Project 418 Proposal- pH Sensor

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The basis of this proposal is to collect pH measurements in three locations in and around He’eia fishpond in order to understand the slight changes in pH of the water that cycles through the pond. The proposed locations include He’eia Stream (the main source of freshwater influx into He’eia fishpond), a location inside He’eia fishpond, and a location directly outside the pond in the surrounding ocean water. The duration and longevity of the sampling is dependent upon the stability of the pH sensor to maintain accurate readings over long periods of time. Although more reliable and stable data would result from using a more expensive pH sensor, due to budget constraints on this project a more affordable pH sensor must be created. However, there are benefits to using low cost pH sensors in that they are more readily available, could contribute to improved development of affordable sensors, and can be replicated at other sites at low cost.

He’eia fishpond is an ancient Hawiian fish pond located in He’eia, Ko’olaupoko on the island of Oahu. It is a walled (Kuapa) style fishpond with a wall encircling the 88 acres of brackish water. The wall has six sluice gates (Makaha) that serve as openings for water input and output. The source of freshwater in the pond comes from three Makaha connected to He’eia Stream. The other three Makaha are along the seaward edge of the pond and connect directly to the ocean. The pond is bordered by the Malauka reef which extends out to Kane’oha Bay. Measuring pH inside and outside of the pond will allow for a basic understanding of the pond’s effect on the surrounding reef. The sampling locations would be 1) In He’eia Stream, a predetermined number of meters upstream from the Makaha openings, 2) a location inside the pond along the interior of the portion of the wall bordering the ocean, and 3) a location outside the pond along the exterior of the wall.

Understanding the pH of the pond would allow for more informed environmental management and aquaculture decisions at He’eia and elsewhere. Acidification of the water within the pond could affect productivity of various species being cultivated in the pond. If water exiting the pond is acidic it could be adversely affecting the surrounding reef. Coral is sensitive to ocean acidification and might be affected by slight changes in water temperature and pH. The resulting data could then be used to understand other native fishponds and bring about further fish pond pH research throughout the islands.

The main components required to develop a basic pH sensor include but are not limited to: a pH probe from Atlas Scientific ($75), Batteries, a Raspberry pi (already provided), an EZO pH circuit from Atlas Scientific ($40), and possibly a basic EZO inline voltage isolator ($26). The rough total estimate would be around $150. One challenge of the pH probe is that they tend to become less stable over time and measurements are less reliable than the more expensive pH sensors. However, the data could prove valuable given the cost constraints and would still be helpful in understanding basic pH fluctuations in and around the pond.