

Rookery Bay (RKB) NERR Nutrient Metadata
(January 2007 – December 2007)
Latest Update: November 15, 2011

I. Data Set and Research Descriptors

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- 2) Research Objectives** – The four stations selected are in estuaries with different land-use patterns within their watersheds. Their placement addresses priority resource management issues that are identified in the Reserve's management plan. Specifically, the data from these stations are providing valuable information concerning the affects of land-use activities on the quantity, quality and timing of freshwater inflow into the Reserve.

- a) **Monthly grab-** The principal objective of the monthly grab sampling is to determine spatial and temporal differences in water quality within the Reserve.
- b) **Diel Sampling Program** – The principal objective of the diel sampling is to determine the impact of tidal water exchange within Henderson Creek (the main source of freshwater into Rookery Bay).

3) Research Methods- Samples are collected in coordination with the Southeastern Environmental Research Center (SERC) Water Quality Monitoring Program – Florida International University (FIU).

- a) **Monthly Grab Sampling Program** – Two successive monthly grab samples are taken within 50 meters of all four SWMP water quality stations (Henderson Creek, Middle Blackwater River, Faka Union Bay and Fakahatchee Bay). Typically three types of water samples were taken for each grab sample 1) filtered soluble nutrient samples; 2) unfiltered total nutrient samples; and 3) chlorophyll-a samples. Clean 60 and 125 ml high density polyethylene (HDPE) bottles are used for filtered and total nutrient samples, respectively. These bottles, as well as all sample bottles are cleaned as per section 9.1 of SERC laboratory manual. Chlorophyll samples are stored in 1.8 ml micro-centrifuge tubes, which are used once and then discarded. The unfiltered samples are collected 10 cm below the surface using 125 ml HDPE bottles and kept at ambient temperature in the dark. Duplicate water samples for dissolved nutrient analysis are collected using acid washed and sample rinsed (x 3) 140 ml syringes and filtered in the field (SOP SERC 003-98) using 25 mm (0.7 μ) glass fiber GF/F filters. The sample water was then stored in acetone-washed and sample rinsed 60 ml HDPE bottles, which were capped and immediately stored on ice in the dark – these are the filtered samples. The wet filters, used for chlorophyll a (Chl a) analysis, were placed in 1.8 ml plastic centrifuge tubes to which 1.5 ml of 90% acetone were added (Strickland and Parsons 1972); they were then capped and put into a dark bottle on ice for transport. (See SOP SERC 003-98).

Surface water quality parameters (available through the Reserve only, not reported in this data set) were measured with a YSI 600-xl multi-parameter data logger, and hand held display (YSI model 650). Salinity (ppt) and temperature ($^{\circ}$ C) were measured using a combination salinity-conductivity-temperature probe (YSI model 6560); dissolved oxygen (DO, mg/L) was measured at the surface and bottom using a Rapid Pulse- Clarke Type probe (YSI model 6562), and pH was measured using a (YSI model 605091) as per section 6.4.2 of the SER field QA plan.

- b) **Diel Sampling Program** - Monthly diel samples (10) were collected every 2.5 hours over a lunar day (24hr:48 min) using an ISCO model

3700FR refrigerated auto-sampler. The sampler was stationed at the end of the Rookery Bay dock, approximately 100 meters from the water quality station. Collection of the samples began at slack low tide whenever possible. Prior to sampling the Polyethylene bottles were washed using (Liqui-Nox® soap), soaked in an acid bath (10% HCL) for at least 3 hours and rinsed 3-6 times with tap water and distilled-deionized water, then air dried. The siphon hose is rinsed 3 times with ambient water prior to set up.

Sample filtration: Each polyethylene bottle was shaken to redistribute sediments in bottom. Using a large syringe (60 ml), sample water was filtered through a 25 mm (0.7µm) Glass Microfibre filter (Whitman GF/F) into a 30 ml Nalgene/HDPE sample bottle and labeled. This was done for all 10 water samples (total nutrient parameters were not measured for diel samples).

Chlorophyll a: The remainder of the water sample is passed through the filter along with an additional 60 mls for a total of 120ml (unless noted on Chain-of- Custody sheets). A known amount of air (60 cc) is forced through the filter three times to aid in drying. Using forceps, the filter is carefully folded and transferred to a 1.8 ml micro-centrifuge tube and the tube is filled with 90% acetone (approx. 1.5 ml). The tube is labeled and placed in an Amber Nalgene HDPE bottle (dark). This procedure is repeated for all the water samples collected in the ISCO sampler. The samples are then transported in a cooler on ice directly to the Analytical Laboratory.

4) Site location and character-

Lower Henderson Creek (rkblhnut)– This site is located at the mouth of Henderson Creek. While this station receives most of its freshwater from a canal system that drains a watershed area approximately 50% development versus natural landscape, a weir controls most of the freshwater flow. This structure has been upgraded to mimic more natural conditions. The water quality data logger is located within the creek channel at the “manatee caution” marker, The diel samples are taken off the Rookery Bay Dock located within Henderson Creek approximately 100 meters from the water quality station.

The salinity within the creek varies with season rains. The creek bottom is comprised mostly of fine sand and mud. The dominant vegetation near the sampling site is red mangrove. Watershed activities that potentially impact the site include non-point source pollution from road runoff, drift of mosquito control pesticides, and runoff from upstream agricultural areas as well as leachate from nearby residential septic systems.

Salinity Range: 0 – 42 ppt

Tidal Range: 0 – 2.7 meters

Average depth (mid-channel at MHW): 2.0 meters

Position: Latitude: 26.0257 N

Longitude: 81.7332 W

Middle Blackwater River (rkbmbnut) - This site is located mid-way down the river at navigational marker #17 within the channel. The “Middle” Blackwater labeling is to distinguish it from other historical sites.

The substrate within the channel is a mixture of silt, sand, and oyster shell. Red mangroves dominate the surrounding vegetation at the site. Upstream influences consist of the Collier-Seminole State Park’s boat basin, SR 41 canal, and some agricultural influences. Also, the historical flow seems to be altered by the Southern Golden Gate Estates Drainage Project.

Salinity Range: 0 – 42 ppt

Tidal Range: 0.2 – 1.8 meters

Average Depth at MHW: 2.0 meters

Position: Latitude: 25.9343 N

Longitude: 81.5946 W

Faka Union Bay (rkbfunut) – This site is located at the mouth of the Faka Union Canal at the “Manatee Caution” marker within the main channel.

The substrate within the channel is a mixture of sand and silt. Red mangrove forest and spoil islands dominate the area around the canal. Upstream influences consist of Port-of-the Islands development and marina. The upstream flow consists of an elaborated canal system (Southern Golden Gate Estates Drainage basin). This system has altered natural freshwater flow into Faka Union Bay and Blackwater River.

Salinity Range: 0 – 42 ppt

Tidal Range: 0.2 – 1.6 meters

Average Depth at MHW: 2.0 meters

Position: Latitude: 25.9005 N

Longitude: 81.5159 W

Fakahatchee Bay (rkbfbnut)– This site is located between the mouths’ of the Fakahatchee River and the East River,

The substrate within the channel is a mixture of sand, shell and silt. Red mangrove dominates the area vegetation. Upstream influences consists of minimal effects of the Prairie Canal, I-75 and US 41. The majority of the watershed is within the Fakahatchee Strand Preserve and Big Cypress National Park.

Salinity Range: 0 – 43 ppt

Tidal Range: 0.2 – 1.8 meters

Average Depth at MHW: 2.0 meters

Position: Latitude: 25.8922 N

Longitude: 81.4770 W

5) Code variable definitions-

rkbhlhnut = Rookery Bay NERR Lower Henderson Creek nutrients (monthly grab and diel sampling)

rkbmbnut = Rookery Bay NERR Middle Blackwater River nutrients (monthly grabs)

rkbfunut = Rookery Bay NERR Faka Union Bay nutrients (monthly grabs)

rkbfbnut = Rookery Bay NERR Fakahatchee Bay nutrients (monthly grabs)

Monitoring Codes:

Monitoring codes were established to indicate which type of sampling procedure was used:

1 = Grab Samples

2 = Diel Samples

Replicate numbers were also noted in the table. Grabs having replicates 1 and 2; while the diel samples are collected 1 sample every 2.5 hrs and therefore the replicate number is always "1".

6) Data Collection Period- Monthly Grab Sampling

Site	Start Date	Start Time	End Date	End Time
rkbhlhnut	01/16/07	13:32	01/16/07	13:33
rkbhlhnut	02/13/07	10:00	02/13/07	10:01
rkbhlhnut	03/13/07	13:50	03/13/07	13:51
rkbhlhnut	04/18/07	14:24	04/18/07	14:25
rkbhlhnut	05/15/07	13:41	05/15/07	13:42
rkbhlhnut	06/19/07	13:30	06/19/07	13:31
rkbhlhnut	07/27/07	13:04	07/27/07	13:05
rkbhlhnut	08/20/07	13:38	08/20/07	13:39
rkbhlhnut	09/11/07	14:54	09/11/07	14:55
rkbhlhnut	10/23/07	13:04	10/23/07	13:05
rkbhlhnut	11/13/07	13:38	11/13/07	13:39
rkbhlhnut	12/04/07	14:54	12/04/07	14:55

rkbmbnut	01/29/07	11:44	01/29/07	11:45
rkbmbnut	02/26/07	13:08	02/26/07	13:09
rkbmbnut	03/21/07	12:54	03/21/07	12:55
rkbmbnut	04/18/07	08:38	04/18/07	08:39
rkbmbnut	05/24/07	11:36	05/24/07	11:37
rkbmbnut	06/14/07	08:16	06/14/07	08:17
rkbmbnut	07/15/07	15:40	07/15/07	15:41
rkbmbnut	08/28/07	10:08	08/28/07	10:09
rkbmbnut	09/19/07	13:40	09/19/07	13:41
rkbmbnut	10/30/07	15:40	10/30/07	15:41
rkbmbnut	11/14/07	10:08	11/14/07	10:09
rkbmbnut	12/05/07	13:40	12/05/07	13:41
rkbfunut	01/29/07	10:34	01/29/07	10:35
rkbfunut	02/26/07	11:14	02/26/07	11:15
rkbfunut	03/21/07	11:36	03/21/07	11:37
rkbfunut	04/18/07	09:57	04/18/07	09:58
rkbfunut	05/24/07	10:20	05/24/07	10:21
rkbfunut	06/14/07	09:37	06/14/07	09:38
rkbfunut	07/15/07	12:09	07/15/07	12:10
rkbfunut	08/28/07	11:29	08/28/07	11:30
rkbfunut	09/19/07	12:13	09/19/07	12:14
rkbfunut	10/30/07	12:09	10/30/07	12:10

rkbfunut	11/14/07	11:29	11/14/07	11:30
rkbfunut	12/05/07	12:13	12/05/07	12:14
rkbfbnut	01/29/07	09:26	01/29/07	09:27
rkbfbnut	02/26/07	11:25	02/26/07	11:26
rkbfbnut	03/21/07	09:57	03/21/07	09:58
rkbfbnut	04/18/07	10:25	04/18/07	10:26
rkbfbnut	05/24/07	09:10	05/24/07	09:11
rkbfbnut	06/14/07	09:56	06/14/07	09:57
rkbfbnut	07/15/07	12:27	07/15/07	12:28
rkbfbnut	08/28/07	11:43	08/28/07	11:44
rkbfbnut	09/19/07	09:25	09/19/07	09:26
rkbfbnut	10/30/07	12:27	10/30/07	12:28
rkbfbnut	11/14/07	11:43	11/14/07	11:44
rkbfbnut	12/05/07	09:25	12/05/07	09:26

Diel Sampling

Site	Start Date	Start Time	End Date	End Time
rkbllhnut	01/15/07	08:00	01/16/07	06:30
rkbllhnut	02/12/07	08:00	02/13/07	06:30
rkbllhnut	-----	-----	-----	-----
rkbllhnut	04/17/07	08:00	04/18/07	06:30

rkblhnut	05/14/07	08:00	05/15/07	06:30
rkblhnut	06/18/07	08:00	06/19/07	06:30
rkblhnut	07/16/07	08:00	07/17/07	06:30
rkblhnut	08/13/07	08:00	08/14/07	06:30
rkblhnut	09/10/07	08:00	09/11/07	06:30
rkblhnut	10/21/07	08:00	10/22/07	06:30
rkblhnut	-----	-----	-----	-----
rkblhnut	12/09/07	08:00	12/10/07	06:30

7) Associated Researchers and Projects- The nutrient data collection and analysis are part of the Southeastern Environmental Research Center (SERC) Water Quality Monitoring Program. This program was established to address regional water quality concerns outside the boundaries of individual agencies. This “network” collects some 479 sites within the South Florida Region (for more information visit the following website: <http://serc.fiu.edu>.) In addition, this data is incorporated into the National Estuarine Research Reserve (NERR) dataset and is used in conjunction with associated water quality and meteorological data collected at the same sites.

8) Distribution-

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Services, National Oceanic and Atmospheric Administration. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or

comparisons. The Federal government does not assume liability to Recipients or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

NERR water quality/nutrient data and metadata can be obtained from the Research Coordinator at Rookery Bay NERR site (please see Section 1. Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under general information link on the CDMO home page) and online at the CDMO home page <http://cdmo.baruch.sc.edu/>. Data are available in text tab-delimited format.

II. Physical Structure Descriptors

- 9) **Entry Verification** – Nutrient data collection and analysis for Rookery Bay NERR is part of a partnership with Florida International University/ Southeast Environmental Research Center's Estuarine Water Quality Monitoring Network. Water quality data is collected monthly during the annual period of record (POR) from 8 stations in the Ten Thousand Islands, and 16 stations in Cape Romano-Rookery Bay. The results and quarterly report (which includes Rookery Bay's SWMP sites) are submitted to Christina Gwaltney, Research Coordinator at RKBNERR and Vicki McGee, Water Quality Program Manager at RKBNERR as deliverables as per their annual purchase order agreement. For details on FIU/SERC laboratory QA/QC procedures please contact Dr. Joseph Boyer, Associate Director of SERC: boyerj@fiu.edu. Upon receiving the quarterly reports Vicki McGee reviews and compiles the data according to CDMO Nutrient monitoring guidelines.

Nutrient data are entered into a Microsoft Excel worksheet and processed using the NutrientQAQC Excel macro. The NutrientQAQC macro sets up the data worksheet, metadata worksheets, and MDL worksheet; facilitates data entry; allows the user to set the number of significant figures to be reported for each parameter and rounds using banker's rounding rules; allows the user to input MDL values and automatically flags and codes values below MDL; calculates parameters chosen by the user and automatically flags for component values below MDL and negative values; allows the user to apply QAQC flags and codes to the data; graphs selected parameters for review; append files; and export the resulting data files to the CDMO for tertiary QAQC and assimilation into the CDMO's authoritative online database.

10) Parameter Titles and Variable Names by Data Category

Required NOAA/NERRS System-wide Monitoring Program water quality parameters are denoted by an asterisks”*”.

Data Category	Parameter	Variable Name	Units of Measure
Phosphorus & Nitrogen:	**Total Phosphorus	TP	mg/L as P
	*Orthophosphate	PO4F	mg/L as P
	**Total Nitrogen	TN	mg/L as N
	** Total Organic Nitrogen	TON	mg/L as N
	*Nitrite + Nitrate, Filtered	NO23F	mg/L as N
	*Nitrite, Filtered	NO2F	mg/L as N
	*Nitrate, Filtered	NO3F	mg/L as N
	*Ammonium, Filtered	NH4F	mg/L as N
	Dissolved Inorganic Nitrogen	DIN	mg/L
Plant Pigments:	*Chlorophyll a	CHLA_N	µg/L
Carbon:	**Total Carbon	TOC	mg/L

** Total Nitrogen, Total Organic Nitrogen, Total Phosphorus and Total Carbon were only measured for grab samples.

Notes:

1. Time is coded based on a 2400 hour clock and is referenced to Eastern Standard Time (EST).
2. Reserves have the option of measuring either NO2 and NO3 or they may substitute NO23 for individual analyses if they can show that NO2 is a minor component relative to NO3.

11) Measured and Calculated Laboratory Parameters –

a) Parameters Measured Directly-

Nitrogen species: NO2F, NO23F, NH4F, TN
 Phosphorous species: PO4F, TP
 Other: TOC, CHLA

b) Calculated Parameters-

NO3: NO23F –NO2F
 DIN: NO23F +NH4F
 TON: TN-NH4F-NO23F

12) Limits of Detection-

Method Detection Limits (MDL), the lowest concentration of a parameter that an analytical procedure can reliably detect, have been established by the Florida International University/ Southeastern Environmental Research Center Analytical Laboratory. Table 1 represents the current MDL's; these values are reviewed and revised periodically.

Parameter	Variable	MDL	start date	End date
Ammonium	NH4	0.0057 mg/L	09/05/06	12/31/07
Nitrate + Nitrite	NO23	0.0024 mg/L	09/05/06	12/31/07

Nitrite	NO2	0.0003 mg/L	09/05/06	12/31/07
Orthophosphate	PO4	0.0022 mg/L	09/05/06	12/31/07
Total Phosphorous	TP	0.0012 mg/L	09/05/06	12/31/07
Total Organic Carbon	TOC	0.04 mg/L	09/05/06	12/31/07
Total Nitrogen	TN	0.05 mg/L	09/05/06	12/31/07
Chlorophyll a	CHLA	0.1 ug/L	09/05/06	12/31/07

13) Laboratory Methods:

- a) **Laboratory Methods** – All laboratory analysis was preformed by Southeast Environmental Research Program Florida International University, Miami, Florida

i) Parameter: NH4

EPA or other Reference Method: EPA350.1

Method Reference: SERC SOP #002-98

Method Description: *Analysis for inorganic filtered nutrients (ammonium, nitrite, nitrate and soluble reactive phosphorus) are run simultaneously using a four-channel Alpkem RFA-300 (Rapid Flow Analyzer). The indophenol blue method for ammonium was used.*

Preservation Method: Samples filtered in the field and stored at 4°C up to 24 hours.

ii) Parameter: NO2

EPA or other Reference Method: EPA353.2

Method Reference: SERC SOP #002-98

Method Description: *Nitrite is determined as an azo dye formed by the reaction of nitrite with sulfanilamide and subsequent coupling with N-1-naphthylethylenediamine (NEDA).*

Preservation Method: Samples filtered in the field and stored at 4°C up to 24 hours.

iii) Parameter: NO3

EPA or other Reference Method: Substraction

Method Reference: SERC SOP #002-98

Method Description: *Nitrate is determined by the quantitative reduction of nitrate to nitrite using an activated cadmium column.*

Preservation Method: Samples filtered in the field and stored at 4°C up to 24 hours.

iv) Parameter: Orthophosphate

EPA or other Reference Method: EPA365.1

Method Reference: SERC SOP #002-98

Method Description: *Soluble reactive phosphate is determined by reacting phosphate with molybdenum (IV) and antimony (III) in an acid medium to form a phosphoantimonyl-molybdenum*

complex; this complex is reduced with ascorbic acid to form a colored dye.

Preservation Method: Samples are filtered and stored at 4°C for up to 24 hours.

v) Parameter: NO₂

EPA or other Reference Method: *EAP353.2*

Reference Method: *SM4500-NO₃F*

Method Description:

Preservation Method: Samples are stored at 4°C for up to 24 hours.

vi) Parameter: TN

EPA or other Reference Method: *ANTEK 7000*

Reference Method:

Method Description: The procedure is a modification of the classical Dumas (1831) method of determining nitrogen by combustion technique with the addition of chemiluminescence. The method involves converting all forms of nitrogen into nitric oxide (NO) upon combustion of a sample with oxygen at a temperature in excess of 1000 °C. The NO is reacted with ozone (O₃) to form a metastable form of nitrogen dioxide (NO₂⁻). As the metastable form of nitrogen dioxide decays, a quantum of light is emitted in an amount directly proportional to the amount of nitrogen in the sample. The chemiluminescent emission is detected by a photomultiplier tube at a specific wavelength. An ANTEK Instrument, Inc, Model 7000N Nitrogen Analyzer is used to determine total nitrogen of a 5µl injection of a preserved water sample.

Preservation Method: Samples are stored at 4°C for up to 24 hours.

vii) Parameter: TP

EPA or other Reference Method: *EPA365.1*

Reference Method: *SECR #001-98*

Method Description: Total Phosphorous is determined by oxidizing and hydrolyzing all the phosphorus-containing compounds in a sample to soluble reactive phosphate (orthophosphate). Soluble reactive phosphate then is determined by reacting phosphate with molybdenum (VI) and antimony (III) in an acid medium to form phosphoantimonylmolybdenum complex; this complex is reduced with ascorbic acid to form a colored dye.

Preservation Method: Samples are stored at 4°C for up to 24 hours.

viii) Parameter: TOC

EPA or other Reference Method: *EPA415.1*

Reference Method: *SERC # 001-04*

Method Description: Samples are analyzed by hot-platinum catalyst combustion of the non-purgeable organic carbon in the sample to CO₂ on a Shimadzu TOC_ VCSH Total Organic Carbon Analyzer.

Preservation Method: Samples are stored at 4°C for up to 24 hours. Samples should be processed within 28 days of collection,

ix) Parameter: CHLA

EPA or other Reference Method: *SM10200H*

Method Reference: *SERC SOP #009-98*

Method Description: *An extractive fluorometric technique is used to determine chlorophyll-a concentrations. Acetone extracts of suspended material collected on filters (saturated magnesium carbonate is not added to filters as a preservative since acetone is added immediately) and excited with 435 nm light, and the fluorescent emission of light at 667 nm is measured using a spectrofluorometer. The amount of fluorescence is directly proportional to chlorophyll concentration as determined by a standard curve of chlorophyll prepared in 90% acetone solution.*

Preservation Method: *Filters are stored in 90% acetone and placed in the dark and stored at 4°C for a minimum of 48 hours.*

x) Parameter: Field Measurements

EPA or other Reference Method:

Reference Method: *SERC SOP #005-98*

Method Description: *This procedure applies to the measurements of temperature, pH, light, salinity/conductivity, and dissolved oxygen at the surface and bottom of the water column at each sampling station.*

14) Field and Laboratory QA/QC programs-

a) Precision:

i) **Field Variability** – Two successive grab samples are collected for each monthly sampling event.

ii) **Laboratory variability** – Standard laboratory QC checks include, blanks, replicates, and QC standards and QC check samples. At least one replicate is run per analytical batch and every 20 samples thereafter.

iii) **Inter-organizational splits** – “Quality control samples are prepared in-house or from a NIST certified source. These samples are submitted blind to the analyst every 6 months to check instrument and user performance. The QC samples are run with each proficiency testing to ensure precision and accuracy.” (see pg 56 of SERC laboratory manual attached.)

b) Accuracy: is defined as the agreement between the analytical results and the known concentration. Accuracy is determined by running matrix spikes (MS) and/or sample duplicates. The acceptance criteria is usually $RPD \leq 20\%$.

i) **Sample spikes**- “Matrix spike samples are prepared by splitting a sample from the survey of using an S2 (not a blank, in the absence of enough sample or of high concentration that will go over the calibration curve) into two duplicates and spiking one of the duplicates with a known concentration. The concentration from the un-spiked one of the duplicates is subtracted from the spiked results and the percent recovery by comparing the remainder to the known spike concentration. MS % recovery should be between 90 – 110%. Also the matrix spike duplicates are used to calculate accuracy by calculating their RPD (Relative Percent Different) by subtracting the absolute value of the 2 matrix spikes and dividing it by the sum of its MS and then multiply by 100.” (pg 55 of SERC laboratory manual).

ii) **Standard Reference material analysis** – Standard stocks are received by the laboratory staff, initialed, dated and stored in designated areas. The preparation dates of in-house primary stock solutions are recorded in a log book along with the following information: analyte, concentration, supplier, date opened, expiration data and date of disposal. Preparation logs are maintained for each standard stock.

iii) **Cross calibration exercised** – (pg 54 of SERC laboratory manual).

15) QAQC flag definitions- This section details the primary and secondary QAQC flag definitions.

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter’s associated flag column (header preceded by an F_). QAQC flags are applied to the nutrient data during secondary QAQC to indicate data that are out of sensor range low (-4), rejected due to QAQC checks (-3), missing (-2), optional and were not collected (-1), suspect (1), and that have been corrected (5). All remaining data are flagged as having passed initial QAQC checks (0) when the data are uploaded and assimilated into the CDMO ODIS as provisional plus data. The historical data flag (4) is used to indicate data that were submitted to the CDMO prior to the initiation of secondary QAQC flags and codes (and the use of the automated primary QAQC system for WQ and MET data). This flag is only present in historical data that are exported from the CDMO ODIS.

- 4 Outside Low Sensor Range*
- 3 Data Rejected due to QAQC
- 2 Missing Data
- 1 Optional SWMP Supported Parameter
- 0 Data Passed Initial QAQC Checks
- 1 Suspect Data
- 4 Historical Data: Pre-Auto QAQC
- 5 Corrected Data

*The -4 Outside Low Sensor Range flag was added to the 2007 dataset in August of 2011. See the Other Remarks section for more details.

16) QAQC code definitions- This section details the secondary QAQC definitions used in combination with flags above.

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the sample or sample collection, sensor errors document common sensor or parameter specific problems, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be

applied to a particular data point. However, a record flag column (F_Record) in the nutrient data allows multiple comment codes to be applied to the entire data record.

General errors

GCM	Calculated value could not be determined due to missing data
GCR	Calculated value could not be determined due to rejected data
GDM	Data missing or sample never collected
GQD	Data rejected due to QA/QC checks
GQS	Data suspect due to QA/QC checks

Sensor errors

SBL	Value below minimum limit of method detection
SCB	Value calculated with a value that is below the MDL
SCC	Calculation with this component resulted in a negative value
SNV	Calculated value is negative
SRD	Replicate values differ substantially
SUL	Value above upper limit of method detection

Parameter Comments

CAB	Algal bloom
CDR	Sample diluted and rerun
CHB	Sample held beyond specified holding time
CIP	Ice present in sample vicinity
CIF	Flotsam present in sample vicinity
CLE	Sample collected later/earlier than scheduled
CRE	Significant rain event
CSM	See metadata
CUS	Lab analysis from unpreserved sample

Record comments

CAB	Algal bloom
CHB	Sample held beyond specified holding time
CIP	Ice present in sample vicinity
CIF	Flotsam present in sample vicinity
CLE	Sample collected later/earlier than scheduled
CRE	Significant rain event
CSM	See metadata
CUS	Lab analysis from unpreserved sample

Cloud cover

CCL	clear (0-10%)
CSP	scattered to partly cloudy (10-50%)
CPB	partly to broken (50-90%)
COC	overcast (>90%)
CFY	foggy
CHY	hazy
CCC	cloud (no percentage)

Precipitation

PNP	none
PDR	drizzle
PLR	light rain
PHR	heavy rain
PSQ	squally
PFQ	frozen precipitation (sleet/snow/freezing rain)

PSR mixed rain and snow

Tide stage

TSE ebb tide
TSF flood tide
TSH high tide
TSL low tide

Wave height

WH0 0 to <0.1 meters
WH1 0.1 to 0.3 meters
WH2 0.3 to 0.6 meters
WH3 0.6 to > 1.0 meters
WH4 1.0 to 1.3 meters
WH5 1.3 or greater meters

Wind direction

N from the north
NNE from the north northeast
NE from the northeast
ENE from the east northeast
E from the east
ESE from the east southeast
SE from the southeast
SSE from the south southeast
S from the south
SSW from the south southwest
SW from the southwest
WSW from the west southwest
W from the west
WNW from the west northwest
NW from the northwest
NNW from the north northwest

Wind speed

WS0 0 to 1 knot
WS1 > 1 to 10 knots
WS2 > 10 to 20 knots
WS3 > 20 to 30 knots
WS4 > 30 to 40 knots
WS5 > 40 knots

16) Other Remarks –

Data may be missing due to problems with sample collection or processing. Laboratories in the NERRS System submit data that are censored at a lower detection rate limit, called the Method Detection Limit or MDL. MDLs for specific parameters are listed in the Laboratory Methods and Detection Limits Section (Section II, Part 12) of this document. Concentrations that are less than this limit are censored with the use of a QAQC flag and code, and the reported value is the method detection limit itself rather than a measured value. For example, if the measured concentration of NO₂3F was 0.0005 mg/l as N (MDL=0.0008), the reported value would be 0.0008 and would be flagged as out of sensor range low (-4) and coded SBL. In addition, if any of the components used to calculate a variable are below the MDL, the calculated variable is removed and flagged/coded -4 SCB.

If a calculated value is negative, it is rejected and all measured components are marked suspect. If additional information on MDL's or missing, suspect, or rejected data is needed, contact the Research Coordinator at the Reserve submitting the data.

Note: The way below MDL values are handled in the NERRS SWMP dataset was changed in November of 2011. Previously, below MDL data from 2007-2010 were also flagged/coded, but either reported as the measured value or a blank cell. Any 2007-2011 nutrient/pigment data downloaded from the CDMO prior to November of 2011 will reflect this difference.

*The 2007 dataset was updated on August of 2011 to include the -4 Outside Low Sensor Range flag. The 2007 data published prior to that time used the -3 Rejected data flag with the SBL and SCB QAQC codes to indicate that data were below the minimum detection limit. These flag code combinations were all replaced with the -4 SBL or SCB update as mandated by the Data Management Committee.

a) Missing data:

Diel samples were not collected/processed during the month of March. They were also not collected during the month of November due to a bad battery in the sampler.

Due to budget cuts within the analytical lab, beginning in October 2007 duplicate samples were no longer collected at all four SWMP sites. Duplicate samples were randomly collected at two of the sites instead.

Lower Henderson (rkbhnut) program 1 (grab) 05/15/07 at 13:42 no value for NH₄F. A rerun was requested for this site, but not preformed.

Middle Blackwater (rkbmbnut) grab sample on 12/05/07 at 13:41 was missing PO₄, NH₄, NO₂, NO₃ data because the sample bottle was lost.

b) General weather patterns affecting the water quality sites:

January: Due to a lack of cold fronts, significantly dry conditions prevailed across the region.

February: Drier than normal conditions prevailed across the region.

March: Continued high atmospheric pressure across the area.

April: Continued drought conditions prevailed, with scatter rain fall across the region the second and fourth week.

May: Some sea breeze activity generated some scattered showers, not enough to be significant.

June: Tropical storm Barry kicked off the rainy season, but didn't deliver much rainfall and June continued to be one of the driest on record.

July: Although within "wet season", the typical summer rain fall patterns still haven't shown up, it continues to be dry for the month of July.

August: As hurricane Dean moved across the Caribbean drier air was forced across the state, therefore continuing the dry conditions. The summer time rainfall has yet to appear in August.

September: Although some summer time weather patterns started to appear across SW Florida, there continued to be lower than normal rain fall amounts.

October: Same.

November: Wide spread dry air from Tropical Storm Noel, and lack of cold fronts prevented rain fall activity.

December: A low atmospheric trough extended from the remnants of Tropical Storm Olga, generating some moderate rain fall amounts.