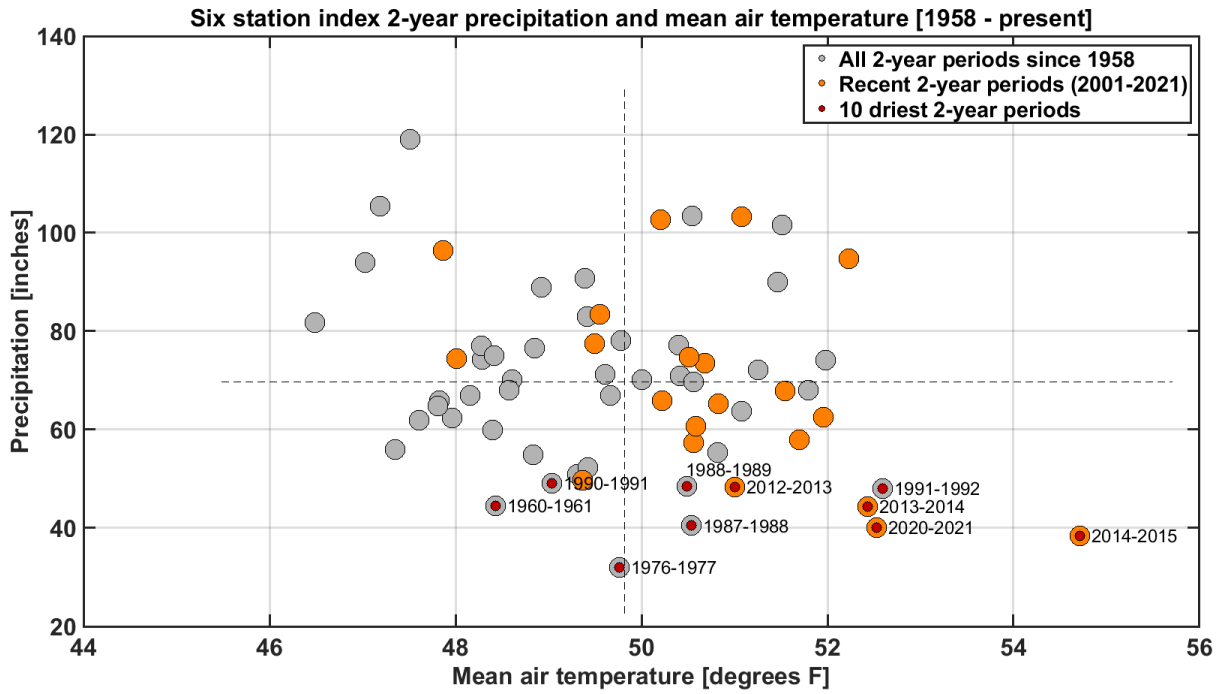
San Francisco Public Utilities Commission
Hydrological Conditions Report
May 2021

J. Chester, C. Graham, N. Waelty, June 9, 2021



This plot shows cumulative precipitation of every 2 (water) year period since 1958, plotted against 2 year average temperature. Plots like these show the severity of drought conditions in the upcountry watersheds.

Water Years 2020 and 2021 have been very dry and very warm. While 2014-2015 was the warmest 2 year stretch since 1958, and 1976-1977 was the driest, the current 2 year period is in the top 4 of temperature and bottom 4 of precipitation.

Orange dots indicate the last 20 years, showing a trend towards warmer conditions, and little evidence for a trend towards drier or wetter conditions.

System Storage

Current Tuolumne System and Local Bay Area storage conditions are summarized in Table 1.

Table 1
Current System Storage
as of June 1, 2021

	Current Storage		Maximum Storage		Available Capacity		Percentage of Maximum Storage
	acre-feet	millions of gallons	acre-feet	millions of gallons	acre-feet	millions of gallons	
Tuolumne System							
Hetch Hetchy Reservoir[1]	309,819		340,830		31,011		91%
Cherry Reservoir[2]	265,998		273,345		7,347		97%
Lake Eleanor[3]	26,726		27,100		374		99%
Water Bank	317,328		570,000		252,672		56%
Tuolumne Storage	919,871		1,211,275		291,404		76%
Local Bay Area Storage							
Calaveras Reservoir	57,818	18,840	96,824	31,550	39,006	12,710	60%
San Antonio Reservoir	49,673	16,186	50,496	16,454	822	268	98%
Crystal Springs Reservoir	46,717	15,223	58,377	19,022	11,660	3,799	80%
San Andreas Reservoir	17,061	5,559	18,996	6,190	1,936	631	90%
Pilarcitos Reservoir	1,820	593	2,995	976	1,174	383	61%
Total Local Storage	173,089	56,401	227,688	74,192	54,598	17,791	76%
Total System	1,092,960		1,438,962		346,002		76%

[1] Maximum Hetch Hetchy Reservoir storage with drum gates deactivated.
[2] Maximum Cherry Reservoir storage with flash-boards out.
[3] Maximum Lake Eleanor storage with two flash-boards in.

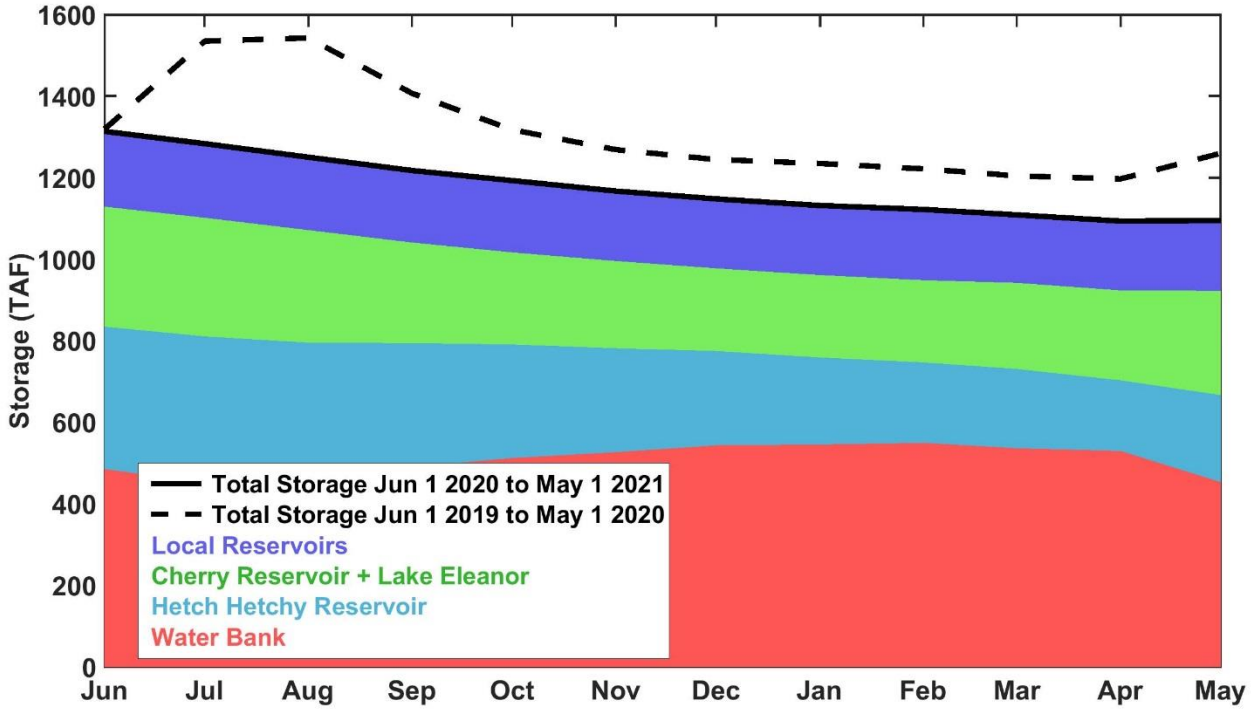


Figure 1: System storage for past 12 months in thousand acre-feet (TAF). Color bands show contributions to total system storage. Solid black line shows total system storage for the past 12 months. Dashed black line shows total system storage the previous 12 months.

Hetch Hetchy System Precipitation Index

Current Month: The May 2021 six-station precipitation index reported 0.12 inches of precipitation for the month, which is 8% of the monthly average. The precipitation index is computed as the average of six Sierra precipitation stations and is an indicator of the overall basin wetness.

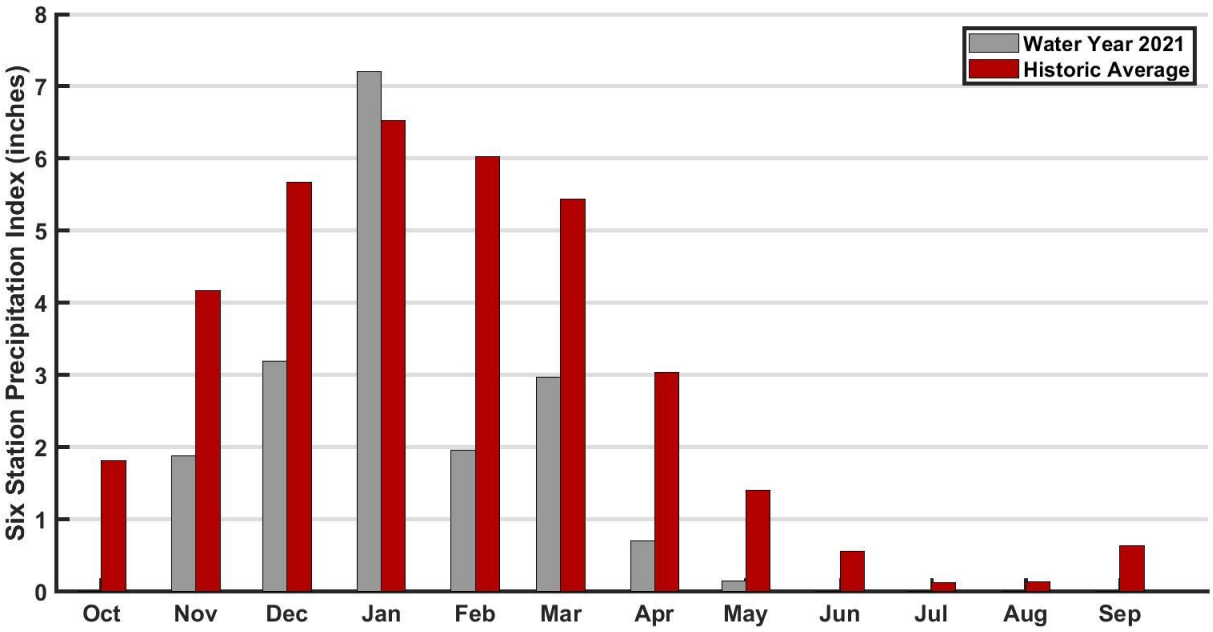


Figure 2: Monthly distribution of the six-station precipitation index relative to the monthly precipitation averages. The precipitation index is computed as the average of six Sierra precipitation stations and is an indicator of the overall basin wetness.

Cumulative Precipitation to Date: As of June 1, the six-station precipitation index for Water Year (WY) 2021 was 18.02 inches, which is 51% of the average annual water year total. The Hetch Hetchy Weather Station received 0.46 inches of precipitation in May for a total of 18.14 inches for WY 2021, or 53% of average to-date. The cumulative WY 2021 Hetch Hetchy precipitation is shown in Figure 3 in red.

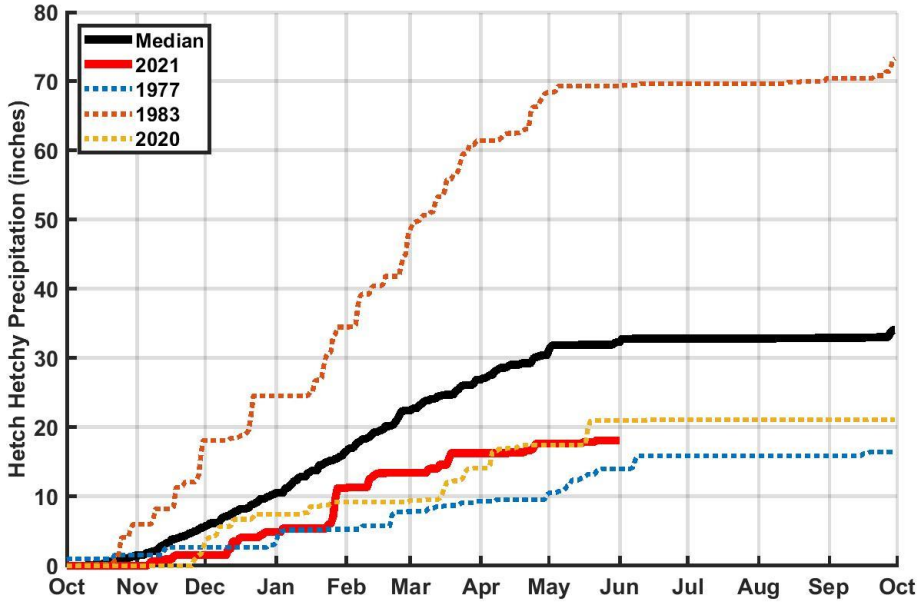


Figure 3: Water Year 2021 cumulative precipitation measured at Hetch Hetchy Weather Station. Median cumulative precipitation measured at Hetch Hetchy Weather Station and example wet and dry years are included with Water Year 2020 for comparison purposes.

Tuolumne Basin Unimpaired Inflow

Unimpaired inflow to SFPUC reservoirs and the Tuolumne River at La Grange for May 2021 and the water year to date is summarized below in Table 2.

Table 2
Calculated Reservoir Inflows and Water Available to City

* All flows are in acre-feet	May 2021				October 1, 2020 through May 31, 2021			
	Observed Flow	Median[1]	Mean[1]	Percent of Mean	Observed Flow	Median[1]	Mean[1]	Percent of Mean
Inflow to Hetch Hetchy Reservoir	124,481	216,444	218,549	57%	234,602	441,643	439,312	53%
Inflow to Cherry Reservoir and Lake Eleanor	59,964	120,476	122,263	49%	175,983	326,141	334,049	53%
Tuolumne River at La Grange	210,791	447,773	443,131	48%	542,682	1,184,419	1,317,161	41%
Water Available to City	22,979	198,767	207,995	11%	48,541	433,036	527,586	9%

[1]Hydrologic Record: 1919-2015

Hetch Hetchy System Operations

Hetch Hetchy Reservoir power draft and stream releases during the month totaled 28,217 acre-feet. Hetch Hetchy Reservoir minimum instream release requirements for May were 50 cfs. Total precipitation for Water Year 2021 has resulted in a Water Year Type C for Hetch Hetchy Reservoir. Hetch Hetchy Reservoir instream releases will increase to 75 cfs for June.

Cherry Reservoir valve and power draft releases totaled 16,869 acre-feet for the month and were used to maintain seasonal target elevations. The required minimum instream release from Cherry Reservoir for May was 5 cfs and will remain at that flow through June 2021. Lake Eleanor required release for May was 20 cfs and will remain there until September 2021. The Cherry / Eleanor Pumps were activated on April 4th and are utilized to manage spring runoff inflows.

San Joaquin Pipeline deliveries were 246 MGD for the month of May.

Regional System Treatment Plant Production

The Harry Tracy Water Treatment Plant average production rate for May was 26 MGD. The Sunol Valley Water Treatment Plant production for the month was 1 MGD, the plant was in standby for most of the month.

Local System Water Delivery

The average May delivery rate was 222 MGD, which is a 9% increase over the April delivery rate of 203 MGD.

Local Precipitation

The rainfall summary for May 2021 is presented in Table 3.

Table 3
Precipitation Totals at Three Local Area Reservoirs

Weather Station Location	May		October 1, 2020 through May 31, 2021	
	Total (inches)	Percent of Mean for the Month	Total (inches)	Percent of Mean for the Year-To-Date
Pilarcitos Reservoir	0.14	12%	18.47	50%
Lower Crystal Springs Reservoir	0.04	5%	11.91	46%
Calaveras Reservoir	0.00	0%	10.19	48%

Snowpack, Water Supply and Planned Water Supply Management

Water Year 2021 has been remarkably dry, following a very dry latter half of the previous water year. To date, WY 2021 Hetch Hetchy accumulated precipitation currently ranks as the 3rd driest on record (*n*=91 years). Due to the dry conditions in the fall, at the onset of spring snowmelt there was a significant soil moisture deficit, resulting in a lagged and muted streamflow response. The snowpack has largely melted out from elevations below 9,500 feet. Water Year inflows to date at Hetch Hetchy Reservoir have totaled 234,602 acre-feet, the 5th driest on record for the same period. For the April to date seasonal period, inflows have totaled 197,483 acre-feet, the 8th driest on record.

Due to the well below average inflows, Hetch Hetchy Reservoir is not expected to spill this spring. Inflows to date are 53% of average and fell below the low end of forecasts for the runoff season (Figure 5). With the snowmelt runoff nearly complete, Hetch Hetchy Reservoir is expected to reach 320 in early June, or 90% full. Reduced generation at Holm Powerhouse in the spring resulted in Cherry Reservoir and Lake Eleanor filling in the first week of June. Water Bank will not refill this spring, as Water Available to the City will be greatly exceeded by water deliveries.

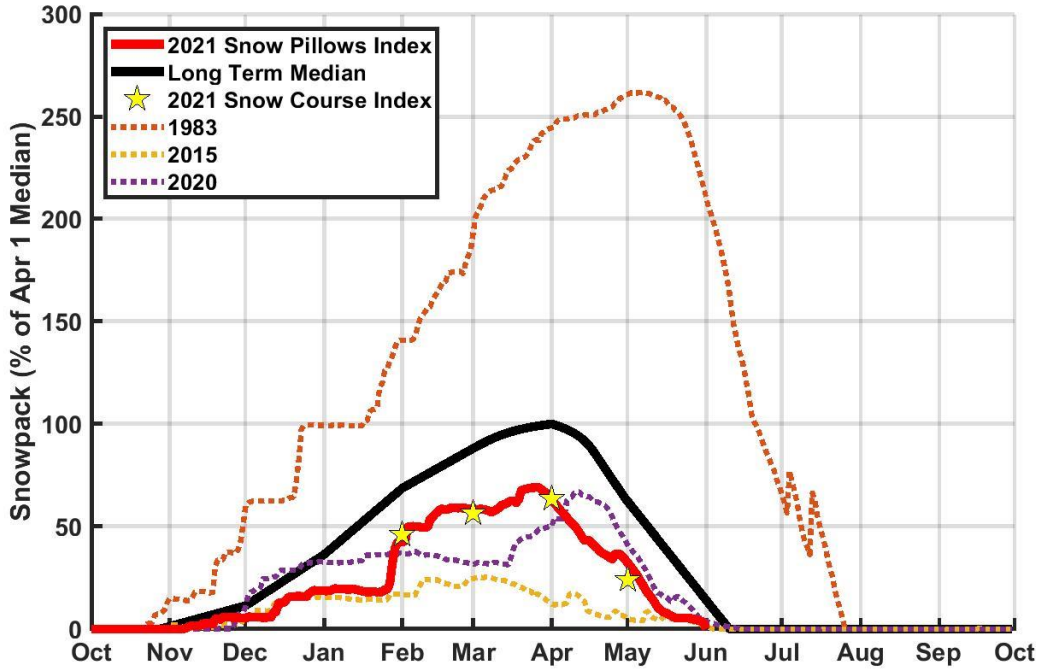


Figure 4: Tuolumne River Basin 10 Station Snow Index (lines), based on real time snow pillow SWE measurements. Also plotted is the mean monthly manual snow surveys (stars) in the Tuolumne Basin.

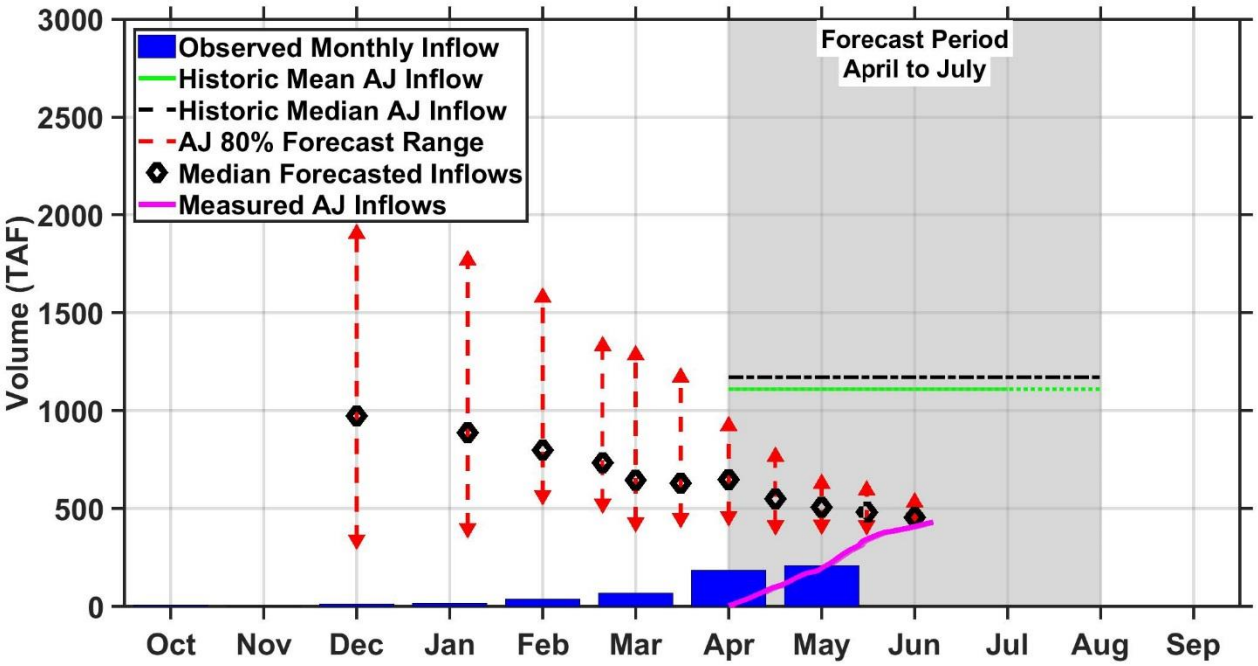


Figure 5: Forecasted April to July Full Natural Flow at La Grange. Sustained below average precipitation has resulted in a significant reduction in forecasted inflows. The median forecast is currently at around 40% of normal, roughly corresponding with the precipitation and snow to date.

The calculated unimpaired flow at La Grange and the allocation of flows between the Districts and the City are shown in Figure 6. As of June 1, there has been 48,541 ac-ft water available to the City in Water Year 2021.

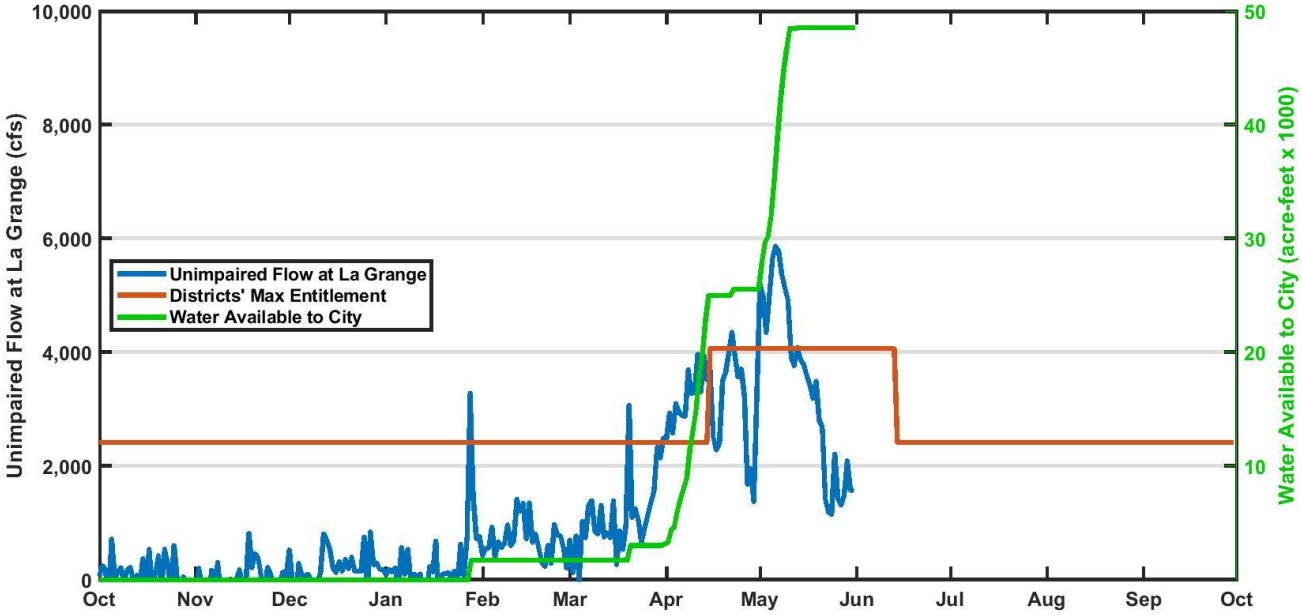


Figure 6: Calculated unimpaired flow at La Grange and the allocation of flows between the Districts and the City.