

Snapshot Water Quality Monitoring Day: September 18, 2010. Kailua and Waimānalo, Oʻahu

Background

On Saturday September 18, 2010 Hui o Koʻolaupoko (HOK) hosted the 2010 Snapshot Water Quality Monitoring as part of World Wide Water Quality Monitoring Day in Kailua and Waimānalo. HOK is a non-profit community organization whose mission is to: *protect ocean health by restoring the 'aina, mauka to makai*. The mission is achieved through three programs: 1. Community volunteering and education (e.g. water quality monitoring events), 2. On-theground restoration projects and 3. Project effectiveness monitoring (e.g. how effective was the restoration project at improving water quality?).

For this event, HOK staff and volunteers monitored four water bodies at two locations: 1. the mouth of Ka'elepulu Stream mauka of the sandbar and Kailua Bay and 2. the mouth of Muliwai'ōlena Stream mauka of the sandbar and Waimānalo Bay (see map on page 10). The main objectives of the event were to engage the community in water quality monitoring, provide background information regarding water quality problems from non-point sources and collect a discrete amount of data to compare spatially during a given timeframe (e.g. snapshot). The parameters monitored for each location included: temperature, turbidity, salinity, dissolved oxygen (D.O.), pH, nitrate, phosphate, coliform and Enterococcus bacteria.

Both in Kailua and Waimānalo, water quality is degraded from a variety sources including nonpoint source pollution from roads, parking lots, residential homes and agriculture. Pollutants include nitrogen and phosphates from fertilizers, gas and oil from vehicles, sediment from eroding hill sides and streambanks and animal waste. Additionally, water quality problems are compounded with the increase of impervious surface (e.g. concrete, roads and roofs) in the urban areas and following periods of rain, pollutants flow across the landscape and enter into stormdrains, streams and ultimately the ocean.

Protocols

Protocols for each location were similar yet flexible enough to allow the various volunteers to participate in the event and utilized different equipment.

In both locations, volunteers used *LaMotte Low Cost Water Monitoring Kit* (Kits) to analyze temperature, D.O. p.H. nitrate, phosphate, turbidity and coliform. In addition to the Kits, in Kailua, a YSI 556 unit was used for temperature, salinity, p.H and dissolved oxygen. In Kailua, volunteers also used a Hach 2100P Turbidimeter for collecting turbidity. In Waimānalo, a YSI 85 was used for temperature, salinity, p.H. and dissolved oxygen. There was not a second Turbidimeter available for turbidity in Waimānalo. Lastly, at both locations, volunteers collected Enterococcus samples which were placed on ice and processed in the HOK lab.

At each location, volunteers collected a water sample in the LaMotte kits to analyze the different parameters. Additionally, to analyze parameters using the YSIs, volunteers collected samples in a 3-gallon plastic bucket.

Weather

At both locations similar weather conditions existed. Partly to heavy cloud cover was observed with zero precipitation in Waimānalo to intermittent drizzle in Kailua. Ocean conditions consisted of ripples to small waves with no connection between either of the streams with the ocean.

Results

Overall the data suggest the different methods were fairly accurate when compared to one another and across the two locations. The YSI 556 and 85 are more accurate while the Kits are more objective and designed for education.

For temperature, data ranged from 23.65°c to 27.7°c. Temperature chart one below shows the average temperature for all four locations using the two different protocols. These data were consistent with past data collected in similar conditions. No data was collected in Waimānalo Bay with the YSI.



Chart #1: Temperature

Dissolved oxygen ranges were mostly consistent between the sites and different protocols. These data in chart two below are very representative of past data collected at the various sites for the existing conditions and fall within the range of the State of Hawai'i standards. No data was collected in Waimānalo Bay with the YSI.



Chart #2: Dissolved Oxygen

For p.H., data were very consistent across the various locations with two different protocols used—YSI 556 and LaMotte. Chart three below shows the p.H. ranges for everyday items. All readings were averaged together for each method. For streams, the State of Hawai'i standard is 5.5 - 8.0 for p.H and 8.1 for the ocean. These data all fall within the acceptable range for p.H. as represented in chart four below. No data was collected in Muliwai'ōlena Stream or Waimānalo Bay with the YSI.

Chart #3: p.H. chart





Turbidity ranges were zero NTUs in Kailua Bay to 30.0 in Waimānalo Bay. The significant variation likely has to do with the methods of collecting data. The LaMotte kits are much more objective and not as accurate and the digital Tubidmeters. Often turbidity is higher depending on weather conditions such as wind stirring sediment in shallow areas of the nearshore ocean environments or rainfall moving pollutant into the stream causing increased turbidity. The State of Hawai'i standard for turbidity is 2.0 NTU in the streams for the time of year this monitoring was conducted and 0.02 for the ocean. Several of the data points are higher than the standards and is comparable to past data collected in these areas. Chart five below represents the data, no data was collected in Muliwai'ōlena Stream or Waimānalo Bay with the YSI.

Kailua and Waimānalo Tubidity Comparision 9-18-10

Ka'elepulu Stream

20.0

10.1

Muliwai'ōlena

Stream

27.5

Waimānalo Bay

30.0

Chart # 5: Turbidity Comparison

Kailua Bay

0

4.22

Kit

YSI

Enterococcus bacteria can originate from both human and animal (mammals such as cats, dogs, mongoose, etc.) sources. This test does not distinguish the source of bacteria. Nevertheless, bacteria cane come from human impacts from surrounding communities, antiquated sewer systems and runoff which includes animal waste. Past data collected by HOK, primarily in Ka'elepulu Stream, following periods of dry conditions see Enterococcus levels often near zero. Conversely, following periods of heavy rain, Enterococcus levels often spike (over the State limit) in the Stream; however, ocean levels are generally not impacted unless the sandbar is opened and there is a connection of the two water bodies.

For this event, limited Enterococcus bacteria data were collected for all sites, see chart six. In Ka'elepulu and Kailua Bay all collected samples fell below the State of Hawaii criteria for one time sampling events. For inland streams, a onetime sample should not exceed 89 Colony Forming Units (CFU) and 104 CFU for ocean water. In Muliwai'ōlena Stream, two samples were collected with very different results, with one exceeding the standard at 172.5 CFU and once sample well below at forty-eight (48) CFU. Enterococcus data can often vary dramatically like this, thus the protocols call for more samples to be collected at each event than was collected at this event. More data on a regular basis is needed to determine long-term trends.



Chart #6: Enterococcus comparisons

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Lastly, Coliform testing at the various sites showed positive results (Coliform detected) in all but one sample. Results are either positive (> 20 coliform colonies per 100 mL) or negative (< 20 coliform colonies per 100 mL). The one negative test (coliform not detected) was from water collected coming from the drinking fountain at Waimānalo Beach Park. Federal and State monitoring protocols all call for using Enterococcus sampling as it is more accurate and results are completed in twenty-four hours (rather than 48 hours for Coliform) for quicker response time if there is a water quality violations. However, Coliform testing is a great educational tool because it's inexpensive very easy to perform.



Waimānalo Coliform results (negative on far right of picture). Negative results have the following:

- ✓ Clean liquid gel
- ✓ Gel remains at bottom of tube
- ✓ Turns red or yellow with no gas bubbles

Kailua Coliform results

Positive results have the following:

- ✓ Cloudy liquid gel
- ✓ Gel rises to surface
- ✓ Turns yellow with many gas bubbles

Overall, these data are consistent with past data collected by HOK and for this "snapshot" in time, water quality mostly fell within the State standards. More data needs to be collected, particularly for Enterococcus to establish good baseline data and see changes over time. HOK consistently seeks funds (private, state and federal) to continue monitoring water quality and works as closely as possible with the State of Hawai'i to share data. For future snapshot

monitoring days, volunteers will be invited again to participate and learn about local water quality.

HOK would like to thank the Hawai'i Department of Health, Clean Water Branch, Polluted Control Runoff and the Environmental Protection Agency for helping support this effort with 319 (h) grant funds. Additionally, we like to thank Hawai'i Pacific University for the use of equipment and Surfrider O'ahu Chapter for the use of their Enterococcus processing equipment. Lastly, we like to thank all the volunteers who participated in the event. MAHALO



Map #1: Kailua and Waimanalo Monitoring Locations



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