

Snapshot Water Quality Monitoring Day 2009. Kailua and Waimānalo , Oahu

Background

On Saturday October 3, 2009 Hui o Ko‘olaupoko (HOK) hosted the 2009 Snapshot 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 interaction and education (e.g. snapshot days), 2. On-the-ground 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 in 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. The main objectives of the event were to engage the community in water quality monitoring, provide background information regarding water quality problems and collect a discrete amount of data to compare spatially during a given timeframe (e.g. snapshot). The parameters for each location included: temperature, turbidity, salinity, dissolved oxygen, pH and enterococcus bacteria.

Protocols

Protocols for each location were similar yet flexible enough to allow the various volunteers to participate in the event

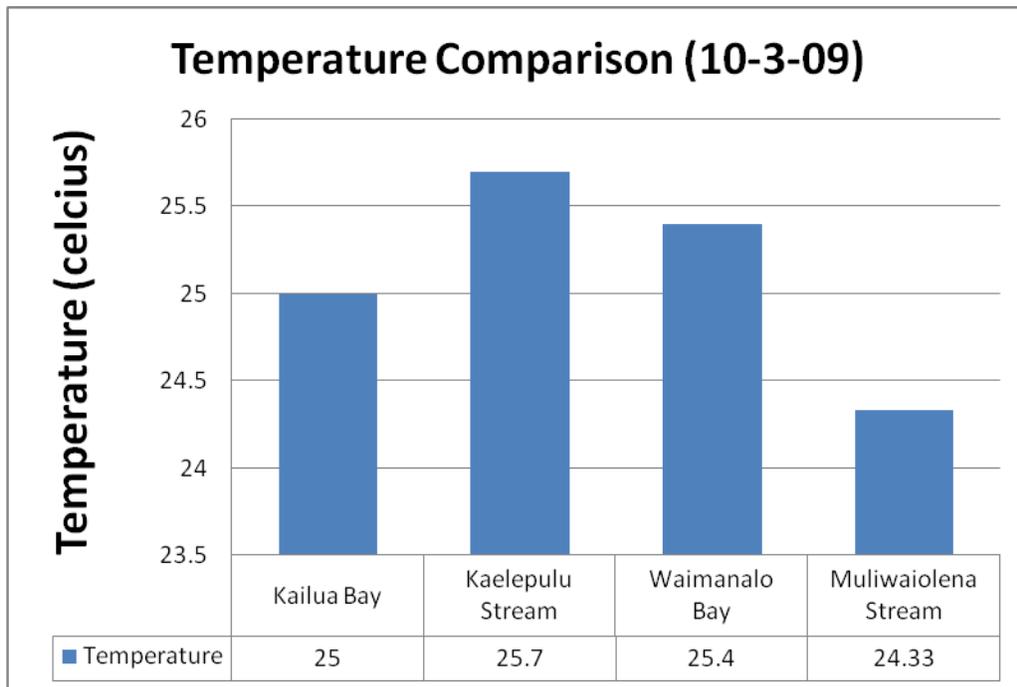
In Waimānalo, each group of participants collected a separate five-gallon bucket of water from both the bay and stream. Data for each group was then taken from that sub-sample of the water body. Volunteers in Waimānalo operated the YSI to collect data for temperature, dissolved oxygen, and salinity. Thermometers and CHEMetric kits were also used to obtain secondary readings for temperature and dissolved oxygen. Turbidity samples were collected from each bucket and pH strips were submerged in the sample water and volunteers compared the color of the strip to a chart to determine pH units.

In Kailua, a YSI 556 unit was used for temperature, salinity, ph and dissolved oxygen. Each site also used a Hach 2100P Turbidimeter for collecting turbidity. Additionally, each site utilized CHEMetric Dissolved Oxygen kits for secondary dissolved oxygen readings. Each location and water body was also sampled for enterococcus bacteria. This was conducted using Idexx Enterolert. In Kailua, all data were taken from a sub-sample gathered from a three-gallon bucket in both the bay and stream. Volunteers worked in teams (often parent and child/ren) to record

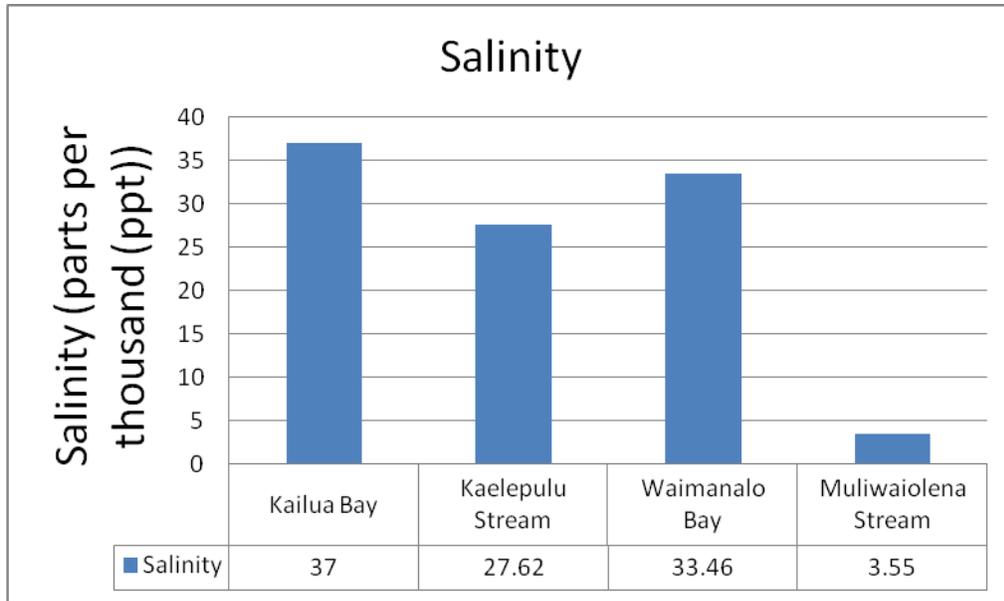
data. Volunteers, primarily children, also collected samples for the turbidity from the bucket and performed dissolved oxygen test with CHEMetric kits.

Results

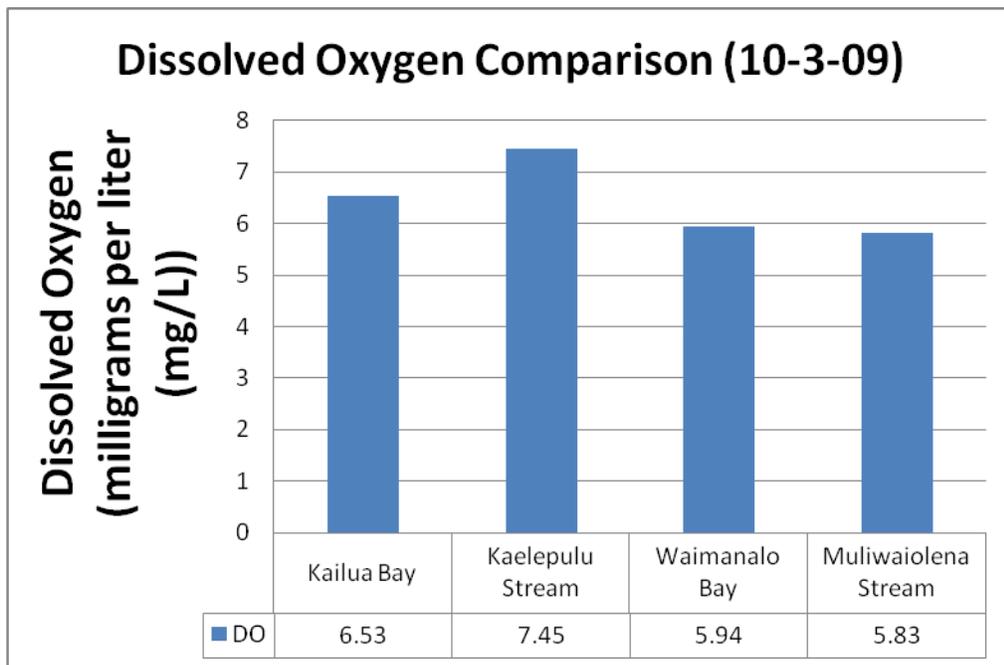
The results were very similar across all parameters between the two sites. For temperature, data ranged from 24.33°C to 25.7°C.



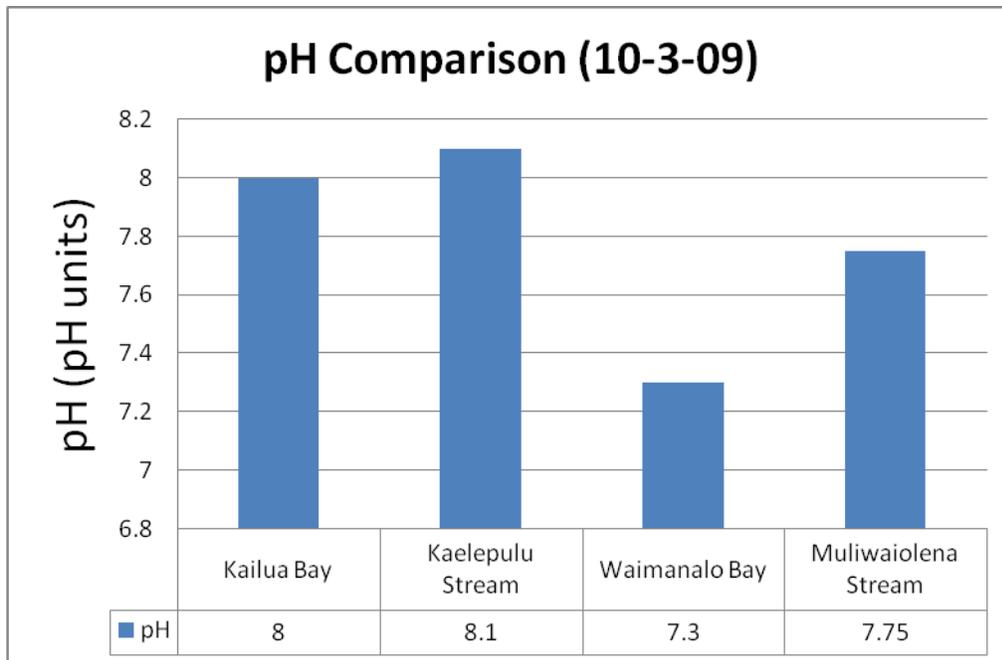
Salinity ranges from 3.55 parts per thousand (ppt) in Muliwai‘ōlena Stream to 37 ppt in Kailua Bay. Ka‘elepulu Stream has a significantly higher salinity concentration (27.62 ppt) than Muliwai‘ōlena Stream this is likely due to the periodic opening of the sandbar and the influx of ocean water mixing with Ka‘elepulu Stream. Community members in Waimānalo noted that the connection between Muliwai‘ōlena Stream and Waimānalo Bay does not take place very often; perhaps resulting in very low salinity concentration.



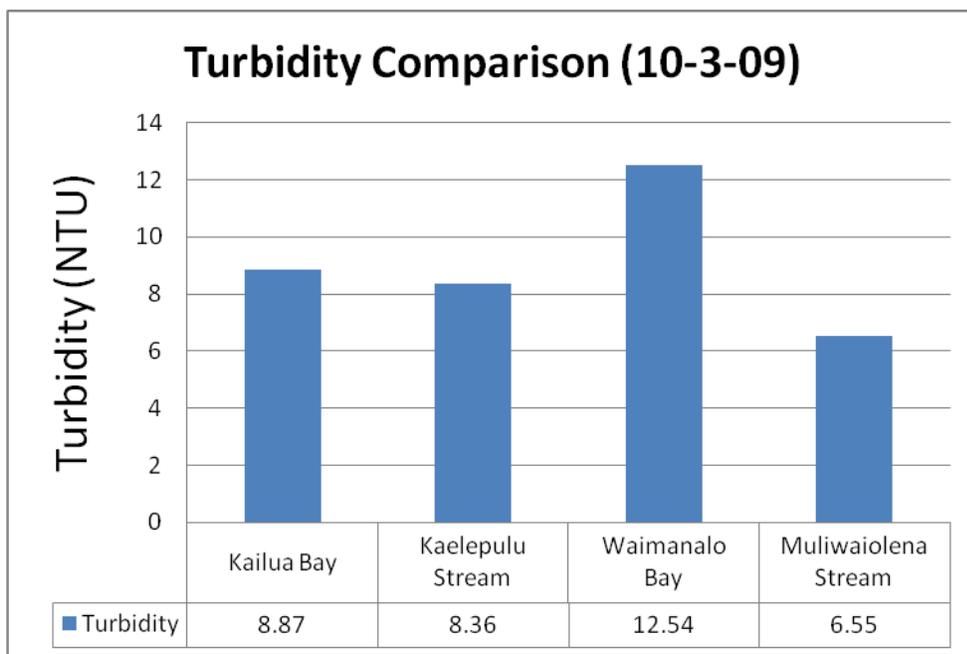
Dissolved oxygen ranges were fairly consistent between the sites. However, different protocols were being used and the data represent the average of all samples. In Kailua, three dissolved oxygen samples were collected in Ka‘elepulu Stream and three for Kailua Bay. In Waimānalo, five dissolved oxygen samples were taken in Muliwai‘ōlena Stream and five in Waimānalo Bay.



For pH, data were very consistent across the various locations with two different protocols used—YSI 56 and pH strips. These readings were averaged together.

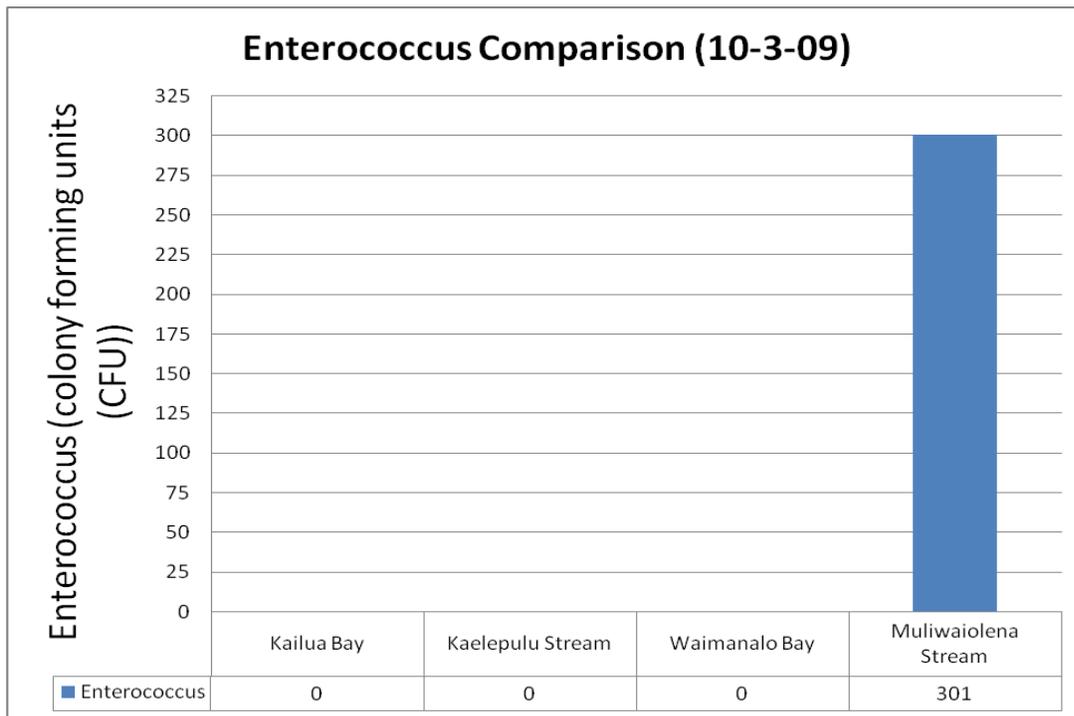


Turbidity ranges were 6.55 NTUs in Muliwai‘ōlena Stream to 12.54 NTUs in Waimānalo Bay. It’s likely the higher turbidity readings in Waimānalo Bay were the results of the strong winds (~18-20 mph) generating larger wind waves and thus increasing turbidity. A total of eight turbidity samples were collected in Ka‘elepulu Stream, five in Kailua Bay, five in Waimānalo Bay and six in Muliwai‘ōlena Stream.



Lastly, enterococcus bacteria readings were collected in all locations. For Kailua, Ka‘elepulu and Kailua Bay each had one sample collected and in Waimānalo, each location had three

samples collected. These data ranged from zero colony forming units (CFU) per one hundred milliliters of water in Ka‘elepulu Stream and Kailua and Waimānalo Bay to 301 CFU per one hundred milliliters of water in Muliwai‘ōlena Stream. The State of Hawai‘i standard for this water body is 33 CFU per one hundred milliliters of water. However, while this site is potentially out of compliance it’s important to note more data needs to be collected (a total of five samples in a 30-day period) over various conditions to be statistically valid. Additionally, 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 could be coming from human impacts from surrounding communities, antiquated sewer systems and runoff which includes animal waste. Past data collected from HOK, primarily in Ka‘elepulu Stream, following periods of dry conditions note 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.



Overall, these data are consistent with past data collected by HOK. 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.