

Colorado Basin River Forecast Center

Carpe Diem West
11th Healthy Headwaters
Leadership Convening

June 3, 2016
Salt Lake City, UT

Paul Miller, Service Coordination Hydrologist
Michelle Stokes, Hydrologist in Charge

Overview

- Who are we? What do we do?
- Water in the Upper Basin: Now and the Next 50 Years
 - Climate change and impacts
 - Challenges now and in the future

Who We Impact



30 million people

4 million irrigated acres

4,200 MW Hydropower

15 Native American Tribes

16 National Lands

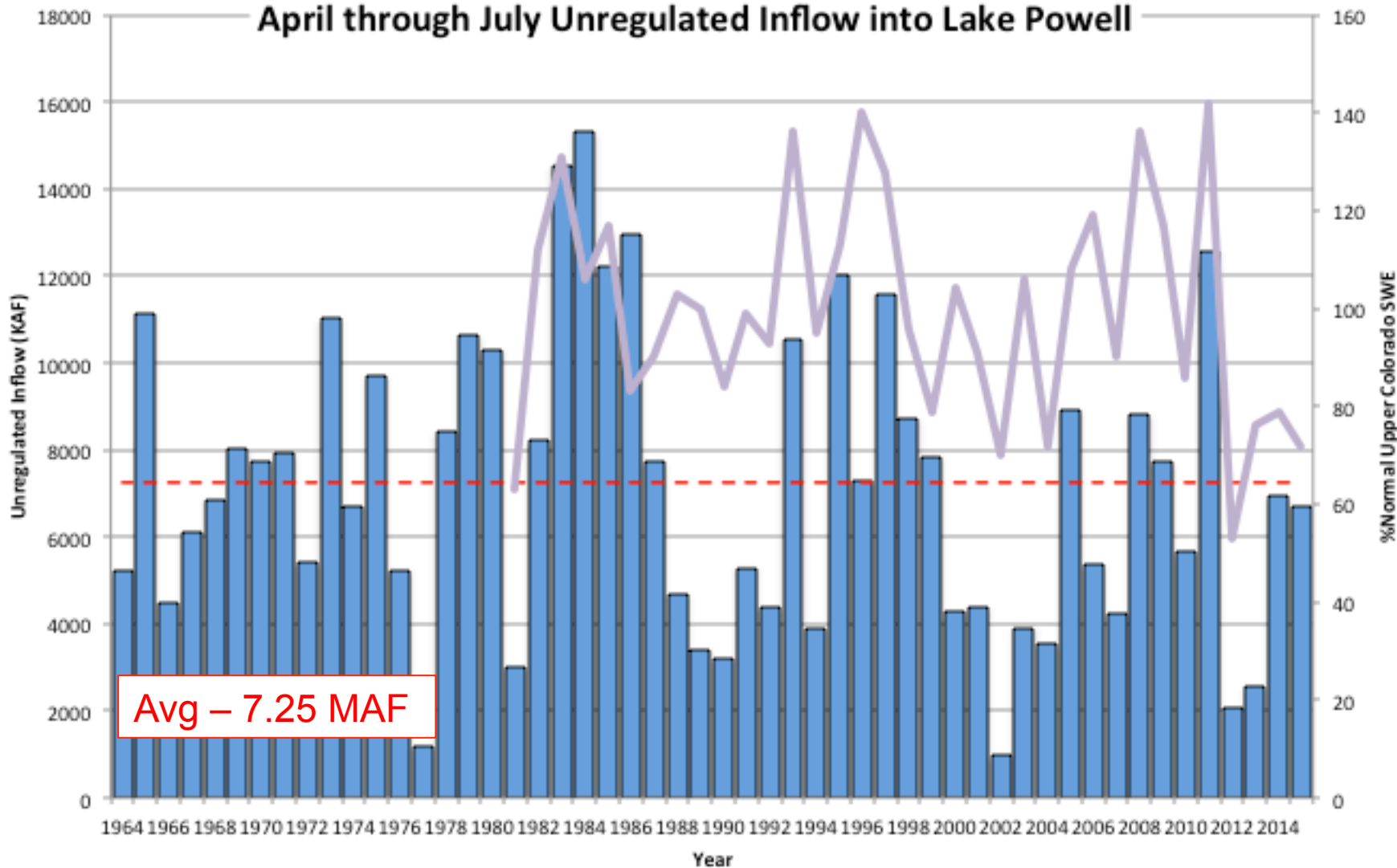
2 Nations

About 15 MAF annually

About 60 MAF worth of storage

Hydroclimatic Variability over the Colorado River Basin

April through July Unregulated Inflow into Lake Powell



Avg – 7.25 MAF



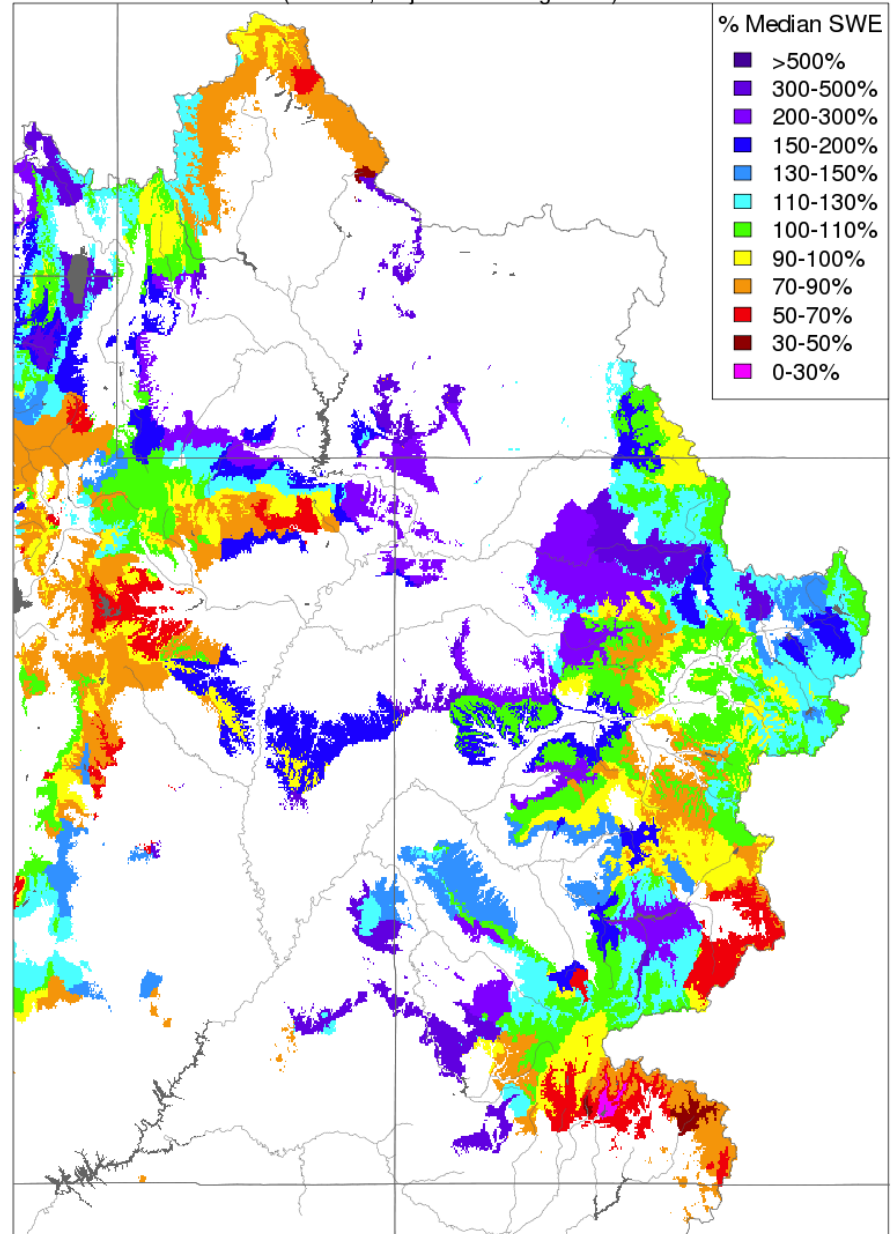
Contributing Areas

Snowpack

- Possibly our most important, and variable, reservoir
- Reliance on our model, informed by gage information
- Sparse information at high elevations
- Dust on Snow
- We believe most of the flow comes from about 23% of the UC area

Snow Conditions - April 01 2016

(Modeled, Major Contributing Areas)



Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov



So. Much. Data.

Gage Networks

- USGS, and others, for Q
- NRCS SNOTEL
- Precip and Temp

Radar Information

Remotely Sensed Data

- Snow Cover
- Dust on Snow

Forecasted Data

- 5-Day QPF
- 10-Day QTF

Regulation

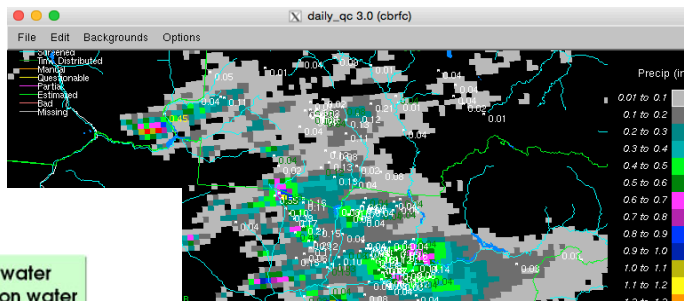
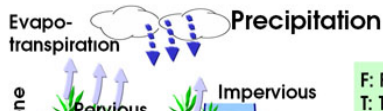
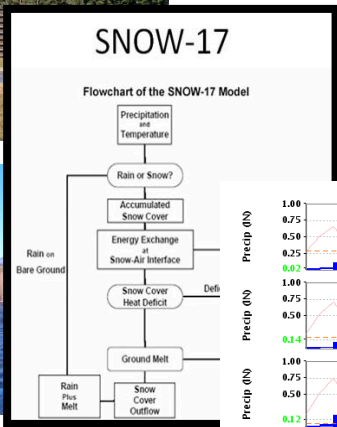
- Diversions
- Dam Operations

Ensemble Information

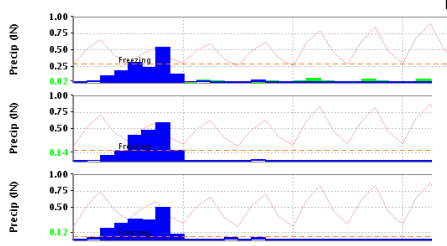
- 1981-2010
- Adding more years soon!



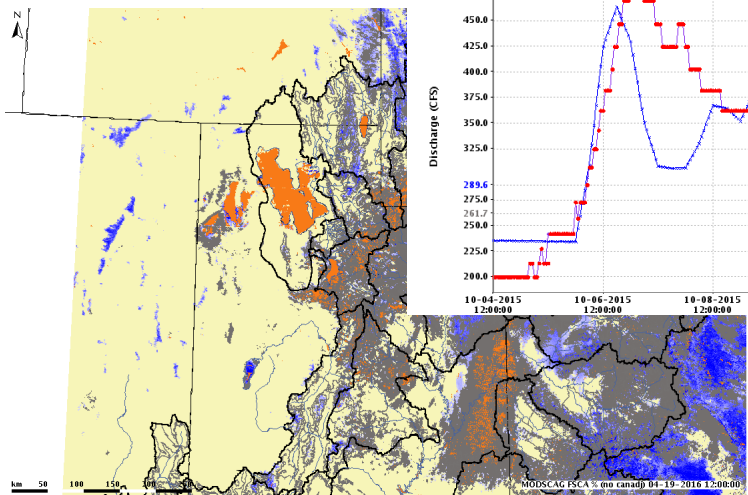
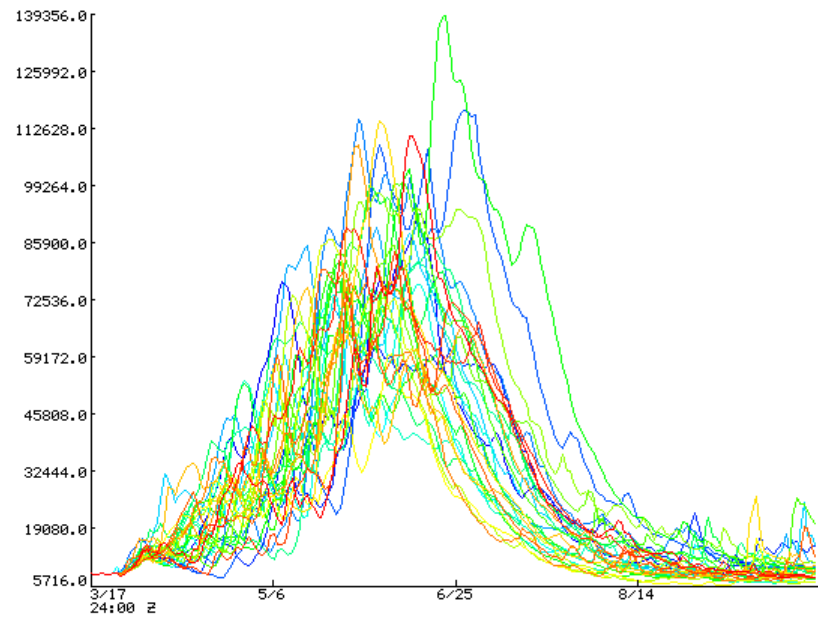
Our Forecasting Process



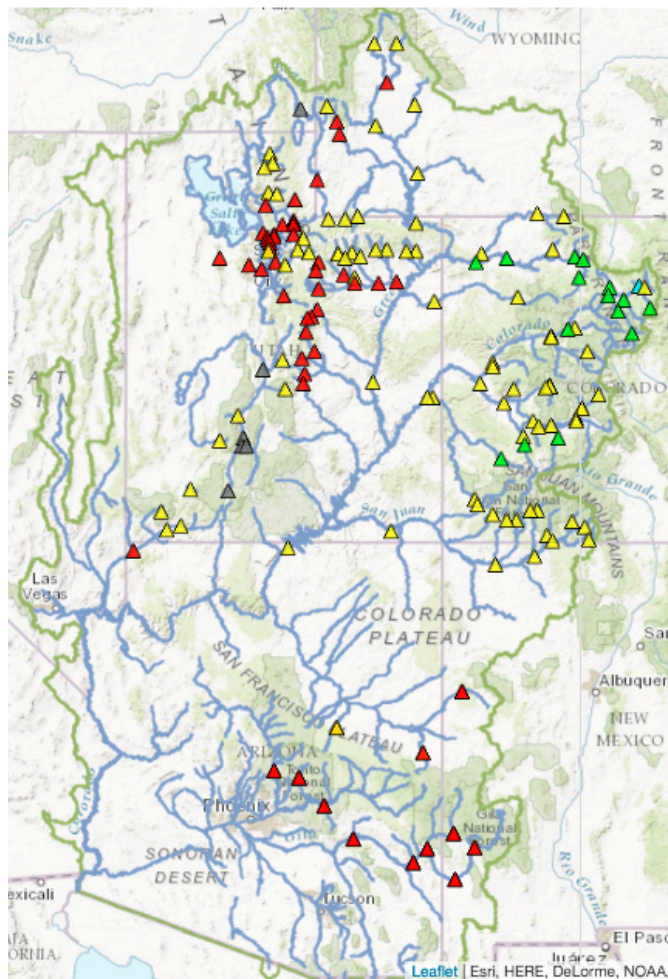
F: Free water
T: Tension water
DRGC2H.F: ANIMAS - DURANGO - Forecast



ESP Trace Ensemble of COLORADO - LAKE POWE
Latitude: 36.9 Longitude: -111.5
Forecast for the period 3/17/2014 24h - 10/1/2014 24h
This is a conditional simulation based on the current conditions as of 3/17/2014

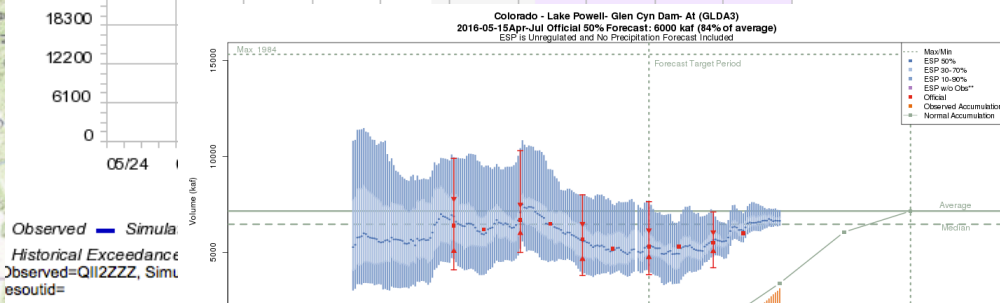
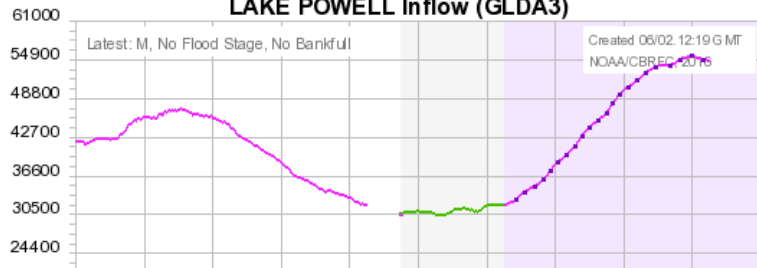


Reaching our Stakeholders



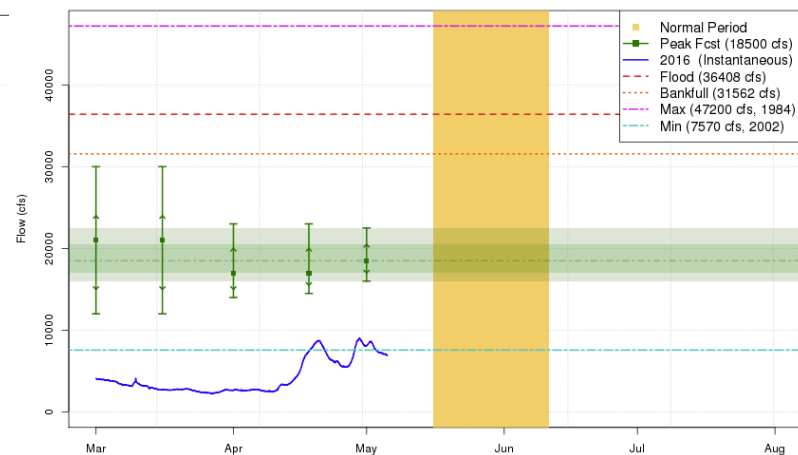
Colorado Basin River Forecast Center

LAKE POWELL Inflow (GLDA3)



Observed — Simula
 Historical Exceedance
 Observed=Q112ZZZ, Simu
 esoutid=

2016 Mean Daily Peak Flow Forecast Green - Green River - Ut (GRVU1)



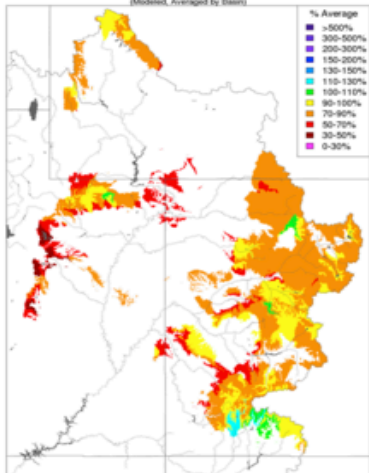
These graphics are updated approximately every two weeks between 3/1 and 5/1
 Plot Created 2016-05-05 11:30:53
 CBRFC / NWS / NOAA



Upper Colorado Situational Awareness

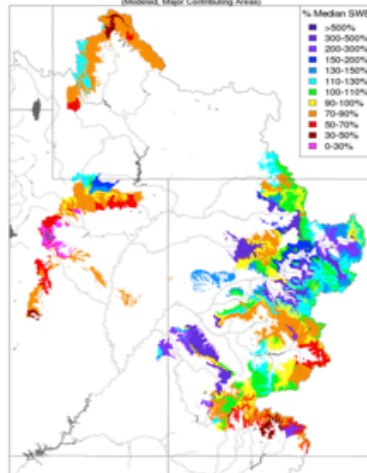
Soil Moisture

Soil Moisture - Fall - 2015 (November 01)
(Modelled, Averaged by Basin)



Snow Conditions

Snow Conditions - April 20 2016
(Modelled, Major Contributing Areas)



Lake Powell Unregulated Inflow (kaf) Water Year 2016 Forecasts as of 2016-04-01

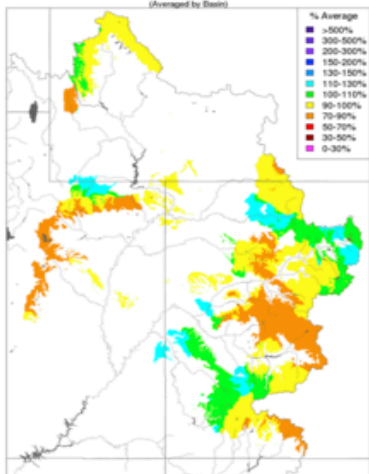
Period	Obs to Date	Full Fcst	%Avg
Apr-Jul	0	5300	74%
Water Year	2472	8442	78%

Lake Powell %Average Precipitation Water Year 2016

Area	Oct	Nov	Dec	Jan	Feb	Mar	Water Year
UC-Powell	89	100	127	108	51	97	96

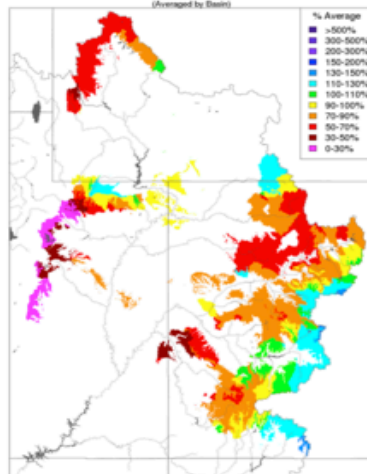
Water Year Precipitation

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

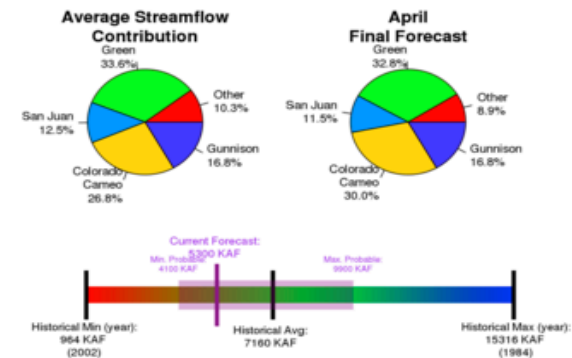


Month to Date Precipitation

Month to Date Precipitation - April 20 2016
(Averaged by Basin)



April - July Unregulated Inflow into Lake Powell As of 2016-04-01



More Information

- Lake Powell Forecast Evolution Plot
- Apr-July Text Forecast Product
- Water Year Text Forecast Product
- Snotel Group Plot
- Snotel Group Data
- USBR 24 Month Study

Times are Changing!

Where we were:

- What is THE forecast?
- How much water is there?
- How much snow is there?
- Will there be flooding?

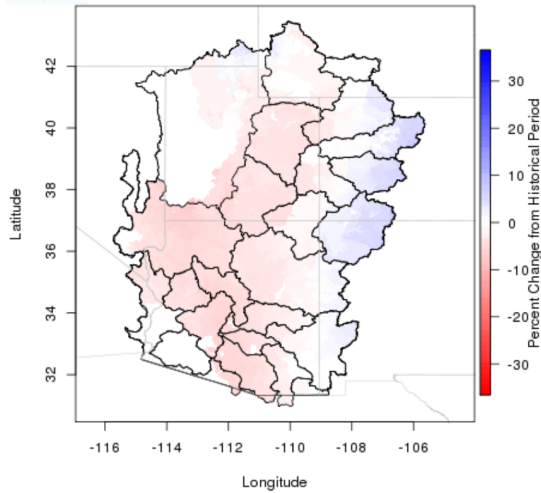
Where we are going:

- What is the range of forecasts?
- What is the likelihood of reaching this flow?
- What if it's a dry/wet year?
- What is the risk to filling my reservoir?
- What is your uncertainty?

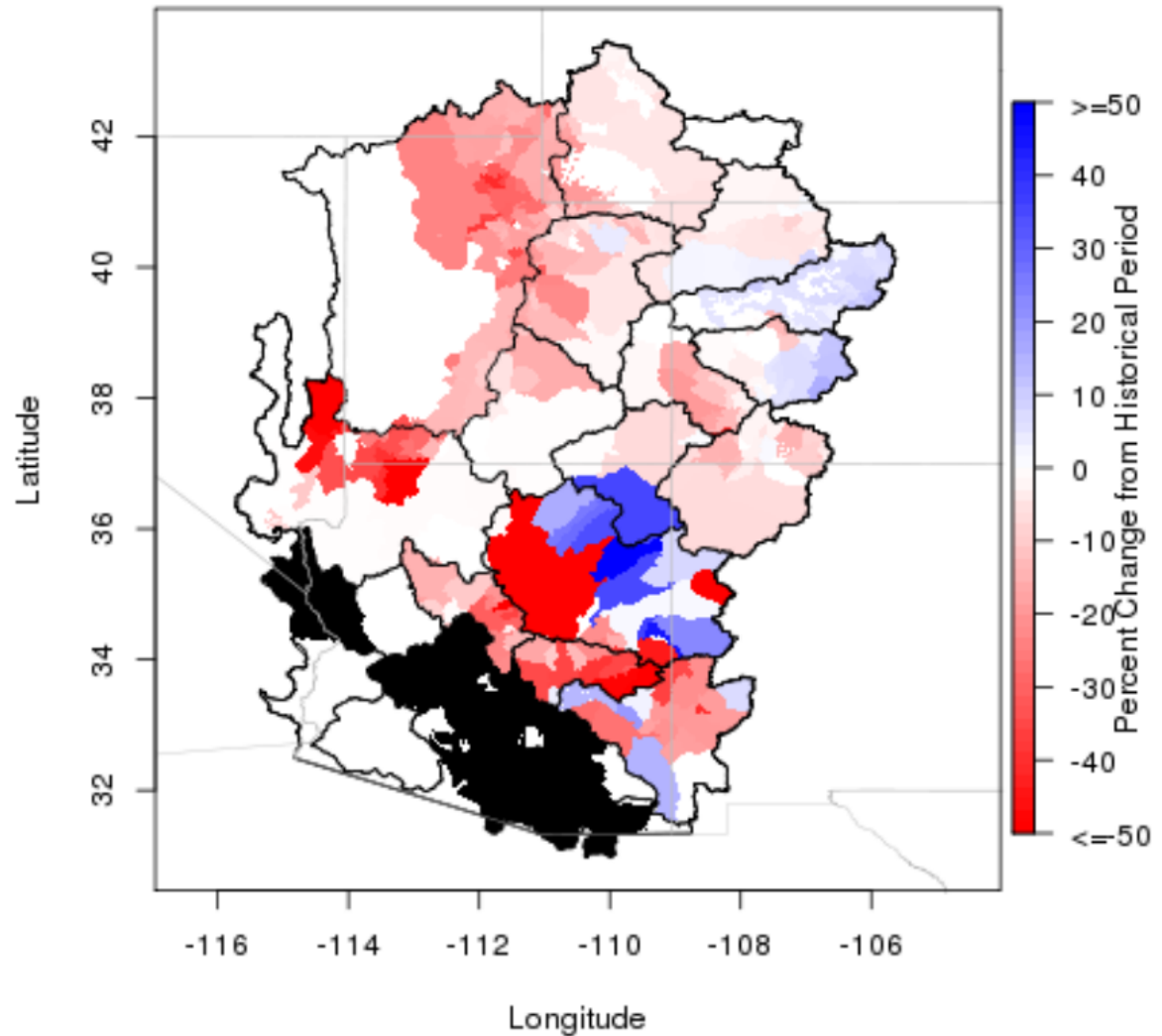


We know the climate is changing

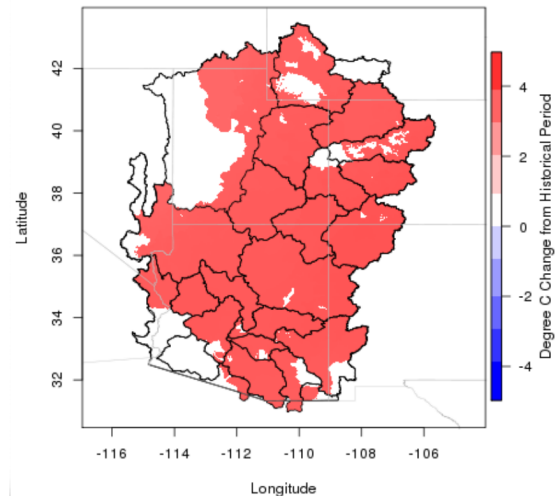
BCSD CMIP5 Ensemble Mean Precipitation Change
from 1881-2010 to 2070-2099



Avg Seasonal CMIP5 Change
from 1881-2010 to 2070-2099



BCSD CMIP5 Ensemble Mean Temperature Change
from 1881-2010 to 2070-2099



Challenges Ahead

- Climate change impacts
 - Stationarity is in the past – but it's also how we look forward
 - Extreme events – persistent drought and intense rains can impact our forecasts, and our stakeholder's ability to manage resources effectively
- Infrastructure and Operations
 - How to we continue to bridge the operations to research gap?
 - Our model from the 1970s was not built for the data we have access to now, so we have to be innovative
- Outreach
 - Facilitating cooperative and continued decision support
 - Reaching those partners we haven't met yet

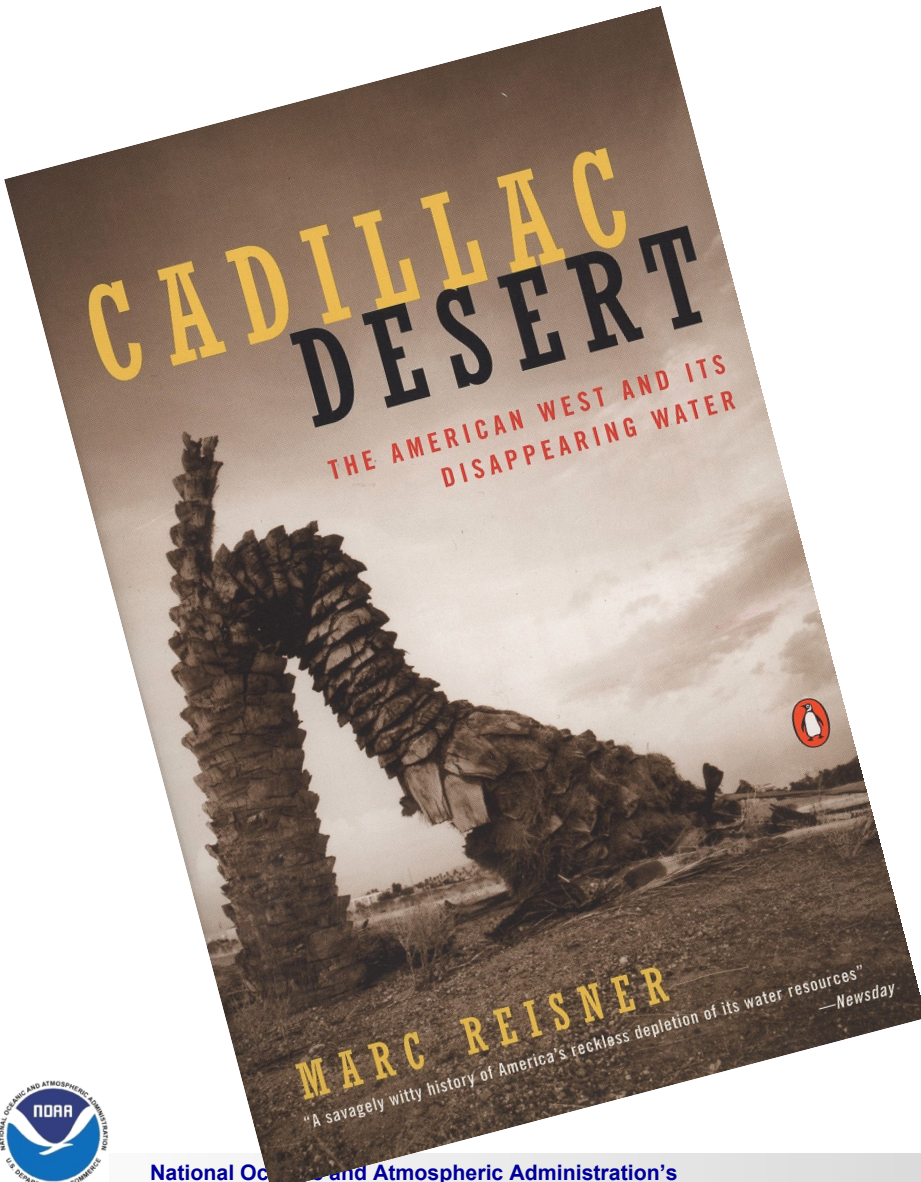
A diverse area with diverse needs! Great Basin, Lower Basin, Upper Basin...



Challenges Ahead

Marc Reisner did not live long enough to see the contentious nature of the Colorado River Basin softened, and an era of cooperation and collaboration.

But things are about to get tough.

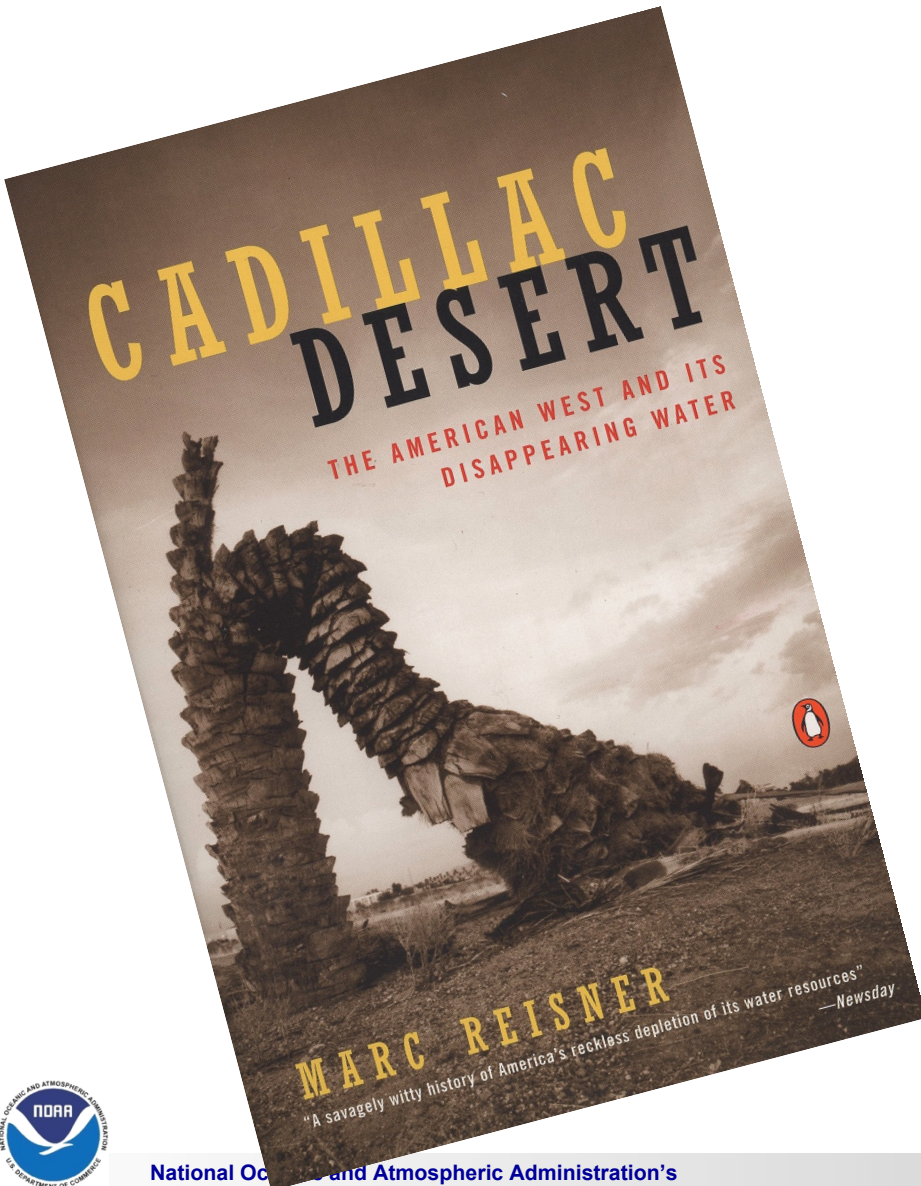


Challenges Ahead

If we want to continue to thrive in a Cadillac Desert, we have to carpool!

We need to facilitate and champion the notion of a hydrologic community – we're one basin.

New partnerships, new voices, and new ideas are going to be needed – we can help!



Contact Us!

- Operations Desk Direct Line
- [801-524-4004](tel:8015244004)
- Michelle Stokes - Hydrologist In Charge
- michelle.stokes@noaa.gov
- Paul Miller - Service Coordination Hydrologist
- paul.miller@noaa.gov

E-mail: cbrfc.operations@noaa.gov

Additional Contacts on our website: <http://www.cbrfc.noaa.gov/us/us.php>



~~Questions?~~

Ideas. Tell me what
you need. How can
we help?

