

4-2017

2017 Annual Operating Plan

U.S. Department of the Interior, Bureau of Reclamation

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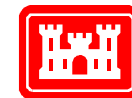
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2017 Annual Operating Plan

April 1 Runoff Forecast



Definitions

Native/Natural Rio Grande water: Water that comes directly from the Rio Grande Basin

San Juan-Chama water: Water that is imported into the Rio Grande Basin from the San Juan Basin through the San Juan-Chama Project

Rio Grande Compact: Agreement between the states of Colorado, New Mexico, and Texas that apportions Rio Grande water between the three states.

Article 7: Section of the Rio Grande Compact that dictates storage in reservoirs. If Rio Grande Project storage is less than 400,000 ac-ft at Elephant Butte and Caballo, no storage of Rio Grande water can take place at El Vado except to satisfy Native American needs or as part of the Emergency Drought Water Agreement.

Definitions (cont.)

cfs- cubic feet per second (roughly 7.5 gallons/second)

Acre foot = approximately 326,000 gallons or 43,560 cubic feet

Hydrograph – graph of flow rate per unit time

The District – Middle Rio Grande Conservancy District (MRGCD)

The City – City of Albuquerque now Albuquerque Bernalillo County Water Utility Authority (ABCWUA)

NRCS – Natural Resources Conservation Service

Supplemental water – Water leased by Reclamation to augment flows in support of the Rio Grande Silvery Minnow as outlined in the 2016 Biological Opinion

P&P – Prior & Paramount

What Drives the Process

Volume Forecast from the NRCS

Based on snowpack, soil moisture, climate forecast

Choose similar year based on similar volume

Actual hydrograph vs. average hydrograph

Can tweak timing of hydrograph to best match forecasted conditions (warm Spring vs. cool Spring)

Inflows/Outflows based on nature and policies

Article VII restrictions

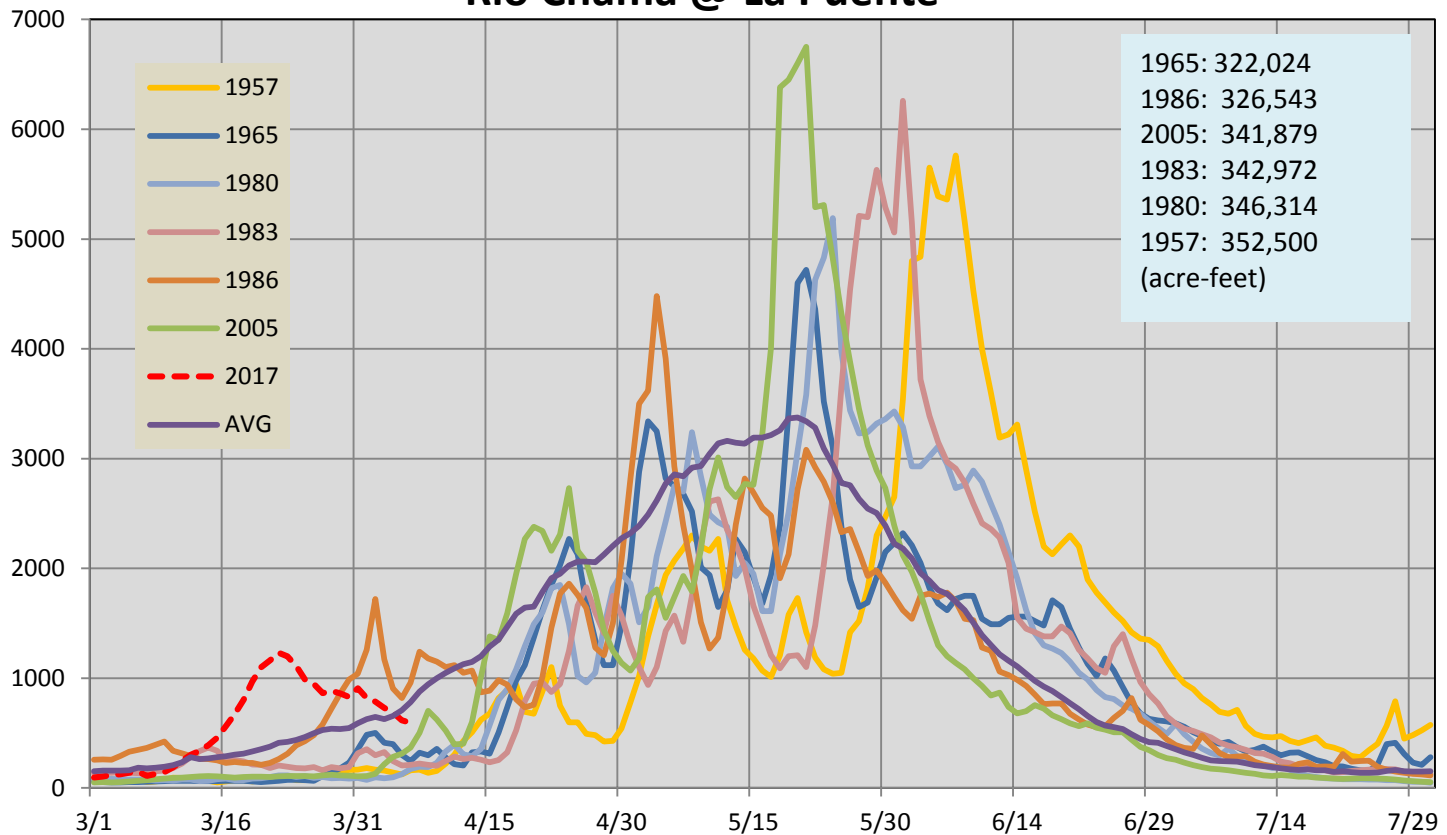
Flood control and channel capacity





























Timing of water deliveries

Demand curves from water users

Similar Year Hydrographs

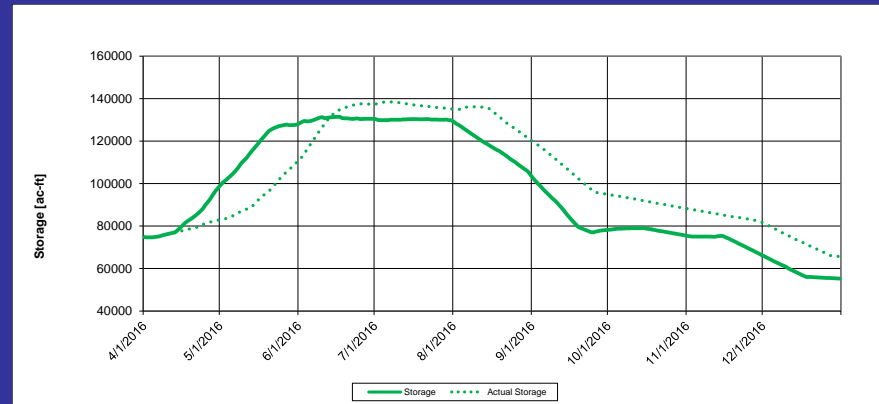
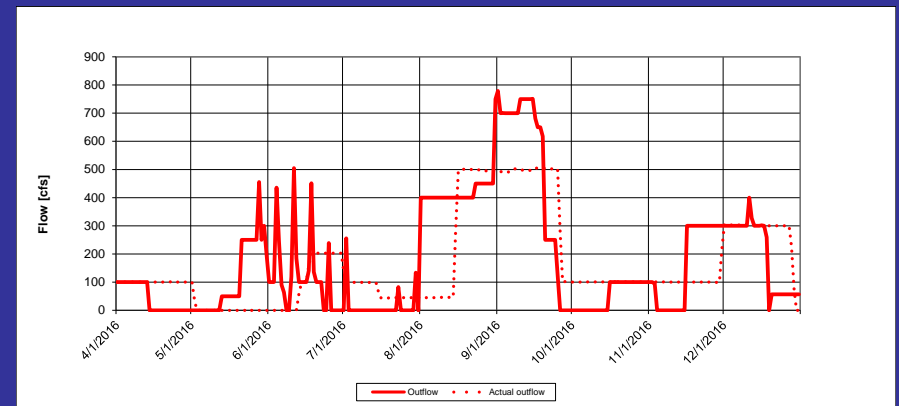
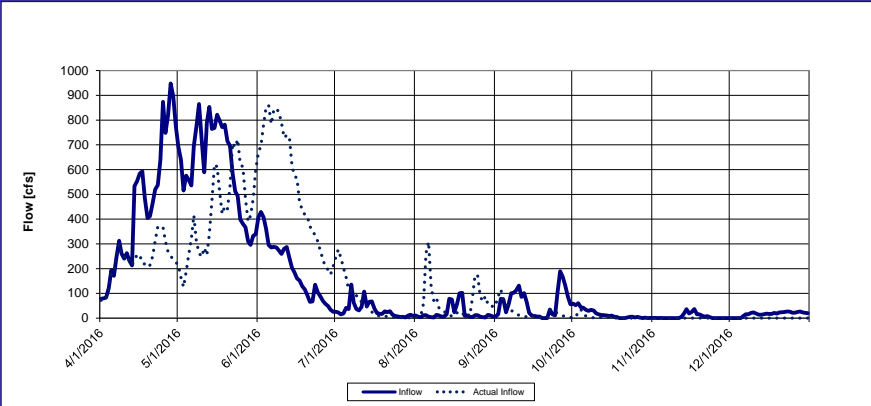
Rio Chama @ La Puente



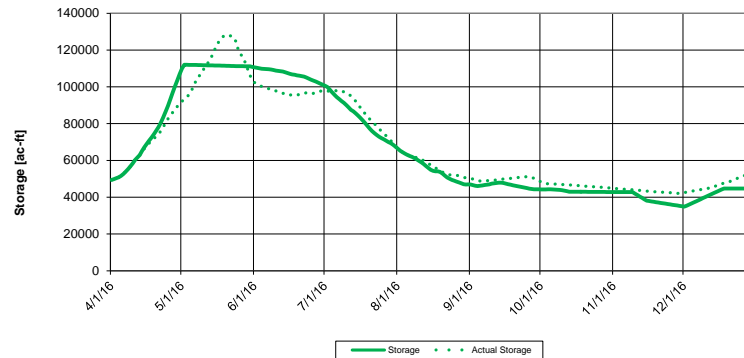
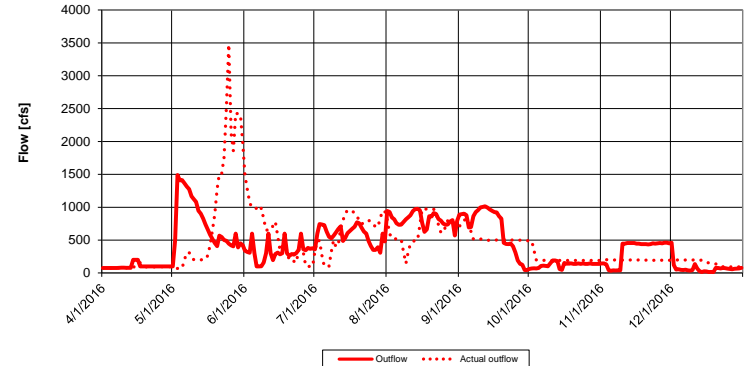
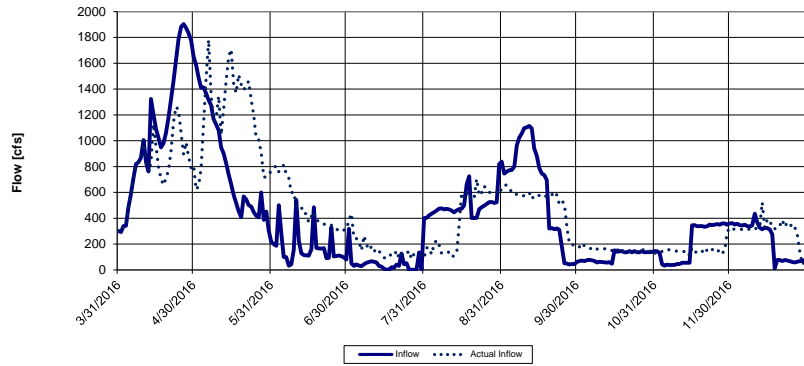
| <u>Operated By:</u> <u>Dams:</u> | Reclamation  | Corps  | Water Supply | Recreation | Flood Control | Sediment Control |
|-------------------------------------|--|--|--|---|---|---|
| HERON |  | |  |  | | |
| EL VADO |  | |  |  | | |
| ABIQUIU | |  |  |  |  |  |
| NAMBE FALLS |  | |  |  | | |
| GALISTEO | |  | | |  | |
| COCHITI | |  | |  |  |  |
| JEMEZ CANYON | |  | | |  |  |
| ELEPHANT BUTTE |  | |  |  | | |

2016: The Year in Review

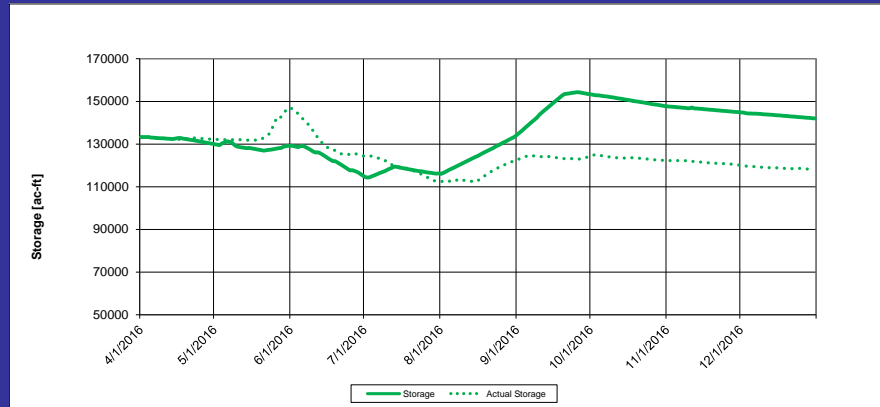
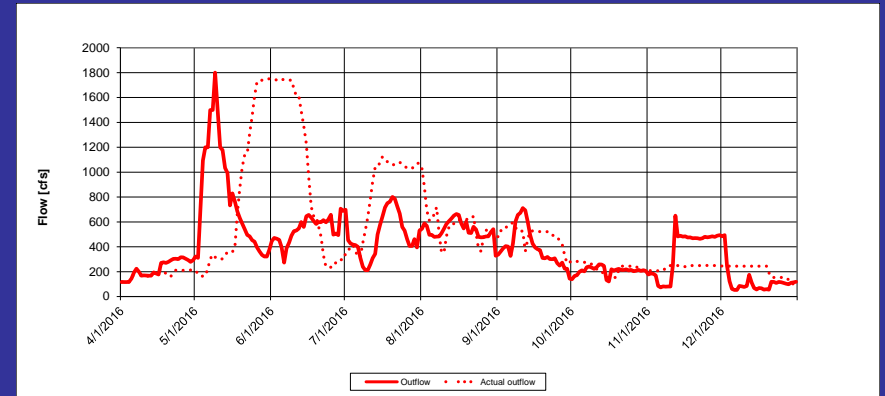
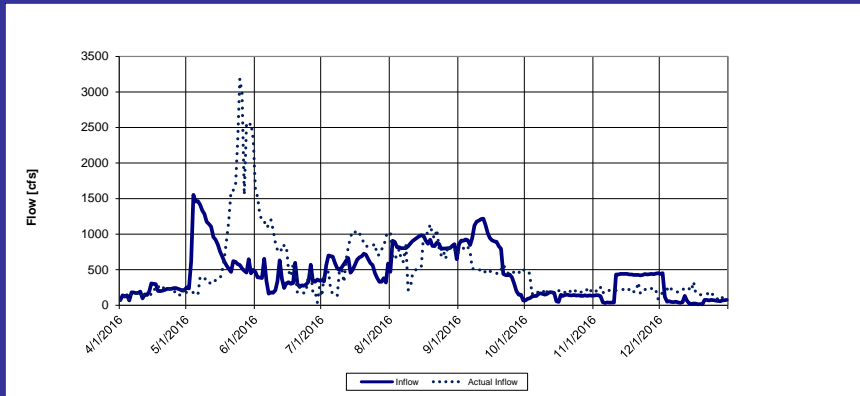
Heron Reservoir



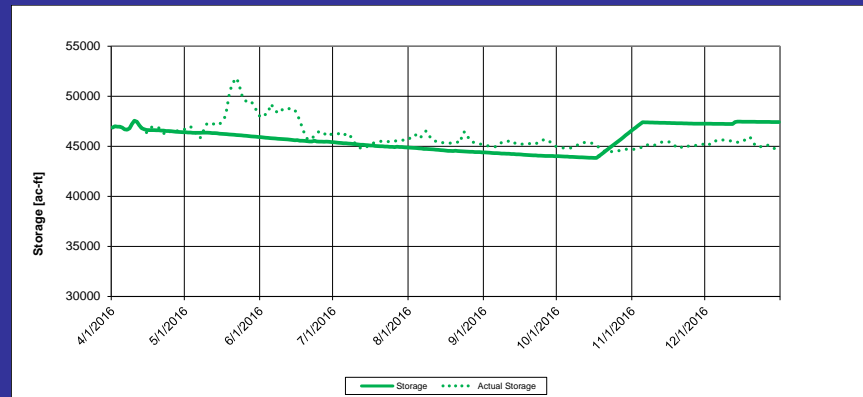
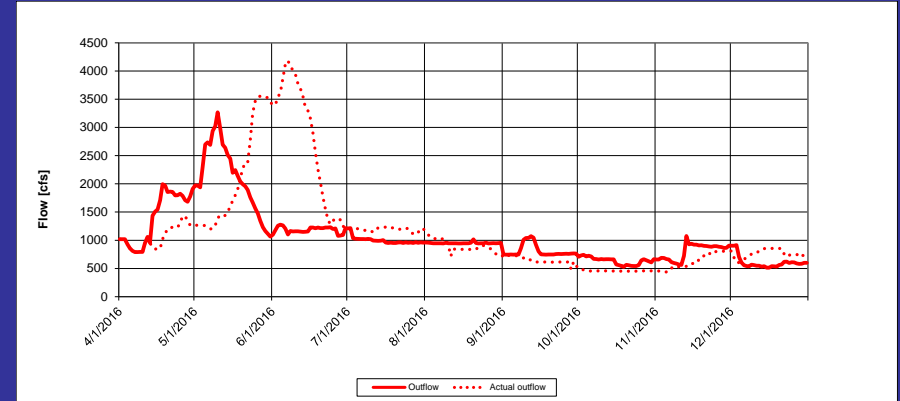
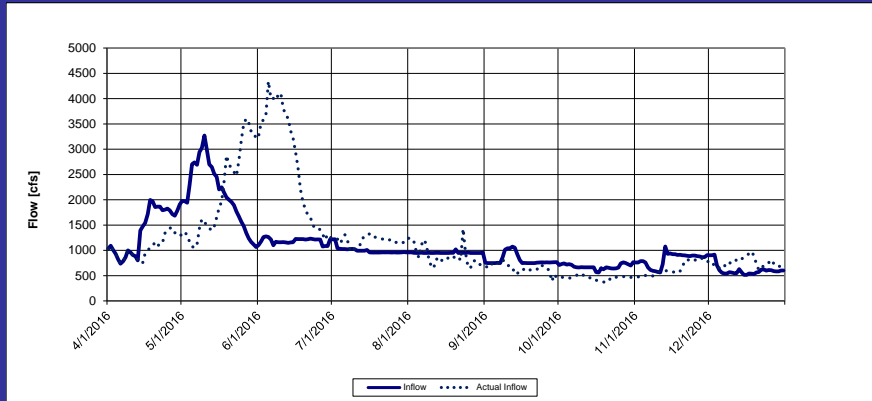
El Vado Reservoir



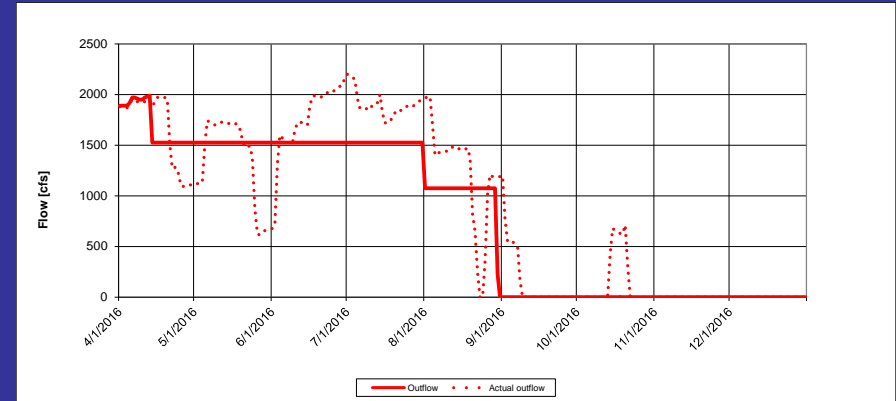
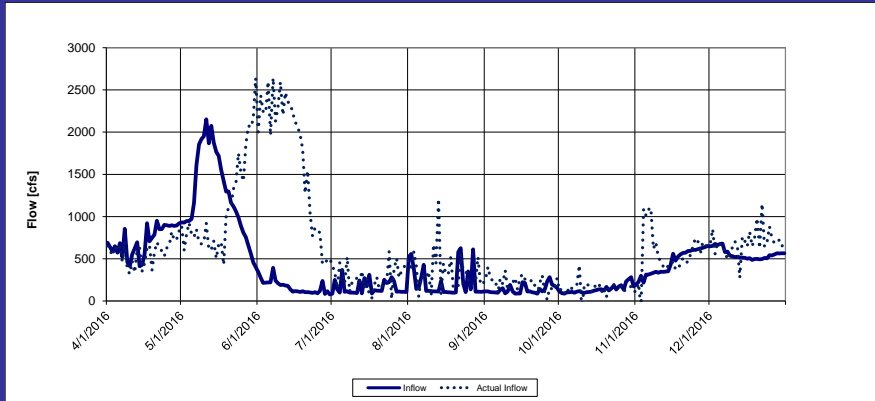
Abiquiu Reservoir



Cochiti Reservoir

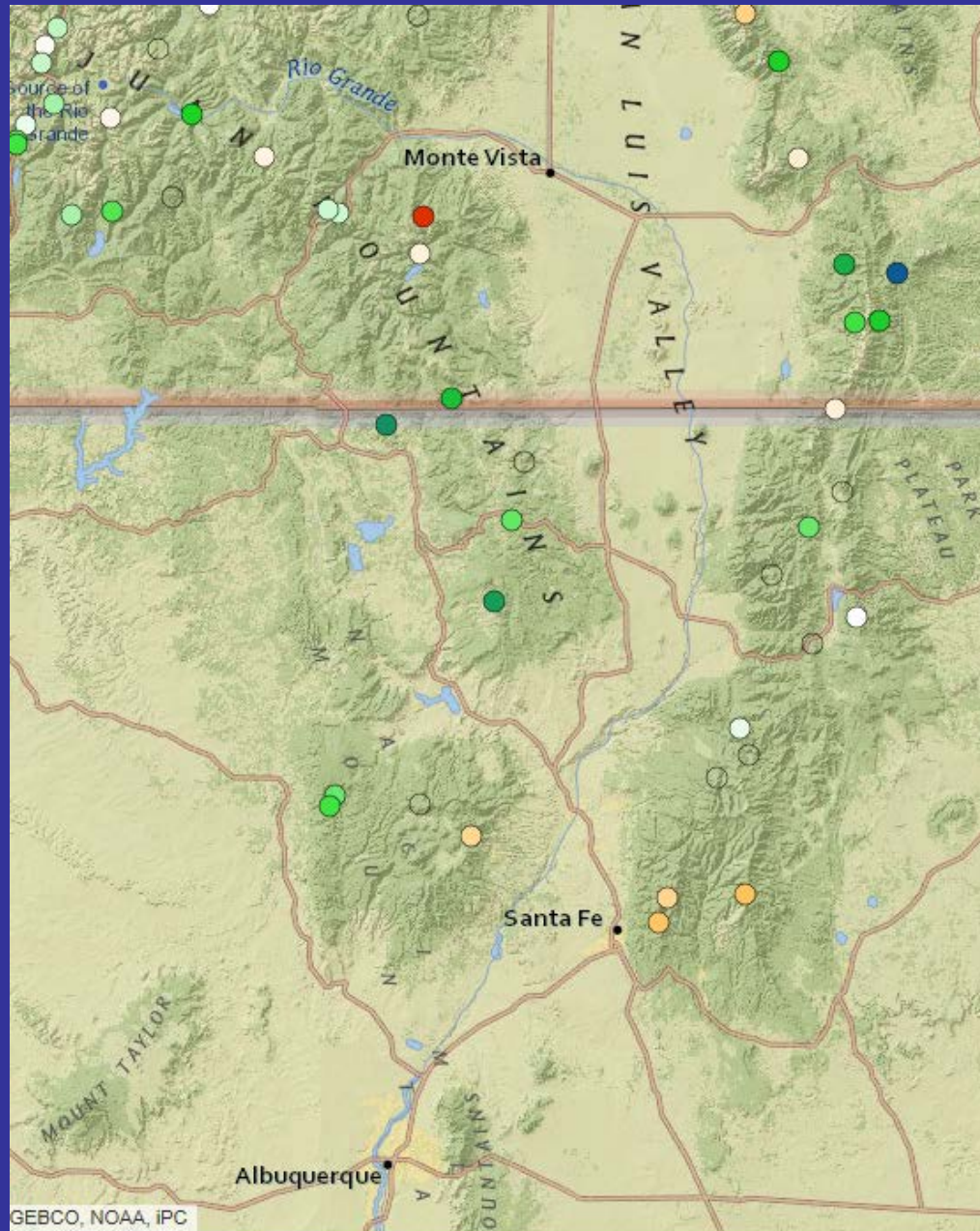


Elephant Butte Reservoir

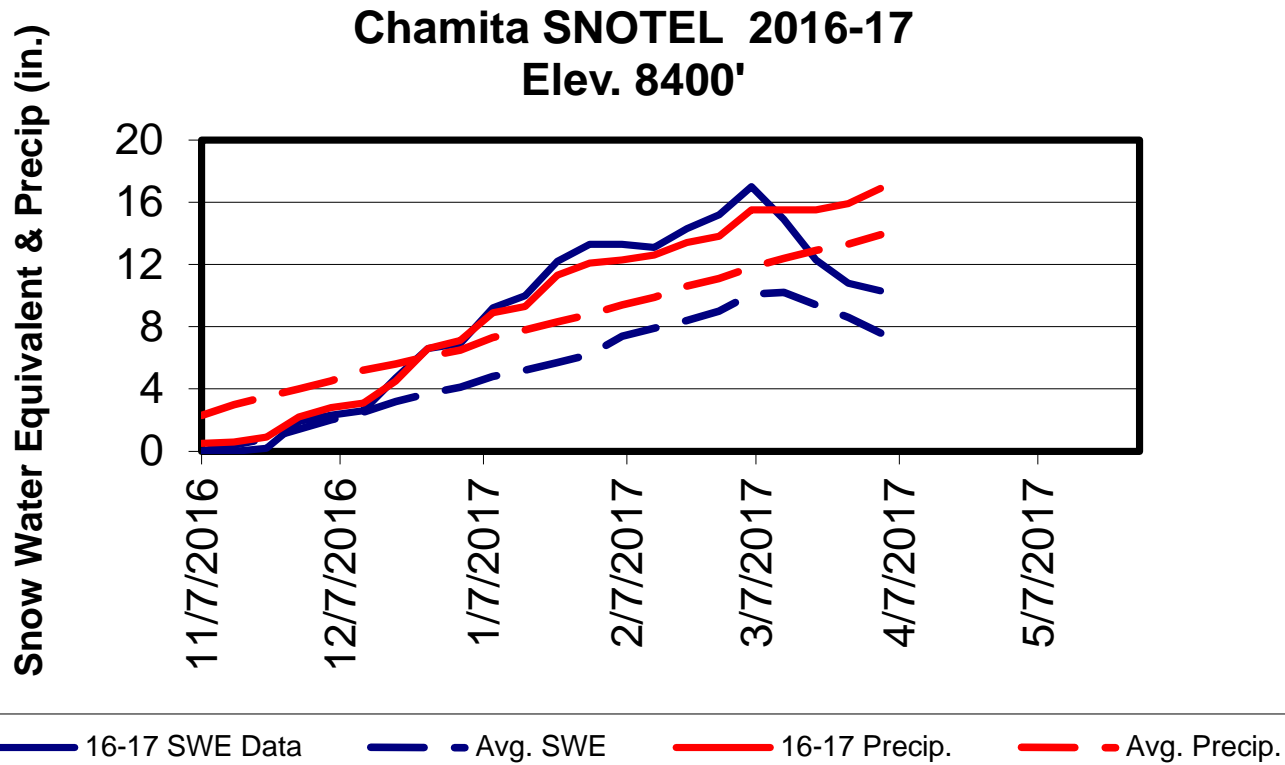


Current Snow Conditions

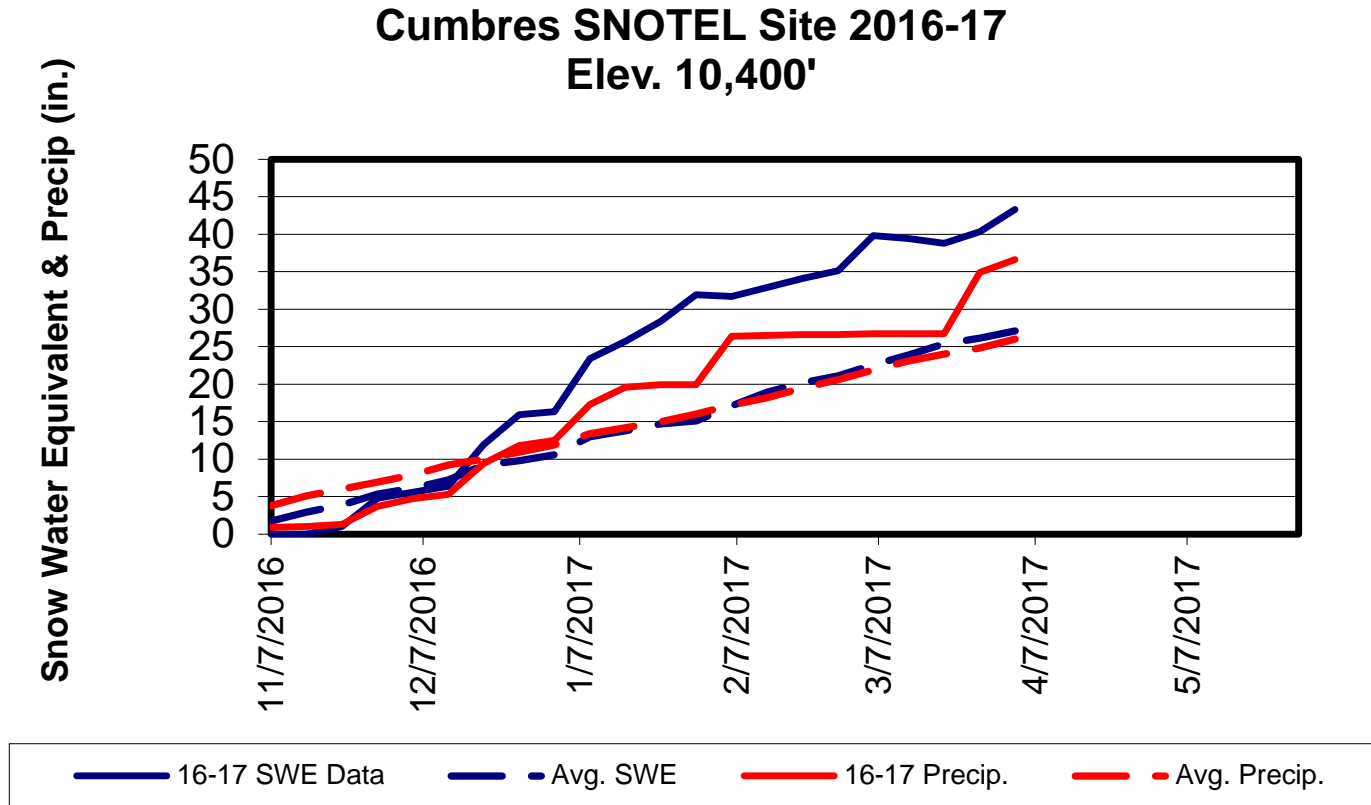
SNOTEL Locations



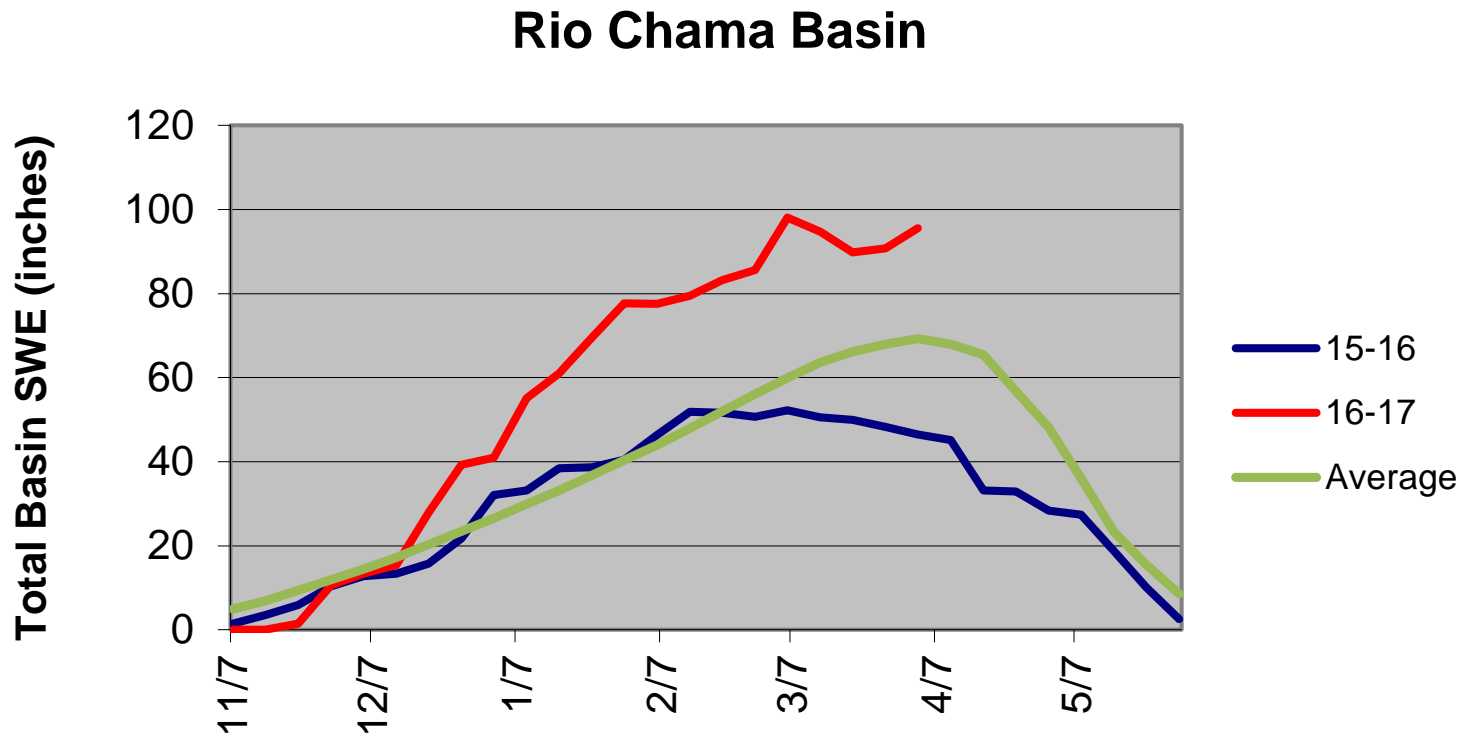
Rio Chama Snow Data



Rio Chama Snow Data

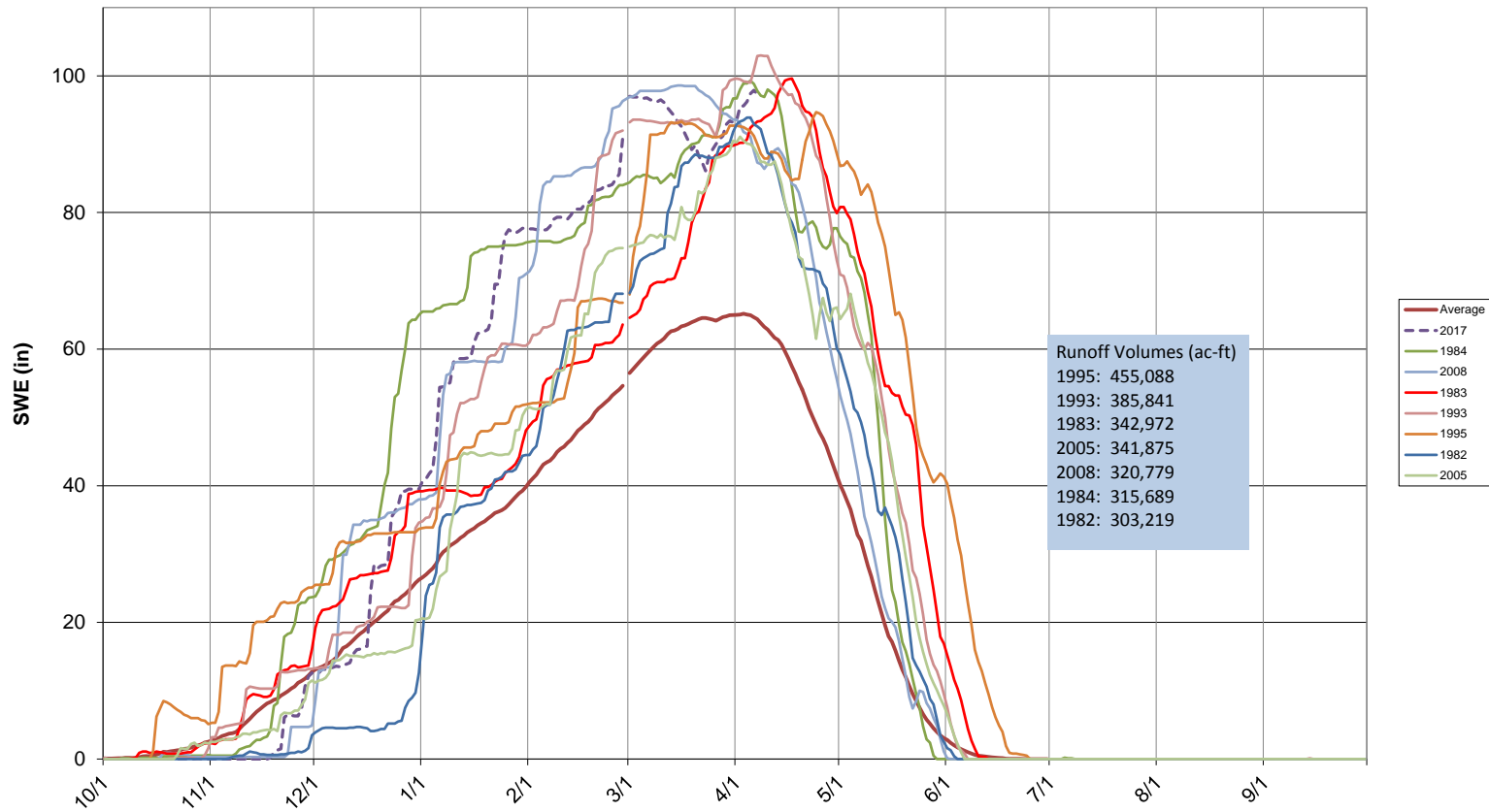


Rio Chama Snow Comparison

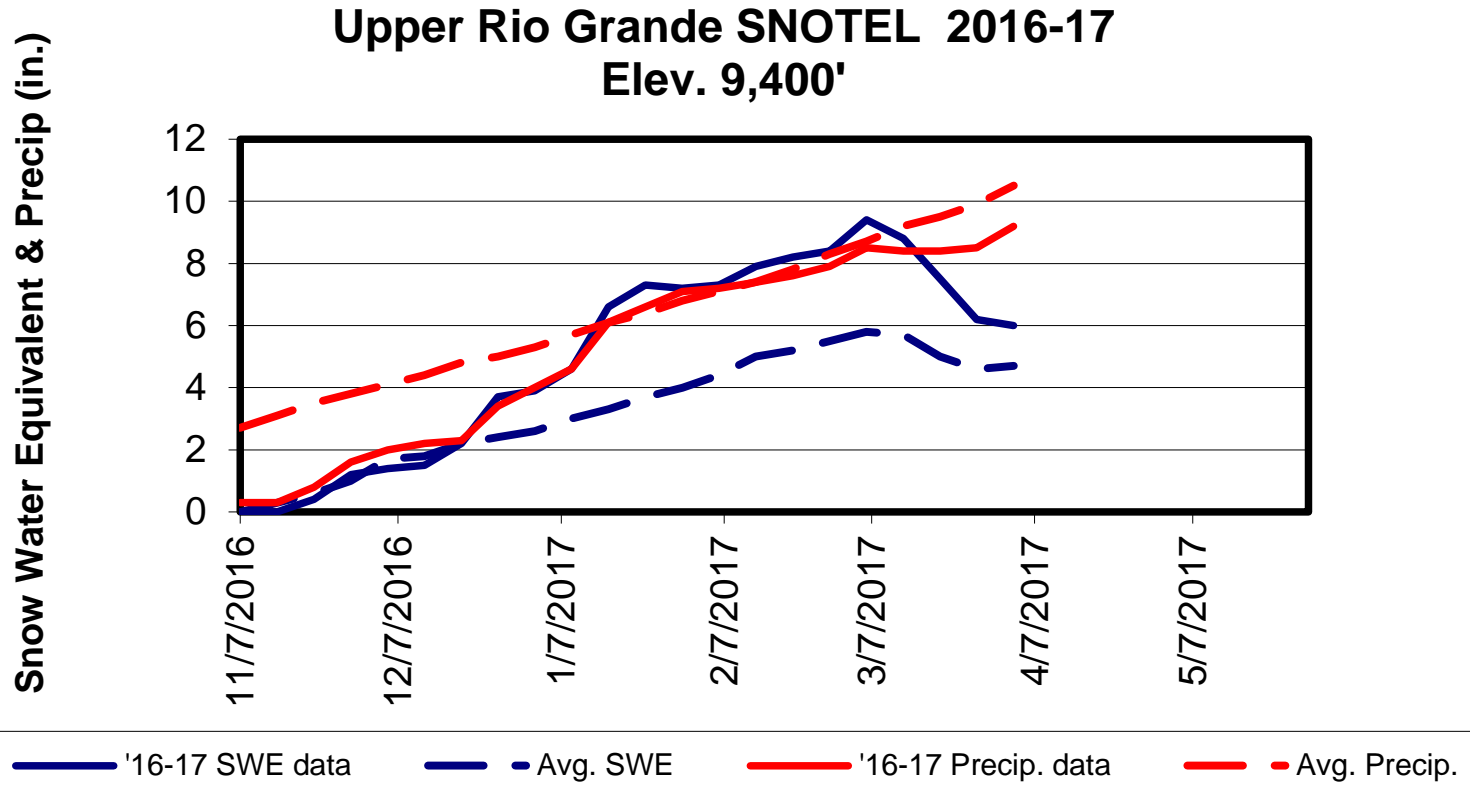


Similar Snowpack Years

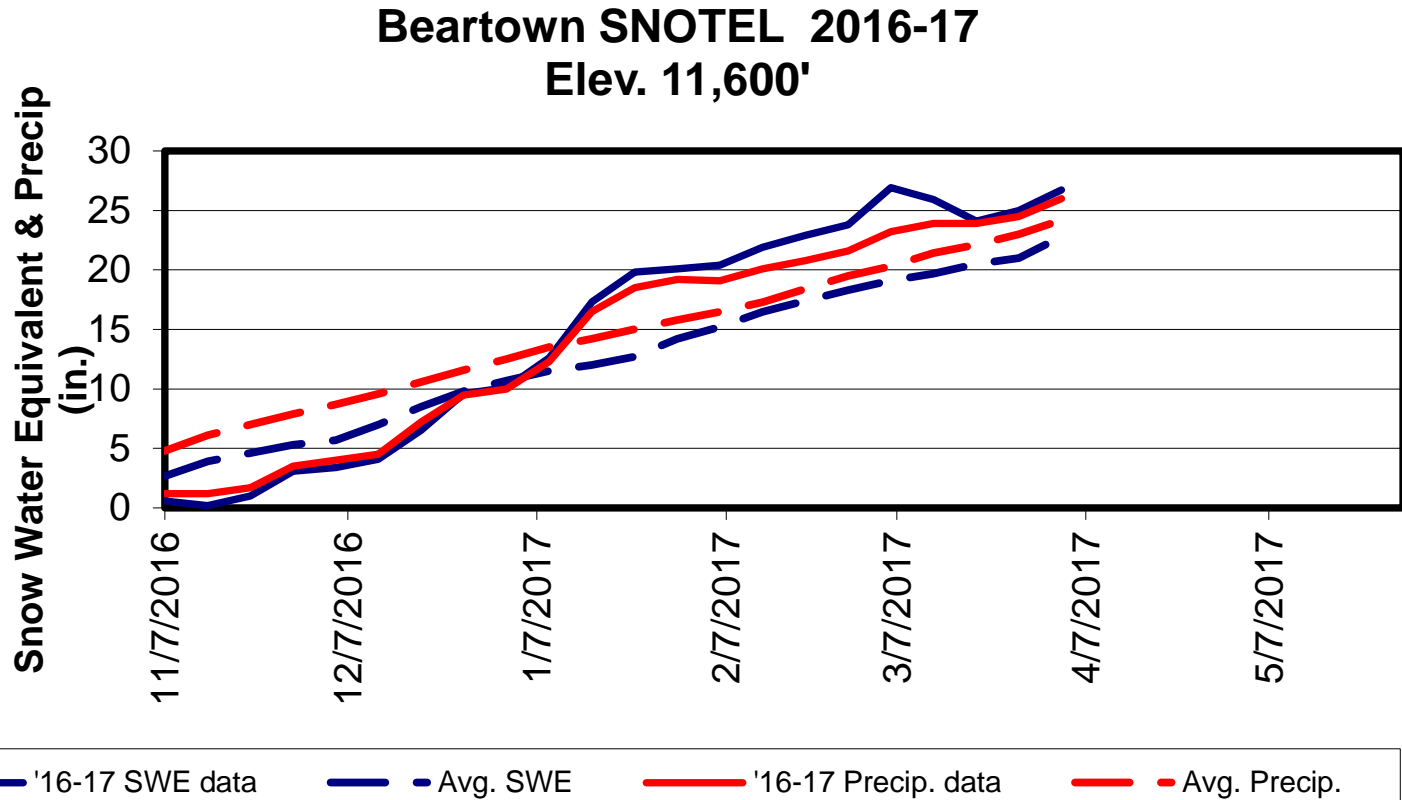
2017 vs. Similar Years, and Average Rio Chama Snowpack Index



Rio Grande Snow Data



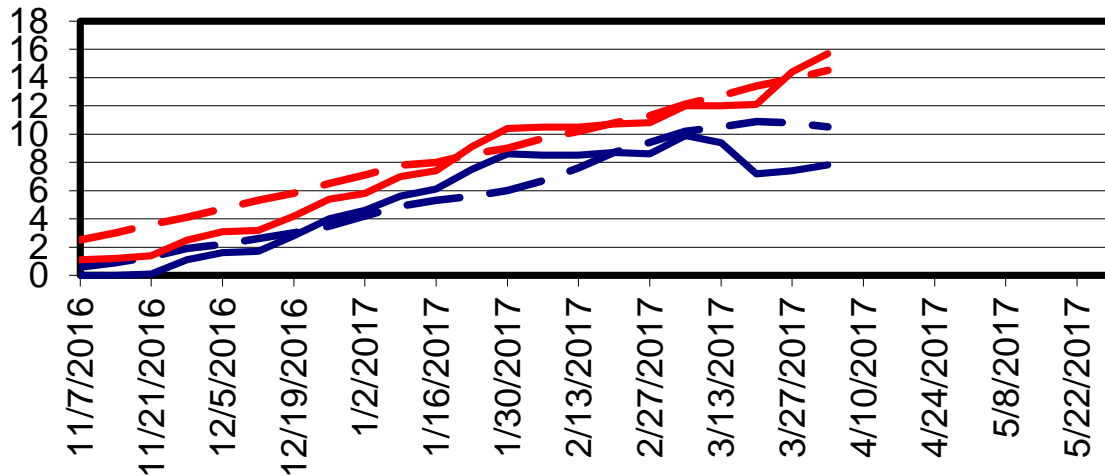
Rio Grande Snow Data



Sangre de Cristo Snow Data

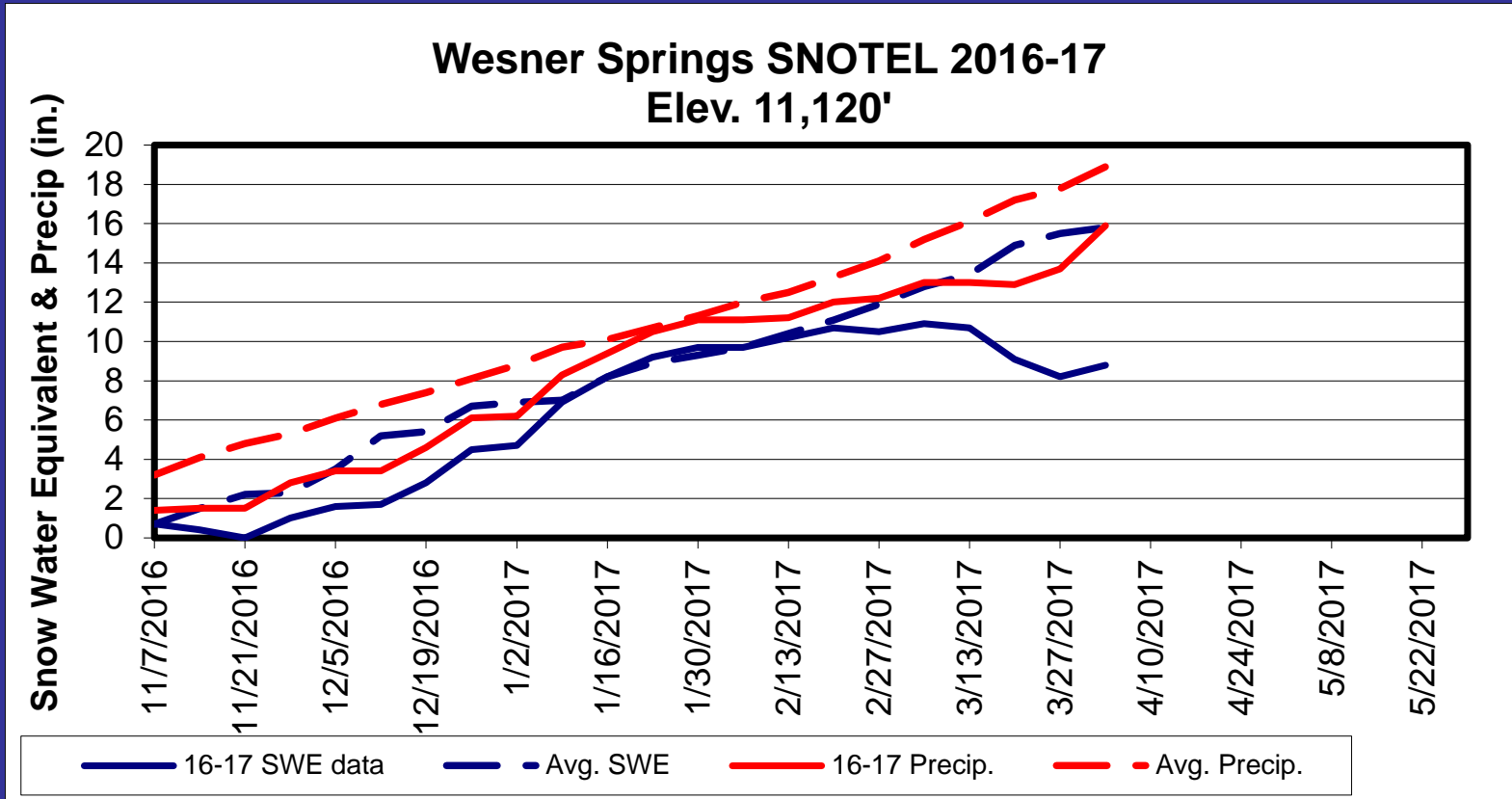
Gallegos Peak SNOTEL 2016-17
Elev. 9,800'

Snow Water Equivalent & Precip (in.)



— 16-17 SWE data - - - Avg. SWE — 16-17 Precip. - - - Avg. Precip.

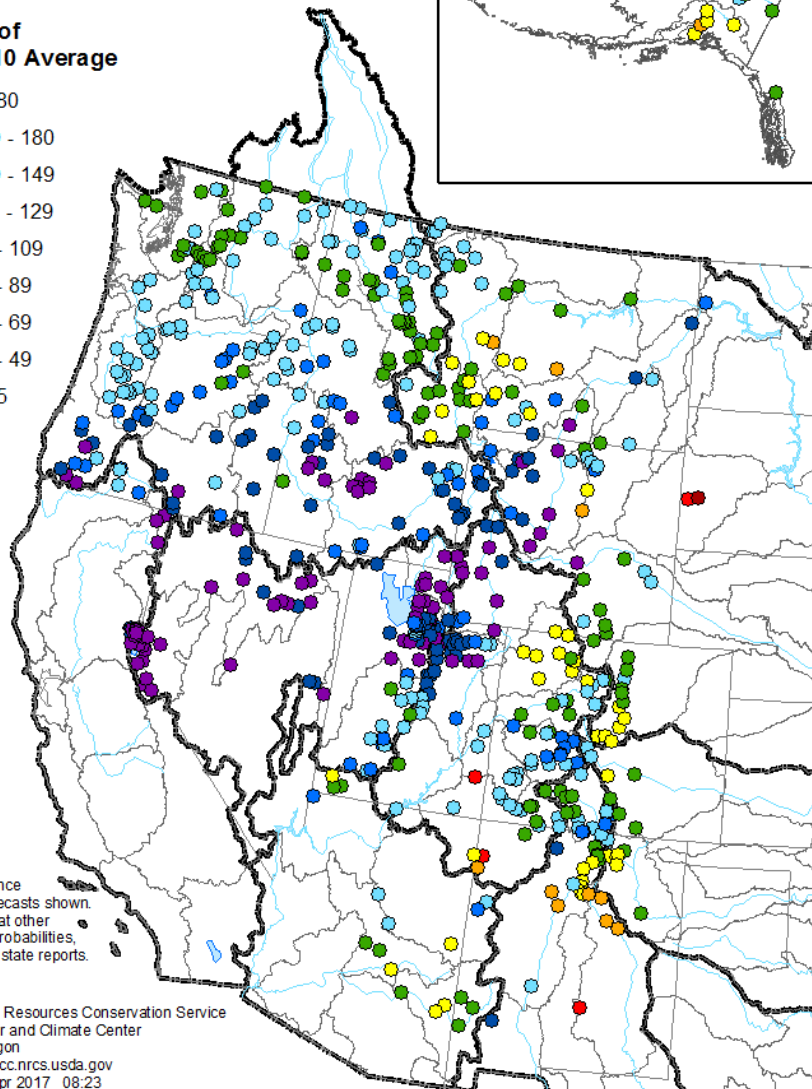
Sangre de Cristo Snow Data



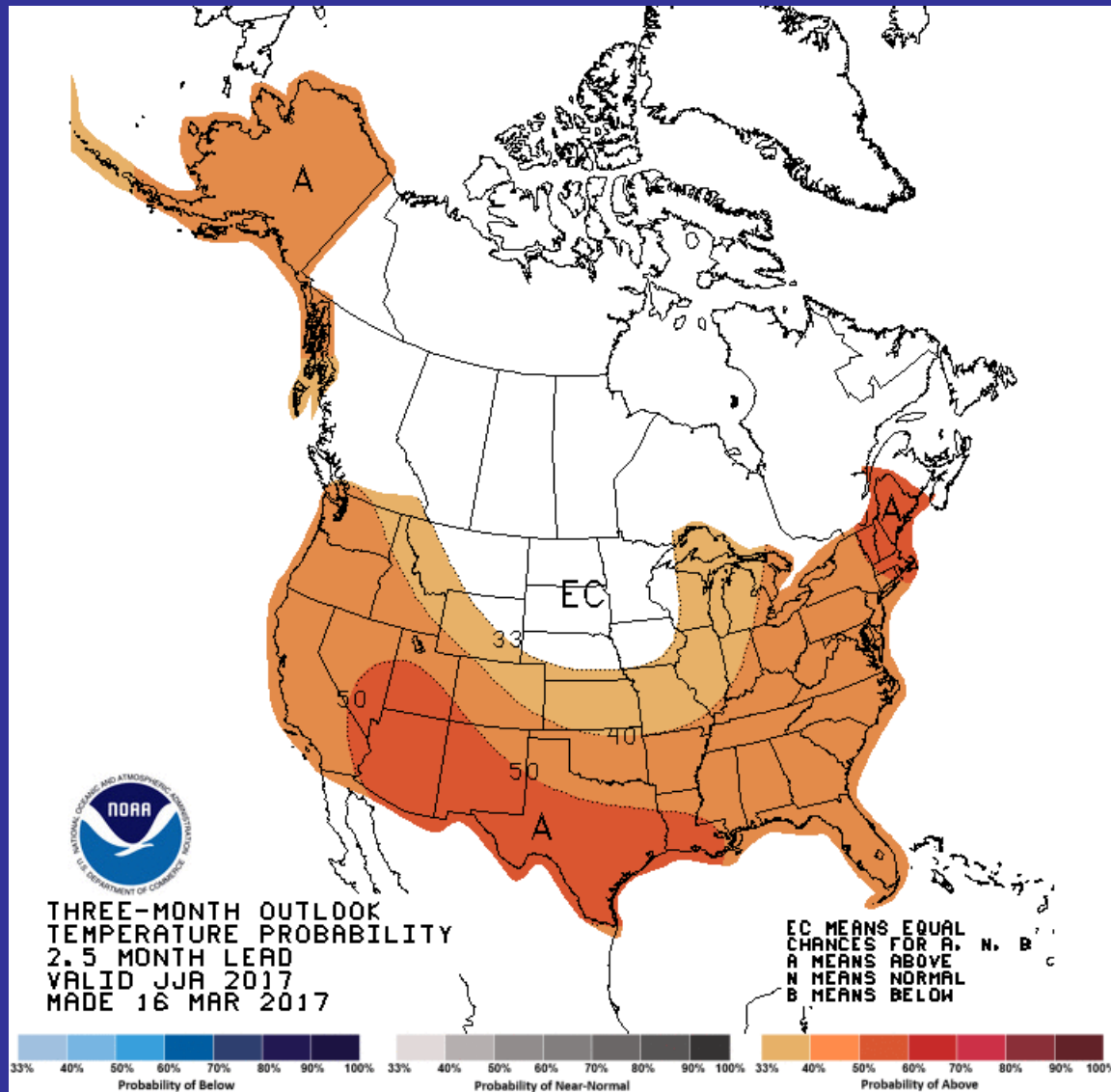
Spring and Summer Streamflow Forecasts as of April 1, 2017

Percent of
1981-2010 Average

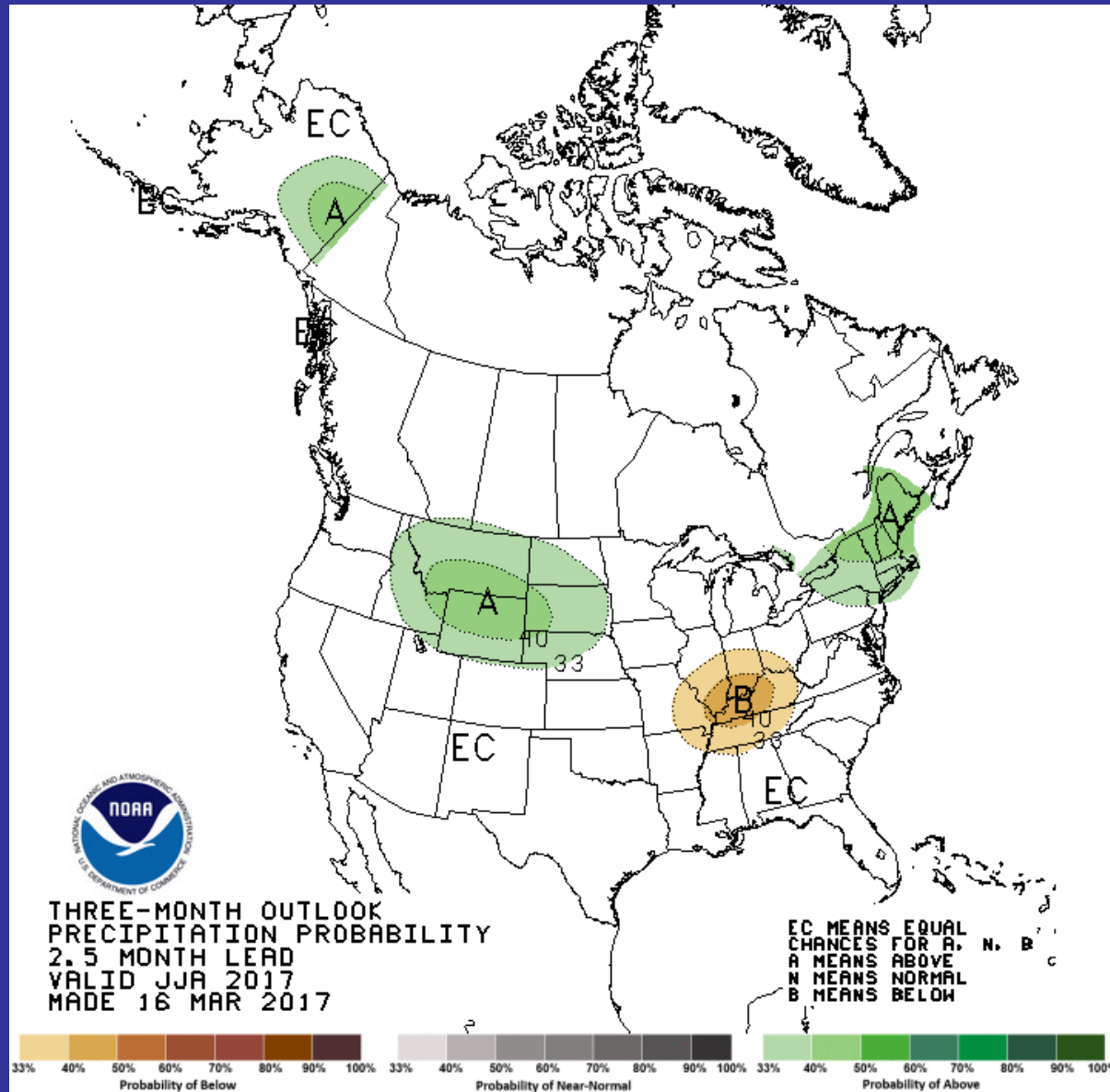
- > 180
- 150 - 180
- 130 - 149
- 110 - 129
- 90 - 109
- 70 - 89
- 50 - 69
- 25 - 49
- < 25



Monsoon Season Temperature Outlook



Monsoon Season Precipitation Outlook



2017 Water Operations Modeling

Major Assumptions

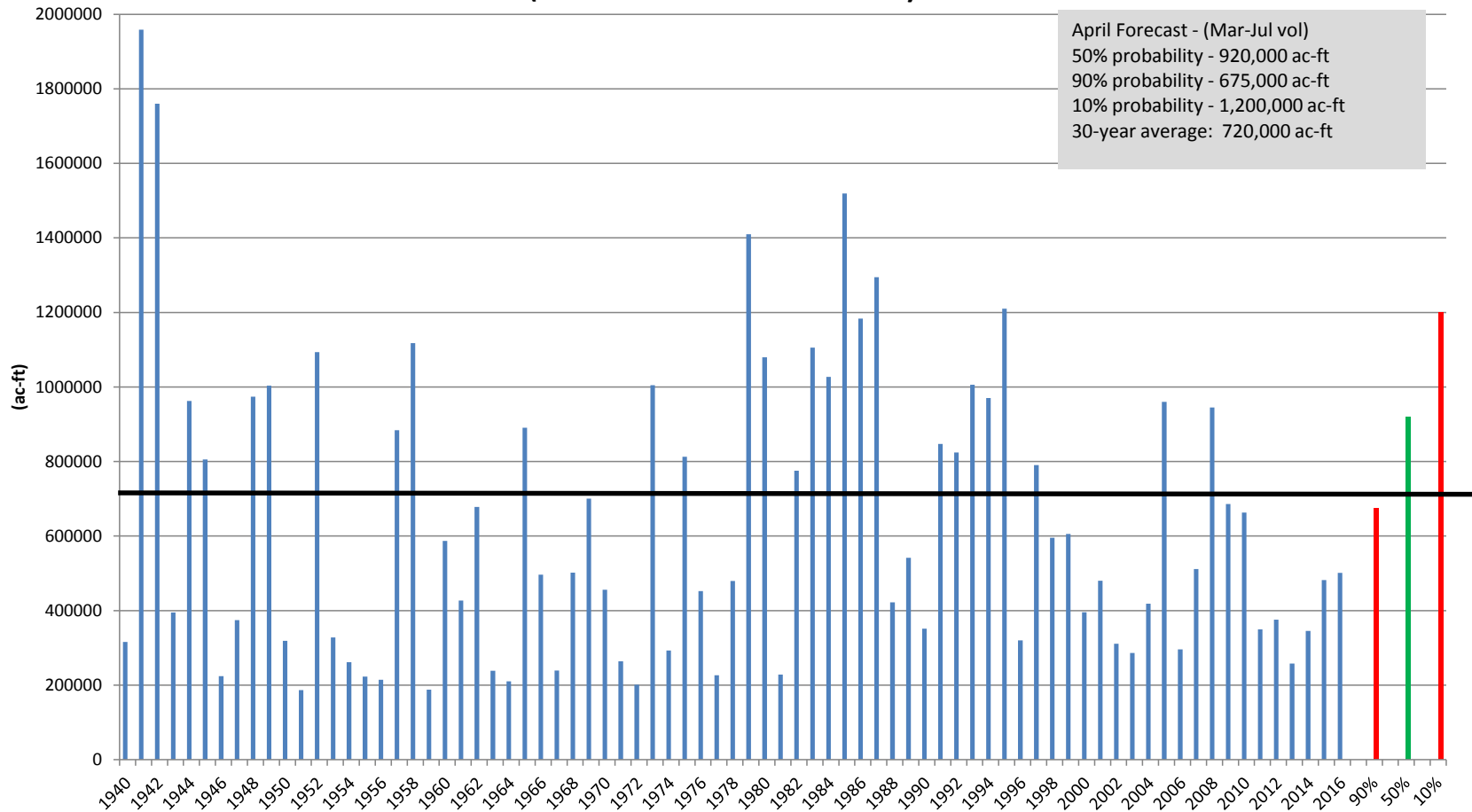
- April 1 50% most probable forecast
- Storage of water for Prior & Paramount lands
- Out of Article VII restrictions for several weeks

April Forecast Data

| | Most Probable Percent of Average | | April 1 50% Probability Volume, ac-ft |
|--------------------------|----------------------------------|------|---------------------------------------|
| | 2016 | 2017 | 2017 |
| Rio Grande nr Del Norte | 84% | 109% | 560,000 |
| El Vado Reservoir Inflow | 60% | 160% | 360,000 |
| Rio Grande at Otowi | 60% | 128% | 920,000 |
| Nambe Reservoir Inflow | 71% | 89% | 5,800 |
| Jemez blw Jemez Dam | 44% | 74% | 25,000 |
| Rio Blanco @ Diversion | 76% | 117% | 63,000 |
| Navajo River @ Diversion | 75% | 115% | 75,000 |

Historic Mar-Jul Flow Volumes at Otowi

March-July Volumes at Otowi
(2017 - NRCS forecast volumes)

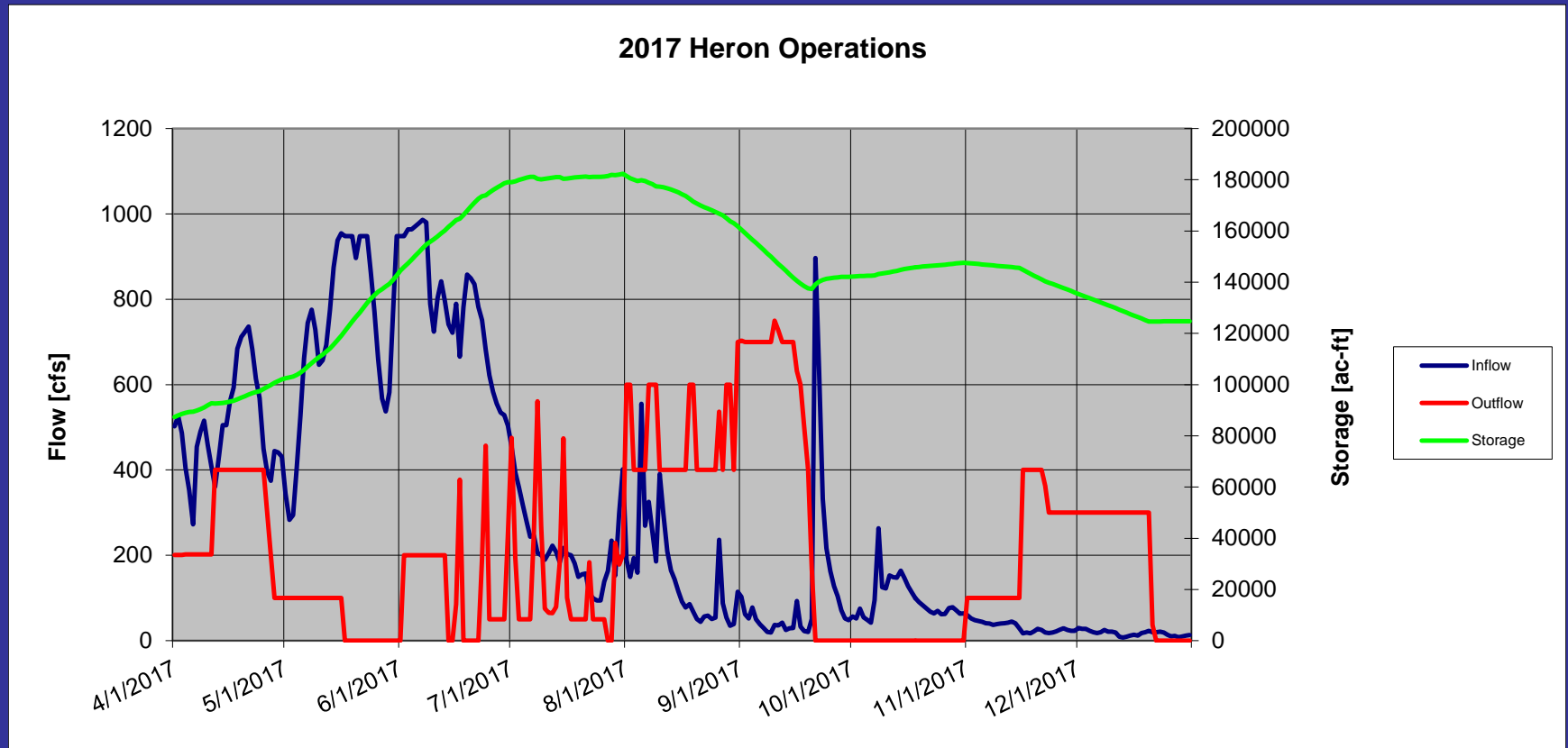


Heron Reservoir



Proposed 2017 Heron Operations

Storage Capacity=401,000 ac-ft



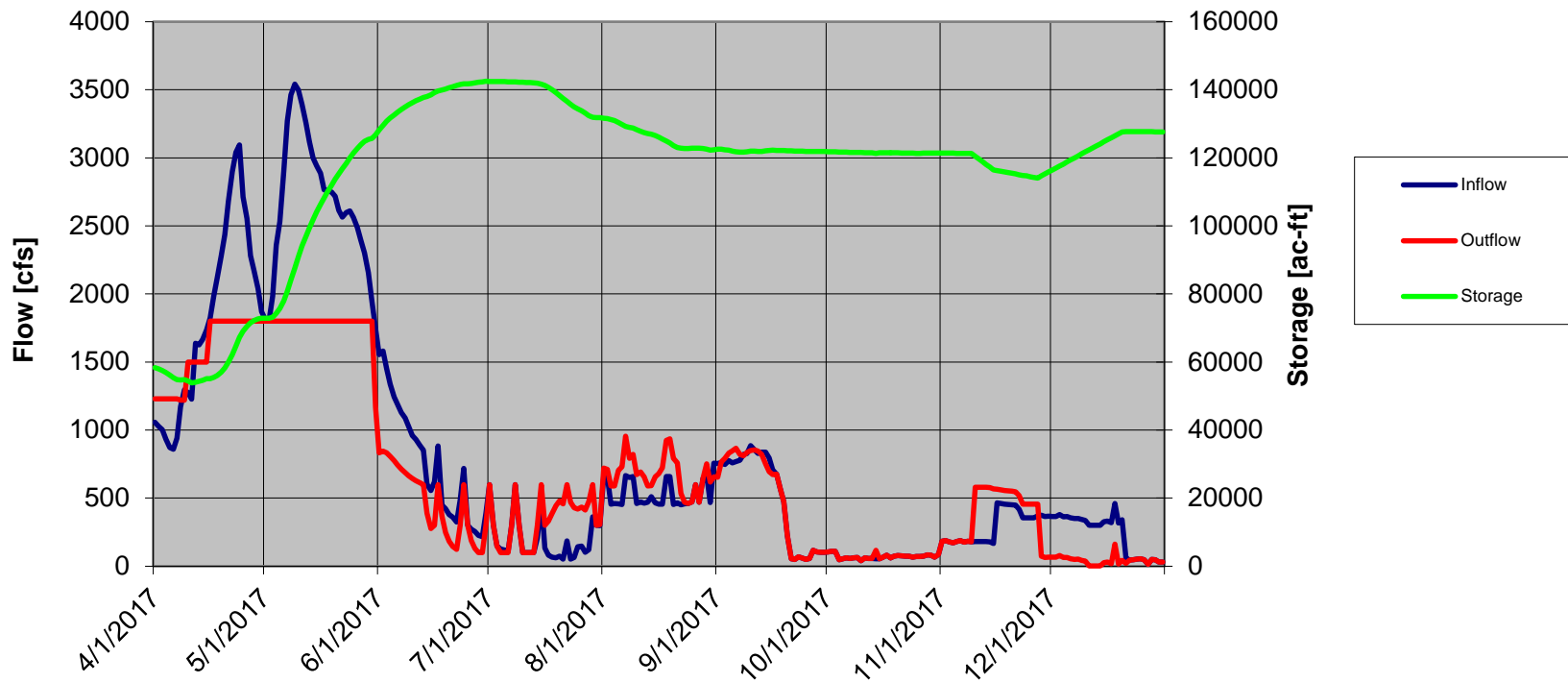
Reservoir will rise up to 25 feet from beginning of year to end

El Vado Reservoir



Proposed 2017 El Vado Operations

2017 El Vado Operations

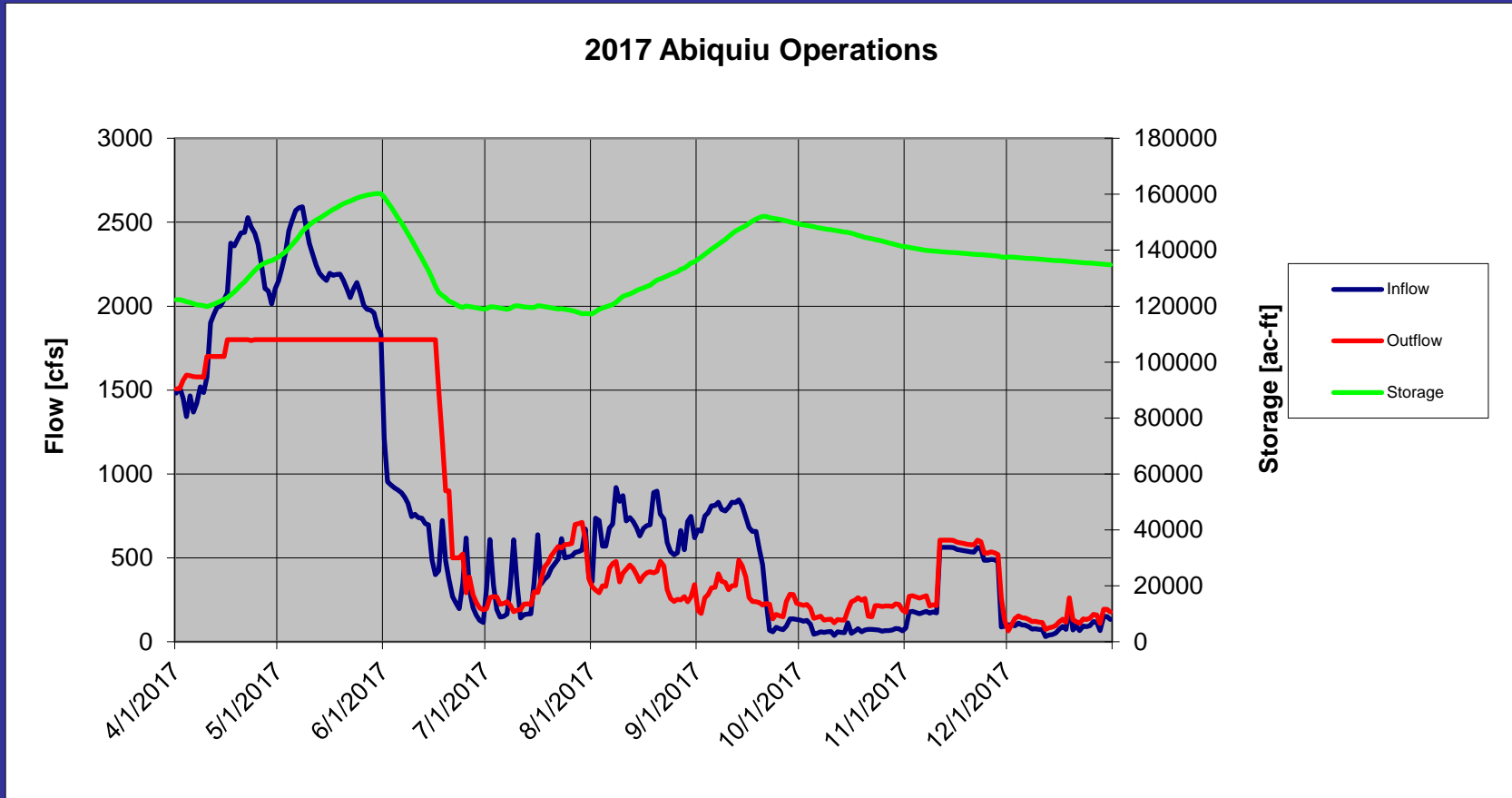


Lake Level: Could finish the year 35' higher than current levels

ABIQUIU LAKE



Proposed 2017 Abiquiu Operations



Estimated Hydrograph at Embudo

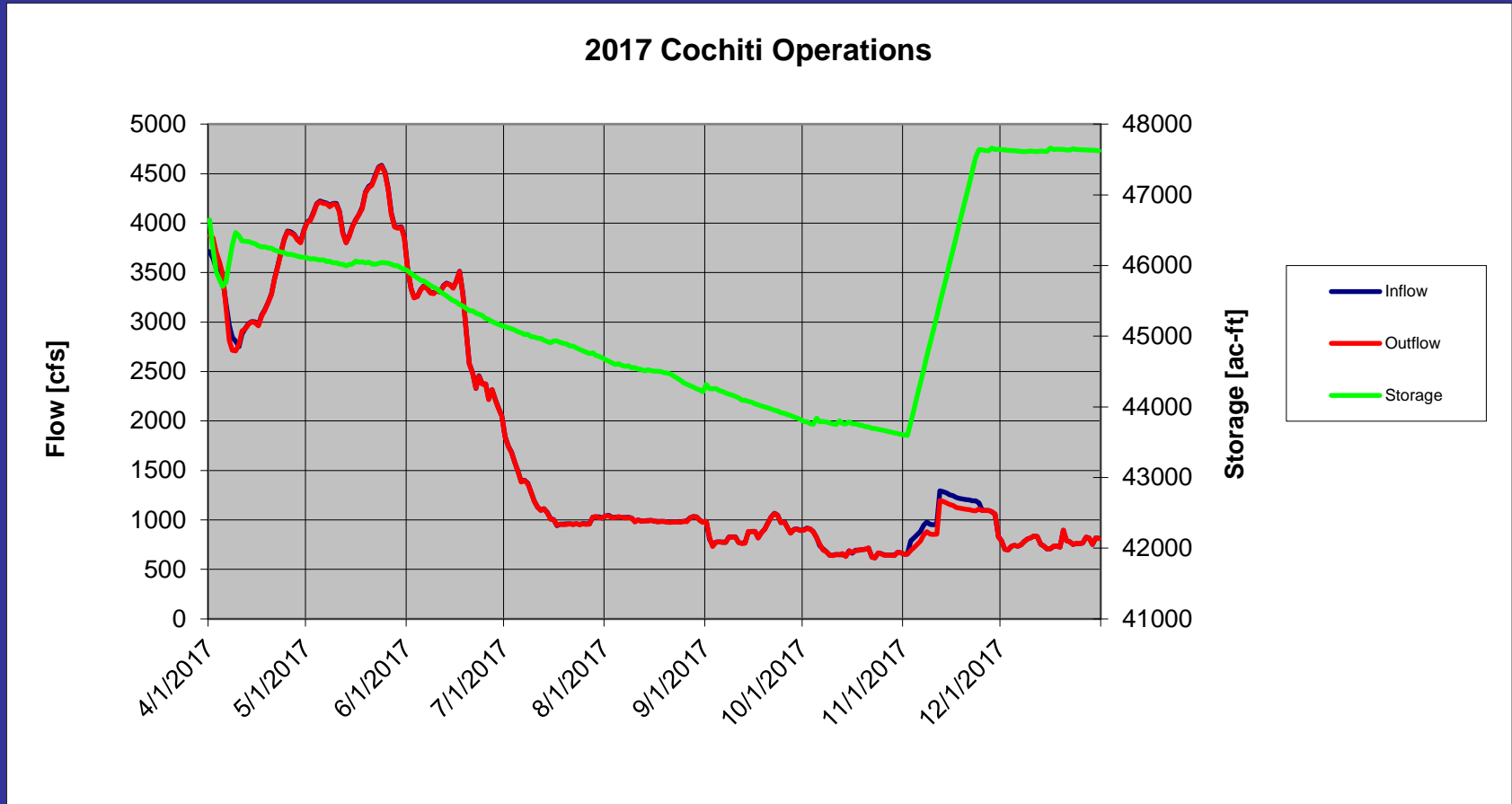
2017 Flow at Embudo



COCHITI LAKE

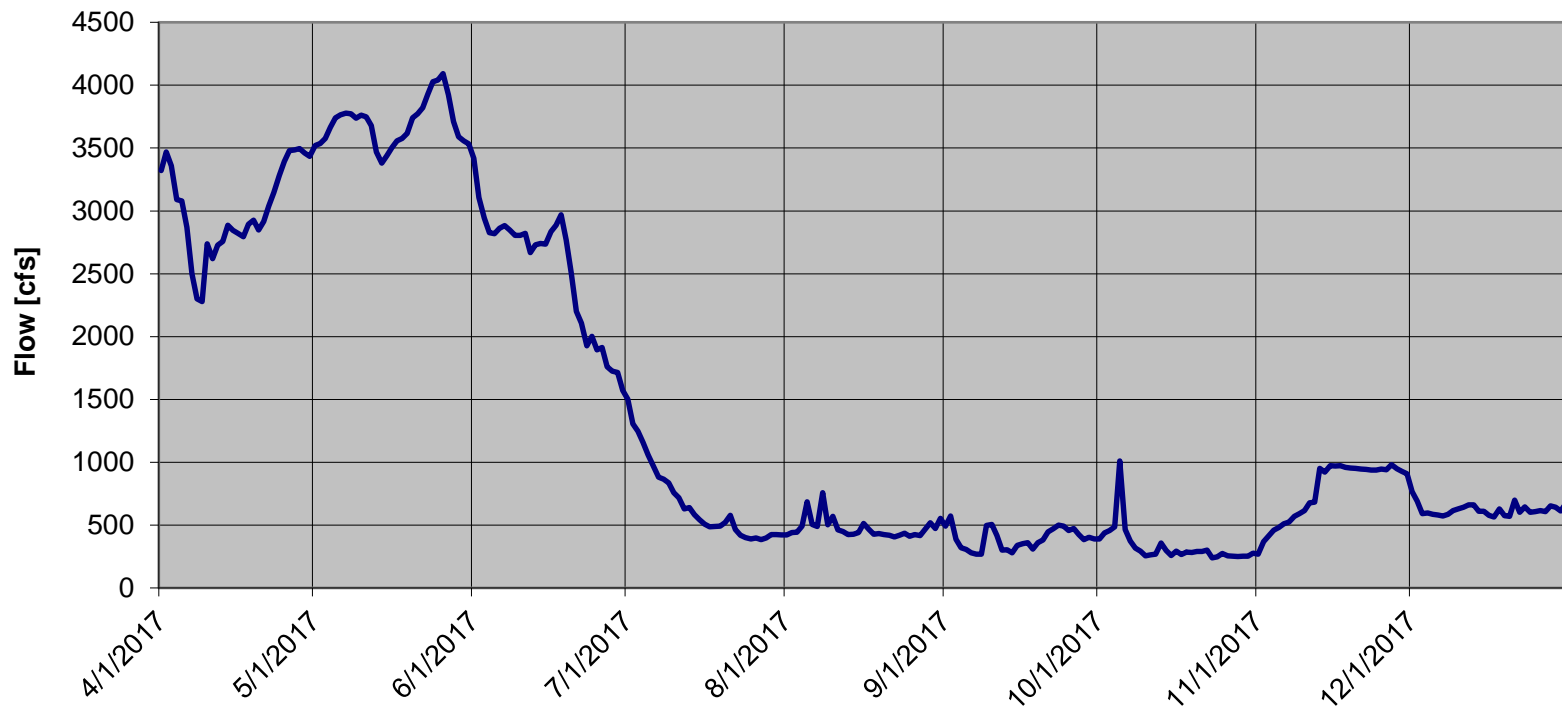


Proposed 2017 Cochiti Operations



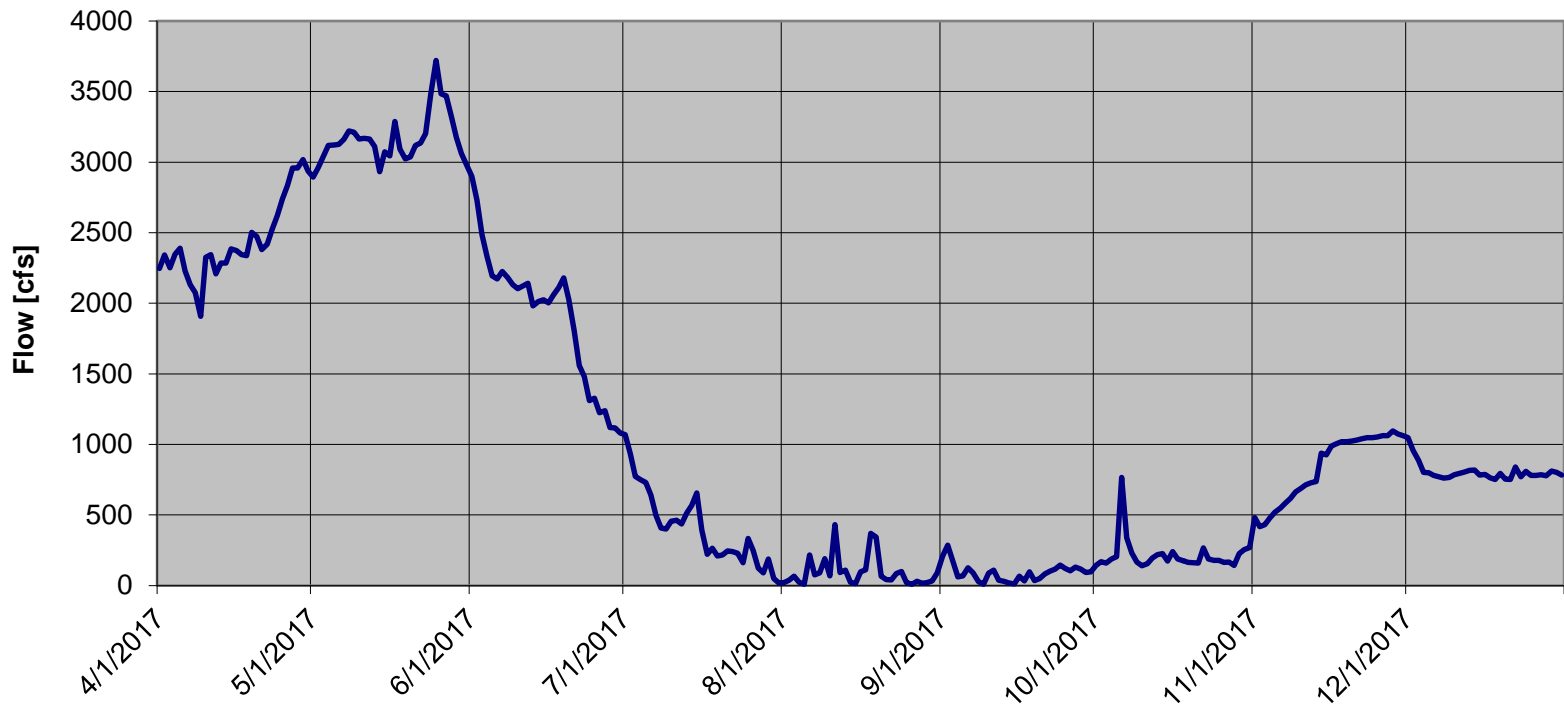
Estimated Hydrograph at Central Ave.

2017 Flow at Central Ave Gage

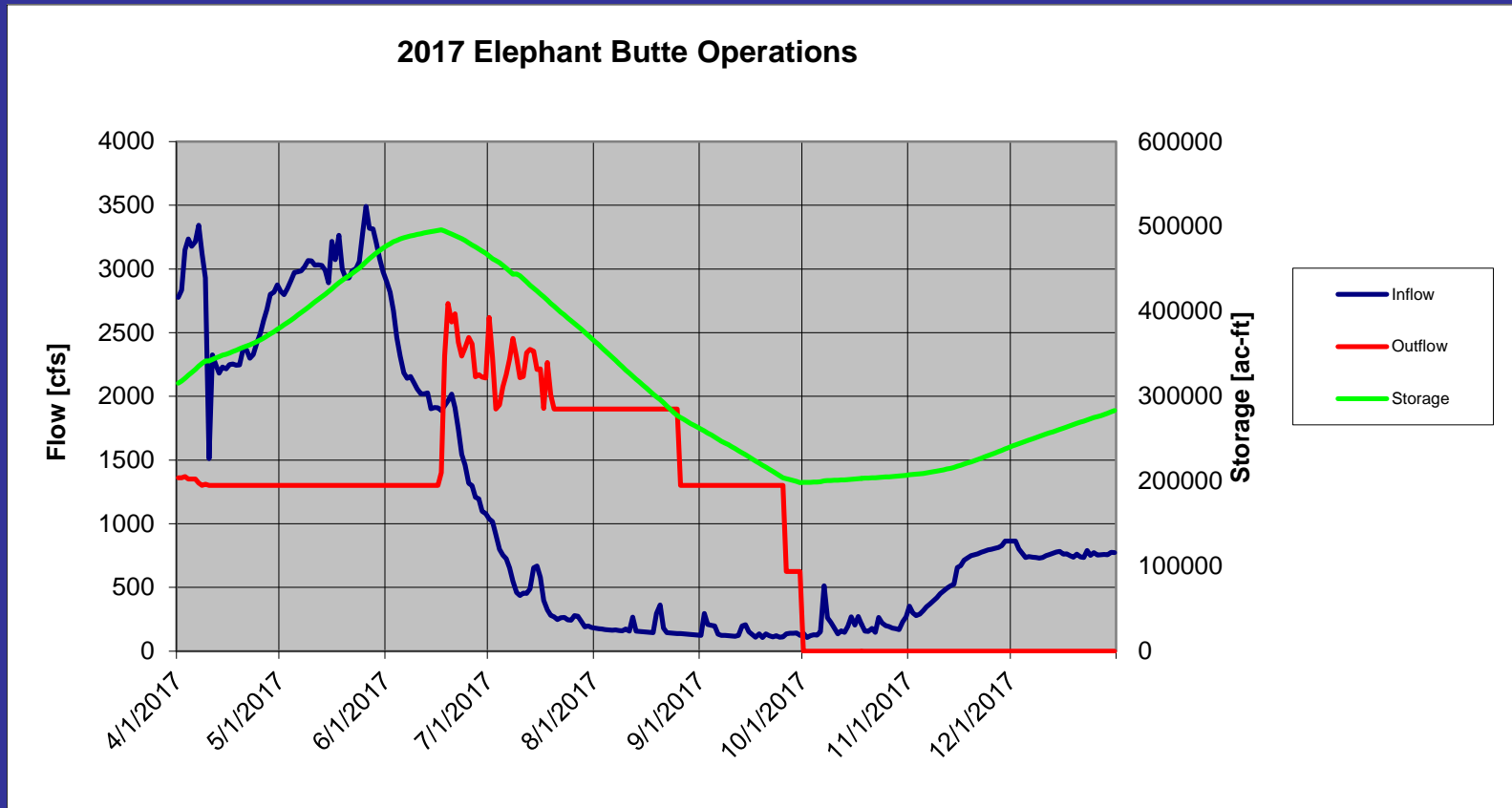


Estimated Flow at San Acacia

2017 Flow at San Acacia Gage



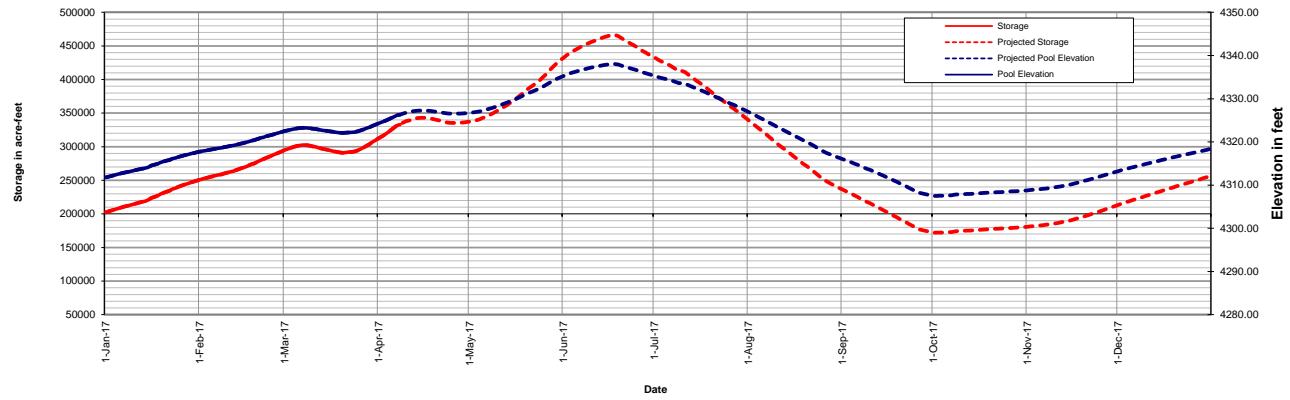
Proposed Elephant Butte Operations



Maximum Elevation = 4340.35' (6/17). Minimum Elevation= 4311.25' (9/30)

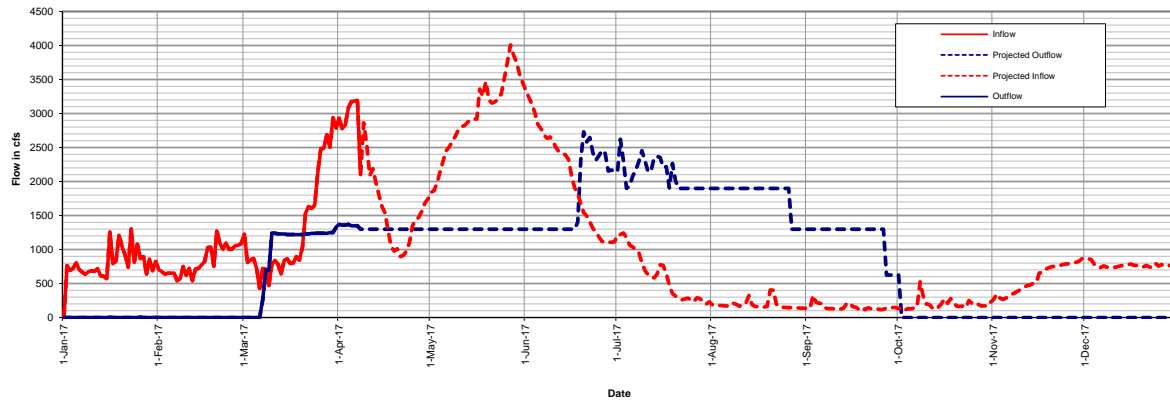
Provisional- Subject to Change

Elephant Butte Storage and Pool Elevation



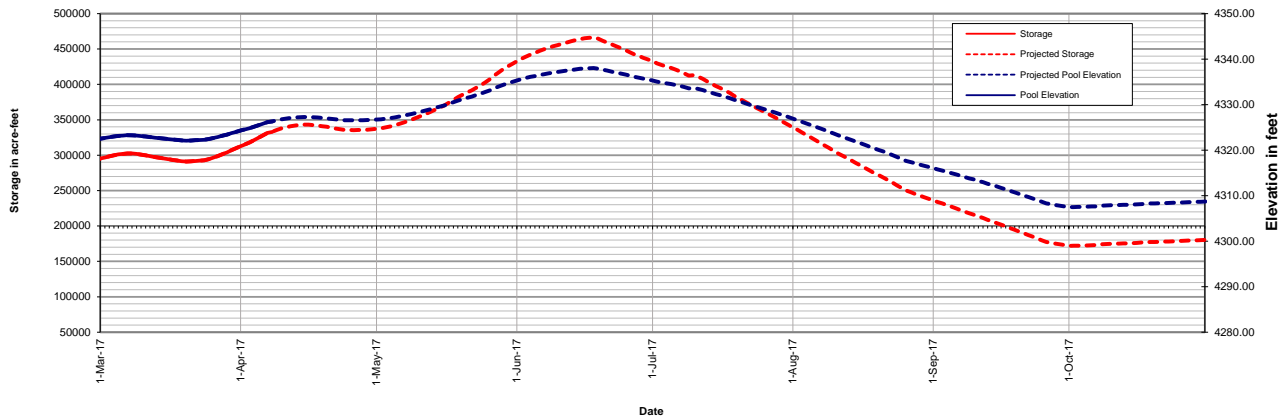
Provisional- Subject to Change

Elephant Butte Inflow and Outflow



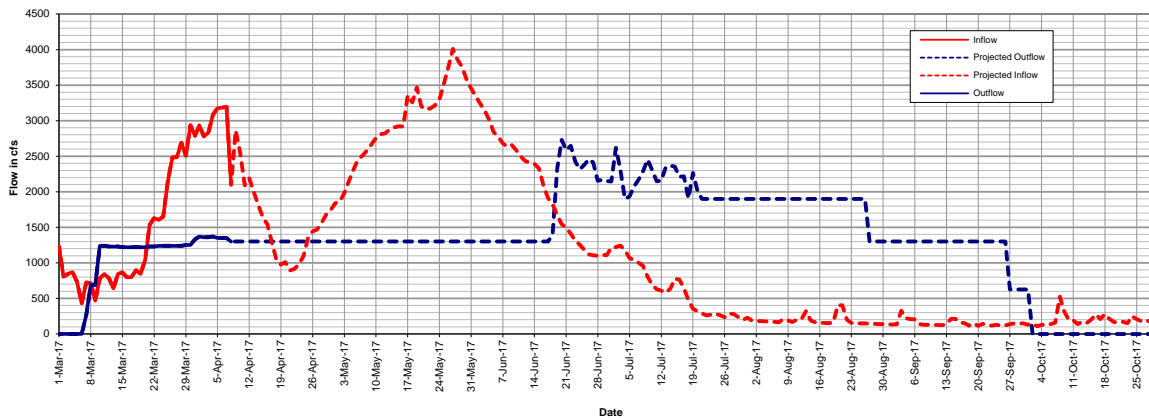
Provisional- Subject to Change

Elephant Butte Storage and Pool Elevation

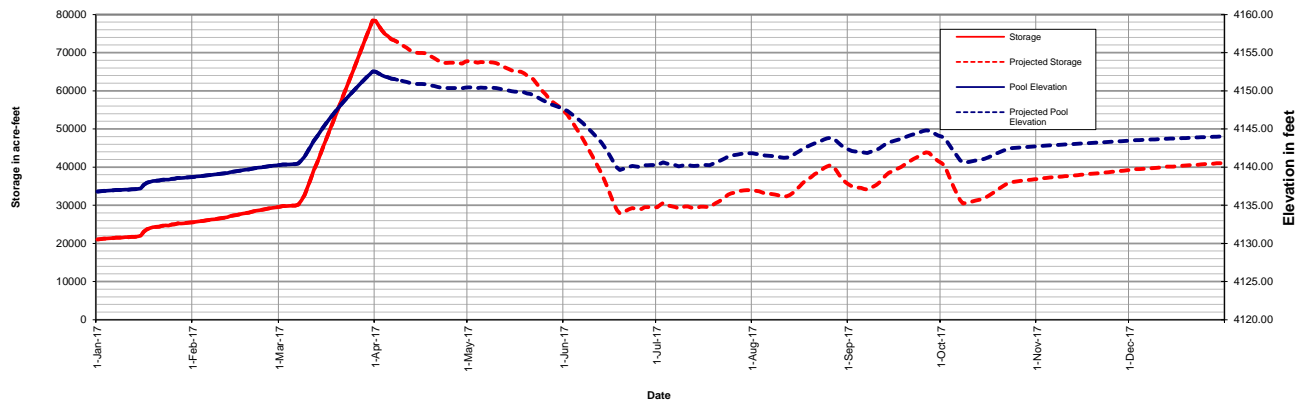


Provisional- Subject to Change

Elephant Butte Inflow and Outflow

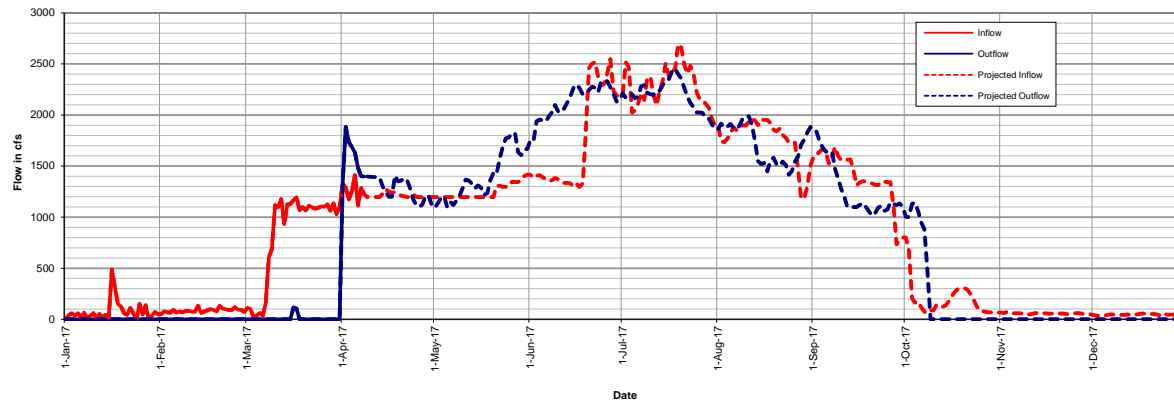


Caballo Storage and Pool Elevation



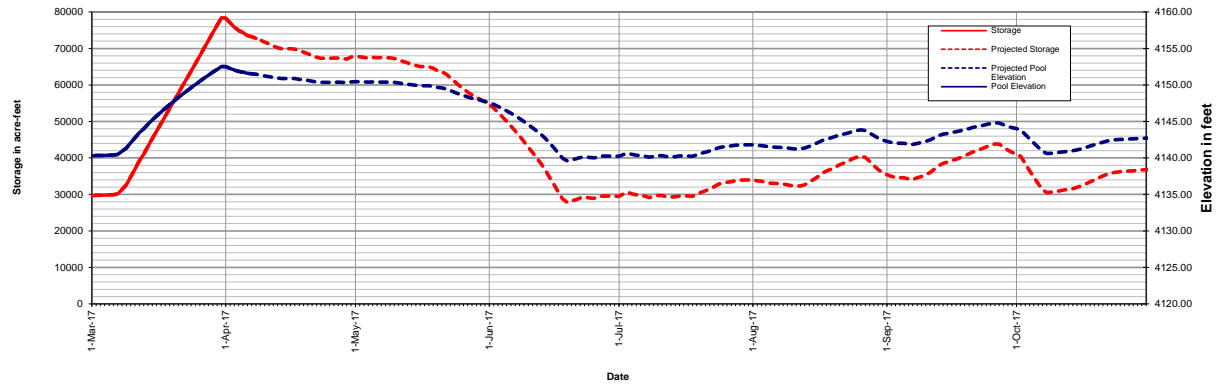
Provisional- Subject to Change

Caballo Inflow and Outflow



Provisional- Subject to Change

Caballo Storage and Pool Elevation



Provisional- Subject to Change

Caballo Inflow and Outflow

