Sapelo Island (SAP) NERR Nutrient Metadata
January 2004 - December 2004
Latest Update: May 22, 2025

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

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c) **Other Contacts and Programs**
none

2) Research objectives

The nutrient monitoring program is designed upon near benthic sampling at each of the four System Wide Monitoring Program (SWMP) water and weather quality sites located within waters surrounding and within the Sapelo Island NERR. Monitoring efforts at these sites is based upon collection of water quality, nutrient and atmospheric data across salinity gradients existing within the marshes and estuarine waters of the Reserve. Two of the four stations are located on the "headwaters" and "mouth" of Duplin River Basin (Hunt Camp and Lower Duplin; respectively). The Duplin River is a tidal basin with no freshwater influence within its headwaters apart from surficial aquifer weeping from this perched lens of freshwater and direct runoff associated with marsh/precipitation interactions. The other two stations (Carbretta Creek and Dean Creek), are located in small creek waters subjected to greater oceanic influence hence, higher overall salinity gradients than the stations located within the Duplin. Cabretta Creek represents a highly marine, influenced creek and marsh system with little fresh water runoff potential. By contrast, the Dean Creek station is also highly, marine influenced but with a proportionally larger, freshwater run-off watershed to creek size ratio, resulting in a much more dynamic and flasher salinity regime associated with rainfall events as compared to the other stations. This nutrient monitoring effort is tied into the Georgia Coastal Ecosystems, Long-Term Ecological Research (GCE-LTER) initiative and the University of Georgia Marine Extension Service water quality database whose collection and analysis of the water samples facilitates the database. This long-term data set is being developed to provide information on estuarine water mixing, salinity gradients and effects of salinity gradients upon salt marsh function in the lesser studied, small, saline, creek systems.

The nutrient characterization within these systems will hopefully help in defining marine water influence upon biological function and nutrient delivery effects within salt marshes of differing size, fresh and saline water delivering regimes and dynamics within the South Atlantic Bight.

a) **Monthly Grab** (same objectives as above)
b) **Diel Sampling Program** (same objectives as above)

3) **Research methods**

a) **Monthly Grab Sampling Program**

Monthly grab samples were taken within the Duplin River estuary from January to December 2004. From January 2004 to August 2004, surface and bottom water samples were taken at the Marsh Landing datasonde station (ML = Marsh Landing (surface), LD = Lower Duplin (bottom)), bottom samples were taken at Hunt Dock (HD) and surface water samples were taken up river at the Flume Dock (FD), all using a Niskin bottle. As of September 2004, two new stations were added to the monitoring program. These near benthic sites, Cabretta Creek (CA) and Dean's Creek (DC), took place of surface sampling at Marsh Landing and the Flume Dock. As of September 2004, when the new inland stations were added to the program, the Marine Extension Water Quality crew would split into two crews to complete the sampling. Two people would stay on the boat to sample at Marsh Landing (bottom sampling) and Hunt Dock (bottom sampling), and the other two people would borrow a truck on Sapelo Island and visit Cabretta and Dean's Creek for sampling of these bottom sites. All grab samples were taken sequentially in triplicate beginning at Marsh Landing with the collection of the last diel sample, which is collected by the ISCO sampler at low tide at the end of the tidal cycle. At the time of sample collection, latitude, longitude, time and depth were recorded. All grab samples were collected from the Niskin bottle into an acid-washed (10% HCl) polypropylene beaker for filtering. Two filter towers were set up, one acid-washed tower with a 0.45 um polycarbonate filter for nutrient filtering and one clean tower with a GF/F filter for chlorophyll filtering. A small amount of sample was used to rinse the nutrient filter tower equipped with a filter and this filtrate discarded. The tower was then filled to the 250-mL mark. The chlorophyll tower with the GF/F filter was also filled to the 250-mL mark and the two towers were connected by a small piece of tubing. The vacuum pump was turned on to pull the 250 mL through each filter and then the vacuum was released. The nutrient sample tower was disconnected and an acid-washed 250-mL polypropylene bottle was rinsed and filled with the filtrate. Space was left in the sample bottle for expansion during freezing at approximately –18 degC. If the first 250 milliliters went through the chlorophyll filter easily, the filtrate was discarded and an additional 50, 100 or 250 milliliters was filtered, depending on suspended sediment load, to concentrate the sample onto the filter. The chlorophyll filter was then removed with tweezers and placed face up in a petri dish, wrapped in aluminum foil and labeled with the volume filtered and sample information. The chlorophyll filter towers were rinsed between replicate grabs with distilled water and the nutrient filter tower was acid-washed and DI water rinsed between samples. Nutrient and chlorophyll filtering between grabs took approximately 10 minutes to complete. Samples were immediately placed on ice, in the dark and returned to the laboratory within six hours. Once in the laboratory, samples were frozen and processed within the specified times (unless flagged) for nutrient and chlorophyll-a concentrations.

b) **Diel Sampling Program**

WWW Tide and Current Predictor for Wolf Island, South End was used to estimate low tide. As close to an early, low, neap tide as possible was selected each month for sampling. The ISCO sampler was deployed at Marsh Landing (ML) on the day previous to the grab sample date chosen for that particular month with the sample line suction placed at 1.5 feet below the surface of the water. The ISCO sampler collected the first diel sample two hours later than low tide on the following day and continued collecting samples every two hours for the next 22 hours, representing a full tidal cycle, a total of 12 samples, and ending at low tide when grab sampling began. The ISCO was turned off and the 12 samples were secured with caps upon arriving at Marsh Landing and the samples were filter processed either in the field after completion of grab sampling at Marsh Landing or back in the laboratory weather depending. The filtration process for the diel samples follows the same process as for grab samples described above. All diel samples were filtered from the ISCO bottles and transferred into a high density polypropylene bottles after filtration. Polypropylene bottles and filter towers were soaked in 10% HCl in preparation for the field work, then triple rinsed with distilled water. A squeeze bottle was used to acid wash (then rinse with distilled water) beakers and filter towers in the field between filtering of each sample.

c) Table of 2003 Duplin River NERR surface and bottom sampling depths.

Month	**Site**	**Surface sample depth at ML and FD (feet)**	**Bottom sample depth at LD and HD (feet)**
Jan.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	17
Jan.	Flume Dock (FD) Hunt Dock (HD)	just below surface	8
Feb.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	14
Feb.	Flume Dock (FD) Hunt Dock (HD)	just below surface	9
March	Marsh Landing (ML) Lower Duplin (LD)	just below surface	19
March	Flume Dock (FD) Hunt Dock (HD)	just below surface	8
April	Marsh Landing (ML) Lower Duplin (LD)	just below surface	16
April	Flume Dock (FD) Hunt Dock (HD)	just below surface	8
May	Marsh Landing (ML) Lower Duplin (LD)	just below surface	11
May	Flume Dock (FD) Hunt Dock (HD)	just below surface	8
June	Marsh Landing (ML) Lower Duplin (LD)	just below surface	10
June	Flume Dock (FD) Hunt Dock (HD)	just below surface	6
July	Marsh Landing (ML) Lower Duplin (LD)	just below surface	11
July	Flume Dock (FD) Hunt Dock (HD)	just below surface	7
Aug.	Marsh Landing (ML) Lower Duplin (LD)	just below surface	12

Aug.	Flume Dock (FD) Hunt Dock (HD)	just below surface	8
Month	**Site**	**Bottom sample depth at ML and CA (feet)**	**Bottom sample depth at HD and DC (feet)**
Sept.	Marsh Landing (ML) Hunt Dock (HD)	18	9
Sept.	Cabretta (CA) Dean's Creek (DC)	~7	1
Oct.	Marsh Landing (ML) Hunt Dock (HD)	13	8
Oct	Cabretta (CA) Dean's Creek (DC)	~6	~2
Nov.	Marsh Landing (ML) Hunt Dock (HD)	14	12
Nov.	Cabretta (CA) Dean's Creek (DC)	~6	~3
Dec.	Marsh Landing (ML) Hunt Dock (HD)	11	7
Dec.	Cabretta (CA) Dean's Creek (DC)	~6	~3
Month	**Site**	**Surface sample depth at ML and FD (feet)**	**Bottom sample depth at LD and HD (feet)**
AVG	**Marsh Landing (ML) Lower Duplin (LD) Jan. '05 - August '05**	Just below surface	13.75
AVG	**Flume Dock (FD) Hunt Dock (HD) Jan.'05 - August'05**	Just below surface	7.75
Month	**Site**	**Bottom sample depth at ML and CA (feet)**	**Bottom sample depth at HD and DC (feet)**
AVG	**Marsh Landing (ML) Hunt Dock (HD) Sept.'05 – Dec.'05**	14	9
AVG	**Cabretta (CA) Dean's Creek (DC) Sept.'05 – Dec.'05**	~6.25	~2.25

4) **Site location and character**

The Sapelo Island National Estuarine Research Reserve is located on the Southeastern Atlantic coast of the United States in McIntosh County, Georgia. The study area encompasses the Duplin River estuary, a tidally flushed drainage system flowing into Doboy Sound from the north and two inland creeks, Cabretta and Dean's Creek. The Duplin River watershed occupies most of the Reserve, which also contains various forest types, sand dunes, a section of ocean beach and minor developed areas.

The Duplin River estuary covers 3,300 acres between Sapelo Island and the mainland in McIntosh County. It drains a tidal bay and an extensive network of salt marshes about 6 miles long, into which there is little upland run-off. Diverse estuarine wetlands provide extensive and complex habitat types for fish and wildlife. The island contains several small, interior brackish and freshwater marshes fed by surficial aquifer expression (interdune meadow of Nannygoat beach: south end) and anthropogenic upland ditches and dikes produced in the early 19th century (north end). The upland forests are composed of several diverse habitats including long leaf pine/slash pine forests, climax maritime forests, small amounts of pond cypress bays and naturally regenerated loblolly pine forests which are timbered on a 70 year selectively cut harvest rotation.

Locations-
Marsh Landing: Lat: 31 25' 4" N, Long: 81 17' 46" W
Lower Duplin: Lat: 31 25' 4" N, Long: 81 17' 46" W
Flume Dock: Lat: 31 28' 58" N, Long: 81 16' 03" W
Hunt Dock: Lat: 31 28' 43" N, Long: 81 16' 23" W
Cabretta Creek: Lat: 31 26 37.3" N, Long: 81 14 23.7" W
Dean Creek: Lat: 31 23 22.5" N, Long: 81 16 44.2" W

Water Quality site descriptions-

Salinities at all sites vary according to localized rainfall and associated runoff. Upper Duplin River sites (Flume Dock and Hunt Dock) experience slightly lower salinities associated with rainfall events (2 -3ppt) as compared to lower Duplin River sites (Marsh Landing). Average salinities range from 15 ppt to 30 ppt depending on seasonal or event rainfall. Average tidal range of diurnal tidal cycle is approximately 2.5 meters twice daily. Due to high turbidity, all sites are lacking any persistent submerged aquatic vegetation and have an unconsolidated sandy/mud bottom (soft sediment) typical of southeastern near-ocean estuaries. Marsh sediments are relatively pristine and free of pollutants based on sediment analysis conducted in 1996 by C. Alexander, Skidaway Institue of Oceanography. Watershed is dominated by oceanic tidal influences associated with Doboy Sound. Depth are as follows: Marsh Landing (ML) and Lower Duplin (LD) ranges from 1.5 meters to 6.0 meters depending on tide, Hunt Dock's maximum depth is 4.27 meters, and Flume Dock's maximum depth is 4.27 meters.

Cabretta Creek is fed directly from waters of the Atlantic Ocean. Cabretta experiences a maximum tidal range of approximately 14 feet. Cabretta creek is a high order, polyhaline (25-32 ppt) creek with relatively low sinuosity and a fairly homogenous depth throughout most of its basin. The SWMP site is located mid-length the creeks overall basin. This section of Cabretta Creek has a typical mean low water depth averaging 2.5-3.5 m. Salinity ranges, with exception to major, long-term precipitation events, from 15-36 ppt., seasonally. The station is located on a small (one-lane), wooden, roadway bridge spanning Cabretta Creek, located on the island's extreme eastern side. The benthos is composed primarily of sand substrate with small, intertidal oyster reef conglomerate communities. Adjacent to the site is extensive, intertidal, bank stabilization (armoring) in the form of woven rip-rap fencing and granite rocks. This manipulation is slowly becoming stabilized via oyster reef community colonization. The adjacent marshes are dominated by Spartina alterniflora with occasional Juncus romerianus in the nearby fringe community habitat. The creek has very little adjacent uplands due to: 1) the low elevational gradient and 2) the areas geologically recent accretion genesis (Holocene) resulting in sandy soils; of which neither conditions allow for extensive floral colonization or stabilization.

Dean Creek is located on a small wooden bridge spanning Dean Creek, in close proximity to the adjacent Nannygoat Beach causeway. Dean Creek is a small tidal basin fed from the waters of Doboy Sound, which is located on Sapelo Island's south end. With exception to short duration local or long duration regional precipitation events, the creeks' salinity normally ranges between

20 and 30 ppt. Mean depth varies at the Dean Creek site with the SWMP station located within the upper basin characterized by tidal pooling and low flows on the last of the ebbing tides. Water depth in this section varies between 0.25- 1.0 m at mean low water. Water depth in the creeks lower section varies between 1.5-2.5 m at mean low water. Maximum/minimum salinities are unknown at this time. The benthic community consists of a sandy-mud substrate with occasional, small, intertidal oyster reef community and mean tidal amplitude of approximately 8 feet. The small creek feeds approximately 150 acres of Spartina alterniflora dominated salt marsh, which is interspersed with small 0.5-1 acre hammocks and salt pans. Fringe community components range from Loblolly pine forests with a sub-canopy of Yaupon holly to Wax myrtle and Sable Palm.

5) **Coded variable definitions**

ML = Marsh Landing; LD = Lower Duplin; HD = Hunt Dock; FD = Flume Dock; CA = Cabretta Creek; DC = Dean Creek.

Each individual sample is given a 3 part name code in addition to other codes. The 3 part name code, "sapmlnut" for example, gives the reserve name (sap = Sapelo), station name (ml = Marsh Landing, etc), and SWMP program code (nut = nutrient monitoring program).

Sampling Site codes:
sapmlnut – Sapelo Island nutrient data for Marsh Landing
sapldnut – Sapelo Island nutrient data for Lower Duplin
saphdnut – Sapelo Island nutrient data for Hunt Dock
sapfdnut – Sapelo Island nutrient data for Flume Dock
sapcanut – Sapelo Island nutrient data for Cabretta Creek
sapdcnut – Sapelo Island nutrient data for Dean Creek

The monitoring codes are set as "1" to indicate grab samples and "2" to indicate diel samples. Replicates are also given specific codes. Grab samples in which triplicate samples are taken utilize a "1" for the first sample, "2" for the second sample, and "3" for the third sample. Diel samples are always labeled with a "1" for the first lab replicate and a "2" for the second lab replicate. Only one actual sample is taken at each interval with the ISCO sampler.

6) **Data collection period**

Diel sampling for 2004 began at 16:01:00 on January 20, 2004. Grab sampling commenced on January 21, 2004 at 14:01:00 at the Marsh Landing site.

Diel Sampling

Site	Start Date	Start Time	End Date	End Time
ML	01/20/2004	1601	01/21/2004	1401
ML	02/16/2004	1358	02/17/2004	1158
ML	03/15/2004	1242	03/16/2004	1042
ML	04/26/2004	1028	04/27/2004	0828
ML	05/17/2004	1715	05/18/2004	1515
ML	06/28/2004	1415	06/29/2004	1215
ML	07/27/2004	1419	07/28/2004	1219
ML	08/23/2004	1150	08/24/2004	0950
ML	09/21/2004	1138	09/22/2004	0938

ML	10/25/2004	1635	10/26/2004	1435
ML	11/09/2004	1458	11/10/2004	1258
ML	12/07/2004	1337	12/08/2004	1137

Grab Sampling

Site	Start Date	Start Time	End Date	End Time
ML	01/21/2004	1401	01/21/2004	1418
ML	02/17/2004	1158	02/17/2004	1216
ML	03/16/2004	1042	03/16/2004	1056
ML	04/27/2004	0828	04/27/2004	0843
ML	05/18/2004	1515	05/18/2004	1541
ML	06/29/2004	1215	06/29/2004	1223
ML	07/28/2004	1227	07/28/2004	1240
ML	08/24/2004	0950	08/24/2004	1001
CA	09/22/2004	0940	09/22/2004	1001
CA	10/26/2004	1436	10/26/2004	1455
CA	11/10/2004	1539	11/10/2004	1557
CA	12/08/2004	1120*	12/08/2004	1141*
LD	01/21/2004	1422	01/21/2004	1442
LD	02/17/2004	1223	02/17/2004	1248
LD	03/16/2004	1106	03/16/2004	1126
LD	04/27/2004	0848	04/27/2004	0905
LD	05/18/2004	1547	05/18/2004	1603
LD	06/29/2004	1228	06/29/2004	1246
LD	07/28/2004	1242	07/28/2004	1256
LD	08/24/2004	1006	08/24/2004	1018
LD	09/22/2004	1110	09/22/2004	1131
LD	10/26/2004	1515	10/26/2004	1536
LD	11/10/2004	1443	11/10/2004	1505
LD	12/08/2004	1110	12/08/2004	1129
HD	01/21/2004	1507	01/21/2004	1524
HD	02/17/2004	1333	02/17/2004	1355
HD	03/16/2004	1154	03/16/2004	1211
HD	04/27/2004	1008	04/27/2004	1018
HD	05/18/2004	1632	05/18/2004	1645
HD	06/29/2004	1312	06/29/2004	1338
HD	07/28/2004	1320	07/28/2004	1342
HD	08/24/2004	1042	08/24/2004	1051
HD	09/22/2004	1025	09/22/2004	1044
HD	10/26/2004	1431	10/26/2004	1446
HD	11/10/2004	1324	11/10/2004	1340
HD	12/08/2004	1155	12/08/2004	1207
FD	01/21/2004	1540	01/21/2004	1555
FD	02/17/2004	1410	02/17/2004	1427
FD	03/16/2004	1225	03/16/2004	1241
FD	04/27/2004	0932	04/27/2004	0949
FD	05/18/2004	1655	05/18/2004	1712
FD	06/29/2004	1350	06/29/2004	1414
FD	07/28/2004	1358	07/28/2004	1410
FD	08/24/2004	1101	08/24/2004	1110

DC	09/22/2004	1035	09/22/2004	1053
DC	10/26/2004	1535	10/26/2004	1554
DC	11/10/2004	1644	11/10/2004	1657
DC	12/08/2004	1200*	12/08/2004	1221*

* data sheet was lost, therefore times were approximated

7) **Associated researchers and projects**

For a complete viewing of associated projects visit the following website and search the collaborators links:
http://gce-lter.marsci.uga.edu/lter/
http://www.uga.edu/marine_advisory/

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 water quality data and metadata can be obtained from the Research Coordinator at the individual 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 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, Microsoft Excel spreadsheet format and comma-delimited format.

II. Physical Structure Descriptors

9) **Entry verification**

A Lachat QuikChem 8000 FIA+ is used to analyze nutrient concentrations. The instrument is calibrated daily for each parameter to be tested using a series of working standards. Once the calibration run is complete and satisfactory (r >/= 0.99900 up to 1.0000), the samples are set up for analysis. A set of mid-range check standards is used before the sample run, after approximately every 10 samples and at the end of the run to ensure the instrument is in control. The check standards must remain within + or – 10% of their original value during the entire run. Also, a blank sample is run and then spiked with each analyte to a known concentration, which must come out within + or – 10% as well. Once the run is complete, the raw data is reviewed on the computer attached to the Lachat QuikChem 8000 FIA+ instrument, and the timing is checked to ensure proper integration of sample peaks. Once this is completed, the data is exported onto a floppy disk and transferred to another computer. Here the raw text file is converted to an Excel file and calculations are performed to obtain the appropriate units (ie. uM to ppm). The data file for each month is saved and the results are copied into a comprehensive file with all results. A data quality management (DQM) report is filed with the results. The data was entered and reviewed by Katy Austin, Research Coordinator I and Lab Manager at the University of Georgia Marine Extension Service.

10) **Parameter Titles and Variable Names by Data Category**

Data Category	Parameter	Variable Name	Units of Measure
i) Phosphorus:	*Orthophosphate	PO4F	mg/L as P
ii) Nitrogen:	*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 as N
iii) Other Lab Parameters:			
	Chlorophyll a	CHLA_N	µg/L
iv) Field Parameters:			
	none		

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 NO23 or NO2 or NO3.

11) **Measured and Calculated Laboratory Parameters**

i) **Variables Measured Directly**

Nitrogen species:	NO2F, NO23F, NH4F
Phosphorus species:	PO4F
Other:	CHLA

ii) **Computed Variables**

NO3:	NO23F-NO2F
DIN:	NO23F+NH4F

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 UGA Marine Extension Service Laboratory. The MDL is determined as 3 times the standard deviation of a minimum of 7 replicates of a low concentration sample. Table 1 presents the current MDLs; these values are reviewed and revised periodically.

Table 1. Method Detection Limits (MDL) for measured water quality parameters.

Parameter	Variable	Mean Conc.	Std. Dev.	MDL	Dates in use
		mg/L as N or P		mg/L as N or P	
Ammonium	NH4F	0.047	0.001	0.003	Dec.'01 – Dec.'04
Nitrite	NO2F	0.126	0.001	0.004	Dec.'01 – Dec.'04
Nitrite + Nitrate	NO23F	0.126	0.001	0.004	Dec.'01 – Dec.'04
Orthophosphate	PO4F	0.087	0.001	0.002	Dec.'01 – Dec.'04
Chl-a	CHLA			0.0	

13) **Laboratory Methods**

ii) **Parameter: NH4F**
QuikChem Method: 31-107-06-1-E
Method Reference: U.S. EPA 1983. USEPA-600/4-79-020. Method 350.1.
Standard Methods 4500-NH_3 H.
Method Descriptor: Samples were filtered with a 0.45 µm membrane filter and subjected to hypochlorite, which in the presence of phenol, catalytic amounts of nitroprusside and excess hypochlorite, yields indophenol blue, which measured at 630 nm is proportional to the original ammonia concentration.
Preservation Method: Samples filtered and stored frozen (-18 degC).
Holding Time: 2-3 days

iii) **Parameter: NO23F**
QuikChem Method: 31-107-04-1-C
Method Reference: U.S. EPA 1974. Method 353.2.
Standard Methods 4500-NO_3 F.
Method Descriptor: Samples were filtered with 0.45 um polycarbonate filters. Filtered sample is subjected to cadmium reduction column to reduce nitrate to nitrite. The sample nitrite is then determined by diatizing with sulfanilamide and coupling with N-(1-napthyl)-ethylenediamine dihydrochloride to form a highly colored azo dye which is measured at 520 nm and is proportional to the original nitrate + nitrite concentration. The NO2F concentration (below) is subtracted from this result to give NO3F.
Preservation Method: Samples filtered and stored frozen (-18 degC).
Holding Time: 2 weeks

iii) **Parameter: NO2F**
QuikChem Method: 31-107-04-1-C
Method Reference: U.S. EPA 1974. Method 353.2.
Standard Methods 4500-NO_3 F.

Method Descriptor: Samples were filtered with 0.45 um polycarbonate filters. Nitrite in a filtered sample is measured by closing off the cadmium reduction column so that the nitrate is not converted and the sample follows through the same chemistry as with NO3F to yield the original nitrite concentration.
Preservation Method: Samples filtered and stored frozen (-18 degC).
Holding Time: 1-2 days

iv) **Parameter: NO3F**
QuikChem Method: 31-107-04-1-C
Method Reference: U.S. EPA 1974. Method 353.2.
Standard Methods 4500-NO_3 F.
Method Descriptor: Nitrate is calculated from NO23F minus NO2F results.
Preservation Method: Samples filtered and stored frozen (-18 degC).
Holding Time: 2 weeks

v) **Parameter: DIN**
Method: DIN is calculated by adding the NH4F and NO23F results together.

vi) **Parameter: PO4F**
QuikChem Method: 31-115-01-3-A
Method Reference: U.S. EPA 1978. Method 365.1.
Standard Methods 4500-P E.
Method Descriptor: Samples were filtered with 0.45 um polycarbonate filters. Filtered sample is subjected to ammonium molybdate and antimony potassium tartrate under acidic conditions to form a yellow complex. This complex is reduced with ascorbic acid to form a blue complex, which absorbs light at 880 nm. The absorbance is proportional to the concentration of orthophosphate in the sample.
Preservation Method: Samples filtered and stored frozen (-18 degC).
Holding Time: 30 days

vii) **Parameter: CHLA**
APHA Standard Methods: 10200 H.
Method Reference:
Method Descriptor: Suspended sediment and other material in a water sample is concentrated onto a 47 mm GF/F filter under low vacuum. The sample is stored in a petri dish wrapped in aluminum foil in an airtight plastic bag kept on ice while in the field. The samples are then kept frozen and in the dark until analysis. The acetone extraction method is used to extract the chlorophyll over 2-24 hours and a spectrophotometer is used to obtain readings, which are calculated into a final result.
Preservation Method: Filters are stored frozen (-18 degC).
Holding Time: 28 days

14) **Reporting of Missing Data, Data with Concentrations Lower than Method Detection Limits**

Nutrient/Chla comment codes and definitions are provided in the following table. Missing data are denoted by a blank cell " " and commented coded with an "M". Laboratories in the NERRS System submit data that are censored at a lower detection rate limit, called the Method Detection Limit or MDL. MDL's for specific parameters are listed in the Laboratory Methods and Detection Limits Section (Section II, Part 14) of this document. Measured concentrations that are less than this limit are replaced with the minimum detection limit value and comment coded with a "B" in the variable code comment column. For example, the measured concentration of NO23F was 0.0005 mg/L as N

(MDL=0.0008), the reported value would be 0.0008 with a "B" placed in the NO23F comment code column. Calculated parameters are comment coded with a "C" and if any of the components used in the calculation are below the MDL, the calculated value is removed and also comment coded with a "B". If a calculated value is negative, the value is removed and comment coded with an "N".

Note: The way below MDL values are handled in the NERRS SWMP dataset was changed in November of 2011. Previously, below MDL data from 2002-2006 were also coded with a B, but replaced with -9999 place holders. Any 2002-2006 nutrient/pigment data downloaded from the CDMO prior to December November of 2011 will contain -9999s representing below MDL concentrations.

Comment Code	Definition
A	Value above upper limit of method detection
B	Value below method detection limit
C	Calculated value
D	Data deleted or calculated value could not be determined due to deleted data, see metadata for details
H	Sample held beyond specified holding time
K	Check metadata for further details
M	Data missing, sample never collected or calculated value could not be determined due to missing data
P	Significant precipitation (reserve defined, see metadata for further details)
U	Lab analysis from unpreserved sample
S	Data suspect, see metadata for further details

15) **QA/QC Programs**

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a. **Precision**
   i. **Field Variability** – Field replicates are successive grab samples. These are done in triplicate. Samples are filtered and placed on ice before the next sample is grabbed (usually about 10 minutes between grabs).
   ii. **Laboratory Variability** – Laboratory replicates are done in duplicate.
   iii. **Inter-organizational splits** –Samples were analyzed by one lab.

b. **Accuracy**
   i. **Sample Spikes** – A blank sample is spiked with each set for each analyte to obtain a 100 % recovery + or – 10 %. One or two sample unknowns are spiked with each set for each analyte to obtain a 100 % recovery + or – 20 percent under ideal conditions.
   ii. **Standard Reference Material Analysis –** none for 2004 (9/03 & 2/05 only)
   iii. **Cross Calibration Exercises** - None.

16) **Other Remarks**

On 05/22/2025 this dataset was updated to include embedded QAQC flags and codes for anomalous/suspect, rejected, missing, and below detection limit data. System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than using the original single letter codes used for the nutrient and pigment dataset along with the detailed sections in the metadata document for suspect, missing, and rejected data. Please note that prior to 2007, rejected data were deleted from the dataset so they are unavailable to be used at all. Suspect, missing, rejected and below minimum detection flags and appropriate three letter codes were embedded retroactively for dataset consistency. The QAQC flag/codes corresponding to the original letter codes are detailed below.

Flag/code	*If also C*	Historic Letter Code	Historic Code Definition
<1> [SUL]		A	Value above upper limit of method detection
<-4> [SBL]	<-4> [SCB]	B	Value below method detection limit
no need to flag/code unless combined		C	Calculated value
<-3> [GQD]	<3> [GCR]	D	Data deleted or calculated value could not be determined due to deleted data, see metadata for details
<1> (CHB)		H	Sample held beyond specified holding time
<0> (CSM) unless other flag		K	Check metadata for further details
<-2> [GDM]	<-2> [GCM]	M	Data missing, sample never collected or calculated value could not be determined due to missing data
<-3> [SNV] and <1> [SCC] for components		N	Negative calculated value
(CRE) or F_Record {CRE}		P	Significant precipitation (reserve defined, see metadata for further details)
<0> (CUS)		U	Lab analysis from unpreserved sample
<1> (CSM)		S	Data suspect, see metadata for further details

a) Times for grab and diel samples were adjusted by one minute due to importation of data into EQWin.

b) Rep number had to be changed to an 'S' where Diel and Grab samples were collected a the same date, time, station in order to process into EQWin.

c) The rainfall data for 2004 did not show significant amounts of rain falling prior to or on any of our sampling dates. To the best of our knowledge, the Duplin River sampling event on the 21st and 22nd was not significantly affected by the hurricanes occurring in September of 2004.