

# Physical environmental data from Little Lagoon, Alabama collected from 2012-2013.

Website: <https://www.bco-dmo.org/dataset/723993>

Data Type: Other Field Results

Version: 1

Version Date: 2018-01-16

## Project

» [Groundwater Discharge, Benthic Coupling and Microalgal Community Structure in a Shallow Coastal Lagoon](#) (LittleLagoonGroundwater)

Contributors	Affiliation	Role
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## Abstract

Physical environmental data from Little Lagoon, Alabama collected from 2012-2013.

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## Coverage

**Spatial Extent:** Lat:30.241929 Lon:-87.773756

**Temporal Extent:** 2012-02 - 2013-02

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## Dataset Description

Physical environmental data from Little Lagoon, Alabama.

## Acquisition Description

Little Lagoon is a shallow coastal lagoon that is tidally connected to the Gulf of Mexico but has no riverine inputs. The water in the lagoon is replenished solely from precipitation and groundwater inputs primarily on the East end (Su et al. 2012). Because of the rapid development in Baldwin County, a large amount of NO<sub>3</sub><sup>-</sup> enters the Little Lagoon system through SGD (Murgulet & Tick 2008). In this region, there can be rapid changes in the depth to groundwater (Fig. 4.1 inset) and episodic SGD inputs to the lagoon (Su et al. 2013). Within the lagoon, three sites were selected (East, Mouth, and West) to represent the gradient that exists across the lagoon from the input of groundwater. Sites were sampled on a near-monthly basis from February 2012 to February 2013.

### **Abiotic Parameters**

At each site, point measurements of temperature, salinity, pH, and dissolved oxygen (DO) were recorded with a YSI 556 Multiparameter Meter. Triplicate sediment porewater samples were collected with a modified coring device (2.7 cm ID), sectioned at 10 mm intervals to 60 mm, and extracted in 10 mL of 1 M NaCl (Smith & Caffrey 2009) prior to filtering and freezing. The filtered (GF/F, 0.7 micron) supernatant was analyzed for DIN (NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup>) and phosphate (PO<sub>4</sub><sup>3-</sup>), and represents total extractable porewater nutrients. Standard wet chemical techniques modified for the Skalar SAN+ Autoanalyzer (Pennock & Cowan 2001) were performed for all nutrient concentration analysis. Water column and sediment chlorophyll- $\alpha$  content were determined fluorometrically (Welschmeyer 1994) after cold extraction in 90% acetone from filters and in triplicate, respectively.

### **Additional methodology can be found in:**

Bernard, Rebecca & Mortazavi, Behzad & A. Kleinhuizen, Alice. (2015). Dissimilatory nitrate reduction to ammonium (DNRA) seasonally dominates NO<sub>3</sub><sup>-</sup> reduction pathways in an anthropogenically impacted sub-tropical coastal lagoon. *Biogeochemistry*. 125. 47-64. [10.1007/s10533-015-0111-6](https://doi.org/10.1007/s10533-015-0111-6).

### **Processing Description**

Data were flagged as below detection limits if no measurable rates were returned after calculations. See equations in methodology section of:

Bernard, Rebecca & Mortazavi, Behzad & A. Kleinhuizen, Alice. (2015). Dissimilatory nitrate reduction to ammonium (DNRA) seasonally dominates NO<sub>3</sub><sup>-</sup> reduction pathways in an anthropogenically impacted sub-tropical coastal lagoon. *Biogeochemistry*. 125. 47-64. [10.1007/s10533-015-0111-6](https://doi.org/10.1007/s10533-015-0111-6).

## **Statistical Analysis**

To test the seasonal flux variability between sites in Little Lagoon, two-way ANOVAs with site and date as independent variables were performed. When data could not be transformed to meet ANOVA assumptions, Wilcoxon/Kruskal-Wallis nonparametric tests were used. When significant differences occurred, Tukey HSD or Steel-Dwass post hoc tests were used to determine significant interactions. A Principal component analysis (PCA) was conducted on all biogeochemical parameters to identify underlying multivariate components that may be influencing N fluxes. Spearman's rho correlation analysis was used to examine the relationship between the principal components and fluxes. Statistical significance of the data set was determined at  $\alpha=0.05$  and error is reported as standard error. All statistical analyses were performed in SAS JMP 10 (SAS Institute Inc.).

## **BCO-DMO Data Processing Notes:**

- Data reorganized into one table under one set of column names from both original files
- Units removed from column names
- Column names reformatted to meet BCO-DMO standards
- Created column Year to describe to capture the metadata in the file name

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## **Related Publications**

Bernard, R. J., Mortazavi, B., & Kleinhuizen, A. A. (2015). Dissimilatory nitrate reduction to ammonium (DNRA) seasonally dominates NO<sub>3</sub> – reduction pathways in an anthropogenically impacted sub-tropical coastal lagoon. *Biogeochemistry*, 125(1), 47–64. doi:[10.1007/s10533-015-0111-6](https://doi.org/10.1007/s10533-015-0111-6)

Murgulet, D., & Tick, G. R. (2008). Assessing the extent and sources of nitrate contamination in the aquifer system of southern Baldwin County, Alabama. *Environmental Geology*, 58(5), 1051–1065. doi:[10.1007/s00254-008-1585-5](https://doi.org/10.1007/s00254-008-1585-5)

Su, N., Burnett, W.C., Eller, K.T., MacIntyre, H.L., Mortazavi, B., Leifer, J., Novoveska, L. (2012). Radon and radium isotopes, groundwater discharge and harmful algal blooms in Little Lagoon, Alabama. *Interdisciplinary Studies on Environmental Chemistry*, 6, 329–337.

Su, N., Burnett, W.C., MacIntyre, H.L., Liefer, J.D., Peterson, R.N., Viso, R. (2013). Natural radon and radium isotopes for assessing groundwater discharge into Little Lagoon, AL: implications for harmful algal blooms. *Estuaries Coasts*, 1–18

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## Parameters

Parameter	Description	Units
Year	Year ID that samples were taken	unitless
Date	Month and day that samples were taken; MMM-DD	unitless
avg_sediment_chla	Average sediment chlorophyll-a content from all sites	milligrams per m <sup>2</sup>
avg_sediment_chla_SE	Standard error of average sediment chlorophyll-a content	milligrams per m <sup>2</sup>
avg_waterColumn_chla	Average water column chlorophyll-a content from all sites	ug L <sup>-1</sup>
avg_waterColumn_chla_SE	Standard error of average water column chlorophyll-a content	ug L <sup>-1</sup>
avg_temperature	Average temperature across sites	Celsius
avg_temperature_SE	Standard error of average temperatures across sites	Celsius
avg_salinity	Average salinity across sites	PSU

avg_salinity_SE	Standard error of average salinity across sites	PSU
avg_waterColumn_Nox	Average water column values for nitrate plus nitrite	micromoles
avg_waterColumn_Nox_SE	Standard error of average water column values for nitrate plus nitrite	micromoles
avg_waterColumn_NH4	Average water column values for ammonium	micromoles
avg_waterColumn_NH4_SE	Standard error of average water column values for ammonium	micromoles
avg_waterColumn_PO4	Average water column values for PO4 3-	micromoles
avg_waterColumn_PO4_SE	Standard error of average water column values for PO4 3-	micromoles
Mouth_Temperature	Temperature sampled at the site Mouth; location of site is 30.243683, -87.738407	Celsius
East_Temperature	Temperature sampled at the site East; location of site is 30.253347, -87.724729	Celsius
West_Temperature	Temperature sampled at the site West; location of site is 30.247181, -87.767856	Celsius
Mouth_Salinity	Salinity at the site Mouth; location of site is 30.243683, -87.738407	PSU
East_Salinity	Salinity at the site East; location of site is 30.253347, -87.724729	PSU
West_Salinity	Salinity at the site West; location of site is 30.247181, -87.767856	PSU
Mouth_sediment_chla	Sediment chlorophyll-a content from the site Mouth; location of site is 30.243683, -87.738407	milligrams per m-2
Mouth_sediment_chla_SE	Standard error of sediment chlorophyll-a content.	milligrams per m-3
East_sediment_chla	Sediment chlorophyll-a content from the site East location of site is 30.253347, -87.724729	milligrams per m-2
East_sediment_chla_SE	Standard error of sediment chlorophyll-a content.	milligrams per m-3

West_sediment_chla	Sediment chlorophyll-a content from the site West location of site is 30.247181, -87.767856	milligrams per m-2
West_sediment_chla_SE	Standard error of sediment chlorophyll-a content.	milligrams per m-3
Mouth_waterColumn_NH4	NH4+ concentration in the water column of site Mouth; location of site is 30.243683, - 87.738407	micromoles
Mouth_waterColumn_NH4_SE	Standard error of NH4+ concentration in the water column.	micromoles
East_waterColumn_NH4	NH4- concentration in the water column of site East; location of site is 30.253347, -87.724729	micromoles
East_waterColumn_NH4_SE	Standard error of NH4+ concentration in the water column.	micromoles
West_waterColumn_NH4	NH4+ concentration in the water column of site West; location of site is 30.247181, - 87.767856	micromoles
West_waterColumn_NH4_SE	Standard error of NH4+ concentration in the water column.	micromoles
Mouth_waterColumn_NO3	NO3- concentration in the water column of site Mouth; location of site is 30.243683, - 87.738407	micromoles
Mouth_waterColumn_NO3_SE	Standard error of NO3- concentration in the water column.	micromoles
East_waterColumn_NO3	NO3- concentration in the water column of site East; location of site is 30.253347, -87.724729	micromoles
East_waterColumn_NO3_SE	Standard error of NO3- concentration in the water column.	micromoles
West_waterColumn_NO3	NO3- concentration in the water column of site West; location of site is 30.247181, - 87.767856	micromoles
West_waterColumn_NO3_SE	Standard error of NO3- concentration in the water column.	micromoles

Mouth_waterColumn_PO4	PO4 3- concentration in the water column of site Mouth; location of site is 30.243683, - 87.738407	micromoles
Mouth_waterColumn_PO4_SE	Standard error of PO4 3- concentration in the water column.	micromoles
East_waterColumn_PO4	PO4 3- concentration in the water column of site East; location of site is 30.253347, - 87.724729	micromoles
East_waterColumn_PO4_SE	Standard error of PO4 3- concentration in the water column.	micromoles
West_waterColumn_PO4	PO4 3- concentration in the water column of site West; location of site is 30.247181, - 87.767856	micromoles
West_waterColumn_PO4_SE	Standard error of PO4 3- concentration in the water column.	micromoles

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## Instruments

<b>Dataset-specific Instrument Name</b>	pH sensor
<b>Generic Instrument Name</b>	pH Sensor
<b>Dataset-specific Description</b>	Used to determine pH
<b>Generic Instrument Description</b>	General term for an instrument that measures the pH or how acidic or basic a solution is.

<b>Dataset-specific Instrument Name</b>	YSI 556 Multiparameter Meter
<b>Generic Instrument Name</b>	Dissolved Oxygen Sensor
<b>Dataset-specific Description</b>	Used to determine DO
<b>Generic Instrument Description</b>	An electronic device that measures the proportion of oxygen (O <sub>2</sub> ) in the gas or liquid being analyzed

<b>Dataset-specific Instrument Name</b>	Salinity Sensor
<b>Generic Instrument Name</b>	Salinity Sensor
<b>Dataset-specific Description</b>	Used to sample salinity
<b>Generic Instrument Description</b>	Category of instrument that simultaneously measures electrical conductivity and temperature in the water column to provide temperature and salinity data.

<b>Dataset-specific Instrument Name</b>	Thermometer
<b>Generic Instrument Name</b>	digital thermometer
<b>Dataset-specific Description</b>	Used to collect temperature
<b>Generic Instrument Description</b>	An instrument that measures temperature digitally.

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## Deployments

## LittleLagoon

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/528089">https://www.bco-dmo.org/deployment/528089</a>
<b>Platform</b>	SmallBoat_FSU
<b>Start Date</b>	2010-04-05
<b>End Date</b>	2013-08-17
<b>Description</b>	The sampling sites were all accessed from small boats, here amalgamated to one deployment called LittleLagoon.

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## Project Information

### Groundwater Discharge, Benthic Coupling and Microalgal Community Structure in a Shallow Coastal Lagoon (LittleLagoonGroundwater)

**Coverage:** southern Alabama, east of Mobile

This project investigated the link between submarine groundwater discharge (SGD) and microalgal dynamics in Little Lagoon, Alabama. In contrast to most near-shore environments, it is fully accessible; has no riverine inputs; and is large enough to display ecological diversity (c. 14x 0.75 km) yet small enough to be comprehensively sampled on appropriate temporal and spatial scales. The PIs have previously demonstrated that the lagoon is a hot-spot for toxic blooms of the diatom *Pseudo-nitzschia* spp. that are correlated with discharge from the surficial aquifer. This project assessed variability in SGD, the dependence of benthic nutrient fluxes on microphytobenthos (MPB) abundance and productivity, and the response of the phytoplankton to nutrient enrichment and dilution. The work integrated multiple temporal and spatial scales and demonstrated both the relative importance of SGD vs. benthic recycling as a source of nutrients, and the role of SGD in structuring the microalgal community. (paraphrased from Award abstract)

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## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-0962008</a>

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