



MARU STREAM BIOASSESSMENT: 2024 ANNUAL REPORT



Photo: Upper Poway Creek Sampled in 2024

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1. Introduction

This technical report was produced by the California Water Quality Control Board San Diego Region's (San Diego Water Board) Monitoring, Assessment and Research Unit (MARU). The MARU supports San Diego Water Board regulatory and non-regulatory programs by conducting water quality monitoring and data assessment, as well as by guiding and/or conducting scientific research to better protect and restore beneficial uses of the San Diego Region's waters. MARU regularly conducts stream bioassessment at up to 20 stream sites on an annual basis. In some years, the California Department of Fish and Wildlife (CDFW) conducts bioassessments in Region 9 under the statewide [reference condition management program](#) (RCMP). Occasionally, bioassessments are done in Region 9 as part of the United State Environmental Protection Agency (USEPA) [National Rivers and Streams Assessment](#) (NRSA). Whenever possible, the San Diego Water Board supports the bioassessment efforts of external partners.

This report summarizes 27 bioassessments conducted in 2024 – 16 by MARU, eight by CDFW/Moss Landing Marine Labs, and three by Trout Unlimited. This report also includes a summary of environmental DNA (eDNA) sampling done by MARU in 2024, most of which was done in conjunction with bioassessment.

2. Bioassessment Background and Purpose

Biological assessment, or bioassessment, is the science of evaluating the health or integrity of an ecosystem by assessing the organisms that live within it. Bioassessment allows for the San Diego Water Board to better protect and restore waters by facilitating a broader evaluation of the cumulative effects of stressors beyond analyzing for individual chemicals. The use of bioassessment is central to the Clean Water Act (CWA), as the CWA goal is to protect and restore the biological integrity of waters (33 U.S. Code § 1251). In addition, the Porter-Cologne Act also relies on the use of bioassessment to protect water quality, which is defined to include chemical, physical, biological, bacteriological, and radiological properties (CWC section 13050).

Unlike traditional chemistry-based monitoring, which provides only limited information about a relatively narrow portion of the environment at a discrete point in time, bioassessment can account for living organisms exposed to multiple chemicals and other stressors such as altered habitats and changes in water-flow patterns over extended time periods. Bioassessment therefore provides a far more integrated view of the condition of an aquatic ecosystem. Bioassessment is also more closely tied to an environmental manager's end-goal focus on ecosystem protection and serves as an important way to monitor and protect populations of endangered species and fisheries. Biological assessment is a critical component of implementation of the San Diego Water Board's [monitoring and assessment framework](#) ("Monitoring Framework", [Figure 1](#)).

Biological assessment can and should be used to conduct waterbody-oriented monitoring and assessment, specifically to:

- 1) Answer the M1 question: “Are habitats and ecosystems healthy?”
- 2) Guide the M2 and M3 Stressor Identification Process, and
- 3) Evaluate M4 performance monitoring to document success.

Figure 1. Water Body-Oriented Monitoring and Assessment



2.1. Stream Bioassessment Background

While bioassessment can and should be used to assess the condition of all surface waterbody types, this report focuses on bioassessment done on perennial and intermittent wadeable streams. The State of California has been conducting bioassessment on wadeable streams in the San Diego region since the 1990s, with early sampling conducted by the San Diego Water Board, the State Water Board's Surface Water Ambient Monitoring Program (SWAMP), and USEPA.

The San Diego Water Board, in December of 2020, adopted biological objectives for streams using stream bioassessment, specifically the California Stream Condition Index (CSCI, see Mazor et al. 2016), discussed in section 2.2.1 below. Stream bioassessment has been used in multiple San Diego Water Board program areas for over two decades, including municipal stormwater, CWA assessment under sections 305(b) and 303(d), ambient monitoring, CWA Section 401 water quality certifications, and waste discharge requirements.

SWAMP has developed standard operating procedures (SOPs) for bioassessment field sampling, laboratory identification of specimens, quality assurance/control, data management, and reporting. These SOPs are on the SWAMP bioassessment website: https://www.waterboards.ca.gov/water_issues/programs/swamp/bioassessment/

Current stream bioassessment includes the following measurements:

- Benthic macroinvertebrates (BMI)
- Benthic algae: diatoms and soft algae, including cyanobacteria
- Physical habitat: instream and riparian
- Water chemistry
- Flow

All San Diego Water Board bioassessment data is available to the public via the California Environmental Data Exchange Network ([CEDEN](#)) database.

2.2. Indices of Integrity and Water Quality Objectives

2.2.1. Biological Indices

To assess bioassessment data, biological scoring tools are needed to translate complex species identification information into a stream condition determination. The development of these biological scoring tools, often referred to as indices or metrics of biological integrity, has been on-going since the 1990s, with various regional indices developed throughout the State. In 2015, the State of California released the peer-reviewed statewide CSCI (Mazor et al. 2016) for assessing the biological condition of wadeable streams throughout the State based on benthic macroinvertebrates. The CSCI uses a combined-reference-site approach to determine the site-specific benthic community expected to be present at any sampled site. In 2020, the peer-reviewed statewide Algal Stream Condition Index (ASCI, Theroux et al. 2020) was released. The ASCI uses an approach that mirrors the CSCI, except multiple indices were developed, with a diatom-specific index (d-ASCI) and combined “hybrid” diatom/soft algae index (h-ASCI).

Both the CSCI and ASCI are indices that have a possible score range of 0 to greater than 1. A score of 1 or above indicates the condition of a sampled stream site is equivalent to conditions at reference sites with similar environmental settings. A lower score indicates deviation from expected condition. The CSCI and ASCI publications calculated thresholds for scores, below which a site could be considered impaired (Table 1). The CSCI threshold of 0.79 was adopted by the San Diego Water Board as a water quality objective in December 2020. A recent evaluation of both the hybrid and diatom index scores at Region 9 reference sites found that meeting either ASCI index would be indicative of a site being similar to reference, and failing both indices (or a single index over multiple samples) would indicate impaired condition (Loflen 2025).

Furthermore, a molecular ASCI (m-ASCI) has been developed (Theroux et al. 2023) and is being further refined for statewide application. The m-ASCI uses DNA sequencing for taxa identification instead of the traditional microscopy used for the d-ASCI and h-ASCI. The m-ASCI is a valuable new tool for stream bioassessment because DNA methods have the potential to detect a greater diversity of algal taxa and are more time- and cost-effective than traditional methods. The 2024 season is the first for which m-ASCIs will be available for all sites sampled by MARU.

2.2.2. Physical Habitat Indices

The State of California developed an [Index of Physical Habitat Integrity](#) (IPI) in 2018 that relies on in-stream measures of physical habitat. Like the CSCI and ASCIs, the IPI uses a reference approach to determine what a site's physical habitat expectations are. The IPI is also scored on a 0-1 scale. The IPI should be used for provisional informational purposes only, as the State has identified some needed improvements for the IPI to better reflect conditions and impacts and prevent Type I and II errors.

Table 1. Impairment Thresholds for Bioassessment Indices

Index	Threshold
CSCI	0.79
d-ASCI	0.86
h-ASCI	0.86
m-ASCI	TBD
IPI	0.84

2.2.3. Chemical and Physical Water Quality Objectives

While stream bioassessment focuses on the organisms living in the stream, the SWAMP SOP requires a minimum level of sampling for chemical (e.g. nitrogen) and physical (e.g. turbidity) parameters. These grab samples simply provide a baseline assessment of water quality at the time of sampling. They do not include all potential stressors or matrices (e.g. sediment), though additional parameters and matrices can be added to sampling efforts and are noted in this report where conducted. Data for all sites are available on the ([CEDEN](#)) database.

Table 2. Chemical and physical water quality objectives and impairment thresholds

Parameter	Threshold
Temperature	Narrative (Deg C)
Dissolved Oxygen	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	6.5-8.5
Total Nitrogen	1.0 mg/L
Total Phosphorus	0.1 mg/L
Turbidity	20 NTU
Chloride	^b waterbody-specific mg/L, ^c 230 & 860 mg/L
Sulfate	^b waterbody-specific mg/L
Conductivity	^a NA uS/cm
Alkalinity	^a NA mg/L
Silica	^a NA mg/L
Dissolved Organic Carbon	^a NA mg/L
Benthic Ash Free Dry Mass (AFDM)	^d 25 g/m ²
Benthic Chlorophyll a (Chl-a)	^d 44 mg/m ²
Benthic Carbon:Nitrogen Molar Ratio (C:N)	^a NA

^a Informational

^b [Basin Plan criteria](#) are specific to non-aquatic use

^c [USEPA recommended freshwater criteria](#) for 4-day and 1-hour exposure, respectively. Assumes an association with sodium.

^d Mazon et al. 2022 threshold for obtaining 10th percentile ASCI score

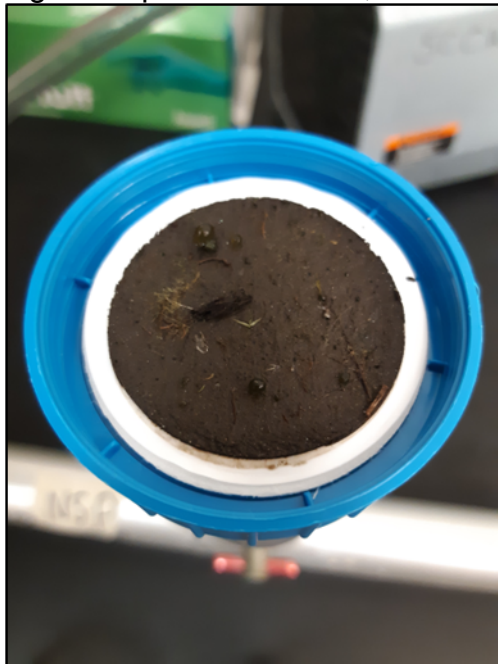
2.3. Supplemental Sampling

The San Diego Water Board often will conduct supplemental sampling or special studies at bioassessment sites. This can allow for efficiencies in testing new methods, take advantage of existing sampling of reference sites, or be done to support the work of sister agencies (e.g. California Department of Fish and Wildlife). In 2024, MARU conducted several types of supplemental sampling as described below.

2.3.1. **Molecular benthic algal analysis**

Molecular benthic algal analysis is a Region 9 funded SWAMP project to evaluate the potential transition from traditional microscope-based benthic algae analysis to a molecular DNA-based approach. For this analysis, there is no change in the SWAMP collection method for benthic algae; only a small subsample of the collected algal composite is needed ([Figure 2](#)). Molecular algal analysis is being done by SWAMP and partners statewide, with the San Diego Water Board funding the analysis and development of independent or supplemental indices of biological integrity. MARU has conducted this sampling since 2017 while the DNA-based m-ASCI was under development. In 2024, samples for molecular algal analysis were collected at all but the three NRSA sites and, when available, m-ASCI scores will be provided in the stream summaries below.

Figure 2. A filter for benthic algal molecular analysis. Typically, 15-25 ml of the collected algal composite is filtered, and three replicates are prepared.



2.3.2. Environmental DNA (eDNA)

Sampling for eDNA was done at 20 sites (16 bioassessment sites plus four others) using pre-packaged metabarcoding kits from Jonah Ventures provided by the statewide SWAMP eDNA Metabarcoding Monitoring and Analysis Project (SeMMAAP). In brief, eDNA sampling using these kits involved the filtration of 200-400 ml of stream water through a DNA filter, which was then mailed to a lab for analysis. Metabarcoding does not target single species but looks at the overall community.

In addition, eDNA sampling was done at 19 sites using a Smith-Root pump device in the field ([Figure 3](#)), and at 19 sites using vacuum filtration of collected water in the lab (16 bioassessment sites plus three others). Concurrent use of the Jonah Ventures, Smith-Root, and lab filtration methods allows for comparison of sensitivity and usefulness among the three. Notable eDNA results for higher trophic level species are presented in the site summaries and section 5.7. As of report publication, only Jonah Ventures results are available. No funding or contract was available to run eDNA analyses of Smith-Root and laboratory vacuum filters. A new contract for this work is under development with the University of California at Santa Cruz.

Figure 3. Collection of eDNA samples using a Smith-Root pump (left) and Jonah Ventures kit (right). Water was also collected for vacuum filtration in the lab.



2.3.3. Particulate carbon and nitrogen (PCN)

Particulate carbon and nitrogen (PCN) was sampled at MARU's 16 bioassessment sites. Analysis of PCN was done for the third year, having first sampled it in 2022. PCN analysis provides insight into the carbon and nitrogen sources typical of a given waterbody. Specifically, the Carbon:Nitrogen ratio (C:N) tells us about a stream's relative proportions of carbon-rich sources (leaves) or nitrogen-rich sources (algae, animal waste). A higher C:N (>16) indicates a stream is dominated by terrestrial carbon sources, whereas a lower C:N (<8) indicates a stream is dominated by algal sources or external nitrogen loading. A C:N between 8 and 16 indicates a mix of the two. SWAMP has recommended that PCN replace the AFDM parameter. PCN analysis requires no change in the SWAMP collection method for benthic algae; only a small subsample of the collected algal composite is needed. In 2024, two filters for each site were analyzed to get a measure of variability, and the molar C:N ratio for both is given in the site summaries below.

2.3.4. Bacteria and HF183

E.coli and total coliform were sampled at 12 bioassessment sites and HF183 was sampled at 13 sites to test for the presence of human fecal contamination. While *E. coli* and total coliform can have human or non-human sources, HF183 is a gene sequence unique to human-associated *Bacteroides* bacteria and is specific to human fecal sources. The IDEXX Quantitray method was used to quantify *E.coli* and total coliform, and droplet digital polymerase chain reaction (ddPCR) was used for HF183.

2.3.5. Taxonomic Richness

Out of interest, the number of BMI and algal taxa recorded from each site was compiled by counting taxa in CEDEN's Final ID column. For BMI, Final IDs are at various levels (species, genus, family, group), and "notable taxa" for this report are those in the orders Ephemeroptera, Plecoptera, and Trichoptera (EPT taxa). EPT taxa are relatively sensitive, and their presence is indicative of good stream condition. Each sample from which BMI taxa were recorded was a composite of 11 subsamples (30 x 30 cm), or a total of ~1 m² of stream bed sampled.

For algae, Final IDs are at the level of species or genus, and "sensitive taxa" for this report are those with a California Biological Condition Gradient (BCG) rating of 1 or 2 (Paul et al. 2020). The presence of sensitive algae is indicative of good stream condition. Each sample from which algal taxa were recorded was a composite of 11 subsamples (5.3 or 12.6 cm²), or a total of ~100 cm² of stream bed sampled (actual total areas were between 95 cm² and 131 cm²).

2.3.6. Laboratories Used for Sample Analyses

The external laboratories used to process supplemental and standard bioassessment samples were:

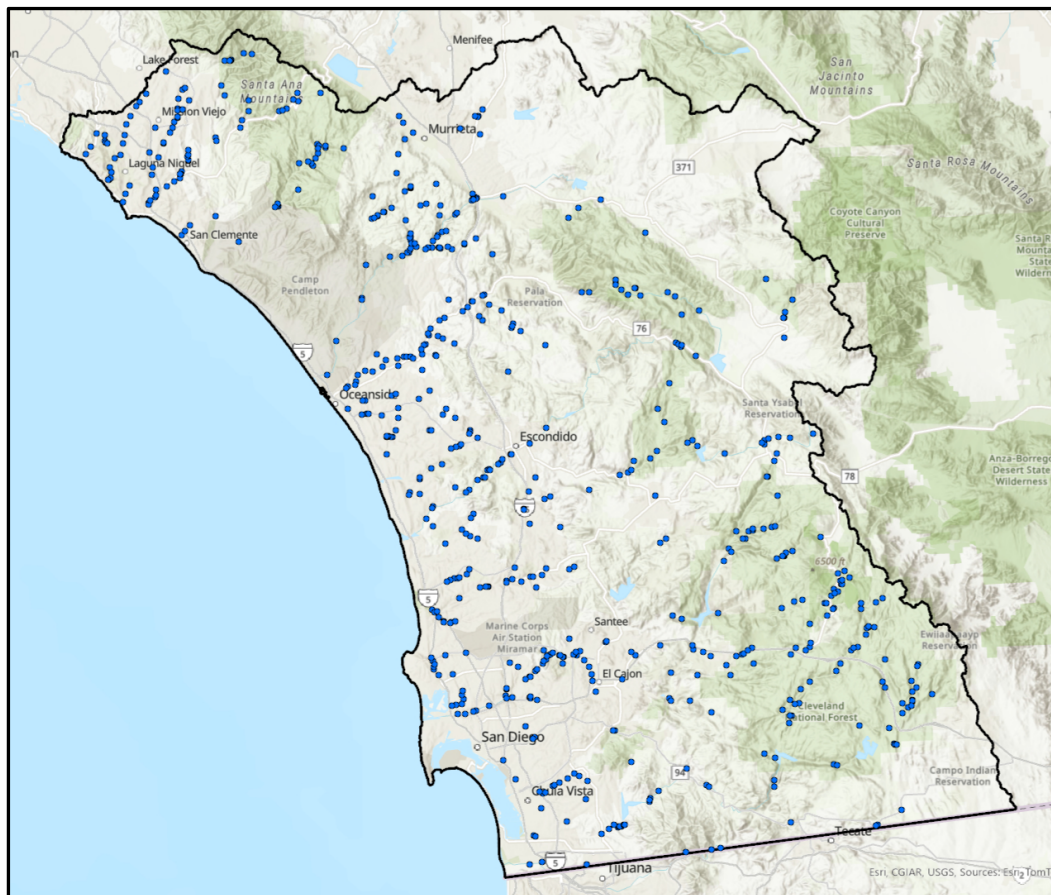
- BMI identification – California State University, Chico
- Algal identification – George Mason University
- Chemistry – Moss Landing Marine Lab
- Molecular algal analyses – Southern California Coastal Water Research Project (SCCWRP)
- ddPCR eDNA lab-filtered samples – SCCWRP
- ddPCR eDNA Smith-Root filters – University of California, Santa Cruz
- qPCR eDNA – Jonah Ventures
- PCN – University of California, Santa Barbara, Marine Science Institute
- Bacteria – Alpha Analytical Laboratories, Inc.
- HF183 – WSP Molecular Technical Services

3. Bioassessment Site Types

Stream bioassessment has been conducted in the San Diego Region for over two decades, with sampling at over 600 sites ([Figure 4](#)) and with many sites sampled multiple times (1,700+ total samples). Bioassessment samples have been collected by multiple entities and include a mix of site types: reference, non-reference, targeted, probabilistic, trend, and investigation sites. MARU typically conducts stream bioassessment at site types 1 through 5 below; types 6 and 7 were added for this year's report:

- 1) Reference Condition Management Program/Reference Sites
- 2) Water Board Program Request Sites
- 3) Causal/Protective Assessment Sites
- 4) Trend Sites
- 5) Coverage Expansion Sites
- 6) National Rivers and Streams Assessment Sites
- 7) Partner Support Sites

Figure 4. Existing bioassessment sampling sites within the San Diego Region.

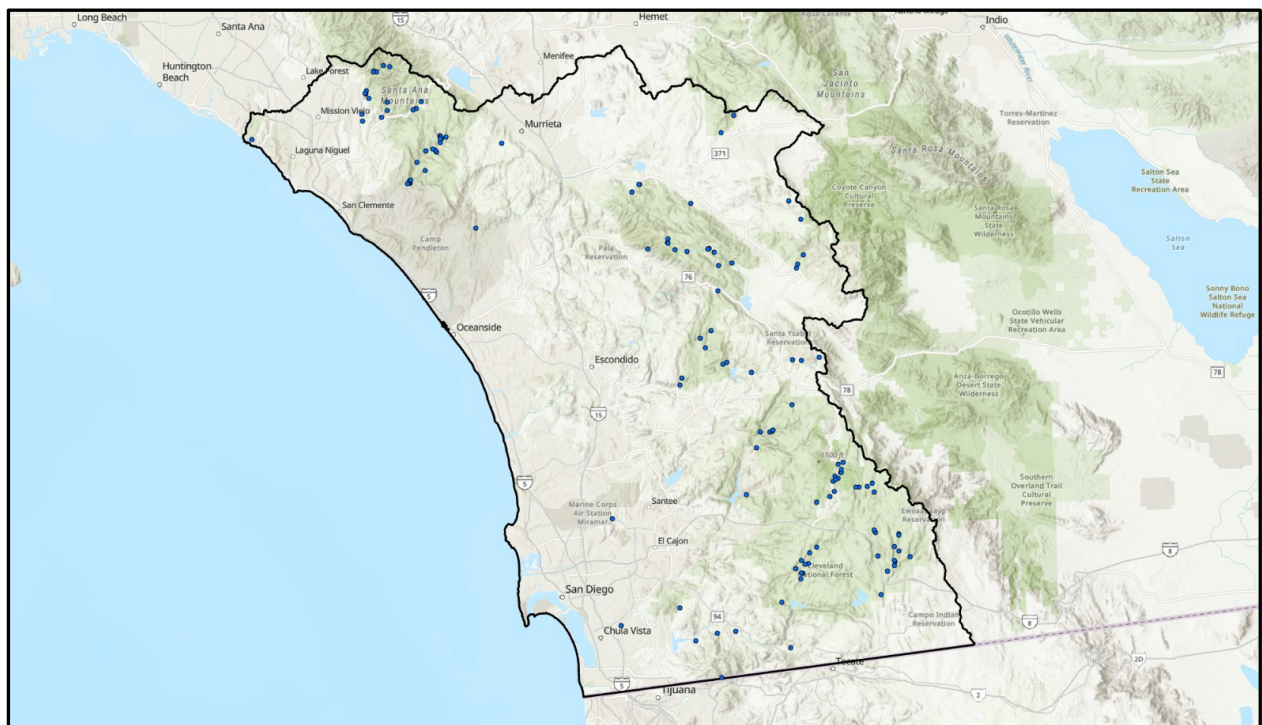


3.1. Reference Condition Management Program Sites/Reference Sites

The SWAMP program conducts long-term monitoring at a set of sites that meet GIS reference screening criteria (Ode et al. 2016) as part of the state's [reference condition management program](#) (RCMP). This network of sites, and their on-going monitoring, is critical for establishing reference conditions, which are “healthy” or “biologically intact” conditions in streams with little to no upstream anthropogenic stressors. In addition, the RCMP helps assess longer-term impacts to California’s streams from large-scale changes, such as those associated with climate change.

The San Diego Water Board supports the RCMP in two ways: MARU conducts repeat sampling at long-term RCMP sites, and MARU identifies new reference sites to add to the potential State reference site pool ([Figure 5](#), also section 3.5).

Figure 5. Bioassessment Sites in the San Diego Region that meet reference screens. Reference sites are those that meet GIS screening criteria under Ode et al. 2016.



3.2. Program Request Sites

Program request sites are those that have been identified by internal San Diego Water Board staff/programs as a priority for monitoring to determine condition (M1 of the Monitoring Framework). Monitoring may be done to investigate discharge impacts, determine the success of mitigation measures, monitor trends for CWA section 305(b)/303(d) assessment, etc. In addition, some program request sites include requests from partner agencies who manage sensitive native species, such as the California Department of Fish and Wildlife (CDFW), United States Geologic Survey (USGS), and United States Fish and Wildlife Service (USFWS), and from partner nonprofit organizations such as the San Diego River Park Foundation.

3.3. Causal/Protective Assessment Sites

For stream bioassessment sites that score poorly, determining the likely stressor(s) causing the poor condition allows for actions to be taken to improve biological condition (M2 of the Monitoring Framework). The process for investigating and determining likely stressors is referred to as “causal assessment.” This process can also be used to assess whether sites scoring above an index threshold might be at risk from stressors, especially for sites close to the threshold (“protective assessment”). MARU may conduct stream bioassessment revisits, combined with extra stressor-related sampling, to support causal and protective assessment efforts.

3.4. Trend Sites

Trend sites are sites that have been previously sampled and are targeted for re-sampling due to the time since prior sampling or a change in upstream development or management, or for regular monitoring associated with other factors (e.g. sensitive species). These sampling events are typically M1 or M4 of the Monitoring Framework.

3.5. Coverage Expansion Sites

While bioassessment has been conducted at more than 600 sites in the San Diego Region, many streams have never been bioassessed. MARU is working to conduct stream bioassessment at previously unsampled streams (M1 of the Monitoring Framework). Doing so helps clarify the condition of streams across the region, identify new reference sites, and determine baseline condition for anti-degradation purposes (e.g. in the event of a spill).

3.6. National Rivers and Streams Assessment Sites

The National Rivers and Streams Assessment (NRSA) is a USEPA led national probability-based bioassessment survey of both Wadeable and non-Wadeable rivers and streams. The goals of the NRSA are to “determine the extent to which rivers and streams support a healthy biological condition and the extent of major stressors that affect them.” NRSA sampling field seasons are conducted over a 2-year period every 5 years, with surveys conducted in 2008-2009, 2013-2014, 2018-2019, and 2023-2024.

3.7. Partner Support Sites

The San Diego Water Board is an active participating member of the State of California’s SWAMP bioassessment program. As such, the San Diego Water Board has consistently assisted the SWAMP bioassessment program and its partners by funding monitoring and research that promotes and expands the use of bioassessment in the state. Examples include efforts to develop a statewide molecular algal stream condition index (mASCI), develop and pilot bioassessment methods for ephemeral and intermittent streams during their dry phase, and use bioassessment to evaluate restoration success. Our partners in these bioassessment efforts can include other regional boards, local and federal government agencies, and -non-profit organizations.

4. Sites Sampled in 2024

4.1. Site Type and Location

MARU, CDFW/Moss Landing, and Trout Unlimited bioassessment site details are in Tables 3, 4, and 5, respectively. Table 6 shows the location of eDNA-only sites.

Table 3. Bioassessment sites sampled by MARU in 2024

Site Type	SWAMP Code	Stream	Latitude	Longitude	Date
RCMP	901NP9TNC	Tenaja Canyon	33.52770	-117.40780	5/21
RCMP	903ACPCT1	Agua Caliente Creek at Pacific Crest Trail	33.29658	-116.63842	6/3
RCMP	905DGCC1x	Carney Canyon in Pamo Valley	33.15771	-116.84084	5/16
RCMP	911TJKC1x	Kitchen Creek above Kitchen Creek Road crossing	32.75901	-116.45099	6/14
Program Request	902UDLVGR	Upper De Luz Creek Above Vuelta Grande Road	33.48185	-117.30843	5/1
Program Request	906UPCSVR	Upper Poway Creek at Sycamore Valley Road	32.95813	-117.00410	4/30
Program Request	906UPCUQV	Upper Poway Creek Upstream of Quiet Valley Road End	32.96165	-116.99539	4/22
Trend	901S01705	Hot Spring Canyon Creek ~1.2mi above Hwy 74	32.75975	-116.46792	6/26
Trend	907SDBOC2	Boulder Creek 2	32.96350	-116.66418	6/17
Trend	911TJNPC2	North Pine Creek (NPCNC)	32.86540	-116.51818	6/25
Coverage Expansion	901LIONCN	Lion Canyon Creek above San Juan Creek	33.60251	-117.46001	6/5
Coverage Expansion	901UNTLCC	Unnamed Tributary to Long Canyon Creek above San Juan	33.61825	-117.43539	4/23

Site Type	SWAMP Code	Stream	Latitude	Longitude	Date
Coverage Expansion	901USMFCP	Unnamed Tributary to San Mateo Creek below Fishermans Camp Trailhead	33.53659	-117.40103	5/17
Coverage Expansion	905SMGRAM	Santa Maria Creek Ramona	33.05573	-116.85903	5/23
Coverage Expansion	911FCCA KC	Fred Canyon Creek above Kitchen Creek	32.76083	-116.45084	5/10
Coverage Expansion	911HCCSMR	Horse Canyon Creek below Sheephead Mountain Road Trail	33.60171	-117.51103	5/30

Table 4. Bioassessment sites in Region 9 sampled by CDFW/Moss Landing in 2024. Streams were sampled as part of SWAMP's Reference Condition Management Plan (RCMP) and USEPA's National Rivers and Streams Assessment Program (NRSA).

Site Type	SWAMP Code	Stream	Latitude	Longitude	Date
RCMP	901CSCADC	Cold Spring Canyon above Devil Cyn Creek	33.49366	-117.43071	5/3
RCMP	905S02561	Santa Ysabel Creek ~2mi below Dan Price Cr.	33.12974	-116.63592	6/6
RCMP	911TJKC1x	Kitchen Creek above Kitchen Creek Road crossing	32.76012	-116.45123	6/5
RCMP	SMC08157	Cole Creek	33.53913	-117.26484	5/4
NRSA	903FC0048	San Luis Rey River ~0.2mi above Lusardi Cyn. Cr.	33.2666	-116.8176	7/10, 7/30
NRSA	909FC0260	Descanso Creek 60 m above Oakzanita Springs Campground	32.8915	-116.5740	6/04
NRSA	911FC0343	Cottonwood Creek, 4 km below Barrett Dam	32.6476	-116.6804	7/09

Table 5. Bioassessment sites sampled by Trout Unlimited in 2024. Streams were sampled as part of an evaluation of stream improvement projects undertaken to improve biological condition.

Site Type	SWAMP Code	Stream	Latitude	Longitude	Date
Partner Support	GLNTRKRIV	Truckee River, off Glenshire Drive, three miles east of the Visitor Center on Donner Pass Rd	39.33997	-120.13013	8/30
Partner Support	554LMCBBM	Mulkey Creek top of Lower Mulkey Meadow below Bullfrog Meadow	36.39765	-118.20813	9/4
Partner Support	554LMCBMD	Mulkey Creek at bottom of Lower Mulkey Meadow above rocky hill	36.39026	-118.21246	9/4

Table 6. Additional sites sampled for eDNA by MARU in 2024.

Site Type	SWAMP Code	Stream	Latitude	Longitude	Date
eDNA	901SMCABW	San Mateo Creek above Bluewater	33.52608	-117.42619	1/4
eDNA	901SMCBAB	San Mateo Creek Bedrock above Bluewater	33.53011	-117.42245	1/4
eDNA	901BCCDSC	Bear Canyon Creek downstream of USFS Campground	33.60988	-117.4332	4/15
eDNA	903NP9UAC	Upper Agua Caliente	33.3204	-116.623	12/16

Figure 6. Region 9 Sites sampled in 2024 by MARU and CDFW/MLML.



4.2. Overview of Results

The low and high values recorded for indices and other parameters are below. All streams were sampled at base flow condition, except for 903FC0048 (San Luis Rey River NRSA site). All were narrow (1.3 – 4.1 m wetted width, on average) and shallow (10 – 58 cm deep, on average). Slope over the 150 m sampled reach ranged from a low of 0.5% (Santa Maria Creek) to a high of 11.5% (Fred Canyon Creek).

Range of index scores from the 2024 bioassessed streams

Index	Results	Threshold
CSCI	0.73 to 1.23	0.79
d-ASCI	0.50 to 1.27	0.86
h-ASCI	0.67 to 1.30	0.86
m-ASCI	TBD	TBD
IPI	0.87 to 1.20	0.84

Range of chemical and physical water quality results from the 2024 bioassessed streams

Parameter	Results	Threshold
Temperature	13.7 to 20.6	Narrative (Deg C)
Dissolved Oxygen	7.2 to 9.8	5.0 (WARM BU), 6.0 (COLD BU) mg/L
pH	7.4 to 8.3	6.5-8.5
Total Nitrogen	ND to 2.11	1.0 mg/L
Total Phosphorus	ND to 0.3	0.1 mg/L
Turbidity	0.5 to 2.5	20 NTU
Chloride	26 to 176	^b waterbody-specific mg/L, ^c 230 & 860 mg/L
Sulfate	5 to 96	^b waterbody-specific mg/L
Conductivity	260 to 1,290	^a NA uS/cm
Alkalinity	72 to 335	^a NA mg/L
Silica	6.18 to 8.6	^a NA mg/L
Diss. Org. Carbon	4.1 to 24.64	^a NA mg/L
Benthic AFDM	6.83 to 230	^d 25 g/m ²
Benthic Chl-a	8.67 to 159	^d 44 mg/m ²
Benthic C:N	7.9 to 15.3	^a NA
Total Coliform	1553 to >2419	^a NA MPN/100 mL
E. coli	6.3 to 73.3	^a NA MPN/100 mL
HF183	ND to BLOQ ^e	^a copies/ 100mL

*Non-detect

^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

^e Below Limit of Quantification

Range of BMI and algal taxa counts recorded from 2024 bioassessed streams

	# Taxa	# Notable or Sensitive Taxa
BMI	18 to 66	4 to 26
Algae	62 to 103	0 to 10

5. Site Summaries

5.1. RCMP/Reference Sites

5.1.1. 901NP9TNC: Tenaja Canyon



Tenaja Canyon is an intermittent stream within the San Mateo Wilderness of the Cleveland National Forest. The site meets RCMP GIS screens, though portions of the upper watershed contain rural residential development. (Photo DW 5/21/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat.

Index	Result	Threshold
CSCI	1.18	0.79
d-ASCI	0.94	0.86
h-ASCI	1.05	0.86
m-ASCI	TBD	TBD
IPI	1.15	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	20.6	Narrative (Deg C)
Dissolved Oxygen	9.0	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	8.1	6.5-8.5
Total Nitrogen	ND	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	0.7	20 NTU
Chloride	47	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	9	^b waterbody-specific mg/L
Conductivity	431	^a NA uS/cm
Alkalinity	134	^a NA mg/L
Silica	8.8	^a NA mg/L
Dissolved Organic Carbon	22.64	^a NA mg/L
Benthic AFDM	20.2	^d 25 g/m ²
Benthic Chl-a	33.0	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	11.9,10.7	^a NA

*Non-detect

^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazon et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	60	21
Algae	81	8

Notable BMI:

- Ephemeroptera: Baetidae; Baetis; *Baetis adonis*; *Baetis tricaudatus*; *Caenis bajaensis*; *Callibaetis*; *Centroptilum*; *Dipheter hageni*; Ephemerellidae; *Paraleptophlebia*; *Serratella micheneri*
- Plecoptera: *Isoperla*
- Trichoptera: *Cheumatopsyche*; *Hydropsyche*; Hydropsychidae; *Hydroptila*; Hydroptilidae; *Micrasema*; *Ochrotrichia*; *Tinodes*; *Wormaldia*

Sensitive algae:

- Diatoms: *Epithemia sorex*; *Epithemia turgida*; *Gomphonema pumilum*
- Cyanobacteria: *Calothrix marchica*; *Homoeothrix varians*; *Tolypothrix distorta*
- Other: *Sirodotia huillensis*; *Tribonema affine*

eDNA

Method	Detections
Jonah Ventures	<i>Pimephales promelas</i> (fat-head minnow), <i>Taricha granulosa</i> (likely actually the California newt <i>Taricha torosa</i>)
Smith-Root	TBD
Vacuum filtration	TBD

Pacific tree frog (*Pseudacris regilla*), unidentified tadpoles, and fathead minnow were observed while sampling.

5.1.2. 903ACPCT1: Agua Caliente Creek at Pacific Crest Trail



Lower Agua Caliente Creek is a long-term RCMP site located approximately 4 stream kilometers downstream of Upper Agua Caliente. Unlike Upper Agua Caliente, this stream stretch exhibits intermittent flow. This stream has water level and specific conductance loggers deployed. (Photo CK 6/3/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community, as well as intact physical habitat.

Index	Result	Threshold
CSCI	1.11	0.79
d-ASCI	1.15	0.86
h-ASCI	1.18	0.86
m-ASCI	TBD	TBD
IPI	1.11	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	18.2	Narrative (Deg C)
Dissolved Oxygen	8.5	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.9	6.5-8.5
Total Nitrogen	0.32	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	0.6	20 NTU
Chloride	29	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	60	^b waterbody-specific mg/L
Conductivity	438	^a NA uS/cm
Alkalinity	124	^a NA mg/L
Silica	-	^a NA mg/L
Dissolved Organic Carbon	10.3	^a NA mg/L
Benthic AFDM	15.1	^d 25 g/m ²
Benthic Chl-a	29.7	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	9.7,10.2	^a NA
Total Coliform	>2419.6	^a NA MPN/100 mL
E. coli	29.8	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Duplicate samples for chemistry and bacteria were collected at this site. The results were consistent with those listed above, i.e., total nitrogen (0.11 mg/L), total phosphorus (ND), chloride (29 mg/L), sulfate (30 mg/L), dissolved organic carbon (10.03 mg/L), total coliform (>2419.6 MPN/100 mL), and E.coli (32.7 MPN/100 mL).

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	52	16
Algae	78	5

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Fallceon*; *Ironodes*; *Paraleptophlebia*; *Tricorythodes*
- Plecoptera: Chloroperlidae
- Trichoptera: Brachycentridae; *Cheumatopsyche*; *Gumaga*; *Hydropsyche*; *Hydroptila*; Hydroptilidae; *Ochrotrichia*; *Tinodes*

Sensitive algae:

- Diatoms: *Epithemia adnata*; *Epithemia sorex*; *Epithemia turgida*; *Gomphonema pumilum*
- Cyanobacteria: *Homoeothrix varians*
- Other: none

eDNA

Method	Detections
Jonah Ventures	<i>Sus scrofa</i> (wild pigs)
Smith-Root	TBD
Vacuum filtration	TBD

California tree frogs (*Pseudacris cadaverina*) were observed while sampling, as well as unidentified tadpoles.

Figure 7. Heavy diatom growth along the edge of a shallow, sunny glide in Lower Agua Caliente Creek. Diatoms comprised 58% of the algal taxa identified in the sample from this site (i.e., 45 of 78 taxa).

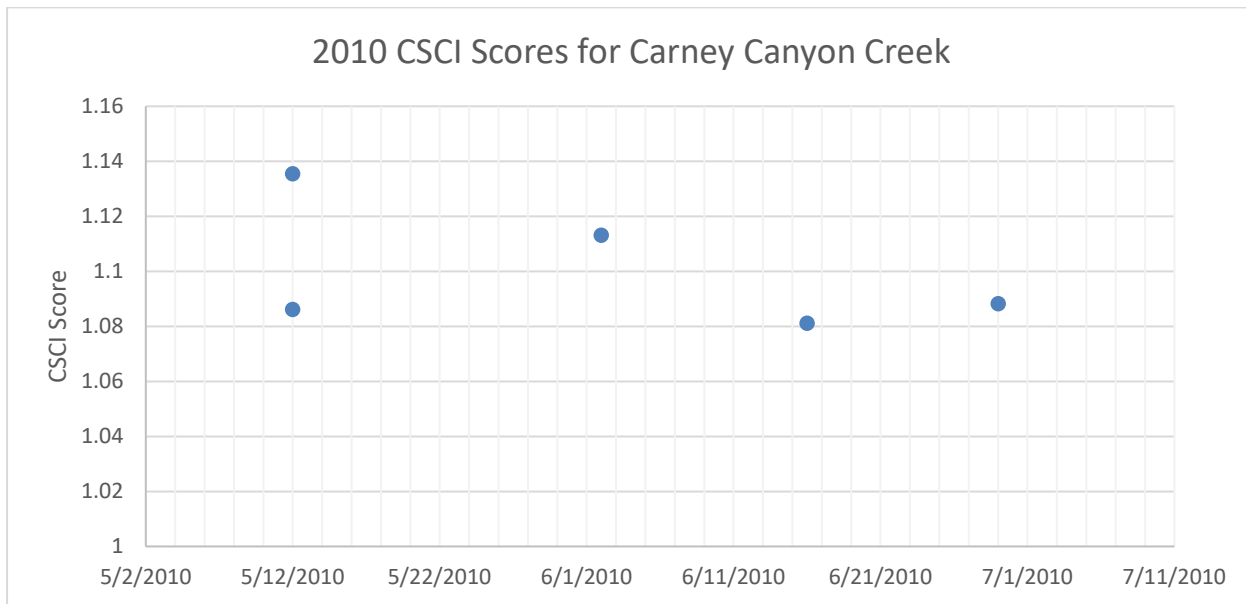


5.1.3. 905DGCC1x: Carney Canyon in Pamo Valley



Carney Canyon in Pamo Valley is a long term RCMP site located in the Cleveland National Forest in San Diego County. Carney Canyon was first selected as a reference site in 2010 for a SCCWRP study evaluating the within season variability for the historic southern California Index of Biotic Integrity in intermittent streams, and then applied to the CSCI, when developed (Mazor et al. 2014, [Figure 8](#)). (Photo CL 5/16/24)

Figure 8. CSCI Scores in 2010 from Carney Canyon Creek, an RCMP site that exhibits intermittent flows.



CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat.

Index	Result	Threshold
CSCI	1.23	0.79
d-ASCI	0.98	0.86
h-ASCI	1.01	0.86
m-ASCI	TBD	TBD
IPI	0.99	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	16.3	Narrative (Deg C)
Dissolved Oxygen	9.5	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	8.2	6.5-8.5
Total Nitrogen		1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	1.1	20 NTU
Chloride	53	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	75	^b waterbody-specific mg/L
Conductivity	714	^a NA uS/cm
Alkalinity	131	^a NA mg/L
Silica	12.7	^a NA mg/L
Dissolved Organic Carbon	14.06	^a NA mg/L
Benthic AFDM	54.3	^d 25 g/m ²
Benthic Chl-a	60.5	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	10.7, 14.2	^a NA
Total Coliform	1553.1	^a NA MPN/100 mL
E. coli	9.7	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	66	25
Algae	90	7

Notable BMI:

- Ephemeroptera: Baetidae; *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Caenis*; *Caenis bajaensis*; *Centroptilum*; *Fallceon*; *Paraleptophlebia*; *Serratella micheneri*
- Plecoptera: *Isoperla*; *Malenka*
- Trichoptera: Brachycentridae; *Cheumatopsyche*; *Gumaga*; *Helicopsyche*; *Hydropsyche*; Hydropsychidae; *Hydroptila*; Hydroptilidae; *Micrasema*; *Ochrotrichia*; Polycentropodidae; *Tinodes*; *Wormaldia*

Sensitive algae:

- Diatoms: *Epithemia adnata*; *Epithemia sorex*; *Epithemia turgida*; *Psammothidium levanderi*; *Sellaphora bacillum*
- Cyanobacteria: *Calothrix marchica*; *Tolypothrix distorta*
- Other: none

eDNA

Method	Detections
Jonah Ventures	<i>Bos</i> genus (cattle), <i>Lepomis</i> genus (sunfish), <i>Sus scrofa</i> (wild pig), human, <i>Aphelocoma coerulescens</i> (scrub jay)
Smith-Root	TBD
Vacuum filtration	TBD

California tree frogs (*Pseudacris cadaverina*) were observed while sampling.

Figure 9. Two of the many California tree frogs observed while sampling at Carney Canyon Creek.



5.1.4. 911TJKC1x: Kitchen Creek above Kitchen Creek Road crossing



Kitchen Creek is an intermittent stream within the Cleveland National Forest. Kitchen Creek has been sampled on an almost annual basis since 2012. Water level and conductivity loggers are deployed in Kitchen Creek to document flow condition. Duplicate biological samples were collected at Kitchen Creek per the SWAMP QAPP. (Photo CL 6/14/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat.

Index	Result	Threshold
CSCI	1.07, 1.10	0.79
d-ASCI	1.06, 1.06	0.86
h-ASCI	1.13, 1.08	0.86
m-ASCI	TBD	TBD
IPI	0.87	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	13.7	Narrative (Deg C)
Dissolved Oxygen	9.3	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	8.3	6.5-8.5
Total Nitrogen	ND	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	1.0	20 NTU
Chloride	30	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	5	^b waterbody-specific mg/L
Conductivity	485	^a NA uS/cm
Alkalinity	235	^a NA mg/L
Silica	18.6	^a NA mg/L
Dissolved Organic Carbon	9.57	^a NA mg/L
Benthic AFDM	103	^d 25 g/m ²
Benthic Chl-a	126	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	14.9, 14.7	^a NA
Total Coliform	>2419.6	^a NA MPN/100 mL
E. coli	22.6	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect

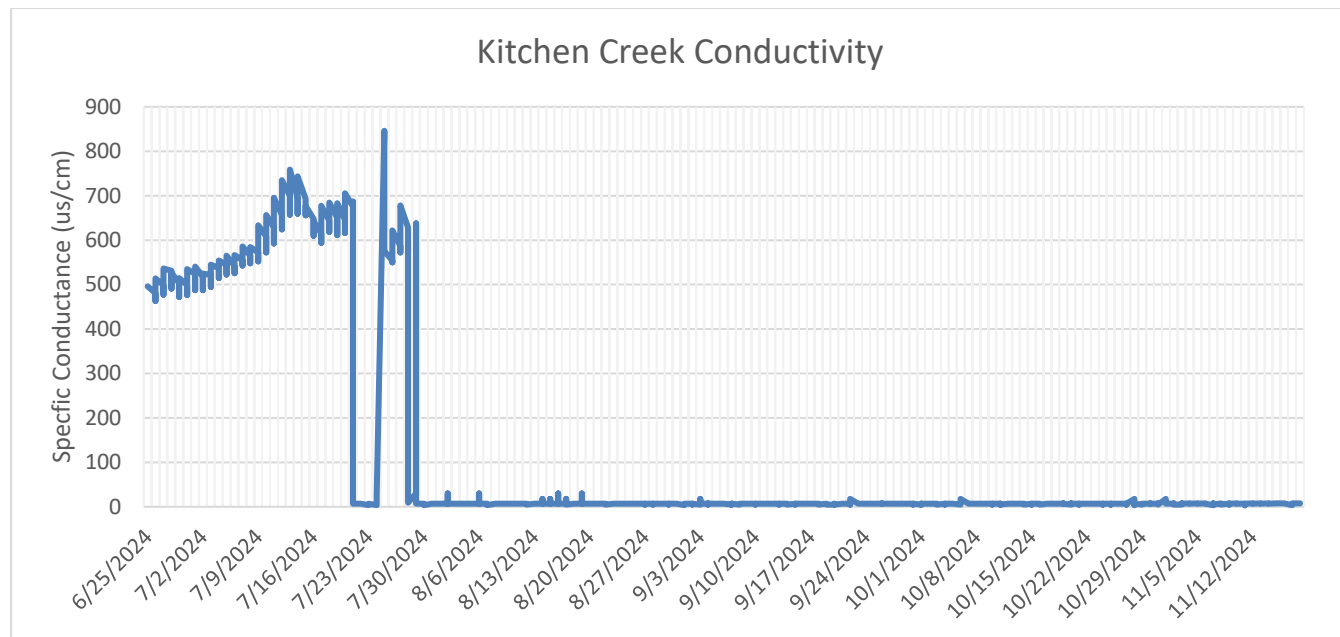
^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazon et al. 2022 threshold for obtaining 10th percentile ASCI score

Figure 10. Water conductivity logger for Kitchen Creek. Conductivity results near zero represent dry stream condition. For 2024, sampling of Kitchen Creek occurred on 6/14. Kitchen Creek then went dry roughly 5-6 weeks later. Brief drying and rewetting events, such as seen at the end of July, are typical when streams begin to dry out.



Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	58	19
Algae	97	6

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Caenis bajaensis*; *Callibaetis*; *Fallceon*; *Leptophlebiidae*; *Matriella teresa*
- Plecoptera: *Isoperla*; *Malenka*; *Nemouridae*
- Trichoptera: *Brachycentridae*; *Hydropsyche*; *Hydropsychidae*; *Hydroptila*; *Hydroptilidae*; *Micrasema*; *Ochrotrichia*; *Tinodes*

Sensitive algae:

- Diatoms: *Epithemia sorex*; *Epithemia turgida*; *Gomphonema pumilum*
- Cyanobacteria: *Calothrix parietina*
- Other: *Spirogyra varians*; *Tribonema affine*

A BMI field duplicate was collected at this site. The duplicate had a CSCI of 1.10. It had 58 BMI, with 17 EPT taxa. Notable taxa were as above but with *Paraleptophlebia* (Ephemeroptera) and *Gumaga* (Tricoptera) instead of *Caenis bajaensis*, *Matriella teresa*, *Isoperla*, and *Brachycentridae*. Combined, the two samples contained 70 taxa.

An algal field duplicate was collected at this site. The duplicate had d-ASCI and h-ASCI scores of 1.06 and 1.08, respectively. It had 87 taxa, with 6 being sensitive. Sensitive taxa were the same as above. Combined, the two samples contained 103 algal taxa. Other results for the duplicate were: benthic AFDM (181 g/m²), benthic chl-a (129 mg/m²), and benthic C:N Rep 1 and Rep 2 (14.5,15.3).

A bacteria duplicate was also collected at this site. Total coliform and *E. coli* were >2419.6 and 32.7, respectively.

eDNA

Method	Detections
Jonah Ventures	No higher trophic level species detected
Smith-Root	TBD
Vacuum filtration	TBD

A California tree frog (*Pseudacris cadaverina*) was observed while sampling.

5.2. Program Sites

5.2.1. 902UDLVGR: Upper De Luz Creek Above Vuelta Grande Road



This site on Upper De Luz Creek is an intermittent stream that drains a portion of the Santa Rosa plateau. While not a reference site due to levels of upstream residential development, this stream was identified for sampling as a program comparator site to assist with evaluating water quality conditions in this portion of the Santa Margarita watershed because the tributary drainage has limited commercial agriculture. The Santa Margarita River and Estuary are currently part of TMDL alternative efforts to address nutrients. (Photo CK 5/1/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat.

Index	Result	Threshold
CSCI	1.04	0.79
d-ASCI	0.87	0.86
h-ASCI	0.98	0.86
m-ASCI	TBD	TBD
IPI	1.17	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	16.4	Narrative (Deg C)
Dissolved Oxygen	8.5	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.4	6.5-8.5
Total Nitrogen	0.13	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	0.7	20 NTU
Chloride	48	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	60	^b waterbody-specific mg/L
Conductivity	525	^a NA uS/cm
Alkalinity	72	^a NA mg/L
Silica	9.04	^a NA mg/L
Dissolved Organic Carbon	8.32	^a NA mg/L
Benthic AFDM	6.83	^d 25 g/m ²
Benthic Chl-a	11.3	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	12.0, 12.7	^a NA
Total Coliform	1986.3	^a NA MPN/100 mL
<i>E. coli</i>	48.7	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	57	16
Algae	73	5

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Centroptilum*; *Fallceon*; Leptophlebiidae; *Paraleptophlebia*; *Tricorythodes*
- Plecoptera: none
- Trichoptera: *Agapetus*; *Hydropsyche*; Hydropsychidae; *Hydroptila*; *Ochrotrichia*; *Rhyacophila sibirica* group; *Tinodes*; *Wormaldia*

Sensitive algae:

- Diatoms: *Epithemia sorex*
- Cyanobacteria: *Tolypothrix lanata*
- Other: *Paralemanea californica*; *Sirodotia huillensis*; *Spirogyra varians*

eDNA

Method	Detections
Jonah Ventures	<i>Lepomis</i> genus (sunfishes), <i>Sus scrofa</i> (wild pig), <i>Carassius</i> genus (goldfish/carps), <i>Microtus californicus</i> (California vole)
Smith-Root	TBD
Vacuum filtration	TBD

California tree frogs (*Pseudacris cadaverina*) were observed while sampling.

Figure 11. Larvae (two in lower right) and pupae of Net-winged Midges (*Blepharicera*) at Upper De Luz Creek. Net-winged Midges are in the Order Diptera and are considered pollutant intolerant. The larvae are filter feeders and adhere to rocks in fast flow. The larvae are sometimes called teddy bears due to their fuzzy appearance. The adults resemble crane flies.



5.2.2. 906UPCSVR: Upper Poway Creek at Sycamore Valley Road



This site on upper Poway Creek is an intermittent stream approximately 1000 meters downstream of 906UPCUQV. This site was selected for sampling as it, unlike 906UPCUQV, receives discharges from a large residential housing development and had stream enhancement conducted historically via invasive vegetation removal. The site was selected to assess changes in benthic macroinvertebrate and algal communities, as well as physical habitat, in comparison to the upstream site. A CRAM assessment conducted 9/16/2024 resulted in a total score of 75, which falls into the condition category of Good. (Photo CK 4/30/24)

ASCI and IPI scores indicated an intact algae community and intact physical habitat. However, the CSCI score indicated an impacted benthic macroinvertebrate community.

Index	Result	Threshold
CSCI	0.74	0.79
d-ASCI	0.89	0.86
h-ASCI	0.93	0.86
m-ASCI	TBD	TBD
IPI	1.19	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	15.0	Narrative (Deg C)
Dissolved Oxygen	8.8	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.5	6.5-8.5
Total Nitrogen	ND	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	1.3	20 NTU
Chloride	103	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	39	^b waterbody-specific mg/L
Conductivity	712	^a NA uS/cm
Alkalinity	94	^a NA mg/L
Silica	6.18	^a NA mg/L
Dissolved Organic Carbon	17.64	^a NA mg/L
Benthic AFDM	34.4	^d 25 g/m ²
Benthic Chl-a	28.3	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	12.2,13.5	^a NA
Total Coliform	>2419.6	^a NA MPN/100 mL
E. coli	24.3	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	28	5
Algae	64	1

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Fallceon*
- Plecoptera: none
- Trichoptera: *Hydroptila*

Sensitive algae:

- Diatoms: *Encyonema silesiacum*
- Cyanobacteria: none
- Other: none

eDNA

Method	Detections
Jonah Ventures	<i>Pseudacris regilla</i> (Pacific tree frog),
Smith-Root	TBD
Vacuum filtration	TBD

Tadpoles and froglets were observed while sampling (species uncertain).

5.2.3. 906UPCUQV: Upper Poway Creek Upstream of Quiet Valley Road



This site on Upper Poway Creek is an intermittent stream located just upstream of the Sycamore Creek housing development. This site was selected as an upstream reference site for evaluating impacts from the housing development and associated stream enhancement work. This site meets GIS screens for reference. A CRAM assessment conducted 9/16/2024 resulted in a total score of 75, which falls into the condition category of Good. (Photo CL 4/22/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat. All scores were substantially higher than the downstream site, except for physical habitat which was similar.

Index	Result	Threshold
CSCI	0.89	0.79
d-ASCI	0.97	0.86
h-ASCI	1.02	0.86
m-ASCI	TBD	TBD
IPI	1.16	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	15.7	Narrative (Deg C)
Dissolved Oxygen	8.3	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.5	6.5-8.5
Total Nitrogen	ND	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	0.6	20 NTU
Chloride	91	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	26	^b waterbody-specific mg/L
Conductivity	493	^a NA uS/cm
Alkalinity	72	^a NA mg/L
Silica	11	^a NA mg/L
Dissolved Organic Carbon	12.22	^a NA mg/L
Benthic AFDM	26.4	^d 25 g/m ²
Benthic Chl-a	24.6	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	11.6, 11.7	^a NA
Total Coliform	1553.1	^a NA MPN/100 mL
E. coli	72.2	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	44	7
Algae	77	3

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Fallceon*; *Centroptilum*
- Plecoptera: none
- Trichoptera: *Rhyacophila sibirica* group; *Hydroptila*; Hydroptilidae

Sensitive algae:

- Diatoms: *Encyonema silesiacum*
- Cyanobacteria: *Calothrix marchica*
- Other: *Spirogyra varians*

eDNA

Method	Detections
Jonah Ventures	Human
Smith-Root	TBD
Vacuum filtration	TBD

No frogs or other higher trophic level species were noted while sampling.

5.3. Trend Sites

5.3.1. 901S01705: Hot Spring Canyon Creek ~1.2mi above Hwy 74



This site on Hot Spring Canyon Creek is a perennial trend site first sampled by the Stormwater Monitoring Coalition in 2009. Hot Spring Canyon Creek is within the Cleveland National Forest. (Photo CL 6/26/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat.

Index	Result	Threshold
CSCI	0.96	0.79
d-ASCI	1.27	0.86
h-ASCI	1.30	0.86
m-ASCI	TBD	TBD
IPI	1.16	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	18.5	Narrative (Deg C)
Dissolved Oxygen	8.3	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.5	6.5-8.5
Total Nitrogen	ND	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	0.7	20 NTU
Chloride	22	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	96	^b waterbody-specific mg/L
Conductivity	466	^a NA uS/cm
Alkalinity	142	^a NA mg/L
Silica	13.3	^a NA mg/L
Dissolved Organic Carbon	7.46	^a NA mg/L
Benthic AFDM	17.2	^d 25 g/m ²
Benthic Chl-a	16.8	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	12.4, 12.9	^a NA
Total Coliform	2419.6	^a NA MPN/100 mL
E. coli	39.9	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	60	26
Algae	71	10

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Caenis bajaensis*; *Ecdyonurus*; Ephemeroptera; *Fallceon*; Heptageniidae; Leptophlebiidae; *Paraleptophlebia*; *Serratella micheneri*; *Tricorythodes*
- Plecoptera: *Isoperla*; *Malenka*; Nemouridae
- Trichoptera: *Cheumatopsyche*; *Gumaga*; *Helicopsyche*; *Hydropsyche*; Hydropsychidae; *Hydroptila*; Hydroptilidae; *Lepidostoma*; *Micrasema*; *Ochrotrichia*; *Polycentropodidae*; *Tinodes*

Sensitive algae:

- Diatoms: *Epithemia sorex*; *Epithemia turgida*; *Gomphonema pumilum*; *Reimeria uniseriata*
- Cyanobacteria: *Calothrix marchica*; *Chamaesiphon minutus*; *Nostochopsis lobatus*
- Other: *Chaetophora elegans*; *Paralemanea californica*; *Zygnema sp 1*

eDNA

Method	Detections
Jonah Ventures	<i>Gila orcuttii</i> (Arroyo chub), <i>Taricha granulosa</i> (likely California newt)
Smith-Root	TBD
Vacuum filtration	TBD

Arroyo chub (*Gila orcuttii*), a native fish, and non-native crayfish (*Procambarus clarkii*) were observed along the reach when sampling, as well as California tree frogs.

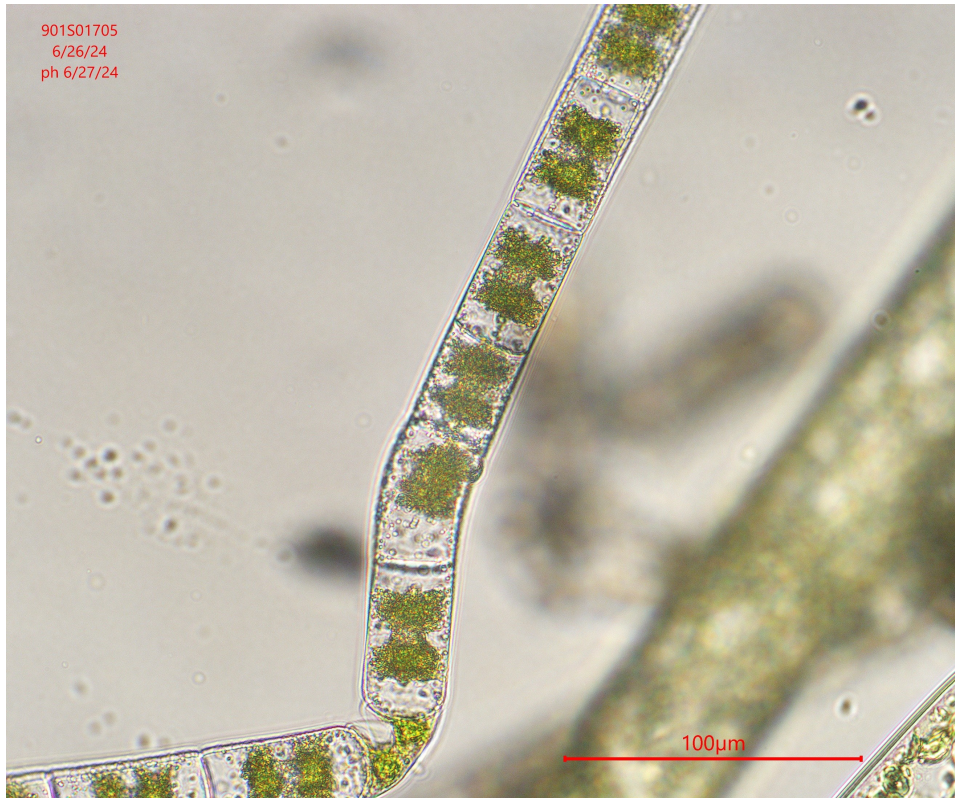
Figure 12. The sensitive green algal species, *Chaetophora elegans*, collected from Hot Spring Canyon Creek. Its profusely branched filaments form small, spherical colonies. (Photo CL 6/26/24)



Figure 13. The sensitive red algal species, *Paralemanea californica*, collected from Hot Spring Canyon Creek. Dark bands of internal reproductive structures give this species a bamboo-like appearance. (Photo CL 6/26/24)



Figure 14. The sensitive green algal species, *Zygnema* sp., collected from Hot Spring Canyon Creek, as seen under the microscope. Two star-shaped chloroplasts per cell is a characteristic of this genus. *Zygnema* can form dense, floating mats. (Photo DW 6/27/24)



5.3.2. 907SDBOC2: Boulder Creek 2



Boulder Creek is a long-term trend site that has been sampled by the State of California on a semi-regular basis for over 20 years. The site was impacted by the 2003 Cedar fire, which burned over 80 percent of the tributary watershed. The benthic macroinvertebrate community has since recovered from the fire. The Boulder Creek sampling site is currently owned by and sampled in partnership with the San Diego River Park Foundation. Boulder Creek's watershed is largely undeveloped open space but does not meet reference screens as flows are controlled by an upstream reservoir (Lake Cuyamaca) and the watershed contains active producer mines. However, Boulder Creek typically contains benthic invertebrates and algae consistent with reference-quality conditions, as well as high-quality habitat. California newts and southwestern pond turtles, both sensitive native species, have been observed at this site in the past. Boulder Creek exhibits intermittent stream flows. (Photo CL 6/17/24)

CSCI and IPI scores indicated a biologically intact benthic macroinvertebrate community and intact physical habitat. ASCI scores indicate a potentially unimpacted algal community as the diatom score was well below the threshold, but the hybrid score just met the threshold.

Index	Result	Threshold
CSCI	1.09	0.79
d-ASCI	0.67	0.86
h-ASCI	0.86	0.86
m-ASCI	TBD	TBD
IPI	1.10	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	16.3	Narrative (Deg C)
Dissolved Oxygen	8.8	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	8.2	6.5-8.5
Total Nitrogen	0.30	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	1.9	20 NTU
Chloride	22	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	27	^b waterbody-specific mg/L
Conductivity	357	^a NA uS/cm
Alkalinity	120	^a NA mg/L
Silica	14.8	^a NA mg/L
Dissolved Organic Carbon	15.45	^a NA mg/L
Benthic AFDM	48.2	^d 25 g/m ²
Benthic Chl-a	21.9	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	13.3,13.8	^a NA
Total Coliform	2419.6 ^e	^a NA MPN/100 mL
E. coli	36.4 ^e	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect

^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazon et al. 2022 threshold for obtaining 10th percentile ASCI score

^e In-house bacteria measurement (not Alpha Lab)

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	46	23
Algae	93	9

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Caenis bajaensis*; *Centroptilum*; *Dipheter hageni*; *Ecdyonurus*; *Epeorus*; Ephemerellidae; Heptageniidae; *Matriella teresa*; *Paraleptophlebia*; *Serratella micheneri*
- Plecoptera: *Isoperla*; *Malenka*; Plecoptera
- Trichoptera: *Cheumatopsyche*; *Gumaga*; *Hydropsyche*; Hydroptilidae; *Lepidostoma*; *Micrasema*; *Ochrotrichia*

Sensitive algae:

- Diatoms: *Achnantheidium rivulare*; *Epithemia sorex*; *Epithemia turgida*; *Gomphonema pumilum*; *Gomphonema subclavatum*; *Reimeria uniseriata*; *Sellaphora bacillum*
- Cyanobacteria: *Calothrix marchica*
- Other: *Paralemanea californica*

eDNA

Method	Detections
Jonah Ventures	None
Smith-Root	TBD
Vacuum filtration	TBD

A rattlesnake was observed on the trail near the stream, but no frogs or other higher trophic level species were noted while sampling.

5.3.3. 911TJNPC2: North Pine Creek (NPCNC)



This site on Pine Creek is a long-term SWAMP trend station that was sampled from 2001-2009. The site was prioritized for sampling due to the time since the last sampling visit. (Photo CK 6/25/24)

CSCI and IPI scores indicated a biologically intact benthic macroinvertebrate community and intact physical habitat. ASCI scores indicated a likely unimpacted algal community as the diatom score was slightly below the threshold while the hybrid score was well above.

Index	Result	Threshold
CSCI	1.14	0.79
d-ASCI	0.82	0.86
h-ASCI	0.93	0.86
m-ASCI	TBD	TBD
IPI	1.13	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	16.4	Narrative (Deg C)
Dissolved Oxygen	7.2	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.4	6.5-8.5
Total Nitrogen	0.36	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	1.1	20 NTU
Chloride	28	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	50	^b waterbody-specific mg/L
Conductivity	373	^a NA uS/cm
Alkalinity	98	^a NA mg/L
Silica	13.3	^a NA mg/L
Dissolved Organic Carbon	10.82	^a NA mg/L
Benthic AFDM	44.6	^d 25 g/m ²
Benthic Chl-a	8.67	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	12.4, 12.9	^a NA
Total Coliform	>2419.6	^a NA MPN/100 mL
E. coli	73.3	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	54	20
Algae	62	7

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Caenis bajaensis*; Ephemerellidae; *Fallceon*; *Leptophlebiidae*; *Serratella micheneri*
- Plecoptera: *Isoperla*; *Malenka*; Nemouridae
- Trichoptera: *Agapetus*; Brachycentridae; *Gumaga*; *Hydropsyche*; Hydropsychidae; *Lepidostoma*; *Micrasema*; Philopotamidae; *Wormaldia*

Sensitive algae:

- Diatoms: *Epithemia sorex*; *Epithemia turgida*; *Gomphonema pumilum*; *Meridion circulare*; *Reimeria uniseriata*
- Cyanobacteria: none
- Other: *Paralemanea californica*; *Sirodotia huillensis*

eDNA

Method	Detections
Jonah Ventures	<i>Sus scrofa</i> (wild pig)
Smith-Root	TBD
Vacuum filtration	TBD

California tree frogs (*Pseudacris cadaverina*) and Pacific tree frogs (*Pseudacris regilla*) were observed while sampling.

Figure 15. The sensitive red algal species, *Sirodotia huillensis*, collected from North Pine Creek. While relatively inconspicuous in the field, its whorled branching is distinctive under the microscope. (Photo DW 6/25/24)



5.4. Coverage Expansion Sites

5.4.1. 901LIONCN: Lion Canyon Creek above San Juan Creek



This site on Lion Creek is an intermittent stream in the Cleveland National Forest. Lion Creek is a tributary to upper San Juan Creek, meets GIS reference streams, and had never been sampled. (Photo CL 6/5/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat.

Index	Result	Threshold
CSCI	1.13	0.79
d-ASCI	1.00	0.86
h-ASCI	1.08	0.86
m-ASCI	TBD	TBD
IPI	1.20	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	17.6	Narrative (Deg C)
Dissolved Oxygen	8.8	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.6	6.5-8.5
Total Nitrogen	0.09	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	0.9	20 NTU
Chloride	35	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	30	^b waterbody-specific mg/L
Conductivity	315	^a NA uS/cm
Alkalinity	84	^a NA mg/L
Silica	-	^a NA mg/L
Dissolved Organic Carbon	8.27	^a NA mg/L
Benthic AFDM	39.3	^d 25 g/m ²
Benthic Chl-a	19.4	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	12.8,13.2	^a NA
Total Coliform	2419.6	^a NA MPN/100 mL
E. coli	6.3	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	64	20
Algae	69	5

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Caenis bajaensis*; *Centroptilum*; Ephemerellidae; *Fallceon*; *Paraleptophlebia*; *Serratella micheneri*
- Plecoptera: Nemouridae
- Trichoptera: Brachycentridae; *Gumaga*; *Hydropsyche*; Hydropsychidae; *Hydroptila*; Hydroptilidae; *Lepidostoma*; *Micrasema*; *Ochrotrichia*; *Wormaldia*

Sensitive algae:

- Diatoms: *Epithemia turgida*
- Cyanobacteria: *Calothrix marchica*
- Other: *Paralemanea californica*; *Sirodotia huillensis*; *Spirogyra varians*

eDNA

Method	Detections
Jonah Ventures	None
Smith-Root	TBD
Vacuum filtration	TBD

California tree frogs (*Pseudacris cadaverina*) were observed when sampling.

Figure 16. A Giant Water Bug observed at Lion Canyon Creek (*Abedus* in the family Belostomatidae). Often called Toe Biters, these aquatic insects are sit-and-wait predators that eat tadpoles and other small prey. This was a 3-4 cm male, carrying and tending to eggs that a female glued to its back. (Photo CK 6/5/24)



5.4.2. 901UNTLCC: Unnamed Tributary to Long Canyon Creek



This unnamed tributary to Long Canyon Creek above San Juan Creek is an intermittent stream located in the Cleveland National Forest. The site, which meets GIS reference streams, had never been sampled. (Photo CL 4/23/24)

CSCI and IPI scores indicated a biologically intact benthic macroinvertebrate community and intact physical habitat. Algal scores were mixed, but an d-ASCI above the threshold indicates a likely intact algal community.

Index	Result	Threshold
CSCI	1.14	0.79
d-ASCI	0.90	0.86
h-ASCI	0.85	0.86
m-ASCI	TBD	TBD
IPI	1.10	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	14.6	Narrative (Deg C)
Dissolved Oxygen	9.6	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	8.0	6.5-8.5
Total Nitrogen	-	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	2.5	20 NTU
Chloride	26	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	6	^b waterbody-specific mg/L
Conductivity	260	^a NA uS/cm
Alkalinity	86	^a NA mg/L
Silica	12	^a NA mg/L
Dissolved Organic Carbon	22.75	^a NA mg/L
Benthic AFDM	24.8	^d 25 g/m ²
Benthic Chl-a	16.5	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	13.7, 14.9	^a NA
Total Coliform	>2419.6	^a NA MPN/100 mL
E. coli	29.9	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	62	22
Algae	96	9

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Caenis bajaensis*; Ephemerellidae; *Fallceon*; Leptophlebiidae; *Paraleptophlebia*; *Serratella micheneri*
- Plecoptera: *Isoperla*; *Malenka*; Perlodidae
- Trichoptera: Brachycentridae; *Gumaga*; *Hydropsyche*; Hydropsychidae; *Hydroptila*; Hydroptilidae; *Lepidostoma*; *Ochrotrichia*; *Rhyacophila sibirica* group; *Tinodes*

Sensitive algae:

- Diatoms: *Encyonema silesiacum*; *Epithemia adnata*; *Epithemia turgida*; *Meridion circulare*
- Cyanobacteria: *Calothrix marchica*; *Chamaesiphon minutus*; *Tolypothrix distorta*
- Other: *Spirogyra weberi*; *Tribonema affine*

eDNA

Method	Detections
Jonah Ventures	None
Smith-Root	TBD
Vacuum filtration	TBD

A two-striped garter snake (*Thamnophis hammondi*) was observed when sampling, as well as California tree frogs (*Pseudacris cadaverina*).

5.4.3. 901USMFCP: Unnamed Tributary to San Mateo Creek



This unnamed tributary to San Mateo Creek below Fisherman's Camp Trailhead is an intermittent stream located in the Cleveland National Forest. The stream had never been sampled. (Photo DW 5/17/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat.

Index	Result	Threshold
CSCI	1.19	0.79
d-ASCI	1.09	0.86
h-ASCI	0.99	0.86
m-ASCI	TBD	TBD
IPI	1.18	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	15.3	Narrative (Deg C)
Dissolved Oxygen	9.8	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	8.3	6.5-8.5
Total Nitrogen	ND	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	1.5	20 NTU
Chloride	46	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	18	^b waterbody-specific mg/L
Conductivity	595	^a NA uS/cm
Alkalinity	271	^a NA mg/L
Silica	13.3	^a NA mg/L
Dissolved Organic Carbon	13.19	^a NA mg/L
Benthic AFDM	97.4	^d 25 g/m ²
Benthic Chl-a	159	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	13.4, 13.7	^a NA
Total Coliform	-	^a NA MPN/100 mL
E. coli	-	^a NA MPN/100 mL
HF183	-	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	66	24
Algae	83	7

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Caenis bajaensis*; *Centroptilum*; Ephemerellidae; *Fallceon*; Leptophlebiidae; *Paraleptophlebia*; *Serratella micheneri*
- Plecoptera: *Isoperla*; *Malenka*; Nemouridae; Perlodidae
- Trichoptera: *Cheumatopsyche*; *Gumaga*; *Hydropsyche*; Hydropsychidae; *Hydroptila*; Hydroptilidae; *Lepidostoma*; *Ochrotrichia*; *Tinodes*; *Wormaldia*

Sensitive algae:

- Diatoms: *Encyonema silesiacum*; *Epithemia sorex*; *Epithemia turgida*; *Gomphonema pumilum*
- Cyanobacteria: *Calothrix marchica*; *Tolypothrix lanata*
- Other: *Tribonema affine*

eDNA

Method	Detections
Jonah Ventures	<i>Taricha granulosa</i> (likely truly a California newt <i>Taricha torosa</i>), <i>Batrachoseps nigriventris</i> (Black-bellied Slender Salamander), <i>Sus scrofa</i> (wild pig), <i>Pseudacris regilla</i> (Pacific tree frog)
Smith-Root	TBD
Vacuum filtration	TBD

California tree frogs (*Pseudacris cadaverina*), Pacific tree frogs (*Pseudacris regilla*), and many small tadpoles were observed while sampling.

5.4.4. 905SMGRAM: Santa Maria Creek Ramona



The site on Santa Maria Creek is an intermittent stream that flows between a public park. Santa Maria Creek is the main creek that flows through the unincorporated town of Ramona and had never been bioassessed. The margin-center-margin sampling method for benthic macroinvertebrates and algae was used at this site due to its low gradient, uniform sandy/fine-substrate, and stable habitat at stream margins. (Photo CK 5/23/24)

CSCI and IPI scores indicated a biologically intact benthic macroinvertebrate community and intact physical habitat. Algal scores were both well below thresholds, indicating a likely impacted algal community.

Index	Result	Threshold
CSCI	1.05	0.79
d-ASCI	0.50	0.86
h-ASCI	0.67	0.86
m-ASCI	TBD	TBD
IPI	0.88	0.84

Except for total nitrogen and phosphorus, chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	16.1	Narrative (Deg C)
Dissolved Oxygen	7.6	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.9	6.5-8.5
Total Nitrogen	2.11	1.0 mg/L
Total Phosphorus	0.3	0.1 mg/L
Turbidity	0.9	20 NTU
Chloride	176	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	83	^b waterbody-specific mg/L
Conductivity	1,290	^a NA uS/cm
Alkalinity	335	^a NA mg/L
Silica	-	^a NA mg/L
Dissolved Organic Carbon	24.64	^a NA mg/L
Benthic AFDM	17.4	^d 25 g/m ²
Benthic Chl-a	107	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	7.9,8.2	^a NA
Total Coliform	>2419.6	^a NA MPN/100 mL
E. coli	36.8	^a NA MPN/100 mL
HF183	BLOQ ^e	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

^e Below Level of Quantification

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	39	4
Algae	64	0

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Fallceon*
- Plecoptera: none
- Trichoptera: *Hydroptila*

Sensitive algae:

- Diatoms: none
- Cyanobacteria: none
- Other: none

eDNA

Method	Detections
Jonah Ventures	<i>Xiphias gladius</i> (swordfish), <i>Sus scrofa</i> (wild pig). Note some trash was observed in the creek, including recently consumed packets of tuna.
Smith-Root	TBD
Vacuum filtration	TBD

No frogs or other higher trophic species were noted while sampling.

5.4.5. 911FCCA KC: Fred Canyon Creek above Kitchen Creek



This site on Fred Canyon Creek is an intermittent stream on the Cleveland National Forest. Fred Canyon Creek is located just upstream of, and is tributary to, Kitchen Creek and site 911TJKC1x. The site, which meets GIS reference streams, had never been sampled. Fred Canyon Creek exhibits intermittent flows and was unable to be sampled by MARU in prior dry years due to low or no-flow conditions. (Photo CL 5/10/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat.

Index	Result	Threshold
CSCI	1.05	0.79
d-ASCI	1.06	0.86
h-ASCI	1.10	0.86
m-ASCI	TBD	TBD
IPI	1.04	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	15.5	Narrative (Deg C)
Dissolved Oxygen	9.2	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	8.2	6.5-8.5
Total Nitrogen	0.06	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	0.5	20 NTU
Chloride	46	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	17	^b waterbody-specific mg/L
Conductivity	753	^a NA uS/cm
Alkalinity	245	^a NA mg/L
Silica	11.9	^a NA mg/L
Dissolved Organic Carbon	19.66	^a NA mg/L
Benthic AFDM	230	^d 25 g/m ²
Benthic Chl-a	139	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	14.0, 12.6	^a NA
Total Coliform	2419.6	^a NA MPN/100 mL
E. coli	20.1	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	52	10
Algae	81	6

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Caenis bajaensis*; *Fallceon*
- Plecoptera: *Isoperla*
- Trichoptera: *Gumaga*; *Hydropsyche*; *Hydroptila*; *Ochrotrichia*; *Tinodes*

Sensitive algae:

- Diatoms: *Epithemia sorex*; *Epithemia turgida*; *Gomphonema pumilum*; *Meridion circulare*
- Cyanobacteria: none
- Other: *Spirogyra varians*; *Tribonema affine*

eDNA

Method	Detections
Jonah Ventures	<i>Sus scrofa</i> (wild pig)
Smith-Root	TBD
Vacuum filtration	TBD

California tree frogs (*Pseudacris cadaverina*) and Pacific tree frogs (*Pseudacris regilla*) were observed while sampling. A vole and extensive burrowing was also seen (species uncertain).

5.4.6. 911HCCSMR: Horse Canyon Creek



This site on Horse Canyon Creek below Sheephead Mountain Road Trail is an intermittent stream located on the Cleveland National Forest. Horse Canyon Creek had never been bioassessed. (Photo CK 5/31/24)

CSCI, ASCI, and IPI scores indicated a biologically intact benthic macroinvertebrate and algal community as well as intact physical habitat. Flows during sampling were low but still met minimum SOP requirements.

Index	Result	Threshold
CSCI	0.98	0.79
d-ASCI	1.05	0.86
h-ASCI	0.90	0.86
m-ASCI	TBD	TBD
IPI	1.06	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	17.6	Narrative (Deg C)
Dissolved Oxygen	9.2	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.5	6.5-8.5
Total Nitrogen	0.21	1.0 mg/L
Total Phosphorus	ND	0.1 mg/L
Turbidity	1.3	20 NTU
Chloride	51	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	24	^b waterbody-specific mg/L
Conductivity	571	^a NA uS/cm
Alkalinity	203	^a NA mg/L
Silica	-	^a NA mg/L
Dissolved Organic Carbon	19.46	^a NA mg/L
Benthic AFDM	84.5	^d 25 g/m ²
Benthic Chl-a	92.5	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	11.0, 11.8	^a NA
Total Coliform	-	^a NA MPN/100 mL
E. coli	-	^a NA MPN/100 mL
HF183	ND	^a copies/ 100mL

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	47	6
Algae	103	2

Notable BMI:

- Ephemeroptera: Baetidae; *Baetis*; *Baetis adonis*; *Fallceon*
- Plecoptera: none
- Trichoptera: *Hydroptila*; Hydroptilidae

Sensitive algae:

- Diatoms: *Encyonema silesiacum*; *Epithemia turgida*
- Cyanobacteria: none
- Other: none

eDNA

Method	Detections
Jonah Ventures	None
Smith-Root	TBD
Vacuum filtration	TBD

A two-striped garter snake (*Thamnophis hammondi*), California tree frogs (*Pseudacris cadaverina*), and unidentified tadpoles were observed when sampling. A gopher snake (*Pituophis catenifer*) and horned lizard (*Phrynosoma blainvillii*) were on the trail.

5.5. CDFW/Moss Landing RCMP and NRSA sites

SWAMP's CDFW field crews sampled multiple RCMP sites in 2024. For 2024, the sites chosen for sampling were predominantly sites that met RCMP screening criteria but had not been sampled in over 10 years. CDFW and Moss Landing field crews sampled 3 NRSA sites in 2024. NRSA sites are used by USEPA to give an overall estimate of the biological integrity of rivers and streams across the United States.

5.5.1. 901CSCADC: Cold Spring Canyon above Devil Cyn Creek



Cold Spring Canyon is a RCMP site and tributary of Devil Canyon Creek in the San Mateo Wilderness portion of the Cleveland National Forest. Cold Spring Canyon had not been sampled since 2011 (CSCI: 1.03) due to access issues associated with a property owner change along the forest service road.

The CSCI and IPI scores indicated a biologically intact benthic macroinvertebrate community as well as intact physical habitat. Algae results are pending for this site and only include diatoms.

Index	Result	Threshold
CSCI	1.04	0.79
d-ASCI	TBD	0.86
m-ASCI	TBD	TBD
IPI	1.06	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	13.6	Narrative (Deg C)
Dissolved Oxygen	8.6	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	8.0	6.5-8.5
Total Nitrogen	0.21	1.0 mg/L
Total Phosphorus	-	0.1 mg/L
Turbidity	4.9	20 NTU
Chloride	36	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	6.3	^b waterbody-specific mg/L
Conductivity	351	^a NA uS/cm
Alkalinity	108	^a NA mg/L
Silica	-	^a NA mg/L
Dissolved Organic Carbon	4.2	^a NA mg/L
Benthic AFDM	7.6	^d 25 g/m ²
Benthic Chl-a	25.1	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	-	^a NA

*Non-detect

^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazon et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	61	18
Algae	TBD	TBD

Notable BMI:

- Ephemeroptera: Baetidae; *Baetis*; *Baetis adonis*; *Baetis tricaudatus*; *Caenis bajaensis*; *Centroptilum*; *Fallceon*; Heptageniidae; Leptophlebiidae; *Paraleptophlebia*
- Plecoptera: *Isoperla*; Leuctridae; *Malenka*; Nemouridae
- Trichoptera: *Gumaga*; *Hydropsyche*; *Lepidostoma*; *Wormaldia*

Sensitive algae:

- Diatoms: TBD

5.5.2. 905S02561: Santa Ysabel Creek ~2mi below Dan Price Cr.



Santa Ysabel Creek at this sampling location is an intermittent stream first sampled as a probabilistic site by the Stormwater Monitoring Coalition in 2011 (CSCI: 1.10). As the site meets GIS reference screens, it was added to the RCMP site pool for future resampling but had not been resampled due to access logistics.

The CSCI and IPI scores indicated a biologically intact benthic macroinvertebrate community as well as intact physical habitat. Algae results are pending for this site and only include diatoms.

Index	Result	Threshold
CSCI	1.00	0.79
d-ASCI	TBD	0.86
m-ASCI	TBD	TBD
IPI	1.02	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	14.9	Narrative (Deg C)
Dissolved Oxygen	8.3	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.5	6.5-8.5
Total Nitrogen	-	1.0 mg/L
Total Phosphorus	-	0.1 mg/L
Turbidity	17.8	20 NTU
Chloride	-	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	-	^b waterbody-specific mg/L
Conductivity	466	^a NA uS/cm
Alkalinity	142	^a NA mg/L
Silica	-	^a NA mg/L
Dissolved Organic Carbon	-	^a NA mg/L
Benthic AFDM	-	^d 25 g/m ²
Benthic Chl-a	-	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	-	^a NA

*Non-detect

^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazon et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	43	18
Algae	TBD	TBD

Notable BMI:

- Ephemeroptera: *Ameletus*; *Attenella*; *Baetis tricaudatus*; *Drunella coloradensis*; *Ironodes*; *Matriella teresa*
- Plecoptera: *Isoperla*; *Malenka*
- Trichoptera: *Agapetus*; *Anagapetus*; *Dolophilodes*; *Helicopsyche*; *Lepidostoma*; *Micrasema*; *Parapsyche*; *Rhyacophila*; *Rhyacophila betteni* group; *Tinodes*

Sensitive algae:

- Diatoms: TBD

5.5.3. 911TJKC1x: Kitchen Creek above Kitchen Creek Road crossing



Kitchen Creek is an intermittent stream within the Cleveland National Forest. Kitchen Creek has been sampled as part of RCMP on an almost annual basis since 2012. In 2024 both the CDFW field crew and R9 field crew sampled Kitchen Creek on 06/05 and 06/14, respectively. This duplication of efforts served as an assessment of inter-crew sampling variability (note the R9 field crew also collected duplicate samples). All samples had similar CSCI scores.

The CSCI and IPI scores indicated a biologically intact benthic macroinvertebrate community as well as intact physical habitat. Algae results are pending for this site and only include diatoms.

Index	Result	Threshold
CSCI	1.14	0.79
d-ASCI	TBD	0.86
m-ASCI	TBD	TBD
IPI	0.88	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	15.3	Narrative (Deg C)
Dissolved Oxygen	9.3	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	8.5	6.5-8.5
Total Nitrogen	-	1.0 mg/L
Total Phosphorus	-	0.1 mg/L
Turbidity	0.9	20 NTU
Chloride	-	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	-	^b waterbody-specific mg/L
Conductivity	460	^a NA uS/cm
Alkalinity	180	^a NA mg/L
Silica	-	^a NA mg/L
Dissolved Organic Carbon	-	^a NA mg/L
Benthic AFDM	-	^d 25 g/m ²
Benthic Chl-a	-	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	-	^a NA

*Non-detect

^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazon et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	62	22
Algae	TBD	TBD

Notable BMI:

- Ephemeroptera: Baetidae; *Baetis*; *Baetis adonis*; *Caenis bajaensis*; Ephemerellidae; *Fallceon*; Leptophlebiidae; *Matriella teresa*; *Paraleptophlebia*
- Plecoptera: *Isoperla denningi*; *Malenka*
- Trichoptera: *Gumaga*; *Hydropsyche*; Hydropsychidae; *Hydroptila*; Hydroptilidae; *Lepidostoma*; *Micrasema*; *Mystacides*; *Ochrotrichia*; *Tinodes*; Trichoptera

Sensitive algae:

- Diatoms: TBD

5.5.4. SMC08157: Cole Creek



Cole Creek is an intermittent stream located within the CDFW Santa Rosa Plateau Ecological Preserve. Cole Creek was first sampled as a probabilistic site by the Stormwater Monitoring Coalition in 2011 (CSCI: 0.61). As the site meets GIS reference screens, it was added to the RCMP site pool for future resampling. Cole Creek exhibits highly intermittent flows and is unable to be sampled in some drought years. Flows were sufficient to sample per the SOP in 2024. It is unknown if 2011 sampling was during a period of no/low flow.

The CSCI and IPI scores indicated a biologically intact benthic macroinvertebrate community as well as intact physical habitat. Algae results are pending for this site and only include diatoms.

Index	Result	Threshold
CSCI	0.87	0.79
d-ASCI	TBD	0.86
m-ASCI	TBD	TBD
IPI	0.95	0.84

Chemical and physical water quality results met relevant aquatic life water quality objectives in the Basin Plan.

Parameter	Result	Threshold
Temperature	16.6	Narrative (Deg C)
Dissolved Oxygen	4.8	5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH	7.6	6.5-8.5
Total Nitrogen	0.22	1.0 mg/L
Total Phosphorus	-	0.1 mg/L
Turbidity	1.4	20 NTU
Chloride	50	^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate	30	^b waterbody-specific mg/L
Conductivity	434	^a NA uS/cm
Alkalinity	-	^a NA mg/L
Silica	-	^a NA mg/L
Dissolved Organic Carbon	4.1	^a NA mg/L
Benthic AFDM	25.7	^d 25 g/m ²
Benthic Chl-a	9.8	^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2	-	^a NA

*Non-detect

^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazon et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	46	9
Algae	TBD	TBD

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Centroptilum*; *Fallceon*; Leptophlebiidae; *Tricorythodes*
- Plecoptera: *Isoperla*
- Trichoptera: Glossosomatidae; *Hydroptila*

Sensitive algae:

- Diatoms: TBD

5.5.5. 903FC0048: San Luis Rey River ~0.2mi above Lusardi Cyn. Cr.



This NRSA trend site was previously sampled in 2018 with a CSCI of 0.90. Stream flows at this site are largely controlled by discharges from Lake Henshaw and, when sampled twice in 2024, water levels were well above base flow. (Photo: MLML July 2024)

BMI counts from both sampling events were below the number of organisms needed to accurately calculate CSCI scores. Samples from 07/10 and 07/30 contained only 53 and 123 BMI, respectively, when a minimum of 250 organisms in a sample is generally considered sufficient for CSCI scores to be considered valid for most uses (see Beck and Mazor 2020). Dam releases at the time of sampling likely impacted BMI presence. Algae results are pending for this site and only include diatoms. The IPI is not available.

Index	Result 7/10	Result 7/30	Threshold
CSCI	*BLNO	*BLNO	0.79
d-ASCI	TBD	TBD	0.86
m-ASCI	NA	NA	TBD
IPI	NA	NA	0.84

*QA Code BLNO: Below Number of Organisms needed to calculate an accurate score

Chemical and physical water quality results are pending from USEPA.

Parameter	Result	Threshold
Temperature		Narrative (Deg C)
Dissolved Oxygen		5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH		6.5-8.5
Total Nitrogen		1.0 mg/L
Total Phosphorus		0.1 mg/L
Turbidity		20 NTU
Chloride		^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate		^b waterbody-specific mg/L
Conductivity		^a NA uS/cm
Alkalinity		^a NA mg/L
Silica		^a NA mg/L
Dissolved Organic Carbon		^a NA mg/L
Benthic AFDM		^d 25 g/m ²
Benthic Chl-a		^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2		^a NA

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI 7/10	19	5
BMI 7/30	18	6
BMI 7/10+7/30	26	7
Algae	TBD	TBD

Notable BMI 7/10:

- Ephemeroptera: *Baetis*; *Baetis adonis*
- Plecoptera: *Yoraperla nigrisoma*
- Trichoptera: *Hydropsyche*; *Hydroptila*

Notable BMI 7/30:

- Ephemeroptera: *Baetis*; *Baetis adonis*; *Fallceon*
- Plecoptera: none
- Trichoptera: *Hydropsyche*; *Hydroptila*; *Ochrotrichia*

Sensitive algae:

- Diatoms: TBD

5.5.6. 909FC0260: Descanso Creek



Descanso Creek 60 m above Oakzanita Springs Campground is an intermittent stream located within Rancho Cuyamaca State Park. This stream was selected as a new random site for NRSA. This stream exhibits highly variable intermittent flows and is often too dry for sampling during drought years due to a lack of flow.

The CSCI score indicated a biologically intact benthic macroinvertebrate community. Algae results are pending for this site and only include diatoms.

Index	Result	Threshold
CSCI	1.16	0.79
d-ASCI	TBD	0.86
m-ASCI	NA	TBD
IPI	NA	0.84

Chemical and physical water quality results are pending from USEPA.

Parameter	Result	Threshold
Temperature		Narrative (Deg C)
Dissolved Oxygen		5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH		6.5-8.5
Total Nitrogen		1.0 mg/L
Total Phosphorus		0.1 mg/L
Turbidity		20 NTU
Chloride		^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate		^b waterbody-specific mg/L
Conductivity		^a NA uS/cm
Alkalinity		^a NA mg/L
Silica		^a NA mg/L
Dissolved Organic Carbon		^a NA mg/L
Benthic AFDM		^d 25 g/m ²
Benthic Chl-a		^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2		^a NA

*Non-detect ^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	55	16
Algae	TBD	TBD

Notable BMI:

- Ephemeroptera: *Baetis*; *Baetis tricaudatus*; *Diphetor hageni*; Ephemerellidae; *Ironodes*; *Matriella teresa*; *Paraleptophlebia*
- Plecoptera: *Isoperla denningi*; *Malenka*
- Trichoptera: *Gumaga*; *Hydropsyche*; Hydropsychidae; *Lepidostoma*; *Ochrotrichia*; *Tinodes*; *Wormaldia*

Sensitive algae:

- Diatoms: TBD

5.5.7. 911FC0343: Cottonwood Creek, 4 km below Barrett Dam



Cottonwood Creek is an intermittent stream located just downstream of Barrett reservoir in unincorporated San Diego County. This stream was selected as a new random site for NRSA.

The CSCI score indicated a benthic macroinvertebrate community that was not biologically intact. Algae results are pending for this site and only include diatoms.

Index	Result	Threshold
CSCI	0.73	0.79
d-ASCI	TBD	0.86
m-ASCI	NA	TBD
IPI	NA	0.84

Chemical and physical water quality results are pending from USEPA.

Parameter	Result	Threshold
Temperature		Narrative (Deg C)
Dissolved Oxygen		5.0 (WARM BU) or 6.0 (COLD BU) mg/L
pH		6.5-8.5
Total Nitrogen		1.0 mg/L
Total Phosphorus		0.1 mg/L
Turbidity		20 NTU
Chloride		^b waterbody-specific mg/L; ^c 230 & 860 mg/L
Sulfate		^b waterbody-specific mg/L
Conductivity		^a NA uS/cm
Alkalinity		^a NA mg/L
Silica		^a NA mg/L
Dissolved Organic Carbon		^a NA mg/L
Benthic AFDM		^d 25 g/m ²
Benthic Chl-a		^d 44 mg/m ²
Benthic C:N Rep 1, Rep 2		^a NA

*Non-detect

^a Informational

^b Basin Plan criteria are specific to non-aquatic use

^c USEPA recommended freshwater criteria for 4-day and 1-hour exposure, respectively.

^d Mazor et al. 2022 threshold for obtaining 10th percentile ASCI score

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	39	5
Algae	TBD	TBD

Notable BMI:

- Ephemeroptera: *Caenis bajaensis*; *Callibaetis*; *Tricorythodes*
- Plecoptera: none
- Trichoptera: *Oxyethira*; *Tinodes*

Sensitive algae:

- Diatoms: TBD

5.6. Partner supported Trout Unlimited sites

5.6.1. GLNTRKRIV: Truckee River, off Glenshire Drive

Truckee River, off Glenshire Drive, three miles east of the Visitor Center on Donner Pass Rd was sampled by Trout Unlimited as part of a restoration project for the Truckee River. In fall of 2020 Trout Unlimited conducted an in-stream habitat restoration project at the site and conducted stream bioassessment sampling, which showed a pre-project CSCI of 0.86. The post-project CSCI score indicated an improved and biologically intact benthic macroinvertebrate community at this site, with the score increasing from 0.86 to 0.96. Unfortunately, non-native New Zealand mud snail (*Potamopyrgus antipodarum*) continue to be present, though at low abundance in the 2024 sample.

The CSCI score indicated a biologically intact benthic macroinvertebrate community.

Index	Result	Threshold
CSCI	0.96	0.79

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	46	24

Notable BMI:

- Ephemeroptera: *Acentrella*; *Baetis*; *Baetis tricaudatus*; *Dipheter hageni*; *Drunella grandis*; *Epeorus*; *Ephemerella*; *Heptagenia*; *Paraleptophlebia*; *Rhithrogena*; *Serratella micheneri*; *Tricorythodes*
- Plecoptera: *Calineuria californica*; *Cultus*; *Skwala*
- Trichoptera: *Cheumatopsyche*; *Glossosoma*; *Hydropsyche*; *Hydroptila*; *Hydroptilidae*; *Lepidostoma*; *Leucotrichia pictipes*; *Ochrotrichia*; *Rhyacophila betteni* group

5.6.2. 554LMCBBM: Mulkey Creek top of Lower Mulkey Meadow

Mulkey Creek top of Lower Mulkey Meadow below Bullfrog Meadow was sampled as part of Trout Unlimited's efforts to conduct meadow restoration work in the Golden Trout Wilderness. This was a pre-restoration sampling event, and the site will be resampled after meadow restoration is conducted.

The CSCI score indicated a biologically intact benthic macroinvertebrate community.

Index	Result	Threshold
CSCI	0.85	0.79

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	40	10

Notable BMI:

- Ephemeroptera: *Baetis tricaudatus*; *Centroptilum*; *Dipheter hageni*; *Drunella spinifera*; *Paraleptophlebia*
- Plecoptera: Capniidae; *Zapada cinctipes*
- Trichoptera: *Hydroptila*; Hydroptilidae; *Psychoglypha*

5.6.3. 554LMCBMD: Mulkey Creek at bottom of Lower Mulkey Meadow

Mulkey Creek at bottom of Lower Mulkey Meadow above rocky hill was sampled as part of Trout Unlimited's efforts to conduct meadow restoration work in the Golden Trout Wilderness. This was a pre-restoration sampling event, and the site will be resampled after meadow restoration is conducted.

The CSCI score indicated a biologically intact benthic macroinvertebrate community.

Index	Result	Threshold
CSCI	0.95	0.79

Taxa

	# Taxa	# EPT or Sensitive Taxa
BMI	45	12

Notable BMI:

- Ephemeroptera: *Baetis tricaudatus*; *Centroptilum*; *Dipheter hageni*; *Ephemerella*; Heptageniidae; *Paraleptophlebia*
- Plecoptera: Capniidae; *Zapada cinctipes*
- Trichoptera: *Hydropsyche*; *Hydroptila*; Hydroptilidae; Limnephilidae

5.7. eDNA-only sites

5.7.1. 901SMCABW: San Mateo Creek above Bluewater



This site is located at the confluence of San Mateo and Bluewater Creeks in the San Mateo Wilderness. The confluence location has a large pool that can persist through the summer dry months. As seen in the site photo, it has a notable geologic feature that bisects the pool. A Jonah Ventures kit was used at this site, which used the MiFish primer set. This site was sampled for the presence of DNA from California newt, steelhead, red-legged frog, and southwestern pond turtle using species-specific probes and ddPCR. (Photo CL 1/4/2024)

eDNA

Method	Detections
Jonah Ventures	<i>Ameiurus</i> (bullheads)
Smith-Root	<i>Oncorhynchus mykiss</i> (steelhead)
Vacuum filtration	No detections

5.7.2. 901SMCBAB: San Mateo Creek Bedrock above Bluewater



This site is a bedrock pool located upstream of the Bluewater confluence. This pool retained water throughout the 2013-2016 drought. A Jonah Ventures kit was used at this site, which used the MiFish primer set. This site was sampled for the presence of DNA from California newt, steelhead, red-legged frog, and southwestern pond turtle using species-specific probes and ddPCR. (Photo DW 1/4/24)

eDNA

Method	Detections
Jonah Ventures	<i>Lepomis</i> (sunfishes), <i>Ameiurus</i> (bullheads), human, <i>Notemigonus crysoleucas</i> (golden shiner), <i>Pimephales promelas</i> (fathead minnow), <i>Sus scrofa</i> (wild pig)
Smith-Root	<i>Rana draytonii</i> (red-legged frog), <i>Oncorhynchus mykiss</i> (steelhead)
Vacuum filtration	<i>Oncorhynchus mykiss</i> (steelhead)

5.7.3. 901BCCDSC: Bear Canyon Creek



This site on Bear Canyon Creek is an intermittent stream located in the Cleveland National Forest downstream of the old Upper San Juan campground. This site was selected to assist with development of a California newt (*Taricha torosa*) specific probe as the stream reach has a high concentration of newts. Samples from this site were analyzed only for California newt. (Photo CL 4/17/24)

eDNA

Method	Detections
Jonah Ventures	NA
Smith-Root	NA
Vacuum filtration	<i>Taricha torosa</i>

5.7.4. 903NP9UAC: Upper Agua Caliente



Upper Agua Caliente Creek is a long term RCMP site within the Cleveland National Forest. Site visits and water level loggers have documented that Upper Agua Caliente Creek exhibits perennial flow. For 2022 to 2023, the logger was deployed to a new stream location, but it did not accurately depict water level, showing the stream as dry from June to October. It was moved to a new position in 2024 and deployed with a trail camera to test the feasibility of using photographic images to document flow conditions. (Photo CL 12/16/24)

eDNA

Method	Detections
Jonah Ventures	None
Smith-Root #1	TBD
Vacuum filtration	NA

6. Summary

- 2024 marked the 29th year of State of California bioassessment monitoring in Region 9. To date, over 600 sites in the region have been bioassessed at least once, and more than 1,750 bioassessments have been done.
- This report summarizes 27 bioassessments done in 2024 by MARU (16), CDFW (5), Moss Landing (3), and Trout Unlimited (3). These bioassessments covered 25 stream sites, as repeat sampling was done at two sites.
- **CSCI scores indicated intact macroinvertebrate communities at all but two sites.**
 - One site sampled by Moss Landing for the NRSA had too few BMI in the sample to calculate an accurate CSCI (San Luis Rey River ~0.2mi above Lusardi Cyn. Cr.)
 - Another site sampled by Moss Landing for the NRSA scored 0.73, indicating poor biological condition (Cottonwood Creek below Barrett Dam)
- **ASCI scores indicated intact algal communities at all but two sites.**
 - A coverage expansion site sampled by MARU had both d-ASCI and h-ASCI scores well below the 0.86 threshold (Santa Maria Creek Ramona)
 - A program request site sampled by MARU had both ASCI scores slightly below the threshold (Upper Poway Creek at Sycamore Valley Road)
 - Three sites had one ASCI score above the threshold, still indicating conditions similar to reference (Boulder Creek, North Pine Creek, and Unnamed Tributary to Long Canyon Creek)
 - ASCI scores were available only for sites sampled by MARU
 - mASCI scores will be added to this report when available
- **IPI scores indicated intact physical habitat at all sites.**
 - IPI scores were available only for sites sampled by MARU
- **Chemistry results met Basin Plan objectives for aquatic life at all but one site.**
 - Total nitrogen (2.11 mg/L) and total phosphorus (0.3 mg/L) levels at Santa Maria Creek were above the Basin Plan objectives of 1.0 mg/L and 0.1 mg/L, respectively.
 - Benthic AFDM at 11 of the 18 sites tested was above a published threshold for California, as was benthic chl-a at 6 of 18 sites, but both parameters are documented to have a high degree of variability.

- **Carbon:Nitrogen molar ratios were between 8 and 16 at all 16 sites tested**, indicating the streams had a mix of carbon-rich (leaves) and nitrogen-rich (algae, animal waste) sources.
 - Borderline low ratios at Santa Maria Creek (7.9, 8.2) suggest this stream has a predominance of algal and/or external nitrogen sources.
- **E. coli and HF183 results were acceptable at the sites tested.**
 - *E. coli* did not exceed the Basin Plan objective at the 12 sites tested.
 - HF183 was non-detect at 12 sites and below the limit of detection at one.
- **The maximum number of BMI taxa in a sample was 66** (Carney Canyon and Unnamed Tributary to San Mateo Creek). This is the highest number of BMI taxa found in a Region 9 sample since 2022. Overall, pooling taxonomic data from the 16 bioassessments done by MARU, 181 BMI taxa were recorded in Region 9 in 2024. When the eight bioassessments done by CDFW/MLML are included, 235 taxa were recorded in the region in 2024.
- **The maximum number of algal taxa in a sample was 103** (Horse Canyon Creek). Since 2022, the highest number of algal taxa found in a Region 9 sample is 126 (found at Kitchen and Boulder Creeks in 2022). Overall, pooling taxonomic data from the 16 bioassessments done by MARU, 386 algal taxa were recorded in Region 9 in 2024. At the time of writing, algal data were not available for the bioassessments done by CDFW/MLML.
- **eDNA metabarcoding kits detected notable aquatic wildlife at 13 of the 19 sites where they were used.** The Jonah Ventures eDNA kits detected one sensitive native fish species, five non-native fish species, three native amphibians and one non-native amphibian.
 - The native species were arroyo chub (*Gila orcuttii*), newt (*Taricha granulosa*, likely truly a California newt *Taricha torosa*), black-bellied salamander (*Batrachoseps nigriventris*), and Pacific tree frog (*Pseudacris regilla*).
 - The non-native species were sunfish (*Lepomis* genus), bullheads (*Ameiurus*), fat-head minnow (*Pimephales promelas*), golden shiner (*Notemigonus crysoleucas*), and goldfish/carp (*Carassius* genus).
 - MARU plans to use eDNA metabarcoding kits again in 2025.
- **Results from targeted eDNA analyses using ddPCR were available for only three eDNA-only sites sampled in early 2024. The San Diego Water Board is transitioning to a new eDNA laboratory which has delayed results for the later sites.**
 - Sites sampled on San Mateo Creek detected the presence of steelhead where metabarcoding kits did not, likely due to low gene copies of steelhead, which indicates low density, as well as low sampled volumes for Jonah Venture kits.

- Red-legged frog, believed to be extirpated from San Mateo Creek, was detected at one site.
 - A newly developed probe for the California newt successfully detected newts in Bear Creek when sampling downstream of visually observed newts.
 - MARU plans to use the Smith-Root device and ddPCR again in 2025.
- **According to the CEDEN database (searched 7/29/25), a total of 55 bioassessments were done in Region 9 in 2024.** MARU and CDFW did 24, and 31 were done by other entities. Bioassessment data from 2024 can be found in CEDEN under these Projects:

# BAs	Project
16	RWB9 Bioassessment 2024
4	Statewide Ref Condition Management Plan 2024
4	National Rivers and Streams Assessment 2024
12	SMC Regional Watershed Monitoring 2024
11	SMC Regional Watershed Monitoring SCCWRP
5	Otay River Bioassessment Monitoring - 2024
3	SCWD Aliso Creek Flow Diversion Monitoring

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