LAKE COUNTY WATER RESOURCES DEPARTMENT
LAKE COUNTY WATERSHED PROTECTION DISTRICT

BLUE RIBBON TECHNICAL SUBCOMMITTEE
APRIL 19, 2019
RUNNING CREEK CASINO, UPPER LAKE, CA

Acknowledgments and Thanks

Blue Ribbon Committee for the Rehabilitation of Clear Lake

Outline

- Introduction to Clean Water Program
- Water Quality Activities in Lake County
  - Current & Future
  - Data
- TMDL Activities– Lake County Perspective
  - Data
  - Current & Future

Clean Water Program
Storm Water Management

Clean Water Program

Home | Water Issues | Programs | Stormwater | Phase II Municipal

Phase II Small Municipal Separate Storm Sewer System (MS4) Program

Quick Links

- Amendments to the statewide Small MS4 General Permit to include TMDLs
- Phase II Small MS4 Permit
- Trainings and Meetings

Storm Water Management Plan

Fiscal Years 2003-2004 through 2007-2008

Lake County Clean Water Program

County of Lake | City of Clearlake | City of Lakeport

Program Management Council
(At least one representative from each Co-permittee)

Purpose – Provide overall program management and monitor implementation of SWMP / MS4 permits / applicable provisions & amendments.

Representatives may include:

- Storm Water Program Coordinators (Angela, Kevin/Bonnie, Clearlake?)
- Board of Supervisors Members (E.J. Crandell)
- City Council Members (
- Program Workgroup Members

Public Education and Outreach

Public Participation/ Involvement

Illegal Discharge Detection and Elimination

Construction Site Storm Water Runoff Control

Post-Construction Storm Water Management

Pollution Prevention/ Good Housekeeping for Municipal Operations

Total Maximum Daily Load

Program Effectiveness Assessment and Improvement Plan

Public Education, Outreach and Participation (PEOP) Workgroup

Purpose- Develop a program to educate and involve the public on storm water quality issues

Illicit Discharge Detection and Elimination (IDDE) Workgroup

Purpose- Develop a program to detect and eliminate illicit discharges into the MS4.

Construction and Post-Construction Runoff Control (CON/PCON) Workgroup

Purpose- Ensure controls are in place to prevent water quality impacts from construction sites, and to minimize long-term impacts of storm water runoff from new development and redevelopment projects.

Pollution Prevention/Good House Keeping for Municipal Operations (MUNI) Workgroup

Purpose- Prevent pollutants in runoff from municipal operations.

Total Maximum Daily Load (TMDL) Workgroup

Purpose- Develop a program to reduce sediment and phosphorous loading into the lake to meet Waste Load Allocations set by the State.

Effectiveness Assessment and Improvement Plan (EAIP) Workgroup

Purpose- To design a plan that will evaluate the effectiveness of the current program and provides recommendations for improvement.

Trash Amendment will apply to all of these provisions and workgroups but will be managed separately

Clea

County of LAKE California

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Phase II Sma
System (MS4

Quick Links

- Amendments to the
- Phase II Small MS4 P
- Trainings and Meetin

Clean Water Program

The Lake County Clean Water Program (LCCWP) Stormwater Program is a joint effort between the County of Lake, City of Clearlake and the City of Lakeport to reduce the damage caused by polluted stormwater runoff and impacts of increases in peak flows from development.

Effects of Stormwater Runoff

Lake County's lakes, streams, rivers, forests and farms all depend on the replenishing waters of annual precipitation. However, when rain falls on land or impervious areas such as paved streets, parking lots and building roof tops it results in increased peak flows that can wash away soil and sediment, increase stream erosion and cause flooding. Stormwater runoff can change both water quantity and quality affecting our water resources physically, chemically and biologically. Polluted runoff containing oil, grease, chemicals, nutrients, lawn clippings and other yard debris, metals, litter and pathogens for example, can severely reduce water quality. If left unmanaged, runoff stresses our streams, provides extra nutrients for nuisance aquatic weeds and algae blooms, and degrades the beneficial uses of the waters we all enjoy.

Clean Water Program Shortcuts

Main · Management Council · Annual Reports · Community Involvement · Construction BMP
Home Tips · Illegal Activities · History · Water Complaints · Program Documents & Links

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Water Resources
255 N. Forbes Street, Room 301
Lakeport, CA 95453

Phone: (707) 263-2344

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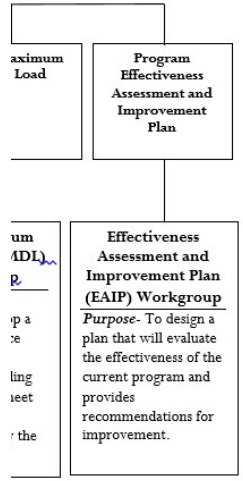
HOT TOPICS!

Idle Speed Zone Map

Highland Springs Recreational Area Temporary Trail Closure

Repairing Flooded Home Brochure

WATER COMPLAINTS



Clean Water Program – Agreement & Map

AGREEMENT
PROVIDING FOR IMPLEMENTATION AND MAINTENANCE OF
THE LAKE COUNTY CLEAN WATER PROGRAM

THIS AGREEMENT, is made by and between the Lake County Watershed Protection District (DISTRICT), County of Lake (COUNTY), City of Clearlake (CLEARLAKE) and City of Lakeport (LAKEPORT).

COUNTY, CLEARLAKE and LAKEPORT are hereinafter collectively referred to as "PARTIES" or individually as "PARTY".

RECITALS:

A. Amendments to the Clean Water Act (CWA) in 1987 added section 402(p), which established a framework for regulating stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) Program. Pursuant to Section 402 (p) of the CWA and EPA regulations, the Central Valley Regional Water Quality Control Board adopted State Water Resources Control Board (SWRCB) Water Quality Order No. 2003-0005, NPDES Permit No. CAS000004, defining the program that the PARTIES are required to develop and implement. This order has since been amended by order to be NPDES Permit No. CAS000004 WQ 2015-0133-EXEC, ORDER WQ 2016-0069-EXEC, WQ ORDER 2017-XXXX-DWQ, ORDER WQ 2018-0001-EXEC, AND ORDER WQ 2018-0007-EXEC, and will co
or continued as appropriate.

B. On February 19, 2002, the Lake County Stormwater Task Forc
1) Investigate individual vs. area-wide permits;
2) Identify joint efforts/individual efforts;
3) Estimate program costs;
4) Determine existing funding from existing programs; and
5) Evaluate other funding options and establish an impleme

Stormwater Task Force conclusions and recommendatio
Supervisors and both City Councils were:
1) File for permit coverage as co-permittees under
Management Plan (SWMP),
2) Utilize the DISTRICT for overall program coordination an
3) Each PARTY would be responsible for implementing t

EXHIBIT A

LAKE COUNTY CLEAN WATER PROGRAM
SCHEDULE OF COST-SHARING PROPORTIONS

Jurisdiction	Proportional Share 2018
County of Lake	67.7%
City of Clearlake	24.5%
City of Lakeport	7.9%
TOTAL	100%

CALIFORNIA DEPT. OF FINANCE POPULATION FIGURES

Jurisdiction	2017	2018
County of Lake	64,740	65,081
Clearlake	16,151	15,917
Lakeport	5,125	5,134
Unincorporated	43,464	44,030

CWP - Next Steps

- Agreement Approved & Sent to State – County, Lakeport, Clearlake
- Introduce and establish Official Management Council - April 25th
  - Members, By-Laws, Work Groups, & Schedule
- Legally move forward to complete storm water tasks
- Coordinate with other departments and agencies
  - CDD
  - Environmental Health
  - Public Works
  - CASQA
  - Water Boards
  - Tribes
  - Farm Bureau

Table #: Clean Water Program Proposed Time Schedule with special consideration for TMDL-Related Activities **PROPOSED CHANGES IN RED**																			
TASK # & DESCRIPTION	**2019**				**2020**				**2021**				**2022**				**2023**	**2024**	**2025**
	J-F-M	A-M-J	J-A-S	O-N-D	J-F-M	A-M-J	J-A-S	O-N-D	J-F-M	A-M-J	J-A-S	O-N-D	J-F-M	A-M-J	J-A-S	O-N-D			
CWP Joint Power Submission Request Letter	x																		
CWP Joint Power Agreement Approval	x																		
CWP JPA Agreement Submission RWQCB		x																	
CWP Bylaws Finalized		x																	
Design and Form Workgroups		x																	
Meeting Schedule for Workgroups																			
PEOP & PP		x																	
IDDE & Trash Provision		x																	
Con /Pcon/LID																			
MUNI																			
TMDL & EAIP		x																	
Fundraising / Financial		x																	
Reporting SMARTS				x				x				x				x			
Update Website - LC			x				x				x				x				
Update Website – Lakeport	x																		
Update Website – Clearlake																			
BOS / City / Public Presentations	x			x				x				x				x			
Update Website	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
Update Storm Water Man. Plan (LC-SWMP)									x	x	x	x							
TMDL Tasks ***(This section needs to be updated based on feedback from TSO and July 1st due date for Monitoring plan and associated QAPPs)***																			
Submit Time Schedule Order		x																	
Develop BMP Monitoring Plan		x																	
Conduct Storm WQ Monitoring				x	x			x	x			x	x			x			
Analyze Storm WQ Results					x	x			x	x			x						
Identify priority locations for BMP							x	x	x	x									
Develop plan for BMP placement									x	x	x								
Coordinate w/ Dept. for BMPs																			
Develop TMDL section for LCSWMP								x	x	x	x								

Management Council Documents

Agendas and Minutes

Date	Agenda	Minutes
March 21, 2019	Agenda	Minutes
February 21, 2019	Agenda	Minutes
January 17, 2019	Agenda	Minutes
November 15, 2018		Minutes
October 18,2018		Minutes
September 19, 2018	Agenda	Minutes
August 23,2018	Agenda	Minutes
August 15, 2012	Agenda	Minutes
February 22, 2012	Agenda	Minutes

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HOT TOPICS!

Highland Springs Recreational Area Temporary Trail Closure

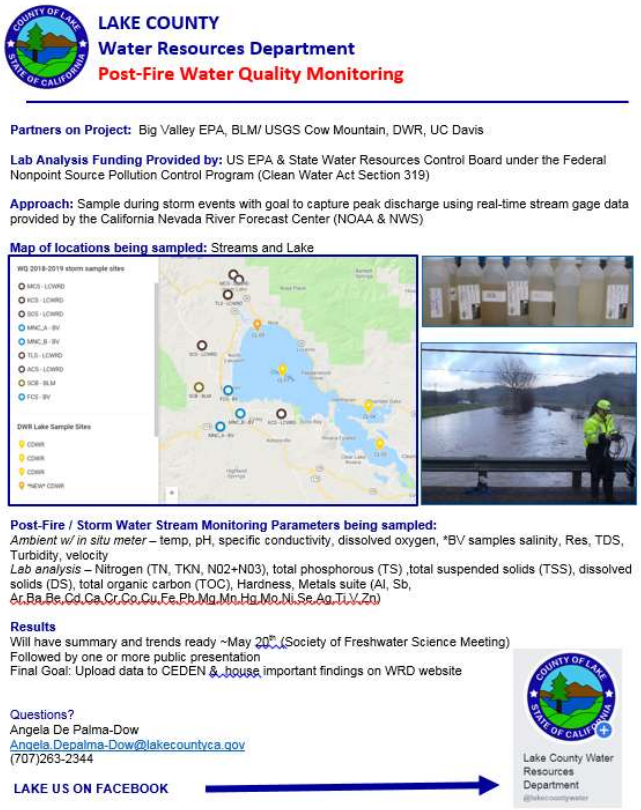
Repairing Flooded Home Brochure

Water Quality Activities

April 2019

Water Quality Activities – Current

- Post-Fire Stream Storm Monitoring
  - Post-Fire Factsheet (hard copies)
  - QAPP / CEDEN in progress…
- Lake Monitoring w/ DWR
  - Chl A – TMDL target
  - Sediment Cores from top 10cm
    - N & P, Al-P, Fe-P
    - Currently being analyzed by UC Davis – Dr. Steve Sadro's Lab
- Aquatic Plant Treatments & Data
- Shoreline development & construction activity
- Q/Z Mussel Monitoring – some WQ CDFW



LAKE COUNTY
Water Resources Department
Post-Fire Water Quality Monitoring

Partners on Project: Big Valley EPA, BLM/ USGS Cow Mountain, DWR, UC Davis

Lab Analysis Funding Provided by: US EPA & State Water Resources Control Board under the Federal Nonpoint Source Pollution Control Program (Clean Water Act Section 319)

Approach: Sample during storm events with goal to capture peak discharge using real-time stream gage data provided by the California Nevada River Forecast Center (NOAA & NWS)

Map of locations being sampled: Streams and Lake

Post-Fire / Storm Water Stream Monitoring Parameters being sampled:
Ambient w/ in situ meter – temp, pH, specific conductivity, dissolved oxygen, *BV samples salinity, Res, TDS, Turbidity, velocity
Lab analysis – Nitrogen (TN, TKN, N02+N03), total phosphorous (TS) ,total suspended solids (TSS), dissolved solids (DS), total organic carbon (TOC), Hardness, Metals suite (Al, Sb, As,Ba,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Hg,Mo,Ni,Se,Ag,Ti,V,Zn)

Results
Will have summary and trends ready ~May 20th (Society of Freshwater Science Meeting)
Followed by one or more public presentation
Final Goal: Upload data to CEDEN & house important findings on WRD website

Questions?
Angela De Palma-Dow
Angela.Depalma-Dow@lakecountyca.gov
(707)263-2344

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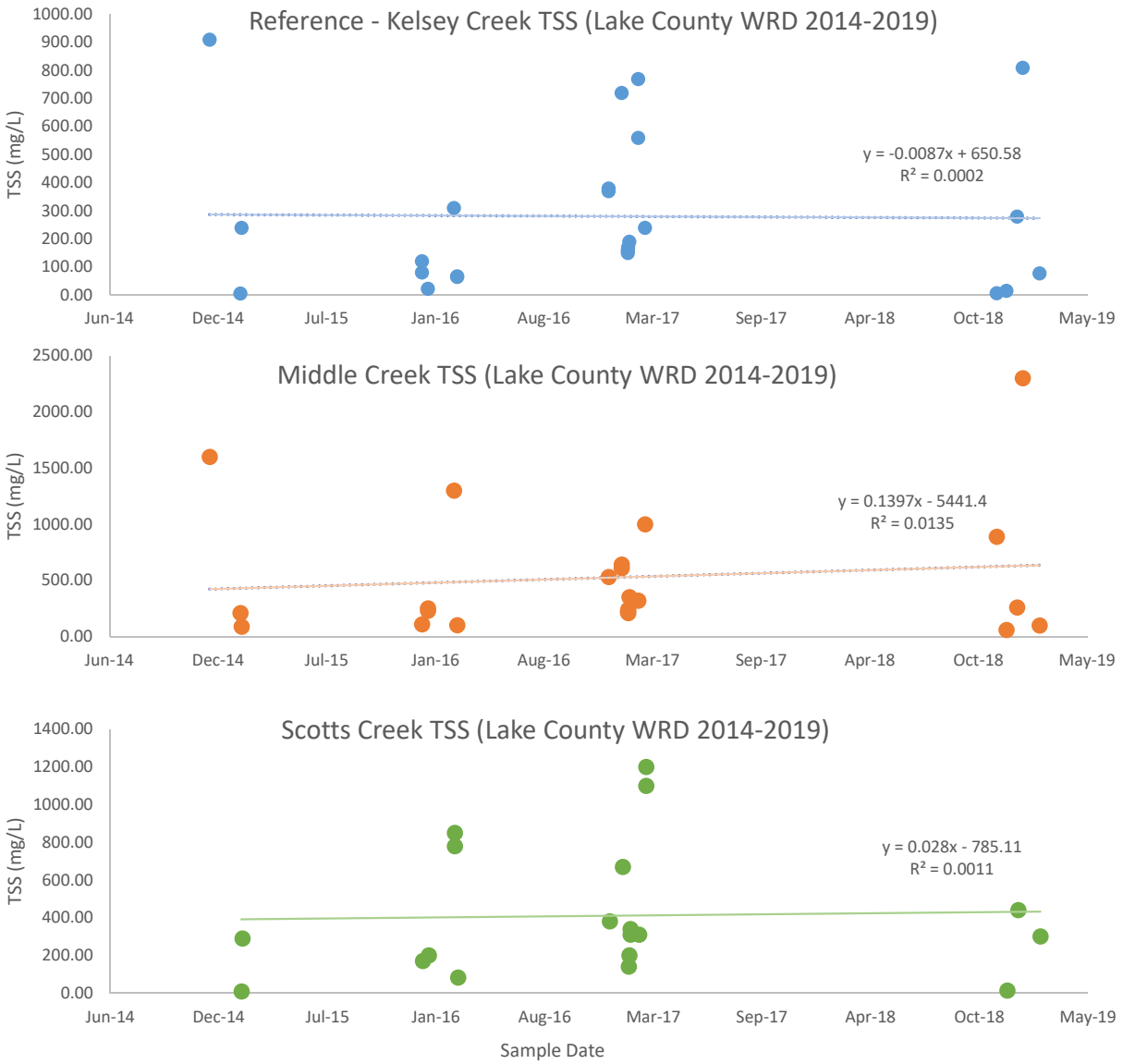
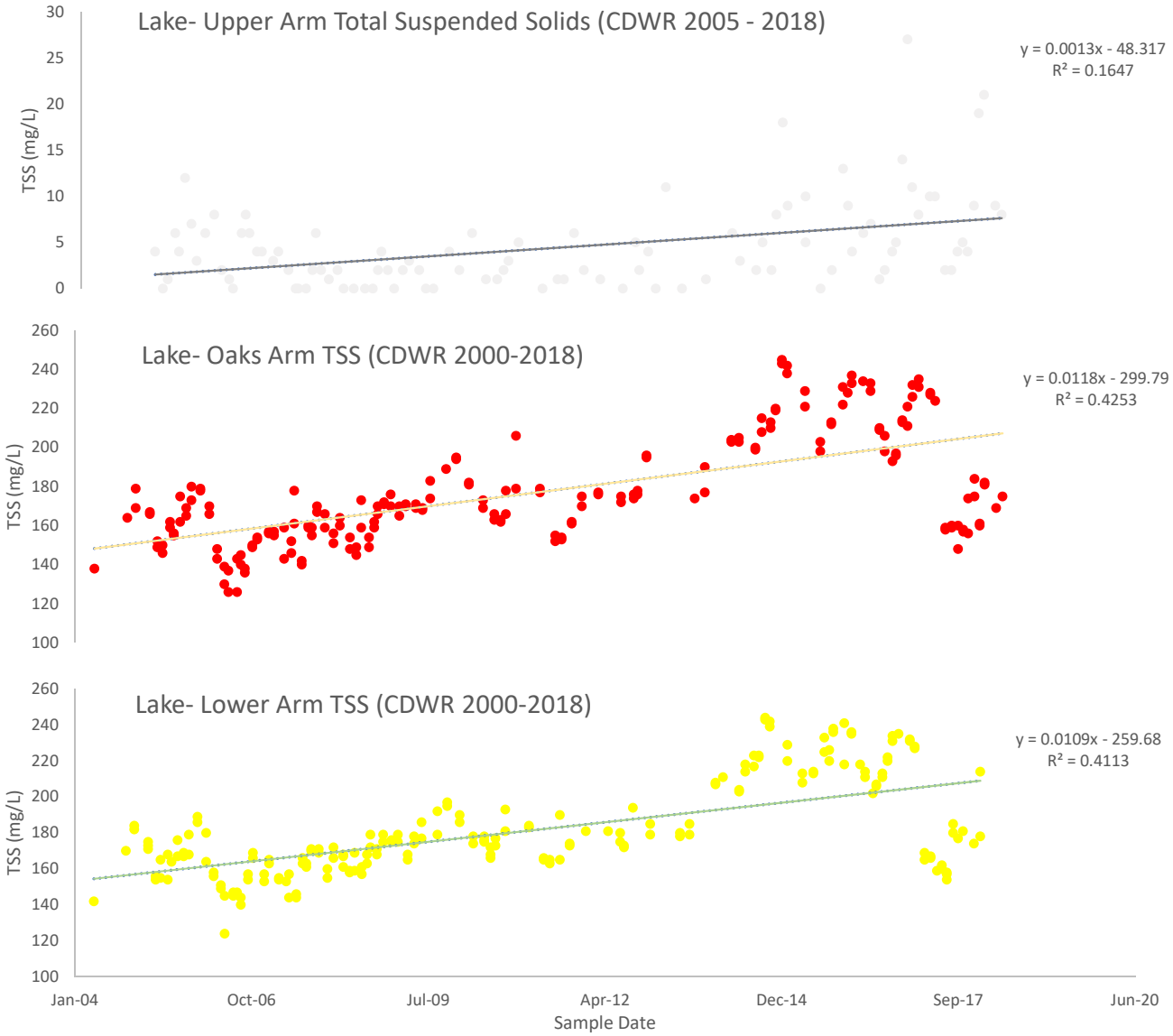
Lake County Water Resources Department

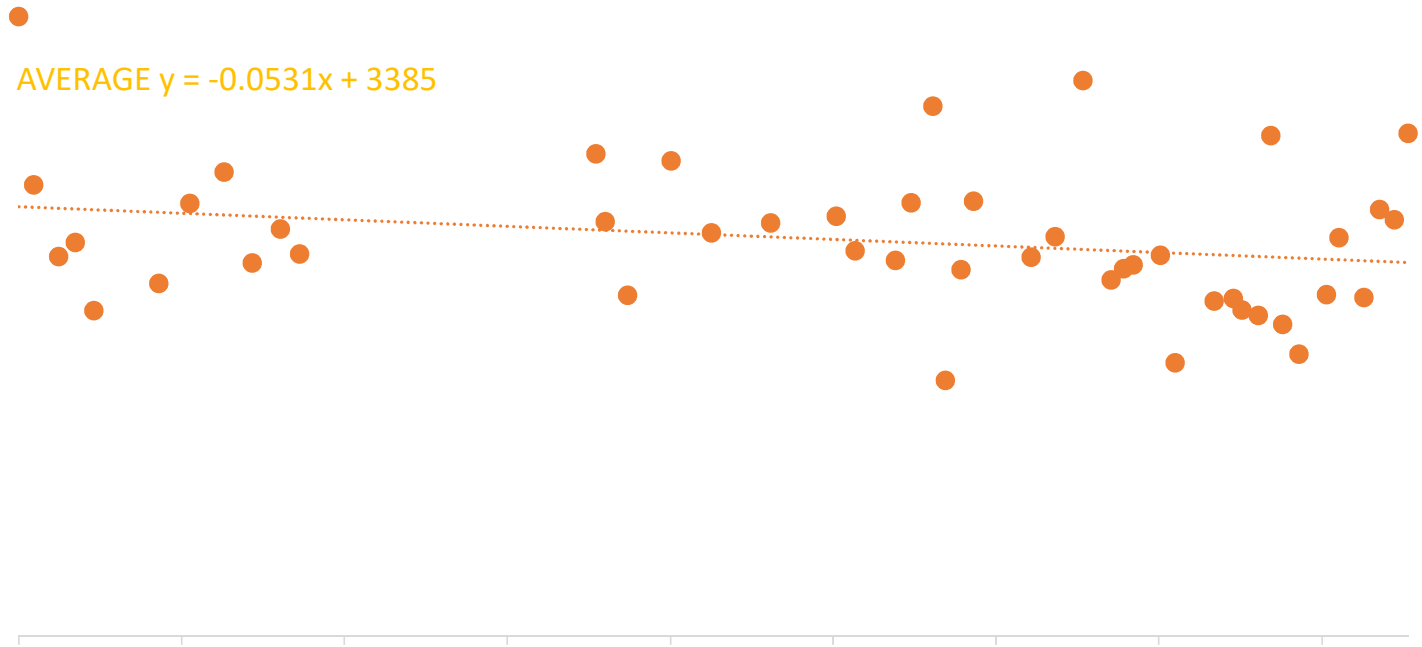
Pre/ Post-Fire – Stream TSS Trends

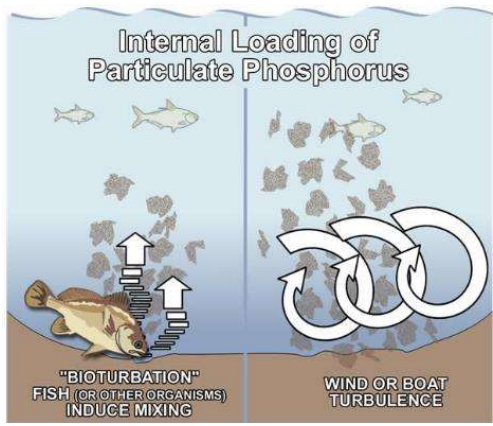


Pre-Fire Lake TSS Trends



Sediment Cores – Total P (DWR & UCD)





July 2018

THE EFFECTS OF MOTOR BOATS ON WATER QUALITY IN SHALLOW LAKES

DAVID N. NEDOHIN and P. ELEFSINIOTIS*

University of Manitoba, Department of Civil and Geological Engineering, Winnipeg, Manitoba, Canada R3T 5V6

(Received 29 May 1996; Revised 19 November 1996)

A case study was performed to determine if motor boats could accelerate the rate at which eutrophication occurs in shallow lakes. Two lakes were examined and tested for pH, turbidity, and phosphorous concentrations: one with motor boat activity and one without. Results indicate that motor boat activity creates enough disturbance on the bottom sediment to release the stored phosphorous into the overlying water.

Keywords: Phosphorus; natural eutrophication; cultural eutrophication; storage pool; limiting nutrient; pH; turbidity

TABLE I Effective Mixing Depth by Engine Size

HORSEPOWER	*MIXING DEPTH (m)*
10	1.8
28	3.0
50	4.6

THE EFFI
QU

D

University of Mar

A case study was p
eutrophication occur
and phosphorous cor
that motor boat activ
phosphorous into the

Keywords: Phospho
nutrient; pH; turbidit

TABLE

HORSE

1
2
5

Review of boat wake wave impacts on shoreline erosion and potential solutions for the Chesapeake Bay

STAC Review Report

Fall 2016

Original Articles

Physical Impacts of Wind and Boat Traffic on Clear Lake, Iowa, USA

James L. Anthony & John A. Downing

Pages 1-14 | Published online: 23 Jan 2009

Download citation https://doi.org/10.1080/07438140309353984

References Citations Metrics Reprints & Permissions PDF

ABSTRACT

Clear Lake is a shallow (Z_{mean}=2.9 m), eutrophic (TP_{mean}=188 μgL^{-1}) lake that is intensively used forrecreation. After a century of intense agriculture in the watershed, the bottom is covered with nutrient-rich organic sediments. We monitored wind, boat traffic and turbidity and found that resuspension of this sediment by wind-induced waves and recreational boat traffic contributes to daily, often substantial, nutrient fluxes. Intensive monitoring over a wind-event showed that total phosphorus concentrations can increase by 100% over a diel period and ammonia concentrations

Original Articles

Effect of motorized watercraft on summer nearshore turbidity at Lake Tahoe, California–Nevada

Michael T. Alexander & Russell C. Wigart

Pages 247-256 | Published online: 15 Oct 2013

Download citation https://doi.org/10.1080/10402381.2013.840704

Water Quality Activities – Planned

- MS4 Storm Water Monitoring
  - Lake County, Lakeport, Clearlake – Plan before 2020 Storm Season
  - Urban inputs – sediments, nutrients
  - Trash impacts – plan done in July

- TMDL Monitoring
  - Part of MS4 Monitoring above

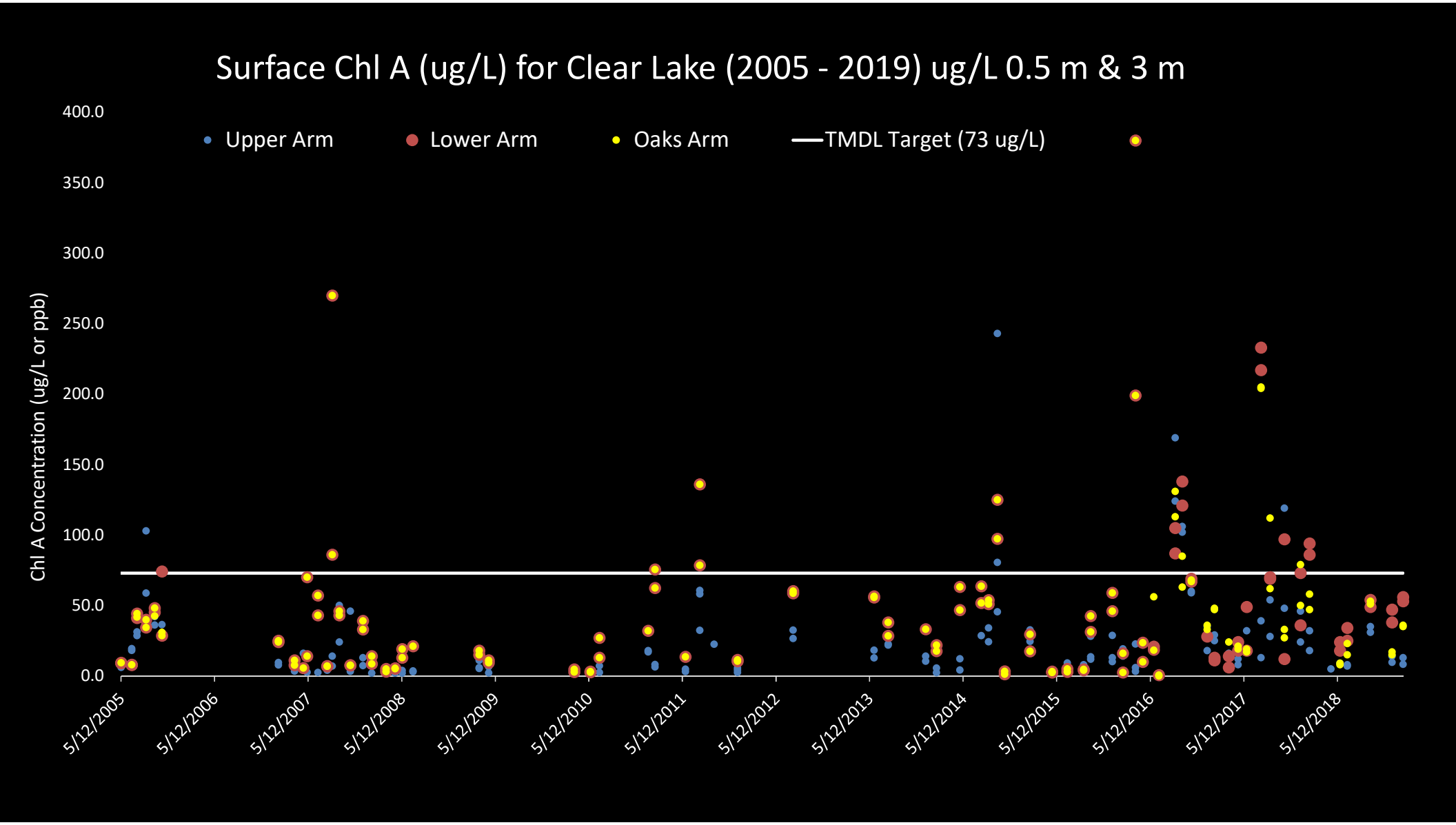
- Expand surface stream monitoring – Quality & Quantity
  - Adobe Creek / Highland Springs
  - Upper Watershed – Alley, Clover, Tule Lake, Scotts Creek
  - Middle Creek Wetland Restoration Area Pre / Post

- Data Management
  - Get all new & old data into CEDEN
  - Portal / Access from WRD webpage


TMDL!

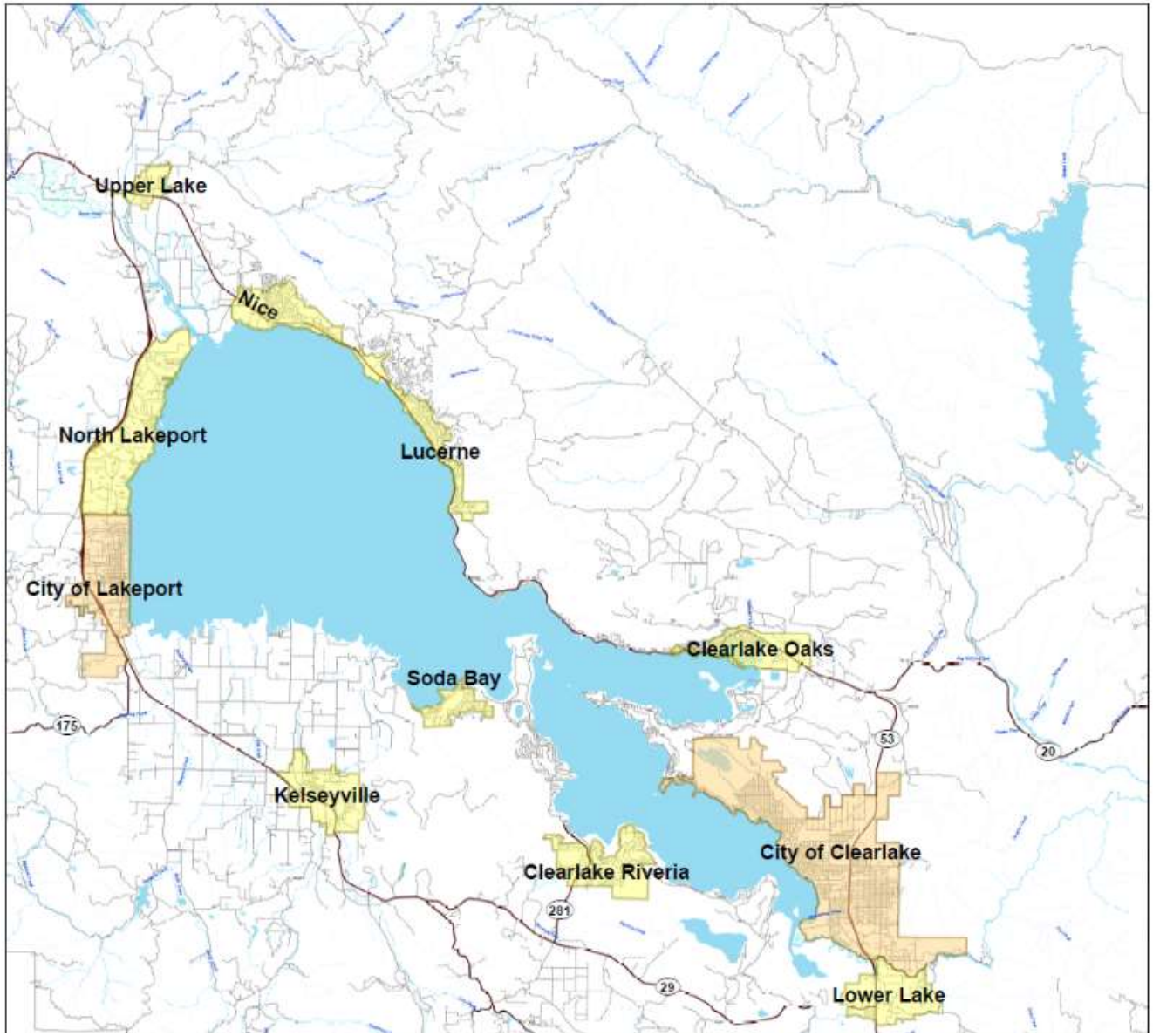
TMDL – What & How?

- Total Maximum Daily Load
  - Impaired waterbody 303d list by USEPA – bill of health
  - Allowable amount or “load” - health target
  - Way to gauge lake health – is what you are doing working?
  - Clear Lake Nutrient TMDL Chl A – 73ug/l


Surface Chl A (ug/L) for Clear Lake (2005 - 2019) ug/L 0.5 m & 3 m
Upper Arm
Lower Arm
Oaks Arm
TMDL Target (73 ug/L)
Chl A Concentration (ug/L or ppb)
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
5/12/2005
5/12/2006
5/12/2007
5/12/2008
5/12/2009
5/12/2010
5/12/2011
5/12/2012
5/12/2013
5/12/2014
5/12/2015
5/12/2016
5/12/2017
5/12/2018

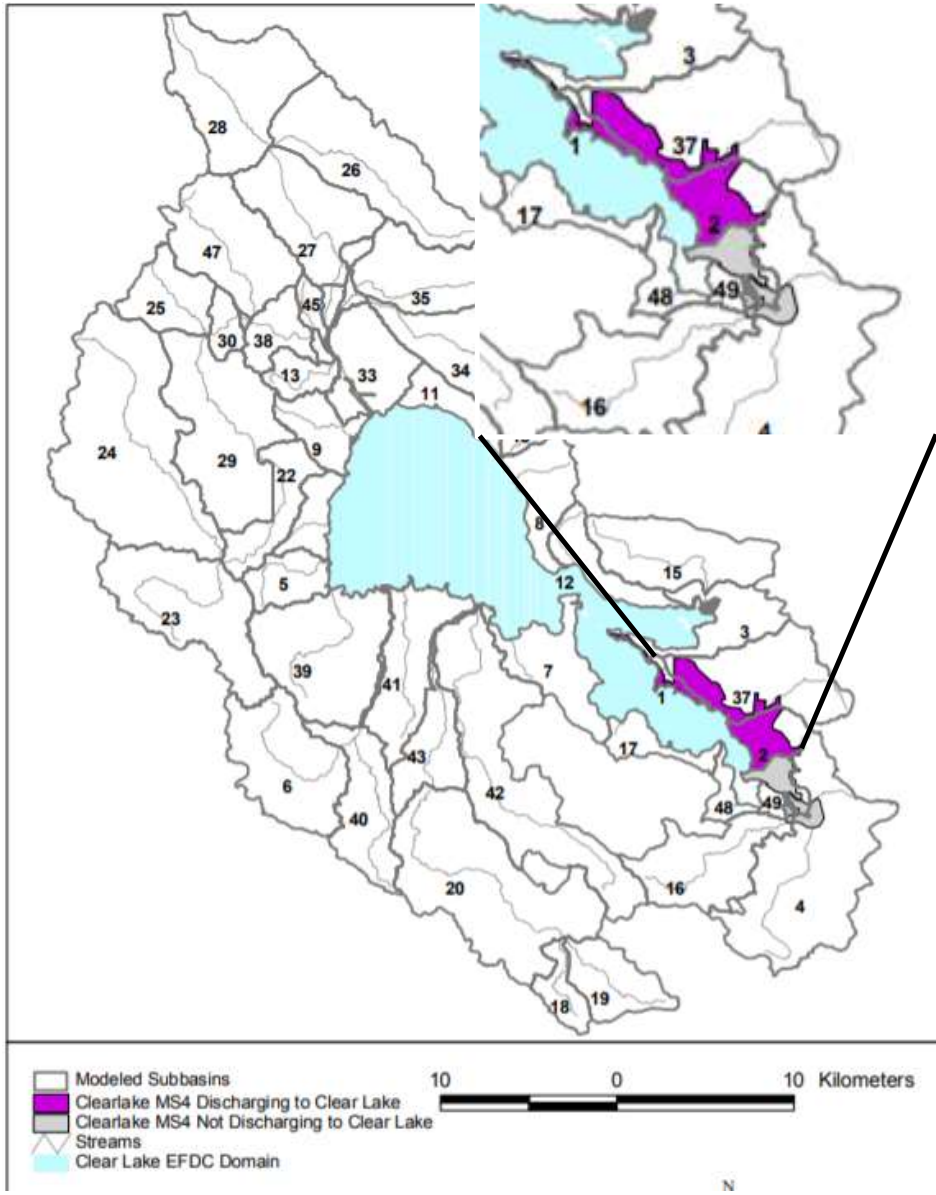
Lake County's Role in TMDL

- Reduce P / sediments inputs in from
  - County MS4 areas
    - Yellow (not tan)
  - Non-MS4 areas
    - Highland Springs
    - Middle Creek
    - Scott's Valley
    - County Park area



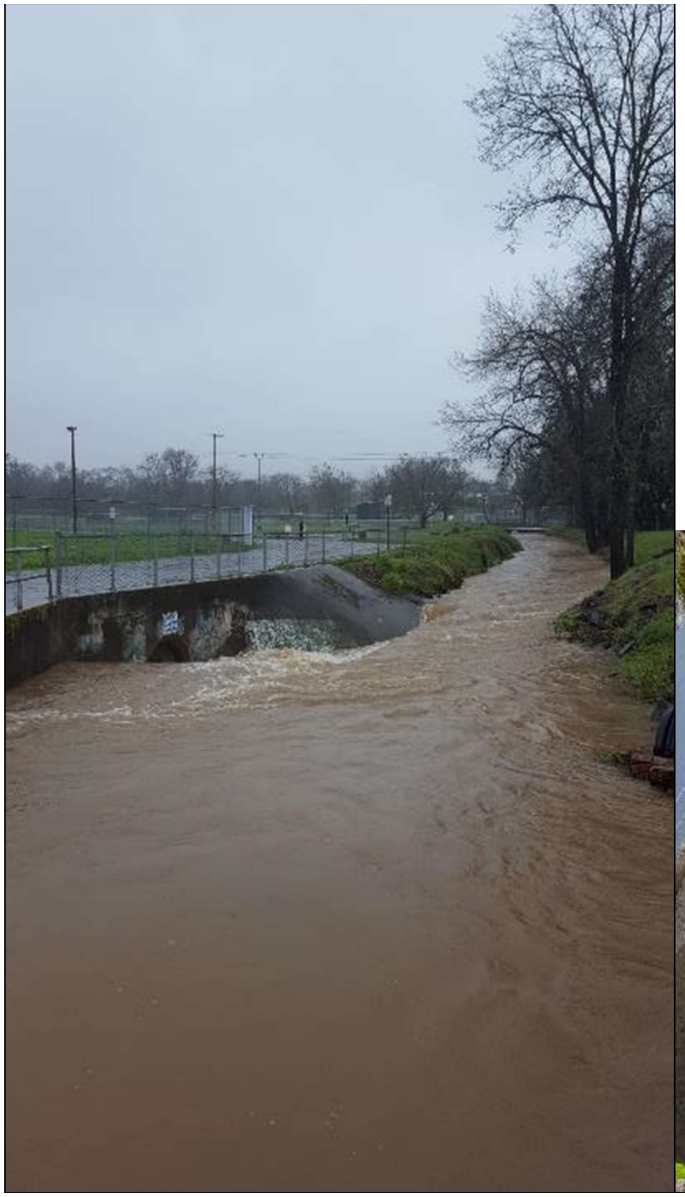
Clearlake TMDL

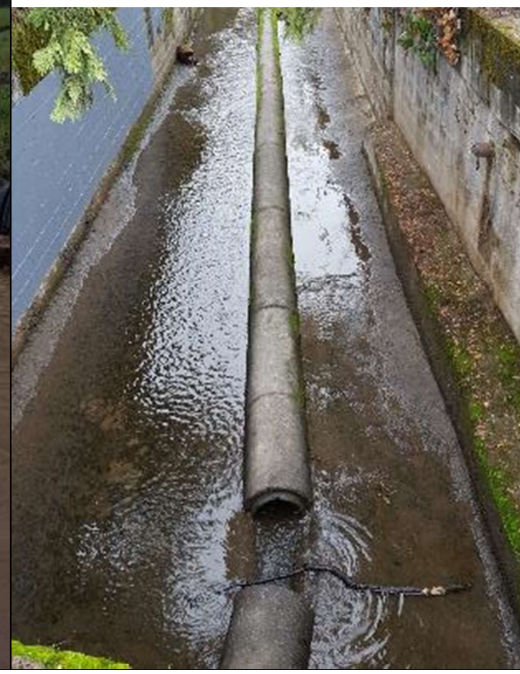
- Reduce P / sediments inputs in from
  - Purple Shaded areas – for TMDL
  - Urban areas
  - New Construction
  - Roads
  - Direct Lake input, outflows
  - Street sweeping / cleaning
  - Any other storm water infrastructure



Lakeport TMDL

- Reduce P / sediments inputs from
  - Urban areas
  - New Construction
  - Roads
  - Direct Lake input, outflows
  - Street sweeping / cleaning
  - Impervious surface $$





CWP TMDL - Steps Forward

- Quantify Structural Control → Develop method to track bmps
  - Find them
  - Identify effectiveness → Expand monitoring & Find literature
- Quantifying source control → Outreach effectiveness
  - Blue Ribbon Outreach Special Project Proposal
- Program Expansion
  - Create a TMDL Monitoring Plan & QAPP (before 2020)
  - Budget for monitoring plan
  - Grants for planning projects are limited or absent
  - Increase Storm Water Outreach
  - Think about contribution of internal lake processes
    - Boating activity
    - Shoreline activities

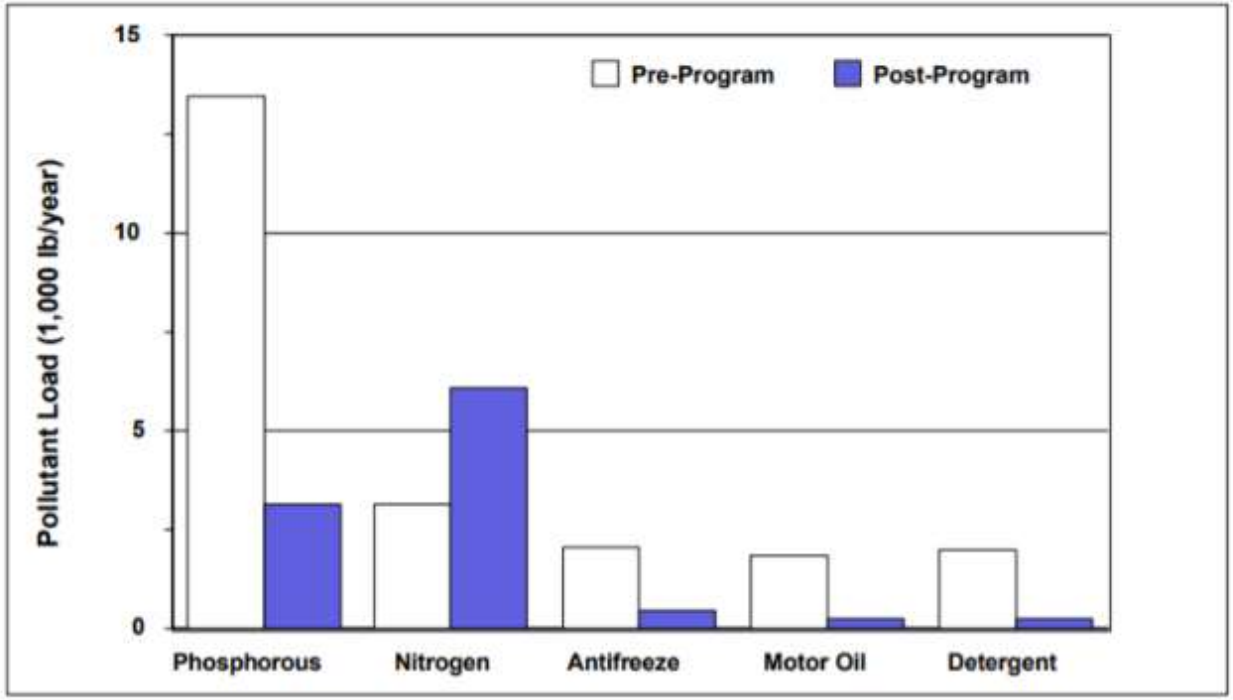
Example:

Table 6. Comparison of street-dirt yields, measured during the no-sweeping phase of this study in Madison, Wis., to those for other residential streets in the United States.

[--, no data; all values in pounds per curb-mile]

Statistic	Study basin				Previous studies			
	Control	Air sweeper	High-frequency broom	Low-frequency broom	Champaign, Ill.[1]	Bellevue, Wash.[2]	San Jose, Calif.[3]	U.S. nationwide[4]
				486	408	815	310	391
				488	--	705	--	--

Figure 6-5. Changes in Pollutant Load Associated with a Public Education Program Based on a Public Survey



Source: Claytor, 1996

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				488	--	705	--	--

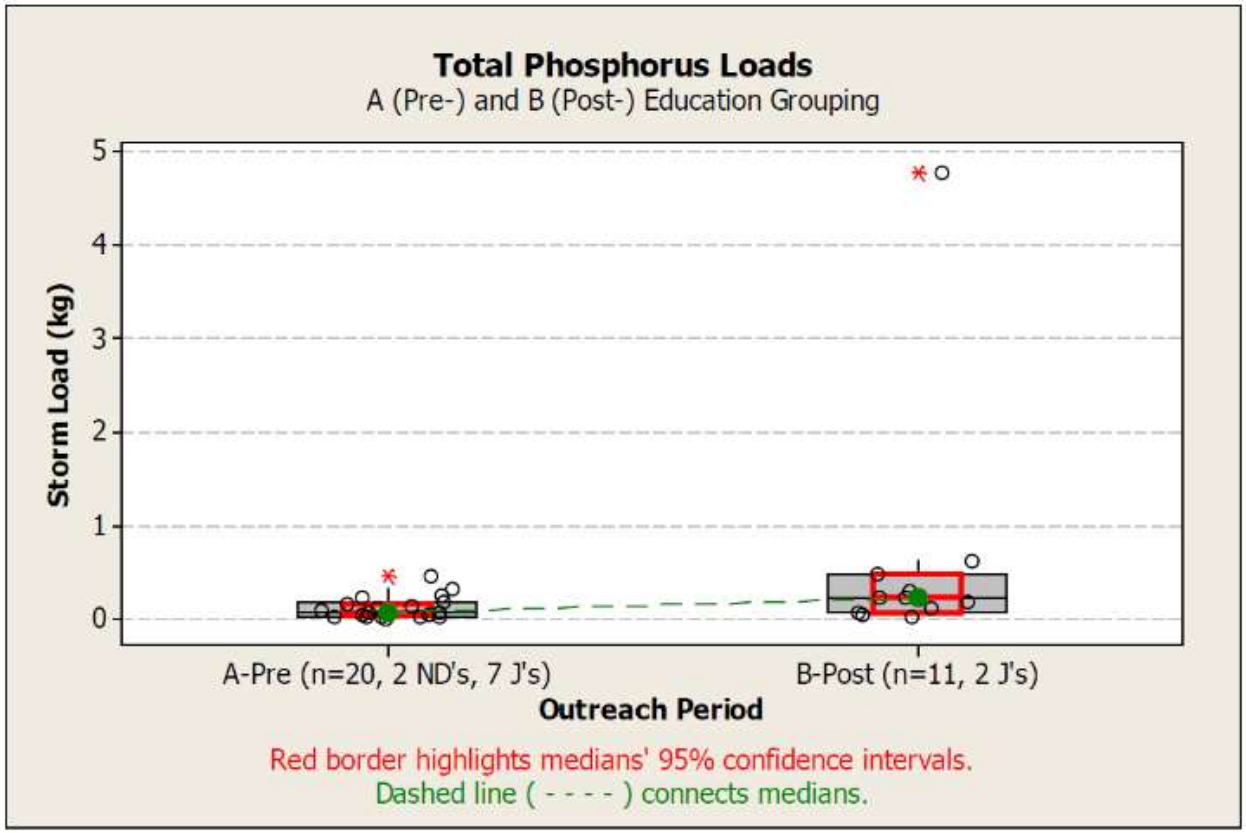

Figure 38 Storm total phosphorus load boxplots

Example:

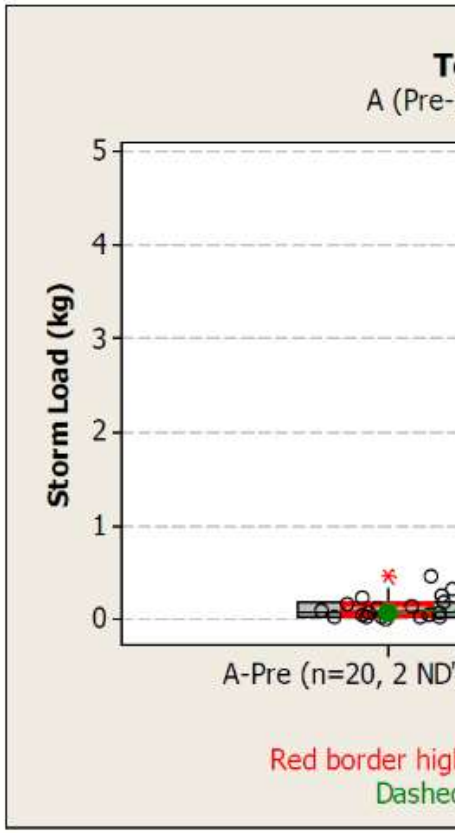

Figure 38 Storm total phosphorus loa

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[--, no data; all values in pounds per curb-mile]

Statistic	Study basin		Previous studies			
	High-frequency	Low-frequency	Champaign	Bellevue	San Jose	U.S.

Table 4-3. Typical Pollutant Loadings from Runoff by Urban Land Use (lbs/acre-yr)

Land Use	TSS	TP	TKN	NH_3-N	NO_2+NO_3-N	BOD	COD	Pb	Zn	Cu
Commercial	1000	1.5	6.7	1.9	3.1	62	420	2.7	2.1	0.4
Parking Lot	400	0.7	5.1	2	2.9	47	270	0.8	0.8	0.04
HDR	420	1	4.2	0.8	2	27	170	0.8	0.7	0.03
MDR	190	0.5	2.5	0.5	1.4	13	72	0.2	0.2	0.14
LDR	10	0.04	0.03	0.02	0.1	NA	NA	0.01	0.04	0.01
Freeway	880	0.9	7.9	1.5	4.2	NA	NA	4.5	2.1	0.37
Industrial	860	1.3	3.8	0.2	1.3	NA	NA	2.4	7.3	0.5
Park	3	0.03	1.5	NA	0.3	NA	2	0	NA	NA
Construction	6000	80	NA	NA	NA	NA	NA	NA	NA	NA

HDR: High Density Residential, MDR: Medium Density Residential, LDR: Low Density Residential
NA: Not available; insufficient data to characterize loadings
Source: Horner et al, 1994

Lake County Water Resources Department

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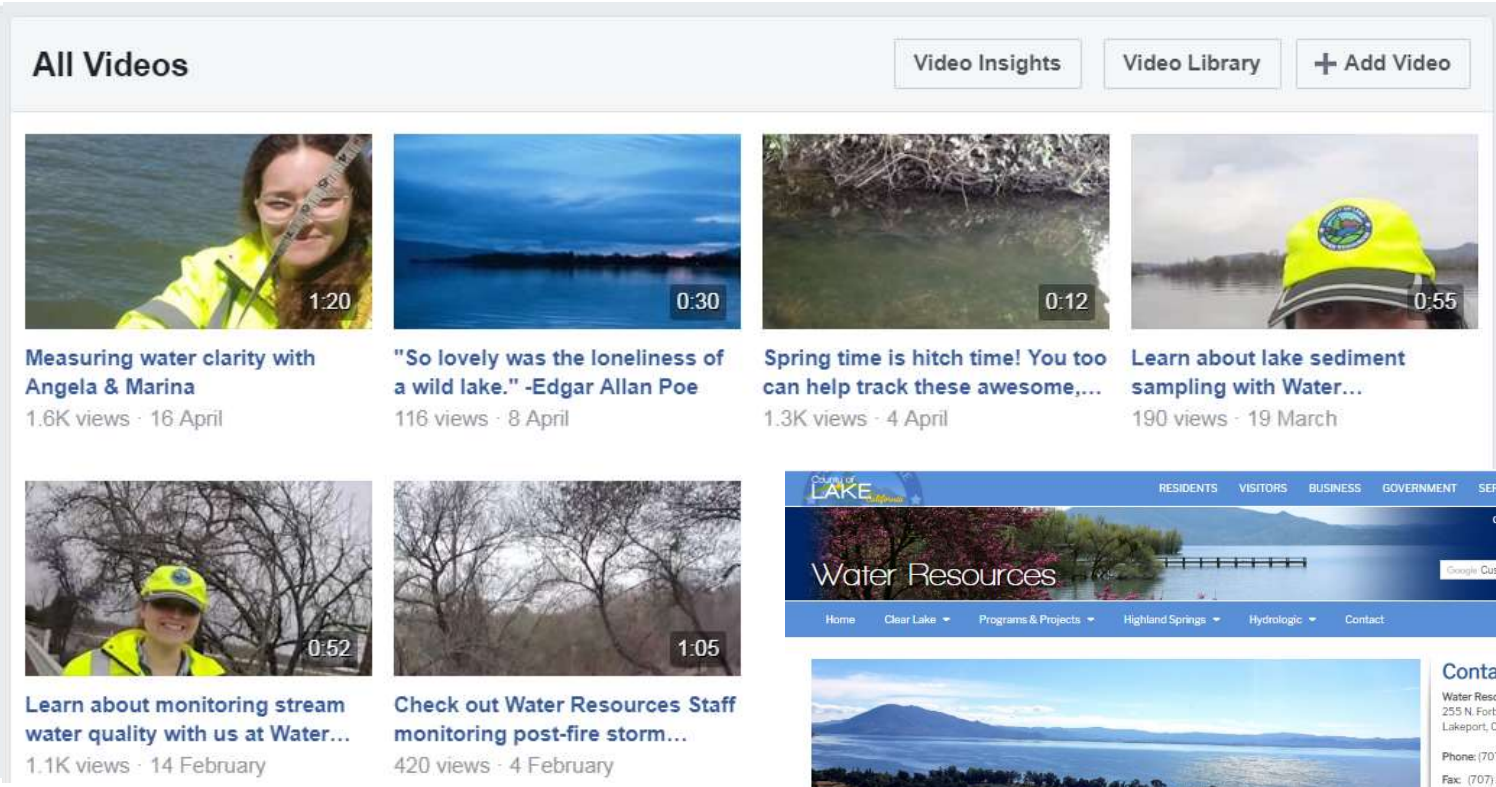

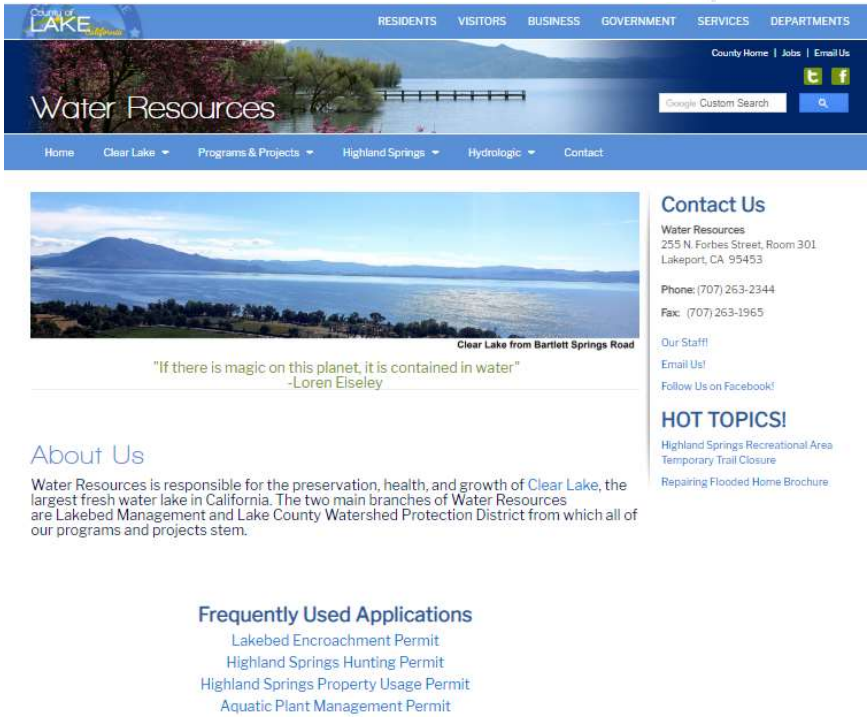

See, Learn, Like

Questions?
Angela.Depalma-Dow@lakecountyca.gov