Rookery Bay (RKB) National Estuarine Research Reserve (NERR) Nutrient Metadata (January 2009 – December 2009)
Latest Update: August 13, 2013

I. Data Set and Research Descriptors

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2. Research Objectives – The four stations were in estuaries affected by watersheds demonstrating different patterns of land-use. Their placement addresses priority resource management issues that are identified in the Reserve's management plan. Specifically, the data from these stations provide valuable information concerning the effects of land-use activities on the quantity, quality and timing of freshwater inflow into the Reserve. Each bay studied exhibits a different pattern of altered freshwater inflow.

a. Monthly grab- The principal objective of the monthly grab sampling was to determine spatial and temporal differences in water quality between sites representing different land-use patterns.

b. Diel Sampling Program – The principal objective of the diel sampling was to quantify temporal variability over a tidal cycle and determine the impact of tidal water exchange within Henderson Creek (the main source of freshwater into the Rookery Bay waterbody).

3. Research Methods-

a. Monthly Grab Sampling Program

Monthly grab samples were collected at all four System-Wide Monitoring Program (SWMP) water quality stations: Henderson Creek, Middle Blackwater River, Faka Union Bay and Fakahatchee Bay. Triplicate grab samples were taken every other month at one randomly chosen water quality station following the National Estuarine Research Reserve System Nutrient and Chlorophyll Monitoring Program and Database Design SOP v 1.3. Slack low tide was generally not considered for the grab sampling

events due to time constraints with the contracted laboratory. Rainfall conditions prior to grab sampling were not considered. For analysis of dissolved inorganic nutrients the samples were filtered in the field. For chlorophyll *a* analysis the samples were filtered at the laboratory. Sample bottles were pre-cleaned by the laboratory following their Quality Assurance Management Plan (available by request). Three different bottles per station were labeled with a unique sample identification and chain of custody sheets were completed for tracking the samples during laboratory analysis and in the laboratory database. Water sampling devices (Van Dorn), carboys (for deionized water), and filter assemblies were pre-cleaned using a Fl Department of Environmental (FDEP) decontamination procedure (FDEP SOP FC1000/DEP-QAA-01/001) which involved cleaning the equipment with phosphate-free soap, rinsing three times with tap water, rinsing with a 10% solution of hydrochloric acid, rinsing three times with deionized water, and drying for 24 hours. After drying, the filter assemblies were pre-assembled with in-line filters (0.7 µm glass microfiber filters and 0.7 µm membrane filters). At each sampling station, grab samples for dissolved nutrients were collected 12 inches below the surface (near surface grab) using a Van Dorn sampler. Nitrile gloves were worn through the entire process of sample collection and filtering. For the chlorophyll *a* samples, 1000 ml HDPE amber sample bottles were rinsed three times with the sample water and then filled to the neck, capped, and immediately stored in a cooler with ice. For the dissolved phosphorus and nitrite, 250 ml HDPE sample bottles were rinsed three times with the filtered water (using a disposable 60 cc syringe with an attached filter assembly) and then filled with 120 ml of the filtrate, capped, and immediately stored in a cooler with ice. For the dissolved ammonium and nitrite + nitrate, 125 ml HDPE sample bottles were filled with 25-30 ml of the filtrate (using a disposable 60 cc syringe with an attached filter assembly), capped, and immediately stored in a cooler with ice. The 125 ml HDPE sample bottles contained sulfuric acid for preservation and therefore were not rinsed before adding the filtrate. To avoid cross contamination, the Van Dorn sampler was rinsed three times with deionized water after each sampling at each station and then rinsed three times with sample water before sampling at each new station. New gloves, syringes, and filter assemblies were used for each sample. Additionally, an equipment blank was performed at the end of each sampling event by following all the same procedures but with deionized water as the sample.

At each site physical/chemical water quality parameters were measured at the same depth as where the nutrient samples were taken. AYSI 600-xl multi-parameter data logger and a hand held display (YSI model 650) were used to record the measurements. Salinity (ppt) and temperature (°C) were measured using a combination salinity-conductivity-temperature probe (YSI model 6560); dissolved oxygen (DO, mg/L) was measured using a Rapid Pulse- Clarke Type probe (YSI model 6562), and pH was measured using a (YSI model 6561). pH data were not collected at the LH site. Equipment calibration and field verification were done according to FDEP SOP 001/01.

b. Diel Sampling Program - Monthly diel samples (11) were collected at the depth of the water quality datasonde (6 inches above the bottom) every 2.5 hours over a lunar day (24hr:48 min) using an ISCO refrigerated auto-sampler (model 3700FR). The sampler was stationed at the end of the Rookery Bay dock, approximately 100 meters from the water quality station. Prior to sampling, the polyethylene bottles used in the ISCO were washed following the same FDEP decontamination procedure as described above. A day or two before the sampling was to begin, the ISCO autosampler was set up and programmed. The siphon hose was rinsed three times with ambient water prior to setting up and running the auto-sampler. Sample bottles for the laboratory analysis were pre-cleaned by the laboratory following their Quality Assurance Management Plan (available by request). Three different bottles per sample interval (11) were labeled with a unique sample identification and chain of custody sheets were completed for tracking the samples during laboratory analysis and in the laboratory database.
Sample filtration: In the lab, each polyethylene bottle containing 900 ml of sample water was shaken to redistribute sediments on the bottom. For the dissolved ammonium and nitrite + nitrate, 125 ml HDPE sample bottles were filled with 25-30 ml of the filtrate (using a disposable 60 cc syringe with an attached filter assembly), capped, and immediately stored in a cooler with ice. For the dissolved phosphorus and nitrite, 250 ml HDPE sample bottles were rinsed three times with the filtered water (using a disposable 60 cc syringe with an attached filter assembly) and then filled with 120 ml of the filtrate, capped, and immediately stored in a cooler with ice. For the chlorophyll *a* samples, 1000 ml HDPE amber sample

bottles were rinsed three times with the sample water and then filled with 500 ml of unfiltered sample, capped, and immediately stored in a cooler with ice. New gloves, syringes, and filter assemblies were used for each sample.

4. Site location and character-

Lower Henderson Creek (rkblhnut)–

UTM GPS coordinates (using UTM zone 17, datum NAD-83): E 426633, N 2878731
Lat/Long (Decimal Degrees): 26.0257 N, 81.7332 W

This site is located at the mouth of Henderson Creek. The monitoring site is approximately 5 km downstream of a four-lane highway (SR 951) that crosses Henderson Creek. The water quality data logger is located within the creek channel at the "manatee caution" marker. The diel samples were taken off the Rookery Bay Dock located within Henderson Creek approximately 100 meters from the water quality station. The creek is 5.8 km long (mainstream linear dimension), has an average mid-channel depth of approximately 2 meters at MHW, and an average width of 239 meters. At the sampling site, the depth is 2 meters at MHW and the width is 600 meters. Tides at Lower Henderson Creek are mixed and range from 0 m to 2.76 m (average 1.06 m). Salinities at this site range from 0 to 40 ppt. Creek bottom habitats are predominantly fine sand and there is no bottom vegetation. The dominant marsh vegetation near the sampling site is red mangrove. The dominant natural vegetation of the watershed is hydric pine and cypress.

Upland land use near the sampling site includes residential areas with septic systems. Watershed activities that potentially impact the site include non-point source pollution from road runoff, drift of mosquito control pesticides, runoff from upstream agricultural areas and leachate from nearby residential septic systems and a weir structure located at SR 41. The amount of water released from this weir can sometimes mask natural tidal salinity patterns. The historic Henderson Creek watershed was approximately 50% under State ownership and much of this protected area had intact cypress sloughs and other wetland vegetation. Canals and water use for agriculture and human consumption have altered the hydroperiod of this watershed. Consequently, the Henderson creek watershed may receive non-point source pollution runoff from a variety of sources.

Middle Blackwater River (rkbmbnut) –

UTM GPS coordinates (using UTM zone 17, datum NAD-83): E 440363, N 2868541
Lat/Long (Decimal Degrees): 25.9343 N, 81.5946 W

This site is located at the mouth of the river at navigational marker #17 within the channel. The "Middle" Blackwater labeling is to distinguish it from other historical sites. The water quality data logger is affixed to marker #17. The average depth at this marker is approximately 2 meters at MHW. The tidal range for Middle Blackwater River varies between 0.2 and 1.8 meters. Blackwater salinities range from 0 to 42.1 ppt and fluctuate with the tides and watershed rainfall. The substrate within the channel is a mixture of sand and silt with oyster shell with some organic matter mixed in. Mature red mangrove forests dominate the banks of the river.

Upstream influences consist of the Collier-Seminole State Park boat basin and upstream agricultural fields adjacent to Blackwater River's main feeder canal (SR 41 canal). Nonpoint source pollution from agricultural operations and golf courses may affect this site. In addition, canals and roads built during the 1960's (Picayune Strand, formerly Southern Golden Gate Estates) have caused significant disruptions to overland sheet-flow reducing the amounts of freshwater flowing to this estuary. Despite these alterations, the salinity fluctuations of this site suggest that seasonal fluctuations in salinity are more closely correlated to watershed rainfall patterns than salinities of estuaries with water control structures, such as Henderson Creek.

Faka Union Bay (rkbfunut) –

UTM GPS coordinates (using UTM zone 17, datum NAD-83): E 448330, N 2864765

Lat/Long (Decimal Degrees): 25.9005 N, 81.5159 W
The "Faka Union Bay" sonde is located at the mouth of the Faka Union Canal. The water quality data logger is affixed to a manatee speed zone sign within the main channel. The average depth at this site is approximately 2 meters at MHW. The tidal range for Faka Union Bay varies between 0.2 and 1.6 meters. Salinities range from 0 to 42.3 ppt and fluctuate daily with tides, seasonal rainfall, and water management use of upstream water control structures. The substrate within the channel is a mixture of sand and silt with some organic matter. Mature red mangrove forests and spoil islands dominate the banks of the canal.

Upstream influences consist of the Port of the Islands development and marina. The watershed consists of an elaborate canal system (Picayune Strand, formerly Southern Golden Gate Estates) which has altered natural water drainage patterns into Faka Union Bay.

Fakahatchee Bay (rkbfbnut)–

UTM GPS coordinates (using UTM zone 17, datum NAD-83): E 2863829, N 452224
Lat/Long (Decimal Degrees): 25.8922 N, 81.4770 W

This site is located between the mouths' of the Fakahatchee River and the East River. The water quality data logger is placed in a 4" PVC housing secured to a 6" PVC pipe at this location. The average depth at MHW is approximately 2 meters. The tide range for Fakahatchee varies between 0.2 and 1.8 meters. Salinities range from 0.7 – 42.6 ppt and fluctuate daily with the tides and seasonal rainfall. The substrate within the channel is a mixture of sand, silt and some organic matter. Mature red mangrove forests dominate the banks of the rivers.

Upstream there are minimal influences from the Picayune Strand State Forest with non-point source pollutants possible from the culverts under I-75 and US 41. Fakahatchee Strand State Preserve and Big Cypress National Park manage the headwaters of Fakahatchee Bay. Fakahatchee Bay's watershed is considered the least altered.

5. Code variable definitions-

rkblhnut = Rookery Bay Lower Henderson Creek nutrients (monthly grabs and diel sampling)
rkbmbnut = Rookery Bay Middle Blackwater River nutrients (monthly grabs)
rkbfunut = Rookery Bay Faka Union Bay nutrients (monthly grabs)
rkbfbnut = Rookery Bay Fakahatchee Bay nutrients (monthly grabs)

Monitoring Codes:
1 = monthly grab sample program
2 = monthly diel sample program

Replicate grab samples were denoted as 1 for the first sample, 2 for the second sample, and 3 for the third sample at one station. Since 1 diel sample was collected every 2.5 hrs, the replicate number was always denoted as 1.

6. Data Collection Period- The System-Wide Monitoring Program nutrient sampling began in January 2002 at all of the sampling stations. For 2009, the data collection period was from February to December.

Monthly Grab Sampling

rkblhnut

rkblhnut	02/24/2009 09:28
rkblhnut	03/19/2009 08:41
rkblhnut	04/16/2009 08:49 – 09:08
rkblhnut	05/14/2009 08:20
rkblhnut	06/11/2009 08:21 – 08:47
rkblhnut	07/08/2009 08:25
rkblhnut	08/20/2009 09:35
rkblhnut	09/15/2009 08:35

rkblhnut	10/13/2009 11:22
rkblhnut	11/10/2009 10:38
rkblhnut	12/08/2009 10:25

rkbmbnut

rkbmbnut	02/24/2009 13:35
rkbmbnut	03/19/2009 09:21
rkbmbnut	04/16/2009 09:00
rkbmbnut	05/14/2009 08:46
rkbmbnut	06/11/2009 09:09
rkbmbnut	07/08/2009 08:59
rkbmbnut	08/20/2009 08:45
rkbmbnut	09/15/2009 08:57
rkbmbnut	10/13/2009 08:40
rkbmbnut	11/10/2009 09:57
rkbmbnut	12/08/2009 09:16 – 09:42

rkbfunut

rkbfunut	02/24/2009 14:28
rkbfunut	03/19/2009 10:40
rkbfunut	04/16/2009 10:08
rkbfunut	05/14/2009 09:44
rkbfunut	06/11/2009 10:15
rkbfunut	07/08/2009 09:54
rkbfunut	08/20/2009 09:39
rkbfunut	09/15/2009 09:58
rkbfunut	10/13/2009 09:40
rkbfunut	11/10/2009 11:02
rkbfunut	12/08/2009 11:27

rkbfbnut

rkbfbnut	02/24/2009 15:00 – 15:23
rkbfbnut	03/19/2009 11:09
rkbfbnut	04/16/2009 10:53
rkbfbnut	05/14/2009 10:15
rkbfbnut	06/11/2009 10:42
rkbfbnut	07/08/2009 10:18
rkbfbnut	08/20/2009 10:05 – 10:25
rkbfbnut	09/15/2009 10:23
rkbfbnut	10/13/2009 10:12 – 10:45
rkbfbnut	11/10/2009 11:34
rkbfbnut	12/08/2009 10:58

Diel Sampling

Station Code	Begin Date Time Stamp	End Date Time Stamp
rkblhnut	02/23/2009 05:00	02/24/2009 06:00
rkblhnut	03/18/2009 07:00	03/19/2009 08:00
rkblhnut	04/15/2009 08:00	04/16/2009 09:00
rkblhnut	05/17/2009 01:00	05/18/2009 02:00
rkblhnut	06/10/2009 07:00	06/11/2009 08:00
rkblhnut	07/07/2009 06:00	07/08/2009 07:00

rkblhnut	08/19/2009 05:30	08/20/2009 06:30
rkblhnut	09/14/2009 02:00	09/15/2009 03:00
rkblhnut	10/12/2009 10:00	10/13/2009 12:00
rkblhnut	11/09/2009 06:00	11/10/2009 08:00
rkblhnut	12/07/2009 07:30	12/08/2009 08:30

7. Associated Researchers and Projects-

Rookery Bay NERR participates in the NERR SWMP for water quality and meteorological data collection. The principal objective of these programs is to record long-term environmental data within Rookery Bay NERR in order to observe any changes or trends over time. The four water quality sites were also selected to represent various degrees of watershed hydrologic alteration. Both water quality and meteorological data are available from the Research Coordinator or online at http://cdmo.baruch.sc.edu.

Both water quality and nutrient data generated by Rookery Bay are being used to analyze restoration targets established for the Picayune Strand Restoration Project (PSRP; formerly known as Southern Golden Gate Estates) which is a portion of the Comprehensive Everglades Restoration Plan (CERP). Additional datasets used in this analysis include a long-term fisheries survey (July 1998 to the present), a shark demographics survey (May 2000 to the present), and an oyster reef/benthic crab survey (1999 to 2008). These data are available from the Research Coordinator.

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 Service, 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 the Recipient 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 nutrient data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the 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 – The analytical results (electronic Excel files) were provided monthly from the laboratory to Christina Panko Graff, Water Quality Program Manager. Upon receiving the results Christina reviewed the data for errors. Christina was responsible for compilation and QA/QC of the final data set according to chapter 10 of the Centralized Data Management Office (CDMO) NERR SWMP Data Management Manual v 6.3. The data reported from the lab were in the required units making it unnecessary to convert the data prior to entering it into Microsoft Excel.

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; adds chosen parameters and 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 then automatically flags/codes measured values below MDL and inserts the MDL ; calculates parameters chosen by the user and automatically flags/codes for component values below MDL, negative calculated values, and missing data; allows the user to apply QAQC flags and codes to the data; produces summary

statistics; graphs selected parameters for review; and exports the resulting data file 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 and asterisks "*".

Data Category	Parameter	Variable Name	Units of Measure
Phosphorus & Nitrogen:	*Orthophosphate, Filtered	PO4F	mg/L as P
	*Ammonium, Filtered	NH4F	mg/L as N
	*Nitrite, Filtered	NO2F	mg/L as N
	*Nitrate, Filtered	NO3F	mg/L as N
	*Nitrite + Nitrate, Filtered	NO23F	mg/L as N
	Dissolved Inorganic Nitrogen	DIN	mg/L
Plant Pigments:	*Chlorophyll *a*	CHLA_N	µg/L
Field Parameters (grabs only):			
	Water Temperature	WTEM_N	°C
	Specific Conductance	SCON_N	mS/cm
	Salinity	SALT_N	ppt
	Dissolved Oxygen	DO_N	mg/L
	% Dissolved Oxygen Saturation	DO_S_N	%
	pH	PH_N	standard units

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 or Calculated Laboratory Parameters –

a. Parameters Measured Directly-

Phosphorus species: PO4F
Nitrogen species: NH4F, NO2F, NO23F
Plant Pigments: CHLA

b. Calculated Parameters-

NO3: NO23F –NO2F
DIN: NO23F +NH4F

12. Limits of Detection- Method Detection Limits (MDL), the minimum concentration of a parameter that an analytical procedure can reliably detect, were established by the Collier County Pollution Control and Prevention Department Laboratory as referenced in their Quality Assurance Management Plan Version 04-02-08 (Appendix G page 61, available by request). MDLs are determined annually for standard methods methodologies and every six months for EPA methodologies.

Parameter	Variable	MDL	Approved
Orthophosphate	PO4F	0.004 mg/L	1/1/2010
Ammonium	NH4F	0.012 mg/L	1/1/2010
Nitrite	NO2F	0.002 mg/L	1/1/2010
Nitrite +Nitrate	NO23F	0.002 mg/L	1/1/2010
Chlorophyll a	CHLA	3 µg/L	1/1/2010

13. Laboratory Methods– All laboratory analysis was performed by Collier County Pollution Control and Prevention Department Laboratory according to their Quality Assurance Management Plan version 04-02-08 (available by request).

a. Parameter: PO4F
EPA or other Reference Method: SM 4500-P E (ascorbic acid method)
Method Reference: Standard Methods for Examination of Water and Wastewater, 20th ed.
Method Description: Ammonium molybdate and potassium antimonyl tartrate react in acid medium with orthophosphate to form a heteropoly acid—phosphomolybdic acid—that is reduced to intensely colored molybdenum blue by ascorbic acid. The color's absorbance is directly proportional to analyte concentration and is measured as peak height units with an Astoria Pacific Rapid Flow Analyzer.
Preservation Method: Samples were filtered in the field and stored at 4 ºC until analysis.

b. Parameter: NH4F
EPA or other Reference Method: EPA 350.1 (no distillation)
Method Reference: Methods for Chemical Analysis of Water and Wastes
Method Description: Alkaline phenol and hypochlorite react with ammonia to form indophenol blue that is proportional to the ammonia concentration. The blue color formed is intensified with sodium nitroprusside. The color's absorbance is directly proportional to analyte concentration and is measured as peak height units with an Astoria Pacific Rapid Flow Analyzer.
Preservation Method: Samples were filtered in the field and stored with sulfuric acid at 4 ºC until analysis.

c. Paramter: NO2F
EPA or other Reference Method: SM 4500-NO2 B
Method Reference: Standard Methods for Examination of Water and Wastewater, 20th ed.
Method Description: Nitrite was determined as an azo dye formed by the reaction of nitrite with sulfanilamide and subsequent coupling with N-1-naphthylethylenediamine (NEDA). The color's absorbance is directly proportional to analyte concentration and is measured as peak height units with an Astoria Pacific Rapid Flow Analyzer .
Preservation Method: Samples were filtered in the field and stored at 4 ºC until analysis.

d. Parameter: NO23F
EPA or other Reference Method: EPA 353.2
Reference Method: Methods for Chemical Analysis of Water and Wastes
Method Description: A filtered sample is passed through a column containing granulated copper-cadmium to reduce nitrate to nitrite. The nitrite (that was originally present plus reduced nitrate) is determined by diazotizing with sulfanilamide and coupling with N-(1-naphthyl)-ethylenediamine dihydrochloride to form a highly colored azo dye which is measured colorimetrically with an Astoria Pacific Rapid Flow Analyzer .
Preservation Method: Samples were filtered in the field and stored with sulfuric acid at 4 ºC until analysis.

e. Parameter: CHLA
EPA or other Reference Method: SM 10200 H
Method Reference: Standard Methods for the Examination of Water and Wastewater, 20th Edition
Method Description: An extractive spectrophotometric technique was used to determine chlorophyll *a* concentrations. Samples were filtered immediately at the laboratory. Filters were placed in a tissue grinder with 2-3 ml of 90% aqueous acetone. Extracts steeped for at least 2 hours at 4 °C in the dark. Extracts were analyzed using a GBC UV/VIS Spectrophotometer.
Preservation Method: Stored at 4 ºC and filtered in lab on the same day as collection.

14. Field and Laboratory QAQC programs- based on Collier County Pollution Control and Prevention Department Laboratory's Quality Assurance Management Plan version 04-02-08 (available by request).

a) Precision: is defined as the agreement or closeness of two or more results.

i) **Field Variablity –** Duplicates (successive grabs at each station) were not taken every month; instead triplicate grabs were taken at one randomly chosen station every other month.

ii) **Laboratory variability –**Matrix duplicates (replicate aliquots of the same sample taken through the entire analytical procedure) were conducted for each analyte with a frequency of one per analytical batch (10 or 20 samples per analytical batch). Low level precision was defined as a concentration less than 20 times the MDL and the high level precision was defined as a concentration greater than 20 times the MDL. The low level precision and high level precision for all analytes was 25 % RPD and 10 % RPD respectively.

iii) **Inter-organizational splits –** The laboratory participates in external audit programs including split sample analysis with both public and private laboratories.

b) Accuracy: is defined as the agreement between the analytical results and the know concentration.

i) **Sample spikes-** Matrix spikes were conducted for each analyte with a frequency of one per analytical batch (10 or 20 samples per analytical batch). The % recovery was 90-110 % for nitrate-nitrite and ammonium and 85-115 % for nitrite and orthophosphate.

ii) **Standard reference material analysis-** Laboratory control samples were evaluated for each analyte with a frequency of beginning and end of each analytical batch (10 or 20 of samples per analytical batch). The % recover was 90-110 % for nitrate-nitrite and ammonium and 85-115 % nitrite and orthophosphate.

iii) **Cross calibration exercised –** The laboratory participates in external audit programs including split sample analysis with both public and private laboratories. The laboratory also participates in several inter-laboratory comparisons annually. The laboratory supervisor evaluates the results of these comparisons and if necessary, operational changes are implemented and documented.

15. 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

16. QAQC code definitions –

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	Calculated value could not be determined due to a below MDL component
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

17. Other remarks/notes –

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.

For January both the grab and diel samples are missing due to problems associated with changing laboratories which required increasing sample volumes and as a result modifying some of our field collection methods.

Weather conditions based on Big Cypress Basin Hydrologic Summary Reports:

January: Continued rainless hydrologic conditions caused drought conditions to persist through the month.
February: Weather patterns were dominated by high pressure ridges across Florida which prevented active cold fronts and rainfall. Rainfall was only 22% of historical.
March: Severe dry hydrologic conditions continued. Despite a series of cold fronts there was very little rainfall. Rainfall was only 13% of historical.
April: Severe drought conditions persist surpassing historic records since 1932. There was no significant rainfall activity despite two cold fronts on April 14th and 16th. Rainfall was only 30% of historical.
May: Dry hydrologic conditions persisted through the month.
June: Wet season finally began with summertime convective thunderstorms beginning early this month. The convective thunderstorms lost their momentum with easterly rain producing clouds. The intensity and distribution of rainfall was scattered. Rainfall was about 23% below historical rainfall year-to-date. Overall hydrological conditions were drier than historical records.
July: Typical summer time weather patterns started with most of the stronger storms occurring inland.
August: Hydrologic conditions reflected wet season annual cycles with slightly above average rainfall. There was no major tropical activity other than two tropical waves between August 15th and 20th. Summertime convective thunderstorms continued but the intensity and distribution of rainfall was scattered. Rainfall was about 12% above historical for the month but 18% below historical year-to-date.
September: The intensity and distribution of rainfall was scattered this month.
October: This month marked the end of the wet season with considerably drier than historical conditions. There was very little rainfall activity this month due to an early end of daily seabreeze cycle and the absence of any tropical activity or cold fronts. The intensity and duration of rainfall was scattered. Rainfall was 70% below historical.
November: There was one significant rain event at the end of the month (11/25/09).
December: Two systems of strong subtropical jet stream generated two significant rainfall events in the month. These events made this December the wettest in seven years. The average weighted rainfall was 4.72 inches, about 193% above historical for December. Total rainfall for 2009 was about 7% below historical conditions. El Niño conditions developed this winter causing below average temperatures and above average precipitation.

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