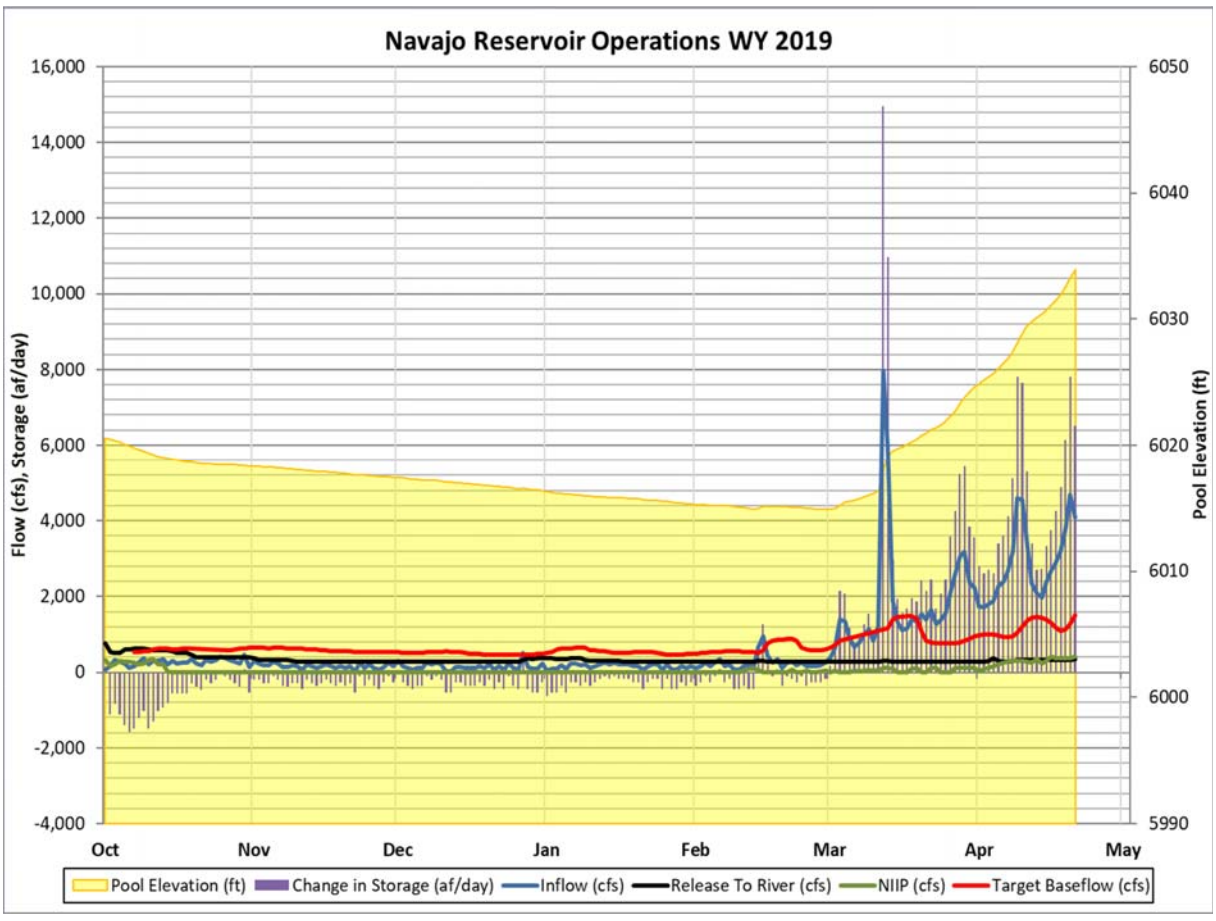
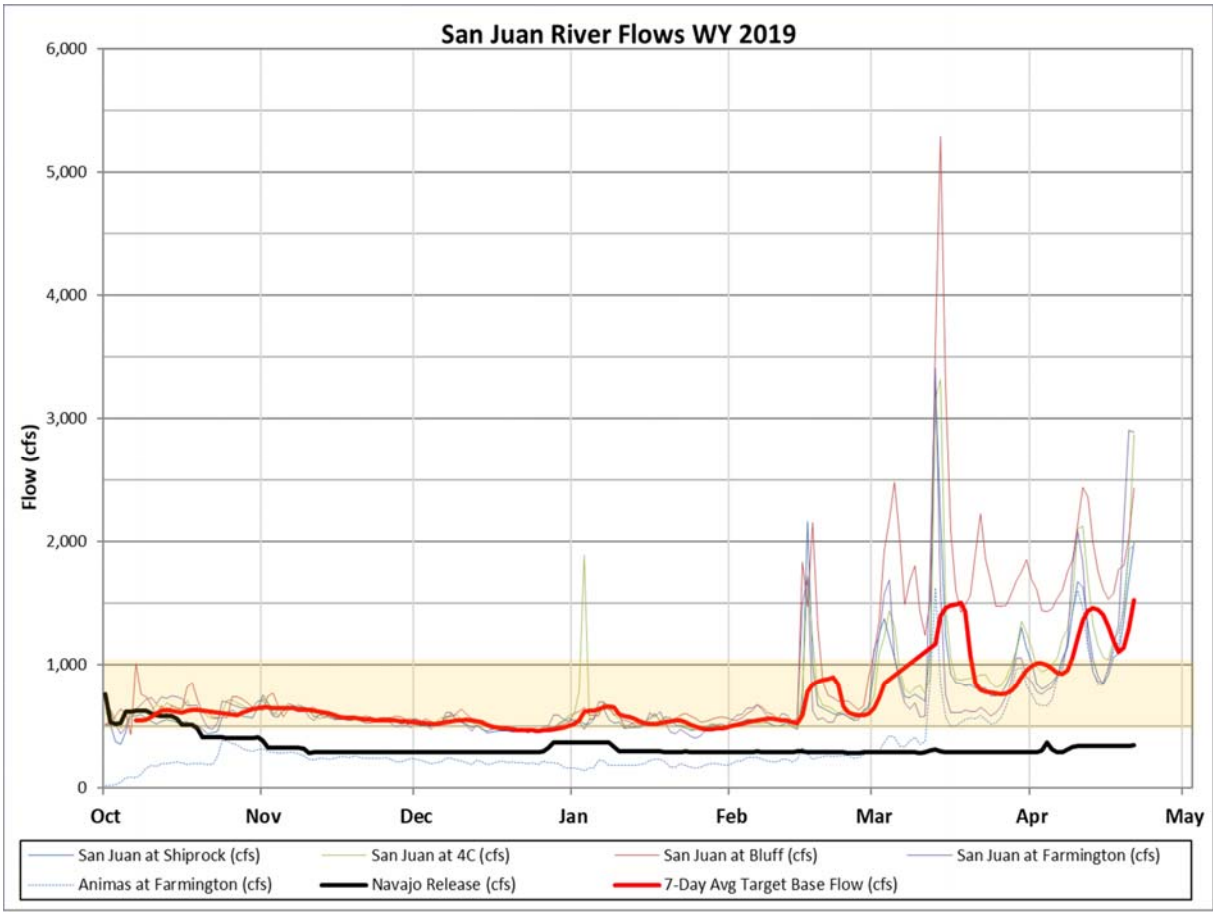
RECLAMATION

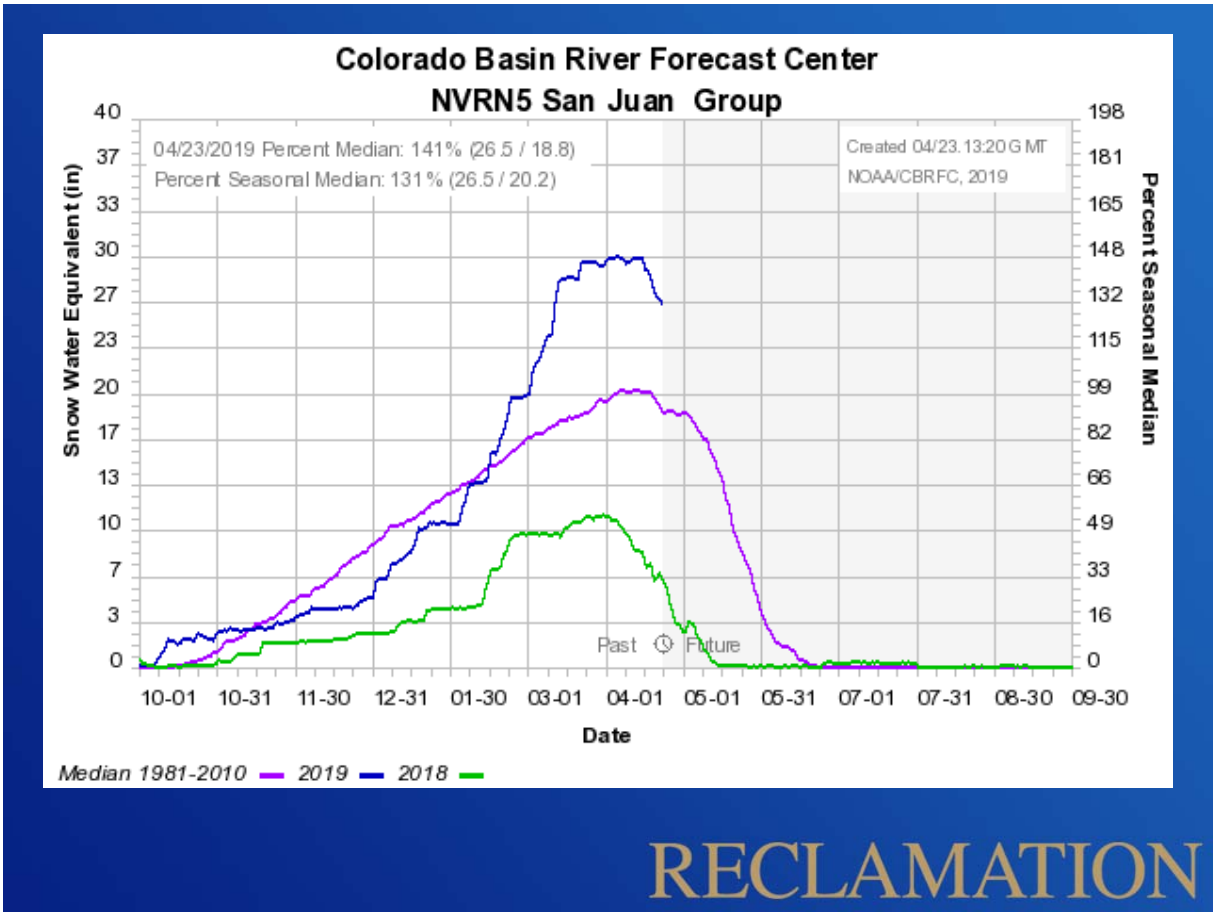
Managing Water in the West

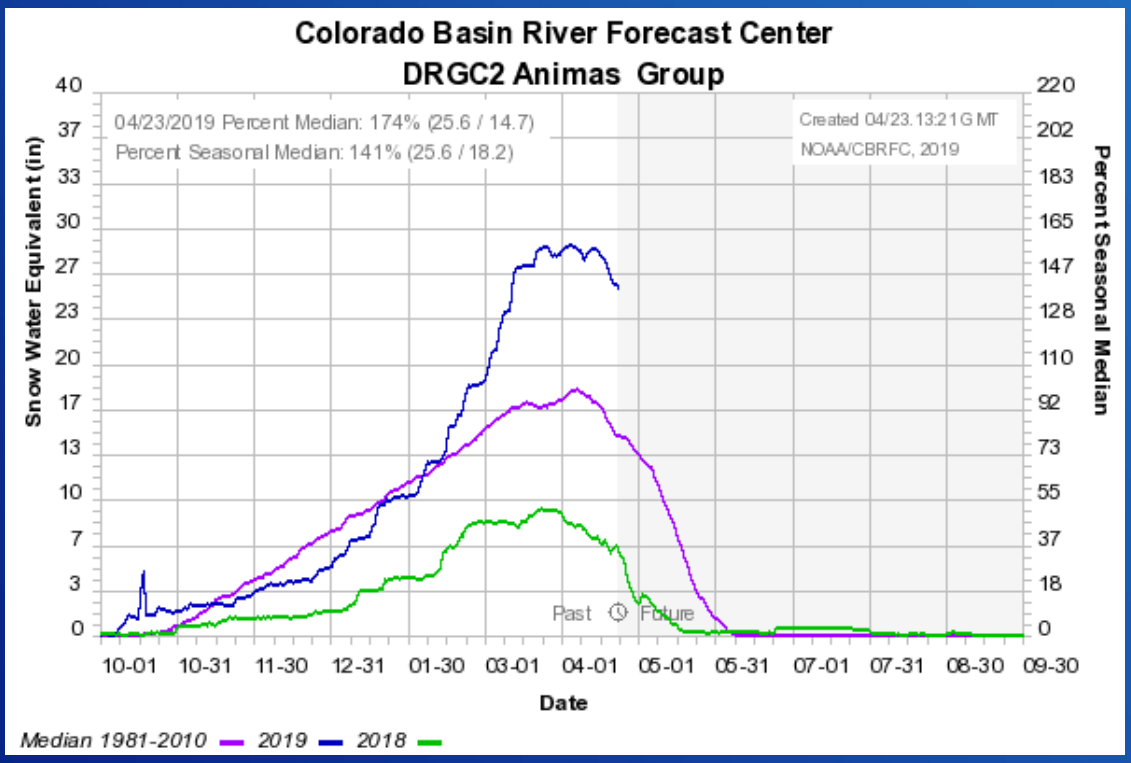
Navajo Unit Operations
April 23rd, 2019
Coordination Meeting

U.S. Department of the Interior
Bureau of Reclamation




San Juan River Flows WY 2019
Flow (cfs)
6,000
5,000
4,000
3,000
2,000
1,000
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
San Juan at Shiprock (cfs)
San Juan at 4C (cfs)
San Juan at Bluff (cfs)
San Juan at Farmington (cfs)
Animas at Farmington (cfs)
Navajo Release (cfs)
7-Day Avg Target Base Flow (cfs)


Colorado Basin River Forecast Center
NVRN5 San Juan Group
04/23/2019 Percent Median: 141% (26.5 / 18.8)
Percent Seasonal Median: 131% (26.5 / 20.2)
Created 04/23.13:20 G MT
NOAA/CBRFC, 2019
Snow Water Equivalent (in)
40
37
33
30
27
23
20
17
13
10
7
3
0
Percent Seasonal Median
198
181
165
148
132
115
99
82
66
49
33
16
0
Past
Future
10-01
10-31
11-30
12-31
01-30
03-01
04-01
05-01
05-31
07-01
07-31
08-30
09-30
Date
Median 1981-2010
2019
2018
RECLAMATION



RECLAMATION

Navajo Current Conditions

(as of 4/22/19)

Elevation = 6034.07 ft

Storage = 1,050,120 af *(62% Full, 37% Active)*

Inflow* = 3,400 cfs

Release* = 340 cfs

NIIP* = 380 cfs

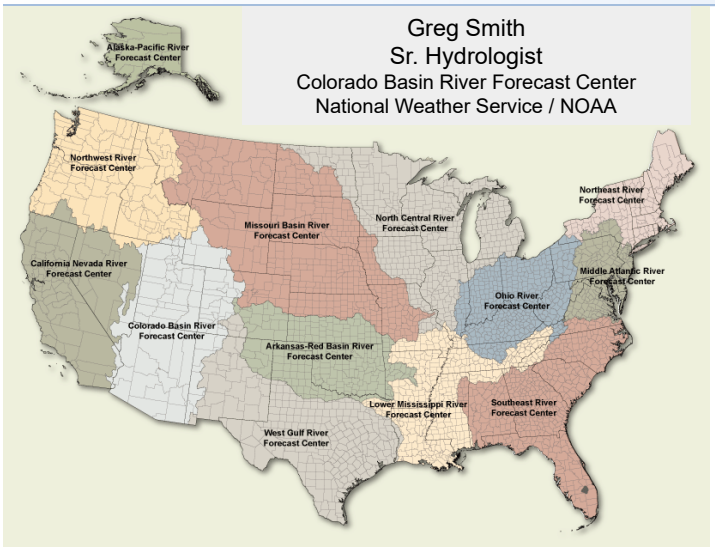
San Juan-Chama Diversion* = 415 cfs

**Flows averaged over the past 7 days*

RECLAMATION

Navajo Reservoir / San Juan Basin – Water Supply Outlook 2019

Greg Smith
Sr. Hydrologist
Colorado Basin River Forecast Center
National Weather Service / NOAA



Water Supply Forecasts:
Navajo & San Juan / Animas Basins

Conditions impacting the forecast

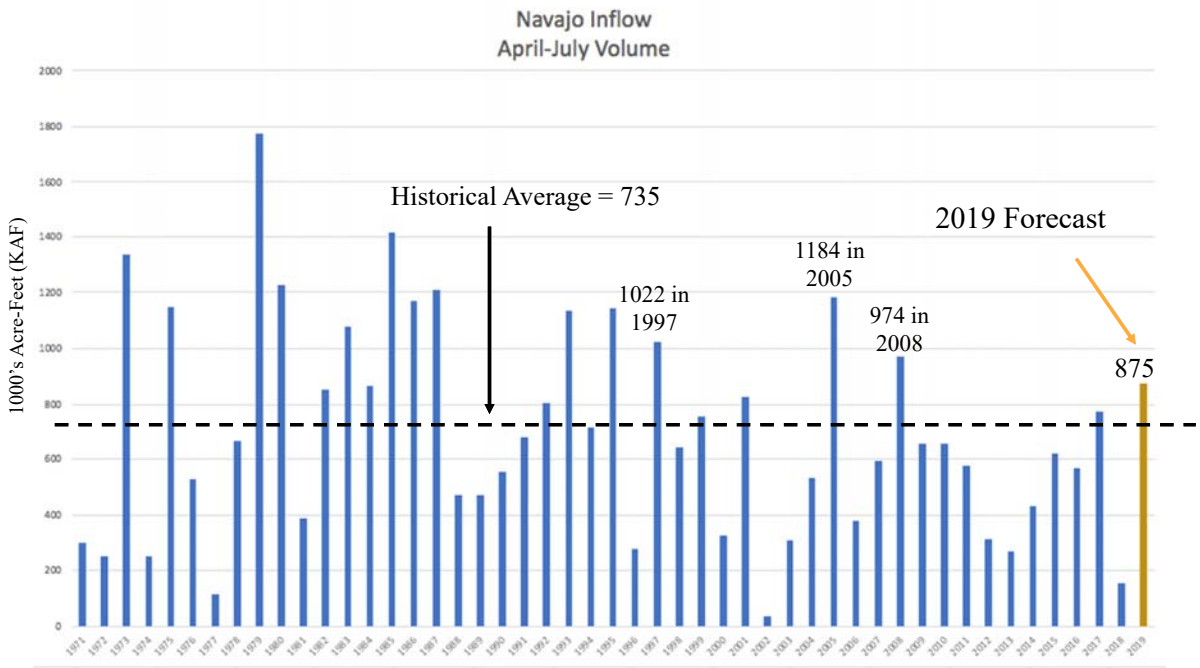
Animas peak flow outlook

Limitations / Accuracy of the forecast

Future weather impacts

2019 Navajo Operations Meeting
April 23 2019
Farmington, New Mexico

2019 April-July Navajo Inflow Forecast (Comparison to historical record)

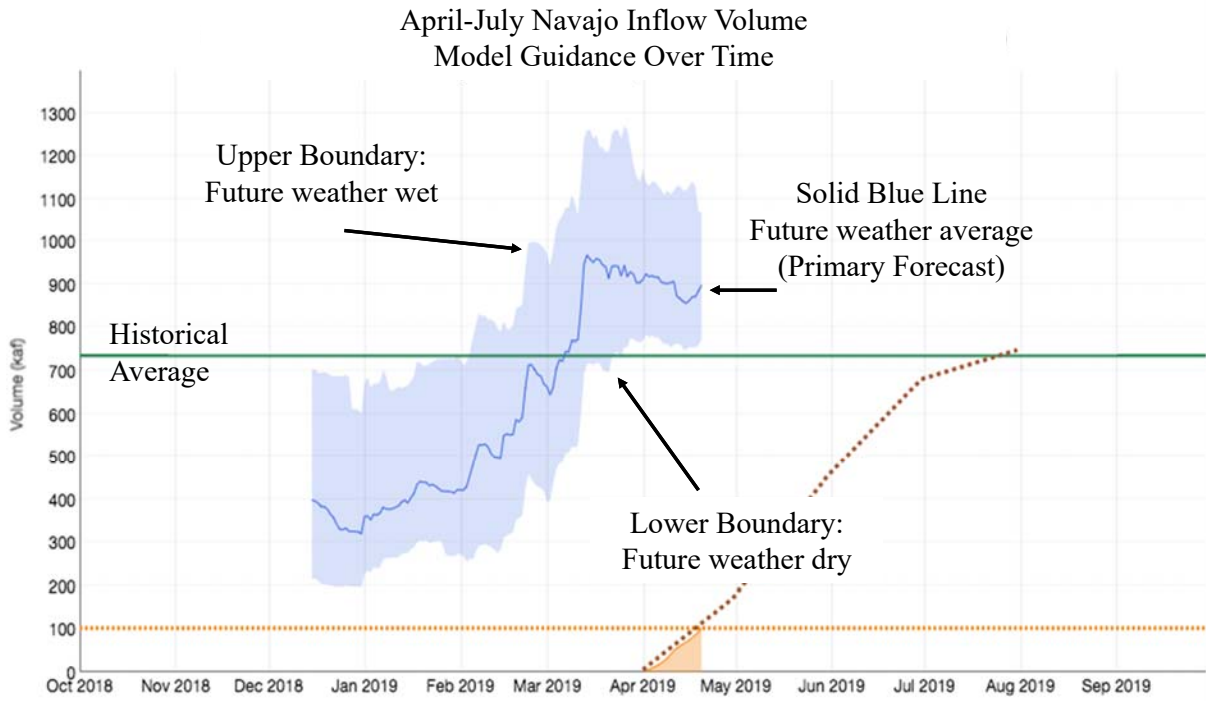


Navajo April-July Inflow Forecast
875 KAF (119% of Average)

154
2018

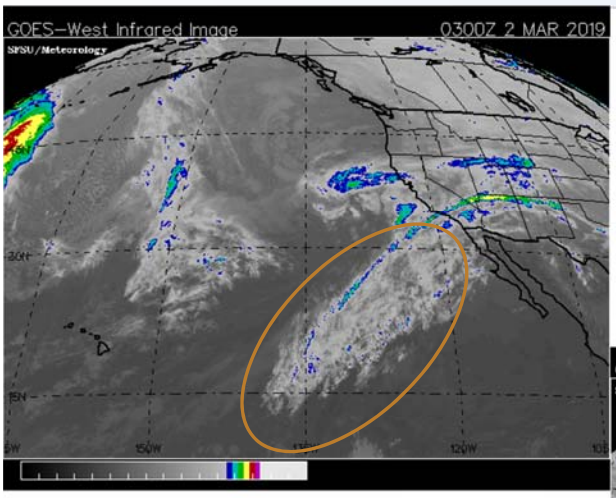
This would be the largest inflow dating back to 2008

Evolution of the Forecast: Significant increase early February to mid March



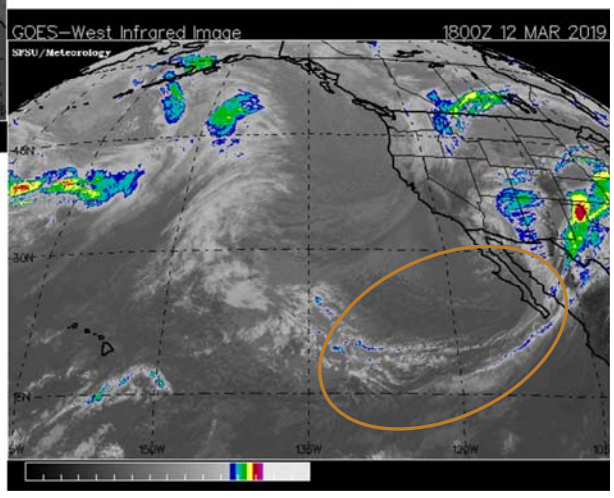
Model indicates 90% chance of April-July volume above 750 KAF (102% average)

What is driving the forecast: February & early March storms contained significant moisture

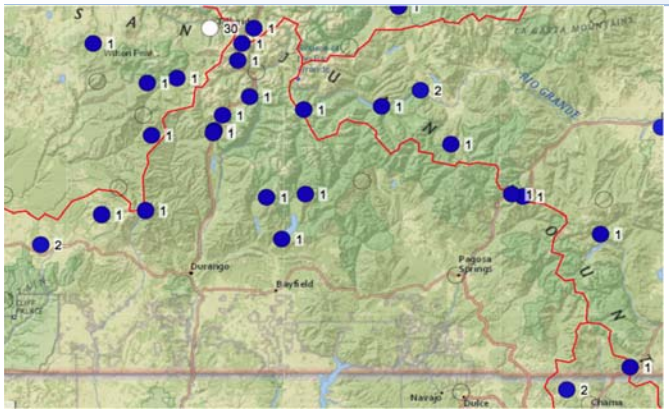


March 2nd 2019

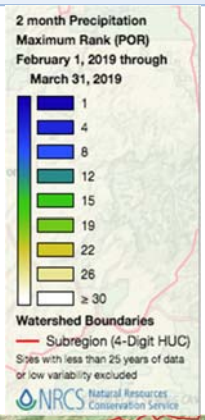
March 12th 2019



What is driving the forecast

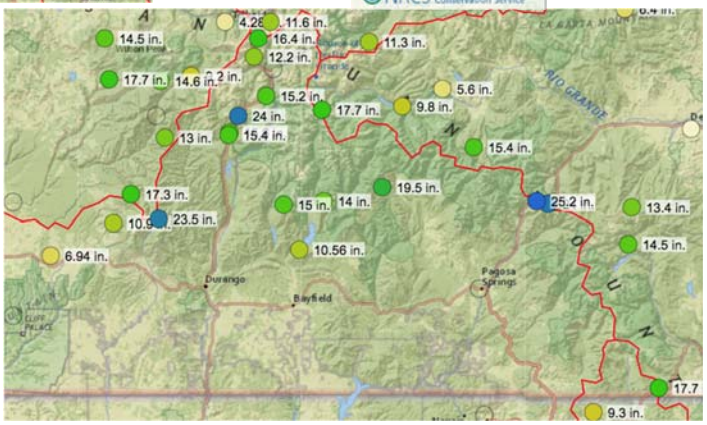


(historical record 33-38 years)

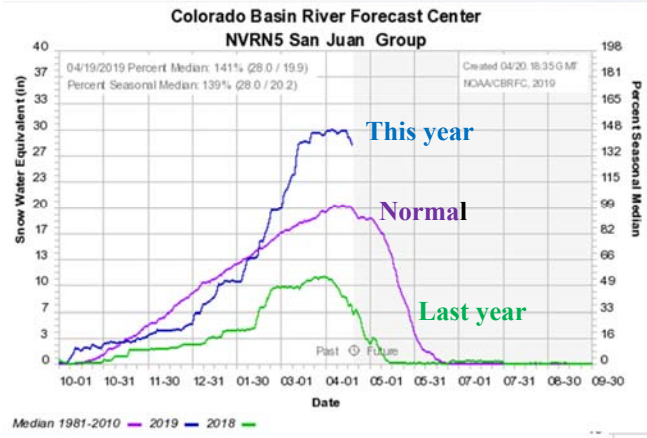


A record wet February through March

Over 20 inches of water in high elevations

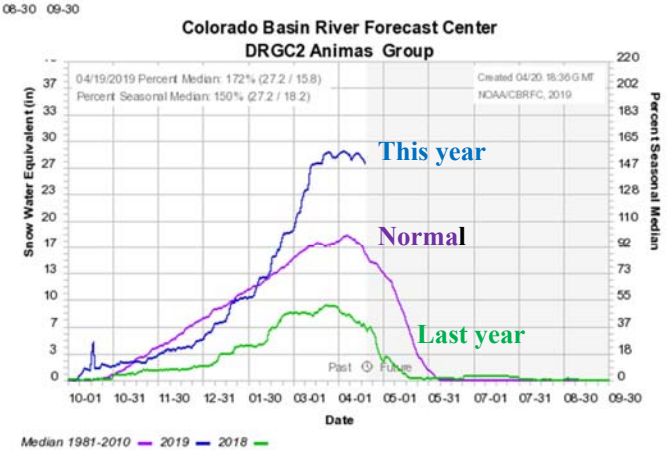


What is driving the forecast



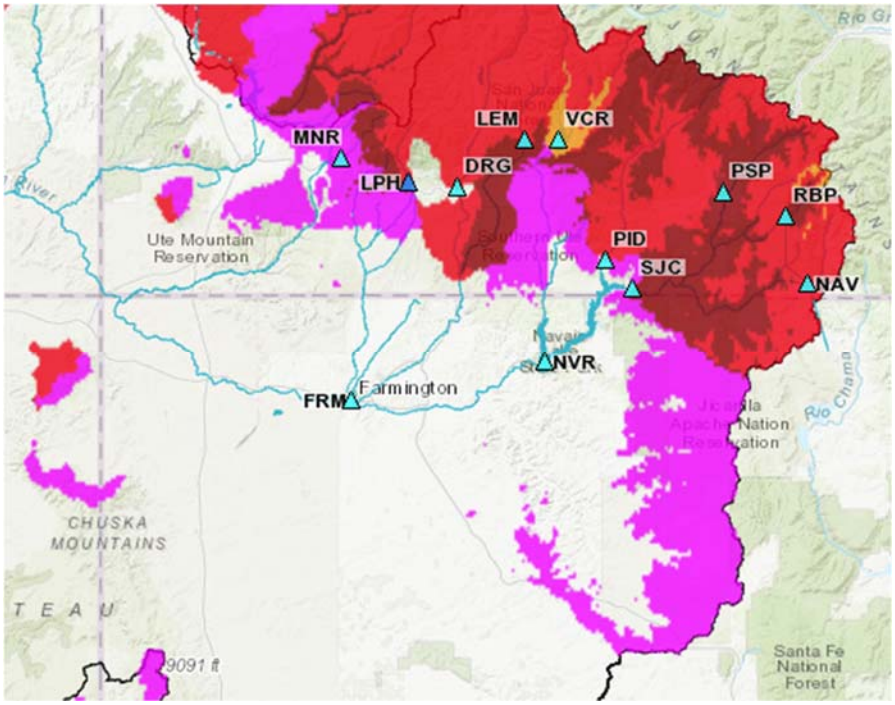
Above Navajo
Snowpack peak was
near 145% of normal

Animas Basin
Snowpack peak was near
155% of normal



What is driving the forecast: Soil Moisture Conditions in the Hydrologic Model

San Juan River Basin



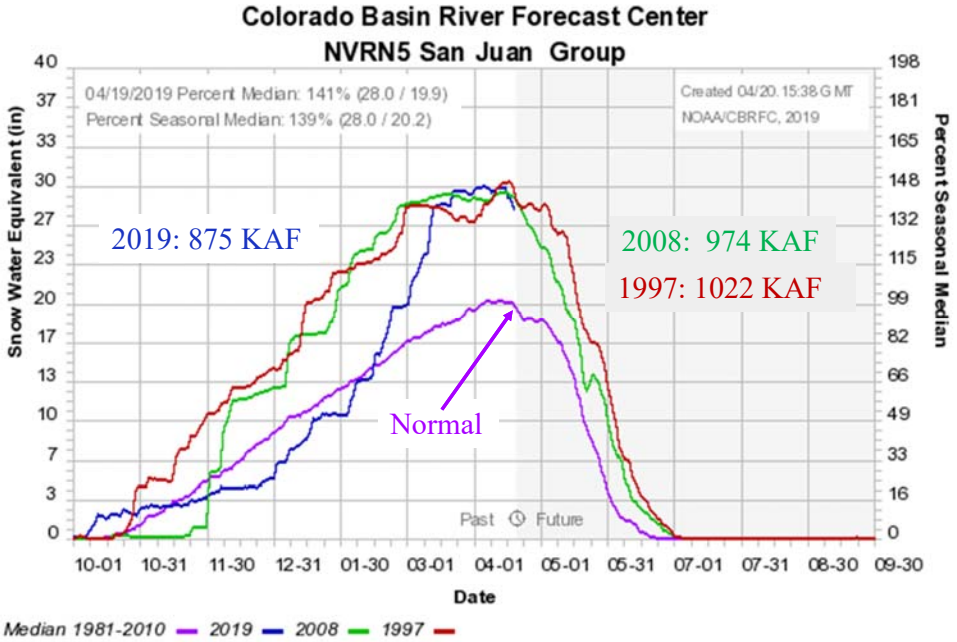
Percent of normal soil moisture

- 70-90%
- 50-70%
- 30-50%
- 0-30%

Soil moisture situation entering the winter season

Generally knocks 5% to 15% of average off the seasonal runoff volume

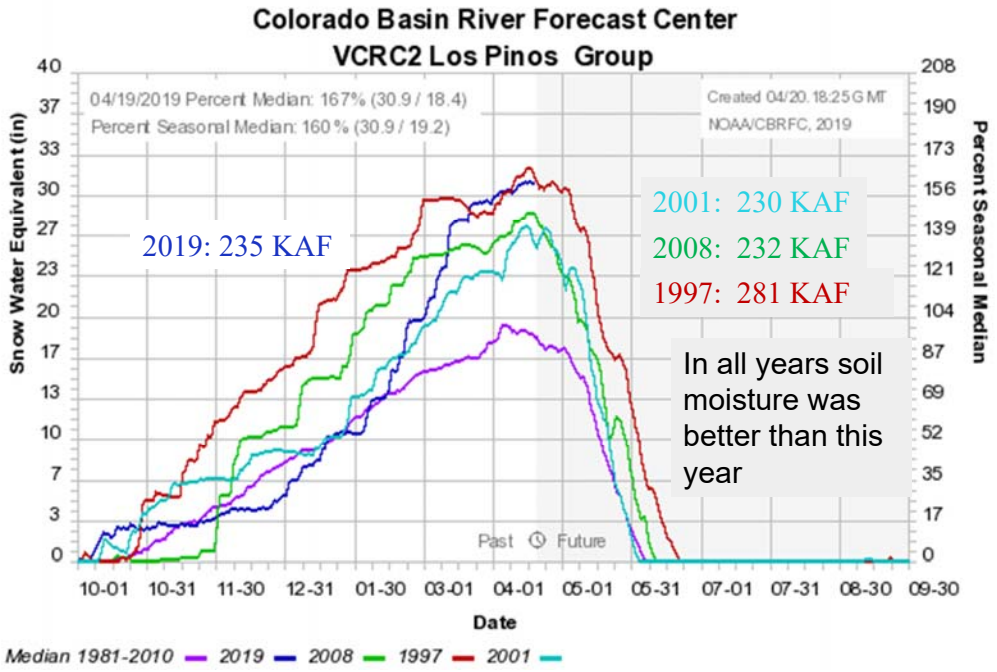
April-July runoff in similar snow years – Above Navajo Reservoir



1997 – Conditions were very wet through the spring and summer (3rd-4th wettest Apr-Jun)
2008 – Dry April, near to above average precipitation May & July, below average June

Soil Moisture conditions were better heading into winter in both years compared to this year

April-July runoff in similar snow years – Above Vallecito Reservoir

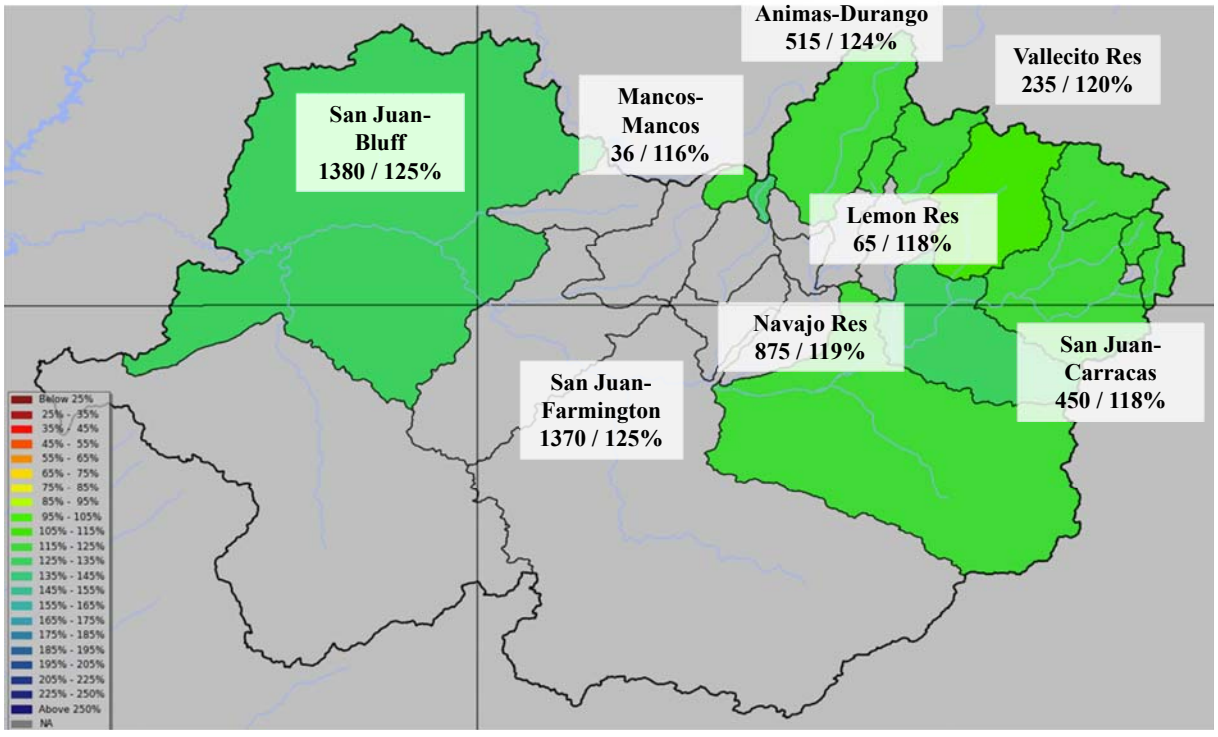


1997 – Conditions were very wet through the spring and summer (3rd-4th wettest Apr-Jun)
2001 – Near to above average April-May, July precipitation, below average in June
2008 – Dry April, near to above average precipitation May & July, below average June

Upper Colorado: San Juan Basin

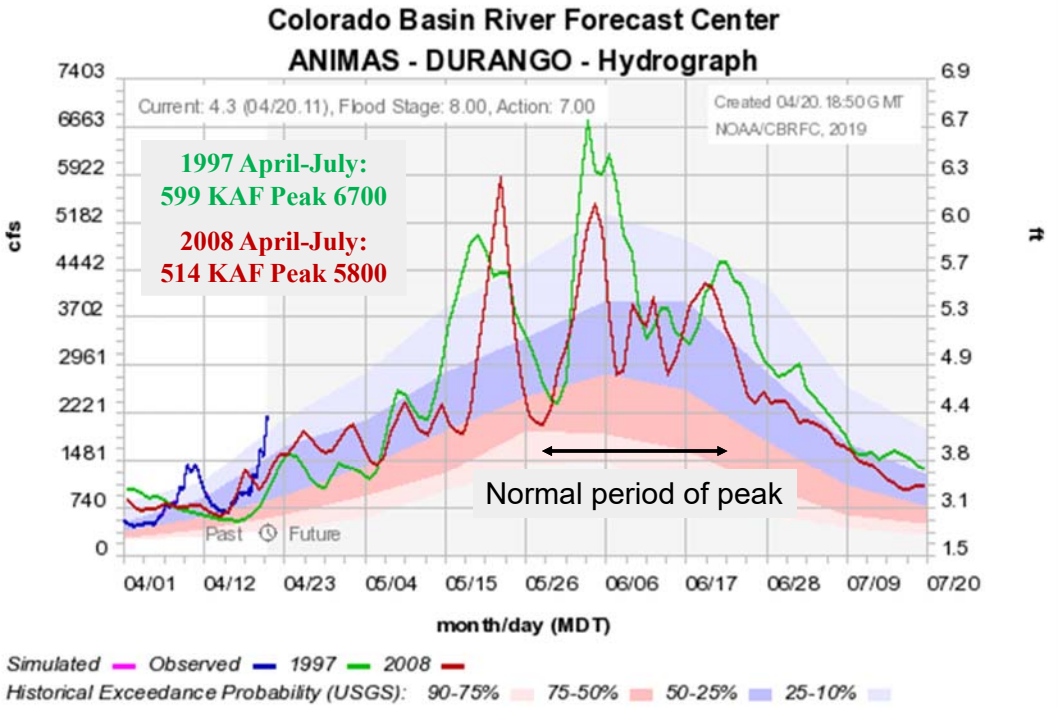
Most Recent April-July Runoff Volume Forecasts

Volume in 1000's acre-feet / Percent of 1981-2010 average



2019 Animas Durango Peak Flow: Current Forecast 5000 mean daily CFS (top 35% of record) (most probable forecast range 4500-5600 mean daily CFS)

- Future Weather (temperatures) will determine the pattern and magnitude of peak flows
- 1997 and 2008 had much above average snow and were similar to this year's snowpack.

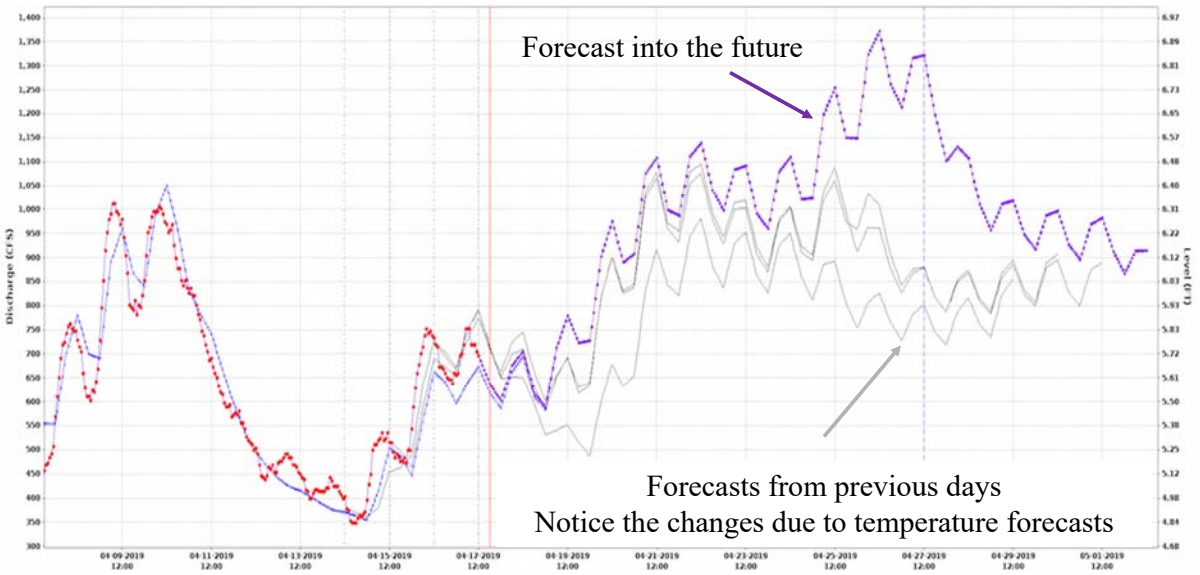


Limitations of The Forecast – Future Weather (temperatures)

As the temperature forecasts change, the streamflow forecast will change

Model is sensitive to as little as a 3-4 degree change in temperatures

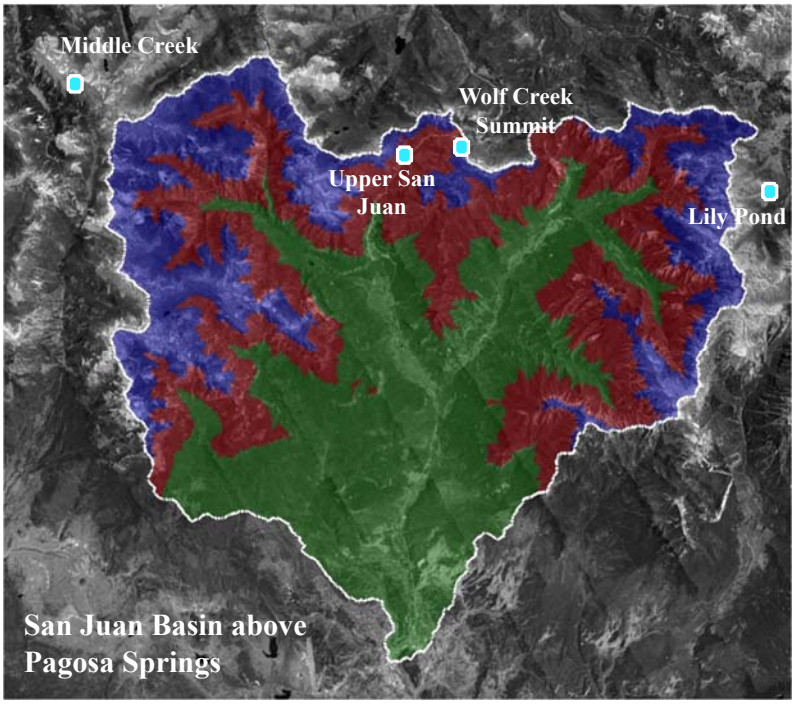
San Juan at Pagosa Springs



Limitations of The Forecast – Does the model have a good handle on current conditions?

Our model represents snow as an area value (by elevation zone)

Relationships are needed between SNOTEL data and area snow representation.
This relationship is created in the model calibration period (1981-2015).



Basin Zone Elevation Ranges (ft)

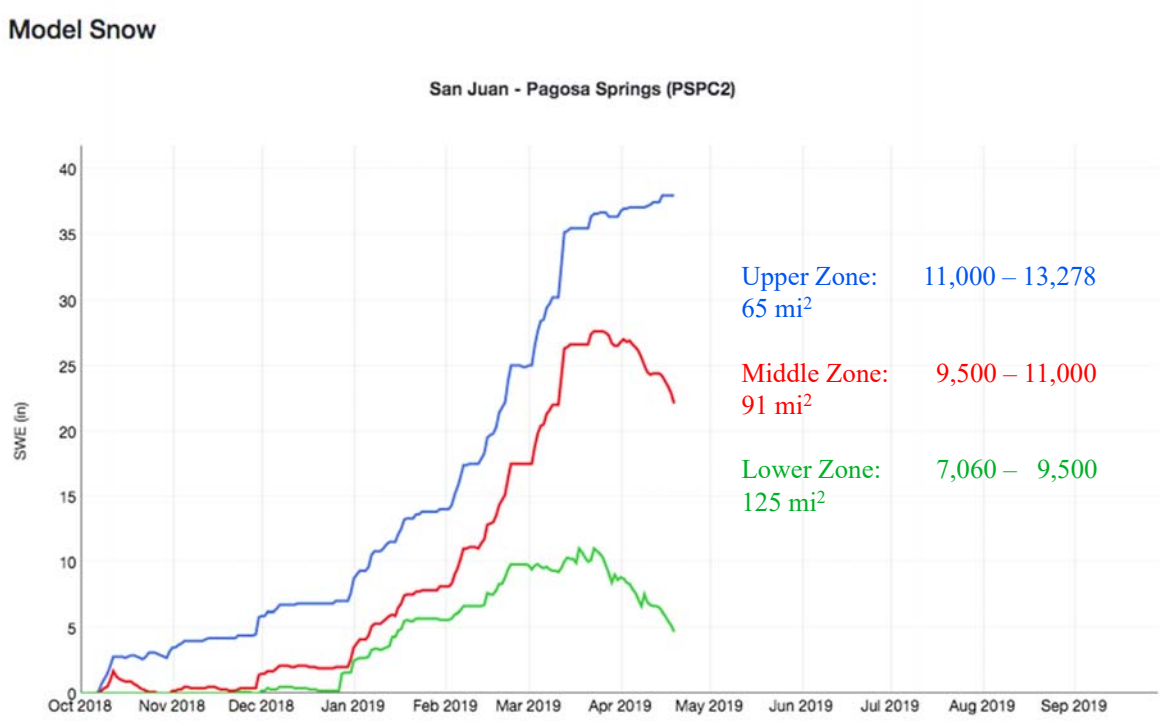
Upper Zone: 11,000 – 13,278
65 mi²

Middle Zone: 9,500 – 11,000
91 mi²

Lower Zone: 7,060 – 9,500
125 mi²

Limitations of The Forecast – Does the model have a good handle on current conditions?

The area snow representation in the model for 2019



Upper Zone: 11,000 – 13,278
65 mi²

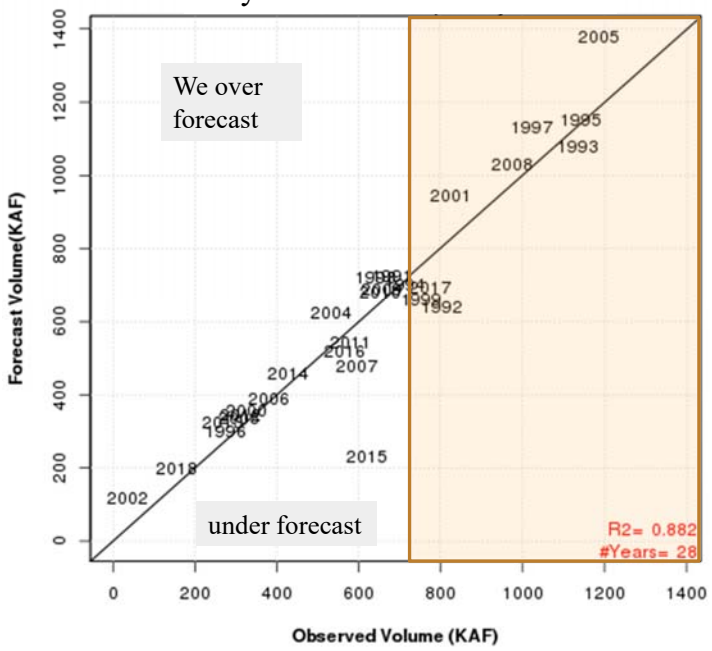
Middle Zone: 9,500 – 11,000
91 mi²

Lower Zone: 7,060 – 9,500
125 mi²

Verification of The April-July Navajo Inflow Forecast: Historical May 1st model forecast error is 15%

- In years with above average observed volumes:
  - There were a greater number of forecasts that were too high on May 1st
  - There were also a few years under-forecast (where observations were closer to average)

May 1st Forecast 1991-2018

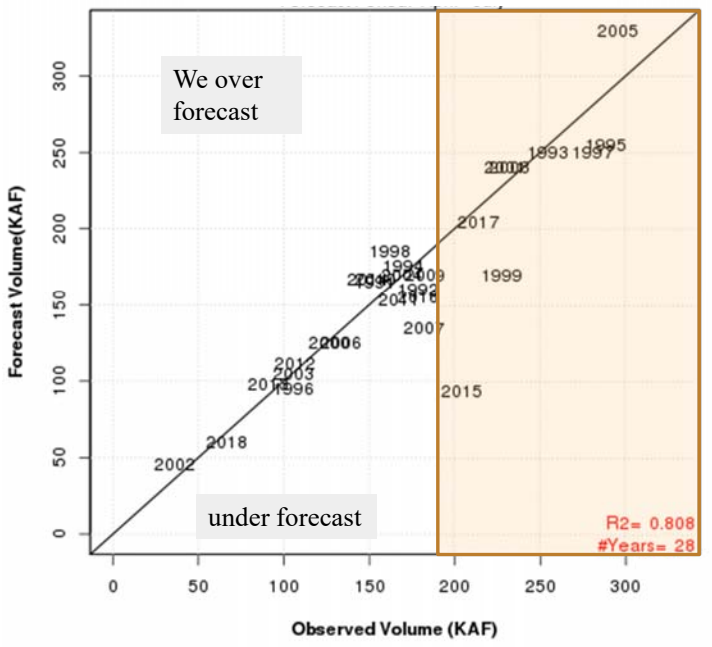


Years with above average observed volumes (shaded area)

Verification of The April-July Vallecito Inflow Forecast: Historical May 1st model forecast error is 13%

- In years with above average observed volumes:
  - Generally near or two low with forecasts on May 1st.

May 1st Forecast 1991-2018



Years with above average observed volumes (shaded area)

Going Forward – Parting Thoughts

- We're going from such a low year to such a high year. While not out of the realm of possibilities (1972 to 1973, 1974 to 1975, 1996 to 1997) the 2018 inflow to Navajo was the 3rd lowest on record. It's challenging to know just how much impact such a dry year will have on this years runoff.

- Timing and rate of snowmelt will impact peak flow levels and volumes. Heavier snowpack will typically melt out later and rapid melt may overcome some soil moisture deficiencies.

- From this point forward forecasters are very actively interacting with the model on a daily basis to adjust simulated flow to match observed flows. Many things will impact snowmelt but usually we begin to get a handle on how well the area snow representation was handled in the model. So far so good, models have been tracking fairly well.

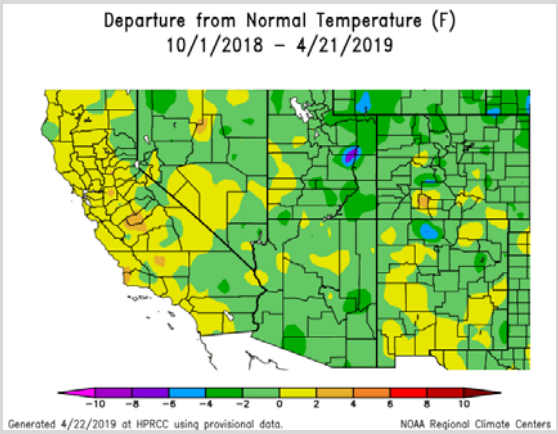
- Communication between the RFC, Reclamation, and others is frequent throughout the spring. A good relationship exists in order to communicate forecast uncertainties and changing hydrologic conditions.

Weather Outlook
April 2019

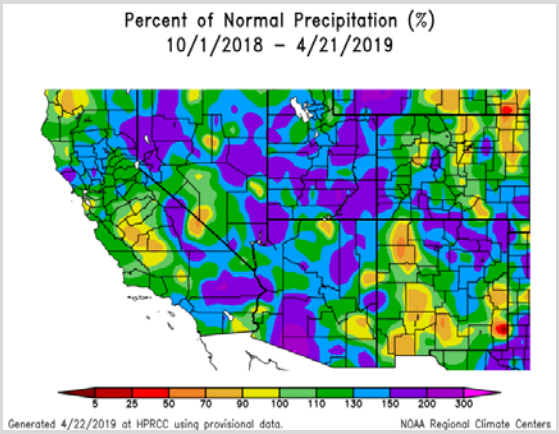
Aldis Strautins
National Weather Service
Grand Junction, CO
http://www.weather.gov/gjt

The Past
April 2019

Temperature
Departure from normal



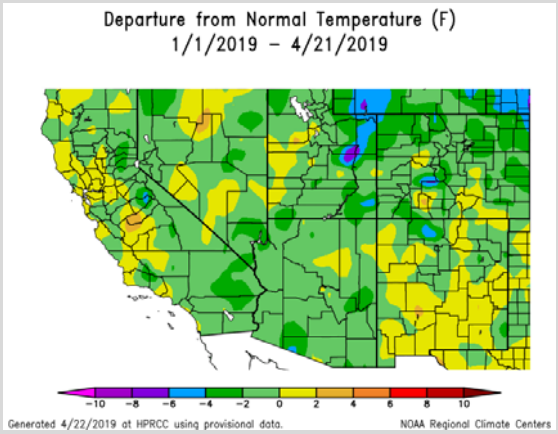
Precipitation
% of normal



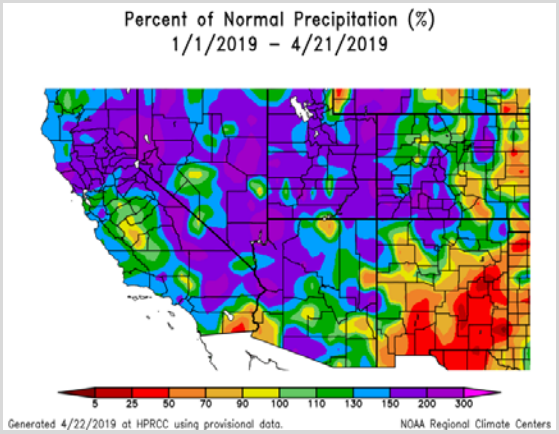
Water Year 2019

The Past
April 2019

Temperature
Departure from normal



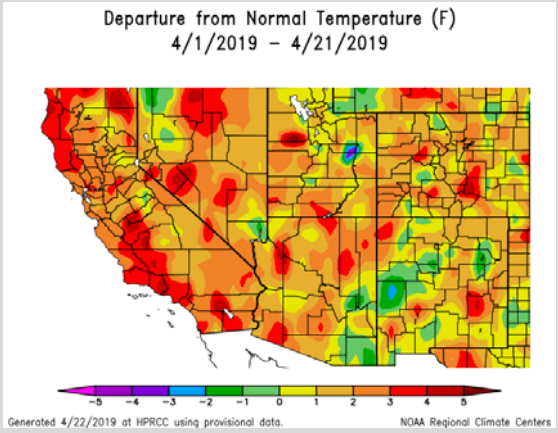
Precipitation
% of normal



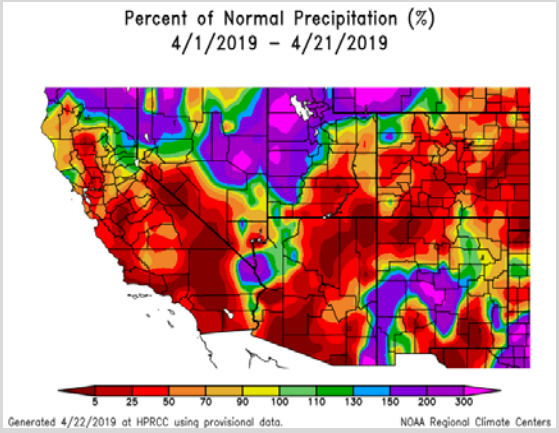
From January 1, 2019

The Past
April 2019

Temperature
Departure from normal



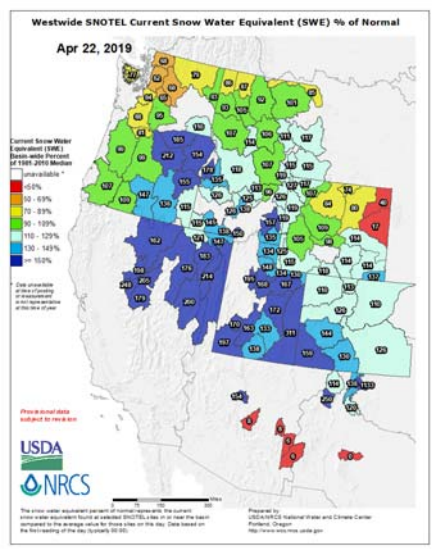
Precipitation
% of normal



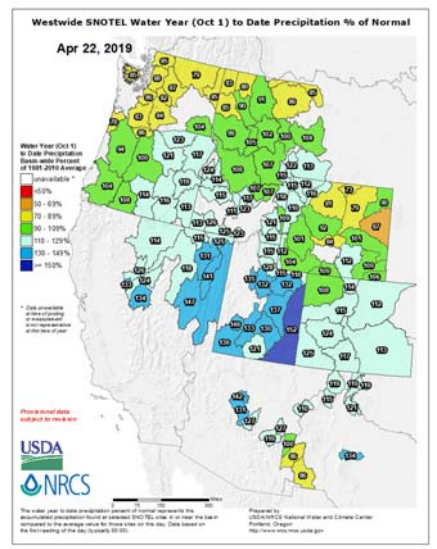
April 1-22, 2019

Snotel
April 22, 2019

SWE

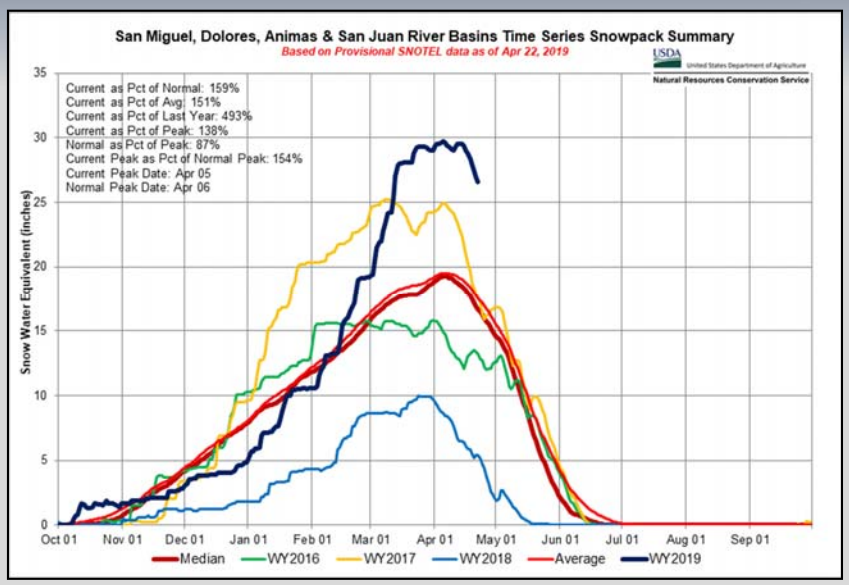


Precipitation



SNOTEL - Percent of Normal
Water Year 2019

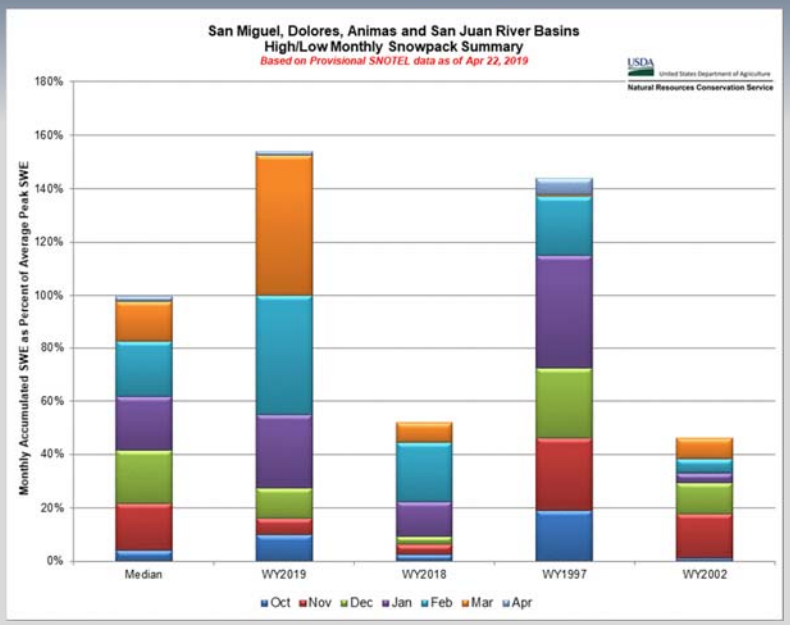
Snow
April 22, 2019



SNOTEL Snow Water Equivalent – NRCS
Southwestern Colorado

Snow
April 22, 2019

As of April 22: 159% of normal and 154% of peak median

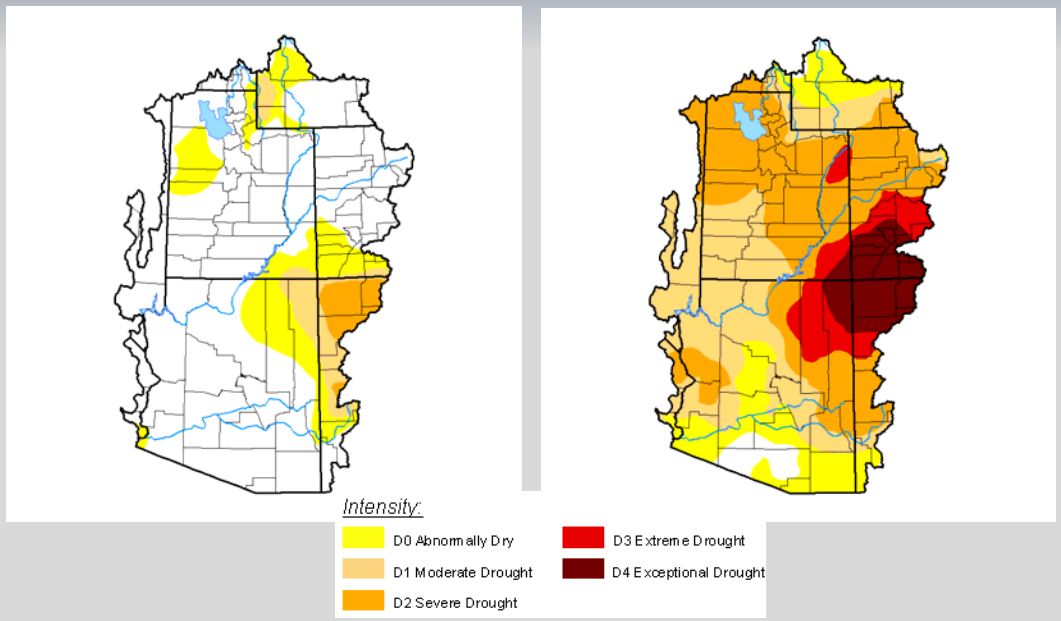


SNOTEL Snow Water Equivalent – NRCS Southwestern Colorado

Drought
April 2019

April 16, 2019

January 1, 2019

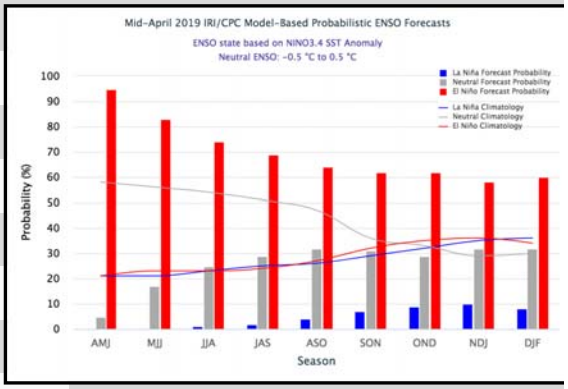


Drought – Monitor

ENSO
April 2019

CPC/IRI Early-Month Consensus ENSO Forecast Probabilities
(using NWS CPC classification system)

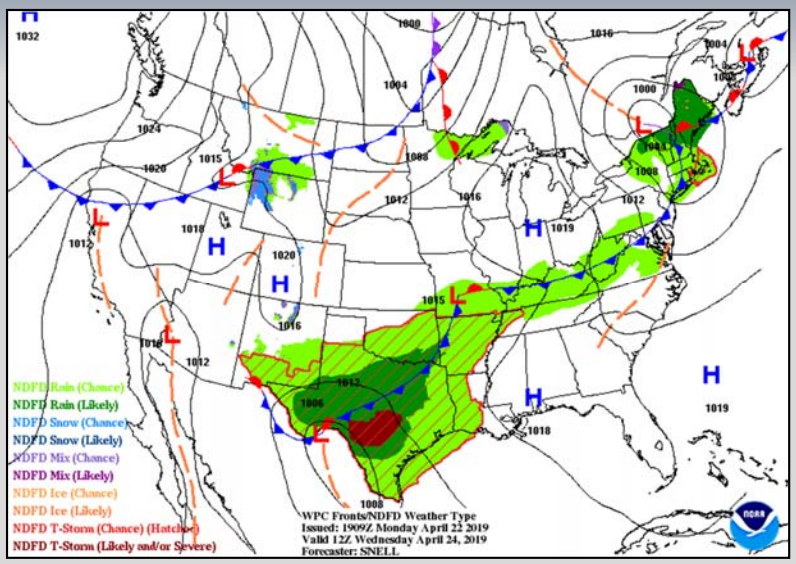
Season	La Niña	Neutral	El Niño
MAM 2019	0%	6%	94%
AMJ 2019	0%	15%	85%
MJJ 2019	1%	25%	74%
JJA 2019	2%	32%	66%
JAS 2019	5%	35%	60%
ASO 2019	6%	39%	55%
SON 2019	8%	39%	53%
OND 2019	10%	39%	51%
NDJ 2019	11%	38%	51%



ENSO – Outlook

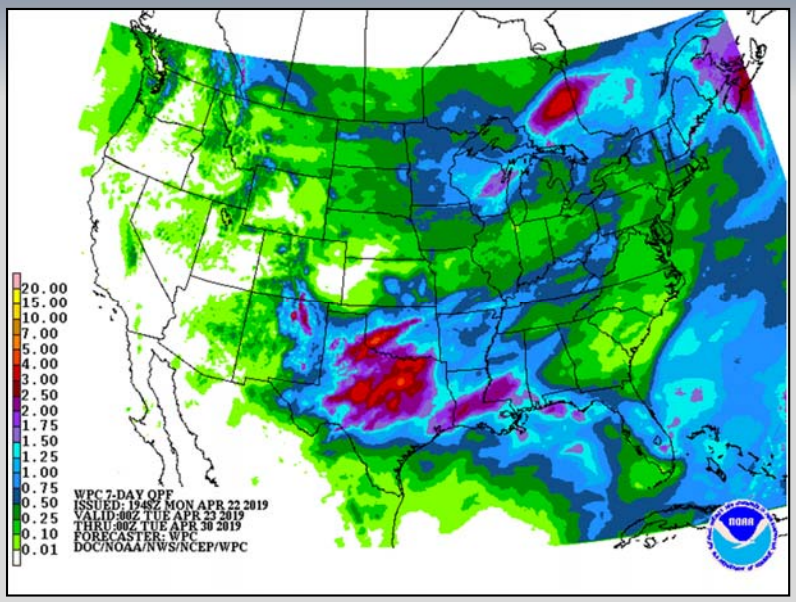
ENSO- Neutral moving to El Nino

Weather Outlook
April 2019



Forecast - Wednesday

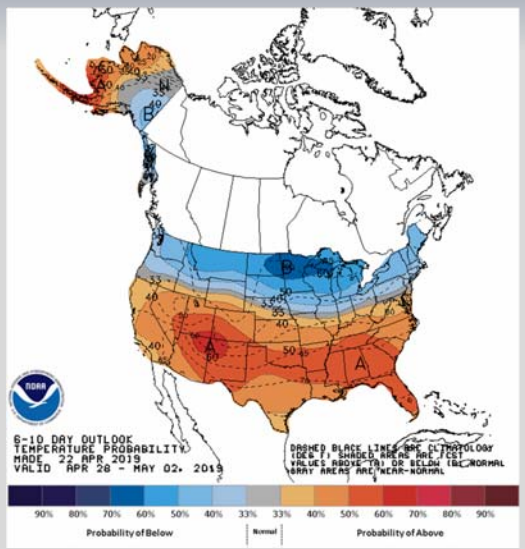
Weather Outlook
April 2019



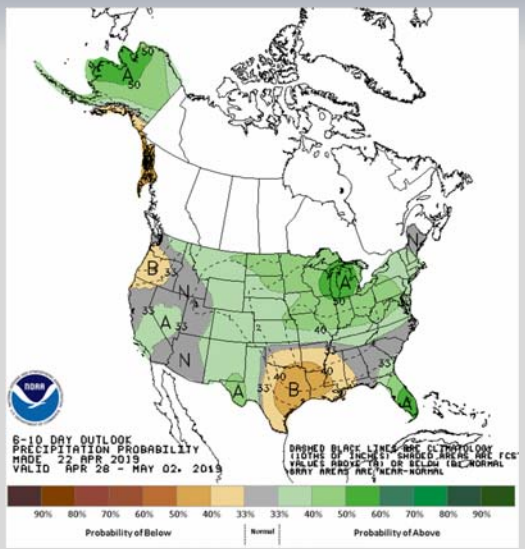
WPC 7-Day Precipitation

Weather Outlook
April 2019

Temperature



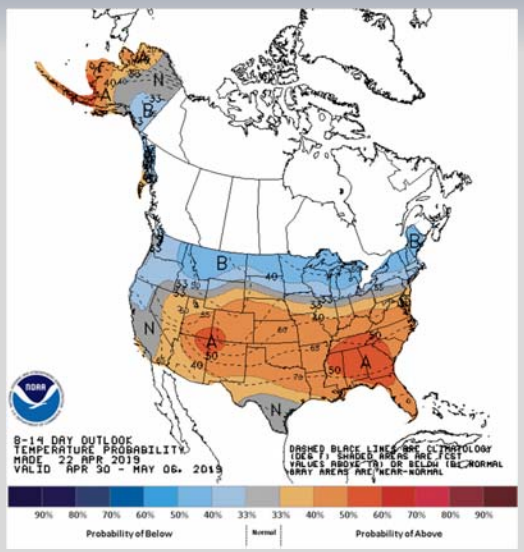
Precipitation



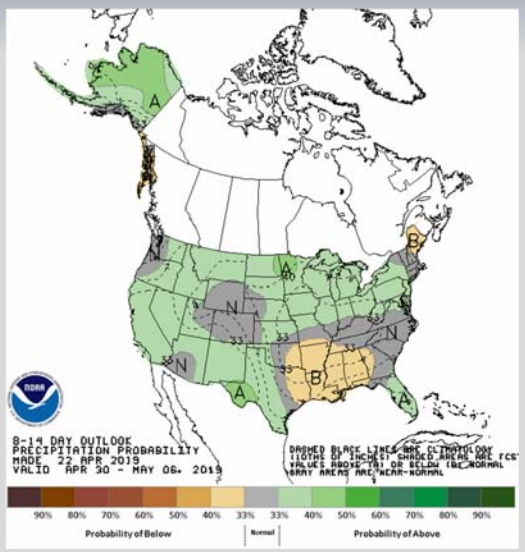
6-10 Day Outlook
Apr 28 - May 02

Weather Outlook
April 2019

Temperature



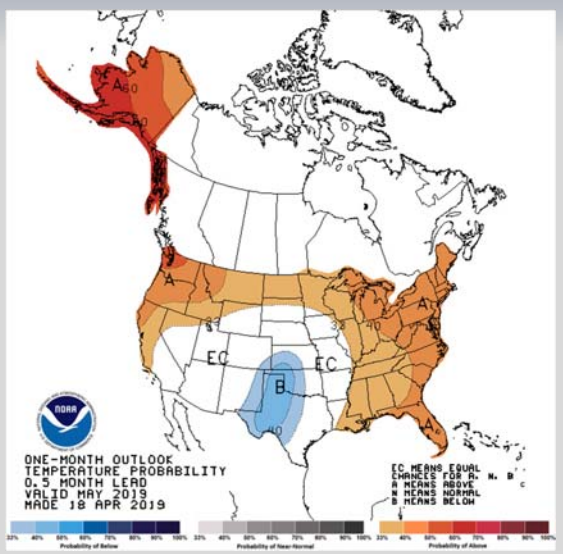
Precipitation



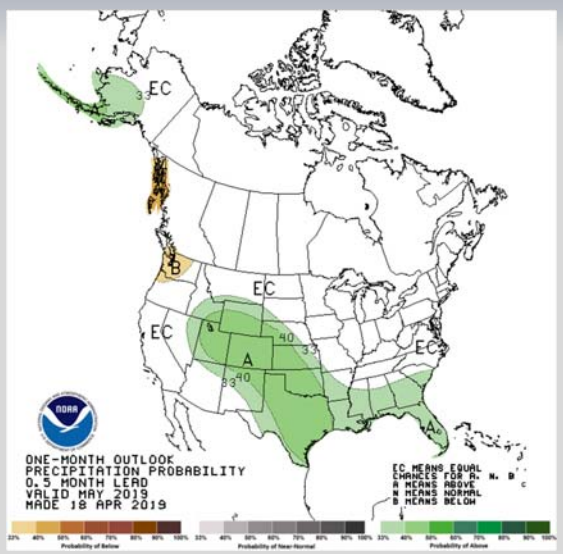
8-14 Day Outlook
Apr 30 - May 06

Weather Outlook
April 2019

Temperature



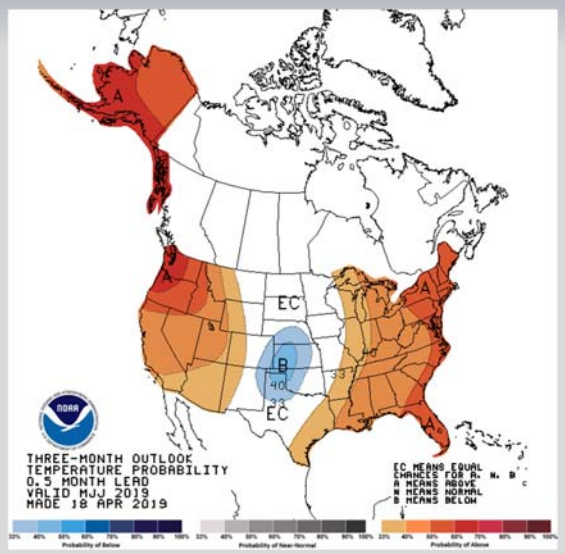
Precipitation



May – Outlook

Weather Outlook
April 2019

Temperature



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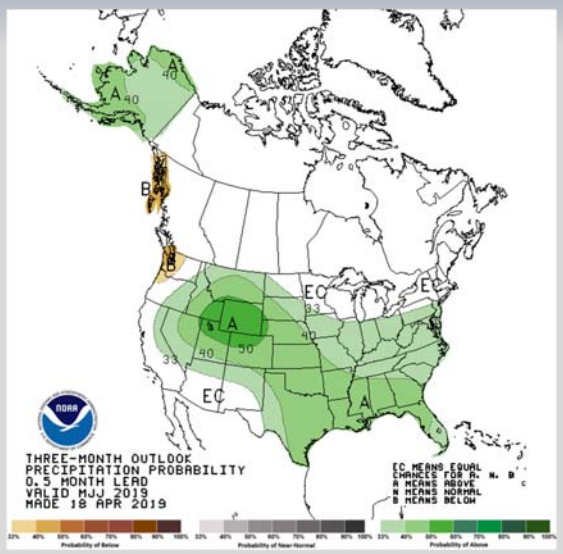
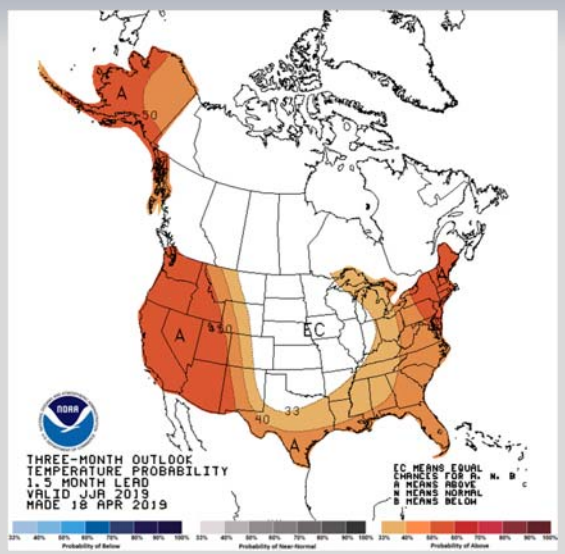


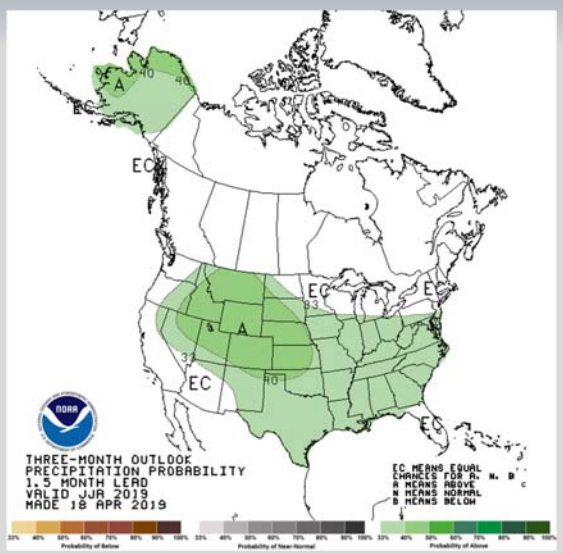
May/Jun/Jul – Outlook

Weather Outlook
April 2019

Temperature



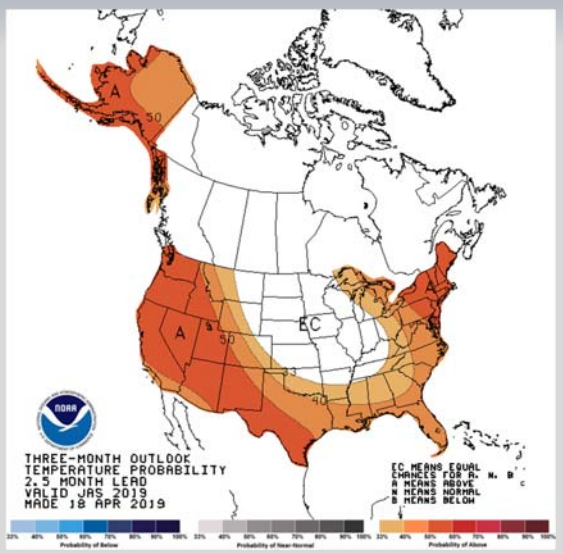
Precipitation



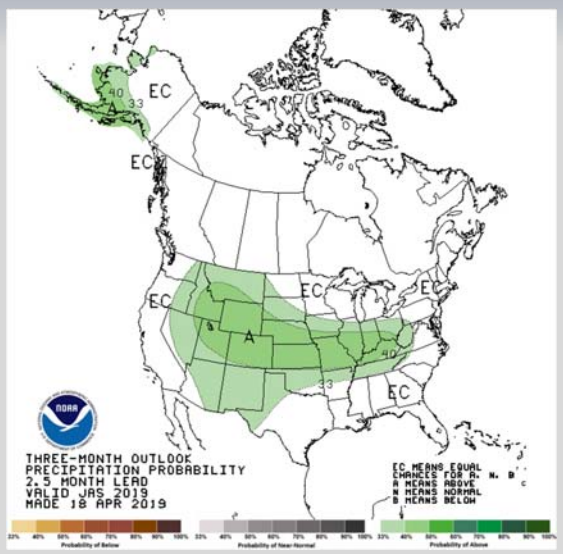
Jun/Jul/Aug – Outlook

Weather Outlook
April 2019

Temperature



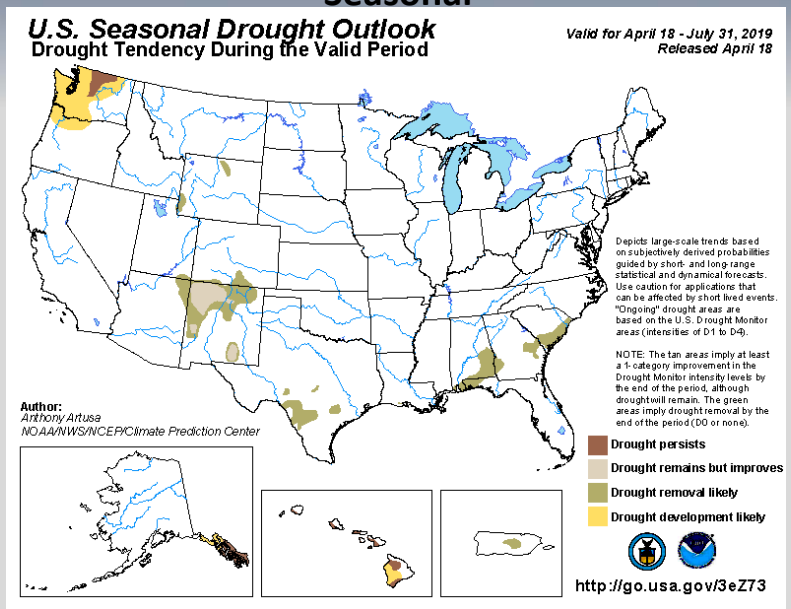
Precipitation



Jul/Aug/Sep – Outlook

Weather Outlook
April 2019

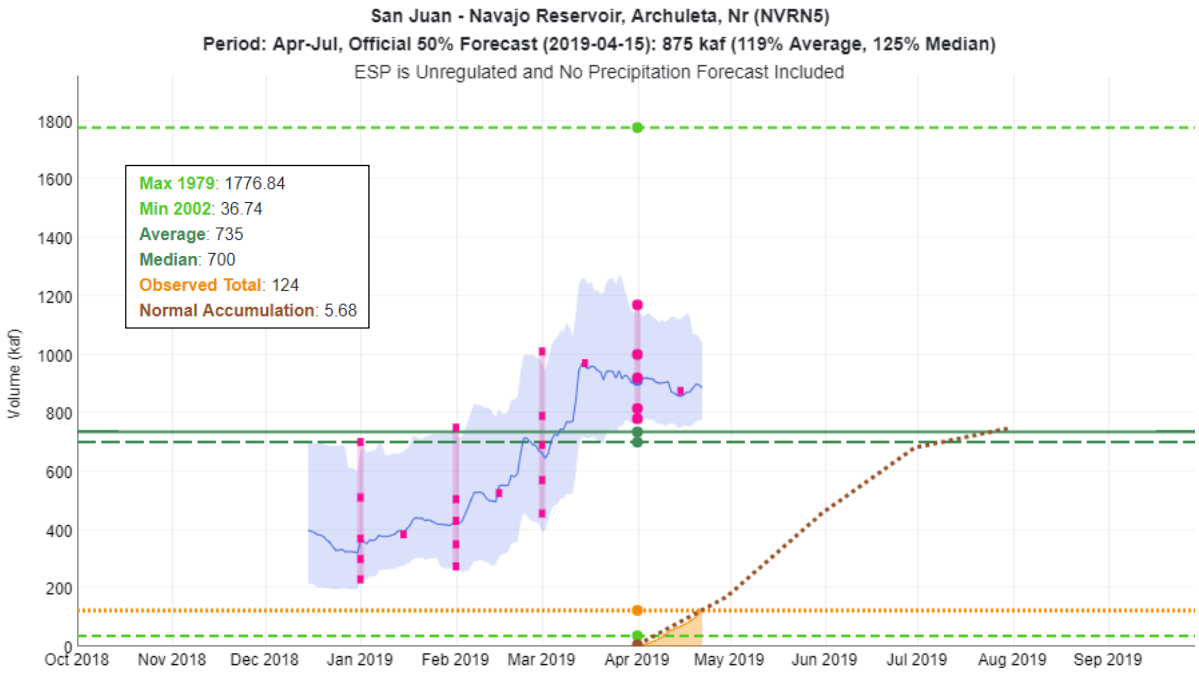
Seasonal



Drought– Outlook

Latest Forecast

Water Supply Forecast

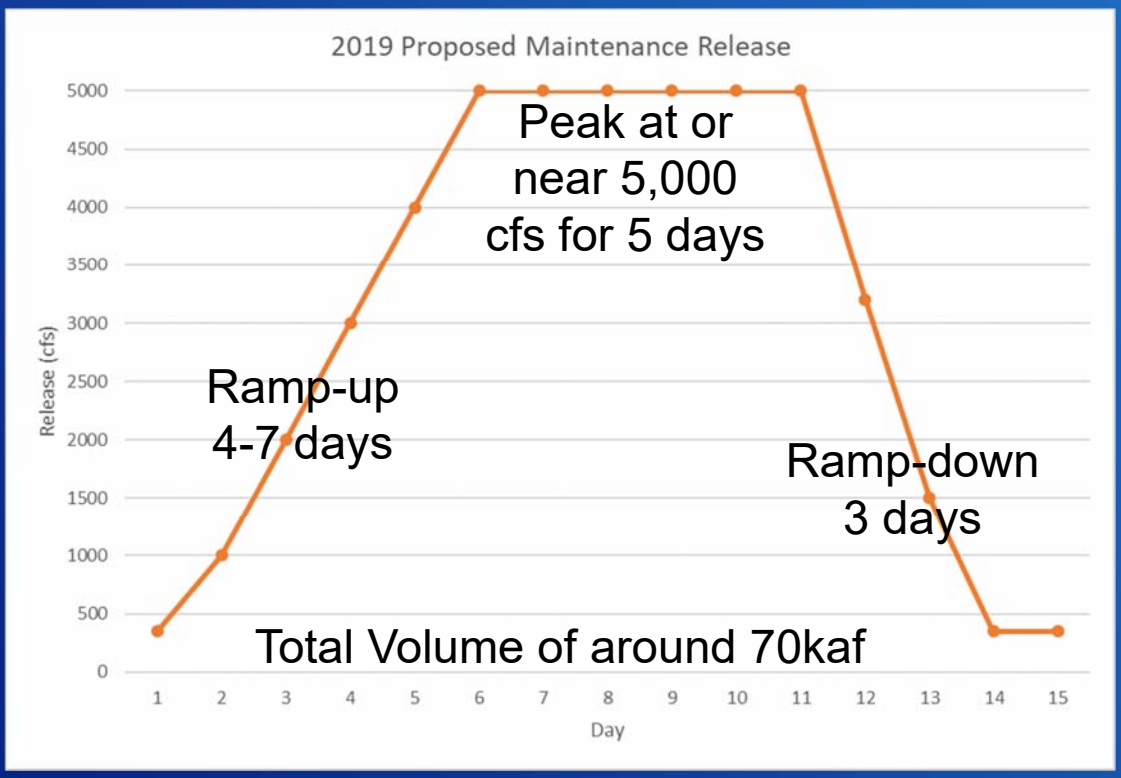


WATER YEAR 2019 PROPOSED OPERATIONS SUMMARY

Based on mid-April CBRFC forecast

- Reservoir recovery with releases made to target minimum baseflows in the critical habitat reach
- Short duration maintenance release to be timed with the peak of the Animas River

RECLAMATION



Peak will be measured at the USGS Archuleta gage and will be coordinated with SJOEM

RECLAMATION

WHY?

- As part of a strategy to improve and maintain existing channel capacity with the goal of reaching 5,000 cfs release
- Remove and disturb sediment and debris before it has a chance to establish vegetation
- Push back channel bank encroachment on a consistent basis

RECLAMATION

WHY?

"…the magnitude of the peak river flow is more important than the duration. The release of high flows for even one or two weeks will help maintain the flow conveyance capacity of the downstream channel."

-San Juan River Channel Processes and Flow Conveyance below Navajo Dam, NM. U.S. Department of Interior Technical Report No. SRH-2016-33 September 2016

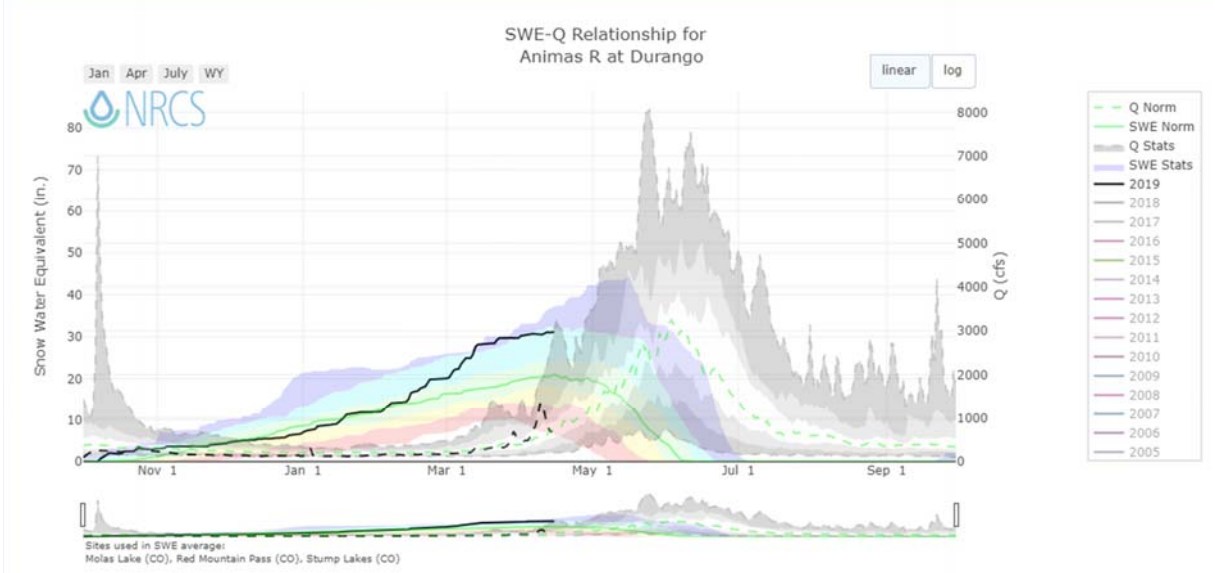
RECLAMATION

WHEN?

- For maximum benefit, the release will be timed to coincide with the peak on the Animas River.
- Daily communication with weather and flow forecasters throughout spring will help determine the peak timing.
- Call or email any time for latest updates.

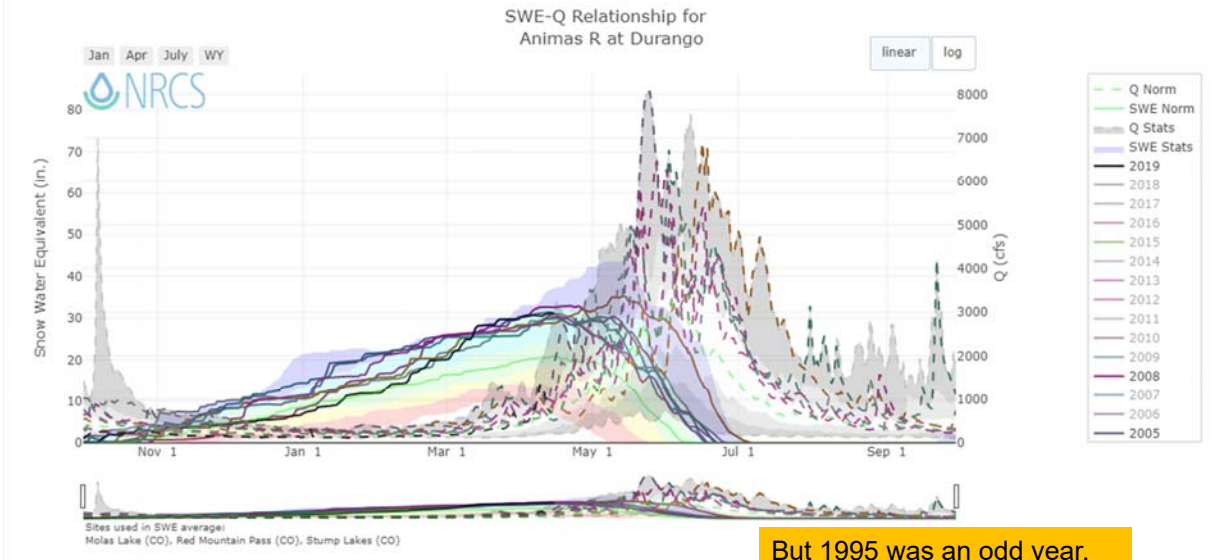
RECLAMATION

WHEN?



RECLAMATION

WHEN?



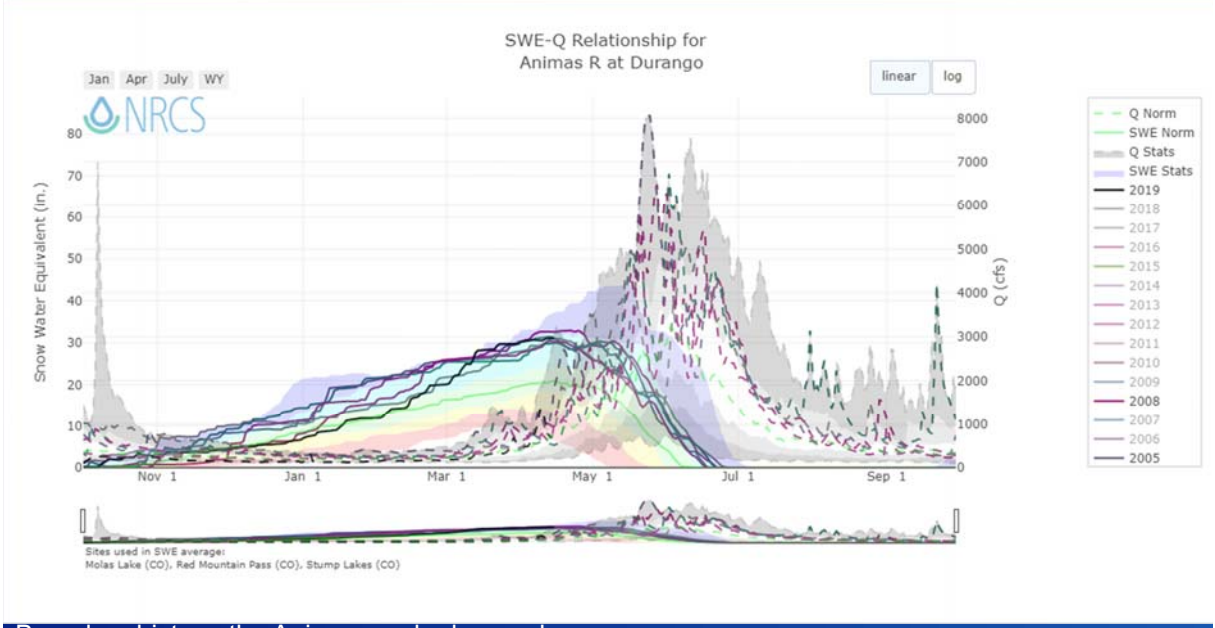
Based on history, the Animas peaked as early as May 21st, as late as June 18th with an average date of June 1st.

Years: 2008,2005,1997,1995,1993,1987

But 1995 was an odd year, and had a lot of very late season snow. Unless we see that coming, I'm going to take it out.

RECLAMATION

WHEN?



Based on history, the Animas peaked as early as May 21st, as late as June 7th with an average date of May 28th.

Years: 2008,2005,1997,1993,1987

RECLAMATION

WHEN?

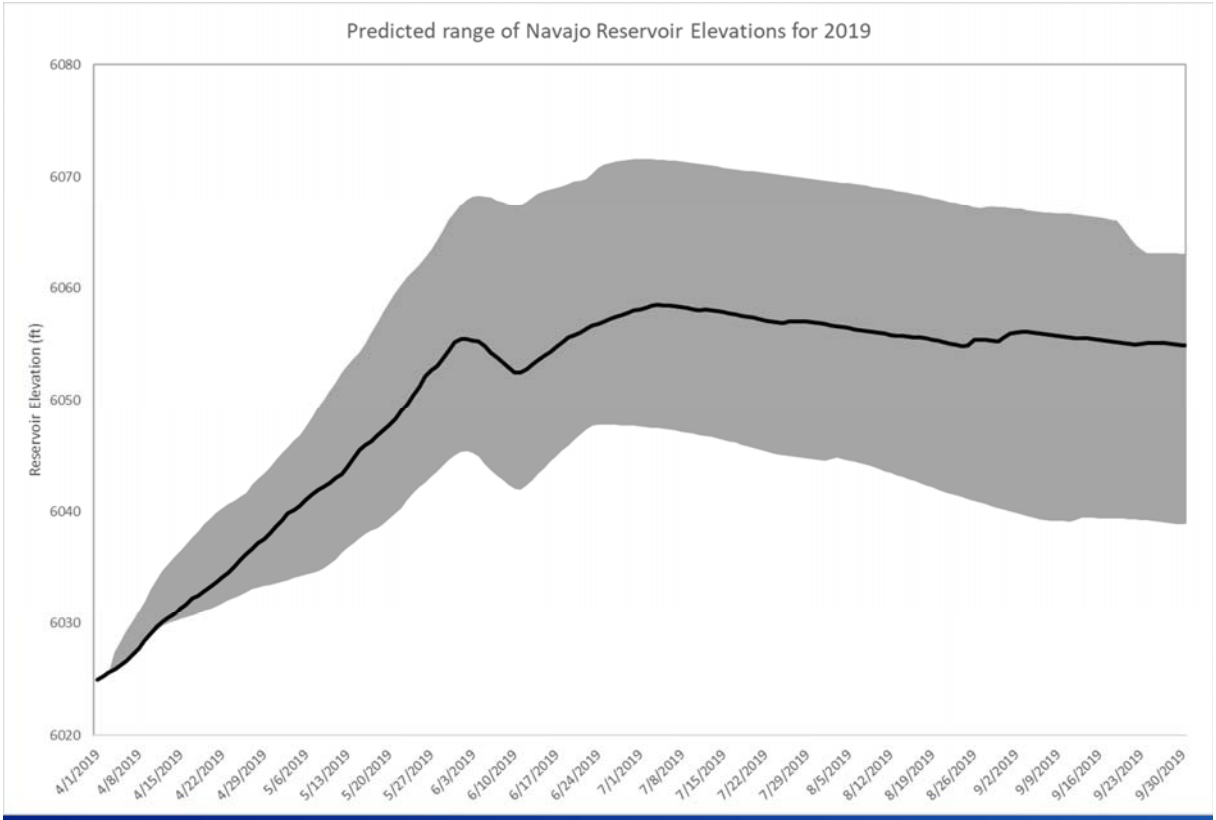
Based on history, we can guess that the peak will occur around May 28-ish. This puts our ramp up beginning the previous week around May 22-ish.

THIS IS A GUESS AND IS LIKELY TO CHANGE

It could be earlier! Look for a notice!

Call or email any time for an update
sbehery@usbr.gov or 970-385-6560

RECLAMATION



RECLAMATION

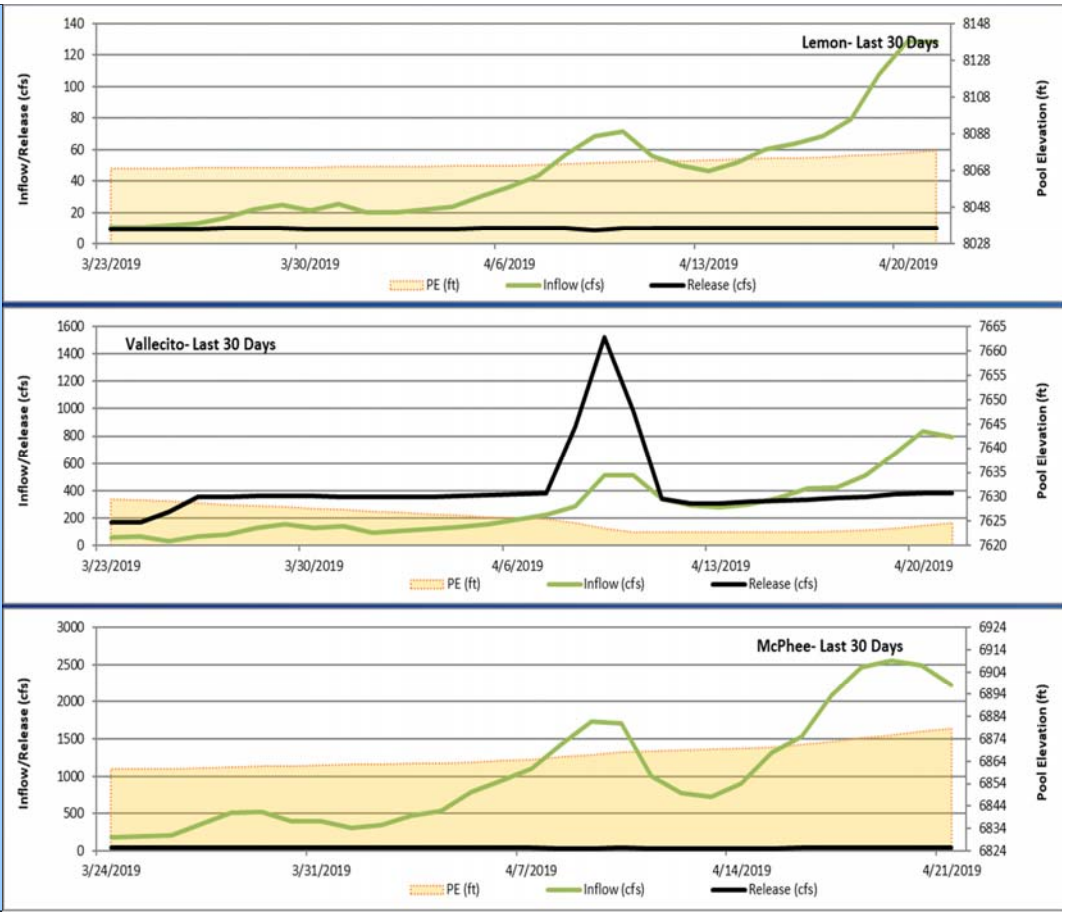
Monitoring

Sediment monitoring in the channel is being conducted before and after the release.

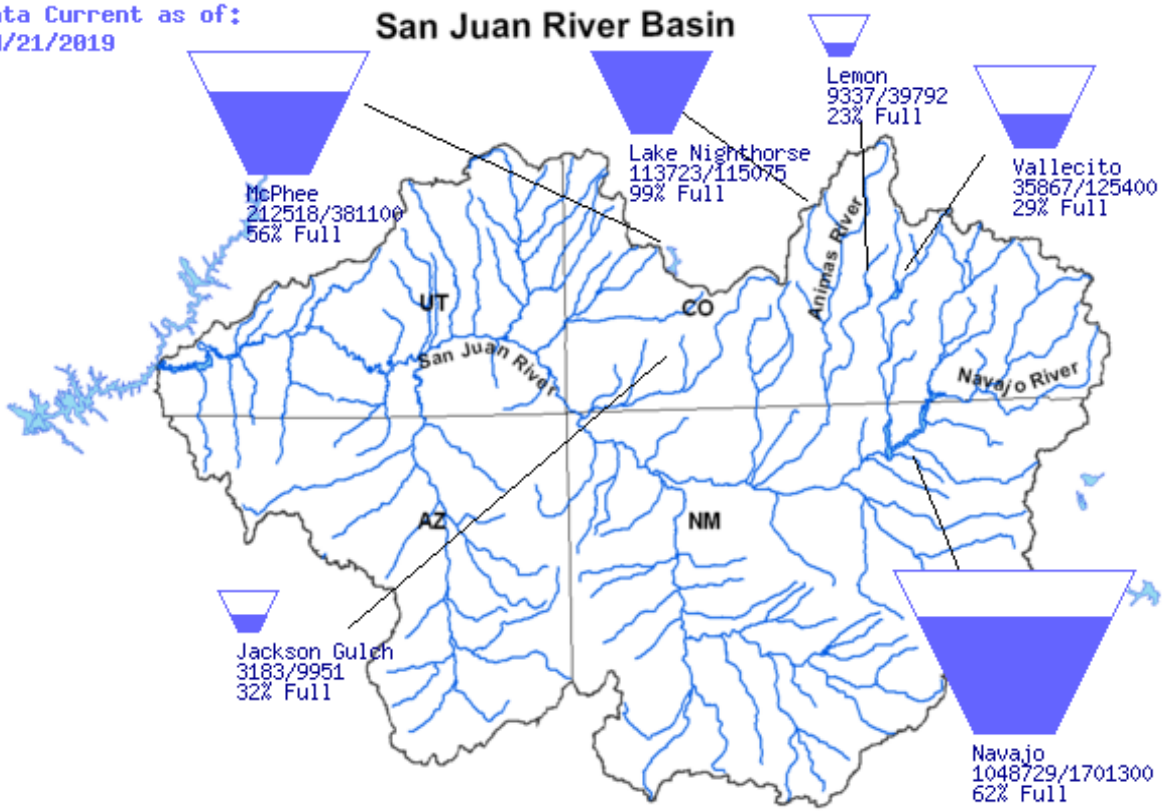
RECLAMATION

Major San Juan River Basin Reservoirs

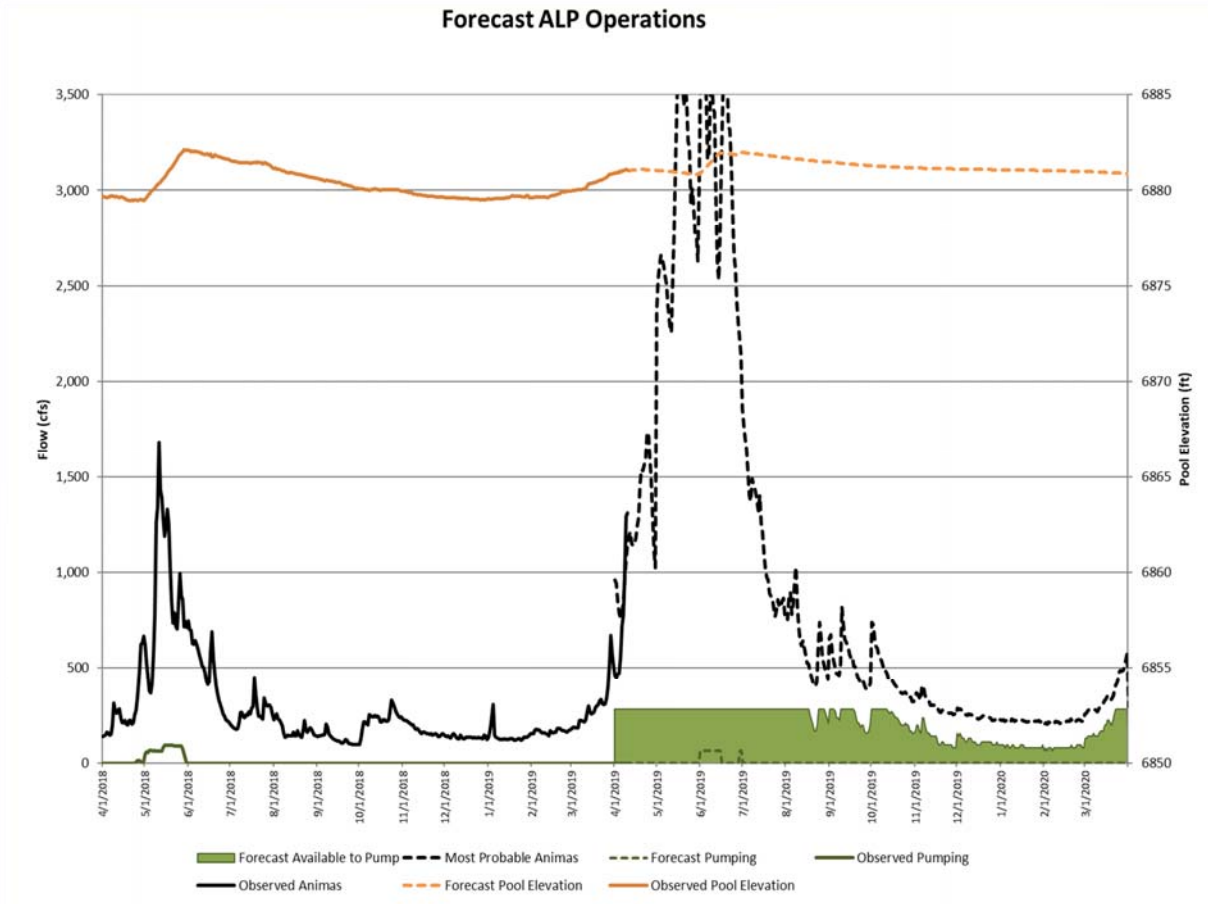
(4/22/2019)



Data Current as of:
04/21/2019



RECLAMATION



Summary

- Peak snow water equivalent over Navajo was 29.9 inches (148% of median peak) on April 5th.
- Current Most Probable forecast into Navajo is 875kaf
- A short maintenance release is proposed for spring 2019.
- End of water year reservoir elevation is forecast to be around 6055 ft
- Releases will likely range between 300 and 800 cfs for the remainder of the water year, that necessary to maintain target baseflow in the critical habitat reach
- Next meeting Tuesday, August 20th, 2019

RECLAMATION

How You Can Access Information

Bureau of Reclamation
www.usbr.gov/uc

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

Colorado Basin River Forecast Center
www.cbrfc.noaa.gov

RECLAMATION

For Operations Updates

- EMAIL UPDATES
  - to be added, email rswickard@usbr.gov
- WEBSITE
  - Navajo Reservoir: http://www.usbr.gov/uc/wcao/water/rsvrs/notice/nav_rel.html
  - All UC Operations https://www.usbr.gov/uc/water/index.html
- PHONE
  - Susan Behery 970-385-6560
  - WCAO Main Office 970-385-6500

RECLAMATION

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Ruth Swickard
970-385-6523 rswickard@usbr.gov

RECLAMATION