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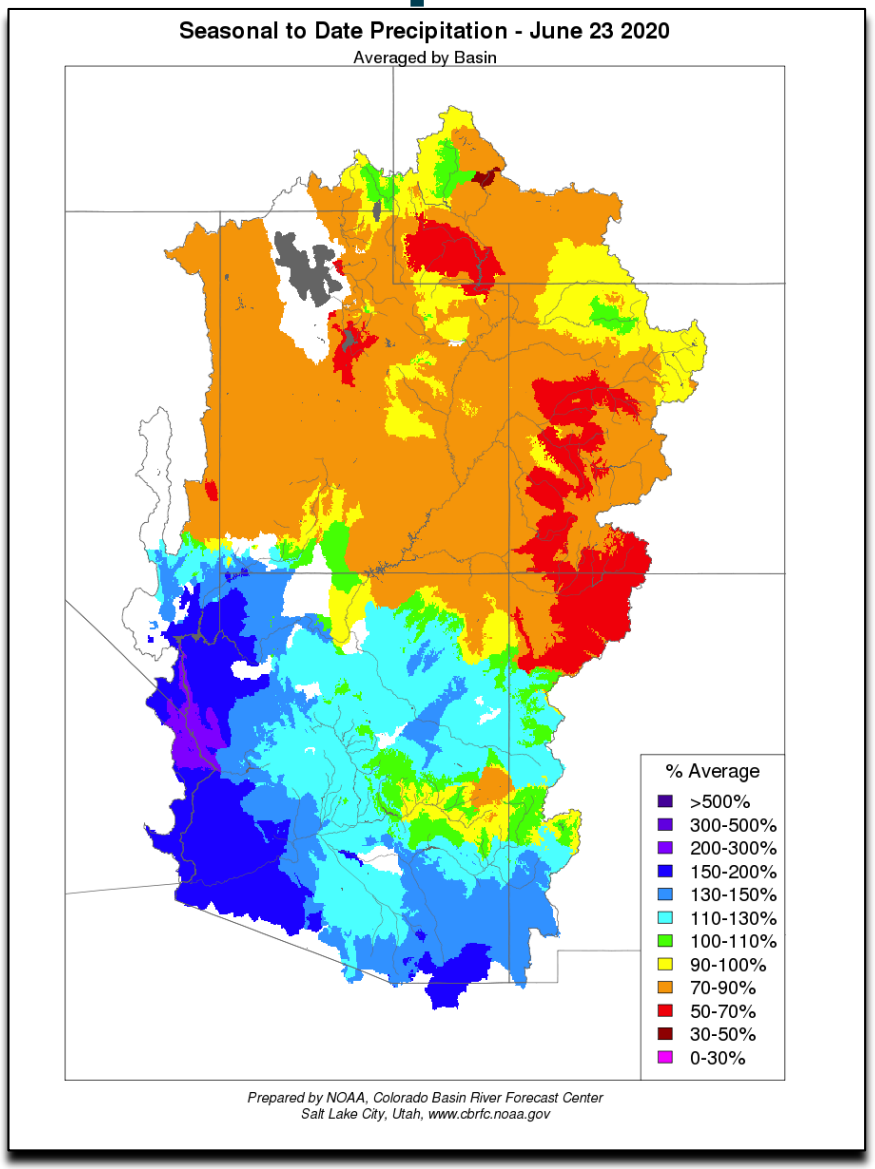
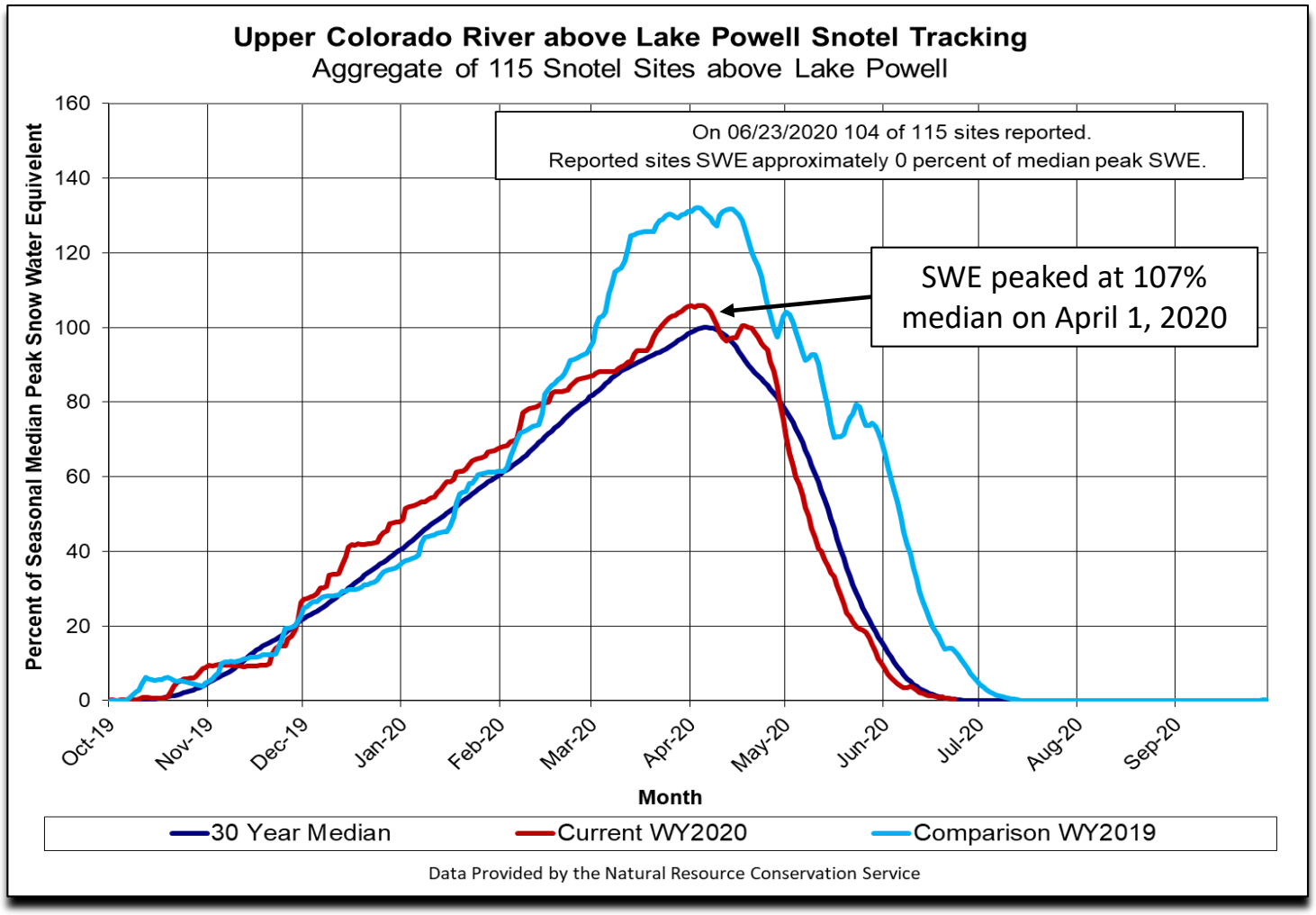
Glen Canyon Monthly Hydrology and Operations Update

June 25, 2020

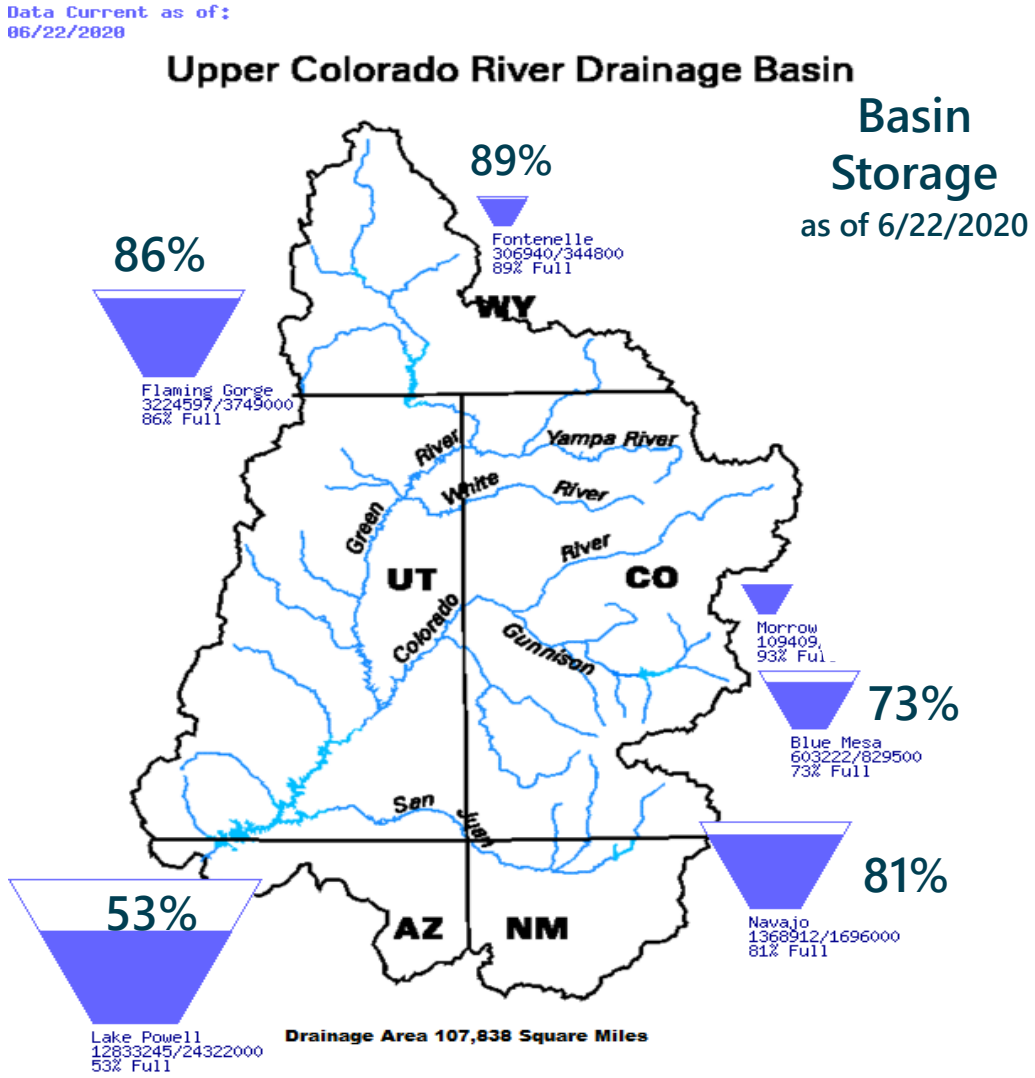
Heather E. Patno
Hydraulic Engineer

Precipitation and Snow Conditions





Upper Basin Storage



Basin Storage
as of 6/22/2020

2020 April – July Unregulated Inflow Forecast

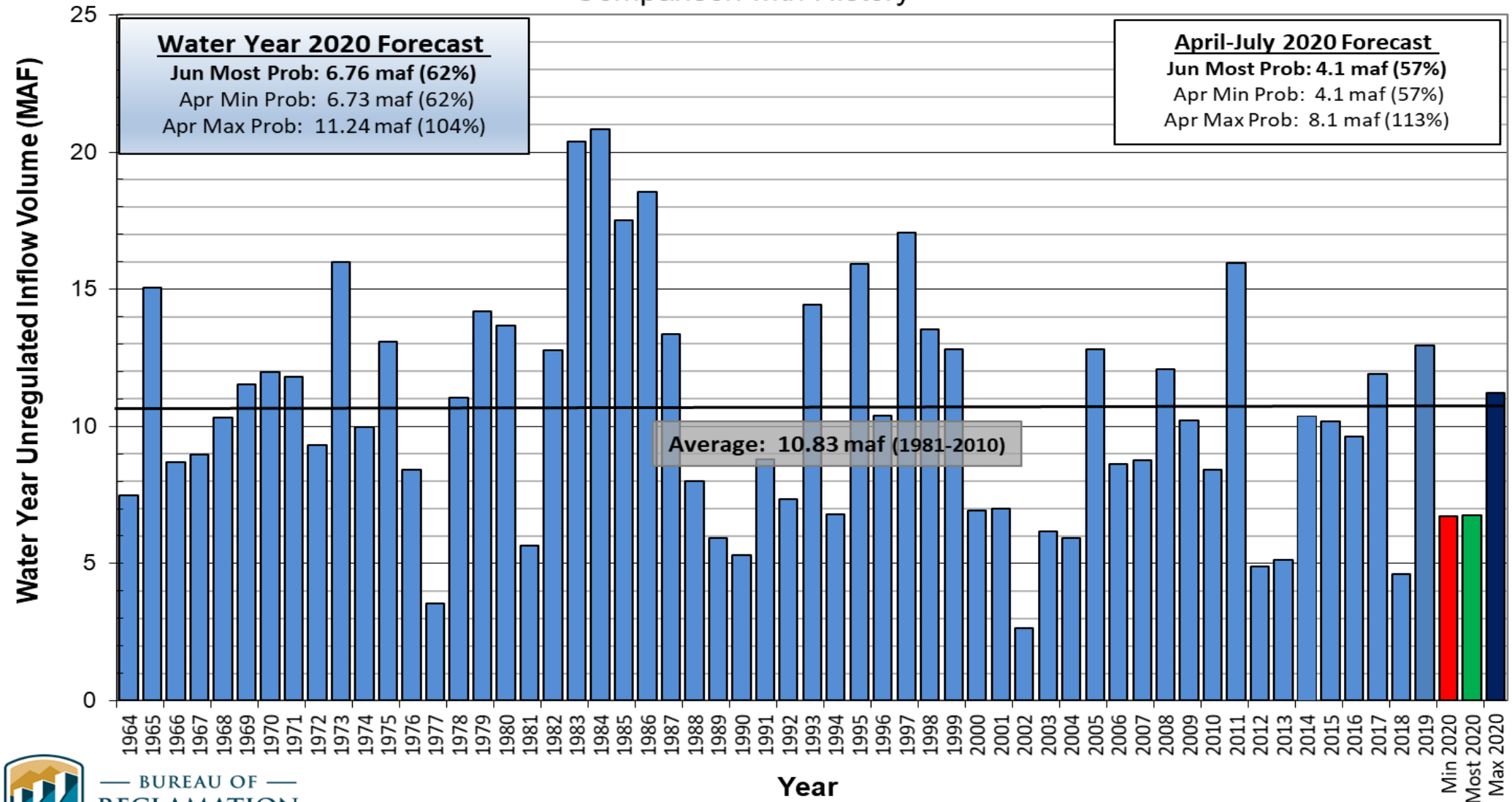
as of June 16, 2020

Reservoir	Forecast (kaf)	Percent of Average[1]
Fontenelle	610	84
Flaming Gorge	770	79
Blue Mesa	395	59
Navajo	365	50
Powell	4,100	57

[1] Percent of average based on the period of record from 1981-2010.

Available online at: www.usbr.gov/uc/water/basin/index.html

Lake Powell Unregulated Inflow
Water Year 2020 Forecast *(issued June 3)*
Comparison with History



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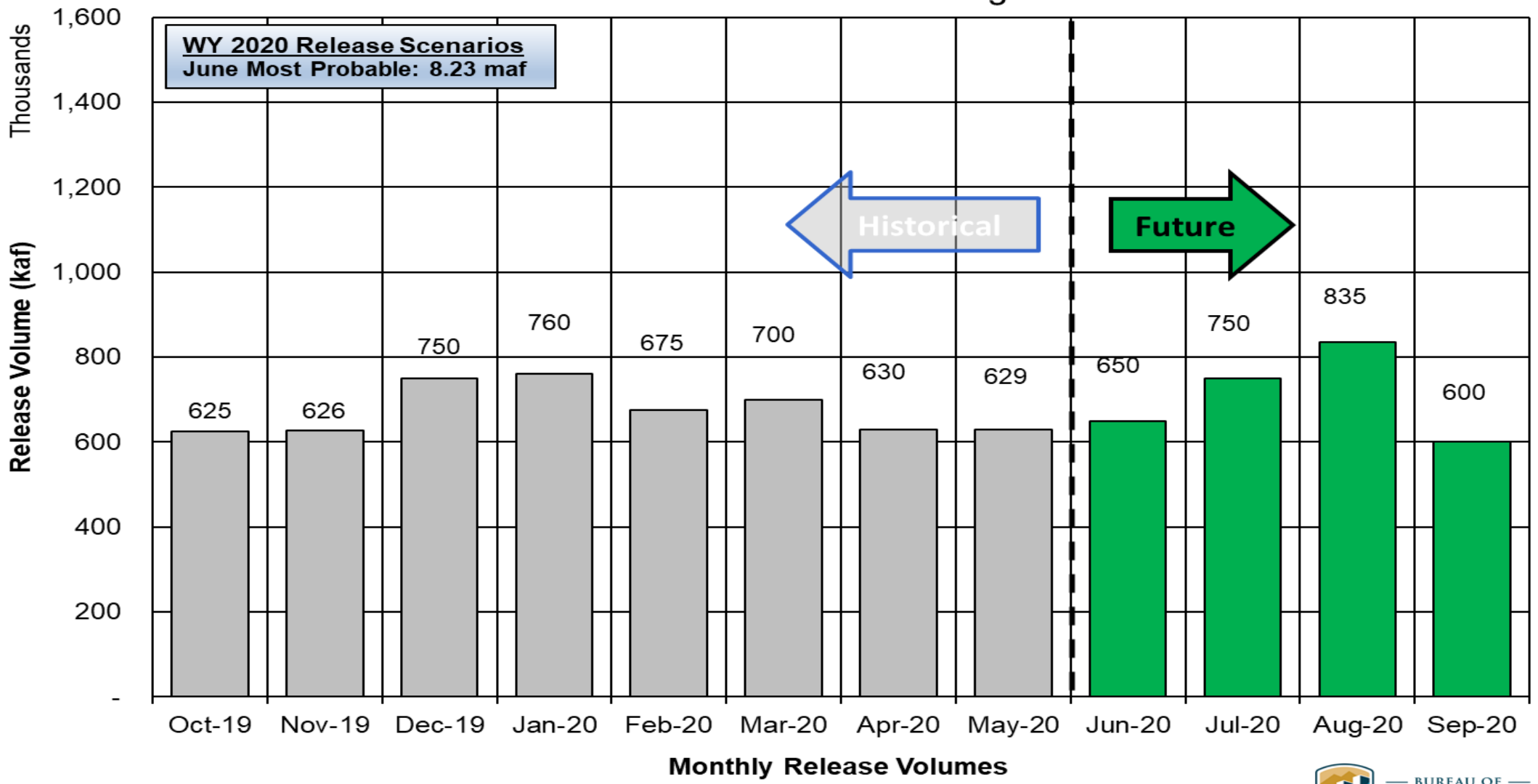
Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2020

Based on June 2020 Modeling



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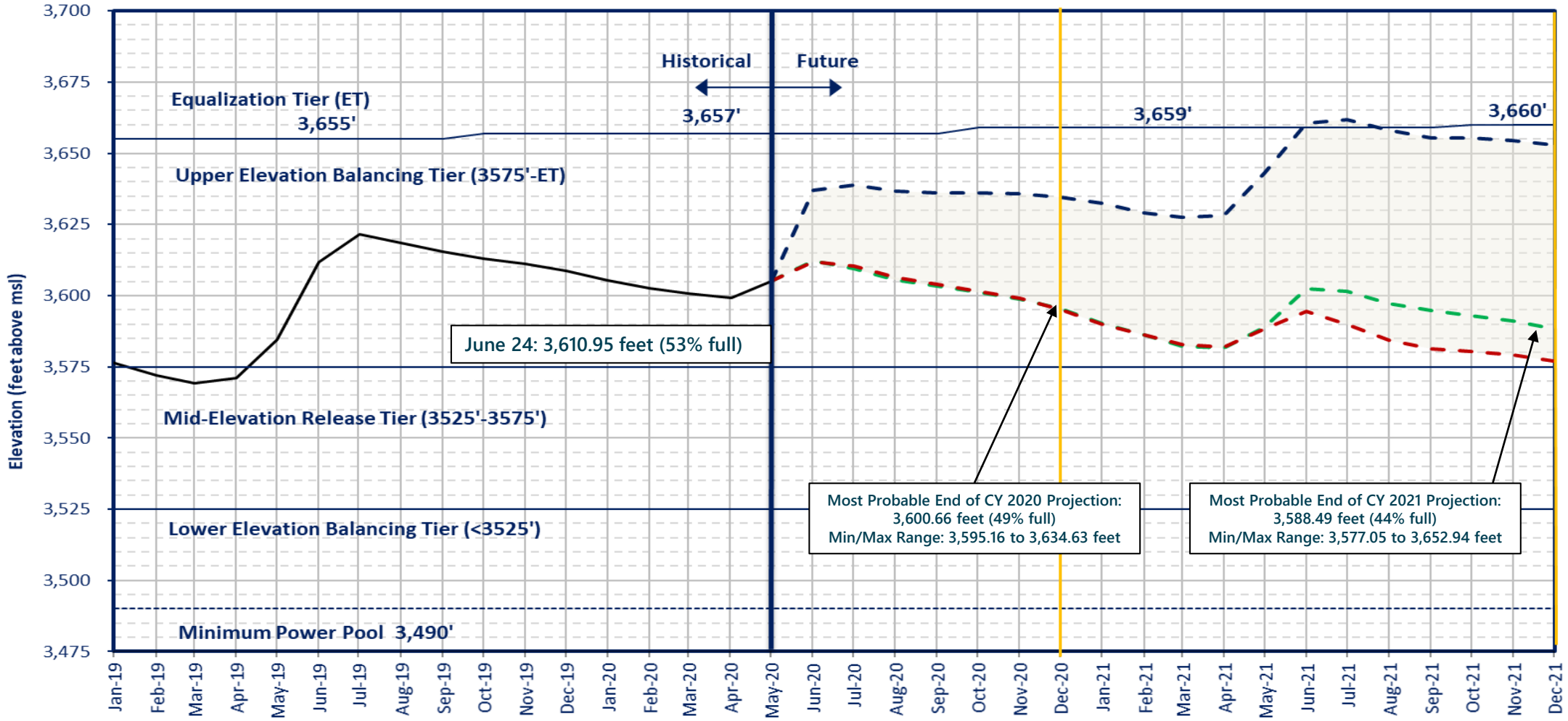
Lake Powell WY 2021 Operating Tier Scenarios

Based on April and June 2020 24-Month Study

Inflow Scenario	Operating Tier/ Release Volume
April Minimum Probable	Upper Elevation Balancing 9.00 maf
June Most Probable	Upper Elevation Balancing 9.00 maf
April Maximum Probable	Equalization 10.81 maf

Lake Powell End of Month Elevations

Historic and Projected based on April and June 2020 24-Month Study Inflow Scenarios



June 2020 Most Probable - Lake Powell release of 8.23 maf in WY2020 and 9.0 maf in WY2021

Apr 2020 Max Probable - Lake Powell release of 8.23 maf in WY2020 and 10.81 maf in WY2021

Apr 2020 Min Probable - Lake Powell release of 8.23 maf in WY2020 and 9.0 in WY2021

Historical Elevations

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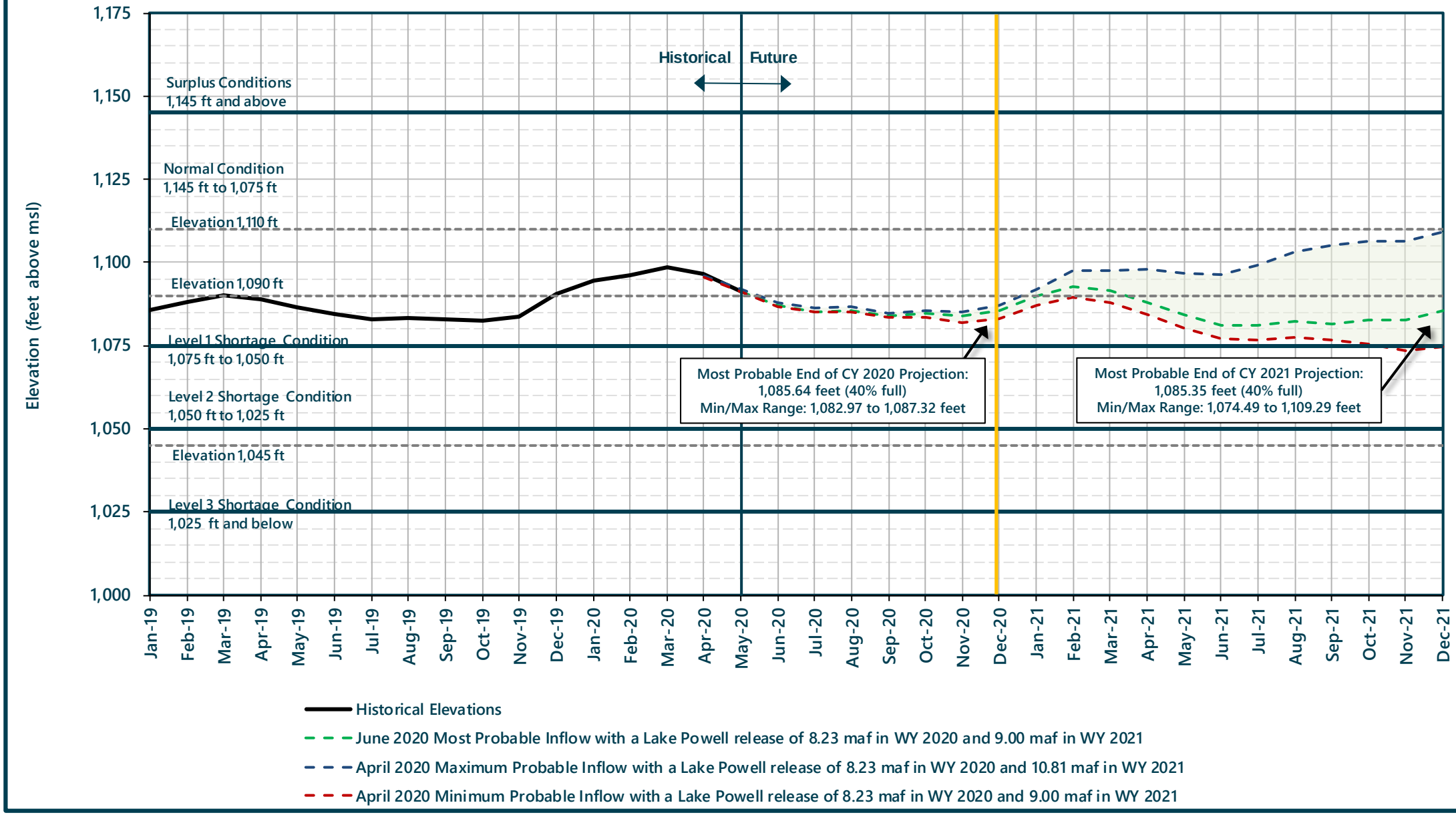
Lake Mead End of Month Elevations

Projections from the April and June 2020 24-Month Study Inflow Scenarios



Historical Elevations

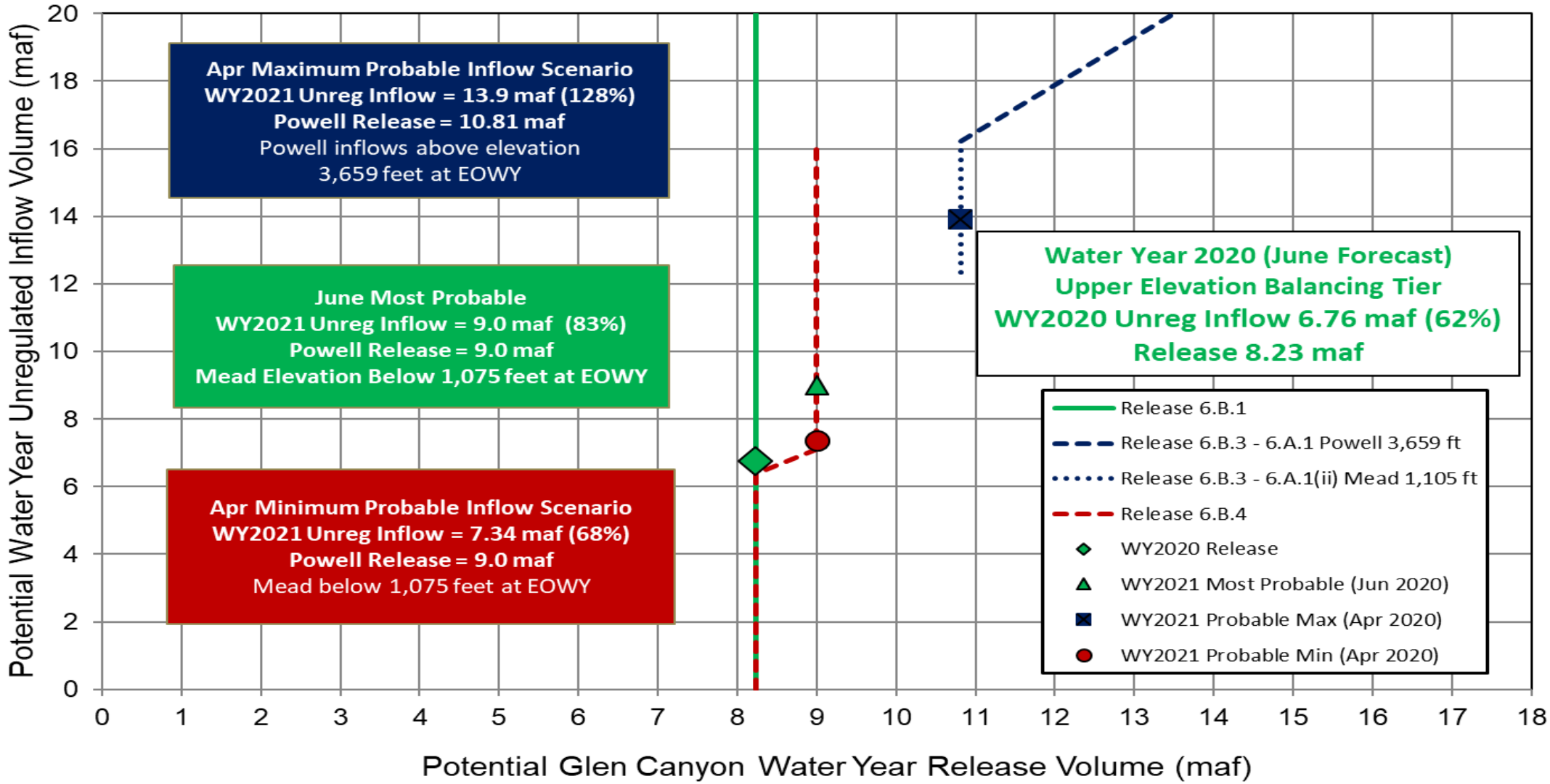
June 2020 Most Probable Inflow with a Lake Powell release of 8.23 maf in WY 2020 and 9.00 maf in WY 2021

April 2020 Maximum Probable Inflow with a Lake Powell release of 8.23 maf in WY 2020 and 10.81 maf in WY 2021

April 2020 Minimum Probable Inflow with a Lake Powell release of 8.23 maf in WY 2020 and 9.00 maf in WY 2021

Lake Powell Release Scenarios under Section 6.B

Water Year 2020 and 2021 Release Volume as a Function of Upper Elevation Balancing Tier
based on April and June 2020 24-Month Study Conditions



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	6	6	6	6	5	6	6	6	6	6	6	
Capacity (cfs)	16,800	20,500	20,400	20,400	20,300	16,500	20,200	20,400	20,600	20,500	20,400	20,400	JUNE MOST[3]
Capacity (kaf/month)	1,060	1,160	1,420	1,250	1,180	1,100	1,210	1,300	1,390	1,670	1,380	1,210	APR MAX
Max (kaf) [2]	625	625	750	760	675	700	630	630	650	750	835	599	8.23
Most (kaf) [1]	625	625	750	760	675	700	630	630	650	750	835	599	8.23
Min (kaf) [2]	625	625	750	760	675	700	630	630	650	750	835	599	8.23
												(updated 06-22-2020)	

1 Projected release, based on June 2020 MOST Probable Inflow Projections and 24-Month Study model runs
2 Projected release, based on April 2020 Min and Max Probable Inflow Projections and 24-Month Study model runs
3 *Dependent upon availability to shift regulation and reserves

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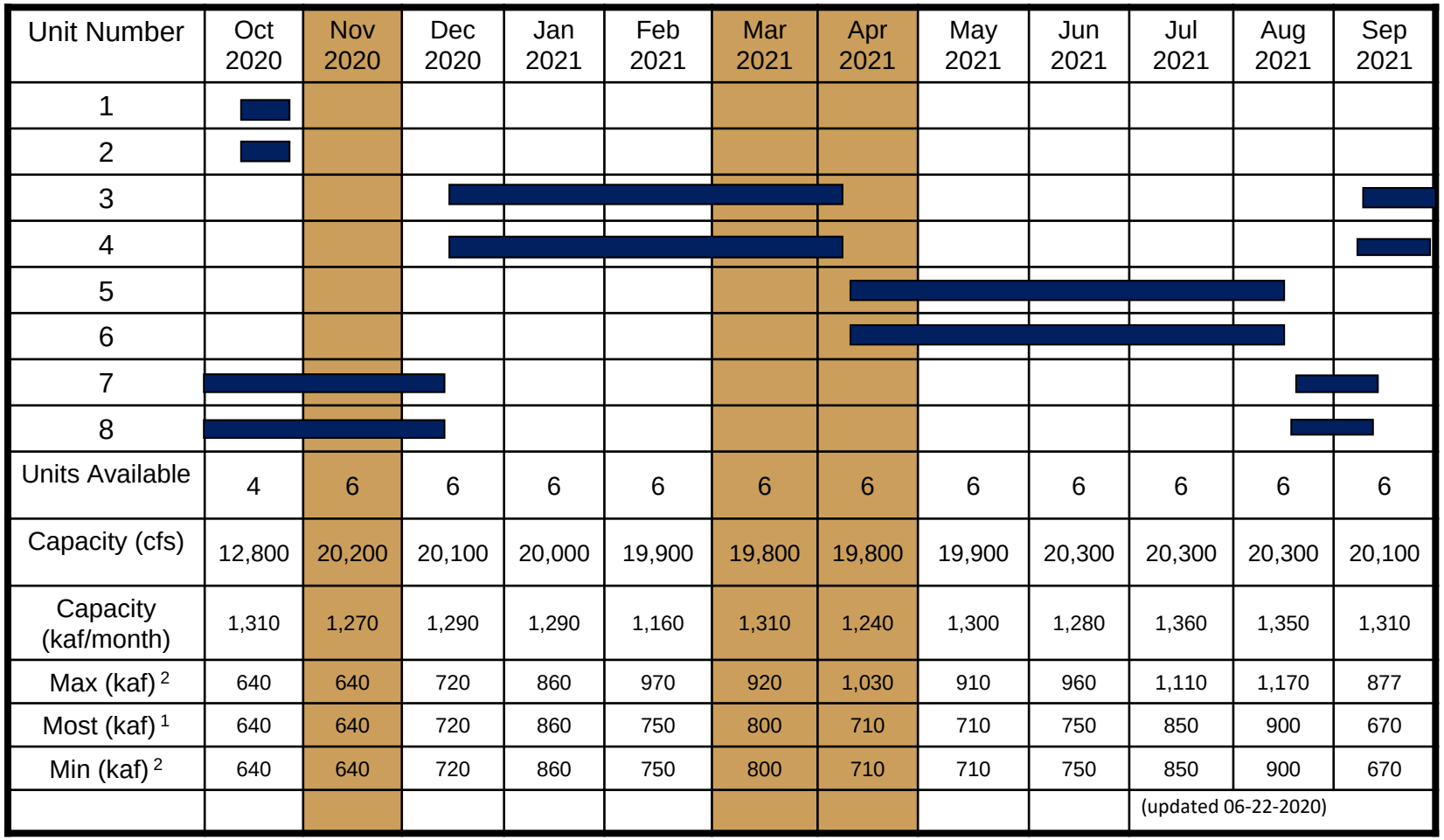
Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2021



Unit Number	Oct 2020	Nov 2020	Dec 2020	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	Jun 2021	Jul 2021	Aug 2021	Sep 2021	
1													
2													
3													
4													
5													
6													
7													
8													
Units Available	4	6	6	6	6	6	6	6	6	6	6	6	
Capacity (cfs)	12,800	20,200	20,100	20,000	19,900	19,800	19,800	19,900	20,300	20,300	20,300	20,100	JUNE MOST[3]
Capacity (kaf/month)	1,310	1,270	1,290	1,290	1,160	1,310	1,240	1,300	1,280	1,360	1,350	1,310	APR MAX
Max (kaf) [2]	640	640	720	860	970	920	1,030	910	960	1,110	1,170	877	10.81
Most (kaf) [1]	640	640	720	860	750	800	710	710	750	850	900	670	9.0
Min (kaf) [2]	640	640	720	860	750	800	710	710	750	850	900	670	9.0
										(updated 06-22-2020)			

1 Projected release, based on June 2020 Most Probable Inflow Projections and 24-Month Study model runs
2 Projected release, based on April 2020 Min and Max Probable Inflow Projections and 24-Month Study model runs
3 Dependent upon availability to shift regulation and reserves

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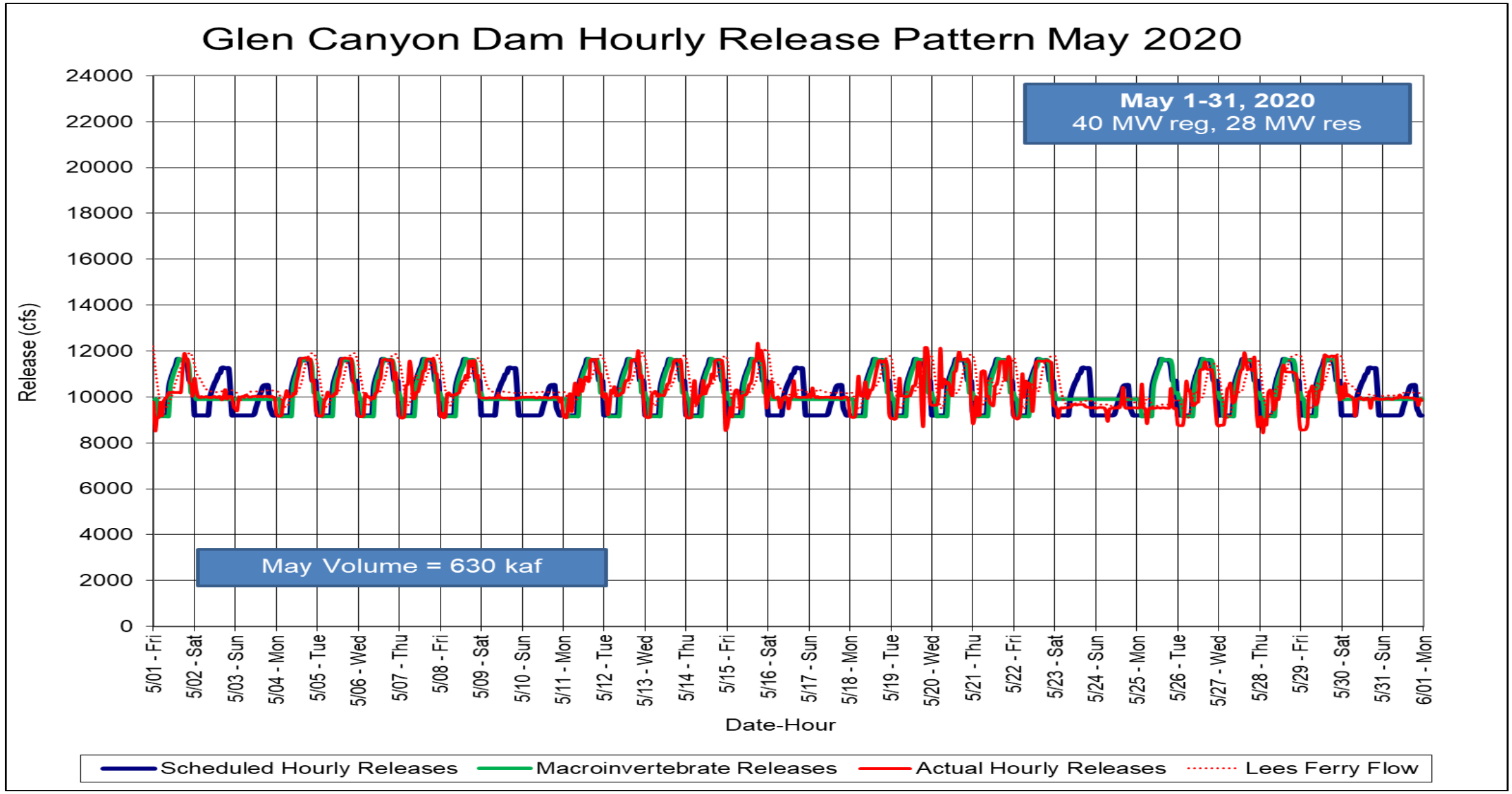
Bug Flow Hydrograph

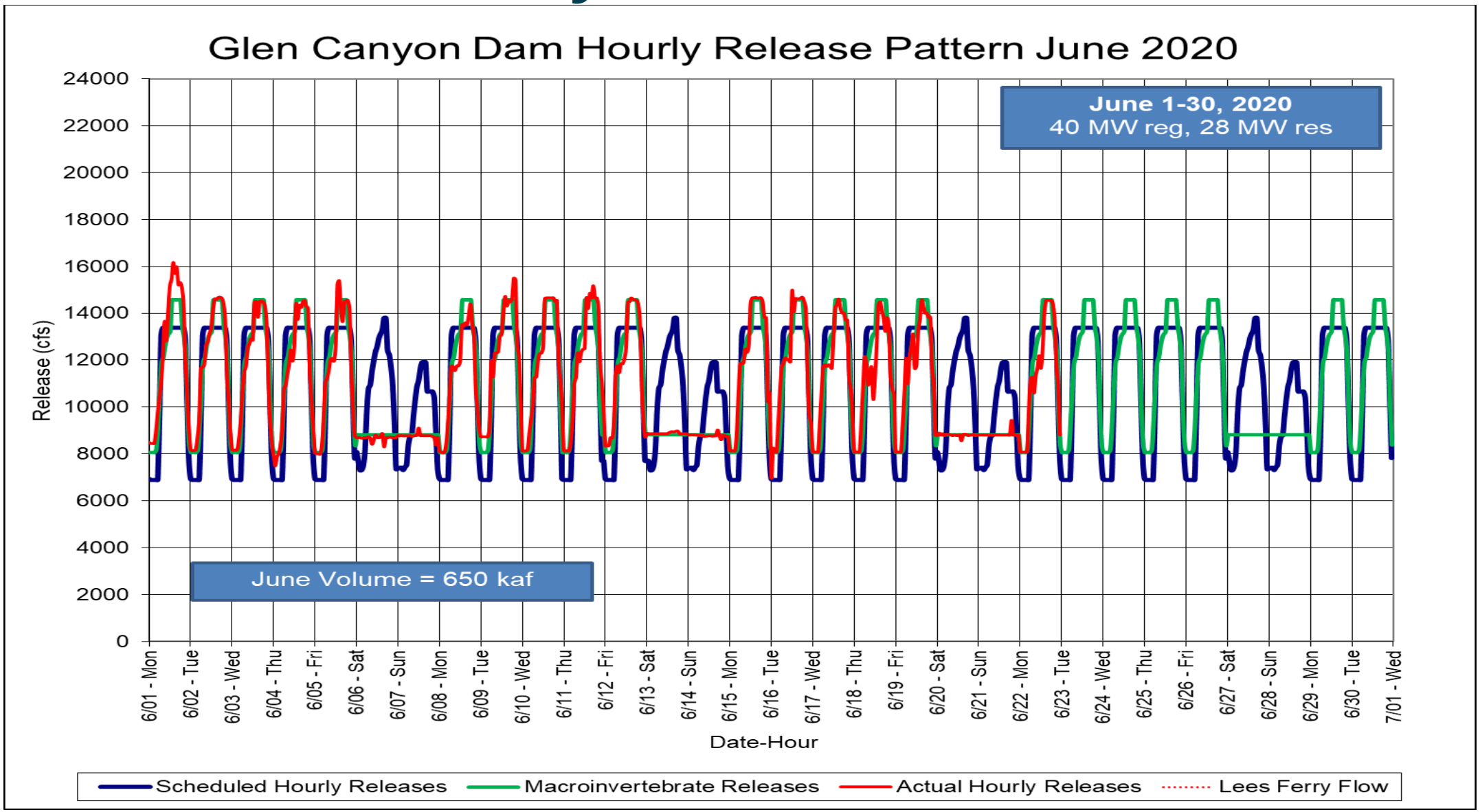
- Hydrograph characteristics:
  - Implement May 1 through August 31, 2020
  - Steady weekend lows, fluctuating weekday releases
  - Weekend lows 750 cfs higher than weekday lows
  - Weekly, monthly, and annual release volumes do not change
  - Hydropower reserves, regulation and emergency criteria remain in effect

Month	Release Volume (af)	Maximum Daily Fluctuation (cfs)	Weekday Maximum (cfs)	Weekday Minimum (cfs)	Weekend Release (cfs)
May	630,000	2,525	11,665	9,135	9,890
June	650,000	6,500	14,565	8,065	8,815
July	750,000	7,500	16,030	8,530	9,280
August	835,000	8,000	17,880	9,880	10,630

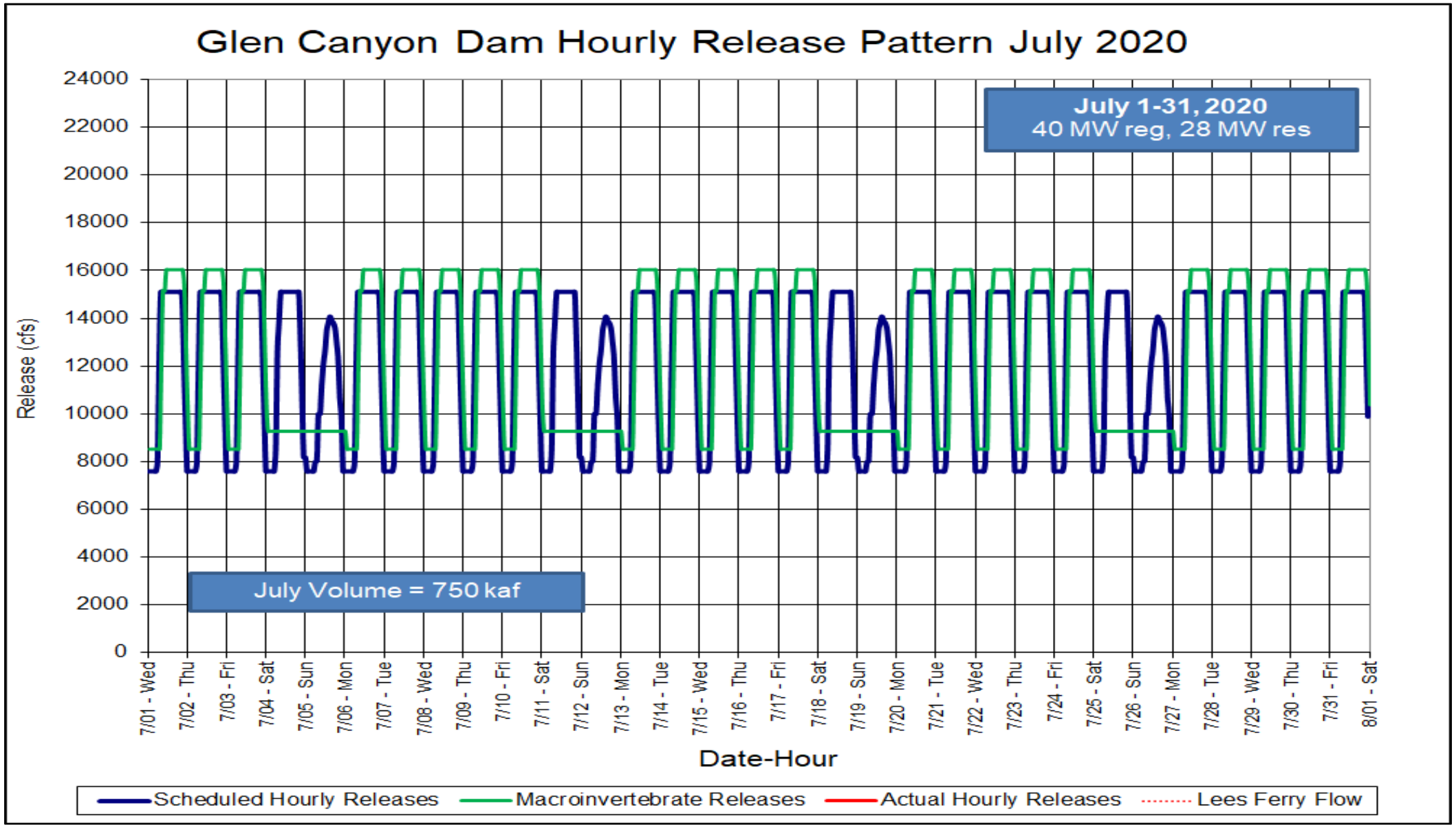
May 2020 Hourly Releases



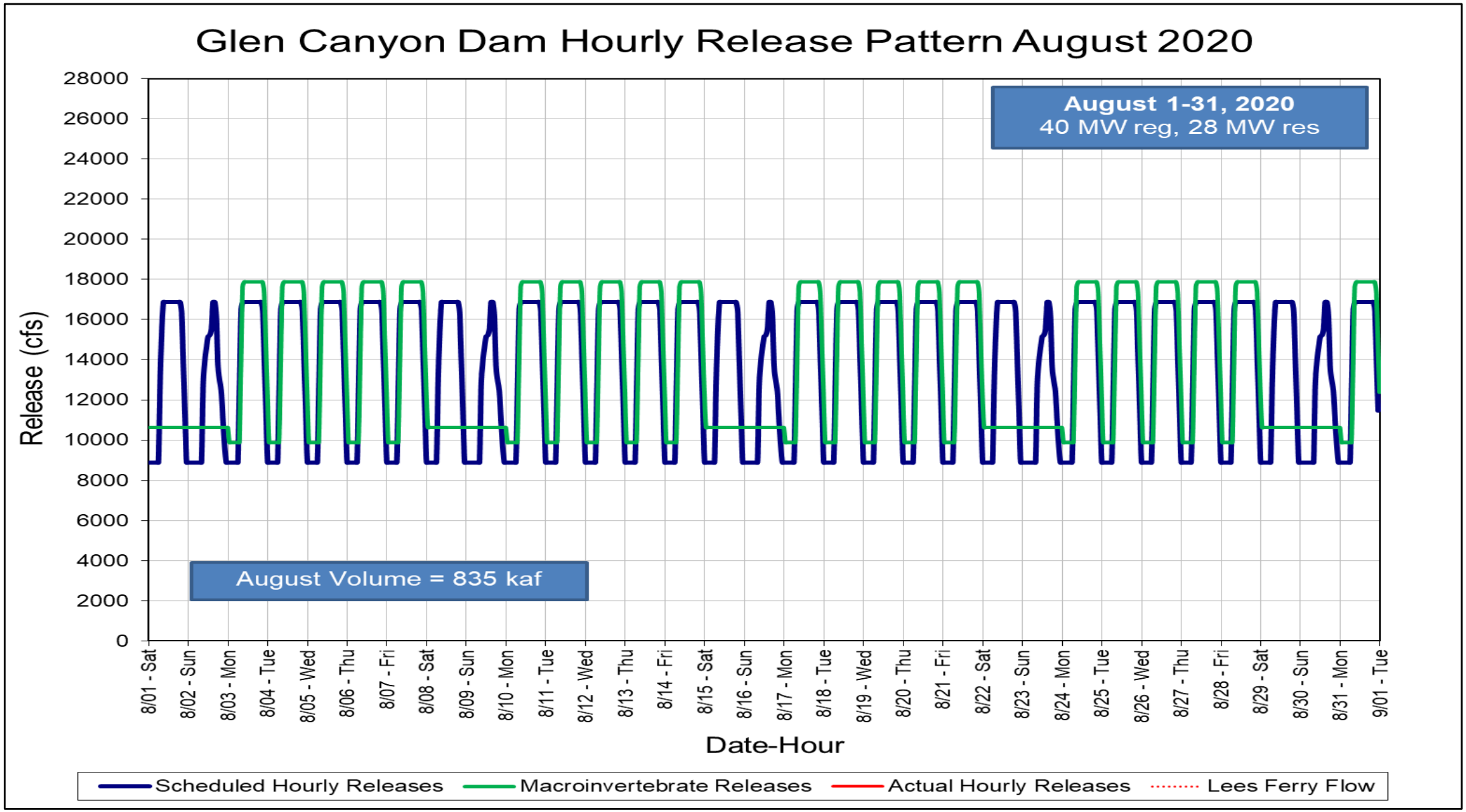
June 2020 Hourly Releases

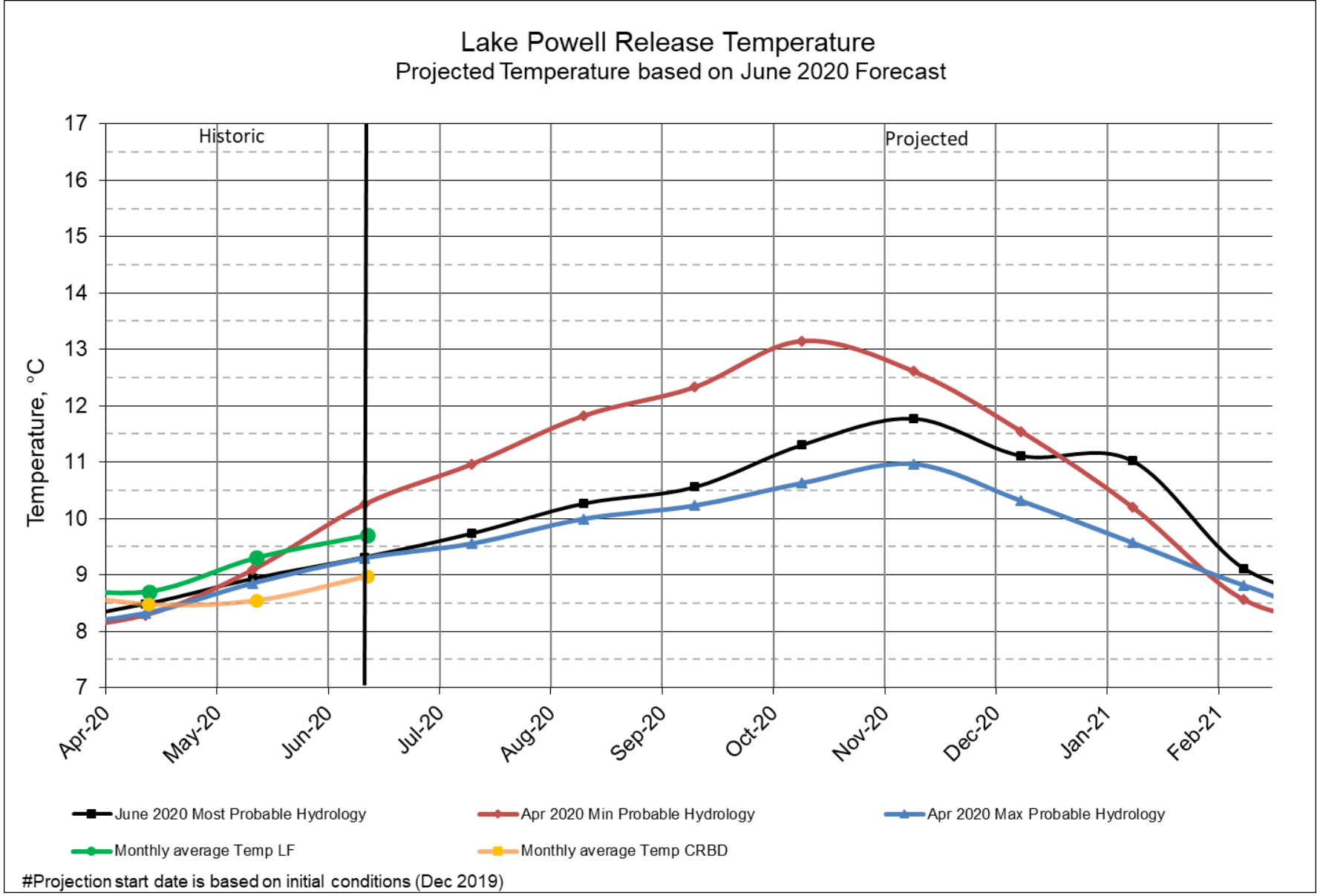


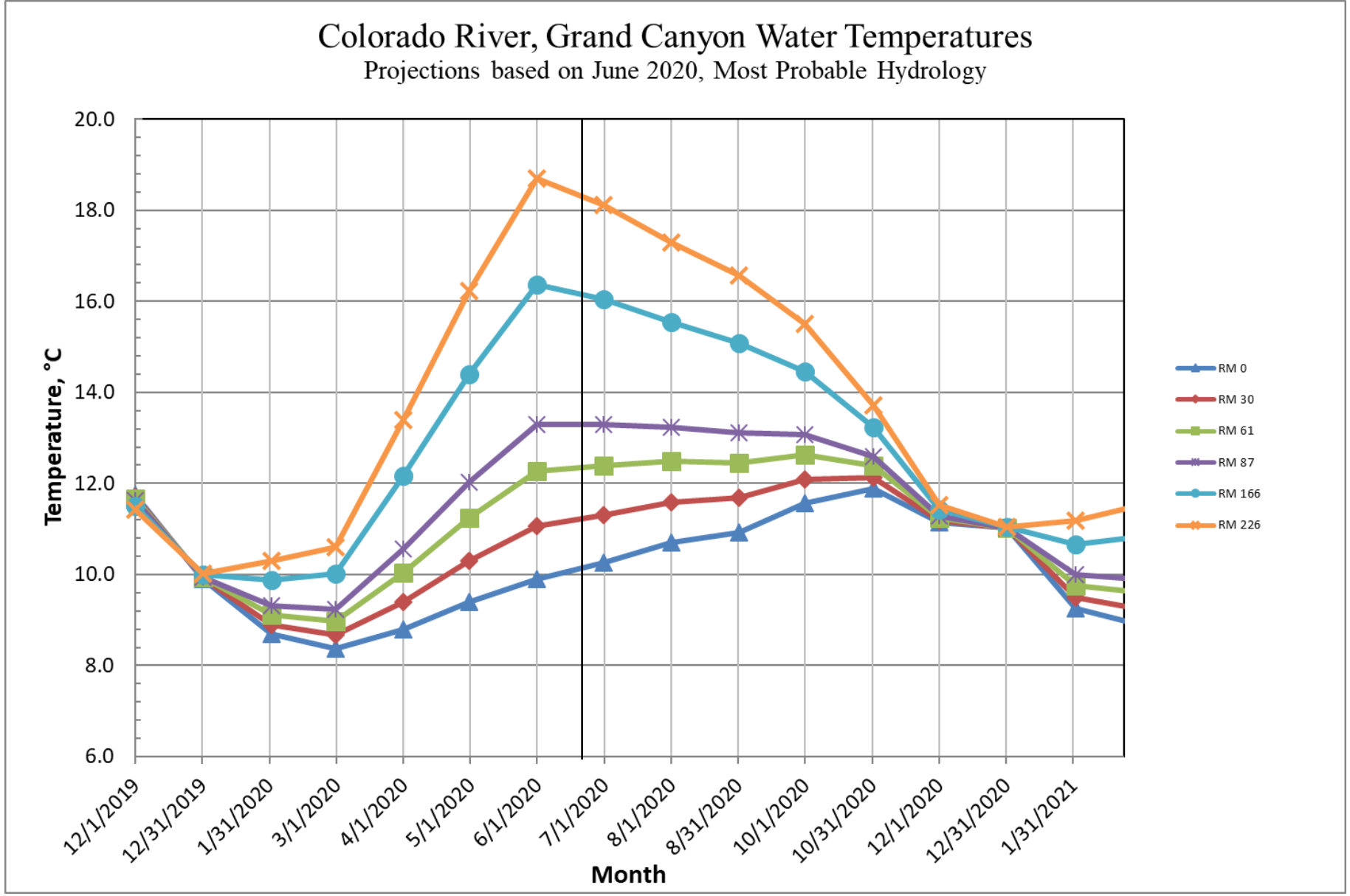
July 2020 Hourly Releases



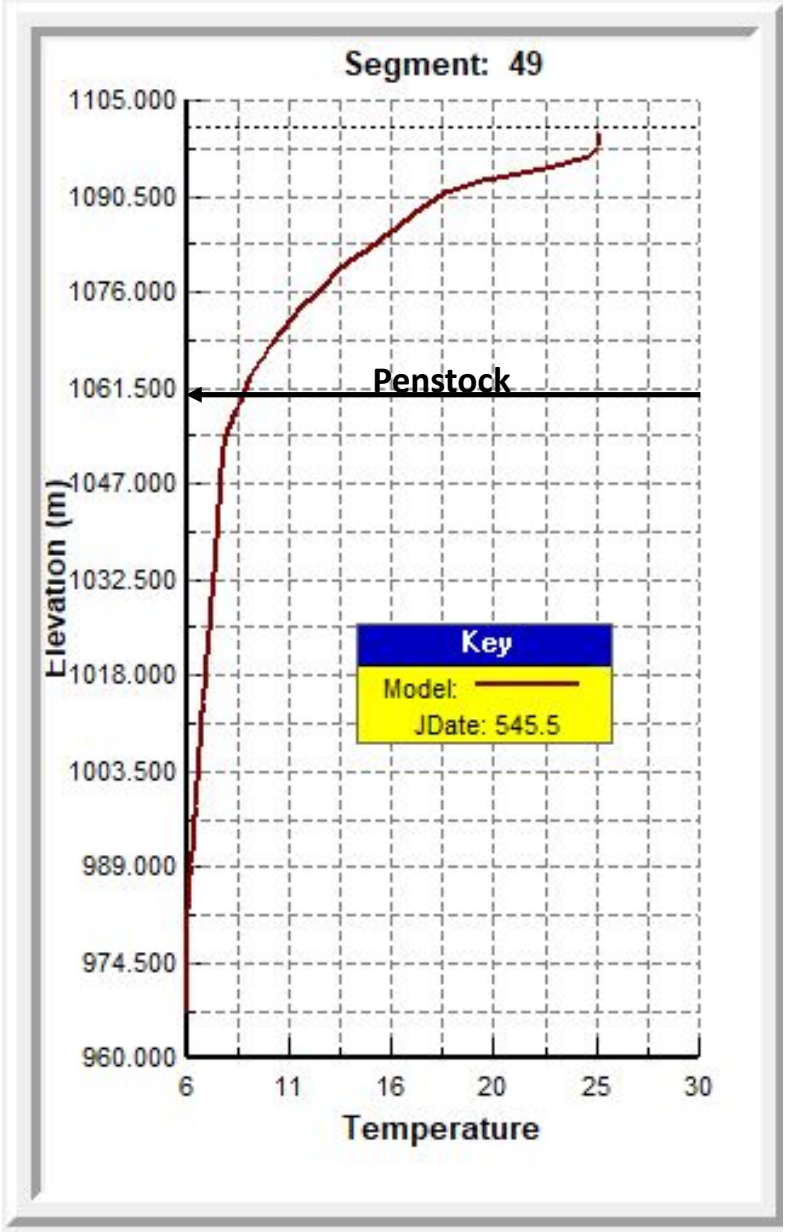
August 2020 Hourly Releases



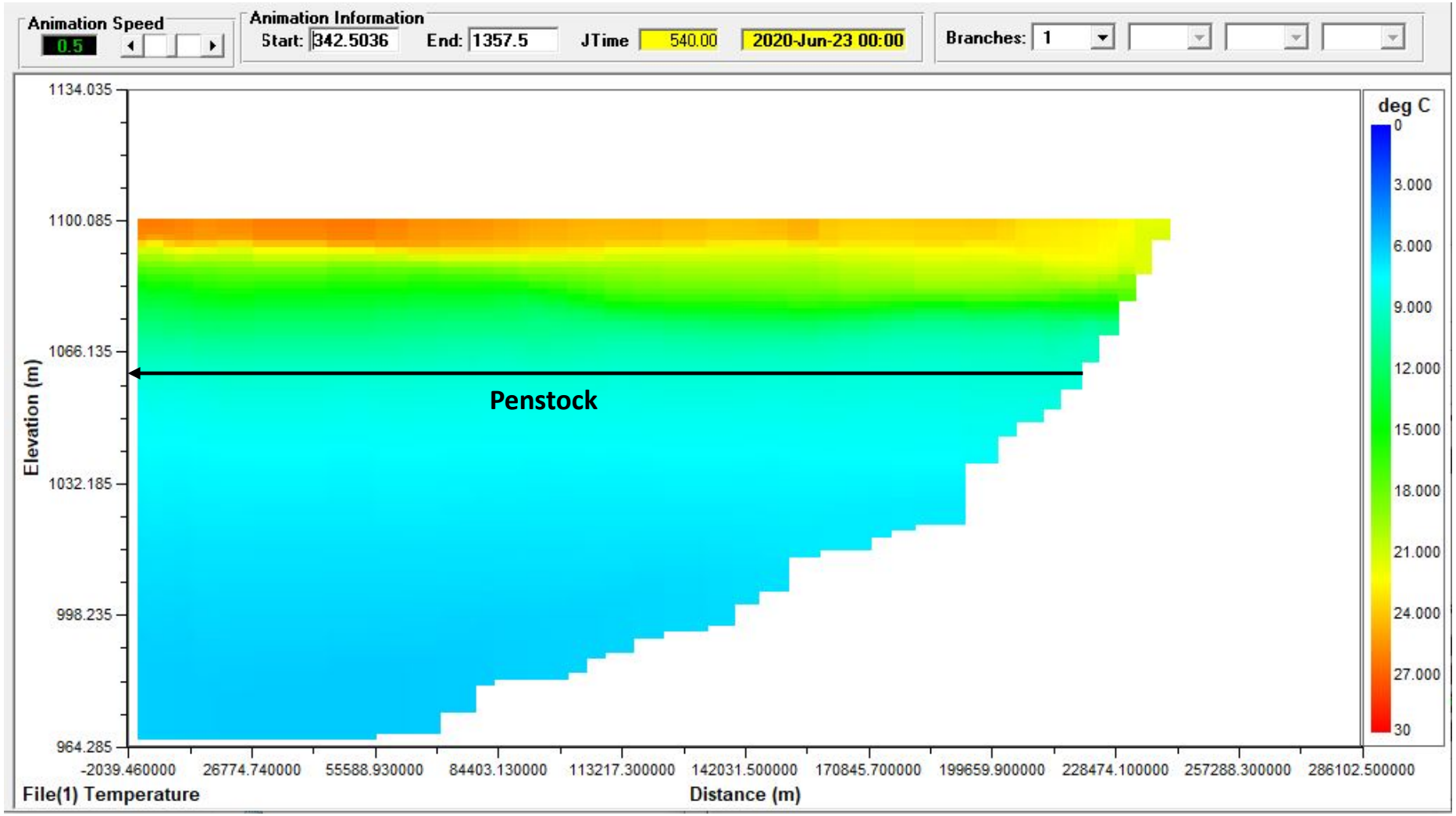

Lake Powell Release Temperature
Projected Temperature based on June 2020 Forecast
Historic
Projected
Temperature, °C
17
16
15
14
13
12
11
10
9
8
7
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
Nov-20
Dec-20
Jan-21
Feb-21
June 2020 Most Probable Hydrology
Apr 2020 Min Probable Hydrology
Apr 2020 Max Probable Hydrology
Monthly average Temp LF
Monthly average Temp CRBD
#Projection start date is based on initial conditions (Dec 2019)


Colorado River, Grand Canyon Water Temperatures
Projections based on June 2020, Most Probable Hydrology
Temperature, °C
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
12/1/2019
12/31/2019
1/31/2020
3/1/2020
4/1/2020
5/1/2020
6/1/2020
7/1/2020
8/1/2020
8/31/2020
10/1/2020
10/31/2020
12/1/2020
12/31/2020
1/31/2021
Month
RM 0
RM 30
RM 61
RM 87
RM 166
RM 226

Temperature Profile near GC Dam



Cross sectional Temperature Profile of Lake Powell



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