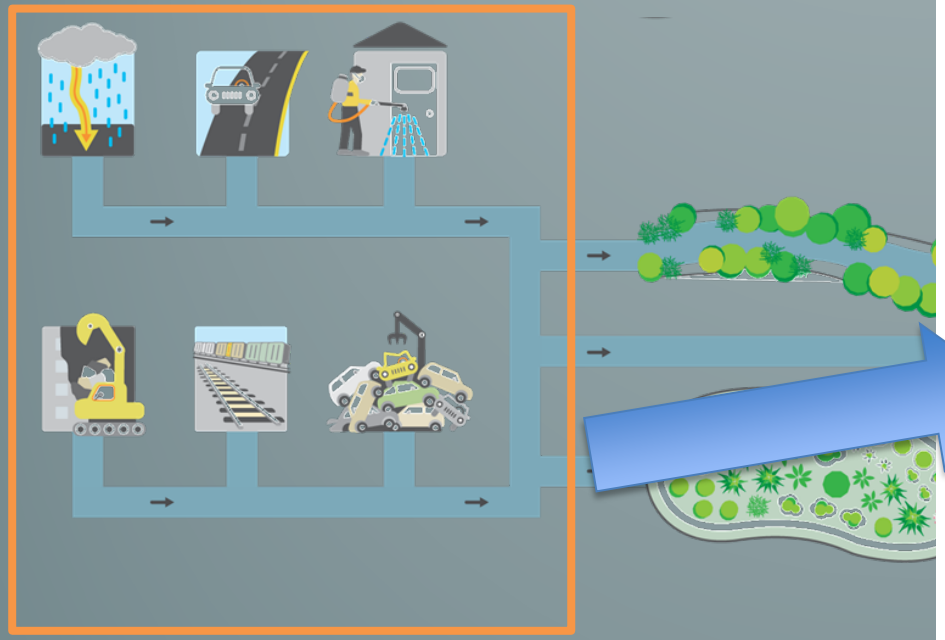
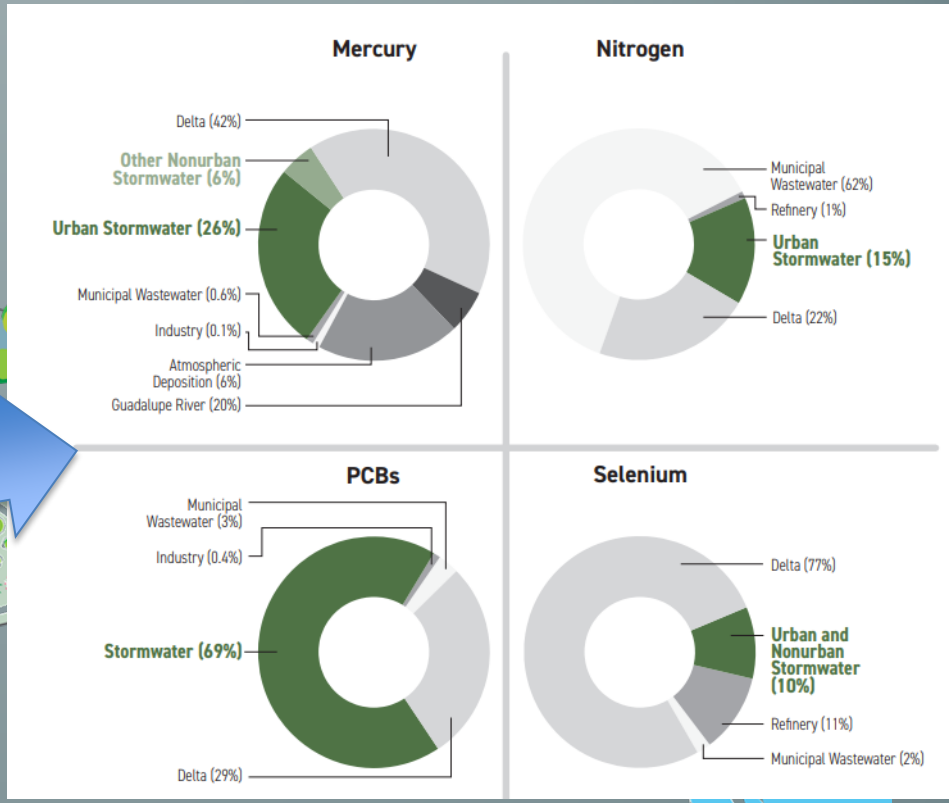
Update on Modeling to Estimate Stormwater Contaminant Loads

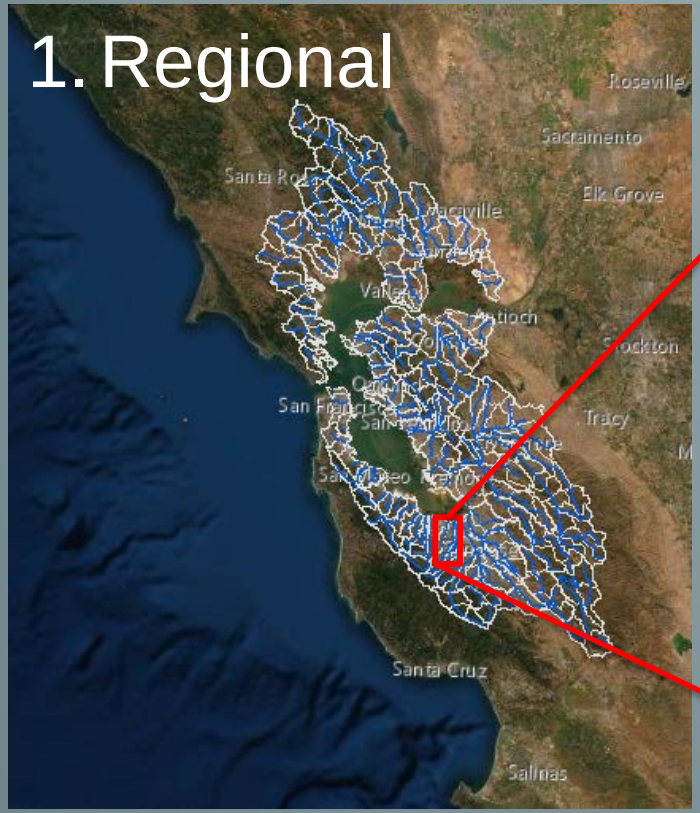
Tan Zi





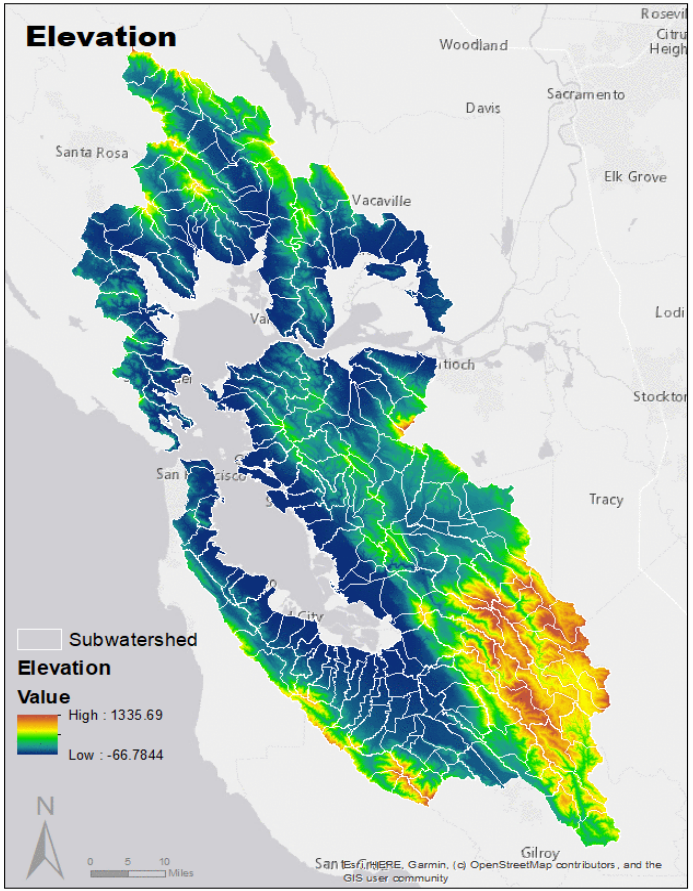
Stormwater contaminant loads

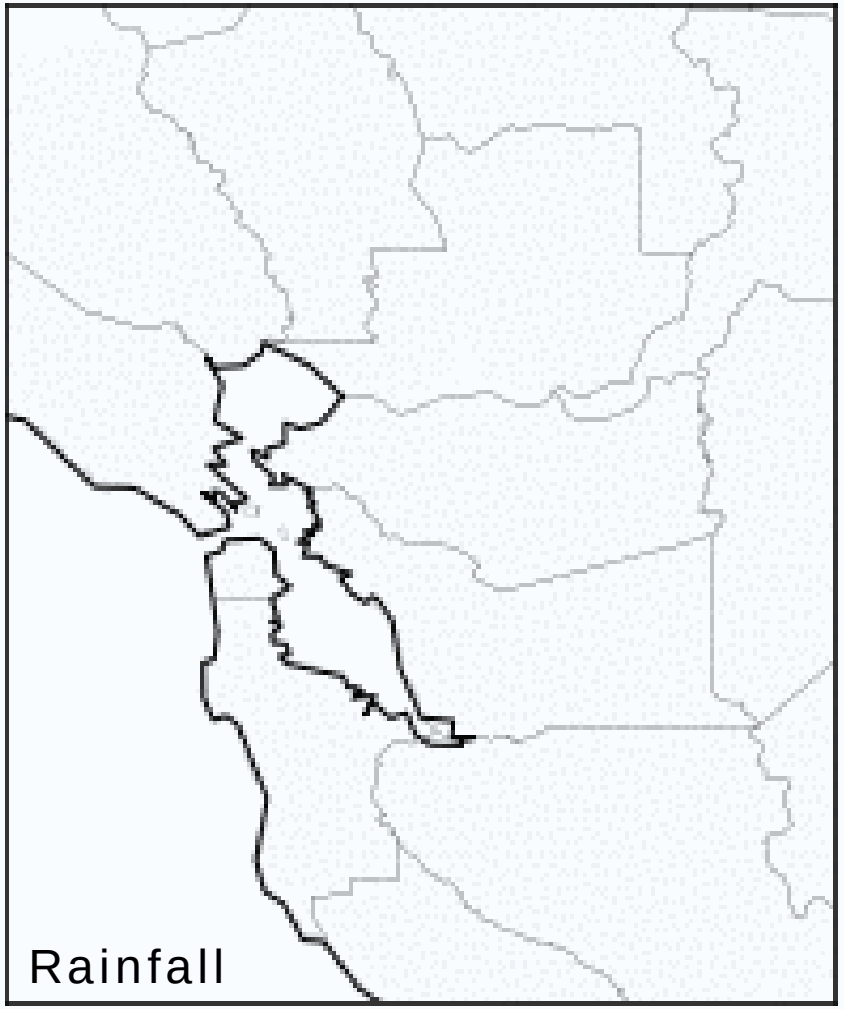
Modeling stormwater loading at different scales



1.Regional


Roseville
Sacramento
Elk Grove
Stockton
Tracy
Santa Cruz
Salinas


Elevation
Woodland
Davis
Sacramento
Santa Rosa
Vacaville
Elk Grove
Lodi
Stockton
Tracy
Gilroy
Subwatershed
Elevation
Value
High : 1335.69
Low : -66.7844
N
0 5 10
Miles
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community


Rainfall

Artificial controls

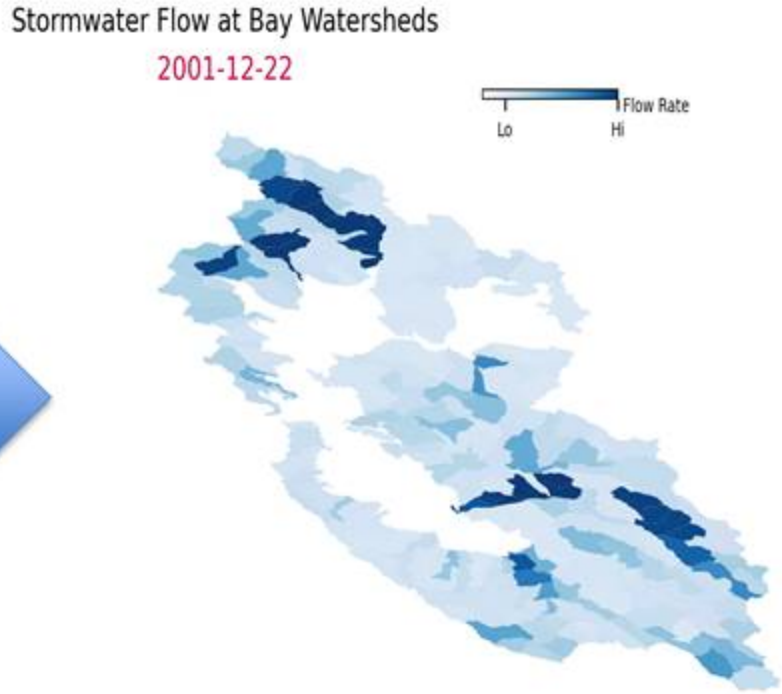
Anderson Dam Spillway FEB-2017

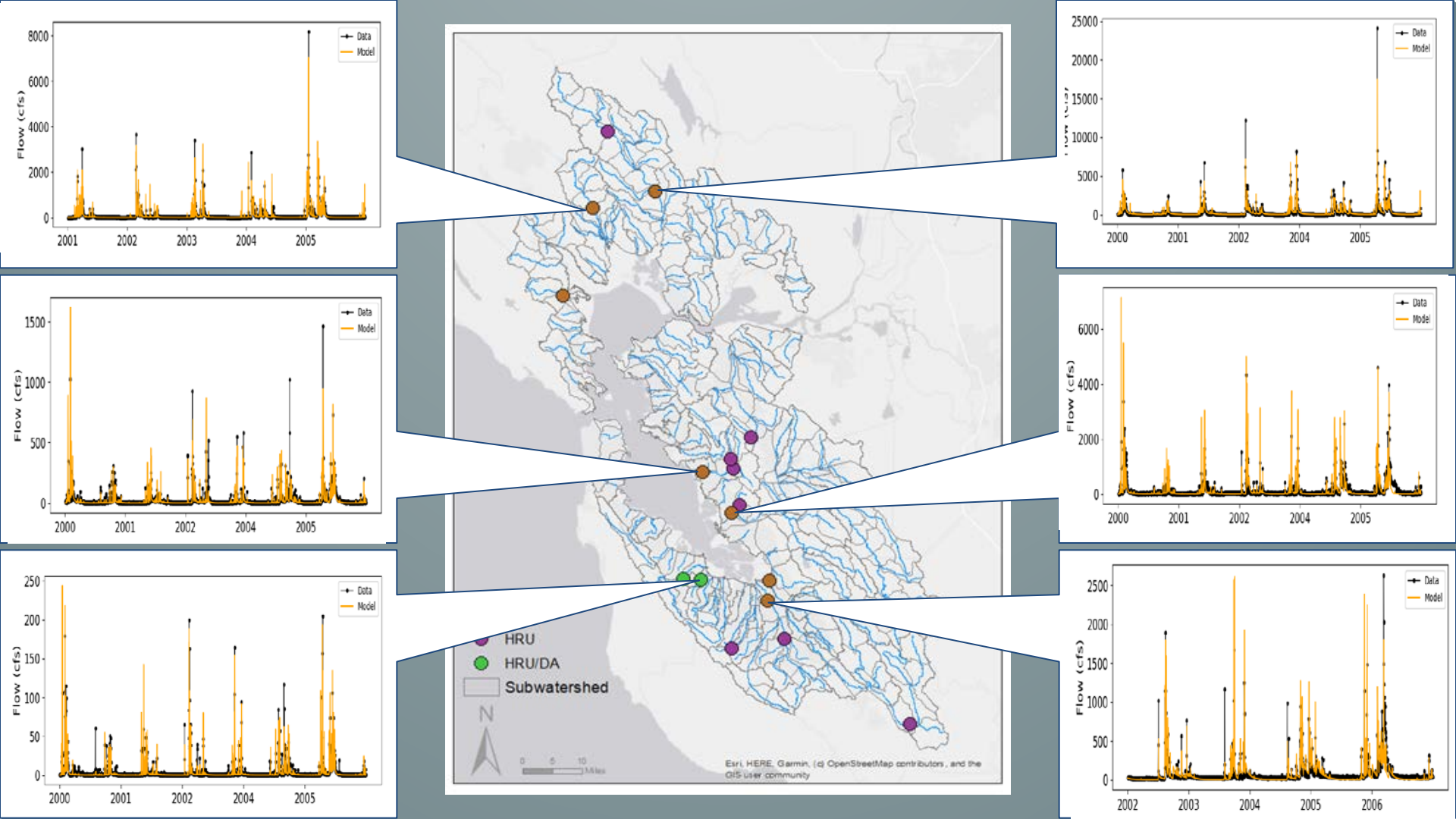
Photo By **QUEENIE WONG** | qwong@bayareanewsgroup.com and **JASON GREEN** | jason.green@bayareanewsgroup.com | Bay Area News Group

Photo by Len Ramirez
https://www.sfgate.com/bayarea/article/Anderson-Reservoir-Dam-spilling-waterfall-spillway-10947314.php

A dynamic watershed model

A dynamic watershed model



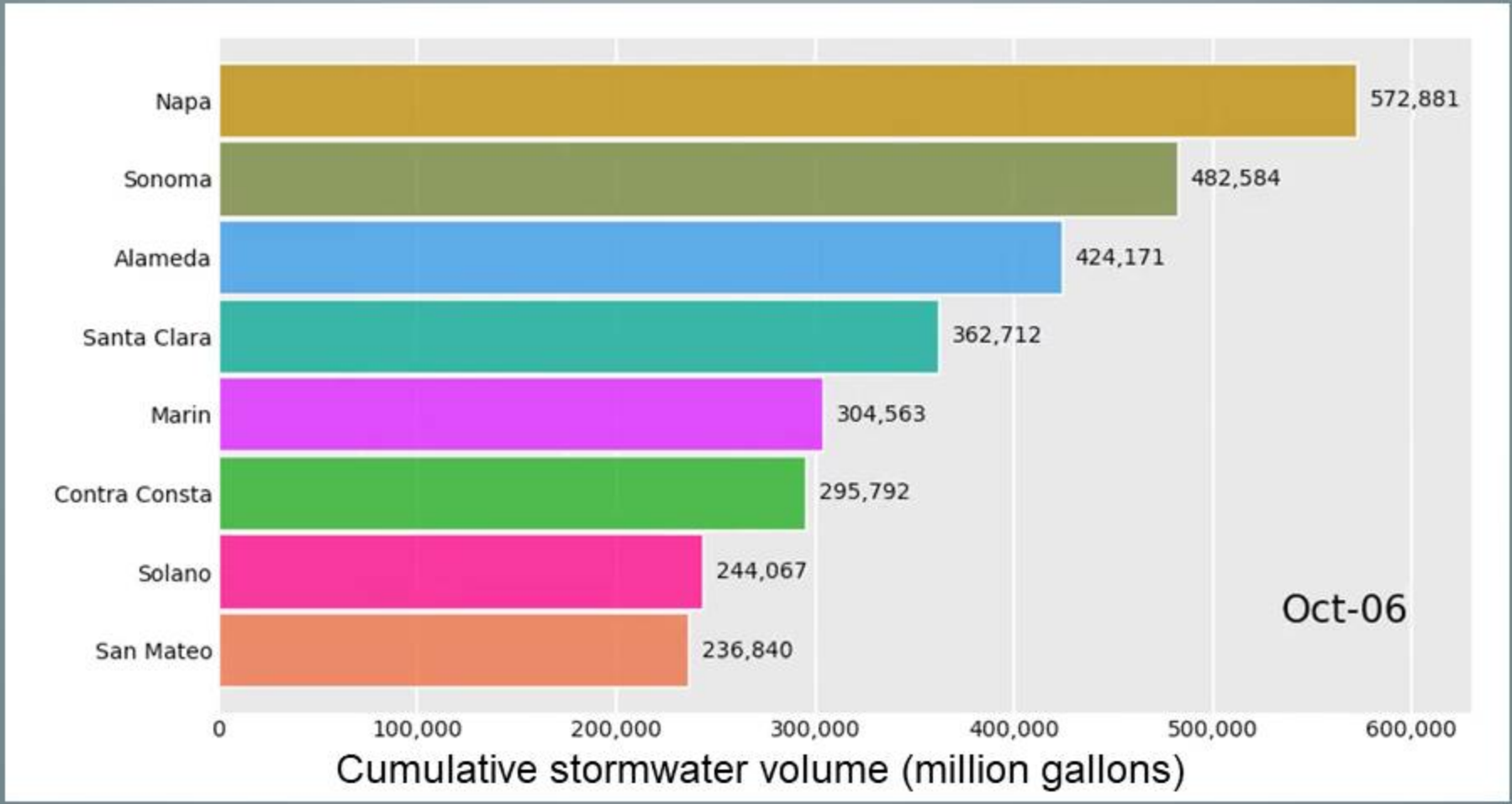

Flow (cfs)
Data
Model
HRU
HRU/DA
Subwatershed
N
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Poll

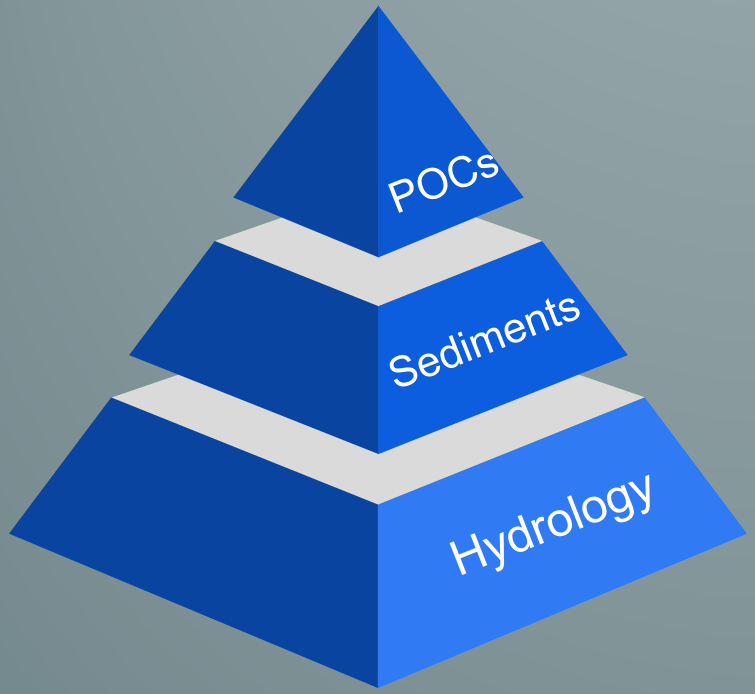
Which Bay-adjacent county has the most stormwater flow into the Bay (2000-2006)?

Answer

Answer


Napa
572,881
Sonoma
482,584
Alameda
424,171
Santa Clara
362,712
Marin
304,563
Contra Consta
295,792
Solano
244,067
San Mateo
236,840
Oct-06
0
100,000
200,000
300,000
400,000
500,000
600,000
Cumulative stormwater volume (million gallons)

The next year or two



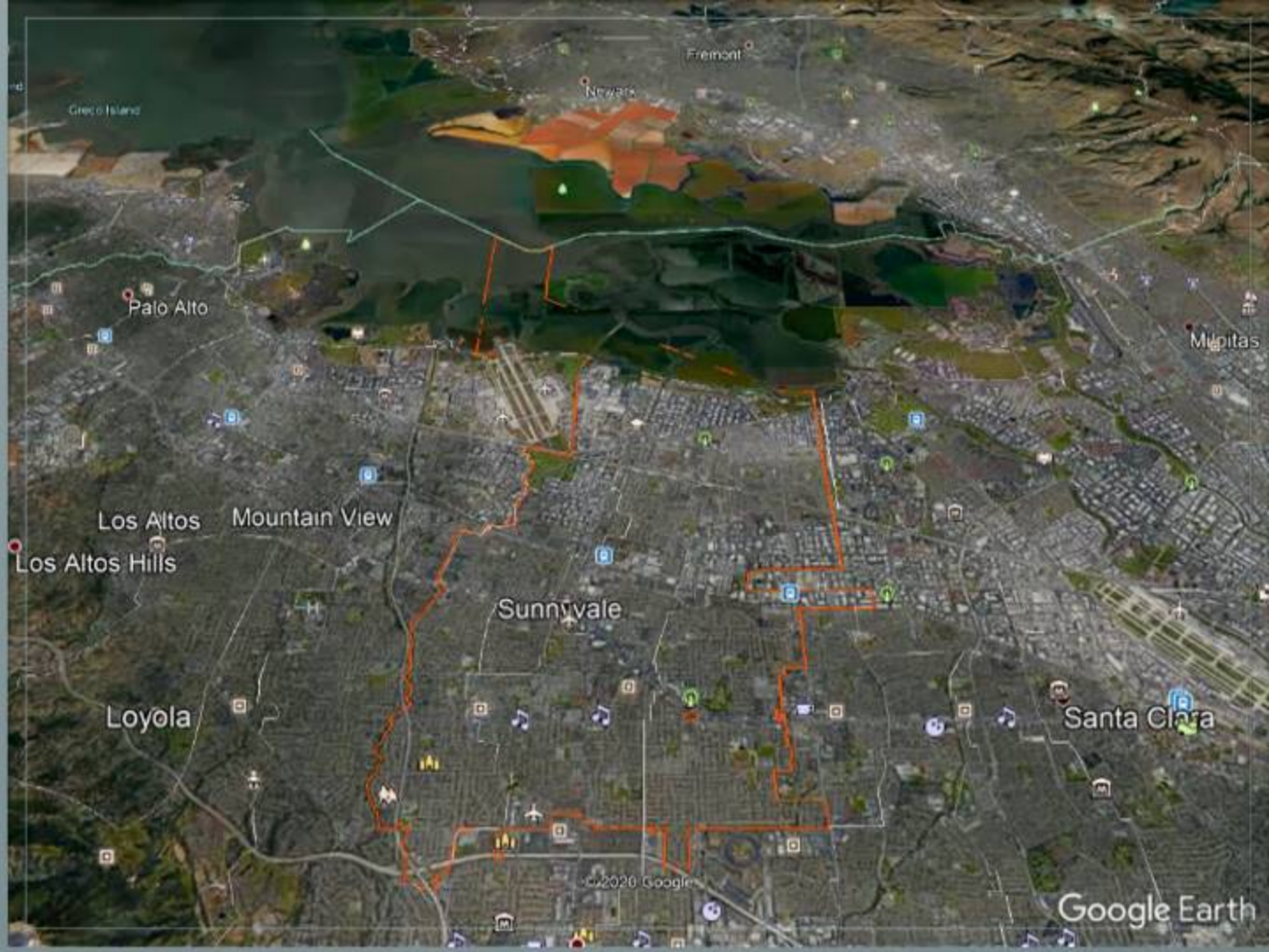
TMDL support
Emerging contaminants support

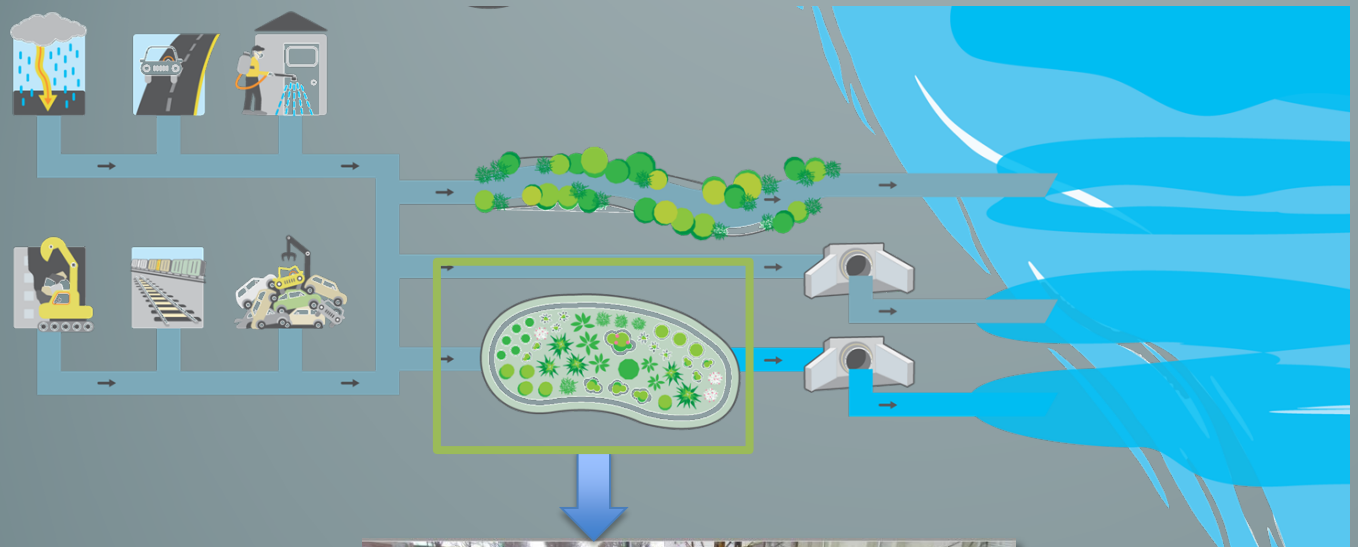
Year 2021

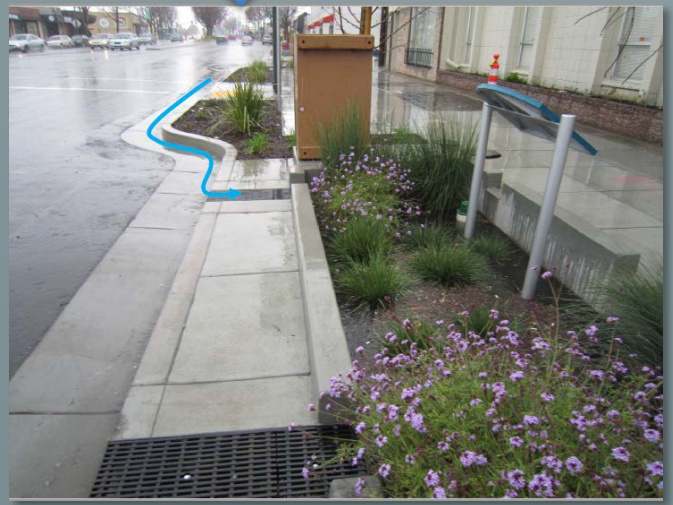
Year 2020

2. Local

2. Local


Fremont
Newark
Palo Alto
Milpitas
Los Altos
Mountain View
Los Altos Hills
Sunnyvale
Loyola
Santa Clara
Google Earth





Green Stormwater Infrastructure

Trees vs GSIs

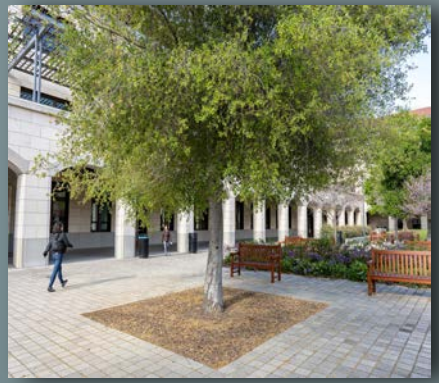
Trees

- Less efficient in stormwater treatment
- Cheap
- Provide other benefits (biodiversity, heat, human health, etc.)

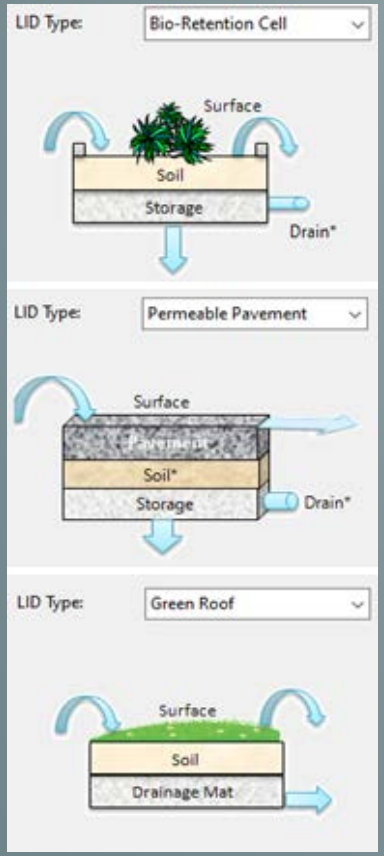
vs

GSIs

- Efficient in stormwater treatment
- Costly
- Provide water quality benefits



How to model GSIs? What about trees?

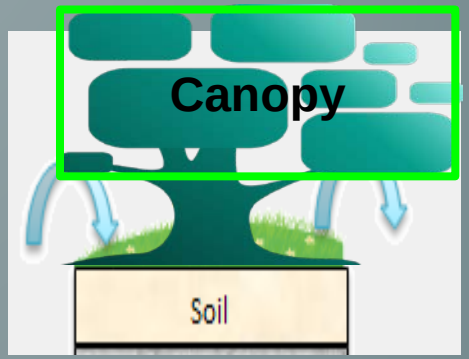


EPA SWMM

Bio-Retention =
Surface + Soil + Storage + Drain(*)

Permeable Pavement =
Surface +Pavement + Soil + Storage + Drain(*)

Green Roof =
Surface + Soil + Drainage Mat



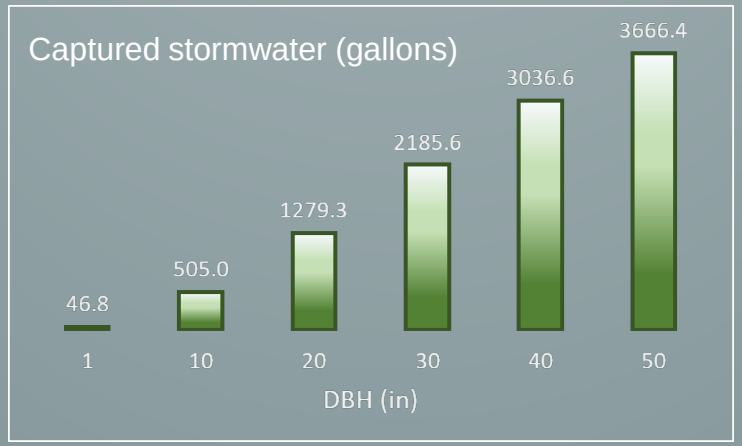
Trees?

Trees =
Canopy + Soil

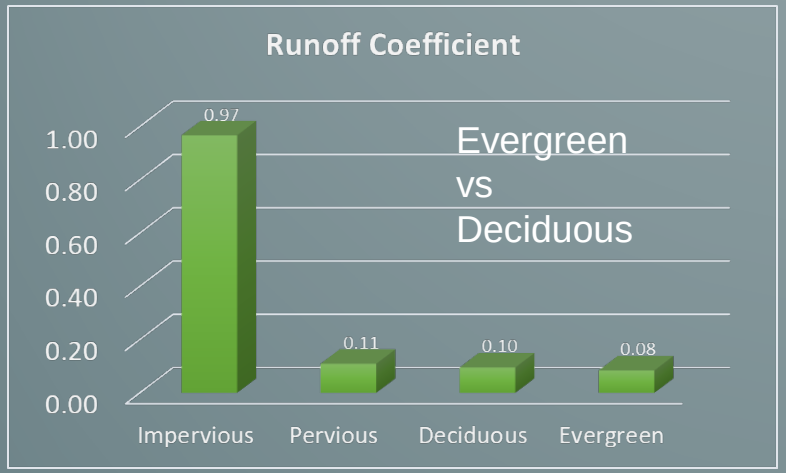
EPA SWMM + iTree

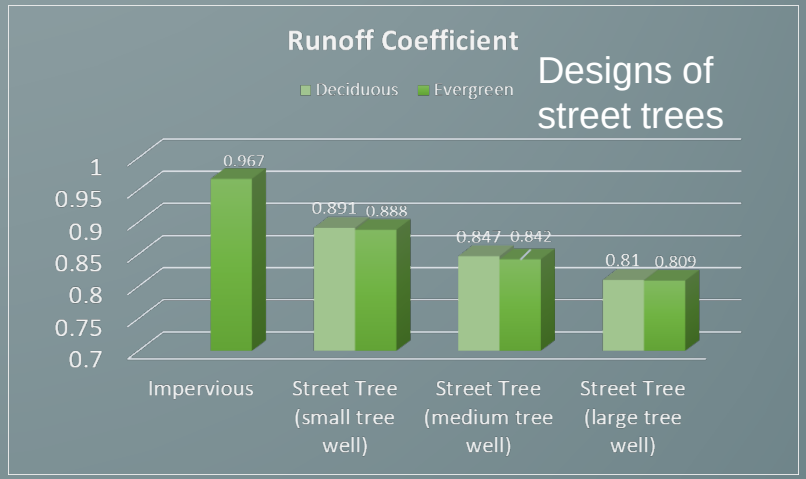
Varied Trees

DBH =1 inch
Canopy coverage 1%



DBH =50 inch
Canopy coverage 75%



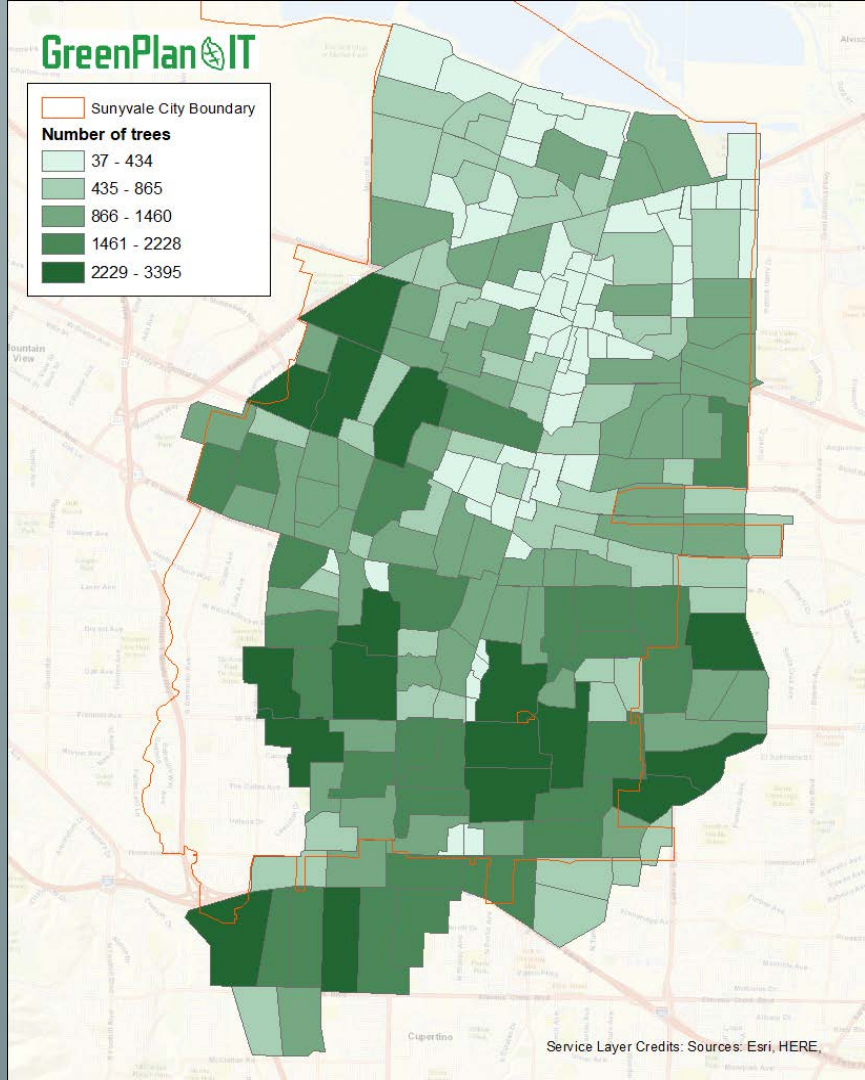


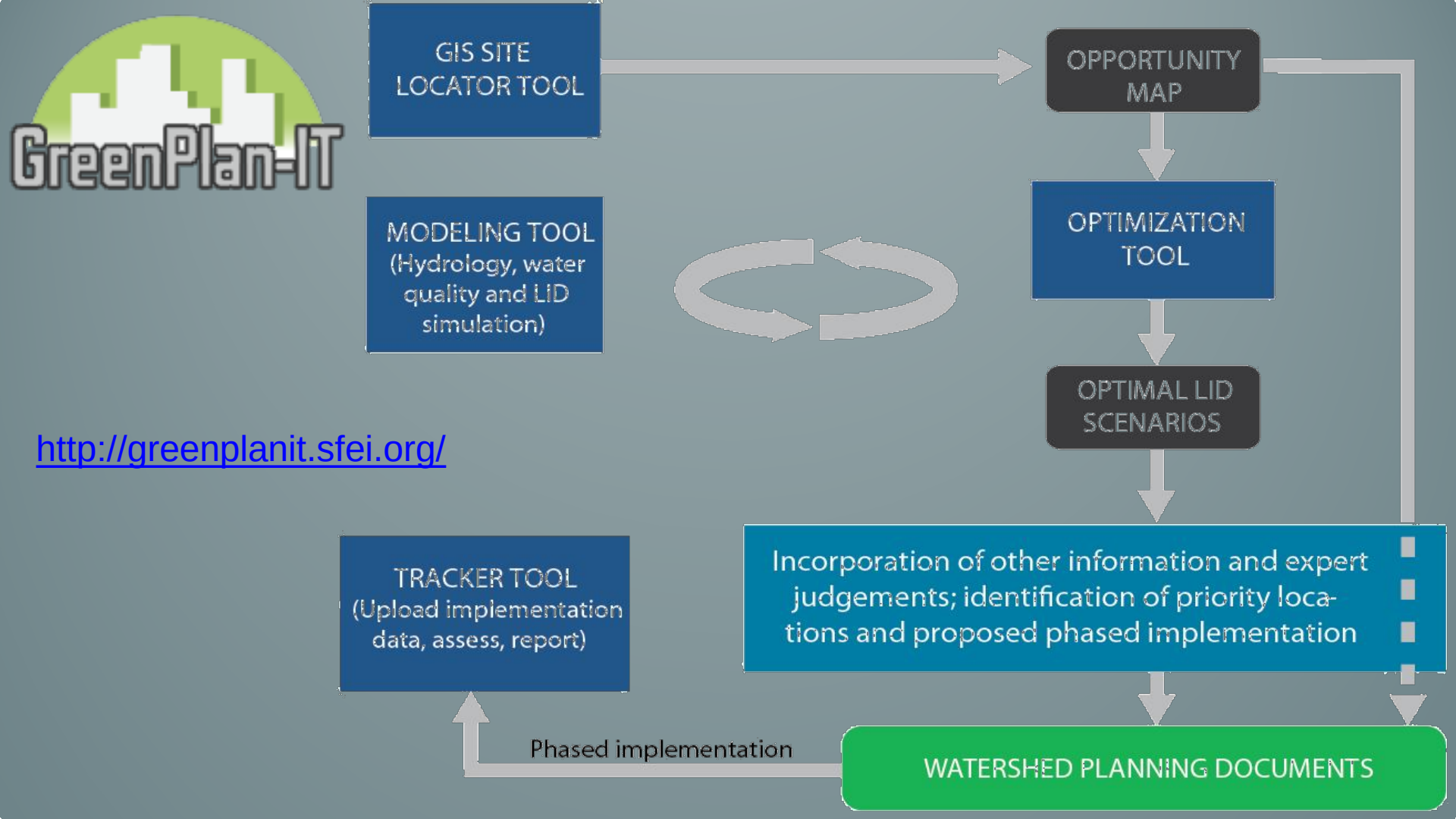
To a larger scale:

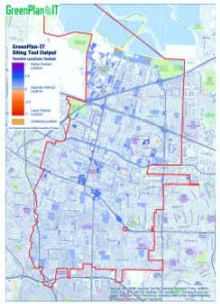
City of Sunnyvale (WY2002)

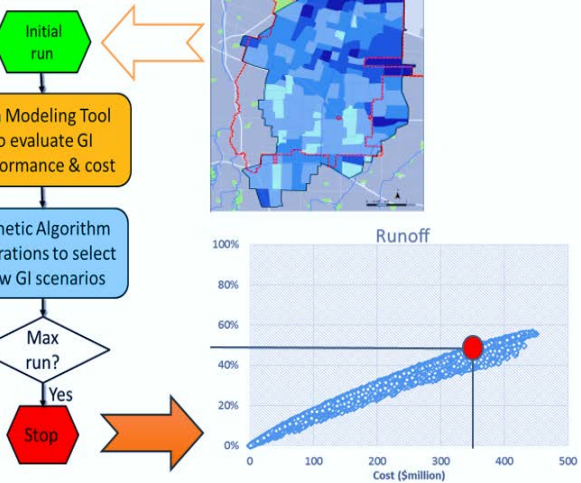
- Scale up (individual tree -> city):
  - Average size tree
  - Number of street tree/park tree per subwatershed

- Runoff reduction:
  - Reduced more than 18,000 gallons runoff per acre
  - ~10% of the total runoff




GreenPlan-IT
GIS SITE LOCATOR TOOL
OPPORTUNITY MAP
MODELING TOOL (Hydrology, water quality and LID simulation)
OPTIMIZATION TOOL
OPTIMAL LID SCENARIOS
http://greenplanit.sfei.org/
TRACKER TOOL (Upload implementation data, assess, report)
Incorporation of other information and expert judgements; identification of priority locations and proposed phased implementation
Phased implementation
WATERSHED PLANNING DOCUMENTS





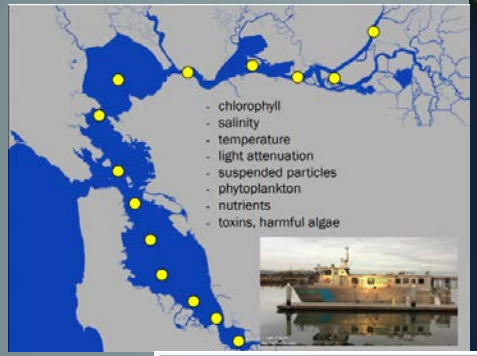
Urban Greening Efforts

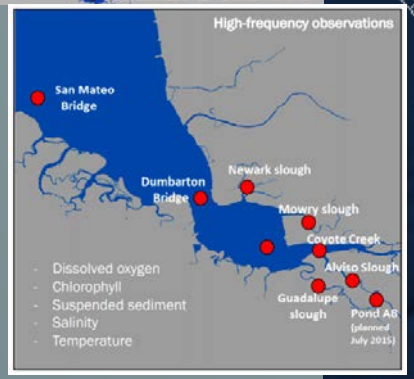
Stormwater management

…

Urban biodiversity

3. Future


- chlorophyll
- salinity
- temperature
- light attenuation
- suspended particles
- phytoplankton
- nutrients
- toxins, harmful algae

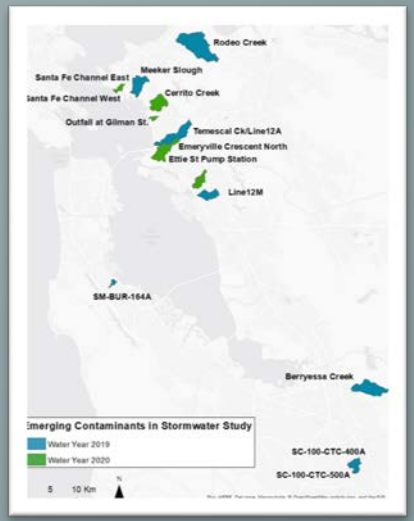

High-frequency observations
San Mateo Bridge
Dumbarton Bridge
Newark slough
Mowry slough
Coyote Creek
Alviso Slough
Guadalupe slough
Pond A8
(planned July 2015)
- Dissolved oxygen
- Chlorophyll
- Suspended sediment
- Salinity
- Temperature

POC Reconnaissance Monitoring

Rodeo Creek
Meeker Slough
Santa Fe Channel East
Santa Fe Channel West
Carrito Creek
Outfall at Gilman St.
Temescal Ck/Line12A
Emeryville Crescent North
Ettie St Pump Station
Line12M
SM-BUR-164A
Berryessa Creek
Emerging Contaminants in Stormwater Study
SC-100-CTC-500A

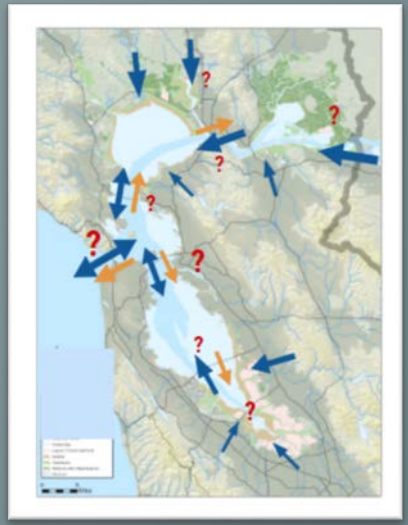
CECs

Stormwater Monitoring Program



Dynamic Models

Conceptual Models



Thank you!

Questions?