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**US Army Corps  
of Engineers®**  
Albuquerque District

# 2021 Annual Operating Plan April 1 Runoff Forecast

April 15-16, 2021

# Definitions 1.1

- **Native/natural Rio Grande water:** water that comes directly from the Rio Grande Basin
- **San Juan-Chama water:** water imported from San Juan Basin of Colorado River into Rio Grande Basin through San Juan-Chama Project
- **Rio Grande Compact:** agreement between Colorado, New Mexico, and Texas apportioning Rio Grande water between the three states



# Definitions 1.2

- Compact debit – results when actual delivery falls below scheduled delivery of the Rio Grande Compact
- Article VII restrictions: restricts storage of Rio Grande water at El Vado when Rio Grande Project storage in Elephant Butte and Caballo is less than 400,000 ac-ft, except for P&P needs or relinquishment credit
- cfs – cubic feet per second (flowrate)
- Acre-foot – volume of water needed to cover one acre to depth of one foot
- Hydrograph – graph of flowrate over time



# Definitions 1.3

- MRGCD – Middle Rio Grande Conservancy District
- The City/Water Authority – Albuquerque Bernalillo County Water Utility Authority (ABCWUA)
- NRCS – Natural Resources Conservation Service
- Supplemental water – water leased by Reclamation to augment flows in support of Rio Grande Silvery Minnow as outlined in 2016 Biological Opinion
- P&P – Prior & Paramount lands of the six Middle Rio Grande Pueblos

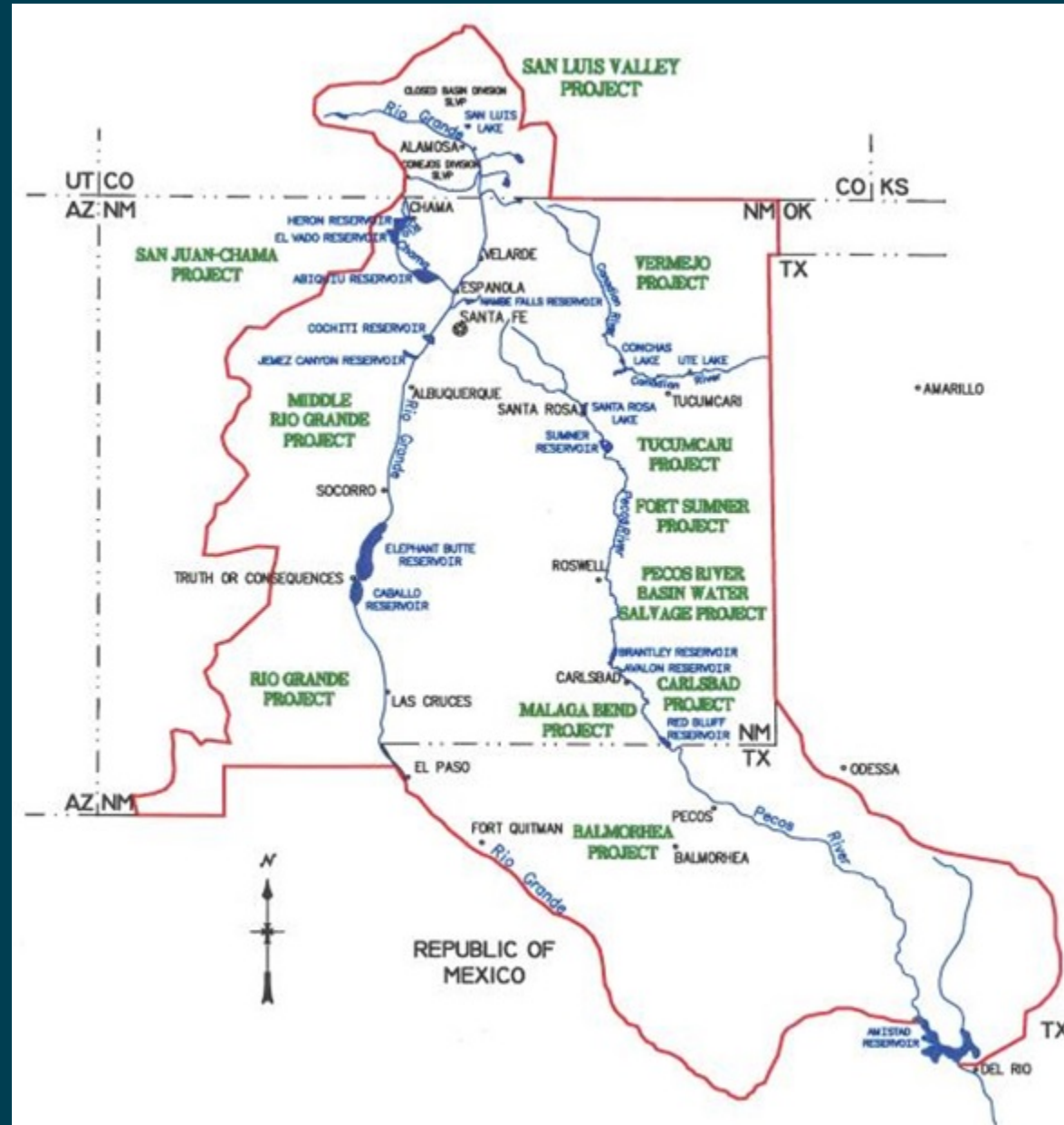


# Definitions 1.4

- EBID – Elephant Butte Irrigation District
- EP1 – El Paso County Water Improvement District No. 1
- HCCRD – Hudspeth County Conservation & Reclamation District
- IBWC – International Boundary and Water Commission, US Section
- 1906 Convention – Convention between the United States and Mexico, signed May 21, 1906
- OA – 2008 Operating Agreement for the Rio Grande Project, between EBID, EP1, Reclamation



# Map of Reclamation's Albuquerque Area Office Projects

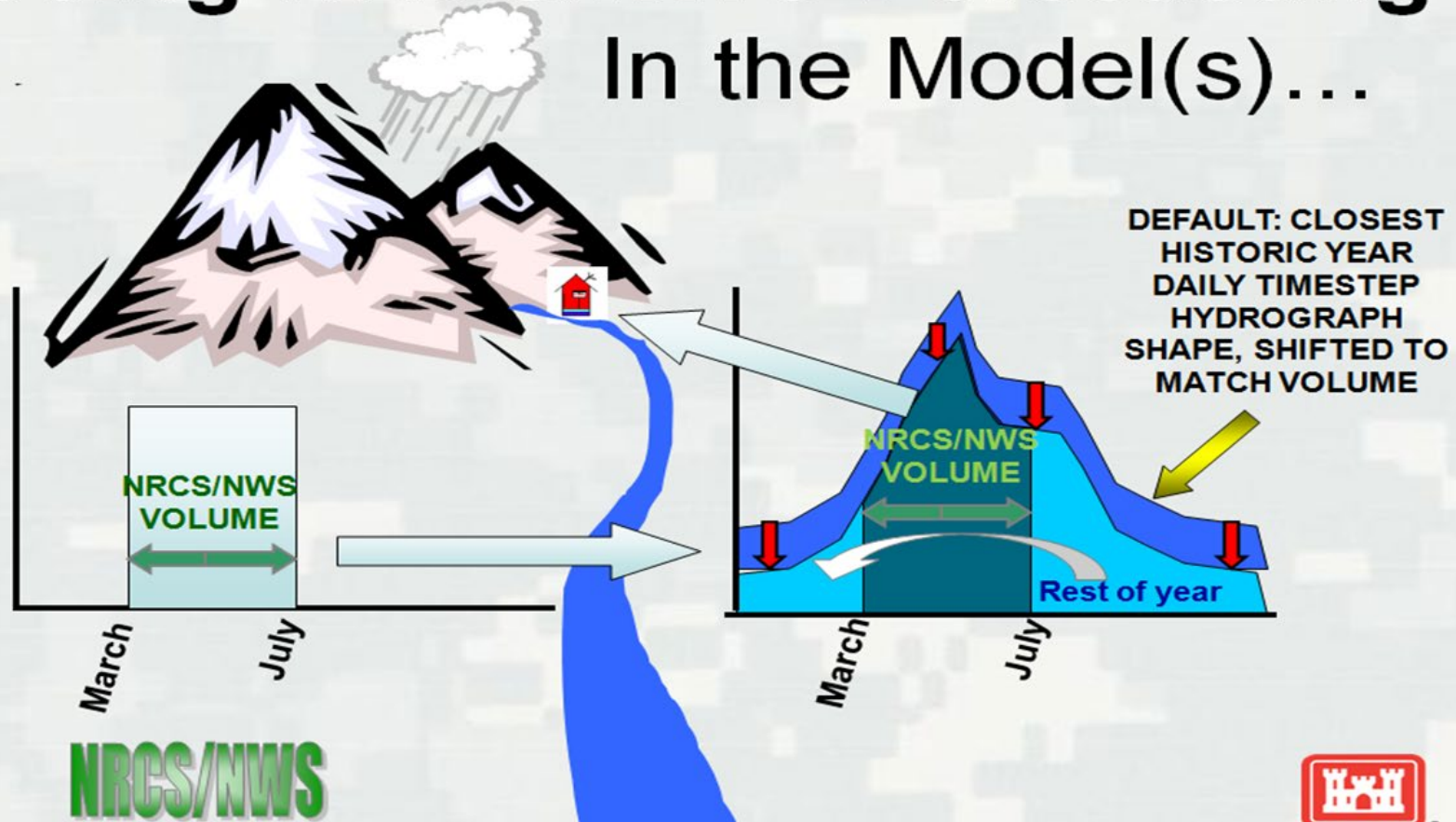


# What Drives the Process

- Volume forecast from 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



# Using NRCS/NWS Forecasting In the Model(s)...

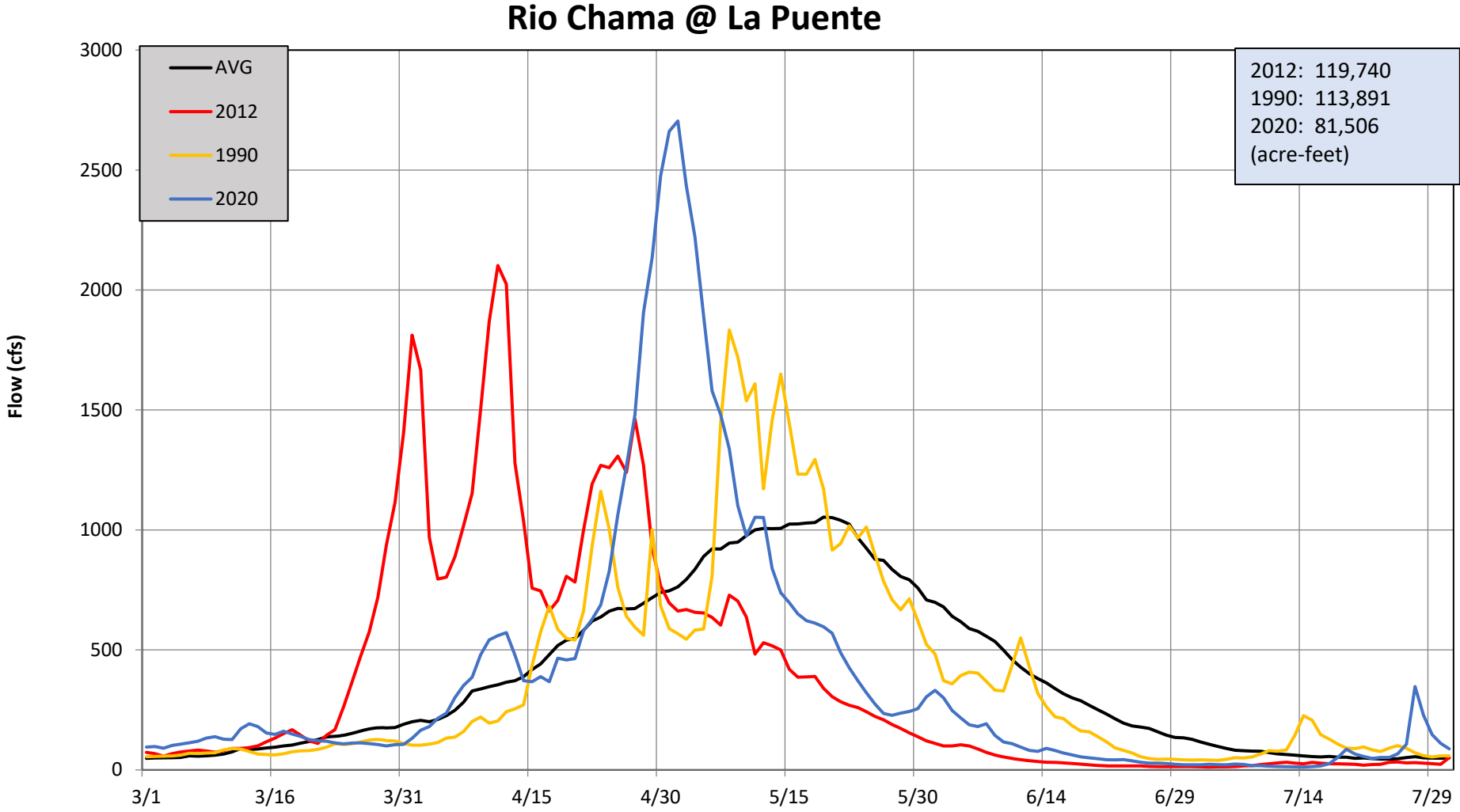


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# Similar Year Hydrographs



# Reservoirs by Agency and Water Source



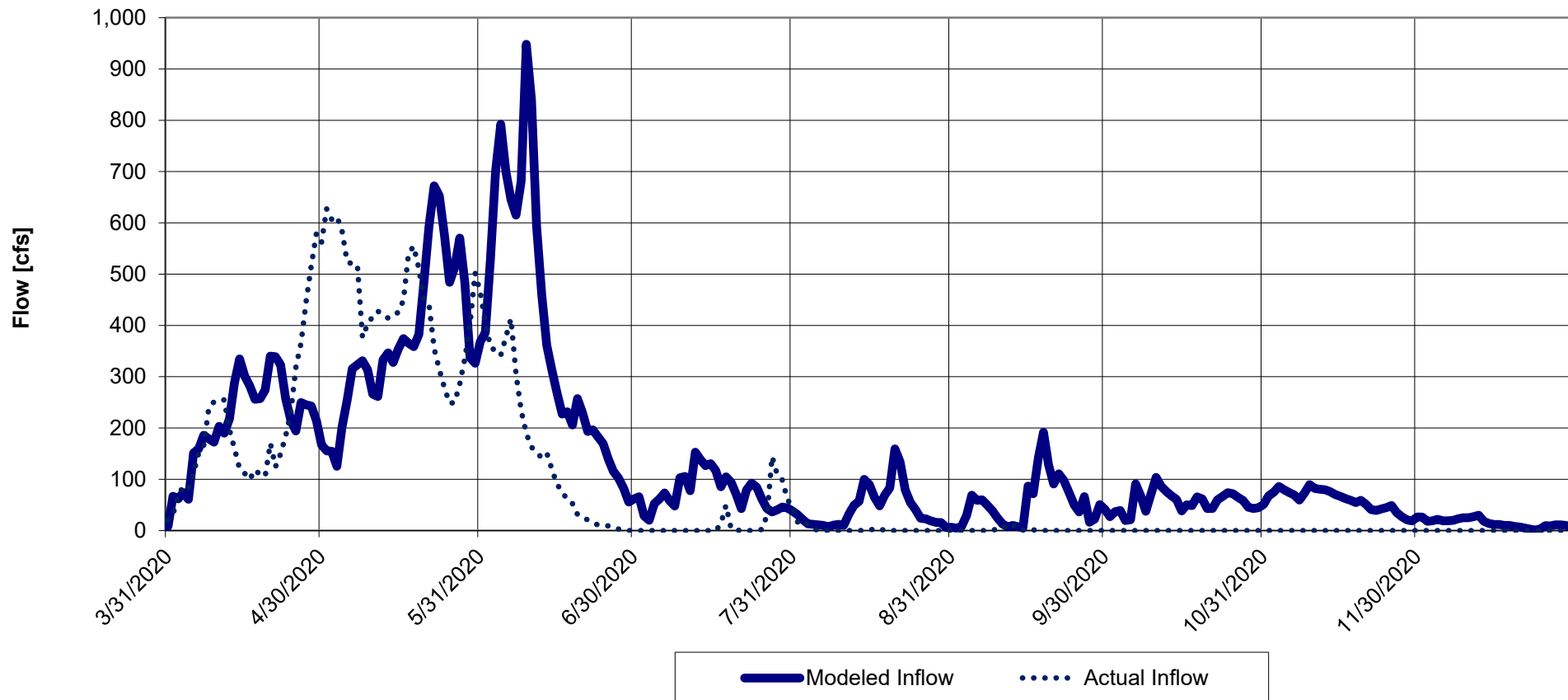
<u>Operated By:</u>	Reclamation	Corps	Water Supply	Recreation	Flood Control	Sediment Control
<u>Dams:</u>						
HERON						
EL VADO						
ABIQUIU						
NAMBE FALLS						
GALISTEO						
COCHITI						
JEMEZ CANYON						
ELEPHANT BUTTE						
CABALLO						



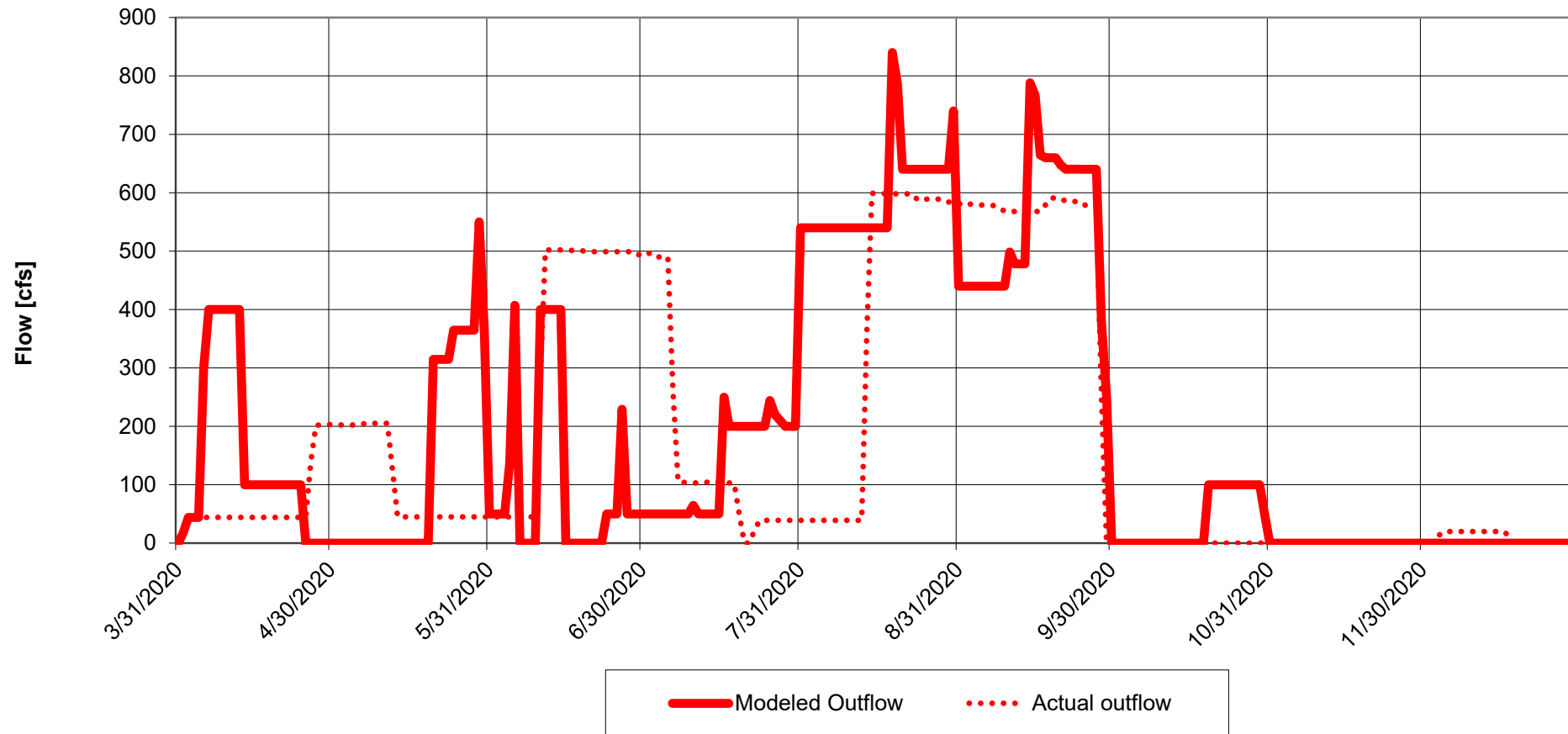
# 2020: The Year in Review



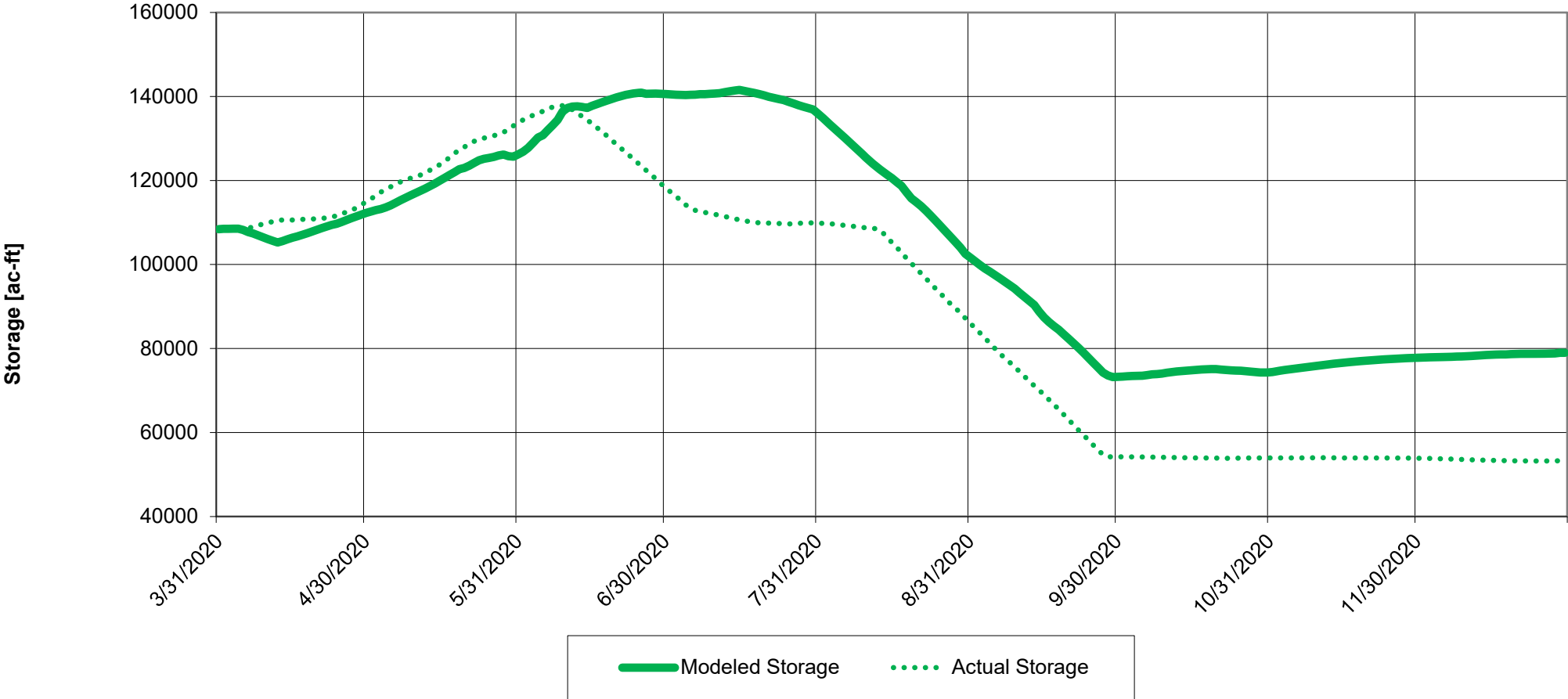
# Heron Reservoir Inflow



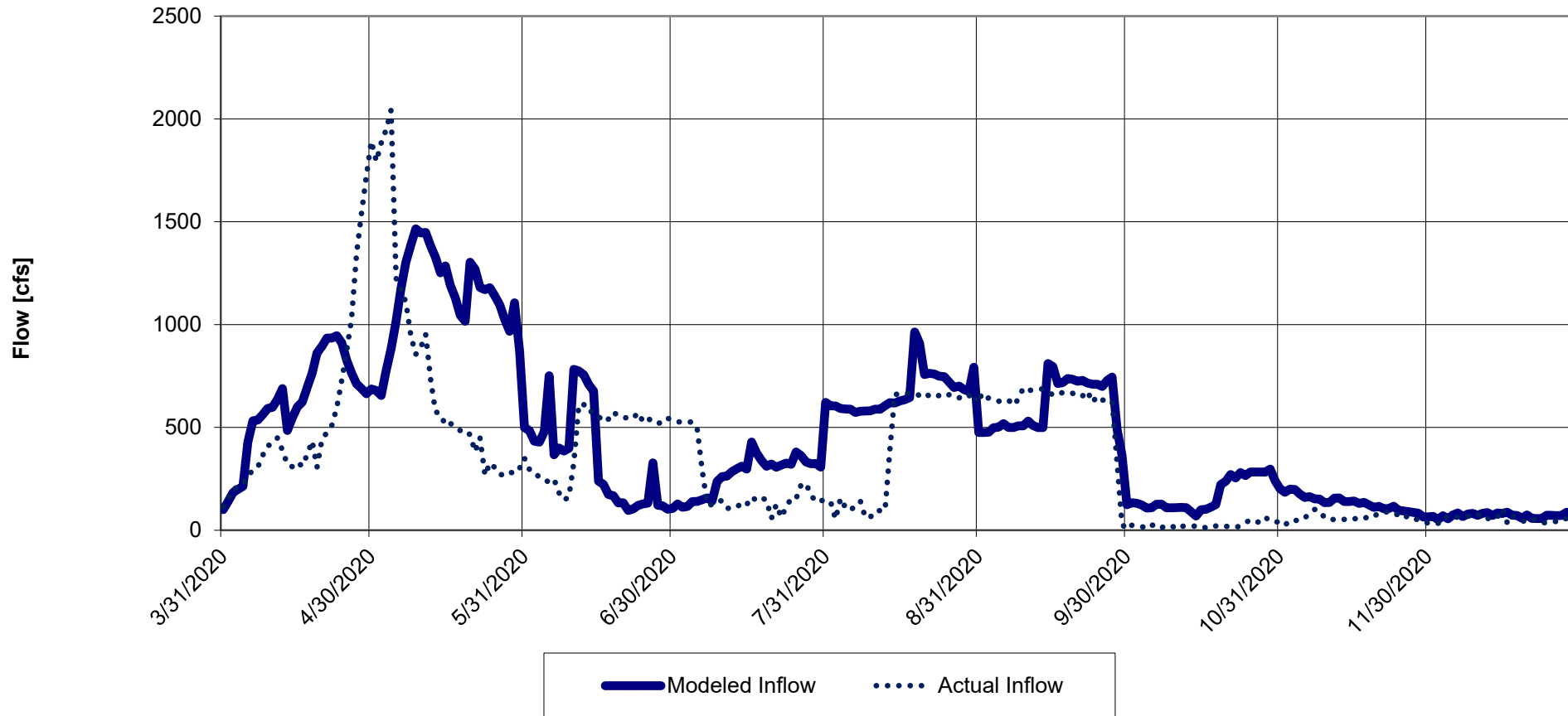
# Heron Reservoir Outflow



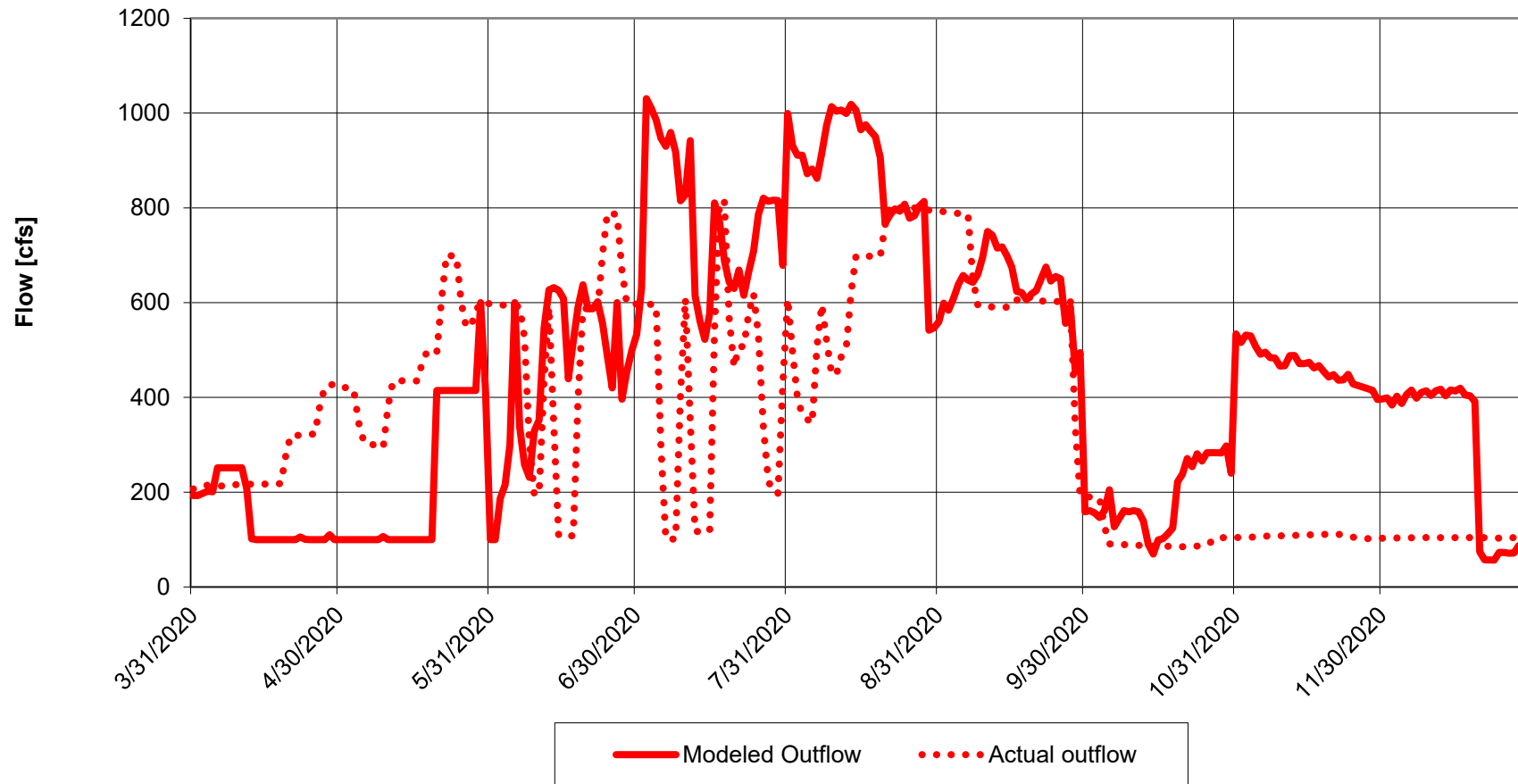
# Heron Reservoir Storage



# El Vado Reservoir Inflow

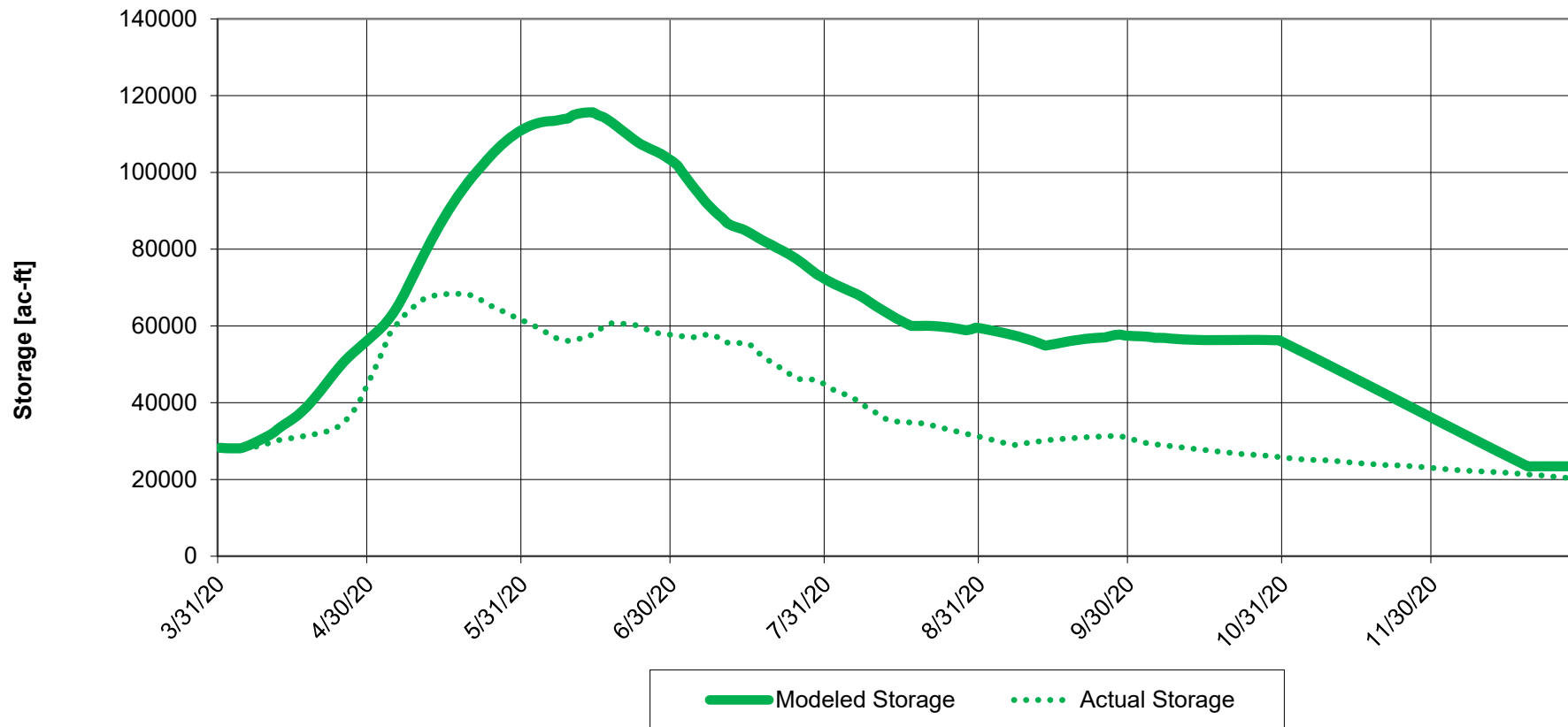


# El Vado Reservoir Outflow

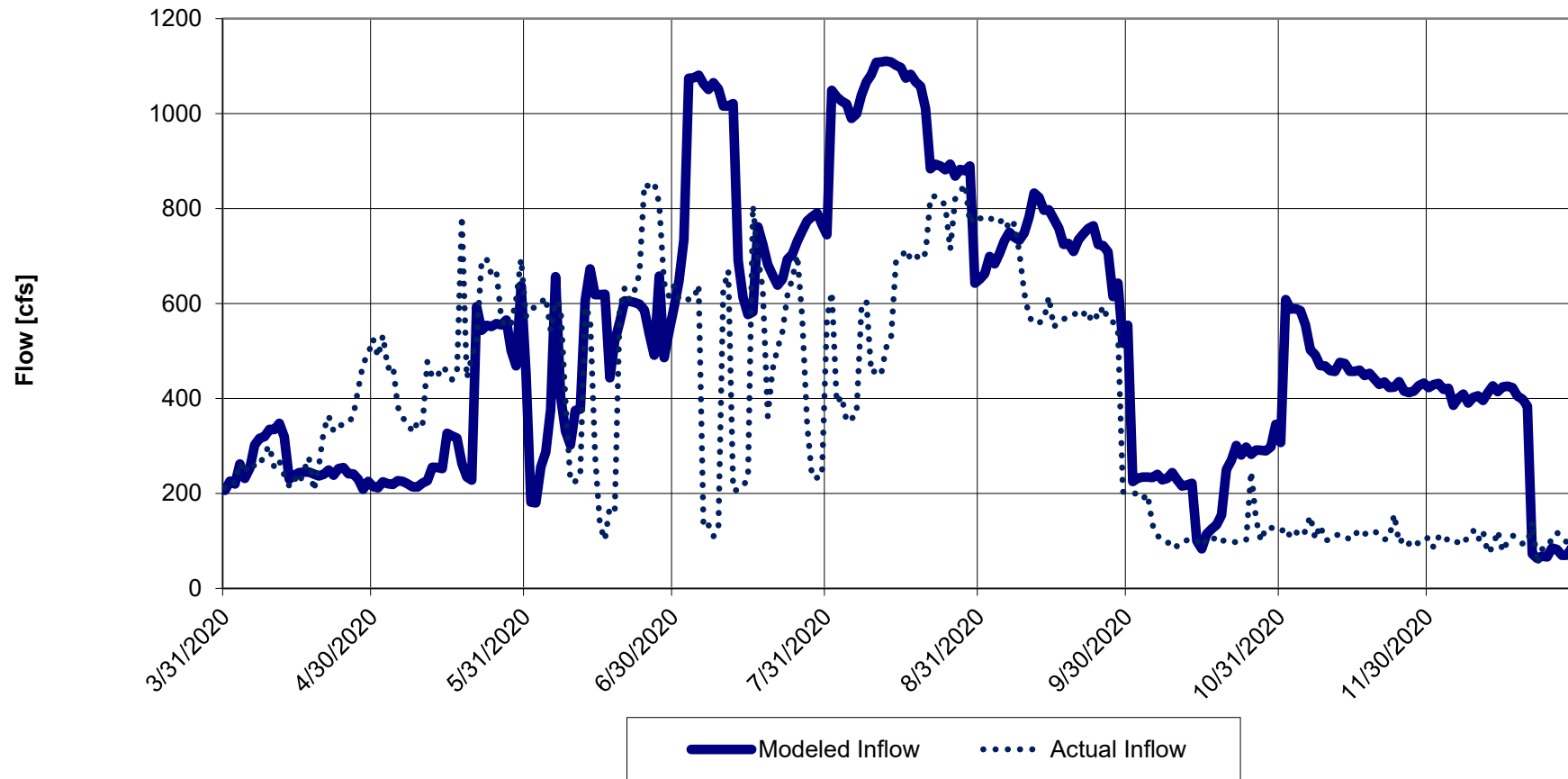




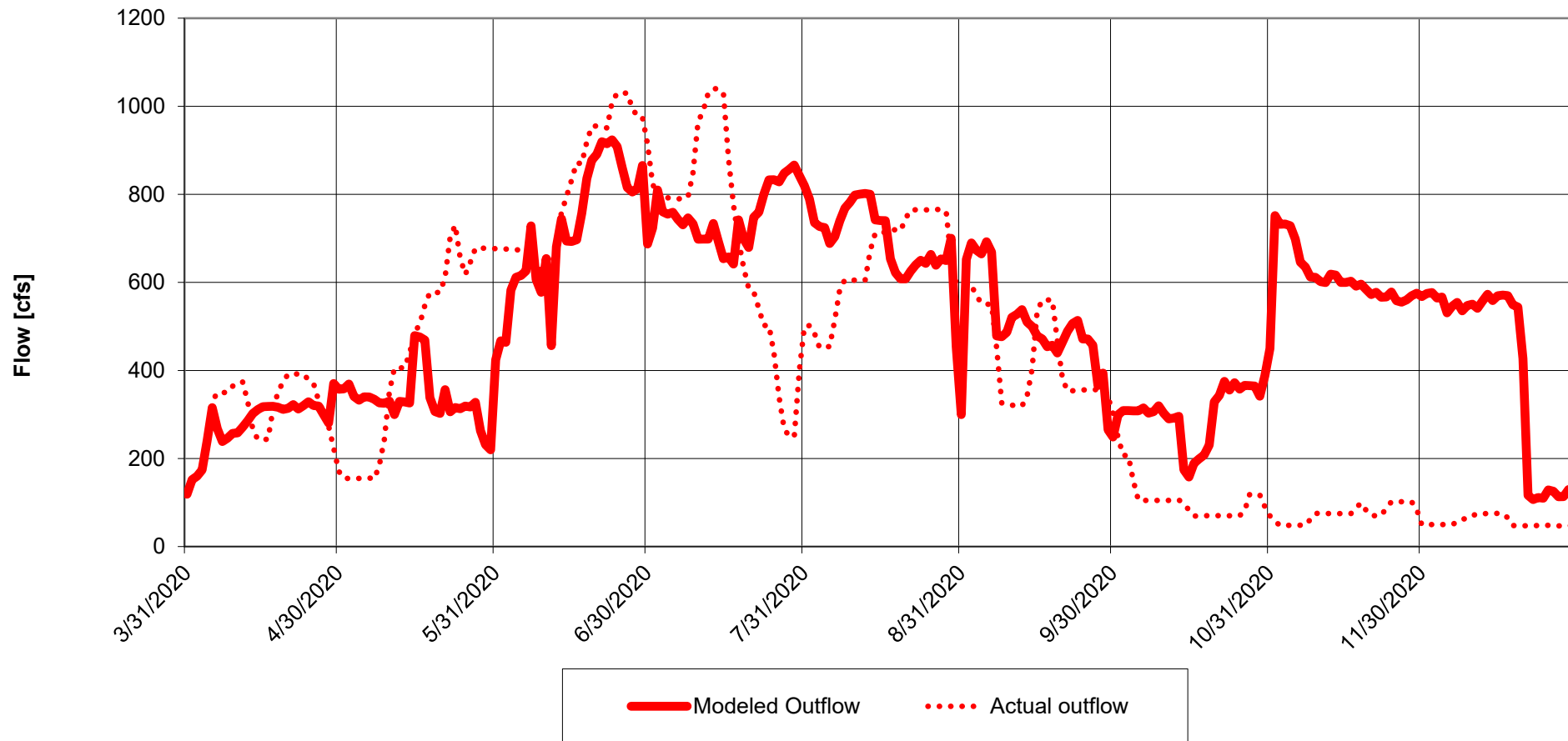
# El Vado Reservoir Storage



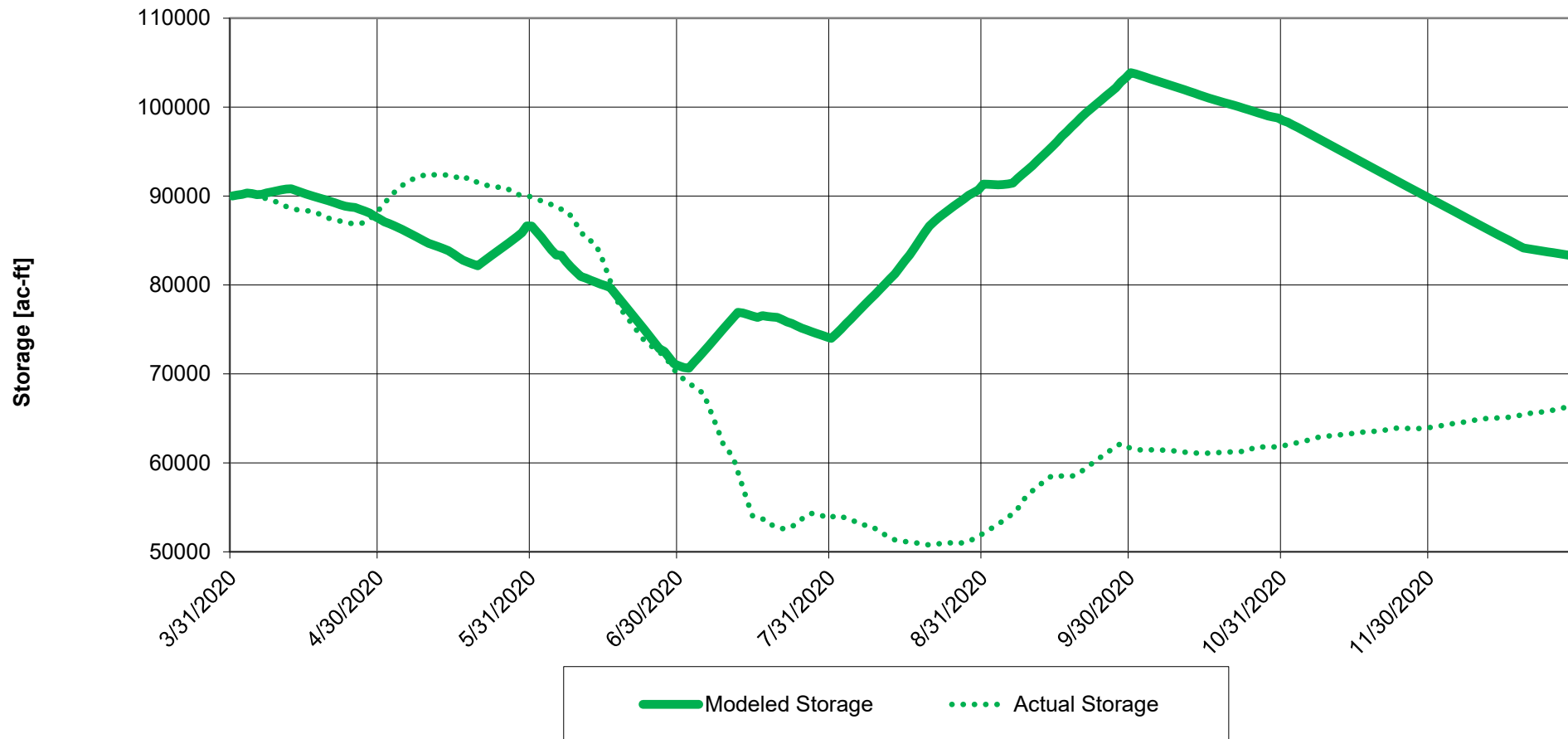
# Abiquiu Reservoir Inflow



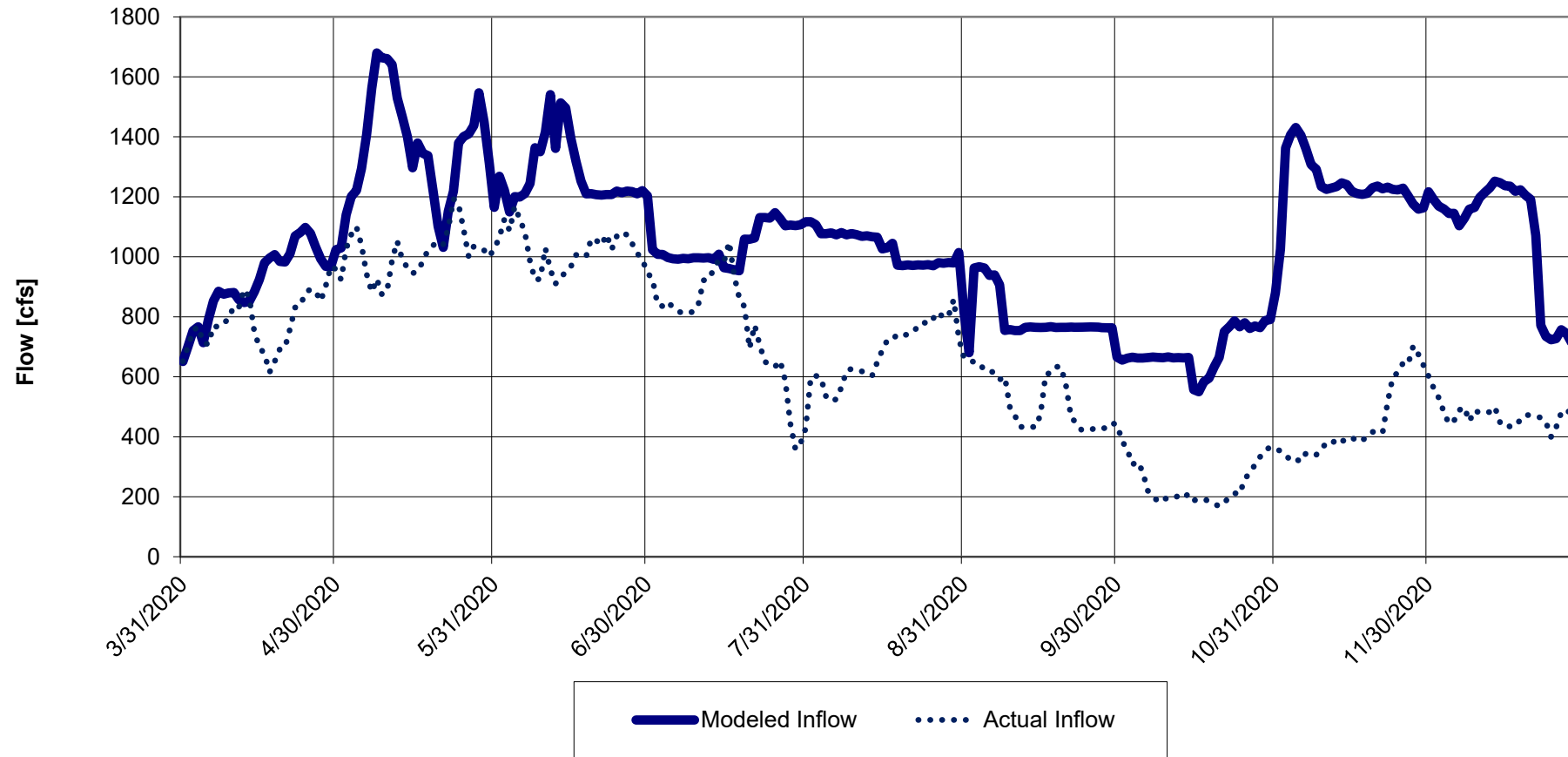
# Abiquiu Reservoir Outflow



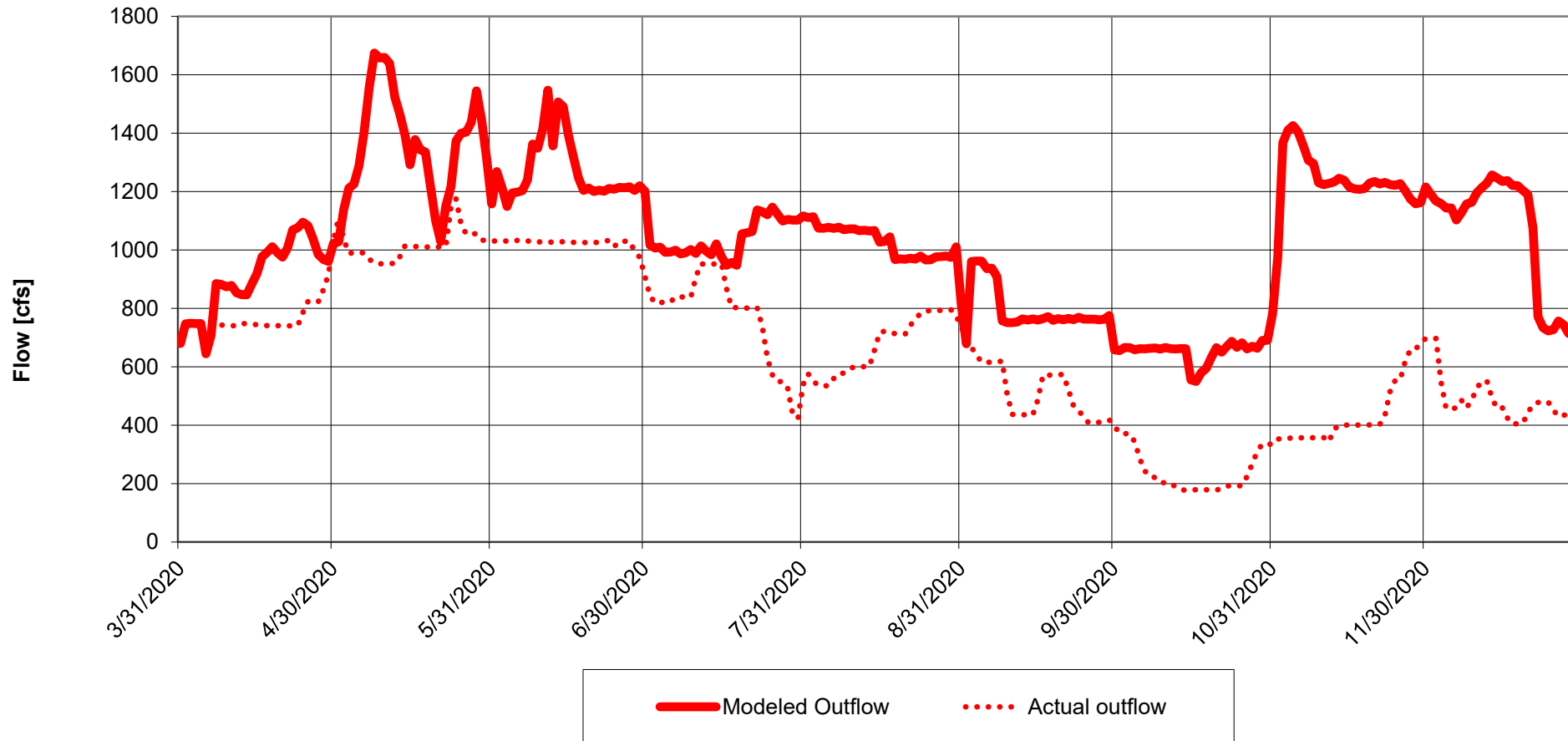
# Abiquiu Reservoir Storage



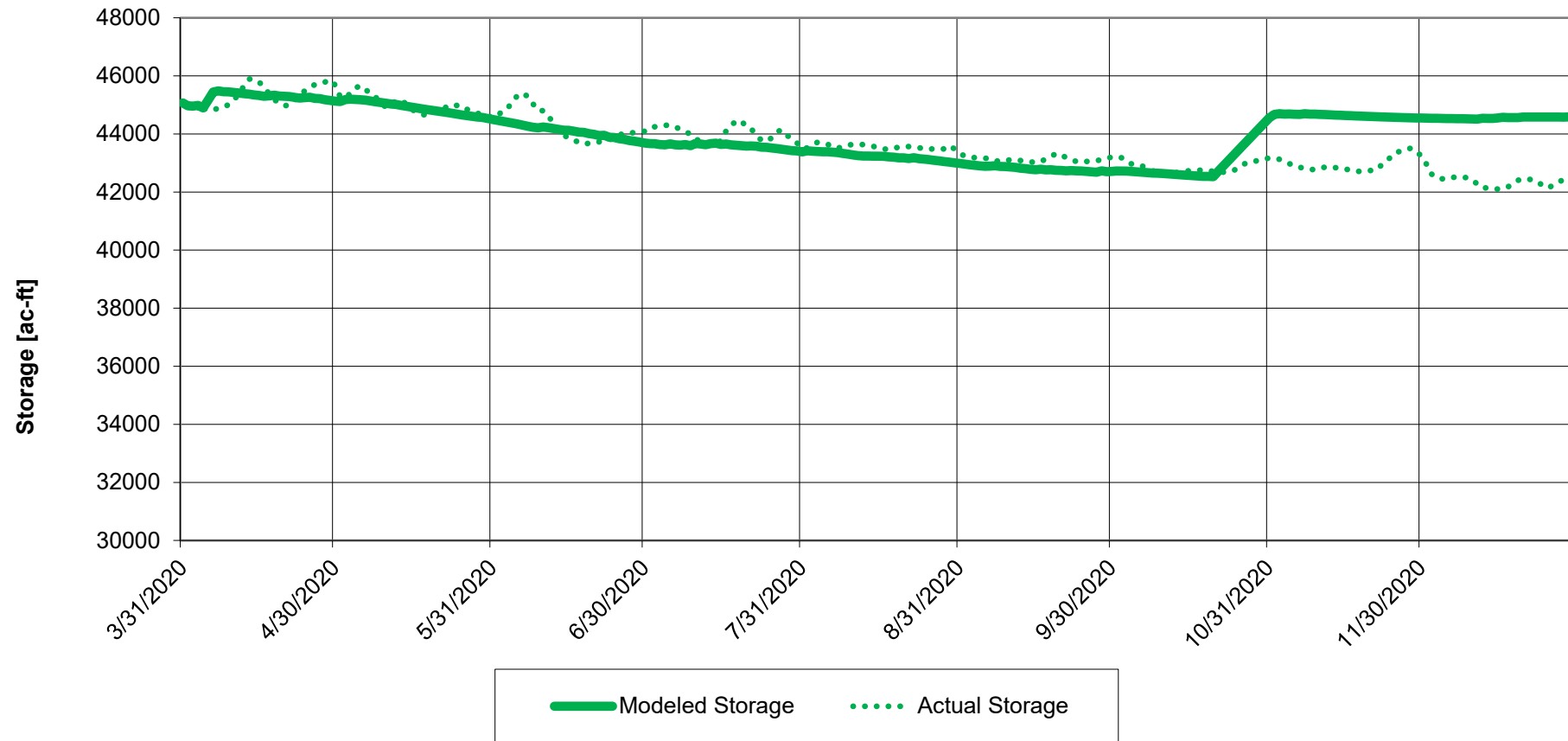
# Cochiti Reservoir Inflow



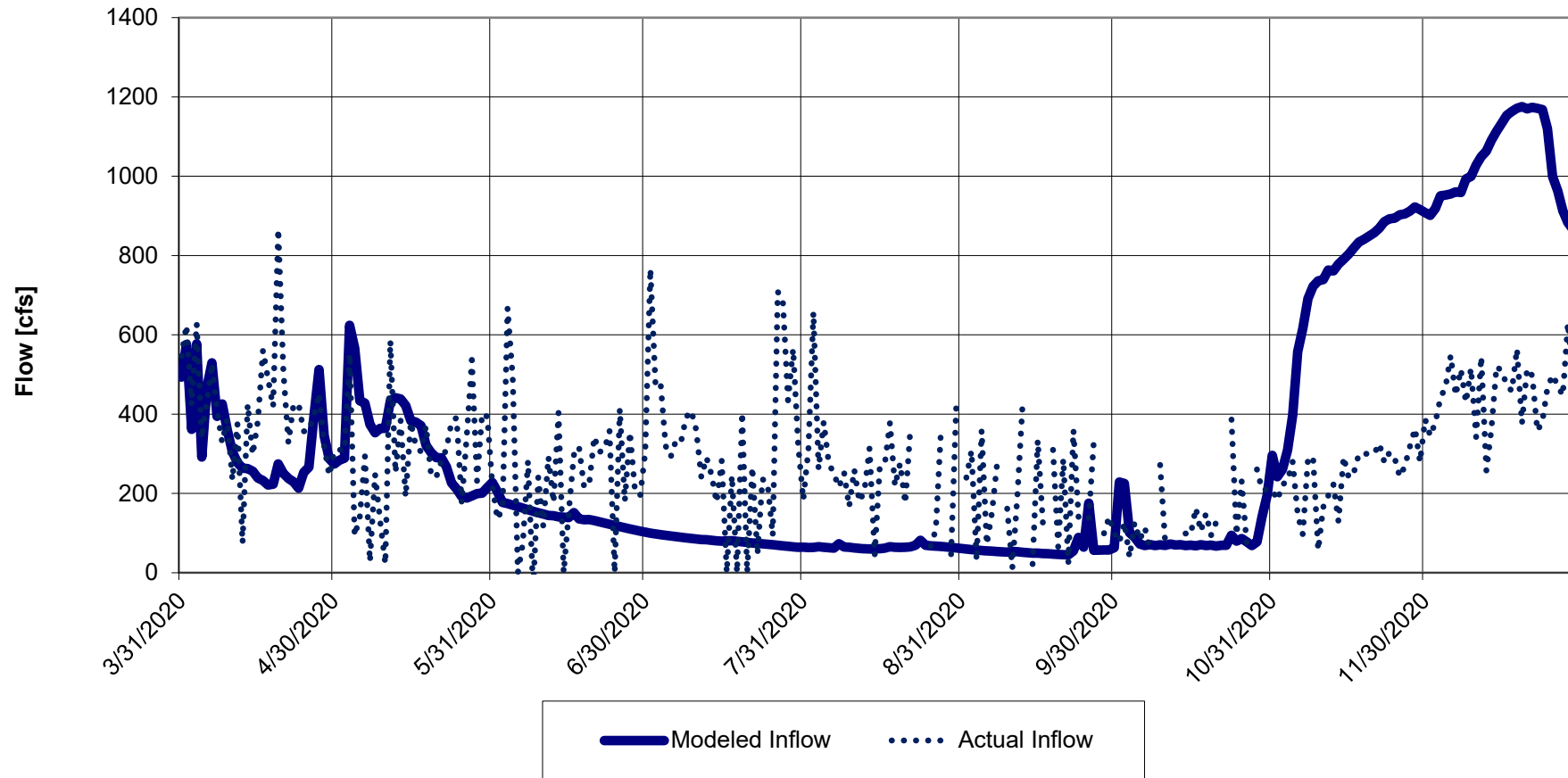
# Cochiti Reservoir Outflow



# Cochiti Reservoir Storage

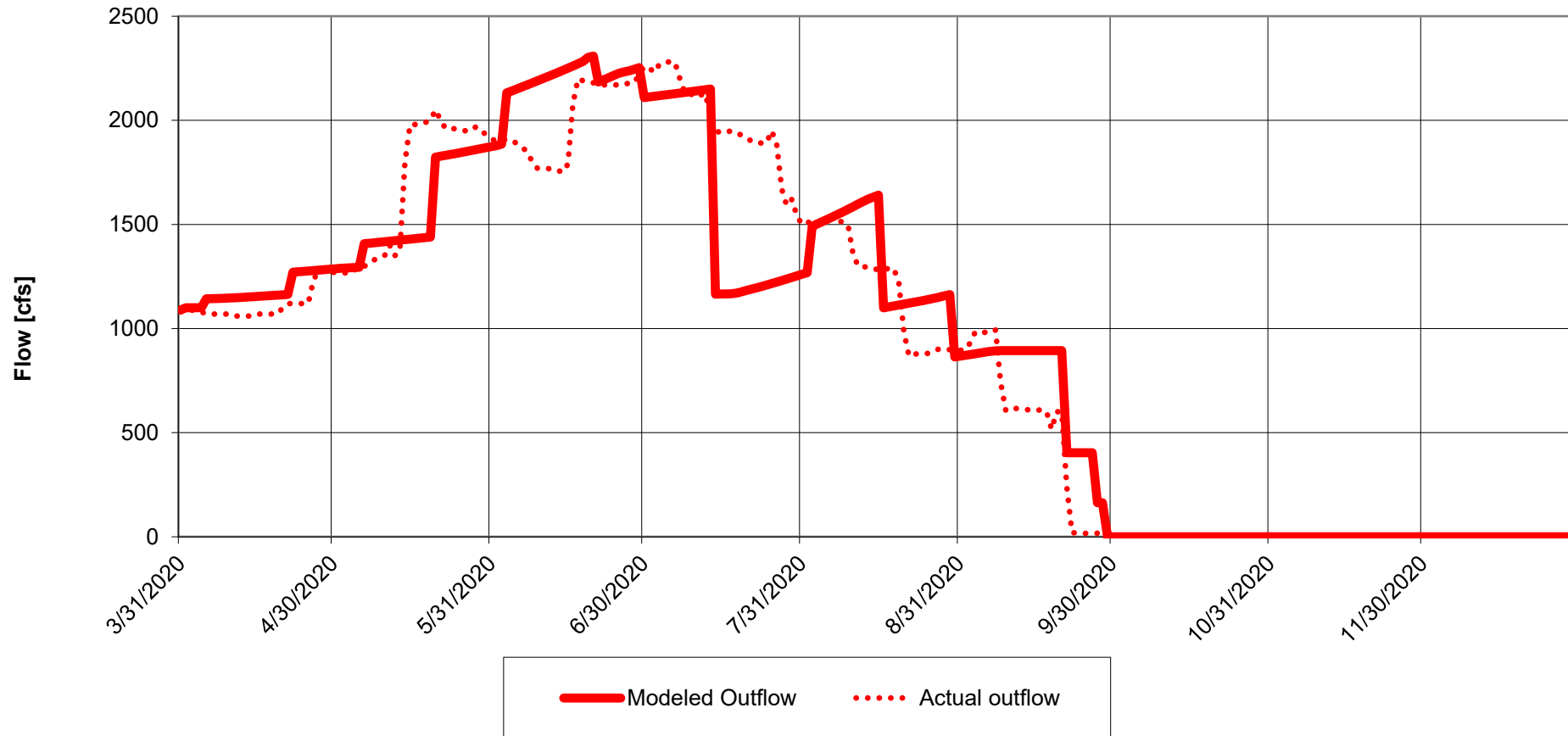


# Elephant Butte Reservoir Inflow

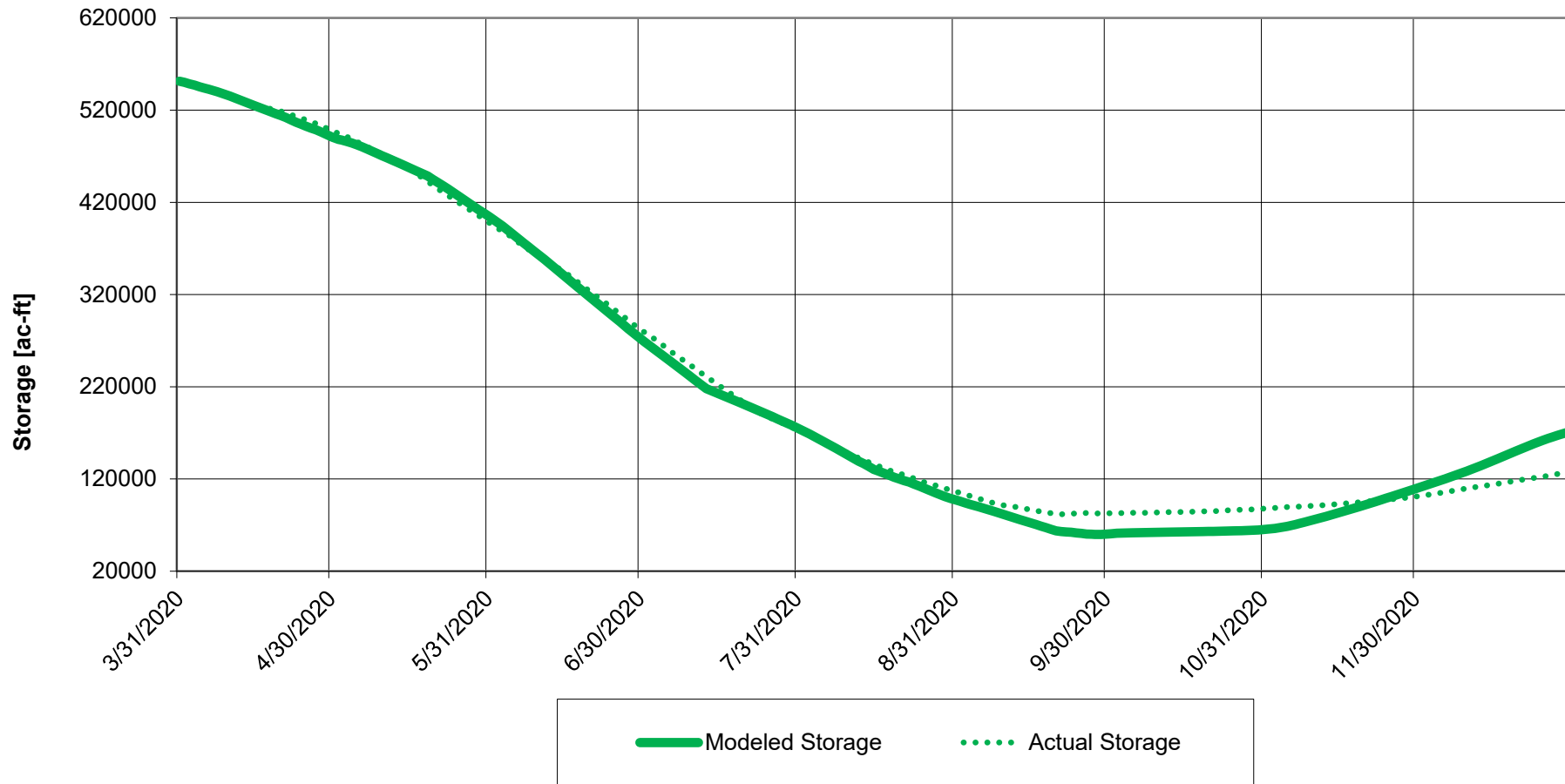




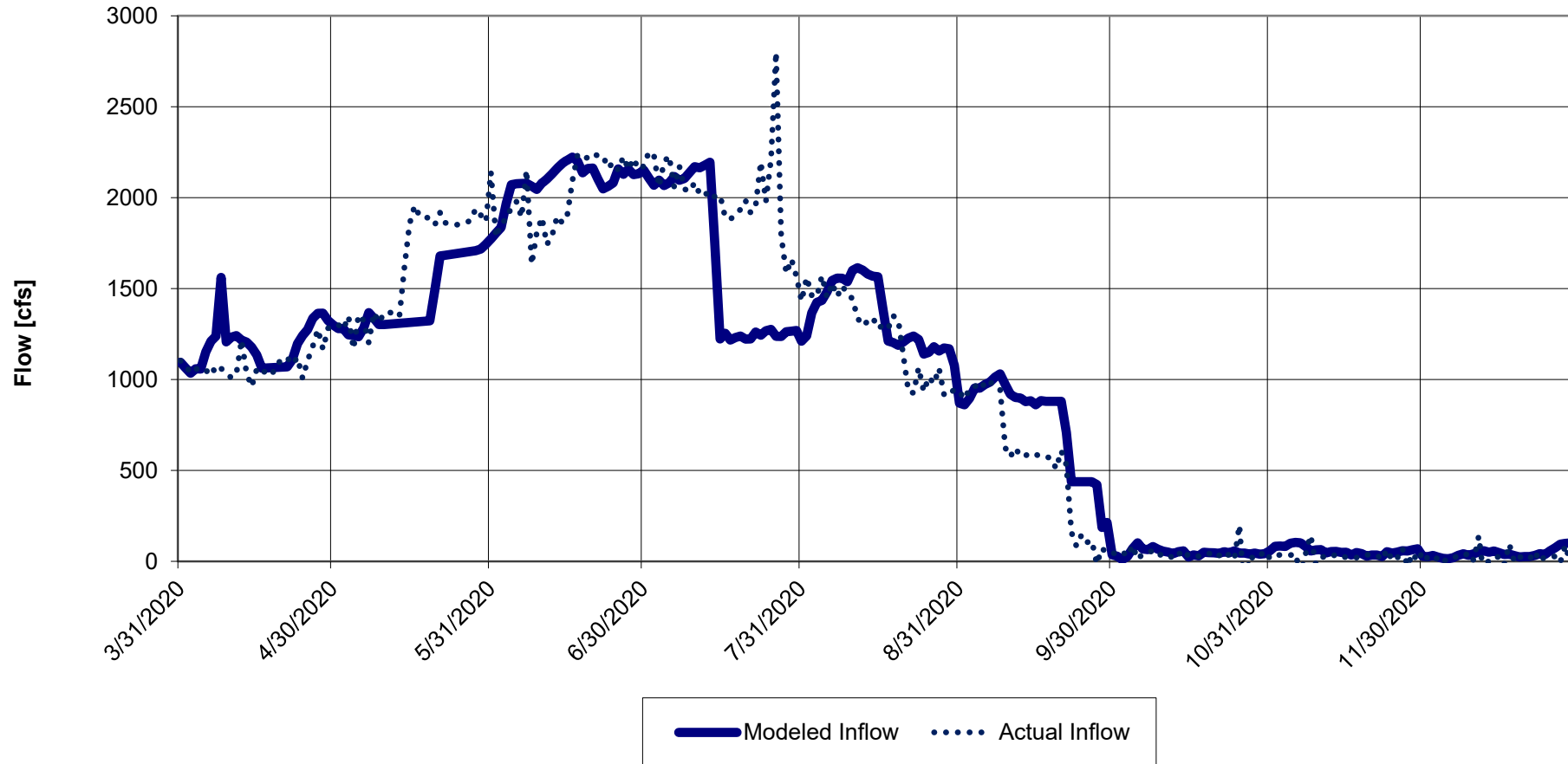
# Elephant Butte Reservoir



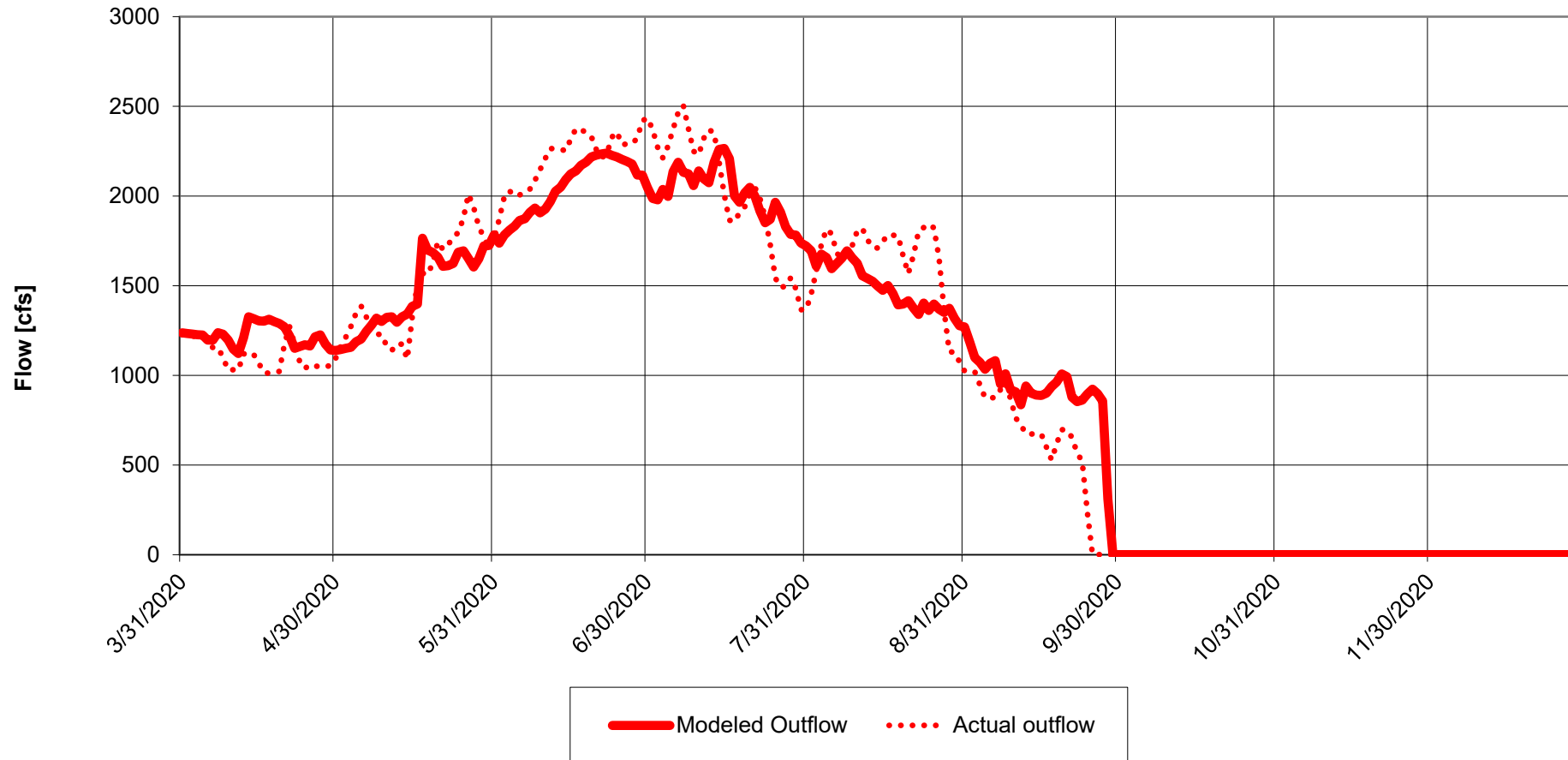
# Elephant Butte Reservoir Storage



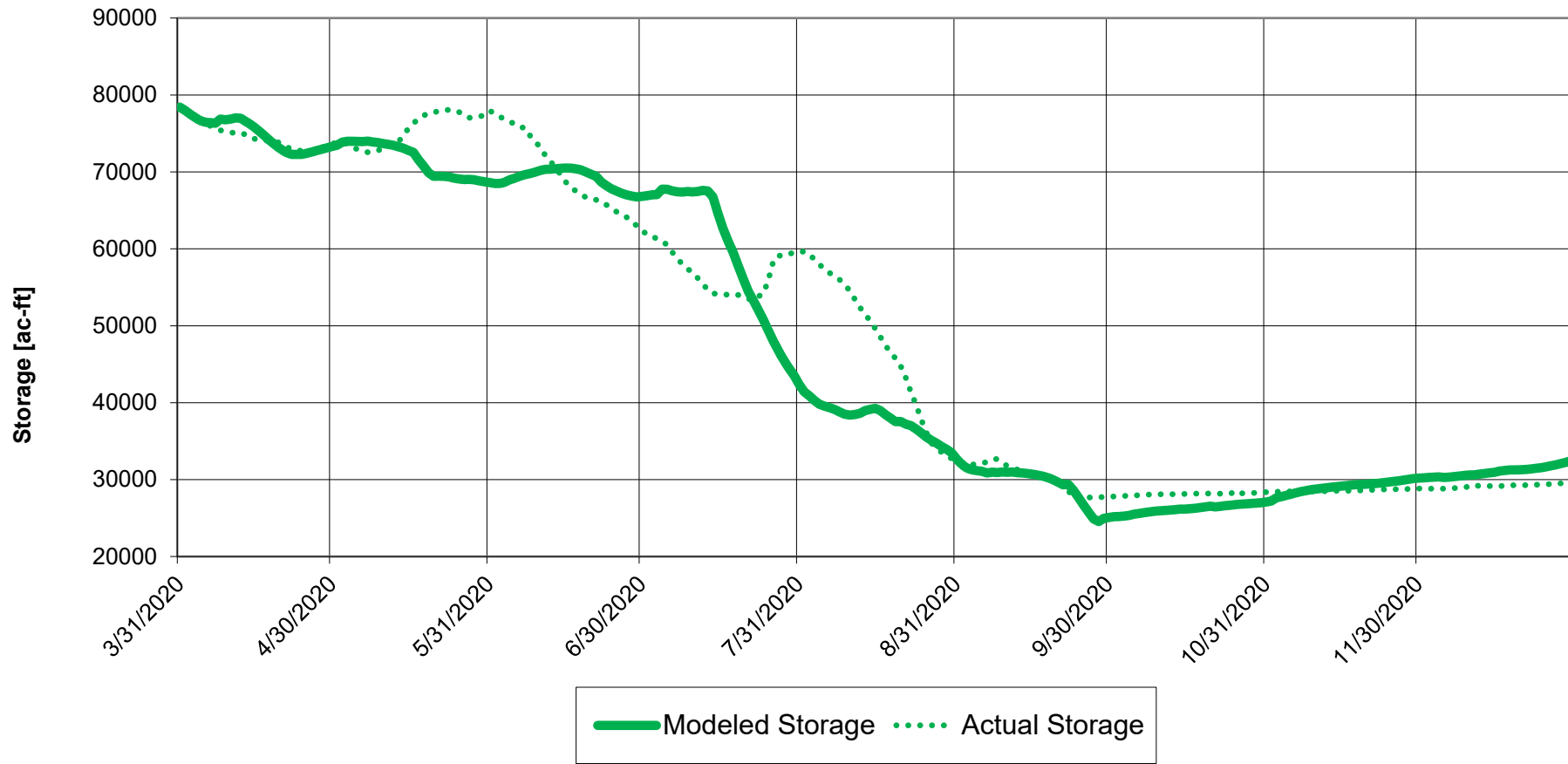
# Caballo Reservoir Inflow



# Caballo Reservoir Outflow



# Caballo Reservoir Storage



# 2020 Rio Grande Project Operations

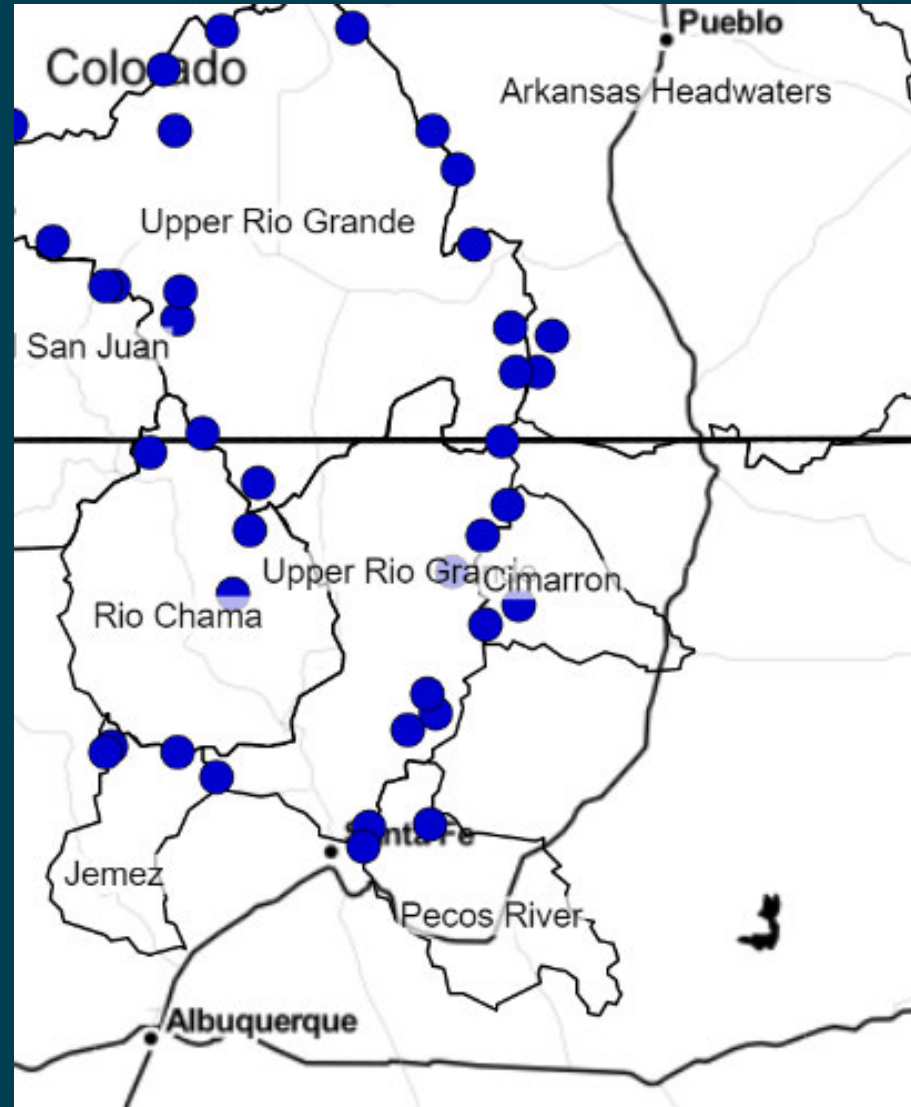
- Irrigation releases – March 13 to September 25
- Caballo released 592,862 ac-ft
- Bonita Lateral – 1,138 ac-ft
- HCCRD – 45,792 ac-ft



# Current Snow Conditions

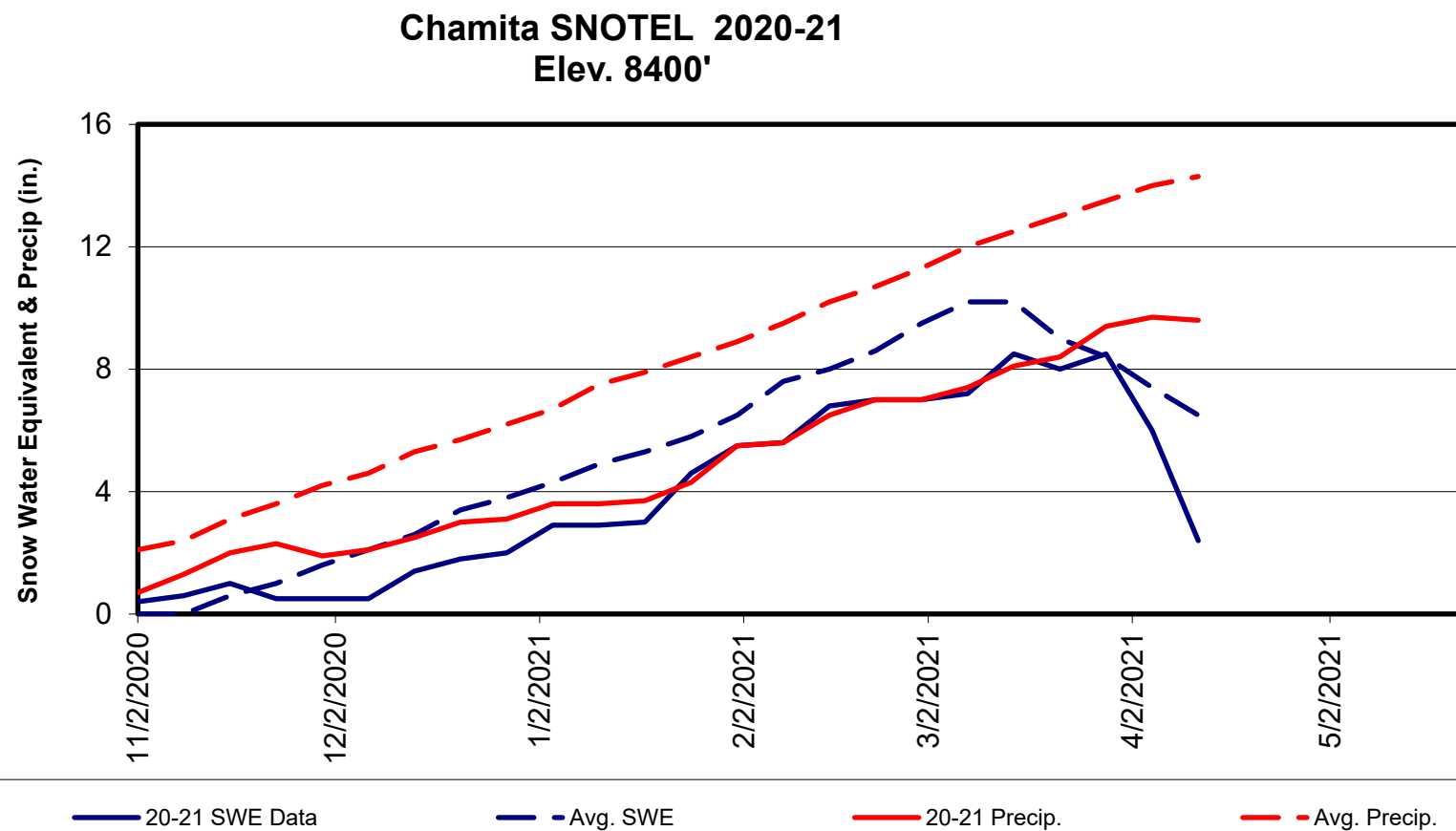


# SNOTEL Locations





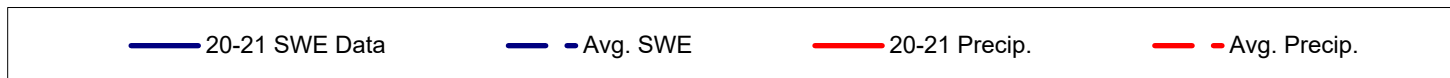
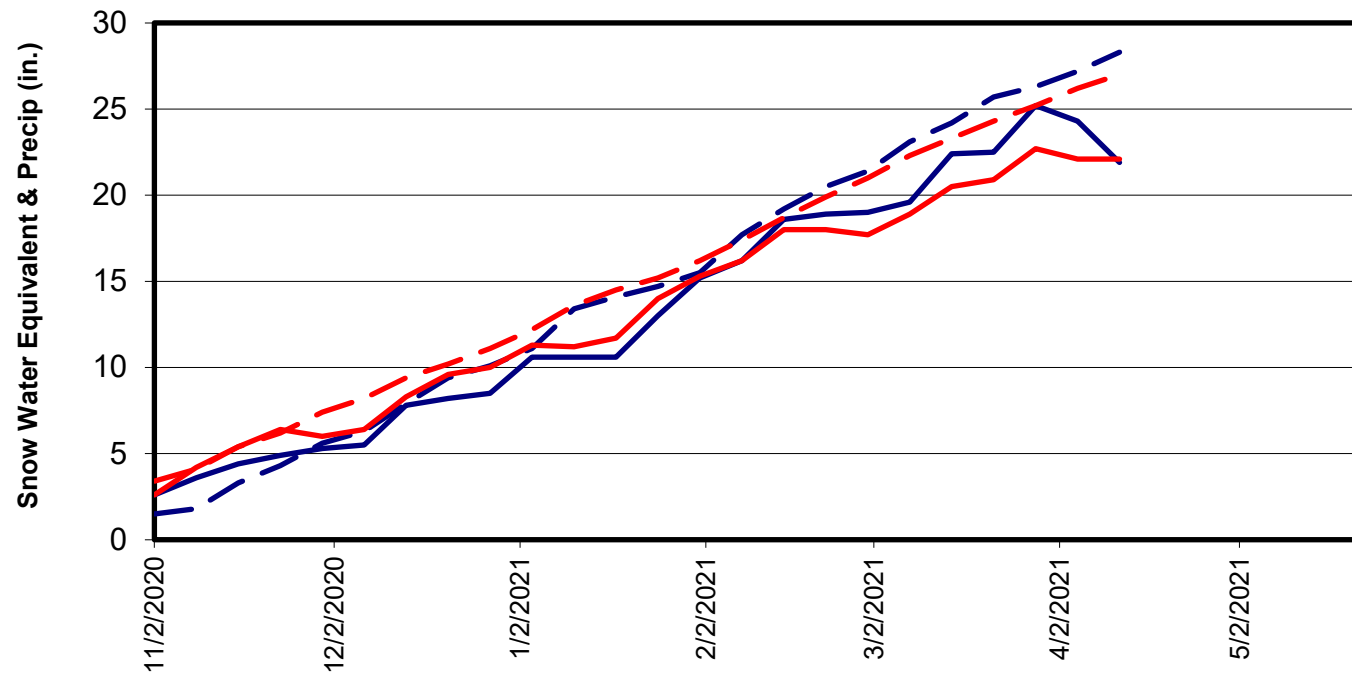
# Rio Chama Snow Data



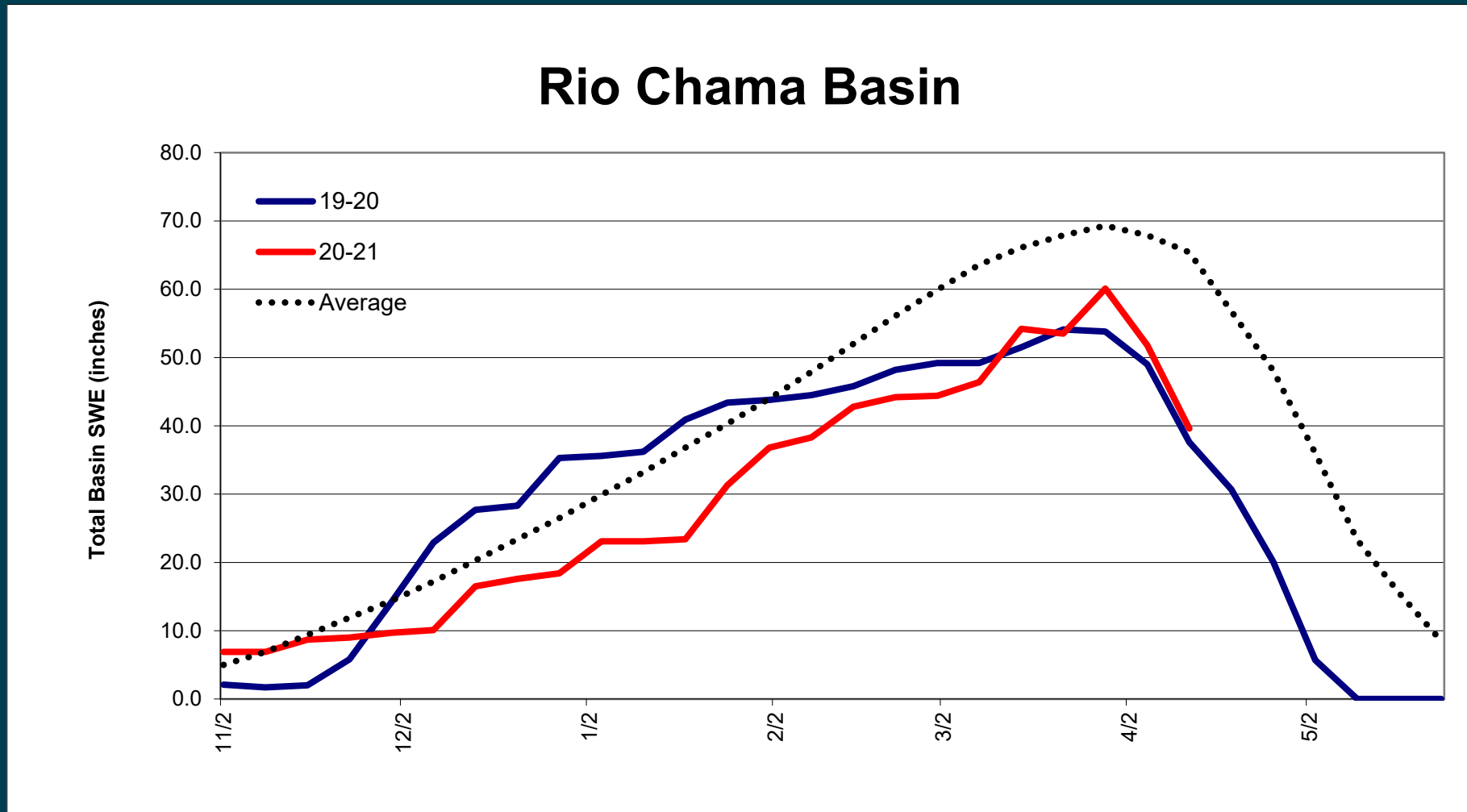
# Rio Chama Snow Data

(continued)

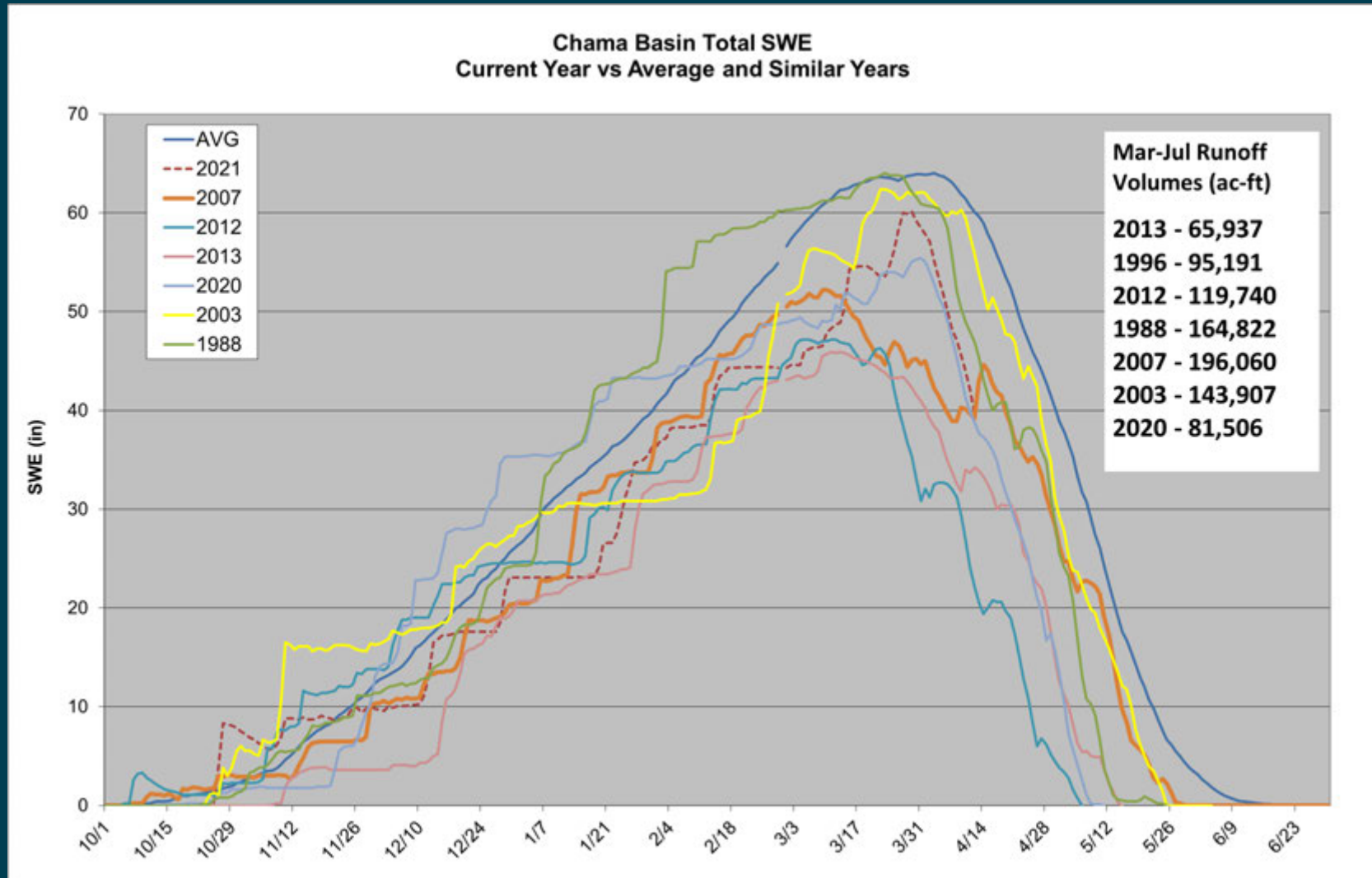
Cumbres SNOTEL Site 2020-21  
Elev. 10,400'



# Rio Chama Snow Comparison

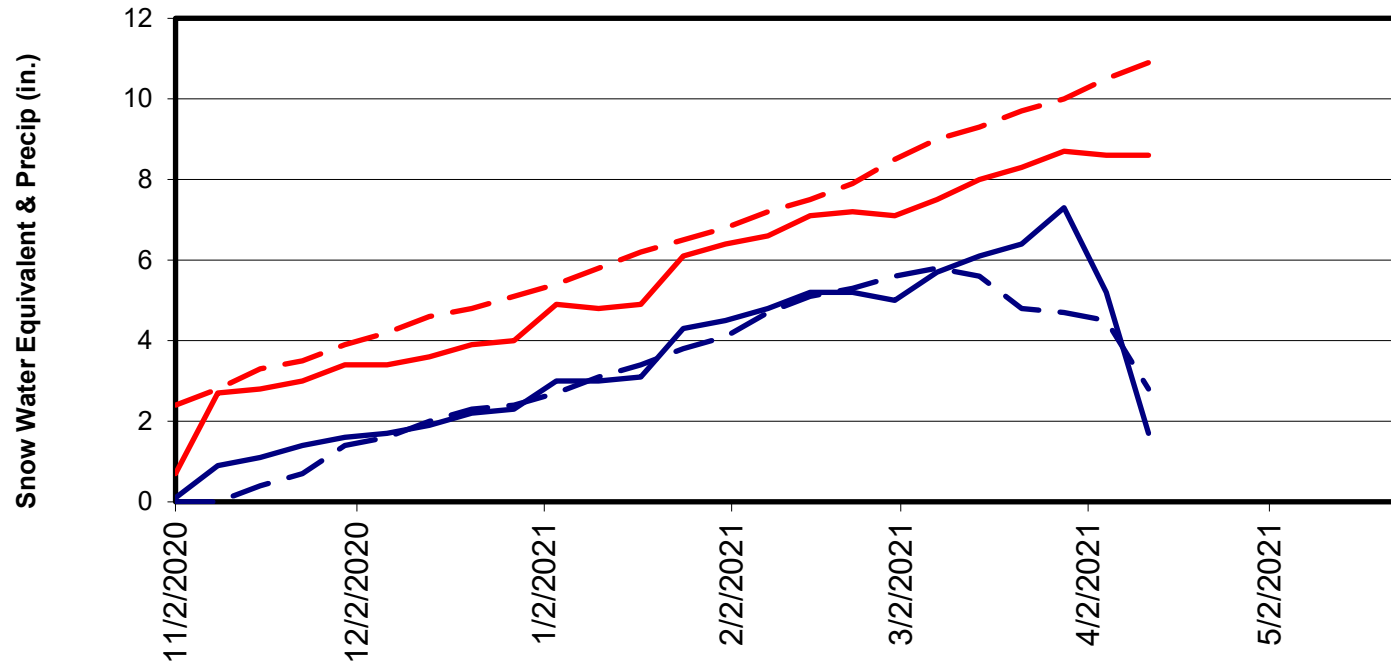


# Similar Snowpack Years



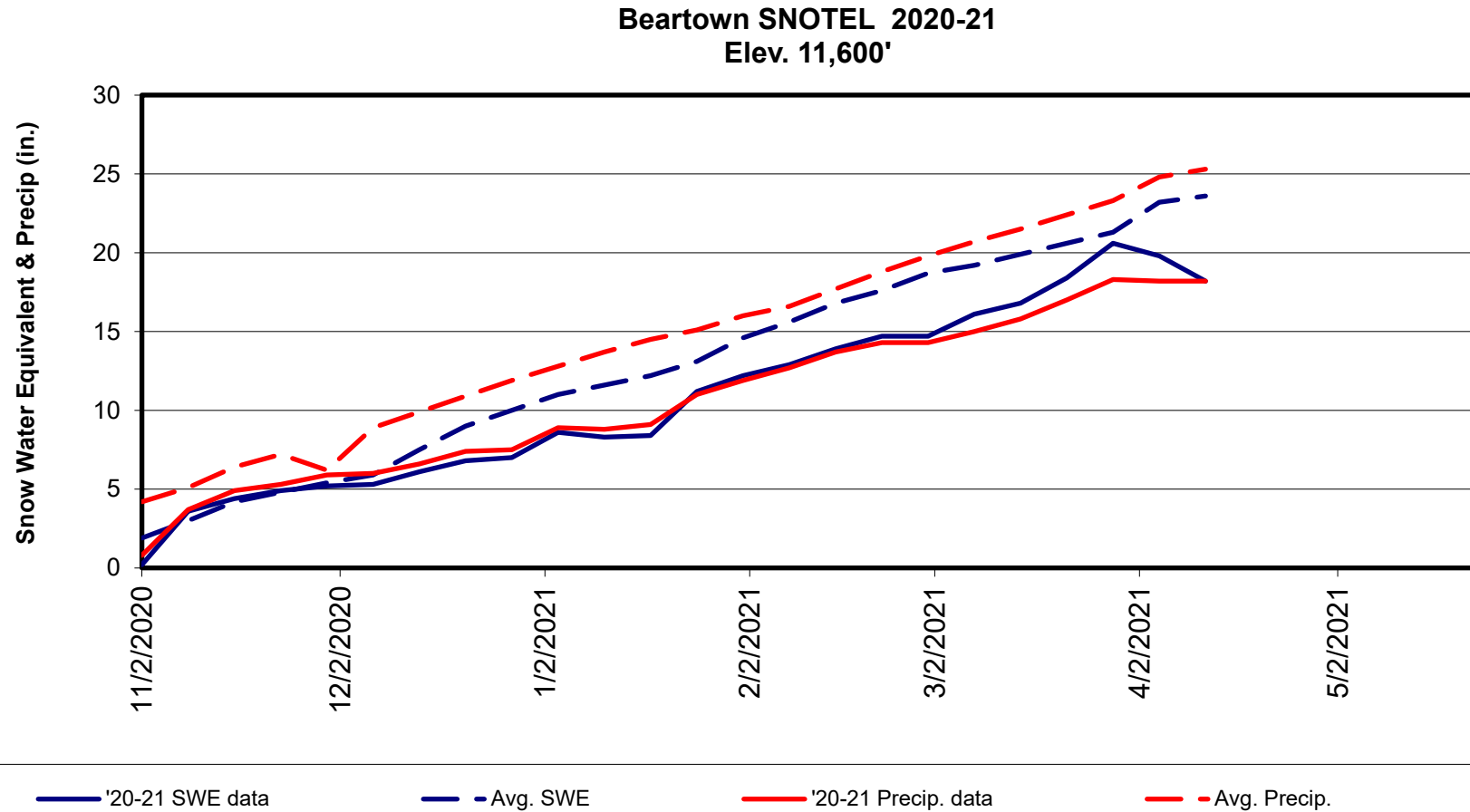
# Rio Grande Snow Data

Upper Rio Grande SNOTEL 2020-21  
Elev. 9,400'

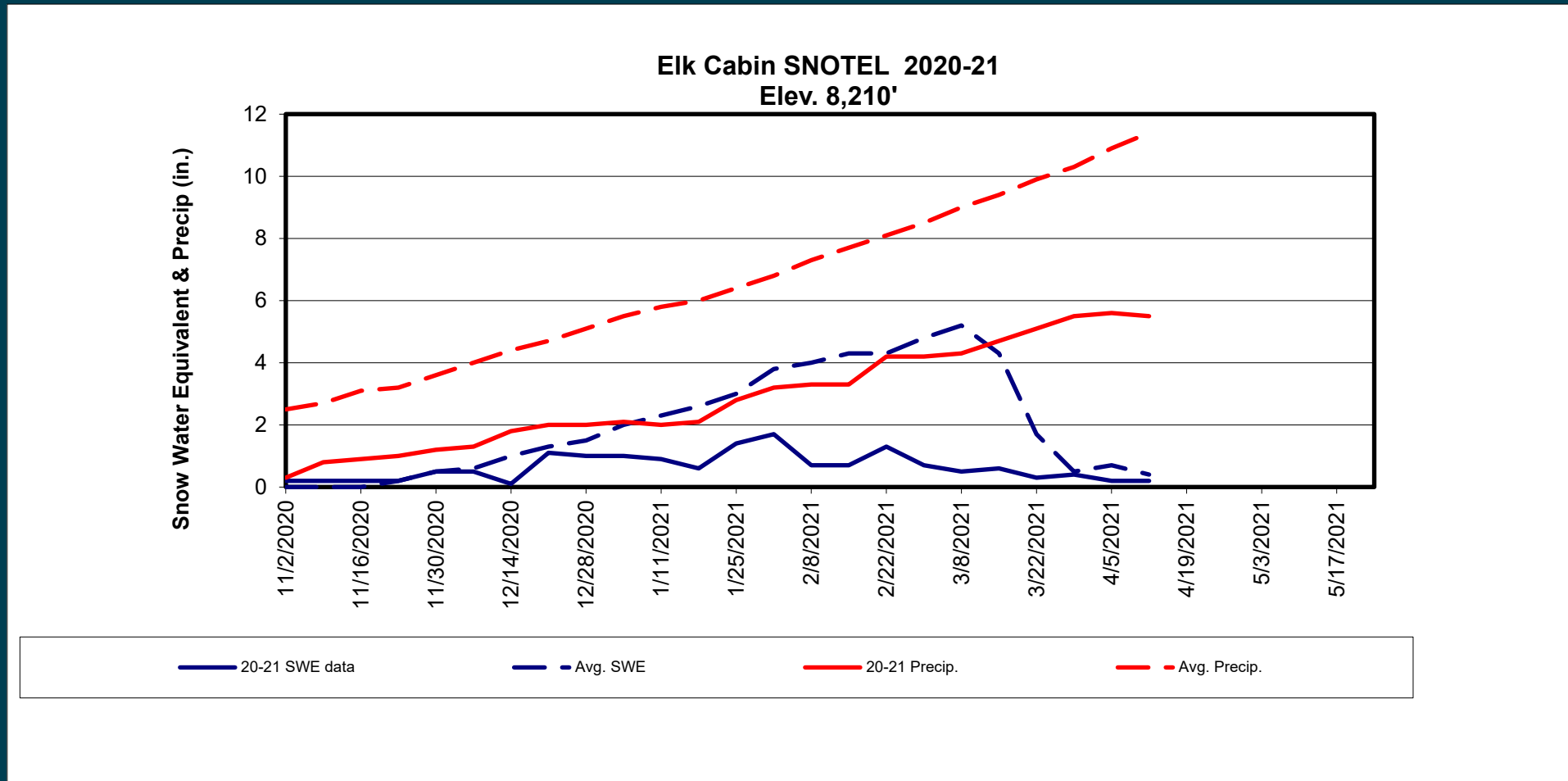


# Rio Grande Snow Data

(continued)

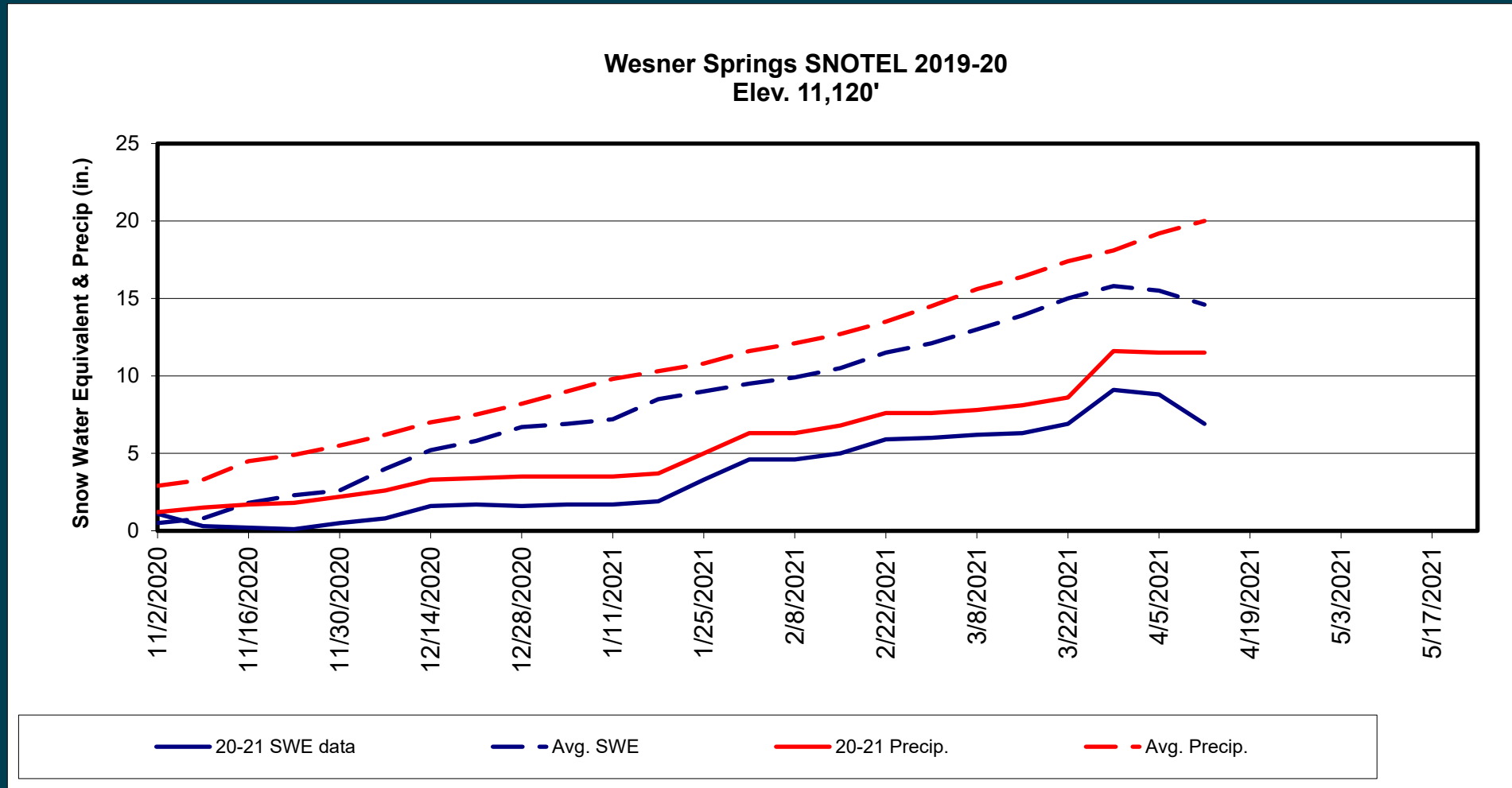


# Sangre de Cristo Snow Data



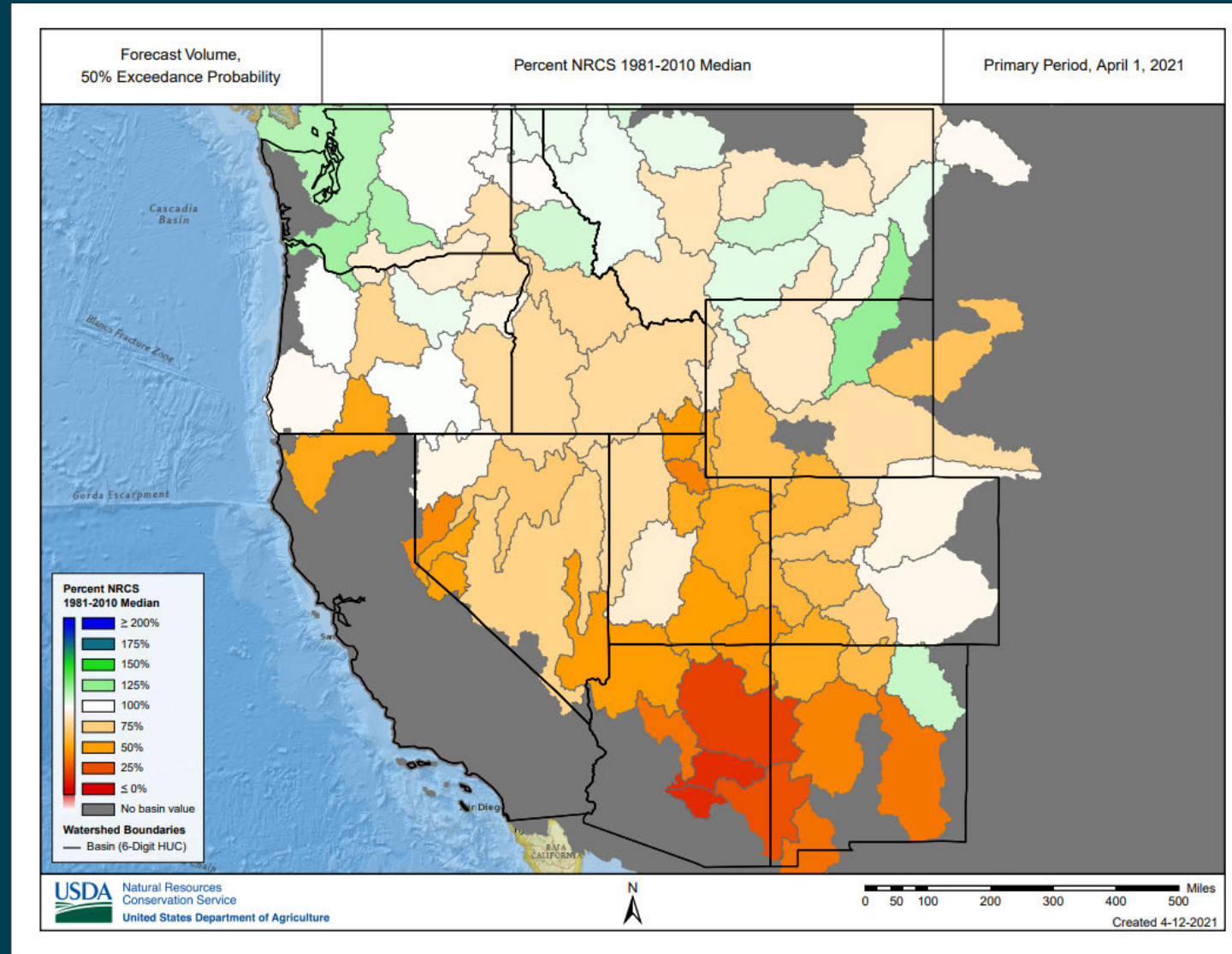
# Sangre de Cristo Snow Data

(continued)

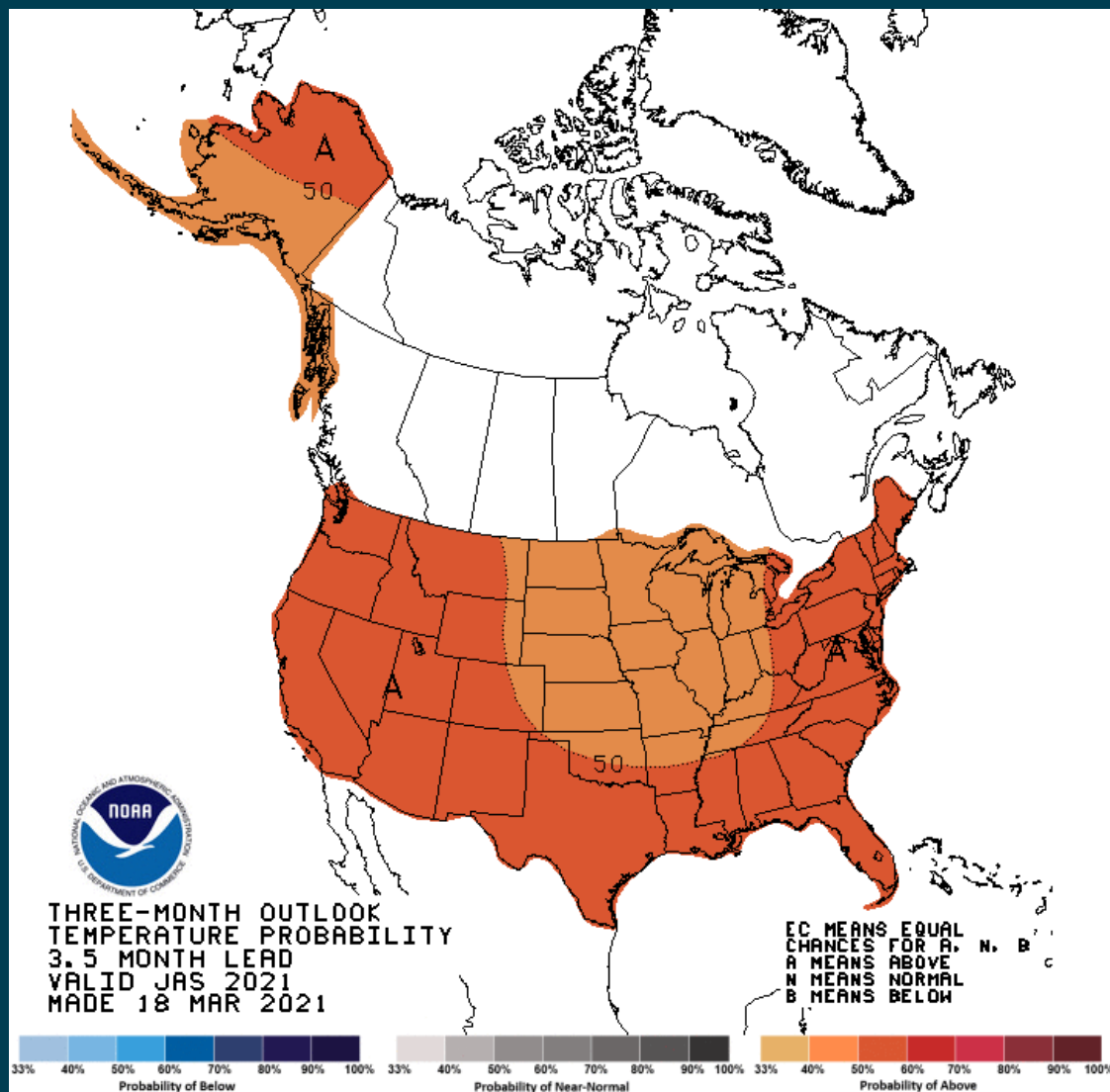




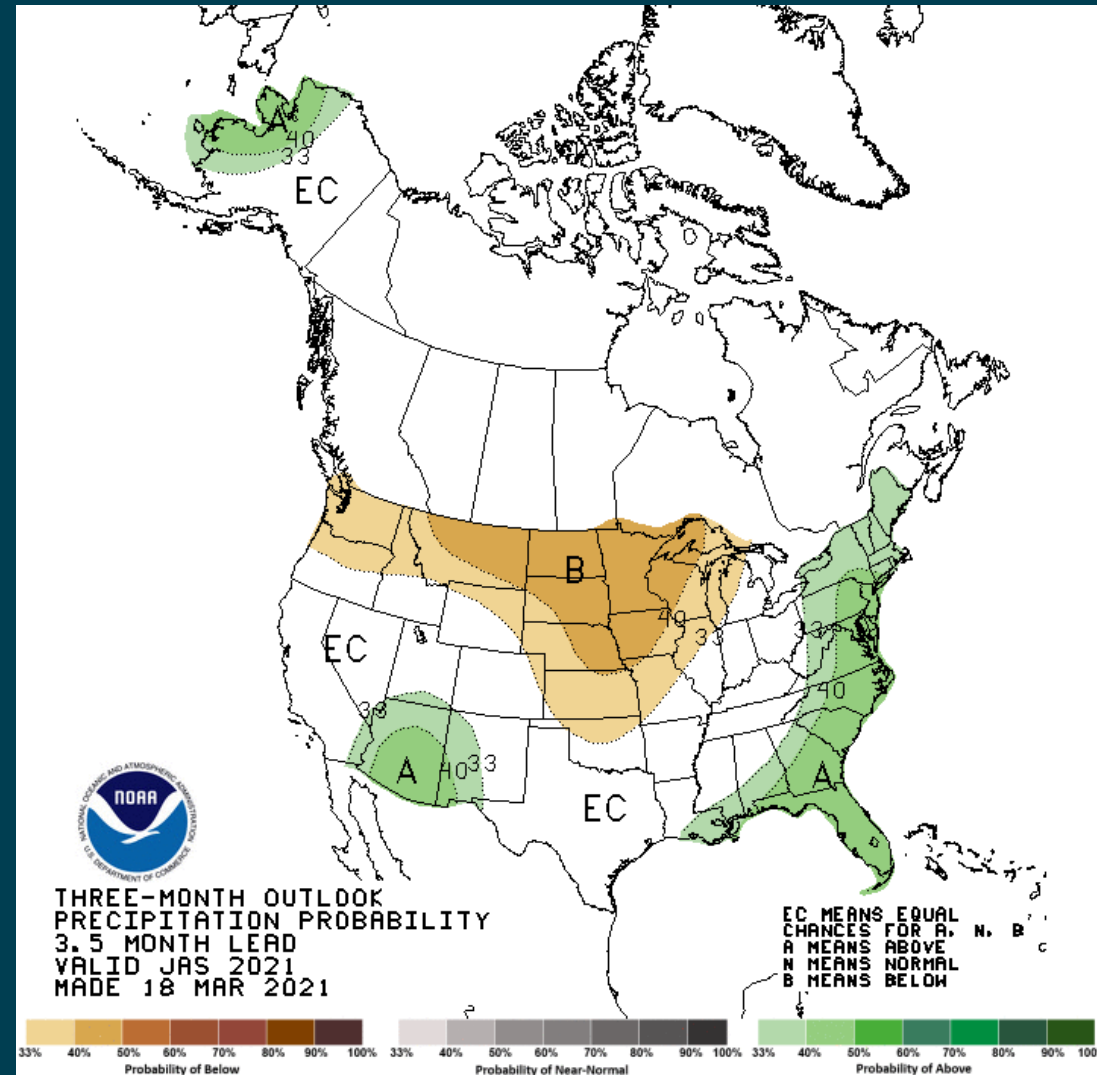
# Western U.S. River Basin Streamflow Forecast



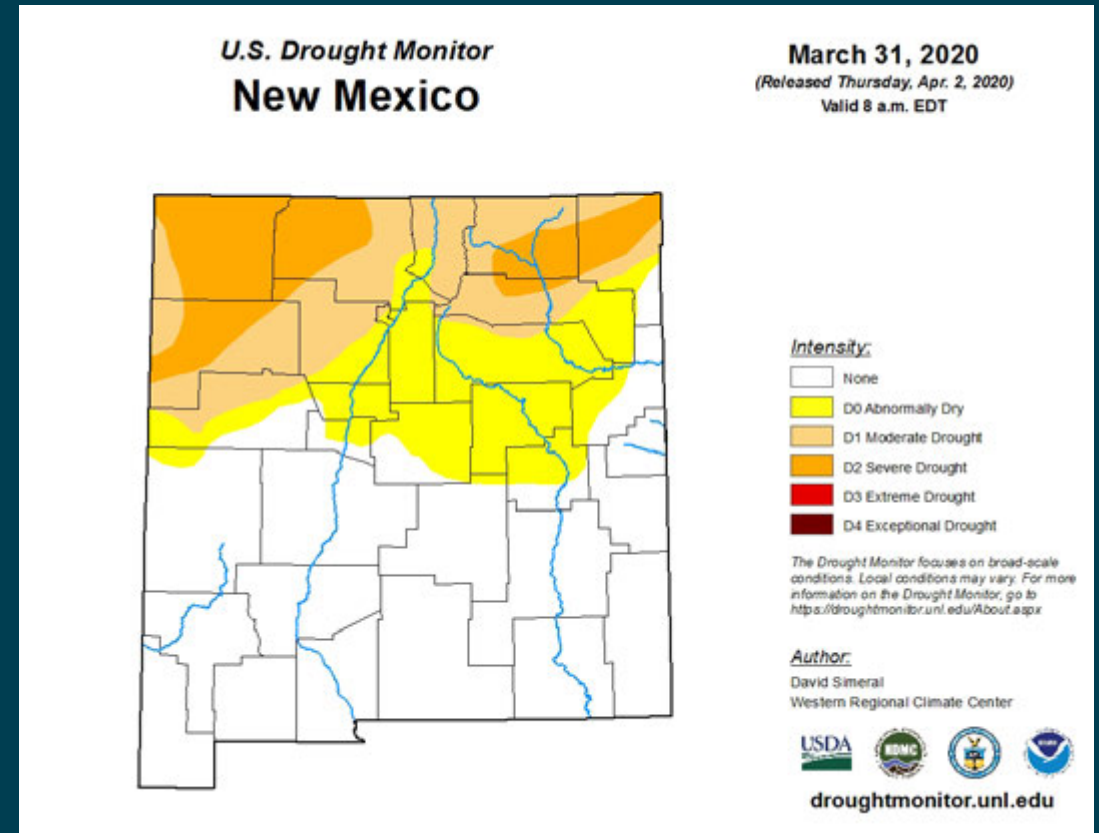
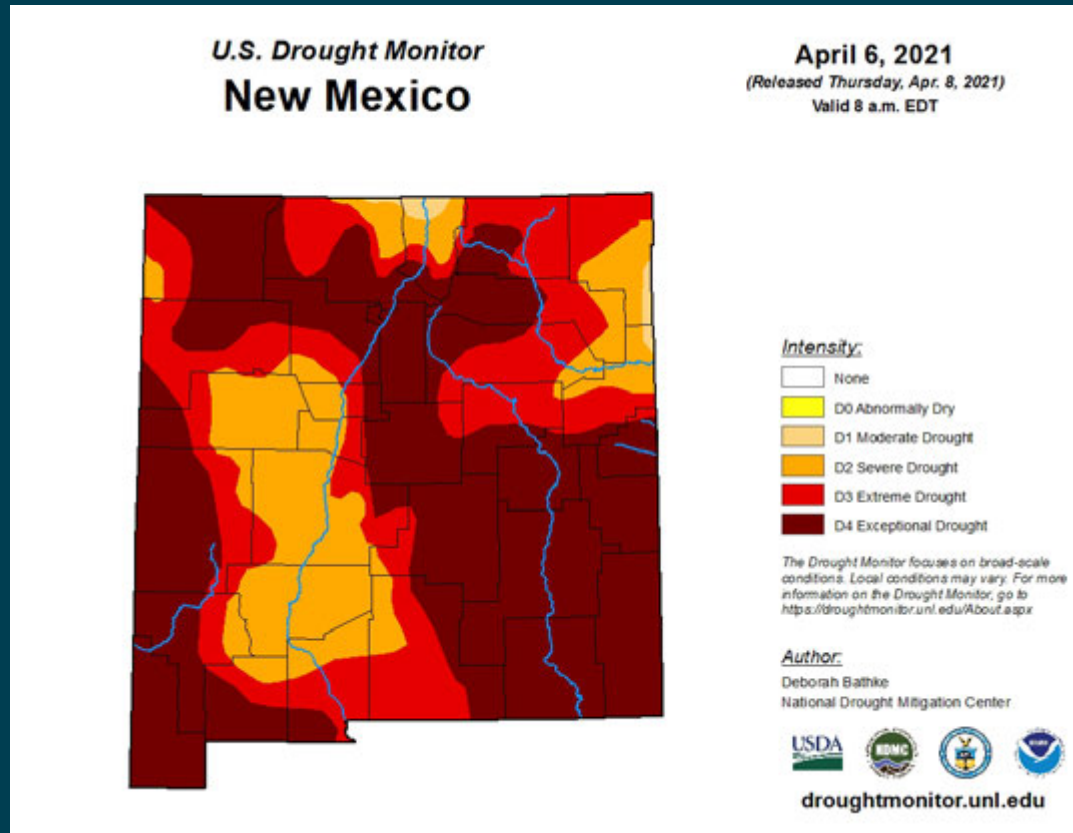
# Monsoon Season Temperature Outlook



# Monsoon Season Precipitation Outlook



# U.S. Drought Monitor – New Mexico



# 2021 Water Operations Modeling



# Major Assumptions, Input, and Results

- April 1<sup>st</sup> 70% exceedance forecast
- Storage of water for Prior & Paramount lands
- Article VII restrictions all year
- No native storage for MRGCD nor release of SJCP water
- MRGCD started irrigation April 1, using reduced demand curve
- Irrigation limited to P&P in late July or August
- Reclamation has ~1,200 ac-ft supplemental water, expects additional ~12,000 depending on SJCP shortage



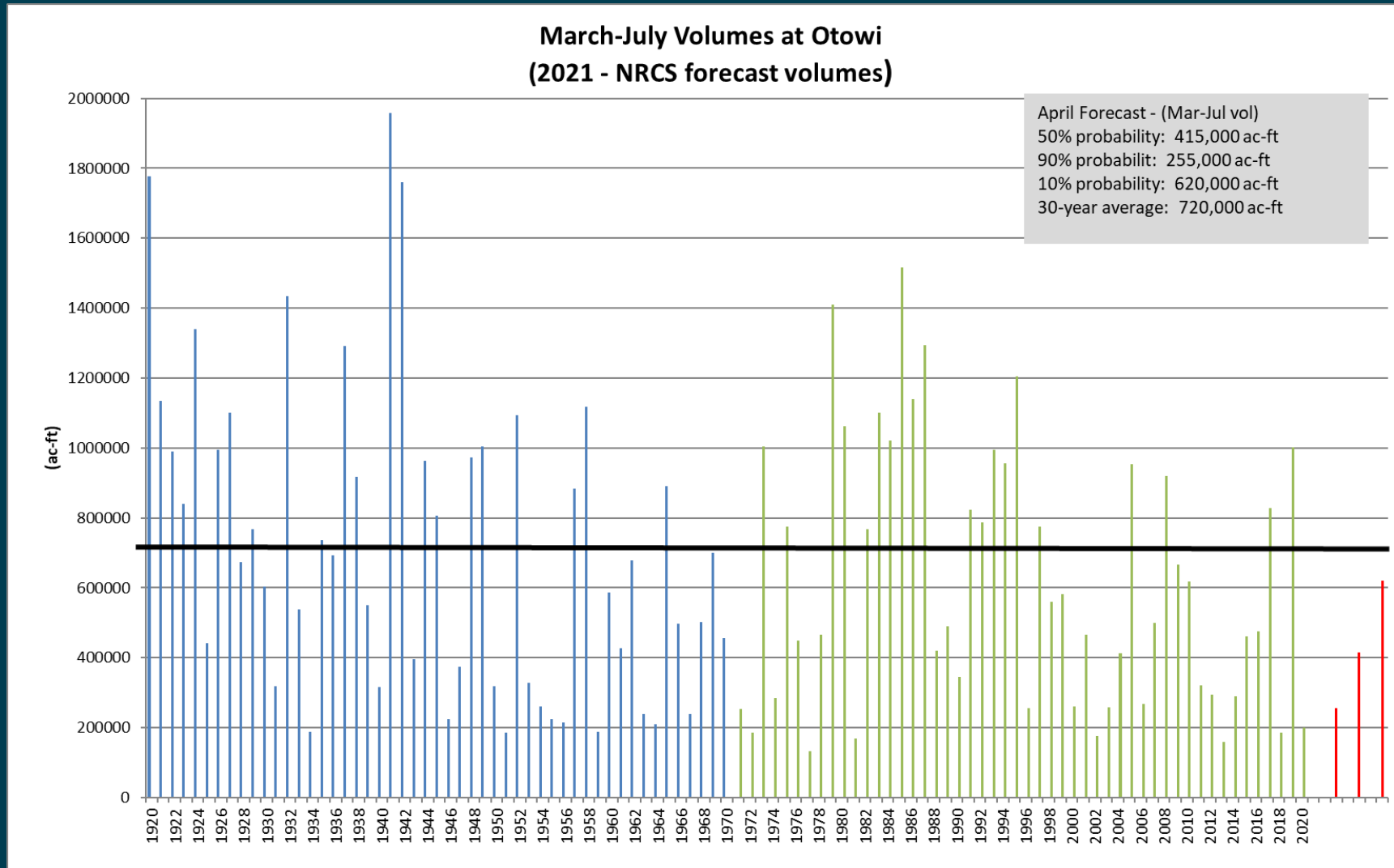
# April Forecast Data

	Most Probable Percent of Average		April 1 50% / 70% Probability Volume, ac-ft
	2020	2021	2021
Rio Grande nr Del Norte	69%	71%	365,000 / 310,000
El Vado Reservoir Inflow	56%	52%	116,000 / 97,000
Rio Grande at Otowi	53%	58%	415,000 / 345,000
Nambe Reservoir Inflow	77%	43%	2,800 / 2,100
Jemez blw Jemez Dam	39%	18%	6,200 / 4,000
Rio Blanco @ Diversion	65%	74%	40,000 / 35,000
Navajo River @ Diversion	62%	69%	45,000 / 39,000





# Historic Mar-Jul Flow Volumes at Otowi

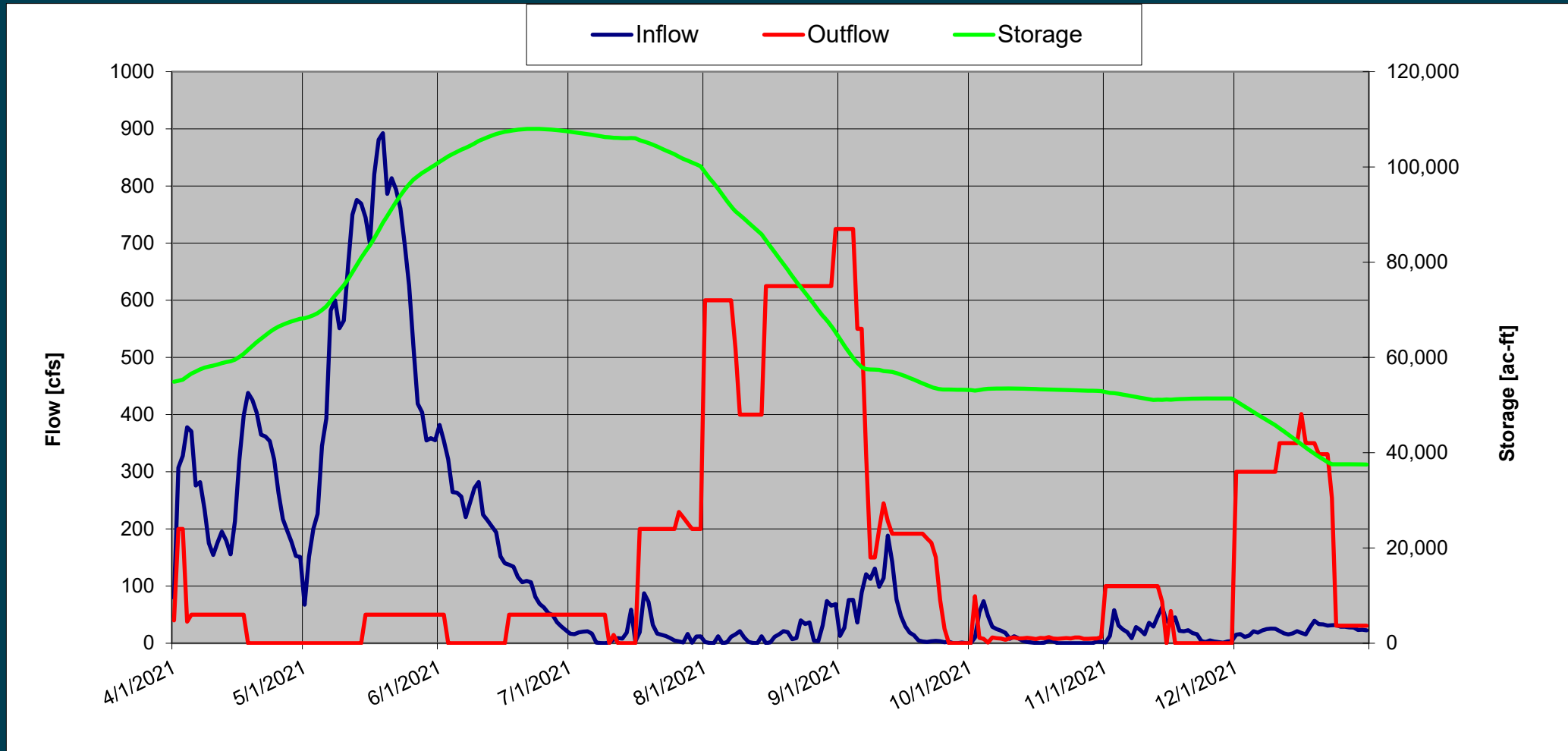




# Heron Reservoir



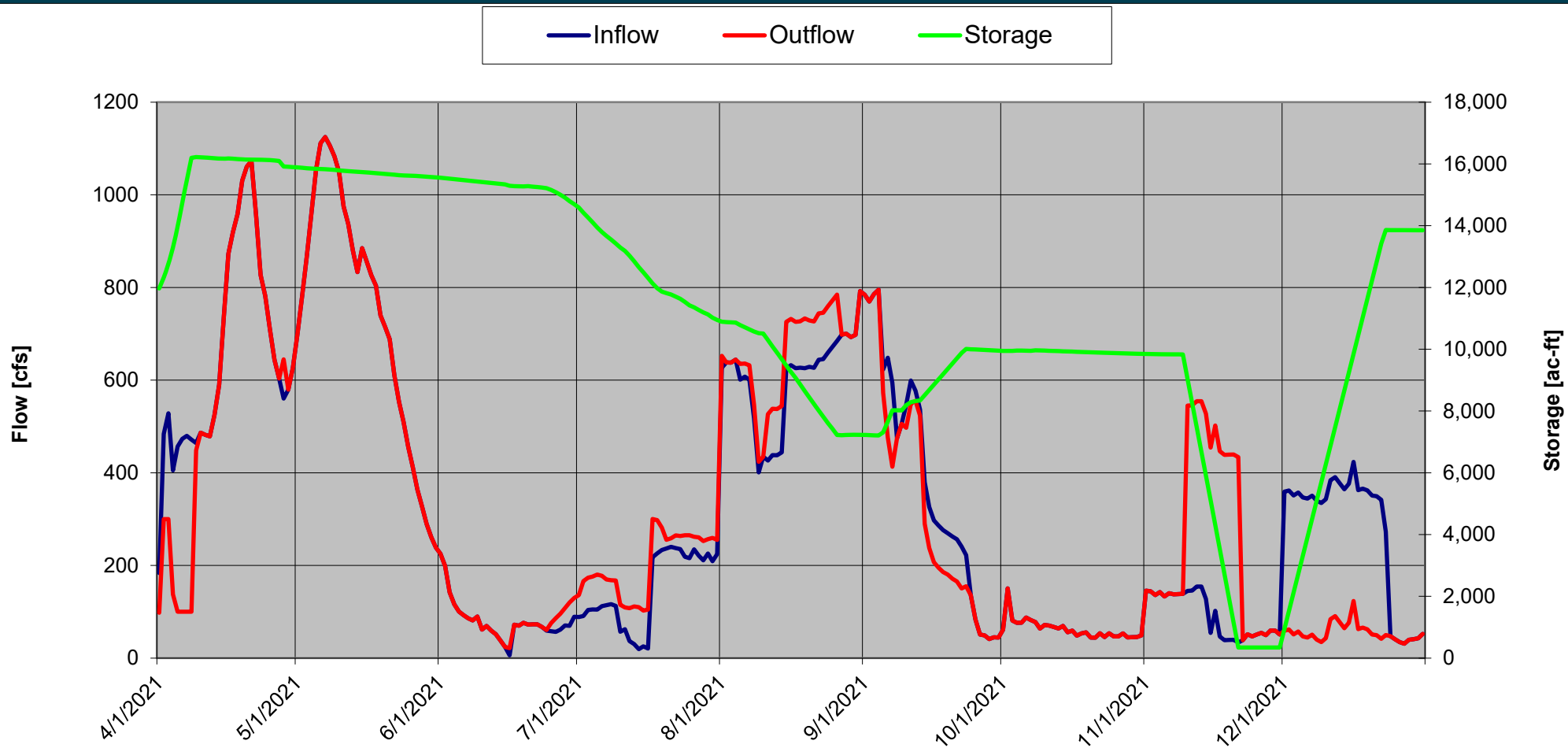
# Proposed 2021 Heron Operations



# El Vado Reservoir



# Proposed 2021 El Vado Operations



# El Vado Dam Construction Update

- On track to begin construction in 2022 with installation of geomembrane over steel faceplates and grouting inside dam
- Currently finishing final designs and final contracting steps
- Reclamation will attempt to maintain water operations to extent possible during three years of construction
- Reclamation not considering modifications to inlet tower as they do not align with Safety of Dams project

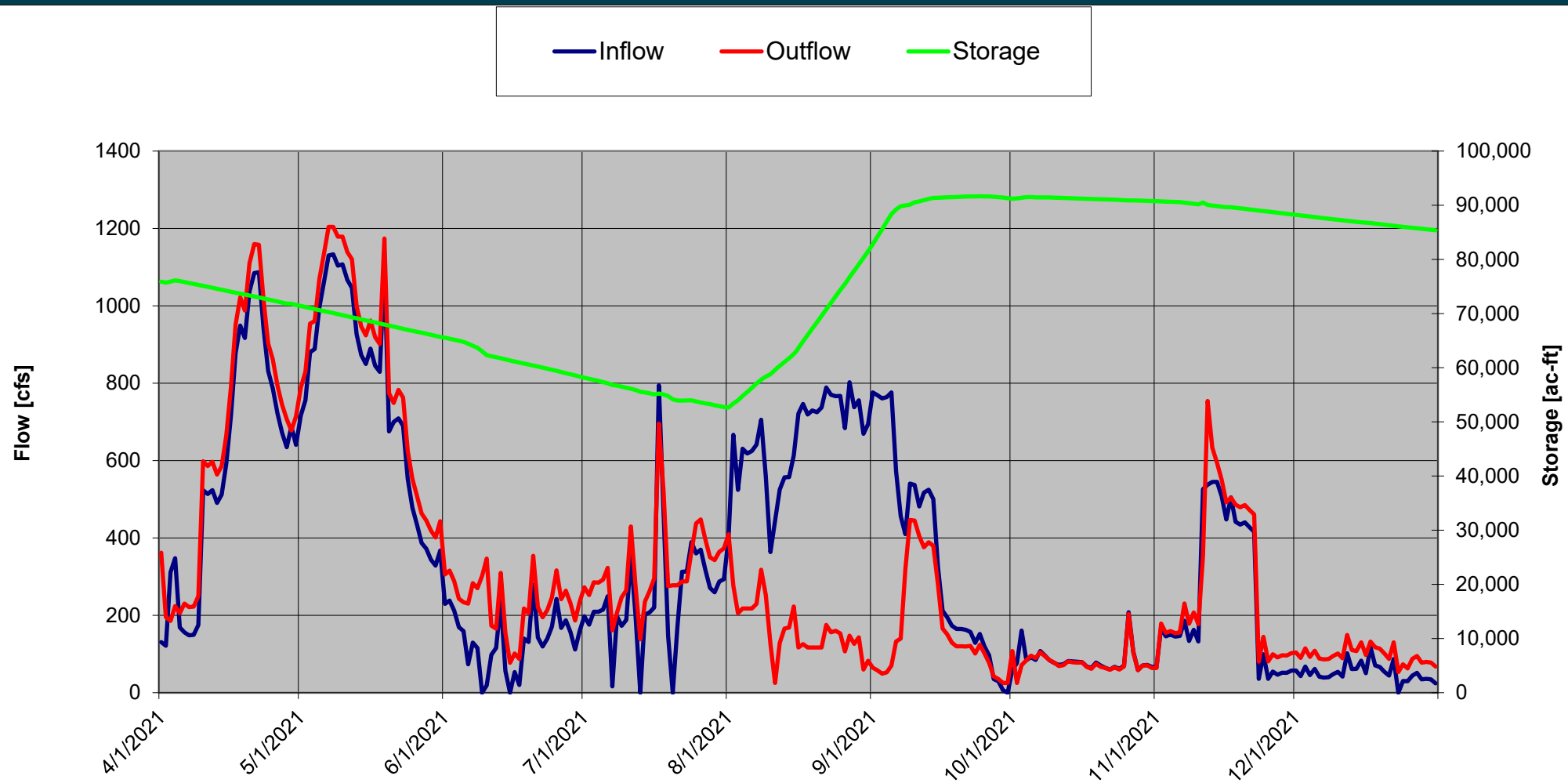




# Abiquiu Lake



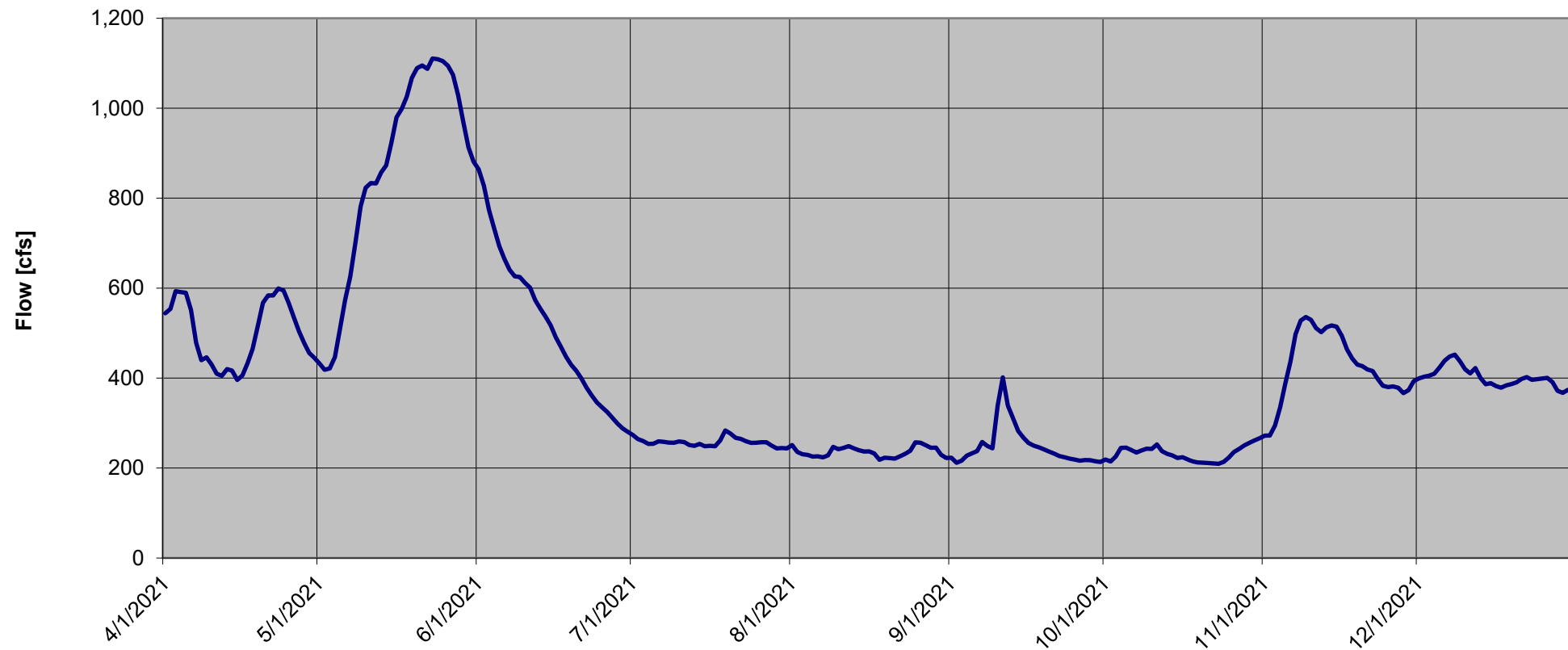
# Proposed 2021 Abiquiu Operations



# Estimated Hydrograph at Embudo

## Rio Grande main stem

2021 Flow at Embudo

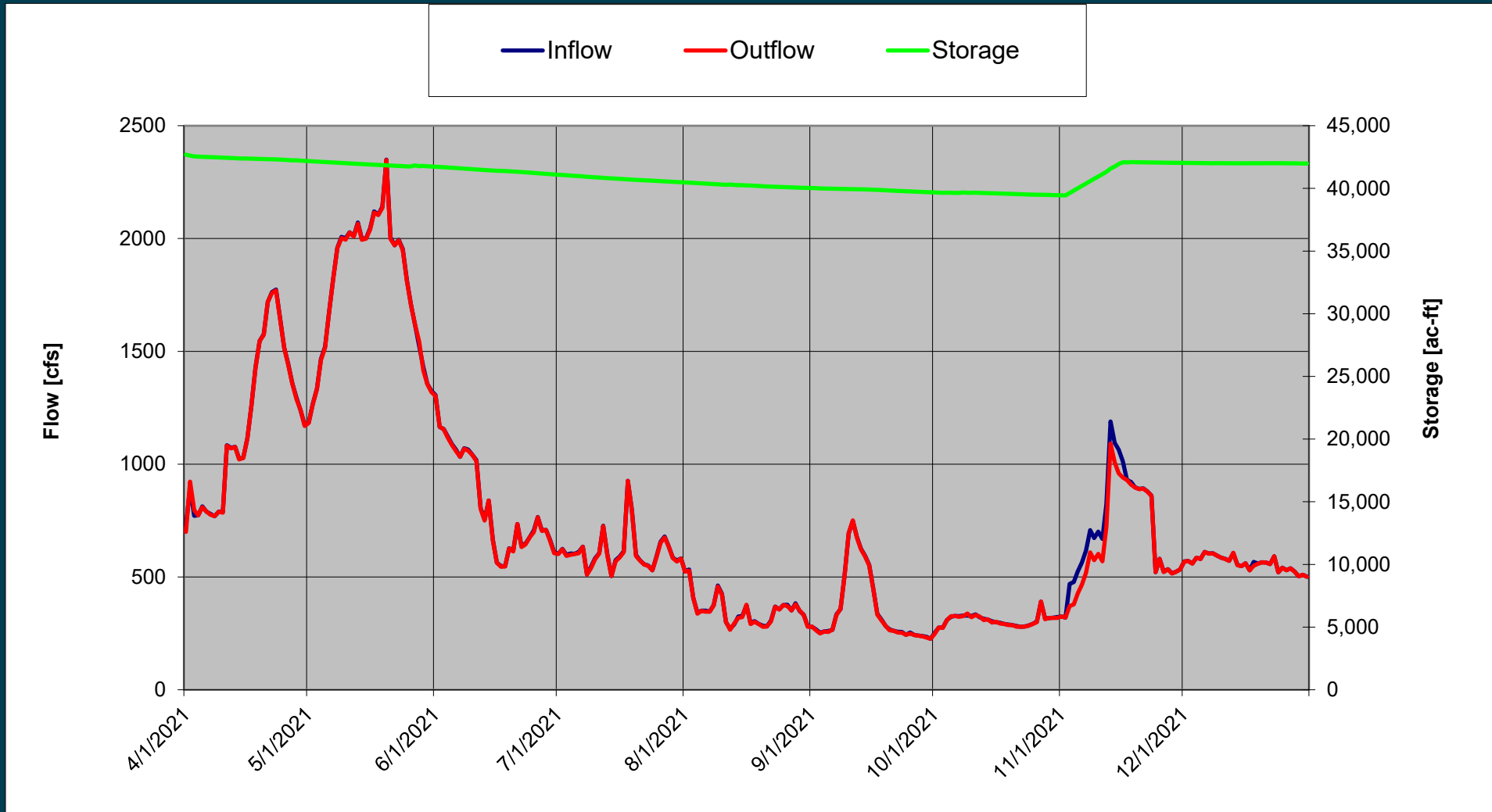




# Cochiti Lake

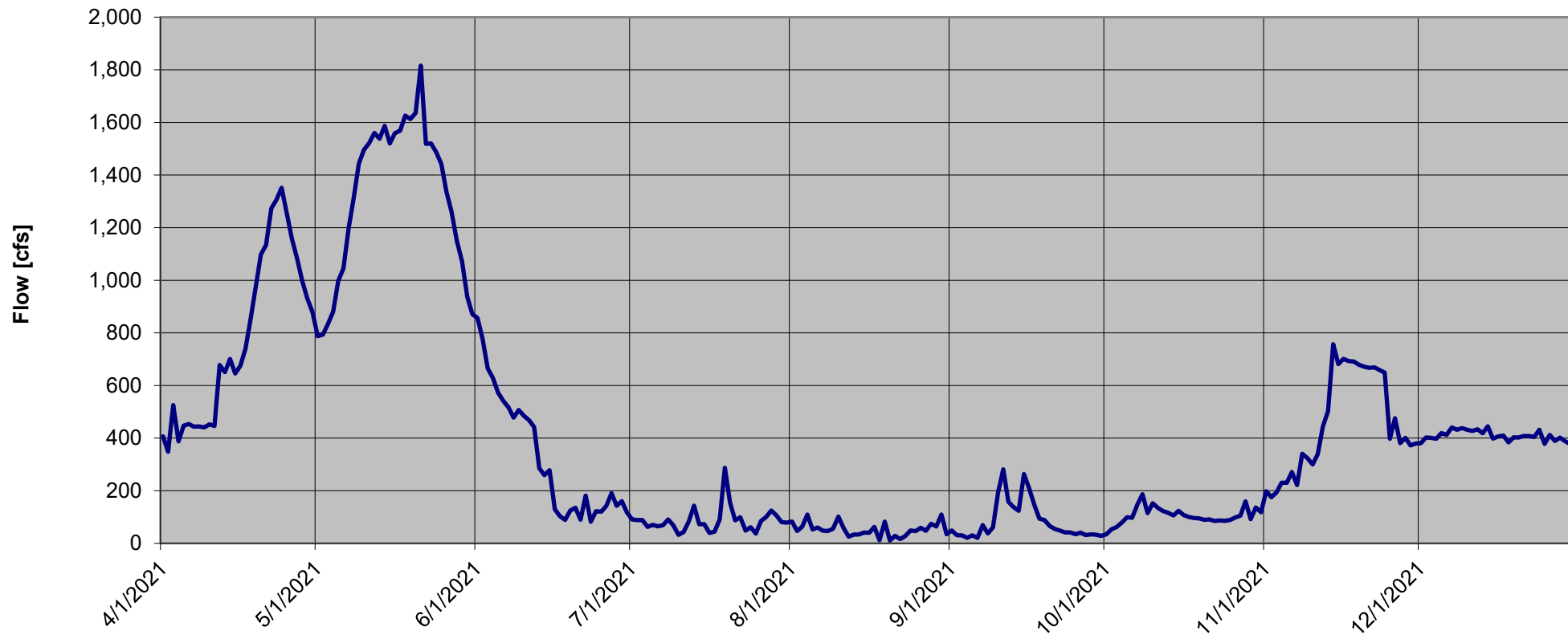


# Proposed 2021 Cochiti Operations



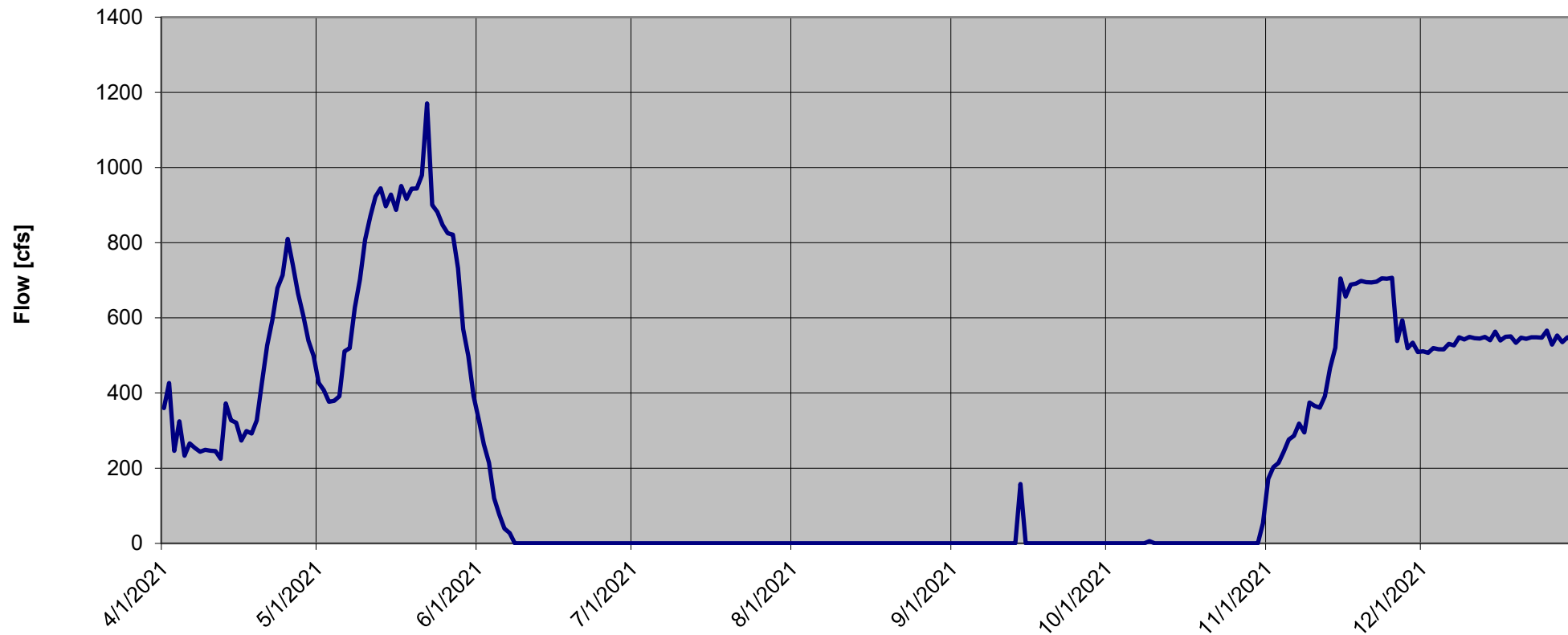
# Estimated Hydrograph at Central

2021 Flow at Central Ave Gage



# Estimated Hydrograph at San Acacia

2021 Flow at San Acacia Gage



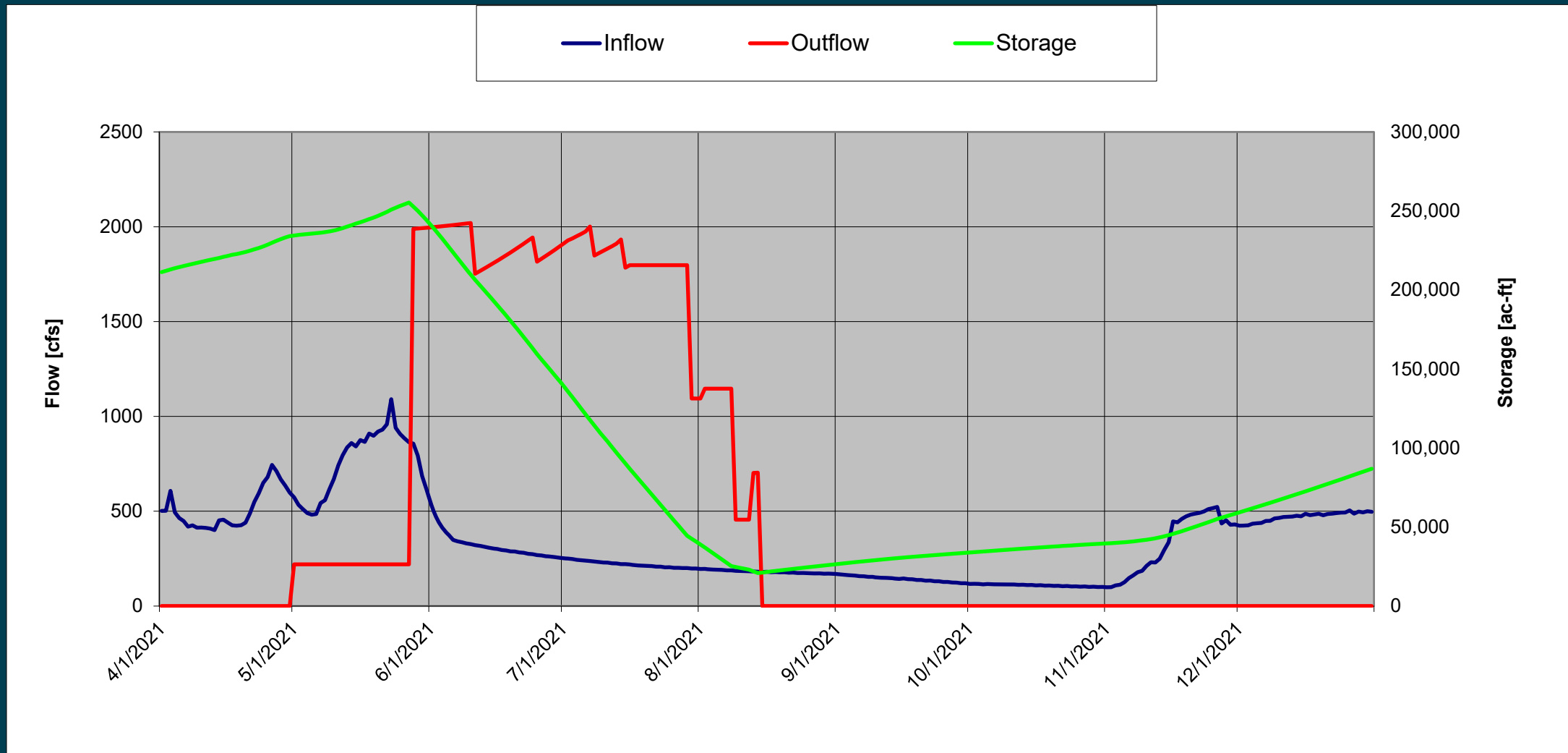
# 2021 Rio Grande Project Operations



# Elephant Butte Dam

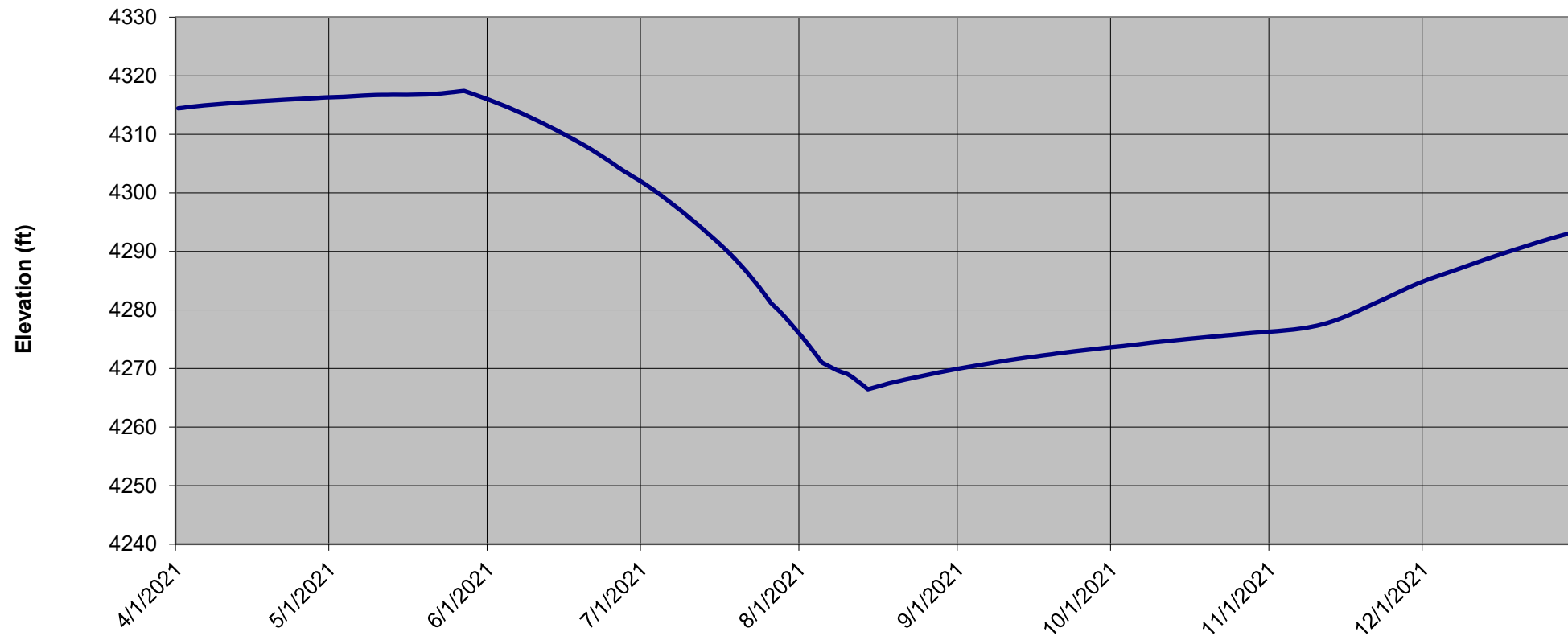


# Proposed Elephant Butte Operations



# Elephant Butte Projected Levels

2021 Elephant Butte Elevation

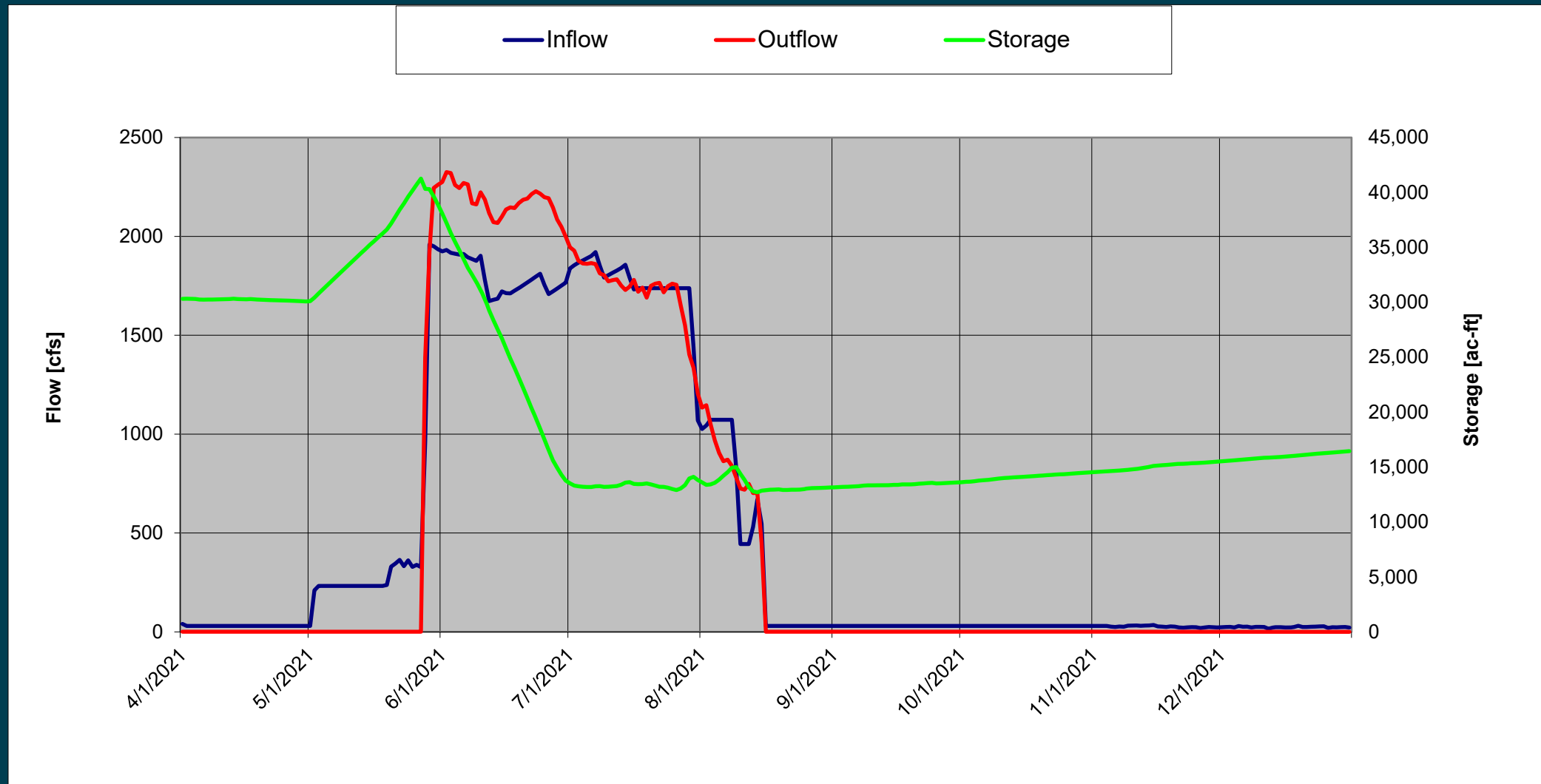




# Caballo Dam

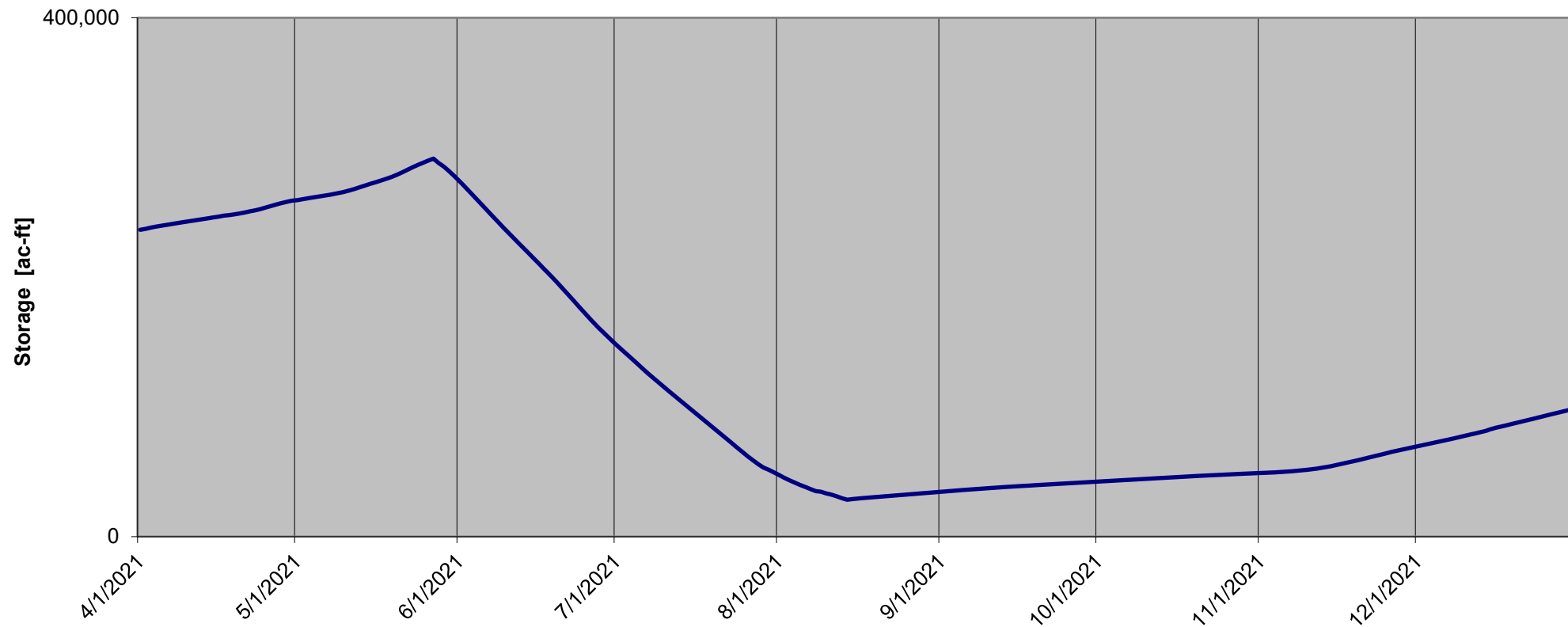


# Proposed Caballo Operations



# Article VII Restrictions: In or Out?

2021 Rio Grande Project Usable Storage





# Questions / Comments

<https://www.usbr.gov/uc/albuq/water/aop/index.html>



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