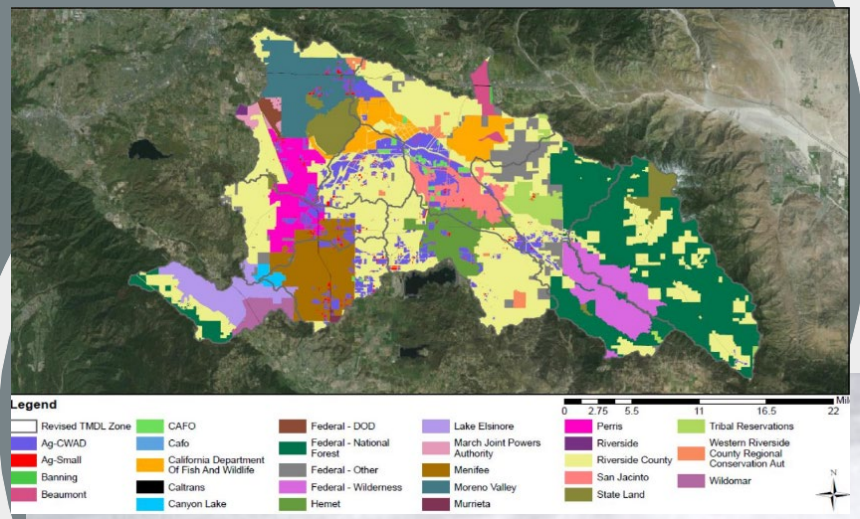
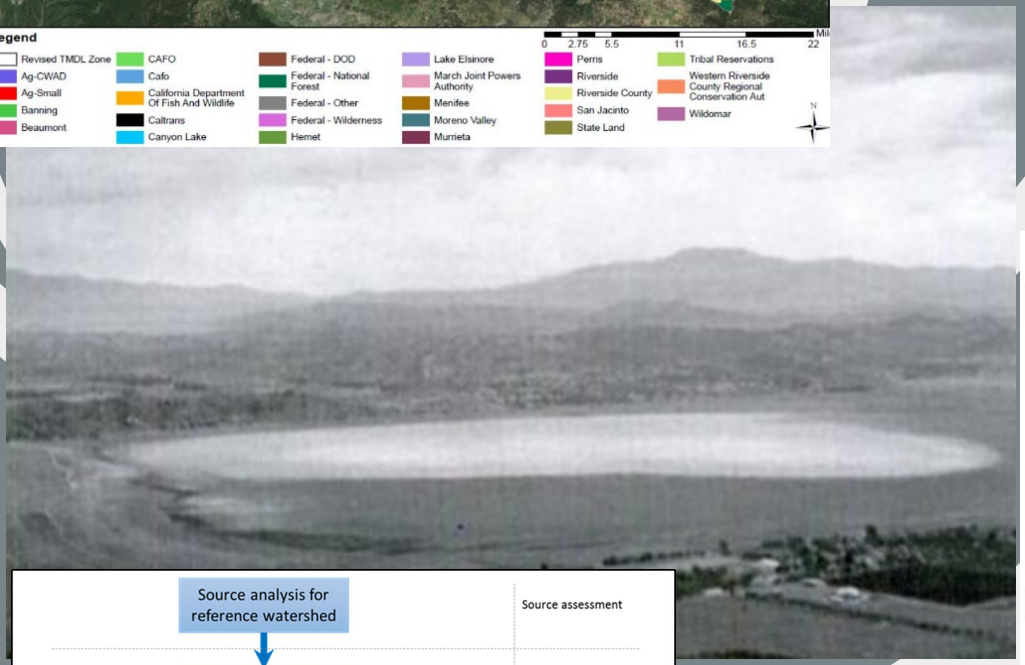
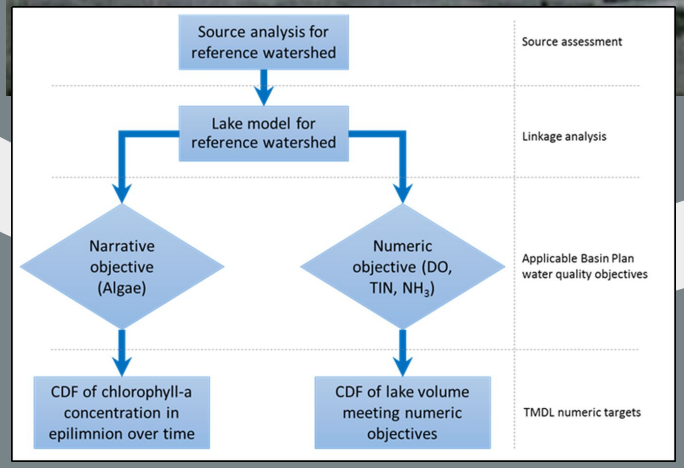
LECL TMDL Task Force Update to TMDL Revision

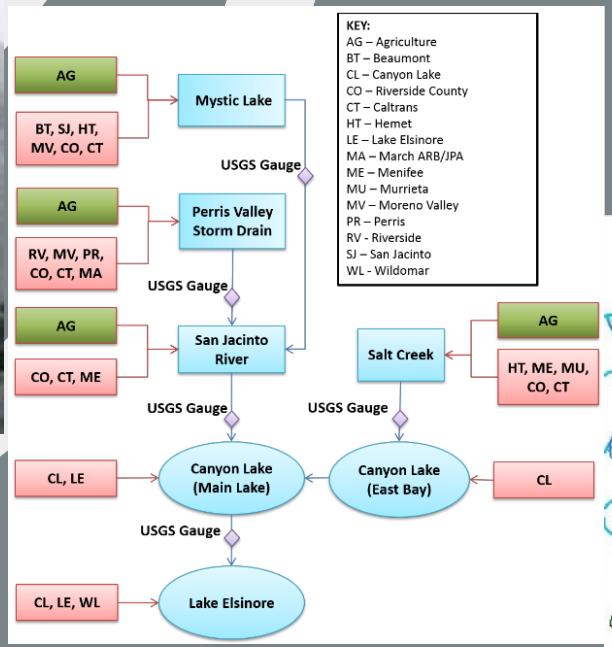
Presentation by Steve Wolosoff

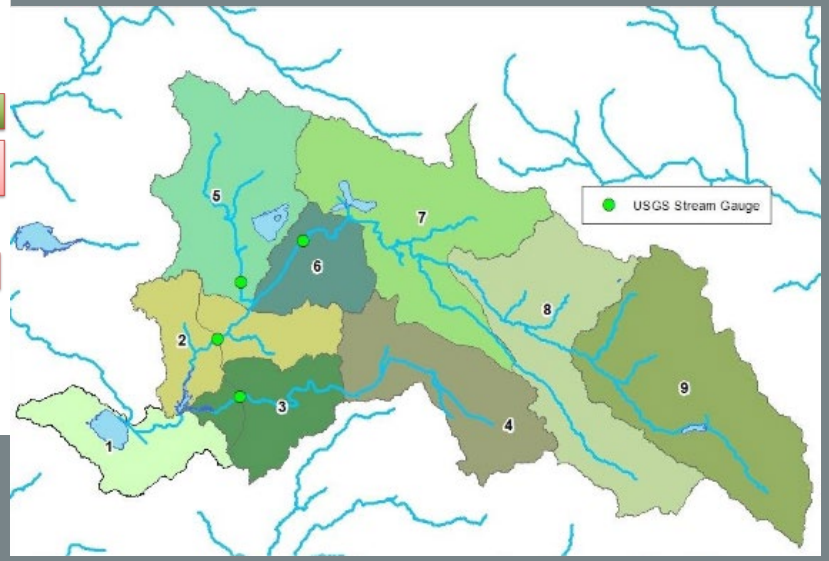
October 26, 2023









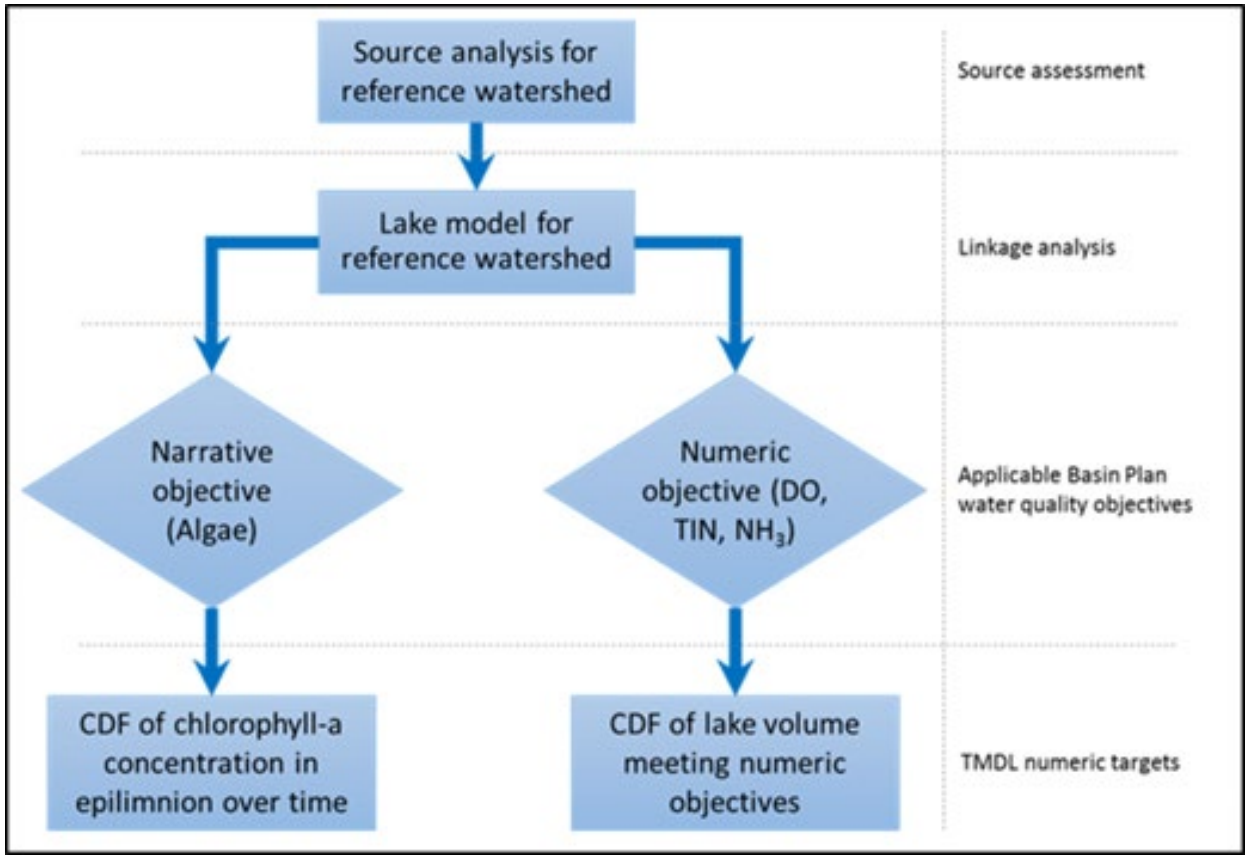


Agenda

- Section 1: Introduction
- Section 2: Problem Statement
- Section 3: Numeric Targets
- Section 4: Source Assessment
- Section 5: Linkage Analysis
- Section 6: Allocations
- Section 7: Implementation
- Section 8: Monitoring
- Section 9: CEQA
- Section 10: Economic Considerations

Section 1 Introduction

- Regulatory background
- Reasons to revise TMDL
- Reference watershed approach



Section 2 Problem Statement

- More regulatory background
- Historical data characterization
- Natural history
- 2020 compliance assessment
- Unique factors

Section 2 Problem Statement

- Subwatershed map update
- New table of land use change

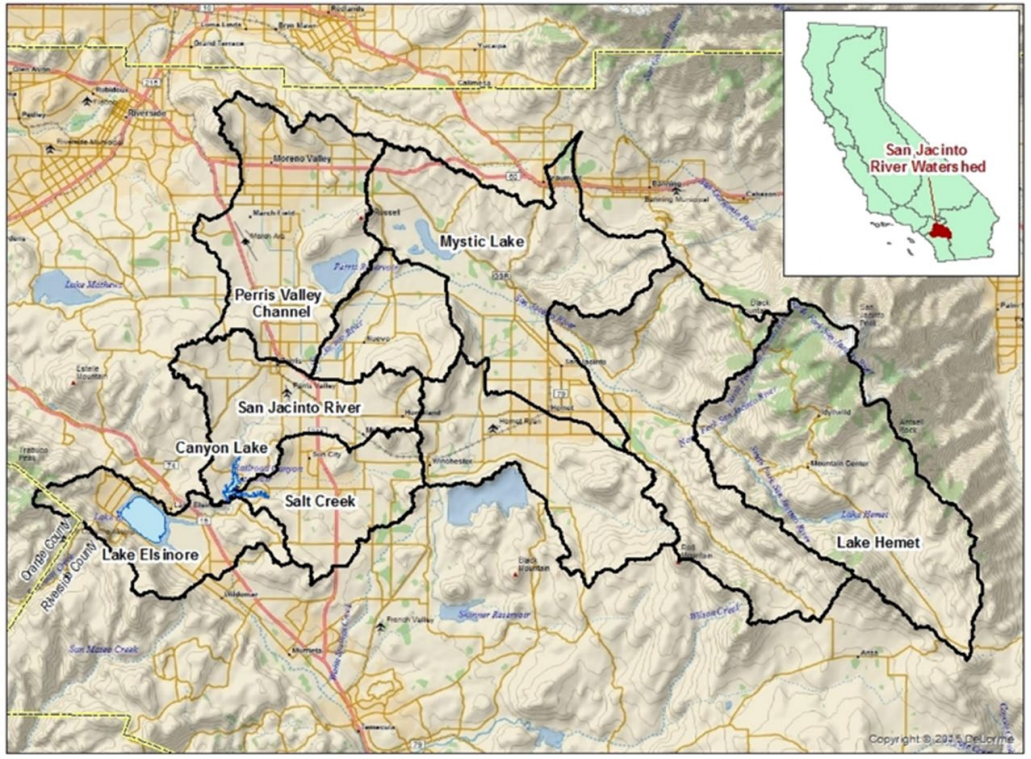


Table 2-5. Comparison of Agricultural, Urban, and Open Space Landuse Acreage Supporting this Proposed TMDL Revision with the Basis for the 2004 TMDL Source Assessment

TMDL	Agricultural (acres) [3]	Urban (acres)	Open Space (acres) [4]
2004 [1]	93,691	71,164	312,455
Proposed Revision [2]	53,090	106,186	318,033
Change	-40,601	+35,022	+5,578

[1] Mapping used to support source assessment based on SCAG 1993.

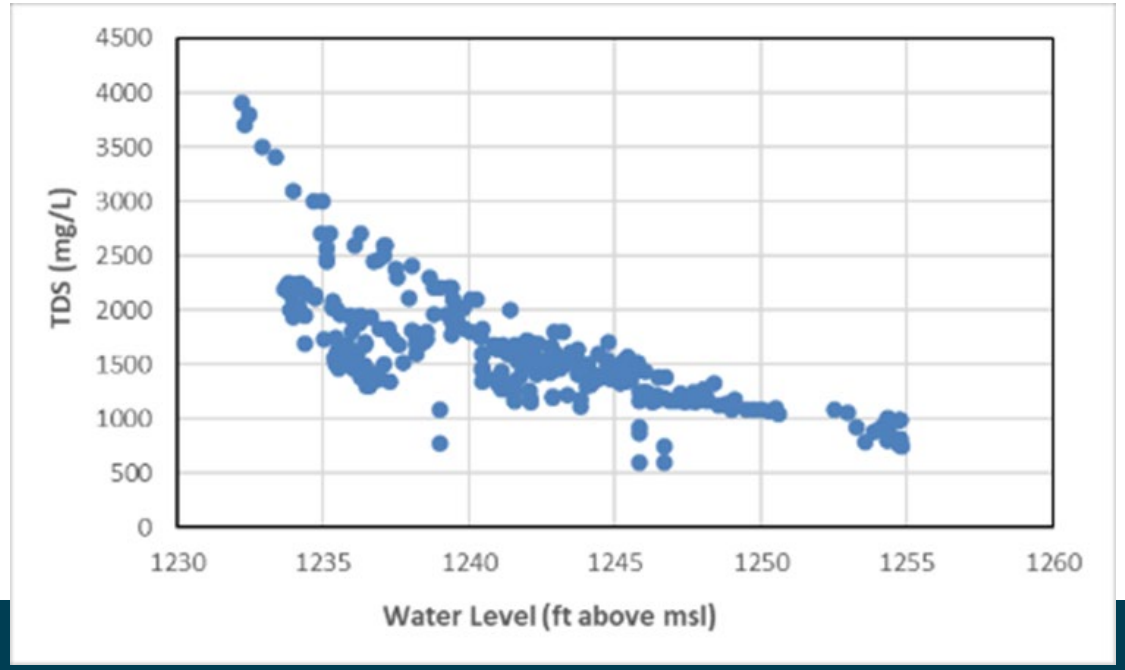
[2] Mapping used to support source assessment based on SCAG 2019 with refinements for agricultural areas based on AIS 2022.

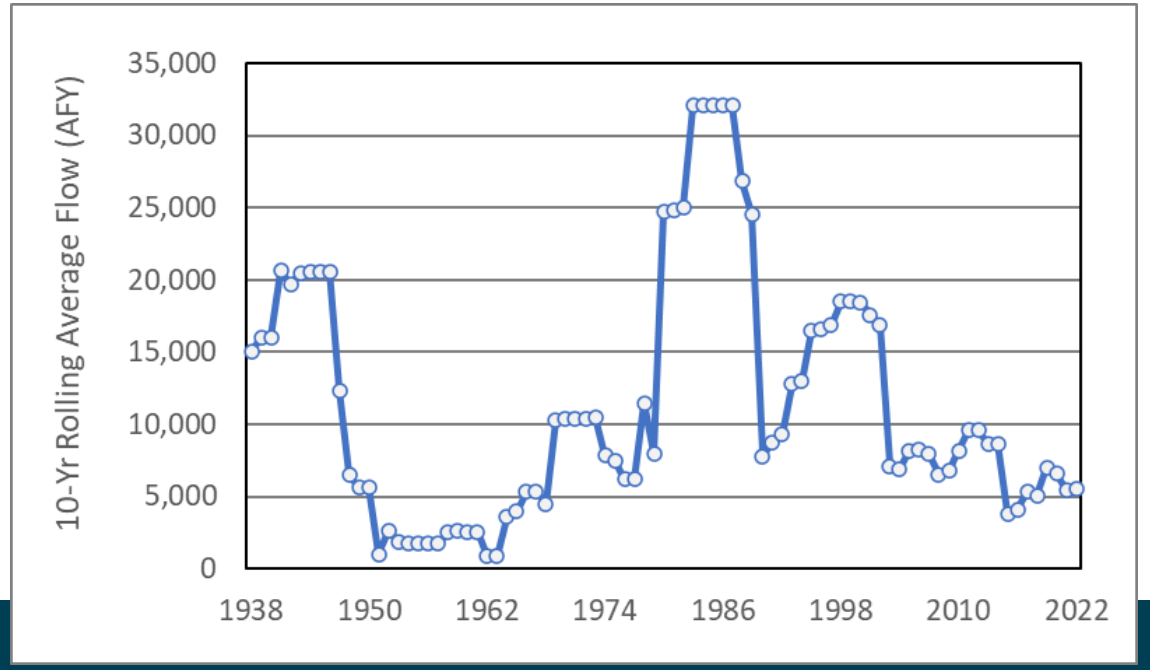
[3] Includes irrigated cropland, non-irrigated cropland, orchard/vineyard, pasture/hay, other livestock, and dairy operations.

[4] Estimate for open space from 2004 TMDL was modified by less than 0.5% to account for smaller open water areas treated as open space in 2023 update to source assessment.

Section 2 Problem Statement

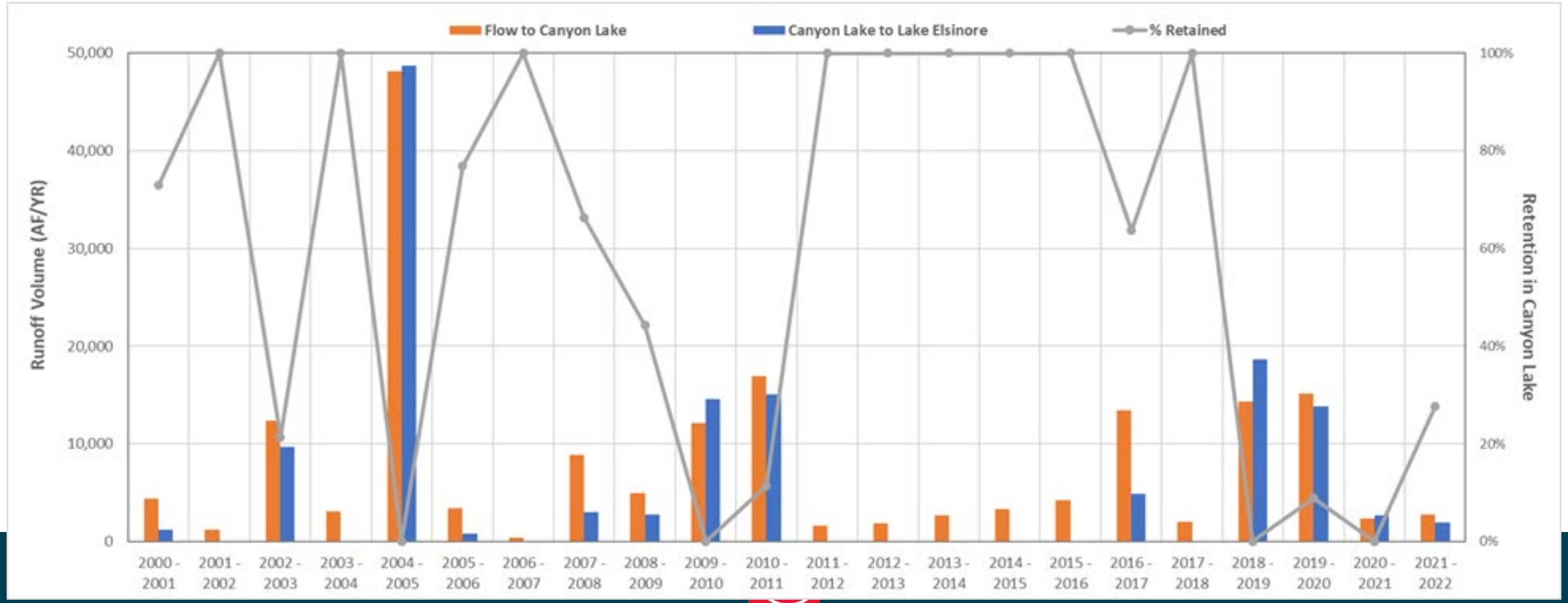
- Update (2000-2022 data) to Figure 2-14 showing relationship between water level and TDS
- Flow data charts updated through 2022





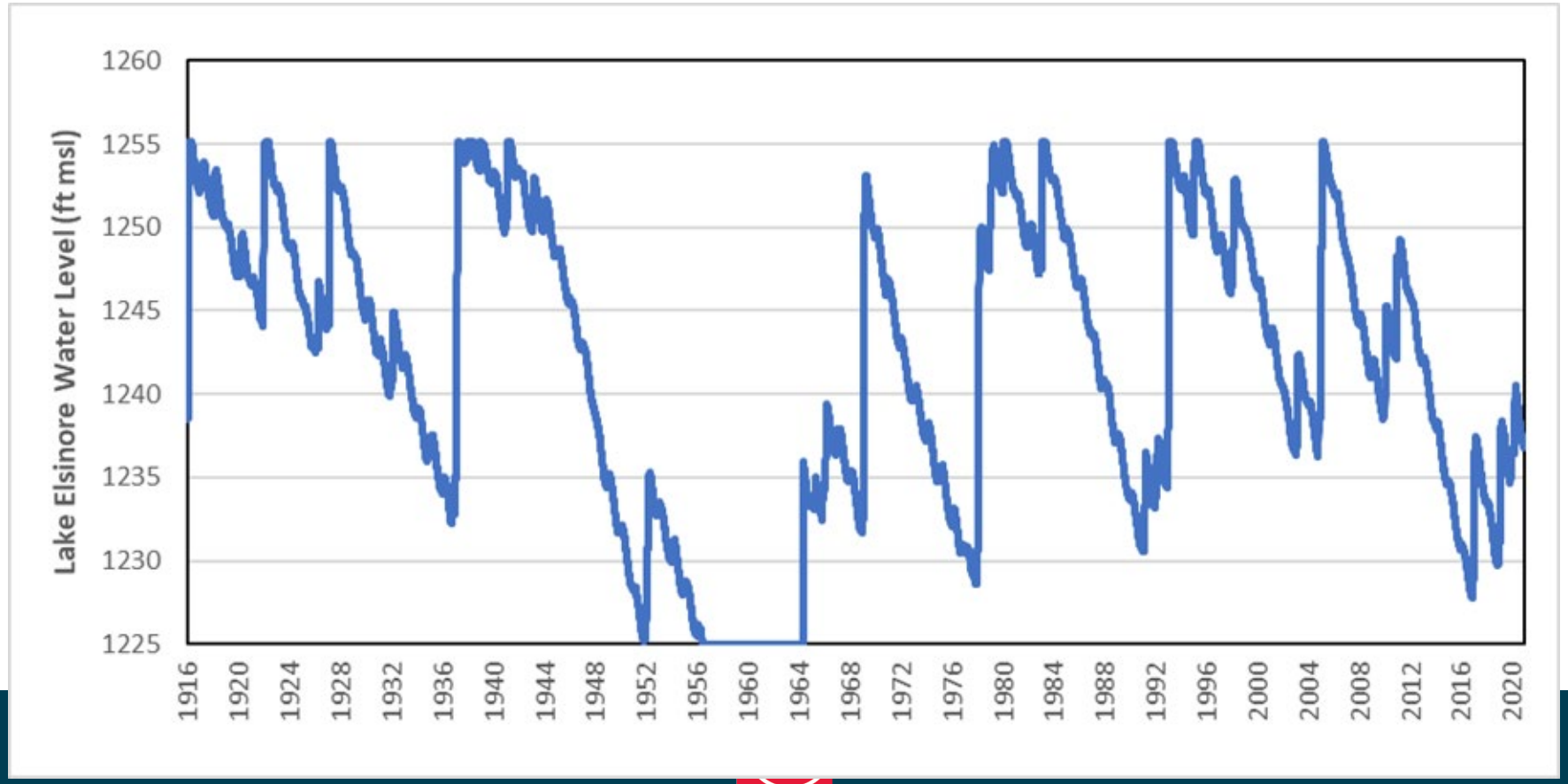
Section 2 Problem Statement

- Flow data charts updated through 2022



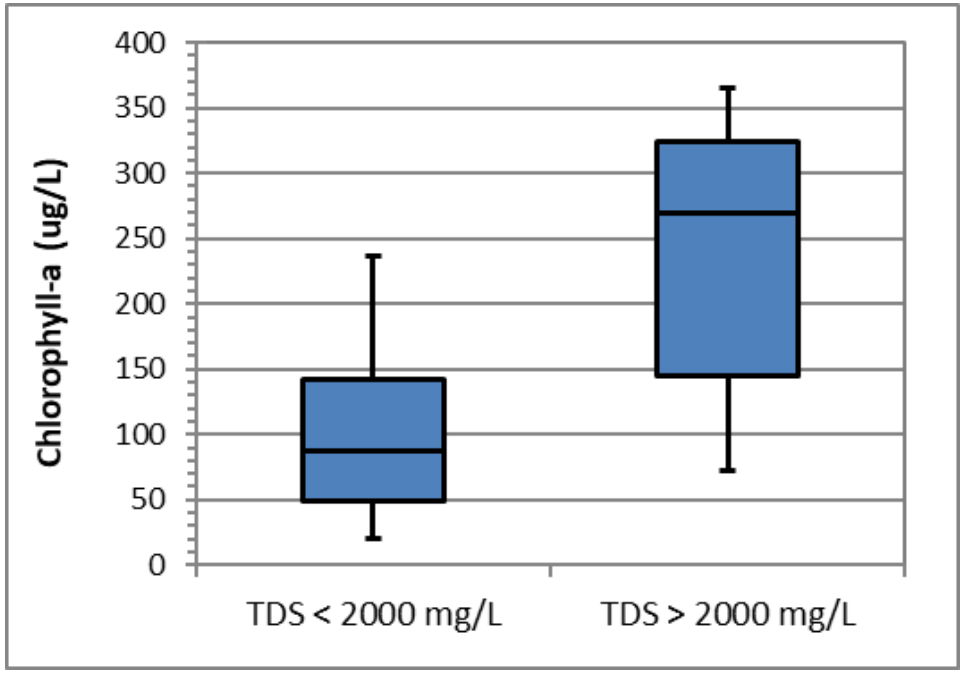
Section 2 Problem Statement

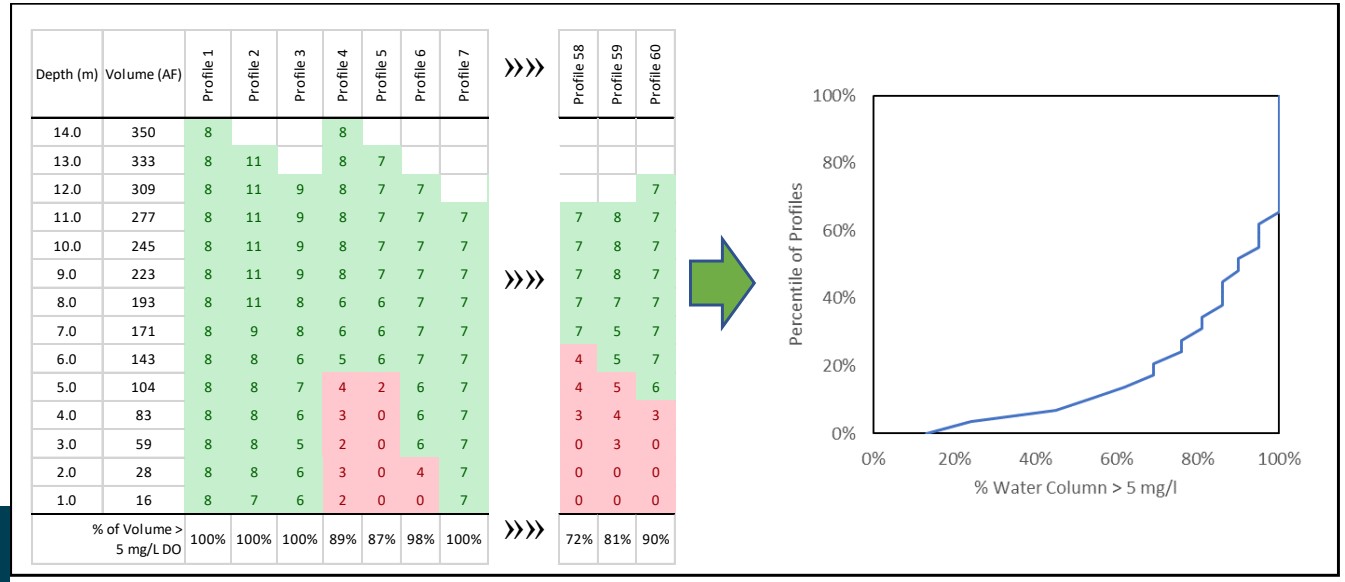
- GLMmodel results for water level without supplemental water addition



Section 3 Numeric Targets

- Update (2002-2022 data) to Figure 3-1 showing measured Lake Elsinore chlorophyll-a in samples collected with > or < 2,000 mg/L TDS
- Update to Figure 3-5 showing how DO profiles are converted into a CDF

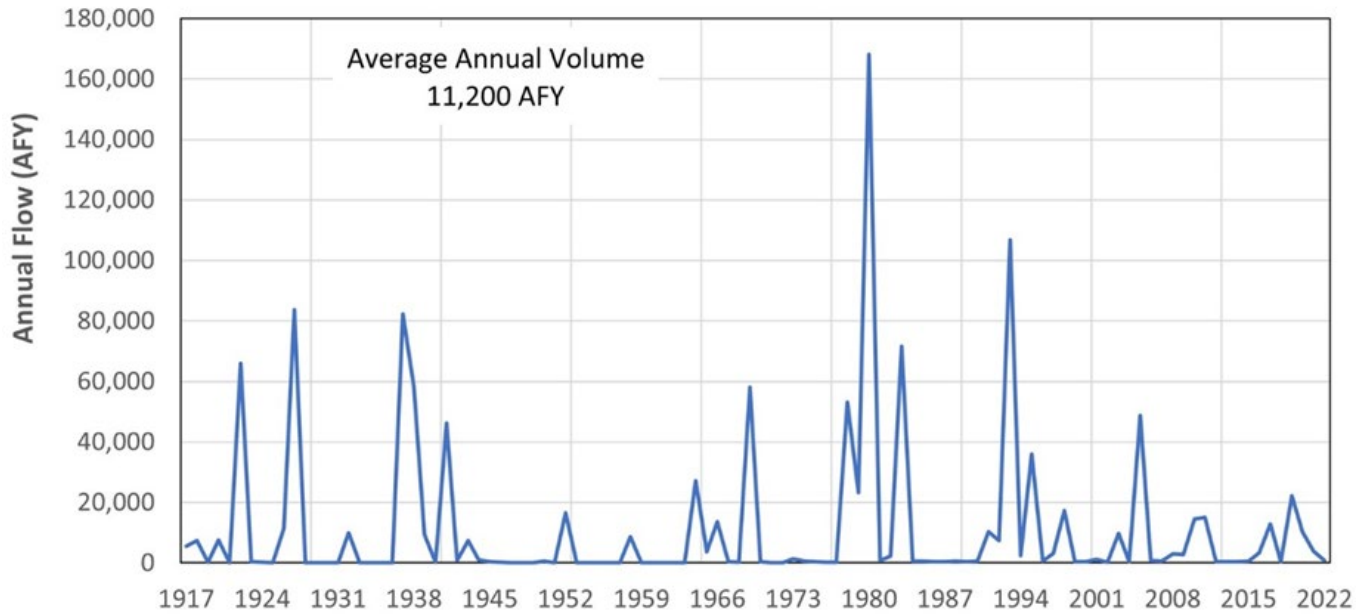


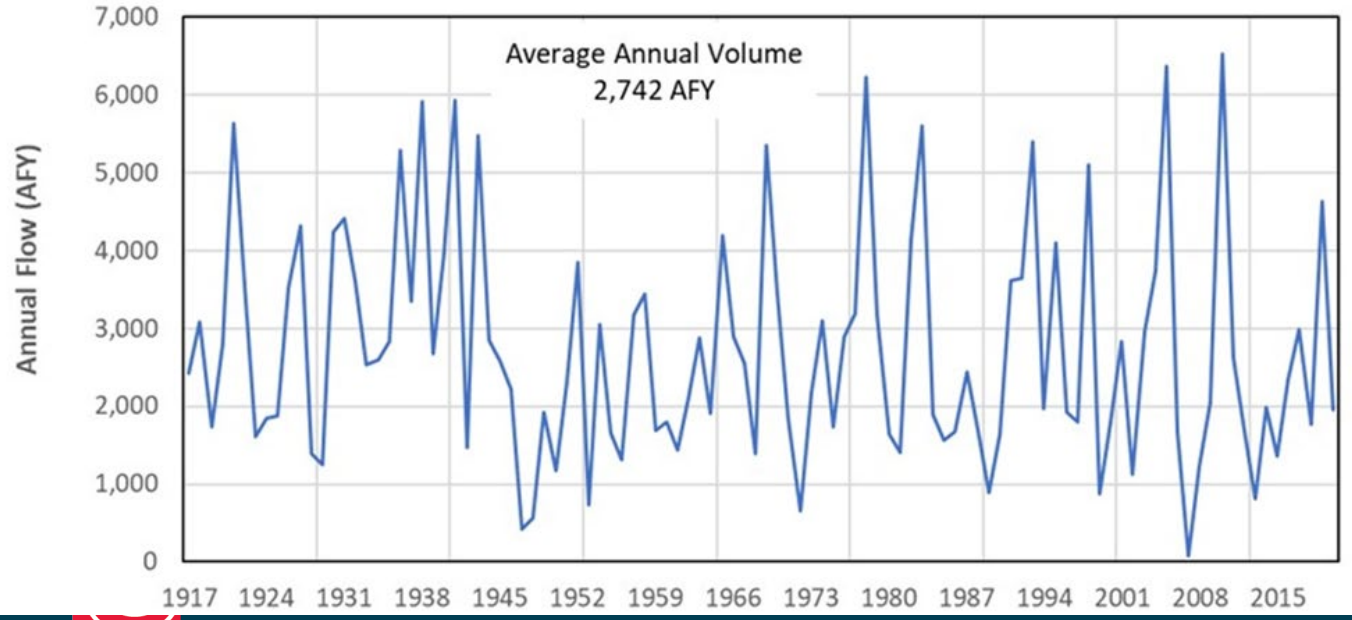


Depth (m)	Volume (AF)	Profile 1	Profile 2	Profile 3	Profile 4	Profile 5	Profile 6	Profile 7	Profile 58	Profile 59	Profile 60
14.0	350	8			8						
13.0	333	8	11		8	7					
12.0	309	8	11	9	8	7	7				7
11.0	277	8	11	9	8	7	7	7	7	8	7
10.0	245	8	11	9	8	7	7	7	7	8	7
9.0	223	8	11	9	8	7	7	7	7	8	7
8.0	193	8	11	8	6	6	7	7	7	7	7
7.0	171	8	9	8	6	6	7	7	7	5	7
6.0	143	8	8	6	5	6	7	7	4	5	7
5.0	104	8	8	7	4	2	6	7	4	5	6
4.0	83	8	8	6	3	0	6	7	3	4	3
3.0	59	8	8	5	2	0	6	7	0	3	0
2.0	28	8	8	6	3	0	4	7	0	0	0
1.0	16	8	7	6	2	0	0	7	0	0	0
	% of Volume > 5 mg/L DO	100%	100%	100%	89%	87%	98%	100%	72%	81%	90%

Section 3 Numeric Targets

- Flow data charts for CL to LE overflow updated through 2022
- Local Lake Elsinore watershed runoff volume inflow estimated by water balance





Section 3 Numeric Targets

- New table with multiple summary states on the Cranston Guard Station dataset

Table 3-2. Summary Statistics from Reference Watershed Site, San Jacinto River at Cranston Guard Station

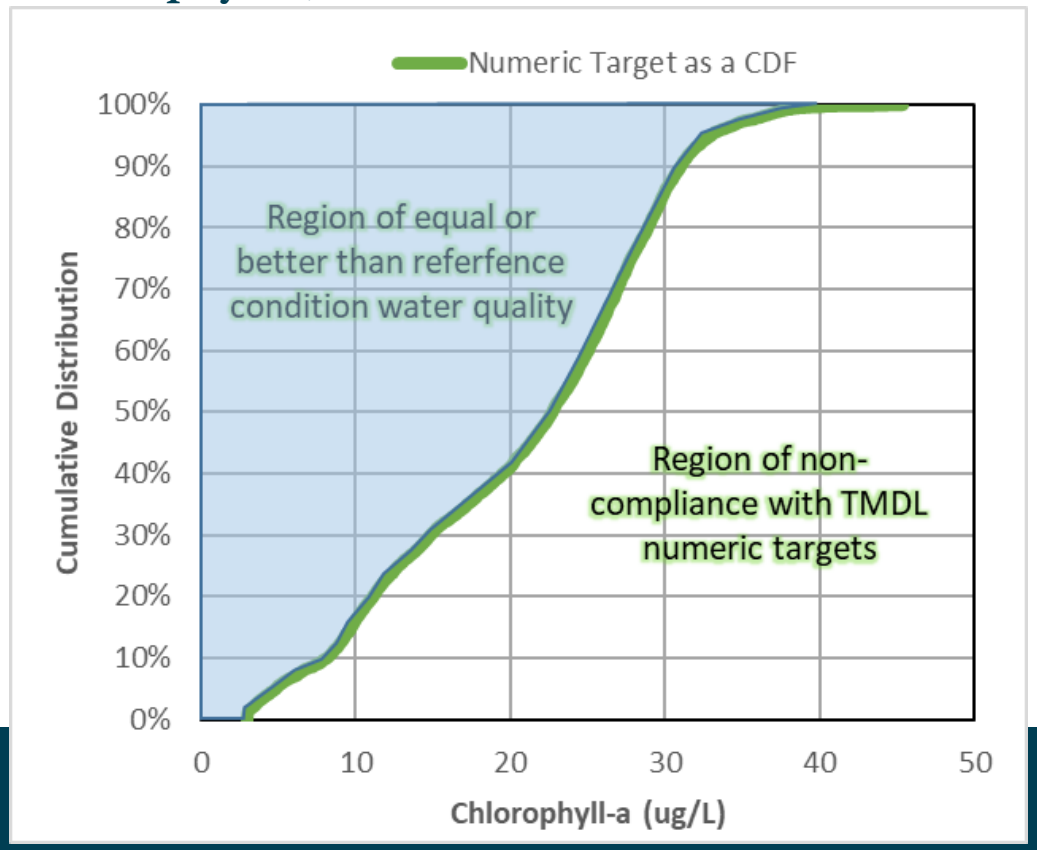
Metric	TP (mg/L)	TN (mg/L)
Range of Samples	0.05 – 48.00	0.51 – 27.78
Range of Event Means[1]	0.11 – 10.13	0.58 – 7.09
25th Percentile of Samples	0.16	0.68
25th Percentile of Event Means[1]	0.22	1.00
Median of Samples	0.32	0.92
Median of Event Means[1]	0.39	1.15
75th Percentile of Samples	0.73	1.50
75th Percentile of Event Means[1]	1.07	2.62

[1] Number of samples per event varies

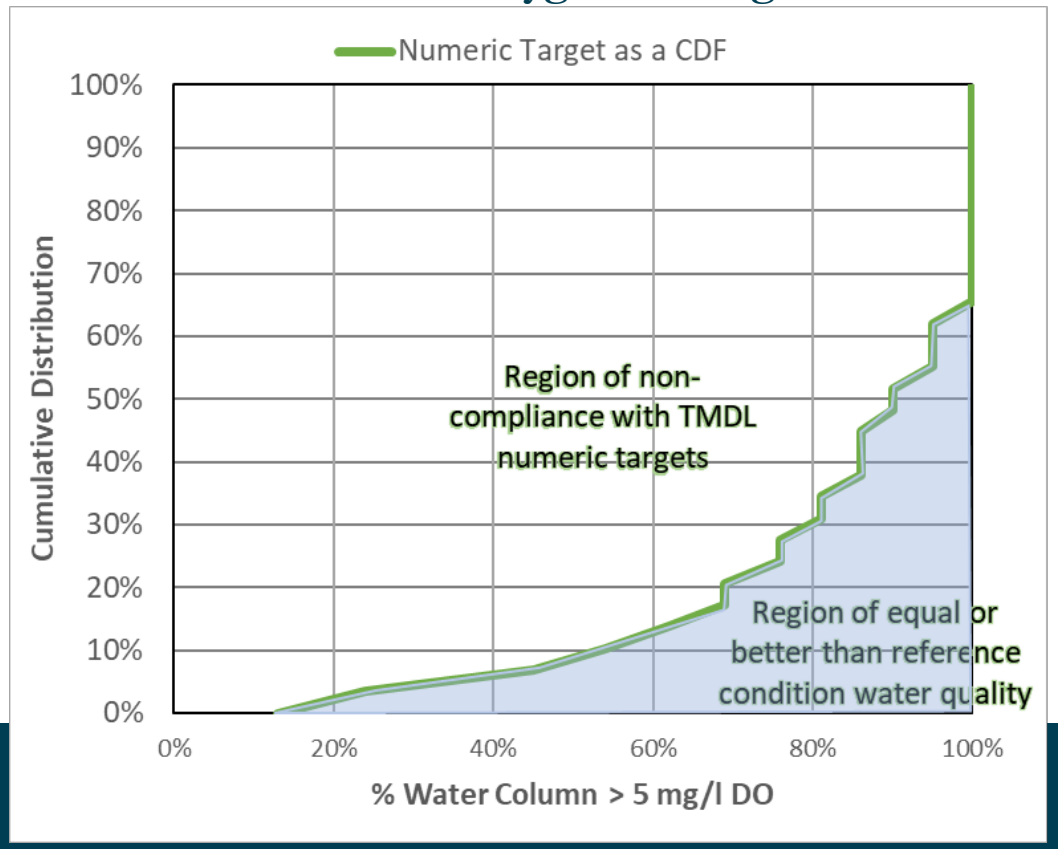
Section 3 Numeric Targets

- What is better water quality when comparing two CDFs?

Chlorophyll-a, Ammonia-N

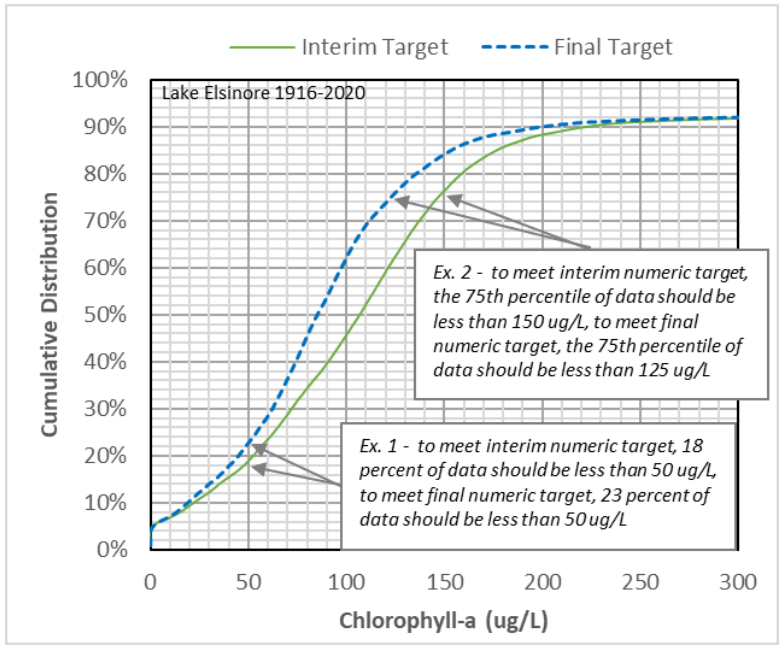


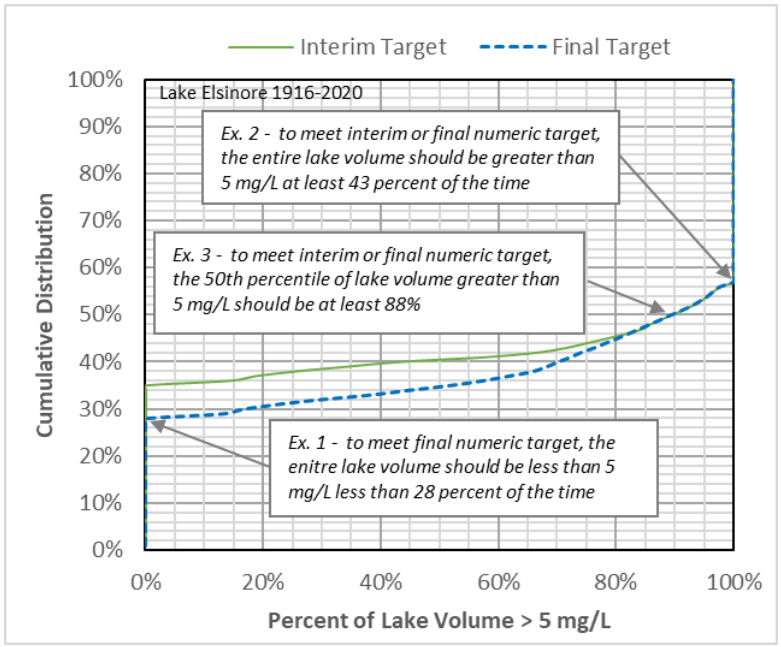
Volume of Dissolved Oxygen > 5 mg/L

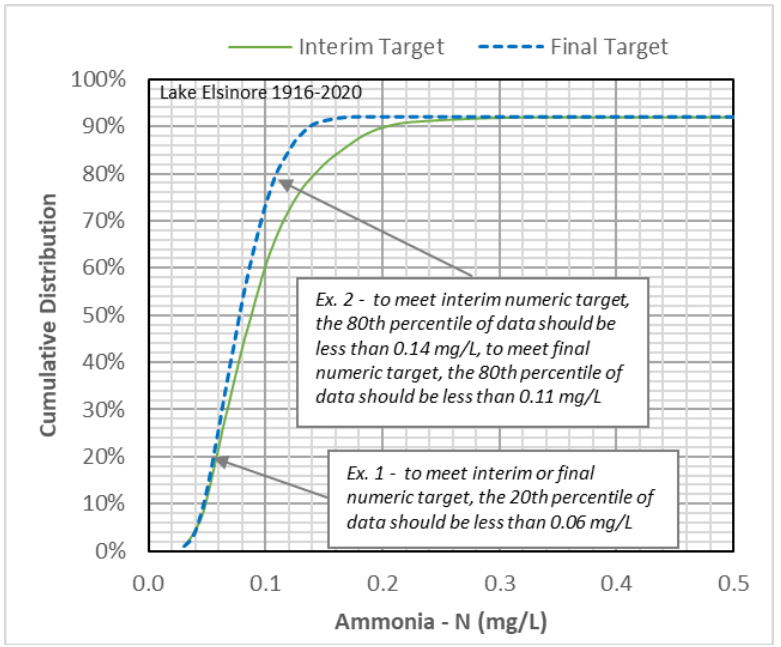


Section 3 Numeric Targets

- CDF Targets Updated – Lake Elsinore

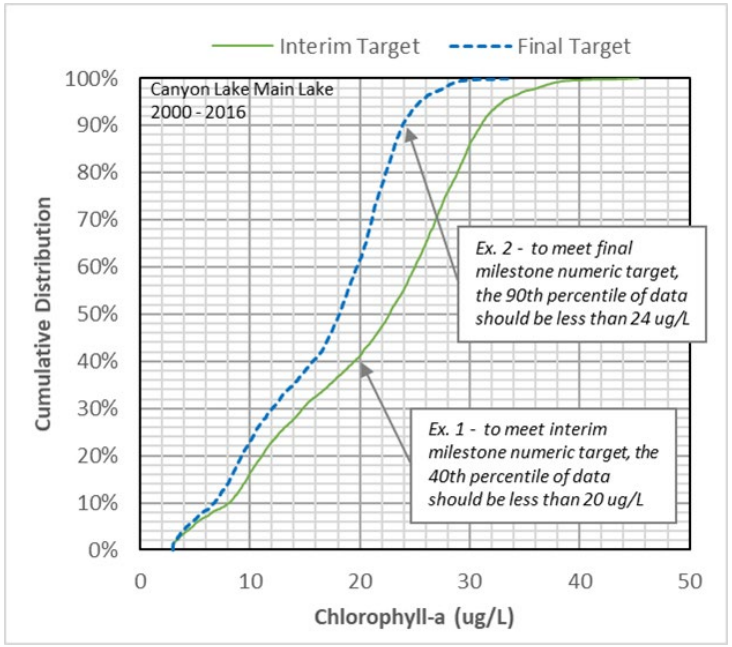


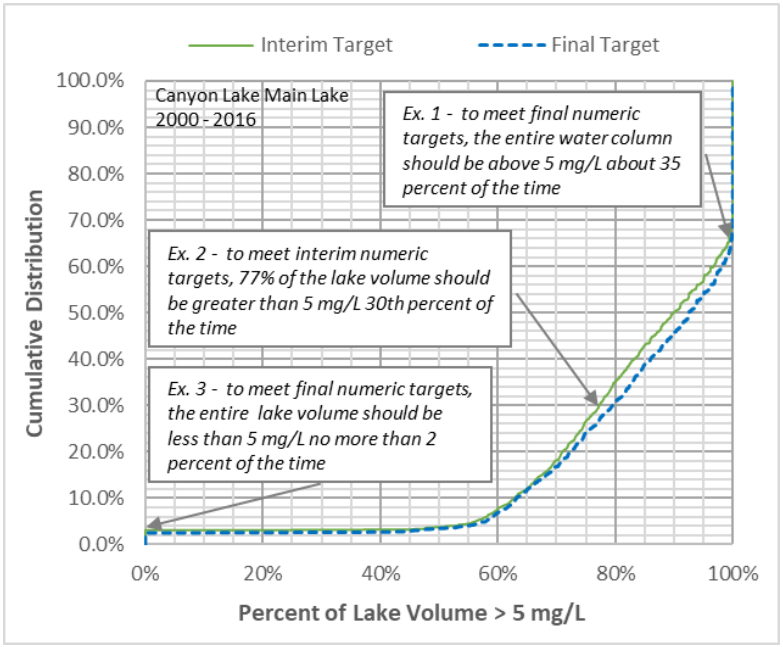


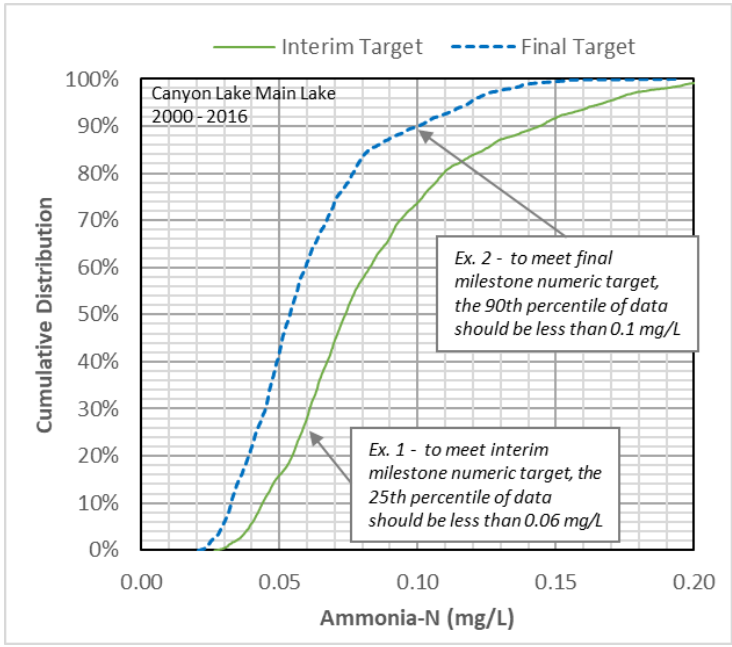


Section 3 Numeric Targets

- CDF Targets Updated – Canyon Lake Main Lake

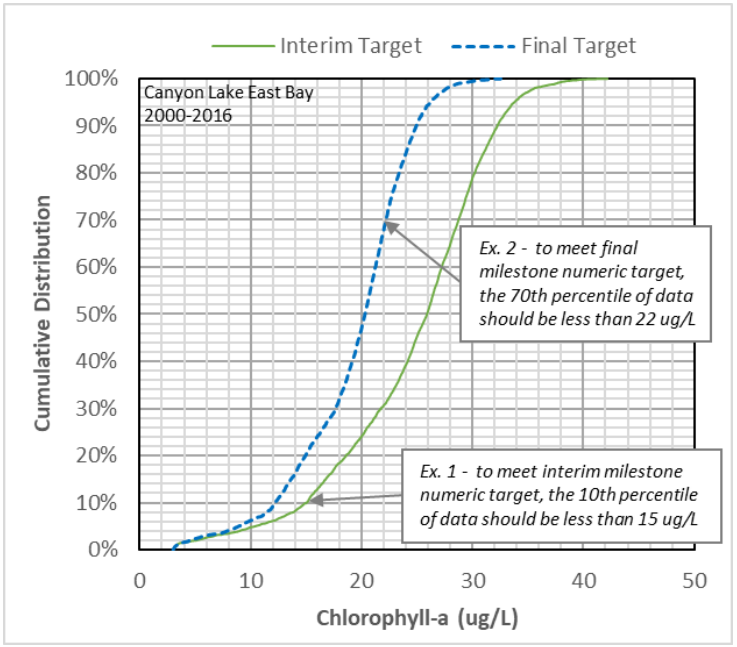


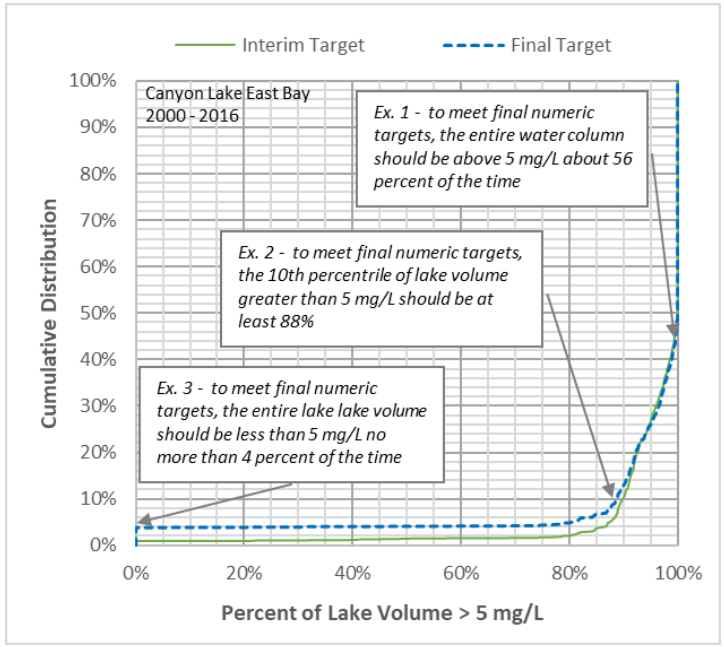


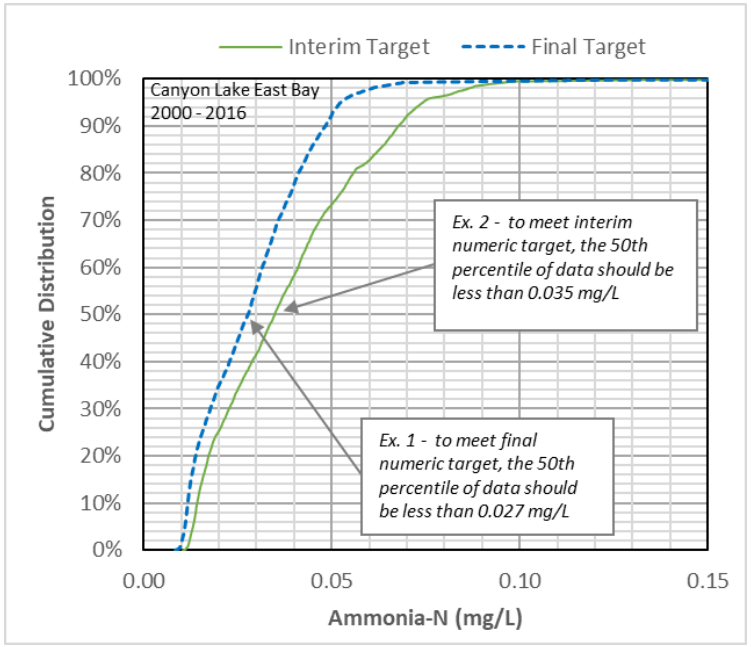


Section 3 Numeric Targets

- CDF Targets Updated – Canyon Lake East Bay

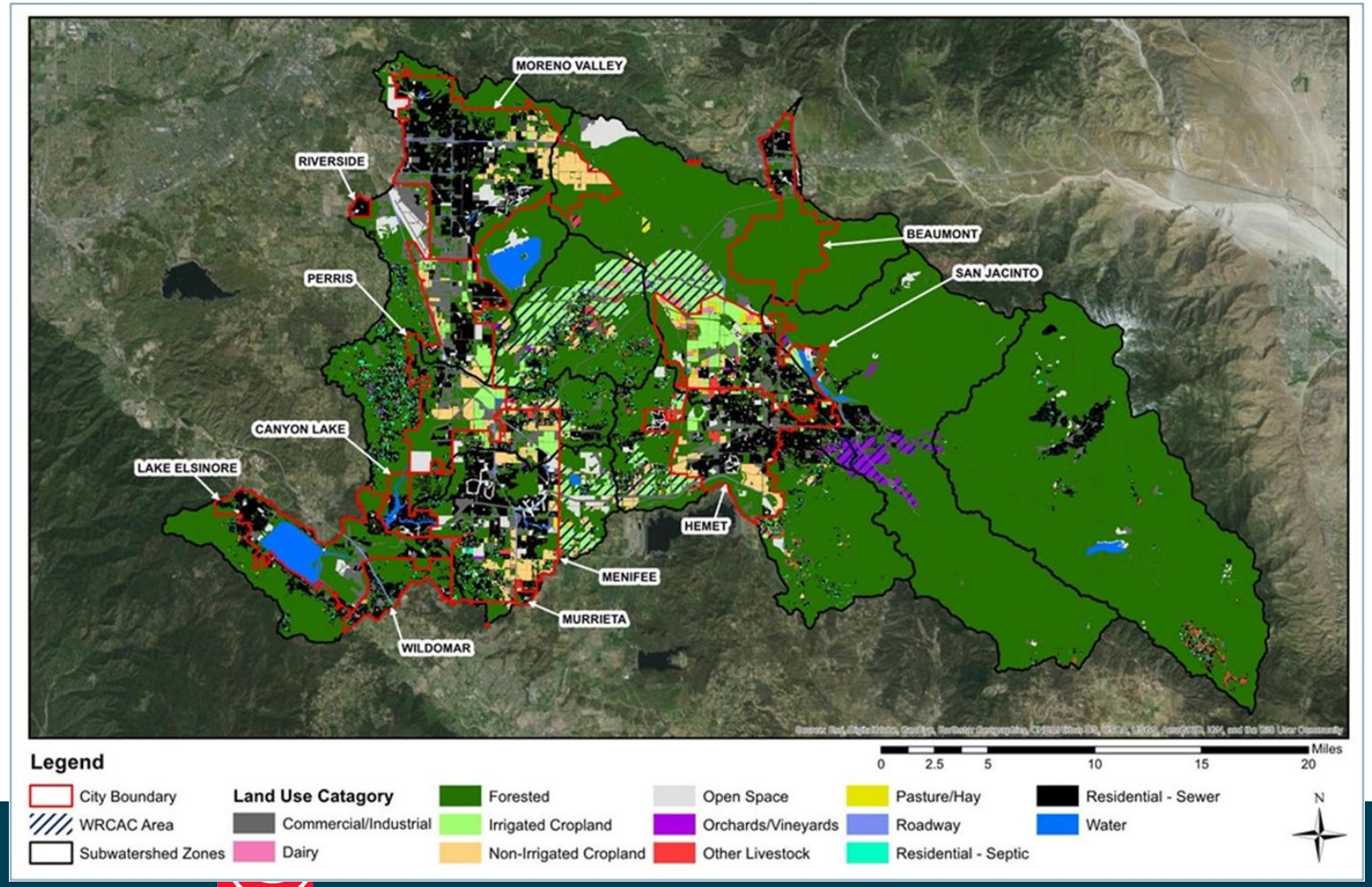






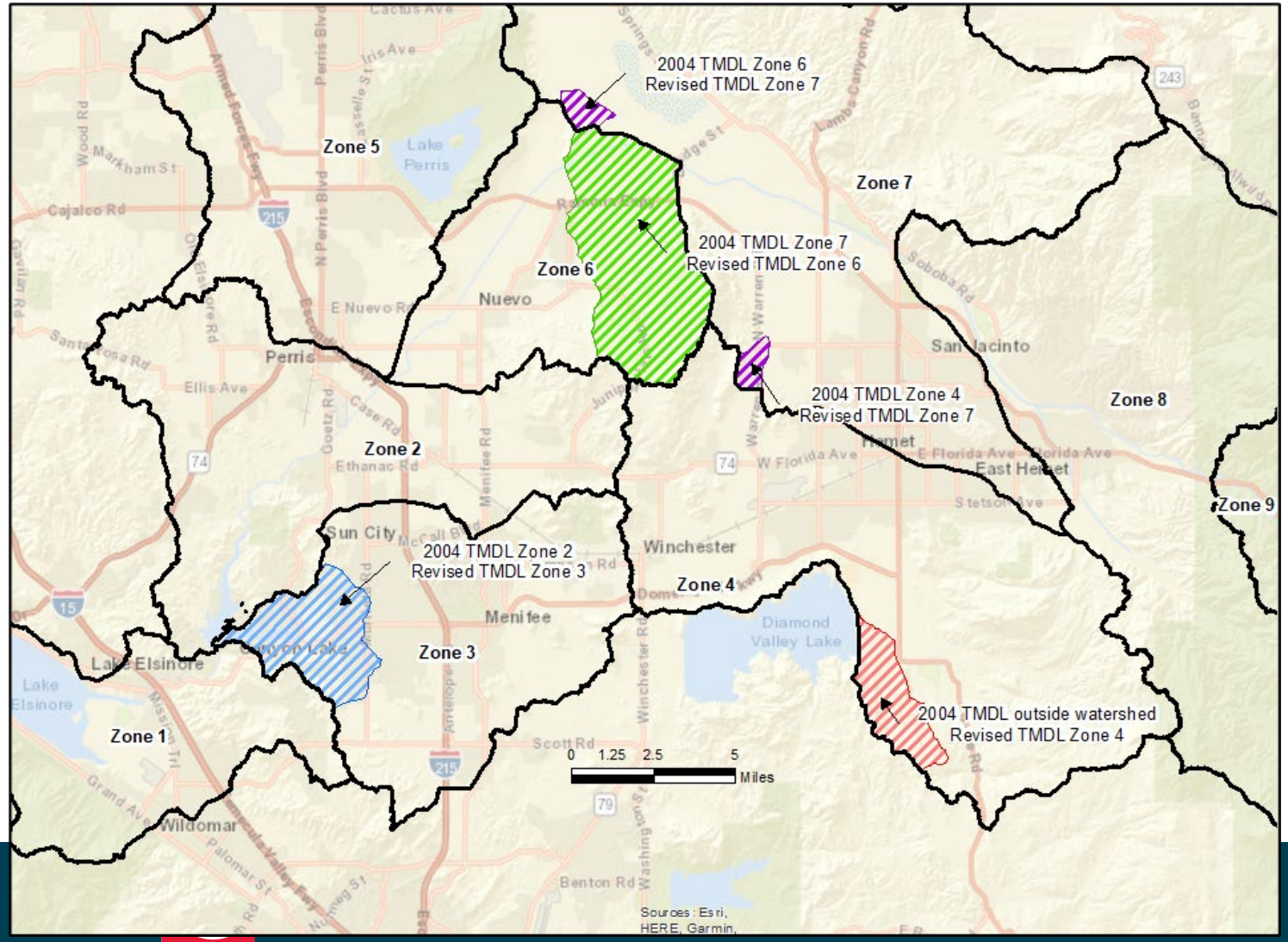
Section 4 Source Assessment

- Update to model segments of common jurisdictional boundaries, land use, subwatershed zone



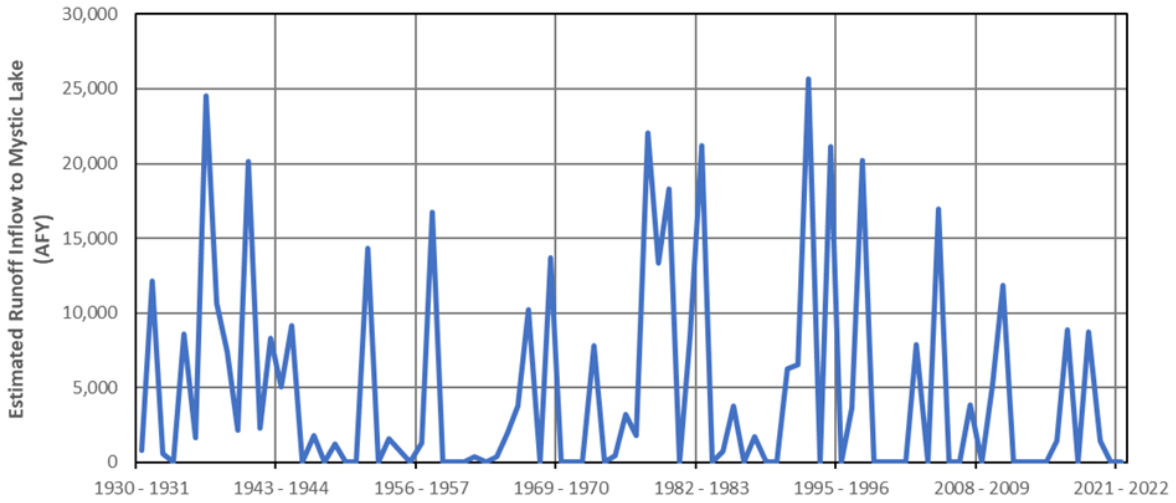
Section 4 Source Assessment

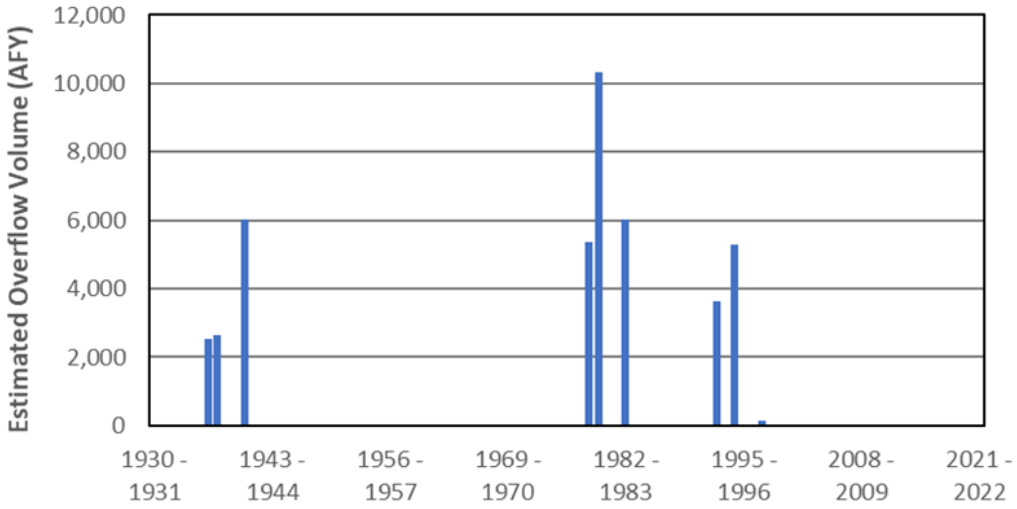
- New watershed boundary revision in zone 4



Section 4 Source Assessment

- Mystic Lake water balance update





Section 4 Source Assessment

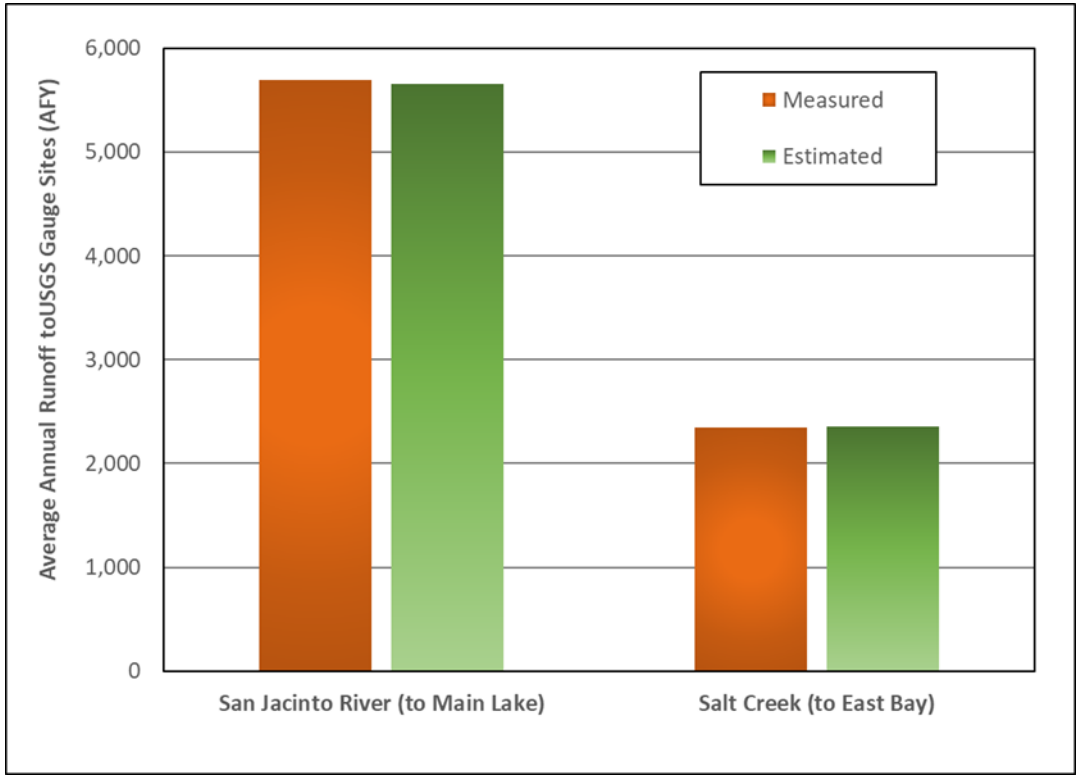
- Nutrient washoff concentration assumption for 'other livestock' land use (future non-dairy CAFO)

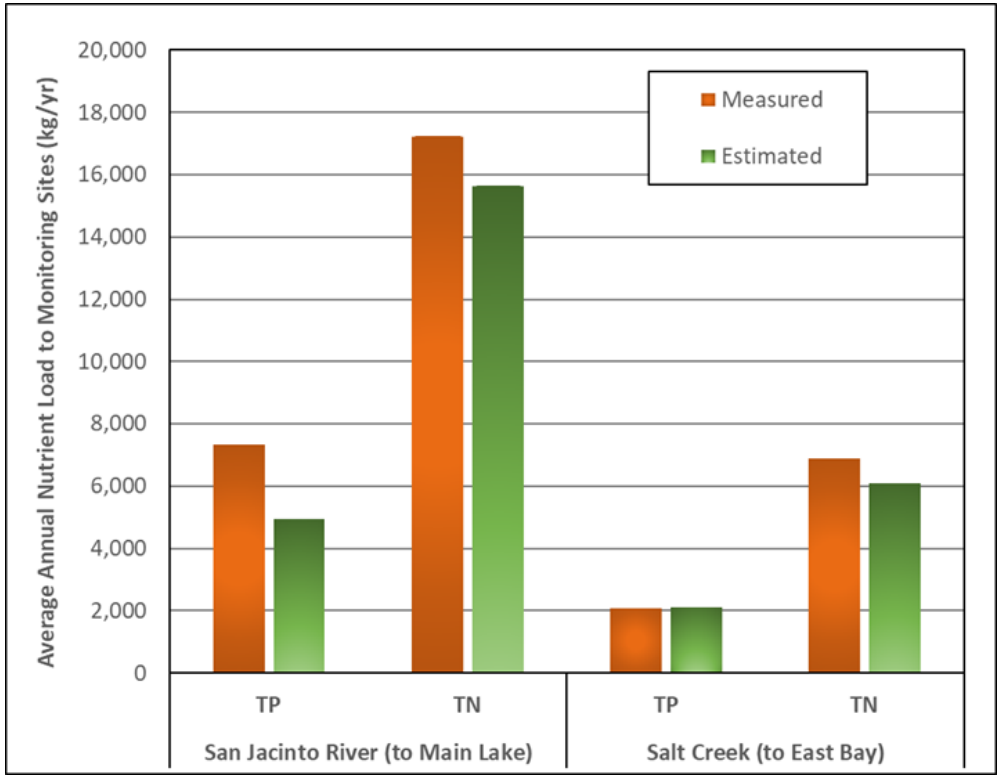
Table 4-7. Urban and Dairy Land Use-specific Nutrient Washoff Concentrations Used for Source Assessment

Land Use	TP (mg/L)	TN (mg/L)	Site Name	Source (No. of Samples; Period of Record)
Commercial / Industrial	0.56	2.76	Corona Storm Drain (Station 40)	RCFC&WCD (n=49; 2004–2022)
Residential – Sewer	0.48	2.43	Sunnymead Channel (Station 316)	RCFC&WCD (n=49; 2004–2022)
Residential – Septic	0.59	5.30	Canyon Lake at Sierra Park (Station 834)	RCFC&WCD (n=21; 2000-2004)
Roadway	0.38	3.41	Freeway (FW) CACTA006, 011, 012, 013	NSQD (n=14; 1997-1999)
Open Space / Forested	0.32	0.92	Cranston Guard Station	USFS (n=54; 2001–2010)
Other Livestock (e.g., chicken farm, horse ranch)	1.97	7.94	Median of nationwide studies included in the MANAGE model database (after Harmel et al, 2006)	
Dairy	9.10	14.90	SJBRCD1	San Jacinto Resource Conservation District 2009 (n=1; May 2008)

Section 4 Source Assessment

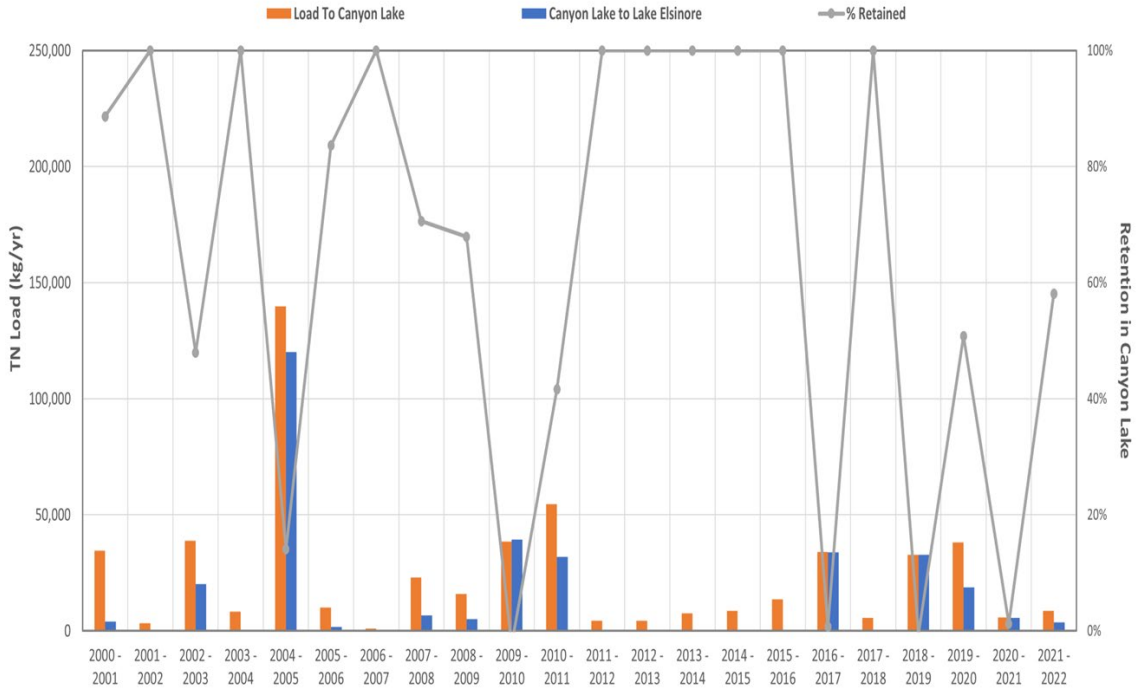
- Updated model fit charts

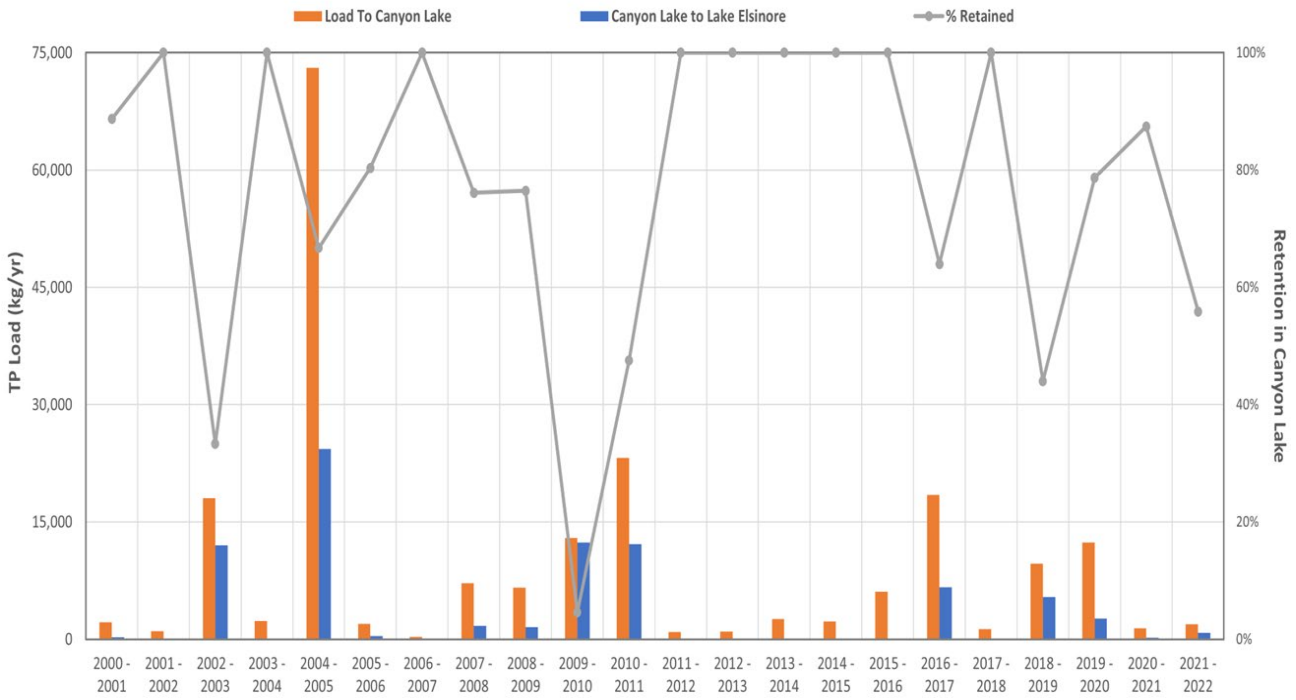




Section 4 Source Assessment

- Updated nutrient mass inflow and outflow from Canyon Lake





Section 4 Source Assessment

- New table of baseline watershed loads by jurisdiction

Table 4-9. Baseline Nutrient Washoff at Jurisdictional Boundaries and at Downstream Lake Inflows

Responsible Agency or Jurisdiction	Jurisdiction Washoff [1]		To Canyon Lake (Zones 2-6) [2]		To Lake Elsinore (Zones 1 and 7-9) [3]	
	TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)
Banning	25	107	0	0	2	11
Beaumont	229	865	0	0	23	87
CAFO	43	63	9	14	4	5
Caltrans	170	1,036	73	543	24	160
City of Canyon Lake	145	655	127	574	18	81
Federal – DOD	96	636	88	582	0	0
Hemet	1,297	4,454	187	620	38	142
City of Lake Elsinore	645	2,273	96	338	549	1,935
March Joint Powers Authority	93	408	86	373	0	0
Menifee	1,513	5,210	1,505	5,184	8	26
Moreno Valley	1,688	6,801	1,521	6,166	3	6
Murrieta	30	112	30	112	0	0
Perris	1,276	3,605	1,202	3,394	0	0
City of Riverside	48	161	44	148	0	0
Riverside County	7,031	17,833	2,312	6,239	483	1,392
San Jacinto	692	2,394	1	5	70	240
Wildomar	168	599	0	0	167	598
Agriculture: Irrigated	986	897	402	376	49	44
Agriculture: Non-irrigated	1,067	1,359	545	694	42	53
California DFW	295	835	52	151	24	68
Federal – BLM	285	801	33	90	23	67
Federal – National Forest	2,481	7,110	1	3	319	915
Federal – Native American Land	170	406	0	0	17	41
Federal – Wilderness	466	1,340	0	0	47	136
State Land	251	695	53	137	20	55
WRCRCA	79	171	11	32	6	11
Total Baseline Watershed Load	**21,268**	**60,827**	**8,379**	**25,775**	**1,937**	**6,073**

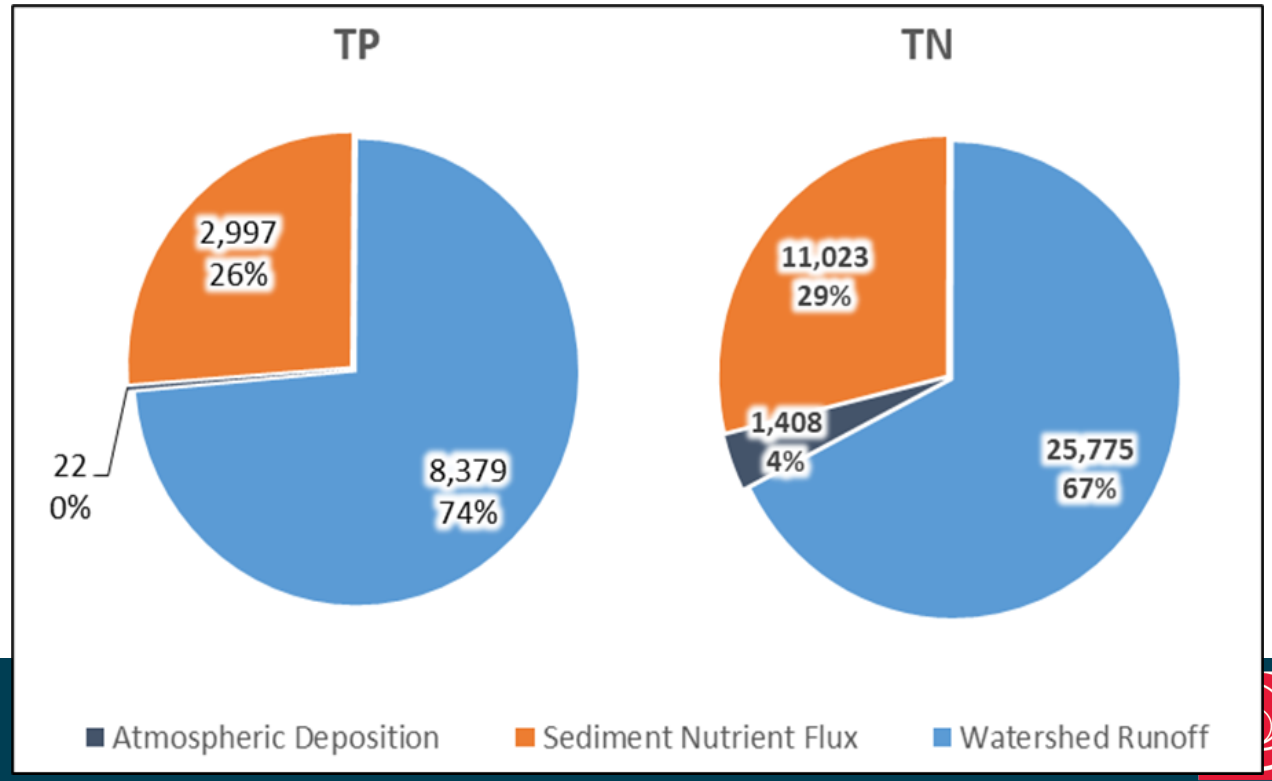
[1] Washoff load for open space and forest lands estimated using 50th percentile of Cranston Guard Station shown in Table 4-7 above. For estimation of load reduction to meet final allocations at the 25th percentile of Cranston Guard Station, these baseline loads were necessarily adjusted for open space and forest to coincide with the 25th percentile washoff concentrations of 0.16 mg/L TP and 0.68 mg/L TN.

[2] Loads are total delivered to Canyon Lake inflow accounting for losses by channel bottom recharge in subwatershed zones 4,5, and 6. Overflows to Lake Elsinore are not subtracted from inflow load.

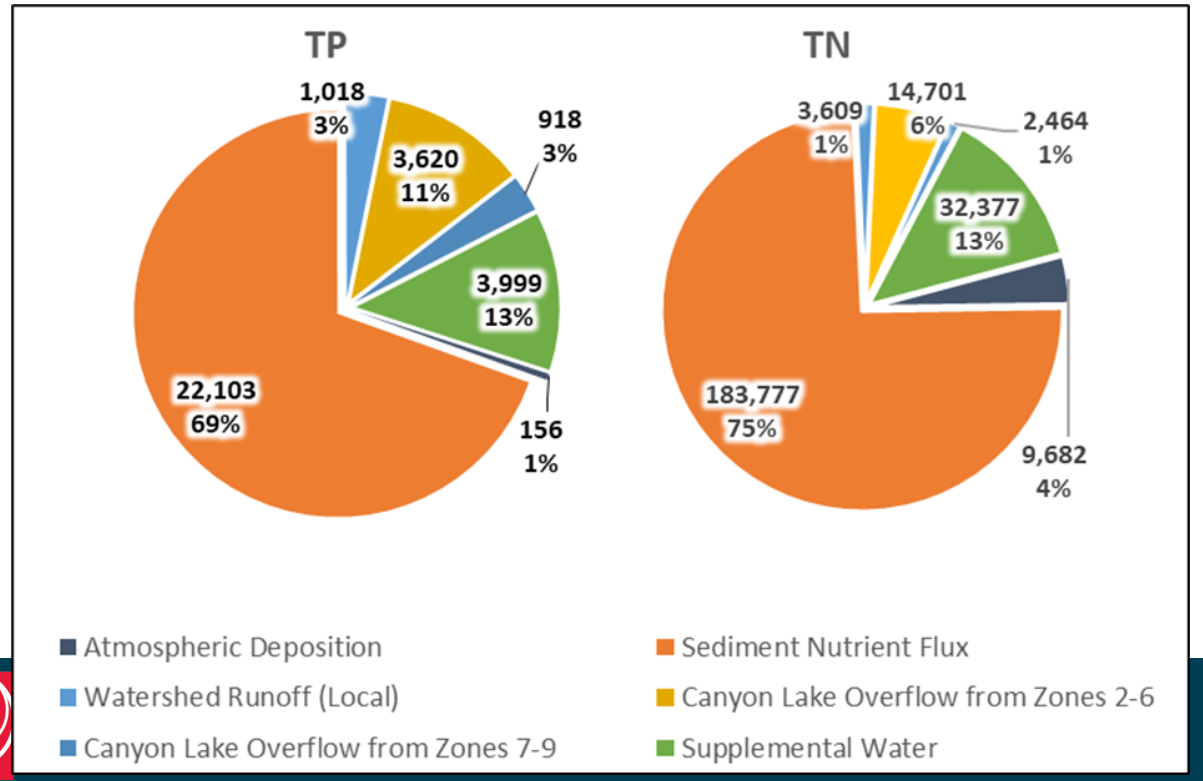
Section 4 Source Assessment

- Summary of nutrient sources for existing conditions

Canyon Lake



Lake Elsinore

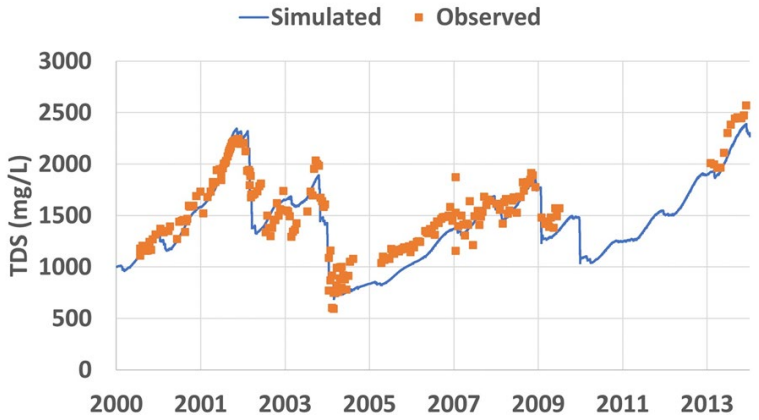


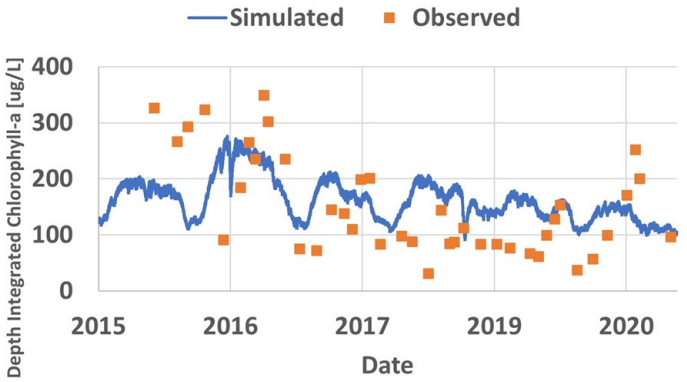
Section 5 Linkage Analysis

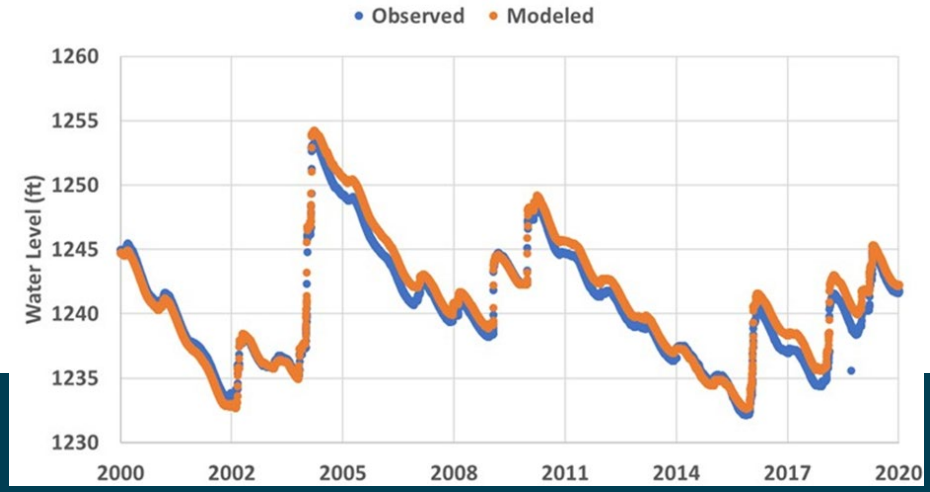
- Calibration with migrated models; GLM for Lake Elsinore

Table 5-2. Mean Observed and Predicted Values and Model Percent Relative Error of Key Water Quality Parameters for Calibration Period (2000-2014) for Lake Elsinore

Variable	Observed	Predicted	% Relative Error	RMSE	Observed Standard Deviation
Lake Elevation (ft)	1241.5	1241.3	2.6%	0.86	4.43
Temperature (°C)	24.4	25.6	6.6%	2.17	2.42
TDS (mg/L)	1509	1499	12.2%	200	401
DO (mg/L)	8.1	7.9	19.2%	2.02	1.16
Seasonal Average TN (mg/L)	4.2	5.1	36.1%	1.35	1.75
Seasonal Average TP (mg/L)	0.30	0.28	35.1%	0.12	0.16
Seasonal Average Chlorophyll-*a* (µg/L)	155	158	57.7%	90	98





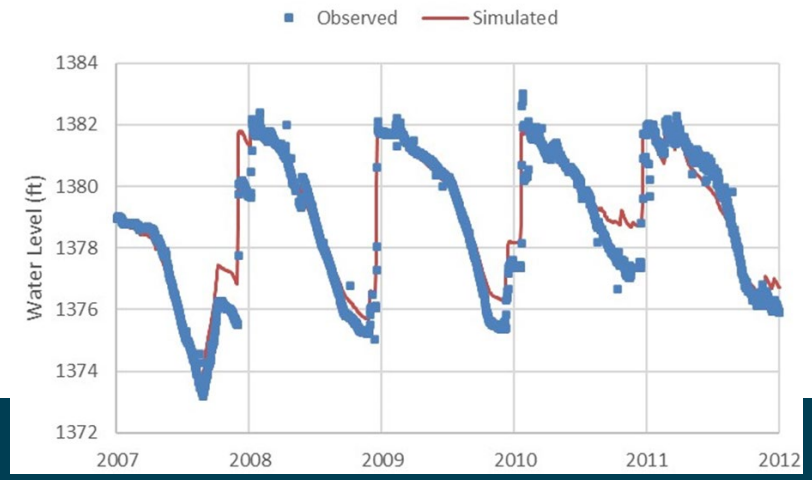


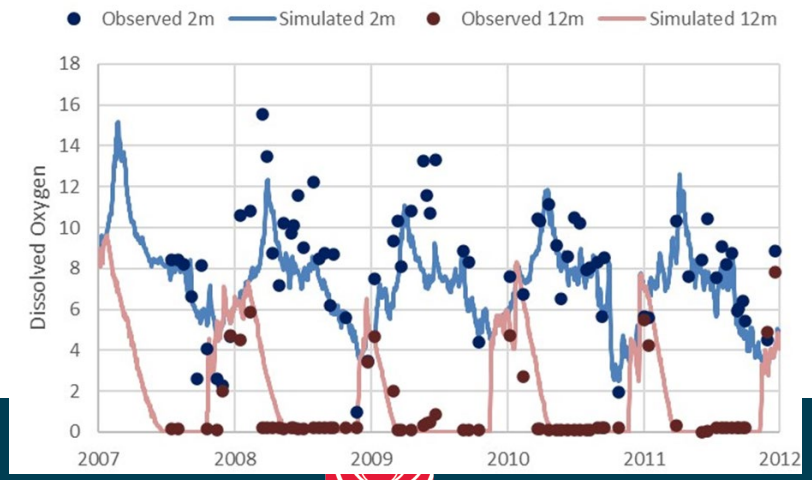
Section 5 Linkage Analysis

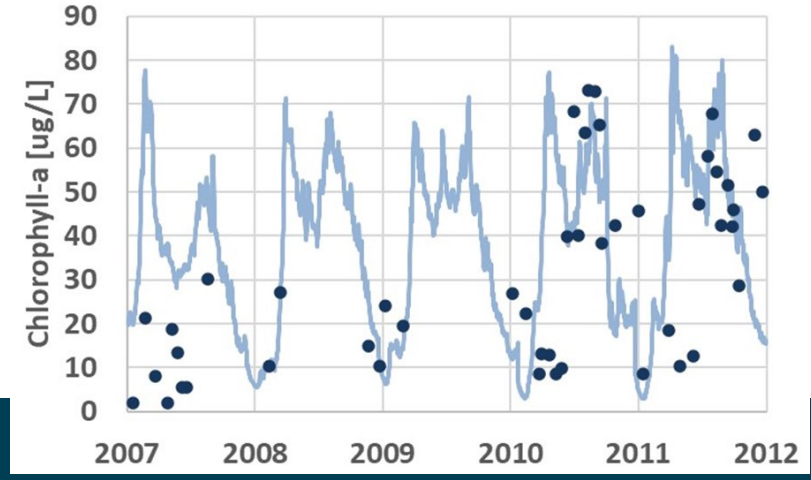
- Calibration with migrated models; AEM3D for Canyon Lake

Table 5-4. Mean Values for Observed and Predicted Water Quality Parameters in Canyon Lake (Observed/Predicted)

Site	Depth (m)	Temperature (°C)	DO (mg/L)	Chlorophyll-*a* (µg/L)	Total N (mg/L)	Total P (mg/L)
Main Lake (M1)	Epilimnion (2-m)	21.5 / 21.3	8.1 / 7.3	31.2 / 38.8	1.57 / 1.24	0.59 / 0.66
	Hypolimnion (12-m)	13.3 / 12.9	1.0 / 1.3	-	-	-
East Bay (E2)	Epilimnion (1-m)	-	-	50.8 / 53.7	1.80 / 1.36	0.48 / 0.64

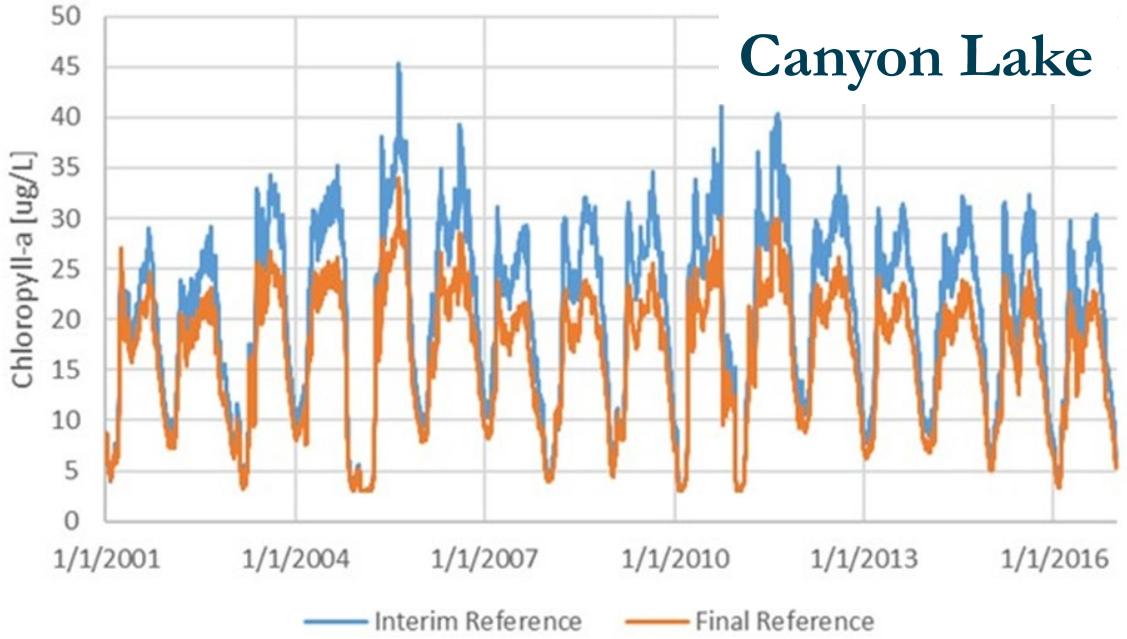


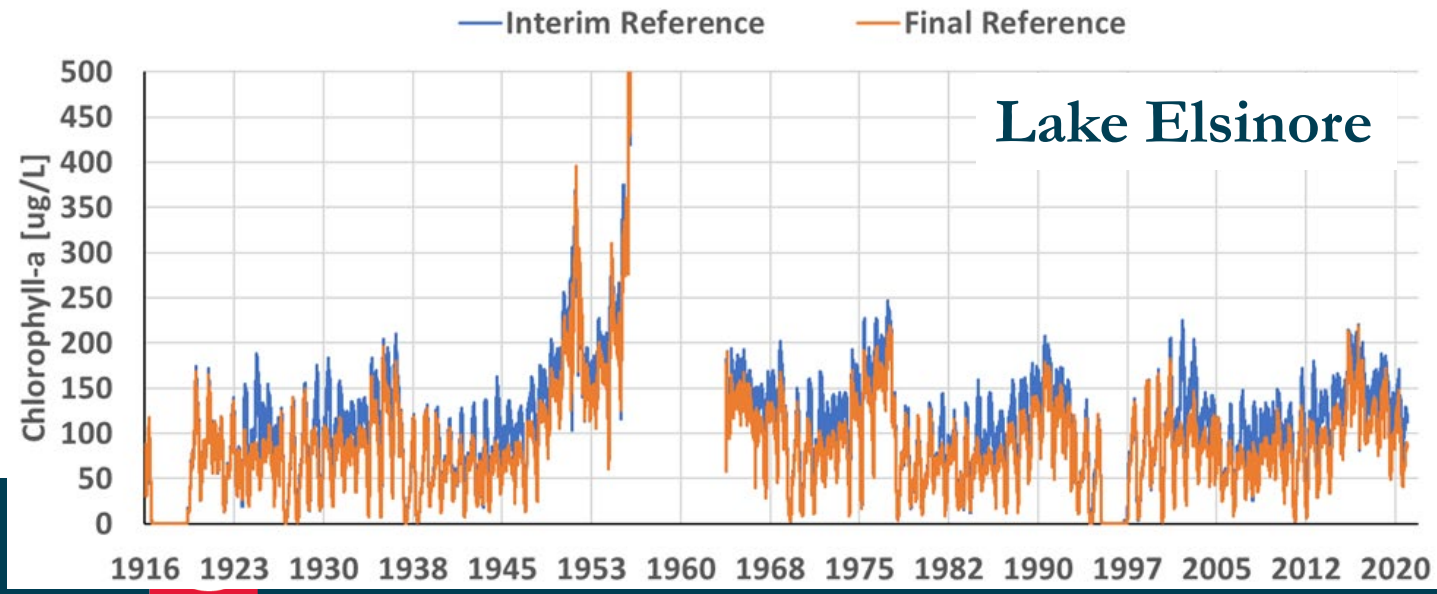




Section 5 Linkage Analysis

- Model scenario for a reference watershed nutrient inflow to create numeric in-lake water quality targets (presented as CDFs in Section 3)





Section 6 Allocations

- Wasteload and Load Allocations based on nutrient washoff from a condition where each jurisdictional area is returned to reference watershed

Table 6-1. Allocations for Watershed Runoff in Lake Elsinore and Canyon Lake Nutrient TMDLs

Responsible Agency or Jurisdiction	Interim Milestone		Final Milestone	
	TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)
Wasteload Allocations				
Banning	17	49	8	36
Beaumont	166	477	83	352
CAFO	3	10	2	7
Caltrans	131	377	66	279
City of Canyon Lake	102	294	51	217
Federal - DOD	68	195	34	144
Hemet	796	2,289	398	1,692
City of Lake Elsinore	470	1,352	235	999
March Joint Powers Authority	65	188	33	139
Menifee	942	2,708	471	2,002
Moreno Valley	1,089	3,132	545	2,315
Murrieta	20	56	10	42
Perris	620	1,783	310	1,318
City of Riverside	32	91	16	67
Riverside County	3,010	8,654	1,505	6,396
San Jacinto	440	1,266	220	936
Wildomar	121	347	60	256
Load Allocations				
Agriculture: Irrigated	268	772	134	571
Agriculture: Non-irrigated	81	232	40	171
California DFW	288	827	144	612
Federal - BLM	274	788	137	583
Federal - National Forest	2,460	7,074	1,230	5,228
Federal - Native American Land	135	389	68	288
Federal - Wilderness	466	1,340	233	991
State Land	234	674	117	498
WRCRCA	45	129	23	96
Total Allowable Watershed Load (WLAs and LAs)	**12,346**	**35,495**	**6,173**	**26,235**

[1] Allocations are for watershed runoff at the jurisdictional boundary. Losses not accounted for are associated with reductions occurring downstream of subwatersheds 7-9 at Mystic Lake and downstream of subwatershed 4,5,6 in

Section 6 Allocations

- Current load minus allocation equals the load reduction to be achieved by each jurisdiction in watershed

Table 6-2. Nutrient Load Reduction Required for Watershed Jurisdictions to Comply with Lake Elsinore and Canyon Lake Nutrient TMDLs

Responsible Agency or Jurisdiction	Interim Milestone [1]		Final Milestone [2]	
	TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)
Wasteload Allocations				
Banning	8	58	15	69
Beaumont	63	389	124	479
CAFO	39	54	41	56
Caltrans	39	659	87	731
City of Canyon Lake	43	361	90	433
Federal - DOD	28	441	60	489
Hemet	501	2,165	846	2,682
City of Lake Elsinore	175	921	331	1,155
March Joint Powers Authority	28	220	47	248
Menifee	571	2,502	926	3,035
Moreno Valley	598	3,669	1,079	4,390
Murrieta	11	56	20	69
Perris	656	1,823	897	2,185
City of Riverside	16	70	32	94
Riverside County	4,020	9,179	4,677	10,164
San Jacinto	252	1,128	416	1,374
Wildomar	47	252	89	315
Load Allocations				
Agriculture: Irrigated	717	125	850	324
Agriculture: Non-irrigated	987	1,127	1,027	1,187
California DFW	7	8	7	8
Federal - BLM	11	13	11	14
Federal - National Forest	21	36	24	41
Federal - Native American Land	35	17	42	27
Federal - Wilderness	-	-	-	-
16 21 18 24 State Land	16	21	18	24
WRCRCA	34	42	36	44
Total Watershed Load Reduction	**8,922**	**25,333**	**14,664**	**43,514**

[1] Baseline load (Table 4-1) – Allocation (Table 6-1) = Watershed Load Reduction (Table 6-2)
[2] Baseline load with open space and forest at 25th percentile – Allocation (Table 6-1) = Watershed Load Reduction (Table 6-2)

Section 6 Allocations

- EVMWD reclaimed water

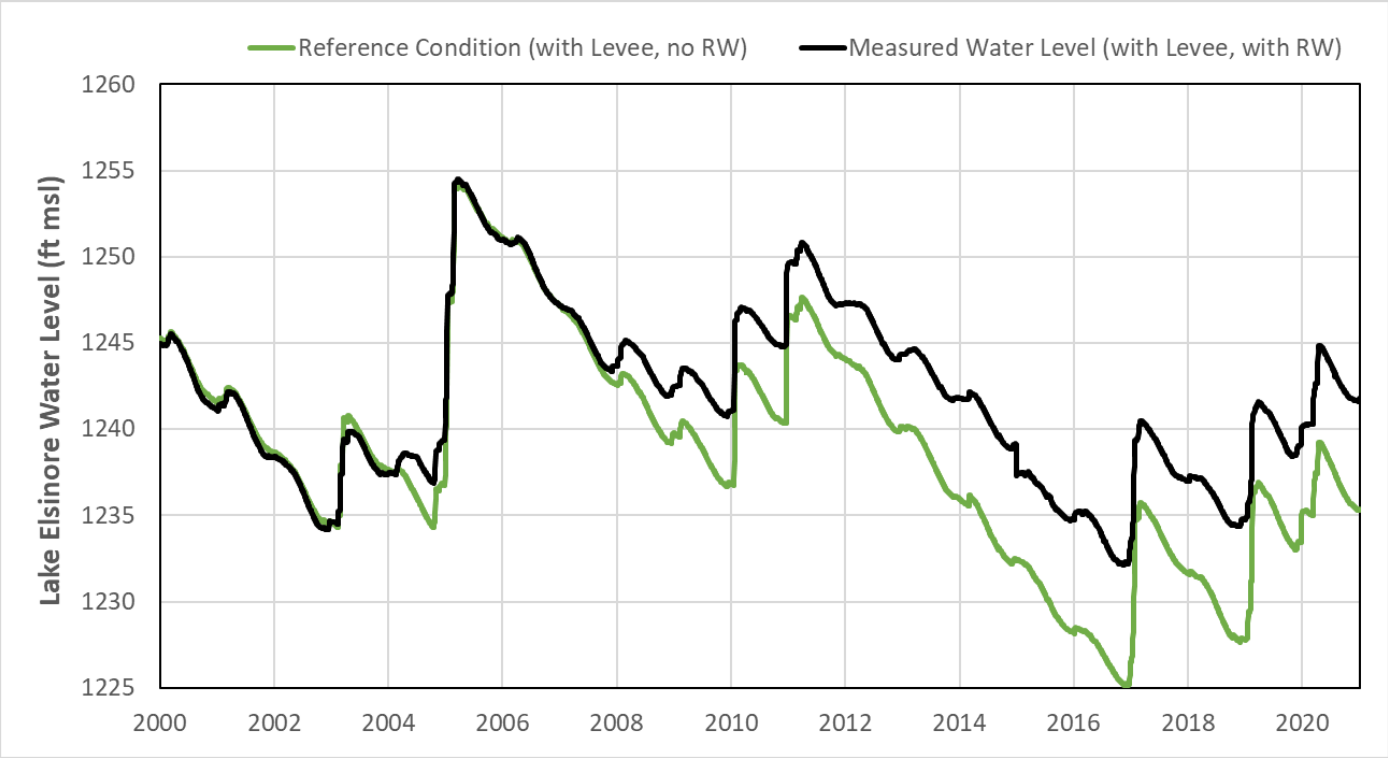


Table 6-3. WLAs for EVMWD Reclaimed Water Additions to Lake Elsinore

EVMWD Reclaimed Water Additions	Flow		Concentration		Nutrient Load	
	mgd	AFY	TP (mg/L)	TN (mg/L)	TP (kg/yr)	TN (kg/yr)
Current Permit	7.5	6,037	0.50	1.00	3,721	7,442
Interim WLA	7.5	8,402	0.32	0.92	3,317	9,535
Final WLA	7.5	8,402	0.16	0.68	1,658	7,048

Section 6 Allocations

- TMDL revision reduces allowable external nutrient loads to lakes relative to 2004 TMDL

Table 6-7. Comparison of Total WLAs and LAs for External Nutrient Sources Between the Proposed Revised TMDLs and Existing 2004 TMDLs

Total Allowable External Loads[1]	Total Phosphorus (kg/yr)			Total Nitrogen (kg/yr)		
	2004 TMDL	TMDL Revision - Interim	TMDL Revision - Final	2004 TMDL	TMDL Revision – Interim	TMDL Revision - Final
Total Canyon Lake	3,845	4,286	2,143	22,268	12,321	9,107
Canyon Lake to Lake Elsinore (LA)	2,770	2,471	1235	20,774	7,104	5,251
Lake Elsinore[2]	6,922	4,717	2,359	29,953	13,562	10,024

[1] Total allowable external load is the TMDL minus allocations for internal sources, e.g. sediment nutrient flux and atmospheric deposition
[2] TMDL includes the LA for Canyon Lake overflows

Section 7 Implementation – Phase 1

- 2004 – Present
- Review of existing controls in watershed and within the lakes

Table 7-4. Change in Median Total Phosphorus and Total Nitrogen Concentrations in Monitored Events from Before and After 2010-2011 Wet Season

Period	San Jacinto River at Goetz Road		Salt Creek at Murrieta		San Jacinto River near Elsinore (Canyon Lake Overflow)	
	TP (mg/L)	TN (mg/L)	TP (mg/L)	TN (mg/L)	TP (mg/L)	TN (mg/L)
Median (Pre-2011)	0.68	2.87	0.62	2.68	0.46	1.89
Median (Post-2011)	0.58	2.10	0.43	2.29	0.15	1.50
Difference	-0.10	-0.77	-0.19	-0.39	-0.31	-0.39
Percent Change	-15%	-27%	-31%	-15%	-68%	-20%

Section 7 Implementation – Phase 2 (Years 1-20)

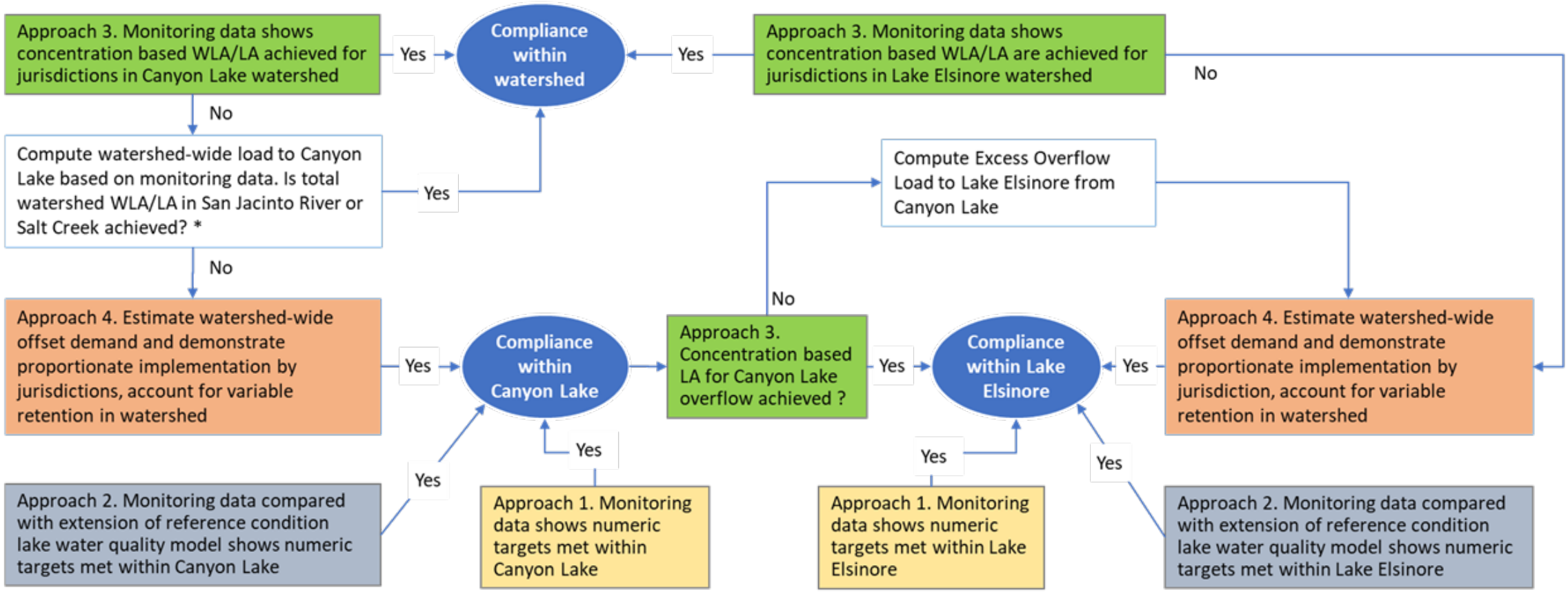
Task	Brief Description	Phase 2 Implementation - Year After Effective Date
		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Task 1 – Stakeholder Coordination	LECL Task Force collaboration at least quarterly	
Task 2 – Revision to Existing Permits and Other Regulatory Actions	Update permits or other regulatory actions to support TMDL implementation	
Task 3 – Revise Existing Watershed Implementation Plans	Revise existing Riverside County MS4 Program CNRP	Watershed Plans
Task 4 – Implementation and/or Revision of Existing In-lake Water Quality Controls for Canyon Lake	Evaluate effectiveness of the Canyon Lake Alum Project and potential feasibility of implementation of other water quality control options	Study Implement Preferred Option(s)
Task 5 – Evaluate In-Lake Control Options to Main Intended Uses in Lake Elsinore	Identify and evaluate feasible water quality control options that may be implemented to improve and maintain water quality in Lake Elsinore for its intended uses; identify preferred option(s)	Report
Task 6 – Implementation of Preferred Option or Options for Water Quality Controls in Lake Elsinore	Prepare schedule to implement findings from Task 5 based on available funding and schedule	Workplan Implement Preferred Option(s)
Task 7 – Revise Lake Elsinore Water Quality Criteria Based on In-Lake Treatment Controls, if applicable	Develop Work Plan to revise water quality criteria applicable to Lake Elsinore	Workplan
Task 8 – Special Study: Evaluate Cyanobacteria in Lake Elsinore	Evaluate HAB conditions in Lake Elsinore and options to manage cyanobacteria and toxicity	Study Study
Task 9 – Special Study: Performance of Watershed Controls	Evaluate performance of updated watershed controls included in the revised and approved watershed implementation plans	Workplan Implement Study
Task 10 – Special Study: Reference Watershed Conditions	Conduct Special Study to validate basis for Phase 2 interim targets and allocations being representative of reference watershed conditions	Workplan Implement Study
Task 11 - Special Study: Lake-bottom Sediment Sampling and Core Flux Experiments	Evaluate status of nutrient enrichment in lake sediments	Study Study
Task 12 – Special Studies: Fishery Management	Evaluate status of Common Carp population in Lake Elsinore	Study Study
Task 13 – Evaluate Status of TMDL Compliance with Interim Targets, Wasteload and Load Allocations	Evaluate status of compliance with TMDLs	
Task 14 – Evaluate Final TMDL Targets, Wasteload Allocations and Load Allocations	Re-evaluate final TMDL targets, wasteload, load allocations, and approaches to demonstrate compliance	Report
Task 15 – Identify Possible Revisions to the TMDLs	As appropriate, prepare necessary documentation to support revisions to the TMDLs	Report
Task 16 – Surveillance & Monitoring Program (SAP)	Update existing SAP for the LECL TMDLs	Sampling and Analysis Plan Sampling and Analysis Plan
Task 17 – Annual Water Quality Reports	Prepare annual water quality reports	

Section 7 Implementation – Phase 3 (Years 21-30)

Task	Brief Description	Phase 3 Program of Implementation Activities									
		21	22	23	24	25	26	27	28	29	30
Task 1 – Stakeholder Coordination	LECL Task Force collaboration at least quarterly										
Task 2 – Revise Existing Watershed Implementation Plans	Revise existing Riverside County MS4 Program CNRP		CNRP for MS4s								
	Revise other existing Watershed Implementation Plans, revise existing Irrigated Lands General Order, as needed			Other watershed plans							
Task 3 – Evaluation of In Lake Water Quality Controls for Canyon Lake	Evaluation and implementation of existing in-lake water quality controls										
Task 4 – Implementation of New or Revised Water Quality Controls for Lake Elsinore	Implement new or revised water quality controls for Lake Elsinore as determined appropriate										
Task 5 – Special Studies – Fishery Management	Evaluate status of fishery populations in Lake Elsinore using consistent sampling and data analysis methods used in previous studies										
Task 6 – Evaluate Status of TMDL Compliance with Final Targets, Wasteload and Load Allocations	Evaluate status of compliance with the final TMDL targets and allocations										
Task 7 – Implementation of Gap Analysis	Based on results of Task 6, determine the load reductions remaining to be achieved to meet the final allocations and targets										
Task 8 - Special Study: Lake-bottom Sediment Sampling and Core Flux Experiments	Two rounds of collection and analysis of lake bottom sediment cores will be collected from historically sampled locations in both Canyon Lake and Lake Elsinore to assess changes to nutrient enrichment after project										
Task 9 - Evaluate Water Quality Control Options for Canyon Lake to Maintain Intended Aquatic Life, Recreational and Municipal Uses, if necessary	Evaluation of reasonably feasible lake management activities in Canyon Lake that may be implemented to improve and maintain water quality for intended uses.										
Task 10 - Evaluate Supplemental Water Quality Control Options for Lake Elsinore to Maintain Intended Aquatic Life and Recreational Uses, if necessary	Evaluate supplemental water quality control options for Lake Elsinore to maintain intended aquatic life and recreational uses, including reduction of harmful algae blooms in frequently used swimming beaches.										
Task 11 - Implementation of New/Refined Water Quality Controls	Implement new/refined projects included in Phase 3 updates to the CNRP and other related watershed management activities (see Task 2); as necessary and applicable										
Task 12 – Surveillance & Monitoring Program	Update TMDL SMP (and QAPP) as needed; updates should include a program to conduct watershed aerial surveys of land use every 5 years, and HAB and cyanotoxin monitoring or both lakes										
Task 13 – Annual Reporting Program	Annual Water Quality Reports										
Task 14 – Adaptive Management	Meet any of the remaining implementation gap (see Task 7) through adaptive management; coordinate project refinements or enhancements with operators and other stakeholders through the TMDL Task Force										

Section 7 Implementation

- Guidance for multiple pathways for future compliance demonstrations



Section 7 Implementation

- Approach 1: Monitoring Data Compared to Numeric Targets

Step 1. Calculate fraction of Main Lake volume with DO > 5mg/L

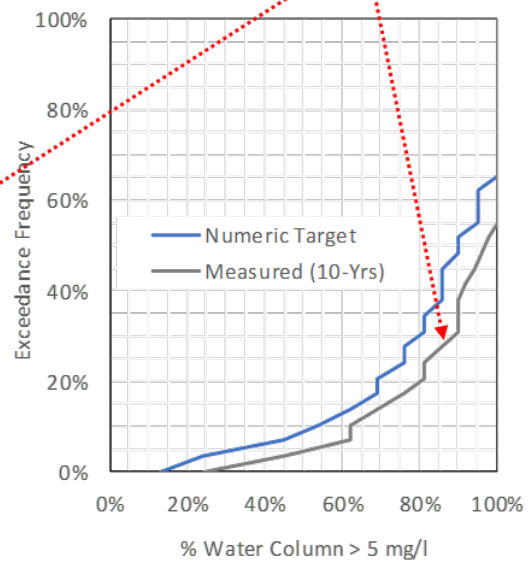
Example for Profile 1 of 60

Water Surface Elevation (ft msl)	Depth of Water (m)	Profile 1 DO Readings (mg/L)	Cumulative Volume (AF)	Incremental Volume (AF)	Volume with DO > 5 mg/L
1382	14.0	9.0	6,537	829	829
1379	13.0	8.5	5,709	766	766
1376	12.0	8.0	4,943	705	705
1373	11.0	8.0	4,238	645	645
1370	10.0	7.0	3,593	587	587
1367	9.0	7.0	3,007	530	530
1364	8.0	6.5	2,477	475	475
1361	7.0	6.0	2,002	421	421
1358	6.0	6.0	1,581	369	369
1355	5.0	5.5	1,212	318	318
1352	4.0	4.5	893	269	0
1349	3.0	4.0	624	221	0
1346	2.0	3.0	403	175	0
1343	1.0	2.5	227	227	0
			Volume (AF)	6,537	5,644
			Fraction above 5 mg/L DO		86%

Step 2. Repeat step 1 for all 60 profiles

Step 3. Plot as CDF

Exceedence Frequency	Fraction of Lake Volume with DO > 5 mg/L	Reference CDF (Numeric Target)
0%	24%	13%
3%	45%	24%
7%	62%	45%
10%	62%	54%
14%	69%	62%
17%	76%	69%
21%	81%	69%
24%	81%	76%
28%	86%	76%
31%	90%	81%
34%	90%	81%
38%	90%	86%
41%	92%	86%
45%	94%	86%
48%	96%	90%
52%	98%	90%
55%	100%	95%
59%	100%	95%
62%	100%	95%
66%	100%	100%
69%	100%	100%



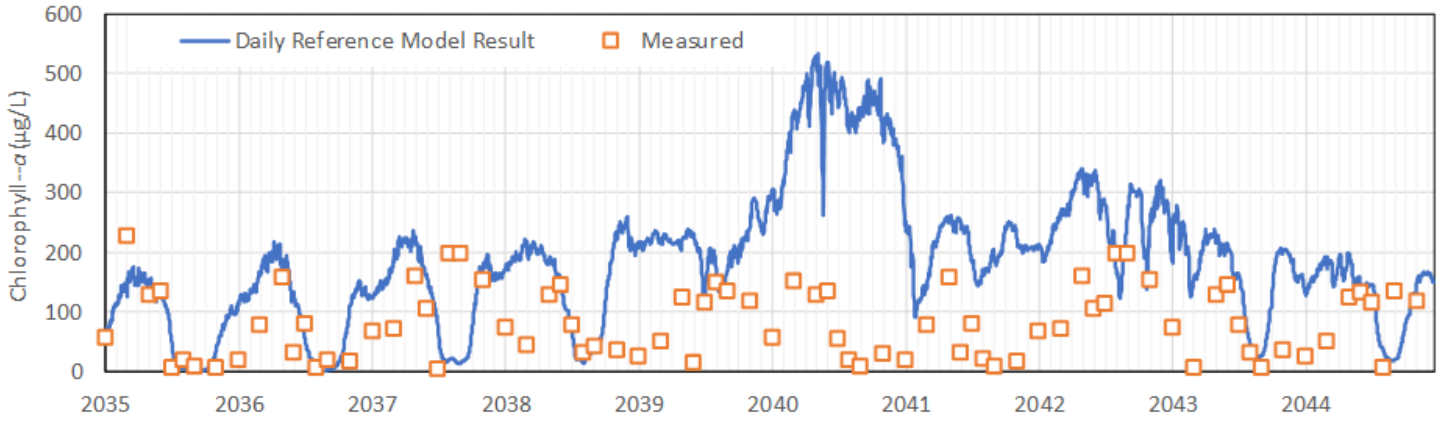
Compliance √

Section 7 Implementation

- Approach 2: Reference Condition Model

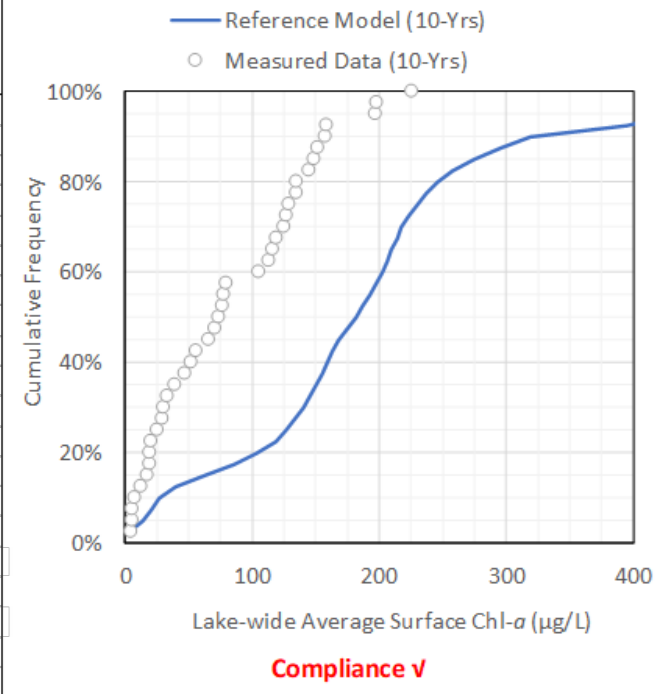
Step 1. Run lake water quality model for preceding five-year period, output daily lakewide average surface chlorophyll-*a* concentration

Step 2. Compile chlorophyll-*a* from monitoring program dataset



Step 3. Plot measured and modeled chlorophyll-*a* (µg/L) as CDF

%ile	Observed Data	Reference Model	%ile	Observed Data	Reference Model
3%	4	3	51%	131	146
5%	5	14	54%	134	149
8%	5	21	56%	134	152
10%	7	27	59%	144	154
13%	11	40	62%	147	157
15%	16	63	64%	150	159
18%	18	86	67%	151	162
20%	18	103	69%	152	165
23%	20	118	72%	155	169
25%	24	126	74%	157	172
28%	28	133	77%	158	175
30%	30	140	79%	179	181
33%	33	145	82%	179	188
35%	38	150	85%	186	194
38%	46	155	87%	188	200
40%	51	159	90%	196	203
43%	55	163	92%	197	206
45%	65	168	95%	200	210
48%	70	175	97%	204	213
50%	72	182	100%	216	222



Compliance √

Section 7 Implementation

- Approach 3: External Load Reduction

Step 1. Compile 10 years of wet weather composite sample concentrations

Year	Storm 1 TP (mg/L)	Storm 2 TP (mg/L)	Storm 3 TP (mg/L)	Storm 1 TN (mg/L)	Storm 2 TN (mg/L)	Storm 3 TN (mg/L)
Year 1	0.27			2.00		
Year 2	0.20	0.43		2.40	2.30	
Year 3	0.18	0.32		4.20	2.10	
Year 4	0.16			4.30		
Year 5	0.10	0.14	0.14	2.10	3.77	3.28
Year 6	0.11	0.21	0.11	1.40	4.12	2.89
Year 7	0.33	0.24	2.88 *	1.20	2.11	16.02 *
Year 8	0.29	0.37		0.80	2.36	
Year 9	0.42			0.96		
Year 10	0.68	0.32		3.40	0.91	
Step 2. Compute 10-yr Average		**0.26**			**2.45**	

* Sample removed from average calculation because of influence of burned hillside erosion (TSS = 3163 mg/L)

Step 3. Determine whether one or both nutrients are reduced to reference concentration	Compliance √ - TP only

Section 7 Implementation

- Approach 4: In-lake Offsets
- Formulas to estimate the excess nutrient load from watershed or reclaimed water sources to be demonstrated through in-lake offsets

- Canyon Lake, $OD_{CL} = (L_{SJR} - V_{SJR}*C_{REF}) + (L_{SC} - V_{SC}*C_{REF})$, where
  - OD_{CL} = Offset demand in Canyon Lake
  - L_{SJR} = Measured load to Canyon Lake from San Jacinto River
  - V_{SJR} = Measured volume to Canyon Lake from San Jacinto River
  - C_{REF} = Reference nutrient concentration
  - L_{SC} = Measured load to Canyon Lake from Salt Creek
  - V_{SC} = Measured volume to Canyon Lake from Salt Creek
- Canyon Lake overflow to Lake Elsinore, $OD_{OVER} = (L_{OVER} - V_{OVER}*C_{REF})$, where
  - OD_{OVER} = Offset demand for Canyon Lake overflows to Lake Elsinore
  - L_{OVER} = Measured overflow load from Canyon Lake to Lake Elsinore
  - V_{OVER} = Measured overflow volume from Canyon Lake to Lake Elsinore
  - C_{REF} = Reference nutrient concentration
- Local Lake Elsinore watershed, $OD_{zone1} = (L_{Zone1} - V_{Zone1}*C_{REF})$, where
  - OD_{zone1} = Offset demand for local Lake Elsinore watershed
  - L_{Zone1} = Estimated load from local Lake Elsinore watershed
  - V_{Zone1} = Estimated volume from local Lake Elsinore watershed
  - C_{REF} = Reference nutrient concentration
- Reclaimed water addition, $OD_{RW} = V_{RW} * (C_{RW} - C_{REF})$
  - OD_{RW} = Offset demand for reclaimed water addition to Lake Elsinore
  - V_{RW} = Measured volume of reclaimed water addition to Lake Elsinore
  - C_{RW} = Measured nutrient concentration of reclaimed water addition to Lake Elsinore
  - C_{REF} = Reference nutrient concentration

Section 7 Implementation

- Guidance for data to support multiple pathways for compliance demonstration

Table 7-10. Summary of Minimum Watershed and In-Lake Data Needs to Apply Compliance Demonstration Approaches (see text)

Compliance Approach	Description	Metric				Reclaimed Water
			Canyon Lake East Bay	Canyon Lake Main Lake	Lake Elsinore	Lake Elsinore
Approach 1 – Monitoring Data Compared to Numeric Targets (Section 7.3.1)	Compliance demonstrated if in-lake monitoring data are equal to or better than numeric target CDFs (see Section 3)	10-yr CDF	1. Average of bi-monthly samples collected at sites CL07 and CL08 (n=60)	1. Average of bi-monthly samples collected at sites CL09 and CL10 (n=60)	1. Single site LE2 sampled 8 times per year (n=80)	N/A
Approach 2 – Reference Condition Model (Section 7.3.2)	Evaluates the current monitoring data against modeled water quality for a reference condition over the same hydrologic period	10-yr CDF	1. Average of bi-monthly samples collected at sites CL07 and CL08 (n=60) *AND* 2. 10-yr AEM3D model simulation of reference condition over the same compliance assessment period	1. Average of bi-monthly samples collected at sites CL09 and CL10 (n=60) *AND* 2. 10-yr AEM3D model simulation of reference condition over the same compliance assessment period	1. Single site LE2 sampled 8 times per year (n=80) *AND* 2. 10-yr GLM model simulation of reference condition over the same compliance assessment period	
Approach 3 – External Load Reduction (Section 7.3.3)	Demonstrating compliance with allowable concentrations that show nutrients in external sources have been reduced to be equal to or below the allocations	10-yr average concentration at end of pipe	At least 15 wet weather grab samples			Monthly TP/TN concentrations
Approach 4 – In-Lake Offsets (Section 7.3.4)	Meeting WLAs/LAs by reducing internal loads by the amount of external load in excess of reference conditions	10-yr average excess load, in-lake control effectiveness demonstration	Salt Creek USGS Gauge #11070465 runoff volume; flow-weighted samples at Murrieta Road (n=~30)	San Jacinto River USGS Gauge #11070365 runoff volume; flow-weighted samples at Goetz Road (n=~30)	San Jacinto River USGS Gauge #11070500 runoff volume; Canyon Lake Overflow flow-weighted samples (n=~15)	Metered discharge; monthly TP/TN concentrations

Section 8 Monitoring

- Monitoring plan update at start of Phase 2

Table 8-1. Summary of Elements for Inclusion in Revised TMDL Monitoring Program

Waterbody	Elements Recommended for Inclusion in Revised TMDL Monitoring Program
San Jacinto River Watershed	• Re-inclusion of the Cranston Guard Station (see text) • Add two new monitoring stations below reference sub-watersheds (see text) • Reduce the storm mobilization criteria for the October 1 to December 31 period from a 1.0-inch to a 0.5-inch forecast within 24-hours. The January 1 through April 30 mobilization criteria remains the same.
Lake Elsinore	• Discontinue the afternoon water column profile at each existing monitoring station. Analysis of water column profiles will continue to be performed once in mid to late morning during each monitoring event. • Utilize the two EVMWD multi-depth in-lake water quality sondes in combination with fixed depth DO sondes mounted just under the surface at both EVMWD sondes. These data will supplement the single point-in-time water column profiles recorded during each field monitoring event. • Incorporate Sentinel-2 satellite imagery (10-m resolution) for chlorophyll-*a* and turbidity measurements during months in which it is available (September through May), and LandSat 8 satellite imagery (30-m resolution) during all other months (June through August).
Canyon Lake	• Discontinue the afternoon water column profile at each existing monitoring station. Analysis of water column profiles will continue to be performed once in mid to late morning during each monitoring event. • Utilize a combination of fixed depth in-lake DO and temperature sondes to supplement single point-in-time water column profiles recorded during each field monitoring event. • Add Station CL09 to sites being monitored for full analyte list during each event. • Add total and dissolved aluminum to the analyte list for all sites to assess any influences from alum treatments in Canyon Lake. • Incorporate Sentinel-2 satellite imagery (10-m resolution) for chlorophyll-a and turbidity measurements during months in which it is available (September through May), and LandSat 8 satellite imagery (30-m resolution) during all other months (June through August)

Section 9 CEQA

- No potential adverse environmental impacts associated with the Proposed Project or reasonably foreseeable methods of compliance
- No action alternative would leave existing TMDLs in place - water quality controls implemented under the No Action Alternative and the associated water quality improvements would occur at a functionally equivalent level to the Proposed Project

Section 10 Economic Considerations

- Supplemental project concepts and planning levels cost estimation