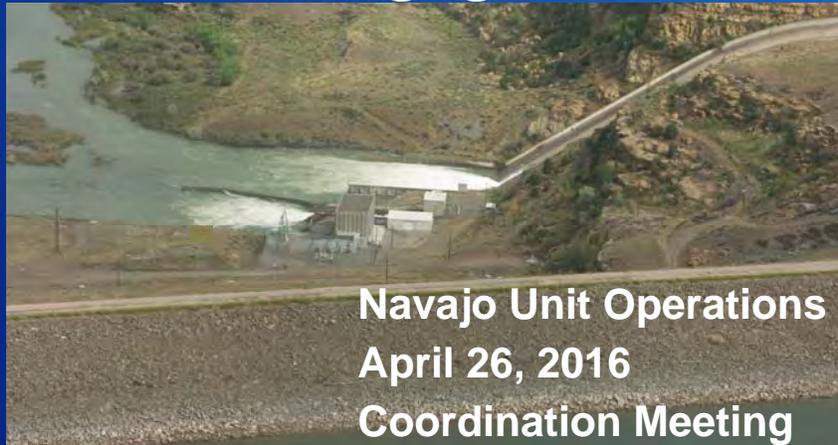


# RECLAMATION

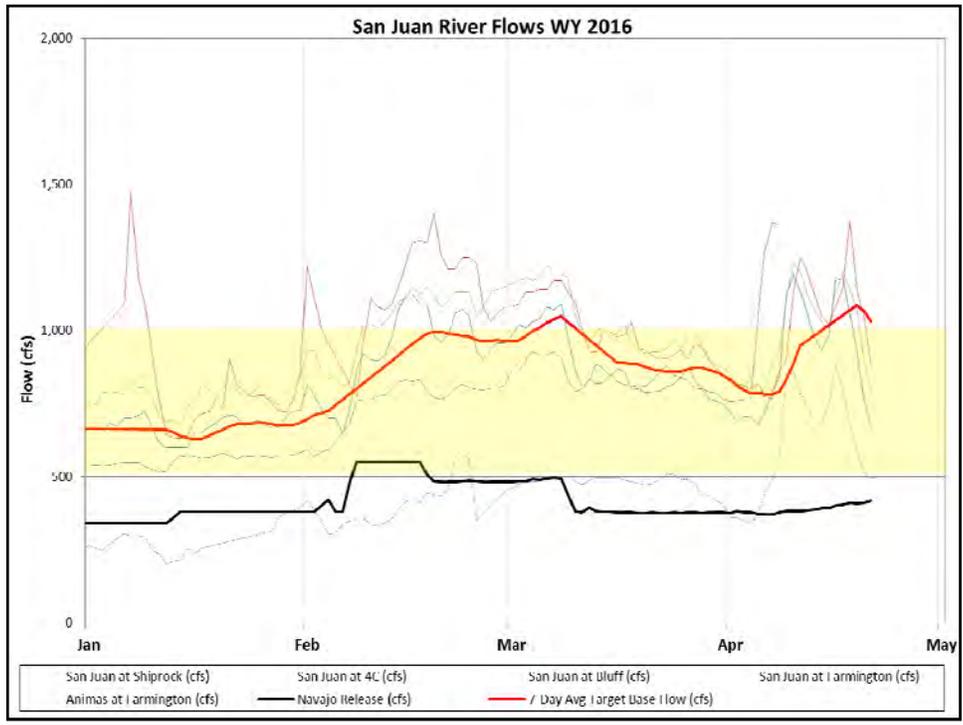
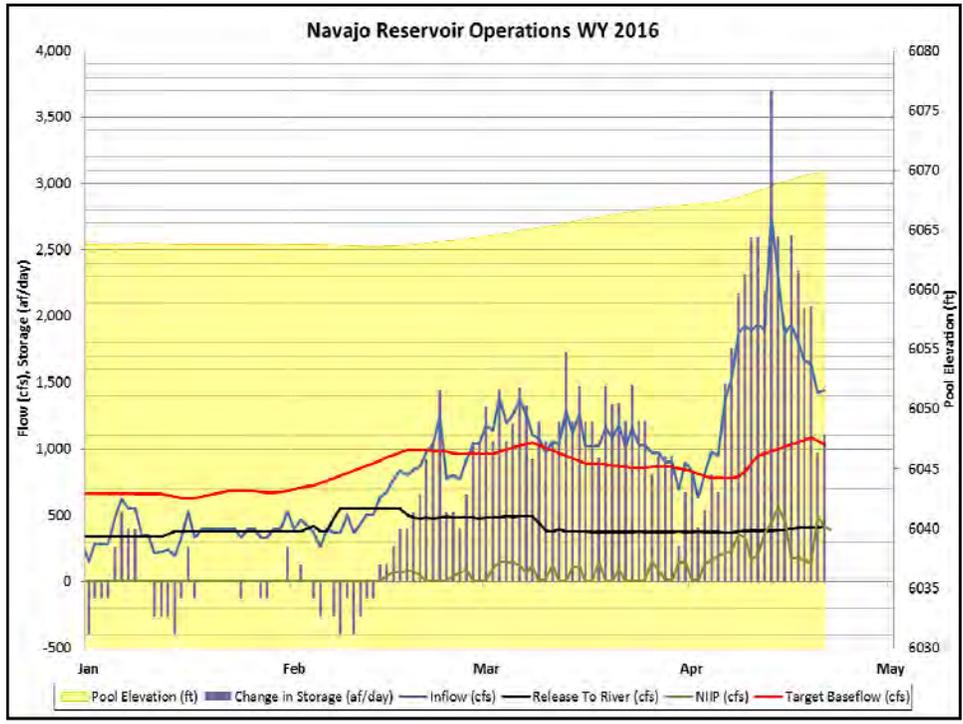
*Managing Water in the West*



U.S. Department of the Interior  
Bureau of Reclamation

## **AGENDA**

- REVIEW OF WATER YEAR 2016 OPERATIONS (TO DATE)
- WY 2016 SNOWPACK AND RUNOFF AND WY 2016 WEATHER OUTLOOK  
GREG SMITH (CBRFC)
- WY 2016 PROPOSED OPERATIONS
- NEARBY PROJECTS UPDATE
- NAVAJO DAM MAINTENANCE ACTIVITIES
- FISH & WILDLIFE SERVICE/SAN JUAN RIP UPDATE
- REPORTS FROM OTHER AGENCIES



## Navajo Current Conditions

(as of 4/24/16)

Elevation = 6070.18 (87% Full, 79% of Active)

Storage = 1,483,045 af

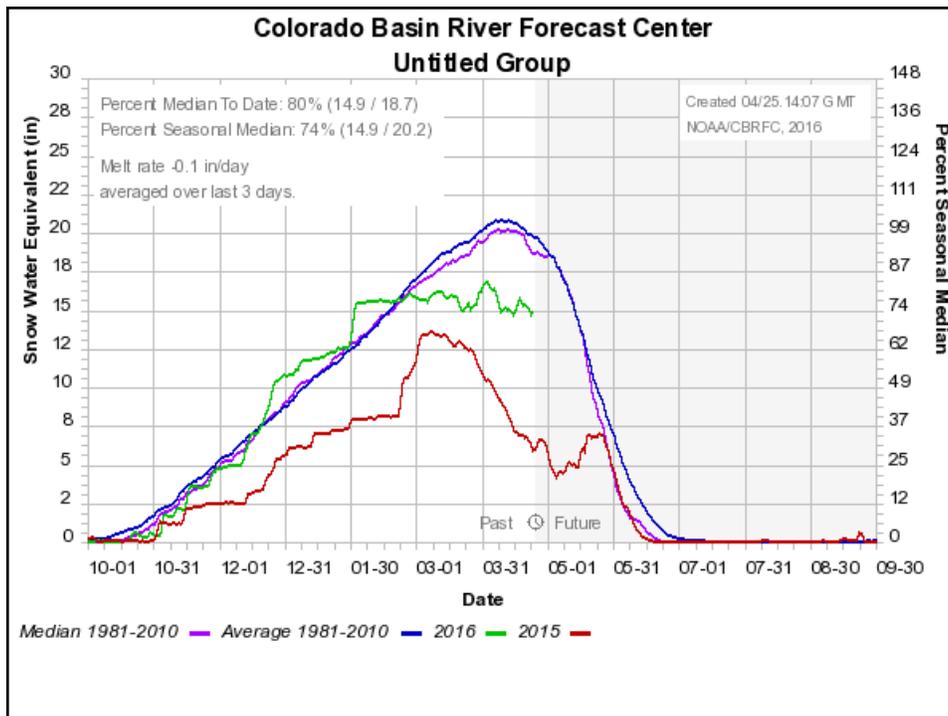
Inflow = 1908 cfs

Release = 350 cfs

NIIP = 370 cfs\*

SJ-Chama Diversion = 270 cfs\*

*\*average of the last 7 days*



# Navajo Unit Operations Meeting

1 pm April 26, 2016

Farmington, New Mexico

Greg Smith - Sr. Hydrologist

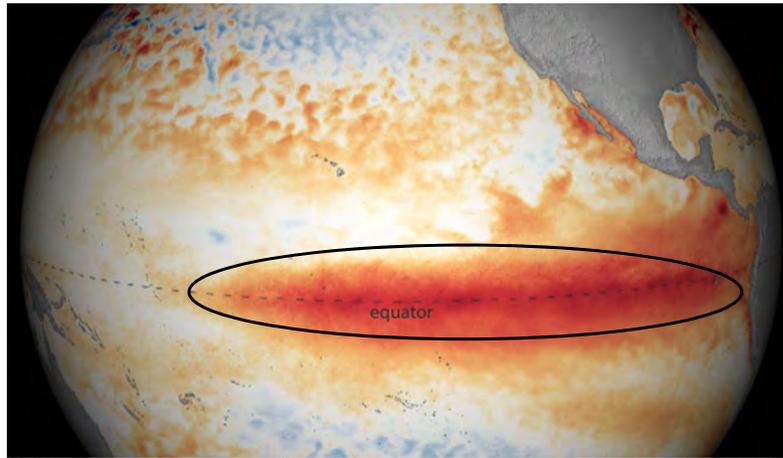
Colorado Basin River Forecast Center  
National Weather Service  
NOAA

## Today's Presentation – Questions to Answer

- > **Did the fact we had El Niño conditions impact the runoff forecasts ?**
  - > Our expectations regarding El Niño
- > **Forecasts started out great !**
  - > Early season impacts to the forecasts
- > **Forecasts Tanked – What happened ?**
  - > Evolution of the runoff forecasts
  - > Impacts of spring weather up until now
- > **What is coming up?**
  - > What are the odds of receive average runoff ?
  - > How unique was last spring ? Might that happen again ?
  - > Latest storms and possible impacts
  - > Animas peak flow outlook
- > **Drought Status (compared to a year ago)**
- > **La Niña conditions are likely by fall – should we be worried ?**

## El Niño Event

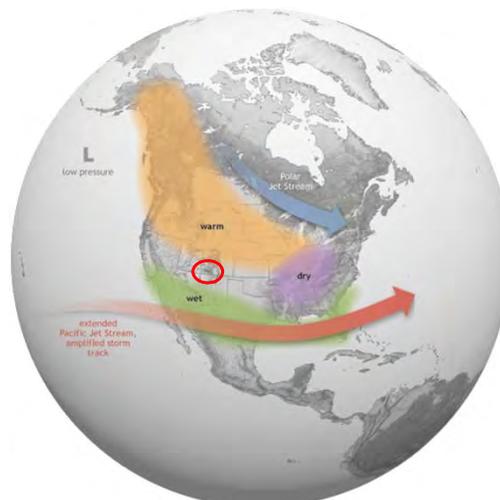
- Characterized by unusually warm temperatures in Pacific Ocean near the equator
- Impacts the Jet stream strength, location, and storm tracks.
- The 2015-2016 will go down as one of the strongest on record (82-83, 97-98)



## El Niño – What were we expecting ?

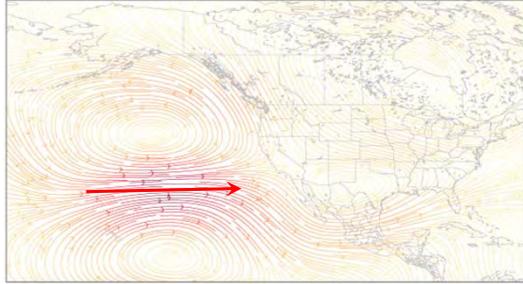
### Typical Impacts

- Enhanced southern jet stream / increased precipitation southern third of the U.S.
- Warmer / drier conditions more common over the northern tier of the U.S.
- San Juan Basin ??



# El Niño – What happened this year ?

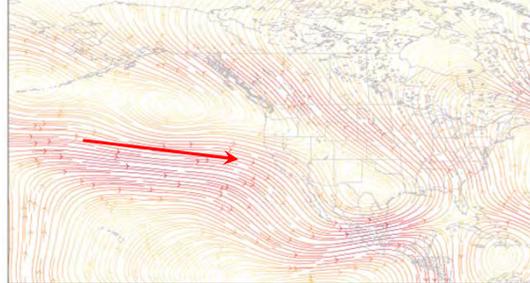
average El Niño winter (Dec-Jan)



Jet Stream displaced farther north than what typically occurs

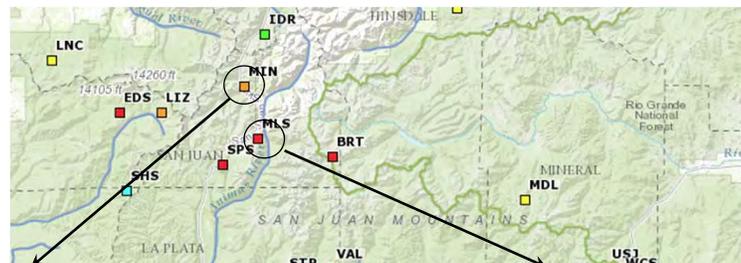


this winter (Dec 2015-Jan 2016)

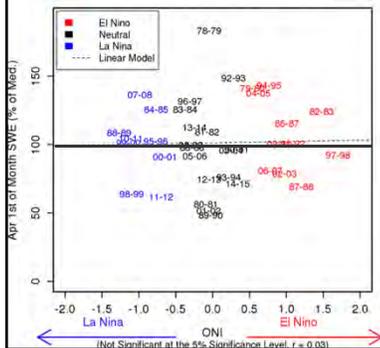


Images from Climate.gov's ENSO blog entry on February 24<sup>th</sup> by Michelle L'Heureux

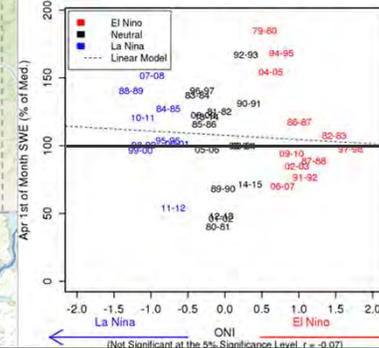
## How well does April 1<sup>st</sup> Snowpack correlate with El Niño Conditions



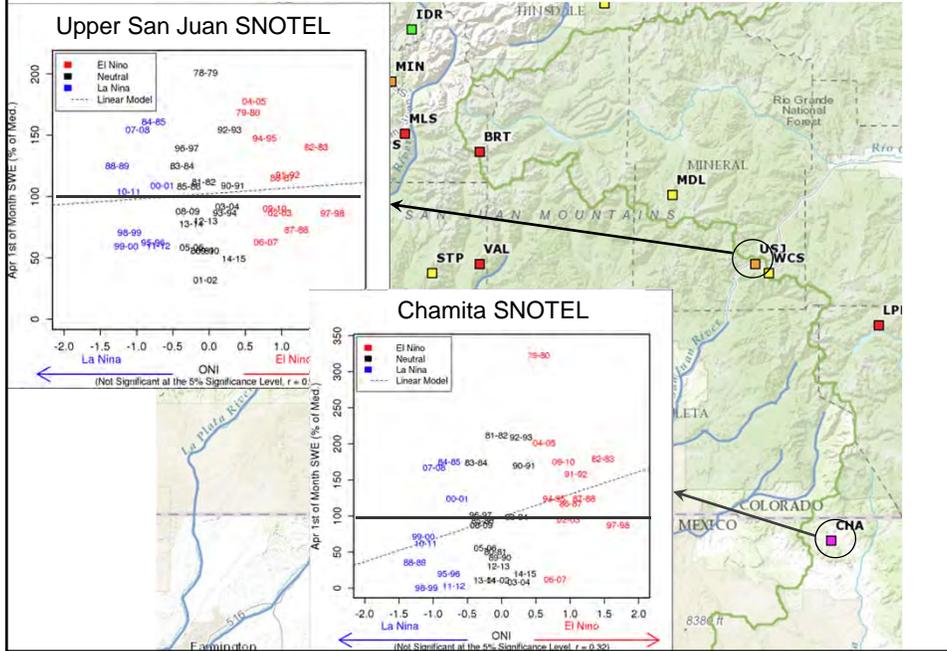
Mineral Creek SNOTEL



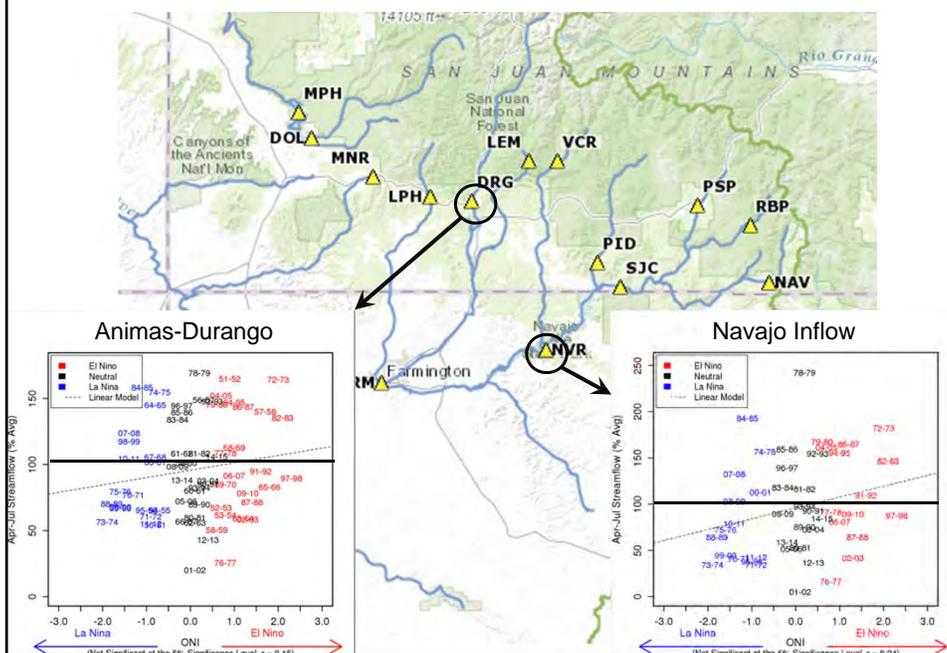
Molas Lake Creek SNOTEL



### How well does April 1st Snowpack correlate with El Niño Conditions



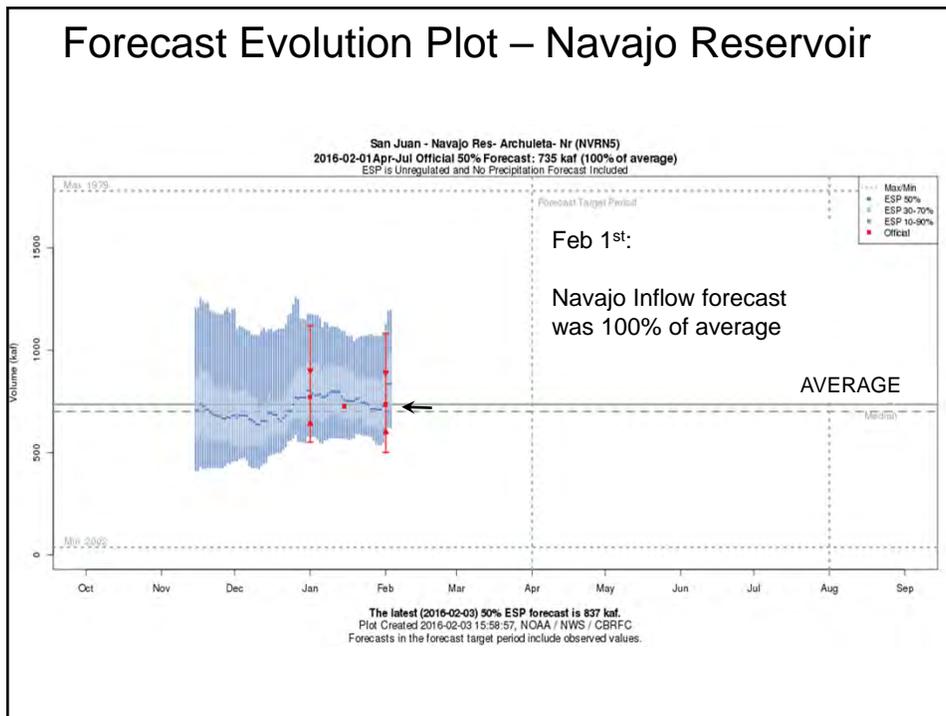
### How well does Apr-July streamflow volumes correlate with El Niño Conditions



## Primary Drivers of the Forecast

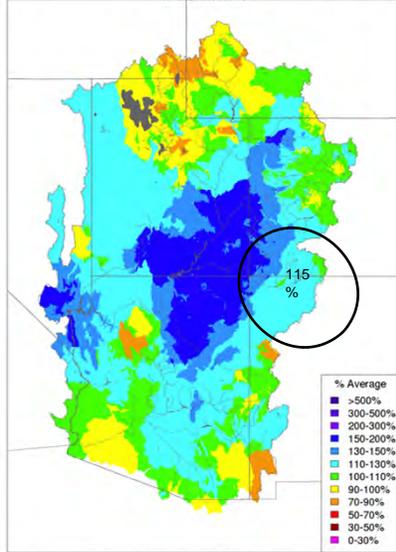
- **Runoff Forecasts did not include an El Niño component**
  - No El Niño influence in the forecasts
- **Early season forecasts were influenced by good initial hydrologic conditions**
  - Some decent soil moisture conditions in parts of the San Juan Basin
  - Above average precipitation for Oct-Nov-Dec
  - Healthy snow conditions early in the forecast period (Jan-Feb)

## Forecast Evolution Plot – Navajo Reservoir



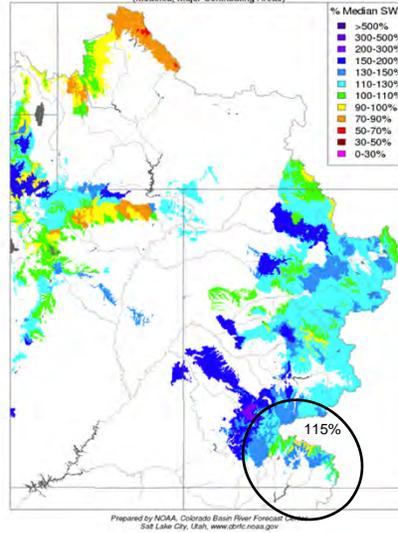
# February 1 Conditions/Forecasts

Water Year Precipitation, October 2015 - January 2016  
(Averaged by Basin)



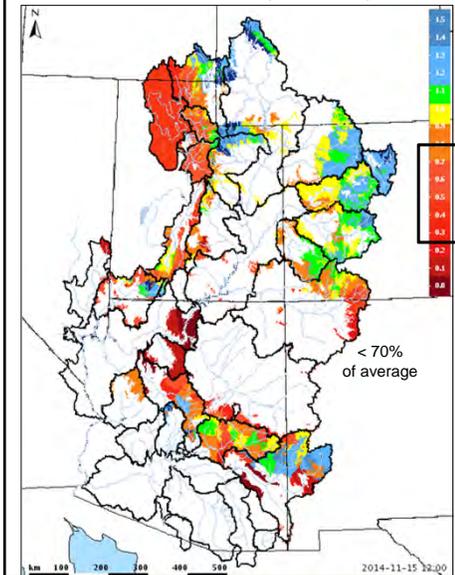
Water year precipitation 115% of average  
Snow conditions 115% of median

Snow Conditions - February 01 2016  
(Modeled, Major Contributing Areas)

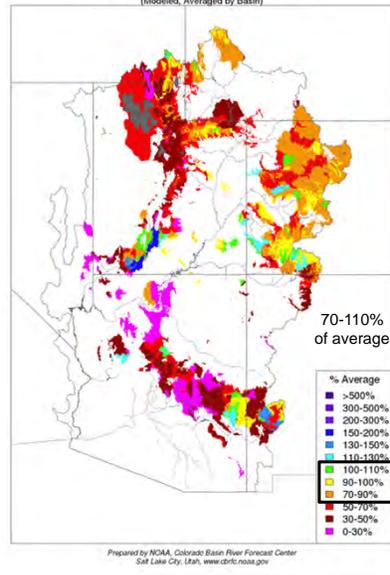


# Soil Moisture Conditions (from the hydrologic model)

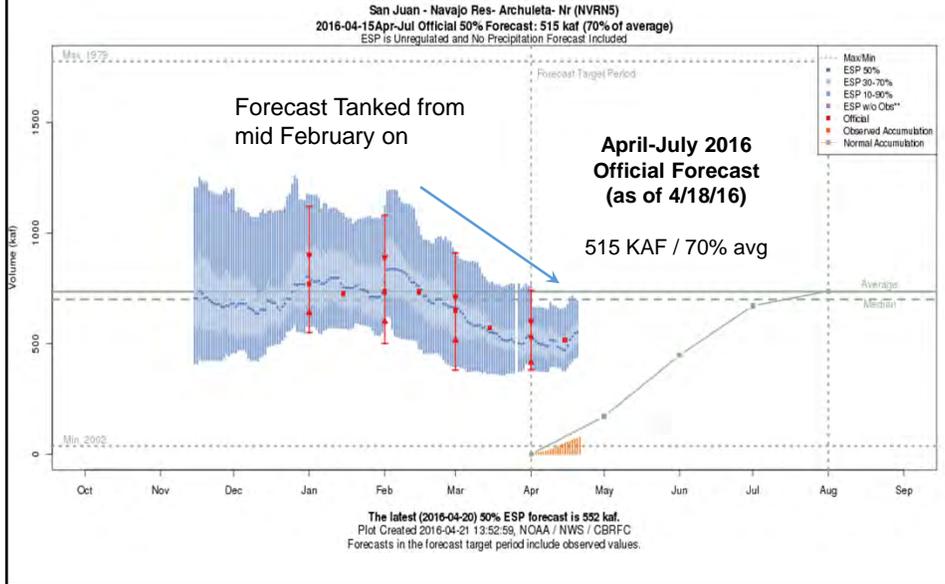
Soil Moisture - Fall - 2014 (November 15)



Soil Moisture - Fall - 2015 (November 15)  
(Modeled, Averaged by Basin)



# Forecast Evolution Plot – Navajo Reservoir



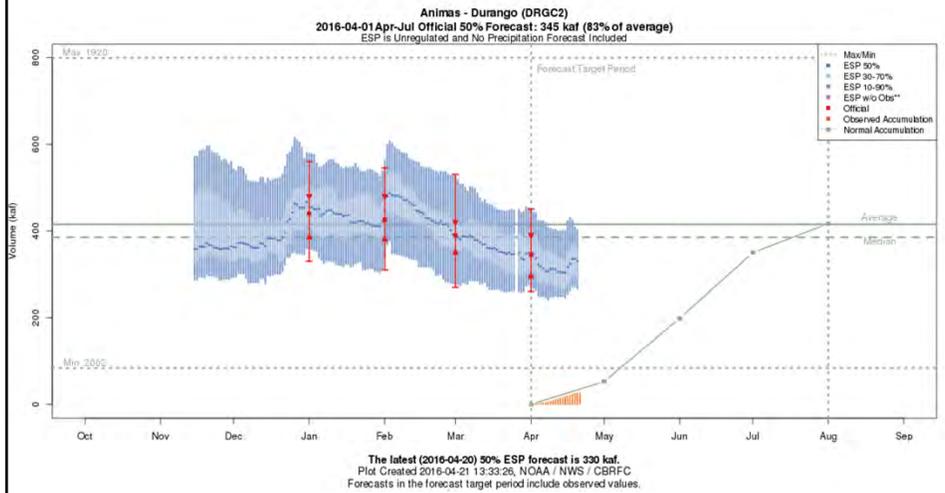
# Forecast Evolution Plot – Animas River

April-July 2016 Official Forecast (as of 2/1/16)

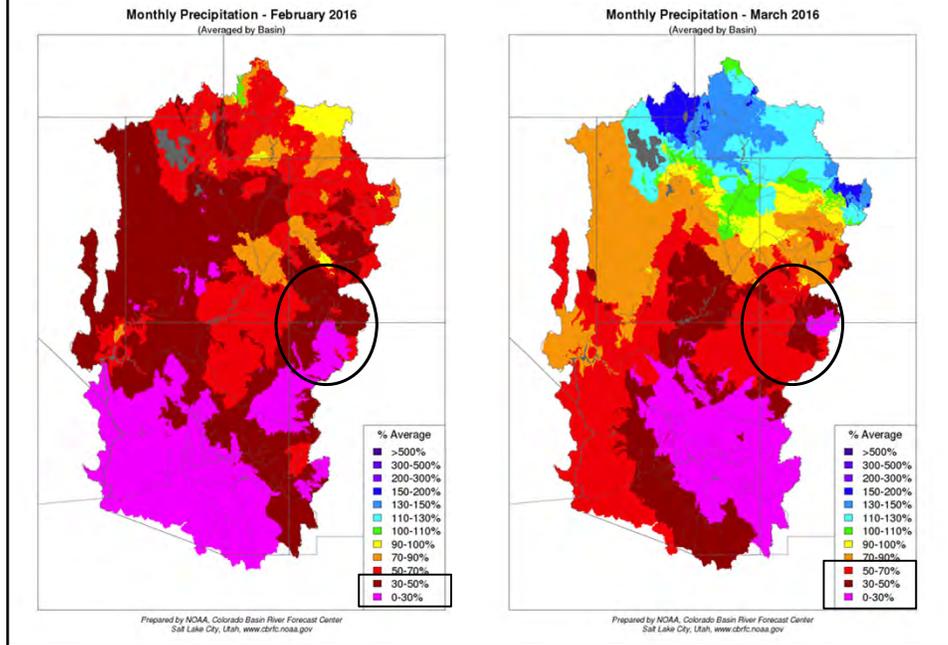
425 KAF / 102% avg

April-July 2016 Official Forecast (as of 4/18/16)

330 KAF / 79% avg



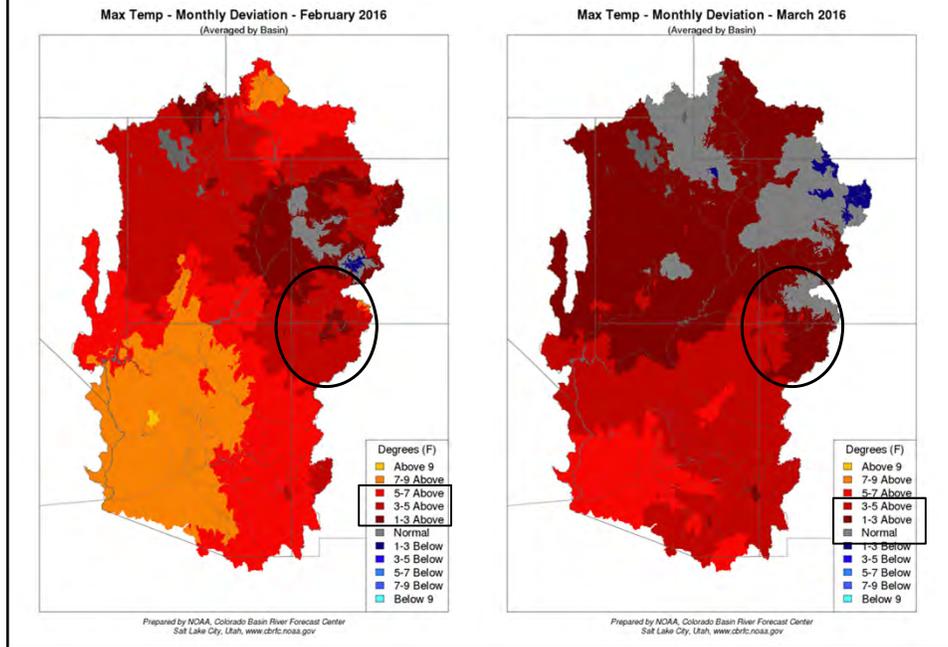
## February & March – Very Dry



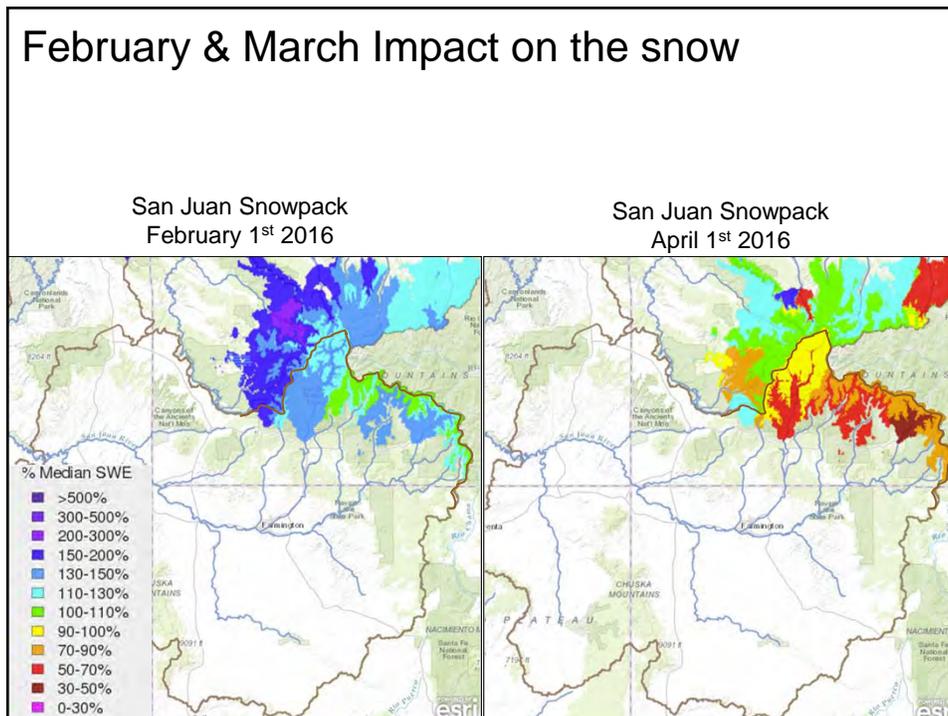
## How Dry ?

Area	# of Sites reporting February Precipitation in Top 5 driest
Green	11 (3 driest)
Yampa	10 (5 driest)
Upper Colorado	10
Gunnison	7
Dolores	3 (1 driest)
<b>San Juan</b>	<b>11 (2 driest)</b>

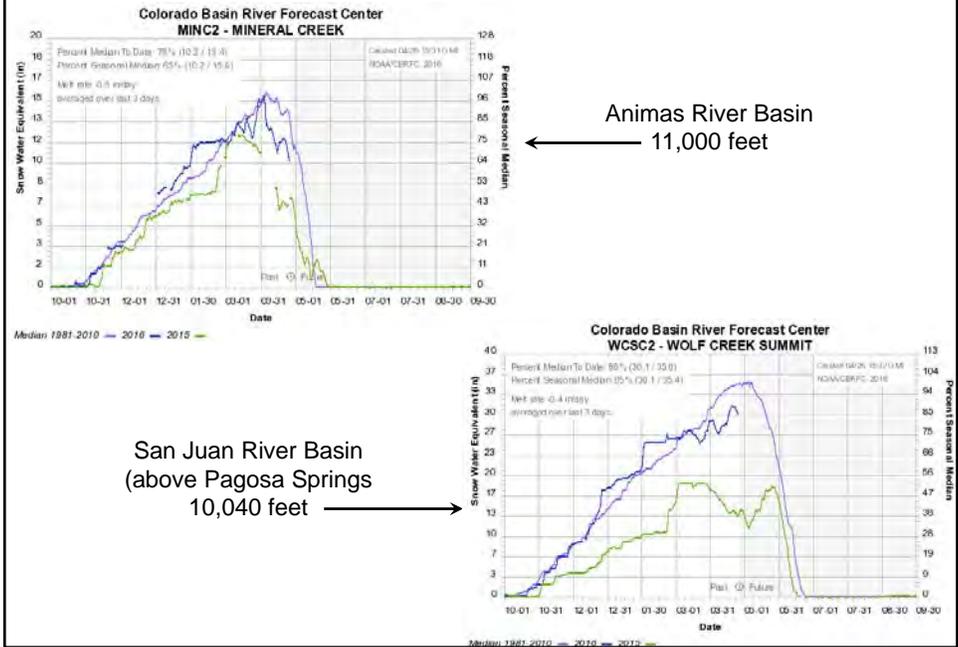
## February & March – Above Average Temperatures



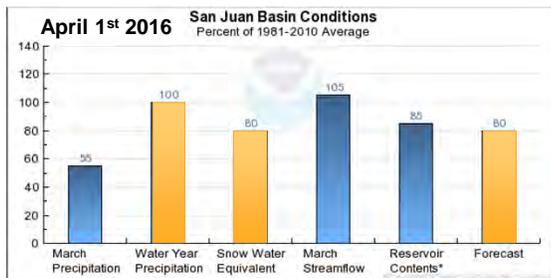
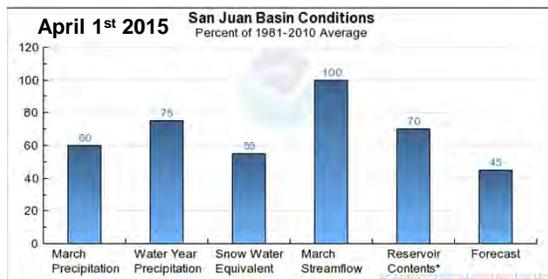
## February & March Impact on the snow



# SNOTELS:



## Conditions today are better than last year at this time



Comparing Forecasts  
KAF (% avg)

4/1/2015 4/1/2016

Navajo Inflow 310  
(42%) 530 (72%)

Animas River 260  
(63%) 345 (83%)

Observed Flows

KAF 345

2015 2016

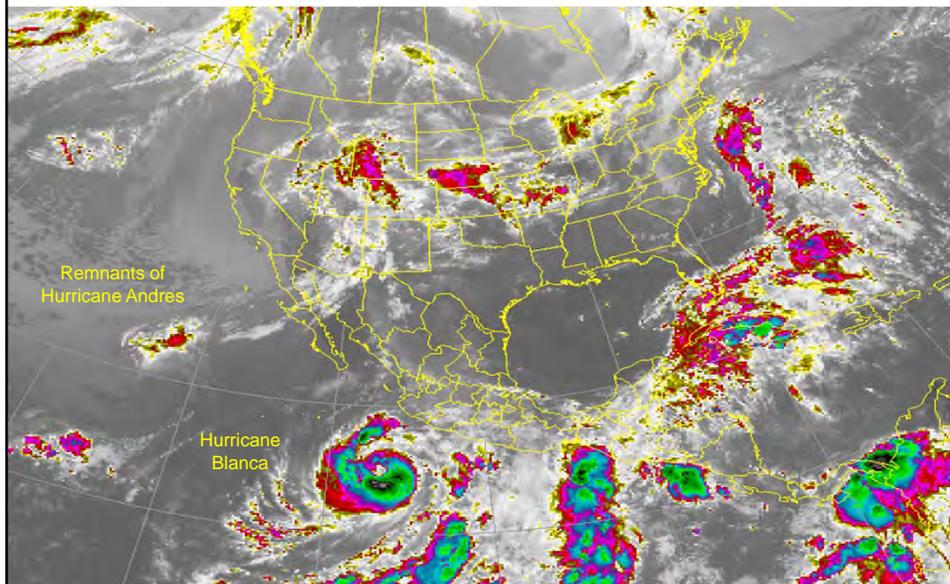
Navajo Inflow: 619 (84%)

Animas River: 439 (106%)

## Today's Presentation – Questions to Answer

- **What are the chance of reaching average runoff this year ?**
  - Navajo Inflow – less than 3 % chance of receiving average runoff
  - Animas River ~ 7 % chance of average runoff / ~30% chance of reaching 90% runoff
  - Outlooks based on 1981-2010 climatology
- **What were last years odds of reaching the observed volumes at Navajo for 2015**
  - Less than 7% chance on May 1<sup>st</sup> 2015
- **What happened to get us there ?**
  - May-July precipitation was in the top 3-7% of historical record.
  - It was an extreme event
  - Two tropical storm system impacted the forecast area.

## Late May/Early June 2015 - Impacted by Two Pacific Hurricanes



## What can we expect this spring?

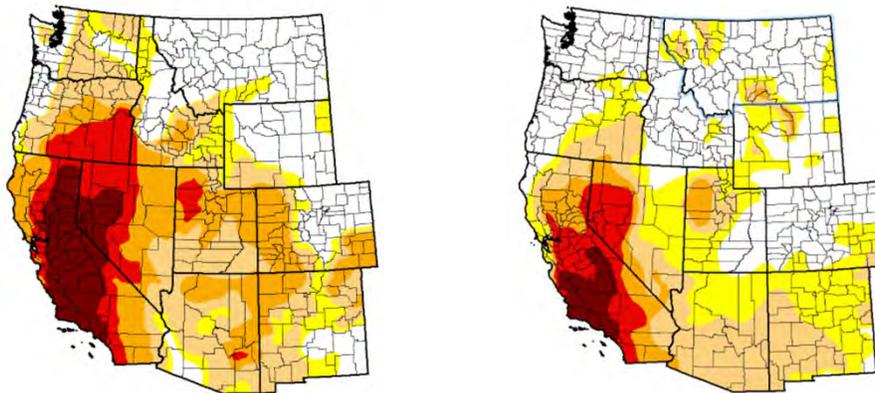
- **What are the chance of reaching average runoff this year ?**
  - Navajo Inflow – less than 3 % chance of receiving average runoff
  - Animas River ~ 7 % chance of average runoff / ~30% chance of reaching 90% runoff
- **What were last years odds of reaching the observed volumes at Navajo for 2015**
  - Less than 7 % chance on May 1<sup>st</sup> 2015
- **What happened to get us there ?**
  - May-July precipitation was in the top 3-7% of historical record.
  - It was an extreme event
  - Two tropical storm system impacted the forecast area.
- **Might that type of wet spring occur this year ?**
  - Anything is possible, but it is unlikely.
  - It would be against what historical climate suggests.

## Drought Status

U.S. Drought Monitor

April 21 2015

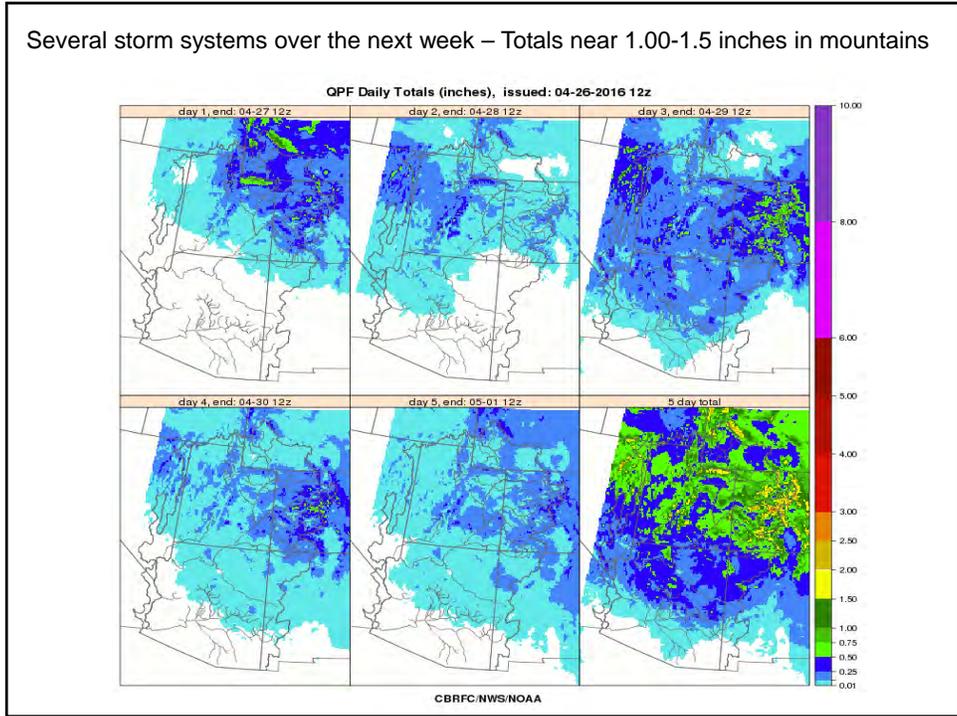
April 21 2016



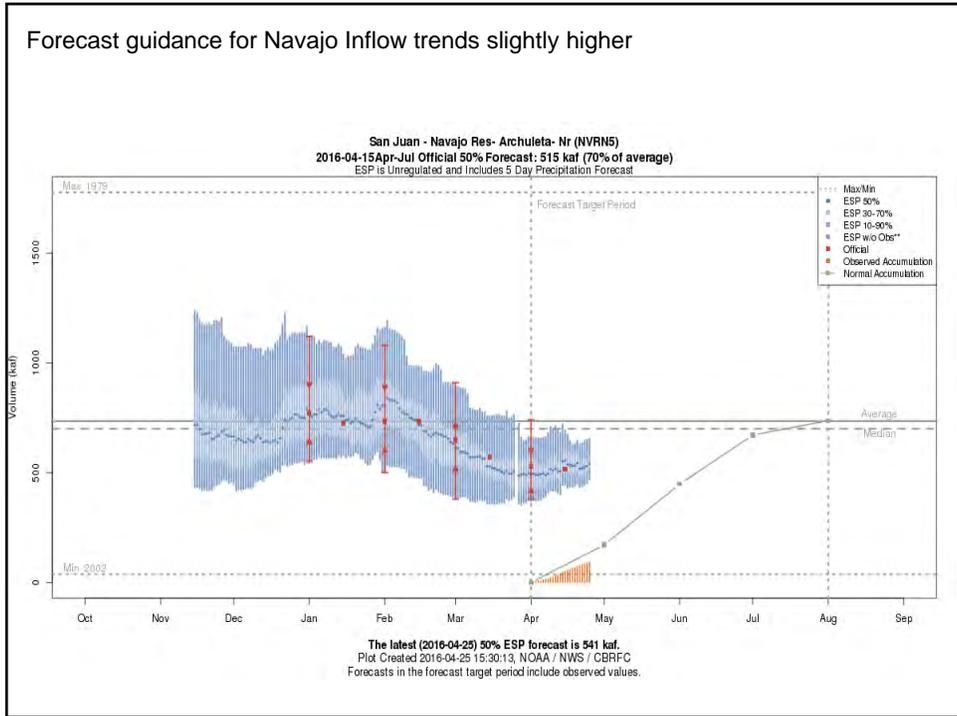
Intensity:

- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)

Several storm systems over the next week – Totals near 1.00-1.5 inches in mountains



Forecast guidance for Navajo Inflow trends slightly higher



Animas @ Durango peak flow outlook:

Daily Peak -- Seasonal Maximum

#	0.90	0.75	0.50	0.25	0.10	Units
# ANIMAS - DURANGO						
# Exceedance Prob.	0.90	0.75	0.50	0.25	0.10	Units
#	2444	2803	3132	3730	4067	CFSD

Number of Days to Peak from: 2016-04-18

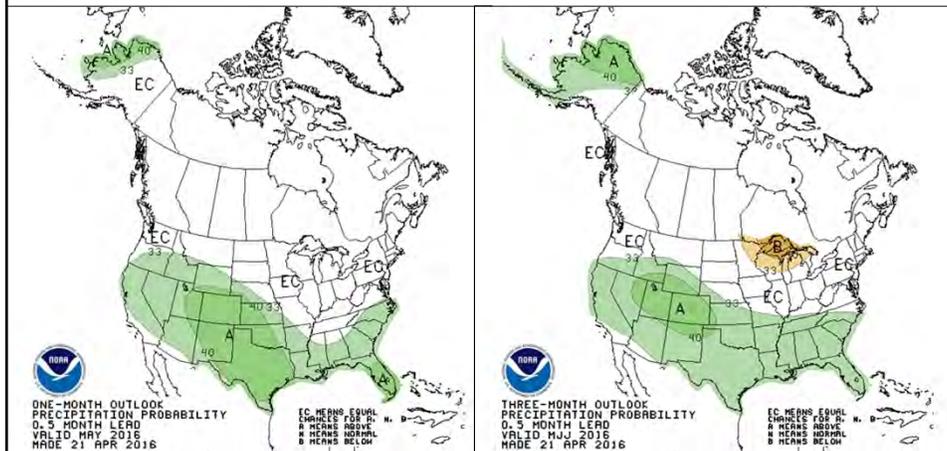
#	0.90	0.75	0.50	0.25	0.10	Units
# ANIMAS - DURANGO						
# Exceedance Prob.	0.90	0.75	0.50	0.25	0.10	Units
#	23	33	44	54	68	DAYS

Climate Prediction Center Guidance

Do we use these ?  
 What are our other options ?  
 CBRFC verification efforts

May 2015

May 2015 – July 2016



# Thank You

1 pm April 26, 2016

Farmington, New Mexico

Greg Smith - Sr. Hydrologist

Colorado Basin River Forecast Center  
National Weather Service  
NOAA

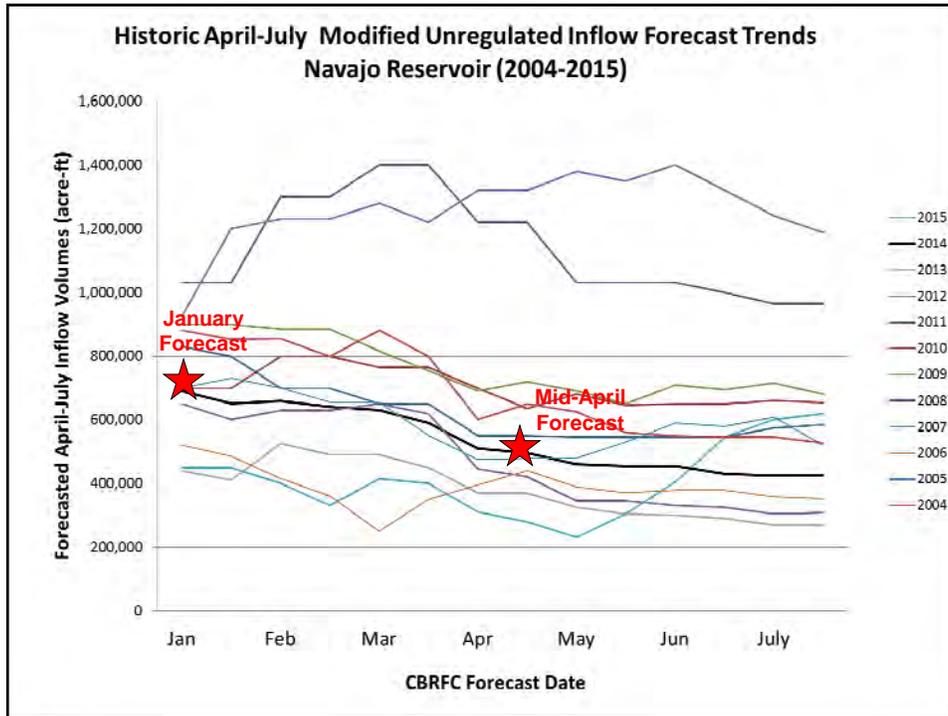
[greg.smith@noaa.gov](mailto:greg.smith@noaa.gov)

801-524-5130 ext 332

## Mid-April 2016 CBRFC Forecast Navajo Reservoir Mod Unregulated April-July Inflow Volume

Probability	Inflow (af)	% of Average	2015 Forecast
MIN	350,000	47%	173,000 (23%)
<b>MOST</b>	<b>515,000</b>	<b>70%</b>	<b>280,000</b> <b>(38%)</b>
MAX	730,000	99%	395,000 (54%)

*2015 Actual = 619,000 acre-feet (84%)*



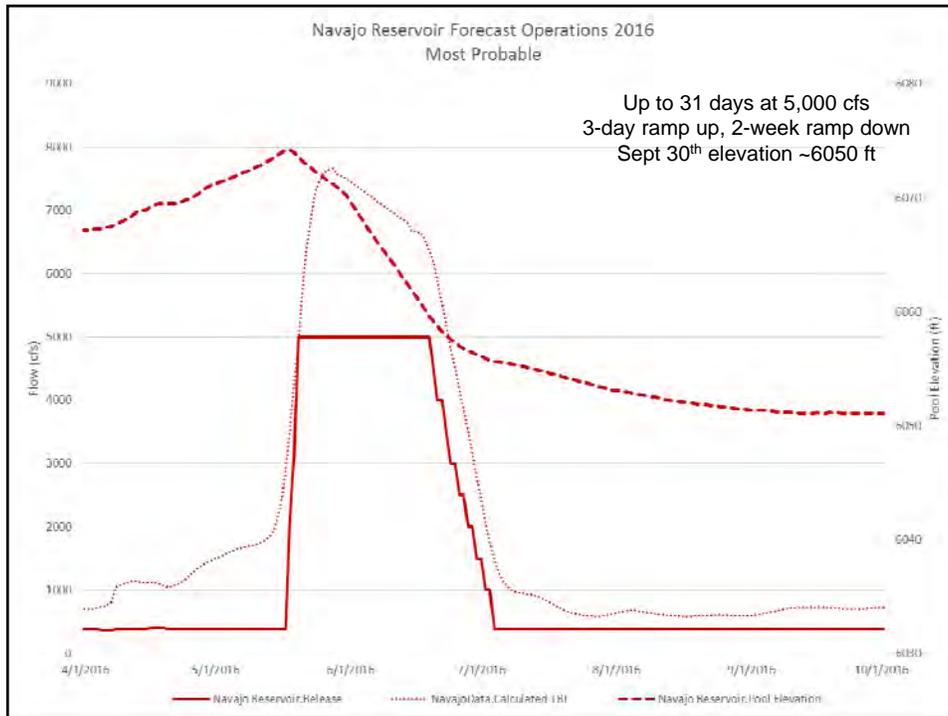
**new!**

## 2016 Interim Operations

- Available Water calculated after contracts and minimum target baseflow met.
- Available Water calculated down to September 30<sup>th</sup> storage of 6050 ft.
- Spring Peak Release is maximum number of days at 5,000 cfs (minimum of 21 days)
- If no spring peak release, target 6063 ft at end of water year.
- Time release with Animas peak for biggest benefit.
- If Animas is spent, ramp down to save water

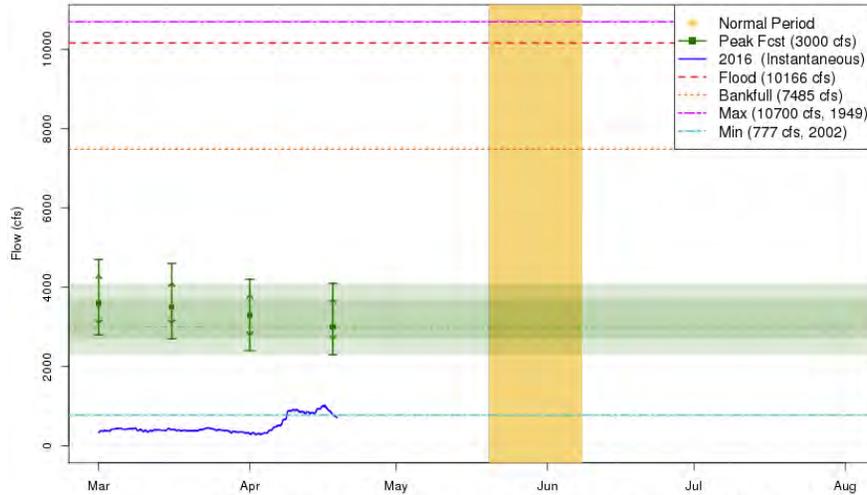
# 2016 Interim Operations Available Water

2016 Forecast	Avail Water (af)*	Possible Days@Peak	Modeled Days@Peak	Total SPR Vol (af)*	Op Spill (calc, af)
MIN	204,416	14	0	0	43,549
MOST	376,656	31	31	358,231	0
MAX	553,190	52	52	551,917	0



# CBRFC PEAK FLOW FORECASTS

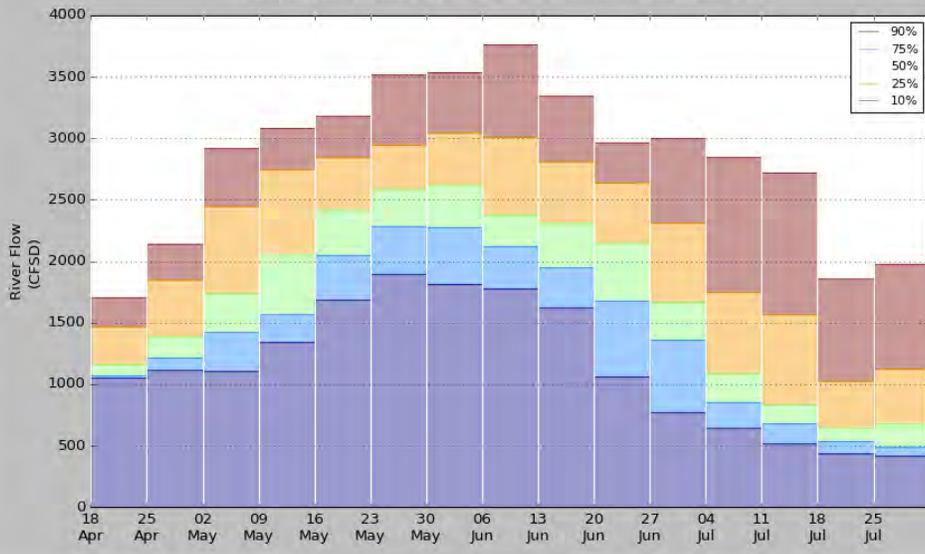
2016 Mean Daily Peak Flow Forecast  
Animas - Durango (DRGC2)



These graphics are updated approximately every two weeks between 3/1 and 5/1  
Plot Created 2016-04-18 15:25:07  
CBRFC / NWS / NOAA

# CBRFC PEAK FLOW FORECASTS

Chance of Exceeding River Levels for:  
ANIMAS - DURANGO  
Forecast Period: 2016-04-18 - 2016-08-01 Simulation date: 2016-04-18

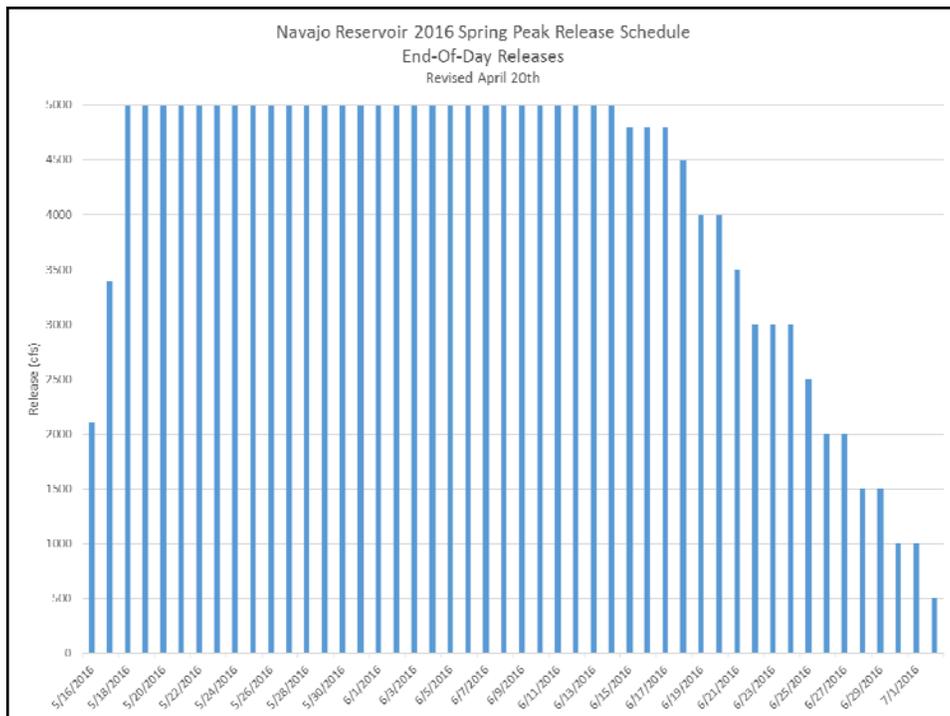


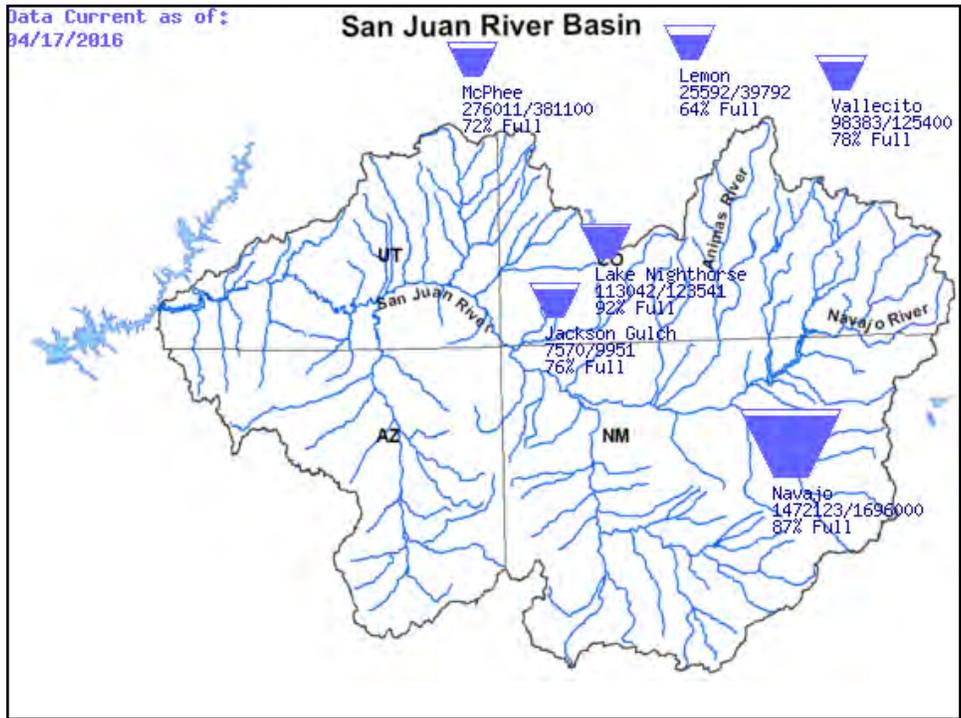
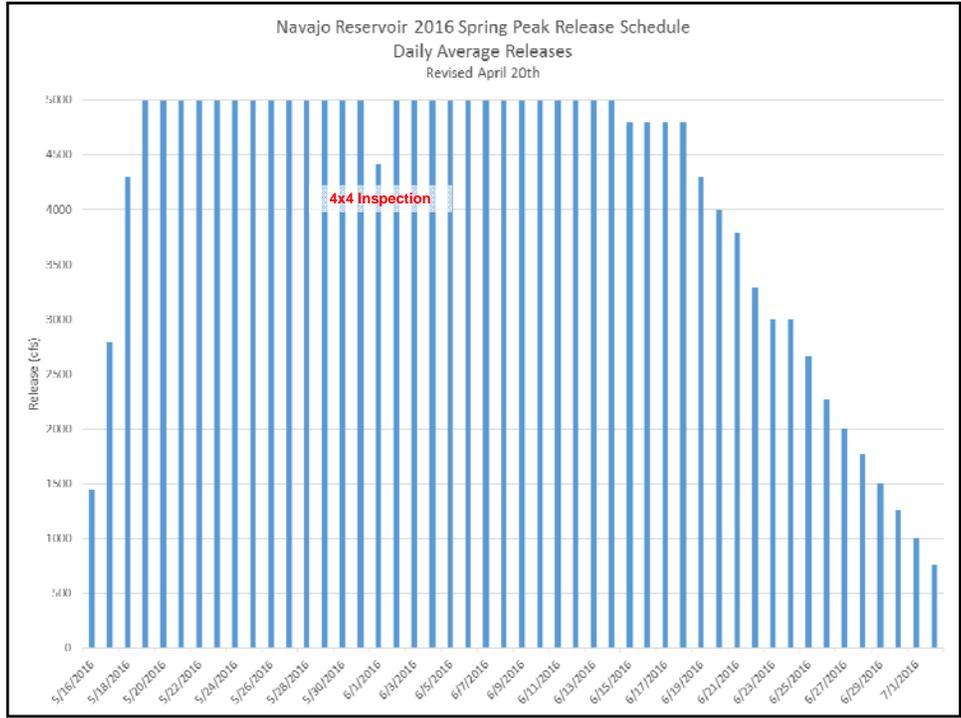
# 2016 Spring Peak Release

Based on Mid-April forecast

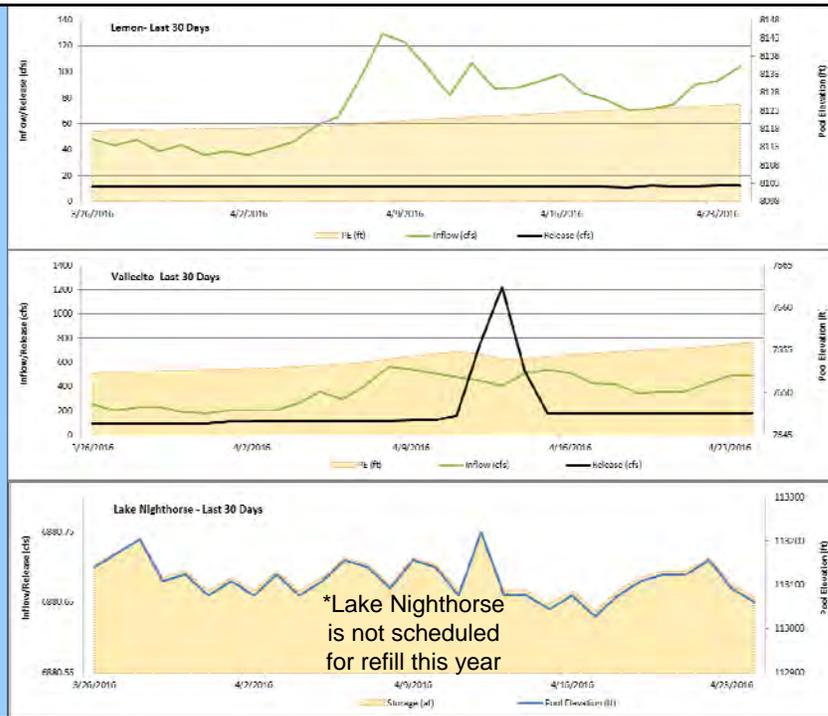
- 3-day ramp up to 5,000 cfs
- 31-days at 5,000 cfs (or until Animas spent)
- 2-week ramp down
  
- Start date May 16<sup>th</sup> (tentative)
- Total volume over base release: 370,000 af

LENGTH AND TIMING SUBJECT TO CHANGE!





Major San Juan River Basin Reservoirs  
(4/24/2016)



## Navajo Maintenance Activities

Drilling at the downstream dam face and up to 500 yards downstream will be occurring now through August.

This operation may be audible and visible from the road and along the river immediately downstream of Navajo.

How You Can  
Access Information

Bureau of Reclamation  
[www.usbr.gov/uc](http://www.usbr.gov/uc)

USGS  
<http://water.usgs.gov/nwis>

Colorado Basin River Forecast Center  
[www.cbrfc.noaa.gov](http://www.cbrfc.noaa.gov)



Reclamation Contacts:

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**Susan Novak Behery**

970-385-6560 [sbehery@usbr.gov](mailto:sbehery@usbr.gov)

**Ruth Swickard**

970-385-6523 [rswickard@usbr.gov](mailto:rswickard@usbr.gov)

## Summary

- Precipitation has been below average for much of the winter and into spring in the San Juan River Basin.
- El Nino started out strong, but a dry winter and spring added to the dropping forecast (but it's not over yet).
- Most Probable April–July Inflow Forecast is 70% of average (as of Mid-April).
- 2016 interim operations are in place for this year. The current most probable forecast calls for up to 31-day spring peak release. It will be timed with the Animas. The release will end at 31 days or when the Animas has peaked for the last time, whichever occurs first.
- The peak is *tentatively* scheduled to start May 16<sup>th</sup>. This cool weather may cause us to postpone another week.
- After the spring peak release, the release will be the minimum necessary to maintain a target baseflow of at least 500 cfs in the critical habitat reach.
- Under Most Probable operational forecast, Navajo will reach a reservoir elevation of 6050 ft by September 30<sup>th</sup>.

Next Operations Meeting Tuesday, August 23<sup>rd</sup> 2016