

NERR site nutrient metadata form with explanations
Weeks Bay (WKB) NERR Nutrient Metadata
January - December 2003
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). Datasondes were deployed at these stations beginning May 05 of 2003. 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

Twenty-four individual samples are collected each month using an ISCO 3700 portable auto sampler. Sampler was programmed to make 1000 ml collections every 65 minutes throughout a complete tidal cycle. No distinction between neap and spring tide was considered. Samples are stored on ice in 1000 ml 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. 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 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)

6) Data collection period

The first water samples collected for 2003 SWMP nutrient monitoring program occurred on January 22 at 11:00 and the last was collected on December 22nd at 20:55. Individual collection dates and times 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.

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	µg/L
	Phaeophytin	PHEA	µg/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	Nephelometer 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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K	Check metadata for further details
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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> [SCB]	B	Value below method detection limit
<i>no need to flag/code unless combined</i>		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> [SQQ] for components (ORE) or F_Record (ORE)		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 commonly below method detection limits from January through December. When nitrites (NO₂) were below detection limits, nitrate (NO₃) was reported as equivalent to NO₂. Orthophosphate (PO₄F) values are commonly below method detection limits (MDL). Based on experience it is assumed that in months where TDP was low (< 0.02 mg/L) orthophosphate (PO₄F) levels would be below method detection limits.
2. Weather and wave height parameters during diel sampling were not collected for all of 2003 and thus are coded 'M'. It may be possible for interested researchers to correlate weather parameters with diel sampling times by referencing the 2003 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'.

b. Expanded explanations of missing, suspect, and deleted data for 2003

January: TSS, TVS, and TFS data for diel samples two and three deleted due to negative values. Chla and Phea samples from diel monitoring program inadvertently acidified and/or contaminated, data deleted. NH₄F determinations not completed due to continuing lab construction and lack of equipment, as a result dissolved inorganic nitrogen totals were not calculated.

February: NH₄F determinations not completed due to continuing lab construction and lack of equipment, as a result dissolved inorganic nitrogen totals were not calculated and are missing. TSS, TVS and TFS data for diel sample (wkbwsnut) number 4 deleted/not reported due to contaminated filter.

March: NH₄F determinations not completed due to continuing lab construction and lack of equipment, as a result dissolved inorganic nitrogen totals were not calculated. Diel samples three through twenty-four not collected due to battery failure of ISCO sampler. TVS and TFS data for diel sample (wkbwsnut) number 1 deleted due to reported negative values.

April: Grab sample times not recorded, technician error. As a result tide conditions could not be determined. TDP data for sample wkbwbnut rep 1 deleted due to mishandling of sample during analysis. As a result DOP value could not be calculated. PO4F determinations for samples wkbwsnut numbers 7 and 15 negative, data deleted.

May: NH4F determinations not completed, as a result dissolved inorganic nitrogen totals were not calculated. TVS and TFS data for diel sample (wkbwsnut) number 6 deleted due to negative reported values. TSS, TVS, and TFS data for diel sample (wkbwsnut) number 23 deleted due to lost filter.

June: TDP and PO4F data for samples wkbwbnut rep 3, diel (wkbwsnut) numbers 3, 11 and 20 deleted from record due to suspected contamination. DOP values for these samples could not be calculated.

July: Chla data for diel sample numbers 8 and 14 not reported/deleted, suspect contamination. TVS and TFS data for diel sample number 21 deleted due to reported negative values.

August: NH4F determinations not completed for all samples due to excess holding time, as a result DIN values could not be determined.

TDP value for diel sample number 6 deleted due to technician error in sample handling. TVS and TFS values for wkbmrnut rep 1 sample deleted due to erroneous negative reported values.

DO values for grab sampling at site wkbmbnut not reported due to temporary probe malfunction. DO values for remaining sites are suspect.

September:

October: TDP values for wkbmbnut reps 2 and 3 deleted due to erroneous negative values reported, as a result DOP values could not be calculated for these samples.

November: NO23F values for sample wkbmrnut rep 1 deleted due to suspected contamination of glassware, as a result NO3 and DIN could not be calculated.

December: Depth data for this month represents depth at which grab samples were collected, not total depth of water at the site. Total depth was not recorded. TSS, TVS and TFS data was deleted for sample wkbmrnut, rep 3 due to reported negative values.