

# Lake Elsinore and Canyon Lake TMDL Water Quality Monitoring 2022-2023 Summary

Lake Elsinore / Canyon Lake TMDL Task Force Meeting  
October 26, 2023

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**WSP USA**

**Garth Engelhorn**  
**NV5**



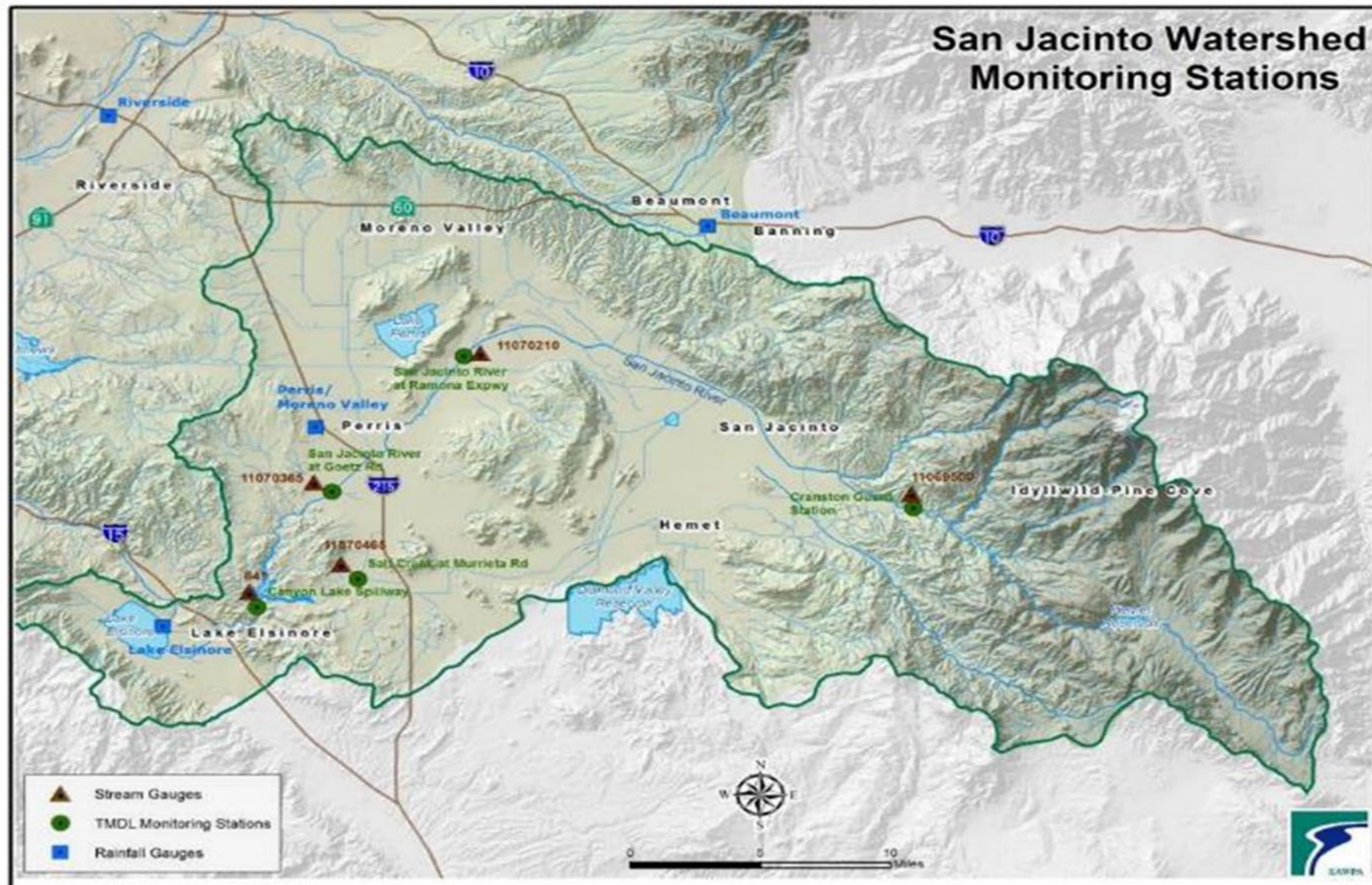
WSP

NV5





# Watershed Monitoring



# Watershed Monitoring

## Summary of 2022-2023 Rainfall

Monthly Rainfall (inches)	Lake Elsinore	Perris CDF	Pigeon Pass	Hemet / San Jacinto	Winchester
Jul-22	0.02	0.00	0.00	0.00	0.00
Aug-22	0.01	0.00	0.00	0.02	0.03
Sep-22	1.08	0.23	0.44	0.37	1.76
Oct-22	0.57	0.53	0.31	0.58	0.25
Nov-22	0.98	0.82	1.59	1.23	1.56
Dec-22	1.18	0.97	1.53	1.16	1.03
Jan-23	4.19	3.71	5.42	4.09	3.95
Feb-23	2.31	2.26	2.84	1.94	1.72
Mar-23	4.79	4.17	5.88	5.74	4.28
Apr-23	0.03	0.01	0.12	0.05	0.00
May-23	0.25	0.57	0.59	0.6	0.63
Jun-23	0.32	0.03	0.23	0.06	0.00
<b>Annual Rainfall (Inches)</b>	<b>15.73</b>	<b>13.30</b>	<b>18.95</b>	<b>15.84</b>	<b>15.21</b>



# Watershed Monitoring

## Summary of 2022-2023 Monitoring

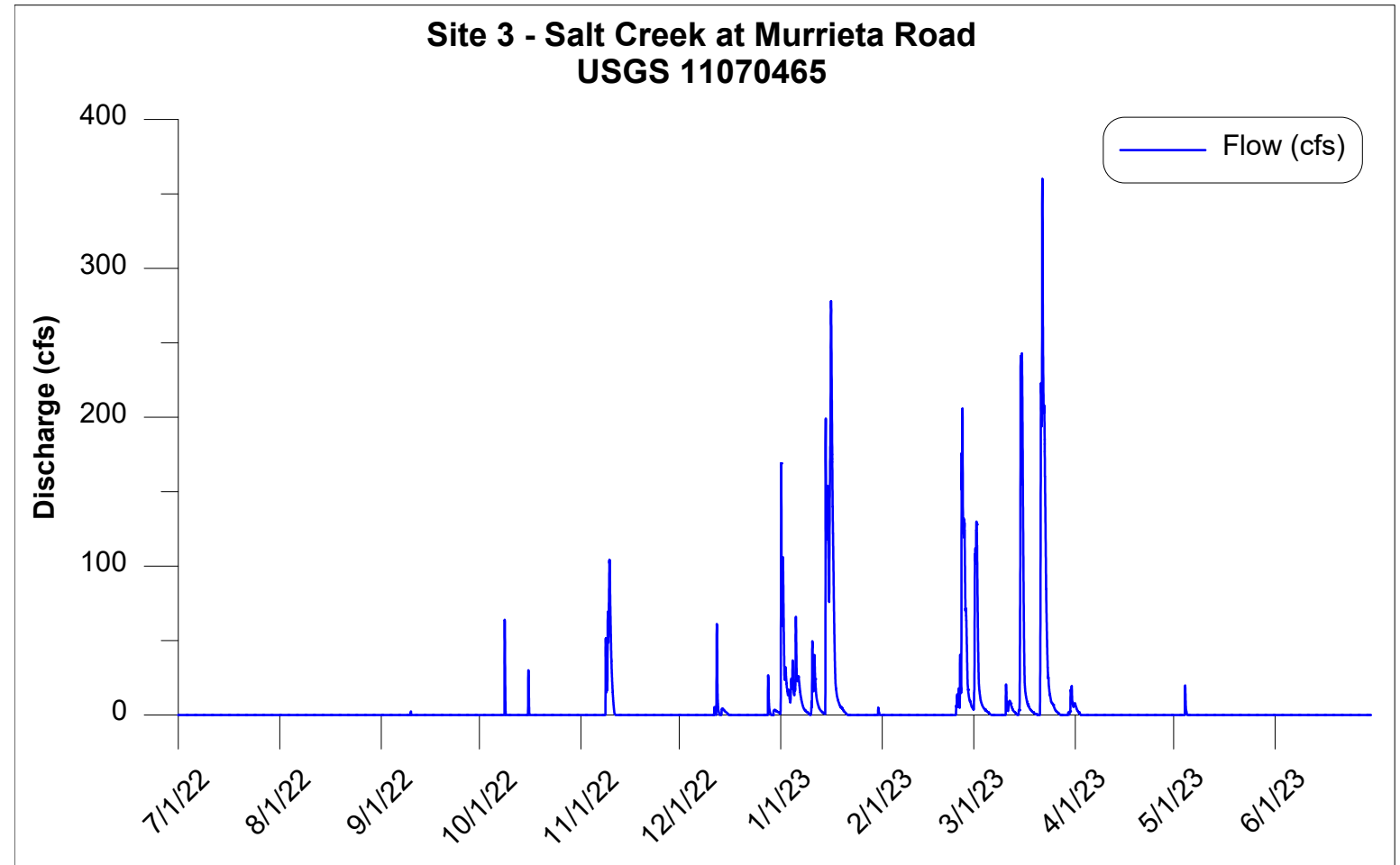
Number and Location Description	Total Annual Flow <sup>a</sup> (Mgal)	Annual Event Mean Storm Concentration (mg/L)		Estimated Annual Load (kg)	
		Total Nitrogen	Total Phosphorus	Total Nitrogen	Total Phosphorus
Site 3 - Salt Creek at Murrieta Road (USGS 11070465)	1,240	1.83	0.33	8,576	1,533
Site 4 - San Jacinto River at Goetz Road (USGS 11070365)	2,821	1.67	0.43	17,643	4,516
Site 6 - San Jacinto River at Ramona Expressway (USGS 11070210)	13	Not Measured	Not Measured	Not Measured	Not Measured
Site 30 - Canyon Lake Spillway (USGS 11070500)	4,037	1.57	0.10	23,428	1,662



# Watershed Monitoring



## 2022-2023 Annual Hydrograph

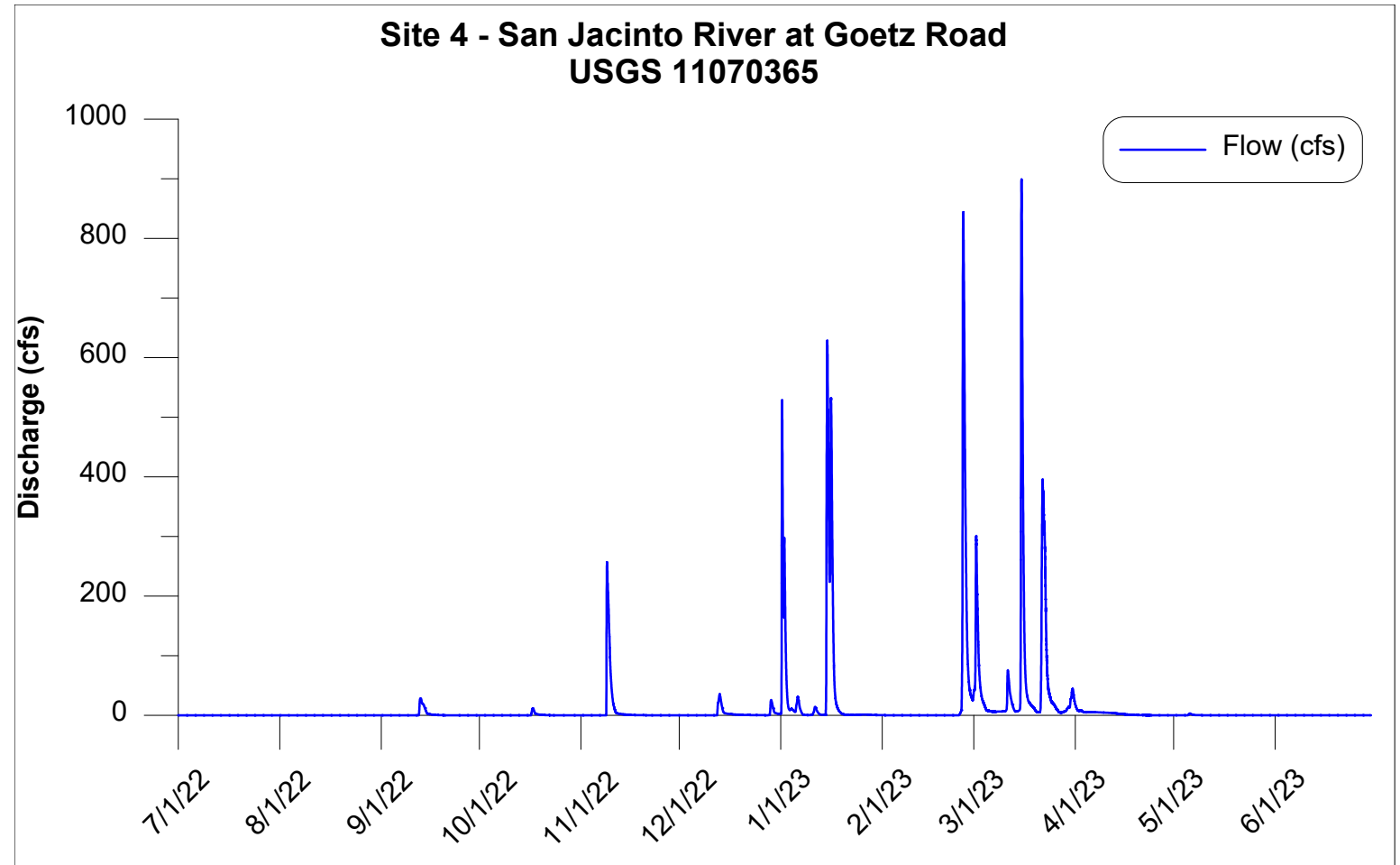




# Watershed Monitoring



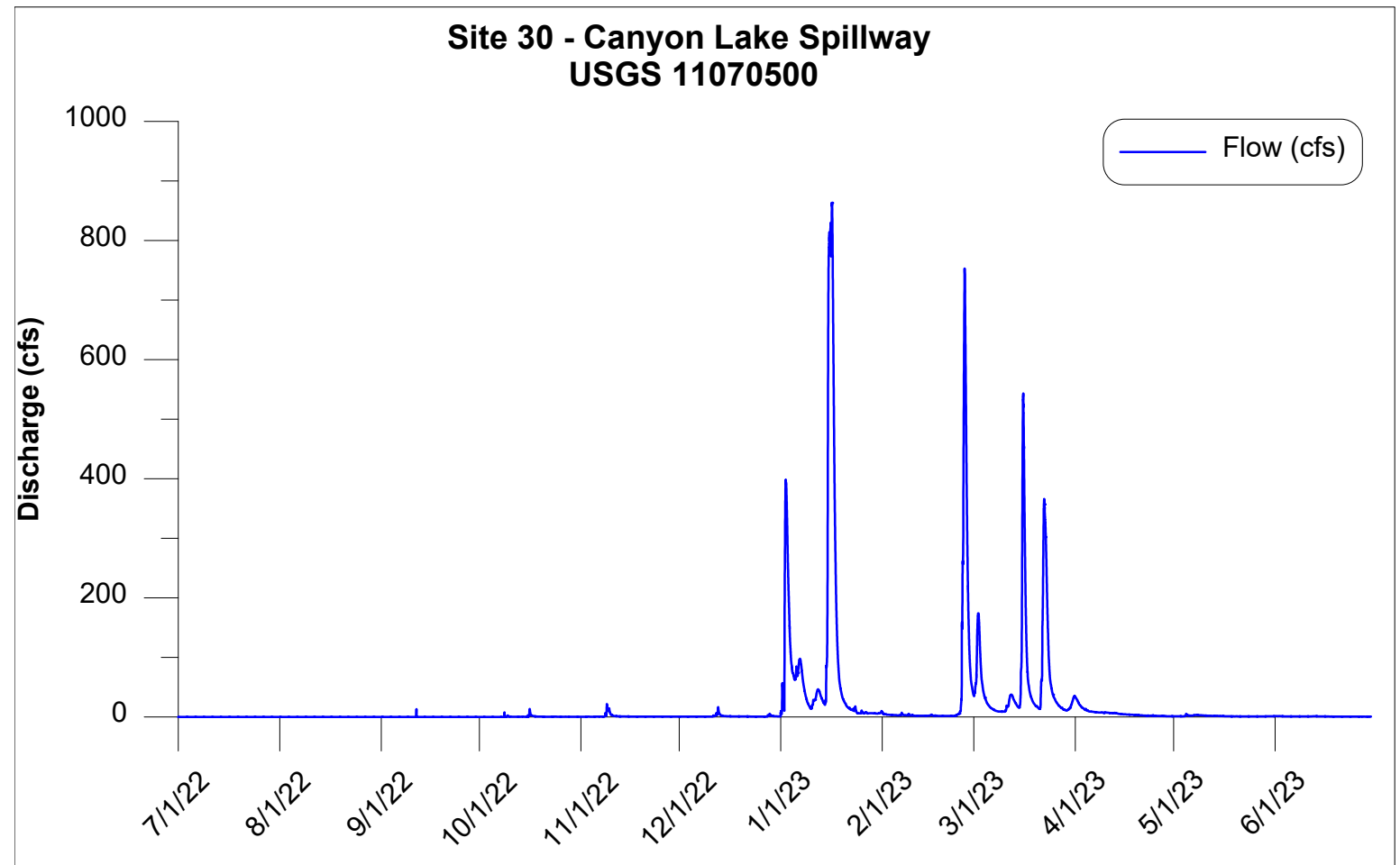
## 2022-2023 Annual Hydrograph





# Watershed Monitoring

## 2022-2023 Annual Hydrograph

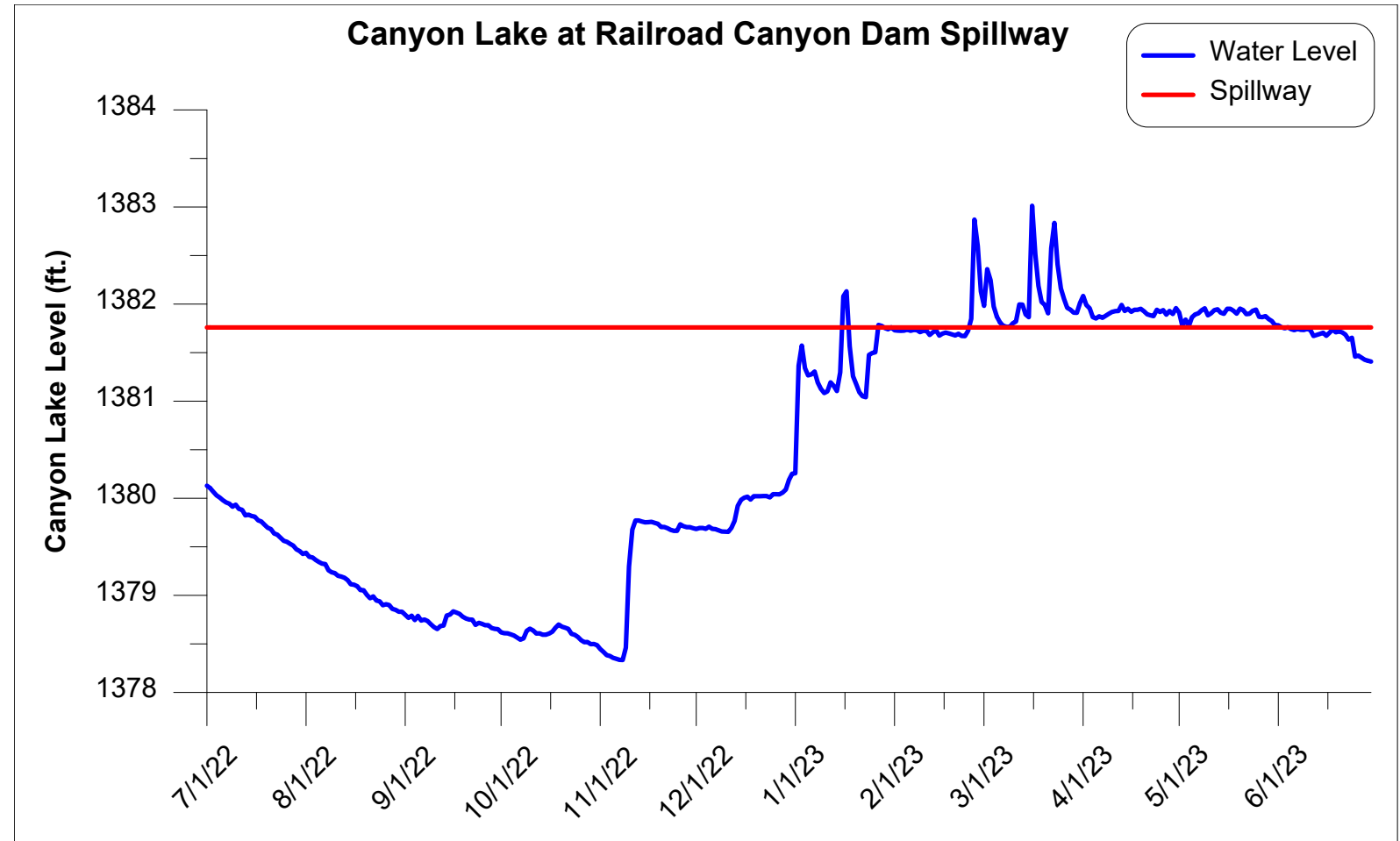






# Watershed Monitoring

## 2022-2023 Annual Hydrograph

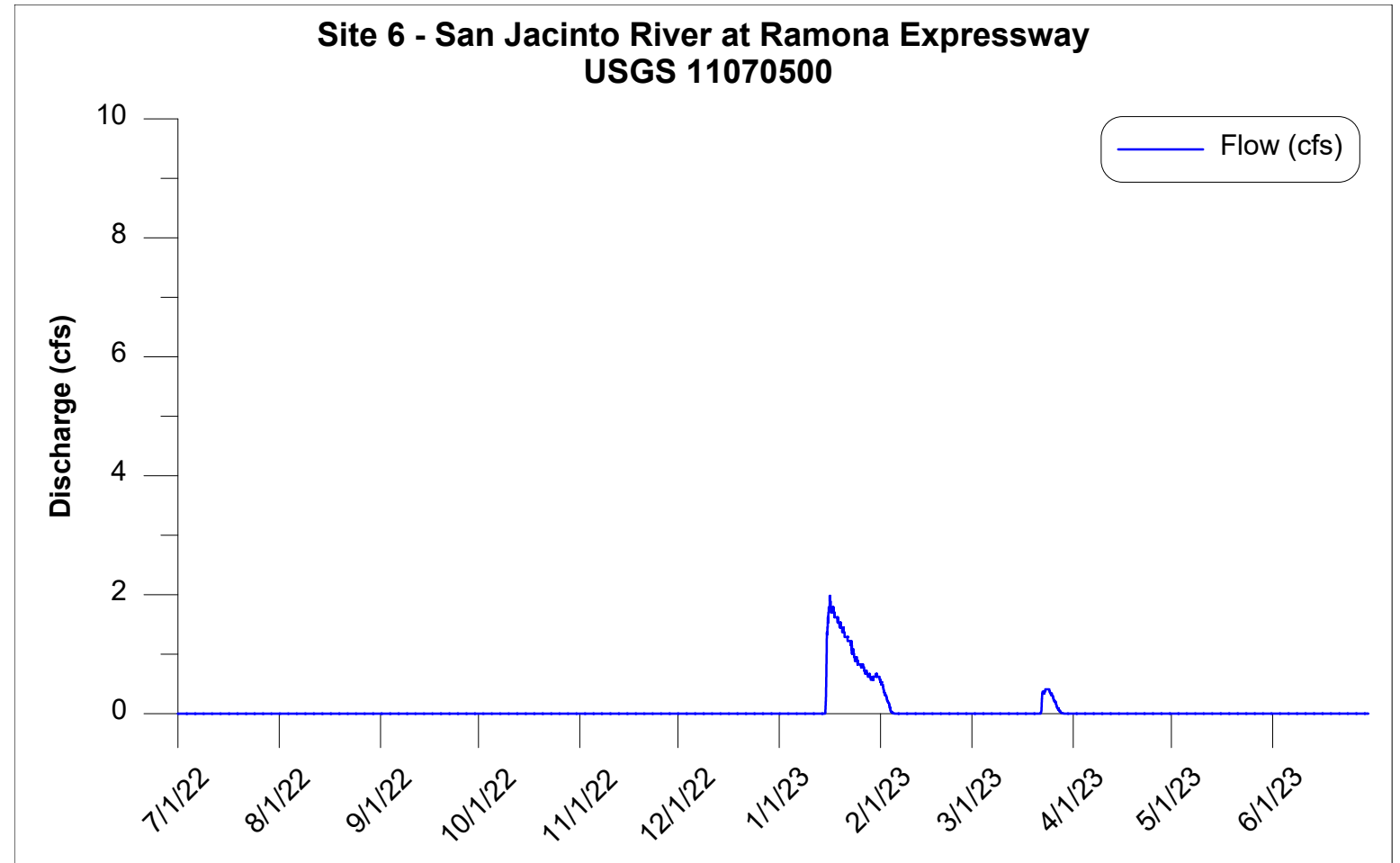






# Watershed Monitoring

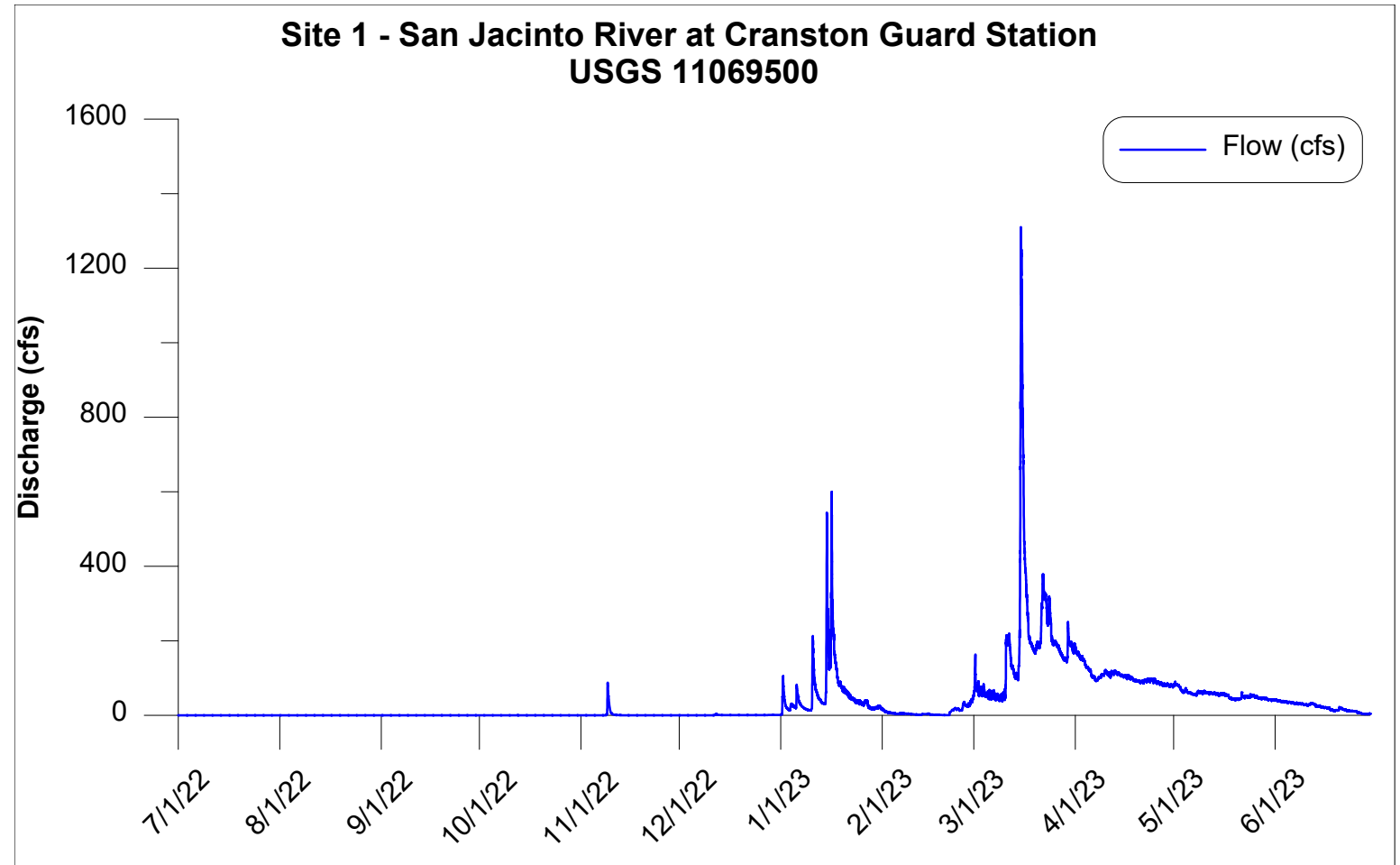
## 2022-2023 Annual Hydrograph





# Watershed Monitoring

## 2022-2023 Annual Hydrograph



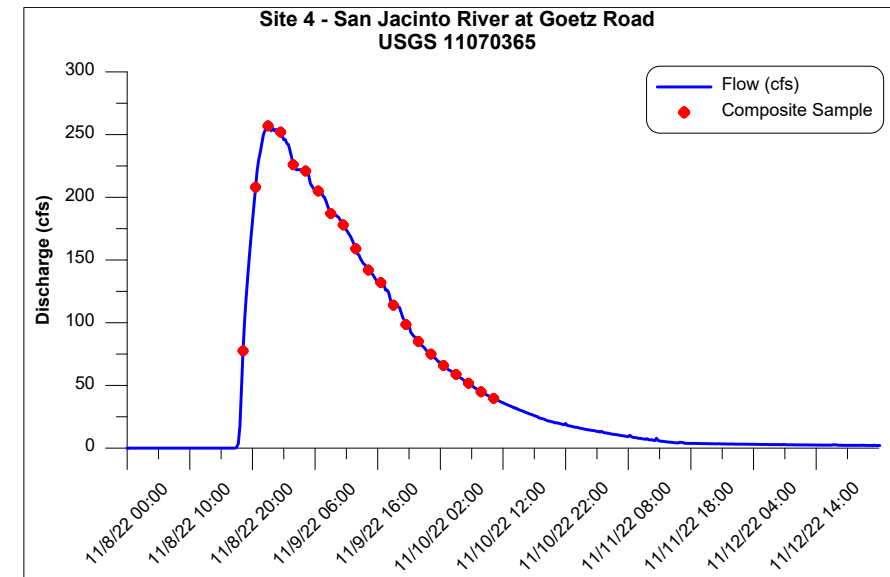
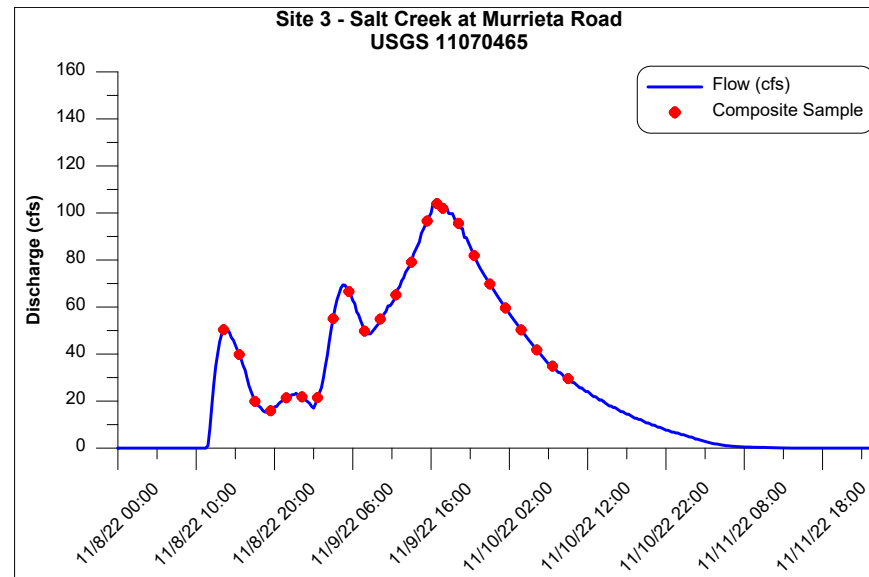
# Watershed Monitoring

## Wet Event #1

November 8-10, 2022

Watershed Rainfall: 0.8 to 1.57 inches

Sites: Salt Creek and San Jacinto





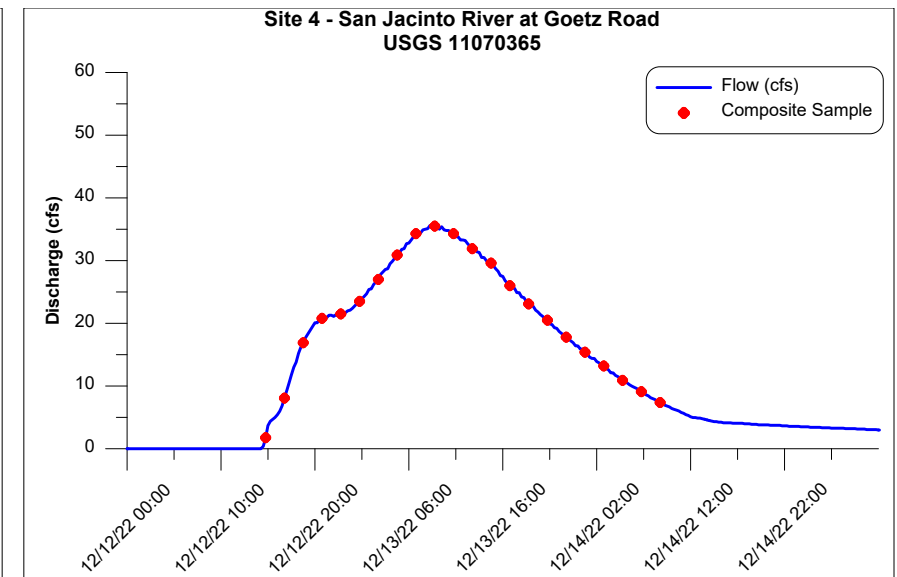
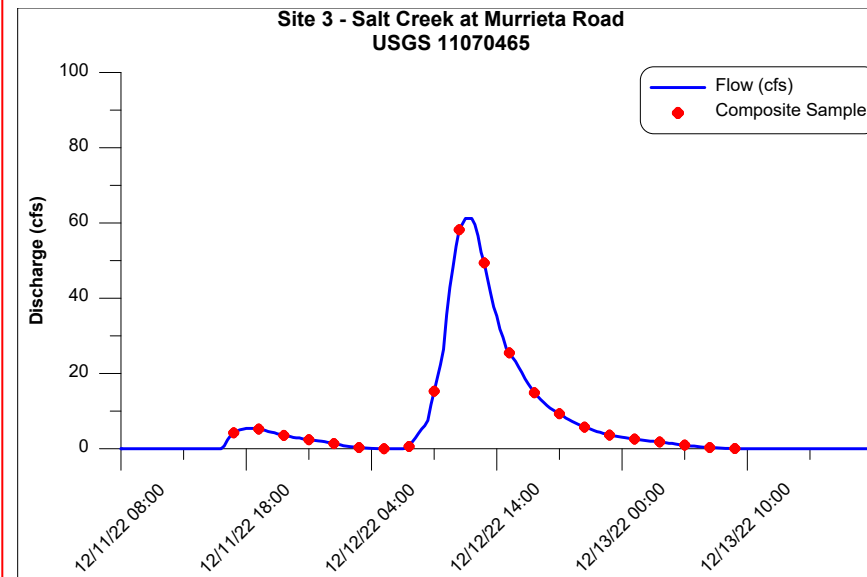
# Watershed Monitoring

## Wet Event #2

December 11-14

Watershed Rainfall: 0.61 to 1.07 inches

Sites: Salt Creek and San Jacinto



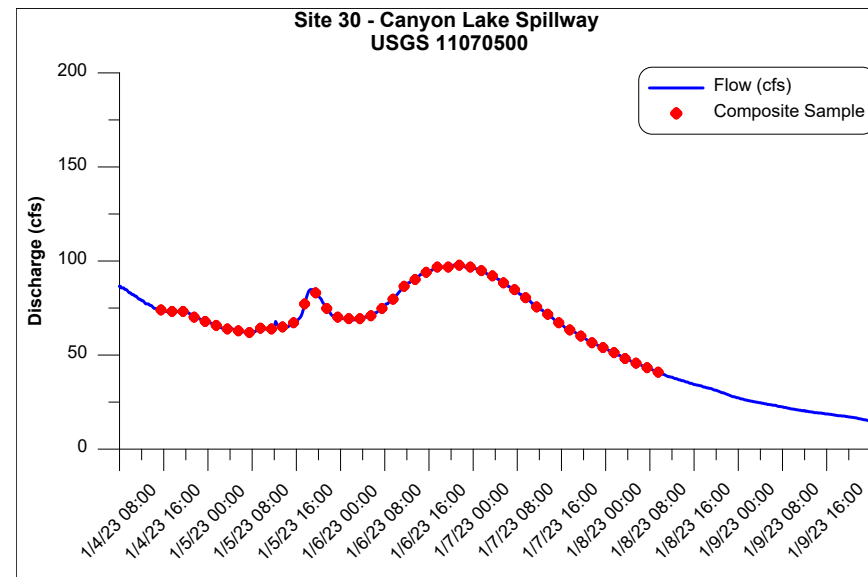
# Watershed Monitoring

## Wet Event #3

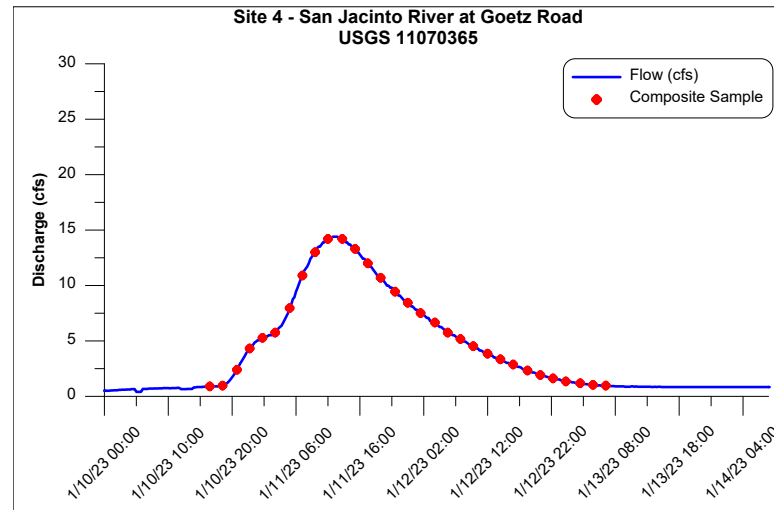
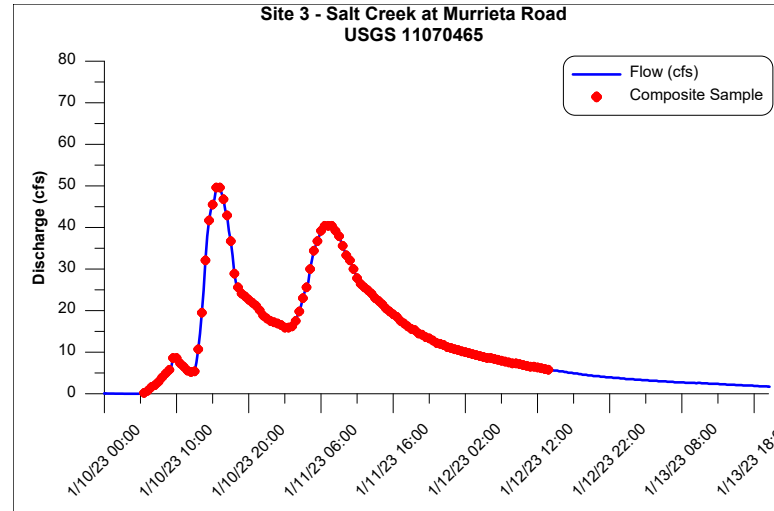
January 4-8, 2023

Watershed Rainfall: 1.49 to 1.52 inches

Sites: Canyon Lake Spillway



# Watershed Monitoring



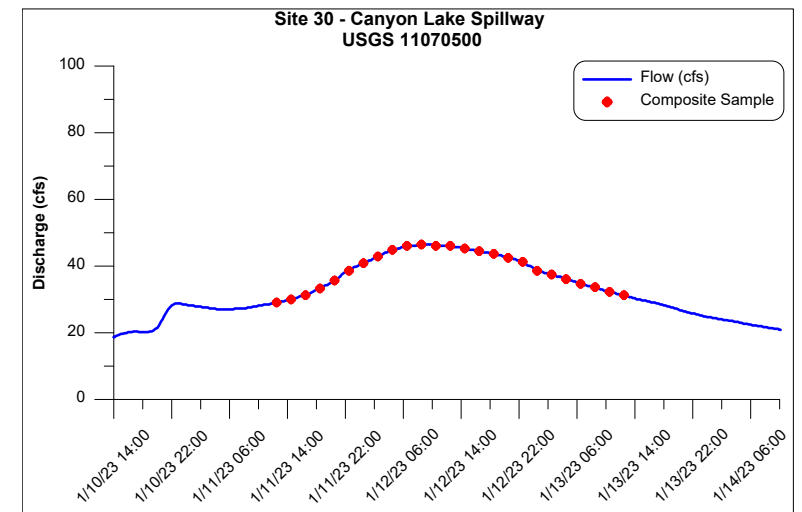
## Wet Event #4

January 10-12, 2023

Watershed Rainfall: 0.32 to 0.52 inches

Sites: Salt Creek, San Jacinto, and

Canyon Lake Spillway





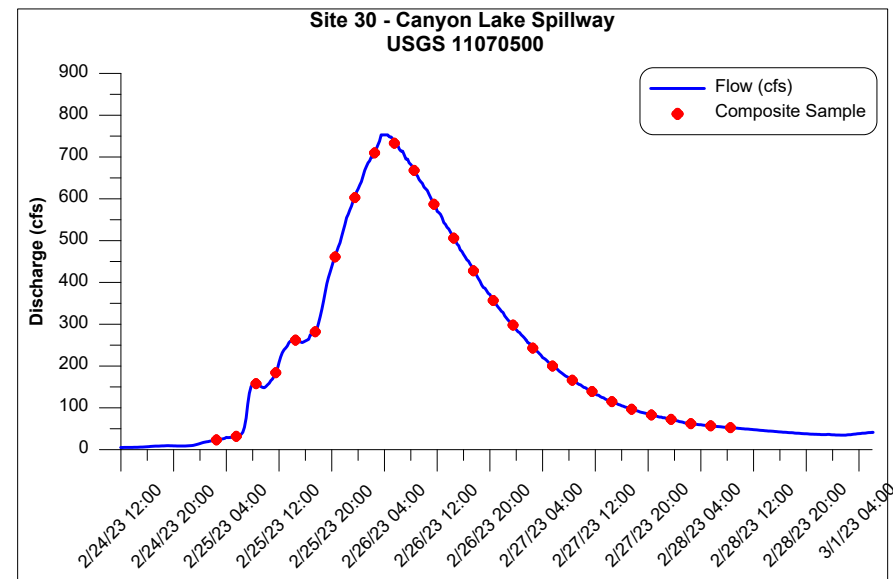
# Watershed Monitoring

## Wet Event #5

February 24-28, 2023

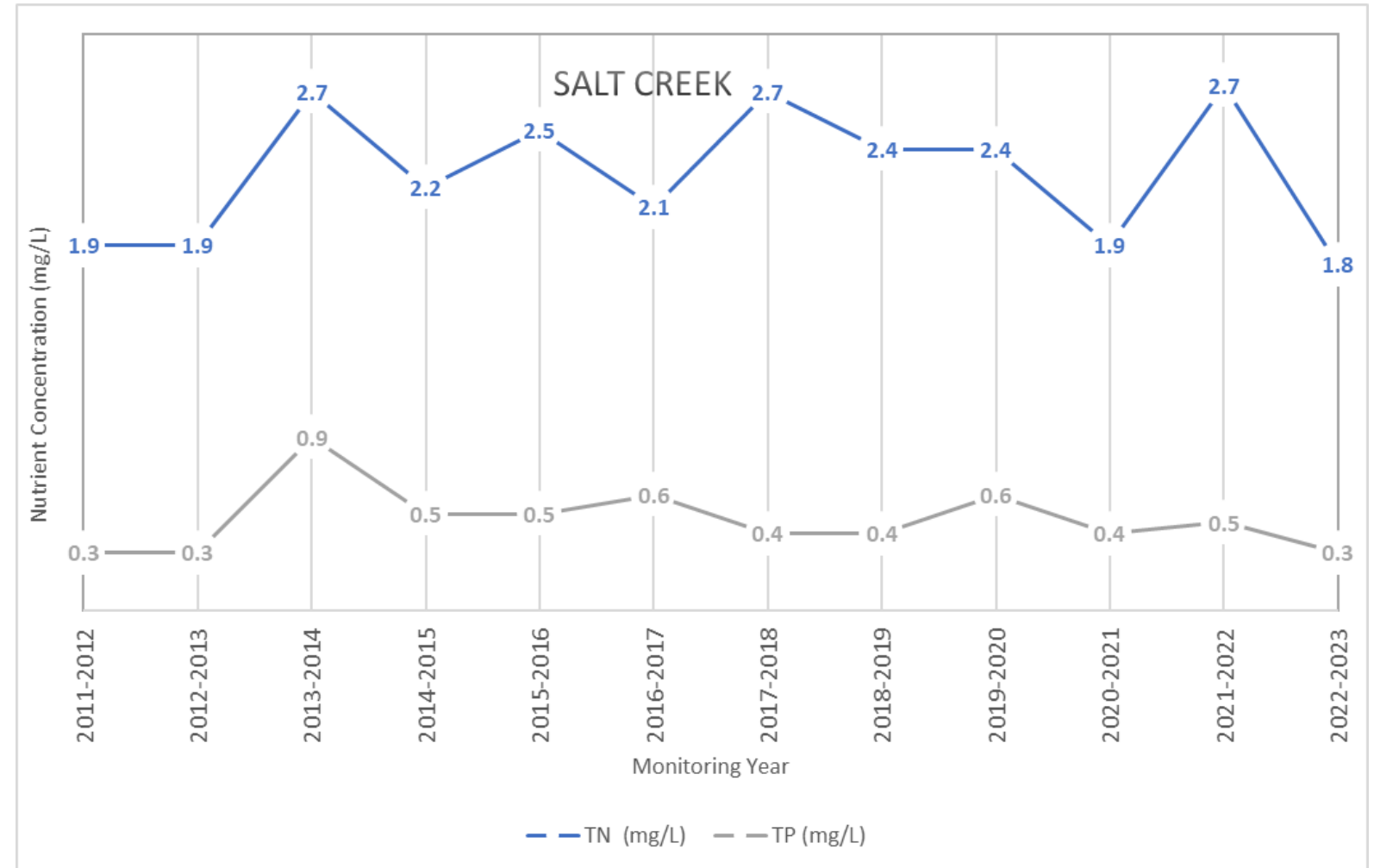
Watershed Rainfall: 1.23 to 2.64 inches

Sites: Canyon Lake Spillway



# Watershed Monitoring

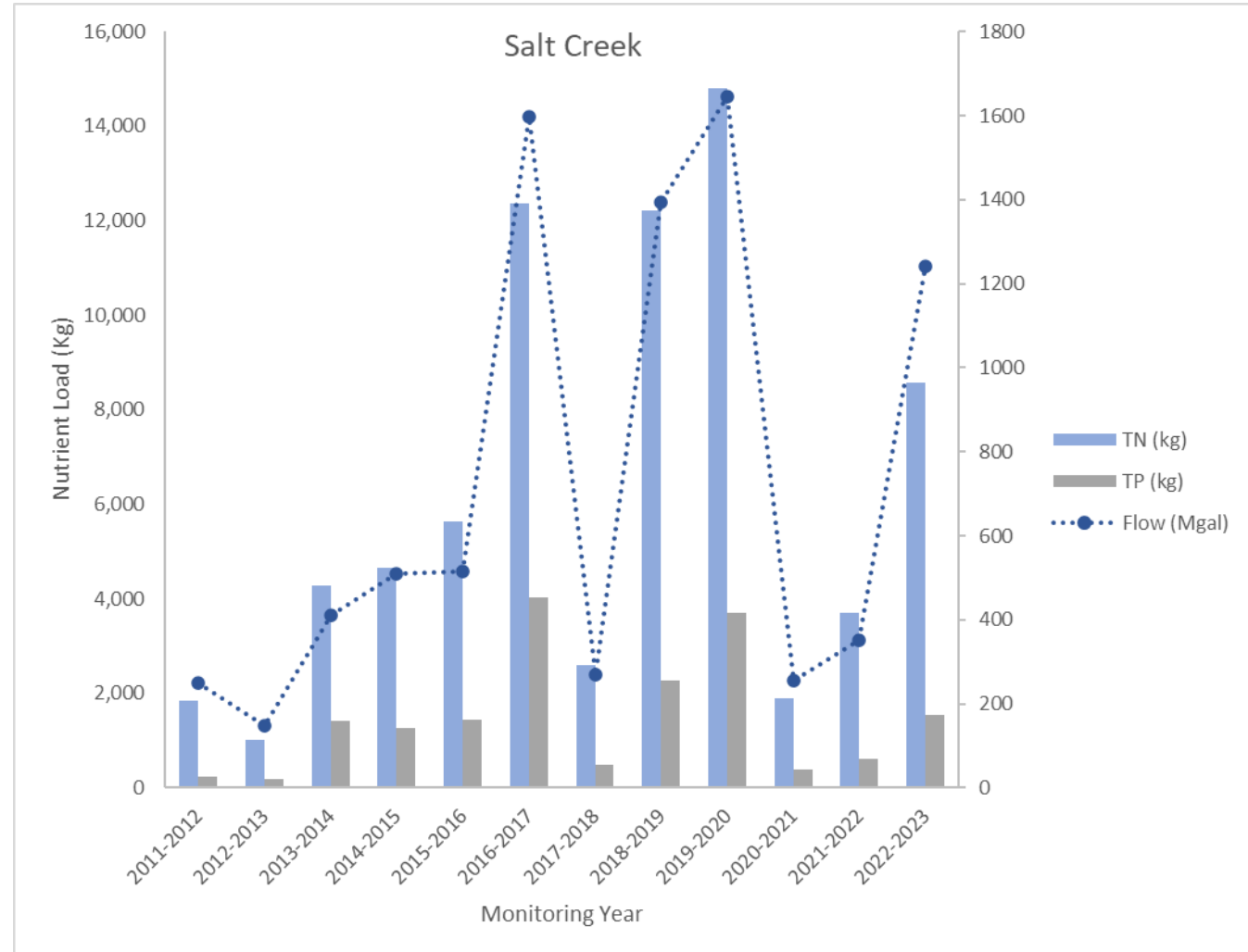
## Salt Creek Historical Nutrient Concentrations





# Watershed Monitoring

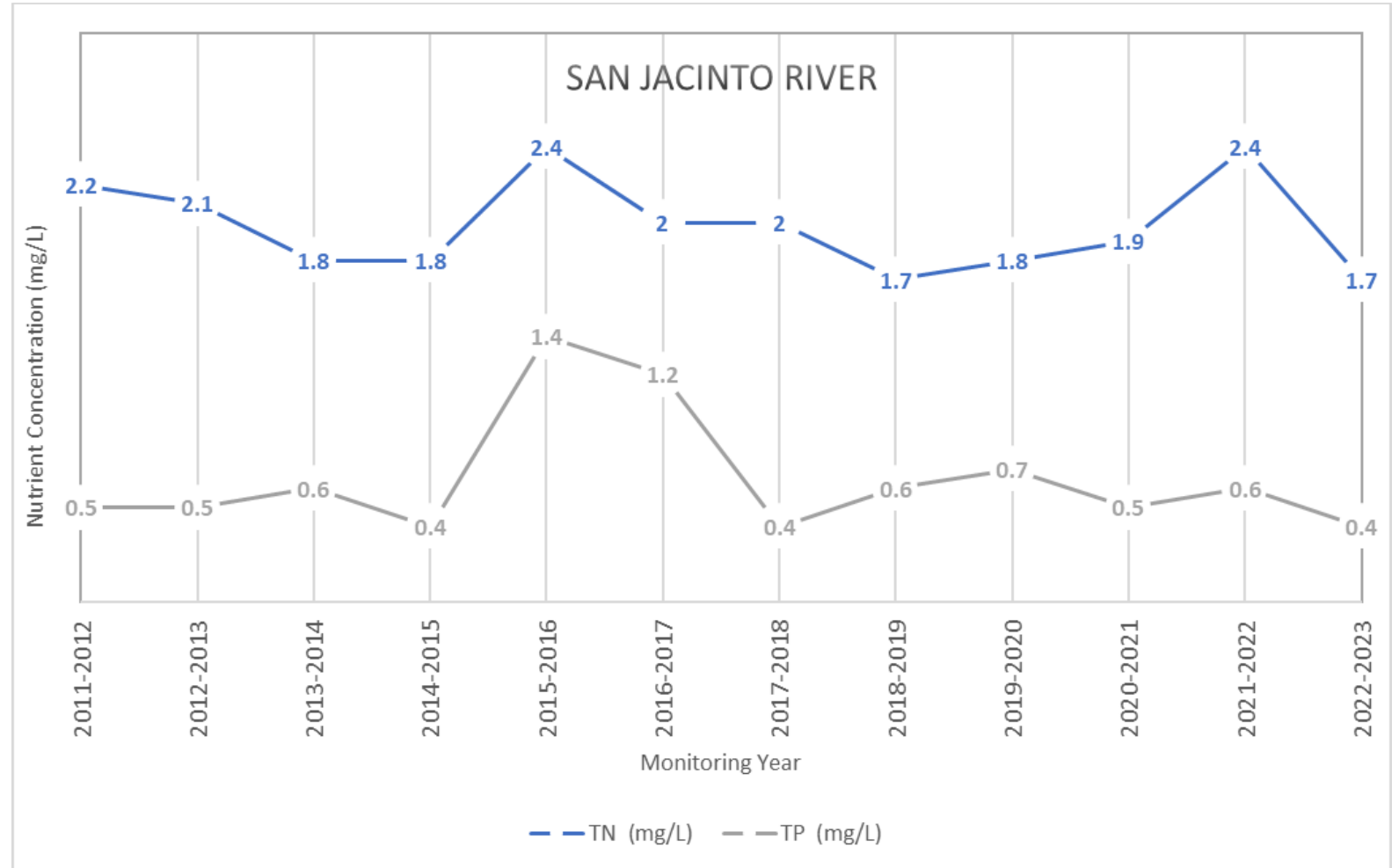
## Salt Creek Historical Nutrient Loads





# Watershed Monitoring

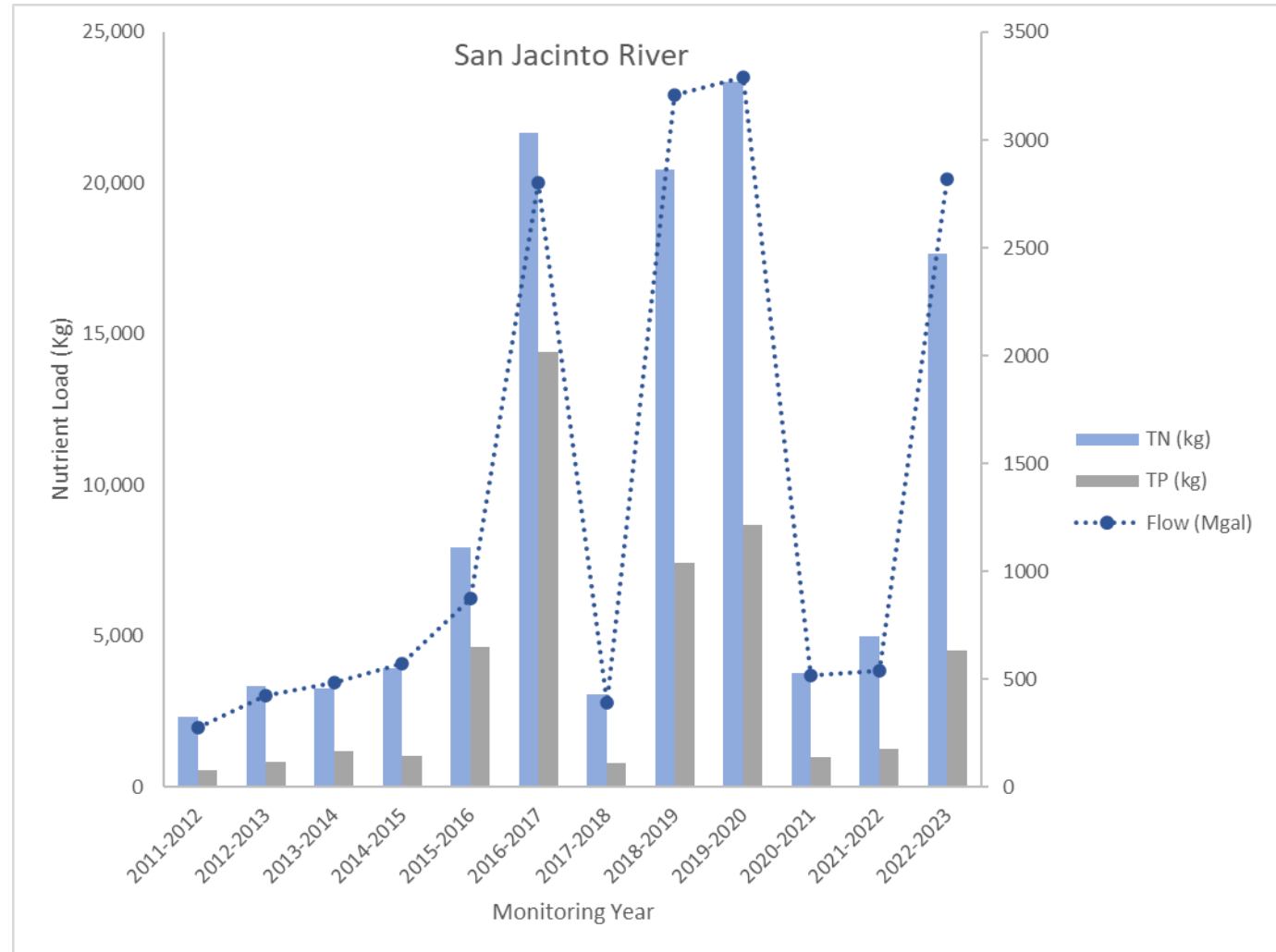
## San Jacinto Historical Nutrient Concentrations





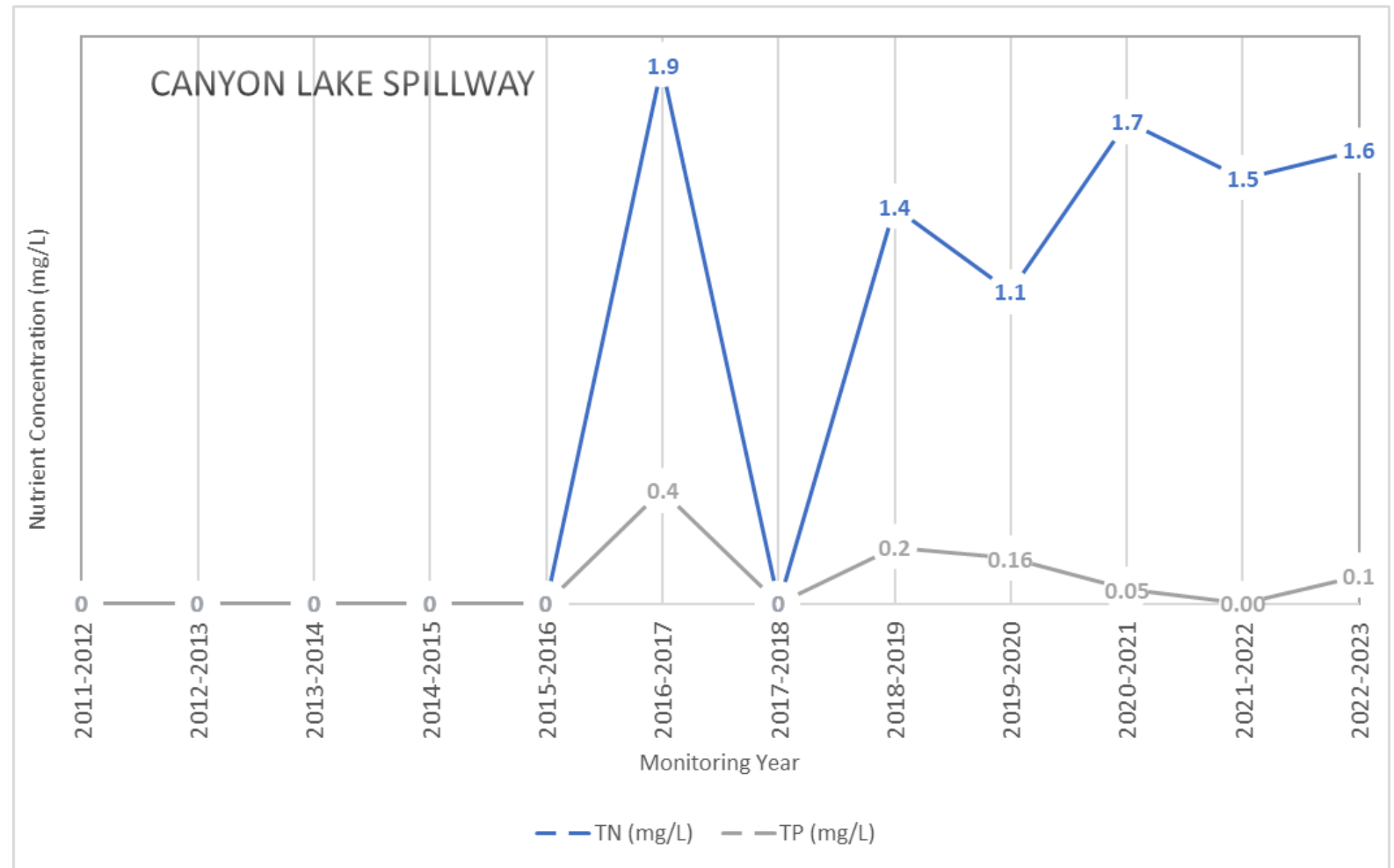
# Watershed Monitoring

## San Jacinto Historical Nutrient Loads



# Watershed Monitoring

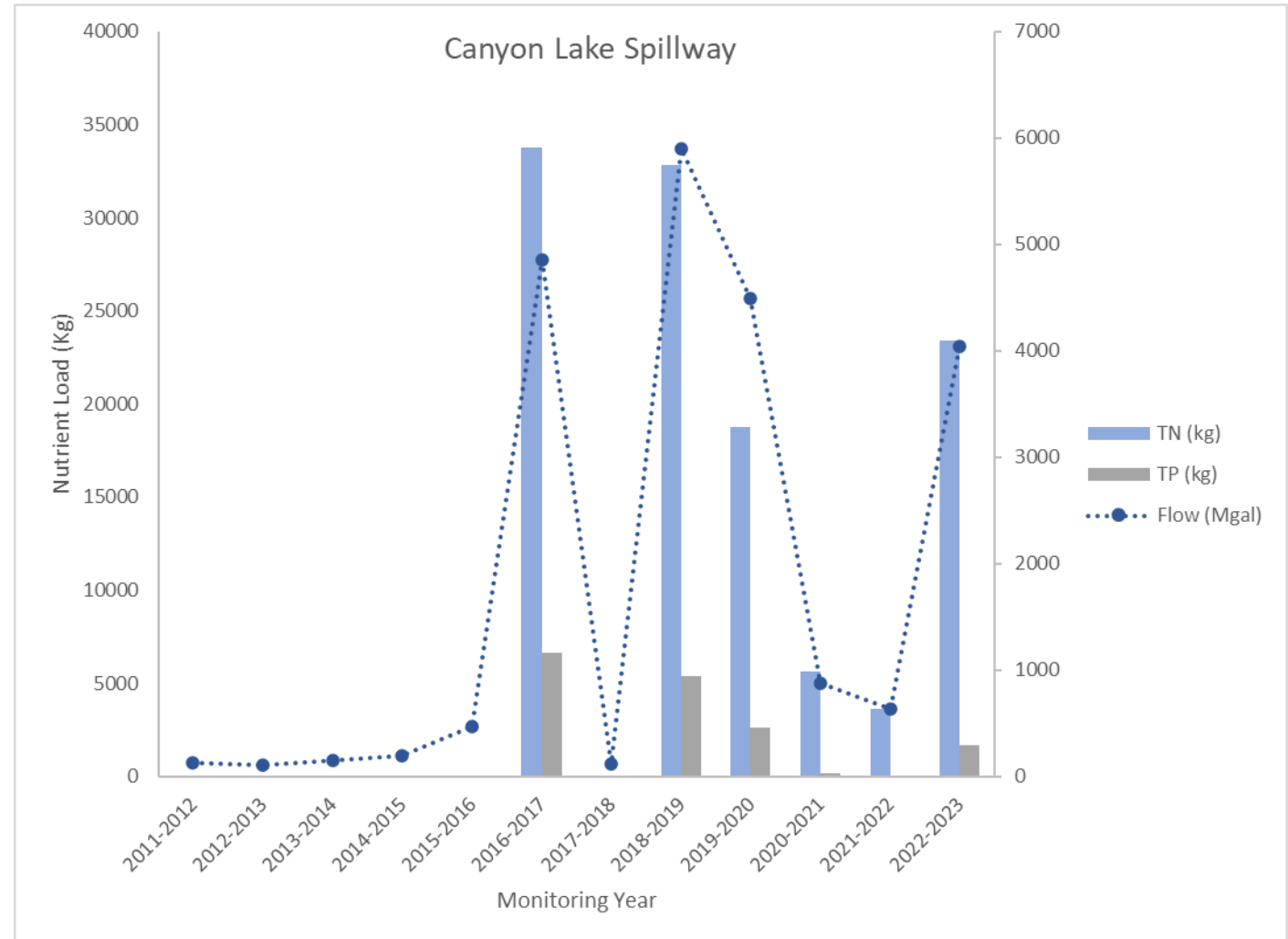
## Canyon Lake Spillway Historical Nutrient Concentrations





# Watershed Monitoring

## Canyon Lake Spillway Historical Nutrient Loads



# Watershed Monitoring

## Summary of Nutrient Concentrations

Monitoring Year	Site 3 - Salt Creek at Murrieta Road		Site 4 - San Jacinto River at Goetz Road		Site 30 - Canyon Lake Spillway	
	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
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	1.2	1.9	0.4
2017-2018	2.7	0.4	2	0.4	NS	NS
2018-2019	2.4	0.4	1.7	0.6	1.4	0.2
2019-2020	2.4	0.6	1.8	0.7	1.1	0.16
2020-2021	1.9	0.4	1.9	0.5	1.7	0.05
2021-2022	2.7	0.5	2.4	0.6	1.5	ND(<0.003)
2022-2023	1.8	0.3	1.7	0.4	1.6	0.10

# Watershed Monitoring

## Summary of Nutrient Loads

Monitoring Year	Site 3 - Salt Creek at Murrieta Road			Site 4 - San Jacinto River at Goetz Road			Site 30 - Canyon Lake Spillway		
	Total Annual Flow (Mgal)	Total Nitrogen (kg)	Total Phosphorus (kg)	Total Annual Flow (Mgal)	Total Nitrogen (kg)	Total Phosphorus (kg)	Total Annual Flow (Mgal)	Total Nitrogen (kg)	Total Phosphorus (kg)
2013-2014	464	4,641	1,473	638	4,457	1,475	217	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
2018-2019	1,394	12,213	2,266	3,208	20,457	7,409	5,893	32,832	5,416
2019-2020	1,645	14,792	3,705	3,290	23,337	8,660	4,497	18,762	2,635
2020-2021	255	1,902	396	519	3,794	992	878	5,626	175
2021-2022	351	3,698	625	537	4,976	1,282	640	3,632	0
2022-2023	1,240	8,576	1,533	2,821	17,643	4,516	4,037	23,428	1,662



# Watershed Monitoring

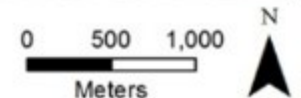
Historical Estimated Annual Loads as a 10-Year Running Average Relative to the 2004 TMDL Wasteload and Load Allocations

Lake	Analyte	10-yr Running Average (kg/yr) <sup>a</sup>	TMDL Load Allocation (kg/yr) <sup>b</sup>	% of TMDL Load Allocation
Lake Elsinore	Total Nitrogen	9,493	29,953	31.7%
	Total Phosphorus	1,486	6,922	21.5%
Canyon Lake	Total Nitrogen	15,835	22,268	71.1%
	Total Phosphorus	5,688	3,845	147.9%
		-1,993 credit for alum application = 3,695		96.1%

# In-Lake Monitoring



Sample Locations and Water Quality Data Sondes For Lake Elsinore





# In-Lake Monitoring

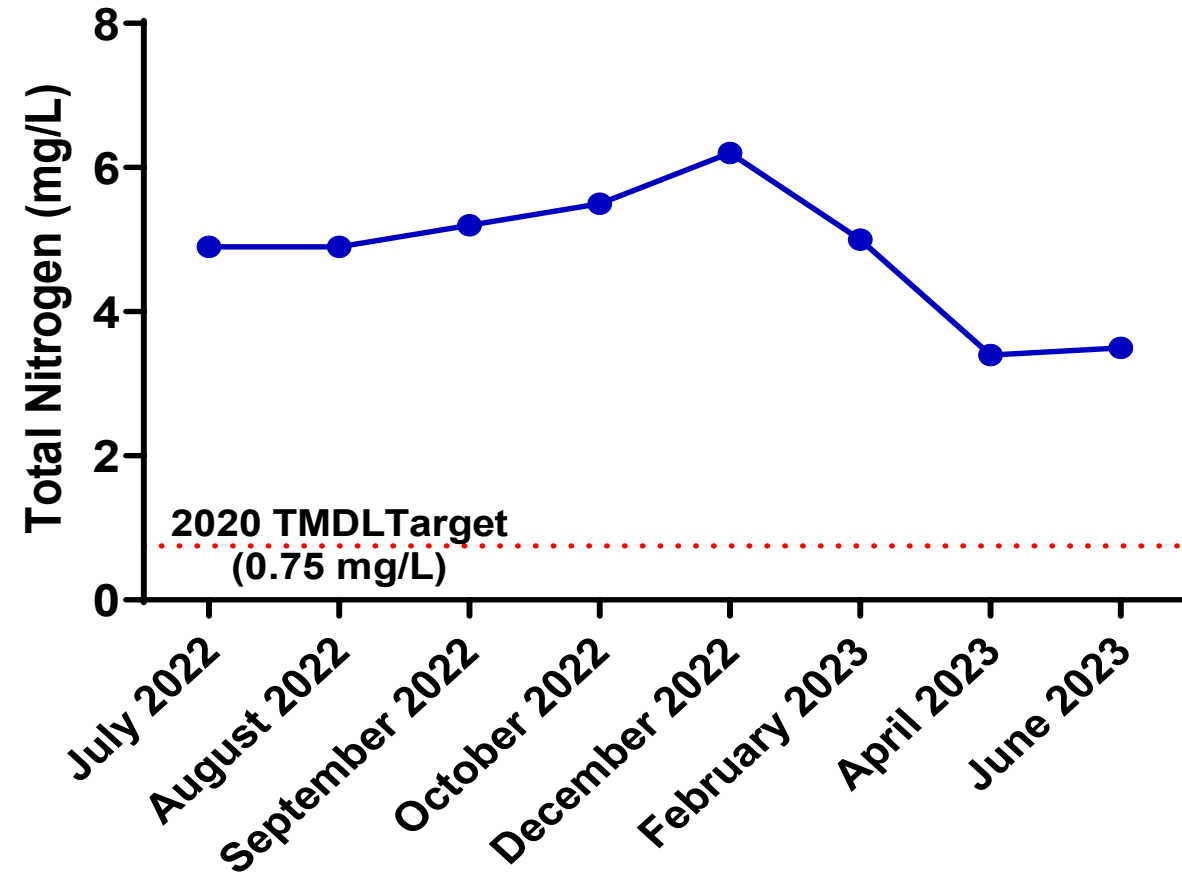






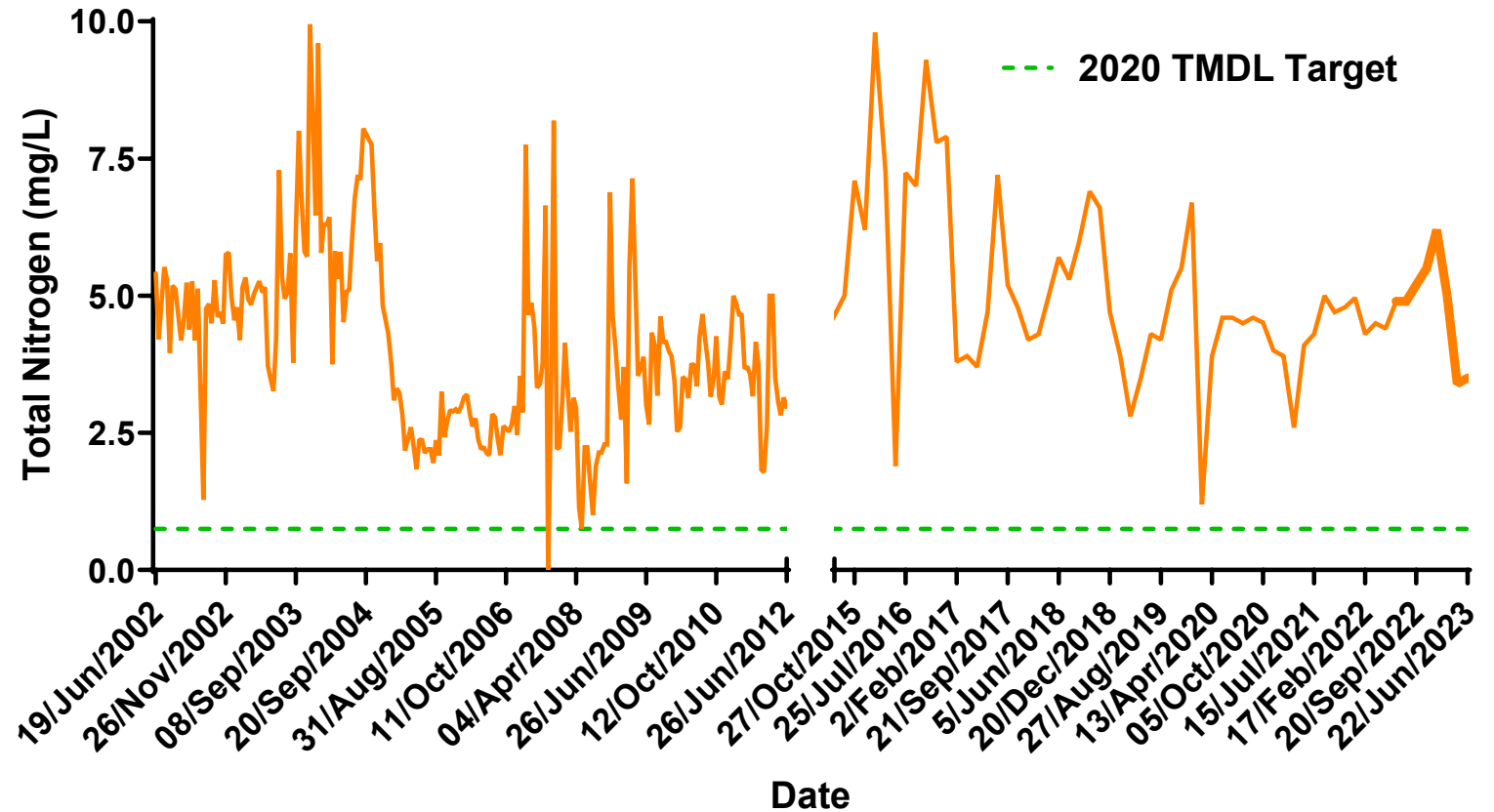
# In-Lake Monitoring – Lake Elsinore

## Total Nitrogen





# In-Lake Monitoring - Lake Elsinore



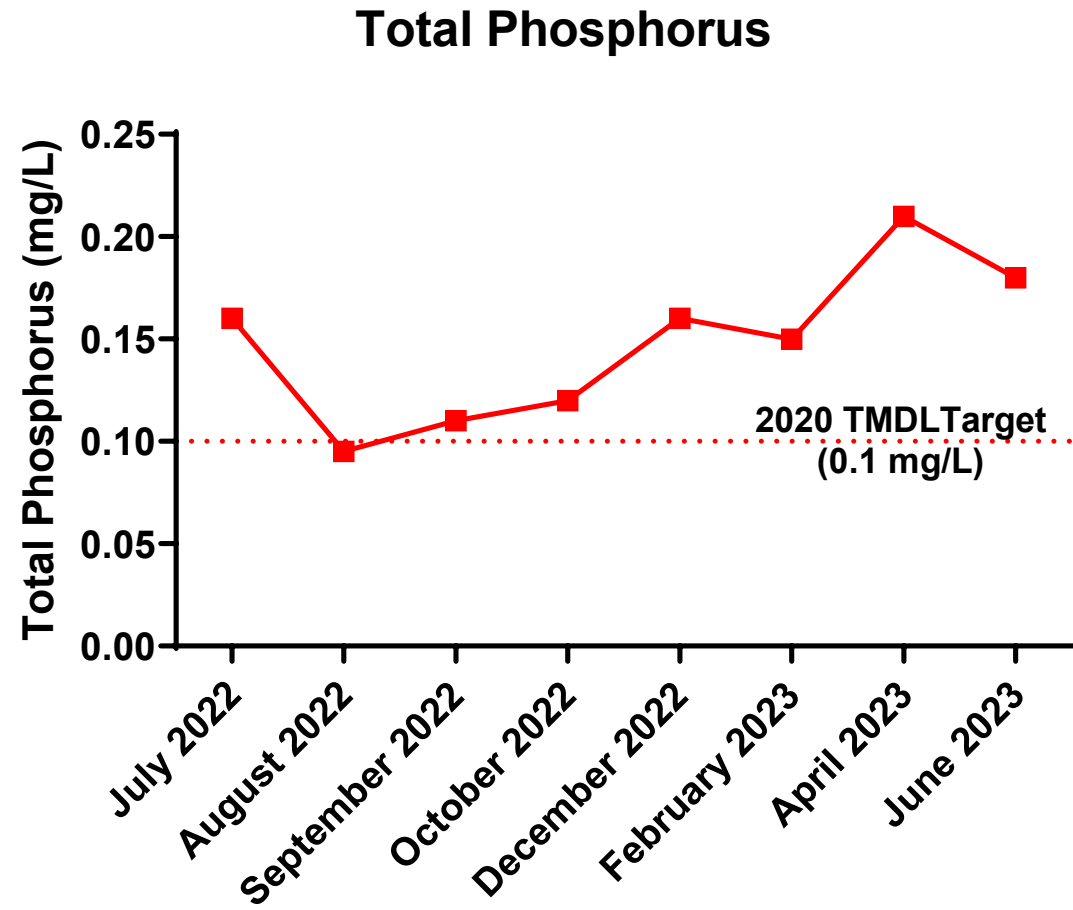
No data available from June 2012-July 2015

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

**Bold represents current monitoring year July 2022-June 2023**



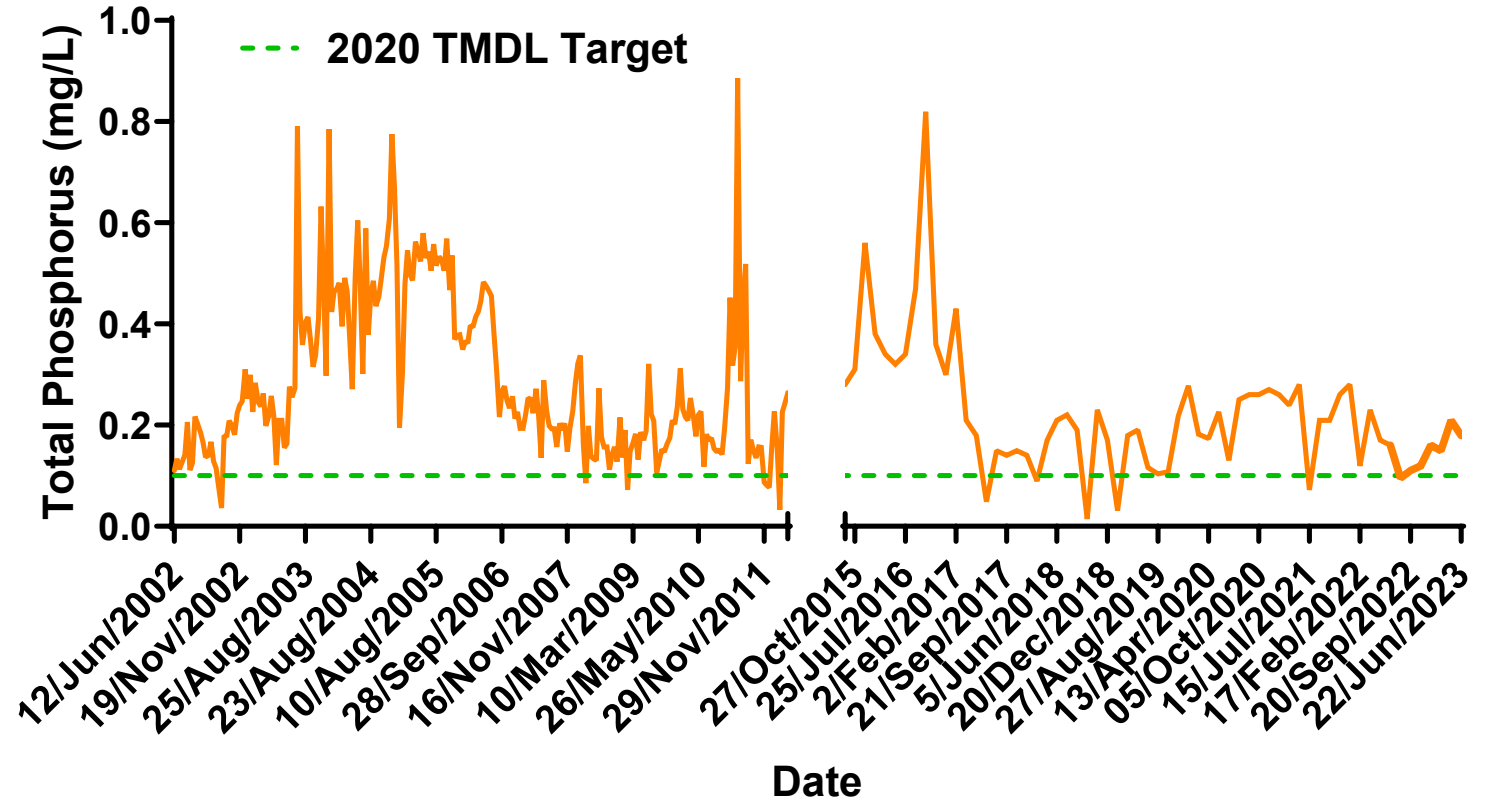
# In-Lake Monitoring - Lake Elsinore







# In-Lake Monitoring - Lake Elsinore



No data available from June 2012-July 2015

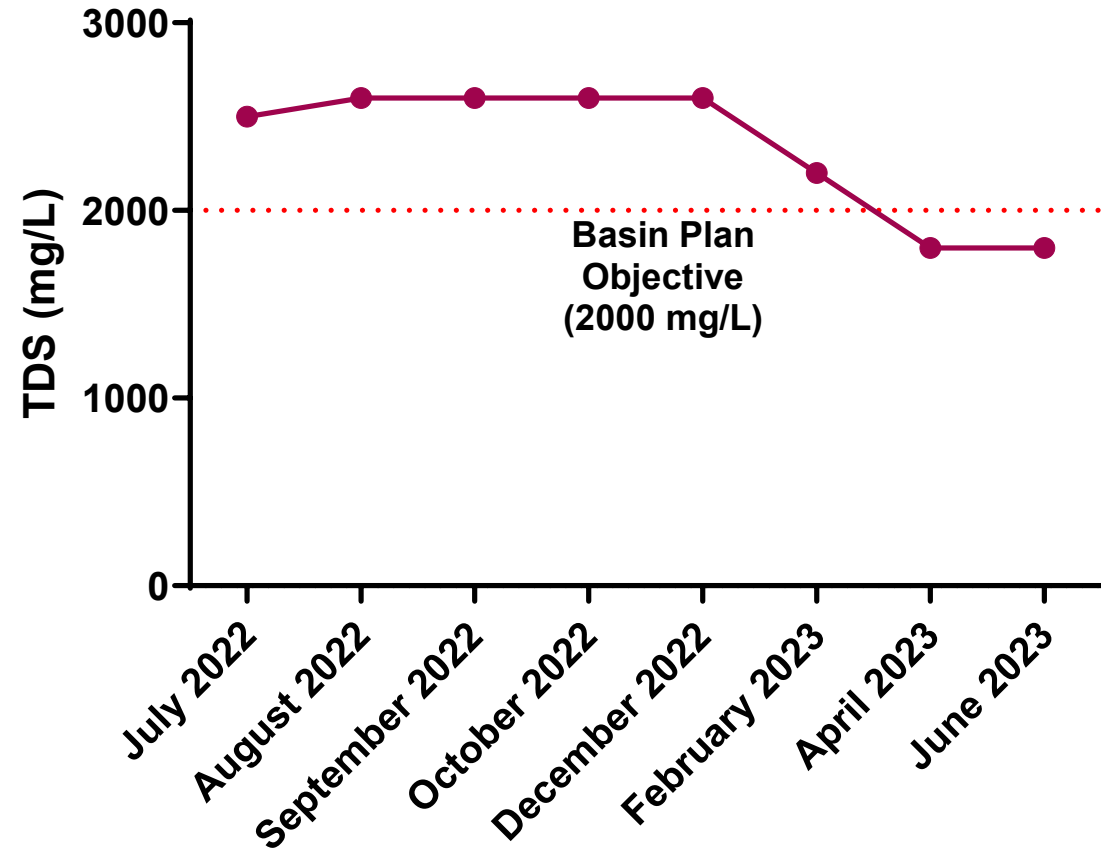
TMDL target of 0.1 mg/L is annual average to be attained by 2020

**Bold represents current monitoring year July 2022-June 2023**



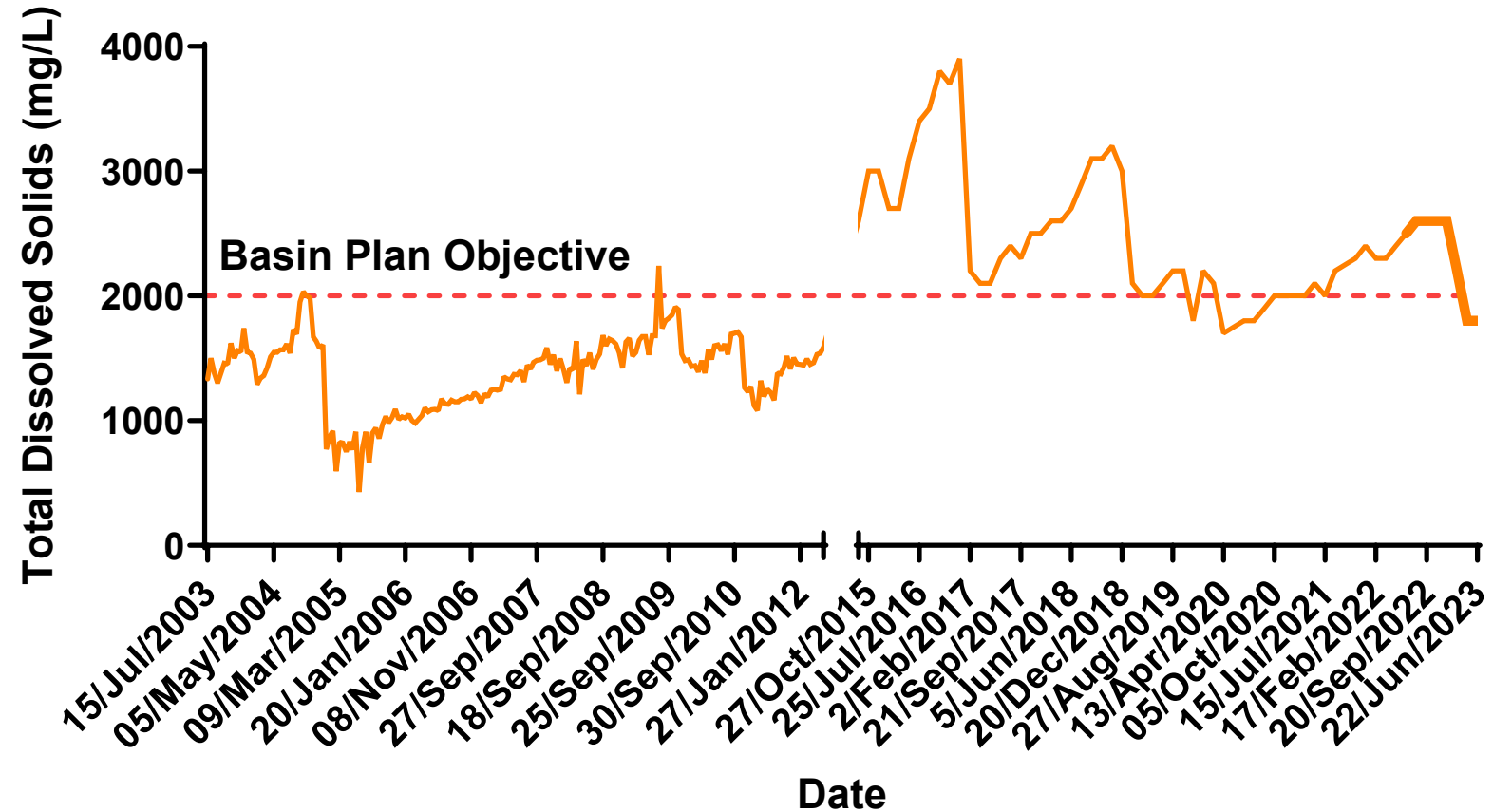
# In-Lake Monitoring - Lake Elsinore

### Total Dissolved Solids





# In-Lake Monitoring - Lake Elsinore



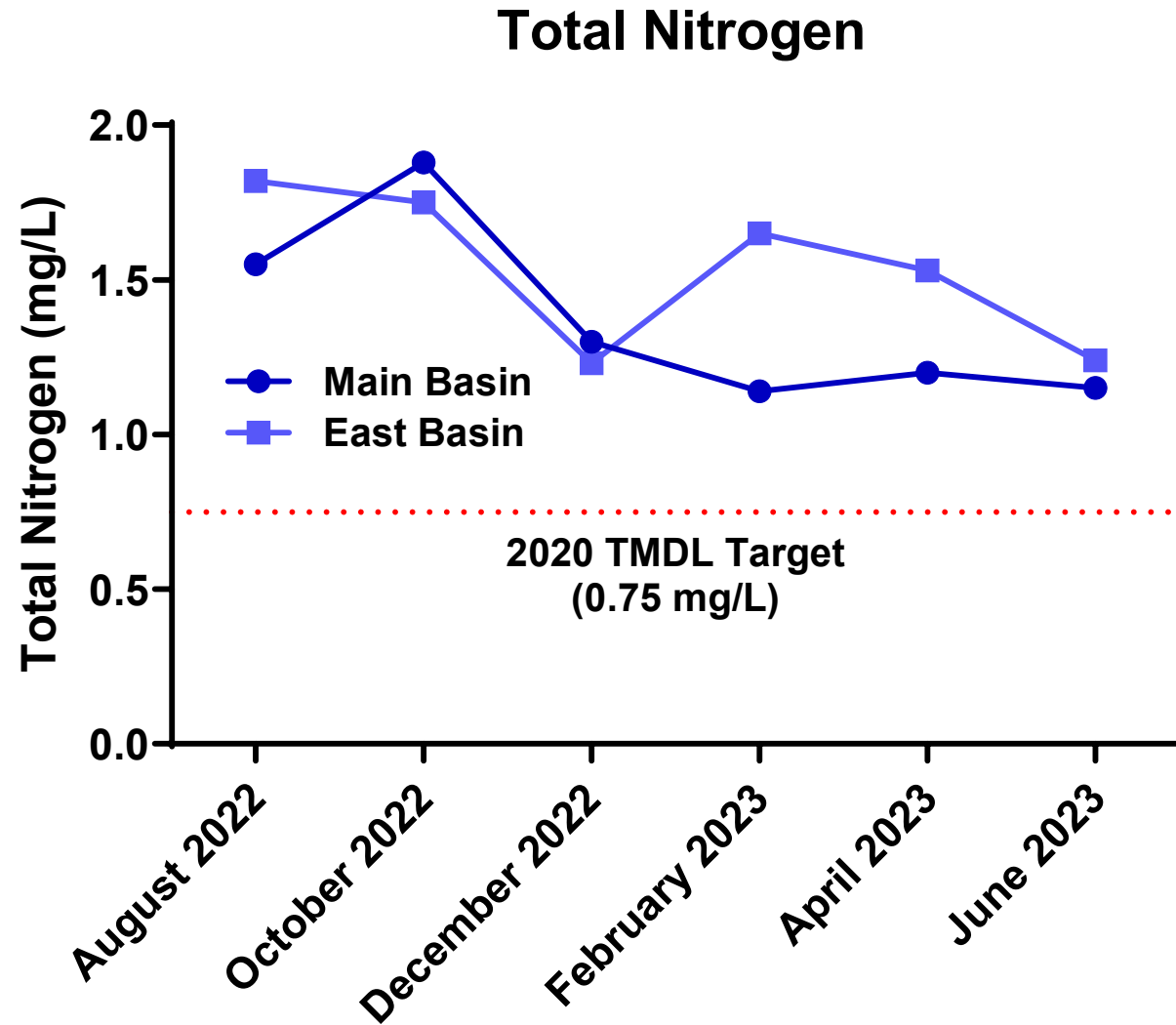
No data available from June 2012-July 2015

**Bold represents current monitoring year July 2022-June 2023**



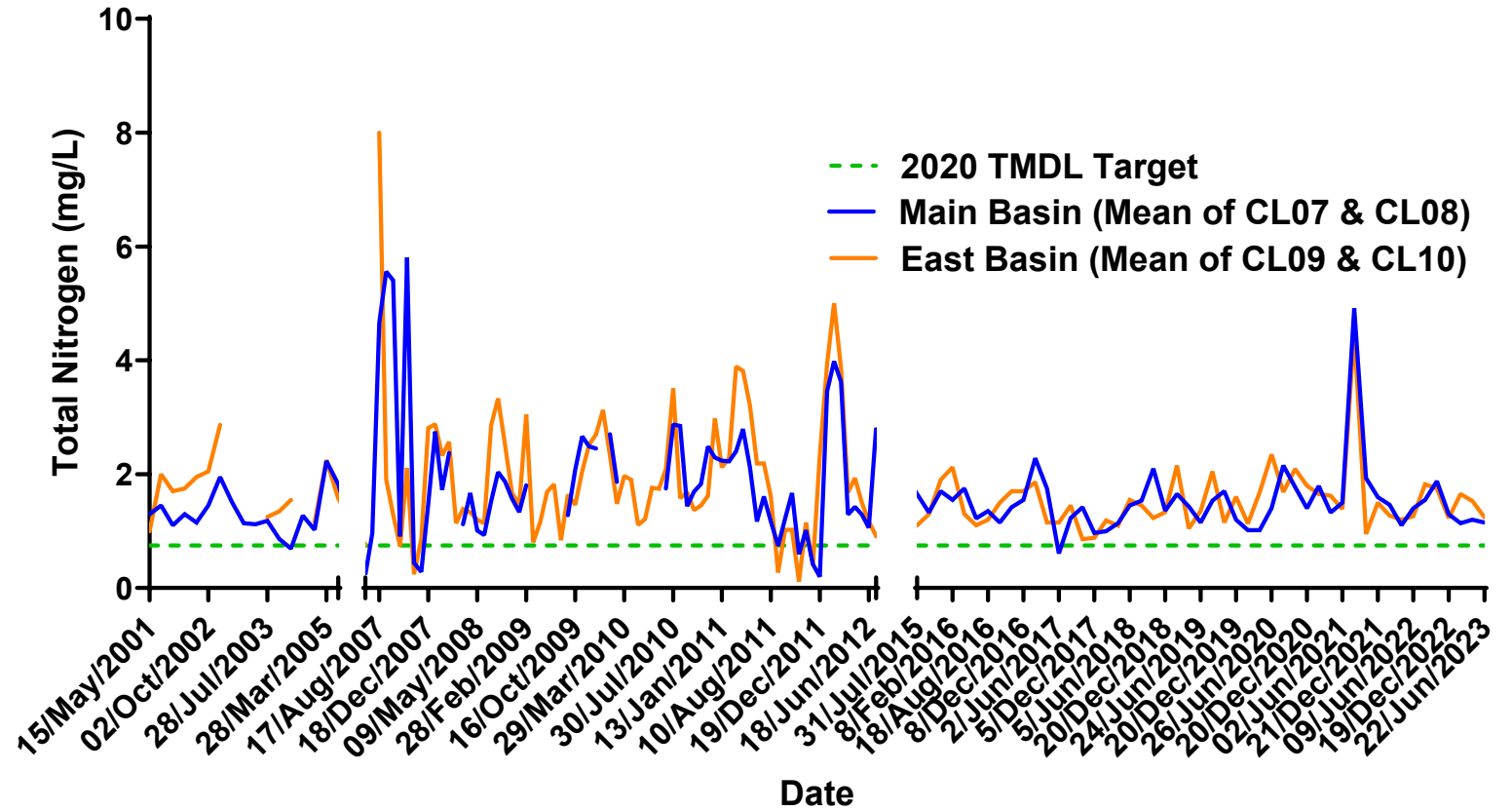


# In-Lake Monitoring – Canyon Lake





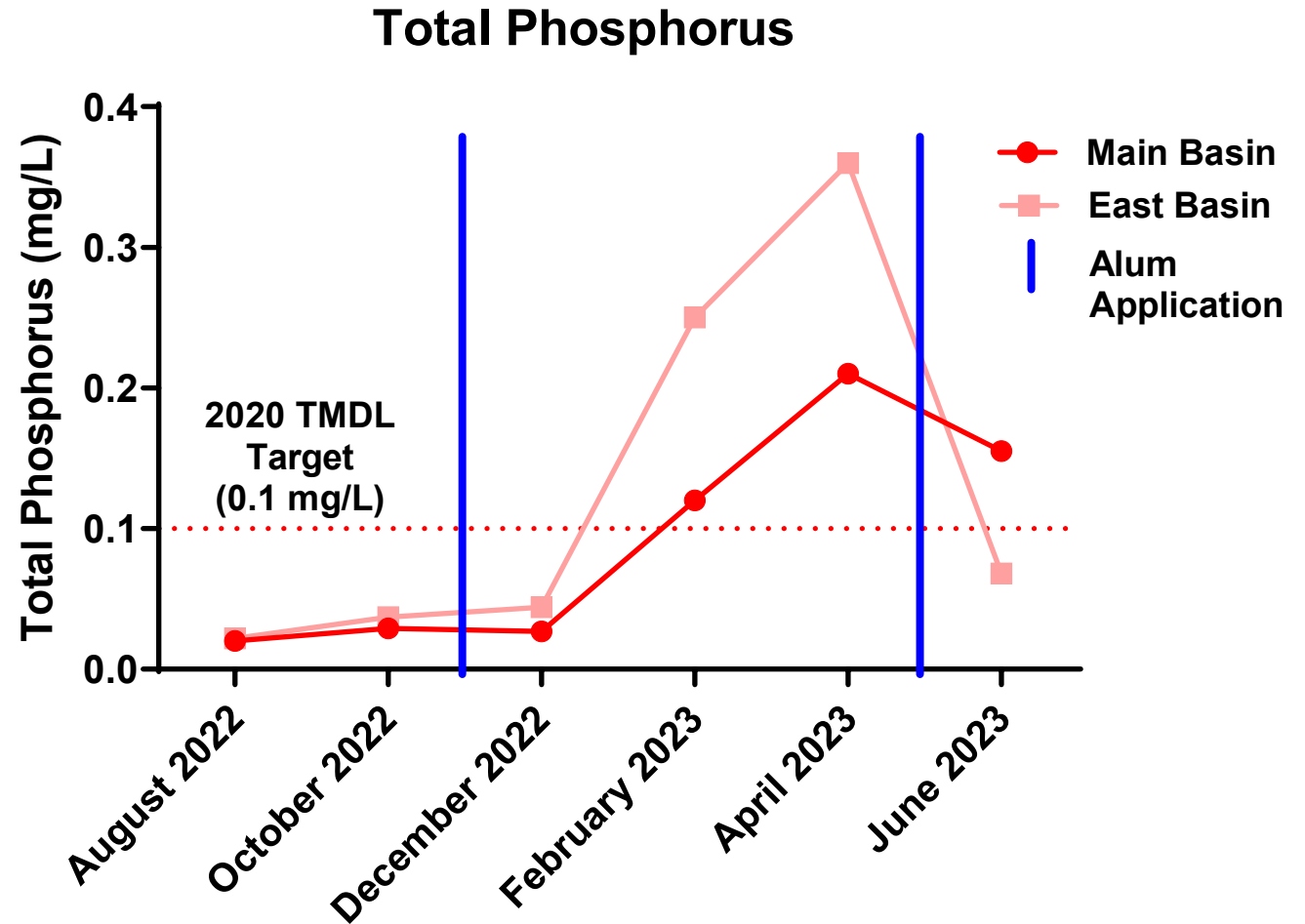
# In-Lake Monitoring - Canyon Lake



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 2022-June 2023**



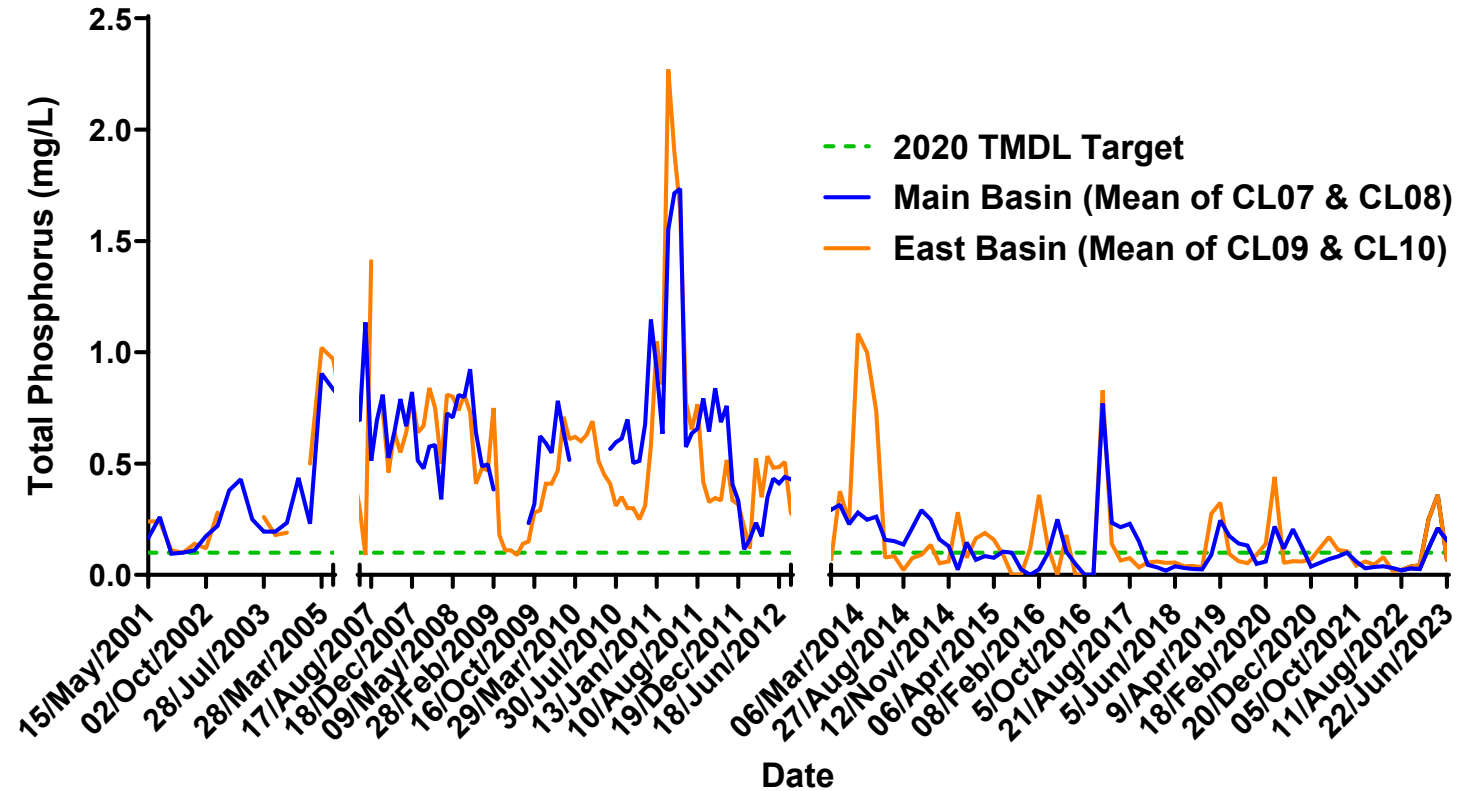
# In-Lake Monitoring - Canyon Lake





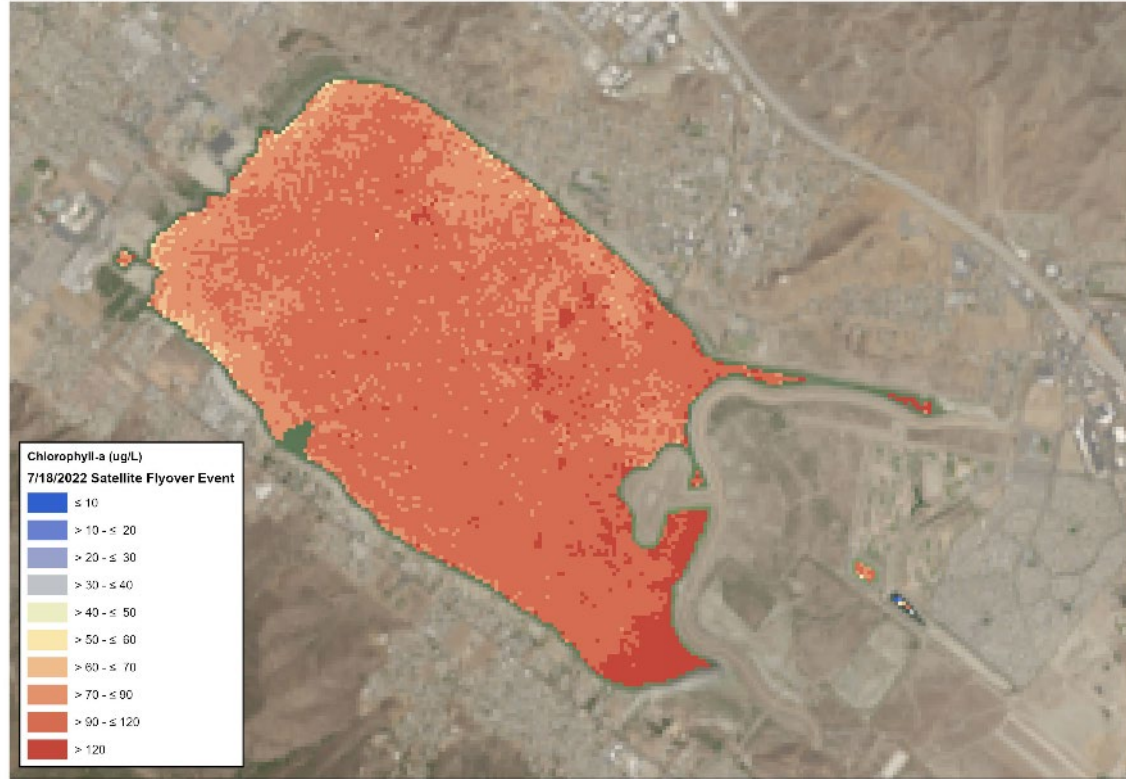


# In-Lake Monitoring - Canyon Lake



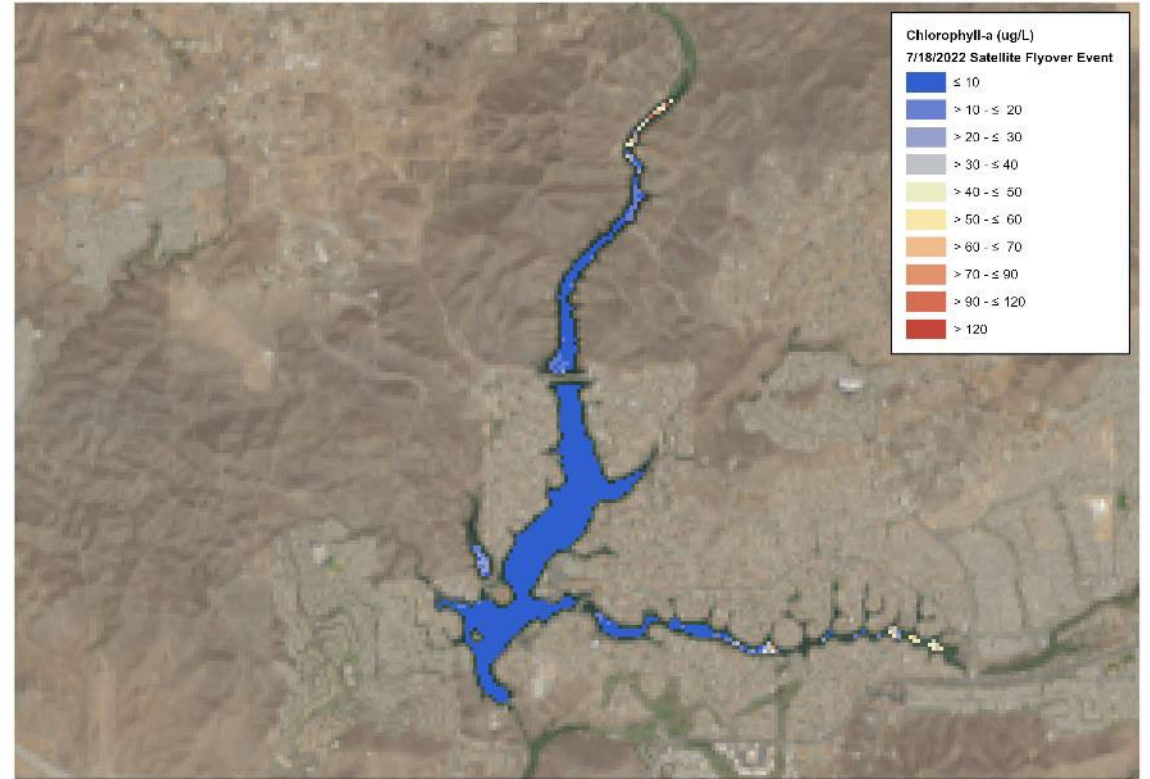
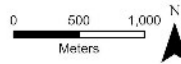
No data available from May 2005-July 2007; June 2012-Sept 2013  
 TMDL target of 0.1 mg/L is annual average to be attained by 2020  
 Bold represents current monitoring year July 2022-June 2023

# In-Lake Monitoring – Satellite July



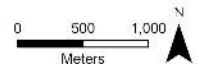
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**Chlorophyll-a Concentrations  
Lake Elsinore  
July 18, 2022 Satellite Flyover Event**



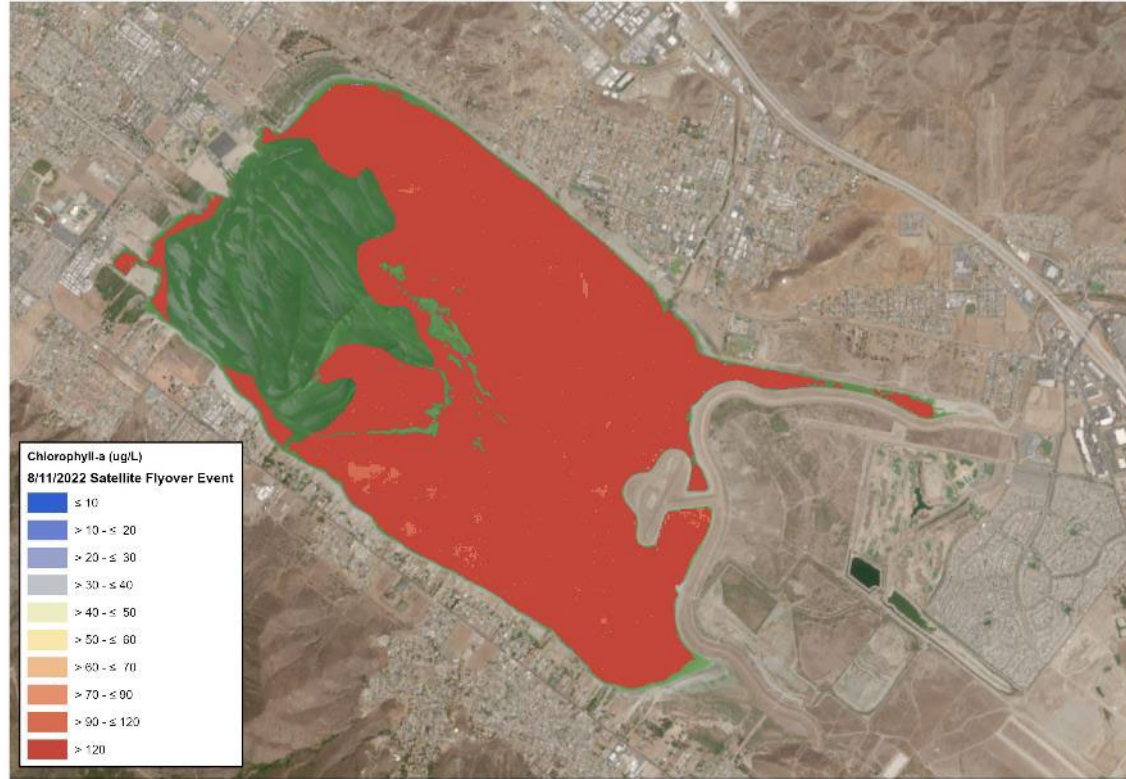
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**Chlorophyll-a Concentrations  
Canyon Lake  
July 18, 2022 Satellite Flyover Event**

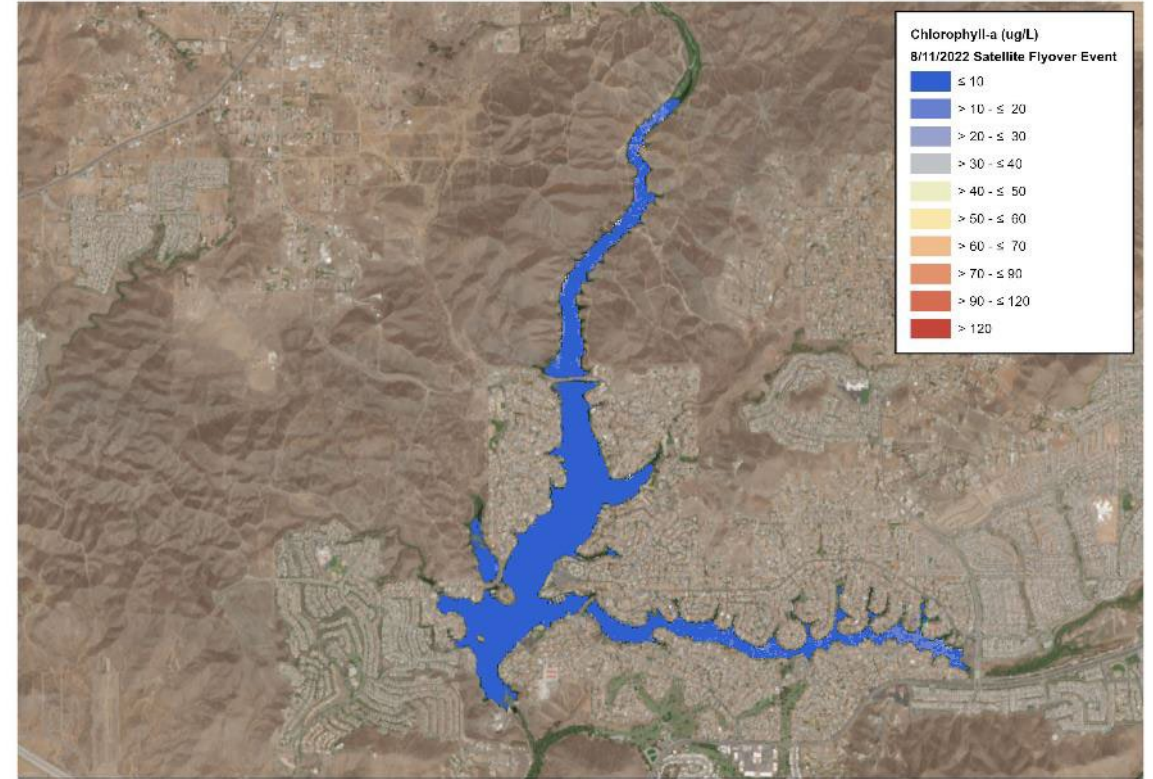
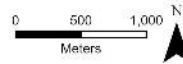




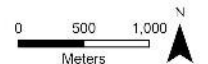
# In-Lake Monitoring - Satellite August



Chlorophyll-a Concentrations  
Lake Elsinore  
August 11, 2022 Satellite Flyover Event

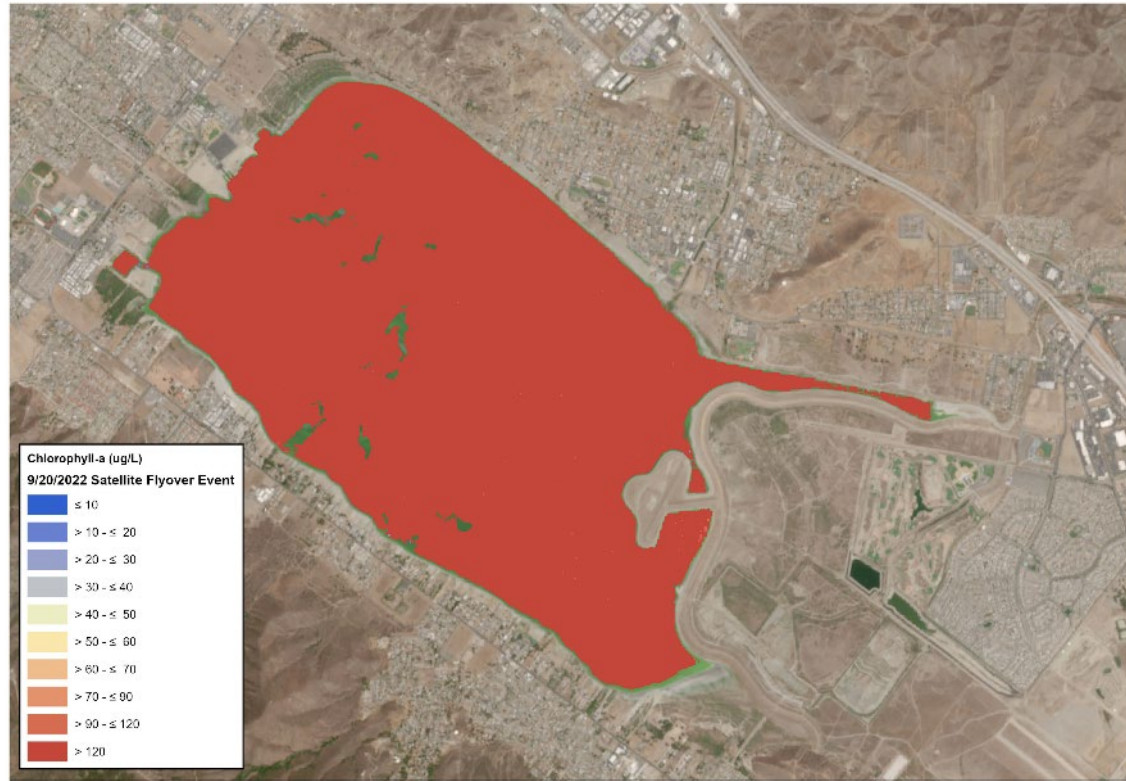


Chlorophyll-a Concentrations  
Canyon Lake  
August 11, 2022 Satellite Flyover Event

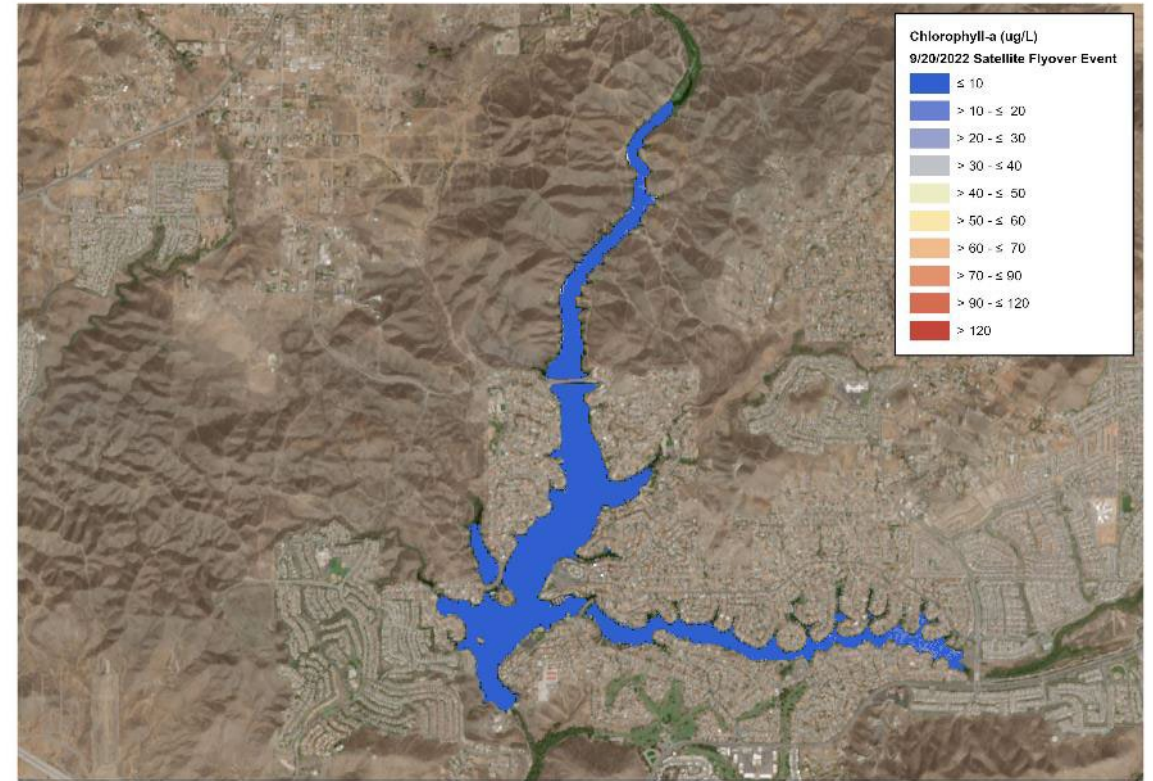
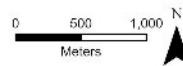




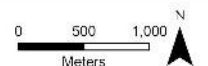
# In-Lake Monitoring – Satellite September



**Chlorophyll-a Concentrations  
Lake Elsinore  
September 20, 2022 Satellite Flyover Event**

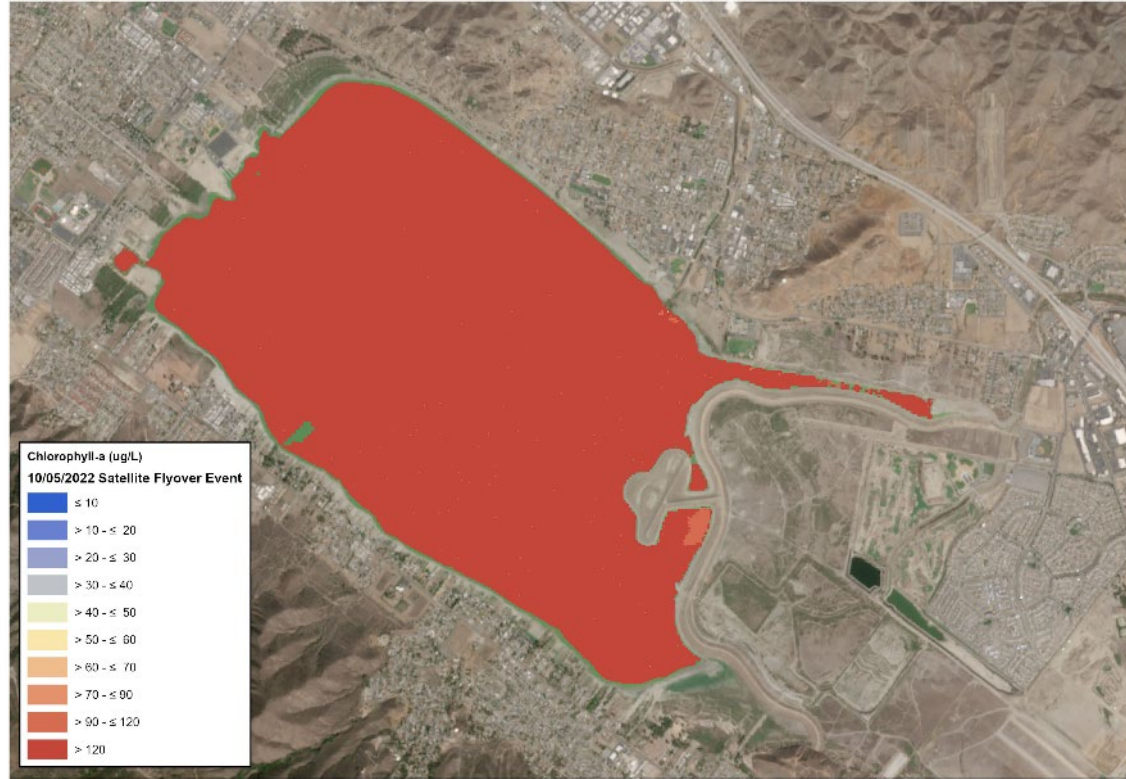


**Chlorophyll-a Concentrations  
Canyon Lake  
September 20, 2022 Satellite Flyover Event**



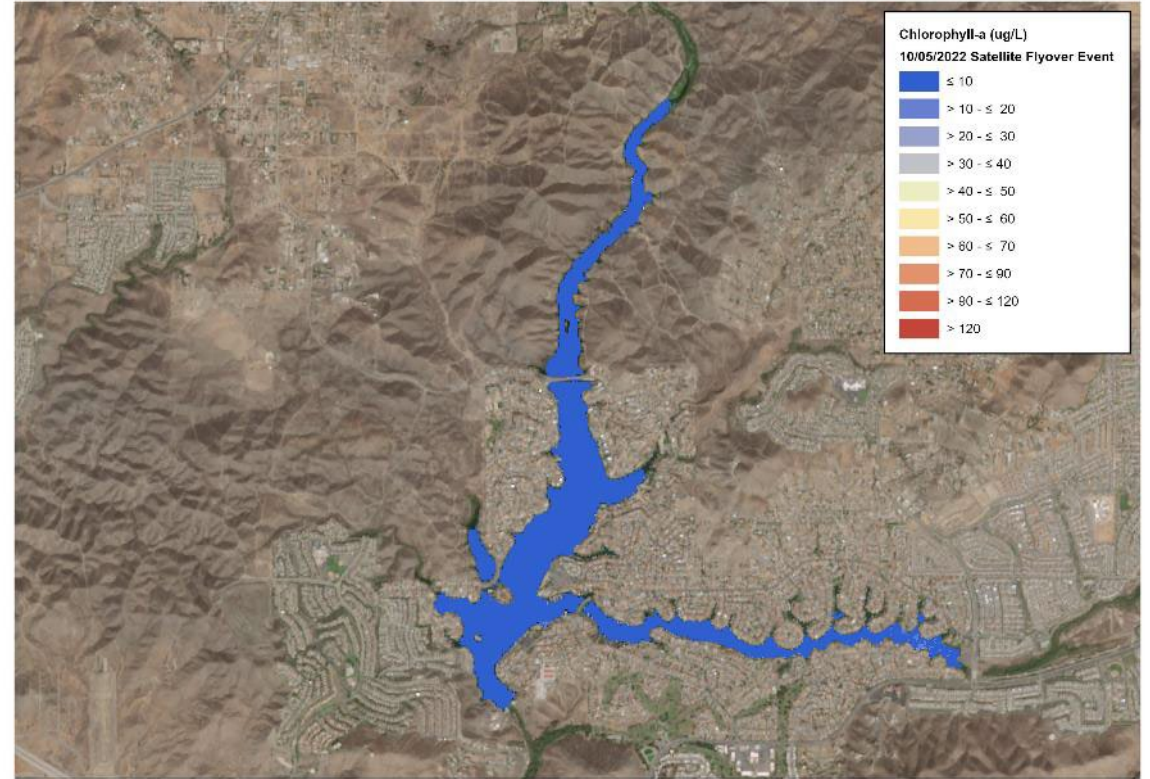
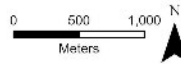


# In-Lake Monitoring – Satellite October



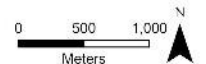
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Chlorophyll-a Concentrations  
Lake Elsinore  
October 5, 2022 Satellite Flyover Event



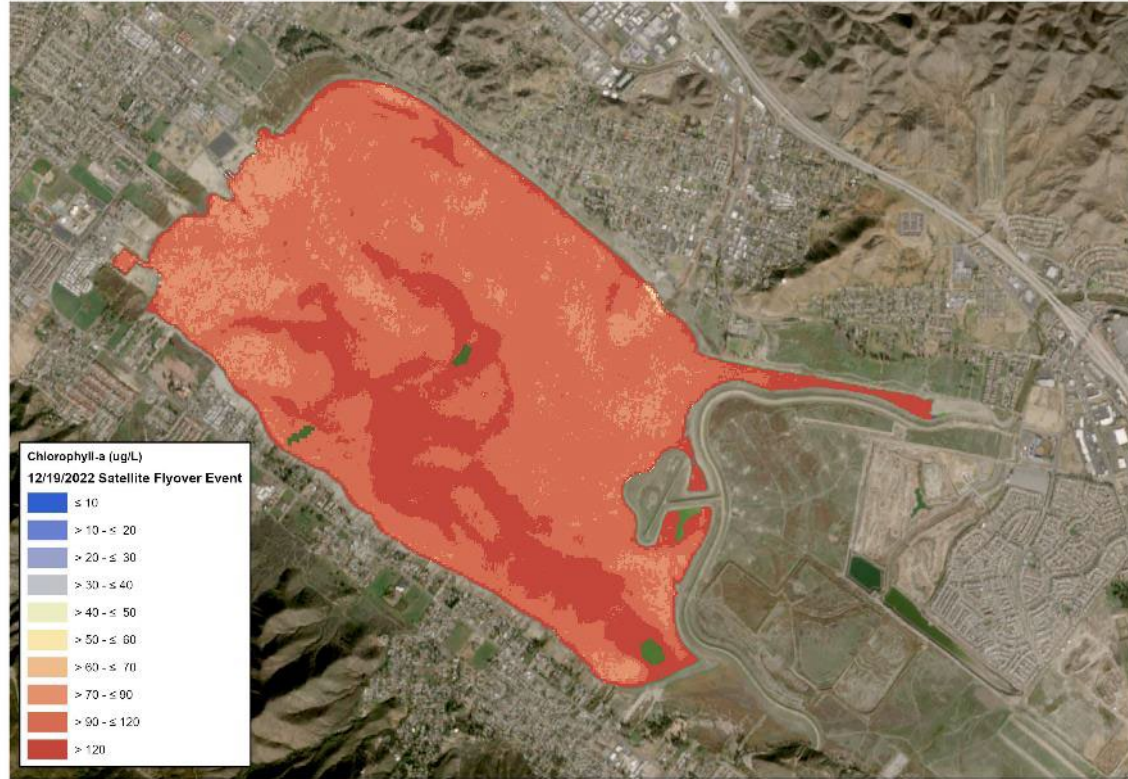
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Chlorophyll-a Concentrations  
Canyon Lake  
October 5, 2022 Satellite Flyover Event

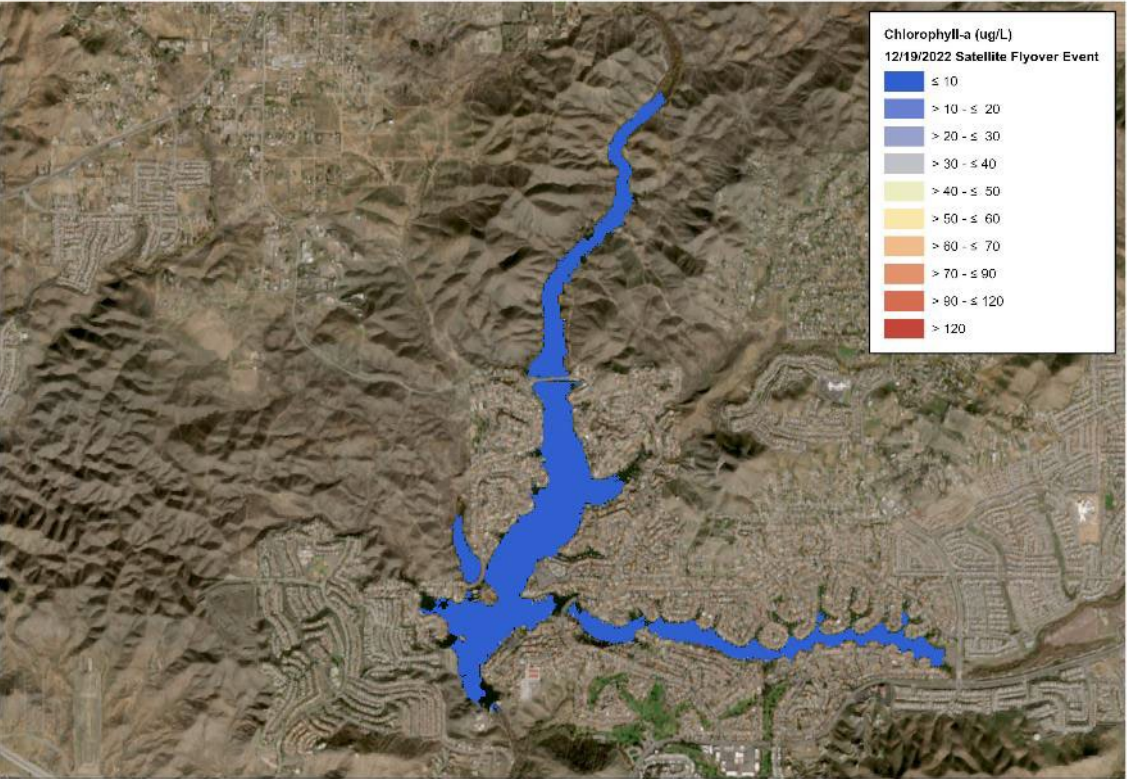




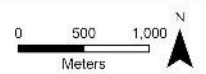
# In-Lake Monitoring – Satellite December



**Chlorophyll-a Concentrations**  
**Lake Elsinore**  
 December 19, 2022 Satellite Flyover Event

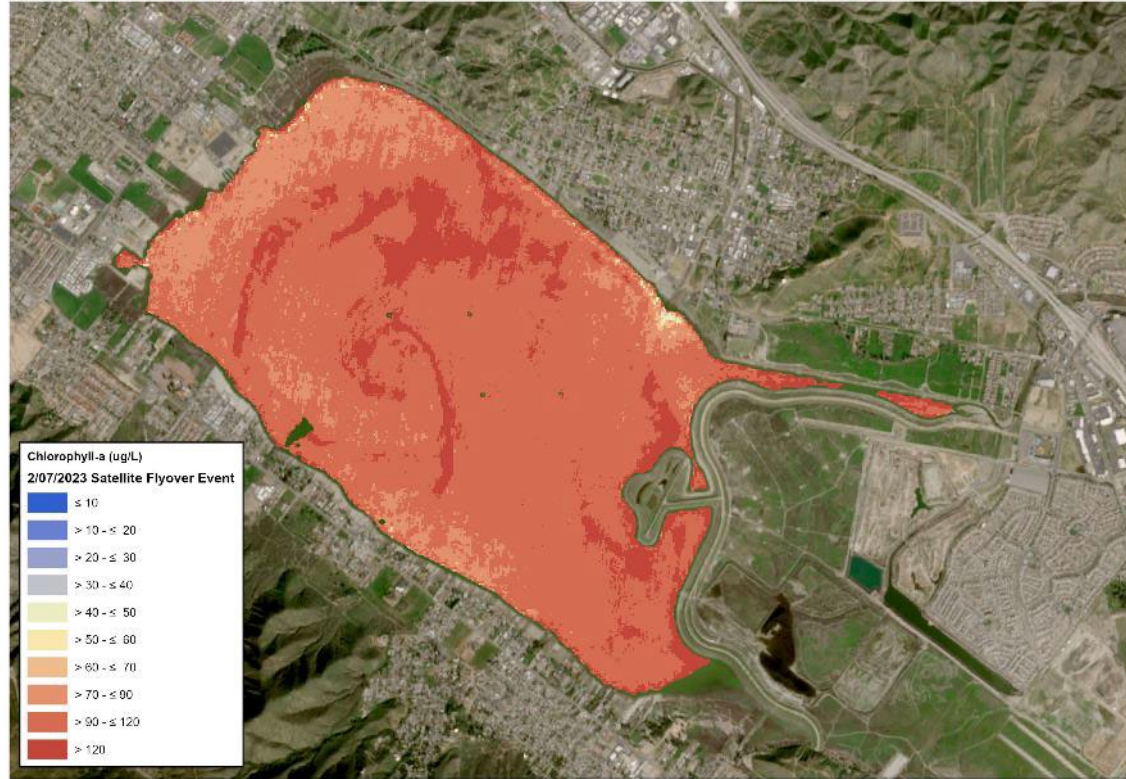


**Chlorophyll-a Concentrations**  
**Canyon Lake**  
 December 19, 2022 Satellite Flyover Event

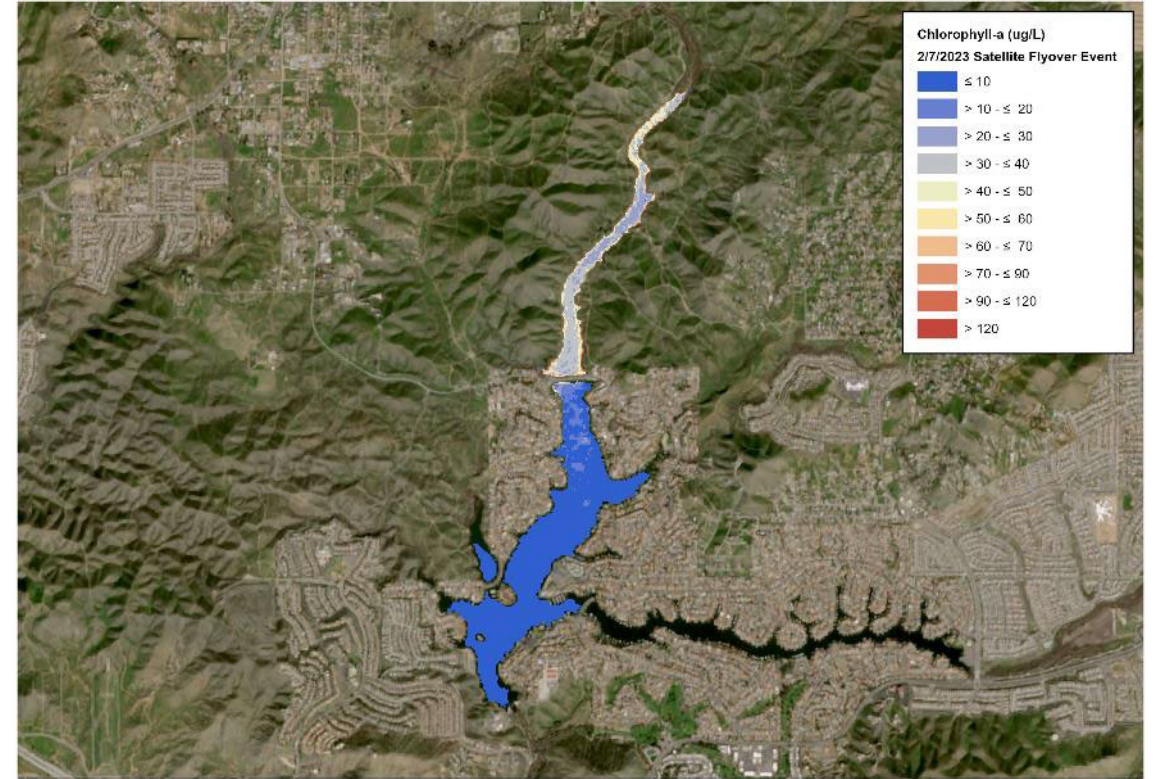
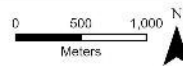




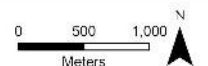
# In-Lake Monitoring - Satellite February



**Chlorophyll-a Concentrations  
Lake Elsinore  
February 7, 2023 Satellite Flyover Event**

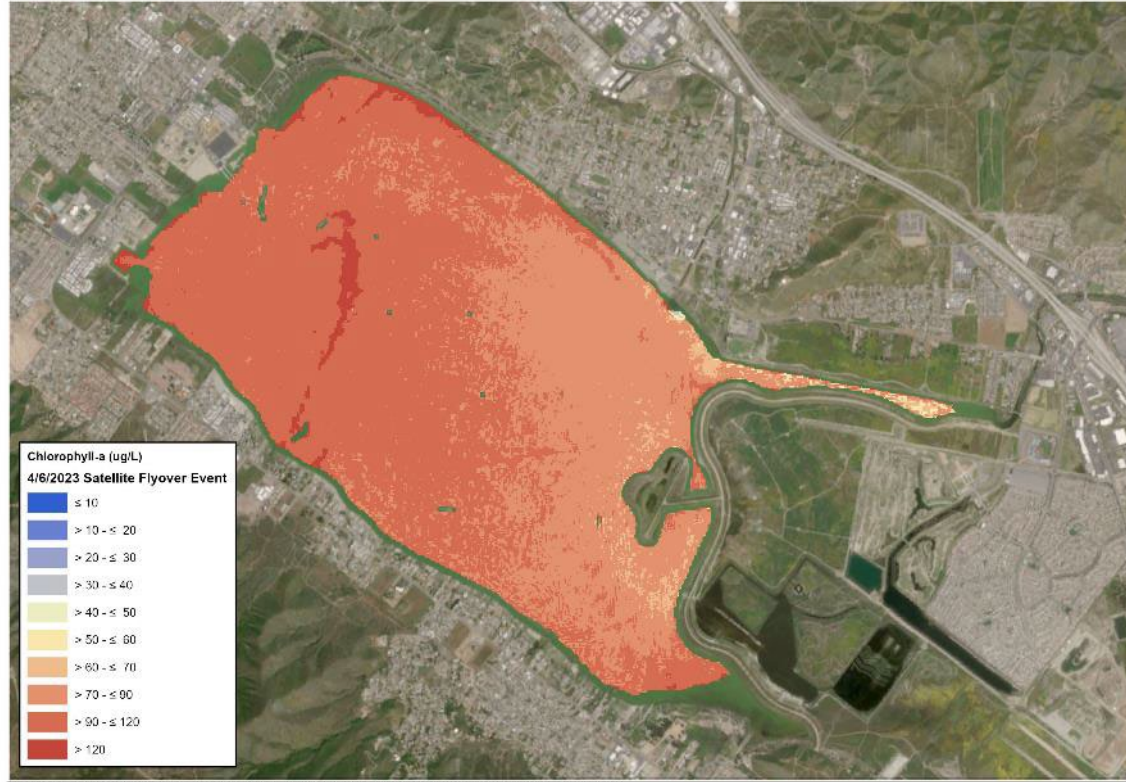


**Chlorophyll-a Concentrations  
Canyon Lake  
February 7, 2023 Satellite Flyover Event**

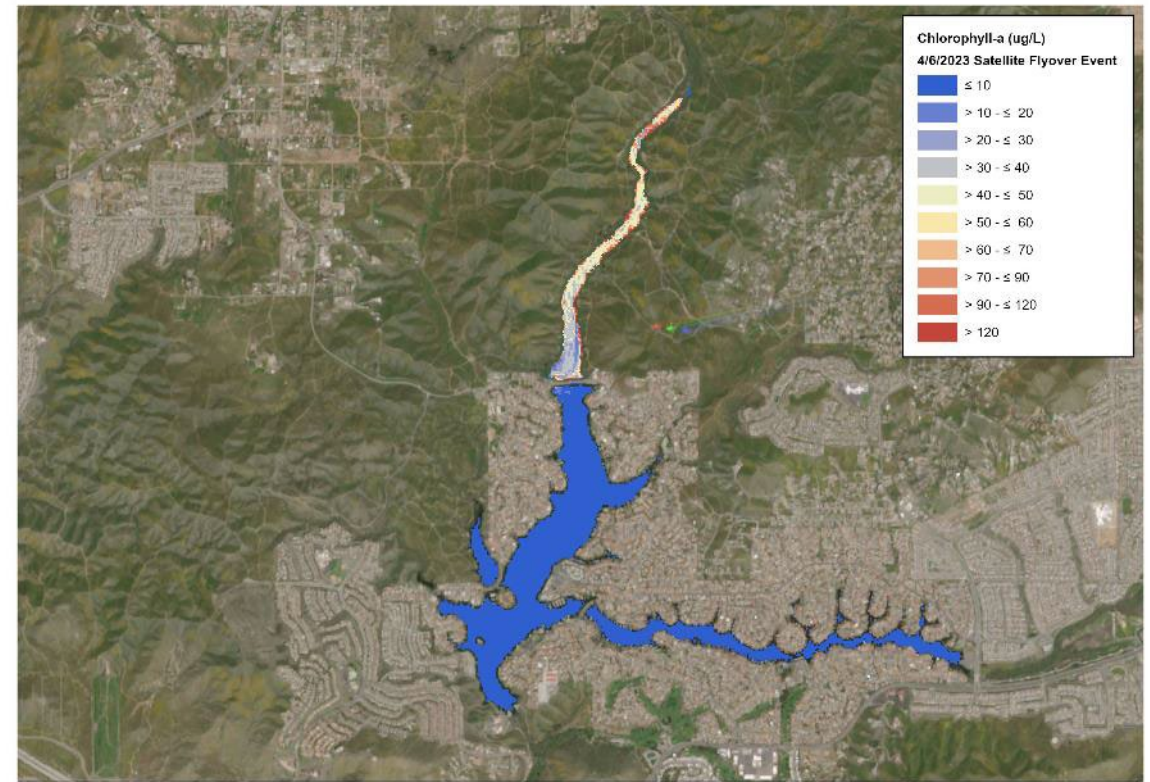




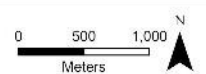
# In-Lake Monitoring – Satellite April



Chlorophyll-a Concentrations  
Lake Elsinore  
April 6, 2023 Satellite Flyover Event

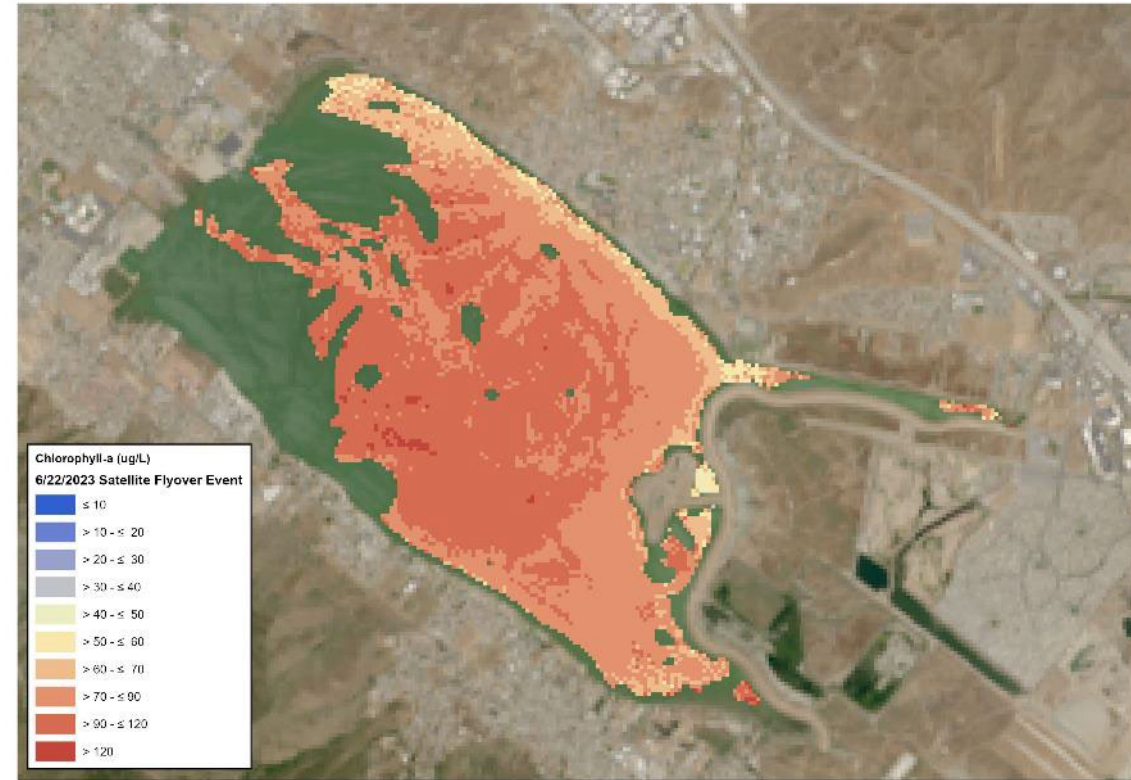


Chlorophyll-a Concentrations  
Canyon Lake  
April 6, 2023 Satellite Flyover Event

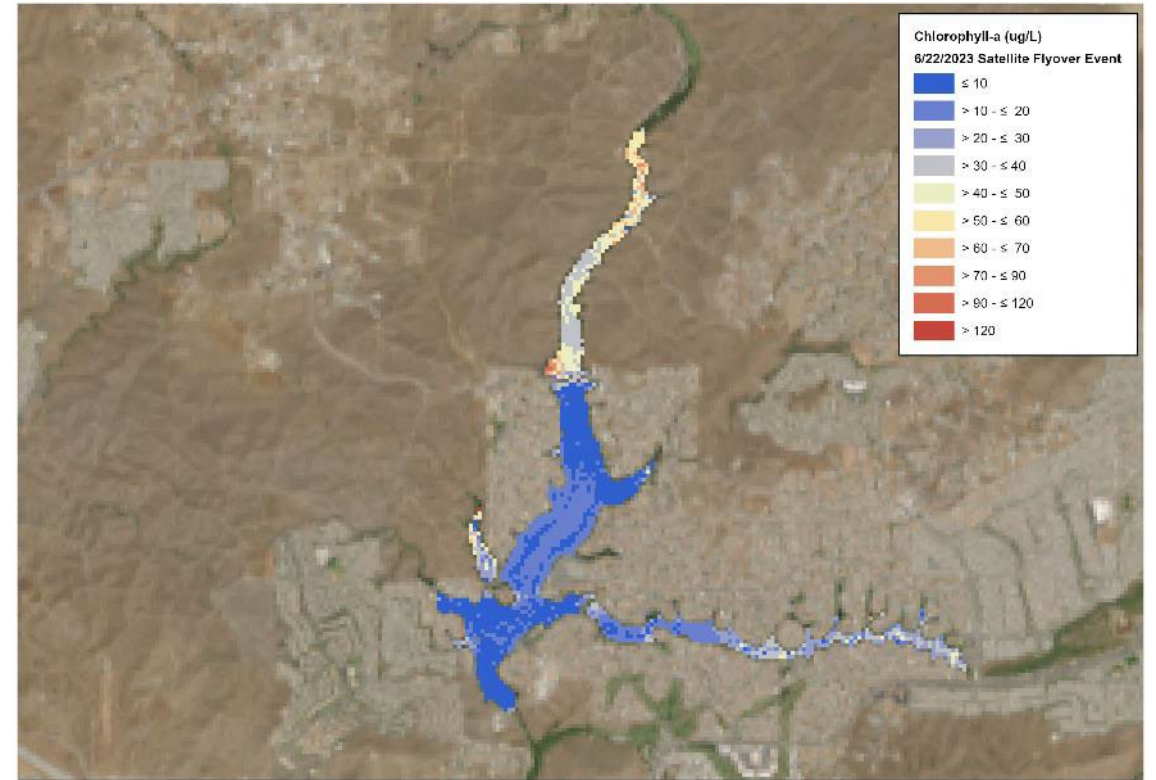
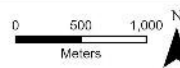




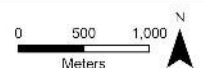
# In-Lake Monitoring – Satellite June



**Chlorophyll-a Concentrations  
Lake Elsinore  
June 22, 2023 Satellite Flyover Event**



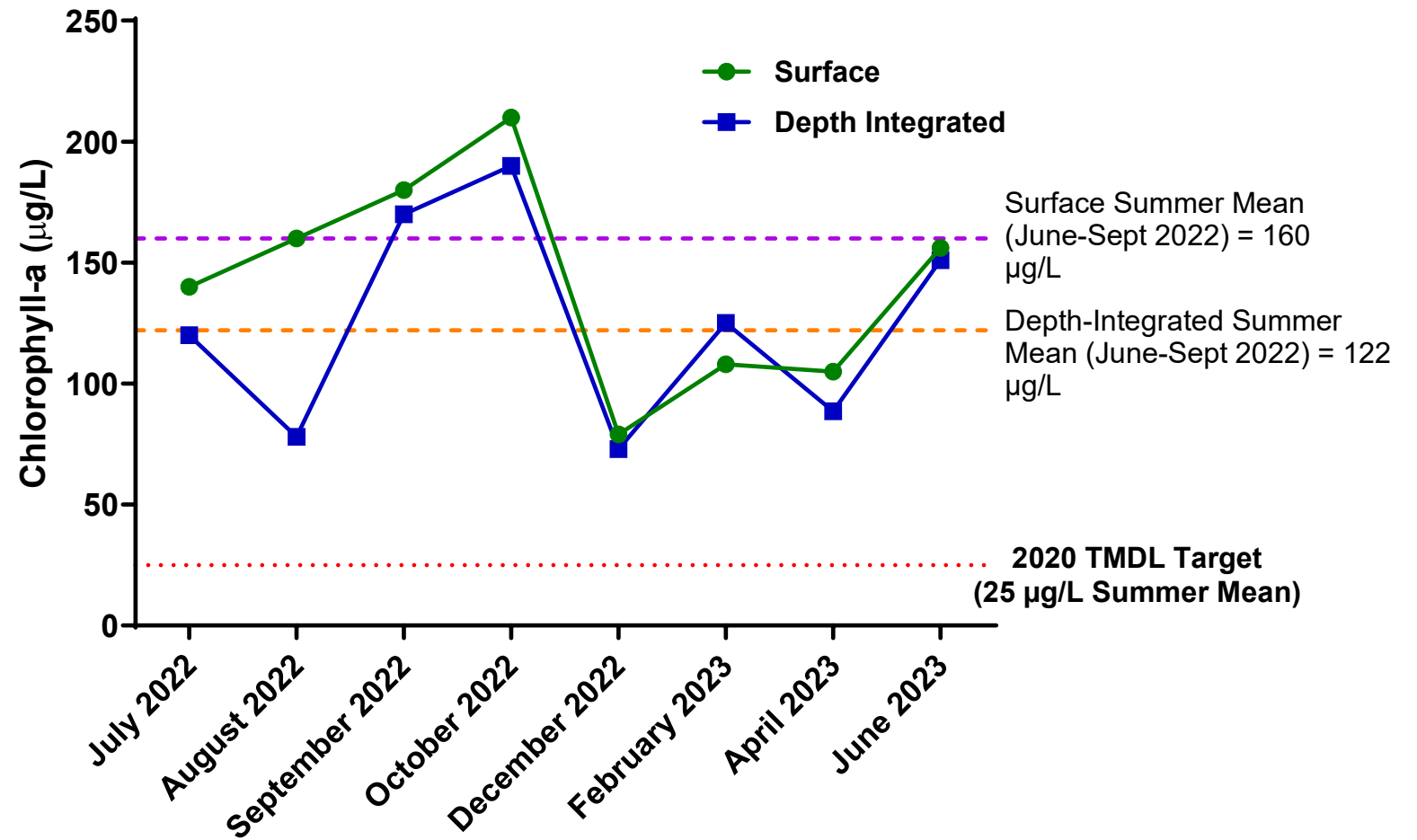
**Chlorophyll-a Concentrations  
Canyon Lake  
June 22, 2023 Satellite Flyover Event**





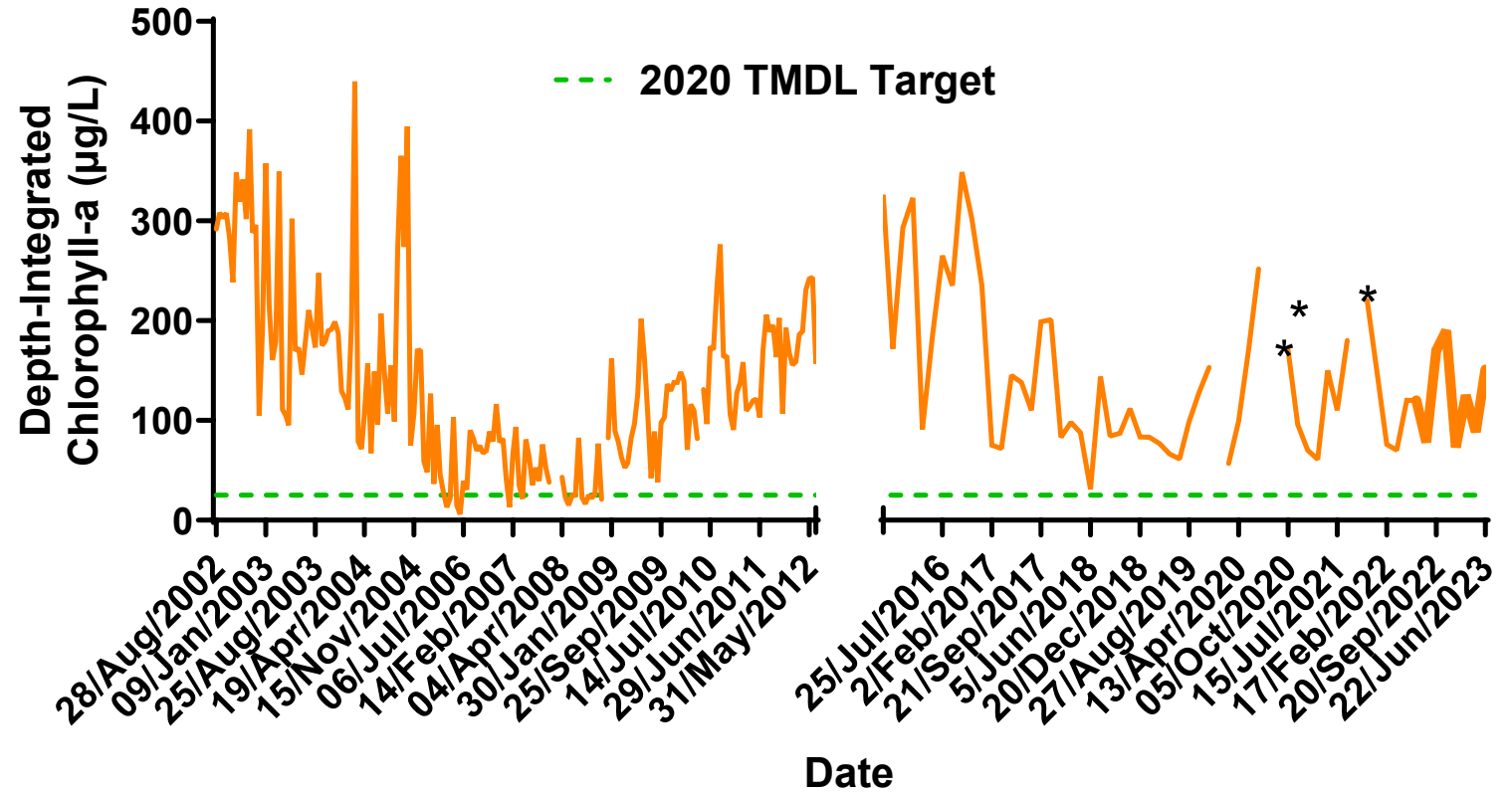


# In-Lake Monitoring – Lake Elsinore





# In-Lake Monitoring – Lake Elsinore



No data available from June 2012-July 2015

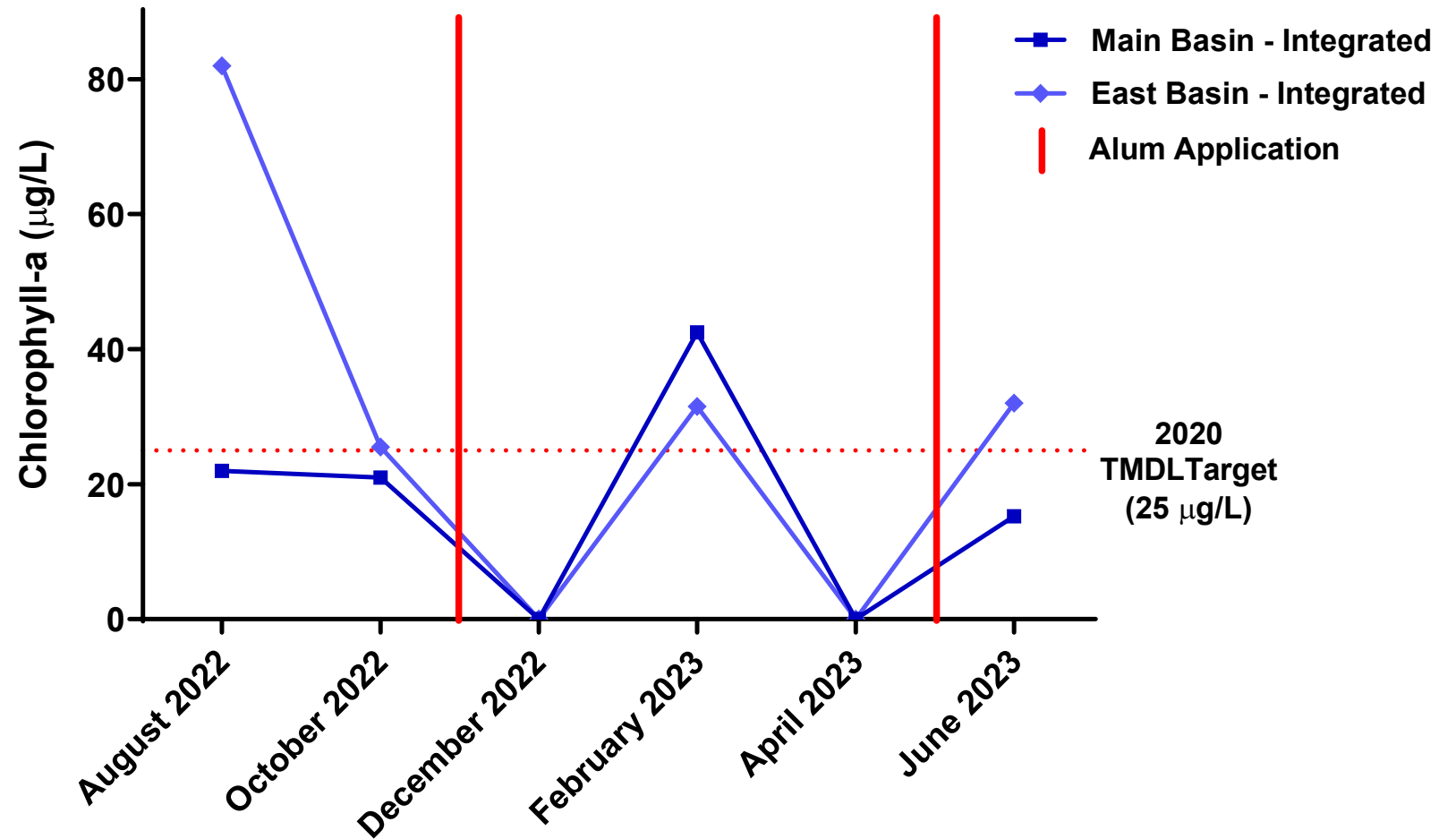
TMDL target of 25 µg/L is summer average to be attained by 2020

**Bold** represents current monitoring year July 2022- June 2023

\*Not measured due to laboratory error. See report for details.



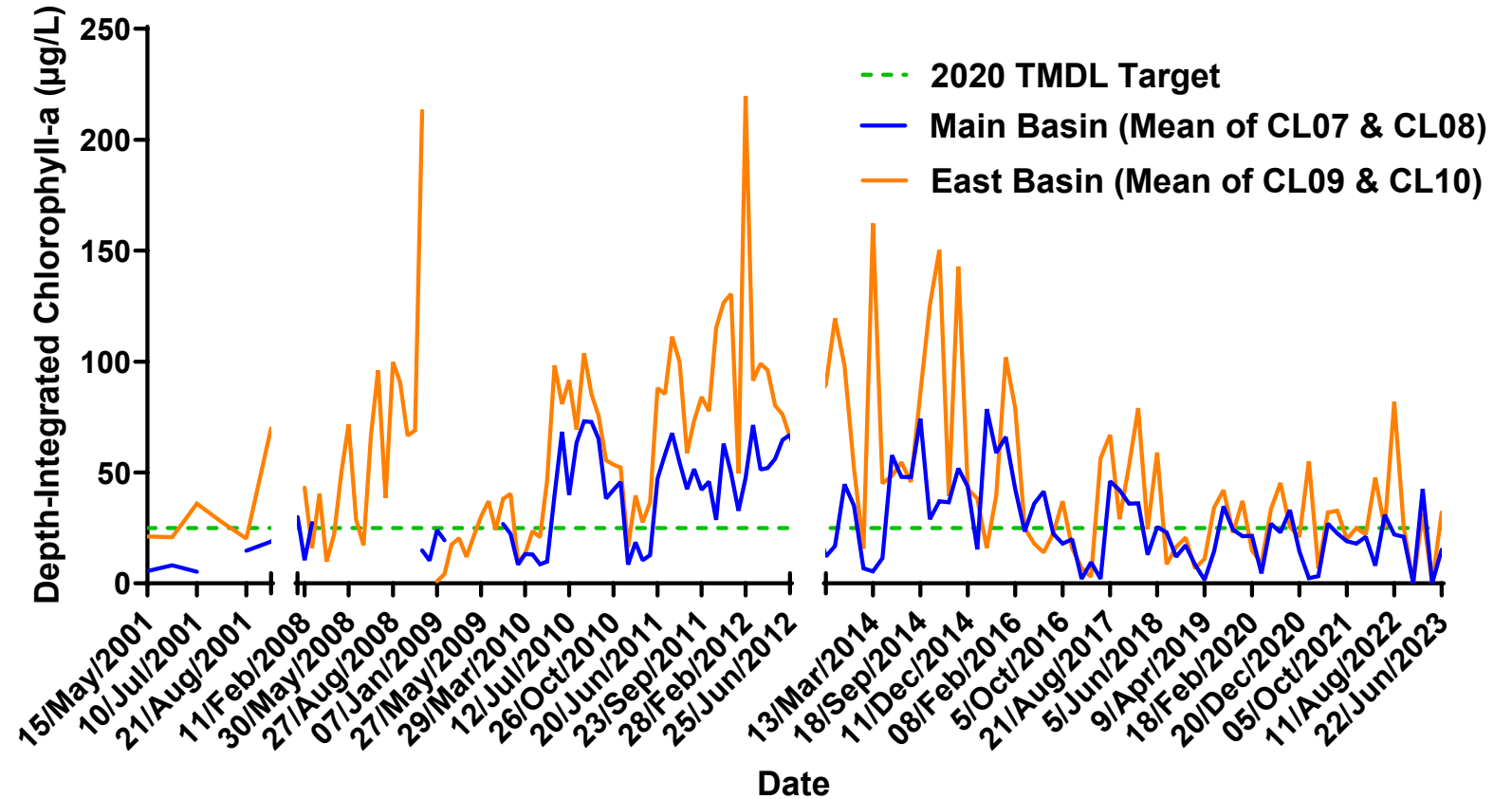
# In-Lake Monitoring – Canyon Lake







# In-Lake Monitoring – Canyon Lake



No data available from June 2012-July 2015

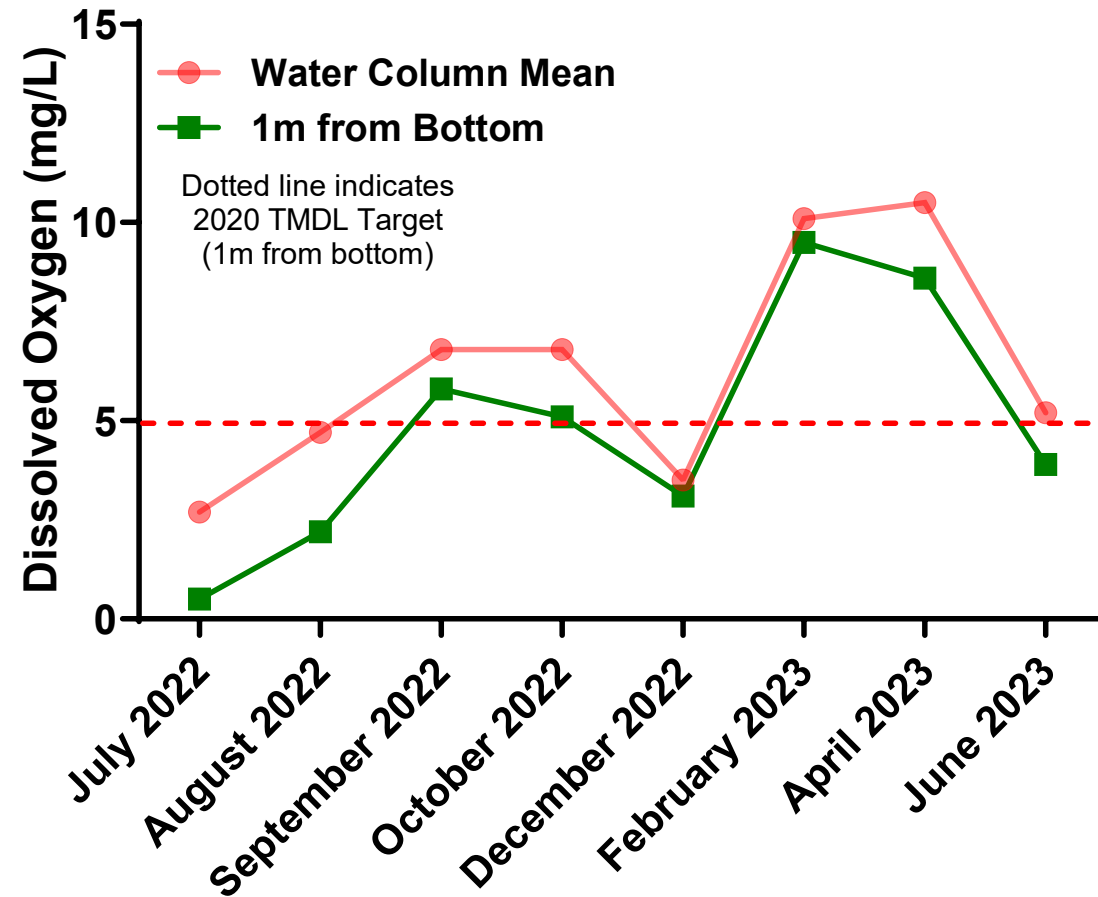
2020 TMDL target of 25 µg/L is annual average to be attained by 2020

**Bold represents current monitoring year July 2022-June 2023**



# In-Lake Monitoring – Lake Elsinore

## Dissolved Oxygen

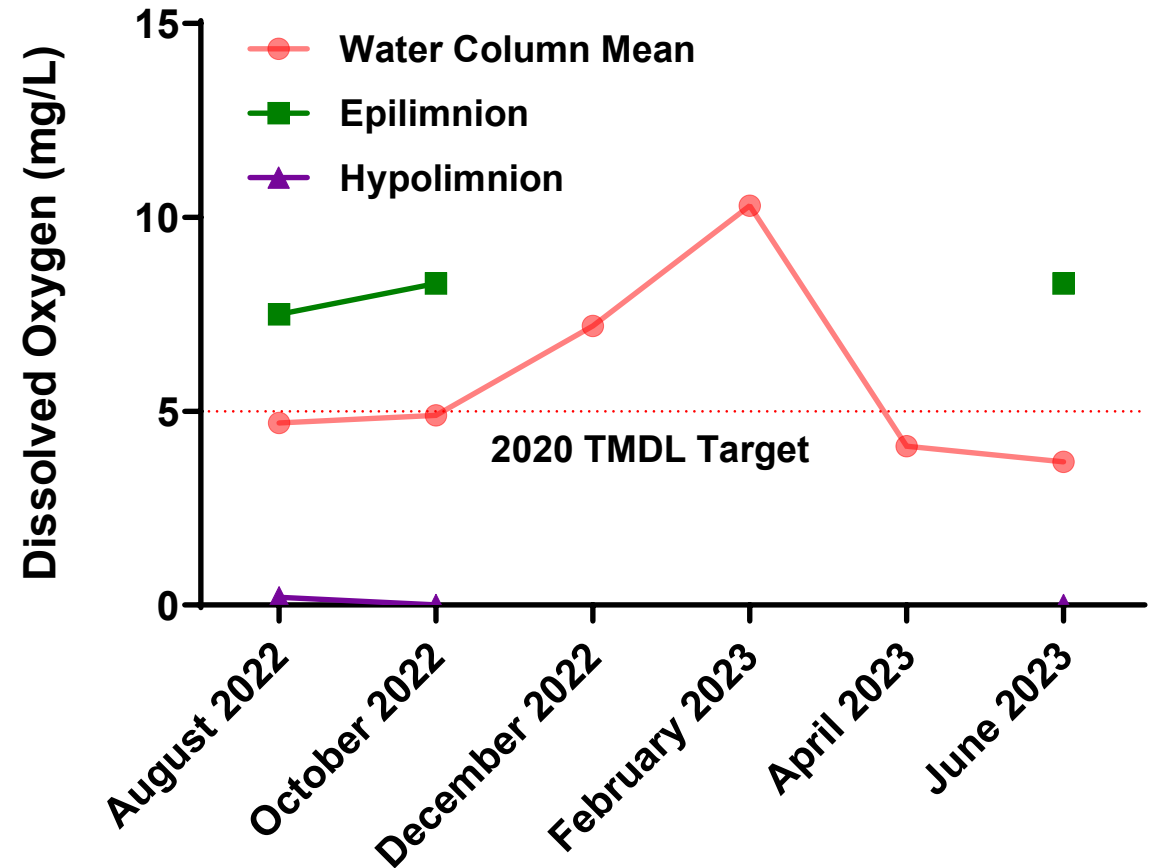




# In-Lake Monitoring – Canyon Lake

**Main Basin  
Mean of Sites  
CL07 & CL08**

## Dissolved Oxygen



No stratification in December, February, and April

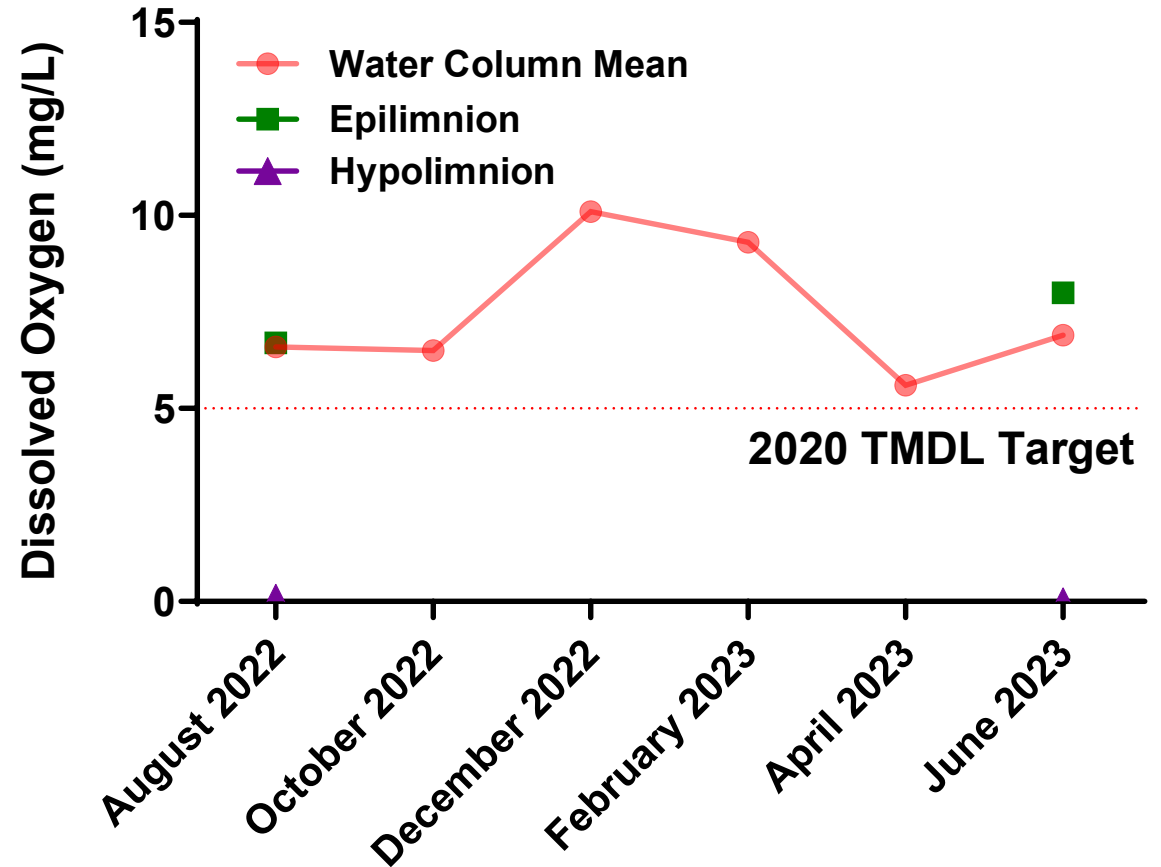




# In-Lake Monitoring – Canyon Lake

East Basin  
Mean of Sites  
CL09 & CL10

## Dissolved Oxygen

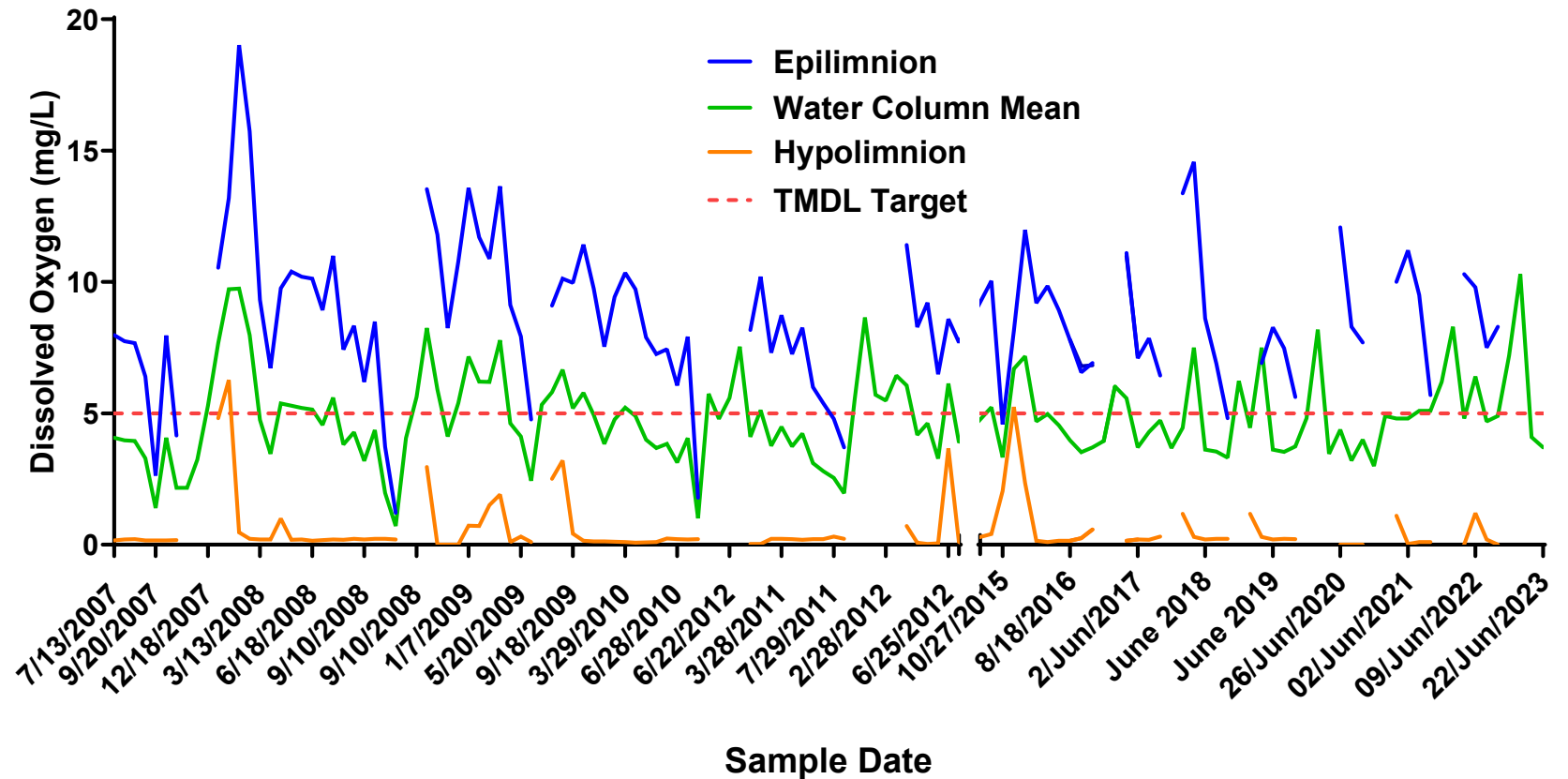


No stratification in October, December, February, and April



# In-Lake Monitoring – Canyon Lake

## Main Basin



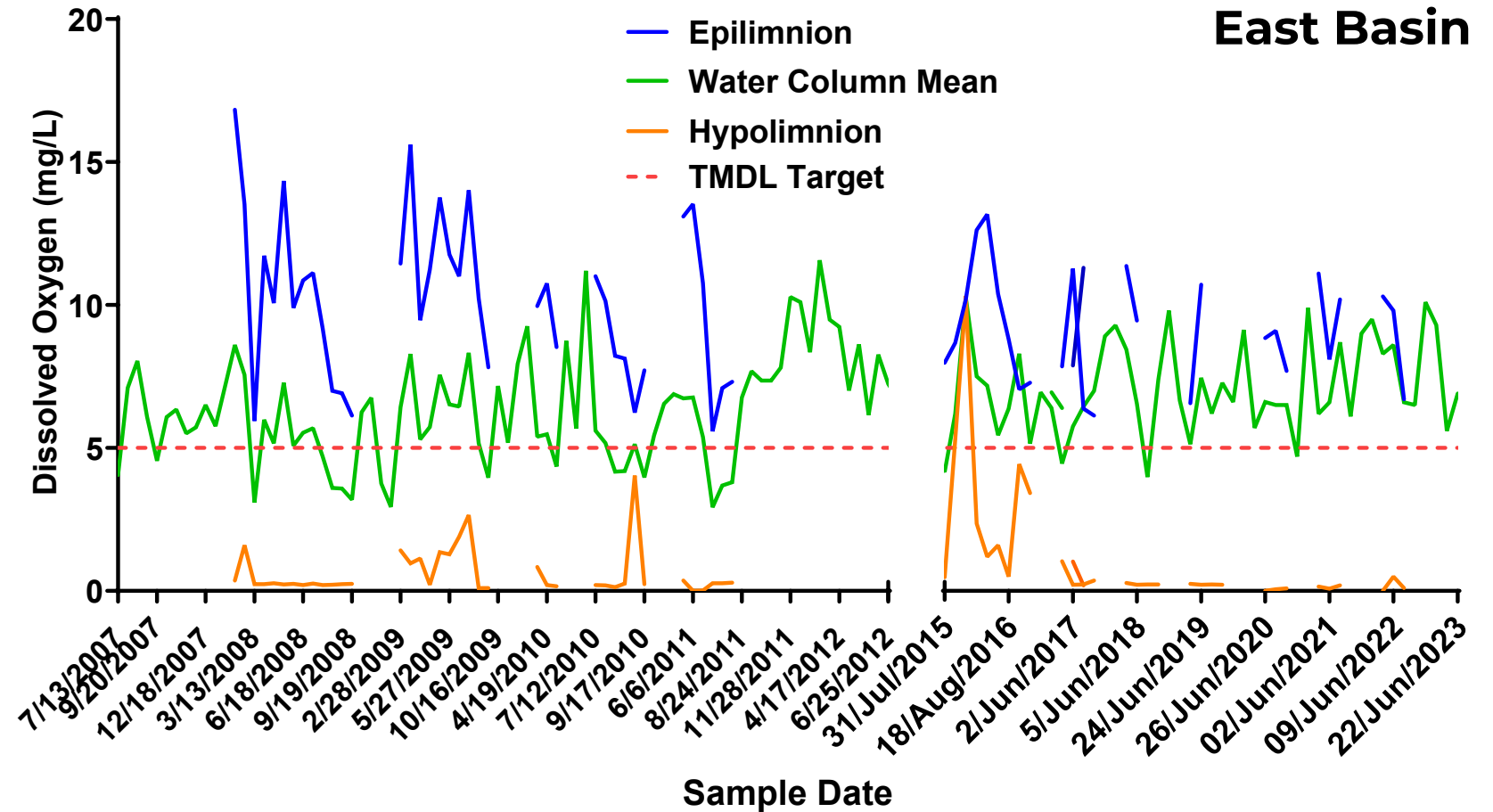
No data available from June 2012 - July 2015

Data represents average values of sites CL07 and CL08

TMDL 2015 target >5 mg/L in Epilimnion, 2020 target >5 mg/L in Hypolimnion



# In-Lake Monitoring – Canyon Lake



No data available from June 2012 - July 2015

Data represents average values of sites CL09 and CL10

TMDL 2015 target >5 mg/L in Epilimnion, 2020 target >5 mg/L in Hypolimnion





Questions?



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