

Data Navigator Guide for CCAMP Statistical Analysis

1 Navigate to www.ccamp.org/datanavigator

The screenshot shows the 'Data Navigator' interface for the 'Central Coast Ambient Monitoring Program'. The page has a blue header with the title 'Data Navigator' and 'Central Coast Ambient Monitoring Program'. In the top right corner, there is a logo for 'THE Bay Four' and text that reads 'Powered by Marine Pollution at Moss Landing Marine Lab'. Below the header, there is a dropdown menu set to 'Public (All Programs)' and a 'Reset' button. The main content area features a map of California with various monitoring sites marked with numbers (304, 306, 305, 307, 308, 309, 310, 311, 312, 313, 315, 316). To the right of the map, there is a text instruction: 'To begin, use the Org ID drop-down list to select the Program/Organization data you would like to view'. At the bottom left of the map area, it says 'Selected site: None' and 'Zoom to site'. The Google logo and 'Map data ©2026 Google, INEGI Terms' are visible at the bottom of the map.

- 2 Click the "Org ID" drop down menu and select the "Public (All Programs)" option.

The screenshot shows the 'Data Navigator' interface for the 'Central Coast Ambient Monitoring Program'. The title 'Data Navigator' is in large black font, and 'Central Coast Ambient Monitoring Program' is below it. In the top right corner, there is a logo for 'THE Bay Four' and text that reads 'Powered by Marine Pollution at Moss Landing Marine Lab'. Below the title, there is a dropdown menu labeled 'Public (All Programs)' with a downward arrow, and a 'Reset' button below it. To the left is a map of California with monitoring sites marked with numbers (304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 315, 316). To the right of the map, there is a text prompt: 'To begin, use the Org ID drop-down list to select the Program/Organization data you would like to view'. At the bottom left, it says 'Selected site: None' and 'Zoom to site'.

- 3 Click the Data Type drop down menu and select the "Basic Water Quality" option.

The screenshot shows the 'Data Navigator' interface with the 'Data Type' dropdown menu selected. The title and logo are the same as in the previous screenshot. The 'Org ID' dropdown menu is still set to 'Public (All Programs)'. The 'Data Type' dropdown menu is now set to 'Basic Water Quality'. Below the dropdowns is a 'Reset' button. The map on the left is the same. To the right of the map, there is a text prompt: 'Please select an analyte to view. An empty Analytes list means the currently selected Data Type has no samples.' At the bottom left, it says 'Selected site: None' and 'Zoom to site'.

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Click the "Analytes" drop down menu and choose an analyte (ex. Oxygen, Dissolved-departure).

Data Navigator
Central Coast Ambient Monitoring Program

Public (All Programs) Basic Water Quality **Analytes**

Watershed: Regionwide

Selected site: None

5

Click on the "More Information" drop down menu beneath the graph, then select the "About the Analyte" option.

Regional: Average Oxygen, Dissolved-departure (mg/L)

Watershed Number	Mean (mg/L)
304	0.44
306	1.37
308	0.19
310	4.90
311	5.23
313	1.25
314	1.12
315	0.08
317	0.33

Watershed	Units	Min	Mean	Geomean	Median	Max	Samples
304	mg/L	0.01	0.44	0.16	0.15	90.10	4792
La Nueva (306)	mg/L	0.01	1.37	1.06	0.75	81.40	4096
308	mg/L	0.01	0.78	0.12	0.54	9.17	659
308	mg/L	0.01	0.19	0.02	0.01	5.65	2675
308	mg/L	0.01	1.67	0.34	0.87	849.00	8797
San Pedro Bay (310)	mg/L	0.01	1.32	0.22	0.92	88.40	10219
310	mg/L	0.01	4.90	1.25	5.23	9.89	11
310	mg/L	0.01	1.12	0.08	0.33	113.50	4380

6 Below the key, an explanation of the analyte will be provided [Task 1.4].

Selected site: None [Zoom to site](#) Bar chart - linear scale [About the Analyte](#)

● = Excellent ● = Good ● = Fair ● = Poor ● = Very Poor ↑ = Getting Better ↓ = Getting Worse ● = No change
 ● = Insufficient sample count to score but one or more samples exceed the criteria

When no goal is available Lowest ● = 0-25% ● = 25-50% ● = 50-75% ● = 75-100% Highest ▲ = Increasing ▼ = Decreasing

Analyte Information [Close](#)

DO PPM DEP

Dissolved Oxygen Departure (mg/L)


Oxygen Departure is a term used here to describe the extent to which dissolved oxygen measurements exceed their thresholds. For this project, the Magnitude Exceedance Quotient is calculated based on the normal cold water range of 7.0 to 13.0 mg/L. "Exceedance" is calculated as the combined number of samples that exceed 13 mg/L or fall below 7 mg/L. MEQ scoring of dissolved oxygen has been modified because of the unique "double-ended nature of oxygen thresholds. For aquatic life, oxygen "exceedance" is calculated as the percent of measurements that fall outside of the normal range of 7.0 to 13 mg/L. Any measurement inside the normal range scores a "zero" for departure, and any measurement outside this range is scored as the difference between its value and the center point of the "normal" oxygen range, which for aquatic life is 10.0. For example, a measurement of 14.5 mg/L is given a departure score of 4.5, since it is 4.5 mg/L above 10.0. A measurement of 5.5 also has a departure score of 4.5 mg/L. The magnitude term is calculated by dividing the departure score into the threshold of 3.0, which is the distance between the center point (10.0 mg/L) and the applicable threshold (e.g. 7.0 or 13.0). The resulting MEQ score is indifferent to the direction of the exceedance.

For more information on Dissolved Oxygen, see [DO_PPM](#). For more information on MEQ calculations see this associated document[[1]].

7 To select a different analyte, click the 'Data Type' drop down menu, and select the "Toxicity Testing in water" option.

Data Navigator

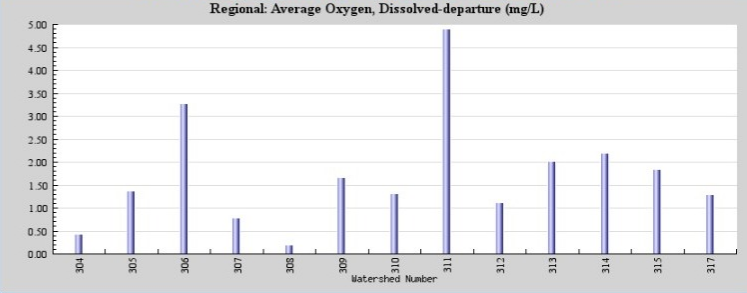
Central Coast Ambient Monitoring Program

 Powered by Marine Pollution Studies Lab at Moss Landing Marine Laboratories

Public (All Programs) [Reset](#) **Toxicity Testing in water** Analytes [Monitoring Sites](#)

Please select an analyte to view.
An empty Analytes list means the currently selected Data Type has no samples.

Regional: Average Oxygen, Dissolved-departure (mg/L)

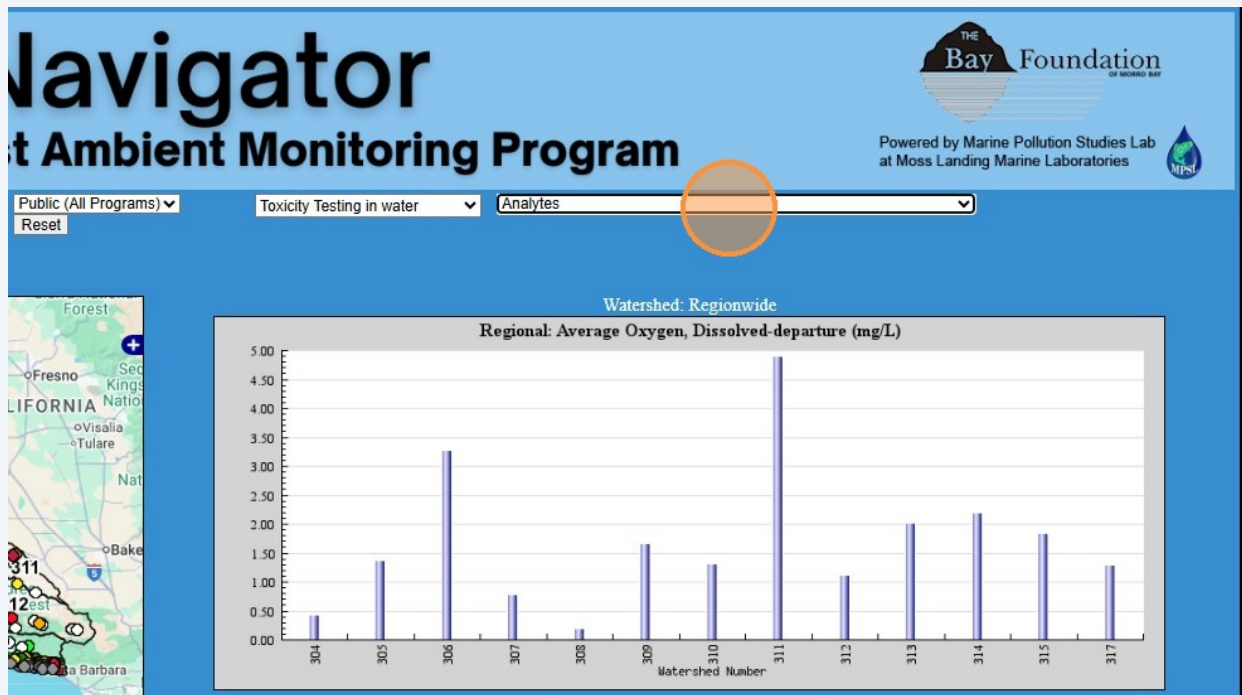


Selected site: None [Zoom to site](#)

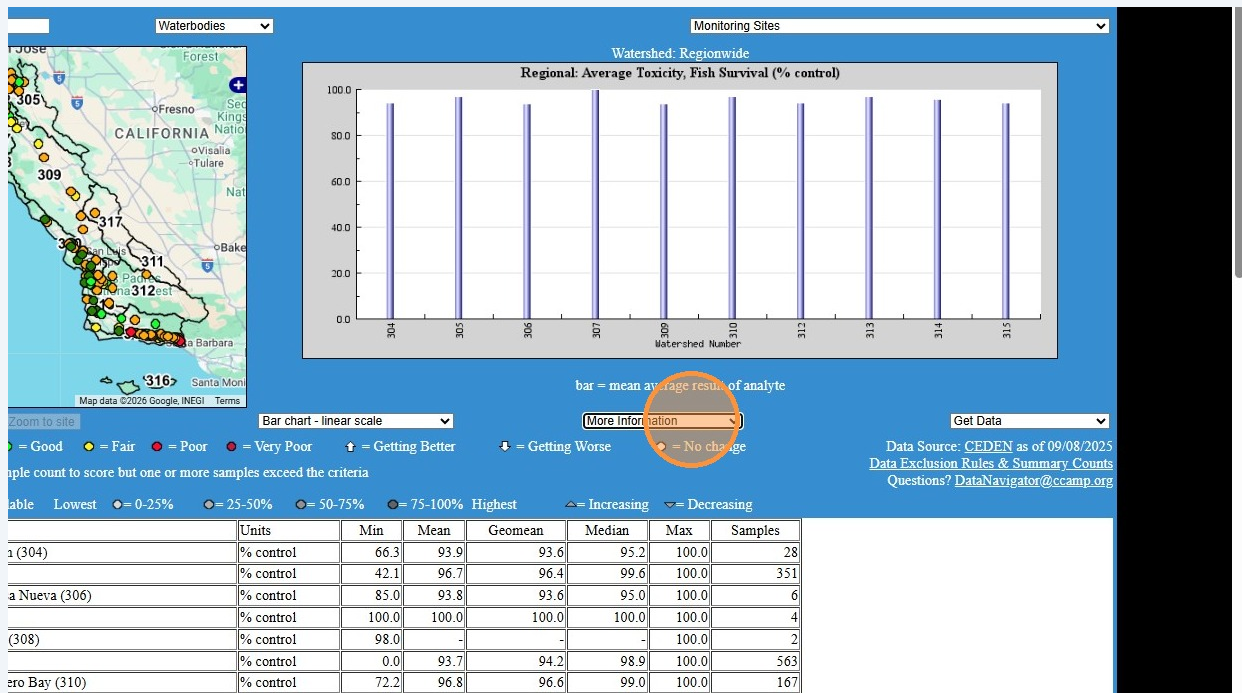
● = Excellent ● = Good ● = Fair ● = Poor ● = Very Poor ↑ = Getting Better ↓ = Getting Worse ● = No change
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Data Source: CEDEN as of 09/08
 Data Exclusion Rules & Summary
 Questions? DataNavigator@ccar

8 Click the "Analytes" option, and select an analyte (ex. Fish Survival).



9 Beneath the graph, click the "More Information" drop down menu, and select 'About Change Detection' [Task 2.2].



10 Scroll down to learn more about Change Point Analysis.

About Change Detection

The primary statistical software used by this project is R, a free, open source software environment for statistical computing and graphics [1]. Other software includes Non-detects And Data Analysis (NADA) for R (also open source and downloadable from Practical Stats [2] (Helsel, 2005 and 2012). NADA is used for analyses involving censored data (data including non-detects or "less thans"), including general statistics, change detection and associated graphics.

We employ change analysis and trend analysis as two different statistical approaches to evaluate patterns in the monthly time series data. In some cases these two approaches can produce contrasting results, as when there is an overall increasing trend in a data set that has some change points that mark a decrease. For this CCAMP assessment, confidence that overall improvement (or degradation) is occurring at a site is strongest when there is agreement between both trend and change analysis, when there is a relatively steep slope to the trend line, and when there is a relatively high percent difference between data before and after change points.

Trend analysis identifies consistent linear change in a single direction. If a trend line through the data has a slope that is statistically different from zero (horizontal), we consider the trend significant and it is represented on our graphs by a sloping green line (decreasing trend) or sloping red line (increasing trend). The statistical significance of the trend is determined using the Mann-Kendall test, as modified for non-detects using the "Non-detects And Data Analysis" (NADA) package (Helsel 2005), which computes Kendall's tau correlation coefficient and the associated trend line for censored data. The alpha value for this analysis is set at 0.01 (99% certainty) because our data set is large and even trend lines with relatively low slope can be statistically significant at higher alpha values. The higher confidence level makes it more likely that the trends we detect are environmentally meaningful. When evaluating trend results, the reader should consider the steepness of the trend line and the potential for logical causal relationships.

Change analysis looks for specific points in time when there is a high probability that measurements taken before a certain date are different from measurements taken after. Change points are identified here in two steps. In the first step, R package Bayesian Change Point Analysis is used to identify candidate change points by segmenting data into contiguous blocks so that the mean within each block is constant. We used a minimum block size of 10 samples to identify candidate change points, which are shown on our graphs as blue vertical lines. This first step may identify none, one, or more than one candidate change point in the data.

In the second step, statistical significance is determined by identifying blue-line candidate change points that meet the following conditions to become

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When no goal is available Lowest ●= 0-25% ●= 25-50% ●= 50-75% ●= 75-100% Highest ▲= Increasing ▼= Decreasing

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In the second step, statistical significance is determined by identifying blue-line candidate change points that meet the following conditions to become a red- or green-line statistically significant change point:

- (1) For conventional water quality parameters, the change point must have at least 20 samples taken before the change date and at least 20 samples taken after.
- (2) For water toxicity, the change point must have at least 8 samples taken before the change date and at least 8 samples taken after.
- (3) For sediment toxicity and chemistry and for bioassessment, the change point must have at least 4 samples taken before the change date and at least 4 samples taken after.
- (3) A t-test (with $\alpha = 0.05$) must detect a statistically significant difference between the mean of all samples taken before the change date and the mean of all samples taken after.

Once statistically significant change points are identified, they are prioritized so that each graph has only one vertical green line (for decreasing data values) or one vertical red line (for increasing data values). If there is more than one statistically significant change point for a given parameter at a given site, and all of the change points indicate a change in the same direction, then it is the earliest change point that is highlighted as a green or red vertical line. This is because we want to know the earliest event that could have caused a consistent series of changes. If there are multiple significant change points indicating changes in opposite directions, then the most recent change point is highlighted as a green or red vertical line, because in this case we want to know the most recent change and its direction. The remaining blue lines are useful for highlighting other potential change points that may indicate increasing change in one direction, or points at which data values changed in an opposite direction, possibly indicating episodic events.

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