



Snapshot Water Quality Monitoring Day 2010. Ko'olaupoko, Kualoa Beach Park, O'ahu

Background

On Saturday February 6, 2010 Hui o Ko'olaupoko (HOK) hosted the first 2010 Snapshot Water Quality Monitoring Day at Kualoa Beach Park. 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 Kāne'ōhe Bay at Kualoa Beach Park swim area located behind the first bathroom. 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 overtime (temporally) with future data. The parameters monitored for this event included: temperature, turbidity, salinity, dissolved oxygen, pH and enterococcus bacteria.

Based on the nature of a “snapshot” event, it is difficult to determine definitively the overall health of the location monitored. To have a greater understanding of water quality, more samples would have to be collected over a longer period of time. For example, the turbidity on this date was higher than the state standards; however, these data were only based on one sampling event. Additionally, pH could change based on other conditions such as rain events and the amount of non-point source pollution entering the water body.

This data will be used by HOK to help inform the public about water quality, pique the interest of island residents and provide a forum for education regarding non-point source pollutants.

Protocols

Protocols for the event were flexible enough to allow the various volunteers to participate in the event and use different equipment and techniques.

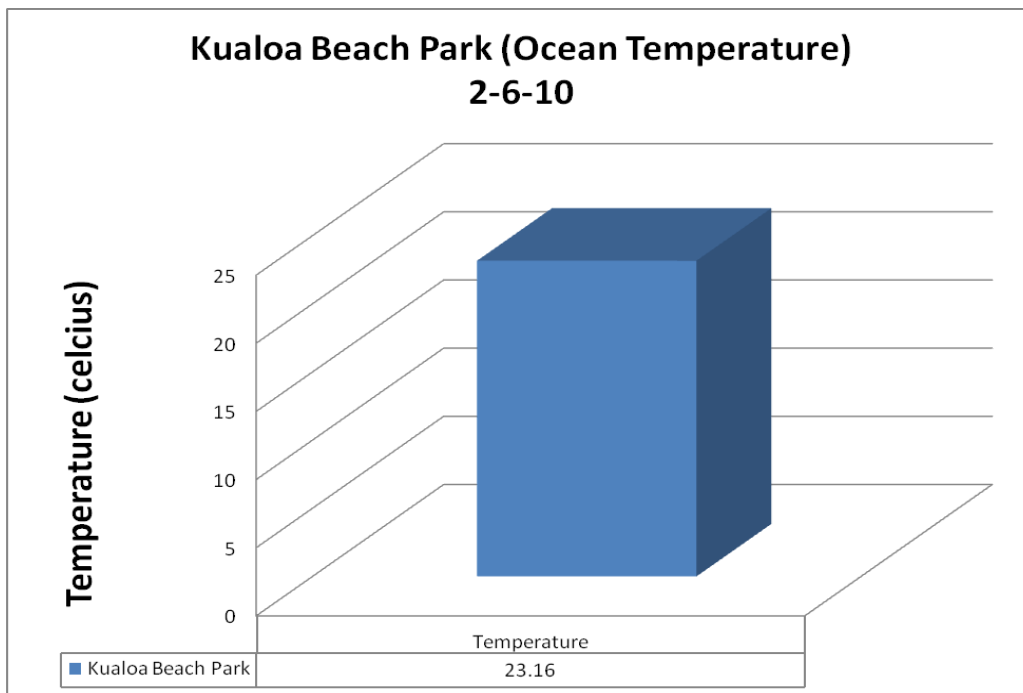
Each group collected water in a three-gallon bucket from the beach area; participants then analyzed the various parameters from these samples. Testing equipment included a YSI 556 and YSI 85. Each instrument collected data for temperature, salinity and dissolved oxygen with the YSI 556 also determining pH. A Hach 2100P Turbidimeter was used for determining turbidity. Additionally, for educational and comparison purposes, thermometers and CHEMetric kits were also used to obtain secondary readings for temperature and dissolved oxygen, respectively and pH strips as a secondary method to determine pH.



Results

Participants noted information on local weather conditions which included flat ocean conditions, clear skies, no rainfall within the previous 24 hours and no precipitation during the event. During the monitoring, the tide was approximately mid-stage of an outgoing tide (+ 0.5' low tide at 2:30 pm) at Mokuoloe, Kaneohe Bay. The results from the different methods were very similar across all parameters. For temperature, the average (from ten samples) was 23.16° Celsius (73.68° Fahrenheit) (see Chart #1).

Chart #1: Temperature



Salinity from all samples averaged 33.57 (parts per thousand (ppt)) are represented in Chart #2. The salinity readings are very standard for this environment as can be compared to other environments in Chart #3.

Chart #2: Salinity

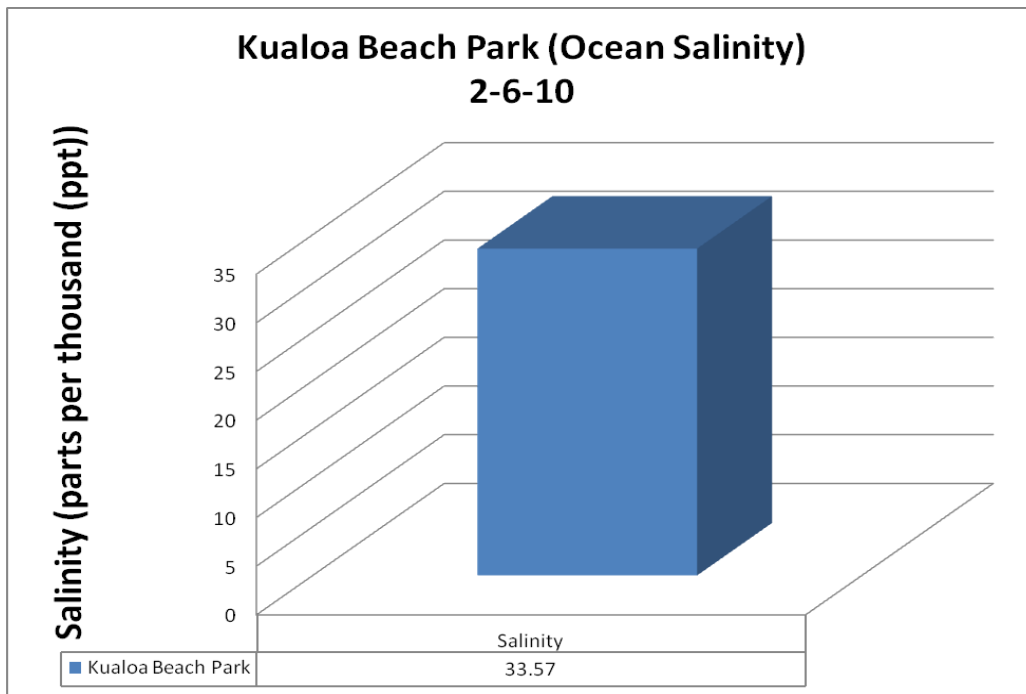
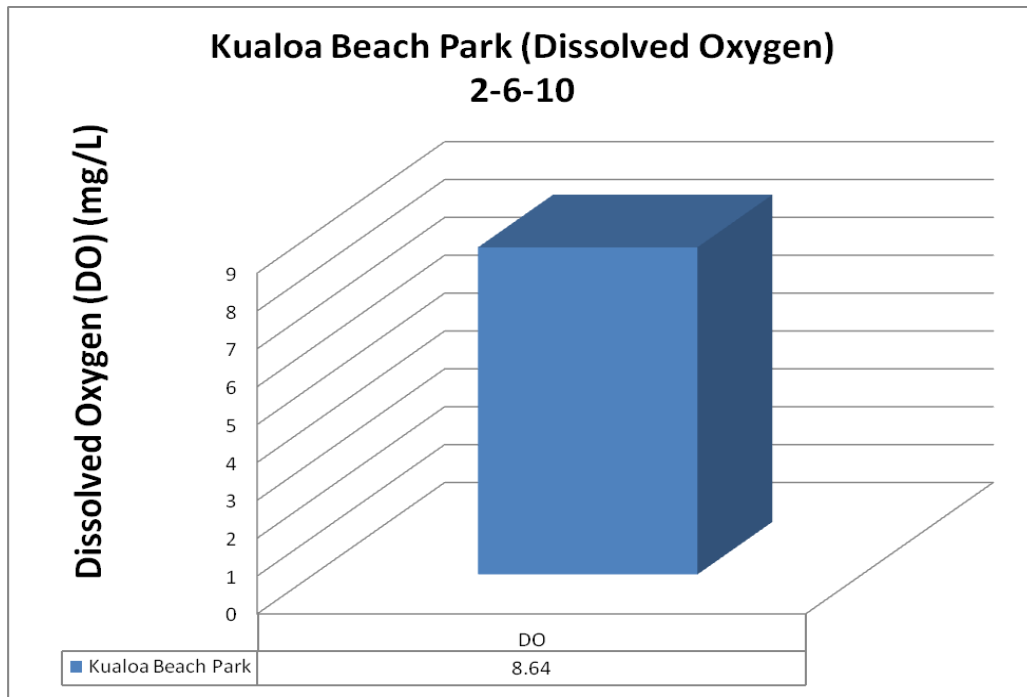


Chart # 3: Salinity comparisons

<u>Fresh Water</u>	<u>Brackish water</u>	<u>Saline water</u>
< 0.5 ppt	0.5 – 30 ppt	30 – 50 ppt

Dissolved Oxygen (D.O.) (see Chart #4) was very consistent from other near shore/beach environments Hui o Ko'olaupoko has monitored in the past. The average D.O. was 8.64 mg/L (total of ten-samples).

Chart #4: Dissolved Oxygen



For pH, data were very consistent with other monitoring efforts. Chart #5 below helps illustrate pH of everyday items. pH in ocean waters should be 8 pH units, the average at Kualoa was 8.09 (total of ten samples) (see Chart #6). The State of Hawaii criteria for pH in embayment areas is 8.0 pH units.

Chart #5: pH ranges

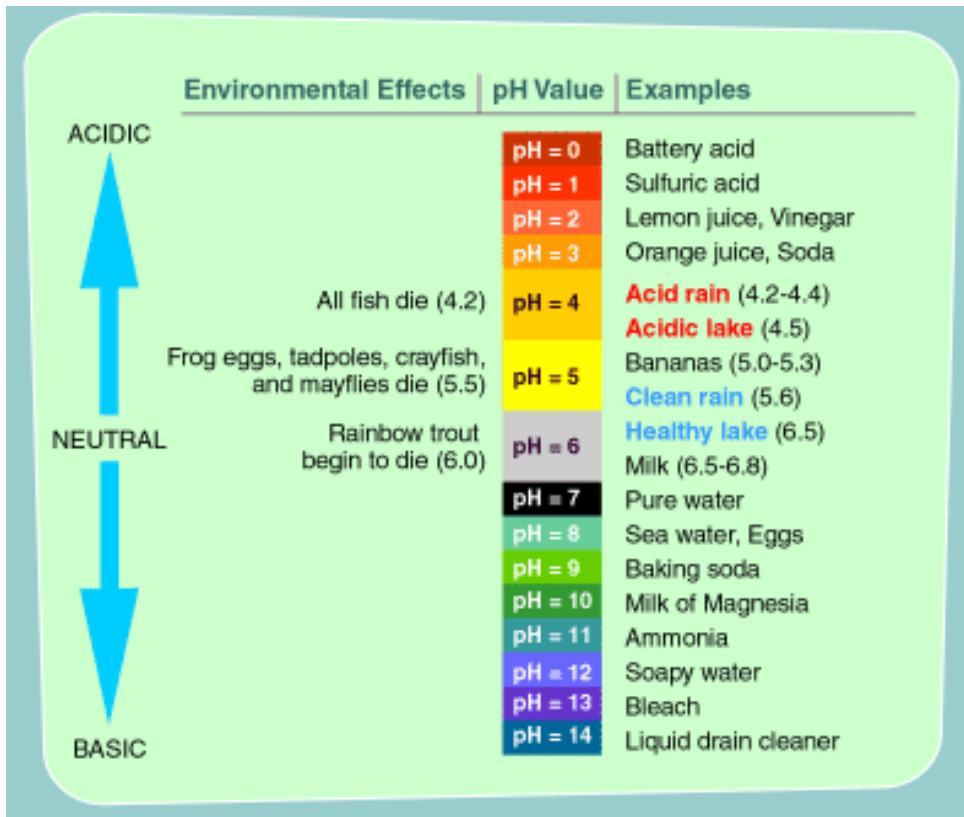
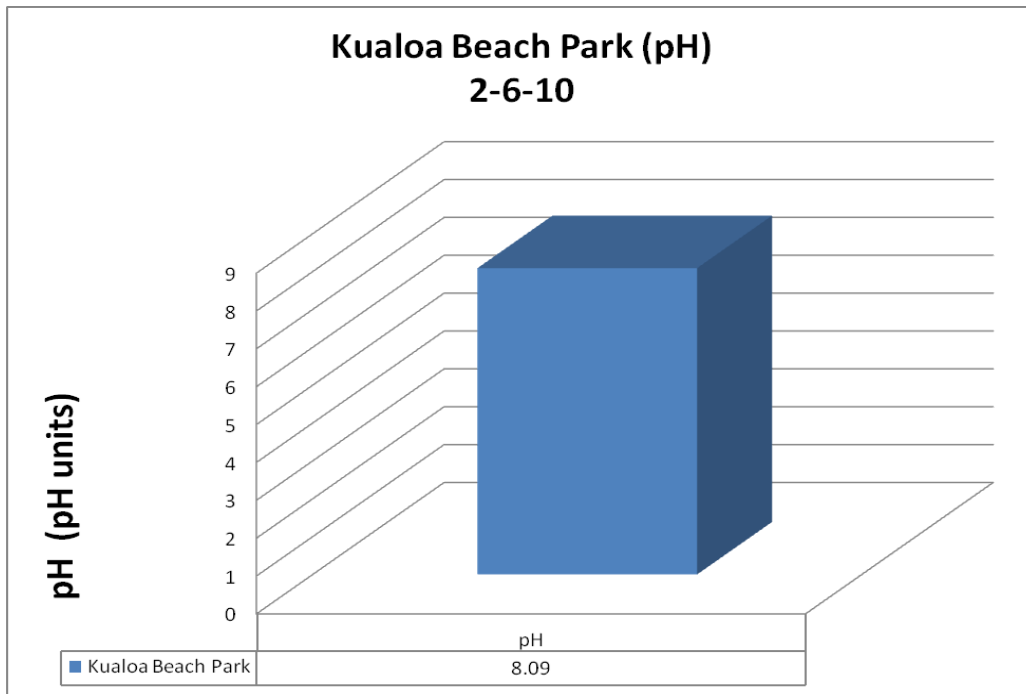
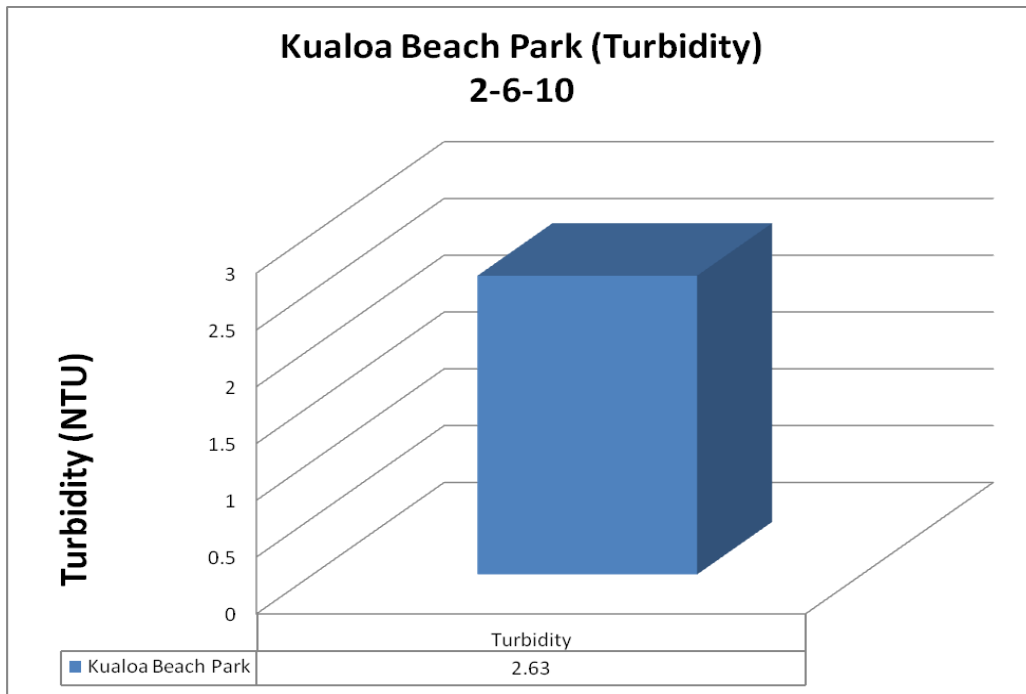


Chart # 6: pH



Turbidity averaged 2.63 NTUs (nephelometer turbidity units) based on a total of ten samples (see Chart #7). The State of Hawaii turbidity criteria for in Kāneʻohe Bay is 0.4 NTU. This data notes levels higher than the criteria; however, visual observations would suggest very clear ocean conditions.

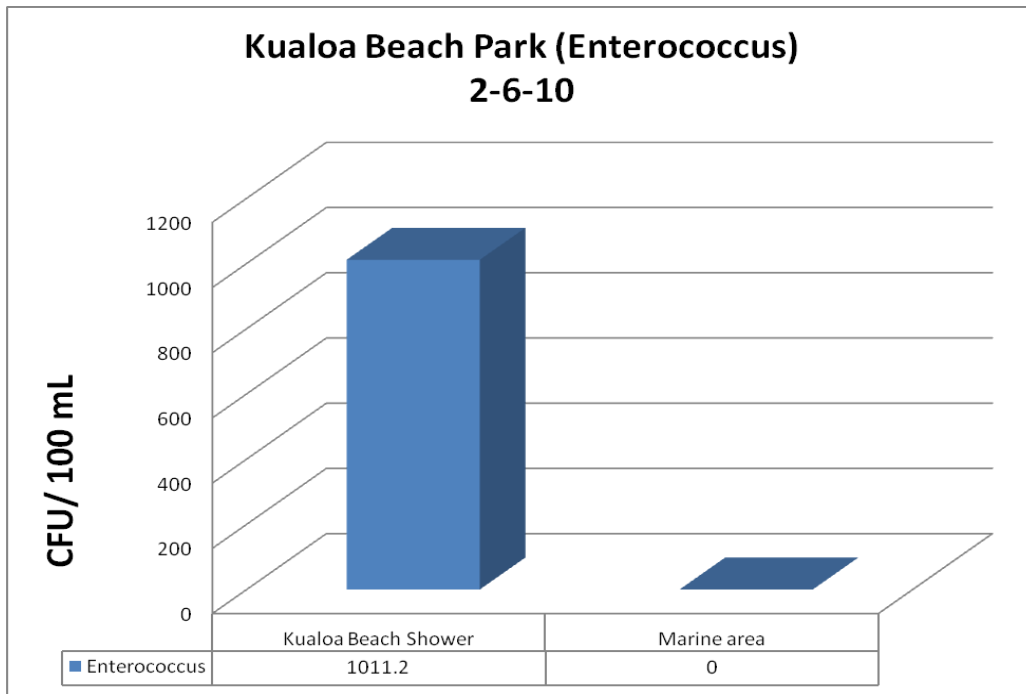
Chart # 7: Turbidity



Lastly, enterococcus bacteria samples were collected at the same location as the other parameters. For the ocean water, a total of total six samples were taken. The state standard for enterococcus bacteria in marine recreation waters shall not exceed 7 CFU (Colony Forming Units) per 100 milliliters of water. To determine this, a minimum of five samples need to be taken over the course of 25-30 days. All five samples from this event were zero for enterococcus bacteria from the ocean.

Additionally, during this event, some participants were curious about water quality near the shower area of the bathroom. One sample was collected and processed. The sample had 1,011.2 CFUs per 100 milliliters of water (see Chart #8). It's important to note that the State of Hawaii has no standards for standing water around showers and it becomes difficult to compare it to any standard.

Chart #8: Enterococcus



The high enterococcus counts likely result from a combination of factors. One source of the bacteria could have originated from humans washing their bodies in the shower. A second source could have originated from dogs, cats, mongoose or birds using the shower area and ultimately defecating in the water. Enterococcus is an indicator bacteria and does not differentiate between human and animals regarding the source.

Other compounding factors for high counts are the fact that beach showers are rarely if ever completely shut off; therefore, a water source is always available. Couple a water source with warm temperatures and bacteria can multiply and show up in significant numbers.

HOK recommends taking the same precautions as would be used in other public shower facilities (e.g. health clubs) by wearing slippers while showering, not letting children play in these areas and not using them if you have open cuts on your feet.

Other organizations from O‘ahu have tested the water around beach showers and have seen similar results and provided similar recommendations as HOK.

Summary

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. However, for this particular “snapshot” in time, the marine area sampled for water quality appears to be healthy.

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.

Acknowledgements

HOK would like to thank all the volunteers who participated, Hawai‘i Pacific University for the use of the YSI 85 and Surfrider Foundation, O‘ahu Chapter for the use of the Idexx machine to process enterococcus samples.