

# An Assessment of Nutrients, Sedimentation, and Total Suspended Solids (TSS) in the St. Thomas East End Reserves (STEER)



**NOAA National Centers for Coastal Ocean Science  
Center for Coastal Monitoring and Assessment**

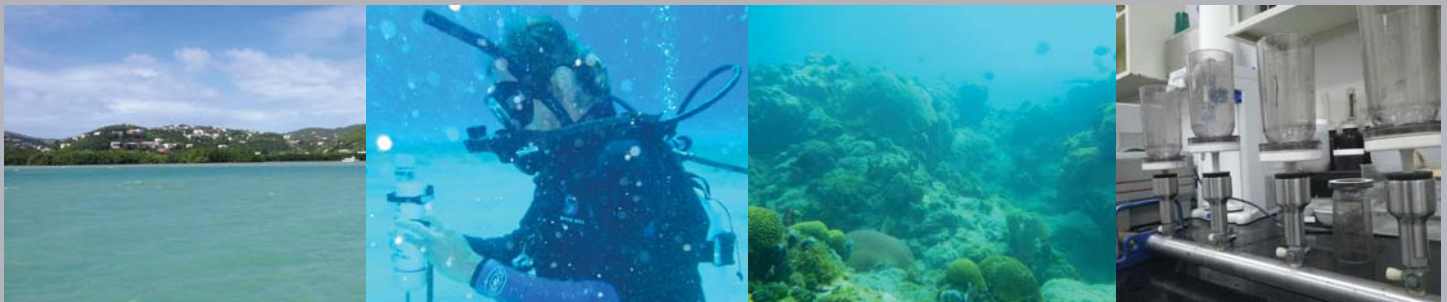
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April 2015

NOAA TECHNICAL MEMORANDUM NOS NCCOS 184

NOAA NCCOS Center for Coastal Monitoring and Assessment



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## **Citation**

Pait, A.S., F.R. Galdo Jr, S.I. Hartwell, A.L. Mason, D.A. Apeti, C.F.G. Jeffrey, A.M. Hoffman, and S.J. Pittman. 2015. An assessment of nutrients, sedimentation, and total suspended solids (TSS) in the St. Thomas East End Reserves (STEER). NOAA Technical Memorandum NOS/NCCOS 184. Silver Spring, MD. 66pp.

## **Acknowledgments**

The authors wish to acknowledge the support from NOAA's Coral Reef Conservation Program (CRCP) for this project. We would also like to thank Jean-Pierre Oriol, Acting Commissioner for the USVI Department of Planning and Natural Resources (DPNR), Roy Pemberton, Director along with Stephen Hale of DPNR Division of Fish and Wildlife, Anita Nibbs of DPNR Division of Environmental Protection, Jeanne Brown of The Nature Conservancy, Tyler Smith, Sandra Romano, and Renata Platenberg of the University of the Virgin Islands (UVI), and Rob Ferguson and Marlon Hibbert of NOAA's CRCP, for help with the planning, logistics, and interpretation of results.

Government contract labor was provided by CSS-Dynamac of Fairfax, Virginia under NOAA contract number DG133C-11CO0019.

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NOAA Technical Memorandum NOS NCCOS 184



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## Abstract

*This is the fifth report from a project to assess land-based sources of pollution (LBSP) and their effects, and to characterize the biological community within the St. Thomas East End Reserves (STEER) in St. Thomas, USVI. Here we summarize the results of nearly two years of monthly monitoring for nutrients, sedimentation, and total suspended solids (TSS) at six sites in the STEER.*

*Concentrations of nutrients in the western part of the STEER and in nearshore areas were significantly higher than in the rest of the STEER. Specifically, ammonium ( $\text{NH}_4^+$ ), nitrite ( $\text{NO}_2^-$ ), and dissolved inorganic nitrogen (DIN) were higher in Mangrove Lagoon and Benner Bay than the other sites (i.e., Cowpet Bay, Rotto Cay, Saint James Island, and Little St. James Island). There did not appear to be a correlation between rainfall and nutrients.*

*Using a set of nutrient concentrations, above which may be associated with the overgrowth of algae on reefs, approximately 60% of the samples collected in the STEER were above the threshold for orthophosphate ( $\text{HPO}_4^-$ ), while 55% of samples were above the DIN threshold, indicating the reefs in the STEER may be at risk to blooms of macroalgae and phytoplankton, as a result of these elevated concentrations.*

*Benner Bay had the highest sedimentation rate of any site in the STEER, including Mangrove Lagoon. There was also an east to west and a north to south gradient in sedimentation, indicative of higher sedimentation rates in the western, more populated areas surrounding the STEER, and in the more nearshore sites. Rainfall was not correlated with sedimentation. Although none of the sites had a mean or average sedimentation rate above a proposed threshold that could indicate impacts to coral reefs, the mean sedimentation rate in Benner Bay was just below the proposed threshold.*

*TSS also tended to be higher in the western and nearshore areas of the STEER. There appeared to be no correlation between rainfall and TSS in the STEER. Finally, none of the sites had a mean TSS value that exceeded a threshold above which has been shown to impact coral reefs, although the mean Benner Bay TSS during the study was close to the threshold.*

## Introduction

Located on the southeastern end of the island of St. Thomas, US Virgin Islands, the St. Thomas East End Reserves or STEER (Figure 1), is a collection of Marine Reserves and Wildlife Sanctuaries (MRWS) containing extensive mangroves and seagrass beds, along with coral reefs, lagoons and cays. The STEER comprises an area of 9.6 km<sup>2</sup>, with approximately 34 km of coastline, and is thought to be one of the most valuable fisheries nursery areas remaining around St. Thomas (STEER, 2011). The only perennial stream on the island (Turpentine Gut) flows into Mangrove Lagoon on the west end of the STEER. In addition, there are numerous intermittent streams that discharge stormwater to the STEER throughout the watershed. There is also a large active landfill within the watershed, numerous marinas and boatyards, a number of resorts, various commercial/industrial activities, an EPA Superfund Site, a horse racetrack, and residential areas served by individual septic systems (IRF, 1993). All these activities can contribute a variety of pollutants, including nutrients, to the STEER.

Beginning in 2011, NOAA's National Centers for Coastal Ocean Science (NCCOS) partnered with the USVI Department of Planning and Natural Resources (DPNR), Divisions of Coastal Zone Management, Fish and Wildlife, and Environmental Protection, along with the University of the Virgin Islands, and The Nature Conservancy, with

funding from NOAA's Coral Reef Conservation Program (CRCP), to develop an integrated (chemical and biological) assessment for the STEER.

One component of the integrated assessment was the monthly monitoring of nutrients and total suspended solids (TSS) in the water column, along with sedimentation using sediment traps. The monthly monitoring was conducted by project partners at the University of the Virgin Islands (UVI). This report details the results from the assessment of nutrients, sedimentation and TSS in the STEER from 2012 through 2013.

Nutrients were identified as a major environmental concern in the STEER Management Plan (STEER, 2011). While dissolved nutrients are essential to productivity in aquatic systems, an overabundance of nutrients can help trigger macroalgae and phytoplankton blooms, resulting in degra-



*Diver installing a sediment trap in the STEER.*

duction of water quality and habitat (Bricker *et al.*, 2007). In coral reef systems, algal blooms can lead to the algae out-competing and then smothering juvenile and adult corals, ultimately resulting in the loss of those corals (D'Angelo *et al.*, 2014; Box and Mumby, 2007).

It has also been shown that nutrients can have direct effects on corals. Ammonium and phosphate in parts per billion

diversity and recruitment, along with lower growth and calcification rates (ISRS, 2004; Rogers, 1990). Like nutrients, the input of sediment was identified as a major threat in the STEER Management Plan (STEER, 2011).

The presence of total suspended solids or TSS in the water column acts to decrease the amount of light available for corals as well as seagrasses. Nemeth and Nowlis (2001)



Figure 1. Sampling sites for nutrients, sedimentation, and TSS along with the STEER boundary.

(ug/l or ppb) concentrations can impact fertilization success (Harrison and Ward, 2001), while nitrate has been shown to decrease calcium deposition in corals (Marubini and Davis, 1996).

Sediments can be deposited on coral reefs as a result of surface water transporting eroded soils, as might occur during a storm, or through the resuspension of bottom sediments. Sedimentation on coral reefs can also have serious impacts (Fabricius, 2005; Burke *et al.*, 2011; Waddell *et al.*, 2005). The deposition of sediments in reef areas can act to smother corals and physically abrade coral tissues. At the very least, sediments raining down upon corals results in the organisms having to expend more energy to remove sediment particles, meaning there is less energy available for other functions including growth and reproduction. Elevated sedimentation has been linked to less coral cover, lower

suggested that excessive levels of suspended sediments led to increased coral bleaching, specifically along the north shore of St. Thomas.

### Materials and Methods

The locations for the monitoring sites (Figure 1) were selected non-randomly by project partners at UVI and DPNR, in order to target potential sources of land based pollution. These sites were used to assess terrestrial inputs from the surrounding watershed, including residential areas surrounding Benner Bay, and the Bovoni Landfill adjacent to Mangrove Lagoon. Samples for nutrient analysis, TSS and sedimentation were collected monthly from five targeted sites from January 2012 to November 2013. A sixth site, at Little St. James (LSJ, Figure 1) Island, was added beginning in March 2012. The methods used for the collection and analysis of each of these parameters are described below.



### Nutrients

At each site, duplicate samples were collected for the analysis of dissolved nutrients. Nitrile gloves were worn by personnel, in order to prevent contamination of the water samples. Samples were kept in the dark, and then filtered at the time of collection into acid-washed 125 ml high density polyethylene (HDPE) bottles, using 60 ml syringes equipped with disposable Millipore Sterivex 0.22 µm filter units. The syringe was first rinsed with several full volumes of site water. Next, the syringe was refilled, the Sterivex filter attached, and a full volume of site water was pushed through the filter. The sample bottles were rinsed three times with filtered site water. The filter was removed and the syringe refilled with site water. After replacing the filter, the syringe/filter process was repeated until the bottles were filled, leaving adequate headspace to allow for expansion during freezing. Samples were immediately packed on ice for transport to UVI. Upon return to the laboratory, the water samples were frozen until shipped.

Water samples were analyzed by the Geochemical and Environmental Research Group (GERG) at the Texas A&M University, through a subcontract with TDI-Brooks, Inc. The following is a brief summary of methods used for the analysis of nutrients in the water samples. Nitrate and nitrite analyses were based on the methodology of Armstrong *et al.* (1967) and use a ground cadmium column for reduction of nitrate to nitrite. Orthophosphate was measured using the methodology of Bernhardt and Wilhelms (1967), with the modification of hydrazine as a reductant. Silicate determination was accomplished using the methods of Armstrong *et al.* (1967) using stannous chloride.

Ammonium analysis was based on the method of Harwood (Harwood and Kuhn, 1970) using dichloroisocyanurate as an oxidizer. Urea was measured using diacetyl-monoximine and themicarbozide. Total nitrogen and total phosphorus concentrations were determined after an initial decomposition step. This method involves persulfate oxidation while heating the sample in an autoclave (Hansen and Koroleff 1999). After oxidation of the samples, nutrient determinations were conducted on a Technicon® II analyzer.

As the water samples were filtered for this project, reported values are for dissolved nutrient species. Proposed nutrient thresholds for coral reefs for dissolved organic nitrogen (DIN), and for orthophosphate (also referred to as soluble reactive phosphorus or SRP), are compared with the results from the STEER.

### Sedimentation

Sediment traps are commonly used in conjunction with laboratory techniques to provide insight into sedimentation rates, composition, sources, and distributions in marine environments. Beginning in December 2011, sediment trap arrays were deployed at five sites located throughout the STEER, and included Great St. James (SJ), Cowpet Bay (CB), Rotto Cay (RC), Benner Bay (BB), and Mangrove Lagoon (ML). In March 2012, at the request of DPNR, an additional station was added near the island of Little St. James (LSJ), to address concerns related to major ongoing construction activities on the island. GPS coordinates were recorded for each station, and are shown in Table 1.

Each sediment trap consisted of a two-inch diameter PVC cylinder, sealed at one end, with a minimum height-to-diameter ratio of 4:1, same as those already in use by the University of the Virgin Islands (Smith, *et al.* 2008). This height:diameter ratio has been shown to minimize resuspension and escape of trapped sediments under normal flow conditions (Smith, *et al.* 2008). The cylinders were deployed vertically, affixed to metal posts at a height of approximately 60 cm above the seafloor, and approximately 30 cm for very shallow sites (Benner Bay and Mangrove Lagoon). The cylinders were affixed to the posts with combinations of Velcro and plastic zip-ties, allowing for monthly exchange of the traps. Three replicate cylinders were spaced approximately one meter apart, in order to minimize the effects of water flow disturbances between replicates, thus helping to ensure independence of replicate samples (Butman, 1984).

At four sites (Little St. James, St. James, Cowpet Bay, and Rotto Cay), traps were exchanged by divers using SCUBA. For trap arrays located in the shallowest sites (Benner Bay and Mangrove Lagoon), the exchange was generally accomplished by wading, taking care to minimize disturbance to bottom sediments. During sediment trap exchanges, each trap was carefully removed from its post, and sealed with a tight-fitting cap. Due to the fact that a variety of small fish and invertebrates were attracted to the refuge provided by the sediment traps, cylinders were checked for the presence of marine organisms prior to being capped.

Replacement traps were cleaned thoroughly between deployments, and rinsed just prior to deployment at each site. Newly deployed traps were visually inspected just before divers departed a site, in order to ensure that no sediment entered during the exchange process. If sediment was observed in a newly deployed trap, the cylinder was removed from the post, cleaned, and replaced.

Beginning in April 2012, Pettit (Kop-Coat, Inc.) inflatable boat anti-fouling paint was applied to the upper 5 cm of the traps due to concerns that fouling of trap apertures at several sites, could significantly affect trap performance.

Efforts were taken to ensure that traps were retrieved and replaced at all sites within a period of no more than 24 hours, however on several occasions, extenuating circumstances (e.g., storms), resulted in delays of several days between sites. Such occasions have been noted and were taken into account when calculating sedimentation rates. Upon retrieval, the sealed sediment traps were stored upright until decanted and filtered.

calculated by the following equations, respectively:

$$\%LOI\ 550^{\circ}\ C = ((DW\ 105^{\circ}\ C - DW\ 550^{\circ}\ C)/DW\ 105^{\circ}\ C)*100$$

$$\%LOI\ 950^{\circ}\ C = ((DW\ 550^{\circ}\ C - DW\ 950^{\circ}\ C)/DW\ 105^{\circ}\ C)*100$$

#### Total Suspended Solids

At each site, a one (1) liter water sample was collected for analysis of total suspended solids (TSS) each month. A clean, pre-labeled bottle was uncapped and submerged approximately one half meter below the water surface. The bottle was filled and rinsed out twice with site water, then filled, capped, and placed on ice for transport back to UVI.

Table 1. Location of sites and mean water quality values from STEER sites.

Site Name	Site Code	Latitude (DD)	Longitude (DD)	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	DO (mg/l)	Temperature (°C)
Mangrove Lagoon	ML	18.31385	-64.87988	35.6 ±0.3	4.07 ±0.71	8.09 ±0.03	1.3 ±0.1	1.86 ±0.17	6.79 ±0.13	29.3 ±0.3
Benner Bay	BB	18.3167	-64.8674	36.0 ±0.1	10.7 ±1.4	8.13 ±0.03	1.2 ±0.1	1.12 ±0.08	6.18 ±0.12	29.3 ±0.2
Rotto Cay	RC	18.31331	-64.86423	35.8 ±0.1	1.41 ±0.20	8.13 ±0.02	2.1 ±0.1	0.37 ±0.03	6.37 ±0.16	28.6 ±0.2
Cowpet Bay	CB	18.31487	-64.84267	35.9 ±0.1	0.91 ±0.13	8.17 ±0.02	1.7 ±0.1	0.32 ±0.02	6.54 ±0.03	28.3 ±0.2
Saint James	SJ	18.30302	-64.83671	35.9 ±0.1	1.03 ±0.16	8.16 ±0.02	1.8 ±0.1	0.28 ±0.03	6.42 ±0.02	28.0 ±0.1
Little St. James	LJ	18.30069	-64.83003	35.8 ±0.1	1.52 ±0.13	8.15 ±0.02	1.6 ±0.1	0.28 ±0.03	6.51 ±0.02	28.4 ±0.1

Values are ± standard error. Abbreviations: DD, decimal degrees; ppt, parts per thousand; NTU, nephelometric turbidity units; m, meters; DO, dissolved oxygen; mg/l, milligrams/ liter; °C, degrees Celsius. Note that depth is the water depth at which the water quality measurements were made, and not the depth of the site.

Sediment samples were decanted, filtered, rinsed to remove salts, then dried completely at 70° C. Samples were then cooled to room temperature in a desiccator, and weighed to the nearest 0.001 g to obtain total dry weight of accumulated sediments for each trap.

An analysis of sediment composition (organic/carbonate/terrigenous fractions) was carried out using loss on ignition (LOI) at 550° C and 950° C, following the techniques described by Heiri, *et al.* (2001). Briefly, homogenized sediment sub-samples were placed into clean, labeled, and pre-weighed porcelain crucibles. Crucibles and sediments were then dried at 105° C, cooled, and weighed to the nearest 0.001 g prior to combustion at 550° C in a muffle furnace (Fisher Scientific Isotemp 550 series). Samples were held at 550° C for four (4) hours, then cooled to room temperature. Samples were again dried, cooled in a desiccator, and re-weighed post-combustion, then returned to the muffle furnace and combusted at 950° C for two (2) hours. After cooling to room temperature, the weighing process was repeated a final time to obtain dry weight post-combustion. Organic and carbonate contents of samples were

The water samples for TSS were stored refrigerated for a period of no longer than one month from collection until analysis.

Each one liter sample was filtered through a pre-weighed glass fiber filter mounted in a suction flask apparatus. (if less than one liter was used, the exact volume of water filtered was noted). The filtered sample was rinsed several times with deionized water in order to remove salts, then dried at 105° C, and weighed to the nearest 0.001 g. Calculation of TSS was as follows:

$$TSS\ (mg/l) = ([A-B]*1000)/C$$

Where A = End weight of the filter in grams (g)

B = Initial weight of the filter in grams (g)

C = Volume of water filtered in liters (l).

#### Statistical Analysis

The data collected from the project were analyzed using JMP® statistical software. Because the data were not normally distributed, nonparametric tests (e.g, Spearman's nonparametric multivariate correlation) were used. When needed, pairwise comparisons were made using the Wilcoxon Rank-Sum Method.

Table 2. Summary statistics for nutrients measured in the STEER. All units are expressed as mg-N/l or mg-P/l.

Nutrient	Mangrove Lagoon			Benner Bay			Rotto Cay		
	Mean	Median	Max	Mean	Median	Max	Mean	Median	Max
NO <sub>3</sub> <sup>-</sup> + NO <sub>2</sub> <sup>-</sup>	0.04 ±0.023	0.016	0.422	0.013 ±0.004	0.008	0.075	0.007 ±0.002	0.004	0.022
NH <sub>4</sub> <sup>+</sup>	0.020 ±0.003	0.017	0.055	0.016 ±0.003	0.011	0.042	0.007 ±0.002	0.002	0.039
Urea	0.004 ±0.001	0.003	0.017	0.007 ±0.003	0.005	0.056	0.004 ±0.001	0.003	0.023
DIN	0.061 ±0.024	0.031	0.442	0.029 ±0.005	0.022	0.08	0.014 ±0.003	0.005	0.059
DON	0.305 ±0.048	0.312	0.652	0.280 ±0.040	0.239	0.62	0.258 ±0.037	0.289	0.467
Total N	0.366 ±0.060	0.347	1.094	0.309 ±0.040	0.286	0.701	0.272 ±0.037	0.305	0.526
HPO <sub>4</sub> <sup>=</sup>	0.004 ± 0.001	0.006	0.012	0.006 ±0.001	0.006	0.012	0.005 ±0.001	0.004	0.011
Total P	0.012 ±0.001	0.011	0.027	0.012 ±0.001	0.011	0.022	0.017 ±0.006	0.009	0.116

Nutrient	Cowpet Bay			Saint James			Little Saint James		
	Mean	Median	Max	Mean	Median	Max	Mean	Median	Max
NO <sub>3</sub> <sup>-</sup> + NO <sub>2</sub> <sup>-</sup>	0.007 ±0.002	0.005	0.021	0.009 ±0.002	0.004	0.024	0.007 ±0.002	0.003	0.024
NH <sub>4</sub> <sup>+</sup>	0.006 ±0.002	0.003	0.022	0.006 ±0.001	0.004	0.017	0.006 ±0.001	0.004	0.015
Urea	0.003 ±0.001	0.003	0.01	0.003 ±0.001	0.004	0.007	0.003 ±0.001	0.002	0.008
DIN	0.014 ±0.003	0.011	0.034	0.015 ±0.003	0.008	0.036	0.013 ±0.003	0.007	0.036
DON	0.251 ±0.032	0.257	0.502	0.255 ±0.037	0.267	0.438	0.297 ±0.036	0.36	0.45
Total N	0.265 ±0.031	0.262	0.504	0.270 ±0.036	0.276	0.469	0.310 ±0.036	0.385	0.463
HPO <sub>4</sub> <sup>=</sup>	0.005 ±0.001	0.005	0.011	0.005 ±0.001	0.007	0.013	0.005 ±0.002	0.003	0.018
Total P	0.013 ±0.003	0.009	0.047	0.011 ±0.002	0.008	0.05	0.009 ±0.001	0.008	0.022

Abbreviations: NO<sub>3</sub><sup>-</sup>, nitrate; NO<sub>2</sub><sup>-</sup>, nitrite; NH<sub>4</sub><sup>+</sup>, ammonium; DIN, dissolved inorganic nitrogen; DON, dissolved organic nitrogen; HPO<sub>4</sub><sup>=</sup>, orthophosphate.

## Results and Discussion

### Water Parameters

In addition to the site location information for the monthly monitoring, Table 1 also contains a summary of the water parameters measured during the monitoring. Note that depth refers to the depth made for the water quality measurements, and not the depth of the water at the site. More detailed results for these parameters can be found in Appendix A.

The mean (average) turbidity was highest at the Benner Bay site (10.7 NTU). A nonparametric (Wilcoxon Rank-Sum) comparison between sites indicated that the turbidity at the Benner Bay site was significantly ( $p < 0.05$ ) higher than all the other sites sampled monthly in the STEER, including Mangrove Lagoon.

For chlorophyll a, the mean for Mangrove Lagoon (1.86 µg/l) was significantly ( $p < 0.0001$ ) higher than all other sites, including Benner Bay ( $p = 0.0005$ ), using a Wilcoxon nonparametric pairwise comparison test. Nonpoint source inputs from surrounding residential areas, along with inputs from the horse racetrack, which are adjacent to the northern border of Mangrove Lagoon, are likely contributing

nutrients, leading to the increased phytoplankton growth (and correspondingly higher chlorophyll a concentrations) seen in Mangrove Lagoon. For pH, salinity, and temperature, the average readings between sites were fairly similar (Appendix A).

### Nutrients

A summary of the results from the nutrient monitoring can be seen in Table 2, and in Figures 2-8. The intervals in the maps were derived using the Jenks Natural Breaks Classification Method. More detailed results from the analysis of nutrients in the STEER can be seen in Appendices B - H. In general, higher nutrient concentrations were found in the western portion of the study area, specifically in Mangrove Lagoon and Benner Bay.

*Differences by Site.* Nonparametric analyses indicated that ammonium (NH<sub>4</sub><sup>+</sup>), nitrite (NO<sub>2</sub><sup>-</sup>), and dissolved inorganic nitrogen (DIN) varied significantly by site. The variation of the combined nitrate/nitrite (NO<sub>3</sub><sup>-</sup> + NO<sub>2</sub><sup>-</sup>), however, was not significant. Mangrove Lagoon and Benner Bay had significantly higher ( $p < 0.05$ ) mean levels of NH<sub>4</sub><sup>+</sup> and DIN than the sites at Cowpet Bay, Rotto Cay, Saint James, and Little St. James. For nitrite, Benner Bay had signifi-

cantly higher mean values than all other sites, except for Mangrove Lagoon. Finally, Mangrove Lagoon and Benner Bay did not differ significantly from each other for any of the nutrient species analyzed, indicating elevated levels of the nutrients analyzed at both of these locations. Figures 2 - 8 show the mean and maximum values recorded at the sites during the monthly sampling. From these figures as well, it can be seen that the Mangrove Lagoon and Benner Bay areas, had higher concentrations (both the mean and maximum values), for a number of the nutrients analyzed. The watershed surrounding the western portion of the study area includes the higher density residential areas of Estate Bovoni and Anna's Retreat, along with the active Bovoni Landfill, and are likely contributing nutrients to

(east/west orientation) and latitude (onshore/offshore orientation). A non parametric analysis (Spearman's) revealed a significant ( $p < 0.05$ ) and negative correlation between longitude and ammonium, nitrite, DIN, and total phosphorus, indicating that moving east to west, mean nutrient concentrations tended to increase. For latitude, there was a significant ( $p < 0.05$ ) positive correlation for these same nutrients, indicating that as latitude increased (i.e., moving towards the shore), concentrations of nutrients also tended to increase. These results provide evidence that land-based and nearshore activities are sources of elevated nutrient concentrations in the STEER. The sites further offshore tended to have lower levels for a number of the nutrient species.

Table 3. Comparison of STEER nutrient results with those from other US Caribbean locations.

Nutrient	St. Thomas			St. John <sup>1</sup>						St. Croix <sup>1</sup>			Puerto Rico <sup>2</sup>		
	STEER			Lameshur Bay			Coral Bay			Teague Bay			Guanica		
	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
NO <sub>3</sub> + NO <sub>2</sub>	0	0.014	0.426	ND	0.001	2.664	ND	0.001	3.936	ND	0.001	0.289	0	0.14	3.68
NH <sub>4</sub>	0	0.01	0.055	ND	0.004	0.175	ND	0.0039	0.2335	ND	0.010	0.978	0	0.05	6.45
Orthophosphate	0	0.005	0.018	ND	0.002	0.158	ND	0.0016	1.8176	ND	0.002	1.234	0	0.05	1.48

<sup>1</sup>Data from Smith *et al.*, 2013. <sup>2</sup>Data from Whittall *et al.*, 2013. Abbreviations: NO<sub>3</sub>, nitrate; NO<sub>2</sub>, nitrite. NH<sub>4</sub>, ammonium; ND, not detected.

the STEER. In addition, there appear to be a number of live-aboard boats in Benner Bay, which are also potential sources of nutrients. The east to west gradients seen with nitrogen compounds was not seen with orthophosphate and total phosphate, which indicates a different matrix of sources and/or forcing functions that drive distributions of these nutrients.

Horsley Witten (HWG, 2013) estimate that approximately 70% of the residential housing in these areas are on septic systems, many of which are failing. There is also a deteriorating sewer infrastructure for those connected to the public sewer system. The STEER Management Plan (STEER, 2011), cited nutrients as a high to very high threat in the STEER. An assessment of fecal coliform bacteria (FCB) in Mangrove Lagoon and Benner Bay (Tetra Tech, 2005), indicated a variety of sources including improperly functioning septic systems, urban runoff and discharges from recreational vessels in the area. Pait *et al.* (2013) found the highest concentrations of the sewage marker *Clostridium perfringens* in Mangrove Lagoon, adjacent to where Turpentine Gut empties into the lagoon.

*Variation by Latitude and Longitude.* Nutrient concentrations were assessed to determine if they varied by longitude

*Comparison with Other US Caribbean Studies.* A number of projects in the US Caribbean have examined the concentration of various nutrients in nearshore waters. Summarized results, along with those from the current work in the STEER, are presented in Table 3. From this table, it can be seen that for most of the nutrient species, the mean concentrations appeared to be somewhat higher in the STEER compared to the locations monitored in St. John and St. Croix (Smith *et al.*, 2013), although lower than that found in and around Guanica Bay, Puerto Rico. Data from Guanica Bay includes both coastal embayments (similar to the STEER), and an enclosed estuary. The maximum concentrations found in these other studies were almost always higher than that recorded in the STEER (Table 3). These data indicate that the nutrient concentrations in the STEER were similar to what has been found in other parts of the USVI and also in southwest Puerto Rico.

*Nutrient Concentrations and Rainfall.* Ideally, streamflow gauge data would be used to help assess nutrient delivery to the STEER. There are, however, no active streamflow gauges in the Turpentine Gut watershed, the largest watershed that drains directly to the STEER. The record of the USGS stream gauge data in Turpentine Gut appears to



Figure 2. Mean and max concentrations of ammonium ( $\text{NH}_4^+$ ) detected in water samples from the STEER.



Figure 3. Mean and max concentrations of nitrate (NO<sub>3</sub><sup>-</sup>) and nitrite (NO<sub>2</sub><sup>-</sup>) detected in water samples from the STEER.

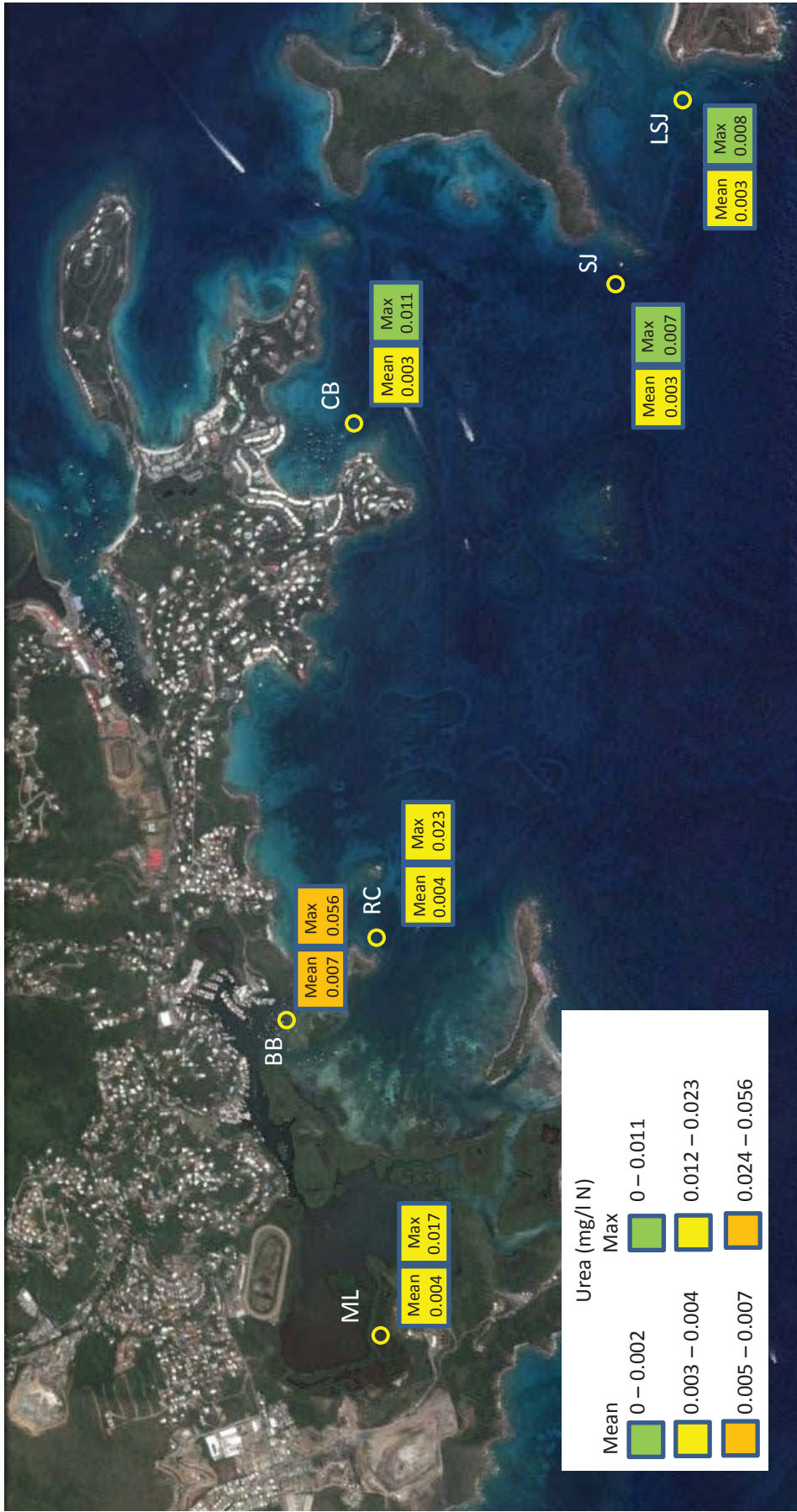


Figure 4. Mean and max concentrations of urea detected in water samples from the STEER.

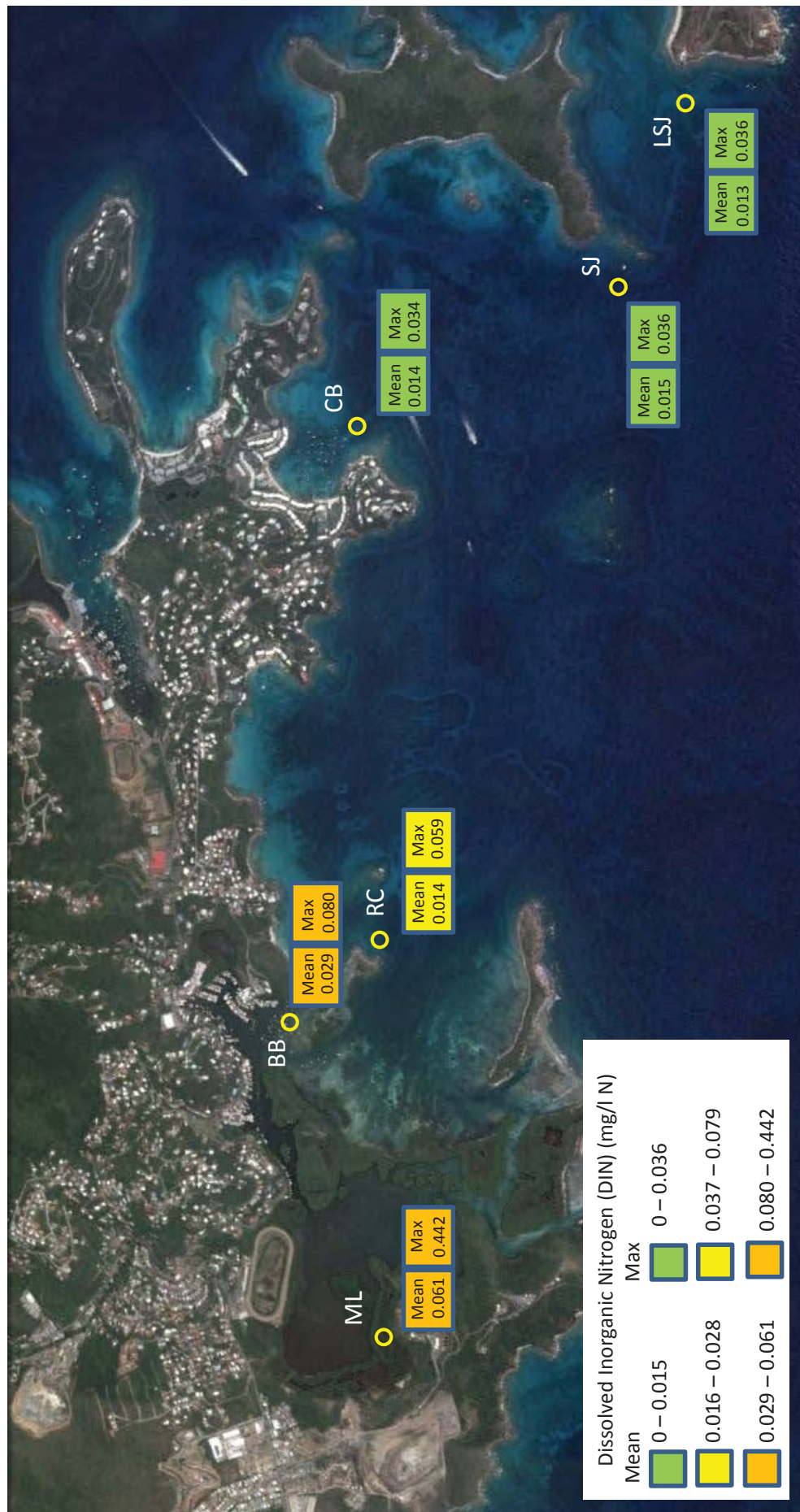


Figure 5. Mean and max concentrations of dissolved inorganic nitrogen (DIN) detected in water samples from the STEER.



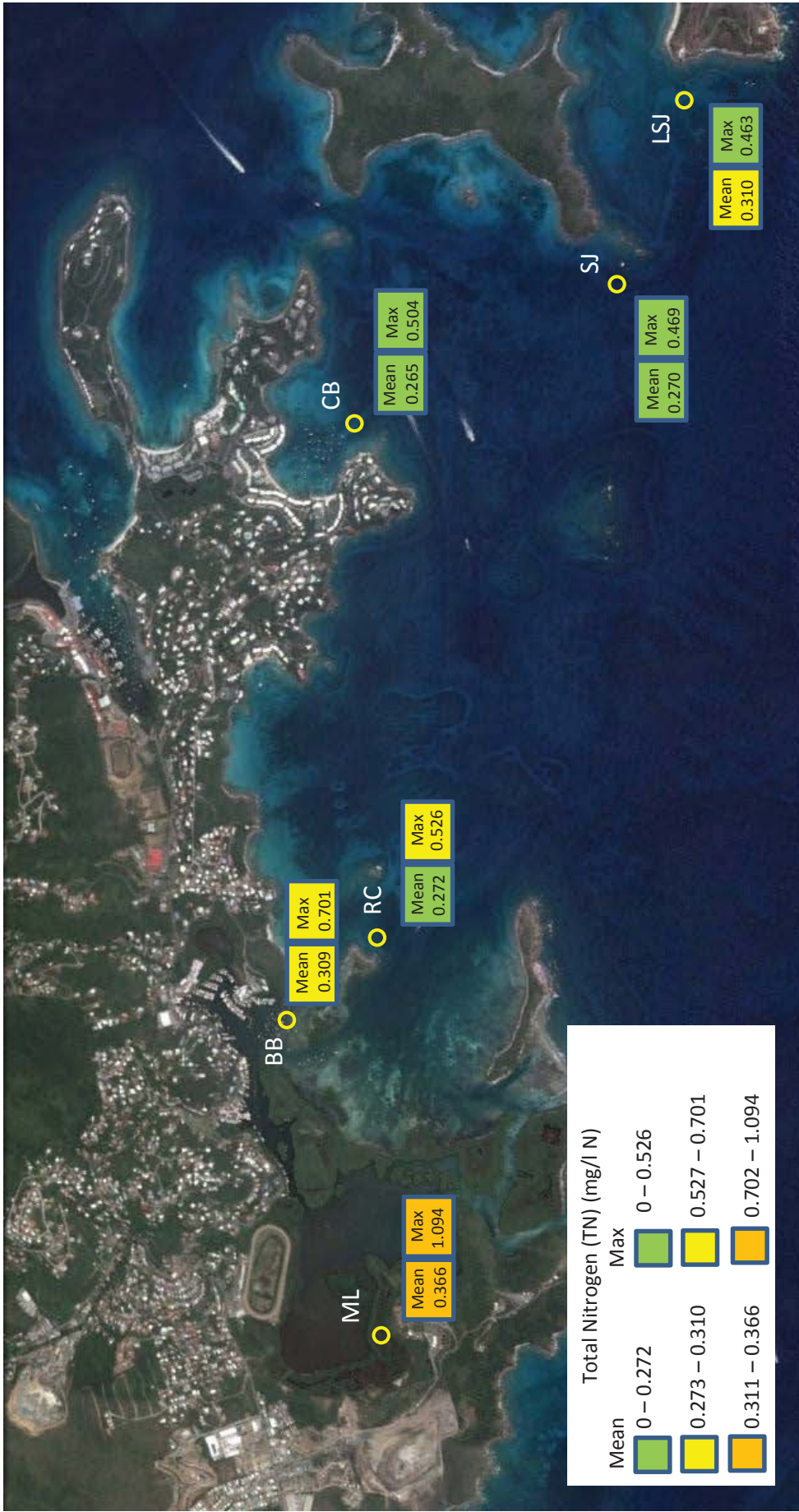


Figure 6. Mean and max concentrations of total nitrogen (TN) detected in water samples from the STEER.



Figure 7. Mean and max concentrations of orthophosphate ( $\text{HPO}_4^-$ ) detected in water samples from the STEER.



Figure 8 Mean and max concentrations of total phosphorus (TP) detected in water samples from the STEER.

have ended in 2008. Because of this, rainfall data was used in place of streamflow, as a proxy to assess the relationship between the amount of rainfall (precipitation) and variations in nutrient concentrations in the STEER. The rationale for using this data is that higher rainfall would be expected to result in additional runoff and nutrients entering streams that flow into the STEER, and also directly into the STEER through runoff from streets and hillsides which would not be accounted for from the stream gauge data. The closest rainfall gauge to the STEER is located at Redhook Bay in St. Thomas. Unfortunately, nearly 40% of the data were missing from the records for the time period that the nutrient monitoring was conducted for this project. On those days when water samples were collected for nutrient

day along with the day before was 0 mm. During the period of highest rainfall (1,364 mm) in September 2013, there were unfortunately no water samples taken for nutrient analysis. Additional graphs for nutrients and rainfall can be seen in Appendices C-H.

It's unclear why there wasn't a positive correlation between nutrient concentrations and rainfall in the STEER, although there are a number of possibilities. One of these is the lack of more complete rain gauge data adjacent to the STEER. Rainfall data near the STEER might reveal better correlations between rainfall and nutrient concentrations. Rainfall patterns on St. Thomas can be highly localized, and more complete rainfall data near the STEER might

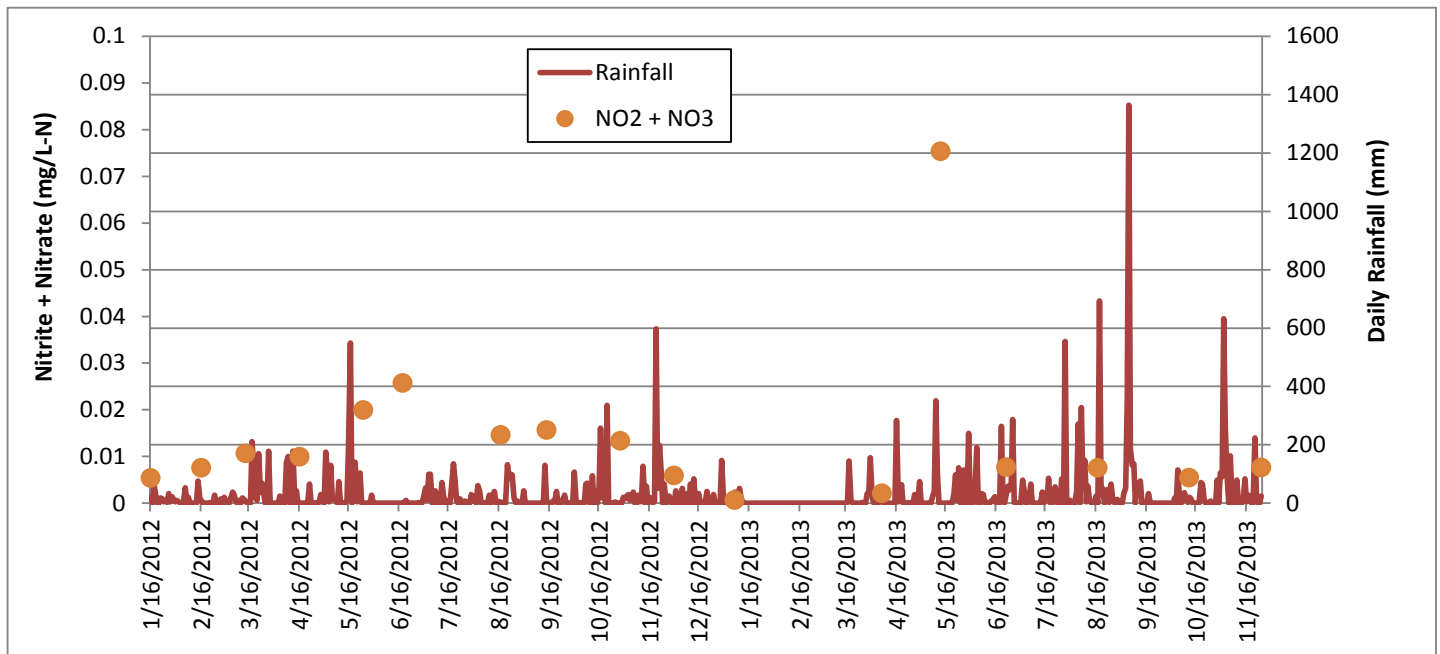


Figure 9. Nitrate and nitrite concentrations versus rainfall in Benner Bay during the study period.

analysis, the amount of missing rainfall data was over 80%. As a result, precipitation records from the Cyril E. King Airport in West Charlotte Amalie, with a more complete data set, were used. Daily rainfall records for the Cyril E. King Airport were accessed through NOAA's National Climatic Data Center. Daily rainfall estimates were plotted against concentrations for each nutrient species at each of the six sites in the STEER.

A series of nonparametric tests did not indicate a significant positive correlation between rainfall and nutrients in the STEER. An example of the data for nitrite + nitrate ( $\text{NO}_2 + \text{NO}_3$ ) plotted against rainfall for Benner Bay is presented in Figure 9. The highest concentration of nitrite + nitrate was found in the May 2013 sampling, however, rainfall for that

help better elucidate any relationships between rainfall, the mountainous terrain and nutrients. Another possibility is that discharges from septic systems into the STEER either from streams like Turpentine Gut, or via groundwater to the STEER, are providing a constant source of nutrients, independent of rainfall. Another factor may be the influence of winds or tides on the resuspension of sediments into the water column containing nutrients. There is also significant boating activity including some live aboards, particularly in the Benner Bay area, which are also a likely source of nutrients to the STEER. Finally, sampling for this project was not designed to be during or just after heavy rainfall events, which might have provided a better correlation between rainfall and nutrient levels.

*Relationships Between Nutrients.* Whitall *et al.* (2013) examined correlations between nutrient species, leaving out those that are autocorrelated (e.g., orthophosphorus and total phosphorus), and found that ammonium, urea and orthophosphorus are associated with runoff, while the oxidized forms of nitrogen tend to percolate into soils during rainfall events, and eventually into groundwater.

Spearman’s rank correlation coefficient analysis for the STEER indicated significant correlations between ammonium, urea and orthophosphorus. However, these species were not correlated with the more oxidized forms of nitrogen, particularly nitrate plus nitrite.

*Nutrients and Coral Reefs.* Lapointe (1997) suggested nutrient thresholds for water, above which macroalgae and phytoplankton were more likely to flourish on coral reefs, in the greater Caribbean. While it needs to be acknowledged that coral species respond differently to elevated nutrient concentrations, the thresholds proposed by Lapointe (1997) provide an opportunity to at least begin to assess nutrient levels more likely to be detrimental to corals. Thresholds were proposed for orthophosphate (0.003 mg/l as P), and dissolved inorganic nitrogen (DIN, 0.014 mg/l as N). DIN is the summation of nitrate, nitrite and ammonium.

Using the values proposed by Lapointe (1997), approximately 60% of the samples analyzed from the STEER were above the threshold for orthophosphate, with a slightly higher number within the western portion of the study area. For DIN (Figure 10), the mean exceedance across the STEER was 55%. A nonparametric analysis using the Wilcoxon method indicated that DIN varied by sampling site.

Using the thresholds developed Lapointe (1997), the STEER may be at risk, particularly in the western portion, to blooms of macroalgae which could outcompete and eventually smother corals in the area. There is also concern regarding the direct effects of nutrients on corals (Harrison and Ward, 2001; Marubini and Davis, 1996). The likely source of these nutrients are inputs from the developed areas around the STEER. Efforts are needed to reduce the amount of nutrients entering the STEER, particularly from the residential and commercial areas, and

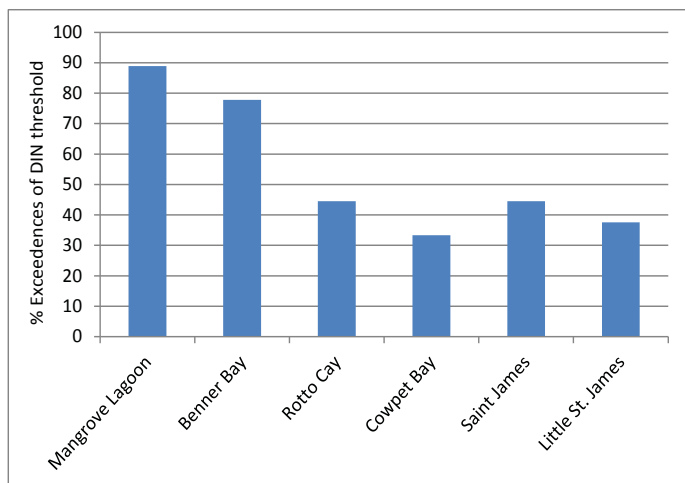


Figure 10. Percent exceedances of DIN threshold by site in the STEER.

also from the live aboard vessels that can be found in the STEER, particularly in Benner Bay.

Sedimentation

A summary of the results from the monthly monitoring of sediment traps in the STEER (January 2012 to November 2013) can be seen in Figures 11 - 16, and in Appendix I.

*Differences by Site.* The average bulk deposition of sediments is presented in Figure 11. For all sites, terrigenous material was dominant, accounting for 60 to 70% of total

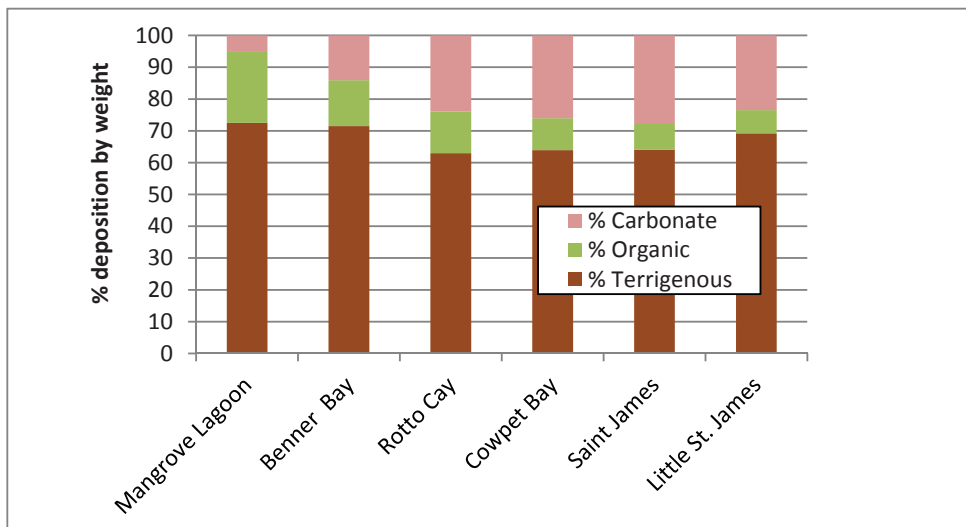


Figure 11. Bulk deposition of sediment in traps placed in the STEER.

sediment in the traps, highlighting the role of terrestrial inputs to the STEER. Conversely, it can also be seen that carbonate inputs appeared somewhat smaller in Mangrove Lagoon and Benner Bay, compared to the more offshore sites, as might be expected. Also, the organic fraction tend-

ed to be higher at the Mangrove Lagoon, Benner Bay and perhaps the Rotto Cay sites. Organic inputs can be either from terrestrial or marine sources.

The percent terrigenous material in the sediment traps in the STEER was significantly higher ( $p < 0.05$ ) in both Mangrove Lagoon and Benner Bay compared to the other locations in the STEER. In addition to fresh input from the surrounding watershed, resuspended bed sediments from within the STEER can enter the traps as well, as a result of storms (wave and wind activity), or from boat traffic in Benner Bay. The contribution from new versus resuspended materials can not be determined using the traps deployed.

The percent contribution from carbonate sediments appeared higher at the more offshore sites. Carbonate sediments are derived primarily from marine skeletons (e.g., coral) and shells. The percent carbonate deposition in the sediment traps was significantly higher ( $p < 0.05$ ) at Rotto Cay, Cowpet Bay and Saint James, further away from the land-based inputs in the Benner Bay and Mangrove Lagoon areas.

The sediment trap site adjacent to Little St. James Island (Figure 1), arguably the site furthest away from Benner Bay and Mangrove Lagoon, appeared to have a somewhat higher terrigenous fraction (Figure 11), and a correspondingly lower carbonate input. The difference in the percent carbonate fraction between the Little St. James and Saint James sites was significant. During the course of the sediment trap work, substantial earth moving activities were observed on Little St. James Island (Figure 12), which would likely be a major source of terrigenous sediments entering the adjacent waters.

A comparison of the mean daily accumulation rates in the sediments traps by site is presented in Figure 13. The mean accumulation rate ( $9.02 \text{ mg/cm}^2/\text{day}$ ) in the Benner Bay sediment traps was significantly ( $p < 0.001$ ) higher than the trap accumulation rates at all other sites in the STEER.

Similar to the bulk deposition of sediments, the highest accumulation rates were seen for the terrigenous fraction. The mean terrigenous accumulation rate ( $6.45 \text{ mg/cm}^2/\text{day}$ ) was also higher ( $p < 0.0001$ ) in Benner Bay than the other sediment traps in the STEER, including Mangrove Lagoon. Although Mangrove Lagoon receives input from Turpentine Gut, the only perennial stream on St. Thomas, the highest rate of terrigenous sediment input occurred in Benner Bay.

There are likely two sources of input to the traps placed at Benner Bay: terrestrial materials washed off the roads and hillsides from the surrounding landscape, and resuspend-

ed sediments from within Benner Bay. The hillsides in the watershed surrounding Benner Bay are fairly steep, with shallow soils, and insufficient ground cover. These factors, along with widespread construction activities, and periodic torrential downpours, can lead to the transport of soils into the STEER (HWG, 2013). Pait *et al.* (2013) found that sediments in northern Benner Bay had some of the highest silt and clay fractions (31 - 56%) in the STEER. Silt and clay sediments are typically derived from terrestrial sources. Sediment coring work in northern Benner Bay by NCCOS in 2013 revealed a thick layer of silt and clay over a deeper layer of shell hash, indicating that changes in land use over

time have resulted in higher amounts of terrigenous materials transported to the STEER.

*Variation by Latitude and Longitude.* A nonparametric analysis revealed a significant negative correlation (Spearman's Rho =  $-0.6686$ ,  $p < 0.0001$ ) between longitude and mean trap accumulation rate, and between the terrigenous accumulation rate and longitude (Spearman's Rho =  $-0.6625$ ,  $p < 0.0001$ ), indicating that moving east to west, the deposition rate of terrigenous sediments tended to increase.



Figure 12. Excavation activity on Little St. James Island, a possible source of terrigenous sediments found in the sediment traps at this site.

There was also a significant (Spearman's  $Rho = 0.5047$ ,  $p < 0.001$ ) positive correlation between latitude and the mean trap accumulation rate, along with the terrigenous accumulation rate, indicating that deposition tended to increase moving from the more offshore sites to the nearshore locations.

*Comparison with Other US Caribbean Studies.* The results from the STEER can be compared with those from other recent work in the US Caribbean. The mean terrigenous accumulation in sediments traps found by Sherman *et al.* (2013) within Guanica Bay Puerto Rico, was roughly 58%, somewhat similar to what was found in the STEER, but outside

Guanica Bay the percent terrigenous was only 24%. As noted, the mean percent terrigenous sediment in the traps in the STEER was higher, approximately 66% terrigenous and 20% carbonate. Within the STEER, Mangrove Lagoon (73%) and Benner Bay (71%) were even higher. Working in St. John, Gray *et al.* (2012), found that terrigenous input into the sediment

traps in Coral Bay located near the shore accounted for 56%. Out on the reefs in Coral Bay, that value fell to roughly 21%. In Lameshur Bay, terrigenous sediment accounted for approximately 32% of the material in the near-shore sites, and fell to roughly 15% out on the reefs in this Bay. Terrigenous input into the sediment traps in the STEER was quite high. Additional work is needed to better characterize the inputs of fresh material from the surrounding watershed versus resuspended sediments.

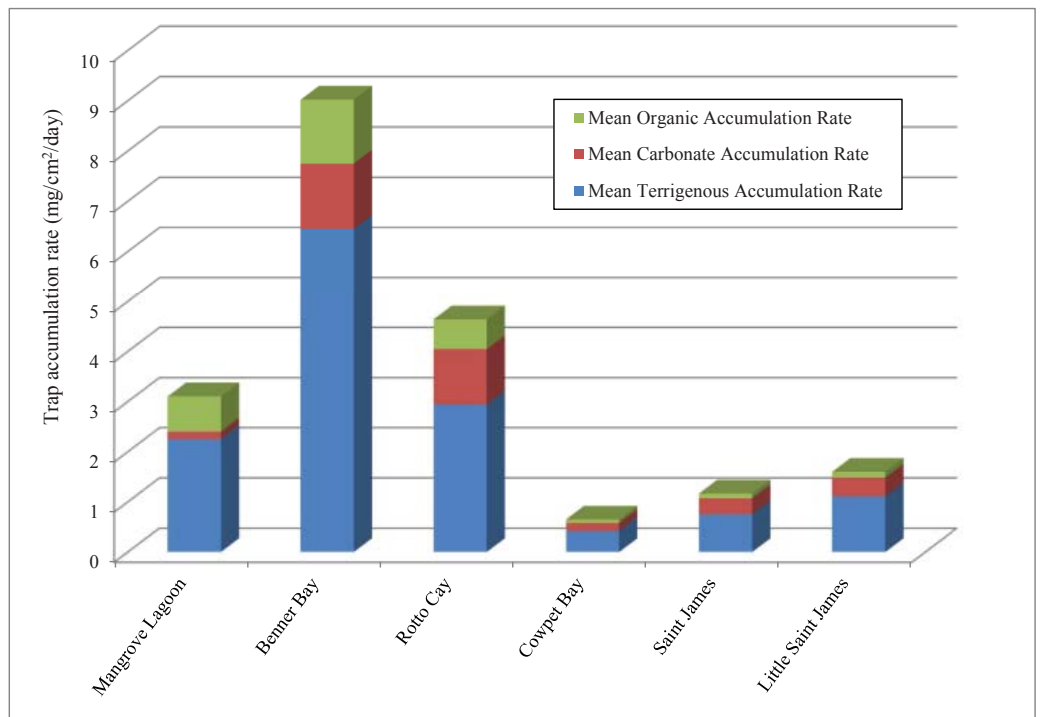


Figure 13. Average accumulation rates at the sediment trap sites in the STEER.

*Sediment Deposition and Rainfall.* As with nutrients, there did not appear to be a good correlation between sediment deposition and rainfall. A plot of the sediment trap accumulation rate and rainfall for Benner Bay can be seen in Figure 14. A plot of the terrigenous accumulation rate showed similar results. Nonparametric analyses of the re-

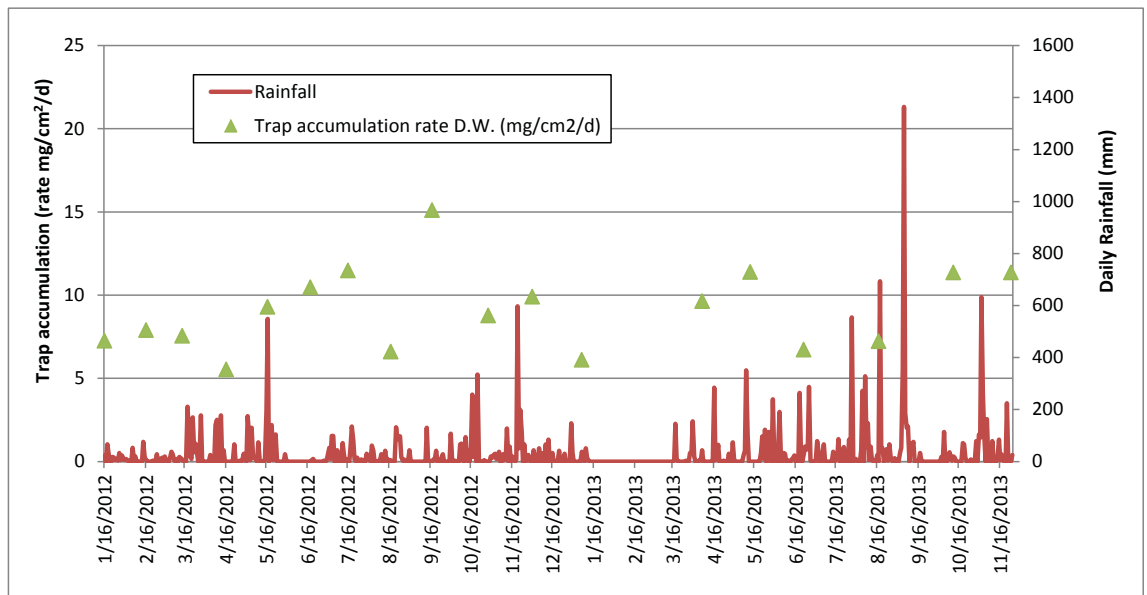


Figure 14. Bulk deposition in Benner Bay sediment traps plotted against rainfall.

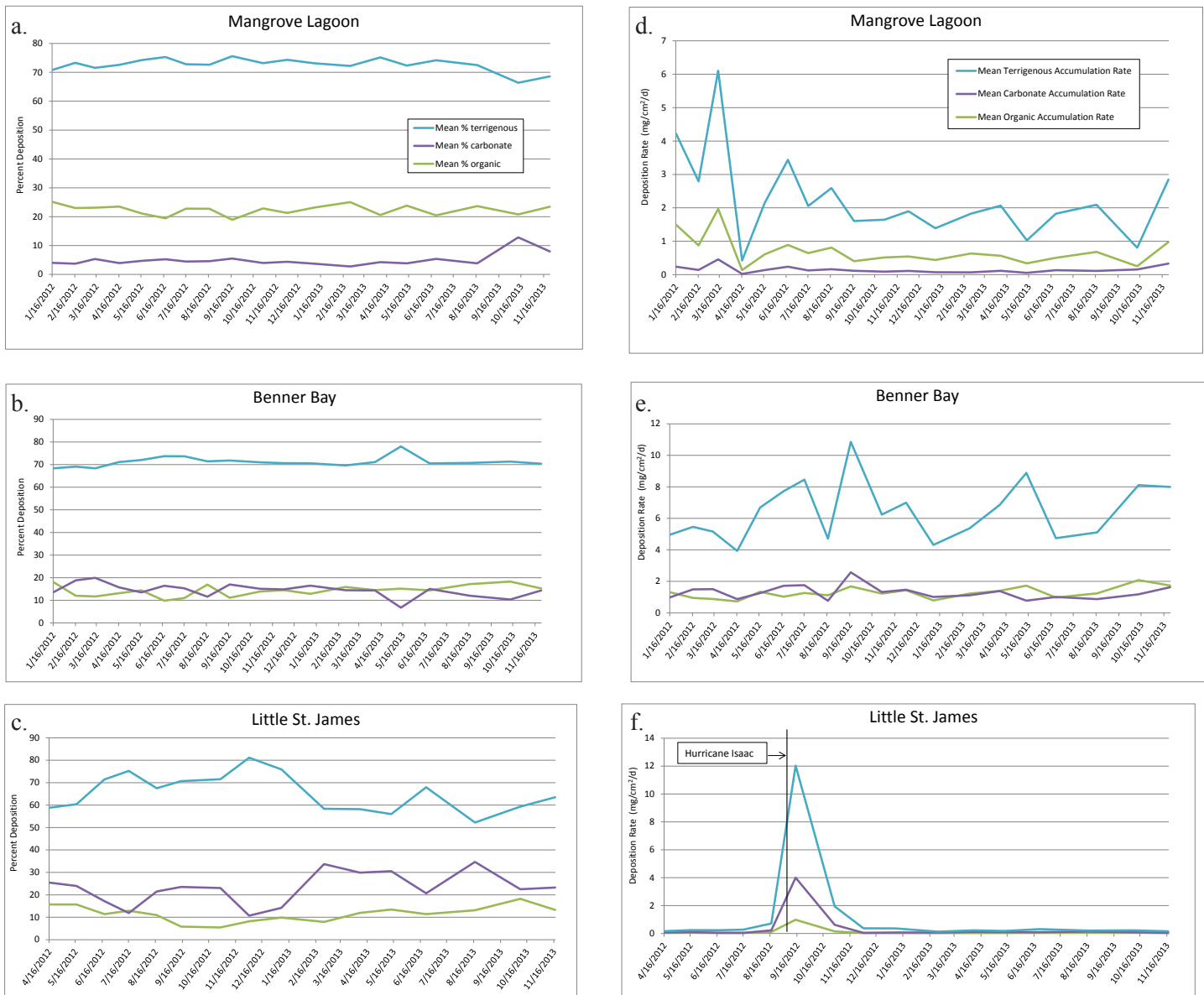


Figure 15. Percent and rates of deposition for terrigenous, carbonate and organic materials in the sediment traps in the STEER over time for Mangrove Lagoon (a, d), Benner Bay (b, e), and Little St. James (c, f).

sults between sedimentation and daily and monthly rainfall (Cyril E. King Airport) failed ( $p > 0.05$ ) to show any significant relationship, either across the STEER or for each site.

On the northwestern coast of St. Thomas, Nemeth and Nowlis (2001) found that sedimentation closely tracked rainfall during a period of early construction at a new resort near Caret Bay, however, once the earth-moving phase had been completed, that relationship disappeared, resulting in an overall lack of significance between rainfall and sedimentation during their study. In the STEER, it would likely take sustained rainfall over a period of days in order to alter the amount of sediment accumulating in the traps from surface water runoff, and so correlations with daily rainfall might not be particularly useful. However, monthly rainfall

amounts did not correlate with the sediment deposition rates either. It may be that other factors are also involved with increases in sedimentation, including increased wave action resuspending sediments already within the STEER.

*Sediment Deposition Over Time.* Plots of sediment deposition over time, both in terms of percent deposition and by sedimentation rate for three of the sites in the STEER are shown in Figure 15. Graphs for Rotto Cay, Cowpet Bay, and Saint James can be seen in Appendix J. In Figure 15, the contributions from terrestrial, carbonate and organic sources were fairly constant over time for both Mangrove Lagoon (a) and Benner Bay (b). In both cases, terrigenous material was the major component (~70%) found in the sediment traps. The lack of substantial variation in the



sources (terrestrial versus carbonate) in Mangrove Lagoon and Benner Bay sediment traps could indicate a continuous input of terrestrially-derived sediments at these two sites, as a result of new input, resuspension of sediments into the water column from storms, tides and boats, or a combination of these phenomena. On the right hand side of Figure 15, for Mangrove Lagoon (d) and Benner Bay (e), there is substantial amount of variation in the rate of terrigenous and carbonate deposition (organic material can be derived from terrestrial or marine sources) over time. In March 2012, there was a sharp increase in the terrigenous fraction found in the sediment traps in Mangrove Lagoon (Figure 15d). Specifically, the rate increased from 2.79 mg/cm<sup>2</sup>/day to 6.10 mg/cm<sup>2</sup>/day, a factor of 2.18. However, at the same time, the carbonate deposition rate went from 0.141 to 0.456 mg/cm<sup>2</sup>/day, a factor of 3.23, higher than the rate increase for the terrigenous fraction. While the increase in the terrigenous sediment deposition rate may have been related to rainfall during this period, other factors such as the movement of tides, winds, or disturbance by animals leading to a resuspension of sediments cannot be ruled out. In addition, there does not appear to be a corresponding increase in the rate of sediment deposition in the adjacent Benner Bay site in March 2012, as might be expected if rainfall had resulted in higher surface water runoff from the steep hillsides, carrying terrestrially derived materials to the STEER.

For Little St. James (Figure 15c), deposition appeared more variable, and may be related to weather and wave patterns. In Figure 15f, it can be seen that there was a spike in terrigenous, organic and carbonate deposition into the Little St. James sediment traps sampled in September 2012. In August 2012, sediment traps in the STEER were sampled around the middle of the month. In late August 2012, Hurricane Isaac (noted on Figure 15f), passed to the south of the USVI, and appears likely responsible for the increased rates of sedimentation found when the sediment traps were retrieved in September. Further evidence of this is presented in Figure 16. Total monthly deposition of sediment in the traps is plotted from January 2012 through October 2012. The average deployment of the sediment traps during this period was 30 days. Daily rainfall records from the Cyril E. King Airport are shown in Figure 16b. Wave height data (Figure 16c) were obtained from the Caribbean Coastal Ocean Observing System (CariCOOS), for a site south of St. John (Station 41052), and accessed online through NOAA's National Data Buoy Center data base ([http://www.ndbc.noaa.gov/station\\_page.php?station=41052](http://www.ndbc.noaa.gov/station_page.php?station=41052)). Although the station is not within the boundaries of the STEER (there appear to be no wave stations in the STEER), it does provide an indication of likely increases

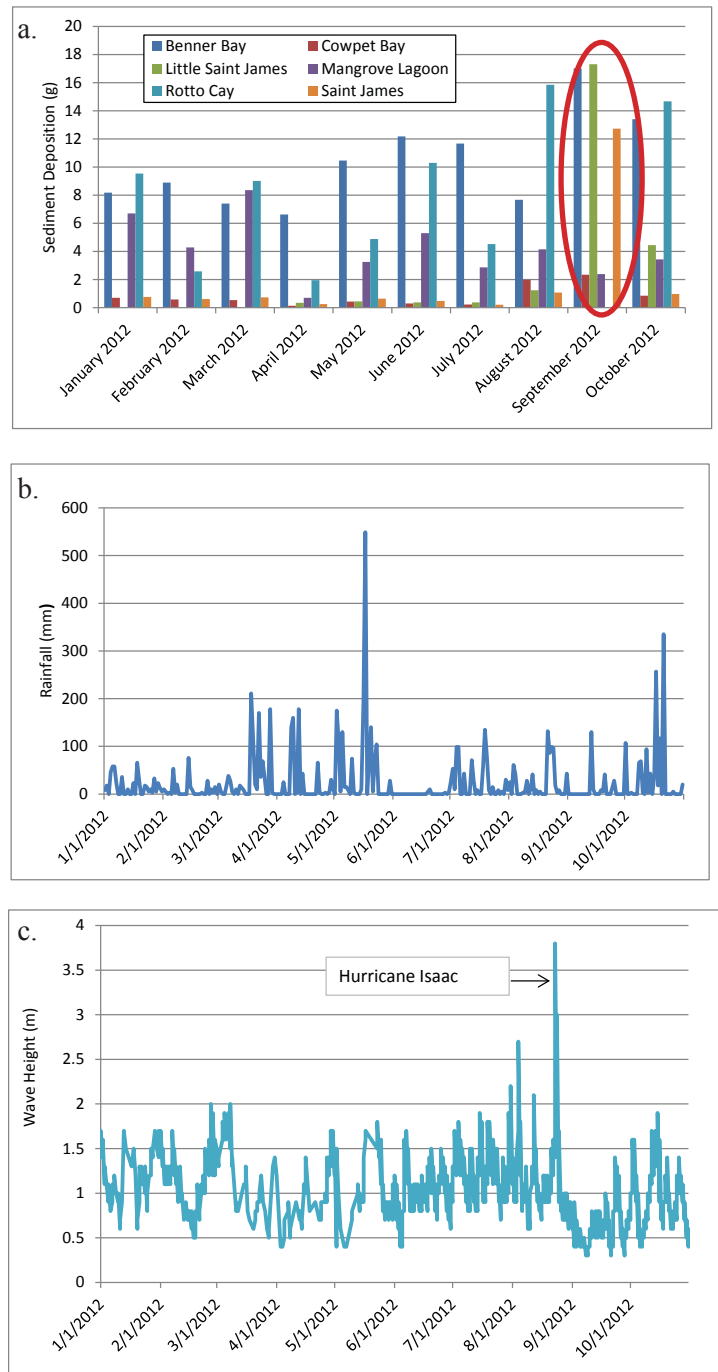


Figure 16. Plots of mean sediment deposition (a), rainfall (b) and wave height at Station 41052 (c).

es in wave height within the STEER, at least in the southern portion.

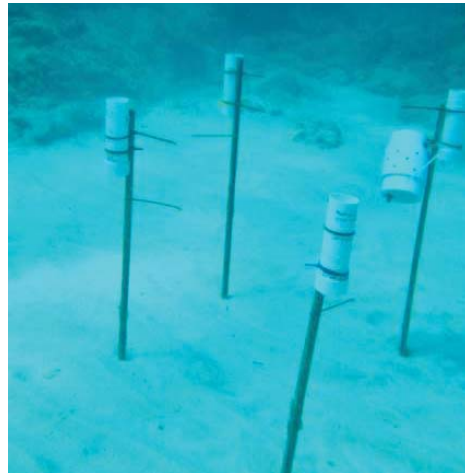
In Figure 16a, there was increased deposition in the traps found during the September 2012 sampling, particularly in the more offshore traps at Little St. James and Saint James (highlighted in red circle). The amount of sediment in the traps at Little St. James (17.3g) in September 2012, was actually higher than in the traps at Benner Bay. The amount of sediment in the traps at Little St. James in September 2012 was higher by a factor of 14 from the

previous month at this site. At Saint James, the amount of sediment in the traps was 12.7g, an increase in sediment deposition by a factor of 12 from the previous month. As mentioned, Hurricane Isaac passed to the south of the USVI in late August 2012. While there did not appear to be a substantial amount of rainfall (Figure 16b) in St. Thomas associated with this system, wave height increased to nearly 4 meters (Figure 16c) at the CariCOOS wave station just south of St. John. It seems likely that waves from Hurricane Isaac, moving into the southern portion of the STEER, resulted in the remobilization of bed sediments that were then deposited into the sediment traps at both Saint James and Little St. James. As can be seen in Figure 15, the percent contribution from terrigenous versus carbonate during this time did not appear to change appreciably. During the same period, the Benner Bay traps also accumulated more sediment, however, the percent terrigenous contribution did not change.

**Sedimentation and Coral Reefs.** Rogers (1990) suggested that impacts to the structure and function of coral reefs resulted with sedimentation rates above 10 mg/cm<sup>2</sup>/day. Research by Smith *et al.* (2008) and Nemeth and Nowlis (2001) have shown this value may be useful at least in the USVI, for determining when coral reefs are likely impacted by chronic sedimentation.

Using the rate of 10 mg/cm<sup>2</sup>/day, none of the sites had a mean rate above this, although Benner Bay (Figure 13) (9.02 mg/cm<sup>2</sup>/day) was fairly close. There were nine occasions, however, during the course of the monthly monitoring when a site exceeded this threshold. Benner Bay exceeded the threshold on six occasions, and Rotto Cay, Saint James (September 2012) and Little St. James (September 2012) each exceeded the threshold once.

Although none of the sites had a mean sedimentation rate above the suggested threshold, sedimentation in Benner Bay appears to be high enough to put the corals in this area at some risk. Additional work is needed to better describe sedimentation throughout Benner Bay, and to reduce sedimentation into the area. In addition, it would also be useful to understand the association between coral species richness/diversity and sedimentation in Benner Bay and throughout the Reserves, in order to assess how sedimentation may be affecting the distribution of individual coral species.



*Sediment traps deployed in the STEER. Larger cylinder is a passive water chemistry sampler used in another part of the project in the STEER.*

#### Total Suspended Solids (TSS)

A summary of the results from TSS monitoring in the STEER is presented in Figure 17. Detailed results are presented in Appendix K. TSS includes silts which can precipitate out onto reefs impacting the health of corals, along with plankton and other materials, some naturally occurring while others are derived from human activities. TSS also impacts corals and seagrasses by decreasing the amount of light available for photosynthesis.

**Differences by Site.** Nonparametric analysis (Wilcoxon Rank-Sum) revealed that the mean TSS value (8.32 ± 0.88 mg/l) in Benner Bay was significantly ( $p < 0.01$ ) higher than the other sites, with the exception of Mangrove Lagoon. As was seen earlier, the Benner Bay site had a significantly different (higher) mean turbidity than the other sites in the STEER (Table 1). TSS at the remaining sites, with

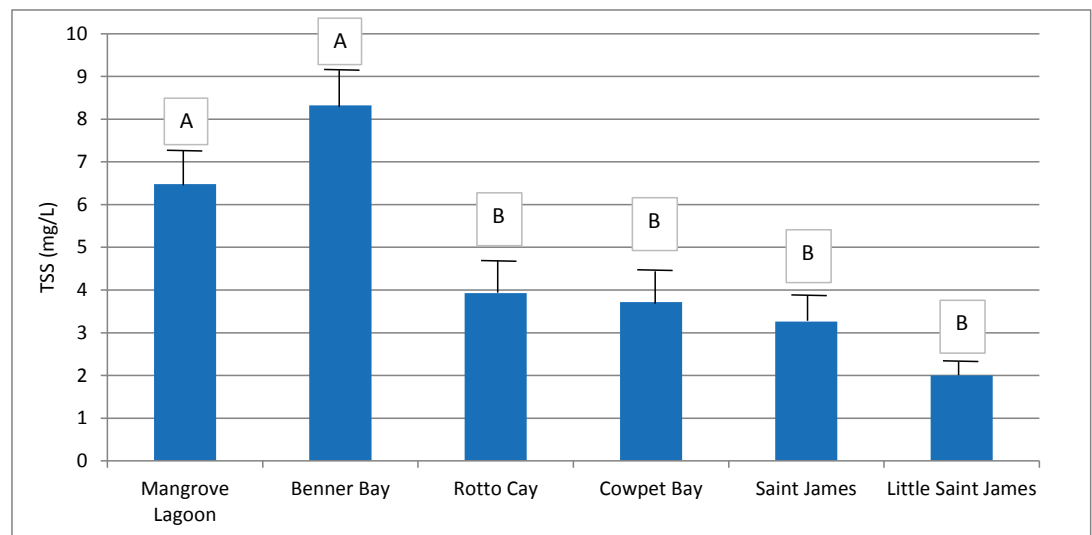


Figure 17. Total suspended solids (TSS) means (±SE) at sampling sites in the STEER. Sites with the same letter were not statistically different.

the exception of Mangrove Lagoon, were not significantly different from each other (Figure 17).

**Variation by Latitude and Longitude.** Like the results from the sediment traps, a nonparametric analysis indicated there was a negative and significant (Spearman's Rho = -0.5466,  $p < 0.0001$ ) correlation between longitude and TSS, indicating that the means were higher in the western portion of the study area. In addition, there was a positive and significant (Spearman's Rho = 0.4725,  $p < 0.0001$ ) correlation between latitude and TSS, indicating that TSS was lower in the more offshore sites.

**Comparison with Other US Caribbean Studies.** Table 4 presents a comparison of the TSS results from work in the STEER, with that of measurements made in St. John and St. Croix; (Smith *et al.*, 2013). From this table, it can be seen that the STEER sites were similar to the sites sampled on St. John and St. Croix, for both the mean and maximum values. The highest TSS value recorded in the STEER was 18.6 mg/l, in Benner Bay in January 2012.

**TSS Concentrations and Rainfall.** A nonparametric correlation analysis (Spearman Rank Correlation) was first run on TSS versus daily rainfall. The results (Spearman's Rho = -0.0844,  $p = 0.3535$ , ) indicated no significant relationship between daily rainfall and TSS in the STEER throughout the course of the study. The lack of a significant relationship with rainfall was similar to that found for the sediment traps. As with those results, it is not clear why there wasn't a significant relationship between TSS and rainfall in the STEER. Although stream flow data was not available, higher rainfall might be expected to result in higher levels of TSS. As with sedimentation, it is possible that at least some of the TSS was the result of resuspension of sediments. It could also be that there is a lag time between a large rain event and when that water empties into the STEER. This second possibility seems unlikely though, given the steep slopes in much of the watershed. Additional work is needed to assess the relationship between rainfall, streamflow and sediment delivery to the STEER.

**TSS and Coral Reefs.** Rogers (1990) suggested that a TSS concentration at or above 10 mg/l can affect the structure and function of coral reef ecosystems in the Caribbean.

Table 4. Comparison of TSS in the STEER with other locations in the USVI.

	TSS (mg/l)		
	Minimum	Mean	Maximum
St. Thomas			
STEER	0.5	4.7	18.6
St. John <sup>1</sup>			
Lameshur Bay	0.4	6.5	22.0
Coral Bay	1.0	6.5	22.0
Fish Bay	0.8	6.8	24.0
St. Croix <sup>1</sup>			
Teague Bay	1.0	6.4	28.0

<sup>1</sup>Data from Smith *et al.*, 2013.

Impacts include fewer coral species, less live coral cover, lower growth rates, reduced recruitment and decreased calcification. None of the sites in the STEER had a mean TSS value above 10 mg/l, however, the mean for Benner Bay during the study was 8.32 mg/l.



Apparatus for filtering water samples for measuring TSS in the STEER.

There were 19 occasions during the monthly monitoring when TSS exceeded the value of 10 mg/l. The highest TSS value recorded was 18.6 mg/l in Benner Bay. Forty-seven percent of the exceedances of the threshold occurred in Benner Bay, followed by Mangrove Lagoon with 26%. Similar to the results for sedimentation, corals in the Benner Bay area would appear at some risk as a result of suspended solids in the STEER. While there were a number of exceedances in Mangrove Lagoon, there appear to be very

few corals in this area; corals were only found the extreme southern portion of the lagoon.

#### Relationships Between Parameters Measured for this Report

Finally, a series of nonparametric analyses (Spearman Rank Correlation) were carried out to assess relationships between parameters measured in this part of the project in the STEER. The mean sediment trap accumulation rate was highly correlated with TSS. This is perhaps not surprising, as some of the TSS eventually settles out. Areas with higher levels of TSS might also be areas of higher sediment deposition, as a result of transport from the watershed, or from resuspension within the STEER. A number of the nutrients, particularly the nonoxidized forms (e.g., ammo-

nium, urea, and orthophosphate) were correlated ( $p < 0.05$ ) with both TSS and sediment deposition, again suggesting areas with higher inputs of sediments were associated with higher inputs of specific nutrient classes, along with the possibility of nutrients being transported (adsorbed) to the sediment particles.

### Summary and Conclusions

The monitoring of nutrients, sedimentation and total suspended solids (TSS) in the STEER for 23 months was part of a larger project to assess the presence and effects of land-based sources of pollution, including a characterization of the biological communities within the STEER. The results from this part of the project indicate elevated levels of the parameters measured in the western portion (Mangrove Lagoon and Benner Bay) of the STEER. These areas contain higher densities of residential housing, most of which have septic systems, and many that are likely failing. There is also a horse racetrack along with the Bovoni Landfill, which surround Mangrove Lagoon, as well as live-aboard boats in Benner Bay, all of which likely contribute nutrients, leading to higher concentrations in this part of the STEER.

Ammonium, nitrite and dissolved inorganic nitrogen (DIN) were higher in Benner Bay and Mangrove Lagoon than the other sites in the STEER. For DIN, both Mangrove Lagoon and Benner Bay had significantly higher levels than the other four sites.

A significant relationship between rainfall and nutrients, although expected, was not found. Because there are no active stream gauges in the watershed draining to the STEER, rainfall was used a proxy for streamflow. The reason for the lack of correlation between rainfall and nutrients was not clear. It would be useful to have an active stream gauge in the watershed that could be used to assess the relationship between stream flow and concentrations of nutrients. If a stream gauge is not possible, then more complete rainfall data at Redhook would be helpful.

The concentrations of the nutrients measured in the STEER were similar to other sites recently monitored in the US Caribbean. Nutrient values in the STEER appeared slightly higher than in St. John and St. Croix, USVI, but lower than in Guanica Bay in Puerto Rico.

Approximately 60% of the nutrient samples analyzed from the STEER were above a proposed threshold for coral reefs for orthophosphate, with a slightly higher number within the western portion of the study area. For DIN, the mean

exceedance across the STEER was 55%. From this, it would appear that some areas in the STEER, particularly in Mangrove Lagoon and Benner Bay, may be at risk to blooms of phytoplankton that could impact the area by reducing the amount of light available to corals and seagrasses, and for macroalgae outcompeting and eventually replacing corals. One of the goals of this project is to integrate the biogeographic information with data on stressors (e.g., chemical contaminants as well as nutrients. Correlations between stressors such as nutrients and the abundance of seagrasses and/or benthic algae is scheduled to be assessed in the final integrated assessment for this project. In any case, efforts are needed to reduce the amount of nutrients entering the STEER, particularly from residential and commercial areas, and also from the live aboard vessels.

Results from the monitoring of sedimentation indicated that terrigenous material accounted for roughly 60 - 70% of the material found in the traps, highlighting the role of terrestrial inputs to the STEER. Terrigenous inputs to the sediment traps in the STEER appear higher than other studies that have been conducted in nearby St. John, USVI, and also in the Guanica Bay area in Puerto Rico, highlighting the magnitude of terrigenous input to the STEER. The percent terrigenous material in the sediment traps was higher in both Mangrove Lagoon and Benner Bay compared to the other locations in the STEER. It is likely that in addition to inputs of sediment from the surrounding watershed, resuspended sediments as a result of storm (wave and wind activity) or boat traffic (Benner Bay) are likely contributing to the terrigenous material found in the traps as well.

The average daily accumulation rates in the sediments traps were higher in Benner Bay than at all the other sites in the STEER, including Mangrove Lagoon. The mean accumulation rate and the terrigenous accumulation rate were negatively correlated with longitude, and positively correlated with latitude, indicating those rates tended to be higher in the western and nearshore portions of the study area.

There are steep hillsides in the area around northern Benner Bay that have and are likely still contributing sediments to the STEER. In addition, this area also contains numerous marinas and boat yards. The boat traffic in and out of this portion of the STEER may be contributing as a result of sediment resuspension. Follow up work in 2013 for another part of the STEER project, in which sediment cores were taken, revealed a thick layer of silt and clay over older shell hash in sediment cores from northern Benner Bay, testifying to historic changes in land use that have resulted in increased transport of terrigenous material to the STEER.

As with nutrients, there did not appear to be a good correlation between sediment deposition and rainfall. A stream gauge in the watershed would help with understanding the relationship between streamflow, rainfall and sediment delivery.

The deposition of sediment over time in terms of percent deposition (i.e., terrigenous, carbonate and organic) was fairly constant, particularly for Mangrove Lagoon and Benner Bay, with terrigenous material being the major component (~70%) found in the sediment traps. It would appear that the lack of substantial variation in the sources (terrestrial versus carbonate) in the Mangrove Lagoon and Benner Bay traps could indicate a continuous input of terrestrially-derived sediments at these two sites as a result of runoff, resuspension of sediments from storms, tides or boats, or a combination of these phenomena.

A comparison of the sedimentation rates in the STEER with a proposed threshold for coral reefs (10 mg/cm<sup>2</sup>/day), indicated that none of the sites monitored in the STEER had an average above this value, although Benner Bay (9.02 mg/cm<sup>2</sup>/day) was fairly close. Individual samples in Benner Bay exceeded the value roughly 32% of the time, indicating that corals in Benner Bay may be experiencing high levels of sedimentation, meaning they are having to expend resources to remove the sediments, impacting energy available for other functions like growth and reproduction. Additional work is needed to better understand the patterns and possible effects of sedimentation throughout Benner Bay, including associations between coral species richness/diversity and sedimentation.

Results from the monthly monitoring of total suspended solids or TSS indicated, like the nutrient and sedimentation monitoring, that the western and more nearshore portions of the STEER had higher levels.

Benner Bay and Mangrove Lagoon had higher TSS levels than the other sites monitored in the STEER. Results indicated that the TSS levels in the STEER were similar to those found in studies in St. John and St. Croix. As with sedimentation, there was no correlation between TSS and rainfall. A streamflow gauge or more complete rainfall data from a station near the STEER would be helpful. This type of information, particularly stream gauge data, would help in the assessment of relationships between the amount of water being delivered to the STEER from Turpentine Gut, for example, and increases in parameters like TSS.

None of the sites in the STEER had a mean value that exceeded a proposed TSS threshold for coral reefs of 10 mg/l. The highest was Benner Bay with a mean of 8.32 mg/l. From this, the Benner Bay area would appear to be most at risk from elevated levels of TSS in the STEER.

The results from this part of the project in the STEER show that nutrients in particular, along with sedimentation are elevated and may be impacting the reefs. The Mangrove Lagoon and Benner Bay areas are of particular concern and in need of additional management efforts to reduce the input of these environmental stressors in order to ensure a healthy, functioning ecosystem, one that continues to provide recreational opportunities for those that live on St. Thomas, as well as for visitors to this popular island destination.

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Appendix A. Water quality data from sampling in the STEER.

Date	Site	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	Dissolved Oxygen (mg/l)	Temperature (C°)	Comments/Notes
1/16/12	Saint James	35.68	N/A	8.07	3.5	0.19	6.47	26.26	
1/16/12	Saint James	35.69	N/A	8.06	3.4	0.21	6.45	26.27	
1/16/12	Saint James	35.67	N/A	8.06	3.4	0.2	6.46	26.26	
1/16/12	Saint James	35.68	N/A	8.05	3.4	0.17	6.46	26.28	
1/16/12	Cowpet Bay	35.68	N/A	8.07	3.5	0.24	6.4	26.14	
1/16/12	Cowpet Bay	35.68	N/A	8.06	3.5	0.24	6.43	26.16	
1/16/12	Cowpet Bay	35.67	N/A	8.06	3.4	0.24	6.4	26.17	
1/16/12	Cowpet Bay	35.68	N/A	8.05	3.5	0.23	6.42	26.18	
1/16/12	Rotto Cay	35.61	N/A	8.03	3.6	0.2	6.52	26.33	
1/16/12	Rotto Cay	35.6	N/A	8.03	3.4	0.21	6.45	26.33	
1/16/12	Rotto Cay	35.61	N/A	8.03	3.7	0.21	6.47	26.33	
1/16/12	Rotto Cay	35.61	N/A	8.02	3.5	0.2	6.46	26.33	
1/16/12	Benner Bay	35.51	N/A	8.2	2.3	0.29	8.69	27.5	
1/16/12	Benner Bay	35.51	N/A	8.2	2.3	0.29	8.67	27.5	
1/16/12	Benner Bay	35.51	N/A	8.2	2.3	0.28	8.64	27.47	
1/16/12	Benner Bay	35.52	N/A	8.2	2.3	0.3	8.69	27.45	
1/16/12	Benner Bay	34.92	N/A	7.95	2.3	2.52	6.97	27.05	
1/16/12	Mangrove Lagoon	34.92	N/A	7.95	2.3	3.15	6.97	27.02	
1/16/12	Mangrove Lagoon	34.92	N/A	7.94	2.2	3.2	7.06	27.04	
1/16/12	Mangrove Lagoon	34.91	N/A	7.94	2.3	3	7.02	27.08	
2/16/2012	Saint James	35.97	N/A	8.21	3.4	0.2	6.46	26.05	
2/16/2012	Saint James	35.96	N/A	8.21	3.4	0.2	6.46	26.05	
2/16/2012	Saint James	35.96	N/A	8.21	3.4	0.17	6.47	26.07	
2/16/2012	Saint James	35.96	N/A	8.21	3.3	0.17	6.48	26.07	
2/16/2012	Cowpet Bay	35.97	N/A	8.22	3.4	0.19	6.48	26.12	
2/16/2012	Cowpet Bay	35.97	N/A	8.22	3.4	0.2	6.46	26.12	
2/16/2012	Cowpet Bay	35.97	N/A	8.21	3.4	0.21	6.47	26.12	
2/16/2012	Cowpet Bay	35.97	N/A	8.22	3.3	0.19	6.47	26.12	
2/16/2012	Cowpet Bay	35.99	N/A	8.2	3.4	0.14	6.42	26.33	
2/16/2012	Rotto Cay	35.97	N/A	8.2	3.4	0.12	6.56	26.36	
2/16/2012	Rotto Cay	36	N/A	8.2	3.3	0.12	6.46	26.34	
2/16/2012	Rotto Cay	35.98	N/A	8.2	3.3	0.12	6.44	26.32	
2/16/2012	Rotto Cay	35.95	N/A	8.09	2.4	4.71	7.08	27.68	
2/16/2012	Mangrove Lagoon	35.96	N/A	8.09	2.4	4.62	7.15	27.72	
2/16/2012	Mangrove Lagoon	35.96	N/A	8.1	2.3	4.83	7.21	27.76	
2/16/2012	Mangrove Lagoon	35.95	N/A	8.1	2.3	4.73	7.21	27.76	
2/16/2012	Benner Bay	36.02	N/A	8.15	2.4	1.43	6.3	27.41	
2/16/2012	Benner Bay	36.04	N/A	8.15	2.4	1.39	6.23	27.4	
2/16/2012	Benner Bay	36.04	N/A	8.12	2.5	1.89	5.98	27.42	
2/16/2012	Benner Bay	36.04	N/A	8.12	2.5	2.31	6.02	27.42	
3/14/2012	Mangrove Lagoon	36.71	71.9	8.15	2.5	3.32	5.47	25.44	possible turbidity calibration issues
3/14/2012	Mangrove Lagoon	36.71	90.4	8.18	2.5	3.27	5.45	25.47	possible turbidity calibration issues
3/14/2012	Mangrove Lagoon	36.71	252.3	8.18	2.6	3.08	5.39	25.46	possible turbidity calibration issues
3/14/2012	Benner Bay	36.49	106.3	8.19	2.5	0.39	5.52	25.77	possible turbidity calibration issues
3/14/2012	Benner Bay	36.5	105.2	8.21	2.5	0.37	5.51	25.78	possible turbidity calibration issues
3/14/2012	Benner Bay	36.5	105.2	8.17	2.5	0.6	5.21	25.94	possible turbidity calibration issues
3/14/2012	Benner Bay	36.51	106.8	8.18	2.5	0.58	5.33	25.95	possible turbidity calibration issues
3/14/2012	Saint James	36.25	79.7	8.31	2.9	0.08	6.81	26.16	possible turbidity calibration issues
3/14/2012	Saint James	36.25	79.8	8.3	2.9	0.09	6.75	26.12	possible turbidity calibration issues
3/14/2012	Saint James	36.26	74.5	8.29	3	0.1	6.76	26.14	possible turbidity calibration issues

Abbreviation: N/A, not available



Appendix A. Water quality data from sampling in the STEER (cont.).

Date	Site	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	Dissolved Oxygen (mg/l)	Temperature (C°)	Comments/Notes
3/14/2012	Little Saint James	36.23	87	8.32	2.9	0.1	6.96	26.43	possible turbidity calibration issues
3/14/2012	Little Saint James	36.23	78.3	8.31	3	0.08	6.95	26.42	possible turbidity calibration issues
3/14/2012	Little Saint James	36.19	75	8.3	3	0.1	6.92	26.46	possible turbidity calibration issues
3/14/2012	Little Saint James	36.24	72.7	8.29	2.9	0.1	6.92	26.49	possible turbidity calibration issues
3/14/2012	Little Saint James	36.24	73	8.31	2.9	0.11	6.9	26.4	possible turbidity calibration issues
3/14/2012	Little Saint James	36.25	70	8.3	2.9	0.12	6.9	26.34	possible turbidity calibration issues
3/14/2012	Rotto Cay	36.26	84.5	8.3	3	0.14	7	26.23	possible turbidity calibration issues
3/14/2012	Rotto Cay	36.24	78.9	8.3	3	0.16	7.01	26.23	possible turbidity calibration issues
3/14/2012	Rotto Cay	36.25	76	8.29	3	0.17	7	26.23	possible turbidity calibration issues
3/14/2012	Rotto Cay	36.26	73.8	8.31	2.9	0.16	6.98	26.23	possible turbidity calibration issues
3/14/2012	Rotto Cay	36.26	72.3	8.27	2.9	0.15	6.99	26.23	possible turbidity calibration issues
3/14/2012	Cowpet Bay	36.25	80.4	8.3	3	0.21	6.86	26.29	possible turbidity calibration issues
3/14/2012	Cowpet Bay	36.25	74.2	8.3	3.1	0.23	6.89	26.29	possible turbidity calibration issues
3/14/2012	Cowpet Bay	36.25	73.7	8.31	3	0.22	6.89	26.29	possible turbidity calibration issues
3/14/2012	Cowpet Bay	36.25	73	8.3	3	0.21	6.88	26.3	possible turbidity calibration issues
4/16/2012	Little Saint James	36.56	64.5	7.96	1.5	0.34	6.45	26.66	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Little Saint James	36.55	64.9	7.96	1.5	0.36	6.47	26.65	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Little Saint James	36.55	72.3	7.97	1.8	0.33	6.47	26.65	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Little Saint James	36.56	82.4	7.96	1.9	0.35	6.46	26.67	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Saint James	36.55	92.5	7.96	2	0.41	6.41	26.65	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Saint James	36.55	95.2	7.95	2	0.37	6.42	26.64	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Saint James	36.56	132.5	7.95	2	0.9	6.44	26.66	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Saint James	36.55	130.6	7.95	1.9	0.36	6.45	26.66	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Saint James	36.57	120.1	7.95	2	0.33	6.45	26.66	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Cowpet Bay	36.59	116.5	7.95	1.2	0.29	6.67	26.67	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Cowpet Bay	36.58	106.2	7.95	1.2	0.34	6.67	26.66	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Cowpet Bay	36.58	99	7.95	1.1	0.33	6.68	26.66	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Cowpet Bay	36.57	96.5	7.95	1.2	0.34	6.67	26.67	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Rotto Cay	36.6	115.9	7.97	1.9	0.22	6.82	26.7	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Rotto Cay	36.6	100.2	7.97	1.9	0.25	6.78	26.7	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Rotto Cay	36.61	94.3	7.96	2	0.24	6.81	26.72	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Rotto Cay	36.61	87.8	7.96	2	0.24	6.81	26.72	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Rotto Cay	36.61	87.8	7.96	2	0.24	6.81	26.72	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Mangrove Lagoon	37.2	102.3	7.86	1	1.53	6.85	27.03	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Mangrove Lagoon	37.21	95.1	7.86	1	1.54	6.95	27.03	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Mangrove Lagoon	37.2	98.8	7.86	1	1.61	6.85	27.03	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Mangrove Lagoon	37.22	97.8	7.86	1	1.59	6.85	27.03	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Benner Bay	36.67	93.8	8.02	0.6	0.19	7.77	27.27	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Benner Bay	36.67	82.7	8.02	0.6	0.2	7.82	27.27	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Benner Bay	36.68	76.4	8.01	0.6	0.19	7.83	27.29	possible turbidity calibration issues, pH recalibrated 1st week of April
4/16/2012	Benner Bay	36.67	75.2	8.01	0.6	0.22	7.81	27.31	possible turbidity calibration issues, pH recalibrated 1st week of April
5/25/2012	Little Saint James	35.92	0	8.14	0.7	0.06	6.62	27.8	Note: due to problems with the HydroLab datasonde on May 17, water quality data were unable to be collected during monthly sampling fieldwork. Data were re-collected on May 25th.
5/25/2012	Little Saint James	35.9	0	8.11	0.8	0.04	6.64	27.81	Note: Because of the draft of the vessel used on May 25th, Mangrove Lagoon was unable to be re-sampled with the HydroLab.
5/25/2012	Little Saint James	35.89	0	8.14	0.9	0.04	6.63	27.81	Note: The replacement HydroLab used on May 25th was calibrated just prior to use.
5/25/2012	Saint James	35.94	0	8.12	0.6	0.06	6.59	27.82	Note: All water samples for nutrient and TSS analysis were collected during the May 17th sediment collection trip.
5/25/2012	Saint James	35.94	0	8.14	0.9	0.05	6.59	27.81	
5/25/2012	Saint James	35.86	0	8.12	0.7	0.04	6.59	27.81	
5/25/2012	Cowpet Bay	36.05	0	8.13	0.4	0.11	6.71	28.12	
5/25/2012	Cowpet Bay	36.12	0.2	8.13	0.5	0.11	6.69	28.18	
5/25/2012	Cowpet Bay	36.36	0	8.13	0.5	0.1	6.72	28.15	
5/25/2012	Rotto Cay	36	0	8.14	0.8	0.27	6.77	28.32	

Abbreviation: N/A, not available

Appendix A. Water quality data from sampling in the STEER (cont.).

Date	Site	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	Dissolved Oxygen (mg/l)	Temperature (C°)	Comments/Notes
5/25/2012	Rotto Cay	36.03	0	8.14	0.8	0.27	6.76	28.35	
5/25/2012	Rotto Cay	35.95	0	8.13	0.8	0.27	6.77	28.36	
5/25/2012	Benner Bay	35.9	24.1	8.08	0.8	0.67	6.95	29.93	
5/25/2012	Benner Bay	36.01	24.6	8.1	0.8	0.6	6.94	29.93	
5/25/2012	Benner Bay	35.94	15	8.09	0.7	0.58	6.93	29.92	
6/18/2012	Mangrove Lagoon	37.23	6	8.01	2.2	1.77	5.94	29.99	
6/18/2012	Mangrove Lagoon	37.21	6.1	8.02	2.2	1.65	5.93	30	
6/18/2012	Mangrove Lagoon	37.21	6.2	8.03	2.2	1.76	5.91	29.99	
6/18/2012	Benner Bay	36.76	10.3	8.03	2.2	1.15	5.51	30.26	
6/18/2012	Benner Bay	36.75	10.4	8.03	2.2	1.05	5.5	30.26	
6/18/2012	Benner Bay	36.75	10.2	8.03	2.2	1.07	5.49	30.26	
6/18/2012	Benner Bay	36.76	10.1	8.03	2.2	1.06	5.46	30.26	
6/18/2012	Saint James	36.06	1.5	8.13	2.9	0.17	6.31	28.74	
6/18/2012	Saint James	36.06	1.7	8.13	2.8	0.18	6.28	28.74	
6/18/2012	Saint James	36.06	1.8	8.13	2.9	0.18	6.29	28.75	
6/18/2012	Saint James	36.06	2	8.13	3	0.2	6.29	28.74	
6/18/2012	Saint James	36.07	2	8.13	2.8	0.18	6.28	28.74	
6/18/2012	Little Saint James	36.05	1.3	8.14	2.9	0.1	6.52	28.88	
6/18/2012	Little Saint James	36.02	1.4	8.13	2.9	0.11	6.55	28.87	
6/18/2012	Little Saint James	36.05	1.5	8.13	2.9	0.1	6.52	28.84	
6/18/2012	Little Saint James	36.05	1.7	8.14	2.9	0.11	6.51	28.89	
6/18/2012	Little Saint James	36.04	1.8	8.14	2.9	0.11	6.52	28.9	
6/18/2012	Cowpet Bay	36.12	2.2	8.14	3.1	0.2	6.51	29.22	
6/18/2012	Cowpet Bay	36.12	2.2	8.14	3.1	0.18	6.51	29.22	
6/18/2012	Cowpet Bay	36.12	2.3	8.14	3	0.13	6.53	29.23	
6/18/2012	Cowpet Bay	36.13	2.5	8.14	3.1	0.21	6.55	29.23	
6/18/2012	Rotto Cay	36.15	2.5	8.15	3	0.2	6.63	29.55	
6/18/2012	Rotto Cay	36.15	2.4	8.15	3	0.2	6.65	29.56	
6/18/2012	Rotto Cay	36.15	2.5	8.15	3.1	0.17	6.6	29.57	
6/18/2012	Rotto Cay	36.15	2.5	8.15	3.1	0.18	6.62	29.56	
6/18/2012	Rotto Cay	36.15	2.9	8.14	3	0.2	6.7	29.55	
6/18/2012	Rotto Cay	36.16	2.8	8.14	3.1	0.21	6.74	29.55	
6/18/2012	Rotto Cay	36.15	2.8	8.14	2.8	0.21	6.69	29.56	
6/18/2012	Rotto Cay	36.15	2.8	8.14	3	0.21	6.69	29.55	
7/16/2012	Benner Bay	35.88	12.3	8.01	2.2	1.44	5.39	30.56	
7/16/2012	Benner Bay	35.89	11.8	8	2.2	1.42	5.43	30.57	
7/16/2012	Benner Bay	35.9	12	8.01	2.2	1.39	5.3	30.57	
7/16/2012	Benner Bay	35.9	12	8.01	2.2	1.36	5.29	30.57	
7/16/2012	Mangrove Lagoon	36.16	6	8.11	2.2	0.98	7.26	31.05	
7/16/2012	Mangrove Lagoon	36.17	6.1	8.11	2.2	1.02	7.31	31.05	
7/16/2012	Mangrove Lagoon	36.17	6.6	8.11	2.2	1.03	7.33	31.07	
7/16/2012	Mangrove Lagoon	36.16	6.3	8.12	2.2	0.93	7.29	31.1	
7/16/2012	Saint James	35.34	0.6	8.09	2.4	0.17	6.25	28.95	
7/16/2012	Saint James	35.34	1.1	8.06	2.5	0.16	6.24	28.95	
7/16/2012	Saint James	35.34	1.3	8.09	2.5	0.15	6.27	28.96	
7/16/2012	Saint James	35.34	1.6	8.09	2.5	0.15	6.27	28.95	
7/16/2012	Little Saint James	35.35	2.4	8.09	2.4	0.13	6.45	29.06	
7/16/2012	Little Saint James	35.34	2.5	8.09	2.3	0.12	6.48	29.07	
7/16/2012	Little Saint James	35.36	2.5	8.09	2.4	0.12	6.49	29.09	
7/16/2012	Little Saint James	35.35	2.5	8.1	2.4	0.12	6.49	29.09	

Abbreviation: N/A, not available

Appendix A. Water quality data from sampling in the STEER (cont.).

Date	Site	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	Dissolved Oxygen (mg/l)	Temperature (C°)	Comments/Notes
7/16/2012	Cowpet Bay	35.46	2.4	8.14	2.5	0.39	6.63	29.64	
7/16/2012	Cowpet Bay	35.45	2.4	8.15	2.4	0.4	6.62	29.63	
7/16/2012	Cowpet Bay	35.45	2.4	8.15	2.5	0.39	6.62	29.63	
7/16/2012	Cowpet Bay	35.45	2.4	8.15	2.4	0.39	6.62	29.63	
7/16/2012	Rotto Cay	35.46	0	8.14	2.6	0.32	6.54	29.5	
7/16/2012	Rotto Cay	35.46	0.3	8.19	2.6	0.32	6.51	29.5	
7/16/2012	Rotto Cay	35.47	1.7	8.12	2.5	0.32	6.51	29.5	
8/17/2012	Saint James	35.86	2.2	7.97	3.3	0.15	6.2	29.18	
8/17/2012	Saint James	35.86	2.3	8.02	3.3	0.15	6.21	29.16	
8/17/2012	Saint James	35.86	2.3	8.04	3.4	0.15	6.21	29.15	
8/17/2012	Little Saint James	35.81	1.5	8.06	3.3	0.15	6.39	29.18	
8/17/2012	Little Saint James	35.81	1.9	8.06	3.3	0.14	6.37	29.14	
8/17/2012	Little Saint James	35.8	2.1	8.06	3.2	0.17	6.41	29.12	
8/17/2012	Little Saint James	35.81	2.1	8.06	3.3	0.14	6.41	29.13	
8/17/2012	Cowpet Bay	35.86	0.5	8.04	3.3	0.15	6.27	29.56	
8/17/2012	Cowpet Bay	35.86	0.8	8.04	3.3	0.15	6.25	29.56	
8/17/2012	Cowpet Bay	35.85	1.2	8.04	3.4	0.15	6.26	29.54	
8/17/2012	Cowpet Bay	35.85	1.3	8.04	3.3	0.16	6.25	29.53	
8/17/2012	Mangrove Lagoon	36.29	5.6	8.07	2.3	1.04	7.78	32.33	
8/17/2012	Mangrove Lagoon	36.3	6.6	8.08	2.2	1.1	7.81	32.35	
8/17/2012	Mangrove Lagoon	36.3	6.6	8.07	2.3	1.07	7.85	32.36	
8/17/2012	Mangrove Lagoon	36.29	6.6	8.08	2.3	1.1	7.86	32.35	
8/17/2012	Benner Bay	36.05	5.7	7.99	2.3	1.73	6.68	31.89	
8/17/2012	Benner Bay	36.05	6.5	7.99	2.3	1.68	6.68	31.9	
8/17/2012	Benner Bay	36.06	6.8	7.99	2.3	1.65	6.68	31.89	
8/17/2012	Rotto Cay	35.88	0	8.06	3.5	0.3	6.64	30.11	
8/17/2012	Rotto Cay	35.88	0	8.05	3.2	0.3	6.65	30.11	
8/17/2012	Rotto Cay	35.9	0.2	8.05	3.2	0.28	6.62	30.11	
9/14/2012	Little Saint James	35.8	2.3	8.15	1.2	0.15	6.17	29.62	
9/14/2012	Little Saint James	35.81	3	8.15	1.1	0.16	6.17	29.63	
9/14/2012	Saint James	35.78	2.8	8.14	1.2	0.16	6.15	29.61	
9/14/2012	Saint James	35.79	2.6	8.14	1.2	0.15	6.12	29.62	
9/14/2012	Cowpet Bay	35.82	1.1	8.14	1.1	0.15	6.11	29.88	
9/14/2012	Cowpet Bay	35.81	1	8.13	1.2	0.17	6.12	29.9	
9/14/2012	Rotto Cay	35.83	0.4	8.13	1.2	0.14	6.22	30.3	
9/17/2012	Mangrove Lagoon	36.11	15.7	8.01	0.5	1.24	6.01	32.81	Loss of battery power during RC
9/17/2012	Mangrove Lagoon	36.09	14.2	8.03	0.5	1.17	6.29	32.86	ML and BB data collected 9/17/12
9/17/2012	Mangrove Lagoon	36.09	14.1	8.03	0.5	1.21	6.59	32.84	
9/17/2012	Mangrove Lagoon	36.1	13.9	8.04	0.5	1.21	6.72	32.86	
9/17/2012	Benner Bay	36.18	8.2	7.97	0.8	1.87	5.75	32.45	
9/17/2012	Benner Bay	36.18	8.5	7.98	0.8	1.85	5.74	32.44	
9/17/2012	Benner Bay	36.17	9.1	7.97	0.7	1.88	5.77	32.45	
9/17/2012	Benner Bay	36.17	9.4	7.98	0.8	1.9	5.79	32.44	
10/29/2012	Cowpet Bay	36.55				0.23	6.12	29.2	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Cowpet Bay	36.56		8.16		0.12	6.14	29.19	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Cowpet Bay	36.56		8.17		0.16	6.13	29.19	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Cowpet Bay	36.56		8.16		0.2	6.15	29.19	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Cowpet Bay	36.57		8.16		0.15	6.15	29.2	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Saint James	36.48		8.2		0.1	6.3	29.22	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m

Abbreviation: N/A, not available

Appendix A. Water quality data from sampling in the STEER (cont.).

Date	Site	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	Dissolved Oxygen (mg/l)	Temperature (C°)	Comments/Notes
10/29/2012	Saint James	36.47		8.19		0.12	6.3	29.22	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Saint James	36.48		8.16		0.17	6.29	29.23	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Saint James	36.47		8.18		0.16	6.26	29.24	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Saint James	36.47		8.18		0.12	6.25	29.24	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Little Saint James	36.5		8.17		0.19	6.4	29.54	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Little Saint James	36.48		8.17		0.2	6.4	29.57	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Little Saint James	36.49		8.17		0.19	6.41	29.55	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Little Saint James	36.49		8.17		0.18	6.4	29.57	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Rotto Cay	36.49		8.16		0.32	6.6	29.56	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Rotto Cay	36.52		8.16		0.31	6.57	29.56	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Rotto Cay	36.49		8.16		0.3	6.6	29.57	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Rotto Cay	36.48		8.16		0.3	6.59	29.59	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Rotto Cay	36.47		8.16		0.3	6.6	29.51	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Mangrove Lagoon	36.86		8.05		1.12	6.42	31.24	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Mangrove Lagoon	36.88		8.05		1.23	6.38	31.24	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Mangrove Lagoon	36.86		8.06		1.08	6.39	31.24	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Mangrove Lagoon	36.86		8.06		0.94	6.42	31.23	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Benner Bay	36.75		8.07		2.15	6.25	30.81	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Benner Bay	36.75		8.07		2.13	6.28	30.81	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Benner Bay	36.75		8.07		2.24	6.26	30.81	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
10/29/2012	Benner Bay	36.75		8.07		2.28	6.23	30.82	Turbidity and depth data not recorded. Readings taken at usual depth of approx. 1m
12/1/2012	Little Saint James	36.68	25.2	8.5	1.1	0.11	6.07	28.47	Turbidity readings inappropriately high
12/1/2012	Little Saint James	36.68	29.5	8.5	1	0.16	6.07	28.47	Turbidity readings inappropriately high
12/1/2012	Little Saint James	36.68	30.8	8.5	1	0.21	6.07	28.46	Turbidity readings inappropriately high
12/1/2012	Saint James	36.69	32.4	8.52	0.9	0.21	6.16	28.47	Turbidity readings inappropriately high
12/1/2012	Saint James	36.7	34.4	8.52	0.9	0.2	6.16	28.47	Turbidity readings inappropriately high
12/1/2012	Saint James	36.71	38.1	8.52	0.9	0.23	6.15	28.46	Turbidity readings inappropriately high
12/1/2012	Saint James	36.69	36.9	8.52	0.9	0.2	6.14	28.48	Turbidity readings inappropriately high
12/1/2012	Saint James	36.7	36.5	8.52	0.8	0.23	6.16	28.48	Turbidity readings inappropriately high
12/1/2012	Cowpet Bay	36.68	37.2	8.51	0.8	0.21	6.02	28.45	Turbidity readings inappropriately high
12/1/2012	Cowpet Bay	36.68	38.6	8.51	0.9	0.22	6.01	28.44	Turbidity readings inappropriately high
12/1/2012	Cowpet Bay	36.68	39.3	8.51	0.9	0.22	6.03	28.44	Turbidity readings inappropriately high
12/1/2012	Cowpet Bay	36.69	39.1	8.51	0.8	0.22	6.03	28.45	Turbidity readings inappropriately high
12/1/2012	Rotto Cay	36.71	28.6	8.51	0.9	0.19	0	28.5	Turbidity readings inappropriately high
12/1/2012	Rotto Cay	36.7	30.3	8.51	0.9	0.19	4.02	28.5	Turbidity readings inappropriately high
12/1/2012	Rotto Cay	36.71	31.5	8.51	1	0.19	0	28.5	Turbidity readings inappropriately high
12/1/2012	Rotto Cay	36.7	32.2	8.51	0.9	0.2	3.4	28.5	Turbidity readings inappropriately high
12/1/2012	Benner Bay	36.75	45.6	8.38	0.9	1.45	5.24	28.49	Turbidity readings inappropriately high
12/1/2012	Benner Bay	36.75	43.2	8.37	0.9	1.14	5.23	28.52	Turbidity readings inappropriately high
12/1/2012	Benner Bay	36.76	43.3	8.38	0.7	1.08	5.34	28.53	Turbidity readings inappropriately high
12/1/2012	Benner Bay	36.74	40.8	8.36	0.9	1.34	5.25	28.55	Turbidity readings inappropriately high
12/1/2012	Mangrove Lagoon	36.33	41.6	8.29	1	1.75	5.52	28.52	Turbidity readings inappropriately high
12/1/2012	Mangrove Lagoon	36.34	37.5	8.28	1	1.26	5.49	28.53	Turbidity readings inappropriately high
12/1/2012	Mangrove Lagoon	36.33	37.8	8.29	1	1.33	5.52	28.55	Turbidity readings inappropriately high
12/1/2012	Mangrove Lagoon	36.34	37.6	8.28	1	1.21	5.52	28.55	Turbidity readings inappropriately high
1/7/2013	Benner Bay Dock	37.85	9.7	8.51	0.7	2.94	1.74	26.52	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Benner Bay Dock	37.85	11.2	8.51	0.7	3.05	0	26.52	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Saint James	37.38	0	8.81	1.3	0.18	4.01	26.77	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Saint James	37.36	0	8.81	1.3	0.19	3.57	26.77	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Saint James	37.38	0	8.82	1.5	0.21	1.19	26.77	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC

Abbreviation: N/A, not available

Appendix A. Water quality data from sampling in the STEER (cont.).

Date	Site	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	Dissolved Oxygen (mg/l)	Temperature (C°)	Comments/Notes
1/7/2013	Saint James	37.37	0	8.82	1.5	0.18	6.28	26.77	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Little Saint James	37.37	0	8.83	1.5	0.17	0	26.85	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Little Saint James	37.36	0	8.83	1.3	0.15	4.65	26.86	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Little Saint James	37.37	0	8.83	1.3	0.16	4.21	26.85	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Little Saint James	37.36	0	8.83	1.4	0.16	1.83	26.87	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Cowpet Bay	37.36	0	8.83	1.3	0.28	0	26.76	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Cowpet Bay	37.36	0	8.83	1.4	0.28	1.19	26.77	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Cowpet Bay	37.36	0	8.83	1.4	0.3	8.45	26.76	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Cowpet Bay	37.34	0	8.83	1.4	0.33	3.52	26.76	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Cowpet Bay	37.36	0	8.83	1.4	0.31	3.46	26.75	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Mangrove Lagoon	37.76	0	8.76	0.6	0.59	1.22	26.94	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Mangrove Lagoon	37.75	0	8.76	0.6	0.56	0.38	26.95	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Mangrove Lagoon	37.76	0	8.76	0.6	0.6	0	26.94	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Mangrove Lagoon	37.75	0	8.76	0.6	0.57	9.77	26.94	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Benner Bay	37.44	21	8.86	0.8	0.46	4.6	27.34	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Benner Bay	37.45	26.7	8.86	0.8	0.47	0	27.34	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Benner Bay	37.44	28.5	8.86	0.5	0.43	9.66	27.34	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Benner Bay	37.44	29.2	8.86	0.5	0.43	0	27.34	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Benner Bay	37.44	31.3	8.86	0.4	0.46	7.18	27.35	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Benner Bay	37.45	32.2	8.86	0.4	0.46	4.75	27.34	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Benner Bay	37.44	32.1	8.86	0.7	0.42	3.69	27.35	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
1/7/2013	Benner Bay	37.44	31.8	8.86	0.7	0.45	8.45	27.35	DO data questionable; turbidity sensor malfunctioning, loss of battery power just before RC
2/25/2013	Benner Bay	34	N/A	N/A	N/A	N/A	N/A	29.3	Data taken from handheld refractometer and dive computer due to Hydrolab being out for service, and calibration issues with YSI probes.
2/25/2013	Mangrove Lagoon	33	N/A	N/A	N/A	N/A	N/A	30.3	Data taken from handheld refractometer and dive computer due to Hydrolab being out for service, and calibration issues with YSI probes.
2/25/2013	Little Saint James	34.5	N/A	N/A	N/A	N/A	N/A	28	Data taken from handheld refractometer and dive computer due to Hydrolab being out for service, and calibration issues with YSI probes.
2/25/2013	Saint James	35	N/A	N/A	N/A	N/A	N/A	28	Data taken from handheld refractometer and dive computer due to Hydrolab being out for service, and calibration issues with YSI probes.
2/25/2013	Cowpet Bay	34.5	N/A	N/A	N/A	N/A	N/A	29	Data taken from handheld refractometer and dive computer due to Hydrolab being out for service, and calibration issues with YSI probes.
2/25/2013	Rotto Cay	34.5						29.5	Data taken from handheld refractometer and dive computer due to Hydrolab being out for service, and calibration issues with YSI probes.
4/7/2013	Mangrove Lagoon	35.92	1.7	8.08	0.9	0.8	7.43	29.78	Hydrolab returned and re-calibrated just prior to data collection
4/7/2013	Mangrove Lagoon	35.93	1.7	8.07	0.9	0.81	7.47	29.78	
4/7/2013	Mangrove Lagoon	35.94	2.7	8.11	0.9	0.77	7.44	29.87	
4/7/2013	Benner Bay	36.01	14.1	8	0.9	2.15	6.2	29.79	
4/7/2013	Benner Bay	36.02	3000	8.01	0.9	1.78	6.33	29.83	Turbidity readings inappropriately high
4/7/2013	Benner Bay	36.03	228.2	8.01	0.9	9999999	6.25	29.83	Turbidity and chlorophyll a readings inappropriately high
4/7/2013	Saint James	35.81	0.7	8.05	1	0.11	6.63	27.04	
4/7/2013	Saint James	35.81	0.8	8.05	0.9	0.1	6.62	27.06	
4/7/2013	Saint James	35.81	0.9	8.04	1	0.1	6.63	27.06	
4/7/2013	Saint James	35.8	0.8	8.05	0.9	0.11	6.63	27.07	
4/7/2013	Saint James	35.81	1.4	8.04	1.1	0.12	6.6	27.05	
4/7/2013	Little Saint James	35.82	1.2	8.08	1	0.16	6.61	27.06	
4/7/2013	Little Saint James	35.78	1.4	8.06	1	0.13	6.67	27.1	
4/7/2013	Little Saint James	35.81	1.6	8.06	0.9	0.12	6.63	27.12	
4/7/2013	Little Saint James	35.82	1.7	8.05	0.9	0.13	6.64	27.1	
4/7/2013	Cowpet Bay	35.86	0.3	8.04	1	0.17	6.82	27.67	
4/7/2013	Cowpet Bay	35.87	0.6	8.09	0.9	0.2	6.82	27.66	
4/7/2013	Cowpet Bay	35.86	1	8.06	1	0.21	6.82	27.67	
4/7/2013	Cowpet Bay	35.86	1.1	8.09	0.9	0.21	6.78	27.67	
4/7/2013	Cowpet Bay	35.86	1.7	8.08	1	0.24	6.82	27.68	Loss of battery power before RC
4/7/2013	Cowpet Bay	35.86	1.6	8.09	0.9	0.24	6.82	27.68	Hydrolab calibrated just before data collection
5/13/2013	Mangrove Lagoon	29.56	1.6	8.07	0.8	4.32	8.99	30.83	

Abbreviation: N/A, not available

Appendix A. Water quality data from sampling in the STEER (cont.).

Date	Site	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	Dissolved Oxygen (mg/l)	Temperature (C°)	Comments/Notes
5/13/2013	Mangrove Lagoon	28.36	1.8	8.08	0.8	4.99	8.75	30.76	
5/13/2013	Mangrove Lagoon	27.74	2.2	8.08	0.7	4.91	9.27	30.7	
5/13/2013	Mangrove Lagoon	31.81	3.2	8.17	0.7	4.04	9.97	31.75	
5/13/2013	Benner Bay	33.38	2.7	8.01	0.2	2.38	6.63	30.93	
5/13/2013	Benner Bay	33.38	2.9	8.01	0.2	2.42	6.64	30.93	
5/13/2013	Benner Bay	33.46	3.2	8.02	0.2	2.52	6.7	30.9	
5/13/2013	Benner Bay	33.49	3.7	8.02	0.2	2.51	6.72	30.91	
5/13/2013	Saint James	35.92	0.4	8.09	1.3	0.12	6.6	27.77	
5/13/2013	Saint James	35.92	0.6	8.08	1.2	0.14	6.55	27.73	
5/13/2013	Saint James	35.9	0.8	8.08	1.3	0.15	6.52	27.71	
5/13/2013	Saint James	35.9	1.2	8.09	1.2	0.14	6.58	27.77	
5/13/2013	Little Saint James	35.9	1.6	8.1	1.7	0.14	6.69	27.78	
5/13/2013	Little Saint James	35.9	1.6	8.09	1.7	0.13	6.65	27.79	
5/13/2013	Little Saint James	35.9	1.6	8.09	1.6	0.14	6.64	27.81	
5/13/2013	Little Saint James	35.89	1.7	8.09	1.7	0.14	6.69	27.76	
5/13/2013	Little Saint James	35.9	1.7	8.09	1.6	0.11	6.78	28.01	
5/13/2013	Cowpelt Bay	35.92	0.8	8.09	2	0.16	6.6	28.25	
5/13/2013	Cowpelt Bay	35.89	1.1	8.08	1.9	0.19	6.55	28.37	
5/13/2013	Cowpelt Bay	35.93	1.2	8.08	1.9	0.2	6.54	28.41	
5/13/2013	Rotto Cay	35.51	1.5	8.06	1.7	0.63	6.24	29.32	
5/13/2013	Rotto Cay	35.51	1.8	8.06	1.6	0.62	6.17	29.32	
5/13/2013	Rotto Cay	35.53	2	8.06	1.6	0.63	6.19	29.32	
5/13/2013	Rotto Cay	35.52	2.1	8.06	1.8	0.67	6.15	29.34	
6/22/2013	Mangrove Lagoon	34.7	0	7.98	0.5	0.98	6.35	28.57	Hydrohab calibrated just prior to data collection
6/22/2013	Mangrove Lagoon	34.68	0	7.96	0.6	1.02	6.32	28.58	
6/22/2013	Mangrove Lagoon	34.68	0	7.97	0.5	1.07	6.3	28.58	
6/22/2013	Mangrove Lagoon	34.67	0.5	7.97	0.6	1.09	6.34	28.58	
6/22/2013	Mangrove Lagoon	34.69	0.7	7.98	0.6	1.04	6.32	28.58	
6/22/2013	Mangrove Lagoon	34.69	0.8	7.99	0.6	0.96	6.31	28.6	
6/22/2013	Mangrove Lagoon	34.7	0.8	7.99	0.6	0.95	6.37	28.6	
6/22/2013	Mangrove Lagoon	34.73	0.9	8.02	0.5	0.89	6.69	28.65	
6/22/2013	Benner Bay	35.94	2.7	7.98	0.5	0.54	5.92	28.77	
6/22/2013	Benner Bay	35.95	2.8	7.98	0.5	0.53	5.93	28.76	
6/22/2013	Benner Bay	35.96	2.9	7.97	0.5	0.57	5.93	28.75	
6/22/2013	Benner Bay	35.94	2.9	7.98	0.6	0.58	5.92	28.75	
6/22/2013	Benner Bay	35.94	3	7.98	0.6	0.56	5.93	28.75	
6/22/2013	Benner Bay	35.95	3.2	7.98	0.6	0.54	5.94	28.76	
6/22/2013	Benner Bay	35.95	3.3	7.98	0.5	0.58	5.94	28.75	
6/22/2013	Benner Bay	35.95	3.4	7.98	0.5	0.56	5.93	28.74	
6/22/2013	Benner Bay	35.93	4	7.98	0.5	0.54	5.97	28.75	
6/22/2013	Saint James	36.04	0	8.04	0.7	0.06	6.44	28.04	
6/22/2013	Saint James	36.05	0	8.04	0.6	0.07	6.44	28.04	
6/22/2013	Saint James	36.06	0	8.03	0.6	0.29	6.45	28.07	
6/22/2013	Saint James	36.07	0	8.03	0.5	0.59	6.44	28.08	
6/22/2013	Little Saint James	36.04	0	8.04	0.5	0.13	6.61	28.17	
6/22/2013	Little Saint James	36.06	0	8.04	0.6	0.13	6.6	28.24	
6/22/2013	Little Saint James	36.07	0	8.04	0.6	0.12	6.63	28.25	
6/22/2013	Little Saint James	36.06	0.9	8.04	0.6	0.15	6.61	28.14	
6/22/2013	Little Saint James	36.05	1.5	8.04	0.6	0.13	6.6	28.19	
6/22/2013	Little Saint James	36.04	1.6	8.04	0.6	0.15	6.66	28.23	

Abbreviation: N/A, not available

Appendix A. Water quality data from sampling in the STEER (cont.).

Date	Site	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	Dissolved Oxygen (mg/l)	Temperature (C°)	Comments/Notes
6/22/2013	Cowpet Bay	36.06	0	8.03	0.7	0.33	6.73	28.09	
6/22/2013	Cowpet Bay	36.07	0	8.04	0.8	0.32	6.72	28.09	
6/22/2013	Cowpet Bay	36.06	0	8.04	0.8	0.31	6.71	28.09	
6/22/2013	Cowpet Bay	36.06	0	8.04	0.7	0.32	6.72	28.1	
6/22/2013	Cowpet Bay	36.06	0	8.03	0.8	0.33	6.71	28.09	
6/22/2013	Cowpet Bay	36.06	0	8.04	0.8	0.32	6.7	28.09	
6/22/2013	Rotto Cay	36.04	0	8.06	0.7	0.3	6.84	28.13	
6/22/2013	Rotto Cay	36.03	0	8.05	0.9	0.3	6.85	28.13	
6/22/2013	Rotto Cay	36.03	0	8.05	0.7	0.29	6.86	28.13	
6/22/2013	Rotto Cay	36.05	1.4	8.04	0.7	0.26	6.85	28.13	
6/22/2013	Rotto Cay	36.04	1.7	8.04	0.8	0.32	6.86	28.14	
8/17/2013	Saint James	34.84	0	8.12	1.4	0.66	6.26	29.22	
8/17/2013	Saint James	34.84	0	8.12	1.2	0.66	6.25	29.21	
8/17/2013	Saint James	34.86	0	8.13	1.3	0.68	6.25	29.21	
8/17/2013	Saint James	34.84	0	8.13	1.3	0.68	6.28	29.22	
8/17/2013	Saint James	34.85	0	8.13	1.3	0.66	6.31	29.22	
8/17/2013	Saint James	34.85	0	8.12	1.3	0.7	6.32	29.22	
8/17/2013	Little Saint James	34.86	0.6	8.13	1	0.64	6.39	29.37	
8/17/2013	Little Saint James	34.85	0.6	8.12	0.9	0.64	6.33	29.35	
8/17/2013	Little Saint James	34.88	0.6	8.13	1	0.63	6.32	29.4	
8/17/2013	Little Saint James	34.87	0.7	8.12	1	0.66	6.31	29.31	
8/17/2013	Little Saint James	34.85	0.9	8.12	1.1	0.64	6.34	29.41	
8/17/2013	Little Saint James	34.86	0.9	8.12	1.2	0.62	6.35	29.38	
8/17/2013	Little Saint James	34.77	0.9	8.12	1.2	0.64	6.43	29.39	
8/17/2013	Little Saint James	34.88	0.9	8.12	1.2	0.63	6.42	29.49	
8/17/2013	Little Saint James	34.85	0.9	8.12	1.1	0.65	6.46	29.49	
8/17/2013	Cowpet Bay	34.86	0	8.11	1	0.65	6.37	29.46	
8/17/2013	Cowpet Bay	34.86	0	8.11	1.1	0.67	6.37	29.47	
8/17/2013	Cowpet Bay	34.86	0	8.1	1.1	0.67	6.41	29.47	
8/17/2013	Cowpet Bay	34.85	0	8.1	1.1	0.65	6.38	29.47	
8/17/2013	Cowpet Bay	34.86	0.5	8.1	1	0.59	6.44	29.48	
8/17/2013	Cowpet Bay	34.86	0.5	8.1	1	0.66	6.45	29.48	
8/17/2013	Cowpet Bay	34.86	0.8	8.09	1.1	0.65	6.39	29.5	
8/17/2013	Rotto Cay	34.82	0	8.09	2	0.65	6.52	29.75	
8/17/2013	Rotto Cay	34.81	0.2	8.09	2	0.62	6.51	29.77	
8/17/2013	Rotto Cay	34.82	0.6	8.09	1.9	0.63	6.57	29.81	
8/17/2013	Rotto Cay	34.83	0.7	8.09	1.9	0.63	6.56	29.81	
8/17/2013	Rotto Cay	34.82	0.9	8.08	1.9	0.64	6.55	29.82	
8/17/2013	Benner Bay	34.86	6	8.01	1.1	1.62	6.18	31.81	
8/17/2013	Benner Bay	34.85	1.2	8	0.9	1.58	6.19	32	
8/17/2013	Benner Bay	34.9	1.7	8.02	0.9	1.68	6.45	31.92	
8/17/2013	Benner Bay	34.86	2.3	7.99	0.9	1.67	6.56	31.84	
10/8/2013	Saint James	34.98	2.9	7.91	0.6	0.65	6.46	30.07	Loss of battery power before ML
10/8/2013	Saint James	34.97	2.9	7.92	0.6	0.61	6.44	30.07	
10/8/2013	Saint James	34.97	3	7.92	0.9	0.67	6.43	30.08	
10/8/2013	Saint James	34.97	3.1	7.92	0.8	0.61	6.42	30.07	
10/8/2013	Little Saint James	35.03	2.5	7.95	0.7	0.67	6.36	29.97	
10/8/2013	Little Saint James	35.02	2.5	7.95	0.8	0.68	6.36	29.96	
10/8/2013	Little Saint James	35.02	2.5	7.95	0.7	0.68	6.37	29.97	
10/8/2013	Little Saint James	35.02	2.6	7.95	0.6	0.68	6.36	29.97	

Abbreviation: N/A, not available

Appendix A. Water quality data from sampling in the STEER (cont.).

Date	Site	Salinity (ppt)	Turbidity (NTU)	pH	Depth (m)	Chlorophyll a (µg/l)	Dissolved Oxygen (mg/l)	Temperature (C°)	Comments/Notes
10/8/2013	Little Saint James	35.05	2.8	7.95	0.6	0.7	6.36	29.97	
10/8/2013	Little Saint James	34.99	3	7.95	0.7	0.7	6.38	29.97	
10/8/2013	Little Saint James	35.03	3.2	7.95	0.7	0.67	6.38	29.97	
10/8/2013	Little Saint James	35.06	3.6	7.94	0.7	0.72	6.34	29.95	
10/8/2013	Cowpet Bay	35.13	1.4	7.98	0.5	0.84	6.87	30.5	
10/8/2013	Cowpet Bay	35.17	1.7	7.98	0.7	0.82	6.85	30.5	
10/8/2013	Cowpet Bay	35.17	2.2	7.98	0.7	0.81	6.85	30.5	
10/8/2013	Cowpet Bay	35.17	2.5	7.98	0.5	0.81	6.86	30.5	
10/8/2013	Rotto Cay	35.03	2.7	7.95	0.6	1.02	6.64	31.12	
10/8/2013	Rotto Cay	35.04	2.9	7.94	0.6	1.03	6.64	31.12	
10/8/2013	Rotto Cay	35.03	3.1	7.94	0.6	1.05	6.63	31.08	
10/8/2013	Rotto Cay	35.06	3.3	7.94	0.6	1.04	6.65	31.09	
10/8/2013	Rotto Cay	35.02	3.5	7.94	0.6	1.04	6.65	31.1	
10/12/2013	Mangrove Lagoon	34.7	2.1	7.82	0.6	1.92	5.97	30.24	
10/12/2013	Mangrove Lagoon	34.73	2.3	7.84	0.6	1.87	6.04	30.26	
10/12/2013	Mangrove Lagoon	34.75	2.5	7.86	0.6	1.93	6.27	30.31	
10/12/2013	Mangrove Lagoon	34.73	2.5	7.86	0.6	1.95	6.38	30.31	
10/12/2013	Benner Bay	35.06	3.6	7.78	0.8	0.95	5.03	30.71	
10/12/2013	Benner Bay	35.05	3.7	7.76	0.6	0.93	5.12	30.7	
10/12/2013	Benner Bay	35.04	4	7.75	0.5	0.97	4.91	30.72	
10/12/2013	Benner Bay	35.04	4.1	7.74	0.6	0.98	4.71	30.73	
10/12/2013	Benner Bay	35.04	4.1	7.74	0.6	0.98	4.7	30.72	
11/17/2013	Saint James	34.9	0*	8.21	0.8	0.68	6.86	28.61	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Saint James	34.92	0*	8.21	0.9	0.68	6.85	28.61	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Saint James	34.9	0*	8.21	0.9	0.7	6.87	28.61	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Saint James	34.88	0*	8.21	0.8	0.68	6.85	28.62	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Little Saint James	34.83	0*	8.2	0.8	0.67	6.86	28.69	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Little Saint James	34.85	0*	8.21	0.8	0.68	6.88	28.69	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Little Saint James	34.83	0*	8.2	0.8	0.68	6.87	28.69	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Cowpet Bay	34.85	0*	8.19	0.8	0.68	6.83	28.78	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Cowpet Bay	34.86	0.6*	8.19	0.8	0.68	6.83	28.8	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Cowpet Bay	34.86	0.5*	8.19	0.8	0.66	6.83	28.79	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Rotto Cay	34.85	0*	8.18	0.9	0.68	7.15	28.78	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Rotto Cay	34.86	0*	8.19	0.9	0.71	7.19	28.78	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet
11/17/2013	Rotto Cay	34.86	0*	8.18	0.8	0.71	7.16	28.78	Turbidity sensor malfunctioning time logged incorrectly - inserted times from field log sheet

Abbreviation: N/A, not available



## Appendix B. Nutrient concentrations detected in water samples from the STEER.

Site	Site Code	Collection Date	Nutrient Species					
			NH <sub>4</sub> <sup>+</sup>		NO <sub>2</sub> <sup>-</sup>		Urea	
			conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L N)
Saint James	SJ	01/16/12	0.310	0.004	0.141	0.002	0.328	0.005
Cowpet Bay	CB	01/16/12	0.024	0.000	0.184	0.003	0.491	0.007
Rotto Cay	RC	01/16/12	0.008	0.000	0.216	0.003	0.339	0.005
Benner Bay	BB	01/16/12	0.220	0.003	0.182	0.003	0.368	0.005
Benner Bay (duplicate)	BB	01/16/12	0.566	0.008	0.190	0.003	0.324	0.005
Mangrove Lagoon	ML	01/16/12	3.93	0.055	0.266	0.004	0.263	0.004
Saint James	SJ	02/16/12	0.064	0.001	0.255	0.004	0.545	0.008
Saint James (duplicate)	SJ	02/16/12	0.032	0.000	0.147	0.002	0.400	0.006
Cowpet Bay	CB	02/16/12	0.110	0.002	0.165	0.002	0.526	0.007
Rotto Cay	RC	02/16/12	0.159	0.002	0.183	0.003	0.360	0.005
Benner Bay	BB	02/16/12	1.08	0.015	0.050	0.001	0.348	0.005
Mangrove Lagoon	ML	02/16/12	2.62	0.037	0.244	0.003	0.421	0.006
Saint James	SJ	03/14/12	0.125	0.002	0.133	0.002	0.290	0.004
Little Saint James	LSJ	03/14/12	0.044	0.001	0.017	0.000	0.488	0.007
Cowpet Bay	CB	03/14/12	0.096	0.001	0.174	0.002	0.154	0.002
Cowpet Bay (duplicate)	CB	03/14/12	0.117	0.002	0.168	0.002	0.367	0.005
Rotto Cay	RC	03/14/12	0.121	0.002	0.157	0.002	0.353	0.005
Benner Bay	BB	03/14/12	0.829	0.012	0.303	0.004	0.308	0.004
Mangrove Lagoon	ML	03/14/12	1.22	0.017	0.046	0.001	0.592	0.008
Saint James	SJ	04/16/12	0.056	0.001	0.037	0.001	0.215	0.003
Little Saint James	LSJ	04/16/12	0.094	0.001	0.123	0.002	0.338	0.005
Cowpet Bay	CB	04/16/12	0.093	0.001	0.144	0.002	0.766	0.011
Rotto Cay	RC	04/16/12	0.702	0.010	0.043	0.001	0.189	0.003
Benner Bay	BB	04/16/12	0.700	0.010	0.122	0.002	0.483	0.007
Mangrove Lagoon	ML	04/16/12	1.69	0.024	0.232	0.003	0.216	0.003
Mangrove Lagoon (duplicate)	ML	04/16/12	0.735	0.010	0.340	0.005	2.25	0.031
Little Saint James	LSJ	05/25/12	0.715	0.010	0.050	0.001	0.538	0.008
Saint James	SJ	05/25/12	0.549	0.008	0.052	0.001	0.487	0.007
Cowpet Bay	CB	05/25/12	0.815	0.011	0.055	0.001	0.352	0.005
Cowpet Bay (duplicate)	CB	05/25/12	0.567	0.008	0.000	0.000	0.251	0.004
Rotto Cay	RC	05/25/12	2.81	0.039	0.014	0.000	1.61	0.023
Benner Bay	BB	05/25/12	3.03	0.042	0.109	0.002	0.598	0.008
Mangrove Lagoon	ML	05/25/12	1.98	0.028	0.088	0.001	0.183	0.003
Little Saint James	LSJ	06/18/12	0.586	0.008	0.000	0.000	0.306	0.004
Little Saint James (duplicate)	LSJ	06/18/12	0.629	0.009	0.000	0.000	0.467	0.007
Saint James	SJ	06/18/12	0.805	0.011	0.041	0.001	0.429	0.006
Cowpet Bay	CB	06/18/12	0.971	0.014	0.000	0.000	0.276	0.004
Rotto Cay	RC	06/18/12	0.664	0.009	0.000	0.000	0.342	0.005
Benner Bay	BB	06/18/12	2.69	0.038	0.141	0.002	0.570	0.008
Mangrove Lagoon	ML	06/18/12	2.55	0.036	0.198	0.003	0.567	0.008
Little Saint James	LSJ	08/17/12	0.898	0.013	0.000	0.000	0.221	0.003

Nutrient species: NO<sub>3</sub><sup>-</sup>, nitrate; HPO<sub>4</sub><sup>=</sup>, orthophosphate; HSiO<sub>3</sub><sup>-</sup>, silicate; NH<sub>4</sub><sup>+</sup>, ammonium; NO<sub>2</sub><sup>-</sup>, nitrite.

## Appendix B. Nutrient concentrations detected in water samples from the STEER (continued).

Site	Site Code	Collection Date	Nutrient Species					
			NH <sub>4</sub> <sup>+</sup>		NO <sub>2</sub> <sup>-</sup>		Urea	
			conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L N)
Saint James	SJ	08/17/12	1.02	0.014	0.000	0.000	0.341	0.005
Cowpet Bay	CB	08/17/12	0.962	0.013	0.000	0.000	0.250	0.004
Rotto Cay	RC	08/17/12	0.915	0.013	0.000	0.000	0.221	0.003
Benner Bay	BB	08/17/12	1.26	0.018	0.075	0.001	0.449	0.006
Benner Bay (duplicate)	BB	08/17/12	1.44	0.020	0.069	0.001	0.433	0.006
Mangrove Lagoon	ML	08/17/12	0.825	0.012	0.000	0.000	0.281	0.004
Little Saint James	LSJ	09/14/12	0.900	0.013	0.000	0.000	0.272	0.004
Saint James	SJ	09/14/12	0.765	0.011	0.000	0.000	0.272	0.004
Cowpet Bay	CB	09/14/12	1.06	0.015	0.000	0.000	0.197	0.003
Rotto Cay	RC	09/14/12	0.723	0.010	0.000	0.000	0.262	0.004
Benner Bay	BB	09/14/12	1.33	0.019	0.091	0.001	3.520	0.049
Benner Bay (duplicate)	BB	09/14/12	1.86	0.026	0.166	0.002	4.456	0.062
Mangrove Lagoon	ML	09/14/12	3.20	0.045	0.311	0.004	1.247	0.017
Little Saint James	LSJ	10/29/12	1.07	0.015	0.000	0.000	0.322	0.005
Saint James	SJ	10/29/12	1.17	0.016	0.000	0.000	0.245	0.003
Cowpet Bay	CB	10/29/12	0.911	0.013	0.000	0.000	0.181	0.003
Cowpet Bay (duplicate)	CB	10/29/12	1.09	0.015	0.000	0.000	0.179	0.003
Rotto Cay	RC	10/29/12	0.982	0.014	0.000	0.000	0.485	0.007
Benner Bay	BB	10/29/12	1.72	0.024	0.067	0.001	0.471	0.007
Mangrove Lagoon	ML	10/29/12	1.62	0.023	0.041	0.001	0.330	0.005
Mangrove Lagoon	ML	12/01/12	1.10	0.015	0.019	0.000	0.239	0.003
Benner Bay	BB	12/01/12	1.37	0.019	0.095	0.001	0.362	0.005
Rotto Cay	RC	12/01/12	0.156	0.002	0.024	0.000	0.000	0.000
Cowpet Bay	CB	12/01/12	0.101	0.001	0.016	0.000	0.000	0.000
Saint James	SJ	12/01/12	0.177	0.002	0.008	0.000	0.000	0.000
Little Saint James	LSJ	12/01/12	0.140	0.002	0.013	0.000	0.000	0.000
Mangrove Lagoon	ML	01/07/13	1.46	0.020	0.064	0.001	0.086	0.001
Benner Bay	BB	01/07/13	0.313	0.004	0.029	0.000	0.000	0.000
Rotto Cay	RC	01/07/13	0.052	0.001	0.007	0.000	0.059	0.001
Rotto Cay (duplicate)	RC	01/07/13	0.096	0.001	0.000	0.000	0.000	0.000
Cowpet Bay	CB	01/07/13	0.003	0.000	0.000	0.000	0.000	0.000
Saint James	SJ	01/07/13	0.545	0.008	0.000	0.000	0.000	0.000
Little Saint James	LSJ	01/07/13	0.266	0.004	0.000	0.000	0.000	0.000
Mangrove Lagoon	ML	02/25/13	0.976	0.014	0.017	0.000	0.000	0.000
Benner Bay	BB	02/25/13	0.547	0.008	0.108	0.002	0.240	0.003
Benner Bay (duplicate)	BB	02/25/13	0.854	0.012	0.104	0.001	0.172	0.002
Rotto Cay	RC	02/25/13	1.11	0.016	0.024	0.000	0.000	0.000
Cowpet Bay	CB	02/25/13	0.230	0.003	0.016	0.000	0.112	0.002
Saint James	SJ	02/25/13	0.000	0.000	0.012	0.000	0.055	0.001
Little Saint James	LSJ	02/25/13	0.014	0.000	0.018	0.000	0.000	0.000
Mangrove Lagoon	ML	04/07/13	1.06	0.015	0.000	0.000	0.018	0.000

Nutrient species: NO<sub>3</sub><sup>-</sup>, nitrate; HPO<sub>4</sub><sup>=</sup>, orthophosphate; HSiO<sub>3</sub><sup>-</sup>, silicate; NH<sub>4</sub><sup>+</sup>, ammonium; NO<sub>2</sub><sup>-</sup>, nitrite.

## Appendix B. Nutrient concentrations detected in water samples from the STEER (continued).

Site	Site Code	Collection Date	Nutrient Species					
			NH <sub>4</sub> <sup>+</sup>		NO <sub>2</sub> <sup>-</sup>		Urea	
			conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L N)
Benner Bay	BB	04/07/13	0.456	0.006	0.069	0.001	0.221	0.003
Rotto Cay	RC	04/07/13	0.000	0.000	0.006	0.000	0.225	0.003
Cowpet Bay	CB	04/07/13	0.486	0.007	0.005	0.000	0.049	0.001
Saint James	SJ	04/07/13	0.655	0.009	0.001	0.000	0.290	0.004
Little Saint James	LSJ	04/07/13	0.207	0.003	0.000	0.000	0.000	0.000
Little Saint James (duplicate)	LSJ	04/07/13	0.000	0.000	0.000	0.000	0.000	0.000
Little Saint James	LSJ	05/13/13	0.263	0.004	0.018	0.000	0.126	0.002
Saint James	SJ	05/13/13	0.243	0.003	0.005	0.000	0.257	0.004
Cowpet Bay	CB	05/13/13	0.989	0.014	0.010	0.000	0.000	0.000
Cowpet Bay (duplicate)	CB	05/13/13	2.10	0.029	0.006	0.000	0.431	0.006
Rotto Cay	RC	05/13/13	0.232	0.003	0.005	0.000	0.000	0.000
Benner Bay	BB	05/13/13	0.352	0.005	0.104	0.001	0.000	0.000
Mangrove Lagoon	ML	05/13/13	1.46	0.020	0.000	0.000	0.000	0.000
Little Saint James	LSJ	06/22/13	0.185	0.003	0.000	0.000	0.000	0.000
Saint James	SJ	06/22/13	0.229	0.003	0.000	0.000	0.000	0.000
Saint James	SJ	06/22/13	0.216	0.003	0.000	0.000	0.000	0.000
Cowpet Bay	CB	06/22/13	0.673	0.009	0.000	0.000	0.000	0.000
Rotto Cay	RC	06/22/13	0.000	0.000	0.000	0.000	0.000	0.000
Benner Bay	BB	06/22/13	0.428	0.006	0.023	0.000	0.000	0.000
Mangrove Lagoon	ML	06/22/13	0.143	0.002	0.000	0.000	0.000	0.000
Little Saint James	LSJ	08/17/13	0.912	0.013	0.000	0.000	0.000	0.000
Saint James	SJ	08/17/13	0.109	0.002	0.000	0.000	0.000	0.000
Cowpet Bay	CB	08/17/13	0.143	0.002	0.000	0.000	0.000	0.000
Rotto Cay	RC	08/17/13	0.000	0.000	0.008	0.000	0.000	0.000
Benner Bay	BB	08/17/13	0.375	0.005	0.110	0.002	0.000	0.000
Mangrove Lagoon	ML	08/17/13	0.920	0.013	0.000	0.000	0.056	0.001
Mangrove Lagoon (duplicate)	ML	08/17/13	0.357	0.005	0.000	0.000	0.424	0.006
Little Saint James	LSJ	10/08/13	0.590	0.008	0.000	0.000	0.000	0.000
Little Saint James (duplicate)	LSJ	10/08/13	0.000	0.000	0.000	0.000	0.000	0.000
Saint James	SJ	10/08/13	0.000	0.000	0.000	0.000	0.007	0.000
Cowpet Bay	CB	10/08/13	0.004	0.000	0.000	0.000	0.123	0.002
Rotto Cay	RC	10/08/13	0.000	0.000	0.000	0.000	0.000	0.000
Benner Bay	BB	10/12/13	1.88	0.026	0.073	0.001	0.131	0.002
Mangrove Lagoon	ML	10/12/13	0.000	0.000	0.000	0.000	0.000	0.000
Little Saint James	LSJ	11/17/13	0.708	0.010	0.000	0.000	0.231	0.003
Saint James	SJ	11/17/13	1.20	0.017	0.000	0.000	0.358	0.005
Cowpet Bay	CB	11/17/13	0.000	0.000	0.000	0.000	0.240	0.003
Rotto Cay	RC	11/17/13	0.153	0.002	0.000	0.000	0.279	0.004
Benner Bay	BB	11/25/13	0.401	0.006	0.104	0.001	0.016	0.000
Mangrove Lagoon	ML	11/25/13	0.470	0.007	0.175	0.002	0.000	0.000
Mangrove Lagoon (duplicate)	ML	11/25/13	0.192	0.003	0.169	0.002	0.040	0.001

Nutrient species: NO<sub>3</sub><sup>-</sup>, nitrate; HPO<sub>4</sub><sup>=</sup>, orthophosphate; HSiO<sub>3</sub><sup>-</sup>, silicate; NH<sub>4</sub><sup>+</sup>, ammonium; NO<sub>2</sub><sup>-</sup>, nitrite.

## Appendix B. Nutrient concentrations detected in water samples from the STEER (continued).

Site	Site Code	Collection Date	Nutrient Species					
			NO <sub>3</sub> <sup>-</sup>		HPO <sub>4</sub> <sup>=</sup>		HSiO <sub>3</sub> <sup>-</sup>	
			conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L P)	conc. (umol/L)	conc. (mg/L SiO <sub>3</sub> )
Saint James	SJ	01/16/12	0.044	0.001	0.257	0.008	2.28	0.173
Cowpet Bay	CB	01/16/12	0.725	0.010	0.230	0.007	2.08	0.158
Rotto Cay	RC	01/16/12	0.057	0.001	0.203	0.006	1.88	0.143
Benner Bay	BB	01/16/12	0.250	0.004	0.221	0.007	2.35	0.179
Benner Bay (duplicate)	BB	01/16/12	0.090	0.001	0.242	0.007	2.29	0.175
Mangrove Lagoon	ML	01/16/12	2.18	0.030	0.288	0.009	2.40	0.183
Saint James	SJ	02/16/12	1.34	0.019	0.181	0.006	1.93	0.147
Saint James (duplicate)	SJ	02/16/12	1.71	0.024	0.226	0.007	3.75	0.285
Cowpet Bay	CB	02/16/12	0.265	0.004	0.180	0.006	1.87	0.143
Rotto Cay	RC	02/16/12	0.704	0.010	0.249	0.008	1.77	0.134
Benner Bay	BB	02/16/12	0.488	0.007	0.229	0.007	3.57	0.271
Mangrove Lagoon	ML	02/16/12	1.11	0.016	0.319	0.010	2.87	0.218
Saint James	SJ	03/14/12	1.16	0.016	0.220	0.007	2.91	0.221
Little Saint James	LSJ	03/14/12	0.459	0.006	0.192	0.006	1.47	0.112
Cowpet Bay	CB	03/14/12	0.838	0.012	0.289	0.009	2.47	0.188
Cowpet Bay (duplicate)	CB	03/14/12	0.508	0.007	0.172	0.005	1.67	0.127
Rotto Cay	RC	03/14/12	0.058	0.001	0.205	0.006	1.71	0.130
Benner Bay	BB	03/14/12	0.459	0.006	0.321	0.010	4.21	0.320
Mangrove Lagoon	ML	03/14/12	0.509	0.007	0.183	0.006	1.67	0.127
Saint James	SJ	04/16/12	0.254	0.004	0.236	0.007	1.29	0.098
Little Saint James	LSJ	04/16/12	0.105	0.001	0.273	0.008	0.89	0.068
Cowpet Bay	CB	04/16/12	0.660	0.009	0.187	0.006	1.04	0.079
Rotto Cay	RC	04/16/12	0.579	0.008	0.135	0.004	0.79	0.060
Benner Bay	BB	04/16/12	0.587	0.008	0.181	0.006	2.50	0.190
Mangrove Lagoon	ML	04/16/12	1.84	0.026	0.280	0.009	3.64	0.277
Mangrove Lagoon (duplicate)	ML	04/16/12	0.096	0.001	0.158	0.005	4.04	0.307
Little Saint James	LSJ	05/25/12	1.35	0.019	0.575	0.018	0.89	0.067
Saint James	SJ	05/25/12	1.61	0.023	0.417	0.013	8.63	0.657
Cowpet Bay	CB	05/25/12	1.07	0.015	0.415	0.013	2.11	0.160
Cowpet Bay (duplicate)	CB	05/25/12	1.28	0.018	0.304	0.009	1.09	0.083
Rotto Cay	RC	05/25/12	1.38	0.019	0.284	0.009	1.64	0.125
Benner Bay	BB	05/25/12	1.32	0.018	0.338	0.010	5.34	0.407
Mangrove Lagoon	ML	05/25/12	1.46	0.020	0.234	0.007	12.06	0.917
Little Saint James	LSJ	06/18/12	1.42	0.020	0.328	0.010	0.26	0.020
Little Saint James (duplicate)	LSJ	06/18/12	1.53	0.021	0.325	0.010	0.27	0.021
Saint James	SJ	06/18/12	1.55	0.022	0.333	0.010	0.34	0.026
Cowpet Bay	CB	06/18/12	1.49	0.021	0.327	0.010	0.58	0.044
Rotto Cay	RC	06/18/12	1.57	0.022	0.339	0.011	0.37	0.028
Benner Bay	BB	06/18/12	1.69	0.024	0.376	0.012	5.78	0.440
Mangrove Lagoon	ML	06/18/12	2.00	0.028	0.394	0.012	4.56	0.347
Little Saint James	LSJ	08/17/12	1.69	0.02	0.440	0.014	0.54	0.041

Nutrient species: NO<sub>3</sub><sup>-</sup>, nitrate; HPO<sub>4</sub><sup>=</sup>, orthophosphate; HSiO<sub>3</sub><sup>-</sup>, silicate; NH<sub>4</sub><sup>+</sup>, ammonium; NO<sub>2</sub><sup>-</sup>, nitrite.

## Appendix B. Nutrient concentrations detected in water samples from the STEER (continued).

Site	Site Code	Collection Date	Nutrient Species					
			NO <sub>3</sub> <sup>-</sup>		HPO <sub>4</sub> <sup>=</sup>		HSiO <sub>3</sub> <sup>-</sup>	
			conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L P)	conc. (umol/L)	conc. (mg/L SiO <sub>3</sub> )
Saint James	SJ	08/17/12	1.58	0.022	0.411	0.013	0.517	0.039
Cowpet Bay	CB	08/17/12	1.01	0.014	0.297	0.009	0.586	0.045
Rotto Cay	RC	08/17/12	1.04	0.015	0.325	0.010	1.76	0.134
Benner Bay	BB	08/17/12	0.992	0.014	0.297	0.009	6.33	0.482
Benner Bay (duplicate)	BB	08/17/12	0.945	0.013	0.304	0.009	6.14	0.467
Mangrove Lagoon	ML	08/17/12	1.06	0.015	0.265	0.008	8.47	0.644
Little Saint James	LSJ	09/14/12	1.03	0.014	0.304	0.009	0.992	0.075
Saint James	SJ	09/14/12	1.16	0.016	0.314	0.010	1.04	0.079
Cowpet Bay	CB	09/14/12	1.05	0.015	0.305	0.009	1.04	0.079
Rotto Cay	RC	09/14/12	0.976	0.014	0.304	0.009	0.617	0.047
Benner Bay	BB	09/14/12	1.02	0.014	0.302	0.009	3.90	0.296
Benner Bay (duplicate)	BB	09/14/12	0.958	0.013	0.476	0.015	3.44	0.262
Mangrove Lagoon	ML	09/14/12	0.893	0.013	0.150	0.005	2.93	0.223
Little Saint James	LSJ	10/29/12	1.01	0.014	0.410	0.013	1.29	0.098
Saint James	SJ	10/29/12	0.937	0.013	0.276	0.009	1.23	0.094
Cowpet Bay	CB	10/29/12	0.852	0.012	0.309	0.010	1.06	0.081
Cowpet Bay (duplicate)	CB	10/29/12	0.923	0.013	0.311	0.010	1.04	0.079
Rotto Cay	RC	10/29/12	0.937	0.013	0.288	0.009	0.796	0.061
Benner Bay	BB	10/29/12	0.887	0.012	0.311	0.010	3.29	0.250
Mangrove Lagoon	ML	10/29/12	0.915	0.013	0.293	0.009	3.78	0.288
Mangrove Lagoon	ML	12/01/12	0.000	0.000	0.178	0.006	2.07	0.158
Benner Bay	BB	12/01/12	0.326	0.005	0.184	0.006	2.51	0.191
Rotto Cay	RC	12/01/12	0.139	0.002	0.126	0.004	0.000	0.000
Cowpet Bay	CB	12/01/12	0.014	0.000	0.118	0.004	0.005	0.000
Saint James	SJ	12/01/12	0.343	0.005	0.245	0.008	0.230	0.017
Little Saint James	LSJ	12/01/12	0.135	0.002	0.129	0.004	0.123	0.009
Mangrove Lagoon	ML	01/07/13	0.000	0.000	0.080	0.002	0.125	0.010
Benner Bay	BB	01/07/13	0.018	0.000	0.218	0.007	0.000	0.000
Rotto Cay	RC	01/07/13	0.000	0.000	0.067	0.002	0.000	0.000
Rotto Cay (duplicate)	RC	01/07/13	0.000	0.000	0.010	0.000	0.000	0.000
Cowpet Bay	CB	01/07/13	0.000	0.000	0.000	0.000	0.000	0.000
Saint James	SJ	01/07/13	0.008	0.000	0.065	0.002	0.050	0.004
Little Saint James	LSJ	01/07/13	0.000	0.000	0.000	0.000	0.101	0.008
Mangrove Lagoon	ML	02/25/13	0.000	0.000	0.064	0.002	0.896	0.068
Benner Bay	BB	02/25/13	0.301	0.004	0.042	0.001	1.88	0.143
Benner Bay (duplicate)	BB	02/25/13	0.288	0.004	0.063	0.002	1.77	0.134
Rotto Cay	RC	02/25/13	0.104	0.001	0.097	0.003	0.000	0.000
Cowpet Bay	CB	02/25/13	0.000	0.000	0.132	0.004	0.000	0.000
Saint James	SJ	02/25/13	0.000	0.000	0.000	0.000	0.000	0.000
Little Saint James	LSJ	02/25/13	0.056	0.001	0.000	0.000	0.000	0.000
Mangrove Lagoon	ML	04/07/13	0.000	0.000	0.000	0.000	0.321	0.024

Nutrient species: NO<sub>3</sub><sup>-</sup>, nitrate; HPO<sub>4</sub><sup>=</sup>, orthophosphate; HSiO<sub>3</sub><sup>-</sup>, silicate; NH<sub>4</sub><sup>+</sup>, ammonium; NO<sub>2</sub><sup>-</sup>, nitrite.

Appendix B. Nutrient concentrations detected in water samples from the STEER (continued).

Site	Site Code	Collection Date	Nutrient Species					
			NO <sub>3</sub> <sup>-</sup>		HPO <sub>4</sub> <sup>=</sup>		HSiO <sub>3</sub> <sup>-</sup>	
			conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L P)	conc. (umol/L)	conc. (mg/L SiO <sub>3</sub> )
Benner Bay	BB	04/07/13	0.082	0.001	0.000	0.000	1.80	0.137
Rotto Cay	RC	04/07/13	0.000	0.000	0.000	0.000	0.000	0.000
Cowpet Bay	CB	04/07/13	0.148	0.002	0.000	0.000	0.000	0.000
Saint James	SJ	04/07/13	0.000	0.000	0.000	0.000	0.000	0.000
Little Saint James	LSJ	04/07/13	0.000	0.000	0.000	0.000	0.000	0.000
Little Saint James (duplicate)	LSJ	04/07/13	0.000	0.000	0.000	0.000	0.000	0.000
Little Saint James	LSJ	05/13/13	0.178	0.002	0.000	0.000	0.000	0.000
Saint James	SJ	05/13/13	0.176	0.002	0.000	0.000	0.000	0.000
Cowpet Bay	CB	05/13/13	0.198	0.003	0.011	0.000	0.000	0.000
Cowpet Bay (duplicate)	CB	05/13/13	0.238	0.003	0.066	0.002	0.000	0.000
Rotto Cay	RC	05/13/13	0.181	0.003	0.032	0.001	0.312	0.024
Benner Bay	BB	05/13/13	5.27	0.074	0.000	0.000	6.78	0.516
Mangrove Lagoon	ML	05/13/13	30.1	0.422	0.178	0.006	39.84	3.031
Little Saint James	LSJ	06/22/13	0.000	0.000	0.055	0.002	0.000	0.000
Saint James	SJ	06/22/13	0.000	0.000	0.008	0.000	0.000	0.000
Saint James	SJ	06/22/13	0.000	0.000	0.025	0.001	0.000	0.000
Cowpet Bay	CB	06/22/13	0.000	0.000	0.000	0.000	0.000	0.000
Rotto Cay	RC	06/22/13	0.329	0.005	0.023	0.001	0.000	0.000
Benner Bay	BB	06/22/13	0.525	0.007	0.040	0.001	1.43	0.109
Mangrove Lagoon	ML	06/22/13	1.18	0.016	0.000	0.000	3.16	0.241
Little Saint James	LSJ	08/17/13	0.197	0.003	0.000	0.000	0.000	0.000
Saint James	SJ	08/17/13	0.357	0.005	0.059	0.002	0.000	0.000
Cowpet Bay	CB	08/17/13	0.078	0.001	0.049	0.002	0.000	0.000
Rotto Cay	RC	08/17/13	0.059	0.001	0.012	0.000	0.000	0.000
Benner Bay	BB	08/17/13	0.431	0.006	0.000	0.000	3.090	0.235
Mangrove Lagoon	ML	08/17/13	0.011	0.000	0.000	0.000	0.796	0.061
Mangrove Lagoon (duplicate)	ML	08/17/13	0.000	0.000	0.055	0.002	0.759	0.058
Little Saint James	LSJ	10/08/13	0.010	0.000	0.000	0.000	0.464	0.035
Little Saint James (duplicate)	LSJ	10/08/13	0.046	0.001	0.000	0.000	0.597	0.045
Saint James	SJ	10/08/13	0.081	0.001	0.000	0.000	0.706	0.054
Cowpet Bay	CB	10/08/13	0.138	0.002	0.000	0.000	0.500	0.038
Rotto Cay	RC	10/08/13	0.315	0.004	0.000	0.000	0.065	0.005
Benner Bay	BB	10/12/13	0.318	0.004	0.003	0.000	6.48	0.493
Mangrove Lagoon	ML	10/12/13	0.000	0.000	0.000	0.000	20.3	1.547
Little Saint James	LSJ	11/17/13	0.000	0.000	0.000	0.000	1.16	0.088
Saint James	SJ	11/17/13	0.056	0.001	0.000	0.000	0.614	0.047
Cowpet Bay	CB	11/17/13	0.000	0.000	0.000	0.000	0.936	0.071
Rotto Cay	RC	11/17/13	0.000	0.000	0.000	0.000	0.162	0.012
Benner Bay	BB	11/25/13	0.441	0.006	0.000	0.000	1.78	0.135
Mangrove Lagoon	ML	11/25/13	8.16	0.114	0.000	0.000	14.9	1.13
Mangrove Lagoon (duplicate)	ML	11/25/13	7.05	0.099	0.085	0.003	13.1	0.996

Nutrient Species: NO<sub>3</sub><sup>-</sup>, nitrate; HPO<sub>4</sub><sup>=</sup>, orthophosphate; HSiO<sub>3</sub><sup>-</sup>, silicate; NH<sub>4</sub><sup>+</sup>, ammonium; NO<sub>2</sub><sup>-</sup>, nitrite.

## Appendix B. Nutrient concentrations detected in water samples from the STEER (continued).

Site	Site Code	Collection Date	Nutrient Species				
			NO <sub>3</sub> <sup>-</sup> +NO <sub>2</sub> <sup>-</sup> conc. (uM)	Total N		Total P	
				conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L P)
Saint James	SJ	01/16/12	0.185	5.79	0.081	1.60	0.050
Cowpet Bay	CB	01/16/12	0.909	8.51	0.119	1.52	0.047
Rotto Cay	RC	01/16/12	0.273	8.84	0.124	3.75	0.116
Benner Bay	BB	01/16/12	0.432	2.41	0.034	0.351	0.011
Benner Bay (duplicate)	BB	01/16/12	0.280	6.46	0.090	0.414	0.013
Mangrove Lagoon	ML	01/16/12	2.44	12.47	0.175	0.360	0.011
Saint James	SJ	02/16/12	1.59	5.38	0.075	0.332	0.010
Saint James (duplicate)	SJ	02/16/12	1.85	7.67	0.107	0.578	0.018
Cowpet Bay	CB	02/16/12	0.430	17.74	0.248	0.924	0.029
Rotto Cay	RC	02/16/12	0.887	7.94	0.111	0.895	0.028
Benner Bay	BB	02/16/12	0.538	8.72	0.122	0.691	0.021
Mangrove Lagoon	ML	02/16/12	1.36	16.16	0.226	0.435	0.013
Saint James	SJ	03/14/12	1.30	10.54	0.148	0.291	0.009
Little Saint James	LSJ	03/14/12	0.476	4.68	0.066	0.698	0.022
Cowpet Bay	CB	03/14/12	1.01	2.97	0.042	0.255	0.008
Cowpet Bay (duplicate)	CB	03/14/12	0.676	20.42	0.286	0.844	0.026
Rotto Cay	RC	03/14/12	0.215	4.00	0.056	0.421	0.013
Benner Bay	BB	03/14/12	0.762	8.76	0.123	0.561	0.017
Mangrove Lagoon	ML	03/14/12	0.555	5.34	0.075	0.861	0.027
Saint James	SJ	04/16/12	0.291	5.31	0.074	0.662	0.020
Little Saint James	LSJ	04/16/12	0.228	4.02	0.056	0.294	0.009
Cowpet Bay	CB	04/16/12	0.804	3.30	0.046	0.311	0.010
Rotto Cay	RC	04/16/12	0.622	5.31	0.074	1.03	0.032
Benner Bay	BB	04/16/12	0.709	9.27	0.130	0.340	0.011
Mangrove Lagoon	ML	04/16/12	2.07	23.58	0.330	0.342	0.011
Mangrove Lagoon (duplicate)	ML	04/16/12	0.436	11.04	0.155	0.420	0.013
Little Saint James	LSJ	05/25/12	1.40	33.03	0.463	0.308	0.010
Saint James	SJ	05/25/12	1.67	33.50	0.469	0.510	0.016
Cowpet Bay	CB	05/25/12	1.12	21.44	0.300	0.505	0.016
Cowpet Bay (duplicate)	CB	05/25/12	1.28	25.76	0.361	0.469	0.015
Rotto Cay	RC	05/25/12	1.39	37.52	0.526	0.384	0.012
Benner Bay	BB	05/25/12	1.42	18.87	0.264	0.293	0.009
Mangrove Lagoon	ML	05/25/12	1.55	2.34	0.033	0.384	0.012
Little Saint James	LSJ	06/18/12	1.42	9.44	0.132	0.293	0.009
Little Saint James (duplicate)	LSJ	06/18/12	1.53	9.51	0.133	0.316	0.010
Saint James	SJ	06/18/12	1.59	9.08	0.127	0.290	0.009
Cowpet Bay	CB	06/18/12	1.49	16.42	0.230	0.273	0.008
Rotto Cay	RC	06/18/12	1.565	23.15	0.324	0.270	0.008
Benner Bay	BB	06/18/12	1.835	16.53	0.232	0.410	0.013
Mangrove Lagoon	ML	06/18/12	2.200	25.41	0.356	0.304	0.009
Little Saint James	LSJ	08/17/12	1.686	26.56	0.372	0.263	0.008

Nutrient species: NO<sub>3</sub><sup>-</sup>, nitrate; HPO<sub>4</sub><sup>=</sup>, orthophosphate; HSiO<sub>3</sub><sup>-</sup>, silicate; NH<sub>4</sub><sup>+</sup>, ammonium; NO<sub>2</sub><sup>-</sup>, nitrite.

## Appendix B. Nutrient concentrations detected in water samples from the STEER (continued).

Site	Site Code	Collection Date	Nutrient Species				
			NO <sub>3</sub> <sup>-</sup> +NO <sub>2</sub> <sup>-</sup>	Total N		Total P	
			conc. (uM)	conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L P)
Saint James	SJ	08/17/12	1.58	13.9	0.194	0.302	0.009
Cowpet Bay	CB	08/17/12	1.01	5.94	0.083	0.856	0.027
Rotto Cay	RC	08/17/12	1.04	4.64	0.065	0.392	0.012
Benner Bay	BB	08/17/12	1.07	14.4	0.201	0.350	0.011
Benner Bay (duplicate)	BB	08/17/12	1.01	12.1	0.170	0.318	0.010
Mangrove Lagoon	ML	08/17/12	1.06	4.34	0.061	0.344	0.011
Little Saint James	LSJ	09/14/12	1.03	11.6	0.163	0.297	0.009
Saint James	SJ	09/14/12	1.16	7.60	0.107	0.268	0.008
Cowpet Bay	CB	09/14/12	1.05	8.21	0.115	0.297	0.009
Rotto Cay	RC	09/14/12	0.976	8.27	0.116	0.280	0.009
Benner Bay	BB	09/14/12	1.11	13.4	0.187	0.291	0.009
Benner Bay (duplicate)	BB	09/14/12	1.12	13.6	0.190	0.390	0.012
Mangrove Lagoon	ML	09/14/12	1.20	17.7	0.247	0.658	0.020
Little Saint James	LSJ	10/29/12	1.01	22.5	0.315	0.397	0.012
Saint James	SJ	10/29/12	0.937	9.39	0.131	0.269	0.008
Cowpet Bay	CB	10/29/12	0.852	15.8	0.221	0.273	0.008
Cowpet Bay (duplicate)	CB	10/29/12	0.923	7.61	0.107	0.690	0.021
Rotto Cay	RC	10/29/12	0.937	9.62	0.135	0.353	0.011
Benner Bay	BB	10/29/12	0.954	16.9	0.237	0.720	0.022
Mangrove Lagoon	ML	10/29/12	0.956	16.0	0.224	0.330	0.010
Mangrove Lagoon	ML	12/01/12	0.019	43.9	0.615	0.271	0.008
Benner Bay	BB	12/01/12	0.421	37.1	0.520	0.452	0.014
Rotto Cay	RC	12/01/12	0.163	30.9	0.432	0.189	0.006
Cowpet Bay	CB	12/01/12	0.030	36.0	0.504	0.204	0.006
Saint James	SJ	12/01/12	0.351	31.5	0.442	0.172	0.005
Little Saint James	LSJ	12/01/12	0.148	30.2	0.423	0.232	0.007
Mangrove Lagoon	ML	01/07/13	0.064	36.1	0.505	0.210	0.007
Benner Bay	BB	01/07/13	0.047	31.0	0.434	0.184	0.006
Rotto Cay	RC	01/07/13	0.007	29.9	0.418	0.281	0.009
Rotto Cay (duplicate)	RC	01/07/13	0.000	30.0	0.421	0.190	0.006
Cowpet Bay	CB	01/07/13	0.000	31.1	0.436	0.167	0.005
Saint James	SJ	01/07/13	0.008	30.2	0.424	0.130	0.004
Little Saint James	LSJ	01/07/13	0.000	32.4	0.453	0.278	0.009
Mangrove Lagoon	ML	02/25/13	0.017	35.7	0.500	0.242	0.007
Benner Bay	BB	02/25/13	0.409	36.3	0.508	0.378	0.012
Benner Bay (duplicate)	BB	02/25/13	0.392	35.9	0.503	0.299	0.009
Rotto Cay	RC	02/25/13	0.128	31.7	0.445	0.223	0.007
Cowpet Bay	CB	02/25/13	0.016	26.5	0.371	0.195	0.006
Saint James	SJ	02/25/13	0.012	26.9	0.376	0.200	0.006
Little Saint James	LSJ	02/25/13	0.074	28.4	0.398	0.196	0.006
Mangrove Lagoon	ML	04/07/13	0.000	33.9	0.476	0.235	0.007

Nutrient species: NO<sub>3</sub><sup>-</sup>, nitrate; HPO<sub>4</sub><sup>=</sup>, orthophosphate; HSiO<sub>3</sub><sup>-</sup>, silicate; NH<sub>4</sub><sup>+</sup>, ammonium; NO<sub>2</sub><sup>-</sup>, nitrite.

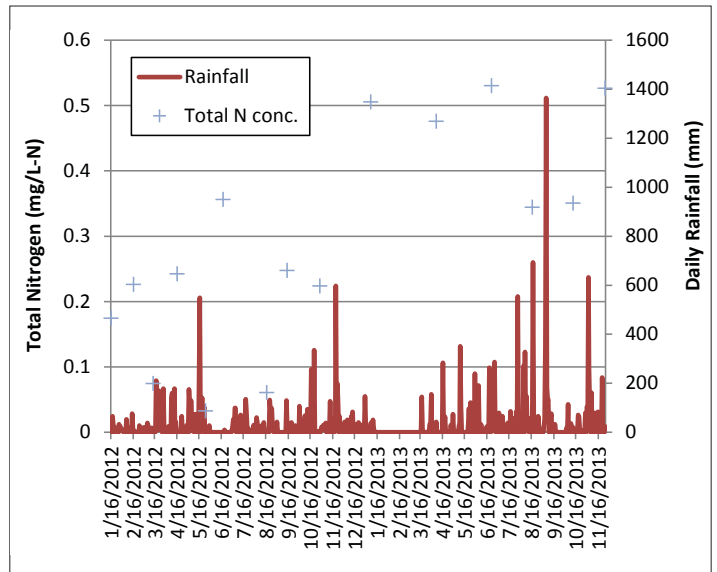
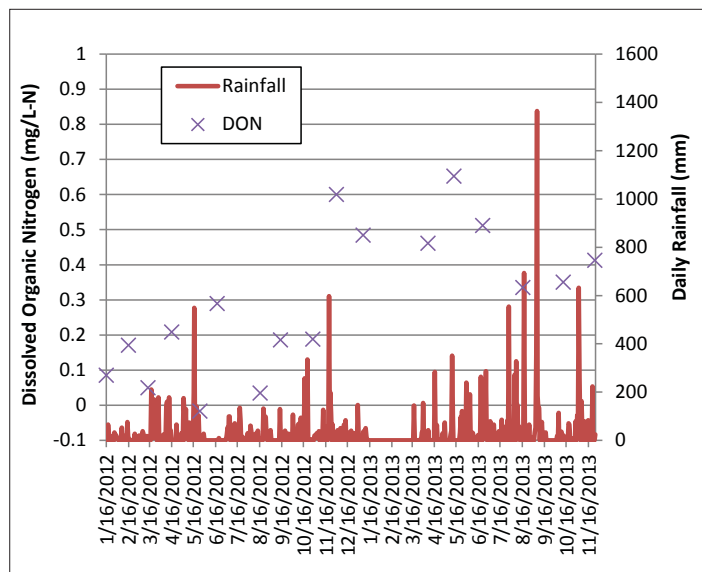
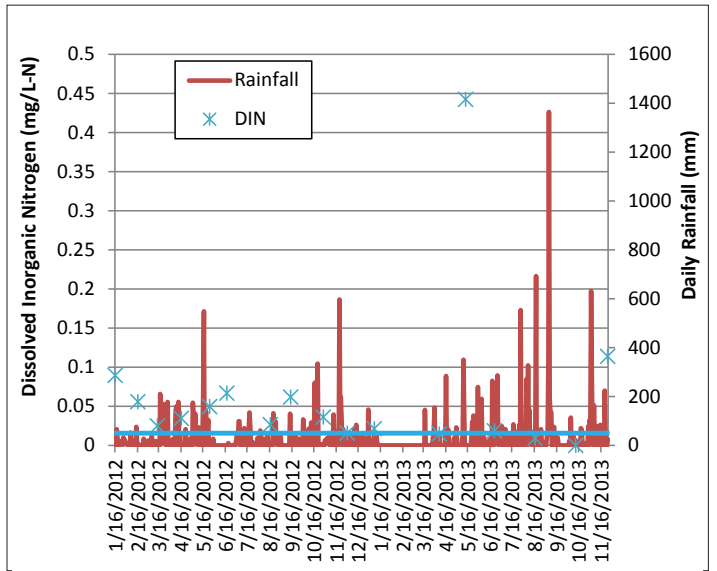
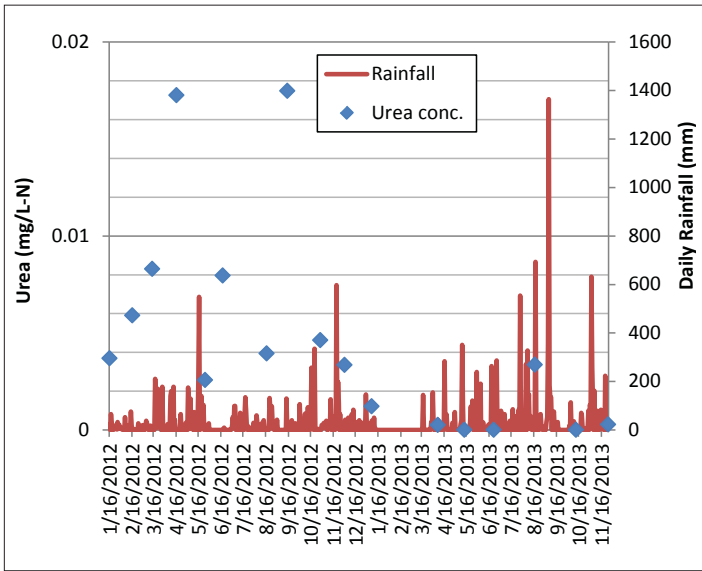
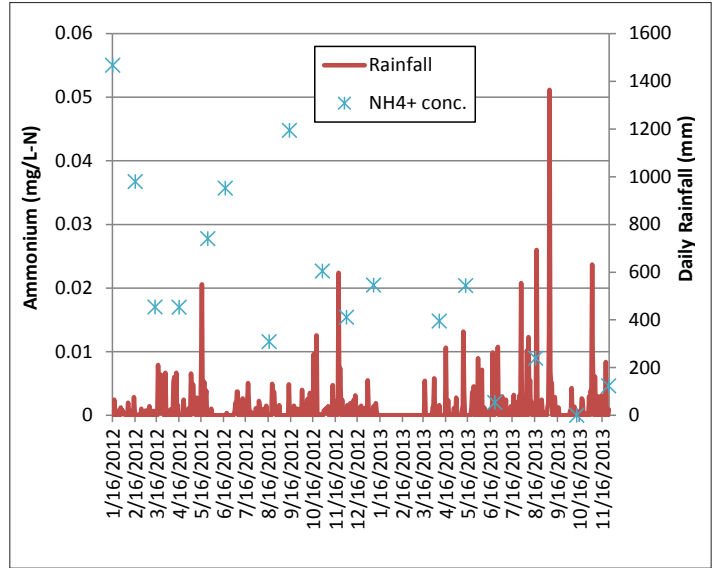
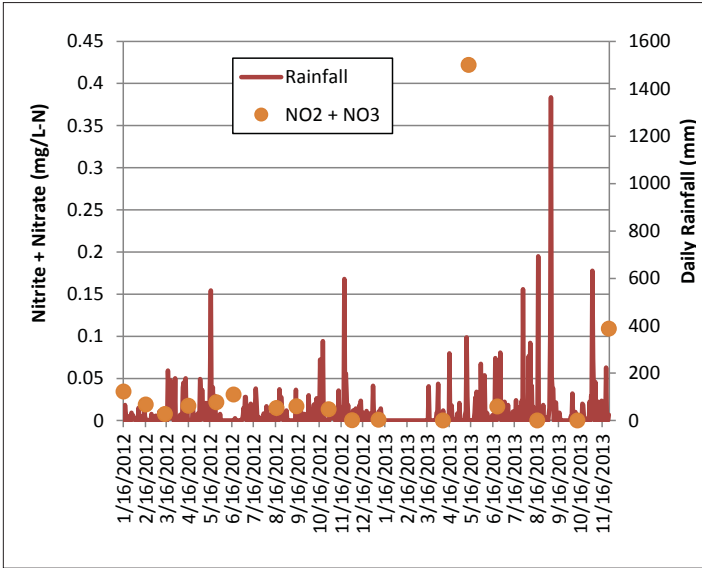


## Appendix B. Nutrient concentrations detected in water samples from the STEER (continued).

Site	Site Code	Collection Date	Nutrient Species				
			NO <sub>3</sub> <sup>-</sup> +NO <sub>2</sub> <sup>-</sup>	Total N		Total P	
			conc. (uM)	conc. (umol/L)	conc. (mg/L N)	conc. (umol/L)	conc. (mg/L P)
Benner Bay	BB	04/07/13	0.151	34.0	0.476	0.309	0.010
Rotto Cay	RC	04/07/13	0.006	28.6	0.400	0.209	0.006
Cowpet Bay	CB	04/07/13	0.153	27.4	0.384	0.236	0.007
Saint James	SJ	04/07/13	0.001	31.4	0.440	0.228	0.007
Little Saint James	LSJ	04/07/13	0.000	28.5	0.400	0.237	0.007
Little Saint James (duplicate)	LSJ	04/07/13	0.000	29.4	0.411	0.195	0.006
Little Saint James	LSJ	05/13/13	0.196	30.9	0.433	0.314	0.010
Saint James	SJ	05/13/13	0.181	29.4	0.412	0.398	0.012
Cowpet Bay	CB	05/13/13	0.208	30.0	0.420	0.229	0.007
Cowpet Bay (duplicate)	CB	05/13/13	0.244	29.8	0.417	0.212	0.007
Rotto Cay	RC	05/13/13	0.186	30.9	0.433	0.305	0.009
Benner Bay	BB	05/13/13	5.38	50.0	0.701	0.464	0.014
Mangrove Lagoon	ML	05/13/13	30.1	78.1	1.09	0.422	0.013
Little Saint James	LSJ	06/22/13	0.000	31.1	0.436	0.188	0.006
Saint James	SJ	06/22/13	0.000	26.6	0.373	0.193	0.006
Saint James	SJ	06/22/13	0.000	27.6	0.387	0.252	0.008
Cowpet Bay	CB	06/22/13	0.000	25.6	0.358	0.207	0.006
Rotto Cay	RC	06/22/13	0.329	27.6	0.386	0.197	0.006
Benner Bay	BB	06/22/13	0.548	31.1	0.436	0.245	0.008
Mangrove Lagoon	ML	06/22/13	1.18	37.9	0.530	0.349	0.011
Little Saint James	LSJ	08/17/13	0.197	28.6	0.401	0.195	0.006
Saint James	SJ	08/17/13	0.357	29.2	0.410	0.236	0.007
Cowpet Bay	CB	08/17/13	0.078	21.0	0.294	0.181	0.006
Rotto Cay	RC	08/17/13	0.067	15.6	0.219	0.189	0.006
Benner Bay	BB	08/17/13	0.541	22.3	0.312	0.194	0.006
Mangrove Lagoon	ML	08/17/13	0.011	24.5	0.342	0.196	0.006
Mangrove Lagoon (duplicate)	ML	08/17/13	0.000	24.7	0.346	0.210	0.007
Little Saint James	LSJ	10/08/13	0.010	14.7	0.205	0.173	0.005
Little Saint James (duplicate)	LSJ	10/08/13	0.046	15.2	0.212	0.333	0.010
Saint James	SJ	10/08/13	0.081	14.9	0.209	0.175	0.005
Cowpet Bay	CB	10/08/13	0.138	19.6	0.275	0.236	0.007
Rotto Cay	RC	10/08/13	0.315	24.3	0.341	0.208	0.006
Benner Bay	BB	10/12/13	0.391	21.9	0.307	0.289	0.009
Mangrove Lagoon	ML	10/12/13	0.000	25.0	0.350	0.371	0.011
Little Saint James	LSJ	11/17/13	0.000	17.3	0.242	0.210	0.007
Saint James	SJ	11/17/13	0.056	24.6	0.344	0.225	0.007
Cowpet Bay	CB	11/17/13	0.000	16.2	0.227	0.301	0.009
Rotto Cay	RC	11/17/13	0.000	20.4	0.286	0.237	0.007
Benner Bay	BB	11/25/13	0.545	23.6	0.330	0.378	0.012
Mangrove Lagoon	ML	11/25/13	8.33	37.6	0.526	0.483	0.015
Mangrove Lagoon (duplicate)	ML	11/25/13	7.22	37.6	0.526	0.524	0.016

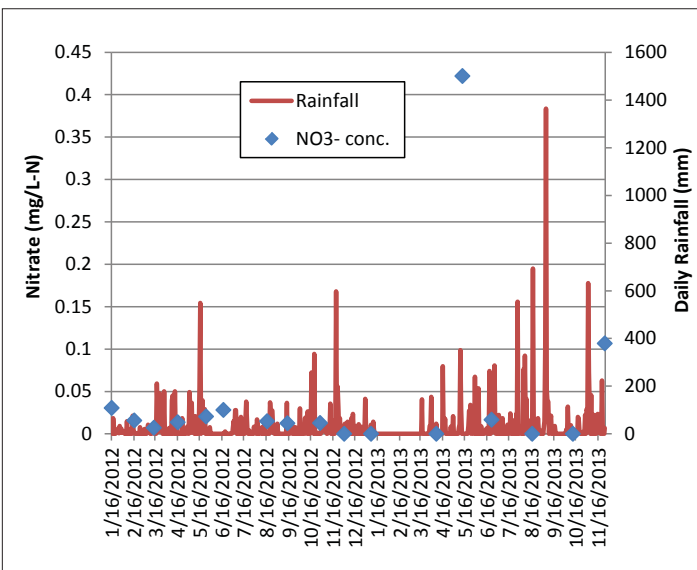
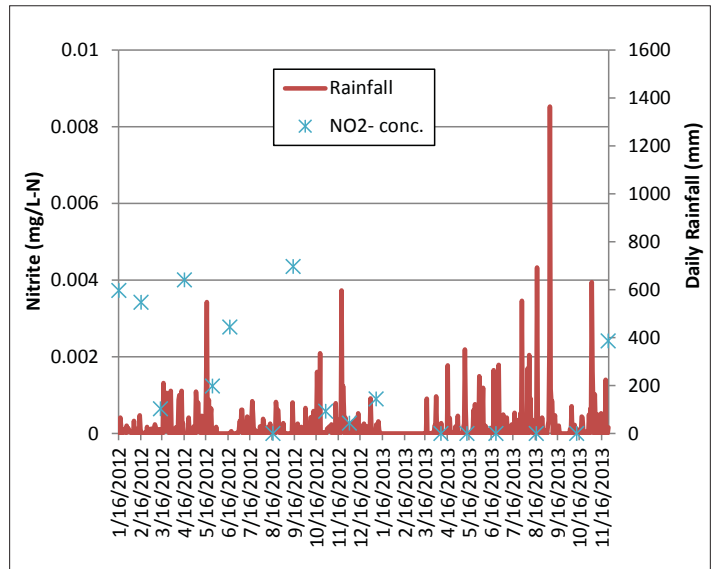
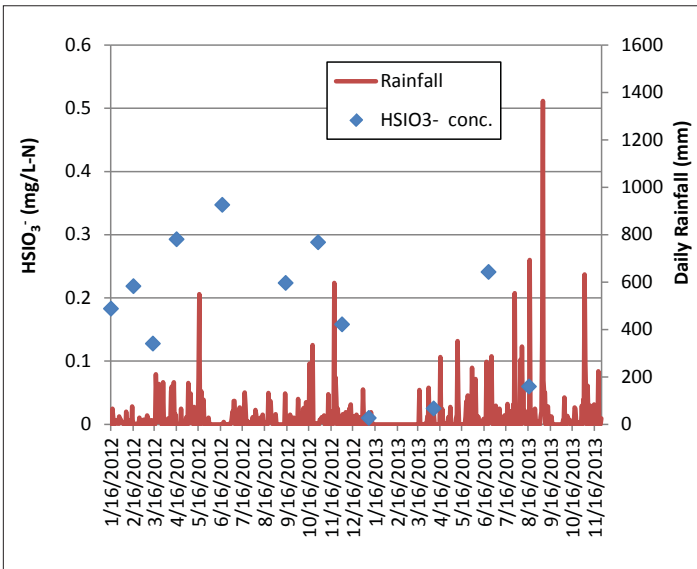
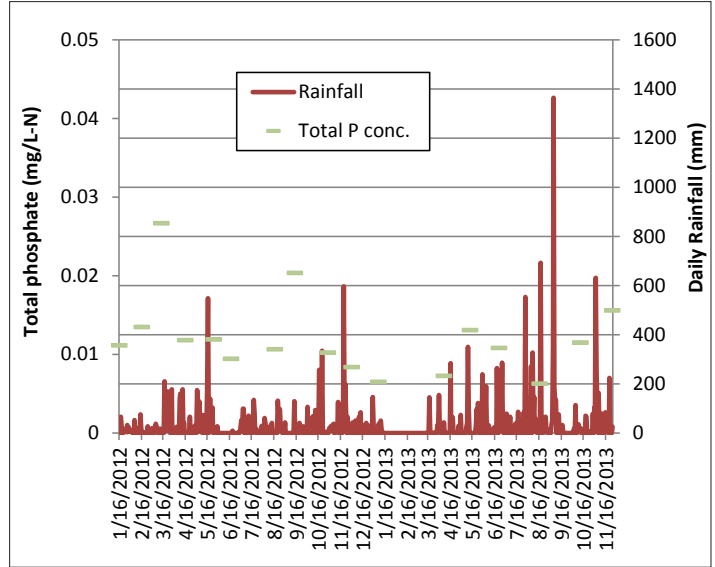
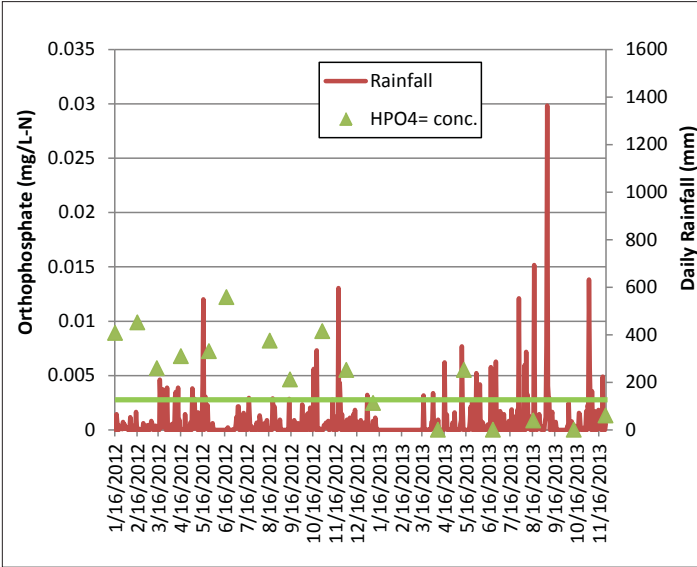
Nutrient species: NO<sub>3</sub><sup>-</sup>, nitrate; HPO<sub>4</sub><sup>=</sup>, orthophosphate; HSiO<sub>3</sub><sup>-</sup>, silicate; NH<sub>4</sub><sup>+</sup>, ammonium; NO<sub>2</sub><sup>-</sup>, nitrite.

Appendix C. Mangrove Lagoon nutrient concentrations plotted against daily rainfall.



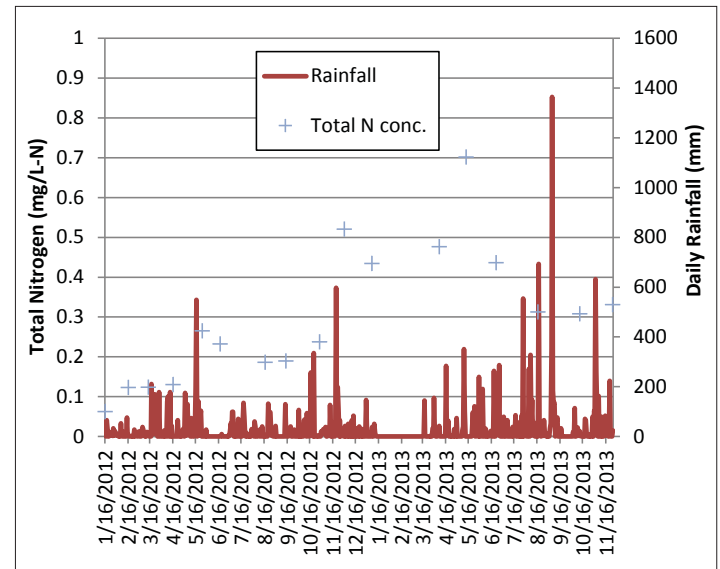
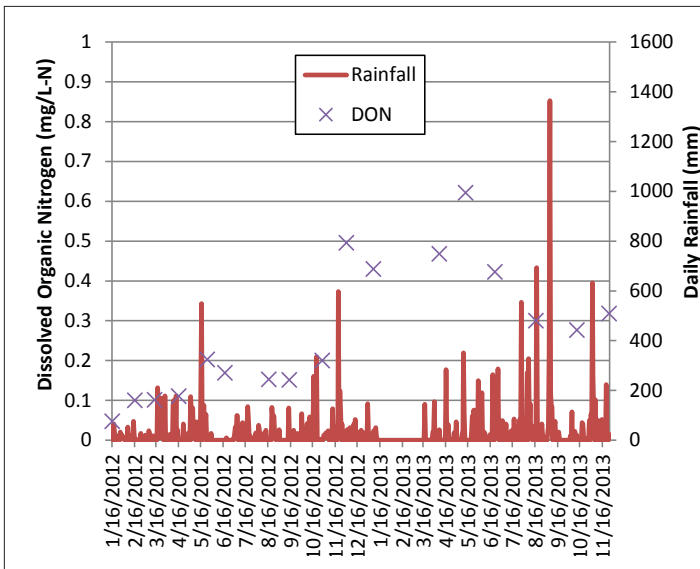
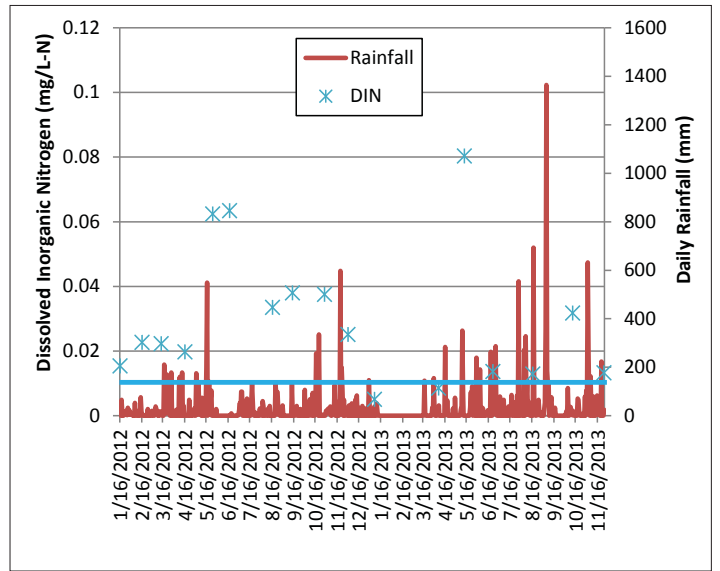
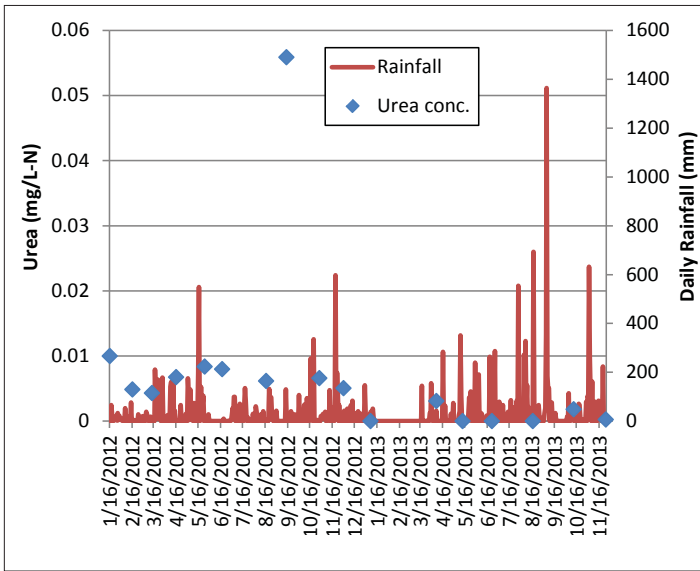
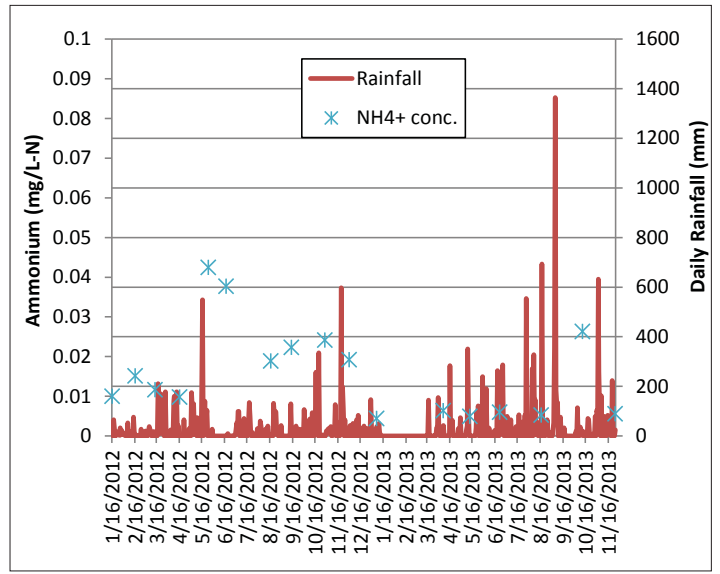
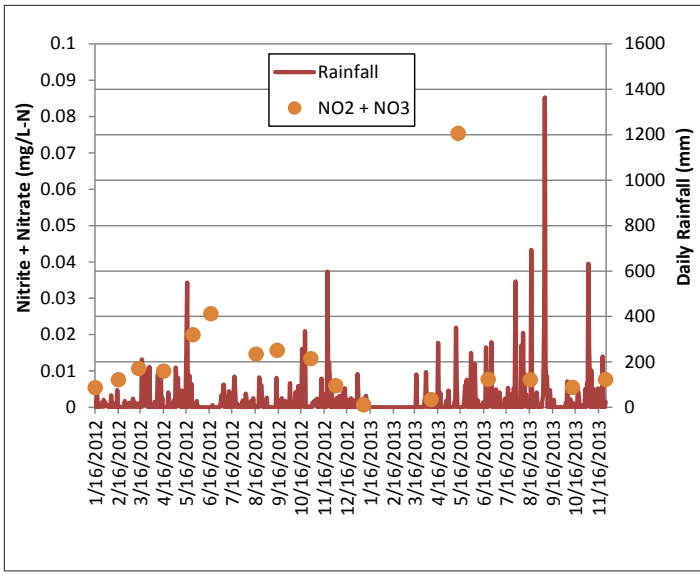
Note: Blue line in dissolved inorganic nitrogen graph represents proposed threshold for coral reefs (Lapointe, 1997).

Appendix C. Mangrove Lagoon nutrient concentrations plotted against daily rainfall (continued).



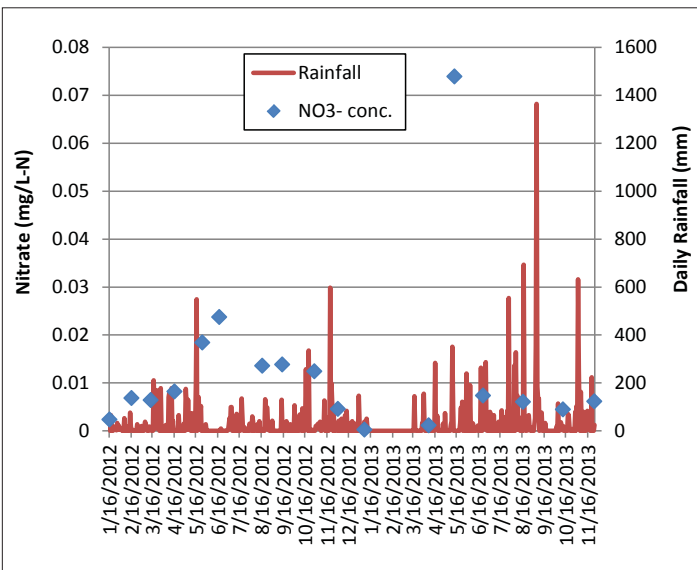
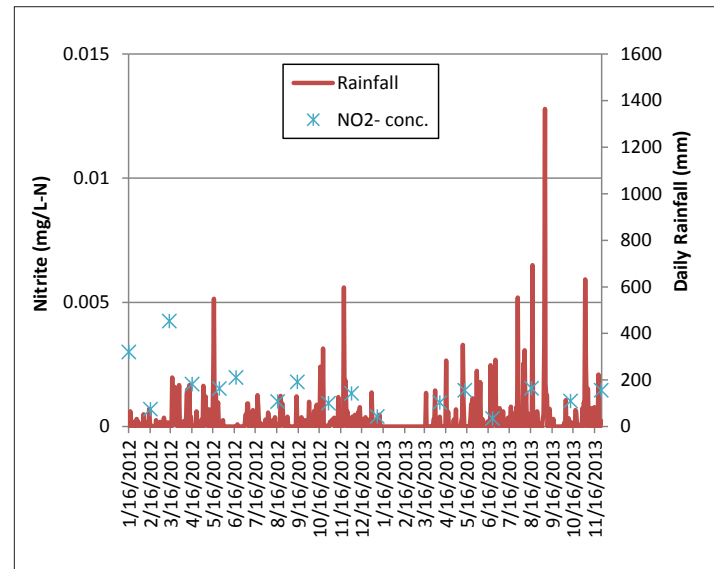
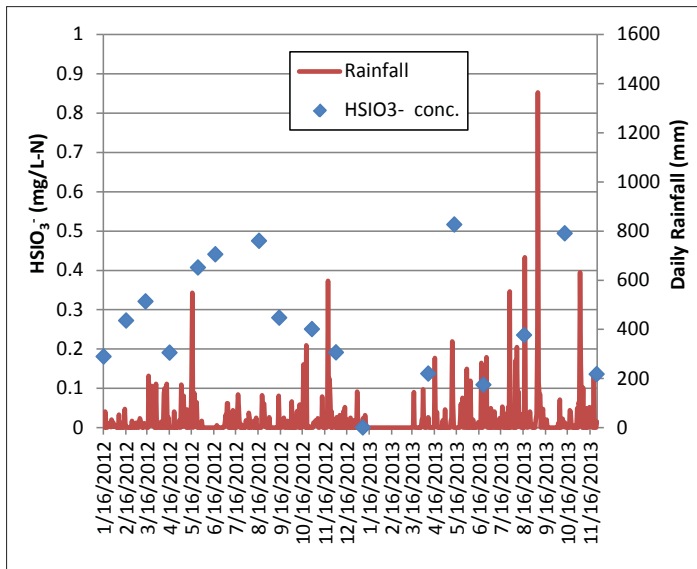
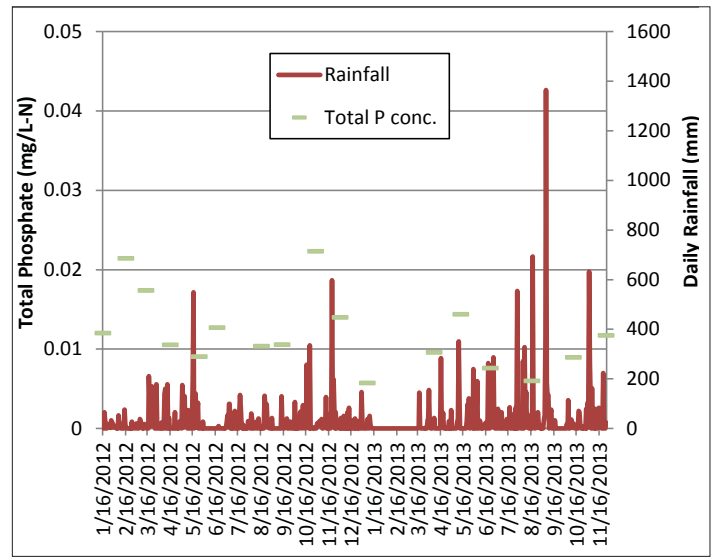
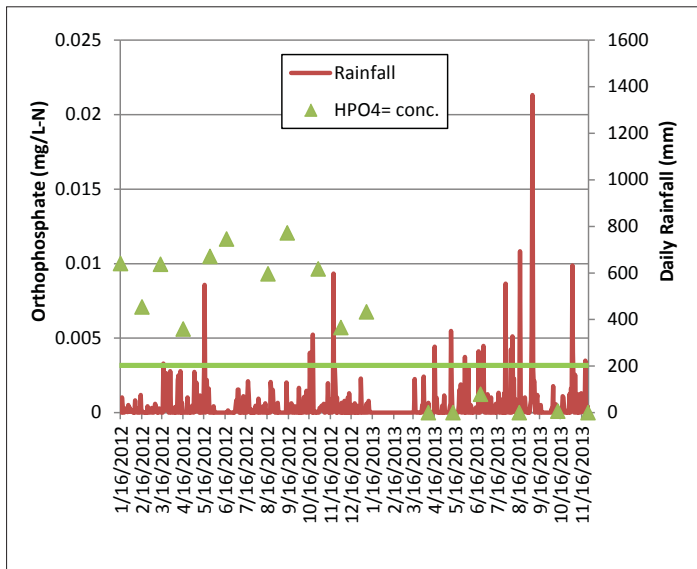
Note: Green line in orthophosphate graph represents proposed threshold for coral reefs (Lapointe, 1997).

Appendix D. Benner Bay nutrient concentrations plotted against daily rainfall.



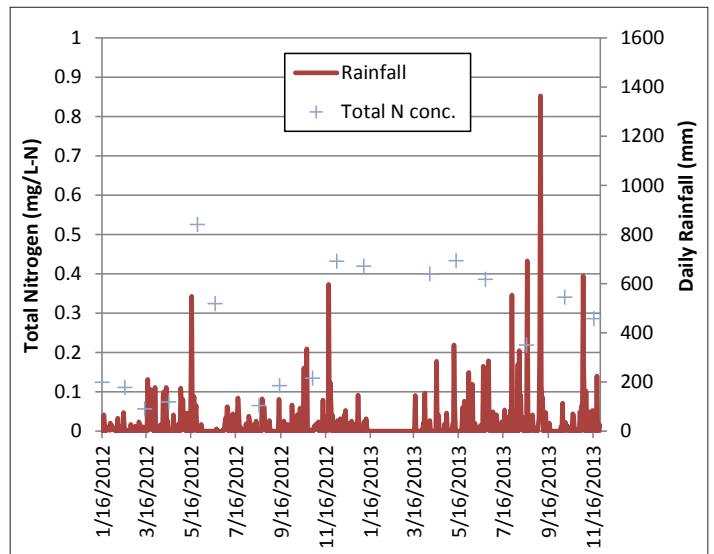
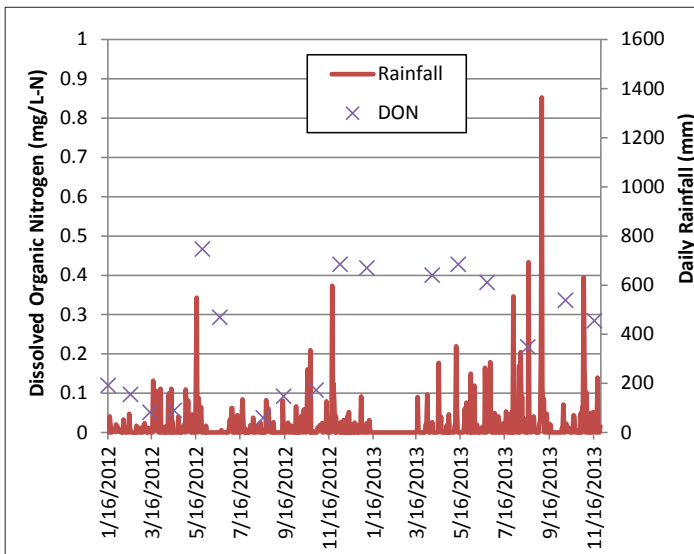
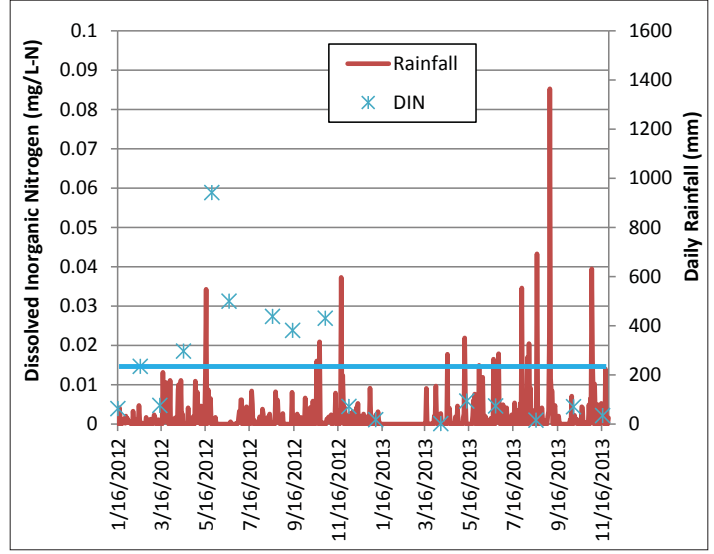
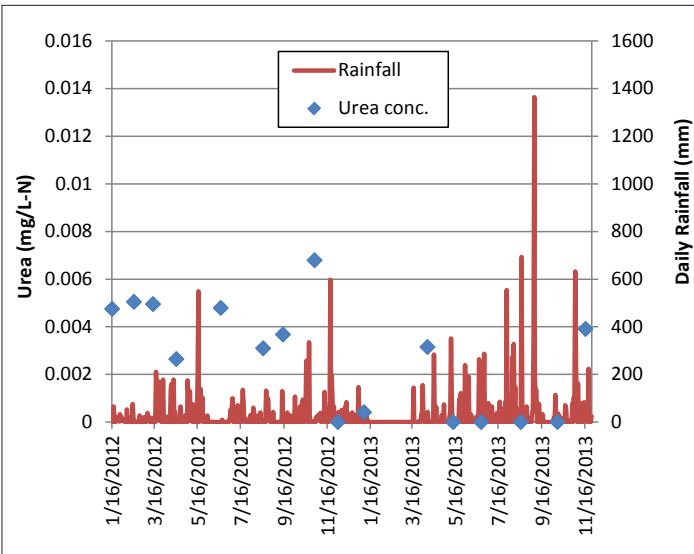
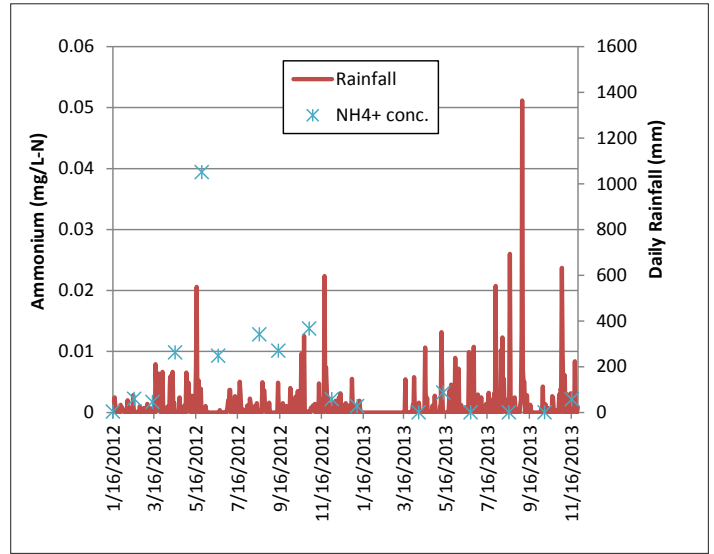
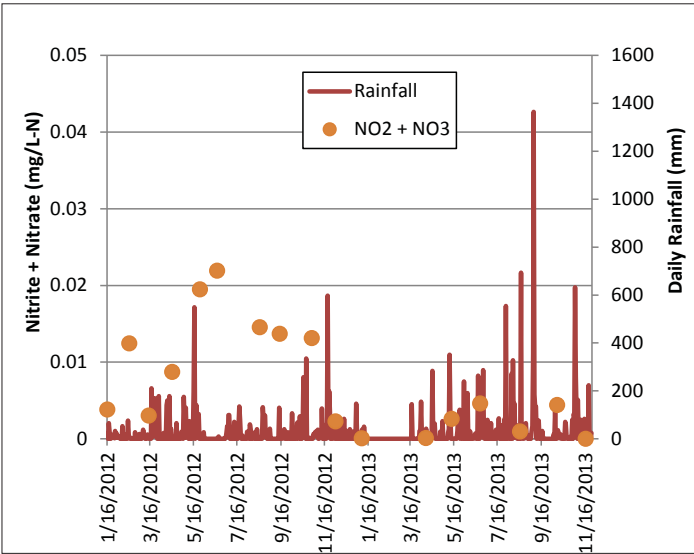
Note: Blue line in dissolved inorganic nitrogen graph represents proposed threshold for coral reefs (Lapointe, 1997).

Appendix D. Benner Bay nutrient concentrations plotted against daily rainfall (continued).



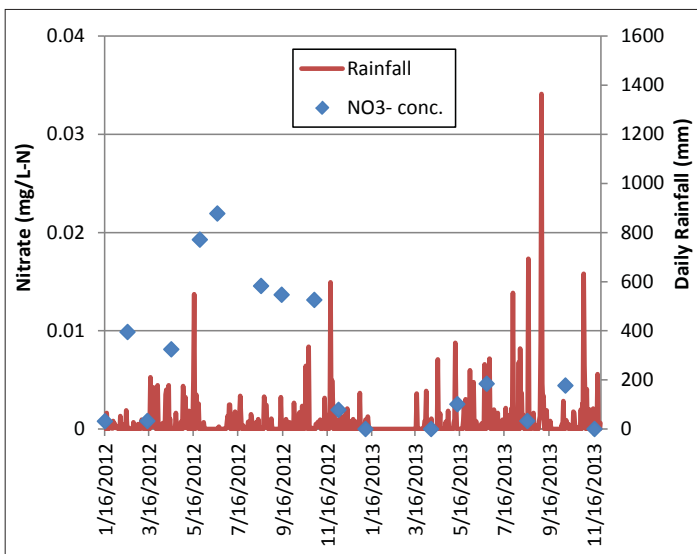
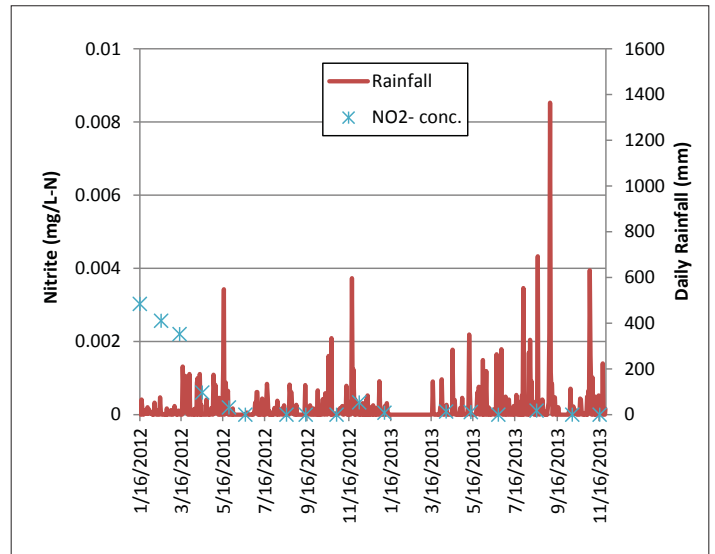
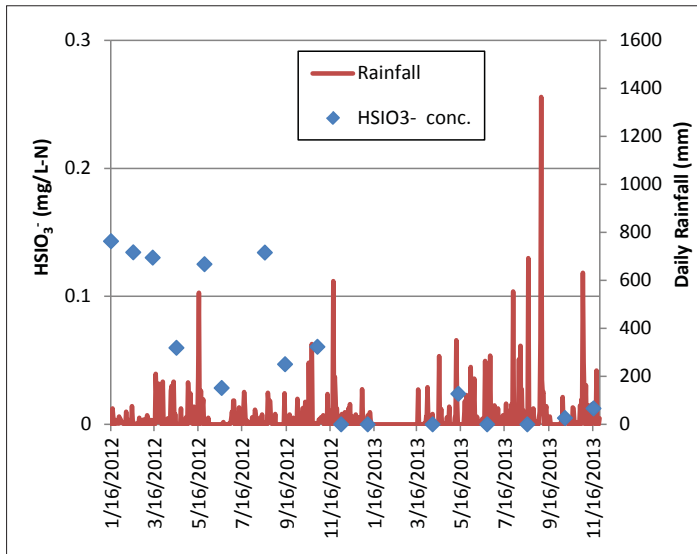
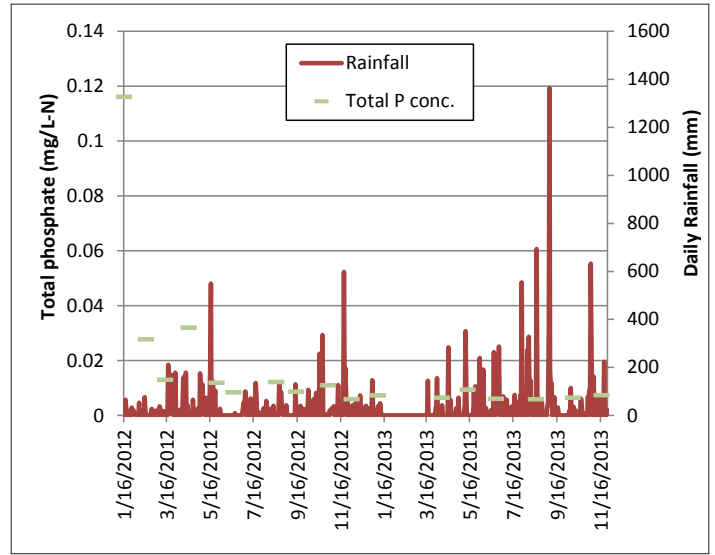
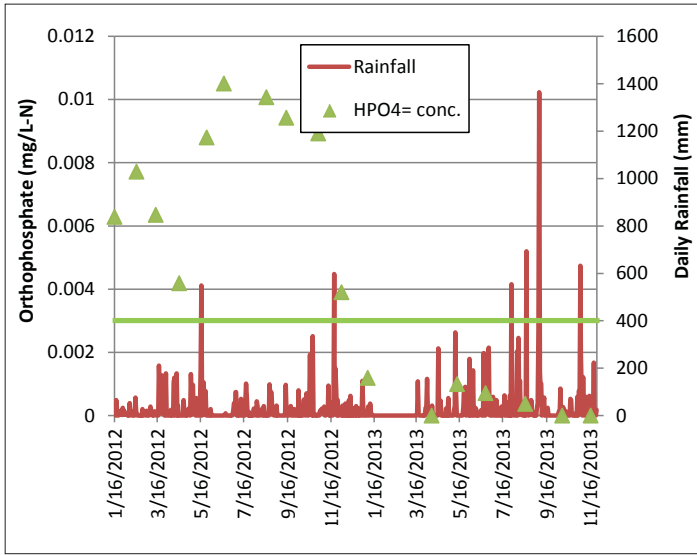
Note: Green line in orthophosphate graph represents proposed threshold for coral reefs (Lapointe, 1997).

Appendix E. Rotto Cay nutrient concentrations plotted against daily rainfall.



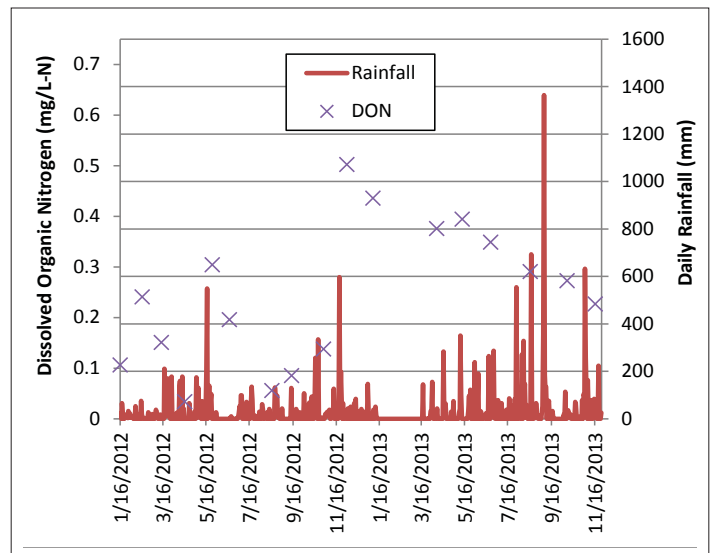
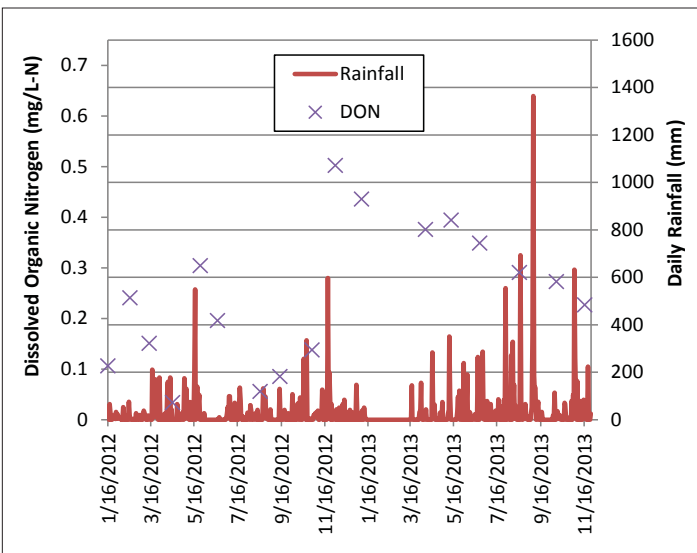
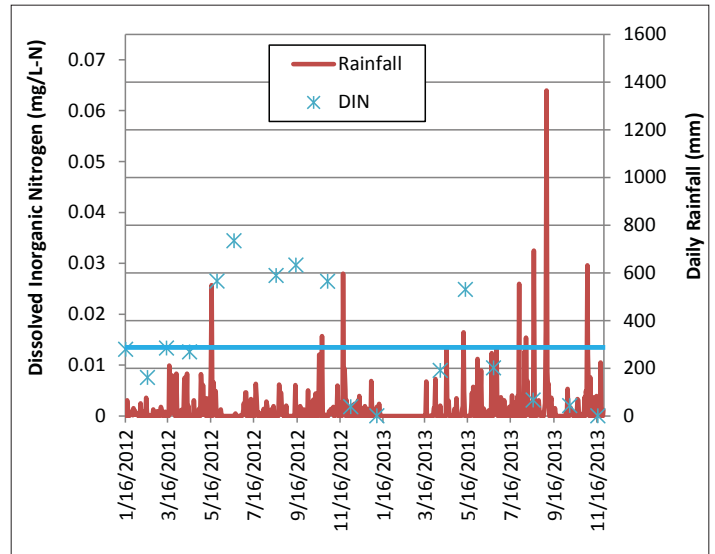
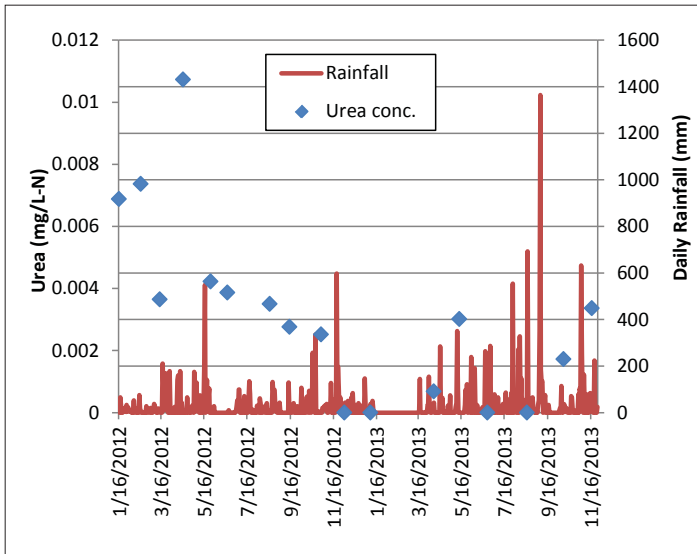
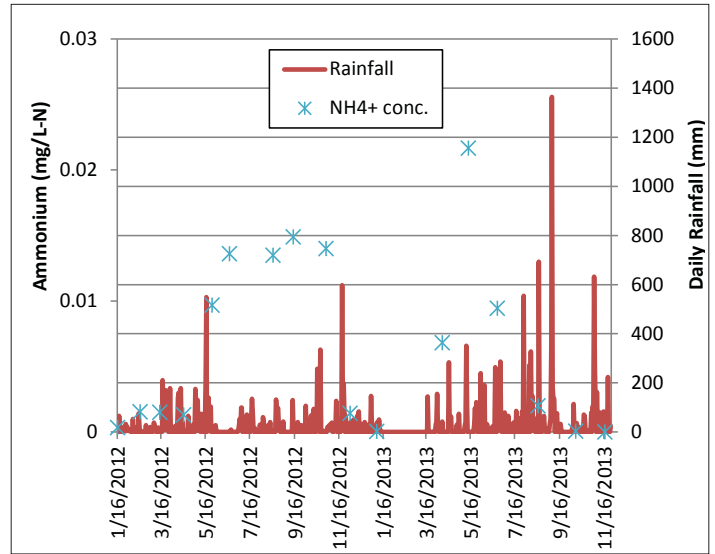
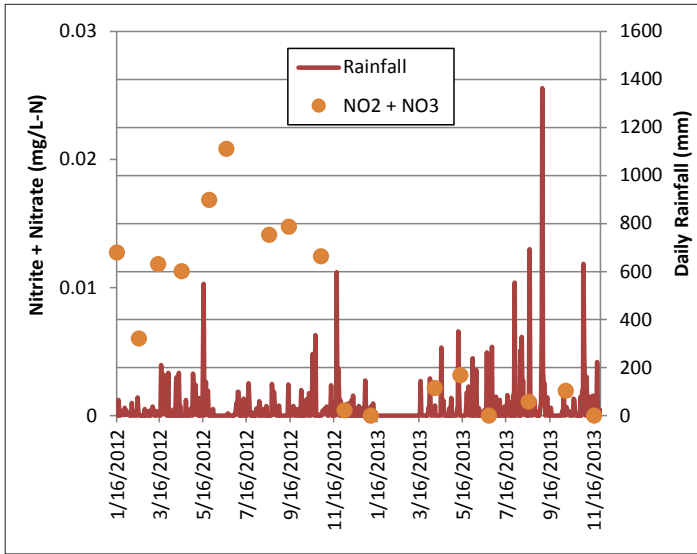
Note: Blue line in dissolved inorganic nitrogen graph represents proposed threshold for coral reefs (Lapointe, 1997).

Appendix E. Rotto Cay nutrient concentrations plotted against daily rainfall (continued).



Note: Green line in orthophosphate graph represents proposed threshold for coral reefs (Lapointe, 1997).

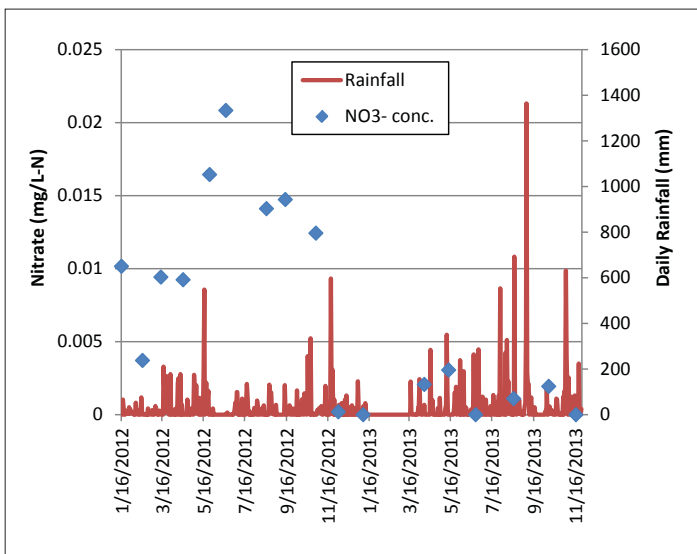
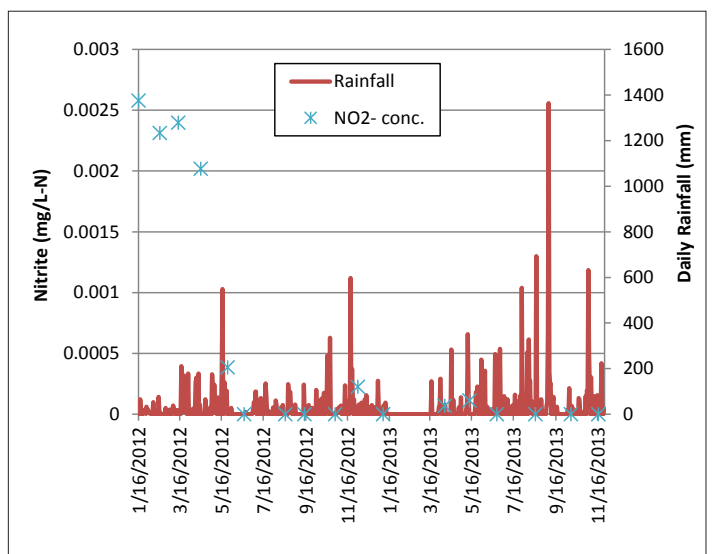
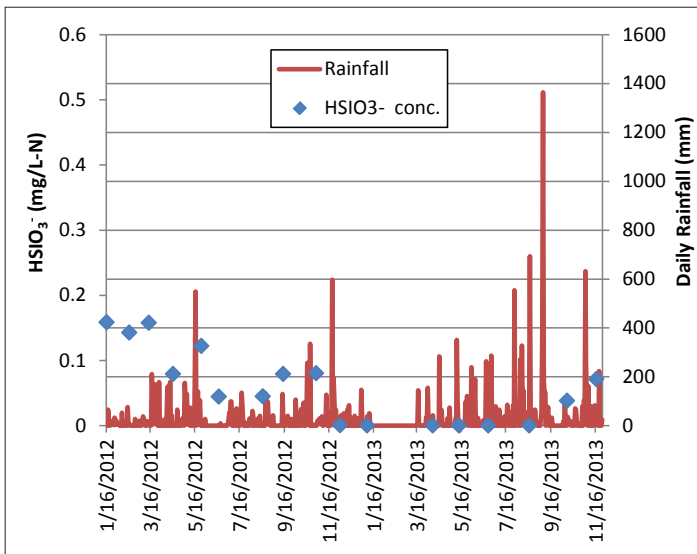
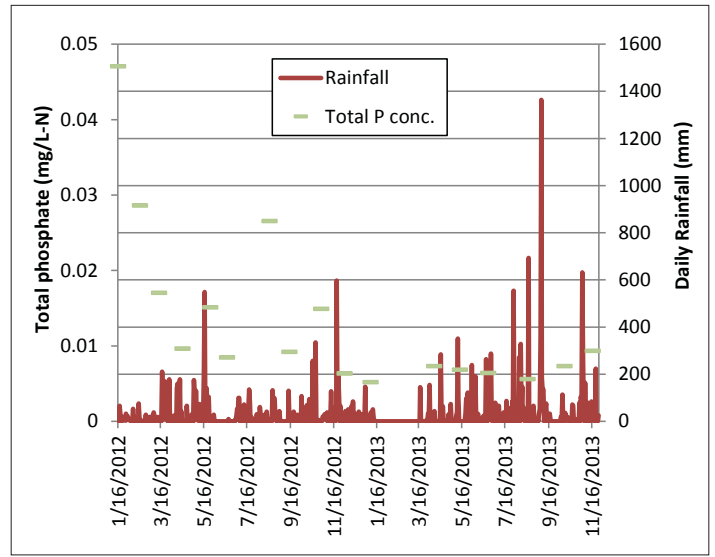
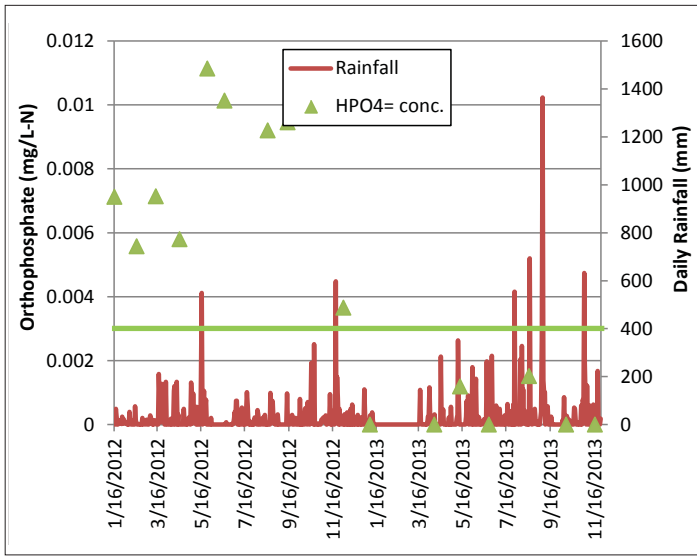
Appendix F. Cowpet Bay nutrient concentrations plotted against daily rainfall.



Note: Blue line in dissolved inorganic nitrogen graph represents proposed threshold for coral reefs (Lapointe, 1997).

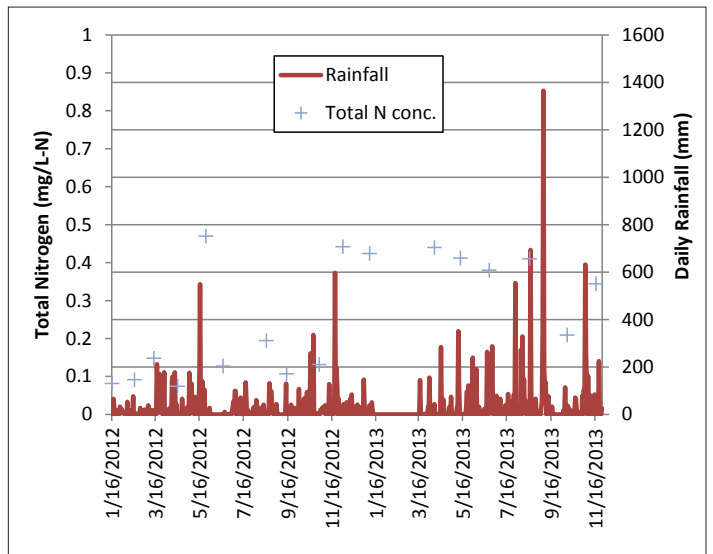
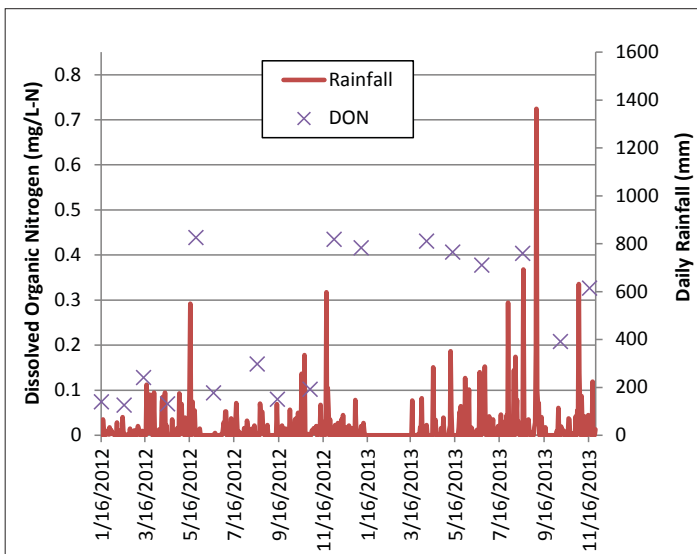
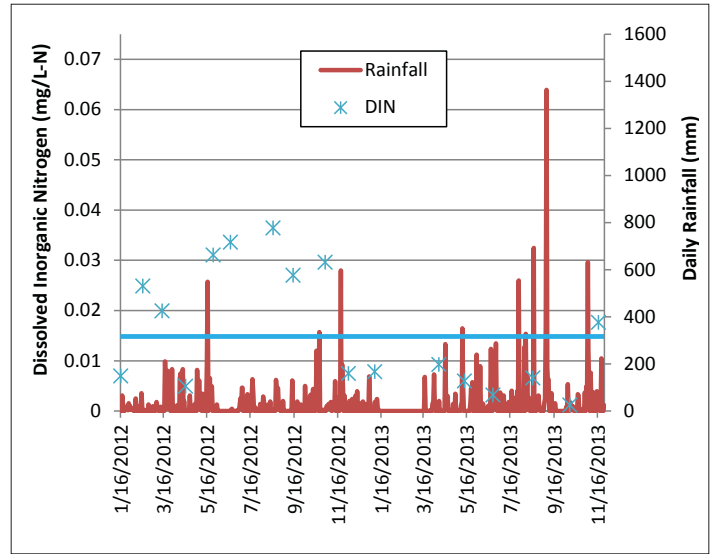
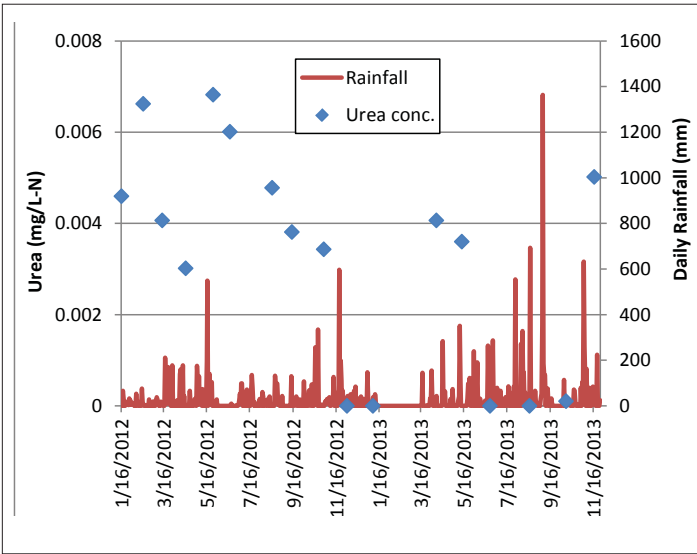
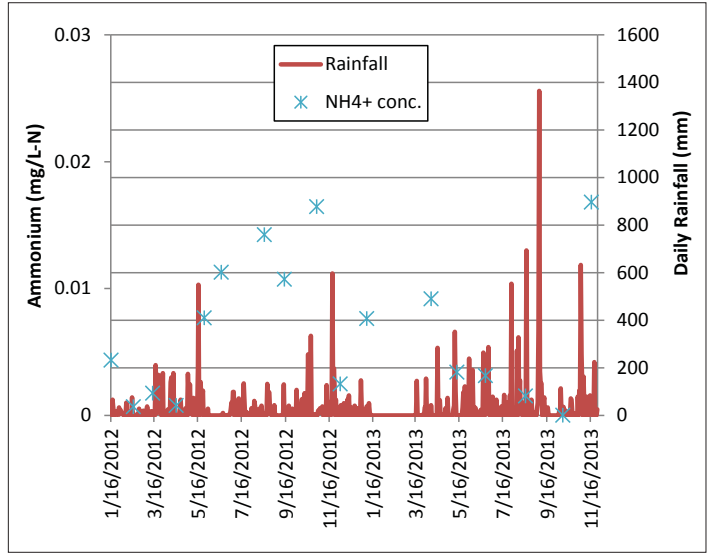
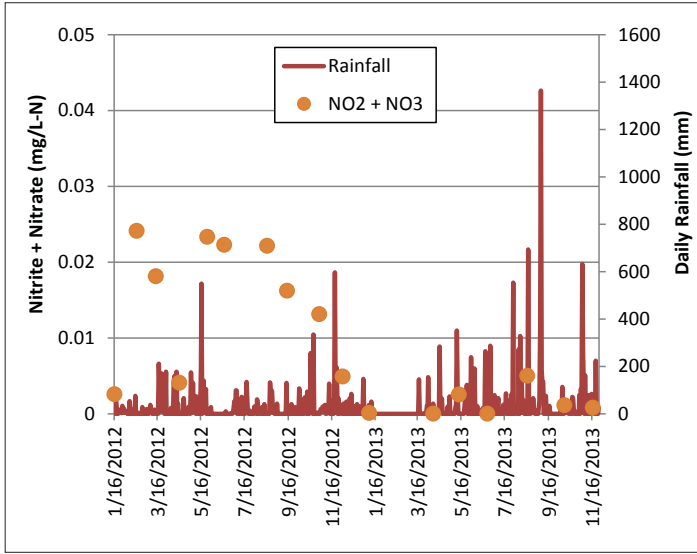


Appendix F. Cowpet Bay nutrient concentrations plotted against daily rainfall (continued).



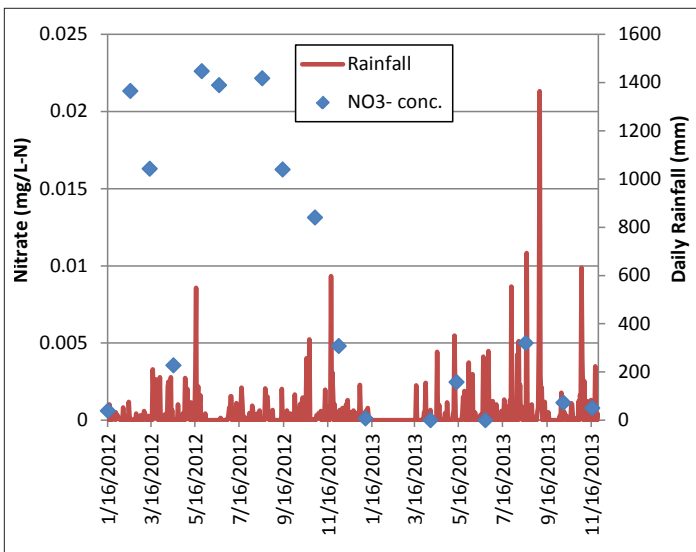
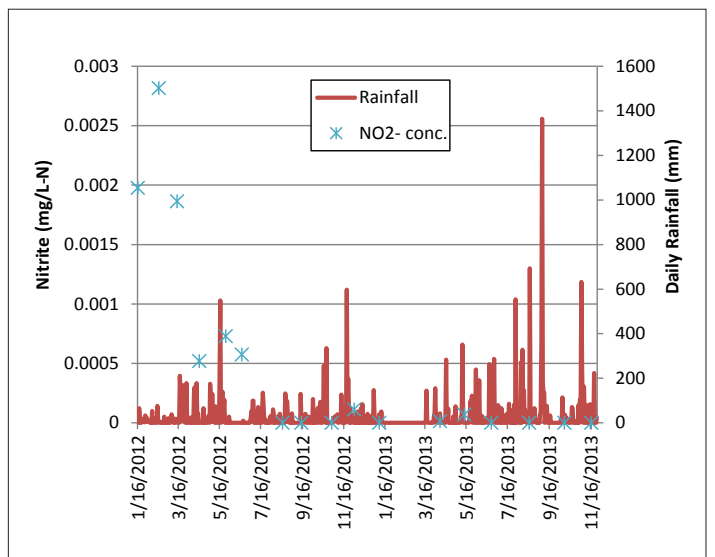
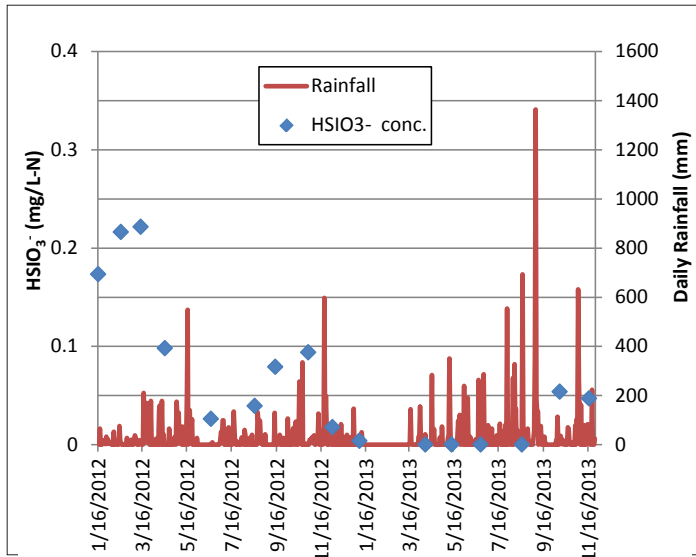
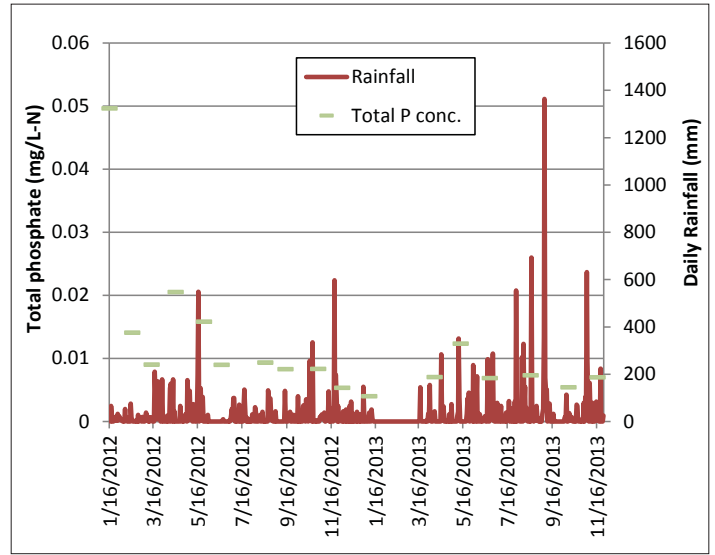
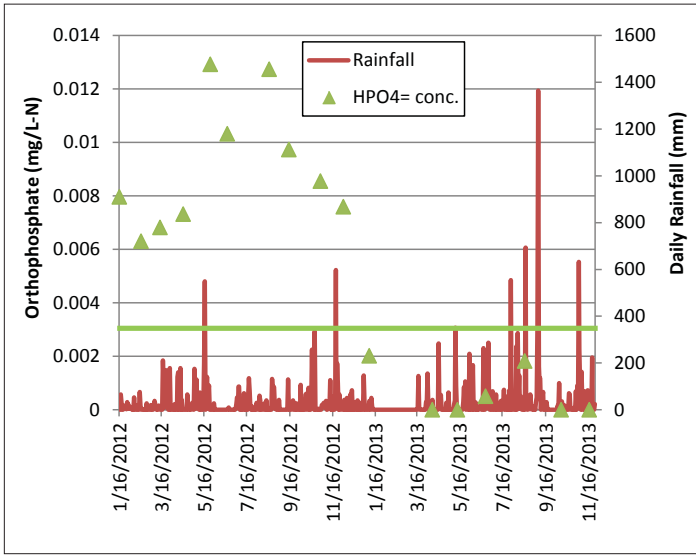
Note: Green line in orthophosphate graph represents proposed threshold for coral reefs (Lapointe, 1997).

Appendix G. Saint James nutrient concentrations plotted against daily rainfall.



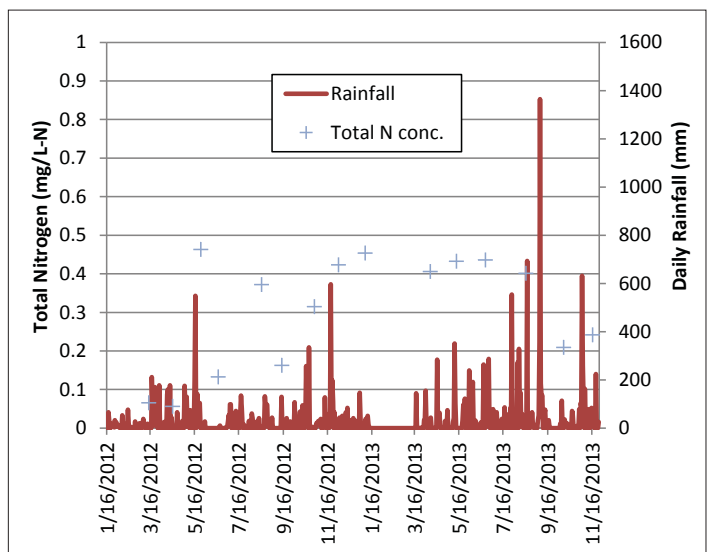
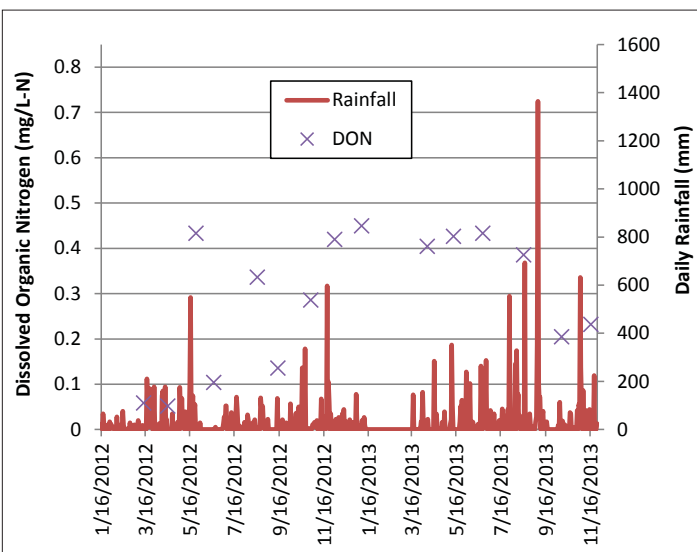
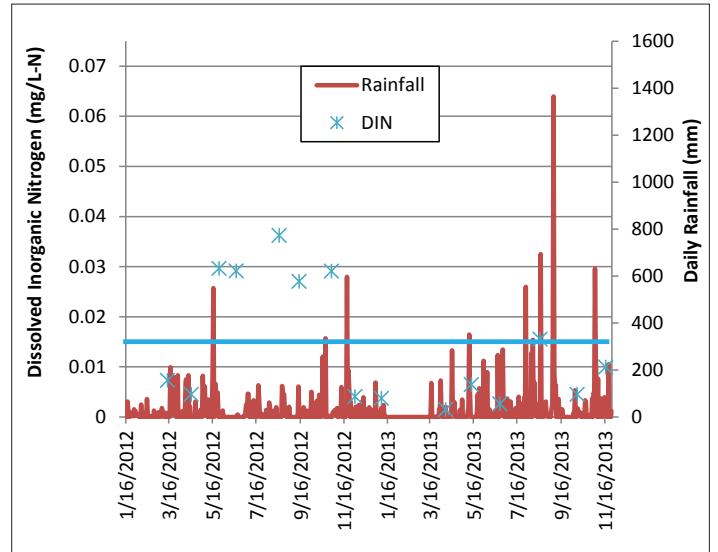
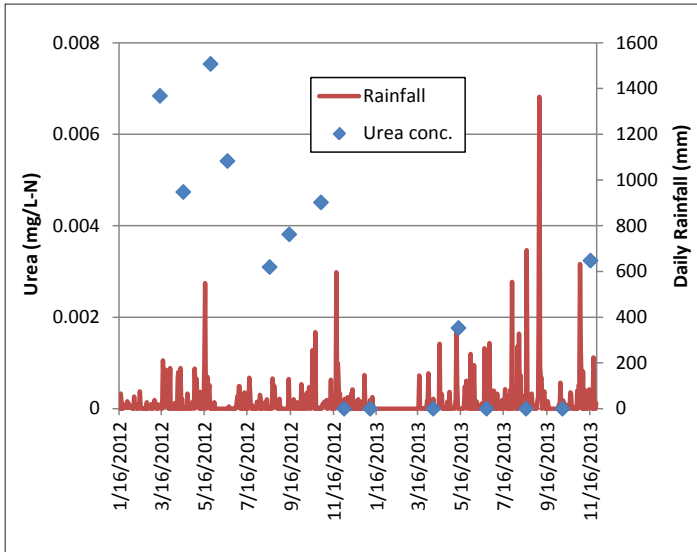
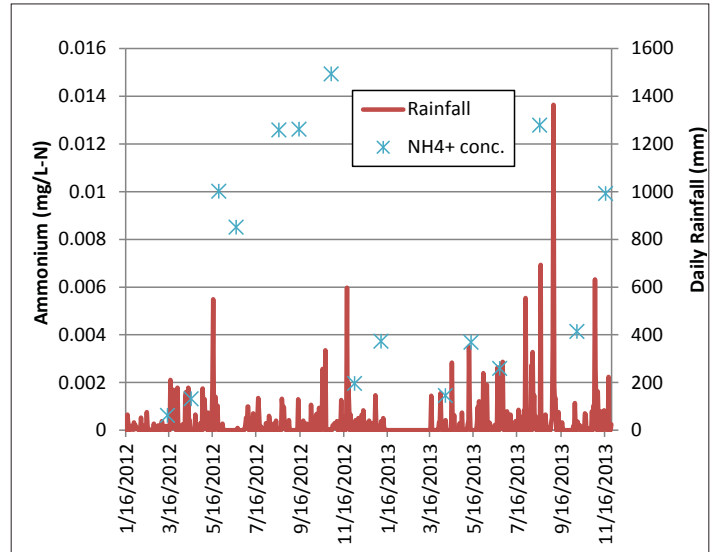
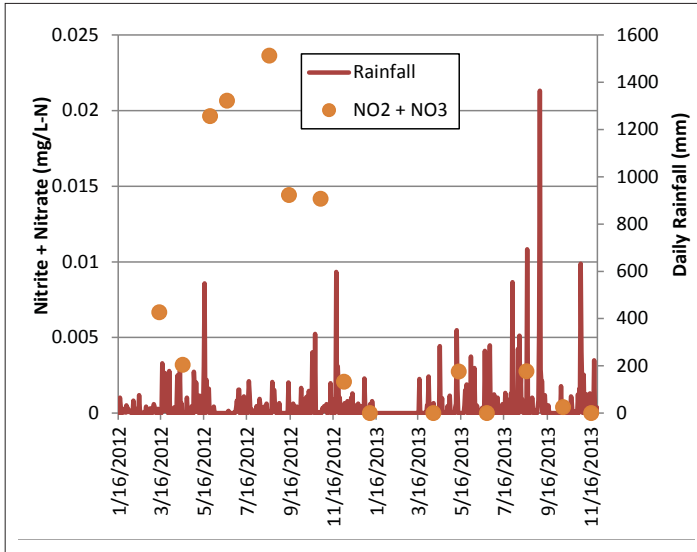
Note: Blue line in dissolved inorganic nitrogen graph represents proposed threshold for coral reefs (Lapointe, 1997).

Appendix G. Saint James nutrient concentrations plotted against daily rainfall (continued).



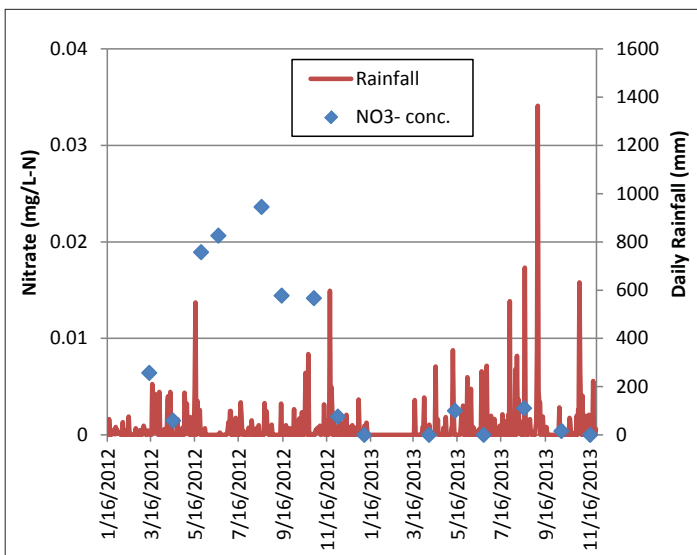
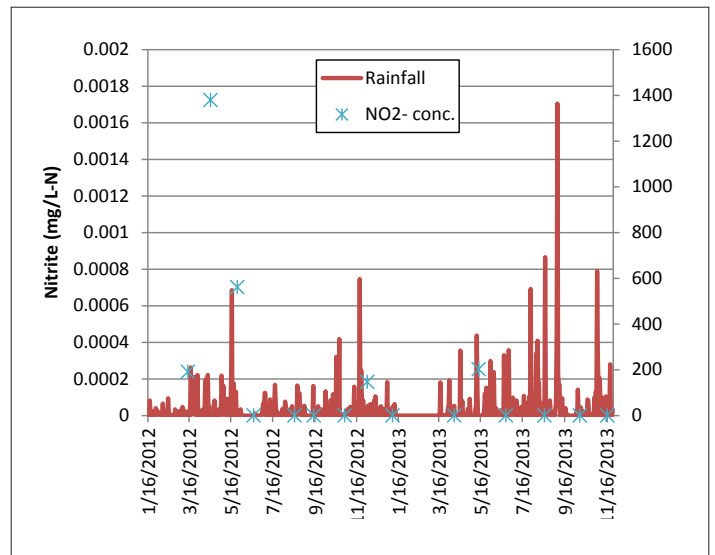
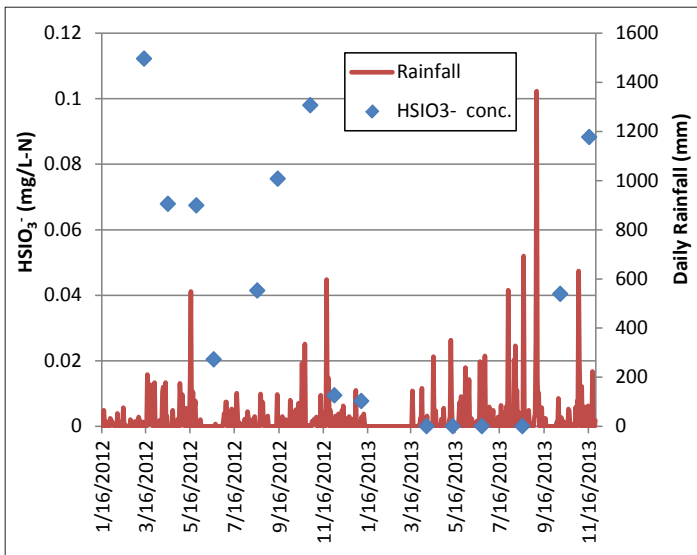
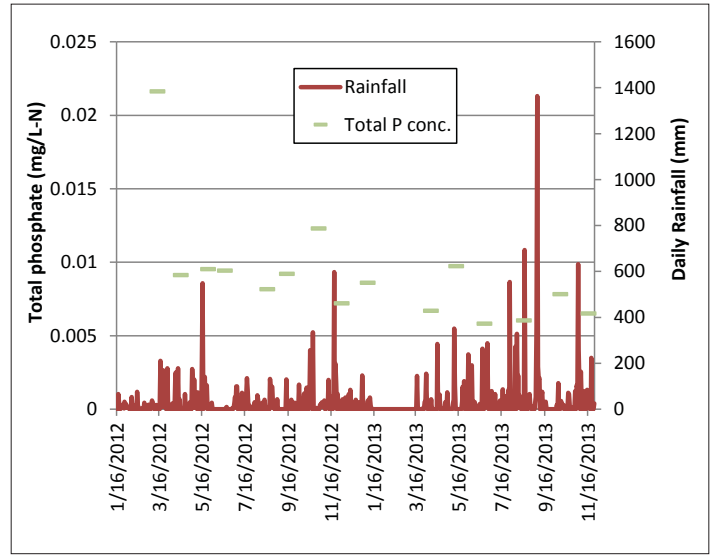
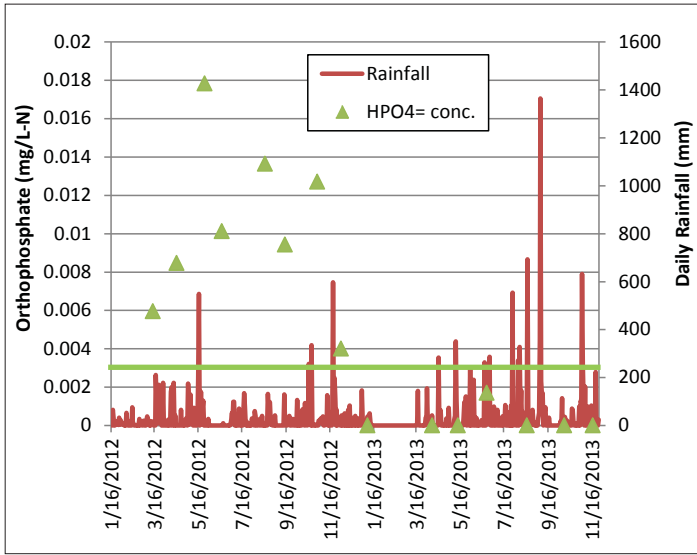
Note: Green line in orthophosphate graph represents proposed threshold for coral reefs (Lapointe, 1997).

Appendix H. Little St. James nutrient concentrations plotted against daily rainfall.



Note: Blue line in dissolved inorganic nitrogen graph represents proposed threshold for coral reefs (Lapointe, 1997).

Appendix H. Little St. James nutrient concentrations plotted against daily rainfall (continued).



Note: Green line in orthophosphate graph represents proposed threshold for coral reefs (Lapointe, 1997).

## Appendix I. Results from the deployment of sediment traps in the STEER.

Site	Site Code	Date Deployed	Date Collected	Total Days Deployed	Trap Sediment dw (g)	Mean Sediment dw (g)	Dry Weight SE	Trap Accumulation Rate dw (mg/cm <sup>2</sup> /d)	Mean Trap Accumulation Rate (mg/cm <sup>2</sup> /d)	Accumulation Rate SE
Saint James	SJ	12/16/2011	1/16/2012	31	0.68	0.77	0.06	0.61	0.68	0.05
Saint James	SJ	12/16/2011	1/16/2012	31	0.88			0.78		
Saint James	SJ	12/16/2011	1/16/2012	31	0.73			0.65		
Cowpet Bay	CB	12/16/2011	1/16/2012	31	0.83	0.70	0.06	0.74	0.63	0.06
Cowpet Bay	CB	12/16/2011	1/16/2012	31	0.62			0.55		
Cowpet Bay	CB	12/16/2011	1/16/2012	31	0.67			0.59		
Rotto Cay	RC	12/16/2011	1/16/2012	31	9.51	9.54	0.01	8.45	8.47	0.01
Rotto Cay	RC	12/16/2011	1/16/2012	31	9.56			8.49		
Rotto Cay	RC	12/16/2011	1/16/2012	31	9.54			8.47		
Benner Bay	BB	12/16/2011	1/16/2012	31	7.59	8.18	0.30	6.75	7.26	0.27
Benner Bay	BB	12/16/2011	1/16/2012	31	8.61			7.65		
Benner Bay	BB	12/16/2011	1/16/2012	31	8.33			7.40		
Mangrove Lagoon	ML	12/16/2011	1/16/2012	31	8.10	6.70	0.86	7.19	5.95	0.76
Mangrove Lagoon	ML	12/16/2011	1/16/2012	31	5.13			4.56		
Mangrove Lagoon	ML	12/16/2011	1/16/2012	31	6.88			6.11		
Saint James	SJ	1/16/2012	2/16/2012	31	0.54	0.62	0.06	0.48	0.55	0.05
Saint James	SJ	1/16/2012	2/16/2012	31	0.58			0.51		
Saint James	SJ	1/16/2012	2/16/2012	31	0.73			0.65		
Cowpet Bay	CB	1/16/2012	2/16/2012	31	0.63	0.59	0.09	0.56	0.52	0.08
Cowpet Bay	CB	1/16/2012	2/16/2012	31	0.42			0.37		
Cowpet Bay	CB	1/16/2012	2/16/2012	31	0.72			0.64		
Rotto Cay	RC	1/16/2012	2/16/2012	31	4.40	2.58	0.95	3.91	2.29	0.84
Rotto Cay	RC	1/16/2012	2/16/2012	31	2.11			1.87		
Rotto Cay	RC	1/16/2012	2/16/2012	31	1.23			1.10		
Benner Bay	BB	1/16/2012	2/16/2012	31	10.40	8.89	0.83	9.24	7.90	0.73
Benner Bay	BB	1/16/2012	2/16/2012	31	7.55			6.71		
Benner Bay	BB	1/16/2012	2/16/2012	31	8.74			7.76		
Mangrove Lagoon	ML	1/16/2012	2/16/2012	31	4.26	4.29	0.15	3.78	3.81	0.14
Mangrove Lagoon	ML	1/16/2012	2/16/2012	31	4.57			4.06		
Mangrove Lagoon	ML	1/16/2012	2/16/2012	31	4.04			3.59		
Saint James	SJ	2/16/2012	3/14/2012	27	0.76	0.73	0.02	0.77	0.74	0.02
Saint James	SJ	2/16/2012	3/14/2012	27	0.73			0.74		
Saint James	SJ	2/16/2012	3/14/2012	27	0.70			0.71		
Cowpet Bay	CB	2/16/2012	3/14/2012	27	0.62	0.55	0.05	0.64	0.56	0.05
Cowpet Bay	CB	2/16/2012	3/14/2012	27	0.46			0.46		
Cowpet Bay	CB	2/16/2012	3/14/2012	27	0.56			0.57		
Rotto Cay	RC	2/16/2012	3/14/2012	27	9.23	9.02	0.14	9.42	9.20	0.14
Rotto Cay	RC	2/16/2012	3/14/2012	27	9.07			9.25		
Rotto Cay	RC	2/16/2012	3/14/2012	27	8.75			8.92		
Benner Bay	BB	2/16/2012	3/14/2012	27	7.71	7.41	0.47	7.86	7.55	0.48
Benner Bay	BB	2/16/2012	3/14/2012	27	6.48			6.61		
Benner Bay	BB	2/16/2012	3/14/2012	27	8.03			8.19		
Mangrove Lagoon	ML	2/16/2012	3/14/2012	27	9.53	8.36	1.06	9.71	8.53	1.08
Mangrove Lagoon	ML	2/16/2012	3/14/2012	27	6.25			6.37		
Mangrove Lagoon	ML	2/16/2012	3/14/2012	27	9.32			9.50		
Little Saint James	LJ	3/14/2012	4/16/2012	33	0.38	0.34	0.02	0.32	0.29	0.02
Little Saint James	LJ	3/14/2012	4/16/2012	33	0.31			0.26		
Little Saint James	LJ	3/14/2012	4/16/2012	33	0.33			0.28		
Saint James	SJ	3/14/2012	4/16/2012	33	0.21	0.26	0.02	0.18	0.22	0.02
Saint James	SJ	3/14/2012	4/16/2012	33	0.30			0.25		
Saint James	SJ	3/14/2012	4/16/2012	33	0.27			0.22		

Abbreviations: dw, dry weight; SE, standard error; mg/cm<sup>2</sup>/d, milligrams/square centimeter/day

## Appendix I. Results from the deployment of sediment traps in the STEER (continued).

Site	Site Code	Date Deployed	Date Collected	Total Days Deployed	Trap Sediment dw (g)	Mean Sediment dw (g)	Dry Weight SE	Trap Accumulation Rate dw (mg/cm <sup>2</sup> /d)	Mean Trap Accumulation Rate (mg/cm <sup>2</sup> /d)	Accumulation Rate SE
Cowpet Bay	CB	3/14/2012	4/16/2012	33	0.12	0.14	0.02	0.10	0.12	0.02
Cowpet Bay	CB	3/14/2012	4/16/2012	33	0.19			0.16		
Cowpet Bay	CB	3/14/2012	4/16/2012	33	0.11			0.09		
Rotto Cay	RC	3/14/2012	4/16/2012	33	1.80	1.96	0.08	1.50	1.63	0.07
Rotto Cay	RC	3/14/2012	4/16/2012	33	2.03			1.69		
Rotto Cay	RC	3/14/2012	4/16/2012	33	2.04			1.70		
Benner Bay	BB	3/14/2012	4/16/2012	33	4.95	6.63	1.30	4.13	5.53	1.09
Benner Bay	BB	3/14/2012	4/16/2012	33	5.76			4.80		
Benner Bay	BB	3/14/2012	4/16/2012	33	9.20			7.67		
Mangrove Lagoon	ML	3/14/2012	4/16/2012	33	N/A	N/A	N/A	N/A	N/A	N/A
Mangrove Lagoon	ML	3/14/2012	4/16/2012	33	0.54	0.70	0.16	0.45	0.58	0.14
Mangrove Lagoon	ML	3/14/2012	4/16/2012	33	0.86			0.72		
Little Saint James	LJ	4/16/2012	5/17/2012	31	0.35	0.46	0.06	0.31	0.41	0.05
Little Saint James	LJ	4/16/2012	5/17/2012	31	0.54			0.48		
Little Saint James	LJ	4/16/2012	5/17/2012	31	0.49			0.43		
Saint James	SJ	4/16/2012	5/17/2012	31	0.67	0.64	0.03	0.60	0.57	0.03
Saint James	SJ	4/16/2012	5/17/2012	31	0.58			0.52		
Saint James	SJ	4/16/2012	5/17/2012	31	0.66			0.59		
Cowpet Bay	CB	4/16/2012	5/17/2012	31	0.44	0.44	0.05	0.39	0.39	0.05
Cowpet Bay	CB	4/16/2012	5/17/2012	31	0.35			0.31		
Cowpet Bay	CB	4/16/2012	5/17/2012	31	0.53			0.47		
Rotto Cay	RC	4/16/2012	5/17/2012	31	4.78	4.88	0.05	4.24	4.34	0.05
Rotto Cay	RC	4/16/2012	5/17/2012	31	4.96			4.40		
Rotto Cay	RC	4/16/2012	5/17/2012	31	4.91			4.36		
Benner Bay	BB	4/16/2012	5/17/2012	31	10.24	10.46	0.61	9.10	9.29	0.54
Benner Bay	BB	4/16/2012	5/17/2012	31	11.60			10.30		
Benner Bay	BB	4/16/2012	5/17/2012	31	9.52			8.46		
Mangrove Lagoon	ML	4/16/2012	5/17/2012	31	N/A	N/A	N/A	N/A	N/A	N/A
Mangrove Lagoon	ML	4/16/2012	5/17/2012	31	3.45	3.26	0.19	3.06	2.90	0.17
Mangrove Lagoon	ML	4/16/2012	5/17/2012	31	3.07			2.73		
Little Saint James	LJ	5/17/2012	6/18/2012	32	0.37	0.38	0.01	0.32	0.32	0.01
Little Saint James	LJ	5/17/2012	6/18/2012	32	0.36			0.31		
Little Saint James	LJ	5/17/2012	6/18/2012	32	0.40			0.35		
Saint James	SJ	5/17/2012	6/18/2012	32	0.50	0.48	0.01	0.43	0.41	0.01
Saint James	SJ	5/17/2012	6/18/2012	32	0.48			0.41		
Saint James	SJ	5/17/2012	6/18/2012	32	0.47			0.41		
Cowpet Bay	CB	5/17/2012	6/18/2012	32	0.32	0.30	0.01	0.27	0.26	0.01
Cowpet Bay	CB	5/17/2012	6/18/2012	32	0.29			0.25		
Cowpet Bay	CB	5/17/2012	6/18/2012	32	0.29			0.25		
Rotto Cay	RC	5/17/2012	6/18/2012	32	10.61	10.29	0.19	9.13	8.86	0.16
Rotto Cay	RC	5/17/2012	6/18/2012	32	10.30			8.87		
Rotto Cay	RC	5/17/2012	6/18/2012	32	9.97			8.58		
Benner Bay	BB	5/17/2012	6/18/2012	32	11.95	12.17	0.11	10.28	10.47	0.10
Benner Bay	BB	5/17/2012	6/18/2012	32	12.31			10.59		
Benner Bay	BB	5/17/2012	6/18/2012	32	12.26			10.55		
Mangrove Lagoon	ML	5/17/2012	6/18/2012	32	5.45	5.31	0.10	4.69	4.57	0.08
Mangrove Lagoon	ML	5/17/2012	6/18/2012	32	5.12			4.41		
Mangrove Lagoon	ML	5/17/2012	6/18/2012	32	5.35			4.61		
Little Saint James	LJ	6/18/2012	7/16/2012	28	0.37	0.38	0.01	0.36	0.38	0.01
Little Saint James	LJ	6/18/2012	7/16/2012	28	0.40			0.39		
Little Saint James	LJ	6/18/2012	7/16/2012	28	0.38			0.38		

Abbreviations: N/A, not available; dw, dry weight; SE, standard error; mg/cm<sup>2</sup>/d, milligrams/square centimeter/day

## Appendix I. Results from the deployment of sediment traps in the STEER (continued).

Site	Site Code	Date Deployed	Date Collected	Total Days Deployed	Trap Sediment dw (g)	Mean Sediment dw (g)	Dry Weight SE	Trap Accumulation Rate dw (mg/cm <sup>2</sup> /d)	Mean Trap Accumulation Rate (mg/cm <sup>2</sup> /d)	Accumulation Rate SE
Saint James	SJ	6/18/2012	7/16/2012	28	0.23	0.21	0.02	0.23	0.20	0.02
Saint James	SJ	6/18/2012	7/16/2012	28	0.17			0.17		
Saint James	SJ	6/18/2012	7/16/2012	28	0.22			0.22		
Cowpet Bay	CB	6/18/2012	7/16/2012	28	0.29	0.22	0.04	0.29	0.22	0.04
Cowpet Bay	CB	6/18/2012	7/16/2012	28	0.16			0.15		
Cowpet Bay	CB	6/18/2012	7/16/2012	28	0.22			0.21		
Rotto Cay	RC	6/18/2012	7/16/2012	28	4.60	4.52	0.05	4.52	4.45	0.04
Rotto Cay	RC	6/18/2012	7/16/2012	28	4.44			4.37		
Rotto Cay	RC	6/18/2012	7/16/2012	28	4.52			4.45		
Benner Bay	BB	6/18/2012	7/16/2012	28	12.13	11.67	0.71	11.93	11.48	0.70
Benner Bay	BB	6/18/2012	7/16/2012	28	12.60			12.39		
Benner Bay	BB	6/18/2012	7/16/2012	28	10.29			10.12		
Mangrove Lagoon	ML	6/18/2012	7/16/2012	28	2.96	2.87	0.09	2.91	2.83	0.09
Mangrove Lagoon	ML	6/18/2012	7/16/2012	28	2.98			2.93		
Mangrove Lagoon	ML	6/18/2012	7/16/2012	28	2.69			2.65		
Little Saint James	LJ	7/16/2012	8/17/2012	32	1.14	1.24	0.06	0.98	1.07	0.05
Little Saint James	LJ	7/16/2012	8/17/2012	32	1.25			1.07		
Little Saint James	LJ	7/16/2012	8/17/2012	32	1.34			1.15		
Saint James	SJ	7/16/2012	8/17/2012	32	0.85	1.08	0.29	0.73	0.93	0.25
Saint James	SJ	7/16/2012	8/17/2012	32	0.74			0.64		
Saint James	SJ	7/16/2012	8/17/2012	32	1.67			1.43		
Cowpet Bay	CB	7/16/2012	8/17/2012	32	5.47	1.99	1.74	4.71	1.72	1.50
Cowpet Bay	CB	7/16/2012	8/17/2012	32	0.20			0.17		
Cowpet Bay	CB	7/16/2012	8/17/2012	32	0.31			0.27		
Rotto Cay	RC	7/16/2012	8/17/2012	32	15.43	15.85	0.81	13.27	13.63	0.70
Rotto Cay	RC	7/16/2012	8/17/2012	32	14.70			12.65		
Rotto Cay	RC	7/16/2012	8/17/2012	32	17.41			14.98		
Benner Bay	BB	7/16/2012	8/17/2012	32	14.54	7.67	3.53	12.51	6.60	3.04
Benner Bay	BB	7/16/2012	8/17/2012	32	5.69			4.89		
Benner Bay	BB	7/16/2012	8/17/2012	32	2.79			2.40		
Mangrove Lagoon	ML	7/16/2012	8/17/2012	32	4.18	4.15	0.18	3.60	3.57	0.15
Mangrove Lagoon	ML	7/16/2012	8/17/2012	32	4.44			3.82		
Mangrove Lagoon	ML	7/16/2012	8/17/2012	32	3.82			3.28		
Little Saint James	LJ	8/17/2012	9/14/2012	28	10.06	17.31	5.90	9.89	17.03	5.80
Little Saint James	LJ	8/17/2012	9/14/2012	28	29.01			28.52		
Little Saint James	LJ	8/17/2012	9/14/2012	28	12.87			12.66		
Saint James	SJ	8/17/2012	9/14/2012	28	11.43	12.72	1.09	11.24	12.51	1.08
Saint James	SJ	8/17/2012	9/14/2012	28	11.84			11.65		
Saint James	SJ	8/17/2012	9/14/2012	28	14.90			14.65		
Cowpet Bay	CB	8/17/2012	9/14/2012	28	1.94	2.35	0.27	1.90	2.31	0.27
Cowpet Bay	CB	8/17/2012	9/14/2012	28	2.25			2.21		
Cowpet Bay	CB	8/17/2012	9/14/2012	28	2.86			2.81		
Rotto Cay	RC	8/17/2012	9/14/2012	28	N/A	N/A	N/A	N/A	N/A	N/A
Rotto Cay	RC	8/17/2012	9/14/2012	28	N/A			N/A		
Rotto Cay	RC	8/17/2012	9/14/2012	28	N/A			N/A		
Benner Bay	BB	8/17/2012	9/17/2012	31	16.60	17.02	0.45	14.74	15.11	0.40
Benner Bay	BB	8/17/2012	9/17/2012	31	17.91			15.91		
Benner Bay	BB	8/17/2012	9/17/2012	31	16.54			14.69		
Mangrove Lagoon	ML	8/17/2012	9/17/2012	31	2.66	2.39	0.14	2.36	2.12	0.12
Mangrove Lagoon	ML	8/17/2012	9/17/2012	31	2.31			2.05		
Mangrove Lagoon	ML	8/17/2012	9/17/2012	31	2.20			1.96		

Abbreviations: N/A, not available; dw, dry weight; SE, standard error; mg/cm<sup>2</sup>/d, milligrams/square centimeter/day



## Appendix I. Results from the deployment of sediment traps in the STEER (continued).

Site	Site Code	Date Deployed	Date Collected	Total Days Deployed	Trap Sediment dw (g)	Mean Sediment dw (g)	Dry Weight SE	Trap Accumulation Rate dw (mg/cm <sup>2</sup> /d)	Mean Trap Accumulation Rate (mg/cm <sup>2</sup> /d)	Accumulation Rate SE
Little Saint James	LJ	9/14/2012	10/29/2012	45	3.43	4.45	0.51	2.10	2.72	0.31
Little Saint James	LJ	9/14/2012	10/29/2012	45	4.98			3.05		
Little Saint James	LJ	9/14/2012	10/29/2012	45	4.93			3.01		
Saint James	SJ	9/14/2012	10/29/2012	45	1.30	0.97	0.19	0.80	0.59	0.12
Saint James	SJ	9/14/2012	10/29/2012	45	0.65			0.39		
Saint James	SJ	9/14/2012	10/29/2012	45	0.96			0.59		
Cowpet Bay	CB	9/14/2012	10/29/2012	45	0.76	0.86	0.06	0.47	0.52	0.03
Cowpet Bay	CB	9/14/2012	10/29/2012	45	0.95			0.58		
Cowpet Bay	CB	9/14/2012	10/29/2012	45	0.85			0.52		
Rotto Cay	RC	9/14/2012	10/29/2012	45	11.83	14.66	3.10	7.24	8.97	1.90
Rotto Cay	RC	9/14/2012	10/29/2012	45	20.86			12.77		
Rotto Cay	RC	9/14/2012	10/29/2012	45	11.29			6.91		
Benner Bay	BB	9/17/2012	10/29/2012	42	15.50	13.39	2.88	10.16	8.78	1.89
Benner Bay	BB	9/17/2012	10/29/2012	42	16.98			11.13		
Benner Bay	BB	9/17/2012	10/29/2012	42	7.71			5.05		
Mangrove Lagoon	ML	9/17/2012	10/29/2012	42	3.23	3.43	0.30	2.12	2.25	0.20
Mangrove Lagoon	ML	9/17/2012	10/29/2012	42	3.04			1.99		
Mangrove Lagoon	ML	9/17/2012	10/29/2012	42	4.02			2.63		
Little Saint James	LJ	10/29/2012	12/1/2012	33	0.65	0.55	0.06	0.54	0.46	0.05
Little Saint James	LJ	10/29/2012	12/1/2012	33	0.55			0.46		
Little Saint James	LJ	10/29/2012	12/1/2012	33	0.45			0.38		
Saint James	SJ	10/29/2012	12/1/2012	33	0.71	0.60	0.12	0.59	0.50	0.10
Saint James	SJ	10/29/2012	12/1/2012	33	0.35			0.29		
Saint James	SJ	10/29/2012	12/1/2012	33	0.73			0.61		
Cowpet Bay	CB	10/29/2012	12/1/2012	33	1.28	1.06	0.17	1.07	0.89	0.14
Cowpet Bay	CB	10/29/2012	12/1/2012	33	1.19			0.99		
Cowpet Bay	CB	10/29/2012	12/1/2012	33	0.72			0.60		
Rotto Cay	RC	10/29/2012	12/1/2012	33	0.58	0.68	0.05	0.48	0.57	0.04
Rotto Cay	RC	10/29/2012	12/1/2012	33	0.73			0.61		
Rotto Cay	RC	10/29/2012	12/1/2012	33	0.74			0.61		
Benner Bay	BB	10/29/2012	12/1/2012	33	12.12	11.86	0.39	10.11	9.90	0.33
Benner Bay	BB	10/29/2012	12/1/2012	33	11.10			9.26		
Benner Bay	BB	10/29/2012	12/1/2012	33	12.38			10.33		
Mangrove Lagoon	ML	10/29/2012	12/1/2012	33	3.09	3.06	0.03	2.58	2.55	0.03
Mangrove Lagoon	ML	10/29/2012	12/1/2012	33	3.03			2.53		
Mangrove Lagoon	ML	10/29/2012	12/1/2012	33	N/A					
Little Saint James	LJ	12/1/2012	1/7/2013	37	1.02	0.65	0.20	0.76	0.48	0.15
Little Saint James	LJ	12/1/2012	1/7/2013	37	0.58			0.43		
Little Saint James	LJ	12/1/2012	1/7/2013	37	0.34			0.25		
Saint James	SJ	12/1/2012	1/7/2013	37	0.74	0.61	0.10	0.55	0.46	0.08
Saint James	SJ	12/1/2012	1/7/2013	37	0.40			0.30		
Saint James	SJ	12/1/2012	1/7/2013	37	0.69			0.51		
Cowpet Bay	CB	12/1/2012	1/7/2013	37	0.53	0.63	0.10	0.39	0.47	0.08
Cowpet Bay	CB	12/1/2012	1/7/2013	37	N/A					
Cowpet Bay	CB	12/1/2012	1/7/2013	37	0.74			0.55		
Rotto Cay	RC	12/1/2012	1/7/2013	37	6.18	5.65	0.28	4.60	4.21	0.21
Rotto Cay	RC	12/1/2012	1/7/2013	37	5.22			3.88		
Rotto Cay	RC	12/1/2012	1/7/2013	37	5.56			4.14		
Benner Bay	BB	12/1/2012	1/7/2013	37	4.89	8.21	1.68	3.64	6.11	1.25
Benner Bay	BB	12/1/2012	1/7/2013	37	10.31			7.67		
Benner Bay	BB	12/1/2012	1/7/2013	37	9.42			7.01		

Abbreviations: N/A, not available; dw, dry weight; SE, standard error; mg/cm<sup>2</sup>/d, milligrams/square centimeter/day

## Appendix I. Results from the deployment of sediment traps in the STEER (continued).

Site	Site Code	Date Deployed	Date Collected	Total Days Deployed	Trap Sediment dw (g)	Mean Sediment dw (g)	Dry Weight SE	Trap Accumulation Rate dw (mg/cm <sup>2</sup> /d)	Mean Trap Accumulation Rate (mg/cm <sup>2</sup> /d)	Accumulation Rate SE
Mangrove Lagoon	ML	12/1/2012	1/7/2013	37	2.49	2.55	0.12	1.85	1.90	0.09
Mangrove Lagoon	ML	12/1/2012	1/7/2013	37	2.78			2.07		
Mangrove Lagoon	ML	12/1/2012	1/7/2013	37	2.39			1.78		
Little Saint James	LJ	1/7/2013	2/25/2013	49	0.44	0.40	0.04	0.25	0.22	0.02
Little Saint James	LJ	1/7/2013	2/25/2013	49	0.33			0.18		
Little Saint James	LJ	1/7/2013	2/25/2013	49	0.43			0.24		
Saint James	SJ	1/7/2013	2/25/2013	49	0.54	0.81	0.32	0.31	0.46	0.18
Saint James	SJ	1/7/2013	2/25/2013	49	0.44			0.25		
Saint James	SJ	1/7/2013	2/25/2013	49	1.45			0.82		
Cowpet Bay	CB	1/7/2013	2/25/2013	49	0.98	1.37	0.50	0.55	0.77	0.28
Cowpet Bay	CB	1/7/2013	2/25/2013	49	2.35			1.32		
Cowpet Bay	CB	1/7/2013	2/25/2013	49	0.78			0.44		
Rotto Cay	RC	1/7/2013	2/25/2013	49	1.10	1.94	0.89	0.62	1.09	0.50
Rotto Cay	RC	1/7/2013	2/25/2013	49	1.01			0.57		
Rotto Cay	RC	1/7/2013	2/25/2013	49	3.73			2.09		
Benner Bay	BB	1/7/2013	2/25/2013	49	16.38	13.71	1.34	9.20	7.71	0.75
Benner Bay	BB	1/7/2013	2/25/2013	49	12.59			7.08		
Benner Bay	BB	1/7/2013	2/25/2013	49	12.17			6.84		
Mangrove Lagoon	ML	1/7/2013	2/25/2013	49	4.30	4.50	0.12	2.42	2.53	0.07
Mangrove Lagoon	ML	1/7/2013	2/25/2013	49	4.73			2.66		
Mangrove Lagoon	ML	1/7/2013	2/25/2013	49	4.47			2.51		
Little Saint James	LJ	2/25/2013	4/7/2013	41	0.45	0.59	0.08	0.30	0.40	0.05
Little Saint James	LJ	2/25/2013	4/7/2013	41	0.73			0.49		
Little Saint James	LJ	2/25/2013	4/7/2013	41	0.59			0.40		
Saint James	SJ	2/25/2013	4/7/2013	41	0.82	0.83	0.01	0.55	0.56	0.00
Saint James	SJ	2/25/2013	4/7/2013	41	0.84			0.57		
Saint James	SJ	2/25/2013	4/7/2013	41	0.83			0.55		
Cowpet Bay	CB	2/25/2013	4/7/2013	41	0.81	0.79	0.09	0.54	0.53	0.06
Cowpet Bay	CB	2/25/2013	4/7/2013	41	0.63			0.42		
Cowpet Bay	CB	2/25/2013	4/7/2013	41	0.93			0.63		
Rotto Cay	RC	2/25/2013	4/7/2013	41	0.69	0.92	0.36	0.46	0.62	0.24
Rotto Cay	RC	2/25/2013	4/7/2013	41	0.44			0.29		
Rotto Cay	RC	2/25/2013	4/7/2013	41	1.62			1.09		
Benner Bay	BB	2/25/2013	4/7/2013	41	13.02	14.36	0.68	8.74	9.64	0.45
Benner Bay	BB	2/25/2013	4/7/2013	41	15.20			10.21		
Benner Bay	BB	2/25/2013	4/7/2013	41	14.86			9.98		
Mangrove Lagoon	ML	2/25/2013	4/7/2013	41	5.20	4.09	0.68	3.49	2.75	0.46
Mangrove Lagoon	ML	2/25/2013	4/7/2013	41	4.23			2.84		
Mangrove Lagoon	ML	2/25/2013	4/7/2013	41	2.85			1.91		
Little Saint James	LJ	4/7/2013	5/13/2013	36	0.41	0.43	0.01	0.31	0.33	0.01
Little Saint James	LJ	4/7/2013	5/13/2013	36	0.45			0.34		
Little Saint James	LJ	4/7/2013	5/13/2013	36	0.42			0.32		
Saint James	SJ	4/7/2013	5/13/2013	36	0.50	0.64	0.08	0.38	0.49	0.06
Saint James	SJ	4/7/2013	5/13/2013	36	0.62			0.47		
Saint James	SJ	4/7/2013	5/13/2013	36	0.78			0.60		
Cowpet Bay	CB	4/7/2013	5/13/2013	36	0.54	0.62	0.09	0.42	0.47	0.07
Cowpet Bay	CB	4/7/2013	5/13/2013	36	0.79			0.61		
Cowpet Bay	CB	4/7/2013	5/13/2013	36	0.52			0.40		
Rotto Cay	RC	4/7/2013	5/13/2013	36	0.67	1.10	0.24	0.51	0.84	0.18
Rotto Cay	RC	4/7/2013	5/13/2013	36	1.13			0.87		
Rotto Cay	RC	4/7/2013	5/13/2013	36	1.49			1.14		

Abbreviations: N/A, not available; dw, dry weight; SE, standard error; mg/cm<sup>2</sup>/d, milligrams/square centimeter/day

## Appendix I. Results from the deployment of sediment traps in the STEER (continued).

Site	Site Code	Date Deployed	Date Collected	Total Days Deployed	Trap Sediment dw (g)	Mean Sediment dw (g)	Dry Weight SE	Trap Accumulation Rate dw (mg/cm <sup>2</sup> /d)	Mean Trap Accumulation Rate (mg/cm <sup>2</sup> /d)	Accumulation Rate SE
Benner Bay	BB	4/7/2013	5/13/2013	36	13.54	14.89	0.91	10.36	11.39	0.69
Benner Bay	BB	4/7/2013	5/13/2013	36	16.62			12.71		
Benner Bay	BB	4/7/2013	5/13/2013	36	14.50			11.09		
Mangrove Lagoon	ML	4/7/2013	5/13/2013	36	2.07	1.85	0.21	1.58	1.42	0.16
Mangrove Lagoon	ML	4/7/2013	5/13/2013	36	1.43			1.09		
Mangrove Lagoon	ML	4/7/2013	5/13/2013	36	2.06			1.57		
Little Saint James	LJ	5/13/2013	6/22/2013	40	0.51	0.66	0.10	0.35	0.46	0.07
Little Saint James	LJ	5/13/2013	6/22/2013	40	0.84			0.58		
Little Saint James	LJ	5/13/2013	6/22/2013	40	0.65			0.45		
Saint James	SJ	5/13/2013	6/22/2013	40	0.83	0.86	0.02	0.57	0.59	0.01
Saint James	SJ	5/13/2013	6/22/2013	40	0.88			0.61		
Saint James	SJ	5/13/2013	6/22/2013	40	0.86			0.59		
Cowpet Bay	CB	5/13/2013	6/22/2013	40	0.63	0.76	0.07	0.44	0.52	0.05
Cowpet Bay	CB	5/13/2013	6/22/2013	40	0.76			0.52		
Cowpet Bay	CB	5/13/2013	6/22/2013	40	0.89			0.61		
Rotto Cay	RC	5/13/2013	6/22/2013	40	9.69	10.58	0.89	6.67	7.29	0.61
Rotto Cay	RC	5/13/2013	6/22/2013	40	1.82			1.25		
Rotto Cay	RC	5/13/2013	6/22/2013	40	11.47			7.90		
Benner Bay	BB	5/13/2013	6/22/2013	40	9.12	9.76	0.40	6.28	6.72	0.27
Benner Bay	BB	5/13/2013	6/22/2013	40	10.48			7.22		
Benner Bay	BB	5/13/2013	6/22/2013	40	9.68			6.66		
Mangrove Lagoon	ML	5/13/2013	6/22/2013	40	4.11	3.57	0.28	2.83	2.46	0.19
Mangrove Lagoon	ML	5/13/2013	6/22/2013	40	3.44			2.37		
Mangrove Lagoon	ML	5/13/2013	6/22/2013	40	3.16			2.18		
Little Saint James	LJ	6/22/2013	8/17/2013	56	0.88	0.82	0.03	0.43	0.41	0.02
Little Saint James	LJ	6/22/2013	8/17/2013	56	0.77			0.38		
Little Saint James	LJ	6/22/2013	8/17/2013	56	0.82			0.40		
Saint James	SJ	6/22/2013	8/17/2013	56	0.89	0.75	0.09	0.44	0.37	0.04
Saint James	SJ	6/22/2013	8/17/2013	56	0.58			0.29		
Saint James	SJ	6/22/2013	8/17/2013	56	0.78			0.38		
Cowpet Bay	CB	6/22/2013	8/17/2013	56	0.97	1.13	0.10	0.48	0.56	0.05
Cowpet Bay	CB	6/22/2013	8/17/2013	56	1.33			0.65		
Cowpet Bay	CB	6/22/2013	8/17/2013	56	1.10			0.54		
Rotto Cay	RC	6/22/2013	8/17/2013	56	8.80	9.64	0.84	4.33	4.74	0.41
Rotto Cay	RC	6/22/2013	8/17/2013	56	10.49			5.16		
Rotto Cay	RC	6/22/2013	8/17/2013	56	4.50			2.21		
Benner Bay	BB	6/22/2013	8/17/2013	56	14.91	14.68	0.98	7.33	7.22	0.48
Benner Bay	BB	6/22/2013	8/17/2013	56	16.25			7.99		
Benner Bay	BB	6/22/2013	8/17/2013	56	12.89			6.34		
Mangrove Lagoon	ML	6/22/2013	8/17/2013	56	5.70	5.87	0.35	2.80	2.88	0.17
Mangrove Lagoon	ML	6/22/2013	8/17/2013	56	5.36			2.64		
Mangrove Lagoon	ML	6/22/2013	8/17/2013	56	6.54			3.22		
Little Saint James	LJ	8/17/2013	10/8/2013	52	0.70	0.72	0.05	0.37	0.38	0.02
Little Saint James	LJ	8/17/2013	10/8/2013	52	0.81			0.43		
Little Saint James	LJ	8/17/2013	10/8/2013	52	0.65			0.35		
Saint James	SJ	8/17/2013	10/8/2013	52	0.45	0.49	0.03	0.24	0.26	0.01
Saint James	SJ	8/17/2013	10/8/2013	52	0.49			0.26		
Saint James	SJ	8/17/2013	10/8/2013	52	0.54			0.29		
Cowpet Bay	CB	8/17/2013	10/8/2013	52	0.52	0.91	0.20	0.28	0.48	0.10
Cowpet Bay	CB	8/17/2013	10/8/2013	52	1.05			0.56		
Cowpet Bay	CB	8/17/2013	10/8/2013	52	1.16			0.61		

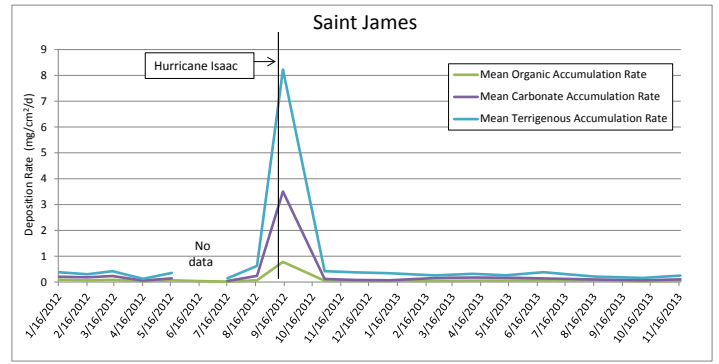
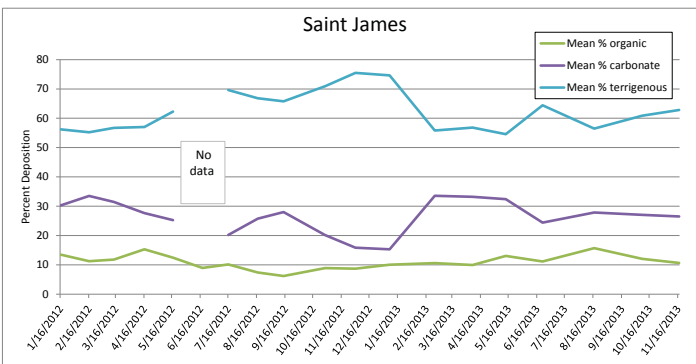
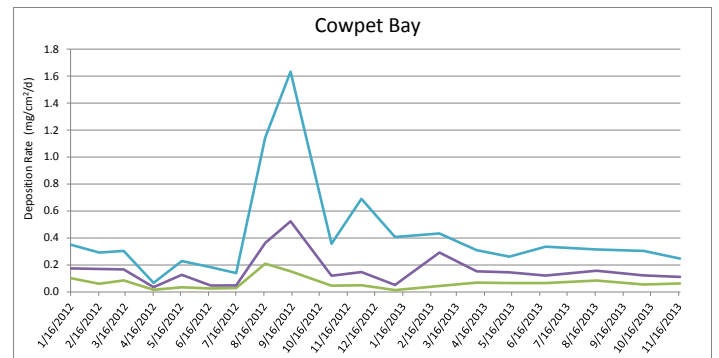
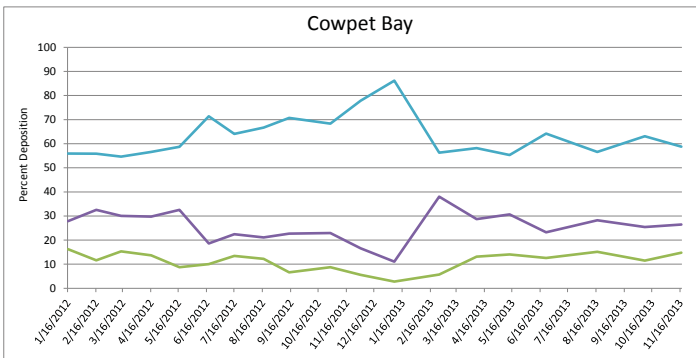
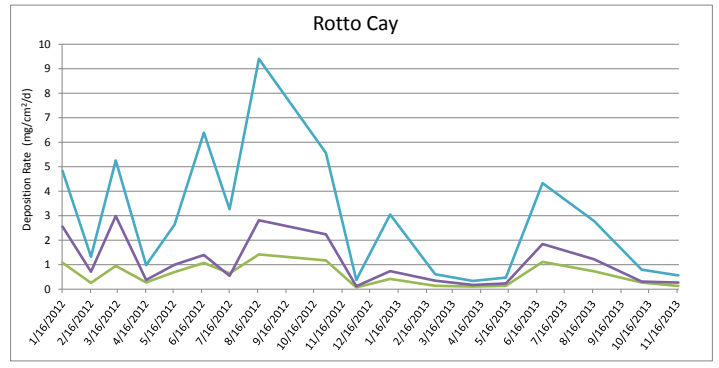
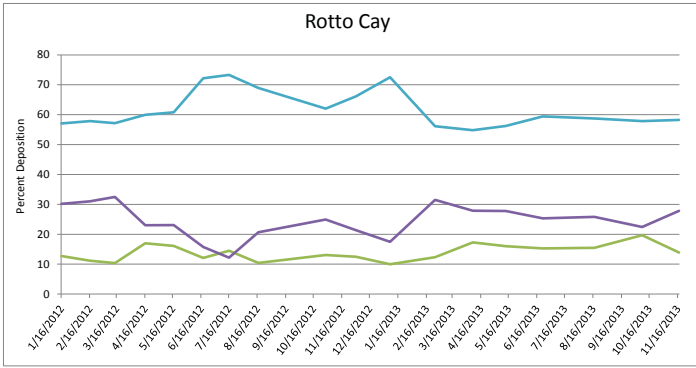
Abbreviations: N/A, not available; dw, dry weight; SE, standard error; mg/cm<sup>2</sup>/d, milligrams/square centimeter/day

## Appendix I. Results from the deployment of sediment traps in the STEER (continued).

Site	Site Code	Date Deployed	Date Collected	Total Days Deployed	Trap Sediment dw (g)	Mean Sediment dw (g)	Dry Weight SE	Trap Accumulation Rate dw (mg/cm <sup>2</sup> /d)	Mean Trap Accumulation Rate (mg/cm <sup>2</sup> /d)	Accumulation Rate SE
Rotto Cay	RC	8/17/2013	10/8/2013	52	2.32	2.60	0.53	1.23	1.38	0.28
Rotto Cay	RC	8/17/2013	10/8/2013	52	3.62			1.92		
Rotto Cay	RC	8/17/2013	10/8/2013	52	1.87			0.99		
Benner Bay	BB	8/17/2013	10/12/2013	56	24.01	23.11	0.95	11.81	11.36	0.47
Benner Bay	BB	8/17/2013	10/12/2013	56	21.21			10.43		
Benner Bay	BB	8/17/2013	10/12/2013	56	24.10			11.85		
Mangrove Lagoon	ML	8/17/2013	10/12/2013	56	2.82	2.47	0.32	1.39	1.21	0.16
Mangrove Lagoon	ML	8/17/2013	10/12/2013	56	2.75			1.35		
Mangrove Lagoon	ML	8/17/2013	10/12/2013	56	1.82			0.90		
Little Saint James	LJ	10/8/2013	11/17/2013	40	0.27	0.35	0.04	0.18	0.24	0.03
Little Saint James	LJ	10/8/2013	11/17/2013	40	0.40			0.28		
Little Saint James	LJ	10/8/2013	11/17/2013	40	0.39			0.27		
Saint James	SJ	10/8/2013	11/17/2013	40	0.48	0.58	0.11	0.33	0.40	0.08
Saint James	SJ	10/8/2013	11/17/2013	40	0.46			0.32		
Saint James	SJ	10/8/2013	11/17/2013	40	0.80			0.55		
Cowpet Bay	CB	10/8/2013	11/17/2013	40	0.80	0.61	0.12	0.55	0.42	0.08
Cowpet Bay	CB	10/8/2013	11/17/2013	40	0.64			0.44		
Cowpet Bay	CB	10/8/2013	11/17/2013	40	0.40			0.27		
Rotto Cay	RC	10/8/2013	11/17/2013	40	1.37	1.40	0.25	0.94	0.96	0.17
Rotto Cay	RC	10/8/2013	11/17/2013	40	0.98			0.67		
Rotto Cay	RC	10/8/2013	11/17/2013	40	1.85			1.27		
Benner Bay	BB	10/12/2013	11/24/2013	43	17.48	17.74	0.42	11.19	11.36	0.27
Benner Bay	BB	10/12/2013	11/24/2013	43	18.56			11.89		
Benner Bay	BB	10/12/2013	11/24/2013	43	17.16			10.99		
Mangrove Lagoon	ML	10/12/2013	11/24/2013	43	7.35	6.48	0.55	4.70	4.15	0.35
Mangrove Lagoon	ML	10/12/2013	11/24/2013	43	5.45			3.49		
Mangrove Lagoon	ML	10/12/2013	11/24/2013	43	6.66			4.26		

Abbreviations: N/A, not available; dw, dry weight; SE, standard error; mg/cm<sup>2</sup>/d, milligrams/square centimeter/day

Appendix J. Percent deposition and deposition rates in sediment traps from Rotto Cay, Cowpet Bay and Saint James.



## Appendix K. Total suspended solids (TSS) in water samples from the STEER.

Date	Site	GF filter (g)	GF filter + solids (g)	Suspended Solids (g)	Volume of water filtered (L)	TSS (g/L)
12/16/2011	SJ	0.125	0.13	0.005	0.8	0.00625
12/16/2011	CB	0.127	0.133	0.006	0.8	0.0075
12/16/2011	RC	0.128	0.136	0.008	0.8	0.0100
12/16/2011	BB	0.129	0.136	0.007	0.6	0.0117
12/16/2011	ML	0.127	0.135	0.008	0.5	0.0160
1/16/2012	SJ	0.126	0.137	0.011	1	0.0110
1/16/2012	CB	0.126	0.137	0.011	0.8	0.0138
1/16/2012	RC	0.128	0.14	0.012	0.8	0.0150
1/16/2012	BB	0.128	0.141	0.013	0.7	0.0186
1/16/2012	ML	0.127	0.134	0.007	0.5	0.0140
2/16/2012	SJ	0.126	0.132	0.006	1	0.0060
2/16/2012	CB	0.126	0.131	0.005	1	0.0050
2/16/2012	RC	0.126	0.129	0.003	1	0.0030
2/16/2012	BB	0.126	0.136	0.01	0.7	0.0143
2/16/2012	ML	0.126	0.133	0.007	0.8	0.0088
3/14/2012	LJ	0.125	0.131	0.006	0.9	0.0067
3/14/2012	SJ	0.126	0.132	0.006	0.9	0.0067
3/14/2012	CB	0.126	0.131	0.005	1	0.0050
3/14/2012	RC	0.126	0.135	0.009	0.95	0.0095
3/14/2012	BB	0.127	0.141	0.014	0.8	0.0175
3/14/2012	ML	0.126	0.134	0.008	0.8	0.0100
4/16/2012	LJ	0.126	0.13	0.004	1	0.0040
4/16/2012	SJ	0.125	0.133	0.008	1	0.0080
4/16/2012	CB	0.126	0.135	0.009	1	0.0090
4/16/2012	RC	0.125	0.132	0.007	1	0.0070
4/16/2012	BB	0.126	0.132	0.006	1	0.0060
4/16/2012	ML	0.125	0.135	0.01	1	0.0100
5/17/2012	LJ	0.126	0.128	0.002	1	0.0020
5/17/2012	SJ	0.125	0.127	0.002	1	0.0020
5/17/2012	CB	0.126	0.127	0.001	1	0.0010
5/17/2012	RC	0.125	0.126	0.001	1	0.0010
5/17/2012	BB	0.123	0.132	0.009	1	0.0090
5/17/2012	ML	0.124	0.131	0.007	1	0.0070
6/18/2012	LJ	0.126	0.129	0.003	1	0.0030
6/18/2012	SJ	0.125	0.13	0.005	1	0.0050
6/18/2012	CB	0.125	0.127	0.002	1	0.0020
6/18/2012	RC	0.125	0.128	0.003	1	0.0030
6/18/2012	BB	0.125	0.132	0.007	1	0.0070
6/18/2012	ML	0.123	0.133	0.01	1	0.0100
7/16/2012	LJ	0.13	0.133	0.003	1	0.0030
7/16/2012	SJ	0.126	0.128	0.002	1	0.0020
7/16/2012	CB	0.124	0.126	0.002	1	0.0020
7/16/2012	RC	0.125	0.127	0.002	1	0.0020

Abbreviations: GF, glass fiber; SJ, Saint James; CB, Cowpet Bay; RC, Rotto Cay; BB, Benner Bay; ML, Mangrove Lagoon, LJ, Little St. James

## Appendix K. Total suspended solids (TSS) in water samples from the STEER (continued).

Date	Site	GF filter (g)	GF filter + solids (g)	Suspended Solids (g)	Volume of water filtered (L)	TSS (g/L)
7/16/2012	BB	0.126	0.136	0.01	1	0.0100
7/16/2012	ML	0.126	0.133	0.007	1	0.0070
8/17/2012	LJ	0.13	0.1309	0.0009	1	0.0009
8/17/2012	SJ	0.1294	0.131	0.0016	1	0.0016
8/17/2012	CB	0.1284	0.1301	0.0017	1	0.0017
8/17/2012	RC	0.1274	0.1296	0.0022	1	0.0022
8/17/2012	BB	0.1308	0.1373	0.0065	1	0.0065
8/17/2012	ML	0.1293	0.1367	0.0074	1	0.0074
9/14/2012	LJ	0.1099	0.1111	0.0012	1	0.0012
9/14/2012	SJ	0.1099	0.1109	0.001	1	0.0010
9/14/2012	CB	0.1086	0.1217	0.0131	1	0.0131
9/14/2012	RC	0.1098	0.1134	0.0036	1	0.0036
9/17/2012	BB	0.1095	0.1146	0.0051	1	0.0051
9/17/2012	ML	0.1091	0.1114	0.0023	1	0.0023
10/29/2012	LJ	0.1094	0.1101	0.0007	1	0.0007
10/29/2012	SJ	0.1096	0.1106	0.001	1	0.0010
10/29/2012	CB	0.1093	0.1106	0.0013	1	0.0013
10/29/2012	RC	0.1084	0.1094	0.001	1	0.0010
10/29/2012	BB	0.1096	0.1133	0.0037	1	0.0037
10/29/2012	ML	0.1089	0.1166	0.0077	1	0.0077
12/1/2012	LJ	0.109	0.1101	0.0011	1	0.0011
12/1/2012	SJ	0.1079	0.109	0.0011	1	0.0011
12/1/2012	CB	0.1099	0.1111	0.0012	1	0.0012
12/1/2012	RC	0.1084	0.1094	0.001	1	0.0010
12/1/2012	BB	0.1104	0.1161	0.0057	1	0.0057
12/1/2012	ML	0.109	0.1127	0.0037	0.95	0.0039
1/7/2013	LJ	0.11	0.1114	0.0014	1	0.0014
1/7/2013	SJ	0.1095	0.1108	0.0013	1	0.0013
1/7/2013	CB	0.1095	0.1108	0.0013	1	0.0013
1/7/2013	RC	0.1088	0.1123	0.0035	1	0.0035
1/7/2013	BB	0.1092	0.1196	0.0104	1	0.0104
1/7/2013	ML	0.1102	0.1133	0.0031	1	0.0031
2/25/2013	LJ	0.1238	0.1271	0.0033	1	0.0033
2/25/2013	SJ	0.1295	0.1325	0.003	1	0.0030
2/25/2013	CB	0.1285	0.1319	0.0034	1	0.0034
2/25/2013	RC	0.1239	0.1261	0.0022	1	0.0022
2/25/2013	BB	0.1251	0.1351	0.01	1	0.0100
2/25/2013	ML	0.1243	0.1293	0.005	1	0.0050
4/7/2013	LJ	0.1245	0.1267	0.0022	1	0.0022
4/7/2013	SJ	0.1239	0.1266	0.0027	1	0.0027
4/7/2013	CB	0.1232	0.1254	0.0022	1	0.0022
4/7/2013	RC	0.1259	0.1284	0.0025	1	0.0025
4/7/2013	BB	0.1234	0.1334	0.01	1	0.0100

Abbreviations: GF, glass fiber; SJ, Saint James; CB, Cowpet Bay; RC, Rotto Cay; BB, Benner Bay; ML, Mangrove Lagoon, LJ, Little St. James

## Appendix K. Total suspended solids (TSS) in water samples from the STEER (continued).

Date	Site	GF filter (g)	GF filter + solids (g)	Suspended Solids (g)	Volume of water filtered (L)	TSS (g/L)
4/7/2013	ML	0.1236	0.1281	0.0045	1	0.0045
5/13/2013	LJ	0.1266	0.1287	0.0021	1	0.0021
5/13/2013	SJ	0.1264	0.1297	0.0033	1	0.0033
5/13/2013	CB	0.1253	0.1282	0.0029	1	0.0029
5/13/2013	RC	0.1232	0.1252	0.002	1	0.0020
5/13/2013	BB	0.1241	0.1297	0.0056	1	0.0056
5/13/2013	ML	0.127	0.1314	0.0044	1	0.0044
6/22/2013	LJ	0.1236	0.1248	0.0012	1	0.0012
6/22/2013	SJ	0.1259	0.1271	0.0012	1	0.0012
6/22/2013	CB	0.1284	0.1295	0.0011	1	0.0011
6/22/2013	RC	0.1251	0.1269	0.0018	1	0.0018
6/22/2013	BB	0.1266	0.1313	0.0047	1	0.0047
6/22/2013	ML	0.1282	0.1325	0.0043	1	0.0043
8/17/2013	LJ	0.1233	0.1248	0.0015	1	0.0015
8/17/2013	SJ	0.1252	0.1269	0.0017	1	0.0017
8/17/2013	CB	0.1255	0.1272	0.0017	1	0.0017
8/17/2013	RC	0.1253	0.127	0.0017	1	0.0017
8/17/2013	BB	0.124	0.1294	0.0054	1	0.0054
8/17/2013	ML	0.1259	0.1285	0.0026	1	0.0026
10/8/2013	LJ	0.124	0.1248	0.0008	1	0.0008
10/8/2013	SJ	0.1239	0.1252	0.0013	1	0.0013
10/8/2013	CB	0.1248	0.1263	0.0015	1	0.0015
10/8/2013	RC	0.1272	0.1294	0.0022	1	0.0022
10/12/2013	BB	0.1304	0.1368	0.0064	1	0.0064
10/12/2013	ML	0.1252	0.128	0.0028	1	0.0028
11/17/2013	LJ	0.1199	0.1204	0.0005	1	0.0005
11/17/2013	SJ	0.1184	0.1205	0.0021	1	0.0021
11/17/2013	CB	0.1181	0.1192	0.0011	1	0.0011
11/17/2013	RC	0.1172	0.1184	0.0012	1	0.0012
11/24/2013	BB	0.1183	0.1236	0.0053	1	0.0053
11/24/2013	ML	0.1183	0.1225	0.0042	1	0.0042
12/15/2013	LJ	0.1172	0.1187	0.0015	1	0.0015
12/15/2013	SJ	0.117	0.1184	0.0014	1	0.0014
12/15/2013	CB	0.1178	0.1195	0.0017	1	0.0017
12/15/2013	RC	0.1261	0.1364	0.0103	1	0.0103
12/15/2013	BB	0.1261	0.1314	0.0053	1	0.0053
12/15/2013	ML	0.1177	0.1217	0.004	1	0.0040
2/24/2014	LJ	0.1195	0.1204	0.0009	1	0.0009
2/24/2014	SJ	0.1196	0.1217	0.0021	1	0.0021
2/24/2014	CB	0.1196	0.1219	0.0023	1	0.0023
2/24/2014	RC	0.1183	0.119	0.0007	1	0.0007
2/26/2014	BB	0.1188	0.1238	0.005	1	0.0050
2/26/2014	ML	0.1201	0.1237	0.0036	1	0.0036

Abbreviations: GF, glass fiber; SJ, Saint James; CB, Cowpet Bay; RC, Rotto Cay; BB, Benner Bay; ML, Mangrove Lagoon, LJ, Little St. James







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