Datasets: Biogeochemical characteristics of salt marsh soils/sediments with contrasting exposure to prescribed burns or biochar amendments

This document provides detailed information about two datasets that were generated through a Collaborative Research project titled "*Do Prescribed Burns of Phragmites Australis Increase Denitrification and Carbon Sequestration?*" This webpage provides information about the project. The project was supported by the National Estuarine Research Reserve System (NERRS) Science Collaborative, which is funded by the National Oceanic and Atmospheric Administration. All Science Collaborative supported projects that collect new data adhere to federal data sharing and archiving requirements.

About the Associated Project

Project page: http://nerrssciencecollaborative.org/project/Wozniak21
Grant Type: Collaborative Research
Focus Area(s): Ecosystem Service Valuation, Habitat Restoration
Keyword(s): invasive species, salt marsh, blue carbon, water quality

Reserve(s): Delaware

Project Duration: October 2021 - March 2025
Grant Amount: $598,966.00
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Project Description

Phragmites australis is an invasive grass species that affects many marshes along the U.S east coast, often displacing native grasses. Removing *Phragmites* has been a decades-long management goal as managers seek to restore native high marsh habitat and ecosystem functions and services. *Phragmites* removal and restoration efforts have proven beneficial for habitat and biodiversity. However, its removal has potentially negative impacts on water quality and carbon storage, as *Phragmites* stores nitrogen and phosphorus and accumulates organic carbon more effectively than native marsh vegetation. Tidal wetland managers are left with uncertainties about these tradeoffs of *Phragmites* removal and their implications for achieving marsh restoration goals. A potential approach for managing tradeoffs associated with *Phragmites* removal is to use prescribed fire. While prescribed fire is a common method for vegetation

removal, there has been limited research on the biogeochemical benefits provided by burned biomass or “biochar”. Biochar may increase soil nitrogen removal and carbon and phosphorus storage, which can help to counteract losses in ecosystem services due to *Phragmites* removal.

Collaborating with regional coastal managers, this project team compared salt marshes with and without a history of prescribed burns at Delaware National Estuarine Research Reserve and area marshes to better quantify how fire impacts marshes and their ecosystem services. The team collected and analyzed salt marsh sediment cores at multiple sites and found that the marshes that were more frequently burned had enhanced carbon storage. They also used biochar amendments to learn more about other biogeochemical metrics, like denitrification potential and phosphorus storage, and found that biochar’s impact on these metrics were limited.

The project convened an Advisory Committee that held productive discussions on current and potential *Phragmites* management practices, prescribed burn practices, and climate-adaptive decision-making procedures, in the context of the project’s findings. These conversations helped inform a comprehensive report on the impacts of prescribed burns on tidal marsh ecosystem services. This report will allow for easier transfer of knowledge among the project’s partners, including Delaware NERR, Delaware Natural Resources and Environmental Control, U.S. Fish and Wildlife Service, Center for the Inland Bays, Partnership for the Delaware Estuary, and Delaware Wild Lands.

Overview of Datasets

Two datasets are described in this document:

- **Dataset 1: Carbon, nitrogen, and phosphorus field data**
  Carbon, nitrogen, phosphorus, and ancillary data measured within salt marsh core sections collected from salt marshes with varying prescribed burn histories.

  Data access and archival: data has been archived with Open Science Framework and can be downloaded at https://osf.io/kq3hw/

- **Dataset 2: Thin layer placement experimental data**
  Denitrification potential, phosphorus measurements and ancillary data measured for salt marsh core sections collected from a field biochar amendment experiment in native and non-native grass stands.

  Data access and archival: data has been archived with Open Science Framework and can be downloaded at https://osf.io/kq3hw/

Questions about these datasets can be directed to:
Andrew Wozniak, University of Delaware, awozniak@udel.edu

About the Project Datasets

Detailed dataset descriptions are provided below.

Dataset 1: Carbon, nitrogen, and phosphorus field data

Data overview

Carbon, nitrogen, phosphorus, and ancillary data were collected at three salt marshes with no, intermediate, and recent burn histories. Variables measured include total organic carbon, black carbon by the CTO-375 and BPCA methods, loss on ignition, total nitrogen, elevation, total inorganic and organic phosphorus, organic and inorganic phosphorus mobility pools separated by sequential extraction, time since high and spring tides, vegetation species. Data collection methods are detailed further in the metadata file associated with the dataset.

Keywords:

Salt marshes, prescribed burn, carbon, nitrogen, phosphorus

Data collection period:

January 2022 - November 2023

Geographic extent:

- 75W 25’5” - 75W 26’3” and 39N 4’5” - 39N 5’2”; Dover, DE
- 75W 35’2” - 75W 36’3” and 39N 25’1” - 39N 26’10”; Towsend, DE

File format:

.XLSX file

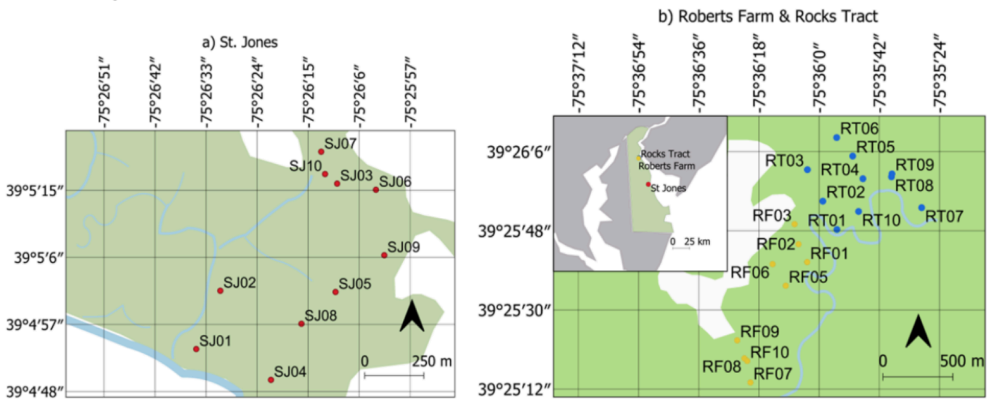
File name(s):

“Field Collection Data 9-24.xlsx”

Data access and archival:

Data has been archived with Open Science Framework and can be downloaded at https://osf.io/kq3hw/

Maps and schematics for data collection:



Dataset 2: Thin layer placement experimental data

Data overview
Denitrification potential, phosphorus measurements and ancillary data collected from a field biochar amendment experiment in native and non-native grass stands. Variables include denitrification potential, extractable nitrogen (ammonium, nitrate+nitrite), sediment % nitrogen and carbon, black carbon by the BPCA method, nirS and nirK gene copies, porewater dissolved organic carbon, and belowground biomass are reported. Core samples were taken in triplicate at 5 sampling times with the phosphorus samples collected once in July 2023. Data collection methods are detailed further in the metadata file associated with the dataset.

Keywords:
Salt marshes, biochar, thin layer placement, denitrification, phosphorus

Data collection period:
June 2022 - July 2024

Geographic extent:
- 39N 5’22” and 75W 26’9”; Dover, DE

File format:
.XLSX file

File name(s):
“TLP experiment data 1-25.xlsx”

Data access and archival:
Data has been archived with Open Science Framework and can be downloaded at https://osf.io/kq3hw/

Maps and schematics for data collection:
Maps are included in metadata