LAKE SAN MARCOS REMEDIATION
PROGRESS AND STATUS UPDATE

San Diego Water Board Meeting Agenda Item 9
December 14, 2016

Presented by:

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Representing **Citizens Development Corporation**

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Representing **County of San Diego and Public Agencies**

This presentation was not prepared by or submitted on behalf of any one party

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COOPERATING PARTIES

Citizens Development Corporation (CDC)

VALLECITOS WATER DISTRICT
Water and Wastewater Specialists since 1955

ESCONDIDO
City of Choice

CITY OF SAN MARCOS
VALLEY OF DISCOVERY
INCORPORATED JANUARY 28, 1963
CHARTERED JULY 4, 1994

THE NOBLEST MOTIVE IS THE PUBLIC GOOD
COUNTY OF SAN DIEGO
MDCCCLI

AGENDA

Project Background and Summary

Process, Progress, and Findings

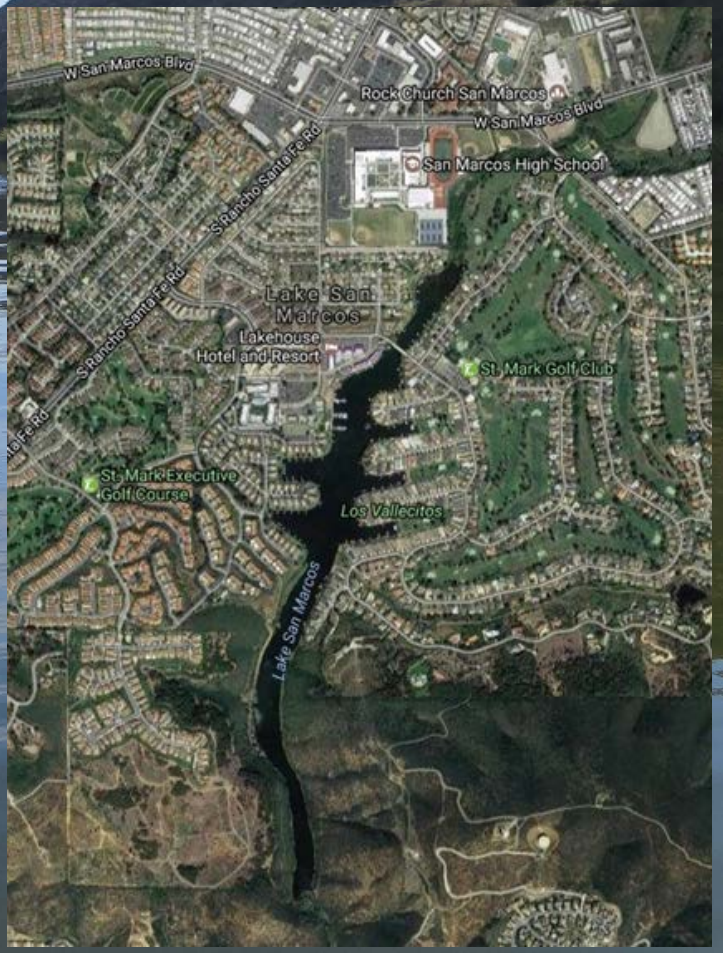
Recommended Lake Remedial Actions

Recommended Watershed Remedial Actions

Q&A

BACKGROUND

- Lake San Marcos is a *eutrophic* lake
- 2006: listed under the Clean Water Act 303(d) for Ammonia as Nitrogen and Nutrients
- September 2011: RB issued Investigative Order No. R9-2011-0033
- February 2012: CDC filed suit against watershed parties under CERCLA



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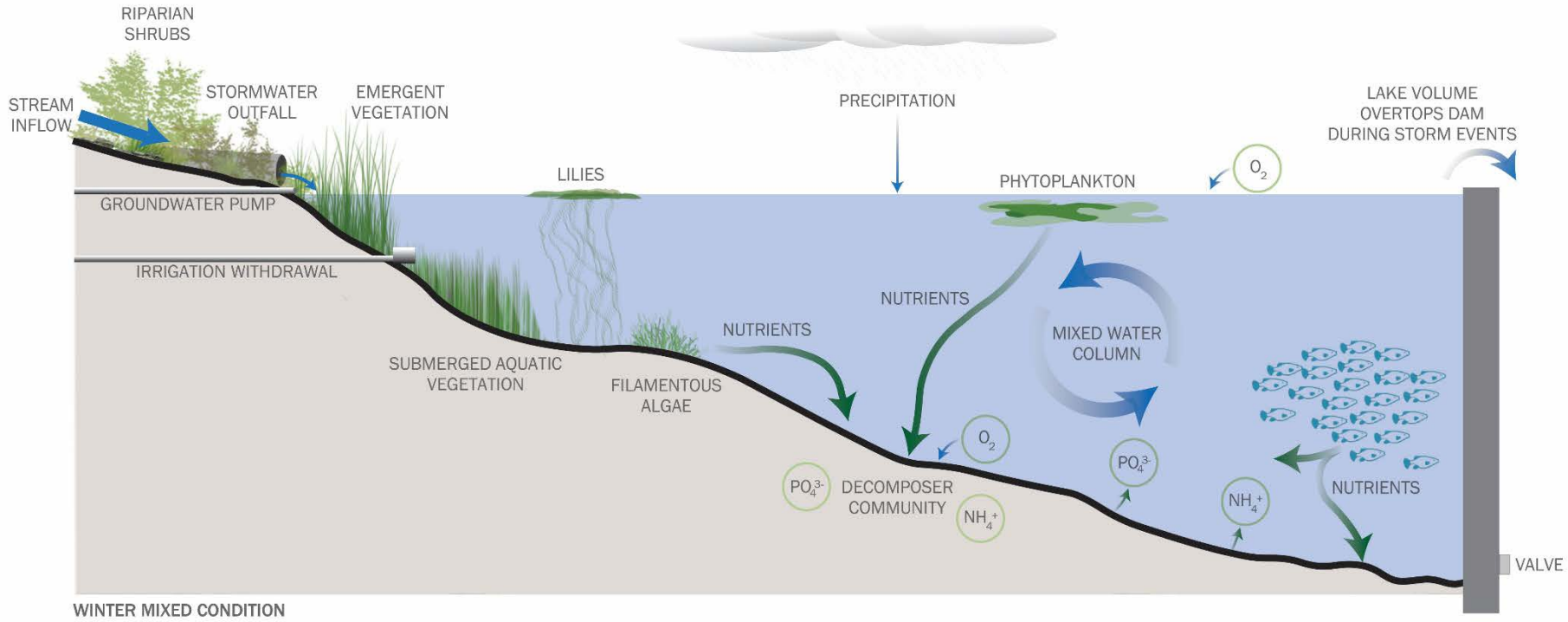
SUMMARY OF WATER QUALITY ISSUES

Winter Predominant Source:

Nutrients from the Watershed enter LSM from the Creek

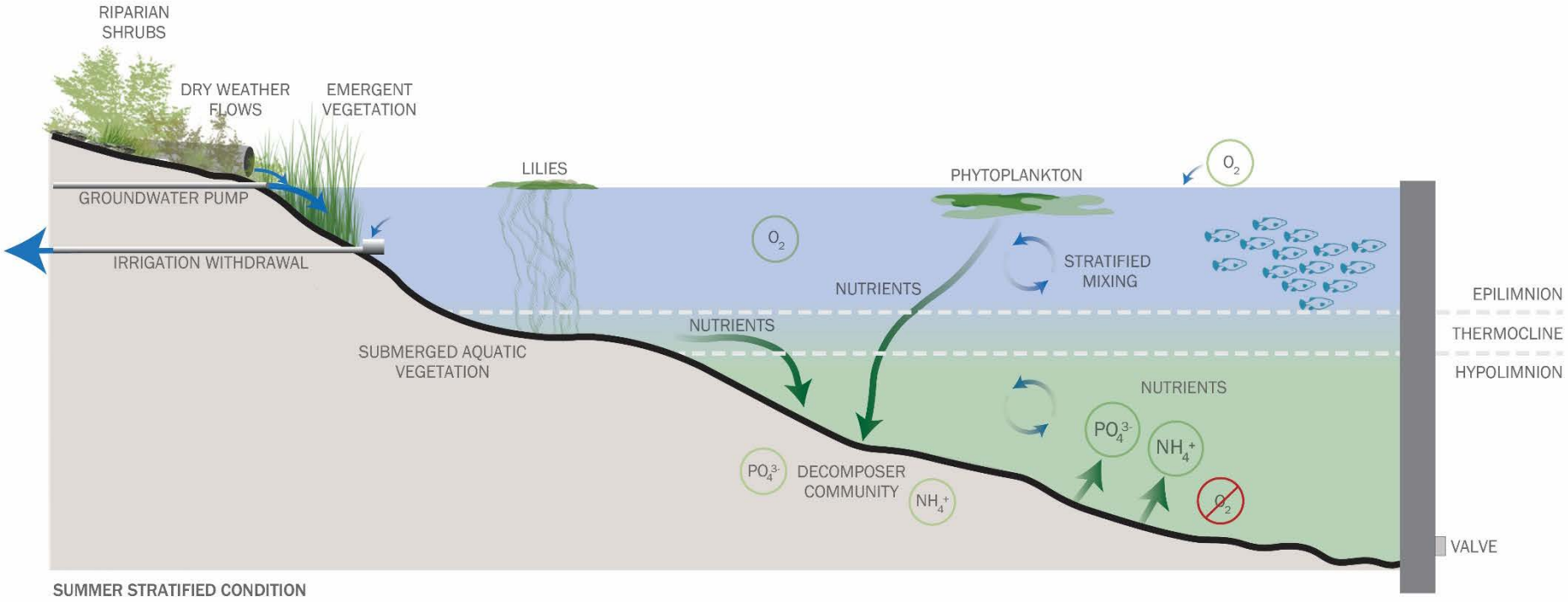


SUMMARY OF WATER QUALITY ISSUES

Summer Predominant Source:

Stratification contributes to Sediment Flux

Sediment Flux: Anoxic water at bottom of the Lake pulls nutrients out of sediment



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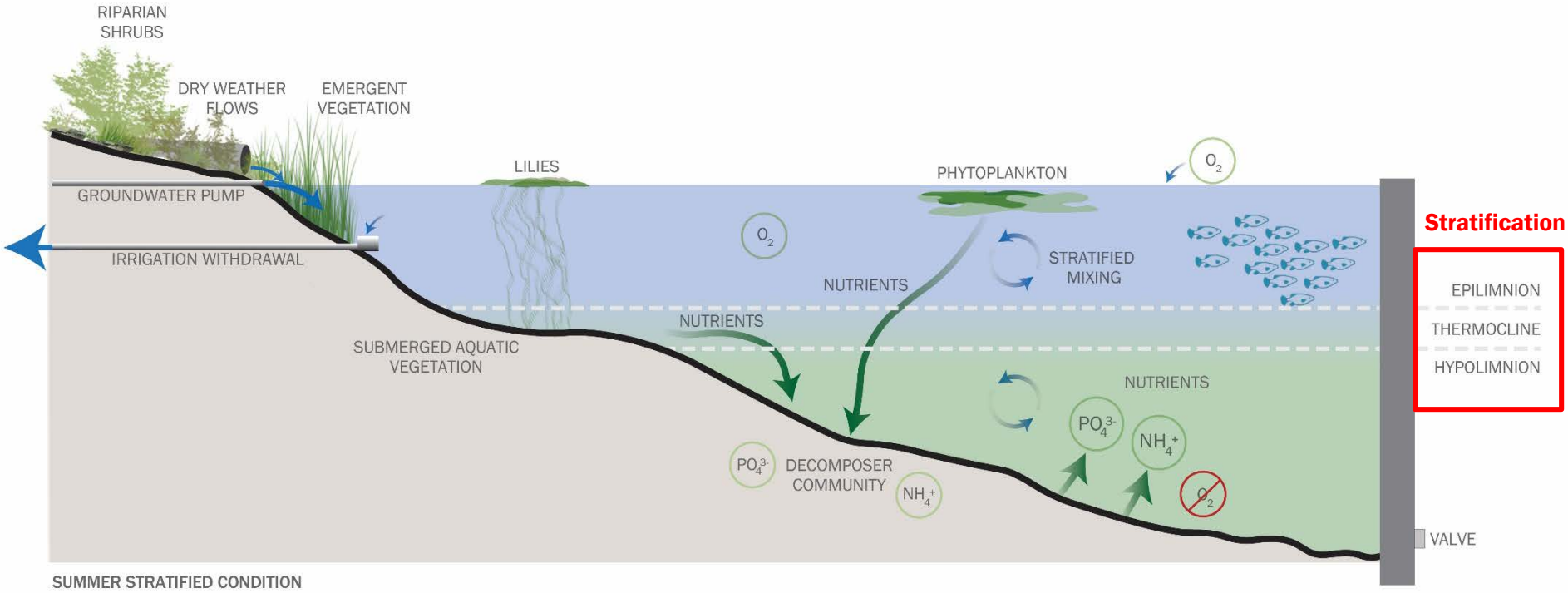
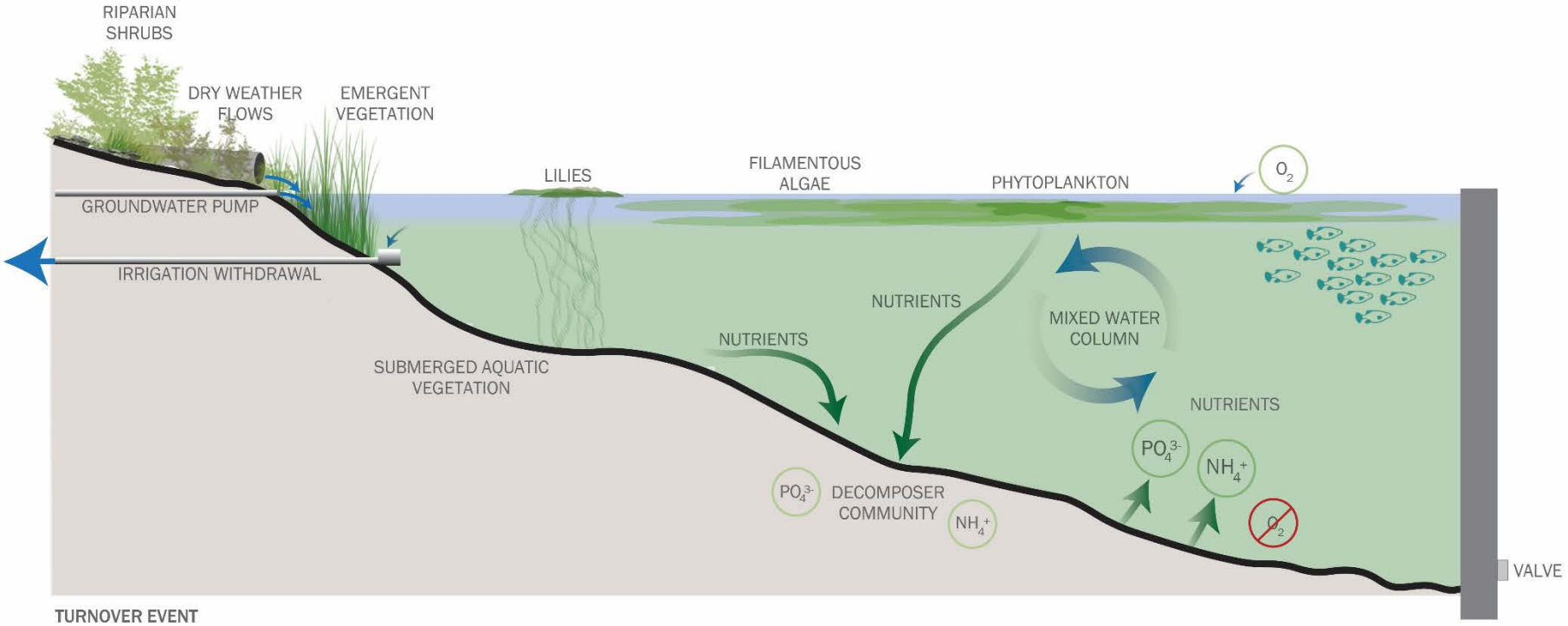


SUMMARY OF WATER QUALITY ISSUES

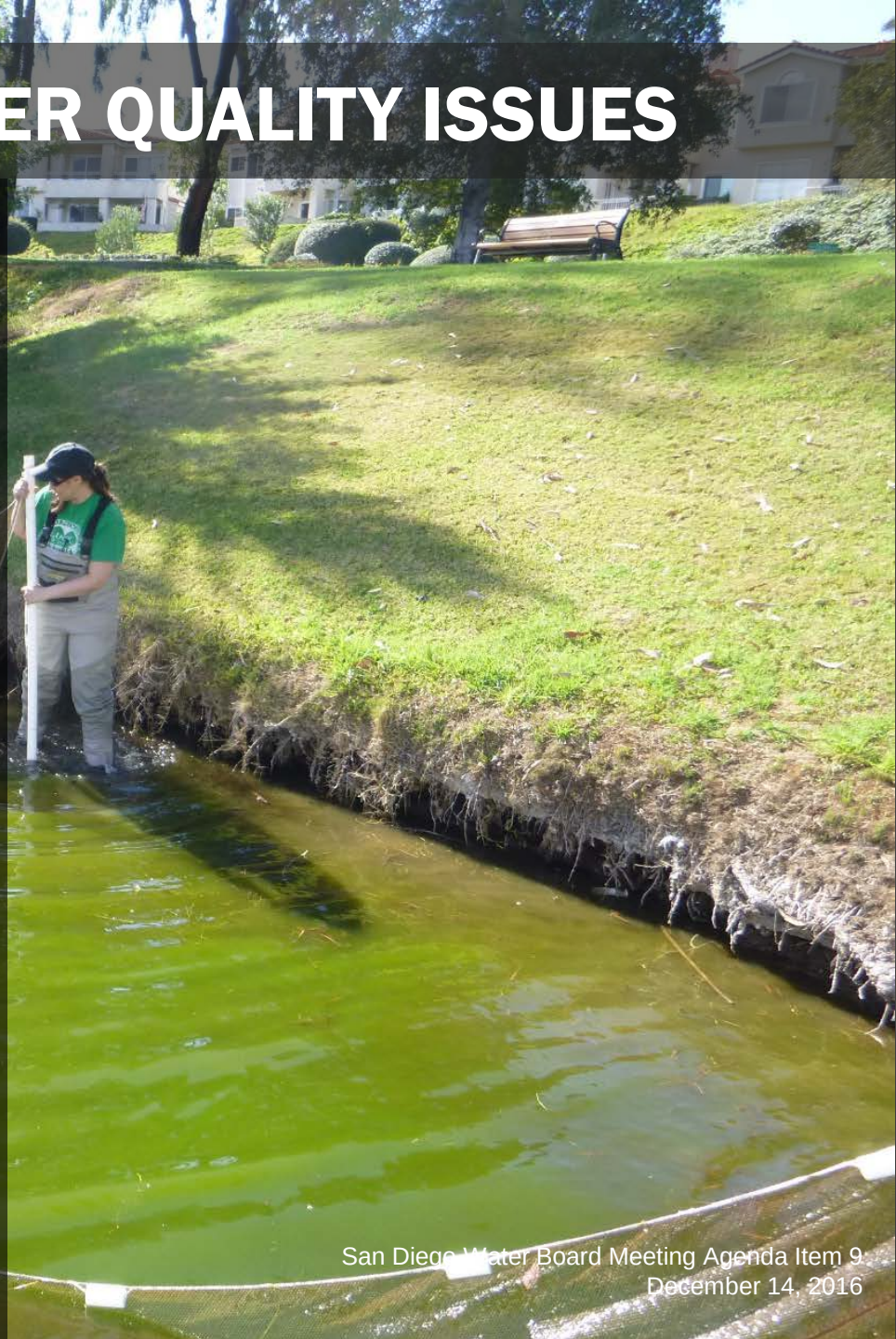
Fall Turnover:
Stratification breaks down and nutrients are mixed throughout Lake



SUMMARY OF WATER QUALITY ISSUES

Takeaway: High levels of nitrogen and phosphorus drive eutrophic conditions, which include:

- Algal Blooms
- Fish Kills
- Odors
- Turbid water
- Excessive aquatic plant growth



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PROJECT PATHWAYS

Two tracks: Investigative Order and RI/FS Process

Track 1:
2011 Investigative Order
(CDC Only)

Track 2:
RI/FS Process
(Cooperating Parties)

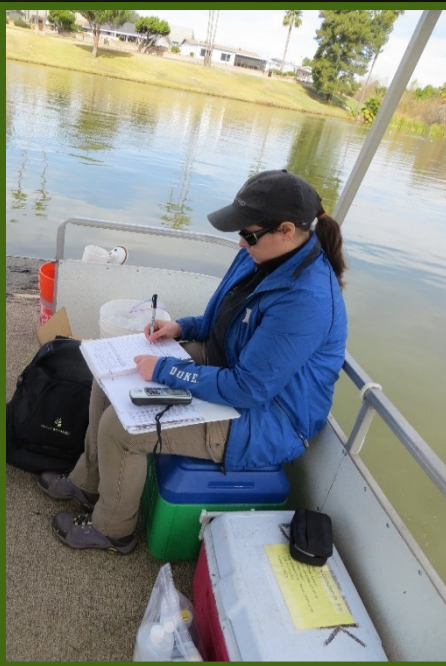
2016 - Regional Board determined that the Remedial Investigation/Feasibility Study (RI/FS) Report Satisfies the Investigative Order Requirements

Lake Remediation Solution will be Jointly Addressed by CDC and Public Agencies

REMEDIAL INVESTIGATION ACTIVITIES

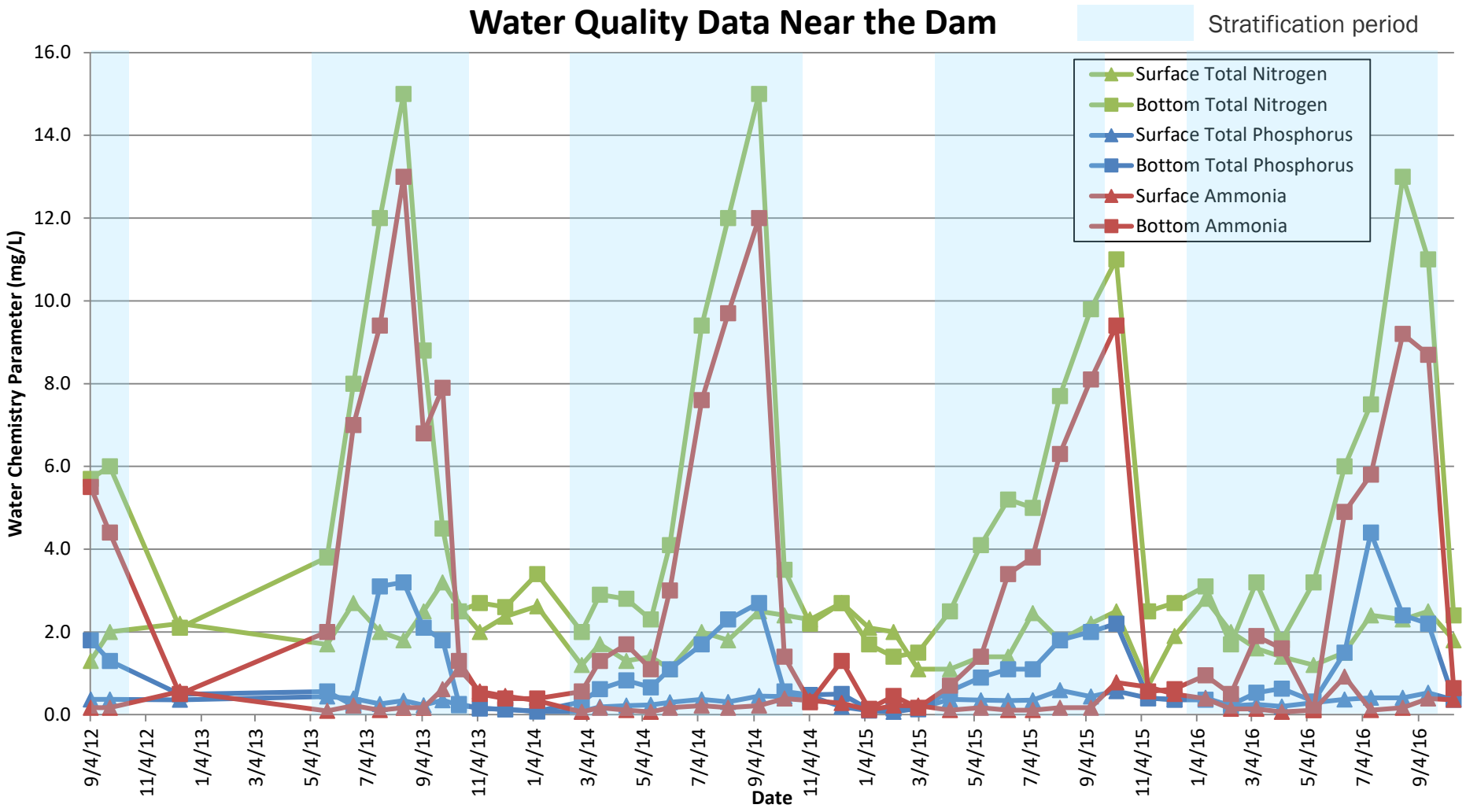
- Lake and Creek Monitoring
- Lake Data Collection
- Lake Modeling Efforts



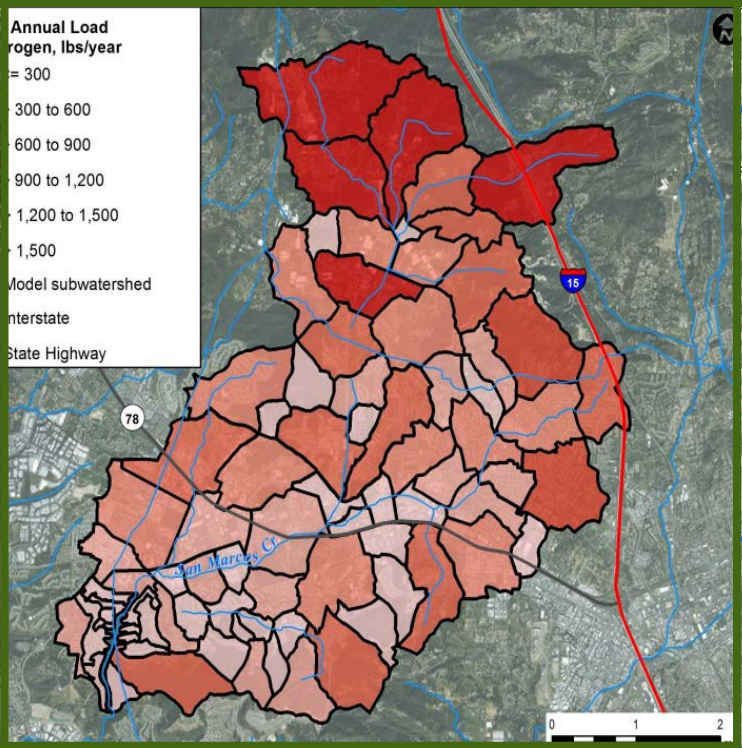
These activities have also supported the RI/FS process

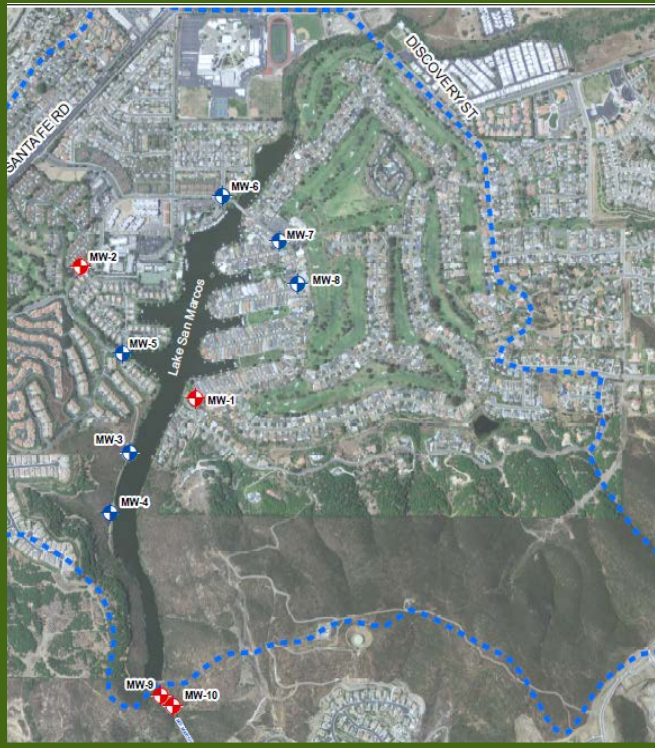
WATER QUALITY MONITORING 2012-2016



REMEDIAL INVESTIGATION ACTIVITIES

- Watershed Monitoring
- Watershed Data Collection
- Watershed Modeling Efforts





REMEDIAL INVESTIGATION
SUMMARY OF FINDINGS - SOURCES

1. Wet-Weather Watershed Runoff Contributes Nutrients and Sediment
2. Lake Stratification Results in Nutrient Release from Sediments, Particularly in Deep Lake
3. Must address *both* #1 & 2

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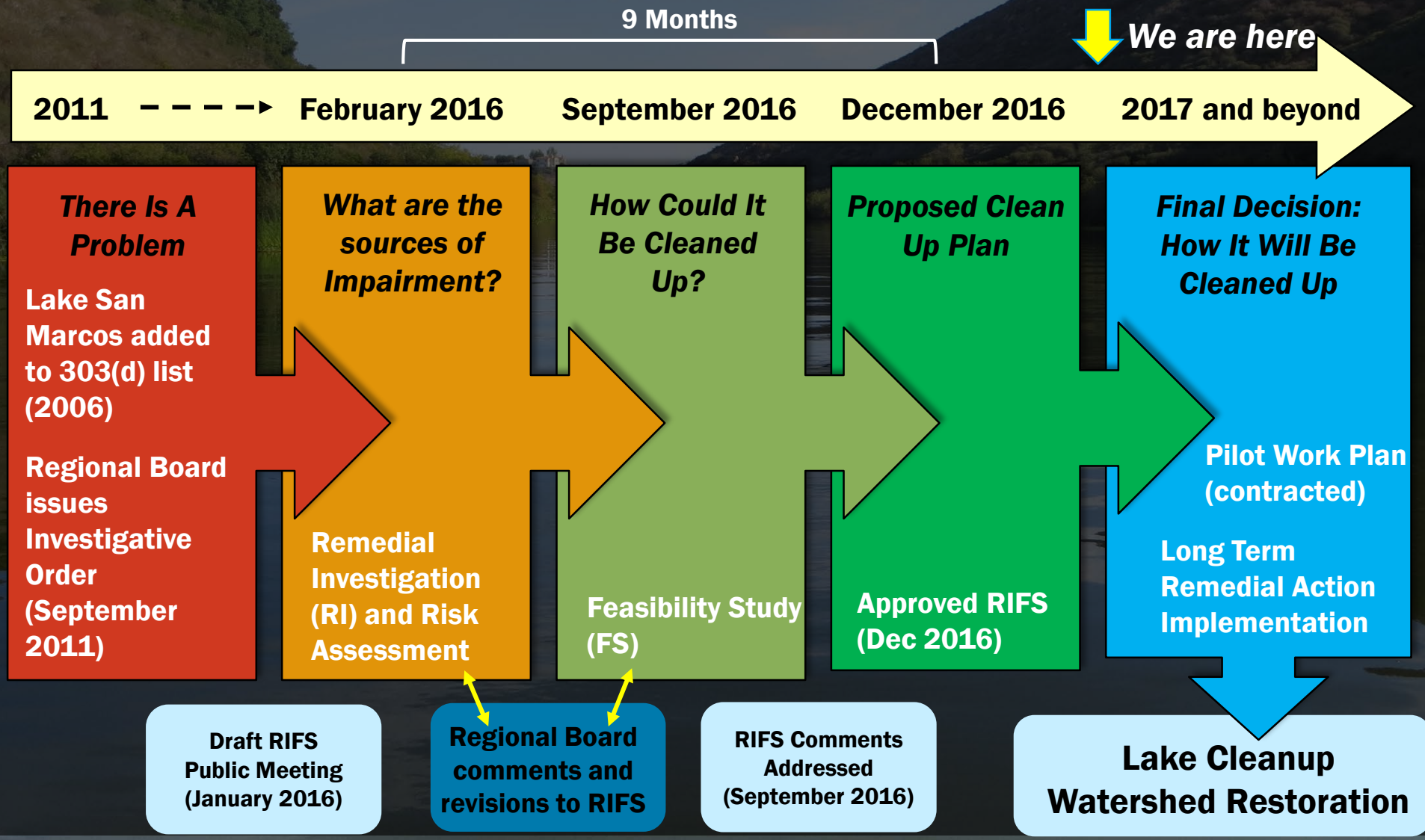
RI/FS PROCESS & TIMELINE



MAJOR ACCOMPLISHMENTS

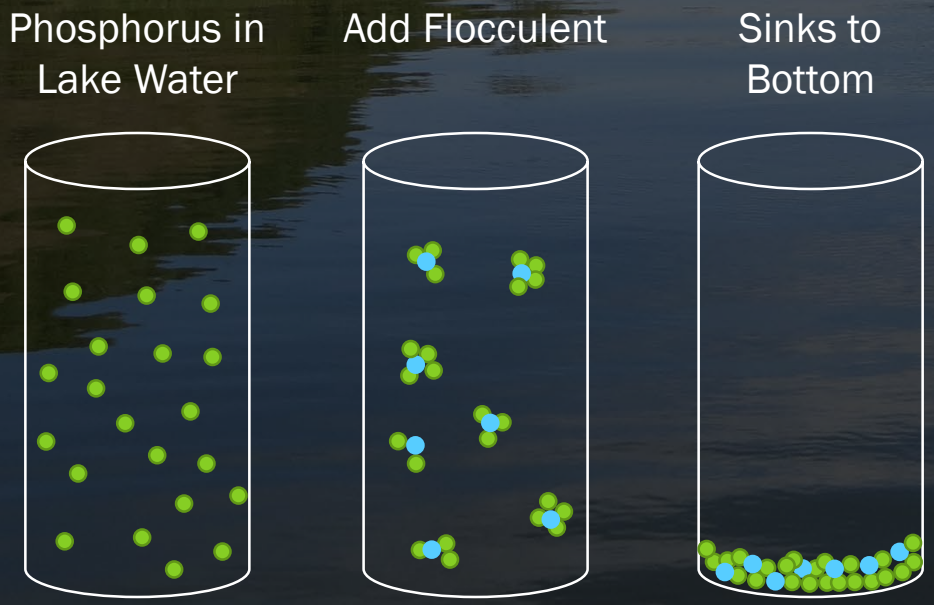
- Collected Additional Watershed and Lake data;
- Compiled and Interpreted available data from numerous sources for the RI/FS;
- Performed Risk Assessments;
- Prepared Inter-dependent Watershed and Lake Models;
- Identified and prioritized nutrients sources;
- Submitted RI/FS to RWQCB and responded to comments;
- Communication: Three public Meetings, Weekly Technical Team Calls, Monthly RWQCB Update Calls;
- Screened potential Lake remedies;
- Submitted potential Watershed restoration technologies matrix to the RWQCB;
- Currently *on schedule* for preparing Watershed and Lake Pilot Work Plans.

FS RECOMMENDED ACTIONS

Watershed Recommendations	
Alternative W3	Supplemental BMPs
Alternative W4	Stream Restoration
Lake Recommendations	
Alternative L2	Diffused Aeration
Alternative L4	Phosphorus Inactivation
Alternative L6	Selective Withdrawal

FS RECOMMENDED LAKE STRATEGIES

Lake Recommendations	
Alternative L2	Diffused Aeration
Alternative L4	Phosphorus Inactivation
Alternative L6	Selective withdrawal



Objectives:

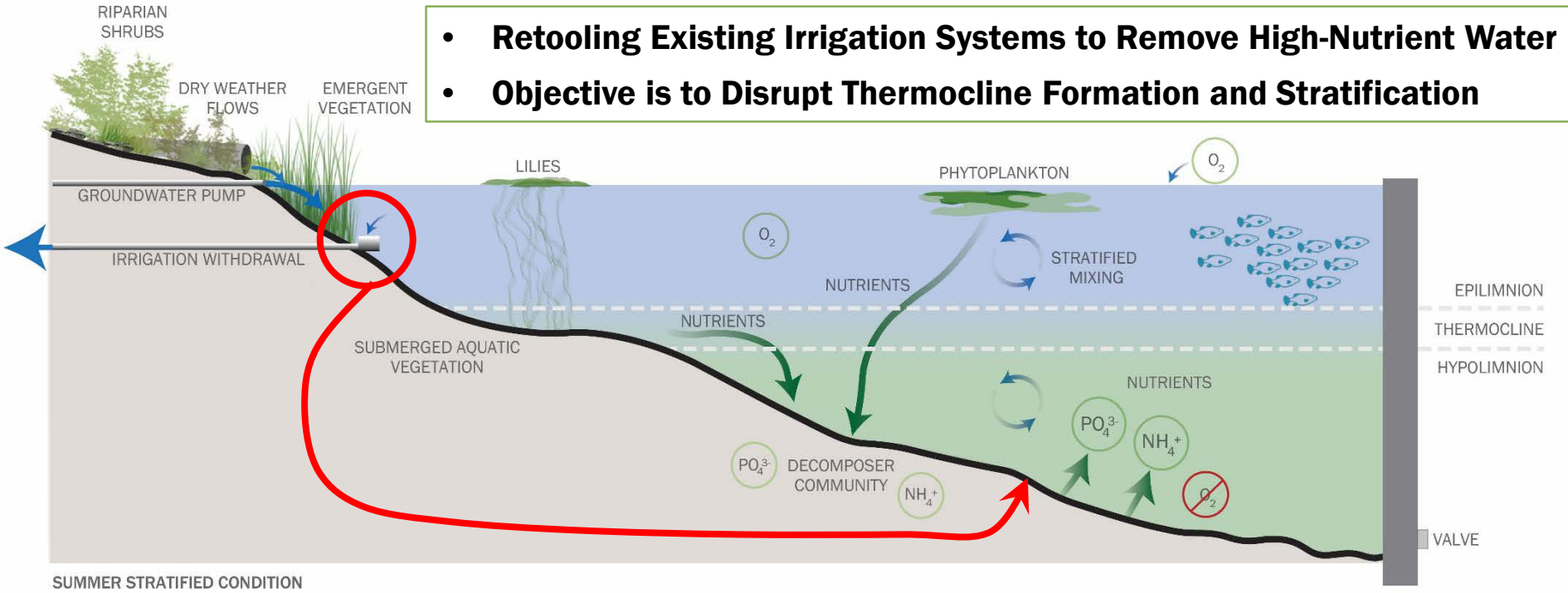
Remove phosphorus from water column

Sequester nutrients in sediments

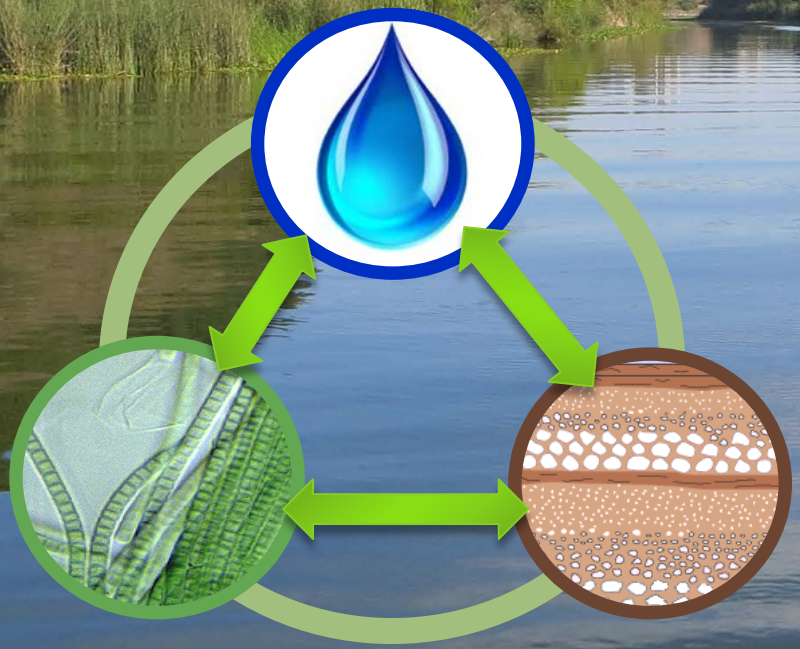
FS RECOMMENDED LAKE STRATEGIES

Lake Recommendations	
Alternative L2	Diffused Aeration
Alternative L4	Phosphorus Inactivation
Alternative L6	Selective withdrawal

- **Retooling Existing Irrigation Systems to Remove High-Nutrient Water**
- **Objective is to Disrupt Thermocline Formation and Stratification**



NEXT STEPS - LAKE



Remedial Action Plan (jointly in development)

Lake Pilot Studies (implementation of flocculent application in Summer 2017)

- Permitting Support for actions under R9-2012-0063 and
- Ongoing Coordination with State Board

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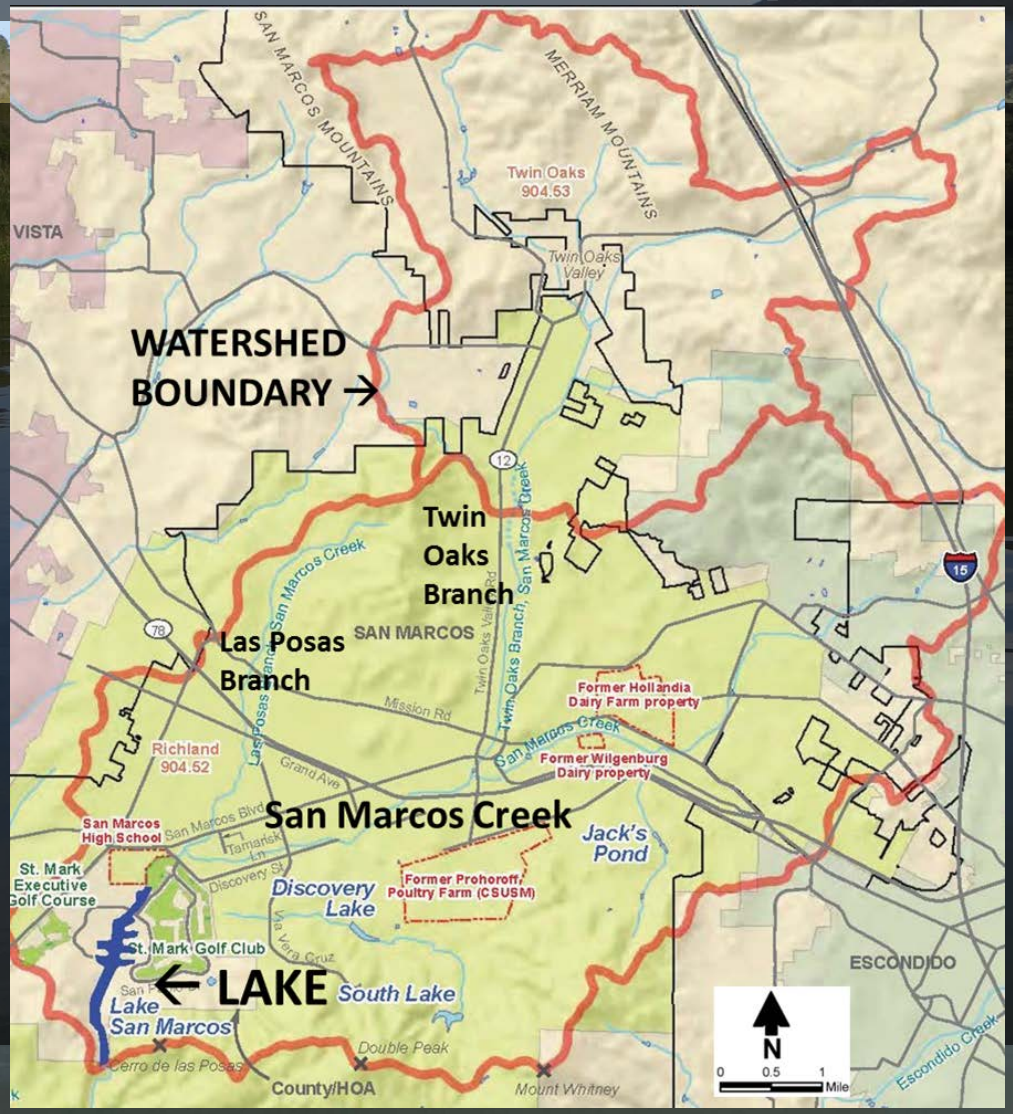
WATERSHED REMEDIAL ACTIONS

Site Location Map



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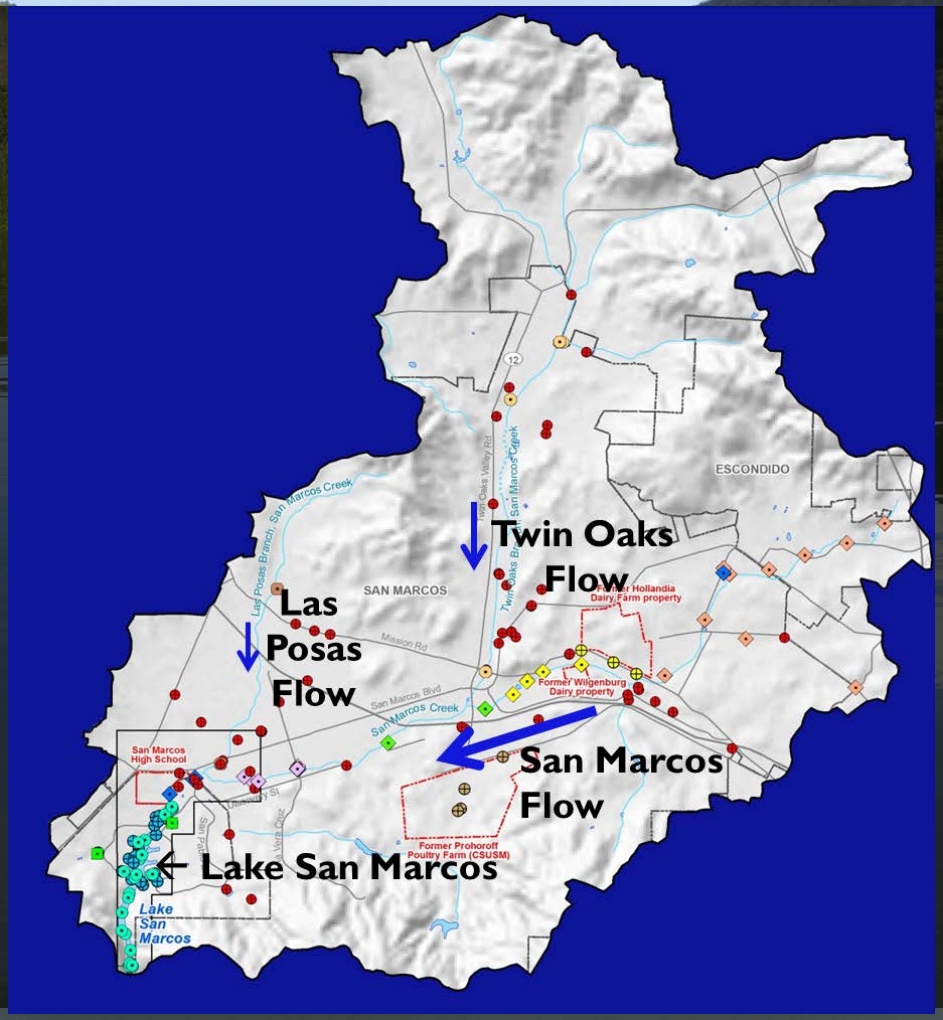
WATERSHED REMEDIAL ACTIONS

Relative Flow Rates



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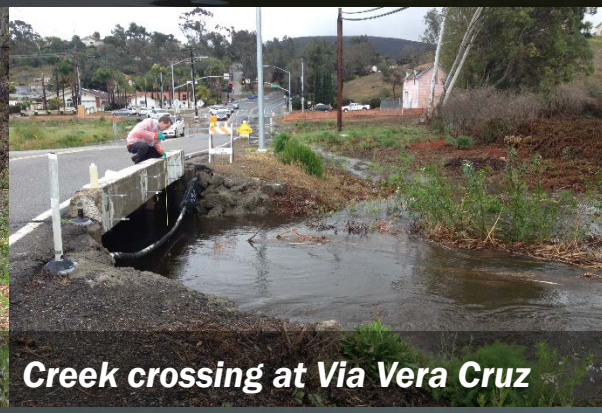
FS RECOMMENDED WATERSHED STRATEGIES

Watershed Recommendations	
Alternative W3	Supplemental BMPs
Alternative W4	Stream Restoration

- Supplemental BMPs could be implemented in concert with existing programs to control run-off to the Creek
- Stream restoration to increase stormwater capacity and water retention time, facilitate nutrient uptake by plants and soils, promote groundwater recharge, and reduce erosion-driven transport of sediment and nutrients to the Lake

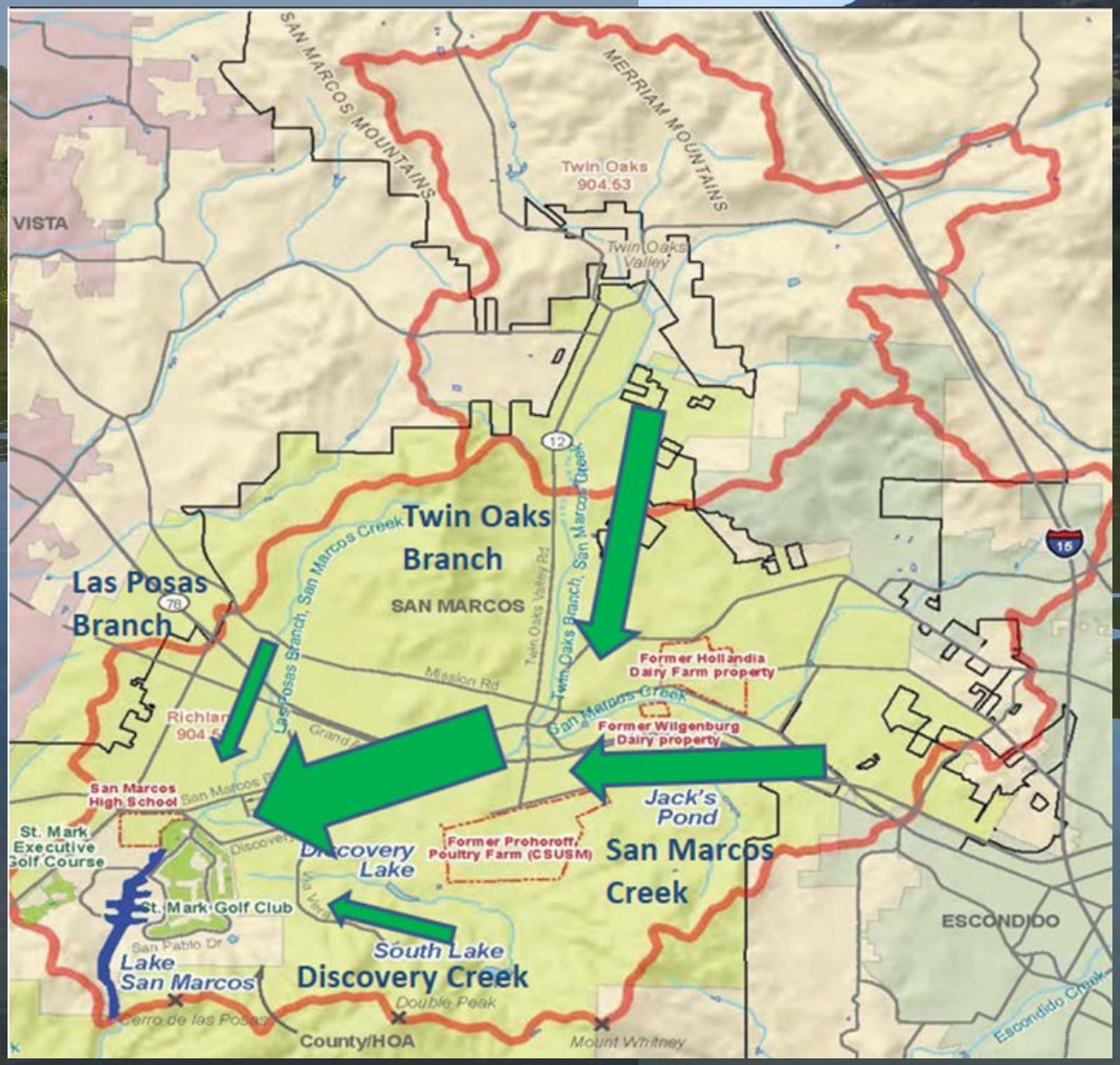
Agricultural buffer strips

Creek during storm



Creek crossing at Via Vera Cruz

RELATIVE NUTRIENT LOADS FROM WATERSHED



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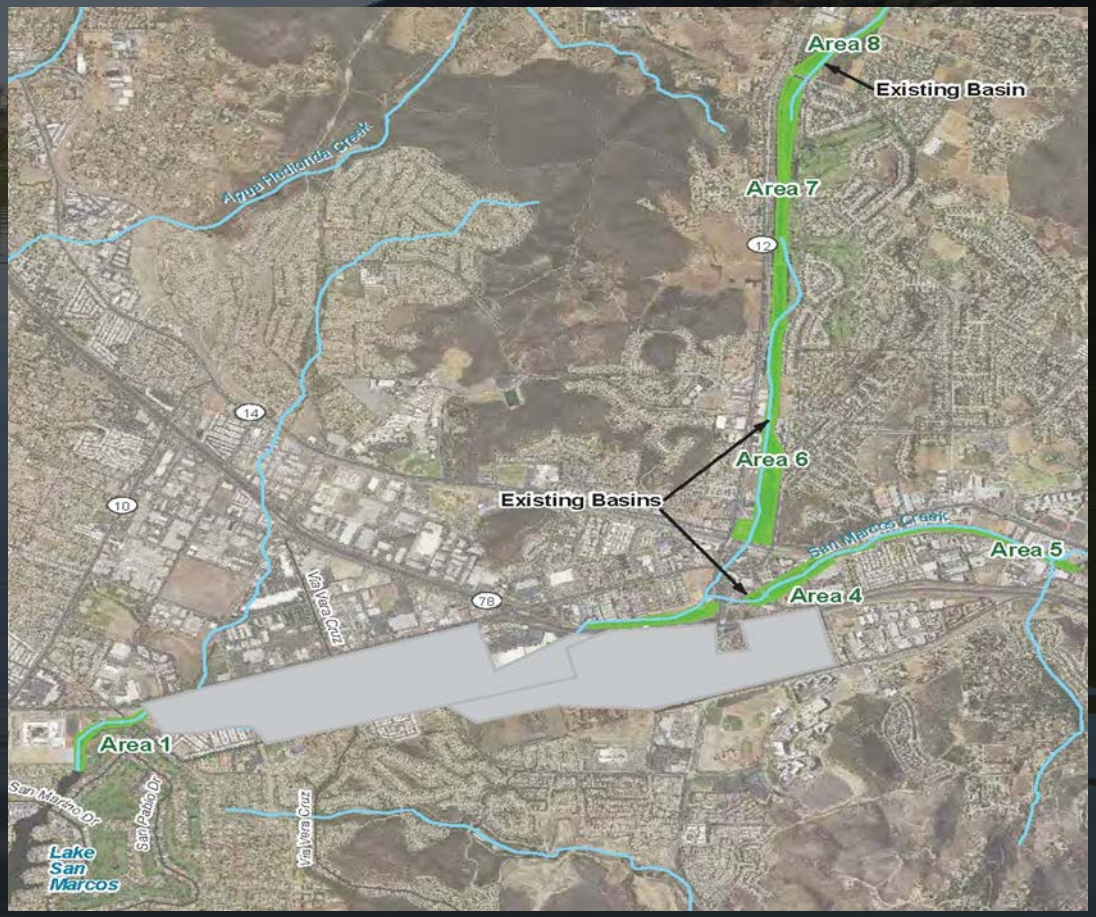
WATERSHED CONCEPTUAL STREAM RESTORATION

Buck Gully, Newport Beach



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WATERSHED CLEANUP OPTIONS/ACTIONS

Stream Restoration / Nutrient Control Benefits

- Restore Native Wetlands/Vegetation
- Reduced Erosion/sediment
- Slower Flow, less TSS, more Oxygen
- Increased Infiltration to groundwater
- Increased Nutrient uptake
- Supplement Nutrient Control with Flocculent

WATERSHED CLEANUP OPTIONS/ACTIONS

Watershed Pilot Testing Goals

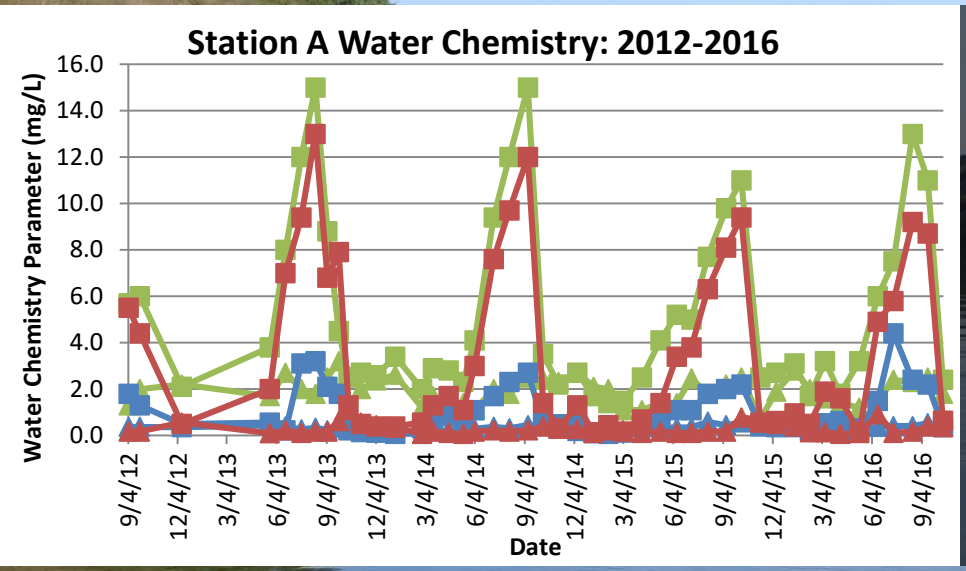
- Permitting issues for stream reconfiguration
- Sampling and analysis of soil types for infiltration and groundwater recharge
- Using the Watershed Model to “size” and locate retention basins to minimize treatment
- Stormwater capture and treatment with flocculent to remove nutrients
- Test/measure treatment of stormwater and flocculent as treated stormwater is released

WATERSHED CLEANUP OPTIONS/ACTIONS

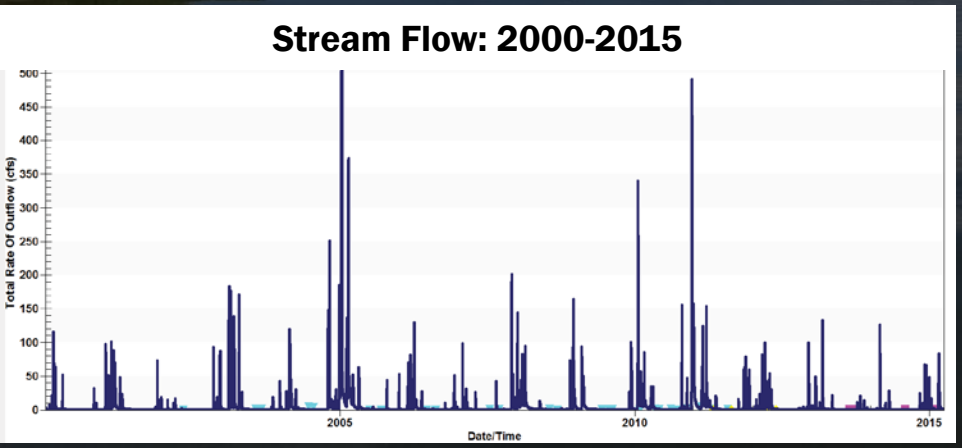
Watershed Pilot Testing

- Presented list of potential pilot/remediation sites to RWQCB
- Proposed treatment options presented to RWQCB to discuss permitting options
- Workplan Preparation/Submittal to RWQCB
- Permitting with RWQCB, USACE, Fish & Wildlife, Municipalities
- Property ownership determination/access discussions
- Field Implementation/Data Collection/Analysis/Reporting
- Analysis for Scalability, full scale implementation

TIMING OF PILOT STUDIES



Lake Remedies are Coordinated to address Summer Stratification-Related Nutrient Inputs (Late Spring/Summer)



Watershed Remedies are Coordinated to address Nutrient Inputs from Watershed Sources (Winter)

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FUTURE PROGRESS

- The PADs and CDC have demonstrated substantial progress towards restoring the lake and watershed
- We intend to continue this progress with pilot testing and full-scale remedy implementation
- We prefer to continue working with the Water Board under a voluntary agreement

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