Los Angeles River Watershed Monitoring Program
2024 Annual Report

Prepared by:

The Council for Watershed Health
177 E. Colorado Blvd., Suite 200
Pasadena, CA 91105

Aquatic Bioassay & Consulting Laboratories, Inc.
29 N Olive St
Ventura, CA 93001

Suggested Citation:
CWH. 2025. Los Angeles River Watershed Monitoring Program 2024 Annual Report. Technical report, Council for Watershed Health, Pasadena, CA.
https://www.watershedhealth.org/reports

Acknowledgements

The Los Angeles River Watershed Monitoring Program (LARWMP) was funded and conducted by several public agencies and private nonprofit entities working in the watershed. These participants contributed staff time, laboratory analyses, and funding in a collaborative effort and included representatives from regulated, regulatory, environmental, and research organizations. The majority of the funding was provided by the Cities of Los Angeles and Burbank and the Los Angeles County Flood Control District.

Agencies and Organizations
City of Burbank
City of Los Angeles
Los Angeles County Flood Control District
Los Angeles Regional Water Quality Control Board
Council for Watershed Health
Southern California Coastal Water Research Project
U.S. Environmental Protection Agency (USEPA)
U.S. Forest Service
Heal the Bay
Friends of the LA River (FOLAR)
L.A. Waterkeeper

Table of Contents

List of Figures

List of Tables

List of Acronyms

Algal IBI	Algal Index of Biological Integrity
ATL	Advisory Tissue Levels
ASCI	Algal Stream Condition Index
ASCI-H	Algal Stream Condition Index - Hybrid
BMI	Benthic Macroinvertebrate
BOD	Biochemical Oxygen Demand
BWRP	Burbank Water Reclamation Plant
CIMP	Coordinated Integrated Monitoring Program
COD	Chemical Oxygen Demand
CRAM	California Rapid Assessment Method
CRM	Certified Reference Material
CSCI	California Stream Condition Index
CTR	California Toxics Rule
DCTWRP	Donald C. Tillman Water Reclamation Plant
DDT	Dichlorodiphenyltrichloroethane
DNQ	Detect, not quantifiable
DO	Dissolved Oxygen
DQO	Data Quality Objective
EWMP	Enhanced Watershed Management Plan
FCG	Fish Contaminant Goals
GM	Geometric Mean
GN	Glendale Narrows
IBI	Index of Biological Integrity
IPI	Index of Physical Integrity
LAGWRP	Los Angeles Glendale Water Reclamation Plant
LARERR	Los Angeles River Ecosystem and Recreation Reach 8a
LARWQCB	Los Angeles Regional Water Quality Control Board
LARW	Los Angeles River Watershed
LARWMP	Los Angeles River Watershed Monitoring Program
LMP	Lewis MacAdams Park
MDL	Method Detection Limit
MLOE	Multiple Lines of Evidence
MQO	Measurement Quality Objective
MMI	Multi-Metric Index
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSE	Mean squared error
ND	Non-detect
NPDES	National Pollutant Discharge Elimination System
OEHHA	Office of Environmental Health and Hazard Assessment (CA)
PAH	Polycyclic Aromatic Hydrocarbons
PCA	Principal Component Analysis
PCB	Polychlorinated Biphenyl
PHAB	Physical Habitat

POP	Persistent Organic Pollutant. The listed constituents, PCBs and DDTs, are both persistent organic pollutants under the Stockholm Convention.
POTW	Publicly Owned Treatment Works
PPM	Parts Per Million
RPD	Relative Percent Difference
SGRRMP	San Gabriel River Regional Monitoring Program
SSM	Single Sample Maximum
SMC	Stormwater Monitoring Coalition
SQO	Sediment Quality Objective
STV	Statistical Threshold Value
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
UEV	Upper Elysian Valley
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WER	Water-Effect Ratio
WQO	Water Quality Objective
WRP	Water Reclamation Plant

Executive Summary

The Los Angeles River Watershed Monitoring Program (LARWMP) conducts annual assessments to better understand the health of a dynamic and predominantly urban watershed. The guiding questions and corresponding monitoring framework of the LARWMP provide both the public and resource managers with an improved understanding of conditions and trends in the watershed.

Question 1. What is the condition of streams in the Los Angeles River Watershed?

Every year the LARWMP assesses stream conditions at random sites located in effluent, urban, and natural sub-regions. The LARWMP began revisiting random sites to better understand trends across the entire watershed. The findings from the 2024 assessments are summarized below.

- A pattern of better biotic conditions, as demonstrated by higher scores, in the natural regions of the watershed compared to the effluent dominated and urban reaches is consistently seen across bioassessment indices designed to identify locations disturbed by human influence California Stream Condition Index (CSCI), Algal Stream Condition Index-Hybrid (ASCI-H), Index of Physical Habitat Integrity (IPI), and California Rapid Assessment Methods (CRAM)). Water quality and physical habitat assessments mirror these patterns.
- The majority of sites are not in reference conditions and have altered biological conditions. Approximately 61% of all random sites were altered or were below the reference conditions for benthic macroinvertebrate communities (CSCI score ≤ 0.79). In addition, riparian zone habitat conditions (CRAM) was below the reference thresholds at roughly 62% of sites, while for algal communities (ASCI-H) approximately 83% of sites were altered.
- In 2024, plastic was the most common trash category (>50%) across all sub-regions, followed by fabric, and metals.
- Wrappers/wrapper pieces, soft plastic, hard plastic, and biodegradable food waste was the most common trash items in the watershed in 2024.

Question 2. Are conditions at areas of unique interest getting better or worse?

LARWMP conducts periodic monitoring at sites identified by the Technical Stakeholder Group (TSG) as unique areas of interest. In the past this included confluence sites, which were discontinued entirely in 2021 and replaced with soft bottom sites along the main-channel, and riparian areas. Regular and recurring assessment can help build upon our understanding of site conditions and how conditions are changing over time. Findings from this monitoring effort are summarized below.

Trends at Freshwater Target Sites

- In 2024, the Lewis MacAdams Park (LMP) (LAR08599) and Glendale Narrows (GN) (LAR10210) were monitored. These sites are important because they are located near potential Los Angeles River restoration construction projects and may help to resolve any improvements in biological and physical habitat conditions as a result of these projects.

- LMP nitrate-N and total nitrogen concentrations showed a decline from the previous year.
- Between 2021 and 2024, concentrations of total organic carbon, nitrate, total nitrogen, orthophosphate, and total phosphorus have remained similar *between* LMP and GN sites, likely due to their proximity to each other.
- At LMP (LAR08599) some physical habitat metrics suggested a change in physical habitat conditions. For example, epifaunal substrate score and %sand/fines declined while % canopy cover, %concrete/asphalt, and sediment deposition score increased.
- GN site physical habitat metrics from 2021 and 2024 were generally stable.

High Value Sites

- The best riparian zone conditions have been consistently found at sites located in the upper watershed (prefix LAUT). Some sites in the lower watershed, particularly those downstream of recent fires and undergoing restoration, also have good riparian zone conditions.
- In 2024, Glendale Narrows (LALT400), Sepulveda Basin (LALT405), and Eaton Wash (LALT406) were assessed for riparian habitat conditions. CRAM scores for all three sites were below the reference condition.
- CRAM scores at Arroyo Seco USGS Gage (LALT450), Haines Creek Pools and Stream (LALT407), and Upper Arroyo Seco (LAUT402) showed likely impairment since the sites were last assessed (score diminishment ranged from -16 to -2).

Question 3. Are receiving waters near permitted discharges meeting water quality objectives (WQO)?

Donald C. Tillman Water Reclamation Plant (DCTWRP)

- The statistical threshold value (STV) water quality objective of 320 MPN/100mL for REC-1 beneficial use was exceeded for approximately 38% of upstream samples and 32% of the downstream samples during the 2024 sampling year.
- In 2024, both upstream and downstream samples of the DCTWRP effluent each registered below the nitrate-N WQO for the entire monitoring season.
- Monitoring yielded no exceedances of the ammonia-N WQO at either location
- Downstream concentrations of arsenic, zinc, lead, copper, and cadmium were assessed below both chronic and acute CTR criteria.
- All four samples upstream of the discharge exceeded the selenium chronic CTR criteria, with subsequent effluent dilution likely lowering selenium concentration below the chronic threshold by the downstream site
- Trihalomethane concentrations above and below the DCTWRP discharge were below the EPA WQO = 80 µg/L.

Los Angeles Glendale Water Reclamation Plant (LAGWRP)

- Approximately 59% of the *E. coli* samples exceeded the WQO at the upstream site, while approximately 30% of the samples exceeded the WQO at the downstream site.
- In 2024, there were no exceedances of the nitrate-N WQO both upstream and downstream of the LAGWRP discharge point. No ammonia-N WQO exceedances were recorded.
- All metal concentrations were below the Water-Effect Ratio (WER) adjusted CTR thresholds both upstream and downstream of the LAGWRP outfall, which supports the finding that effluent discharge is not resulting in elevated metal levels downstream of the plant.
- Trihalomethanes concentrations above and below the LAGWRP discharge were below the WQO.

Burbank Water Reclamation Plant (BWRP)

- Approximately 88% of upstream and 100% of downstream *E. coli* samples exceeded the WQO, with the downstream concentration being significantly higher.
- BRWP met established nitrate-N WQO for the Burbank Channel. One upstream sample exceeded the ammonia-N WQO.
- Metal concentrations were below the CTR chronic and acute standards for all metals, on all occasions.
- Trihalomethanes concentrations above and below the BWRP discharge were below the WQO.

Question 4. Is it safe to recreate?

LARWMP monitors *E. coli* for permitted and informal recreational sites, including kayak sites. Monitoring occurs from Memorial Day to Labor Day at recreation sites and through September at permitted sites. Results are summarized below.

- During the summer of 2024, a total of 396 water samples were successfully collected from 15 recreational swim sites popular with visitors and residents of the LA River watershed.
- We found that the Tujunga Wash site at Hansen Dam (LALT 214) and the Bull Creek site (LALT 200) exceeded the $REC\text{-}1_{STV}$ standard of 320 MPN/100 mL for *E. coli* in all three months of sampling. The 6-week rolling geometric mean ($REC\text{-}1_{GM}$) similarly showed Hansen Dam (LALT 214), and Bull Creek (LALT 200) have consistently higher bacteria concentrations compared to other recreation sites.
- Kayak sites were compared to the LREC-1 single sample maximum ($LREC_{SSM}$) of 526 MPN/100 mL and found that exceedances were generally low and infrequent across all sites. The highest percentage of exceedances was 8% at the Upper (LALT215) Sepulveda Basin Zones.
- Using the 30-day geometric mean based LREC-1 WQO ($LREC\text{-}1_{GM}$) of 126 MPN, three sites showed exceedances in 2024:
    - Half of the samples at LALT215 exceeded the WQO throughout the sampling season.
    - Two sites (LALT219, LALT221) exceeded the WQO in 1 (out of 4 total) sampling months.

- Plastic (51%), biodegradables (20%), metal (15%), and fabric (9%) were the most common categories of trash types across all sites. When analyzing more detailed trash subcategories across all recreation sites, we found that plastic wrappers, paper/cardboard, and metal bottle caps were the most common items.
- Like previous years, Vogel Flats (LAUT 220) had the highest total trash count.

Question 5. Are locally caught fish safe to eat?

The goal of this portion of the monitoring program is to improve our understanding of the health risks associated with consuming fish in water bodies popular among anglers.

- Fish tissue contaminant monitoring for 2024 took place at Echo Park Lake.
- Species that were caught include common carp, largemouth bass, and redear sunfish.
- Sample analysis indicated that all fish species could be eaten, and with the exception of common carp, redear sunfish and largemouth bass could be consumed up to 3 8-oz servings per week.
- Common carp was found to be safe to consume up one 8-oz servings per week.

Introduction

1. Background: The Los Angeles River Watershed

The Los Angeles River watershed (LARW) is a highly urbanized watershed that encompasses western and central portions of Los Angeles County (Figure 0.1). The Los Angeles River's (River) headwaters originate in the Santa Monica, Santa Susana, and San Gabriel Mountains and bound the river to the north and west. The River terminates at the San Pedro Bay/Los Angeles and Long Beach Harbor complex, which is semi-enclosed by a 7.5-mile breakwater. The river's tidal prism/estuary begins in Long Beach at Willow Street and runs approximately three miles before joining with Queensway Bay.

The 824 mi^2 of the LARW encompasses forests, natural streams, urban tributaries, residential neighborhoods, and industrial land uses. Approximately 324 mi^2 of the watershed is open space or forest, located mostly in the upper watershed. South of the mountains, the river flows through highly developed residential, commercial, and industrial areas. From the Arroyo Seco, north of downtown Los Angeles, to its confluence with the Rio Hondo, rail yards, freeways, and major commercial development border the river. South of the Rio Hondo, the river flows through industrial, residential, and commercial areas, including major refineries and storage facilities for petroleum products, major freeways, rail lines, and rail yards. While most of the river is lined with concrete, the unlined bottoms of the Sepulveda Flood Control Basin, Glendale Narrows, Compton Creek, and LA River estuary provide riparian habitat that enhances the ecological and recreational value of these areas.

Figure 0.1

The Los Angeles River Watershed.

2. The Los Angeles River Watershed Monitoring Program (LARWMP)

In 2007, local, state, and federal stakeholders formed LARWMP, a collaborative monitoring effort shared by partnering agencies, permittees, and conservation organizations. Partners lend technical expertise, guidance, and support monitoring efforts and lab analysis through funding or in-kind services. The 2024 monitoring efforts for bioassessments, habitat assessment, bacteria testing, and fish tissue bioaccumulation, detailed in this report, were supported by five sampling teams, three laboratories, funding from the Cities of Los Angeles and Burbank, and the Los Angeles County Flood Control District (Tables 0.1-0.3).

Prior to the implementation of the LARWMP, most monitoring efforts in the watershed were focused on point source National Pollutant Discharge Elimination System (NPDES) compliance monitoring and little was known about the ambient condition of streams in the rest of the watershed. Recognizing this shortfall, the Los Angeles Regional Water Quality Control Board (LARWQCB) negotiated with the NPDES permittees to reduce their sampling efforts at redundant sampling sites and to lower sampling frequencies in exchange for greater sampling coverage throughout the watershed. LARWMP's sampling design provides the ability to assess ambient condition throughout the watershed using probabilistically chosen sites and to track trends at fixed (target) sites (Table 0.4). The watershed-scale effort improves the cost effectiveness, standardization, and coordination of various monitoring efforts in the Los Angeles region. LARWMP strives to be responsive to the River's evolving beneficial uses and impairments (Table 0.5) and to provide managers and the public with a more complete picture of conditions and trends in the LARW.

The objectives of the program are to develop a watershed-scale understanding of the condition (health) of surface waters using a monitoring framework that supports comprehensive and periodic assessments of sites along natural and urban streams, the main channel, estuarine habitats, and downstream of treatment works. The strategies of this program often mirror the activities of the larger region-wide monitoring program led by the Stormwater Monitoring Coalition (SMC). This report summarizes the monitoring activities and results for 2024. It is one of a series of annual monitoring reports produced for the LARWMP since 2008.

LARWMP is designed to answer the following five questions:

1. What is the condition of streams in the watershed?
2. Are conditions at areas of unique interest getting better or worse?
3. Are receiving waters near discharges meeting water quality objectives?
4. Is it safe to recreate?
5. Are locally caught fish safe to eat?

Each year, the Technical Stakeholder Group (TSG) guides the implementation of the program to ensure efforts are responsive to the priorities of both the public and managers. Stakeholders also ensure that the program is consistent in both design and methodology with regional monitoring and assessment efforts.

A more complete description of LARWMP regional setting, motivating questions, its technical design, and its implementation approach can be found in the Los Angeles River Watershed

Monitoring Program Monitoring Plan, Annual Reports, the 2023 State of the Watershed, and Quality Assurance Project Plans, which are posted on the project webpage:

https://www.watershedhealth.org/reports.

3. Los Angeles River Temperature Effects Study (Study)

The LARWQCB recently reinterpreted the Los Angeles Basin Plan WQO for temperature of discharges into the Los Angeles River Watershed, including discharges from Publicly Owned Treatment Works (POTWs). In recognition that effluent temperatures from the POTWs can, at times, exceed the new 80°F permit limit, particularly during summer months when ambient air temperature is at its warmest and solar radiation is at peak levels, the Cities of Los Angeles and Burbank (Cities) developed and implemented a special study to evaluate the potential impacts of the POTWs' effluent temperature and potential control measures that can be implemented to protect beneficial uses. The Cities conducted a study of temperatures and biological conditions in the LARW in the vicinity of the POTW discharges in 2024 to supplement existing data on the regional habitats. The Study was designed to utilize existing standardized monitoring protocols for conducting bioassessment monitoring.

The Cities collaborated with LARWMP to integrate the temperature study with the 2024 LARWMP Bioassessment Monitoring to maximize efficiencies between the concurrent programs. This proposal was brought to the LARWMP TSG and approved. As a result, six previously sampled LARWMP Bioassessment Stations were again monitored in 2024 to support the goals of both monitoring programs. More details of the Study can be found on the project webpage:

https://www.sccwrp.org/la-rivers-temperature-effects-study/la-river

4. Los Angeles River Ecosystem and Recreation Reach 8A (LARERR) Project

The LARERR Reach 8A Project is the first step in restoring steelhead migration in the LA River by building a fish passage and habitat features—such as an inset channel, anchored boulders, resting pockets, and vegetation. Beyond improving passage for steelhead and other native fish, the LARERR Project also fills watershed data gaps and lays groundwork for future recovery efforts. In 2024, LARWMP performed pre-construction monitoring of the project site ("LALTFHR") to provide information on the site's baseline condition, such as water chemistry. This baseline data will serve as a reference point for evaluating post-construction effectiveness. More details of the LARERR Project can be found on the project webpage:

https://lariver.lacity.gov/blog/la-river-ecosystem-restoration

Table 0.1

Sampling and laboratory analysis responsibilities for random and target sites for 2024

Spring/Summer 2024 Sampling		Chemistry			Benthic Macroinvertebrates			Algae			CRAM	
	Site ID	sampling	lab analysis	funding	sampling	lab analysis	funding	sampling	lab analysis	funding	assessment	funding
Targeted Sample												
Effluent, Los Angeles River at Lewis MacAdams Park	LAR08599	Weston	EMD	Cities	Weston	Weston	LACDPW	Weston	Weston	LACDPW	Weston	LACDPW
Effluent, Los Angeles River, Glendale Narrows	LAR10210	Weston	EMD	Cities	Weston	Weston	LACDPW	Weston	Weston	LACDPW	Weston	LACDPW
Random Samples												
Urban, Aliso Canyon Wash	LAR08704	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities
Effluent, Los Angeles River	LAR08706	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities
Trend Revisit Sites												
Effluent, Los Angeles River	LAR00318	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities
Natural, Arroyo Seco	LAR0552	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities
Revisit Sites												
Effluent, Los Angeles River	LAR0232	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities
Effluent, Los Angeles River	LAR03902	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities
Effluent, Los Angeles River	LAR04532	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities
Effluent, Los Angeles River	LAR08695	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities
Urban, Alhambra Wash	LAR0020	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities
Urban, Big Tujunga Creek	LAR0896	ABC	EMD	Cities	ABC	ABC	Cities	ABC	Rhithron	Cities	ABC	Cities

Table 0.2

Sampling and laboratory analysis responsibilities for bacteria monitoring in 2024

Spring/Summer Sampling		Microbiology		
	Site ID	**Sampling**	**Lab Analysis**	**Funding**
Recreation Sites				
LA River/Bull Creek Confluence, Sepulveda Basin	LALT200	ABC	EMD	Cities
Eaton Canyon Natural Area Park	LALT204	CWH	EMD	Cities
Tujunga Wash, Hanson Dam	LALT214	ABC	EMD	Cities
Hanson Dam Recreation Lake	LALT224	ABC	EMD	Cities
Arroyo Secco, Oakwilde Campground or Switzer Falls	LAUT208	ABC	EMD	Cities
Arroyo Secco, Gould Mesa Campground	LAUT209	ABC	EMD	Cities
Tujunga Creek, Hidden Springs	LAUT211	ABC	EMD	Cities
Tujunga Creek, Wildwood Picnic Area	LAUT225	CWH	EMD	Cities
Tujunga Creek, Vogel Flats	LAUT220	CWH	EMD	Cities
Kayak Sites				
LA River Sepulveda Basin at Balboa Blvd	LALT215	ABC	EMD	Cities
LA River Sepulveda Basin	LALT216	EMD	EMD	Cities
LA River Sepulveda Basin at Sepulveda Dam	LALT217	EMD	EMD	Cities
Los Angeles River at Fletcher Dr	LALT218	EMD	EMD	Cities
Los Angeles River at Steelhead Park	LALT219	EMD	EMD	Cities
Los Angeles River at Elysian Valley	LALT221	EMD	EMD	Cities

Table 0.3

Sampling and laboratory analysis responsibilities for fish tissue bioaccumulation monitoring

Fish Tissue Bioaccumulation Sites	Site ID	Year	Bioaccumulation		
			Sampling	**Lab Analysis**	**Funding**
Echo Park (Lake)	LALT300	2018	ABC/DFW	EMD	Cities
		2024	ABC/DFW	EMD	Cities
Balboa Lake	LALT301	2017	ABC/DFW	EMD	Cities
		2020	ABC/DFW	EMD	Cities
		2023	ABC/DFW	EMD	Cities
Peck Road Park (Lake)	LALT302	2016	ABC/DFW	EMD	Cities
Legg Lake	LALT308	2021	ABC/DFW	EMD	Cities
Belvedere Lake	LALT310	2014	ABC/DFW	EMD	Cities
		2022	ABC/DFW	EMD	Cities
Debs Lake	LALT312	2015	ABC/DFW	EMD	Cities
Reseda Lake	LALT313	2015	ABC/DFW	EMD	Cities
Sepulveda Basin (River)	LALT314	2019	ABC/DFW	EMD	Cities

Table 0.4

Monitoring design, indicators, and sampling frequency

Question	Approach	Sites	Indicators	Frequency
Q1: What is the condition of streams?	Probabalistic design with streams assigned to natural, effluent dominated, urban runoff dominated sub-regions	10 randomly selected each year including 4 new random sites, 4 random sites previously sampled and 2 random sites sampled annually.	Bioassessment using BMIs and attached algae, physical habitat, CRAM, water chemistry, trash	Annually, in spring/summer
Q2: What is the trend of condition at unique areas?	Fixed target sites located to detect changes over time	9 high value habitat sites	Riparian habitat condition: CRAM	2 to 4 sites rotating annually in summer
		2 Los Angeles River soft-bottom sites	Bioassessment, physical habitat, water chemistry	2 sites annually, in spring/summer
Q3: Are receiving waters below discharges meeting water quality objectives?	Use existing NPDES water quality data collected by LA River dischargers from receiving waters upstream and downstream of their discharge points.	Sites located upstream and downstream of discharges: - Los Angeles/Glendale - City of Burbank - Tillman Water Reclamation Plant	Constituents with established water quality standards, e.g. CTR for dissolved metals; *e. coli* bacteria; trihalomethane(s)	Varies depending on permit: monthly, quarterly, annual
Q4: Is it safe to swim?	Swim sites selected based on use by the public	16 sites located in ponds, reservoirs, streams and LA River	*E. coli* , trash	Weekly May to September
Q5: Is it safe to eat locally caught fish?	Focus on popular fishing sites; commonly caught species; measuring high-risk chemicals	1 to 2 sites located in streams, reservoirs, lakes, rivers and estuary	Measure mercury, selenium, DDT and PCB in commonly caught fish at each location	Annually in summer

Note. [1] High-value sites are locations of interest to the TSG or relatively isolated, unique habitat

Table 0.5

Impairments (303d listed) along the main stem of the Los Angeles River by reach (select constituents)

Reach	Reach Segment	Ammonia	Benthic Community	Copper	Lead	Nutrients (algae)	Cadmium	Indicator Bacteria	Zinc	pH	Selenium	Toxicity	Trash
LA River Estuary	Queensway Bay											Grey	Grey
LA River Reach 1	Estuary to Carson St.	Grey			Grey	Grey	Grey	Grey		Grey			Grey
LA River Reach 2	Carson to Figueroa St.	Grey		Grey	Grey	Grey		Grey					Grey
LA River Reach 3	Figueroa St. to Riverside Dr.	Grey		Grey		Grey		Grey				Grey	Grey
LA River Reach 4	Sepulveda Dr. to Sepulveda Basin					Grey		Grey				Grey	Grey
LA River Reach 5	Sepulveda Basin	Grey	Grey	Grey	Grey	Grey						Grey	Grey
LA River Reach 6	Above Sepulveda Basin			Grey				Grey			Grey	Grey	

Note. Grey boxes indicate impairment.

Table 0.6

Select beneficial uses of the main stem of the Los Angeles River

Reach	Reach Segment	IND	GWR	NAV	COMM	WARM	EST	MAR	WILD	RARE	MIGR	SPWN	WET	REC1	REC2
LA River Estuary	Queensway Bay	Grey		Grey	Grey		Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
LA River Reach 1	Estuary to Carson St.		Grey			Grey		Grey	Grey	Grey				Grey •	Grey
LA River Reach 2	Carson to Figueroa St.		Grey			Grey								Grey •	Grey
LA River Reach 3	Figueroa St. to Riverside Dr.		Grey			Grey			Grey				Grey	Grey	Grey
LA River Reach 4	Sepulveda Dr. to Sepulveda Basin		Grey			Grey			Grey				Grey	Grey	Grey
LA River Reach 5	Sepulveda Basin		Grey			Grey			Grey				Grey	Grey	Grey
LA River Reach 6	Above Sepulveda Basin		Grey			Grey			Grey				Grey	Grey	Grey

Note. Grey boxes indicate impairment. Dots denote reaches where access is prohibited by LA County Department of Public Works. Only limited contact activities, such as fishing and kayaking, are allowed in the Recreation Zone (Reach 3 and 5; LARWQCB 2020c).

Beneficial uses include: IND = Inland ; GWR = Groundwater ; NAV = Navigation ; COMM = Commercial and Sport Fishing; WARM = Warm Freshwater Habitat, EST = Estuarine Habitat, MAR = Marine Habitat; WILD = Wildlife Habitat , RARE = Rare, Threatened, and Endangered, MIGR = Migration, SPWN = Spawn, Reproduction, and Early Development, WET = Wetland Habitat , REC1 = Water Contact Recreation, REC2 = Non-Contact Recreation

Question 1. What is the condition of streams in the Los Angeles River Watershed?

1. Background

To determine the condition of streams in the Los Angeles River watershed, data were collected at 101 random sites during 15 annual surveys from 2009 through 2024 (Figure 1.1). Sites are selected randomly to facilitate drawing statistically valid inferences about an area, rather than about just the site itself. Spatially, these sites are representative of three major sub-regions:

- Natural streams in the upper reaches of both the mainstream and tributaries (i.e., natural sites).
- Effluent-dominated reaches in the mainstream and the lower portions of the estuary (i.e., effluent dominated sites).
- Urban runoff-dominated reaches of tributaries flowing through developed portions of the watershed (i.e., urban sites).

Ambient surveys, which include both physical habitat assessments and bioassessments, can help identify and prioritize sites for protection or rehabilitation based on how sites compare to other regional sites. This type of data provides a measure of ecological health to help better understand whether streams support aquatic life and assigned beneficial uses. Biological communities at stream sites respond to, and integrate, multiple stressors across both space and time, which improves our understanding of the impact of stressors on stream communities (Mazor 2015).

In 2014, the TSG agreed to modify the LARWMP sampling design based on design changes made by the Southern California Stormwater Monitoring Coalition's (SMC) Regional Monitoring Program. This design modification was made to help improve our ability to detect changing conditions not only in the Los Angeles watershed, but in the whole Southern California region. The design incorporates site revisits at random sites previously sampled by the SMC program. In addition, the program began to revisit sites previously sampled through the LARWMP program, improving our ability to detect changing conditions in the Los Angeles watershed. In addition, one random site known to be a non-perennial stream was added to the program to help address a regional gap in assessment of non-perennial streams, which make up 25% of stream miles in the watershed (SMC 2015).

Figure 1.1

Map of sites sampled in 2024.

2. Methods

LARWMP employed benthic macroinvertebrates (BMIs), attached algae communities, and riparian zone condition to assess biotic condition. A complete list of biotic condition indicators and water chemistry analytes collected for this program, including methods, units, and detection limits can be found in Table C.1.

a. *Benthic Macroinvertebrates and Attached Algae*

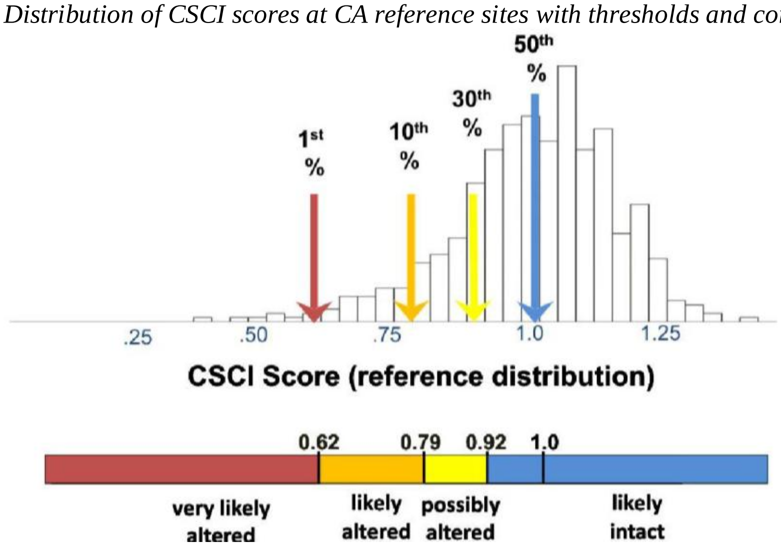
The field protocols and assessment procedures for BMIs and attached algae followed the protocols described by Ode *et al*. (2016). Briefly, BMIs were collected using a D kick-net from eleven equidistant transects along a 150-m reach and were identified to Level 2 (generally genus) as specified by the Southwest Association of Freshwater Invertebrate Taxonomists, Standard Taxonomic Effort List (SAFIT; Richards and Rogers 2006). Algal samples were collected one meter upstream of where BMI samples were collected.

b. *California Stream Condition Index*

The California Stream Condition Index (CSCI) was used to assess the BMI community condition. The CSCI is a statewide biological scoring tool that translates complex data about benthic macroinvertebrates (BMIs) found living in a stream into an overall measure of stream health (Mazor *et al*. 2015). The CSCI incorporates two indices, the multi-metric index, helpful in understanding ecological structure and function, and the observed-to-expected (O/E) index, which measures taxonomic completeness (Rehn *et al.* 2015). The CSCI was developed with a large data set spanning a wide range of environmental settings. CSCI scores from nearly 2,000 study reaches sampled across California ranged from approximately 0.1 to 1.4 (Mazor *et al.*, 2015). For the purposes of making statewide assessments, three thresholds were established based on 30th, 10th, and 1st percentile of CSCI scoring range at reference sites according to Rhen (2015) (**Figure 1.2**). These three thresholds divide the CSCI scoring range into 4 categories of biological conditions. While these ranges do not represent regulatory thresholds, they provide a useful framework for interpreting CSCI results.

Figure 1.2

Distribution of CSCI scores at CA reference sites with thresholds and condition categories



Note. From Rhen et al., 2015

c. *The Algal Stream Condition Index*

The Algal Stream Condition Index (ASCI) employs an approach that synthesizes multiple lines of evidence to understand stream condition. The metric is a complement to the CSCI multi-metric index for BMI. Algae are useful indicators of stream condition because they are sensitive to water quality conditions, particularly nutrients, and can respond to management actions in locations where BMI are less useful (e.g. engineered channels) (Theroux et al., 2020). Like CSCI, ASCI captures the likelihood of biological degradation by comparing scores to the 1st, 10th, and 30th percentile of scores at reference sites located throughout the state (Table 1.1). The performance of indices based on soft algae, diatoms, and hybrid of both assemblages have been tested for responsiveness, accuracy, and precision. Multi-metric indices based on diatoms and a hybrid assemblage have been found to be the best performing (Theroux et al., 2020).

Table 1.1

Summary of CSCI, ASCI-H, CRAM, and IPI environmental condition score ranges.

Score	Very Likely Altered condition	Likely Altered Condition	Possibly Altered Condition	Likely Intact Condition
CSCI	≤ 0.62	0.63 to 0.79	0.80 to 0.91	≥ 0.92
ASCI-H	≤ 0.74	0.75 to 0.85	0.86 to 0.93	≥ 0.94
CRAM	≤ 63	63 to 72	72 to 79	≥ 79
IPI	≤ 0.70	0.71 to 0.83	0.84 to 0.93	≥ 0.94

d. *California Rapid Assessment*

Riparian wetland condition was assessed using the California Rapid Assessment Method (CRAM; Collins et al. 2008), a method developed by the USEPA and modified by SWAMP for use in California (Fetscher and McLaughlin 2008). The method was developed to allow evaluation of statewide investments in restoring, protecting, and managing wetlands. Briefly, the CRAM method assesses four attributes of wetland condition: buffer and landscape, hydrologic connectivity, physical structure, and biotic structure. Each of these attributes is composed of several metrics and sub-metrics that are evaluated in the field for a prescribed assessment area. The CRAM metrics are ecologically meaningful and reflect the relationship between stress and the high priority functions and ecological services of wetlands. The greater the CRAM score, the better the biotic, physical, hydrologic, and buffer zone condition of the habitat. Streams in reference condition are expected to have a CRAM score ≥72 (Mazor 2015). In addition, since CRAM scores provide insight into a stream's physical condition, they are often used as a surrogate for abiotic stress.

e. *Physical Habitat*

Physical habitat (PHAB) assessments were completed in conjunction with algal and benthic macroinvertebrate assessments to aid in the interpretation of biological data. Human alteration and the instream and topographical features that result in adverse impacts to habitat quality and structure are important factors that shape aquatic communities (Barbour *et al*., 1999). Briefly, the same 11 equidistant transects that were used for the collection of BMI and algal samples were used in the assessment of wetted width, bank stability, discharge, substrate, canopy cover, flow habitats, bank dimensions, human influence, depth, algal cover, and cobble embeddedness. Ten inter-transects, at the mid-point of the 11 transects used for sample collection, were also used to collect information related to wetted width, flow habitats, and pebble counts. All PHAB assessments were completed as specified by Ode *et al.* (2016).

In the 2021 report, we began reporting on the physical habitat condition of a stream site using the Index of Physical Habitat Integrity (IPI). The index is an easily interpretable measure of PHAB condition (Rehn et al., 2018). The index includes metrics that are broadly categorized into 5 thematic groups that capture different habitat elements including: substrate, riparian vegetation, flow habitat variability, in-channel cover and channel morphology. Scores for the IPI close to 0 indicate departure from reference condition and those greater than 1 indicate that a site has better physical habitat than is predicted based on environmental setting. The thresholds for IPI are similar to the CSCI and are based on 30th, 10th, and 1st percentiles of scores at reference sites.

f. ***Aquatic Chemistry***

Nutrients, total metals, major ions, and general chemistry analytes (pH, dissolved oxygen, suspended solids, alkalinity, and hardness) were monitored at each site. Data was collected in-situ using digital field probes that were deployed by field crews or via grab sample and lab analysis. Measured analytes and methods are described in the Appendices (Table B.1).

g. ***Trash Assessments***

Trash assessments began in 2018 at random sites using the SMC developed riverine quantitative tally method as reviewed in the trash monitoring playbook (Moore *et al*., 2020). Trash items are tallied under broad categories of trash types (e.g. paper, plastic, cloth and fabric) into more detailed trash types (e.g. foam pieces, plastic bag pieces). A 30 meter stretch of each random site was visually assessed. The assessment area spans the thalweg to the bankfull width. The assessment also makes note of storm drain and homeless encampments within the assessment area (Moore *et al.,* 2020).

h. ***Data Analysis***

The R statistical software (version 4.4.1, R Core Team, 2025) and Excel were used for most of the graphing and data analysis.

3. Results

a. *Biotic Condition*

Summary results for all biotic condition measurements and water quality analytes by watershed sub-region are presented in Table 1.2. A pattern of better biotic and physical habitat conditions is consistently seen in CSCI, ASCI, IPI, and CRAM, as demonstrated by higher scores, in the natural regions of the watershed compared to the effluent dominated and urban reaches (Figure 1.3). Compared to CSCI, fewer of the streams in the upper watershed are in the higher scoring "possibly altered" or "likely intact" categories based on ASCI hybrid scores, a proxy for water quality (Figures 1.4 & 1.5).

ASCI scores were lowest in effluent dominated sub-region and highest in the natural sub-region (Figure 1.5). Hybrid and Diatom ASCI scores mirrored other biotic indicators, showing higher average scores for the natural sites than effluent-dominated or urban sites (Table 1.2 & Figure 1.3). Soft Algae ASCI did not differentiate the sub-regions as well as the other bioindicators.

The CSCI incorporates two indices: the multi-metric index (MMI), which clarifies ecological structure and function; and the observed-to-expected (O/E) index, which measures taxonomic completeness. A lower O/E score indicates site degradation due to the loss of expected taxa. On average, effluent-dominated and urban sites exhibited lower MMI, O/E, and overall CSCI scores compared to natural sites, reflecting the poorer condition of benthic macroinvertebrates and greater taxa loss in urbanized areas (Figure 1.4).

The CRAM results underscore the contrast between the highly urbanized lower watershed and the relatively natural conditions found in the upper watershed (Figure 1.3). Each CRAM score is composed of four individual attribute scores that define riparian habitat conditions. They include buffer zone, hydrology, and physical and biotic structure. Natural sites were characterized by wide, undisturbed buffer zones, good hydrologic connectivity, and a multilayer, interspersed vegetative canopy composed of native species. In contrast, the urban and effluent-dominant sites often had no buffer zones, highly modified concrete-lined channels, and lacked vegetative cover. Intermediate to these extremes are the effluent dominated, soft-bottom sites like the Glendale Narrows and Sepulveda Basin. These sites tended to have higher attribute scores for buffer and biotic condition, though overall habitat condition scores were still in the likely altered category. Development in the lower watershed has virtually eliminated natural streambed habitat and adjacent buffer zones and altered stream hydrology. In most cases, the natural riparian vegetation has either been eliminated or replaced by invasive or exotic species. These conditions have led to lower habitat condition scores.

Table 1.2

Summary statistics for biotic conditions and water quality analytes at all random sites combined, collected from 2009 – 2024.

	Watershed						Urban						Effluent						Natural					
Analyte	n=	Mean	±	Stdev	min	max	n=	Mean	±	Stdev	min	max	n=	Mean	±	Stdev	min	max	n=	Mean	±	Stdev	min	max
Biological Condition																								
Benthic Macroinvertebrates (CSCI)	165	0.72	±	0.25	0.21	1.35	54	0.49	±	0.15	0.21	0.80	42	0.62	±	0.13	0.33	0.84	69	0.95	±	0.15	0.65	1.35
MMI	165	0.65	±	0.25	0.18	1.43	54	0.46	±	0.12	0.23	0.69	42	0.53	±	0.15	0.18	1.04	69	0.88	±	0.18	0.43	1.43
O/E	165	0.78	±	0.28	0.12	1.32	54	0.53	±	0.20	0.12	0.99	42	0.71	±	0.17	0.19	1.02	69	1.02	±	0.17	0.70	1.32
Attached Algae																								
ASCI Hybrid	145	0.65	±	0.21	0.21	1.32	46	0.69	±	0.20	0.35	1.32	37	0.44	±	0.12	0.21	0.71	62	0.75	±	0.16	0.41	1.14
ASCI Diatom	145	0.63	±	0.20	0.25	1.21	46	0.65	±	0.19	0.34	1.21	37	0.42	±	0.10	0.25	0.68	62	0.74	±	0.17	0.38	1.08
ASCI Soft Algae	146	0.76	±	0.23	0.00	1.26	47	0.76	±	0.18	0.31	1.07	37	0.70	±	0.14	0.36	1.06	62	0.80	±	0.29	0.00	1.26
Index of Physical Habitat	125	0.62	±	0.37	0.04	1.21	37	0.32	±	0.21	0.04	1.04	36	0.38	±	0.22	0.13	1.07	52	1.00	±	0.12	0.75	1.21
Riparian Habitat (CRAM)	163	55	±	22	27	99	54	38	±	10	27	79	42	37	±	7	27	70	67	79	±	7	63	99
BioticStructure	163	46	±	24	22	97	54	30	±	12	22	72	42	28	±	9	22	69	67	71	±	14	39	97
BufferLandscape	163	71	±	22	25	100	54	55	±	17	25	88	42	58	±	16	25	75	67	92	±	5	75	100
Hydrology	163	56	±	25	25	100	54	38	±	11	25	83	42	36	±	10	25	75	67	84	±	9	58	100
PhysicalStructure	163	44	±	23	25	100	54	28	±	11	25	75	42	26	±	6	25	63	67	69	±	14	38	100
InSitu Measurements																								
Temperature (C°)	164	21.23	±	5.72	10.97	36.69	54	24.61	±	6.38	13.84	36.69	42	23.32	±	4.19	16.30	32.80	68	17.26	±	2.96	10.97	25.03
Dissolved Oxygen (mg/L)	165	9.47	±	2.65	3.72	20.34	54	10.39	±	2.72	5.30	16.81	42	10.29	±	3.52	3.72	20.34	69	8.24	±	1.02	5.46	10.48
pH	165	8.33	±	0.65	6.99	10.80	54	8.75	±	0.81	7.34	10.80	42	8.42	±	0.44	7.42	9.36	69	7.95	±	0.33	6.99	8.51
Salinity (ppt)	164	0.45	±	0.31	0.13	1.93	54	0.66	±	0.43	0.14	1.93	41	0.52	±	0.07	0.32	0.60	69	0.23	±	0.05	0.13	0.37
SpecificConductivity (us/cm)	165	887	±	585	8	3681	54	1285	±	791	8	3681	42	1055	±	115	736	1210	69	473	±	112	245	762
General Chemistry																								
Alkalinity as CaCO3 (mg/L)	165	209.5	±	342.4	40.0	4520.0	54	260.7	±	595.0	40.0	4520.0	42	141.6	±	26.0	93.0	206.0	69	210.8	±	37.7	119.0	276.0
Hardness as CaCO3 (mg/L)	159	304.3	±	269.9	94.0	2540.0	52	463.1	±	424.3	94.0	2540.0	42	260.6	±	68.1	166.0	422.0	65	205.6	±	42.9	96.0	370.0
Calcium (mg/L)	40	49.9	±	38.7	0.2	176.0	14	68.5	±	53.2	0.2	176.0	14	38.7	±	27.5	5.2	80.9	12	41.2	±	19.8	0.7	61.5
Chloride (mg/L)	160	88.2	±	90.1	2.3	554.4	53	149.2	±	106.4	11.2	554.4	42	133.5	±	17.7	94.6	162.7	65	9.2	±	3.2	2.3	18.4
Magnesium (mg/L)	40	26.2	±	15.3	0.0	74.2	14	31.5	±	22.0	0.0	74.2	14	30.2	±	7.8	16.3	40.1	12	15.3	±	1.0	13.2	16.7
Sodium (mg/L)	40	75.1	±	46.9	0.0	138.0	14	85.6	±	42.7	0.0	138.0	14	112.8	±	9.5	93.8	134.0	12	18.7	±	10.1	0.1	37.4
Sulfate (mg/L)	160	167.1	±	270.2	2.6	2360.0	53	322.9	±	413.1	17.0	2360.0	42	187.2	±	55.3	123.0	302.0	65	27.2	±	21.8	2.6	135.0
TSS (mg/L)	148	33.4	±	126.7	0.1	1330.0	47	76.1	±	217.1	2.0	1330.0	40	28.6	±	35.7	2.4	218.0	61	3.6	±	4.8	0.1	26.4
Nutrients																								
Ammonia as N (mg/L)	165	0.15	±	0.78	0.01	9.95	54	0.26	±	1.35	0.01	9.95	42	0.14	±	0.13	0.03	0.63	69	0.06	±	0.07	0.02	0.40
Nitrate as N (mg/L)	165	1.32	±	1.77	0.01	7.08	54	1.39	±	1.75	0.01	7.08	42	3.25	±	1.50	0.36	5.87	69	0.08	±	0.11	0.01	0.53
Nitrite as N (mg/L)	165	0.05	±	0.08	0.01	0.51	54	0.04	±	0.05	0.01	0.20	42	0.12	±	0.13	0.01	0.51	69	0.02	±	0.02	0.01	0.11
NitrogenTotal (mg/L)	165	3.11	±	4.25	0.00	38.84	54	4.82	±	6.05	0.23	38.84	42	5.27	±	1.73	2.19	8.41	69	0.45	±	0.85	0.00	6.46
OrthoPhosphate as P (mg/L)	165	0.09	±	0.13	0.01	1.06	53	0.12	±	0.14	0.01	0.77	41	0.09	±	0.10	0.01	0.48	69	0.07	±	0.13	0.01	1.06
Phosphorus as P (mg/L)	165	0.20	±	0.27	0.01	2.19	54	0.32	±	0.39	0.01	2.19	42	0.21	±	0.14	0.06	0.77	69	0.09	±	0.16	0.01	1.33
Dissolved Org Carbon (mg/L)	163	6.37	±	5.51	1.20	37.62	54	10.11	±	7.84	1.49	37.62	42	6.95	±	0.79	5.22	9.08	67	3.00	±	1.32	1.20	6.87
Total Organic Carbon (mg/L)	163	7.63	±	9.87	0.18	102.22	54	11.16	±	9.29	1.63	42.00	42	7.63	±	1.38	5.43	11.90	67	4.78	±	12.26	0.18	102.22
Algal Biomass																								
AFDM (mg/cm ^{2})	146	4.98	±	11.35	0.00	113.38	47	5.03	±	9.75	0.16	48.25	37	7.53	±	18.85	0.07	113.38	62	3.41	±	4.27	0.00	26.63
Chl-a (ug/cm ^{2})	146	6.98	±	9.33	0.15	62.40	47	6.22	±	6.38	0.41	34.00	37	13.65	±	14.35	0.50	62.40	62	3.57	±	3.96	0.15	25.00
Dissolved Metals																								
Arsenic (ug/L)	127	1.81	±	1.21	0.03	6.52	45	2.38	±	1.29	0.11	6.52	31	1.74	±	0.60	0.31	3.48	51	1.34	±	1.21	0.03	5.35
Cadmium (ug/L)	131	0.09	±	0.10	0.01	0.41	47	0.08	±	0.08	0.01	0.32	31	0.20	±	0.10	0.01	0.41	53	0.03	±	0.05	0.01	0.35
Chromium (ug/L)	129	1.18	±	1.26	0.02	7.50	45	1.62	±	1.51	0.15	7.50	31	0.92	±	0.60	0.38	2.53	53	0.95	±	1.23	0.02	7.26
Copper (ug/L)	131	5.49	±	5.92	0.04	30.60	47	9.78	±	7.47	0.58	30.60	31	6.09	±	2.40	1.47	13.10	53	1.33	±	0.68	0.04	3.12
Iron (ug/L)	131	103	±	801	0.00	9180	47	40	±	59	0.00	253	31	18	±	30	0.00	156	53	209	±	1257	0.00	9180
Lead (ug/L)	131	0.24	±	0.46	0.01	5.04	47	0.38	±	0.74	0.02	5.04	31	0.26	±	0.13	0.06	0.64	53	0.10	±	0.07	0.01	0.32
Mercury (ug/L)	131	0.00	±	0.01	0.00	0.05	47	0.01	±	0.01	0.00	0.05	31	0.00	±	0.00	0.00	0.02	53	0.00	±	0.01	0.00	0.04
Nickel (ug/L)	131	4.24	±	8.69	0.32	78.00	47	7.35	±	13.81	0.32	78.00	31	4.73	±	1.30	1.69	7.81	53	1.19	±	0.84	0.32	4.15
Selenium (ug/L)	131	1.33	±	2.16	0.05	11.50	47	2.43	±	3.16	0.10	11.50	31	1.63	±	0.81	0.22	3.28	53	0.18	±	0.14	0.05	0.70
Zinc (ug/L)	131	11.99	±	13.36	0.52	59.30	47	9.08	±	9.24	1.47	59.30	31	30.07	±	12.17	8.39	58.20	53	3.99	±	4.20	0.52	20.30

Figure 1.3

CSCI, ASCI (hybrid, diatom, and soft algae), CRAM, IPI, and attribute scores for effluent, natural, and urban random sites from 2009 – 2024

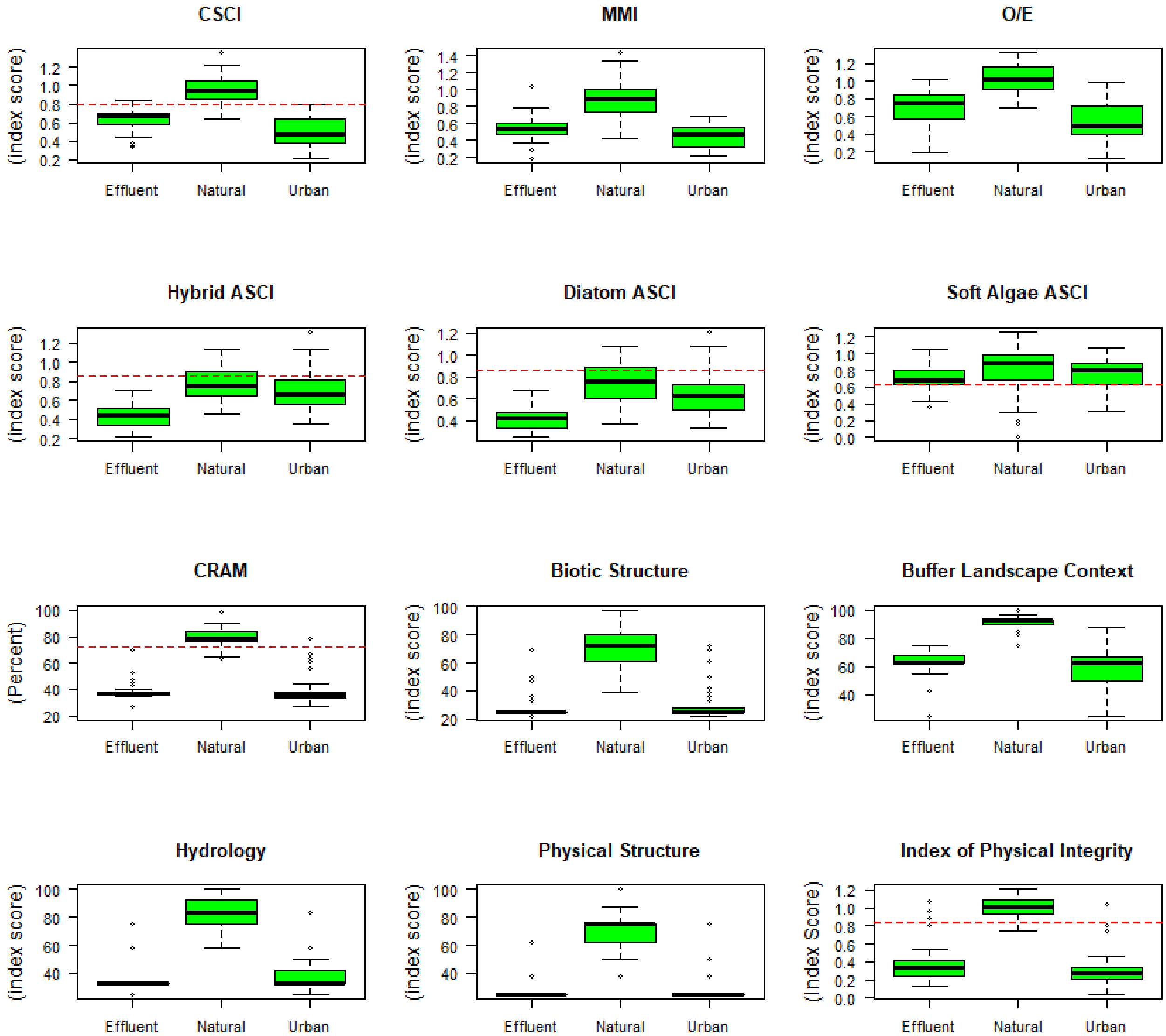
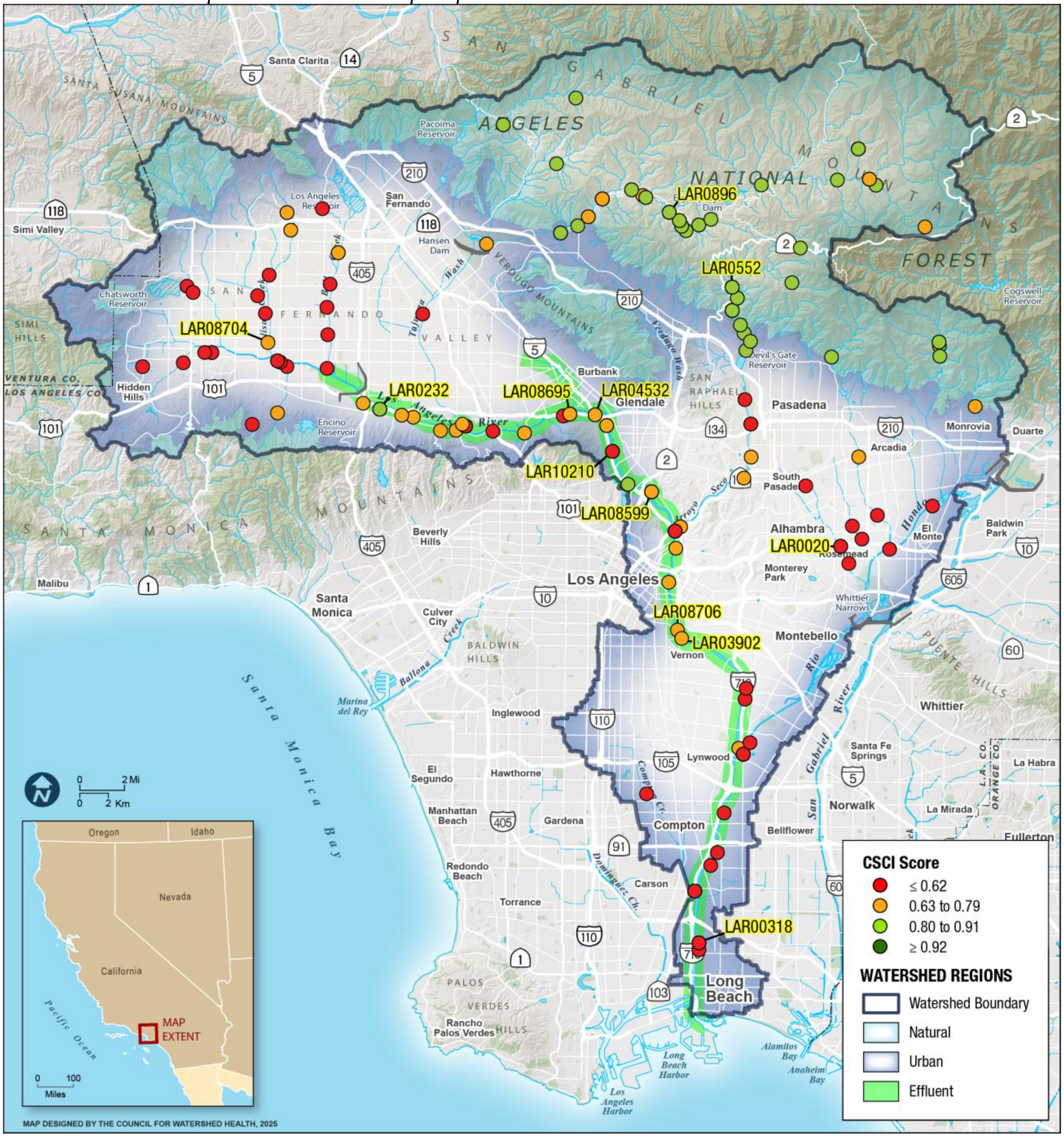


Figure 1.4

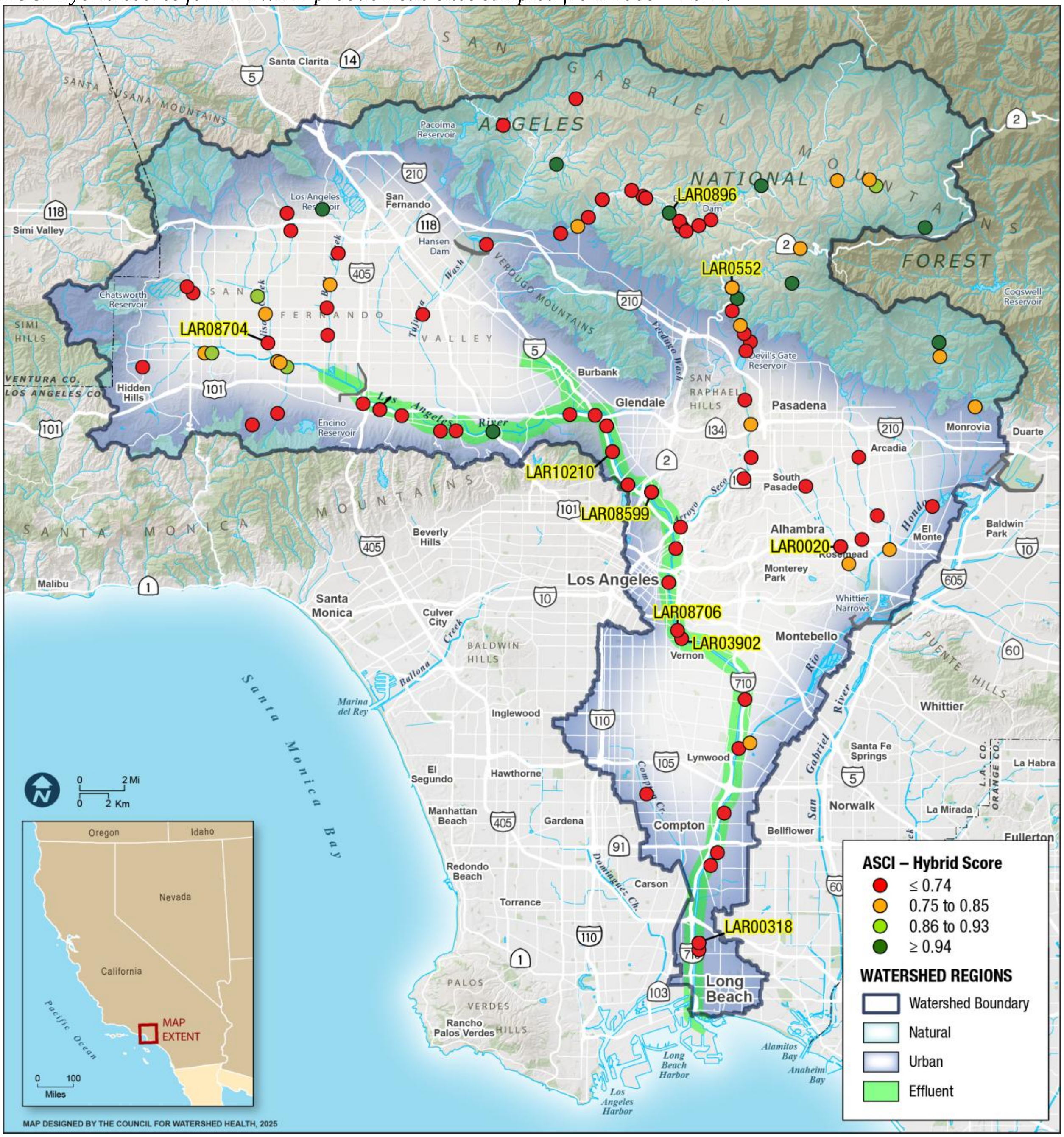
CSCI scores based on probabilistic sites sampled from 2009 – 2024.



Note. Likely intact condition = CSCI ≥0.92; possibly altered condition = CSCI 0.91 to 0.80; likely altered condition = CSCI 0.79 to 0.63; very likely altered condition = CSCI ≤0.62. Sites sampled in 2024 are highlighted.

Figure 1.5

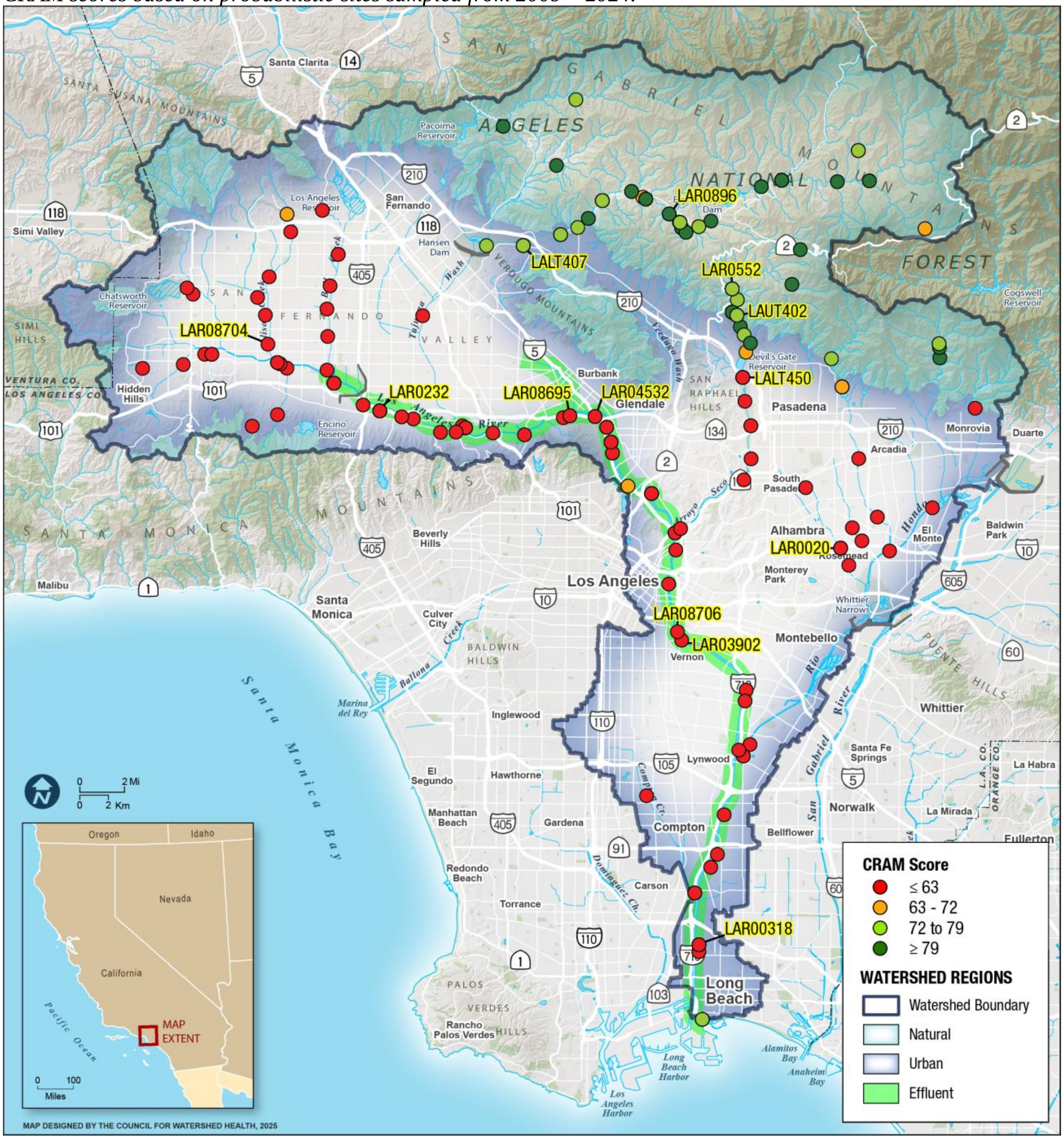
ASCI-hybrid scores for LARWMP probabilistic sites sampled from 2009 – 2024.



Note. Likely intact condition = ASCI ≥0.94; possibly altered condition = ASCI 0.93 to 0.86; likely altered condition = ASCI 0.86 to 0.75; very likely altered condition = ASCI ≤0.74. Sites sampled in 2024 are highlighted.

Figure 1.6

CRAM scores based on probabilistic sites sampled from 2009 – 2024.

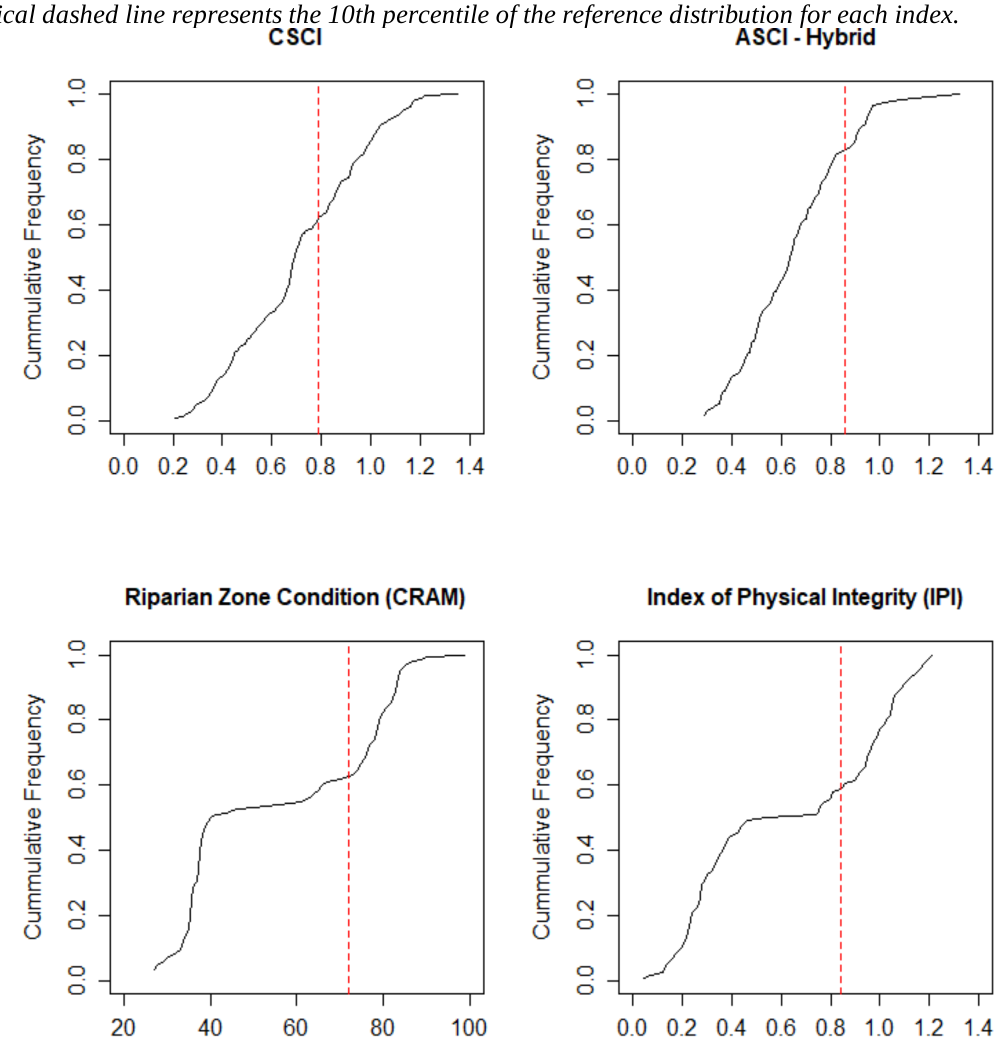


Note. Likely intact condition = CRAM ≥79; possibly altered condition = CRAM 79 to 72; likely altered condition = CRAM 72 to 63; very likely altered condition = CRAM ≤63. Sites sampled in 2024 are highlighted.

The cumulative frequency distribution for the biotic condition index scores provides insight into the percentage of streams that are in reference and non-reference condition according to three different indicators of ecological health (Figure 1.7). In the LARW, most sites are not in biological reference condition and have altered biological condition. Over the 2009 – 2024 monitoring period, approximately 61% of all random sites were altered or were below the reference condition for benthic macroinvertebrate communities (CSCI). In addition, riparian zone habitat conditions (CRAM) were altered or were below the reference thresholds at 62% of random sites. For algal communities (ASCI- hybrid) 83% of random sites were altered or below the reference thresholds. Most watershed sites are altered based on assessments that capture the quality of riparian and physical habitat, and water quality.

Figure 1.7

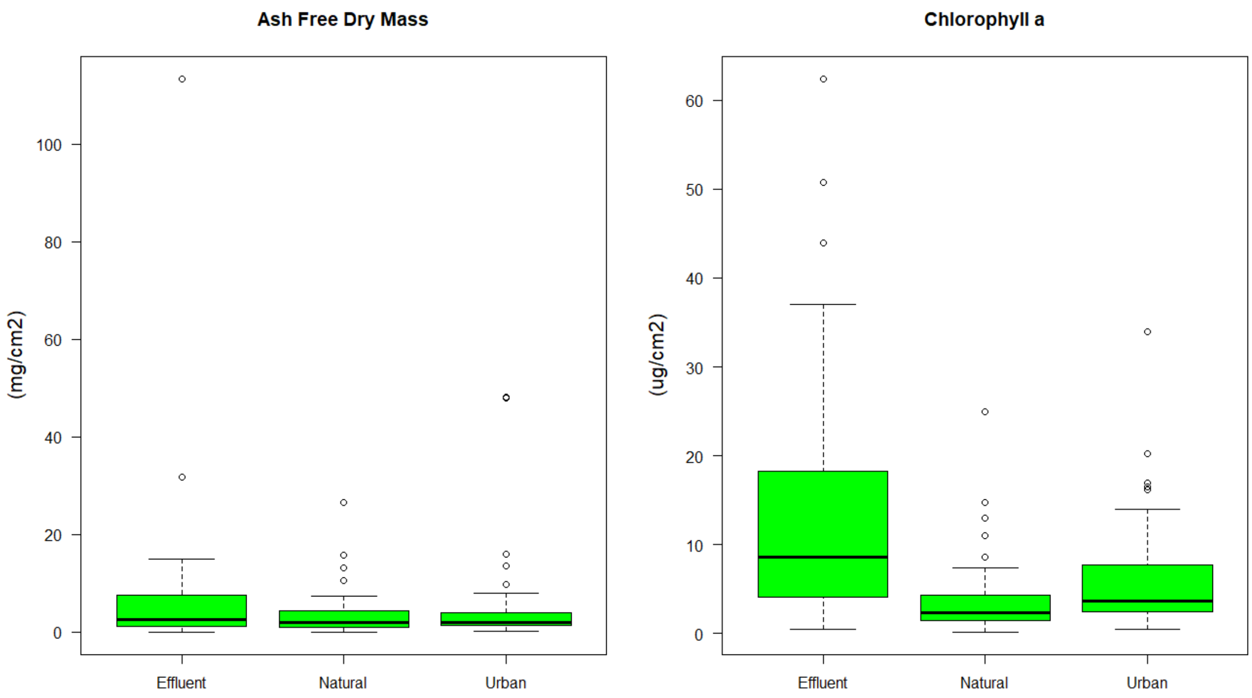
Cumulative frequency distribution of CSCI, ASCI- Hybrid, CRAM, and IPI scores at random sites from 2009 – 2024. Vertical dashed line represents the 10th percentile of the reference distribution for each index.



Ash free dry mass, a measure of organic matter, was similar in all three sub-regions (Figure 1.8 & Table 1.2). Chlorophyll a was highest in effluent (M = 13.65 µg/cm ^{2}) and urban (M = 6.22 µg/cm ^{2}) sub-regions. Algal growth is encouraged by environmental conditions, such as nutrients, warm temperatures, and sunlight. These conditions are found in urban and effluent dominated regions due to reduced canopy cover, as compared to natural sub-regions, and increased nutrient inputs.

Figure 1.8

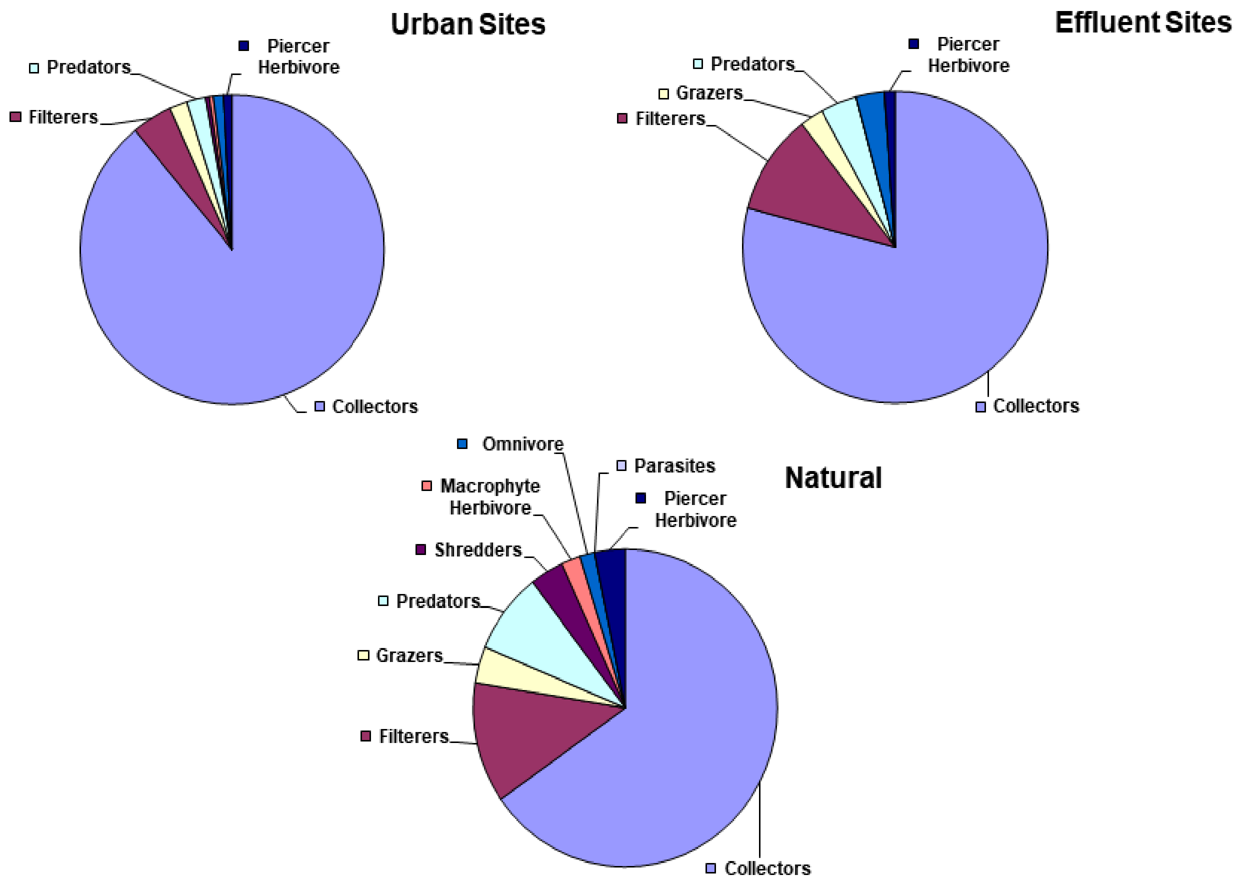
Ash free dry mass and chlorophyll A concentrations in effluent, natural, and urban regions in the watershed in 2024.



The proportion of BMI feeding groups represented in each of the three watershed sub-regions for all random sites from 2008 – 2024 is shown in Figure 1.9. Collectors, a feeding assemblage that feeds on fine particulate organic matter in the stream bottom, were the dominant group in each sub-region. Collectors make up a larger proportion of the total in the effluent-dominated (79%) and urban (89%) sub-regions of the watershed. Effluent dominated and urban sites are mostly concrete-lined with little or no canopy cover and substrate complexity, and hence have a smaller relative abundance of other feeding groups compared to natural sites. Natural sites in the upper watershed had a more balanced community assemblage represented by eight feeding groups, although still dominated by collectors (65%). Filterers were also more prevalent in this sub-region, generally indicating better water quality conditions (Vannote et al. 1980).

Figure 1.9

Relative proportion of benthic macroinvertebrate functional feeding groups in each watershed sub-region for 2008-2024 random sites.



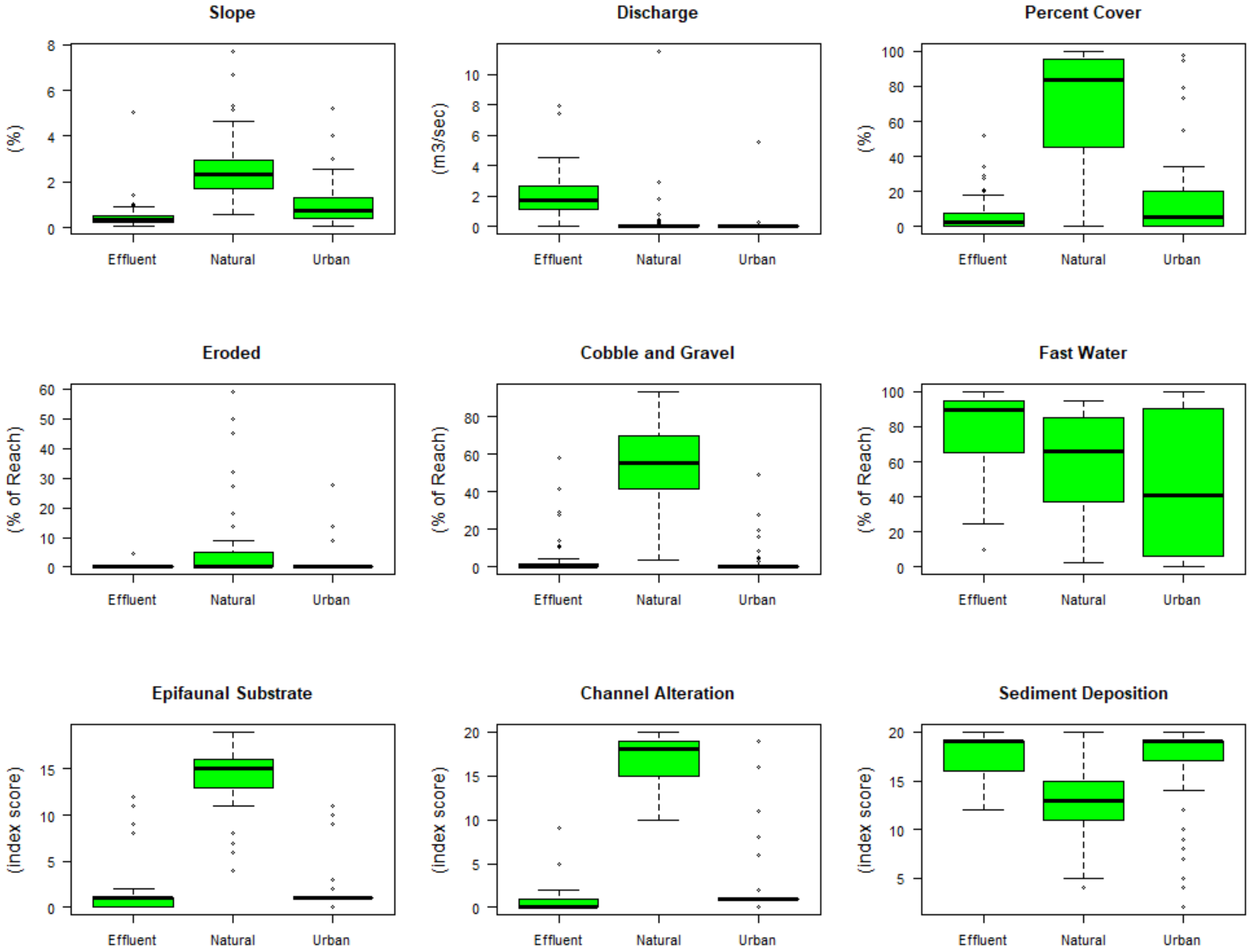
b. *Physical Habitat Assessments*

Physical habitat assessments were performed following SWAMP protocols (Ode *et al.* 2016). SWAMP protocols focus on streambed quality and the condition of the surrounding riparian zone out to 50 meters. Overall, natural sites have the best physical habitat parameters as compared to other sub-regions (Figure 1.10). Natural subregions had the highest percent canopy cover, percent eroded, percent cobble and gravel, epifaunal substrate scores, and channel alteration scores. Epifaunal substrate score, which was markedly higher in natural sub-regions, is a measure of the amount of natural streambed complexity due to the presence of cobble, fallen trees, undercut stream banks, etc. This complexity is important for healthy benthic macroinvertebrate and fish communities.

Natural sites have minimal channel alteration, resulting in high scores. In contrast, effluent-dominated and urban sites are mostly channelized and concrete-lined, resulting in low scores. Percent bank erosion and sediment deposition scores, where low deposition corresponds to high scores, should be considered and assessed before management actions are taken.

Figure 1.10

Box-and-whisker plots showing the median and range of representative physical habitat parameters measured in each of the three LARW regions from 2009 - 2024.

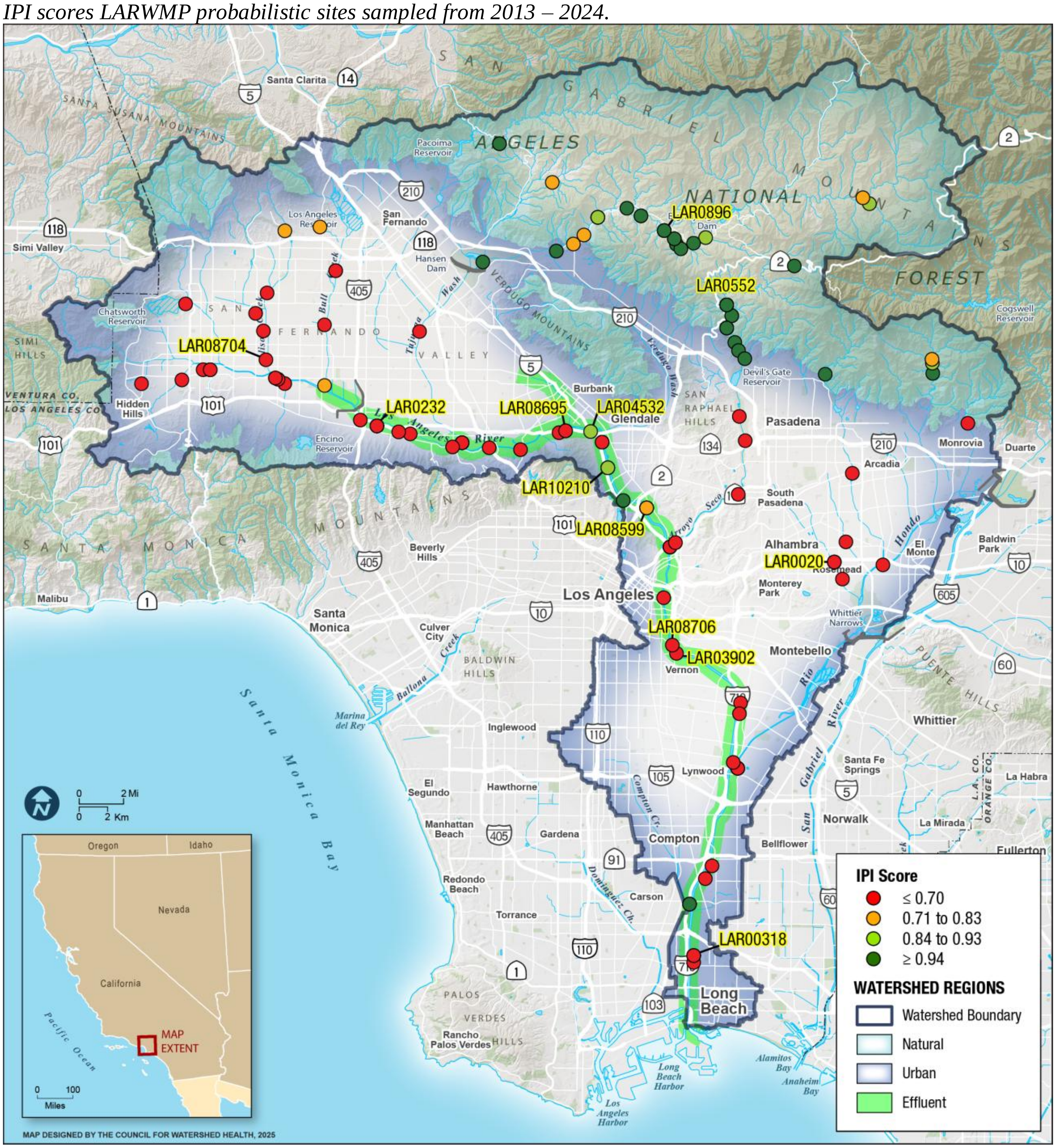


Note. Channel alteration, epifaunal substrate cover, and sediment deposition are scored assessments, higher scores denote better conditions. Channelized streams are an exception. Channelization of streams decreases sedimentation, which results in higher sediment deposition scores. This does not indicate that these sites have better physical habitat.

The Index of Physical Integrity (IPI), which incorporates several physical habitat metrics, showed the majority of natural sites had physical habitat conditions that were in the possibly altered/likely intact categories compared to effluent and urban sites (Figure 1.11).

Figure 1.11

IPI scores LARWMP probabilistic sites sampled from 2013 – 2024.



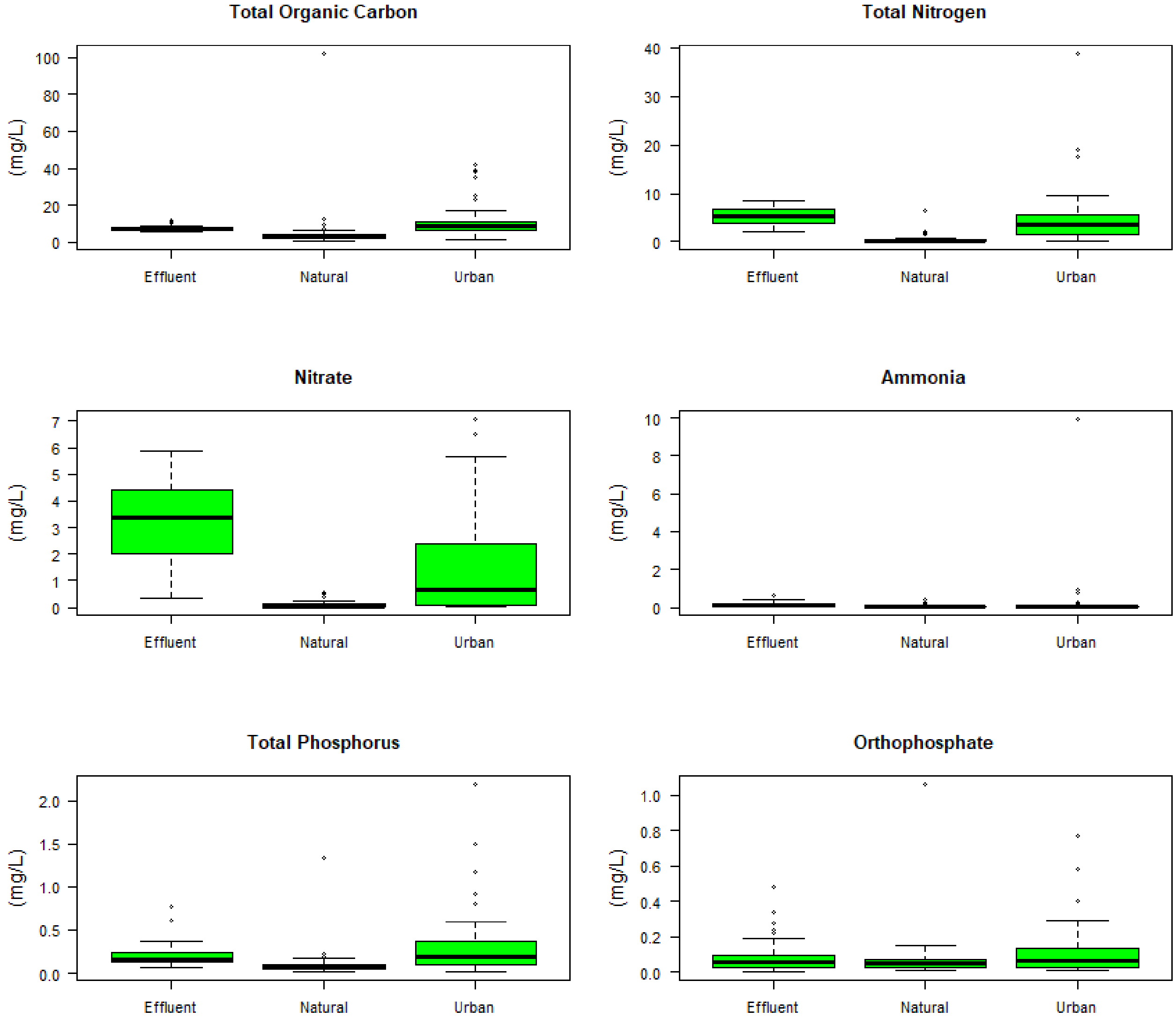
Note. Likely intact condition = ≥0.94; possibly altered condition = 0.93 to 0.84; likely altered condition = 0.83 to 0.71; very likely altered condition = ≤ 0.70. Sites sampled in 2024 are highlighted.

c. *Aquatic Chemistry and Physical Habitat*

The differences in nutrient concentrations between watershed subregions is shown in Figure 1.12. From 2009 to 2024, effluent-dominated and urban sites had greater median concentrations of many nutrients compared to natural sites. For example, Total Nitrogen and Nitrate-N concentrations were highest in the effluent-dominated regions. Total phosphorus, total organic carbon, and orthophosphate were somewhat greater in the urban region.

Figure 1.12

Box-and-whisker plots showing the median and range of representative nutrients measures in each of the three Los Angeles River watershed regions from 2009 - 2024

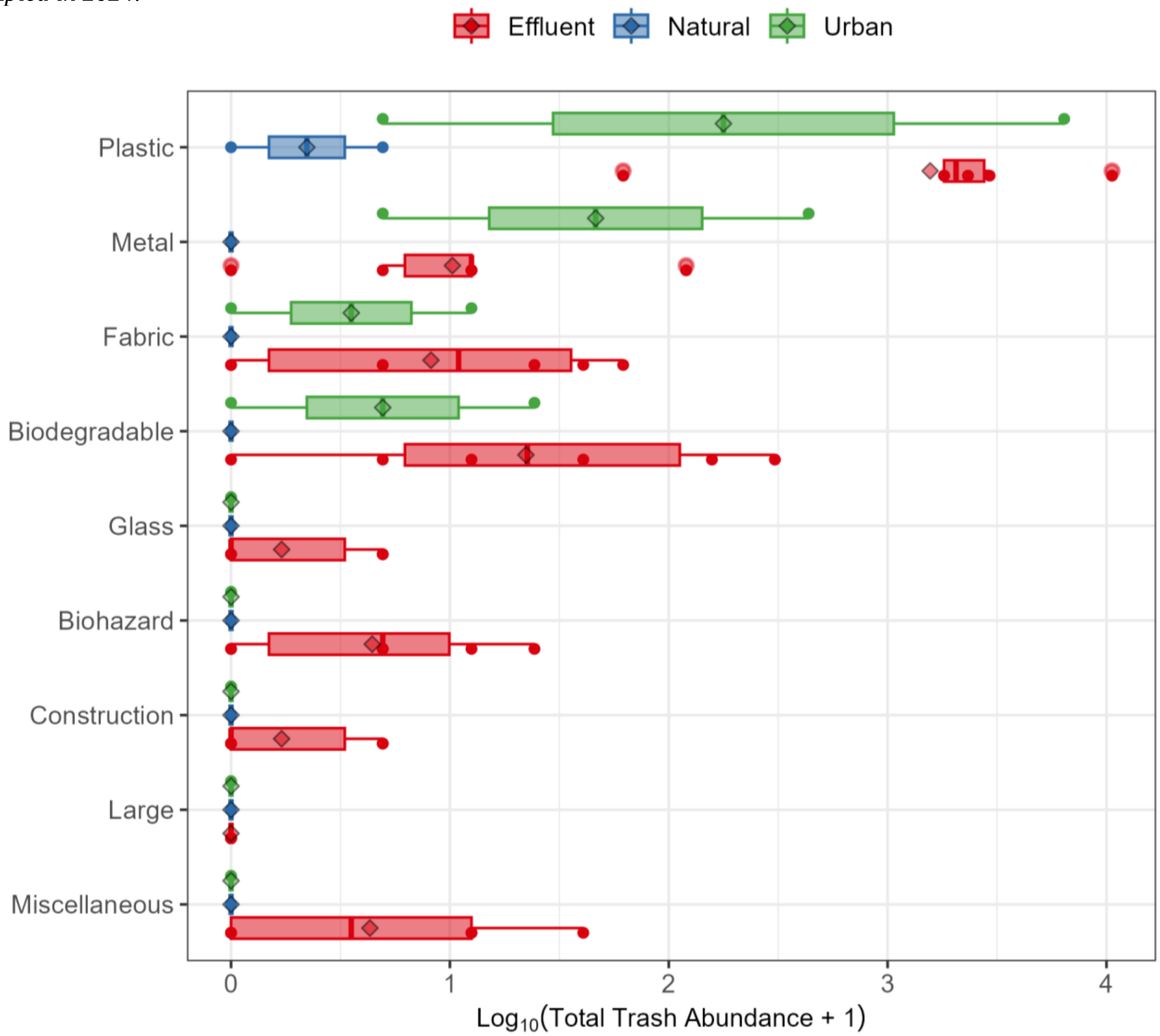


d. ***Trash Assessments***

In 2024, trash assessments were conducted at Effluent (n = 6), Natural (n = 2), and Urban (n = 2) sites (Figure 1.13**.** On average, plastic was the most prevalent trash type across all subregions in 2024 (Figure 1.14). Other common trash types included metal, fabric/cloth, and biodegradable items, which were consistently observed across the three subregions. Analysis from 2018 to 2024 shows the trash profiles of each subregion (Figure 1.15). Plastic consistently made up over 50% of the waste in all subregions. Effluent and Urban sites exhibited the greatest diversity in trash categories. Urban areas showed a higher prevalence of metal, glass, and construction materials. Natural areas consistently had the lowest total trash abundance.

Figure 1.13

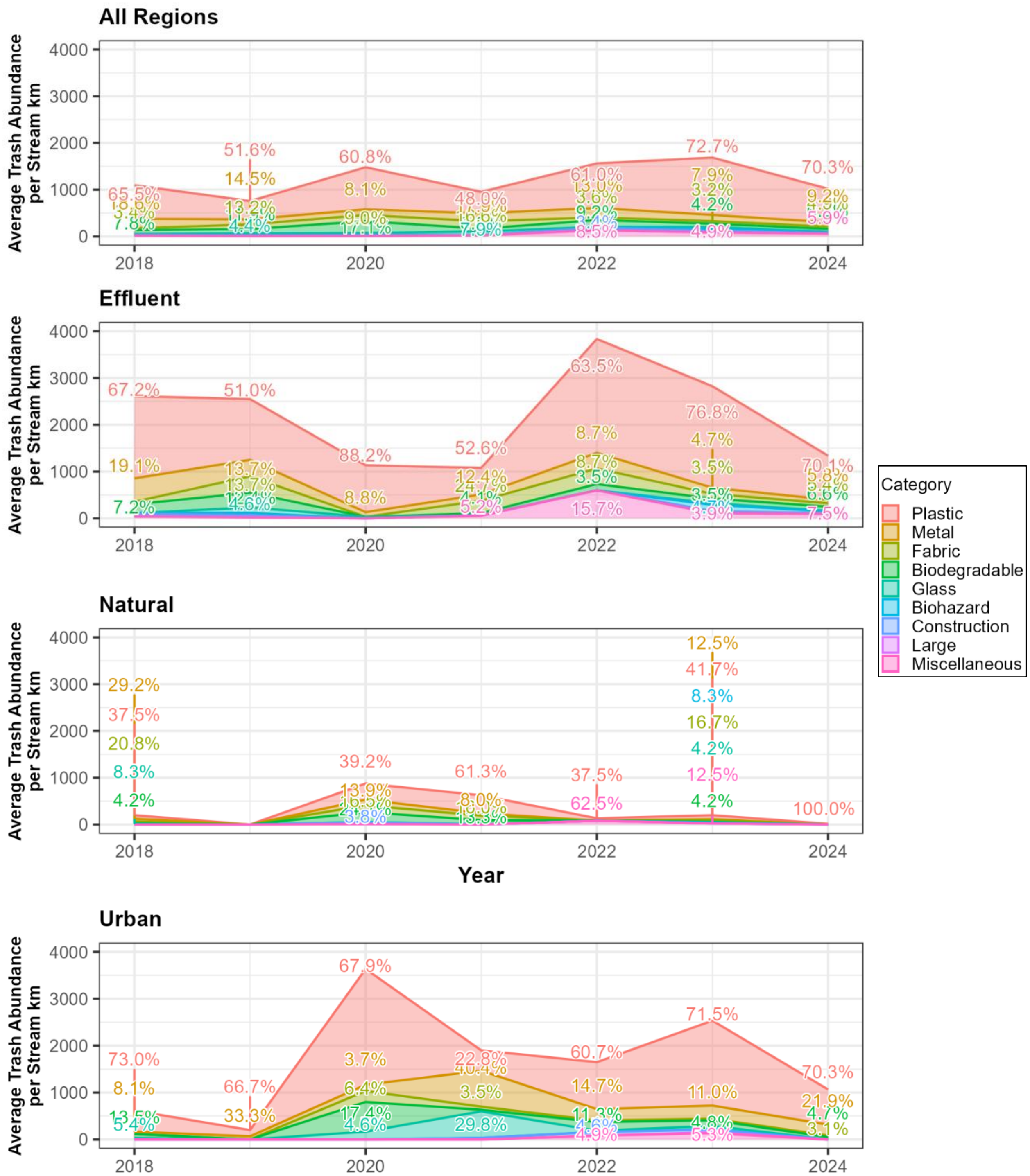
Distribution of total trash abundance (Log$_{10}$ transformed) for each trash category and subregion of LAWRMP sites sampled in 2024.



Note. Diamonds represent averages.

Figure 1.14

Timeline of trash category distribution for each sub-region and all watershed regions of LARWMP sites sampled from 2018 - 2024.

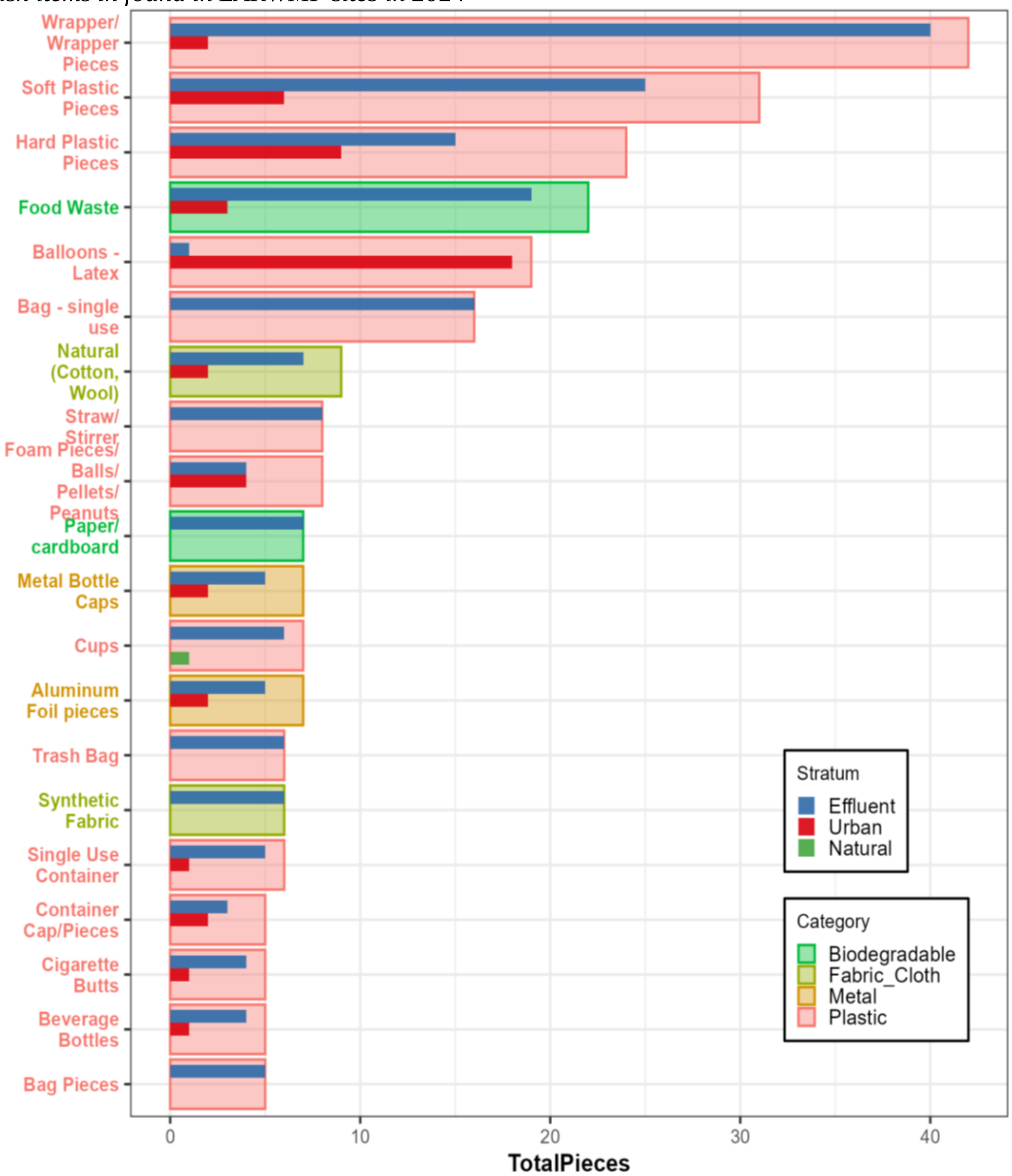


Note. Annual percentage of total trash abundance (>3%) by category is shown. Natural (n = 2) areas consistently had the lowest trash abundance compared to the other subregions.

Figure 1.15 shows the top 20 trash items both overall and by subregion. Similar to last year, wrappers/wrapper pieces were the most abundant trash items overall. Effluent sites were also affected by soft plastic, hard plastic, and biodegradable food waste. In contrast, urban sites assessed were most affected by latex balloons and hard plastics. The differences in trash profiles across subregions can likely be attributed to varying site uses and activity levels of each area. For example, balloons are generally more common in areas where social gatherings and community events take place, such as urban parks.

Figure 1.15

Top 20 trash items in found in LARWMP sites in 2024



Note. The larger background bars represent the total trash piece counts across all sites and are color coded by their respective categories. The smaller overlaid bars represent the distribution of pieces by stratum. Effluent sites dominated the overall sample distribution and are overrepresented in this graph.

Question 2. Are conditions at areas of unique interest getting better or worse?

1. Background

Question 2 monitoring efforts focus on specific locations in the watershed that represent unique areas of special concern to the workgroup. The methods that were used to better understand the conditions of sites that are unique areas of interest are consistent with those described in the previous chapter. These sites are monitored annually to help better understand how conditions in the watershed are changing over time and when protection or restoration is needed. For this purpose, two programs were created.

a. *Freshwater Target Sites*

Originally, four target sites were established on lower watershed tributaries upstream of their confluence points with the Los Angeles River to monitor water chemistry and assess biological, riparian, and physical habitat conditions. These sites differ from the random sites used to assess ambient watershed conditions in that their locations are fixed and sites are sampled regularly. Over time these data are being used to assess trends and to determine if changes in these trends can be attributed to natural, anthropogenic, or watershed management changes.

In 2018, the TSG proposed a new site of interest: Lewis McAdams Park (LMP; LAR08599) (Table 2.1). This unlined location was a random site in 2015, dredged in 2018, and would become a revisit site in 2019.

In 2021, Los Angeles County Flood Control District began monitoring a new site along Glendale Narrows (GN; LAR10210). GN was chosen due to its soft bottom location on the main-channel in an area of the River with few LARWMP sampling locations.

Table 2.1

Freshwater Target Sites

Site ID	Targeted Confluence Site	Channel Type	Latitude	Longitude
LAR08599	Lewis McAdams Park	Unlined	34.10603	-118.24338
LAR10210	Glendale Narrows	Unlined	34.13224	-118.27407

b. *High-Value Habitat Sites*

Nine locations were chosen to assess trends in riparian zone conditions at sites deemed by the workgroup to be unique (Table 2.2). The emphasis of these assessments is on riparian habitat conditions using CRAM. Riparian zone conditions at these sites provide trend data and valuable baseline data for potential habitat restoration or protection efforts. Since CRAM scores do not vary greatly from year to year, these sites are rotated and each site is sampled every 2-4 years.

Table 2.2

High Value Habitat Sites

Site ID	High Value Habitat Site	Channel Type	Latitude	Longitude
LALT450	Arroyo Seco USGS Gage	Unlined	34.18157	-118.17297
LALT400	Glendale Narrows	Unlined	34.139368	-118.2752
LALT404	Golden Shores Wetlands	Unlined	33.76442	-118.2039
LALT405	Sepulveda Basin	Unlined	34.17666	-118.49335
LALT406	Eaton Wash	Unlined	34.17463	-118.0953
LALT407	Haines Creek Pools and Stream	Unlined	34.2679	-118.3434
LAUT401	Tujunga Sensitive Habitat	Unlined	34.28220	-118.22160
LAUT402	Upper Arroyo Seco	Unlined	34.22121	-118.17715
LAUT403	Alder Creek	Unlined	34.30973	-118.14190

Note. Sites sampled in 2024 are highlighted.

Figure 2.1

Map of Freshwater Target Sites and High Value Habitat Sites in 2024.

Note. Sites sampled in 2024 are highlighted.

2. Trends at Freshwater Target Sites

A total of 12 samples were collected from the confluence locations annual surveys from 2015 to 2024 (Figure 2.1). The goal of repeated annual sampling at these locations is to monitor changing conditions. Samples were collected and analyzed for aquatic chemistry, biological and riparian habitat condition (CRAM), and physical habitat condition.

a. *Aquatic Chemistry*

In 2024, the LMP (LAR08599) and GN (LAR10210) sites were monitored. The general chemistry of these sites was nearly identical, likely owing to how close these sites are to each other (Figure 2.2). Similar to 2023, hardness, sulfate, and alkalinity appear to continue their upward trend, though further investigation likely is required to understand influencing factors.

Figure 2.2

General chemistry at confluence sites sampled annually from 2015 - 2024.

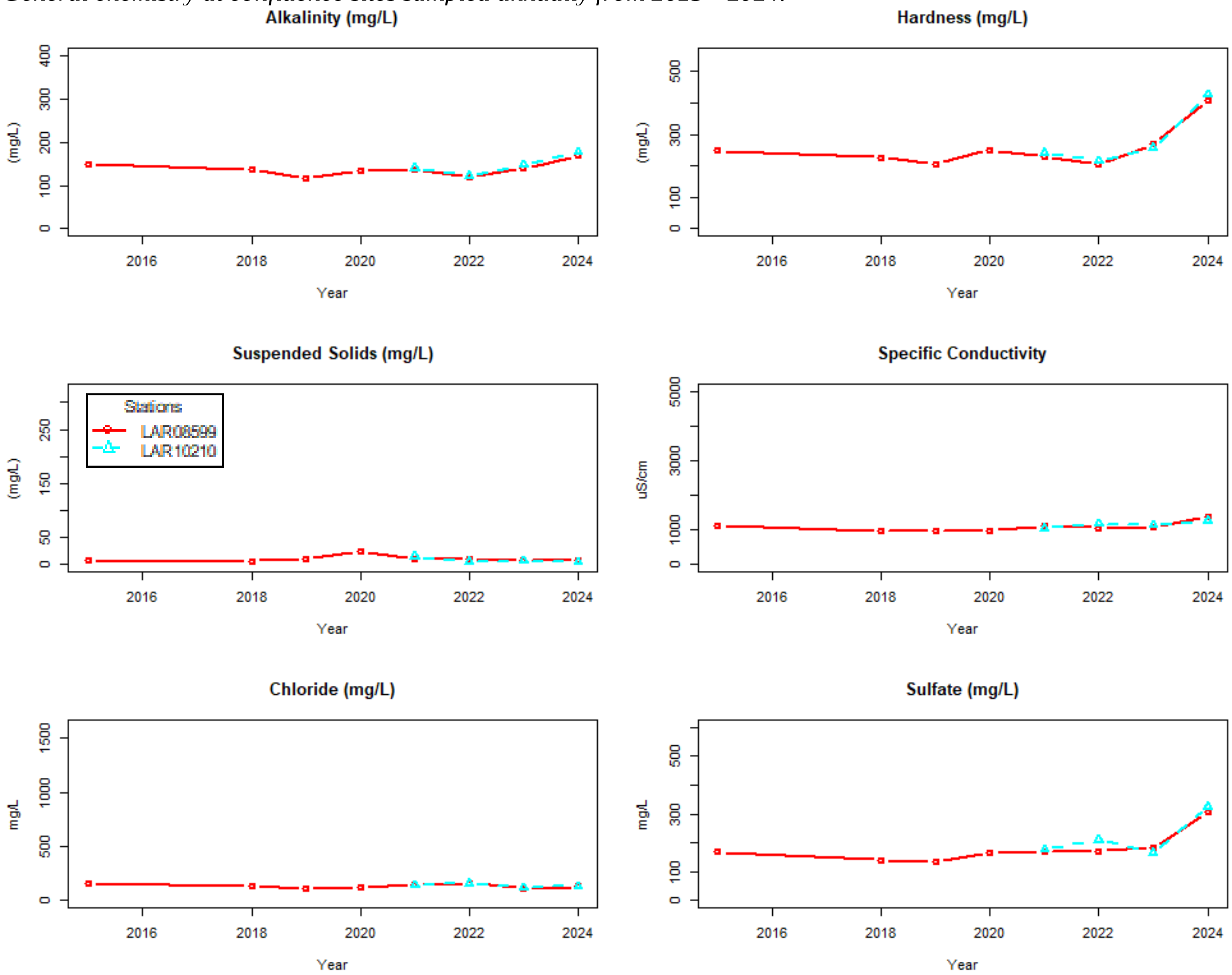
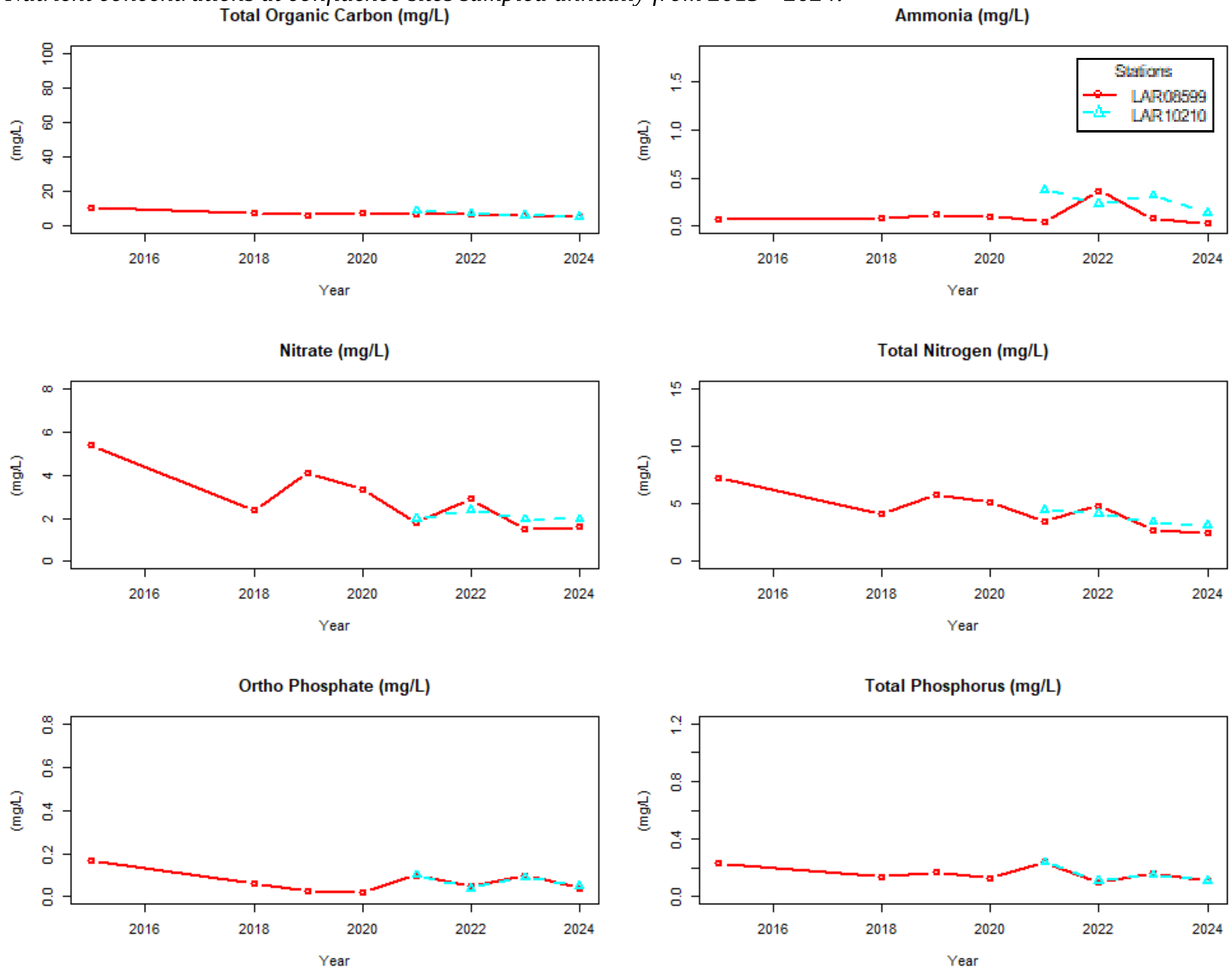


Figure 2.3 summarizes the nutrient concentrations for the trend sites over the last few years. From 2015 - 2024, nitrate-N and total nitrogen concentrations have generally decreased at LMP. Both sites have consistently reported nitrate-N levels below the water quality thresholds set by the Los Angeles Basin Plan (<10 mg/L; LARWQCB 2019). Since monitoring at GN commenced in 2021, concentrations of total organic carbon, nitrate, total nitrogen, orthophosphate, and total phosphorus at both sites are observed to be closely aligned.

Figure 2.3

Nutrient concentrations at confluence sites sampled annually from 2015 - 2024.

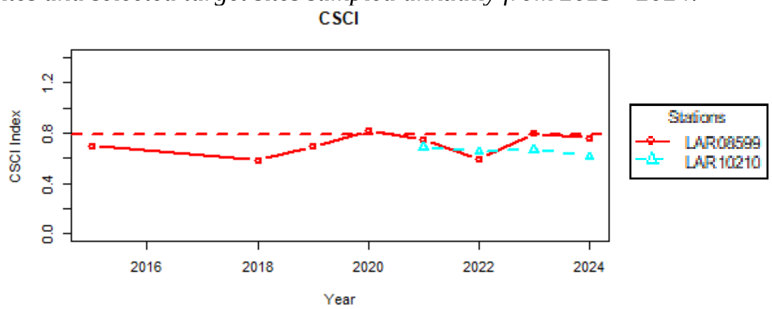


b. ***Biological Condition (CSCI)***

Figure 2.4 presents the 2024 biotic condition index scores for BMI (CSCI) at GN (LAR10210) and LMP (LAR08599). After LMP scored below the reference threshold in 2022, the biotic condition improved in 2023 and has continued to remain stable in 2024. GN has consistently scored below the reference condition (CSCI = 0.79), but has remained stable.

Figure 2.4

CSCI Scores at confluence sites and selected target sites sampled annually from 2015 - 2024.



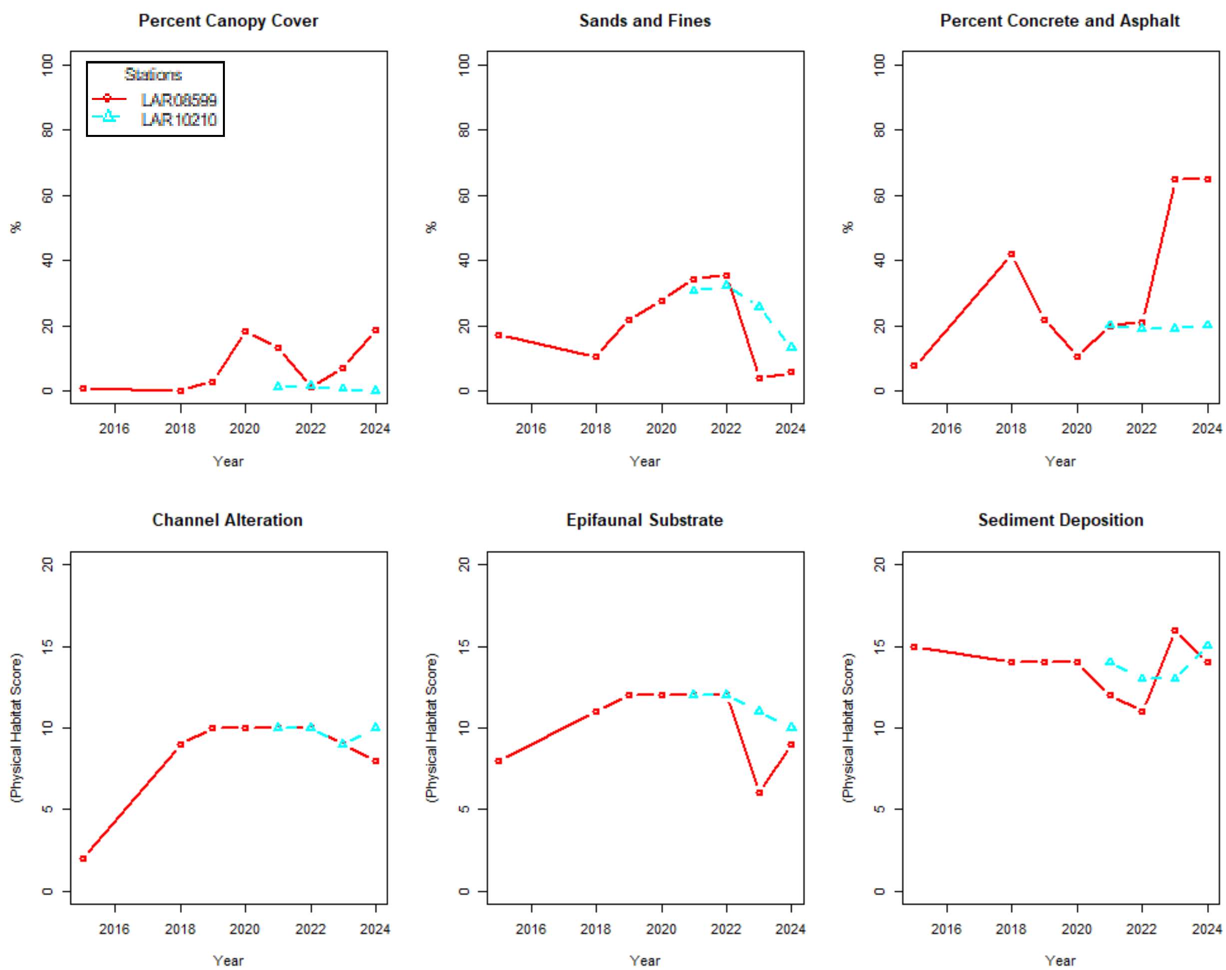
Note. The red dashed horizontal line on the CSCI graph indicates the threshold, below which the site is in non-reference condition (0.79 for CSCI).

c. ***Physical Habitat***

Figure 2.5 shows selected metrics of physical habitat condition. The three top plots show transect-based measurements recorded in conjunction with bioassessment sampling, while the three bottom plots show three visual physical habitat assessment scores. It is important to note that though visual physical habitat assessments are standardized as much as possible, they still may vary between users. As a result, only large changes in these assessments should be considered as reflecting changing conditions at a site. In 2024, the LMP physical habitat metrics saw large changes from the previous year in percent canopy cover and epifaunal substrate. At GN, sands and fines and sediment deposition showed large changes. Site metric changes at these sites could be due to the natural recovery after the historic rainfall events in 2022 scoured the stream bed. Evidence of habitat recovery can be seen in LMP's increased canopy cover, and epifaunal substrate.

Figure 2.5

Physical habitat at confluence sites sampled annually from 2015 - 2024.



3. High-Value Habitat Sites

The condition of the riparian zone was assessed at nine sites deemed by members of the Workgroup to be minimally impacted, high-value, or sites at high risk of impact/loss in the watershed (Table 2.3). The goal of measuring site condition over time is to ensure that conditions are not degrading. CRAM assessments at the riparian zone sites commenced in 2009. The Workgroup determined that subsequent visits would occur every two to three years since conditions at these locations were not changing rapidly. In 2024, Haines Creek Pools and Stream (LALT407), Arroyo Seco USGS Gage (LALT450), and Upper Arroyo Seco (LAUT402) were assessed for riparian habitat conditions (Table 2.3).

Table 2.3

Summary of latest Overall CRAM scores at High Value Habitat Sites

Site ID	High Value Habitat Site	Year Sampled	Overall CRAM Score	ΔCRAM Score	Condition
LALT450	Arroyo Seco USGS Gage	2024	63	-16	Very Likely Altered Condition
LALT400	Glendale Narrows	2023	54	+8	Very Likely Altered Condition
LALT404	Golden Shores Wetlands	2020	75	+7	Possibly Altered Condition
LALT405	Sepulveda Basin	2023	63	+7	Very Likely Altered Condition
LALT406	Eaton Wash	2023	65	-5	Likely Altered Condition
LALT407	Haines Creek Pools and Stream	2024	76	-2	Possibly Altered Condition
LAUT401	Tujunga Sensitive Habitat	2022	77	-4	Possibly Altered Condition
LAUT402	Upper Arroyo Seco	2024	75	-4	Possibly Altered Condition
LAUT403	Alder Creek	2022	80	-3	Likely Intact Condition

Note. Sites sampled in 2024 are highlighted. ΔCRAM Score is calculated as the CRAM score from the latest assessment year minus the score from the previous assessment year; positive values indicate an increase, and negative values indicate a decrease. Score is considered significantly greater than another Index Score if the score is ≥7 points different (CWMW 2019).

CRAM scores at lower watershed sites (prefix LALT) have usually fallen below the 10th percentile of the reference distribution of sites throughout California, indicating they are 'likely altered' (Table 2.3). Some high value sites in the Lower Watershed have been an exception to this general trend of poorer condition at lower watershed sites. This may be because many urban high value sites are downstream of areas that were burned in the 2009 Station Fire and/or are undergoing restoration activities, which include LALT450 and LALT407.

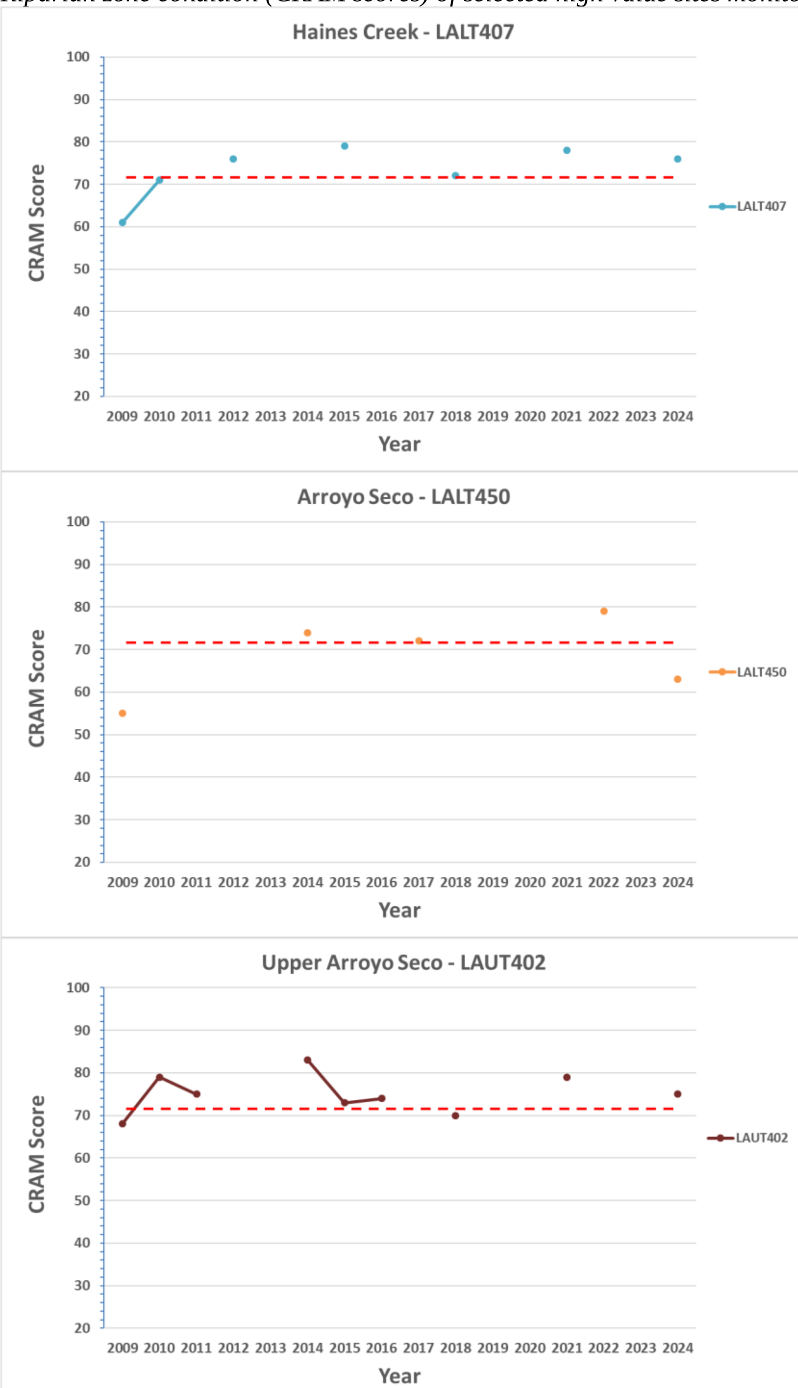
In 2024, LALT450's overall CRAM score decreased by 16 points since the last assessment in 2021, falling below reference condition. This change indicates a significant decline in riparian conditions at the site. In contrast, LALT407 has remained stable between 2024 and 2021 and stayed above the reference threshold condition.

The best riparian zone conditions have been found consistently at sites located in the upper watershed (prefix LAUT). The 2009 Station Fire created the opportunity for the LARWMP program to better understand the impact of fire to riparian habitats and recovery. Upper watershed sites that burned included: Tujunga Sensitive Habitat (LAUT401), Upper Arroyo Seco

(LAUT402), and Alder Creek (LAUT403). Since the 2009 Station Fire, all three upper watershed sites have remained stable and above reference condition. In 2024, LAUT403 continued this trend.

Figure 2.6

Riparian zone condition (CRAM scores) of selected high value sites monitored from 2009 - 2024



Note. The red horizontal line represents the 10th percentile of the reference distribution of sites in California. Scores below this line represent *'likely altered'* habitat.

Question 3. Are receiving waters near permitted discharges meeting water quality objectives?

1. Background

Question 3 addresses the potential impacts of permitted point-source discharges on the Los Angeles River, its tributaries, and receiving waters' ability to meet the Water Quality Objectives set forth in the Los Angeles Basin Plan (LARWQCB 2019) and the National Primary Drinking Water Regulations (USEPA 2002). The data compiled by LARWMP include indicator bacteria (*E. coli*), nutrients, metals, and trihalomethanes. These parameters are measured to provide a basic assessment of water quality and include the contaminants potentially introduced into a stream system via effluent from Publicly Owned Treatment Works (POTWs).

This chapter summarizes National Pollutant Discharge Elimination System (NPDES) monitoring data for the period from January through December 2024 for three major POTWs that discharge into the Los Angeles River: The City of Los Angeles' Donald C. Tillman Water Reclamation Plant (DCTWRP), the City of Los Angeles' Glendale Water Reclamation Plant (LAGWRP), and the City of Burbank's Water Reclamation Plant (BWRP). Site codes for the receiving water stations upstream and downstream of each POTW's discharge and their locations are shown in Table 3.1 and Figure 3.1, respectively.

Table 3.1

Station designations for NPDES monitoring sites

POTW	NPDES No.	Upstream Site	Downstream Site
City of Los Angeles - Tillman	CA0056227	LATT612	LATT630
City of Los Angeles - Glendale	CA0053953	LAGT650	LAGT654
City of Burbank - Burbank	CA0055531	RSW-002U (R-1)	RSW-002D (R-2)

Figure 3.1

NPDES receiving water sites monitored by the City of Los Angeles and the City of Burbank.

Receiving water stations are monitored by the permittees as a requirement of their NPDES permits and were chosen to best represent locations upstream and downstream of the discharge locations. Non-detects and detected, but not quantifiable (DNQ) values in the analysis were estimated at half the MDL. Values were compared to WQOs described in Table 3.2. In 2020, new water quality objectives for *E. coli* were made effective in City of Los Angeles's permits to assess the water quality upstream and downstream of the discharge (LARWQCB 2020a; 2020b).

Table 3.2

Freshwater WQOs for Nutrients, Indicator Bacteria, and Total Trihalomethanes.

Parameter	WQO
Nitrate-nitrogen plus nitrite-nitrogen (NO_3-N + NO_2-N)	8.0 mg/L
Nitrate-Nitrogen (NO_3-N)	10.0 mg/L
Nitrite-Nitrogen (NO_2-N)	1.0 mg/L
REC-1 $_{STV}$ for Indicator Bacteria [a]	320 MPN/100mL
Total Trihalomethanes[b]	80 µg/L

Note. This table was adapted from the Los Angeles Basin Plan and amendments (LARWQCB 2019). WQO values were last updated in May 2019.
[a] REC-1_{STV} refers to the REC-1 statistical threshold value (STV) for indicator bacteria, *E. coli*. Details of indicator bacteria standards are discussed in Question 4.
[b] The total trihalomethane WQO is from the USEPA's National Primary Drinking Water Regulations (USEPA 2002) Maximum Contaminant Level Goals.

Ammonia is toxic to aquatic life and the proportion of toxic ammonia-N (NH_3) to total ammonium (NH_4) depends on pH and temperature. To account for this, the ammonia-N WQO ($[NH_3]_{WQO}$) under specific water quality conditions is determined using a function of pH and temperature (LARWQCB 2019).

The difference between the sample NH_3 value and its corresponding WQO is determined by the following equation:

$$[NH_3]_{Sample} - [NH_3]_{WQO} = \Delta NH_3$$

Where:
$[NH_3]_{Sample}$: Ammonia-N concentration (mg/L) of the sample
$[NH_3]_{WQO}$: Ammonia-N WQO (mg/L) under the Sample's water quality conditions
ΔNH_3 : ammonia-N sample-WQO difference (mg/L)

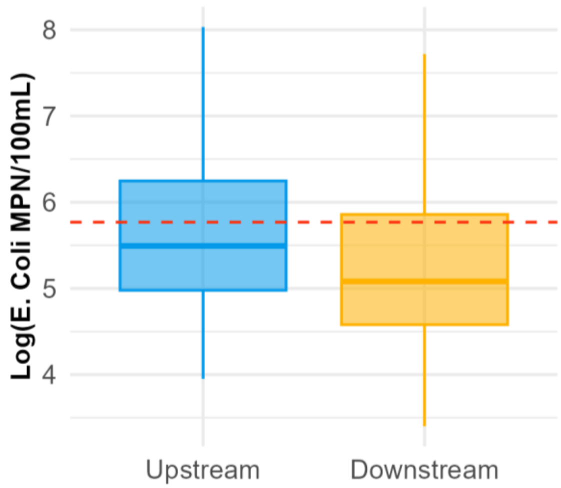
If $\Delta NH_3 < 0$, then the sample complies with the ammonia-N WQO. Conversely, if $\Delta NH_3 \geq 0$, then the sample exceeds the WQO.

2. City of Los Angeles - DCTWRP

The distribution of *E. coli* concentrations above and below the City of Los Angeles' DCTWRP discharge location are shown in Figure 3.2. In 2024, approximately 38% of upstream samples (*M* = 454 MPN/100mL) and 32% of the downstream samples (*M* = 320 MPN/100mL) exceeded the REC-1_{STV}.

Figure 3.2

Log10-transformed distributions of E. coli concentrations upstream and downstream of DCTWRP discharge in 2024.



Note. The red dashed horizontal line denotes REC-1_{STV} = 320 MPN/100mL. Downstream *E. coli* concentrations (*M* = 320, *SD* = 450 MPN/100mL) were significantly lower than upstream (*M* = 454, *SD* = 580 MPN/100mL) at DCTWRP (*paired t-test*: t(46) = 2.5 , p = 0.02).

Table 3.3 shows the average concentrations of several nitrogen species observed at a site upstream and downstream of DCTWRP discharge. Nitrate-N, nitrite-N, and ammonia-N were tested weekly. Average downstream concentrations of nitrate-N and nitrite-N were higher than upstream locations. Both locations were below water quality objectives for all nutrients (Table 3.3).

Table 3.3

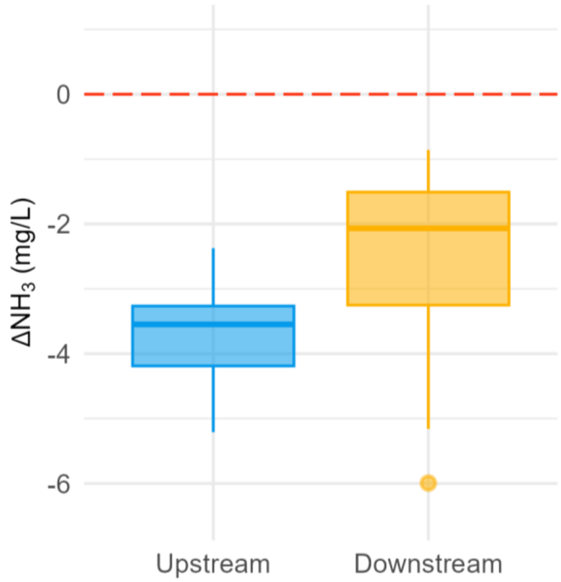
Range of nutrient concentrations upstream and downstream of DCTWRP discharge in 2024

Position	N-Species	Mean	Median	Max	SD
Upstream	NH_3 - N	0.13	0.10	0.51	0.11
	NO_3 - N	2.80	2.62	5.91	0.92
	NO_2 - N	0.07	0.06	0.23	0.05
Downstream	NH_3 - N	0.08	0.03	0.30	0.09
	NO_3 - N	3.22	2.98	6.17	1.13
	NO_2 - N	0.06	0.06	0.15	0.04

ΔNH_3 upstream and downstream of DCTWRP effluent are shown in Figure 3.3. In 2024, there were no ammonia-N WQO exceedances both upstream and downstream of the DCTWRP discharge point.

Figure 3.3

Ammonia-N WQO difference upstream and downstream of DCTWRP in 2024.



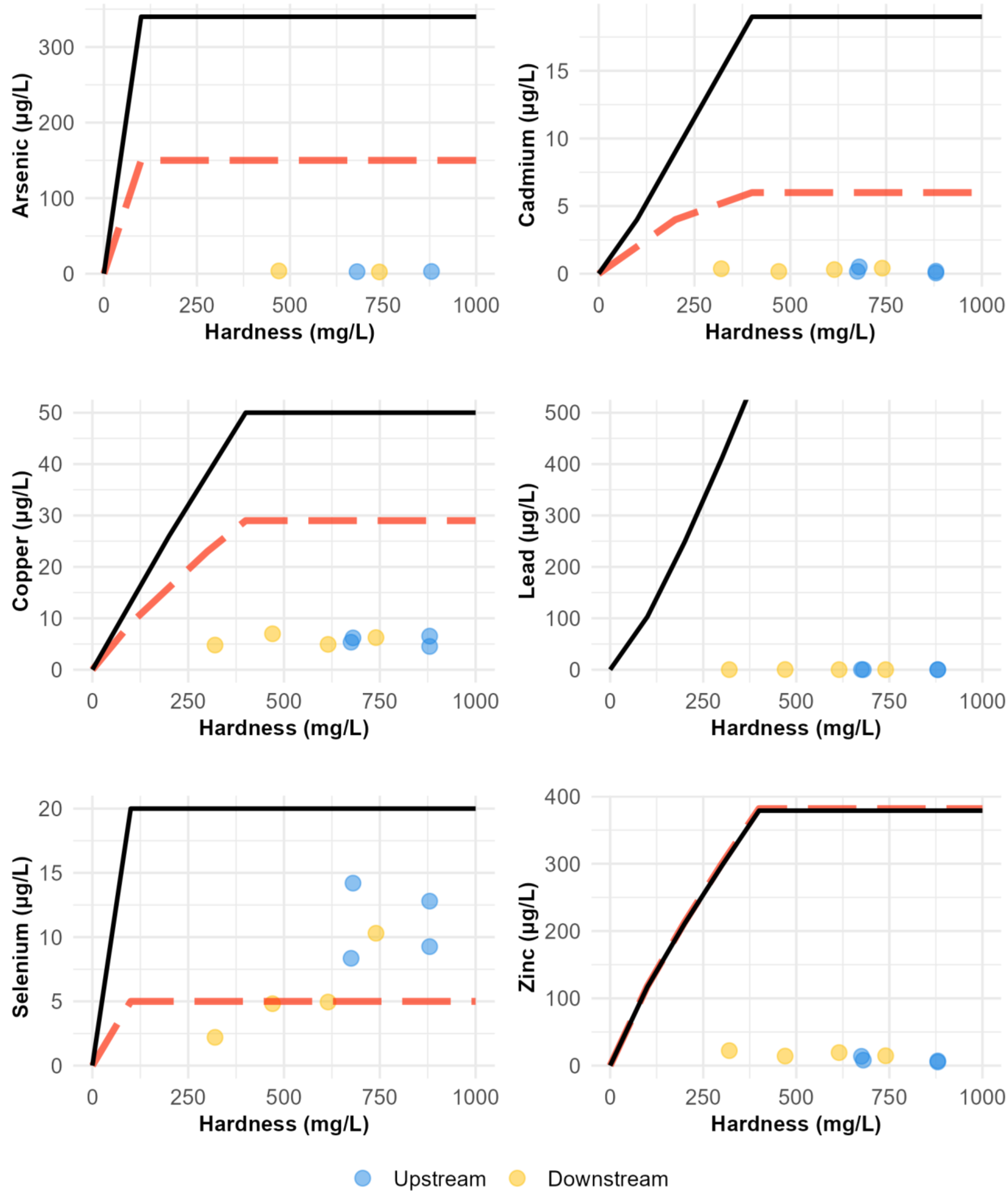
Note. The horizontal dashed red line represents $\Delta NH_3 = 0$ mg/L. Values at or below the line ($\Delta NH_3 \leq 0$ mg/L) comply with WQOs, while values above the line ($\Delta NH_3 > 0$ mg/L) exceed WQOs.

The metals concentrations shown in Figure 3.4 were compared to the California Toxics Rule (CTR) chronic and acute standards. It is important to note that total recoverable metals, rather than dissolved metals, were measured by the City of Los Angeles as a requirement of their NPDES permit. Total recoverable concentrations from DCTWRP and LAGWRP were converted to dissolved concentrations, which represent the biologically active fraction of the total metal concentration, using a Metals Translator Guidance document written by the EPA (USEPA 1996).

Figure 3.4 shows the concentration of select metals upstream and downstream of the DCTWRP discharge location. Downstream concentrations of arsenic, zinc, lead, copper, and cadmium were below both chronic and acute CTR criteria. Selenium concentrations upstream of the discharge exceeded the CTR chronic threshold during all four sampling events but were likely diluted by wastewater effluent at the downstream sampling location. Effluent from the DCTWRP does not contribute to metal exceedances downstream of the DCTWRP discharge.

Figure 3.4

Dissolved metals concentrations above and below the DCTWRP discharge compared to hardness-adjusted, total recoverable CTR thresholds for acute and chronic effects.



Note. Values are compared to hardness-adjusted, total recoverable CTR thresholds for acute (black line) and chronic (dashed red line) effects. Lead does not have an acute CTR threshold because the USEPA has not established a human health criterion for it. Lead is harmful to human health even at low exposure levels. Values are estimated in instances where there were non-detects that did not meet the laboratory's reporting limit.

Total trihalomethanes, which are common disinfection by-products, were either not detected or not quantified both upstream and downstream of the discharge location and well below the WQO.

Table 3.4

Trihalomethane concentrations above and below the DCTWRP discharge in 2024.

LOCATION	CONSTITUENT	2/13/24	8/6/24
Upstream	BROMODICHLOROMETHANE	ND	ND
	BROMOFORM	ND	ND
	CHLOROFORM	ND	ND
	DIBROMOCHLOROMETHANE	ND	ND
	Total	ND	ND
Downstream	BROMODICHLOROMETHANE	ND	ND
	BROMOFORM	ND	ND
	CHLOROFORM	DNQ	DNQ
	DIBROMOCHLOROMETHANE	ND	ND
	Total	DNQ	DNQ

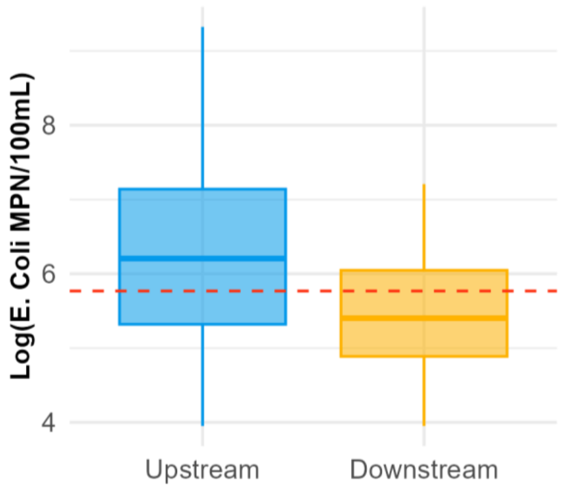
Note. Total trihalomethanes were calculated as the sum of bromodichloromethane, bromoform, chloroform, and dibromochloromethane concentrations in µg/L. "ND" indicates the analyte was not detected or the detected value was below the MDL. "DNQ" indicates the analyte was detected, but not quantifiable. The EPA water quality objective for total trihalomethanes is 80 µg/L (U.S. EPA 2002).

3. City of Los Angeles – LAGWRP

Figure 3.5 shows the distribution of *E. coli* concentrations at sites upstream and downstream of the LAGWRP discharge point. Approximately 59% of upstream and 30% of downstream samples exceeded the REC-1_{STV}. The mean downstream *E. coli* concentration (M = 338 MPN/100mL) was lower than the upstream value (M = 1367 MPN/100mL), indicating a dilution effect from the LAGWRP effluent.

Figure 3.5

Log10-transformed distributions of E. coli concentrations upstream and downstream of LAGWRP discharge



Note. The red dashed horizontal line denotes REC-1_{STV}=320 MPN/100mL. Downstream *E. coli* concentrations (M = 338, SD = 327 MPN/100mL) were significantly lower than upstream (M = 1367, SD = 2525 MPN/100mL) at LAGWRP (*paired t-test:* $t(45) = 2.7$, $p = 0.008$).

Table 3.5 shows the average concentration of regulated nitrogen species above and below the LAGWRP discharge. Nitrate-N, nitrite-N, and ammonia-N were tested weekly. Most of the nitrogen downstream and upstream of the POTW was represented by nitrate-N. Downstream concentrations of nitrate-N and nitrite-N were below WQOs.

Table 3.5

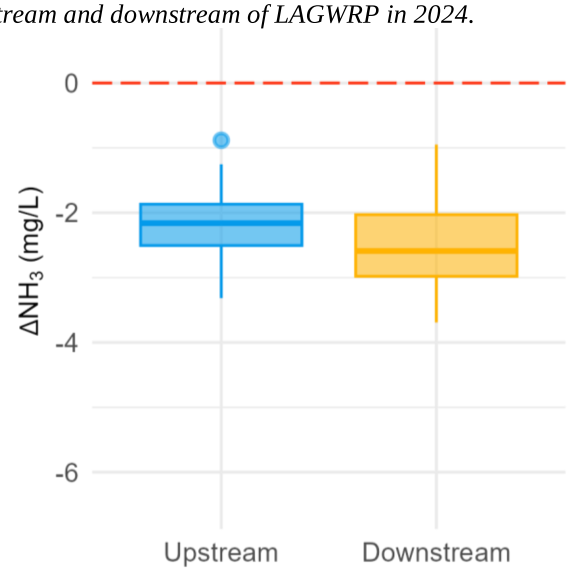
Range of nutrient concentrations upstream and downstream of LAGWRP discharge in 2024

Position	N-Species	Mean	Median	Max	SD
Upstream	NH3 - N	0.13	0.12	0.38	0.11
	NO_3 - N	2.98	2.82	5.32	1.02
	NO2 - N	0.13	0.10	0.41	0.10
Downstream	NH_3 - N	0.20	0.18	0.61	0.16
	NO_3 - N	3.19	3.13	5.58	1.06
	NO_2 - N	0.14	0.10	0.44	0.10

The ΔNH_3 distribution upstream and downstream of LAGWRP effluent are graphed in Figure 3.6. In 2024, there were no ammonia-N WQO exceedances both upstream and downstream of the discharge point.

Figure 3.6

Ammonia WQO difference upstream and downstream of LAGWRP in 2024.

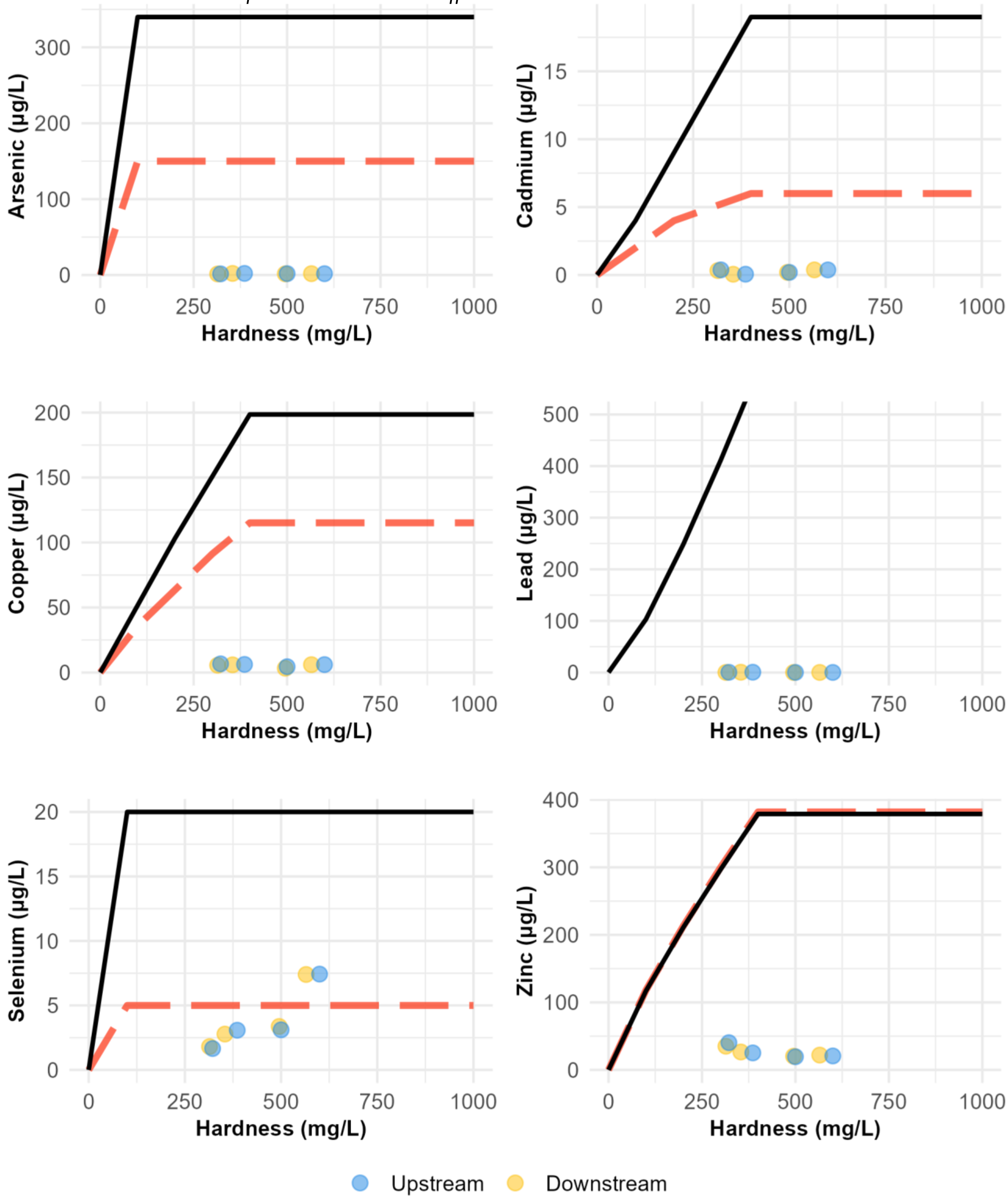


Note. The horizontal dashed red line represents $\Delta NH_3 = 0$ mg/L. Values at or below the line ($\Delta NH_3 \leq 0$ mg/L) comply with WQOs, while values above the line ($\Delta NH_3 > 0$ mg/L) exceed WQOs.

Total recoverable metals were measured both upstream and downstream of the LAGWRP discharge (Figure 3.7). The copper WER ratio for Reach 3 of the river, where LAGWRP is located, is 3.97 and CTR criteria are adjusted accordingly. All metal concentrations were below the WER adjusted CTR thresholds both upstream and downstream of the LAGWRP outfall, except selenium which exceeded the chronic threshold on two occasions. Treated wastewater from LAGWRP is not causing elevated concentrations of metals downstream of discharge locations and metal concentrations are below regulatory objectives.

Figure 3.7

Dissolved metals concentrations above and below the LAGWRP discharge compared to hardness-adjusted, total recoverable CTR thresholds for acute and chronic effects.



Note. Values are compared to hardness-adjusted, total recoverable CTR thresholds for acute (black line) and chronic (dashed red line) effects. Lead does not have an acute CTR threshold because the USEPA has not established a human health criterion for it. Lead is harmful to human health. Values are estimated in instances where there were non-detects that did not meet the laboratory's reporting limit. Downstream and upstream concentrations may be close in value, as a result it may be difficult to see overlapping yellow and blue points on the graph.

All trihalomethanes were either not detected or not quantifiable upstream of the LAGWRP discharge location (Table 3.6). Downstream, chloroform was detected (2.07 µg/L) but remained well below the EPA water quality objective for total trihalomethanes (80 µg/L).

Table 3.6

Trihalomethane concentrations above and below the LAGWRP discharge in 2024.

LOCATION	CONSTITUENT	2/13/24	8/6/24
Upstream	BROMODICHLOROMETHANE	ND	ND
	BROMOFORM	ND	ND
	CHLOROFORM	DNQ	ND
	DIBROMOCHLOROMETHANE	ND	ND
	Total Trihalomethanes	DNQ	ND
Downstream	BROMODICHLOROMETHANE	DNQ	DNQ
	BROMOFORM	ND	ND
	CHLOROFORM	2.07	DNQ
	DIBROMOCHLOROMETHANE	DNQ	ND
	Total Trihalomethanes	2.07	DNQ

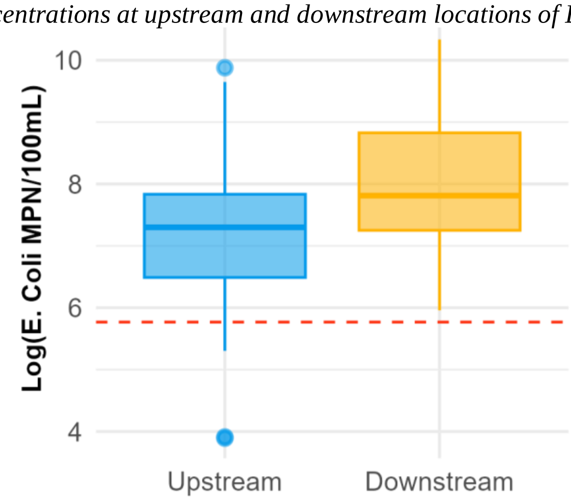
Note. Total trihalomethanes were calculated as the sum of bromodichloromethane, bromoform, chloroform, and dibromochloromethane in µg/L. "ND" indicates the analyte was not detected or the detected value was below the MDL. "DNQ" indicates the analyte was detected, but not quantifiable. The EPA water quality objective for total trihalomethanes is 80 µg/L (U.S. EPA 2002).

4. City of Burbank – BWRP

The distribution of *E. coli* values upstream and downstream of the City of Burbank's BWRP discharge location are shown in Figure 3.8. In 2024, 88% of upstream (*M* = 2859 MPN/100mL) and 100% downstream samples (*M* = 4824 MPN/100mL) exceeded the REC-1$_{STV}$. *E. coli* concentrations downstream were significantly higher than upstream.

Figure 3.8

Log$_{10}$-transformed E. coli concentrations at upstream and downstream locations of DCTWRP discharge.



Note. The red dashed horizontal line denotes REC-1$_{STV}$=320 MPN/100mL. Downstream *E. coli* concentrations (*M* = 4824, *SD* = 5915 MPN/100mL) were significantly higher than upstream (*M* = 2859, *SD* = 3961 MPN/100mL) at Burbank (*paired t-test:* $t(49) = -2.2$, $p = 0.03$).

Table 3.7 shows the range in nutrient concentration measured above and below the BWRP discharge. Nutrients were measured approximately every week. Average concentrations for all nitrogen species were higher downstream, and, on average, met WQOs.

Table 3.7

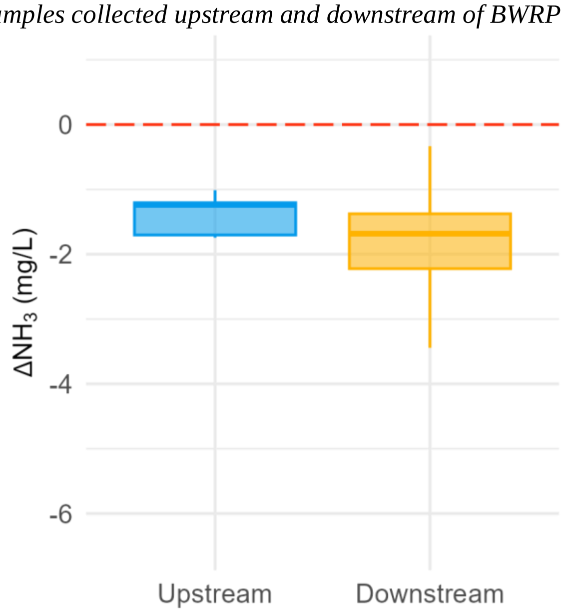
Range of nutrient concentrations upstream and downstream of BWRP discharge in 2024.

Position	N-Species	Mean	Median	Max	SD
Upstream	NH_3 - N	0.20	0.11	1.20	0.26
	NO_3 - N	2.97	2.90	5.10	1.21
	NO_2 - N	0.11	0.06	0.43	0.11
Downstream	NH_3 - N	0.77	0.79	1.30	0.26
	NO_3 - N	4.06	4.10	6.00	0.78
	NO_2 - N	0.14	0.15	0.31	0.09

Similar to other nitrogen species, upstream ammonia-N concentrations at BWRP were higher than downstream concentrations. ΔNH_3 upstream and downstream of the BWRP discharge are shown in Figure 3.9. In 2024, excluding one upstream sample, BWRP generally met WQOs for ammonia-N.

Figure 3.9

Ammonia WQO difference of samples collected upstream and downstream of BWRP in 2024.

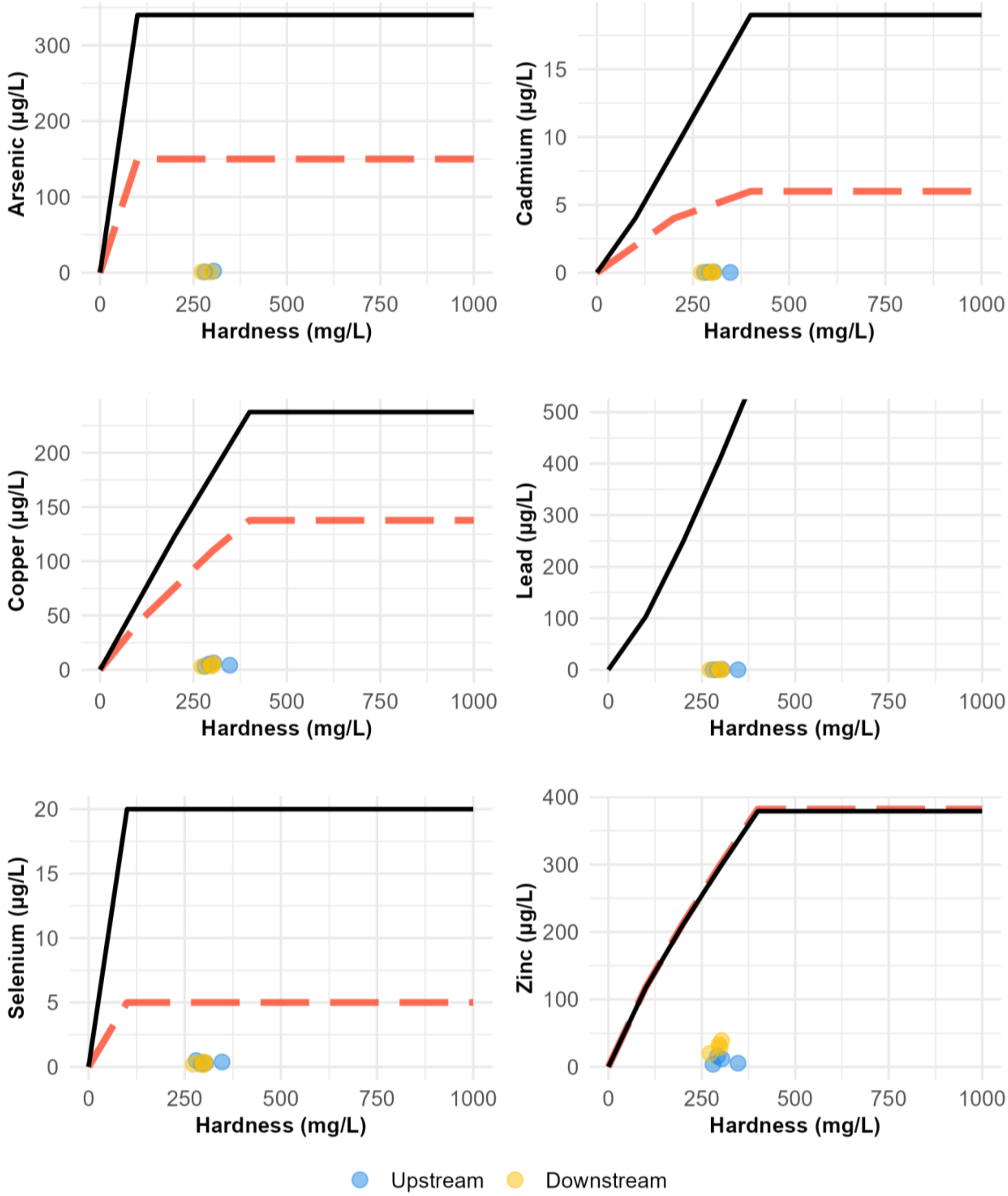


Note. The horizontal dashed red line represents $\Delta NH3 = 0$ mg/L. Values at or below the line ($\Delta NH3 \leq 0$ mg/L) comply with WQOs, while values above the line ($\Delta NH3 > 0$ mg/L) exceed WQOs.

Figure 3.10 shows the hardness adjusted dissolved metal concentrations compared to their CTR chronic and acute standards. The copper WER for this reach of the Burbank Channel is 4.75 and CTR criteria were adjusted accordingly. Metal concentrations were below the CTR chronic and acute standards for all metals, on all occasions.

Figure 3.10

Dissolved metals concentrations above and below the BWRP discharge compared to hardness-adjusted, total recoverable CTR thresholds for acute and chronic effects.



Note. Values are compared to hardness-adjusted, total recoverable CTR thresholds for acute (black line) and chronic (dashed red line) effects. Lead does not have an acute CTR threshold because the USEPA has not established human health criteria for this contaminant. Values are estimated in instances where there were non-detects that did not meet the laboratory's reporting limit. Downstream and upstream concentrations may be close in value, as a result it may be difficult to see overlapping yellow and blue points on the graph.

Trihalomethanes were detected above and below the BWRP discharge locations (Table 3.8). Concentrations at both upstream and downstream locations were well below the EPA water quality objective for total trihalomethanes (80 µg/L). Generally, trihalomethane values were higher downstream of POTW effluent.

Table 3.8

Trihalomethane concentrations above and below the BWRP discharge in 2024.

LOCATION	CONSTITUENT	1/8	2/12	3/11	4/3	5/1	6/5	7/8	8/12	9/4	9/16	10/7	11/11	12/9
Upstream	BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND	6.7	ND	ND	ND	ND	ND	ND
	BROMOFORM	ND	ND	ND	ND	ND	ND	0.69	ND	ND	ND	ND	ND	ND
	CHLOROFORM	0.49	ND	ND	ND	ND	ND	15	ND	ND	ND	ND	ND	ND
	DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND	3.1	ND	ND	ND	ND	ND	ND
	Total Trihalomethanes	ND	ND	ND	ND	ND	ND	25	ND	ND	0.29	0	ND	ND
Downstream	BROMODICHLOROMETHANE	3.6	1.8	1.3	0.88	1.3	0.25	ND	0.47	0.95	-	0.52	2.8	1.5
	BROMOFORM	0.49	ND	ND	ND	ND	ND	ND	ND	ND	-	ND	ND	ND
	CHLOROFORM	14	6.6	4.6	2.7	4.7	1.8	ND	2.6	3.3	-	2.8	7.1	5.3
	DIBROMOCHLOROMETHANE	1.6	0.5	ND	ND	0.49	ND	ND	ND	ND	-	ND	0.62	0.58
	Total Trihalomethanes	19.2	8.4	5.9	2.7	6	1.8	ND	2.6	3.3	-	2.8	9.9	6.8

Note. Total trihalomethanes was precalculated and reported by the City of Burbank in µg/L. “ND” indicates the analyte was not detected or the detected value was below the MDL. The EPA water quality objective for total trihalomethanes is 80 µg/L (U.S. EPA 2002).

Question 4. Is it safe to recreate?

1. Background

Thousands of people swim at unpermitted sites within the Los Angeles River Watershed each summer. The fourth element of the monitoring program assesses the beneficial use of formal and informal sites in the Los Angeles River Watershed for Water Contact Recreation. Prior to the initiation of LARWMP, the concentrations of potentially harmful fecal pathogens and the bacteria that indicate their presence was not known. Monitoring at both permitted and informal recreational swim sites reflects concerns for the risk of gastrointestinal illness posed by pathogen contamination to recreational swimmers in streams of the Los Angeles River watershed and to kayakers in the recreation zones. Depending on the site, sources of indicator bacteria and pathogen contamination could include humans, dogs, wildlife, urban runoff, and refuse from campgrounds and homeless encampments.

Fecal indicator bacteria (FIB) tests are inexpensive and the body of literature shows *E. coli* to be a good predictor for gastrointestinal illness. Standards used by both EPA and LARWQCB are also based on *E. coli* cultivation methodology (EPA, 2010; Wade et al., 2003). However, several studies have found that no single indicator is protective of public health and that in some studies, FIB do not correlate well with pathogens (Hardwood et al., 2005). Studies have also highlighted the need to better understand whether faster and more specific microbial methods can better predict health outcomes (Wade et al., 2003), particularly since human fecal sources have an increased pathogenic risk. Many improved methods are in development but challenges related to performance, specificity, and sensitivity remain before they are applied to a regulatory realm (Harwood et al., 2013). Until methods improve and become cost-effective, the safe to recreate effort within the LARWMP will monitor FIB, specifically *E. coli*, at recreational sites in the watershed.

2. Methods

LARWMP's bacteria-monitoring program samples for *E. coli* about five times a month at each recreational swim site during the summer (Memorial Day to Labor Day) (Figure 4.1 and Table 4.1). The kayak sites are monitored from Memorial Day through the end of September. Sites sampled for swimming safety are selected based on the collective knowledge of the workgroup related to the most frequently used swimming locations in the watershed. To better understand the relationships between periods of heavy recreational swim use and *E. coli* concentrations, sampling is conducted on weekends and holidays to capture the occasions when the greatest numbers of people are swimming. This is because the San Gabriel River Watershed program, a similar program to LARWMP, found that indicator bacteria levels are higher on weekends and holidays when recreational swim use is greatest (SGRRMP 2009).

Field-monitoring teams deploy in the morning and collect grab samples at recreational sites. Observational data are also recorded at each site including information on flow habitats, number of visitors and swimmers, animals present, wind direction, and site refuse. Handheld meters and probes were used to collect data on dissolved oxygen, pH, water conductivity, and water temperature.

Figure 4.1

Recreational swim site locations sampled in 2024.

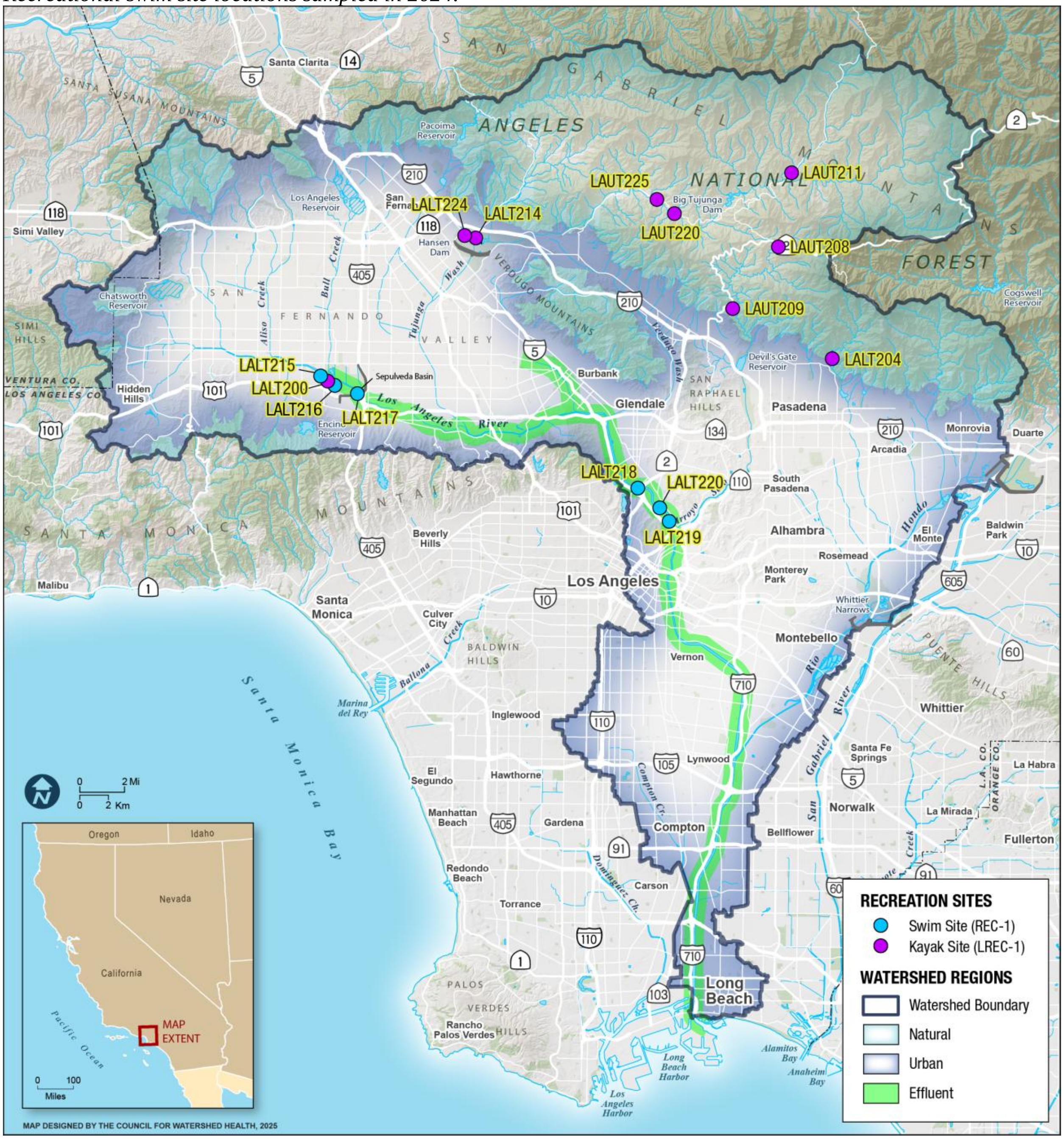


Table 4.1

2024 Sampling locations and site codes for indicator bacteria

Program Element	Sampling Sites	Site Code
Recreational Swim Sites	Bull Creek Sepulveda Basin	LALT200
	Eaton Canyon Natural Area Park	LALT204
	Tujunga Wash at Hansen Dam	LALT214
	Hansen Dam Recreation Lake	LALT224
	Switzer Canyon	LAUT208
	Gould Mesa Campground	LAUT209
	Hidden Springs Site (Upper Tujunga Wash)	LAUT211
	Tujunga Wash at Vogel Flats	LAUT220
	Wildwood Picnic Site	LAUT225
Recreational Kayak Sites	Upper Sepulveda Basin Zone	LALT215
	Middle Sepulveda Basin Zone	LALT216
	Lower Sepulveda Basin Zone	LALT217
	Upper Elysian Valley Zone	LALT218
	Middle Elysian Valley Zone	LALT221
	Lower Elysian Valley Zone	LALT219

Indicator bacteria concentrations were compared against State of California REC-1 and LREC-1 standards listed in Tables 4.2 & 4.3. LARWQCB describes REC-1 (LARWQCB 2020a; 2020b) as they apply to recreational activities where ingestion is reasonably possible and LREC-1 standards as they apply to activities where ingestion is infrequent. A standard that makes use of the GM provides an indication of how persistent elevated bacterial concentrations are at a site. Recent updates to the basin plan require a 6-week rolling geometric mean (GM) be applied at REC-1 sites and STV applied to single samples. REC-1 $_{STV}$ (320 MPN/100 mL) was applied to all informal recreation sites. LREC-1$_{SSM}$ (576 MPN/100 mL) was applied to kayak sites since recreators have limited water contact when kayaking as opposed to swim sites, where full submersion in water is more likely to occur. To apply the GMs, at least 5 samples per month per site are required.

Table 4.2

REC-1 Indicator Bacteria WQOs for Freshwater

Estimated Illness Rate (NGI): 32 per 1,000 water contact recreators		
Magnitude		
Indicator	**Statistical Threshold Value (REC-1 $_{STV}$)**	**6-Week Rolling Geometric Mean (REC-1 $_{GM}$)**
E. coli	320 MPN/100 mL	100 MPN/100 mL

Note. The statistical threshold value (STV) is not to be exceeded by more than 10% of samples collected in a calendar month. Whereas the geometric mean (GM) is calculated using a weekly rolling average.

Table 4.3

LREC-1 Indicator Bacteria WQOs for Freshwater

Magnitude		
Indicator	**Single Sample Maximum (LREC-1$_{SSM}$)**	**30-day Geometric Mean (LREC-1$_{GM}$)**
E. coli	576 MPN/100 mL	126 MPN/ 100 mL

Note. The Single Sample Maximum (SSM) is not to be exceeded by any sample. Whereas the GM is calculated monthly (every 30 days).

3. Results

a. *Recreational Swim Sites (REC-1)*

During the summer of 2024, a total of 396 water samples were successfully collected from 15 recreational swim and kayak sites popular with visitors and residents. Table 4.4 summarizes site observations at recreational swim sites during the 2024 monitoring year. The most popular sites for all visitor types were Eaton Canyon (LALT204), Hansen Dam Recreation Lake (LALT224), and Vogel Flats (LAUT220). The most popular sites for swimming/bathing were Eaton Canyon, Vogel Flats, and Wildwood Picnic Site (LAUT225). The least popular site was Bull Creek (LAUT 200). Similar to last year, July 4th saw the highest overall visitorship across all monitoring sites with Eaton Canyon taking the lead (Max = 56 visitors). Refuse was prominent at all sampling locations and was observed in 76% across all sampling events. Algae and foam were sporadically observed throughout the season. Oil, tar, sewage, and upstream storm drain flow were all absent.

Table 4.4

Site usage summary for recreational swim sites sampled in 2024

Parameter		Site ID								
		LALT200	LALT204	LALT214	LALT224	LAUT208	LAUT209	LAUT211	LAUT220	LAUT225
		Bull Creek	Eaton Canyon	Tujunga Wash At Hansen Dam	Hansen Dam Rec Lake	Switzer Falls	Gould Mesa	Hidden Springs	Vogel Flats	Wildwood Picnic Site
No. Sample Days		20	20	20	20	20	17	20	20	19
Swim Site Usage Statistics										
On-Shore	*M ± SD*	1 ± 1	15 ± 13	1 ± 1	12 ± 8	8 ± 13	2 ± 5	1 ± 3	8 ± 9	3 ± 4
	Mdn	0	11	0	11	2	0	0	5	2
	Min	0	2	0	0	0	0	0	0	0
	Max	4	56	3	31	45	20	12	35	11
Bathers	*M ± SD*	0 ± 0	3 ± 5	0 ± 0	1 ± 2	0 ± 1	0 ± 0	0 ± 1	3 ± 4	3 ± 4
	Mdn	0	2	0	0	0	0	0	1	0
	Min	0	0	0	0	0	0	0	0	0
	Max	0	16	0	10	2	0	6	15	13
Animals	*M ± SD*	0 ± 1	2 ± 1	1 ± 1	2 ± 3	1 ± 1	0 ± 1	0 ± 0	0 ± 1	0 ± 0
	Mdn	0	2	0	0	0	0	0	0	0
	Min	0	0	0	0	0	0	0	0	0
	Max	3	5	3	12	2	3	0	2	1
Swim Site Observations										
Refuse		100%	45%	95%	75%	50%	65%	65%	95%	95%
Algae		0%	0%	0%	5%	5%	0%	0%	0%	0%
Foam		65%	0%	5%	10%	0%	6%	5%	0%	0%
Oil		0%	0%	0%	0%	0%	0%	0%	0%	0%
Tar		0%	0%	0%	0%	0%	0%	0%	0%	0%
Sewage		0%	0%	0%	0%	0%	0%	0%	0%	0%
Upstream Storm Drain flow		0%	0%	0%	0%	0%	0%	0%	0%	0%

The concentrations of *E. coli* at swim sites and kayak sites were compared to their respective WQOs. The REC-1 STV standard was applied to recreational swim sites (Table 4.5). A site exceeds the REC-1 GM if more than 10% of samples within a calendar month are above 320 MPN/100 mL.

In 2024, 16% of all samples taken at LARWMP's Recreational Swim Sites exceeded 320 MPN/100 mL. Tujunga Wash at Hansen Dam (LALT214) and Bull Creek (LALT200) exceeded the REC-1 STV during all three months of sampling. Tujunga Wash at Hansen Dam, a popular site for equestrian activities such as trail riding, has been noted by the field team for the presence of horses and large animal waste at the monitoring site. This may contribute to the elevated FIB levels observed. However, further microbial source tracking is necessary to confirm the primary source of the bacteria.

The FIB levels at the most popular site, Eaton Canyon, exceeded REC-1 STV (320 MPN/100 mL) once during the first month of sampling. The following most popular sites, Hansen Dam Recreation Lake and Vogel Flats, were below the REC-1 STV throughout the monitoring season. Switzer Falls and Hidden Springs exceeded the REC-1 STV in the final month of monitoring. All the other swim sites stayed below the REC-1 STV throughout the monitoring season.

Table 4.5

Single sample E. coli values at LARWMP recreation sites from May 2024 – Sept. 2024

Sample Date		Site ID								
		LALT200	**LALT204**	**LALT214**	**LALT224**	**LAUT208**	**LAUT209**	**LAUT211**	**LAUT220**	**LAUT225**
		Bull Creek	**Eaton Canyon**	**Tujunga Wash at Hansen Dam**	**Hansen Dam Rec Lake**	**Switzer Falls**	**Gould Mesa**	**Hidden Springs**	**Vogel Flats**	**Wildwood Picnic Site**
5/24/2024 - 6/16/2024	**5/24/2024**	323	20	75	<10	<10	10	20	<10	NS
	5/27/2024	443	41	160	<10	63	20	<10	<10	20
	5/28/2024	538	41	171	<10	31	<10	20	20	20
	6/2/2024	364	98	249	<10	<10	10	<10	20	52
	6/8/2024	345	708	521	<10	63	<10	10	20	20
	6/11/2024	441	10	328	<10	31	20	<10	52	10
	6/16/2024	262	31	521	20	31	NS	10	10	10
5/24/2024 - 6/16/2024 Exceedances		**86%**	**14%**	**43%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
6/27/2024 - 7/28/2024	**6/27/2024**	464	31	4,110	<10	134	<10	<10	41	63
	7/4/2024	197	183	712	<10	155	<10	161	84	75
	7/5/2024	85	20	684	<10	63	<10	63	41	132
	7/15/2024	683	203	933	<10	86	10	134	31	63
	7/20/2024	75	75	789	10	75	31	20	10	52
	7/28/2024	158	30	738	<10	41	NS	41	20	20
6/27/2024 - 7/28/2024 Exceedances		**40%**	**0%**	**100%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
8/4/2025 - 9/2/2024	**8/4/2024**	146	31	388	120	161	30	10	20	173
	8/10/2024	1,250	41	288	<10	160	118	86	41	75
	8/12/2024	1,039	NS	557	<10	213	<10	86	62	51
	8/21/2024	183	20	432	<10	158	<10	30	10	73
	8/25/2024	228	30	1,850	<10	10	228	41	10	<10
	9/1/2024	213	31	1,043	<10	135	63	364	10	31
	9/2/2024	213	146	1,300	<10	1,140	<10	2,910	10	31
8/4/2025 - 9/2/2024 Exceedances		**25%**	**0%**	**88%**	**0%**	**13%**	**0%**	**25%**	**0%**	**0%**

Note. <10 MPN/100 mL = non-detect. NS indicates the site was not sampled on that date. Samples are compared to the REC-1 STV = 320 MPN/100mL. Exceedances are highlighted in red. If more than 10% of samples taken within a calendar month exceed this value, it is considered an exceedance. Monthly exceedances are red and underlined.

Similarly, the 6-week rolling geometric mean (GM) similarly showed Tujunga Wash at Hansen Dam (LALT 214) and Bull Creek (LALT 200) had consistently high *E. coli* concentrations whereas all other sites, except Switzer Falls (LAUT208), met the REC-1 GM. Switzer Falls exceeded the REC-1 GM later in the monitoring period.

Table 4.6

Geometric mean of E. coli concentrations (MPN/100 mL) at LARWMP recreation sites n 2024.

6-week period	Site ID								
	LALT200	**LALT204**	**LALT214**	**LALT224**	**LAUT208**	**LAUT209**	**LAUT211**	**LAUT220**	**LAUT225**
	Bull creek	**Eaton Canyon**	**Tujunga Wash at Hansen Dam**	**Hansen Dam Rec Lake**	**Switzer Falls**	**Gould Mesa**	**Hidden springs**	**Vogel Flats**	**Wildwood Picnic Site**
5/24 - 7/5	312	49	394	6	36	8	14	21	31
5/31 - 7/12	273	59	641	6	45	7	14	31	35
6/7 - 7/19	299	65	774	6	68	7	23	33	36
6/14 - 7/26	217	61	957	7	80	8*	33	28	52
6/21 - 8/2	199	61	1014	6	84	8*	42	31	59
6/28 - 8/9	164	61	684	10	86	12*	47	27	69
7/5 - 8/16	279	48	584	9	99	17	47	28	66
7/12 - 8/23	311	48	547	9	113	17	42	23	61
7/19 - 8/30	266	35	603	9	83	29	36	19	43
7/26 - 9/6	295	37	687	7	124	25	89	18	38

Note. Rolling 6-week GMs ≥ REC-1 GM (100 MPN/100 mL) are highlighted in red. At least 6 samples per 6-week period are required for analysis. * Indicates insufficient data (<6 samples).

b. *Recreational Kayak Sites (LREC-1)*

Single sample *E. coli* concentrations at kayak sites were compared to the LREC-1_{SSM} = 576 MPN/100 mL (Table 4.3). In 2024, exceedances at kayak sites were generally infrequent (Table 4.7). The Upper Sepulveda Basin Zone (LALT215) had the highest rate of exceedances at 8%. With the exception of the Middle Elysian Valley Zone (LALT 219), all other sites had no LREC-1_{SSM} exceedances throughout the 2024 monitoring season.

Table 4.7

Single sample E. coli concentrations (MPN/100 mL) at LARW kayak sites from May 2024 – Sept. 2024.

Sample Date		Sepulveda Basin Zones			Elysian Valley Zones		
		Upper	Middle	Lower	Upper	Middle	Lower
		LALT215	LALT216	LALT217	LALT218	LALT219	LALT221
5/23 - 6/22	5/23/24	934	226	216	52	52	52
	5/28/24	301	110	31	75	119	98
	5/30/24	556	213	158	86	63	85
	6/4/24	303	146	75	108	52	86
	6/6/24	336	72	63	63	52	120
	6/11/24	529	52	41	86	95	74
	6/13/24	309	97	108	20	52	74
	6/18/24	145	31	73	63	121	10
	6/20/24	233	199	31	86	31	63
6/25 - 7/25	6/25/24	299	62	52	31	1,658	109
	6/27/24	158	10	83	41	52	265
	7/2/24	389	41	31	31	41	31
	7/4/24	323	41	30	31	62	107
	7/9/24	187	52	<10	10	30	<10
	7/11/24	96	20	10	173	52	97
	7/16/24	173	73	20	96	41	86
	7/18/24	723	85	63	52	259	20
	7/23/24	206	52	109	31	52	63
	7/25/24	457	97	97	20	160	31
7/30 - 8/30	7/30/24	86	144	20	41	173	74
	8/1/24	134	299	31	98	63	52
	8/6/24	131	74	119	98	41	228
	8/8/24	480	73	97	110	74	41
	8/13/24	158	155	20	134	134	538
	8/15/24	75	63	63	148	134	134
	8/20/24	243	62	41	41	63	488
	8/22/24	171	41	20	85	146	96
	8/27/24	158	148	52	98	146	85
9/3 – 10/3	9/3/24	373	31	41	75	203	52
	9/5/24	132	30	63	399	246	97
	9/10/24	199	85	52	63	110	41
	9/12/24	121	63	<10	41	109	63
	9/17/24	96	199	63	63	86	10
	9/19/24	109	327	132	52	97	109
	9/24/24	146	195	75	52	201	75
	9/26/24	3,076	110	52	75	193	132
% Exceedance		8%	0%	0%	0%	3%	0%

Note. NS indicates the site was not sampled on that date. Samples are compared to the single sample LREC-1_{SSM} = 576 MPN/100 mL. Exceedances are highlighted in red.

The 30-day GM of *E. coli* for each kayak site was compared to the LREC-1_{GM} = 126 MPN/100mL (Table 4.8). In contrast, LALT215 exceeded LREC-1 $_{GM}$ throughout the sampling period. LALT219 and LALT221 exceeded the LREC-1_{GM} in the third and fourth months, respectively.

Table 4.8

30-day Geometric means of E. coli (MPN/100 mL) at kayak sites from May – Sept. 2024

30-day period	Sepulveda Basin Zones			Elysian Valley Zones		
	Upper	Middle	Lower	Upper	Middle	Lower
	LALT215	LALT216	LALT217	LALT218	LALT219	LALT221
5/23 - 6/22	354	106	72	65	65	63
6/25 - 7/25	257	45	43	38	89	68
7/30 - 8/29	157	98	42	87	98	130
9/3 - 10/3	220	96	64	75	145	59

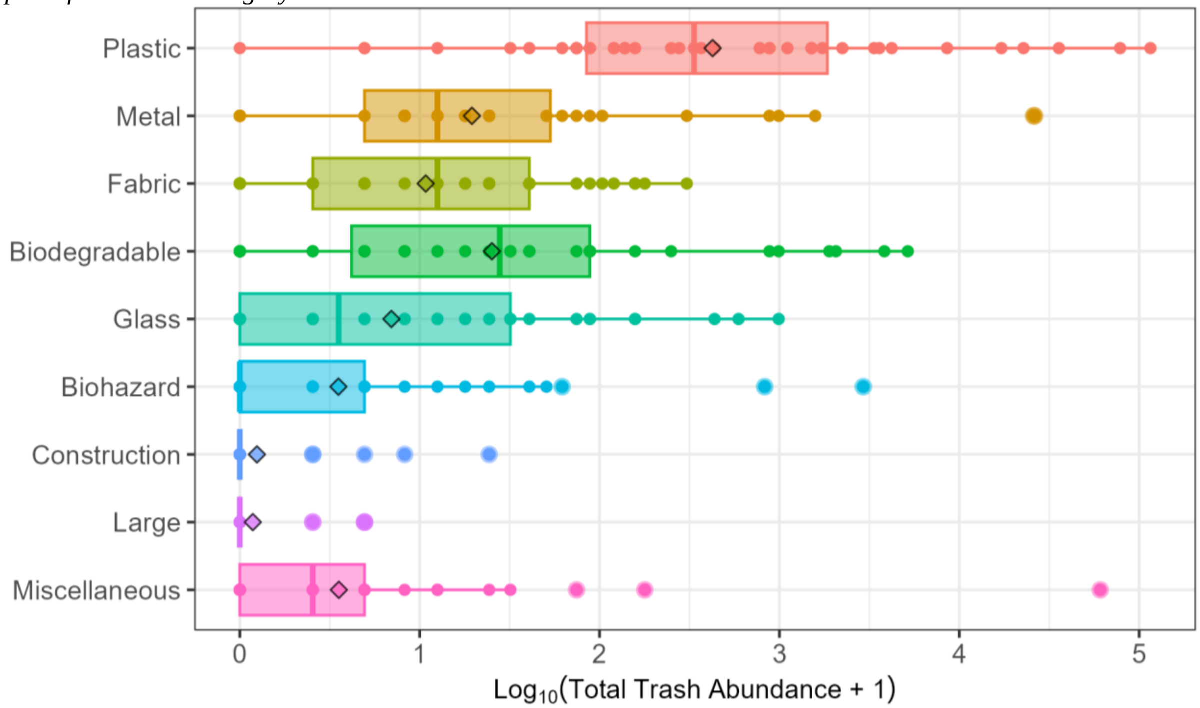
Note. 30-day geometric means are compared to the LREC-1_{GM} objective of 126 MPN/100 mL. Values that were above the WQO are highlighted in red.

c. ***Trash Assessments***

Trash assessments were also completed at recreation sites, excluding kayak sites, from 2018 - 2024 using the methodology described under Question 1: Methods. In 2024, plastic, metals, and fabric were the most common trash categories (Figure 4.2). Plastic was the predominant material at every location, accounting for an average of 51% of the total trash. Vogel Flats (LAUT 220) had the highest total counts (Figure 4.3). In 2024, trash counts at recreation sites generally increased compared to the previous two years (Figure 4.4).

Figure 4.2

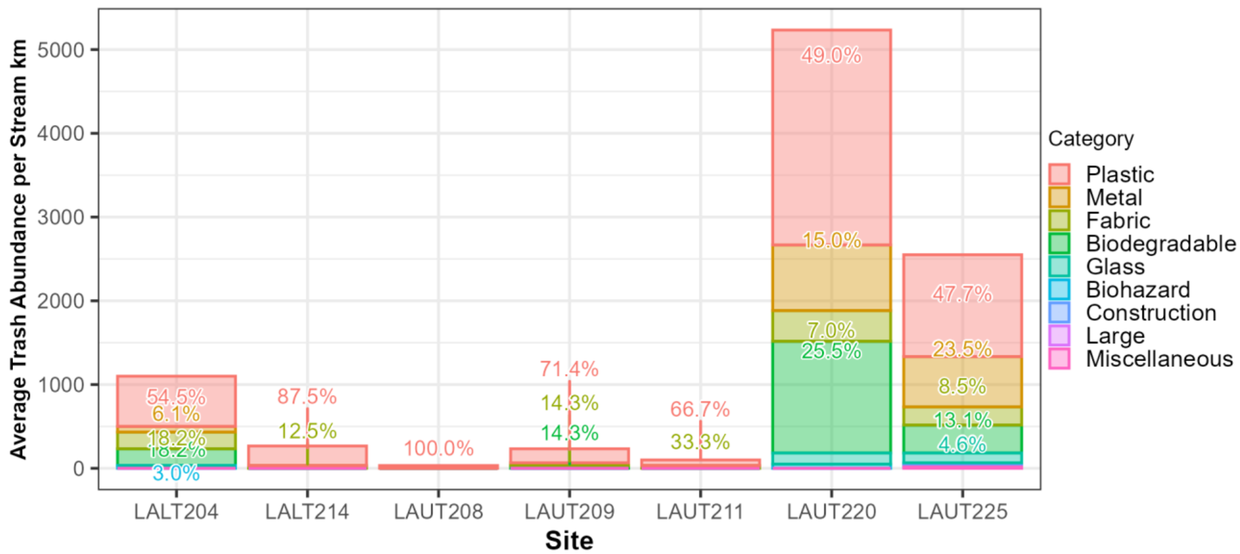
Boxplot of each trash category at LARWMP recreational swim sites in 2024.



Note. Diamonds represent averages.

Figure 4.3

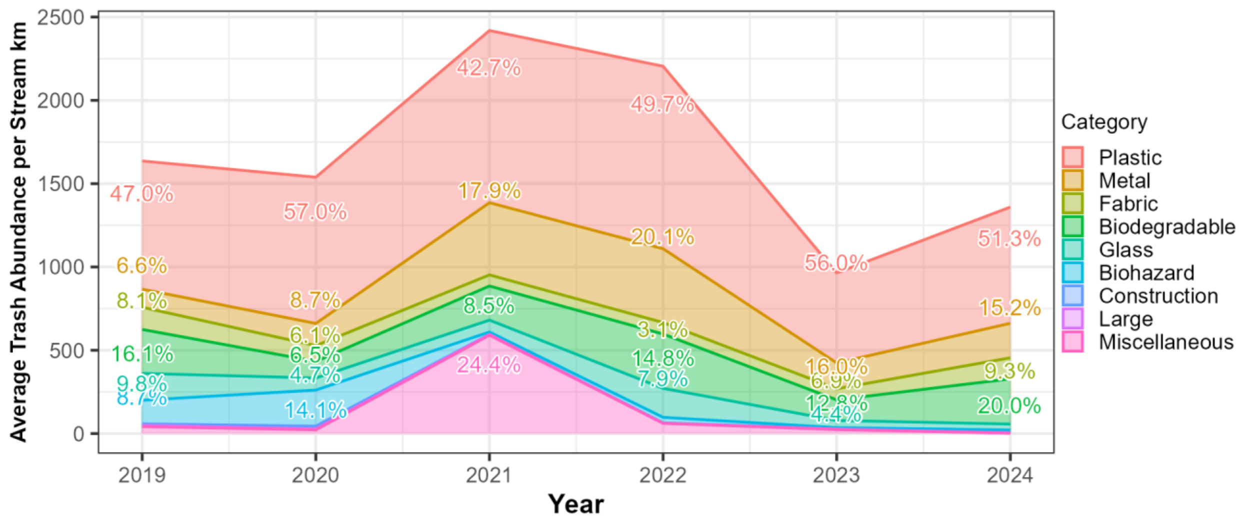
Average trash abundance of LARWMP recreational swim sites in 2024



Note. Percentage of total trash abundance (>3%) by category is shown.

Figure 4.4

2018 – 2024 Timeline of trash category distribution for LARWMP recreational swim sites sampled

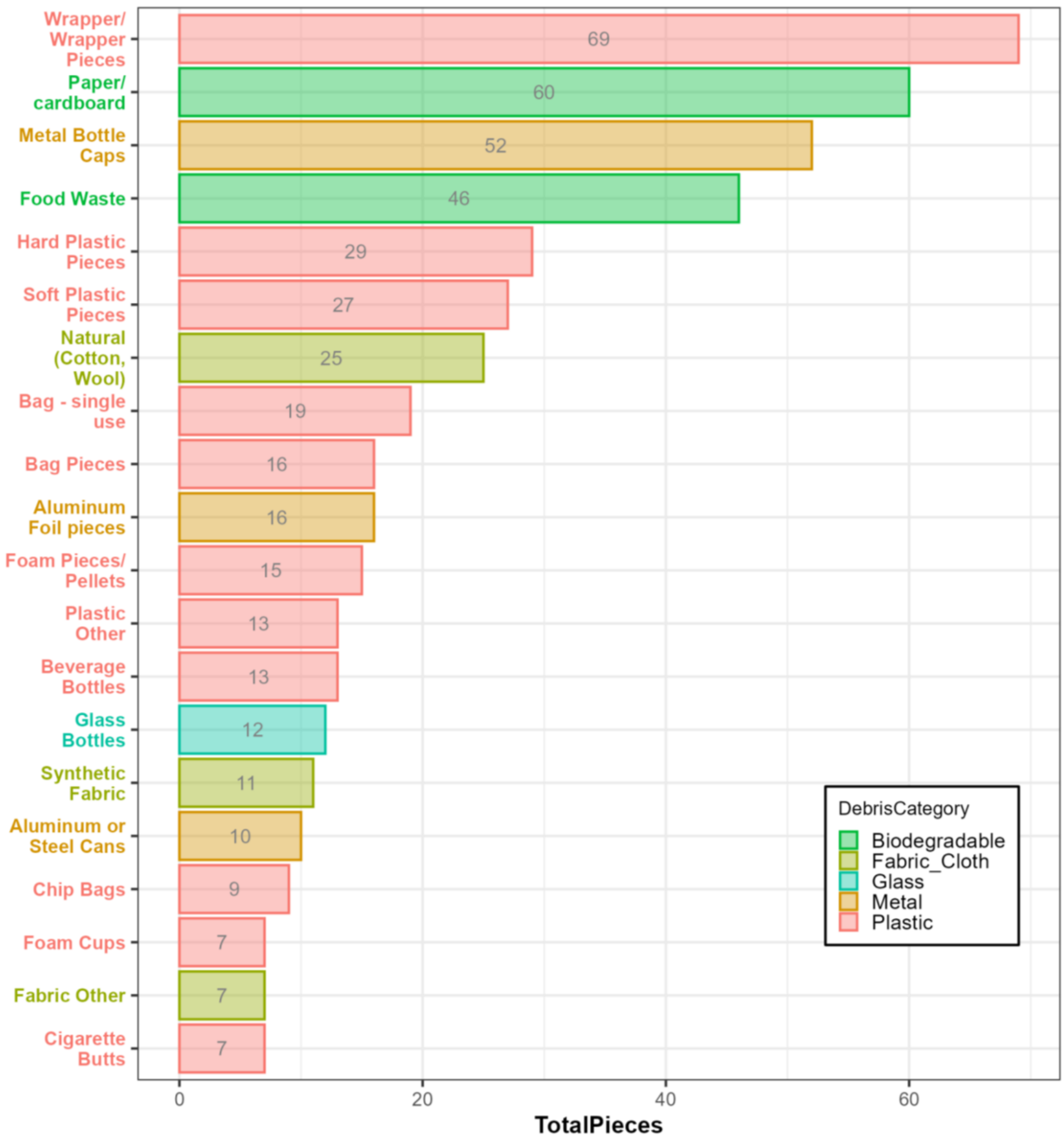


Note. Annual percentage of total trash abundance (>3%) by category is shown.

When analyzing the specific trash items found at recreation sites, wrapper pieces, paper/cardboard, and metal bottle caps were the most common item types (Figure 4.5). This pattern of common trash types reflects typical recreational activities at these sites, such as social gatherings and parties. These activities often involve food and beverages, leading to a higher frequency of items like food wrappers, beverage containers, and disposable utensils.

Figure 4.5

Top 20 trash items in found in LARWMP recreational swim sites in 2024



Note. The bars and their number labels represent the total number of each item found. The bars for each item are color coded by their category.

Question 5. Are locally caught fish safe to eat?

1. Background

Question 5 addresses the human health risk associated with consuming contaminated fish caught at popular fishing locations in the watershed. The monitoring program focuses on one or two fishing sites each year with the goal of identifying the fish species and contaminant types that are of concern. Sites are selected based on the TSG's input about sites that are popular with the angler community. Data will provide watershed managers with the information necessary to educate the public about the safety of consuming the fish they catch.

2. Methods

a. *Sampling and Tissue Analysis*

Sites for contaminant monitoring in fish populations revolve from year to year and have included various lake and river sites throughout the watershed. Lake and river sites are selected based on angler surveys conducted at recreational sites throughout the watershed by Allen et al. (2008) and the recommendations of the TSG.

Fish were collected using a boat outfitted with electroshocking equipment, in accordance with the Office of Environmental Health Hazards (OEHHA) sport fish sampling and analysis protocols, which allowed specific species and size classes to be targeted (OEHHA 2005). OEHHA specifies that the muscle filets from at least five individual fish of the same species and size class be combined to form a composite sample. LARWMP analyzed only the muscle tissue of the fish, which is common practice in regional regulatory programs. Other body parts, such as the skin, eyes, and organs of fish may contain higher levels of contaminants and are not recommended for consumption by the OEHHA. Four contaminants, mercury, selenium, total DDTs, and total PCBs, were selected for analysis based on their contribution to human health risk in California's coastal and estuarine fishes.

Mercury can transform in the environment, affecting its behavior and tendency for biological accumulation. It is widely assumed that nearly all (>95%) of the mercury present in fish is methyl mercury (Wiener et al. 2007). Consequently, monitoring programs usually analyze total mercury as a proxy for methyl mercury, as was done in this study. The U.S. EPA (2000) recommends using the conservative assumption that all mercury that is present is methyl mercury, since it is most protective of human health.

It is also important to note that this program component does not include rainbow trout, a popularly stocked and locally caught fish. Once rainbow trout are released to a waterbody they are caught very quickly and, therefore, have a very short residence time, reducing their potential to accumulate contaminants from that waterbody. There is still the potential for stocked fish to accumulate contaminants from the waterbody where they were raised, but that is not the focus of this study.

b. *Advisory Tissue Levels*

Concentrations of contaminants in each fish species were compared to State Fish Contaminant Goals (FCGs) and Advisory Tissue Levels (ATLs) for human consumption developed by the OEHHA (2008). The OEHHA Fish Contaminant Goals (FCGs) are estimates of contaminant levels in fish that pose no significant health risk to individuals consuming sport fish at a standard consumption rate of eight ounces per week (32 g/day), prior to cooking, and over a lifetime. This guidance assumes a lifetime risk level of 1 in one million for fishermen who consume an 8-ounce fish filet containing a given amount of a specific contaminant.

The OEHHA ATLs, while still conferring no significant health risk to individuals consuming sport fish in the quantities shown over a lifetime, were developed with the recognition that there are unique health benefits associated with fish consumption and that the advisory process should be expanded beyond a simple risk paradigm to best promote the overall health of the fish consumer (Table 5.1 & Table 5.2). ATLs protect consumers from being exposed to more than the average daily reference dose for non-carcinogens or to a lifetime cancer risk level of 1 in 10,000 for fishermen who consume an 8-ounce fish filet containing a given amount of a specific contaminant. For specific details regarding the assumptions used to develop the FCGs and ATLs, go to: http://oehha.ca.gov/fish/gtlsv/crnr062708.html (OEHHA, 2008).

Table 5.1

Fish contaminant goals (FCGs) for selected contaminants based on cancerous and noncancerous risk

	FCGs (ppb, wet weight)
Contaminant Cancer Slope Factor (mg/kg/day)-1	
DDTs (0.34)	**21**
PCBs (2)	**3.6**
Contaminant Reference Dose (mg/kg-day)	
DDTs (5x10-4)	1600
Methylmercury (1x10-4)[S]	**220**
PCBs (2x10-5)	63
Selenium (5x10-3)	**7400**

*The most health protective Fish Contaminant Goal for each chemical (cancer slope factor-
**g/day represents the average amount of fish consumed daily, distributed over a 7-day
[S]Fish Contaminant Goal for sensitive populations (i.e., women aged 18 to 45 years and children aged 1 to 17 years.)

Note. This table uses an 8-ounce/week (prior to cooking) consumption rate (32 g/day**).

Table 5.2

OEHHA (2008) advisory tissue levels (ATLs) for selected fish contaminants.

Contaminant	Three 8-ounce Servings* a Week	Two 8-ounce Servings* a Week	One 8-ounce Servings* a Week	No Consumption
DDT[snc]**	≤520	>520-1,000	>1,000-2,100	>2,100
Methylmercury (Women aged 18-45 years and children aged 1-17 years)[nc]	≤70	>70-150	>150-440	>440
Methylmercury (Women over 45 years and men)[nc]	≤220	>220-440	>440-1,310	>1,310
PCBs[nc]	≤21	>21-42	>42-120	>120
Seleniumn[c]	≤2500	>2500-4,900	>4,900-15,000	>15,000

[c]ATLs are based on cancer risk
[nc]ATLs are based on non-cancer risk
*Serving sizes are based on an average 160 pound person. Individuals weighing less than 160 pounds should eat proportionately smaller amounts (for
**ATLS for DDTs are based on non-cancer risk for two and three servings per week and cancer risk for one serving per week.

Note. ATLs are based on cancer or non-cancer risk using an 8-ounce serving size (prior to cooking; ppb, wet weight).

Figure 5.1

Fish tissue sampling location for the 2024 bioaccumulation survey.

3. Results

A total of 17 fish and 3 different fish species were successfully collected from Echo Park Lake (Figure 5.1). Species that were caught included common carp (*Cyprinus carpio*), redear sunfish (*Lepomis microlophus*), and largemouth bass (*Micropterus salmoides*). The largest fish species captured in the lake was the common carp with an average weight of 3.7 kg, while the smallest was redear sunfish with an average of 0.06 kg (Table 5.3).

The feeding strategies for each of the three species are as follows:

- Largemouth bass: Carnivorous diet that include fish fry, benthic macroinvertebrates, and zooplankton.
- Common carp: Omnivorous bottom feeding diet.
- Redear Sunfish: Carnivorous diet that includes snails, clams, and the bottom dwelling larval stages of aquatic insects.

Table 5.3

Number, average standard weight, and length of the individual and composite fish samples collected in 2024

Waterbody	Comp #	n	Species Name	Common Name	Avg. Weight (g)	Standard Length			Total Length		
						Avg. (mm)	Min (mm)	Max (mm)	Avg. (mm)	Min (mm)	Max (mm)
Echo Park Lake (LALT300)	1	5	Cyprinus carpio	common carp	3751	536	470	590	646	585	710
	1	6	Lepomis microlophus	redear sunfish	56	117	102	125	144	127	154
	1	3	Micropterus salmoides	largemouth bass	1117	336	310	353	393	349	415
	2	3	Micropterus salmoides	largemouth bass	530	284	280	288	342	320	370

Of the four contaminants measured in each of the composites of fish tissue, all fish types could be eaten based on ATL thresholds, but the concentration of PCBs indicate that common carp consumption should be limited to one 8 oz servings per week (Table 5.4).

The concentrations of harmful contaminants are generally consistent with predictions based on size, trophic position, and feeding ecology. According to the State Water Resources Control Board (SWRCB), contaminant concentration in fish tissue is often directly related to fish length and trophic position. The longer length may also explain why common carp had higher concentrations of DDTs, selenium, and PCBs than largemouth bass and tilapia. In addition, a higher trophic level and feeding ecology may explain why largemouth bass had higher concentrations of mercury than redear sunfish.

Additionally, while it is common for fish consumers to consume many parts of the fish they catch, it is important to note that the results of this report are based on the concentration of contaminants in fish filet. According to OEHHA, contaminants can be much higher in the eggs, guts, liver, skin, and fatty parts of fish. They do not recommend consuming these parts of the fish because of the increased risk of contaminant exposure. Interestingly, a study by Regine et al. (2006) found that fish who feed on bacteria and small benthic invertebrates had higher organ to muscle ratios of mercury in their liver and kidneys. Fish who fed on other fish had higher ratios of mercury in their muscle tissue.

Table 5.4

Sport fish consumption chemistry results in 2024

Fish Consumption					
Echo Park - LALT300					
Common Name	**Comp. #**	**Mercury (ppb)**	**Selenium (ppb)**	**DDTs (ppb)**	**PCBs (ppb)**
common carp	1	31	820	18.3	57.0
largemouth bass	1	61	640	6.3	17.5
largemouth bass	2	65	680	3.8	11.6
readear sunfish	2	24	520	3.3	11.3

Three 8-oz servings a week ATL
Two 8-oz servings a week ATL
One 8-oz serving a week ATL
No consumption ATL

Note. Concentration of contaminants in fish tissues relative to the OEHHA ATL thresholds.

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Appendices

Appendix A. Quality Assurance/Quality Control

LARWMP includes an emphasis on QA/QC for each phase of the program including the standardization of data formats so that monitoring results can be shared with local, state, and federal agencies. The data quality objectives for the program are outlined in LARWMP's QAPP and were finalized prior to the 2009 survey and it was updated each year thereafter (https://www.watershedhealth.org/larwmp). Therefore, the data reported herein from the 2024 survey were based on field sampling and laboratory analysis protocols agreed upon by the participants.

Measurement or Data Quality Objectives (MQOs or DQOs) are quantitative or qualitative statements that specify the tolerable levels of potential errors in the data and ensure that the data generated meet the quantity and quality of data required to support the study objectives. The DQOs for LARWMP are detailed in the Program QAPP (CWH 2024b). The MQOs for the processing and identification of benthic macroinvertebrate samples are summarized in LARWMP's QAPP and detailed in the Southern California Regional Watershed Monitoring Program: Bioassessment Quality Assurance Project Plan, Version 1.0 (SCCWRP 2009). The DQOs and MQOs focused on five aspects of data quality: completeness, precision, accuracy, representativeness, and sensitivity.

Completeness

Completeness describes the success of sample collection and laboratory analysis (biology, chemistry, and toxicity) which should be sufficient to fulfill the statistical criteria of the project. One lake, 2 randomly selected sites, 2 trend revisit sites, 6 revisit sites, and 2 targeted sites were sampled in 2024.

Freshwater targeted and random analysis completeness was 100% for general chemistry, nutrients, major ions, and bioassessment (Table A.1).

Percent completeness for bioaccumulation samples analyzing organochlorine pesticides was 100% in 2024. PCB's were 100% complete for 39 congeners. Due to missing standards, 25 PCB congeners were reported 0% (Table A.2). The sampling team and laboratories were notified of completeness deficiencies.

Accuracy

Accuracy provides an estimate of how close a laboratory or field measurement of a parameter is to the true value. Field sampling accuracy was assessed by calibration of the water quality probes with standards of known concentration. The accuracy of physical habitat measurements was assessed during a field audit conducted by the Southern California Coastal Water Research Project (SCCWRP) as part of the Stormwater Monitoring Coalitions (SMC) Southern California Regional Monitoring Survey, field calibration exercise. BMI sorting accuracy was assessed by a recount of 10% of sorted materials. The MQO of 95% was met for each lab reporting results for this program. Taxonomic identification accuracy was assessed through the independent re-identification of 10% of samples by the Department of Fish and Games Aquatic Biology Laboratory. MQOs for taxa count, taxonomic identification, and individual identification rates were met.

Analytical chemistry accuracy measures how close measurements are to the true value. For analytical chemistry samples Certified Reference Materials (CRM), matrix spike / matrix spike duplicates and laboratory control standards are used to assess method accuracy and precision. LARWMP followed SWAMP protocols, which allow one of these elements to fail in a batch and still be compliant. If data fails accuracy checks, it is noted in data and an accuracy qualifier is associated with that result.

Precision

Field duplicates were collected for chemistry, toxicity, and benthic macroinvertebrates at 10% of the random sites visited in 2024 The MQO for field duplicates was a relative percent difference (RPDs) <25%, except for benthic macroinvertebrates. At this time, no MQO has been developed for benthic macroinvertebrate duplicate samples. For analytical chemistry results matrix spike (MS), matrix spike duplicates (MSD), and laboratory duplicates (DUP) were used to assess laboratory precision. RPDs <25% for either the MS/MSD or DUPs were considered acceptable.

Of the analytes measured in 2024, two did not meet the precision criteria (Table A.4**).** Taxonomic precision was assessed using three error rates: random errors which are misidentifications that are made inconsistently within a taxon; systemic errors occur when a specific taxon is consistently misidentified; taxonomic resolution errors occur when taxa are not identified to the proper taxonomic level. Error rates of <10% are considered acceptable and all precision requirements were met.

Laboratory Blanks

Laboratory blanks were used to demonstrate that the analytical procedures do not result in sample contamination. The MQO for laboratory blanks were those with values less than the Method Detection Limit (MDL) for the analyte. During the 2024 surveys, no laboratory blanks were above the MDL (Table A.3).

Program Improvements and Standardization

Intercalibration studies will be ongoing as part of the Stormwater Monitoring Coalition (SMC) Regional Monitoring Program. This intercalibration included all participating laboratories and covered nutrient and metal analyses. Environmental Monitoring Division (EMD), City of Los Angeles is participating in an interlab calibration study involving nutrients, metals pesticides and PAH analysis methods in 2024. EMD uses all ELAP-approved methods and routinely participates in internal QC and Proficiency Test (PT) studies mandated by the SWRCB/ Environmental Laboratory Accreditation Program (ELAP).

Sampling procedures for each field team collecting samples for LARWMP were audited by biologists from the Southern California Coastal Water Research Project during summer surveys. The audit covered the SWAMP bioassessment and physical habitat protocols, including algae and benthic macroinvertebrate collection, and CRAM assessment (Ode, 2007, Fetscher et al., 2009, CWMW 2013 & 2019). Each team passed their audit.

Table A.1

Percent completeness and non-detects by watershed sub-region for water chemistry samples collected in 2024

Analyte	2024					
	Number of Sites	Completeness (%)	Number of Non-Detects (<MDL)			
			Effluent (n=8)	Natural (n=2)	Urban (n=2)	Total
General Chemistry						
Alkalinity as CaCO3	12	100	0	0	0	0
Hardness as CaCO3	12	100	0	0	0	0
Total Suspended Solids	12	100	0	1	0	1
Turbidity	12	100	0	0	0	0
Chlorophyll a	12	100	0	0	0	0
Ash-Free Dry Mass	12	100	0	0	0	0
Nutrients						
Ammonia as N	12	100	6	2	2	10
Dissolved Organic Carbon	12	100	0	2	0	2
Nitrate as N	12	100	0	0	0	0
Nitrite as N	12	100	0	1	0	1
OrthoPhosphate as P	12	100	4	2	2	8
Phosphorus as P	12	100	2	0	0	2
Total Nitrogen (calculated)	12	100	0	0	0	0
Total Organic Carbon	12	100	0	1	0	1
Major Ions						
Chloride	12	100	0	0	0	0
Magnesium	12	100	0	0	0	0
Sodium	12	100	0	0	0	0
Sulfate	12	100	0	0	0	0
Metals						
Arsenic	12	100	0	0	0	0
Cadmium	12	100	0	2	0	2
Chromium	12	100	0	1	0	1
Copper	12	100	0	0	0	0
Iron	12	100	0	0	0	0
Lead	12	100	8	2	1	11
Mercury	12	100	0	0	0	0
Nickel	12	100	0	0	0	0
Selenium	12	100	0	2	0	2
Zinc	12	100	0	0	0	0
Bioassessment						
Benthic Macroinvertebrate ID	12	100	NA	NA	NA	NA
Algae ID	12	100	NA	NA	NA	NA

Table A.2

Bioaccumulation completeness and non-detects by watershed sub-region for fish tissue samples collected in 2024

2024			
Bioaccumulation	**Number of Samples**	**Completeness (%)**	**Number of Non-Detects (<MDL)**
Lipids	4	100	0
Metals			
Mercury	4	100	0
Selenium	4	100	0
Organochlorine Pesticides			
Aldrin	4	0	NA
Chlordane, cis-	4	0	NA
Chlordane, trans-	4	0	NA
DDD(o,p')	4	100	4
DDD(p,p')	4	100	3
DDE(o,p')	4	100	4
DDE(p,p')	4	100	0
DDT(o,p')	4	100	4
DDT(p,p')	4	100	4
Dieldrin	4	0	NA
Endosulfan I	4	0	NA
Endosulfan II	4	0	NA
Endosulfan Sulfate	4	0	NA
Endrin	4	0	NA
Endrin Aldehyde	4	0	NA
HCH, alpha	4	0	NA
HCH, beta	4	0	NA
HCH, delta	4	0	NA
HCH, gamma	4	0	NA
Heptachlor	4	0	NA
Heptachlor Epoxide	4	0	NA
Methoxychlor	4	0	NA
Mirex	4	0	NA
Nonachlor, cis-	4	0	NA
Nonachlor, trans-	4	0	NA
Oxychlordane	4	0	NA
Toxaphene	4	0	NA

Table A.2 *[cont.]*

2024			
Bioaccumulation	**Number of Samples**	**Completeness (%)**	**Number of Non-Detects (<MDL)**
PCBs			
PCB 003	4	0	NA
PCB 008	4	0	NA
PCB 018	4	100	3
PCB 027	4	0	NA
PCB 028	4	100	3
PCB 029	4	0	NA
PCB 031	4	0	NA
PCB 033	4	0	NA
PCB 037	4	100	4
PCB 044	4	100	0
PCB 049	4	100	0
PCB 052	4	100	0
PCB 056	4	0	NA
PCB 056/060	4	0	NA
PCB 060	4	0	NA
PCB 064	4	0	NA
PCB 066	4	100	3
PCB 070	4	100	1
PCB 074	4	100	4
PCB 077	4	100	4
PCB 081	4	100	3
PCB 087	4	100	4
PCB 095	4	0	NA
PCB 097	4	0	NA
PCB 099	4	100	0
PCB 101	4	100	0
PCB 105	4	100	0
PCB 110	4	100	1
PCB 114	4	100	4
PCB 118	4	100	0
PCB 119	4	100	4
PCB 123	4	100	4
PCB 126	4	100	4
PCB 128	4	100	3
PCB 128/167	4	0	NA
PCB 137	4	0	NA
PCB 138	4	0	NA
PCB 141	4	0	NA

Table A.2 *[cont.]*

2024			
Bioaccumulation	**Number of Samples**	**Completeness (%)**	**Number of Non-Detects (<MDL)**
PCBs			
PCB 146	4	0	NA
PCB 149	4	100	3
PCB 151	4	100	3
PCB 153	4	0	NA
PCB 156	4	100	3
PCB 157	4	100	4
PCB 158	4	100	4
PCB 167	4	100	4
PCB 168	4	0	NA
PCB 168/132	4	0	NA
PCB 169	4	100	4
PCB 170	4	100	4
PCB 174	4	0	NA
PCB 177	4	100	4
PCB 180	4	100	1
PCB 183	4	100	4
PCB 187	4	100	1
PCB 189	4	100	4
PCB 194	4	100	4
PCB 195	4	0	NA
PCB 198/199	4	0	NA
PCB 200	4	100	4
PCB 201	4	100	4
PCB 203	4	0	NA
PCB 206	4	100	4
PCB 209	4	0	NA

Table A.3

Lab Blanks Detected

Analyte	Sampling Year	Sample Type	Batch ID	Result	Unit	Minimum Detection Limit	Reporting Limit
None							
None	2024	LabBlank	NA	NA	NA	NA	NA

Note. No lab blanks were detected in 2024.

Table A.4

QA/QC Table

Analyte	Station ID	Sample Date	Batch ID	Sample Type	Recovery DQO	% Recovery	Dup % Recovery	RPD	RPD DQO
Ions (Samplewater)									
Calcium	SMC03902	12-Jun-24	6876	MS	80 - 120 %	**68**	91	**30**	< 25 %
Sodium	SMC03902	12-Jun-24	6876	MS	80 - 120 %	**10**	118	**169**	< 25 %
Calcium	000NONPJ	15-Jul-24	6897	MS	80 - 120 %	**136**	**127**	8	< 25 %
Calcium	LAR0552	30-Jul-24	6937	MS	80 - 120 %	**122**	86	**34**	< 25 %
Organics (Tissue)									
DDD(o,p')	000NONPJ	7-Aug-24	1668	MS	50 - 150 %	96	72	**30**	<25 %
DDD(p,p')	000NONPJ	7-Aug-24	1668	MS	50 - 150 %	96	70	**32**	<25 %
DDE(o,p')	000NONPJ	7-Aug-24	1668	MS	50 - 150 %	77	102	**29**	<25 %
DDE(p,p')	000NONPJ	7-Aug-24	1668	MS	50 - 150 %	51	90	**56**	<25 %
DDT(o,p')	000NONPJ	7-Aug-24	1668	MS	50 - 150 %	71	98	**33**	<25 %
DDT(p,p')	000NONPJ	7-Aug-24	1668	MS	50 - 150 %	67	94	**33**	< 25 %

Note. Matrix spikes, matrix spike duplicates (MS), laboratory control samples, laboratory control sample duplicates (LCS), certified reference material (CRM), Laboratory Duplicates (Lab Dup), percent recovers (% R) and relative percent differences (RPD) that did not meet data quality objectives (DQO). Boldface type indicates values that did not meet quality control criteria.

Appendix B. Analyte List, Reporting Limits, and Methods

Table B.1

Analyte list and method for each program element in 2024

Analyte	Method	Units	Reporting Limit
Conventional Water Chemistry			
Temperature	Probe	°C	-5
pH	Probe	None	NA
Specific Conductivity	Probe	mS/cm	2.5
Dissolved Oxygen	Probe	mg/L	N/A
Salinity	Probe	ppt	N/A
Water Chemistry: freshwater			
Alkalinity as CaCO3	SM 2320 B	mg/L	10
Hardness as CaCO3	SM 2340 C	mg/L	5
Turbidity	SM 2130 B	NTU	0.3
Chemical Oxygen Demand	SM5220D	mg/L	10
Total Suspended Solids	SM 2540 D	mg/L	1
Nutrients			
Ammonia as N	EPA 350.1	mg/L	0.1
Nitrate as N	EPA 300.0	mg/L	0.1
Nitrite as N	EPA 300.0	mg/L	0.1
TKN	EPA 351.2 (1° Method) or SM4500-NH3 C (2° Method)	mg/L	0.1
Total Nitrogen	Calculated	NA	NA
Total Organic Carbon	SM 5310 C	mg/L	0.1
Dissolved Organic Carbon	SM 5310 C	mg/L	0.1
OrthoPhosphate as P	SM 4500-P E	mg/L	0.1
Phosphorus as P	SM 4500-P E	mg/L	0.1
Major Ions			
Chloride	EPA 300.0	mg/L	1.0
Calcium	EPA 200.7	ug/L	200
Magnesium	EPA 200.7	ug/L	200
Sodium	EPA 200.7	ug/L	200
Sulfate	EPA 300.0	mg/L	1.0
Metals (Dissolved)			
Arsenic	EPA 200.8	ug/L	1
Cadmium	EPA 200.8	ug/L	0.2
Chromium	EPA 200.8	ug/L	0.5
Copper	EPA 200.8	ug/L	0.5
Iron	EPA 200.7	ug/L	50
Lead	EPA 200.8	ug/L	0.5
Mercury	EPA 1631E	ug/L	0.2
Nickel	EPA 200.8	ug/L	1
Selenium	EPA 200.8	ug/L	1
Zinc	EPA 200.8	ug/L	1
Benthic Macroinvertebrate	SWAMP (2007), SAFIT STE	Count	NA

Table B.1 *[cont]*

Quantitative Diatom	SWAMP (2019)	Count	NA
Quantitative Algae	SWAMP (2019)	Count; um3/cm3	NA
Habitat Assessments: Freshwater			
Freshwater Bioassessments	SWAMP (2016)	NA	NA
California Rapid Assessment Method (CRAM)	Collins et al., 2013	NA	NA
Tissue Chemistry: Fish			
Percent Lipids	Pes7209 Method developed by EMD	%	0.05
Metals			
Mercury	EPA 7471A	mg/kg ww	0.02
Selenium	EPA 6010B	mg/kg ww	1
Organics			
Organochlorine Pesticides (DDTs)	EPA 8081A	µg/kg ww	1.0-20
Polychlorinated Biphenyl (PCBs)	EPA 8082	µg/kg ww	0.5-1.0
Indicator Bacteria *E. coli*	SM 9223 B	MPN/100mL	10

Note. *Southern California Regional Monitoring Program, 2008 Field and Laboratory Operating Procedures, SCCWRP.

Appendix C. Biotic Condition Index Scores for the CSCI & CRAM

Table C.1

CSCI and CRAM scores, including sub-metrics, for each random station sampled from 2009 - 2024

Stratum	Station	Station Description	CSCI	CSCI Percentile	MMI	MMI Percentile	O/E	O/E Percentile	Overall CRAM Score	Biotic Structure	Buffer and Landscape Context	Hydrology	Physical Structure
2009													
Effluent	LAR00436	Los Angeles River	0.62	0.01	0.49	0	0.74	0.09	27	8	6	12	6
	LAR02228	Los Angeles River	0.70	0.03	0.55	0.01	0.84	0.21	27	8	6	12	6
Urban	LAR00440	Aliso Canyon Wash	0.80	0.1	0.60	0.01	0.99	0.48	64	25	21	18	12
	LAR00756	Tujunga Wash	0.68	0.02	0.51	0	0.85	0.21	37	8	15	12	6
	LAR01004	Arroyo Seco	0.67	0.02	0.51	0	0.83	0.19	29	8	8	12	6
Natural	LAR00476	Little Bear Canyon	1.22	0.92	1.16	0.82	1.28	0.93	99	34	24	36	24
	LAR00520	Big Tujunga Creek	1.02	0.55	0.77	0.1	1.27	0.92	80	33	20	21	21
	LAR00924	Arroyo Seco	1.35	0.99	1.43	0.99	1.27	0.93	87	33	20	30	21
	LAR01040	Big Tujunga Creek	1.21	0.91	1.10	0.72	1.32	0.95	89	33	24	27	21
	LAR06216	Big Tujunga Creek	0.85	0.17	0.73	0.07	0.97	0.43	64	23	20	21	12
2010													
Effluent	LAR00318	Los Angeles River	0.35	0	0.19	0	0.51	0.01	36	8	16	9	6
	LAR02622	Los Angeles River	0.44	0	0.37	0	0.52	0.01	36	8	16	9	6
Urban	LAR01208	Los Angeles River	0.54	0	0.58	0.01	0.50	0	38	8	16	12	6
	LAR01452	Eaton Wash	0.37	0	0.30	0	0.44	0	36	10	16	9	6
	LAR01716	Bull Creek	0.43	0	0.48	0	0.39	0	38	8	16	12	6
	LAR01972	Bull Creek	0.42	0	0.44	0	0.40	0	38	8	16	12	6
Natural	LAR00080	Lynx Gulch	0.75	0.06	0.64	0.02	0.86	0.23	55	17	18	21	9
	LAR00520	Big Tujunga Creek	0.75	0.06	0.73	0.07	0.76	0.11	63	15	22	24	12
	LAR00924	Arroyo Seco	0.68	0.02	0.55	0.01	0.81	0.16	70	20	24	27	12
	LAR01096	Big Tujunga Creek	0.65	0.01	0.59	0.01	0.71	0.06	63	15	20	27	12
	LAR01196	Big Tujunga Creek	0.82	0.13	0.79	0.12	0.85	0.21	65	21	22	21	12
	LAR01320	Big Tujunga Creek	0.69	0.03	0.62	0.02	0.77	0.12	66	21	22	27	9
	LAR01544	Big Tujunga Creek	0.84	0.15	0.77	0.1	0.90	0.3	66	18	22	30	9

Table C.1 *[cont.]*

Stratum	Station	Station Description	CSCI	CSCI Percentile	MMI	MMI Percentile	O/E	O/E Percentile	Overall CRAM Score	Biotic Structure	Buffer and Landscape Context	Hydrology	Physical Structure
2011													
Effluent	LAR02804	Los Angeles River	0.72	0.04	0.55	0.01	0.88	0.27	39	13	15	12	6
Urban	LAR00632	Tarzana	0.44	0	0.33	0	0.55	0.01	32	15	7	12	6
	LAR00684	Rio Hondo Spillway	0.44	0	0.43	0	0.44	0	38	8	16	12	6
	LAR00748	Rubio Wash, Rosemead	0.25	0	0.27	0	0.24	0	35	10	15	9	6
	LAR00830	Rio Hondo	0.43	0	0.47	0	0.39	0	38	8	16	12	6
	LAR01358	Compton Creek	0.37	0	0.23	0	0.51	0.01	37	8	15	12	6
Natural	LAR00080	Lynx Gulch	0.89	0.25	0.81	0.14	0.98	0.45	78	20	22	36	15
	LAR00520	Big Tujunga Creek	0.80	0.1	0.75	0.08	0.85	0.21	71	15	20	30	18
	LAR00924	Arroyo Seco	0.79	0.1	0.80	0.13	0.79	0.13	76	19	22	30	18
	LAR01692	Arroyo Seco	0.83	0.15	0.67	0.03	0.99	0.48	63	16	18	30	12
	LAR01808	Alder Creek	0.87	0.21	0.80	0.14	0.93	0.37	86	26	23	36	18
	LAR02088	Big Tujunga Creek	0.86	0.2	0.71	0.05	1.02	0.54	66	14	20	33	12
	LAR02092	Big Tujunga Creek	0.88	0.23	0.72	0.06	1.04	0.58	77	21	22	30	18
2012													
Effluent	LAR04532	Los Angeles River	0.68	0.02	0.51	0	0.85	0.21	47	13	16	21	6
Urban	LAR01464	Aliso Canyon Wash	0.70	0.03	0.60	0.01	0.80	0.14	34	8	7	21	6
	LAR01656	Cabarello Creek	0.69	0.03	0.52	0	0.86	0.22	36	13	12	12	6
	LAR01772	Alhambra Wash	0.60	0.01	0.52	0	0.67	0.04	39	12	15	12	6
	LAR01912	Santa Susana Creek	0.36	0	0.32	0	0.39	0	34	8	13	12	6
	LAR02028	Arroyo Seco	0.68	0.02	0.57	0.01	0.78	0.13	34	10	12	12	6
Natural	LAR00080	Lynx Gulch	0.85	0.17	0.85	0.2	0.85	0.21	79	25	24	30	15
	LAR00520	Big Tujunga Creek	1.01	0.52	1.03	0.57	0.99	0.47	61	16	18	27	12
	LAR00924	Arroyo Seco	0.82	0.13	0.87	0.23	0.77	0.11	74	20	22	30	15
	LAR02568	Big Tujunga Creek	0.97	0.42	0.91	0.31	1.02	0.55	79	23	22	30	18
	LAR02712	Pacoima Canyon	1.04	0.59	0.84	0.18	1.24	0.89	77	21	24	27	18
	LAR04204	Santa Anita Wash	0.99	0.48	0.81	0.14	1.18	0.83	69	25	22	27	9
	LAR04880	Big Tujunga Creek	1.04	0.6	0.83	0.17	1.25	0.91	82	20	23	36	18

Table C.1 *[cont.]*

Stratum	Station	Station Description	CSCI	CSCI Percentile	MMI	MMI Percentile	O/E	O/E Percentile	Overall CRAM Score	Biotic Structure	Buffer and Landscape Context	Hydrology	Physical Structure
2013													
Effluent	LAR03646	Los Angeles River	0.61	0.01	0.48	0	0.73	0.08	38	25	67.67	33.33	25
Urban	LAR02232	Limekiln Canyon Wash	0.24	0	0.30	0	0.18	0	40	25	50	58.33	25
	LAR02484	Tujunga Wash	0.56	0	0.55	0.01	0.56	0.01	30	36.11	25	33.33	25
	LAR02488	Wilbur Wash	0.21	0	0.30	0	0.12	0	40	25	50	58.33	25
	LAR02796	Rubio Wash	0.28	0	0.28	0	0.29	0	27	25	25	33.33	25
	LAR02936	Bell Creek Tributary	0.46	0	0.46	0	0.46	0	37	27.78	55.17	41.67	25
Natural	LAR05020	Arroyo Seco	0.95	0.37	0.90	0.29	1.00	0.49	84	69.44	93.29	100	75
	LAR05640	Big Tujunga Creek	0.92	0.31	0.95	0.39	0.89	0.29	81	77.78	93.29	91.67	62.5
	LAR05848	Gold Creek	0.91	0.28	0.87	0.23	0.95	0.4	84	77.78	100	83.33	75
	LAR06044	Arroyo Seco	1.13	0.79	1.10	0.72	1.15	0.79	84	75	93.29	91.67	75
2014													
Effluent	LAR05694	Los Angeles River	0.45	0	0.45	0	0.45	0	35	25	58.54	33.33	25
Urban	LAR02680	Los Angeles River	0.41	0	0.34	0	0.48	0	38	25	67.67	33.33	25
	LAR02988	Sawpit Wash	0.70	0.03	0.69	0.04	0.72	0.07	36	25	62.5	33.33	25
	LAR02996	Big Tujunga Wash	0.47	0	0.38	0	0.55	0.01	34	25	62.5	25	25
Natural	LAR00520	Big Tujunga Creek	0.86	0.2	0.81	0.14	0.92	0.34	74	61.11	90.29	83.33	62.5
	LAR00924	Arroyo Seco	1.13	0.79	1.02	0.55	1.24	0.89	81	86.11	93.29	83.33	62.5
	LAR06188	Big Tujunga Wash	1.11	0.75	0.95	0.38	1.27	0.92	83	97.22	93.29	66.67	75
	LAR06216	Big Tujunga Creek	0.92	0.31	0.84	0.18	1.01	0.51	81	88.89	90.29	83.33	62.5
	LAR06252	Santa Anita Wash	0.82	0.13	0.88	0.25	0.76	0.1	83	83.33	85.38	75	87.5
	LAR07128	Pacoima Canyon	1.05	0.63	0.99	0.48	1.11	0.72	90	97.22	96.54	91.67	75
2015													
Effluent	LAR0232	Los Angeles River	0.66	0.02	0.50	0	0.82	0.17	36	25	62.5	33.33	25
	LAR08597	Los Angeles River	0.69	0.03	0.48	0	0.89	0.28	38	25	67.67	33.33	25
	LAR08599	Los Angeles River	0.70	0.03	0.51	0	0.89	0.28	45	33.33	62.5	58.33	25
	LAR08602	Los Angeles River	0.38	0	0.28	0	0.47	0	39	33.33	62.5	33.33	25
	LAR0616	Los Angeles River	0.68	0.02	0.58	0.01	0.77	0.12	36	25	62.5	33.33	25
	LAR0732	Los Angeles River	0.59	0	0.42	0	0.75	0.1	36	25	62.5	33.33	25
Natural	LAR0552	Arroyo Seco	0.98	0.45	0.89	0.27	1.07	0.64	79	75	93.29	83.33	62.5

	LAR00520	Big Tujunga Creek	0.92	0.3	0.83	0.17	1.01	0.51	77	80.56	82.92	83.33	62.5
	LAR0896	Big Tujunga Creek	0.93	0.33	0.87	0.24	0.98	0.47	85	77.78	100	75	87.5

Table C.1 *[cont.]*

Stratum	Station	Station Description	CSCI	CSCI Percentile	MMI	MMI Percentile	O/E	O/E Percentile	Overall CRAM Score	Biotic Structure	Buffer and Landscap e Context	Hydrolog y	Physical Structure
2016													
Effluent	LAR0232	Los Angeles River	0.65	0.01	0.54	0	0.76	0.1	39	33.33	62.5	33.33	25
Natural	LAR0552	Arroyo Seco	0.91	0.28	0.91	0.31	0.91	0.31	75	69.44	93.29	75	62.5
	LAR00520	Big Tujunga Creek	0.94	0.35	0.90	0.28	0.98	0.46	76	63.89	82.92	83.33	75
	LAR00924	Arroyo Seco	1.00	0.51	0.96	0.42	1.05	0.59	84	63.89	93.29	91.67	87.5
	LAR01096	Big Tujunga Creek	0.77	0.08	0.71	0.05	0.84	0.2	84	88.89	90.29	83.33	75
	LAR01544	Big Tujunga Creek	0.87	0.21	0.72	0.06	1.02	0.55	85	77.78	90.29	83.33	87.5
	LAR08610	Santa Anita Wash	0.97	0.43	0.89	0.27	1.05	0.6	84	66.67	93.29	100	75
	LAR08622	Eaton Wash	1.01	0.52	0.90	0.3	1.12	0.73	77	52.78	93.29	75	87.5
Urban	LAR08608	Bull Creek	0.50	0	0.49	0	0.52	0.01	61	61.11	75	58.33	50
	LAR08615	Los Angeles River	0.67	0.02	0.56	0.01	0.77	0.12	39	33.33	62.5	33.33	25
	LAR08616	Arroyo Calabasas	0.53	0	0.63	0.02	0.43	0	34	25	62.5	25	25
	LAR0020	Alhambra Wash	0.29	0	0.30	0	0.28	0	34	25	62.5	25	25
	LAR0040	Bull Creek	0.59	0.01	0.55	0.01	0.62	0.02	39	25	62.5	41.67	25
2017													
Effluent	LAR0232	Los Angeles River	0.72	0.04	0.60	0.01	0.83	0.19	36	25	62.5	33.33	25
	LAR00436	Los Angeles River	0.68	0.02	0.63	0.02	0.74	0.08	38	25	67.67	33.33	25
	LAR08627	Los Angeles River	0.35	0	0.20	0	0.51	0.01	38	25	67.67	33.33	25
Urban	LAR0052	Los Angeles River	0.51	0	0.43	0	0.58	0.01	39	25	62.5	41.67	25
	LAR08630	Alhambra Wash	0.27	0	0.31	0	0.24	0	33	25	50	33.33	25
	LAR08632	Santa Susana Pass Wash	0.41	0	0.54	0.01	0.27	0	36	25	62.5	33.33	25
Natural	LAR0552	Arroyo Seco	0.97	0.41	1.01	0.51	0.93	0.35	78	61.11	93.29	83.33	75
	LAR00520	Big Tujunga Creek	0.78	0.08	0.69	0.04	0.87	0.24	78	72.22	82.92	83.33	75
	LAR00924	Arroyo Seco	0.95	0.38	1.00	0.5	0.90	0.3	77	66.67	93.29	75	75
	LAR08638	Arroyo Seco	0.99	0.48	1.07	0.65	0.91	0.32	77	66.67	93.29	75	75

Table C.1 *[cont.]*

Stratum	Station	Station Description	CSCI	CSCI Percentile	MMI	MMI Percentile	O/E	O/E Percentile	Overall CRAM Score	Biotic Structure	Buffer and Landscape Context	Hydrology	Physical Structure
2018													
Effluent	LAR0232	Los Angeles River	0.71	0.03	0.63	0.02	0.78	0.12	25	62.5	33.33	36	25
	LAR08599	Los Angeles River	0.59	0	0.65	0.02	0.52	0.01	50	67.67	58.33	53	37.5
	LAR08642	Los Angeles River	0.72	0.04	0.58	0.01	0.87	0.24	25	67.67	33.33	38	25
	LAR08643	Los Angeles River	0.33	0	0.18	0	0.48	0	33.33	67.67	33.33	40	25
Urban	LAR08640	Aliso Canyon Wash	0.33	0	0.31	0	0.35	0	25	62.5	33.33	36	25
	LAR00440	Aliso Canyon Wash	0.64	0.01	0.50	0	0.78	0.12	50	82.92	58.33	67	75
	LAR00756	Tujunga Creek	0.52	0	0.52	0	0.52	0.01	25	62.5	33.33	36	25
Natural	LAR0552	Arroyo Seco	0.77	0.07	0.58	0.01	0.96	0.41	66.67	93.29	91.67	79	62.5
	LAR02092	Big Tujunga Creek	1.07	0.67	0.88	0.24	1.27	0.92	72.22	93.29	75	79	75
	LAR02568	Big Tujunga Creek	1.13	0.79	1.03	0.56	1.24	0.89	69.44	93.29	83.33	83	87.5
	LAR02088	Big Tujunga Creek	1.01	0.52	0.89	0.27	1.12	0.74	83.33	93.29	91.67	80	50
2019													
Effluent	LAR00318	Los Angeles River	0.47	0	0.43	0	0.51	0.01	38	25	67.67	33.33	25
	LAR0232	Los Angeles River	0.72	0.04	0.59	0.01	0.86	0.23	36	25	62.5	33.33	25
Natural	LAR01808	Alder Creek	0.76	0.07	0.62	0.02	0.90	0.31	83	80.56	90.29	75	87.5
	LAR04204	Santa Anita Wash	0.98	0.45	0.75	0.08	1.21	0.86	75	58.33	93.29	100	50
	LAR0552	Arroyo Seco	1.03	0.56	1.08	0.67	0.97	0.44	76	63.89	93.29	83.33	62.5
	LAR08641	Big Tujunga Creek	0.88	0.23	0.69	0.04	1.07	0.64	79	61.11	96.54	88.33	75
	LAR08647	Big Tujunga Creek	0.92	0.3	0.81	0.14	1.02	0.54	74	47.22	100	100	50
Urban	LAR01004	Arroyo Seco	0.49	0	0.40	0	0.57	0.01	36	25	62.5	33.33	25
	LAR08645	Bull Creek	0.62	0.01	0.44	0	0.80	0.14	56	69.44	67.67	50	37.5
	LAR08646	Eaton Wash	0.67	0.02	0.61	0.01	0.74	0.08	36	25	62.5	33.33	25

Table C.1 *[cont.]*

Stratum	Station	Station Description	CSCI	CSCI Percentile	MMI	MMI Percentile	O/E	O/E Percentile	Overall CRAM Score	Biotic Structure	Buffer and Landscape Context	Hydrology	Physical Structure
2020													
Effluent	LAR0232	Los Angeles River	0.59	0	0.59	0.01	0.58	0.01	36	25	62.5	33.33	25
	LAR08656	Los Angeles River	0.74	0.05	0.58	0.01	0.89	0.29	36	25	62.5	33.33	25
	LAR08659	Los Angeles River	0.66	0.02	0.58	0.01	0.74	0.08	38	25	67.67	33.33	25
Natural	LAR05020	Arroyo Seco	1.11	0.76	1.33	0.97	0.89	0.29	75	47.22	100	91.67	62.5
	LAR0552	Arroyo Seco	1.18	0.87	1.11	0.73	1.24	0.9	79	77.78	93.29	83.33	62.5
	LAR05640	Big Tujunga Creek	1.17	0.85	1.07	0.65	1.27	0.92	84	83.33	93.29	83.33	75
	LAR06216	Big Tujunga Creek	1.00	0.5	0.88	0.25	1.12	0.74	76	80.56	90.29	83.33	50
	LAR08655	Big Tujunga Creek	1.17	0.85	1.14	0.78	1.20	0.85	85	88.89	93.29	83.33	75
Urban	LAR01208	Los Angeles River	0.45	0	0.46	0	0.44	0	38	25	67.67	33.33	25
	LAR08658	Arroyo Seco	0.71	0.04	0.58	0.01	0.85	0.21	41	33.33	62.5	41.67	25
2021													
Effluent	LAR00318	Los Angeles River	0.33	0	0.19	0	0.47	0	38	25	67.67	33.33	25
	LAR0232	Los Angeles River	0.71	0.04	0.70	0.05	0.72	0.07	36	25	62.5	33.33	25
	LAR08661	Los Angeles River	0.68	0.02	0.57	0.01	0.78	0.12	36	25	62.5	33.33	25
	LAR08663	Los Angeles River	0.84	0.16	0.65	0.02	1.04	0.58	70	69.44	75	75	62.5
Natural	LAR00520	Big Tujunga Creek	0.70	0.03	0.71	0.05	0.70	0.06	79	72.22	82.92	75	87.5
	LAR00924	Arroyo Seco	1.11	0.75	1.20	0.87	1.01	0.52	80	80.56	93.29	83.33	62.5
	LAR01544	Big Tujunga Creek	0.79	0.1	0.70	0.05	0.88	0.27	83	75	90.29	91.67	75
	LAR0552	Arroyo Seco	0.83	0.15	0.78	0.11	0.88	0.27	80	80.56	93.29	83.33	62.5
Urban	LAR08662	Rio Hondo	0.34	0	0.28	0	0.39	0	38	25	67.67	33.33	25
	LAR08672	Los Angeles River	0.42	0	0.34	0	0.51	0	38	25	67.67	33.33	25
2022													
Effluent	LAR00318	Los Angeles River	0.33	0	0.19	0%	0.47	0	38	25	67.67	33.33	25
	LAR0232	Los Angeles River	0.71	0.04	0.70	0.05	0.72	0.07%	36	25	62.5	33.33	25
	LAR08661	Los Angeles River	0.68	0.02	0.57	0.01	0.78	0.12	36	25	62.5	33.33	25
	LAR08663	Los Angeles River	0.84	0.16	0.65	0.02	1.04	0.58	70	69.44	75	75	62.5
Natural	LAR00520	Big Tujunga Creek	0.70	0.03	0.71	0.05	0.70	0.06	79	72.22	82.92	75	87.5
	LAR00924	Arroyo Seco	1.11	0.75	1.20	0.87	1.01	0.52	80	80.56	93.29	83.33	62.5
	LAR01544	Big Tujunga Creek	0.79	0.10	0.70	0.05	0.88	0.27	83	75	90.29	91.67	75
	LAR0552	Arroyo Seco	0.83	0.15	0.78	0.11	0.88	0.27	80	80.56	93.29	83.33	62.5
Urban	LAR08662	Rio Hondo	0.34	0	0.28	0	0.39	0	38	25	67.67	33.33	25
	LAR08672	Los Angeles River	0.42	0	0.34	0	0.51	0	38	25	67.67	33.33	25

Table C.1 *[cont.]*

Stratum	Station	Station Description	CSCI	CSCI Percentile	MMI	MMI Percentile	O/E	O/E Percentile	Overall CRAM Score	Biotic Structure	Buffer and Landscape Context	Hydrology	Physical Structure
2023													
Effluent	LAR00318	Los Angeles River	0.45	0	0.38	0	0.51	0.01	38	25	67.67	33.33	25
	LAR00436	Los Angeles River	0.68	0.02	0.50	0	0.86	0.23	35	25	55.17	33.33	25
	LAR08599	Los Angeles River	0.63	0.01	0.53	0	0.72	0.07	45	33.33	25	58.33	62.5
	LAR08695	Los Angeles River	0.63	0	0.53	0	0.72	0.07	27	25	25	33.33	25
	LAR10210	Los Angeles River	0.67	0.02	0.60	0.01	0.73	0.08	50	44.44	25	66.67	62.5
Natural	LAR0552	Arroyo Seco	0.86	0.19	0.86	0.22	0.85	0.22	72	61.11	93.29	83.33	50
	LAR08698	Arroyo Seco	0.92	0.30	0.65	0.03	1.18	0.83	84	77.78	90.29	91.67	75
	LAR08702	Arroyo Seco	0.79	0.10	0.68	0.04	0.91	0.31	82	66.67	90.29	83.33	87.5
	LAR0896	Big Tujunga Creek	0.66	0.02	0.43	0	0.90	0.30	79	77.78	93.29	83.33	62.5
Urban	LAR0020	Alhambra Wash	0.29	0	0.29	0	0.29	0	27	25	25	33.33	25
	LAR01208	Los Angeles River	0.50	0	0.49	0	0.50	0	44	25	67.67	58.33	25
	LAR08694	Arroyo Seco	0.73	0.05	0.62	0.02	0.84	0.20	40	38.89	62.5	33.33	25
2024													
Effluent	LAR00318	Los Angeles River	0.60	0.01	0.49	0	0.71	0.06	38	25	67.67	33.33	25
	LAR0232	Los Angeles River	0.82	0.13	0.62	0.02	1.02	0.54	27	25	25	33.33	25
	LAR03902	Los Angeles River	0.71	0.03	0.63	0.02	0.78	0.12	27	25	25	33.33	25
	LAR04532	Los Angeles River	0.76	0.06	0.60	0.01	0.91	0.32	43	47.22	42.67	58.33	25
	LAR08695	Los Angeles River	0.69	0.03	0.60	0.01	0.78	0.13	27	25	25	33.33	25
	LAR08706	Los Angeles River	0.70	0.03	0.54	0.01	0.87	0.24	27	25	25	33.33	25
Natural	LAR0552	Arroyo Seco	1.06	0.64	1.05	0.60	1.07	0.64	75	61.11	93.29	83.33	62.5
	LAR0896	Big Tujunga Creek	1.11	0.76	1.07	0.65	1.16	0.80	80	72.22	93.29	91.67	62.5
Urban	LAR0020	Alhambra Wash	0.47	0	0.49	0	0.45	0	27	25	25	33.33	25
	LAR08704	Aliso Canyon Wash	0.64	0.01	0.55	0.01	0.72	0.07	33	25	25	58.33	25