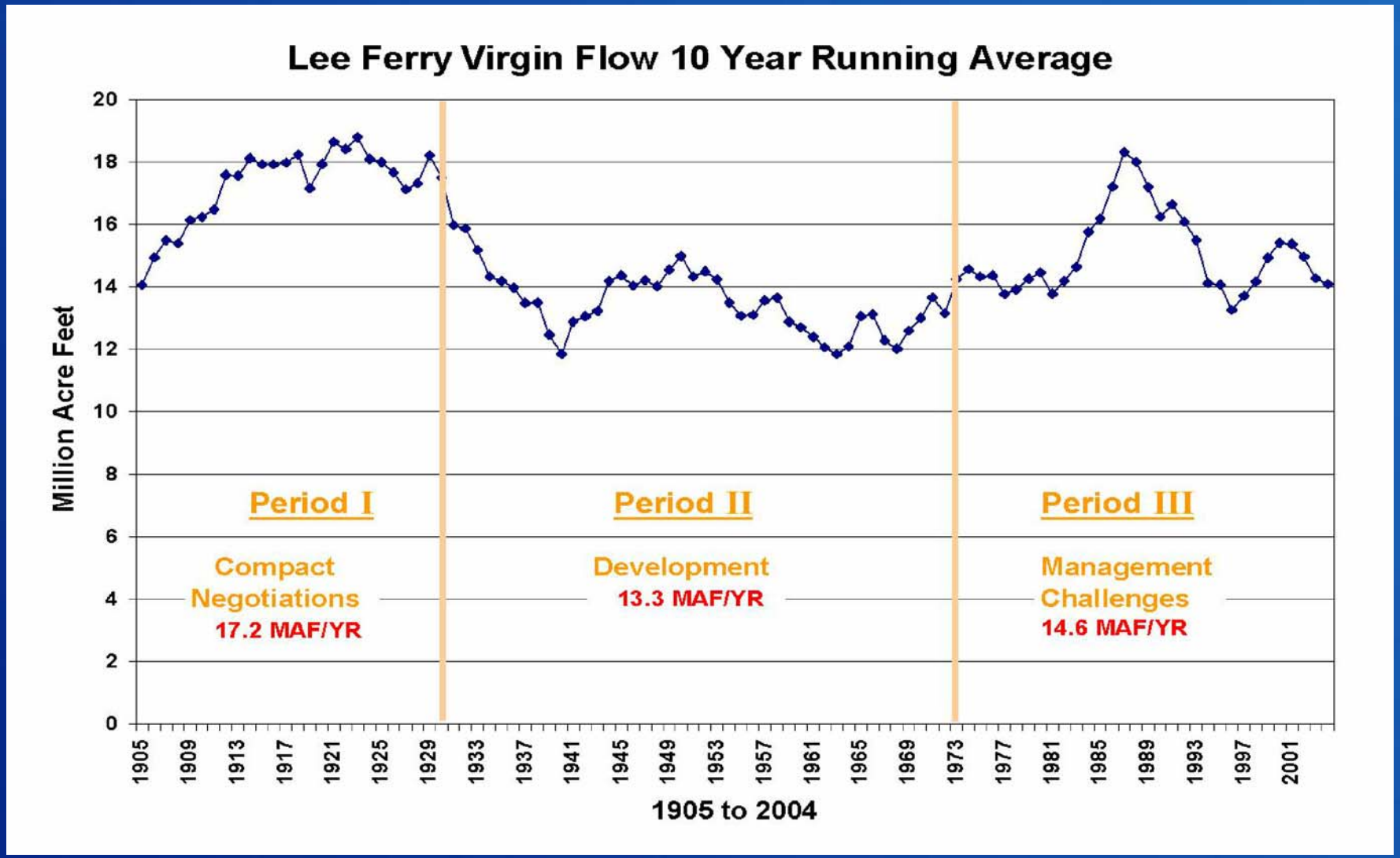
Natural Flow at Lee Ferry
10-year Running Average



Courtesy of Colorado River Water Conservation District

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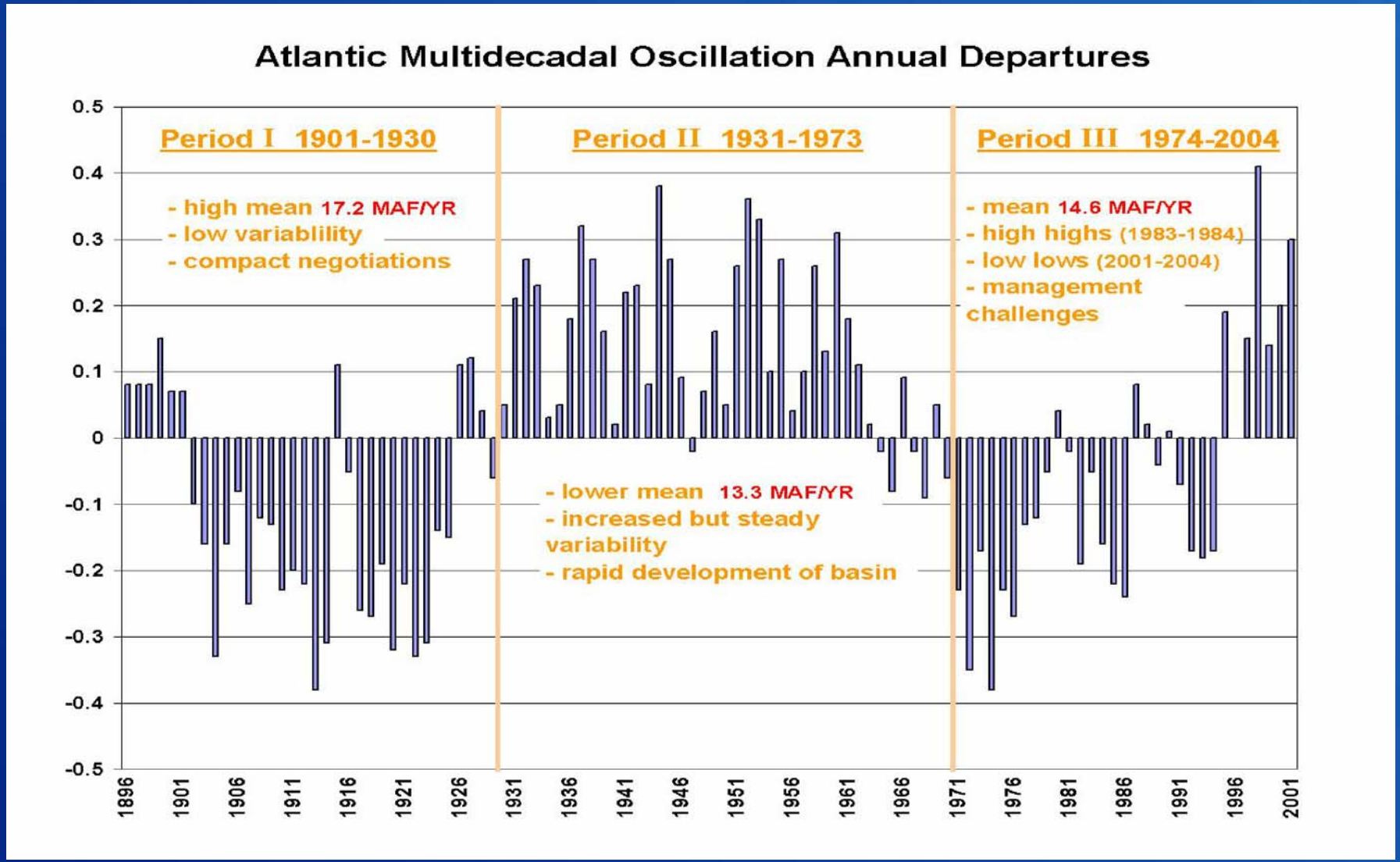
Atlantic Multi-Decadal Oscillation (AMO)



Courtesy of Colorado River Water Conservation District

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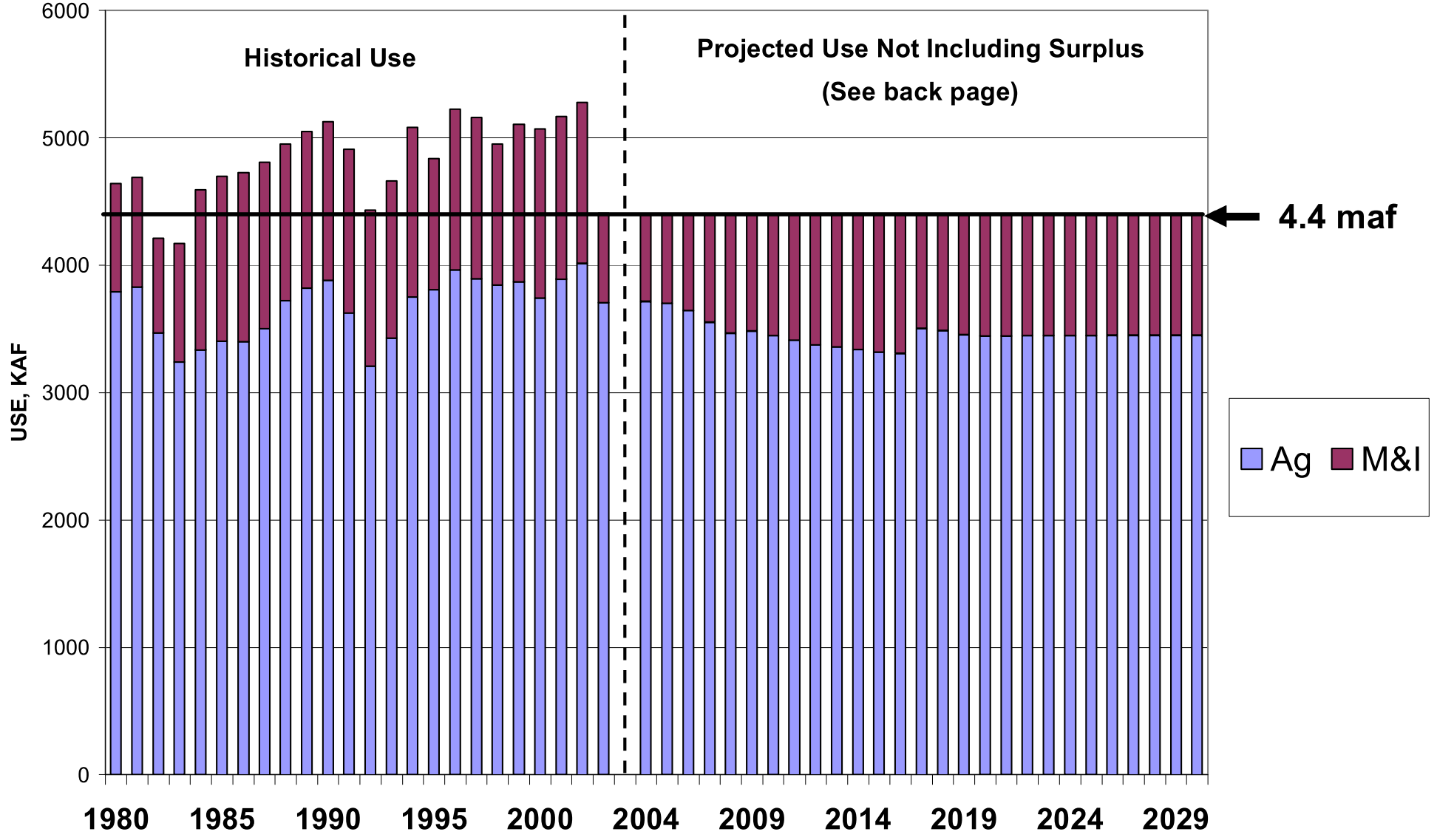
Historical and Projected California Water Use



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