Fact Sheet | **CCAMP Data Navigator**

CCAMP Data Navigator

Overview

The Central Coast Ambient Monitoring Program (CCAMP) Data Navigator is a web-based tool for viewing data interpretations in map, table and graph formats, accessible at www.ccamp.org. The web site provides access to many different types of data, including conventional water quality, metals, organic chemicals, toxicity, and bioassessment data. It includes data for both water and sediment quality. Displays include bar charts, box plots, time series and other data views.

Recent improvements include direct data downloads, color-scored displays of a broad variety of parameters, trend and change point analysis. Flow and instantaneous loads are also provided. The color scoring approach is based on the Canadian Water Quality Index, and uses analyte thresholds (typically from regulatory sources) to calculate magnitude and exceedance components. The web site has been enhanced with substantially more documentation, additional statistical tools, access to thresholds and threshold references. It provides an excellent way to screen for problems, learn about the characteristics of the data, and then download the data for further analysis.

The target audiences for this tool are those interested in specific SWAMP projects, as well as water quality monitoring in general. These may include elected officials (e.g. the State Legislature), government agencies, consultants, researchers, NGOs and informed members of the general public. The Data Navigator has been developed by CCAMP staff to support data for the Central Coast Water Board and Central Coast Region. It currently includes data from CCAMP, the Surface Water Ambient Monitoring Program, and the Central Coast Cooperative Monitoring Program for Agriculture.

Data Navigator Basics

The Data Navigator shows views of site scores for the analyte of interest on a navigable map of the Region, in chart format, and in summary tables. The user can chose to view chart data at the level of the Hydrologic Unit (Figure 1), the water body or the monitoring site (Figure 2).
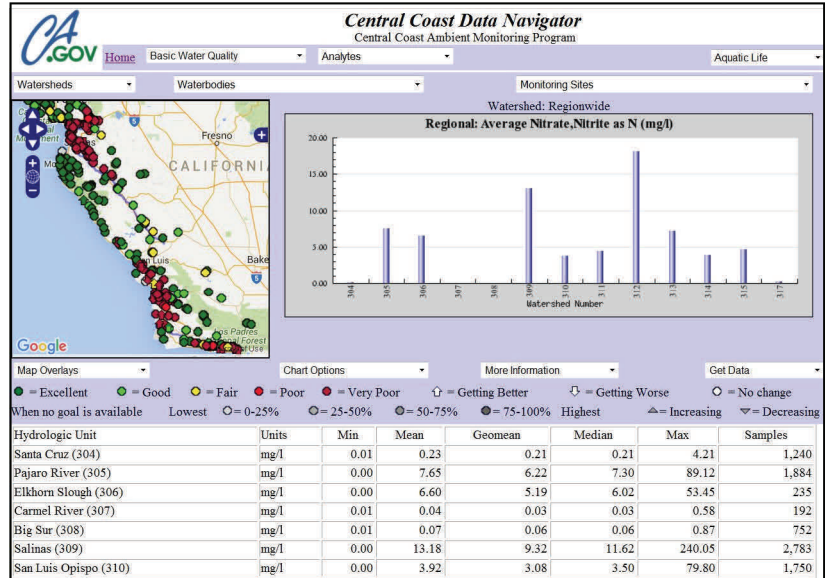

Figure 1. Screen shot from CCAMP Data Navigator showing average nitrate concentrations in the Region, by Hydrologic Unit.

The user can drill down to the level of the waterbody or individual site (Figure 2). The map will automatically zoom to the waterbody or site that is chosen. At this level, the user can clearly see the color score assigned to a site for the analyte that is chosen. Downward pointing arrows on the site map imply worsening conditions based on change point analysis. Figure 2 shows the times series and map for nitrate-N in lower San Simeon Creek. The arrow is dark red and pointing downward, indicating very high concentrations that have gotten higher in recent years.
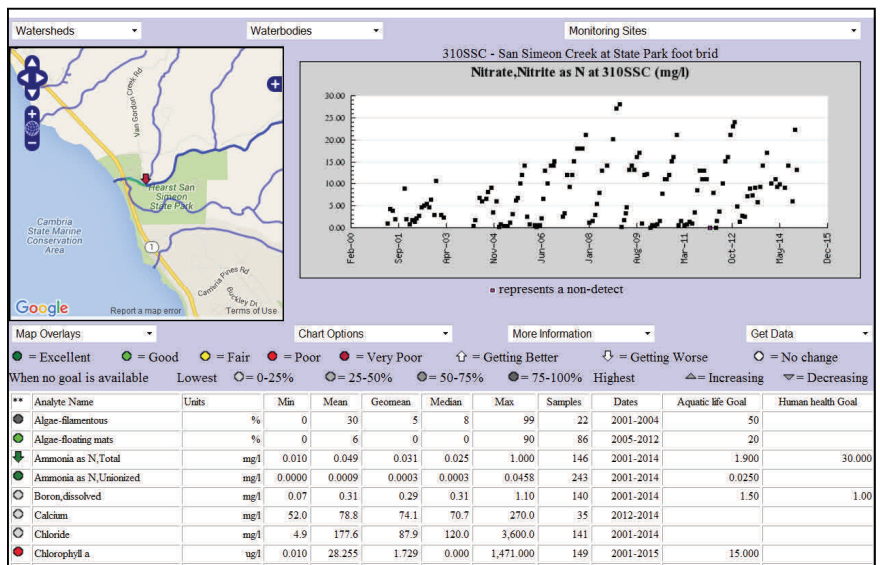

Figure 2. Screen shot from CCAMP Data Navigator showing Nitrate-N time series and condition score at San Simeon Creek, San Luis Obispo County.

Data Navigator "Chart Options" Menu

Logarithmic Chart Scale – Two chart options include "linear" or "logarithmic" scale. For some parameters with very widely ranging values, such as coliform or turbidity, it is helpful to view data using a logarithmic scale. Figure 3 shows the same fecal coliform data using a linear (a) and logarithmic (b) y-axis.
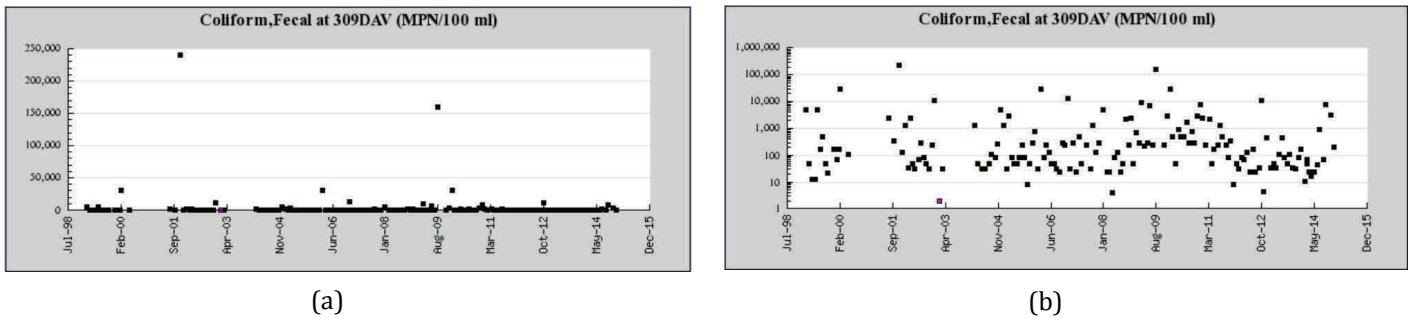

(a)

(b)

Figure 3. Fecal coliform data from the Salinas River at Davis Rd. (309DAV), displayed using a linear y-axis (a) and a logarithmic y-axis (b).

Chart Displays – Data can be viewed at the Hydrologic Unit (large watershed) or water body scale as bar charts, box-and-whisker plots or scatter plots. The charts in Figure 4a-c show these three graph formats for Nitrate-N in the Big Basin Hydrologic Unit (in coastal Santa Cruz County), using a logarithmic y-axis. The bar and box-and-whisker plots (Figures 4a and 4b respectively) are shown for each site sampled in the Hydrologic Unit. The scatter plot (Figure 4c) is shown over time for all sites. In the scatter plot, "non-detected" data points are shown in pink. These are concentrations that are lower than the laboratory's measurement capabilities.
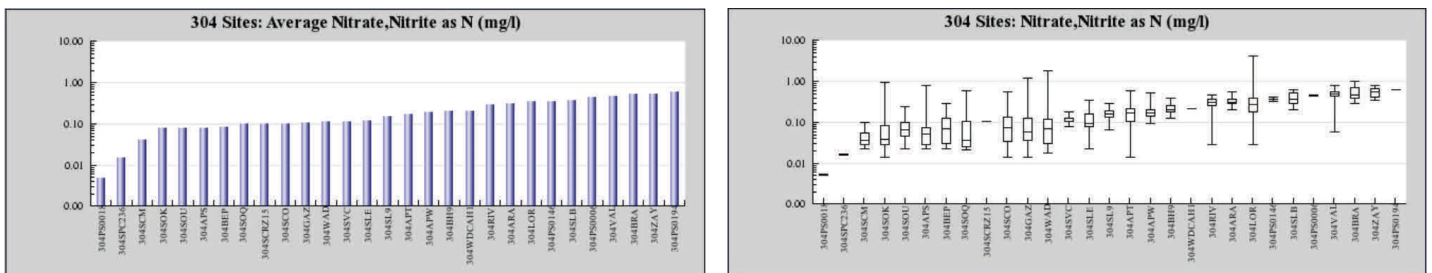
(a) Bar chart for sites sampled in Hydrologic Unit 304

(b) Box-and-whisker plot for sites sampled in Hydrologic Unit 304

(c) Scatter plot for all nitrate data in Hydrologic Unit 304. Pink sample dots represent "non-detected" values.

Figure 4. Basic chart displays available from the "Chart Options" menu.

Change Analysis - Interactive maps show site data scores using red-yellow-green shades in one of two shapes; dots or arrows. Sites that do not show any significant change use dots to display condition scores. Sites that are getting better or worse display condition scores using an up- or down-arrow (respectively). In some cases, arrows are two-toned, when a scoring boundary is crossed. Figure 5 shows an example of a site that has changed from poor to good condition for Total Ammonia concentration. To accompany the map icons are change graphs that include both Mann Kendall non-parametric linear change and Bayesian Change Point Analysis. This latter analysis shows highly probable change points where before and after periods are also significantly different from one another. Change charts are available on the web site both with and without outliers.
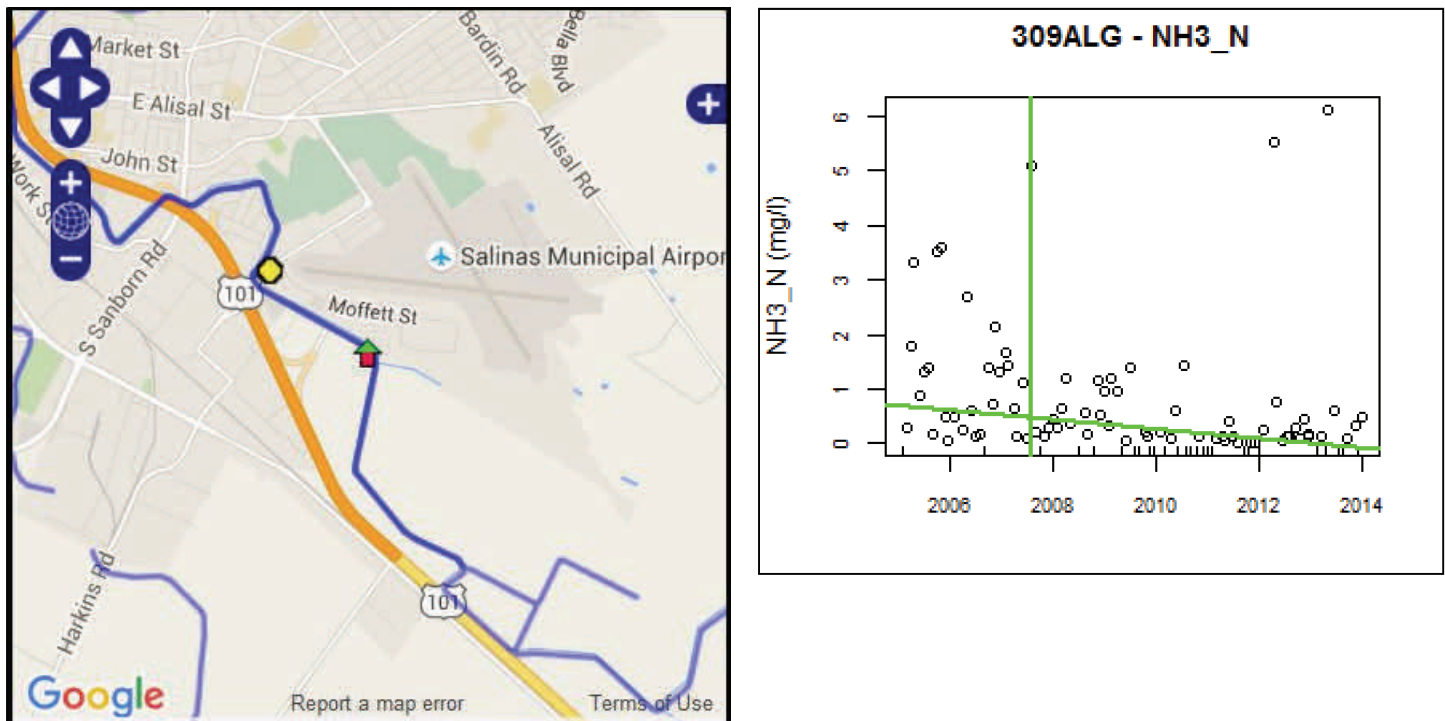

Figure 5. Map and change graph for a site changing from poor to good condition. Map shows site icon as a two toned arrow pointing up. Color change in the arrow indicates change from poor (red) condition to good (green) condition. Upward pointing arrow indicates "improvement". Change graph shows both linear improving trend over time (sloped green line) and significant change point (vertical green line) occurring in 2007.

The viewer can learn more details about significant trends and change through the chart options menu. Change analysis (both for linear trend and significant change point) is shown graphically and is summarized in table format for all analytes showing change at that location (Figure 6).
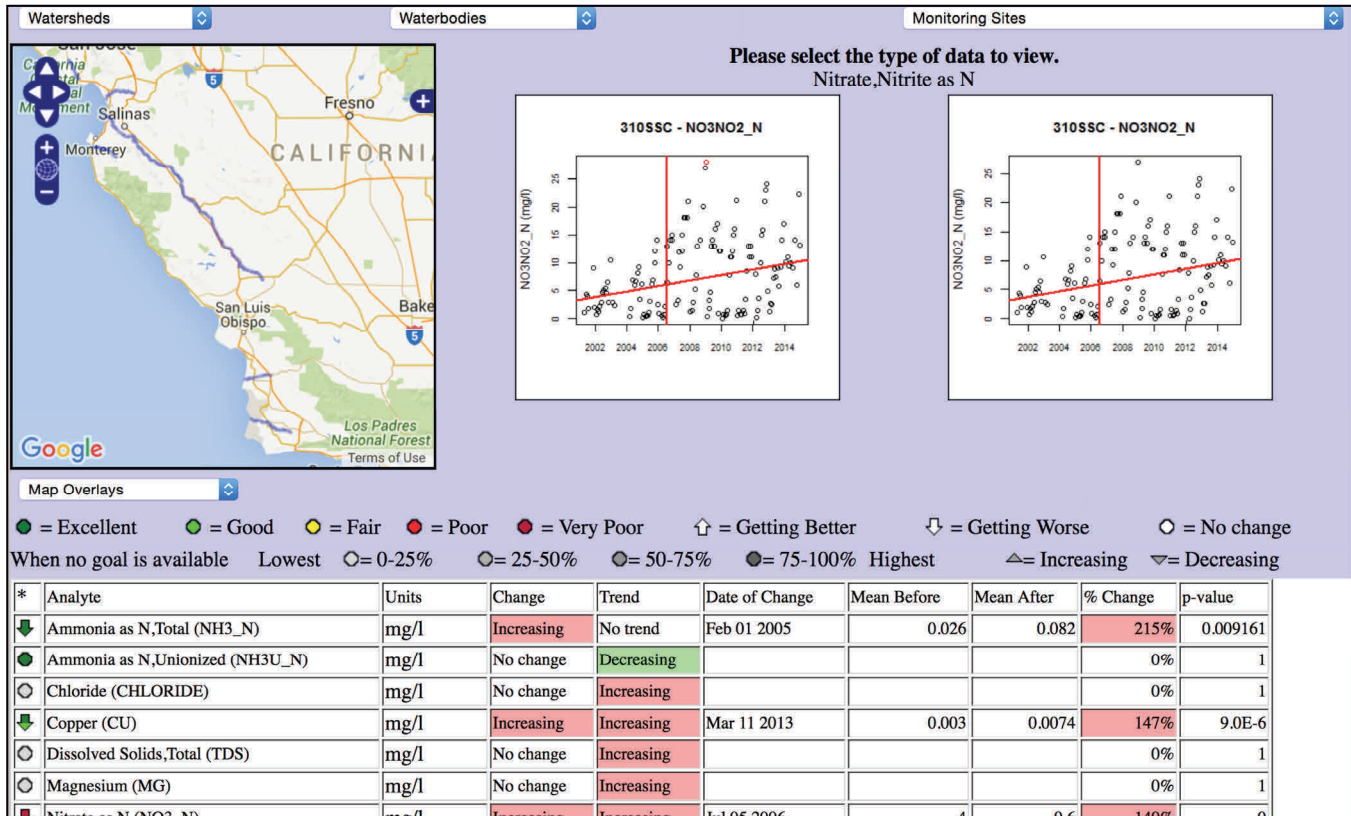
Figure 6. Screen shot from CCAMP Data Navigator showing Nitrate change analysis at San Simeon Creek, San Luis Obispo County. Red sloped lines indicate significant linear trends (Mann-Kendall non-parametric test); red vertical lines indicate a significant Bayesian Change Point. Red colored cells in the table indicate analytes with significant change that is increasing. Green colored cells indicate analytes with significant change that is decreasing.

Cumulative Frequency Distribution – Site averages can be viewed in a cumulative frequency distribution of all sites in the Region. For example, the site in Figure 7 has an average nitrate-N value of approximately 20 mg/L, which is higher than approximately 80% of the sites sampled in the Region. It should be noted that site selection is not random, and data from the Central Coast's agricultural monitoring program is included in the Navigator, meaning distributions may reflect a higher percentage of poor quality sites.
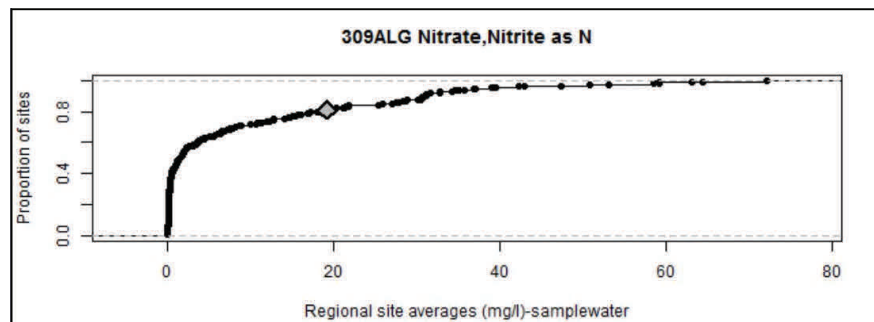

Figure 7. Cumulative Frequency Distribution for mean Nitrate-N, at site 309ALG on Alisal Creek, Monterey County.

Other Data Navigator Features

"Flow and Loading" Data Type Option – Instantaneous load (or flux) is the concentration at the time of sampling multiplied by the flow and is typically here expressed as kilograms per day. Some analytes, particularly turbidity and coliform, are not true loads as they are not measured as mass, but are provided as an expression of overall quantity of water in this condition. Figure 8 shows instantaneous load of nitrate at a site on San Luis Obispo Creek. A seasonal pattern is evident, with loads higher during wet weather.
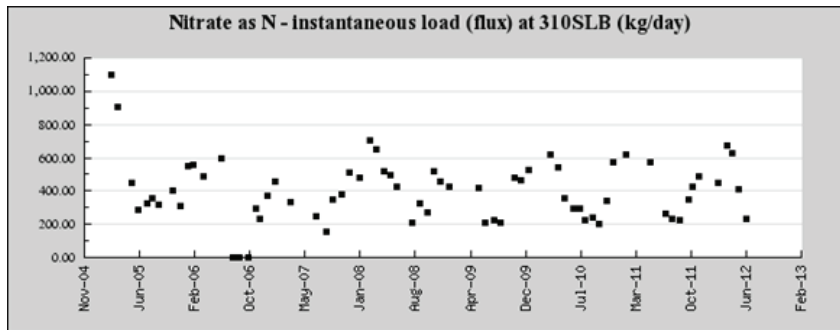

Figure 8. Instantaneous load of Nitrate-N in San Luis Obispo Creek from 2005 through 2012.

Modeled Loads are available for coastal confluence trend sites. This output uses daily flow estimates from the CCAMP flow model, derived from locally relevant flow gauges and National Hydrology Dataset annual mean daily runoff values. Detailed flow model documentation is provided on the "More Information" menu. At some locations, modeled loads have been augmented with additional flow and concentration data from outside sources.
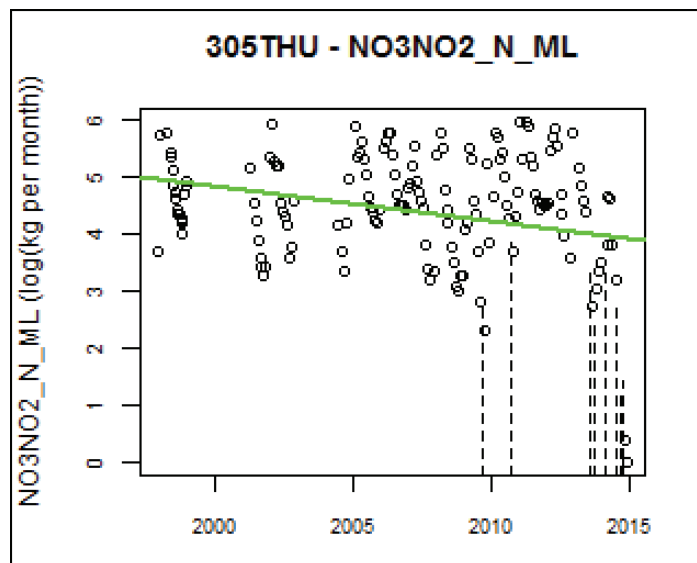

Figure 9. Significant declining trend (sloped green line) in nitrate load (Kg/month) at Thurwachter Rd. on the Pajaro River, Santa Cruz County. Dashed lines represent load estimates based on non-detected concentrations.

"Beneficial Use Group" Menu

This menu toggles site colors between scoring based on two different sets of thresholds (or goals): those used for aquatic life support (including marine, estuarine, and fresh water thresholds) and those used for human health support (including drinking water uses and, for pathogen indicators only, recreational contact use). Site colors will shift based on scoring using the different sets of thresholds. For some analytes, there are no thresholds for one or both beneficial use groups. If no threshold exists, the sites are gray-shaded, based on quartiles.

"More Information" Menu

This menu provides extensive access to information on how the website works. This includes technical information on how the change analysis and color scoring works, information on the various menus, detailed information on analytes, and access to all thresholds available for the analyte being investigated.

"Get Data" Menu

The user can download the data they are viewing on the screen, using the "Get Data" menu. For "chart data", this includes summary statistics, like mean, median, geomean, change analysis, report card grade, etc. For "sample data", this includes individual sample measurements. For "chart site details" this includes site name, latitude and longitude and other site information.

Summary

The CCAMP Data Navigator is a unique and helpful tool that allows the user access to data in a color-scored map environment. It provides quick access to locations where analytes are present and are elevated to levels that may cause problems. It also helps identify areas that are in good condition currently and are in need of protection. The web tool is updated with data from several online databases, including the SWAMP/CEDEN system. This means that the website can be readily updated when new information is available.   Data is downloadable, allowing the user to readily conduct more extensive analyses. The website is used extensively by the public, staff, decision-makers, researchers and others who have questions about water quality in the Central Coast Region.

For more information: *www.ccamp.org*; *Karen.worcester@waterboards.ca.gov*