



Claiming Compliance Credit for Stormwater Management Strategies
2026 CEAC Spring Conference and Public Works Officers Institute
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Panelists

- Grant Sharp, OC Public Works
- Aaron Poresky, Geosyntec Consultants
- Kathleen Elmquist, Environmental Science Associates (ESA)

Key Contributors

- OC Survey
- Orange County Transportation Authority



Municipal Stormwater Management and Watershed Planning

Multiple drivers: TMDLs,
WMPs, Trash Orders, land
development, and more

Areas of unmet need

Opportunities for partnership

Prioritization
and goal setting



BMP
implementation

Combo of program activities
and structural controls

Mix of public and private
ownership

Diverse purposes and scales



Iterative
Approach



What is working?

How much more is needed?
What? Where?

Adaptive
management



Monitoring and
assessment

BMP condition

Program effectiveness

BMP contributions to compliance

Municipal Stormwater Management and Watershed Planning

What is already built? What condition is it in?

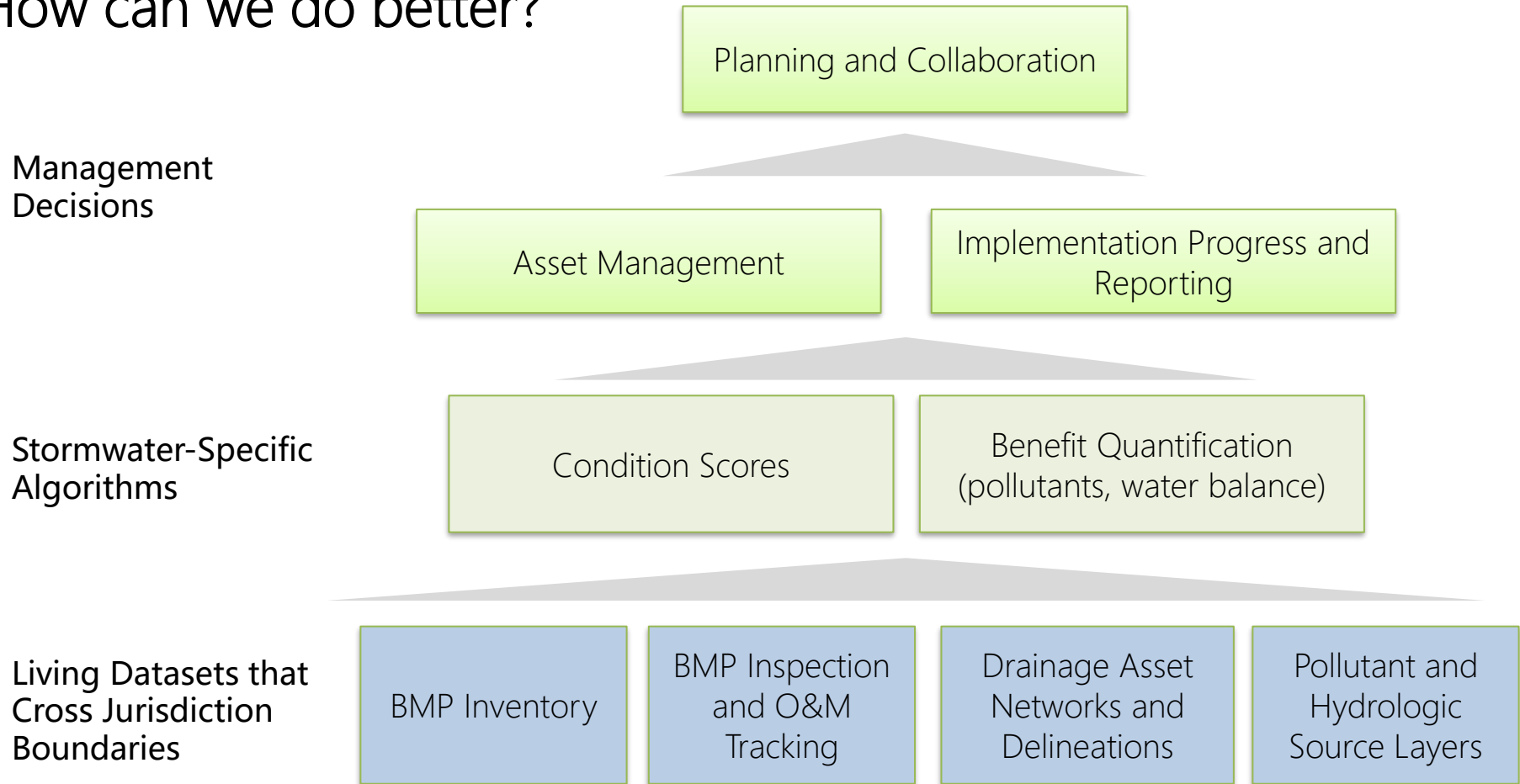
How does it contribute to compliance? How much more is needed?
Where?

How much will it cost to reach and maintain compliance? Can this be
prioritized?

Do I have everything? From everyone in the watershed?

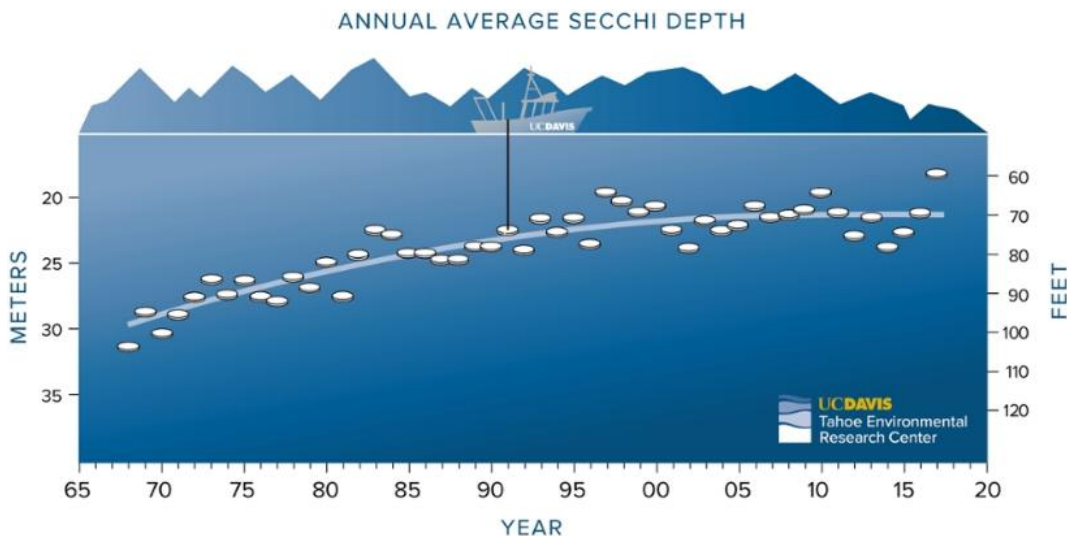
**How has this all changed since the last time I pulled this
together?**

How can we do better?



Stormwater Management in the Lake Tahoe Basin

Declines in lake clarity have led to three decades of investment and regulation in the basin



Lake Tahoe Restoration Act

- Federal authorization in 2000 and 2011

Lake Tahoe Lake Clarity TMDL

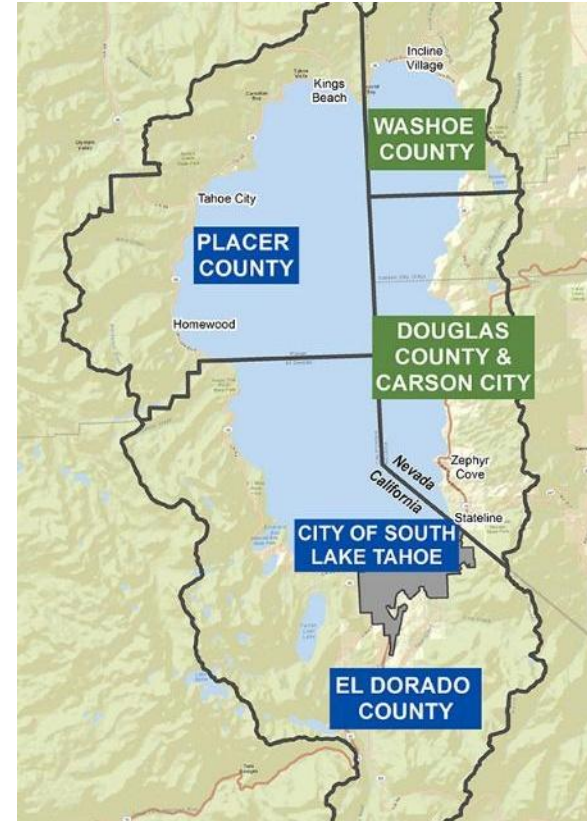
- Adopted by CA and NV in 2011
- Urban stormwater accounts for 70+% of fine particles

TRPA Environmental Improvement Program

- 1997 to present
- Over \$3B invested by federal, state, local, and private partners
- Watersheds and WQ is a key focus

Lake Clarity TMDL and Lake Clarity Credit Program

- Performance based regulation
- Applies to 5 counties, 1 city, and 2 DOTs across two states
- Requires Permittees to reduce fine stormwater particulates (FSP), N, and P as percent of 2004 baseline
- Standard Metric: One Lake Clarity Credit = 1×10^{16} FSP



Current Setting for Stormwater Management and Planning

Many existing projects/assets and many different owners

- Traditional stormwater BMPs (public, private)
- Erosion repairs
- Stream enhancements
- Road maintenance and source control

O&M is important to maintain function - required by the TMDL

More progress is needed, and the low hanging fruit are gone



The Solution: Lake Tahoe Info Stormwater Tools

- Shared platform for regulators and Permittees
- Permittee workflows for inventory, inspection, asset management, and compliance tracking
- The regulatory system of record

BMP Inventory

BMP RAM

Road RAM

Pollutant Load
Reduction Model

Lake Clarity
Credit
Registration and
Trading

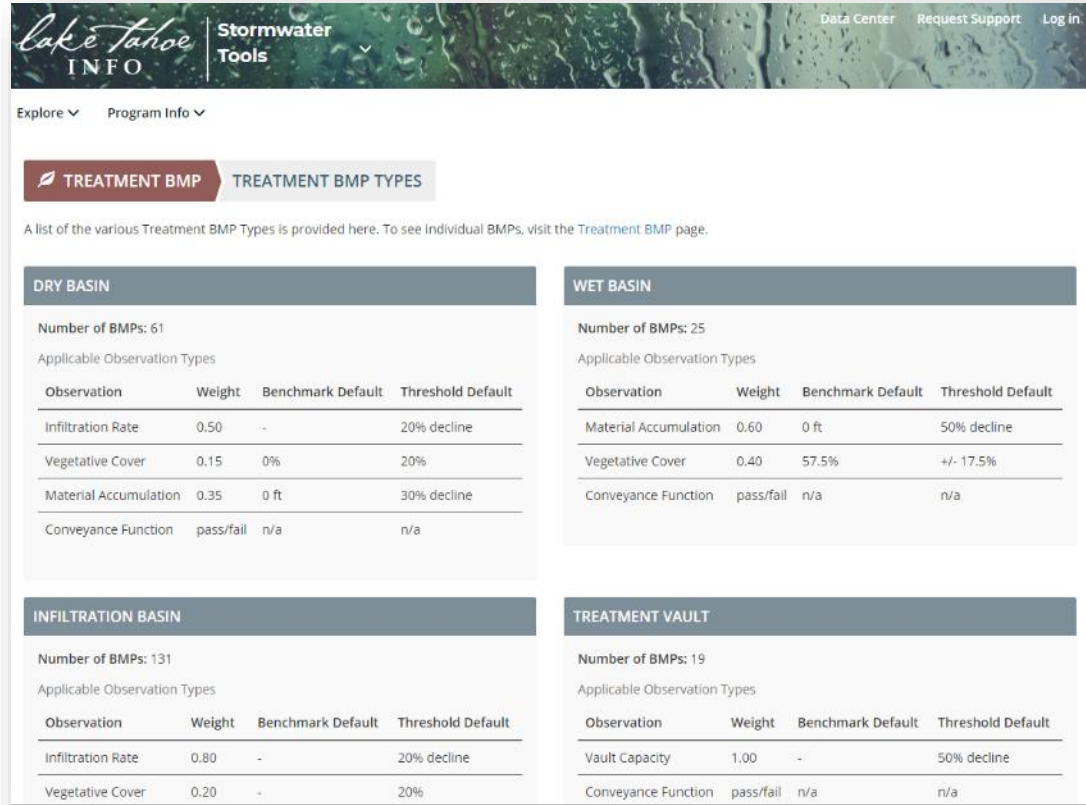
Progress
Tracking and
Performance
Reporting

BMP Inventory

12 distinct BMP Types define by program

A suite of relevant observations are defined for each type

BMP are added to inventory and inspection templates established



lake tahoe | Stormwater
INFO Tools

Data Center Request Support Log in

Explore Program Info

TREATMENT BMP TREATMENT BMP TYPES

A list of the various Treatment BMP Types is provided here. To see individual BMPs, visit the [Treatment BMP](#) page.

DRY BASIN			
Number of BMPs: 61			
Applicable Observation Types			
Observation	Weight	Benchmark Default	Threshold Default
Infiltration Rate	0.50	-	20% decline
Vegetative Cover	0.15	0%	20%
Material Accumulation	0.35	0 ft	30% decline
Conveyance Function	pass/fail	n/a	n/a

WET BASIN			
Number of BMPs: 25			
Applicable Observation Types			
Observation	Weight	Benchmark Default	Threshold Default
Material Accumulation	0.60	0 ft	50% decline
Vegetative Cover	0.40	57.5%	+/- 17.5%
Conveyance Function	pass/fail	n/a	n/a

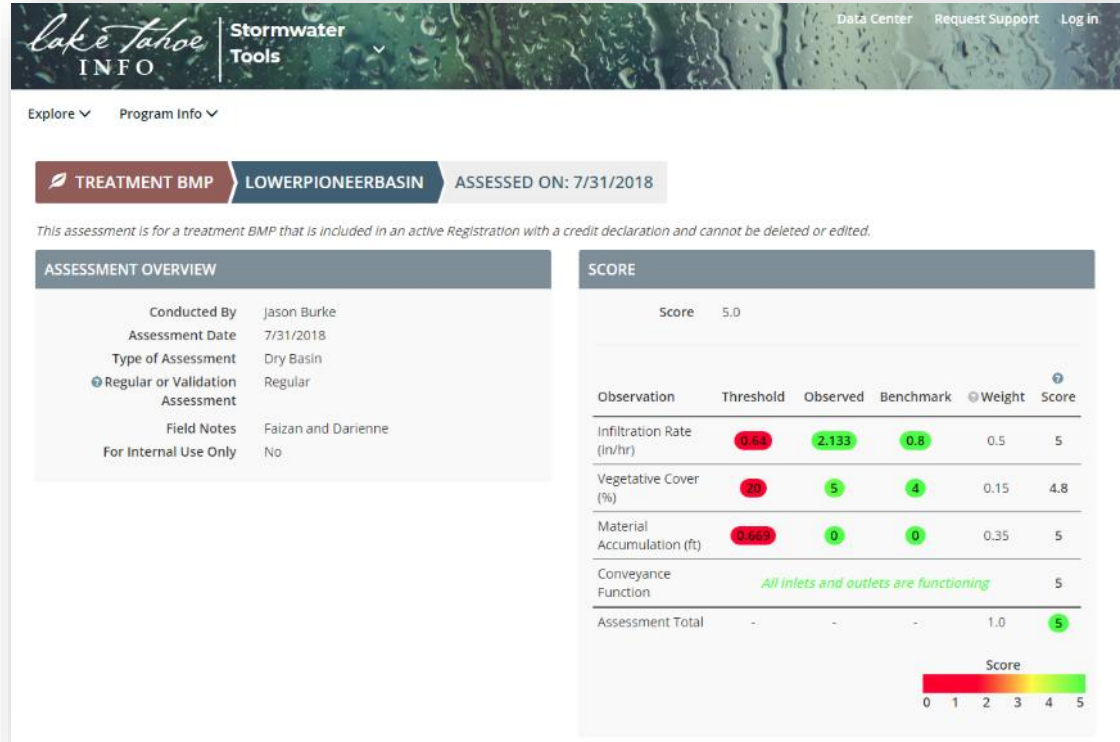
INFILTRATION BASIN			
Number of BMPs: 131			
Applicable Observation Types			
Observation	Weight	Benchmark Default	Threshold Default
Infiltration Rate	0.80	-	20% decline
Vegetative Cover	0.20	-	20%

TREATMENT VAULT			
Number of BMPs: 19			
Applicable Observation Types			
Observation	Weight	Benchmark Default	Threshold Default
Vault Capacity	1.00	-	50% decline
Conveyance Function	pass/fail	n/a	n/a

BMP Assessment

Periodic assessment of BMP condition is used to generate a relative condition score

Condition score relates to expected pollutant load efficacy

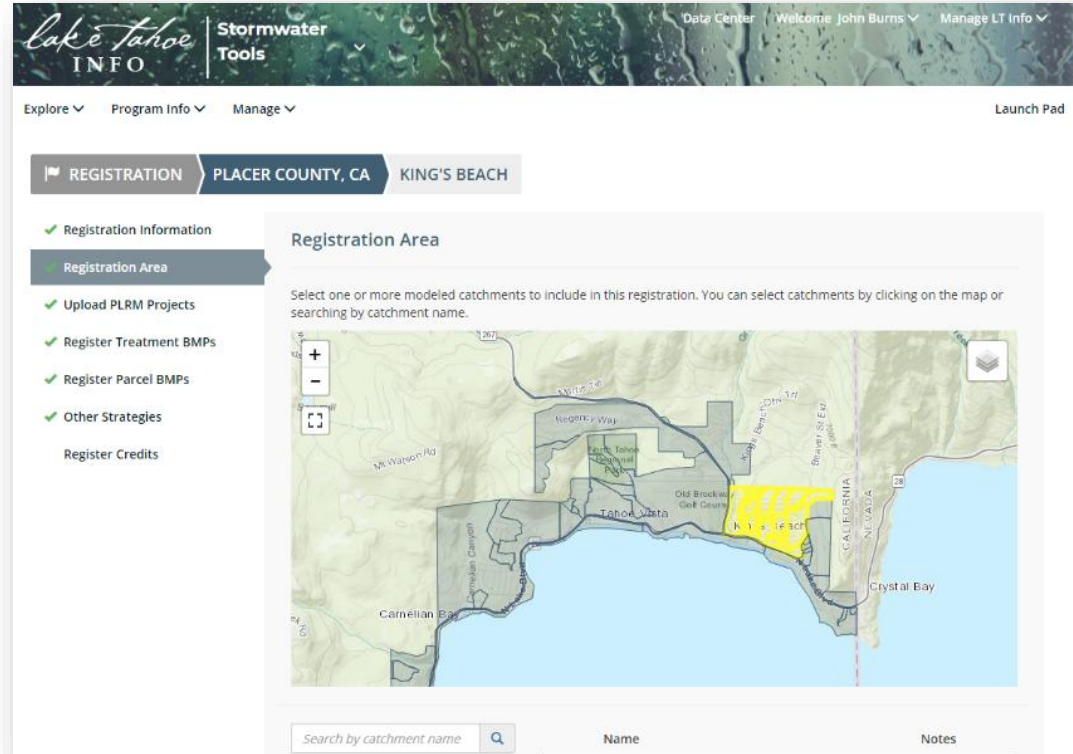


Credit Registration Accounting and Workflows

Registrations are the agreement between regulators and jurisdictions

Registrations provide transparency and predictability

Software tools facilitate consistent data tracking and convenient data submission and review



Pollutant Load Reduction Model

As part of the registration process users upload a PLRM File and the system calculates modeled load reduction values

REGISTRATION

CENTRAL INCLINE VILLAGE PHASE ...

PLRM SUMMARY REPORT

REGISTRATION DETAILS

Registration

Central Incline Village Phase I BMP Registration

Jurisdiction

Washoe County, NV

Type

Treatment/Parcel BMPs

Status

Approved

PLRM Subcatchments

Treatment BMPs

RWCUp2

FSP Load Reduction: 1,481 lbs / yr

RWCler1

FSP Load Reduction: 737 lbs / yr

WdTrib1A

FSP Load Reduction: 561 lbs / yr

RWCler2

FSP Load Reduction: 310 lbs / yr

WdTrib1D

FSP Load Reduction: 234 lbs / yr

WdTrib1Cb

FSP Load Reduction: 201 lbs / yr

RWCUp2

Model: CIVph1_noThirdCrk

Met Grid: 818

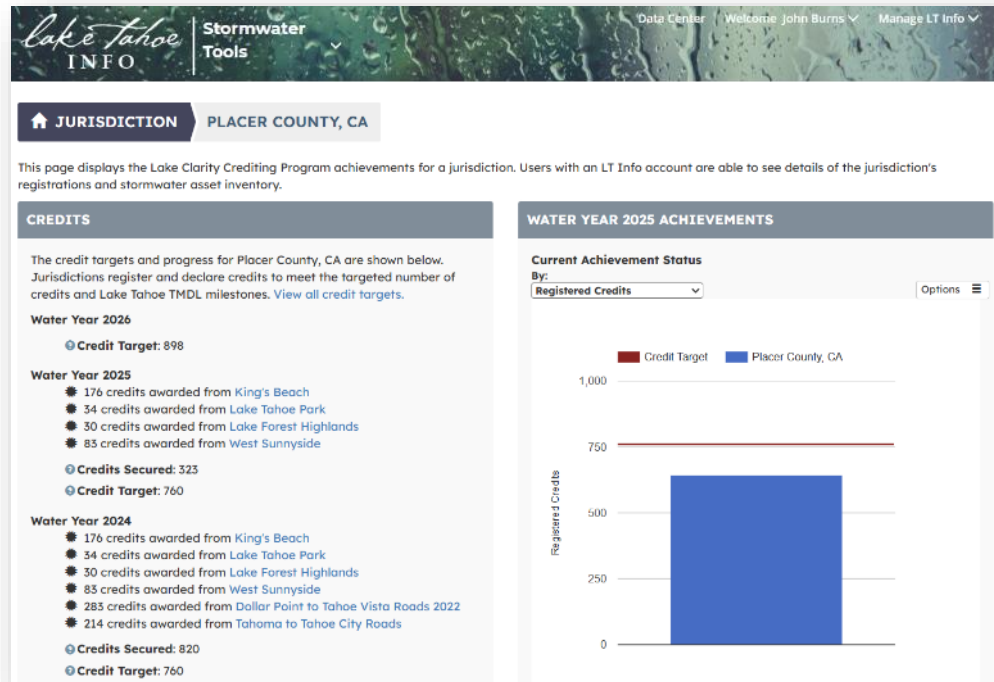
Slope: 10%

Flows To: RWCUp2OF

Catchment Output	Baseline Scenario Value	Road Operations Scenario Value	Expected Scenario Value	Load Reduction	% Load Reduction
Volume (ac-ft/yr)	7.6	7.6	4.6	3	39%
FSP (lbs/yr)	3,466	3,466	1,985	1,481	43%
TP (lbs/yr)	14	14	9	5	36%
TN (lbs/yr)	57	57	36	21	37%

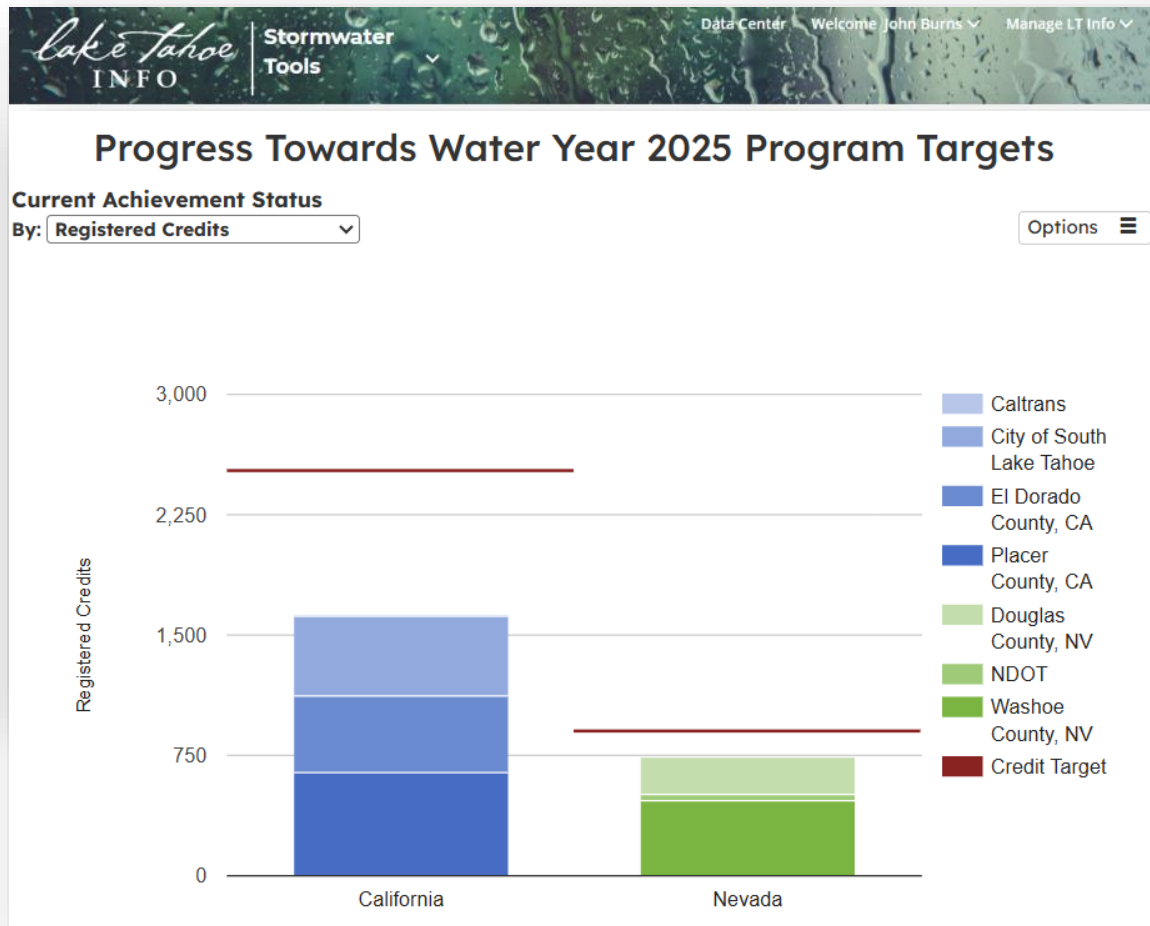
Demonstrating Progress

The results of annual road and BMP assessments are used to demonstrate that expected load reductions are being met



Demonstrating Progress

Results are rolled up across jurisdictions, accounting for transfers of credits between Permittees



Connecting Actions to Outcomes

Installation of Treatment BMPs and Investment in Road Operations ...



Central Incline Village Water Quality Improvement Project - Phase II

Project Number	01.01.01.0044
Action Priority	Reducing Stormwater Pollution from City and County Roads
Implementers	Washoe County, NV
Primary Contact	Ben Jesch (bjesch@washoecounty.us)
Stage	Completed
Duration	2011 - 2016

Stormwater Management > Reducing Stormwater Pollution from City and County Roads

This project included small specific areas that were identified for water quality improvements as part of the Washoe County EIP Project Assessment completed in 2006. The areas are within project boundaries of several completed EIP projects however improvements for these areas were never included as part of the older projects. The problem areas were in need of source control, treatment and improved flow conveyance.

Key Accomplishments

- Miles of Roads Decommissioned or Retrofitted: 3.06 miles

Threshold Categories

- Soil Conservation
- Water Quality



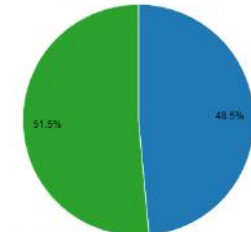
Stormwater Improvements Along Lakeshore Blvd.

Location



Expenditures

Expenditures by Funding Source to Date: \$2,455,770
(Estimated Cost: \$2,455,770)



■ Southern Nevada Public... (USFS - LTBMU): \$1,192,121
■ Tahoe Bonds Act (NDSL): \$1,263,649

Connecting Actions to Outcomes

... And confirmation they are maintained and operated effectively ...

REGISTRATION

WASHOE COUNTY, NV

CENTRAL INCLINE VILLAGE PHASE ...

Update

Withdraw

OVERVIEW

Jurisdiction

Washoe County, NV

Name

Central Incline Village Phase 1 BMP Registration

Type

BMP Registration

Status

Approved

Timeframe

10/01/2016 to 09/30/2031 (15 years)

Annual Credit Potential

44 credits

Establishment Year Credit Potential

44 credits (100%)

Treatment BMPs Included in Registration

Yes

Parcel BMPs Included in Registration

Yes

Other Pollutant Control Strategies

No

Supporting Documents

CIVph1_BMPRegisMemo Final_2018.09.27.pdf

CIVph1_BMPRegisMemo_2021.05.11.pdf

Central Incline Village Phase 1 WQI P-CertificateStatistics-01_13_2021.pdf

REGISTRATION AREA & BMPs

DECLARATIONS

Currently Viewing 9 out of 9 Registration Years

Download Table

		Water Year	Declaration Status	Credits	Reason for Overriding Credit Potential
	View	2017	Awarded	37	In the process to complete Parcel BMP RAM and declare credits for C
	View	2018	Awarded	36	LT Info Stormwater Tools says the CICU parcel BMP percentage has d

Connecting Actions to Outcomes

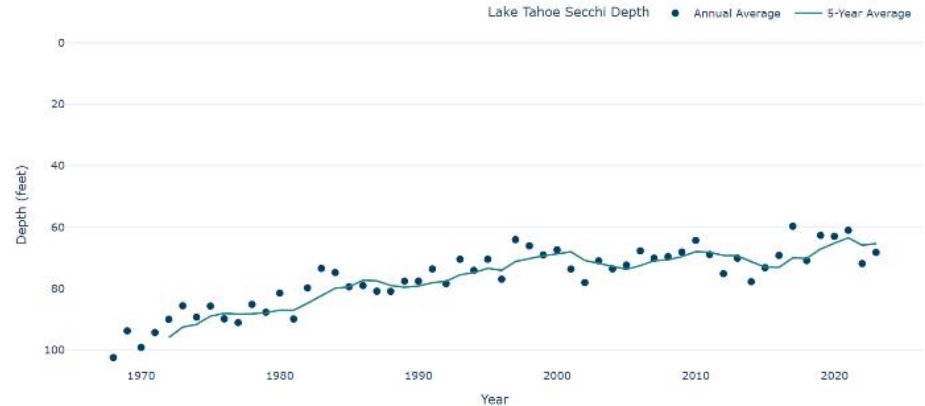
... And ultimately results in desired environmental outcomes



LAKE CLARITY TRACKER

WATER CLARITY

Lake clarity measurements have been taken continuously by UC Davis Tahoe Environmental Research Center (TERC) since 1968, when a white disk, called the Secchi disk, could be seen down to 102 feet. It is one of the longest, unbroken clarity records in the world. Secchi depth is the most widely used method of clarity measurement, and the values are consistent with laser-based measurements also taken by TERC researchers. Water transparency in Lake Tahoe is controlled by fine particles blocking light penetration either by scattering or by absorption. The decline in transparency is the result of accumulation of fine sediment particles and growth of small phytoplankton (algae). Fine sediments and nutrients are transported to the lake by stormwater runoff, stream erosion, and through atmospheric deposition.

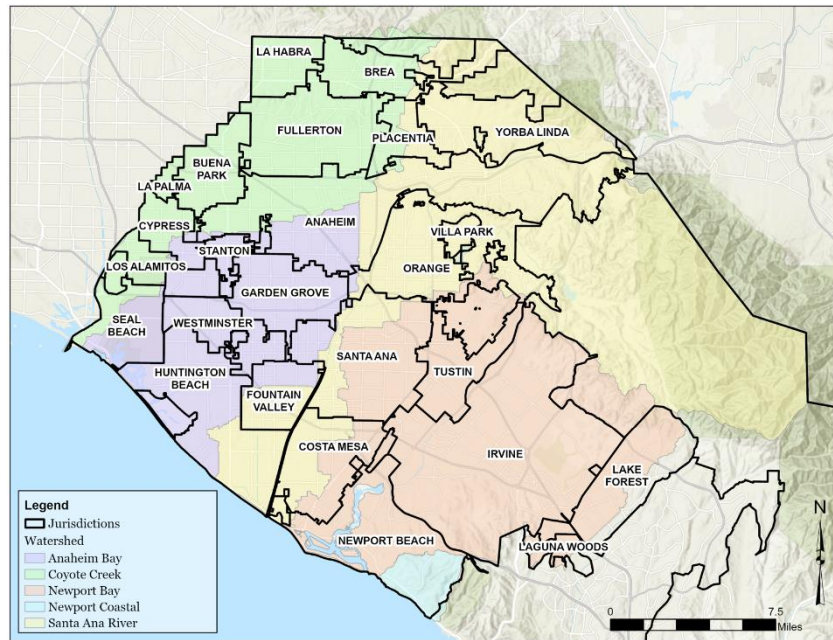


Summary

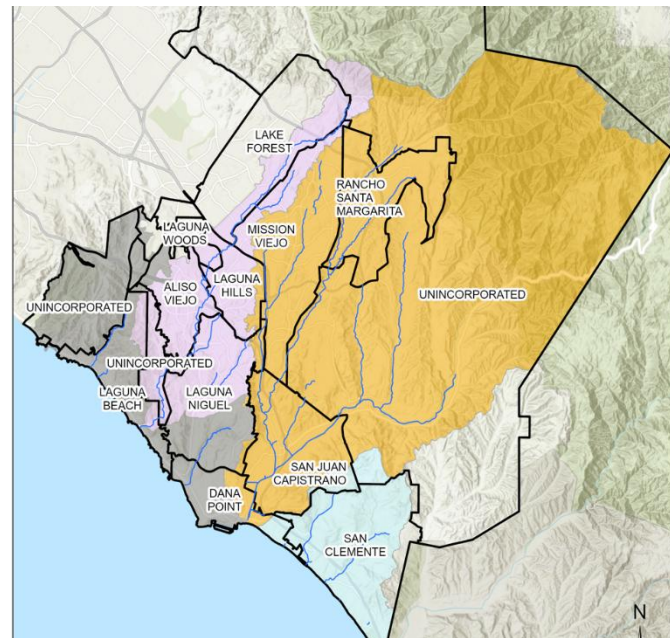
Sources

Average annual Secchi depth from the Lake Tahoe Index Station as taken by UC Davis.

Orange County Stormwater Program



North OC

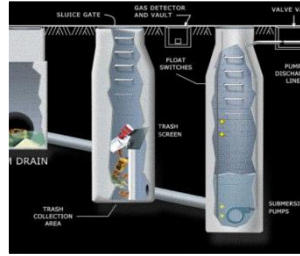


South OC

Stormwater BMPs in Orange County



Trash Capture
Devices



Low Flow
Diversions



Site Level LID



ROW Green
Infrastructure



Regional WQ
Retrofits



Groundwater
Recharge

Statewide Trash Order

Land Development
Stormwater Planning

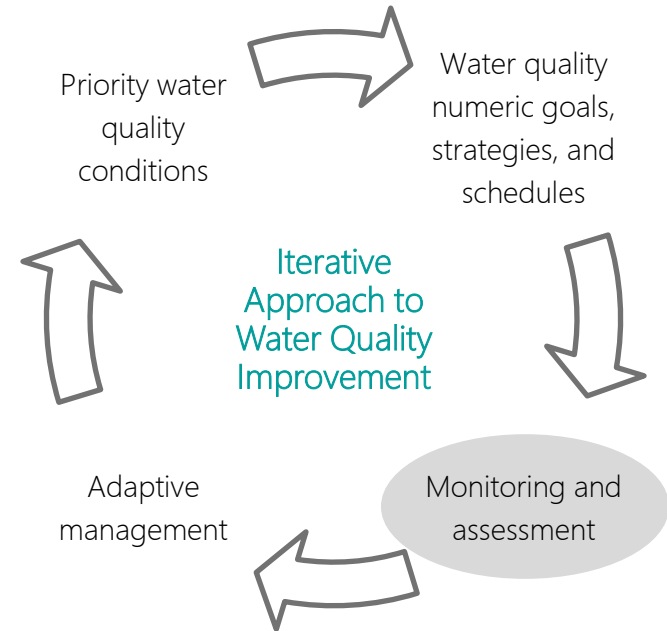
Beach Water Quality

TMDLs and Watershed
Management Plans

Opportunistic IRWM
Partnerships

South OC Water Quality Improvement Plan

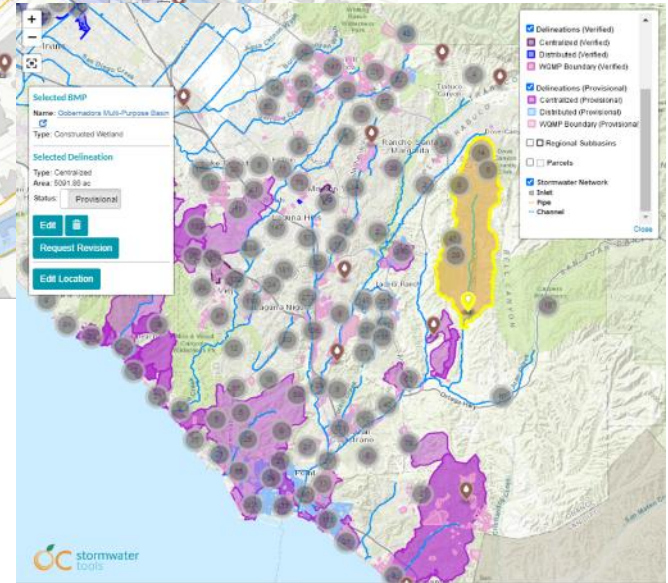
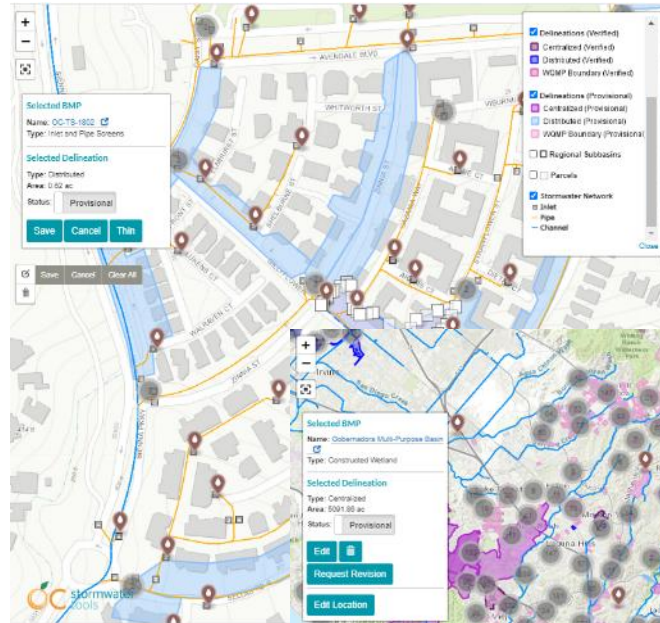
A watershed management plan that relies on the implementation of structural and non-structural strategies to achieve water quality improvement (primarily through pollutant load reduction) according to a schedule of goals/commitments.



Need: Standardize asset tracking and condition assessment of BMPs

Solution:  **stormwater tools** | **Inventory Module**

- ✓ Build and maintain consistent inventory of BMP assets
- ✓ Support field users and maintenance managers with rapid BMP condition assessment and maintenance tracking
- ✓ Track BMPs within private parcels and verify O&M
- ✓ Store BMP delineations

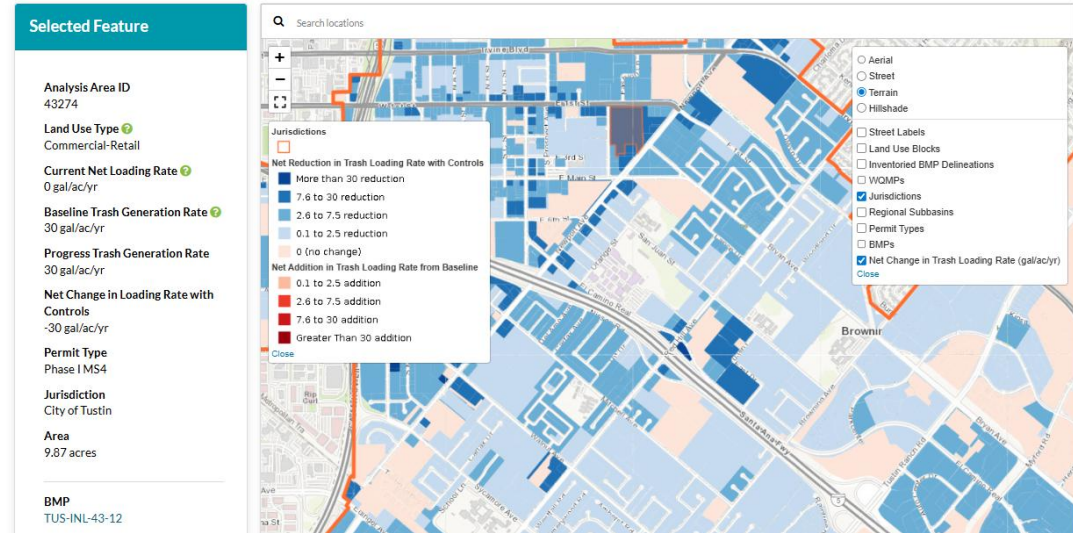
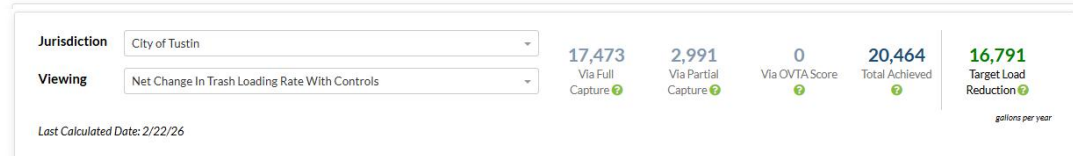


Need: Standardize compliance determination and reporting for the Statewide Trash Amendments, once written into renewed MS4 Permits



Solution:  **stormwater tools** | **Trash Module**

- ✓ Manage jurisdictional land use layers (priority vs. alternate)
- ✓ Assign trash capture effectiveness to inventoried BMPs
- ✓ Perform On-land Visual Trash Assessments (OVTAs)
- ✓ View progress
- ✓ Support compliance reporting



Need: Quantify pollutant load reduction and water capture performance

Solution:  **stormwater tools** | **Modeling Module**

Microsoft PowerBI
Modeling Results Summary by Jurisdiction or Watershed

- ✓ Model the performance of existing structural BMPs
- ✓ Report progress

Treatment BMP Performance Volume & Load Removal

- ☐ City of Aliso Viejo
- ☐ City of Dana Point
- ☐ City of Laguna Beach
- ☐ City of Laguna Niguel
- ☐ City of Lake Forest
- ☐ City of Mission Viejo
- ☐ Dry Extended Detention Basin
- ☐ Flow Duration Control Tank
- ☐ Hydrodynamic Separator
- ☐ Infiltration Trench
 - ☐ MIV-IT-LHG-3
 - ☐ MIV-IT-MOLC-1
 - ☐ MIV-IT-MOLC-2
 - ☐ MIV-IT-NHP-1
- ☐ Low Flow Diversion
- ☐ Proprietary Biotreatment
- ☐ Proprietary Treatment Control

Preliminary Results; For Discussion Purposes Only

Total		Dry	Wet
Volume Removal Fate		Volume Removed (cuft/yr)	
Harvesting or Diversion		18,635,393	
Infiltration		343,959	
Total		18,979,352	
Pollutant		Load Removed (lbs/yr)	
TSS		185,808.08	
TN		5,555.83	
TP		680.31	
Pollutant		Load Removed (lbs/yr)	
TPb		17.98236	
DCu		22.95179	
TCu		60.29111	
DZn		207.82587	
TZn		425.24022	
Pollutant		Load Removed (MPN/yr)	
FC		214,265bn	

How it works....

Inventory Module

BMP Location
and Attributes

Modeling
Parameters

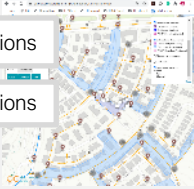
Verification Status



Delineation Module

Delineations

Connections



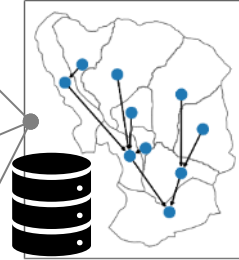
GIS Services

Hydrologic
Response Units

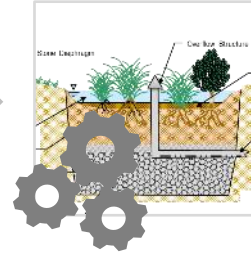
Drainage
Network



Watershed Database



Modeling Engine

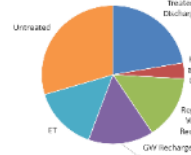


Results and Reporting

Time Period

Wet Dry

Water Balance – Current Condition

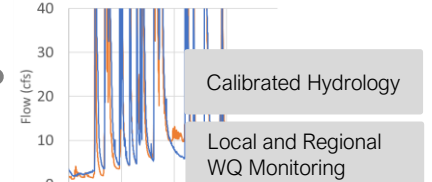


Water Balance Results

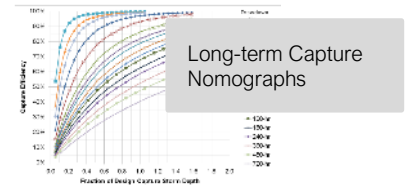


Pollutant Load Results

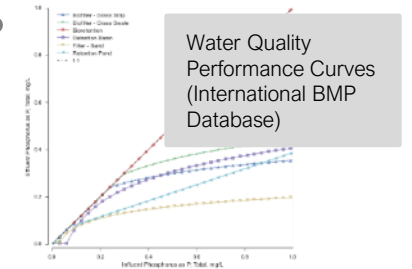
Runoff Loading



BMP Hydrology



BMP Treatment

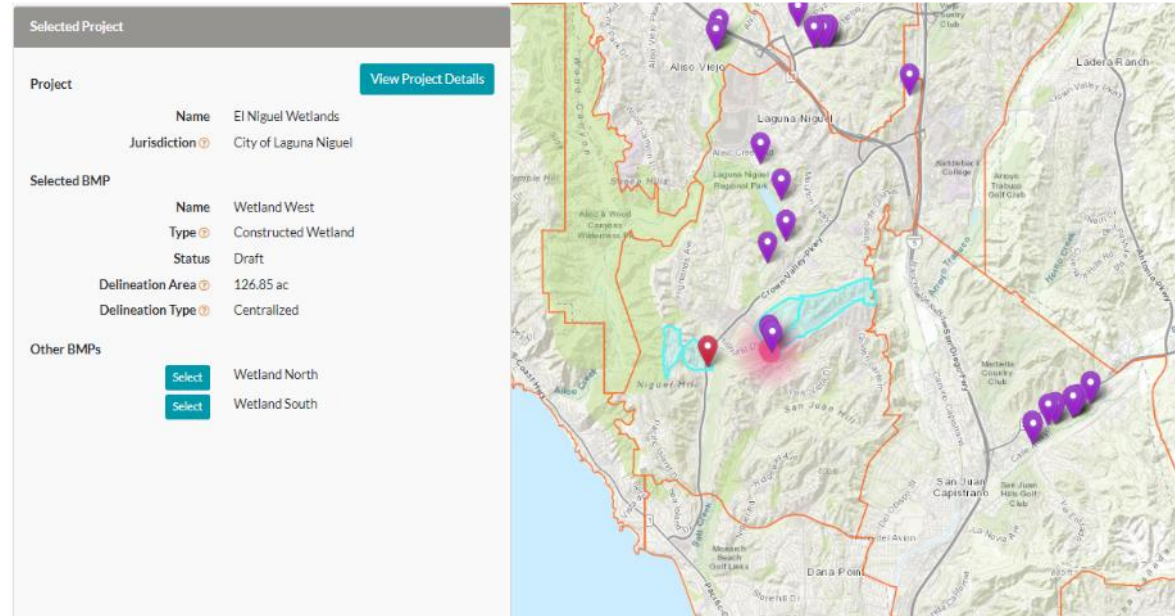


Need: An interactive environment to collaborate on potential projects and explore their stormwater capture and pollutant load reduction benefits



Solution:  **Planning Module**

- ✓ Prioritize project locations to get the most value
- ✓ Calculate benefits of potential future projects
- ✓ Review and submit projects for grant funding
- ✓ Create and store a jurisdictional portfolio of potential opportunities



Why did this solution make sense?

Asset management systems are not designed for this

Value in standardization and transparency

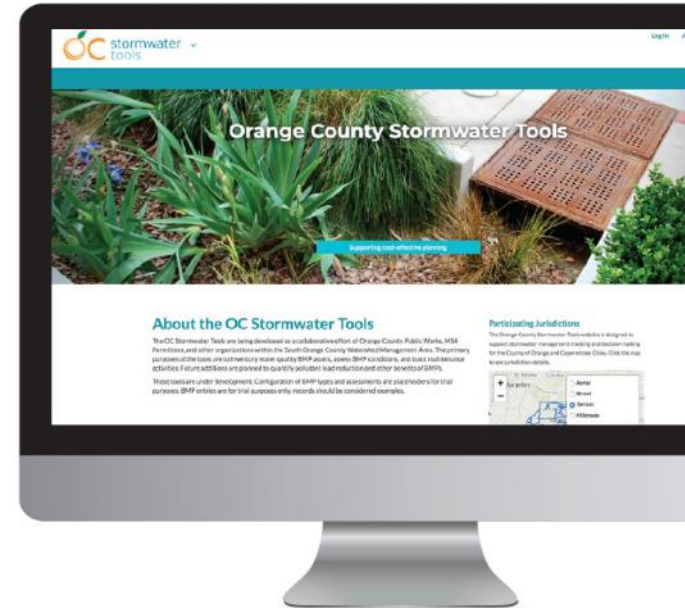
Inventory management, planning, and reporting effort >> custom software development costs

We have better things to do with our time

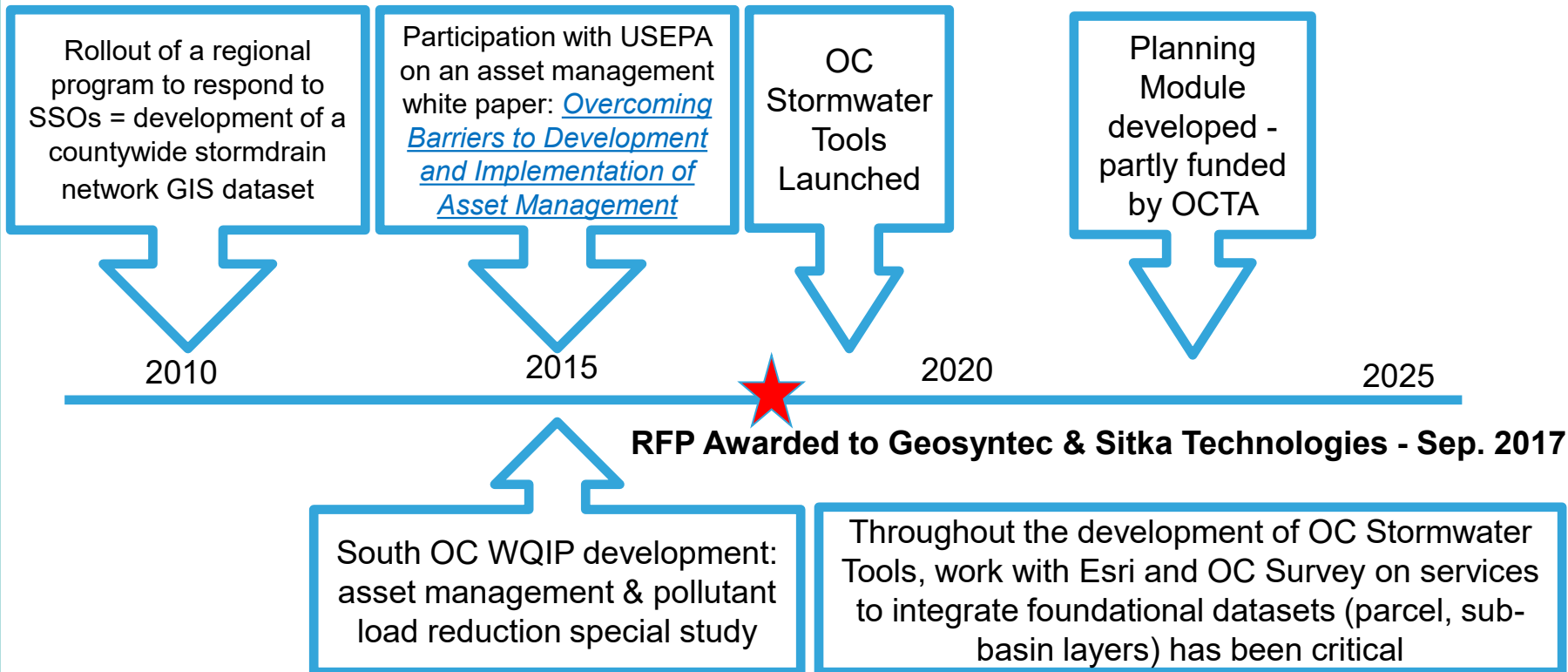
Thank You!

Resources:

- www.ocstormwatertools.org
- <https://www.southocwqip.org/pages/stormwater-quality-asset>
- <https://ocgov.box.com/v/SWQSpecialStudyReport>



OC Stormwater Tools Timeline



Stormwater Runoff Capture Data for South Orange County
As of July, 2023

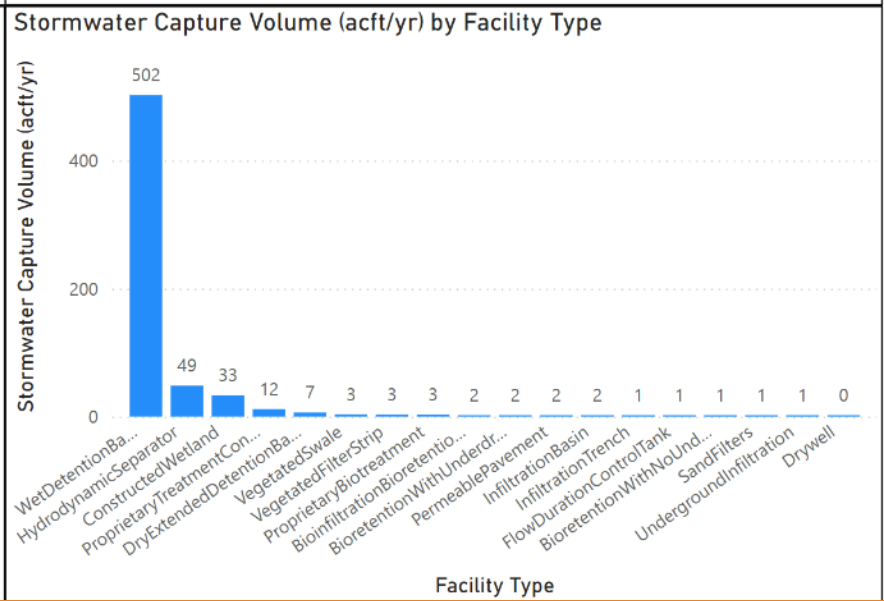
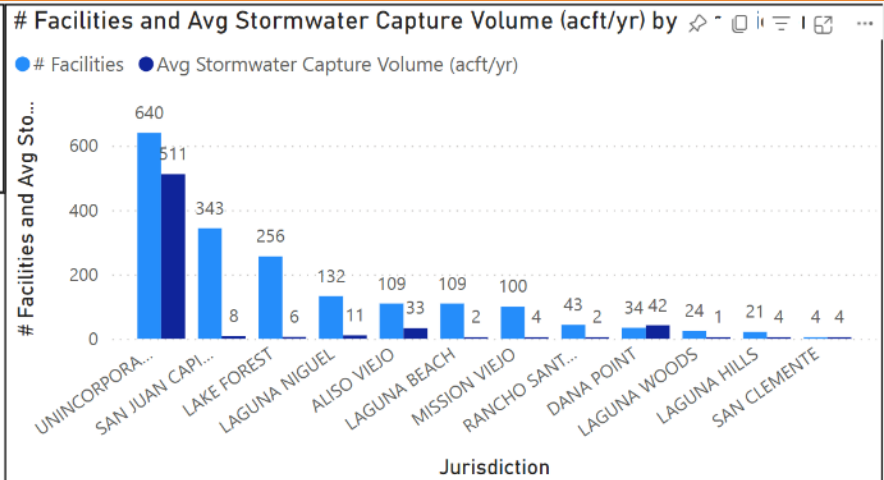
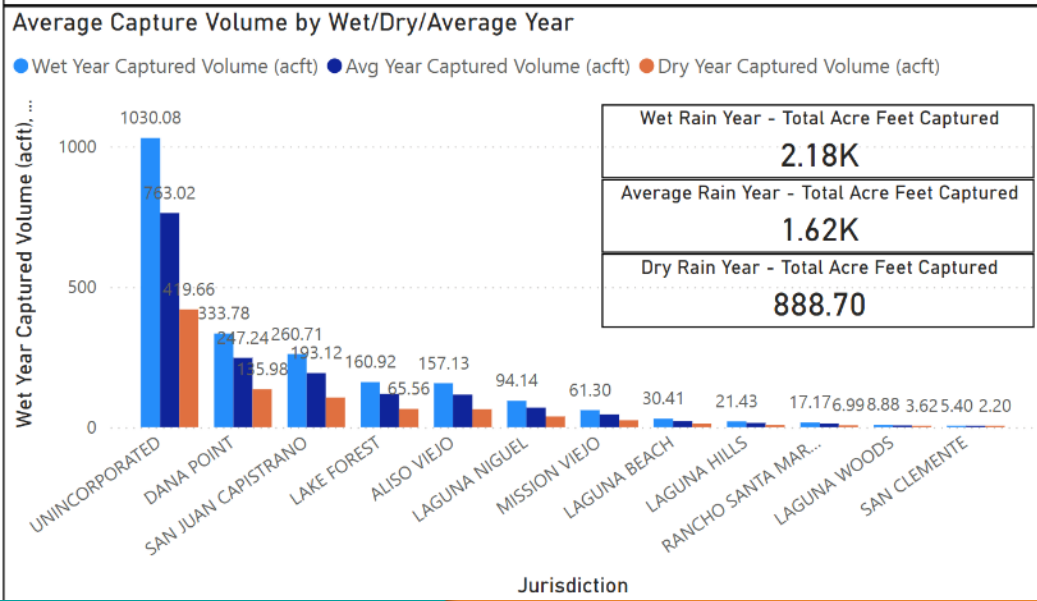
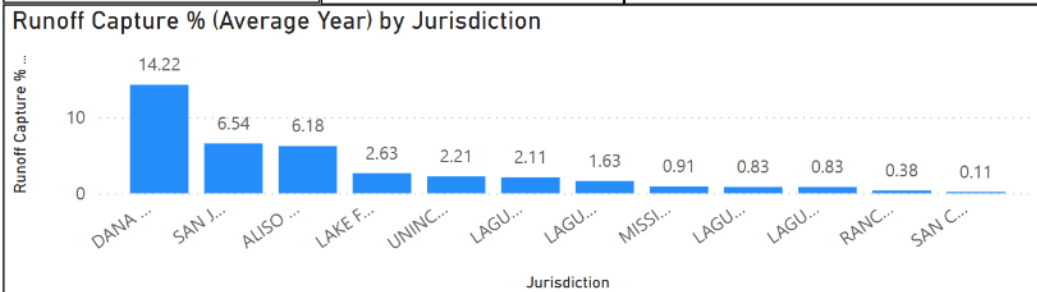
Jurisdiction

All



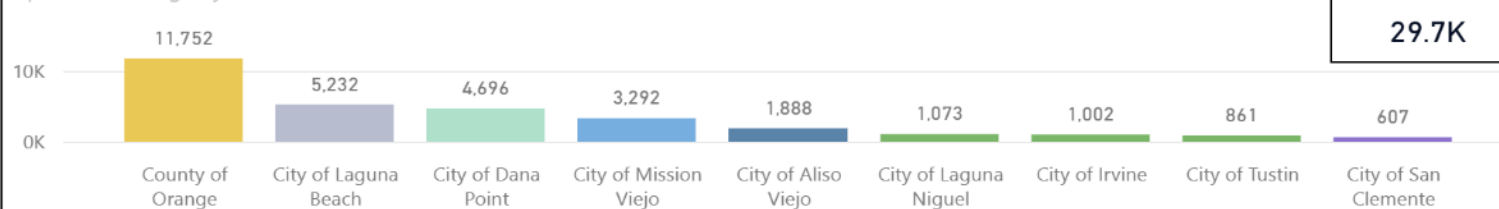
Facility Type

All

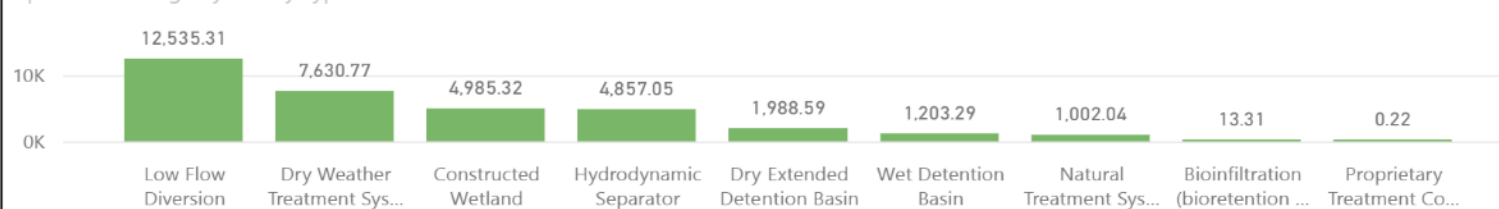


Centralized Stormwater Capture/Treatment Assets - Upstream Tributary Acreage by Jurisdiction and Type

Upstream Acreage by Jurisdiction



Upstream Acreage by Facility Type



Distributed Stormwater Capture/Treatment Assets - Upstream Tributary Acreage by Jurisdiction

Upstream Treated Acreage by Jurisdiction

