

Lake Elsinore and Canyon Lake TMDL Water Quality Monitoring Update – 2016 Summary

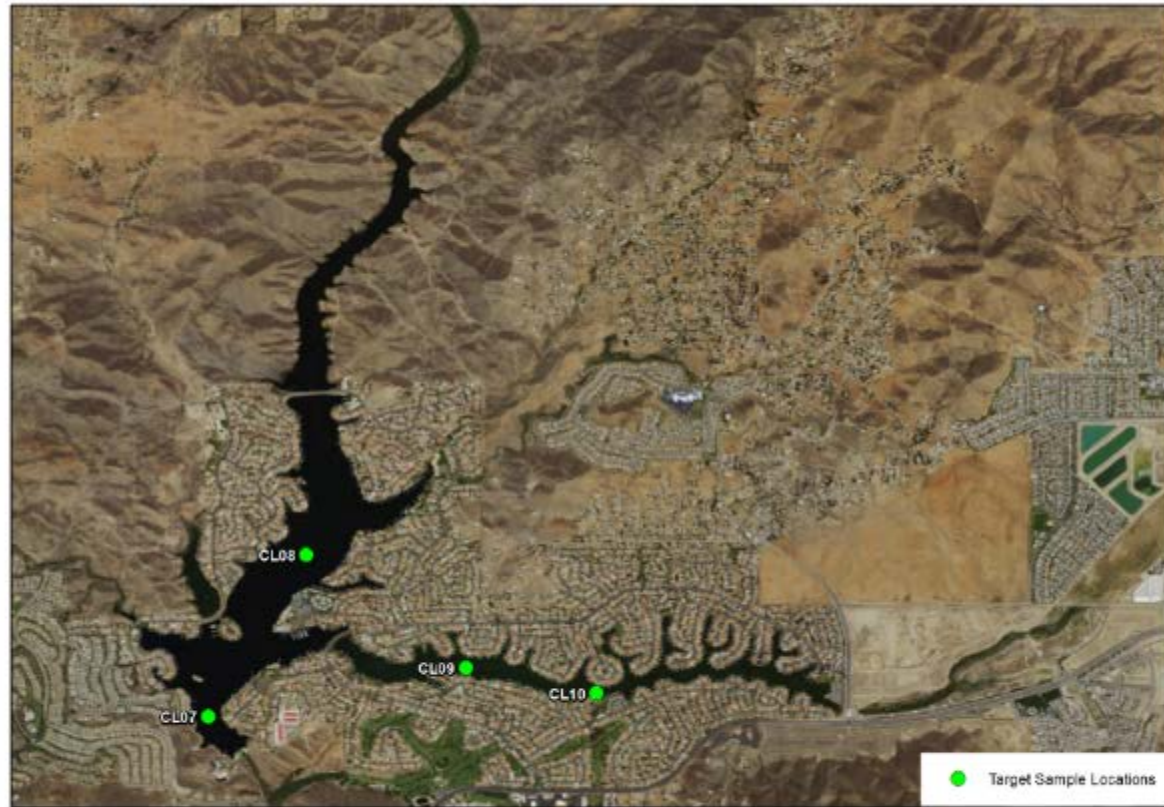


January 4, 2017

Station Locations – Lake Elsinore



Station Locations – Canyon Lake



Total Nitrogen – Lake Elsinore 2016



Total Nitrogen (mg/L)

Total Phosphorus – Lake Elsinore 2016



Total Phosphorus (mg/L)

Total Nitrogen – Canyon Lake 2016

Total Nitrogen – Canyon Lake 2016



Canyon Lake East Basin

Total Phosphorus – Canyon Lake 2016



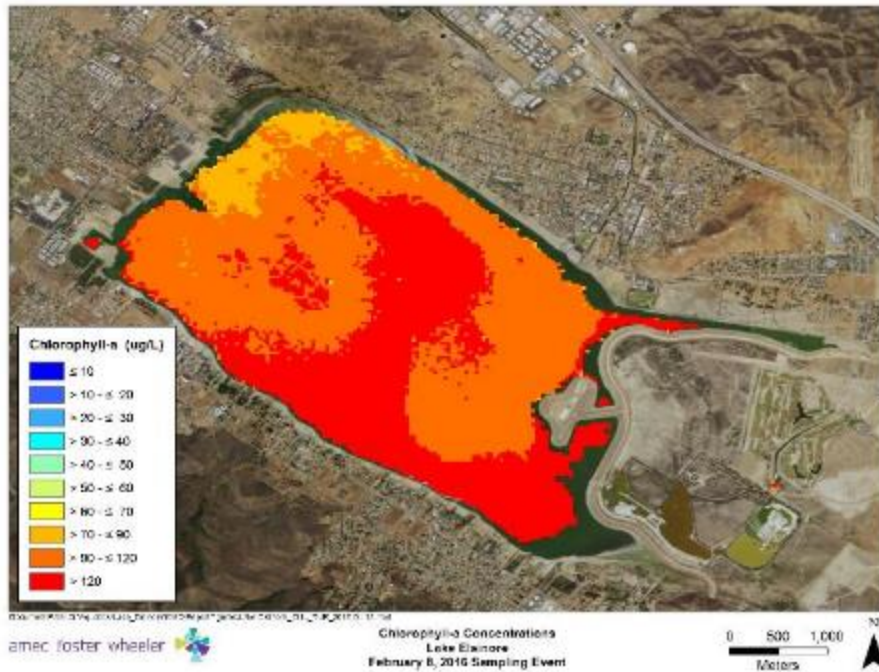
Total Phosphorus – Canyon Lake 2016



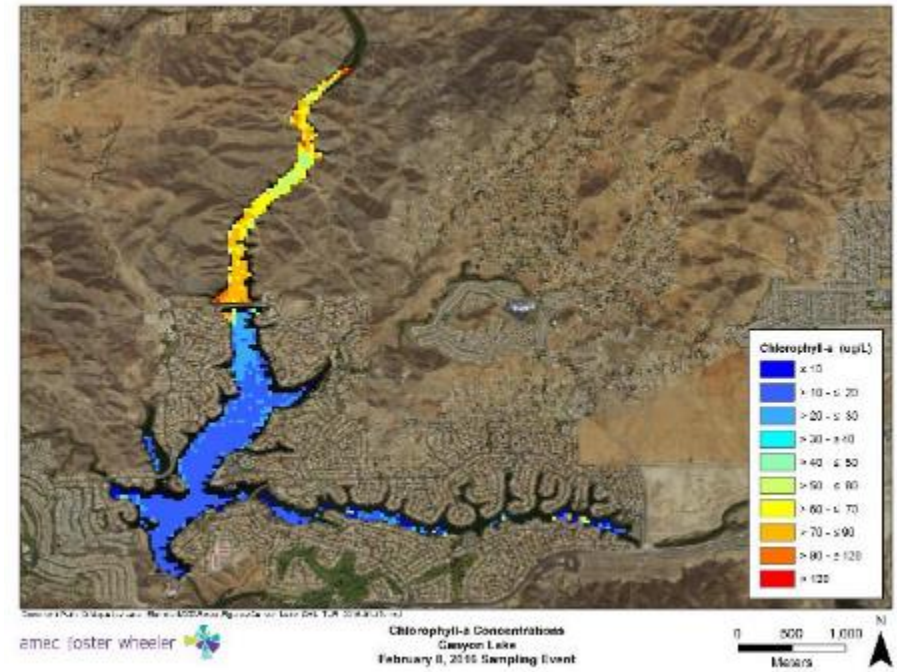
Canyon Lake East Basin

Satellite Imagery – Chlorophyll February 2016

Lake Elsinore



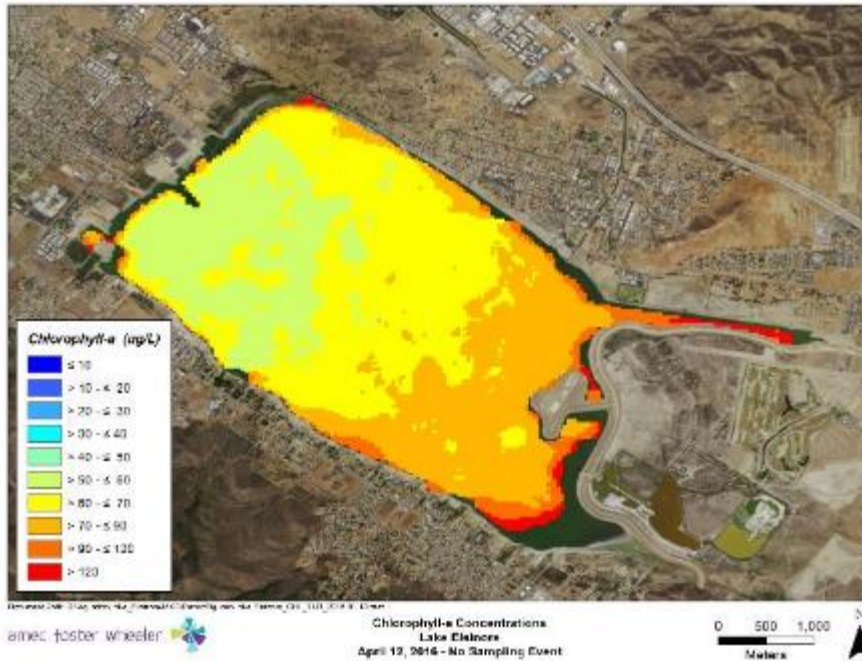
Canyon Lake



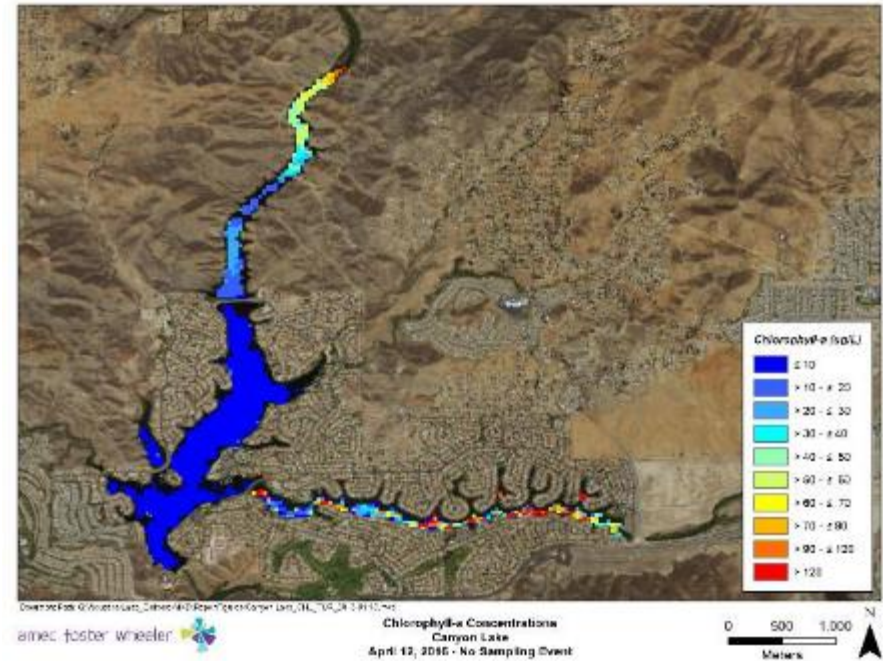
**Data gaps in eastern arm due to high cirrus clouds

Satellite Imagery – Chlorophyll April 2016

Lake Elsinore



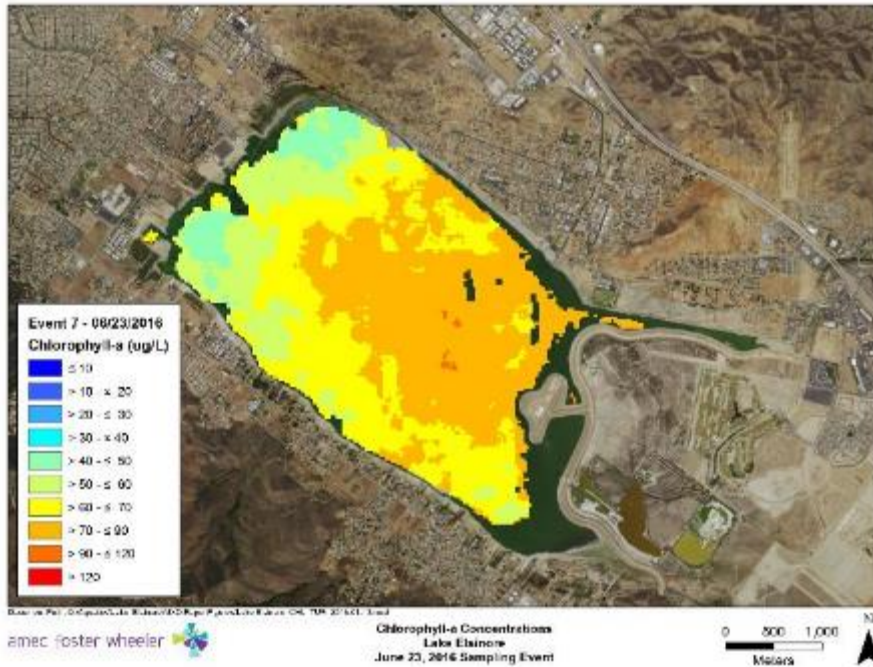
Canyon Lake



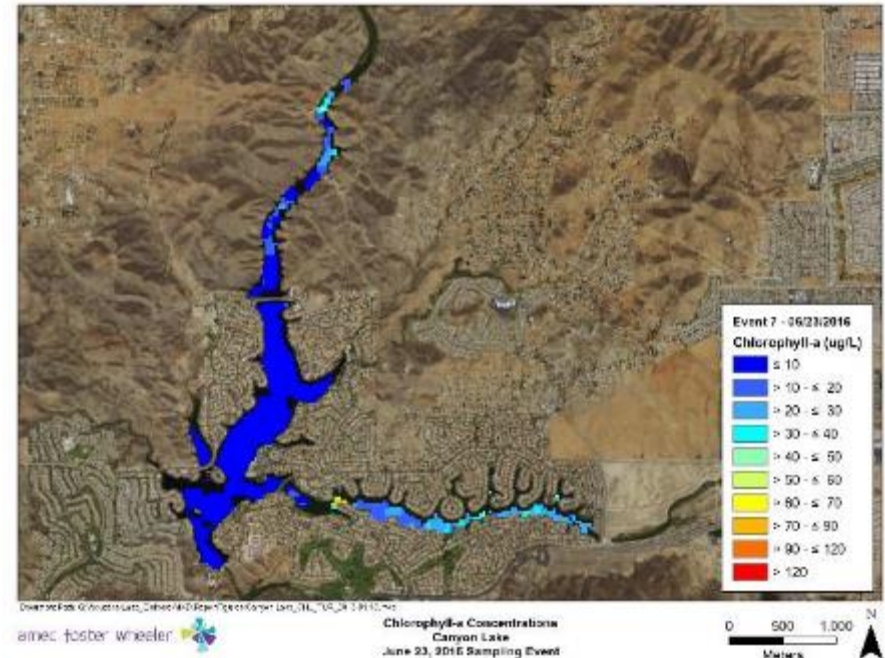
**Data gaps in eastern arm due to high cirrus clouds

Satellite Imagery – Chlorophyll June 2016

Lake Elsinore



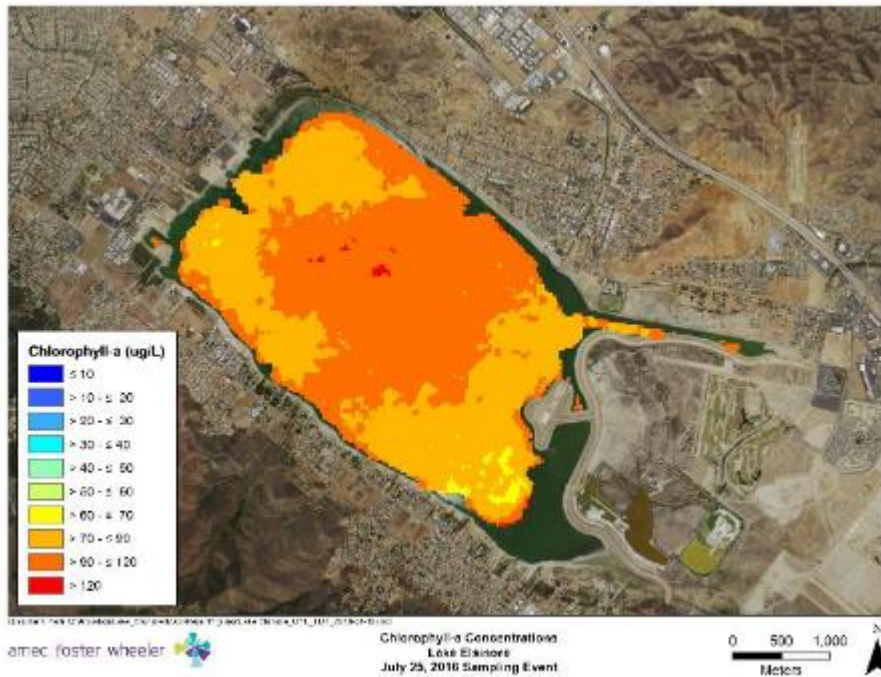
Canyon Lake



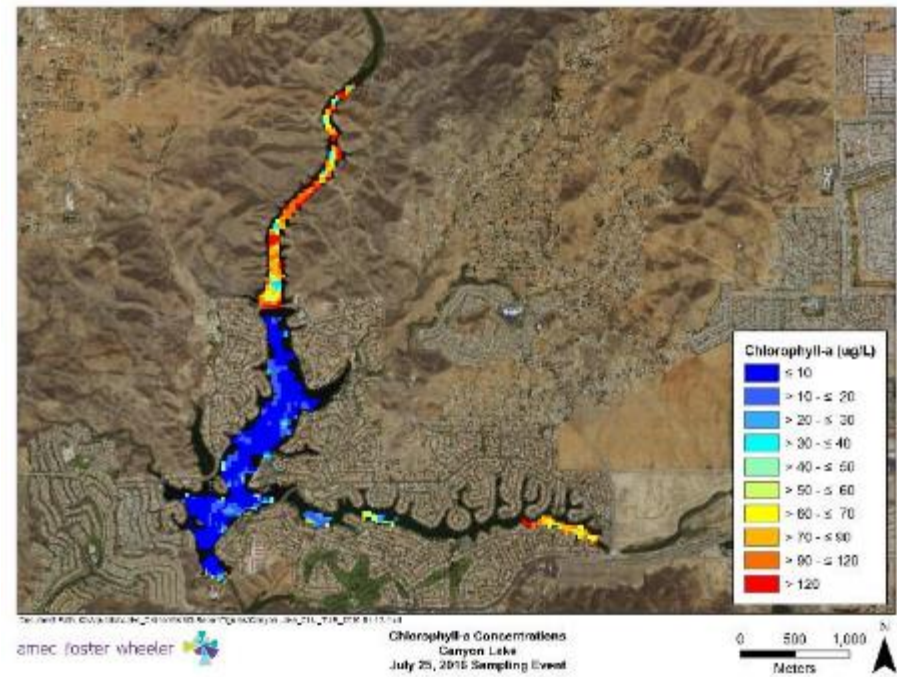
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Satellite Imagery – Chlorophyll July 2016

Lake Elsinore



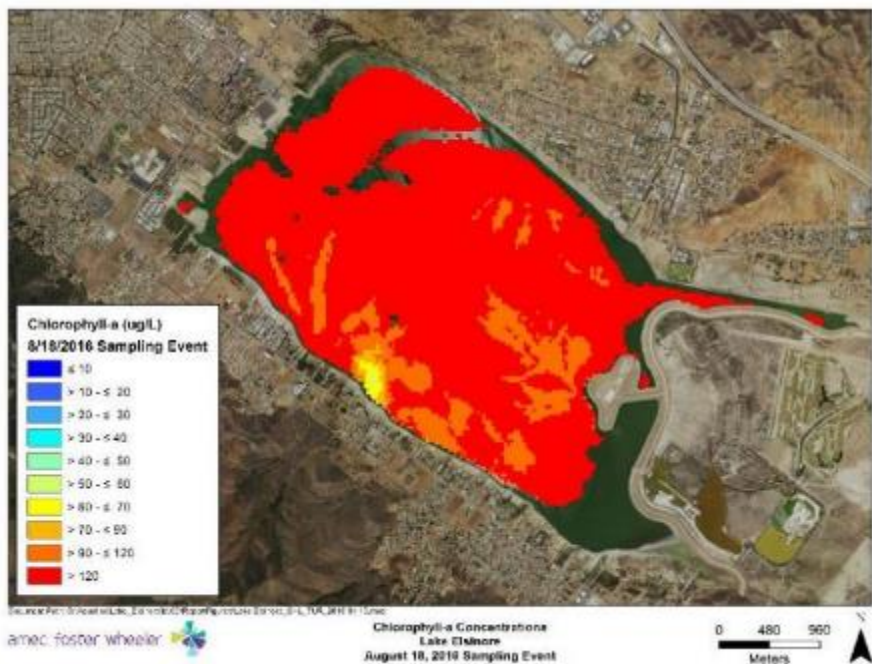
Canyon Lake



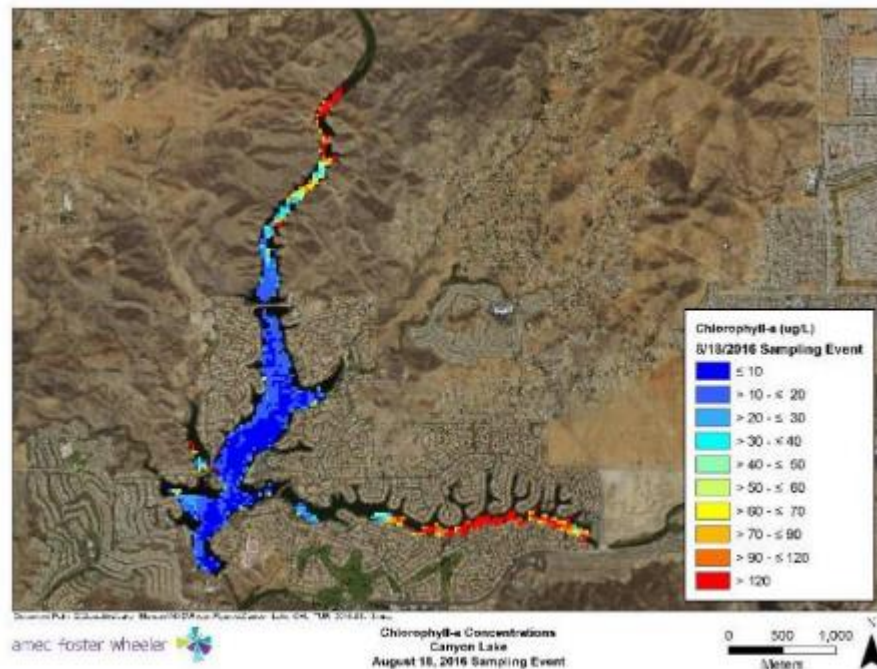
**Data gaps in eastern arm due to high cirrus clouds

Satellite Imagery – Chlorophyll August 2016

Lake Elsinore



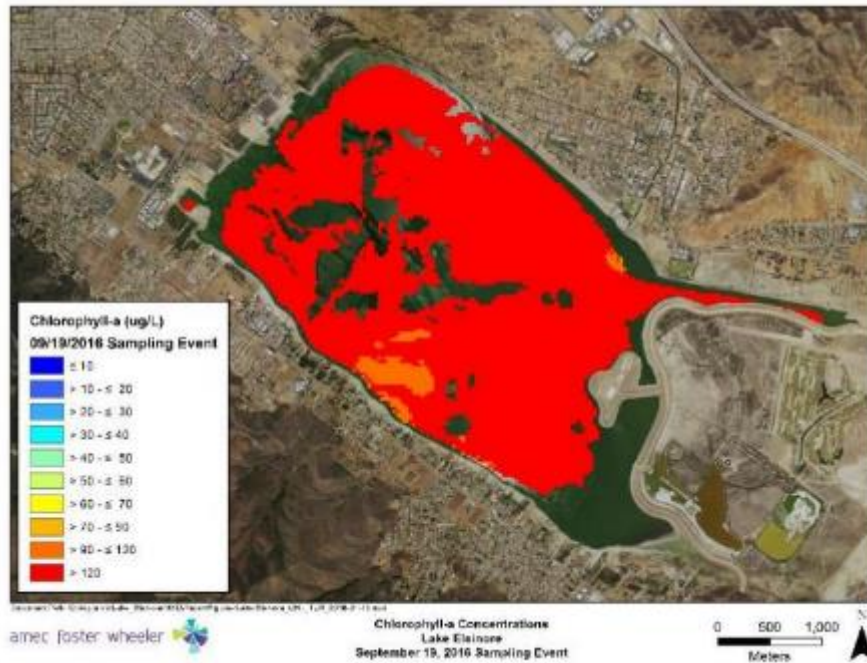
Canyon Lake



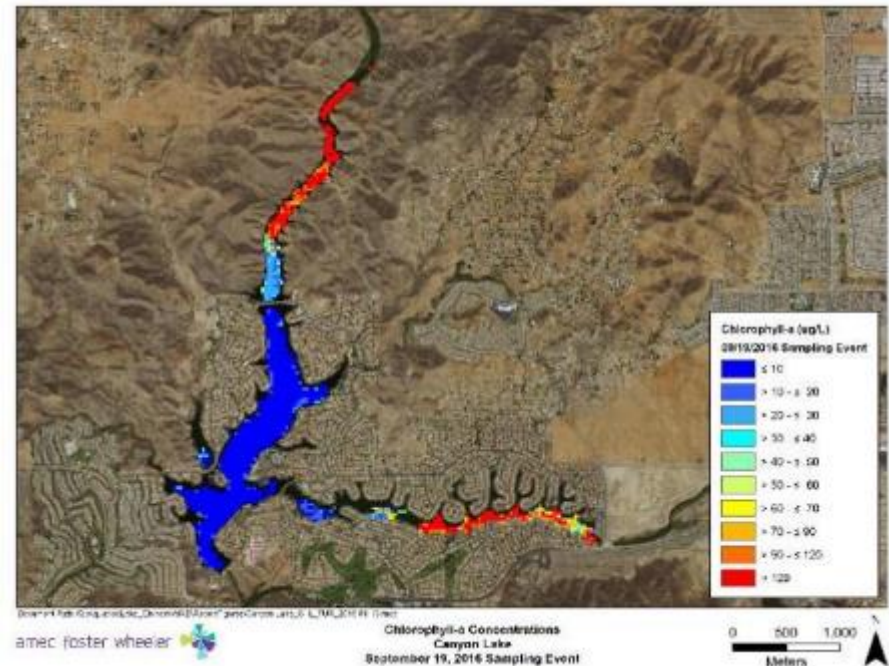
**Data gaps due to large floating cyanobacterial slicks

Satellite Imagery – Chlorophyll September 2016

Lake Elsinore



Canyon Lake



**Data gaps due to large floating cyanobacterial slicks

Satellite Imagery – Chlorophyll October 2016

Lake Elsinore



Canyon Lake



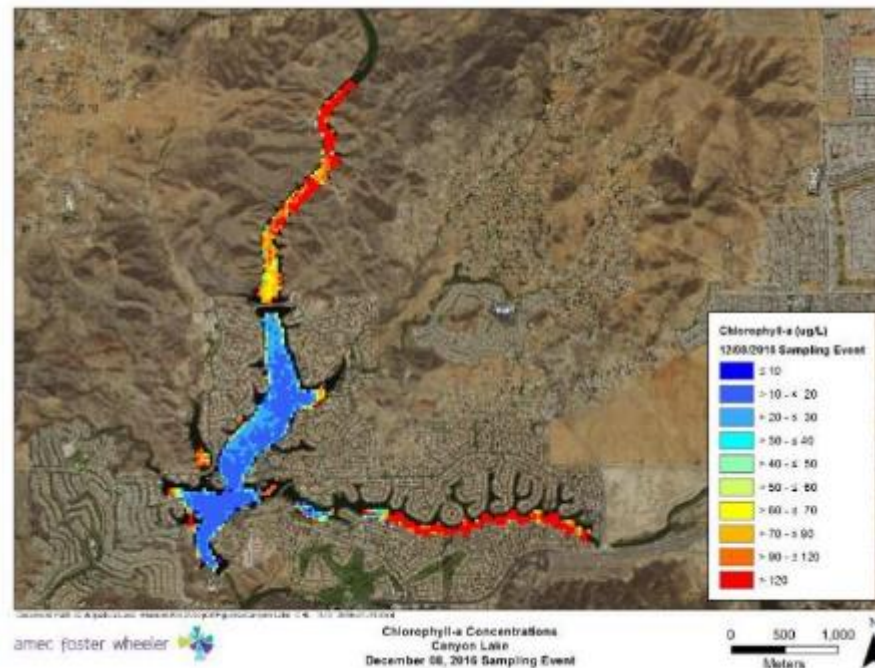
**Data gaps in eastern arm due to high cirrus clouds

Satellite Imagery – Chlorophyll December 2016

Lake Elsinore



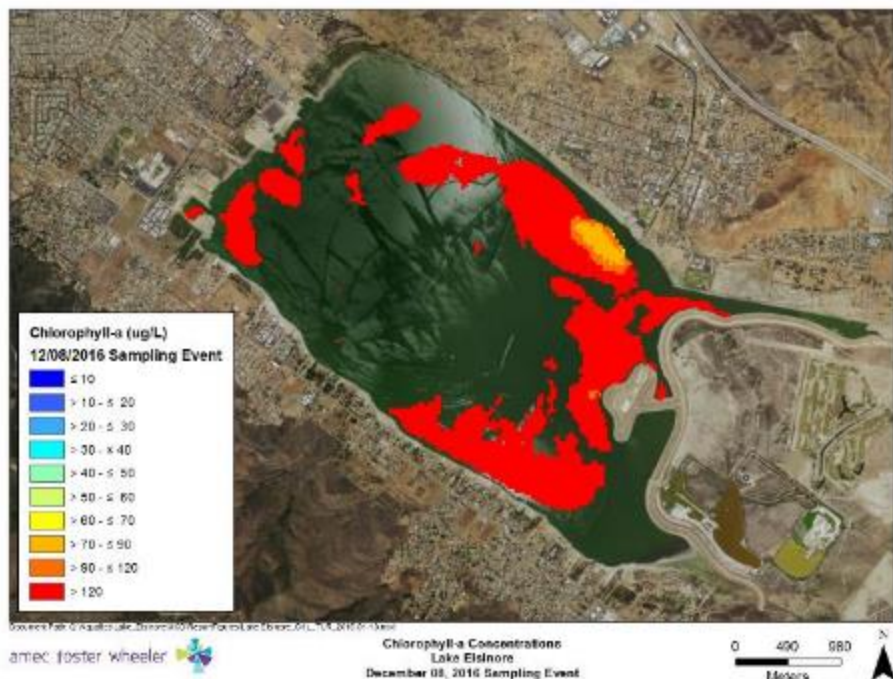
Canyon Lake



**Data gaps due to large floating cyanobacterial slicks

Satellite Imagery – Chlorophyll December 2016

Lake Elsinore – Processed Image



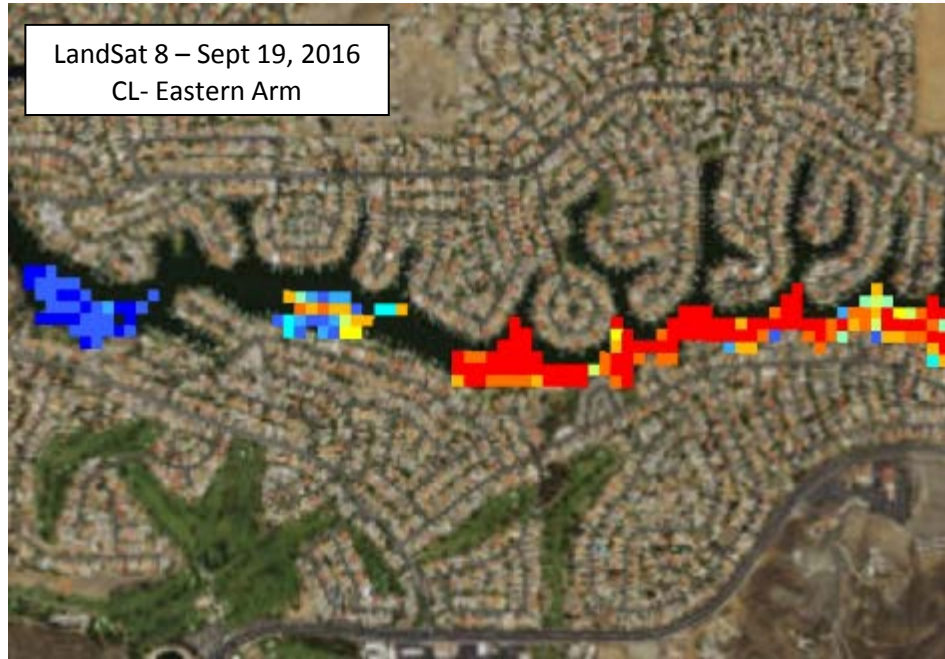
Lake Elsinore – Raw Image



**Data gaps due to large floating cyanobacterial slicks

Satellite Imagery – Chlorophyll Edge Interference

LandSat 8 – Sept 19, 2016
CL- Eastern Arm



Sentinel 2A – Sept 16, 2016
CL- Eastern Arm



Lake Elsinore Chlorophyll – Depth Integrated 2016



Chlorophyll-a ($\mu\text{g/L}$)

Canyon Lake Chlorophyll – Depth Integrated 2016



Canyon Lake Chlorophyll – Depth Integrated 2016

Lake Elsinore Dissolved Oxygen – Water Column Mean vs. 1m from Bottom 2016



Dissolved Oxygen (m g/L)

Canyon Lake Dissolved Oxygen – Epilimnion vs. Hypolimnion 2016

No stratification in December
Not sampled in July

Canyon Lake Dissolved Oxygen – Epilimnion vs. Hypolimnion 2016

No stratification in Sept (CL10) & Dec (both)
Not sampled in July

Dissolved Oxygen – All Sites 2016



Dissolved Oxygen (mg/L)

LE02

CL07

CL08

CL09

CL10

Questions?



Back Up Slides

Cyanotoxin Bloom – Lake Elsinore 2016

Analytes	Microcystin Concentration (ug/L)							
	July 27	Aug 1	Aug 9	Aug 18	Aug 29	Sept 19	Oct 5	Dec 8
La Laguna Boat Ramp - Scum	26500		19450	382	26000	23425	6600	201
La Laguna Boat Ramp - Surface Water	5.36		11.6	77.5	5950	27.5	19.4	
Center Lake - Depth Integrated Water		5.3	8.9	7.2	30.6	13.5	20	
Center Lake - Scum		93500				3110	70	114
Center Lake - Surface Water			161	10.6	15.3			
Elm Grove Beach - Surface Water			326	163	172	10900	35	56

California CyanoHAB Trigger Levels for Human Health (ug/L)			
Toxin	Caution – Action Trigger	Warning – Tier 1	Danger – Tier 2
Microcystin	0.8	6.0	20

Water Chemistry – Lake Elsinore 2016

Analytes	Units	LE02								Summer Mean*	Annual Mean
		Feb	Apr	June	July	Aug	Sept	Oct	Dec		
Total Dissolved Solids	mg/L	<u>2700</u>	<u>2700</u>	<u>3100</u>	<u>3400</u>	<u>3500</u>	<u>3800</u>	<u>3700</u>	<u>3900</u>		
Sulfide	mg/L	ND	ND	ND	ND	ND	ND	ND	ND		
Nitrate as N	mg/L	ND	0.37	ND	0.44	ND	ND	ND	ND		
Nitrite as N	mg/L	ND	ND	ND	ND	ND	ND	ND	ND		
Kjeldahl Nitrogen	mg/L	9.8	6.9	1.9	6.8	7.0	9.3	7.8	7.9		
Total Nitrogen ^a	mg/L	<u>9.8</u>	<u>7.3</u>	<u>1.9</u>	<u>7.2</u>	<u>7.0</u>	<u>9.3</u>	<u>7.8</u>	<u>7.9</u>		<u>7.3</u>
Ammonia-Nitrogen	mg/L	0.60	0.71	ND	ND	ND	ND	0.10	ND		
Ortho Phosphate Phosphorus	mg/L	ND	ND	ND	ND	ND	ND	ND	ND		
Total Phosphorus	mg/L	<u>0.38</u>	<u>0.34</u>	<u>0.32</u>	<u>0.34</u>	<u>0.47</u>	<u>0.82</u>	<u>0.36</u>	<u>0.30</u>		<u>0.42</u>
Surface Chl-a	µg/L	<u>187</u>	<u>80</u>	<u>197</u>	<u>212</u>	<u>249</u>	<u>309</u>	<u>240</u>	<u>172</u>	<u>242</u>	
Depth Integrated Chl-a	µg/L	<u>323</u>	<u>91</u>	<u>184</u>	<u>265</u>	<u>235</u>	<u>349</u>	<u>302</u>	<u>235</u>	<u>258</u>	

Summer = June – Sept ND = Not Detected

Bold underline exceeds an applicable TMDL or Basin Plan Target

Water Chemistry – Canyon Lake 2016



Analytes	Units	CL07						Annual Mean
		Feb	Apr	June	Aug	Oct	Dec	
Total Dissolved Solids	mg/L	<u>710</u>	680	<u>730</u>	<u>790</u>	<u>880</u>	<u>800</u>	
Sulfide	mg/L	ND	ND	ND	ND	NS	ND	
Nitrate as N	mg/L	0.39	ND	ND	ND	ND	ND	
Nitrite as N	mg/L	ND	ND	ND	ND	ND	ND	
Kjeldahl Nitrogen	mg/L	1.1	2.2	1.6	1.6	2.1	1.6	
Total Nitrogen ^a	mg/L	<u>1.5</u>	<u>2.2</u>	<u>1.6</u>	<u>1.6</u>	<u>2.1</u>	<u>1.6</u>	<u>1.8</u>
Ammonia-Nitrogen	mg/L	ND	0.25	0.64	0.67	2.1	0.55	
Ortho Phosphate Phosphorus	mg/L	ND	0.098	0.061	ND	ND	ND	
Total Phosphorus	mg/L	ND	<u>0.11</u>	<u>0.5</u>	<u>0.21</u>	ND	ND	0.15
Surface Chl-a	µg/L	<u>88</u>	6	16	16	12	11	24.8
Depth Integrated Chl-a	µg/L	<u>31</u>	14	<u>54</u>	<u>54</u>	24	14	<u>31.8</u>

ND = Not Detected; NS – Not Sampled

Bold underline exceeds an applicable TMDL or Basin Plan Target

Water Chemistry – Canyon Lake 2016



Analytes	Units	CL08						Annual Mean
		Feb	Apr	June	Aug	Oct	Dec	
Total Dissolved Solids	mg/L	700	650	<u>740</u>	<u>770</u>	<u>800</u>	<u>850</u>	
Sulfide	mg/L	ND	ND	ND	ND	NS	ND	
Nitrate as N	mg/L	0.29	ND	ND	ND	ND	ND	
Nitrite as N	mg/L	ND	ND	ND	ND	ND	ND	
Kjeldahl Nitrogen	mg/L	1.3	1.3	0.85	1.1	0.73	1.5	
Total Nitrogen ^a	mg/L	<u>1.6</u>	<u>1.3</u>	<u>0.85</u>	<u>1.1</u>	0.73	<u>1.5</u>	<u>1.2</u>
Ammonia-Nitrogen	mg/L	ND	0.35	ND	ND	ND	0.44	
Ortho Phosphate Phosphorus	mg/L	ND	ND	ND	ND	ND	0.05	
Total Phosphorus	mg/L	0.05	0.09	ND	ND	ND	ND	0.04
Surface Chl-a	µg/L	<u>86</u>	7	2	7	10	<u>54</u>	<u>27.7</u>
Depth Integrated Chl-a	µg/L	<u>54</u>	<u>33</u>	18	<u>29</u>	12	<u>26</u>	<u>28.7</u>

ND = Not Detected; NS = Not Sampled

Bold underline exceeds an applicable TMDL or Basin Plan Target

Water Chemistry – Canyon Lake 2016



Analytes	Units	CL09						Annual Mean
		Feb	Apr	June	Aug	Oct	Dec	
Surface Chl-a	µg/L	<u>76</u>	<u>100</u>	9	14	33	14	<u>41.0</u>

Bold underline exceeds an applicable TMDL or Basin Plan Target

Water Chemistry – Canyon Lake 2016



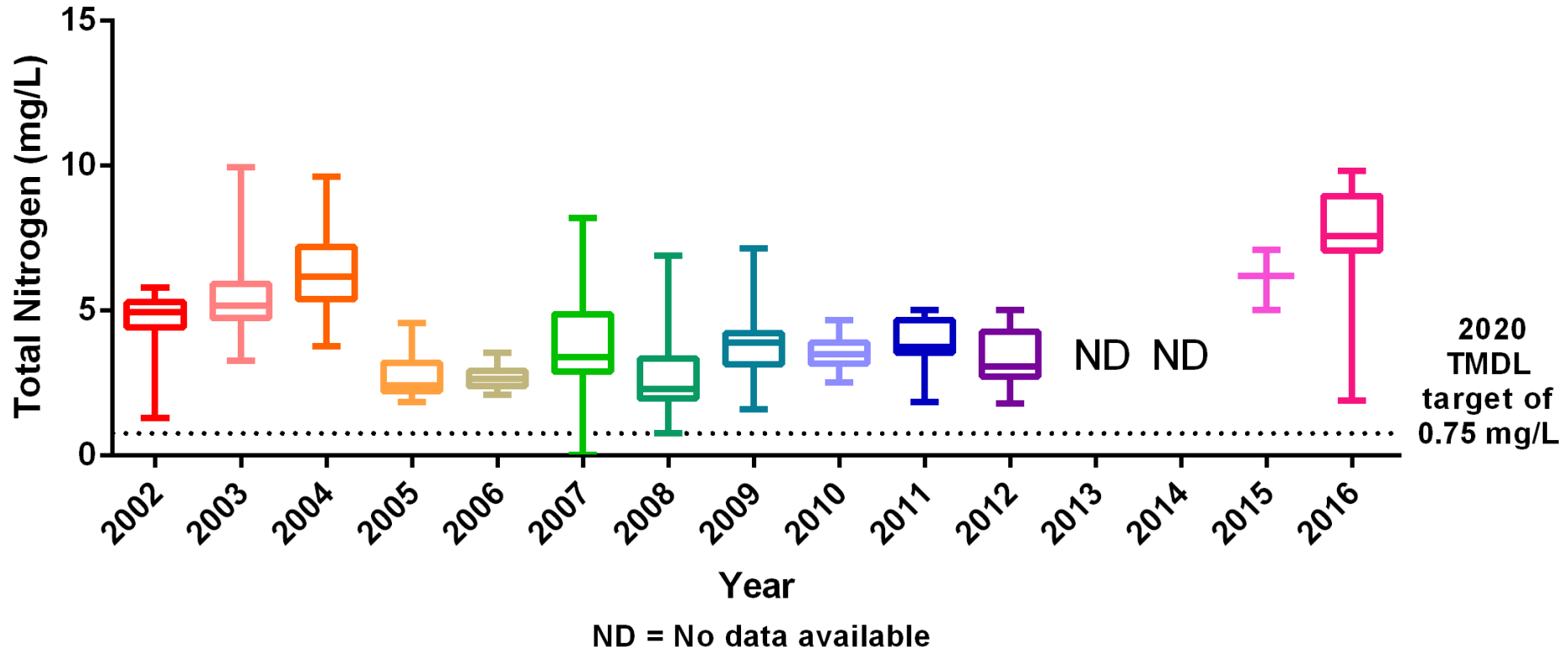
Analytes	Units	CL10						Annual Mean
		Feb	Apr	June	Aug	Oct	Dec	
Total Dissolved Solids	mg/L	640	<u>800</u>	<u>800</u>	<u>870</u>	<u>900</u>	<u>900</u>	
Sulfide	mg/L	ND	ND	ND	ND	NS	ND	
Nitrate as N	mg/L	0.42	ND	ND	ND	ND	ND	
Nitrite as N	mg/L	ND	ND	ND	ND	ND	ND	
Kjeldahl Nitrogen	mg/L	1.7	1.3	1.1	1.2	2.3	1.7	
Total Nitrogen ^a	mg/L	<u>2.1</u>	<u>1.3</u>	<u>1.1</u>	<u>1.2</u>	<u>2.3</u>	<u>1.7</u>	<u>1.6</u>
Ammonia-Nitrogen	mg/L	ND	ND	ND	ND	ND	0.4	
Ortho Phosphate Phosphorus	mg/L	<u>0.18</u>	ND	ND	ND	ND	ND	
Total Phosphorus	mg/L	<u>0.36</u>	<u>0.12</u>	ND	<u>0.18</u>	ND	ND	<u>0.13</u>
Surface Chl-a	µg/L	<u>65</u>	<u>37</u>	12	15	<u>38</u>	18	<u>30.8</u>
Depth Integrated Chl-a	µg/L	<u>79</u>	25	18	14	<u>38</u>	16	<u>31.7</u>

ND = Not Detected; NS = Not Sampled

Bold underline exceeds an applicable TMDL or Basin Plan Target

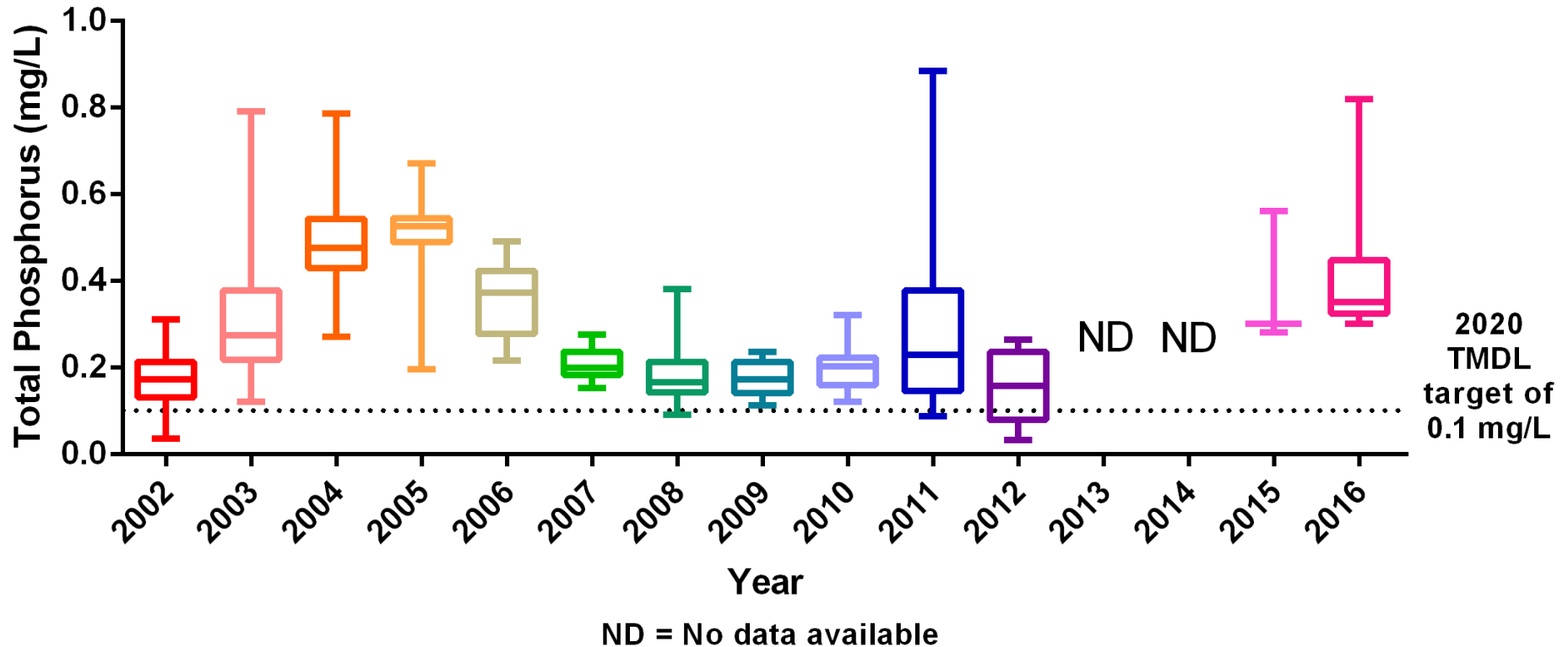
Comparison to Historical Data

Lake Elsinore - Annual Total Nitrogen



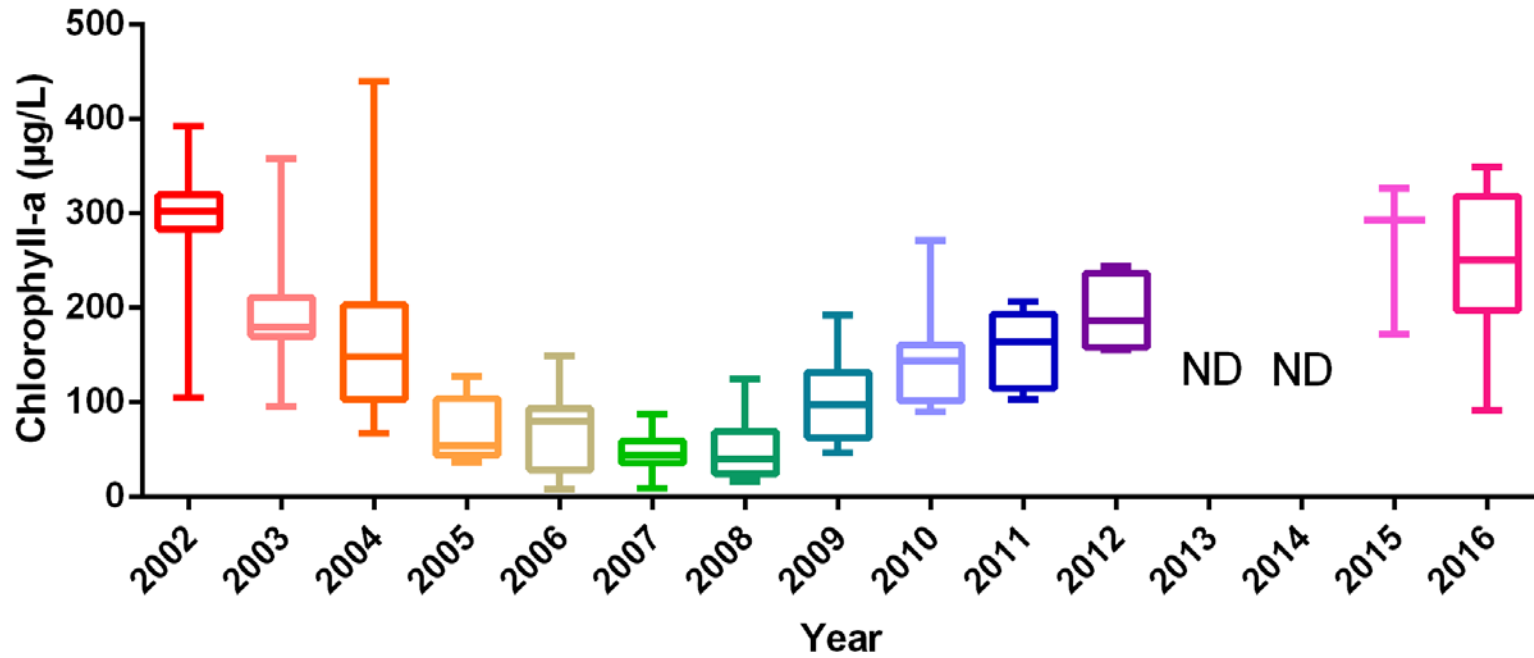
Comparison to Historical Data

Lake Elsinore - Annual Total Phosphorus



Comparison to Historical Data

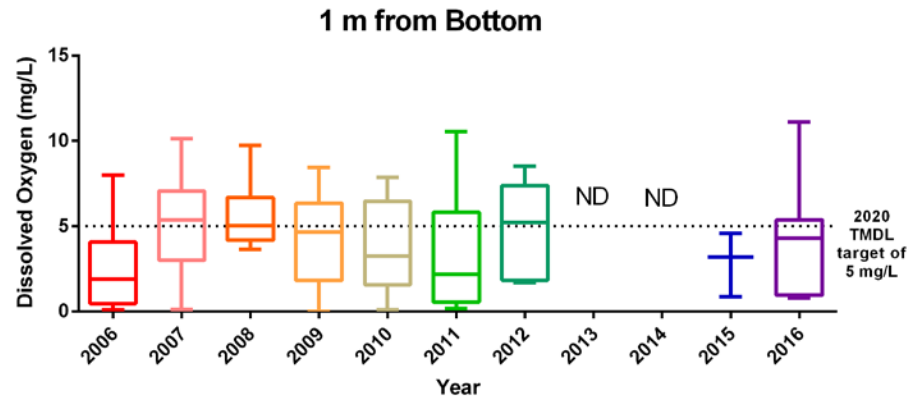
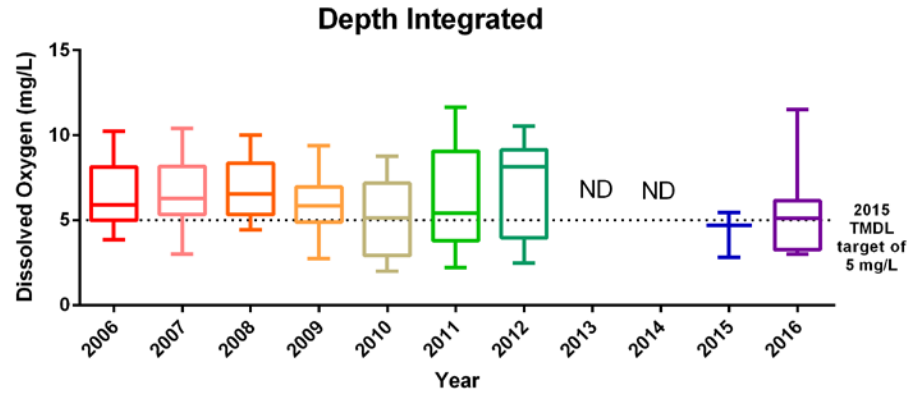
Lake Elsinore - Annual Chlorophyll-a



ND = No data available

Comparison to Historical Data

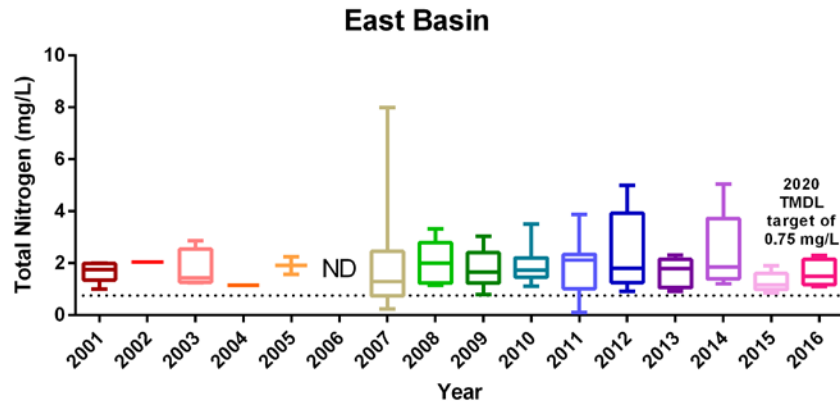
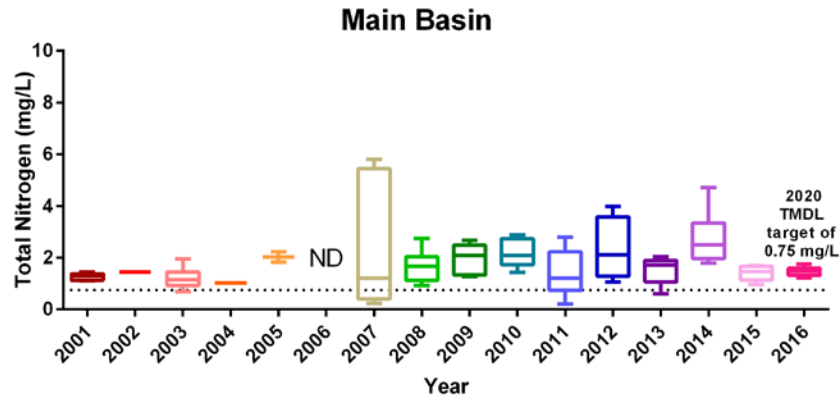
Lake Elsinoe Annual Dissolved Oxygen



ND = No data available

Comparison to Historical Data

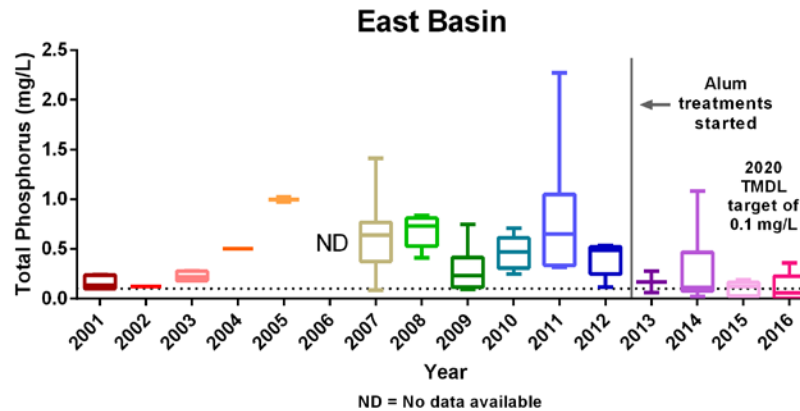
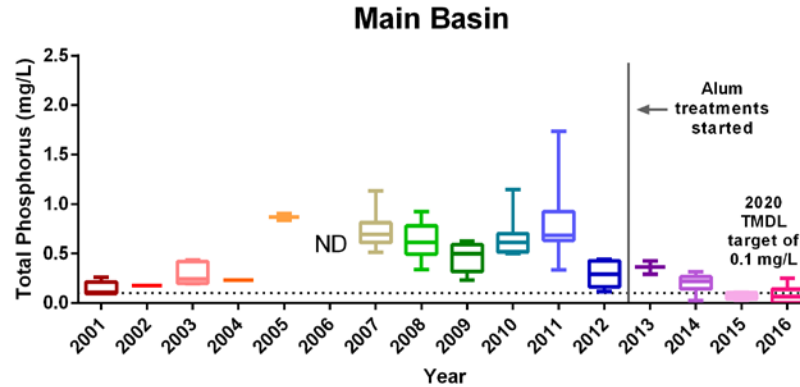
Canyon Lake Annual Total Nitrogen



ND = No data available

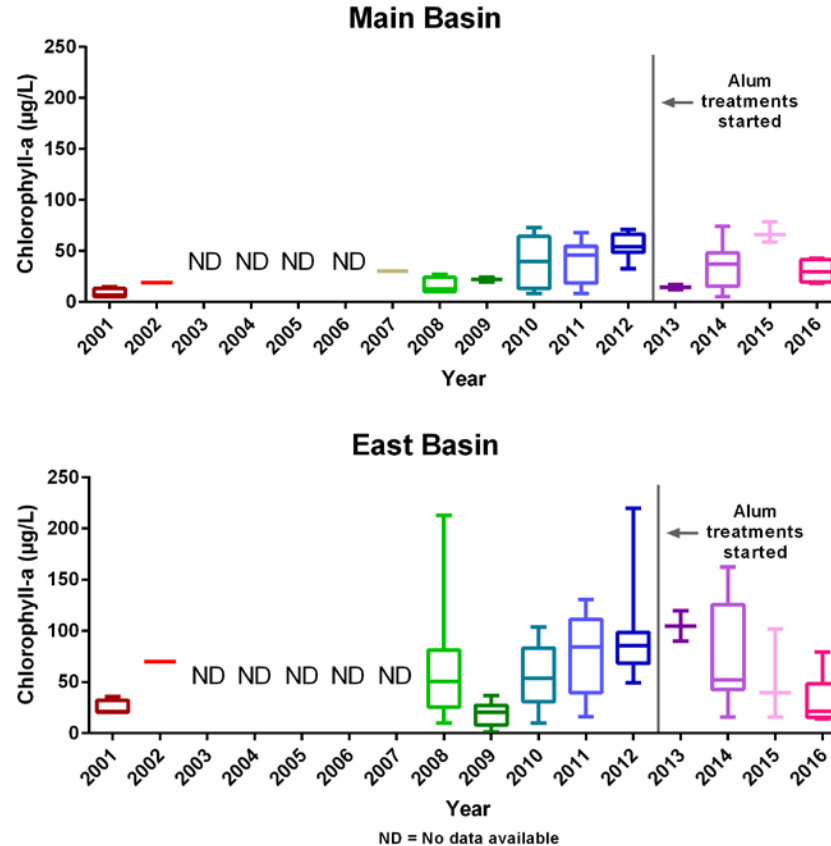
Comparison to Historical Data

Canyon Lake Annual Total Phosphorus



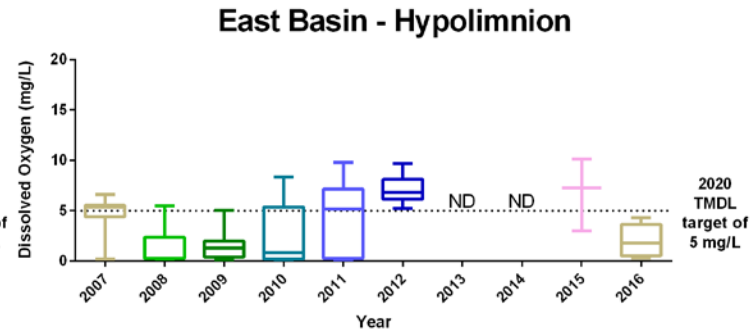
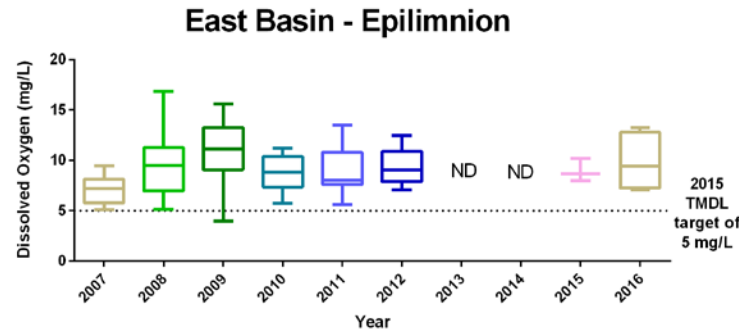
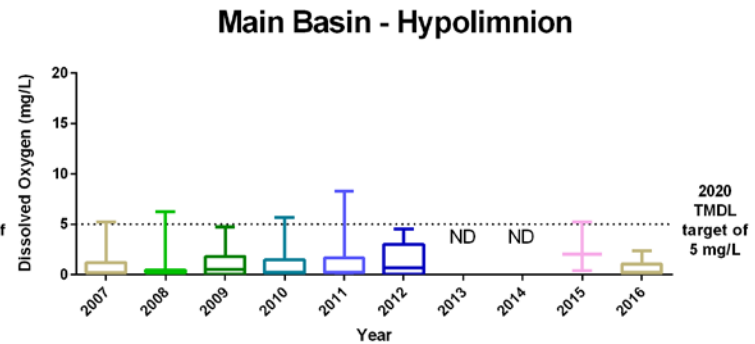
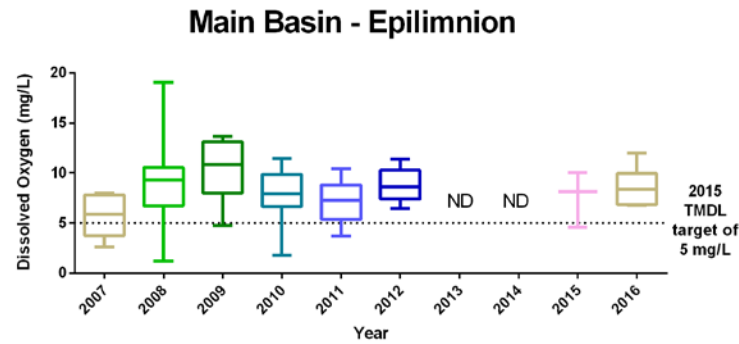
Comparison to Historical Data

Canyon Lake Annual Chlorophyll-a



Comparison to Historical Data

Canyon Lake Annual Dissolved Oxygen



ND = No data available