Bulk soil and elemental properties of marsh and infilled pond soils collected in 2014-2015 within Plum Island Ecosystems LTER

Website: https://www.bco-dmo.org/dataset/827298
Data Type: Other Field Results
Version: 1
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Project
» Eutrophication Effects on Sediment Metabolism and Benthic Algal-bacterial Coupling: An Application of Novel Techniques in a LTER Estuary (Benthic_PP_at_TIDE)

Contributors	Affiliation	Role
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Abstract
Bulk soil and elemental properties of marsh and infilled pond soils within Plum Island Ecosystems - LTER. Data were collected 2014-2015.

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Coverage

Spatial Extent: **N**:42.741354 **E**:-70.8300014 **S**:42.7373999 **W**:-70.8472003
Temporal Extent: 2014-07 - 2015-12

Dataset Description

Bulk soil and elemental properties of marsh and infilled pond soils within Plum Island Ecosystems - LTER. Bulk soil properties of the soils are complemented with Fourier Transform Infrared Spectroscopy and ramped pyrolysis oxidation measurements of the soils. Data were collected during 2014-2015.

Acquisition Description

Soil cores were collected from three sites within the Plum Island Ecosystems - Long Term Ecological Research (PIE-LTER) domain (MA, USA; 42.74° N, -70.85° W). A core liner was fitted with a gasketed piston and placed on the sediment surface and pushed down into the marsh subsurface, ensuring that the

soil column did not compact during collection.

The sites had similar elevations (1.41 - 1.51 m North American Vertical Datum of 1988 [NAVD88]) and salt marsh grass communities, dominated by *Spartina patens, S. alterniflora*, and *Distichlis spicata*. Permanently inundated ponds within each site had comparable depths (0.24 - 0.30 m) but varied in size (643 - 7,149 m²) and age (40 - 53 years) (Spivak et al., 2017; Spivak et al., 2018).

Soil cores were split lengthwise and sectioned into 1, 2, or 5 cm sections, with higher resolution in the top 30 cm. Soil water content (%) and bulk density (g/cm³) were determined gravimetrically after drying to constant mass (60°C). Samples were sieved (1 mm) to remove root material and homogenized with a Retsch Mixer Mill 200. Soil samples were fumed with hydrochloric acid (Hedges and Stern, 1984) prior to elemental (total organic carbon [TOC]) and isotopic (δ13C) analyses at the Stable Isotope Laboratory in the Marine Biological Laboratory (Woods Hole, MA).

Processing Description

BCO-DMO Processing:
- replaced NaN and NA with nd as the missing data identifier;
- changed date format to YYYY-MM;
- renamed fields to conform with BCO-DMO naming conventions (no spaces or special characters).

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Related Publications

Spivak, A. C., Gosselin, K. M., & Sylva, S. P. (2018). Shallow ponds are biogeochemically distinct habitats in salt marsh ecosystems. Limnology and Oceanography. doi:10.1002/lno.10797
Methods

Spivak, A. C., Gosselin, K., Howard, E., Mariotti, G., Forbrich, I., Stanley, R., & Sylva, S. P. (2017). Shallow ponds are heterogeneous habitats within a temperate salt marsh ecosystem. Journal of Geophysical Research: Biogeosciences, 122(6), 1371–1384. doi:10.1002/2017jg003780
https://doi.org/10.1002/2017JG003780
Methods

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Parameters

Parameter	Description	Units
Site_ID	Site number (1, 2, or 3); three high marsh sites were cored in PIE-LTER	unitless
Location	Location within each site (HIGH MARSH or POND); at each of the three sites, two high marsh cores and one inundated pond core were collected	unitless
Core_ID	Core identifier (1 or 2); the two marsh cores were labeled 1 and 2	unitless
Date	Month and year of sample collection; format: YYYY-MM	unitless
Lat	Latitude of sampling site	degrees North
Lon	Longitude of sampling site	degrees East
Depth_min	Depth minimum of sample horizon relative to surface of the marsh	centimeters (cm)
Depth_max	Depth maximum of sample horizon relative to surface of the marsh	centimeters (cm)
Elevation	Elevation of the soil horizon; North American Vertical Datum of 1988	meters (m)
Water_Content	Water content of soil by mass percent	unitless (percent)
Dry_Bulk_Density	Dry bulk density of soil by weight and volume of the soil horizon	grams per cubic meter (g cm-3)
Porosity	Porosity of soil	unitless
TN	Percent Total Nitrogen	unitless (percent)
TOC	Percent Total Organic Carbon	unitless (percent)
C_N	Ratio of total organic carbon to total nitrogen	unitless
Carbon_Density	Total organic carbon accounting for dry bulk density of soil	kilograms per cubic meter (kg m-3)
d13C	The stable isotopic carbon composition	per mil

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Instruments

Dataset-specific Instrument Name	Dual-Inlet and Continuous Flow Isotope Ratio Mass Spectrometer
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Dual-Inlet and Continuous Flow Isotope Ratio Mass Spectrometer for elemental and stable isotopic analysis.
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

Dataset-specific Instrument Name	Retsch Mixer Mill 200
Generic Instrument Name	Homogenizer
Dataset-specific Description	Retsch Mixer Mill 200 was used for homogenization.
Generic Instrument Description	A homogenizer is a piece of laboratory equipment used for the homogenization of various types of material, such as tissue, plant, food, soil, and many others.

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Project Information

Eutrophication Effects on Sediment Metabolism and Benthic Algal-bacterial Coupling: An Application of Novel Techniques in a LTER Estuary (Benthic_PP_at_TIDE)

Coverage: Plum Island Estuary, Rowley Massachusetts

Extracted from the NSF award abstract: This project will address how rates of benthic microalgal production respond to eutrophication and geomorphological changes in human-impacted tidal creeks. Excess nutrient loading increases benthic algal biomass and likely stimulates production rates but the magnitude of nutrient and geomorphological effects on rates of production is unknown. Will changes in benthic algal productivity affect algal-bacterial coupling? Furthermore, how is algal-bacterial coupling affected by geomorphological changes, which may be exacerbated by excess nutrient loading but can also occur in pristine marshes? This project will take advantage of the infrastructure of the TIDE project, a long-term saltmarsh eutrophication experiment at the Plum Island Ecosystem - Long Term Ecological Research site in Northeastern Massachusetts. Specifically, the PIs will measure benthic metabolism and examine algal- bacterial coupling in fertilized and ambient nutrient tidal creeks in the first field season. The following field season, they will compare sediment metabolism and carbon dynamics on slumped tidal creek walls (i.e. areas where low marsh has collapsed into the tidal creek) to that on the bottom of tidal creeks. In both years, gross and net production will be determined using an innovative triple oxygen isotope technique and traditional dissolved oxygen and inorganic carbon flux measurements. Comparisons between these methods will be useful in informing studies of sediment metabolism. Lipid biomarkers will be used to characterize the sources of organic matter to creek sediments, and stable isotope analysis of bacterial specific biomarkers to identify the sources of organic carbon utilized by sediment bacteria. The biomarkers will reveal whether sediment bacteria use organic matter substrates, such as benthic

microalgal carbon, selectively or in proportion to availability. Overall, results from the proposed study will provide important information about how sediment carbon dynamics in shallow tidal creeks respond to long term eutrophication. Furthermore, findings will enhance understanding of the role of tidal creeks in coastal biogeochemistry.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1233678

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