

# Measurements of nutrient flux, denitrification and N<sub>2</sub>O production rates in a restored oyster reef in Lynnhaven River, Virginia in 2014 using a continuous flow system (Oyster Reef N<sub>2</sub>O Emission project)

**Website:** <https://www.bco-dmo.org/dataset/722372>

**Version:**

## Project

» [Microbial Regulation of Greenhouse Gas N<sub>2</sub>O Emission from Intertidal Oyster Reefs](#) (Oyster Reef N<sub>2</sub>O Emission)

Contributors	Affiliation	Role
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## Coverage

**Spatial Extent:** Lat:36.89735 Lon:-76.088683

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## Dataset Description

Note: This dataset has been submitted to BCO-DMO and is in the process of being served.

Measurements of nutrient flux, denitrification and N<sub>2</sub>O production rates in a restored oyster reef in Lynnhaven River, Virginia in 2014 from a continuous flow system.

## Data Processing Description

BCO-DMO Data Manager Processing Notes:

- \* added a conventional header with dataset name, PI name, version date
- \* modified parameter names to conform with BCO-DMO naming conventions (no spaces, hyphens, names that start with numbers)
- \* removed leading whitespace in year column
- \* added site latitude and longitude (Lat,Lon) supplied by the contributor. Values were converted from degrees decimal minutes to decimal degrees and rounded to five decimal places.

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## Parameters

*Parameters for this dataset have not yet been identified*

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## Deployments

### Smith Island Song

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/721959">https://www.bco-dmo.org/deployment/721959</a>
<b>Platform</b>	shoreside Virginia

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## Project Information

### **Microbial Regulation of Greenhouse Gas N<sub>2</sub>O Emission from Intertidal Oyster Reefs (Oyster Reef N<sub>2</sub>O Emission)**

*Extracted from the NSF award abstract:*

Oyster reefs are biogeochemical hot spots and prominent estuarine habitats that provide disproportionate ecological function. Suspension-feeding eastern oysters, *Crassostrea virginica*, are capable of improving water quality and diminishing eutrophication by filtering nutrients and particles from the water and depositing them in the sediments. Remineralization of these deposits may enhance sedimentary denitrification that facilitates nitrogen removal in tidal estuaries. However, the scientific underpinning of oyster reef function has been challenged in various studies. In addition, recent studies of filter feeding invertebrates reported the production of nitrous oxide (N<sub>2</sub>O), a greenhouse gas, as an end product of incomplete denitrification by gut microbes. *C. virginica* could be another source of N<sub>2</sub>O flux from intertidal habitats. Preliminary work indicated substantial N<sub>2</sub>O production from individual oysters. The estimated N<sub>2</sub>O production from high density oyster reefs may exceed the N<sub>2</sub>O flux measured from some estuaries. With the new discovery of N<sub>2</sub>O emission and uncertainty regarding eutrophication control, the ecological value of oyster reef restoration may become equivocal.

This project will quantify N<sub>2</sub>O fluxes to understand the factors controlling N<sub>2</sub>O emission from oyster reefs. Sedimentary N processes will be examined to develop an oyster reef N model to estimate N<sub>2</sub>O emission from tidal creek estuaries relative to other N cycling processes. The PIs hypothesize that intertidal oyster reefs are a substantial source of N<sub>2</sub>O emission from estuarine ecosystems and the magnitude of emission may be linked to water quality. If substantial N<sub>2</sub>O flux from oyster reefs is validated, ecological benefits of oyster reef restoration should be reevaluated. This interdisciplinary research team includes a microbial ecologist, a biogeochemist, an ecologist and an ecosystem modeler. They will utilize stable isotope and molecular microbiological techniques to quantify oyster N<sub>2</sub>O production, elucidate microbial sources of N<sub>2</sub>O emission from oysters and sediments, and estimate seasonal variation of N<sub>2</sub>O fluxes from oyster reefs. Measurements from this study will be integrated into a coupled oyster bioenergetics-sediment biogeochemistry model to compare system level rates of N cycling on oyster reefs as a function of oyster density and water quality. Modeling results will be used to assess the relative trade-offs of oyster restoration associated with N cycling. They expect to deliver the following end products: 1) estimation of annual N<sub>2</sub>O flux from oyster reefs as an additional source of greenhouse gases from estuaries, 2) a better understanding of the environmental and microbial factors influencing N<sub>2</sub>O and N<sub>2</sub> fluxes in tidal estuaries, 3) transformative knowledge for the effect of oyster restoration on water quality enhancement and ecosystem function, 4) direct guidance for oyster restoration projects whose goals include water quality enhancement, and 5) a modeling tool for use in research and restoration planning.

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## Funding

<b>Funding Source</b>	<b>Award</b>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1321373</a>

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