

## WATER QUALITY MONITORING PROGRAM FOR BERMUDA'S COASTAL RESOURCES

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### EXECUTIVE SUMMARY

This report serves as a summary of our efforts to date in the execution of the Water Quality Monitoring Program for the Bermuda Department of Conservation Services (BDCS). The Bermuda Government initiated a water quality monitoring program in September, 2007 at 17 sites with seagrass, which are spread across the Bermuda Platform. At each of these sites chemical and physical water quality characteristics are monitored monthly and a continuous temperature data logger is deployed. At least one species of seagrass is present at each site.

The period of record for this report spans the 19 months from Sept. 2007 up to and including March 2009. Physical, chemical, and biological parameters were collected by BDCS personnel and water samples shipped to the Southeast Environmental Research Center at Florida International University for nutrient analysis. Field parameters measured at each station include salinity (practical salinity scale), temperature (°C), dissolved oxygen (DO, mg l<sup>-1</sup>), turbidity (NTU), pH, and secchi depth (m). Water quality variables include the dissolved nutrients nitrate (NO<sub>3</sub><sup>-</sup>), nitrite (NO<sub>2</sub><sup>-</sup>), ammonium (NH<sub>4</sub><sup>+</sup>), dissolved inorganic nitrogen (DIN), and soluble reactive phosphate (SRP). Total unfiltered concentrations include those of nitrogen (TN), organic nitrogen (TON), organic carbon (TOC), phosphorus (TP), silicate (SiO<sub>2</sub>) and chlorophyll *a* (CHLA, µg l<sup>-1</sup>).

Cluster analysis of water quality variables by site resulted in 4 groups which had distinct differences in water quality. **Cluster 1** (in red) was composed of stations 9B, 15, and 16, which are those sites most strongly affected by anthropogenic nutrient inputs as indicated by their high levels of NO<sub>3</sub><sup>-</sup>, TP, TOC, and turbidity. Interestingly, this cluster also showed high DO but did not have elevated CHLA. **Cluster 2** (in yellow) included a mix of stations on the SW and NE part of the platform (#2, 4, 5, 8, 9A, 13, 17, & 19). These sites exhibited lower NO<sub>3</sub><sup>-</sup>, TP, TOC, CHLA, and turbidity than Cluster 1. **Cluster 3** (in green) was composed of far offshore sites along the northwestern part of the platform (#1, 3, 6, 7, & 20). These stations had the lowest NO<sub>3</sub><sup>-</sup>, TP, TOC, SiO<sub>2</sub>, CHLA, DO, and turbidity. Interestingly, these sites also had lowest light penetration, not because of optical clarity but because of greater water column depth. Salinity was also the most invariable at these sites. **Cluster 4** (in blue) consisted of only one site, station #18 off Trunk Island, but it was so different than any of the other sites that it had to be treated separately. It had the highest NO<sub>3</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup>, SRP, SiO<sub>2</sub>, CHLA, and the lowest salinity of any other sites in the monitoring network. These all may be due to the location of this site in an enclosed bay. The low salinity reflects a source of terrestrial freshwater from either runoff or outfall and the enclosed nature of the bay (Harrington Sound) means that water residence time is probably higher than other areas. Longer water residence time allows more nutrients to be incorporated into phytoplankton biomass, hence the high CHLA levels at this site.

We developed and maintain a website (<http://serc.fiu.edu/wqmnetwork/BERMUDA%20new/home.html>) where anyone can download 1) all data from the program, 2) the interpretive reports, and 3) Google maps of all measured variables, by month, in classified post style.

