DISTRIBUTION AND VARIABILITY OF BLUE CARBON IN TIDAL MARSH SOILS OF SOUTHERN NEW ENGLAND

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ABSTRACT

Tidal marshes in Southern New England represent critical blue carbon ecosystems and support some of the richest carbon stocks of any ecosystem on Earth. This thesis addresses the challenge of accurately quantifying carbon stocks in these ecosystems and explores spatial strategies for carbon accounting at both a landscape and pedon level. In particular, the study investigates the effectiveness of partitioning tidal marshes into landscape or pedogeomorphic units (PGUs) based on their geomorphic characteristics and using soil morphological characteristics to estimate soil carbon stocks. Soils from 32 separate marshes were described and sampled along transects, representing four different PGUs (back barrier, cove, tidal creek, tidal river). The findings revealed significant differences ($p<0.001$) in carbon stocks among PGUs, with cove marshes exhibiting the highest mean carbon stock at both 100 cm (46 kg m^{-2}) and 200 cm (83 kg m^{-2}) depths and back barriers holding the least amount of carbon at both 100 cm (20 kg m^{-2}) and 200 cm (27 kg m^{-2}). Plant community and linear distance from open water were not accurate predictors of carbon stocks ($p=0.859$ and $p=0.449$, respectively). The study emphasized the need to measure carbon stocks to at least 200 cm depth for more precise blue carbon accounting, as there was a large amount of carbon stored below 100 cm. All PGUs, with the exception of back barriers, held more carbon than when applying a previously suggested single value for the contiguous United States (27.0 kg m^{-3}), suggesting that a regional-based pedogeomorphic approach to carbon accounting in tidal marshes is more effective than a broad carbon density value. In order to model soil carbon stocks at the pedon level, we utilized soil morphological properties (including texture and color) and PGUs to develop soil material groups (SMGs) for modeling carbon density of previously described and characterized soils (285 total samples analyzed for carbon content, texture, Munsell color, and fluidity). The final grouping of SMGs includes 2 organic material SMGs (SMG A: organic soil materials from back barriers and tidal creeks; and SMG B: organic soil materials from coves and tidal rivers), and 3 mineral SMGs (dark loamy -- loamy materials with a color value of ≤3; light loamy -- loamy materials with a color value of >3; and sands -- sands and loamy sands). Significant pairwise differences ($p<0.05$) between the mean carbon densities of the final SMGs were found (except for between SMG A and dark loamy materials; $p=0.346$) indicating that PGU and soil characteristics were significant factors in estimating carbon density. These findings highlight the potential for more accurate pedon level and region-specific carbon stock estimates in Southern New England tidal through efforts such as soil survey.

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PREFACE

This thesis was written and formatted following the guidelines presented by the University of Rhode Island Graduate School. There are two chapters: Carbon Stocks of Southern New England Pedogeomorphic Units (Chapter 1), and Use of Soil Horizon Characteristics to Model Carbon Density in Tidal Marsh Soils of Southern New England (Chapter 2) following guidelines for publishing these works in the Soil Science of America Journal.

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CHAPTER 1

CARBON STOCKS OF SOUTHERN NEW ENGLAND PEDOGEOMORPHIC UNITS

ABSTRACT

Tidally influenced salt marshes support some of the highest carbon stocks of any of the Earth's ecosystems. As climate change continues to accelerate, one ongoing debate centers on the most effective spatial strategies for carbon accounting of these blue carbon ecosystems. Recent meta-analyses suggested the best strategy for carbon accounting of tidal marshes was to use a single carbon density value of 27 kg C m^{-3} to 1 m depth for all marshes until a better approach to map stocks in these ecosystems could be supported. In this study, we tested if partitioning tidal marshes into pedogeomorphic types (units) was an effective approach to understand the spatial distribution of carbon stocks in tidal marshes. We measured carbon stocks to 2 m in 48 soils from 32 tidal marshes representing 4 different pedo-geomorphic units (PGUs; back barrier, cove, tidal creek, tidal river) in southern New England. We found significant differences in carbon stocks among PGUs ($p<0.001$), with cove marshes having the highest mean carbon stock at both 100 and 200 cm depth (46 and 83 kg C m^{-2}, respectively). Mean carbon stock of tidal rivers was statistically similar to coves (42 kg C m^{-2} to 100 cm and 75 kg C m^{-2} tot 200 cm) while tidal creeks have significantly less but intermediate mean carbon stocks (33 kg C m^{-2} to 100 cm and 52 kg C m^{-2} at 200 cm). Back barrier marshes had the lowest mean carbon stocks at both 100 and 200 cm (20 and 27 kg C m^{-2}). Plant community was not an accurate predictor of carbon stocks at the 100 or 200 cm depths ($p=0.859$ and $p=0.449$, respectively), nor was linear distance from sampling location to open water at either sampling depth ($p=0.351$ and $p=0.694$, respectively). Total thickness of all organic horizons in the upper 200 cm was significantly correlated with total 200 cm carbon stocks ($r^2=0.512$, $p<0.001$). Tidal creeks were the only PGU that did not exhibit this relationship ($p=0.754$). Our findings suggest the need to measure C stocks to at least a 200 cm depth for accurate blue carbon accounting. In contrast to the previously suggested use of a singular standard carbon stock value across tidal marshes to estimate carbon stocks, our study suggests a simple regional-based pedogeomorphic approach to be much more accurate for carbon accounting of tidal marsh soils.

INTRODUCTION

Salt marshes exist at the boundary of aquatic and terrestrial ecosystems in fresh and haline environments on oceanic coasts across the world. These unique ecosystems are host to a large array of fauna and flora, many of which depend on the marshes for survival (Nixon & Oviatt, 1973). Coastal tidal marshes are also essential for protection of human infrastructure, recreation, and water quality through their mitigation of coastal erosion and anthropogenic nutrient inputs (Barbier et al., 2011) while providing resiliency along coastlines (Masselink, 2019). Tidal marshes are ecologically valuable and serve as a host to commercially important and threatened fauna such as fish and shellfish (Nixon & Oviatt, 1973).

Tidal marshes in New England have formed through a combination of geological and ecological processes since the mid-Holocene (3,700-4,000 yr. B.P.) as rates of sea level rise slowed to approximately 0.06-0.27 cm yr^{-1} (Englehart et al., 2011; Douglas, 2012; Englehart & Horton, 2012). Gradual sea level rise flooded low-lying areas along the coast left by the former glaciation. As these low-lying areas were flooded, a series of estuaries and bays were created. These estuaries and bays were slowly colonized by a variety of salt-tolerant wetland plants; primarily *Spartina alterniflora, Spartina patens, and Distichlis spicata*, which would go on to form salt marshes.

In the majority of southern New England marshes *S. alterniflora* and *S. patens* occur as separate monocultures with *D. spicata* sometimes interspersed among these plants and occasionally forming its own monoculture. *S. patens* is much less salt-tolerant and less tolerant of inundation compared to *S. alterniflora* while *D. spicata* is an early successional plant that is often out competed by Spartina species (Levine et al., 1998) as marsh vegetation succession occurs. *S. patens* tends to inhabit the high-marsh area where the surface is rarely flooded (Bertness, 1991). The low marsh, and the edges of anthropogenic mosquito ditches and natural creeks which dissect the salt marshes, are dominated by *S. alterniflora* as this plant can oxygenate the saturated rhizosphere (Bertness, 1991; Niering & Warren, 1980; Vincent et al., 2013).

Over time, the gradual accumulation of both sediment in the tidal waters and the accumulation of both above and below ground biomass increases the elevation of the marsh (known as accretion), which maintains the equilibrium of the marsh surface to that of sea level (Ellen & Bloom, 1977; Kelley et al., 1988; Wood et al., 1989; Vernberg, 1993; Reed et al., 1999). In-situ vegetative additions to the tidal marsh soils occurs through root production and organic matter debris from the salt marsh plants (Cahoon et al., 2004; Wan et al., 2009). The dense root mats of both species grow and accumulate while sediment in the tidal waters is trapped by above-ground vegetation adding to the marsh elevation (Cahoon et al., 2004; Denise et al., 1999; Wan et al., 2009). Root systems continue to grow upwards as they are buried, and as new shoots grow above the sediment, the cycle continues, allowing for gradual accretion of tidal marshes. Vertical accretion rates during the early stages of marsh development in the mid-Holocene in southern New England averaged 0.11 cm/year with rates as high as 1.72 cm/year in certain coastal environments (Orson et al., 1987; Orson et al., 1998; Turner et al., 2001).

Tidal marshes provide essential habitats for a wide range of plants and animals, including migratory birds, shellfish, and commercially important fish (Minello et al., 2003; Minello et al., 2008). Tidal marshes also provide important ecosystem services essential for humans such as water filtration, erosion control, and carbon sequestration (Peterson et al., 2008; Mitsch et al., 2013). In the fight to limit global warming, carbon sequestration is one of the more important ecosystem services that salt marshes provide (Mcleod et al., 2011; Byrd et al., 2018). Stolt and Hardy (2022) reported carbon sequestration rates in southern New England salt marsh soils to be an order of magnitude greater than forested soils. Carbon accumulation in marshes occurs through two means: vegetation additions and sediment and detritus deposition (Turner et al., 2001; Lei et al., 2013). Tidal marshes are one of the most biologically productive systems on earth, providing a continuous supply of carbon to the soils in the roots and above ground biomass. Carbon accumulation from sediment and detritus deposition is primarily driven by the carbon-rich sediments from marine ecosystems rather than upland sediment inputs (Macreadie et al., 2021; Redfield, 1965; Turner et al., 2000; Weston, 2013). Sediment accumulation is primarily controlled via hydroperiod and sediment supply (Friedrich and Perry, 2001; Nolte et al. 2012).

Currently (in the Anthropocene), tidal marshes are subjected to accelerated sea level rise (ASLR) with the sea level rising at as much as 2 to 5 times greater than historic rates of 0.60-2.7 mm yr^{-1} and as such, many marshes are no longer able to accrete fast enough to keep pace with the rising seas (Englehart et al., 2011; Douglas, 2012; Boon, 2012; Englehart & Horton, 2012; Cazenave et al., 2018). This results in the high marsh becoming more inundated and resembling a low marsh environment, with *S. alterniflora* outcompeting *S. patens*. In addition, *S. patens* tends to not be able to migrate at the same rates as low-marsh due to the steeper elevation at the marsh-upland barrier (Niering & Warren, 1980), resulting in the loss of high marsh environments. At the highest ASLR rates tidal marshes become totally submerged and drown (Morris et al., 2002; Omrod, 2019; Mariotti, 2020), resulting in a loss of the valuable ecosystem services these ecosystems provide as drowned marshes degrade and are lost to erosion.

One reason salt marshes are such effective carbon sinks is the carbon rich marine sediment which settles on the marsh surface and is trapped by vegetation (Mcleod, 2011). There are many processes which increase the concentration of sediment in surrounding waters including increased tidal velocity (especially during storm events) (Reed et al., 1999), wave action (Day et al., 1998), and offshore erosion (Reed, 1989). To a lesser degree upland sediment may be deposited from tidal creeks and rivers (Friedrich and Perry, 2001). Additionally, local geology plays a role in the particle size and thus suspended particle concentration in the water. Much of the fine sediments associated with the prior coastal plain in southern New England were lost during the recent glaciation (Friedrich and Perry, 2001) leading to coarser materials in these soils compared to other regions of the country. Sediment deposition onto marshes tends to increase in the summer and decrease in the winter as a result of the higher amount of baffling provided by vegetation during the warmer months. Although sediment additions are critical to the marsh accretion, organic accumulation has been shown to historically keep pace with sea level rise even in areas with little to no sediment accumulation

(Redfield 1965; Nyman et al., 2006). As sedimentation rates have declined across the globe (Walling & Fang 2003; Syvitsky et al., 2009), the importance of above ground and below ground plant additions may be even more critical to salt marsh accretion and survival in the future.

The combination of low organic decomposition rates, high productivity, and high amounts of sediment inputs makes the salt marsh ecosystem a very effective and efficient storehouse for carbon (Mcleod, 2011). Carbon accumulation rates in salt marsh soils are much greater than other terrestrial systems because of high carbon inputs from in-situ deposition (including both above and below ground biomass) and carbon rich sediment accumulation. Also important are the factors that limit the amount of organic matter decomposition including elevated salinity levels (Baustian et al., 2017), consistent reducing conditions (Cruz et al., 1989; Howes et al., 1981), and the potential toxicity of elevated hydrogen sulfide levels (Rabenhorst & James, 1993; Malik et al., 2018).

Because there is near constant inundation of salt marsh soils, vegetative community structure is primarily driven by pore-water salinity within tidal marsh soils (Niering & Warren, 1980; Vernberg, 1993; Hester et al., 2001). Pore-water salinity levels in turn are primarily driven by the distance between a point and the source of saline water, be it a tidal creek, river, ditch, or the open water (Baustian et al., 2017). Other variables, however, such as evapotranspiration or tide (Hussey& Odum, 1992) may also affect pore-water salinity levels at the time of measurement. Traditionally, elevated salinity levels were thought to correlate with lower rates of decomposition due to decreasing rates of organic material mineralization (Craft, 2007; Noe et al., 2013), however, there are conflicting studies which indicate salinity may not be correlated or may be negatively correlated with organic matter accumulation (Ibanez et al., 1999; Roache et al., 2006).

Due to their inundated nature, tidal marshes tend to have strongly reducing conditions to the near-soil surface (Stribling et al., 2007). Under these conditions, microbial organic matter decomposition is minimized (Freeman et al., 2001; Megonigal et al., 2004). In addition, with a constant source of sulfate in the marine waters, and the strongly reducing conditions, sulfides can rapidly form in the tidal marsh soils. In cases where hydrogen sulfide occurs at highly elevated levels, microbial decomposition can be slowed. Most salt marshes have neutral to high pH values because of the saline waters. However, small aerobic zones can develop in the rhizosphere immediately surrounding *S. alterniflora* roots due to their aerenchyma diffusing oxygen into the surrounding soil (Howes & Teal, 1994). The introduction of oxygen can oxidize mono and disulfides formed in the soils causing acidic soils conditions which also has been shown to limit organic matter decomposition (Rabenhorst & James, 1993; Malik et al., 2018). Since each of these processes limits organic matter decomposition salt marsh soils tend to accumulate more carbon than other soils.

Since the Kyoto protocol of 1997, there has been an increased focus on carbon accounting of various ecosystems to understand the carbon cycle throughout the world as anthropogenic climate change fueled by increased carbon emissions continues to advance and accelerate (Csutora & Harangozo, 2017; Stechemesser & Guenther, 2012). Specifically, within the past decade, research into the carbon storage potential of blue carbon ecosystems (including tidal marsh soils) has gained momentum as they are large sinks for carbon (Crooks et al., 2011; Holmquist et al., 2018; Lovelock & McAlister, 2014; Mcleod et al., 2011; Needleman et al., 2018). Along with the intrinsic benefits to understanding carbon dynamics across blue carbon ecosystems, there is a financial and policy benefit as well (Friess et al., 2022; Sutton-Grier & Moore., 2016). Friess et al. (2022) valued the global financial blue carbon credits at approximately ten billion USD. Thus, understanding the carbon dynamics in these ecosystems can provide an outline for including blue carbon ecosystems into domestic and international policy frameworks towards implementation of carbon credits (Sutton-Grier & Moore, 2016).

Currently, blue carbon ecosystems, like tidal salt marshes, are rapidly being lost to coastal development and ASLR. Thus, by understanding which marshes store the most carbon, local governments and NGO's can prioritize which marshes to manage or protect to conserve their ecological function and carbon sequestering ability. Capitalizing on their use in the carbon market would provide additional local benefits such as building coastal resiliency and conservation of the fauna of these threatened ecosystems (Friess et al., 2022; Lovelock & McAlister, 2014; Mcleod et al., 2011; Needleman et al., 2018; Siikamäki et al., 2013; Sutton-Grier & Moore, 2016).

In order to effectively implement carbon accounting policy of tidal marshes and other blue carbon ecosystems accurately and effectively, it is imperative to have a full understanding of current spatial carbon dynamics in these marsh soils (Needleman, 2018; Mcleod et al., 2011). Unfortunately, as noted by Holmquist et al. (2018), the current mapping of tidal marsh systems is imprecise and inadequate to effectively provide accurate carbon accounting data. The inaccuracies in tidal marsh soil maps are due to their expanse and variability (Mcleod et al., 2011). These ecosystems have not been precisely mapped at the same extent as upland soils, as traditionally soil mapping has primarily been used for agricultural or developmental purposes, and salt marshes are not suitable for either. Additionally, these ecosystems are difficult to traverse, and sampling can be slow and tedious. Modeling carbon quantities and spatial distribution has been mostly unsuccessful (Holmquist et al., 2018). For example, Baustein et al. (2017) and Holmquist et al. (2018) reported variables of climate and salinity to have no significant correlation with soil carbon content. One variable that has shown promise to correlate with carbon stocks and sequestration is geomorphic setting (Holmquist et al., 2018; Gorham et al., 2021). To calculate total carbon stocks across the United States, Holmquist et al. (2018) suggested using a carbon density value of 27.0 kg m^{-3} for the upper meter of soil (effectively 27.0 kg m^{-2}) to estimate stocks. Depth of sampling (> 1m) can be critical to carbon stock accounting, even though carbon density decreases with depth. Studies have shown that there is still substantial carbon stored in many marshes below 100 cm (Kim 2022).

In this study, we hypothesized that similar geomorphic settings have gone through similar formation in regard to tidal range, wave action, sedimentation, vegetation growth; and therefore, should have similar carbon stocks. The objectives of this study were to: 1) determine optimal strategies for quantification of soil organic carbon stocks within representative southern New England tidal marshes; 2) identify unique pedogeomorphic units related to the formation of tidal marshes in the study area; 3) relate changes of landscape-level metrics (such as pedogeomorphic unit [PGU], vegetation, and distance to open water) to quantity of soil organic carbon in the study area; and 4) determine total carbon stocks of sampled soils to 100 and 200 cm depths.

To test our hypothesis, we sampled the soils across a range of settings (Figure 1) in 4 different pedogeomorphic units (PGUs): back barrier (Figure 2), cove (Figure 3), tidal creek (Figure 4), and tidal river (Figure 5), to determine their carbon stocks. The term pedogeomorphic unit originates from combining the terms “pedogenesis” (soil formation) and geomorphic unit (a particular landform which has been modified by a variety of geologic processes) in order to describe specific landforms which have gone through similar pedogenic processes. By classifying marshes in the study area into one of these designated PGUs and finding landscape-level variables which significantly correlate with carbon stocks, we hope to be able to model how much carbon is stored in tidal marshes throughout the study area of southern New England for the purpose of carbon accounting.

MATERIALS AND METHODS

Site selection

Salt marshes were identified using digital SSURGO and NRCS Soil Survey data of mapped soils from Wareham MA to Branford CT. Mapped soils were sorted by series names in order to exclude all non-tidal marsh soils. The soil series included: Ipswich (Euic, mesic Typic Sulfihemists), Matunuck (Sandy, mixed, mesic Histic Sulfaquents), Pawcatuck (Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemists), Sandyhook (Sandy, mixed, mesic Haplic Sulfaquents), and Westbrook (Loamy, mixed, euic, mesic Terric Sulfihemists). Digital aerial photographs of each map unit were consulted to identify geographic signatures to classify marshes into one of four PGU's: back barriers, coves, tidal creeks, or tidal rivers.

Back barrier marshes are typically situated between the fore-dune and the coastal lagoon or embayment (Figure 2). Due to their protected nature, back barrier marshes are generally shielded from wave action (Oertel and Woo, 1994). The coastal lagoon or tidal embayment on the landward side of the salt marsh controls the daily tidal fluctuations onto the marsh but the source of much of the sediment that is deposited onto the marsh comes from overwash events during storms (Boothroyd et al., 1984; Walters, 2013). Total area of back barrier marshes within the study area was the lowest of all PGUs at 954 hectares and the majority (65%) of those marshes sampled occurred in southern Rhode Island (Table 1).

Cove marshes are typically subjected to open water tides but are protected from the bulk of wave action except for during high energy storm events (Anderson, 1973). Typically, coves are found on the seaside of the upland and are more drastically and directly influenced by tidal ebbs and flows than back barrier marshes (Anderson, 1973). Cove marshes were identified as marshes which face seaward and are sheltered on 2 sides by upland or are protected from harsh wave action from either islands or other landforms (Figure 3).

Tidal creek systems formed in low-lying areas adjacent to the coast which were filled with sediment during the mid to late Holocene (Fitzgerald et al., 2002). Tidal creek marshes (Figure 4) are defined by their association with relatively long yet narrow, shallow water systems that exhibit tidal water level fluctuations but weak tidal currents. The creeks have low hydrodynamic energy without significant wave action. The banks of tidal creek are typically well vegetated limiting erosion and promoting sediment deposition (Healy, 2005). Tidal creek marshes of southern New England tend to have smaller watersheds than tidal rivers, but larger marshes relative to the stream width (Stolt, 2016). Networks of tidal creeks are generally directly connected to the ocean and consist of many braided streams carrying less water than tidal rivers and have bidirectional flow (Brinson, 1993; Stolt, 2016). Tidal creek marshes cover similar amounts of the land area as cove marshes (Table 1).

Tidal river marshes are generally along the banks of current day rivers and within drainage basins originating from glacial-drainage systems and thus the channels are larger and carry more water volume than tidal creek systems (Orson et al., 1987; Fitzgerald et al., 2002). Compared to tidal creeks, tidal rivers tend to be more straight with less interwoven stream channels, rather one main channel is the primary carrier of water and sediment with thinner marshes along the river banks (Stolt, 2016). Tidal rivers have larger watersheds than tidal creeks, and more potential for greater amounts of sediment to be deposited. For the purpose of this study, if a marsh was directly connected to a named river then it was generally considered to be a tidal river (Figure 5). Of the total area of land area covered by tidal marshes in southern New England, over 40% of the marshes were tidal river marshes (Table 1).

Marshes were reviewed with Google Earth satellite imagery and Open Street Maps via QGIS to verify validity of site characteristics and accessibility. Representative marshes that were legally accessible, greater than 3 acres in size, and not dominated by *Phragmites australis (*Table 1) were selected for study of each of the 4 PGUs.

Field Sampling

Soils were described and sampled along a transect perpendicular to the open water (Schoeneberger et al., 2014). Transects had no fewer than 3 description points and no more than 6. Pedons were chosen to capture variability within distinct sections of the salt marsh ecosystems (high and low marsh as determined by vegetation). At least one pedon was described in each section of the marsh (high marsh and low marsh). At least one third of described pedons were sampled in duplicate for soil analyses, and approximately 10% of described pedons were sampled in triplicate in order to capture intra-pedon variability.

At each sampling point dominant vegetation was described to the lowest possible taxonomic level, GPS coordinates were recorded, and soil pore-water halinity was measured with an optical refractometer to the nearest part per thousand. A tiling spade was used to remove a roughly 50 cm diameter plug of soil to a depth of approximately 30 cm using a 40 cm long tiling spade. This plug was used to collect samples from the upper 30 cm using the brownie method wherein the plug is cut into blocks of a known volume for bulk density calculations (Stolt & Hardy, 2022). Below 30 cm a Macaulay peat sampler was utilized to collect undisturbed samples until refusal (typically non-fluid mineral soil materials). If the Macaulay was not able to sample to at least one meter, then a bucket auger was utilized to describe the remaining horizon(s). Bucket auger samples were not utilized for measures of sample volume for bulk density calculations due to their inability to capture undisturbed samples.

Field-based soil descriptions were made to at least one meter depth to facilitate classification to at least the family level in Soil Taxonomy (Soil Survey Staff, 2022). If the Macaulay peat sampler was able to sample lower than 100 cm, then descriptions were made until the Macaulay hit refusal and a bucket auger was utilized to describe the horizon which caused refusal. Basic field descriptions included the following horizon information: horizon designations, depths, Munsell colors, textures, course fragment content, von Post classification, sulfide odor, and fluidity (Schoeneberger et al. 2014). A record of the descriptions including field descriptions and laboratory data can be found in Appendix A.

One third of described pedons had duplicate bulk density samples collected with either a Macaulay peat sampler or through the brownie method (Stolt & Hardy, 2022). When a volumetric sample could not be obtained, bulk density was estimated using an exponential regression model based on soil organic matter content (Appendix B). Duplicate samples were collected of every horizon greater than five centimeters in thickness. Samples were placed in a cooler with ice packs to minimize oxidation of sulfidic materials and were refrigerated for no more than seventy-two hours before running laboratory analyses of initial pH and electrical conductivity.

Laboratory Analyses

Within seventy-two hours of field sampling, duplicate soil samples were processed and wet weight, electrical conductivity (EC), and initial pH measurements were recorded. Electrical conductivity was measured at a 5:1 water:soil ratio with a Hannah Instruments HI99301 conductivity meter. Initial pH samples were measured with a bench-top meter and performed with volumetric 1:1 water:soil ratio. We followed the NRCS Soil Taxonomy standard methods to determine presence of sulfidic materials (Soil Survey Staff, 2022). Oxidized pH measurements were conducted weekly until the pH dropped below 4 indicating the presence of sulfidic materials (Soil Survey Staff, 2014).

If the pH didn't drop below 4 after a 16 week monitoring period, the pH was monitored until it stopped dropping or until it finally reached a pH of 4.

After initial time-sensitive analyses were performed, samples were dried at 105◦C for at least twenty-four hours (or until no change in weight was detected with more drying) to determine dry weight and bulk density. Samples were cooled in a desiccator to prevent reabsorption of water and weighed to the nearest hundredth of a gram to determine dry weight. Dried samples were gently ground with a mortar and pestle to break apart aggregates so that the fine-earth fraction would pass through a #10 sieve. Any organic fragments that did not pass through the sieve were weighed separately and designated "stable plant fragments". Coarse mineral fragments which did not pass through the sieve were weighed separately. Coarse fragment weight and volume were subtracted from original sample measures to calculate bulk density.

The fine-earth sized soil materials were homogenized and a subsample was placed in a pre-dried and weighed crucible. Samples were dried at 105◦C for at least eight hours (or until no change in weight was detected with more drying) and placed in a desiccator to cool. Cooled crucibles with sample were weighed to the nearest hundredth of a gram before placing into a muffle furnace at 550◦C for 5 hours to determine soil organic matter (SOM) content. Samples were left in the muffle furnace for at least 8 hours to cool. Cooled ashed samples were removed from the muffle furnace and placed into a desiccator for at least eight hours to ensure they were dry. Samples were then weighed, and loss on ignition (LOI) was determined by subtracting the ashed subsample weight from the original dried subsample weight. Percent SOM was determined by dividing the LOI weight by the original oven dry sample weight and multiplying by 100.

A range of samples were selected, representing both mineral and organic soil materials and having a range of SOM contents and soil textures, for organic carbon analysis via high temperature combustion (Nelson & Sommers, 1996). These samples (approximately 20% of all samples; 150 of 690) were ground with a mortar and pestle to pass through a #60 sieve. Once ground, approximately 3.0 to 20.0 mg of dry soil was subsampled in triplicate and analyzed using a Costech Analytical ECS 4010 (Costech Analytical, Valencia, CA) high temperature combustion elemental analyzer. Temperature of the combustion column was kept at 980°C and the reduction column was kept at 650°C. The drying oven was kept at 65°C. Helium flow rates were kept at 105 ±5 mL min^{-1} and oxygen was kept at 25 ± 5 mL min^{-1}. Acetanilide samples of a known carbon content were run every 10-15 samples in order to ensure calibration. Stable plant fragment samples were also processed through the ECS 4010.

Soils were grouped into mineral and organic materials based on standard criteria (Soil Survey Staff, 2022) in order to develop a SOM to SOC regression models. These models were applied to all the mineral (<24% SOM; n= 115; r^2 =0.98) and organic (≥24% SOM; n= 73; r^2 =0.95) samples (Appendix C and D) to determine SOC for all the samples.Average SOC to SOM ratio for the stable plant fragment samples (n= 30) was 0.54 with a standard deviation of 0.01 and a coefficient of variation of 2.6. The 0.54 SOC to SOM ratio was applied to all the stable plant fragment samples to determine SOC contents. Total C stock of each pedon was calculated by summing stocks for each horizon (Equation 1) to 100 and 200 cm. In some cases, it was not possible to collect an undisturbed sample from each horizon to 200 cm. In such cases, it was assumed that the last sampled horizon extended until 200 cm and the bulk density and carbon content of that last horizon also extended until 200 cm. Because of the relatively low carbon content of these difficult to sample horizons (often <1%), and the statistical power of the model to estimate bulk density from SOM contents (r^2=0.91), we assumed that these estimates were not significantly different than the actual carbon stock.

Statistical Analysis

JASP 0.16.40 (JASP Team 2023) was utilized to compare carbon stocks among marsh PGUs as well as other landscape variables including dominate vegetation, and distance to open water. Prior to modeling, we applied a Shapiro-Wilk test in order to ensure our data was gaussian and could be accurately modeled using gaussian methods. We used a single factor ANOVA to test for significant differences ($p<0.05$) among mean carbon stocks of the four PGUs. A Tukey-Kramer Honest Significant Difference test was applied to our ANOVA results to find significant differences between all possible pairs of means after applying the ANOVA. Additionally, landscape-level variables such as latitude, longitude, primary vegetation, depth to mineral materials, and distance from open water were examined to test for significant correlations to carbon stocks through the use of ANOVA, linear regression, and linear mixed models. Total carbon stored across the study area was determined by multiplying area and carbon stock per area for each PGU and summed together.

Equation 1: Equation to calculate total kg C m^{-2} of each horizon in a soil profile. BD = bulk density, SOC = soil organic carbon, HT = horizon thickness, CF = coarse fragments.

$$Horizon\ C\ Stock\ (kg\ C\ m^{-2}) = BD\ (g\ cm^{-3}) \times \%\ SOC \times HT\ (cm) \times (100 - \%\ CF) \times .001$$

RESULTS AND DISCUSSION

Comparison of carbon stocks of pedogeomorphic units:

We found carbon stocks to be significantly different among PGUs at both 100 and 200 cm (Table 2). Cove marshes had the highest average carbon stocks to 100 cm (mean=46 kg C m^{-2}; Table 4; Figure 6) and 200 cm (83 kg C m^{-2} Figure 7). These marshes are directly adjacent to open water in the back of estuarine areas and are protected from energy related to storms and wind driven waves since they are sheltered on two sides by uplands (Figure 3). Cove stocks (46 kg m^{-2}) were significantly higher than back barriers (21 kg m^{-2}) and tidal creeks (33 kg m^{-2}) at the 100 cm ($p<0.001$ and $p=0.02$, respectively; Table 2) and 200 cm depths ($p<0.001$ and $p=0.008$, respectively; Table 2). The high C stocks may be due to cove marshes having the thickest average organic thickness with depth to a mineral horizon of >5 cm being 88 cm (Table 3). Although adjacent to open water, cove marshes are well protected from turbulent waves and tidal forces which have allowed the marsh to accrete for longer periods than other PGUs on the southern New England coast without being eroded. Thus, we hypothesize that these marshes are relatively older than the other marshes which has allowed them to accumulate thicker organic deposits, carbon-rich sediments, and consequently higher C stocks than other PGUs.

Cove marshes have an average organic horizon thickness of 88 cm (Table 3) and predominantly classify as Sulfihemists and Sulfisaprists (41.2% and 32.4%, respectively). The full extent of C storage in cove marshes may be significantly under accounted for to 200 cm as some of these marshes (14% of cove pedons) have organic materials over 2 meters thick. For example, the three pedons sampled at Colonel Willie Cove marsh in Westerly, RI had the highest 200 cm depth carbon stocks of any visited marsh (94, 95, & 137 kg C m^{-2} to 200 cm), as well as the deepest organic materials (>350 cm at pedons CWC 1, CWC 2, and CWC 3; Appendix A). The high C stock of this particular cove is likely due to its protection from tidal action and forces from waves and is likely one of the oldest and most well protected marshes. This protected environment fosters optimal conditions for organic materials to accumulate, minimizing erosion and transportation away from the marsh. The other marshes with over 200 cm of organic materials were Duck Cove in North Kingstown and Fort Getty in Jamestown. Both these marshes had organic horizon thicknesses ranging from 60-200+ cm organic materials with the deeper organic materials tending to be in parts of the marsh farther away from the open water. In order to capture the full extent of the carbon accumulated in southern New England cove marshes, future studies should consider sampling to at least 3 meters, including any carbon-rich mineral materials.

Back barrier marshes are situated between the ocean-front fore-dune and the adjacent coastal lagoon or embayment. Average carbon stocks to 100 and 200 cm ranged from 20 to 46 kg C m^{-2}, respectively (Table 4 and Table 5). Back barrier marshes had significantly less carbon stocks calculated to 100 cm than coves ($p<0.001$), tidal creeks ($p=0.018$), and tidal rivers ($p<0.001$) (Table 6; Figure 6). Likewise, back-barrier marshes had significantly less carbon stocks calculated to 200 cm than the other three PGUs (Table 7). Daily tidal fluctuations from the coastal lagoon or tidal embayment provides the low energy sediment to the back barrier marshes, however, much of the sediment deposited onto these marshes comes from high energy overwash events during storms (Boothroyd et al., 1984; Walters, 2013). During hurricanes and other strong storm events large amounts of sediment can be deposited on these marshes and bury the marsh under 10-30 cm of low-carbon density sandy materials (Stolt & Hardy, 2022). Back barrier marshes sampled in this study tended to have thinner organic horizons than other PGUs (mean 32.1 cm, median 19.00 cm, Table 8) and are predominantly (58%) classified as Sulfaquents with sandy family particle size classifications. Only 8 out of 30 pedons investigated in back barrier PGUs classified as a Histosol (primarily Sulfisaprists). In addition, the back barrier marshes tended to have higher amounts of carbon-poor sands compared to other PGUs ($p<0.001$) (see chapter 2 for carbon concentrations). The carbon-poor sands may lower the primary productivity of the marsh reducing the vegetative addition of carbon to the soil in these systems.

For this study, we identified tidal creek marshes by their association with relatively long yet narrow, shallow water systems that exhibit tidal water level fluctuations but weak tidal currents. In general, tidal creek pedons classified as either Sulfihemists (56.25%) or Sulfisaprists (31.25%) and were nearly equally split between Terric (56.25%) or Typic (43.75%) subgroups. Tidal creek marshes held on average 33 kg C m^{-2} to 100 cm depth and 52 kg C m^{-2} to the 200 cm depth (Tables 1 and 4). Due to the meandering nature of these creeks, and a larger edge area relative to the other PGUs, sediment is easily trapped along the edges by *S. alterniflora* that inhabits these low marsh areas. The trapped sediment creates a slight berm along the creek side and limiting the majority of deposited sediments to within 20 m of the current creek (Denise et al., 1999). This process may affect carbon stock distribution and cause highly variable carbon stocks of tidal creek marshes depending on how much the creek has migrated over the lifetime of the marsh.

We classified tidal river marshes as those marshes which directly border tidally influenced rivers. As distance increases away from the ocean and upstream, the vegetation of tidal river marshes tends to trend towards *Spartina patens* and *Distichlis spicata* and away from *Spartina alterniflora*. This is due to the lower tidal influence and thus lower salinity farther from the ocean (Perry

& Atkinson, 2009). Tidal rivers of southern New England are remnants of deglaciation (Orson et al., 1985; Fitzgerald et al., 2002), and thus have likely been on the landscape longer than tidal creeks and back barriers. These rivers typically had freshwater wetlands surrounding them which once sea levels began to rise were converted to salt marshes over time. These riverine salt marshes are still present on the landscape and consist of recent saltmarsh deposits on top of freshwater wetland deposits. Thus, we expect tidal rivers to store a higher amount of carbon than other PGUs.

Average C stocks of tidal rivers were 42 kg C m^{-2} for 100 cm depths and 75 kg C m^{-2} for the 200 cm depth (Table 2; Figure 6 and Figure 7). The tidal river stocks were significantly greater than tidal creeks at the 200 cm depth but not 100 cm (Figure 6 and Figure 7). Stocks in tidal rivers were significantly greater than back barrier marshes for both depths, but they were not different from the cove stocks (Figure 6 and Figure 7). The similarity in carbon stocks between coves and rivers may be a function of the similarities in tidal influence, wave action, or similar ages of the marshes; neither tidal rivers nor coves are subject to intense waves (except for during severe storms) and so they are likely not eroded by waves.

Companion studies to ours were completed in the Mid and Southeast Atlantic regions. In the Mid-Atlantic the PGUs examined were back barrier, submerged upland, estuarine non-freshwater, and estuarine freshwater marshes (Kim, 2022). In the Southeast carbon accounting was completed on back barrier and submerged Histosol marshes (Dellinger & Ricker, 2023). The marshes with the highest C density of Mid-Atlantic marshes were found in estuarine non-freshwater PGUs, which had mean C-stocks of 79 kg C m^{-2} to 200 cm. In the south-east region, the most carbon rich PGU was the submerged Histosol PGU, which had mean C stock of 48 kg C m^{-2} to 200 cm. In comparison, cove marshes in southern New England generally accumulated similar carbon stocks to 200 cm (83 kg C m^{-2}) to the Mid-Atlantic estuarine non-freshwater PGUs and nearly twice as much as the richest southeast regions marshes. In contrast, Southeastern Atlantic marshes typically held 12 to 17 kg m^{-2} more carbon to 200 cm than southern New England or Mid-Atlantic marshes barrier marshes (Dellinger & Ricker 2023). Barrier marshes in the southeast are also much wider, often times spanning miles in width, which would limit overwash events from covering the entire marsh, allowing for greater vegetative accretion.

Holmquist et al. (2018) acknowledged the difficulties in C stock accounting in tidal marshes and suggested, until better mapping of these systems was developed, a carbon density value of 27.0 kg C m^{-3} be used to estimate the amount of carbon held in the upper meter of the soil. We found that average carbon stocks of the marshes grouped by PGUs ranged from 21 to 46 kg C m^{-2} when calculating C stock of the upper meter of soil (Table 2) and that there were significant differences among the PGUs (Figure 6 and Figure 7). Compared to the value of 27.0 kg C m^{-3} suggested by Holmquist et al. (2018) for carbon accounting, our C stock values are substantially lower for back barrier marshes and noticeably higher for cove and tidal river marshes (Table

9). Total carbon stock of tidal creeks in southern New England is under estimated when applying a broad 27.0 kg C m^{-3} density value to sampling depths of 100 cm, but not 200 cm (Table 4); this was the only instance where our estimates and those using the standard value suggested in Holmquist et al. (2018) were similar. Our calculations indicate a 95% confidence interval of tidal creek stocks to 200 cm to fall between 567 and 851 gigagrams across the entire study area, while using the Holmquist et al. (2018) standard value of 27.0 kg C m^{-3} in tidal creeks yields C stocks of 367 and 733 gigagrams C to 100 and 200 cm, respectively. Although the use of a standard value of 27.0 kg C m^{-3} results in a carbon stock value within our 95% confidence interval for tidal creeks, it may fail if stocks are modeled deeper as the standard value does not consider the decrease in C density as depth increases whereas grouping based on PGU does.

The 95% confidence interval for our data indicates the total estimated C stock for tidal marshes of the study area is between 2,052 and 2,662 gigagrams to 100 cm (mean = 2,358 gigagrams). A 95% confidence interval for our data estimates a 200 cm C stock of between 3,358 and 4,729 gigagrams (mean = 4,044 gigagrams). Use of the 27.0 kg C m^{-3} standard density value suggested by Holmquist et al. (2018) yields 1,676 gigagrams to 100 cm and 3,351 gigagrams to 200 cm (Table 4). This value substantially underestimates C stocks to 100 cm in southern New England and is close to the lower end of the 95% confidence interval for the 200 cm depth. Using a weighted average of our mean carbon stocks of each PGU weighted by relative area of each PGU yields an estimated weight of total carbon stored of 2,277 gigagrams to 100 cm and 3,884 gigagrams to 200 cm; both values falling within our 95% confidence interval and both being closer to our estimated values than use of values from the study by Holmquist et al. (2018). This suggests that for regional carbon accounting, carbon density measurements should be tailored to the specific region and PGU as this will generate a carbon stock value closer to the true value for the specific region.

Our studies, and those of our companions in the Mid-Atlantic and Southeast point to the importance of calculating carbon stocks to at least 200 cm. It should be noted that about two-thirds of the pedons we sampled could not be volumetrically sampled all the way to 200 cm. These samples were saturated non-fluid sands or loamy soil materials which could not be obtained with a Macaulay peat sampler. To account for the carbon held in these samples, we sampled with a bucket auger and used an exponential regression model based on SOM-bulk density relationships of samples with similar SOM contents to estimate bulk density. These samples were nearly always light-colored sands with SOC contents of <1-2% (Chapter 2). Thus, we are unlikely to have drastically over or underestimated carbon stocks. Both light colored loamy materials and sands have carbon densities <27.0 kg C m^{-3} (23.7 and 13.2 kg C m^{-3}, respectively; see data in Chapter 2). As sampling depth increases, the soil tends to be composed of more light loamy materials and sands than dark loamy or organic materials (which have C densities ≥ 34.3 kg C m^{-3}). This suggests C stocks of southern New England marshes may not be able to be accurately modeled with a standard volumetric C density value of 27.0 kg C m^{-3} used for global tidal marshes, but rather area-based C density values should be calculated regionally by different PGUs in order to produce a more accurate carbon accounting results. Additionally, more sampling with a vibracore or similar sampling device that can obtain relatively undisturbed volumetric samples should be done in order to better understand C density below 200 cm.

<u>Use of vegetation as a predictor of carbon stocks</u>

The plant community is largely controlled by soil pore water salinity and degree of inundation, which would make it an ideal metric to model carbon stocks based off satellite imagery and remote sensing. Plants contribute carbon to the marsh soil through in-situ accretion in the form of roots and detritus, and through the baffling effect on sediment leading to mineral accretion. Because there is a strong zonation in plant communities between the high marsh and low marsh, a natural question is: does the low marsh dominated by *S. alterniflora* have a significantly different carbon stock than the high marsh dominated by *S. patens* or *D. spicata*? When using primary plant cover as a predicator variable, we found that there were no significant differences in carbon stocks to 100 cm ($p=0.859$) and 200 cm ($p=0.449$) (Figure 8). When individual PGUs were examined for this relationship, no PGU had significant correlations between primary plant cover and carbon stock ($p > 0.05$). Although the historic plant community may have been a potential predictor for carbon stocks, the current plant community observed in tidal marshes is likely distinct from its pre-modified state due to the lasting impact of ditching activities (Burdick et al., 2020). Historically, tidal marshes have undergone anthropogenic modifications, with extensive ditching being a prominent alteration over the past two centuries. This human intervention has significantly disrupted natural hydrological patterns and altered the salinity regime of these ecosystems. The changes in water flow and salinity resulting from ditching have led to shifts in plant species composition, favoring those species more tolerant to altered conditions. Furthermore, due to ASLR, tidal marsh plant communities are undergoing further transformations. As tidal marshes migrate landward in response to rising sea levels, plant communities experience varying inundation and salinity regimes. The shifting hydrological conditions, in turn, drive changes in species composition as plant populations adapt to the evolving environment (Kirwan & Megonigal, 2013).

<u>Effects of distance to open water on organic depths and C stocks</u>

We hypothesized that thickness of the organic horizons, measured as the depth to the first mineral horizon >5 cm thick, would decrease from open water to the upland marsh boundary in the tidal creek, tidal river, and cove PGUs. The hypothesis was based on the concept of marsh migration, where older marshes are adjacent to open water and thus have more time to accumulate carbon in the form of peat and younger marshes occur closest to the upland/marsh boundary where migration is currently occurring, and the peat is thin. The older marshes would presumably have thicker organic deposits and the younger marshes less as organic materials take significant amounts of time to accumulate, thus, potentially affecting the carbon stocks. Understanding this spatial relationship would also be useful as soils mapped to the series level are typically identified by the thickness of organic materials.

Back barrier marshes had no significant relationship ($p=0.356$) between distance to open water and depth to mineral horizons. Total thickness of all organic horizons within the top 100 cm and 200 cm was the same in back barrier marshes, and total thickness of organics was correlated to distance to open water ($p=0.011$), however the correlation was relatively weak ($r2=0.164$). This was not the expected outcome of the analysis as most deposition of mineral materials come from overwash events, oceanic waves and storm surges that can bury the marsh in sand and can also extend the marsh into the barrier lagoon. Organic material accretion would theoretically be greatest closest to the barrier lagoon which has the highest water table and tidal range.

Tidal creeks had a weak ($r^2=0.312$) but significant relationship between depth to mineral horizons and distance to open water ($p=0.013$; Figure 9); however, there was no significant relationship between C stock and distance to open water, which is contrary to what would be expected considering organic material depth is correlated with total carbon stock. The weak positive relationship between depth to mineral horizons and distance to open water is contrary to what we expected as we assumed the older parts of the marsh (which have a longer time to accrete organic material depth) would be closer to the stream channel. This relationship may be due to increased mineral material deposition closer to the water-channel from baffling by *S. alterniflora* which causes a decrease in flow speed (Leonard & Luther, 1995).

We found depth of organic horizons to the first mineral horizon >5 cm thick to be significantly correlated with total carbon stocks to 100 and 200 cm when all PGUs are combined ($p=0.001$ and $p<0.001$, respectively) (Figure 10 and Figure 11). The relationship, however, is relatively weak ($r^2=0.1964$ and $r^2=0.3108$, respectively) and cove marsh PGUs were the only PGU which had a significant relationship to 100 cm and 200 cm ($r^2=0.5104$ and $r^2=0.6804$, respectively; Figure 12 and Figure 13). As expected, when total thickness of organic materials within the upper 200 cm was summed in all marshes, it exhibited a significant and moderately strong ($r^2=0.512$, $p<0.001$) relationship to 200 cm C stock (Figure 14); however, cove marshes were the only marsh in our study where depth of organic horizons to the first mineral horizon (>5 cm thick) was significantly correlated to carbon stocks ($p<0.001$, $r^2=0.432$ to 200 cm). Unlike back barrier, tidal creek, or tidal rivers, cove marshes tended not to have many buried organic horizons. Although there were examples of thin lenses of mineral material in cove marshes, typically once carbon poor mineral horizons >5 cm thick were observed in coves, the remaining horizons below tended to be mineral horizons, with no more substantial C rich organic horizons. In contrast, barrier marshes often contained many buried horizons due to large amounts of sedimentation from intense storms. The protected nature of cove marshes may allow vegetation in them to accrete while keeping pace with SLR without the influence of large C poor sediment deposits.

We found no relationship among carbon stock and distance to open water across all marshes at both 100 cm and 200 cm sampling depths (p=0.351, and p=0.694, respectively). Additionally, there was no significant correlation within any one PGU. We believe that the sampling strategy we used to test the relationship between distance to open water and total carbon stock (typically only sampling 1-2 pedons per site) was not adequate. A better sampling strategy might be to sample all points on a transect in order to better capture site-specific changes over the transect. Additionally, extensive marshes range in size to over 200 ha and could be sampled in a grid pattern in order to better elucidate any potential relationships between distance to open water and total carbon stock. Large marshes tend to have large networks of stream channels, both anthropogenic and natural. These channels may affect carbon stocks by altering sediment deposition, water table height, salinity, and other variables. Use of fine-scaled grid mapping would allow for better small-scale understanding of how carbon is distributed compared to open water and other water sources.

SUMMARY AND CONCLUSIONS

One of the most important ecosystem services tidal marshes provide is the ability to sequester and store large amounts of carbon in their soils. Past accounting strategies to spatially assess these carbon stocks, however, have had mixed results. Because of inherent variation, some researchers have suggested assigning a singular value for carbon accounting purposes for the establishment of carbon offsets or credits. In this study, we hypothesized that similar estuarine geomorphic settings have gone through similar formation processes and represent consistent pedogeomorphic units and should have similar carbon stocks. We found carbon storage differs significantly among pedogeomorphic units due to landscape-scale geomorphic differences. Cove marshes, located adjacent to open water yet protected from storms, exhibit the highest carbon stocks, which we attribute to their stability and relatively older age on the landscape. In contrast, back barrier marshes, situated between ocean-front fore-dunes and coastal lagoons are likely the youngest soils often receiving carbon-poor sandy overwash sediments. Thus, back barrier marshes have the lowest carbon stocks. Tidal creek marshes, characterized by a meandering tidally influenced stream, show moderate carbon stocks, influenced by sediment trapping near the creek edges.

Depth of sampling is critical to carbon stock accounting. For example, many of the marshes we sampled had carbon dense materials between 100 and 200 cm, with some marshes having thick carbon dense horizons even below 300 cm. Few studies, however, have sampled below 100 cm pointing toward the likelihood of significant underestimates of the carbon stocks of tidal marshes. This underscores the need for more comprehensive studies that encompass the full soil profile, providing a more accurate depiction of carbon accumulation dynamics.

We tested several variables to determine if within pedogeomorphic marsh types (e.g. tidal creek marshes) there were significant spatial relationships with carbon stocks across marshes. Although there is a strong zonation pattern of the plant community within a tidal marsh, plant community was not an accurate predictor of soil carbon stocks. We speculated plant communities were rapidly changing (relative to the rate of carbon accumulation in the soils) because of accelerated sea level rise. In addition, the effect of anthropogenic activities such as mosquito ditching has altered the hydrology of many marshes, which in part governs plant community dynamics. We hypothesized that because of sea level rise and the subsequent migration of the marsh onto the adjacent upland, marshes such as coves and tidal creeks would show a significant increase in carbon stocks from the upland/marsh boundary across the marsh to the open water/marsh boundary, but this was not the case.

Tidal marshes exist as intricate ecosystems shaped by a multitude of factors including local geography, hydrology, and vegetation. Despite their modest physical dimensions, tidal marshes in southern New England play a highly valued role as reservoirs of blue carbon. Considering their substantial contribution to carbon sequestration, it becomes imperative to prioritize the protection of these marshes. Beyond their capacity for carbon retention, safeguarding these ecosystems from degradation, erosion, and decomposition takes on heightened importance. Studies conducted along the eastern Atlantic coast have both observed and predicted a considerable loss of tidal marshes due to the rapid rise in sea levels. Projections suggest that within the next century, a significant portion of the current tidal marshes along the eastern US coast could vanish. Conservation efforts not only ensure the preservation of these marshes, but their ecosystem services as well. Our findings hold significant implications for the assessment of ecosystem benefits, carbon accounting, and the implementation of carbon credits. Our measures of carbon stocks can serve as an assessment of the potential impact of such marsh losses on the overall value of this ecosystem service. Our studies provided a regional and landscape-level assessment of this approach for carbon accounting in tidal marshes of southern New England. Our data clearly show that carbon stocks are not accurately captured when using a single value and that a simple pedogeomorphic region-based approach, that accommodates the inherent diversity of tidal marshes and their unique carbon storage patterns, should be applied and tested for estimating carbon stocks across a multitude of tidal marsh soils. Further, our simple methods can be replicated in other geographic regions to establish local carbon accounting measures to aid decision-makers.

Table 1.1: Summary of land area of pedogeomorphic units (PGUs) in the study area, marshes visited, pedons mapped, and pedons sampled.

[1]Sandyhook series soils a1re only mapped in back barrier flats,
[2]Two of the classified marshes which are currently mapped as Matunuck actually have significantly deeper organic materials making them Histosols, not Entisols like the Matunuck series.

PGU	Range of soil series previously mapped series within PGU	Total land area in study in hectares (percent of total)	Number of marshes investigated (percent of total in southern New England)	Pedons described (percent of total)	Pedons sampled (percent of total)
Back Barrier	Matunuck, Sandyhook[1], Westbrook	954 (15.4%)	8 (21.6%)	30 (22.7%)	8 (17.4%)
Cove	Ipswich, Matunuck[2], Pawcatuck, Westbrook	1377 (22.2%)	10 (27.0%)	35 (26.5%)	9 (19.6%)
Tidal Creek	Ipswich, Pawcatuck, Westbrook	1358 (21.9%)	4 (10.8%)	17 (12.9%)	9 (19.6%)
Tidal River	Ipswich, Matunuck Pawcatuck, Westbrook	2518 (40.7%)	15 (40.6%)	50 (37.9%)	20 (43.5%)

Table 1.2: Descriptive statistics of mean carbon stocks of sampled back barrier (BB), cove (C), tidal creek (TC), and tidal river (TR) marshes to 100 cm and 200 cm.

100 cm C stock

PGU	N	Mean (kg C m^{-2})	SD	SE	Coefficient of variation
BB	10	21	6.4	2.	31%
C	9	46	12.3	4.	26%
TC	9	33	4.7	1.6	14%
TR	18	42	9.9	2.3	23%

200 cm C stock

PGU	N	Mean (kg C m^{-2})	SD	SE	Coefficient of variation
BB	10	31	14.0	4.4	45%
C	9	83	25.2	8.4	30%
TC	9	52	16.0	5.3	31%
TR	18	75	20.1	4.7	27%

Table 1.3: Descriptive statistics of organic horizon depth to >5 cm thick mineral horizon in respective PGUs back barrier (BB), cove (C), tidal creek (TC), and tidal river (TR)

PGU	N	Mean (cm)	SD	SE	Coefficient of variation
BB	35	30	36.3	6.1	121%
C	35	88	85.5	14.5	97%
TC	19	97	58.6	13.4	60%
TR	51	60	45.1	6.3	75%

Table 1.4: Total modeled carbon stocks (gigagrams) of tidal marshes in southern New England in respective PGUs, back barrier (BB), cove (C), tidal creek (TC), and tidal river (TR), and total throughout the study area

		Holmquist estimate (gigagrams C)		**Our study (gigagrams C)**		**Relative difference (%)**	
PGU	Hectares	100 cm C Stock	200 cm C Stock	100 cm C Stock	200 cm C Stock	100 cm C Stock	200 cm C Stock
BB	954	257	515	199	294	25.4	54.6
C	1,377	372	743	639	1,148	52.8	42.8
TC	1,358	367	733	451	710	20.5	3.2
TR	2,518	680	1,360	1,069	1,892	44.5	32.7
Total	6,206	1676	3351	2358	4044	33.8	18.7

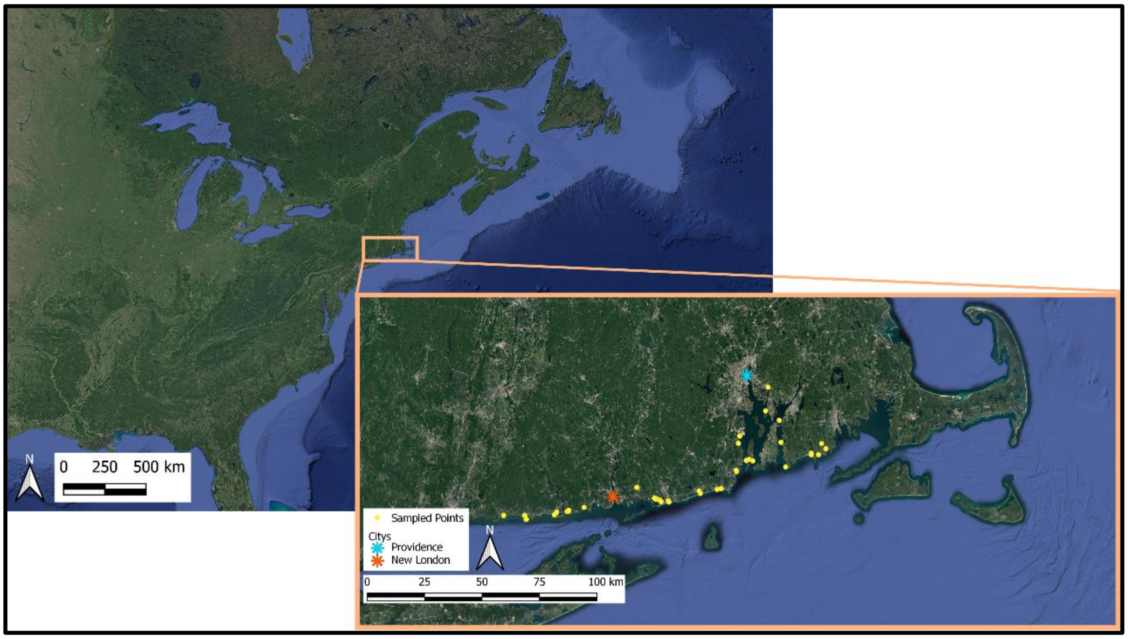

Figure 1.1: Location of marshes sampled in southern New England.

Figure 1.2: Example of a back barrier tidal marsh pedogeomorphic unit located in Westerly, RI.

Figure 1.3: Example of cove marsh pedogeomorphic units located in Jamestown, RI.

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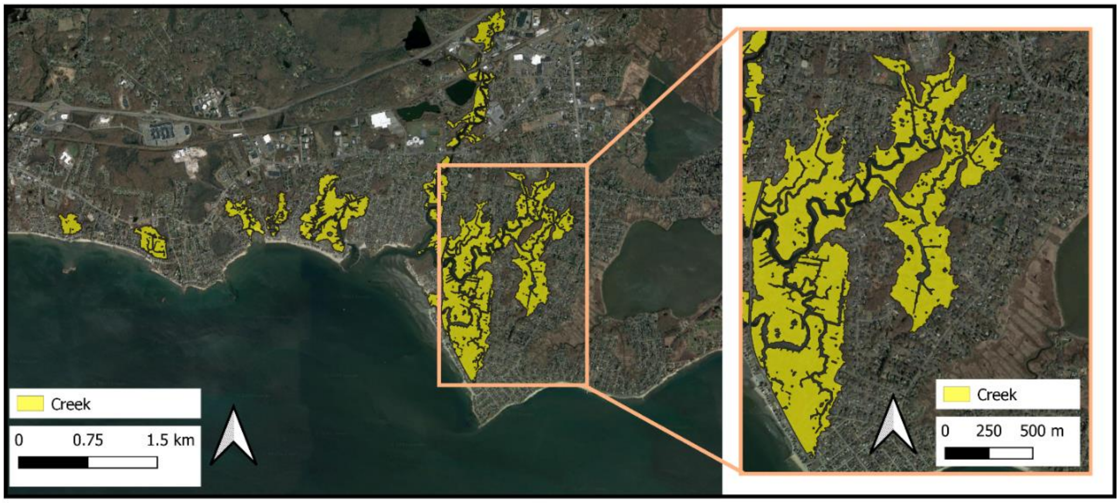


Figure 1.4: Example of tidal creek marsh pedogeomorphic units located in Old Saybrook, CT.

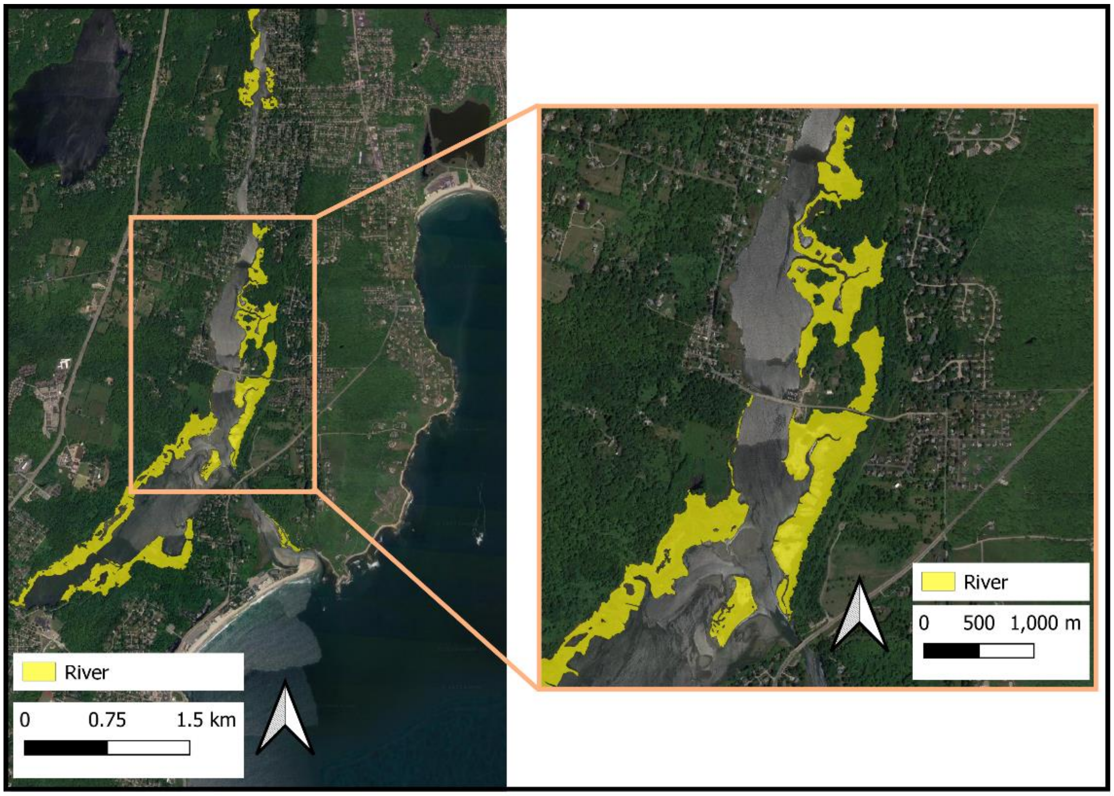


Figure 1.5: Example of Tidal river pedogeomorphic unit located in South Kingston and Narragansett, RI.

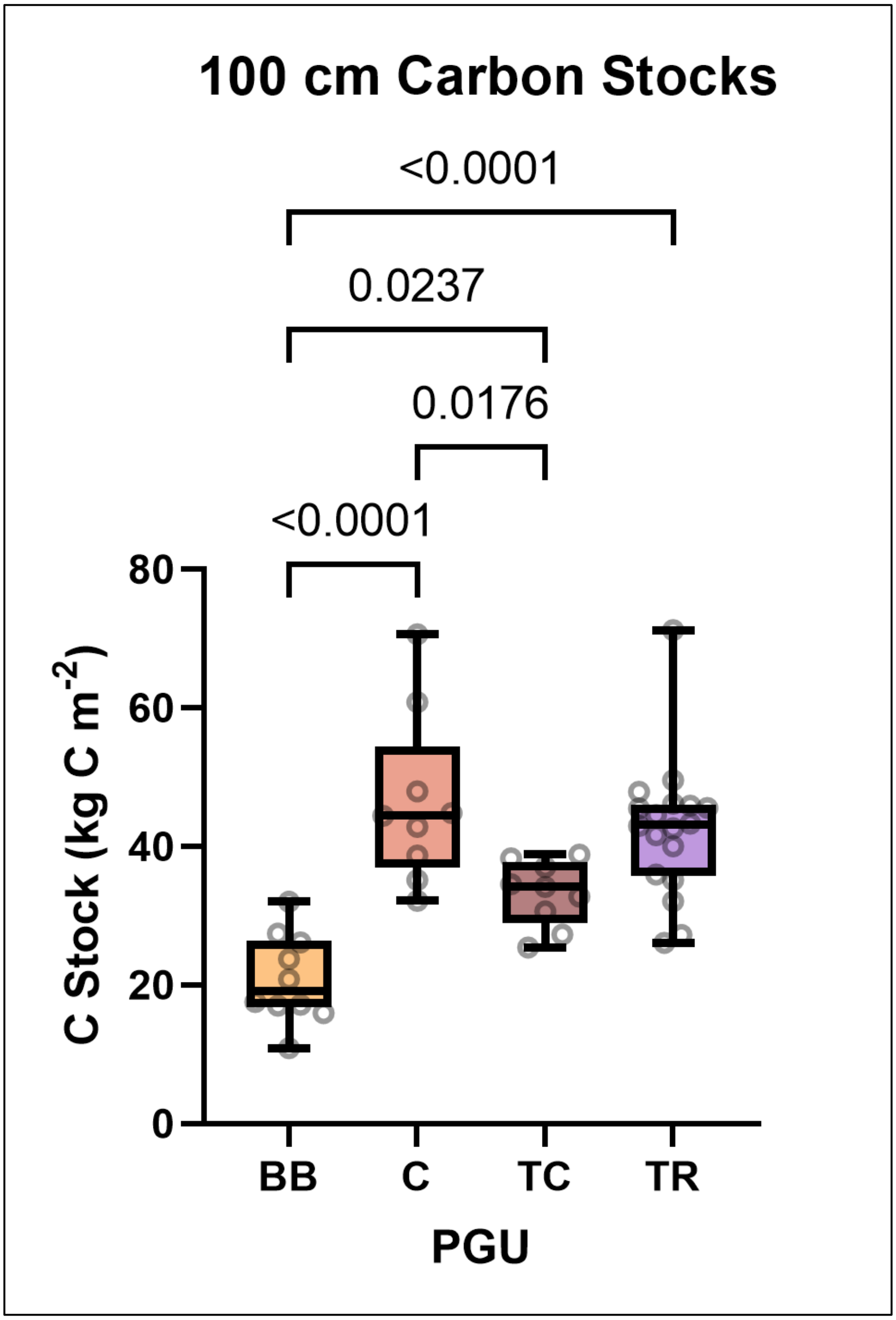


Figure 1.6: Boxplot of carbon stocks of the back barrier (BB), cove (C), tidal creek (TC), and tidal river (TR) marshes of the four studied PGUs to 100 cm sampling depth. Whiskers indicate total range. Pairwise comparisons of C stock means shown for p values <0.05.

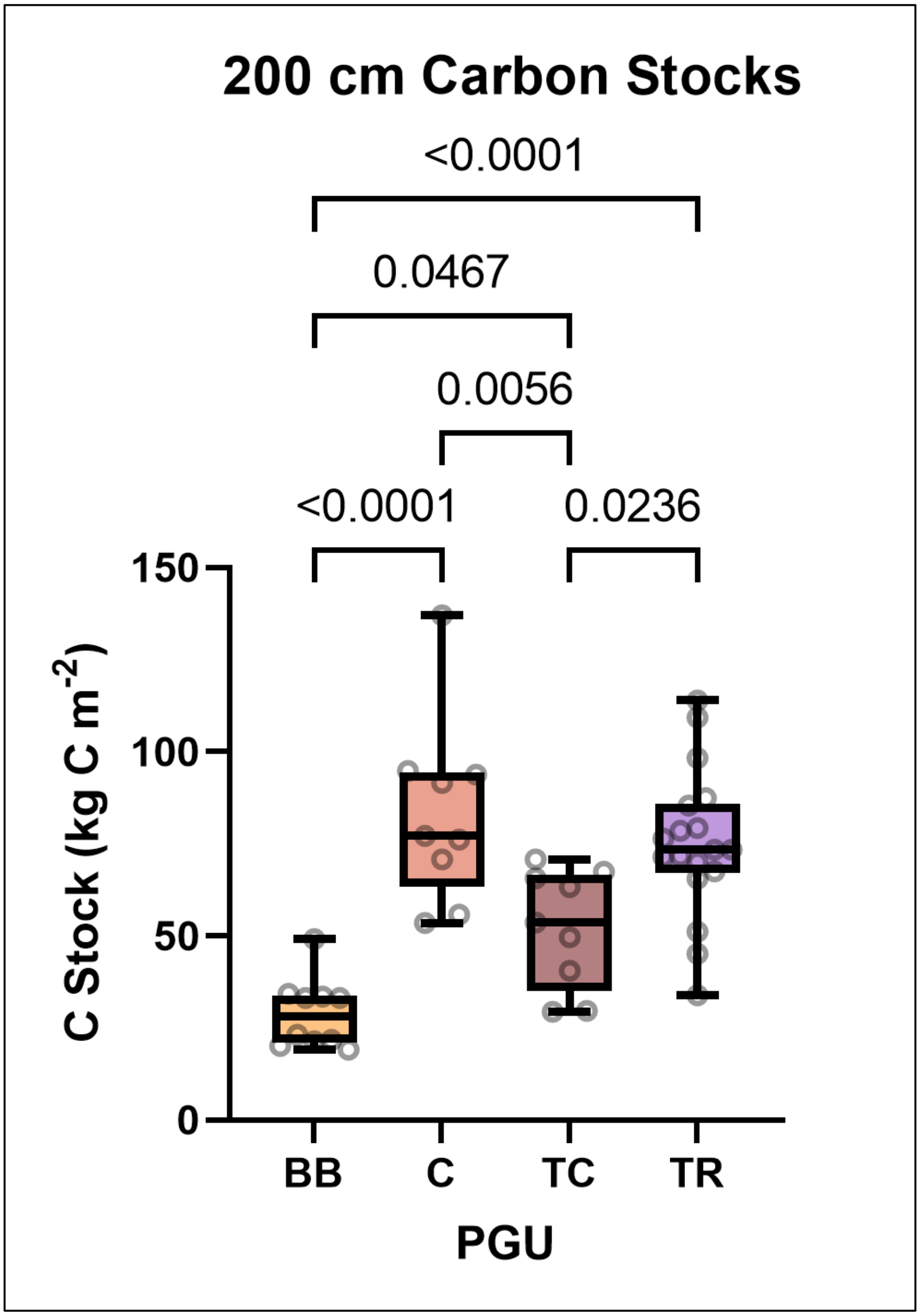


Figure 1.7: Boxplot of carbon stocks of the back barrier (BB), cove (C), tidal creek (TC), and tidal river (TR) marshes of the four studied PGUs to 200 cm sampling depth. Whiskers indicate total range. Pairwise comparisons of C stock means shown for p values <0.05.

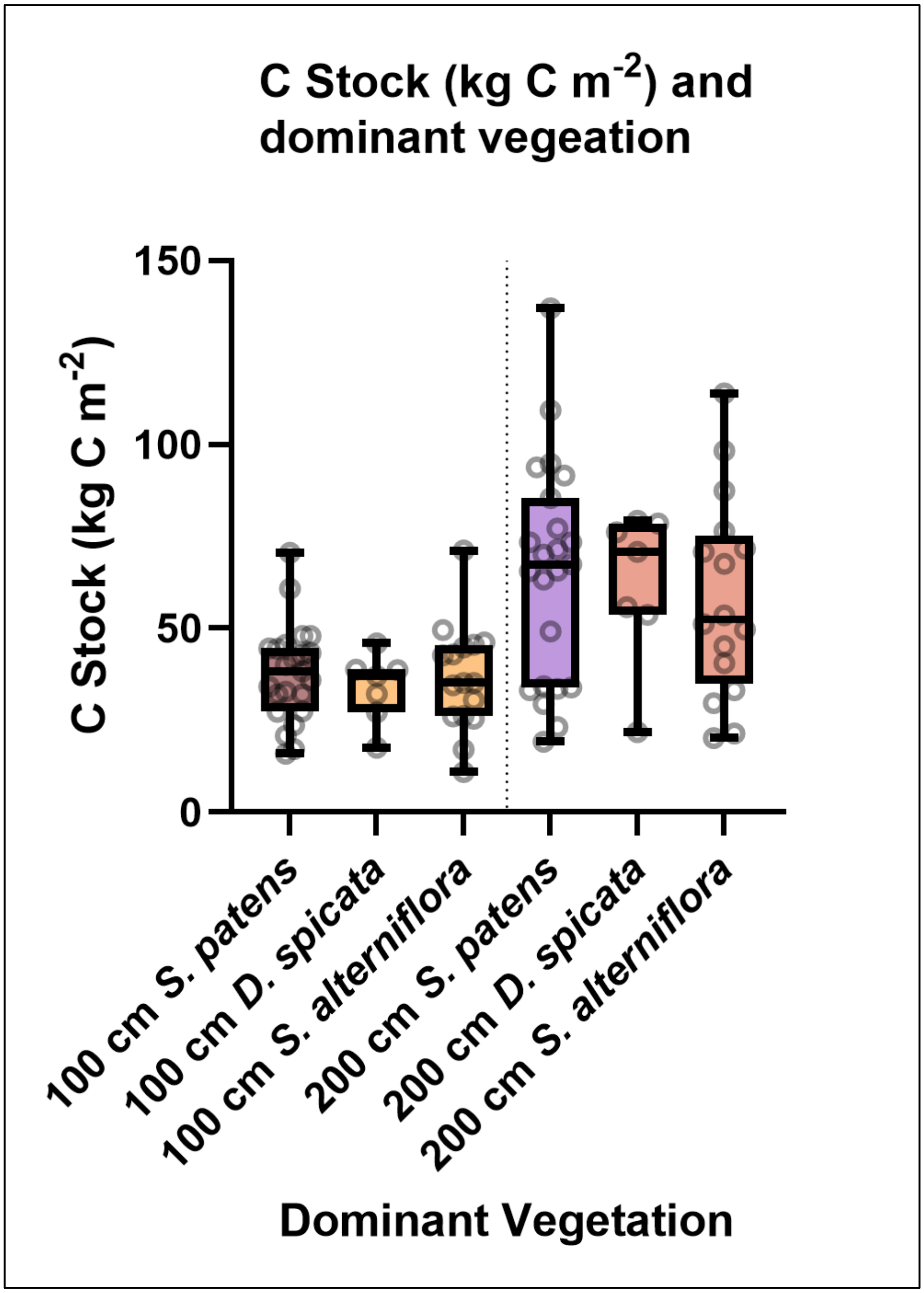


Figure 1.8: Boxplot of carbon stocks for soils sampled to 100 and 200 cm depths associated with dominate plant species at the sampled pedon. There were no significant trends between carbon stocks and dominate plant species at 100 or 200 cm.

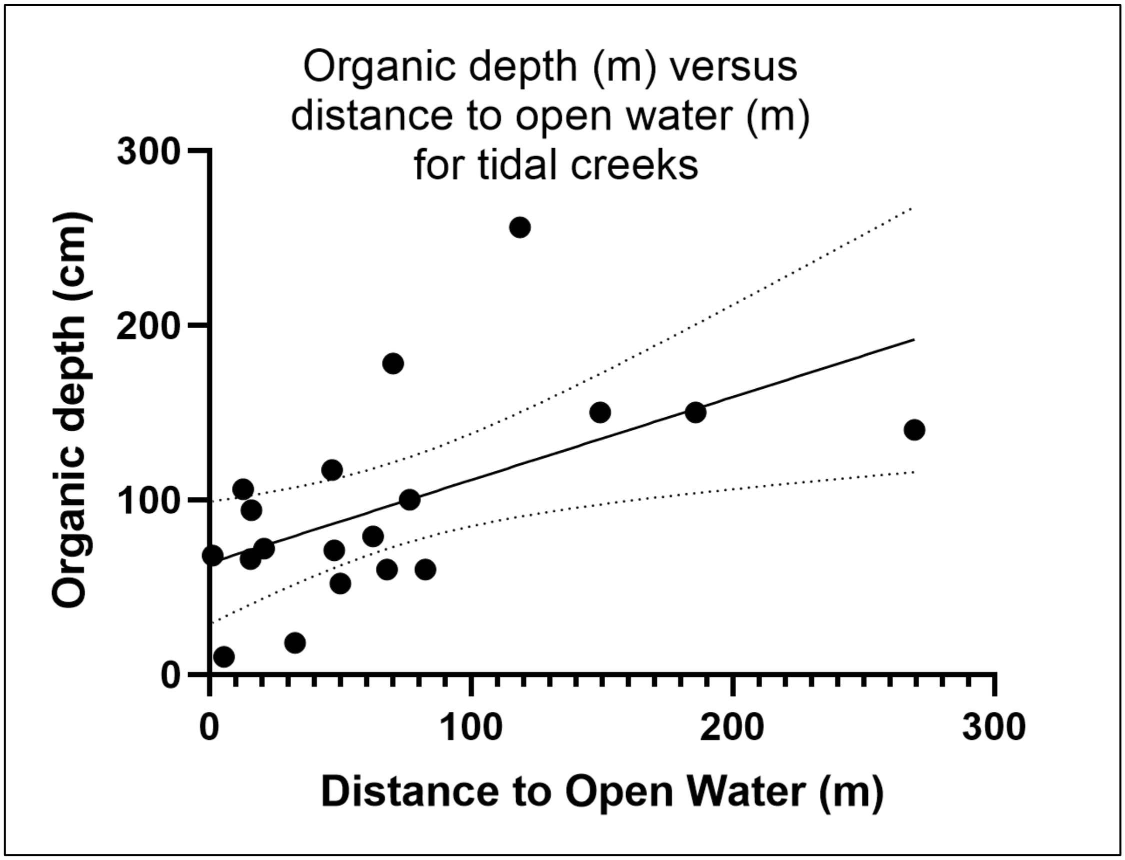


Figure 1.9: Relationship between distance to open water (m) and depth of organic horizons to first mineral horizon >5 cm thick in tidal creek PGUs. Dotted line indicates 95% confidence interval. r^2=0.312, p=0.013.

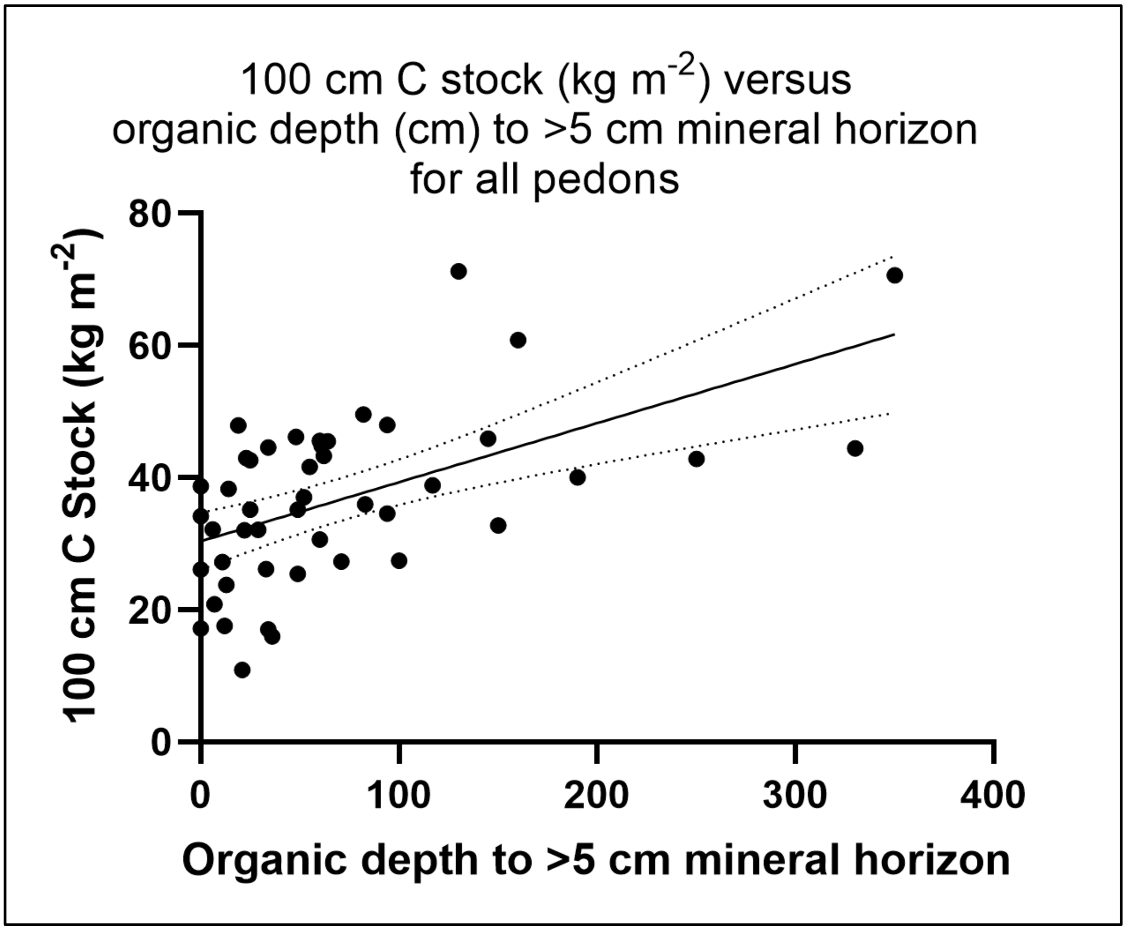


Figure 1.10: Relationship between depth to >5 cm thick mineral horizon and the 100 cm carbon stock (kg C m^{-2}) for all pedons. Dotted line indicates 95% confidence interval. r^2=0. 1964, p=0.001.

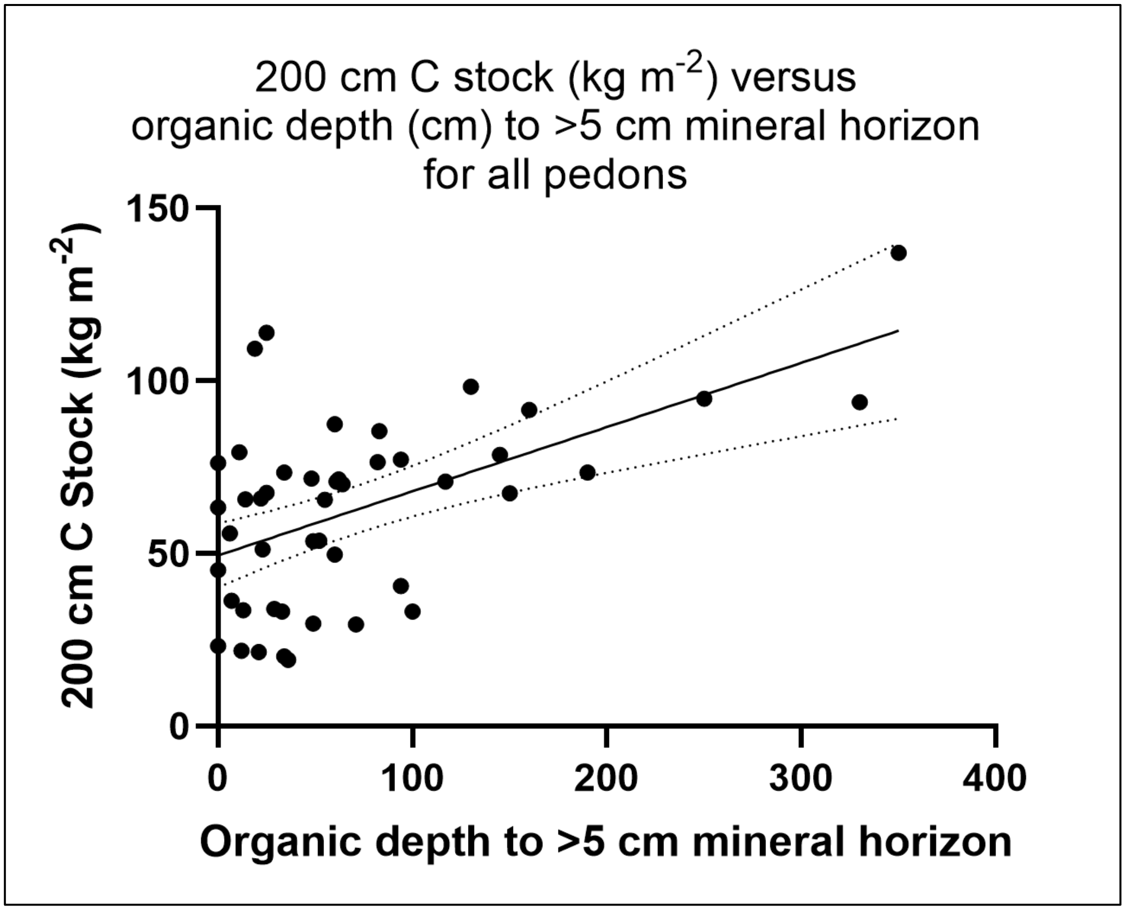


Figure 1.11: Relationship between depth to >5 cm thick mineral horizon and the 200 cm carbon stock (kg C m^{-2}) for all pedons. Dotted line indicates 95% confidence interval. r^2=0.3108, p<0.001.

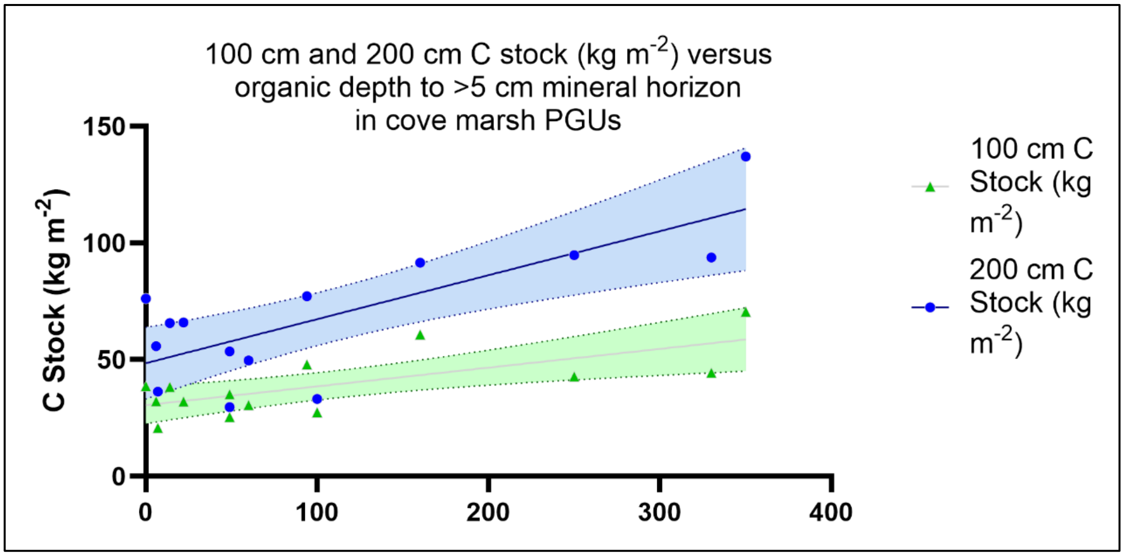


Figure 1.12: 1.Relationship between depth to >5 cm thick mineral horizon and the 100 cm carbon stock (kg C m^{-2}) of cove marshes. Dotted line indicates 95% confidence interval. r^2=0.5104, p=0.009.

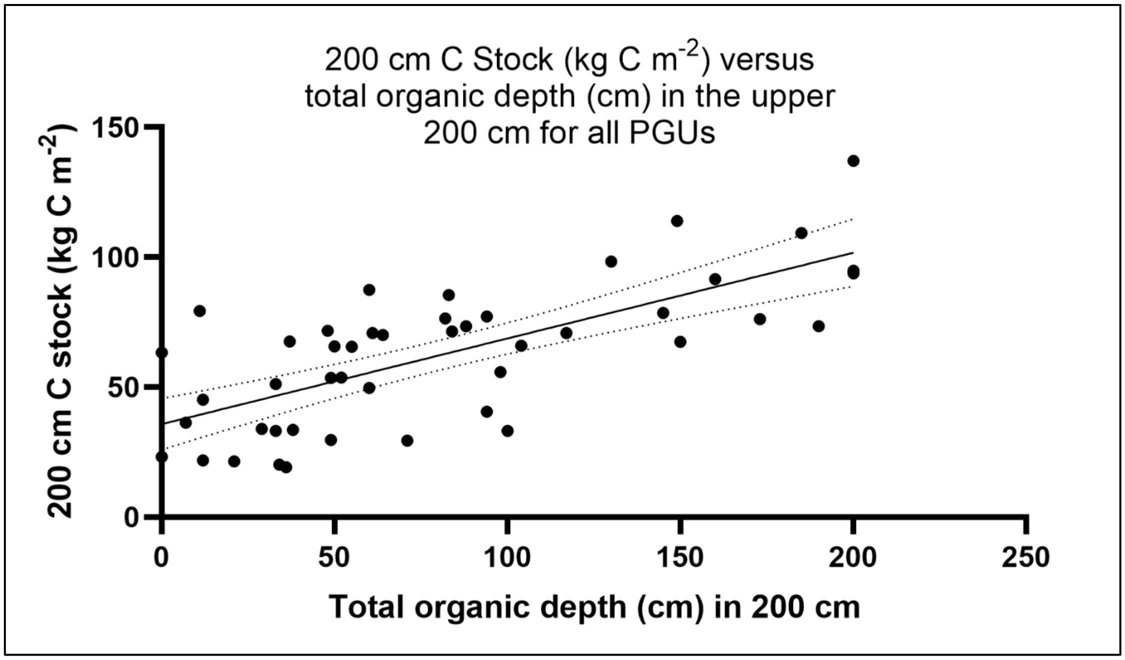


Figure 1.13: Relationship between total depth of organic horizons (cm) in the upper 200 cm of soil and the 200 cm carbon stock (kg C m^{-2}). Dotted line indicates 95% confidence interval. r^2=0.512, $p<0.001$.

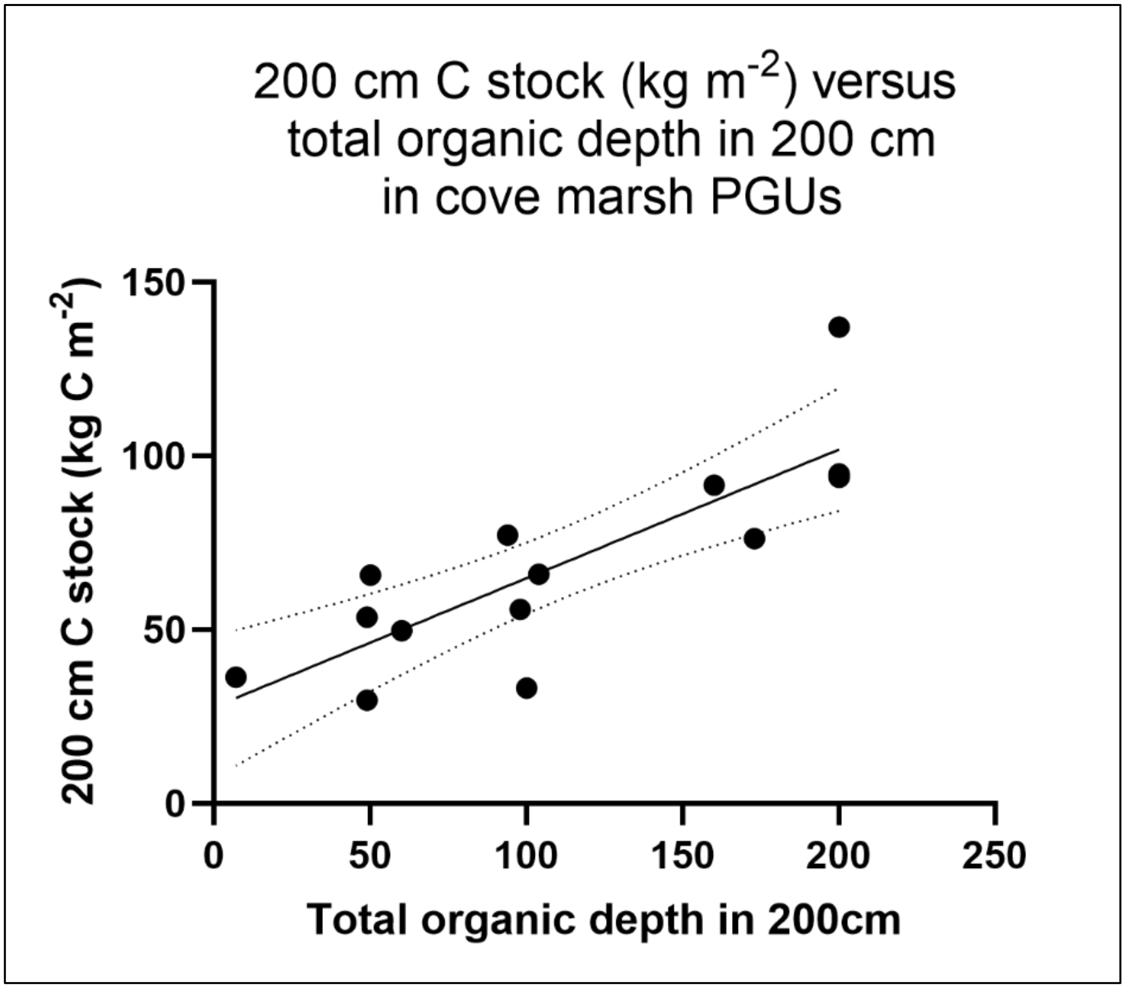


Figure 1.14: Relationship between total depth of organic horizons (cm) in the upper 200 cm of soil and the 200 cm carbon stock (kg C m^{-2}) in cove marsh PGUs. Dotted line indicates 95% confidence interval. r^2=0.6763, p<0.001.

CHAPTER 2

USE OF SOIL HORIZON CHARACTERISTICS TO MODEL CARBON DENSITY IN TIDAL MARSH SOILS OF SOUTHERN NEW ENGLAND

ABSTRACT

Although tidal marsh soils are some of the richest ecosystems in regard to carbon stocks, accurately quantifying or estimating these stocks through modeling can be quite challenging. These challenges are a function of the inherent variability in soil properties within and among types of tidal marshes and the difficulty in sampling and analyzing these soils. This study aimed to improve estimates of carbon stocks at the pedon level in southern New England by using soil morphological properties (i.e. Munsell color or texture) and associated marsh geomorphic type (pedogeomorphic unit, or PGU). A total of 285 samples were described and analyzed from 46 pedons across 4 PGUs in southern New England. Principal component analysis (PCA), and correlation matrices were utilized to identify potential variables which correlate with organic carbon density. These variables were utilized to create preliminary soil material groups (SMGs) which were stratified into organic and mineral groups and further broken down by soil morphological characteristics. Five separate SMGs (2 organic and 3 mineral) were applied to model carbon density and compared using ANOVA. Organic SMGs were best explained by PGU and mineral SMGs by texture and Munsell soil color value (dark loamy, light loamy, and sands). Significant differences were found ($p<0.05$) in all pairwise comparisons except for between dark loamy and organic SMG A ($p=0.346$). We randomly selected 30% of pedons to validate the model and applied the SMGs to these pedons to model carbon stocks based off field determined characteristics. The SMG modeled stocks were compared to actual stocks via linear regression and validated using a students t-test. Our results indicate that southern New England tidal marshes have variable carbon density dependent on PGU as well as location within the marsh. Landscape-level estimates of carbon stocks may broadly estimate carbon stocks of different PGUs, but use of soil descriptions to model stocks may be more precise. Use of SMGs can provide a reasonably accurate estimate of carbon stocks by describing soils or using previous descriptions.

INTRODUCTION

Although tidal marshes are extremely efficient at storing carbon, current models to estimate carbon stocks of these valuable ecosystems are often inaccurate or imprecise (Gedan et al., 2011; Macreadie et al., 2017; Holmquist et al. 2018; Wang et al., 2019). Holmquist et al. (2018) tested three strategies for mapping carbon stocks and concluded that until such a time as modeling and mapping advancements can quantitatively improve accuracy and precision the best performing strategy to map carbon stocks is to assign a carbon density of 27.0 kg C m^{-3} across the top meter of contiguous United States tidal marshes. Our previous research (see Chapter 1), however, found that in southern New England this value drastically underestimates carbon stocks of deep tidal marsh soils (such as coves), and overestimates tidal marsh soils with minimal organic soil materials (such as back barriers). This was true for both estimating carbon stocks to 100 and 200 cm depths. Similar studies conducted in the Mid-Atlantic (Kim, 2022) also found that the Holmquist (2018) approach was ineffective at the regional scale suggesting the need for a more effective approach to model carbon stocks in tidal marshes at regional scales.

Tidal marshes occur on a range of geomorphic settings on the landscape and the associated geomorphic and pedologic processes affect their physical, chemical, and morphological soil properties. Kim (2022) and Manetta (2023; see Chapter 1) called these different marsh types pedo-geomorphic units (PGUs) and showed that at a regional level stratifying marshes by PGU offers an effective approach to estimate carbon stocks. Soil survey reports of Connecticut, Massachusetts, and Rhode Island (Web Soil Survey, NRCS Staff 2019), however, indicate that a range of different soil types can be found within each PGU suggesting that there may also be significant differences in carbon stocks within PGUs. Janoudi (2022) tested the use of random forest models to estimate carbon stocks within PGUs based on variables such as fetch, upland/marsh boundary elevation, mean upland elevation, slope, elevation, and distance to open water. Although some predictors were better than others, Janoudi (2022) concluded that more accurate models for various marsh settings are needed in order to effectively predict carbon stocks within PGUs.

Tidal marshes are dynamic ecosystems subjected to change as a result of a number of processes including daily inundation, erosion and deposition from storm events, and sea level rise leading to considerable inherent variability in soil properties (Adam, 1993; Nicholls et al., 2007; Passeri et al., 2015). Along with issues in traversing the marshes, these totally saturated, and often submerged environments are difficult and time consuming to accurately and fully sample. This is especially true for determining carbon stocks which require undisturbed volumetric samples. Thus, despite being recognized for their important ecosystem services, including carbon sequestration, little data has been collected from tidal marsh soils compared to the number of profile descriptions available from soil survey projects (Hinson et al., 20017; Holmquist et al., 2018; Ouyang & Lee, 2019; Kim 2022). Thus, an approach to estimate carbon stocks that uses soil morphological data, supported by limited physical and chemical data generated in the lab, may be an effective strategy to estimate carbon stocks at the pedon scale.

There are a number of soil morphological properties that are associated with SOC content and bulk density that can be used to estimate carbon stocks. One example is the use of Munsell color value to predict SOC content (Allison, 1965; Robert et al., 1990; Lindbo et al., 1998; Pretorius et al., 2017; Swetha & Chakraborty 2021) with soils having darker colors (lower value, lower chroma) having the highest SOC content (Allison, 1965; Dobos et al., 1990; Lindbo et al., 1998; Pretorius et al., 2017). The degree that soil color influences SOC content is a function of particle size distribution or soil texture which can be accurately estimated in the field (Roman & Daiber, 1989; Arrouays et al., 2006; Salley et al., 2018). Bulk density is a function of soil organic matter content (see Appendix B) as well as fluidity, which is determined in the field (Schoeneberger et al., 2012). Fluidity has also been found to correlate with texture and SOC (Pruett, 2010).

In this study, we adapted methods from Kim (2022) to test which morphologic properties, applied in combination (termed soil material groups; SMGs), could be used to effectively estimate carbon density values of tidal marsh soil samples. Our objective was to determine if the carbon density values of the SMGs could be applied to soil descriptions to effectively estimate carbon stocks at the pedon level to previously described, but not sampled, soils. If successful, this could greatly reduce the amount of time and cost needed for carbon accounting in tidal marsh soils of southern New England.

METHODOLOGY

Field Sampling

One hundred and thirty-two salt marsh pedons were described and 46 of the 132 pedons were sampled in duplicate by horizon to at least a 1 meter depth. The pedons were spread across transects that extended from open water bodies to the upland/salt marsh boundary at 30 marshes in southern

New England. Each transect consisted of three to six transect points. The selection of pedons aimed to encompass the diversity of pedogeomorphic marsh types (tidal creek, tidal river, back barrier, and cove) as well as the distinct high and low marsh settings within each marsh based on vegetation community. At least one pedon was described in both the low and high marsh to attempt to capture variability in carbon stocks by landscape position. Refer to Chapter 1 for comprehensive details on the study site descriptions and methodology used for field sampling..

Laboratory Analysis

Sample analysis included electrical conductivity (EC), initial pH, incubation (oxidized) pH, bulk density, soil organic matter content (SOM), soil organic carbon content (SOC), stable plant fragment content, and coarse mineral fragment content (see Chapter 1 for complete sample analysis methodology). Carbon density was calculated by dividing the SOC content by bulk density in units of (g C cm^{-3}). Particle size distribution (PSD) was determined for all mineral samples following the procedures described by Gee & Or (2002). For samples containing more than 2% organic carbon, samples were treated with 30% hydrogen peroxide to remove organic matter prior to PSD analysis. To prevent flocculation of fine particles by the salts, samples were shaken in 200 ml with water, centrifuged, and the supernatant decanted. Washing of the salts was repeated until supernatant tested negative for salts with silver nitrate (absence of a white precipitate). A 5 g L^{-1} hexametaphosphate (Calgon) solution was added to the samples with 200 ml of water and shaken for eight hours on a low-speed shaker to thoroughly disperse the primary particles. The sand fraction was separated from the silt and clay fraction by wet-sieving using a #270 sieve. The sand fraction was transferred to a 50 ml beaker and dried in the oven overnight at 105 degrees C. Sand fraction weights were recorded after shaking the dried sand fractions samples in a nest of sieves for 5 minutes. Sand fractions included very coarse, coarse, medium, fine, and very fine. The silt and clay particle size fractions were transferred to a sedimentation column and clay content determined by the pipette method. Silt content was determined by difference.

Identification of SMGs

Soil materials were initially separated into mineral and organic materials. Mineral materials have less than 12% organic carbon while organic materials have at least 12% organic carbon (Soil Survey Staff, 2022). Soil organic carbon content was determined through high temperature combustion and loss on ignition (see Chapter 1 for complete details). To investigate possible correlations between soil morphology characteristics and carbon density within the mineral soil horizons, a principal component analysis (PCA) was conducted. The variables considered for the PCA included Munsell value, Munsell chroma, pore water salinity, sand percentage, sand particle size percentages, silt percentage, and clay percentage. Additionally, a correlation matrix was generated to explore relationships between these variables to identify distinct mineral SMGs. For developing organic SMGs, a correlation matrix was used to explore connections between independent numerical variables (soil pore water salinity, Munsell value, and Munsell chroma) and carbon density. To further examine the potential categorical variables (fluidity, Munsell hue, and PGU) to use in grouping SMGs in relation to carbon density, an analysis of variance (ANOVA) was employed. Mineral SMGs within each set were compared to one another using ANOVA to identify the set with the most substantial differences between groups. .

<u>Statistical Analysis</u>

Each individual mineral and organic SMG was compared to each other via ANOVA with a Tukey-Kramer post-hoc in order to examine significant differences between each SMG. Prior to inclusion in the final grouping of SMGs, the organic and mineral SMGs were cross validated in order to ensure the model accurately represented carbon densities.

We utilized the hold-out method of cross-validation where we randomly excluded 30% of our data for the two organic SMGs (A and B) (the test set) and compared it to the other 70% of data (the learning set) (Raquel & Daniel, 2001; Berrar, 2018). If the learning set and test set of each SMG are not significantly different, then we assume the model is accurate.

In order to test the validity of final SMG grouping model, 15 (approximately 30%) sampled pedons were excluded from the model creation. The carbon stocks of these excluded pedons were estimated using our SMGs and the estimate was compared to the previously calculated actual carbon stock calculated in Chapter 1 using a student’s t-test and linear regression.

RESULTS & DISCUSSION

Organic soils

Organic soil materials were initially grouped by degree of humification (sapric, hemic, and fibrist). There was no significant difference in SOC content among the different organic soil materials (p=0.108, Figure 1). Additionally, we found that the bulk density did not significantly differ among sapric, hemic, and fibric materials (p=0.061 Figure 2). Consequently, there was no significant differences (p=0.4756) in carbon density among sapric, hemic, and fibric organic materials (Figure 3). Our conclusion was that degree of humification was not an effective variable in modeling carbon density of organic horizons in this study. Soil pore water halinity (p=0.942; Figure 4), and Munsell soil hue (p=0.075) and chroma (p=0.962, Figure 5), were also not significantly correlated with carbon density. Munsell color value did not significantly correlate with carbon density in organic soils (p>0.05).

Organic material carbon density values were significantly different among PGUs (p<0.0001; Figure 6;) with back barriers significantly less than coves (p=0.003) and tidal rivers (p=0.042). Additionally, carbon density values of organic materials in tidal creeks are significantly less than coves (p=0.0003) and tidal rivers (p=0.004). Thus, two different organic SMGs were created: group A (n=73) including organic materials from tidal creeks and back barriers (average carbon density of 40 kg C m^{-3}); group B (n=114) including organic materials from tidal rivers and coves (average carbon density of 50 kg C m^{-3}). This separation follows our observations that coves and tidal rivers are likely more stable marshes, representing differing depositional environments, and may have been on the landscape longer than tidal creeks or back barrier marshes (see Chapter 1). These results support the use of PGU group as the grouping variable for organic SMGs. In addition, as PGU location can be determined from remote-sensing imagery and organic depth can be quickly assessed across a marsh using a metal probe.

Although the organic SMG model is relatively simple, cross-validation indicated the model was valid. . When the excluded 30% of data (the test set) was compared to the included 70% of data (the learning set) there was no significant difference between excluded and included data from group A ($p=0.939$), nor was there a significant difference between excluded and included data from group B ($p=0.980$). The lack of significant differences in the learning and test sets of SMGs A and B led us to assume the model is accurately able to predict the carbon density of organic soil materials.

Although different groupings of soil material types were used by Kim (2022) to estimate carbon stocks, the organic materials in our study appear to have a higher carbon density then those in the Mid-Atlantic. Our organic soil materials typically held between 40 kg C m^{-3} and 50 kg C m^{-3} while Mid-Atlantic organic soil materials held between approximately 31 and 43 kg C m^{-3}. This underscores the necessity to regionalize soil carbon accounting in tidal marshes rather than using a standard carbon density across all marshes in the United States as is suggested in Holmquist et al (2018).

Mineral soils

Various groupings of SMGs for mineral soils were created combining soil properties including texture, fluidity, color, and PGU. Given the correlations between PGUs and carbon density for organic SMGs, we used ANOVA to test the potential relationships between PGUs and C density for mineral soil materials. Although the ANOVA indicated a significant difference among the PGUs, post hoc tests found there was only a significant difference in carbon density between back barriers and tidal rivers ($p=0.013$) (Figure 7). Thus, we concluded that using PGUs in association with mineral soil properties was not a useful predictor of carbon density. Results of the PCA on mineral soil materials indicated there was a principal component including sand, silt, clay percentages, and carbon content (Figure 8). Additionally, another component was shown which included carbon density, color value, and soil salinity. The variables of these two principal components guided our creation of mineral material SMGs. Additionally, correlation between fluidity and carbon density was analyzed, as Pruett (2010) found significant relationships between C density and fluidity in subaqueous soils. Mean carbon density of non-fluid materials significantly differed from both slightly fluid ($p=0.016$) and moderately fluid ($p=0.016$) (Figure 10). Color value ($p<0.001$, $r^2=-0.462$), sand percentage ($p<0.001$, $r^2=-0.536$), and silt percentage ($p<0.001$, $r^2=0.544$) were the three variables most strongly correlated with carbon density. Pore water salinity was correlated with carbon density ($p=0.019$); however, the relationship was weak ($r^2=-0.223$) and there was no discernable groupings when examining the scatter plot (Figure 10), therefore soil pore water halinity was not used in SMG creation.

Multiple groups of SMGs were created for mineral materials using color value, texture, and fluidity. A color value of 3 was used as the maximum value for dark colors as most values equal to or below 3 had statistically similar carbon densities and most values equal to or above 4 had statistically similar carbon densities while both groups were mostly significantly different from each other. From these 5 categories 3 separate groups of SMGs were created with different combinations of the categories. Definitions of SMG title labels are below:

- Dark: Soil with a color value of 3 or less
- Light: Soil with a color value of 4 or more
- Loamy: Soil with a texture of sandy loam, silt loam, silt, and loam
- Sands: Soils with a texture of sands or loamy sands
- Fluid: Soil with a fluidity class of slightly fluid, moderately fluid, or very fluid
- Non-Fluid: Soil with a fluidity class of non-fluid; having an n-value of 0.7 or less

We expected sands would have lower carbon density values than finer textures soil materials (Kim, 2022). Additionally, we expected that higher color value soils would have lower carbon density based off previous work indicating darker soils hold more carbon (Allison, 1965; Lindbo et al., 1998; Willis et al., 2007; Pretorius et al., 2017). Light colored sands had lower carbon densities than loamy materials ($p<0.001$). Using both dark sand and light sand variables was ineffective as there were only 6 dark sand samples. Thus, we found no correlation between color value and carbon density in sands ($p=0.25$).

The second group of mineral SMGs contained dark fluid materials, light fluid materials, dark non-fluid materials, and light non-fluid materials. Pruett (2010) found fluid subaqueous soils to have higher organic carbon contents than non-fluid soils, and we expected to find the same in tidal marsh soils. We found dark fluid materials had significantly higher carbon density than the other SMGs (mean = 32 kg C m^{-3}) (Figure 12), and notably dark fluid materials held significantly more carbon than light colored fluid materials ($p = 16$). In comparison, light fluid materials, dark non-fluid materials, and light non-fluid materials were not significantly different from each other (Figure 13), indicating fluidity may not correlate with carbon density in tidal marsh soils. To check for possible confounding variables from texture, sands were excluded from the fluid and non-fluid classes and grouped together in a separate sand SMG as sands and loamy sands tend to be less fluid and also contain less carbon. Pairwise comparisons of dark fluid and dark non-fluid materials as well as light fluid materials and light non-fluid materials showed no significant differences when controlling for color value and excluding sands; additionally, fluid loamy and non-fluid loamy materials did not display a difference in carbon density ($p=0.646$). These findings led us to conclude that fluidity class does not exhibit a sufficiently strong correlation with carbon density in tidal marsh soils to serve as a viable basis for modeling carbon stocks. Instead, our analysis suggests that attributes such as texture and color value should take precedence in modeling efforts. Sands consistently exhibited lower mean carbon densities than loamy materials, and lighter-colored materials consistently demonstrated lower carbon density values. Therefore, we advocate for the utilization of these key factors—texture and color value—as more reliable predictors for modeling carbon stocks in tidal marsh soils of southern New England.

To account for texture and color value, the third SMG group consisted of dark loamy materials, light loamy materials, and sands. All pairwise comparisons of carbon densities in this group were significantly different (Figure 14). As expected, based on the relationship between carbon content and bulk density, sands had the highest mean bulk density (1.3 g cm^{-3}) and lowest mean carbon content (1.1%), while dark loamy materials had the lowest mean bulk density (0.7 g cm^{-3}) and highest carbon content (6.3%). It should be noted that sand carbon content has a high coefficient of variation (97%), likely due to the difference between dark sands and light sands as noted in the first group of mineral SMGs. As noted, dark colored sands tended to have similar carbon densities to dark loamy materials; however, not enough dark sands were sampled in this study to establish a significant pattern. Sands in back barrier marshes (mean C density = 10 kg C m^{-3}) and coves (mean C density = 11 kg C m^{-3}) were both less carbon dense than sands from tidal river marshes (mean C density = 19 kg C m^{-3}), but the number of samples was too low (TR sands sampled n = 8) to draw meaningful conclusions; however, future studies may elucidate significant differences in carbon densities of sands from different PGUs possibly due to different formation factors or parent materials. This third group of SMGs is relatively simple (containing only 3 different SMGs), but the degree of significant differences between SMGs leads us to accept this grouping as a potential way to model carbon densities of mineral soil materials in tidal marshes.

As with the organic material SMG group, we wanted to ensure the accuracy of the mineral SMG model. To do this, we again used cross validation by excluding 30% of our data from the mineral SMGs and compared it to the other 70% of data. Included and excluded data for all three SMGs showed no significant difference. The absence of statistically significant disparities between the included and excluded data sets serves as compelling evidence in support of the model's potential utility in extrapolating carbon density estimations for mineral soil materials.

Final SMG grouping

The final SMG grouping included: organic groups A and B, and mineral SMG groups dark loamy materials, light loamy materials, and sands. Significant pairwise comparisons of carbon density were found between all pairs except for between dark loamy materials and organic SMG A ($p=0.346$) (Figure 15). This exception is likely because although the organic SMG A has significantly higher carbon content than the dark loamy mineral SMG ($p<0.001$), it also has a significantly lower bulk density ($p<0.001$). When all 285 individual samples are compared against each other, cove soils had the highest mean carbon density (41 kg C m^{-3}); this aligns with the findings in

Chapter 1 which found coves to have the highest mean carbon stocks at both 100 and 200 cm.

<u>Application of SMGs to described pedons</u>

To test the validity of our model, 30% of pedons were excluded from the data set and the carbon stocks of these pedons were estimated using our 5 SMGs to 100 cm and 200 cm (See Appendix F for an example application of SMGs to a representative tidal marsh soil). These estimated values were compared to our actual calculated values (Appendix 1) using linear regression and a student's t-test. At both 100 and 200 cm, there was no significant difference between our estimated values and our actual values ($p=0.742$ and $p=0.926$, respectively) when compared using a student's t-test. At 100 cm the calculated and actual carbon stocks were strongly correlated ($r^2=0.84$, $p<0.0001$; Figure 16) with an absolute mean difference of 5.4 kg C m^{-2} while at 200 cm the calculated and actual carbon stocks were also strongly correlated ($r^2=0.75$, $p<0.0001$; Figure 17) with an absolute mean difference between of 11.8 kg C m^{-2}. Compared to Kim (2022), our predictions have a higher coefficient of determination at 100 cm and an equivalent value at 200 cm. These results suggest the SMGs carbon density model is a valid approach to estimate carbon stocks in southern New England tidal marshes.

A natural question is: which approach, PGUs or SMGs, yields a more accurate result when modeling carbon stocks? When comparing the two, C stock estimates using SMGs produced more accurate C stock estimates in 15 pedons modeled above. Estimated carbon stocks based off SMGs underestimated carbon stocks by an average of 0.63 kg C m^{-2} while modeling C stock by PGU overestimated stored C by an average of 1.6 kg C m^{-2} at 100 cm. 200 cm stocks were underestimated by the SMG model by an average of 0.41 kg C m^{-2} while PGUs overestimated C stock by an average of 1.82 kg C m^{-2}. Given these differences, if a certain marsh has been sampled or can be sampled, it would likely be more accurate to use SMGs to model total carbon stocks rather than just based off the PGU as carbon stocks vary within marshes with depth to mineral material and depth of dark colored materials, and that variability is not captured in use of landscape level predictors (Chapter 1). Examining standard deviations of SMGs and soil carbon stocks by PGU supports this. The highest standard deviations in SMGs are in organic materials (SMG A σ=13 kg C m^{-3} and SMG B σ=15 kg C m^{-3}). Modeling a marsh's carbon stock with SMGs to 100 cm, the standard deviations of a modeled pedon with 100 cm of organic materials in back barriers and tidal creeks (organic SMG A) produces a lower standard deviation than using PGUs. Using PGUs the standard deviations would be 3 to 4 times higher (1.3 vs 5.3 kg C m^{-2} and 1.3 vs 4.7 kg C m^{-2}, respectively). For coves and tidal rivers (organic SMG B), the difference is 6 to 8 times greater than coves and tidal rivers (1.5 vs 12.3 kg C m^{-2} and 1.5 vs 9.9 kg C m^{-2}, respectively). Considering the inherent variability of tidal marsh soils, modeling carbon stocks on SMGs is a more accurate approach to estimating carbon stocks for the purposes of carbon accounting, at the expense of time and effort as it is also more labor intensive to traverse and classify marshes than it is to identify pedogeomorphic units by satellite imagery. Both PGUs and SMGs have separate use cases and cannot be directly compared. In cases where there is no field recorded data, use of PGUs can give an accurate estimate of the total carbon stored in a marsh; however, being that SMGs are based on field data, they can provide a more accurate estimate of carbons stocks through soil survey where multiple pedons are described across a marsh.

SUMMARY AND CONCLUSIONS

Tidal marshes are recognized as significant carbon sinks, yet accurately estimating their carbon stocks across the landscape remains a challenge. This study addresses the need for improved carbon stock estimation in tidal marsh soils at the pedon level in southern New England, where previous methods have shown limitations. We evaluated soil morphological properties as a means to categorize soil material groups (SMGs) for estimating carbon density values. Statistical measures suggested that Munsell color value, texture, and pedogeomorphic (PGU) unit were the most significant variables to estimate carbon density. These carbon density values were applied to soil descriptions to calculate carbon stocks at a pedon level. Through cross-validation and regression analysis we concluded that SMGs offer a reasonably accurate way to estimate carbon stocks within tidal marshes for regional carbon accounting. In addition, because of the inherent variability within tidal marsh soils, application of SMGs provides a closer approximation of the true carbon stock value than the PGU-based approach

(Chapter 1) when field data are available. This study contributes to the development of a more effective model for estimating carbon stocks in tidal marshes, emphasizing the importance of regional variations and the value of soil morphological properties as key factors in carbon stock assessments.

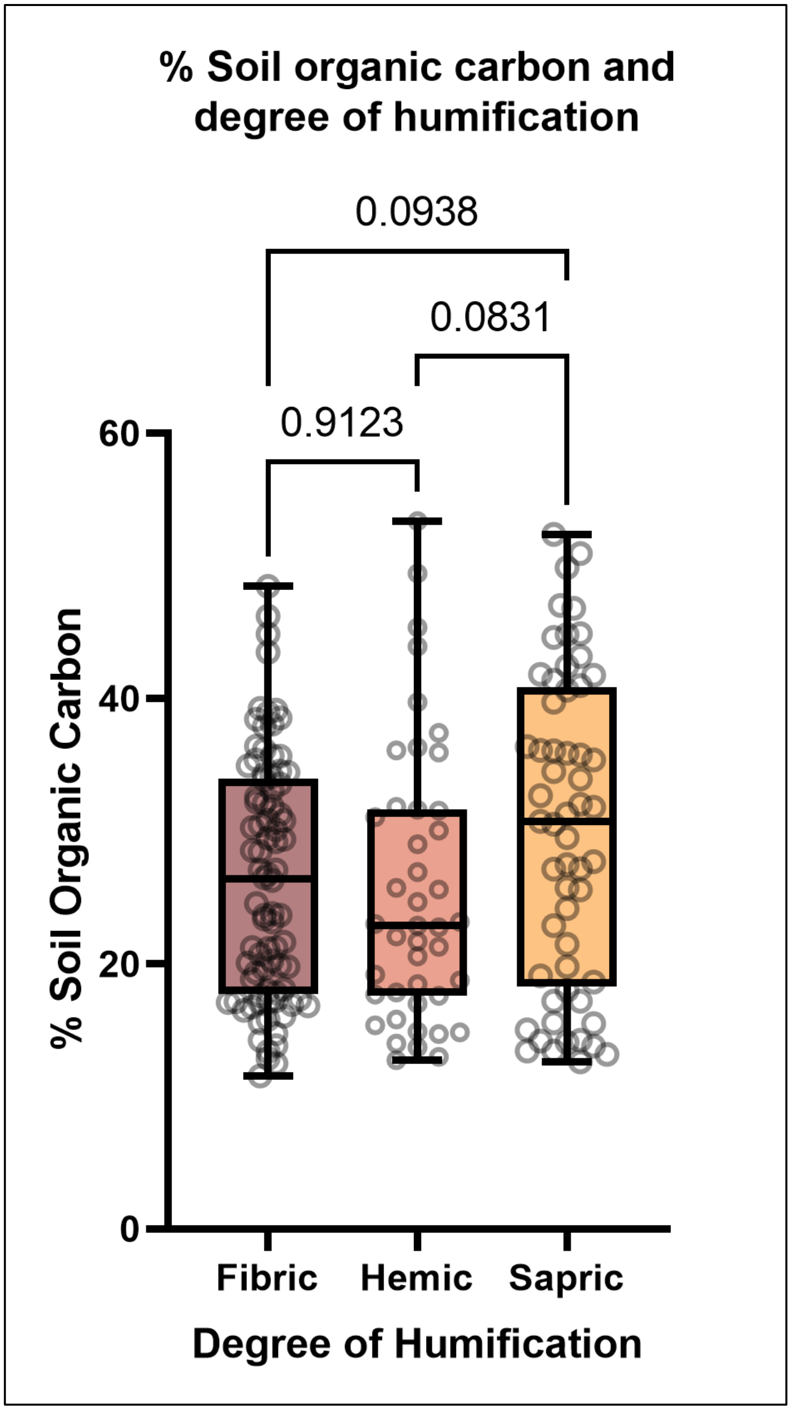


Figure 2.1: Box plot of soil organic carbon content of different degrees of humification of organic materials. Significance of the pairwise comparisons are indicated by a p-value. No significant differences found based on a p-value <0.05. Whiskers indicate total range while the center line indicates the mean value.

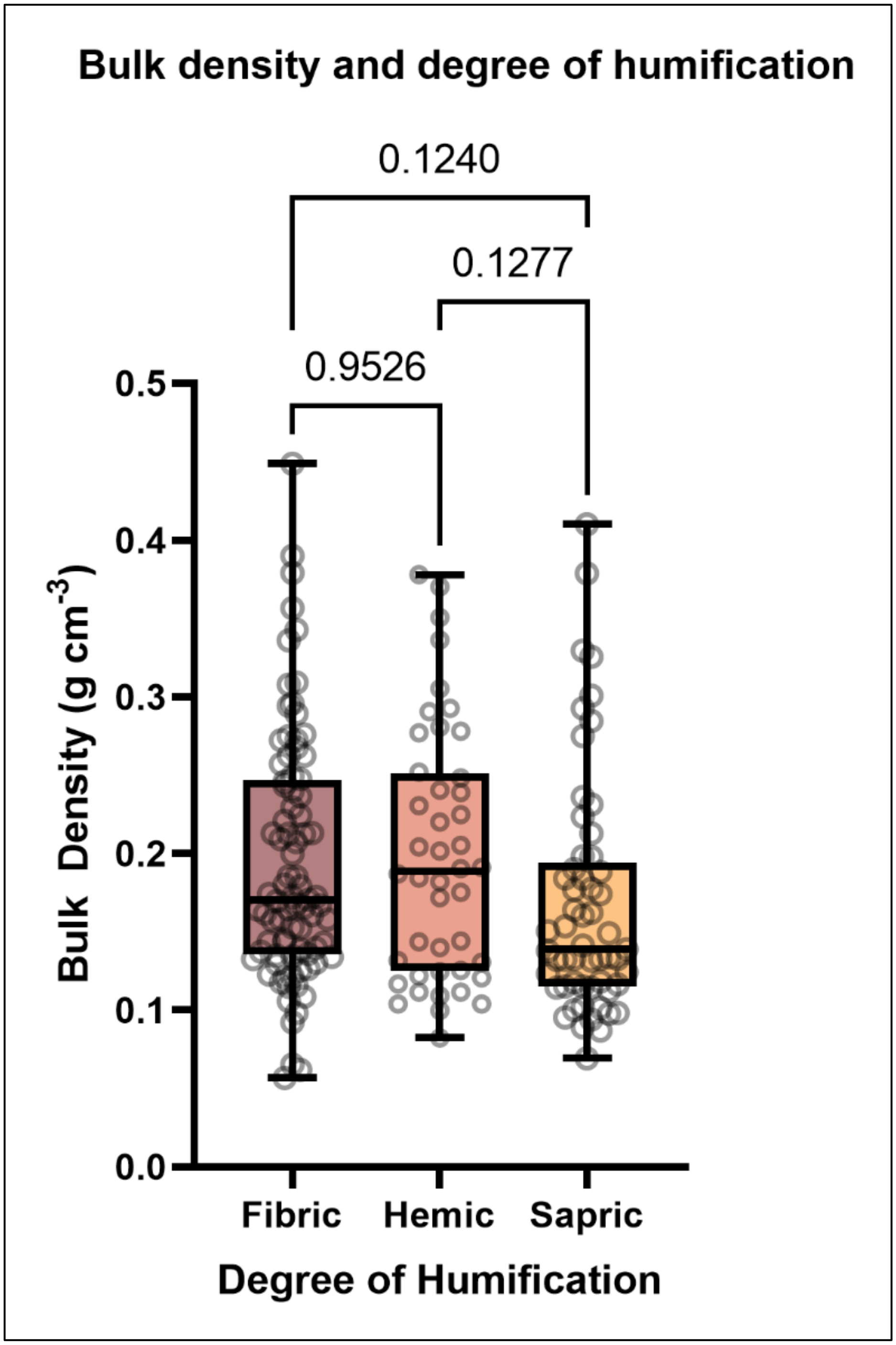


Figure 2.2: Box plot of bulk densities (g cm^{-3}) of different degrees of humification of organic materials. Significance of the pairwise comparisons are indicated by p-value; No significant differences found based on a p-value <0.05. Whiskers indicate total range while the center line indicates the mean value.

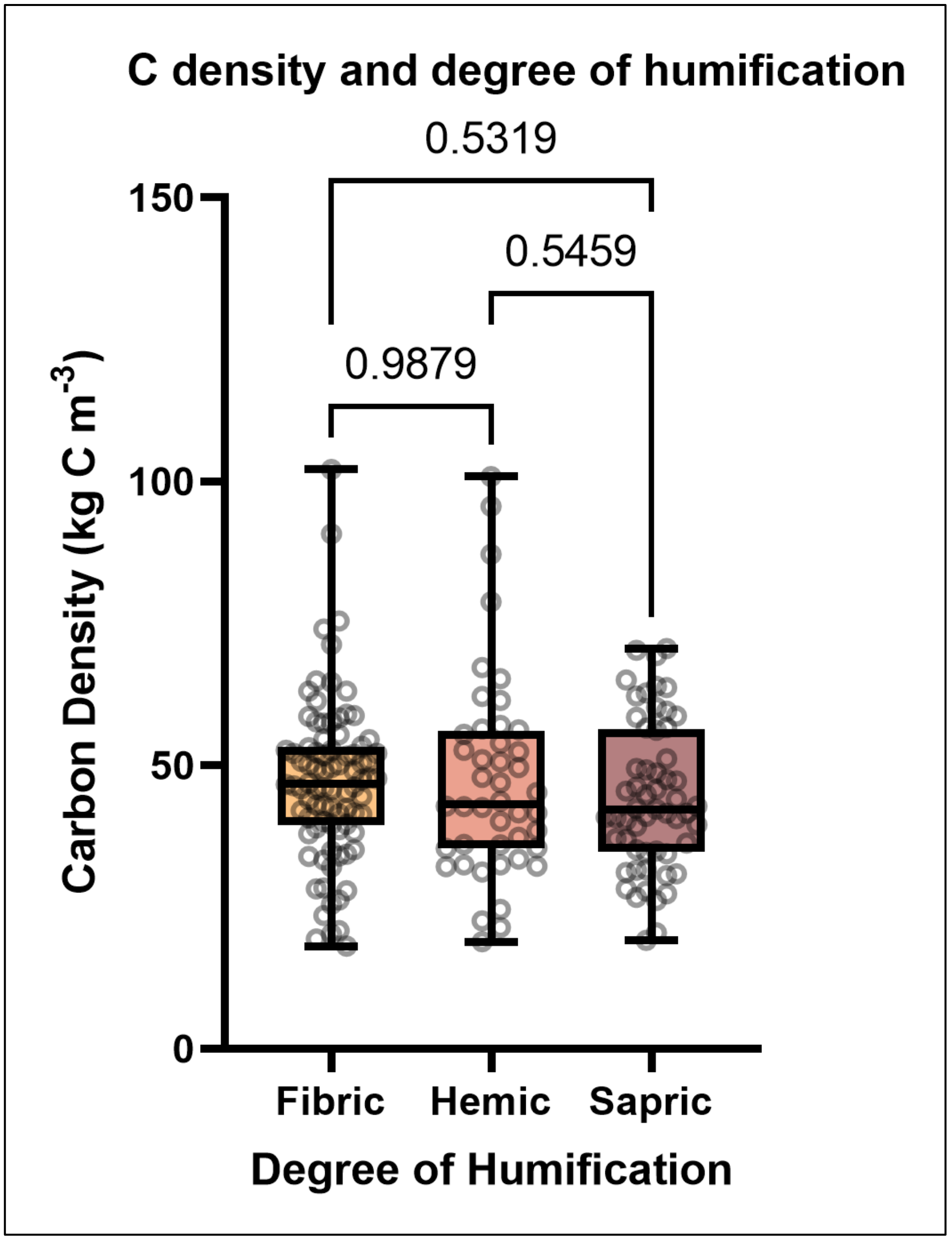


Figure 2.3: Box plot of carbon densities (kg C m^{-3}) of different degrees of humification of organic materials. Significance of the pairwise comparisons display p-value; no significant differences found based on a p-value <0.05. Whiskers indicate total range. Center line indicates the mean value.

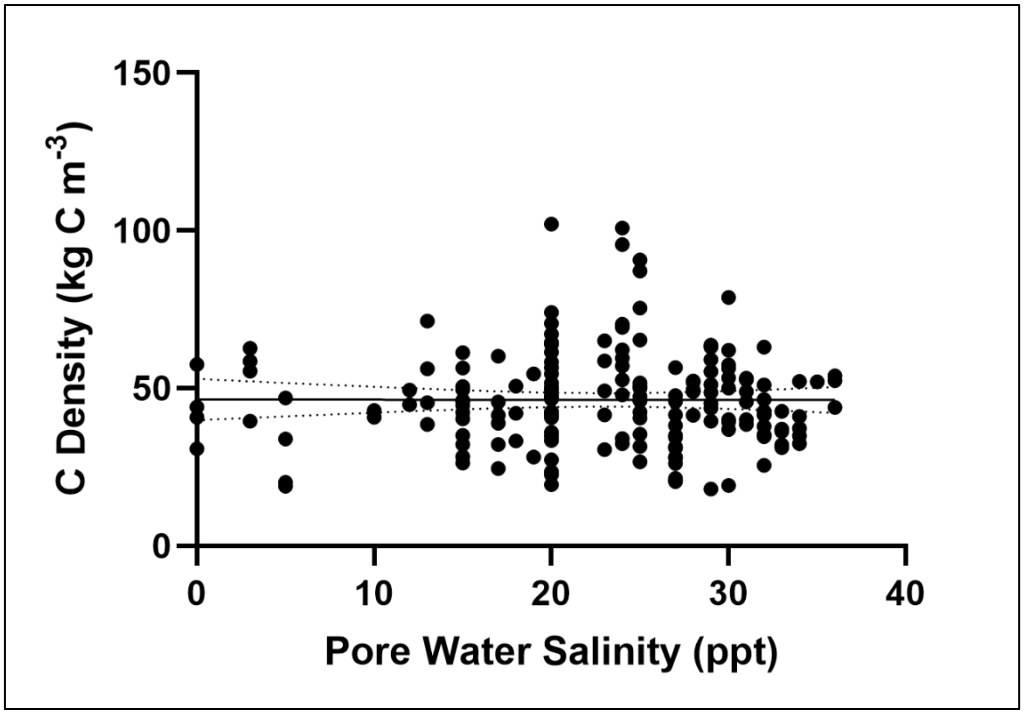


Figure 2.4: Scatter plot of pore water salinity (ppt) and C density (kg C m^{-3}). Dotted line indicates 95% confidence interval. $r^2 < 0.001$; p=0.942.

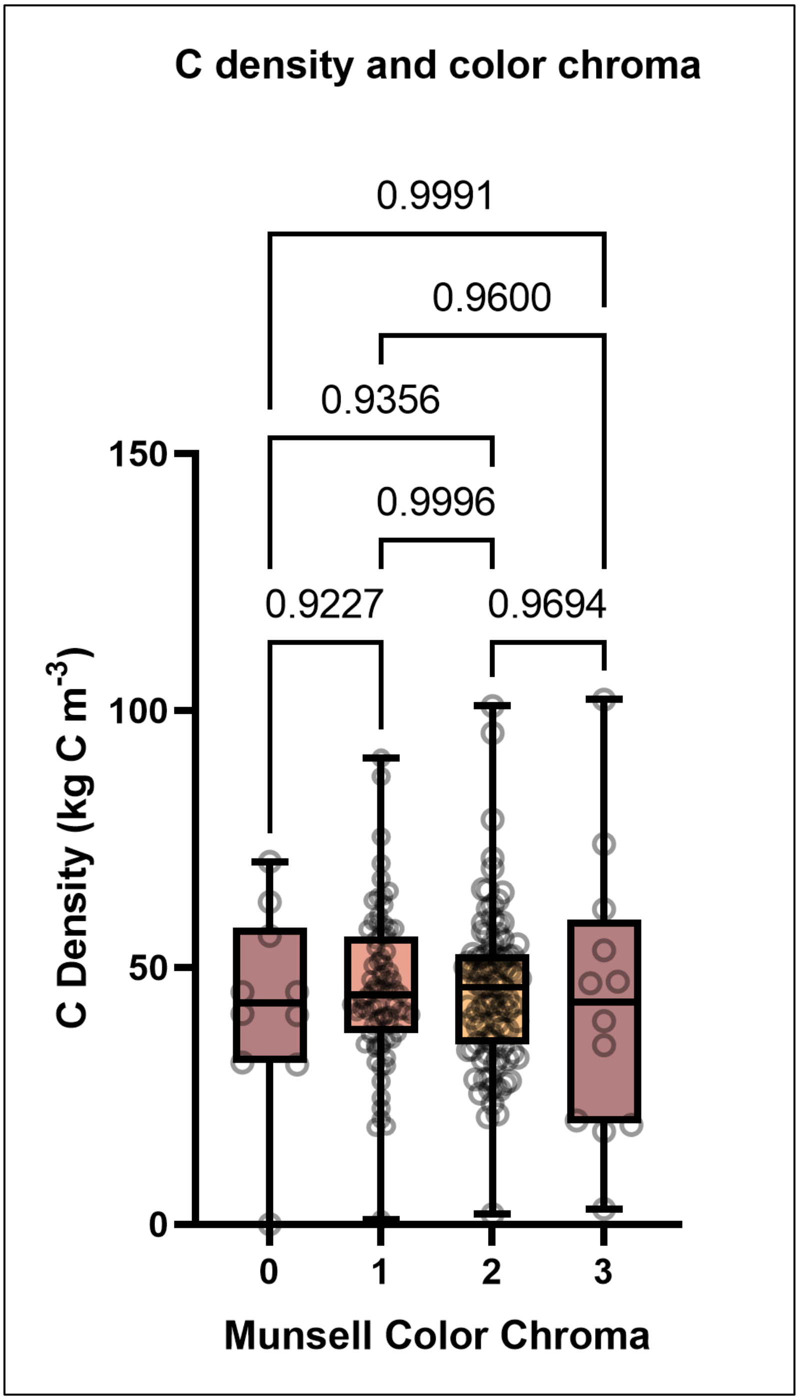


Figure 2.5: Box plot of C density (kg C m^{-3}) of different Munsell color chromas of organic materials. Significance of the pairwise comparisons are indicated by p-value; No significant differences found based on a p-value <0.05 Whiskers indicate total range while the center line indicates the mean value.

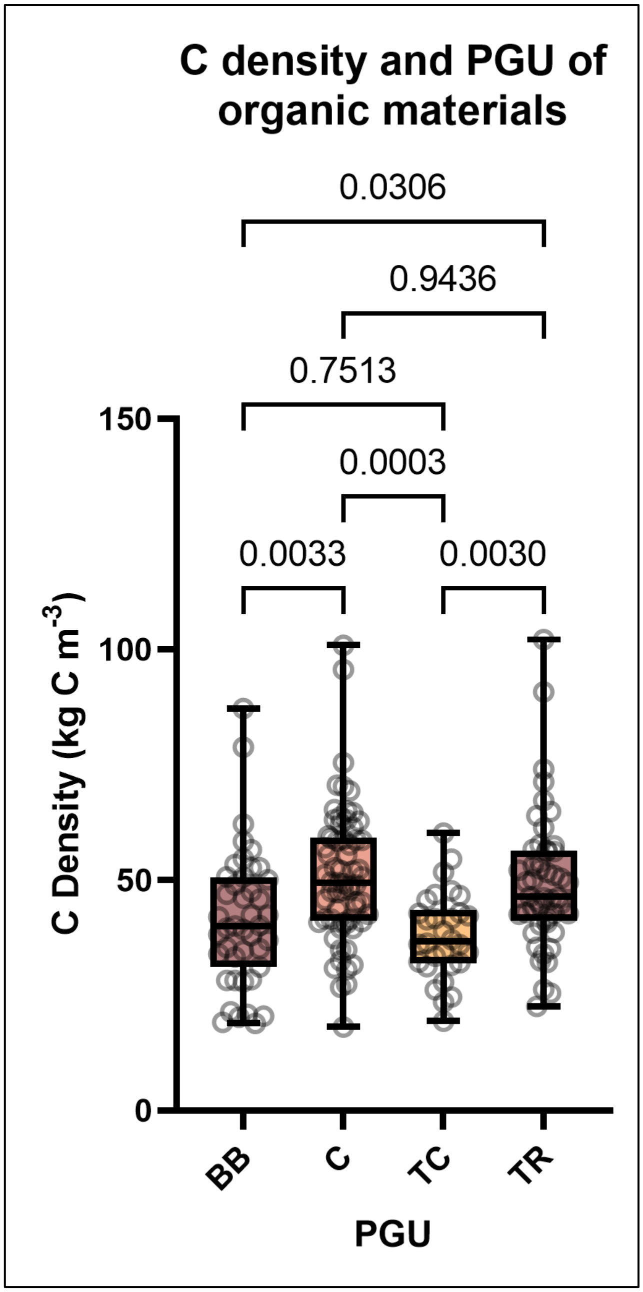


Figure 2.6: Box plot of organic horizon C density (kg C m^{-3}) of each pedogeomorphic unit (PGU). Significance of the pairwise comparisons are indicated by p-value. Note insignificant pairwise comparisons (p>0.05) between barriers and creeks as well as coves and rivers. Whiskers indicate total range and the center line indicates the mean

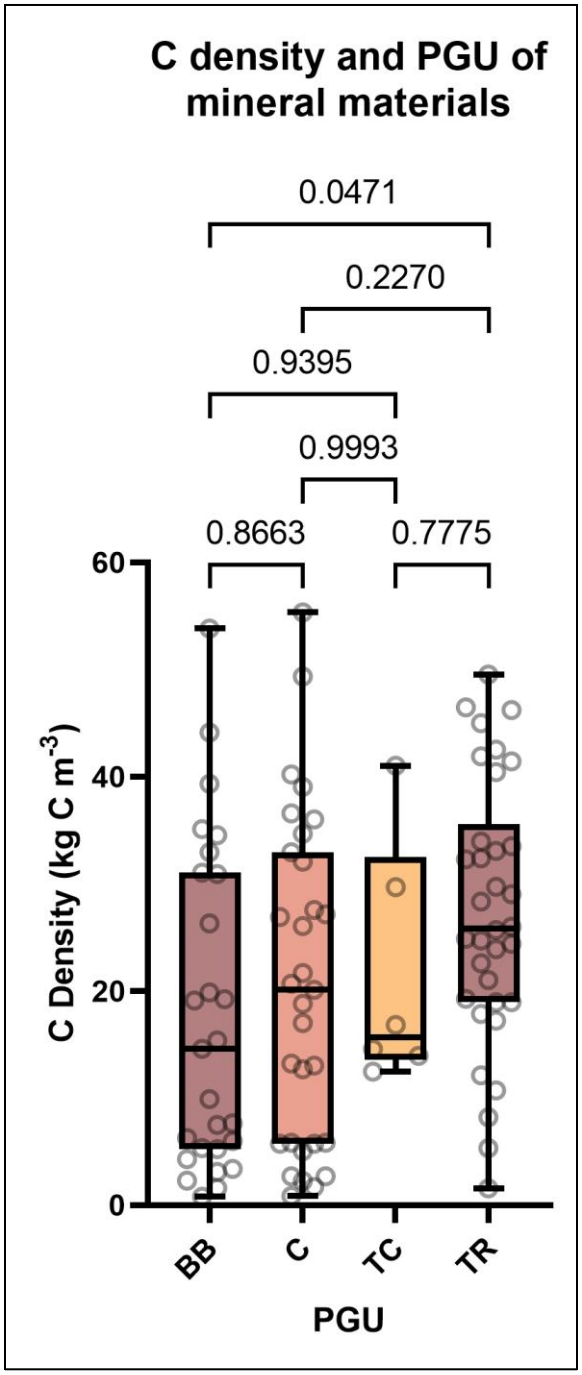


Figure 2.7: Box plot of mineral horizon C density (kg C m^{-3}) of each pedogeomorphic unit (PGU). Significance of the pairwise comparisons are indicated by p-value. Note insignificant pairwise comparisons ($p>0.05$) between all PGUs except barriers and rivers. Whiskers indicate total range and the center line indicates

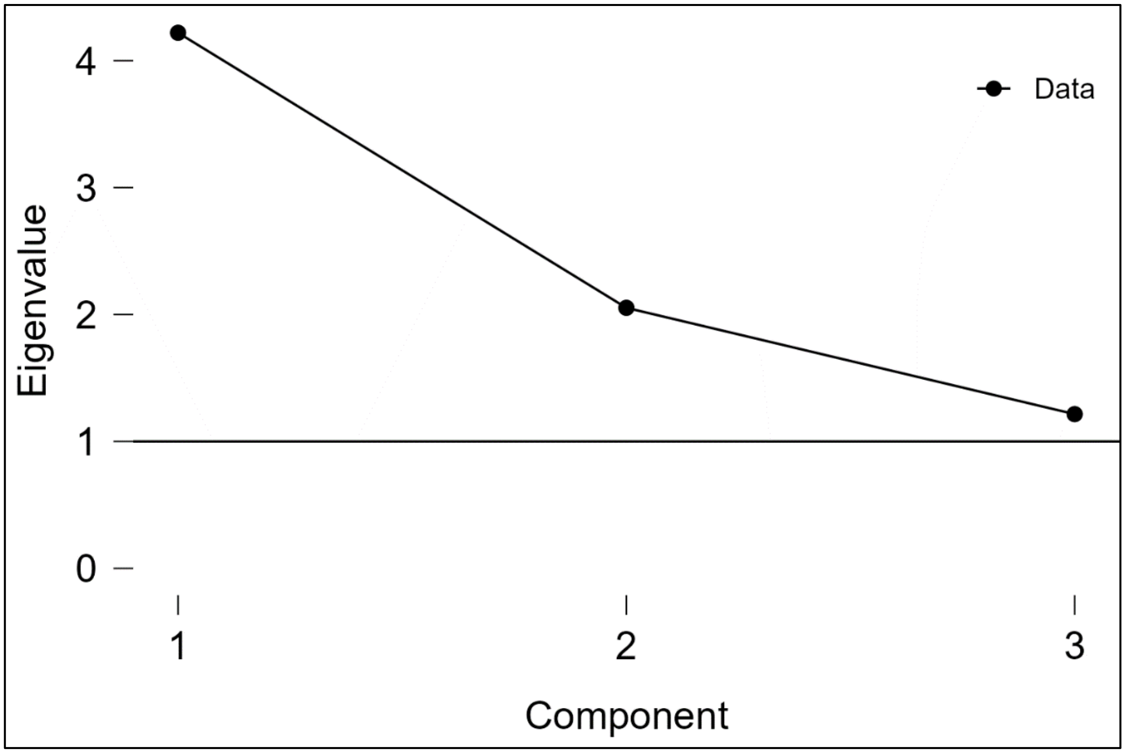


Figure 2.8: Scree plot displaying results of PCA of mineral soil materials. The first 3 principal components explain 68% of the variation. Principle component 1 contains sand %, silt %, clay %, and SOC %. Principle component 2 contains fine sand %, coarse sand %, very coarse sand %, and Munsell value. Principle component 3 contains medium sand % and very fine sand %.

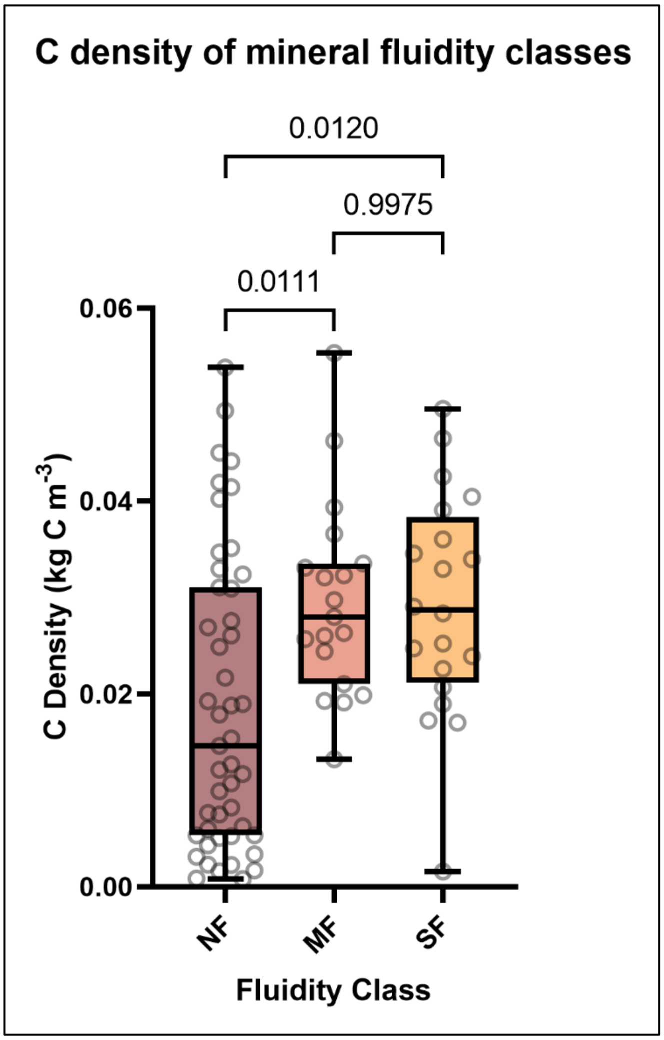


Figure 2.9: Box plot of mineral horizon C density (g C cm^{-3}) of non-fluid (NF), moderately fluid (MF), and slightly fluid (SF) soil. Significance of the pairwise comparison displays p-value. Note insignificant pairwise comparisons ($p>0.05$) between slightly fluid and moderately fluid soils. Whiskers indicate total range and the center line indicates the mean value.

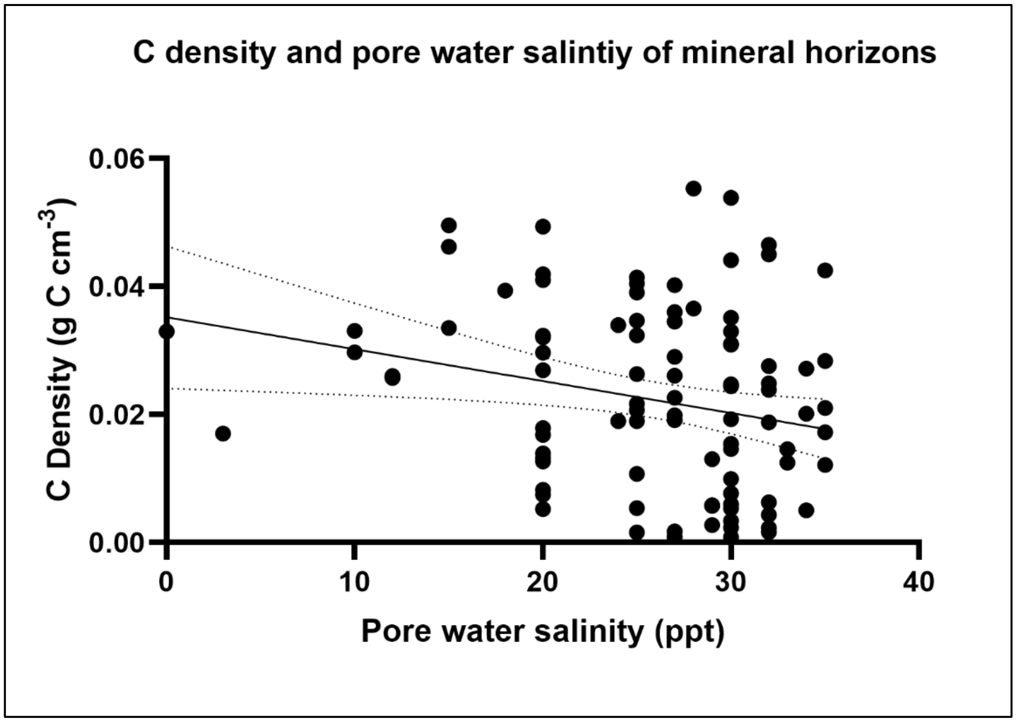


Figure 2.10: Scatter plot of mineral horizon C density (g C cm^{-3}) and pore water salinity (ppt). r^2=-0.237, p=0.019. Dotted line shows 95% confidence interval.

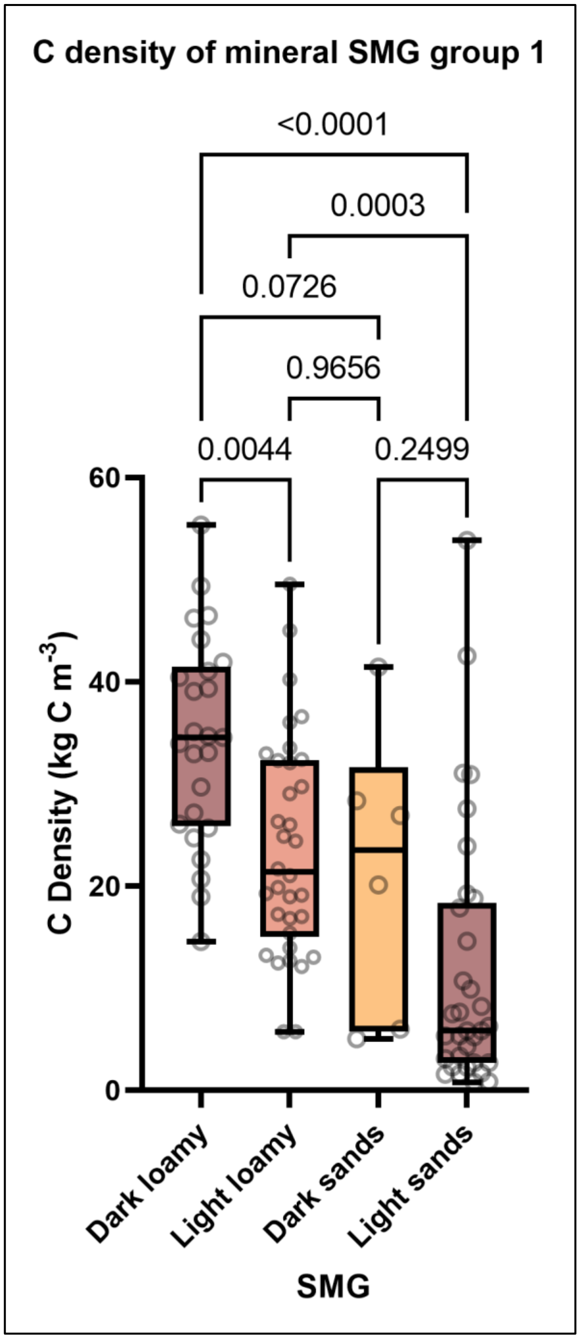


Figure 2.11: Box plot of mineral horizon C density (kg C m^{-3}) of dark and light loamy and dark and light sandy soil materials. Significance of the pairwise comparison displays p-value. Whiskers indicate total range and the center line indicates the mean value.

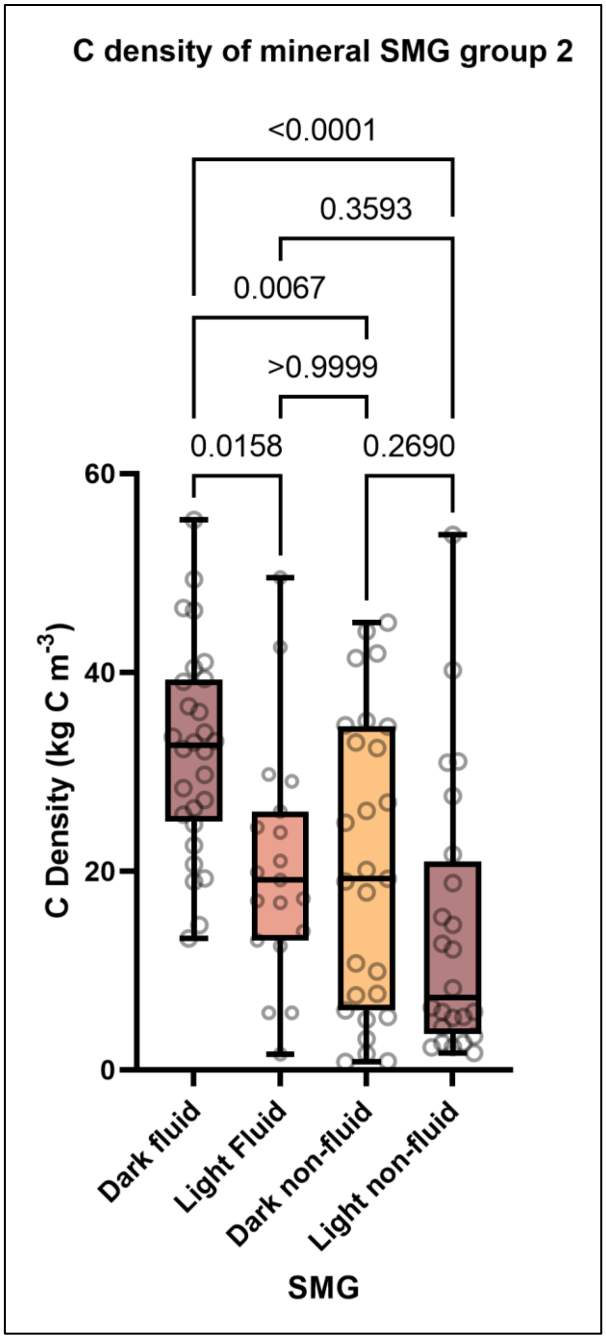


Figure 2.12: Box plot of mineral horizon C density (kg C m^{-3}) of dark and light fluid and dark and light non-fluid soil materials. Significance of pairwise comparison are indicated by p-value. Whiskers indicate total range and the center line indicates the mean value.

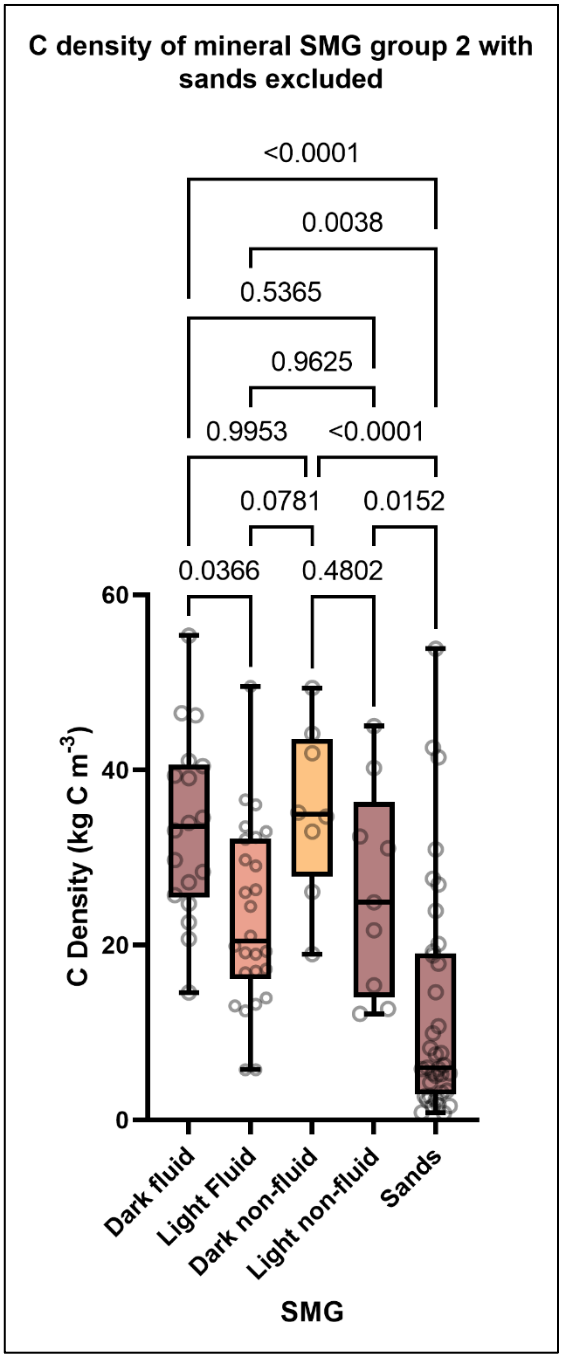


Figure 2.13: Box plot of mineral horizon C density (kg C m^{-3}) of dark and light fluid and dark and light non-fluid soil materials with sands excluded into a separate group. Significance of pairwise comparison are indicated by p-value. Whiskers indicate total range and the center line indicates the mean value.

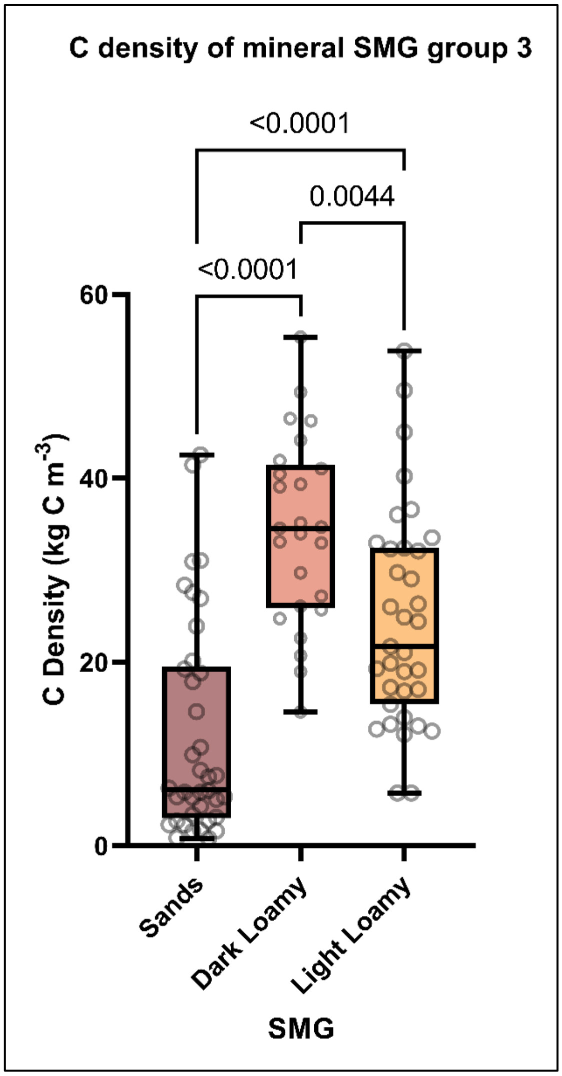


Figure 2.14: Box plot of mineral horizon C density (kg C m^{-3}) of dark and light loamy materials and sands. Significance of pairwise comparison displays p-value; all pairwise comparisons significant ($p<0.05$). Whiskers indicate total range and the center line indicates the mean value.

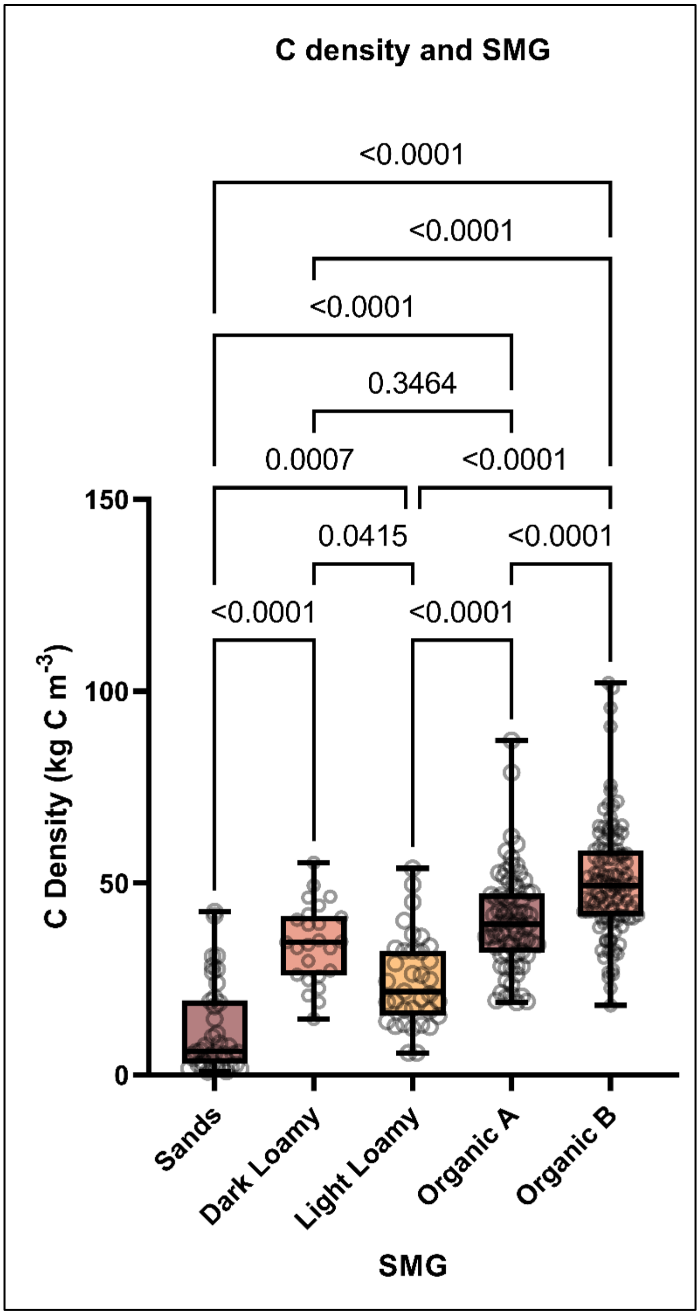


Figure 2.15: Box plot of mineral horizon C density (kg C m^{-3}) of the final grouping of soil material groups (SMGs). Significance of pairwise comparison are indicated by p-value; all pairwise comparisons significant ($p<0.05$). Whiskers indicate total range and the center line indicates the mean value.

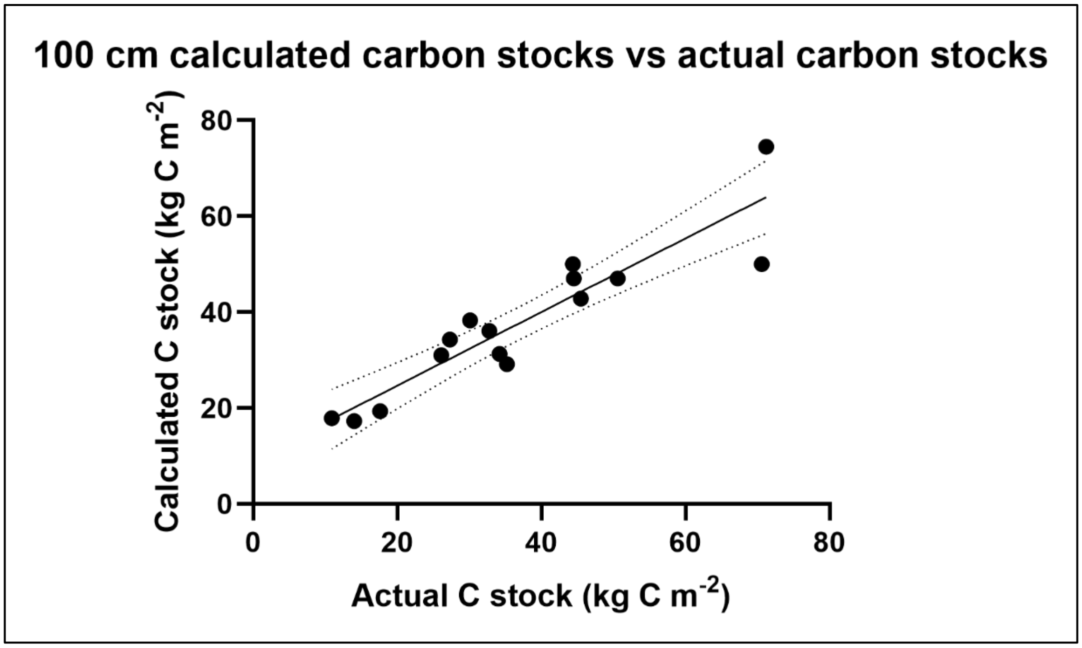


Figure 2.16: Scatter plot of 100 cm validation carbon stocks (not used in the model creation) predicated by SMGs and actual carbon stock (kg C m^{-3}) of the same pedons. r^2=0.84, p<0.0001. Dotted line shows 95% confidence interval.

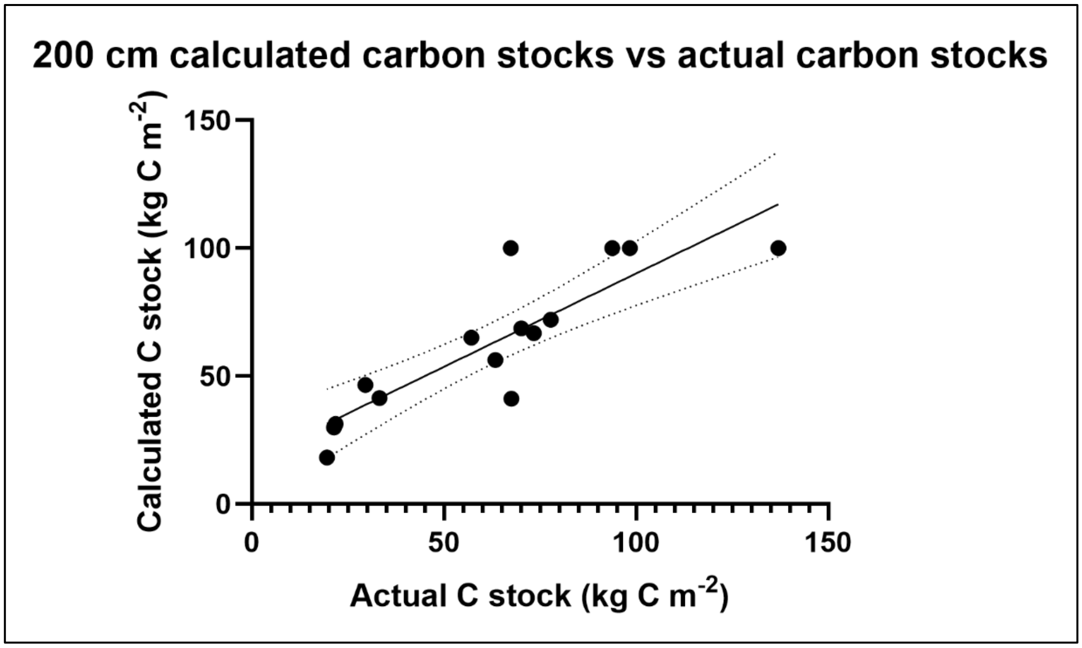


Figure 2.17: Scatter plot of 200 cm validation carbon stocks (not used in the model creation) predicated by SMGs and actual carbon stock (kg C m^{-3}) of the same pedons. r^2=0.75, p<0.0001. Dotted line shows 95% confidence interval.

APPENDICES

APPENDIX A: Described and sampled pedon descriptions

Pedon ID:	BIA1	Date:	5/19/2021	Location:	Stonington, CT	Dominate vegetation: S. patens			Pedogeomorphic Unit: C			
Classification:	Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemist			Latitude:	41.33948701	Secondary vegetation:			1 meter carbon stock (kg C m^{-2}): 25.5			
Pore water halinity (ppt):	29	Open water halinity:	NA	Longitude:	-71.863957	Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): 29.7			
Distance to open water (m):	346	Sampled:	Yes	Site notes:								
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes	
Oi	NA	2.5Y 4/3	9	0.12	33.1	8.32	No	0	ND	ND		
Oise	NA	2.5Y 3/2	22	0.26	23.58	7.85	Yes	0	ND	ND		
Oise2	NA	10YR 3/3	35	0.06	28.07	10.13	Yes	0	ND	ND		
Oese	NA	2.5Y 2.5/1	44	0.17	32.56	6.58	Yes	13.8	ND	ND		
Oase2	NA	5Y 2.5/1	49	0.41	14.94	8.8	Yes	0	ND	ND		
Cg1	LCS	5Y 5/1	76	ND	0.81	6.11	No	11	ND	ND		
Cg2	S	5Y 6/1	99	ND	0.17	4.31	No	8.7	ND	ND		
Cse1	S	5Y5/2	125	1.62	0.36	3.96	Yes	0	ND	ND		
Cse2	LFS	10Y 5/1	125+	1.49	0.38	4.33	Yes	0	ND	ND		

Pedon ID: BIA2	Date: 5/19/2021	Location:	Stonington, CT	Dominate vegetation: S. patens	Pedogeomorphic Unit: C
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.33875703	Secondary vegetation:	1 meter carbon stock (kg C m⁻²): ND
Pore water halinity (ppt): 25	Open water halinity: 10	Longitude:	-71.864777	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): ND
Distance to open water (m): 197	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/4	24	ND	ND	ND	No	0	ND	ND	
Oise	NA	2.5Y 3/2	41	ND	ND	ND	Yes	0	ND	ND	
Oese	NA	10YR 2/2	54	ND	ND	ND	Yes	0	ND	ND	
Oe	NA	N 2.5/	70	ND	ND	ND	No	0	ND	ND	
Cg	S	2.5Y 5/1	92	ND	ND	ND	No	0	ND	ND	
Cse	CS	5B 5/1	117	ND	ND	ND	Yes	0	ND	ND	

Pedon ID:	BIA3	Date:	5/19/2021	Location:	Stonington, CT	Dominate vegetation: S. patens			Pedogeomorphic Unit: C		
Classification:	Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemist			Latitude:	41.338061	Secondary vegetation:			1 meter carbon stock (kg C m⁻²): 30.6		
Pore water halinity (ppt):	34	Open water halinity:	NA	Longitude:	-71.86578501	Tertiary vegetation:			2 meter carbon stock (kg C m⁻²): 49.7		
Distance to open water (m):	86	Sampled:	No	Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	11	0.15	32.8	6.58	No	0	ND	ND	
Oe	NA	5Y 2.5/1	25	0.21	15.2	9.25	No	0	ND	ND	
Oa	NA	10YR 2/1	33	ND	29.35	10.57	No	0	ND	ND	
Oeb	NA	10YR 2/1	47	0.1	34.55	8.3	No	1.2	ND	ND	
Oab	NA	N 2.5/	60	0.11	34.48	5.64	No	0.4	ND	ND	
Cse1	FSL	10YR 3/1	71	1.62	1.68	5.59	Yes	5.3	ND	ND	
Cse2	LS	10YR 2/2	82	0.16	3.16	4.47	Yes	0	ND	ND	
Cse3	S	10YR 3/3	82+	1.22	1.65	5.43	Yes	0	ND	ND	

Pedon ID:	BIA4	Date:	5/19/2021	Location:	Stonington, CT	Dominate vegetation: S. alterniflora			Pedogeomorphic Unit: C		
Classification:	Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemist			Latitude:	41.33711996	Secondary vegetation:			1 meter carbon stock (kg C m^{-2}): ND		
Pore water halinity (ppt):	28	Open water halinity:	NA	Longitude:	-71.86688698	Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): ND		
Distance to open water (m):	13	Sampled:	No	Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	8	ND	ND	ND	No	0	ND	ND	
Oi2	NA	10YR 2/2	23	ND	ND	ND	No	0	ND	ND	
Oe	NA	10YR 3/3	39	ND	ND	ND	No	0	ND	ND	
Oa	NA	N 2.5/	60	ND	ND	ND	No	0	ND	ND	
Cse1	S	10YR 4/1	75	ND	ND	ND	Yes	0	ND	ND	
Cse2	LS	5Y 2.5/2	90	ND	ND	ND	Yes	0	ND	ND	
Cse3	SL	2.5Y 3/3	100	ND	ND	ND	Yes	0	ND	ND	
Cse4	FSL	5Y 3/3	100+	ND	ND	ND	Yes	0	ND	ND	

Pedon ID: BIA5	Date: 5/19/2021	Location: Stonington, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Loamy, mixed, euic, mesic Terric Sulfisaprist		Latitude: 41.33580702	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 33	Open water halinity: 25	Longitude: -71.86754404	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 6	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	21	ND	ND	ND	No	0	ND	ND	
Oi2	NA	10YR 2/2	37	ND	ND	ND	No	0	ND	ND	
Oa	NA	N 2.5/	50	ND	ND	ND	No	0	ND	ND	
C	MLS	2.5Y 4/1 & N2.5/	65	ND	ND	ND	No	0	ND	ND	
Oab1	NA	10YR 2/1	75	ND	ND	ND	No	0	ND	ND	
Oab2	NA	10YR 2/1	94	ND	ND	ND	No	0	ND	ND	
Oab3	NA	N 2.5/	106	ND	ND	ND	No	0	ND	ND	
C	MCSL	2.5Y 3/2	106+	ND	ND	ND	No	0	ND	ND	

Pedon ID: SC1	Date: 5/26/2021	Location:	Sheffield Cove, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.49347699	Secondary vegetation:	1 meter carbon stock (kg C m¯ ²): ND
Pore water halinity (ppt): 15	Open water halinity: NA	Longitude:	-71.38365601	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND
Distance to open water (m): 51	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	10YR 2/2	35	ND	ND	3.6	No	0	ND	ND	
Oa	NA	7.5YR 2.5/1	63	0.12	38.21	2.72	No	0	ND	ND	
A	MSiL	N 2.5/	70	0.89	6.53	0.56	No	7.3	ND	ND	
Cg1	Sil	N 4/	82	ND	2.56	0.415	No	0	ND	ND	
Cg2	S	N 5/	82+	1.67	0.55	0.335	No	0	ND	ND	

Pedon ID: SC2	Date: 5/26/2021	Location:	Sheffield Cove, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.49326904	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 25	Open water halinity: NA	Longitude:	-71.38426404	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 9	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/1	6	ND	ND	ND	No	0	ND	ND	
Oi2	NA	2.5Y 3/2	13	ND	ND	ND	No	0	ND	ND	
Cg	LS	2.5Y 3/1	17	ND	ND	ND	No	0	ND	ND	
Oeb	NA	2.5Y 3/1	46	ND	ND	ND	No	0	ND	ND	
Oeb2	NA	2.5Y 3/2	69	ND	ND	ND	No	0	ND	ND	
Oab	NA	N 2.5Y/	86	ND	ND	ND	No	0	ND	ND	
C	SiL	2.5Y 5/2	87	ND	ND	ND	No	0	ND	ND	
Oab'	NA	N 2.5/	87+	ND	ND	ND	No	0	ND	ND	

Pedon ID: FG1	Date: 5/26/2021	Location:	Fort Getty, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude:	41.489121	Secondary vegetation: S. patens	1 meter carbon stock (kg C m⁻²): 30.2
Pore water halinity (ppt): 32	Open water halinity: NA	Longitude:	-71.39831303	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): 57.1
Distance to open water (m): 42	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/1	13	ND	25.28	6.165	No	0	ND	ND	
A	MSL	2.5Y 3/1	20	0.29	ND	6.185	No	0	ND	ND	
Cse	S	N 4/	26	0.87	3.19	5.125	Yes	0	ND	ND	
Oab	MSL	2.5Y 4/1	31	ND	ND	ND	No	0	ND	ND	
Cse'	S	N 4/	51	0.76	0.3	6.955	Yes	0	ND	ND	
Oab1	MSL	7.5YR 3/1	53	ND	ND	5.425	No	0.4	ND	ND	
Oab2	NA	10YR 3/1	139	0.12	34.68	3.745	No	0	ND	ND	
Cse''	LFS	N 4/	139+	0.67	2.79	3.775	Yes	0	ND	ND	

Pedon ID: FG2	Date: 5/26/2021	Location: Fort Getty, RI	Dominate vegetation: D. spicata	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfihemist		Latitude: 41.48944697	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 27	Open water halinity: 31	Longitude: -71.39751599	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 19	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	10YR 3/1	9	ND	ND	ND	No	0	ND	ND	
Ase	FSL	10YR 4/1	18	ND	ND	ND	Yes	0	ND	ND	
Oeb	NA	2.5Y 4/1	40	ND	ND	ND	No	0	ND	ND	
Oeb2	NA	10YR 3/1	67	ND	ND	ND	No	0	ND	ND	
Oab	NA	10YR 2/1	76	ND	ND	ND	No	0	ND	ND	
Oib	NA	10YR 2/2	107	ND	ND	ND	No	0	ND	ND	
Oab'	NA	2.5Y 2.5/1	116	ND	ND	ND	No	0	ND	ND	
Oab'	NA	2.5Y 2.5/1	128	ND	ND	ND	No	0	ND	ND	
Oib'	NA	10YR 2/1	142	ND	ND	ND	No	0	ND	ND	
Oab''	NA	N 2.5/	152	ND	ND	ND	No	0	ND	ND	
Oeb'	NA	2.5Y 2.5/1	168	ND	ND	ND	No	0	ND	ND	
Cse	FSL	5Y 4/1	172	ND	ND	ND	Yes	0	ND	ND	
Oeb''	NA	10YR 3/1	172+	ND	ND	ND	No	0	ND	ND	

Pedon ID: FG3	Date: 5/26/2021	Location: Fort Getty, RI	Dominate vegetation:	Pedogeomorphic Unit: C
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.48835498	Secondary vegetation:	1 meter carbon stock (kg C m⁻²): 13.9
Pore water halinity (ppt): 25	Open water halinity: NA	Longitude: -71.39634403	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): 19.5
Distance to open water (m): 22	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/1	9	0.16	29.62	3.05	No	0	ND	ND	
Cg	FSL	10Y 3/1	16	1.13	3.46	4.06	No	0	ND	ND	
Oab	NA	2.5Y 2.5/1	24	0.36	20.33	4.33	No	0	ND	ND	
Ase	MVFSL	2.5Y 3/1 & N 2.5/	34	1.07	6.71	3.14	Yes	0	ND	ND	
Cg1	LFS	2.5Y 2.5/1	38	ND	ND	ND	No	0	ND	ND	
Cg2	LFS	5Y 3/1	61	ND	ND	ND	No	0	ND	ND	
Cg3	GRLFS	5Y 2.5/1	61+	ND	ND	ND	No	0	ND	ND	

Pedon ID: FG4	Date: 5/26/2021	Location:	Fort Getty, RI	Dominate vegetation:	Pedogeomorphic Unit: C
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfisaprist		Latitude:	41.48928302	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 37	Open water halinity: NA	Longitude:	-71.39543803	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 32.34	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	5Y 4/2	17	ND	ND	ND	No	0	ND	ND	
Oe	NA	2.5Y 3/2	30	ND	ND	ND	No	0	ND	ND	
Oa1	NA	5Y 3/1	40	ND	ND	ND	No	0	ND	ND	
Oa2	NA	10YR 3/1	48	ND	ND	ND	No	0	ND	ND	
Oa3	NA	2.5Y 2.5/1	56	ND	ND	ND	No	0	ND	ND	
Oa4	NA	N 2.5/	67	ND	ND	ND	No	0	ND	ND	
Cse	LS	2.5Y 3/1	67+	ND	ND	ND	Yes	0	ND	ND	

Pedon ID: FG5	Date: 5/26/2021	Location: Fort Getty, RI	Dominate vegetation:	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfisaprist		Latitude: 41.49029103	Secondary vegetation:	1 meter carbon stock (kg C m⁻²): ND
Pore water halinity (ppt): 33	Open water halinity: 31	Longitude: -71.39523	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): ND
Distance to open water (m): 8	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	17	ND	ND	ND	No	0	ND	ND	
Oe	NA	2.5Y 3/1	29	ND	ND	ND	No	0	ND	ND	
Oa	NA	10YR 3/1	34	ND	ND	ND	No	0	ND	ND	
Oe'	NA	2.5Y 2.5/1	48	ND	ND	ND	No	0	ND	ND	
Oa'1	NA	10YR 2/1	57	ND	ND	ND	No	0	ND	ND	
Oa'2	NA	2.5Y 2.5/1	80	ND	ND	ND	No	0	ND	ND	
Oa'3	NA	N 2.5/	99	ND	ND	ND	No	0	ND	ND	
Oase	NA	10YR 2/1	135	ND	ND	ND	Yes	0	ND	ND	
Oa''1	NA	N 2.5/	143	ND	ND	ND	No	0	ND	ND	
Oa''2	NA	10YR 2/2	148	ND	ND	ND	No	0	ND	ND	
Oa''3	NA	2.5Y 2.5/1	148+	ND	ND	ND	No	0.2	ND	ND	

Pedon ID: BIB1	Date: 5/24/2021	Location:	Stonington, CT	Dominate vegetation: D. spicata	Pedogeomorphic Unit: TC
Classification:	Loamy, mixed, euic, mesic Terric Sulfihemist	Latitude:	41.34062	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 37.0
Pore water halinity (ppt): 20	Open water halinity: NA	Longitude:	-71.8736	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 53.7
Distance to open water (m): 50	Sampled: Yes	Site notes:	Culvert connects creek to cove PGU adjacent to this site		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 2/2	20	0.18	29.1	4.21	No	0	ND	ND	
Oe	NA	2.5Y 3/2	41	0.25	19.92	4.95	No	0	ND	ND	
Oa	NA	5Y 2.5/1	52	0.13	30.57	5.21	No	0	ND	ND	
A	MSL	N 2.5/	62	0.37	11.01	5.06	No	0	ND	ND	
CA	MSL	7.5YR 2.5/1	73	0.84	3.53	4.23	No	0.7	ND	ND	
Cse1	LS	10YR 4/2	82	1.01	1.39	3.085	Yes	0	ND	ND	
Cse2	SL	5B 5/1	82+	1.73	0.97	2.22	Yes	0	ND	ND	

Pedon ID: BIB2	Date: 5/24/2021	Location: Stonington, CT	Dominate vegetation: S. patens	Pedogeomorphic Unit: TC
Classification: Loamy, mixed, euic, mesic Terric Haplosaprist		Latitude: 41.34055	Secondary vegetation: S. alterniflora	1 meter carbon stock (kg C m^{-2}): 34.6
Pore water halinity (ppt): 33	Open water halinity: 30	Longitude: -71.874	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 40.5
Distance to open water (m): 16	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/2	11	0.12	33.59	5.245	No	0	ND	ND	
Oe	NA	10YR 2/2	20	0.24	12.48	4.98	No	0	ND	ND	
Oa1	NA	2.5Y 3/2	34	0.16	19.09	7.03	No	0	ND	ND	
Oa2	NA	10YR 2/2	52	0.13	26.43	7.01	No	0	ND	ND	
Oa3	NA	5Y 2.5/1	77	0.12	30.08	7.145	No	2.3	ND	ND	
Oa4	NA	5Y 2.5/1	94	0.18	23.23	4.485	No	0	ND	ND	
Cse1	CS	2.5Y 2.5/1	105	1.35	1.08	2.575	Yes	0	ND	ND	
Cse2	FSL	5Y 4/1	112	1.15	1.08	3.25	Yes	0	ND	ND	
Cse3	Si	5GY 6/1	144	1.37	0.99	2.255	Yes	0	ND	ND	

Pedon ID:	BIB3	Date:	5/24/2021	Location:	Stonington, CT	Dominate vegetation:		Pedogeomorphic Unit: TC	
Classification:	Loamy, mixed, euic, mesic Terric Sulfisaprist			Latitude:	41.34162	Secondary vegetation:		1 meter carbon stock (kg C m¯ ²): ND	
Pore water halinity (ppt):	28	Open water halinity:	NA	Longitude:	-71.874	Tertiary vegetation:		2 meter carbon stock (kg C m¯ ²): ND	
Distance to open water (m):	21	Sampled:	No	Site notes:					

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/2	9	ND	ND	ND	No	0	ND	ND	
Oe1	NA	2.5Y 2.5/1	18	ND	ND	ND	No	0	ND	ND	
Oe2	NA	2.5Y 3/2	30	ND	ND	ND	No	0	ND	ND	
Oa1	NA	10YR 2/1	72	ND	ND	ND	No	0	ND	ND	
Oa2	NA	N 2.5/	72+	ND	ND	ND	No	0	ND	ND	

Pedon ID: BIB4	Date: 5/24/2021	Location: Stonington, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TC	
Classification: Loamy, mixed, euic, mesic Terric Sulfisaprist		Latitude: 41.34158	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND	
Pore water halinity (ppt): 25	Open water halinity: 25	Longitude: -71.8744	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND	
Distance to open water (m): 1	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/1	10	ND	ND	ND	No	0	ND	ND	
Oa1	NA	10YR 3/1	21	ND	ND	ND	No	0	ND	ND	
Oa2	NA	2.5Y 3/1	43	ND	ND	ND	No	0	ND	ND	
Oa3	NA	N 2.5/	56	ND	ND	ND	No	0	ND	ND	
Oe	NA	10YR 2/1	68	ND	ND	ND	No	0	ND	ND	
Oa'	NA	N 2.5/	68+	ND	ND	ND	No	0	ND	ND	

Pedon ID:	BIB5	Date:	5/24/2021	Location:	Stonington, CT	Dominate vegetation:			Pedogeomorphic Unit: TC		
Classification:	Loamy, mixed, euic, mesic Terric Sulfisaprist			Latitude:	41.34258	Secondary vegetation:			1 meter carbon stock (kg C m⁻²): 27.3		
Pore water halinity (ppt):	27	Open water halinity:	NA	Longitude:	-71.8739	Tertiary vegetation:			2 meter carbon stock (kg C m⁻²): 29.5		
Distance to open water (m):	48	Sampled:	Yes	Site notes:							

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	7.5YR 2.5/2	15	0.13	30.6	5.66	No	0	ND	ND	
Oa1	NA	10YR 2/1	28	0.15	21.98	6.96	No	0	ND	ND	
Oa2	NA	10YR 3/2	42	0.1	24.57	5.615	No	0	ND	ND	
Oa3	NA	10YR 2/1	60	0.09	30.79	6.79	No	0	ND	ND	
Oa4	NA	N 2.5/	71	0.09	34.02	5.325	No	0	ND	ND	
Ase	SiL	2.5Y 2.5/1	77	0.44	6.97	4.51	Yes	0	ND	ND	
CAse	SiL	10YR 3/1	87	0.82	3.86	3.815	Yes	0	ND	ND	
Cse	SiL	5Y 5/1	187+	0.86	0.25	3.365	Yes	0	ND	ND	

Pedon ID: BIB6	Date: 5/24/2021	Location:	Stonington, CT	Dominate vegetation:	Pedogeomorphic Unit: TC
Classification: Loamy, mixed, euic, mesic Terric Sulfisaprist		Latitude:	41.34022	Secondary vegetation:	1 meter carbon stock (kg C m⁻²): ND
Pore water halinity (ppt): 28	Open water halinity: NA	Longitude:	-71.8748	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): ND
Distance to open water (m): 13	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/1	15	0.26	ND	5.185	No	0	ND	ND	
Oa	NA	2.5Y 2.5/1	27	0.28	ND	5.405	No	0	ND	ND	
Oe	NA	10YR 3/2	38	0.19	ND	7.69	No	0	ND	ND	
Oa'1	NA	10YR 2/1	70	0.16	ND	7.48	No	0	ND	ND	
Oa'2	NA	N 2.5	92	0.13	ND	6.855	No	0	ND	ND	
Oa'3	NA	N 2.5	106	0.13	ND	5.05	No	0	ND	ND	
Cg	SL	2.5 4/1	106+	0.85	ND	2.99	No	0	ND	ND	

Pedon ID: BIB7		Date: 5/24/2021		Location:	Stonington, CT	Dominate vegetation:			Pedogeomorphic Unit: TC		
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist				Latitude:	41.34037	Secondary vegetation:			1 meter carbon stock (kg C m⁻²): ND		
Pore water halinity (ppt): 8		Open water halinity: NA		Longitude:	-71.8756	Tertiary vegetation:			2 meter carbon stock (kg C m⁻²): ND		
Distance to open water (m): 82.34		Sampled: No		Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	19	ND	ND	ND	No	0	ND	ND	
Oe	NA	10YR 2/2	30	ND	ND	ND	No	0	ND	ND	
Oi'	NA	2.5Y 3/2	43	ND	ND	ND	No	0	ND	ND	
Oa	NA	10YR 2/1	54	ND	ND	ND	No	0	ND	ND	
Oa2	NA	N 2.5/	60	ND	ND	ND	No	0	ND	ND	
A	SiL	N 2.5/	66	ND	ND	ND	No	0	ND	ND	
Cg1	SL	2.5Y 4/1	77	ND	ND	ND	No	0	ND	ND	
Cg2	SL	5GY 3/1	77+	ND	ND	ND	No	0	ND	ND	

Pedon ID: VB1	Date: 5/17/2021	Location:	South Kingstown, RI	Dominate vegetation: phragmites	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Histic-Haplic Sulfaquent		Latitude:	41.37588099	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 15	Open water halinity: NA	Longitude:	-71.54951099	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 135	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	2.5Y 4/2	33	ND	17.26	ND	No	0	ND	ND	
A	NA	2.5Y 3/2	40	ND	10.13	ND	No	0	ND	ND	
Ase	LS	5Y 2.5/1	48	ND	3.5	ND	Yes	0	ND	ND	
Cse	LS	5Y 3/1	69	ND	3.11	ND	Yes	0	ND	ND	

Pedon ID: VB2	Date: 5/17/2021	Location:	South Kingstown, RI	Dominate vegetation: phragmites	Pedogeomorphic Unit: BB
Classification:	Sandy, Mixed, Mesic Haplic Sulfaquent	Latitude:	41.37561201	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 5	Open water halinity: NA	Longitude:	-71.54925803	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 107	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	5	0.29	11.09	ND	No	0	ND	ND	
C	S	10Y 5/1	14	1.02	1.21	ND	No	13	ND	ND	
Oeb	NA	10YR 3/3	35	0.34	13.43	ND	No	0	ND	ND	
CA	GCS	10YR 2/1	35+	2.51	1.8	ND	No	15	ND	ND	

Pedon ID: CTB1	Date: 6/2/2021	Location: Charlestown, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Histic-Haplic Sulfaquent		Latitude: 41.35991799	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 10.9
Pore water halinity (ppt): 5	Open water halinity: NA	Longitude: -71.635915	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 21.4
Distance to open water (m): 130.17	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 4/3	11	0.06	34.32	1	No	0	ND	ND	
Oe	NA	10YR 3/1	21	0.08	13.61	1.805	No	0.7	ND	ND	
Cg1	GLFS	2.5Y 5/2	36	0.63	1.82	1.89	No	21.6	ND	ND	
Cg2	CS	5Y 5/1	66	1.75	0.17	1.9	No	0	ND	ND	
C	GCSL	2.5Y 3/2	100	1.27	0.78	1.105	No	15	ND	ND	

Pedon ID: CTB2	Date: 6/2/2021	Location:	Charlestown, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude:	41.36016299	Secondary vegetation: P. australis	1 meter carbon stock (kg C m⁻²): ND
Pore water halinity (ppt): 5	Open water halinity: NA	Longitude:	-71.636058	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): ND
Distance to open water (m): 97	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	10	ND	ND	ND	No	0	ND	ND	
Oe	LS	10YR 3/1	17	ND	ND	ND	No	0	ND	ND	
Cg1	S	5Y 3/1	23	ND	ND	ND	No	0	ND	ND	
Cg2	S	5Y 4/1	56	ND	ND	ND	No	0	ND	ND	
Cg3	CS	10Y 4/1	85	ND	ND	ND	No	0	ND	ND	
2C	GSL	2.5Y 3/2	110	ND	ND	ND	No	15	ND	ND	

Pedon ID: CTB3	Date: 6/2/2021	Location:	Charlestown, RI	Dominate vegetation: S. Patens	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude:	41.36055602	Secondary vegetation: S. alterniflora	1 meter carbon stock (kg C m¯ ²): 17.0
Pore water halinity (ppt): 19	Open water halinity: NA	Longitude:	-71.63609597	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): 20.2
Distance to open water (m): 51	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	5Y 2.5/2	13	0.14	37.76	2.58	No	0	ND	ND	
A	VFSL	2.5Y 2.5/1	18	0.24	7.21	6.135	No	0	ND	ND	
Oeb	NA	2.5Y 3/2	34	0.17	16.18	5.795	No	2.1	ND	ND	
Cse1	LS	5y 4/1	51	1.07	1.49	4.16	Yes	0.1	ND	ND	
Cse2	S	5GY 4/1	81	1.57	0.3	2.845	Yes	0	ND	ND	
Cse3	FS	N4/	91	1.59	0.2	3.21	Yes	0	ND	ND	
Cse4	S	N4/	105	0	0	3.29	Yes	0	VF	ND	

Pedon ID: CTB4	Date: 6/2/2021	Location: Charlestown, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.36104904	Secondary vegetation:	1 meter carbon stock (kg C m¯ ²): 17.2
Pore water halinity (ppt): 30	Open water halinity: 25	Longitude: -71.63633301	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): 23.1
Distance to open water (m): 9	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
A1	MSiL	10Yr 4/1	8	0.69	7.69	10.615	No	0	ND	ND	
A2	MSiL	2.5Y 4/1	30	0.58	6.61	9.04	No	1.3	ND	ND	
Cg1	VFS	N4/	47	1.17	1.32	5.805	No	0	ND	ND	
Cg2	S	N4/	97	0.85	0.4	4.015	No	0	ND	ND	
Cg3	FS	N3/	125+	1.45	0.41	5.39	No	0	ND	ND	

Pedon ID: MP1	Date: 2/6/2021	Location: Charlestown, RI	Dominate vegetation: S. Patens	Pedogeomorphic Unit: BB
Classification: Coarse-loamy, Mixed, Active, Mesic Histic-Haplic Sulfaquent		Latitude: 41.37000603	Secondary vegetation:	1 meter carbon stock (kg C m⁻²): 26.1
Pore water halinity (ppt): 15	Open water halinity: NA	Longitude: -71.64379299	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): 33.2
Distance to open water (m): 16	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	10YR 2/2	16	0.11	43.62	1.47	No	0	ND	ND	
Oa1	NA	10YR 2/1	25	0.18	19.1	3.49	No	0.3	ND	ND	
Oa2	NA	10YR 2/2	33	0.3	13.54	3.61	No	0.1	ND	ND	
Ase	MFSL	N 2.5/	48	1.35	2.67	2.74	Yes	0.2	ND	ND	
CAse	SL	2.5Y 3/1	55	1.52	1.82	2.77	Yes	0.2	ND	ND	
Cse1	SL	5Y 4/2	73	1.44	0.78	1.63	Yes	0.1	ND	ND	
Cse2	SL	10Y 5/1	93	1.62	0.68	1.66	Yes	0	ND	ND	
Cse3	S	10Y 5/1	115+	1.52	0.35	1.65	Yes	0	ND	ND	

Pedon ID: MP2	Date: 2/6/2021	Location: Charlestown, RI	Dominate vegetation: S. Patens	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.36933698	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 18	Open water halinity: NA	Longitude: -71.64369701	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 18	Sampled: Yes	Site notes: Could not auger further due to large coarse fragments		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/2	5	0.17	18.88	2.22	No	0	ND	ND	
Oe	NA	2.5Y 3/1	9	0.21	19.2	4.82	No	0	ND	ND	
A	SL	10YR 2.5/1	11	ND	ND	ND	No	0	ND	ND	
Cg	S	2.5Y 5/1	12	ND	ND	ND	No	0	ND	ND	
Oeb	NA	2.5Y 3/1	19	ND	ND	ND	No	0.4	ND	ND	
Oab	NA	2.5Y 4/2	33	0.38	12.86	4.31	No	1.5	ND	ND	
A	SL	2.5Y 2.5/1	42	1.17	3.16	4.55	No	3.6	ND	ND	
CA	SL	10YR 2/1	49	1.55	2.55	2.9	No	0	ND	ND	
C	LS	10YR 3/2	55	ND	1.57	3.46	No	0	ND	ND	

Pedon ID: TN1	Date: 1/6/2021	Location: Narragansett, RI	Dominate vegetation: S. Patens	Pedogeomorphic Unit: TR
Classification: Euic, mesic Typic Sulfisaprist		Latitude: 41.49326904	Secondary vegetation: S. alterniflora	1 meter carbon stock (kg C m⁻²): ND
Pore water halinity (ppt): 9	Open water halinity: NA	Longitude: -71.38426303	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): ND
Distance to open water (m): 8	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/3	16	ND	ND	ND	No	0	ND	ND	
Oe	NA	2.5Y 3/1	43	ND	ND	ND	No	0	ND	ND	
Oa1	NA	N2.5/	71	ND	ND	ND	No	0	ND	ND	
Oa2	NA	10YR 2/1	130	ND	ND	ND	No	0	ND	ND	

Pedon ID: TN2	Date: 1/6/2021	Location: Narragansett, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.44524501	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 20	Open water halinity: 22	Longitude: -71.44799399	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 53	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/1	7	ND	ND	ND	No	0	ND	ND	
C	S	2.5Y 4/2	10	ND	ND	ND	No	0	ND	ND	
Oeb	NA	5Y 3/1	17	ND	ND	ND	No	0	ND	ND	
Cg1	MVFSL	2.5Y 4/1	24	ND	ND	ND	No	0	ND	ND	
Cg2	LFS	10YR 4/1	25	ND	ND	ND	No	0	ND	ND	
Oeb'	NA	5Y 3/1	38	ND	ND	ND	No	0	ND	ND	
C'	MLFS	2.5Y 3/1	60	ND	ND	ND	No	0	ND	ND	
Oab1	NA	5Y 2.5/1	69	ND	ND	ND	No	0	ND	ND	
Oab2	NA	N 2.5/	82	ND	ND	ND	No	0	ND	ND	
Oaseb	NA	N 2.5/	115	ND	ND	ND	Yes	0	ND	ND	

Pedon ID: RN1	Date: 7/6/2021	Location:	East Lyme, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TC
Classification: Euic, mesic Typic Sulfisaprist		Latitude:	41.30331399	Secondary vegetation: S. Patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 12	Open water halinity: 5	Longitude:	-72.24030403	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 62	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe1	NA	10YR 2/2	14	ND	ND	ND	No	0	SF	ND	
Oe2	NA	10YR 3/2	24	ND	ND	ND	No	0	SF	ND	
Oase	NA	10YR 3/1	79	ND	ND	ND	Yes	0	SF	ND	
Ase	SiL	10YR 4/1	99	ND	ND	ND	Yes	0	MF	ND	
Oa'	NA	2.5Y 3/2	129+	ND	ND	ND	No	0	MF	ND	

Pedon ID: RN2	Date: 7/6/2021	Location:	East Lyme, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TC
Classification: Coarse-loamy, Mixed, Active, Mesic Haplic Sulfaquent		Latitude:	41.30309396	Secondary vegetation: S. Patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 15	Open water halinity: NA	Longitude:	-72.24049497	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 33	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	11	ND	ND	ND	No	0	NF	ND	
Oe	NA	2.5Y 2.5/1	18	ND	ND	ND	No	0	SF	ND	
Cg	SiL	10YR 5/2	26	ND	ND	ND	No	0	SF	ND	
Cg2	LFS	2.5Y 4/1	28	ND	ND	ND	No	0	NF	ND	
Cse	SiL	10YR 5/2	40	ND	ND	ND	Yes	0	MF	ND	
Cse2	FS	2.5Y 4/1	45	ND	ND	ND	Yes	0	SF	ND	
Ab	SiL	N 2.5/	53	ND	ND	ND	No	0	SF	ND	
Oab	NA	10YR 3/1	75	ND	ND	ND	No	0	SF	ND	
Oab2	NA	2.5Y 3/2	125+	ND	ND	ND	No	0	MF	ND	

Pedon ID: RN3	Date: 7/6/2021	Location:	East Lyme, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TC
Classification: Coarse-loamy, Mixed, Active, Mesic Typic Sulfaquent		Latitude:	41.30293597	Secondary vegetation:	1 meter carbon stock (kg C m‾ ²): ND
Pore water halinity (ppt): ND	Open water halinity: 0	Longitude:	-72.24077996	Tertiary vegetation:	2 meter carbon stock (kg C m‾ ²): ND
Distance to open water (m): 5	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 2/2	10	ND	ND	ND	No	0	NF	ND	
A	SL	N 2.5/	11	ND	ND	ND	No	0	SF	ND	
A2	SiL	10YR 2/2	29	ND	ND	ND	No	0	SF	ND	
CA	SiL	10YR 3/1	35	ND	ND	ND	No	0	SF	ND	
Cse	L	2.5Y 3/1	82	ND	ND	ND	Yes	0	MF	ND	
Cg	FSL	N 3/	115	ND	ND	ND	No	0	SF	ND	
Cse'	LFS	2.5Y 3/1	130+	ND	ND	ND	Yes	0	NF	ND	

Pedon ID: GI1		Date: 11/6/2021		Location: Old Lyme, CT		Dominate vegetation: S. alterniflora			Pedogeomorphic Unit: TR		
Classification: Coarse-loamy, Mixed, Active, Mesic Typic Sulfaquent				Latitude: 41.28658203		Secondary vegetation:			1 meter carbon stock (kg C m^{-2}): 34.2		
Pore water halinity (ppt): 20		Open water halinity: 26		Longitude: -72.32182902		Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): 63.3		
Distance to open water (m): 30		Sampled: Yes		Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
A	MSiL	2.5Y 2.5/1	19	0.52	7.72	2.5	No	0	SF	ND	
Ase1	MSiL	5Y 3/1	70	0.42	8.65	3.65	Yes	0	MF	ND	
Ase2	VFSL	5Y 4/1	135	0.79	3.31	2.26	Yes	0	MF	ND	
Cse	VFSL	10Y 3/1	150+	0.97	3.17	2	Yes	0	NF	ND	

Pedon ID: GI2	Date: 11/6/2021	Location: Old Lyme, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Euic, mesic Typic Sulfisaprist		Latitude: 41.28671698	Secondary vegetation: S. patens	1 meter carbon stock (kg C m¯ ²): ND
Pore water halinity (ppt): 25	Open water halinity: NA	Longitude: -72.32198903	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND
Distance to open water (m): 48	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	LS	10YR 3/2	17	ND	ND	ND	No	0	NF	ND	
A	NA	10YR 2/1	20	ND	ND	ND	No	0	NF	ND	
Oeb	NA	10YR 3/2	41	ND	ND	ND	No	0	NF	ND	
Ab	NA	2.5Y 3/2	47	ND	ND	ND	No	0	NF	ND	
Oab1	NA	7.5YR 3/2	63	ND	ND	ND	No	0	SF	ND	
Oab2	NA	10YR 2/1	122	ND	ND	ND	No	0	MF	ND	
Cse	MSiL	10YR 3/1	146	ND	ND	ND	Yes	0	MF	ND	
Oab	NA	2.5Y 2.5/1	160+	ND	ND	ND	No	0	MF	ND	

Pedon ID: GI3	Date: 11/6/2021	Location:	Old Lyme, CT	Dominate vegetation: D. spicata	Pedogeomorphic Unit: TR
Classification: Euic, mesic Typic Sulfihemist		Latitude:	41.28693902	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 28	Open water halinity: NA	Longitude:	-72.32176901	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 66	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/1	20	ND	ND	ND	No	0	NF	ND	
A	MVFSL	2.5Y 2.5/1	29	ND	ND	ND	No	0	NF	ND	
Oeb1	NA	2.5Y 3/1	52	ND	ND	ND	No	0	SF	ND	
Oeb2	NA	2.5Y 2.5/1	61	ND	ND	ND	No	0	SF	ND	
Oeseb1	NA	10YR 2/1	86	ND	ND	ND	Yes	0	SF	ND	
Oeseb2	NA	10YR 2/2	100+	ND	ND	ND	Yes	0	SF	ND	

Pedon ID:	LWR1	Date:	9/6/2021	Location:	Westerly, RI	Dominate vegetation: S, patens	Pedogeomorphic Unit: C	
Classification:	Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfisaprist			Latitude:	41.33121902	Secondary vegetation: S. pungens	1 meter carbon stock (kg C m^{-2}): ND	
Pore water halinity (ppt):	3	Open water halinity:	NA	Longitude:	-71.80365399	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND	
Distance to open water (m):	57	Sampled:	Yes	Site notes:				

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 2/1	11	0.12	46.61	0.16	No	0	NF	ND	
Oe	NA	10YR 2/2	18	0.1	51.33	0.14	No	0	NF	ND	
Oase1	NA	7.5YR 2.5/1	39	0.15	24.73	0.46	Yes	0	SF	ND	
Oase2	NA	N 2.5/	57	0.23	26.8	1.55	Yes	0	SF	ND	
Cse	LS	2.5Y 2.5/1	60	ND	ND	ND	Yes	0	SF	ND	
Ab	SL	N 2.5/	63	ND	ND	ND	No	0	SF	ND	
Cse'1	FLS	5Y 3/1	71	ND	ND	ND	Yes	0	NF	ND	
Cse'2	FSL	10YR 5/3	85	ND	ND	1.75	Yes	0	MF	ND	
Cse'3	FS	10Y 5/1	104+	1.2	1.42	0.8	Yes	0	SF	ND	

Pedon ID:	LWR2	Date:	9/6/2021	Location:	Westerly, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification:	Sandy, Mixed, Mesic Haplic Sulfaquent			Latitude:	41.33106102	Secondary vegetation: S. patens	1 meter carbon stock (kg C m¯ ²): ND
Pore water halinity (ppt):	19	Open water halinity:	NA	Longitude:	-71.803584	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND
Distance to open water (m):	39	Sampled:	No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	11	ND	ND	ND	No	0	NF	ND	
A	FSL	10YR 2/2	43	ND	ND	ND	No	0	SF	ND	
Cse1	LFS	7.5YR 4/3	90	ND	ND	ND	Yes	0	NF	ND	
Cse2	FS	10YR 5/4	106	ND	ND	ND	Yes	0	SF	ND	
Cse3	FS	5Y 5/3	115+	ND	ND	ND	Yes	0	NF	ND	

Pedon ID: LWR3	Date: 9/6/2021	Location:	Westerly, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude:	41.33082901	Secondary vegetation: S. patens,	1 meter carbon stock (kg C m^{-2}): 20.8
Pore water halinity (ppt): 20	Open water halinity: 30	Longitude:	-71.80336598	Tertiary vegetation:S. bigelovii	2 meter carbon stock (kg C m^{-2}): 36.3
Distance to open water (m): 7	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	10YR 3/2	7	0.24	24.73	3.58	No	0.2	SF	ND	
Ase	FSL	7.5YR 2.5/1	20	0.62	7.98	2.47	Yes	1	NF	ND	
Cse	LS	5Y 2.5/1	31	1.1	2.44	1.87	Yes	0	NF	ND	
C	FS	5Y 4/2	69	1.74	1.12	1.5	No	0	NF	ND	
Cg	VFS	5BG 6/1	94	ND	0.92	0.87	No	0	NF	ND	
2Cg2	CS, FS	50% 10YR 5/4, 50% 5G 6/1	94+	ND	0.62	1.4	No	0	NF	ND	Stratification in texture and color

Pedon ID: EM1	Date: 10/5/2021	Location: South Kingstown, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.378443	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 20	Open water halinity: NA	Longitude: -71.528033	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 137	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/3	11	0.24	ND	7.13	Yes	0	ND	ND	
Cse1	LS	N 3/	19	1.79	ND	3.37	Yes	0	ND	ND	
Cse2	LS	2.5Y 4/1	25	1.2	ND	3.97	Yes	0	ND	ND	
Aseb	MVFSL	5Y 3/1	30	0.38	ND	6.29	Yes	0	ND	ND	
Cse'	LS	2.5Y 3/2	42	0.28	ND	6.15	Yes	0	ND	ND	
Oeseb	LS	7.5YR 2.5/3	51	0.2	ND	6.85	Yes	0	ND	ND	
C/Ase	LS	5Y 3/1 & 2.5Y 2.5/1	65	ND	ND	4.57	Yes	0	ND	ND	
C"se	L	5Y 3/1	80	ND	ND	3.65	Yes	0	ND	ND	
C"se2	L	2.5Y 3/1	100	ND	ND	2.79	Yes	0	ND	ND	

Pedon ID: EM2	Date: 10/5/2021	Location:	South Kingstown, RI	Dominate vegetation:	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude:	41.378785	Secondary vegetation:	1 meter carbon stock (kg C m⁻²): ND
Pore water halinity (ppt): 30	Open water halinity: NA	Longitude:	-71.528083	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): ND
Distance to open water (m): 134	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	14	ND	ND	ND	No	0	ND	ND	
Cse1	LS	2.5Y 4/1	30	ND	ND	ND	Yes	0	ND	ND	
Cse2	FSL	10YR 4/1	77	ND	ND	ND	Yes	0	ND	ND	
Cse3	LS	5Y 4/1	87	ND	ND	ND	Yes	0	ND	ND	
Cse4	S	5G 4/1	100	ND	ND	ND	Yes	0	ND	ND	

Pedon ID: EM3	Date: 10/5/2021	Location: South Kingstown, RI	Dominate vegetation:	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.379125	Secondary vegetation:	1 meter carbon stock (kg C m¯ ²): ND
Pore water halinity (ppt): 30	Open water halinity: NA	Longitude: -71.528209	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND
Distance to open water (m): 124	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	7.5YR 4/3	11	ND	ND	ND	Yes	0	ND	ND	
Cse1	LS	7.5YR 4/1	23	ND	ND	ND	Yes	0	ND	ND	
Cse2	VFSL	2.5Y 3/2	51	ND	ND	ND	Yes	0	ND	ND	
Oeb	NA	10YR 3/2	56	ND	ND	ND	No	0	ND	ND	
Ab	MSL	2.5Y 3/2	76	ND	ND	ND	No	0	ND	ND	
Cse'	S	5GY 4/1	100	ND	ND	ND	Yes	0	ND	ND	

Pedon ID: EM4	Date: 10/5/2021	Location:	South Kingstown, RI	Dominate vegetation:	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude:	41.379819	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 33	Open water halinity: NA	Longitude:	-71.528296	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 82	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	7.5YR 3/2	17	ND	ND	ND	Yes	0	ND	ND	
Cse1	LS	5Y 4/1	22	ND	ND	ND	Yes	0	ND	ND	
Cse2	MVFSL	5Y 4/1	38	ND	ND	ND	Yes	0	ND	ND	
Ab	MSL	2.5Y 2.5/1	52	ND	ND	ND	No	0	ND	ND	
Cse'1	LS	5Y4/1	79	ND	ND	ND	Yes	0	ND	ND	
Cse'2	S	5Y 3/1	92	ND	ND	ND	Yes	0	ND	ND	
Cse'3	S	10YR 4/2	100	ND	ND	ND	Yes	0	ND	ND	

Pedon ID: EM5		Date: 10/5/2021		Location:	South Kingstown, RI	Dominate vegetation:			Pedogeomorphic Unit: BB		
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent				Latitude:	41.380314	Secondary vegetation:			1 meter carbon stock (kg C m⁻²): ND		
Pore water halinity (ppt): 35		Open water halinity: NA		Longitude:	-71.528756	Tertiary vegetation:			2 meter carbon stock (kg C m⁻²): ND		
Distance to open water (m): 12		Sampled: No		Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/3	15	ND	ND	ND	No	0	ND	ND	
Cse1	LS	10YR 2/2	28	ND	ND	ND	Yes	0	ND	ND	
Cse2	LS	10Y 4/1	41	ND	ND	ND	Yes	0	ND	ND	
Ab	MSiL	10YR 3/2	63	ND	ND	ND	No	0	ND	ND	
Cse'1	LFS	10Y 3/1	70	ND	ND	ND	Yes	0	ND	ND	
Cse'2	LFS	5GY 3/1	100	ND	ND	ND	Yes	0	ND	ND	

Pedon ID: DC1	Date: 6/16/2021	Location:	North Kingstown, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification:	Loamy, mixed, euic, mesic Terric Sulfihemist	Latitude:	41.55695499	Secondary vegetation:	1 meter carbon stock (kg C m⁻ ²): ND
Pore water halinity (ppt): 20	Open water halinity: 27	Longitude:	-71.43894698	Tertiary vegetation:	2 meter carbon stock (kg C m⁻ ²): ND
Distance to open water (m): 4	Sampled: No	Site notes:	Small cove surrounded by fac wet non-salt tolerant plants		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	7.5YR 3/1	20	ND	ND	ND	No	0	NF	ND	
Oe1	FSL	7.5YR 2.5/1	26	ND	ND	ND	No	0	NF	ND	
Oe2	NA	7.5YR 4/2	43	ND	ND	ND	No	0	MF	ND	
Oe3	NA	10YR 4/2	67	ND	ND	ND	No	0	MF	ND	
Oaseb	NA	2.5Y 4/1	99	ND	ND	ND	Yes	0	MF	ND	
Ase1	SiL	2.5Y 2.5/1	117	ND	ND	ND	Yes	0	MF	ND	
Ase2	SiL	2.5Y 2.5/1	125+	ND	ND	ND	Yes	0	MF	ND	

Pedon ID: DC2	Date: 6/16/2021	Location:	North Kingstown, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification:	Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfisaprist	Latitude:	41.55652097	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 24	Open water halinity: NA	Longitude:	-71.438835	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 21	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 2/2	20	ND	ND	ND	No	0	NF	ND	
Oe	SiL	10YR 3/2	41	ND	ND	ND	No	0	MF	ND	
Oase1	NA	7.5YR 2.5/2	63	ND	ND	ND	Yes	0	MF	ND	
Oase2	NA	7.5YR 2.5/1	77	ND	ND	ND	Yes	0	MF	ND	
Ab	LS	N 2.5/1	87	ND	ND	ND	No	0	SF	ND	
Cse	LS	N 3/	100+	ND	ND	ND	Yes	0	NF	ND	

Pedon ID: DC3	Date: 6/16/2021	Location:	North Kingstown, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfihemist		Latitude:	41.55603097	Secondary vegetation:	1 meter carbon stock (kg C m⁻²): 60.8
Pore water halinity (ppt): 29	Open water halinity: NA	Longitude:	-71.43870802	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): 91.5
Distance to open water (m): 62	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi1	NA	2.5Y 3/1	17	0.17	31.89	7.26	No	0	NF	ND	
Oi2	NA	N 2.5/	39	0.21	22.41	8.65	No	0	SF	ND	
Oe1	NA	N2.5/	78	0.12	34.91	8.19	No	0	SF	ND	
Oe2	NA	7.5YR 2.5/1	129	0.12	35.96	ND	No	0	MF	ND	
Oa1	NA	10YR 2/1	145	0.13	34.96	ND	No	0	MF	ND	
Oa2	NA	7.5YR 2.5/1	160+	0.28	17.29	ND	No	0	MF	ND	

Pedon ID: DC4	Date: 6/16/2021	Location:	North Kingstown, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfihemist		Latitude:	41.55525204	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 15	Open water halinity: NA	Longitude:	-71.43789296	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 145	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 2.5/1	11	ND	ND	ND	No	0	MF	ND	
Oese	NA	7.5YR 2.5/1	63	ND	ND	ND	Yes	0	SF	ND	
Oab1	NA	7.5YR 2.5/1	83	ND	ND	ND	No	0	SF	ND	
Oab2	NA	5YR 2.5/1	198+	ND	ND	ND	No	0	SF	ND	

Pedon ID: HNI1	Date: 6/23/2021	Location:	Horseneck Wildlife Preserve, MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfisaprist		Latitude:	41.51619002	Secondary vegetation:	1 meter carbon stock (kg C m¯ ²): 50.7
Pore water halinity (ppt): 31	Open water halinity: NA	Longitude:	-71.05888098	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): 77.8
Distance to open water (m): 31	Sampled: Yes	Site notes:	Across the channel from HNB		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi1	NA	2.5Y 3/1	10	0.19	2.78	5.96	No	0	NF	ND	
Oi2	NA	8	31	0.26	19.28	5.8	No	0	NF	ND	
Oe	NA	2.5Y 4/2	38	0.31	15.2	6.25	No	0	NF	ND	
ACse	FSL	2.5Y 4/1	50	ND	9.48	7.63	Yes	0	SF	ND	
Oab	NA	2.5Y 4/2	100	0.3	17.12	ND	No	0	SF	ND	
CA	LFS	5Y 4/1	125	0.35	8	ND	No	0	MF	ND	
Cg	SiL	10Y 4/1	150+	0.78	3.45	ND	No	0	MF	ND	

Pedon ID: HNI2	Date: 6/23/2021	Location:	Horseneck Wildlife Preserve, MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.51652597	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 32	Open water halinity: NA	Longitude:	-71.05852802	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 76	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	33	ND	ND	ND	No	0	NF	ND	
Oe	NA	10YR 4/2	39	ND	ND	ND	No	0	NF	ND	
Cg	FS	5Y 4/1	40	ND	ND	ND	No	0	NF	ND	
Oe	NA	5Y 3/2	60	ND	ND	ND	No	0	SF	ND	
C	SiL	2.5Y 3/2	126	ND	ND	ND	No	0	MF	ND	
C'g	FSL	10Y 4/1	140+	ND	ND	ND	No	0	MF	ND	

Pedon ID:	HNI3	Date:	6/23/2021	Location:	Horseneck Wildlife Preserve, MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification:	Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfahemist			Latitude:	41.51744102	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt):	30	Open water halinity:	NA	Longitude:	-71.05841696	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m):	179	Sampled:	Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	9	0.13	28.36	8.28	No	0	SF	ND	
Oe	NA	10YR 3/2 10YR 4/1	31	0.37	2.46	8.15	No	0	SF	ND	
Oa	NA	5Y 5/1	50	ND	14.43	7.71	No	0	SF	ND	
Cg	VFSL	10Y 5/1	51	ND	ND	ND	No	0	SF	ND	
Oab	NA	10YR 3/2	69	0.27	12.91	ND	No	0	SF	ND	
C'se	FS	N 5/	102+	ND	0.45	ND	Yes	0	SF	ND	

Pedon ID: HNB1	Date: 6/23/2021	Location: Horseneck Wildlife Preserve, MA	Dominate vegetation: S. alterniflora
Classification: Sandy, Mixed, Mesic Histic-Haplic Sulfaquent		Latitude: 41.50988599	Secondary vegetation:
Pore water halinity (ppt): ND	Open water halinity: NA	Longitude: -71.05839098	Tertiary vegetation:
Distance to open water (m): 22	Sampled: No	Site notes: Originally described as an open water marsh but reclassified when we decided to exclude open water marshes and du to proximity to large tidal river.	

Pedogeomorphic Unit: TR

1 meter carbon stock (kg C m¯ ²): ND

2 meter carbon stock (kg C m¯ ²): ND

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 4/2	4	ND	ND	ND	No	0	NF	ND	
Oe	NA	2.5Y 4/2	9	ND	ND	ND	No	0	NF	ND	
Oe2	NA	5Y 4/2	13	ND	ND	ND	No	0	NF	ND	
Oe3	NA	5Y 3/1	23	ND	ND	ND	No	0	SF	ND	
CA	FS	5Y4/1	35	ND	ND	ND	No	0	NF	ND	
CA2	FS	2.5Y 3/1	45	ND	ND	ND	No	0	NF	ND	
C	LFS	10Y 3/2	55	ND	ND	ND	No	0	MF	ND	
Cg	FS	10Y 5/1	62	ND	ND	ND	No	0	NF	ND	
Cse1	FS	10Y 4/2	82	ND	ND	ND	Yes	0	NF	ND	
Cse2	FS	2.5Y 4/2	102+	ND	ND	ND	Yes	0	MF	ND	

Pedon ID: HNB2	Date: 6/23/2021	Location: Horseneck Wildlife Preserve, MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemist		Latitude: 41.51033501	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 43.3
Pore water halinity (ppt): 32	Open water halinity: NA	Longitude: -71.05829299	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 71.4
Distance to open water (m): 15	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	9	0.16	28.26	6.97	No	0	NF	ND	
Oe	NA	10Y 3/1	18	0.19	22	6.75	No	0	NF	ND	
Oeb	NA	10YR 3/2	47	0.22	22.28	7.25	No	0	NF	ND	
Oab1	NA	2.5Y 3/2	53	0.16	14.94	8.89	No	0	MF	ND	
Oaseb	NA	2.5Y 2.5/1	62	0.24	16.92	ND	Yes	0	SF	ND	
Cg	LVFS	5Y 4/1	74	0.41	11.3	ND	No	0	NF	ND	
Oeseb	NA	5Y 4/2	96	0.29	14.12	ND	Yes	0	MF	ND	
Ase	LVFS	5Y 3/2	115	0.41	11.41	ND	Yes	0	SF	ND	
Cse	FS	2.5Y 4/1	120+	0.73	3.41	ND	Yes	0	NF	ND	

Pedon ID: HNB3	Date: 6/23/2021	Location: Horseneck Wildlife Preserve, MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude: 41.51087497	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 30	Open water halinity: 30	Longitude: -71.05839903	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 9	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe1	NA	10YR 3/2	4	ND	ND	ND	No	0	SF	ND	
Oe2	NA	10YR 3/1	15	ND	ND	ND	No	0	SF	ND	
Oe3	NA	2.5Y 44/1	41	ND	ND	ND	No	0	SF	ND	
A	MVFSL	5Y 4/2	48	ND	ND	ND	No	0	NF	ND	
Cg	SiL	5GY 4/1	51	ND	ND	ND	No	0	SF	ND	
Ab	VFSL	2.5Y 4/2	56	ND	ND	ND	No	0	MF	ND	
Cg1	FS	5Y 3/1	92	ND	ND	ND	No	0	SF	ND	
Cg2	FS	5Y 4/1	100+	ND	ND	ND	No	0	NF	ND	

Pedon ID: GII1	Date: 6/21/2021	Location: Old Lyme, CT	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Coarse-loamy, Mixed, Active, Mesic Typic Sulfaquent		Latitude: 41.286389	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 26.1
Pore water halinity (ppt): 24	Open water halinity: NA	Longitude: -72.32933703	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 45.2
Distance to open water (m): 14	Sampled: No	Site notes: Very large island in CT River, potentially glacially deposited but unsure		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
A	FSL	5Y 3/2	7	0.33	11.77	6.25	No	0	NF	ND	
Oib	NA	5Y 4/2	12	0.21	15.42	6.23	No	0	NF	ND	
Oeb	NA	5Y 3/2	19	0.19	16.33	6.49	No	0	NF	ND	
Ab1	MVFSL	5Y 3/1	40	0.32	1.63	7.59	No	0	SF	ND	
Ab2	MVFSL	2.5Y 3/2	65	0.19	9.17	8.81	No	0	SF	ND	
Cse1	SiL	5Y 4/1	104	0.38	6.13	7.76	Yes	0	MF	ND	
Cse2	LFS	10Y 4/1	145+	1.1	1.73	5.69	Yes	0	SF	ND	

Pedon ID: GII2		Date: 6/21/2021		Location: Old Lyme, CT		Dominate vegetation: S. patens			Pedogeomorphic Unit: TR		
Classification: Coarse-loamy, Mixed, Active, Mesic Typic Sulfaquent				Latitude: 41.28685302		Secondary vegetation:			1 meter carbon stock (kg C m^{-2}): ND		
Pore water halinity (ppt): 21		Open water halinity: NA		Longitude: -72.32827898		Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): ND		
Distance to open water (m): 100		Sampled: No		Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
A	FSL	5Y 4/2	16	ND	ND	ND	No	0	NF	ND	
Oib	NA	5Y3/1	27	ND	ND	ND	No	0	NF	ND	
Oeb	NA	2.5Y 3/1	42	ND	ND	ND	No	0	NF	ND	
Cse1	SiL	2.5Y 4/1	87	ND	ND	ND	Yes	0	MF	ND	
Cse2	VFSL	10Y 4/1	150+	ND	ND	ND	Yes	0	MF	ND	

Pedon ID:	GII3	Date:	6/21/2021	Location:	Old Lyme, CT	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification:	Loamy, mixed, euic, mesic Terric Sulfihemist			Latitude:	41.28686601	Secondary vegetation: S.alterniflora	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt):	25	Open water halinity:	NA	Longitude:	-72.32754397	Tertiary vegetation:S. bigelovii	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m):	133	Sampled:	No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	14	ND	ND	ND	No	0	NF	ND	
Oe1	NA	2.5Y 3/3	22	ND	ND	ND	No	0	NF	ND	
Oe2	NA	10YR 3/2	51	ND	ND	ND	No	0	NF	ND	
Oe3	NA	2.5Y 3/2	75	ND	ND	ND	No	0	NF	ND	
Oa	NA	5Y 3/1	107	ND	ND	ND	No	0	MF	ND	
Cg1	FSL	10Y 4/1	121	ND	ND	ND	No	0	MF	ND	
Cg2	VFSL	5Y 4/1	160	ND	ND	ND	No	0	MF	ND	
Cg3	LVFS	N 4/	180+	ND	ND	ND	No	0	MF	ND	

Pedon ID:	GII4	Date:	6/21/2021	Location:	Old Lyme, CT	Dominate vegetation: S. patens			Pedogeomorphic Unit: TR		
Classification:	Sandy, Mixed, Mesic Histic-Haplic Sulfaquent			Latitude:	41.286921	Secondary vegetation: S. bigelovii			1 meter carbon stock (kg C m^{-2}): 35.2		
Pore water halinity (ppt):	25	Open water halinity:	NA	Longitude:	-72.32590497	Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): 67.6		
Distance to open water (m):	74	Sampled:	Yes	Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	15	0.17	26.2	1.55	No	0	NF	ND	
Oi2	NA	2.5Y 3/2	25	0.25	19.45	7.95	No	0	NF	ND	
Ab	VFSL	10YR 3/2	36	0.48	8.47	8.25	No	0	SF	ND	
CA	VFSL	5Y 4/2	39	ND	ND	ND	No	0	MF	ND	
Oeb	NA	10YR 3/2	51	0.28	12.25	7.62	No	0	SF	ND	
Ab	LFS	2.5Y 2.5/1	69	0.45	8.6	ND	No	0	SF	ND	
C/Ase	FS	2.5Y 3/1	92	0.5	3.78	ND	Yes	0	NF	ND	
C/A	FS	N 4/	140+	0.77	4.19	ND	No	0	NF	ND	

Pedon ID: FP1	Date: 6/30/2021	Location:	Little Compton, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude:	41.55962404	Secondary vegetation: D. spicata	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 26	Open water halinity: NA	Longitude:	-71.21701799	Tertiary vegetation:S. alterniflora	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 63	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	4	ND	ND	ND	No	0	NF	ND	
Cg	FS	N /6	8	ND	ND	ND	No	0	NF	ND	
Ab	FS	2.5Y 4/2	12	ND	ND	ND	No	0	NF	ND	
C/A	FS	N 5/ and 2.5Y 4/2	44	ND	ND	ND	No	0	NF	ND	
2Cse1	FS	N/3	48	ND	ND	ND	Yes	0	NF	ND	
2Cse2	FS	10YR 2/1	105+	ND	ND	ND	Yes	0	NF	ND	

Pedon ID: FP2	Date: 6/30/2021	Location:	Little Compton, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude:	41.55974298	Secondary vegetation: D. spicata	1 meter carbon stock (kg C m¯ ²): 13.9
Pore water halinity (ppt): 30	Open water halinity: NA	Longitude:	-71.21691003	Tertiary vegetation: S. alterniflora	2 meter carbon stock (kg C m¯ ²): 19.5
Distance to open water (m): 51	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oa	NA	10YR 2/2	3	ND	ND	ND	No	0.4	NF	ND	
A	LS	2.5 3/1	8	0.35	9.45	8.64	No	0.3	NF	ND	
C/A	FS	N 5/ and 10YR 2/2	16	0.99	3.11	5.63	No	0	NF	ND	
Oeb	NA	10YR 2/2	35	0.29	13.17	6.38	No	0.1	NF	ND	
2Cse1	FS	N 5/	107	1.32	0.17	5.71	Yes	0	NF	ND	
2Cse2	FSL	5G 3/1	118	0.66	6.73	ND	Yes	0	NF	ND	
2Cse3	EGCS	N 3/	123+	ND	ND	ND	Yes	70	NF	ND	

Pedon ID: FP3	Date: 6/30/2021	Location: Little Compton, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification: Sandy-skeletal, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.56005202	Secondary vegetation:	1 meter carbon stock (kg C m⁻²): ND
Pore water halinity (ppt): 30	Open water halinity: NA	Longitude: -71.21682596	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): ND
Distance to open water (m): 33	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/1	9	ND	ND	ND	No	0	NF	ND	
A	SiL	2.5Y 3/1	16	ND	ND	ND	No	0	NF	ND	
2Cse	FS	5G 4/1	50	ND	ND	ND	Yes	0	NF	ND	
2Cg	VGCS	5G 4/1	61	ND	ND	ND	No	35	NF	ND	
2C	G	NA	64+	ND	ND	ND	No	>90	NF	ND	

Pedon ID: CFP1	Date: 6/30/2021	Location: Tiverton, RI	Dominate vegetation: D. spicata
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.64540502	Secondary vegetation: S. patens
Pore water halinity (ppt): ND	Open water halinity: NA	Longitude: -71.22431603	Tertiary vegetation:
Distance to open water (m): 164	Sampled: No	Site notes:	

Pedogeomorphic Unit: BB	
1 meter carbon stock (kg C m¯ ²): ND	
2 meter carbon stock (kg C m¯ ²): ND	

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	7.5YR 3/2	6	ND	ND	ND	No	0	NF	ND	
A	S	7.5YR 3/1	10	ND	ND	ND	No	0	NF	ND	
A2	LFS	10YR 2/1	14	ND	ND	ND	No	0	NF	ND	
Oib	NA	10YR 3/2	28	ND	ND	ND	No	0	NF	ND	
Oeseb	NA	N 2.5/	45	ND	ND	ND	Yes	0	NF	ND	
C'	GLS	2.5Y 3/1	67	ND	ND	ND	No	15	NF	ND	
C'2	GS	2.5Y 3/1	80+	ND	ND	ND	No	15	NF	ND	

Pedon ID:	CFP2	Date:	6/30/2021	Location:	Tiverton, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB
Classification:	Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfisaprist			Latitude:	41.64580199	Secondary vegetation: S. bigelovii	1 meter carbon stock (kg C m⁻²): 44.8
Pore water halinity (ppt):	25	Open water halinity:	NA	Longitude:	-71.22481802	Tertiary vegetation:D. spicata	2 meter carbon stock (kg C m⁻²): 70.8
Distance to open water (m):	103	Sampled:	Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/2	7	0.13	32.94	8.59	No	0	NF	ND	
Oi2	NA	2.5Y 2.5/1	16	0.13	32.27	7.47	No	0	NF	ND	
Oese	NA	10Y 2.5/1	30	0.28	29.85	7.95	Yes	0.2	NF	ND	
Oase	NA	5Y 2.5/1	61	0.13	34.7	7.42	Yes	1.1	SF	ND	
Ase	MLS	N 2.5/1	83	0.66	5.32	ND	Yes	0	MF	ND	
Cse	MFS	N 4/	102+	1.5	1.75	ND	Yes	0	MF	ND	

Pedon ID: CFP3	Date: 6/30/2021	Location:	Tiverton, RI	Dominate vegetation: D. spicata	Pedogeomorphic Unit: BB
Classification: Coarse-loamy, Mixed, Active, Mesic Haplic Sulfaquent		Latitude:	41.646192	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 30	Open water halinity: NA	Longitude:	-71.22534198	Tertiary vegetation:S. depressa	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 43	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	2.5Y 3/2	4	ND	ND	ND	No	0	SF	ND	
Oi	NA	10YR 3/2	10	ND	ND	ND	No	0	NF	ND	
Cg	Si	5GB 4/1	16	ND	ND	ND	No	0	SF	ND	
Ab	SiL	2.5Y 3/1	76	ND	ND	ND	No	0	NF	ND	
Aseb	LS	5Y 2.5/1	92	ND	ND	ND	Yes	0	SF	ND	
Cse	S	5Y 4/2	110+	ND	ND	ND	Yes	0	NF	ND	

Pedon ID:	SH1	Date:	7/7/2021	Location:	Little Compton, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: C
Classification:	Loamy, mixed, euic, mesic Terric Sulfisaprist			Latitude:	41.463349	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 35.2
Pore water halinity (ppt):	20	Open water halinity:	NA	Longitude:	-71.19197899	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 53.6
Distance to open water (m):	5	Sampled:	Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 4/4	6	0.12	28.96	3.33	No	0	NF	ND	
Oa	NA	10YR 3/3	17	0.13	34.38	4.6	No	0	NF	ND	
Oa2	NA	10YR 2/2	39	0.2	13.26	5.9	No	1.3	SF	ND	
Oa3	NA	N 2.5/1	49	0.38	17.91	4.74	No	11.2	SF	ND	Many rocks
Cse	SL	5Y 4/1	93	1.16	2.77	4.68	Yes	0	MF	ND	
Cg	GSL	N 4/	109+	1.15	1.15	ND	No	15	MF	ND	

Pedon ID: SH2	Date: 7/7/2021	Location: Little Compton, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: C
Classification: Sandy, Mixed, Mesic Histic Sulfaquent		Latitude: 41.46317801	Secondary vegetation:	1 meter carbon stock (kg C m¯ ²): ND
Pore water halinity (ppt): 22	Open water halinity: NA	Longitude: -71.19211402	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND
Distance to open water (m): 22	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	14	ND	ND	ND	No	0	NF	ND	
Oe	NA	2.5Y 3/2	20	ND	ND	ND	No	0	NF	ND	
A	VFSL	2.5Y 2.5/1	34	ND	ND	ND	No	0	SF	ND	
Cg	LS	5GY 4/1	44	ND	ND	ND	No	0	SF	ND	
Oab1	NA	2.5Y 3/2	54	ND	ND	ND	No	0	MF	ND	
Oab2	NA	2.5Y 2.5/1	79	ND	ND	ND	No	0	MF	ND	
Oaseb	NA	N 2.5/	91	ND	ND	ND	Yes	0	MF	ND	
Cse	VGSL	5Y 4/1	103+	ND	ND	ND	Yes	35	SF	ND	

Pedon ID: SH3	Date: 7/7/2021	Location: Little Compton, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: C
Classification: Coarse-loamy, Mixed, Active, Mesic Haplic Sulfaquent		Latitude: 41.46305496	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 22	Open water halinity: 24	Longitude: -71.192284	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 41	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/2	17	ND	ND	ND	No	0	NF	ND	
A	SiL	5Y 2.5/1	33	ND	ND	ND	No	0	NF	ND	
C	S	5Y 6/2	35	ND	ND	ND	No	0	NF	ND	
Aseb	SiL	N 2.5/	115	ND	ND	ND	Yes	0	SF	ND	
Cse	SL	N 4/	125	ND	ND	ND	Yes	0	MF	ND	

Pedon ID: RR1	Date: 7/7/2021	Location:	Jamestown, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB
Classification: Loamy, mixed, euic, mesic Terric Haplohemist		Latitude:	41.48705302	Secondary vegetation:	1 meter carbon stock (kg C m¯ ²): ND
Pore water halinity (ppt): 5	Open water halinity: NA	Longitude:	-71.362888	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND
Distance to open water (m): 68	Sampled: No	Site notes:	Small marsh, slightly below 3 acres		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	15	ND	ND	ND	No	0	NF	ND	
Oe	NA	10YR 2/2	30	ND	ND	ND	No	0	NF	ND	
Oa	SiL	10YR 3/1	43	ND	ND	ND	No	0	VF	ND	
A	SiL	10YR 3/1	61	ND	ND	ND	No	0	MF	ND	

Pedon ID: RR2	Date: 7/7/2021	Location:	Jamestown, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB	
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfisaprist		Latitude:	41.48716701	Secondary vegetation:	1 meter carbon stock (kg C m¯ ²): ND	
Pore water halinity (ppt): 8	Open water halinity: NA	Longitude:	-71.36270997	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND	
Distance to open water (m): 47	Sampled: No	Site notes:				

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/2	34	ND	ND	ND	No	0	NF	ND	
Oase	NA	10YR 2/1	57	ND	ND	ND	Yes	0	VF	ND	
Cse	GLS	10YR 4/1	59	ND	ND	ND	Yes	0	NF	ND	
Oaseb	SL	10YR 2/1	90	ND	ND	ND	Yes	0	VF	ND	
C'se	GCS	N 4/	100+	ND	ND	ND	Yes	15	NF	ND	

Pedon ID: RR3	Date: 7/7/2021	Location: Jamestown, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemist		Latitude: 41.48727899	Secondary vegetation:	1 meter carbon stock (kg C m¯ ²): ND
Pore water halinity (ppt): 13	Open water halinity: NA	Longitude: -71.36254703	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND
Distance to open water (m): 28	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	38	ND	ND	ND	No	0	NF	ND	
Oase	SiL	10YR 2/1	48	ND	ND	ND	Yes	0	MF	ND	
Cse	CS	5G 5/1	49	ND	ND	ND	Yes	0	NF	ND	
Aseb	FSL	10YR 2/1	80	ND	ND	ND	Yes	0	NF	ND	

Pedon ID: BB1	Date: 12/7/2021	Location: North Kingstown, RI	Dominate vegetation: D. spicata	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfisaprist		Latitude: 41.58480504	Secondary vegetation: S. patens	1 meter carbon stock (kg C m⁻²): 38.7
Pore water halinity (ppt): 0	Open water halinity: NA	Longitude: -71.43205798	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): 66.2
Distance to open water (m): 35	Sampled: Yes	Site notes: Directly adjacent to P. australis stand		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Ase	NA	10YR 4/1	27	0.28	11.91	1.25	Yes	0	SF	ND	
Oa	NA	2.5Y 3/1	34	0.34	16.47	2.97	No	0	SF	ND	
Oase'	NA	7.5YR 2.5/1	135	0.1	4.22	2.53	Yes	0	MF	ND	
Oase2'	NA	5YR 2.5/1	165	0.7	42.88	ND	Yes	0	VF	ND	
Oa'	NA	7.5YR 2.5/2	185+	0.1	43.16	ND	No	0	MF	ND	

Pedon ID: BB2	Date: 12/7/2021	Location: North Kingstown, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfisaprist		Latitude: 41.58432098	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 0	Open water halinity: NA	Longitude: -71.43167904	Tertiary vegetation:Salicornia sp.	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 153	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oese	NA	10YR 3/1	15	ND	ND	ND	Yes	0	NF	ND	
A	VFSL	10YR 3/2	36	ND	ND	ND	No	0	SF	ND	Originally described as Oa but changed to A to align with sampled pedons in transect
Oab	NA	7.5YR 2.5/1	58	ND	ND	ND	No	0	SF	ND	
Oaseb	NA	7.5YR 2.5/1	160+	ND	ND	ND	Yes	0	SF	ND	

Pedon ID: BB3	Date: 12/7/2021	Location:	North Kingstown, RI	Dominate vegetation: D. spicata	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfisaprist		Latitude:	41.58384397	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): 32.2
Pore water halinity (ppt): 25	Open water halinity: NA	Longitude:	-71.43147603	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 55.8
Distance to open water (m): 99	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oese	NA	10YR 3/2	6	0.22	27.91	3.98	Yes	0.3	NF	ND	
A/Cse	SL	2.5Y 2.5/1, 2.5Y 6/2	19	0.6	5.76	3.97	Yes	0	NF	ND	Some small lenses that are similar to feel and apperace as Aseb beneath
Aseb	FSL	2.5Y 3/2	44	0.23	9.12	7.55	Yes	0	SF	ND	
Oeseb	NA	10YR 2/2	58	0.28	14.76	6.64	Yes	0	SF	ND	
Oaseb1	NA	10YR 2/1	71	0.21	18.34	ND	Yes	0	MF	ND	
Oaseb2	NA	7.5YR 3/1	81	0.18	16.53	ND	Yes	0.6	MF	ND	
Oab	NA	10YR 2/2	150	0.12	2.64	ND	No	0	VF	ND	
C	LFS	7.5YR 4/2	167+	1.8	2	ND	No	0	NF	ND	

Pedon ID: MB1	Date: 7/14/2021	Location: Westerly, RI	Dominate vegetation: S. alternifloa	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Histic-Haplic Sulfaquent		Latitude: 41.326686	Secondary vegetation: Salicornia sp.	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 30	Open water halinity: 28	Longitude: -71.80024398	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 5	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oa1	NA	5Y 2.5/2	19	ND	ND	ND	No	0	MF	ND	
Oa2	NA	5Y 2.5/1	34	ND	ND	ND	No	0	SF	ND	
Cse	FS	5Y 5/1	49	ND	ND	ND	Yes	0	NF	ND	
Cg1	GCS	5GY 4/1	65	ND	ND	ND	No	15	NF	ND	
Cg2	FS	5G 4/1	101+	ND	ND	ND	No	0	NF	ND	

Pedon ID:	MB2	Date:	7/14/2021	Location:	Westerly, RI	Dominate vegetation: S. alternifloa			Pedogeomorphic Unit: BB		
Classification:	Sandy, Mixed, Mesic Histic-Haplic Sulfaquent			Latitude:	41.32642801	Secondary vegetation: Salicornia			1 meter carbon stock (kg C m^{-2}): 16		
Pore water halinity (ppt):	32	Open water halinity:	NA	Longitude:	-71.79999797	Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): 19.2		
Distance to open water (m):	18	Sampled:	No	Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm^{-3})	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oese	SiL	5Y 3/2	23	0.17	19.78	ND	Yes	0	SF	ND	
Oase	SiL	5Y 2.5/2	30	0.22	14.9	ND	Yes	1.3	MF	ND	
Oa	SiL	2.5Y 3.2	36	ND	27.45	ND	No	0	MF	ND	
Cse	S	2.5Y 5/1	45	1.35	0.32	ND	Yes	0	NF	ND	
Cg1	S	5GY 4/1	67	1.37	0.12	ND	No	0	NF	ND	
Cg2	FS	N 5/	105+	1.18	0.53	ND	No	0	NF	ND	

Pedon ID: MB3		Date: 7/14/2021		Location: Westerly, RI		Dominate vegetation: S. alternifloa			Pedogeomorphic Unit: BB		
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent				Latitude: 41.325923		Secondary vegetation: Salicornia			1 meter carbon stock (kg C m^{-2}): ND		
Pore water halinity (ppt): 32		Open water halinity: NA		Longitude: -71.79993502		Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): ND		
Distance to open water (m): 74		Sampled: No		Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
A	SiL	10YR 3/1	11	ND	ND	ND	No	0	NF	ND	
C/Ase	SL	5Y 2.5/1, 5Y 4/1	16	ND	ND	ND	Yes	0	NF	ND	Thin A lenses
Ab	SiL	2.5Y 2.5/1	20	ND	ND	ND	No	0	NF	ND	
CA	S	5Y 5/2	31	ND	ND	ND	No	0	NF	ND	
Cse1	S	5Y 6/2	43	ND	ND	ND	Yes	0	NF	ND	
Cse2	CS	5Y 5/1	58	ND	ND	ND	Yes	0	NF	ND	
Cg	CS	N 4/	105+	ND	ND	ND	No	0	NF	ND	

Pedon ID: MB4	Date: 7/14/2021	Location: Westerly, RI	Dominate vegetation: D. spicata	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.32547096	Secondary vegetation: S. alterniflora	1 meter carbon stock (kg C m⁻²): 17.6
Pore water halinity (ppt): 20	Open water halinity: NA	Longitude: -71.79963696	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): 21.8
Distance to open water (m): 35	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oase	SiL	2.5Y 4/2	12	0.18	31.33	7.25	Yes	0	SF	ND	
Cse	LS	5Y 6/1	18	0.98	2.1	5.24	Yes	2.2	SF	ND	
Aseb	SiL	5Y 2.5/1	25	0.48	1.73	6.98	Yes	0	NF	ND	
C'se1	SiL	5Y 4/1	44	1.25	0.6	3.14	Yes	0	NF	ND	
C'se2	CS	2.5Y 5/1	64	ND	0.67	2.17	Yes	0.2	NF	ND	
C'se3	FS	10Y 7/1	74	ND	ND	ND	Yes	0	NF	ND	
Cg	FS	N 5/	105+	0.74	0.71	ND	No	0	NF	ND	

Pedon ID: HSP1	Date: 7/19/2021	Location: Clinton, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfisaprist		Latitude: 41.25335801	Secondary vegetation: Salicornia sp.	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 30	Open water halinity: NA	Longitude: -72.541613	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 294	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	2.5Y 3/1	10	ND	ND	ND	No	0	SF	ND	
Oese1	NA	2.5Y 2.5/1	13	ND	ND	ND	Yes	0	SF	ND	
Oase	NA	10YR 3/2	35	ND	ND	ND	Yes	0	MF	ND	
Oase2	NA	2.5Y 3/2	53	ND	ND	ND	Yes	0	MF	ND	
Oase3	NA	N 2.5/	112	ND	ND	ND	Yes	0	MF	ND	
A	MSi	N 3/	122	ND	ND	ND	No	0	MF	ND	
C	FS	2.5Y 3/2	145+	ND	ND	ND	No	0	NF	ND	

Pedon ID: HSP2	Date: 7/19/2021	Location: Clinton, CT	Dominate vegetation: S. alterniflora
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude: 41.25339104	Secondary vegetation:
Pore water halinity (ppt): 27	Open water halinity: NA	Longitude: -72.54068596	Tertiary vegetation:
Distance to open water (m): 217	Sampled: Yes	Site notes:	
Pedogeomorphic Unit: BB	1 meter carbon stock (kg C m¯ ²): 38.3	2 meter carbon stock (kg C m¯ ²): 65.7	

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	MSi	2.5Y 4/1	30	0.24	18.11	5.8	No	0	NF	ND	
Oese1	SiL	2.5Y 4/2	48	0.12	16.47	7.67	Yes	0	SF	ND	
Oese2	MSiL	10YR 3/2	86	0.14	14.27	7.95	Yes	0	SF	ND	
Oase	SiL	10YR 4/1	100	0.16	12.12	ND	Yes	0	VF	ND	
Cg	Si	N 5/	130	0.7	2.74	ND	No	0	MF	ND	
Cse	Si	5Y 2.5/1	150+	0.38	ND	ND	Yes	0	MF	ND	

Pedon ID: HSP3	Date: 7/19/2021	Location: Clinton, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification: Euic, mesic Typic Sulfisaprist		Latitude: 41.25433903	Secondary vegetation: Salicornia sp.	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 25	Open water halinity: NA	Longitude: -72.53961098	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 129	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oese	NA	2.5Y 3/1	46	ND	ND	ND	Yes	0	MF	ND	
Oase	NA	2.5Y 4/2	64	ND	ND	ND	Yes	0	SF	ND	
Oase2	NA	5Y 3/2	89	ND	ND	ND	Yes	0	MF	ND	
Oase3	NA	2.5Y 3/1	112	ND	ND	ND	Yes	0	VF	ND	
Oase4	NA	10YR 2/1	137	ND	ND	ND	Yes	0	MF	ND	
Oase5	NA	2.5Y 3/1	167	ND	ND	ND	Yes	0	MF	ND	
Cse	Si	N 4/	179+	ND	ND	ND	Yes	0	MF	ND	

Pedon ID:	HSP4	Date:	7/19/2021	Location:	Clinton, CT	Dominate vegetation: S. alterniflora			Pedogeomorphic Unit: BB		
Classification:	Euic, mesic Typic Sulfisaprist			Latitude:	41.25417198	Secondary vegetation: Salicornia sp. D. Spicata			1 meter carbon stock (kg C m¯ ²): 12.4		
Pore water halinity (ppt):	27	Open water halinity:	NA	Longitude:	-72.53890104	Tertiary vegetation:			2 meter carbon stock (kg C m¯ ²): 49.4		
Distance to open water (m):	64	Sampled:	Yes	Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oese	SiL	2.5Y 4/2	22	0.28	13.31	8.31	Yes	0	SF	ND	
Cse	Si	5Y 4/1	33	0.21	9.25	7.71	Yes	0	MF	ND	
Oaseb1	SiL	5Y 4/2	55	0.2	13.69	7.94	Yes	0	MF	ND	
Oaseb2	SiL	5Y 2.5/1	59	ND	ND	ND	Yes	0	MF	ND	
Oaseb3	SiL	2.5Y 4/2	82	0.17	16.8	ND	Yes	0	MF	ND	
Oaseb4	SiL	5Y 4/2	95	0.18	29.55	ND	Yes	0	SF	ND	
Oaseb5	Si	N 2.5/	115	0.24	12.67	ND	Yes	0	MF	ND	
Aseb	Si	2.5Y 2.5/1	160+	0.34	1.31	ND	Yes	0	SF	ND	

Pedon ID: STP1	Date: 7/21/2021	Location:	Saybrook, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TC
Classification: Euic, mesic Typic Sulfihemist		Latitude:	41.28412002	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 20	Open water halinity: NA	Longitude:	-72.38259799	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 269	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	19	ND	ND	ND	No	0	NF	ND	
Oe	NA	2.5Y 3/2	30	ND	ND	ND	No	0	NF	ND	
Oe2	NA	10YR 3/1	51	ND	ND	ND	No	0	SF	ND	
Oe3	NA	10YR 2/2	66	ND	ND	ND	No	0	SF	ND	
Oase	NA	10YR 2/1	100	ND	ND	ND	Yes	0	MF	ND	
Oa	NA	7.5YR 2.5/2	140+	ND	ND	ND	No	0	VF	ND	

Pedon ID:	STP2	Date:	7/21/2021	Location:	Saybrook, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TC
Classification:	Euic, mesic Typic Sulfihemist			Latitude:	41.28412002	Secondary vegetation: Salicornia sp.	1 meter carbon stock (kg C m⁻²): 32.8
Pore water halinity (ppt):	20	Open water halinity:	NA	Longitude:	-72.38259799	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): 67.4
Distance to open water (m):	186	Sampled:	Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 5/3	15	0.7	29.65	6.82	No	0	NF	ND	
Oe	NA	5Y 4/2	27	0.13	3.4	7.55	No	0	NF	ND	
Oese2	MSiL	2.5Y 4/1	41	0.14	22.76	6.66	Yes	0	SF	ND	
Oese2	MSiL	5Y 4/1	52	0.2	17.16	6.97	Yes	0	MF	ND	
Oese3	MSiL	7.5YR 2.5/1	150+	0.1	34.69	ND	Yes	0	MF	ND	

Pedon ID: STP3	Date: 7/21/2021	Location:	Saybrook, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TC
Classification: Euic, mesic Typic Sulfihemist		Latitude:	41.28304998	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 20	Open water halinity: NA	Longitude:	-72.38265499	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 149	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise2	NA	5Y 4/2	58	ND	ND	ND	Yes	0	NF	ND	
Oise2	NA	5Y 3/2	82	ND	ND	ND	Yes	0	NF	ND	
Oese1	NA	5Y 3/1	84	ND	ND	ND	Yes	0	NF	ND	
Oese2	NA	5Y 3/2	96	ND	ND	ND	Yes	0	NF	ND	
Oese3	NA	5Y 3/1	99	ND	ND	ND	Yes	0	NF	ND	
Oese4	NA	5Y 3/2	104	ND	ND	ND	Yes	0	NF	ND	
Oabse	NA	7.5YR 2.5/1	150+	ND	ND	ND	Yes	0	MF	ND	

Pedon ID:	HSB1	Date:	7/21/2021	Location:	Old Saybrook, CT	Dominate vegetation: S. alterniflora		Pedogeomorphic Unit: C			
Classification:	Coarse-loamy, Mixed, Active, Mesic Typic Sulfaquent			Latitude:	41.27343502	Secondary vegetation: Salicornia sp.		1 meter carbon stock (kg C m^{-2}): ND			
Pore water halinity (ppt):	18	Open water halinity:	NA	Longitude:	-72.393803	Tertiary vegetation:		2 meter carbon stock (kg C m^{-2}): ND			
Distance to open water (m):	112	Sampled:	No	Site notes:							

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/2	14	ND	ND	ND	No	0	NF	ND	
Ase	VFSL	10YR 3/1	62	ND	ND	ND	Yes	0	NF	ND	
CAse	SiL	2.5Y 4/1	98	ND	ND	ND	Yes	0	MF	ND	
Cse	Si	10Y 4/1	110	ND	ND	ND	Yes	0	MF	ND	
AseB	Si	10Y 3/1	119	ND	ND	ND	Yes	0	VF	ND	
C'se	FSL	N 4/	124	ND	ND	ND	Yes	0	SF	ND	
Oaseb	NA	7.5YR 2.5/2	160+	ND	ND	ND	Yes	0	MF	ND	

Pedon ID:	HSB2	Date:	7/21/2021	Location:	Old Saybrook, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification:	Loamy, mixed, euic, mesic Terric Sulfihemist			Latitude:	41.27339101	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 38.3
Pore water halinity (ppt):	27	Open water halinity:	NA	Longitude:	-72.39443298	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 65.7
Distance to open water (m):	68	Sampled:	Yes	Site notes:	Small marsh next to public beach - potentially HTM or human alteration could be to blame for the lack of horizons		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 3/1	59	0.29	15.85	7.39	No	0	SF	ND	
Cse	Si	5G 4/1	180+	0.48	5.75	ND	Yes	0	VF	ND	

Pedon ID: HSB3	Date: 7/21/2021	Location: Old Saybrook, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Sandy, Mixed, Mesic Haplic Sulfaquent		Latitude: 41.27315003	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 12.4
Pore water halinity (ppt): 27	Open water halinity: 25	Longitude: -72.39473004	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 49.4
Distance to open water (m): 32	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Ase	SiL	5Y 4/1	30	0.41	8.71	6.64	Yes	0	SF	ND	
C1	CS	10Y 5/1	61	ND	0.15	4.53	No	0	NF	ND	
Cg2	S	N 4/	96	ND	0.8	ND	No	0	NF	ND	
Cse1	FSL	2.5Y 3/1	122	0.74	3.5	ND	Yes	0	NF	ND	
Cse2	VFSL	5Y 4/2	150+	0.55	7.34	ND	Yes	0	NF	ND	

Pedon ID:	LB1	Date:	7/26/2021	Location:	Westport. MA	Dominate vegetation: S. patens			Pedogeomorphic Unit: BB		
Classification:	Sandy, Mixed, Mesic Thapto-Humic Pssamaquent			Latitude:	41.50983302	Secondary vegetation: D. spicata			1 meter carbon stock (kg C m^{-2}): ND		
Pore water halinity (ppt):	30	Open water halinity:	NA	Longitude:	-71.02007898	Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): ND		
Distance to open water (m):	105	Sampled:	Yes	Site notes:	A horizons very mucky, oriinally described as Oa horizons.						
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	SiL	7.5YR 2.5/3	10	0.22	22.86	5.48	No	0	NF	ND	
A	SiL	7.5YR 2.5/1	13	0.48	11.63	4.98	No	0	NF	ND	
A2	S	10YR 6/2	15	ND	9.97	3.95	No	0	NF	ND	
A3	SiL	7.5YR 2.5/1	17	ND	11.97	3.24	No	0	NF	ND	
C	S	710YR 6/2	21	ND	2.73	2.75	No	0	NF	ND	
AC	SL	N 2.5/	44	1.9	3.22	3.15	No	0	NF	ND	
Cse	S	2.5Y 4/1	69	ND	0.7	0.8	Yes	0	NF	ND	
C"	S	2.5Y 4/1	116+	ND	0.27	ND	No	0	NF	ND	

Pedon ID:	LB2	Date:	7/26/2021	Location:	Westport. MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification:	Coarse-loamy, Mixed, Active, Mesic Thapto-Humic Fluvaquent			Latitude:	41.51016201	Secondary vegetation: Salicornia sp.	1 meter carbon stock (kg C m¯ ²): ND
Pore water halinity (ppt):	30	Open water halinity:	NA	Longitude:	-71.02046303	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND
Distance to open water (m):	68	Sampled:	No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	7.5YR 3/3	9	ND	ND	ND	No	0	NF	ND	
Ase1	SiL	10YR 2/2	50	ND	ND	ND	Yes	0	SF	ND	
Ase2	SiL	2.5Y 3/2	59	ND	ND	ND	Yes	0	MF	ND	
Cse	FSL	2.5Y 3/1	90	ND	ND	ND	Yes	0	MF	ND	
Aseb	VFSL	10YR 2/1	101+	ND	ND	ND	Yes	0	SF	ND	

Pedon ID: LB3	Date: 7/26/2021	Location: Westport. MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification: Coarse-loamy, Mixed, Active, Mesic Typic Endoaquent		Latitude: 41.51065101	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 30	Open water halinity: NA	Longitude: -71.02096402	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 42	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	10YR 5/3	10	ND	ND	ND	No	0	NF	ND	
Ase	SiL	2.5Y 3/2	19	ND	ND	ND	Yes	0	NF	ND	
CA	Si	5Y 4/1	55	ND	ND	ND	No	0	SF	ND	
Cse	S	5Y 4/1	100+	ND	ND	ND	Yes	0	NF	ND	

Pedon ID: SMP1	Date: 7/28/2021	Location:	Salt Meadow Park, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Euic, mesic Typic Sulfisaprist		Latitude:	41.26991303	Secondary vegetation:	1 meter carbon stock (kg C m⁻²): 47.9
Pore water halinity (ppt): 20	Open water halinity: NA	Longitude:	-72.54923802	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): 109.4
Distance to open water (m): 173	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	10YR 2/1	19	0.12	18.2	5.21	No	0	SF	ND	
Cg	Si	N 5/	29	0.16	9.64	5.13	No	0	SF	ND	
Oab1	NA	10YR 2/2	49	0.33	16.53	5.43	No	0	MF	ND	
Oab2	NA	7.5YR 2.5/1	175+	0.19	32.63	5.15	No	0	MF	ND	

Pedon ID: SMP2	Date: 7/28/2021	Location: Salt Meadow Park, CT	Dominate vegetation: S. alterniflora
Classification: Euic, mesic Typic Sulfihemist		Latitude: 41.26958697	Secondary vegetation:
Pore water halinity (ppt): 25	Open water halinity: NA	Longitude: -72.54891297	Tertiary vegetation:
Distance to open water (m): 141	Sampled: No	Site notes:	

Pedogeomorphic Unit: TR

1 meter carbon stock (kg C m^{-2}): ND

2 meter carbon stock (kg C m^{-2}): ND

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	Si	10YR 3/2	19	ND	ND	ND	No	0	NF	ND	
C	SiL	2.5Y 3/1	30	ND	ND	ND	No	0	SF	ND	
Oeseb	SiL	10YR 3/2	62	ND	ND	ND	Yes	0	SF	ND	
Oaseb1	SiL	2.5Y 3/1	90	ND	ND	ND	Yes	0	MF	ND	
Oaseb2	Si	10YR 2/1	106	ND	ND	ND	Yes	0	MF	ND	
Oab	NA	7.5YR 2.5/1	130	ND	ND	ND	No	0	MF	ND	
AC	Si	2.5Y 3/2	185	ND	ND	ND	No	0	MF	ND	
C/A	SiL	2.5Y 4/1 10YR 3/1	195	ND	ND	ND	No	0	MF	ND	
Cg	Si	N 4/	243+	ND	ND	ND	No	0	MF	ND	

Pedon ID: SMP3	Date: 7/28/2021	Location: Salt Meadow Park, CT	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Coarse-loamy, Mixed, Active, Mesic Histic Sulfaquent		Latitude: 41.26930098	Secondary vegetation: D. spicata	1 meter carbon stock (kg C m⁻²): ND
Pore water halinity (ppt): 25	Open water halinity: NA	Longitude: -72.54826597	Tertiary vegetation:	2 meter carbon stock (kg C m⁻²): ND
Distance to open water (m): 81	Sampled:	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	2.5Y 3/2	20	ND	ND	ND	No	0	NF	ND	
CAse	SiL	2.5Y 3/1	87	ND	ND	ND	Yes	0	SF	ND	
Cse1	Si	5Y 4/1	109	ND	ND	ND	Yes	0	MF	ND	
Cse2	Si	N 4/	120	ND	ND	ND	Yes	0	MF	ND	
C/A	Si	N4/ 2.5Y & 2.5/1	157	ND	ND	ND	No	0	MF	ND	Thin horizons of C and A repeating
Oaseb	MSi	7.5YR 2.5/2	172	ND	ND	ND	Yes	0	MF	ND	
CA'se	Si	7.5YR 3/1	180+	ND	ND	ND	Yes	0	VF	ND	

Pedon ID:	SMP4	Date:	7/28/2021	Location:	Salt Meadow Park, CT	Dominate vegetation: D. spicata	Pedogeomorphic Unit: TR
Classification:	Coarse-loamy, Mixed, Active, Mesic Typic Sulfaquent			Latitude:	41.26911297	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): 27.2
Pore water halinity (ppt):	27	Open water halinity:	NA	Longitude:	-72.54771897	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 40.2
Distance to open water (m):	35	Sampled:	Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/1	11	0.13	26.4	5.67	No	0	NF	ND	
ACse	VFSL	10 Y 3/1	56	0.22	1.42	6.76	Yes	0	SF	ND	
Cse1	VFSL	5Y 4/1	87	0.35	8.3	ND	Yes	0	SF	ND	
Cse2	Si	10Y 4/1	105	0.4	ND	ND	Yes	0	SF	ND	
Cse3	SiL	10Y 2.5/1	152	0.42	ND	ND	Yes	0	SF	ND	
CA'se	Si	5GY 4/1	215	0.49	ND	ND	Yes	0	MF	ND	
C'se4	Si	N 5/	240+	0.68	ND	ND	Yes	0	SF	ND	

Pedon ID:	CRC1	Date:	2/8/2021	Location:	Old Lyme, CT	Dominate vegetation: S. patens		Pedogeomorphic Unit: TC	
Classification:	Euic, mesic Typic Sulfihemist			Latitude:	41.29125796	Secondary vegetation:		1 meter carbon stock (kg C m⁻ ²): 47.4	
Pore water halinity (ppt):	17	Open water halinity:	NA	Longitude:	-72.32079201	Tertiary vegetation:		2 meter carbon stock (kg C m⁻ ²): 105.3	
Distance to open water (m):	119	Sampled:	Yes	Site notes:					

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise1	NA	2.5Y 2.5/1	5	0.14	29.28	5.37	Yes	0	NF	ND	
Oise2	NA	10YR 2/2	27	0.12	31.77	5.52	Yes	0	NF	ND	
Oese	NA	2.5Y 2.5/1	41	0.16	27.35	5.12	Yes	0	NF	ND	
Oese2	NA	10YR 3/1	50	0.11	21.22	3.9	Yes	0	NF	ND	
Oase	NA	10YR 2/1	214	0.17	33.18	ND	Yes	0	MF	ND	
O'ese	NA	10YR 3/2	256+	0.18	17.1	ND	Yes	0	MF	ND	

Pedon ID: CRC2	Date: 2/8/2021	Location: Old Lyme, CT	Dominate vegetation: S. patens
Classification: Euic, mesic Typic Sulfihemist		Latitude: 41.29122997	Secondary vegetation: D. spicata
Pore water halinity (ppt): 23	Open water halinity: NA	Longitude: -72.32026404	Tertiary vegetation:Salicornia sp.
Distance to open water (m): 70	Sampled: No	Site notes:	

Pedogeomorphic Unit: TC

1 meter carbon stock (kg C m^{-2}): ND

2 meter carbon stock (kg C m^{-2}): ND

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 4/3	17	ND	ND	ND	No	0	NF	ND	
Oise	NA	10YR 3/1	36	ND	ND	ND	Yes	0	NF	ND	
Oise2	NA	10YR 3/3	43	ND	ND	ND	Yes	0	NF	ND	
Oese	NA	10YR 2/1	84	ND	ND	ND	Yes	0	SF	ND	
Oase1	NA	10YR 3/1	129	ND	ND	ND	Yes	0	MF	ND	
Oase2	NA	2.5Y 3/1	178	ND	ND	ND	Yes	0	SF	ND	
Cse	VFSL	5Y 4/1	226+	ND	ND	ND	Yes	0	SF	ND	

Pedon ID: CRC3	Date: 2/8/2021	Location: Old Lyme, CT	Dominate vegetation: D. spicata	Pedogeomorphic Unit: TC
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude: 41.29127196	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): 38.9
Pore water halinity (ppt): 20	Open water halinity: NA	Longitude: -72.31989297	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 70.8
Distance to open water (m): 47	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	24	ND	16.54	7.15	No	0	NF	ND	
Oise	NA	2.5Y 3/1	32	0.27	16.46	5.22	Yes	0	NF	ND	
Oise2	NA	2.5Y 4/2	53	0.17	13.68	6.5	Yes	0	NF	ND	
Oese1	NA	2.5Y 2.5/1	87	0.28	16.66	ND	Yes	0	SF	ND	
Oese2	NA	10YR 3/2	117	0.19	16.91	ND	Yes	0	SF	ND	
ACse1	SiL	2.5YR 3/1	130	0.36	9.21	ND	Yes	0	NF	ND	
ACse2	SiL	7.5YR 2.5/1	192	0.44	7.29	ND	Yes	0	SF	ND	
Cse	VFSL	2.5Y 4/1	238+	0.5	6.3	ND	Yes	0	SF	ND	

Pedon ID: CRC4	Date: 2/8/2021	Location:	Old Lyme, CT	Dominate vegetation: D. spicata	Pedogeomorphic Unit: TC
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.29116903	Secondary vegetation: S. patens	1 meter carbon stock (kg C m¯ ²): ND
Pore water halinity (ppt): 35	Open water halinity: NA	Longitude:	-72.31957404	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): ND
Distance to open water (m): 16	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 2/2	17	ND	ND	ND	No	0	NF	ND	
Oese1	NA	10YR 3/1	34	ND	ND	ND	Yes	0	SF	ND	
Oese2	NA	7.5YR 4/2	50	ND	ND	ND	Yes	0	NF	ND	
Oe	NA	7,5YR 2.5/1	66	ND	ND	ND	No	0	SF	ND	
C	SiL	2Y 5/1	69	ND	ND	ND	No	0	SF	ND	
Aseb	VFSL	10YR 2/1	190	ND	ND	ND	Yes	0	SF	ND	Potentially early Holocene age materials
ACseb	VFSL	10YR 3/2	218	ND	ND	ND	Yes	0	MF	ND	
Cse	VFSL	5Y 4/1	236+	ND	ND	ND	Yes	0	MF	ND	

Pedon ID: RSD1		Date: 11/8/2021		Location:	Pawcatuck, CT	Dominate vegetation: S. alterniflora			Pedogeomorphic Unit: TR		
Classification: Coarse-loamy, Mixed, Active, Mesic, Typic Sulfaquept				Latitude:	41.29117699	Secondary vegetation: S. patens			1 meter carbon stock (kg C m^{-2}): ND		
Pore water halinity (ppt): 20		Open water halinity: 0		Longitude:	-72.31958896	Tertiary vegetation: Salicornia sp.			2 meter carbon stock (kg C m^{-2}): ND		
Distance to open water (m): 0		Sampled: Yes		Site notes:	Potential HTM but more likely drowned upland beneath marsh.						
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi1	NA	10YR 3/3	2	ND	ND	ND	No	0	NF	ND	
Oi2	NA	10YR 3/3	14	ND	37.4	4.84	No	0	NF	ND	
Cse	FSL	2.5Y 3/2	19	ND	ND	ND	Yes	0	NF	ND	
2Abse	MFSL	N 2.5/	41	ND	ND	ND	Yes	0	NF	ND	Glacial material buried by sea level rise
2Bw1	FSL	2.5Y 4/3	85	ND	ND	ND	No	0	NF	ND	
2Bw2	FSL	2.5Y 4/3	110	ND	ND	ND	No	0	NF	ND	

Pedon ID: RSD2	Date: 11/8/2021	Location:	Pawcatuck, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.332035	Secondary vegetation: Salicornia sp.	1 meter carbon stock (kg C m^{-2}): 36
Pore water halinity (ppt): 15	Open water halinity: 0	Longitude:	-71.84518598	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 85.5
Distance to open water (m): 55	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise1	NA	2.5Y 4/2	18	0.13	36.59	4.55	Yes	0	NF	ND	
Oise2	NA	10YR 3/1	25	0.25	17.4	4.79	Yes	0	NF	ND	
Oise3	NA	10YR 3/2	61	0.1	25.72	5.2	Yes	0	NF	ND	
Oab	NA	10YR 2/1	83	0.12	31.42	ND	No	0.4	MF	ND	
A	MSiL	N 2.5/	88	0.46	1.12	ND	No	0.1	MF	ND	
Cse1	SL	10YR 4/1	97	1.14	2.93	ND	Yes	0	MF	ND	
Cse2	SL	10YR 4/2	118	1.27	3.9	ND	Yes	0	SF	ND	

Pedon ID:	RSD3	Date:	11/8/2021	Location:	Pawcatuck, CT	Dominate vegetation: S. patens			Pedogeomorphic Unit: TR		
Classification:	Loamy, mixed, euic, mesic Terric Sulfihemist			Latitude:	41.33185303	Secondary vegetation:			1 meter carbon stock (kg C m^{-2}): ND		
Pore water halinity (ppt):	20	Open water halinity:	25	Longitude:	-71.84471198	Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): ND		
Distance to open water (m):	13	Sampled:	No	Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise1	NA	10YR 3/3	14	ND	ND	ND	Yes	0	NF	ND	
Oise2	NA	10YR 3/1	19	ND	ND	ND	Yes	0	NF	ND	
Oese	NA	10YR 3/3	61	ND	ND	ND	Yes	0	SF	ND	
Oase	NA	10YR 2/1	82	ND	ND	ND	Yes	0	MF	ND	
Ase	FSL	N 2.5/	87	ND	ND	ND	Yes	0	SF	ND	
Cse	CSL	5Y 3/1	100	ND	ND	ND	Yes	0	NF	ND	

Pedon ID:	RSDC1	Date:	11/8/2021	Location:	Pawcatuck, CT	Dominate vegetation: S. patens			Pedogeomorphic Unit: TR		
Classification:	Euic, mesic Typic Sulfihemist			Latitude:	41.33344903	Secondary vegetation:			1 meter carbon stock (kg C m¯ ²): ND		
Pore water halinity (ppt):	15	Open water halinity:	0	Longitude:	-71.84593599	Tertiary vegetation:			2 meter carbon stock (kg C m¯ ²): ND		
Distance to open water (m):	76	Sampled:	Yes	Site notes:	Creek adjacent to river system of RSD pedons. Seperated by a road but likely still riverine origin.						
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/1	45	ND	ND	ND	Yes	0	NF	ND	
Oese	NA	10YR 2/1	100	ND	ND	ND	Yes	0	SF	ND	

Pedon ID: RSDC2	Date: 11/8/2021	Location:	Pawcatuck, CT	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.33311501	Secondary vegetation: D. spicata	1 meter carbon stock (kg C m¯ ²): 45.6
Pore water halinity (ppt): 20	Open water halinity: 0	Longitude:	-71.84581102	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): 87.5
Distance to open water (m): 68	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 2/2	42	0.11	37.63	4.66	Yes	0	NF	ND	
Oese	NA	10YR 2/1	60	0.35	18.44	3.38	Yes	0	SF	ND	
A/Cse	SL	10YR 2/1 5Y 6/1	70	0.88	4.77	ND	Yes	0	NF	ND	

Pedon ID: CSP1	Date: 5/19/2022	Location: Bristol, RI	Dominate vegetation: D. spicata
Classification: Coarse-loamy, Mixed, Active, Mesic Typic Psammaquents		Latitude: 41.682476	Secondary vegetation:
Pore water halinity (ppt): 28	Open water halinity: 30	Longitude: -71.296796	Tertiary vegetation:
Distance to open water (m): 111	Sampled: No	Site notes:	

Pedogeomorphic Un C

1 meter carbon stock (kg C m¯ ²): ND

2 meter carbon stock (kg C m¯ ²): ND

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	10YR 2/2	21	ND	ND	ND	No	0	MF	H6	
Oa	NA	2.5YR 2.5/1	34	ND	ND	ND	No	0	MF	H8	
A	SL	5Y 2.5/1	39	ND	ND	ND	No	0	MF	ND	
2CA	GSL	2.5Y 3/2	54	ND	ND	ND	No	15	NF	ND	
2C1	GSL	2.5Y 3/2	83	ND	ND	ND	No	15	SF	ND	
2C2	VGSL	2.5Y 4/2	98	ND	ND	ND	No	35	SF	ND	
2C3	EGSL	5Y 3/2	115+	ND	ND	ND	No	70	SF	ND	

Pedon ID: CSP2		Date: 5/19/2022		Location:	Bristol, RI	Dominate vegetation: S. alterniflora			Pedogeomorphic Unit: C		
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist				Latitude:	41.68245203	Secondary vegetation: S. patens			1 meter carbon stock (kg C m^{-2}): 48		
Pore water halinity (ppt): 28		Open water halinity: 30		Longitude:	-71.29653602	Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): 77.2		
Distance to open water (m): 91		Sampled: Yes		Site notes:							
Oise1	NA	2.5Y 4/2	13	0.9	43.14	ND	Yes	0	NF	H3	
Oise2	NA	2.5Y 3/2	22	0.15	3.95	ND	Yes	0	SF	H4	
Oese1	NA	10YR 3/2	39	0.18	25.87	ND	Yes	0	SF	H5	
Oese2	NA	2.5Y 2.5/1	79	0.14	34.75	ND	Yes	0	MF	H6	
Oese3	NA	2.5Y 2.5/2	94	0.14	34.99	ND	Yes	0.6	SF	H5	
Ase	SL	2.5Y 2.5/3	98	0.85	6.51	ND	Yes	0	MF	ND	
Cse1	FSL	2.5Y 4/2	111	1.44	2.54	ND	Yes	0	MF	ND	
Cse2	FSL	10YR 4/2	125+	ND	ND	ND	Yes	0	MF	ND	

Pedon ID:	CSP3	Date:	5/19/2022	Location:	Bristol, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification:	Loamy, mixed, euic, mesic Terric Sulfihemist			Latitude:	41.68247902	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt):	30	Open water halinity:	30	Longitude:	-71.29618096	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m):	62	Sampled:	No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	2.5Y 4/2	11	ND	ND	ND	No	0	NF	ND	
Oi2	NA	2.5Y 3/1	24	ND	ND	ND	No	0	NF	ND	
Oese1	NA	2.5Y 3/1	34	ND	ND	ND	Yes	0	SF	ND	
Oese2	NA	2.5Y 2.5/1	51	ND	ND	ND	Yes	0	SF	ND	
Oese3	NA	2.5Y 2.5/1	99	ND	ND	ND	Yes	0	MF	ND	
Oase	NA	N 2.5/	104	ND	ND	ND	Yes	0	VF	ND	
C	SL	10YR 3/1	124+	ND	ND	ND	No	0	MF	ND	

Pedon ID: CSP4	Date: 5/19/2022	Location: Bristol, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfihemist		Latitude: 41.68248497	Secondary vegetation: D. spicata	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 29	Open water halinity: 30	Longitude: -71.29564703	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 20	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi2	NA	10YR 3/1	42	ND	ND	ND	No	0	NF	H3	
Oese1	NA	2.5Y 2.5/1	98	ND	ND	ND	Yes	0	SF	H4	
Oese2	NA	10YR 2/1	143	ND	ND	ND	Yes	0	MF	H7	
Oase	NA	10YR 2/1	153	ND	ND	ND	Yes	0	VF	H9	
ACse	SL	2.5Y 3/1	164	ND	ND	ND	Yes	0	MF	ND	
Cse	SL	5Y 6/2	173+	ND	ND	ND	Yes	0	MF	ND	

Pedon ID: CWC1	Date: 5/27/2022	Location:	Colonel Willie Cove Preserve	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfisaprist		Latitude:	41.327011	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): 42.9
Pore water halinity (ppt): 23	Open water halinity: 25	Longitude:	-71.838822	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 94.8
Distance to open water (m): 151	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/2	13	0.14	41.81	6.54	Yes	0	SF	H3	
Oa2	NA	7.5YR 2.5/1	60	0.9	5.36	5.4	No	0	MF	H8	
Oase1	NA	7.5YR 2.5/1	137	0.1	39.41	4.64	Yes	0	MF	H7	
Oase2	NA	7.5YR 2.5/2	173	0.12	47.94	1.4	Yes	0	MF	H8	
Oase3	NA	7.5YR 2.5/2	250+	0.14	45.1	0.79	Yes	0	MF	H7	

Pedon ID:	CWC2	Date:	5/27/2022	Location:	Colonel Willie Cove Preserve	Dominate vegetation: S. alterniflora			Pedogeomorphic Unit: C		
Classification:	Euic, mesic Typic Sulfisaprist			Latitude:	41.326997	Secondary vegetation: S. patens			1 meter carbon stock (kg C m^{-2}): 70.6		
Pore water halinity (ppt):	24	Open water halinity:	25	Longitude:	-71.839572	Tertiary vegetation:Salicornia sp.			2 meter carbon stock (kg C m^{-2}): 137.1		
Distance to open water (m):	93	Sampled:	Yes	Site notes:							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe1	NA	7.5YR 3/2	6	0.14	65.68	7.59	No	0	MF	H6	
Oe2	NA	7.5YR 2.5/2	19	0.11	42.22	6.93	No	0	SF	H3	
O'e2	NA	7.5YR 2.5/2	84	0.14	38.2	7.58	No	0	SF	H4	
Oase1	NA	10YR 2/1	186	0.14	48.98	7.33	Yes	0	MF	H8	
Oase2	NA	7.5YR 2.5/1	260	0.15	4.15	6.7	Yes	0	MF	H7	
Oase3	NA	10YR 2/2	301	0.16	41.52	5.14	Yes	0	MF	H8	
Oase4	NA	7.5YR 2.5/2	350+	0.13	43.12	3.24	Yes	0	MF	H8	

Pedon ID: CWC3	Date: 5/27/2022	Location:	Colonel Willie Cove Preserve	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: C
Classification: Euic, mesic Typic Sulfisaprist		Latitude:	41.326894	Secondary vegetation:	1 meter carbon stock (kg C m¯ ²): 44.4
Pore water halinity (ppt): 20	Open water halinity: 25	Longitude:	-71.840116	Tertiary vegetation:	2 meter carbon stock (kg C m¯ ²): 93.9
Distance to open water (m): 47	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise1	NA	7.5YR 3/2	19	0.14	44.43	6.6	Yes	0	NF	H3	
Oise2	NA	7.5YR 3/2	33	0.13	36.46	8.35	Yes	0	SF	H3	
Oase1	NA	N 2.5/	140	0.1	39.8	7.47	Yes	0	VF	H9	
Oase2	NA	7.5YR 2.5/1	290	0.14	39.79	8.26	Yes	0	MF	H7	

Pedon ID: SPC1	Date: 6/13/2022	Location: Mystic, CT	Dominate vegetation: D. spicata
Classification: Euic, mesic Fibric Haplosaprist		Latitude: 41.382599	Secondary vegetation:
Pore water halinity (ppt): 12	Open water halinity: 18	Longitude: -71.96716698	Tertiary vegetation:
Distance to open water (m): 134	Sampled: Yes	Site notes: Narrow but long marsh. Just on edge of 3 acre size limit	

Pedogeomorphic Unit: TR	
1 meter carbon stock (kg C m⁻²): 45.9	
2 meter carbon stock (kg C m⁻²): 79.3	

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	7.5YR 3/2	64	0.14	33.19	3.66	No	1	NF	H3	
Oase	NA	7.5YR 2.5/1	145	0.1	45.22	0.98	Yes	2.6	MF	H7	
CA	SL	2.5YR 3/2	150	0.88	2.92	0.36	No	0	MF	NA	
Cg	SL	2.5Y 4/2	190+	1.53	1.7	0.18	No	0	MF	NA	

Pedon ID: SPC2	Date: 6/13/2022	Location: Mystic, CT	Dominate vegetation: D. spicata
Classification: Euic, mesic Typic Haplosaprist		Latitude: 41.383019	Secondary vegetation: S. patens
Pore water halinity (ppt): 10	Open water halinity: 18	Longitude: -71.966281	Tertiary vegetation:
Distance to open water (m): 66	Sampled: No	Site notes:	

Pedogeomorphic Un TR

1 meter carbon stock (kg C m^{-2}): ND

2 meter carbon stock (kg C m^{-2}): ND

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	7.5YR 3/2	11	ND	ND	ND	No	0	SF	SF	
Oe	NA	7.5YR 2.5/2	39	ND	ND	ND	No	0	SF	SF	
Oase	NA	7.5YR 2.5/1	45	ND	ND	ND	Yes	0	MF	MF	
CA	SL	10YR 2/1	107	ND	ND	ND	No	0	MF	NA	
Cg	SL	2.5Y 4/2	140+	ND	ND	ND	No	0	MF	NA	

Pedon ID:	SPC3	Date:	6/13/2022	Location:	Mystic, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification:	Loamy, mixed, euic, mesic Terric Haplofibrist			Latitude:	41.38289	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): 40.0
Pore water halinity (ppt):	10	Open water halinity:	18	Longitude:	-71.9659	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 78.6
Distance to open water (m):	31	Sampled:	Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (μS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	7.5YR 3/2	40	0.14	3.7	5.65	No	0.4	SF	H3	
Oa	NA	2.5Y 2.5/1	190	0.11	37.5	7.32	No	6.5	MF	H8	
A	SL	10YR 2/1	207	0.91	3.64	5.13	No	0	MF	NA	
Cse	SL	10YR 4/3	222+	1.53	1.94	4.7	Yes	0	MF	NA	

Pedon ID:	EM1.5	Date:	29-May	Location:	East Matunek, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: BB
Classification:	Sandy, Mixed, Mesic Fluventic Sulfaquent			Latitude:	41.38289	Secondary vegetation: Phragmites australis	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt):	24	Open water halinity:	30	Longitude:	-71.9659	Tertiary vegetation:D. Spictata	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m):	0	Sampled:	No	Site notes:	Second time at this site, using it as training for new intern.		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	7.5YR 2.5/2	8	ND	ND	ND	No	0	NA	H3	
Cg	LS	5Y 4/1	24	ND	ND	ND	No	0	NF	NA	
Oaseb	NA	7.5YR 2.5/2	60	ND	ND	ND	Yes	0	NA	H7	
ACse	S	10YR 3/1	66	ND	ND	ND	Yes	0	NF	NA	
Cse1	S	5Y 4/1	72	ND	ND	ND	Yes	0	NF	NA	
Cse2	S	2.5Y 4/1	88	ND	ND	ND	Yes	0	NF	NA	
Cse3	S	N 4/	113+	ND	ND	ND	Yes	0	NF	NA	

Pedon ID: EM2.5	Date: 29-May	Location: East Matunek, RI	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: BB
Classification: Sandy, Mixed, Mesic Fluventic Sulfaquent		Latitude: 41.37859203	Secondary vegetation: D. spicata	1 meter carbon stock (kg C m^{-2}): 23.7
Pore water halinity (ppt): 30	Open water halinity: 30	Longitude: -71.53003003	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 33.6
Distance to open water (m): 5	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 3/2	13	0.16	3.63	5.39	No	0	NA	H3	
Cse	S	N 4/	21	0.8	2.42	6.2	Yes	0	NF	NA	
Oeseb	NA	10YR 2/2	29	0.25	23.7	7.76	Yes	0	NA	H6	
C'se	S	5Y 4/2	37	0.63	2.34	8.16	Yes	0	NF	NA	
Oaseb	NA	10YR 2/2	54	0.29	12.91	8.15	Yes	0	NA	H7	
C''se1	S	2.5Y 4/1	65	1.6	0.72	6.87	Yes	0	NF	NA	
C''se2	S	N 4/	81	1.44	0.37	5.85	Yes	0	NF	NA	
C''se3	FS	N 4/	110+	1.34	0.74	6.6	Yes	0	NF	NA	

Pedon ID: ERB1	Date: 6/28/2022	Location: East River Boat Launch, CT	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic, Terric Haplofibrist		Latitude: 41.26691	Secondary vegetation: S. alterniflora	1 meter carbon stock (kg C m^{-2}): 46.2
Pore water halinity (ppt): 35	Open water halinity: 25	Longitude: -72.6578	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 71.6
Distance to open water (m): 302	Sampled: Yes	Site notes: Behind barrier spit but also along East river bank. Fine particles suggest formation by riverine forces rather than oceanic		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	2.5Y 3/2	48	0.31	16.27	6.99	Yes	0	NA	ND	
Ase1	NA	2.5Y 3/3	99	0.37	11.78	9.69	Yes	0	NA	ND	
Ase2	NA	2.5Y 3/4	116	0.46	7.45	9.46	Yes	0	NA	ND	
ACse	Si	5Y 4/1	143	0.52	ND	12.49	Yes	0	MF	ND	
Cg1	Si	N 4/	227	0.62	3.41	12.15	No	0	MF	ND	
Cg2	SiL	N 4/	232+	0.96	ND	1.58	No	0	MF	ND	

Pedon ID: ERB2	Date: 6/28/2022	Location: East River Boat Launch, CT	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic, Terric Sulfihemist		Latitude: 41.26737197	Secondary vegetation: S. alterniflora	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 35	Open water halinity: 25	Longitude: -72.65792096	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 251	Sampled: No	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/1	76	ND	ND	ND	Yes	0	NA	ND	
Oese	NA	10YR 3/1	92	ND	ND	ND	Yes	0	NA	ND	
Oase	NA	10YR 2/1	115	ND	ND	ND	Yes	0	NA	ND	
Cg	SCL	N 4/	200+	ND	ND	ND	No	0	MF	ND	

Pedon ID:	ERB3	Date:	6/28/2022	Location:	East River Boat Launch, CT	Dominate vegetation: S. alterniflora			Pedogeomorphic Unit: TR		
Classification:	Loamy, mixed, euic, mesic, Terric Sulfihemist			Latitude:	41.267866	Secondary vegetation: D. spicata			1 meter carbon stock (kg C m⁻²): 45.5		
Pore water halinity (ppt):	30	Open water halinity:	25	Longitude:	-72.65827501	Tertiary vegetation:			2 meter carbon stock (kg C m⁻²): 70.1		
Distance to open water (m):	203	Sampled:	Yes	Site notes:							

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	VFSL	2Y 3/1	9	0.39	14.16	6.39	No	0	MF	ND	
Oe	NA	10YR 3/1	64	0.38	14.32	7.85	No	0	NA	ND	
Ase	Si	2Y 3/1	110	0.29	1.18	1.79	Yes	0	NA	ND	
Cse	Si	N 4/	350	0.92	2.6	7.26	Yes	0	VF	ND	

Pedon ID: ERB4	Date: 6/28/2022	Location: East River Boat Launch, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic, Terric Sulfihemist		Latitude: 41.26886	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 41.6
Pore water halinity (ppt): 30	Open water halinity: 25	Longitude: -72.6578	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 65.6
Distance to open water (m): 86	Sampled: Yes	Site notes: Marsh breaking off into river channel, local fishermen talk about high impact of wake from passing boats. Potentially more likely to erode than others.		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/1	55	0.45	12.35	8.48	Yes	0	NA	ND	
Cse	FSL	10YR 3/1	139	0.41	6.5	1.15	Yes	0	SF	ND	
Cse2	SCL	2Y 4/1	190	0.68	3.59	7.5	Yes	0	MF	ND	
Cse3	SiL	2Y 4/1	250	0.97	1.99	1.47	Yes	0	MF	ND	

Pedon ID: JCW1	Date: 6/16/2022	Location:	John Chafee Wildlife Preserve, RI	Dominate vegetation: S.patens	Pedogeomorphic Unit: TR
Classification: Coarse-loamy, Mixed, Active, Mesic Histic Sulfaquent		Latitude:	41.45073197	Secondary vegetation: D. Spicata	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 5	Open water halinity: 30	Longitude:	-71.450354	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 40	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (μS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	7.5YR 3/3	43	ND	ND	ND	Yes	0	NA	ND	
2Cg1	LS	10YR 4/1	80	ND	ND	ND	No	0	NF	ND	Glacial material
2Cg2	SL	10YR 4/1	96	ND	ND	ND	No	0	NF	ND	
2Cg3	SL	5Y 5/2	108	ND	ND	ND	No	0	NF	ND	

Pedon ID: JCW2	Date: 6/16/2022	Location: John Chafee Wildlife Preserve, RI	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Coarse-loamy, Mixed, Active, Mesic Histic Sulfaquent		Latitude: 41.450767	Secondary vegetation: S. alterniflora	1 meter carbon stock (kg C m^{-2}): 43
Pore water halinity (ppt): 20	Open water halinity: 30	Longitude: -71.45053103	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 51.2
Distance to open water (m): 25	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	7.5YR 3/4	13	0.21	34.1	ND	No	0	NA	ND	
Oise	NA	7.5YR 3/1	23	0.21	22.75	ND	Yes	0	NA	ND	
A	FSL	10YR 3/1	49	0.46	1.96	ND	No	0	MF	NA	
Oa	NA	2.5Y 4/1	59	0.52	12	ND	No	0	NA	ND	
Cse1	FS	N 4/	69	1.21	1.47	ND	Yes	0	NF	ND	
Cse2	SL	10YR 4/1	91	0.97	3.34	ND	Yes	0	MF	ND	
Cse3	LFS	N 5/	103	1.9	0.75	ND	Yes	0	NF	ND	

Pedon ID:	JCW3	Date:	6/16/2022	Location:	John Chafee Wildlife Preserve, RI	Dominate vegetation: S. alterniflora				Pedogeomorphic Unit: TR		
Classification:	Coarse-loamy, Mixed, Active, Mesic Typic Sulfaquent			Latitude:	41.450766	Secondary vegetation: Salicornia sp.				1 meter carbon stock (kg C m^{-2}): ND		
Pore water halinity (ppt):	30	Open water halinity:	30	Longitude:	-71.45072498	Tertiary vegetation:				2 meter carbon stock (kg C m^{-2}): ND		
Distance to open water (m):	9	Sampled:	No	Site notes:								
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes	
Oise	NA	7.5YR 3/3	12	ND	ND	ND	Yes	0	NA	ND		
Ase	L	7.5YR 3/1	34	ND	ND	ND	Yes	0	NF	NA		
Cse1	L	10YR 4/1	66	ND	ND	ND	Yes	0	SF	ND		
Cse2	L	10YR 4/1	84	ND	ND	ND	Yes	0	MF	ND		
Cse3	FS	N 4/	102	ND	ND	ND	Yes	0	VF	ND		

Pedon ID: RSH1	Date: 6/29/2022	Location:	Rotundo Sanctuary, MA	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Euic, mesic Typic Sulfisaprist		Latitude:	41.775148	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 42.7
Pore water halinity (ppt): 15	Open water halinity: 0	Longitude:	-71.282374	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 113.9
Distance to open water (m): 19	Sampled: Yes	Site notes:	With Braden and Maggie Payne in order to test new field sample techniue of soil EC.		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/3	14	0.17	34.28	ND	Yes	0	NA	H3	
Oese	NA	10YR 2/1	25	0.31	17.76	ND	Yes	0	NA	H5	
ACse	FSL	10YR3/2	36	0.4	9.71	ND	Yes	0	SF	NA	
Oase	NA	10YR 2/2	81	0.33	13.62	ND	Yes	0	NA	H5	
O'ese	NA	10YR 2/2	118	0.13	24.63	ND	Yes	0	NA	H5	
O'ase	NA	10YR 3/2	160	0.76	15.86	ND	Yes	0	NA	H8	
Cse	FSL	5Y 4/1	190+	0.78	4.2	ND	Yes	0	SF	NA	

Pedon ID: RSH2	Date: 6/29/2022	Location:	Rotundo Sanctuary, MA	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.775604	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 49.2
Pore water halinity (ppt): 13	Open water halinity: 0	Longitude:	-71.283928	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 76.4
Distance to open water (m): 157	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/2	36	0.19	36.95	ND	Yes	0	NA	H3	
Oase	NA	10YR 2/1	48	0.16	26.65	ND	Yes	0	NA	H7	
Oese	NA	10YR 2/2	69	0.12	3.32	ND	Yes	0	NA	H6	
O'ase	NA	N 2.5/	82	0.19	28.39	ND	Yes	0	NA	H7	
C'se	SiL	2.5Y 4/1	115+	1.7	2.52	ND	Yes	0	SF	NA	

Pedon ID: RSH3	Date: 6/29/2022	Location:	Rotundo Sanctuary, MA	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.775407	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 13	Open water halinity: 0	Longitude:	-71.283493	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 114	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/2	44	ND	ND	ND	Yes	0	NA	H3	
Oese	NA	10YR 2/1	108	ND	ND	ND	Yes	0	NA	H6	
Cse	SiL	10YR 4/1	127	ND	ND	ND	Yes	0	SF	NA	

Pedon ID: RSH4	Date: 6/29/2022	Location:	Rotundo Sanctuary, MA	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.77541	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 13	Open water halinity: 0	Longitude:	-71.283082	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 84	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise1	NA	10YR 3/1	18	ND	ND	ND	Yes	0	NA	H3	
Oise2	NA	10YR 3/2	41	ND	ND	ND	Yes	0	NA	H3	
Oase	NA	10YR 2/2	72	ND	ND	ND	Yes	0	NA	H7	
Oese	NA	10YR 2/1	111	ND	ND	ND	Yes	0	NA	H5	
Cse	SiL	10YR 4/1	122	ND	ND	ND	Yes	0	SF	NA	
O'ase	NA	N 2.5/	131	ND	ND	ND	Yes	0	NA	H5	
C'se	SiL	10YR 4/1	141+	ND	ND	ND	Yes	0	SF	NA	

Pedon ID: DLP1	Date: 7/7/2022	Location:	Demarest Lloyd State Park, MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Sandy, Mixed, Mesic Histic-Haplic Sulfaquent		Latitude:	41.53296	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 23	Open water halinity: 0	Longitude:	-70.983	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 264	Sampled: No	Site notes:	Unable to determine in back barrier or tidal river as it is behind a barrier-like landform but at the mouth of a river. Classifying as TR due to cove-nature of larger landform which may have been eroded by the river; no layered sands in upper horizons as would be expected of a barrier.		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/1	32	ND	ND	ND	Yes	0	NA	H3	
Ase	LS	7.5YR 2.5/1	43	ND	ND	ND	Yes	0	NF	NA	
Cse1	S	2.5Y 4/2	89	ND	ND	ND	Yes	0	SF	NA	
Cse2	S	2.5Y 5/2	120	ND	ND	ND	Yes	0	SF	NA	

Pedon ID: DLP2	Date: 7/7/2022	Location:	Demarest Lloyd State Park, MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Sandy, Mixed, Mesic Histic-Haplic Sulfaquent		Latitude:	41.53357	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 32.1
Pore water halinity (ppt): 25	Open water halinity: 0	Longitude:	-70.9828	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 34
Distance to open water (m): 193	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise1	NA	10YR 3/1	13	0.34	25.45	ND	Yes	0	NA	H3	
Oise2	NA	10YR 3/2	29	0.22	22.47	ND	Yes	0	NA	H3	
CA	LS	10YR 3/1	50	ND	3.65	ND	No	0	NF	NA	
Cg	S	10YR 4/1	89	ND	0.94	ND	No	0	NF	NA	
Cse1	S	2.5Y 4/2	108	ND	0.47	ND	Yes	0	NF	NA	
Cse2	S	2.5Y 5/2	166	ND	0.14	ND	Yes	0	SF	NA	

Pedon ID: DLP3	Date: 7/7/2022	Location:	Demarest Lloyd State Park, MA	Dominate vegetation: S. patens	Pedogeomorphic Unit: TR
Classification: Euic, mesic Typic Sulfihemist		Latitude:	41.53429	Secondary vegetation: S. alterniflora	1 meter carbon stock (kg C m^{-2}): 71.2
Pore water halinity (ppt): 36	Open water halinity: 0	Longitude:	-70.9827	Tertiary vegetation:Salicornia sp.	2 meter carbon stock (kg C m^{-2}): 98.4
Distance to open water (m): 114	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/2	49	0.21	2.41	ND	Yes	0	NA	H3	
Oese1	NA	10YR 2/2	92	0.23	21.88	ND	Yes	0	NA	H6	
Oese2	NA	10YR 3/1	130	0.25	2.86	ND	Yes	0	NA	H6	

Pedon ID: DLP4	Date: 7/7/2022	Location:	Demarest Lloyd State Park, MA	Dominate vegetation: S. alterniflor	Pedogeomorphic Unit: TR
Classification:	Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemist	Latitude:	41.53458	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 34	Open water halinity: 0	Longitude:	-70.9826	Tertiary vegetation:D.spicata	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 82	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi1	NA	10YR/2	22	ND	ND	ND	No	0	NA	H3	
Oi2	NA	2.5YR 3/2	43	ND	ND	ND	No	0	NA	H3	
Oese	NA	10YR 2/2	81	ND	ND	ND	Yes	0	NA	H3	
Ase	LS	10YR 3/1	97	ND	ND	ND	Yes	0	SF	NA	
Cse1	S	2.5Y 2/5	107	ND	ND	ND	Yes	0	NF	NA	
Cse2	S	5Y 5/1	120	ND	ND	ND	Yes	0	SF	NA	

Pedon ID:	DLP5	Date:	7/7/2022	Location:	Demarest Lloyd State Park, MA	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification:	Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemist			Latitude:	41.53489	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt):	34	Open water halinity:	0	Longitude:	-70.9823	Tertiary vegetation:D.spicata	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m):	40	Sampled:	No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi1	NA	10YR 3/2	12	ND	ND	ND	No	0	NA	H3	
Oi2	NA	10YR 2/2	23	ND	ND	ND	No	0	NA	H3	
Oese1	NA	2.5Y 4/2	49	ND	ND	ND	Yes	0	NA	H4	
Oese2	NA	10YR 2/1	72	ND	ND	ND	Yes	0	NA	H4	
Ase	S	2.5Y 3/2	113	ND	ND	ND	Yes	0	NF	NA	

Pedon ID: SRR1	Date: 7/14/2022	Location: Slocum River Reserve, MA	Dominate vegetation: S . Alterniflora
Classification: Coarse-loamy, Mixed, Active, Mesic Histic Sulfaquent		Latitude: 41.55416	Secondary vegetation:
Pore water halinity (ppt): 31	Open water halinity: 0	Longitude: -71.0049	Tertiary vegetation:
Distance to open water (m): 46	Sampled: No	Site notes:	

Pedogeomorphic Unit: TR

1 meter carbon stock (kg C m^{-2}): ND

2 meter carbon stock (kg C m^{-2}): ND

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	2.5Y 3/2	23	ND	ND	ND	Yes	0	NA	H3	
Cse	MSiL	10Y 4/1	37	ND	ND	ND	Yes	0	VF	NA	
Ase	MSiL	10YR 3/2	57	ND	ND	ND	Yes	0	MF	NA	
Cse	MSiL	5Y 4/1	60	ND	ND	ND	Yes	0	VF	NA	
Oase	NA	10YR 2/1	93	ND	ND	ND	Yes	0	NA	H8	
O'ese	NA	10YR 2/1	172	ND	ND	ND	Yes	0	NA	H6	
O'ase	NA	N 2.5/	224	ND	ND	ND	Yes	0	NA	H9	
Ase	FSL	10YR 2/1	234	ND	ND	ND	Yes	0	MF	NA	
C''se	FSL	5Y 4/2	258	ND	ND	ND	Yes	0	MF	NA	

Pedon ID:	SRR2	Date:	7/14/2022	Location:	Slocum River Reserve, MA	Dominate vegetation: S . Alterniflora	Pedogeomorphic Unit: TR
Classification:	Loamy, mixed, euic, mesic Terric Sulfihemist			Latitude:	41.55392	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): 44.5
Pore water halinity (ppt):	31	Open water halinity:	0	Longitude:	-71.0046	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): 73.4
Distance to open water (m):	86	Sampled:	Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	2.5Y 3/1	34	0.23	22.27	ND	Yes	0	NA	H3	
Cse	SiL	5Y 4/1	40	ND	ND	ND	Yes	0	MF	NA	
O'ise	NA	10YR 3/1	68	0.2	18.59	ND	Yes	0	NA	H3	
C'se	SiL	5Y 4/1	71	ND	ND	ND	Yes	0	MF	NA	
O''ise	NA	2.5Y 3/1	97	0.27	16.44	ND	Yes	0	NA	H3	
CAse	SiCL	2.5Y 4/1	179	0.36	8.69	ND	Yes	0	VF	NA	
C''se	SiCL	2.5Y 4/1	190	0.77	5.19	ND	Yes	0	MF	NA	

Pedon ID: SRR3	Date: 7/14/2022	Location:	Slocum River Reserve, MA	Dominate vegetation: S . Alterniflora	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic Terric Sulfihemist		Latitude:	41.55364	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 30	Open water halinity: 0	Longitude:	-71.0043	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 122	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise1	NA	10YR 3/1	34	ND	ND	ND	Yes	0	NA	H3	
Oise2	NA	2.5Y 3/1	64	ND	ND	ND	Yes	0	NA	H4	
Oese	NA	2.5Y 3/2	94	ND	ND	ND	Yes	0	NA	H5	
CAse	SiL	5Y 4/1	130	ND	ND	ND	Yes	0	VF	NA	
Cse	SiCL	N 4/	268	ND	ND	ND	Yes	0	MF	NA	

Pedon ID: WBP1	Date: 11/8/2022	Location:	New London, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfisaprist		Latitude:		Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 32	Open water halinity: 0	Longitude:		Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 0	Sampled: Yes	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise	NA	10YR 3/2	41	ND	ND	13.4	Yes	0	NA	H3	
Oase	NA	10YR 2/1	54	ND	ND	6.7	Yes	0	NA	H5	
CAse	LS	2.5Y 4/2	110	ND	2.1	6.75	Yes	0	SF	NA	
Cse	S	2.5Y 5/1	111+	ND	ND	ND	Yes	0	SF	NA	

Pedon ID: WBP2	Date: 11/8/2022	Location: New London, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Sulfihemist		Latitude:	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 35	Open water halinity: 0	Longitude:	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 0	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	7.5YR 3/3	20	ND	ND	9.55	No	0	NA	H3	
Oise	NA	10YR 3/1	65	ND	ND	9.46	Yes	0	NA	H3	
Oese	NA	10YR 2/1	80	ND	ND	7.24	Yes	0	NA	H4	
ACse	SL	10YR 3/1	94	ND	5.25	4.15	Yes	0	SF	NA	
Cse	LS	2.5Y 4/2	120	ND	1.52	2.35	Yes	0	SF	NA	
C	S	2.5Y 5/2	135+	ND	1.7	2.84	No	0	NF	NA	

Pedon ID: WBP3	Date: 11/8/2022	Location: New London, CT	Dominate vegetation: S. alterniflora	Pedogeomorphic Unit: TR
Classification: Euic, mesic Typic Sulfihemist		Latitude:	Secondary vegetation: S. patens	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 35	Open water halinity: 0	Longitude:	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 0	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oise1	NA	7.5YR 3/3	19	ND	ND	7.22	Yes	0	NA	H3	
Oise2	NA	7.5YR 3/2	56	ND	ND	7.37	Yes	0	NA	H3	
Oese1	NA	7.5YR 2.5/1	94	ND	ND	9.69	Yes	0	NA	H4	
Oese2	NA	7.5YR 2.5/1	127	ND	ND	6.96	Yes	0	NA	H5	
Oa	NA	10YR 2/1	167	ND	ND	8.28	No	0	NA	H6	
Cg	SL	2.5Y 4/1	179+	ND	3.74	5.13	No	0	SF	NA	

Pedon ID: CRV1	Date: 8/15/2022	Location: Warhem, MA	Dominate vegetation: D. spicata	Pedogeomorphic Unit: TR
Classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Haplohemist		Latitude:	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 25	Open water halinity: 0	Longitude:	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 30	Sampled: No	Site notes: Potentially altered by humans as evidenced by slag in bottom of pedon. No indication of this in any other pedon. Directly next to culvert.		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
^Oe1	NA	7.5YR 2.5/2	31	ND	ND	ND	No	0	NA	H4	
^Oe2	NA	7.5YR 2.5/1	67	ND	ND	ND	No	0	NA	H5	
^Oase	NA	10YR 2/1	89	ND	ND	ND	Yes	0	NA	H7	
^Cu	EGCSL	10YR 3/2	115	ND	ND	ND	No	0	NF	NA	Coal slag present
Cg	S	2.5Y 6/1	133+	ND	ND	ND	No	0	NF	NA	Potentiallay HTM but unable to determine

Pedon ID: CRV2		Date: 8/15/2022		Location: Wareham, MA		Dominate vegetation: D. spicata			Pedogeomorphic Unit: TR		
Classification: Loamy, mixed, euic, mesic Terric Haplohemist				Latitude:		Secondary vegetation:			1 meter carbon stock (kg C m^{-2}): ND		
Pore water halinity (ppt): 26		Open water halinity: 0		Longitude:		Tertiary vegetation:			2 meter carbon stock (kg C m^{-2}): ND		
Distance to open water (m): 15		Sampled: No		Site notes: Tide too high to sample							
Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density ($g*cm^{-3}$)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oe	NA	10YR 2/2	33	ND	ND	ND	No	0	NA	H6	
Oe	NA	7.5YR 2.5/2	54	ND	ND	ND	No	0	NA	H7	
A1	FSL	10YR 3/1	70	ND	ND	ND	No	0	MF	NA	
A2	FSL	10YR 2.5/1	80	ND	ND	ND	No	0	MF	NA	
Cg	FSL	2.5Y 5/1	106+	ND	ND	ND	No	0	NF	NA	

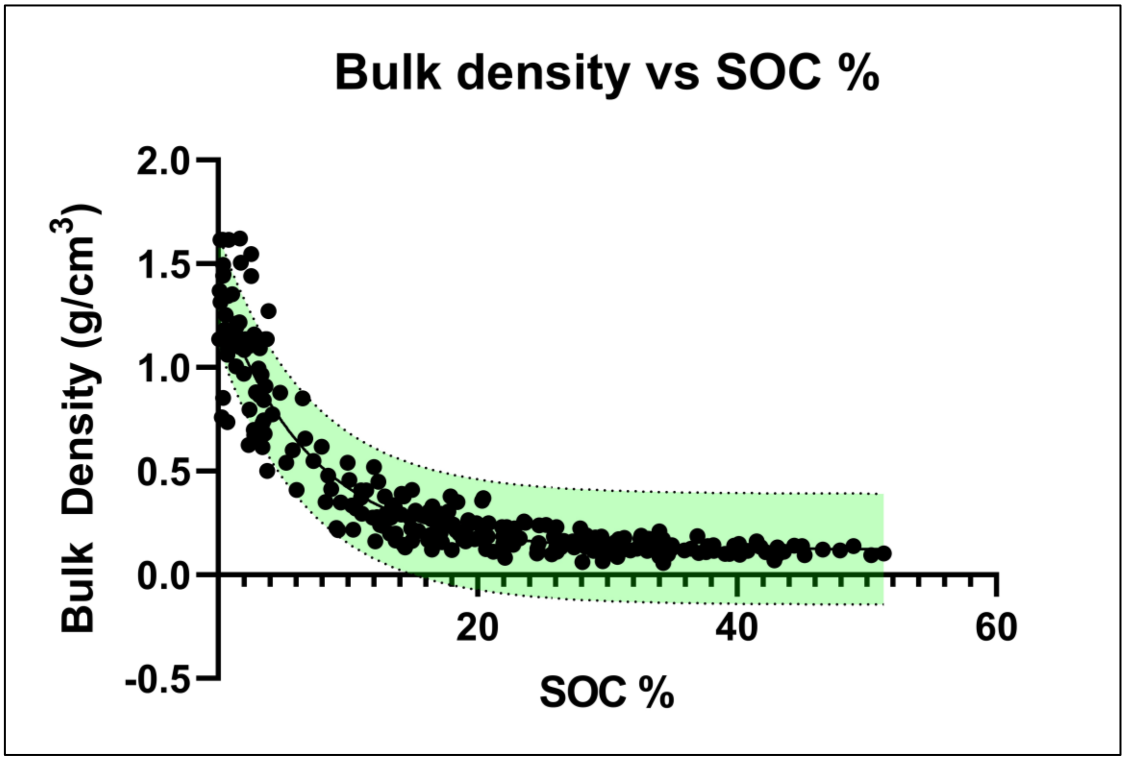
Pedon ID: CRV3	Date: 8/15/2022	Location: Warhem, MA		Dominate vegetation: D. spicata	Pedogeomorphic Unit: TR
Classification: Loamy, mixed, euic, mesic Terric Haplohemist		Latitude:		Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 26	Open water halinity: 0	Longitude:		Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 10	Sampled: No	Site notes:			

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (μS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 2/2	15	ND	ND	ND	No	0	NA	H3	
Oe	NA	10YR 3/2	45	ND	ND	ND	No	0	NA	H6	
A1	FSL	10YR 3/1	89	ND	ND	ND	No	0	MF	NA	
A2	FSL	10YR 2/1	101	ND	ND	ND	No	0	MF	NA	
A3	SL	10YR 3/2	136+	ND	ND	ND	No	0	SF	NA	

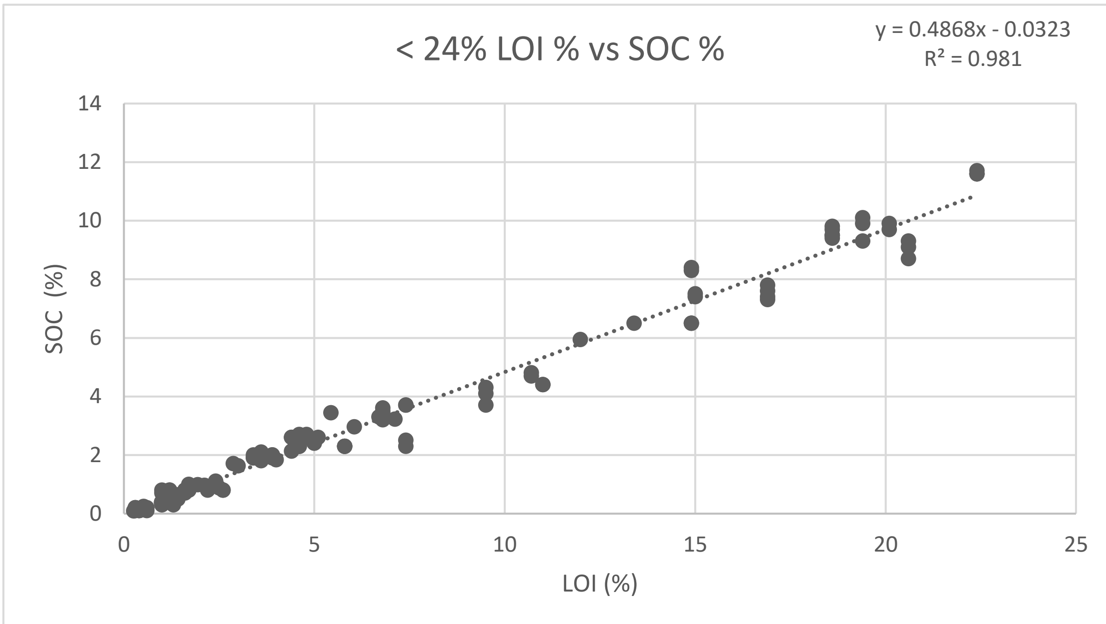
Pedon ID: CRV4	Date: 8/15/2022	Location: Warhem, MA	Dominate vegetation: D. spicata	Pedogeomorphic Unit: TR
Classification: Euic, mesic Typic Sulfisaprist		Latitude:	Secondary vegetation:	1 meter carbon stock (kg C m^{-2}): ND
Pore water halinity (ppt): 26	Open water halinity: 0	Longitude:	Tertiary vegetation:	2 meter carbon stock (kg C m^{-2}): ND
Distance to open water (m): 5	Sampled: Yes	Site notes:		

Horizon	Texture	Munsell Color	Lower Depth (cm)	Bulk Density (g*cm⁻3)	SOC (%)	5:1 EC (µS/m)	Sulfidic odor presence	Course Fragment %	Fluidity	Von Post	Notes
Oi	NA	10YR 2/1	22	ND	ND	7.79	No	0	NA	H3	
Oese	NA	10YR 2/2	33	ND	ND	5.36	Yes	0	NA	H5	
Oase1	NA	7.5YR 2.5/1	72	ND	ND	3.87	Yes	0	NA	H8	
Oase2	NA	10YR 2/1	92	ND	ND	4.4	Yes	0	NA	H7	
Oase3	NA	N 2.5/	156+	ND	ND	3.4	Yes		NA	H8	

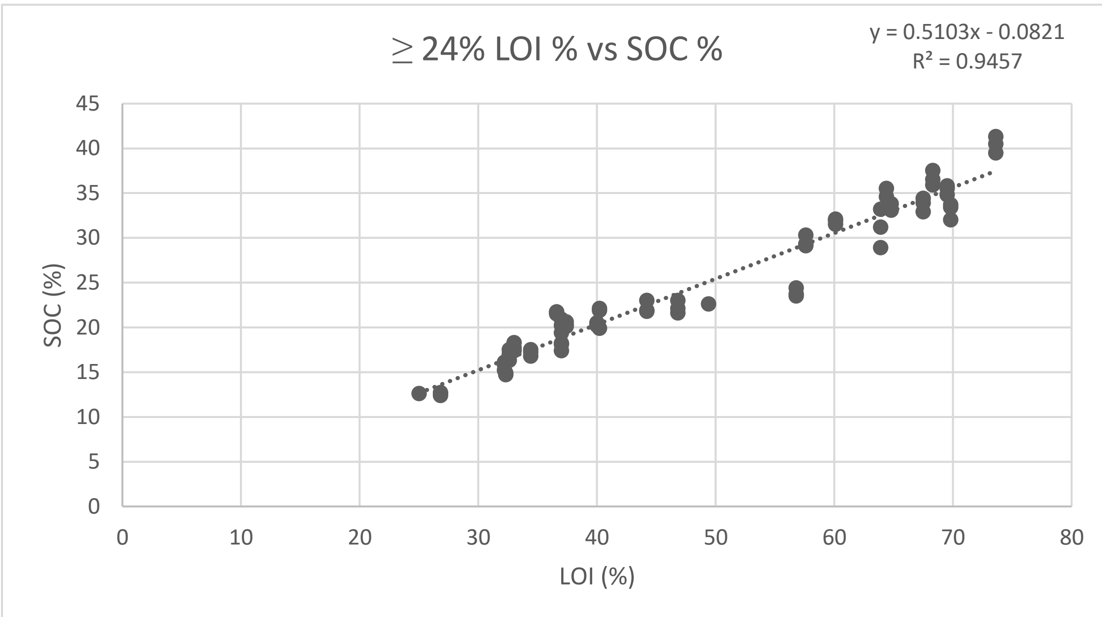
APPENDIX B: Bulk density vs soil organic carbon % used to model bulk density when volumetric sampling is not possible



APPENDIX C: Regression line and equation for estimating SOC of soils with less than 24% LOI.



APPENDIX D: Regression line and equation for estimating SOC of soils with greater than or equal to 24% LOI.



APPENDIX E: Supplemental data

Table E.1: Results of analysis of variance testing between the mean carbon stocks of sampled PGUs to 100 cm.

Cases	**Sum of Squares**	**df**	**Mean Square**	**F statistic**	**p value**
PGU	4047.523	3	1349.174	16.592	< .001***
Residuals	3415.132	42	81.313		

* p < .05, *** p < .001
Note. Type III Sum of Squares

Table E.2: Results of analysis of variance testing between the mean carbon stocks of sampled PGUs to 200 cm.

Cases	Sum of Squares	df	Mean Square	F statistic	p value
PGU	17815.09	3	5938.603	.814	001***
Residuals	15772.36	42	375.532		

* p < .05, *** p < .001
Note. Type III Sum of Squares

Table E.3. Tukey-Kramer post hoc results of mean carbon stocks between sampled PGUs to 100 cm.

		Mean Difference	SE	t	p_{tukey}
BB	C	-25.519	4.143	-6.159	< .001***
	TC	-12.35	4.143	-2.981	0.024*
	TR	-21.544	3.556	-6.058	< .001***
C	TC	13.169	4.251	3.098	0.018*
	TR	3.975	3.681	1.08	0.704
TC	TR	-9.194	3.681	-2.497	0.075

* p < .05, *** p < .001

Note. P-value adjusted for comparing a family of 4

Table E.4: Tukey-Kramer post hoc results of mean carbon stocks between sampled PGUs to 200cm

		Mean Difference	SE	t	p_{tukey}
BB	C	-52.639	8.904	-5.912	< .001***
	TC	-21.471	8.904	-2.411	0.029*
	TR	-44.35	7.643	-5.803	< .001***
C	TC	31.168	9.135	3.412	0.008**
	TR	8.289	7.911	1.048	0.723
TC	TR	-22.879	7.911	-2.892	0.03*

* p < .05, ** p < .01, *** p < .001

Note. P-value adjusted for comparing a family of 4

Table E.5: Results of analysis of variance testing between the mean carbon stocks and primary vegetation to 100 cm.

Cases	Sum of Squares	df	Mean Square	F statistic	p value
Primary vegetation	77.887	2	38.943	0.227	0.798
Residuals	7384.768	43	171.739		

* p < .05, ** p < .01, *** p < .001
Note. Type III Sum of Squares

Table E.6: Results of analysis of variance testing between the mean carbon stocks and primary vegetation to 200 cm.

Cases	Sum of Squares	df	Mean Square	F statistic	p value
Primary veg-etation	557.492	2	278.746	0.363	0.698
Residuals	33030.652	43	768.155		

* p < .05, ** p < .01, *** p < .001
Note. Type III Sum of Squares

Table E.7: Descriptive statistics of carbon content (%) of sapric, hemic, and fibric organic horizons.

Degree of humifica-	**N**	**Mean**	**SD**	**SE**	**Coefficient of variation tion**
Sapric	57	30.0	11.7	1.56	
Hemic	44	26.5	12.2	1.83	
Fibric	86	26.3	9.16	0.97	

Table E.8: Descriptive statistics of bulk densities (g cm^{-3}) of sapric, hemic, and fibric or-ganic horizons.

Degree of humifica-tion	N	Mean	SD	SE	Coefficient of variatio n
Sap	57	0.16	0.07	0.010	0.453
Hen	44	0.19	0.08	0.012	0.404
Fibr	85	0.19	0.07	0.009	0.405

Table E.9: Post Hoc comparisons between learning (INC) and test (DNI) sets of organic SMGs A and B's carbon density (kg C m^{-3}) showing no significant difference between included or excluded data for both organic SMG A and B

		Mean Difference	SE	t	p_{tukey}
DNI_A	INC A	-13	4	0.002	939
DNI_B	INC B	1	3	0.386	980

Table E.10: Descriptive statistics of mineral horizon carbon density (kg C m^{-3}) of pedo-geomorphic units

PGU	N	Mean (kg C m-3)	SD	SE	Coefficient of variation
Back	27	18	15	0.003	0.852
Barrier	31	21	15	0.003	0.737
Cove	6	21	11	0.005	0.535
Tidal creek	34	27	12	0.002	0.452
Tidal river					

Table E.11: Descriptive statistics of mineral horizon carbon density (kg C m^{-3}) of fluidity classes

PGU	N	Mean (kg C m-3)	SD	SE	Coefficient of variation
MF	18	30	10	2	0.351
NF	46	19	15	2	0.813
SF	19	29	12	3	0.404

Table E.12: Correlation and correlation coefficients of sand, silt, and color value with carbon density

Variable	**Pearson's r**	**p**
Sand %	-0.536	< .001
Silt %	0.544	< .001
Color value	-0.462	< .001
Pore water salinity	-0.237	0.019

Table E.13: Descriptive statistics of t-test between carbon density (kg C m^{-3}) of dark (value ≤ 3) and light (value > 3) mineral soil material. $p<0.001$

Group	**N**	**Mean (kg C m-3)**	**SD**	**SE**	**Coefficient of variation**
Dark	31	32	12	0.002	0.377
Light	67	18	13	0.002	0.746

Table E.14: Post Hoc comparisons of bulk densities of the first grouping of mineral SMGs.

		Mean Difference	**SE**	**t**	**p_{tukey}**
DL	DS	-0.223	0.171	-1.308	0.560
	LL	-0.313	0.099	-3.164	0.011
	LS	-0.418	0.099	-4.207	< .001
DS	LL	-0.090	0.166	-0.540	0.949
	LS	-0.195	0.166	-1.174	0.645
LL	LS	-0.106	0.092	-1.154	0.657

Table E.15: Post Hoc comparisons of bulk densities of the first grouping of mineral SMGs.

		Mean Difference	**SE**	**t**	**p_{tukey}**
DL	DS	3.564	1.250	2.851	0.027
	LL	2.998	0.724	4.139	< .001
	LS	5.027	0.729	6.895	< .001
DS	LL	-0.566	1.218	-0.465	0.967
	LS	1.463	1.220	1.199	0.629
LL	LS	2.029	0.672	3.020	0.017

Table E.16: Descriptive statistics of carbon density (kg C m^{-3}) of mineral SMG group 2 with sands excluded to a separate group. Pairwise comparisons in Table 18.

SMG	N	Mean (kg C m-3)	SD	SE	Coefficient of variation
DF	18	34	10	0.002	0.310
DNF	15	35	10	0.002	0.448
LF	19	23	10	0.002	0.448
LNF	9	26	12	0.004	0.454
Sands	37	12	13	0.002	1.074

Table E.17: Post Hoc comparisons of carbon density (kg C m^{-3}) of mineral SMG group 2 with sands excluded to a separate group

		Mean Difference	SE	t	p_{tukey}
Sand	DF	-21	3	-6.350	< .001
	LF	-11	3	-3.656	0.004
	DNF	-23	5	-5.098	< .001
	LNF	-14	4	-3.213	0.015
DF	LF	10	4	2.901	0.037
	DNF	-2	5	-0.384	0.995
	LNF	7	5	1.545	0.536
LF	DNF	-12	5	-2.603	0.078
	LNF	-3	5	-0.669	0.963
DNF	LNF	09	6	1.633	0.480

Table E.18: Descriptive statistics of bulk density (g cm^{-3}) of mineral SMG group 3.

SMG	N	Mean (g cm^{-3})	SD	Min	Maximum
DL	25	0.712	0.397	0.217	1.622
LL	35	1.011	0.415	0.215	1.733
S	38	1.115	0.316	0.160	1.616

Table E.19: Descriptive statistics of carbon content (%) of mineral SMG group 3.

SMG	N	Mean (%)	SD	Minimum	Maximum
DL	25	6.323	3.316	1.077	11.414
LL	35	3.515	3.254	0.384	11.905
S	38	1.299	1.349	0.071	5.250

Table E.20: Post Hoc comparisons between learning (INC) and test (DNI) sets of mineral SMGs DL, LL, and S's carbon density density (kg C m^{-3}) showing no significant difference between included or excluded data for SMGs DL, LL, and S.

		Mean Difference	**SE**	**t**	**p_{tukey}**
DNI_DL	INC_DL	-1	5	-0.216	1.000
DNI_LL	INC_LL	0.02	4	0.004	0.999
DNI_S	INC_S	-4	4	-1.006	0.915

APPENDIX F: Example application of SMGs to a described pedon

Below is a simplified description of an example pedon with most information removed, except for the relevant information used for carbon stock estimation using SMGs.

PGU: Cove			
Horizon	Texture	Munsell Color	Lower Depth (cm)
Oa	NA	7.5YR 2.5/1	63
A	SiL	N 2.5/	70
Cg1	Sil	N 4/	82
Cg2	S	N 5/	10 0

The first relevant information to take note of for carbon calculation is that the pedon is in a cove PGU, so organic SMG B will be used for the Oa horizon. Horizon A has a loamy texture (SiL) and a dark color value (2.5), which equates to a dark loamy SMG. Horizon Cg 1 has the same texture but a light color value (4), meaning it is a light loamy SMG. Finally, horizon Cg2 is a sand which means it is a sand SMG. Relevant SMGs and their carbon density have been added to the description below.

PGU: Cove					
Horizon	Texture	Munsell Color	Lower Depth (cm)	SMG	SMG C Density (kg C m^{-3})
Oa	NA	7.5YR 2.5/1	63	B	50
A	SiL	N 2.5/	70	DL	35
Cg1	Sil	N 4/	82	LL	21
Cg2	S	N 5/	100	S	11

In order to calculate total carbon stock of each horizon, SMG C-density is multiplied by horizon thickness (in meters). This is shown in the table below.

PGU: Cove						
Horizon	Texture	Munsell Color	Lower Depth (cm)	SMG	SMG C Density (kg C m^{-3})	Horizon C m^{-2})
Oa	NA	7.5YR 2.5/1	63	B	50	31.5
A	SiL	N 2.5/	70	DL	35	2.5
Cg1	Sil	N 4/	82	LL	21	2.5
Cg2	S	N 5/	100	S	11	2.0

All horizon C stocks are then summed to yield the total carbon stock of a particular pedon on an area basic (kg C m^{-2}). Adding all horizon carbon stocks together yields an estimated carbon stock of 38.5 kg C m^{-2}.

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