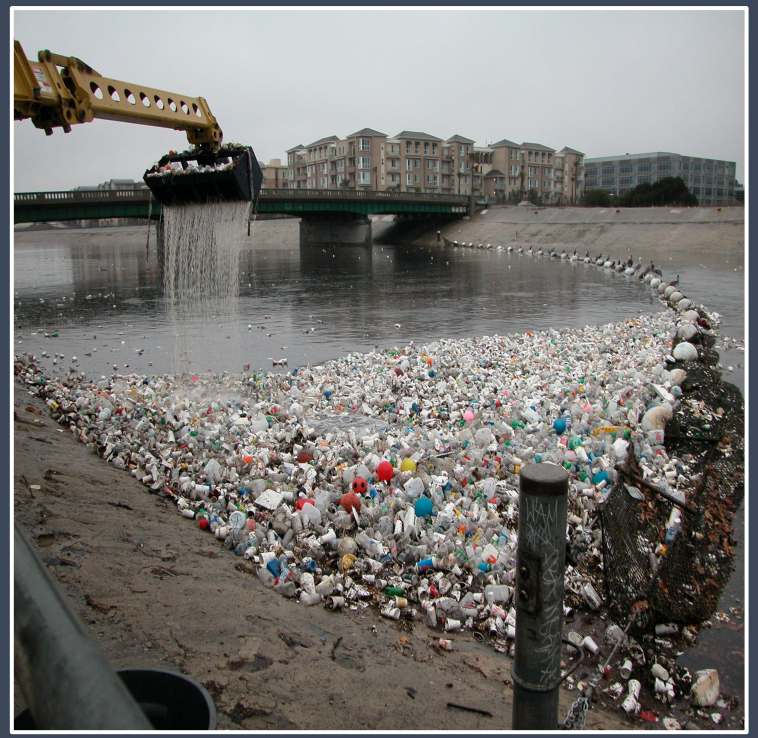
Taking Out the Trash

Stormwater Trash Capture, Control Measures, and Progress Assessment



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Presentation Outline

- Documented Increases in Trash Levels in California Surface Waters
- Trash Sources and Pathways
- TMDLs, State Trash Amendments, and Stormwater Permits
- Stormwater Trash Control Measure Implementation
  - Trash “Full” Capture Systems
  - True and Institutional Source Controls
- Measuring Trash Reduction (Compliance) Progress
  - Use of practical but rigorous monitoring/assessment tools

Definition of Trash (Litter)

All improperly discarded waste material….thrown or deposited on the lands and waters of the state…

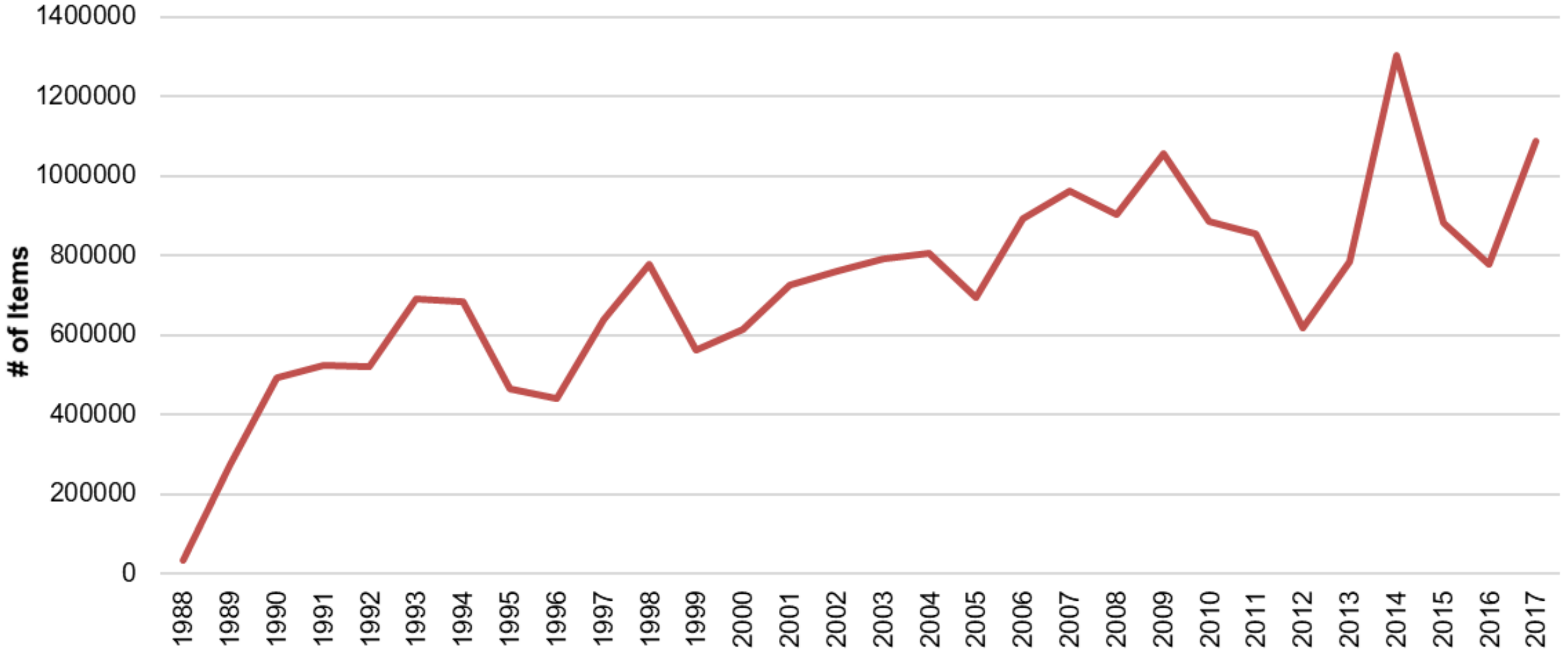
California Government Code Section 68055.1(g)

Documented Increases in Trash Levels in California Waterways

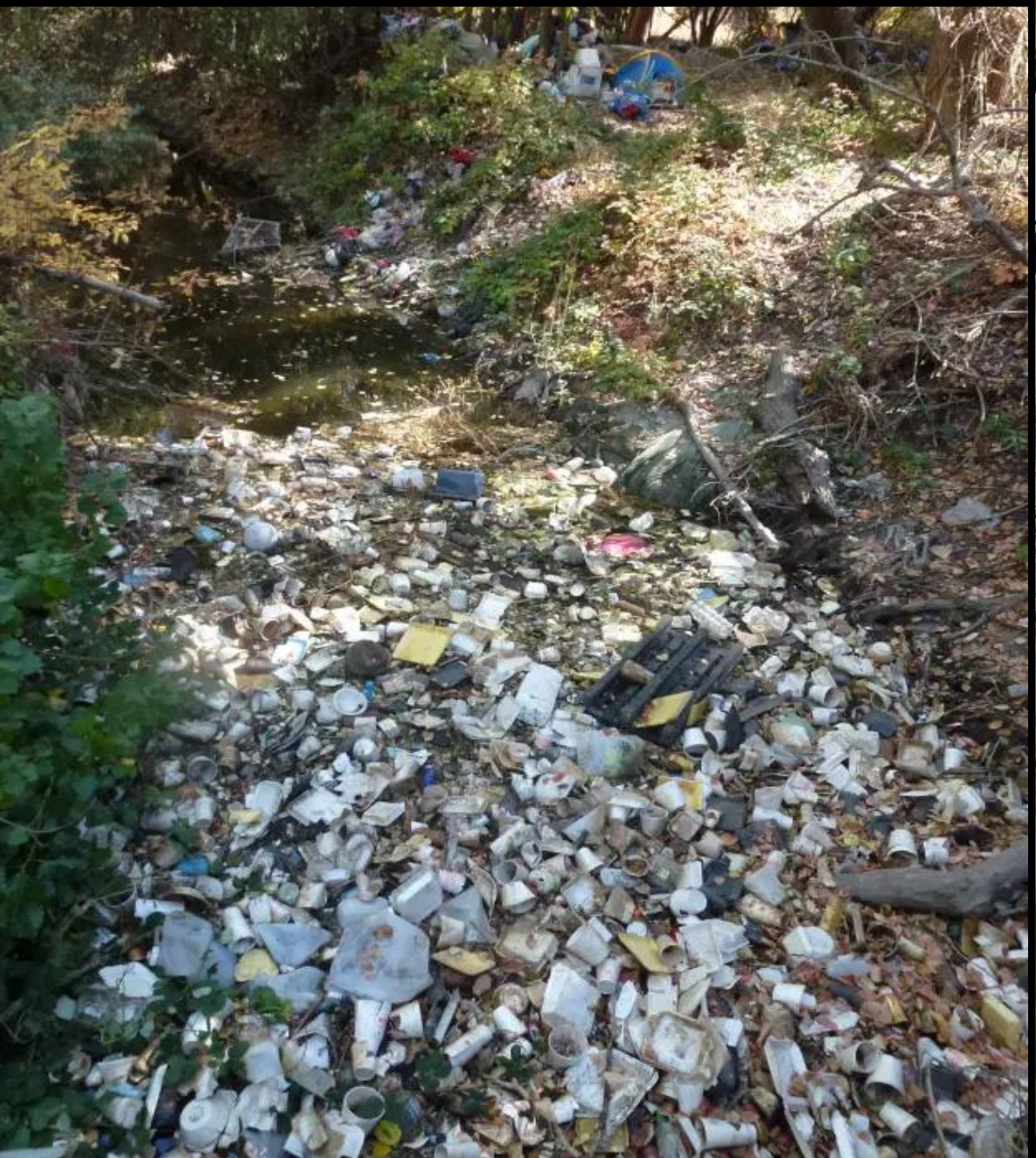
- Comprehensive Data Collection Efforts began in 1990's
  - Los Angeles & San Francisco Bay Regions
  - Alarmingly high levels observed in creeks, rivers and shorelines
- Impacts to Beneficial Uses
  - Wildlife
  - Recreational
  - Navigation

Ballona Creek, Culver City, CA after the first major rainfall of the wet weather season (*Courtesy of Citizen of the Planet/UIG via Getty Images)*

California Coastal Cleanup Day



Coyote Creek (San Jose)



Lower LA River (Los Angeles)

Trash Sources and Pathways to Surface Waters

Sources

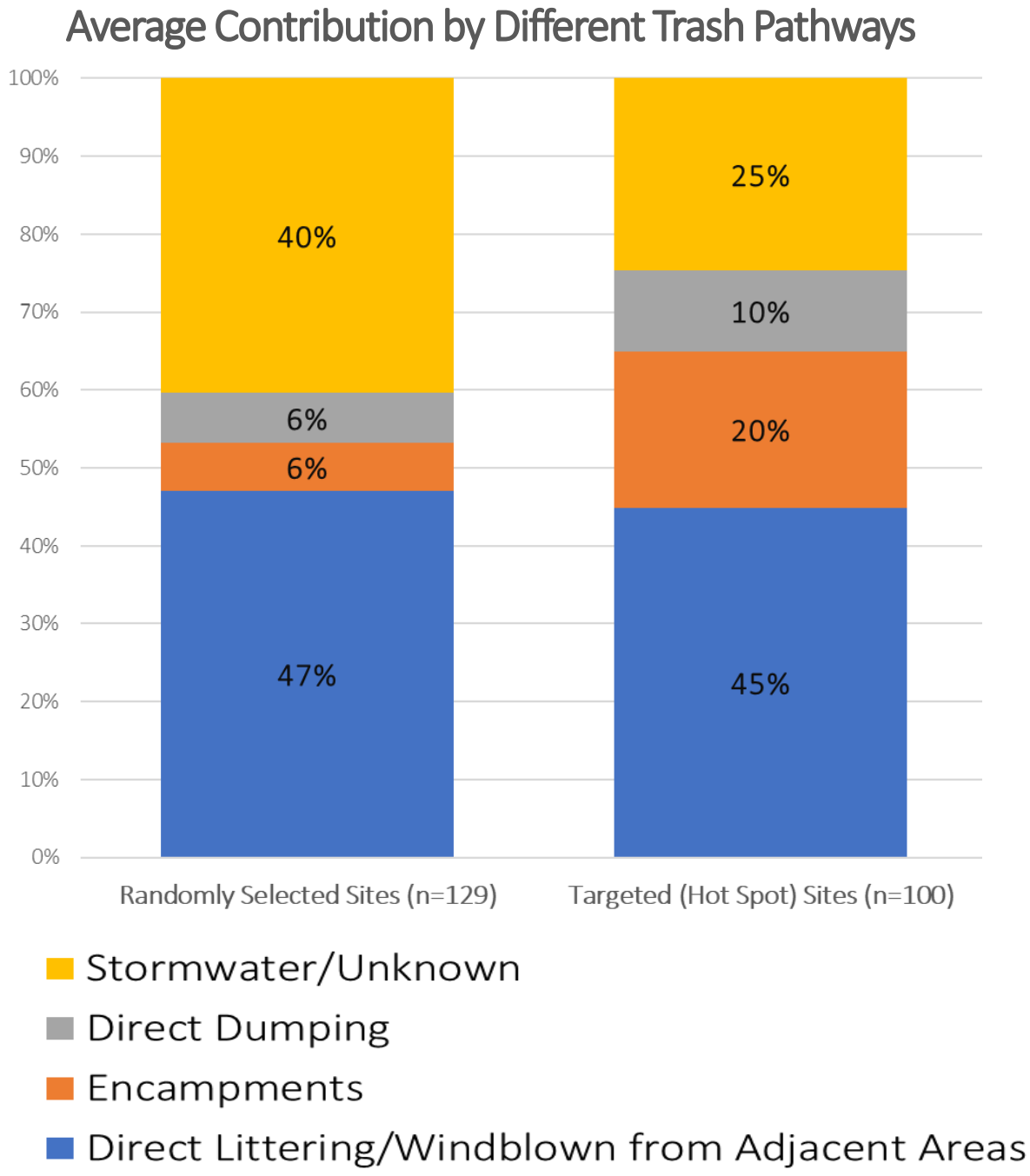
- Pedestrian Litter
- Vehicle/Roadway Litter
- Inadequate Waste Management
- Illegal Dumping & Direct Inputs

Pathways

- Stormwater Conveyance Systems
- Wind Transport
- Direct Inputs
  - Direct littering & Dumping
  - Encampments

Importance of Different Trash Pathways

- **SF Bay Area Study (BASMAA 2020)**
  - Focused on urban creeks/channels
  - 820 monitoring events @ 229 sites
- **Conclusions**
  - Difficult to identify specific pathways
  - All pathways potentially important contributors of trash to surface waters



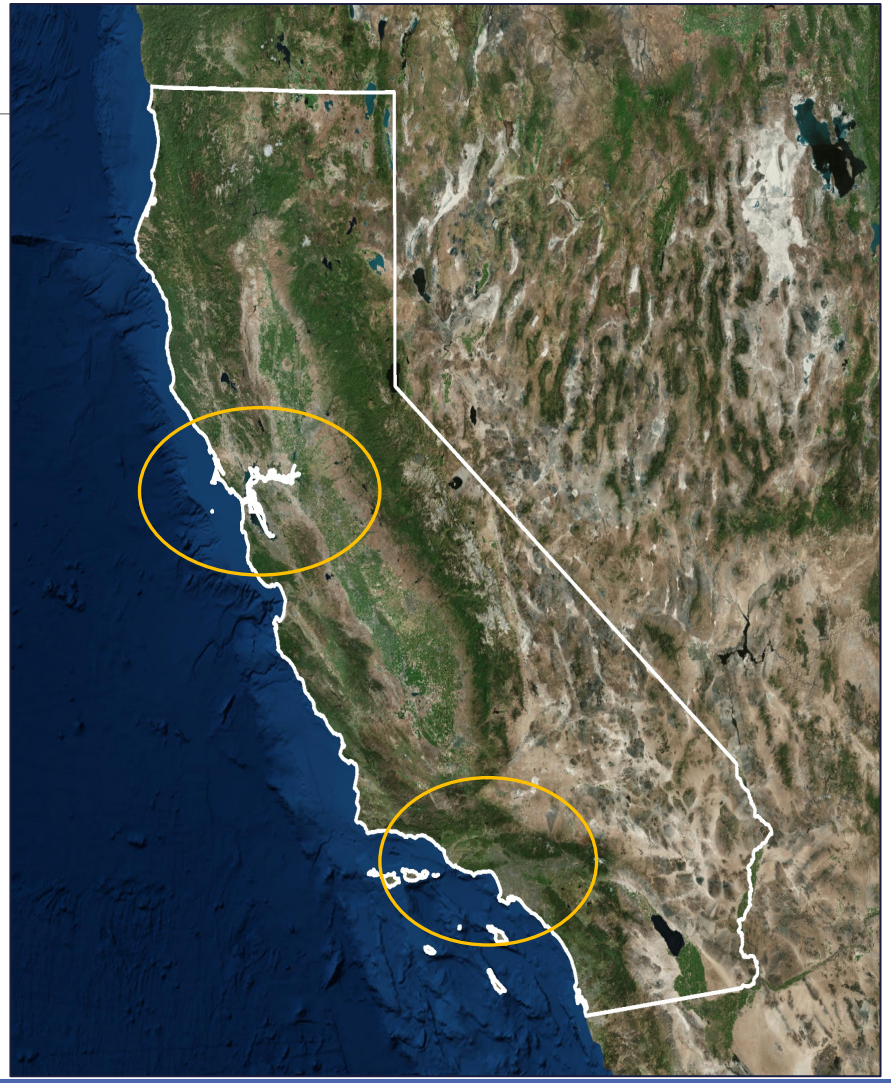
Stormwater Pathway

- Primary focus of regulatory efforts to date
- Topic of today's presentation

Regulatory Responses

Los Angeles & SF Bay Regions

- Numerous waterways placed on CWA 303(d) list for Trash
- 2002/2008 – Los Angeles Region - TMDLs
  - Zero trash in stormwater discharges
  - Trash Full Capture Systems
- 2009 – SF Bay Region – Stormwater Permits
  - 100% reduction in trash from stormwater
  - Trash Full Capture Systems or Equivalent

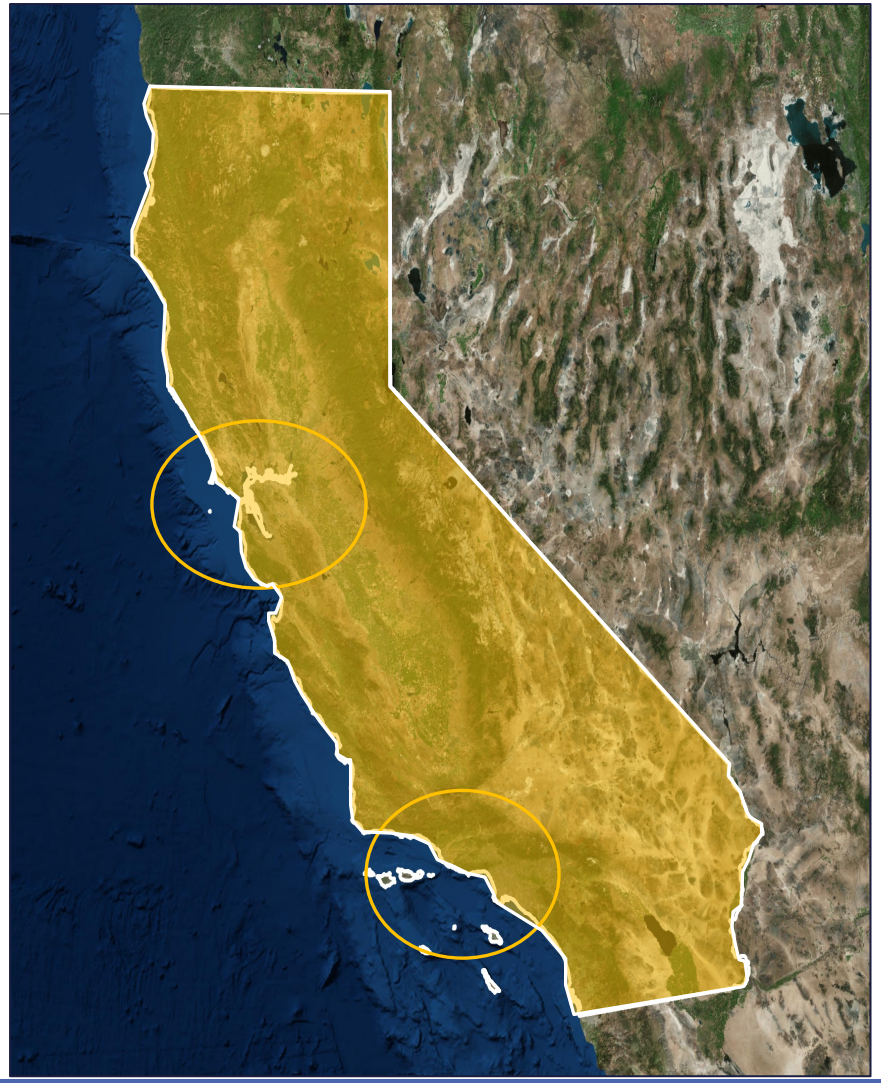


Regulatory Response

Statewide

2015 - Statewide Trash Policy

1. Narrative Water Quality Objectives for Trash
   - No trash in adverse amounts in waterways
2. Discharge Prohibition for ALL Trash Discharges
   - No trash in discharges to waterways
3. Implementation Expectations for Stormwater Pathway
   - Alternative to TMDLs
   - All stormwater dischargers to achieve discharge prohibition by 2030 (at latest)
   - **Two compliance pathways…**



Compliance Pathways for Stormwater

Track 1
Trash Full Capture System

A stormwater treatment control or series of treatment controls that **trap all particles** that are **5 mm or greater** and has a design treatment capacity that is not less than the **peak flow rate resulting from a one-year, one-hour storm** in the subdrainage area

Trash Full Capture Systems

Three General Types

1. Catch Basin Inserts (proprietary)
2. High-flow Capacity Devices (proprietary)
3. Multi-benefit Treatment Controls (non-proprietary)

Trash Full Capture Systems
Certification of Proprietary Devices

- State Water Resources Control Board Executive Officer
- Vendor submits application:
  - Physical Description
  - *Hydraulic Capacity & Sizing*
  - Design Drawings
  - *Design Life*
  - Installation Guidance
  - Operation and Maintenance Information
  - Vector Control Accessibility
  - Field/Lab Testing Information and Analysis
- Review by Vector and Mosquito Control
- If approved, posted on website

CALIFORNIA Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

https://www.waterboards.ca.gov/water_issues/programs/stormwater/trash_implementation.html

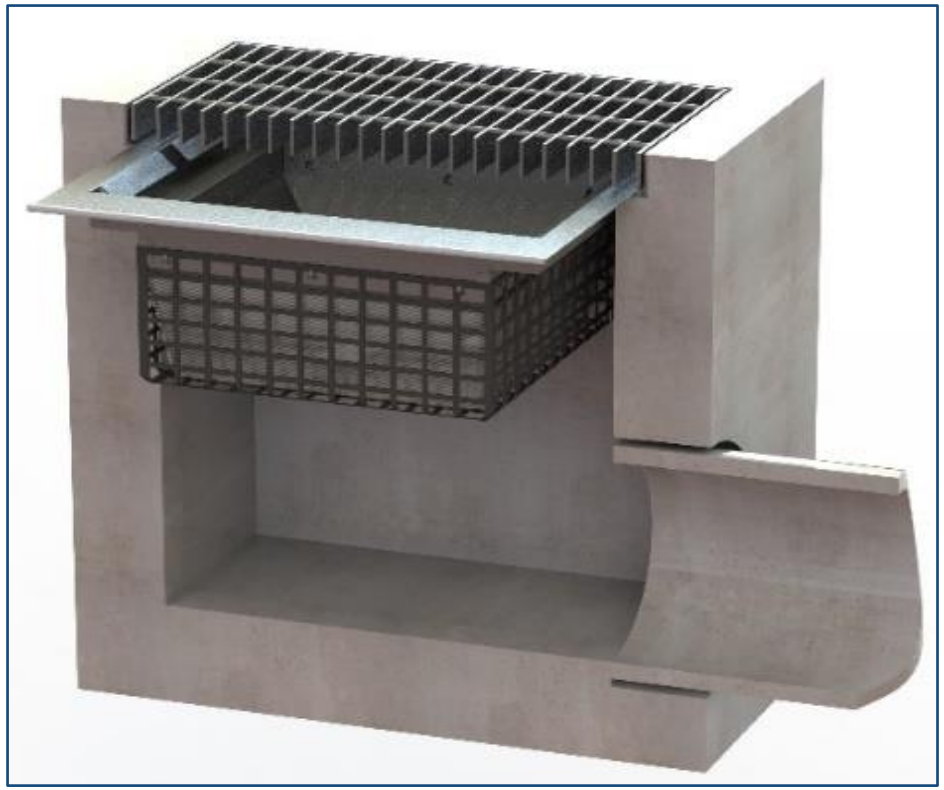
Catch Basin Inserts

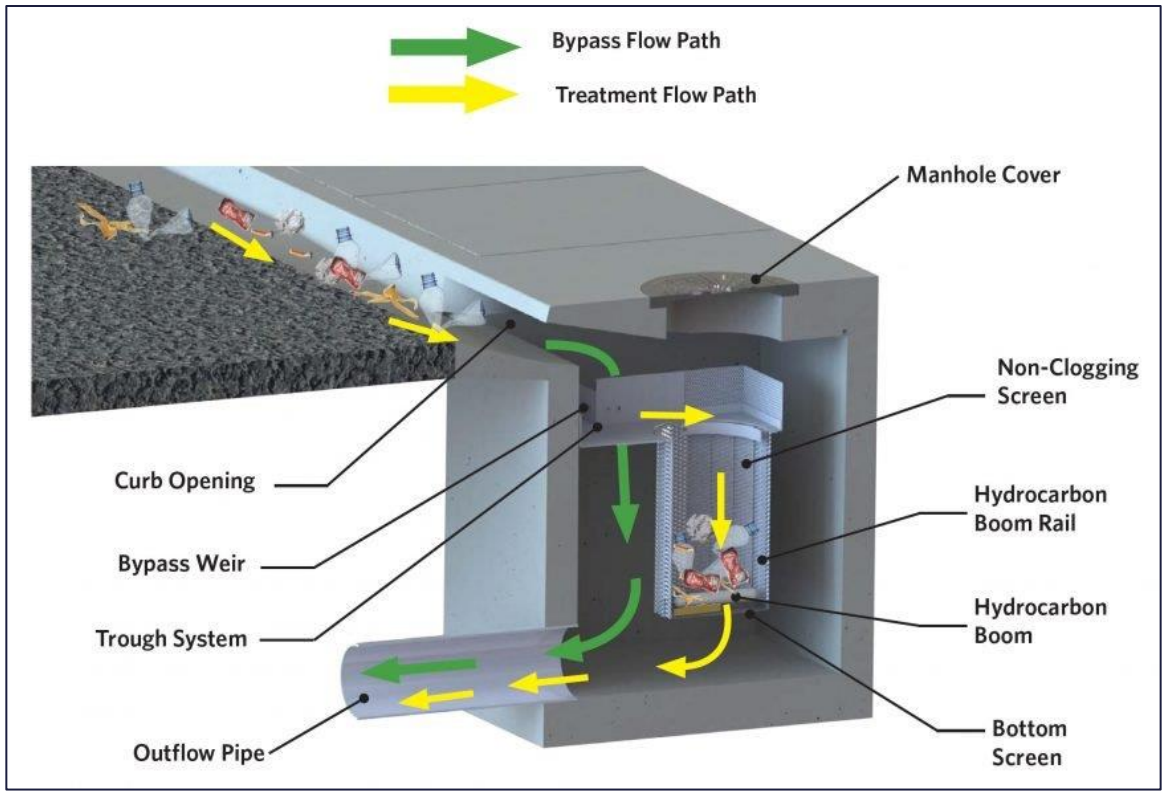
Outflow Screens

Photos courtesy of [illegible] Urban Runoff Pollution Prevention Program and United Stormwater, Inc.

Catch Basin Inserts

Surface Inlet Baskets & Screens

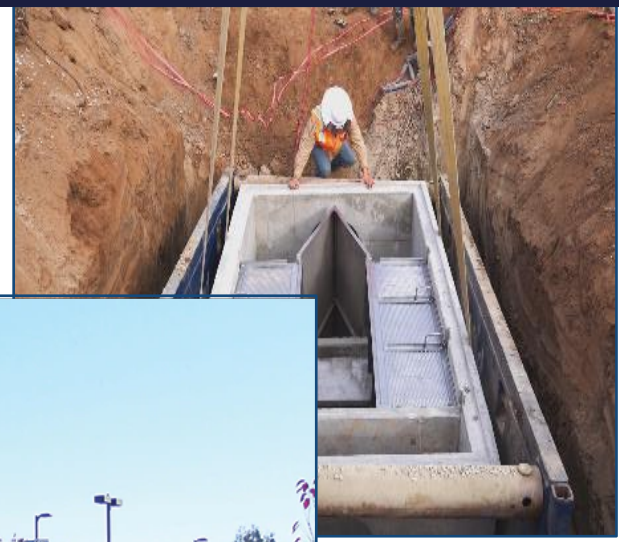




Images courtesy of Oldcastle Infrastructure and Bioclean Environmental

High-flow Capacity Devices

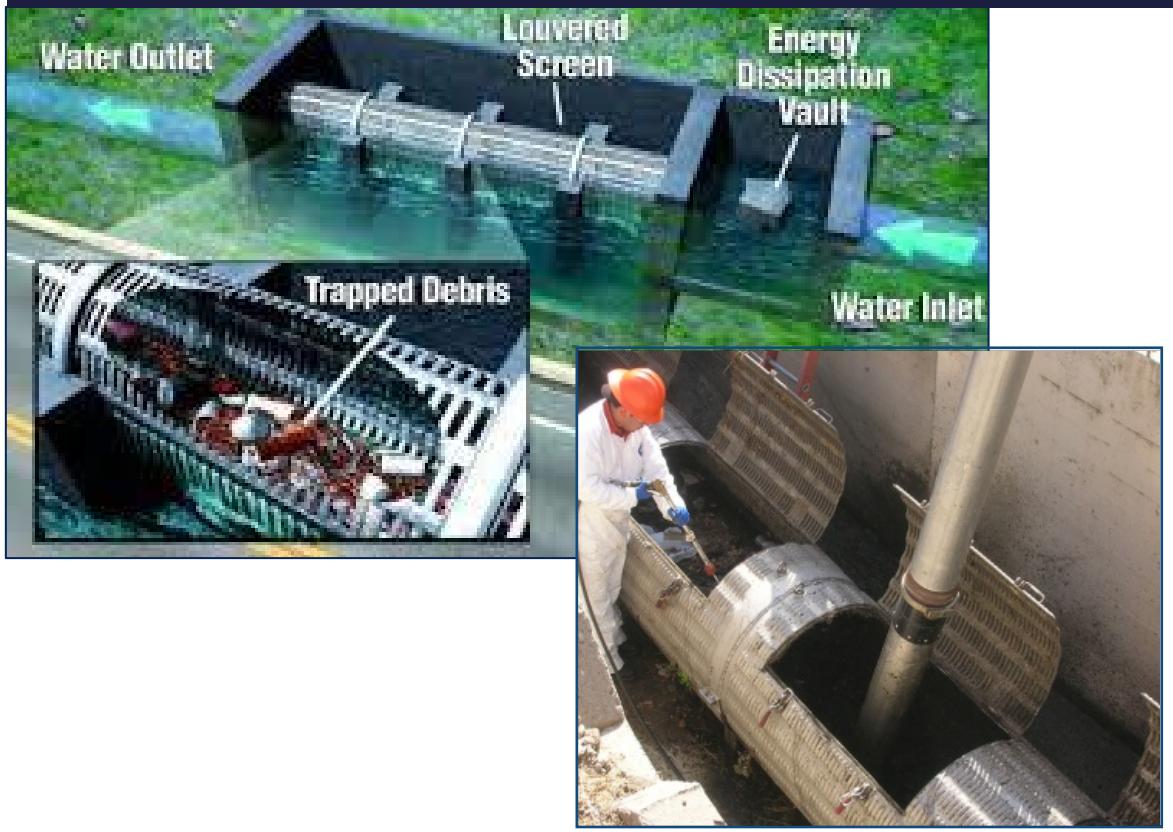
Hydrodynamic Separators



(Photos courtesy of City of Mountain View)

High-flow Capacity Devices

Gross Solids Removal Devices



Photos courtesy of Roscoe Moss and City of East Palo Alto, CA

High-flow Capacity Devices

Netting Devices

Photos courtesy of StormTrap, Inc. and City of Livermore, CA

Multi-benefit Treatment Controls

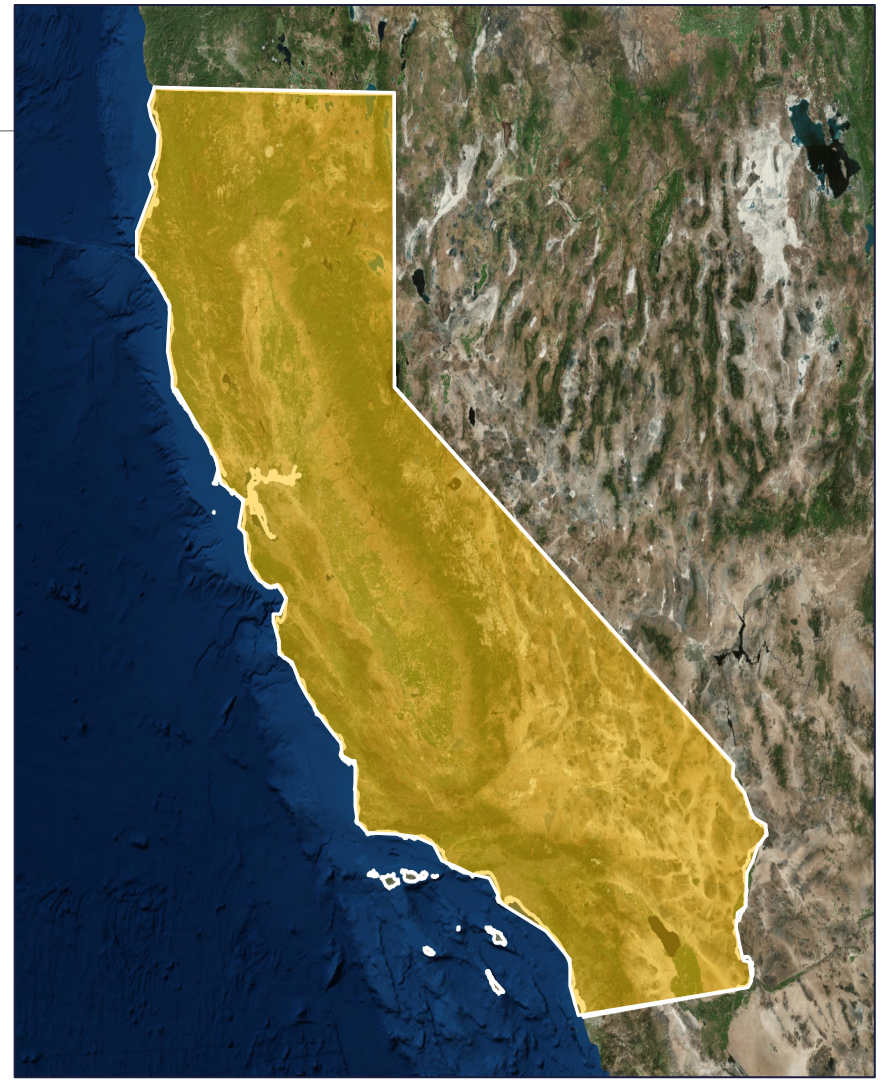
- Bioretention Systems
- Infiltration Trenches or Basins
- Detention Basins
- Media Filters
- Capture and Use Systems

Photo courtesy of EOA, Inc.

- In addition to meeting the “full capture design standard”, systems must include:
  - A screen at the system’s inlet, overflow, or bypass outlet; or
  - An up-gradient structure designed to bypass flows exceeding the design flow

Extent of Trash Full Capture Implementation in California

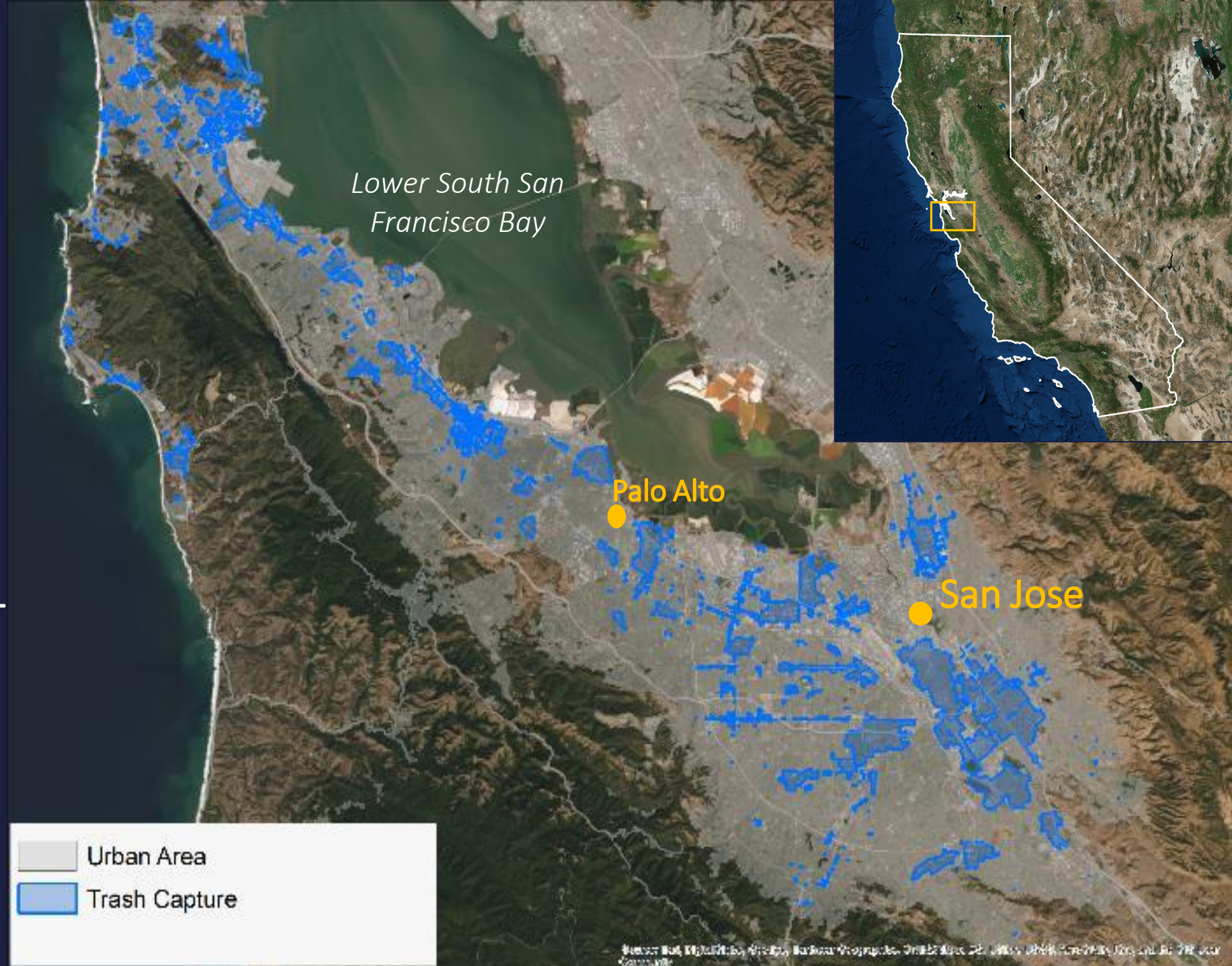
- **Catch Basin Inserts**
  - Over 75,000 installations to-date
- **High-flow Capacity Devices**
  - Over 1,000 to-date
- **Multi-benefit Treatment Systems**
  - Over 10,000 to-date
- **Implementation Tracking/Mapping**
  - Location
  - Type
  - Area addressed/treated



Example Trash Full Capture Implementation

SF Bay Area

- Santa Clara & San Mateo Counties
- 30,000+ acres treated to-date
- $40M+ in capital costs to-date



Cost Ranges & Maintenance Needs

Device Type	Capital Cost Ranges	Maintenance Needs
Catch Basin Inserts	$500 - $2,500 per device	Varies by device 1-6x/year
High-flow Capacity	$2,000 – $5,000 per acre	Varies by device At least 1x/year
Multi-benefit Treatment	Varies by system	Varies by system

Compliance Pathways for Stormwater

Track 1 **Trash Full Capture System**	**Track 2** **Trash Full Capture System** ***Equivalent***
A stormwater treatment control or series of treatment controls that **trap all particles** that are **5 mm or greater** and has a design treatment capacity that is not less than the **peak flow rate resulting from a one-year, one-hour storm** in the subdrainage area	• Demonstrate **equivalent level of reduction** in stormwater via **combination of control measures** • Establish "baseline" trash levels in stormwater, then **assess/monitor over time** to demonstrate **Full Capture System Equivalency (FCSE)**

Example Track 2 “True” & “Institutional” Source Controls

Retractable Curb-inlet Screens

True Source Controls

Cleanups/Prevention

Street Sweeping

Improved Container Management

Required Monitoring/Assessment

Demonstration of Full Capture System Equivalency (FCSE)

- Demonstration that equivalency to full capture has been achieved
- Multiple types of approaches/methods
- **SF Bay Area Approach** – **On-land Visual Trash Assessment (OVTA)** method
  - Walking/driving-based observations
  - Outcome-based
  - Reproducible, practical, and relatively cost-effective
  - Used to demonstrate progress towards mandated trash load reductions (e.g., 40%, 70%, 80%)

OVTA Protocols & Resources Available at: http://eoainc.com/ovta/

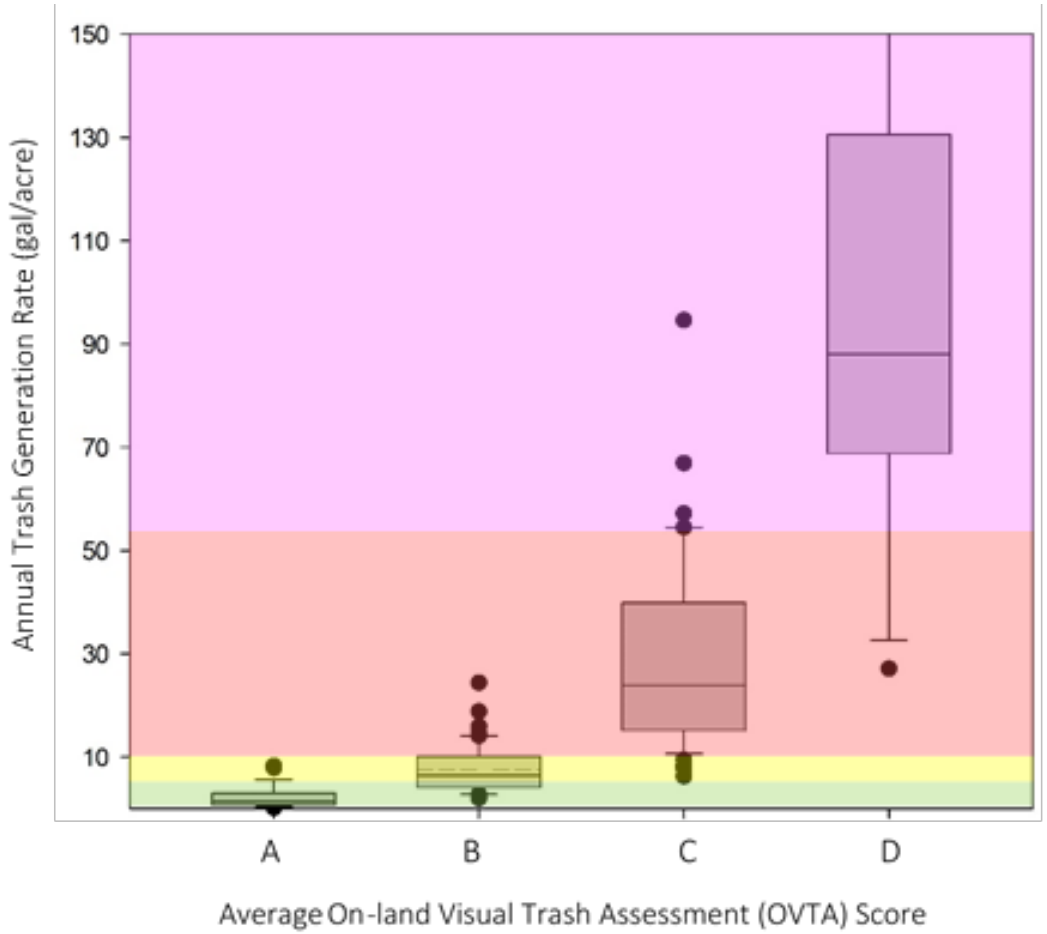

A - Low


B - Moderate


C - High


D – Very High

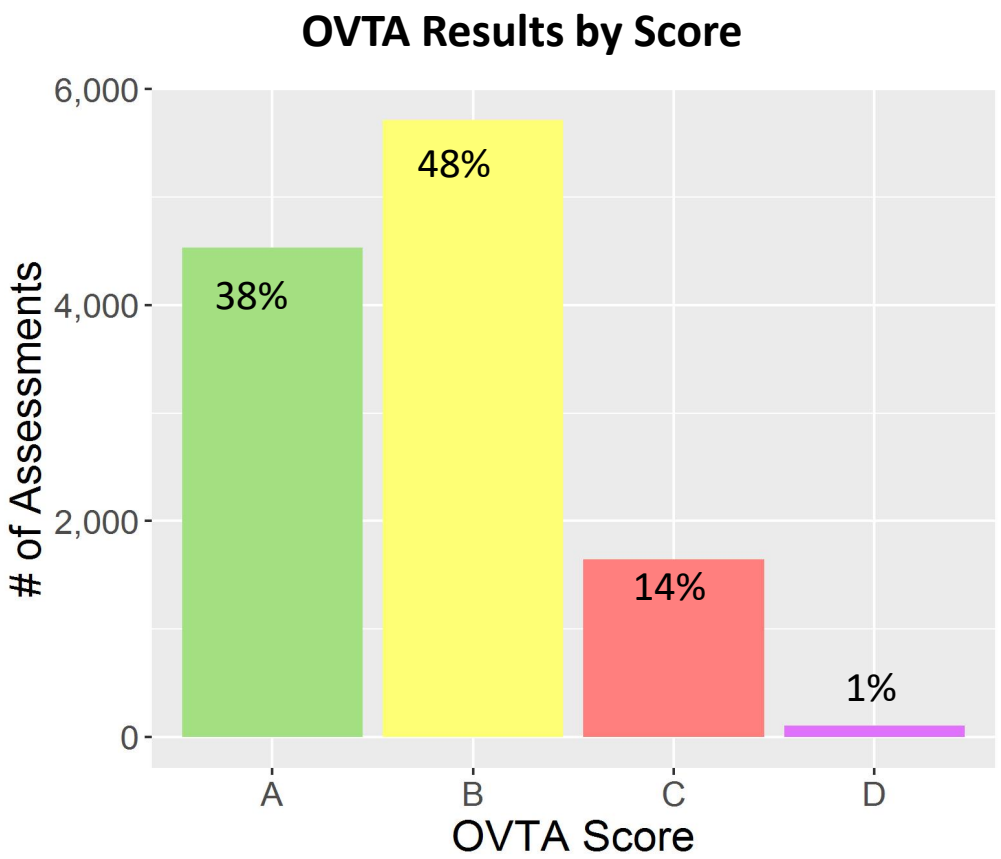
Relationship Between OVTA Scores and Trash in Stormwater



OVTA Score	OVTA Category	Stormwater Trash Generation Rates (gal/acre yr^{-1})
A	Low	< 5
B	Moderate	5-10
C	High	10-50
D	Very High	> 50

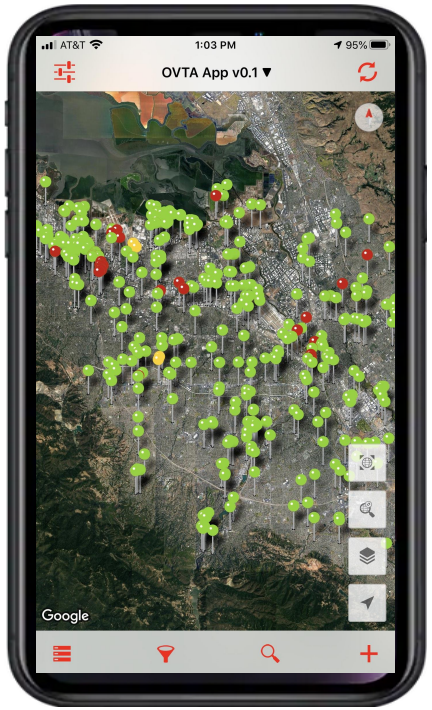
SF Bay Area OVTA Experimental Design & Goal

- **Spatial Representativeness**
  - Minimum of 10% of street miles associated with control measures (other than full capture systems) have to be assessed
- **Temporal Representativeness**
  - Assessments conducted 3x/year
  - 2-year rolling average used to report reductions
- **Full Capture System Equivalency**
  - Low Trash Generation; Consistent OVTA "A" Scores



Evolution of OVTA Protocols

1. **Move from paper field forms to tablet/phone-based data collection**
   - Increased data collection/entry efficiencies
   - Improved QA/QC
   - Potential expansion of data collection
2. **Web-based data management/visualization portals**
   - Querying & downloading of OVTA data via web
   - Enhanced management response by municipalities
   - Increased stakeholder involvement/education
   - Realtime calculation of progress



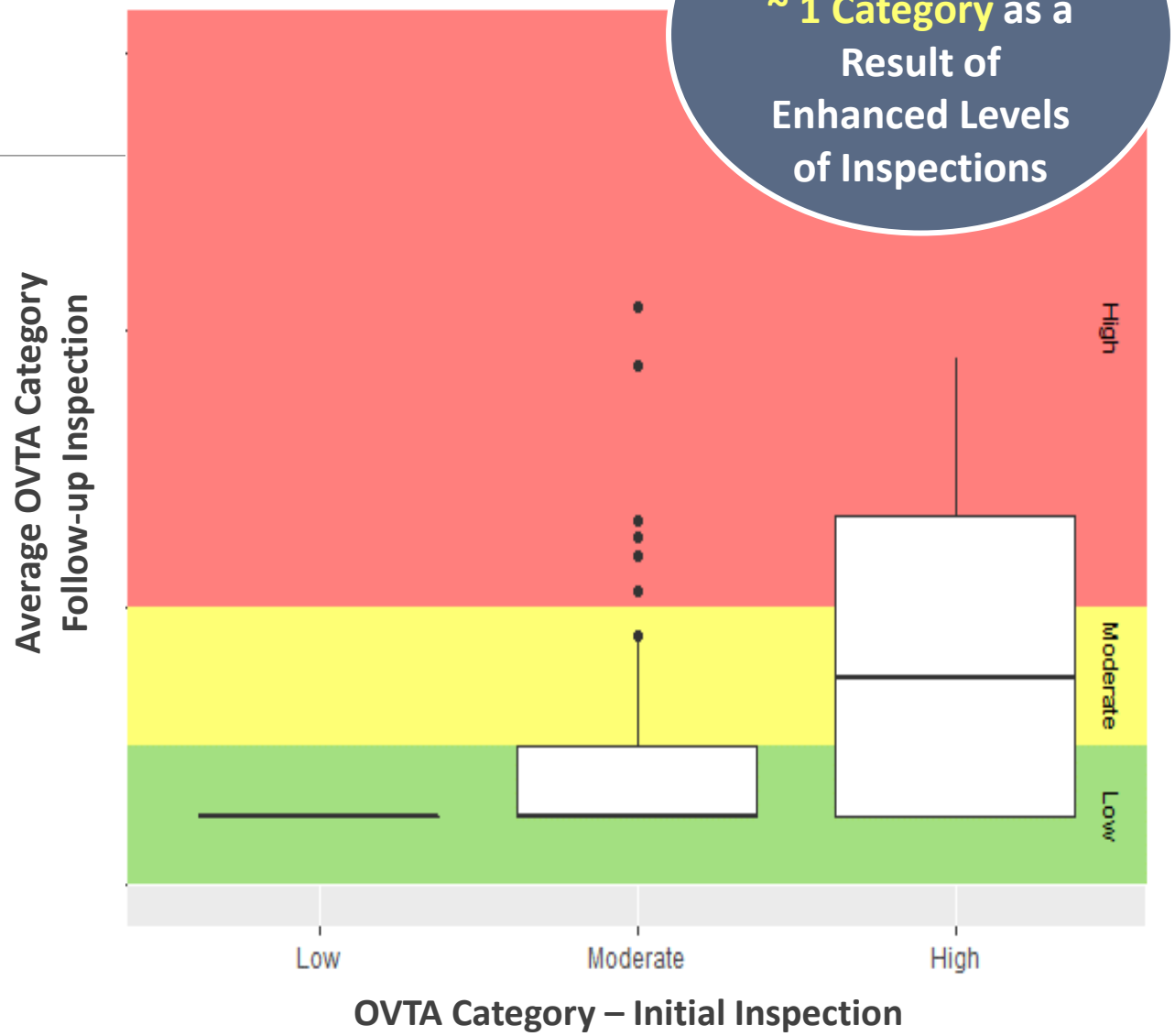
Evolution of OVTA Protocols

3. **Standardized Training Platform & QA/QC standards**
   - Improve quality of (and confidence in) OVTA data
   - Improve comparability of data at broader geographical scales
   - Potential expansion in the number of trained data collectors
4. **Use of Artificial Intelligence (AI) to Complement Human-led Data Collection**

Example: OVTAs Indicate Improvements via Institutional Source Controls

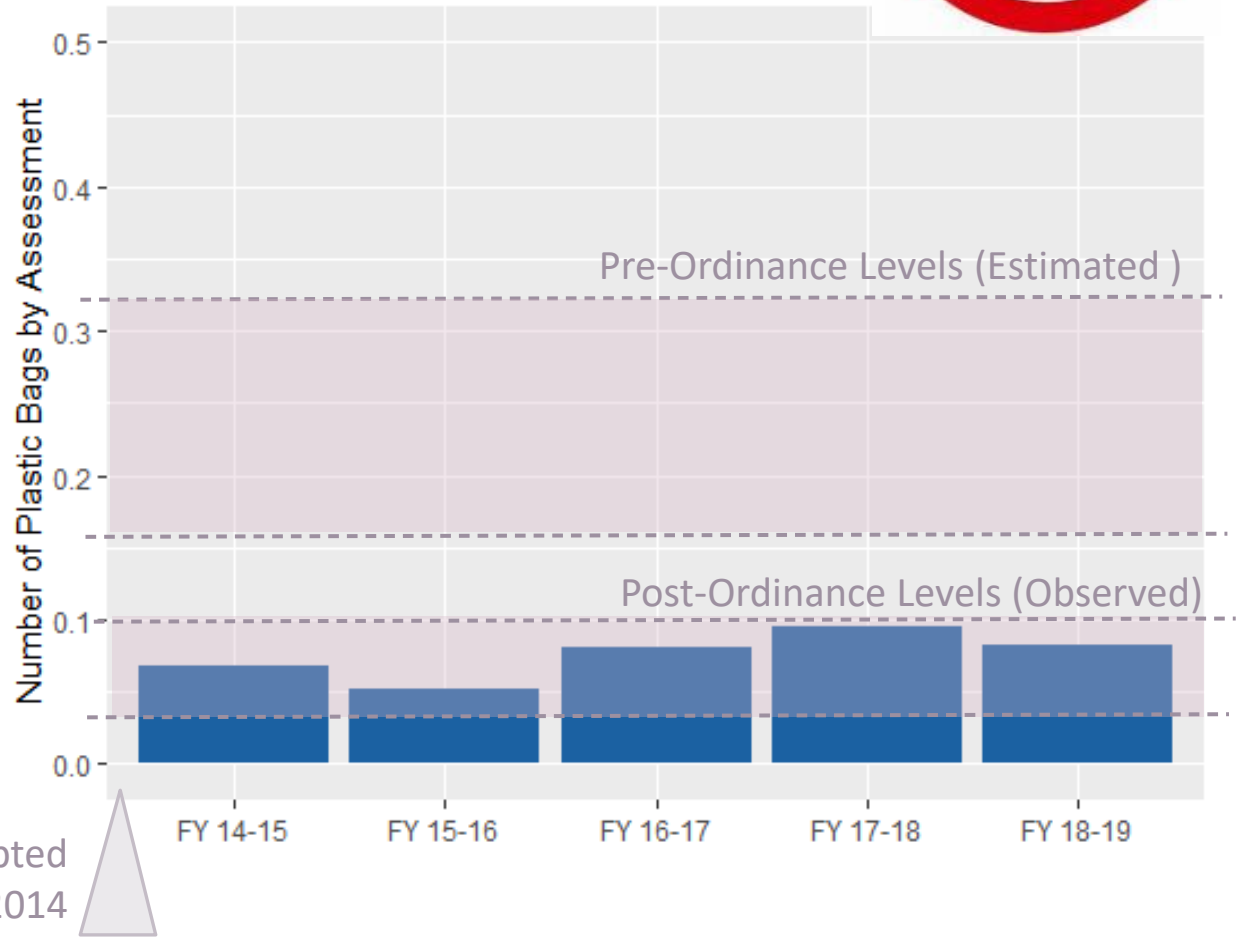
- **Enhanced frequencies of business inspections**
- Inspectors focused on trash issues required businesses to reduce trash on-site and areas adjacent to business (e.g., sidewalks)
- Reinspection/enforcement if initial OVTA score worse than "A"
- Observed significant trash reductions (i.e., improvement of 1 OVTA category) as a result of the enhanced program

OVTA Scores Improved by ~ 1 Category as a Result of Enhanced Levels of Inspections



Example: OVTAs Indicate Improvements via True Source Controls

- **Single-Use Plastic Grocery Bag Ordinances**
- # of single-use bags observed during OVTAs post-adoption of local ordinances
  - # of bags decreased substantially (~50-75%) since ordinance adoption
  - #s have stayed consistently low
- Additional (broader) ordinances adopted/planned



Data from SF Bay Area sites with 4+ years of OVTAs (n=395)

Summary

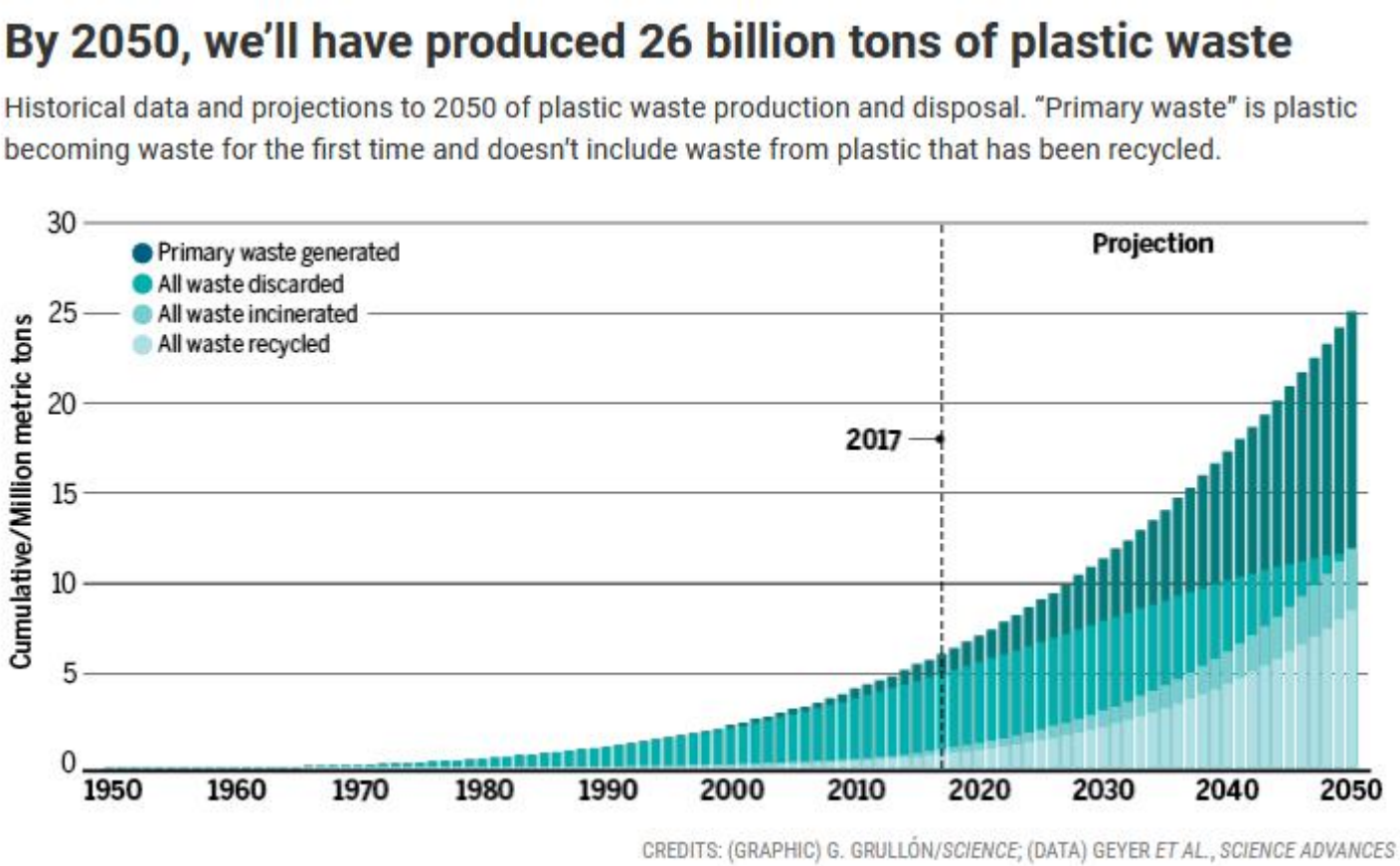
- Data beginning in 1990s/2000s - trash levels in surface waters at high levels
- California regulatory response initially focuses on controlling stormwater pathway
  - Other pathways likely (equally?) as important
- Stormwater Permit Compliance = Full Capture Systems or Equivalency
  - Significant progress to-date (innovative controls/technologies)
  - Science-based, field-tested monitoring/assessment tools available
- Ongoing (and increasing) need to reduce generation of single-use plastic food-related items (litter-prone)

Single Use Plastics are the Dominate Type of Trash in Surface Waters

Top ten most frequent trash items removed from U.S. surface waters during annual International Coastal Cleanup day

(Ocean Conservancy, 2013)

Global and U.S. Plastic Waste Continues to Grow



Thanks!!

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