BUREAU OF RECLAMATION

US Army Corps of Engineers®
Albuquerque District

2024 Rio Grande Annual Operating Plan

April 18, 2024

Agencies & Major Users

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

Operating Rules

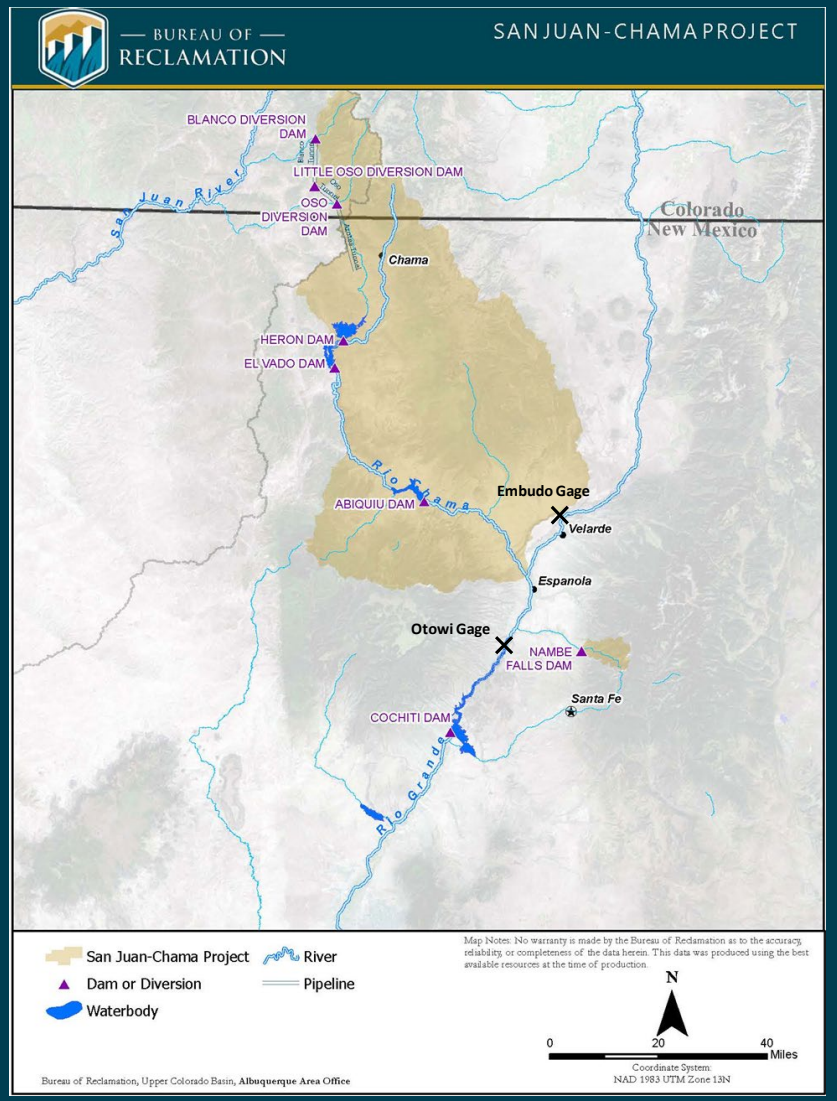
- Treaty/1906 Convention: between the U.S. and Mexico, signed 1906
- Rio Grande Compact: agreement between Colorado, New Mexico, and Texas apportioning Rio Grande water between the three states
- Article VII restrictions: restricts storage of Rio Grande water in post 1929 reservoirs (El Vado) when usable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

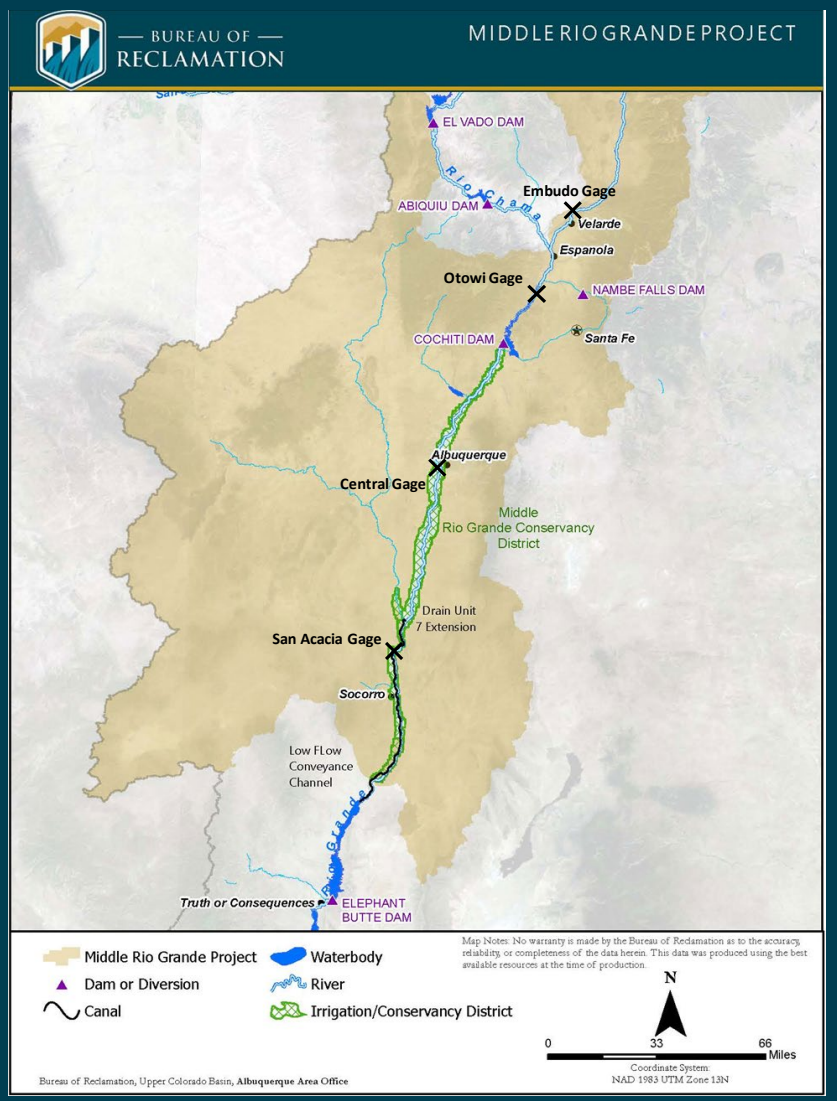
Types of Water

- Native/natural Rio Grande water: water from the Rio Grande Basin
- San Juan-Chama water: water imported from San Juan Basin of Colorado River into Rio Grande Basin through the 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 streamflow 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


— BUREAU OF —
RECLAMATION
SAN JUAN-CHAMA PROJECT
BLANCO DIVERSION DAM
LITTLE OSO DIVERSION DAM
OSO DIVERSION DAM
San Juan River
Colorado
New Mexico
Chama
HERON DAM
EL VADO DAM
Rio Chama
ABIQUIU DAM
Embudo Gage
Velarde
Espanola
Otowi Gage
NAMBE FALLS DAM
Santa Fe
COCHITI DAM
Rio Grande
San Juan-Chama Project
Dam or Diversion
Waterbody
River
Pipeline
Map Notes: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of the data herein. This data was produced using the best available resources at the time of production.
N
0 20 40 Miles
Coordinate System: NAD 1983 UTM Zone 13N
Bureau of Reclamation, Upper Colorado Basin, Albuquerque Area Office


— BUREAU OF —
RECLAMATION
MIDDLE RIO GRANDE PROJECT
EL VADO DAM
Rio Chama
ABIQUIU DAM
Embudo Gage
Velarde
Espanola
Otowi Gage
NAMBE FALLS DAM
COCHITI DAM
Santa Fe
Albuquerque
Central Gage
Middle Rio Grande Conservancy District
Drain Unit 7 Extension
San Acacia Gage
Socorro
Low Flow Conveyance Channel
Rio Grande
Truth or Consequences
ELEPHANT BUTTE DAM
Middle Rio Grande Project
Dam or Diversion
Canal
Waterbody
River
Irrigation/Conservancy District
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N
0 33 66 Miles
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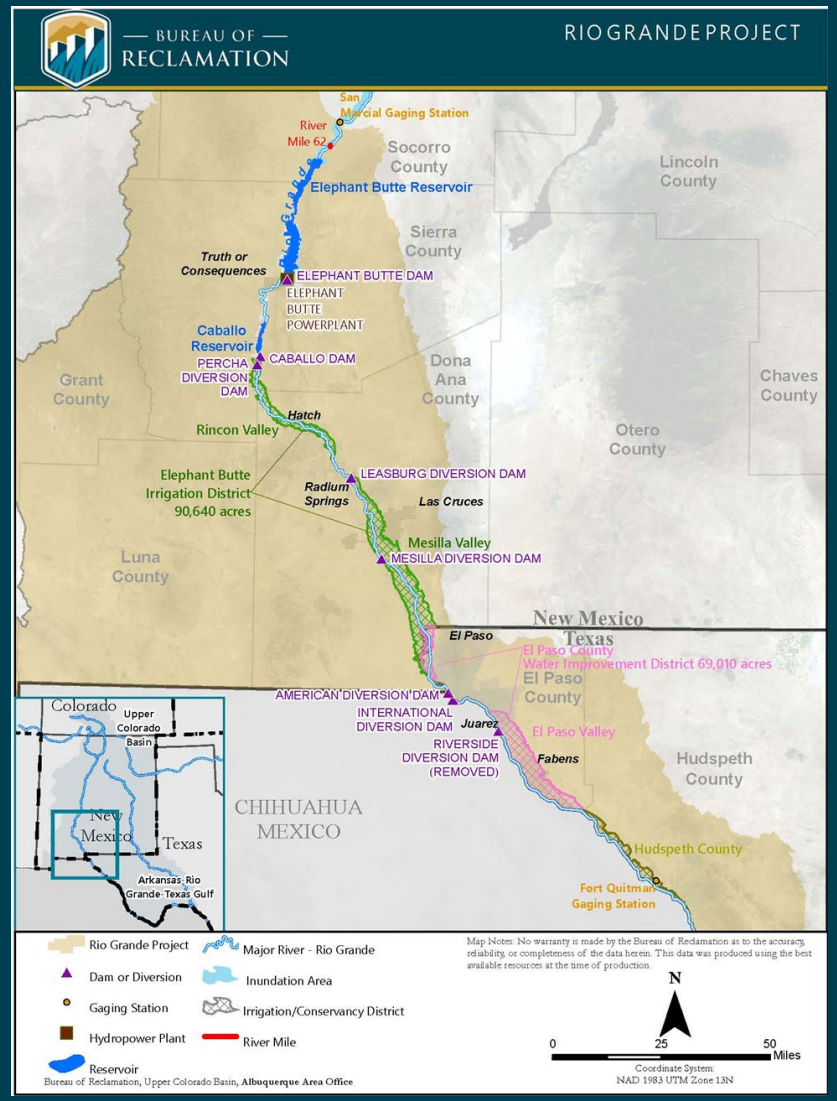
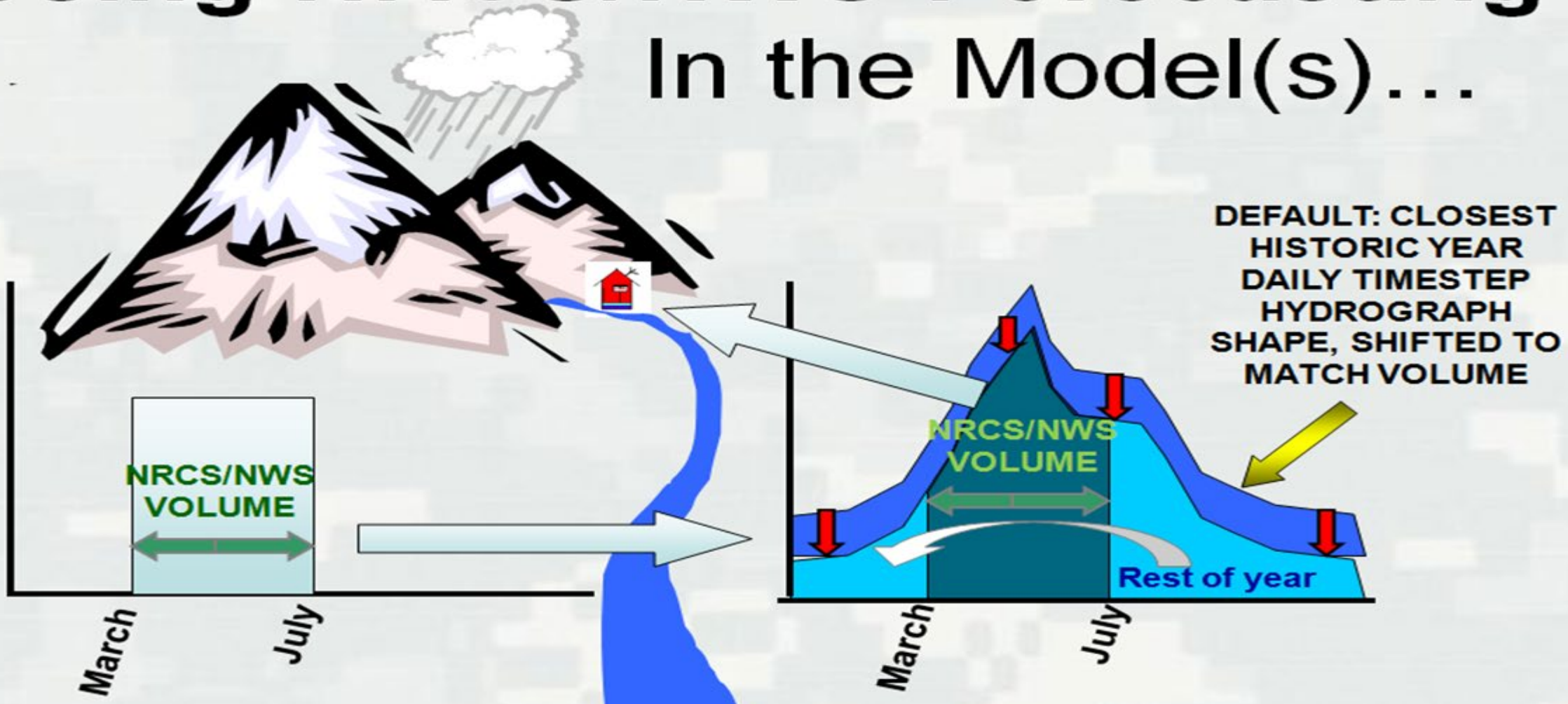
Bureau of Reclamation, Upper Colorado Basin, Albuquerque Area Office


— BUREAU OF —
RECLAMATION
RIO GRANDE PROJECT
San Marcial Gaging Station
River Mile 62
Socorro County
Lincoln County
Elephant Butte Reservoir
Sierra County
Truth or Consequences
ELEPHANT BUTTE DAM
ELEPHANT BUTTE POWERPLANT
Caballo Reservoir
PERCHA DIVERSION DAM
CABALLO DAM
Grant County
Dona Ana County
Chaves County
Hatch
Rincon Valley
Otero County
Elephant Butte Irrigation District 90,640 acres
Radium Springs
LEASBURG DIVERSION DAM
Las Cruces
Mesilla Valley
MESILLA DIVERSION DAM
Luna County
New Mexico
Texas
El Paso
El Paso County Water Improvement District 69,010 acres
El Paso County
AMERICAN DIVERSION DAM
INTERNATIONAL DIVERSION DAM
Juarez
El Paso Valley
RIVERSIDE DIVERSION DAM (REMOVED)
Fabens
Hudspeth County
CHIHUAHUA
MEXICO
Colorado
Upper Colorado Basin
New Mexico
Texas
Arkansas-Rio Grande-Texas Gulf
Fort Quitman Gaging Station
Rio Grande Project
Dam or Diversion
Gaging Station
Hydropower Plant
Reservoir
Major River - Rio Grande
Inundation Area
Irrigation/Conservancy District
River Mile
Map Notes: No warranty is made by the Bureau of Reclamation as to the accuracy, reliability, or completeness of the data herein. This data was produced using the best available resources at the time of production.
N
0 25 50 Miles
Coordinate System: NAD 1983 UTM Zone 13N
Bureau of Reclamation, Upper Colorado Basin, Albuquerque Area Office

What Drives the Process?

- Volume forecast from NRCS
  - Based on snowpack, soil moisture, and other possible antecedent conditions
- Select similar year based on similar volume and/or expected runoff shape/timing
- Can alter hydrograph to best match forecast conditions
  - e.g. move hydrographs earlier or later based on warm spring vs. cool spring
- Reservoir operations based on nature (headwater flows) and policies
  - Compact 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)…



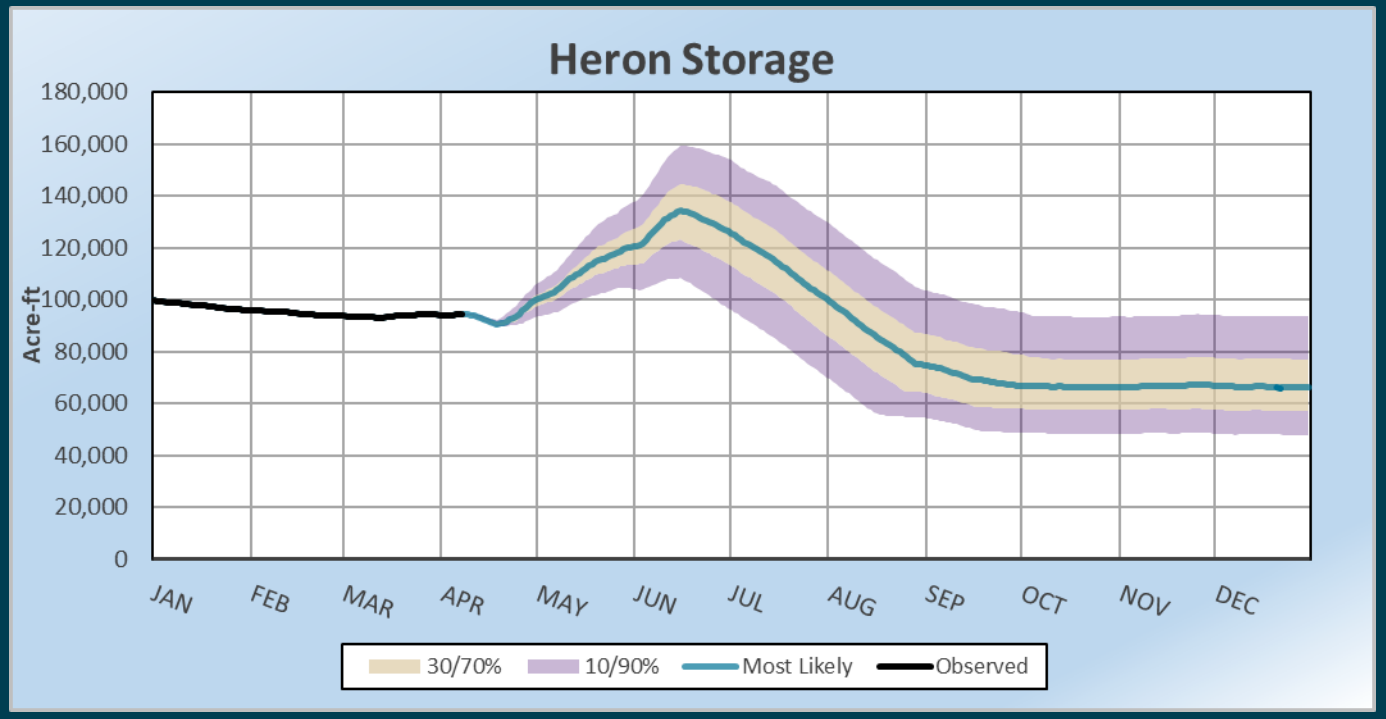
Dam Information

	Agency Owner/Operator		Purposes				
Dam	Reclamation	USACE	Rio Grande Water Supply	San Juan-Chama Water Supply	Recreation	Flood Control	Sediment Control
Heron	✓			✓	✓		
El Vado	✓		✓	✓	✓		
Abiquiu		✓	✓*	✓	✓	✓	✓
Cochiti		✓		✓	✓	✓	✓
Jemez		✓				✓	✓
Elephant Butte	✓		✓	✓	✓	✓	
Caballo	✓		✓		✓	✓	✓

2023: The Year in Review

Forecast Runs (aka AOP runs)

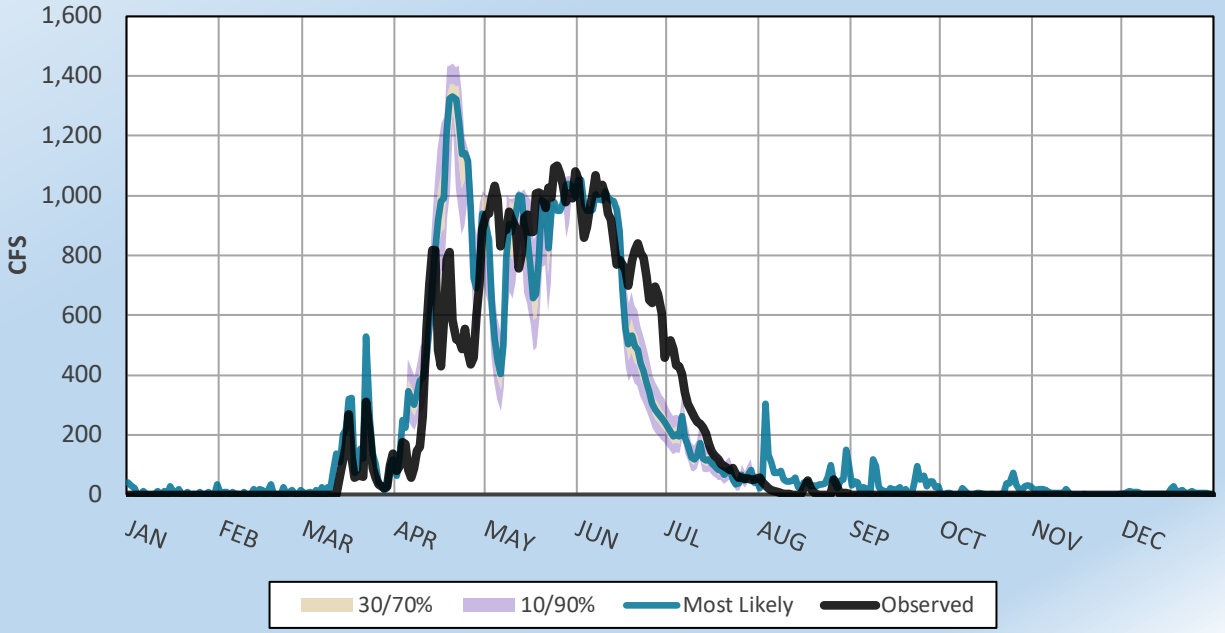
- 5 forecast runs displayed by bands of exceedance



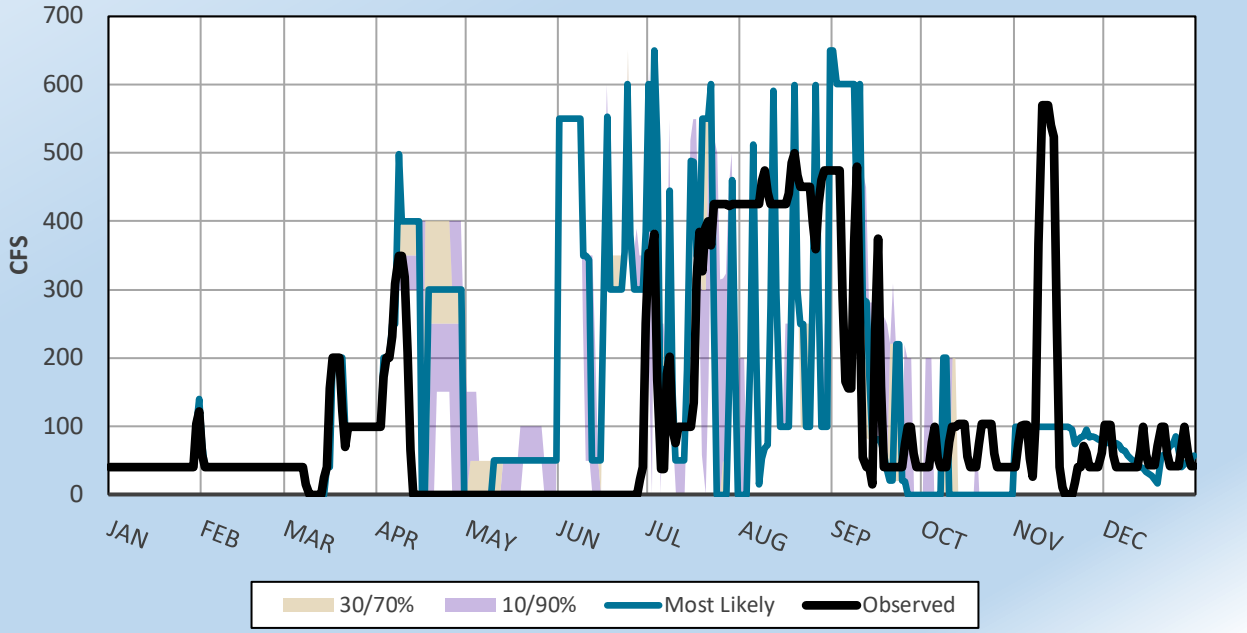
- Black line is the observed data
- Blue line is the most likely (50% exceedance run)
- Tan shading is between the 30% and 70% exceedance runs
- Purple shading is between the 10% and 90% exceedance runs

Exceedance run example - there is a 70% chance that the total volume during the forecast period will exceed the 70% forecast and a 30% chance that flow volume during the period will be lower.

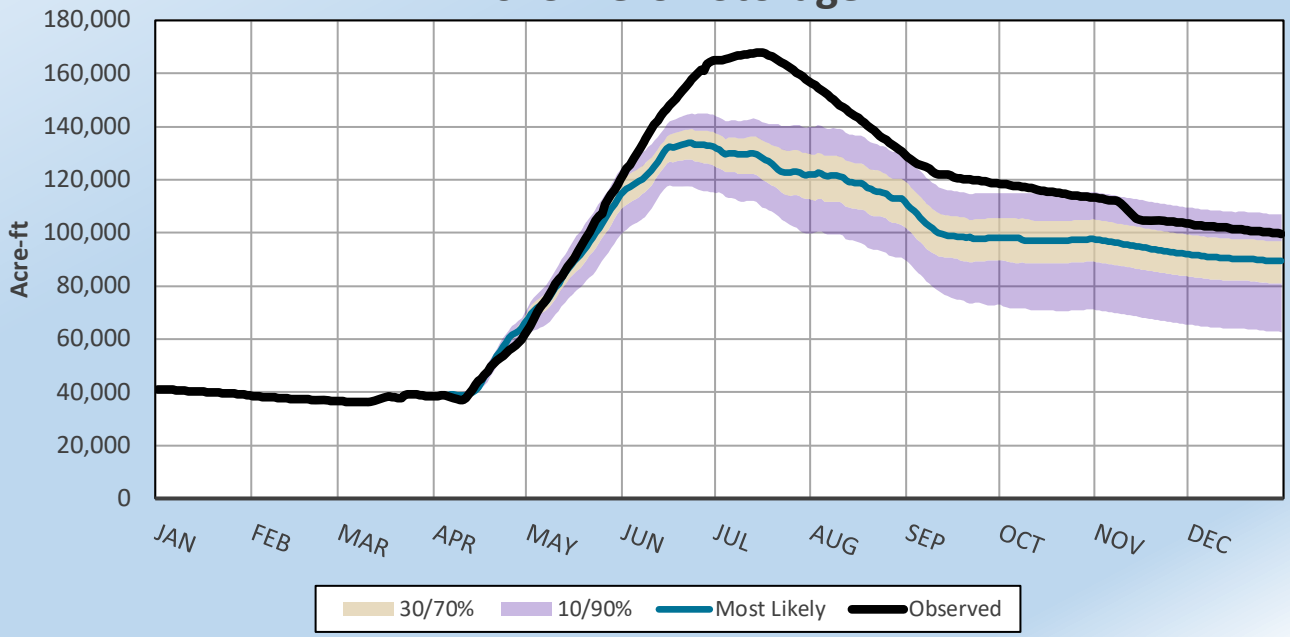
2023 Heron Inflow



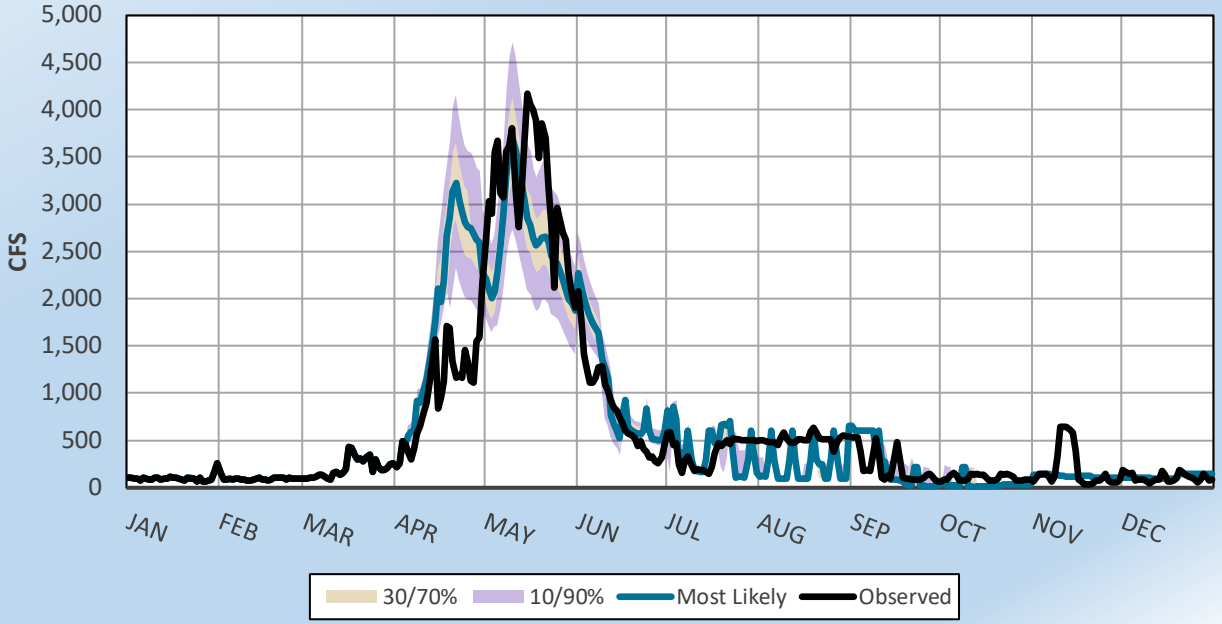
2023 Heron Outflow



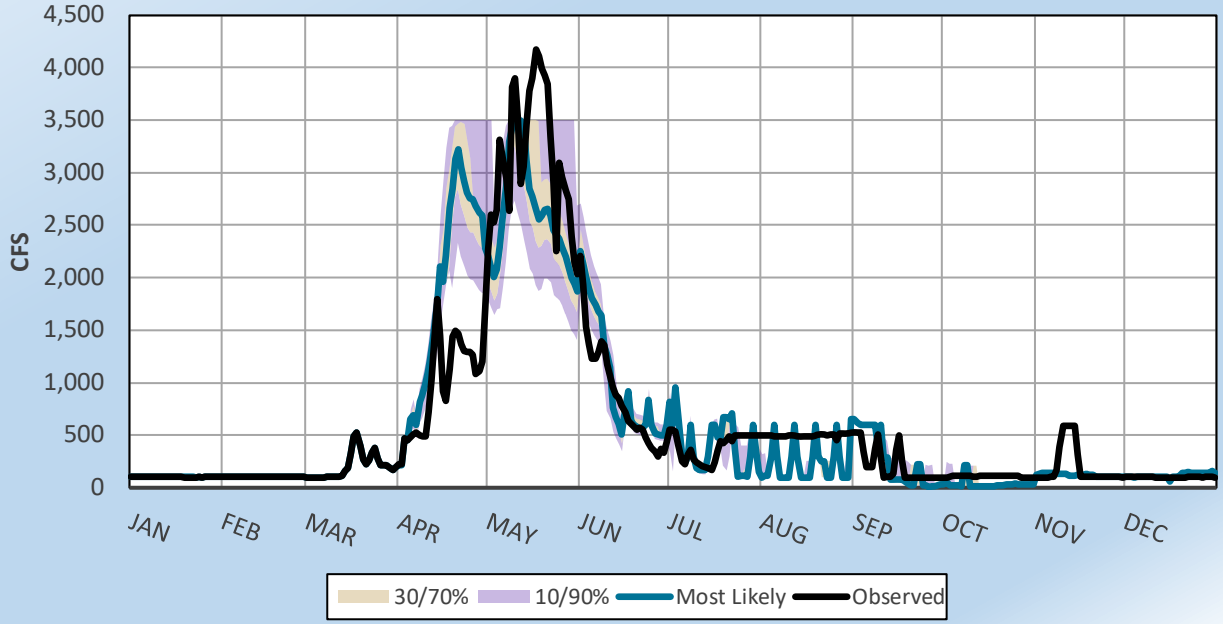
2023 Heron Storage



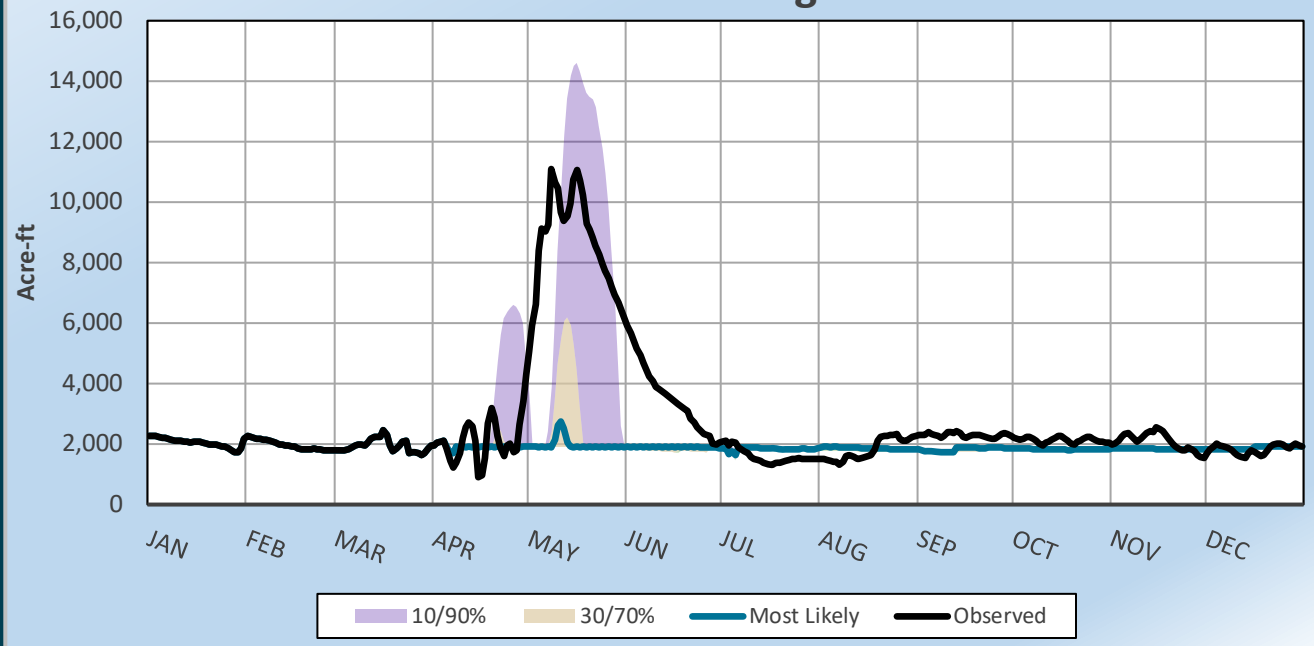
El Vado Inflow



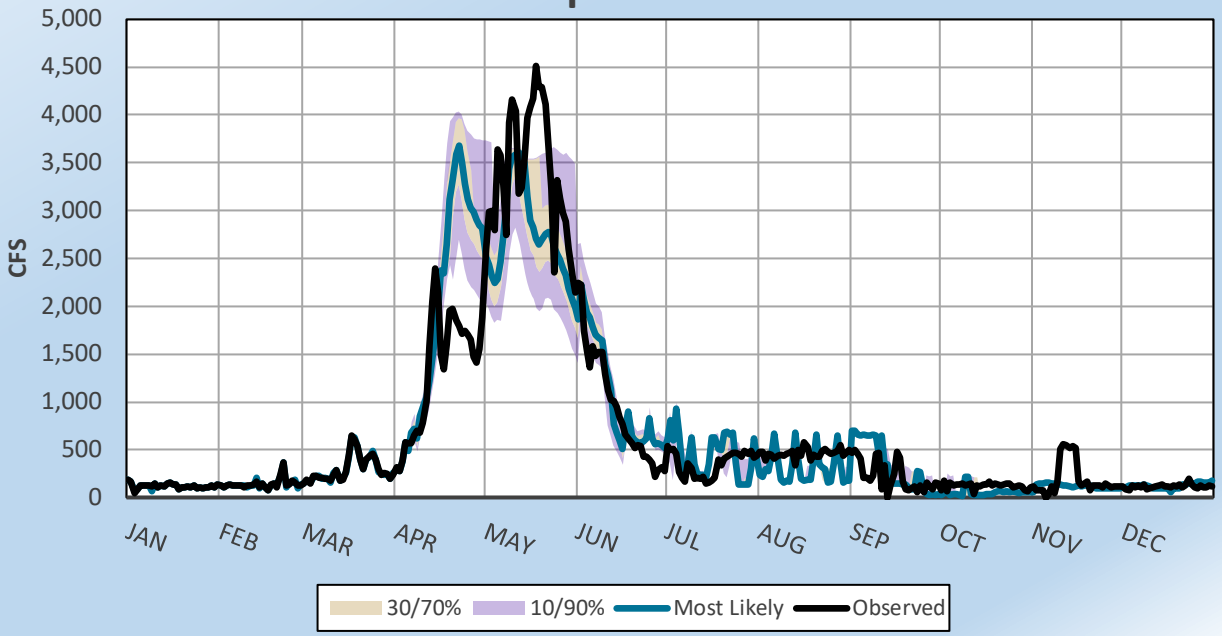
El Vado Outflow



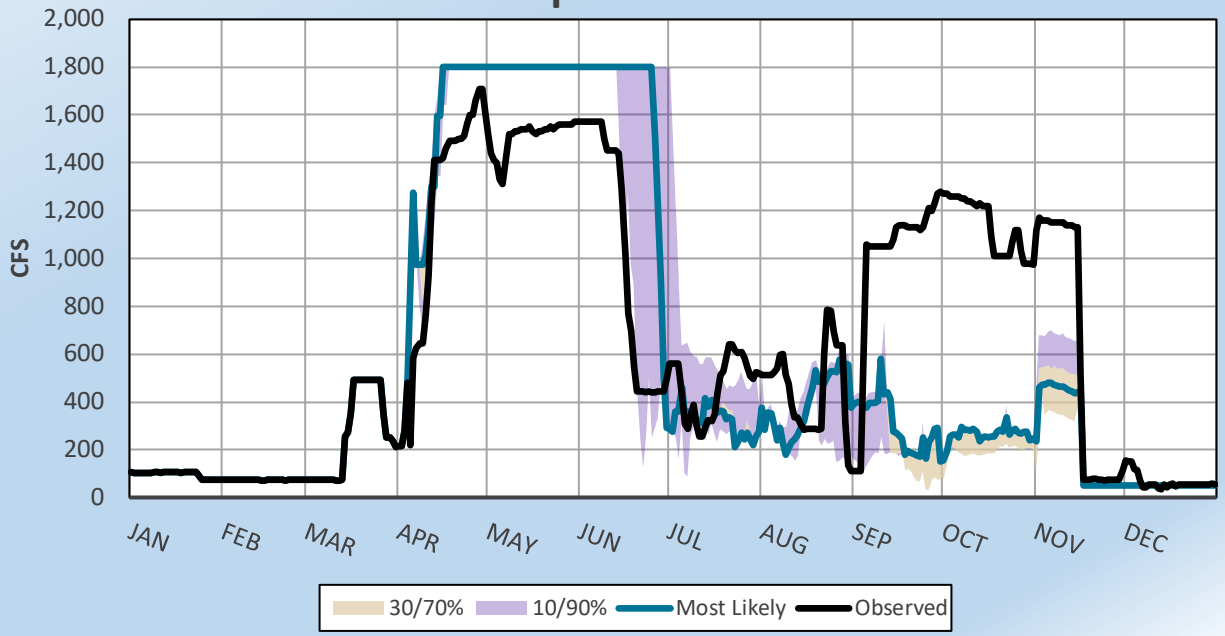
El Vado Storage



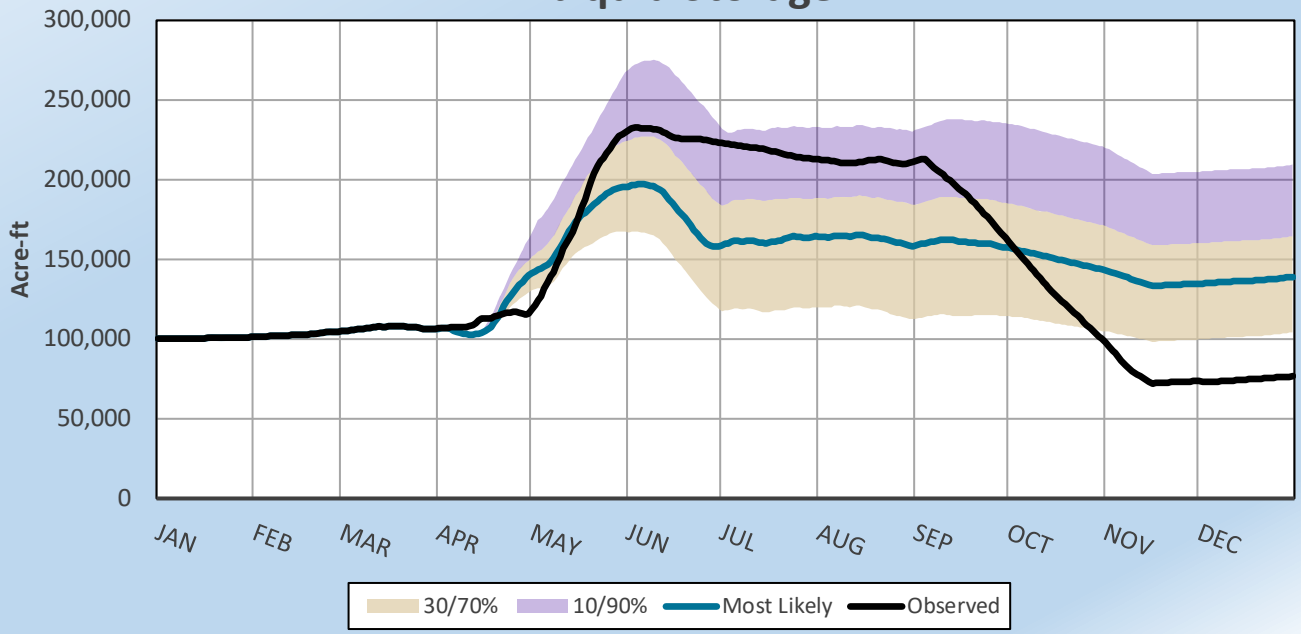
Abiquiu Inflow



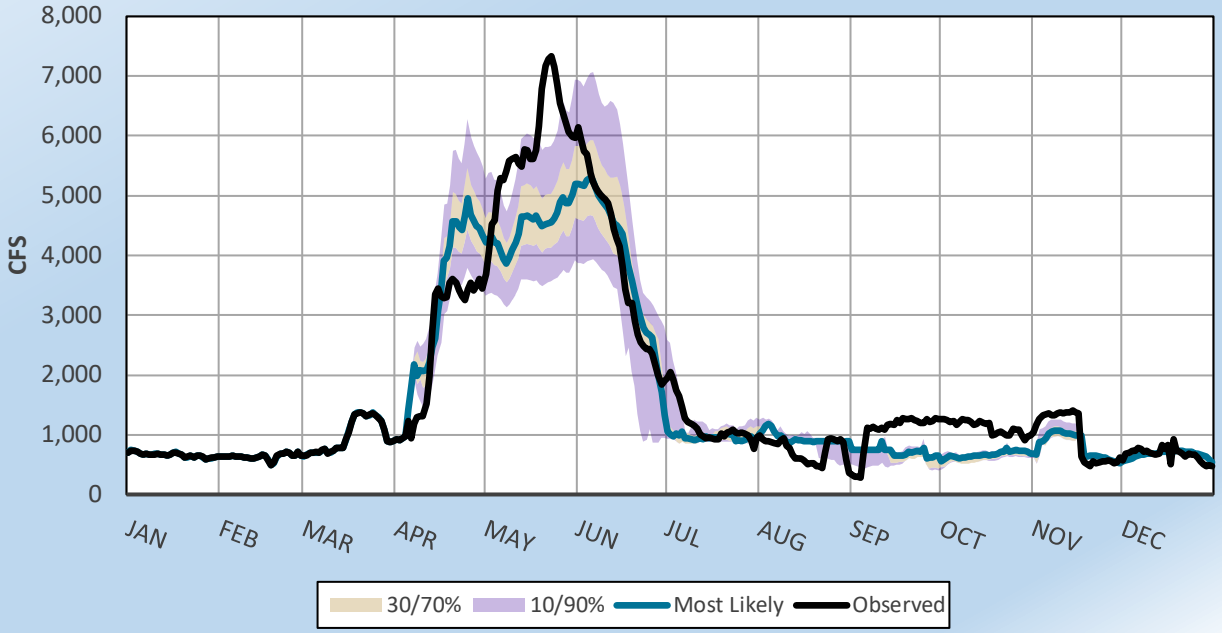
Abiquiu Outflow



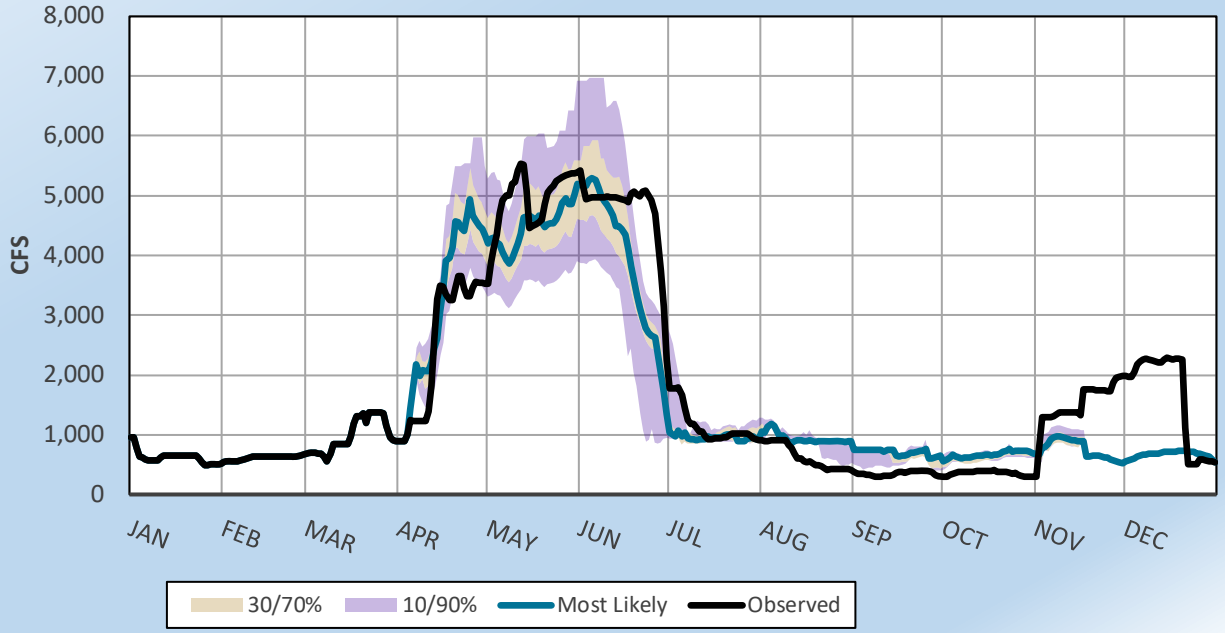
Abiquiu Storage



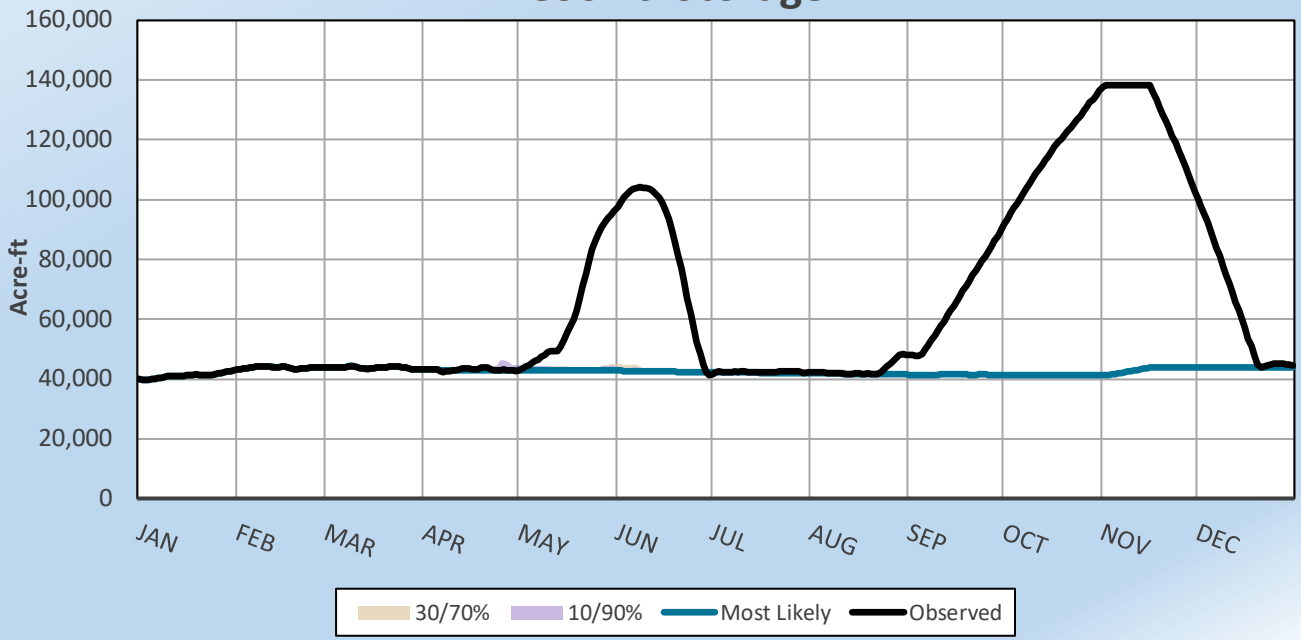
Cochiti Inflow



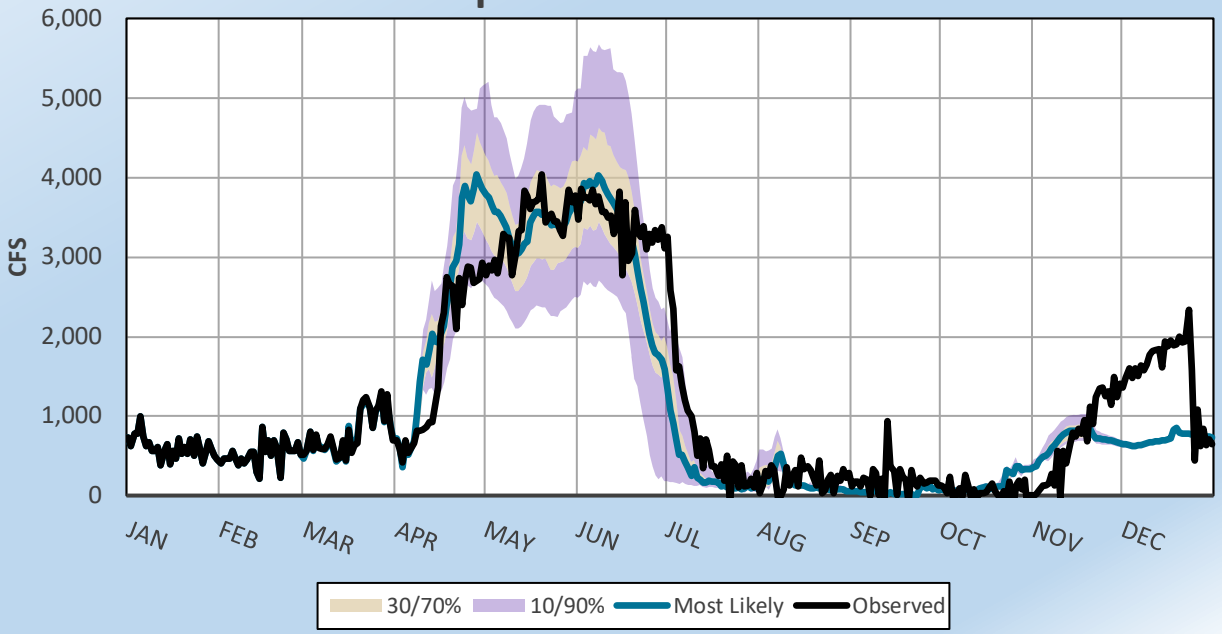
Cochiti Outflow



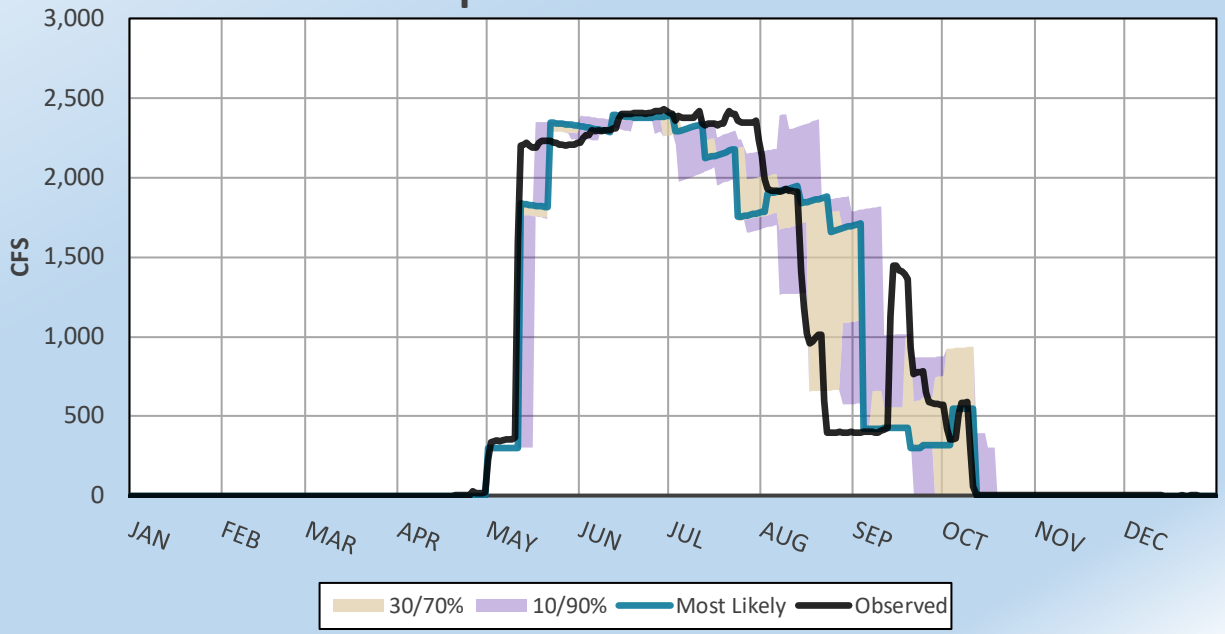
Cochiti Storage



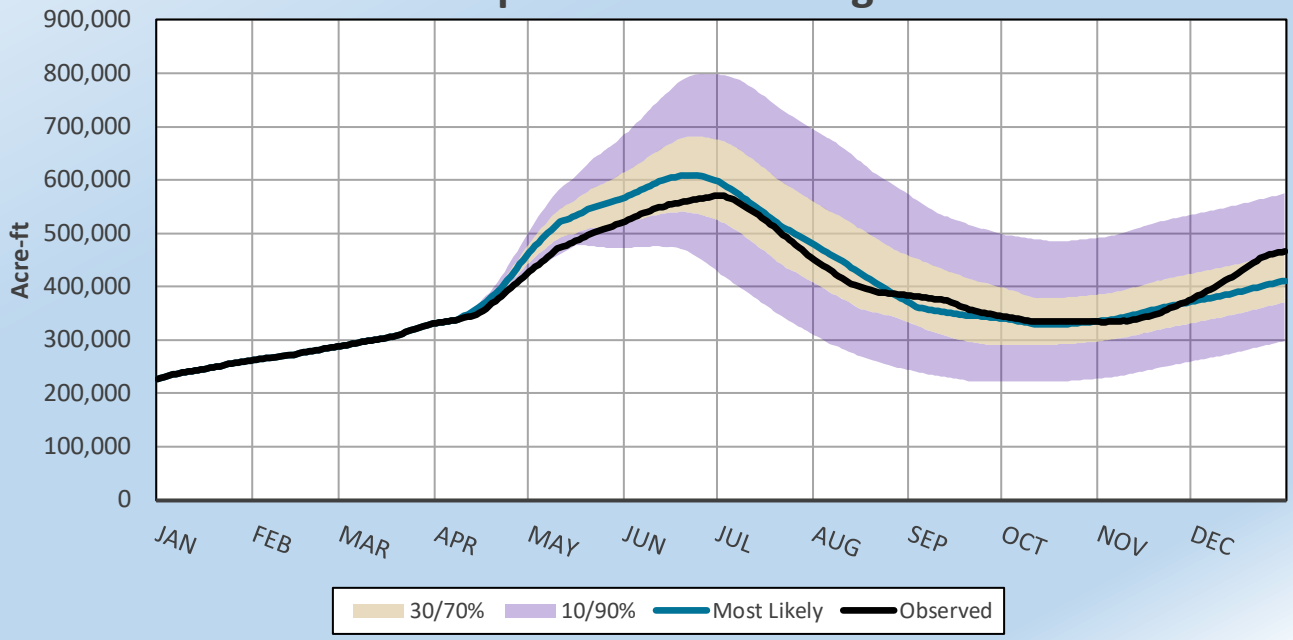
Elephant Butte Inflow



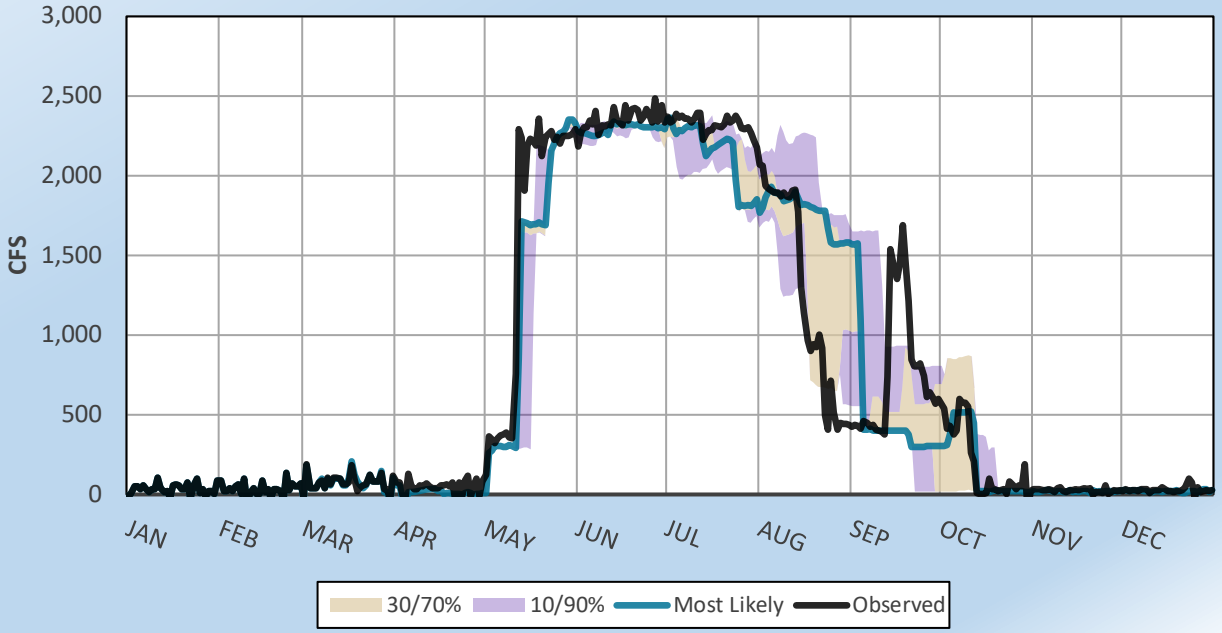
Elephant Butte Outflow



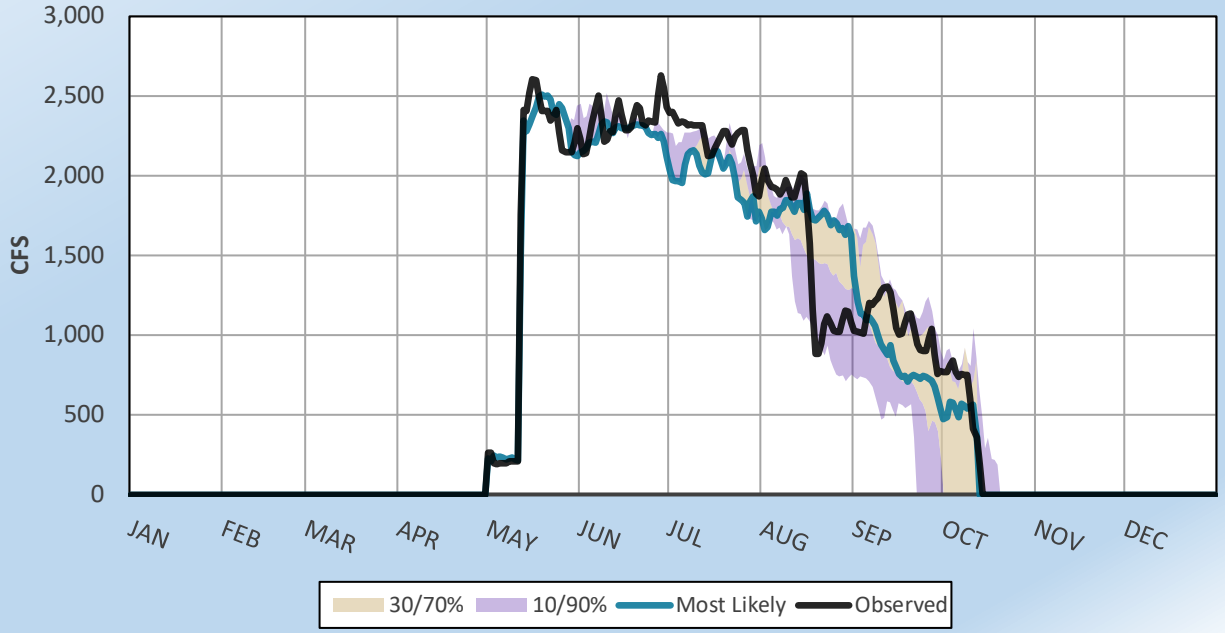
Elephant Butte Storage



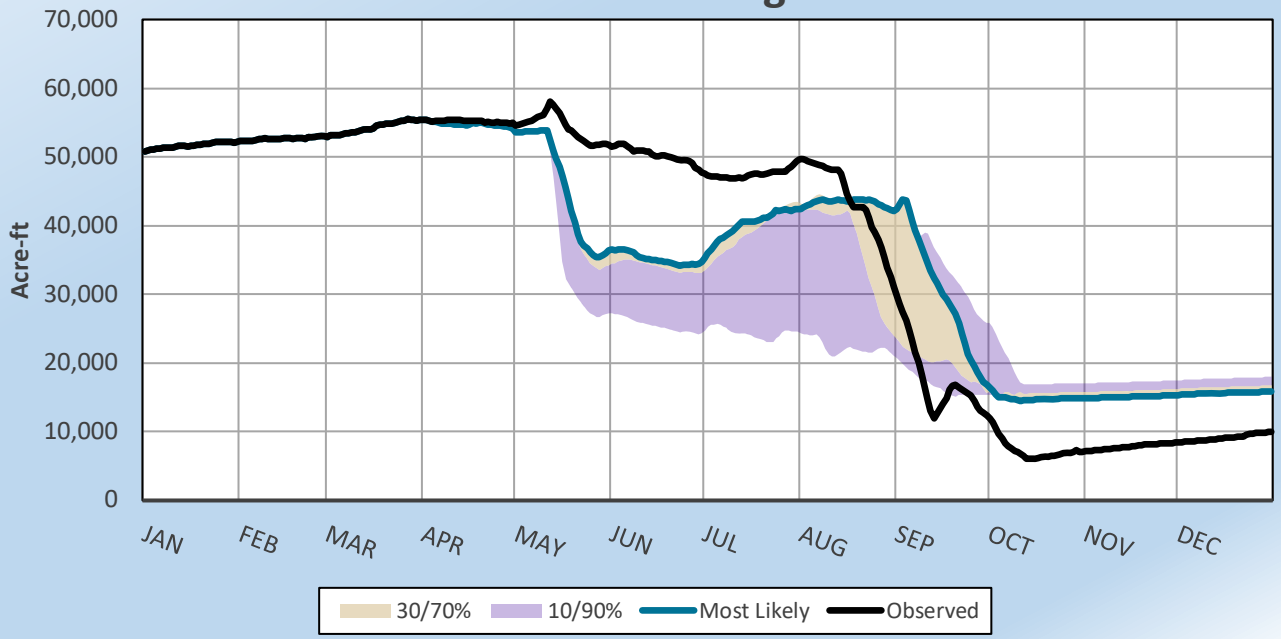
Caballo Inflow



Caballo Outflow



Caballo Storage

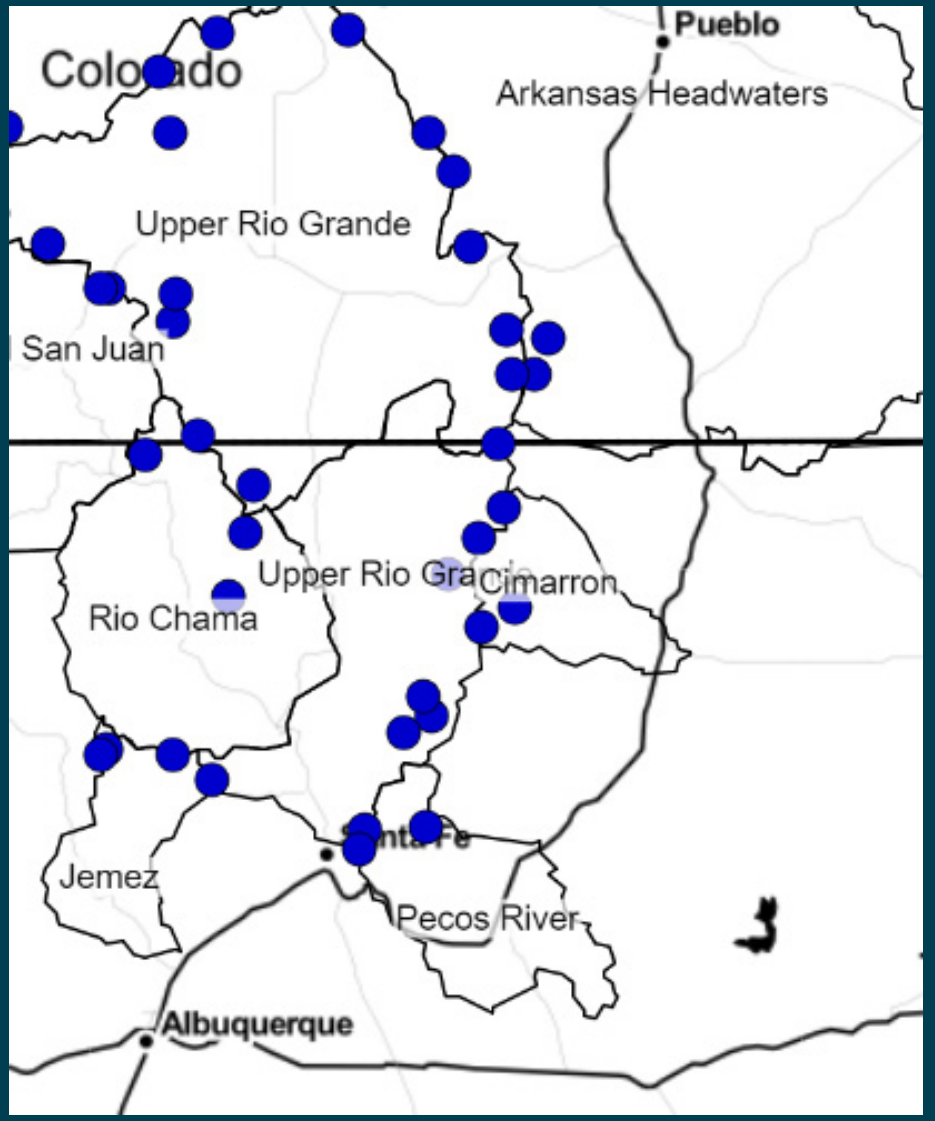


BUREAU OF RECLAMATION

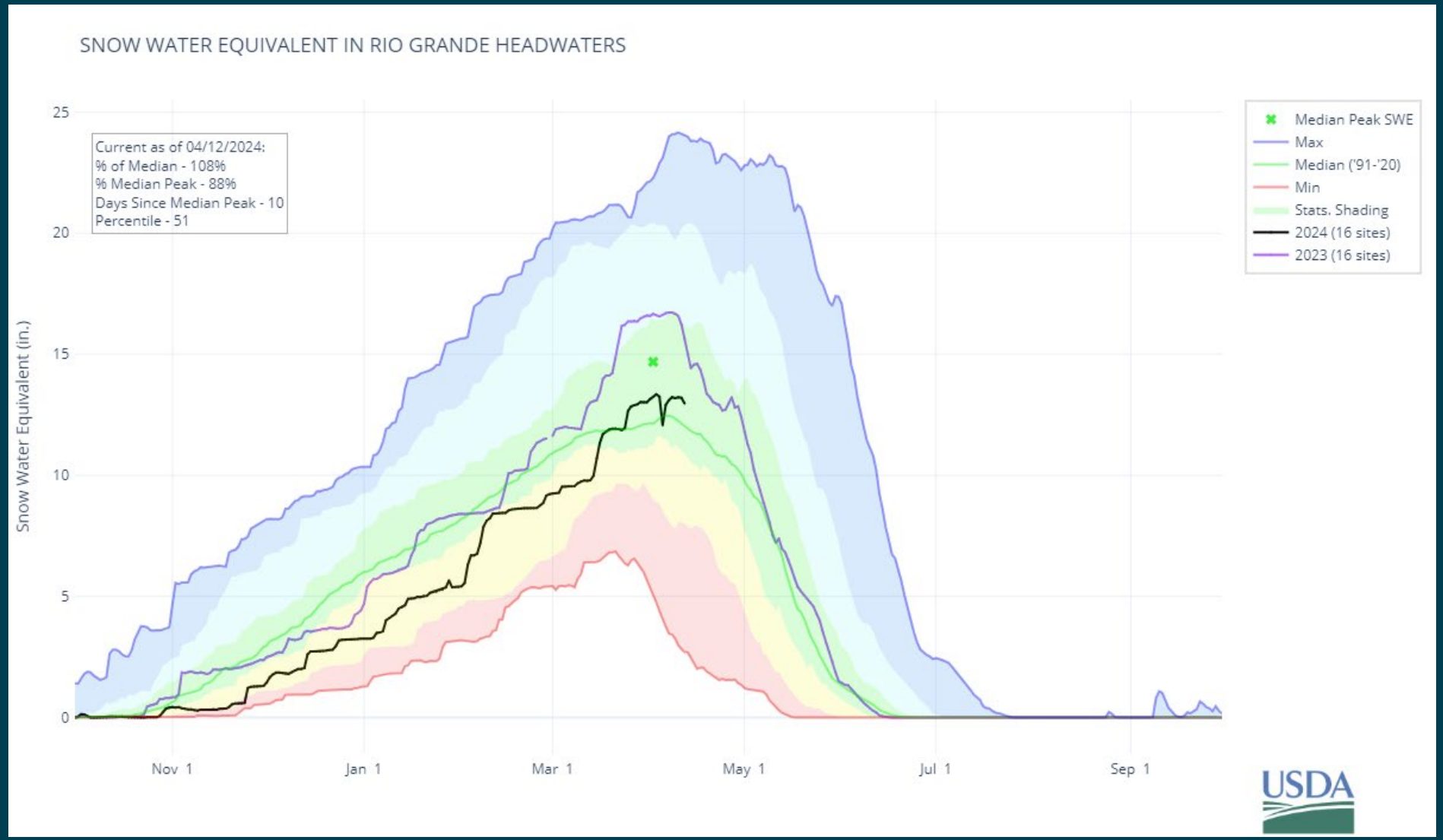
US Army Corps of Engineers®
Albuquerque District

Current Snow Conditions

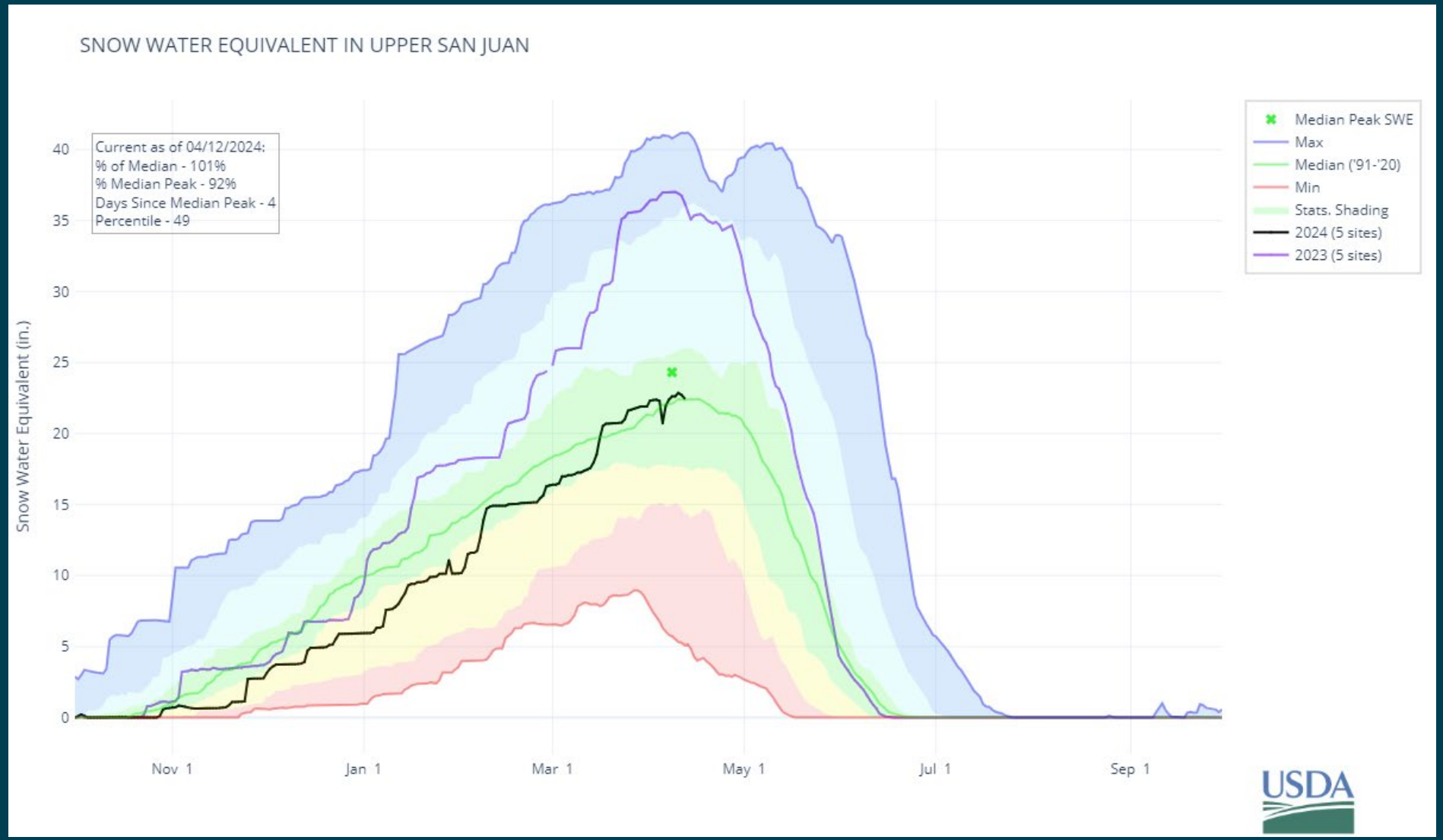
SNOTEL Locations



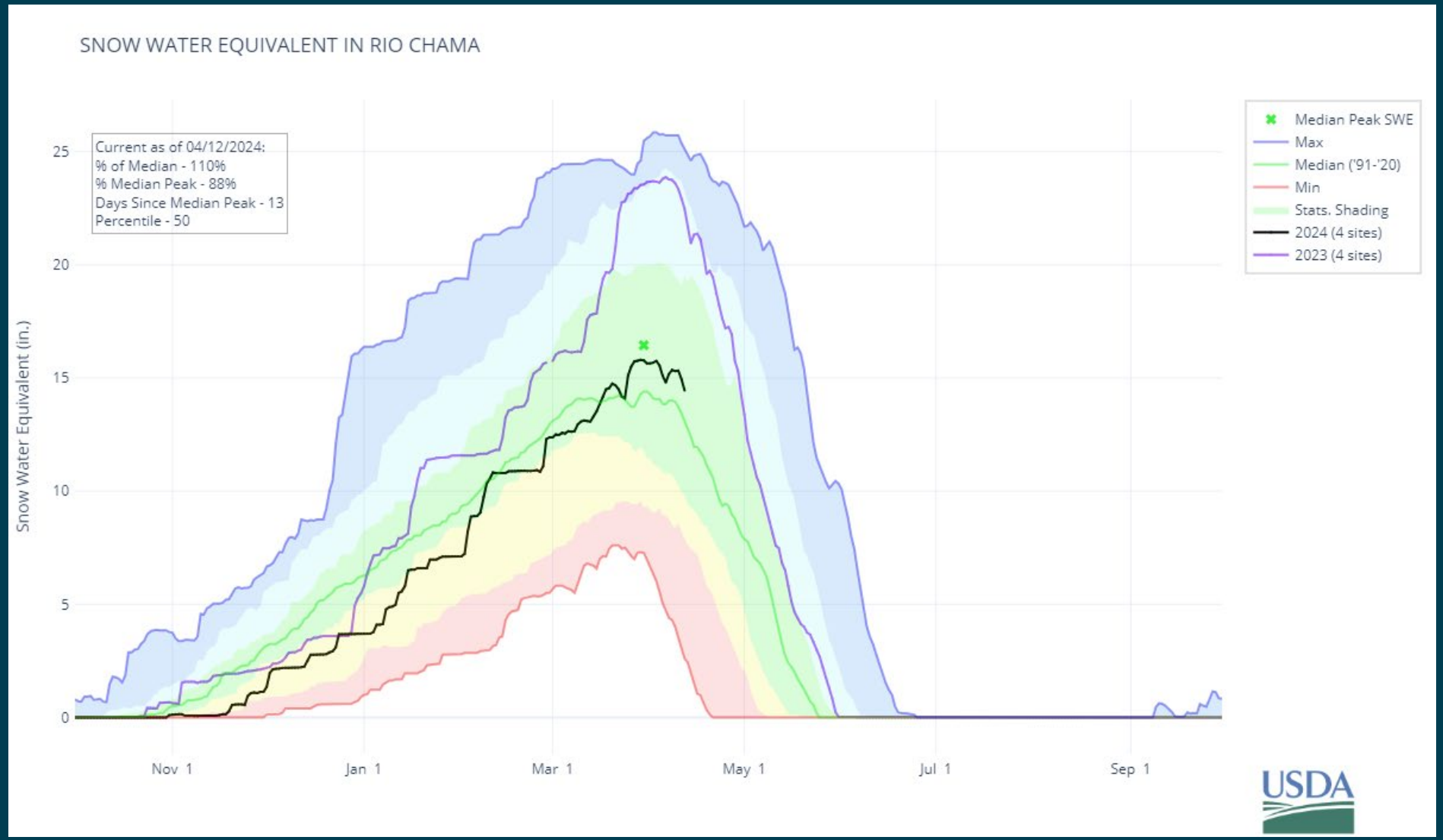
Rio Grande Headwaters



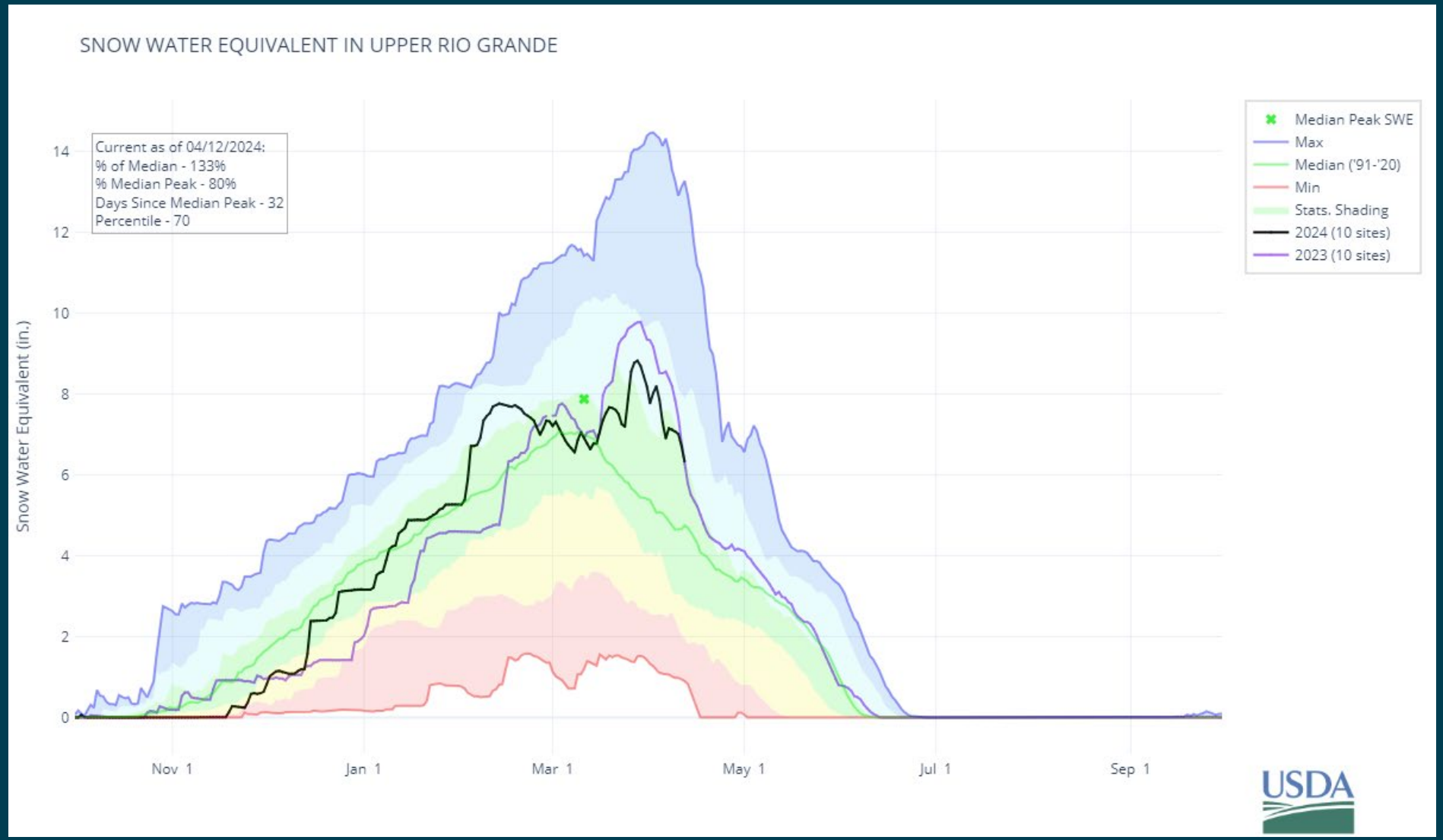
Upper San Juan



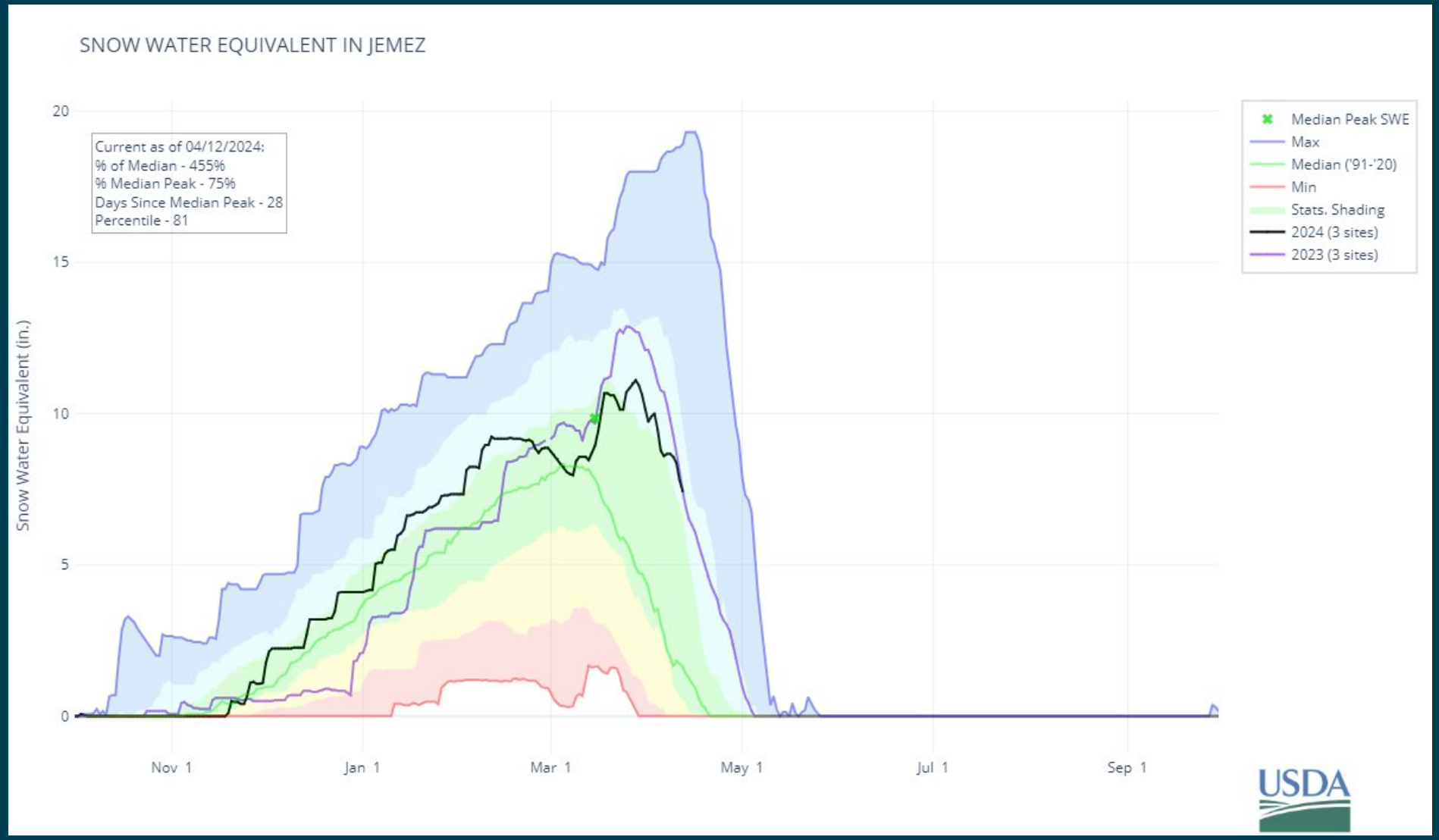
Rio Chama


SNOW WATER EQUIVALENT IN RIO CHAMA
Current as of 04/12/2024:
% of Median - 110%
% Median Peak - 88%
Days Since Median Peak - 13
Percentile - 50
Median Peak SWE
Max
Median ('91-'20)
Min
Stats. Shading
2024 (4 sites)
2023 (4 sites)
Snow Water Equivalent (in.)
25
20
15
10
5
0
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
USDA

Sangre de Cristos



Jemez


SNOW WATER EQUIVALENT IN JEMEZ
Current as of 04/12/2024:
% of Median - 455%
% Median Peak - 75%
Days Since Median Peak - 28
Percentile - 81
Median Peak SWE
Max
Median ('91-'20)
Min
Stats. Shading
2024 (3 sites)
2023 (3 sites)
Snow Water Equivalent (in.)
20
15
10
5
0
Nov 1
Jan 1
Mar 1
May 1
Jul 1
Sep 1
USDA

2024 Projected Water Operations

Important Model Assumptions

- 2000 hydrograph shape
- El Vado Reservoir
  - 6785 ft +/- 1.5ft restriction (except during Apr 1 – May 15)
  - ~3,500 cfs max release (due to low head)
- Abiquiu
  - P&P water: Store 17,500 ac-ft and release any unused before end of year
- Caballo operations
  - EP1 and Mexico start date of March 8, EBID expected start date of June 1
  - EBID expected end date of late July to Early August and EP1 and Mexico expected end date of late September
  - Most recent similar year for expected irrigation supply was 2020
  - Mexico supply is currently at 62% and will increase
  - Total release between 500 KAF (65%) and 660 KAF (85%) with most likely 560 KAF

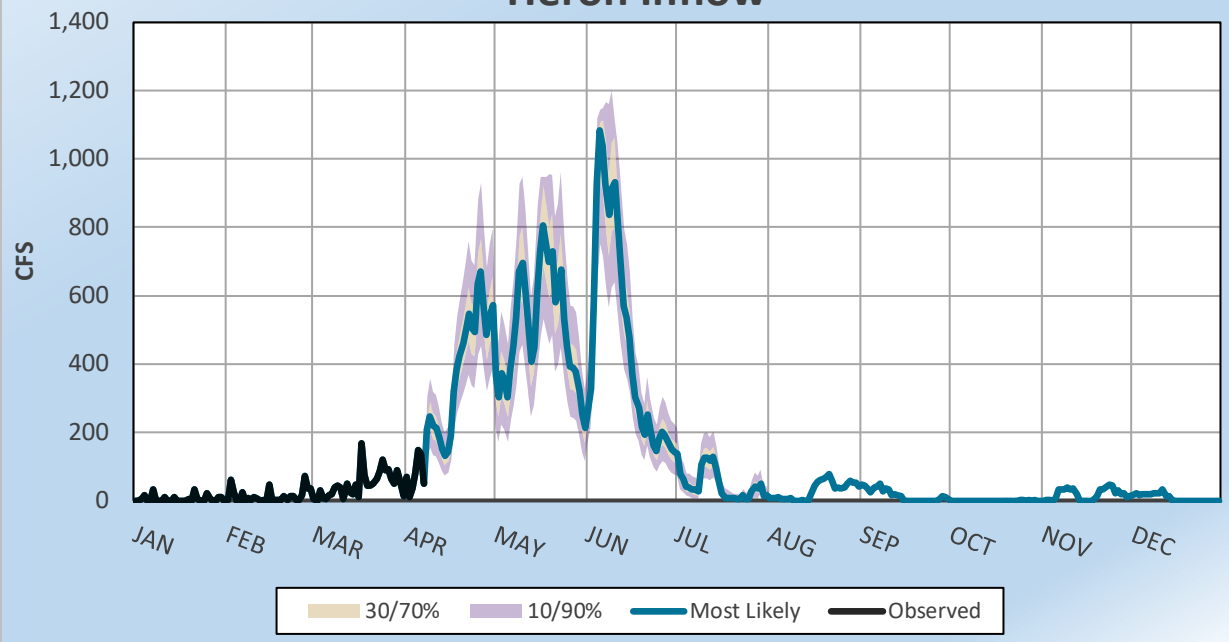
2024 vs 2023 April Streamflow Forecasts

	2024			2023	
Location	af	%*	↑or↓ 24vs23	af	%*
Rio Grande @ Del Norte	445,000	93%	↓	625,000	130%
Rio Blanco @ diversion	42,000	88%	↓	75,000	156%
Navajo River @ diversion	48,000	86%	↓	90,000	161%
El Vado Inflow	150,000	81%	↓	330,000	177%
Nambe Falls Inflow	5,400	96%	↓	8,000	143%
Rio Grande @ Otowi	400,000	71%	↓	850,000	150%
Jemez River @ Jemez	39,000	134%	↓	47,000	162%
Rio Grande @ San Marcial	220,000	64%	↓	640,000	186%

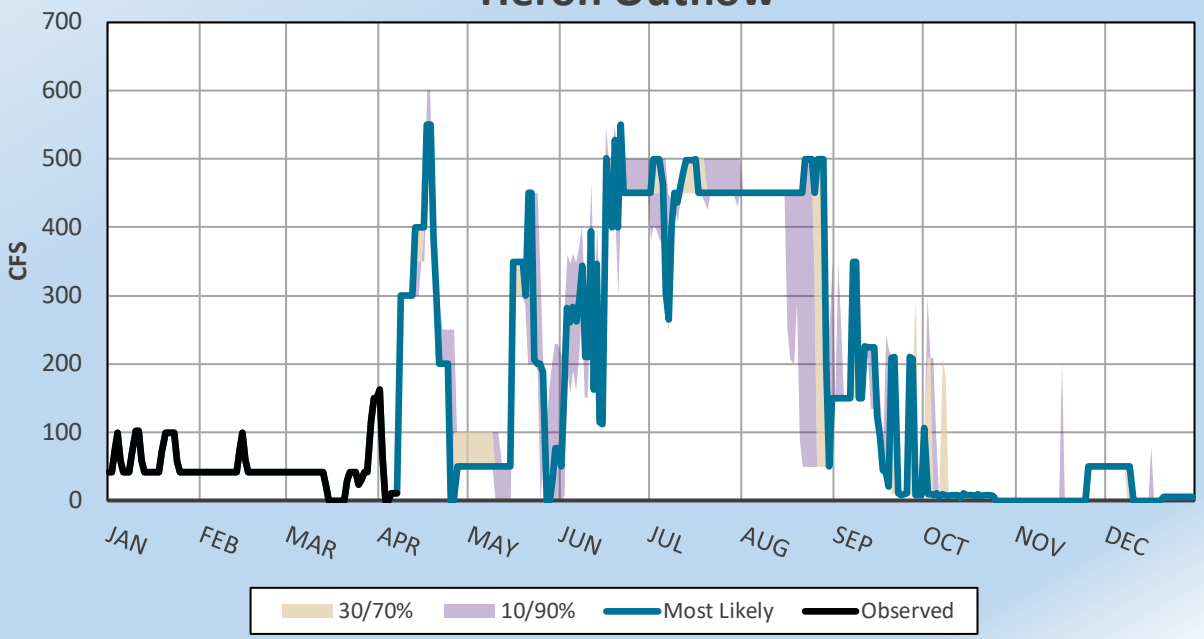
*Percentage based on the 1991-2020 Median

Heron Dam

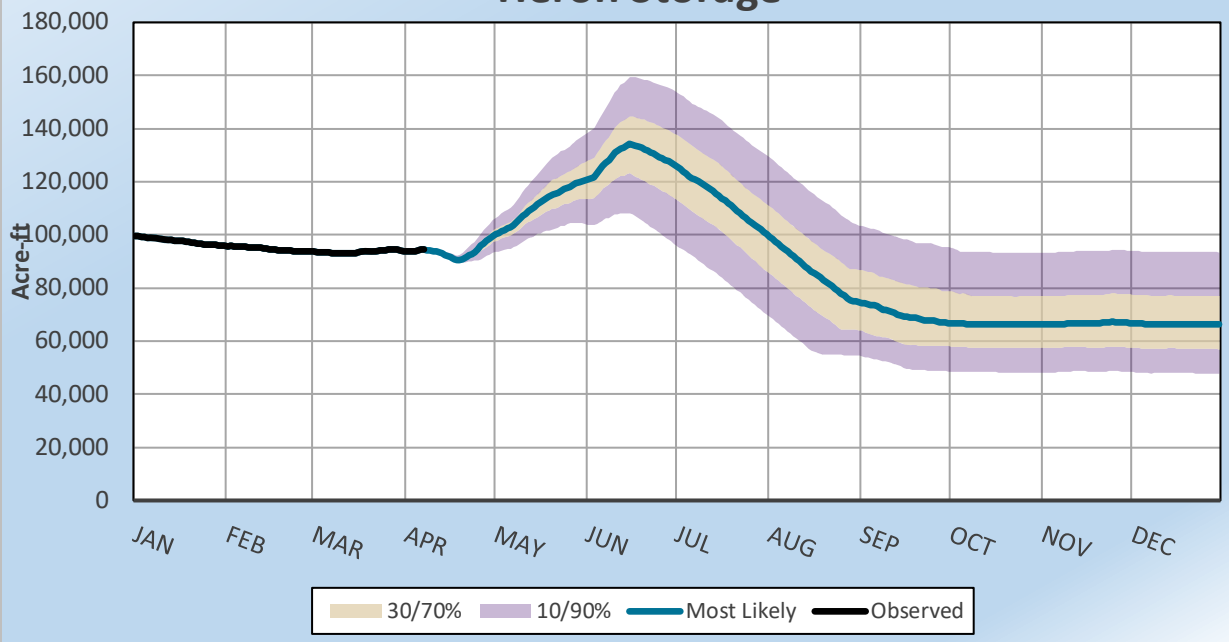
Heron Inflow



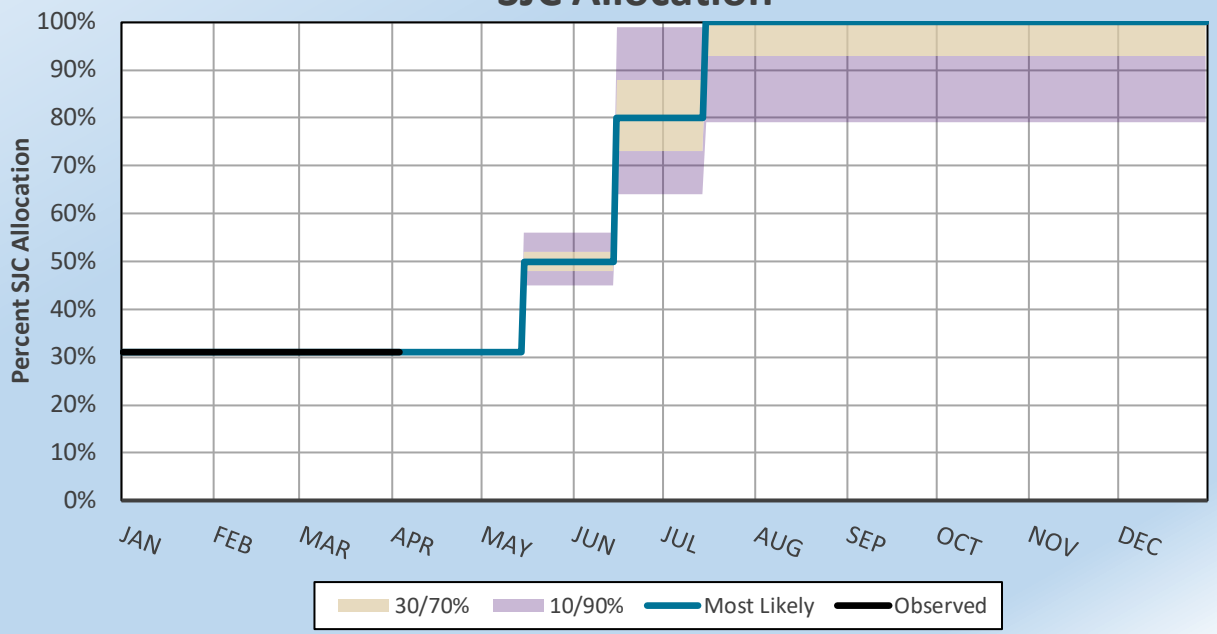
Heron Outflow



Heron Storage



SJC Allocation

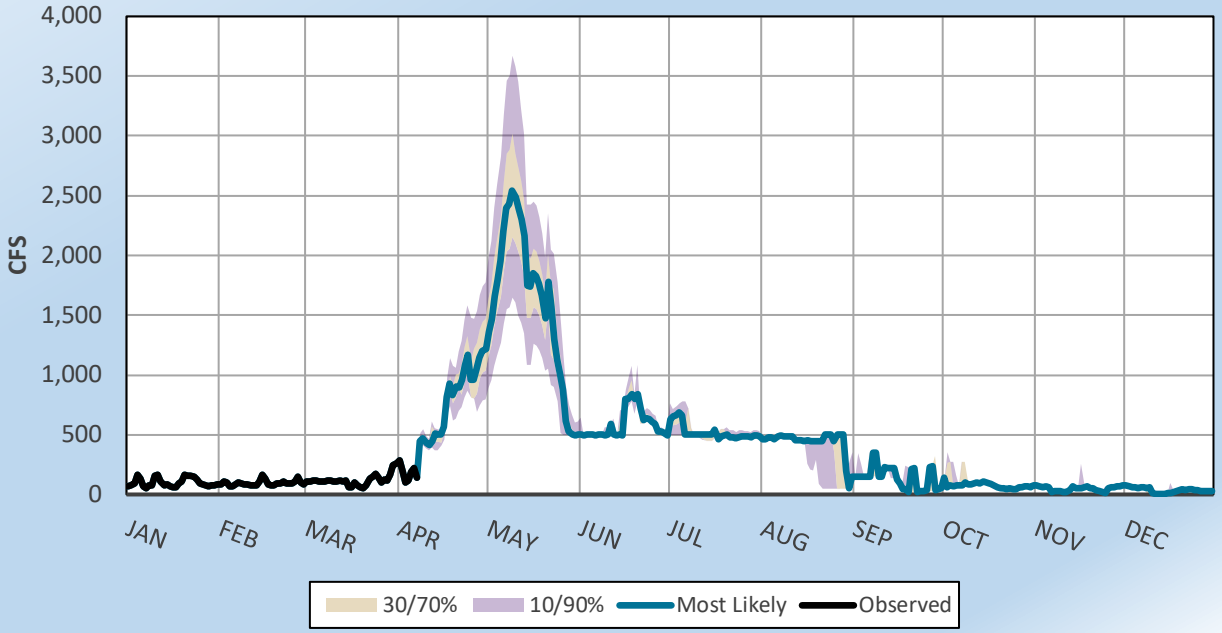


El Vado Dam

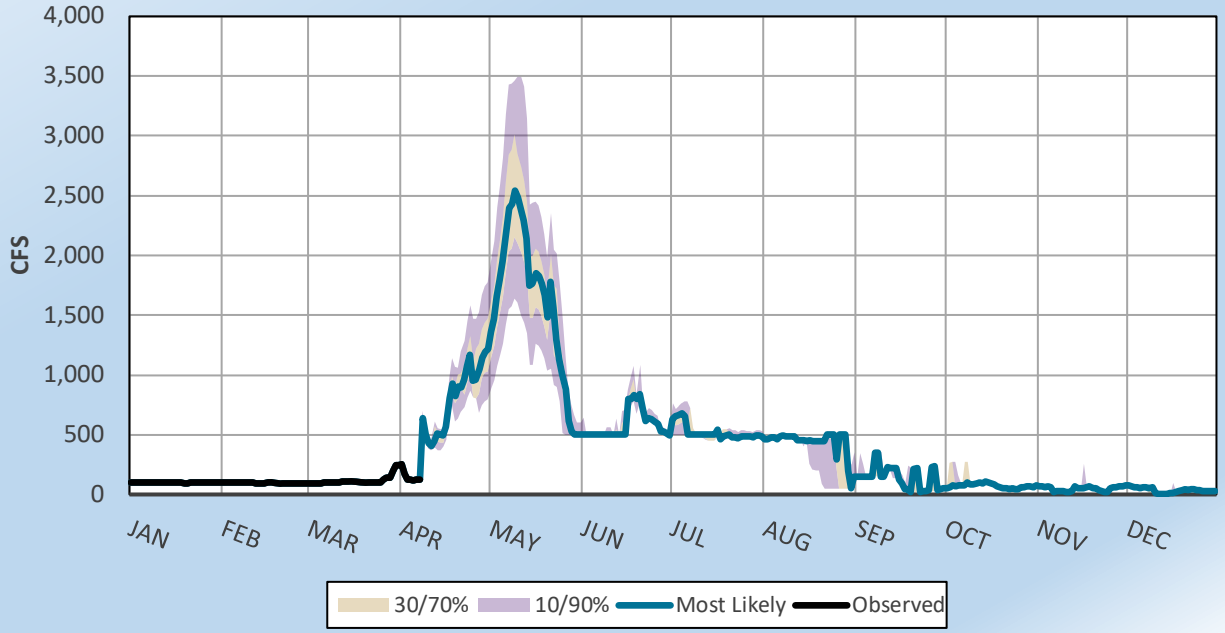
El Vado Restrictions during Construction

- During construction, reservoir elevation restricted to 6,785 ft +/- 1.5 ft (~2,000 ac-ft)
- From April 1 to May 15, reservoir may rise to 6,800 ft (9,405 ac-ft)
- Rafting releases managed from Heron and bypassed through El Vado

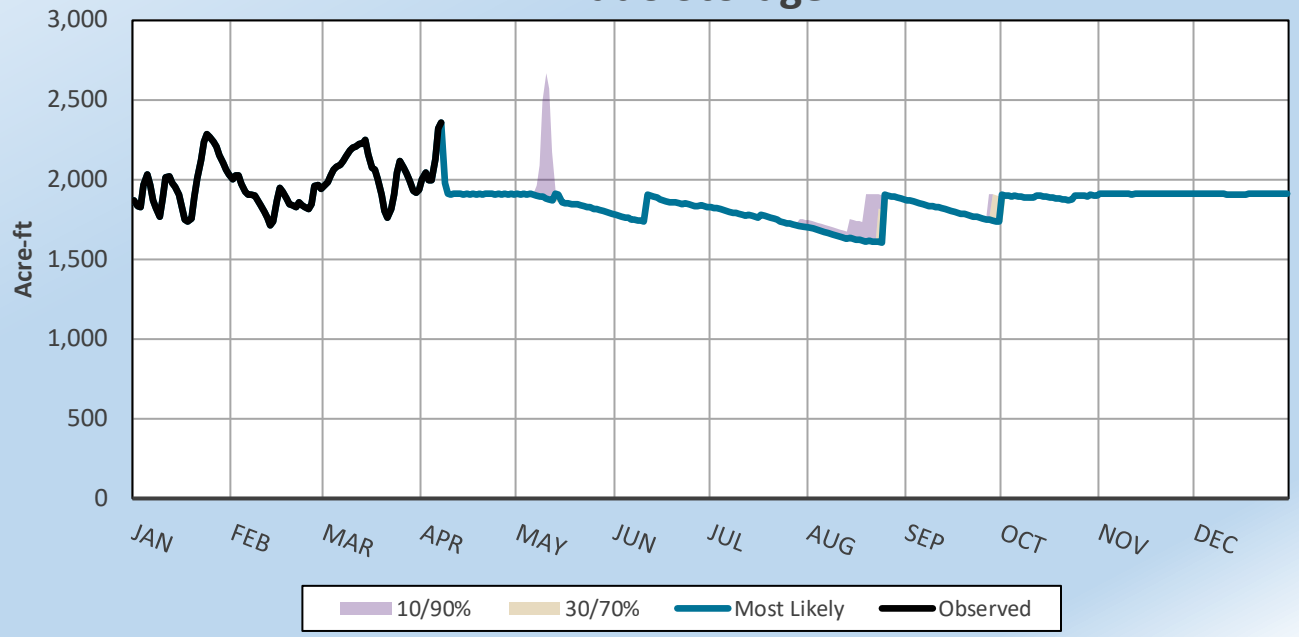
El Vado Inflow



El Vado Outflow

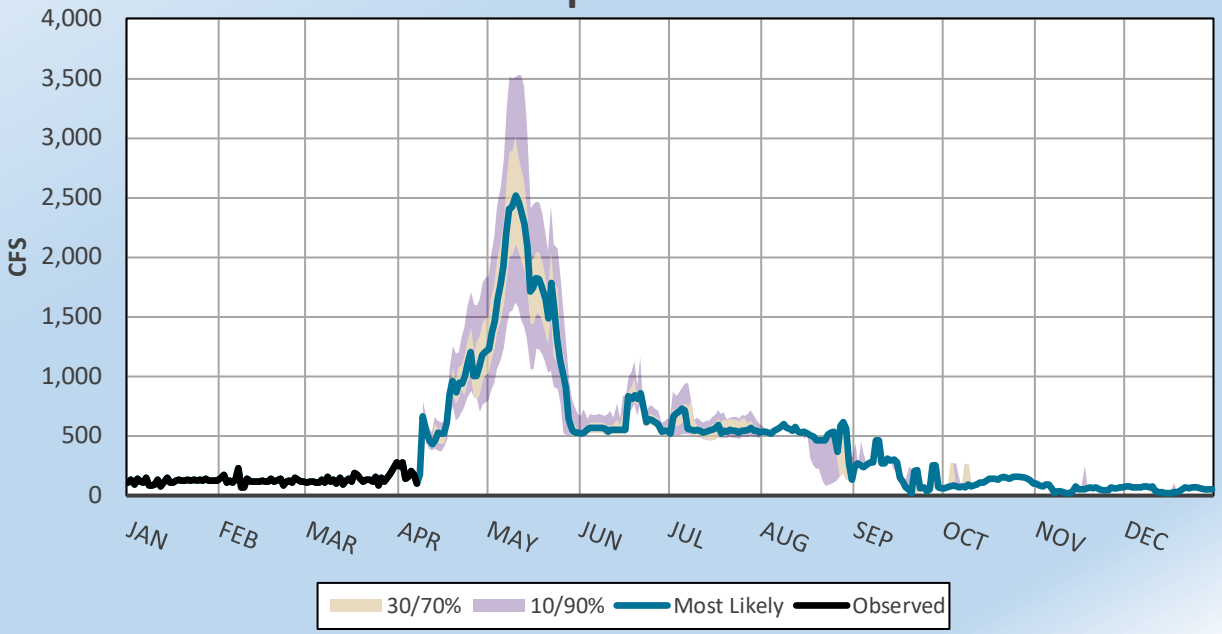


El Vado Storage

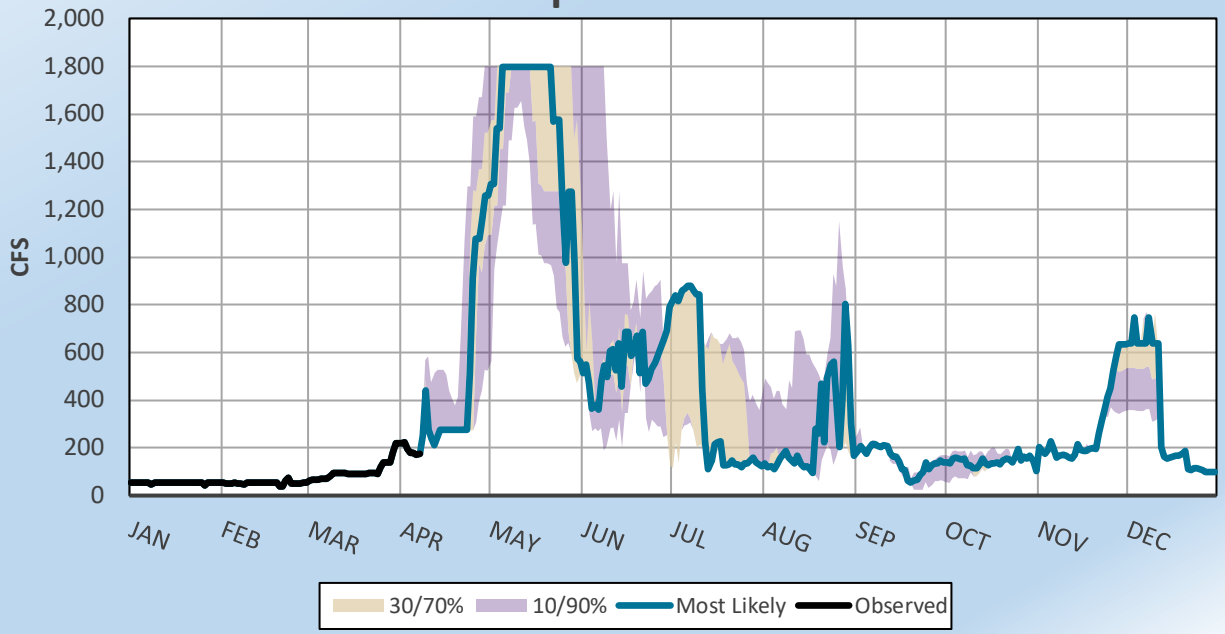


Abiquiu Dam

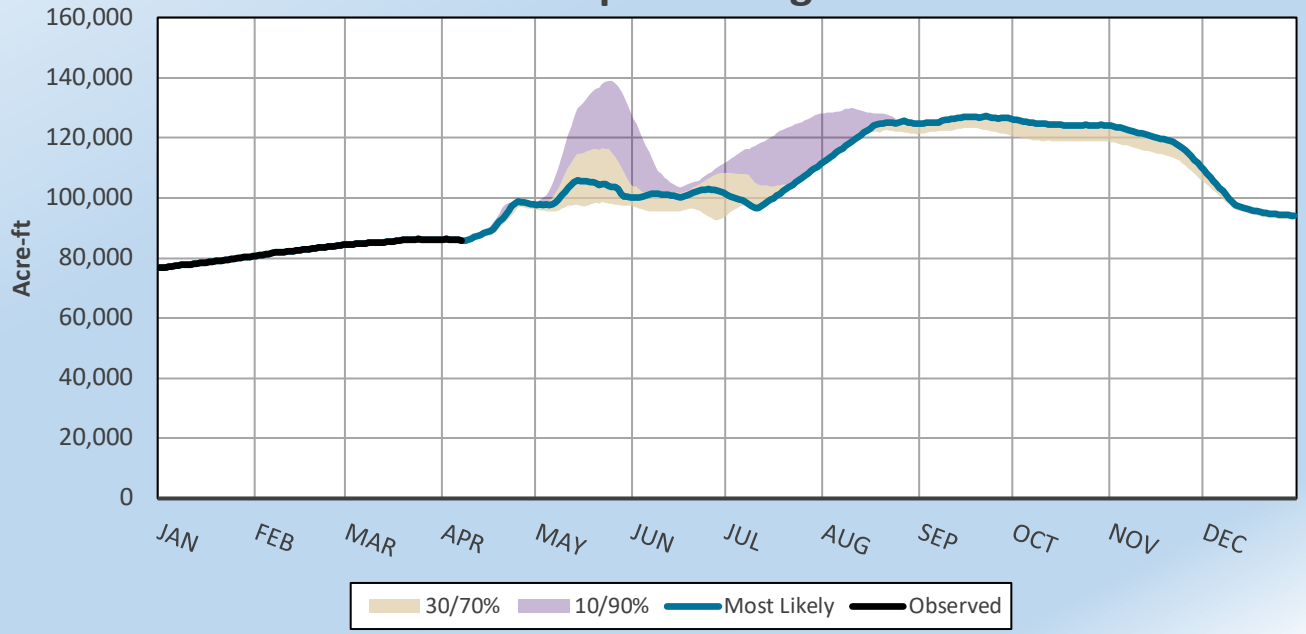
Abiquiu Inflow



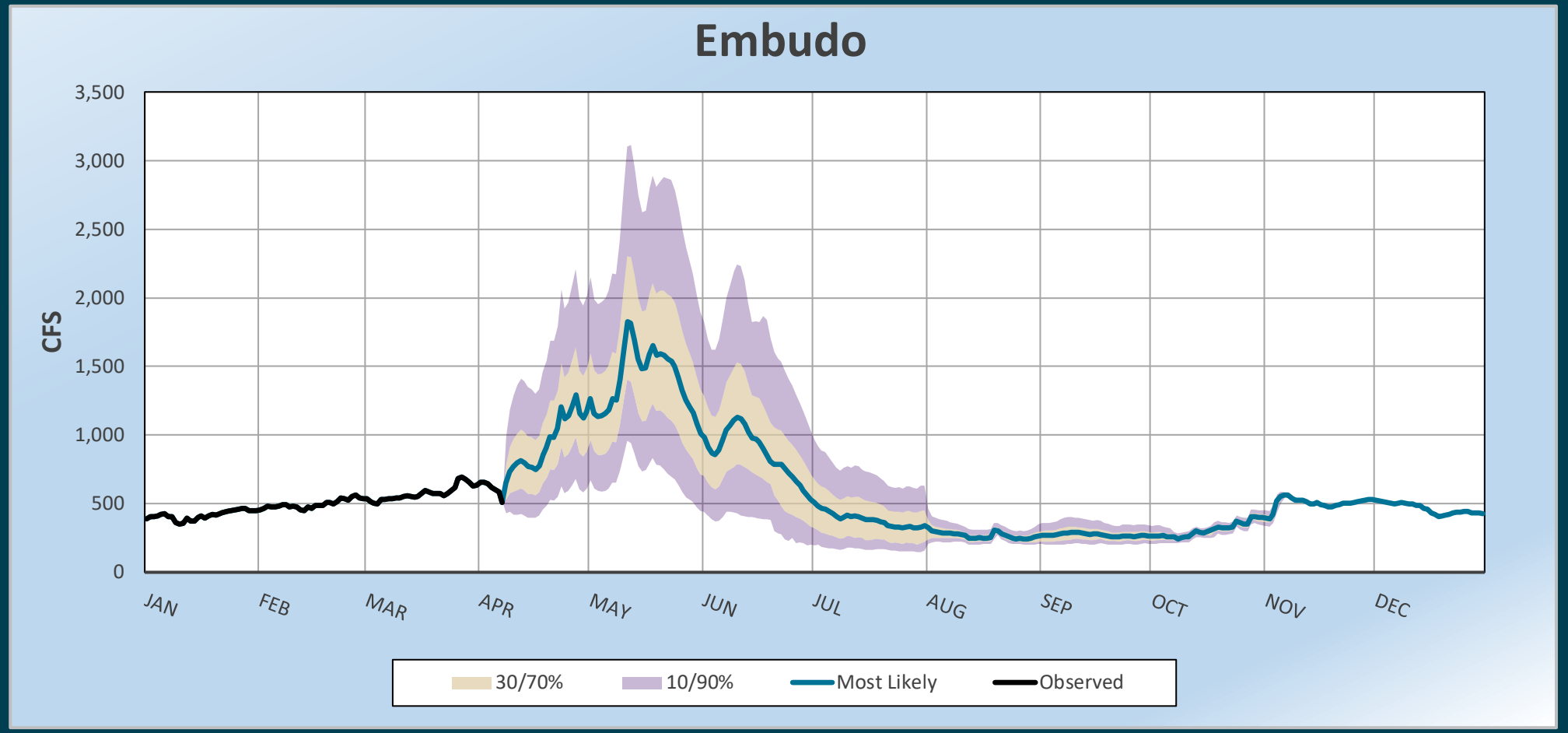
Abiquiu Outflow



Abiquiu Storage

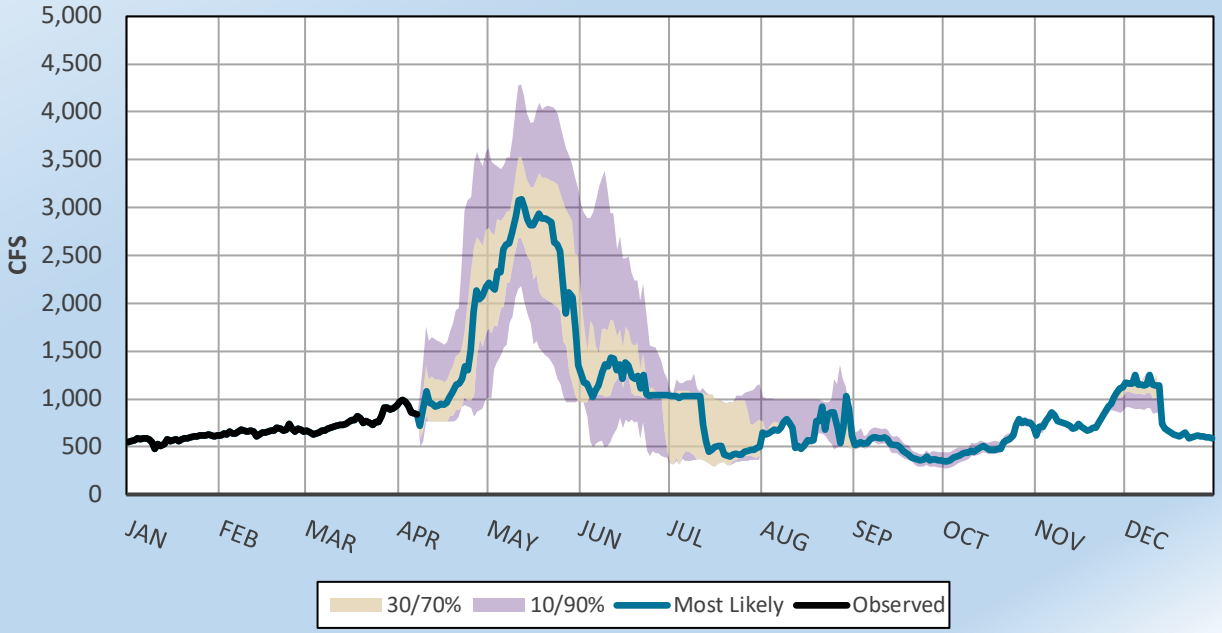


Estimated 2024 Flows at Embudo

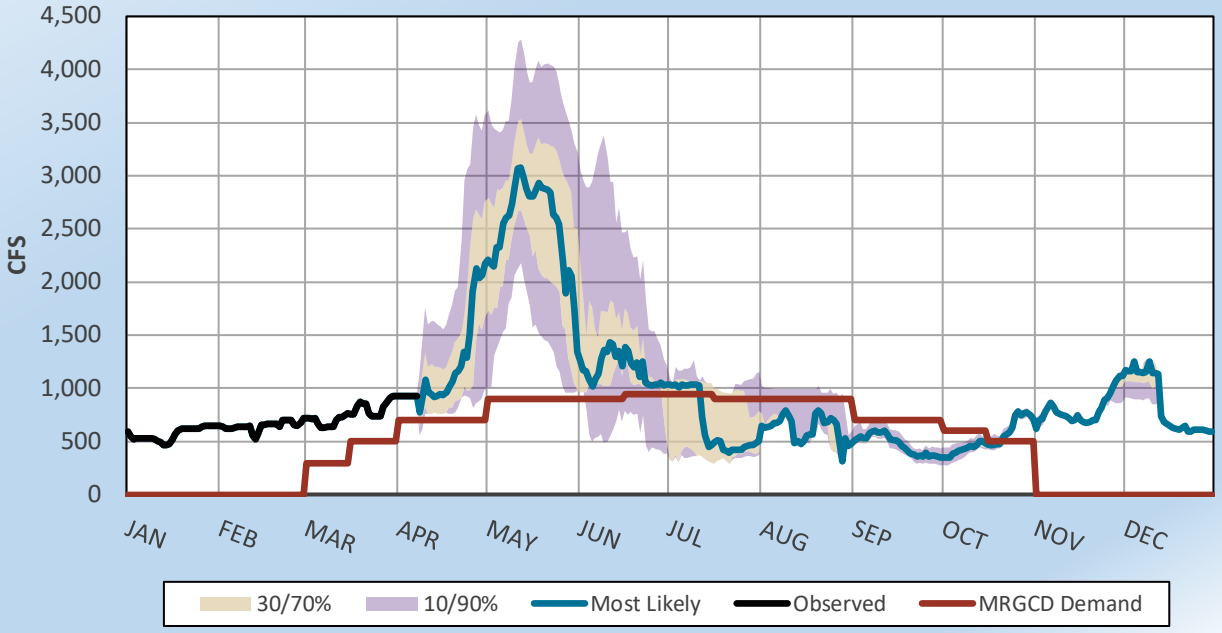


Cochiti Dam

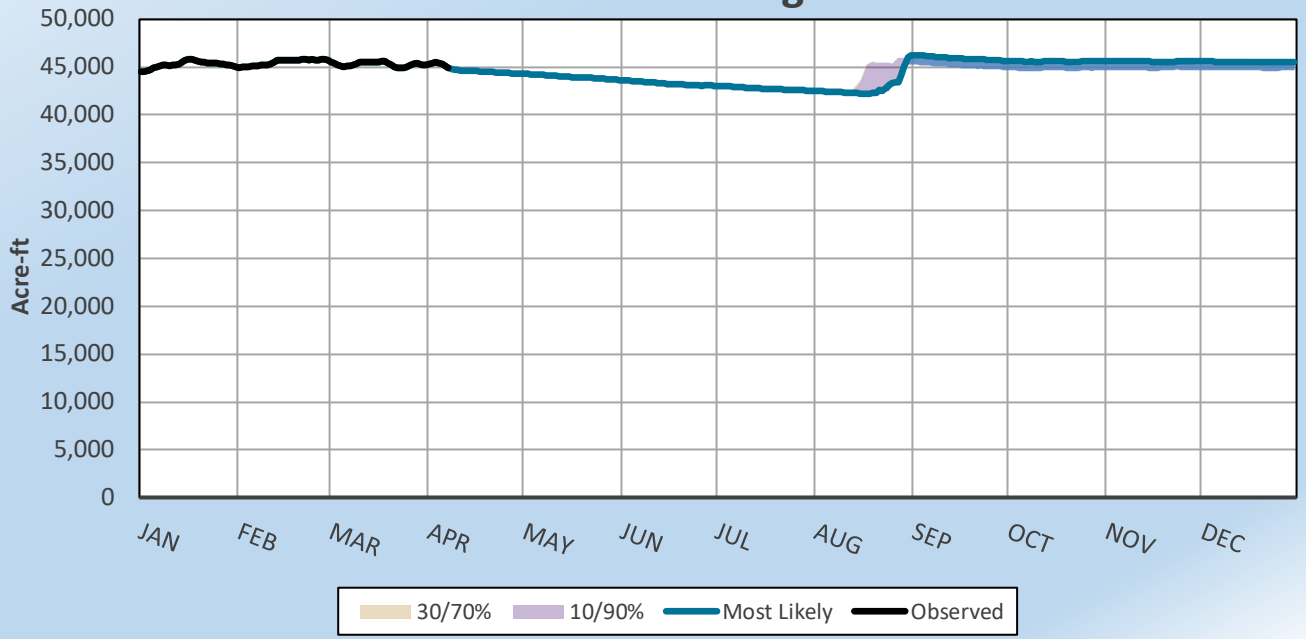
Cochiti Inflow



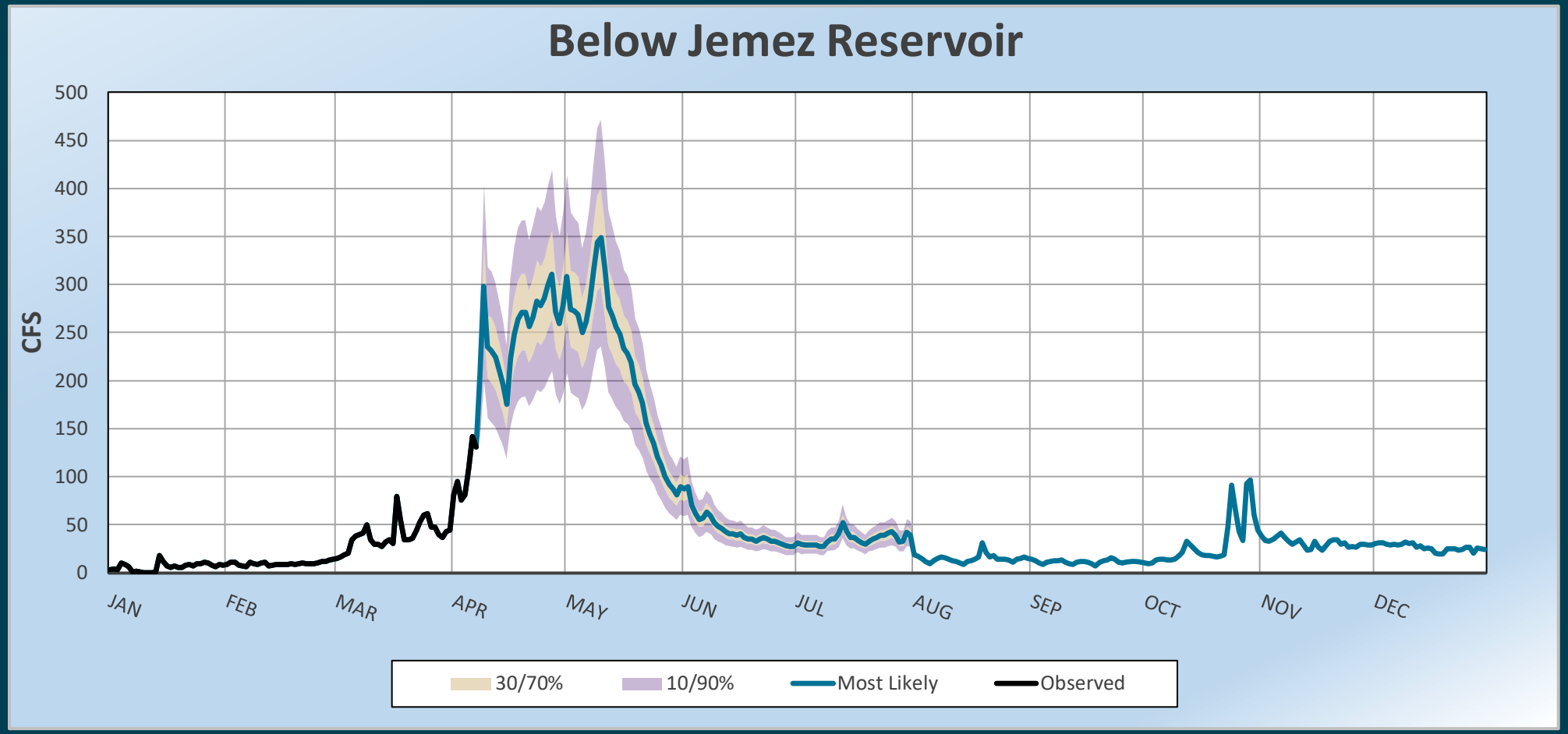
Cochiti Outflow



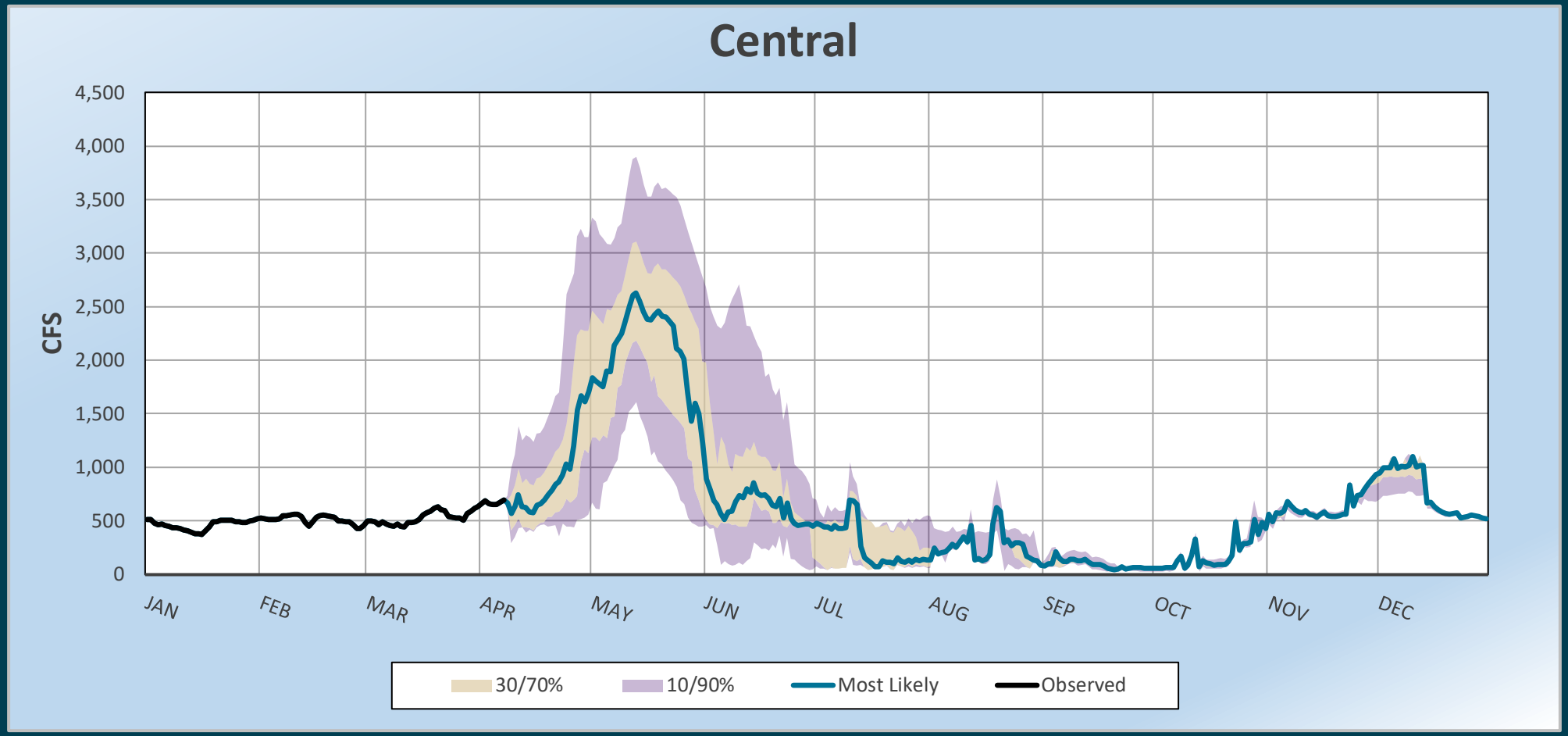
Cochiti Storage



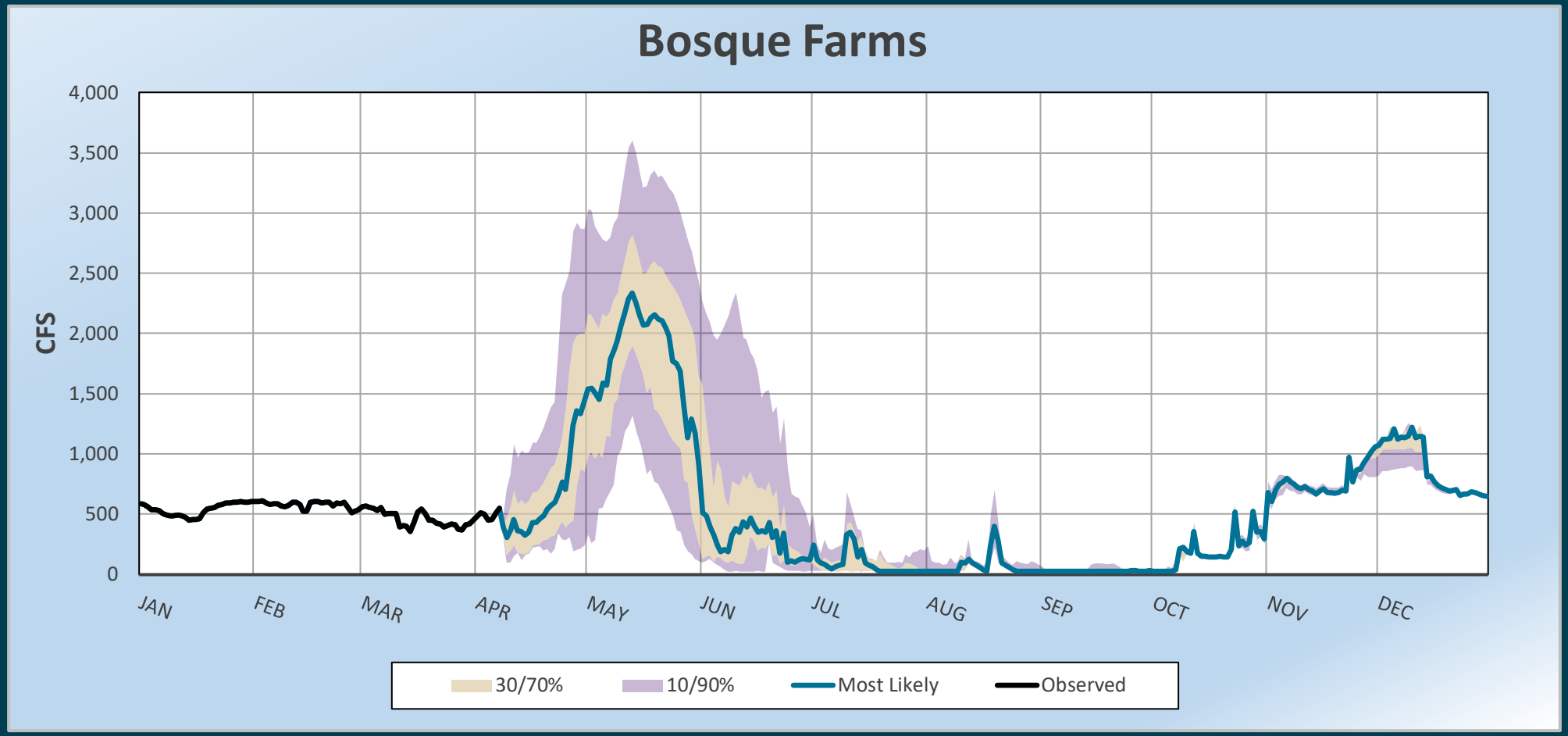
Estimated 2024 Jemez Canyon Dam Outflow



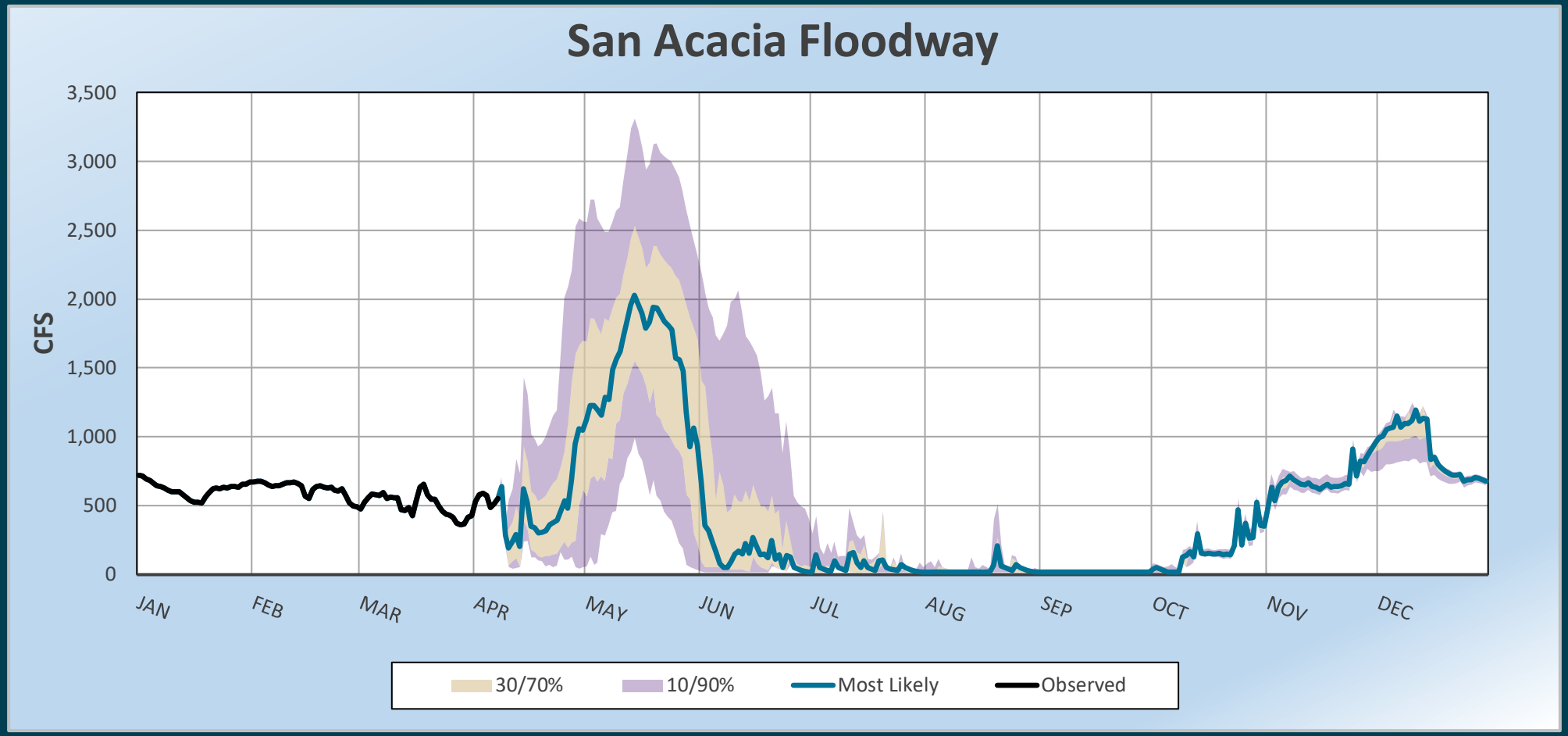
Estimated 2024 Flows at Central



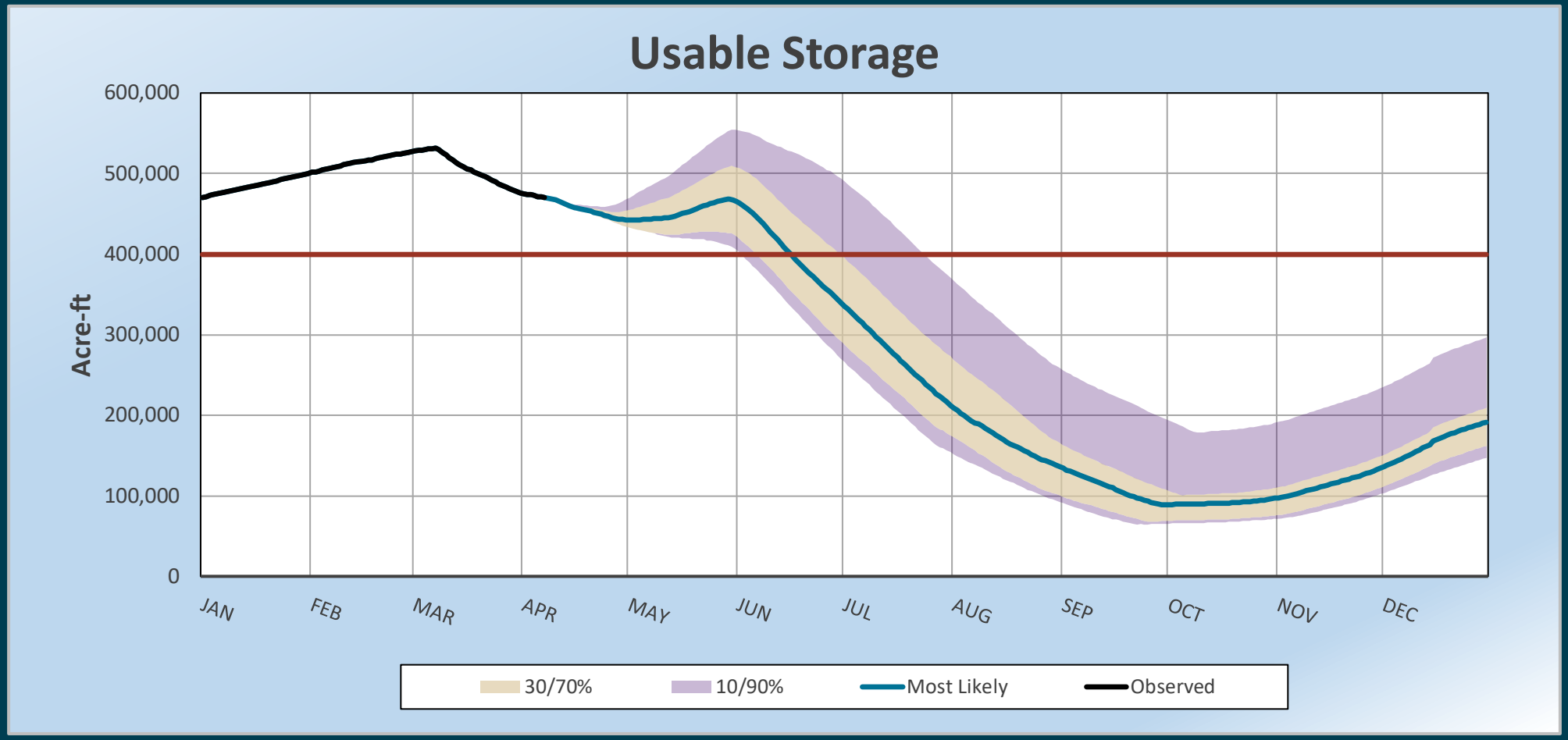
Estimated 2024 Flows at Bosque Farms



Estimated 2024 Flows at San Acacia

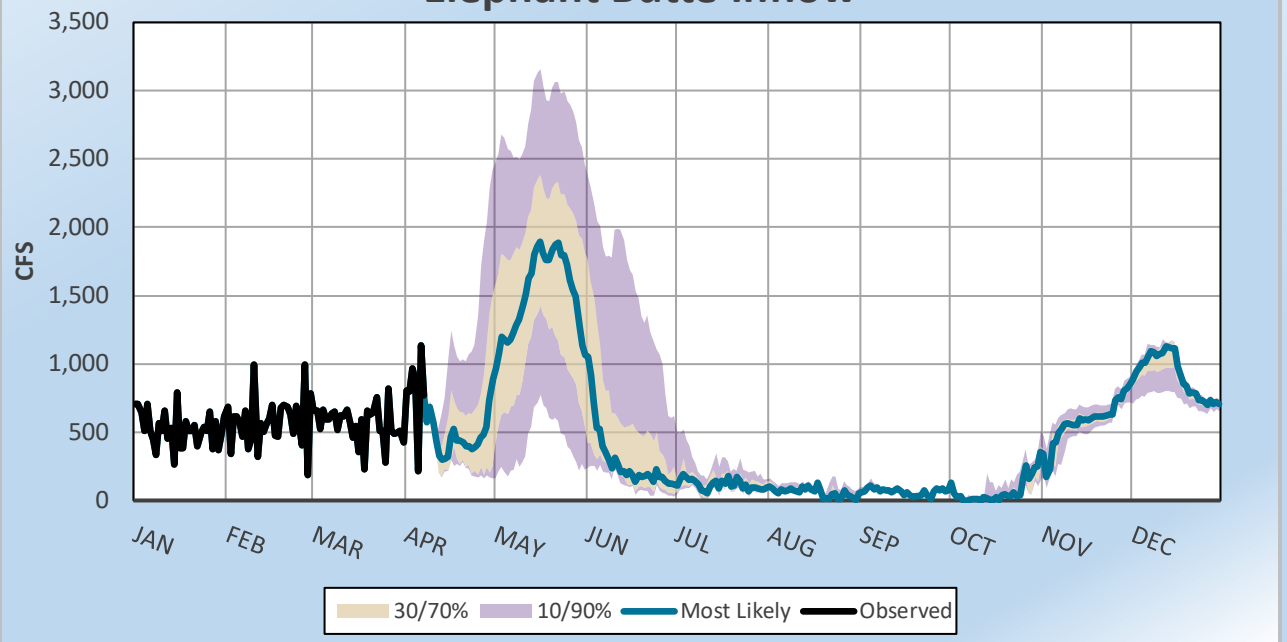


Rio Grande Usable Storage

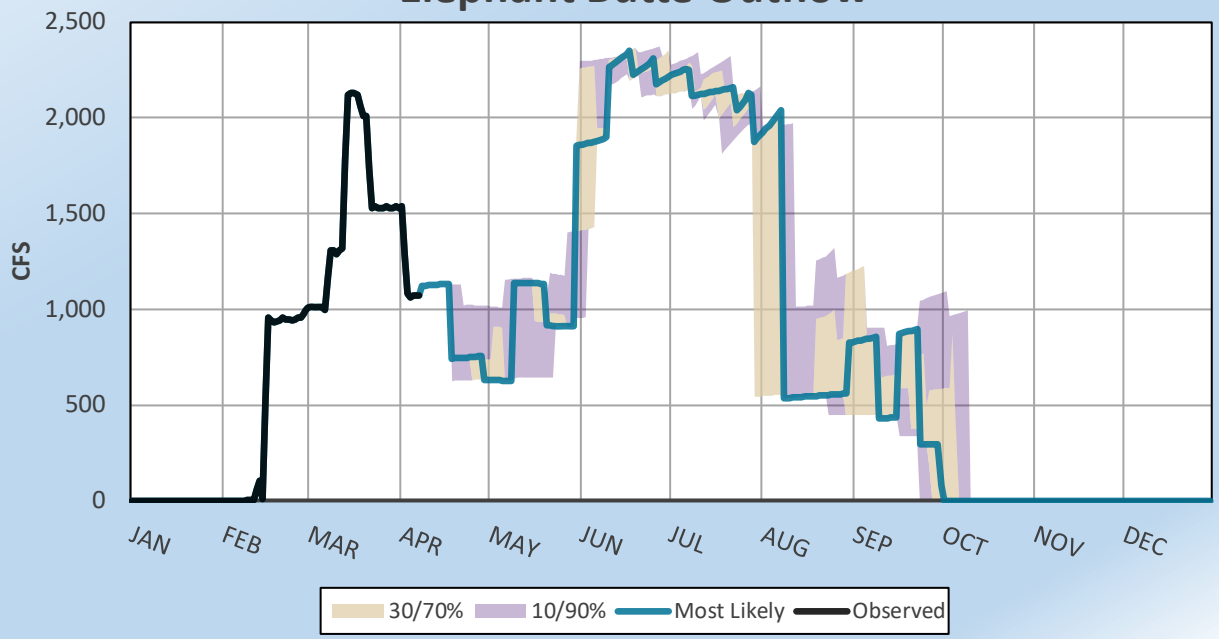


Elephant Butte Dam

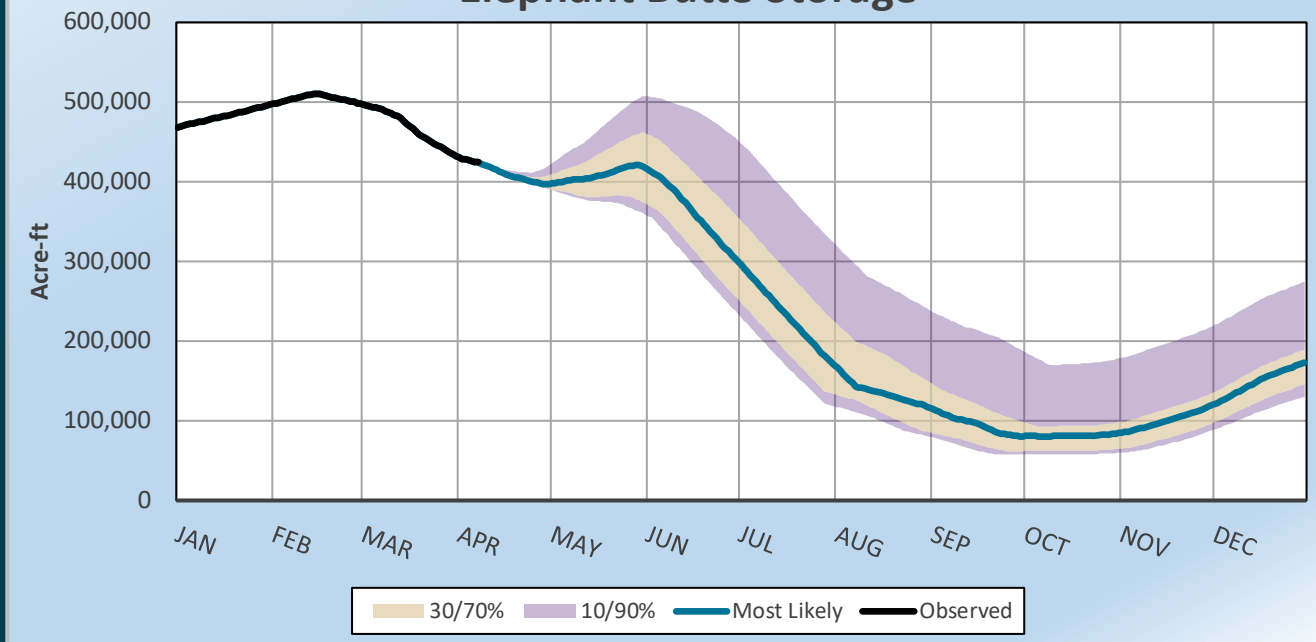
Elephant Butte Inflow



Elephant Butte Outflow

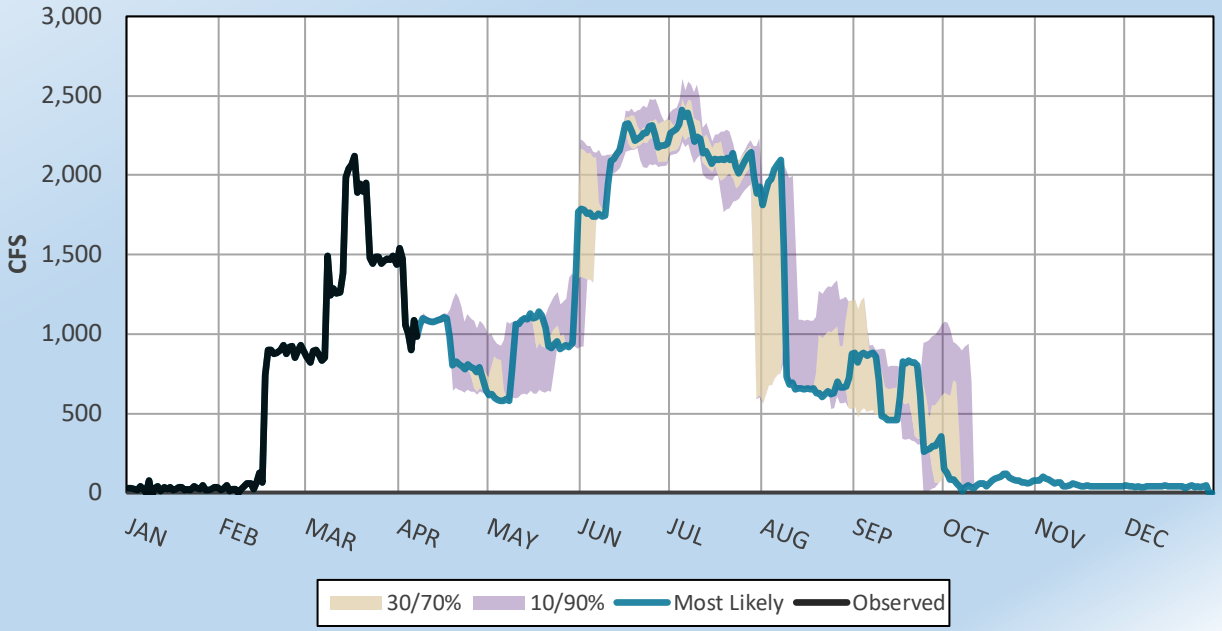


Elephant Butte Storage

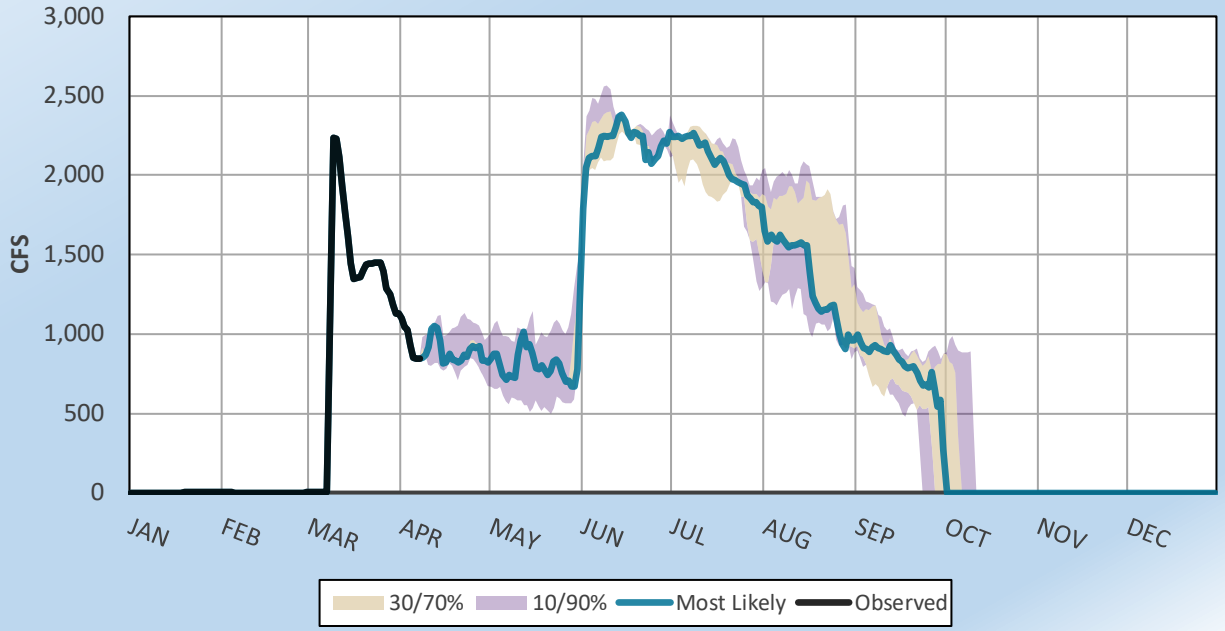


Caballo Dam

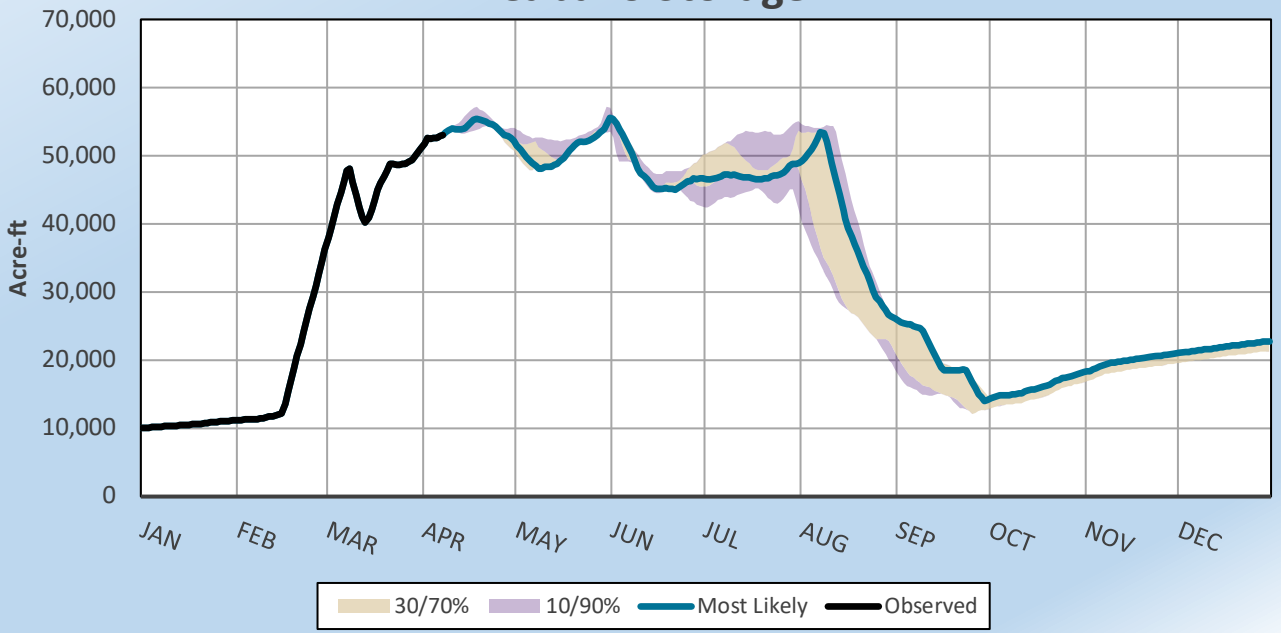
Caballo Inflow



Caballo Outflow

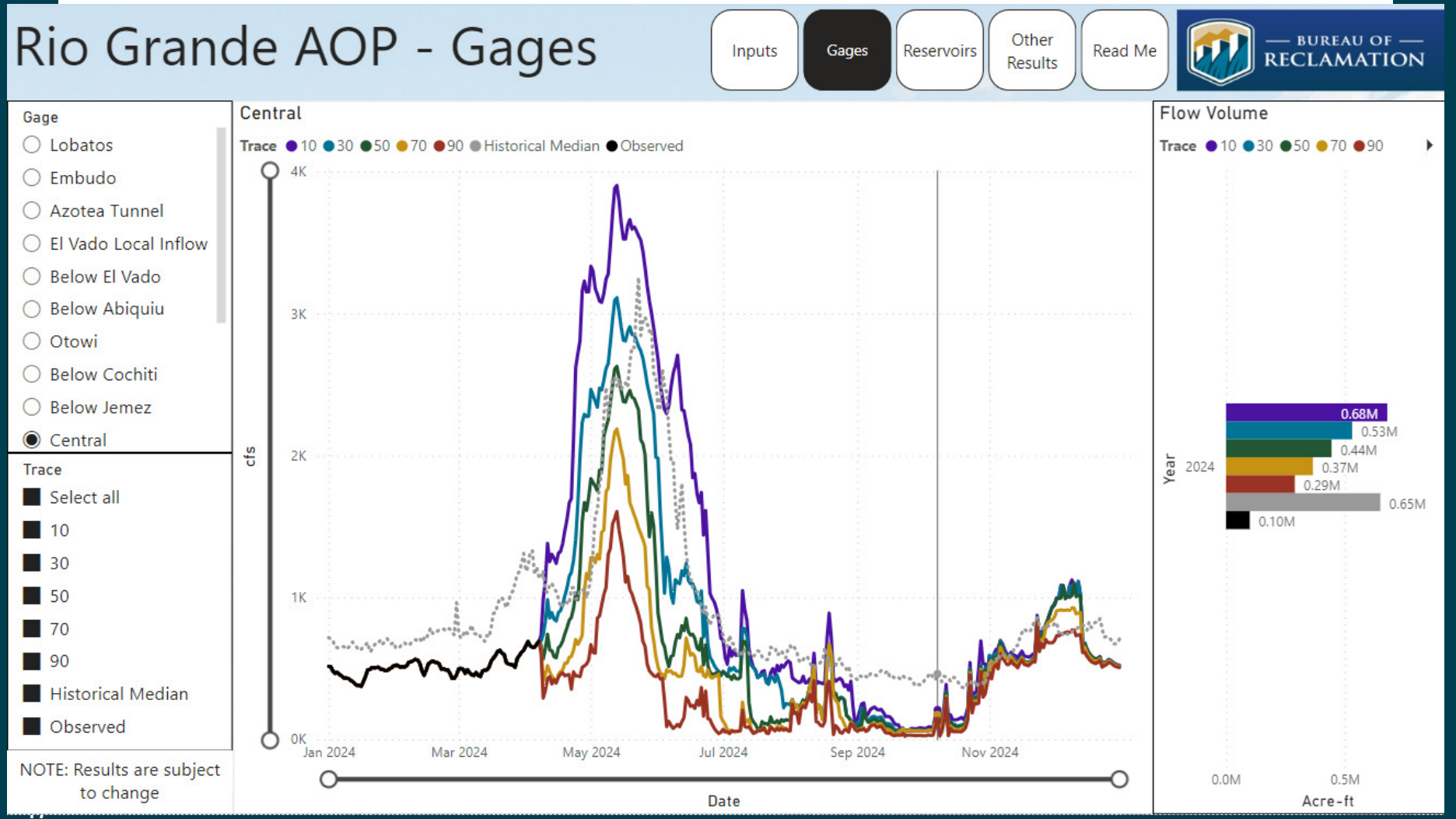


Caballo Storage



New Rio Grande AOP Dashboard

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



Albuquerque Water Operations

Data

HydroData

Reservoir Data *(storage, inflow, releases, elevation & more)*

Gage Data *(flow, flow volume & side inflows.)*

Tools and Dashboards

Middle Rio Grande Water Management Toolbox

Water Operations Dashboard

Rio Grande Annual Operating Plan (AOP) Projections

Basin Overview

HydroData Rio Grande Basin Map *(current reservoir capacity & current and historical snow and precipitation charts)*

HydroData Upper Colorado Basin Maps

Weekly Hydrology Summary

Teacup Diagrams

Real-Time-Data Text Files:

Questions / Comments

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

BUREAU OF RECLAMATION

US Army Corps of Engineers®
Albuquerque District