Project Datasets: Water, sediment, and shellfish properties in the Guana Estuary

This document provides detailed information about datasets that were generated through a 2021 - 2024 collaborative research project titled *Guana Nutrients: Assessing the Current and Potential Role of Shellfish for Improving Water Quality.* This page also 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: https://nerrssciencecollaborative.org/project/Smyth20
Grant Type: Collaborative Research
Focus Area(s): Habitat Restoration, Water Quality
Keyword(s): oyster, water quality, nitrogen, ecosystem services

Reserve(s): Guana Tolomato Matanzas, FL

Project Duration: April 2021 - September 2024
Grant Amount: $594,966.00
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Project Partners
Organization A; Organization B; Organization C; etc.

Project Record in National Catalog:

Project Description

The Guana River Estuary in northeast Florida is impacted by excess nutrients, regular occurrences of algal blooms, and a clear gradient of human influence from the headwaters to the estuary. In 2022, Florida Department of Environmental Protection determined that the Guana River Estuary headwaters, Guana Lake, and Guana River do not meet state water quality standards for nutrient concentrations.

Restoring shellfish populations in ecosystems like the Guana River Estuary, can help improve water quality, since shellfish like oysters and mussels naturally filter water and increase removal of excess nutrients. However, this approach requires that ecosystem managers have a better understanding of how nitrogen moves through their estuary and the capacities of shellfish communities to remove nitrogen (N). Key information gaps include the distribution of shellfish species, the efficacy of different shellfish for nutrient removal, and the effects that water quality may have on shellfish function. By leveraging a well-established collaborative group, GTM Reserve's Oyster and Water Quality Task Force, and engaging additional users, this project helped to fill these gaps and support more holistic water quality management efforts in and around the Guana River Estuary.

The project not only generated valuable water quality and shellfish data but it also established a path for increased research and monitoring by fostering connectedness between people and data. The combination of robust data, open and transparent discussions, and regular check-ins increased trust in science, deepened relationships, and generated a number of products, including shellfish distribution maps, shellfish filtration and denitrification rates, sediment nutrient fluxes and denitrification rates along the salinity gradient, monitoring and restoration recommendations, and peer-reviewed and outreach publications. These outcomes will strengthen water quality restoration efforts in the Guana River Estuary and the greater watershed area.

Overview of Datasets

Thirteen datasets are described in this document:

Questions about these datasets can be directed to:
Ashley Smyth, University of Florida, ashley.smyth@ufl.edu

Detailed dataset descriptions are provided below.

Dataset 1: S::can nitrate sensor data

General description of data:
Data were collected between October 31st 2021 and October 22nd 2023. Measurements were recorded in 15 minute intervals, with each value representing the average of 3 5-minute measurements. Data columns are organized by site (where the sensor was deployed), date time (when the measurement was collected), parameter (which parameter the measurement represents; turbidity, temperature, or nitrate), value (associated value of the parameter), and status (sensor status; 0000 indicates sensor status is ok). Turbidity is represented in FTU/NTU units, temperature is in degrees Celsius, and nitrate is in NO_3-N / NO_3 mg/L.

The sensor used to collect these measurements is the s::can conlyte box paired with the electro::lyser probe. The sensor was deployed at Mickler's Weir, in the Guana Estuary, St Augustine, FL, USA. Data was downloaded and the sensor underwent routine maintenance monthly.

Search keywords:
temperature, turbidity, nitrate, weir, high-frequency, estuary, Guana Tolomato Matanzas National Estuarine Research Reserve

Data collection period:
October 31, 2021 – October 22 ,2023

Geographic extent:
Sensor was deployed in the Guana Estuary at the Guana Tolomato Matanzas National Estuarine Research Reserve at Mickler's Weir (30.16074, -81.3603).

File format:
Sensor raw data and statistics from simulated sampling are reported in a .xlsx file with metadata included.

File name(s):
Scan_Nitrate_Sensor_Micklers.xlsx

Data access and archival:
Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection:
MW: 30.16074, -81.3603

Dataset 2: Isotope signatures of sediments, plants, and suspended particulate matter

General description of data:
Plants and sediments were collected seasonally at six sites in the Guana Estuary and analyzed for ^{15}N, ^{13}C, and C:N at the Stable Isotope Facility in the Department of Geology on a Thermo Delta V Isotope Ratio Mass Spectrometer. Samples were collected in March, June, September, and December 2022 from the Guana Estuary, St Augustine, FL, USA to identify relative sources of nutrients to the estuary. Sediment samples were collected from the middle of the estuarine channel using a Van Veen grab sampler. Plant tissues and sediments were dried, ground, and homogenized between replicates. Sediment samples were then acidified with 1M HCl to remove inorganic carbon (rinsed, centrifuged, and decanted until no reaction was observed), rinsed with DI, and freeze dried. Suspended particulate matter was collected by filtering site water through a 47mm diameter 0.7 uM glass fiber filter. Micro-Dumas flash combustion analysis was performed on plant, sediment, and suspended particulate samples for $\delta^{15}N$, $\delta^{13}C$, and C:N at the UF Stable Isotope Facility in the Department of Geology on a Thermo Delta V Isotope Ratio Mass Spectrometer. Isotope values are presented in delta notation. Plant, sediment, and suspended particulate matter samples were collected at MW, GL2, GR, GR1, LS, and RN all four months; GR1 June, LS June, and MW June sediment samples were misplaced and, therefore, data is not included; GL2 and GR1 plants were not collected in March. Additional sediment samples were collected in December to capture the full span of the Guana Estuary sampling sites.

Search keywords:
stable isotopes, carbon isotopes, nitrogen isotopes, estuary, Guana Tolomato Matanzas National Estuarine Research Reserve, plant isotopes, sediment isotopes, suspended particulate matter isotope, isotope source tracking

Data collection period:
March 2022 to December 2022

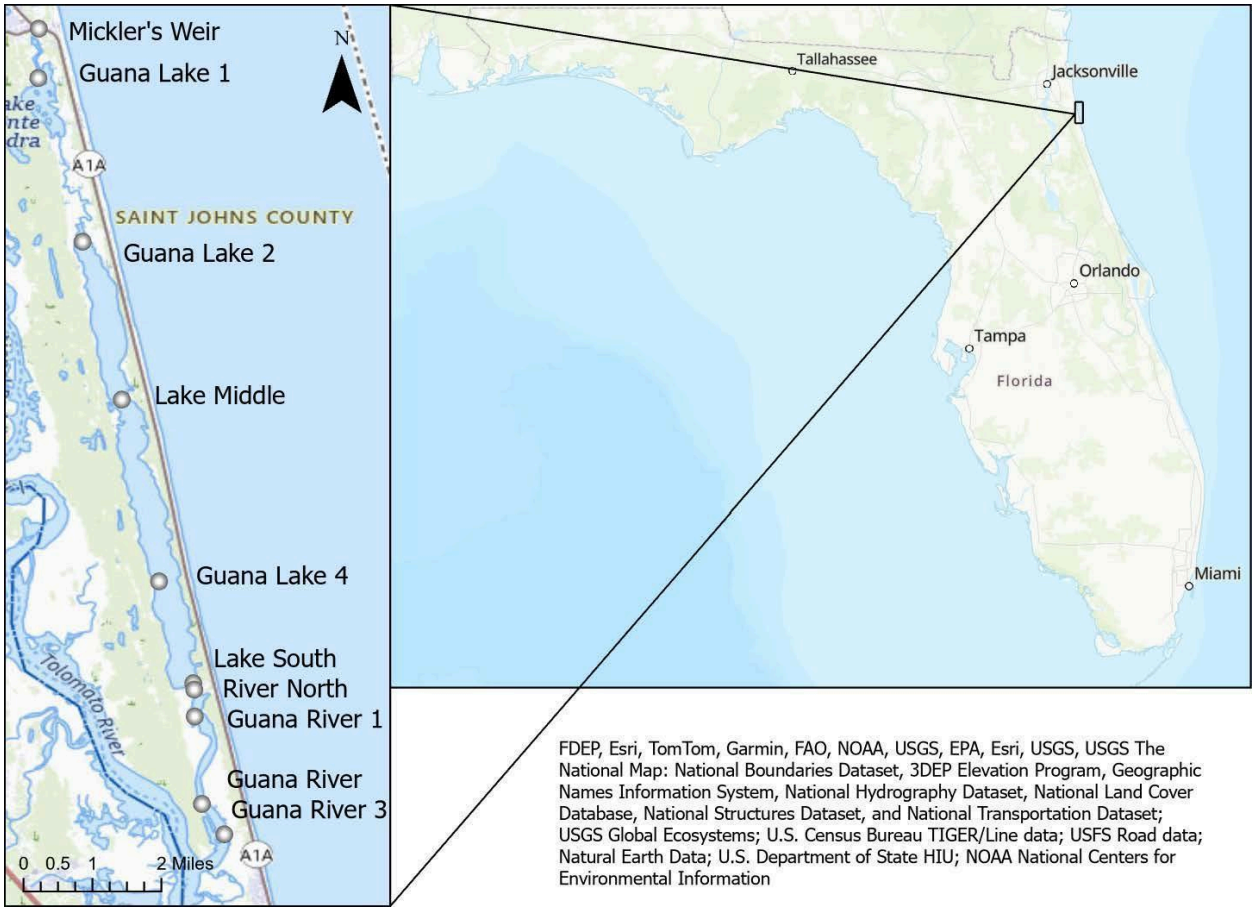
Geographic extent:
Samples were collected from the Guana Estuary at the Guana Tolomato Matanzas National Estuarine Research Reserve. Coordinates for sites are as follows:
MW: 30.16074, -81.3603
GL1: 30.1504, -81.3604
GL2: 30.1161, -81.3511
LM: 30.08302, -81.3429
GL4: 30.0451, -81.3351
LS: 30.02376, -81.3279
RN: 30.02242, -81.3277
GR1: 30.0168, -81.3276
GR: 29.99847, -81.3261
GR3: 29.9921, -81.3214

File format:
Isotope data is prepared in a spreadsheet with metadata included.

File name(s):
Plant_Sediment_Isotope_Data_Guana.xls

Data access and archival:
Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection



Dataset 3: Net N_2 rate measurements from sediment slurries along a salinity gradient

General description of data:
Water and sediment samples for slurries were collected monthly from January 2022 to January 2023 from the Guana Estuary, St Augustine, FL, USA. We collected estuarine sediments and water at 10 of the GTM NERR monthly water quality monitoring sites spanning a salinity gradient (0 to 37 ppt) in the Guana Estuary. These slurries (sensu Reisinger et al. 2016) were repeated monthly for 13 months (January 2022-January 2023) to capture seasonal (e.g. temperature and rainfall) changes. January and February 2022 incubations were not included in the final data set since they were preliminary trials and were used to refine methods. Incubations involve collecting sediment and water from the field and making a slurry, filling a falcon tube with sediment (20g) then pouring water down the side until the tube is full and capping underwater to eliminate headspace and ambient air-water gas exchange. Sediment slurries are then sacrificially sampled over three time points for dissolved N_2 gas, the product of denitrification. Samples were measured on a membrane inlet mass spectrometry (MIMS) for N_2 at the University of Florida Tropical Research and Education Center (TREC) in Homestead, FL. We quantified the production (denitrification) or consumption (N-fixation) of N_2 as the change in N_2 gas concentration over time to establish if sediments were a net source (N-fixation) or sink (denitrification) of reactive N. Denitrification and N-fixation rates are based on the change in concentration of N_2 gas over time; the rate is calculated by simple linear regression, with negative rates of N_2 indicating N-fixation and positive rates of N_2 indicating denitrification.

Search keywords:
denitrification, n-fixation, sediment slurry, estuary, Guana Tolomato Matanzas National Estuarine Research Reserve

Data collection period:
January 2022 - January 2023

Geographic extent:
Samples were collected from the Guana Estuary at the Guana Tolomato Matanzas National Estuarine Research Reserve. Coordinates for sites are as follows:
MW: 30.16074, -81.3603
GL1: 30.1504, -81.3604
GL2: 30.1161, -81.3511
LM: 30.08302, -81.3429
GL4: 30.0451, -81.3351
LS: 30.02376, -81.3279
RN: 30.02242, -81.3277
GR1: 30.0168, -81.3276
GR: 29.99847, -81.3261
GR3: 29.9921, -81.3214

File format:
Rates from slurry incubations and associated metadata are in an xls file.

File name(s):
Sediment_Slurry_N2Data_Guana.xls

Data access and archival: Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection
Same as Dataset 2: Isotope signatures of sediments, plants, and suspended particulate matter

Dataset 4: Benthic fluxes along a salinity gradient

General description of data:
The data includes the results of flux measurements taken from sediment cores placed in a continuous flow flux chamber. These measurements were used to calculate the nutrient fluxes in response to elevated water column nitrate at four sites along a salinity gradient of the GTM Reserve. Replicate cores were collected to measure N_2 and nutrients. Collected cores from each site were submerged in a water bath and allowed to equilibrate for at least 24 hr. After equilibration, cores were sealed with a cap and water pulled by a peristaltic pump flowed through each core. Cores were incubated in dark conditions and the ambient and spiked overlying water from the core was collected into exetainers with no headspace and analyzed for NO_x, NH_4^+, and PO_4^{3-} measured on a SEAL AQ400 discrete analyzer. N_2/Ar was measured on a membrane inlet mass spectrometer (MIMS).

Search keywords:
nitrogen, nutrient regeneration, sediment nutrient fluxes, ecosystem services,

Data collection period:
March 2022 to July 2022

Geographic extent:
GTM: 29.66694, -81.2575 Guana Tolomato Matanzas, FL

File format:
Microsoft Excel file

File format:
Rates from slurry incubations and associated metadata are in an xls file.

File name(s):
Sediment_Flux_Guana.xls

Data access and archival:
Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection
Same as Dataset 2: Isotope signatures of sediments, plants, and suspended particulate matter

Dataset 5: Salinity effects on nitrate reduction pathways

General description of data:
Samples were collected on August 13th, 2024, from the Guana Estuary and St. Augustine Inlet in St Augustine, FL, USA. Sediment cores for the flow-through incubation were collected from Lake Middle (LM). Water for the experiment was collected from Mickler's Weir (MW) as a freshwater site, LM as the ambient site, and the St. Augustine Inlet as a saltwater site. The flow-through salinity manipulation experiment was performed August 13th, 2024 through August 16th, 2024 at the UF Biogeochemistry Lab at the Tropical Research and Education Center in Homestead, FL. Samples for denitrification and dissimilatory nitrate reduction to ammonium (DNRA) were analyzed at the UF Biogeochemistry Lab at the Tropical Research and Education Center in Homestead, FL on a Membrane Inlet Mass Spectrometer.

Search keywords:
Nitrogen cycling, salinity manipulation, denitrification, dissimilatory nitrate reduction to ammonium, estuary, Guana Tolomato Matanzas National Estuarine Research Reserve

Data collection period:
August 13th, 2024 through August 16th, 2024

Geographic extent:
Samples were collected from the Guana Estuary at the Guana Tolomato Matanzas National Estuarine Research Reserve. Coordinates for sites are as follows:

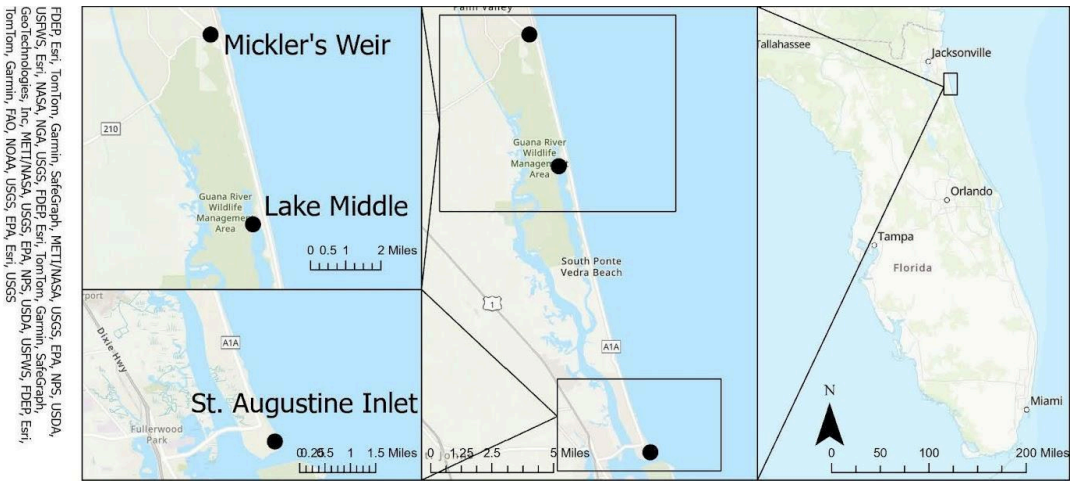
- MW: 30.16074, -81.3603
- LM: 30.08302, -81.3429
- Augustine Inlet: 29.914236, -81.288714

File format:
Nitrogen cycling data is reported in an excel file, with a metadata.

File name(s):
Salinity_NCycling_Data_Guana.xlsx

Data access and archival:
Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection



Dataset 6: Water column phytoplankton nutrient limitation

General description of data:
The data includes measurements of chlorophyll-*a* to quantify the response of phytoplankton growth from elevated nutrient amendments at four sites along a salinity gradient of the GTM Reserve. Water was collected from each site into 1-liter Cubitainers and dosed with 5 nutrient treatments of nitrate, urea, phosphate, nitrate+phosphate, and urea+phosphate. Chlorophyll-*a* concentrations were measured with a fluorometer.

Search keywords:
Nutrient limitation, nutrient limitation bioassay, water quality

Data collection period:
June 2022 to April 2023

Geographic extent:
GTM: 29.66694, -81.2575 Guana Tolomato Matanzas, FL

File format:
Microsoft Excel file

File name(s):
Bioassay_Chl_Guana.xlsx

Data access and archival
Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection
Same as Dataset 2: Isotope signatures of sediments, plants, and suspended particulate matter

Dataset 7: Benthic fluxes from sediments and shellfish

General description of data:
The data includes the results of flux measurements taken from cores placed in a static flux chamber. These measurements were used to calculate the N_2 production as an indicator of denitrification rates and nutrient fluxes from two shellfish sites in the GTM Reserve, Florida.

Replicate sediment cores were collected to measure N_2 and nutrient fluxes. Collected cores from each site were submerged in a water bath and allowed to equilibrate for at least 24 h. After equilibration, cores were sealed with a cap that contained a magnetic stir bar. Cores were incubated in dark and light conditions. The overlying water from the core was collected into exetainers with no headspace and analyzed for NO_x, NH_4^+, and PO_4^{3-} measured on a SEAL AQ400 discrete analyzer. N_2/Ar was measured on a membrane inlet mass spectrometer (MIMS).

Search keywords:
Denitrification, N_2 production, Eastern oysters, *Crassostrea* virginica, Ribbed mussel, *Guekensia demissa*, shellfish,

Data collection period:
November 2022 to July 2023

Geographic extent:
GTM: 29.66694, -81.2575 Guana Tolomato Matanzas, FL

File format:
Microsoft Excel file

File name(s):
Shellfish_NFlux_Guana.xlsx

Data access and archival:
Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection:

Dataset 8: The influence of invasive hogs and ribbed mussels on salt marsh functioning

General description of data:
This dataset contains field surveys and experimental results assessing the role of invasive hogs in disrupting salt marsh functioning and service provisioning. Hogs pose a unique threat to marshes for their ability to disrupt both the dominant foundation species (here, cordgrass) and its mutualist partner (here, mussels). Hogs alter salt marsh functioning in two ways: by trampling, wallowing, and uprooting cordgrass and by consuming ribbed mussels, a keystone mutualist of cordgrass that enhances marsh nitrogen cycling and sediment accretion. In this study, we assess the implications of hogs to marsh functioning by comparing two adjacent marshes, one of which is heavily utilized by hogs and the other is not accessed by hogs.

This data was collected in the marshes along the Guana River, Ponte Vedra Florida. The marsh on the western riverbank is heavily utilized by hogs, while the eastern marsh does not show any signs of hog activity. In this study, we conducted larger-scale surveys and patch-scale measurements within both marshes. Specifically, we quantified patch-scale metrics within five distinct microhabitats across the undisturbed eastern marsh and the hog-impacted western marsh. We identified two microhabitats in the undisturbed marsh: 1) cordgrass-only areas and 2) cordgrass+mussel areas; and three microhabitats in the hog-disturbed marsh: 3) previously disturbed cordgrass-only areas, 4) currently trampled cordgrass areas, and 5) disturbed cordgrass+mussels (Fig. 1).

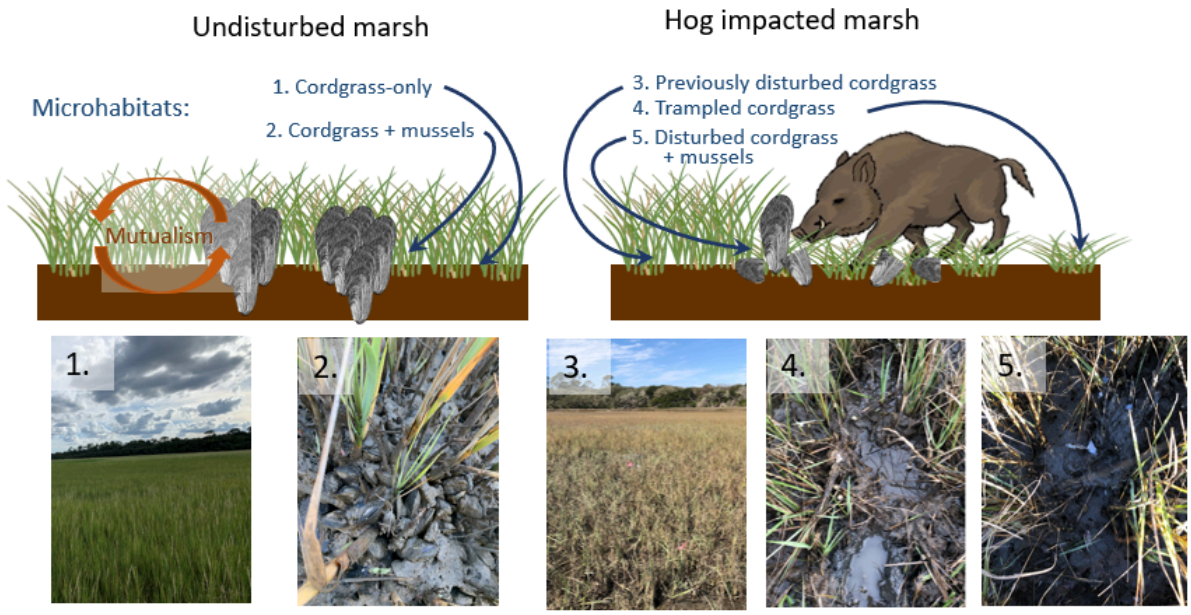


Fig. 1 *Microhabitats within the undisturbed marsh and the hog marsh. The photos depict cordgrass-only and cordgrass+mussel area in the undisturbed marsh (photos 1 & 2, respectively) and previously disturbed cordgrass, trampled cordgrass, and disturbed cordgrass+mussel areas in the hog marsh (photos 3, 4, and 5, respectively)*

Search keywords:

foundation species; ecosystem engineer; ecosystem service; nitrogen cycling; salt marsh accretion; wild hog; ribbed mussel

Data collection period:
March 2021-May 2022

Geographic extent:
Marshes surrounding the Guana River, Ponte Vedra Florida. The Guana River is 5km in length with marshes on either side.

File format:
Excel Spreadsheet, 43kb

File name(s):
Fischman_HogMusselsGuana.xlsx

Data access and archival:
This dataset has been archived with the NERRS Centralized Data Management Office (CDMO). and can be accessed here:
https://nerrssciencecollaborative.org/resource/oyster-reef-mapping-and-hog-data

Dataset 9: Oyster Reefs in the Guana River

General description of data:
These shapefiles contain polygons of the oyster reefs in the Guana River. Oyster reefs are characterized as “consolidated” (high density, patch reefs that can be clearly delineated) and “unconsolidated” (lower density, fringing reefs). Reefs were manually delineated and classified from drone imagery. Data was collected to understand the distribution and density of oyster reefs within the Guana River. Drone imagery was collected over 3 flights flown in Fall, 2022 with a Parrot Anafi AI (48 megapixel camera, <1cm/pixel). Reefs were then manually delineated in ArcGIS Pro and classified as “consolidated reefs” and “unconsolidated reefs”. “Consolidated Reefs” are clearly defined reefs with a high density of oysters. They are generally patch reefs and oysters occupy the vast majority of area within a consolidated reef. “Unconsolidated oysters” are lower-density areas where a single reef could not be identified. Unconsolidated oysters are generally fringing areas along the marsh edge and contain a mixture of smaller oyster clusters and bare sediment.

Search keywords:
Guana River; Oyster Reef; Oyster Map; Oyster

Data collection period:
Drone flights conducted in October and November 2022. Polygons delimited in May 2023

Geographic extent:
The Guana River (Ponte Vedra, FL). The northern limit of this data is the Guana Dam (30.022872, -81.328588), the southern limit is based on drone flight regulations. Oysters at the very southern tip of the Guana River are not included in this dataset because drone flights in the region are prohibited by Saint Augustine Airport.

File format:
Zipped shapefiles; 1,356KB

File name(s):
The zipped file contains two folders labeled “Consolidated” and “Unconsolidated”, corresponding to consolidated and unconsolidated oyster reefs. Within each folder are 8 files that form the shapefiles

Data access and archival:
This dataset has been archived with the NERRS Centralized Data Management Office (CDMO). and can be accessed here:
https://nerrssciencecollaborative.org/resource/oyster-reef-mapping-and-hog-data

In addition, the dataset can be accessed and viewed here:
https://www.arcgis.com/home/item.html?id=4255a13c74c643fabd573c212aa88635

Drone imagery used to delineate reefs is available here:
https://ufl.maps.arcgis.com/apps/mapviewer/index.html?webmap=36676cc56a3f44969e732c77b6119576; Drone flight credit to Orlando Cordero and map stitching by Andew Ortega

Maps and schematics for data collection:

Image of the drone flight used to delineate reefs. This image shows the Guana and Tolomato Rivers and data collected during the drone flight. The white border marks the perimeter of the drone area.

Dataset 10: Guana River marsh and mudflat maps, including mussel density

General description of data:
Ribbed mussels are common across salt marshes across the US eastern seaboard. These mussels can enhance marsh productivity, nitrogen removal rates, marsh accretion, and resistance to drought. However, these mussels are embedded in the mud under canopies of cordgrass, making it difficult to quantify their densities and calculate the ecosystem service benefits they provide at a large scale. In this dataset, we combine field surveys and GIS mapping to estimate mussel cover across the estuary. We also calculate the area of mudflat in the Reserve to identify suitable habitat for possible oyster reef enhancement (see oyster map dataset).

Drone imagery of the Guana was collected over 3 flights flown in Fall, 2022 with a Parrot Anafi AI (48 megapixel camera, <1cm/pixel). All salt marsh and mudflat areas were then manually delineated in ArcGIS Pro. We also conducted field surveys of 101, $9m^2$ areas of marsh and counted all mussels. Surveyed plots were georeferenced for linking to the marsh area maps.

Search keywords:
Ribbed mussel, oyster, ecosystem service, spartina alterniflora, salt marsh map, mudflat map

Data collection period:
May 2021 to December 2022 for mussel surveys; Imagery collected September to November 2022 and delineated in Spring 2024

Geographic extent:
The Guana River (Ponte Vedra, FL). The northern limit of this data is the Guana Dam (30.022872, -81.328588), the southern limit is based on drone flight regulations. Marsh and mudflat habitats at the very southern tip of the Guana River are not included in this dataset because drone flights in the region are prohibited by Saint Augustine Airport.

File format:
Zipped shapefiles with individual folders for marsh area and mudflat area. Excel file with the locations of mussel density surveys and number of mussels counted in each quadrat.

File name(s)
All files are under the folder “Guana_Marsh_Mussel_Maps”.

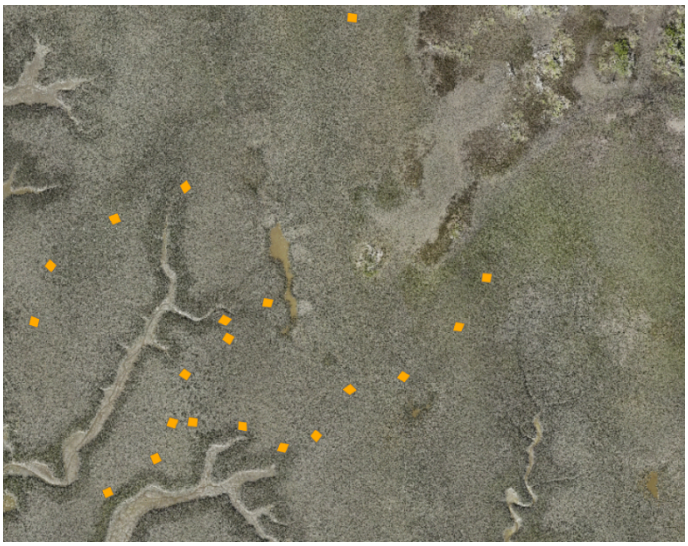
- GuanaMudflats.zip (269KB): Mudflat shapefile manually delineated from drone imagery
- GuanaMarsh.zip (274KB): Marsh shapefile manually delineated from drone imagery
- MusselDensity_forUpload.xlsx (56.3KB): GPS coordinates of quadrats, mussel counts within the $9m^2$ quadrat, metadata explaining spreadsheet columns

Data access and archival:
Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection:
Image of the drone flight used to delineate salt marsh and mudflat areas. This image shows the Guana and Tolomato Rivers and data collected during the drone flight. The white border marks the perimeter of the drone area.

Photo of project team counting mussels in the 9m^2 area

Sample of areas surveyed for mussel density overlayed on marsh imagery



Dataset 11: Bivalve mediated Carbon and Nitrogen storage and removal

General description of data:
Mussels and oysters play a critical role in the carbon and nitrogen cycling of estuaries. Their filter feeding transports material from the water column to the benthos, and they assimilate nutrients in their shell and tissue with growth. They can also enhance denitrification and remove nitrogen from the estuary. In this data, we quantify several components of carbon and nitrogen cycling that are driven by bivalves. These data support the formulation of a model estimating the C and N storage and removal by bivalves. Data include results of field and laboratory experiments and lab processing results. Specifically, we present results of a bivalve transplant experiment in the Guana River that assessed growth rates and condition index for both species at four locations. Using the transplanted bivalves, we measured the carbon and nitrogen content of mussel and oyster shell and tissue at each location. Lastly, we conducted continuous flow incubation measuring the enhanced denitrification rates associated with mussels and oysters at two locations in the Guana River.

Sheets 1 and 2 provide results from the transplant experiment. 80 oysters and 100 mussels were deployed at 4 locations in the Guana (see map below) in April 2022. All surviving oysters and half of the surviving mussels were harvested in October 2022 and the remaining mussels were harvested in April 2023. All harvested individuals were measured to calculate growth, and 20 from each site were dried and measured for condition index.

Sheet 3 provides Carbon and Nitrogen data in mussel tissue. A subsample of harvested individuals were freeze dried and ground for elemental and stable isotope analysis.Sheet 3 also provides N_2 fluxes from a continuous flow incubation across mussel, marsh, oyster, and mudflat habitats.

Search keywords:
ribbed mussel, oyster, blue carbon, carbon cycling, nitrogen cycling, estuary

Data collection period:
April 2022 to April 2024

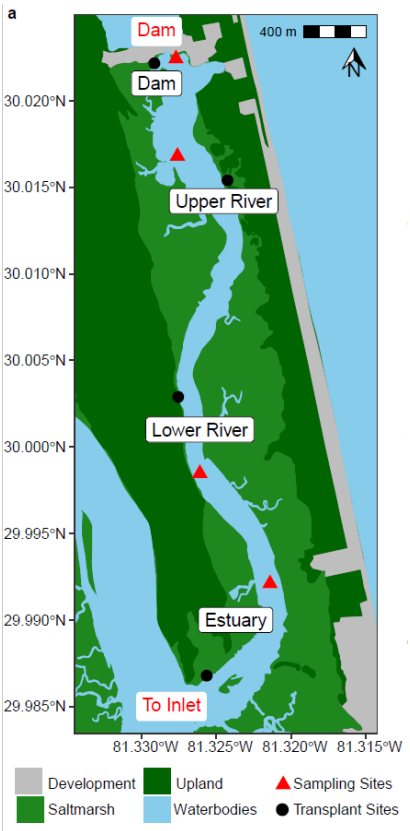
Geographic extent:
Guana River, see datasets above

File format:
Excel spreadsheet, size 261KB

File name(s):
Bivalve_CN_Data_Guana.xlsx

Data access and archival:
Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection



Map of the Guana River with the transplant sites marked

Dataset 12: Shellfish clearance rates

General description of data:
This dataset includes mussel and oyster clearance rates, ammonia excretion rates and biodeposit nitrogen and carbon content from laboratory experiments. Mussels and oysters were collected from the Guana Estuary at low tide. Specimens were placed in aquaria overnight to evacuate their gut contents. Clearance rate measurements were conducted according to Hornbach 1991. A probe colorimeter was used to measure the decrease in light absorbance of a suspension over time. Treatments included 1) a mid-range organic treatment at 135 µL of algae (*Isochrysis*) per liter, 2) a high-range organic treatment at 230 µl algae per liter, and a high-range organic and inorganic treatment, with 230 µl algae and 0.06 grams of clay per liter. Clearance rates were calculated using a standard curve and corrected for absorbance changes in blank chambers with no bivalves. Biodeposits were collected, dried, ground to a powder and analyzed for carbon and nitrogen content. Following clearance rate measurements, water samples were collected, frozen, and transferred to the Smyth lab for ammonia concentration analyses. Bivalves were weighed and measured. Tissues were removed and dried to constant mass.

Search keywords:
Mussel, oyster, clearance rate, ammonia excretion, biodeposits, carbon, nitrogen

Data collection period:
March, 2023

File formation: Excel document.

File format:
Microsoft Excel file

File name(s):
Shellfish Rates_Guana.xlxs, 13.5 KB

Data access and archival
Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).

Maps and schematics for data collection
Same locations as locations for Dataset 11: Bivalve mediated Carbon and Nitrogen storage and removal

Dataset 13: Alternative scenarios for future nutrient export from the Guana watershed

General description of data:
This dataset describes alternative land use scenarios modeled to project future concerns with nutrient export and potential development strategies and best-management practices that could be implemented to offset these future concerns. Initial land use data were extracted from the US EPA's Pollution Load Estimation Tool for the Lower Tolomato River watershed, which includes the Guana Estuary. Future land use scenarios were based on the Florida 2070 project (Carr and Zwick, 2017) that projects future land-use into 2070 for different regions of Florida based upon two scenarios: the 2070 trend scenario and the 2070 alternative scenario. Both scenarios include the same projections for future population growth throughout the state, but the scenarios differ in how population growth affects land use distributions. The trend scenario assumes current development practices remain consistent whereas the 2070 alternative scenario assumes an increase in housing density with land conservation implemented to balance the higher density housing. We quantified the % change in developed lands for NE Florida and then that relative change was applied to the Lower Tolomato land use distribution. The only other land use type capable of being developed in the watershed to the extent required for future population growth was forested land. Therefore, any increase in developed lands in these two scenarios were offset by a decrease in forested lands in the watershed.

These alternative land use scenarios were then entered into the online portal for the US EPA's PLET program, which provides N and P loads based on land use, soil, hydrology, and climatic conditions of the watershed. PLET also allows the addition of BMP's to the watershed in a user-defined approach. This dataset describes multiple alternative BMP scenarios we tested in conjunction with the alternative development scenarios. BMP scenarios had a static distribution of different BMP options implemented among the different land use classifications described within PLET (a default land use distribution is provided for all urban land-use). BMP scenarios ranged from capturing and treating 10 to 100% of developed lands. We also include BMP cost estimates extracted from various peer-reviewed and/or federal agency sources.

Finally, the dataset includes the scenario outputs: N, P, sediment, and BOD loads from all development*BMP scenario combinations, the reduction in pollutant loads due to BMP implementation, and the cost of this load reduction. All details, metadata, etc, are included as the first tab of the spreadsheet.

Search keywords:
Scenario modeling; nitrogen; phosphorus; load; urban; development; BMP; best management practice

Data collection period: Data were processed from 03/2023 – 12/2023.

File Format:
Excel spreadsheet

File name(s):
Guana_PLET_Scenario_Data.xlsx

Data access and archival

Data will be made publicly available within two years of project completion (September 2024) or upon publication of associated project manuscripts, whichever is sooner. Data will be archived in the interim with the Centralized Data Management Office (CDMO).