Lessons Learned from Program Effectiveness Assessment Development and Implementation

CASQA Webinar
November 2, 2016

Hosted by:
Karen Ashby – Larry Walker Associates
Nora Jans – Michael Baker International

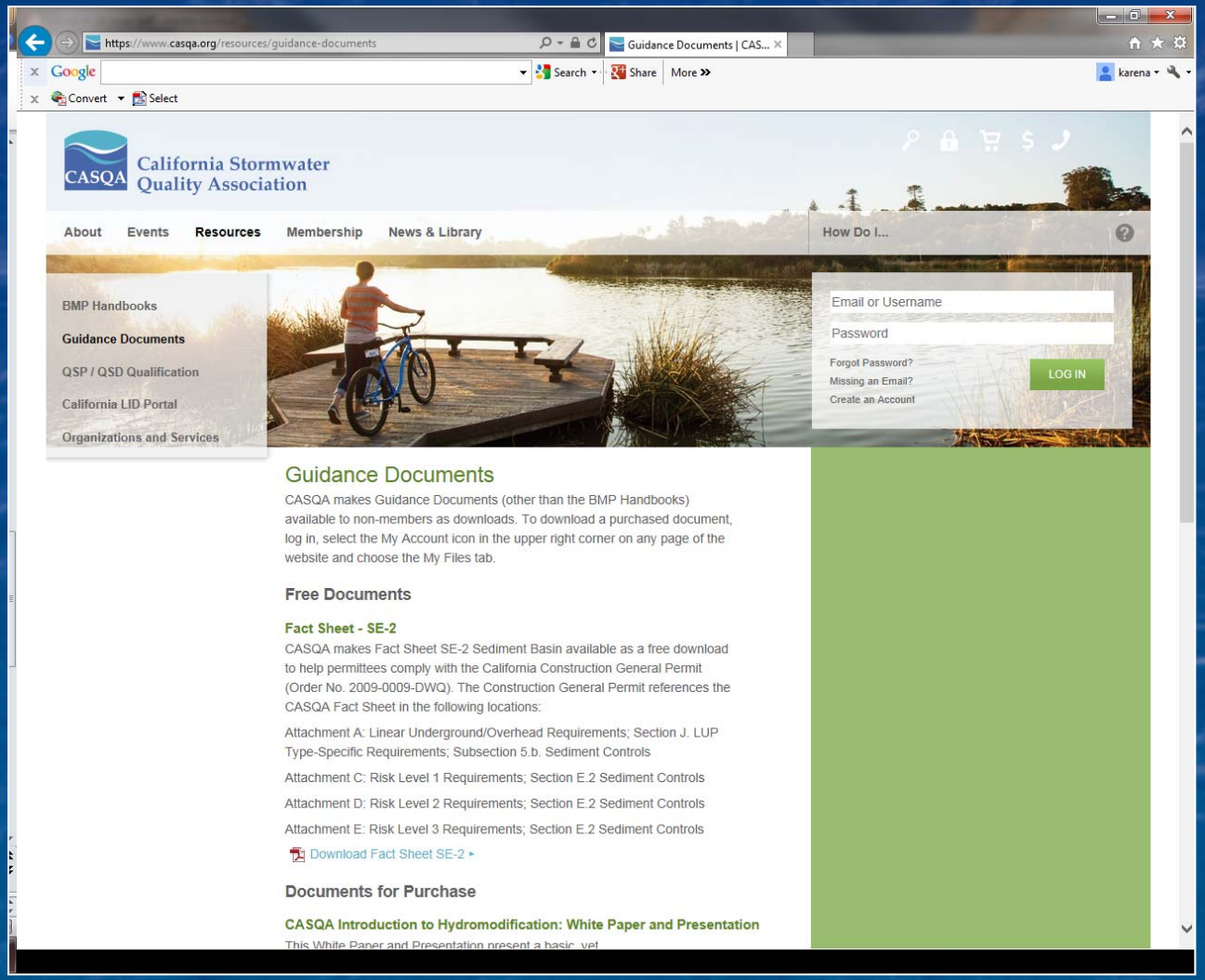
Instructions for Today

- Participants will be muted
- Pause for questions after each speaker
- Ask questions via the Q&A box on the WebEx webinar panel
  - Please send to “Host and Presenter”

Agenda

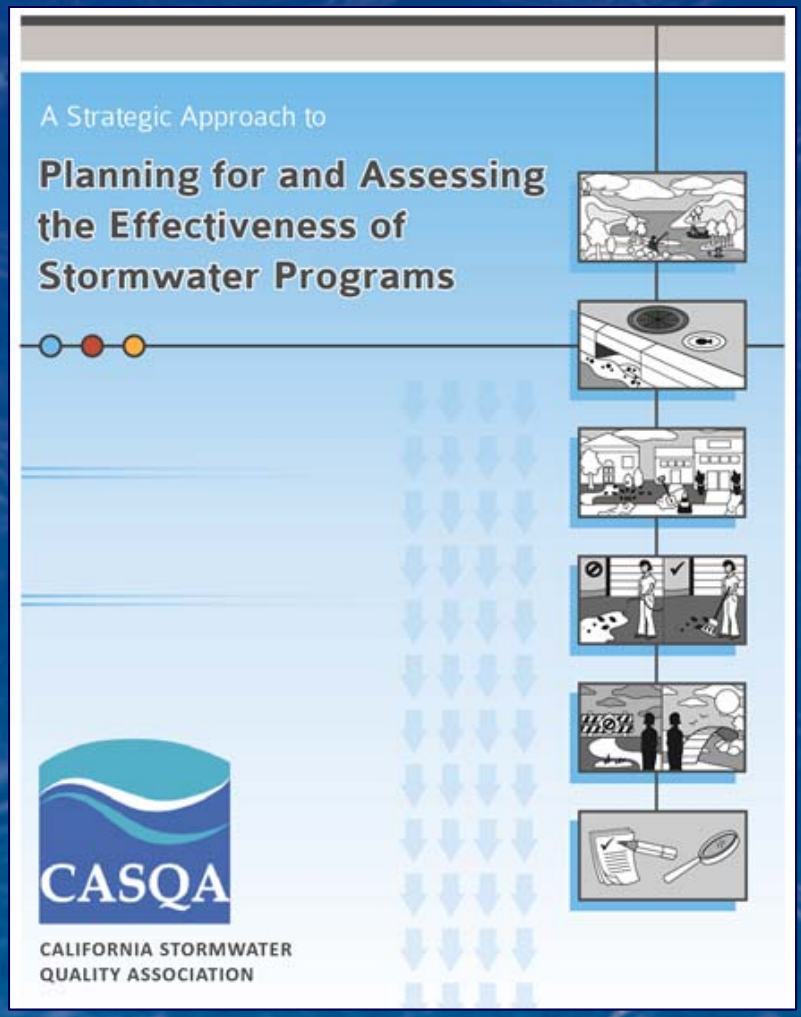
- Stormwater Program Effectiveness Assessment for the City of Paso Robles
  - David LaCaro, City of Paso Robles (17 min)
- LPR Model for Pollutant Load Reduction
  - Cathleen Garnand, County of Santa Barbara (17 min)
- Year 3: Program Effectiveness Assessment Results
  - Lisa Moretti, UC Davis (25 min)
- Orange County Stormwater Program's Headline Environmental Indicators
  - Richard Boon, County of Orange (25 min)
- Non-Structural BMPs - How do they Measure Up?
  - Paul Hartman, LWA (25 min)

https://www.casqa.org/effectiveness_assessment

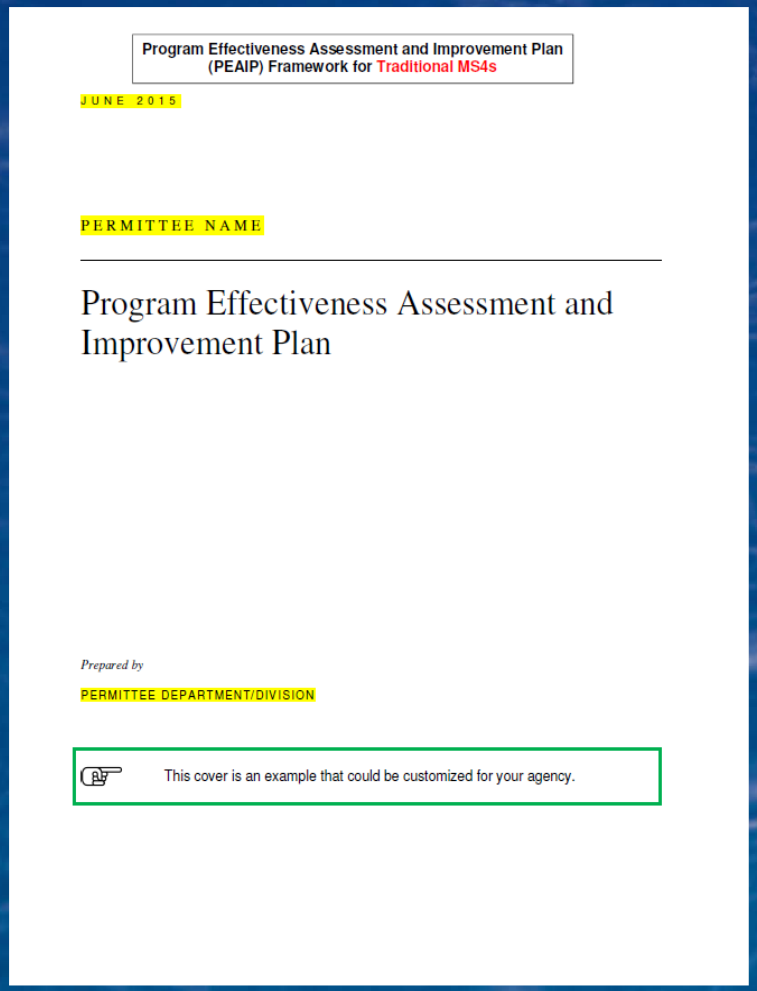


CASQA Guidance Document

- One approach
- Terms and key concepts
- Assessment strategy
- Assessment methods
- Identifies applicability to program elements/ minimum control measures
- Provides examples



Education and Outreach



Program Effectiveness Assessment and Improvement Plan (PEAIP) Framework for Traditional MS4s

JUNE 2015

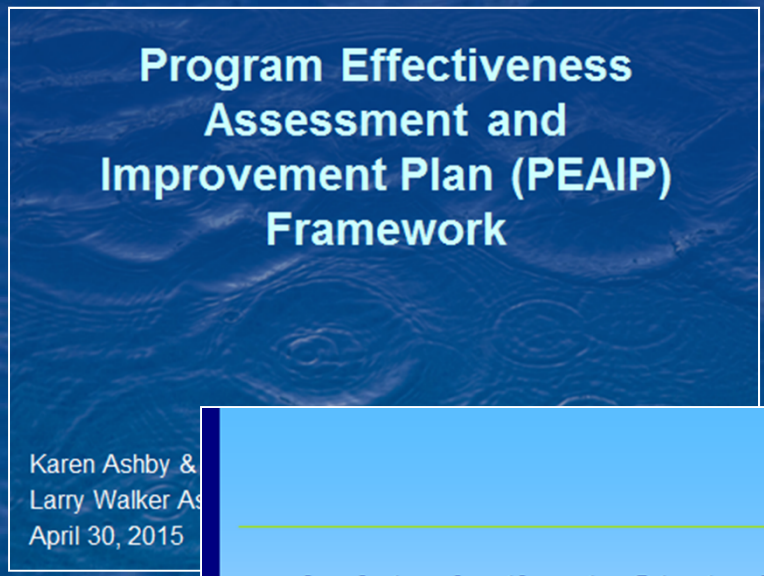
PERMITTEE NAME

Program Effectiveness Assessment and Improvement Plan

Prepared by

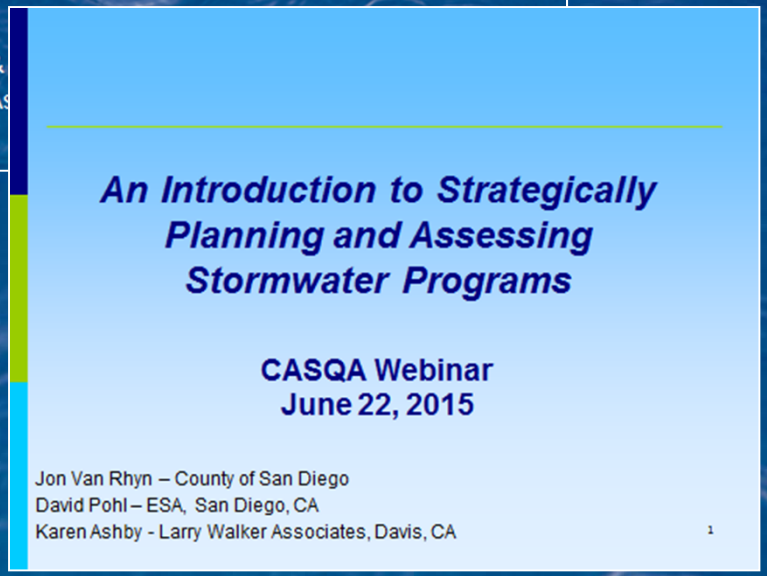
PERMITTEE DEPARTMENT/DIVISION

This cover is an example that could be customized for your agency.



Program Effectiveness Assessment and Improvement Plan (PEAIP) Framework

Karen Ashby &
Larry Walker As
April 30, 2015



An Introduction to Strategically Planning and Assessing Stormwater Programs

CASQA Webinar
June 22, 2015

Jon Van Rhyn – County of San Diego
David Pohl – ESA, San Diego, CA
Karen Ashby - Larry Walker Associates, Davis, CA

1

Stormwater Program Effectiveness Assessment for the City of Paso Robles

David LeCaro, Paso Robles

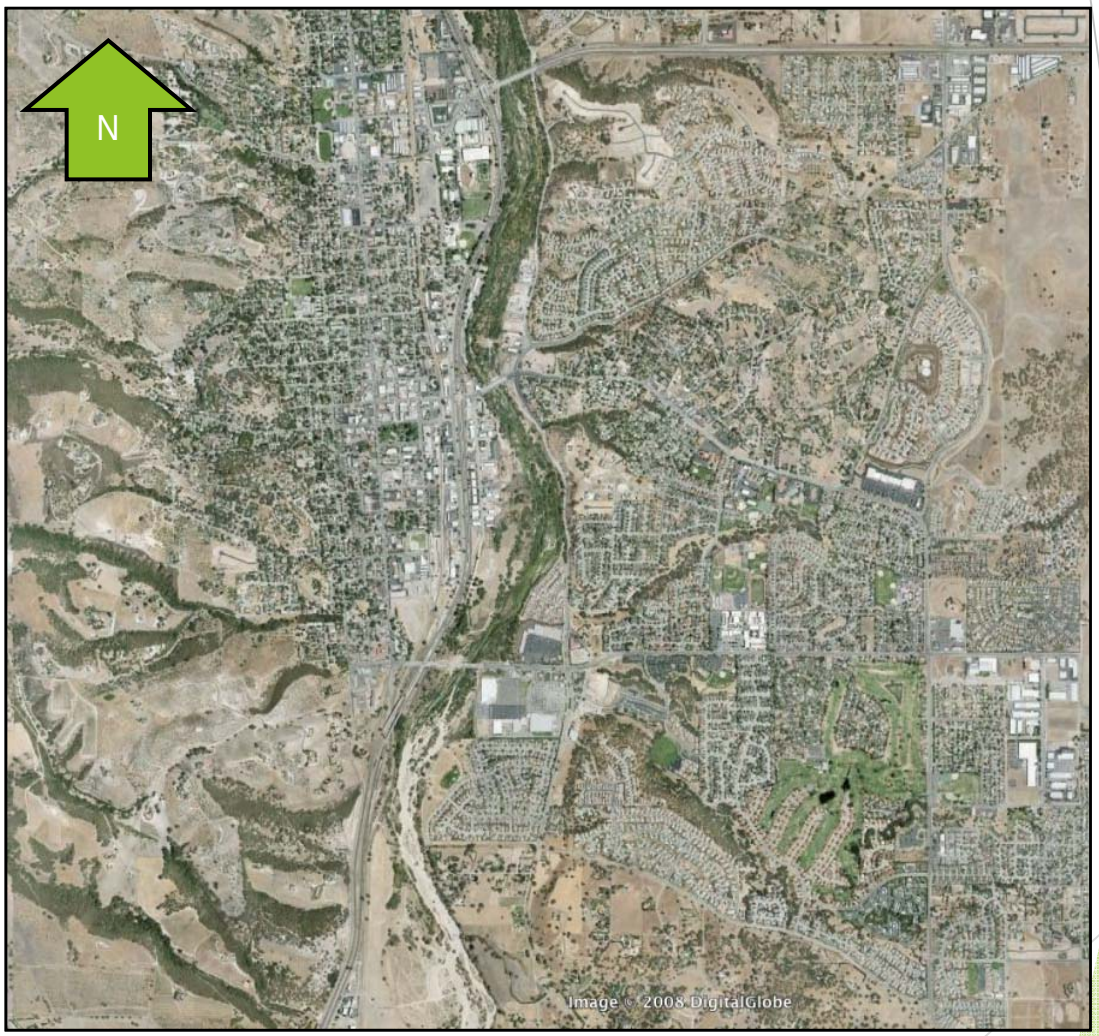

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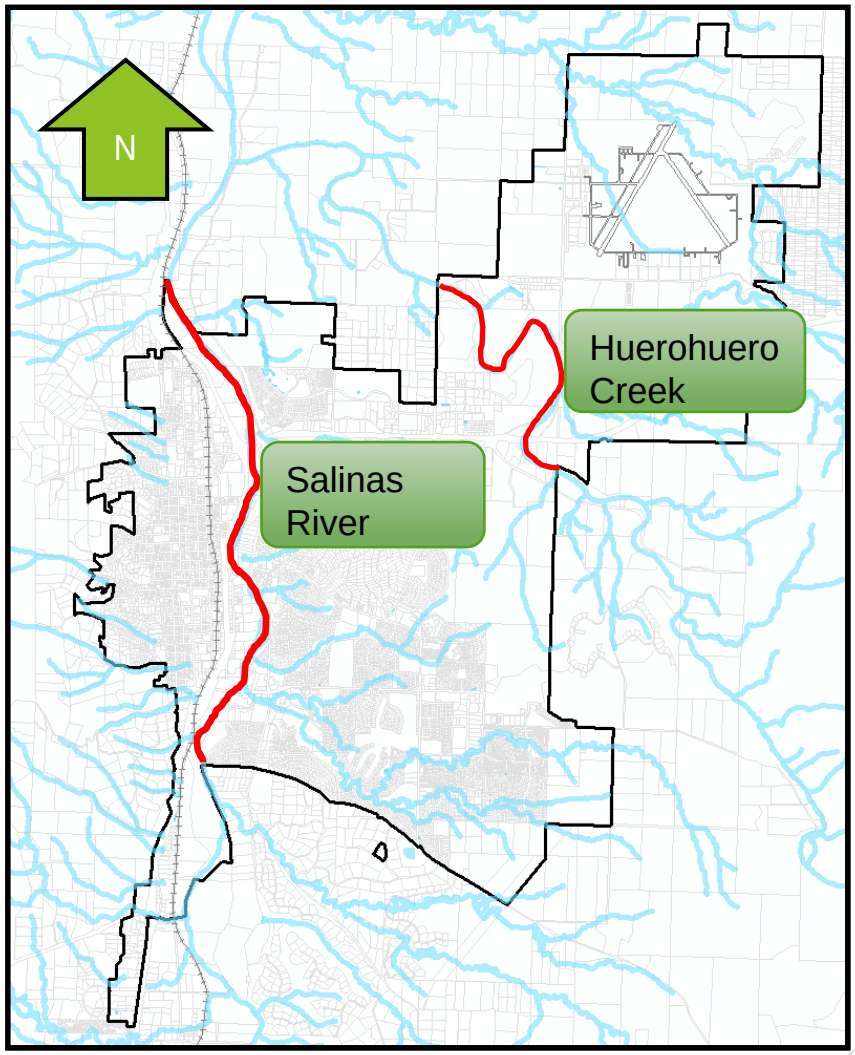
Image © 2008 DigitalGlobe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Huerohuero Creek
Salinas River

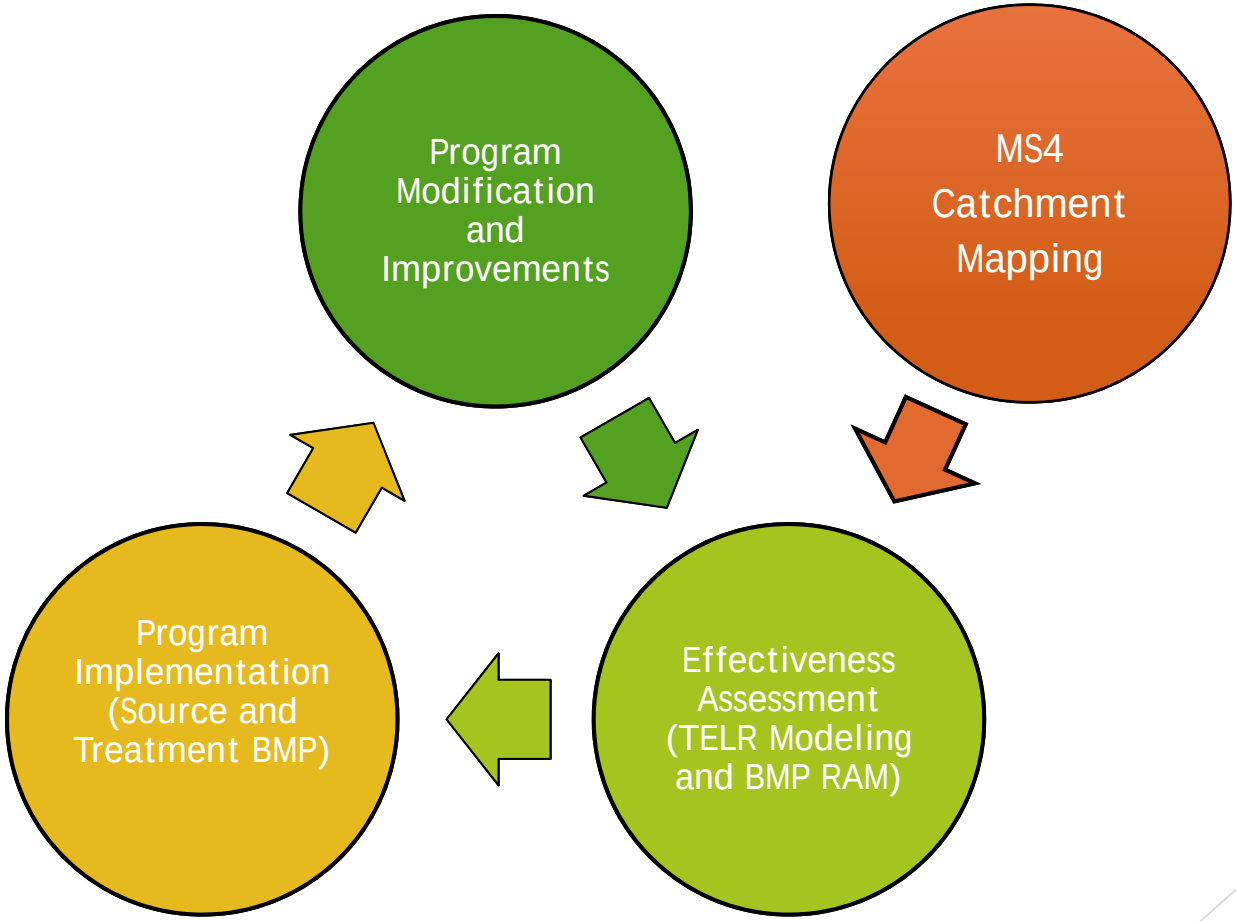
Presentation Outline

- Permit Requirements (E.14.)
- PEA implementation (necessary steps)
  - Mapping
  - BMP RAM
  - TELR (tool to estimate load reduction)
- Permit Linkage
- Benefits to TELR, BMP RAM, Parcel RAM
- Long-Term Tracking and Reporting

General Permit Requirements

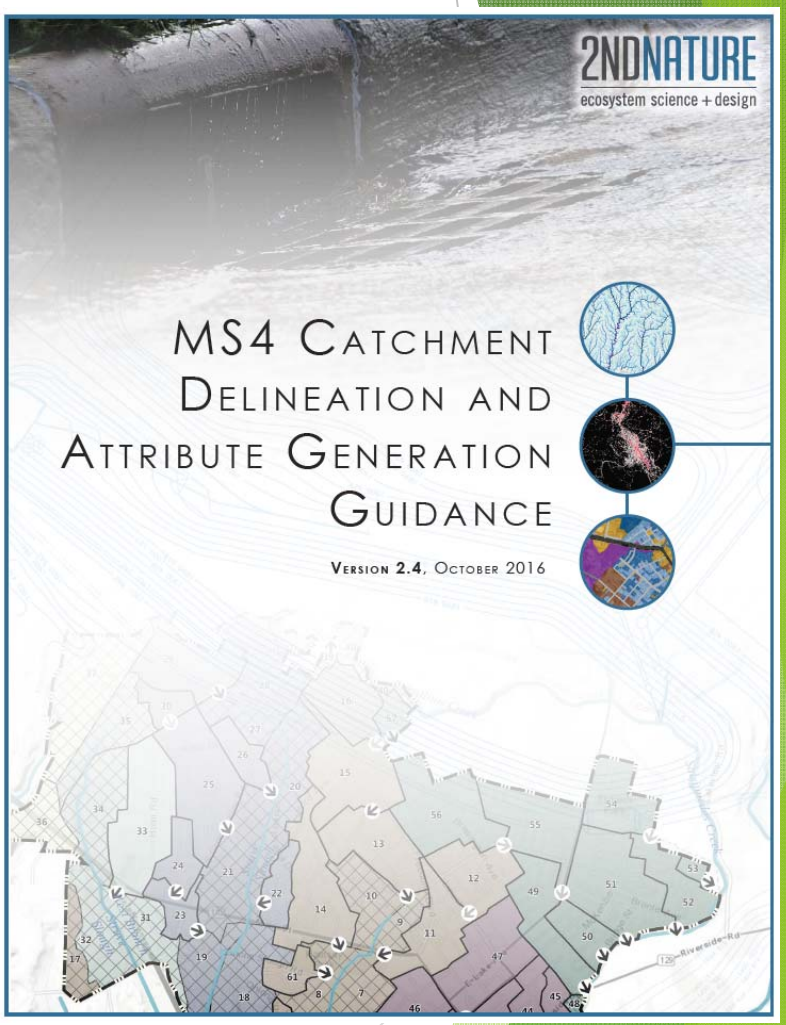
- Program Effectiveness Assessment and Improvement (E.14.)
  - Develop a Plan
  - Assess BMPs and Program Effectiveness (i.e., Outcome Levels)
  - Assess Privately Owned BMP
  - Quantitatively Assess BMP Performance and Load Reduction
  - Answer Management Questions
  - Assess Available Water Quality Monitoring Data
- Central Coast Water Board Clarification
  - July 25, 2014 Letter (plan development, mapping, BMP inventory and effectiveness assessment, load reduction quantification)

PEA Steps for Improvement

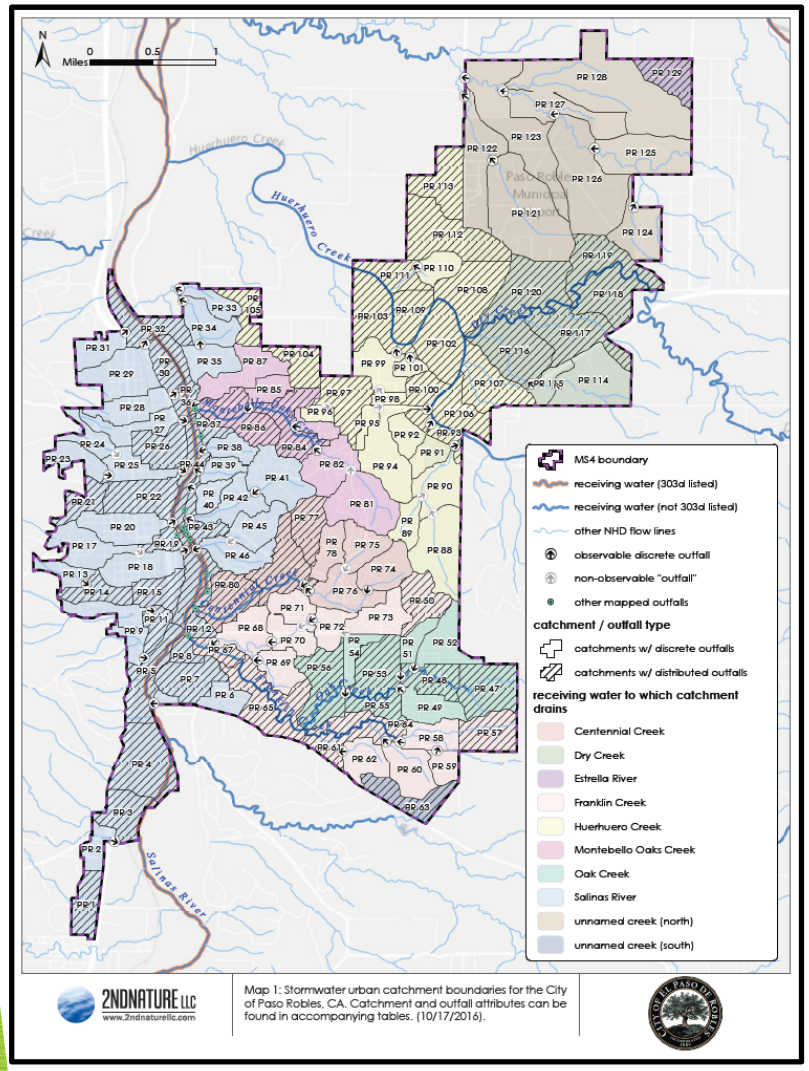


Mapping Process

- MS4 Catchment Delineation
  - Catchment Routing/Connectivity
  - Field mapping
- Attributes
  - Catchment attributes (slope, soils)
  - Land use attributes (% LUs per catchment, roads)
- Final MS4 Maps and Catchment Attributes



www.2ndnaturellc.com



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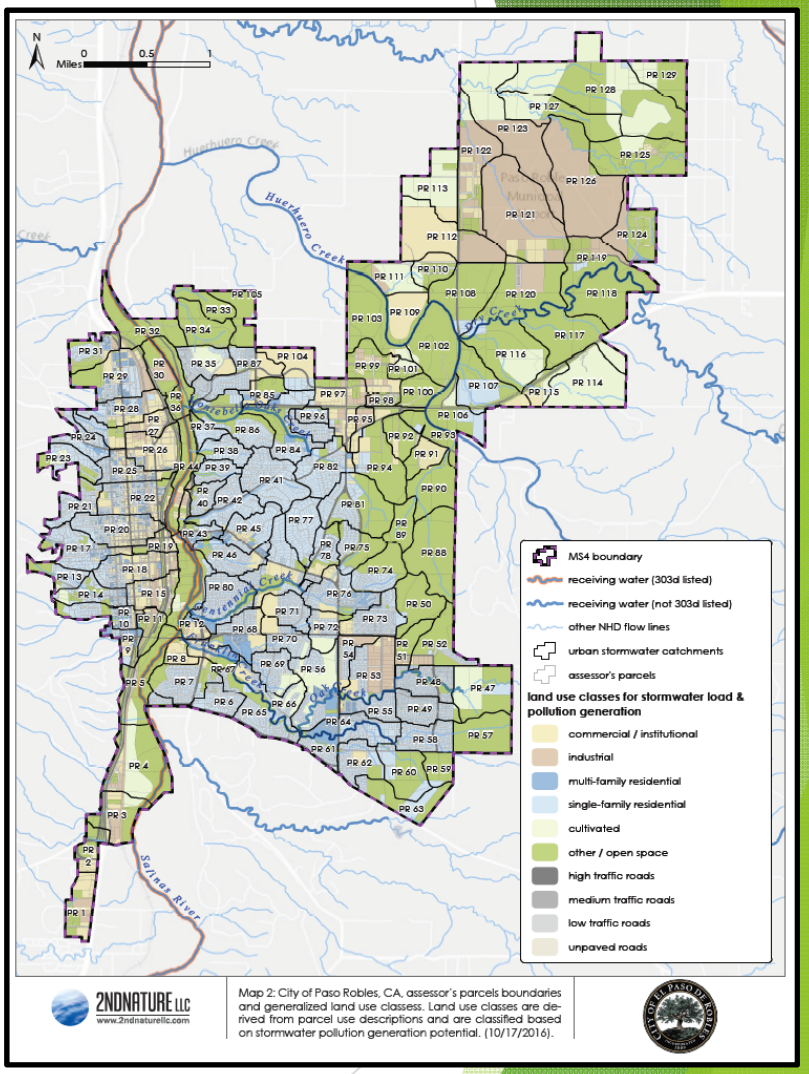
Map 1: Stormwater urban catchment boundaries for the City of Paso Robles, CA. Catchment and outfall attributes can be found in accompanying tables. (10/17/2016).



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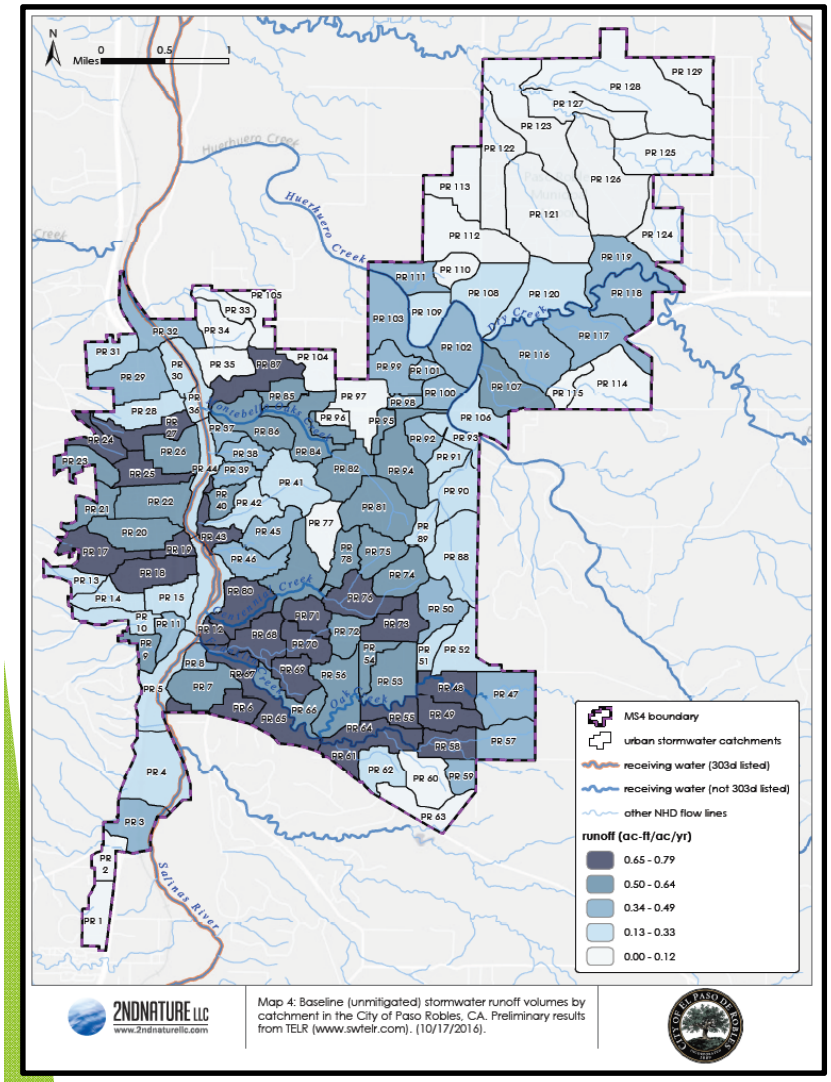
Map 2: City of Paso Robles, CA, assessor's parcels boundaries and generalized land use classess. Land use classes are derived from parcel use descriptions and are classified based on stormwater pollution generation potential. (10/17/2016).

Tool to Estimate Load Reduction

- Standard data set inputs (precipitation, soil type, % impervious surface, land use types, hydrologic connectivity)
- Evaluates Total Suspended Solids and Runoff Volume
  - Particulate – Specific Pollutant and Proxy
  - Runoff Volume - Loading
- Prioritizes catchments
- Easy user-friendly interface and spatial output for easy communication



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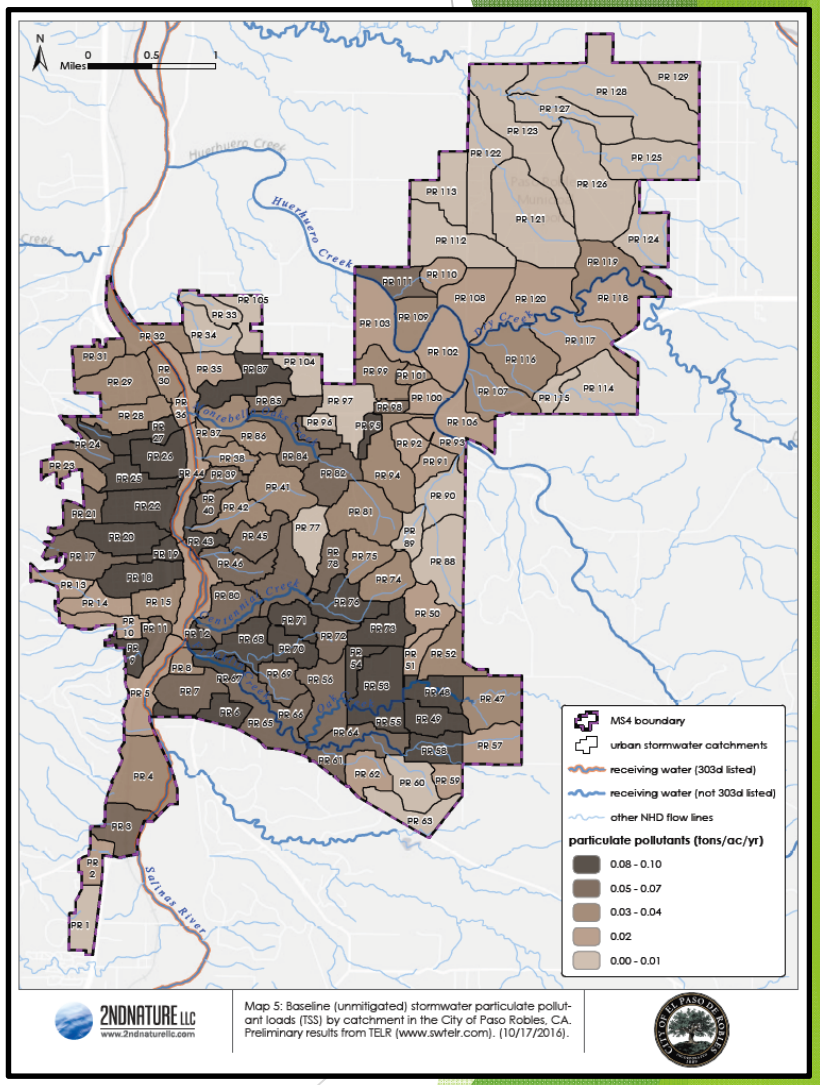
Map 4: Baseline (unmitigated) stormwater runoff volumes by catchment in the City of Paso Robles, CA. Preliminary results from TELR (www.swtelr.com). (10/17/2016).



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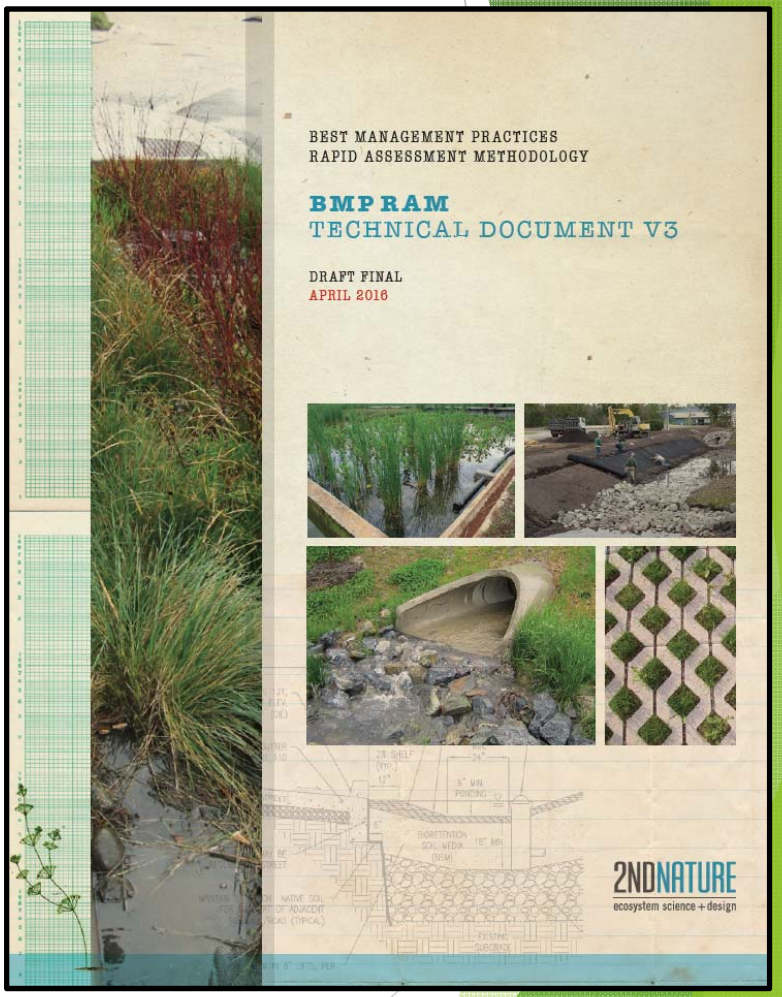
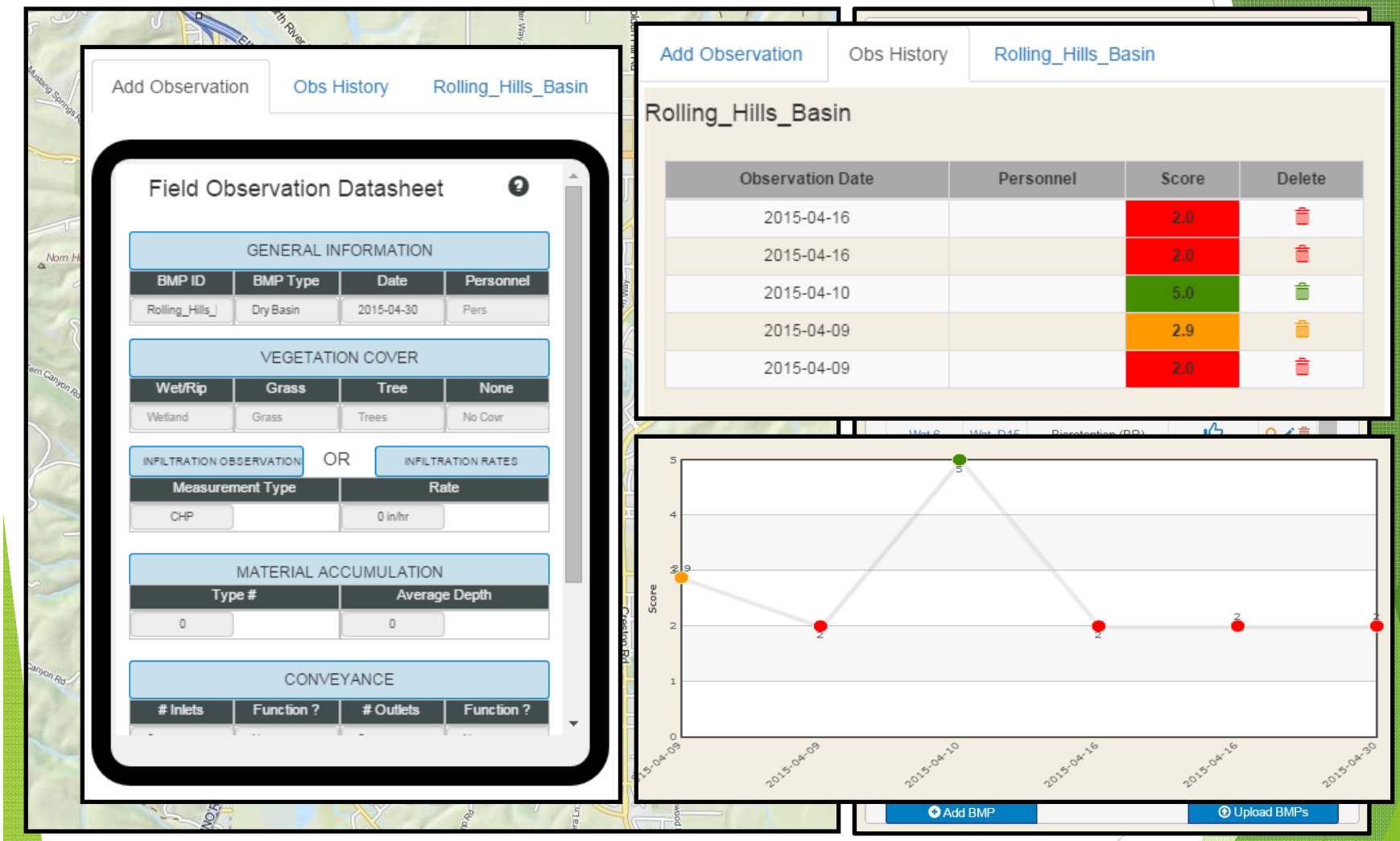
Map 5: Baseline (unmitigated) stormwater particulate pollutant loads (TSS) by catchment in the City of Paso Robles, CA. Preliminary results from TELR (www.swtelr.com). (10/17/2016).

BMP Assessment

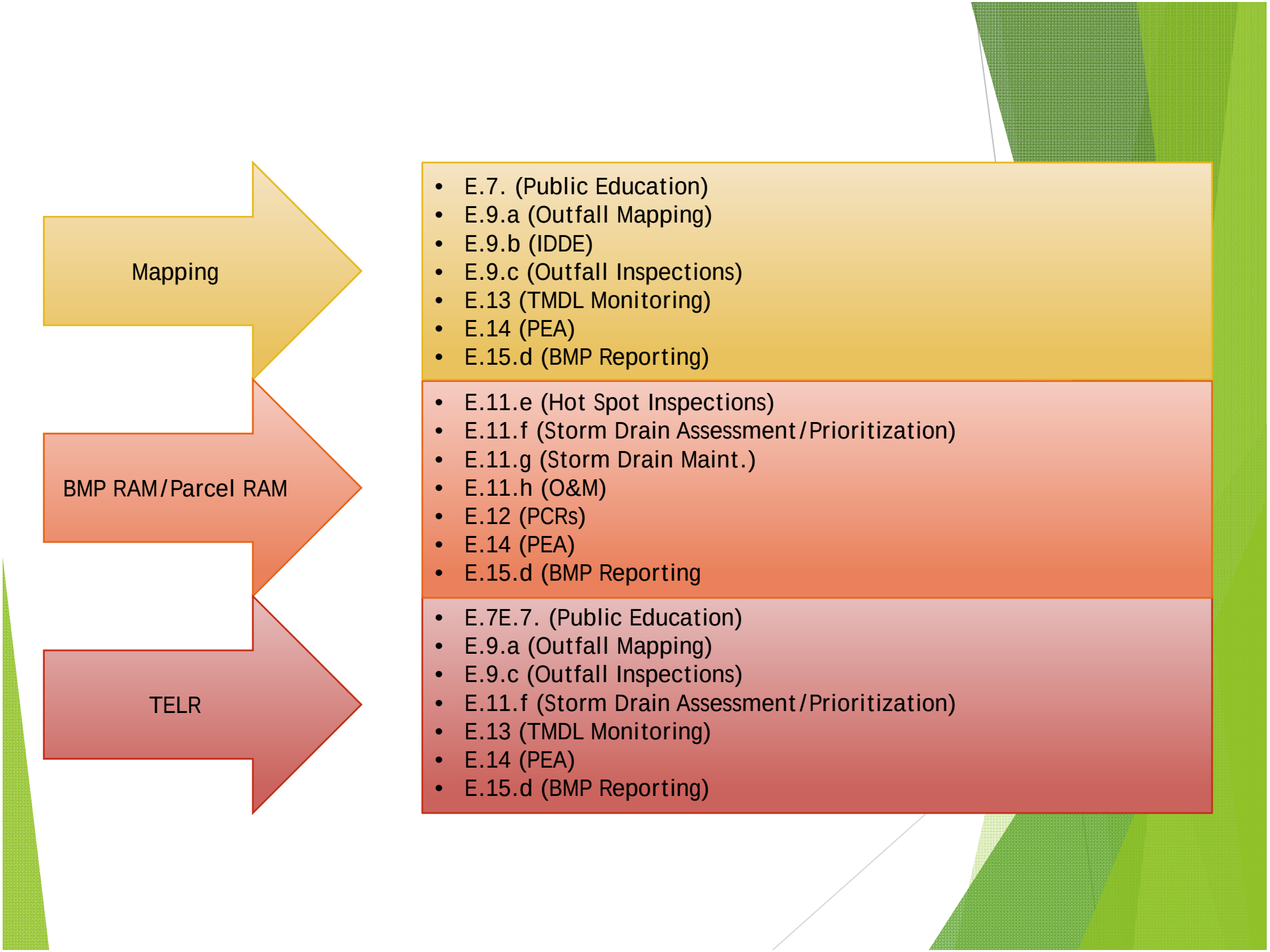
- Inventory BMPs
- Set Thresholds and Benchmarks
- Record Visual Observations
- Track BMP Effectiveness over time
- Prioritize Maintenance Needs
- Focus funding for CIPs/O&M
- Communicates with TELR



www.2ndnaturellc.com


Add Observation
Obs History
Rolling_Hills_Basin
Field Observation Datasheet
GENERAL INFORMATION
BMP ID
BMP Type
Date
Personnel
Rolling_Hills_
Dry Basin
2015-04-30
Pers
VEGETATION COVER
Wet/Rip
Grass
Tree
None
Wetland
Grass
Trees
No Covr
INFILTRATION OBSERVATION
OR
INFILTRATION RATES
Measurement Type
Rate
CHP
0 in/hr
MATERIAL ACCUMULATION
Type #
Average Depth
0
0
CONVEYANCE
Inlets
Function ?
Outlets
Function ?
Add Observation
Obs History
Rolling_Hills_Basin
Rolling_Hills_Basin
Observation Date
Personnel
Score
Delete
2015-04-16
2.0
2015-04-16
2.0
2015-04-10
5.0
2015-04-09
2.9
2015-04-09
2.0
Score
2015-04-09
2015-04-09
2015-04-10
2015-04-16
2015-04-16
2015-04-30
Add BMP
Upload BMPs

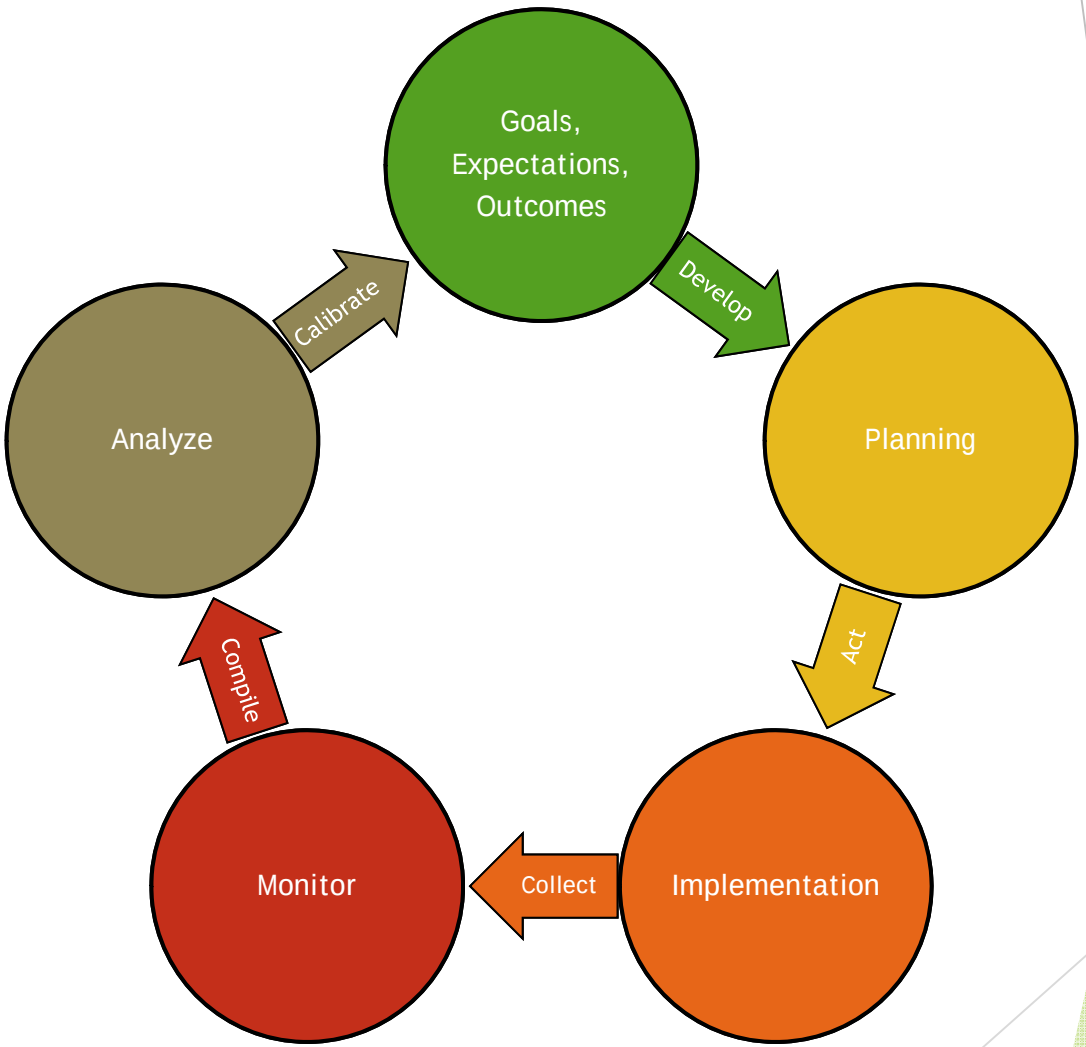

Municipal Progress
Year
2016
2017
2018
2019
2020
2021
ac-ft/yr
Reduction
Current
% Reduction
Unmitigated
0%
99.5
7%
99.5
21%
99.5
17%
99.5
16%
99.5
39%
99.5
2020 Runoff Load Reductions
Reduction 15.4 ac-ft/yr
Current 84.0 ac-ft/yr
Unmitigated 99.5 ac-ft/yr
Parcel Improvements (4.2 ac-ft/yr)
Decentralized BMPs (11
Load Reduction Type
%
Load
Centralized BMPs
0%
0.0 ac-ft/yr
Decentralized BMPs
73%
11.2 ac-ft/yr
Parcel Improvements
27%
4.2 ac-ft/yr
Load Reduction
15.4 ac-ft/yr
Percent Reduced
16%


Mapping
BMP RAM/Parcel RAM
TELR
• E.7. (Public Education)
• E.9.a (Outfall Mapping)
• E.9.b (IDDE)
• E.9.c (Outfall Inspections)
• E.13 (TMDL Monitoring)
• E.14 (PEA)
• E.15.d (BMP Reporting)
• E.11.e (Hot Spot Inspections)
• E.11.f (Storm Drain Assessment/Prioritization)
• E.11.g (Storm Drain Maint.)
• E.11.h (O&M)
• E.12 (PCRs)
• E.14 (PEA)
• E.15.d (BMP Reporting
• E.7E.7. (Public Education)
• E.9.a (Outfall Mapping)
• E.9.c (Outfall Inspections)
• E.11.f (Storm Drain Assessment/Prioritization)
• E.13 (TMDL Monitoring)
• E.14 (PEA)
• E.15.d (BMP Reporting)

Benefits (ancillary and otherwise…)

- Grant Chasing
  - supporting information/data
  - Prop 1 development
- Public Outreach/Involvement Tracking
  - Focused messaging and target areas
- Future Planning Scenarios
  - Assessing future development
  - Identifying beneficial BMP areas

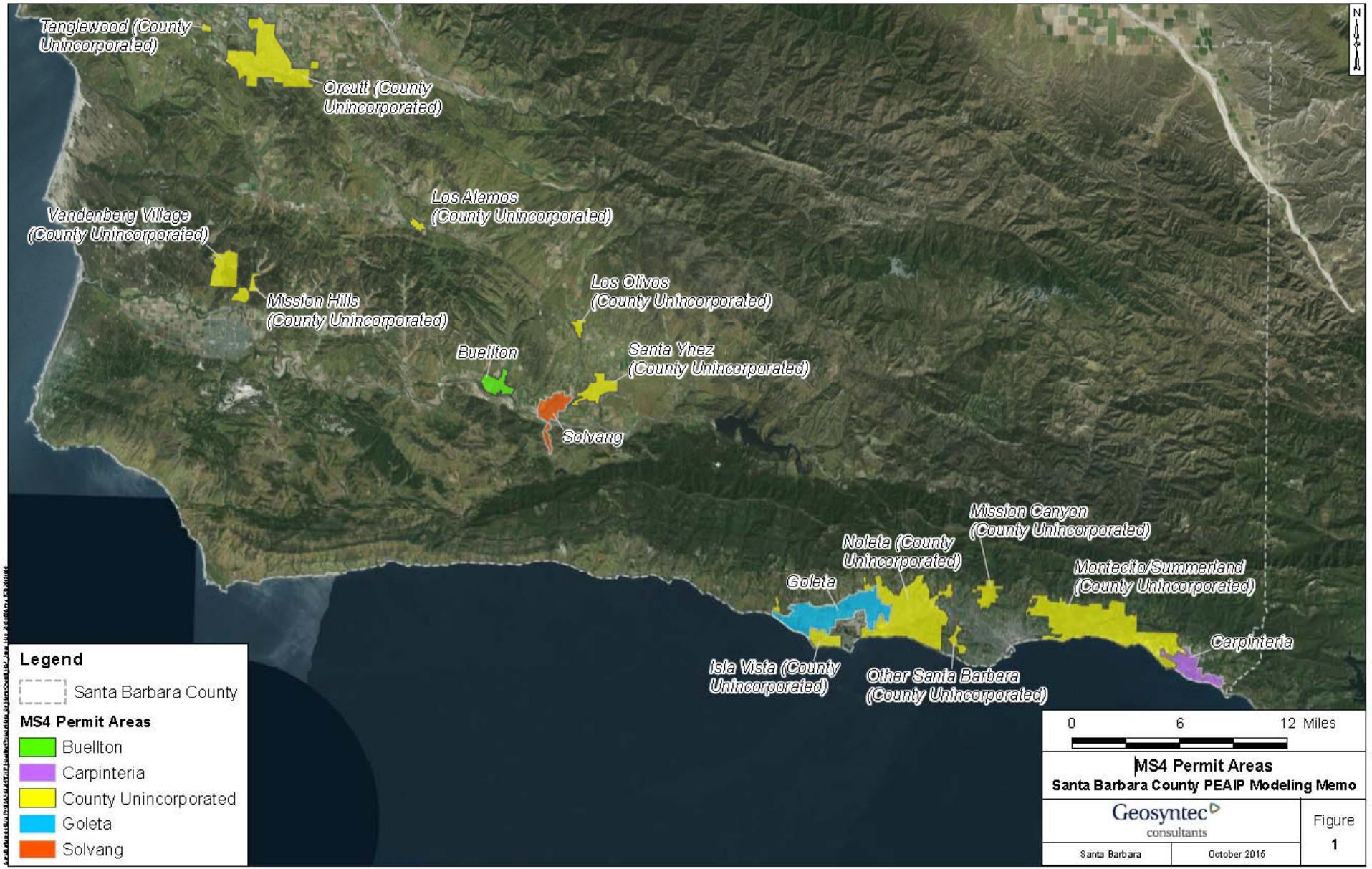
PEAIP

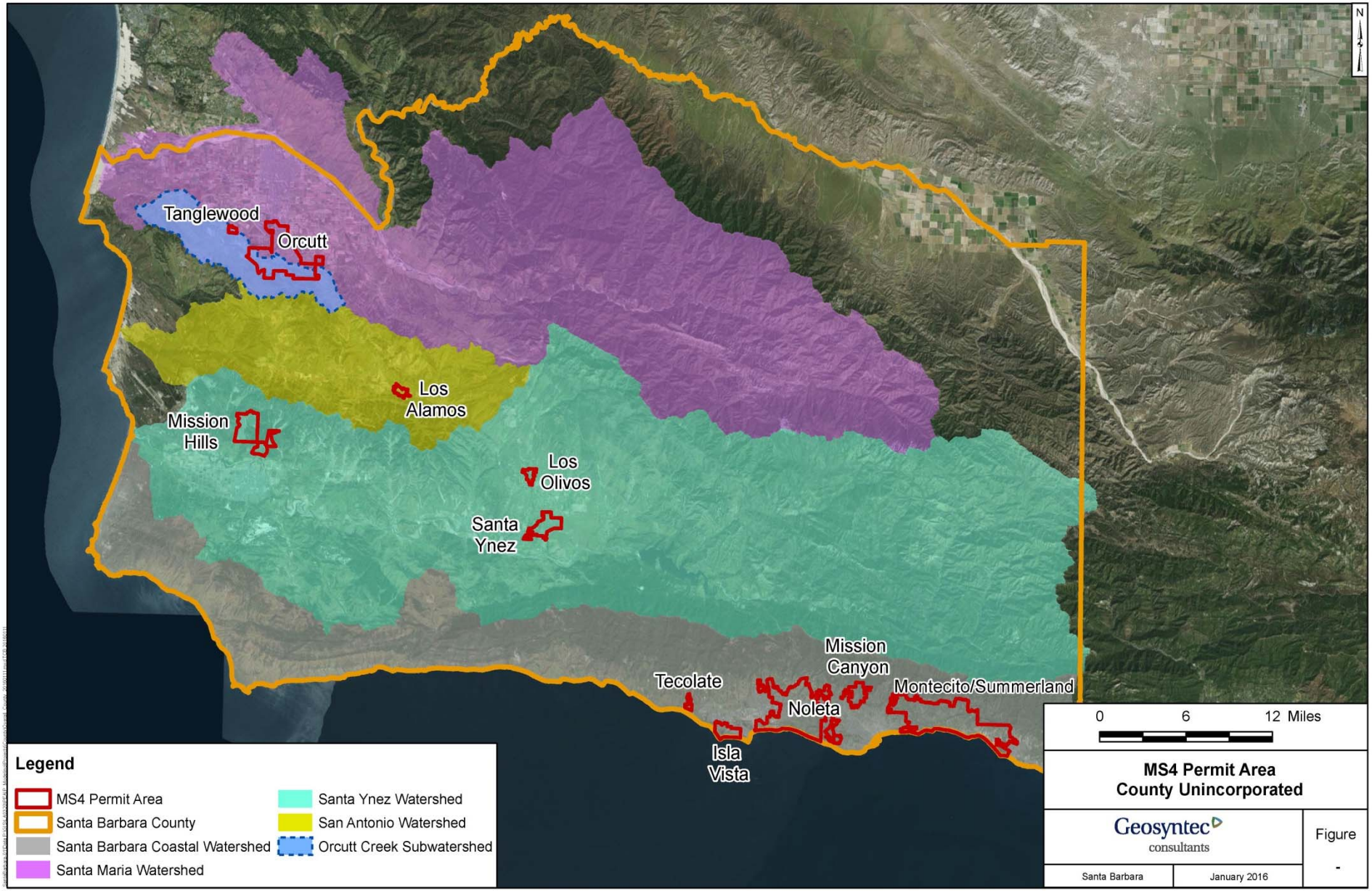

Goals, Expectations, Outcomes
Develop
Planning
Act
Implementation
Collect
Monitor
Compile
Analyze
Calibrate

LPR Model for Pollutant Load Reduction

County of Santa Barbara
Cities of Buellton, Solvang, Goleta, Carpinteria

Cathleen Garnand, County of Santa Barbara


Tanglewood (County Unincorporated)
Orcutt (County Unincorporated)
Los Alamos (County Unincorporated)
Vandenberg Village (County Unincorporated)
Mission Hills (County Unincorporated)
Los Olivos (County Unincorporated)
Buellton
Santa Ynez (County Unincorporated)
Solvang
Mission Canyon (County Unincorporated)
Noleta (County Unincorporated)
Goleta
Montecito/Summerland (County Unincorporated)
Carpinteria
Isla Vista (County Unincorporated)
Other Santa Barbara (County Unincorporated)
N
Legend
Santa Barbara County
MS4 Permit Areas
Buellton
Carpinteria
County Unincorporated
Goleta
Solvang
0
6
12 Miles
MS4 Permit Areas
Santa Barbara County PEAIP Modeling Memo
Geosyntec consultants
Santa Barbara
October 2015
Figure 1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Tanglewood
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Los Alamos
Mission Hills
Los Olivos
Santa Ynez
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Legend
MS4 Permit Area
Santa Barbara County
Santa Barbara Coastal Watershed
Santa Maria Watershed
Santa Ynez Watershed
San Antonio Watershed
Orcutt Creek Subwatershed
MS4 Permit Area
County Unincorporated
Geosyntec consultants
Figure
-
Santa Barbara
January 2016

PEAIP (E.14) meets Monitoring (E.13)

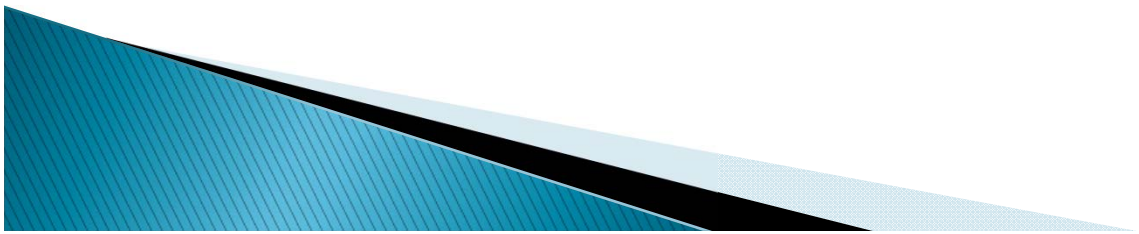
- Spatially-based model
- Quantify pollutant loads
- BMP load reduction
- Monitoring data to support model

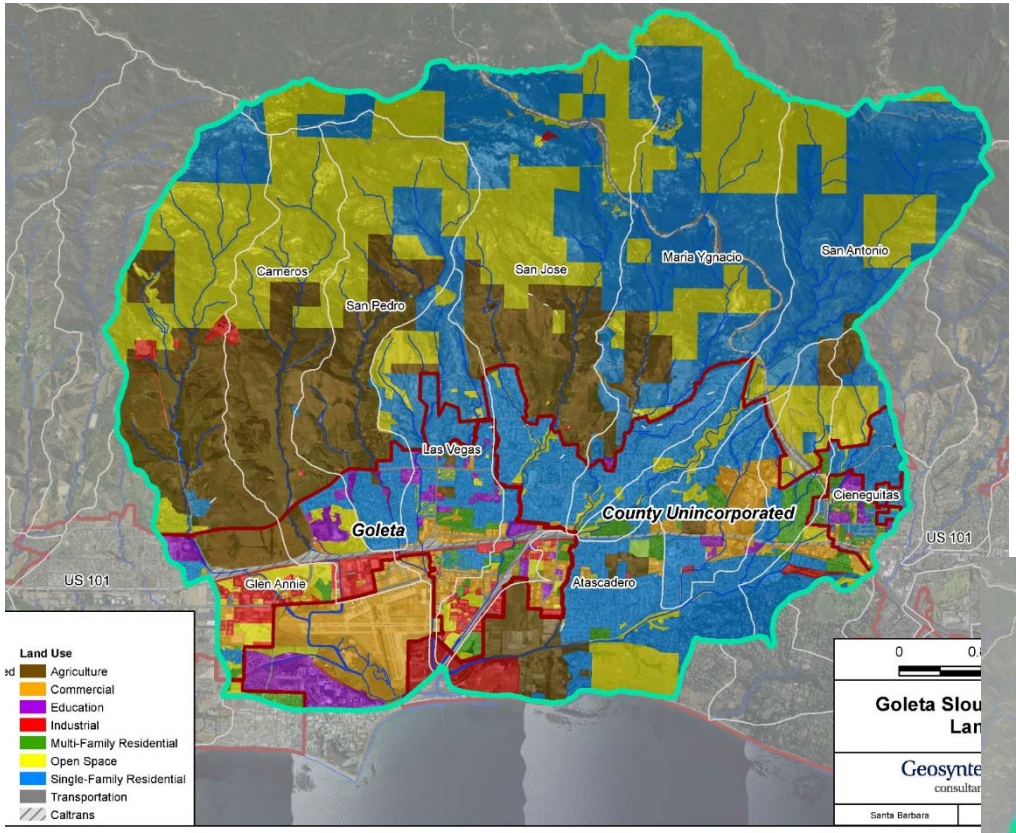
Multiple Modeling Objectives

Model Function	Ph II MS4 Permit	13267 Letter	TMDL Plans	SWRPs
Quantify Structural BMPs Reductions	X (pollutants)	X (vol/sed only)	X (TMDL pollutants)	X (pollutants, water supply)
Quantify Nonstructural BMPs Reductions	X (pollutants)	X (vol/sed only)	X (TMDL pollutants)	
Prioritize Catchments (pre BMPs, post BMPs*)		X		
Incorporate WQ Monitoring Results		X	X	
Inventory Structural BMPs (where, what, maint. status)*		X		
Retrofit Opportunities/ Constraints Screening				X (GIS-based)

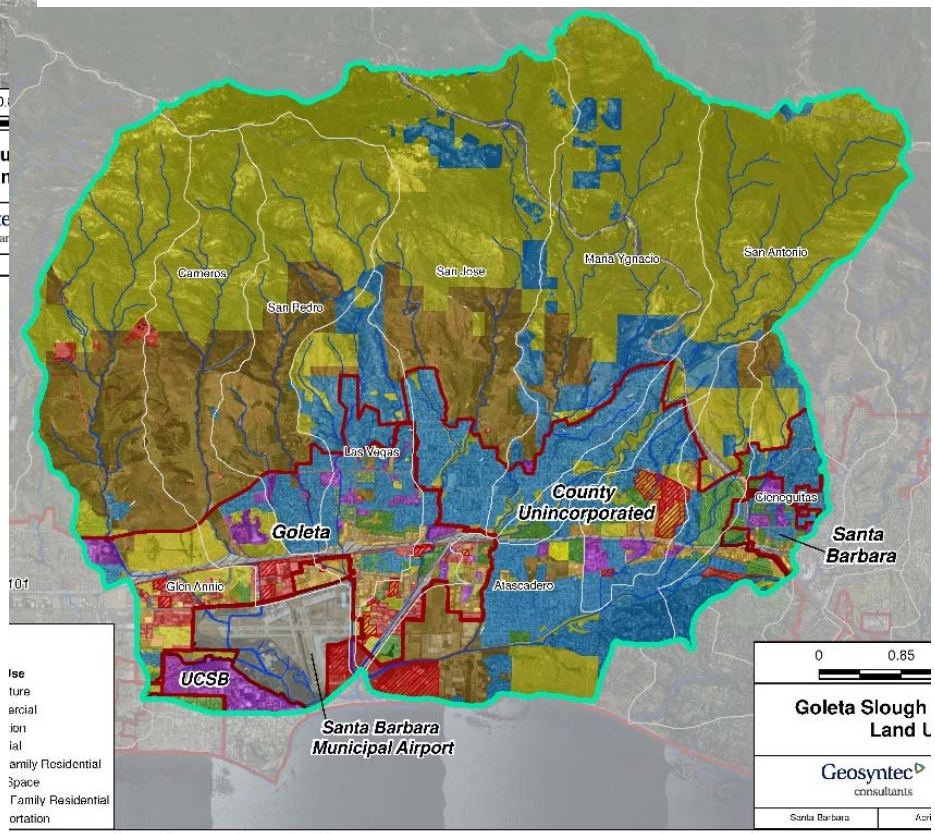
LPR Model Features

- Meet Water Board requirements
- Low Cost
- User-friendly
- Easily customized and adjusted
- Multiple water quality parameters
- Track BMP implementation



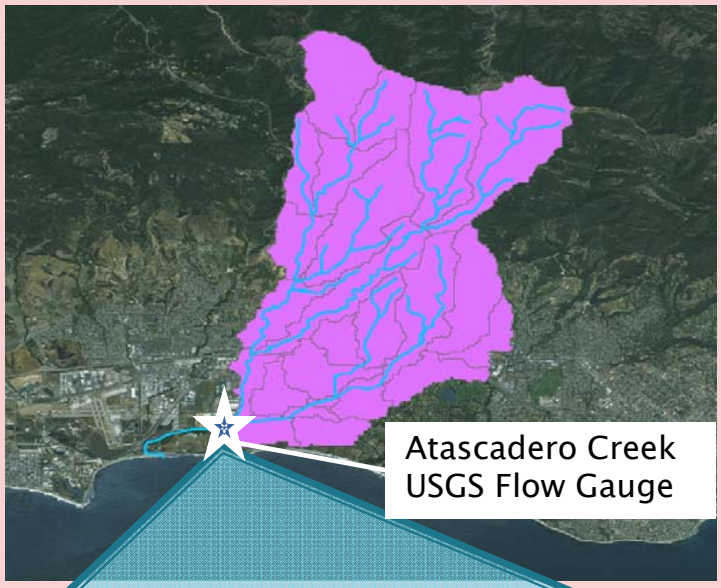


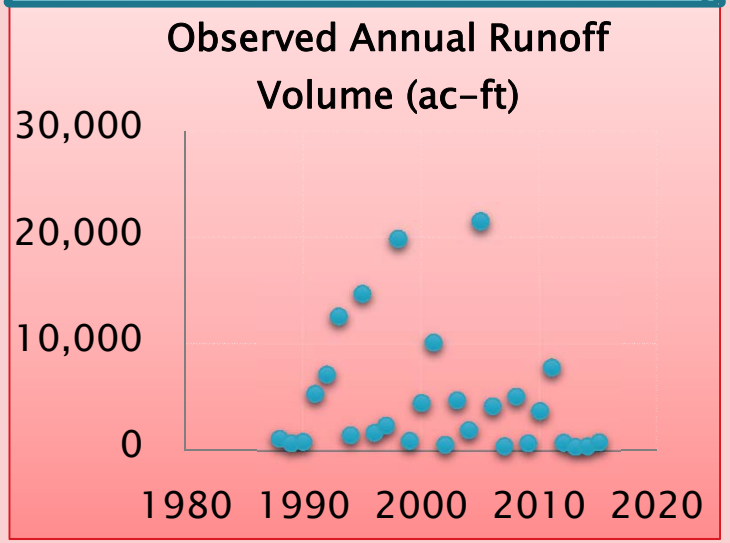
Quantify annual average wet weather pollutant loads and runoff volumes



Inputs: soils, land use (IMP), precip data

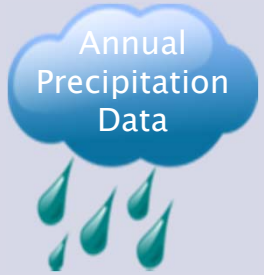
Observed Flow Data



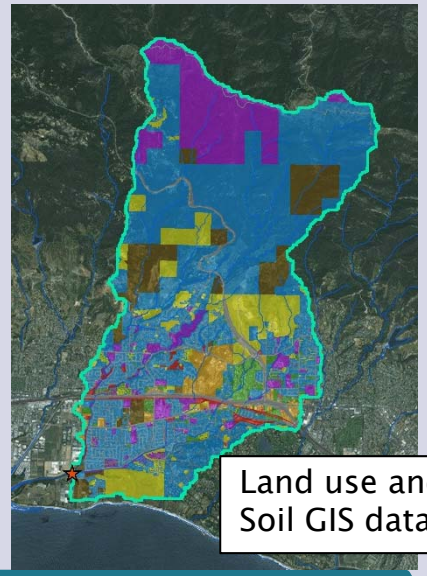


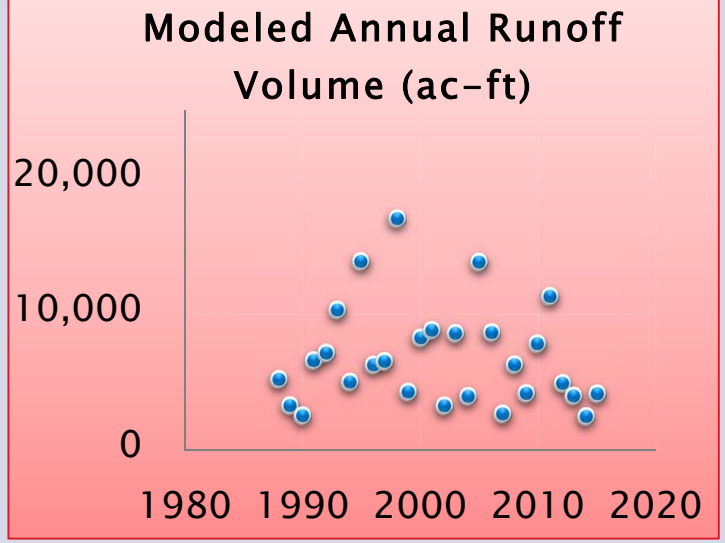
Calibrated Runoff Volume Multiplier

Model-Predicted Runoff



Modeled Runoff Coefficients





Model Framework

Jurisdiction Calculation Tabs

- Input data from GIS (catchments pre-populated, only change if needed)
- Input from "BMP Input" tab is transferred
- Calculates baseline loading and BMP load reductions (by catchment & land use)

Table 1. Baseline Load Calculations (Goleta)

Goleta	Catchment	Land Use	IMP (%)	Hydrologic Soil Group	Area acres	C - Runoff Coefficient	Annual Runoff (cu ft)	Annual Pollutant Loads: TSS lb	Tot P lb	Diss P lb	NH3 lb	NO3 lb	TKN lb	Diss Cu lb	Tot Cu lb	Tot Pb lb	Diss Zn lb	Tot Zn lb	Fecal Col. 10^12 MPN
Goleta Slough Watershed	A001	Commercial	91	B	0.0021	0.90	129	0.54	0.0032	0.0023	0.0097	0.0044	0.028	9.88E-05	2.52E-04	9.96E-05	0.0012	0.0019	2.01E-04
	A001	Industrial	80	B	0.11	0.79	5,947	81	0.14	0.097	0.22	0.32	1.1	0.0056	0.013	0.0061	0.16	0.20	0.031
	A001	Commercial	91	C	0.95	0.90	57,445	240	1.4	1.0	4.3	2.0	12	0.044	0.11	0.044	0.55	0.85	0.090
	A001	Commercial	96	C	0.56	0.94	35,407	148	0.88	0.64	2.7	1.2	7.6	0.027	0.069	0.027	0.34	0.52	0.055
GIS Input	A001	Transportation	91	C	0.95	0.90	57,445	279	2.4	2.0	1.3	2.7	6.6	0.12	0.19	0.033	0.80	1.1	0.027
Model Calculations	A002	Commercial	91	B	2.49E-04	0.90	15	0.063	3.74E-04	2.71E-04	0.0011	5.14E-04	0.0032	1.15E-05	2.94E-05	1.16E-05	1.43E-04	2.22E-04	2.34E-05
User Input (transferred from BMP Input tab)	A002	Industrial	80	B	0.048	0.79	2,565	35	0.062	0.042	0.096	0.14	0.46	0.0024	0.0055	0.0026	0.068	0.086	0.014
	A002	Industrial	80	C	2.05E-04	0.80	11	0.15	2.70E-04	1.80E-04	4.15E-04	6.01E-04	0.0020	1.05E-05	2.38E-05	1.13E-05	2.92E-04	3.71E-04	5.86E-05
	A002	Commercial	91	D	2.00E-06	0.90	0.12	5.09E-04	3.04E-06	2.20E-06	9.18E-06	4.17E-06	2.61E-05	9.34E-08	2.38E-07	9.41E-08	1.16E-06	1.80E-06	1.90E-07
	A002	Industrial	80	D	0.17	0.81	9,153	125	0.22	0.15	0.34	0.50	1.6	0.0087	0.020	0.0094	0.24	0.31	0.048
	A003	Industrial	80	C	0.95	0.80	51,287	702	1.2	0.83	1.9	2.8	9.2	0.049	0.11	0.053	1.4	1.7	0.27
	A003	Industrial	80	D	0.052	0.81	2,848	39	0.069	0.046	0.11	0.15	0.51	0.0027	0.0061	0.0029	0.075	0.096	0.015

Table 2. BMP Load Reduction Calculations (Goleta)

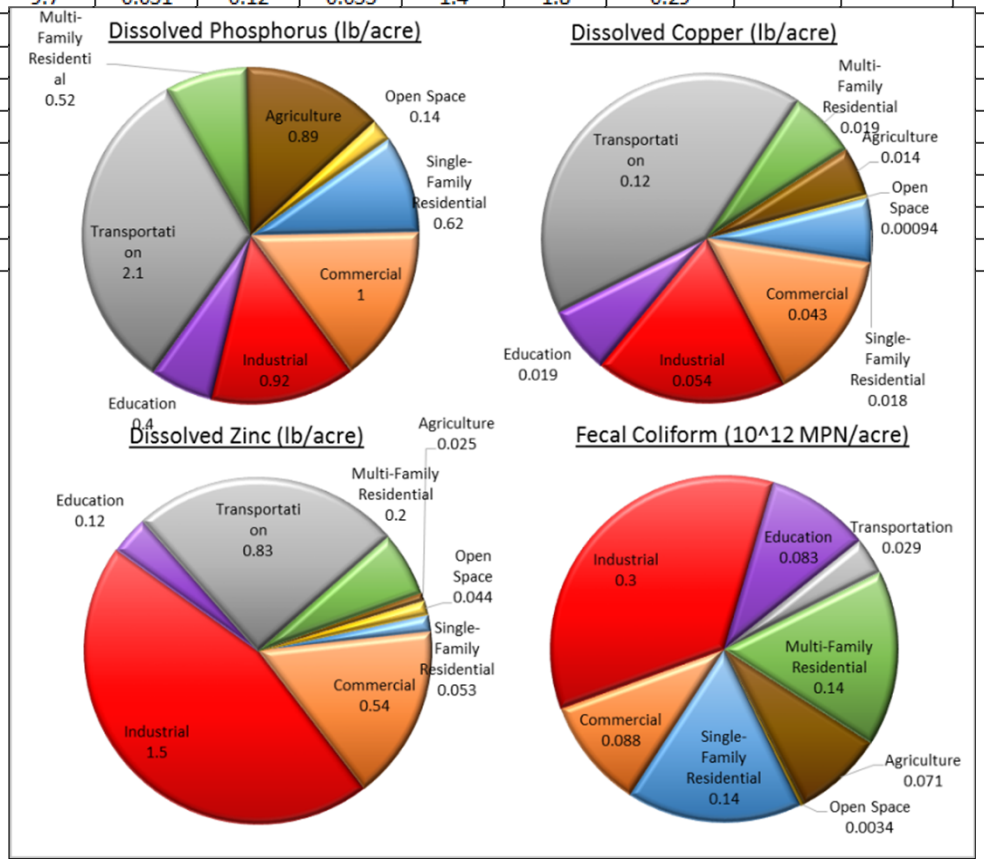
BMP	Catchment	Land Use	BMP Area Input: % of Land Use	OR Acres	Implementation Year	BMP Treatment Area Acres
Brake Pad Copper Phase-out Legislation	All	Single-Family Residential	100%		2013	1,402
Brake Pad Copper Phase-out Legislation	All	Commercial	100%		2013	626
Brake Pad Copper Phase-out Legislation	All	Industrial	100%		2013	446
Brake Pad Copper Phase-out Legislation	All	Multi-Family Residential	100%		2013	372
Brake Pad Copper Phase-out Legislation	All	Transportation	100%		2013	280
Brake Pad Copper Phase-out Legislation	All	Education	100%		2013	418
Brake Pad Copper Phase-out Legislation	All	Agriculture	100%		2013	126
Brake Pad Copper Phase-out Legislation	All	Single-Family Re				

ANNUAL LOAD REDUCTION												
Runoff cu ft	TSS lb	Tot P lb	Diss P lb	NH3 lb	NO3 lb	TKN lb	Diss Cu lb	Tot Cu lb	Tot Pb lb	Diss Zn lb	Tot Zn lb	Fecal Col. 10^12 MPN
0	0	0	0	0	0	0	0.70	1.4	0	0	0	0
0	0	0	0	0	0	0	0.74	1.9	0	0	0	0
0	0	0	0	0	0	0	0.66	1.5	0	0	0	0
0	0	0	0	0	0	0	0.20	0.32	0	0	0	0
0	0	0	0	0	0	0	0.94	1.5	0	0	0	0
0	0	0	0	0	0	0	0.33	0.35	0	0	0	0
0	0	0	0	0	0	0	0.050	0.22	0	0	0	0

Pollutant Load – by land use

Table 1. Baseline Loads by Catchment

Catchment	Runoff	TSS	Tot P	Diss P	NH3	NO3	TKN	Diss Cu	Tot Cu	Tot Pb	Diss Zn	Tot Zn	Fecal Col.	Pollutant	Pollutant	Pollutant
	cu ft	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	10^12 MPN	unit	unit	unit
A001	156,372	749	4.9	3.8	8.6	6.2	28	0.19	0.38	0.11	1.8	2.6	0.20			
A002	11,745	161	0.29	0.19	0.44	0.64	2.1	0.011	0.025	0.012	0.31	0.39	0.062			
A003	54,135	741	1.3	0.88	2.0	2.9	9.7	0.051	0.12	0.055	1.4	1.8	0.29			
A004	154,076	2,108	3.8	2.5	5.8	8.4										
A005	974,930	13,341	24	16	37	53										
A006	1,202,661	15,926	30	21	44	65										
A007	1,018,199	12,025	25	17	45	51										
A008	266,112	3,642	6.5	4.3	10.0	14										
A009	1,658,909	15,102	36	26	73	95										
A010	1,295,413	8,872	28	21	60	71										
A011	2,966,625	27,807	63	46	119	155										

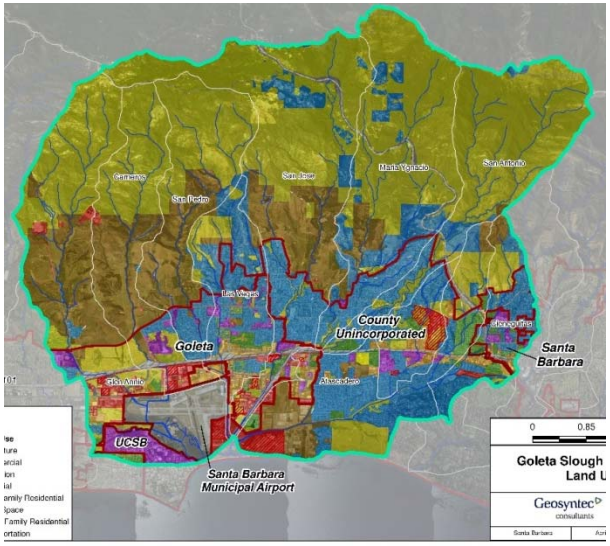


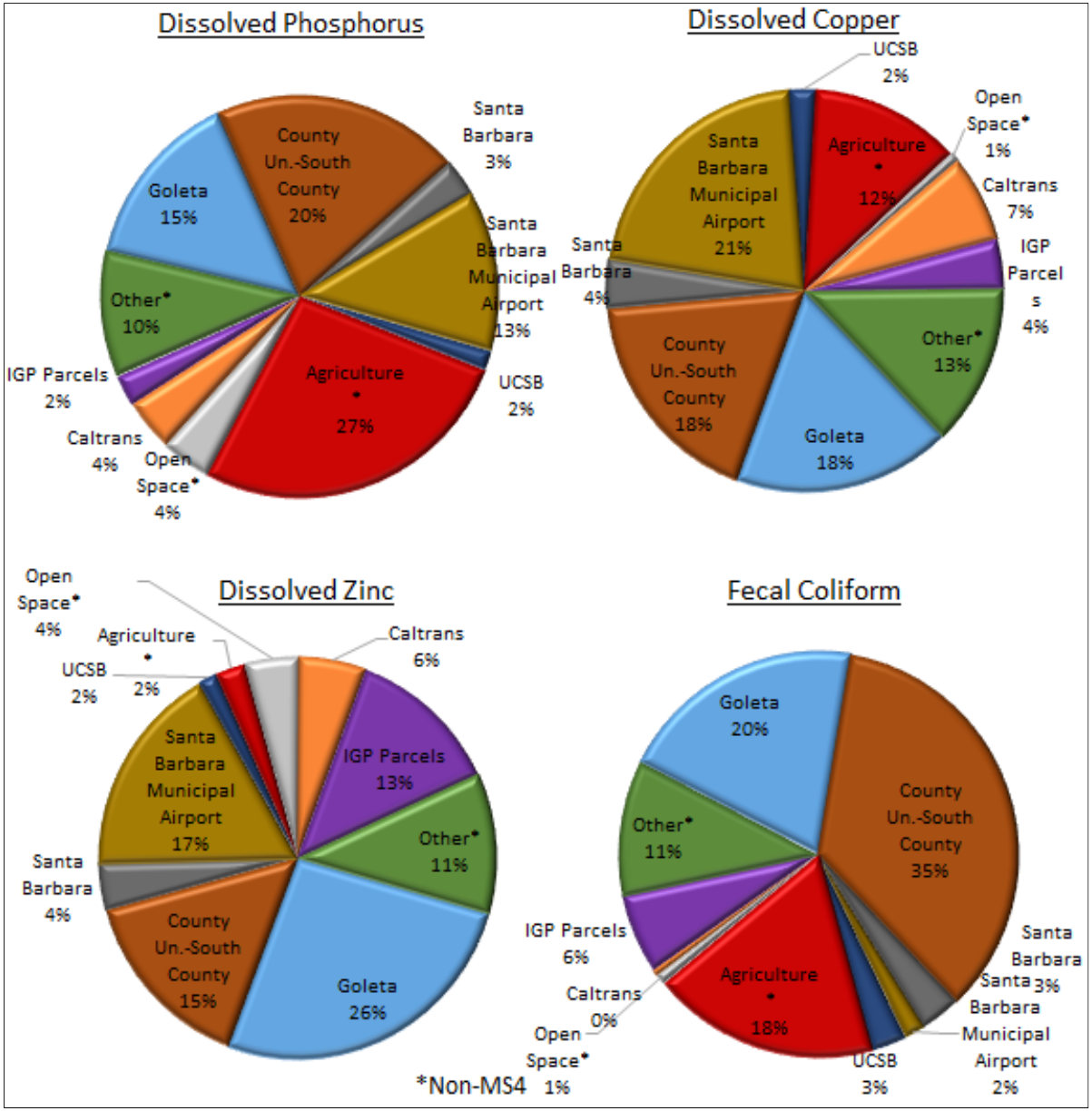
Watershed Loads

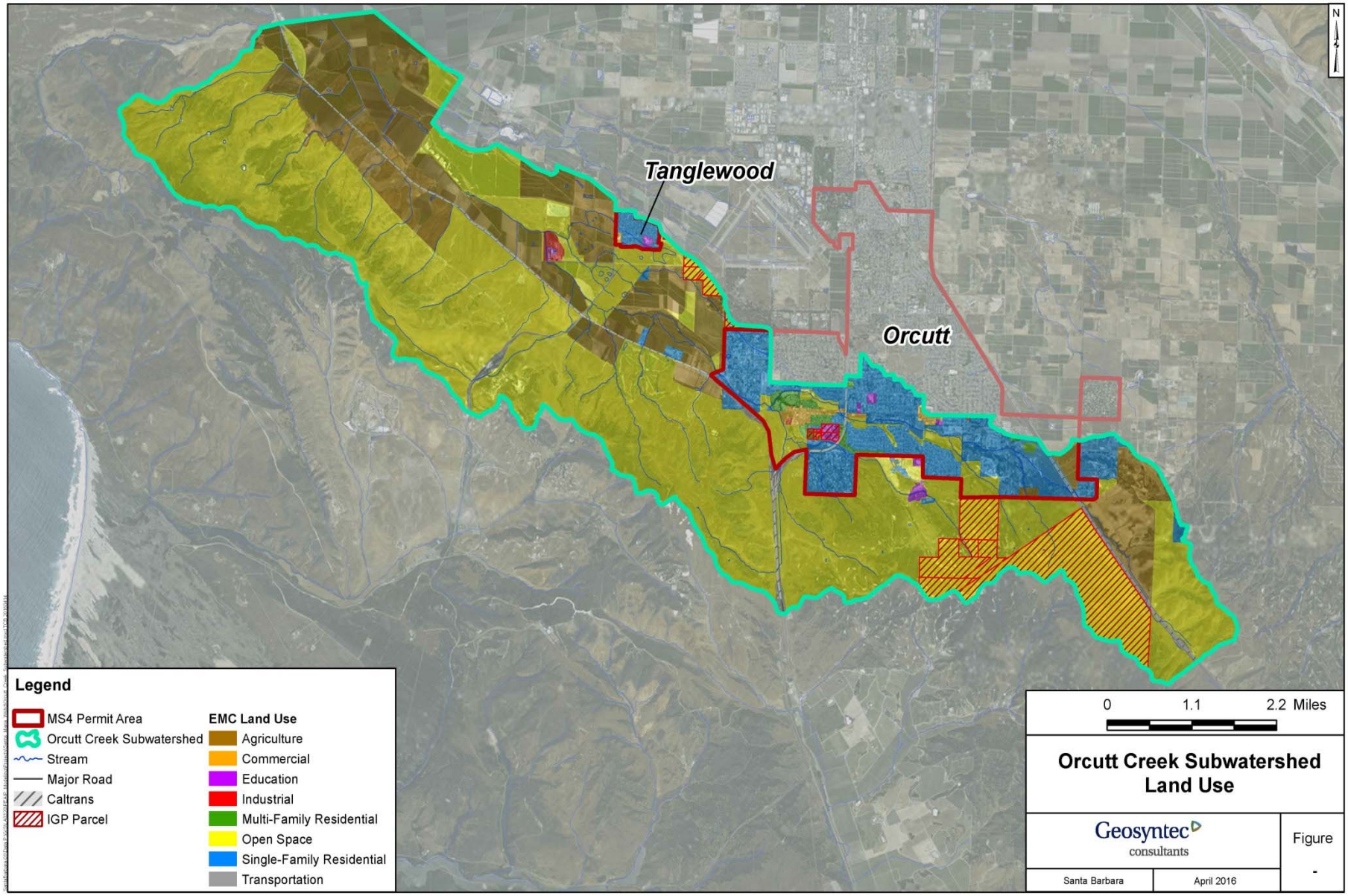
Table 8. Goleta Slough Watershed Baseline Loads

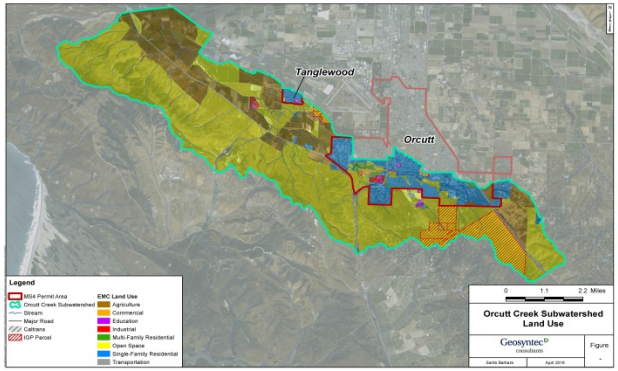
Area	Runoff	TSS	Tot P	Diss P	NH3	NO3	TKN	Diss Cu	Tot Cu	Tot Pb	Diss Zn	Tot Zn	Fecal Col.
	cu ft	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	lb	10^12 MPN
Goleta MS4 Area	110,000,000	950,000	2,700	2,000	4,300	7,800	18,000	87	190	72	1,100	1,500	320
Other MS4 Permit Areas	230,000,000	1,650,000	6,900	5,300	7,700	19,200	36,000	223	410	138	1,600	2,400	680
Agriculture*	42,000,000	2,600,000	8,700	3,700	4,300	90,000	19,000	59	260	79	100	720	290
Open Space*	100,000,000	1,400,000	760	570	700	7,400	6,100	3.8	67	19	180	170	14
Caltrans	17,000,000	81,000	710	580	380	770	1,900	34	54	9.6	230	300	7.9
IGP Parcels	22,000,000	280,000	500	340	800	1,200	3,700	19	44	21	520	660	100
Other*	57,000,000	370,000	1,700	1,400	1,600	2,300	8,900	63	110	38	470	680	170
Total Watershed	578,000,000	7,331,000	21,970	13,890	19,780	128,670	93,600	489	1,135	377	4,200	6,430	1,582

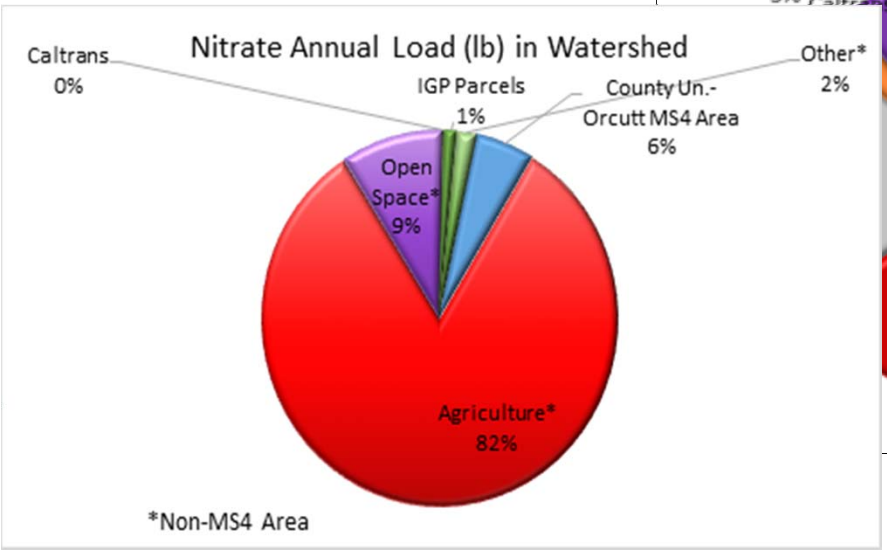
Land Use Types
Can distinguish other permitted discharges i.e. ag, industrial (IGP) and Caltrans

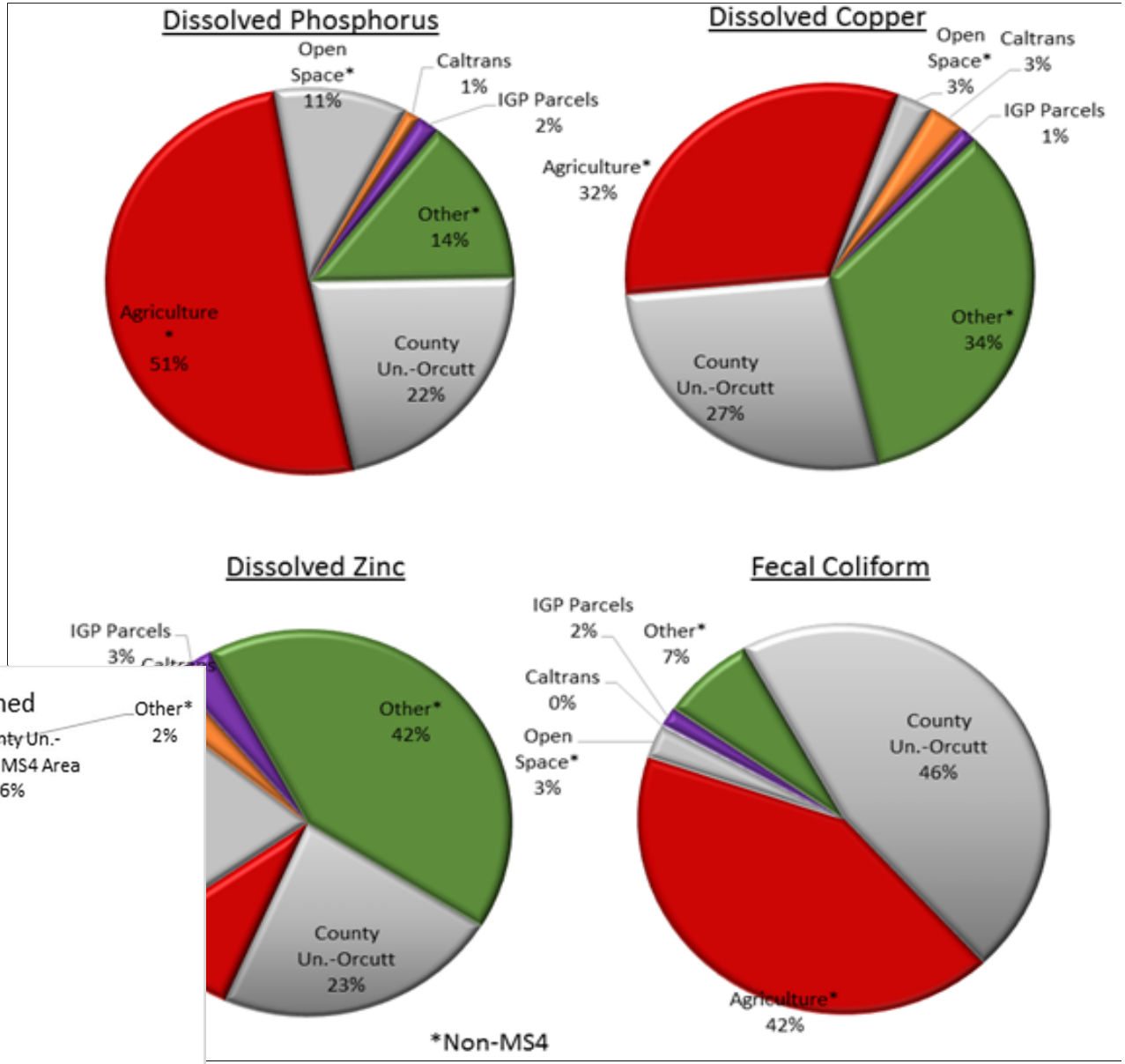

Goleta
County Unincorporated
Santa Barbara
UCSB
Santa Barbara Municipal Airport
Goleta Slough Land U
Geosyntec
consultants


Dissolved Phosphorus
County Un.-South County 20%
Santa Barbara 3%
Santa Barbara Municipal Airport 13%
UCSB 2%
Agriculture* 27%
Open Space* 4%
Caltrans 4%
IGP Parcels 2%
Other* 10%
Goleta 15%
Dissolved Copper
UCSB 2%
Open Space* 1%
Caltrans 7%
IGP Parcels 4%
Other* 13%
Goleta 18%
County Un.-South County 18%
Santa Barbara 4%
Santa Barbara Municipal Airport 21%
Agriculture* 12%
Dissolved Zinc
Open Space* 4%
Agriculture* 2%
UCSB 2%
Caltrans 6%
IGP Parcels 13%
Other* 11%
Goleta 26%
County Un.-South County 15%
Santa Barbara 4%
Santa Barbara Municipal Airport 17%
Fecal Coliform
Goleta 20%
County Un.-South County 35%
Santa Barbara 3%
Santa Barbara Municipal Airport 2%
UCSB 3%
Agriculture* 18%
Open Space* 1%
Caltrans 0%
IGP Parcels 6%
Other* 11%
*Non-MS4

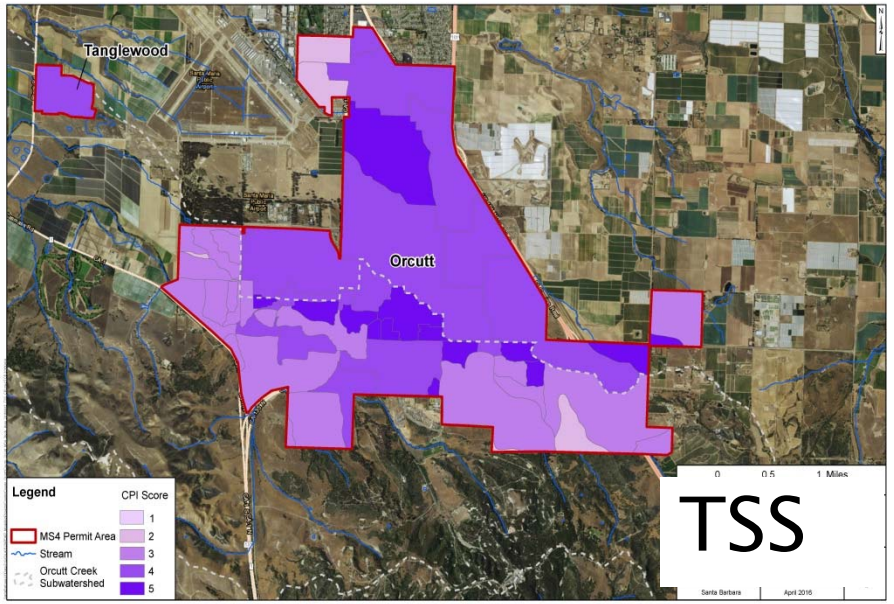

Tanglewood
Orcutt
N
Legend
MS4 Permit Area
Orcutt Creek Subwatershed
Stream
Major Road
Caltrans
IGP Parcel
EMC Land Use
Agriculture
Commercial
Education
Industrial
Multi-Family Residential
Open Space
Single-Family Residential
Transportation
0
1.1
2.2 Miles
Orcutt Creek Subwatershed Land Use
Geosyntec consultants
Santa Barbara
April 2016
Figure
-

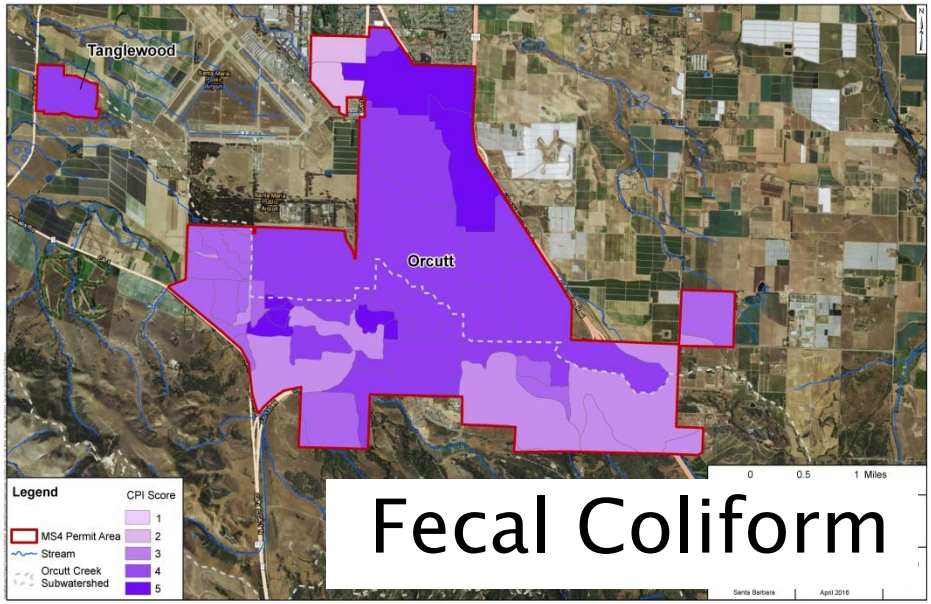

Tanglewood
Orcutt
Legend
MS4 Permit Area
Orcutt Creek Subwatershed
Stream
Major Road
Caltrans
IGP Parcel
EMC Land Use
Agriculture
Commercial
Education
Industrial
Multi-Family Residential
Open Space
Single-Family Residential
Transportation
0 1.1 2.2 Miles
Orcutt Creek Subwatershed Land Use
Geosyntec consultants
Figure -

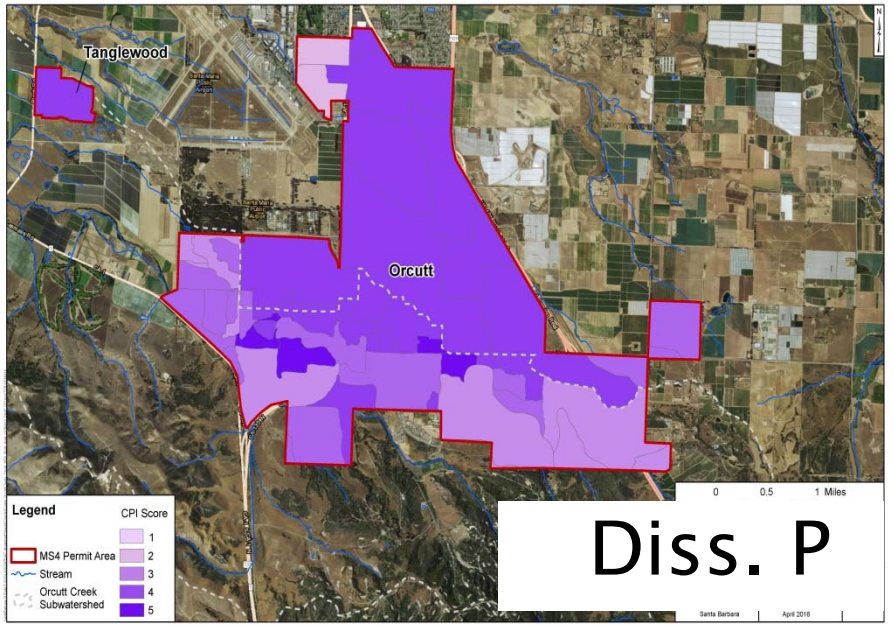

Nitrate Annual Load (lb) in Watershed
Caltrans 0%
IGP Parcels 1%
County Un.-Orcutt MS4 Area 6%
Other* 2%
Open Space* 9%
Agriculture* 82%
*Non-MS4 Area

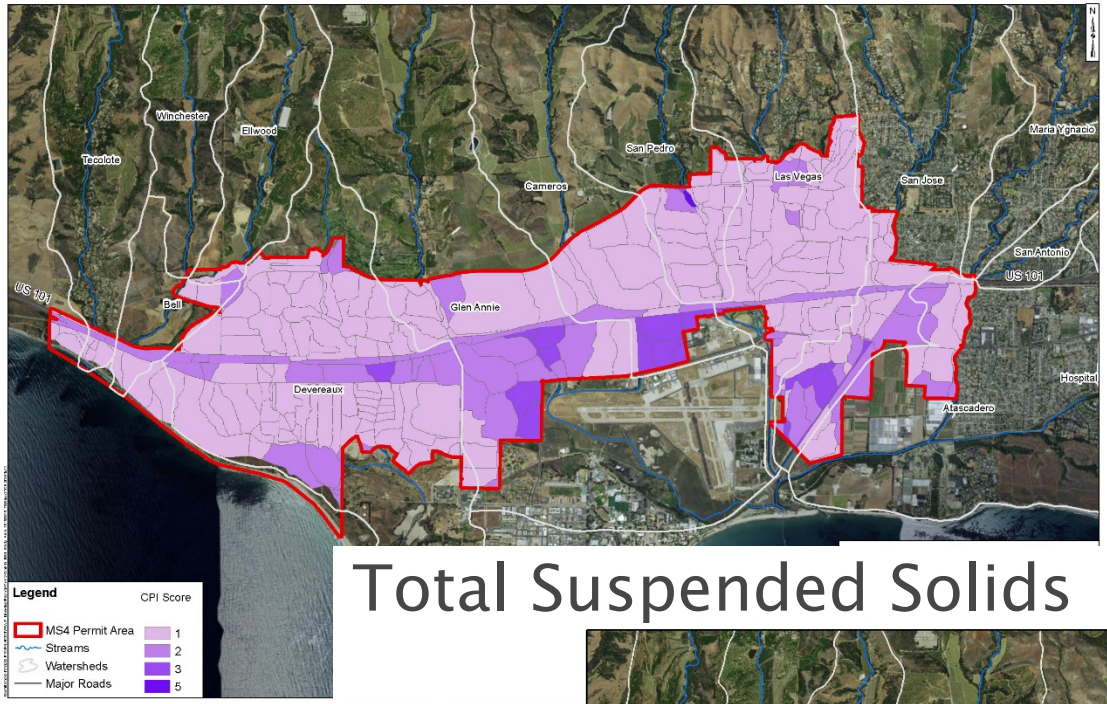

Dissolved Phosphorus
Open Space* 11%
Caltrans 1%
IGP Parcels 2%
Other* 14%
Agriculture* 51%
County Un.-Orcutt 22%
Dissolved Copper
Open Space* 3%
Caltrans 3%
IGP Parcels 1%
Agriculture* 32%
Other* 34%
County Un.-Orcutt 27%
Dissolved Zinc
IGP Parcels 3%
Other* 42%
County Un.-Orcutt 23%
Fecal Coliform
IGP Parcels 2%
Other* 7%
Caltrans 0%
Open Space* 3%
County Un.-Orcutt 46%
Agriculture* 42%
*Non-MS4

Catchment Prioritization Index (CPI)





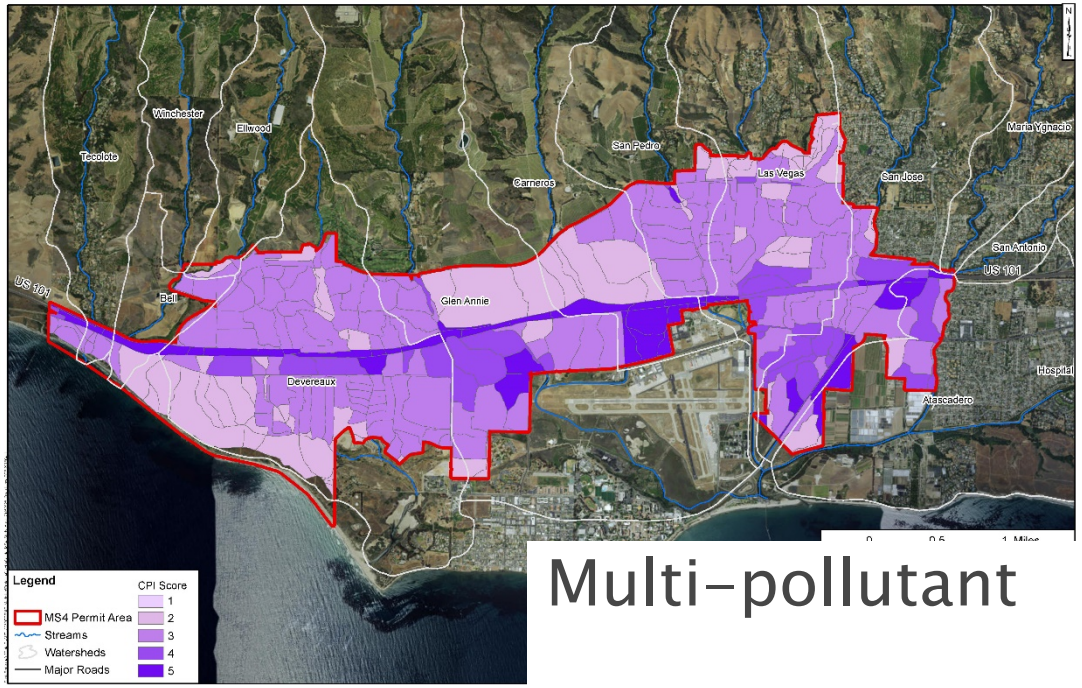




Total Suspended Solids

"Multi-Pollutant"
Based on pollutant weighting

- TMDL
- 303(d) listings
- Pollutants expected to exceed WQOs



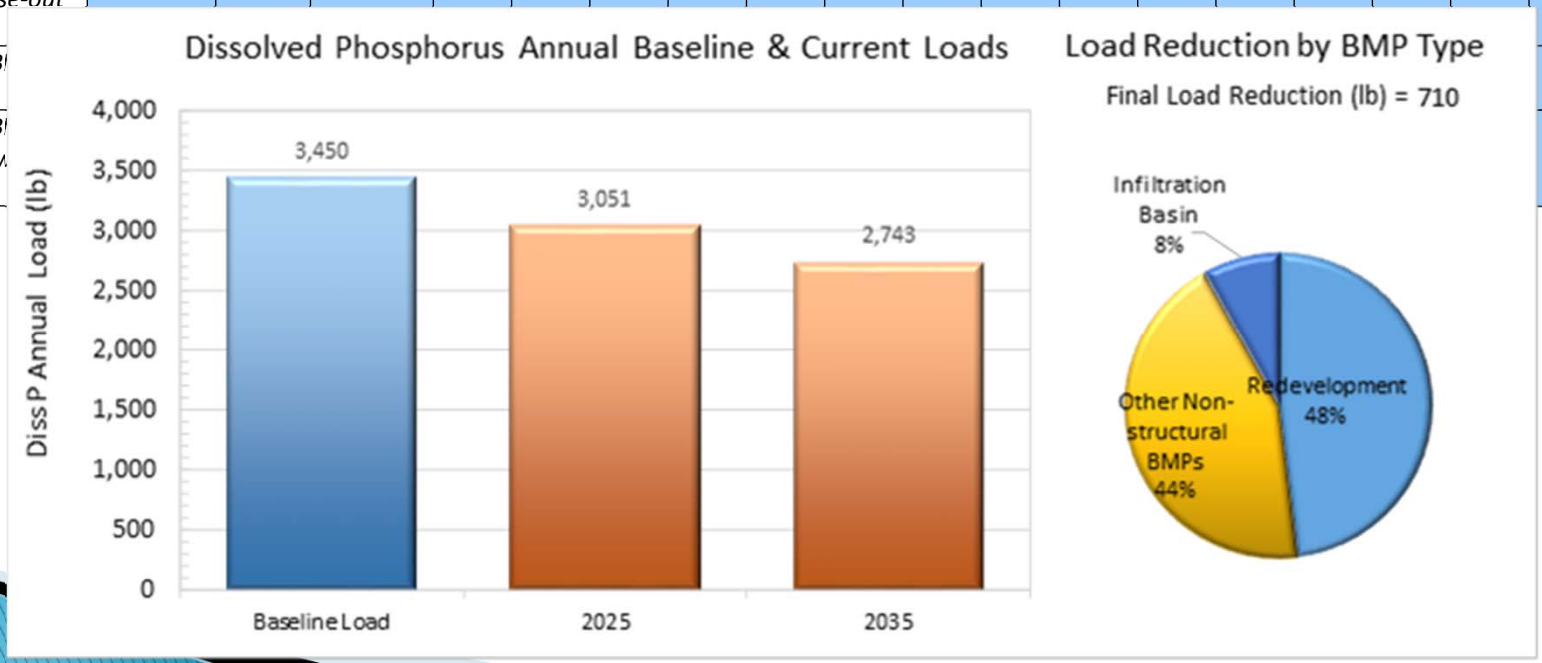
Multi-pollutant

BMP Reductions

Table 7. BMP Reductions (Additional BMPs may be added to the next empty row)

**Note: units shown under pollutants represent concentration. Unit reductions are in units specified in Table 2 and percent reductions are in %.*

BMP Type	Reduction Method*	% Capture	Volume	TSS	Tot P	Diss P	NH3	NO3	TKN	Diss Cu	Tot Cu	Tot Pb	Diss Zn	Tot Zn	Fecal Col.	Pollutant	Pollutant	Pollutant
			cu ft	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	#/100 mL	unit	unit	unit
85th – Redevelopment (100% Infiltration)	E	89%	100%	18.1	0.14	0.07	0.18	0.37	0.98	8.3	8.8	4.2	34.7	37.6	5,890			
85th – Redevelopment (50% Infiltration)	E	89%	50%	18.1	0.14	0.07	0.18	0.37	0.98	8.3	8.8	4.2	34.7	37.6	5,890			
85th – Redevelopment (100% Treatment)	E	89%	0%	18.1	0.14	0.07	0.18	0.37	0.98	8.3	8.8	4.2	34.7	37.6	5,890			
95th – Redevelopment (100% Infiltration)	E	100%	100%	18.1	0.14	0.07	0.18	0.37	0.98	8.3	8.8	4.2	34.7	37.6	5,890			
Brake Pad Copper Phase-out Legislation																		
Other Non-structural B (CBSM)																		
Other Non-structural B (WAAP BMPs - Tanglev Orcutt only)																		



Future LPR Model Uses

Existing/Planned

- Prioritize catchments (or land uses) for MS4 cleaning, street sweeping, outreach, structural BMP placement, etc.
- Support BMP inventory, including BMP assessment results to update catchment prioritization, to best inform BMP placement
- Use maps as communication tools for public, management, elected officials, etc.

Potential Future

- Prioritize BMPs – e.g. compare relative cost-benefit of different BMP options (requires incorporation of cost data)
- Support grant applications and/or Stormwater Resource Plans
  - Can be used to quantify water supply benefits of structural BMPs
- Use maps as educational tools for public, PW managers, and/or elected officials
- Forecast long-term cost of compliance (with TMDL WLAs, etc.)

Please send in your questions using the Q&A box in the webinar panel to “Host and Presenter”.

All participants are muted throughout the webinar.

QUESTIONS

Year 3: Program Effectiveness Assessment Results

MS4 Non-Traditional Phase II Permittee

Lisa Moretti, P.E., QSD, QISP TOR
University of California, Davis
Environmental Health & Safety

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UNIVERSITY OF CALIFORNIA

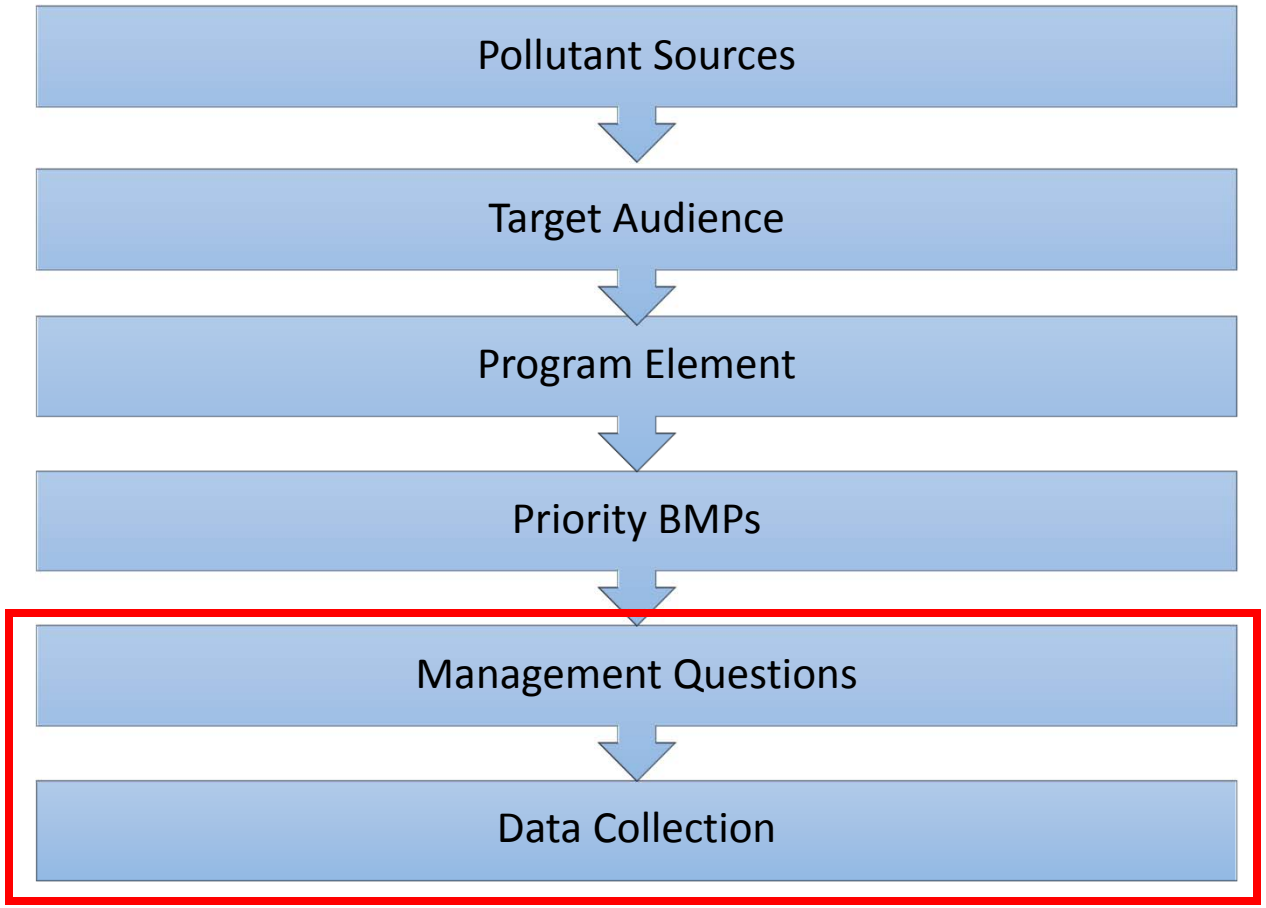
Overview

- Requirements and Goals for Phase II MS4 Permittee Program Effectiveness Assessment and Improvement Plan (PEAIP)
- PEAIP Framework
- Education and Outreach Program Assessment
- Permitee Operations and Maintenance Activities Assessment
- Post-Construction Assessment
- Summary

Program Effectiveness Assessment Goals (F.5.h.1)

- Adaptively manage storm water program
- Improve program effectiveness
- Reduce pollutants of concern
- Achieve the Maximum Extent Practicable (MEP) standard
- Protect water quality
- Document the Permittee's compliance with permit conditions

Program Effectiveness Assessment Framework



Non-Traditional Phase II
Program Effectiveness Assessment Timeline

Year 1 & 2	Year 3 &4	Year 5
• Develop PEAIP	• Track annual and long-term effectiveness of storm water program • Certify compliance with program element requirements	• Identify improvements for BMPs that did not accomplish goals • Continue and expand upon BMPs that proved to be effective • Identify new BMPs or modifications to existing BMPs designed to increase pollutant load reductions; • Discontinue BMPs that may no longer be productive and replacing with more effective BMPs; • Shift priorities to make more effective use of resources

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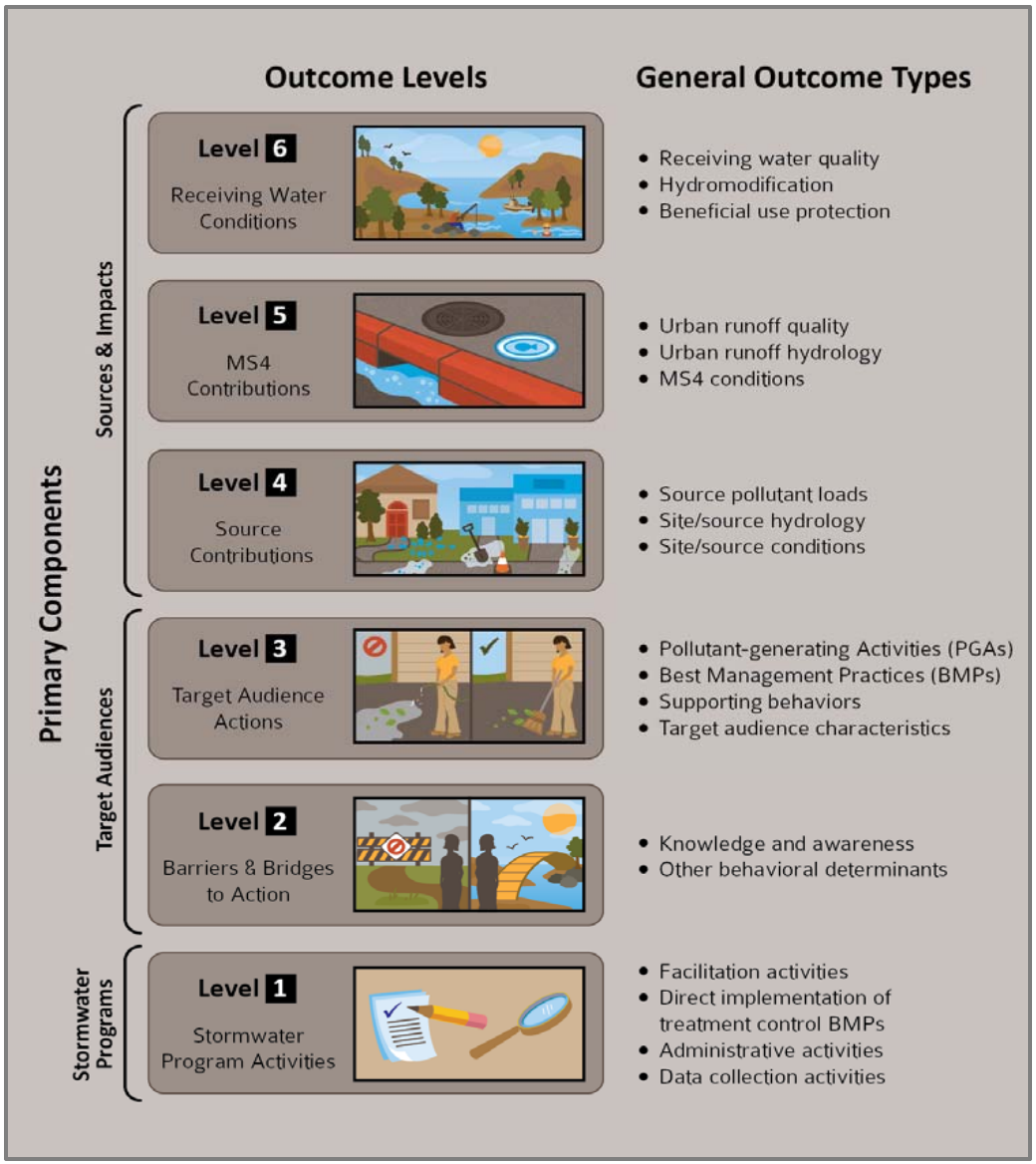
Outcome Levels
General Outcome Types
Primary Components
Sources & Impacts
Target Audiences
Stormwater Programs
Level 6
Receiving Water Conditions
• Receiving water quality
• Hydromodification
• Beneficial use protection
Level 5
MS4 Contributions
• Urban runoff quality
• Urban runoff hydrology
• MS4 conditions
Level 4
Source Contributions
• Source pollutant loads
• Site/source hydrology
• Site/source conditions
Level 3
Target Audience Actions
• Pollutant-generating Activities (PGAs)
• Best Management Practices (BMPs)
• Supporting behaviors
• Target audience characteristics
Level 2
Barriers & Bridges to Action
• Knowledge and awareness
• Other behavioral determinants
Level 1
Stormwater Program Activities
• Facilitation activities
• Direct implementation of treatment control BMPs
• Administrative activities
• Data collection activities

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Program Effectiveness Assessment Framework

Low	Medium	High
• Outcome Level 1 results only • Implemented, but no evidence that there was an impact	• Outcome Level 2 results • Results in a change of awareness	• Outcome Level 3-4 results • Results in a change in behaviors or reduction in pollutant load

F.5.b Education and Outreach

Management Questions:

- How effective is training at increasing staff awareness of pollutants of concern and BMPs to reduce storm water pollution?
- Is training effective at changing behaviors?
- Are trained staff reporting illicit discharges?

Goals:

- Trained staff should be able to identify trash and sediment as pollutants (OL2)
- Trained staff should know that storm water is not treated prior to discharge (OL2)
- Trained staff should be able to identify illicit discharges, report illicit discharges, and prevent illicit discharges (OL2&3)
- Trained staff should be properly implementing BMPs (OL3)

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Staff Survey Results

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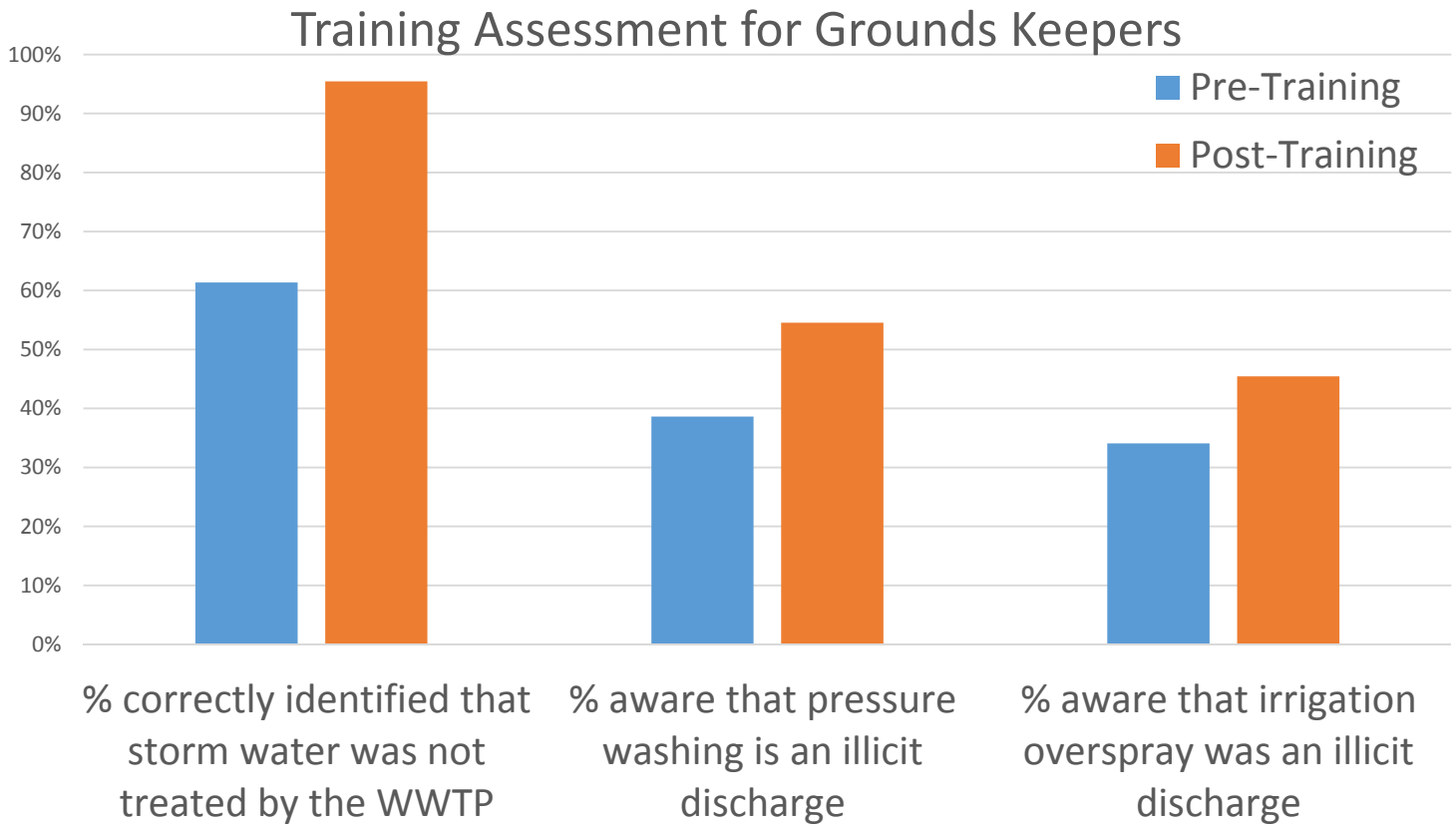
Training Assessment for Grounds Keepers
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Pre-Training
Post-Training
% correctly identified that storm water was not treated by the WWTP
% aware that pressure washing is an illicit discharge
% aware that irrigation overspray was an illicit discharge

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Training Assessment

- Training does result in an increase in awareness
- Training has resulted in an increase in reports of illicit discharges
- There were no repeat illicit discharges. One illicit discharge report was from a trained employee.
- **Overall: Medium Effectiveness**
  - Increase in awareness achieved (OL2)
  - Some evidence that there is change in behavior (OL3)
  - No evidence of reduction in pollutant loads (OL4) due to limits in data collection
- **Modifications:**
  - Collect data to document evidence of change in behavior and implementation of BMPs

F.5.f. 8 Permitee Operations and Maintenance Activities

"Permittee shall assess their O&M activities for potential to discharge pollutants in storm water and inspect all BMPs on a quarterly basis"

Management Questions:	Goals:
• Is staff training resulting in effective implementation of BMPs? • Are BMP implementation resulting in decrease in pollutant loads?	• Trained staff should be properly implementing BMPs (OL3) • Reduction in required corrective actions in Quarterly BMP Assessment (OL4) • 100 % of corrective actions with identified follow-up actions (OL4) • Reduction in illicit discharges from trained staff (OL4)

F.5.f. 8 Permitee Operations and Maintenance Activities

Quarterly Supervisor Assessments (2016 Q1 & Q2)	
Corrective Actions Related to Sediment	6
Corrective Actions Related to Trash	4
% of Corrective Action Addressed*	100%
Decrease in corrective actions (Q1 to Q2)	57%

Illicit Discharge Reports	
Authorized NSWD	45%
Illicit Discharges from Trained Employees	1 of 6 reports

* Corrective actions that require capital investment are excluded if items have been budgeted for and scheduled

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F.5.f. 8 Permitee Operations and Maintenance Activities

- Trained staff are implementing BMPs
- Corrective actions are focused on routine items (sediment collection, litter)
- Implementation of quarterly inspection resulted in decreases in corrective actions.
- **Overall: High Effectiveness**
  - Evidence of change in behavior (OL3)
  - Implementation of corrective actions and BMPs indicates reduction in pollutant load (OL4)
- **Modifications:**
  - Continue to collect data on implementation of BMPs, evaluate by areas and departments.

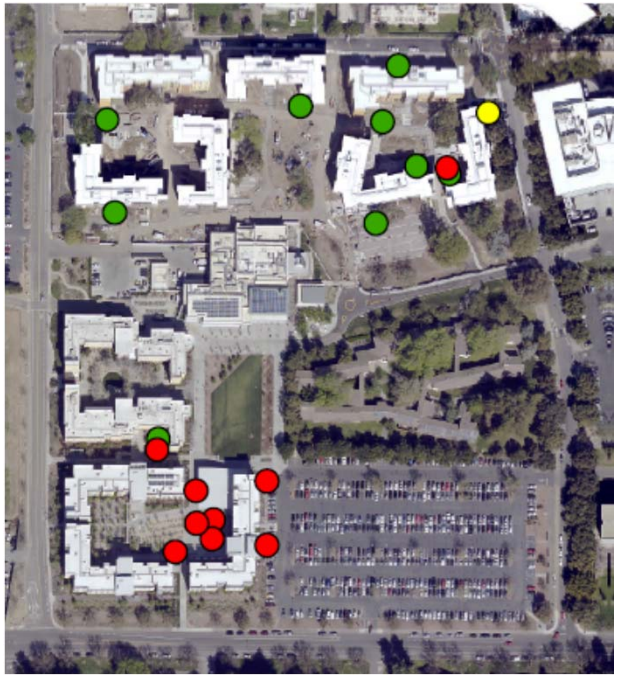
F.5.g.4 O&M of Post Construction BMPs

"The Permittee shall ensure that systems and hydromodification controls installed at projects are properly operated and maintained for the life of the projects."

Management Questions:	Goals:
• How effective are treatment systems at preventing POCs from entering the storm sewer system?	• 100% of required O&M of treatment systems conducted (OL4) • 100% of treatment systems functioning as designed (OL4) • Reduction in hydromodification impacts due to post-construction BMPs (OL5/6)

F.5.g.4 O&M of Post Construction BMPs

- No regulated post-construction systems installed on campus
- Assessment of implemented post-construction systems have shown reduction in effectiveness over time
- Goals for Years 4 & 5:
  - Assessment of O&M protocols to improve effectiveness over time



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Lessons Being Learned

- Difficulties of collection and interpretation of data
- Achieving Year 5 Goals:
  - Identifying which BMPs ineffective and why
  - Evaluation of resource allocation (e.g. storm drain labeling)
- Balancing quantitative and qualitative data

Contact Information

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All participants are muted throughout the webinar.

QUESTIONS

CASQA Program Effectiveness Webinar

Orange County Stormwater Program's Headline Environmental Indicators

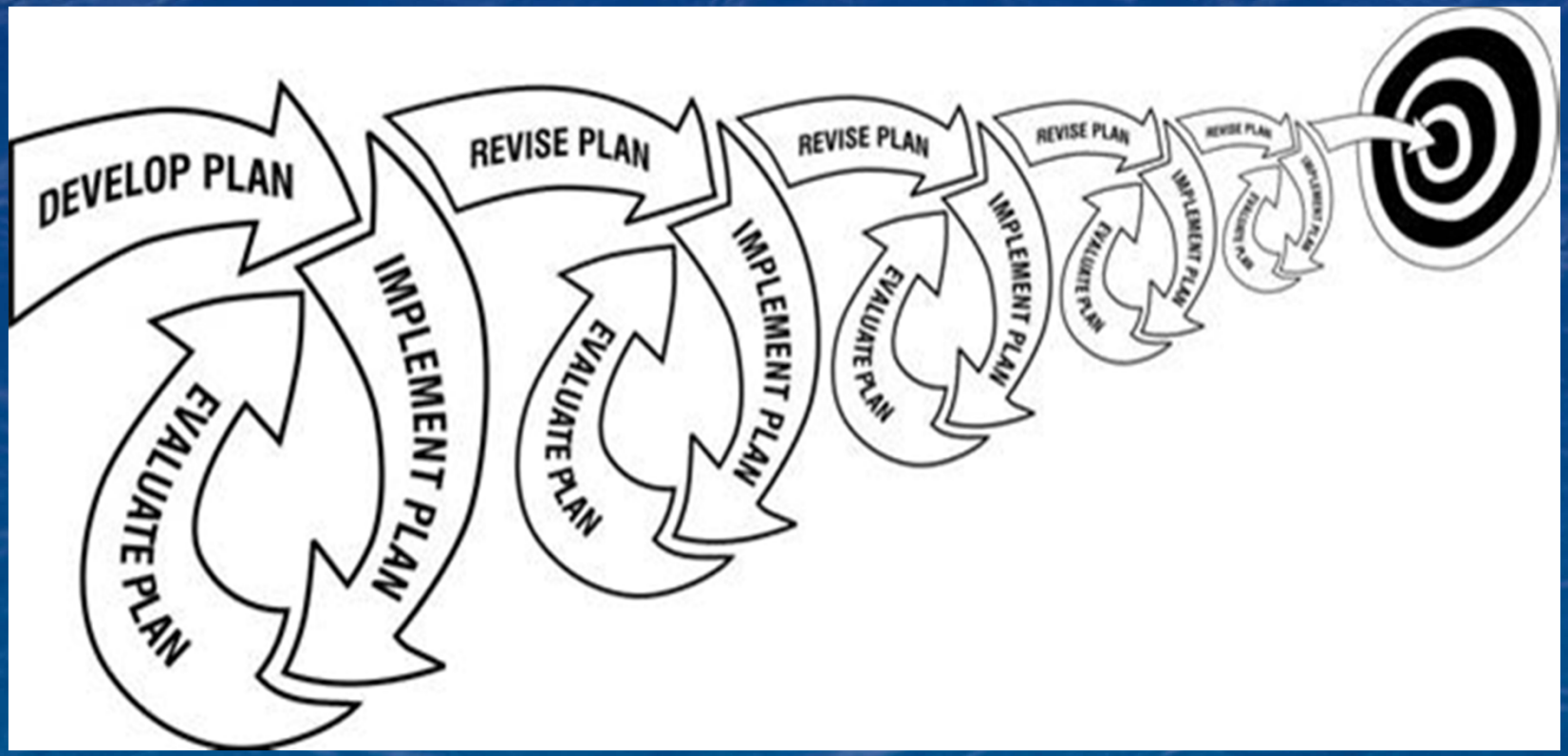
Richard Boon, County Of Orange

Overview

- Background
  - Orange County
  - State Of The Environment Report
- Headline Environmental Indicators
  - Receiving Waters & MS4
  - Target Audiences
- Summary

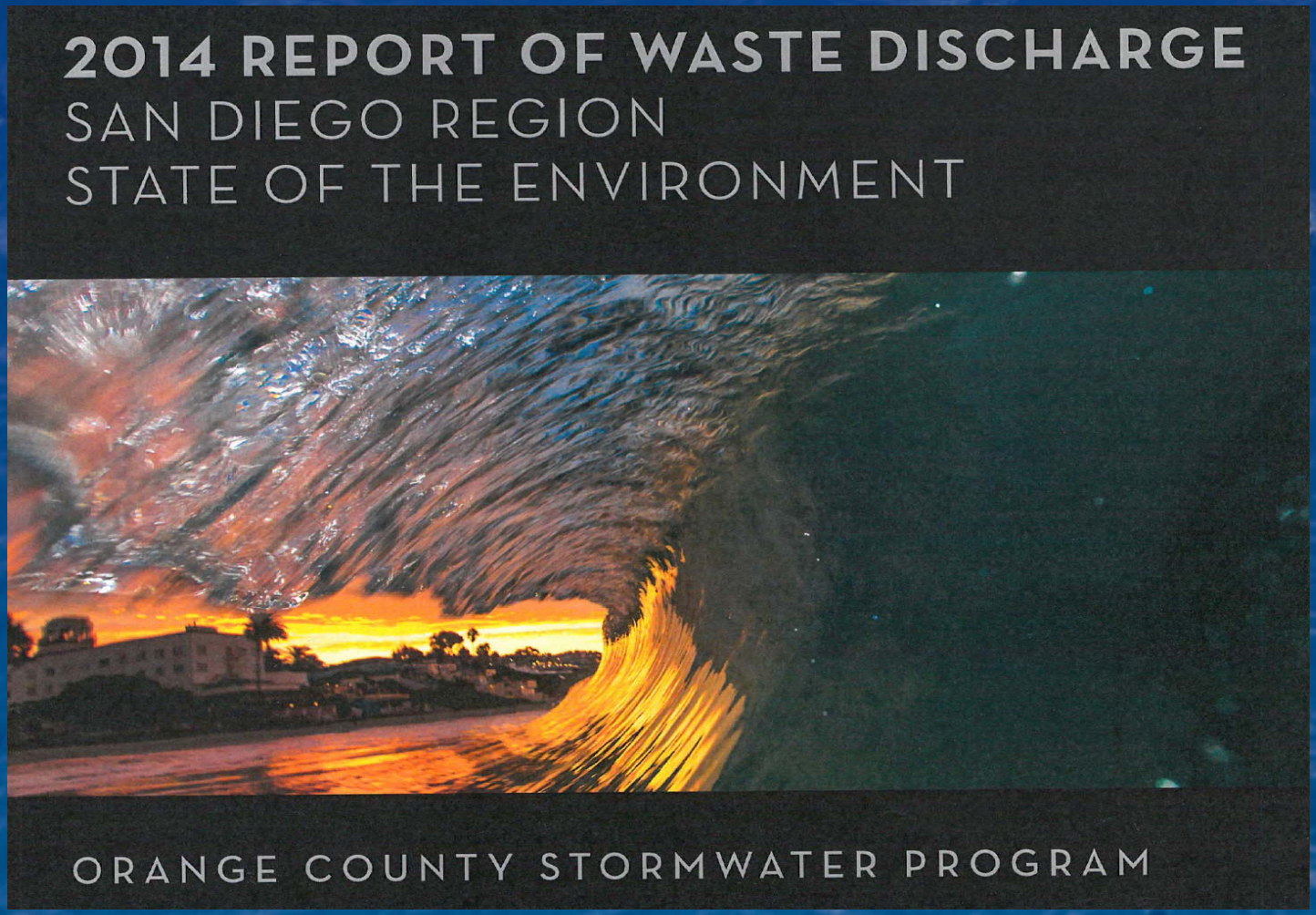
Orange County

MS4 Permitting



Source: USEPA

State Of Environment



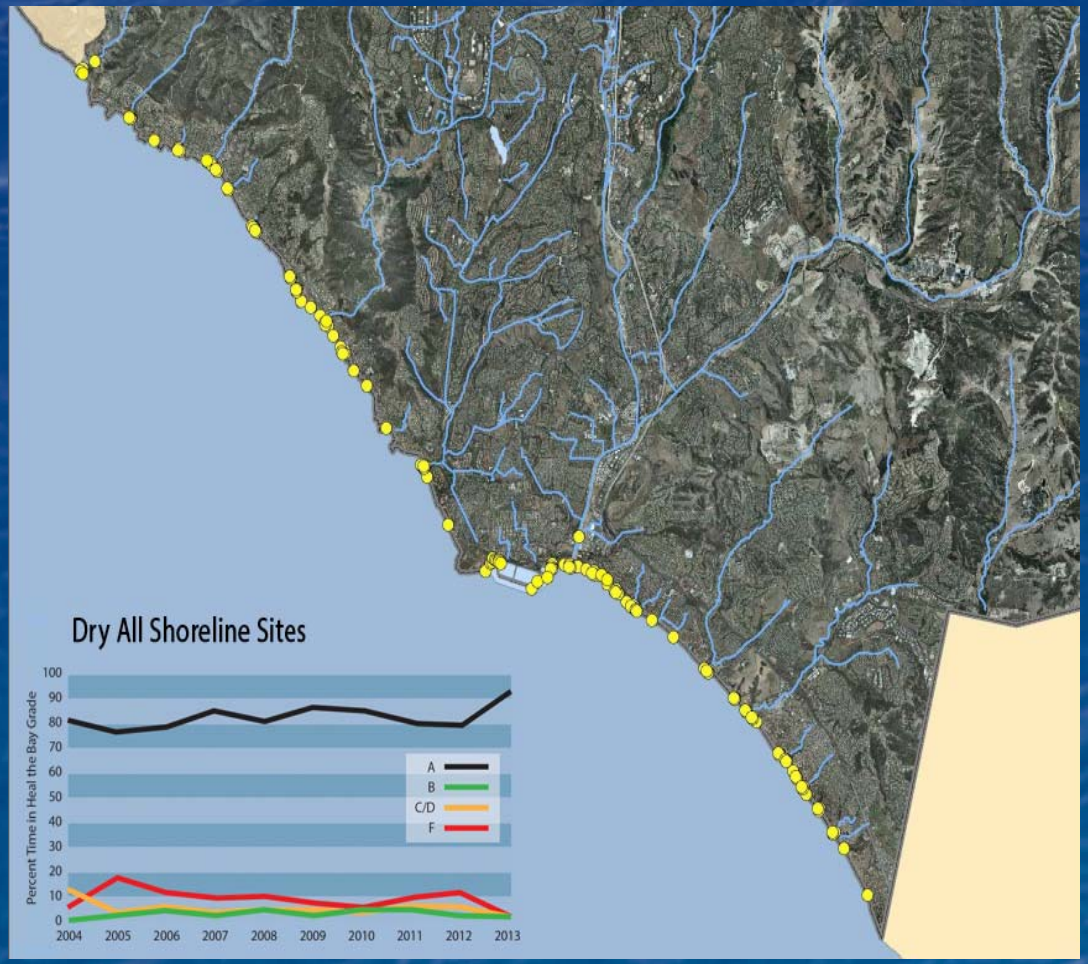
Headline Environmental Indicators

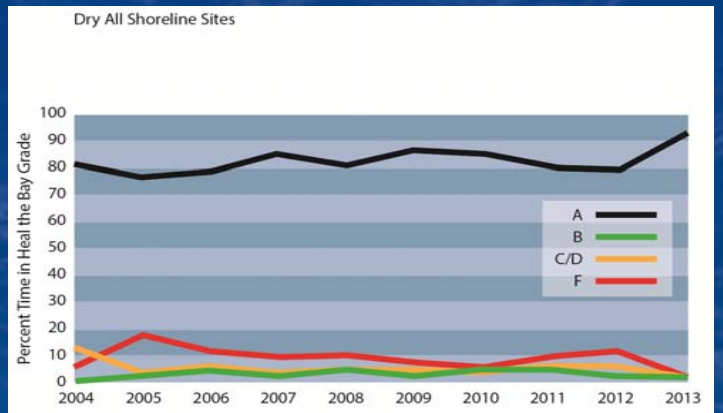
The purpose of environmental headline indicators is to provide simple and clear information to decision-makers and the general public about progress in environmental policies and the key factors determining the state of the environment and whether we are moving towards environmental sustainability.

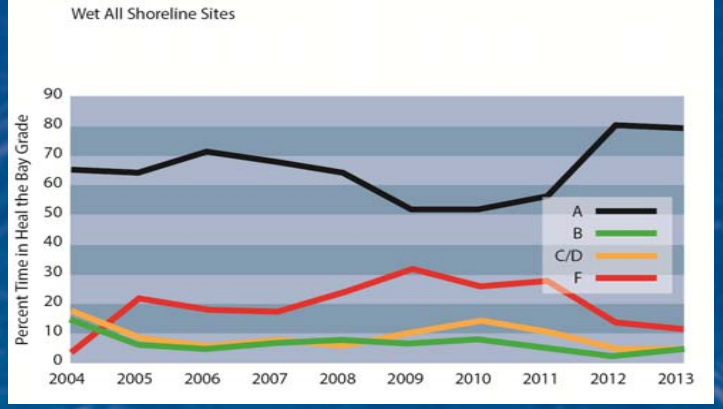
European Environment Agency, 2016

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

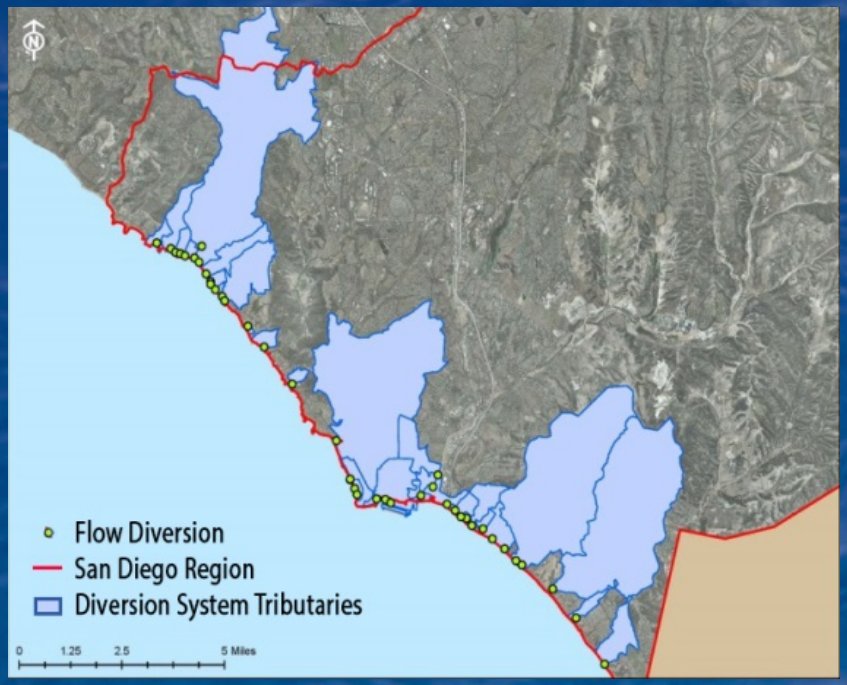
Beneficial Use Protection

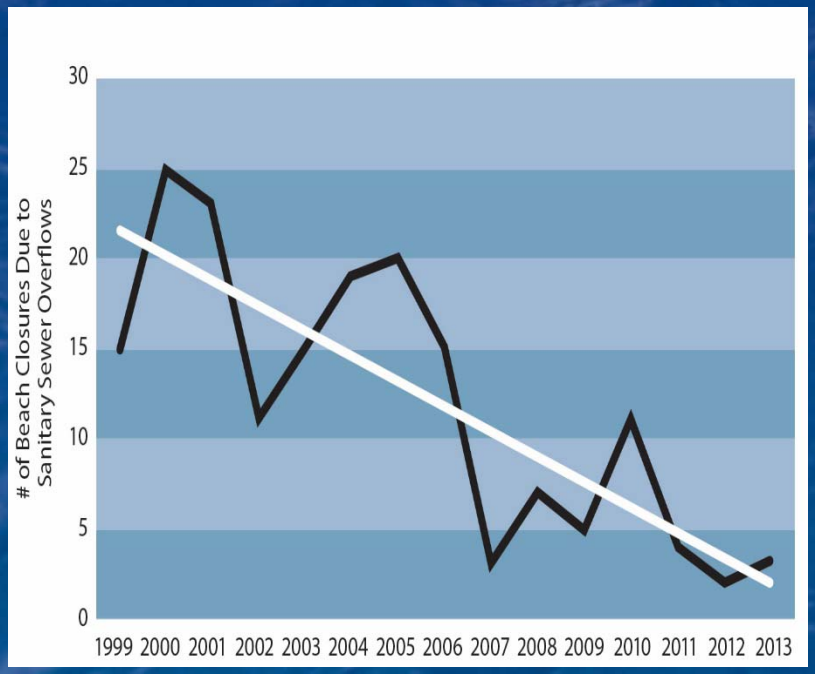






Beneficial Use Protection



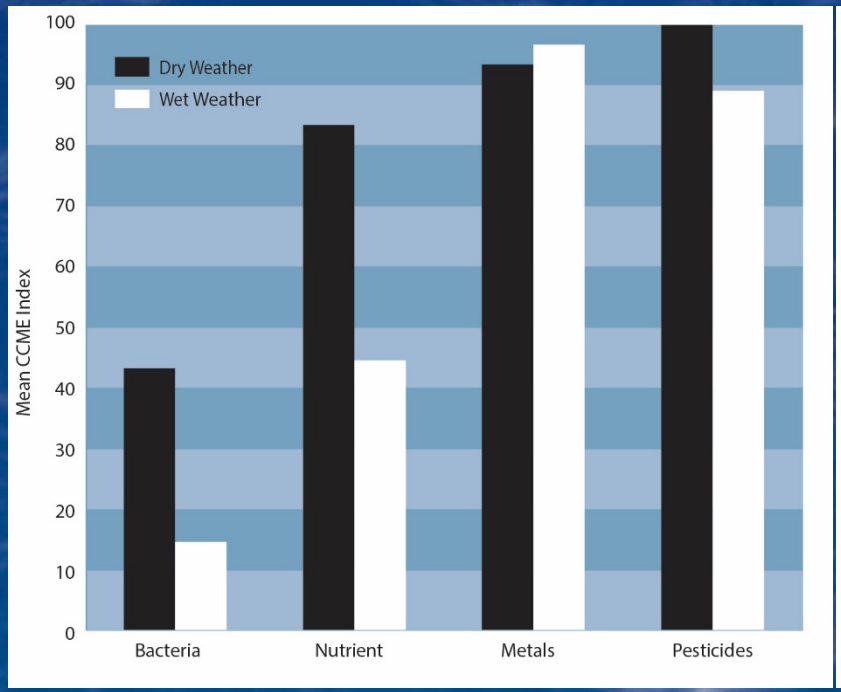


Receiving Waters: Water Quality Index

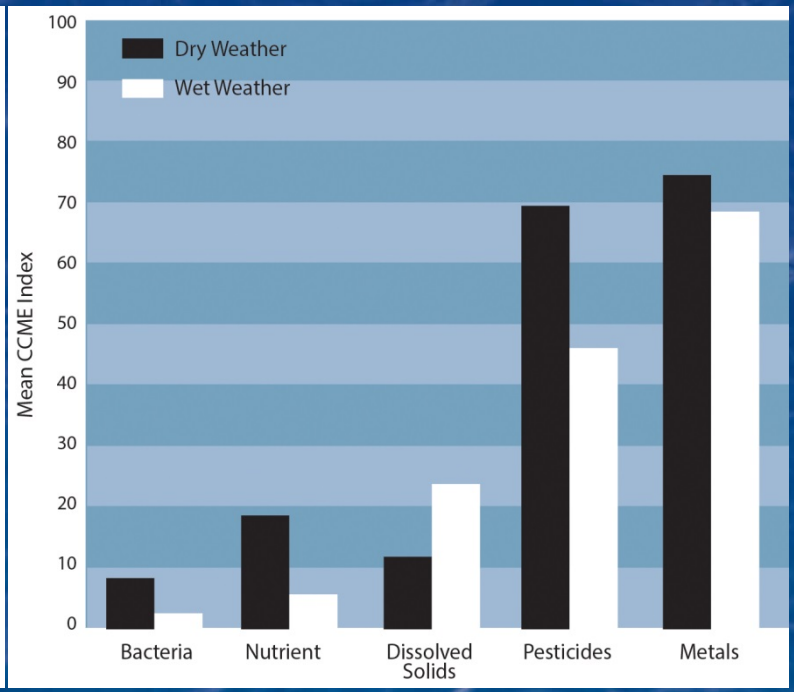
- The CCME WQI provides a mathematical framework for assessing ambient water quality conditions relative to water quality objectives.
- Index is based on a combination of three factors:
  - The numbers of variables whose objectives are not met (*Scope*)
  - The frequency with which the objectives are not met (*Frequency*)
  - The amount by which the objectives are not met (*Amplitude*)
- Provides ranking based upon score (1-100)
  - *Excellent (95-100 – Conditions close to pristine)*
  - *Good (80-94 – Minor degree of threat)*
  - *Fair (65-79 – Occasional impairment)*
  - *Marginal (45-64 – Water quality is frequently threatened)*
  - *Poor (0-44 – Water quality is always impaired)*

» *Source CCME, 2001*

Receiving Waters

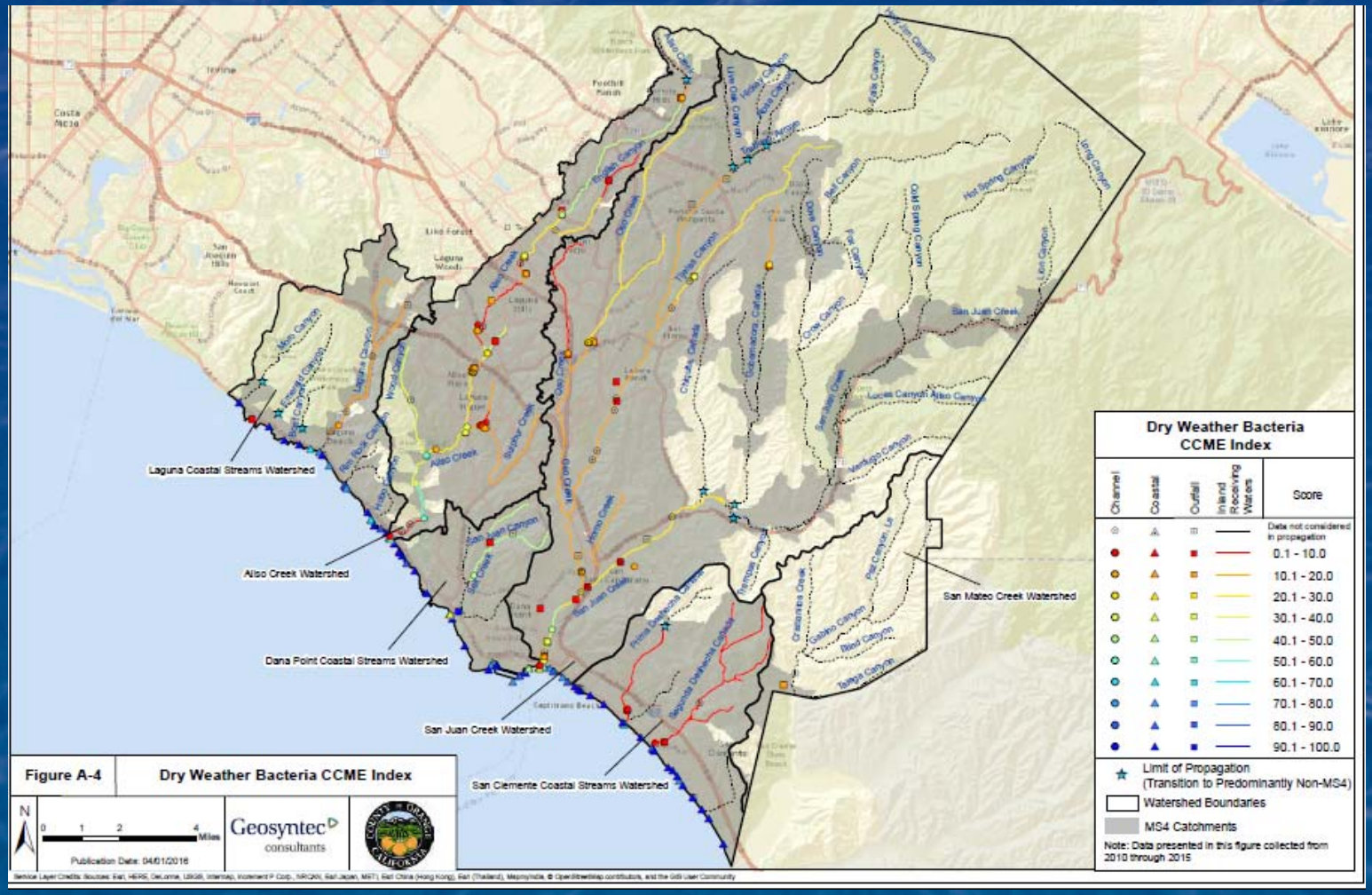


Overall exceedance index for core monitoring constituents at coastal discharge points (2003-2013)

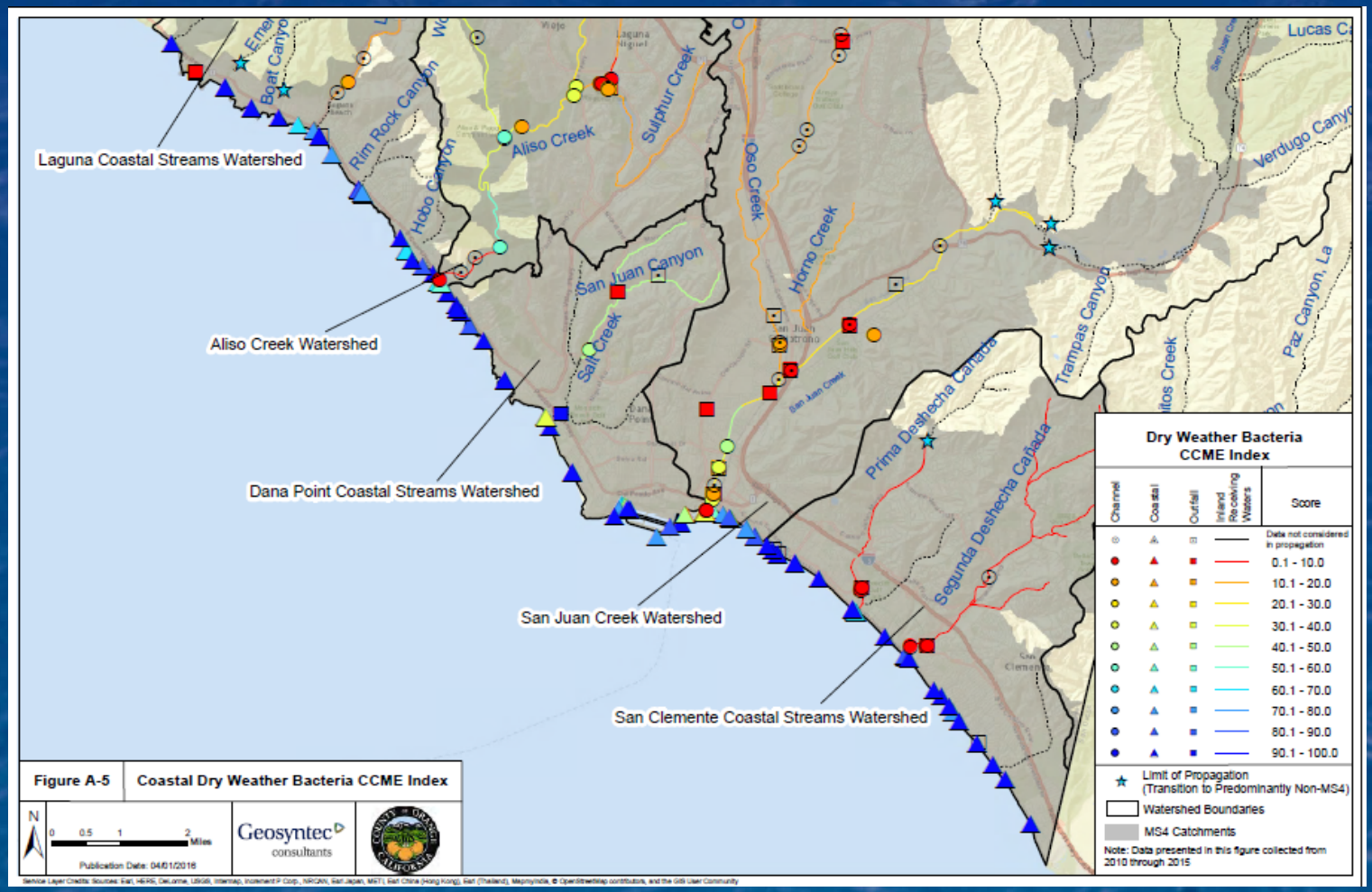


Overall exceedance index for core monitoring constituents in inland Channels (2003-2013)

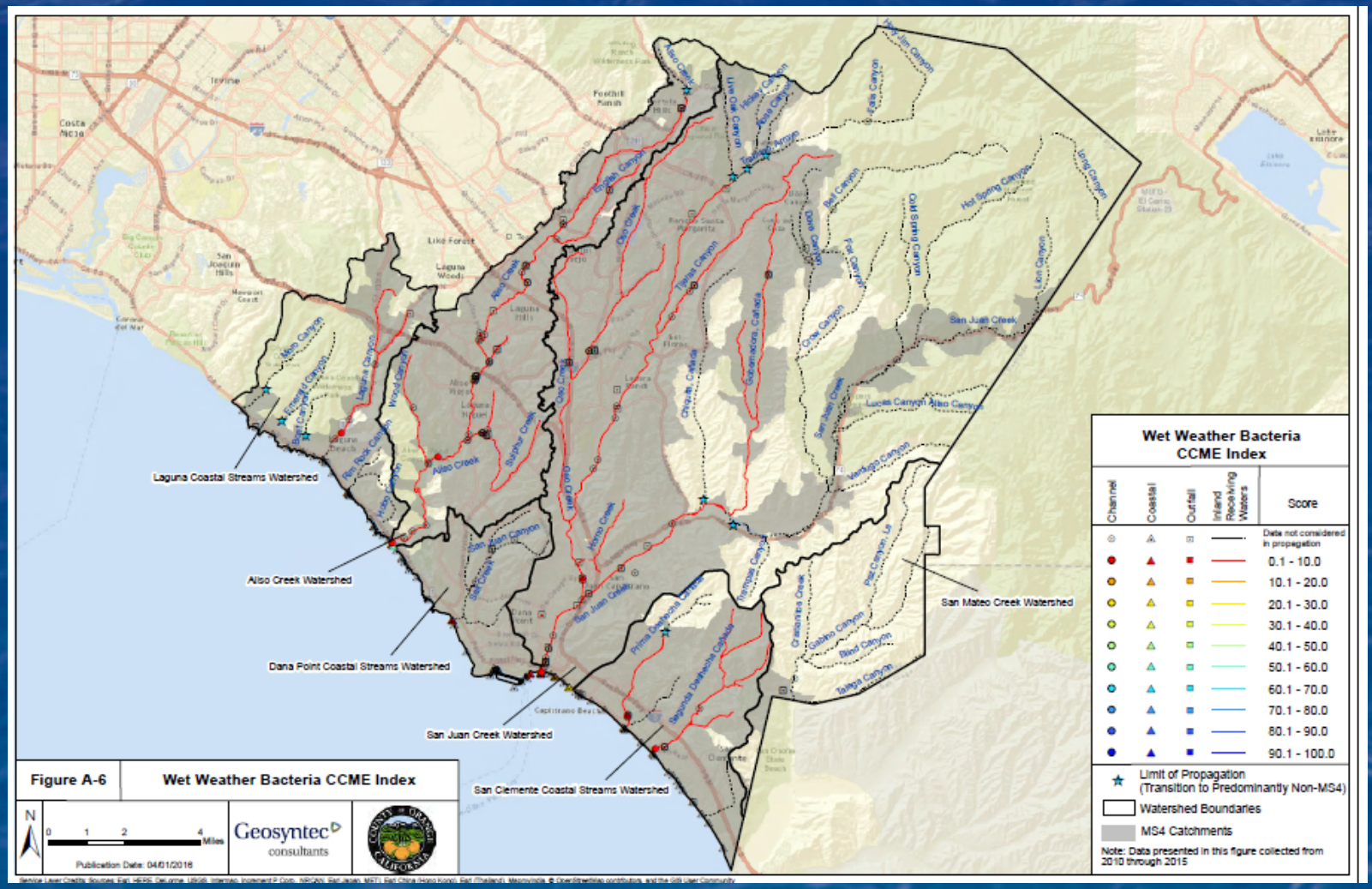
Urban Runoff Quality – Dry Weather



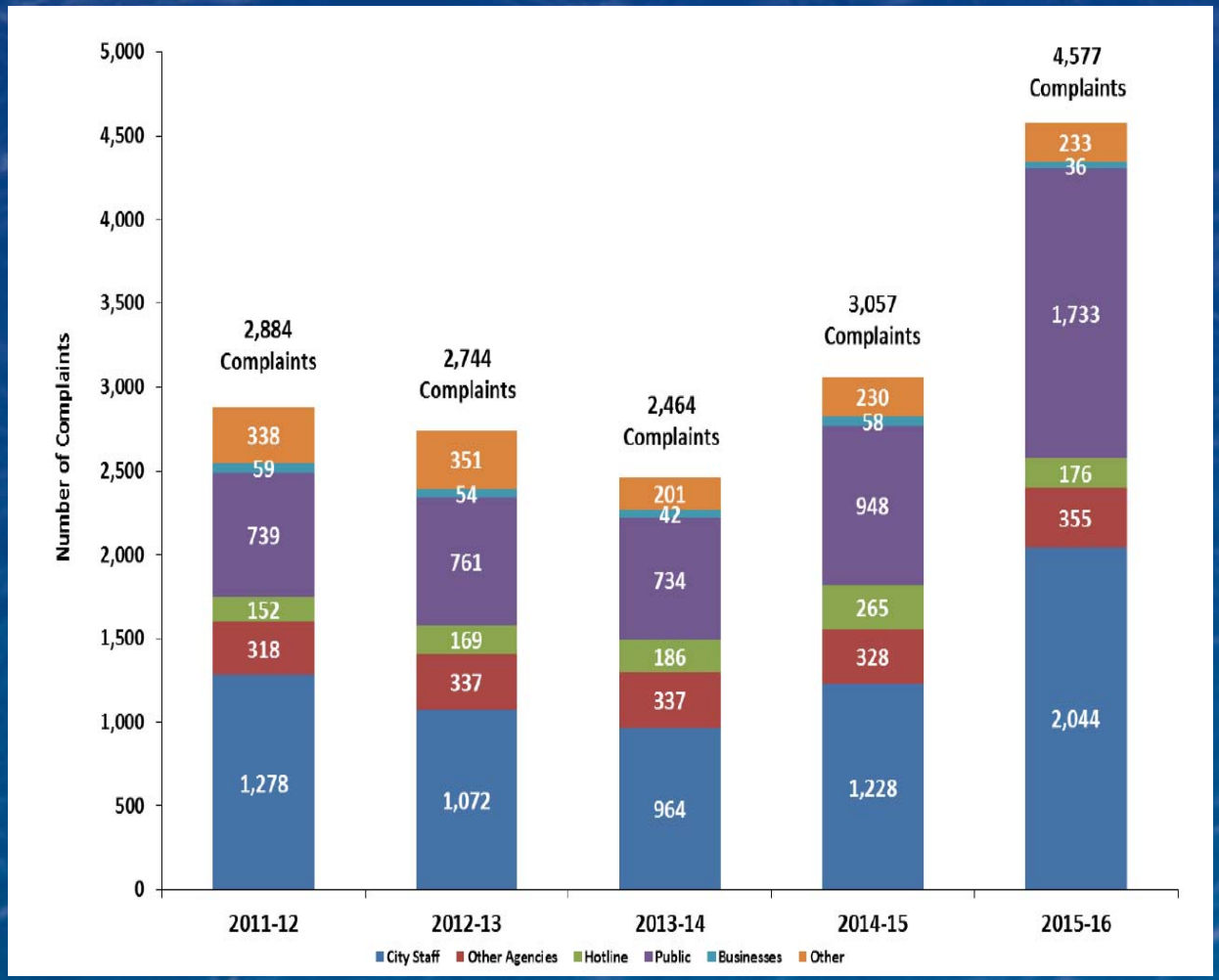
Surfzone – Dry Weather

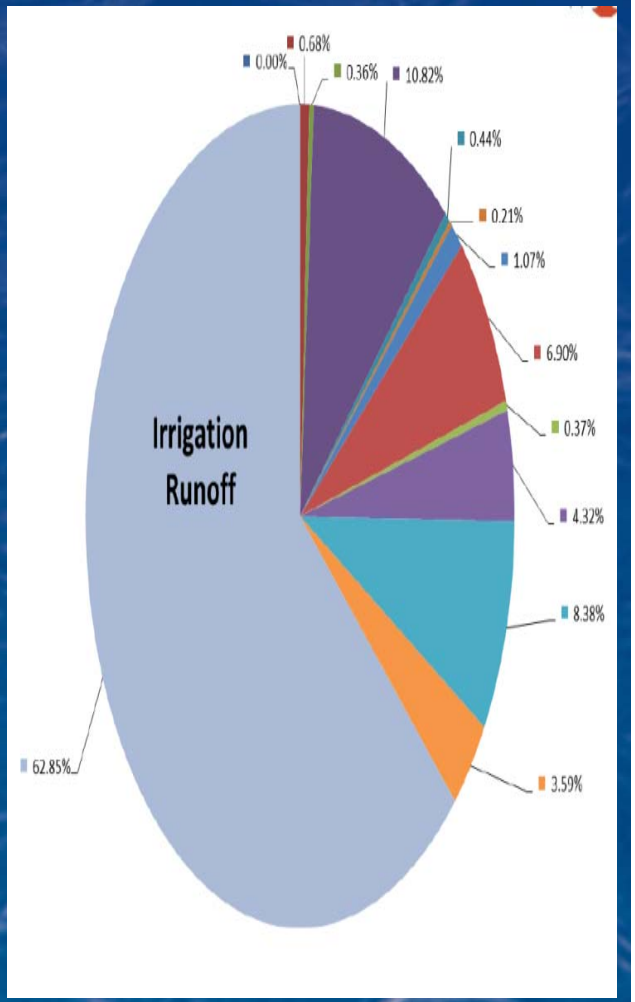


Urban Runoff – Wet Weather



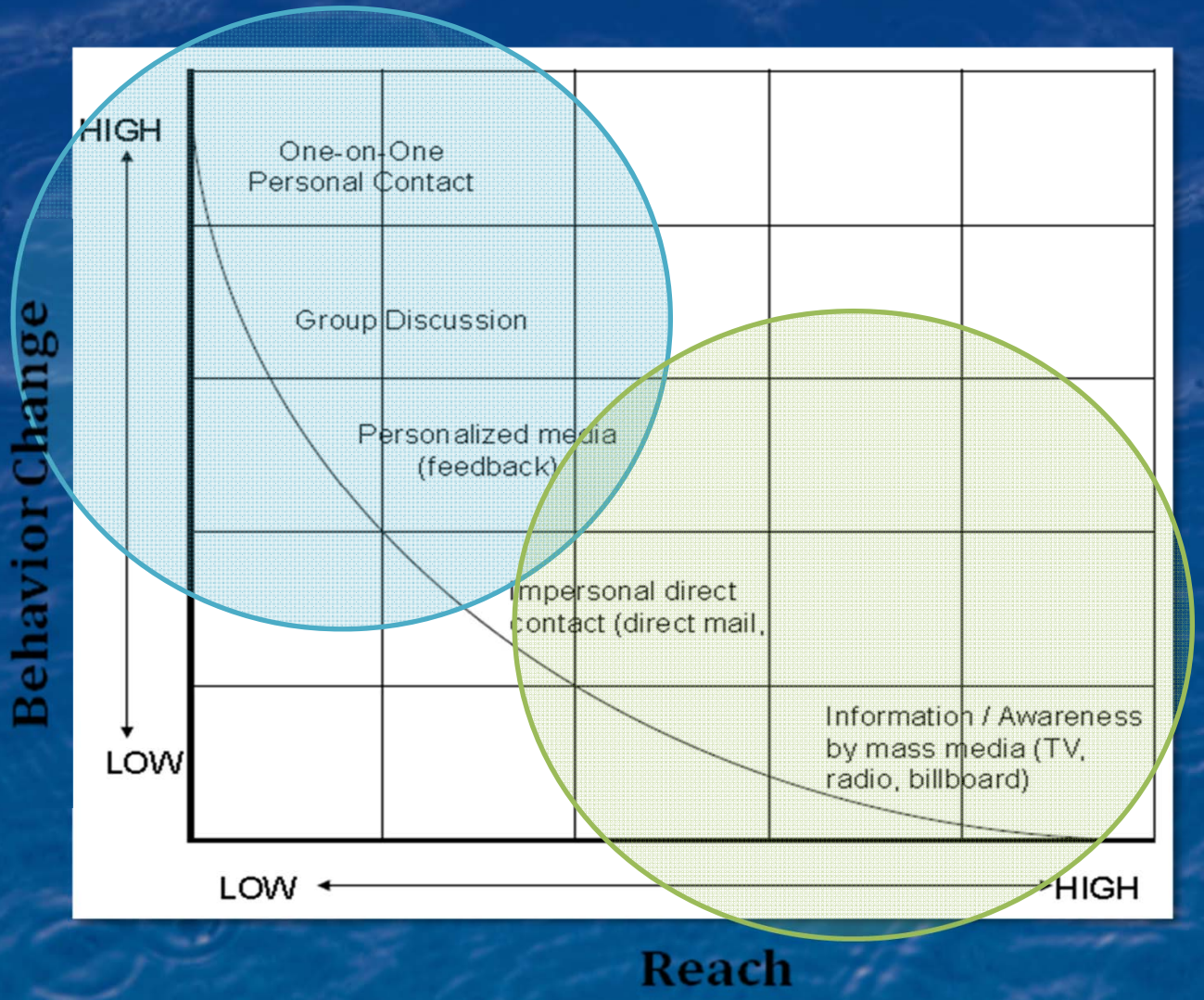
Source Contributions – ID/IC



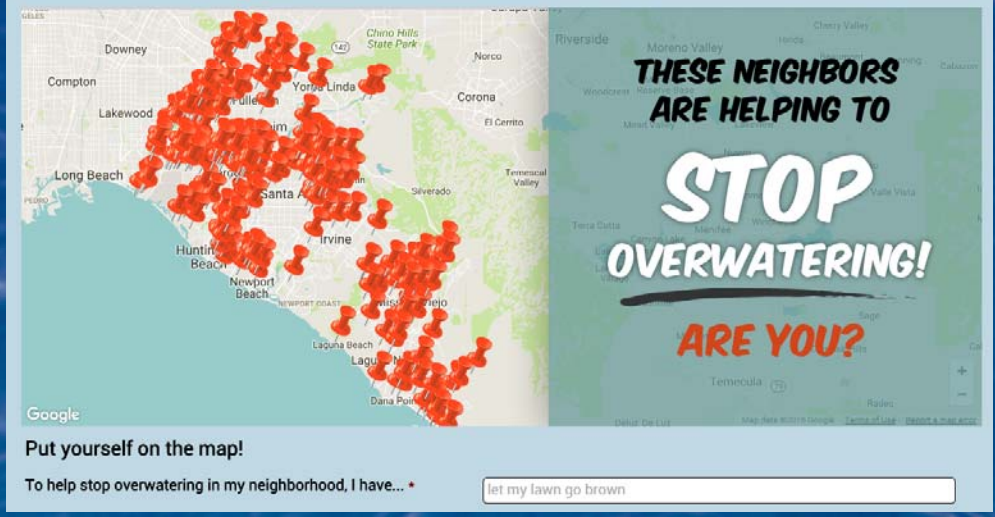


Pollutant Generating Activities/BMPs

Awareness Vs. Engagement



Public Engagement: Approach



Summary

Presented comprehensive picture of state of environment and management actions - Yes

Established basis for broadening participation and creating common purpose - Partially

For More Information

State Of The Environment: http://ocwatersheds.com/

Overwatering Is Out: http://www.overwateringisout.org/

Richard Boon: richard.boon@ocpw.ocgov.com

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Please send in your questions using the Q&A box in the webinar panel to “Host and Presenter”.

All participants are muted throughout the webinar.

QUESTIONS

Non-Structural BMPs
How do they Measure Up?

Paul Hartman, Larry Walker Associates

November 2, 2016

Background and Purpose

- TMDLs and other Regulatory Drivers
- Translate into Numeric Targets or Goals
- Management Approaches to meet the Targets/Goals

Why do we need to quantify?

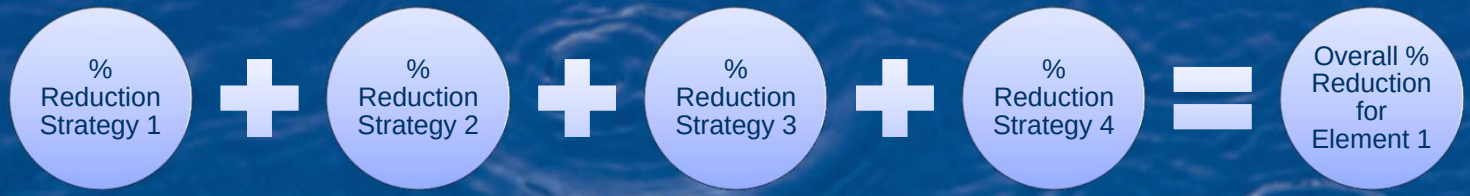
- Watershed Plans – 10% reduction (assumed)
- Numeric Targets and Goals
- Non-structural BMPs might get us there!

Management Questions

- How far will NSBMPs get us?
- How can we quantify the benefits?
- Where should we put our efforts?
- What programs are most effective – from a load reduction and a cost standpoint?

Estimating the Effectiveness of NSBMPs

- Institutional Programs
  - Minimum of Six Elements
  - Multiple Strategies within Each



- Assuming 5-10% effectiveness for new programs

Approach

- New and Enhanced BMPs
- Effectiveness Ratings
- Apply Effectiveness Ratings to Modeled Loads (if available)
- Implementation Schedule and Cost Information

New and Enhanced BMPs

- Not “business as usual”
- Above the Normal Program Elements
- Quantify the Incremental Improvements

Effectiveness Rating =

Participation Factor X Loading Factor

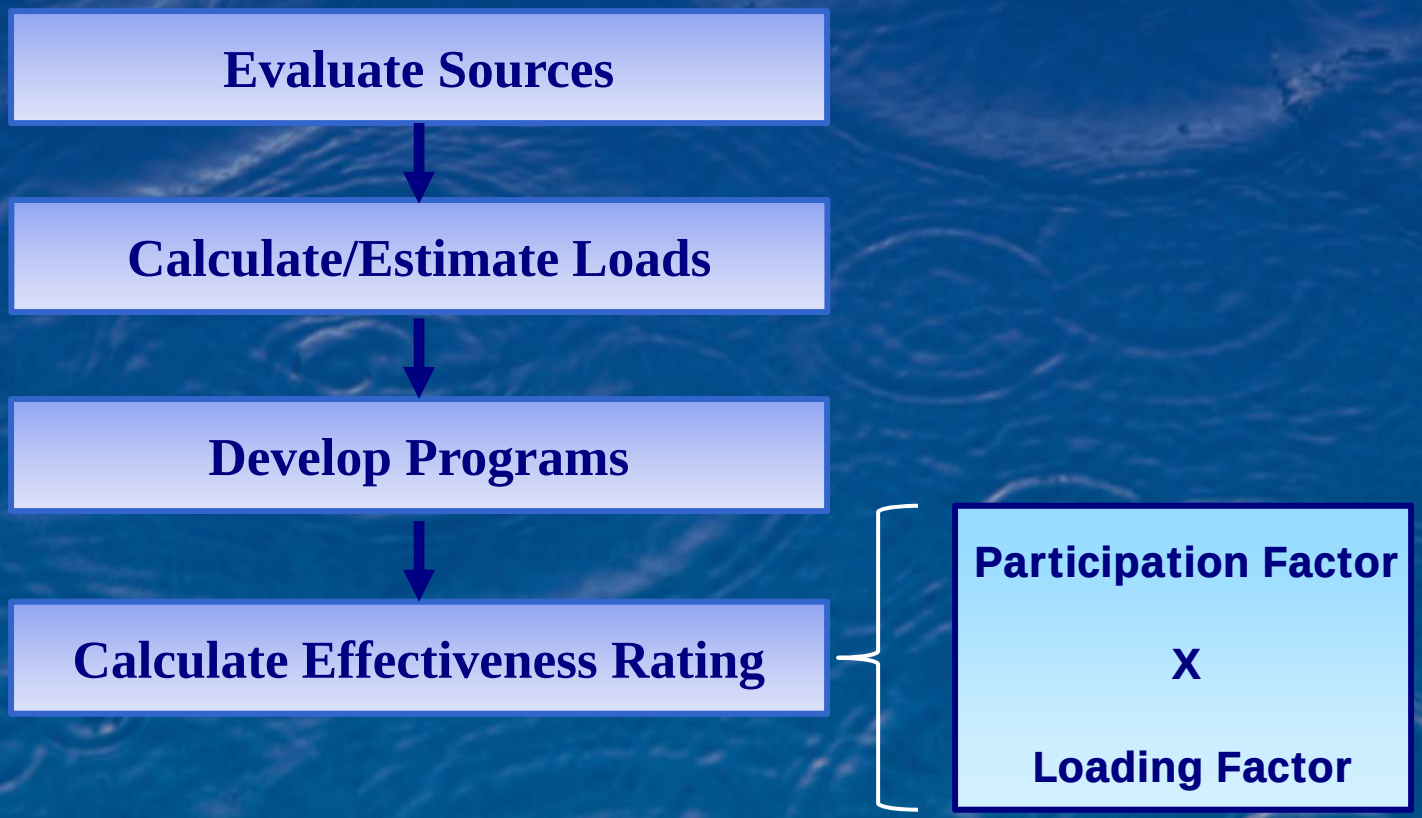
- *Amount of the target audience who would implement the BMP?*
- Outreach to residents → 5-10% of them changing
- New policy requiring a change to municipal maintenance practices → closer to 100%

- *How much of the pollutant load would be reduced if 100% of the target audience changed their behavior?*
- Proper pesticide application → 50% vs. stopped applying, then the loading factor would be 100%.

Effectiveness Ratings

- Effectiveness Assessments
- Literature Information
- Best Professional Judgement
- Engage Staff
- Make Conservative Assumptions

Estimating the Effectiveness of NSBMPs



Effectiveness Rating Example

Participation Factor X Loading Factor = Effectiveness Rating

Program Element	Strategy	Participation Factor	Loading Factor	Effectiveness Rating
Commercial Inspections	Activity specific outreach to businesses.	10 – 20%	75%	7.5 – 15%
	Target areas where frequent dry weather runoff is observed.	50%	25%	12.5%
	Increase presence and enforcement at sites with violations.	60 - 80%	75%	45 – 60%

Effectiveness Rating Example (cont'd)

Effectiveness Rating X Source Load = Estimated Load Reduction

Program Element	Strategy	Effectiveness Rating	Source Load	Estimated Load Reduction
Commercial Inspections	Activity specific outreach to businesses	7.5 – 15%	80%	9%
	Target areas where frequent dry weather runoff is observed	12.5%	25%	3%
	Increase presence and enforcement at sites with violations	45 – 60%	75%	39%

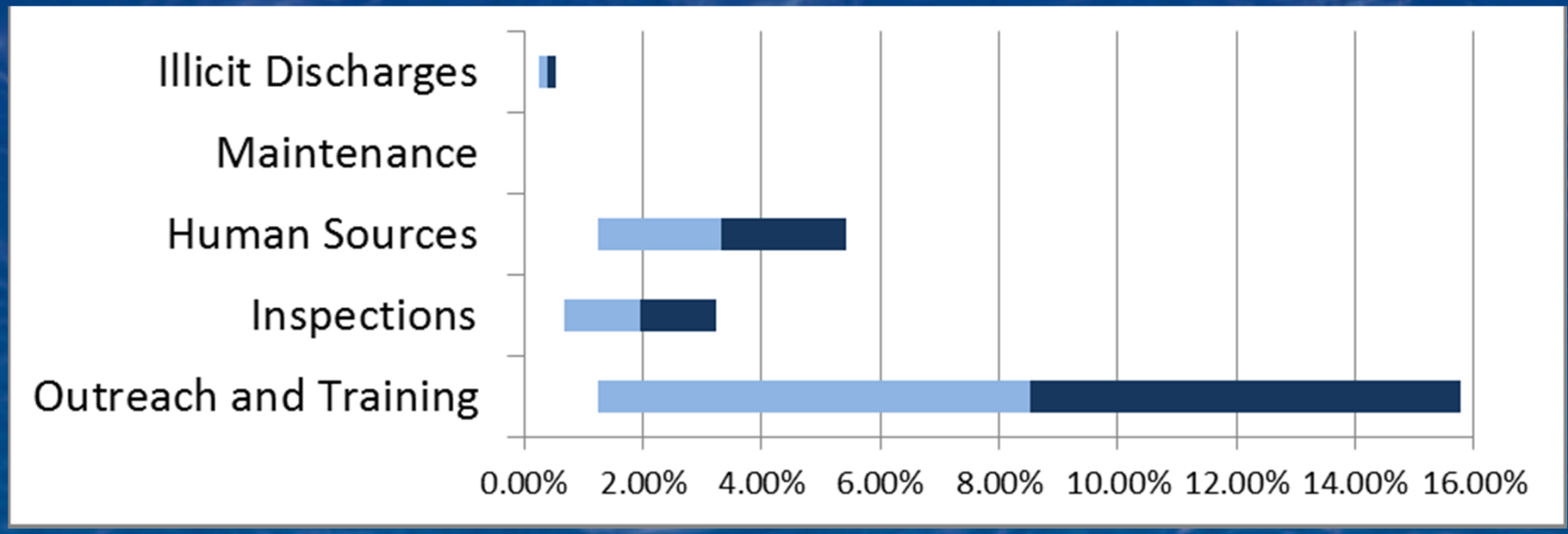
Load Reduction for Program Element

51%

Programmatic Results (examples)

Program Element	Effectiveness Range
Outreach	2 - 20%
Industrial and Commercial	8 – 30%
Construction	20 – 72%
Municipal	2 – 72%
ICID	5 – 45%

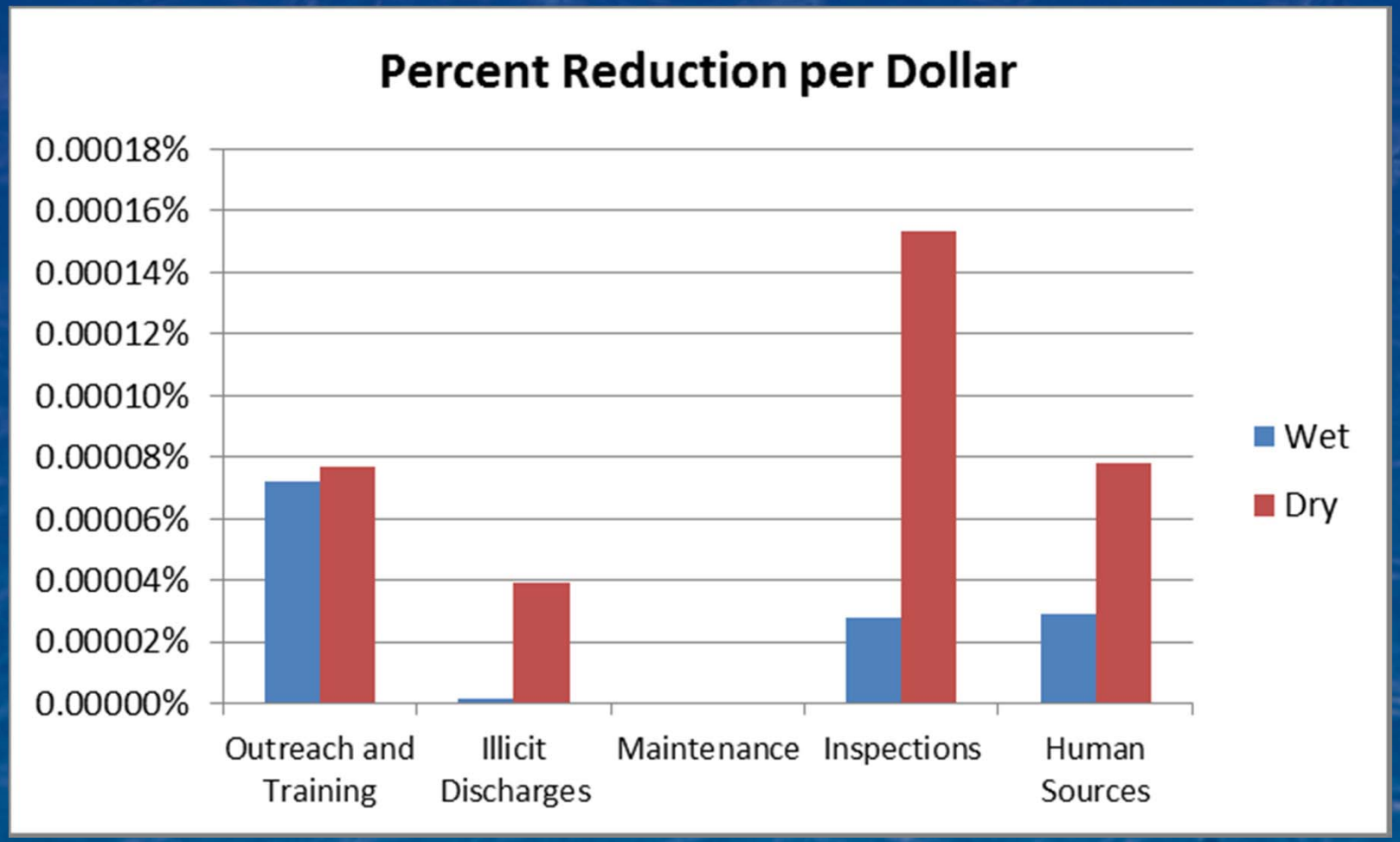
Programmatic Results (examples)



Overall Results (examples)

Constituent	Condition	Estimated Range of Effectiveness	Average
Flow (nutrients)	Dry	35 – 75%	55%
Bacteria	Wet	12 – 33%	22%
Zinc	Both	6 – 45%	25%
Sediment	Wet	5 – 55%	28%

Benefits and Costs (examples)



Conclusions

- Opportunities to focus programs exist, but are still evolving
- Effectiveness assessments are becoming more important (PEA, monitoring)
- Ideally, we will learn from this first step and provide:
  - More flexibility
  - More knowledge
  - Better, more evolved programs

Questions?

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(760) 730-9446

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QUESTIONS

Program Effectiveness Assessment

Thank you for Attending!

CASQA WEBINAR