

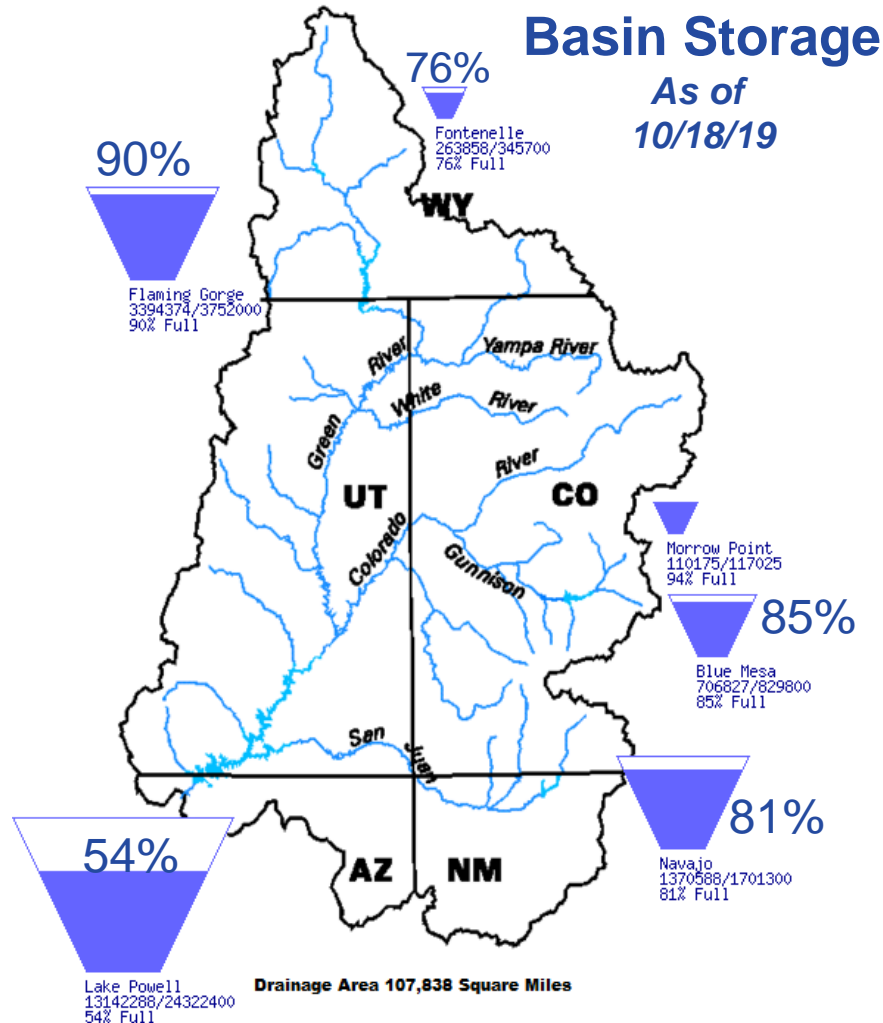
# **Basin Hydrology, Reservoir Operations and 2020 Hydrograph**

**October 21, 2019**

# Upper Basin Storage and Inflow

Data Current as of:  
10/16/2019

## Upper Colorado River Drainage Basin



## Water Year 2020

## Forecasted Unregulated Inflow

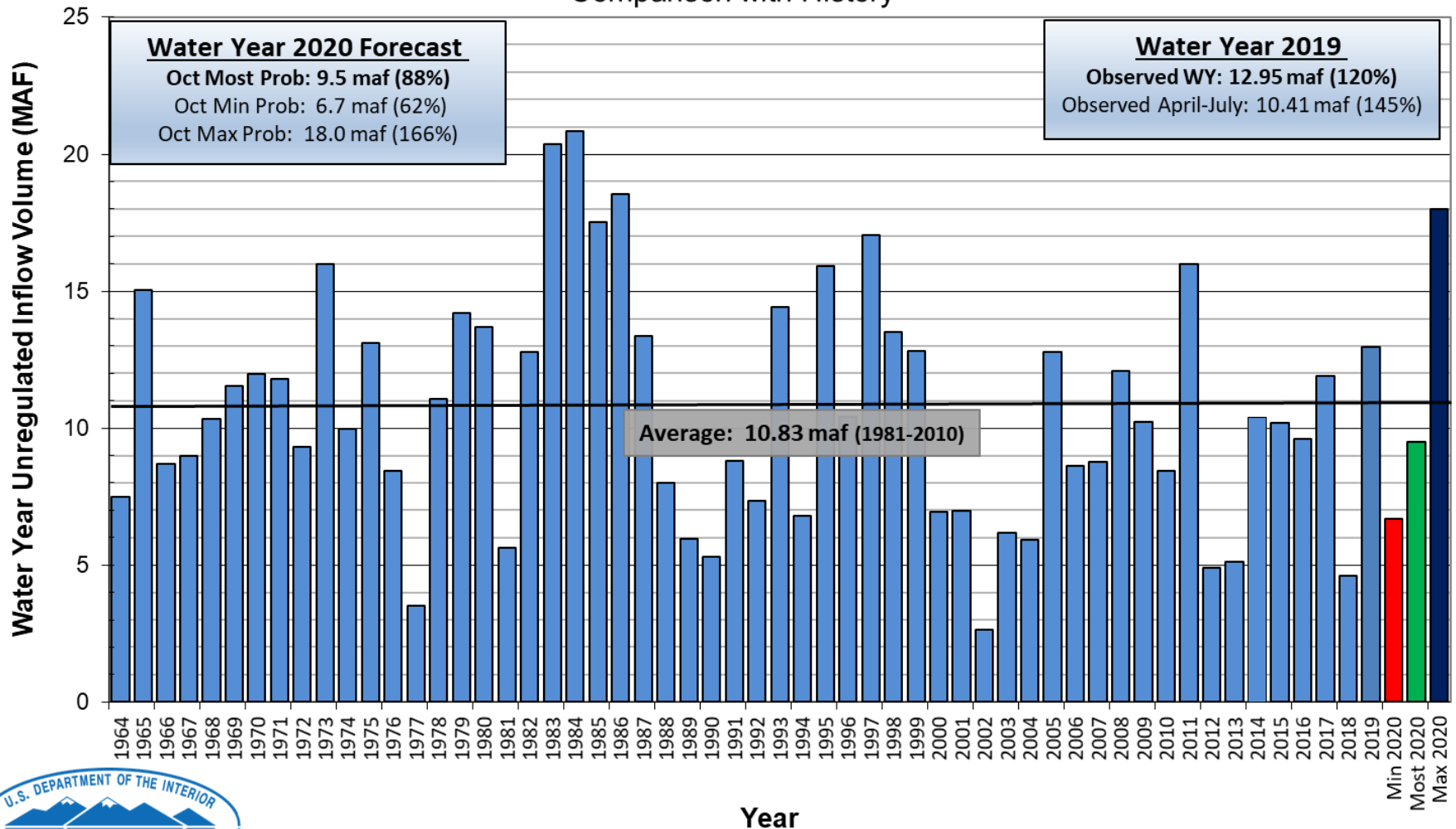
Issued October 2, 2019

Reservoir	Forecast (kaf)	Percent of Average <sup>1</sup>
Fontenelle	1,024	95
Flaming Gorge	1,375	95
Blue Mesa	880	92
Navajo	810	75
Powell	9,500	88

<sup>1</sup> Percent of average based on the period of record from 1981-2010.

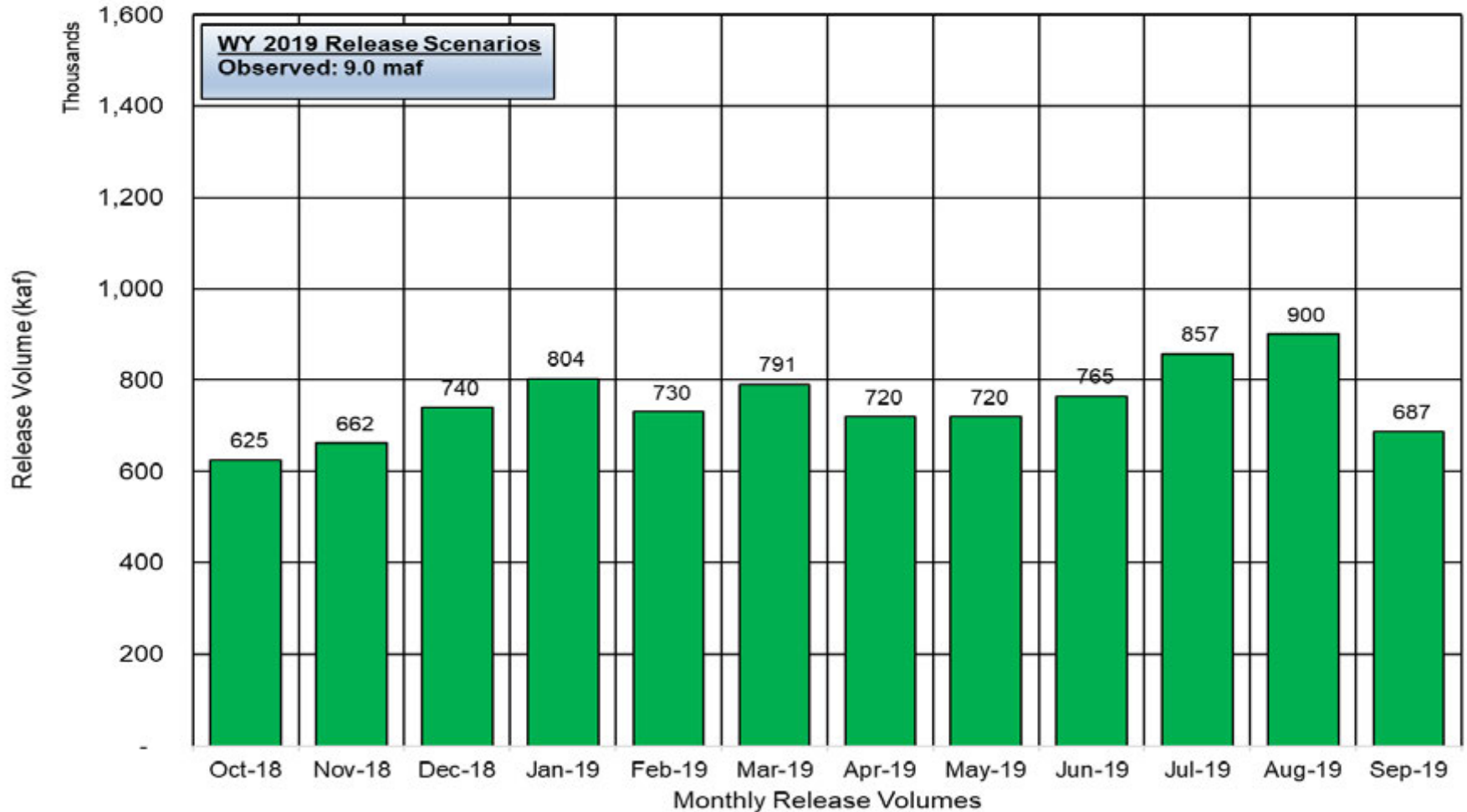
# Lake Powell Inflow

## Lake Powell Unregulated Inflow Water Year 2020 Forecast (issued October 2) Comparison with History



# Lake Powell Monthly Release

**Lake Powell Monthly Release Volume Distribution**  
Observed Releases for Water Year 2019



# Lake Powell & Lake Mead Operational Table

## Operational Tiers for Water/Calendar Year 2020<sup>1</sup>

Lake Powell			Lake Mead		
Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf) <sup>1</sup>	Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf) <sup>1</sup>
3,700	Equalization Tier Equalize, avoid spills or release 8.23 maf	24.3	1,220	Flood Control Surplus or Quantified Surplus Condition Deliver > 7.5 maf	25.9
3,636 - 3,666 (2008-2026)		15.5 - 19.3 (2008-2026)	1,200 (approx.) <sup>2</sup>	Domestic Surplus or ICS Surplus Condition Deliver > 7.5 maf	22.9 (approx.) <sup>2</sup>
	3,618.56 ft Jan 1, 2020 Projection		1,145		15.9
	if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf		1,105	Normal or ICS Surplus Condition Deliver ≥ 7.5 maf	11.9
3,575		9.5		1,089.40 ft Jan 1, 2020 Projection	
	Mid-Elevation Release Tier Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf		1,075		9.4
3,525		5.9	1,050	Shortage Condition Deliver 7.167 <sup>3</sup> maf	7.5
3,490	Lower Elevation Balancing Tier Balance contents with a min/max release of 7.0 and 9.5 maf	4.0	1,025	Shortage Condition Deliver 7.083 <sup>3</sup> maf	5.0
3,370		0	1,000	Shortage Condition Deliver 7.0 <sup>6</sup> maf Further measures may be undertaken <sup>7</sup>	4.3
			895		0

Diagram not to scale

<sup>1</sup> Acronym for million acre-feet

<sup>2</sup> This elevation is shown as approximate as it is determined each year by considering several factors including Lake Powell and Lake Mead storage, projected Upper Basin and Lower Basin demands, and an assumed inflow.

<sup>3</sup> Subject to April adjustments which may result in a release according to the Equalization Tier

<sup>4</sup> Of which 2.48 maf is apportioned to Arizona, 4.4 maf to California, and 0.287 maf to Nevada

<sup>5</sup> Of which 2.40 maf is apportioned to Arizona, 4.4 maf to California, and 0.283 maf to Nevada

<sup>6</sup> Of which 2.32 maf is apportioned to Arizona, 4.4 maf to California, and 0.280 maf to Nevada

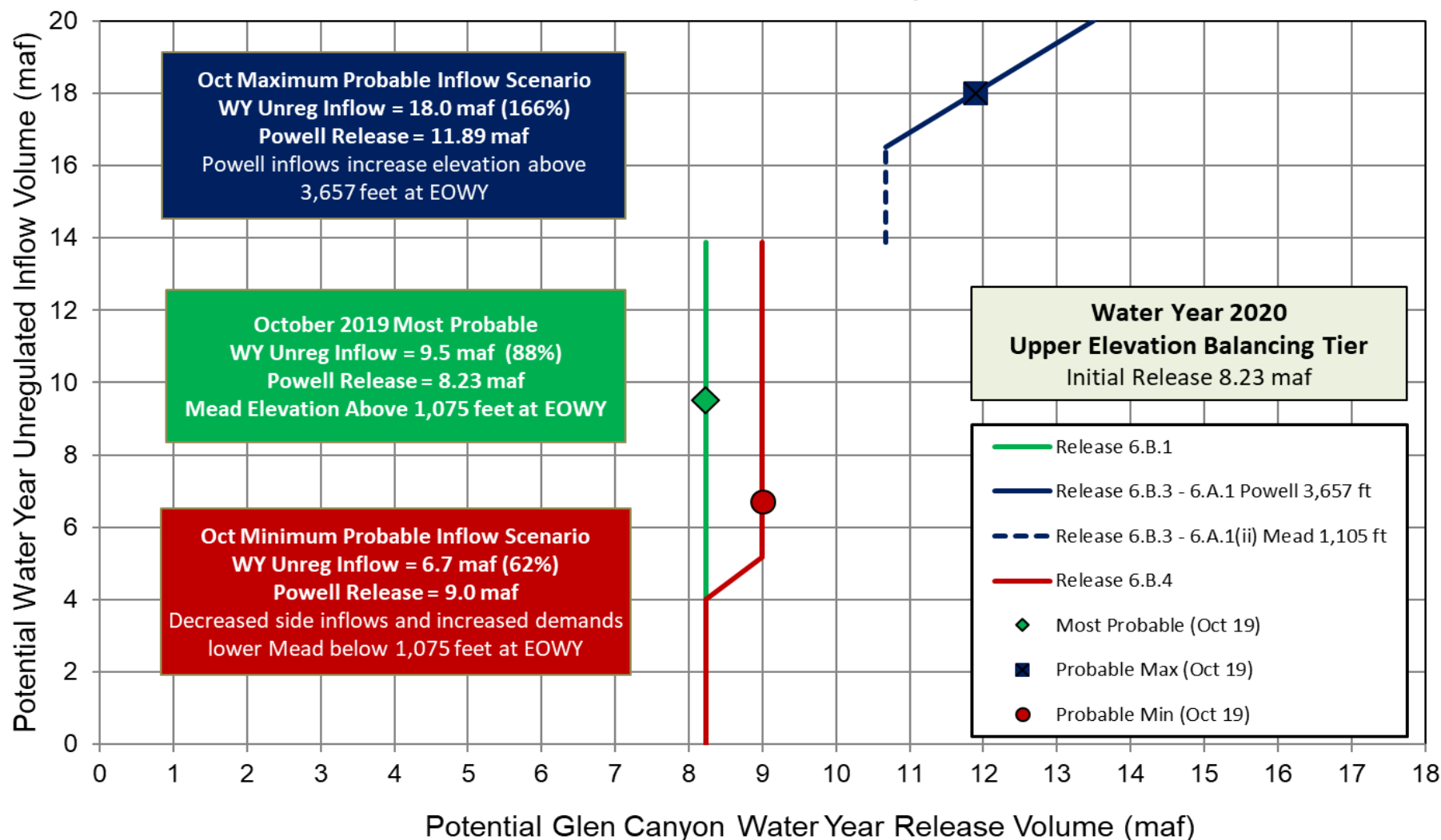
<sup>7</sup> Whenever Lake Mead is below elevation 1,025 feet, the Secretary shall consider whether hydrologic conditions together with anticipated deliveries to the Lower Division States and Mexico is likely to cause the elevation at Lake Mead to fall below 1,000 feet. Such consideration, in consultation with the Basin States, may result in the undertaking of further measures, consistent with applicable Federal law.

<sup>1</sup> Lake Powell and Lake Mead operational tier determinations were based on August 2019 24-Month Study projections and will be documented in the draft 2020 AOP.

# Release Scenarios

## Lake Powell Release Scenarios under Section 6.B

Water Year 2020 Release Volume as a Function of Upper Elevation Balancing Tier  
based on October 2019 24-Month Study Conditions

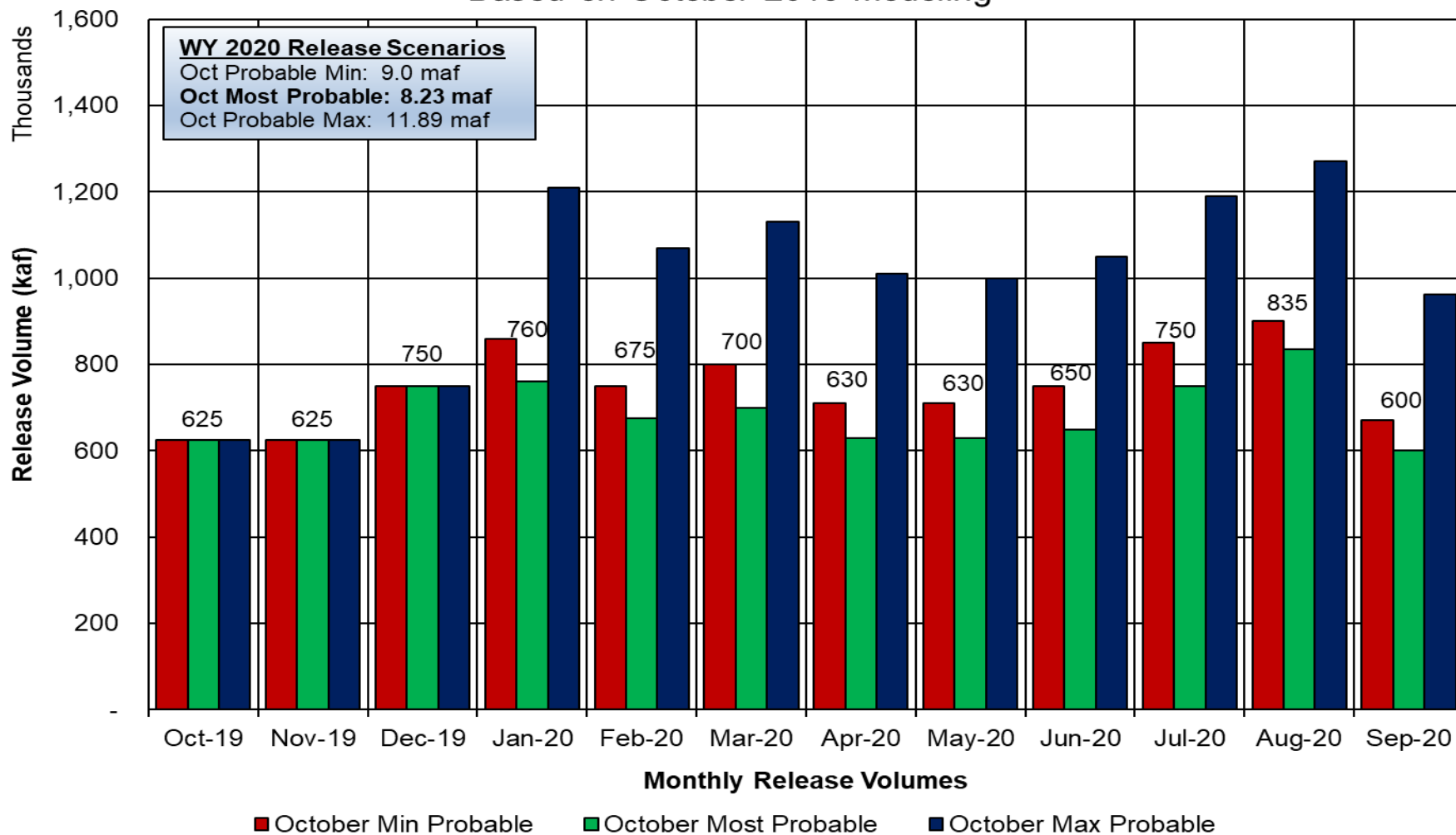


# Monthly Release Volumes

## Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2020

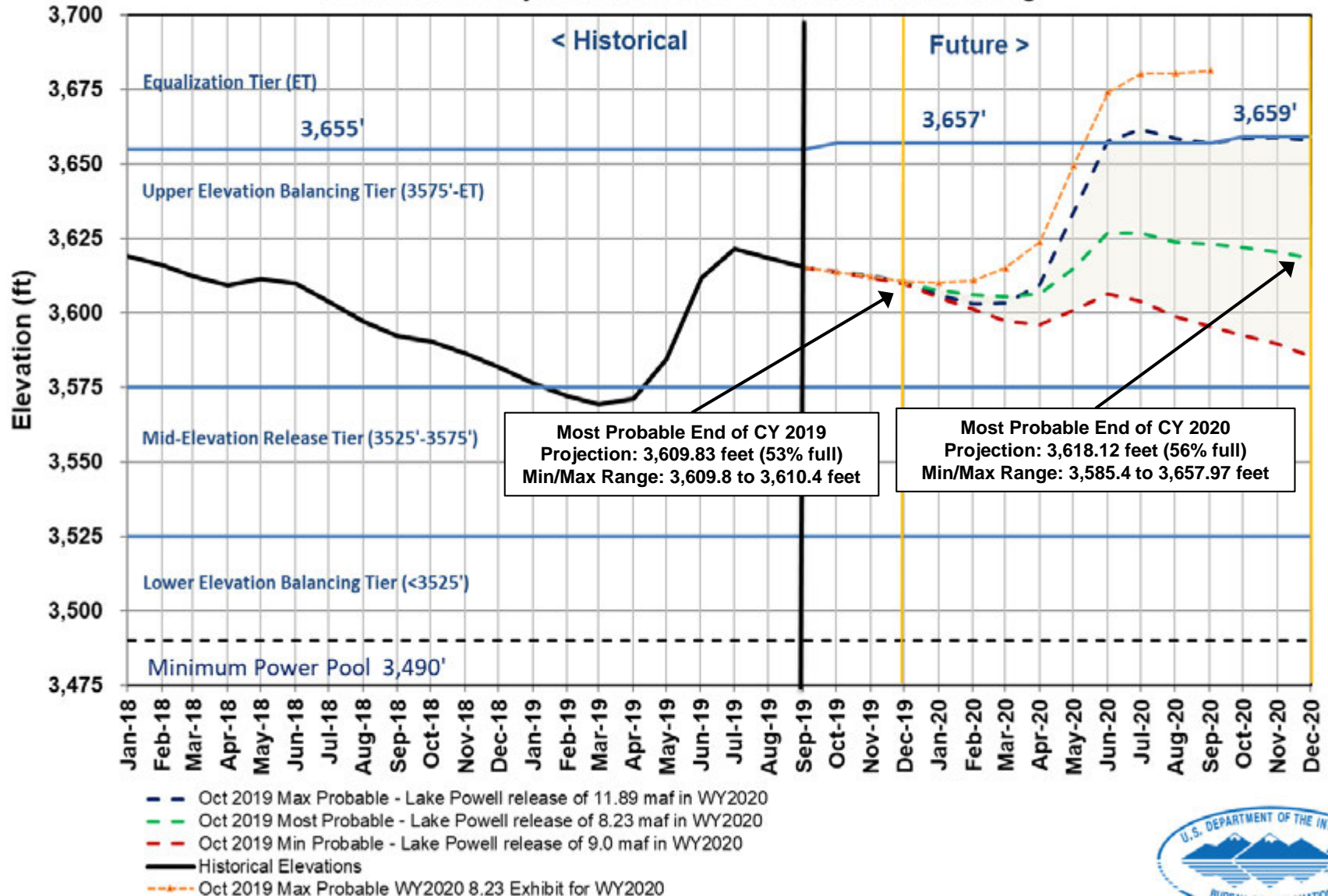
Based on October 2019 Modeling





# Powell Elevations

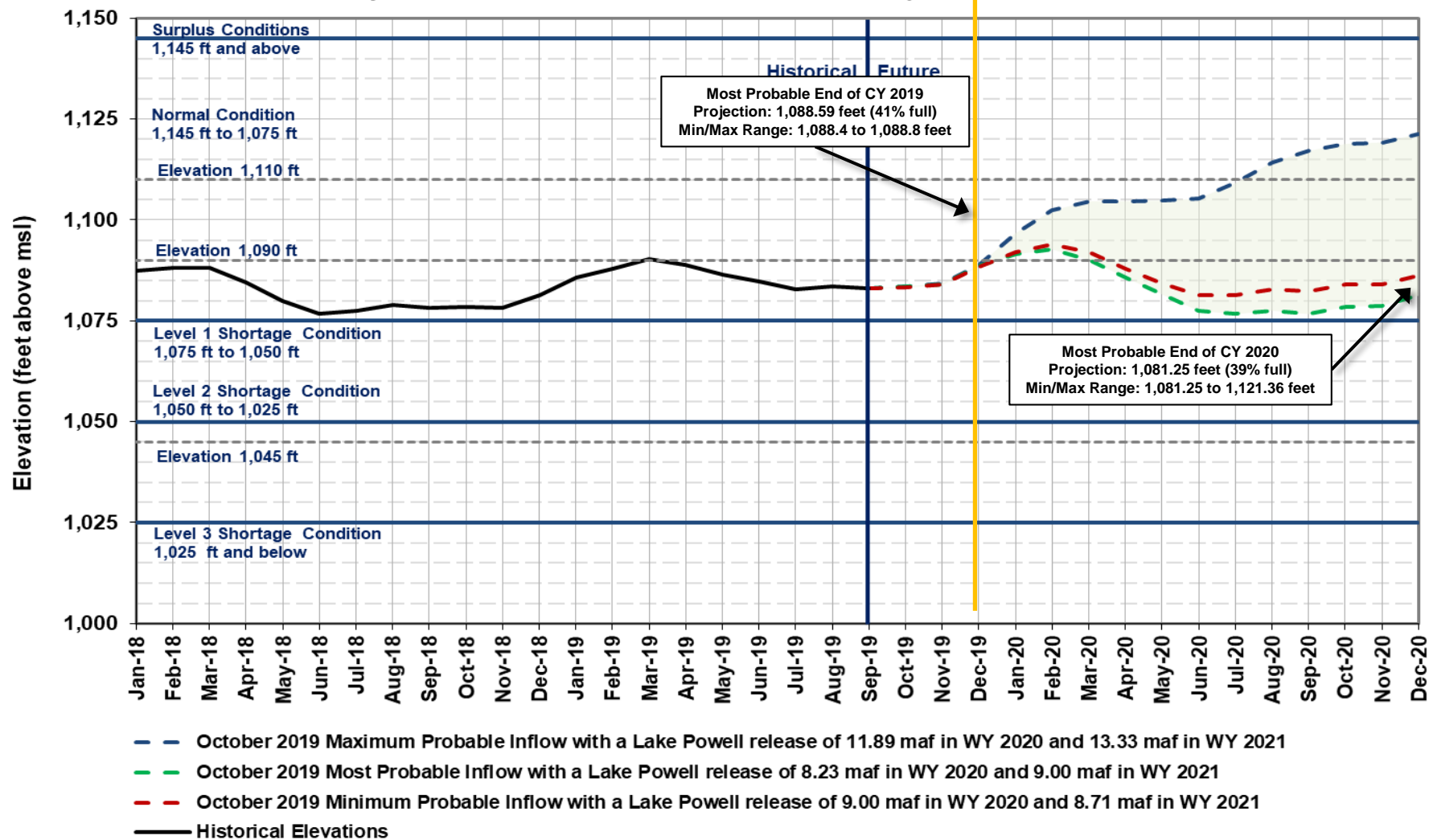
Lake Powell End of Month Elevations  
Historic and Projected based on October 2019 Modeling





# Mead Elevations

**Lake Mead End of Month Elevations**  
Projections from the October 2019 24-Month Study Inflow Scenarios



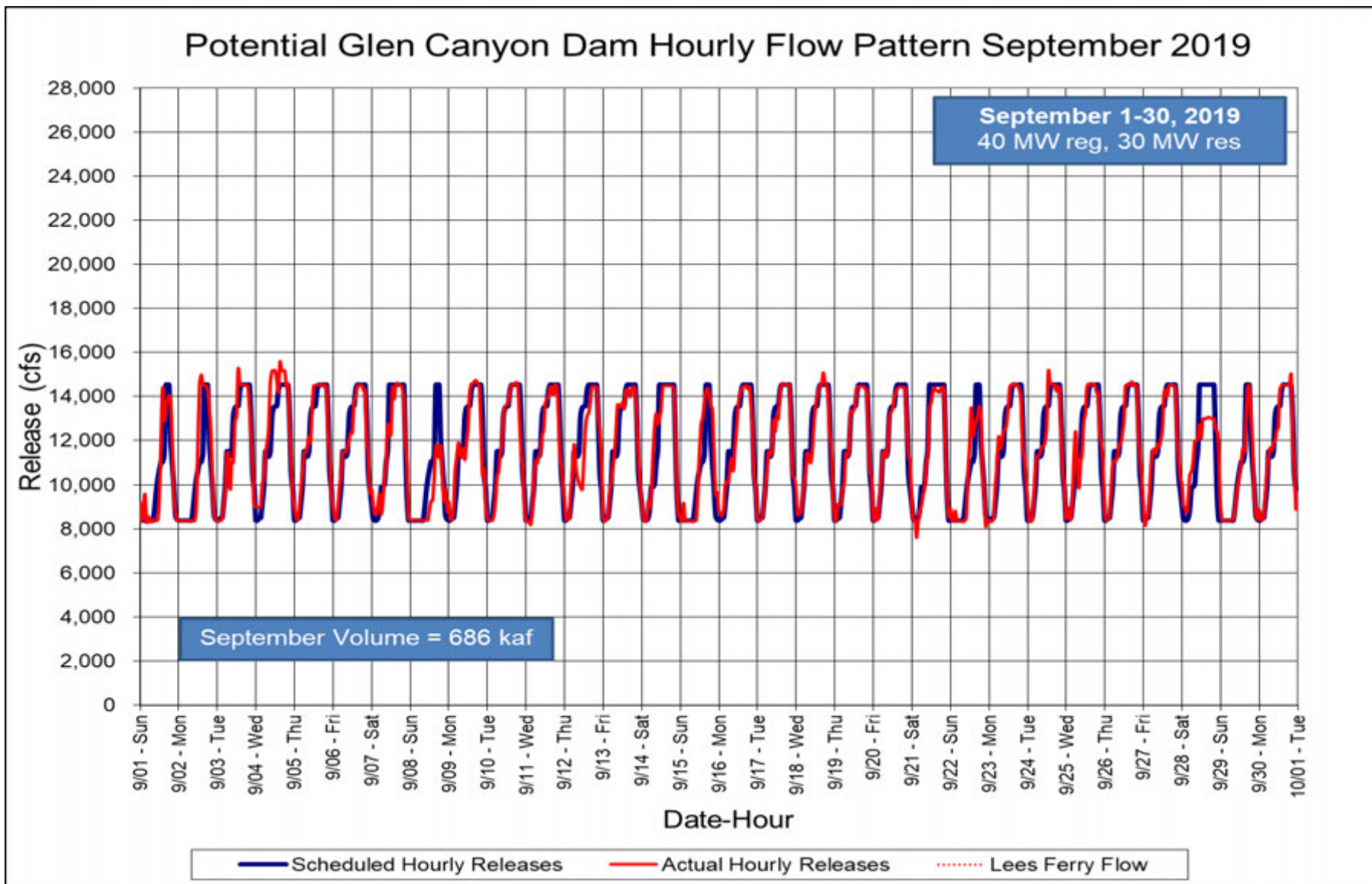
# Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2020

Unit Number	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020	
1													
2													
3													
4													
5													
6													
7													
8													
Units Available	5	5/6	6/8	6	6	6	6	6	6	6	6	6	
Capacity (cfs)	16,800	16,800 /22,520	20,500/ 28,000	20,500	20,400	20,400	20,400	20,600	20,900	20,900	20,800	20,800	MOST
Capacity (kaf/month)	1,060	1,160	1,420	1,330	1,170	1,250	1,220	1,320	1,280	1,330	1,320	1,310	MAX
Max (kaf) <sup>1</sup>	625	625	750	1,210	1,070	1,130	1,010	1,000	1,050	1,190	1,270	963	11.89
Most (kaf) <sup>2</sup>	625	625	750	760	675	700	630	630	650	750	835	600	8.23
Min (kaf) <sup>1</sup>	625	625	750	860	750	800	710	710	750	850	900	670	9.0
										(updated 10-09-2019)			

1 Projected release, based on Oct 2019 Min and Max Probable Inflow Projections and 24-Month Study model runs

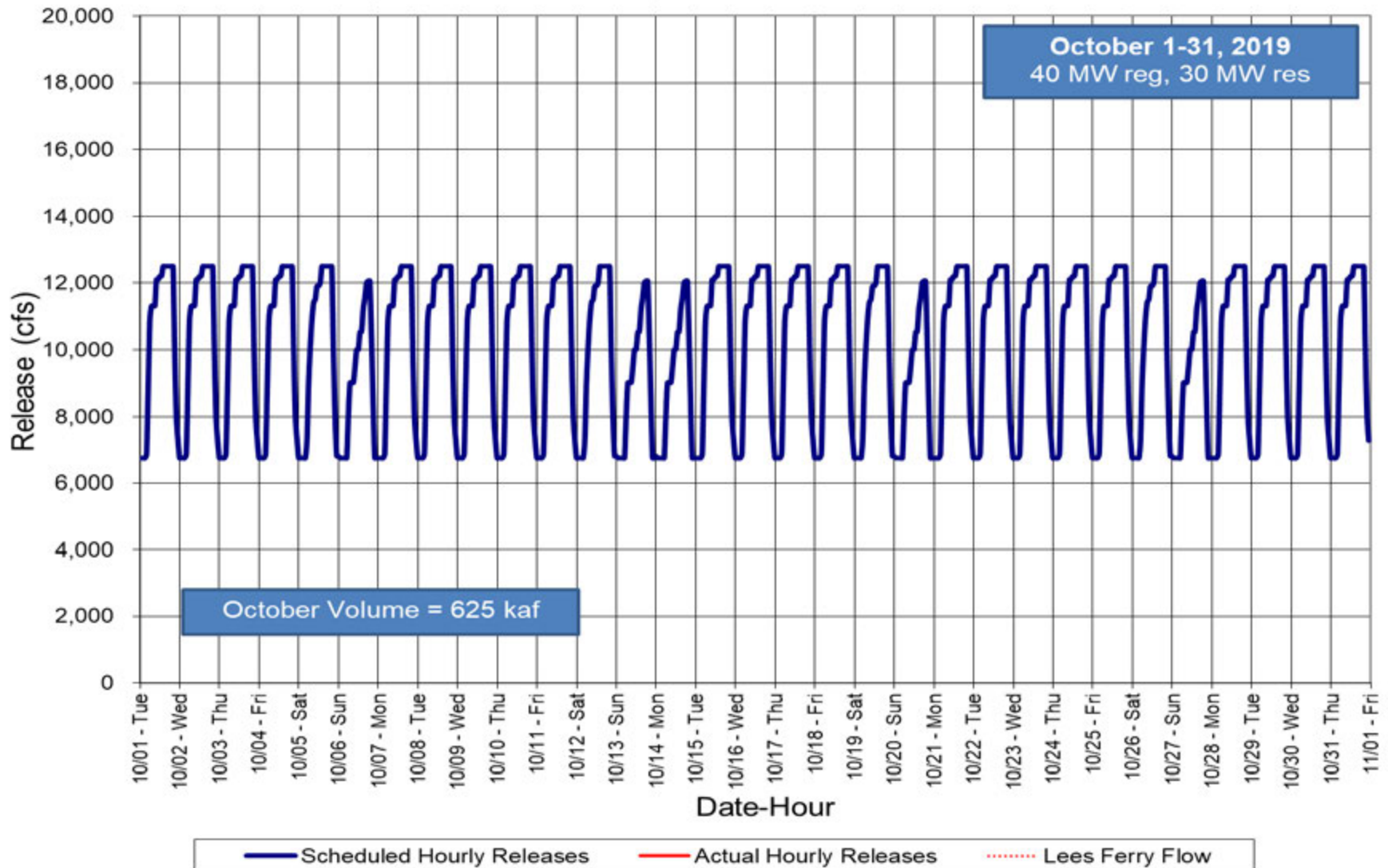
2 Projected release, based on October 2019 Most Probable Inflow Projections and 24-Month Study model runs

# September 2019 Hourly Releases

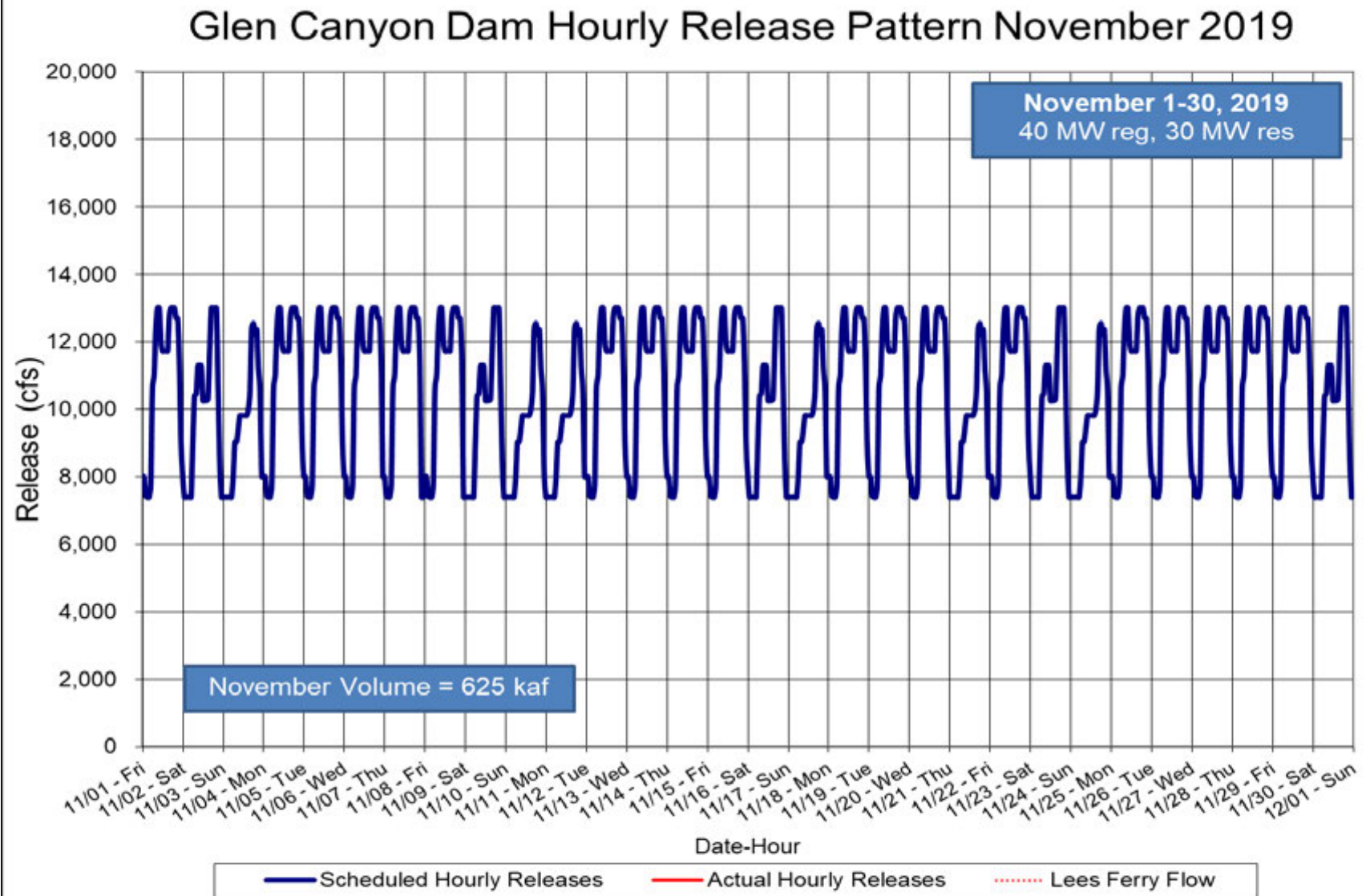


# October 2019 Hourly Releases

Glen Canyon Dam Hourly Release Pattern October 2019

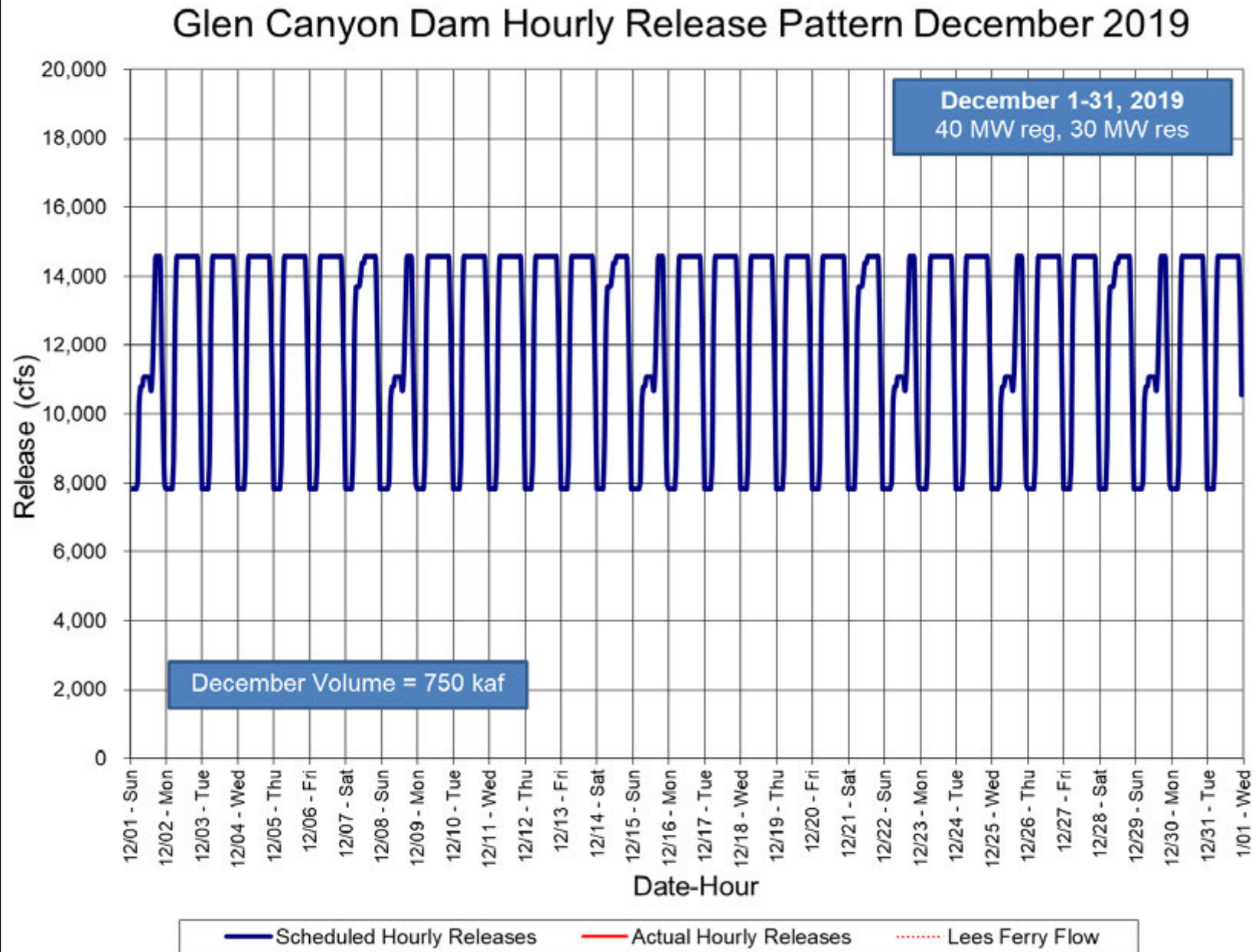


# November 2019 Hourly Releases



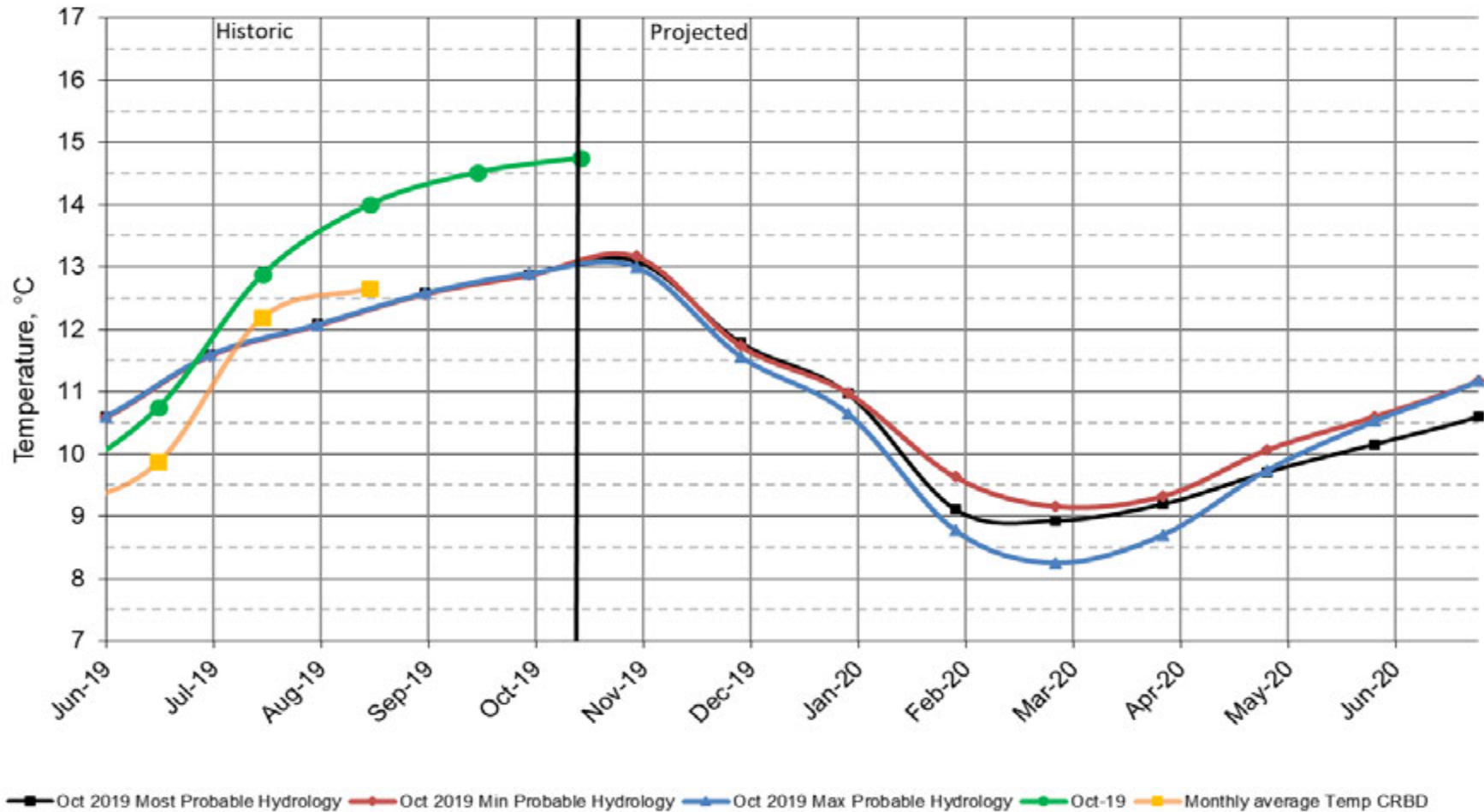


# December 2019 Hourly Releases



# Lake Powell Release Temperatures

Lake Powell Release Temperature  
Projected Temperature based on Oct 2019 Forecast

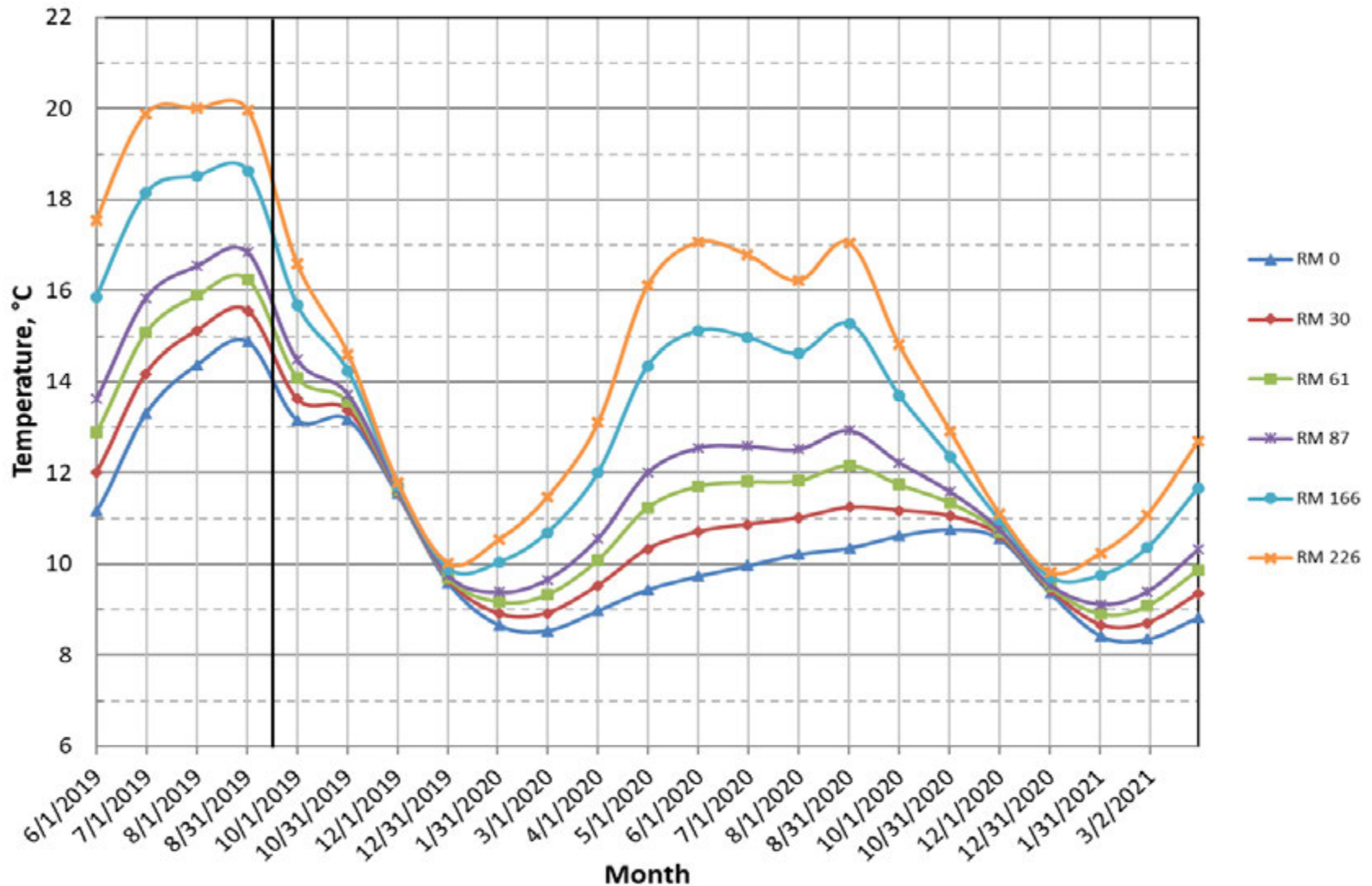


#Projection start date is based on initial conditions (Jan 2018)

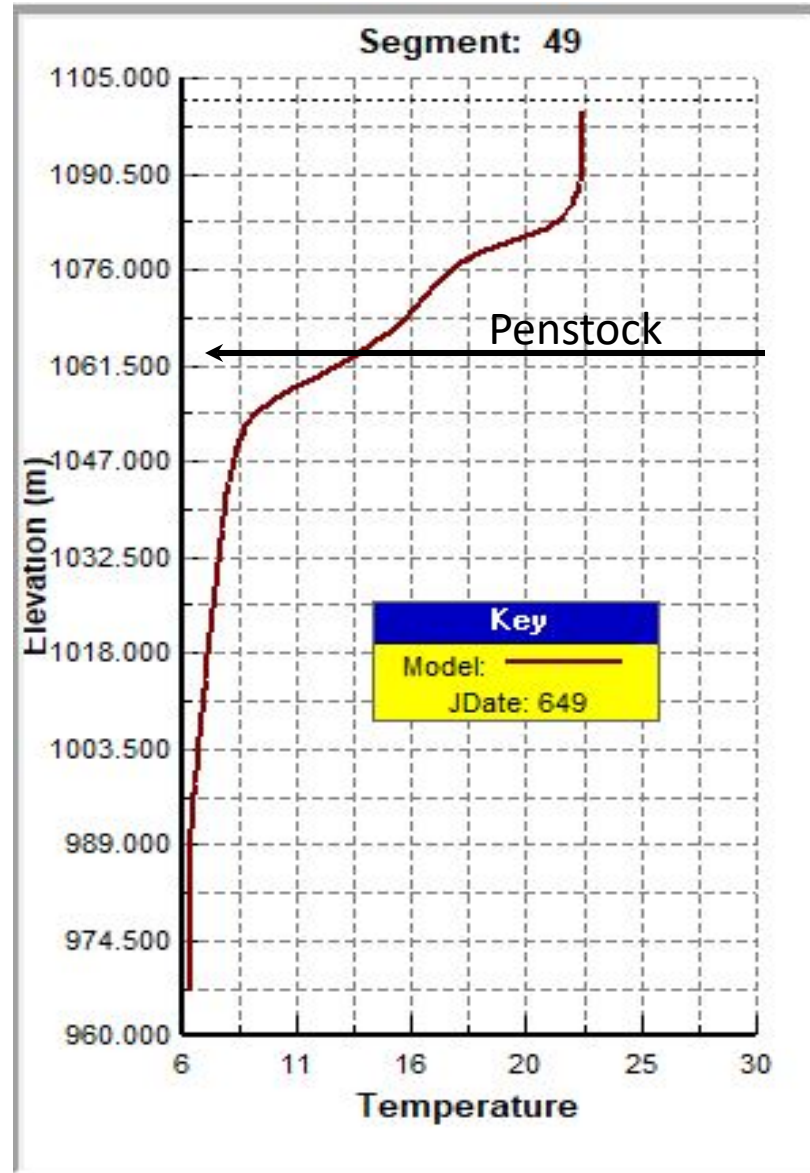


# Grand Canyon Water Temperatures

Colorado River, Grand Canyon Water Temperatures  
Projections based on Sept 2019, Most Probable Hydrology

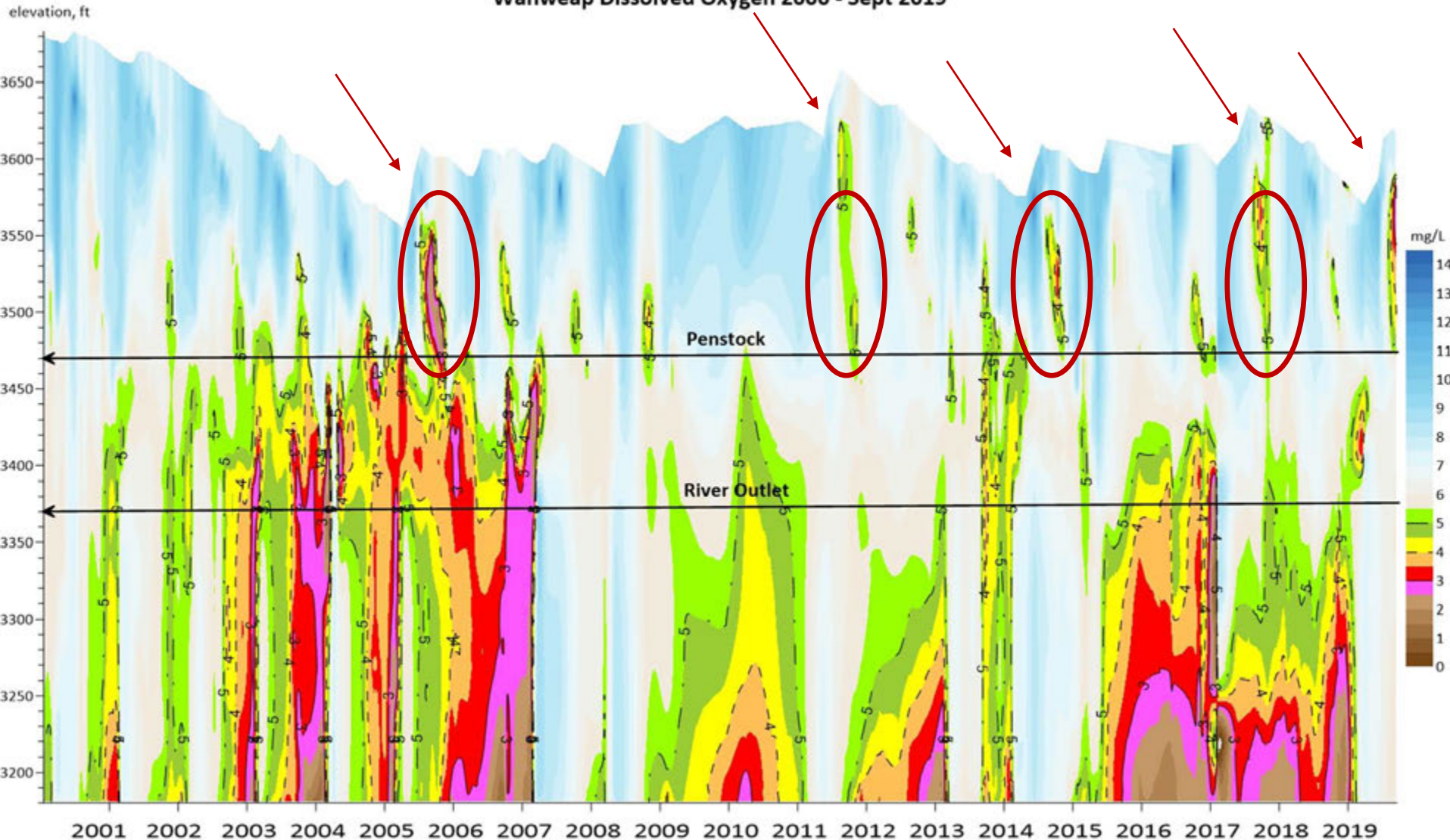


# Lake Powell Reservoir Temperature Profile

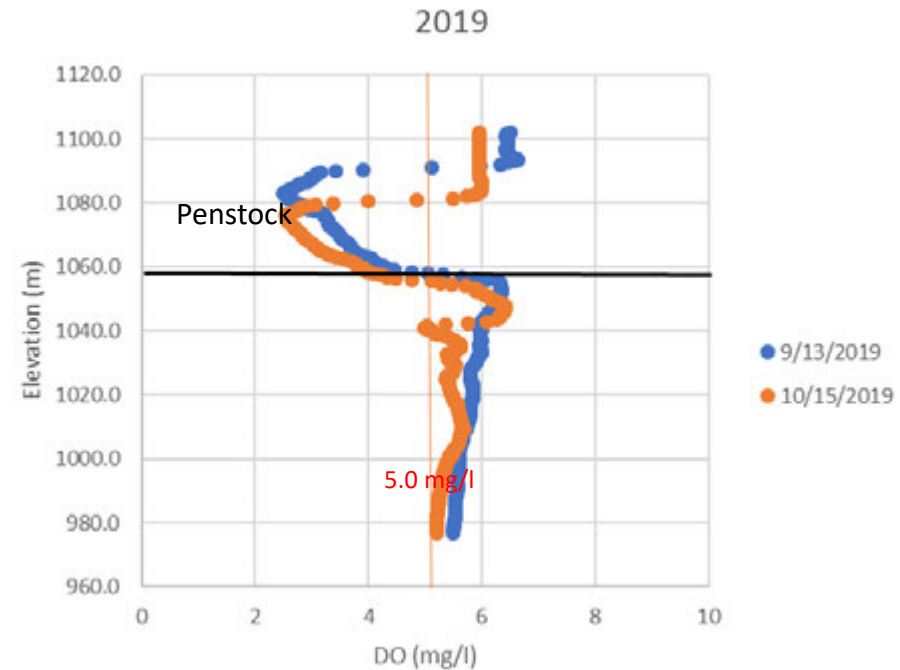
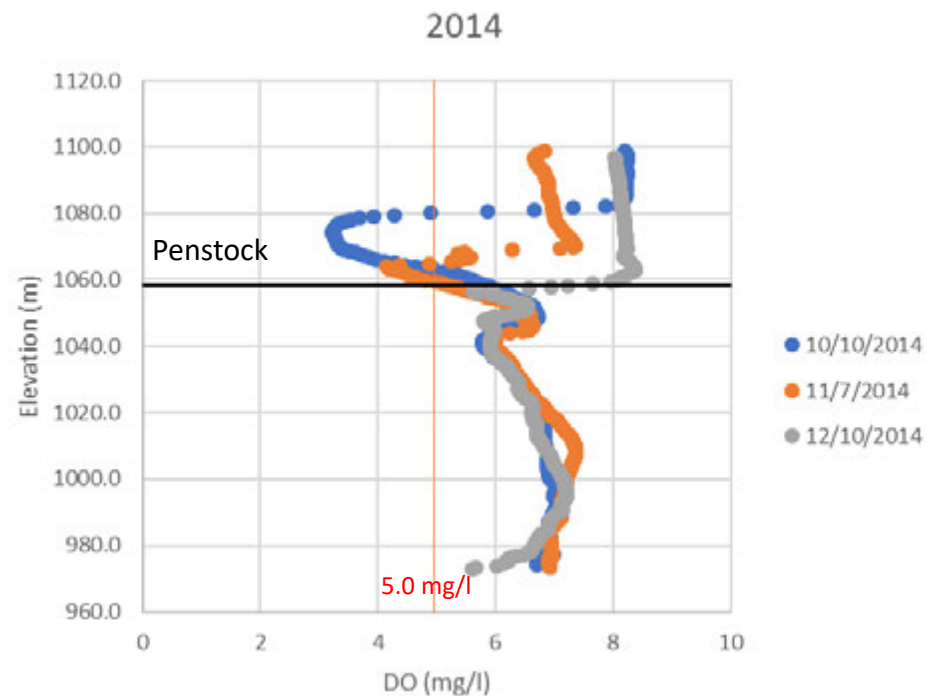
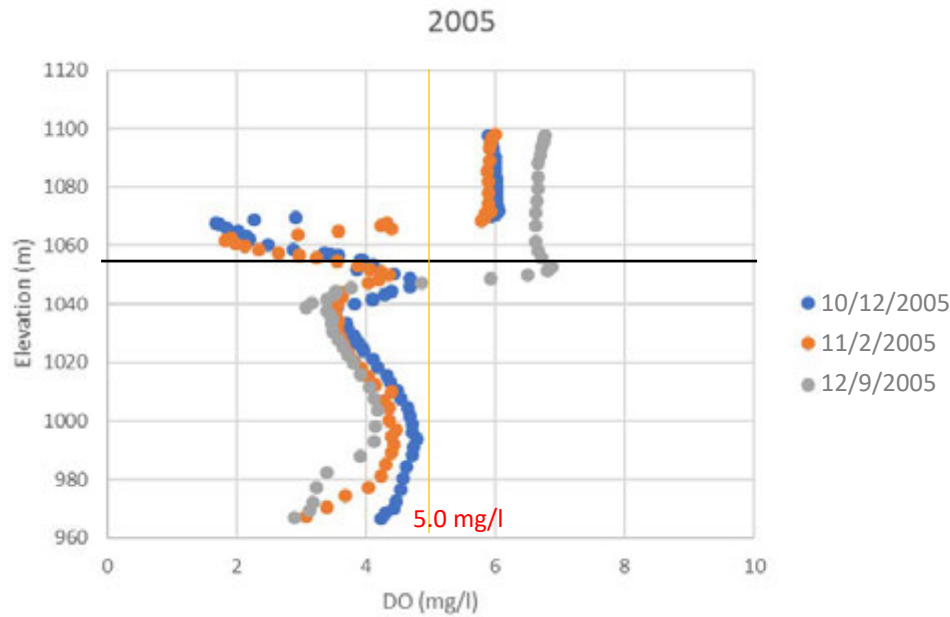


# Historical Dissolved Oxygen

Wahweap Dissolved Oxygen 2000 - Sept 2019



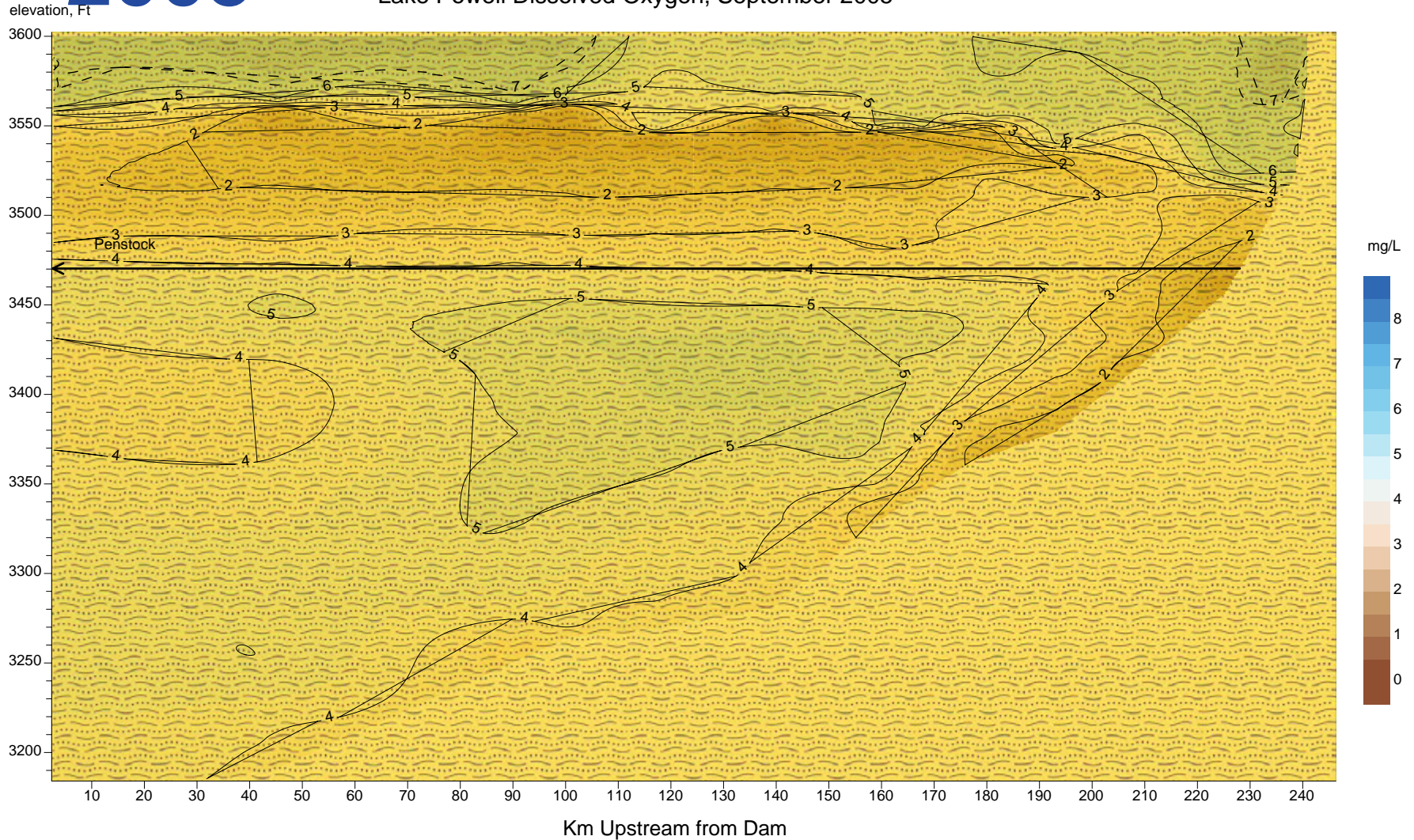
# Dissolved Oxygen Comparison





# Dissolved Oxygen, September 2005

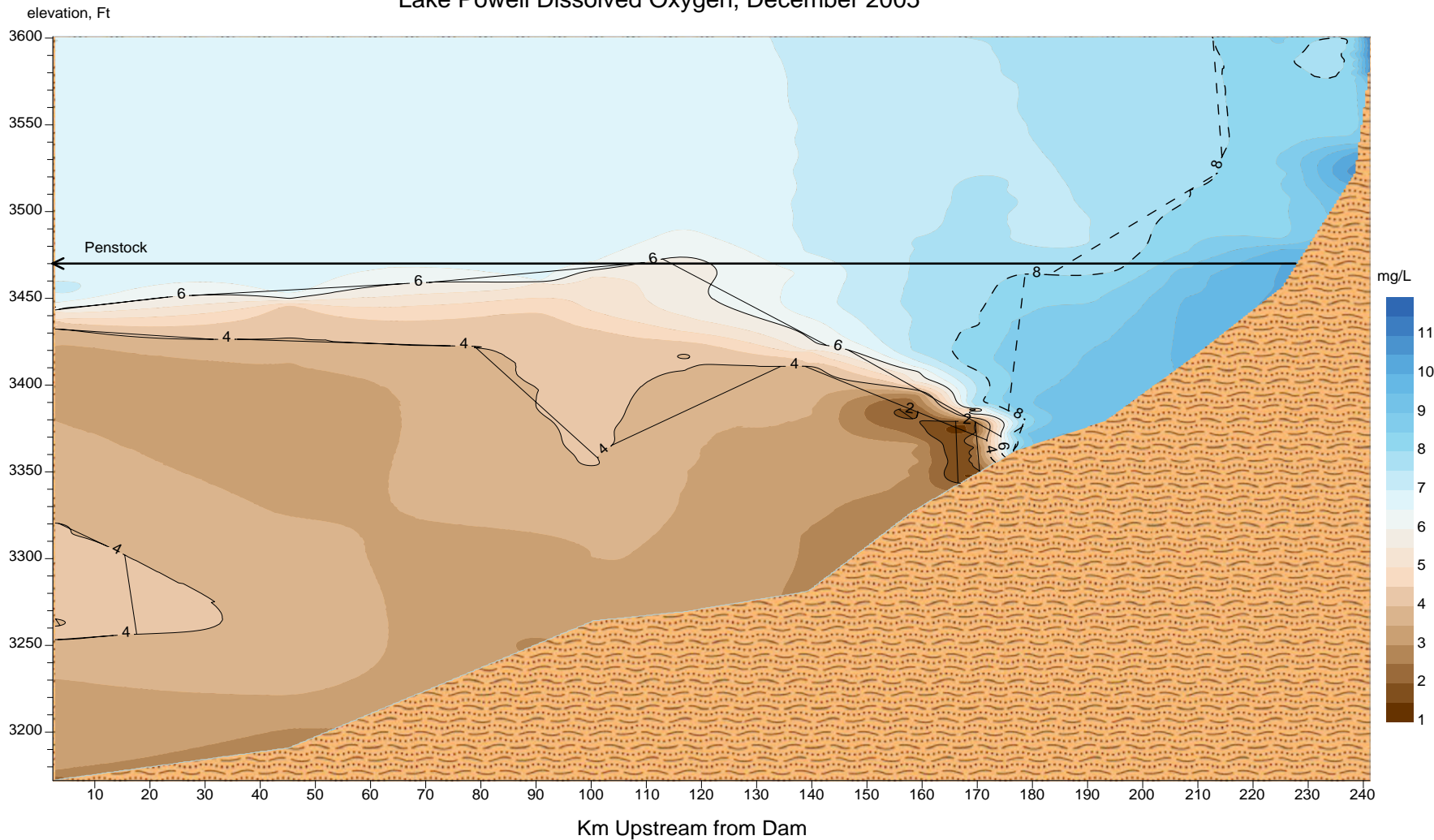
Lake Powell Dissolved Oxygen, September 2005





# Dissolved Oxygen, December 2005

Lake Powell Dissolved Oxygen, December 2005



# Questions and Discussion



**RECLAMATION**  
*Managing Water in the West*