

Water Management & Drought Planning in the Colorado River Basin

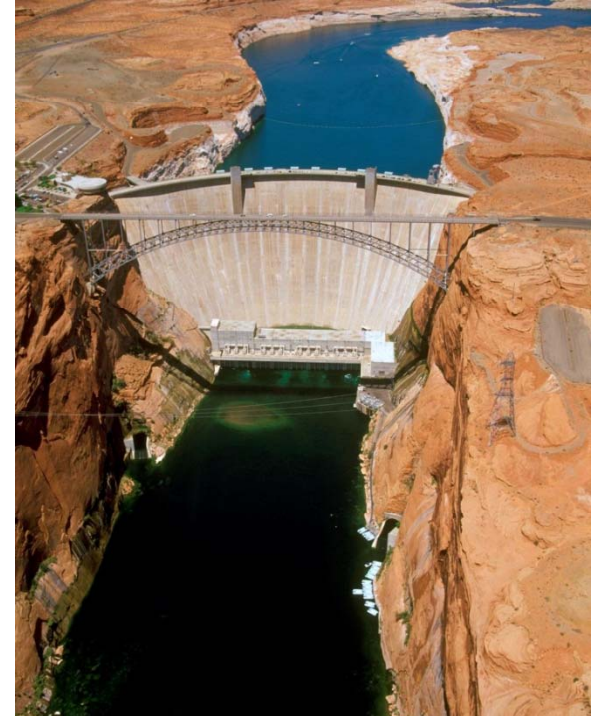


Pat Tyrrell
Wyoming State Engineer
20 May, 2014

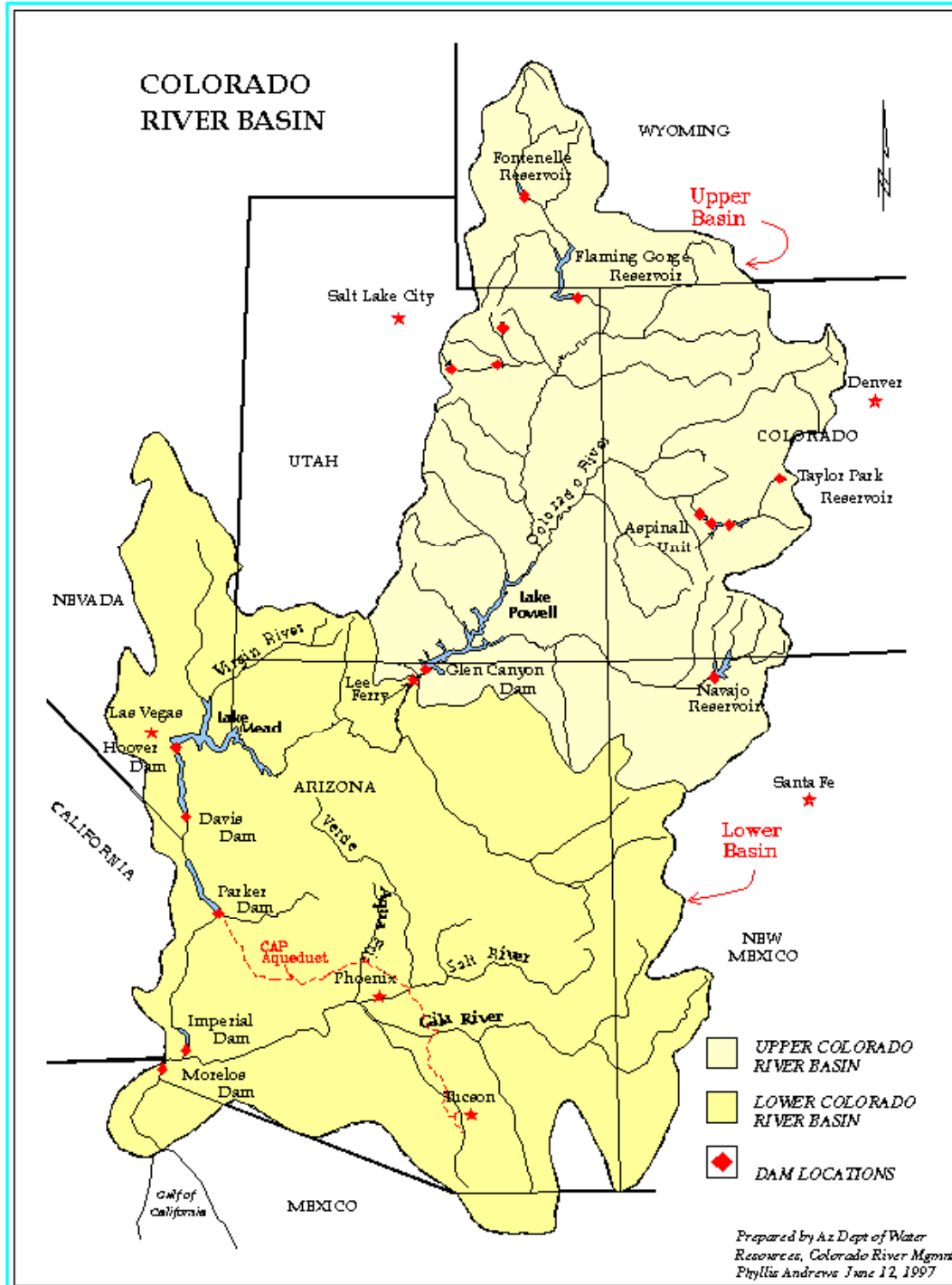
Presented to the Green River Basin
Advisory Group

Today's Presentation

- ▶ Overview of the Colorado River Basin
- ▶ Current basin hydrologic conditions
- ▶ Basin Activities
- ▶ Drought planning in the upper basin & in Wyoming
- ▶ Fontenelle Reservoir

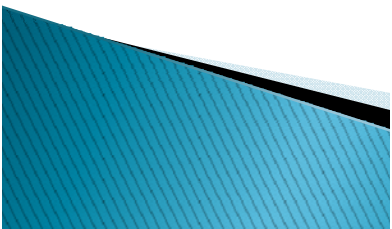


COLORADO RIVER BASIN



- UPPER COLORADO RIVER BASIN
- LOWER COLORADO RIVER BASIN
- DAM LOCATIONS

*Prepared by Az Dept of Water Resources, Colorado River Mgmt
Phyllis Andrews June 12, 1997*



Basic Apportionments Under Law of the River

- ▶ Lower Basin States (7.5 maf!)
 - Arizona 2,800,000 AF/yr
 - California 4,400,000 AF/yr
 - Nevada 300,000 AF/yr

- ▶ Upper Basin States (7.5 maf?)
 - Colorado 51.75 %
 - New Mexico 11.25 %
 - Utah 23.00 %
 - Wyoming 14.00 %

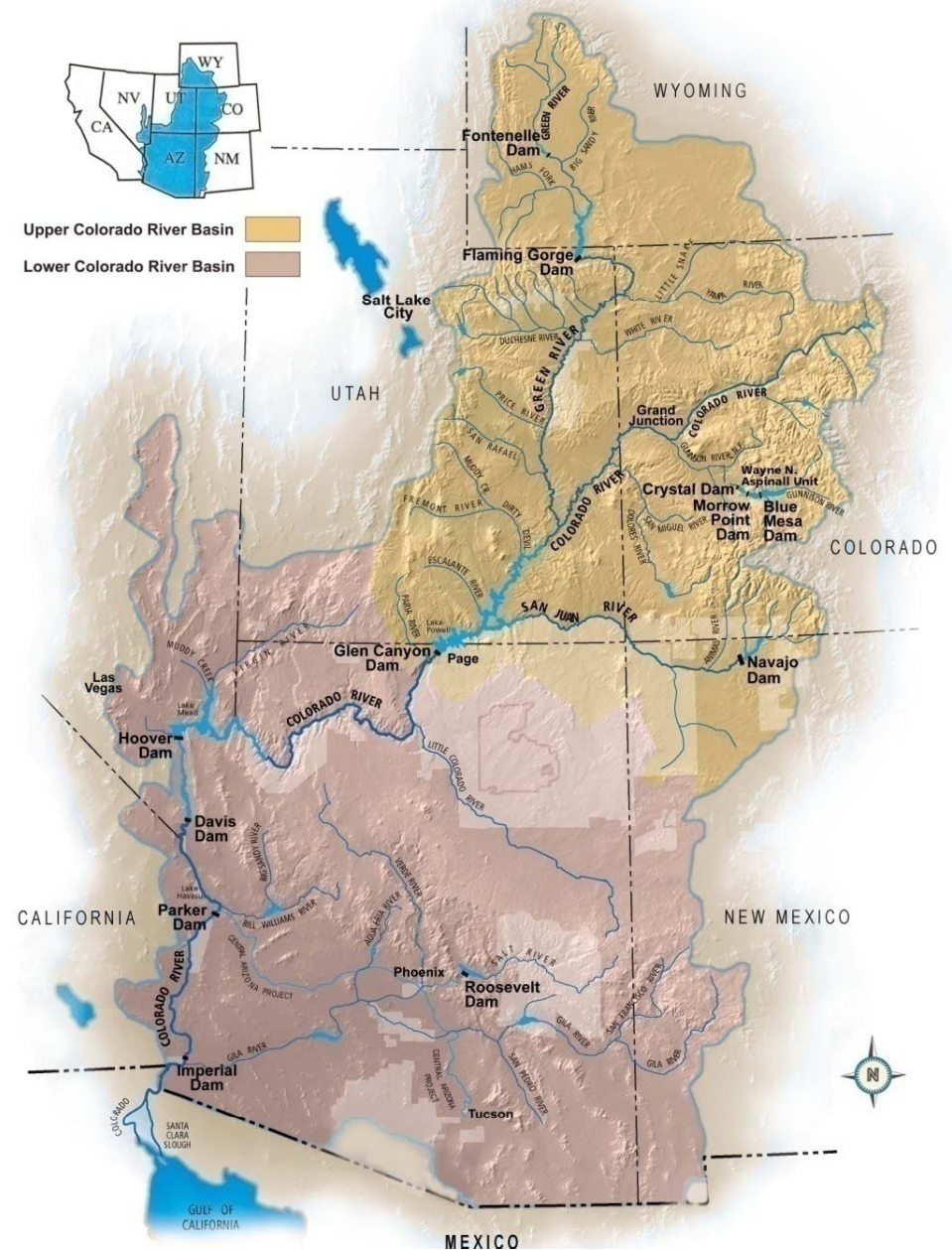
- ▶ Mexico (1.5 maf)



Colorado River Basin Hydrology

- 16.5 million acre–feet (maf) allocated annually
- 14.9 maf average annual “natural” inflow into Lake Powell over past 105 years
- 13 to 14.5 maf of consumptive use annually
- 60 maf of storage
- Inflows are highly variable year–to–year

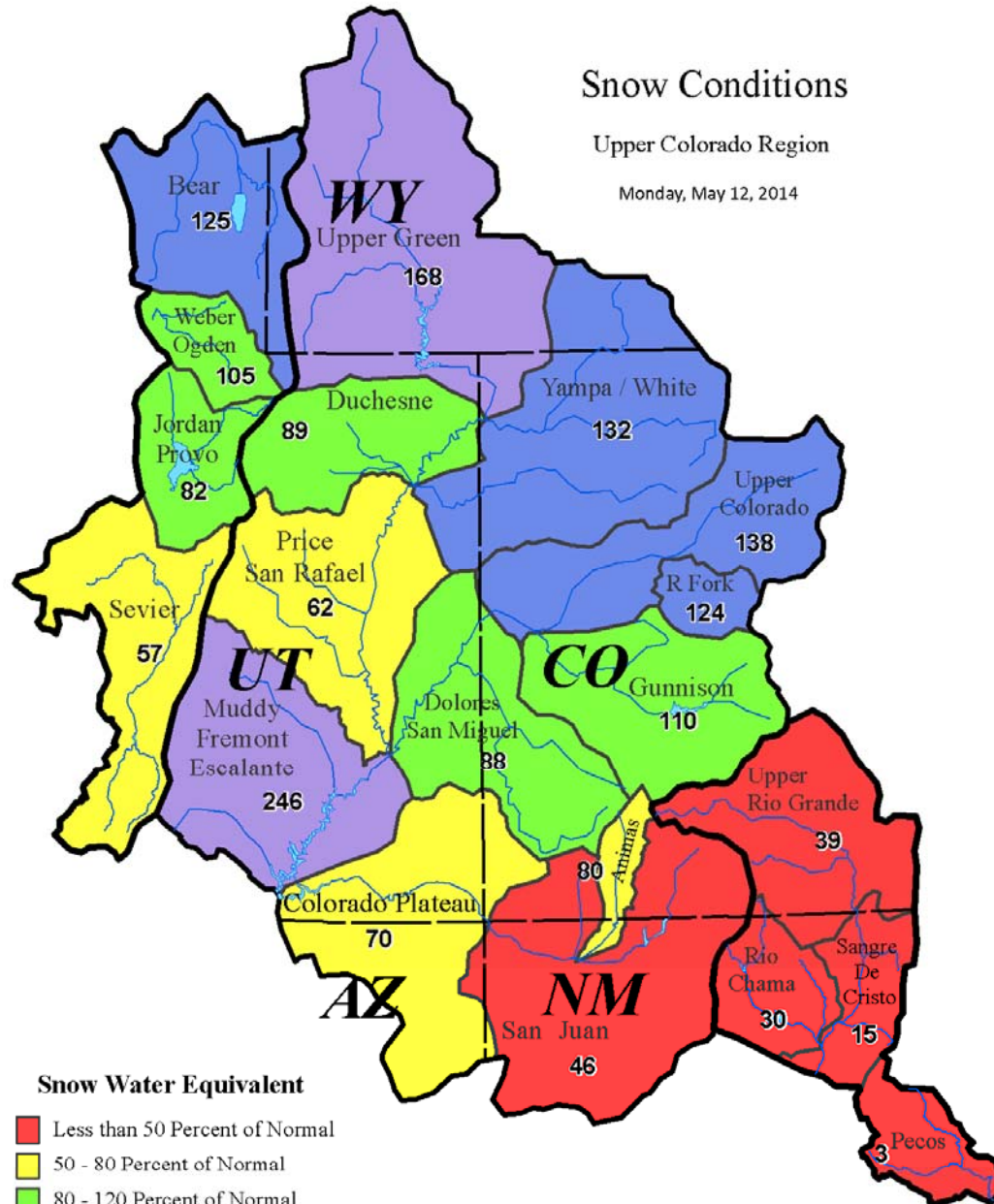
Colorado River Basin



Snow Conditions

Upper Colorado Region

Monday, May 12, 2014



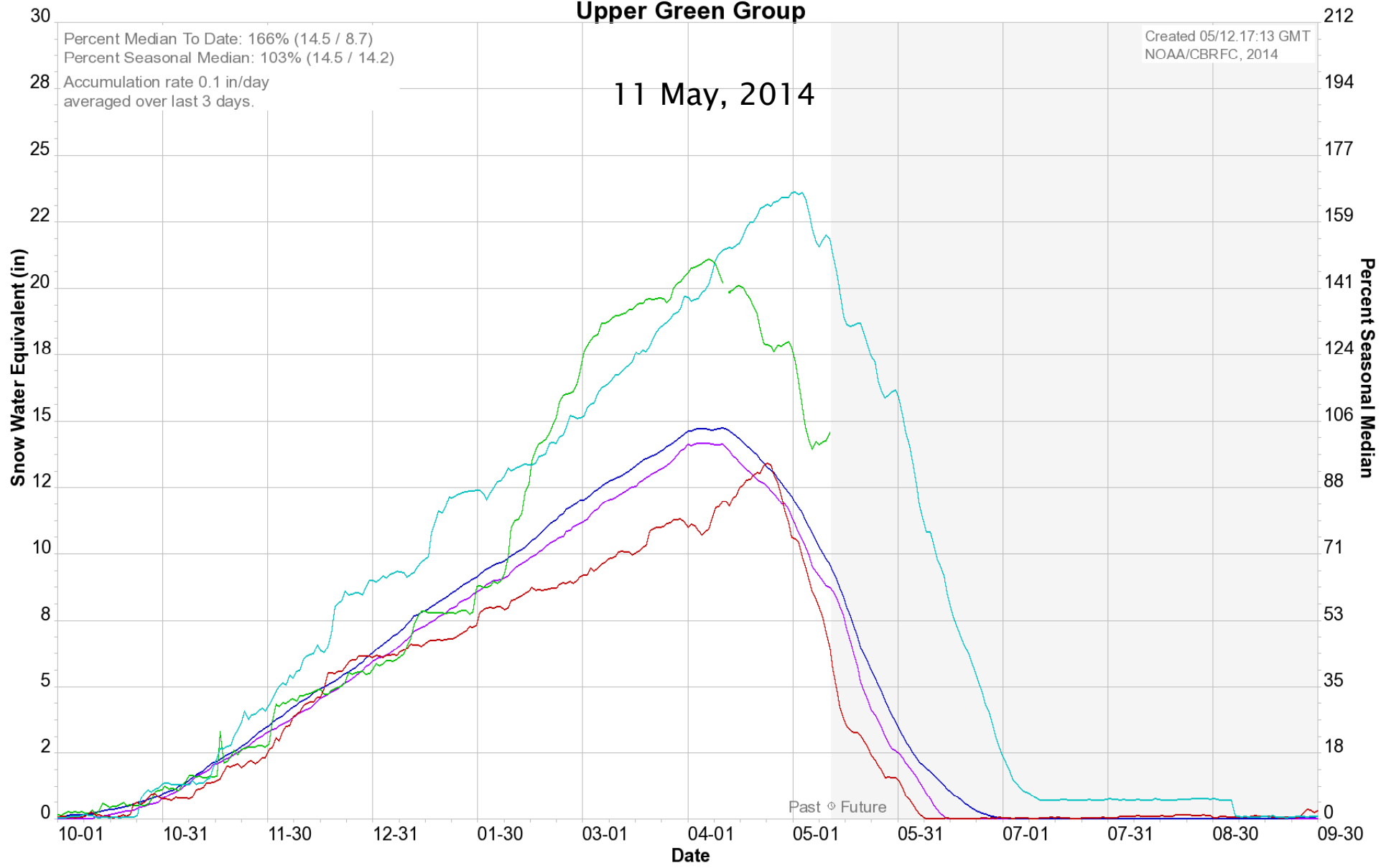
Snow Water Equivalent

- Less than 50 Percent of Normal
- 50 - 80 Percent of Normal
- 80 - 120 Percent of Normal
- 120 - 150 Percent of Normal
- Greater than 150 Percent of Normal

Data Provided by the Natural Resource Conservation Service

Upper Colorado
GIS
Region

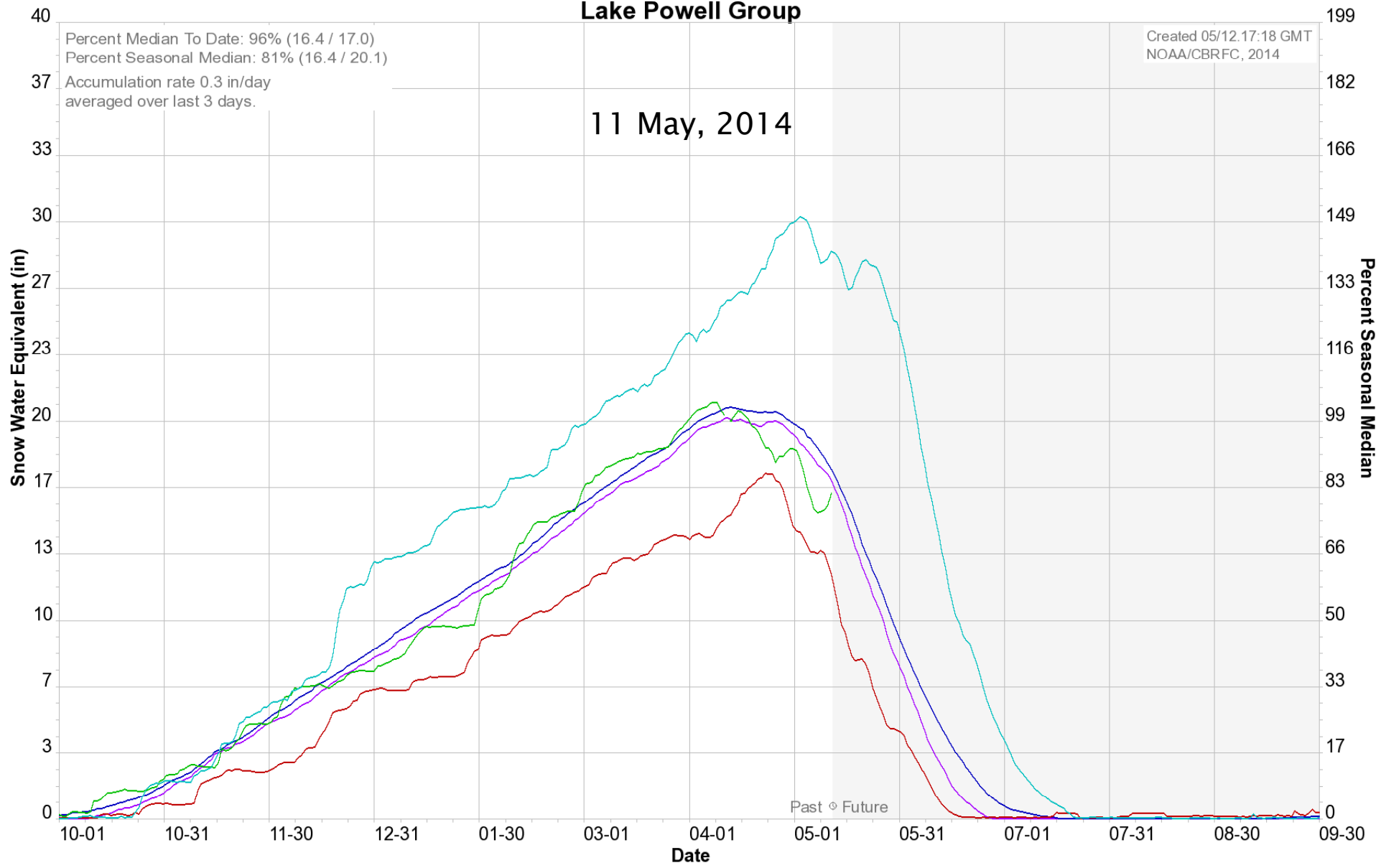
Colorado Basin River Forecast Center Upper Green Group



Median 1981-2010 — Average 1981-2010 — 2014 — 2013 — 2011 —



Colorado Basin River Forecast Center Lake Powell Group

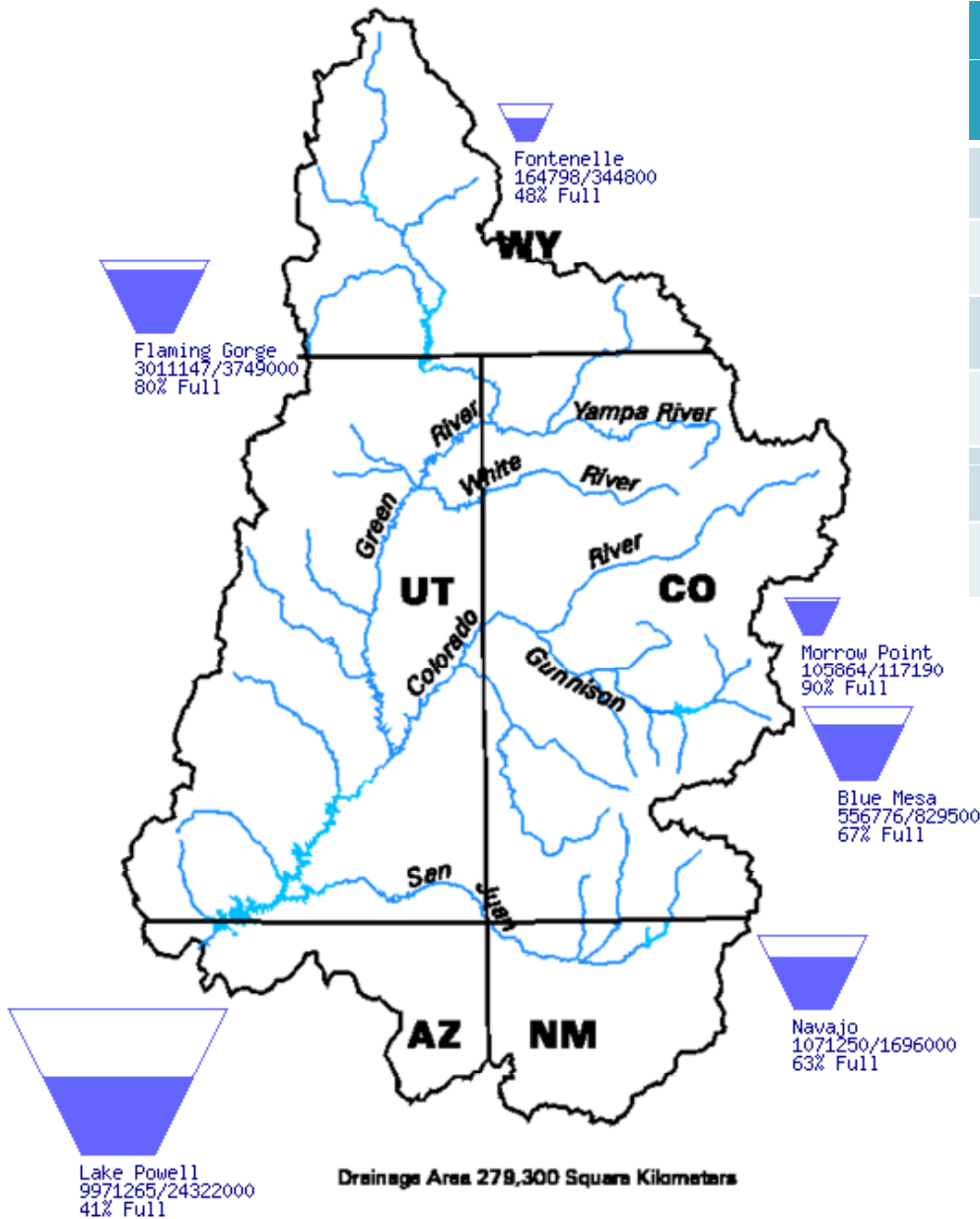


Median 1981-2010 — Average 1981-2010 — 2014 — 2013 — 2011 —



Data Current as of:
05/11/2014

Upper Colorado River Drainage Basin

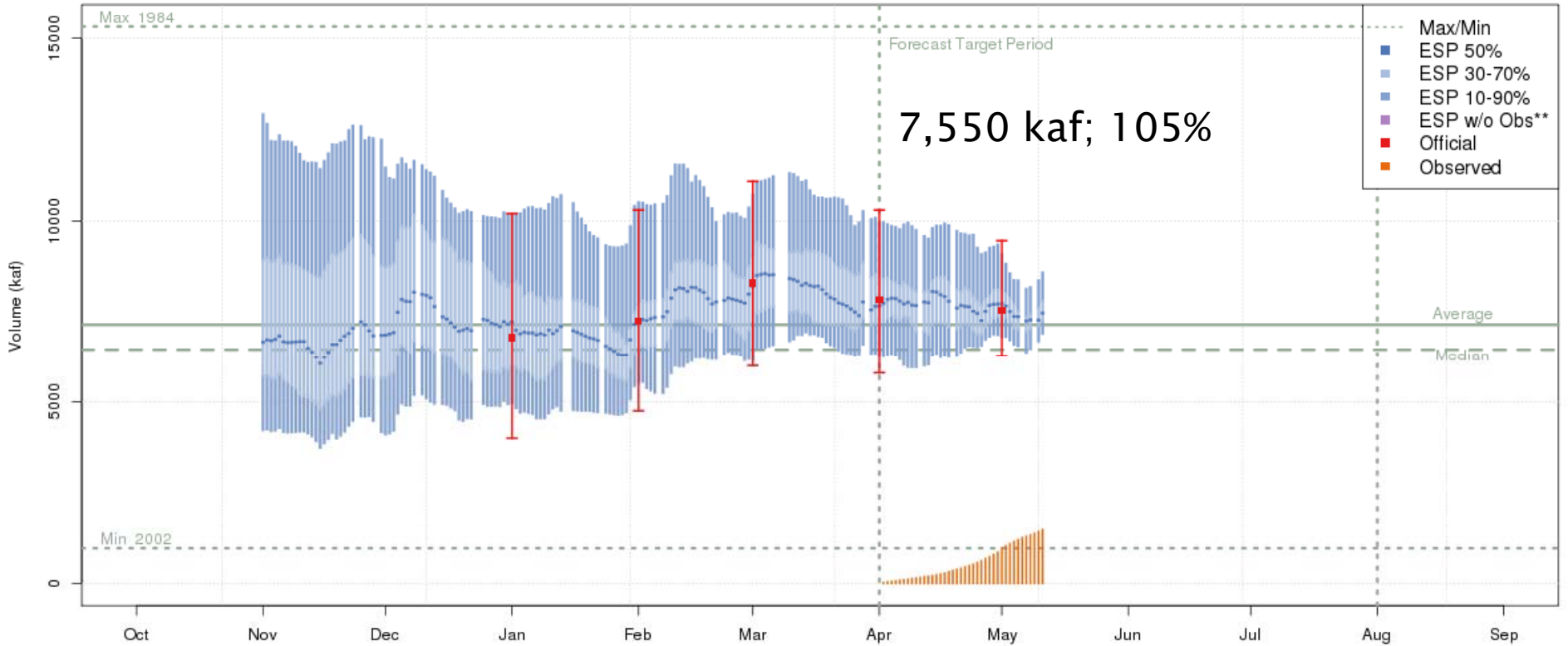


Storage Content (%) (as of May 11, 2014)	
Fontenelle	48%
Flaming Gorge	80%
Morrow Point	90%
Blue Mesa	67%
Navajo	63%
Powell	41%

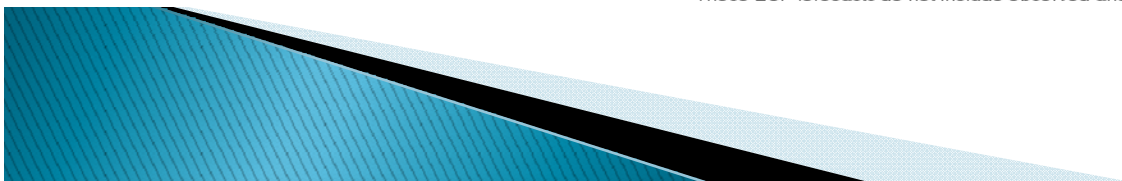


Forecast Inflows to Lake Powell April – July 2014 (as of May 1, 2014)

Colorado - Lake Powell- Glen Cyn Dam- At (GLDA3) Apr-Jul 2014 Runoff Forecast (No Precip Forecast Included)
2014-05-01 Official 50% Forecast: 7550 kaf (105% of average)



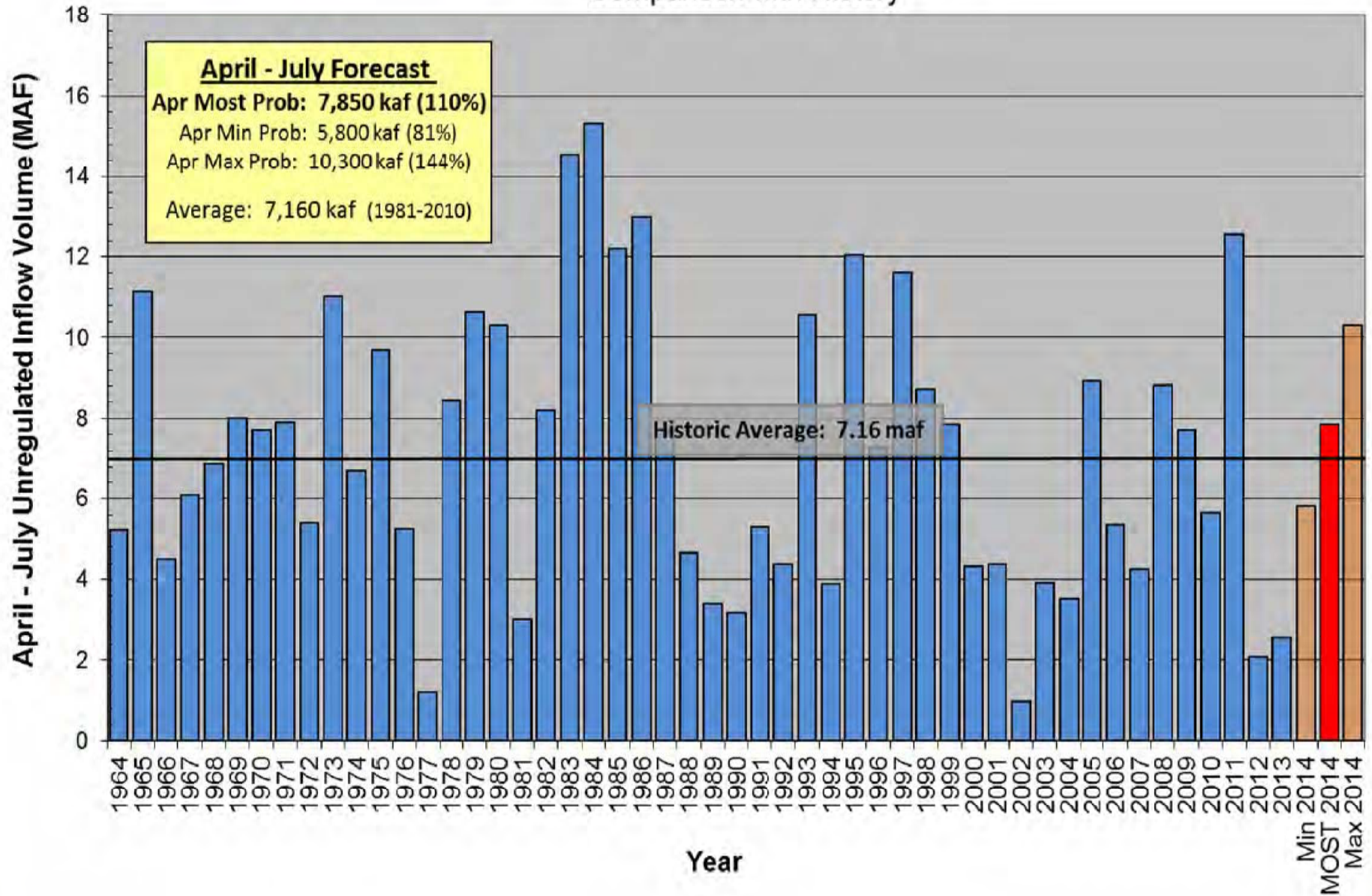
Plot Created 2014-05-11 17:18:55, Lastest ESP Run from 2014-05-11, NOAA / NWS / CBRFC
The latest (2014-05-11) 50% ESP forecast (7480 kaf) changed 2.6% from previous day and -3.1% from May 1
**These ESP forecasts do not include observed and are not total runoff.



Lake Powell Unregulated Inflow

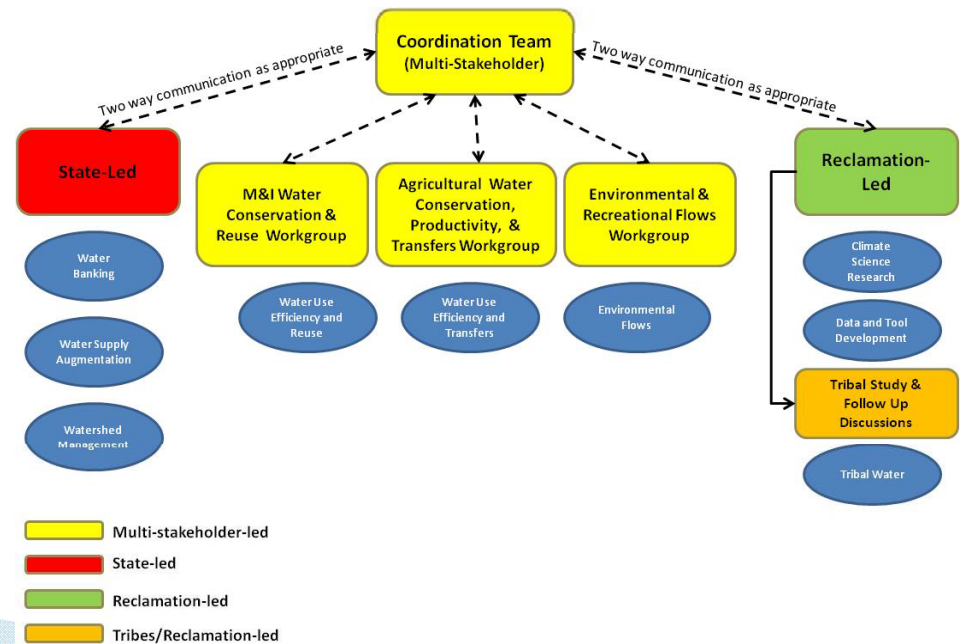
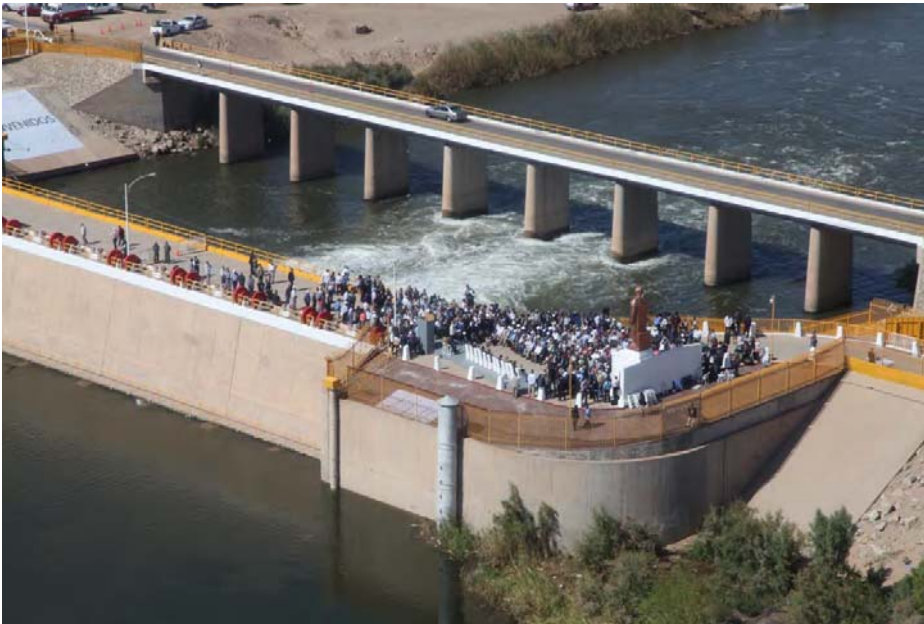
Apr - Jul 2014 Forecast (issued Apr 2)

Comparison with History



Ongoing Basin Activities

- ▶ 2014 & 2015 Operations
 - 2014 deliveries = 7.48 maf
 - 2015 deliveries = 9.0 maf (most probable)
- ▶ Minute 319 Overview
- ▶ Basin Study – Next Steps
- ▶ LTEMP EIS



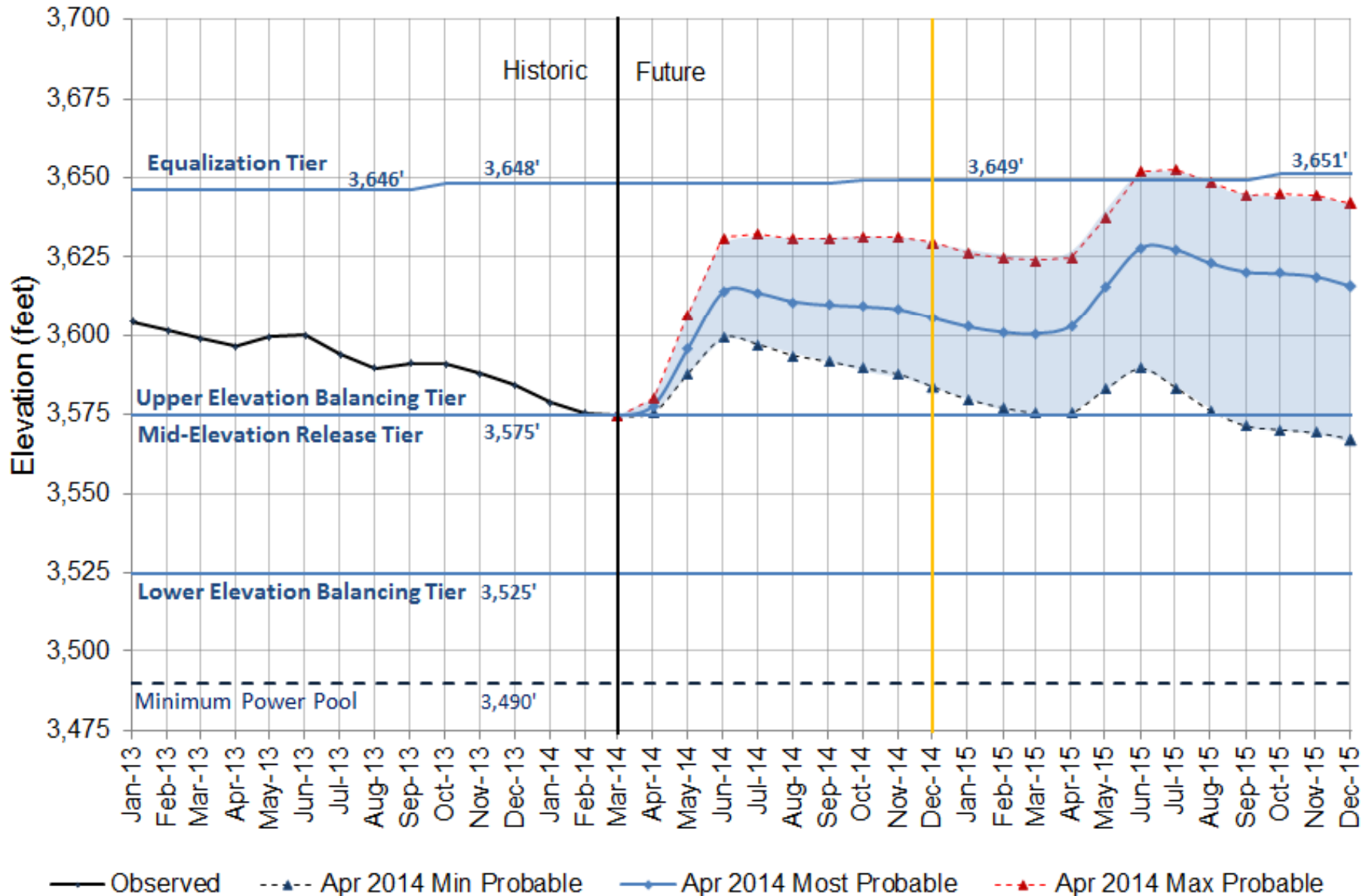
Colorado River Drought

- ▶ 2000 – 2013 was the driest 14-year period in over 100 years of natural flow record
- ▶ 2012 – 2013 was the driest 2-year period on record
- ▶ More severe droughts have occurred over the last 1200 years than current drought
- ▶ CRSP storage at end of WY 2013 was 50% (Only 2000 was lower)
- ▶ Projected 2014 April thru July inflow to Powell is 105% (May 1)



Lake Powell End of Month Elevations

Historic and Projected based on April modeling



Colorado River Basin Storage (as of May 12, 2014)

Current Storage	Percent Full	MAF	Elevation (Feet)
Lake Powell	41%	9.97	3,580
Lake Mead	42%	11.09	1,092
Total System Storage*	47%	28.21	NA

***Total system storage was 31.02 maf or 52% this time last year. System includes Mead, Powell, Navajo, Aspinall Unit & Flaming Gorge.**

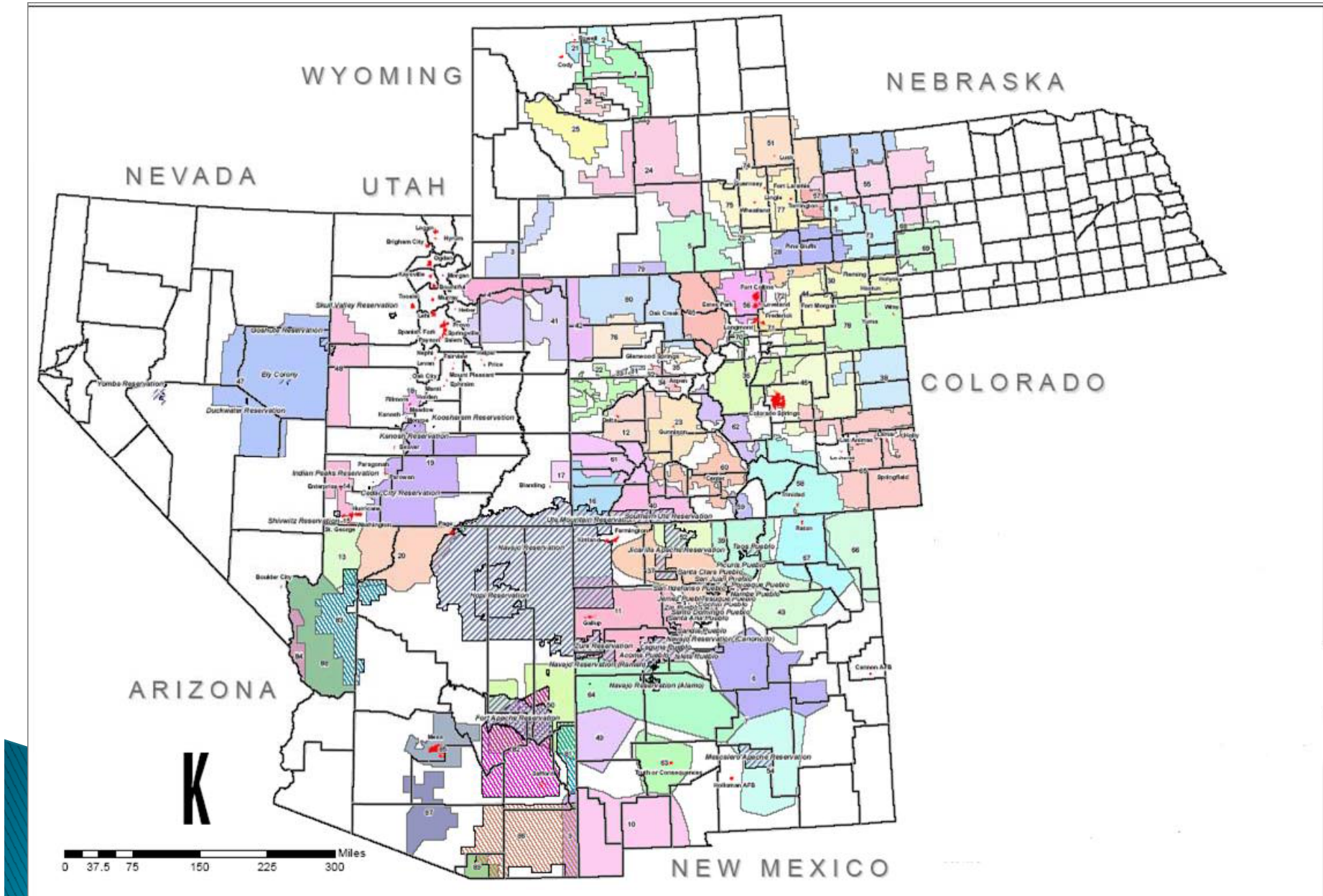


Importance of Lake Powell

- ▶ Upper Basin savings account for Compact deliveries
- ▶ Power generation
- ▶ Project funding (\$200 million/year)

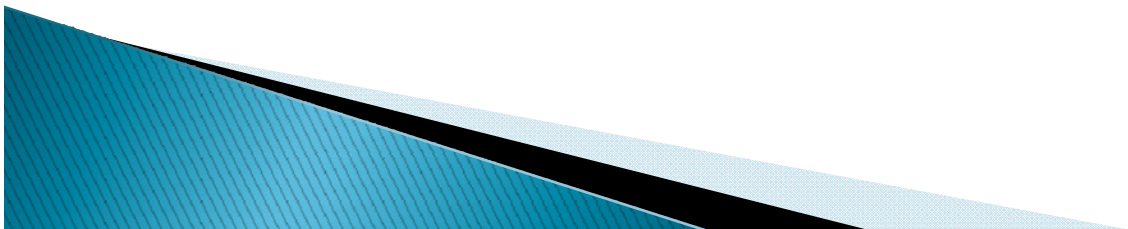
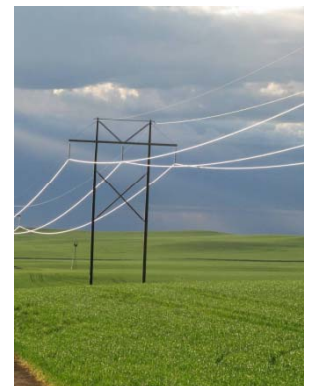
Year	Annual Release (KAF)	10 Year Average (KAF)
2000	9,530	101,754
2001	8,361	101,983
2002	8,348	102,308
2003	8,372	102,543
2004	8,348	102,585
2005	8,395	101,738
2006	8,508	98,716
2007	8,422	93,265
2008	9,180	89,004
2009	8,406	85,870
2010	8,436	84,777
2011	13,277	89,643
2012	9,534	90,829
2013	8,340	90,816

Colorado River Storage Project Power



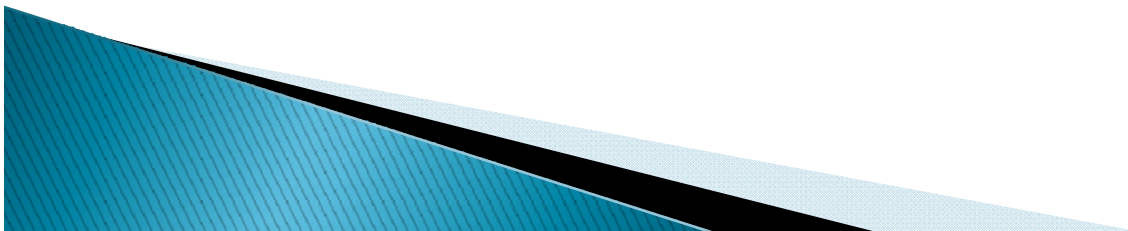
Potential Consequences of Capacity loss at Glen Canyon Dam

- Dramatic increase in Purchase Power Costs
- Dramatic drop in Basin Fund balance
- Trigger Cost Recovery Charge (CRC)
- Significant rate increase to power customers
- Impact on environmental program funding
- Congressional involvement if appropriations are requested
- Impact on energy market prices & availability
- Impact on other CRSP dams for reserve energy



The Question:

How do we manage the system so as to keep Wyoming's Compact and programmatic interests accrued from Lake Powell protected?

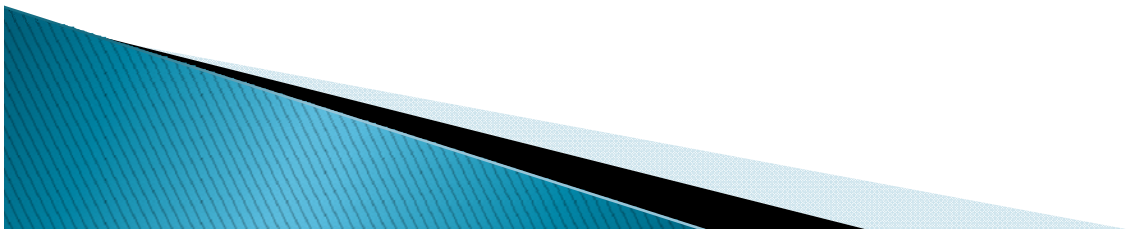


We can hope for wet years, and be faced with possible mandatory restrictions (compact curtailment, power & \$\$).

Or, plan now and implement actions on a voluntary basis to avoid mandatory actions.

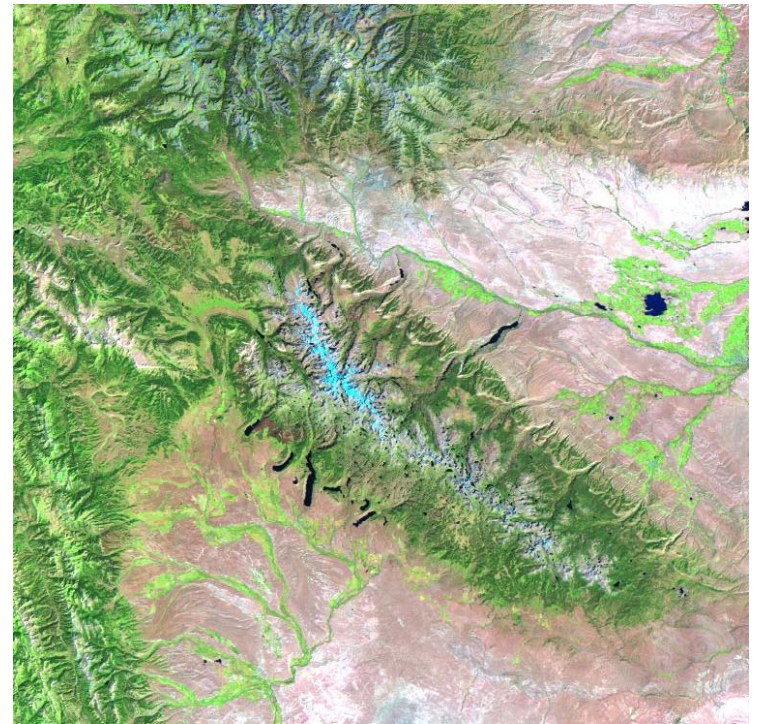
- Augmentation
- Demand management
- Improve system efficiency
- Extended reservoir operations

Should we consider extended reservoir system operations, but only under extreme conditions and only under existing operational criteria (ROD)?



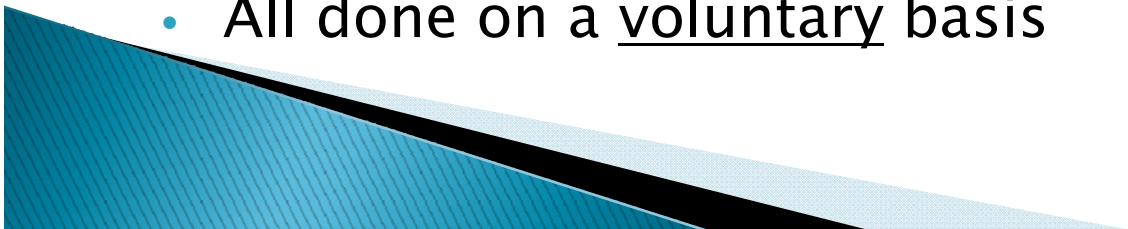
Augmentation

- ▶ Wyoming's weather modification program
 - Ongoing in Wind Rivers (2014–2015?)
 - Feasibility study to begin in Wyoming Range
- ▶ All Upper Basin States have some ongoing weather modification operations



Demand Management

- Compensated, overt, quantifiable water conservation activity(s) combined with a transfer and accounting mechanism
- Interruptible supply arrangements with water right owners, whereby irrigators are paid to reduce use (e.g., deficit irrigation, rotational fallowing)
- Savings “banked” in a reservoir – “deposit” drawn out subsequently when “debt” is incurred.
- Can be utilized to avoid mandatory restrictions, or to better support water users if mandatory restrictions occur
- Funding mechanisms: willing buyer/seller or government \$\$
- All done on a voluntary basis



System Efficiencies

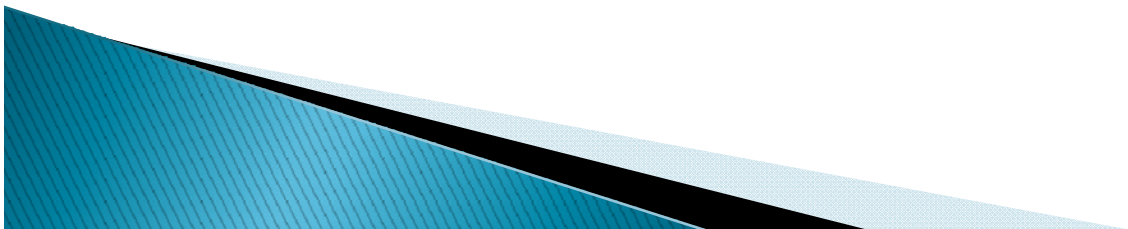
- ▶ Agriculture: Sprinklers & canal to pipes
- ▶ Municipalities: System reuse and in-home conservation
- ▶ Industrial: Operational review

- ▶ Need to carefully examine “efficiency” method and timing. What generates real water savings?



Extended Reservoir System Operations

- ▶ Being evaluated basin-wide (Flaming Gorge, Aspinall Unit, Navajo)
- ▶ Fontenelle Reservoir is not part of current extended operation planning
- ▶ Fontenelle could be of importance to support & protect Wyoming water users



Stress Testing the System

- ▶ These activities are all part of a contingency planning process; not part of normal operations
- ▶ Scenarios we look at are “worst case”, and do not represent expected hydrology
- ▶ We will know well ahead of time (years) if actions will need to be taken on the system



Fontenelle Reservoir

- ▶ Initiating project to assess dam rip-rap and activate additional storage space
- ▶ Evaluating Wyoming's acquisition of additional storage



Thank You!

