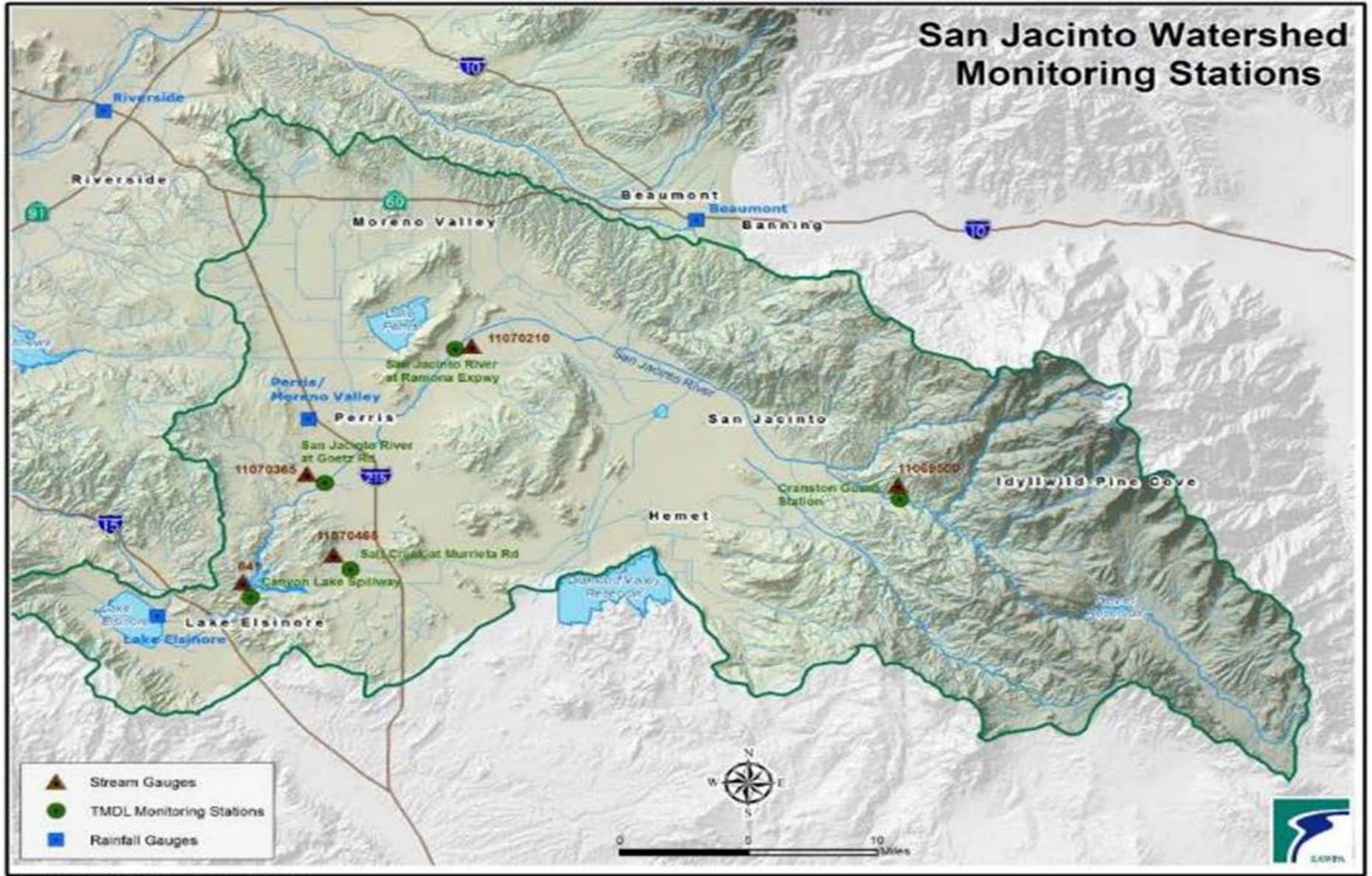
Lake Elsinore and Canyon Lake TMDL Water Quality Monitoring Update – 2017-18 Summary

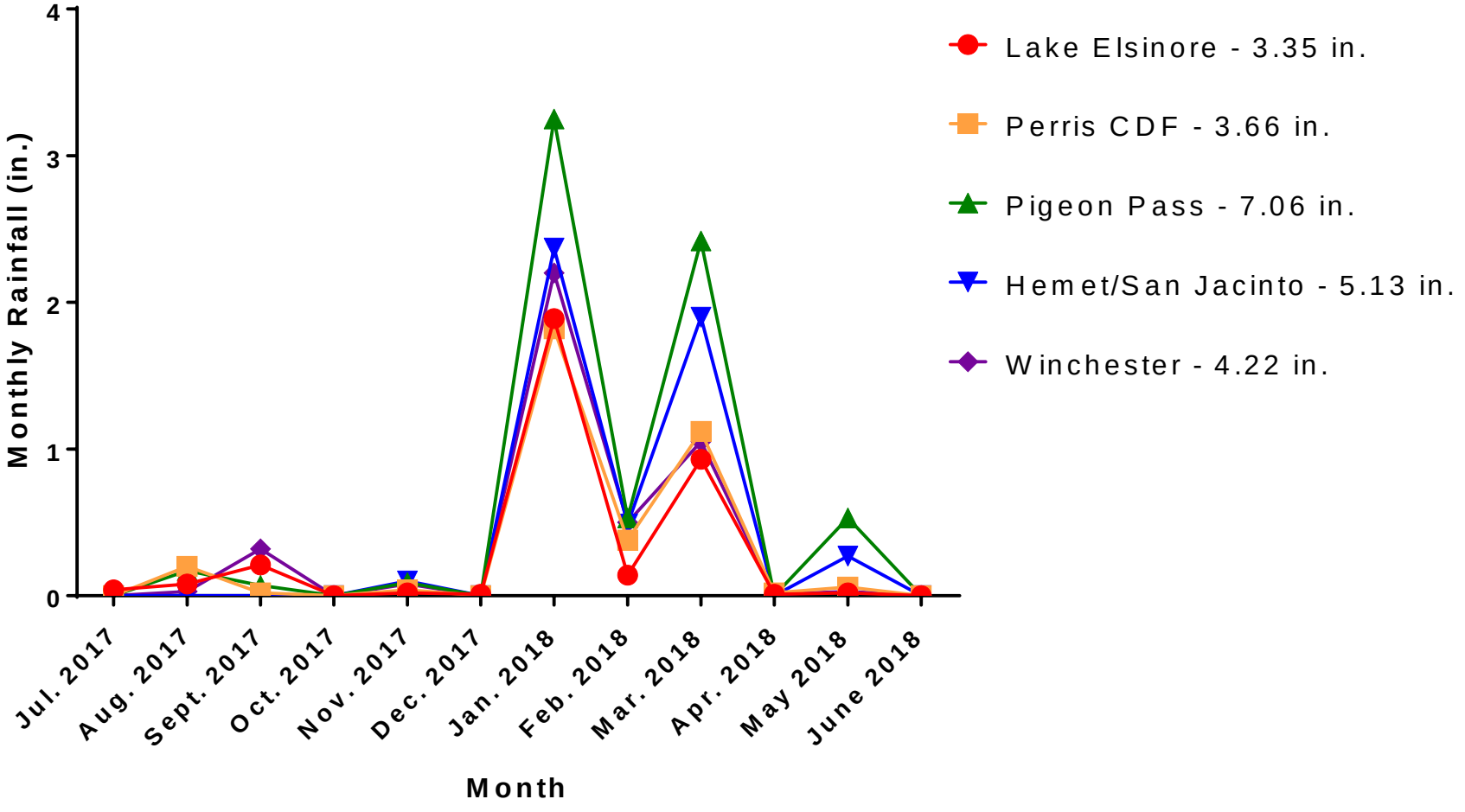
September 19, 2018

Lake Elsinore and Canyon Lake TMDL Water Quality Monitoring Update – 2017-18 Summary

Watershed Monitoring


San Jacinto Watershed
Monitoring Stations
Riverside
Riverside
Moreno Valley
Beaumont
Beaumont
Banning
11070210
San Jacinto River at Ramona Expwy
San Jacinto River
Perris/
Moreno Valley
Perris
San Jacinto
San Jacinto River at Goetz Rd
11070365
11070465
Sal Creek at Murrieta Rd
Canyon Lake Spillway
Lake Elsinore
Lake Elsinore
11069500
Cranston Guard Station
Idyllwild Pine Cove
Hemet
Stream Gauges
TMDL Monitoring Stations
Rainfall Gauges
N
W
E
S
0
5
10
Miles

Summary of 2017-2018 Rainfall

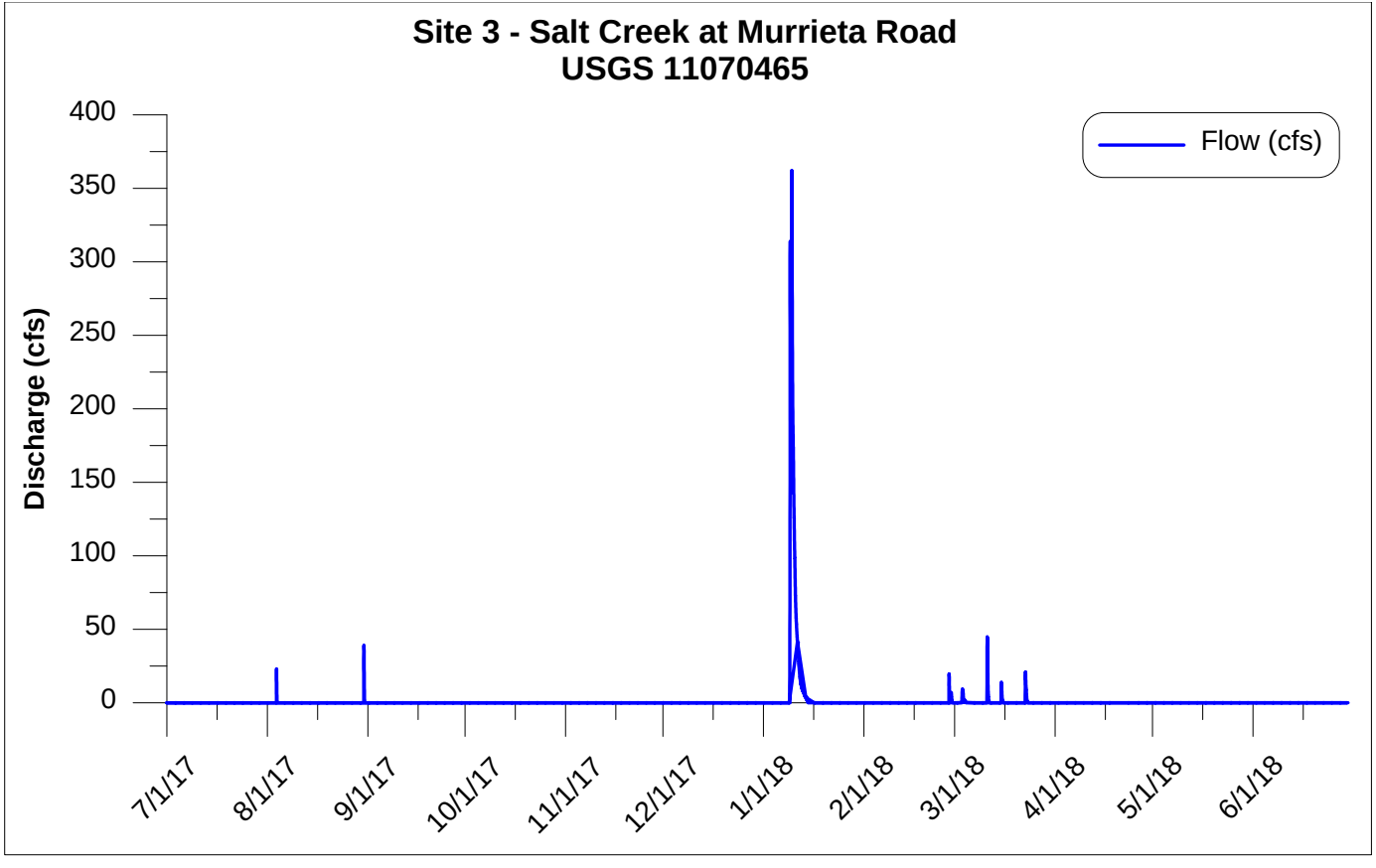


Summary of 2017-2018 Watershed Monitoring and Nutrient Loads

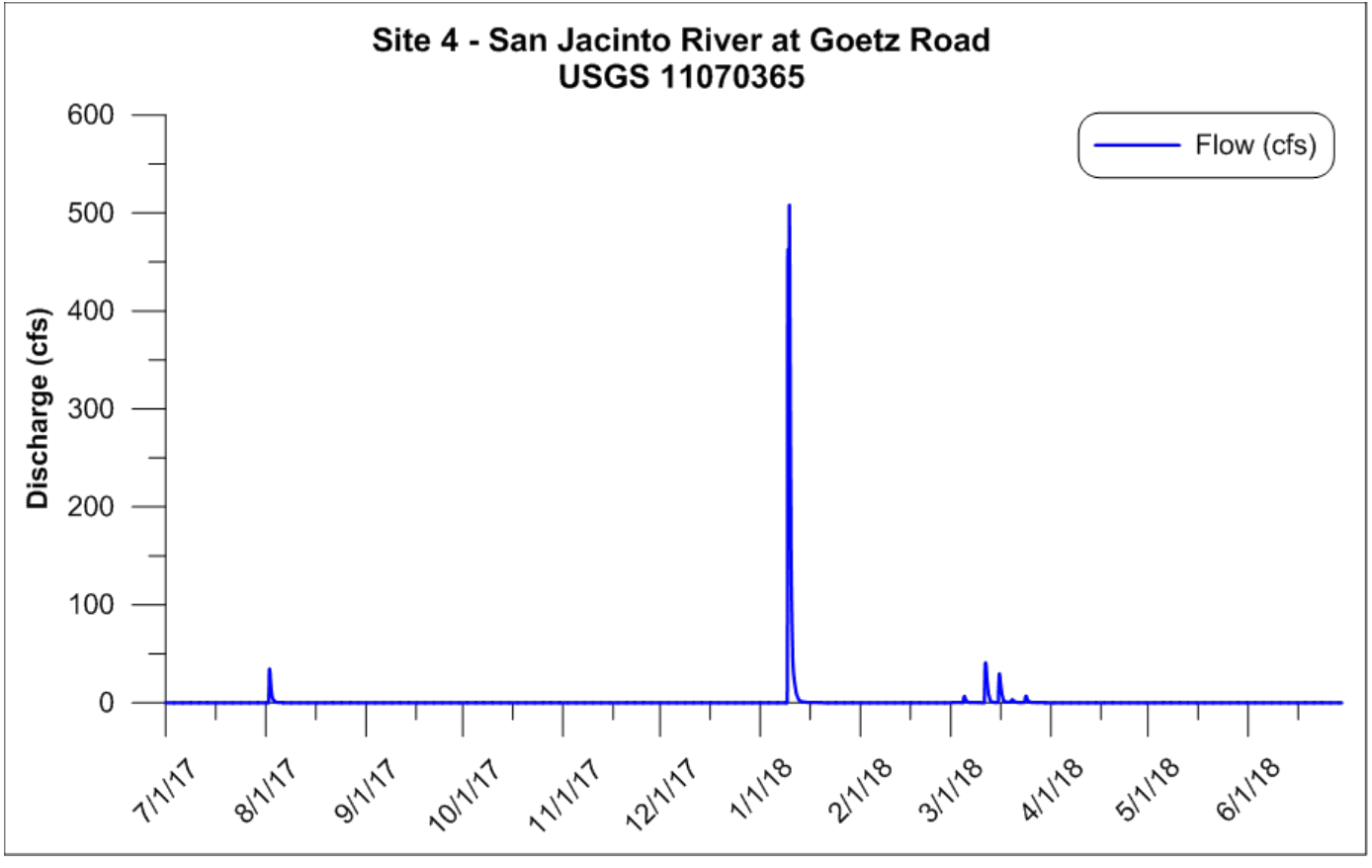
Number and Location Description	Total Annual Flow [a] (Mgal)	Annual Event Mean Storm Concentration (mg/L)		Estimated Annual Load (kg)	
		Total Nitrogen	Total Phosphorus	Total Nitrogen	Total Phosphorus
Site 3 - Salt Creek at Murrieta Road (USGS 11070465)	271	2.73	0.39	2,586	482
Site 4 - San Jacinto River at Goetz Road (USGS 11070365)	393	1.95	0.41	3,055	810
Site 6 - San Jacinto River at Ramona Expressway [b] (USGS 11070210)	0	-	-	-	-
Site 30 - Canyon Lake Spillway [c] (USGS 11070500)	117	Not Measured	Not Measured	Not Measured	Not Measured

a - Flow data after 11/07/2017 are provisional and may be subject to change.
b - No flows occurred at the TMDL monitoring location just downstream of Mystic Lake, which has been actively subsiding.
c - Not measured as the lake did not overtop the Canyon Lake Spillway during the 2017-2018 monitoring period.

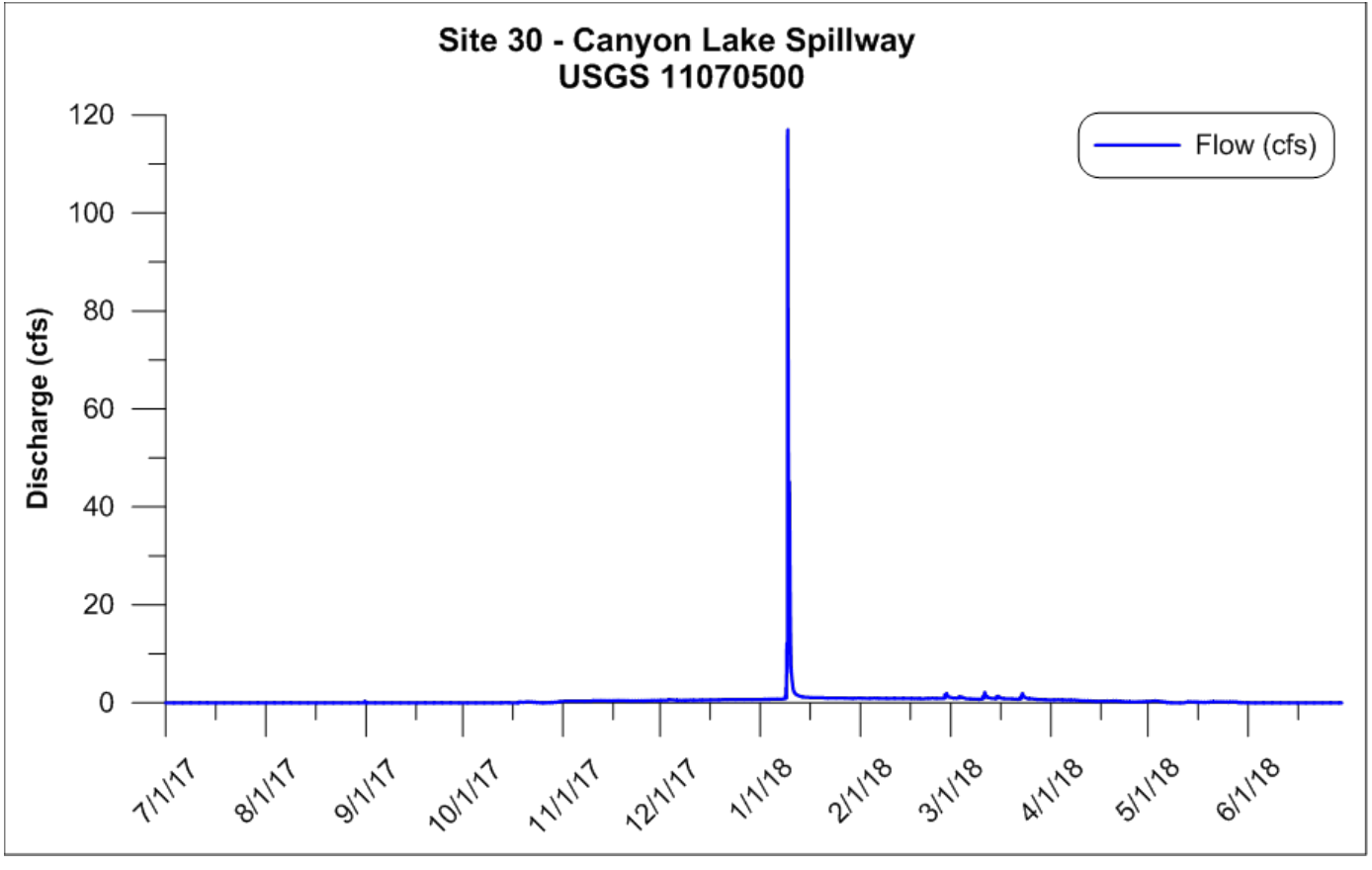
2017-2018 Annual Hydrograph



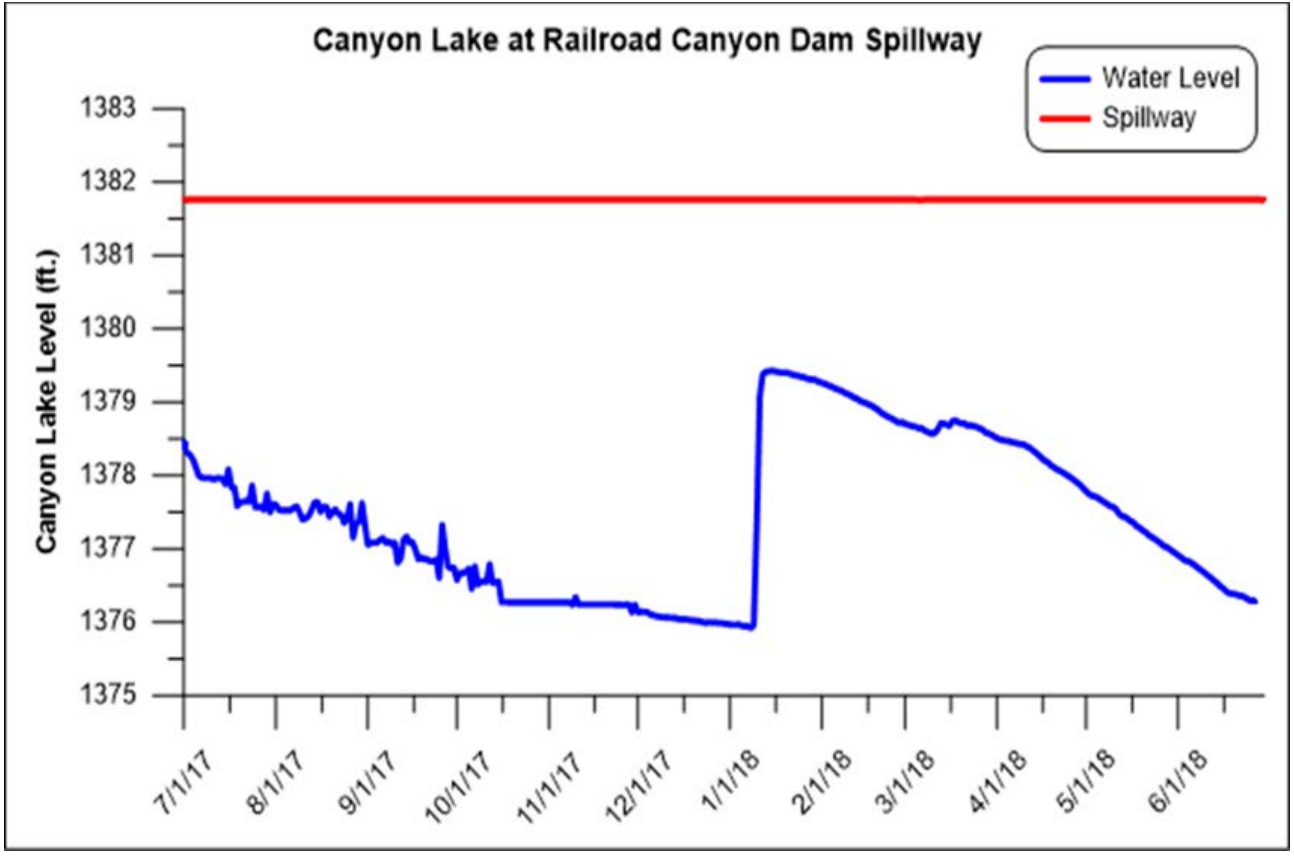
2017-2018 Annual Hydrograph



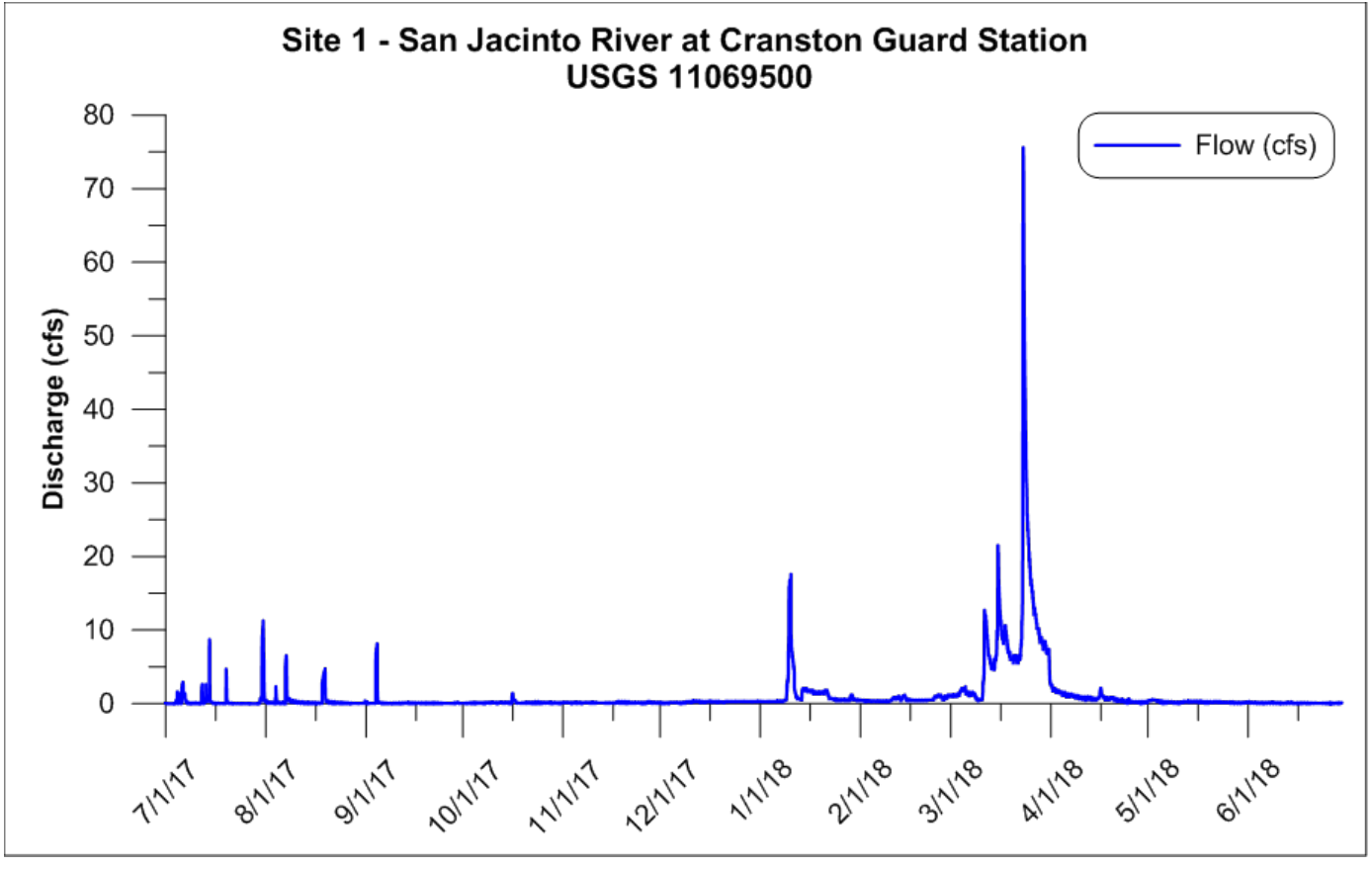
2017-2018 Annual Hydrograph

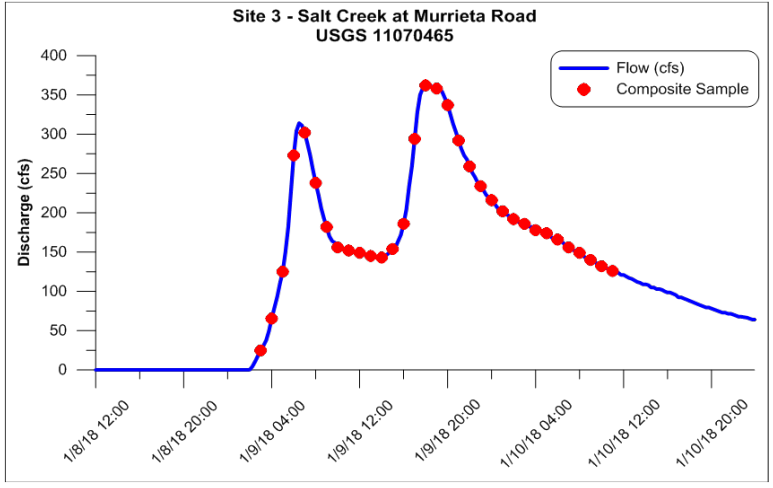


2017-2018 Annual Hydrograph



2017-2018 Annual Hydrograph



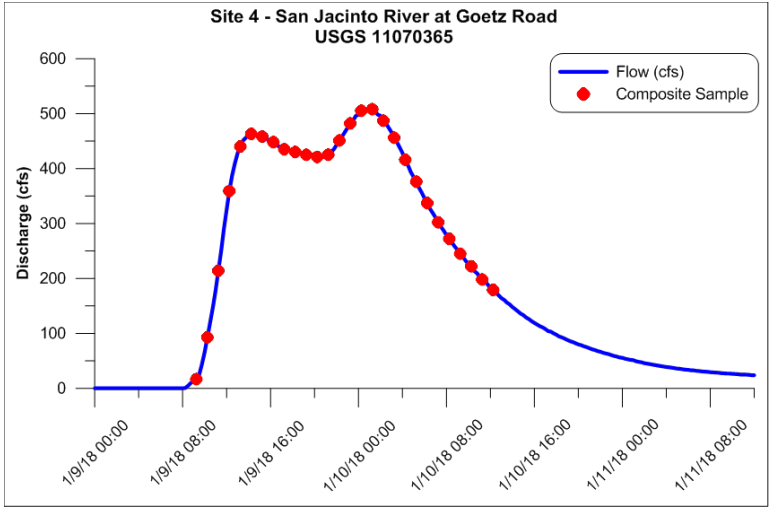


Wet Event #1

January 9-10, 2018

Watershed Rainfall: 1.83 to 2.34 inches

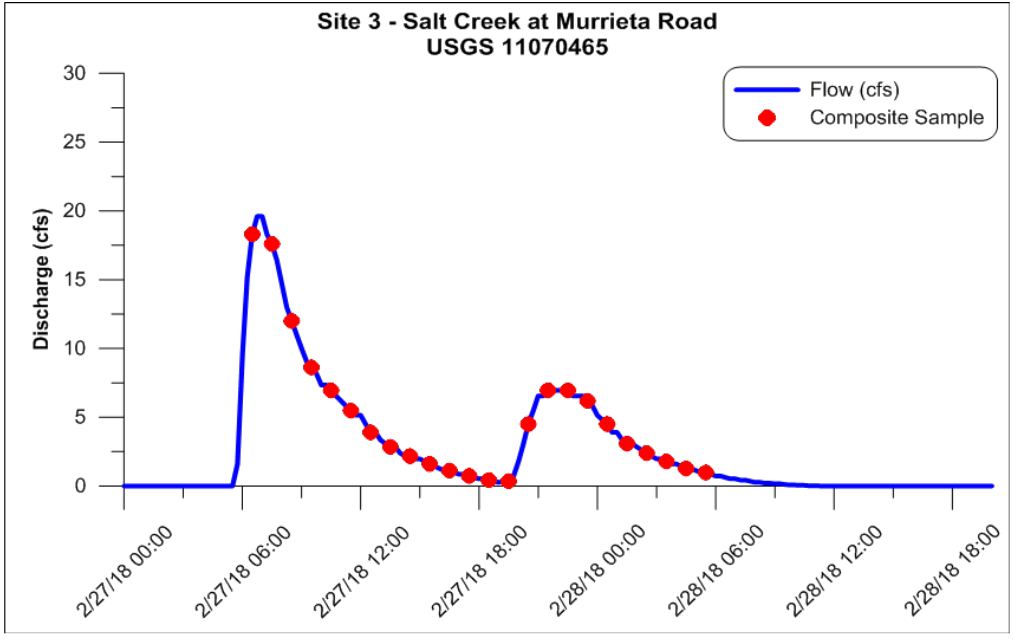
Sites: Salt Creek and San Jacinto



Salt Creek

San Jacinto

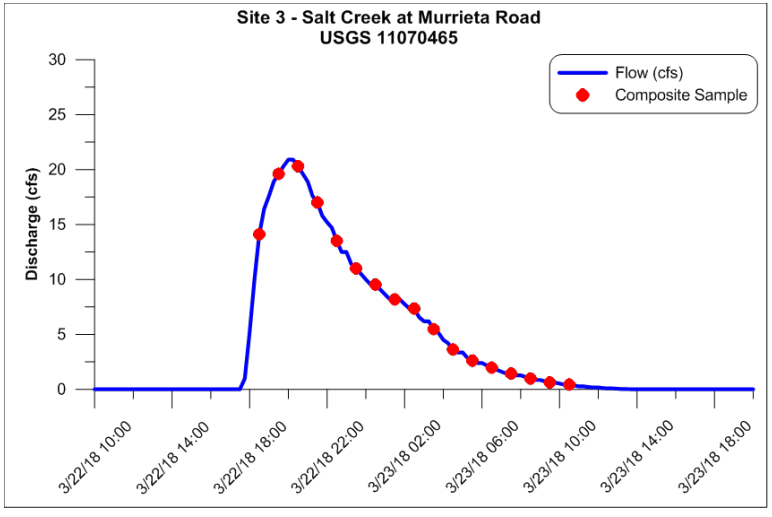
Wet Event #2

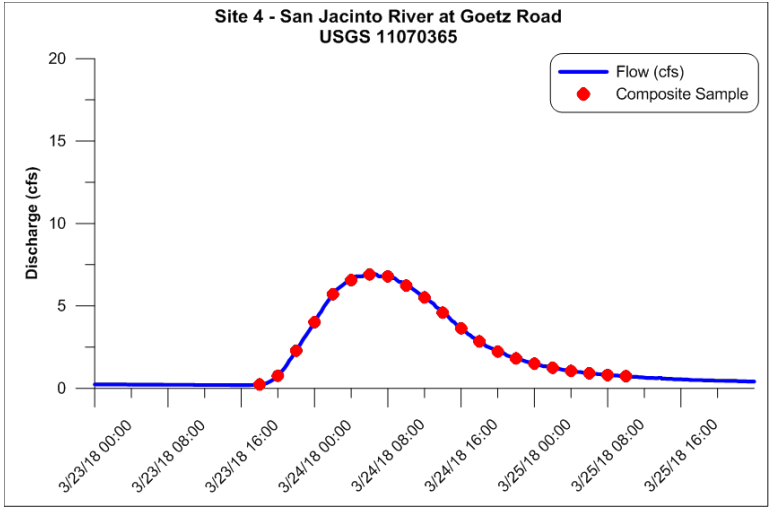


February 27-28, 2018

Watershed Rainfall: 0.11 to 0.49 inches

Sites: Salt Creek





Wet Event #3

March 22-25, 2018

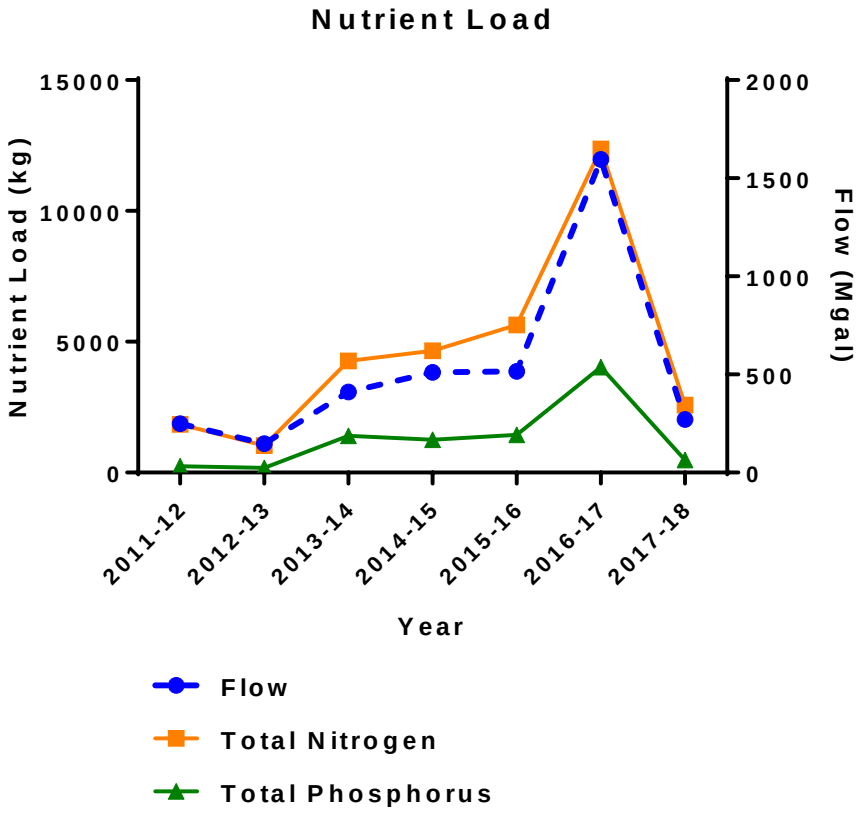
Watershed Rainfall: 0.22 to 0.41 inches

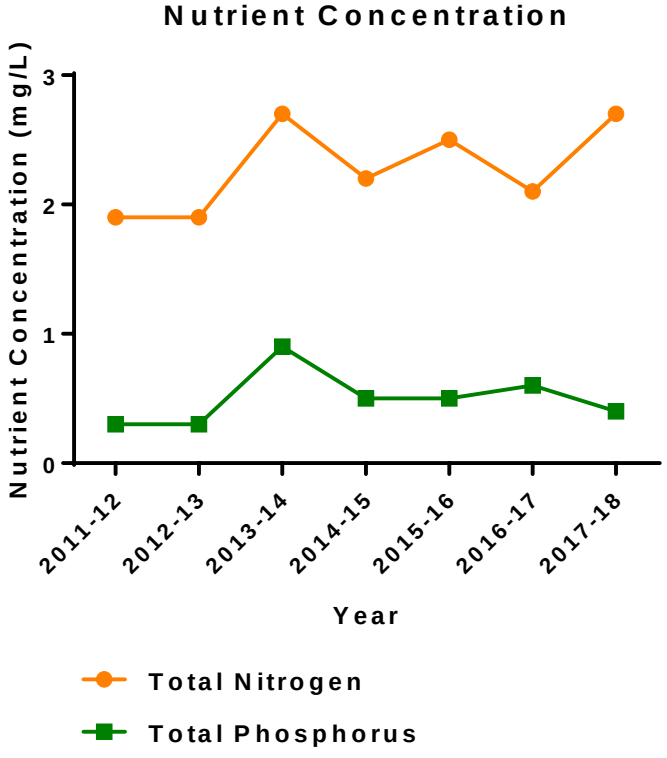
Sites: Salt Creek and San Jacinto

Salt Creek

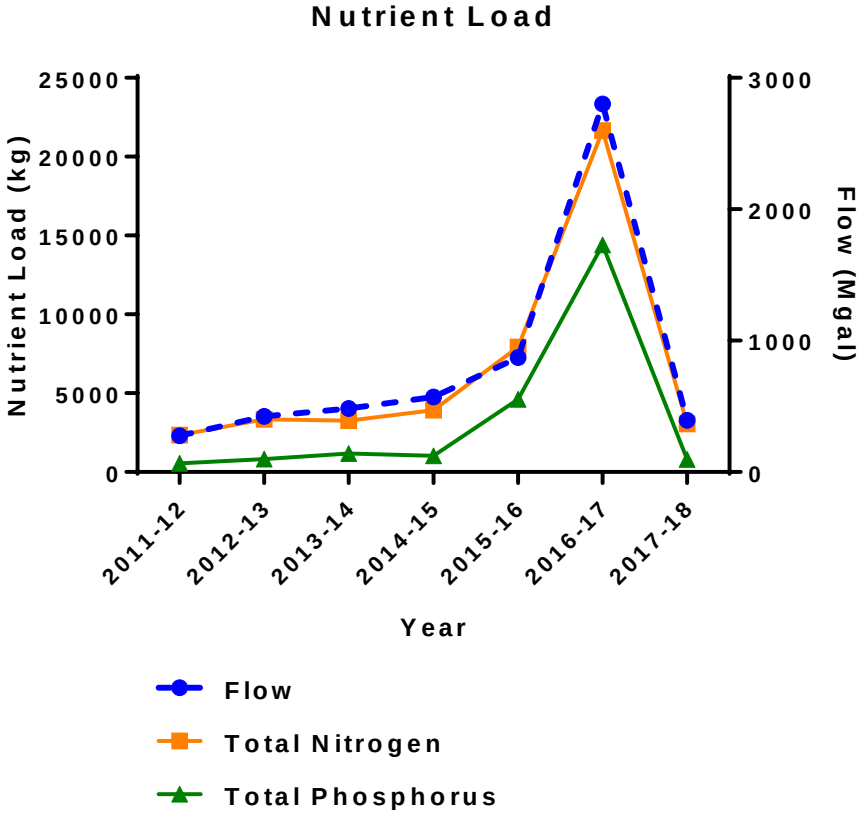
San Jacinto

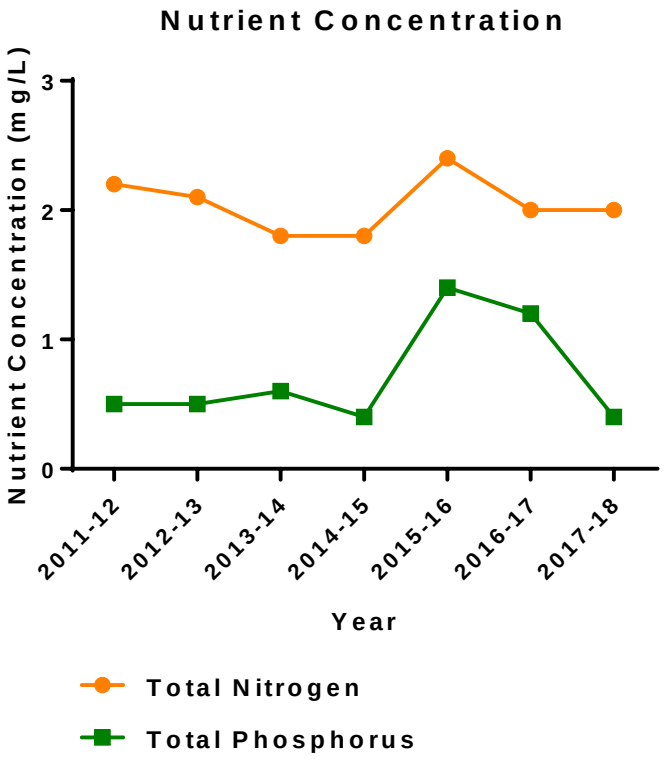
Salt Creek Historic Nutrient Loads and Concentrations





San Jacinto Historic Nutrient Loads and Concentrations





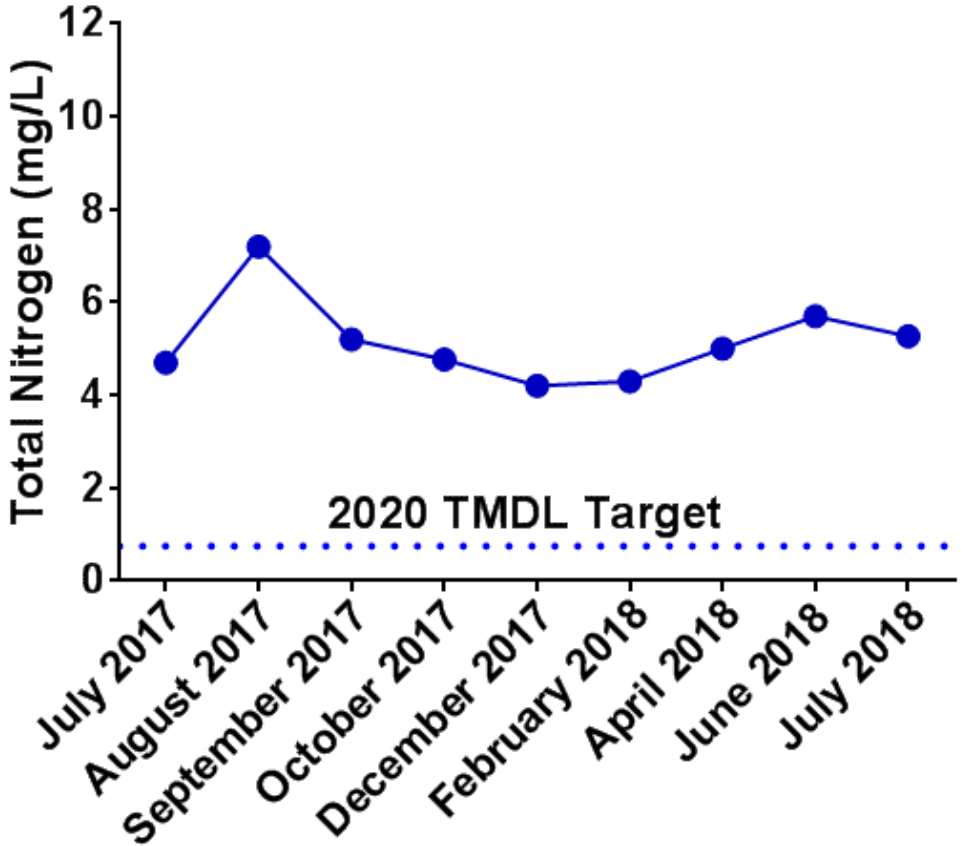
Lake Elsinore and Canyon Lake TMDL Water Quality Monitoring Update – 2017-18 Summary

In-Lake Monitoring

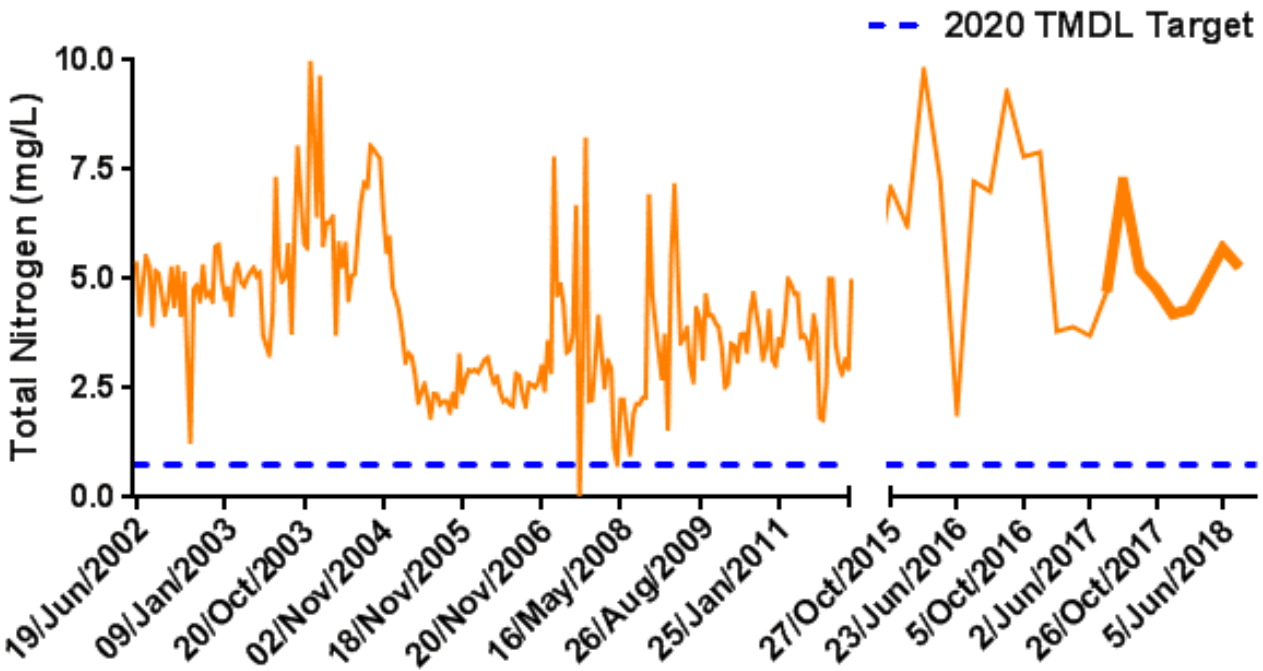
Station Locations – Lake Elsinore

Station Locations – Canyon Lake

Total Nitrogen – Lake Elsinore 2017-2018



Total Nitrogen – Lake Elsinore Historic Data

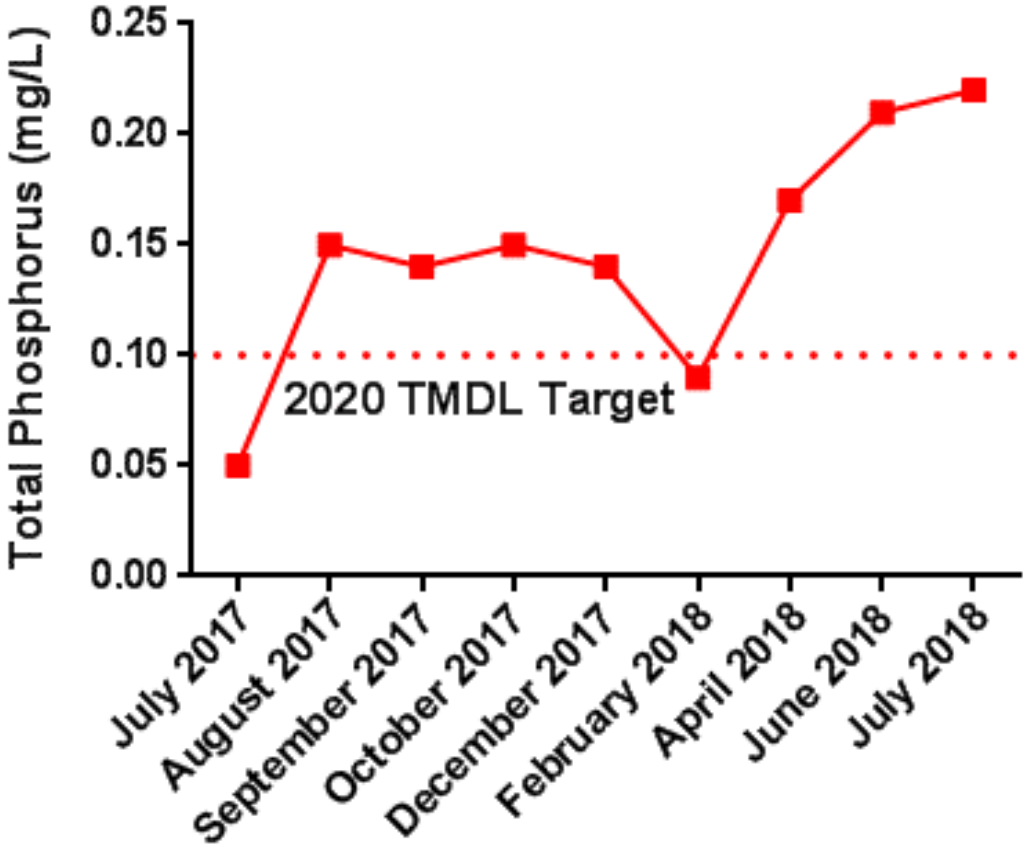


No data available from June 2012-July 2015

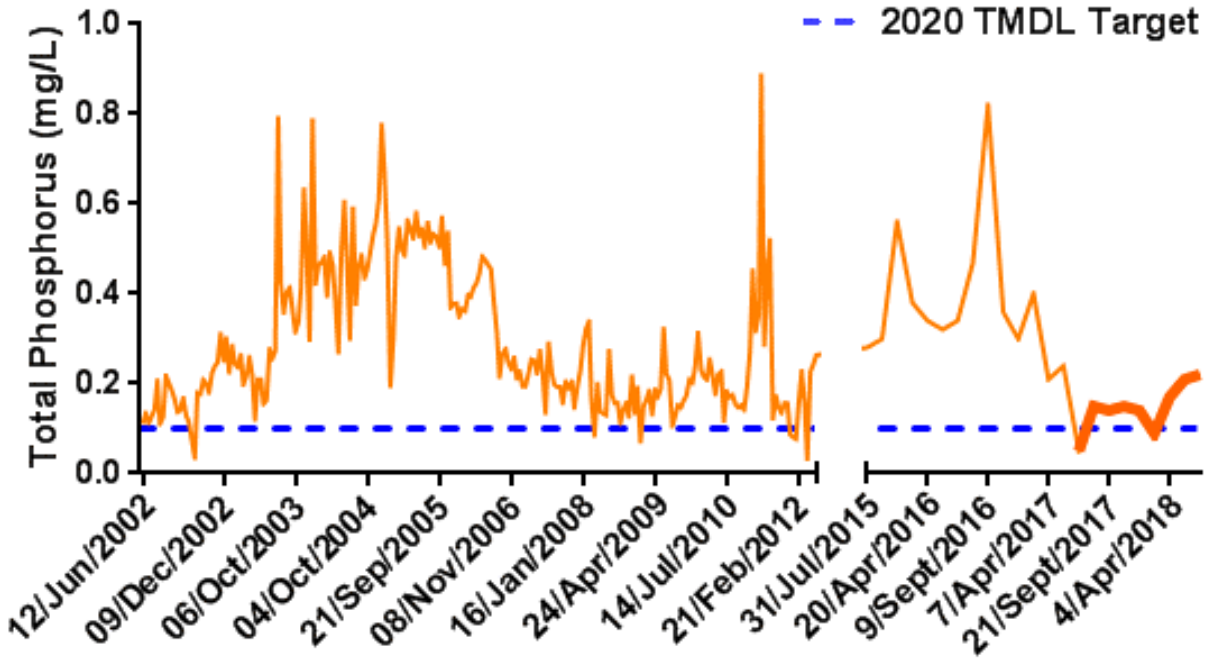
TMDL target of 0.75 mg/L is annual average to be attained by 2020

Bold represents current monitoring year July 2017-July 2018

Total Phosphorus – Lake Elsinore 2017-2018



Total Phosphorus – Lake Elsinore Historic Data

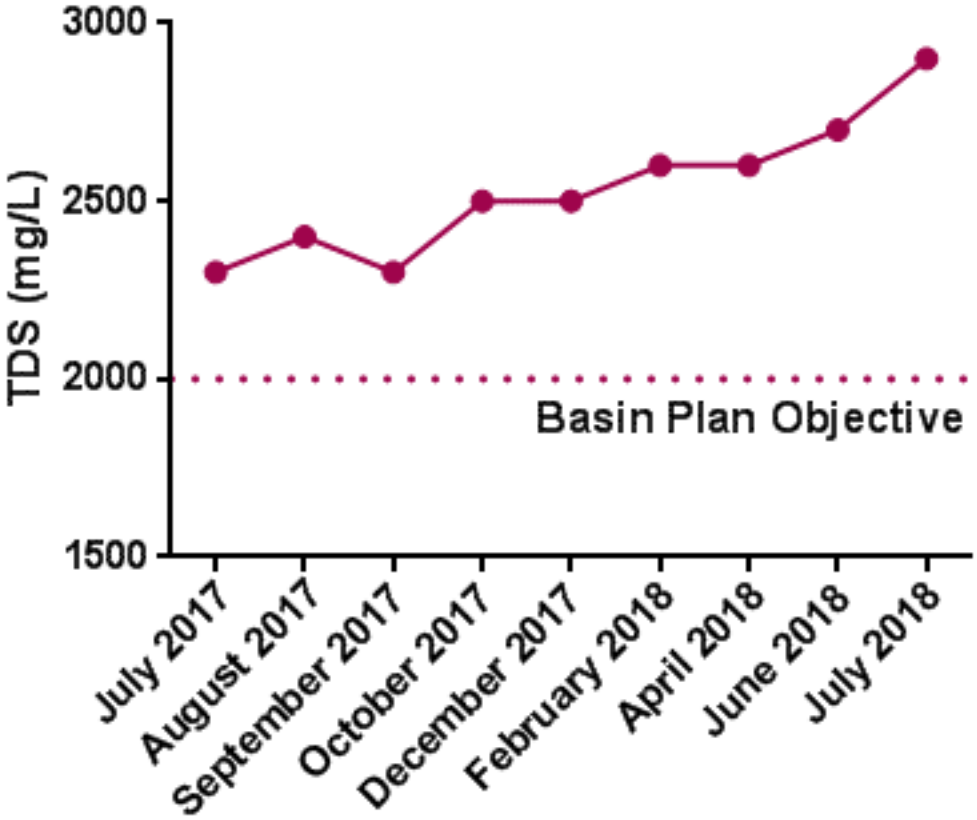


No data available from June 2012-July 2015

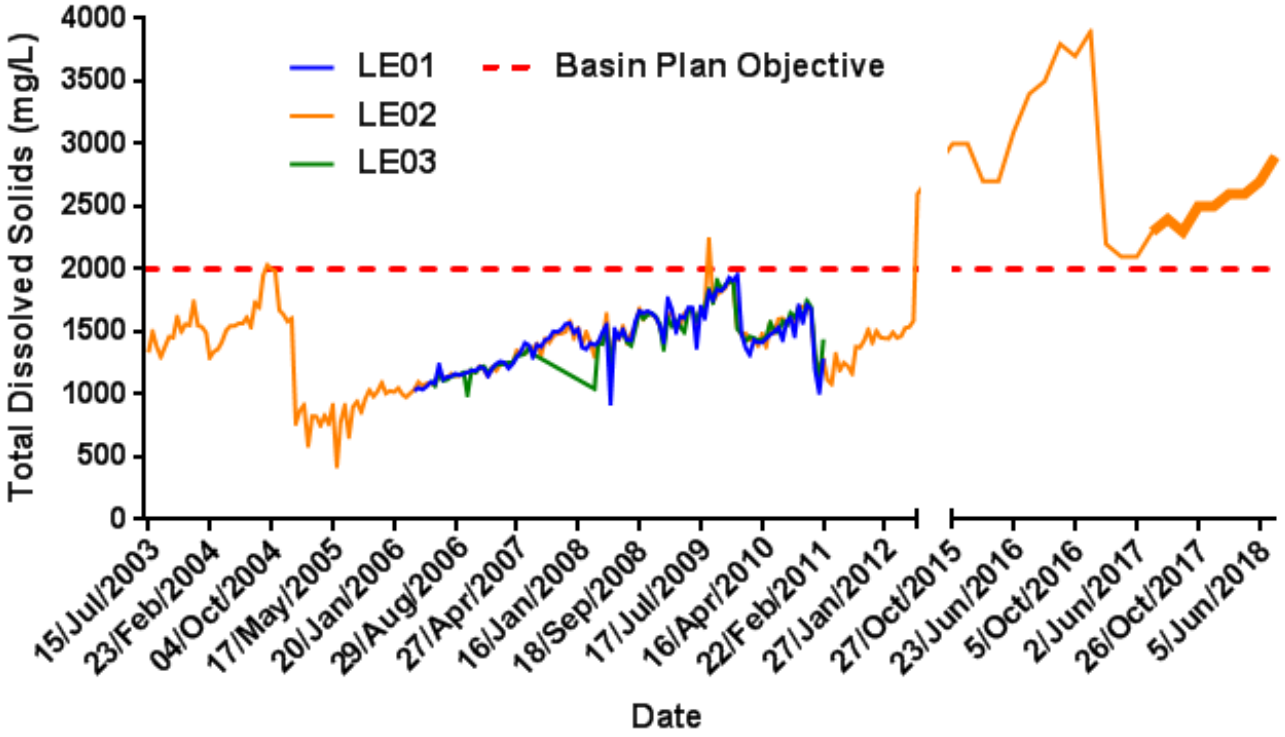
TMDL target of 0.1 mg/L is annual average to be attained by 2020

Bold represents current monitoring year July 2017-July 2018

Total Dissolved Solids– Lake Elsinore 2017-2018



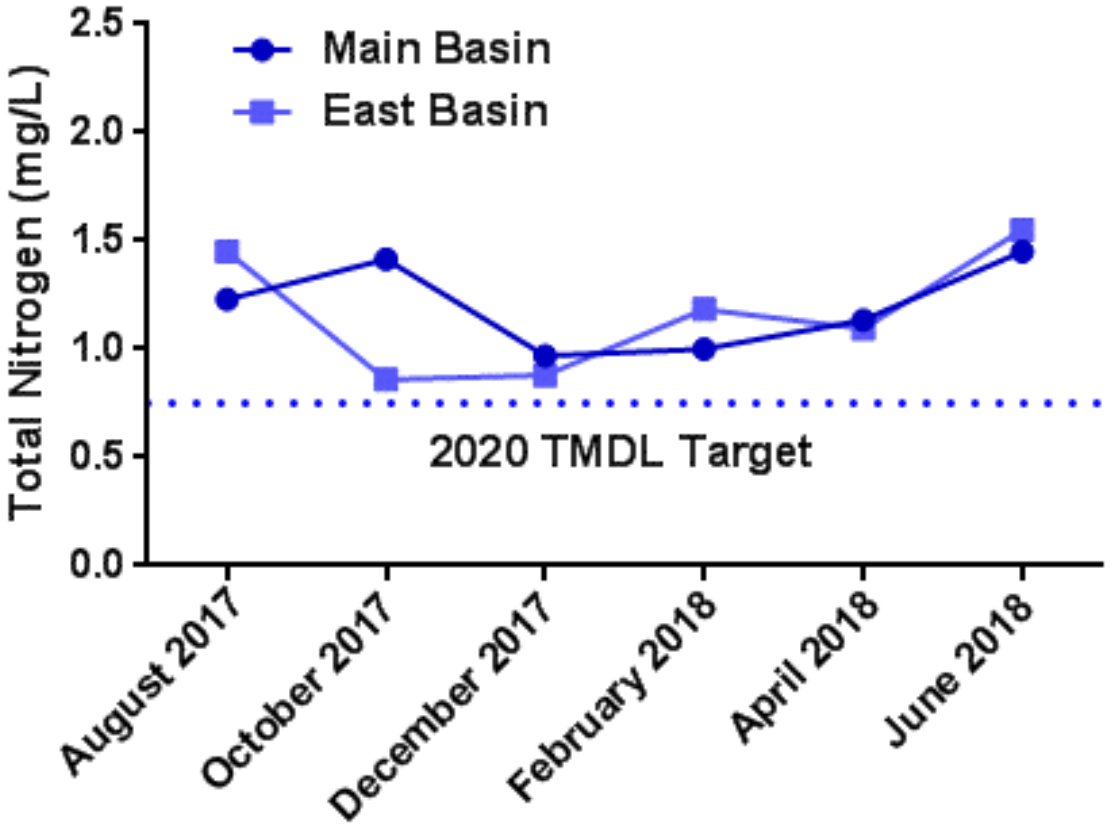
Total Dissolved Solids– Lake Elsinore Historic Data



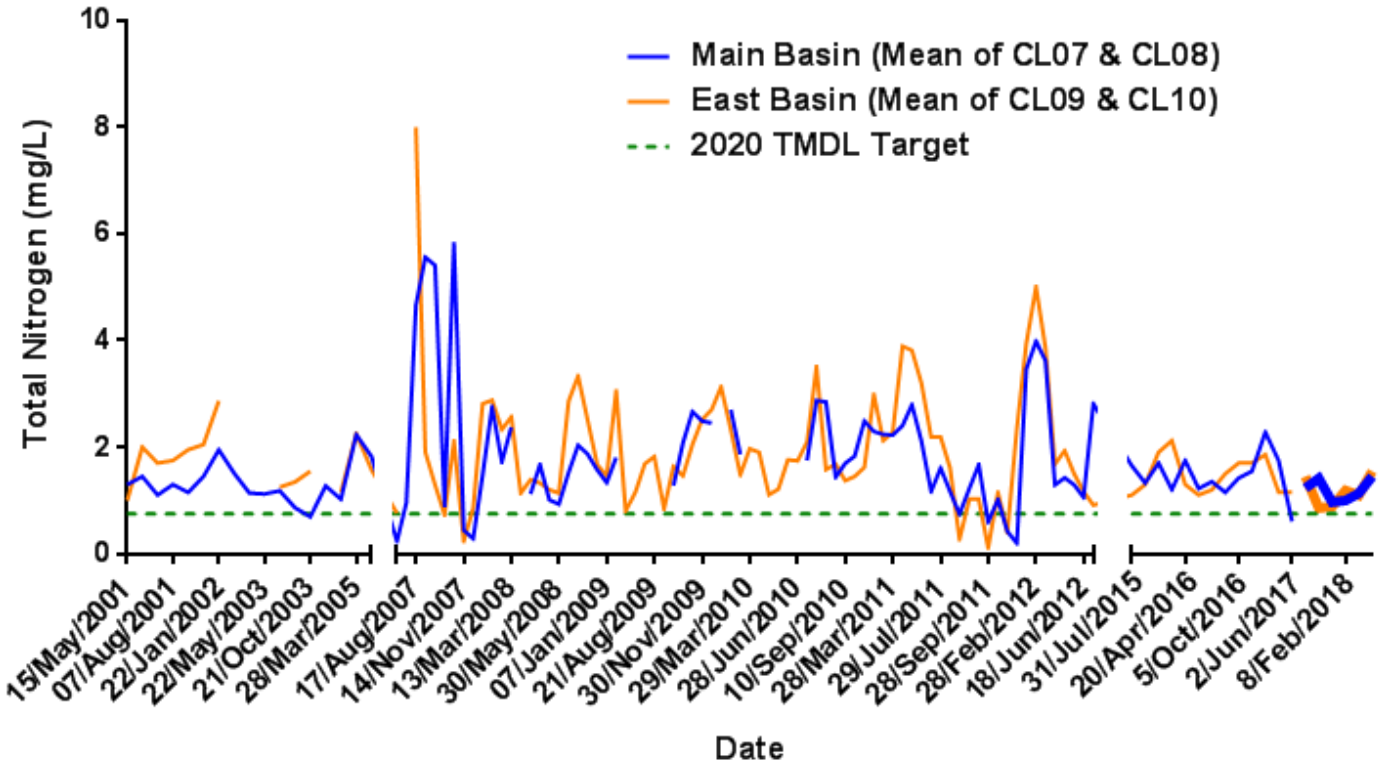
No data available from June 2012-July 2015

Bold represents current monitoring year July 2017-July 2018

Total Nitrogen – Canyon Lake 2017-2018



Total Nitrogen – Canyon Lake Historic Data

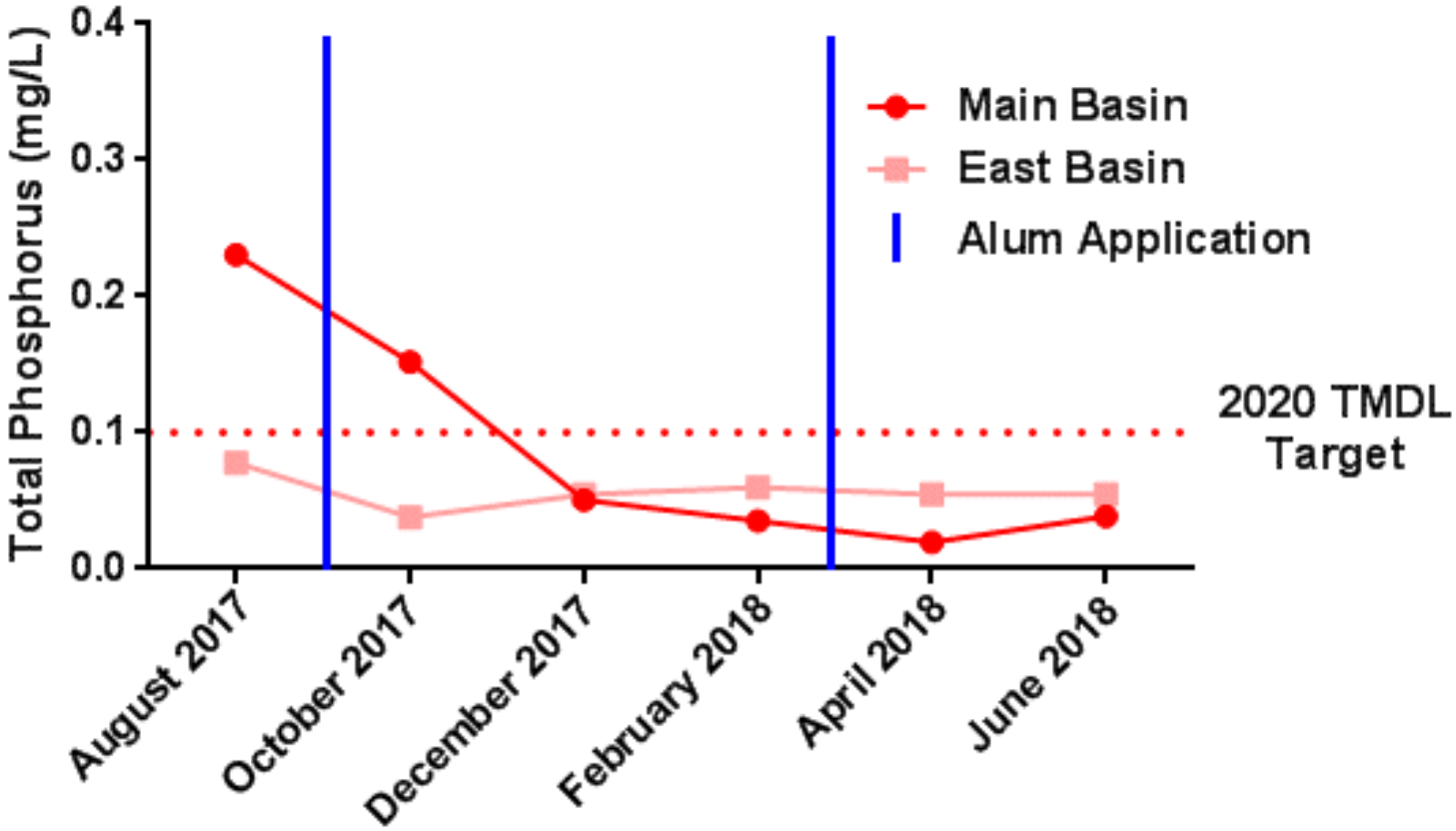


No data available from May 2005-July 2007; June 2012-July 2015

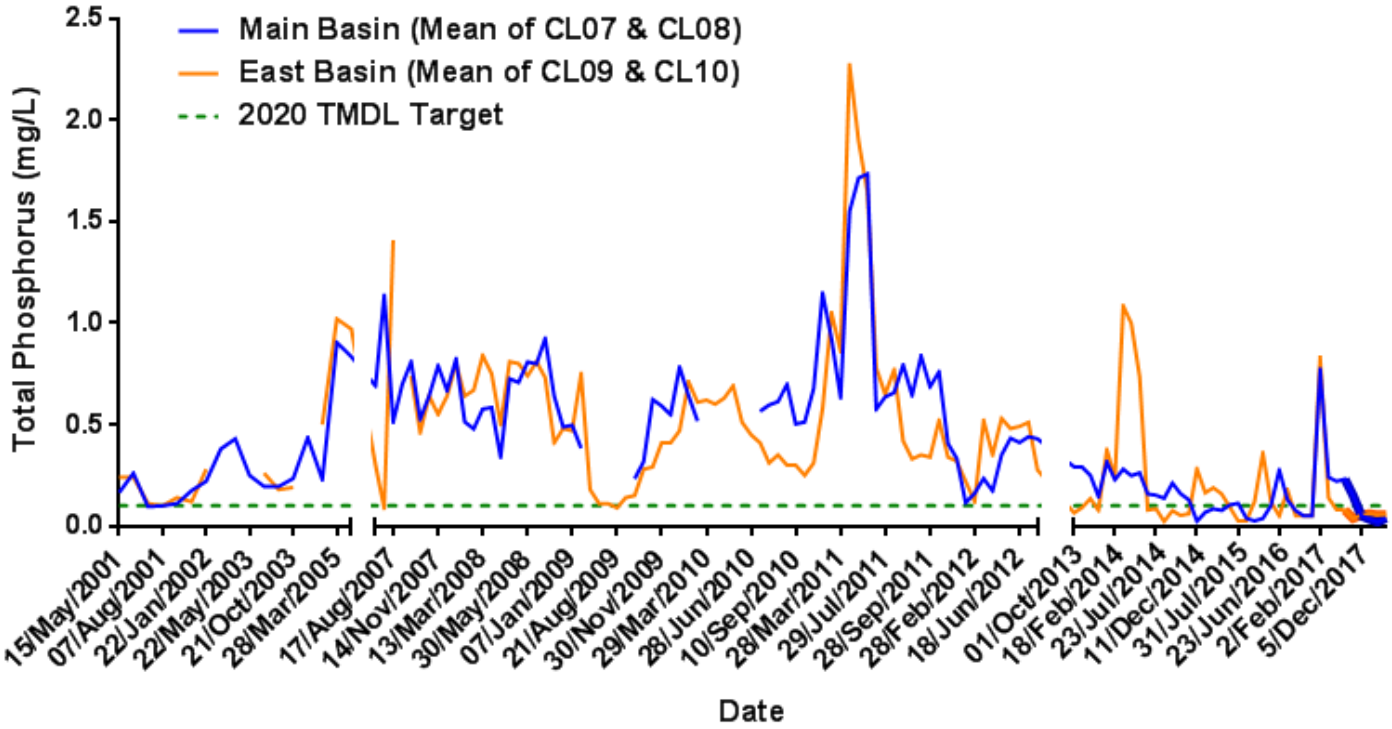
TMDL target of 0.75 mg/L is annual average to be attained by 2020

Bold represents current monitoring year July 2017-June 2018

Total Phosphorus – Canyon Lake 2017-2018



Total Phosphorus – Canyon Lake Historic Data

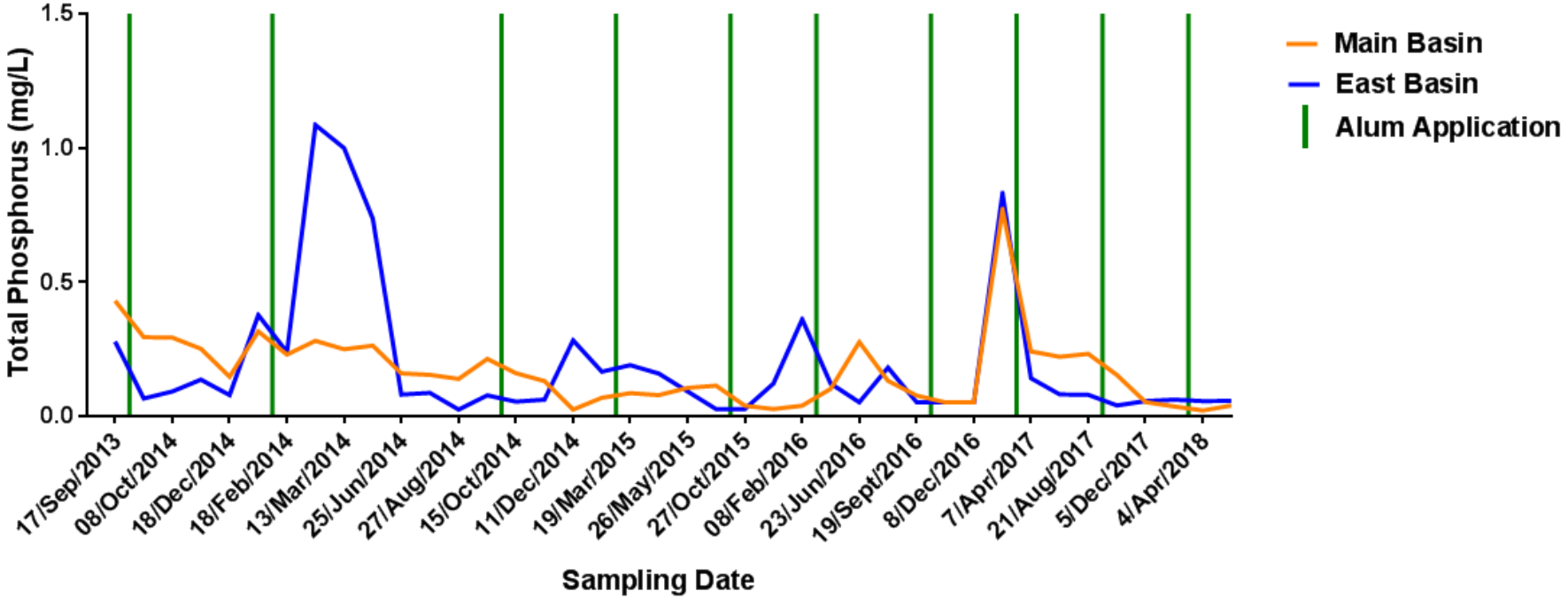


No data available from May 2005-July 2007; June 2012-Sept 2013

TMDL target of 0.1 mg/L is annual average to be attained by 2020

Bold represents current monitoring year July 2017-June 2018

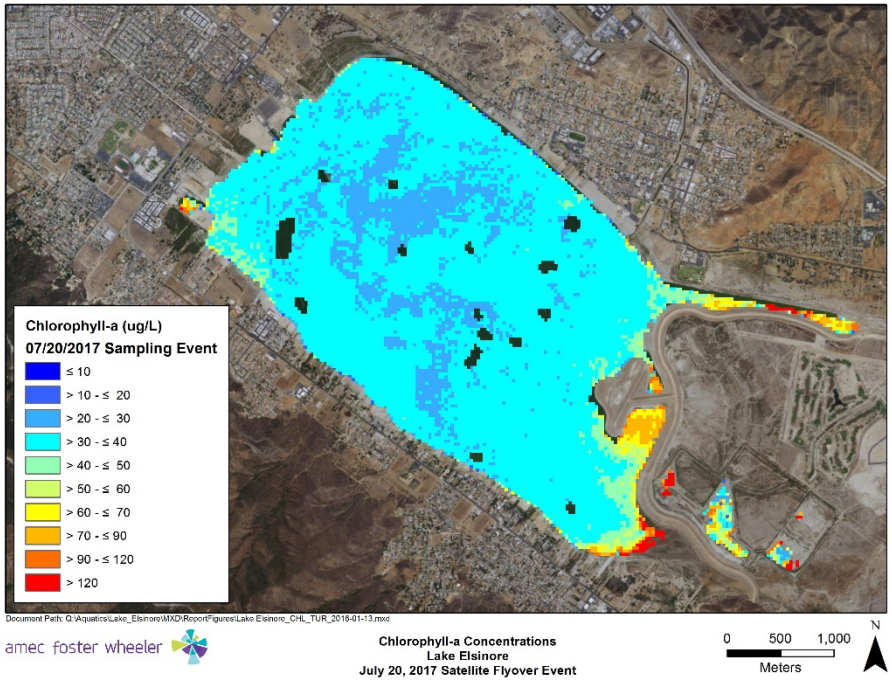
Alum Effectiveness – Canyon Lake
Total Phosphorus



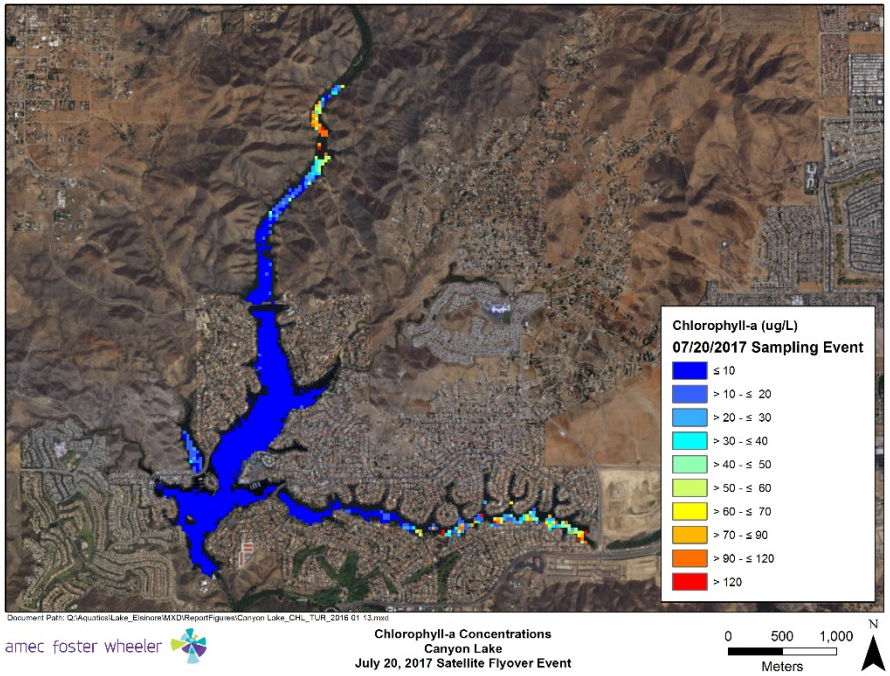
* All samples labels not included on x-axis

Satellite Imagery – Chlorophyll July 20, 2017

Lake Elsinore



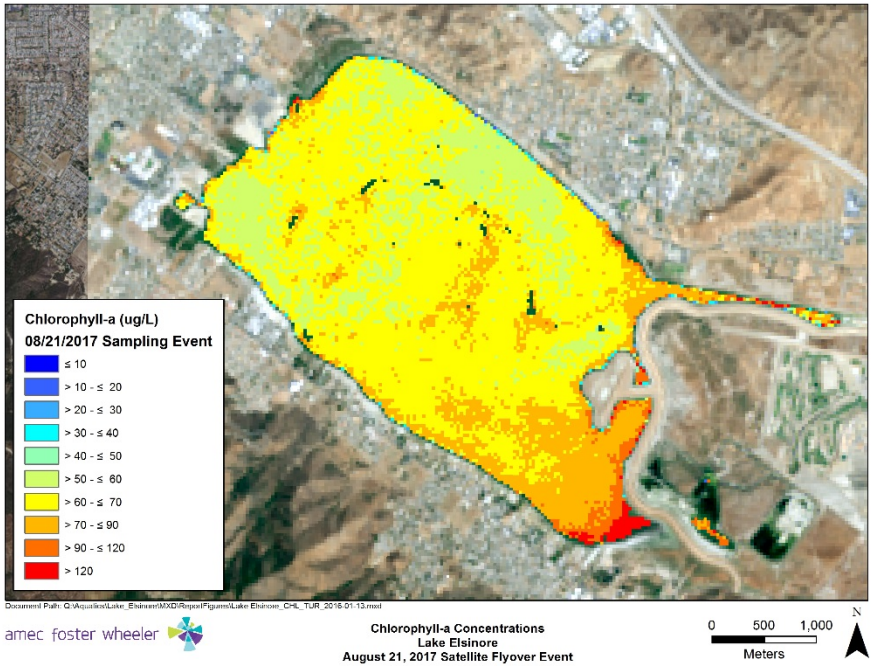
Canyon Lake



**Data gaps due to surficial cyanobacterial slicks.

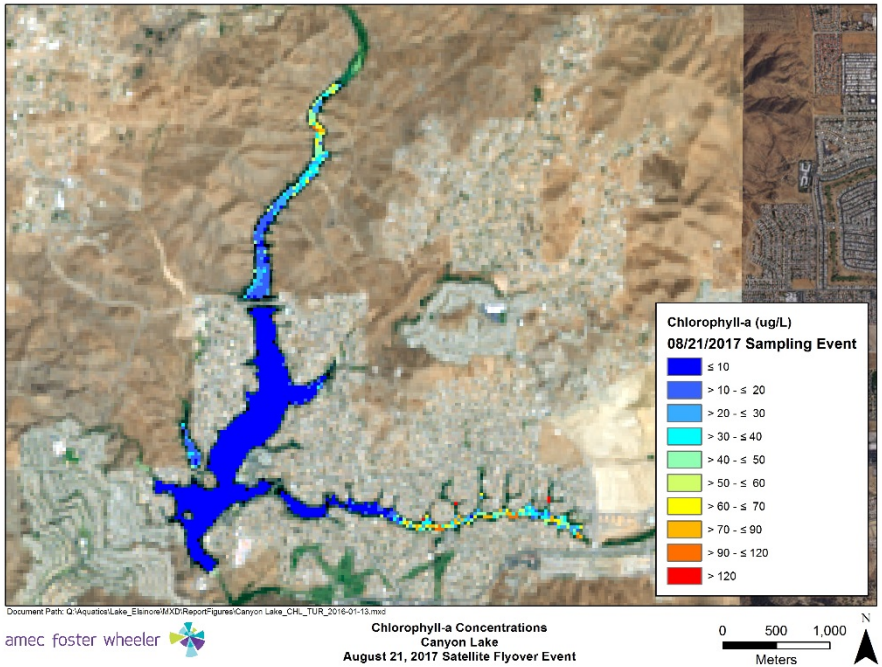
Satellite Imagery – Chlorophyll August 21, 2017

Lake Elsinore



**Data gaps due to large floating cyanobacterial slicks

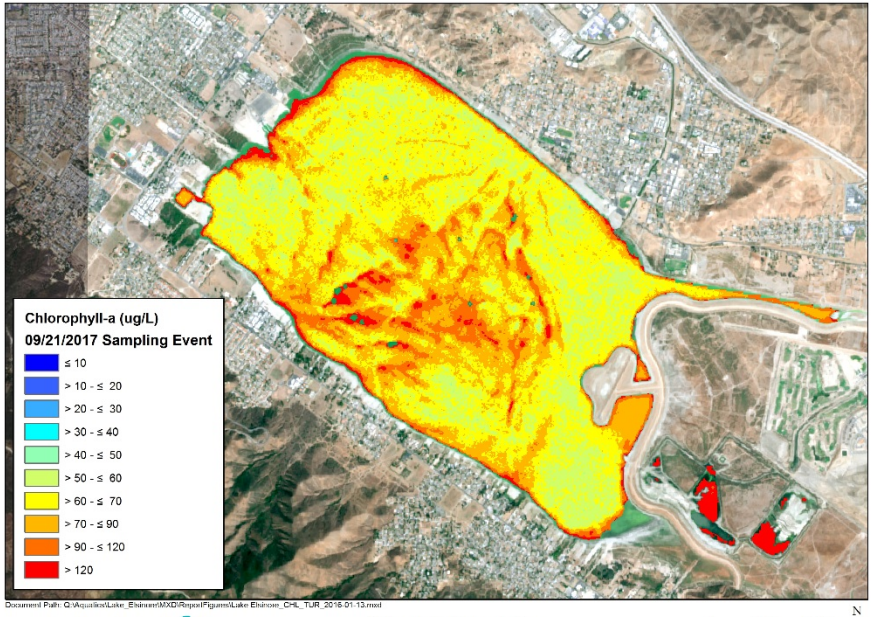
Canyon Lake



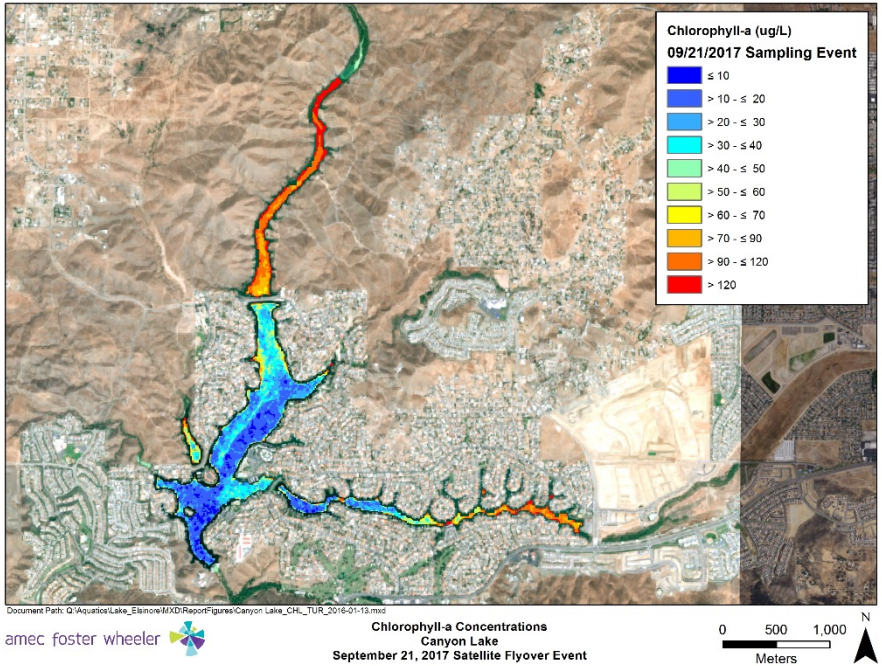
**Decreased clarity due to high cirrus clouds

Satellite Imagery – Chlorophyll September 21, 2017

Lake Elsinore

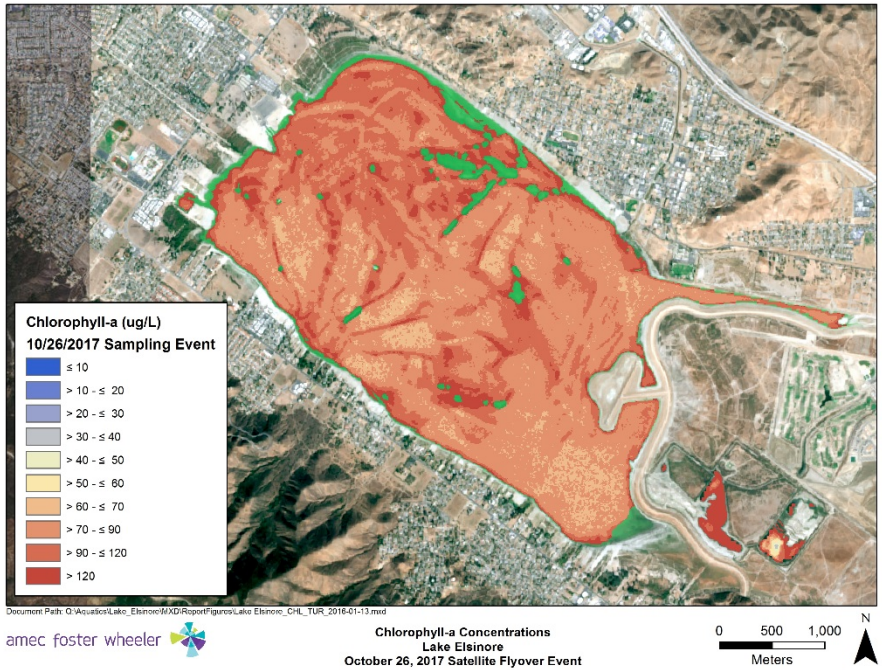


Canyon Lake



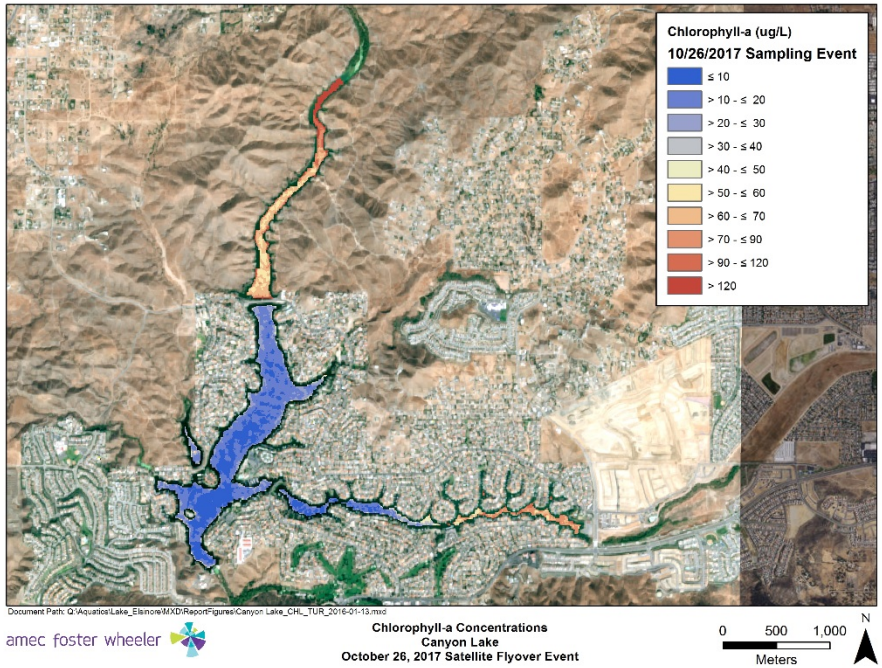
Satellite Imagery – Chlorophyll October 26, 2017

Lake Elsinore



**Data gaps due to surficial cyanobacterial slicks.

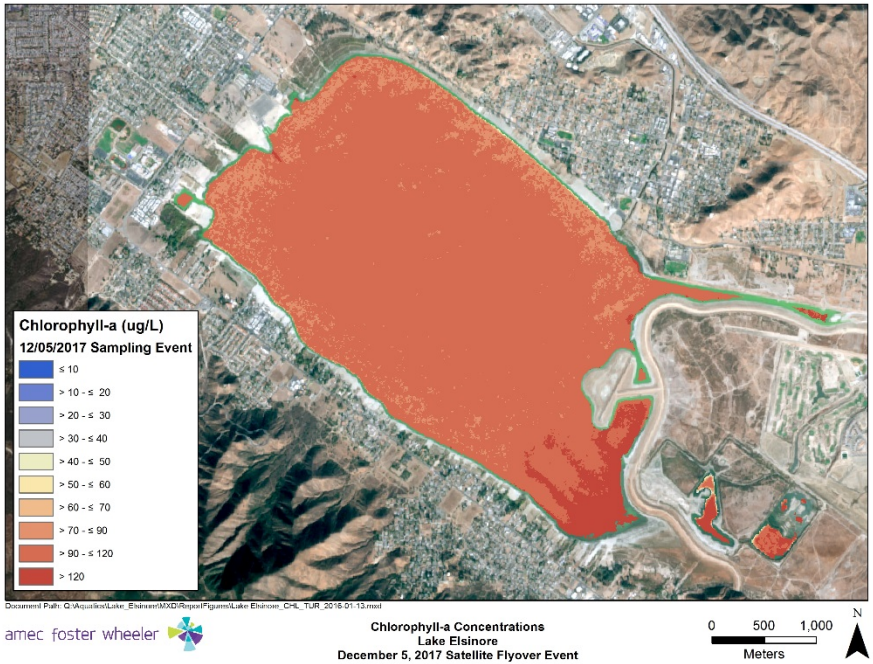
Canyon Lake



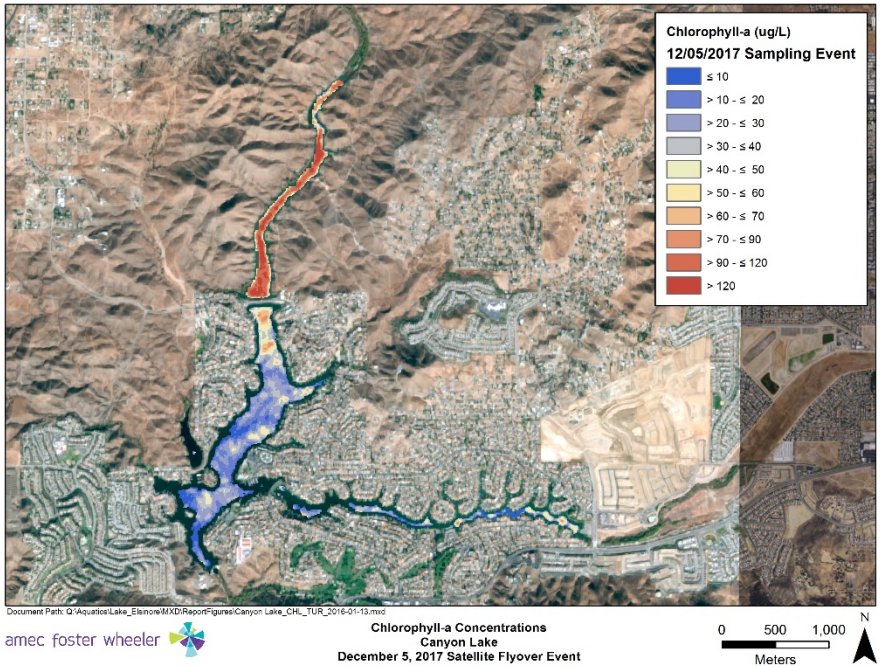
Note changes to the legend colors

Satellite Imagery – Chlorophyll December 5, 2017

Lake Elsinore

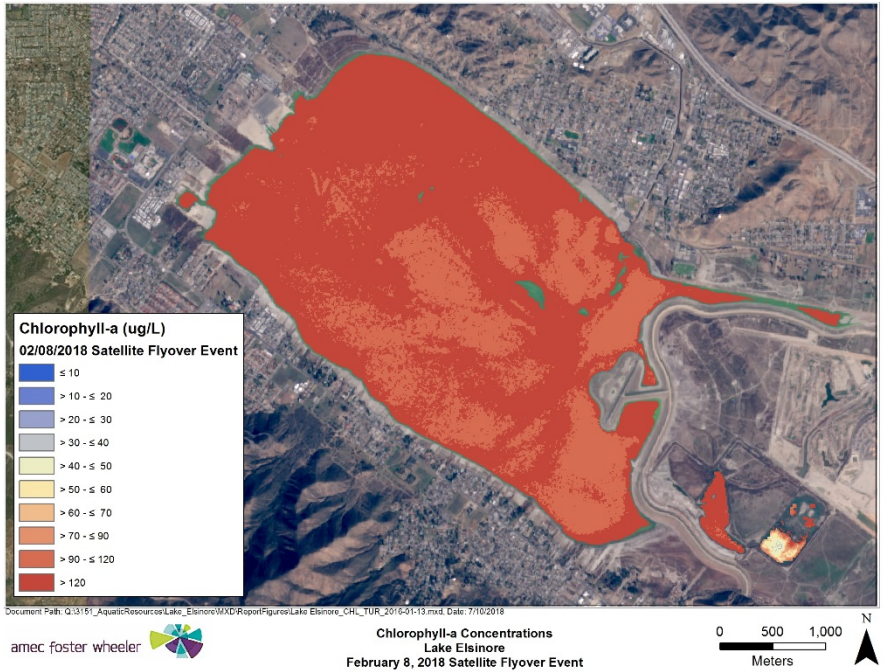


Canyon Lake

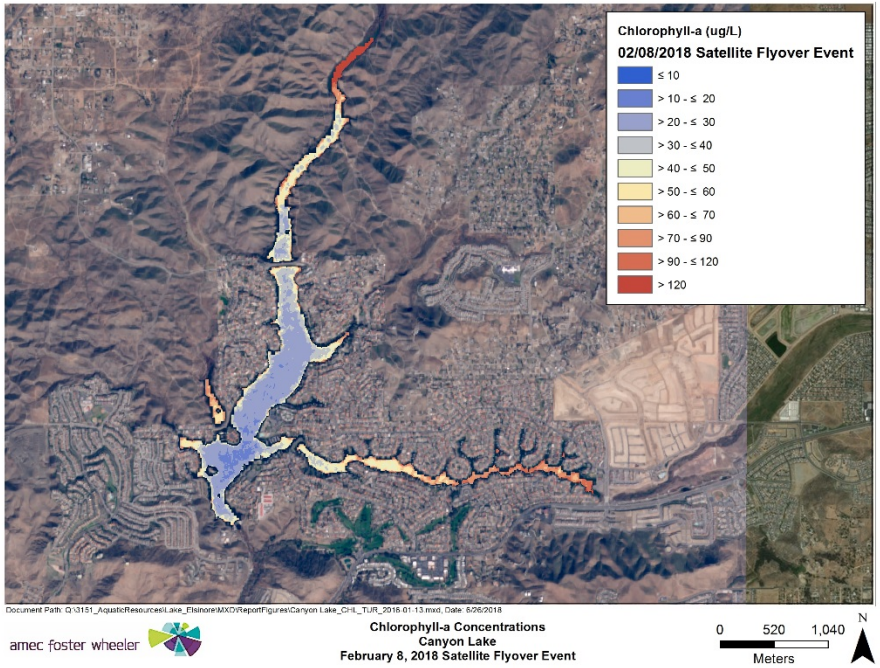


Satellite Imagery – Chlorophyll February 8, 2018

Lake Elsinore

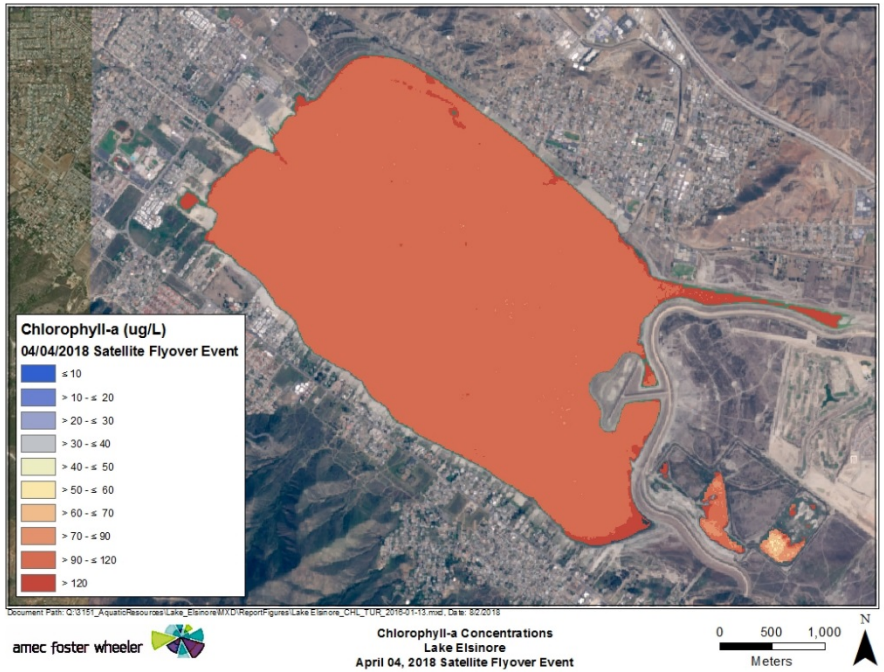


Canyon Lake

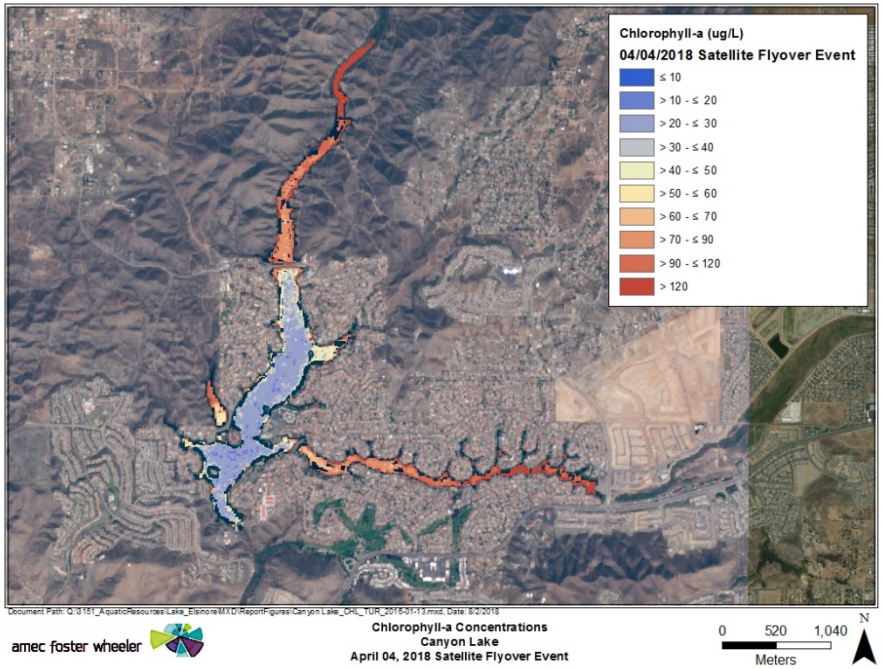


Satellite Imagery – Chlorophyll April 4, 2018

Lake Elsinore

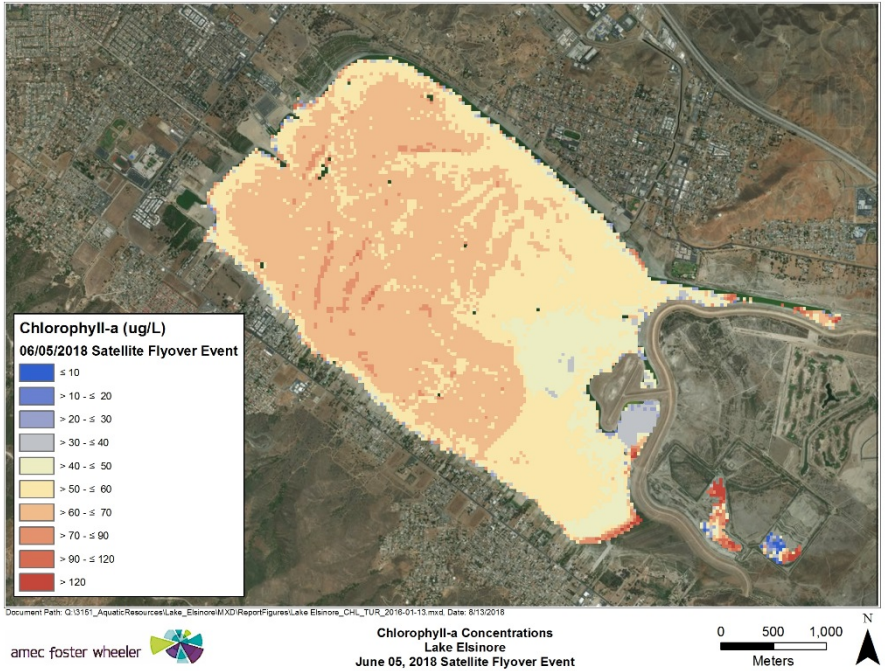


Canyon Lake

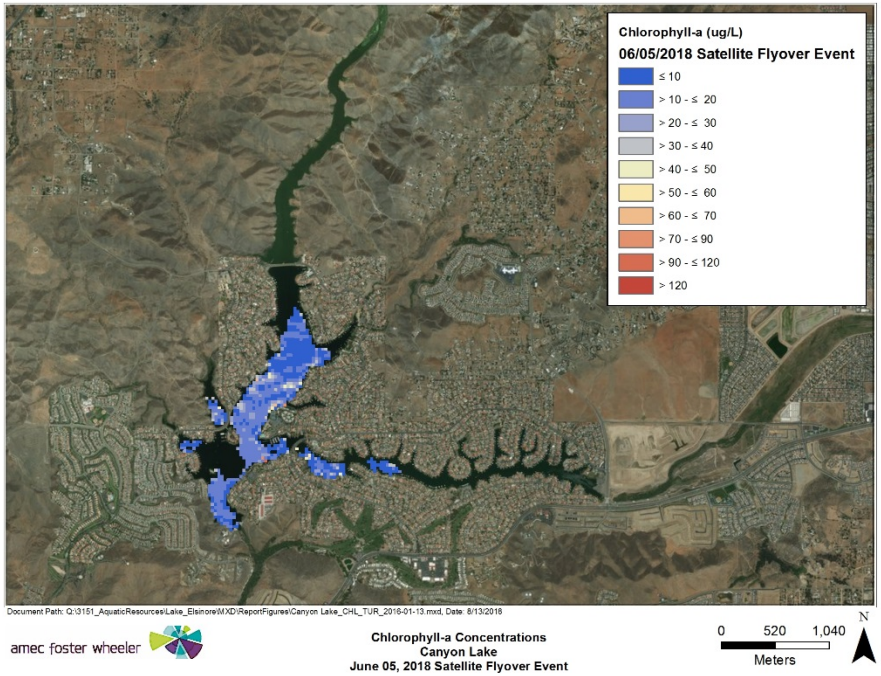


Satellite Imagery – Chlorophyll June 5, 2018

Lake Elsinore



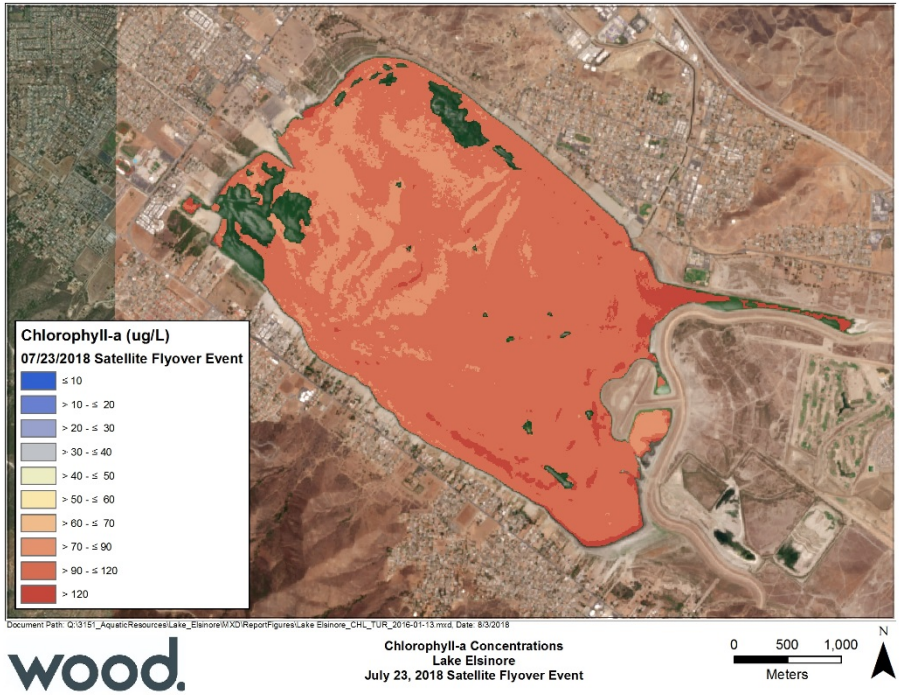
Canyon Lake



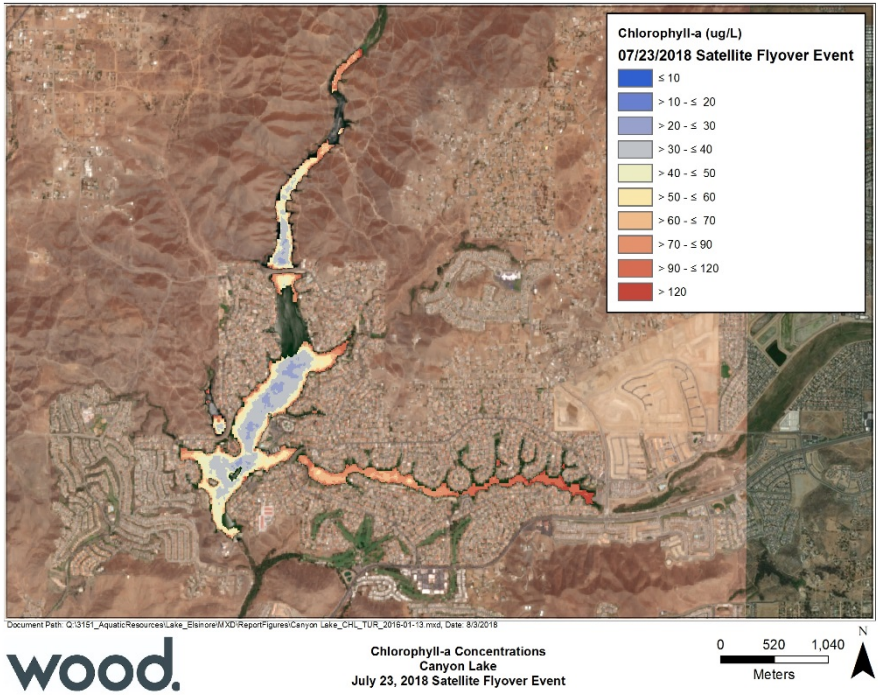
**Data gaps due to high cirrus clouds

Satellite Imagery – Chlorophyll July 23, 2018

Lake Elsinore

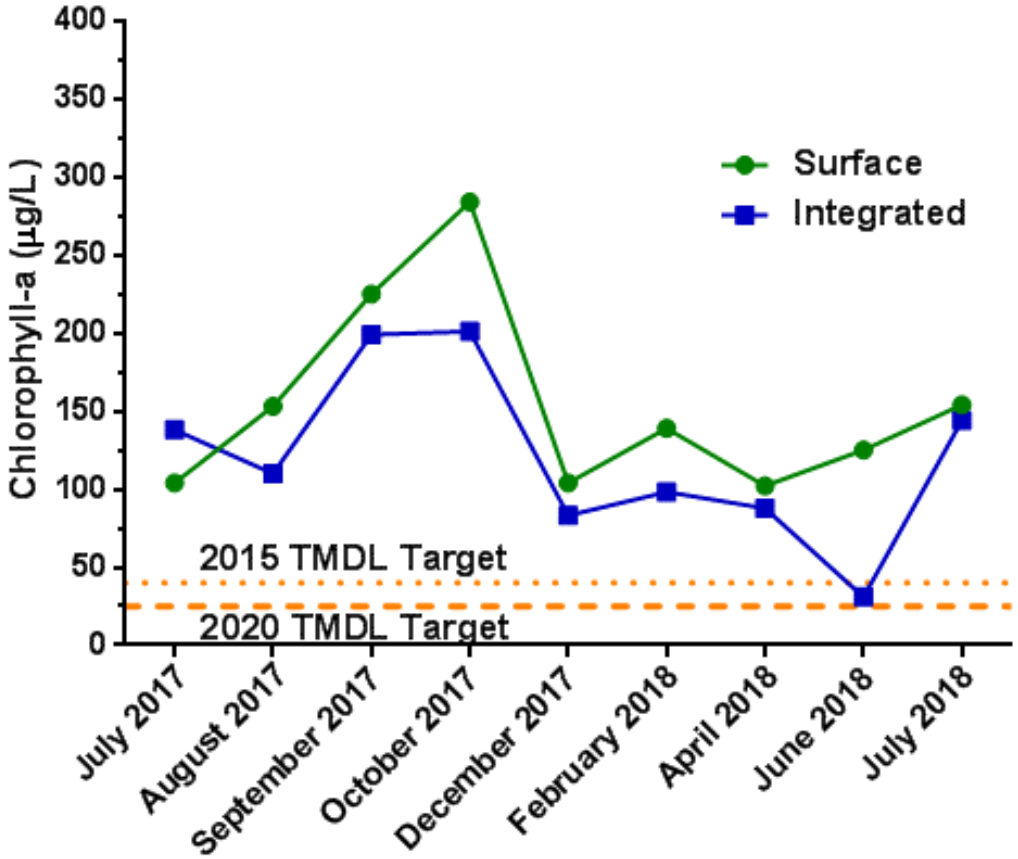


Canyon Lake

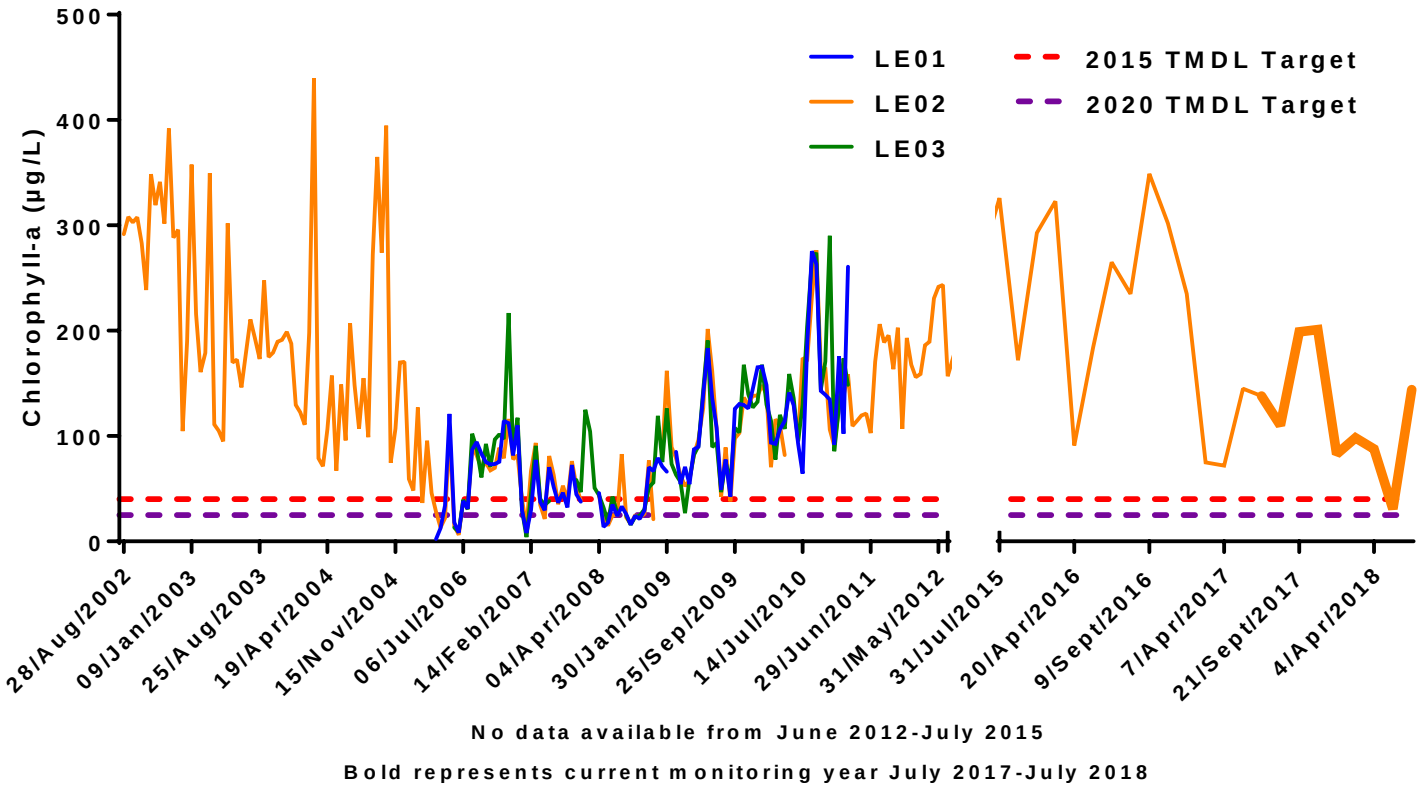


**Data gaps due to high cirrus clouds

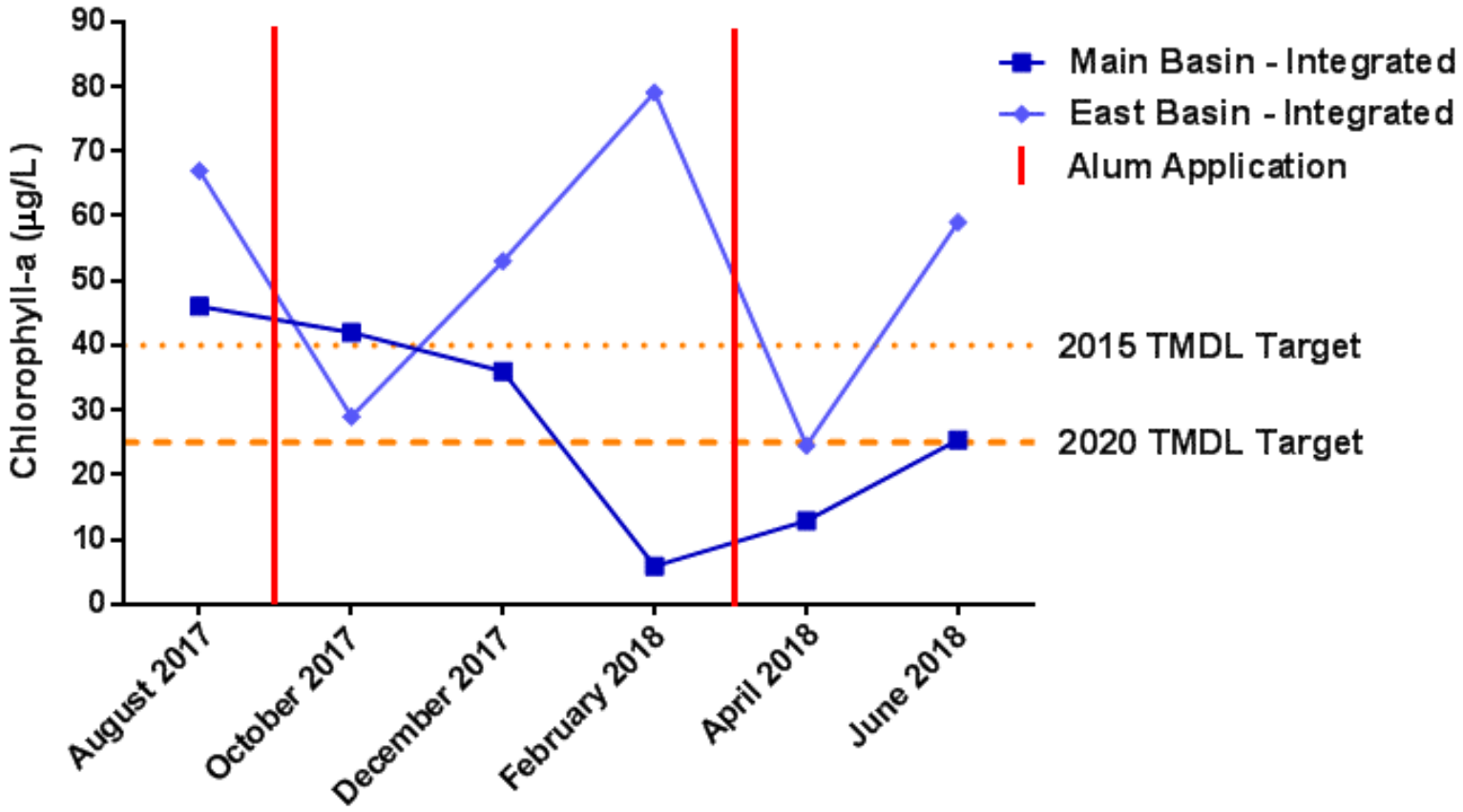
Lake Elsinore Chlorophyll – 2017-2018



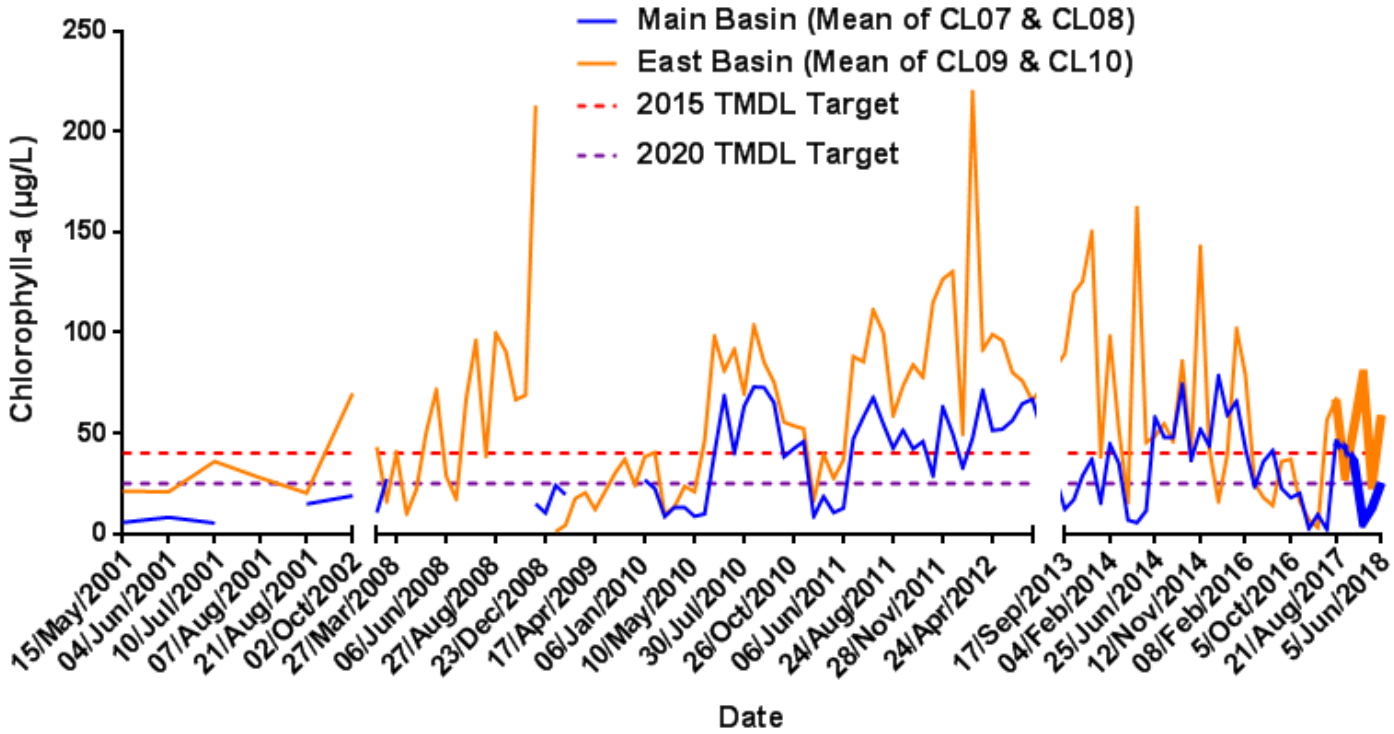
Lake Elsinore Chlorophyll – Integrated Historic Data



Canyon Lake Chlorophyll – 2017-2018



Canyon Lake Chlorophyll – Integrated Historic Data



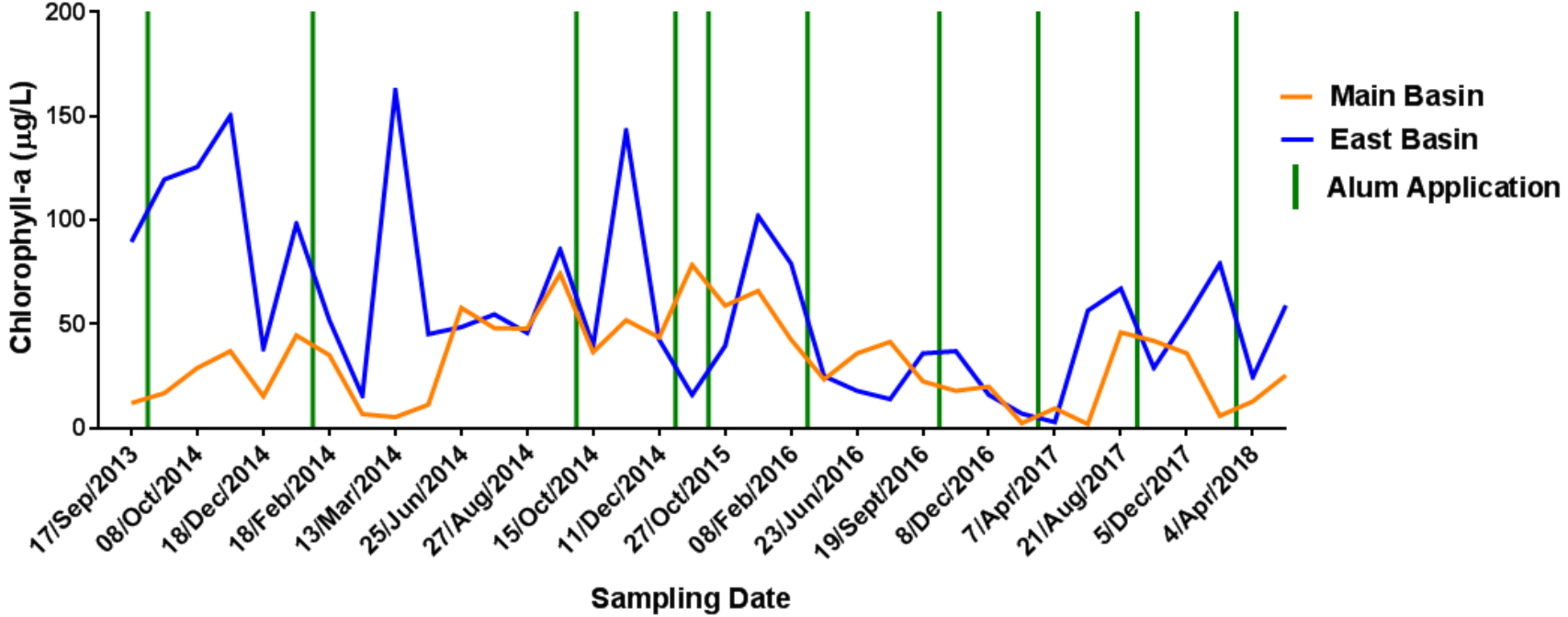
No data available from October 2002-August 2007; June 2012-Sept 2013

2015 TMDL target of 40 µg/L is annual average to be attained by 2015

2020 TMDL target of 25 µg/L is annual average to be attained by 2020

Bold represents current monitoring year July 2016-June 2017

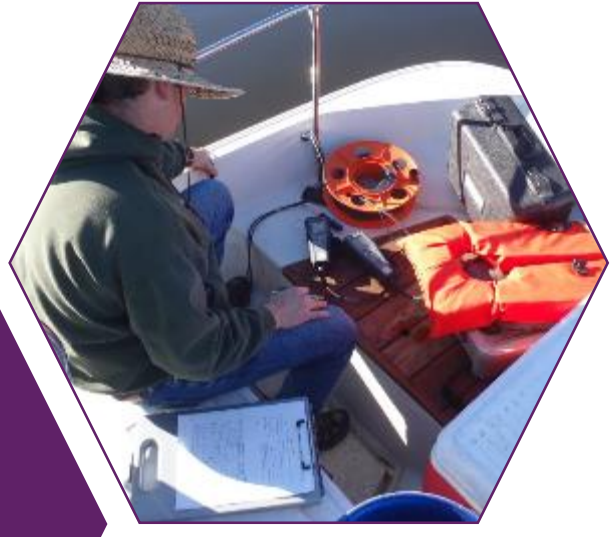
Alum Effectiveness – Canyon Lake Chlorophyll-a



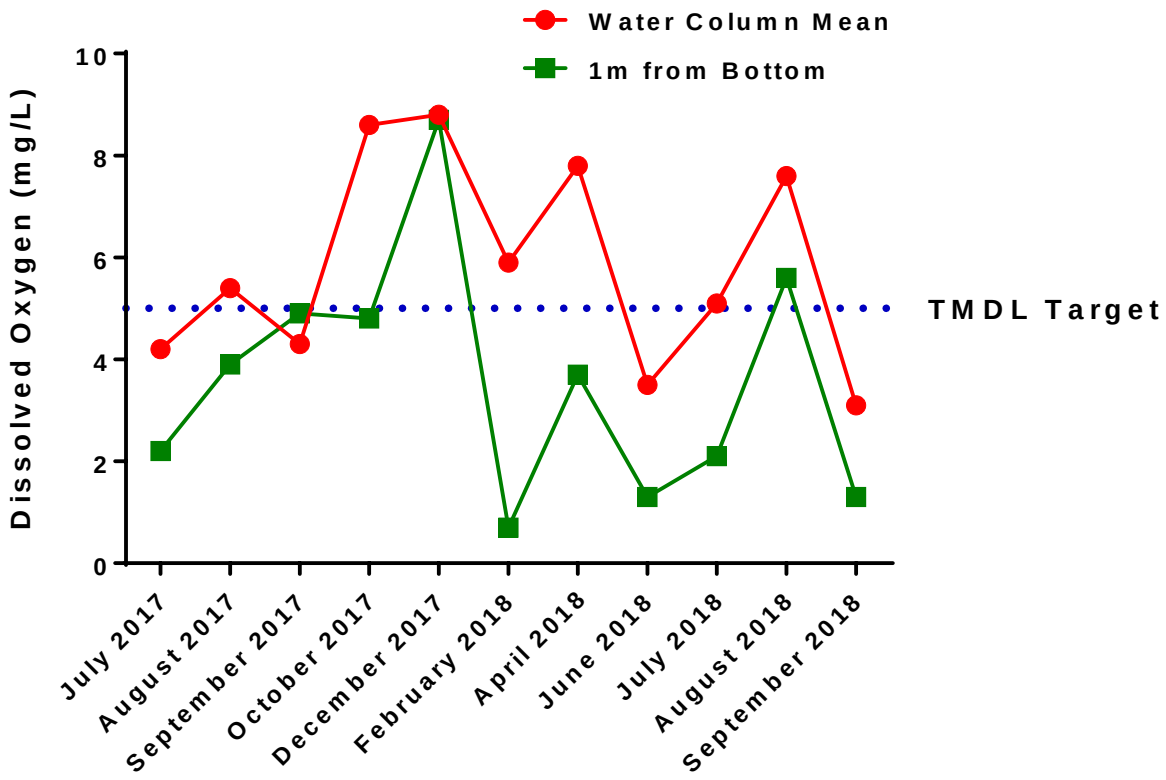
* Note that x-axis does not include dates between sampling (not to scale)
* Alum applied in February 2015, but water not sampled again until October 2015

Lake Elsinore and Canyon Lake TMDL Water Quality Monitoring Update – 2017-18 Summary

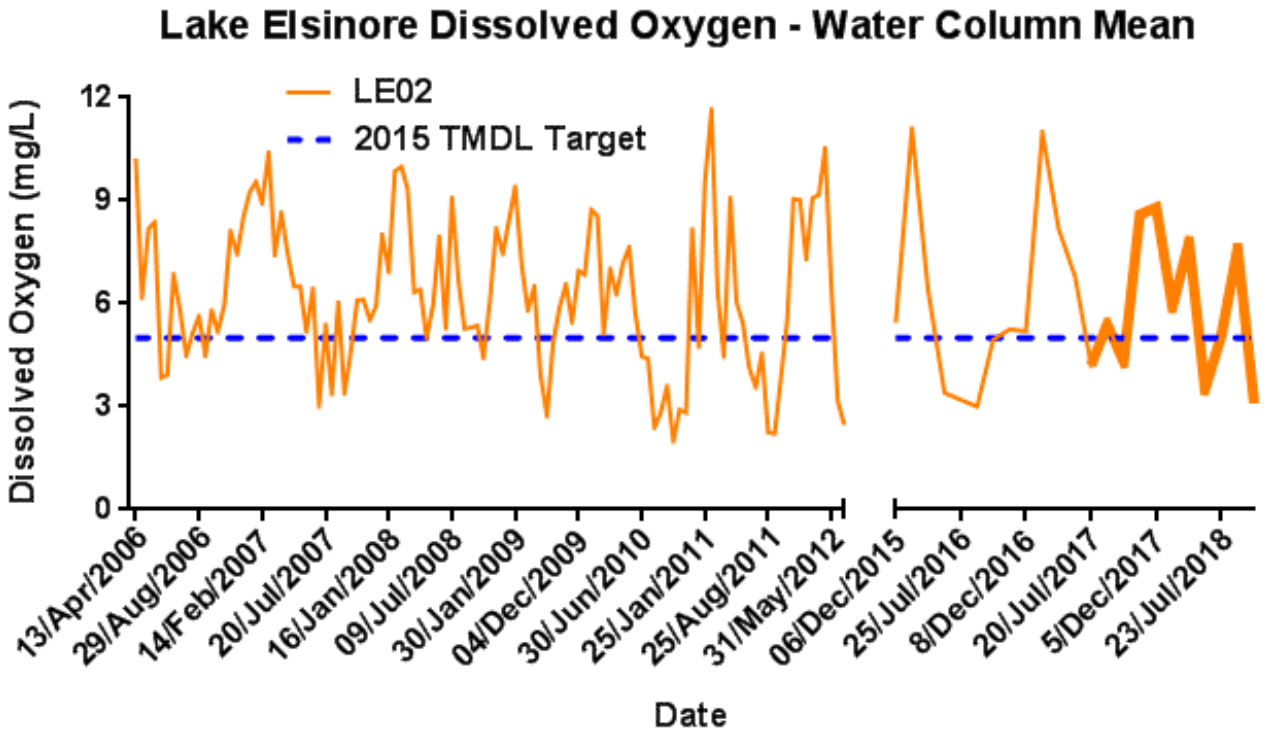
Dissolved Oxygen Monitoring



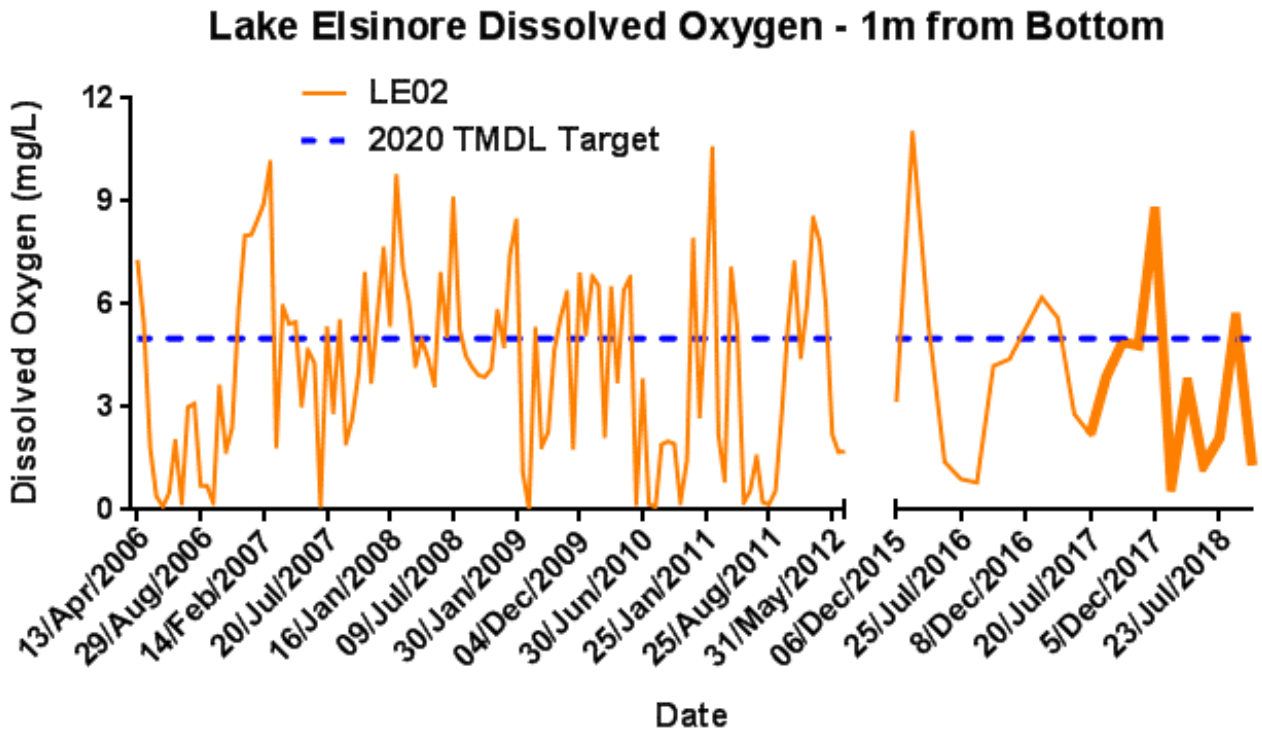
Lake Elsinore Dissolved Oxygen – LE02 Water Column Mean vs. 1m from Bottom 2017-2018



Lake Elsinore Dissolved Oxygen – LE02 Water Column Mean Historic Data



Lake Elsinore Dissolved Oxygen – LE02 1m from Bottom Historic Data



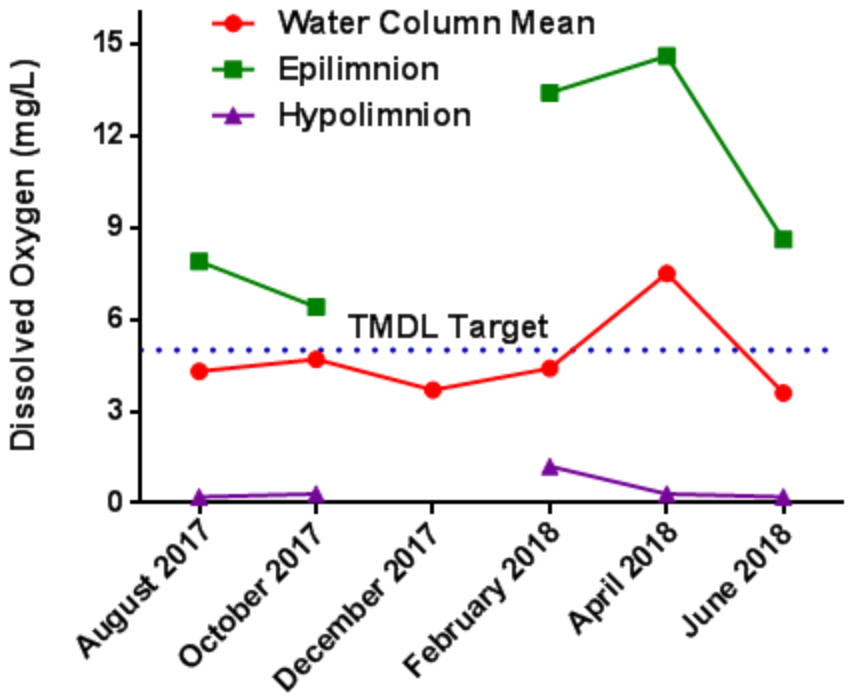
No data available from June 2012-July 2015

TMDL target of 5 mg/L is 1 m off lake bottom to be attained by 2020

Bold represents current monitoring year July 2017-September 2018

Canyon Lake Dissolved Oxygen – Main Basin Epilimnion vs. Hypolimnion 2017-2018

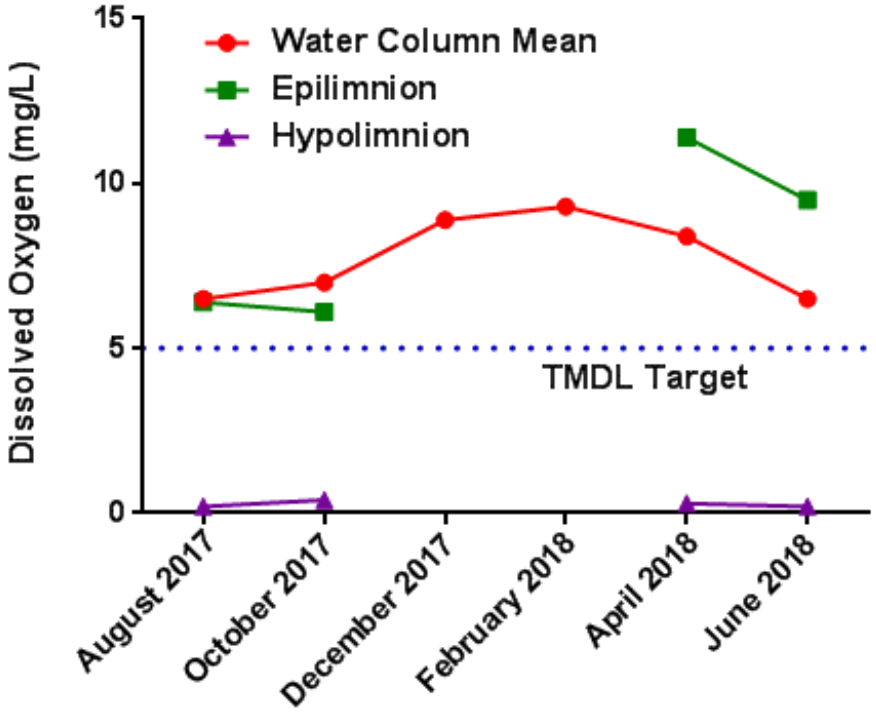
Mean of Sites CL07 & CL08



No stratification in December
Lake not sampled in July 2017

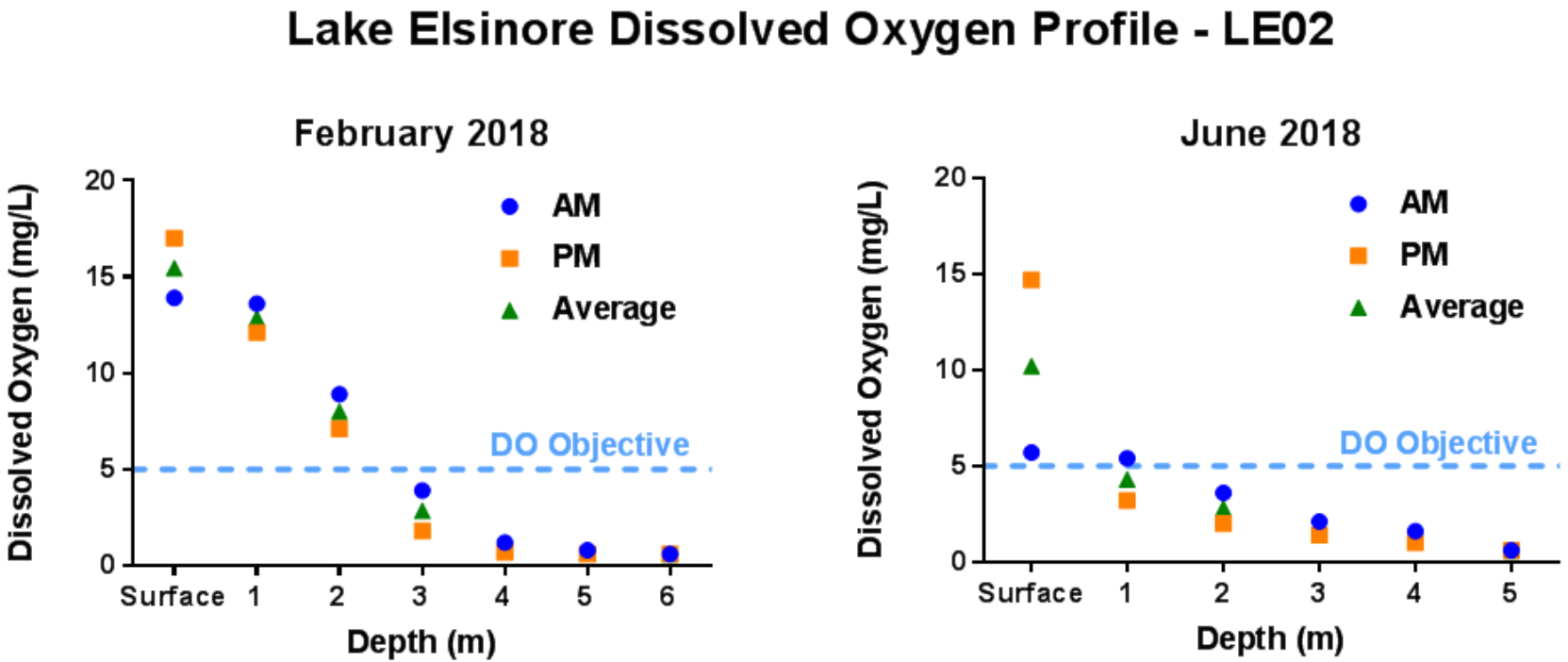
Canyon Lake Dissolved Oxygen – East Basin Epilimnion vs. Hypolimnion 2017-2018

Mean of Sites CL09 & CL10

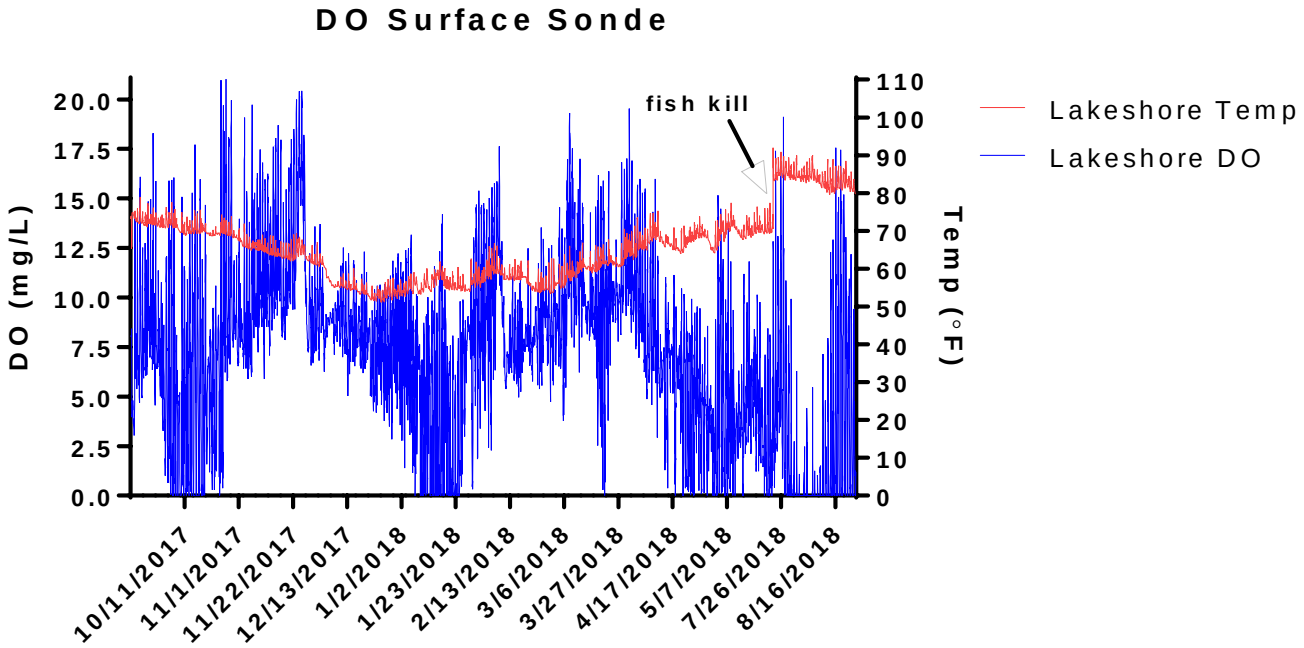


No stratification in December or February
Lake not sampled in July 2017

Dissolved Oxygen – Diurnal Variability
Lake Elsinore (LE02)

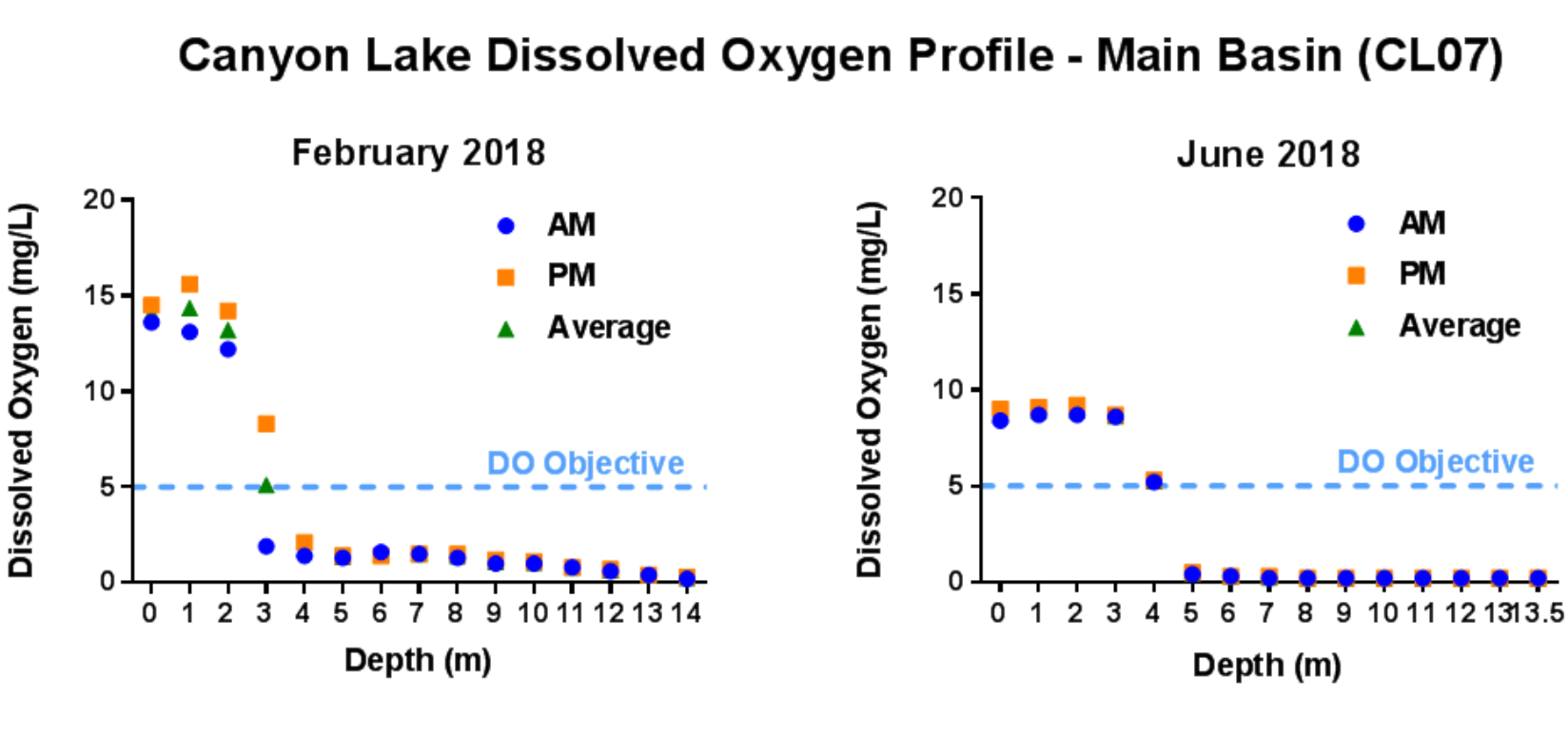


Dissolved Oxygen – Temporal Variability
Lake Elsinore

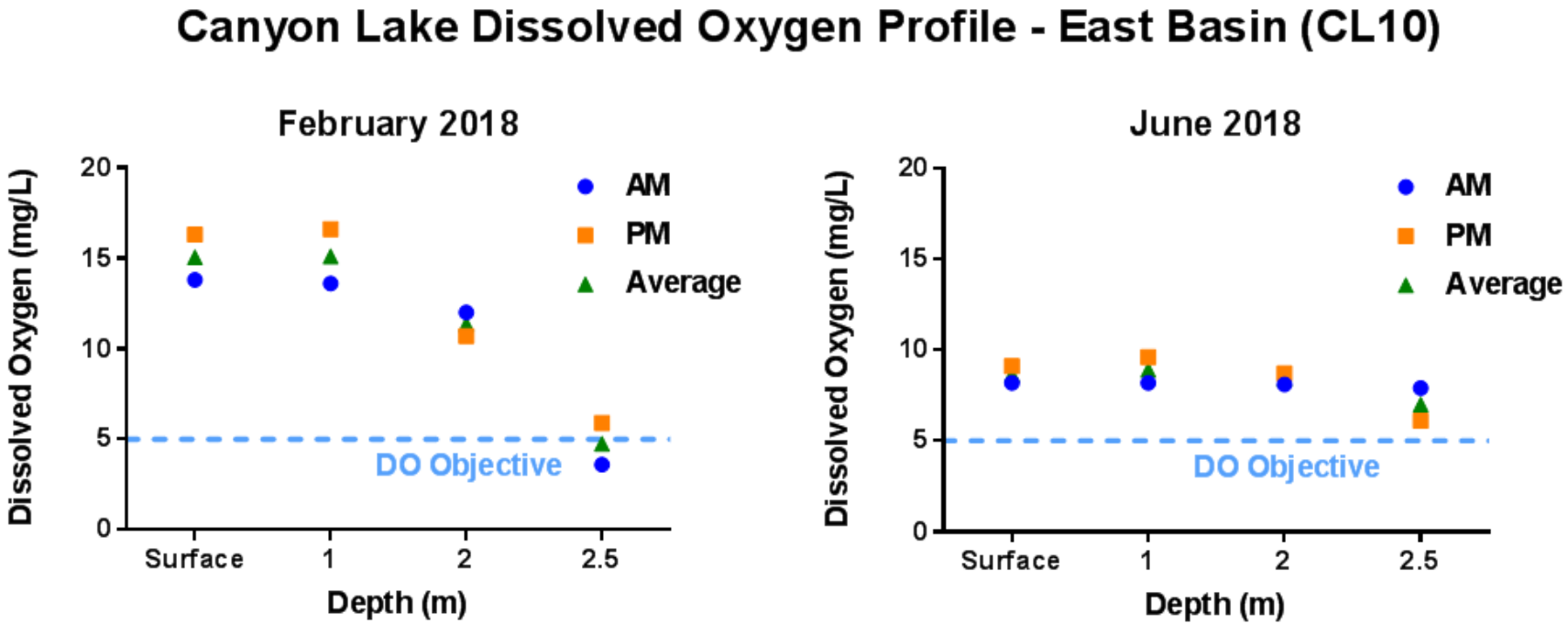


In-situ sonde placed at surface of the EVMWD Lakeshore sonde
Data collected at 1 hour intervals 9/20/17 – 8/24/18
Data gap between 5/26/18 – 7/23/18 (equipment malfunction)

Dissolved Oxygen – Diurnal Variability
Canyon Lake Main Basin (CL07)



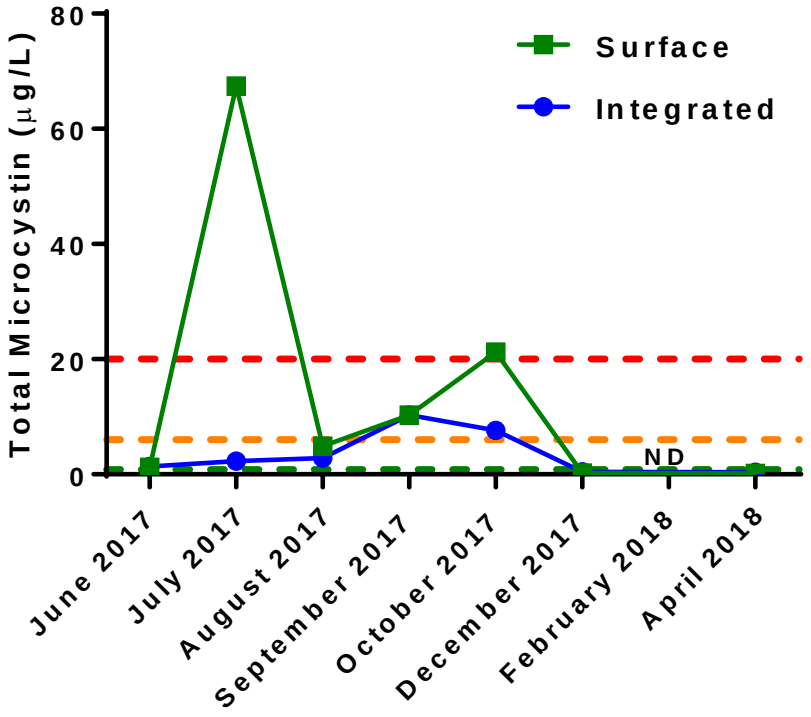
Dissolved Oxygen – Diurnal Variability
Canyon Lake East Basin (CL10)



Lake Elsinore and Canyon Lake TMDL Water Quality Monitoring Update – 2017-18 Summary

Cyanobacterial Toxin Monitoring

Total Microcystin – Lake Elsinore 2017-2018 (LE02)



State CyanoHab Guidance Trigger Levels for Human Water Contact

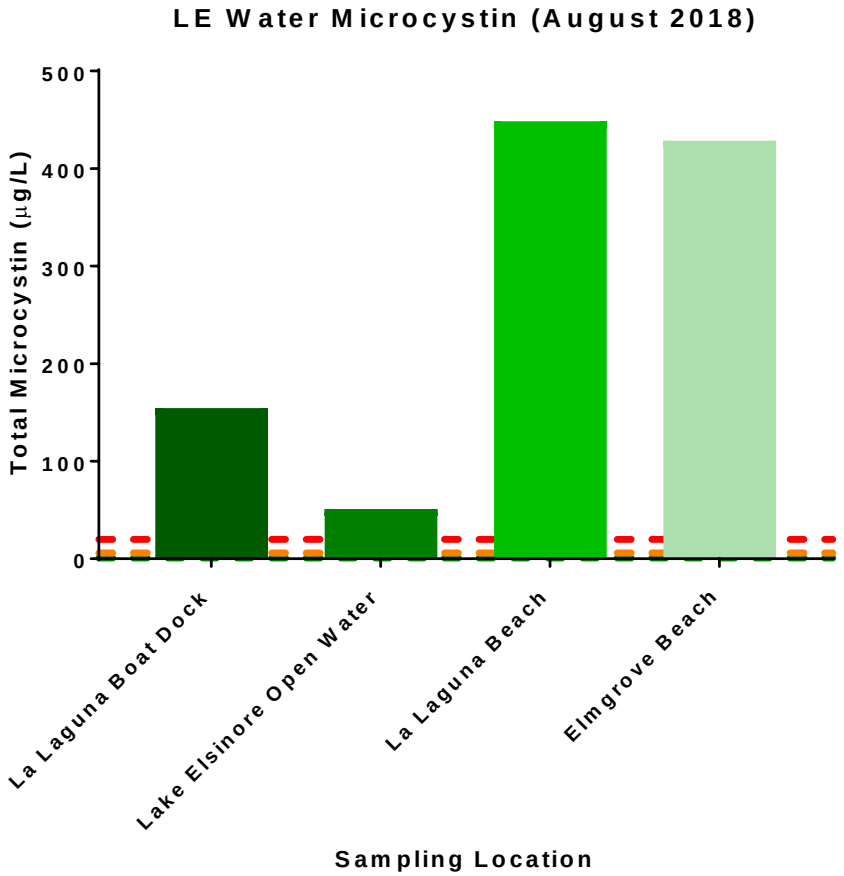
Danger = 20 µg/L

Warning = 6.0 µg/L

Caution = 0.8 µg/L

* Cyanobacterial toxins not sampled in June 2018

Total Microcystin – Lake Elsinore Water
August, 22 2018 State Water Board Sampling



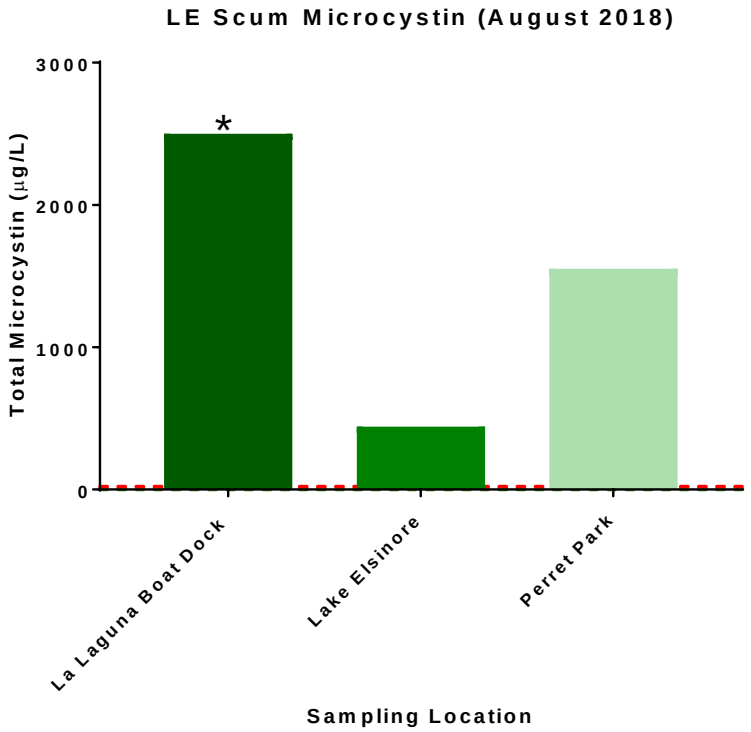
State CyanoHab Guidance Trigger Levels for Human Water Contact

Danger = 20 µg/L

Warning = 6.0 µg/L

Caution = 0.8 µg/L

Total Microcystin – Lake Elsinore Scum
August, 22 2018 State Water Board Sampling



State CyanoHab Guidance Trigger Levels for Human Water Contact

Danger = 20 µg/L
Warning = 6.0 µg/L
Caution = 0.8 µg/L

* Total microcystin concentration of La Laguna Boat Dock scum sample was >2500 µg/L. Lab estimates concentration of ~10,000 µg/L.

Year-in-Review








Questions?

Back Up Slides

Summary of 2017-2018 Rainfall

2018 Monthly Rainfall (inches)	Lake Elsinore	Perris CDF	Pigeon Pass	Hemet / San Jacinto	Winchester
July	0.04	0.00	0.00	0.00	0.00
August	0.08	0.20	0.17	0.00	0.03
September	0.21	0.02	0.07	0.00	0.32
October	0.00	0.00	0.00	0.00	0.00
November	0.02	0.04	0.09	0.10	0.08
December	0.01	0.00	0.00	0.00	0.00
January	1.89	1.82	3.25	2.37	2.20
February	0.14	0.38	0.53	0.49	0.50
March	0.93	1.12	2.42	1.90	1.05
April	0.01	0.02	0.00	0.00	0.01
May	0.02	0.06	0.53	0.27	0.03
June	0.00	0.00	0.00	0.00	0.00
Annual Rainfall (Inches)	**3.35**	**3.66**	**7.06**	**5.13**	**4.22**

Summary of 2017-2018 Monthly Flow

July 2017-June 2018 Mean Monthly Flow (cfs) [a]	Site 3 - Salt Creek at Murrieta Road (11070465)	Site 4 - San Jacinto River at Goetz Road (11070365)	Site 6 - San Jacinto River at Ramona Expressway [b] (11070210)	Site 30 - Canyon Lake Spillway (11070500)	Site 1 - San Jacinto River at Cranston Guard Station (11069500)
July	0.00	0.00	-	0.00	0.43
August	0.25	0.78	-	0.00	0.32
September	0.00	0.00	-	0.00	0.19
October	0.00	0.00	-	0.05	0.15
November	0.00	0.00	-	0.41	0.15
December	0.00	0.00	-	0.60	0.23
January	12.26	16.25	-	2.53	1.41
February	0.18	0.00	-	0.95	0.59
March	0.77	2.60	-	0.89	8.31
April	0.00	0.00	-	0.38	0.81
May	0.00	0.00	-	0.14	0.23
June	0.00	0.00	-	0.00	0.08
Mean Annual Flow (cfs)	**1.15**	**1.67**	**-**	**0.50**	**1.09**

a - This value characterizes the average instantaneous flow rate at the USGS station during both dry and wet weather conditions in a given month. Flow data after 11/07/2017 are provisional and may be subject to change.

b - No flows were reported at Site 6 for the monitoring period

Summary of 2008-2018 Nutrient Concentrations

Monitoring Year	Site 3 - Salt Creek		Site 4 - San Jacinto River		Site 30 - Canyon Lake Spillway	
	TN (mg/L)	TP (mg/L)	TN (mg/L)	TP (mg/L)	TN (mg/L)	TP (mg/L)
2008-2009*	3.0/3.1	0.8/1.3	1.4/3.1	0.7/1.5	NS	NS
2009-2010*	1.5/1.9	0.6/1.0	1.6/3.2	0.5/1.2	0.7/1.3	0.6/0.8
2010-2011*	1.5/2.2	0.4/0.5	1.4/2.2	0.7/1.9	0.9/1.5	0.5/0.9
2011-2012	1.9	0.3	2.2	0.5	NS	NS
2012-2013	1.9	0.3	2.1	0.5	NS	NS
2013-2014	2.7	0.9	1.8	0.6	NS	NS
2014-2015	2.2	0.5	1.8	0.4	NS	NS
2015-2016	2.5	0.5	2.4	1.4	NS	NS
2016-2017	2.1	0.6	2.0	1.2	1.9	0.4
2017-2018	2.7	0.4	2.0	0.4	NS	NS

*Values shown for nutrient concentrations are minimum/maximum
NS-Not sampled

Summary of 2008-2018 Nutrient Loads

Monitoring Year	Site 3 - Salt Creek			Site 4 - San Jacinto River			Site 30 - Canyon Lake Spillway		
	Flow (Mgal)	TN (kg)	TP (kg)	Flow (Mgal)	TN (kg)	TP (kg)	Flow (Mgal)	TN (kg)	TP (kg)
2008-2009*	529	6,085/6,125	1,541/2,642	1,042	5,323/12,145	2,682/5,954	NA	NS	NS
2009-2010*	1,282	7,474/9,180	2,960/4,804	2,681	14,716/32,680	4,668/12,382	62	167/294	137/188
2010-2011*	1,946	5,112/7,484	1,370/1,704	3,269	7,690/12,124	4,041/10,664	1,302	2,035/3,556	1,029/2,102
2011-2012	249	1,843	238	277	2,338	542	133	NS	NS
2012-2013	147	1,025	180	424	3,341	822	114	NS	NS
2013-2014	411	4,268	1,409	484	3,252	1,178	148	NS	NS
2014-2015	511	4,661	1,257	570	3,932	1,041	196	NS	NS
2015-2016	515	5,647	1,447	872	7,926	4,624	476	NS	NS
2016-2017	1,596	12,366	4,026	2,802	21,651	14,403	4,850	33,759	6,637
2017-2018	271	2,586	482	393	3,055	810	117	NS	NS

*Values shown for nutrient loads are minimum/maximum
NS-Not Sampled
NA-Not Available