Apalachicola (APA) NERR Nutrient Metadata
January – December 2005
Latest Update: July 10, 2025

I. Data Set and Research Descriptors

1) **Principal investigators and contact persons**

a) **Reserve Contact**

Lee Edmiston, Research Coordinator
350 Carroll Street
Eastpoint, Fl 32328
850-670-4783
lee.edmiston@dep.state.fl.us

Lauren Levi, Environmental Specialist II
350 Carroll Street
Eastpoint, Fl 32328
850-670-4783
lauren.levi@dep.state.fl.us

b) **Laboratory Contact**

Dr. William Landing
Professor of Environmental and Marine Chemistry
Department of Oceanography, 325 OSB
Florida State University
Tallahassee, FL 32306-4320
VOICE: 850-644-6037; FAX 850-644-2581
WLANDING@MAILER.FSU.EDU

Matt Young
Department of Oceanography
Florida State University
Tallahassee, FL 32306-4320
850-644-6753
may0173@garnet.acns.fsu.edu

c) **Other Contacts and Programs**

Richard L. Iverson
Department of Oceanography
Florida State University
Tallahassee, FL 32306-4320
850-644-1730
riverson@ocean.fsu.edu

Joel E. Kostka
Department of Oceanography
Florida State University

Tallahassee, FL 32306-4320
850-645-3334
jkostka@ocean.fsu.edu

2) **Research objectives**

Previous studies have shown the importance of river flow and flushing rates on nutrients and primary productivity in the bay. Similar studies have determined nitrogen and phosphorus budgets for Apalachicola Bay as well as nutrient limitations related to seasonality and riverflow. There is currently a controversy between the States of Florida, Georgia, and Alabama over the upstream diversion of water. Approximately 88% of the drainage basin for the Apalachicola River and Bay is located in Georgia and Alabama and historical flows are being threatened by upstream development. A tri-state compact, between the states and approved by the US Congress, required negotiations between the states to develop a water allocation formula during the last six years. The states were unable to come to an agreement, the compact has expired, and legal proceedings, which could end up in the US Supreme Court, are underway. This study is one of many looking at short-term variability, long-term change, and the relationship of other environmental factors to the productivity of the Apalachicola Bay system as well as trying to separate natural from man-made variability.

a) **Monthly Grab**

Monthly grab samples are collected at 11 sites located across Apalachicola Bay to monitor spatial and temporal fluctuations in nutrient/chlorophyll *a* concentrations occurring in diverse sections of the bay. The stations have been chosen to help determine the influence of the river, local rainfall, adjacent habitats and man's impact on these parameters. A sampling site is located in the lower Apalachicola River as well as in the coastal area, offshore of the barrier islands. Seasonal, climatic, and anthropogenic factors all impact riverflow, which in turn affects nutrient/ chlorophyll *a* concentrations in the bay. Nutrient/chlorophyll *a* concentrations are also influenced by tidal action, wind direction and speed, and the hydrodynamics of the system.

b) **Diel Sampling Program**

Diel sampling is performed once a month in conjunction with grab sampling for nutrients/ chlorophyll *a*. The East Bay Surface water quality datalogger site (apaesnut) is utilized each month for placement of the sampler so that temporal water quality data may be compared with the spatial nutrient/ chlorophyll *a* data collected at this site. Other studies by the Reserve have shown the influence of tidal action and runoff on other physical parameters in the bay.

3) **Research methods**

a) **Monthly Grab Sampling Program**

Monthly grab samples are collected at eleven stations (see Table 1) within and adjacent to Apalachicola Bay, including a station in the Apalachicola River and the offshore coastal area (Figure 1). Weather permitting, all grab samples are collected on the same day. Due to the distance between the stations it is not always possible to collect all the samples several hours prior to low tide. Tidal condition, wind direction, speed, and cloud cover are recorded for each station at the time of sampling but are not included in this dataset and are available upon request. Significant weather events, such as heavy rains occurring immediately before sampling periods, are also noted. Sampling after heavy rains is avoided if at all possible. Water temperature, salinity, and dissolved oxygen are measured at surface and bottom for each station with a YSI 85 handheld meter. Surface measurements only are included in this dataset for temperature, salinity and dissolved oxygen, with the exception of the East Bay Bottom (apaebnut) station. Bottom measurements for temperature, salinity, and dissolved oxygen are available

on request. pH is also measured and is available on request. Turbidity samples are collected at each site and are tested in the ANERR lab with a DRT-15CE Turbidimeter. A horizontal Van Dorn-style sampler is used to collect 2.2 liters of water from a depth of 0.5 meters at all stations not associated with a SWMP datalogger site. At the Cat Point and Dry Bar SWMP datalogger stations, water samples are collected at a depth of approximately 2 and 1.5 meters (one-half meter from the bottom) respectively, a depth equivalent to the probes of the data loggers deployed at these sites. At the East Bay datalogger station water samples are collected from surface (0.5 meters) and bottom (1.5 meters) depths, equivalent to the depths of the two dataloggers deployed at this site. Water from the sampler is delivered into two one-liter opaque polyethylene bottles. One bottle (acid washed) is designated for nutrient analysis, the other is designated for chlorophyll *a* analysis. Beginning in May 2005, a portion of water is also filtered in the field immediately after collection; the filtrate is collected in an acid rinsed polyethylene bottle designated for ortho-phosphate analysis. Field filtration of ortho-phosphate samples is performed using a Whatman Puradisc 25PP polypropylene 0.45 um disposable filter and a sterile disposable 30 ml BD luer lock syringe. A new filter and syringe assembly are used for each sample and each replicate. Duplicate samples are collected at all monthly grab stations. The duplicate sample is collected with a second dip of the horizontal sampler, with the sample being split between a second set of polyethylene bottles for nutrient and chlorophyll *a* analysis. Polyethylene bottles designated for nutrient samples have been previously acid washed with 3% HCl and then rinsed (5x) with deionized water. No ambient rinsing is performed. Bottles for chlorophyll *a* analysis have been thoroughly rinsed with tap water prior to use. Samples are placed in coolers of ice and kept in the dark immediately after collection. Nutrient samples remain on ice until delivery to the Florida State University Oceanography Department laboratory, which occurs within 36 hours of collection. The nutrient samples are filtered immediately upon arrival at the FSU laboratory, except samples for ortho-phosphate, which have been filtered in the field by ANERR staff . Chlorophyll *a* samples are filtered by ANERR staff within 8 hours of collection, frozen, and delivered to the FSU laboratory along with the nutrient samples.

b) **Diel Sampling Program**

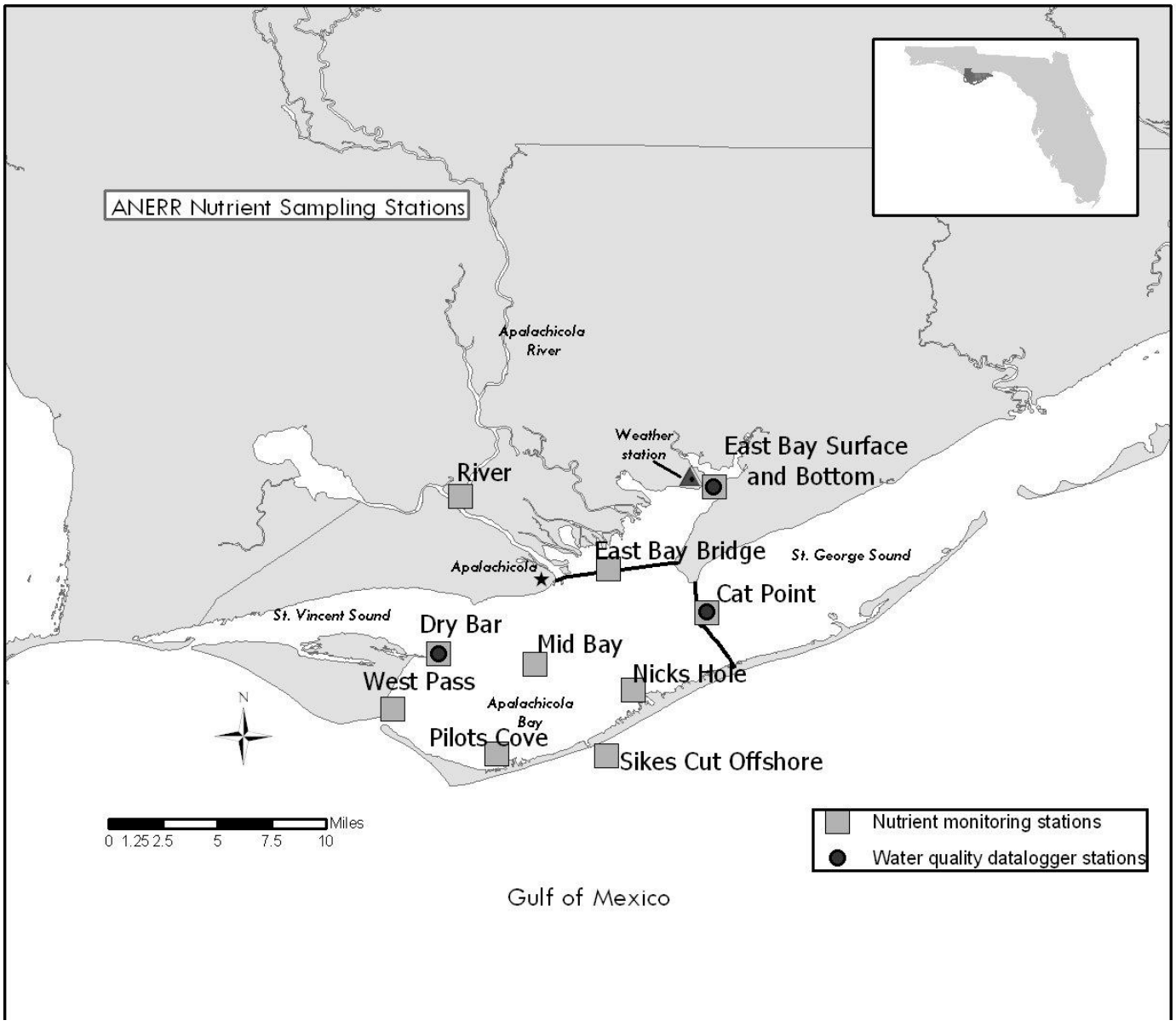
Diel sampling is performed with an ISCO 3700 Portable Automated Sampler at the East Bay surface (apaesnut) station. Whenever possible, the ISCO is deployed on the same day that the bay-wide grab samples are collected. The sampler is programmed to collect a sample for nutrient and chlorophyll *a* every 2.5 hours, over a 25-hour period at the same depth as the East Bay surface datalogger probes (1.7 m above the bottom sediment). This captures a complete 24 hr: 48min lunar-tidal cycle. The sampler is programmed to collect two samples, of one-liter each, every two and one-half hours. Each sample is distributed by the sampler into plastic one-liter ISCO bottles held in the base of the sampler. One of the sample bottles in each set has been acid washed with 3% HCl prior to collection and then rinsed (5x) with deionized water; this bottle is used for nutrient collection. The other bottle in each set has been thoroughly rinsed with tap water and this sample is used for chlorophyll *a* analysis. The ISCO sampler is programmed to purge the suction line before and after each sample collection. The center of the ISCO sampler is filled with ice to aid in sample preservation. All samples are placed in coolers of ice upon retrieval of the ISCO sampler at the end of the 25-hour sampling period. All samples are stored on ice in the dark until laboratory filtering and analysis. The nutrient samples are delivered to the Florida State University Oceanography Department laboratory within 36 hours of collection for immediate filtering. Ortho-phosphate diel samples are not filtered in the field by ANERR staff. Water for ortho-phosphate analysis is filtered by FSU staff at the time of all other nutrient filtering. The chlorophyll *a* samples are filtered by ANERR staff immediately upon retrieval and the filters are frozen and delivered to the lab within 36 hours of collection. The ISCO sampler is deployed at the East Bay datalogger station (Figure 1). The ISCO suction strainer is deployed at a depth equivalent to the probes of the surface datalogger deployed at this station, which are 1.7 meters above the bottom sediment.

Table 1. Nutrient and chlorophyll *a* sampling sites for the Apalachicola NERR SWMP.

STATION CODE	STATION NAME	LATITUDE	LONGITUDE	TIDAL RANGE AVERAGE (meters)	SALINITY RANGE	WATER DEPTH AVERAGE (meters)	BOTTOM HABITAT	DATALOGGER STATION NAME	SAMPLE DEPTH (meters)
APAWPNUT	West Pass	29 38.279	85 5.341	0.7	euryhaline	5.0	sand		0.5
APADBNUT	Dry Bar	29 40.482	85 3.502	0.7	euryhaline	1.7	oyster bar	APA DB	1.5
APAPCNUT	Pilot's Cove	29 36.473	85 1.173	0.7	euryhaline	1.8	patchy seagrass		0.5
APAMBNUT	Mid Bay	29 40.061	84 59.641	0.7	euryhaline	2.2	sandy silt		0.5
APAEGNUT	East Bay Bridge	29 43.848	84 56.711	0.7	euryhaline	1.6	silty clay		0.5
APAESNUT	East Bay Surface	29 47.147	84 52.512	0.7	euryhaline	1.7	clayey sand	APA ES	0.5
APAEBNUT	East Bay Bottom	29 47.147	84 52.512	0.7	euryhaline	1.7	clayey sand	APA EB	1.5
APASCNUT	Sikes Cut Offshore	29 36.401	84 56.799	0.7	marine	>5.0	sand		0.5
APANHNUT	Nick's Hole	29 39.022	84 55.732	0.7	euryhaline	1.0	patchy seagrass		0.5
APACPNUT	Cat Point	29 42.128	84 52.811	0.7	euryhaline	1.8	oyster bar	APA CP	2.0
APARVNUT	River	29 46.743	85 2.606	0.7	oligohaline	NA	sandy silt		0.5

Note: Diel samples are collected 2.5 hours apart at the East Bay Surface datalogger site, APAESNUT, with the ISCO automated water sampler. No duplicate diel samples are taken, however there is some overlap with monthly grabs collected at the East Bay Surface station at deployment of the ISCO sampler.

Figure 1. Station locations.



4) **Site location and character**

The Apalachicola Drainage Basin encompasses over 19,600 square miles and includes parts of three states (Alabama, Georgia, and Florida). The Apalachicola River is the largest in Florida in terms of flow. The amount of river discharge has been shown to be highly significant to the ecology of the estuary, which acts as a buffer between the Gulf of Mexico and fresh water input from upland areas. The nutrient rich plume of "green water" moving out of Apalachicola Bay is also important to the productivity of the northeastern Gulf of Mexico. The Apalachicola National Estuarine Research Reserve is located in the northwestern part of Florida, generally called the panhandle. It is located adjacent to the City of Apalachicola, and encompasses most of the Apalachicola Bay system, including 52 miles of the lower Apalachicola River. Passes, both natural and manmade, connect Apalachicola Bay to the northeastern Gulf of Mexico.

a) East Bay datalogger and nutrient station

East Bay is separated from Apalachicola Bay by two bridges and a causeway and is located to the north of the bay proper. The bay is 8.2 km long, has an average depth of approximately 1.0 m MHW, and an average width of 1.8 km. The tides in East Bay are mixed and range from 0.3 m to 1.0 m (average 0.5 m). The datalogger and nutrient sampling site is located in the upper reaches of East Bay. The piling location for the two East Bay dataloggers (ES and EB) is latitude 29°47.15' N and longitude 84°52.52' W. At the sampling site, the depth is 2.2 m MHW and the width of the bay is 1 km. The tides in the system are mixed, meaning the number of tides can range from one to five tides during a 24 hour period and are not evenly distributed throughout the day. At the East Bay bottom site the meter probes are 0.3 m above the bottom sediment. Salinity ranges from 0 to 30 ppt and the long-term average salinity is approximately 8 ppt. At the East Bay surface site the meter probes are 1.7 m above the bottom sediment and salinity ranges from 0 ppt to 30 ppt with a long term average salinity of 6.3 ppt. The freshwater input is very tannic and usually dark colored. Flows vary with local rainfall and are not quantified due to the diverse sources of the runoff. The bottom habitat at this bay site is soft sediment, primarily silt and clay, with no vegetation present. The dominant marsh vegetation near the sampling site (approximately300 meters away) is *Juncus roemerianus* and *Cladium jamaicense*. The dominant upland vegetation is primarily pineland forests which includes slash pine, saw palmetto, and sand pine. Upland land use near the sampling site includes conservation and silviculture uses with some single family residential in the lower East Bay area. The sampling site is influenced by local runoff from Tate's Hell Swamp, the East Bay marshes, and distributary flow, some of which comes from the Apalachicola River via the East River. Tate's Hell Swamp was ditched, diked, and altered in the late 1960's and early 1970's by timber companies. These changes shortened the drainage period and allowed increased runoff with a concomitant decrease in pH and increase in color, which had a drastic affect on the biological communities in East Bay. Restoration of Tate's Hell Swamp began in 1995 to reduce non-point source runoff and restore historic sheet flow in the area.

b) Cat Point datalogger and nutrient station

The Cat Point datalogger and nutrient sampling site is located in St. George Sound, approximately 400 meters east of the St. George Island Bridge. The piling location is latitude 29°42.12′ N and longitude 84°52.81′ W. The tides at Cat Point are mixed and range from 0.3m to 1.0m (average 0.5m). At the sampling site, the depth is 2.5 m MHW. (The site was moved approximately 600 meters south in October 1997) and the width of the bay is 4 miles. At the Cat Point site the meter probes are 0.3 meters above the bottom sediment. This is also the depth where nutrients are collected monthly. Salinity ranges from 0 to 32 ppt with an average salinity of 20.9 ppt.. Flows vary with local rainfall and are not quantified due to the diverse sources of the runoff. The bottom type is oyster bar with no vegetation present except algae growing on the oysters in the summer. The dominant upland

vegetation is primarily pineland forests, which include slash pine, saw palmetto, and sand pine. Upland land use near the sampling site, includes single family residential and commercial use in the Eastpoint area. The sampling site is influenced by local runoff from Tate's Hell Swamp and flow from the Apalachicola River. High salinity water comes mainly from the east, through East Pass at the eastern end of St. George Island.

c) Dry Bar datalogger and nutrient station

The Dry Bar datalogger and nutrient sampling site is located near St. Vincent Sound, in the western part of the Apalachicola Bay system, approximately one-half mile east of St. Vincent Island. The piling location is latitude 29°40.48′ N and longitude 85°03.50′ W. At the sampling site, the depth is 2 meters and the width of the bay is 7 miles. At the Dry Bar site the datalogger probes are located 0.3 meters above the bottom sediment. This is also the depth where nutrients are collected monthly. The tides are mixed and range from 0.3 to 1.0 meters. Salinity ranges from 0 to 34 ppt with an average salinity of 20.2 ppt. The bottom type is oyster bar with no vegetation present, except algae that grows on the oysters during the summer months. The dominant upland vegetation includes slash pine flatwoods with various combinations of gallberry, smooth cordgrass, fetterbush, cabbage palm, saw palmetto, magnolia, and grasses. Upland use near the sampling site includes state owned and managed Cape St. George Island, St. Vincent National Wildlife Refuge, as well as, single family residential and commercial use in the Apalachicola area. The sampling site is influenced by the flow of the Apalachicola River and high salinity water coming through West Pass and Sikes Cut.

d) Additional Apalachicola Bay nutrient stations

Information for an additional 7 nutrient stations, not associated with the required sampling at the datalogger sites, as well as the datalogger sites, is included in Table 1. Duplicate samples are collected at all monthly grab stations. A map of station locations is given in Figure 1.

5) **Code variable definitions**

Station code names:
apacpnut = Apalachicola Reserve nutrient data for Cat Point
apadbnut = Apalachicola Reserve nutrient data for Dry Bar
apaebnut = Apalachicola Reserve nutrient data for East Bay Bottom
apaegnut = Apalachicola Reserve nutrient data for East Bay Bridge
apaesnut = Apalachicola Reserve nutrient data for East Bay Surface
apambnut = Apalachicola Reserve nutrient data for Mid Bay
apanhnut = Apalachicola Reserve nutrient data for Nicks Hole
apapcnut = Apalachicola Reserve nutrient data for Pilots Cove
aparvnut = Apalachicola Reserve nutrient data for River
apascnut = Apalachicola Reserve nutrient data for Sikes Cut
apawpnut = Apalachicola Reserve nutrient data for West Pass

Monitoring Programs:
Monthly grab samples (1), Diel grab sampling (2).

6) **Data collection period**

Nutrient monitoring began in April 2002 at all stations listed. Sampling has been performed monthly at all stations, unless otherwise noted. This table lists collection times for all nutrient and chlorophyll *a* samples in 2005. The below Start and End time reflect the times that Rep 1 (Start Time) and Rep 2 (End time) were

collected. Time is coded based on a 2400 hour clock and is referenced to Eastern Standard Time (EST), without Daylight Savings Time adjustments.

Grab Sampling (Monitoring Program 1)

Site	Start Date	Start Time	End Date	End Time
apacpnut	1/4/2005	10:46	1/4/2005	10:49
apacpnut	2/7/2005	11:17	2/7/2005	11:19
apacpnut	3/2/2005	12:55	3/2/2005	12:58
apacpnut	4/4/2005	11:50	4/4/2005	11:52
apacpnut	5/2/2005	10:45	5/2/2005	10:47
apacpnut	6/6/2005	10:08	6/6/2005	10:10
apacpnut	7/7/2005	no sample	7/7/2005	no sample
apacpnut	8/9/2005	9:28	8/9/2005	9:31
apacpnut	9/8/2005	9:25	9/8/2005	9:28
apacpnut	10/3/2005	09:25	10/3/2005	09:27
apacpnut	11/8/2005	11:10	11/8/2005	11:12
apacpnut	11/29/2005	13:45	11/29/2005	13:47

Site	Start Date	Start Time	End Date	End Time
apadbnut	1/4/2005	12:15	1/4/2005	12:17
apadbnut	2/7/2005	13:06	2/7/2005	13:08
apadbnut	3/2/2005	12:15	3/2/2005	12:17
apadbnut	4/4/2005	13:37	4/4/2005	13:39
apadbnut	5/2/2005	13:15	5/2/2005	13:17
apadbnut	6/6/2005	11:23	6/6/2005	11:25
apadbnut	7/7/2005	no sample	7/7/2005	no sample
apadbnut	8/9/2005	12:35	8/9/2005	12:38
apadbnut	9/8/2005	8:05	9/8/2005	8:07
apadbnut	10/3/2005	no sample	10/3/2005	no sample
apadbnut	11/8/2005	12:55	11/8/2005	12:57
apadbnut	11/30/2005	10:02	11/30/2005	10:04

Site				
apaebnut	Start Date	Start Time	End Date	End Time
apaebnut	1/4/2005	10:15	1/4/2005	10:17
apaebnut	2/7/2005	10:30	2/7/2005	10:31
apaebnut	3/2/2005	11:18	3/2/2005	11:20
apaebnut	4/4/2005	11:10	4/4/2005	11:12

apaebnut	5/2/2005	10:04	5/2/2005	10:06
apaebnut	6/6/2005	9:41	6/6/2005	9:43
apaebnut	7/7/2005	9:00	7/7/2005	9:12
apaebnut	8/9/2005	9:00	8/9/2005	9:03
apaebnut	9/7/2005	9:04	9/7/2005	9:06
apaebnut	10/3/2005	8:45	10/3/2005	8:50
apaebnut	11/8/2005	10:24	11/8/2005	10:26
apaebnut	11/29/2005	13:09	11/29/2005	13:11

Site

apaegnut	Start Date	Start Time	End Date	End Time
apaegnut	1/4/2005	10:30	1/4/2005	10:33
apaegnut	2/7/2005	11:00	2/7/2005	11:03
apaegnut	3/2/2005	12:00	3/2/2005	12:03
apaegnut	4/4/2005	11:35	4/4/2005	11:37
apaegnut	5/2/2005	10:30	5/2/2005	10:32
apaegnut	6/6/2005	9:05	6/6/2005	9:07
apaegnut	7/7/2005	8:42	7/7/2005	8:44
apaegnut	8/9/2005	9:13	8/9/2005	9:16
apaegnut	9/8/2005	9:50	9/8/2005	9:52
apaegnut	10/3/2005	9:05	10/3/2005	9:08
apaegnut	11/8/2005	10:46	11/8/2005	10:48
apaegnut	11/29/2005	13:41	11/29/2005	13:43

Site

apaesnut	Start Date	Start Time	End Date	End Time
apaesnut	1/4/2005	10:10	1/4/2005	10:12
apaesnut	2/7/2005	10:25	2/7/2005	10:27
apaesnut	3/2/2005	11:10	3/2/2005	11:12
apaesnut	4/4/2005	11:05	4/4/2005	11:07
apaesnut	5/2/2005	9:59	5/2/2005	10:02
apaesnut	6/6/2005	9:37	6/6/2005	9:39
apaesnut	7/7/2005	8:56	7/7/2005	8:58
apaesnut	8/9/2005	8:55	8/9/2005	8:58
apaesnut	9/7/2005	9:00	9/7/2005	9:02
apaesnut	10/3/2005	8:35	10/3/2005	8:38
apaesnut	11/8/2005	10:18	11/8/2005	10:22
apaesnut	11/29/2005	13:05	11/29/2005	13:07

Site

apambnut	Start Date	Start Time	End Date	End Time

apambnut	1/4/2005	11:12	1/4/2005	11:14
apambnut	2/7/2005	12:52	2/7/2005	12:54
apambnut	3/2/2005	15:00	3/2/2005	15:03
apambnut	4/4/2005	13:52	4/4/2005	13:54
apambnut	5/2/2005	12:55	5/2/2005	12:57
apambnut	6/6/2005	11:38	6/6/2005	11:40
apambnut	7/7/2005	no sample	7/7/2005	no sample
apambnut	8/9/2005	12:51	8/9/2005	12:53
apambnut	9/8/2005	no sample	9/8/2005	no sample
apambnut	10/3/2005	no sample	10/3/2005	no sample
apambnut	11/8/2005	13:10	11/8/2005	13:11
apambnut	11/30/2005	10:12	11/30/2005	10:15

Site

apanhnut	Start Date	Start Time	End Date	End Time
apanhnut	1/4/2005	13:39	1/4/2005	13:41
apanhnut	2/7/2005	11:37	2/7/2005	11:40
apanhnut	3/2/2005	12:40	3/2/2005	12:44
apanhnut	4/4/2005	12:12	4/4/2005	12:15
apanhnut	5/2/2005	11:20	5/2/2005	11:22
apanhnut	6/6/2005	10:22	6/6/2005	10:24
apanhnut	7/7/2005	no sample	7/7/2005	no sample
apanhnut	8/9/2005	9:42	8/9/2005	9:45
apanhnut	9/8/2005	no sample	9/8/2005	no sample
apanhnut	11/8/2005	11:28	11/8/2005	11:30
apanhnut	11/29/2005	8:40	11/29/2005	8:42

Site

apapcnut	Start Date	Start Time	End Date	End Time
apapcnut	1/4/2005	13:02	1/4/2005	13:04
apapcnut	2/7/2005	12:10	2/7/2005	12:12
apapcnut	3/2/2005	13:57	3/2/2005	14:00
apapcnut	4/4/2005	12:50	4/4/2005	12:52
apapcnut	5/2/2005	12:07	5/2/2005	12:09
apapcnut	6/6/2005	10:55	6/6/2005	10:57
apapcnut	7/7/2005	no sample	7/7/2005	no sample
apapcnut	8/9/2005	10:30	8/9/2005	10:35
apapcnut	9/8/2005	no sample	9/8/2005	no sample
apapcnut	10/3/2005	no sample	10/3/2005	no sample
apapcnut	11/8/2005	12:08	11/8/2005	12:10
apapcnut	11/30/2005	9:25	11/30/2005	9:30

Site

aparvnut	Start Date	Start Time	End Date	End Time
aparvnut	1/4/2005	14:04	1/4/2005	14:06
aparvnut	2/7/2005	13:40	2/7/2005	13:42
aparvnut	3/2/2005	15:50	3/2/2005	15:58
aparvnut	4/4/2005	15:42	4/4/2005	15:45
aparvnut	5/2/2005	13:50	5/2/2005	13:52
aparvnut	6/6/2005	11:05	6/6/2005	11:07
aparvnut	7/7/2005	9:00	7/7/2005	9:02
aparvnut	8/9/2005	13:06	8/9/2005	13:09
aparvnut	9/8/2005	9:45	9/8/2005	9:47
aparvnut	10/3/2005	10:34	10/3/2005	10:36
aparvnut	11/8/2005	13:42	11/8/2005	13:44
aparvnut	11/30/2005	10:35	11/30/2005	10:37

Site

apascnut	Start Date	Start Time	End Date	End Time
apascnut	1/4/2005	13:21	1/4/2005	13:24
apascnut	2/7/2005	11:57	2/7/2005	11:59
apascnut	3/2/2005	13:23	3/2/2005	13:25
apascnut	4/4/2005	12:25	4/4/2005	12:27
apascnut	5/2/2005	11:40	5/2/2005	11:42
apascnut	6/6/2005	10:40	6/6/2005	10:42
apascnut	7/7/2005	no sample	7/7/2005	no sample
apascnut	8/9/2005	10:20	8/9/2005	10:23
apascnut	9/8/2005	no sample	9/8/2005	no sample
apascnut	10/3/2005	no sample	10/3/2005	no sample
apascnut	11/8/2005	11:50	11/8/2005	11:52
apascnut	11/30/2005	09:02	11/30/2005	09:04

Site

apawpnut	Start Date	Start Time	End Date	End Time
apawpnut	1/4/2005	12:40	1/4/2005	12:42
apawpnut	2/7/2005	12:30	2/7/2005	12:32
apawpnut	3/2/2005	14:30	3/2/2005	14:32
apawpnut	4/4/2005	13:10	4/4/2005	13:15
apawpnut	5/2/2005	12:31	5/2/2005	12:33
apawpnut	6/6/2005	11:05	6/6/2005	11:07
apawpnut	7/7/2005	no sample	7/7/2005	no sample
apawpnut	8/9/2005	12:19	8/9/2005	12:21

apawpnut	9/8/2005	no sample	9/8/2005	no sample
apawpnut	10/3/2005	no sample	10/3/2005	no sample
apawpnut	11/8/2005	12:28	11/8/2005	13:30
apawpnut	11/30/2005	9:47	11/30/2005	9:49

Diel Sampling (Monitoring Program 2)

Site	Start Date	Start Time	End Date	End Time
apaesnut	1/4/2005	10:30	1/5/2005	11:30
apaesnut	2/7/2005	8:00	2/8/2005	9:00
apaesnut	3/2/2005	10:45	3/3/2005	09:15
apaesnut	4/4/2005	11:00	4/5/2005	12:00
apaesnut	5/2/2005	10:00	5/3/2005	11:00
apaesnut	6/6/2005	9:45	6/7/2005	10:45
apaesnut	7/6/2005	9:00	7/7/2005	10:00
apaesnut	8/9/2005	09:00	8/10/2005	10:00
apaesnut	9/7/2005	9:15	9/8/2005	10:15
apaesnut	10/3/2005	8:45	10/4/2005	09:45
apaesnut	11/8/2005	10:20	11/9/2005	11:20
apaesnut	11/29/2005	13:10	11/30/2005	14:10

7) Associated researchers and projects

The Reserve conducts long-term water quality monitoring and maintains a weather station as part of the NERRS SWMP. Other ongoing projects or data that relate to the nutrient monitoring project includes:

Apalachicola River Discharge
U.S. Geological Survey
http://waterdata.usgs.gov/nwis/

Jennifer Putland
Florida State University Department of Oceanography
NOAA Graduate Research Fellowship
"Planktonic food web variations related to salinity and nutrient patterns
in Apalachicola Bay."

Henrieta Dulaiova
Florida State University Department of Oceanography
NOAA Graduate Research Fellowship
“Evaluation of flushing rates of estuaries and embayments via natural geochemical tracers.”

Donnato Surratt

Florida Agricultural and Mechanical University
Environmental Sciences Institute
"Historic trophic status and present trophic status for the Apalachicola Bay compared and contrasted."

Origin and Fate of Suspended Particulates in the Apalachicola River: Impact on Apalachicola Bay Richard Peterson/ Florida State University

The Role of Oligohaline Marshes as a Source or Sink of Nitrogen to the Apalachicola Bay Thomas Gihring/ Florida State University

Edmiston,HL., Wanat, J., Levi, L., Stewart, J. Lamb, M., Fahrny, S.
Apalachicola National Estuarine Research Reserve.
Distribution and density of fishes and benthic invertebrates in Apalachicola Bay.

Edmiston,HL., Lamb, M.,Stewart, J., Wanat, J., Levi, L., Fahrny, S.
Apalachicola National Estuarine Research Reserve
System Wide Monitoring Program
Long-Term Water Quality Monitoring

Edmiston,HL., Fahrny, S., Wanat, J., Levi, L., Stewart, J.
Apalachicola National Estuarine Research Reserve
System Wide Monitoring Program
Long-Term Meteorological Monitoring

Edmiston,HL., Fahrny, S., Wren, K., Bolen, L., Wanat, J., Levi, L., Stewart, J. Lamb, M.
Apalachicola National Estuarine Research Reserve
Submerged Aquatic Vegetation Monitoring

Edmiston, HL., Stewart, J., Wanat, J., Levi, L., Lamb, M., Fahrny, S.
Apalachicola National Estuarine Research Reserve
Apalachicola Bay Oyster Growth Monitoring

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 hardcopy of the original ANERR Field Sample Collection logsheet accompanies the samples from ANERR to FSU Oceanography laboratory. Results data are entered into excel by FSU Oceanography laboratory staff, reviewed and signed off by the laboratory supervisor (Dr. William Landing). The excel data file is then electronically transmitted to ANERR. Lauren Levi, ANERR staff, reviews the data file for completeness and other possible anomalies. Missing data are verified by review of field logs and are denoted by a blank space in the database. ANERR staff utilize the CDMO Rounding Macro, and format the file in excel and EQWin according to CDMO standards. Calculations to determine NO3F and DIN are performed by ANERR staff. Values below the method detection limit (MDL) are replaced with the MDL value and flagged with a "B". Affected calculated values are also flagged with a "B". Other applicable codes are used as specified in section 14 of this report. After review by ANERR staff the data are electronically transmitted to the CDMO.

10) Parameter Titles and Variable Names by Data Category

Data Category	Parameter	Variable Name	Units of Measure
i) Phosphorus:			
	Orthophosphate, filtered	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) Plant Pigments:			
	Chlorophyll *a*	CHLA_N	µg/ L
iv) Field Parameters:			
	Water temperature	WTEM_N	^{0}C
	Salinity	SALT_N	ppt
	Dissolved oxygen	DO_N	mg/L
	%Saturated dissolved oxygen	DO_S_N	%
	Turbidity	TURB_N	NTU

Notes:

1. Time is coded based on a 2400 hour clock and is referenced to Standard Time.
2. Reserves have the option of measuring either NO23 or NO2 or NO3.

11) Measured and Calculated Laboratory Parameters

Variables Measured Directly

Nitrogen species:	NO2F, NO23F, NH4F
Phosphorus species:	PO4F
Other:	CHLA_N, WTEMP, SAT+LT, DO_N, DO_S_N, TURB

Computed Variables

NO3:	NO23F-NO2F
DIN:	NO23F+NH4F

12) Limits of Detection

The information in section 12 is provided by FSU Oceanography Laboratory.
Analytical detection limits were established by replicate analysis of a low sample or blank, and are reported as 3SD. The analytical detection limit or method detection limit (MDL) for each analyte are reported in Table 2.

Table 2. Method Detection Limits

Parameter	Variable	MDL	Dates in use
Ammonium	NH4F	0.004 mg-N/l	2002-2005
Nitrite	NO2F	0.002 mg-N/l	2002-2005
Nitrate-Nitrite	NO23F	0.007 mg-N/l	2002-2005
Nitrate	NO3F	0.007 mg-N/l	2003-2005
Orthophosphate	PO4F	0.001 mg-P/l	2002-2005
Chlorophyll a	CHLA_N	0.5 ug/l	2002-2005

Note: (Explanation for NO3F MDL provided by FSU Oceanography Laboratory) The MDLs for each analysis are calculated as 3 times the standard deviation of a low sample or blank. The NO2+3 MDL is 0.007 mgN/L and the MDL for NO2 is 0.002 mgN/L. The MDL for the NO3 by itself is calculated by squaring those two MDL values, adding them together, then taking the square root, which comes out to 0.0073 mgN/L, which is rounded off to 0.007mgN/L.

13) Laboratory Methods

The information in section 13 is provided by FSU Oceanography Laboratory.

i) **Parameter: NH4F**

Method Reference: Procedure adapted from Bower and Holm-Hansen, Can. J. Fish, Aquat. Sci. 1980. V.37. pp. 794-798.

Method Descriptors:

Solutions:

Solution #1. 110 g sodium salicylate and 0.07 g sodium nitroprusside diluted to 250 ml ddH_2O, store in brown glass @ 5C

Solution #2. 18.5 g sodium hydroxide and 100 g sodium citrate diluted to 1 L ddH_2O, stable

Solution #3. 1 part fresh Chlorox bleach (5.25% sodium hypochlorite), 9 parts Soln. 2. Use within 1 hour of preparation. 5 ml : 45 ml

Procedure:

Reagent addition to be carried out in the dark
To 5 ml sample, add 0.6 ml S #1, Mix, add 1 ml S #3, Mix. Stopper flask and allow color to develop for 1-3 hours in the dark. Sample can be exposed to light after color development is complete.
Read Absorbance @ 640 nm with a 1 cm path length cell
Standards:
Standards: (in mg/L), 0.0, 0.005, 0.0200, 0.0500, 0.2000, 0.5000
Primary Stock: 0.1909 g NH_4Cl/ 1 L = 50 mg N / L
Dilute for working stds (ul to 100ml): 0, 10, 40, 100, 400, 1000

Preservation Method: Nutrient grab samples are collected monthly via Van Dorn bottle grabs and placed into 1L bottles on ice until transport to the FSU Department of Oceanography Laboratory in Tallahassee, Florida (within 36 hours). Nutrient diel samples are collected monthly via an ISCO automated sampler and held on ice until transport to the FSU Department of Oceanography Laboratory in Tallahassee, Florida (within 36 hours). All samples are filtered through 0.45 μm membrane filters (Pall Gelman Supor) and the filtrate is collected into new bottles and placed on ice until analysis (within 48 hours).

ii) **Parameter: PO4F**

Method Reference: Adapted from EPA standard method and Strickland and Parsons.
Method Descriptor:

Solution #1. 78 ml conc. H_2SO_4 diluted up to 500 ml ddH_2O
Solution #2. 1.35 g $C_6H_8O_6$ (Ascorbic Acid) dissolved in 25 ml ddH_2O (make new weekly, store in refrigerator)
Solution #3. 0.34 g $K(SbO)C_4H_4O_6 *_{1/2}H_2O$ dissolved in 250 ml ddH_2O (store in refrigerator).
Solution #4. 7.5 g $(NH_4)_6Mo_7O_{24}*H_2O$ dissolved in 250 ml ddH_2O (store in dark in plastic, stable, discard is see precipitate).
Solution #5. Mixed Reagent. Add in order: **62.5 ml #1, 25 ml #2, 12.5 ml #3, 25 ml #4.** Solution should be light yellow, makes 125 ml. Stable < 6 hours.
Procedure:
For 10 ml samples (or 5 ml samples).

1. Allow samples to come to room temperature
2. **Add 2.0 ml Soln #5** (or 1.0 ml to 5 ml samples)
3. Wait 30 minutes for light blue-green color to develop
4. **Read absorbance @ 880 nm**, in 10 cm cell for 10 ml sample, or 1 cm cuvette

If necessary, samples can be run in pairs, one set for color development and the other as a turbidity blank if necessary(no mixed reagent added). Concentration is determined by subtracting the blank from the sample and multiplying by the standard line slope.
Standards (in mg P / L): 0.0000, 0.0005, 0.0020, 0.0050, 0.0200, 0.0500
Primary Stock: 0.022 g KH2PO4 / 1 L = 5 mg P / L
Dilute for working stds (ul to 100ml): 0, 10, 40, 100, 400, 1000

Preservation Method: Nutrient grab samples are collected monthly via Van Dorn bottle grabs. Starting in May 2005 a portion of each grab sample is filtered in the field immediately after collection and placed into a 250 ml bottle designated for ortho-phosphate analysis. The 250 ml bottle is held on ice until transport to the FSU Department of Oceanography Laboratory in Tallahassee, Florida (within 36 hours). Nutrient diel samples are collected monthly via an ISCO automated sampler and held on ice until transport to the FSU Department of Oceanography Laboratory in Tallahassee, Florida (within 36 hours). Diel samples for ortho-phosphate are not filtered in the field. Diel ortho-phosphate samples are filtered at the FSU lab using 0.45 µm membrane filters (Pall Gelman Supor) and the filtrate is collected into new bottles and placed on ice until analysis (within 48 hours).

iii) **Parameter: CHLA_N**

Method Reference: Adapted from Parsons and Strickland, J. Marine Res., 21: 155, 1963, and from A Practical Handbook of Seawater Analysis, Chapter IV.3.
Method Descriptors:

Filtration:
Up to 1 L of sample is filtered onto Gelman AE 1 micron 47mm filter, 1 ml of magnesium carbonate solution (1 g per 100 ml ddH_2O) is added during final few hundred ml of filtering, desiccate the filter well under suction. The filter is placed in a 15 ml centrifuge tube and placed on ice until analysis.
Analysis:
12 ml of 90% acetone/ 10% water added, the tube is sealed and shaken vigorously.

The tubes are placed in a refrigerator (in the dark) for about 20 hours, shaking them once more at 1 or 2 hours.
Shake once more and spin the filters down for 15 minutes @ 5000 rpm.
Decant the supernatant into a 10 cm path length cell, or 1 cm cuvette (multiply the extinction values by 1.2 to normalize to values expected from 10 ml extract).
Immediately read and record absorbance @ 750nm and @ 664nm, then acidify with 100 ul (10 cm cell) or 20 ul (1 cm cell) of 1.2M HCl, mix well and read again @ 750nm and 664nm.
Make a filter blank by extracting a clean filter along with the sample filters. This measurement should be subtracted from the others OR used to zero spec.
Use Strickland and Parsons, 1972, formula to calculate concentration

Chl a = 26.7 L/g/cm x (664 before – 664 acid) x 12 ml (extract volume) / Volume filtered (L) x 8.5cm (cuvette length) = ug/L
Equation 664 = 664 nm measurement minus 750 nm
For Apalachicola Bay, chl a ~0.1 to 25 ug/L
Spec measurements should be ~ 0.02 to 0.20, with after acid numbers ~ 50-75% less then before acidification
mg pigment/m3 = C/V
C obtained from following equations
V is volume filtered

Preservation Method: Chlorophyll a grab samples are collected monthly via Van Dorn bottle grabs and placed into 1L bottles on ice until transport to ANERR laboratory (2-4 hours). Chlorophyll a diel samples are collected monthly via an ISCO automated sampler and held on ice until transport to ANERR laboratory (2-4 hours). All samples are filtered through glass 47 mm filters at the ANERR laboratory. The filters are frozen and transported to the FSU laboratory for analysis (within 36 hours). The above methods are used at the FSU Oceanography Laboratory.

iv) **Parameter: NO2F**

Method Reference: contact Florida State University lab for information
Method Descriptor:

Solutions:
Sulphanilamide solution: 5 g Sulphanilamide in a mixture of 50 ml concentrated HCl and 300 ml nano H_2O. Dilute up to 500 ml with nano H_2O.
N-(1-Naphthyl)-Ethylenediamine dihydrochloride solution (NED): 0.10 g Dihydrochloride in 100 ml nano H_2O. Store in a dark brown bottle. Renew Weekly.
Analysis of Samples:
10 ml each sample into properly labeled sample tube
Add 0.2 ml sulphanilamide, vortex, wait 2-8 minutes
Add 0.2 ml dihydrochloride, vortex quickly, wait at least 10 minutes
Read Absorbance @ 543 nm
Standards:
Standards (in mg N / L): 0.0000, 0.0007, 0.0014, 0.0140, 0.0700
Primary Standard: 0.346 g NaNO2 / 1L = 5 mM
Dilute for working stds (ul to 100ml): 0, 1, 2, 20, 100
If necessary, samples can be run in pairs, one set for color development and the other as a turbidity blank (no mixed reagent added). The concentration is determined by subtracting the blank from the sample and multiplying by the slope of the standard curve.

Preservation Method: Nutrient grab samples are collected monthly via Van Dorn bottle grabs and placed into 1L bottles on ice until transport to the FSU Department of Oceanography

Laboratory in Tallahassee, Florida (within 36 hours). Nutrient diel samples are collected monthly via an ISCO automated sampler and held on ice until transport to the FSU Department of Oceanography Laboratory in Tallahassee, Florida (within 36 hours). All samples are filtered through 0.45 μm membrane filters (Pall Gelman Supor) and the filtrate is collected into new bottles and placed on ice until analysis (within 48 hours).

v) **Parameter: NO23F**

Method Reference: Adapted from Instruction manual for model 42 chemiluminescence analyzer and Braman, R.S. and S. A. Hendrix. Nanogram Nitrite and Nitrate determination in environmental and biological materials by Vanadium (III) reduction with chemiluminescence detection. Anal. Chem. 1989, 61, 2715-2718.

Method Descriptor: Nitrate (85C) and Nitrite (23C) are rapidly reduced to Nitrous Oxide in acidic Vanadium(III). The nitric oxide is removed via helium carrier gas and detected via analyzer: $NO + O_3 = NO_2 + O_2 + hv$, with the luminescence proportional to the concentration of NO.

Solutions and gases needed:
Helium, Air, Nitrogen
Isoproponyl in dry ice
2 M NaOH in ice
Reducing Reagent:
0.1 M Vanadium Sulfate = 8.15 g $VoSO_4 * nH_2O$ in 500 ml of 2.0 M HCl (2 M in 500 ml = 83.3 ml HCl + 416.7 ml H2O).
Prep: Place ~2 Tbs. Zinc pellets in a 125 ml flask.
Add 30 mls of 2% HgCl (2g in 100ml), swirl, add 70 mls more HgCl. Wait 10 min.
Dump HgCl. Add $VoSO_4$ acid solution. Cover loosely with parafilm and Bubble Nitrogen gas for 20 minutes until purple color develops (Vo(II)). Decant solution only to new flask and bubble with Oxygen (or Air) for 30+ minutes until Marine Blue color.
Apparatus setup:
Check all flow rates and connections before turning power on.

1) Isoproponyl in ice mixed well, with condensation trap in
2) Water and ice with NaOH impinger inside
3) Carefully connect Swagelock fittings Finger Tight Only!

Turn on power and wait 1.5 hours for analyzer to stabilize.
Push the STAT button on the front panel 4 times to attain NO_x mode.
Use the thumbwheel switches to set the range and press Enter.
Ranges include: 050, 100, 200, 500, 1000, 2000, and 5000 ppb.
Push the Stat button one more time to set the averaging time, thumb it and Enter.
Ave. times: 0.5, 1, 2, 3, 4, 5 (=0050), 6, 7, 8, 9, and 10 to 300 sec in mult.of 10.
Push the Man. (manual) button twice to be in NO_x mode.
(should read 3. with a value between 2-10)
100 ul Samples are added to the reducing solution via syringe.
Procedure: Nitrites are reduced at room temp to NO in Vo(III).

Nitrate + Nitrite: Nitrate is reduced by Vo(III) at 80-90C. The Vanadium impinger is heated to 85C and the 100 ul sample is added. Nitrites are also reduced by this method, so the Nitrite concentration measured previously is subtracted to get the Nitrate concentration.

Standards (in mg N / L): 0.0000, 0.0070, 0.0140, 0.1401, 0.2802, 0.7004

Primary Stock: 0.425 $NaNO_3$ / 1 L
Dilute for working stds (ul to 100ml): 0, 10, 20, 200, 400, 1000

Preservation Method: Nutrient grab samples are collected monthly via Van Dorn bottle grabs and placed into 1L bottles on ice until transport to the FSU Department of Oceanography Laboratory in Tallahassee, Florida (within 36 hours). Nutrient diel samples are collected monthly via an ISCO automated sampler and held on ice until transport to the FSU Department of Oceanography Laboratory in Tallahassee, Florida (within 36 hours). All samples are filtered through 0.45 µm membrane filters (Pall Gelman Supor) and the filtrate is collected into new bottles and placed on ice until analysis (within 48 hours).

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.

It should be noted that for the field parameters (water temperature, salinity, turbidity, dissolved oxygen in mg/L and %) readings are only taken once at each grab station. Field parameters are not displayed in the database for duplicate grab samples or diel samples. The appearance of numerous blank data fields in the database for field parameter results are due to the formatting necessary to display duplicate grab sample data and diel sampling data. Comment codes are utilized only for those field parameter data that are concurrent with a primary grab sample.

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

b) Suspect data (comment code "S")

Nitrite (NO2F), nitrate (NO3F), nitrite + nitrate (NO23F), and dissolved inorganic nitrogen (DIN) are considered suspect for the following sites and dates, due to negative NO3 values. NO3 is determined by subtraction of NO2 from NO23. The laboratory method detection limit (MDL) for NO23 is higher than the NO2 MDL, which sometimes results in negative NO3 values. DIN is calculated from the addition of NH4 and NO23. In cases where NO23 is considered suspect, the DIN value is also flagged as suspect.

Station Code	Date	Time	Monitoring Program	Rep
apaebnut	4/4/2005	11:10	1	1
apaebnut	4/4/2005	11:12	1	2
apaesnut	4/5/2005	7:00	2	1
apaesnut	4/5/2005	9:30	2	1
apaesnut	4/5/2005	12:00	2	1
apanhnut	5/2/2005	11:20	1	1
apanhnut	5/2/2005	11:22	1	2
apaesnut	8/9/2005	14:00	2	1
apaesnut	8/9/2005	19:00	2	1
apaesnut	8/9/2005	21:30	2	1
apaesnut	8/10/2005	5:00	2	1
apaesnut	8/10/2005	7:30	2	1
apaesnut	8/10/2005	10:00	2	1
apaebnut	9/7/2005	9:04	1	1
apaebnut	9/7/2005	9:06	1	2
apaesnut	9/7/2005	9:00	1	1
apaesnut	9/7/2005	9:02	1	2
apaesnut	9/7/2005	9:15	2	1
apaesnut	9/7/2005	11:45	2	1
apaesnut	9/7/2005	14:15	2	1
apaesnut	9/7/2005	16:45	2	1
apaesnut	9/7/2005	19:15	2	1
apaesnut	9/7/2005	21:45	2	1
apacpnut	9/8/2005	9:25	1	1
apacpnut	9/8/2005	9:28	1	2
apaesnut	9/8/2005	0:15	2	1
apaesnut	9/8/2005	2:45	2	1
apaesnut	9/8/2005	5:15	2	1
apaesnut	9/8/2005	7:45	2	1
apaesnut	9/8/2005	10:15	2	1
apaesnut	10/3/2005	8:38	1	2
apaesnut	10/3/2005	11:15	2	1
apaesnut	10/3/2005	13:45	2	1

apaesnut	10/3/2005	16:15	2	1
apaesnut	10/3/2005	18:45	2	1
apaesnut	10/3/2005	21:15	2	1
apaesnut	10/4/2005	2:15	2	1
apaesnut	10/4/2005	4:45	2	1
apaesnut	10/4/2005	7:15	2	1
apaesnut	10/4/2005	9:45	2	1

Nitrite (NO2F) and calculated nitrate (NO3F) are considered suspect for the following site and date due to laboratory recalculation of the NO2F value. The suspect NO2F value reported in this dataset is the original laboratory value reported to ANERR.

Station Code	Date	Time	Monitoring Program	Rep
apaesnut	2/7/2005	10:27	1	2

15) QA/QC Programs

a) Precision

i) **Field Variability** – ANERR staff collected field replicate samples from a successive grab sample. Replicate samples are collected from separate grabs at each sampling station. There were no field replicates collected during diel sampling.

ii) Laboratory Variability – Laboratory duplicate sampling was performed monthly in 2005.

iii) Inter-organizational splits – No inter-organizational splits were performed in 2005.

b) Accuracy

i) Sample Spikes – FSU Oceanography lab runs an independently prepared set of internal check samples every month. The check samples are prepared using primary nutrient standards.

ii) Standard Reference Material Analysis – FSU Oceanography lab successfully participated in the NOAA/NERRS Analytical Laboratory Intercomparison Study for 2005.

iii) Cross Calibration Exercises – None performed in 2005

16) Other Remarks

On 7/10/2025 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) Precipitation

Monitoring Program	3 days prior to sampling, and sampling date	East Bay Weather Station, Precipitation in mm	Comment
Monthly Grab	1/1/2005	0	
Monthly Grab	1/2/2005	0	
Monthly Grab	1/3/2005	0.3	
Monthly Grab	1/4/2005	0	
Diel	1/1/2005	0	
Diel	1/2/2005	0	
Diel	1/3/2005	0.3	
Diel	1/4/2005	0	
Monthly Grab	2/4/2005	0	
Monthly Grab	2/5/2005	0	
Monthly Grab	2/6/2005	0	
Monthly Grab	2/7/2005	0	
Diel	2/4/2005	0	
Diel	2/5/2005	0	
Diel	2/6/2005	0	
Diel	2/7/2005	0	
Monthly Grab	2/26/2005	0	
Monthly Grab	2/27/2005	76.2	
Monthly Grab	2/28/2005	0	
Monthly Grab	3/1/2005	0	
Diel	2/28/2005	0	
Diel	3/1/2005	0	
Diel	3/2/2005	6.4	
Diel	3/3/2005	0	
Monthly Grab	4/1/2005	0	
Monthly Grab	4/2/2005	0	
Monthly Grab	4/3/2005	0	
Monthly Grab	4/4/2005	0	
Diel	4/1/2005	0	
Diel	4/2/2005	0	
Diel	4/3/2005	0	
Diel	4/4/2005	0	
Monthly Grab	4/29/2005	58.7	
Monthly Grab	4/30/2005	2.5	

Monthly Grab	5/1/2005	0	
Monthly Grab	5/2/2005	0	
Diel	4/29/2005	58.7	
Diel	4/30/2005	2.5	
Diel	5/1/2005	0	
Diel	5/2/2005	0	
Monthly Grab	6/3/2005	0	
Monthly Grab	6/4/2005	0	
Monthly Grab	6/5/2005	0	
Monthly Grab	6/6/2005	0	
Diel	6/3/2005	0	
Diel	6/4/2005	0	
Diel	6/5/2005	0	
Diel	6/6/2005	0	
Monthly Grab	7/3/2005	8.9	
Monthly Grab	7/4/2005	0	
Monthly Grab	7/5/2005	1.5	
Monthly Grab	7/6/2005	0	
Diel	7/4/2005	0	
Diel	7/5/2005	1.5	
Diel	7/6/2005	0	
Diel	7/7/2005	0	
Monthly Grab	8/6/2005		No data available due to damage from Hurricane Dennis.
Monthly Grab	8/7/2005		
Monthly Grab	8/8/2005		
Monthly Grab	8/9/2005		
Diel	8/6/2005		
Diel	8/7/2005		
Diel	8/8/2005		
Diel	8/9/2005		
Monthly Grab	9/4/2005		No data available due to programming problems.
Monthly Grab	9/5/2005		
Monthly Grab	9/6/2005		
Monthly Grab	9/7/2005		
Diel	9/4/2005		
Diel	9/5/2005		
Diel	9/6/2005		
Diel	9/7/2005		
Monthly Grab	9/30/2005	0	
Monthly Grab	10/1/2005	0	
Monthly Grab	10/2/2005	0	
Monthly Grab	10/3/2005	6.1	
Diel	9/30/2005	0	
Diel	10/1/2005	0	
Diel	10/2/2005	0	
Diel	10/3/2005	6.1	
Monthly Grab	11/5/2005	1.3	
Monthly Grab	11/6/2005	0.3	
Monthly Grab	11/7/2005	0	
Monthly Grab	11/8/2005	0	
Diel	11/5/2005	1.3	

Diel	11/6/2005	0.3
Diel	11/7/2005	0
Diel	11/8/2005	0
Monthly Grab	11/26/2005	0
Monthly Grab	11/27/2005	13.5
Monthly Grab	11/28/2005	0
Monthly Grab	11/29/2005	0
Diel	11/26/2005	0
Diel	11/27/2005	13.5
Diel	11/28/2005	0
Diel	11/29/2005	0

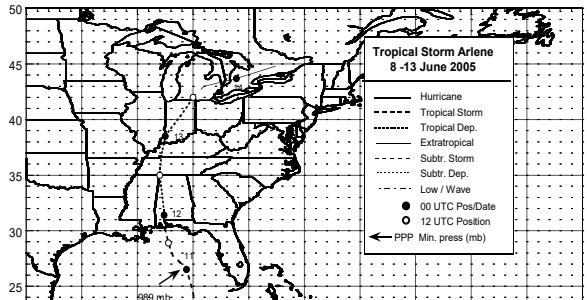
b) Named storm events

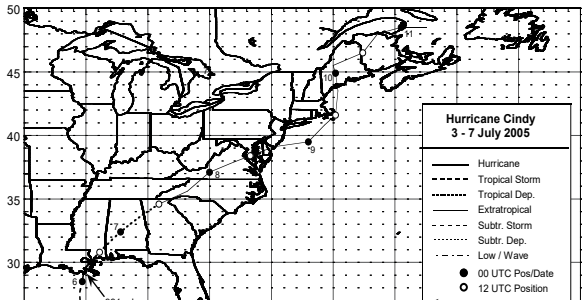
The following hurricanes and tropical storms impacted the Apalachicola Bay area in 2005. These images are from the National Weather Service website. http://www.nhc.noaa.gov/pastall.shtml

Tropical Storm Arlene impacted the Apalachicola Bay area on June 11th, 2005.
Arlene made landfall on June 11 at Pensacola FL.

Hurricane Cindy impacted the Apalachicola Bay area on July 6th and 7th, 2005.
Cindy made landfall on July 6 on southeastern Louisiana.

Hurricane Dennis impacted the Apalachicola Bay area on July 10, 2005.
Dennis made landfall on July 10 at Navarre Beach FL.





c) 2005 Data recalculations:

Data for the following months and parameter has been recalculated by the laboratory prior to final submission.

Monitoring Program 1 (Grab Samples)

Parameter code	Months for which this parameter was recalculated by laboratory
NO2F	January 2005
NO2F	February 2005
NO2F	March 2005

Note: During the QA-QC process performed by ANERR staff, it was determined that all laboratory recalculated NO2F values were identical to the original laboratory NO2F values, with the exception of one NO2F value, which is considered suspect and is detailed under section 14 of this report.

c) Laboratory Quality Assurance Report

Note: The following is the final report from 2004 that includes part of 2005. The laboratory contract calendar year begins in March and ends in February. The final report for March 2005 through February 2006 will be submitted when available.

Apalachicola NERRS SWMP Nutrient Analysis Project 2004-2005 Quality Assurance Report

FDEP PO No. S 3700 762557
FSU Budget No. 1368-889-37

Project Manager:
Lee Edmiston
DEP-Apalachicola National Estuarine Research Reserve
350 Carroll St.
Eastpoint, FL 32328
850-670-4783

Principal Investigators:
William M. Landing, Richard L. Iverson, and Joel E. Kostka
Department of Oceanography
Florida State University
Tallahassee, FL 32306-4320
850-644-6037

1. Analytical Detection Limits

Analytical detection limits were established by replicate analysis of a low sample or blank, and are reported as 3SD. The analytical detection limits for each analyte are reported in Figure 1.

2. Analytical Accuracy

Accuracy was determined by analysis of external nutrient QA/QC samples. In 2005, we participated in the NERRS-SWMP analytical laboratory intercomparison for nutrients in seawater. One "unknown" sample was provided, which we analyzed in duplicate for nitrate+nitrite, nitrite, and Soluble Reactive Phosphorus (SRP). The results are reported in Table 1. Our nitrite and nitrate+nitrite results are within 1SD of the mean values reported for the intercomparison project, while our ortho-P results are within 2SD of the mean. We will continue to participate in these intercalibration exercises when they are offered.

Table 1. Analytical accuracy determined in the 2005 NOAA/SWMP Analytical Laboratory Intercomparison

	Reported		Detected
Soluble Reactive Phosphorus (SRP; mg-P/L)	0.021 ±	0.003	0.015
Nitrate+Nitrite (mg-N/L)	0.171 ±	0.019	0.154
Nitrite (mg-N/L)	0.023 ±	0.002	0.022

Accuracy was also checked by analysis of "check samples" prepared independently from the staff members conducting the analyses. Sets of eight check samples covering a salinity range from 4.9 to 35, and with a series of "low" to "high" added nutrient concentrations were prepared from open-ocean low-nutrient surface seawater and primary nutrient standard solutions prepared from analytical-grade reagents. These check samples were then analyzed along with the regular monthly NERRS sample sets. Figure 1 shows the comparison between the "added" and "measured" concentrations of ammonia, SRP, nitrite, and nitrate+nitrite. Data falling on the 1:1 lines reflect "perfect" analytical agreement. Data fall above the 1:1 lines when the "measured" values are higher than the "added" values. Data fall below the 1:1 lines when the "measured" values are less than the "added" values. With the exception of NO3+2, the measured values were not significantly different from the "added" concentrations, considering the analytical detection limits for each analyte. The NO3+2 analysis was hampered by a failing component on our NOx analyzer. Overall, the analytical recovery for NO3+2 for October 2004 through February 2005 was 80±9%. We have not corrected the field data for this modestly low recovery. The instrument has been sent back for repair, and we are currently using a comparable instrument at FAMU for the NOx analyses, where the check standards agree much better with the expected concentrations. (NOTE: our NOx detector has been repaired, and we are once again making the NO2+3 measurements in our FSU lab. The analytical NOx recovery for May, June and July 2005 are back up to >98%). We will continue this procedure of analyzing check samples each month to keep track of the analytical accuracy.

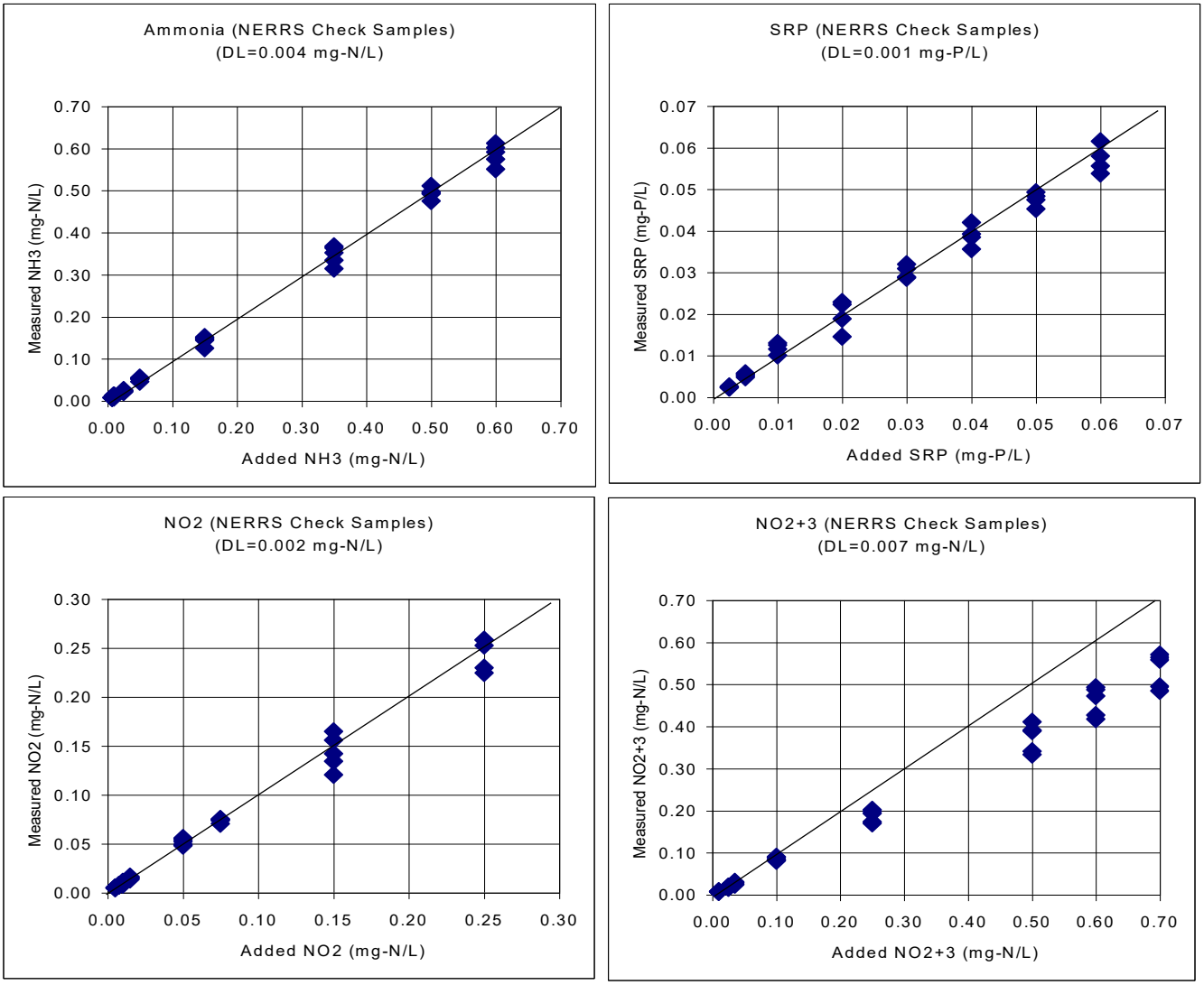


Figure 1. Analysis of "check" samples prepared from low-nutrient open-ocean surface seawater, and spiked from primary standard solutions prepared from analytical-grade reagents. Data from 2004-2005 contract year.

3. Replicate Precision

Duplicate samples were collected from each station during the second year to assess the sampling and analytical reproducibility. The results are shown in Figure 2, where the analysis of each duplicate pair is plotted on a 1:1 plot. Perfect sampling and analytical replication would result in values falling exactly on the 1:1 line. As the sample concentrations approach the analytical detection limit, one expects to see more divergence from the 1:1 line. While the replicate agreement is extremely good for most samples, we observed deviations among the replicate samples that exceeded our analytical precision. Additional sources of variance include: true environmental variance, sample bottle cleanliness (and field rinsing), and low-level contamination during filtration. The samples we have collected thus far do not permit an evaluation of these other sources of variance. The replicate precision of the Nitrite measurements shows several sample sets with poor replicate precision. As far as we can tell from the laboratory data, this is not due to analytical

variability; witness the Check Sample analysis in Fig. 1, showing excellent accuracy and recovery. The replicate chlorophyll measurements have precision comparable to what was observed in the first year of the project (2002), where replicate variability at high chlorophyll concentrations was attributed to natural phytoplankton patchiness.

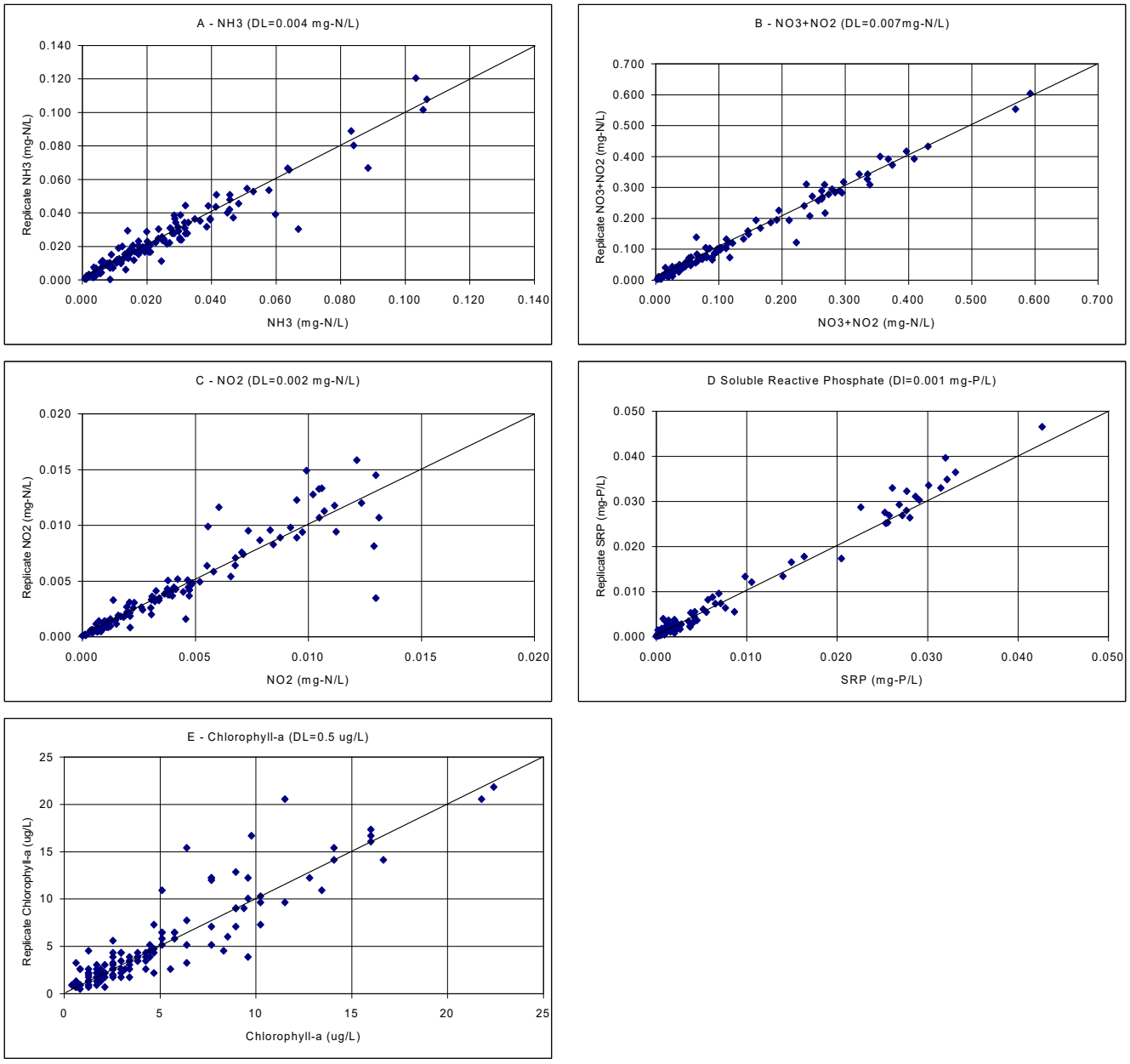


Figure 2. Analysis of duplicate samples collected during the 2004-2005 sampling period. The lines represent 1:1 agreement. Detection limits are reported for each analyte on a 3SD basis.