Regional Pathogen Reduction Study

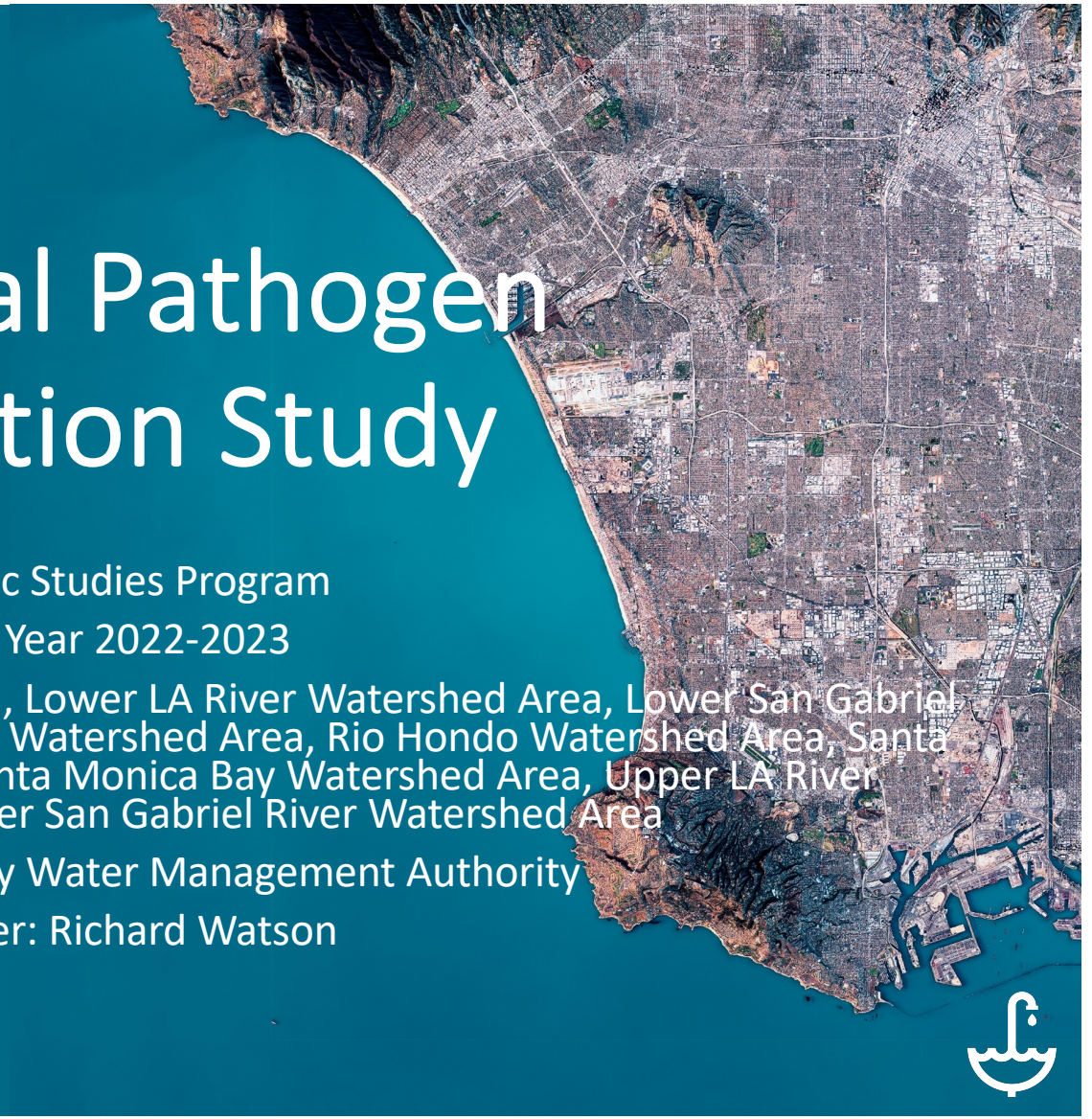
Scientific Studies Program

Fiscal Year 2022-2023

Central Santa Monica Bay Watershed Area, Lower LA River Watershed Area, Lower San Gabriel Watershed Area, North Santa Monica Bay Watershed Area, Rio Hondo Watershed Area, Santa Clara River Watershed Area, South Santa Monica Bay Watershed Area, Upper LA River Watershed Area, and Upper San Gabriel River Watershed Area

Project Lead: Gateway Water Management Authority

Presenter: Richard Watson

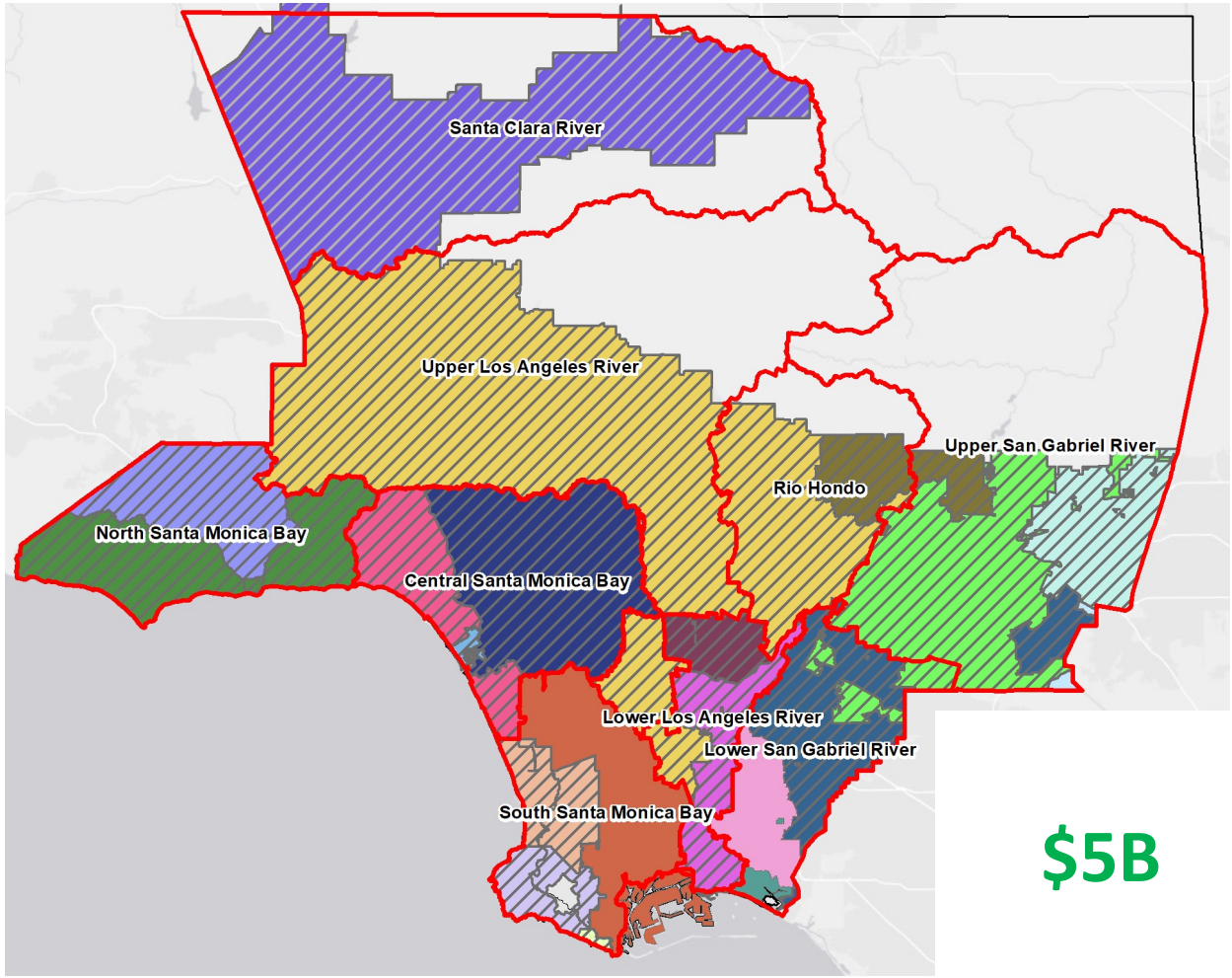


Study Overview

- This Study aims to use the latest available science to measure water-borne pathogens across watersheds. It will help identify key sources of human health risk, and develop cost-effective protective strategies

- Nexus to Stormwater and Urban Runoff Capture and Pollution Reduction
  - Study will facilitate improved targeting of pathogen sources and water to capture and/or treat
  - Study may reduce the level of stormwater capture for bacteria compliance purposes through the identification of non-MS4 sources of risk thereby improving the protection of human health
  - Study will likely lead to partnering with various parties, such as wastewater agencies and homeless services agencies, to address human sources of pathogens.

Study Location



$5B

Study Details

Problem Statement:

- Waterborne pathogens represent the most significant potential threat to the health of people recreating in and around the ocean and inland waters of Los Angeles County.

- Current standards are based on FIB (fecal indicator bacteria), which are used as proxies for pathogens.
  - FIB are ubiquitous; a vast network of structural control measures would need to be implemented to provide adequate control – projected cost over $5 billion.
  - USEPA and academia agree that human sources of pathogens pose the greatest risk
  - Unless high-risk sources are targeted, water capture projects may receive large FIB loads, but miss the highest risk human sources.

(Continued)

Scientific Study Details (Continued)

Methodology:

- Study work plan will be developed through a stakeholder-led process with the input of technical experts, including academics.
  - Stakeholder engagement is at the forefront of the study to ensure that diverse viewpoints are incorporated.

- Study will collect samples from beaches and waterbodies. Samples will be analyzed for traditional bacterial indicators, viruses, and human markers during wet and dry weather.
  - Identify areas with highest risk to support a focus on those areas
  - Identify the sources causing the highest risk to focus on those sources

- Study will assess control measure effectiveness and efficiency
  - Identify the best BMPs to address the sources
  - Support planning, applying municipal funds, requests for SCWP funding, and actions by other parties

(Continued)

Scientific Study Details (Continued)

- *Regional collaboration efforts:*
  - Small Group Initiated Discussions and built a scope for a Safe, Clean Water Regional Program project
  - Presented Approach to E/WMP Groups
  - Discussed with proponents of watershed-specific studies
  - Discussed with Regional Board staff

- Revised study twice to address concerns
  - Clearly focused on human pathogens
  - Clarified that study is a component of overall strategy to protect human health
  - Clarified that implementation continues during the study
  - Recognized that we do not need to wait until the end of the study to take action
  - Reduced first year cost of study

Recent Revisions to Regional Pathogen Summary

- Added North Santa Monica Bay back into study
- Added an illustrative overview in Attachments (for Section 2.3)
- Added a Details Attachment (for Section 2.4)
- Attachments include a fact sheet, a table of potential constituents, and a map of potential monitoring sites
- Clarified that focus is on urbanized areas
- Clarified that monitoring sites would be chosen from MS4 monitoring sites.

Cost & Schedule

Phase	Description	Cost	Schedule
Task 1	Stakeholder Process	$490,000	7/22 – 6/27
Task 2	Health Risk Assessment	$5,880,000	7/22 – 9/26
Task 3	Risk Management	$1,734,600	4/23 – 3/27
Task 4	Application of Study Findings	$490,000	1/26 – 6/27
TOTAL		**$8,594,600**	

Funding Request

WASC	Year 1	Year 2	Year 3	Year 4	Year 5
CSMB	$47,109.15	$329,764.06	$282,654.91	$307,364.38	$107,432.50
LLAR	$33,843.21	$236,902.50	$203,059.29	$220,810.57	$77,179.51
LSGR	$44,169,54	$309,186.78	$265,017.24	$288,184.85	$100,728.71
NSMB	$4,748.60	$33,240.22	$28,491.61	$30,982.33	10,829.20
RH	$30,413.67	$212,895.68	$182,482.01	$198,434.45	$69,358.42
SCR	$15,866.36	$111,064.53	$95,198.17	$103,520.32	$36,183.27
SSMB	$48,654.33	$340,580.32	$291,925.99	$317,445.93	$110,956.29
ULAR	$102,094.95	$714,664.67	$612,569.72	$666,120.09	$232,827.71
USGR	$49,973.39	$349,813.71	$299,840.33	$326,052.14	$113,964.40
TOTAL	**$376,873.21**	**$2,638,112.47**	**$2,261,239.26**	**$2,458,915.06**	**$859,460.00**

Summary of Benefits

- By developing a better understanding of pathogens present in the region's watersheds, the relative risk to human health they pose, and the effectiveness of various control measures, new or adapted BMPs can be established that improve water quality and reduce human health risks at our beaches and inland waterbodies.
- Short-term: results could be used to protect people from health risks that aren't currently known.
- Long-term: results will enable the targeted placement of BMPs in locations where they can maximize the prevention or treatment of key sources of human pathogens.


Questions?

Community-Centered Optimization of Nature-Based BMPs Starting with the Gaffey Nature Center Facility

Scientific Studies Program

Fiscal Year 2022-2023

All Watersheds

SEITec

Shahriar Eftekharzadeh, PhD, PE

Study Overview

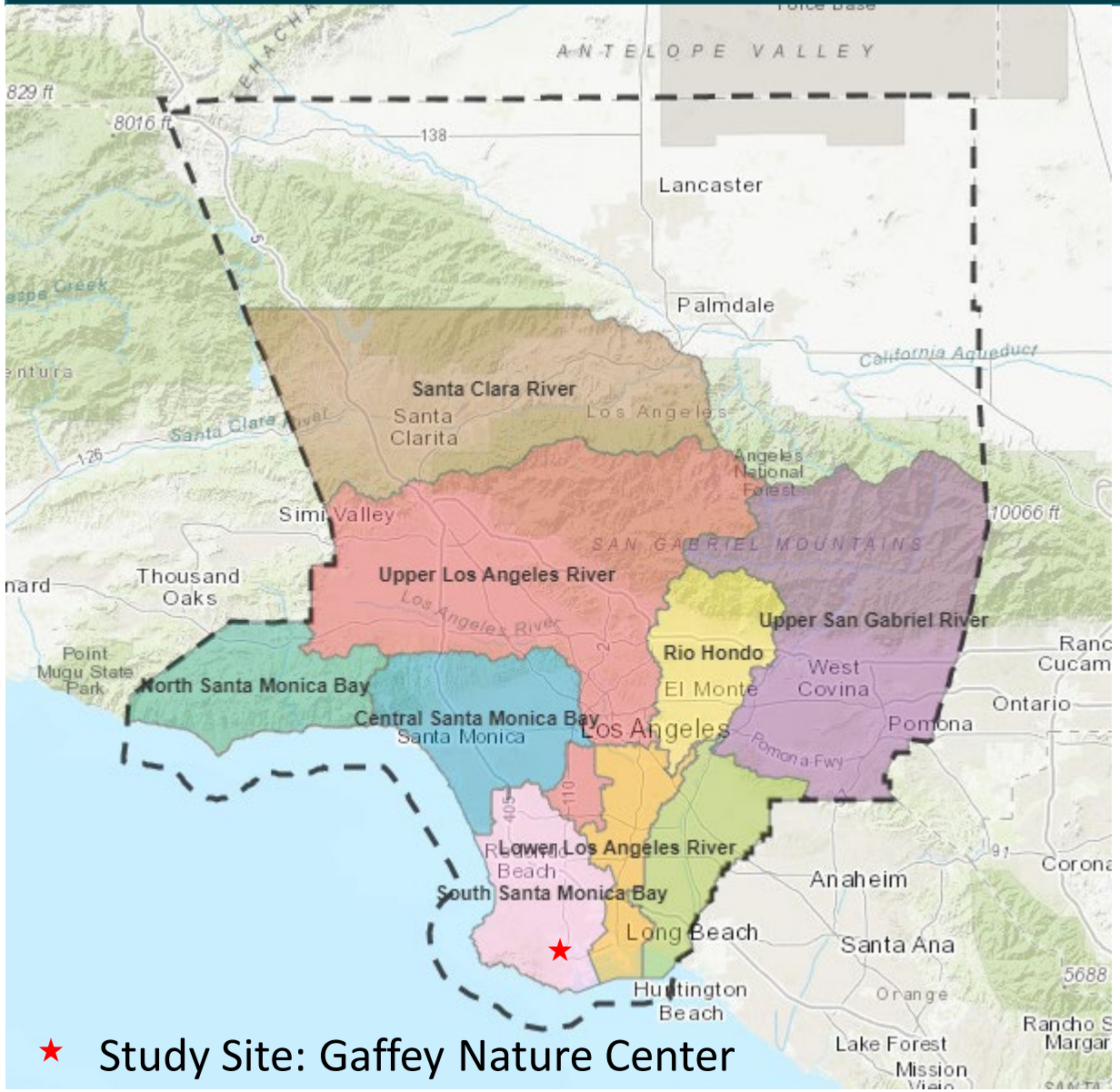
Biofiltration BMP Optimization

This study aims to optimize:

1. plant varieties and species, and
2. the design, construction, and O&M of

nature-based biofiltration BMPs, with special focus on the community.

Study Location



Study Location: The "Gaffey Nature Center" in San Pedro, a purposely built facility to study nature-based stormwater BMPs.

Study Benefits: This study will benefit the implementation of nature-based stormwater BMPs in ALL watersheds.

Study Location – The Gaffey Nature Center

- 3.1-acre site at N. Gaffey St. and 110-FWY in San Pedro, CA
- Land leased to LASAN for BMP education and research
- Construction work completed in September 2021

The Gaffey Nature Center

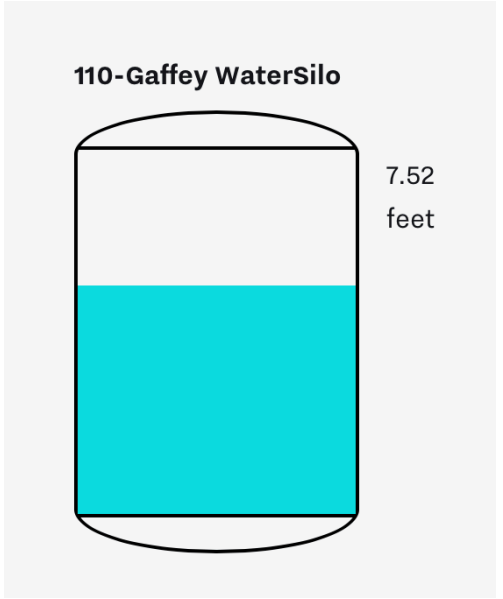
Site incorporates

- City's first vertical cistern, now in several SCW projects
- Central hydroponic bioswale on laser-leveled basins
- Diverse variety of CA-native plants for nature-based BMPs

The Gaffey Nature Center

Site incorporates

- Solar powered pumps and recirculation system
- Internet connectivity
- Infrastructure for instrumentation and remote sensing



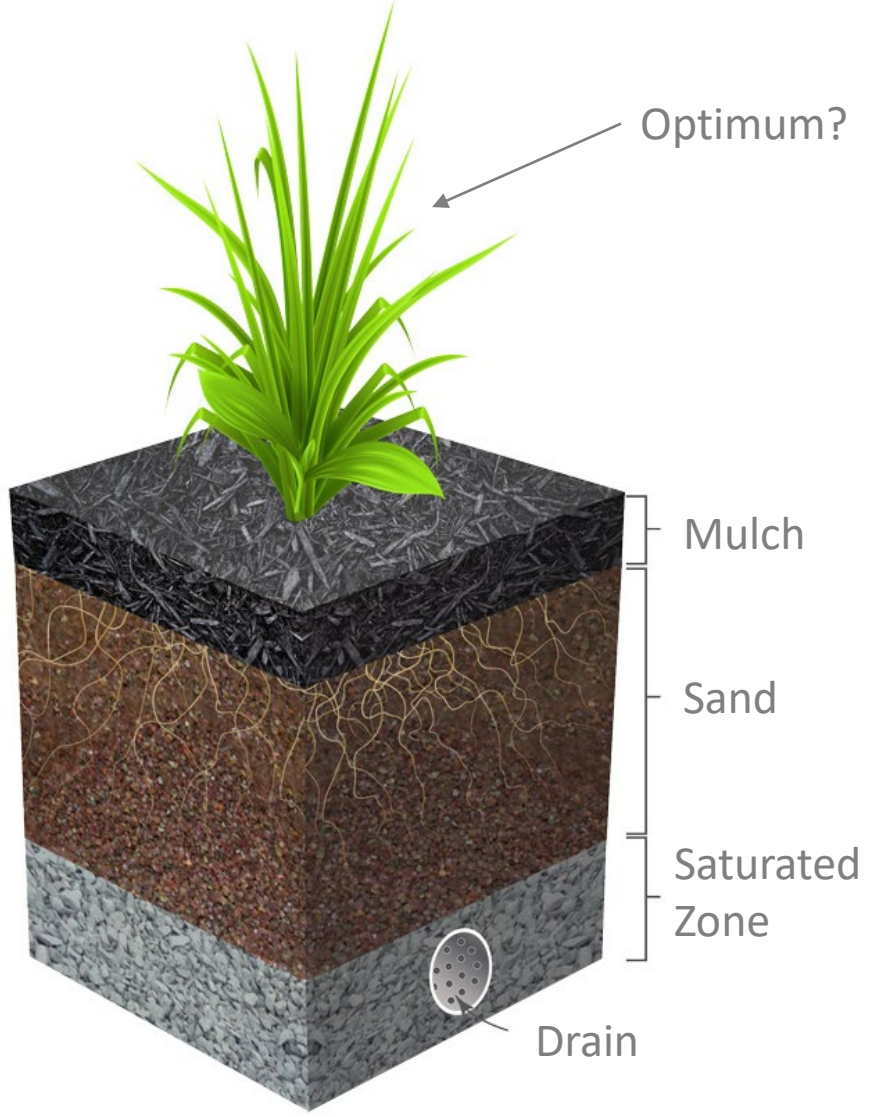
The Gaffey Nature Center

Site incorporates

- Outdoor amphitheater and educational signage
- Experimental plots with CA-native BMP grass varieties
- Basic infrastructure for research and public involvement

Problem Statement

- Los Angeles has adopted Biofiltration for nature-based stormwater BMPs.
- The process relies on bio-diverse native species and beneficial-use varieties.
- There is no research on CA-Native species and varieties, with enormous potential.
- Urgently need credible research to guide the planning, design, O&M of biofiltration using CA-native species and varieties.



Problem Statement – Continued

- A key overlooked potential of nature-based BMPs is biomass production, cooling, and air quality improvement.
- Benefits include carbon sequestration, raw materials supply, medicinal use, animal feed, and human consumption.
- Realizing such benefits requires a community-centered approach involving intimate participation and ownership.
- A key requirement is education and training for bioswale development consistent with community interests.

Study Objectives

1. Develop Guidelines and Standard Operating Procedures for optimized design, construction, and O&M of nature-based biofiltration BMPs.
2. Incorporate guidelines in a future revision of the City and County ROW and LID manuals.

Experiment Questions

Q1: What are the optimal plants and planting practices for biofiltration in California?

Q2: What are the BMP optimization variables for maximum efficacy?

Q3: How will community skills, needs, and level of involvement influence optimization?

Study Tasks

Task	Scope
Task 1: Goals & Parameters	• Identify goals and specify the independent variables • Define baseline conditions • Identify performance parameters to measure and monitor
Task 2: Study Setup	• Procure equipment and tools • Construct plots • Plant selected varieties • Install instrumentation and data collection system
Task 3: Perform Study	• Operate and maintain experimentation plots • Collect onsite samples for processing and analysis • Perform field measurements and collect data • Download the data loggers • Perform plot maintenance activities • Send samples to labs and document lab reports • Monitor site surveillance data

Study Tasks – Continued

Task	Scope
Task 4: Data Analysis	• Develop and implement data documentation architecture and data processing procedures • Develop and execute calculation procedure for the key performance parameters • Develop and rollout dashboard for collected data and calculated performance parameters
Task 5: Data Evaluation and BMP Optimization	• Examine and evaluate experimentation plots performance • Use result to develop and define optimized designs
Task 6: Study Deliverables	1. **Study Report** – Concise account of the study objectives, data, analysis, results, conclusions, and recommendations. 2. **Design Manual** – Practical guide to designing biofiltration nature-based BMPs 3. **Standard Plans** – Series of plans and details as standard practice for biofiltration BMPs

Study Details – Regional collaboration

Study will hold special events and conduct outreach to closely collaborate with:

a) Measure-W funded Regional Green Streets projects,

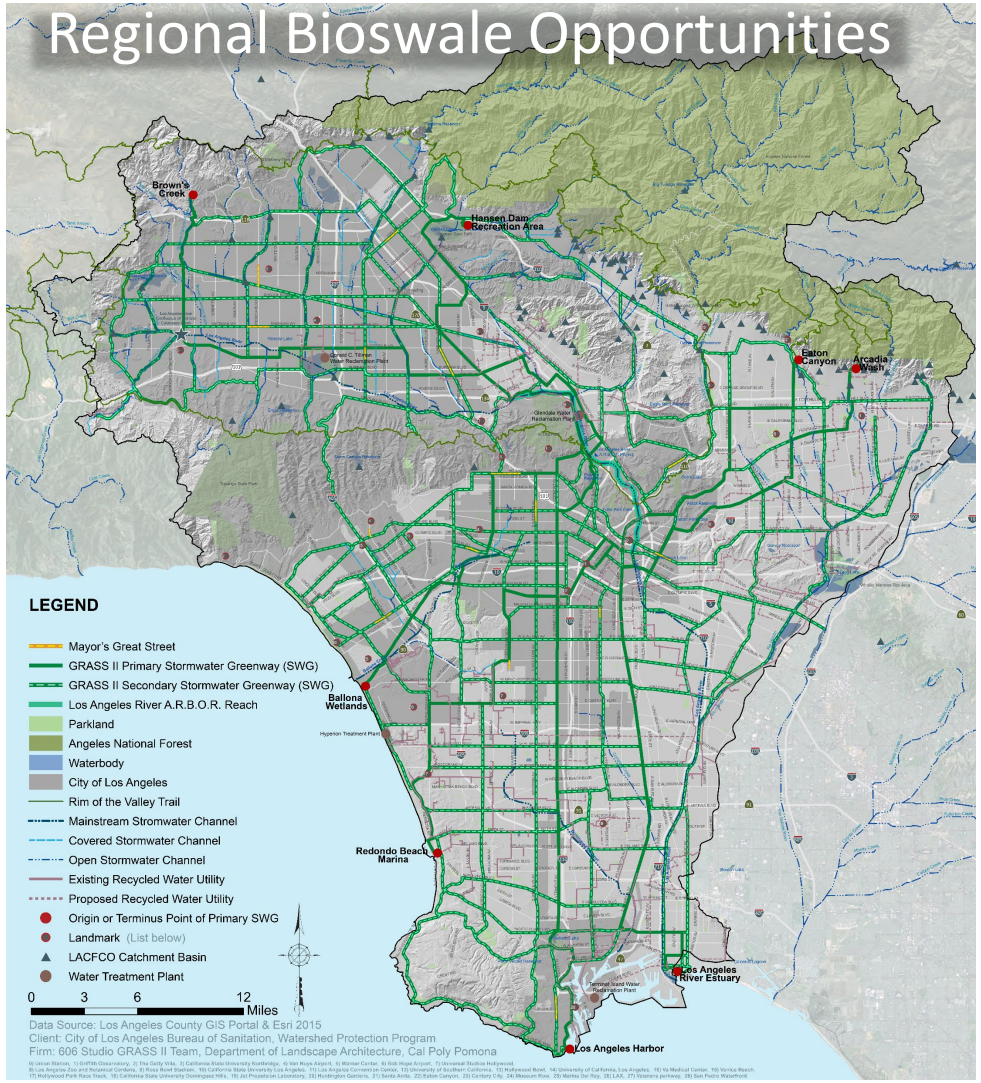
b) universities, community colleges, schools, and other education establishments,

c) non-profit and community-based organizations,

d) neighborhood councils,

e) botanical gardens,

f) Los Angeles zoo.



Cost & Schedule

Task	Description	Cost	Completion Date
Begin Study	Execute funding agreement	N/A	Sep. 2022
Task 1: Goals & Parameters	Identify goals, baseline conditions and performance parameters	$206,000	Nov. 2022
Task 2: Study Setup	Procure equipment, construct plots, procure and plant varieties, install instrumentation, setup communication system	$304,000	Mar. 2023
Task 3: Perform Study	Operate and maintain plots, collect samples and data, download data loggers, maintain plots, document lab reports, monitor site	$1,675,000	Mar. 2027
Task 4: Data Analysis	Develop and implement study architecture, perform calculations and modeling, develop and rollout dashboard	$927,000	Sep. 2023
Task 5: Data Evaluation and BMP Optimization	Examine plot performances, develop and define optimized designs, implement optimized designs in experiment plots	$324,000	Mar. 2027
Task 6: Study Deliverables	1. Study Report 2. Design Manual 3. Standard Plans	$360,000	Sep. 2027
Total		**$3,800,000**	**Sep. 2027**

Funding Request

WASC	Year 1	Year 2	Year 3	Year 4	Year5	Total
CSMB	$175,400	$135,200	$153,200	$151,800	$144,400	$760,000
LLAR	$175,400	$135,200	$153,200	$151,800	$144,400	$760,000
LSGR	$175,400	$135,200	$153,200	$151,800	$144,400	$760,000
NSMB	$175,400	$135,200	$153,200	$151,800	$144,400	$760,000
ULAR	$175,400	$135,200	$153,200	$151,800	$144,400	$760,000
TOTAL	**$877,000**	**$676,000**	**$766,000**	**$759,000**	**$722,000**	**$3,800,000***

* Labor – 67%, Materials 37%

Summary of Benefits

This Study will deliver :

a) Optimum design, construction, operation, and maintenance of biofiltration systems.

b) Enhanced uses of green infrastructure for efficient biofiltration, community enhancement, and for combating climate change.

c) Sustainable water storage and sourcing solutions for consumptive use supply during dry periods.

d) Renewable energy solutions for biofiltration operation and maintenance.

e) Increased educational benefits of nature-based BMPs for communities.

Questions?

Microplastics in LA County Stormwater

Scientific Studies Program
Fiscal Year 2022-2023

Watershed Areas:

Central Santa Monica Bay

Lower Los Angeles River

Lower San Gabriel River

South Santa Monica Bay

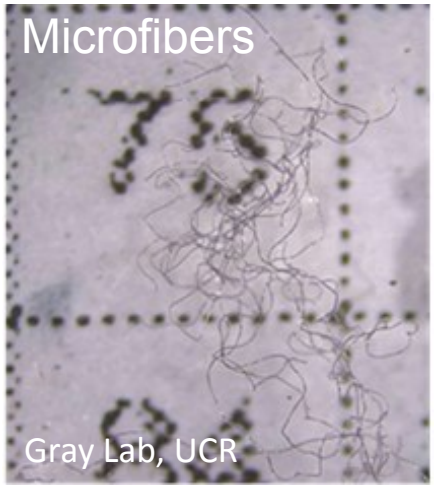
Project Lead & Presenter: Dr. Andrew Gray, UC Riverside

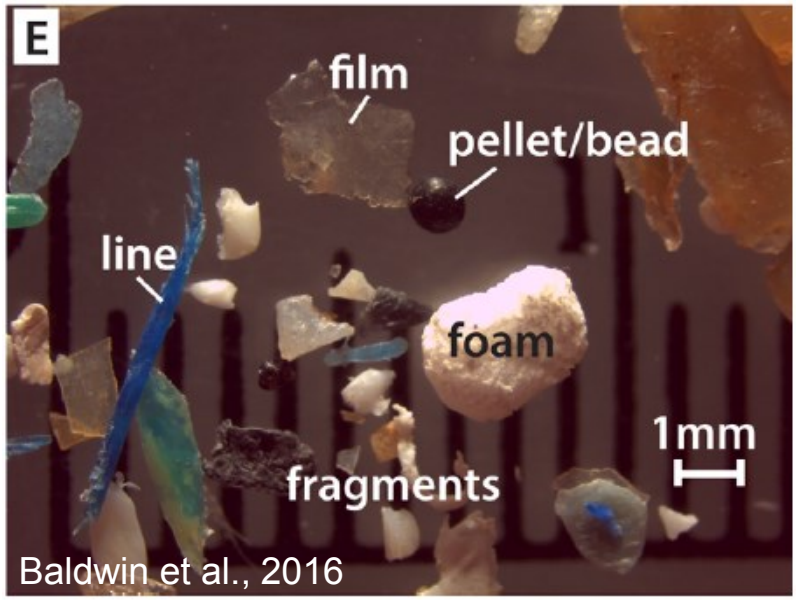
Study Overview

We propose to monitor and model microplastics in the stormflow of 4 stream channels in partnership with Los Angeles County Public Works.

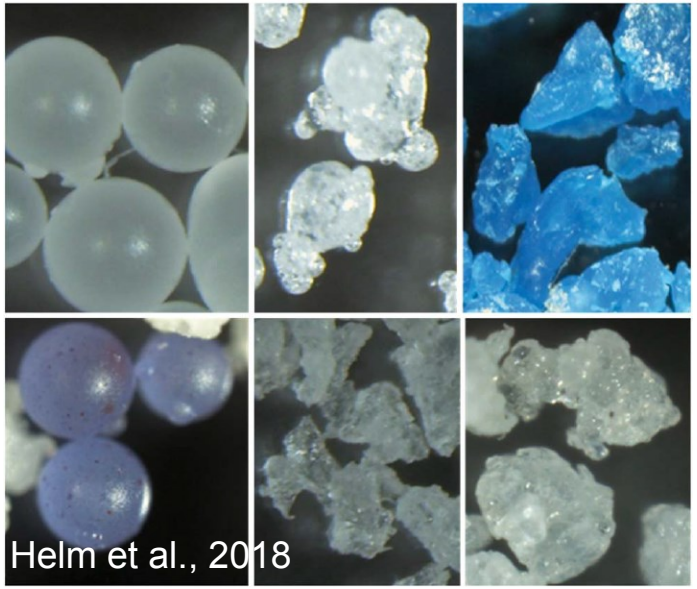
Nexus: Contributions to microplastics monitoring, analysis, and modeling will be used to evaluate the processes controlling microplastics ambient concentrations and loading in stormwater and urban runoff, and advance, effective techniques for microplastics monitoring in rivers and streams.

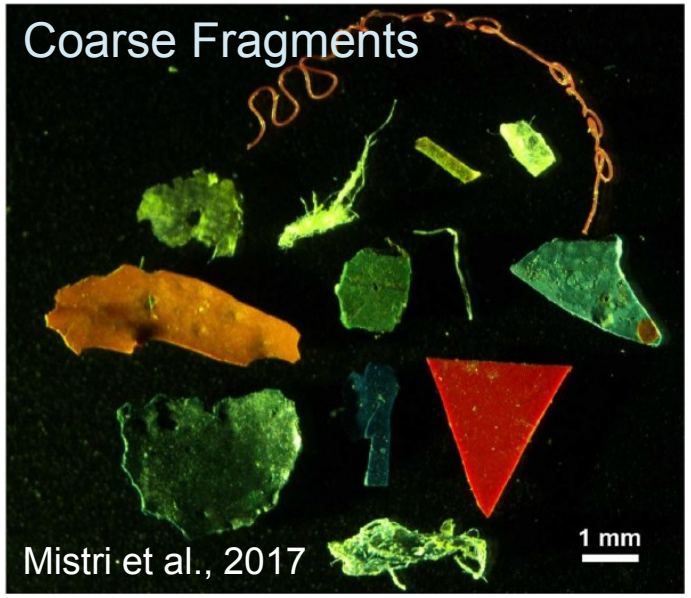
Background – Microplastics





Microbeads Fragments





A diverse suite of contaminants

Size: 1 micron to 5 mm in size

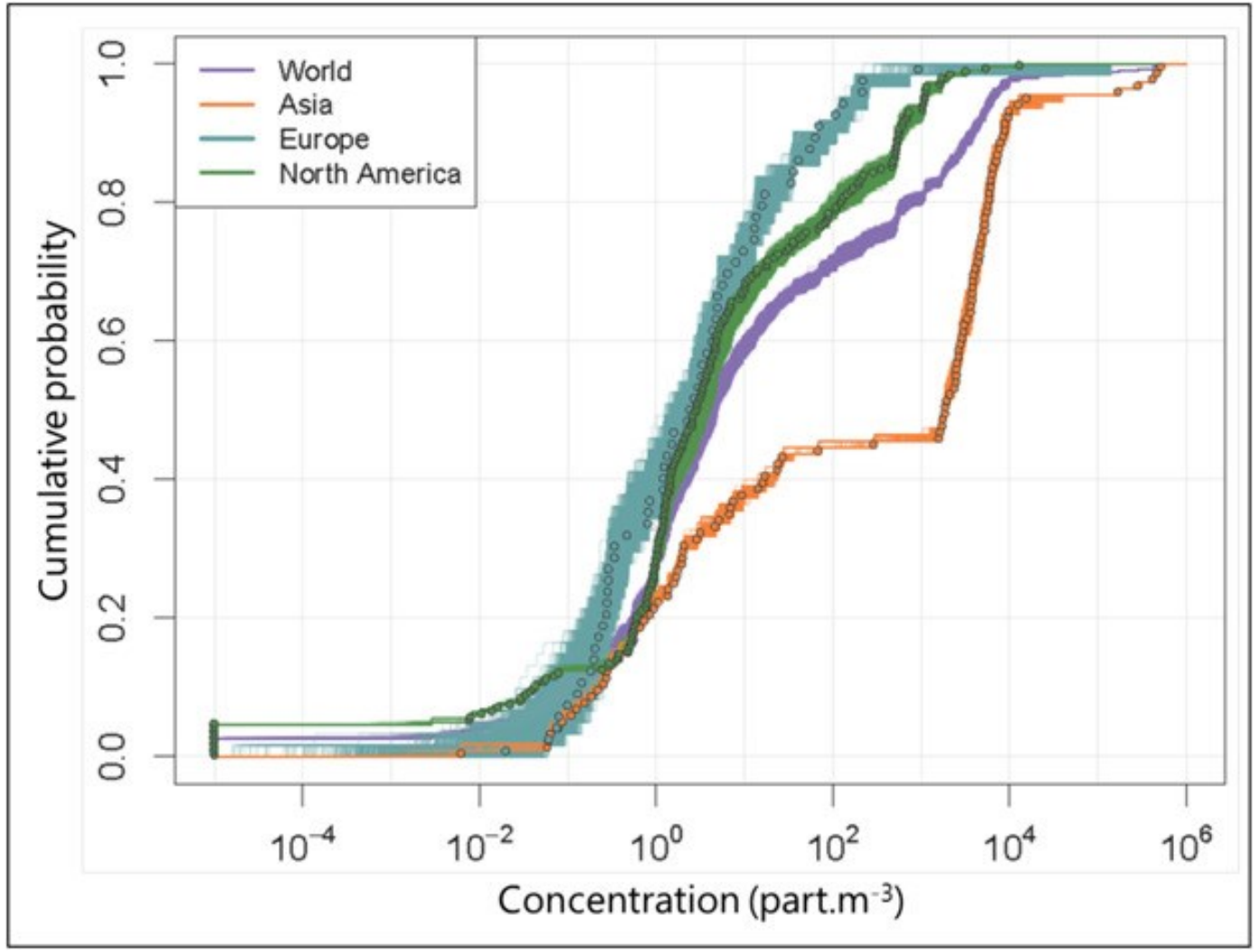
Morphology: from spherical to fiberous

Composition: thousands of plastics chemical additives & sorbed substances

Impacts: potential physical and chemical risks to aquatic biota and human health

Background – Microplastics in Rivers

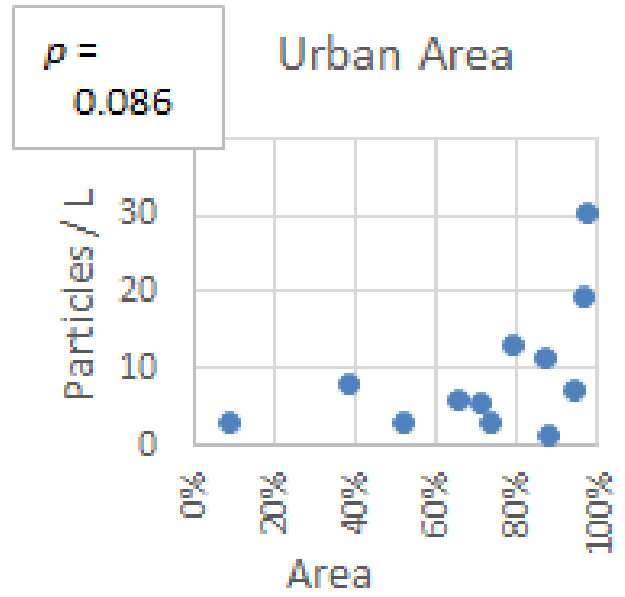
Freshwater Concentration: 10^{-4} to 10^{6} microplastics per cubic meter

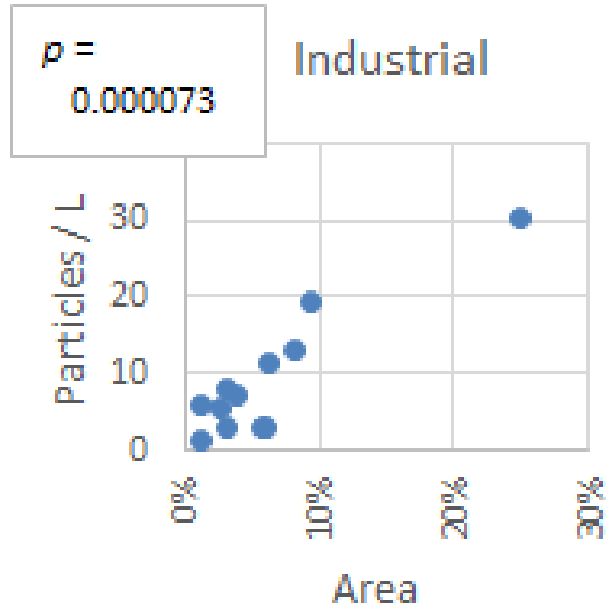


Adam et al. 2019

Background – Lessons from San Francisco Bay

Highly urbanized and industrialized watersheds





Higher microplastics loading in stormwater

Sutton et al. (2019)

Study Details

Problem Statement

- Microplastics are pollutants of increasing concern.
- Urban rivers are likely to be heavily contaminated with microplastics.
- Little is known about the drivers of microplastics concentration and flux in stormflow.
- Optimal stormflow monitoring techniques have not been established.
- Little monitoring in Southern California (so far).

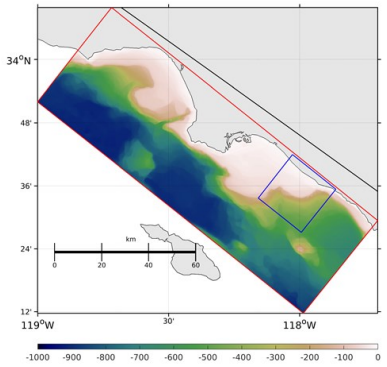
Study Objectives

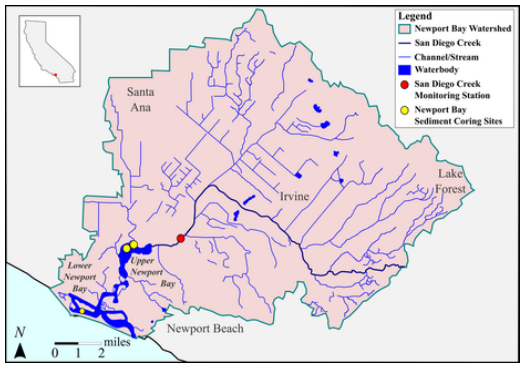
1. Monitor microplastics pollution at LA County mass emission stations.
2. Model microplastics fluxes from LA County rivers and streams.
3. Refine microplastics monitoring techniques for broader application.

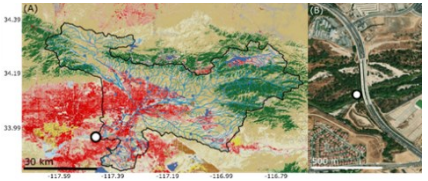
Study Details

Previous and Ongoing Microplastics Studies

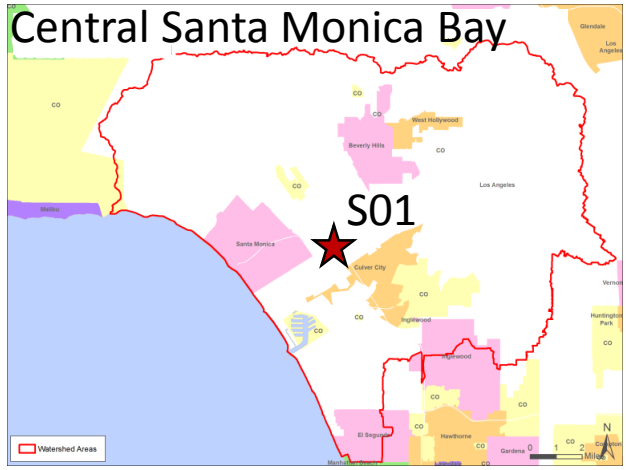
	Microplastics Methods	San Pedro Bay	Newport Bay	Santa Ana River	LAC Stormflow Pilot
Partners	*> 35 participating laboratories*				
Study Type	Inter-laboratory comparison study to harmonize methodologies	Integrated river/coastal ocean monitoring/modeling	Fluvial flux and sedimentation monitoring	Preliminary investigations/ Method Development	Initial river monitoring with LACPW autosamplers
Target	Microplastics	Microplastics	Macro/Microplastics	Macro/Microplastics	Microplastics
Study Systems	Laboratory analysis of blind samples from water, sediment and tissue matrices spiked with a range of microplastics particles.	• Los Angeles River • San Gabriel River • Coyote Creek • Santa Ana River below Prado • San Pedro Bay	• San Diego Creek • Santa Ana Delhi Channel • Marsh and subtidal sediment	• Santa Ana River above Prado • Arlington Channel	• Los Angeles River • Ballona Creek • Dominguez Channel • Malibu Creek



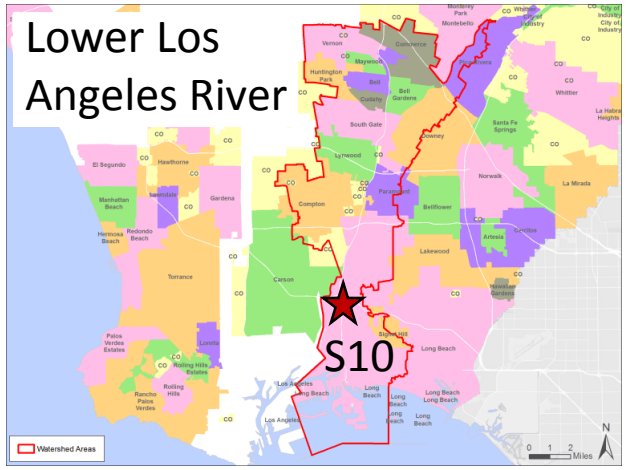




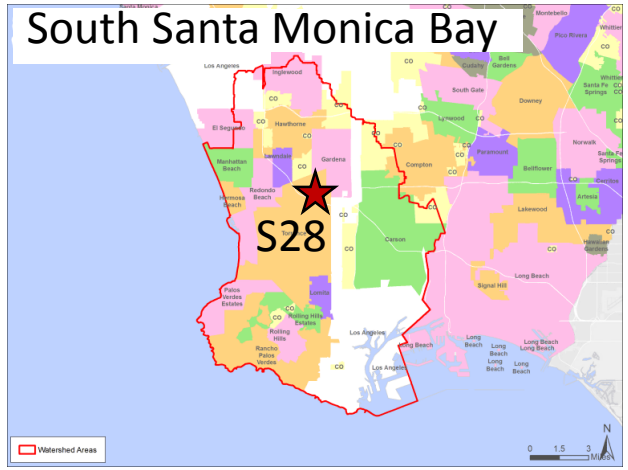
Study Locations



S01: Ballona Creek

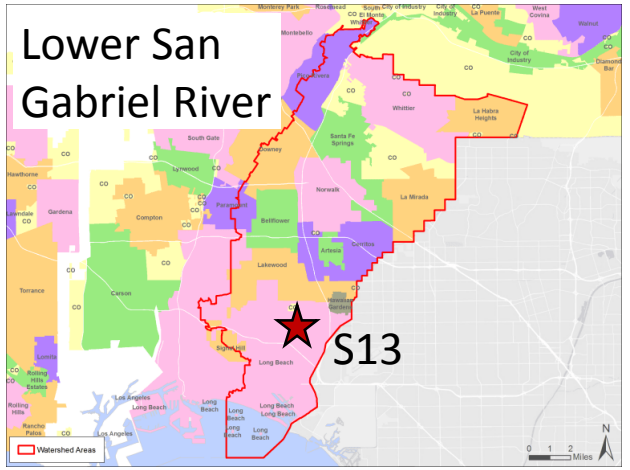


S10: Los Angeles River



S28: Dominguez Channel

★ LA County Mass Emission Stations



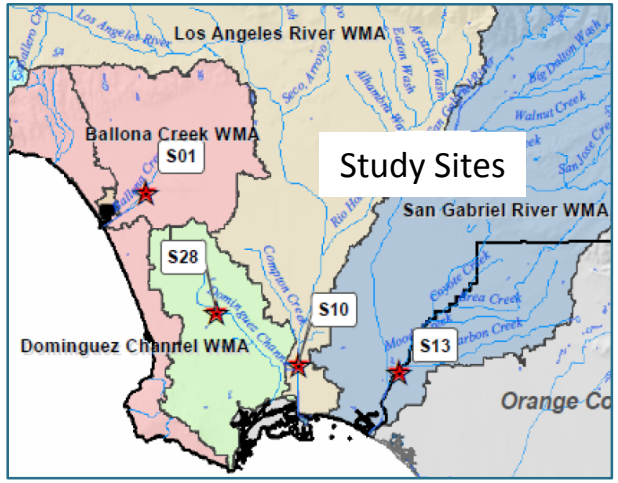
S13: Coyote Creek

Study Details

Study Methods

4 LAC Mass Emission Stations (MES)

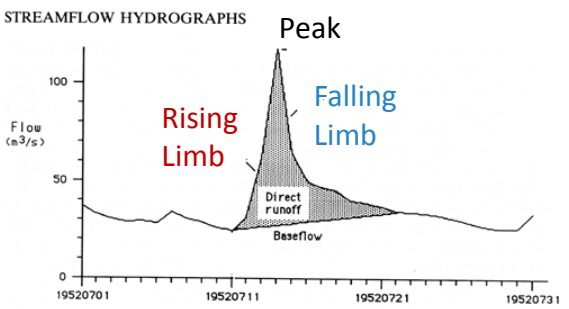
- **Ballona Creek** (S01; Watershed Area: Central Santa Monica Bay Region)
- **Los Angeles River** (S10; Watershed Area: Lower Los Angeles River Region)
- **Coyote Creek** (S13; Watershed Area: Lower San Gabriel River)
- **Dominguez Channel** (S28; Watershed Area: South Santa Monica Bay)

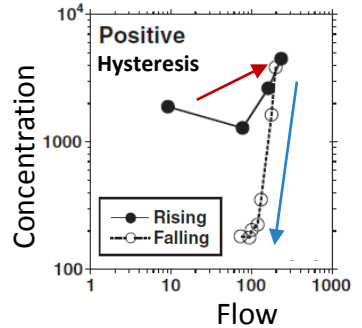


Wet season monitoring during each of years 1, 2, and 3

- 3 stormflow sampling events per year per MES
- Each sampling event = 2 samples:
  - **LAC**: bulk water (10-40 L); fixed intake point; autosampler
  - **UCR**: net (1-20 m^3) and bulk water (3-10L); flow integrated, crane deployed sampling devices
- **First flush** events prioritized when possible
- Additional storm event **hysteresis** monitoring once per MES

	Microplastics Samples (n) from Stormwater															
MES	S01			S10			S13			S28			Total			
Institution/Year	y1	y2	y3	y1	y2	y3	y1	y2	y3	y1	y2	y3	y1	y2	y3	Total
LACPW	3	3	3	3	3	3	3	3	3	3	3	3	12	12	12	36
UCR	3	6	3	3	6	3	3	3	6	3	3	6	12	22	22	48





Study Details

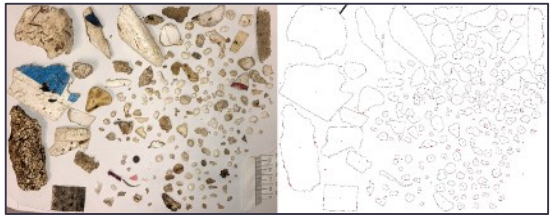
Laboratory Extraction

- Organic digestion
- Density separation
- Size fractionation

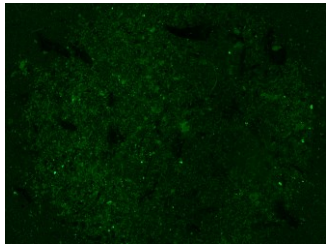
Identification & Characterization

- Brightfield & Fluorescent microscopy with automated image analysis
- µ-FTIR spectroscopy; SEM EDS (tire wear)
- Blanks, QA/QC

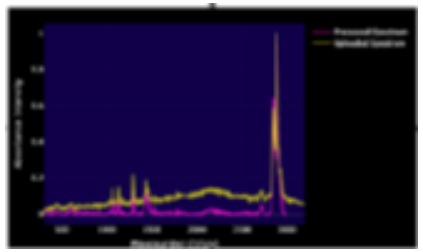
Morphological Characterization



Fluorescence Micro.



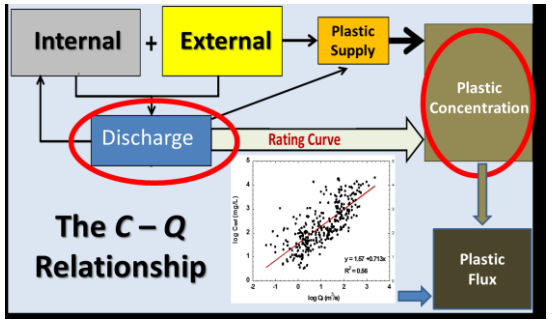
Polymer Characterization



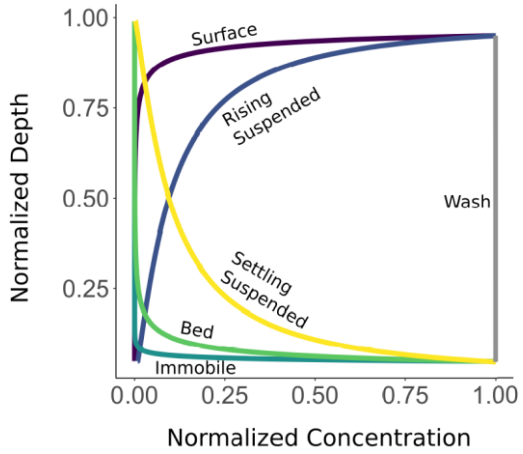
Flux Modeling

- Microplastics concentration results
- LAC MES discharge data
- Concentration-discharge rating curves
- Watershed composition evaluation
- Integration with regional microplastics modeling

Watershed Factors



Cowger et al. (2021)



Monitoring Optimization

- Comparison of LAC autosampler and UCR flow integrated results in terms of concentration, particle size distribution, and polymer compositions
- Evaluation of representative sampling
- Sample effort and cost assessment

Cost & Schedule

Study Component	Year 1				Year 2				Year 3			
	2022				2023				2024			
	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F
Study design *(completed by initiation of project)*												
Microplastics monitoring of LAC stormflow												
Microplastics flux modeling												
Monitoring optimization analysis												
Stakeholder and technical advisory committee meetings												
Final reporting												

Funding Request

WASC	Year 1	Year 2	Year 3	Total
CSMB	$85,158.75	$86,442.50	$76,150.25	$247,751.50
LLAR	$85,158.75	$86,442.50	$76,150.25	$247,751.50
LSGR	$85,158.75	$86,442.50	$76,150.25	$247,751.50
SSMB	$85,158.75	$86,442.50	$76,150.25	$247,751.50
TOTAL	**$340,635.00**	**$345,770.00**	**$304,601.00**	**$991,006.00**

Cost per WASC: **$247,751**

Total Cost: $991,006

Additional Matching Funds: $69,279 (UCR)

Direct Cost Description: Personnel (79%), materials/supplies (16%), and travel (5%).

Summary of Benefits

This study will provide LAC and partner watersheds with answers to the following key questions on microplastics pollution:

1. **How many and what kinds of microplastics are in LAC stormwaters?** Characterizing microplastics in stormwater will allow managers to build a baseline understanding of how much and what kind of microplastics get into California surface waters from stormwater.

2. **What are the optimal methods for monitoring microplastics in stormflow?** Developing robust, reproducible, and cost-effective methods for sampling microplastics in stormflow is essential for supporting the benefits above, and will inform local to statewide microplastics monitoring in the future.

3. **Can we predict the levels of microplastics for the future?** Understanding the role of stormwater in watershed to regional microplastics budgets will further our understanding of microplastics pollution in the region, allowing us to predict microplastics fluxes in unstudied watersheds and with changes to watershed composition over time.

Communication & Outreach. *The findings of this study will also be used to educate the community on the topic of microplastics pollution through open stakeholder meetings, presentations, and community outreach. Through increased community engagement, the results of this study will increase public awareness of the current state of knowledge on microplastics. Results will be published in SCWP reports and peer-reviewed literature.*


Questions?

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Mistri M, Infantini V, Scoponi M, Granata T, Moruzzi L, Massara F, De Donati M, Munari C. 2017. Small plastic debris in sediments from the Central Adriatic Sea: Types, occurrence and distribution. Marine Pollution Bulletin, 124: 435-440. DOI: https://doi.org/10.1016/j.marpolbul.2017.07.063.

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Community Garden Stormwater Capture Investigation

Scientific Studies Program

Fiscal Year 2022-2023

Central Santa Monica Bay Watershed

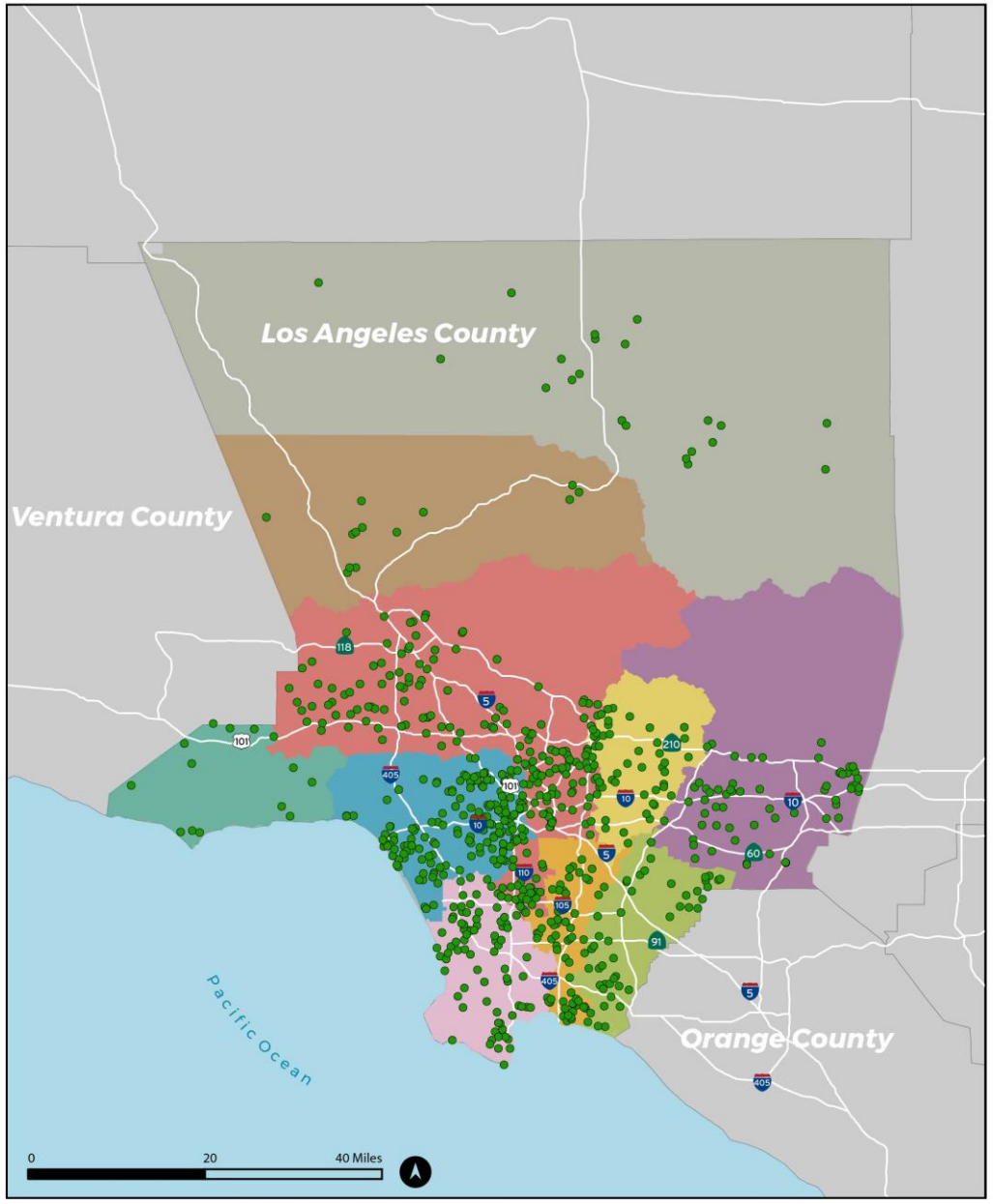
Los Angeles Community Garden Council

Diana Campos Jimenez, Juan Diaz-Carreras

About Us!

- A 501(c)3 non-profit organization founded in 1998
- Our mission is to strengthen communities by building and supporting community gardens where every person in Los Angeles County can grow fresh food in their neighborhood
- Manage 40+ community gardens
- Offer workshops, gardening advice, and community organizing
- Advocate for accessibility to affordable, healthy food

SCW and Scientific Study Program Goals



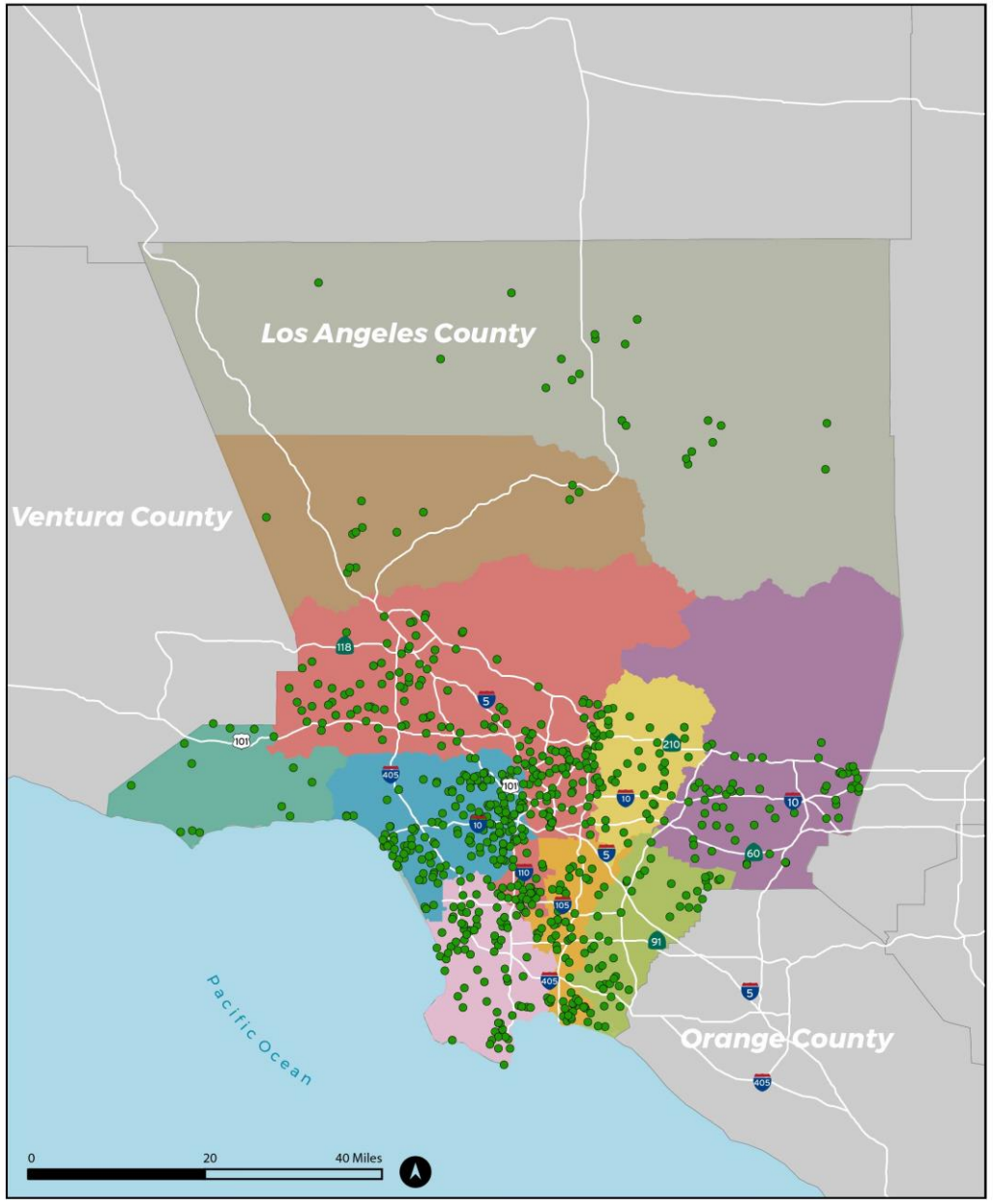
- The purpose of the Scientific Studies Program is to provide funding for scientific and technical activities related to Stormwater and Urban Runoff capture and pollution reduction.
- The study will develop knowledge of the ability of community gardens to advance SCWP goals.

Project Overview

Can community gardens function as stormwater capture facilities? This study will investigate community gardens as a land use, identify site characteristics (i.e. land ownership, infiltration potential, etc.) to determine if the land use has the potential to contribute towards SCW Program goals.

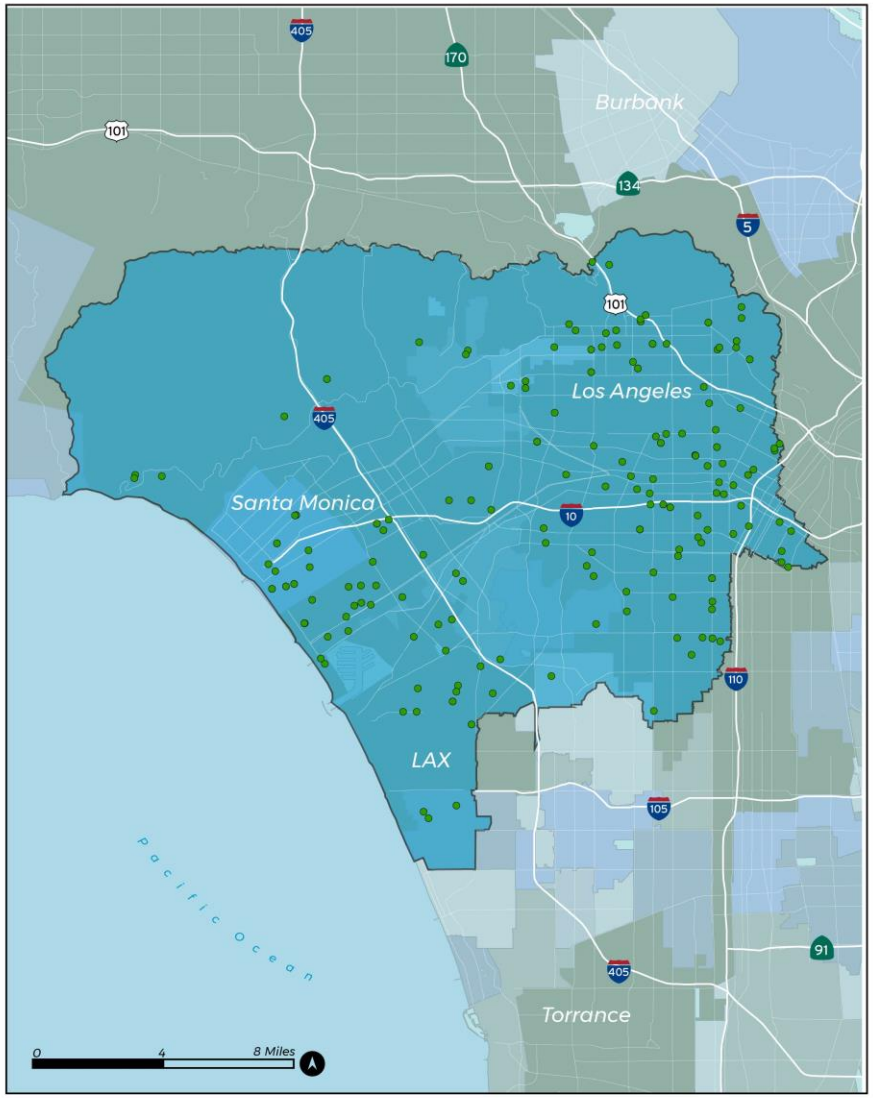
- Primary Objective: Identify conditions under which Community Garden locations have potential for stormwater capture.
- Secondary Objectives: Engage through direct dialog with gardeners to understand their potential needs. Identify 3 locations that can serve as templates for planning purposes.
- Project Status: Planning
- Total Funding Requested: $2,647,990 total/ $378,285 per watershed.

Project Location



- Almost 800 Community Gardens across LA County
- Many are managed by community groups
- Community gardens serve diverse communities in the County

Project Location

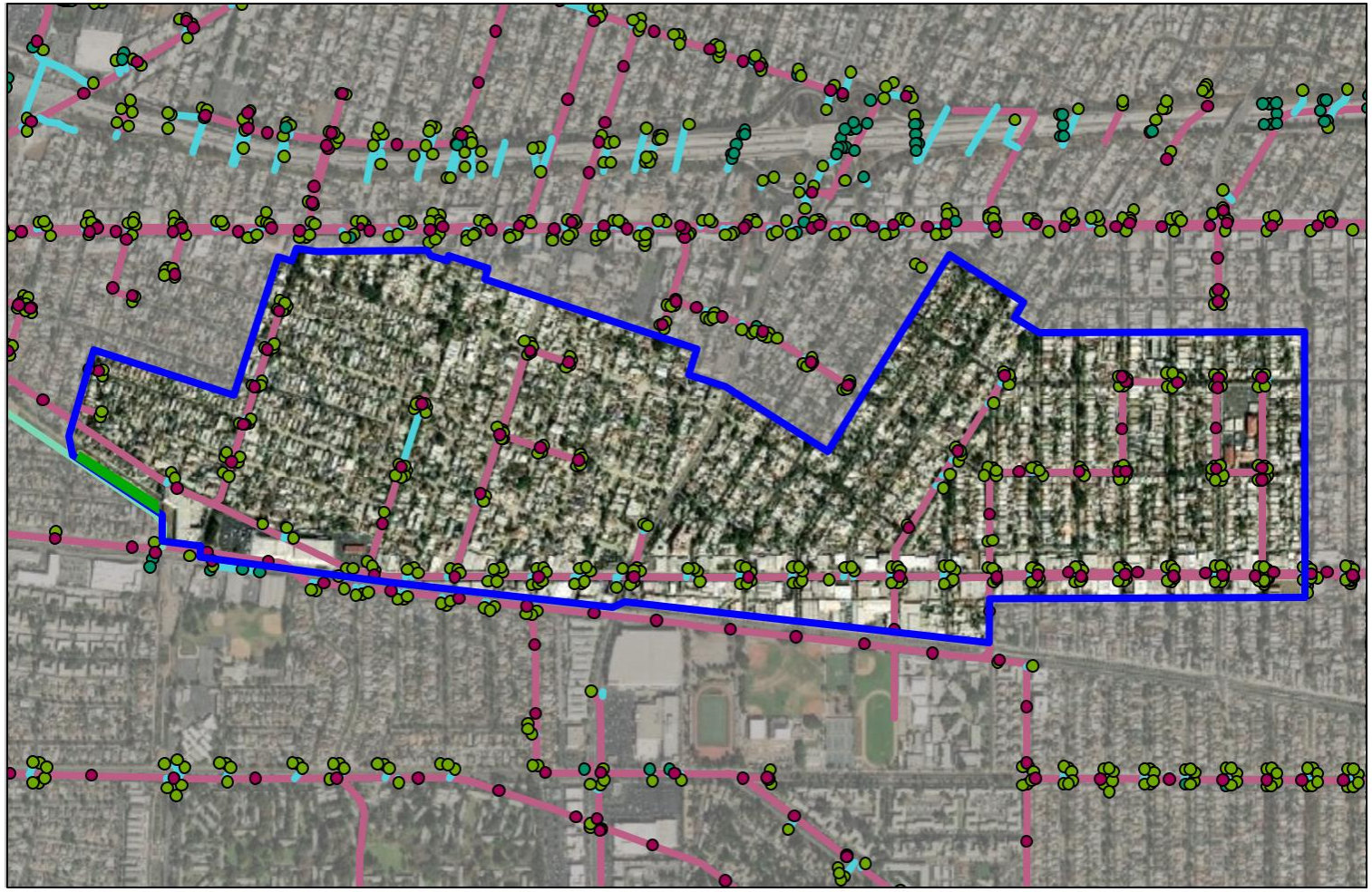


Central Santa Monica Bay Watershed

- 191 community gardens in the watershed

- Good Earth Community Garden
  - Approximately 1 acres
  - Can gardens downstream of urban areas be redesigned to collect offsite “run-on” from these areas to provide pollutant reduction benefits to municipalities?

Project Location



Legend

Good Earth Community Garden (1 acre)

Watershed Area (398 acres)

Utilities

Maintenance Hole

Catch Basin

Gravity Main

Lateral Line

Open Channel

- Example Community Garden with Upstream Tributary Area
- Drainage area is 398 acres to the community garden

Project Background

- Primary Objective: Identify conditions under which Community Garden locations have potential for stormwater capture.
- The Community Garden Stormwater Capture Scientific Study will propose and implement a methodology to compile and evaluate community garden sites to see if compatible with SCWP goals.

Cost & Schedule

Schedule Milestone Table	
Milestone Name	Completion Date
Database of Existing Community Gardens	01/03/2022
Develop Screening Criteria	03/01/2022
Preliminary Investigation	05/02/2022
Site Reconnaissance and Outreach	08/01/2022
Concept Reports and Fact Sheet	10/14/2022
SCW Program Technical Resources Funding Application	11/30/2022

Funding Request

Funding Requested Per Year Per Watershed		
Funding Request Year	Watershed Area	Amount for Year
Year 1	Central Santa Monica Bay	$ 189,142.00
Year 1	Lower Los Angeles River	$ 189,142.00
Year 1	Lower San Gabriel River	$ 189,142.00
Year 1	Rio Hondo	$ 189,142.00
Year 1	South Santa Monica Bay	$ 189,142.00
Year 1	Upper Los Angeles River	$ 189,144.00
Year 1	Upper San Gabriel River	$ 189,142.00
Total Year 1		$ 1,323,996.00
Year 2	Central Santa Monica Bay	$ 189,142.00
Year 2	Lower Los Angeles River	$ 189,142.00
Year 2	Lower San Gabriel River	$ 189,142.00
Year 2	Rio Hondo	$ 189,142.00
Year 2	South Santa Monica Bay	$ 189,142.00
Year 2	Upper Los Angeles River	$ 189,142.00
Year 2	Upper San Gabriel River	$ 189,142.00
Total Year 2		$ 1,323,994.00
Total Funding		$ 2,647,990.00

Project Benefits

Identify under which conditions community gardens can function as stormwater capture facilities.

- Identify conditions under which Community Garden locations have potential for stormwater capture within the Watershed which will benefit WASC member agencies.
- Engage through direct dialog with gardeners to understand their potential needs.
- Identify 3 locations that can serve as templates for planning purposes.


Questions?