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Delta-X: Soil Properties for Herbaceous Wetlands, MRD, Louisiana, 2021, V3

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Documentation Revision Date: 2023-09-21

Dataset Version: 3

Summary

This dataset contains properties of soil core samples for herbaceous wetlands collected in the Atchafalaya and Terrebonne basins in southeastern coastal Louisiana for the period 2021-03-21 to 2021-04-02 and on 2021-08-19. Field measurements were conducted at six sites in the Atchafalaya (N = 3) and Terrebonne (N = 3) basins. Five sites were adjacent to sites from the Coastwide Reference Monitoring System (CRMS). The other site is in the Wax Lake Delta (WLD) without appropriate adjacent CRMS sites. Herbaceous wetland sites in both basins were chosen to represent a salinity gradient including freshwater, brackish and saline ecosystems. Soil properties include bulk density, organic matter content, total densities of carbon, nitrogen, phosphorus, along with ¹³C and ¹⁵N isotopic signatures. The data are provided in comma-separated values (.csv) format.

Delta-X conducted a joint airborne and field campaign in the Mississippi River Delta (MRD) during Spring and Fall 2021. The Delta-X campaign conducted airborne (remote sensing) and field (in situ) measurements to observe hydrology, water quality (e.g., total suspended solids (TSS)) and vegetation structure.

This dataset contains one file in comma-separated values (.csv) format.



Figure 1. Typical soil core from herbaceous wetland collected during March 2021 in coastal Louisiana. This image shows the top 50 cm of soil collected using a Russian corer.

Citation

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1. Dataset Overview

This dataset contains properties of soil core samples for herbaceous wetlands collected in the Atchafalaya and Terrebonne basins in southeastern coastal Louisiana for the period 2021-03-21 to 2021-04-02 and on 2021-08-19. Field measurements were conducted at six sites in the Atchafalaya (N = 3) and Terrebonne (N = 3) basins. Five sites were adjacent to sites from the Coastwide Reference Monitoring System (CRMS; Steyer et al. 2003). The other site is in the Wax Lake Delta (WLD) without appropriate adjacent CRMS sites. Herbaceous wetland sites in both basins were chosen to represent a salinity gradient including freshwater, brackish and saline ecosystems. Soil properties include bulk density, organic matter content, total densities of carbon, nitrogen, phosphorus, along with ^{13}C and ^{15}N isotopic signatures.

Project: [Delta-X](#)

The Delta-X mission is a 5-year NASA Earth Venture Suborbital-3 mission to study the Mississippi River Delta in the United States, which is growing and sinking in different areas. River deltas and their wetlands are drowning as a result of sea level rise and reduced sediment inputs. The Delta-X mission will determine which parts will survive and continue to grow, and which parts will be lost. Delta-X begins with airborne and in situ data acquisition and carries through data analysis, model integration, and validation to predict the extent and spatial patterns of future deltaic land loss or gain.

Acknowledgments

This study was funded by the NASA Science Mission Directorate's Earth Science Division through the Earth Venture Suborbital-3 Program NNH17ZDA001N-EVS3.

2. Data Characteristics

Spatial Coverage: Atchafalaya and Terrebonne Basins, southern coast of Louisiana, USA

Spatial Resolution: Point samples, spaced 30 m apart along transects.

Temporal Coverage: 2021-03-21 to 2021-04-02 and on 2021-08-19

Temporal Resolution: One-time samples

Site Boundaries: Latitude and longitude are given in decimal degrees.

Site	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Atchafalaya and Terrebonne Basins	-91.4451	-90.8219	29.51017	29.1714

Data File Information

There is one data file in comma-separated values (.csv) format with this dataset: [DeltaX_Soil_Properties_Spring_Fall_2021_v3.csv](#)

Table 1. Variables in the data file.

Variable	Units	Description
basin	-	The basins are Atchafalaya or Terrebonne
campaign	-	The campaigns are Spring_2021 or Fall_2021
date	YYYY-MM-DD	Date of sampling
latitude	degree_north	Latitude of sampling site
longitude	degree_east	Longitude of sampling site
site	-	Site name
hydrogeomorphic_zone	-	The hydrogeomorphic zones are intertidal, High intertidal, or intermediate intertidal. Note that this is an update from the previous version (V2) which had supratidal zones in this column
sampling_station	-	Sampling station ID
soil_core_id	-	Soil core ID (1, 2)
depth_interval	text	Depth interval of the soil sample for each core in cm (e.g., "10-20 cm")
bulk_density	g cm^{-3}	Dry mass of soil divided by its wet volume
organic_matter_content	percent	Percent of organic matter in known dry mass of soil
total_carbon_density	mg cm^{-3}	Total carbon density in known wet volume of soil
total_nitrogen_density	mg cm^{-3}	Total nitrogen density in known wet volume of soil
total_phosphorus_density	mg cm^{-3}	Total phosphorus density in known wet volume of soil
15N	‰ (per mille)	$\delta^{15}\text{N}$, ^{15}N isotopic signature, or concentration of ^{15}N isotope in parts per thousand, as relative to the international standards and atmospheric air. Note that this variable has been added with the V3 update to this dataset; these data are not in previous versions.
13C	‰ (per mille)	$\delta^{13}\text{C}$, ^{13}C isotopic signature, or concentration of ^{13}C isotope in parts per thousand, as relative to the international standards and atmospheric air. Note that this variable has been added with the V3 update to this dataset; these data are not in previous versions.

3. Application and Derivation

Soil properties data will be used to calibrate and validate the ecogeomorphic (NUMAR) and hydrodynamic models. This research will contribute to a better understanding of changes in soil carbon and nutrient (N, P) concentrations, bulk density, organic matter content, and isotopic signatures ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) across sites in two coastal deltaic basins (Atchafalaya and Terrebonne) with distinct sediment delivery and hydrologic regimes.

4. Quality Assessment

Data quality for each soil property (e.g., bulk density, TN, etc.) was initially assessed using standard error (SE) and coefficient of variation statistics. Carbon and nutrient analyses were determined on duplicate analytical replicates of each sample and the run precision was determined based on relative percent difference between replicates at an acceptance limit of <5%. Accuracy was determined by the analysis of certified standard reference material during each run. Acceptable limits for accuracy were $\pm 5\%$. Data outside these limits were not used and samples were re-run to obtain new accurate values.

5. Data Acquisition, Materials, and Methods

Soil cores collected at six herbaceous wetland sites (Fig. 2) are for the period during Spring 2021 (between March 21 – April 2, 2021) and at Mike Island intermediate intertidal zone during Fall 2021 (August 19) to determine changes in soil carbon and nutrient (N, P) concentrations, bulk density, organic matter content, and isotopic signatures ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) across sites in two coastal deltaic basins (Atchafalaya and Terrebonne) with distinct sediment delivery and hydrologic regimes. Five out of the six selected sites for field measurements are part of the Coastal Reference Monitoring System (CRMS; Steyer et al., 2003), and they are labeled with 'CRMS' in the *site_id* variable. The WLD site did not have an adjacent CRMS site.

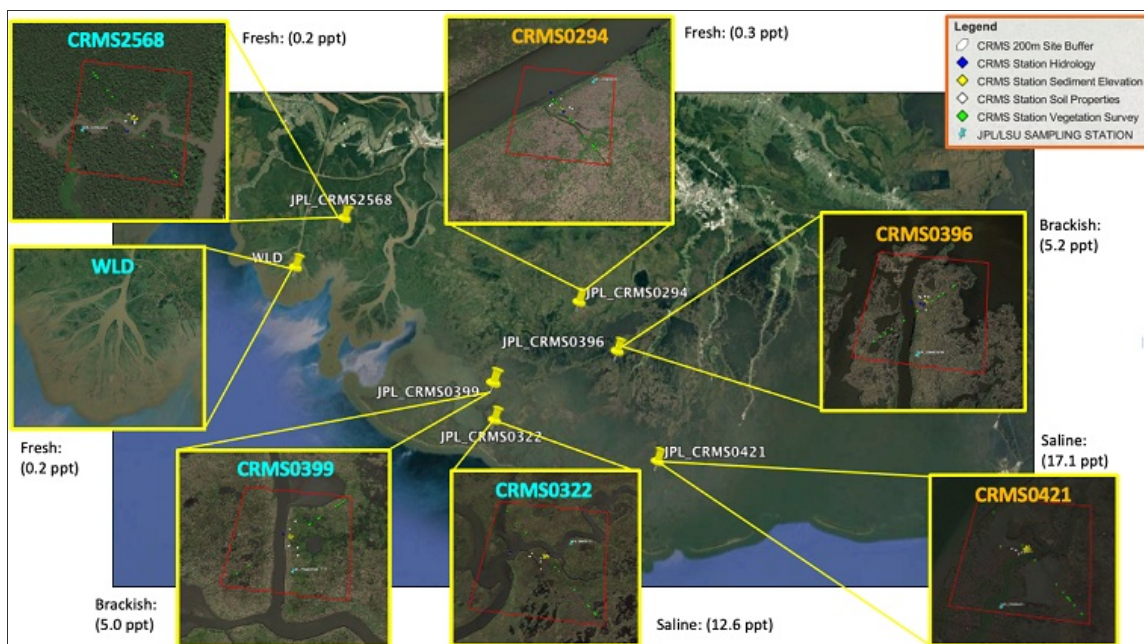


Figure 2. Vegetation sampling sites in Atchafalaya and Terrebonne Basins for the Delta-X 2021 field efforts. The Wax Lake Delta (WLD) location has the *site_id* "Mike Island" in the datafile. Data are not provided for the CRMS2568 site.

At each herbaceous wetland site, duplicate sampling stations (30 m apart) were established parallel to the wetland edge at 25 and 50 m within the intertidal zone to capture within site variability in vegetation dynamics and soil properties. In WLD, due to a variety of elevation ranges within the wetland site, duplicate stations were established in the high and intermediate intertidal zones.

At each sampling station, within each site, one 50-cm soil core was collected using a Russian peat corer (5-cm diameter). Soil cores were sectioned into 10-cm intervals and stored on ice in plastic bags for further analyses in the laboratory. Soil cores were further processed in the lab to determine soil properties including carbon and nutrient (N, P) concentrations and ratios, bulk density, organic matter content, and isotopic signatures. Core samples were ground with a Wiley Mill to pass through a 250- μm -mesh screen and stored separately in glass scintillation vials. Organic matter content (% ash-free dry weight) was determined by loss-on-ignition (LOI) at 550°C for 4 h (Davies 1974). Total carbon (C) and nitrogen (N) content of soil samples were determined on duplicate analytical replicates of each sample with a NA1500 elemental analyzer (Fisons, Instruments, Inc., Danvers, MA). Total P was extracted using an acid-digested (HCl) extraction and concentrations determined by colorimetric analysis (Methods 365.4 and 365.2, US EPA 1983). Soil carbon and nutrient density are expressed in mg cm^{-3} using bulk density values. Soil C and N bulk isotopic signatures ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) were analyzed on a Thermo Scientific Delta V Plus CF-IRMS coupled to a Carlo-Erba 1108 elemental analyzer via a ConFlo IV interface (Thermo Fisher Scientific, Waltham, MA, USA). Stable isotope data are reported in $\delta^{13}\text{C}$ (‰) and $\delta^{15}\text{N}$ (‰) notation as relative to the international standards and atmospheric air (Sulzman 2007).

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

[Delta-X: Soil Properties for Herbaceous Wetlands, MRD, Louisiana, 2021, V3](#)

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

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8. Dataset Revisions

Version	Release Date	Revision Notes
3.0	2023-09-21	The data file was replaced. The column hydrogeomorphic_zone was updated, and the "supratidal" zone is no longer in the data file. Data for ¹³ C and ¹⁵ N isotopic signatures were added
2.0	2022-08-29	Fall campaign data were added and the spring campaign data were updated
1.0	2022-05-02	Version 1.0 released



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