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

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Documentation Revision Date: 2022-08-29

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Summary

This dataset contains properties of soil core samples for herbaceous wetlands collected in the Atchafalaya and Terrebonne basins in southeastern coastal Louisiana during 2021-03-19 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). Five of the 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, and total densities of carbon, nitrogen, and phosphorus.

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 consists of 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

Castañeda-Moya, E., and E. Solohin. 2022. Delta-X: Soil Properties for Herbaceous Wetlands, MRD, Louisiana, 2021. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/2078>

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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 during 2021-03-19 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). Five of the 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, and total densities of carbon, nitrogen, and phosphorus.

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 work was supported by NASA's Earth Venture Suborbital-3 (EVS-3) program (grant NNN17ZDA001N-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: 2021-03-19 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	29.5400	29.1714

Data File Information

This dataset consists of a single file in CSV format named *DeltaX_Soil_Properties.csv*.

The no data value is -9999.

Table 1. Variables in *DeltaX_Soil_Properties.csv*.

Variable	Units	Description
basin	-	"Atchafalaya" or "Terrebonne"
campaign	-	"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_id	-	Site name
hydrogeomorphic_zone	-	"Supratidal" or "Intertidal"
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")
soil_bulk_density	g cm ⁻³	Dry mass of soil divided by its wet volume
soil_organic_matter_content	percent	Percent of organic matter in known dry mass of soil
soil_total_carbon_density	mg cm ⁻³	Total carbon density in known wet volume of soil
soil_total_nitrogen_density	mg cm ⁻³	Total nitrogen density in known wet volume of soil
soil_total_phosphorus_density	mg cm ⁻³	Total phosphorus density in known wet volume of soil

3. Application and Derivation

Soil properties data will be used to calibrate and validate the ecogeomorphic (NUMAR) and hydrodynamic models. Data will be used to characterize in situ soil properties across all Delta X sites and to explain changes in vegetation dynamics as a function of soil characteristics. This research will contribute to a better understanding of changes in soil carbon and nutrient (N, P) concentrations, bulk density, and organic matter content due to seasonality, vegetation

growth, and river discharge.

4. Quality Assessment

Data quality for each soil property (e.g., bulk density, N, 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 and quality control were determined by the analysis of certified standard reference material during each run. Acceptable limits for accuracy were $\pm 5\%$. Data outside these limits was not used, and samples were re-run to obtain new accurate values.

5. Data Acquisition, Materials, and Methods

Soil cores were collected at six herbaceous wetland sites (Fig. 2) during the Delta-X 2021 field efforts (2021-03-19 to 2021-04-02). Intertidal stations at the Mike Island site in the Wax Lake Delta (WLD) were sampled on 2021-08-19. Soil studies determine changes in soil carbon and nutrient (N, P) concentrations, bulk density, and organic matter content due to seasonality, vegetation growth, and river discharge regime (high vs. low).

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.

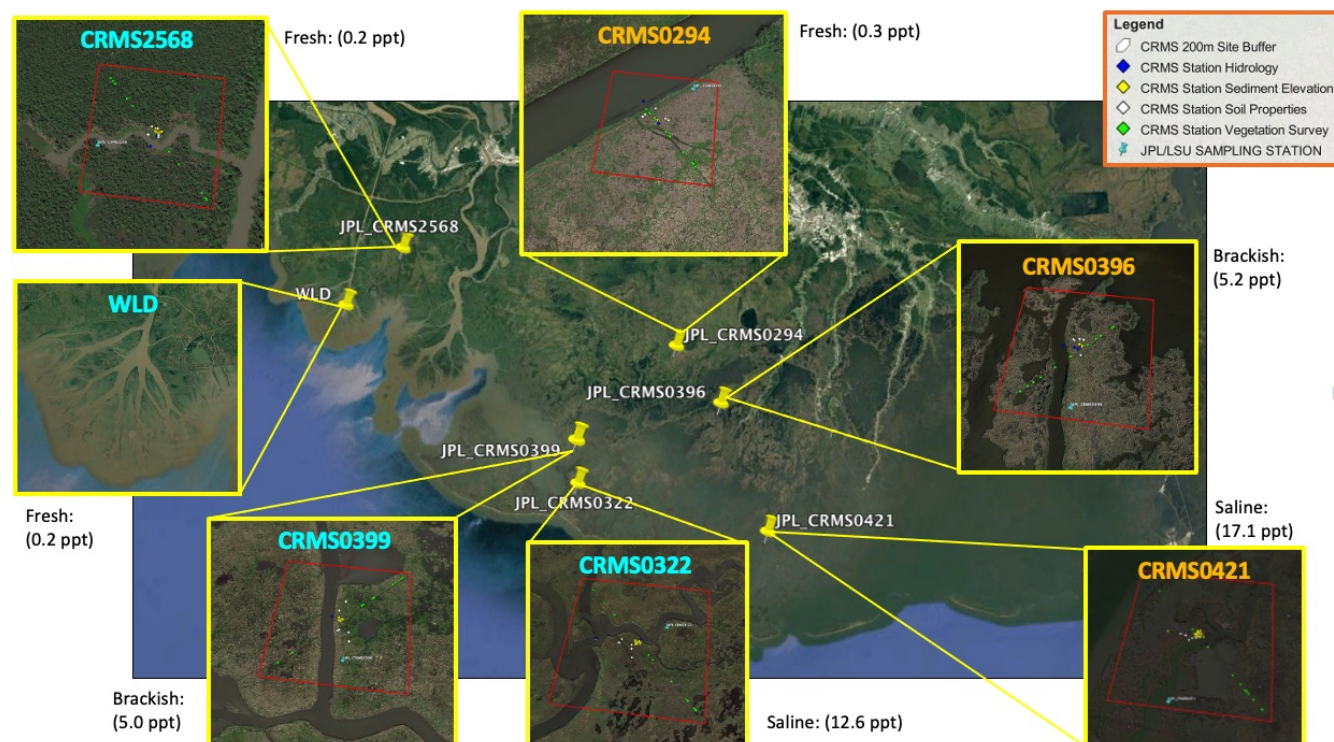


Figure 2. Vegetation sampling sites in Atchafalaya and Terrebonne Basins for the Delta-X 2021 field efforts. The Wax Lake Delta (WLD) location has the *site_id* "Mike Island" in the datafile. Data are not provided for the CRMS2568 site.

At each site, a transect was established perpendicular to the wetland edge to capture a range of hydrogeomorphic zones (HGM, supratidal and intertidal). In each HGM, two sampling stations were established 30 m apart (parallel to the wetland edge). 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, and organic matter content. 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 hours (Davies, 1974). Total carbon (C) and nitrogen (N) concentrations of soil samples were determined for each sample with a NA1500 elemental analyzer (Fisons, Instruments, Inc., Danvers, MA). Ashed samples were also analyzed for total inorganic C (TIC) and the percentage of organic carbon was calculated as the difference between TIC and total carbon (TC) (Dean, 1974; Fourqurean et al., 2012). Total P was extracted using an acid-digested (HCl) extraction and concentrations determined by colorimetric analysis (Methods 365.4 and 365.2; EPA, 1983). Carbon and nutrient content are expressed on a volume basis (mg cm^{-3}) using bulk density values.

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

Contact for Data Center Access Information:

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

7. References

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8. Dataset Revisions

Version	Release Date	Revision Notes
2.0	2022-08-29	Data from August 2021 samples were added. Data from Spring 2021 were updated. Title was revised.
1.0	2022-05-02	Original release with Spring 2021 data.



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