

NERR site nutrient metadata form with explanations
Weeks Bay (WKB) NERR Nutrient Metadata
January - December 2002
Latest Update: July 22, 2025

I. Data Set and Research Descriptors

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2) Research objectives:

a. Monthly Grab

Monthly grab samples are collected to quantify the spatial variability of important nutrients in the water column between sites representing freshwater and estuarine fractions of the local salinity gradient.

b. Diel Sampling Program

Once per month, samples are collected every sixty-five minutes through a tidal cycle to quantify the temporal variability of important nutrients and sediment loading in the water column as a function of tidal forcing.

3) Research methods:

a. Monthly Grab Sampling Program

Monthly grab samples were taken at four stations within the Weeks Bay estuary. Samples were taken at two WBNERR datasonde stations, site Weeks Bay (WB) and Fish River (FR). The two other stations are designated as Middle Bay (MB) and Magnolia River (MR). Attempts were made to collect grab samples within one hour prior to slack low tide. Discrepancies between actual tide conditions, as determined via in-situ datalogger data, to those predicted often resulted in collections being made outside of the intended tidal range. Tidal conditions noted in column AV of the nutrient database reflect actual tide conditions at time of sampling. No distinction was made between neap and spring tide conditions. Rainfall conditions *prior* to grab sampling were not considered. When possible, Grab samples were obtained in conjunction with the deployment of an ISCO 3700

portable sampler. (See 3b) Replicate (N=3) samples were collected using a FieldMaster™ sample collection device lowered to 0.5 meters from the bottom. At time of collection water temperature, salinity, pH, dissolved oxygen and turbidity were measured with an YSI 6600 datasonde. All samples were collected in opaque, 500 ml, Nalgene® sample bottles that were previously acid washed and then rinsed with distilled water. Samples were immediately placed on ice and stored in a dark cooler then returned to the laboratory. Once in the laboratory samples were processed for nutrient, solids and Chla analysis. (See 8b)

b. Diel Sampling Program

Diel sampling program began in November of 2003. Twenty-four individual samples are collected each month using an ISCO 3700 portable auto sampler. Sampler was programmed to make 1000 ml collections every 63 minutes throughout a complete tidal cycle. Beginning in 2003 sampler will be programmed to sample every sixty-five minutes ensuring sampling of complete tidal cycle. No distinction between neap and spring tide was considered. Samples are stored on ice in 1000ml semi-transparent ISCO containers within the body of the sampler. Sample containers were acid washed and rinsed with distilled water prior to sampler deployment. Sampler was programmed to flush collection line 3 times prior to sample uptake. As soon as possible after the final collection time the samples were returned to the laboratory for nutrient, solids and Chla analysis.

4) Site Location and Character

Weeks Bay (30 23' N, 87 50' W) is a small, shallow, microtidal sub-estuary, located on the eastern shore of Mobile Bay in the northern Gulf of Mexico. It is nearly diamond shaped, and its longitudinal axis (3.4 km long) runs nearly north-south from the head, where the Fish River flows in, to the mouth, where water is exchanged with Mobile Bay. Its widest point (3.1 km) is located near the center of the estuary, where the Magnolia River discharges into eastern side of Weeks Bay. Average depth is 1.4 m, although there are two areas where depths are significantly greater. The first is in the mouth of the bay, where the average depth is 6 m; the second is about 100 m upstream of the mouth of the Fish River, where the average depth is 3.5 m. Tides are principally diurnal, and have a mean range of 0.4 m.

The Fish River drainage basin encompasses 14300 hectares and contributes approximately 73% to the total incoming freshwater flow with the Magnolia River supplying the rest. Mean combined discharge is 9 cubic meters per second; although freshets up to 4 times larger occur throughout the year. These characteristics result in a freshwater residence time of 13 days under average discharge conditions, with a range from 0.5 to 100 days. Salinity in Weeks Bay varies substantially both temporally and spatially. During periods of high flow in the river, salinity in the bay may be fresh from the head to the mouth, except in the deeper holes of the estuary that are not as easily flushed. However, during periods of low flow in the river, wind velocity and tidal stage are strong factors influencing salinity structure. Salinity greater than 25 ppt is infrequently observed in Weeks Bay and is usually restricted to the southern portion of the estuary near the mouth.

Site FR (Fish River; 30 24.97'N, 87 49.37'W) is located near the mouth of Fish River at a mean depth of about 2m. Sediment type is sandy-silt, and there are small patches of *Vallisneria* sp. growing near (but not directly under) the Data logger. Land use in the water shed is agricultural, forested and residential with the residential portion rapidly increasing. Directly surrounding the site, land use is residential and forested. Nutrient concentrations at this site are variable and may be quite high, with nitrate and phosphate concentrations ranging from approximately 4-100 μM and <0.5 to 7.5 μM , respectively, over the previous 10 years (Alabama Department of Environmental Management, Geological Survey of Alabama). Over the past year, salinity ranged from 0 to 25 ppt at this site.

Site WB (Weeks Bay; 30 22.85' N, 87 49.92' W) is located near the southeast shore of Weeks Bay, about 0.5 kilometers from the mouth of the estuary. Mean water depth at this site is about 0.9 m; sediment type is sandy-silt. Land use around this site is almost exclusively residential, with agriculture occurring inland. Nutrient concentrations are much lower at this site than at site Fish River. Over the previous 10 years, nitrate and phosphate concentrations here ranged from approximately 0.1 to 50 μM and 0.04 to 0.45 μM , respectively. Salinity ranged from approximately 5 to 27 ppt over the past year.

Site MB (Middle Bay; 30 23.768 N, 87 50.010 W) is located near the middle of Weeks Bay, approximately 1.1 kilometers from the southeastern shoreline. Bottom sediments are a soft silty-clay with no sub-aquatic vegetation present.

Site MR (Magnolia River; 30 23.398 N, 87 49.059 W) is located near the mouth of the Magnolia River. Bottom sediments are silty-clay. The site is approximately twenty meters from the southern shoreline. A bottomland hardwood forest interspersed with patches of woody shrubs dominates the southern shoreline. Approximately forty meters north of the site is a needle rush dominated marsh which extends approximately 200 meters along the Magnolia River and along the north and east fringes of the bay.

Site WS (Weather Station, located approximately two hundred meters south of site FR) ISCO sampler deployed at the end of the pier located at Lulus Restaurant and Marina for security reasons.

5) Code variable definitions

a. Station codes (column 'C' of nutrient data report):

wkbwbnut = Weeks Bay NERR, site Weeks Bay nutrient data
wkbfrnut = Weeks Bay NERR, site Fish River nutrient data
wkbmrnut = Weeks Bay NERR, site Magnolia River nutrient data
wkbmbnut = Weeks Bay NERR, site Middle Bay nutrient data
wkbwsnut = Weeks Bay NERR, site Weather Station nutrient data

b. Monitoring program (column "D" of nutrient data report):

1 = Monthly grab sample 2 = Diel grab sample

c. Underscore "S" indicates the sample was taken at the surface. Ex. wkbfrnut_S= surface grab sample.

d. Nutrient parameter comment codes (denoted with a ‘c’ and found in columns immediately proceeding reported data variable. Refer to section 10 for parameter titles and variable names by data category.)

Comment Code	Definition
A	Value above upper limit of method detection
B	Value below method detection limit
C	Calculated value
D	Data deleted, laboratory determination not performed 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

d. Tide stages data code

Code	Description
1	Ebb tide (E)
2	Flood tide (F)
3	High tide (H)
4	Low tide (L)

e. Cloud cover data code

Code	Description
0	Clear (0-10%)
1	Scattered to partly cloudy (10-50%)
2	Partly to broken (50-90%)
3	Overcast (>90%)
4	Foggy
5	Hazy
6	Cloud (no percentage)

f. Precipitation data code

Code	Description
0	None
1	Drizzle
2	Light rain
3	Heavy rain
4	Squally
5	Frozen precipitation

6	Mixed rain and snow
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g. Wave height data code

Code	Description
0	0 to <0.1 meters
1	0.1 to 0.3 meters
2	0.3 to 0.6 meters
3	0.6 to <1.0 meters
4	1.0 to 1.3 meters
5	>1.3 meters

h. Wind direction data code

Code	Description
0	From the north
23	From the north northeast
45	From the northeast
68	From the east northeast
90	From the east
113	From the east southeast
135	From the southeast
158	From the south southeast
180	From the south
203	From the south southwest
225	From the southwest
248	From the west southwest
270	From the west
293	From the west northwest
315	From the northwest
338	From the north northwest

i. Wind speed data code

Code	Description
0	0 to 1 Knot
1	>1 to 10 knots
2	>10 to 20 knots
3	>20 to 30 knots
4	>30 to 40 knots
5	>40 knots

6) Data collection period

The first water samples were collected for the SWMP nutrient monitoring program on February 13th at 10:45 and the last were collected December 19th at 20:30. Individual

collection date and time for both the monthly grab program and diel program are reported in columns A and B of the nutrient database.

7) Associated researchers and projects

Jim Connors, PhD candidate, University of South Alabama. Wetlands Restoration Groundwater Nutrient Study.

Jane Caffrey, University of West Florida: “Modeling estuarine ecosystem trophic status using continuous nitrate and water quality data.”

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.

9) Entry verification

Samples were collected and analysis performed in accordance with Weeks Bay National Estuarine Research Reserve’s Standard Operating Procedures for Water Chemistry (appendix A). Analysis data was recorded in both a laboratory log book and electronically in spreadsheet form. This data was then transferred in general formatting into the comprehensive Excel form employed by the NERR system for yearly reporting purposes. Data was checked twice for transfer accuracy. After accuracy checks were completed the Central Data Management Office derived Nutrient Rounding Macro was used to round data values to the appropriate number of decimal places.

10) Parameter titles and variable names by data category

a. Laboratory parameters

<u>Data Category</u>	<u>Parameter</u>	<u>Variable</u>	<u>Unit of measurement</u>
Phosphorous	Total Dissolved Phosphorous	TDP	mg/L as P
	Orthophosphate, filtered	PO4F	mg/L as P
	Dissolved Organic Phosphate	DOP	mg/L as P
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
Plant pigments	Chlorophyll a	CHLA N	ug/L
	Phaeophytin	PHEA	ug/L
Solids	Total Suspended Solids	TSS	mg/L
	Total Volatile Solids	TVS	mg/L
	Total Fixed Solids	TFS	mg/L

b. Field parameters

<u>Parameter</u>	<u>Variable</u>	<u>Calculation method</u>	<u>Unit of measurement</u>
Dissolved Oxygen	DO N	YSI datasonde	mg/L
%DO Saturation	DO S N	YSI datasonde	%
pH	pH N	YSI datasonde	stan. units
Salinity	SALT N	YSI datasonde	ppt
Specific Conductivity	SCON N	YSI datasonde	mS/cm
Water Temperature	WTEM N	YSI datasonde	°C
Turbidity	TURB N	YSI datasonde	Nephelometric Turbidity Units
Total Water Depth	TDEP N	YSI datasonde	meters

11) Measured and Calculated Laboratory Parameters

a. Directly measured variables

Nitrogen species: NO23F, NO2F, NH4F

Phosphorus species: PO4F, TDP

Other: CHLA N, PHEA, TSS, TVS, TFS

b. Calculated variables

Nitrogen species: $\text{NO}_3\text{F} = \text{NO}_23\text{F} - \text{NO}_2\text{F}$, $\text{DIN} = \text{NO}_23\text{F} + \text{NH}_4\text{F}$

Phosphorus species: $\text{DOP} = \text{TDP} - \text{PO}_4\text{F}$

12) Limits of Detection – refer to appendix A, Weeks Bay NERR Laboratory Standard Operating Procedures.

13) Laboratory Methods - refer to appendix A, Weeks Bay NERR Laboratory Standard Operating Procedures.

14) Reporting of missing data and 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.

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15) QA/QC Programs

Refer to page 10 of appendix A, Weeks Bay NERR Standard Operating Procedures for Water Chemistry. Additional QA/QC include participation in the NERRS quality assessment program as well as procedures discussed in section 9 of this document.

16) Other remarks

On 07/22/2025 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> [SOB]	B	Value below method detection limit
no need to flag/code unless combined		C	Calculated value
<3> [GOD]	<3> [GOR]	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> [GOM]	M	Data missing, sample never collected or calculated value could not be determined due to missing data
<3> [SNV] and <1> [SCC] for components (CRS) or F_Record (CRS)		N	Negative calculated value
<0> (CUS)		P	Significant precipitation (reserve defined, see metadata for further details)
<1> (CSM)		U	Lab analysis from unpreserved sample
		S	Data suspect, see metadata for further details

a. Blanket statements

1. Nitrites consistently below method detection limits from February through September. Total dissolved phosphorous (TDP) determinations did not begin until May 2002 due to the lack of proper equipment and/or reagents. Orthophosphate (PO₄F) values are commonly below method detection limits (MDL). Based on experience it is assumed that in months where TDP was low (< .02 mg/l) orthophosphate (PO₄F) levels would be below method detection limits.
2. Weather and wave height parameters during diel and grab sampling were not collected for all of 2002 and thus are coded 'M'. It may be possible for interested researcher to correlate weather parameters with diel sampling by referencing the 2002 Weeks Bay NERR weather data available via Central Data Management Office. Water quality conditions for diel sampling program also not collected due to lack of means to collect such data. All pertinent data variables coded as 'M'.
3. The Weeks Bay NERR laboratory is currently undergoing expansion with the addition of a fume hood, water deionizer, and other equipment that will improve the staff's ability to handle and analyze water samples.

b. Expanded explanations of missing, suspect, and deleted data for 2002

January: Nutrient data collection inactive

February: NH₄F no reagents, as a result dissolved inorganic nitrogen totals were not calculated. TDP values not determined due to lack of proper equipment as a result DOP values could not be calculated.

March: No MR samples collected due to engine trouble on boat. Water quality data for site wkbfrnut not collected at time of grab sampling due to datasonde failure. Phenate method of NH₄F determination for the month is as described in the 16th edition of Standard Methods for the Examination of Water and Wastewater, all others as described in the 20th edition. TDP values not determined due to lack of proper equipment as a result DOP values could not be calculated.

April: Chla/Phea samples tampered with resulting in inadequate preservation of samples. TDP values not determined due to lack of proper equipment as a result DOP values could not be calculated.

May: NH₄F water standards impure, data deleted from record. As a result DIN values could not be calculated. Some CHLA and PHEA values during this month were removed and considered erroneous analytical data, cause is unknown.

June: Phosphorous determinations for sample wkbmbnut rep 1 appear high, suspect contamination of sample or glassware.

July: PO₄F of wkbfrnut, reps 1 & 2 comment coded -9999 because PO₄F concentrations read as higher than TDP concentrations. All TDP data believed to be accurate.

August: Chla/Phea data deleted, possible contamination in acid reagent. Sample absorbance readings of spectrophotometric wavelengths accurate until sample acidification.

September: NH₄F determinations not completed due to lab construction, as a result dissolved inorganic nitrogen totals were not calculated. Collection times were never recorded, reason unknown.

October: NH₄F determinations not completed due to lab construction, as a result dissolved inorganic nitrogen totals were not calculated. NO₃F determination values for sample wkbwnut rep 1 missing due to spilled sample. Chla and Phea sample for wkbmrnut, rep 3 was deleted due to erroneous negative value.

November: NH₄F determinations not completed due to lab construction, as a result dissolved inorganic nitrogen totals were not calculated. CHLA and PHEA data for MR site rep. 3 were erroneous and were deleted because the analytical determinations yielded negative values.

December: NH₄F determinations not completed due to lab construction, as a result dissolved inorganic nitrogen totals were not calculated.