

# THE COLORADO RIVER

## A FEW BASICS

April 3, 2015



**Eric Kuhn**

**Colorado River District**

*Protecting Western Colorado Water Since 1937*



Gulf of Mexico

(Havana) La Habana

Nassau  
The Bahamas



# Colorado River District

*Protecting Western Colorado Water Since 1937*



# Colorado River Basin Today

- Seven Basin States
- Almost 300,000 square miles
- 35 Million People and growing
- Up to 5.5 Million Irrigated Acres
- 10 Autonomous / Sovereign Tribes
- 2 Countries

# Colorado River Basin Tomorrow

- Seven Basin States
- Almost 300,000 square miles
- **80 Million People** (increase of 91%?)
- **4.6 Million Irrigated Acres** (decrease of 15%?)
- 10 Autonomous / Sovereign Tribes
- 2 Countries

# Law of the River Allocations

- 7.5 MAF to Upper Basin ( %'s)<sup>1</sup>
  - 7.5 MAF to Lower Basin (4.4 CA; 2.8 AZ; 0.3 NV)<sup>2</sup>
  - 1.0 MAF additional to Lower Basin<sup>3</sup>  
(i.e., tributary development)
  - 1.5 MAF to Mexico<sup>4</sup>
- 

**17.5 MAF** Total Allocated **'on paper'**

<sup>1</sup> 1922 Colorado River Compact, 1948 Upper Colorado River Compact

<sup>2</sup> Colorado River Compact, 1929 Black Canyon Project Act, 1964 AZ v. CA

<sup>3</sup> 1922 Colorado River Compact

<sup>4</sup> Treaty of 1944



**Colorado River District**

*Protecting Western Colorado Water Since 1937*

# 1922 Colorado River Compact

- Divides the Colorado River (incl tributaries), into an **Upper** and **Lower** Basin
- Boundary between the two basins is Lee Ferry, Arizona
- **Lower Division: Nevada, California & Arizona**
- **Upper Division: Wyoming, Colorado, New Mexico & Utah**
- Arizona, Utah and New Mexico have lands within both basins

# Colorado River Compact of 1922

**Colorado, like all Upper Division states, shares obligations to the Lower Division**

**III (d) the Upper Division shall “not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any ten consecutive years.”**

**III (c) regarding Mexico...the Upper Division must “deliver at Lee Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d).”**

# SOURCES OF UNCERTAINTY

1. WHAT IS THE OBLIGATION OF THE UPPER DIVISION STATES AT LEE FERRY UNDER ARTICLE III OF THE 1922 COMPACT?
2. WHAT FUTURE HYDROLOGY WILL OCCUR, CLIMATE CHANGE, 19<sup>TH</sup> CENTURY, LAST 30 YEARS, PALEO?
3. WHAT IS THE FUTURE DEMAND FOR WATER IN ALL FOUR OF THE UPPER DIVISION STATES?



# Current Use Estimates

MAF/ year

<u>Upper Basin uses incl. reservoir evap.</u>	<u>4.0 - 4.5</u>
Lower Basin mainstream uses	7.5 - 7.5
Lower Basin reservoir evap.	1.0 - 1.5
<u>Lower Basin tributaries</u>	<u>2.0 - 2.5</u>
Total Lower Basin	10.5 - 11.5
Subtotal	14.5 - 16.0
<u>Add Mexico</u>	<u>1.5 1.5</u>
<u>TOTAL</u>	<u>16.0 – 17.5</u>

# Hydrology comparison

- 2000-2014 12.3 MAF @ LF
- 1988-2014 13.2 MAF @ LF
- Basin Study CC 13.7 MAF @ LF
- 1906-2014 GR 14.8 MAF @ LF
- 1120-1172 PH 12.7 MAF @ LF

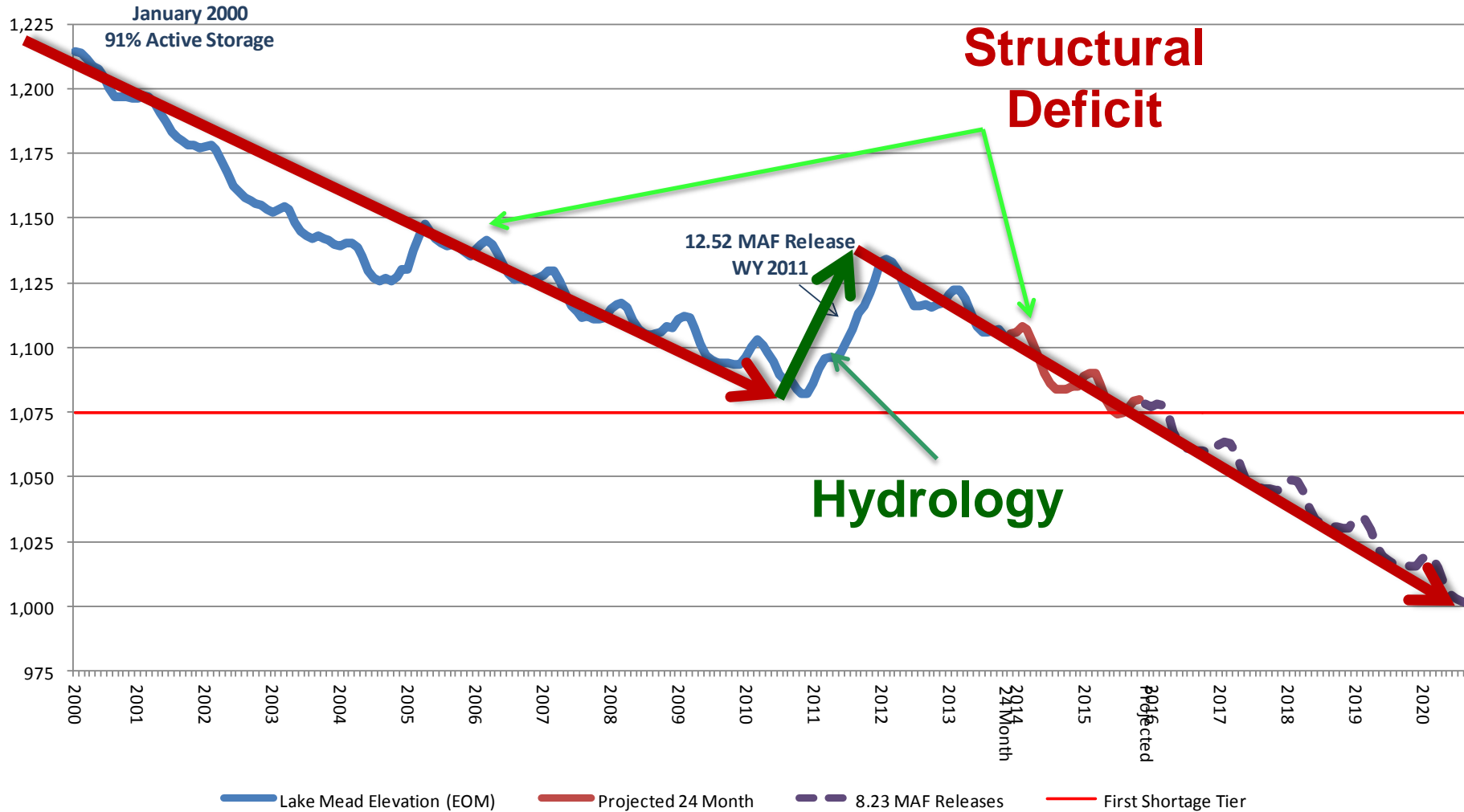
CC –climate change GR – gage period NF PH – paleo-hydrology

# Water Budget at Lake Mead

- Inflow = 9.0 maf  
(release from Powell + side inflows)
- Outflow = - 9.6 maf  
(AZ, CA, NV, and Mexico delivery  
+ downstream regulation and gains/losses)
- Mead evaporation losses = - 0.6 maf
- Balance = - 1.2 maf

Given basic apportionments in the Lower Basin, the allotment to Mexico, and an 8.23 maf release from Lake Powell, Lake Mead storage declines about 12 feet each year

# Lake Mead Elevation Since 2000



# 2000-2015 WATER BUDGET

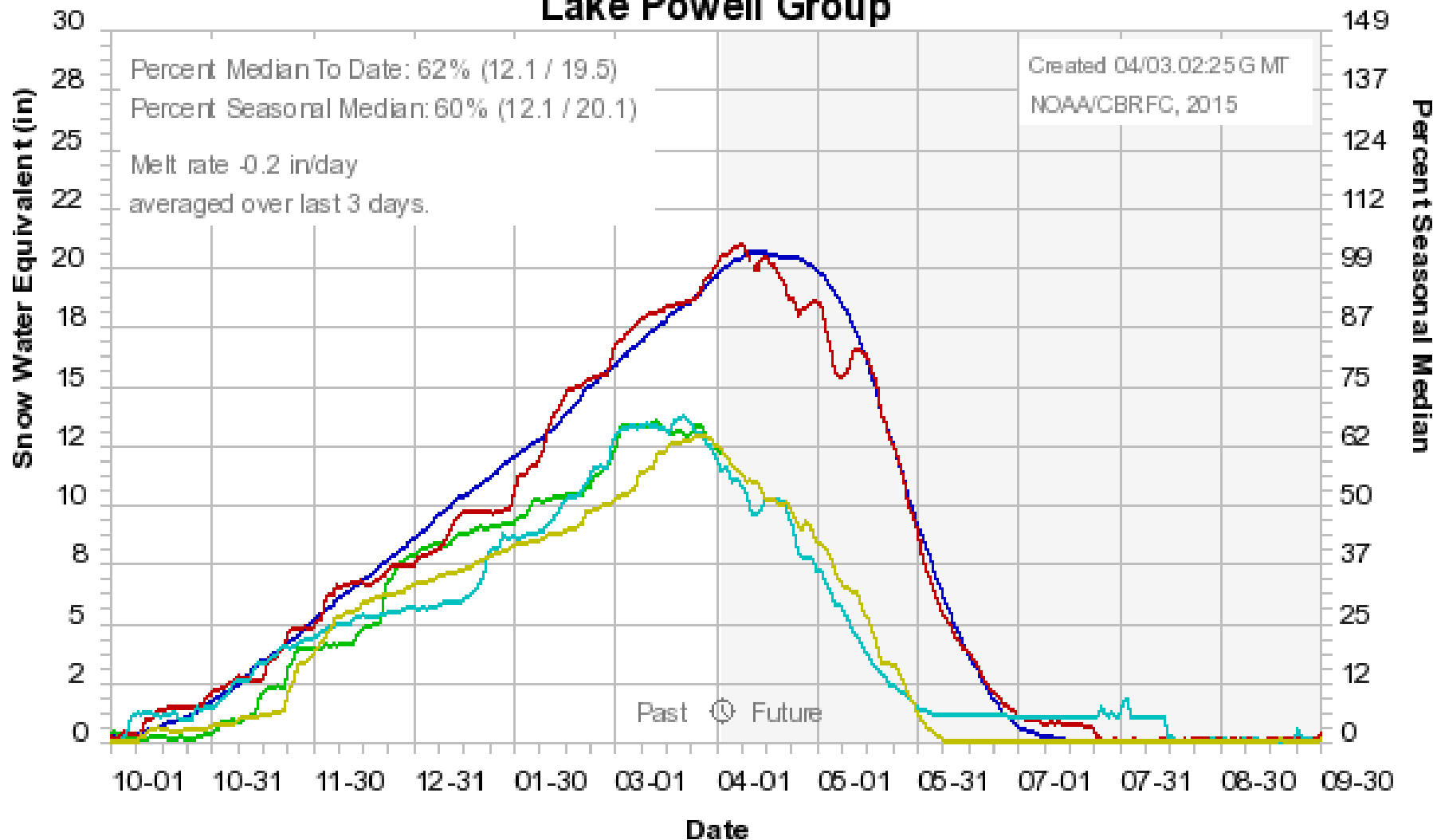
- **SUPPLY – 13 MAF/YR (12.3 LF +.7 LB)**
- **USE – 15+ MAF/YR (ignoring Gila)**
- **DEFICIT – 2+ MAF/YR**
  
- **12/1999 MEAD + POWELL > 50 MAF**
- **12/2015 MEAD + POWELL < 18 MAF**



# Colorado River Storage Project Mainstem Units

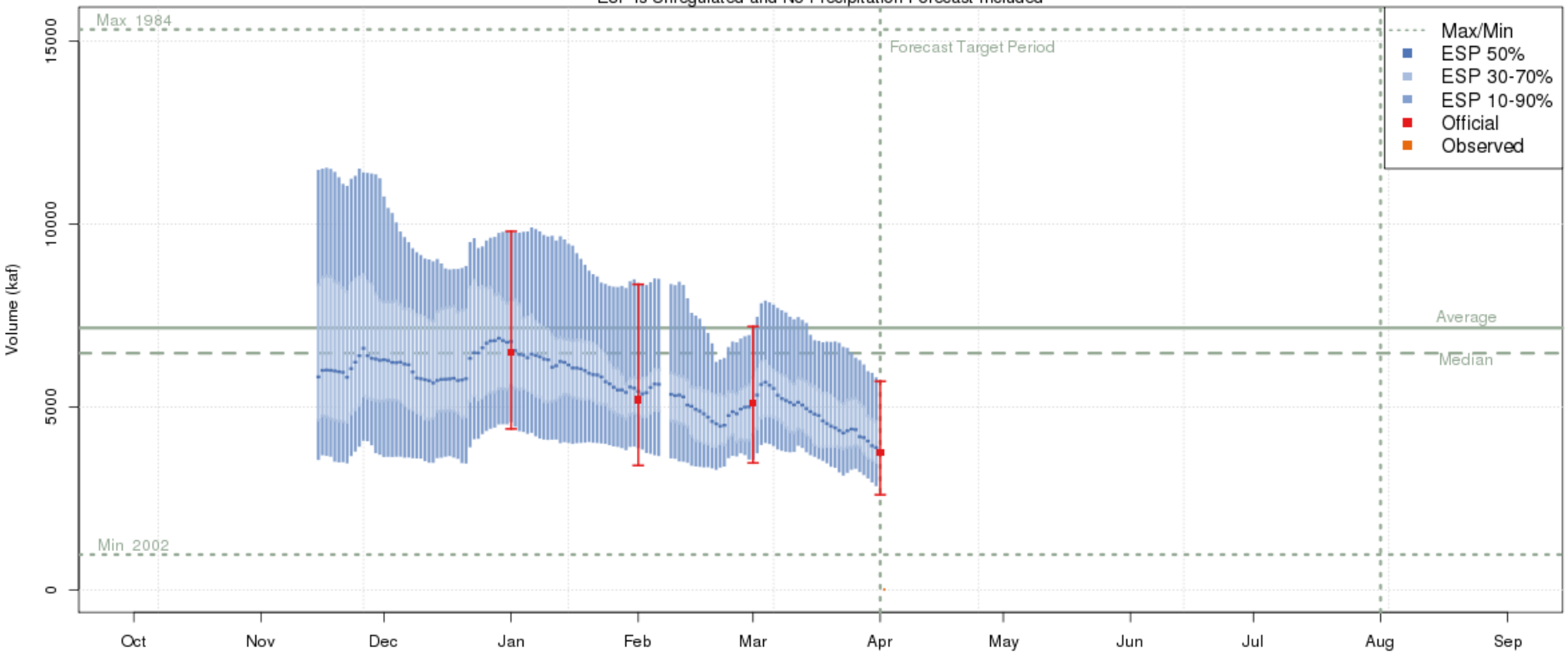


# Colorado Basin River Forecast Center Lake Powell Group



Average 1981-2010 — 2015 — 2014 — 2012 — 2002 —

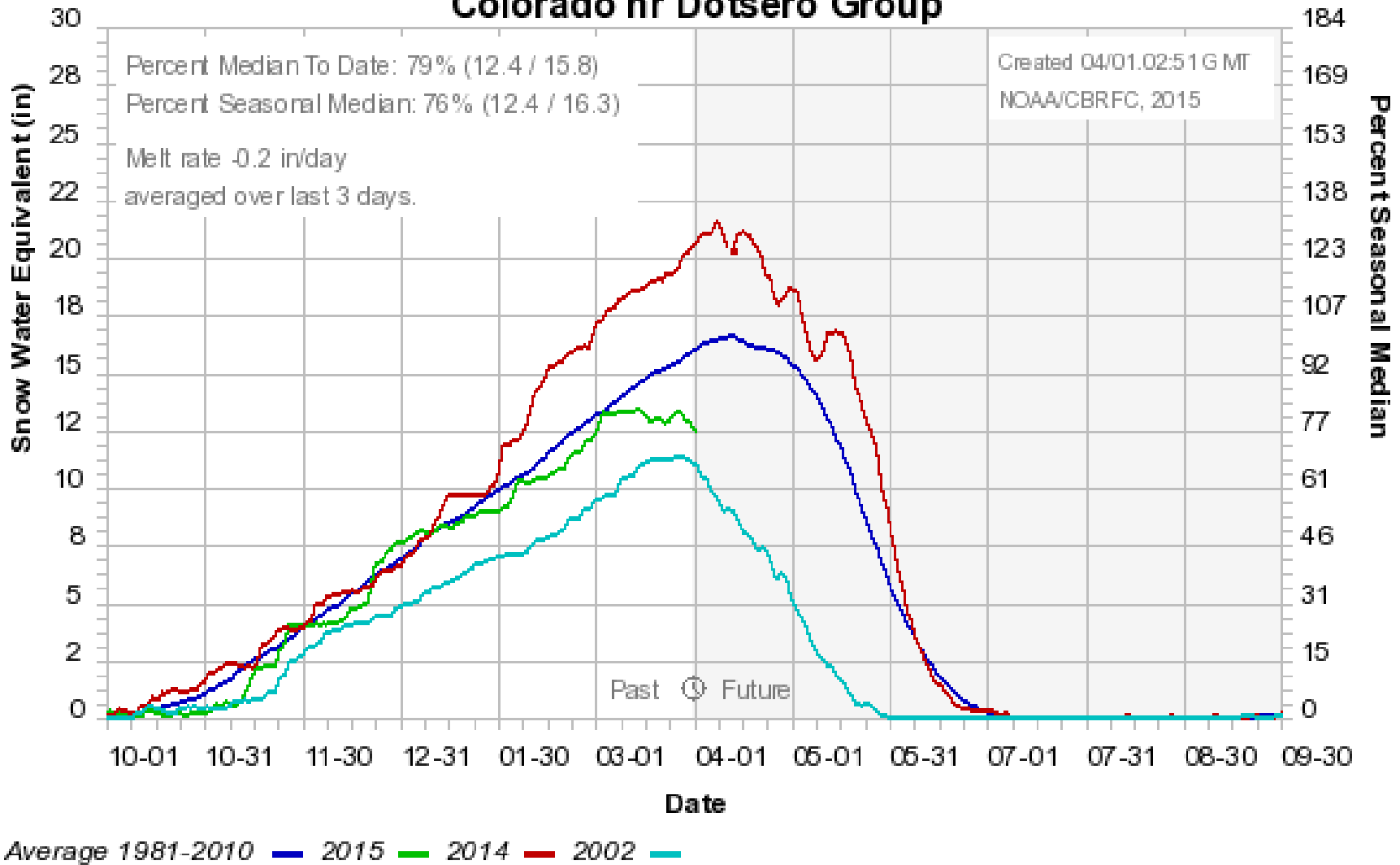
**Colorado - Lake Powell- Glen Cyn Dam- At (GLDA3)**  
**2015-04-01 Apr-Jul Official 50% Forecast: 3750 kaf (52% of average)**  
 ESP is Unregulated and No Precipitation Forecast Included



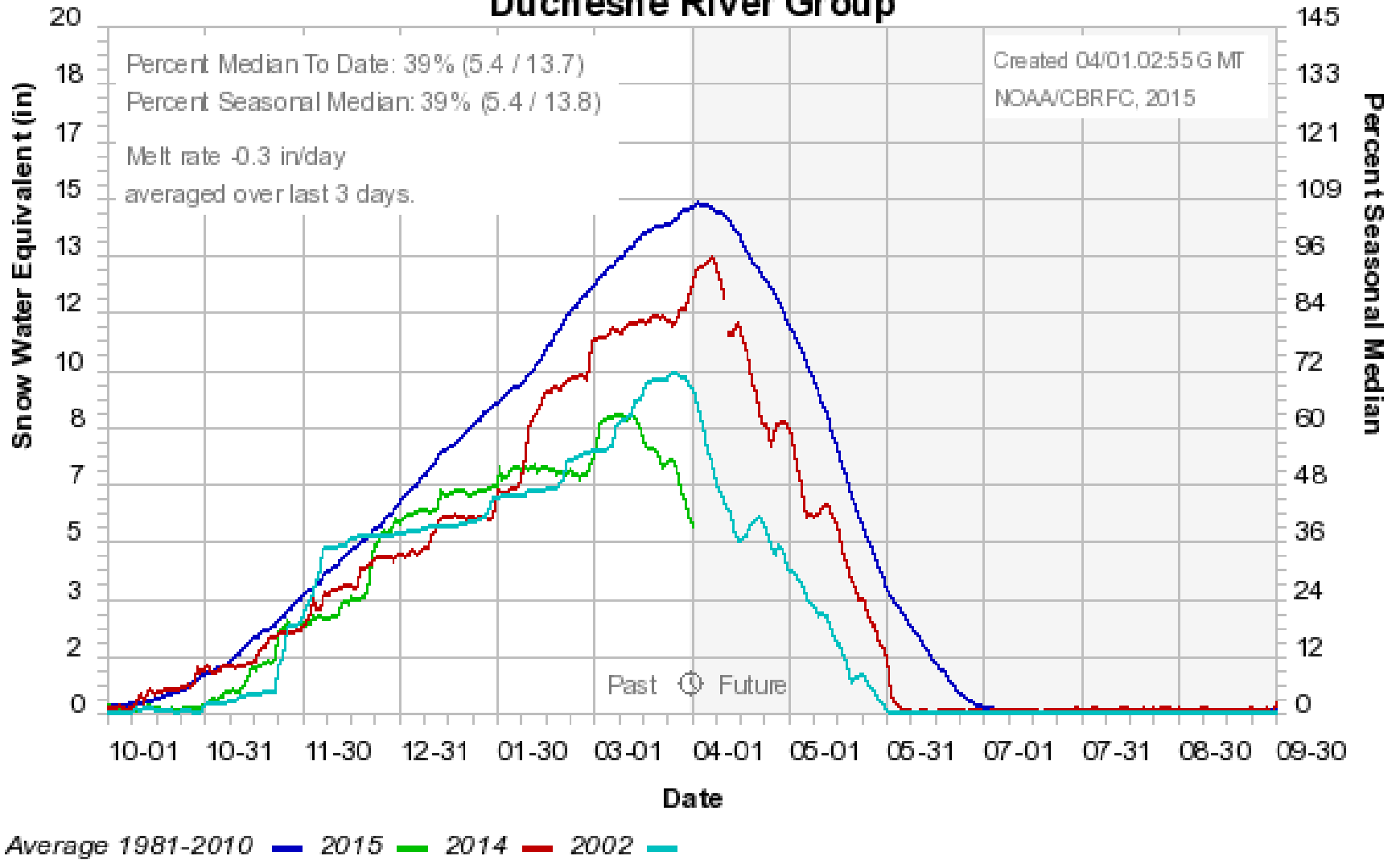
**The latest (2015-03-31) 50% ESP forecast is 3888 kaf.**  
 Plot Created 2015-04-02 15:29:50, NOAA / NWS / CBRFC

# Colorado Basin River Forecast Center

## Colorado nr Dotsero Group

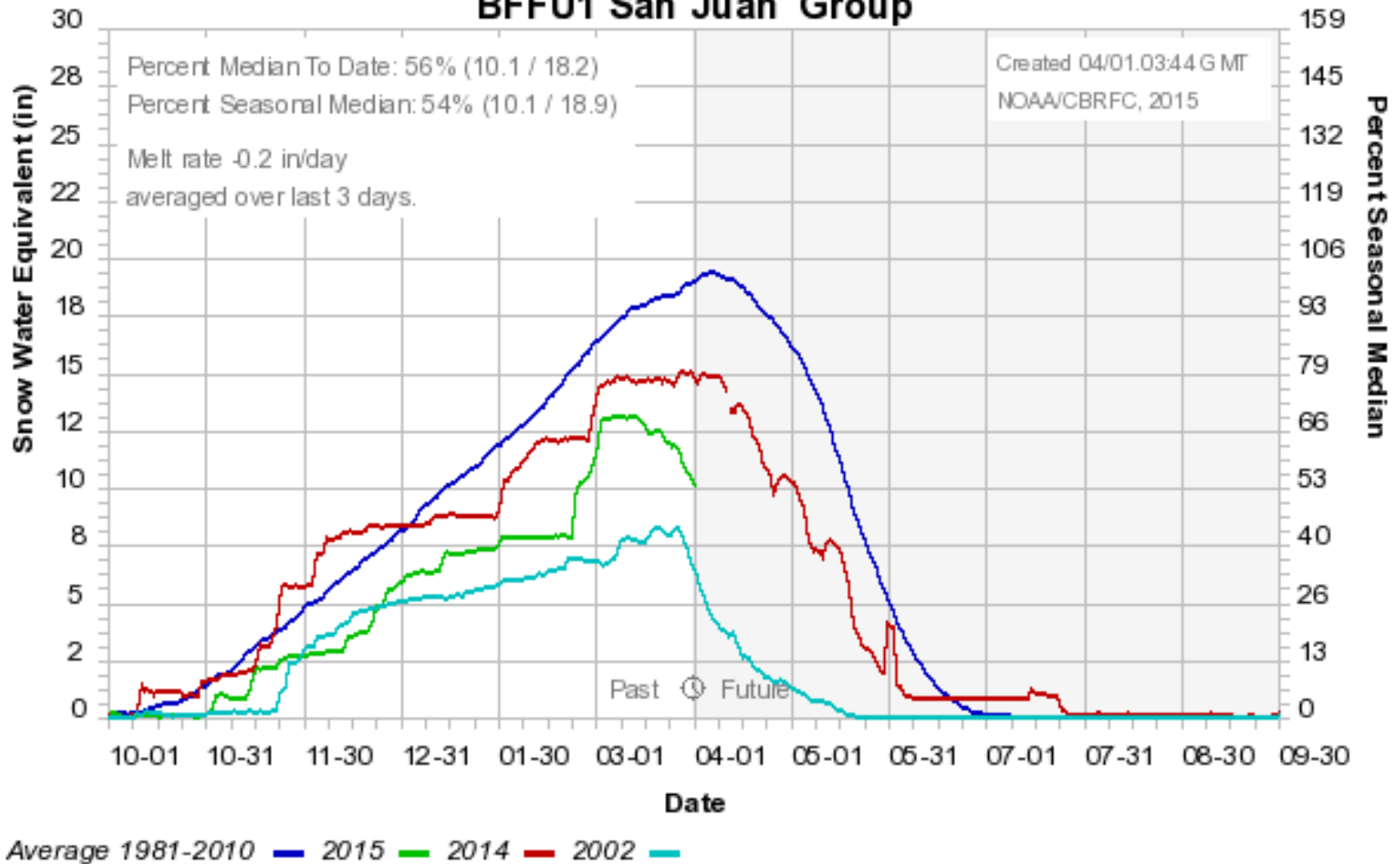


# Colorado Basin River Forecast Center Duchesne River Group

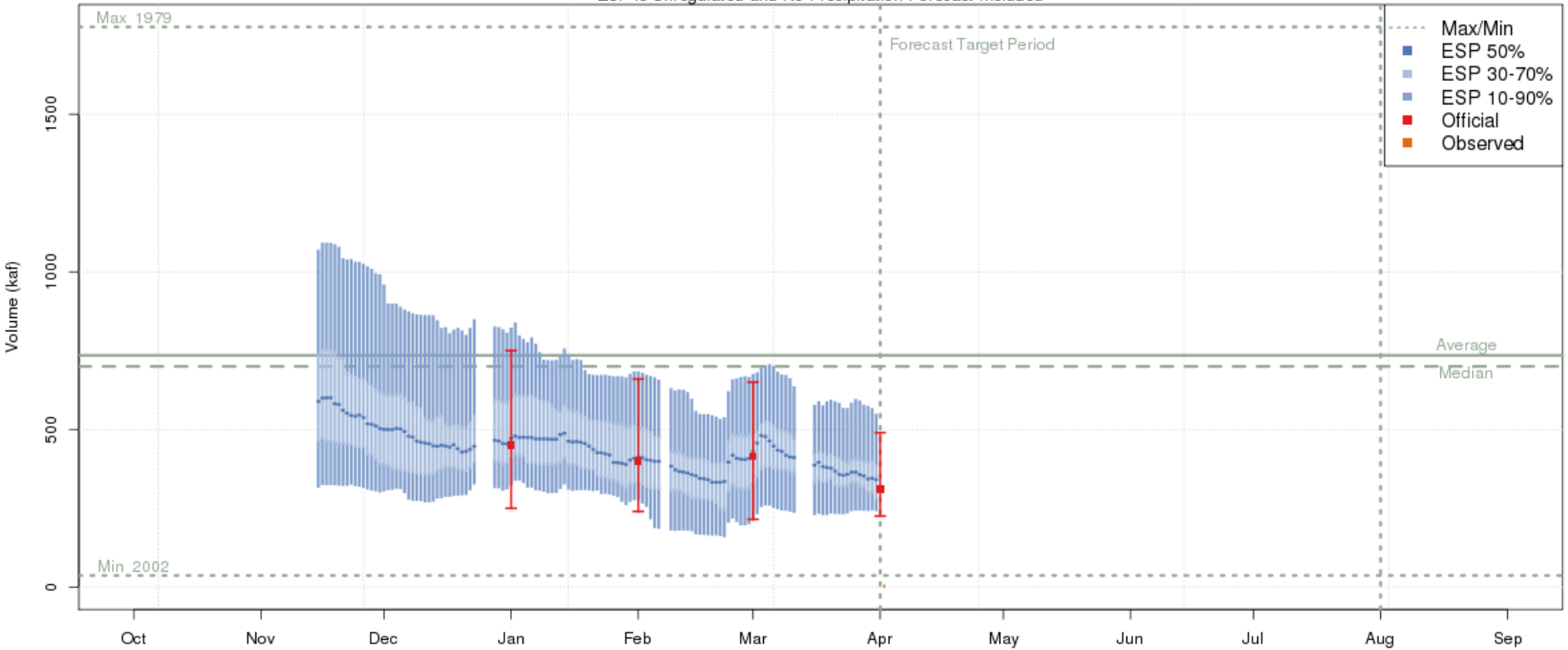




# Colorado Basin River Forecast Center BFFU1 San Juan Group



**San Juan - Navajo Res- Archuleta- Nr (NVRN5)**  
**2015-04-01 Apr-Jul Official 50% Forecast: 310 kaf (42% of average)**  
 ESP is Unregulated and No Precipitation Forecast Included



The latest (2015-03-31) 50% ESP forecast is 341 kaf.  
 Plot Created 2015-04-02 15:24:53, NOAA / NWS / CBRFC

# APRIL 1<sup>ST</sup> FORECASTS

• Powell	3.75 MAF	52%
• Flaming Gorge	650 KAF	66%
• Navajo	310 KAF	42%
• Blue Mesa	480 KAF	71%

# LAKE POWELL RELEASES

- Controlled by the 2007 Interim Guidelines
- Based on storage levels in both Powell AND Mead
- What happens in the LB impacts Powell and what happens in the UB impacts Mead
- As long as Powell has storage – NO compact problems for UB

Lake Powell Operational Tiers (subject to April adjustments or mid-year review modifications)		
Lake Powell Elevation (feet)	Lake Powell Operational Tier	Lake Powell Active Storage (maf)
3,700	<b>Equalization Tier</b> equalize, avoid spills or release 8.23 maf	24.32
3,636 – 3,666 (see table below)	<b>Upper Elevation Balancing Tier</b> release 8.23 maf; if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf	15.54 – 19.29 (2008 – 2026)
3,575	<b>Mid-Elevation Release Tier</b> release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	9.52
3,525	<b>Lower Elevation Balancing Tier</b> balance contents with a min/max release of 7.0 and 9.5 maf	5.93
3,370		0

# 2015 ANOTHER DRY YEAR!

- System storage will continue to decline
- Lake Mead deliveries could see first shortage in 2016 or more likely 2017
- Lake Powell levels will continue to decline moving us closer to min power
- California is still in an historic drought
- Pressure on the states will intensify to implement contingency plans



# LONG TERM QUESTIONS

- FUTURE HYDROLOGY – DRIER?
- OVERUSE OF THE WATER SUPPLY
- OPERATION OF POWELL POST 2026?
- CERTAINTY FOR POST-COMPACT USES – AVOIDING A CURTAILMENT
- FUTURE OF AGRICULTURE
- ALLOWANCE FOR NEW USES
- GOVERNANCE