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US Army Corps
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Albuquerque District



2022 Rio Grande Annual Operating Plan April 1 Runoff Forecast

Presented by Bureau of Reclamation
April 14, 2022



Agencies & Major Users

- Reclamation: Bureau of Reclamation
- USACE/Corps: US Army Corp of Engineers
- IBWC: US Section International Boundary and Water Commission
- Santa Fe: City and/or County of Santa Fe
- Albuquerque/Water Authority: Albuquerque Bernalillo County Water Utility Authority (ABCWUA)
- MRGCD: Middle Rio Grande Conservancy District
- EBID: Elephant Butte Irrigation District
- EP1/El Paso: El Paso County Water Improvement District



Operating Rules

- **Treaty/1906 Convention:** between the U.S. and Mexico, signed 1906
- **Rio Grande Compact:** agreement between Colorado, New Mexico, and Texas apportioning Rio Grande water between the three states
- **Project Authorizations:** each Project (Dam) has its own set of federal laws that apply to its storage and release of water
- **Article VII restrictions:** restricts storage of Rio Grande water in post 1929 reservoirs (El Vado) when usable storage in Elephant Butte and Caballo is less than 400,000 ac-ft, with some exceptions
- **Operating Agreement:** between EBID, EP1, Reclamation, signed in 2008



Types of Water

- **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
- **Supplemental water:** water leased by Reclamation to augment flows in support of Rio Grande Silvery Minnow
- **P&P water:** water for the Prior & Paramount lands of the six Middle Rio Grande Pueblos



Hydrology Terms



- cfs: cubic feet per second (flowrate)
- ac-ft: acre-feet (volume), amount of water needed to cover one acre to depth of one foot
- Hydrograph: graph of flowrate over time
- Runoff Forecast: predicted volumes for March through July provided by Natural Resources Conservation Service (NRCS)
- SNOTEL: Snow Telemetry (SNOTEL) network composed of automated data collection sites located in remote, high-elevation mountain watersheds used to monitor snowpack, precipitation, temperature, and other climatic conditions

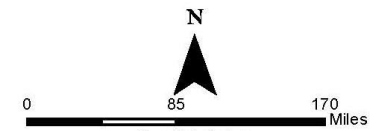
Map of Reclamation's Albuquerque Area Office Projects



Data Attribution: USBR, DWR, NHD, USCB, GDEW, and Fort Reservoirs

Map Notes: Sensitive Information, Only Major Facilities Included

Albuquerque Area Office Boundary



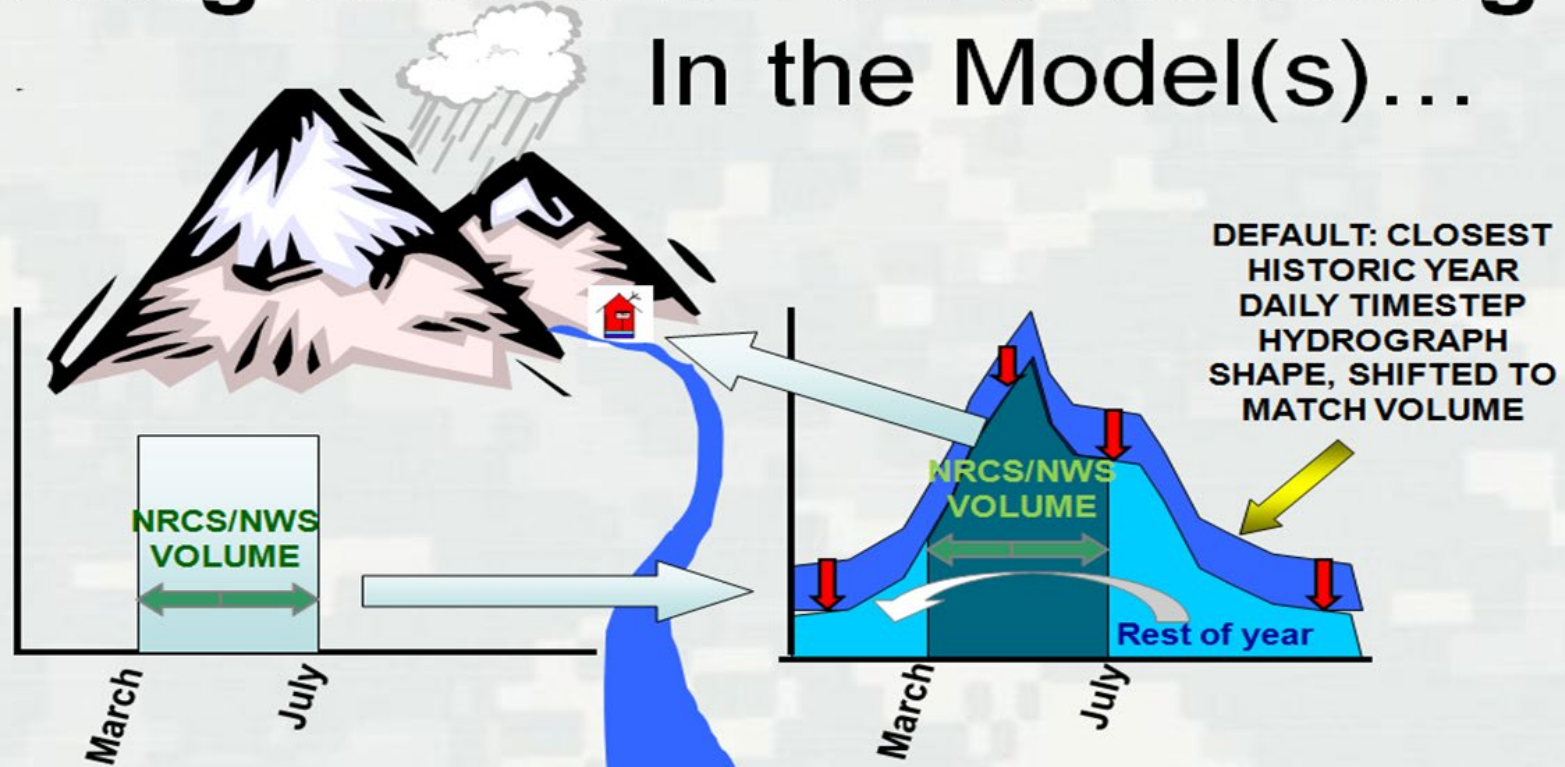


What Drives the Process?



- Volume forecast from NRCS
- Based on snowpack, soil moisture, climate forecast
- Choose similar year based on similar volume
- Actual hydrograph vs. average hydrograph
- Can shift 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 plans from water users and historical data

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



NRCS/NWS

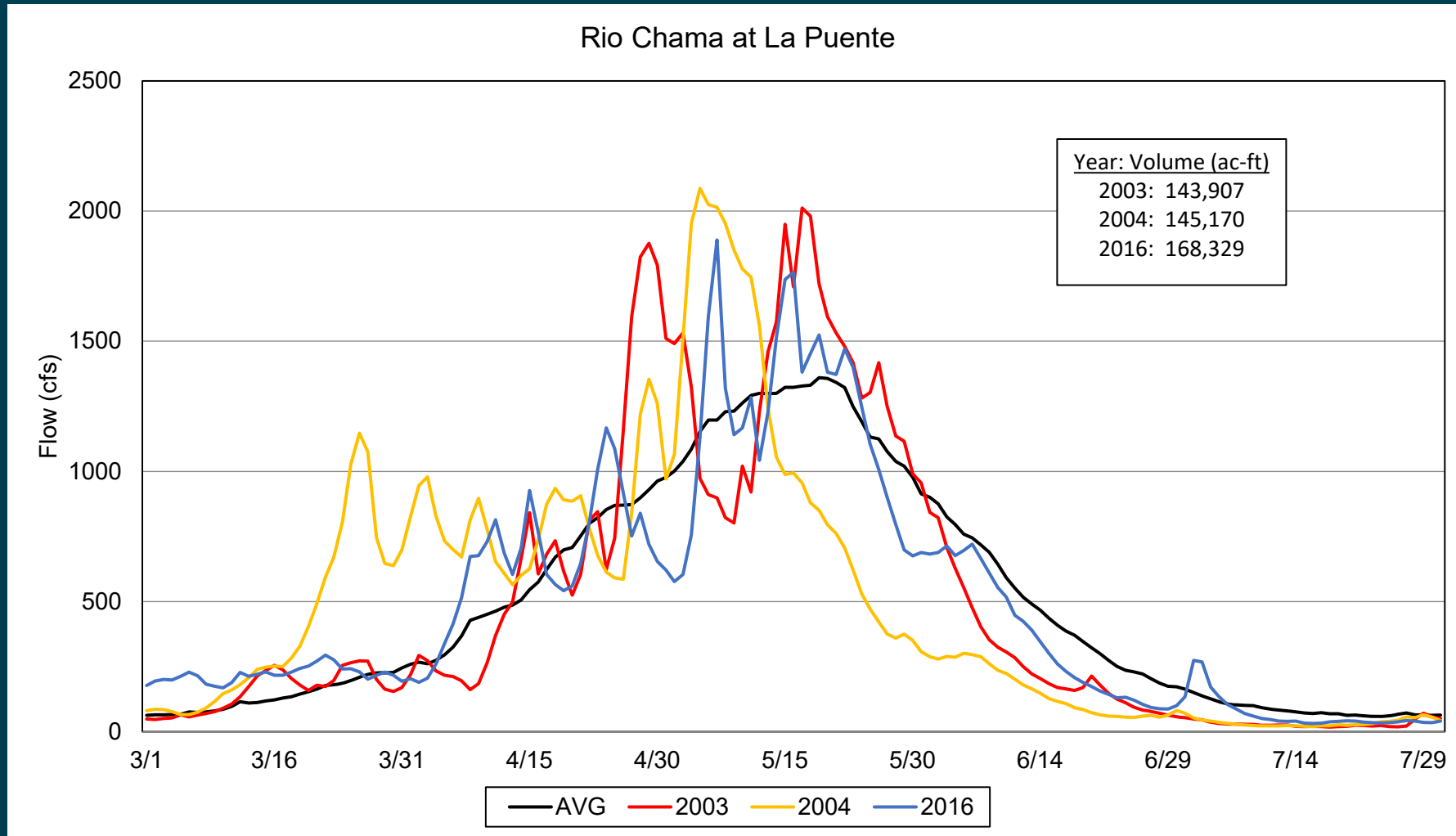


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Similar Year Hydrographs Example



Dam Information

Dam	Agency Owner/Operator		Water Supply		Other Authorized Purposes		
	Reclamation	USACE	Rio Grande	San Juan-Chama	Recreation	Flood Control	Sediment Control
Heron					<input checked="" type="checkbox"/>		
El Vado					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Abiquiu					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cochiti					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Elephant Butte					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Caballo					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



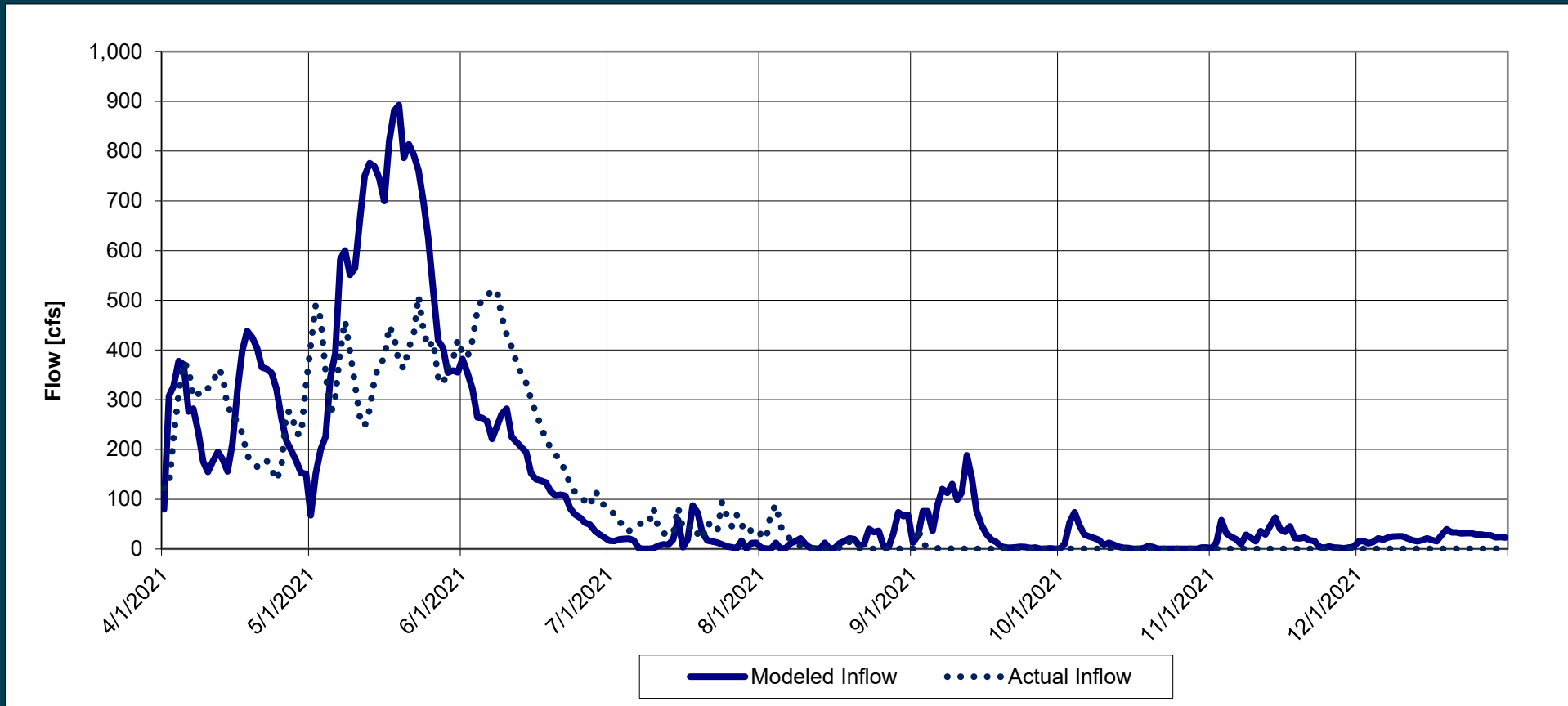
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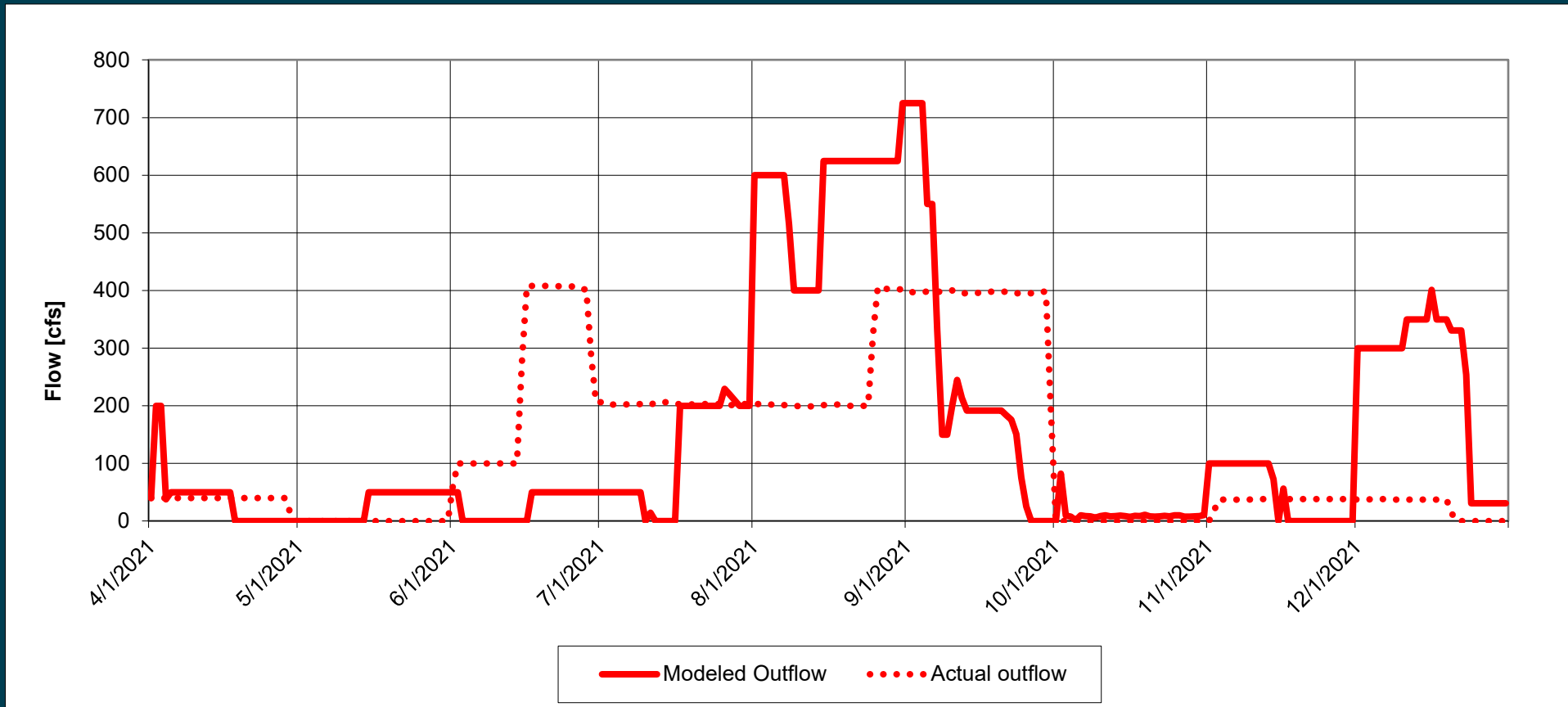


2021: The Year in Review

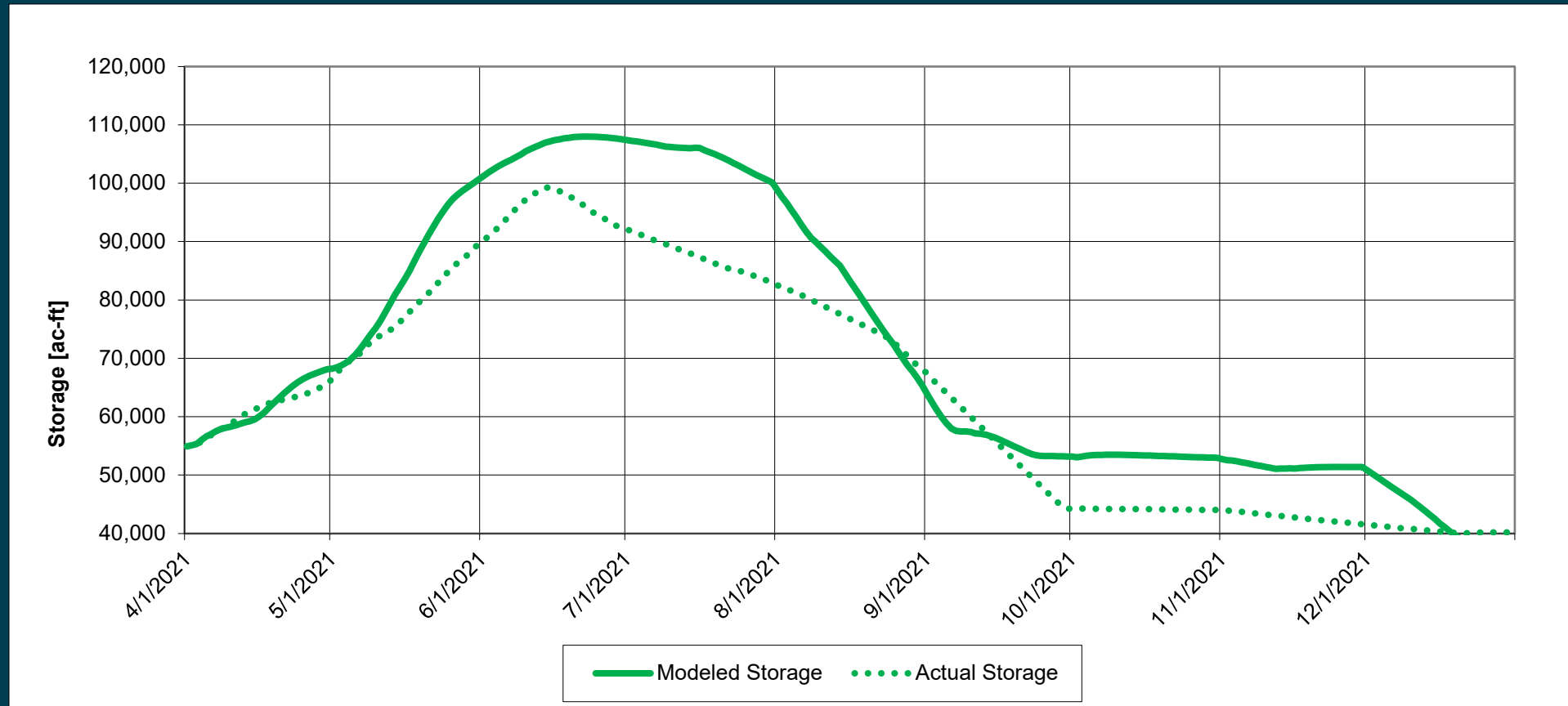
2021 Heron Inflow



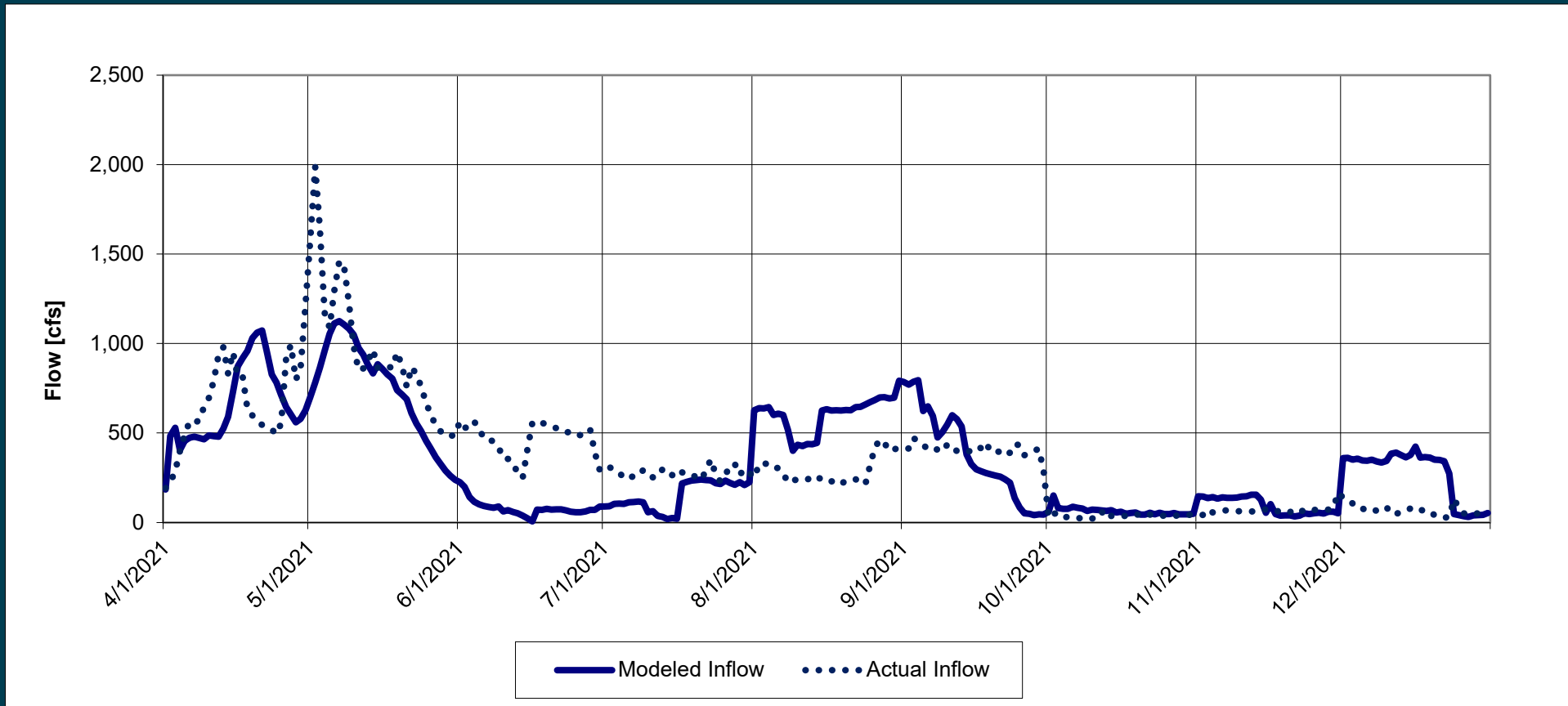
2021 Heron Outflow



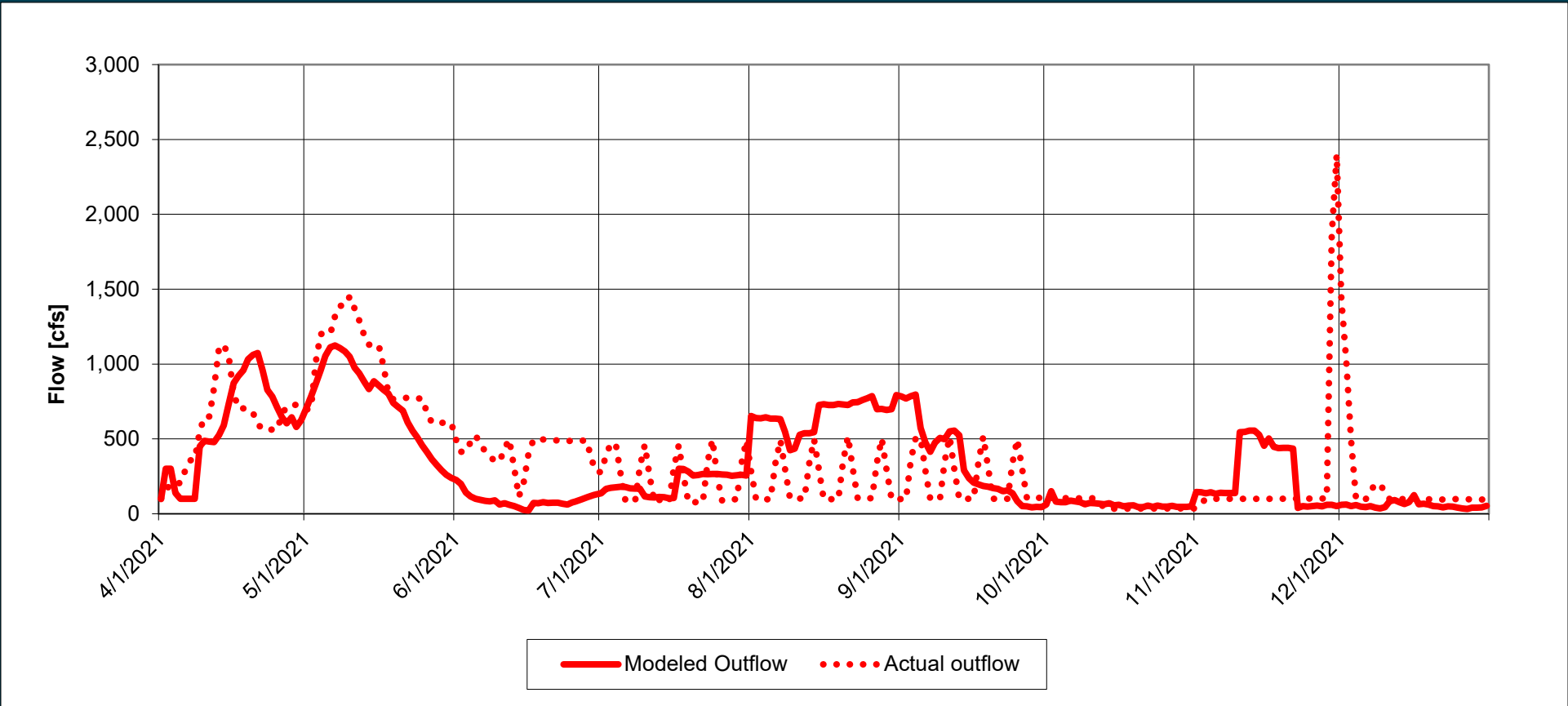
2021 Heron Storage



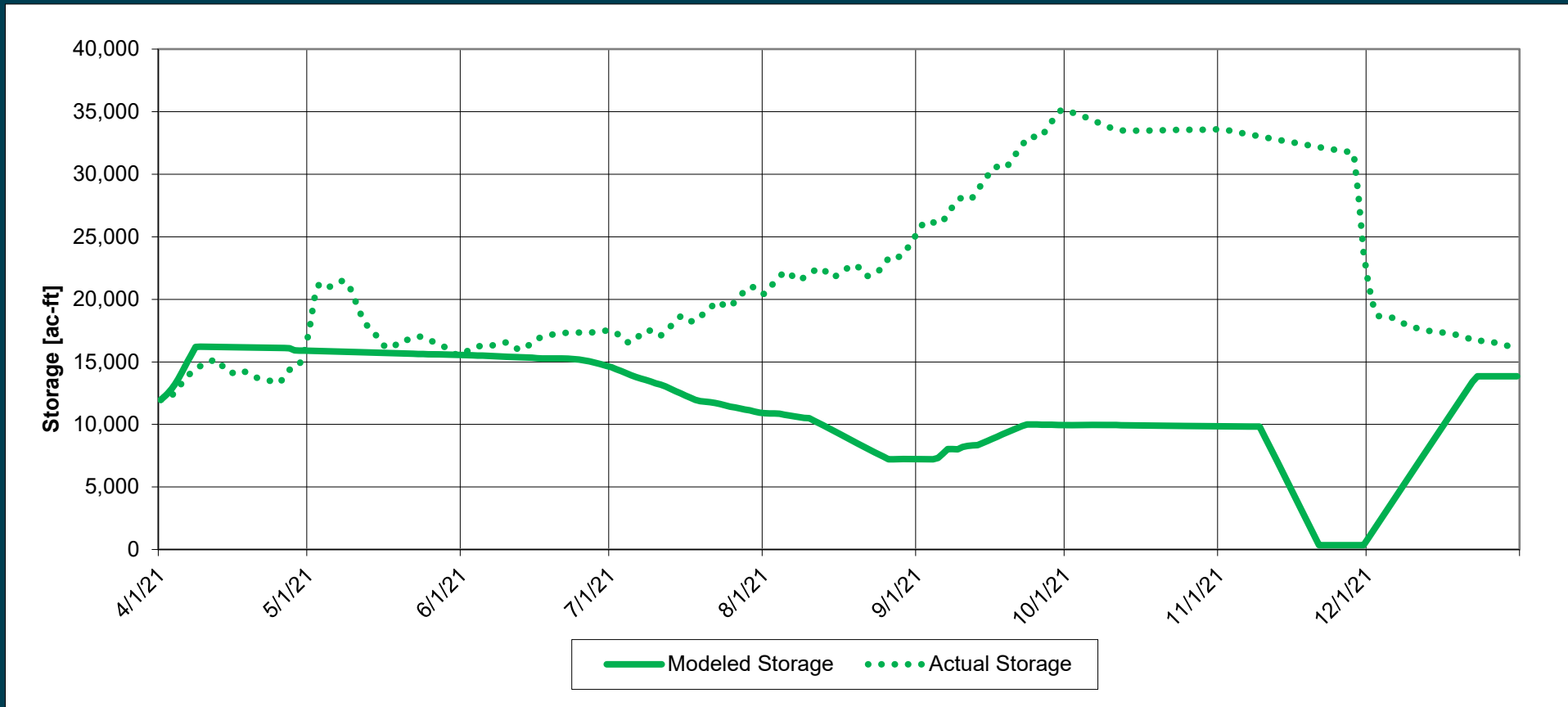
2021 El Vado Inflow



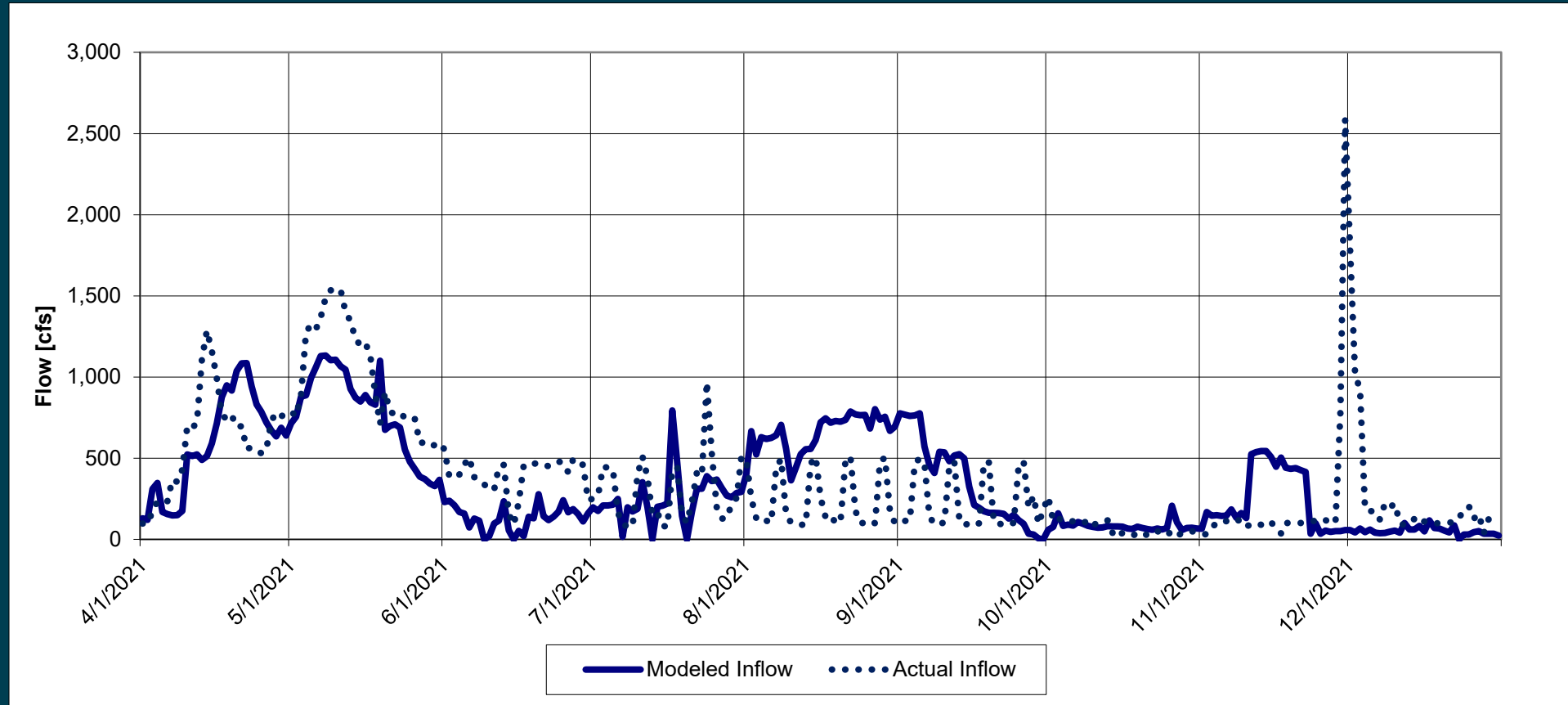
2021 El Vado Reservoir Outflow



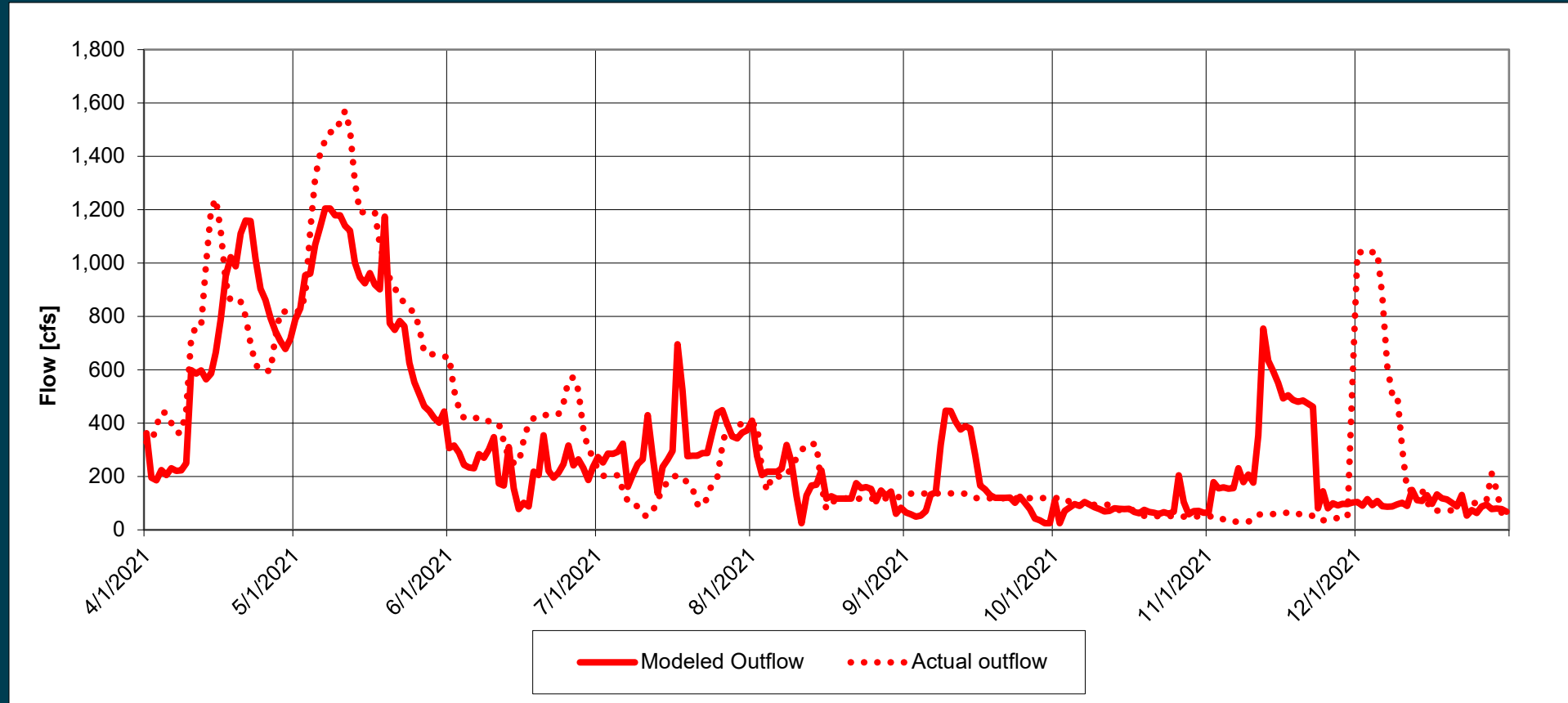
2021 El Vado Storage



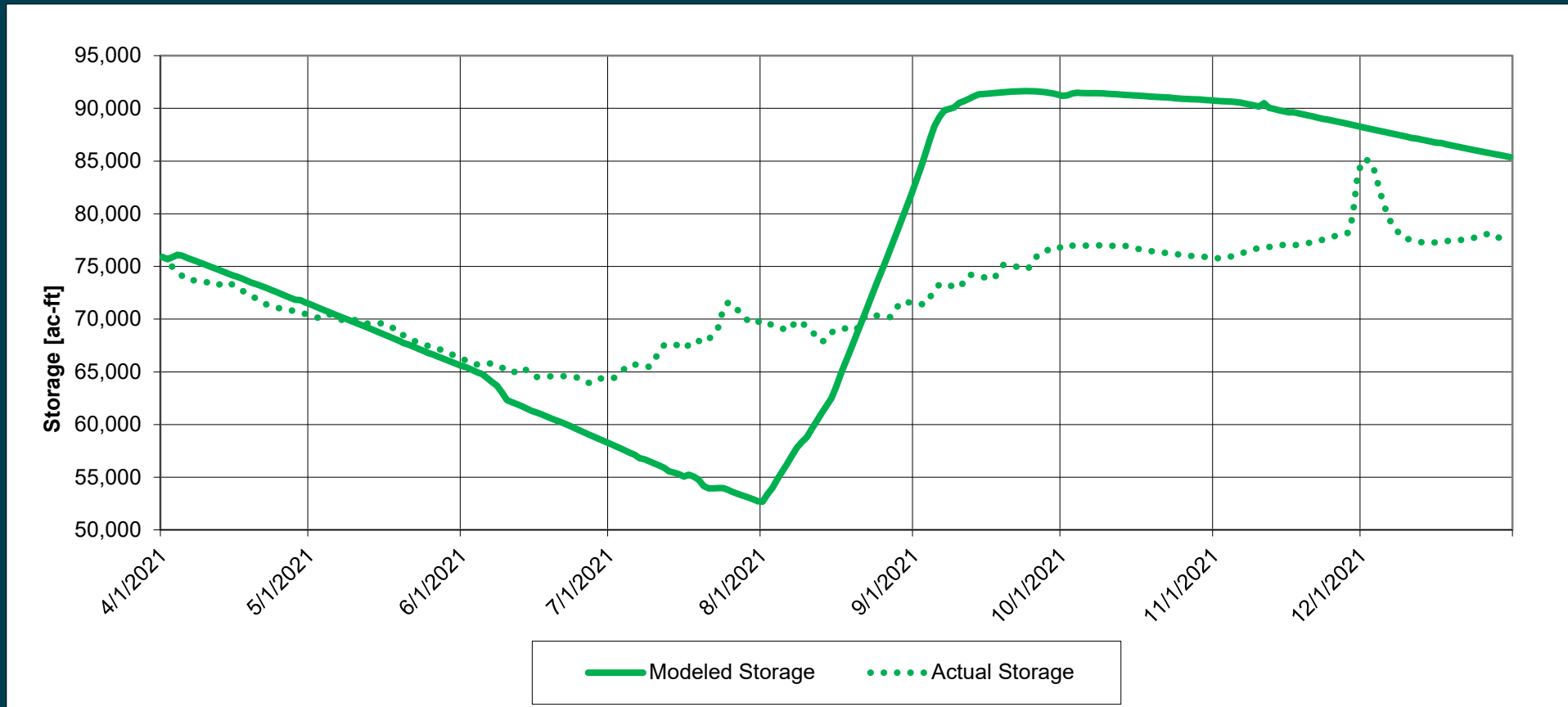
2021 Abiquiu Inflow



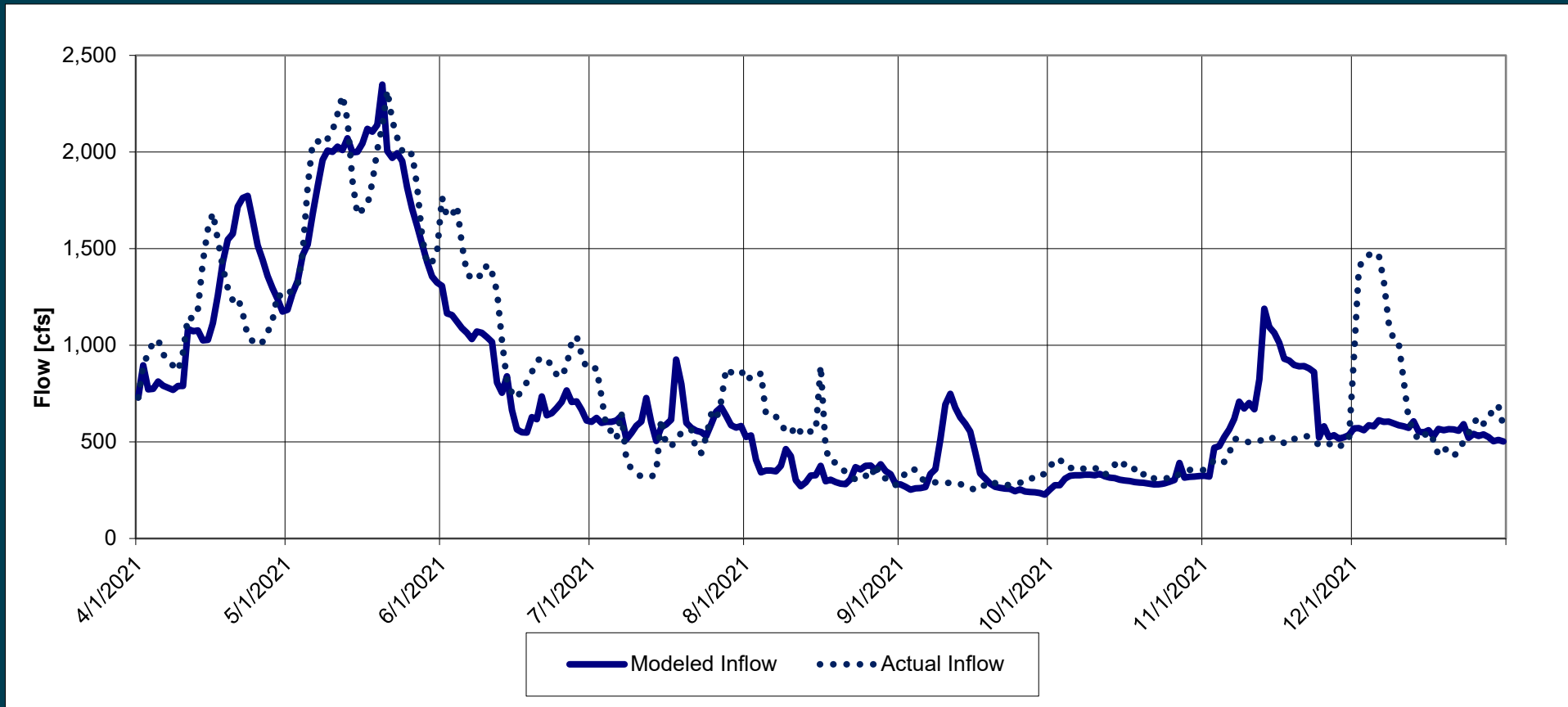
2021 Abiquiu Outflow



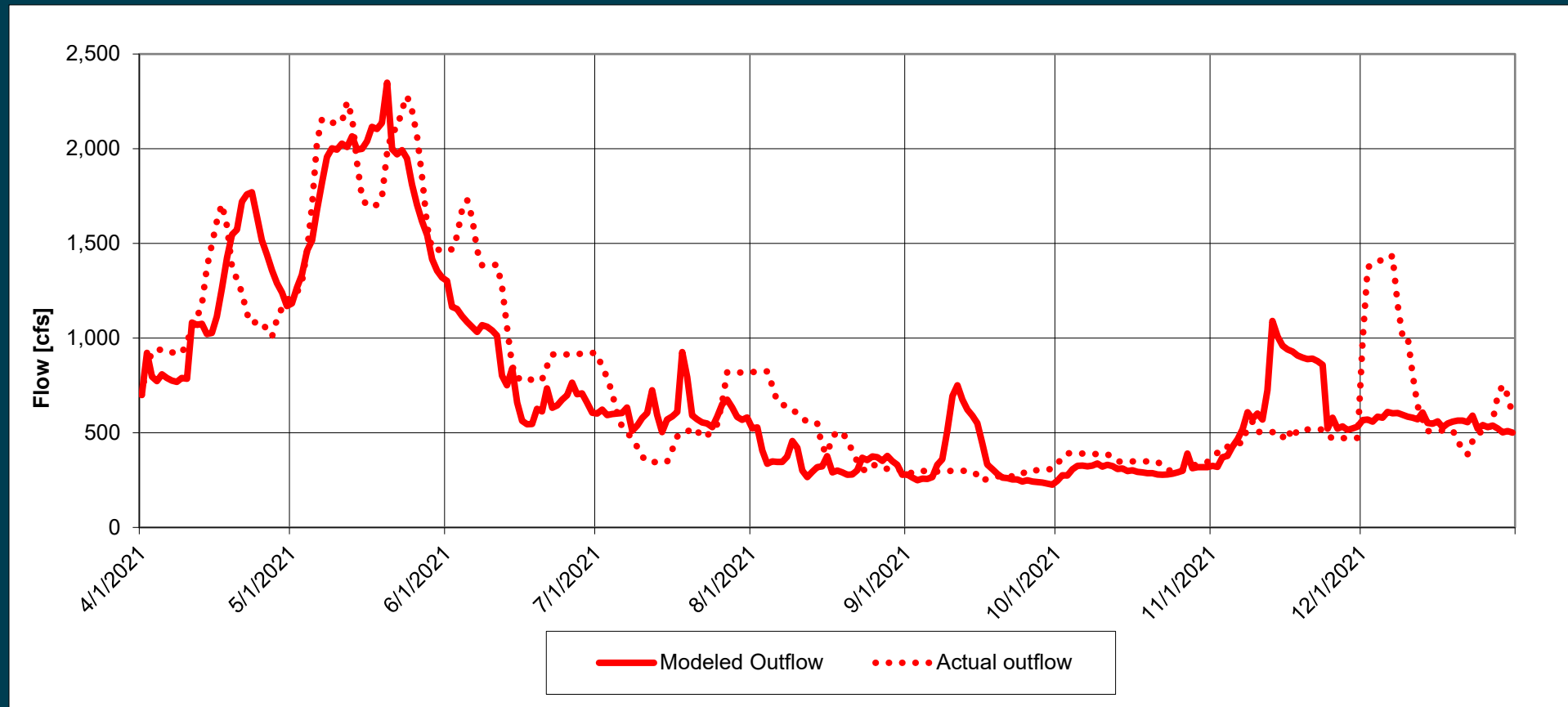
2021 Abiquiu Storage



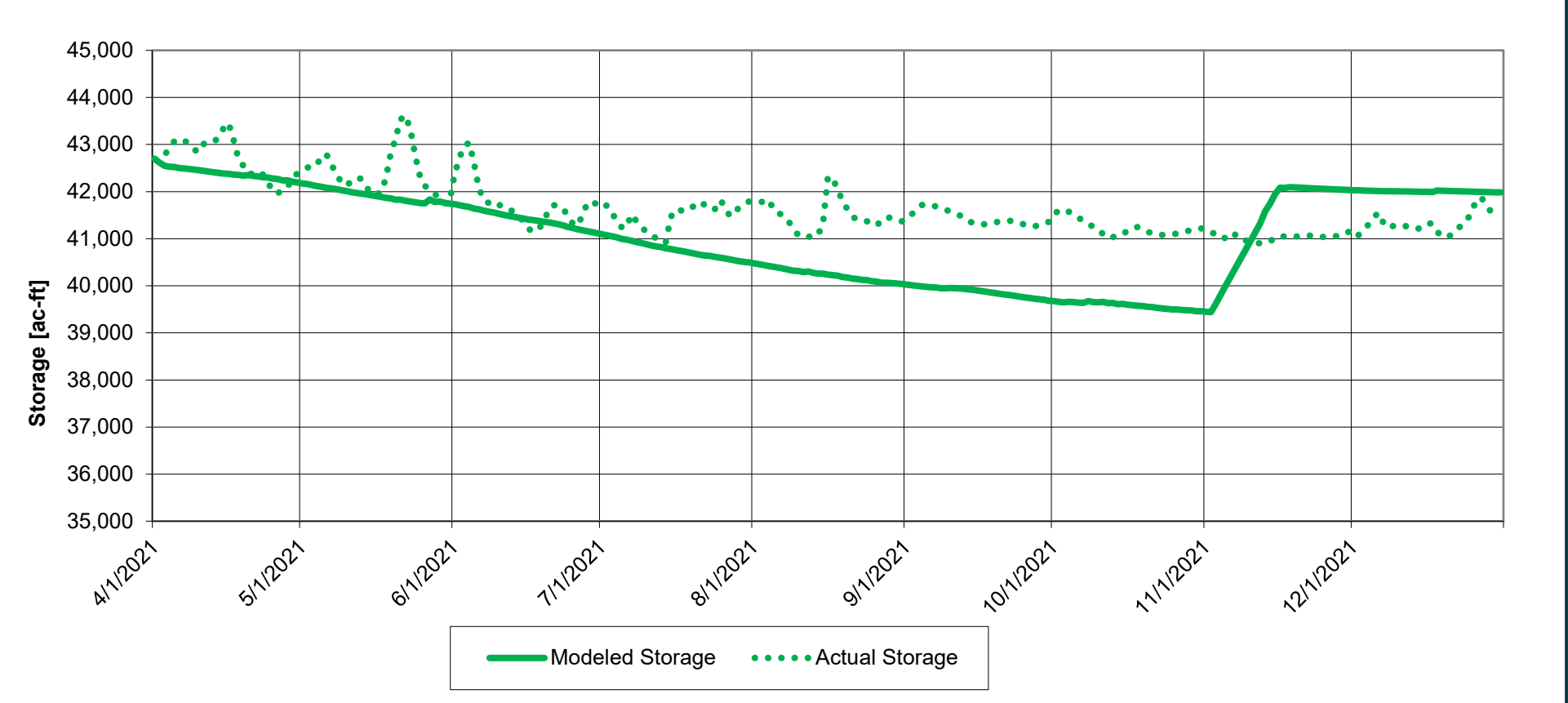
2021 Cochiti Inflow



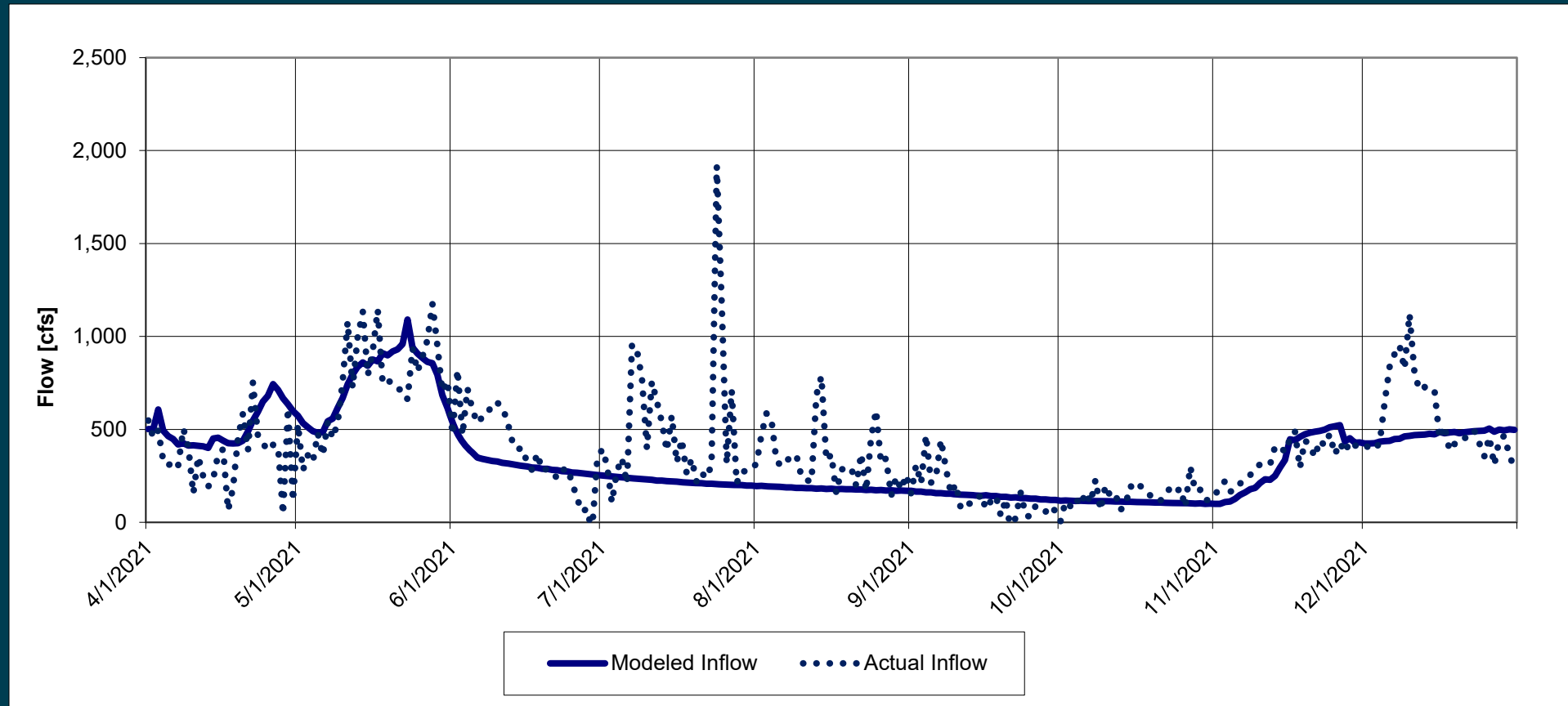
2021 Cochiti Outflow



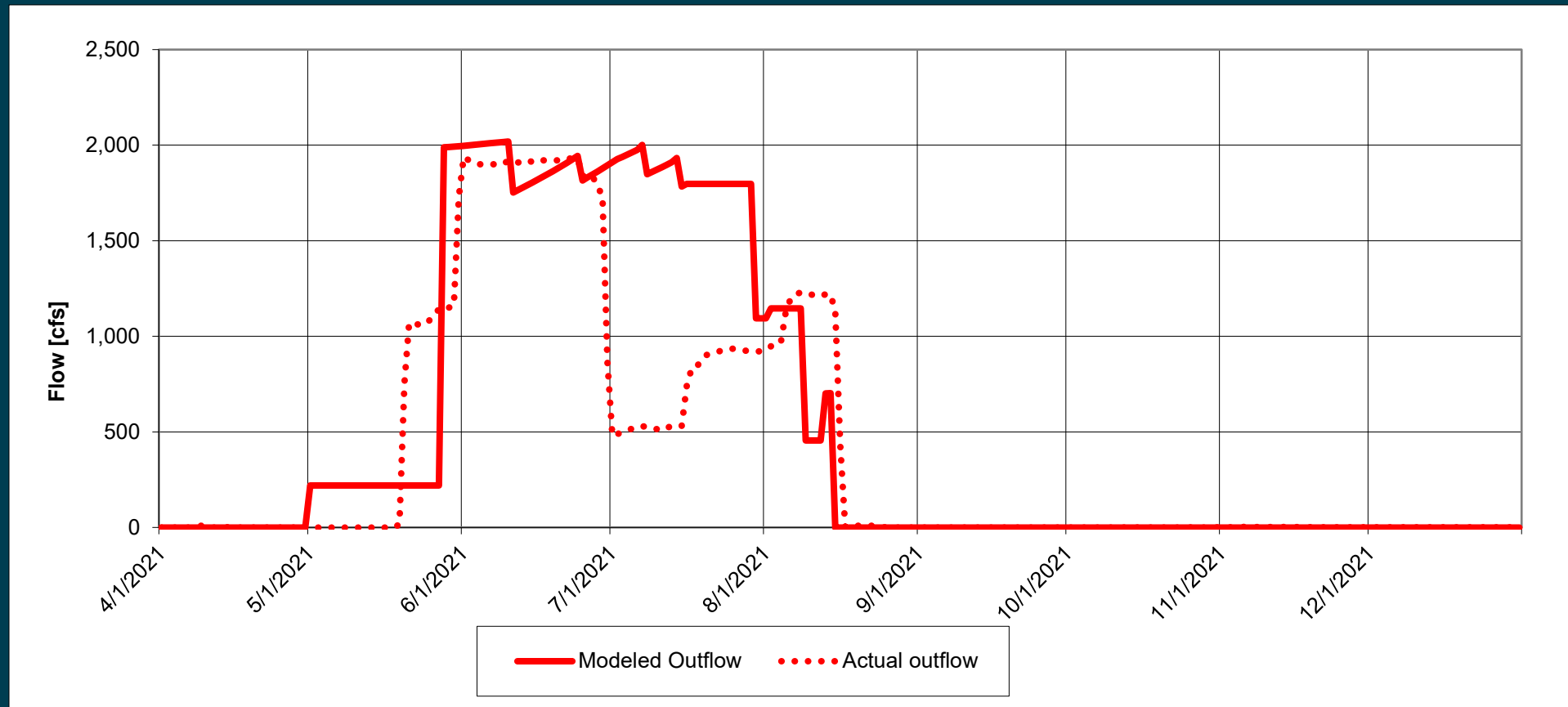
2021 Cochiti Storage



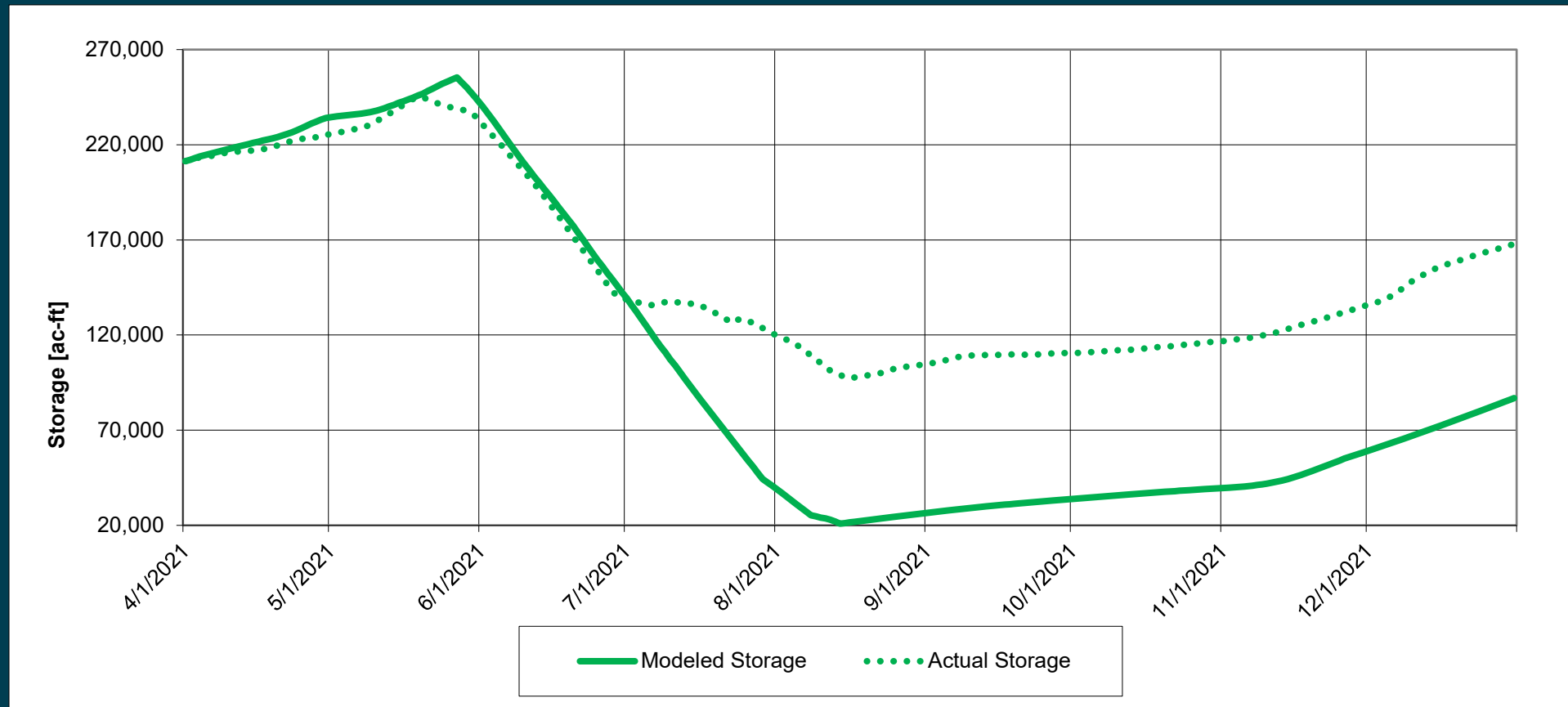
2021 Elephant Butte Inflow



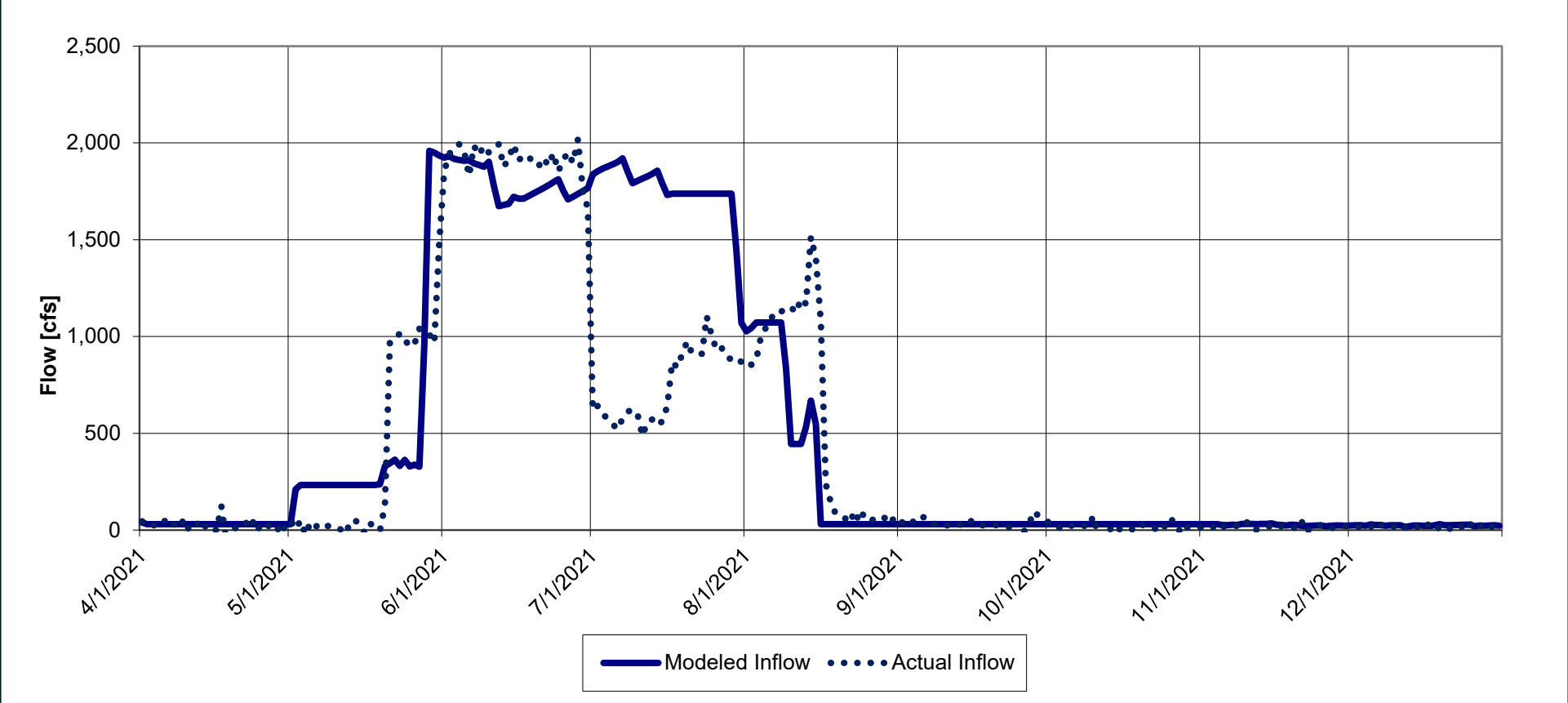
2021 Elephant Butte Outflow



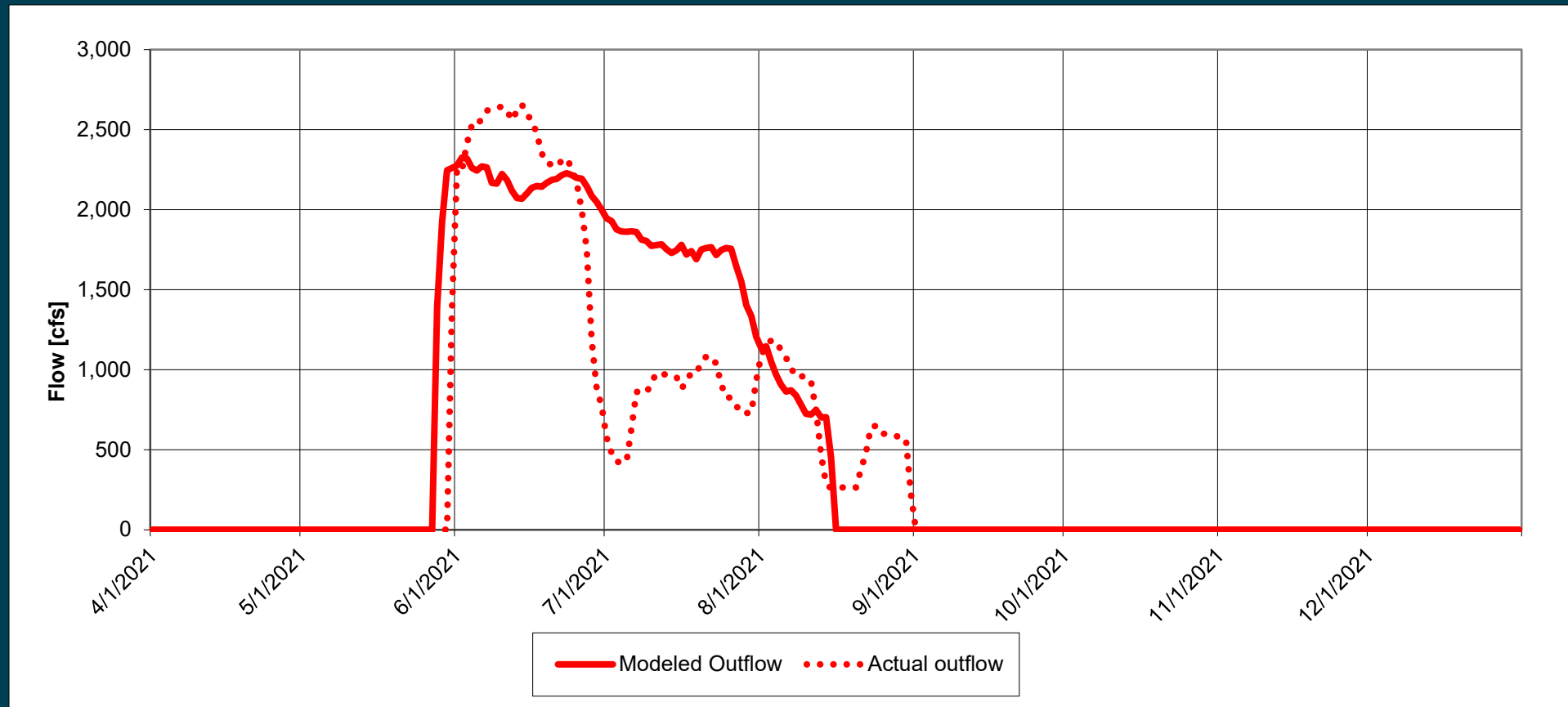
2021 Elephant Butte Storage



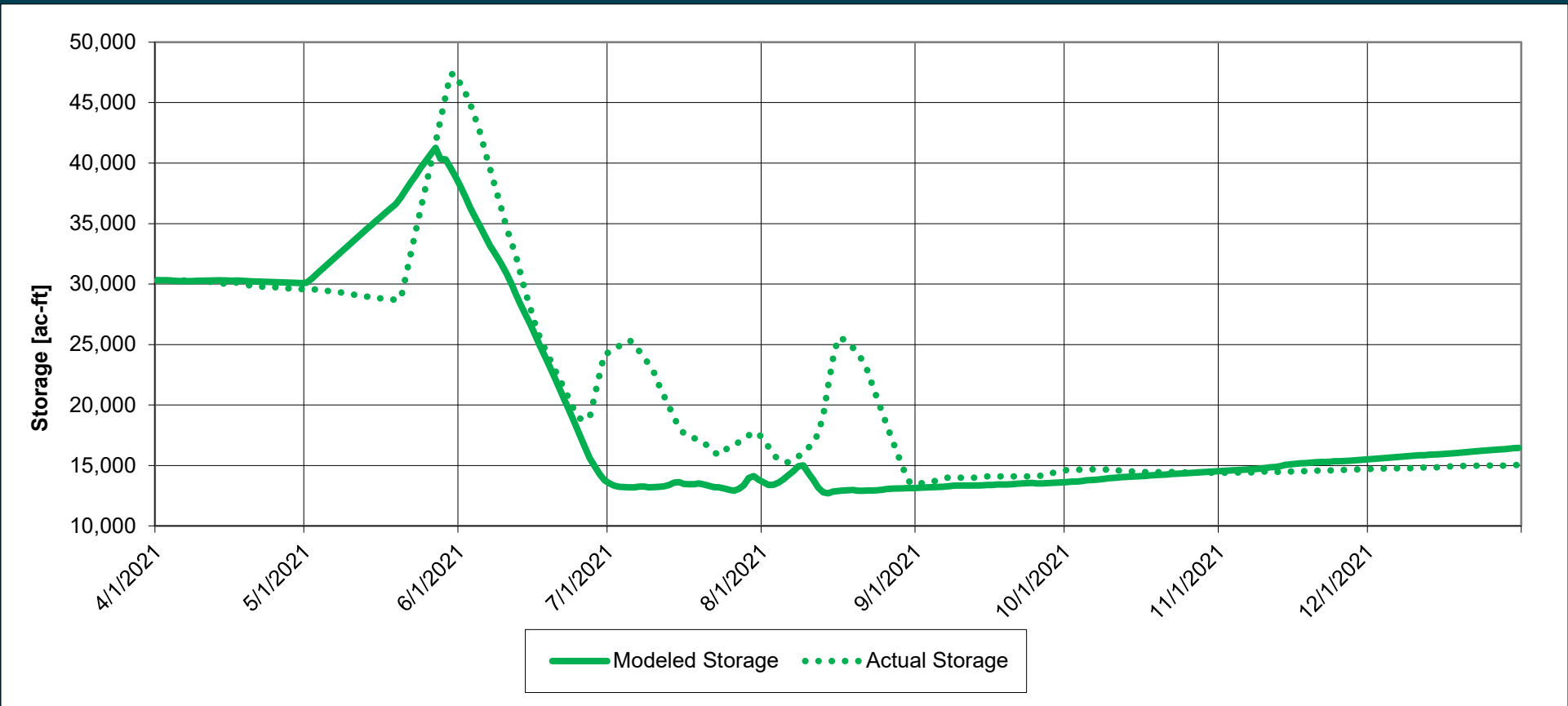
2021 Caballo Inflow



2021 Caballo Outflow



2021 Caballo Storage





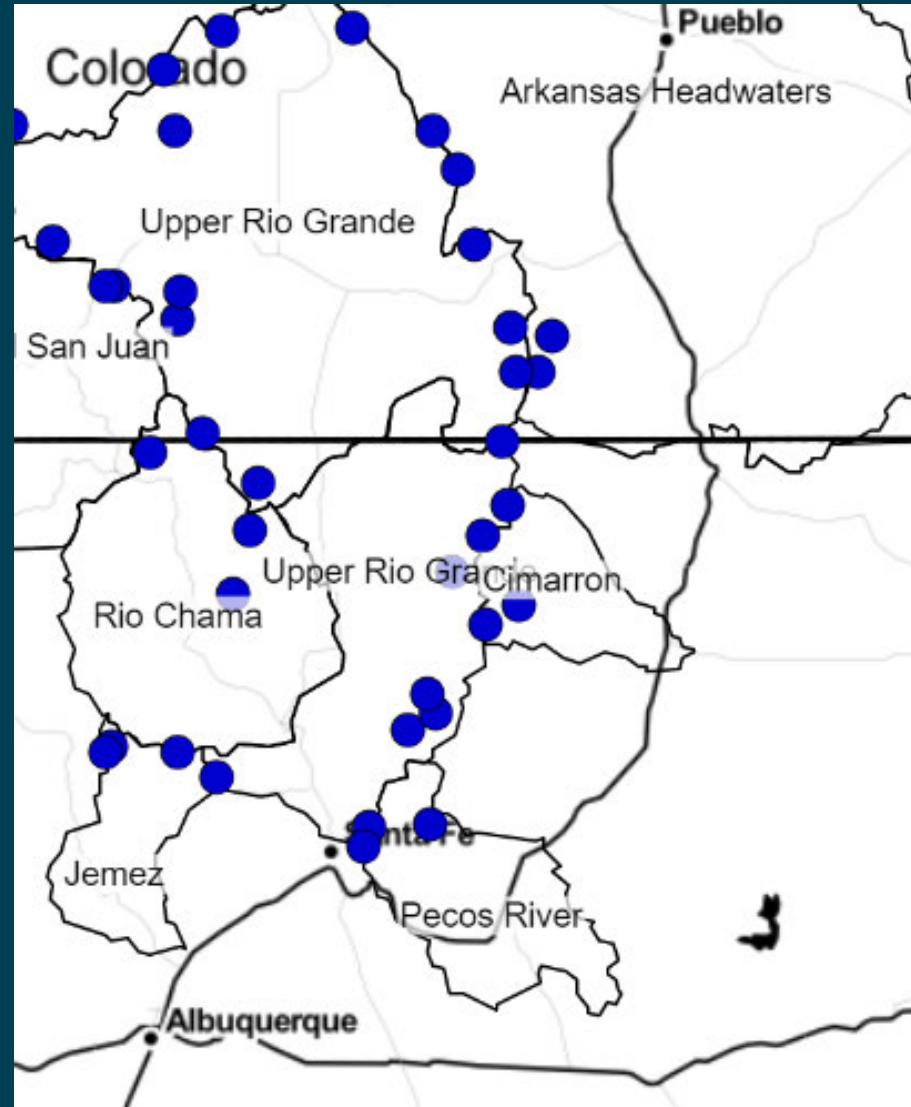
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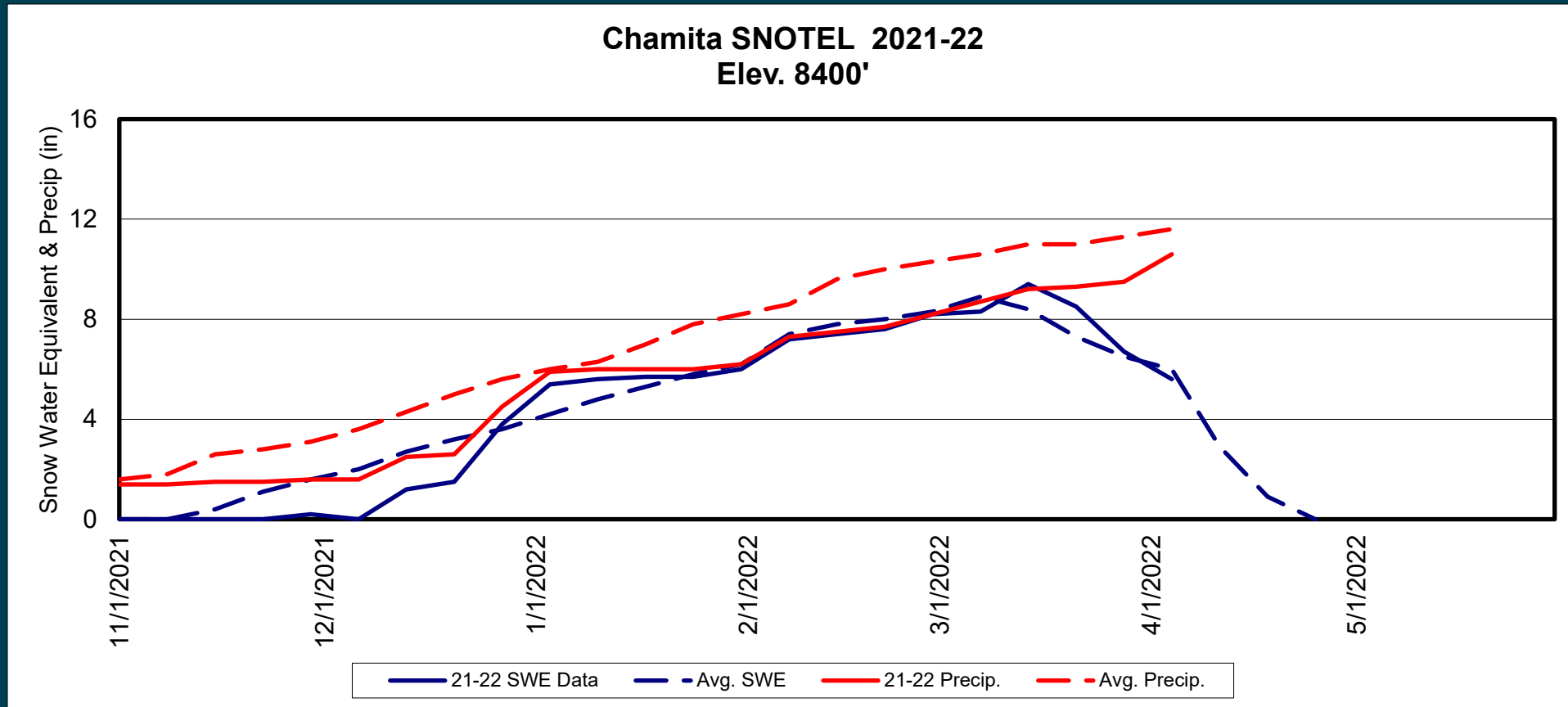


Current Snow Conditions

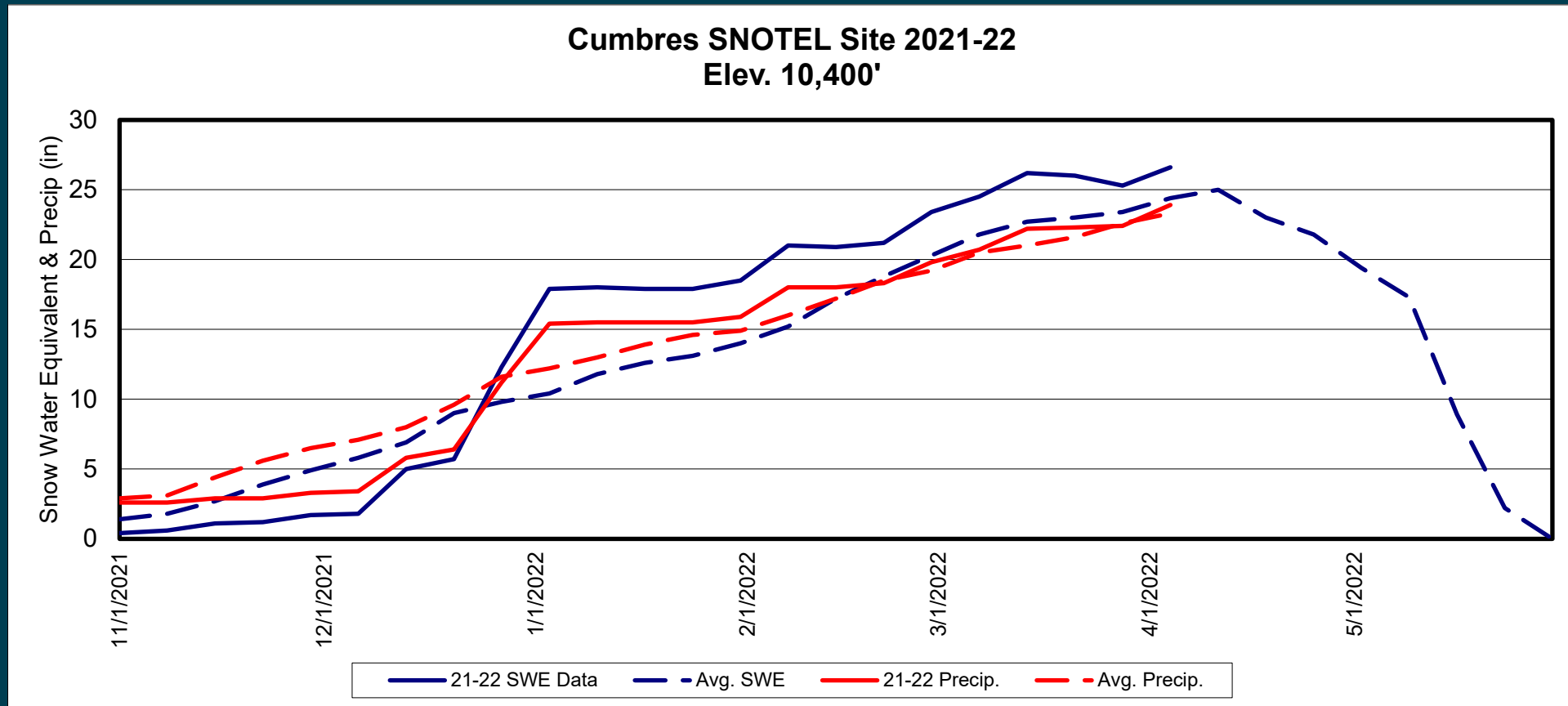
SNOTEL Locations



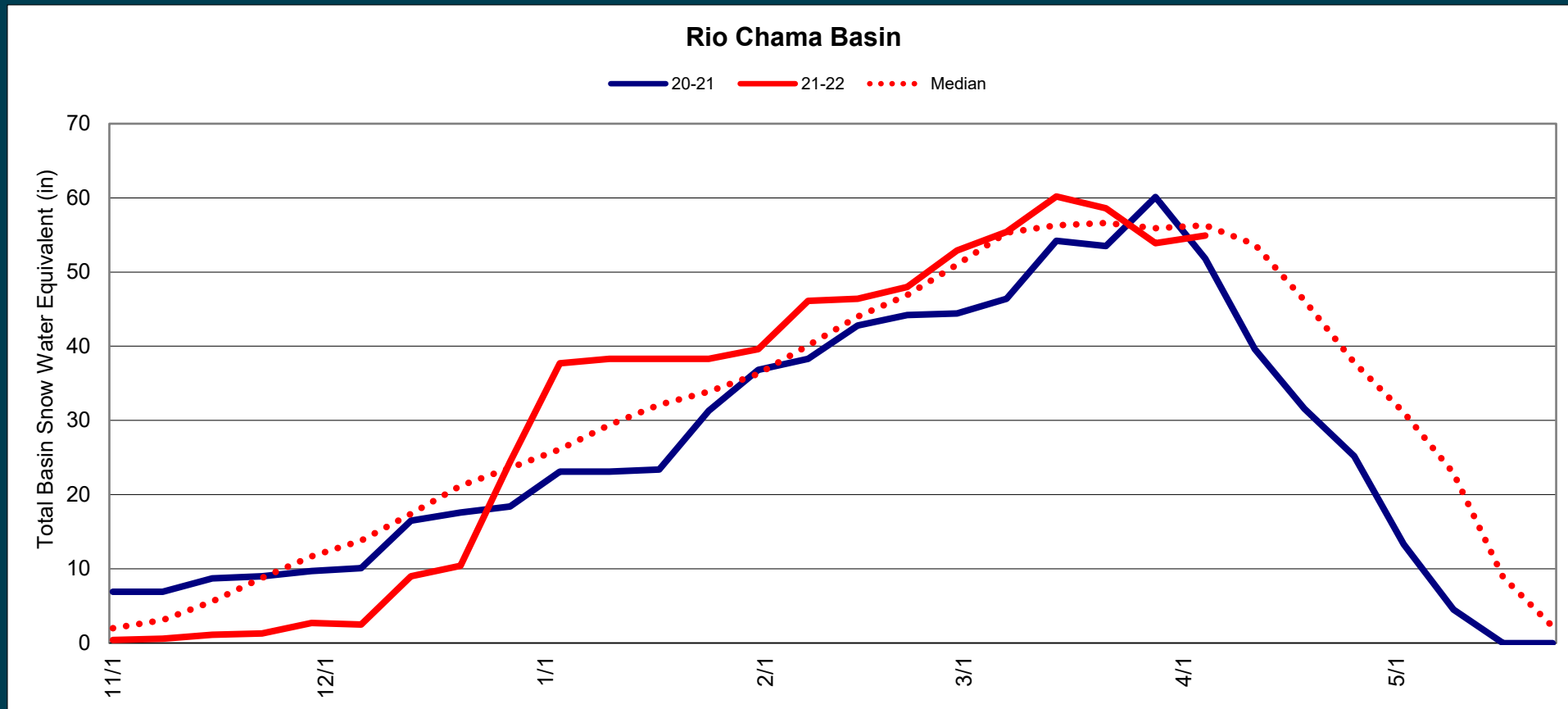
Rio Chama Snow Data Low Elevation



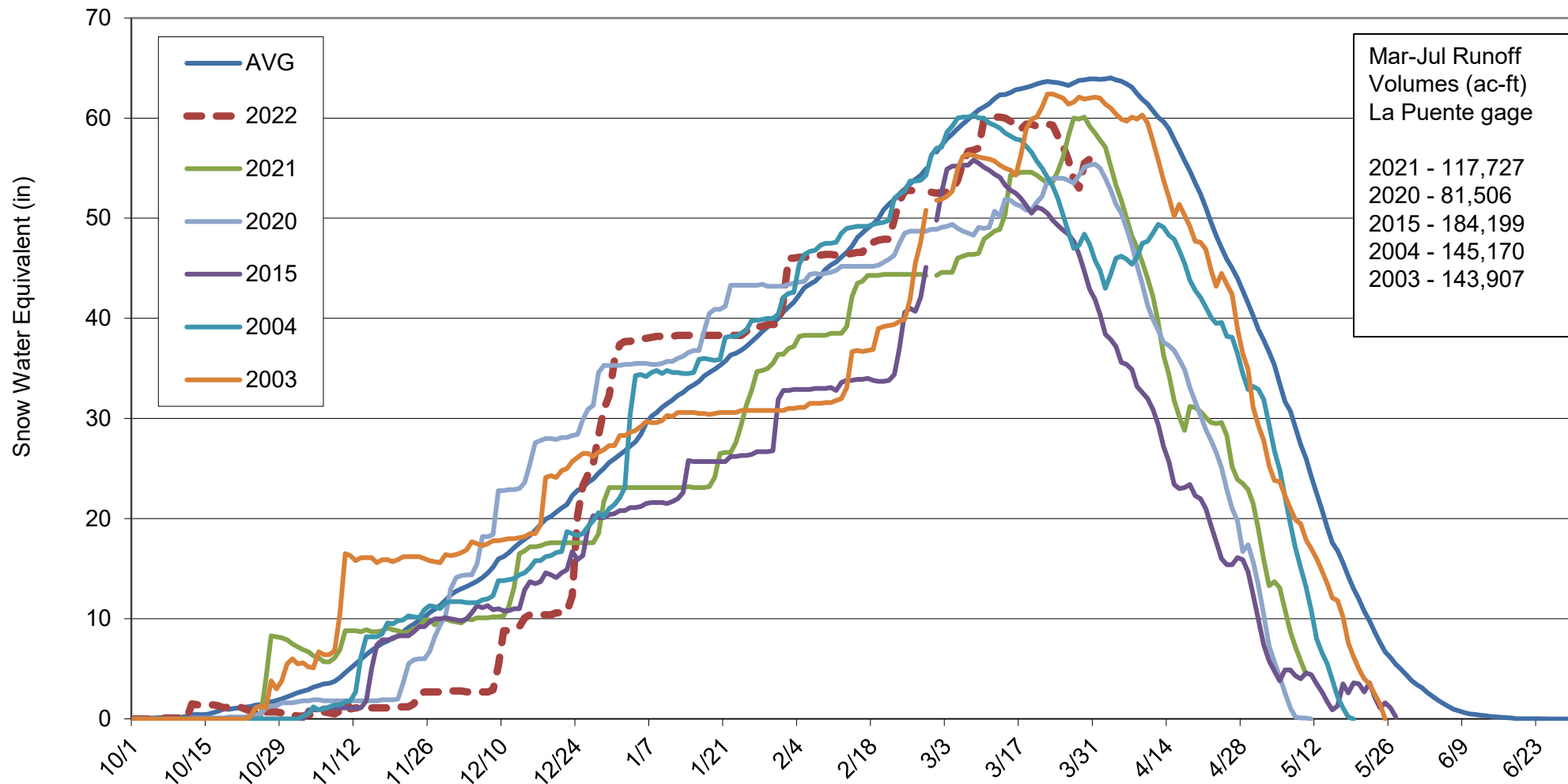
Rio Chama Snow Data High Elevation



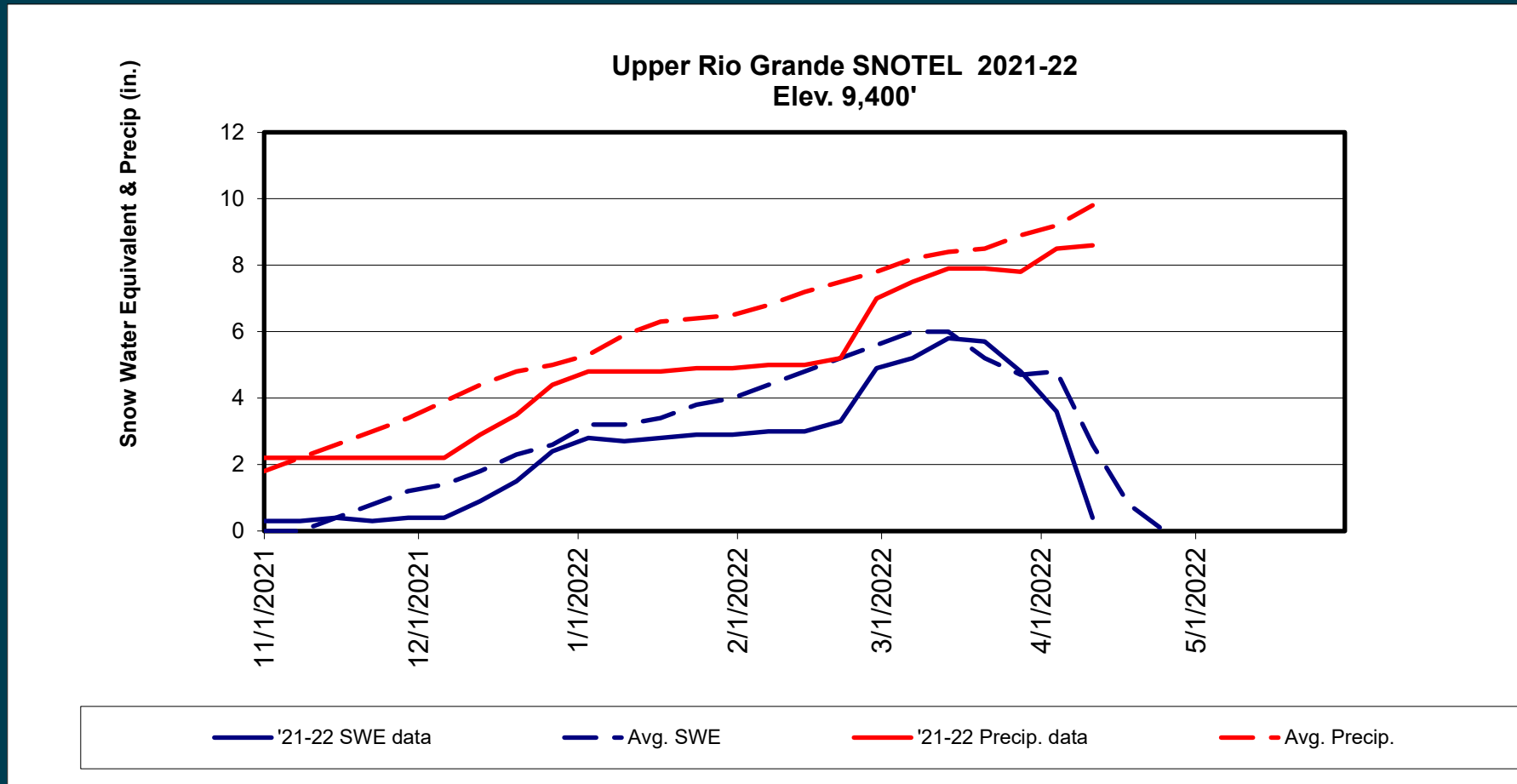
Rio Chama Snow Comparison



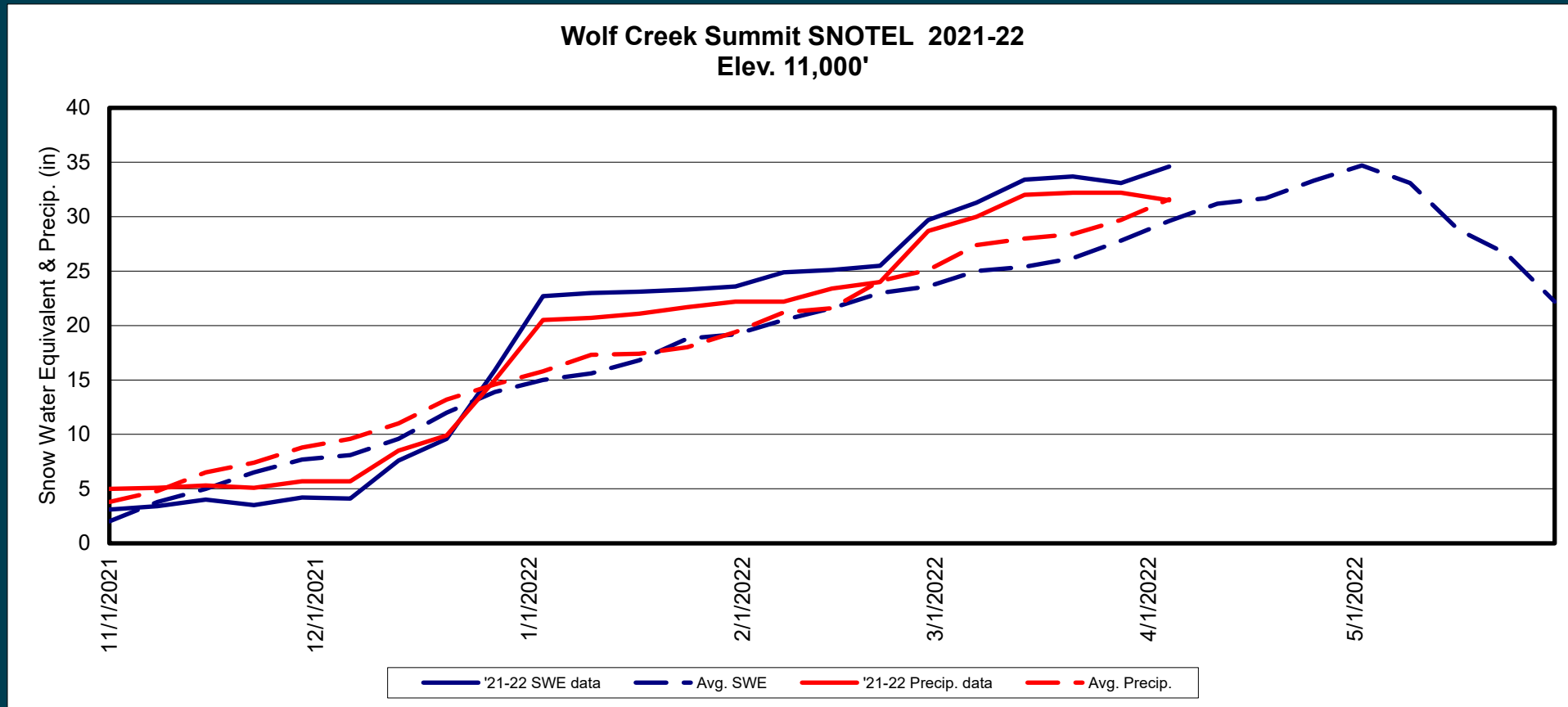
Rio Chama Basin Total Snow Water Equivalent Current Year vs Average and Similar Years



Rio Grande Snow Data Low Elevation

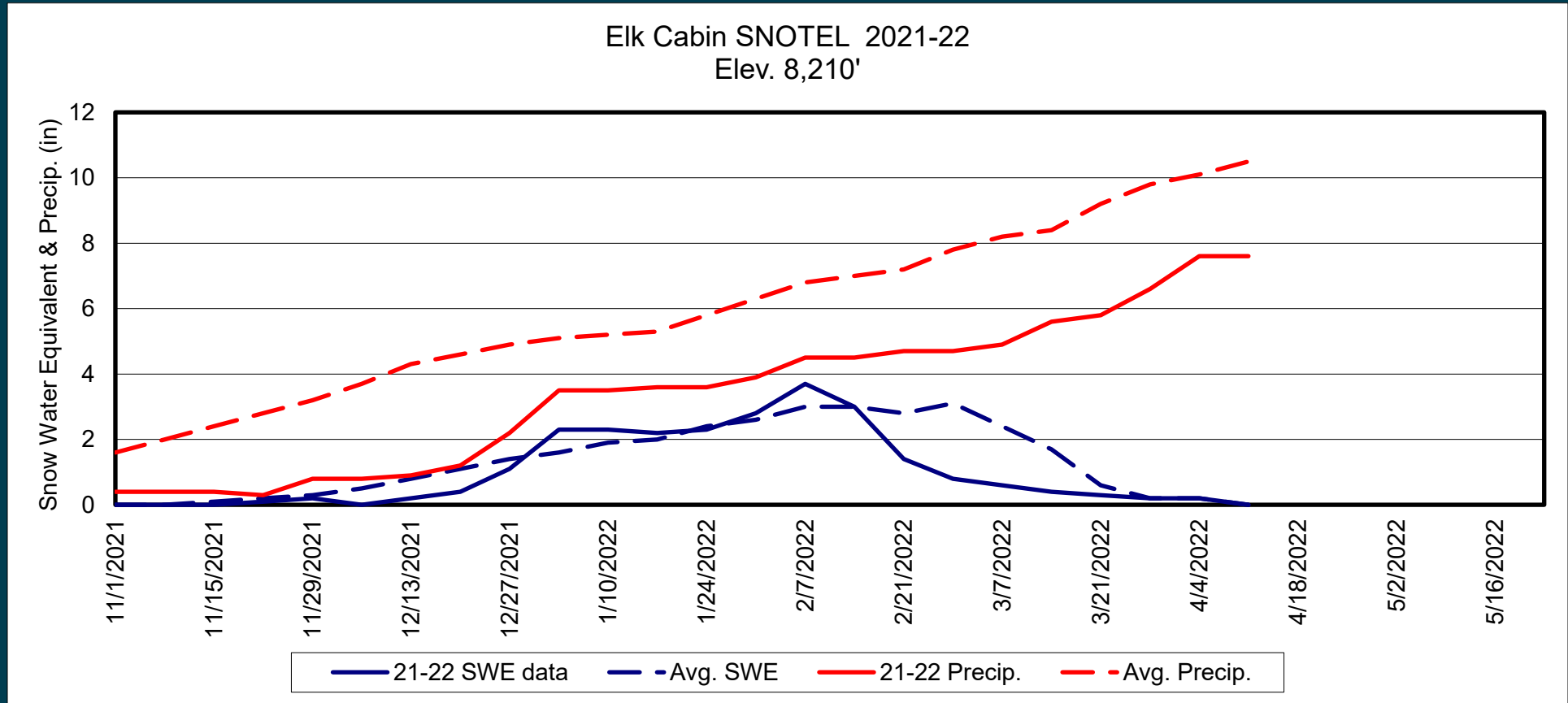


Rio Grande Snow Data High Elevation

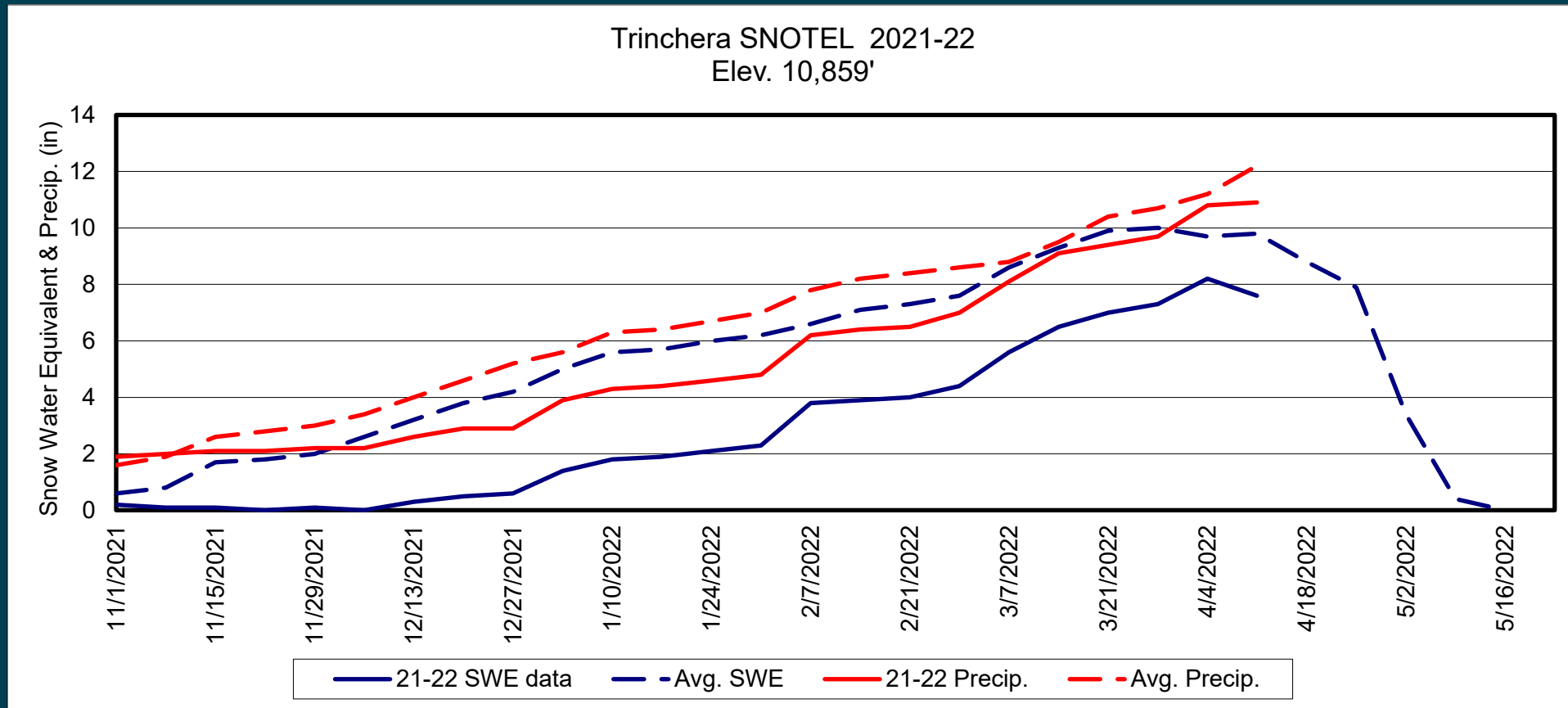


Sangre de Cristo Snow Data

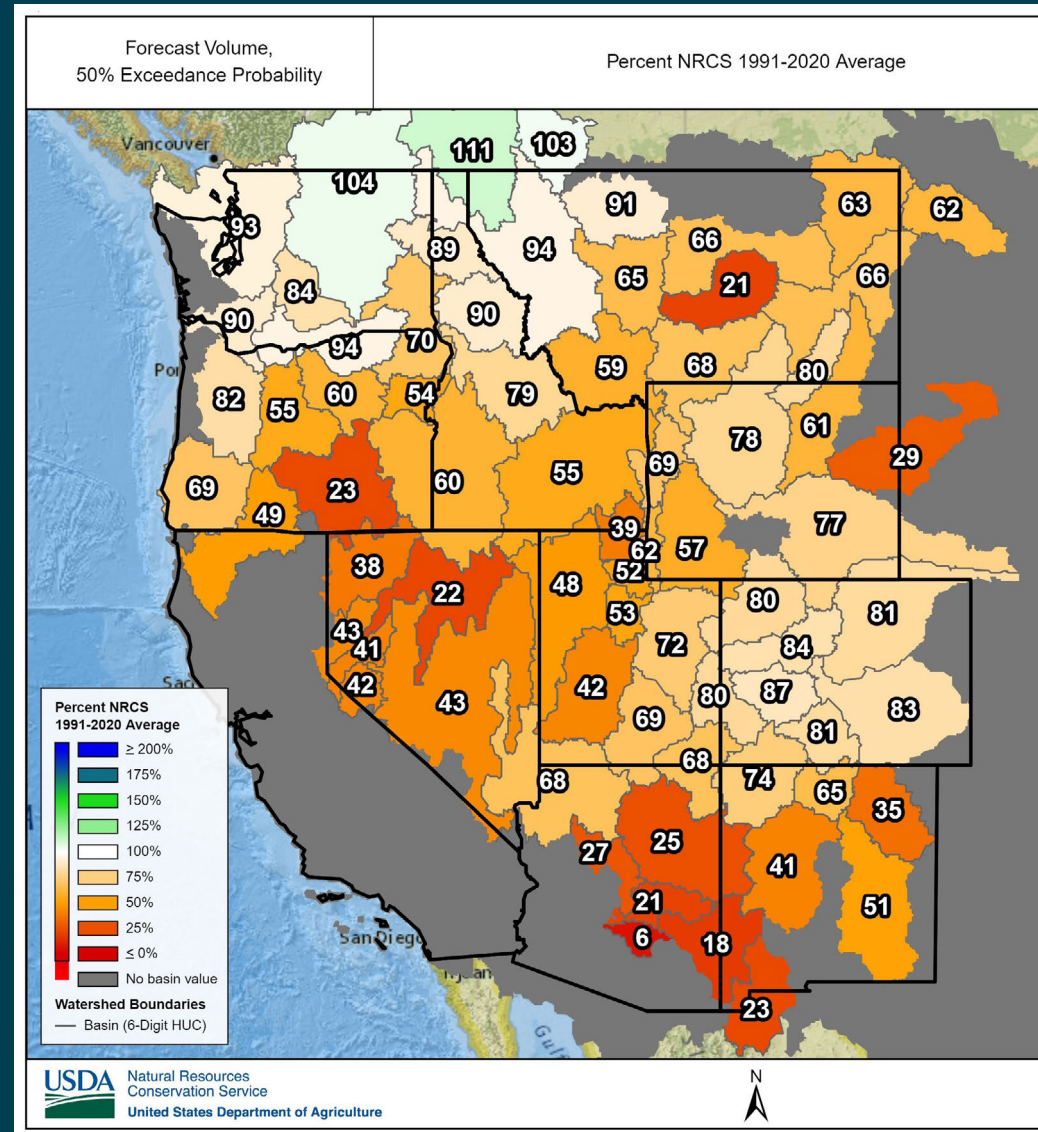
Low Elevation



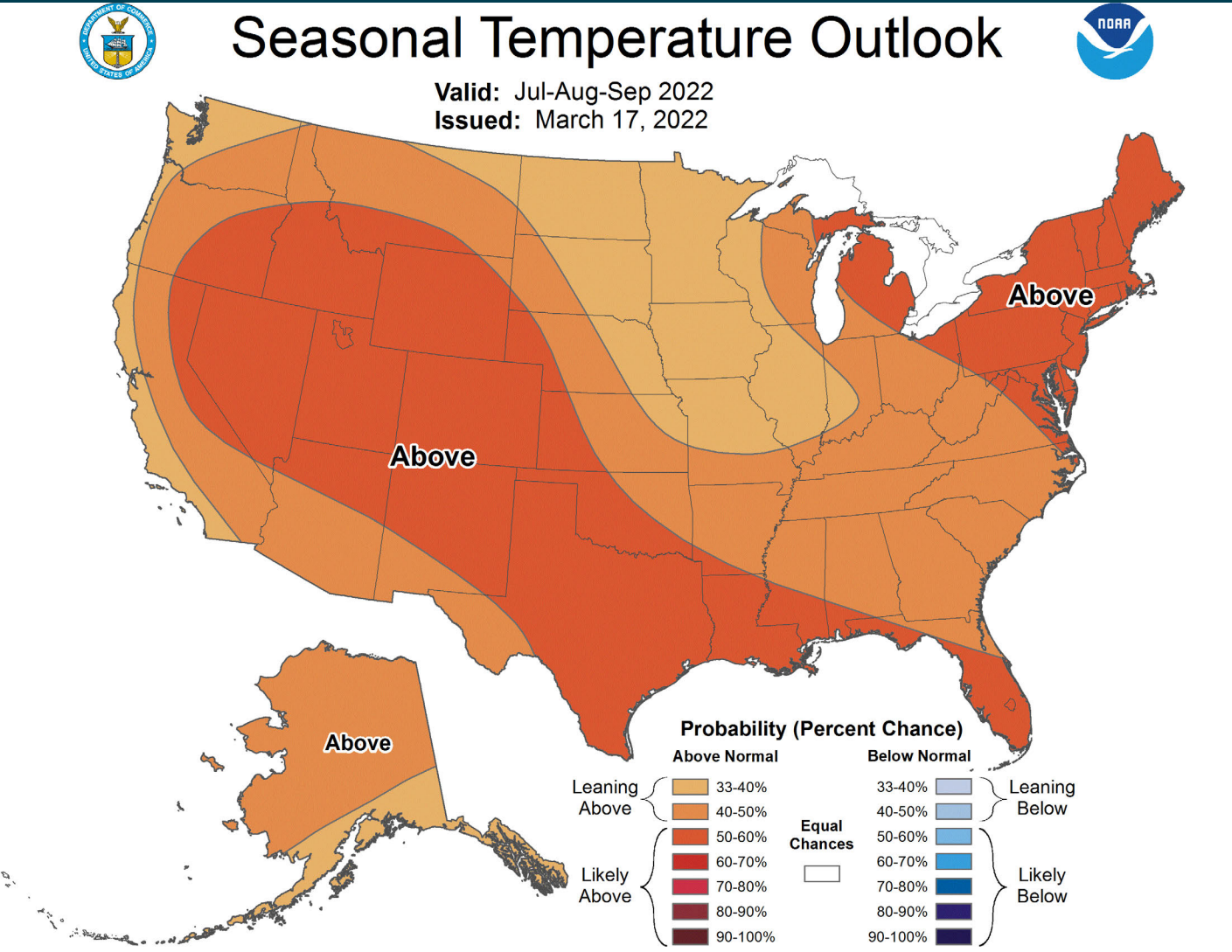
Sangre de Cristo Snow Data High Elevation



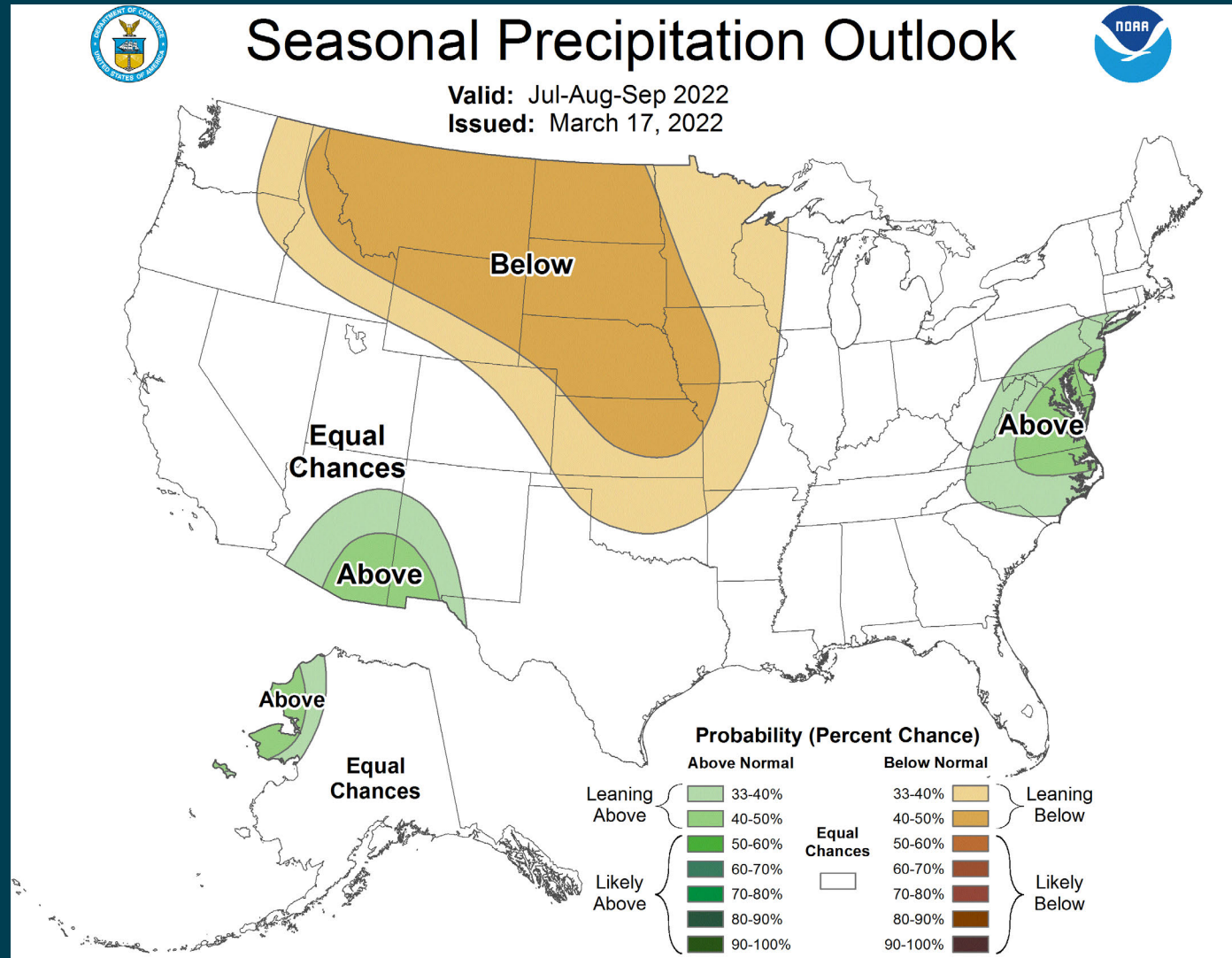
Western U.S. River Basin Streamflow Forecast



Monsoon Season Temperature Outlook

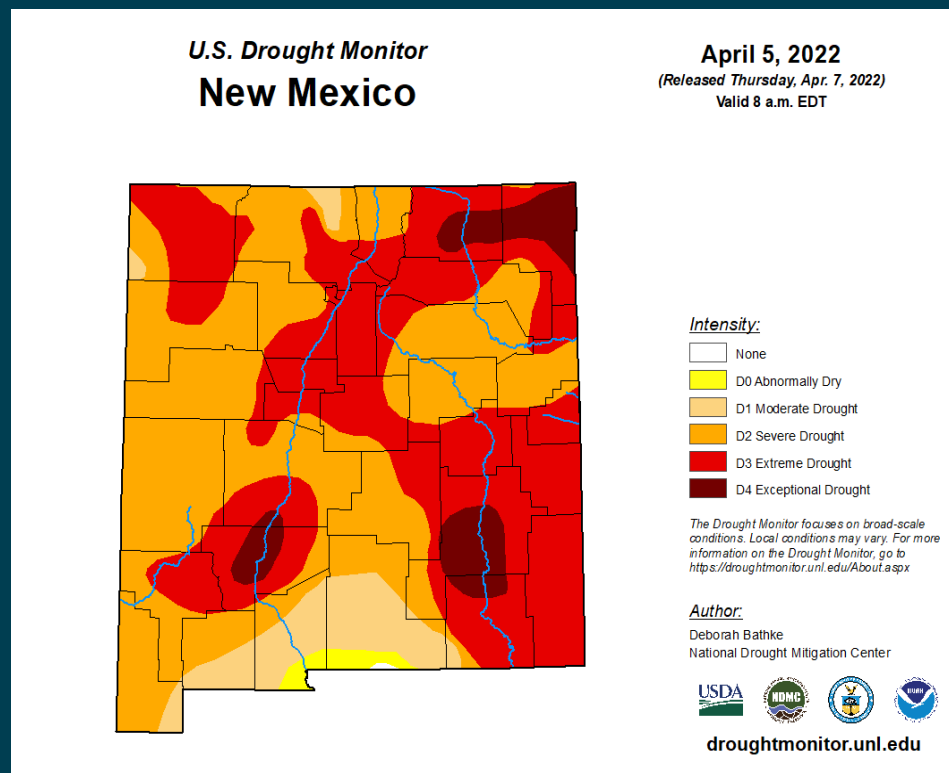


Monsoon Season Precipitation Outlook

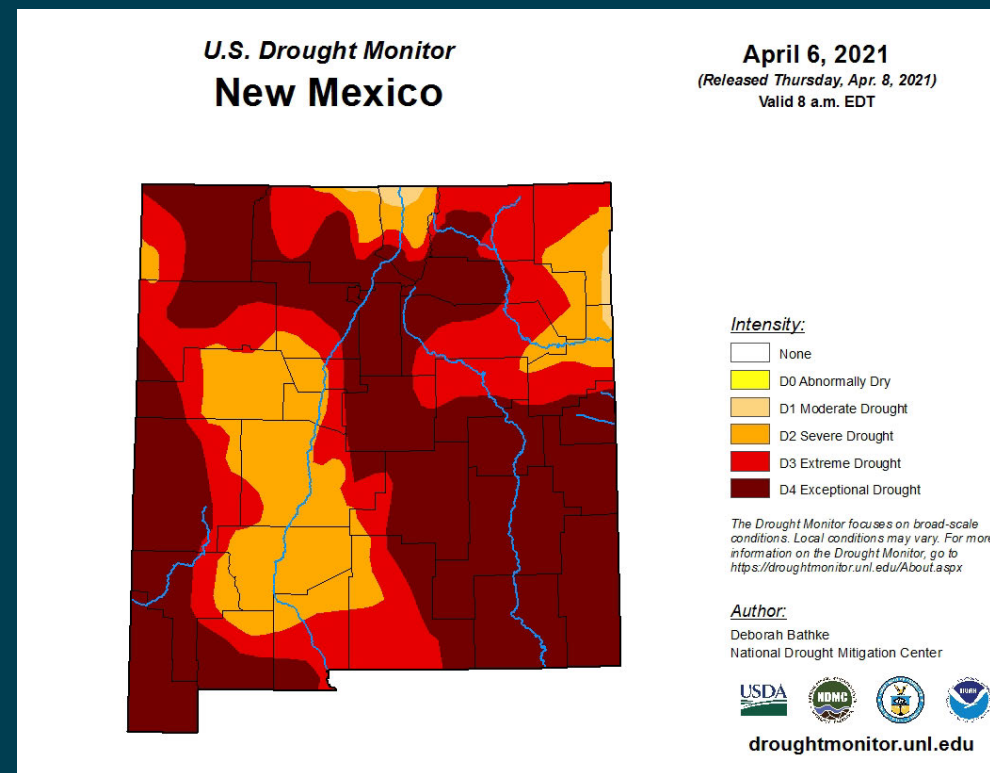


U.S. Drought Monitor – New Mexico

2022



2021





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2022 Projected Water Operations



Model Assumptions

- April 1st 50% exceedance forecast
- El Vado Storage restrictions for construction
 - P&P water managed from Abiquiu
 - Rafting flows managed from Heron
- Article VII restrictions all year- no native storage for MRGCD
- Irrigation
 - MRGCD staggered start for river diversions in March, reduced demand
 - Caballo Reservoir irrigation release begin early June
- ~4,200 ac-ft supplemental water, expect additional ~12,000 depending on SJCP shortage allocation

Changes to Forecast Information

- NRCS updated 30-yr (1981-2010) average to 30-yr (1991-2020) median

Location	Forecast Period	1991-2020 Median [kaf]	1981-2010 Average [kaf]	New as % of Old
Upper Rio Grande				
Rio Grande nr Del Norte	Apr-Sept	480	515	93%
Conejos R nr Magote	Apr-Sept	168	194	87%
Rio Grande nr Lobatos	Apr-July	119	200	60%
San Juan Chama and Middle Rio Grande				
Jemez R bl Jemez Canyon Dam	Mar-July	22	34	65%
El Vado Reservoir Inflow	Mar-July	186	225	83%
Rio Grande at Otowi Bridge	Mar-July	565	720	78%
Rio Grande at San Marcial	Mar-July	345	510	68%



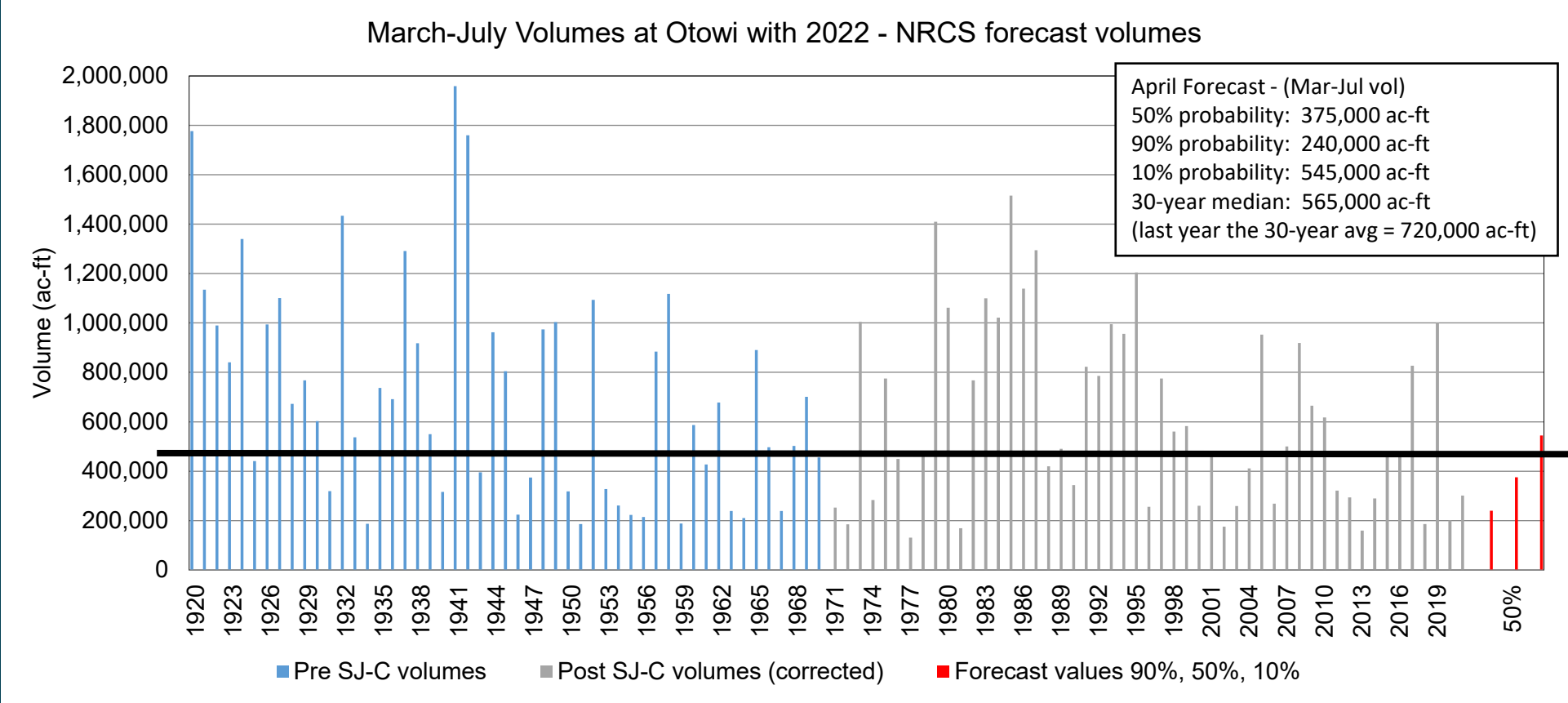
2022 vs 2021 April Streamflow Forecasts

Location	2022		↑ or ↓ 22vs21	2021	
	af	%*		af	%*
Rio Grande @ Del Norte	375,000	78%	↑	365,000	76%
Rio Blanco @ diversion	40,000	83%	-	40,000	83%
Navajo River @ diversion	48,000	86%	↑	45,000	81%
El Vado Inflow	150,000	81%	↑	116,000	63%
Nambe Falls Inflow	3,400	61%	↑	2,800	50%
Rio Grande @ Otowi	375,000	66%	↓	415,000	73%
Jemez River @ Jemez	15,600	54%	↑	11,200	39%
Rio Grande @ San Marcial	151,000	44%	↓	205,000	60%

*Percentage based on the 1991-2020 Median



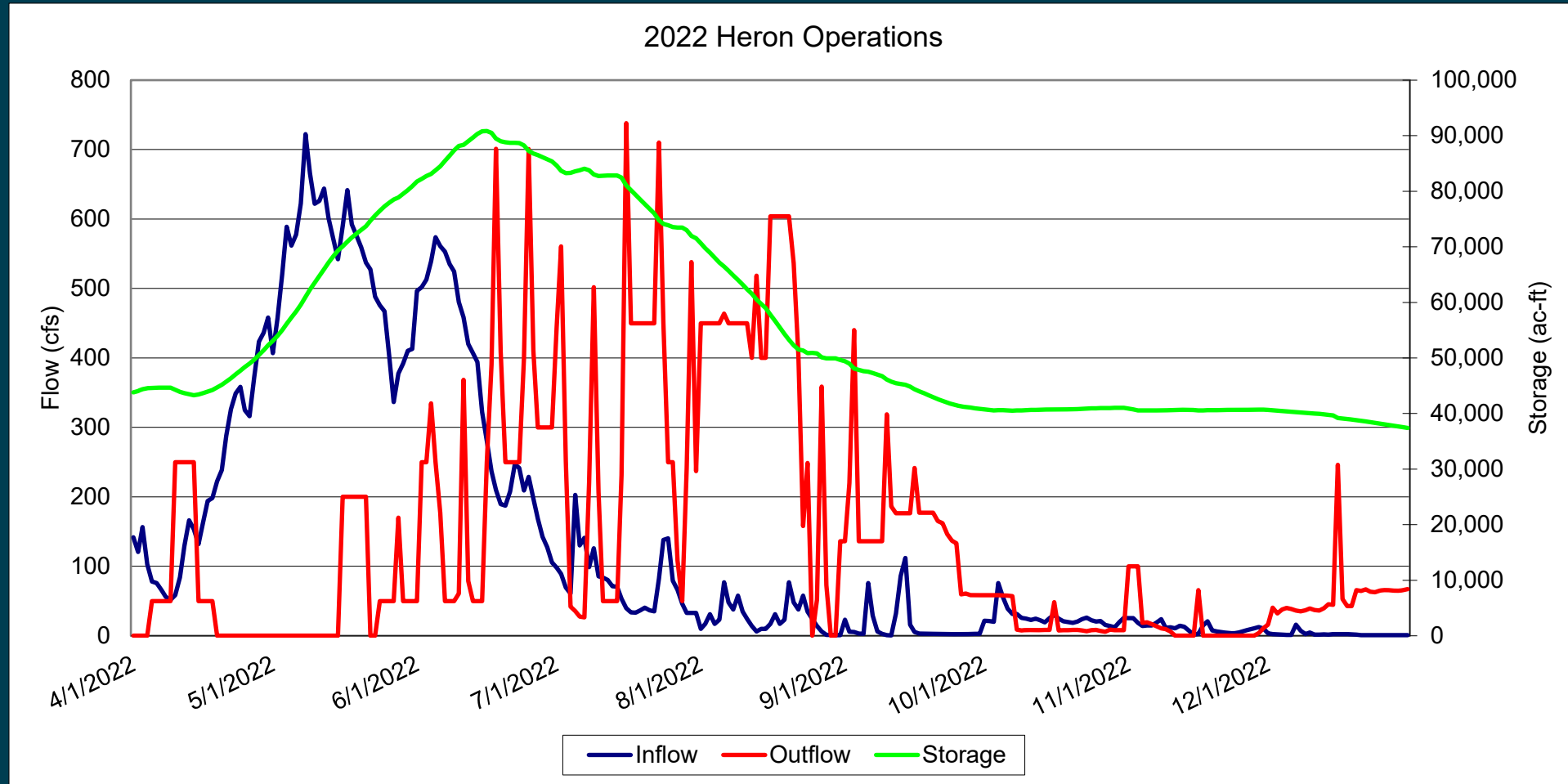
Historic March-July Flow Volumes at Otowi



Heron Dam



Projected 2022 Heron Operations



El Vado Dam



El Vado Restrictions during Construction



- During embankment construction, reservoir restricted to 6,785 ft +/- 1.5 ft (1,420 ac-ft to 2,476 ac-ft) from May 15, 2022, to winter 2023
- Intended to reduce risk of downstream sediment discharge and inundation of construction area

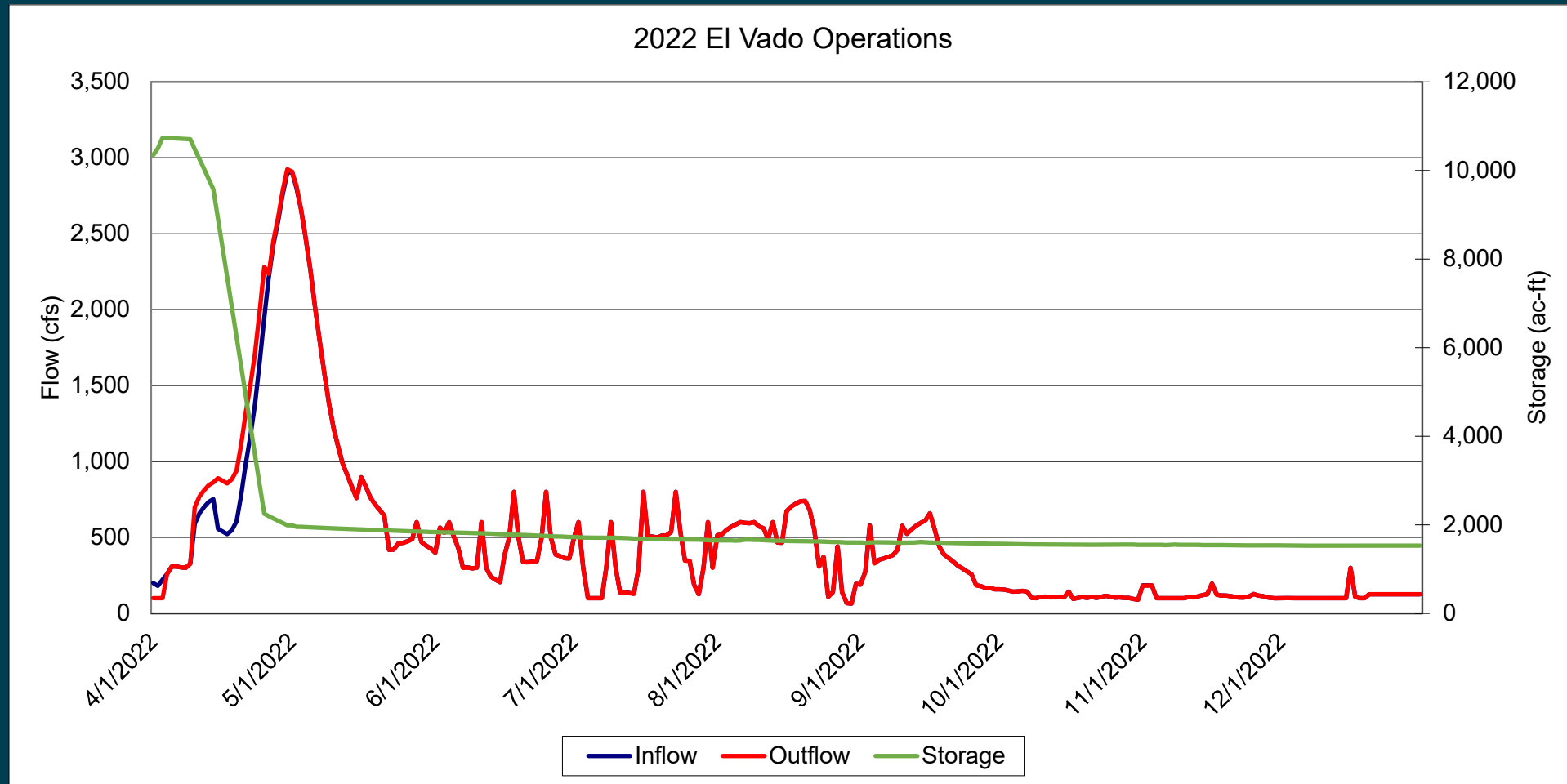


2022 Rio Chama Operations during Construction

- El Vado not available for storage during embankment construction
- Release water by May 15 to meet reservoir restriction
- USACE Abiquiu deviation
 - 2022 P&P water to be moved from El Vado to Abiquiu before May 15
 - Retain additional P&P water, as available and needed, up to 20,000 ac-ft
- Rafting releases managed from Heron and bypassed through El Vado



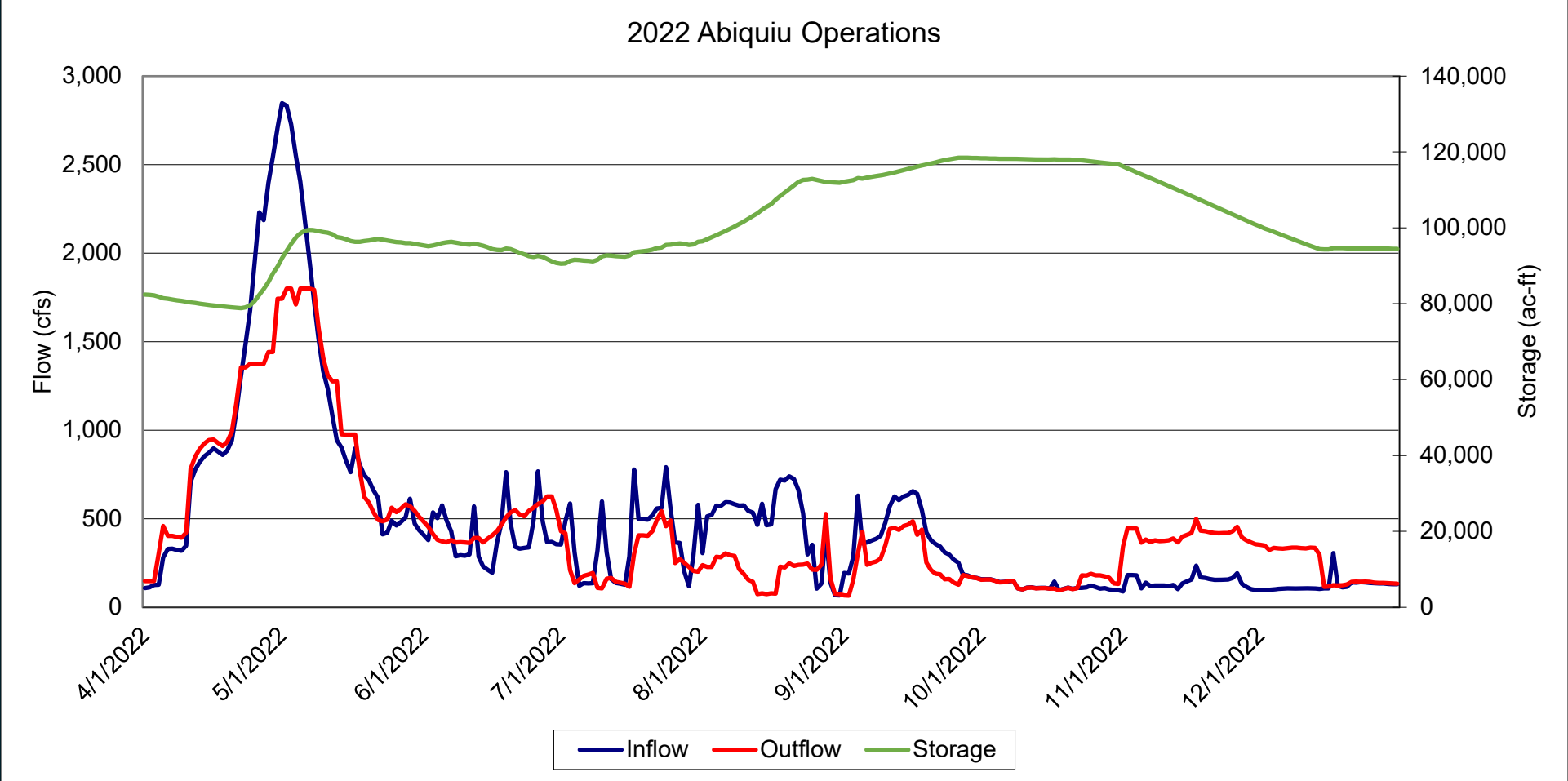
Projected 2022 El Vado Operations



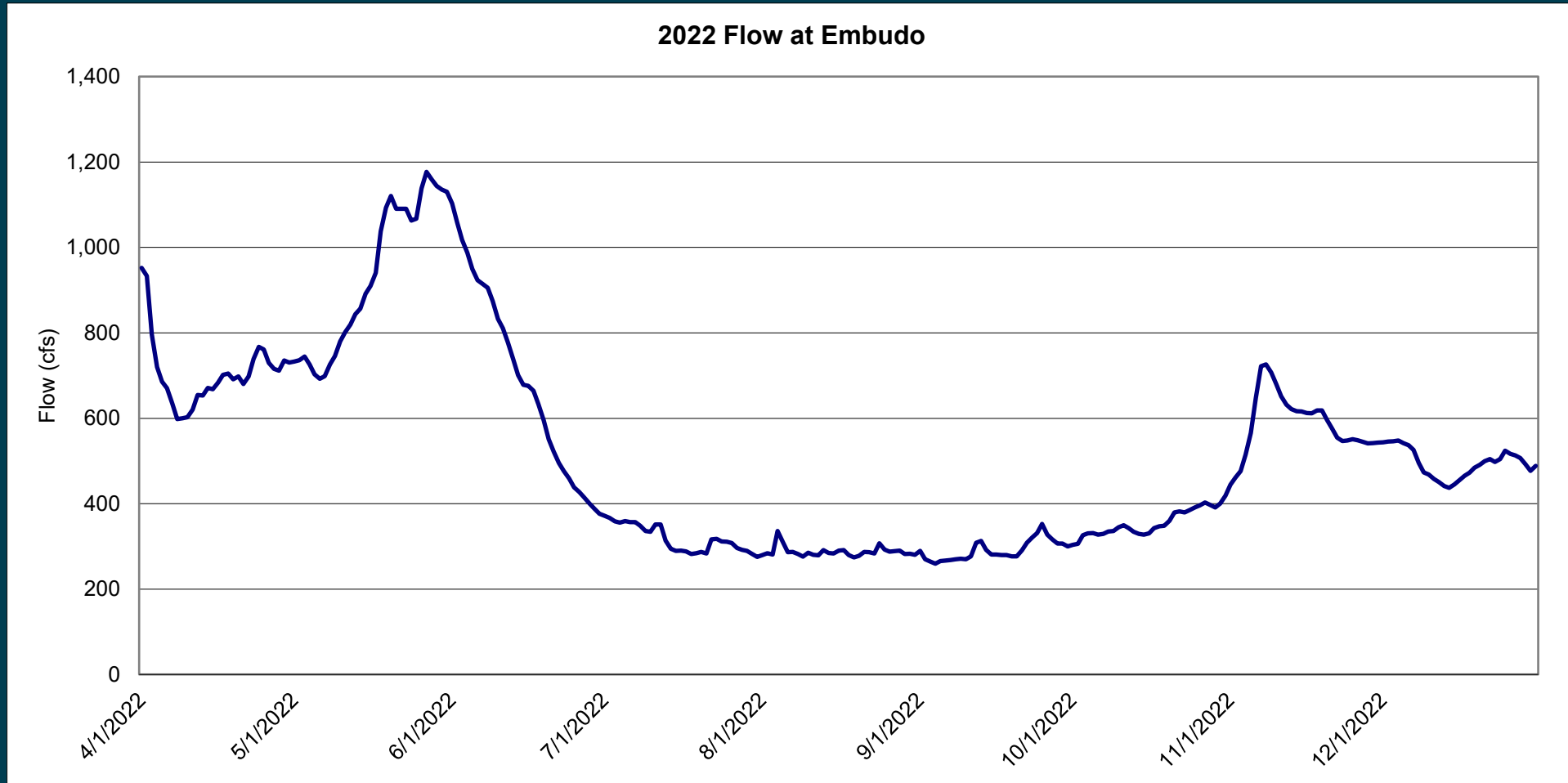
Abiquiu Dam



Projected 2022 Abiquiu Operations



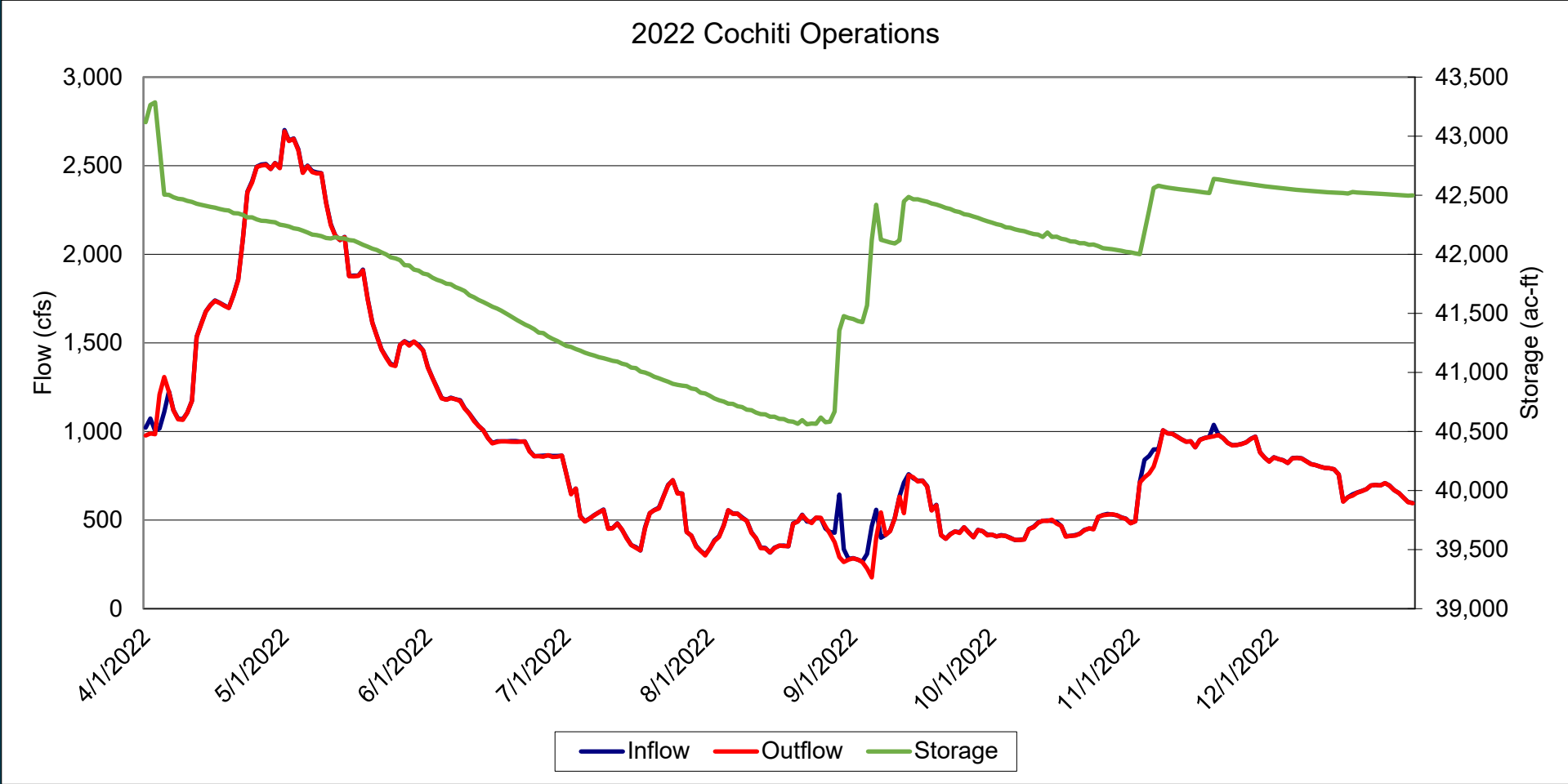
Estimated 2022 Hydrograph at Embudo



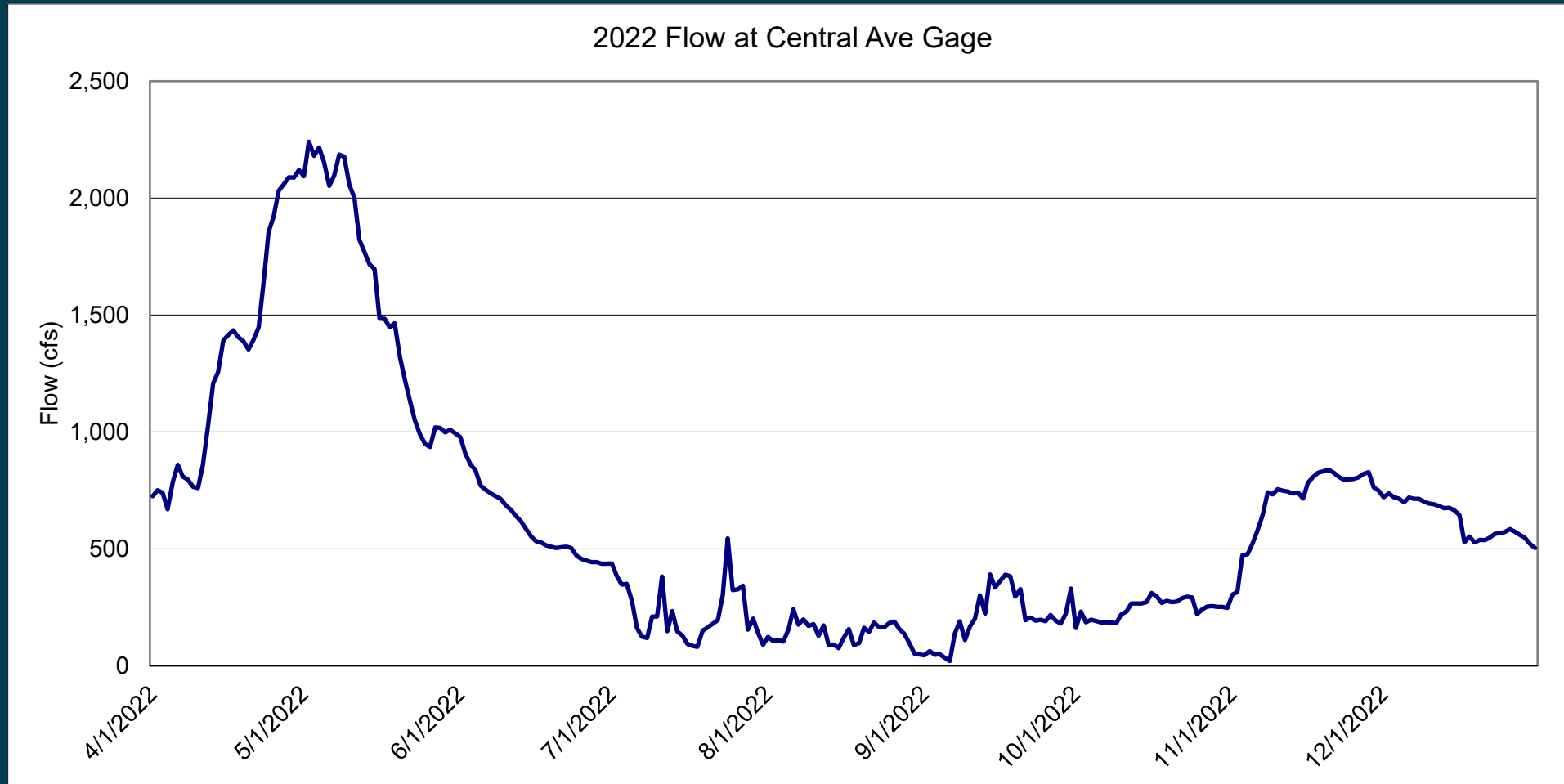
Cochiti Dam



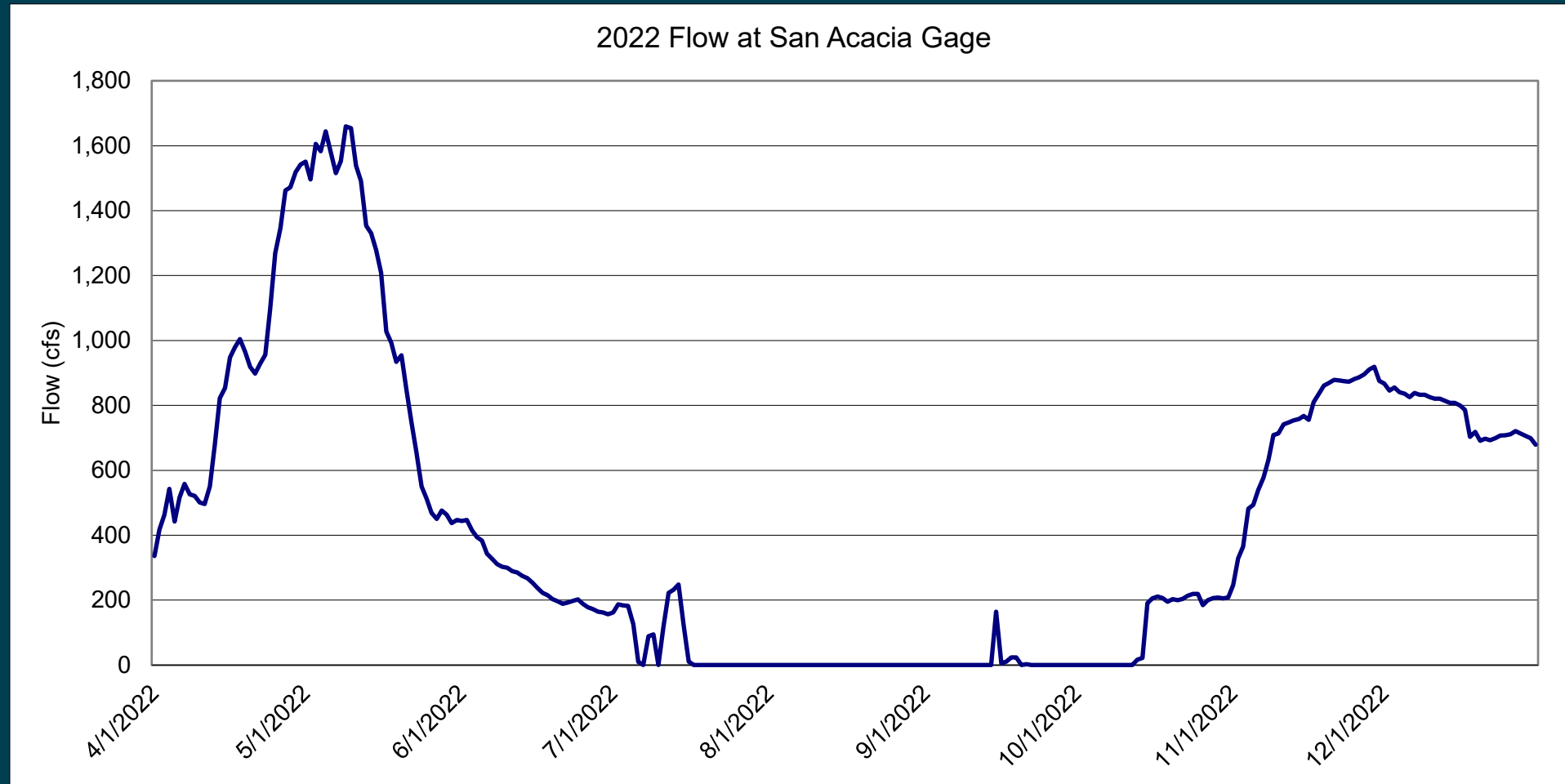
Projected 2022 Cochiti Operations



Estimated 2022 Hydrograph at Central



Estimated 2022 Hydrograph at San Acacia



Projected 2022 Rio Grande Project Operations

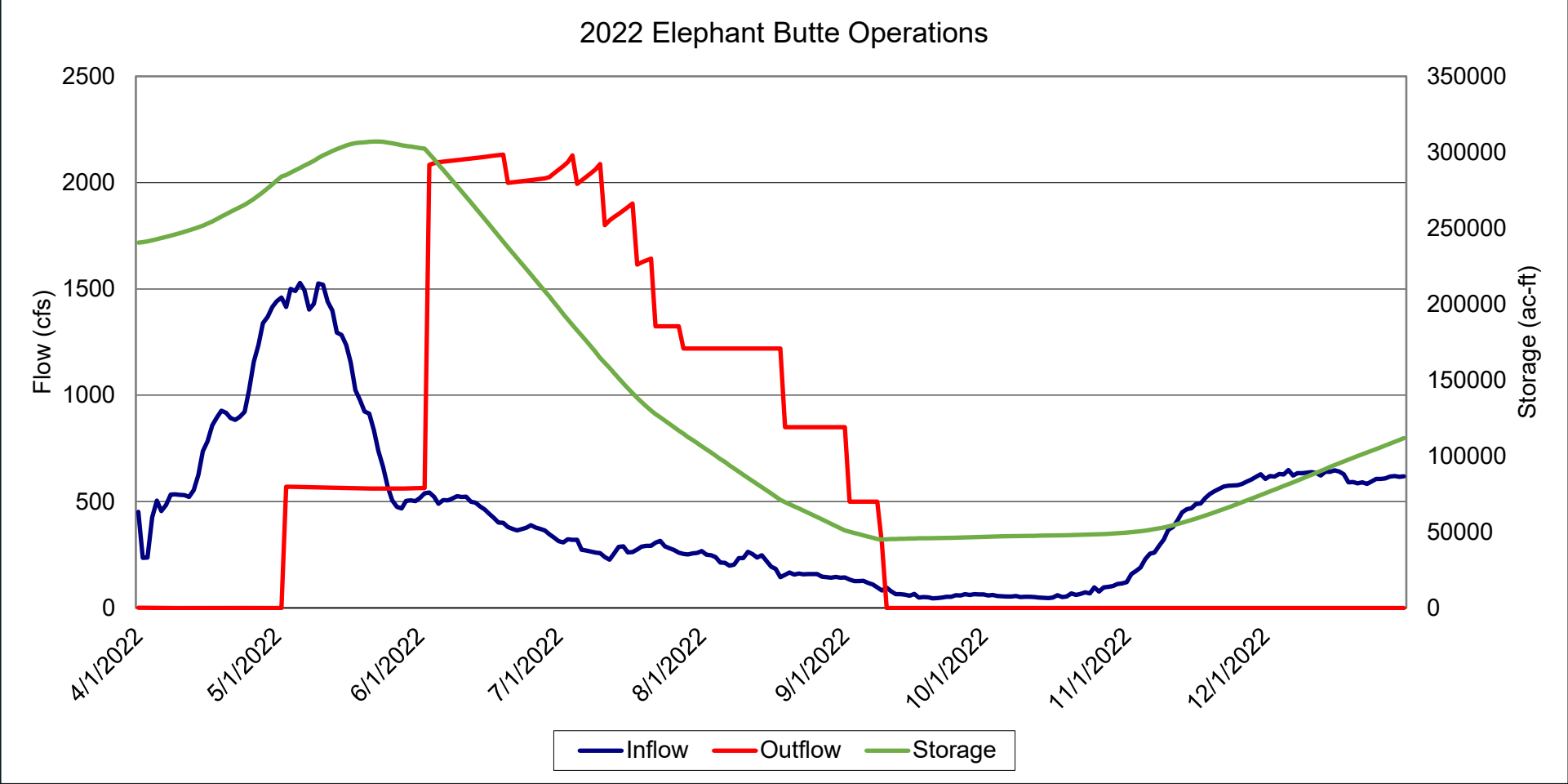
- 40% of a normal release from Caballo
- 25-35% of a full irrigation delivery
 - Reduced delivery efficiencies due to consecutive years of less than 50% of normal release
- Most recent similar year for irrigation supply
 - For EP1 and Mexico: 2014
 - For EBID: 2011 if May/June is dry or 2021 if May/June is wetter



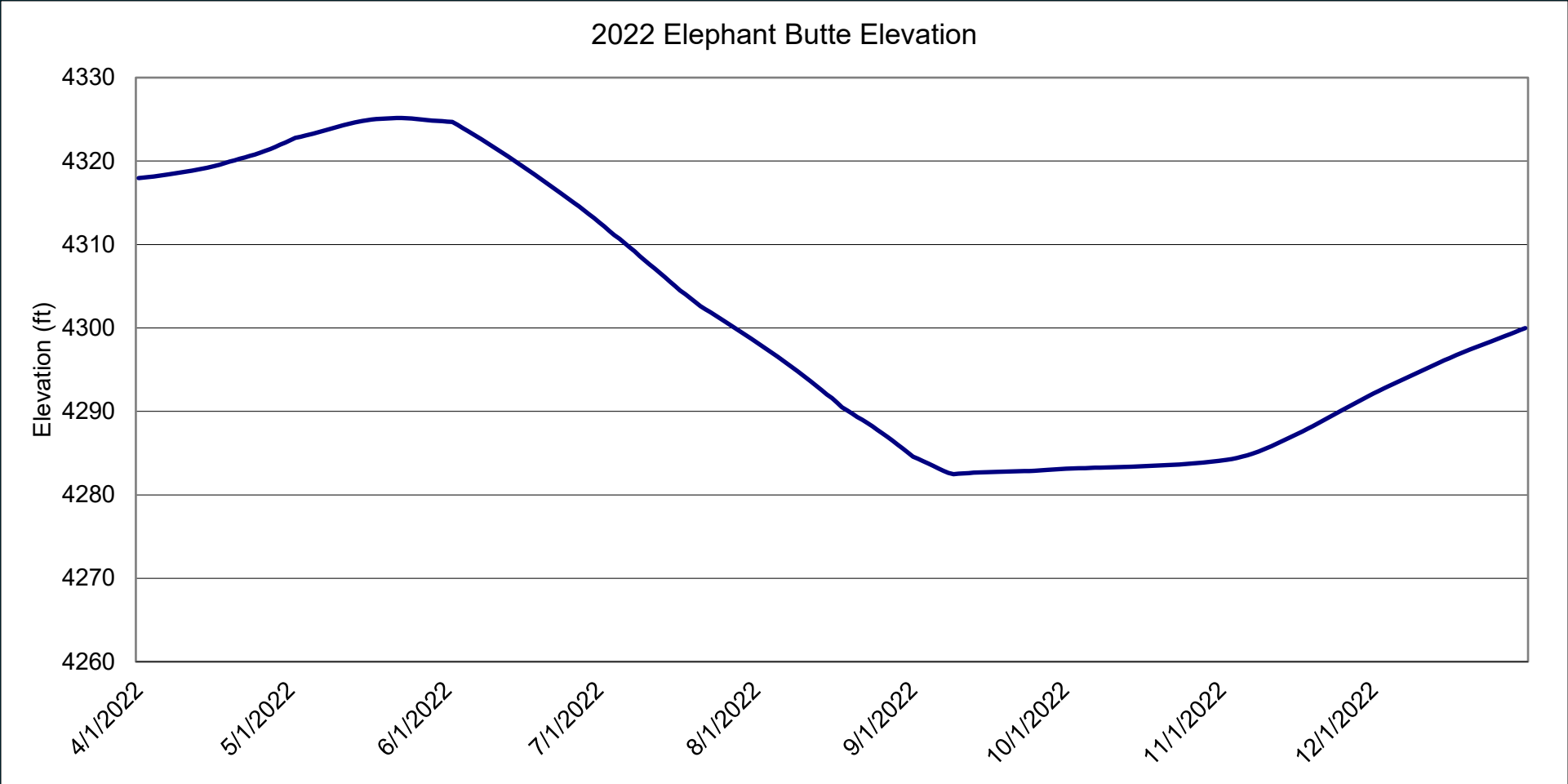
Elephant Butte Dam



Projected 2022 Elephant Butte Operations



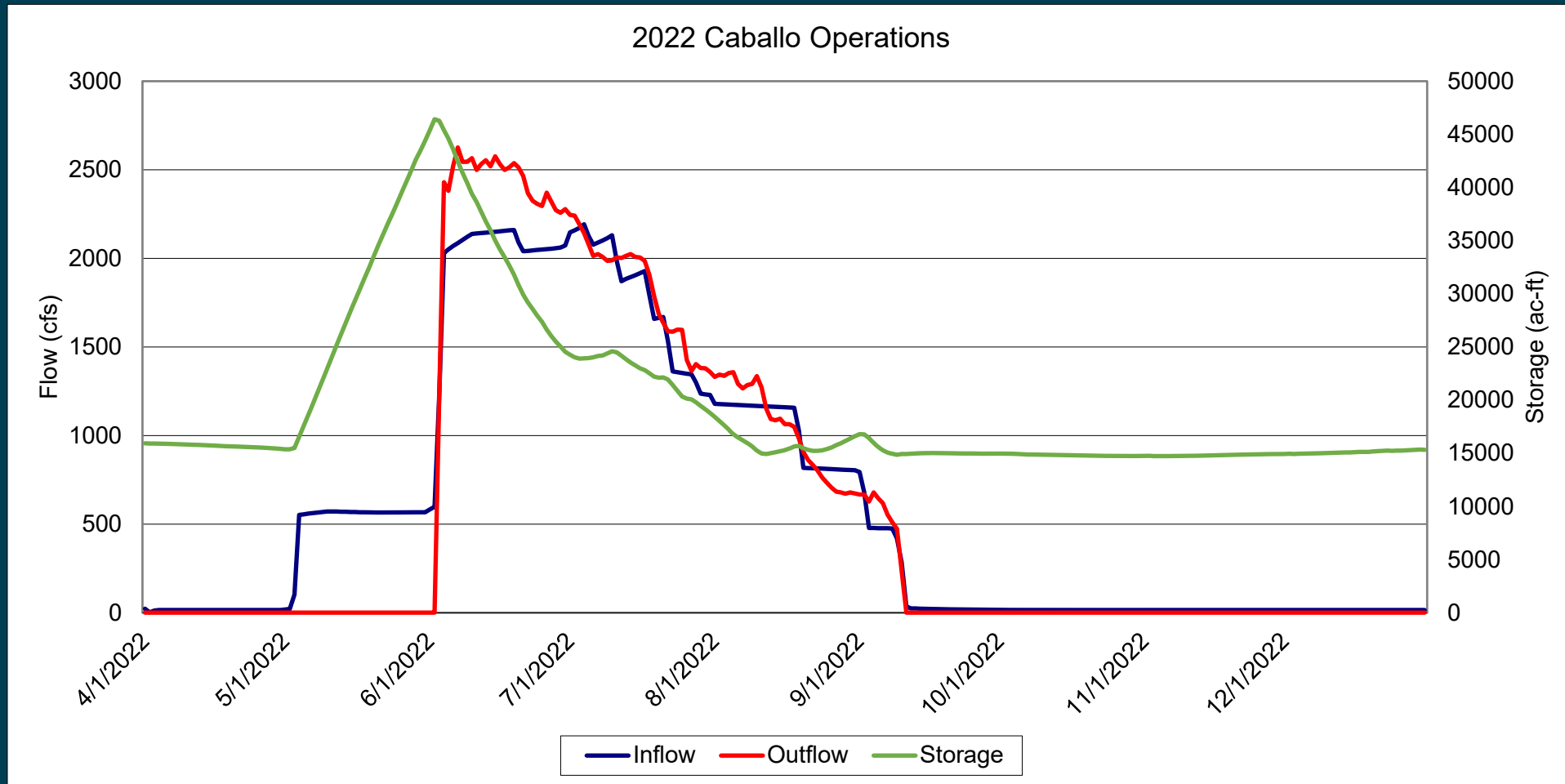
Projected 2022 Elephant Butte Levels



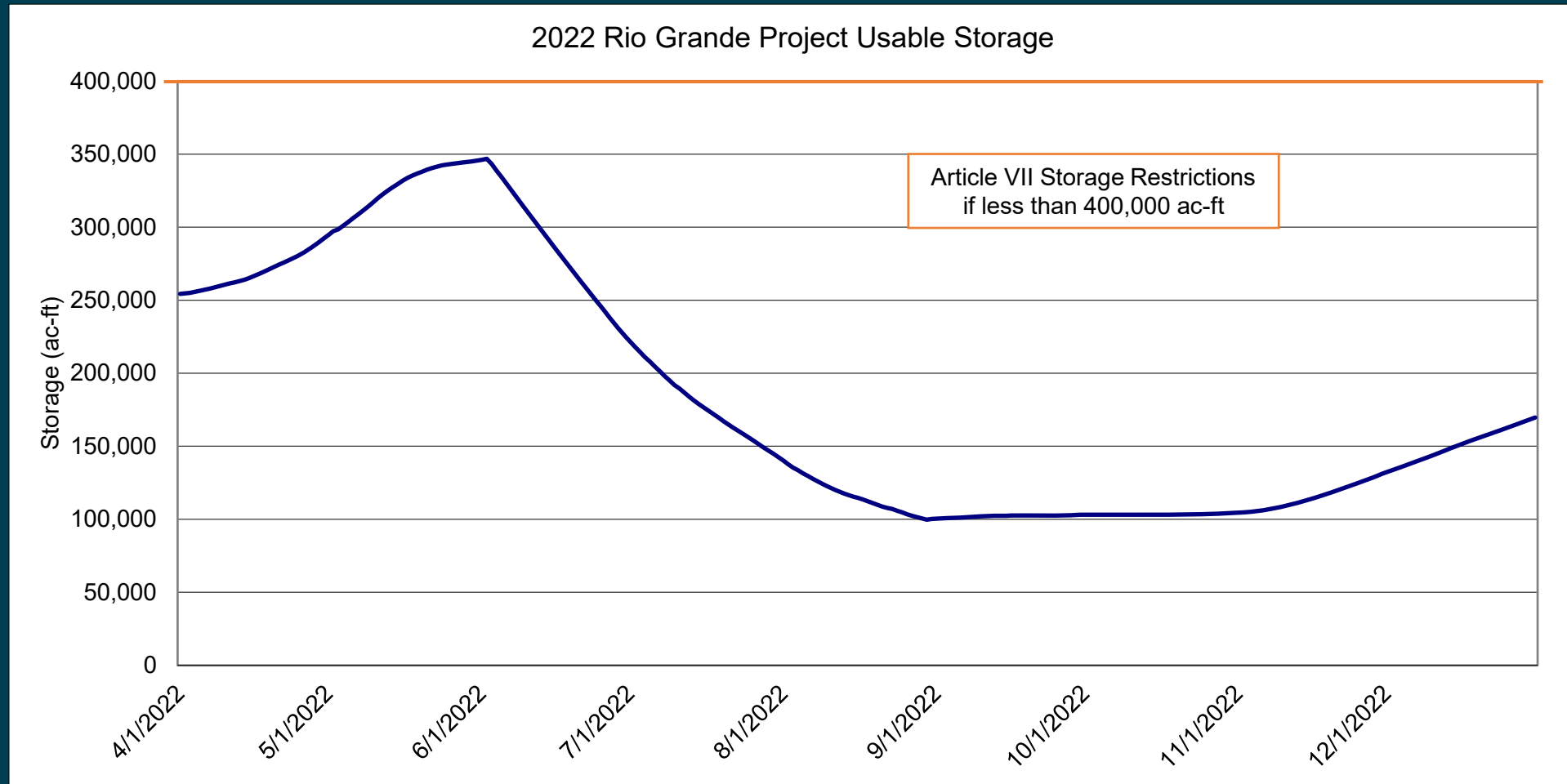
Caballo Dam



Projected 2022 Caballo Operations



Projected 2022 Usable Water



Questions / Comments

Slide deck will be posted at:
<https://www.usbr.gov/uc/DocLibrary/plans.html>



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