

San Francisco Public Utilities Commission

Hydrological Conditions Report

For February 2017

J. Chester, C. Graham, A. Mazurkiewicz, & M. Tsang, March 7, 2017



The Airborne Snow Observatory flew the Tuolumne Basin in February, providing us with the above map of snow depth through the Hetch Hetchy Watershed. Snow depths of up to 30 ft deep were measured in some high elevation canyons. At our Snow Survey sites, snow depths over 200 inches were measured. Nearly 1 million acre-feet of water is estimated to be currently stored as snow in the Hetch Hetchy Watershed.

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

Table 1 Current Storage As of March 1, 2017							
Reservoir	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 ¹	309,258		340,830		31,572		90.7%
Cherry ²	236,821		268,810		31,989		88.1%
Lake Eleanor ³	21,588		21,495		0		Full
Water Bank	570,000		570,000		0		Full
Tuolumne Storage	1,137,667		1,201,135		63,561		94.7%
Local Bay Area Storage							
Calaveras ⁴	53,834	17,542	96,824	31,550	42,990	14,008	55.6%
San Antonio	50,499	16,455	50,496	16,454	0	0	Full
Crystal Springs	52,166	16,998	58,377	19,022	6,211	2,024	89.4%
San Andreas	18,631	6,071	18,996	6,190	365	119	98.1%
Pilarcitos	2,895	943	2,995	976	100	32	96.7%
Total Local Storage	178,025	58,010	227,688	74,192	49,666	16,182	78.2%
Total System	1,137,692		1,428,823		113,131		92.1%

¹ Maximum Hetch Hetchy Reservoir storage with drum gates de-activated.

² Maximum Cherry Reservoir storage with flash-boards removed.

³ Maximum Lake Eleanor storage with flash-boards removed.

⁴ Available capacity does not take into account current DSOD storage restrictions.

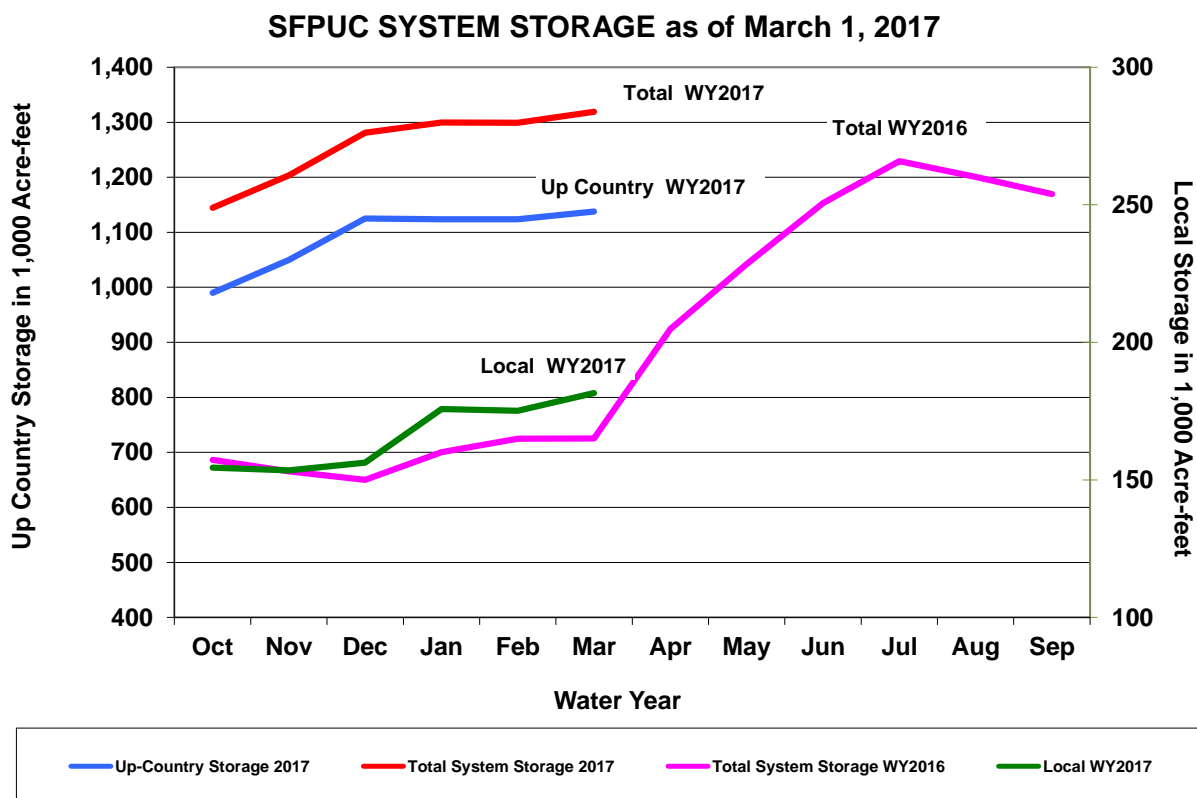


Figure 1: Monthly system storage for Water Year 2017

Hetch Hetchy System Precipitation Index ^{5/}

Current Month: The February 2017 six-station precipitation index was 15.1 inches, or 254.4% of the average index for the month.

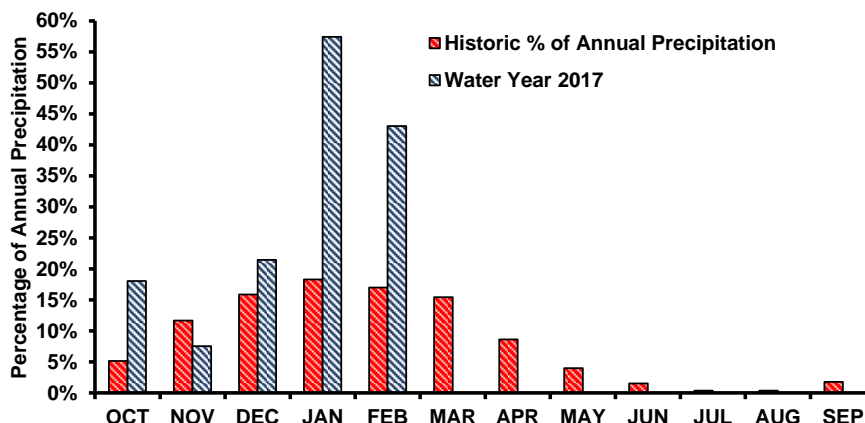


Figure 2: Monthly distribution of the Hetch Hetchy Six-station precipitation index as percent of the annual average precipitation.

Cumulative Precipitation to Date: The accumulated six-station precipitation index for water year 2017 is 53.44 inches, which is 150.2% of the average annual water year total, or 217.0% of average annual to date. Hetch Hetchy received 16.2 inches precipitation in February and a total of 51.46 inches for water year 2017. The cumulative Hetch Hetchy precipitation is shown in Figure 3 in red.

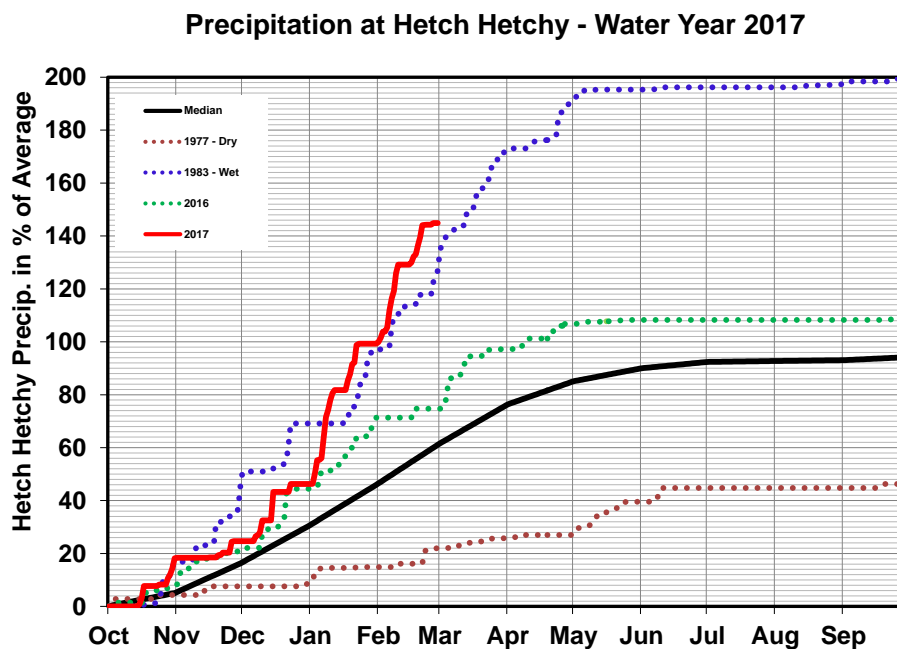


Figure 3: Water year 2017 cumulative precipitation measured at Hetch Hetchy Reservoir through February 28th, 2017. Precipitation at the Hetch Hetchy gauge for wet, dry, median, and WY 2016 are included for comparison purposes.

^{5/}The precipitation index is computed using six Sierra precipitation stations and is an indicator of the wetness of the basin for the water year to date. The index is computed as the average of the six stations and is expressed in inches and in percent.

Tuolumne Basin Unimpaired Inflow

Unimpaired inflow to SFPUC reservoirs and the Tuolumne River at La Grange as of February 28th, 2017 is summarized below in Table 2.

Table 1								
Unimpaired Inflow (Acre-Feet)								
	February 2017				October 1, 2016 through February 28, 2017			
	Observed Flow	Median ⁶	Average ⁶	Percent of Average	Observed Flow	Median ⁶	Average ⁶	Percent of Average
Inflow to Hetch Hetchy Reservoir	116,943	22,324	25,029	467.2%	339,672	70,997	88,829	382.4%
Inflow to Cherry Reservoir and Lake Eleanor	113,406	22,805	26,535	427.4%	386,926	73,826	96,422	401.3%
Tuolumne River at La Grange	829,422	114,214	141,362	586.7%	1,878,857	312,576	410,559	457.6%
Water Available to the City	695,244	20,399	53,559	1,298.1%	1,383,062	55,984	155,962	886.8%

⁶ Hydrologic Record: 1920 – 2015

Hetch Hetchy System Operations

Draft and releases from Hetch Hetchy Reservoir during the month of February totaled 112,118 acre-feet to meet instream release requirements and reservoir management goals. Precipitation to date and inflows are sufficient to keep Hetch Hetchy Reservoir in Year Type A through January. Hetch Hetchy minimum instream release requirements for February were 60 cfs, and will be 60 cfs for March. Hetch Hetchy inflows have remained high through March, requiring additional valve releases to maintain storage within our seasonal targets (300,000-310,000 acre-feet). March generation and additional releases will be set to balance inflows, with the aim of maintaining Hetch Hetchy Reservoir storage within the seasonal targets.

63,059 acre-feet of draft was made from Cherry Reservoir during the month of February to meet instream release requirements and reservoir management goals. About 3,368 acre-feet of water was transferred via pumping from Lake Eleanor to Cherry Reservoir in February. Pumps were turned off February 13, and are expected to stay off until the end of the runoff season. The required minimum instream release from Cherry Reservoir and Lake Eleanor is 5 cfs in February and March. Cherry storage will be maintained below 248,000 acre-feet via power generation through March. Excessive spill at Lake Eleanor will be managed by maintaining storage less than 15,000 acre-feet through valve releases prior to storm events.

Regional System Treatment Plant Production

The Harry Tracy Water Treatment Plant average production rate for February was 65 MGD. The Sunol Valley Water Treatment Plant average production for the month was 83 MGD.

Local System Water Delivery

The average January delivery rate was 147 MGD which is less than 1% increase above the January delivery rate of 147 MGD.

Local Precipitation

Wet weather continued through February pushing rain fall totals across local watersheds above average for a second consecutive month. The February rainfall summary is presented in Table 3.

Reservoir	Month Total (inches)	Percentage of Average for the Month	Water Year to Date ⁷ (inches)	Percentage of Average for the Year-to-Date ⁷
Pilarcitos	15.46	239 %	51.79	180 %
Lower Crystal Springs	8.67	188 %	32.13	162 %
Calaveras	6.51	172 %	21.88	142 %

⁷ WY 2017: Oct. 2016 through Sep. 2017.

Snowmelt and Water Supply

A series of storm events in January and February have resulted in significant snow accumulation, putting the Tuolumne Basin well at historic snowpack levels to date, well above our seasonal average maximum. Our 10 Station Snow Index (Figure 4) was 165% of April 1 Median Conditions on March 1. The 10 Station Snow Index agreed with the February 1 and March 1 snow surveys, which were at similar values compared to long term averages. Snow accumulation remains above 1983, our record precipitation year. Reservoir inflows have correspondingly been above average, maintaining reservoir storages at or above our seasonal targets for all of February. Increased releases from all reservoirs to manage storage levels resulted in full Water Bank in early January, which has been maintained through the remainder of the month.

With high current storage and a large snowpack, inflows will fill all reservoirs by June/July and maintain full Water Bank through next fall. To manage reservoir storage levels, we anticipate powerdraft in excess of municipal load at all powerhouses through the end of runoff. In addition to significant powerdraft, we expect ecological valve releases and spill at Hetch Hetchy in the order of 400 to 700 TAF during the runoff season.

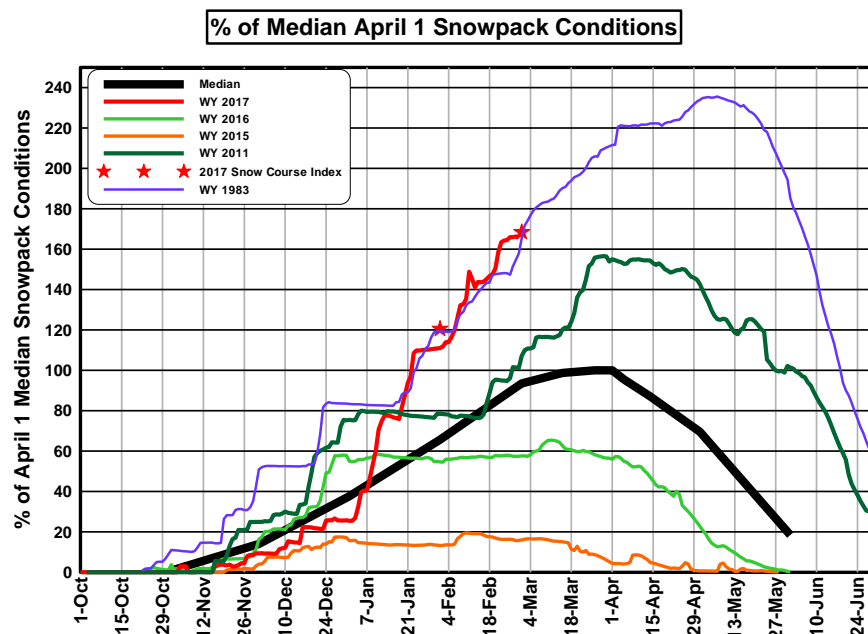


Figure 4: Snowpack conditions as of March 1. Current conditions are well above average to date, and above average seasonal maximum. Snow conditions are above peak 2011 accumulation, the most recent above average year. Snow surveys (red stars) agree with snow pillows (lines), indicating deep and widespread snow accumulation. 1983, the wettest year on record, is included for comparison.

Unimpaired Flow at La Grange & Water Available to the City

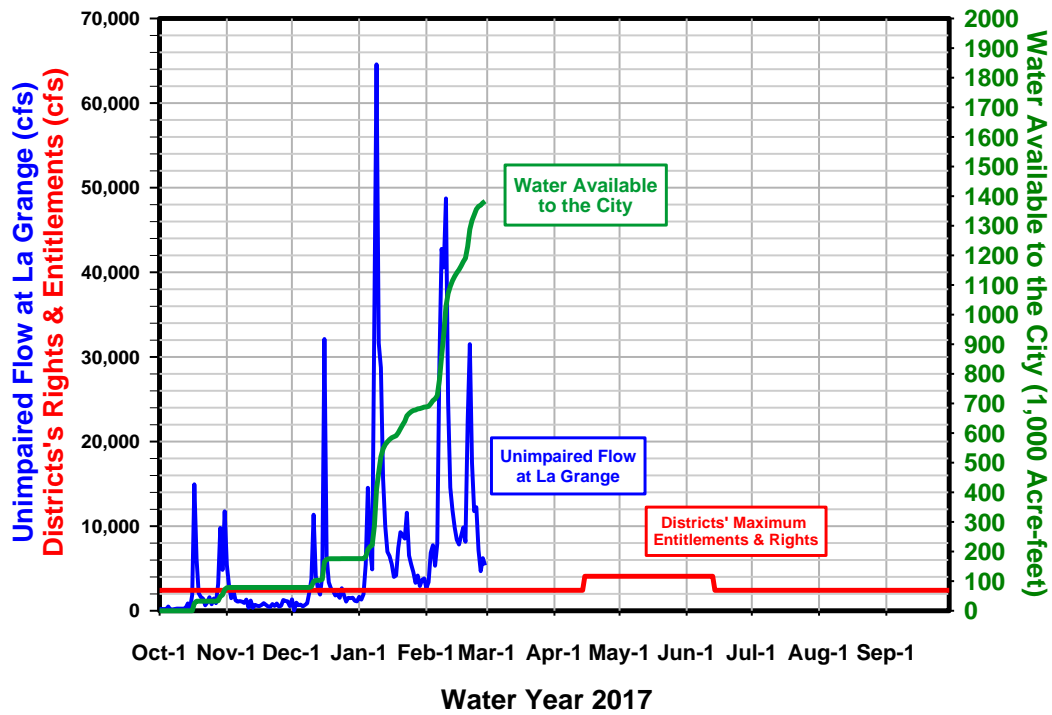


Figure 5: Calculated unimpaired flow at La Grange and the allocation of flows between the Districts and the City. 1,383,062 acre-feet of water has become available to the City during water year 2017. Inflows have exceeded the District Entitlements line since early January.