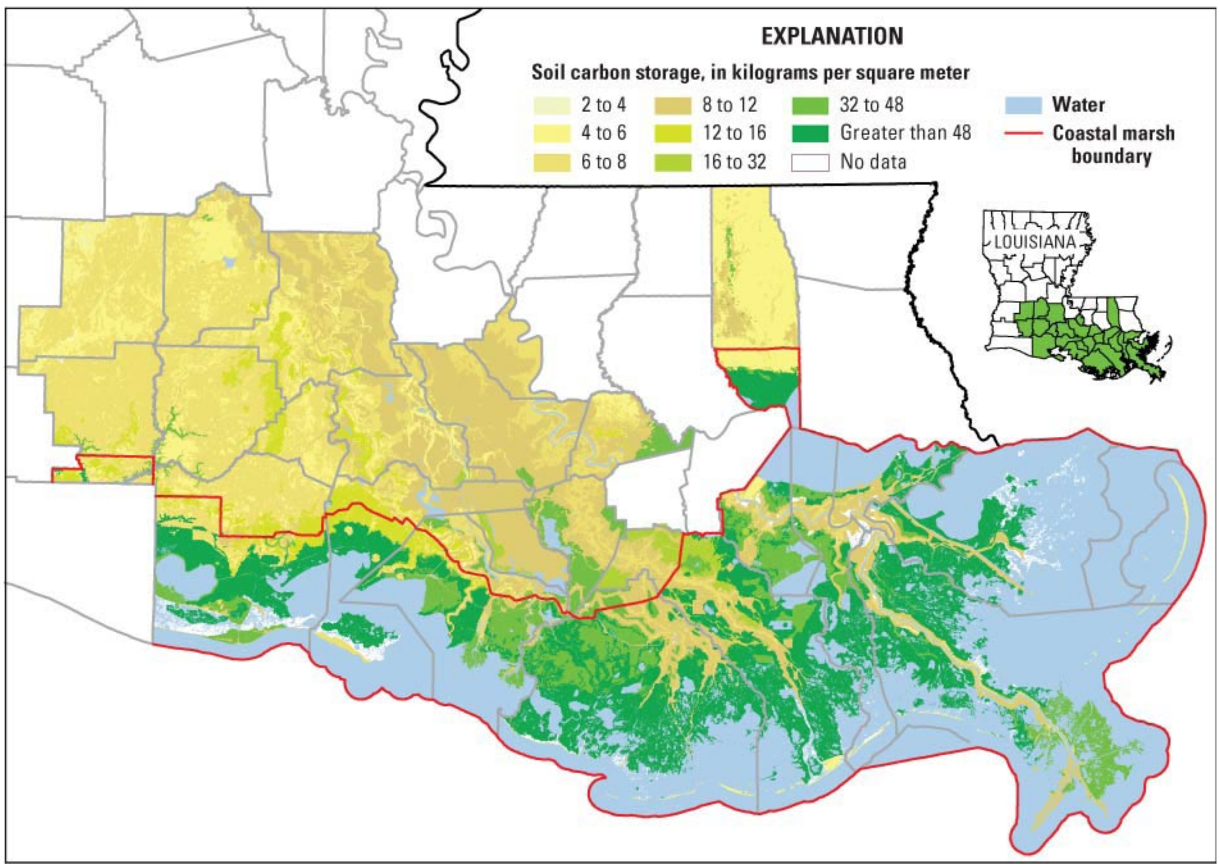
Organic-Carbon Sequestration in Soil/Sediment of the Mississippi River Deltaic Plain—Data; Landscape Distribution, Storage, and Inventory; Accumulation Rates; and Recent Loss, Including a Post-Katrina Preliminary Analysis

Chapter B of

Soil-Carbon Storage and Inventory for the Continental United States

Edited by Helaine W. Markewich



Professional Paper 1686-B

U.S. Department of the Interior
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DIRK KEMPTHORNE, Secretary

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Preface

By Helaine W. Markewich

This study of soil/sediment organic carbon (SOC) in the Mississippi River deltaic plain (MRDP) was initiated in the mid-1990s as part of the U.S. Geological Survey (USGS) investigations of SOC in the Mississippi Basin. The investigation began a few years after Hurricane Andrew struck the southeastern Louisiana coast during August of 1992 and before hurricanes during 1998, 2002, and 2005 caused major land loss and property loss accompanied by displacement of tens of thousands of individuals.

One environmental effect of these storms on the MRDP was the temporary and permanent loss of wetland—primarily marsh. In turn, there was significant change to the total SOC stored in the MRDP. These changes are generally summarized in the "Recent Trends in Soil/Sediment Organic Carbon Loss—Effects of Land Loss," "Hurricanes Katrina and Rita—Effects on Soil/Sediment Organic-Carbon Projections," and "Summary and Conclusions" sections of this report. Archives of the National Oceanic and Atmospheric Administration, U.S. Weather Service, Tropical Prediction Center (accessed November 16, 2005, at *http://www.nhc.noaa.gov/pastall.shtml*) summarize the major storms affecting the southeastern Louisiana coast and its marsh land since 1992.

The resultant environmental effect of the cyclonic storms affecting southeastern Louisiana, in the decade since the USGS investigation on SOC in the MRDP was initiated, is a loss of hundreds of square kilometers of MRDP coastal wetlands. This area recently was touted by Kerry St. Pé (Director, Barataria-Terrebonne National Estuary Program) as "the fastest disappearing land mass in the world" (Kenworthy, 2005). Just the recent land loss from Katrina and Rita is estimated to be greater than 259 km^2 (100 mi^2). Initial USGS assessments of damage from Katrina and Rita are summarized in the following U.S. Geological Survey News report (2005) for southeastern Louisiana:

> Substantial marsh loss, primarily from Katrina, occurred east of the Mississippi River in St. Bernard and Plaquemines parishes. Approximately 39 square miles [101 km^2] of marsh around the upper and central portions of Breton Sound were converted to open water by ripping of the marsh or by marsh submergence. Large compressed marsh features several thousand feet long are evident in Breton Sound. Most of the loss was concentrated in an area bounded by the Mississippi River levee to the west, the Delacroix Ridge to the east, and State Highway 300 to the north. Follow-up imagery and aerial photography will be used to determine if some of the submerged marshes reemerge over time.
>
> An additional 47 square miles [121.7 km^2] of marsh were lost throughout the Pontchartrain, Pearl River, Barataria, and Terrebonne basins. The active Mississippi Delta also incurred approximately 14 square miles [36.26 km^2] of loss. The lower Pearl River basin contains numerous marsh rips south of Highway 90.
>
> Direct impacts from Hurricane Rita were not as severe as Hurricane Katrina's impacts in southeastern Louisiana. For example, rips in marshes from Rita were not nearly the size of rips from Katrina in upper Breton Sound although they are noticeable in the Barataria and Terrebonne basins. Rita's surge caused new tears in fresh and intermediate marshes within Barataria and Terrebonne basins and reactivated older hurricane scars attributable to Hurricane Lili (2002) in western Terrebonne and the East Cote Blanche Bay area.
>
> Accessed November 16, 2005, at
> *http://www.usgs.gov/newsroom/article.asp?id=1409*

As discussed in the "Hurricanes Katrina and Rita—Effects on Soil/Sediment Organic-Carbon Projections" section of this report, the cumulative effects of these storms on SOC flux in Louisiana's coastal areas has the potential to either increase net SOC loss, weaken coastal SOC sinks, or turn SOC sinks into sources.

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Tables—Continued

Conversion Factors and Datums

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
square foot (ft^2)	0.09290	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
square mile (mi^2)	259.0	hectare (ha)
square kilometer (km^2)	100	hectare (ha)
square meter (m^2)	0.0001	hectare (ha)
	Flow rate	
cubic foot per second (ft^3s^{-1})	0.02832	cubic meter per second (m^3s^{-1})
	Mass	
pound, avoirdupois (oz)	28.35	gram (g)
pound, avoirdupois (lb)	0.4536	kilogram (kg)
gram	10^{-3}	kilogram (kg)
gram	10^{-12}	teragram (Tg)
gram	10^{-15}	petagram (Pg)
	Pressure	
pound per square foot (lb/ft^2)	47.9	pascal (Pa)
bar	100,000	pascal (Pa)
bar	100	pascal (Pa)
bar	0.1	megapascal (MPa)
	Concentration	
percent	10	grams per kilogram (g kg^{-1})

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32$$

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

$$°C = (°F - 32)/1.8$$

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Altitude, as used in this report, refers to distance above the vertical datum.

Additional Abbreviations

Δ	Delta
^{137}Cs	cesium-137
^{13}C	carbon-13
^{14}C	carbon-14
^{15}N	nitrogen-15
^{210}Pb	lead-210
^{40}K	potassium-40
ANOVA	analysis of variance
BP	Bayou Perot
BSD	Bayou Sauvage distributary
BSL	Bayou Sauvage levee
BV	Bayou Verret
C	elemental carbon
CAL yr BP	calibrated years before present
ChenoAms	morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families
CO_2	carbon dioxide
FW	Fish and Wildlife
GICWW	Gulf Intracoastal Waterway
IC	inorganic carbon
K	potassium
LCA	U.S. Army Corps of Engineers, Louisiana Coastal Area
LOI	loss-on-ignition
LS	Lake Salvador
MAR	mass accumulation rate
MR	St. Martin
MRB	Mississippi River Basin
MRDP	Mississippi River deltaic plain
MRGO	Mississippi River–Gulf Outlet
NVCS	National Vegetation Classification Standard
NWT	nuclear weapons testing
OC	organic carbon
OD	outside diameter
Pb	elemental lead
PLAQ	Plaquemines
SAF	Society of Foresters
SB	St. Bernard
SL	St. Landry
SM	St. Mary
SOC	soil/sediment organic carbon
TB	Terrebonne
TC	total carbon
TCT	pollen group that includes Taxodiaceae, Cupressaceae, or Taxaceae pollen
TN	Tangipahoa
USDA–NRCS	U.S. Department of Agriculture–National Resources Conservation Service
SSURGO	Soil Survey Geographic Database
USGS	U. S. Geological Survey
yr BP	years before present

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Abstract

Soil/sediment of the Mississippi River deltaic plain (MRDP) in southeastern Louisiana is rich in organic carbon (OC). The MRDP contains about 2 percent of all OC in the surface meter of soil/sediment in the Mississippi River Basin (MRB). Environments within the MRDP differ in soil/sediment organic carbon (SOC) accumulation rate, storage, and inventory. The focus of this study was twofold: (1) develop a database for OC and bulk density for MRDP soil/sediment; and (2) estimate SOC storage, inventory, and accumulation rates for the dominant environments (brackish, intermediate, and fresh marsh; natural levee; distributary; backswamp; and swamp) in the MRDP.

Comparative studies were conducted to determine which field and laboratory methods result in the most accurate and reproducible bulk-density values for each marsh environment. Sampling methods included push-core, vibracore, peat borer, and Hargis[1] sampler. Bulk-density data for cores taken by the "short push-core method" proved to be more internally consistent than data for samples collected by other methods. Laboratory methods to estimate OC concentration and inorganic-constituent concentration included mass spectrometry, coulometry, and loss-on-ignition. For the sampled MRDP environments, these methods were comparable. SOC storage was calculated for each core with adequate OC and bulk-density data. SOC inventory was calculated using core-specific data from this study and available published and unpublished pedon data linked to SSURGO[2] map units. Sample age was estimated using isotopic cesium (^{137}Cs), lead (^{210}Pb), and carbon (^{14}C), elemental Pb, palynomorphs, other stratigraphic markers, and written history. SOC accumulation rates were estimated for each core with adequate age data.

Cesium-137 profiles for marsh soil/sediment are the least ambiguous. Levee and distributary ^{137}Cs profiles show the effects of intermittent allochthonous input and/or sediment resuspension. Cesium-137 and ^{210}Pb data gave the most consistent and interpretable information for age estimations of soil/sediment deposited during the 1900s. For several cores, isotopic ^{14}C and ^{137}Cs data allowed the 1963–64 nuclear weapons testing (NWT) peak-activity datum to be placed within a few-centimeter depth interval. In some cores, a *too old* ^{14}C age (when compared to ^{137}Cs and microstratigraphic-marker data) is the probable result of old carbon bound to clay minerals incorporated into the organic soil/sediment. Elemental Pb coupled with Pb source-function data allowed age estimation for soil/sediment that accumulated during the late 1920s through the 1980s. Exotic pollen (for example, *Vigna unguiculata* and *Alternanthera philoxeroides*) and other microstratigraphic indicators (for example, carbon spherules) allowed age estimations for marsh soil/sediment deposited during the settlement of New Orleans (1717–20) through the early 1900s.

For this study, MRDP distributary and swamp environments were each represented by only one core, backswamp environment by two cores, all other environments by three or more cores. MRDP core data for the surface meter soil/sediment indicate that (1) coastal marshes, abandoned distributaries, and swamps have regional SOC-storage values >16 kg m^{-2}; (2) swamps and abandoned distributaries have the highest SOC storage values (swamp, 44.8 kg m^{-2}; abandoned distributary, 50.9 kg m^{-2}); (3) fresh-to-brackish marsh environments have the second highest site-specific SOC-storage values; and (4) site-specific marsh SOC storage values decrease as the salinity of the environment increases (fresh-marsh, 36.2 kg m^{-2}; intermediate marsh, 26.2 kg m^{-2}; brackish marsh, 21.5 kg m^{-2}). This inverse relation between salinity and SOC storage is opposite the regional systematic increase in SOC storage with increasing salinity that is evident when SOC storage is mapped by linking pedon data to SSURGO map units (fresh marsh, 47 kg m^{-2}; intermediate marsh, 67 kg m^{-2}; brackish marsh, 75 kg m^{-2}; and salt marsh, 80 kg m^{-2}).

[1]Hargis, T.G., and Twilley, R.R., 1994, Improved coring device for measuring soil bulk density in a Louisiana deltaic marsh: Journal of Sedimentary Research, v. 64A, no. 3, p. 681–683

[2]SSURGO is the acronym for the Soil Survey Geographic Database developed and distributed by U.S. Department of Agriculture, Natural Resources Conservation Service. A SSURGO dataset includes digital map data, attribute data, and metadata

MRDP core data for this study also indicate that levees and backswamp have regional SOC-storage values <16 kg m^{-2}. Group-mean SOC storage for cores from these environments are natural levee (17.0 kg m^{-2}) and backswamp (14.1 kg m^{-2}).

An estimate for the SOC inventory in the surface meter of soil/sediment in the MRDP can be made using the SSURGO mapped portion of the *coastal-marsh vegetative-type map* (13,236 km^2, land-only area) published by the Louisiana Department of Wildlife and Fisheries and U.S. Geological Survey (1997). This area has a SOC inventory (surface meter) of 677 Tg (slightly more than 2 percent of the 30,289 Tg SOC inventory for the MRB). The MRDP (6,180 km^2, land-only area) has an estimated SOC inventory of 397 Tg. Most of the MRDP is located within the SSURGO mapped coastal marshlands. The entire MRDP, including water, has an area of about 10,800 km^2. Using the ratio of total MRDP area to SSURGO mapped MRDP area as an adjustment, the MRDP SOC inventory is estimated at 694 Tg. This larger estimate of 694 Tg for the SOC inventory is probably more realistic, because it is reasonable to assume that the marsh sediments overlain by shallow water have comparable SOC storage to that of the adjacent land areas.

MRDP core data for this study indicate that there is some variability in long-term SOC mass-accumulation rates for centuries and millennia and that this variability may indicate important geologic changes or changes in land use. However, the consistency of the range in rates of SOC accumulation through time suggests a remarkable degree of marsh sustainability throughout the Holocene, including the recent period of significant marsh modification/channelization for human use. One example of marsh sustainability is its present ability to function as a SOC sink even with Louisiana's large-scale coastal land loss during the last several decades. With coastal-marsh restoration efforts, this sink potential will increase.

Looking to the future, a total of 1,101 g m^{-2} yr^{-1} SOC is projected to be lost from all of coastal Louisiana (U.S. Army Corps of Engineers, Louisiana Coastal Area (LCA) subprovinces 1–4; not just the MRDP) through coastal erosion from year 2000 to 2050. This translates to a projected SOC-loss rate of about 0.20 percent per year.

The recent Hurricanes Katrina and Rita, which devastated the Louisiana coast during late August and late September 2005, transformed about 259 km^2 (100 mi^2) of marsh to open water (U.S. Geological Survey, 2005). To the extent that some or all of this land loss is permanent, this result equates to a SOC loss of about 15 Tg. This estimate is based on the year-2000 15,153-km^2 land area for the LCA study area that includes LCA subprovince 4. Using the year-2000 land area, the LCA study area had an estimated SOC inventory of 858 Tg. The estimated 15 Tg SOC loss attributable to Hurricanes Katrina and Rita is 1.7 percent of the year-2000 LCA inventory and 2.3 percent of the year-2000 MRDP inventory. If this SOC loss is included in the projection for the year 2050, then the MRDP would either remain a source with a net SOC loss of 3 Tg or become a weak sink with a net SOC gain of 4 Tg. These estimates are lower bounds for potential SOC flux because they are only for the surface meter of landmass.

Introduction

By Helaine W. Markewich

Background

Carbon pools in terrestrial ecosystems include living biomass (for example, trees, roots, and microorganisms), biomass stored as products (for example, lumber used in housing), organic and inorganic soil, and geologic/subsurface carbon. Carbon sequestration in terrestrial ecosystems has been defined as, "the net removal of CO_2 [carbon dioxide] from the atmosphere into long-lived pools of carbon" (Department of Energy Consortium for research on Carbon Sequestration in Terrestrial Ecosystems, accessed November 16, 2006, at *http://csite.esd.ornl.gov/*). It has been estimated that the carbon content of soils at the Earth's surface (from 1,100 to 1,600 Pg) is about double that present in the atmosphere (750 Pg) (Rice, 2002). Soil/sediment carbon is present in both inorganic and organic forms. Soil/sediment organic carbon (SOC) is transient but has several turnover rates—days-to-weeks (labile), decade-to-century (intermediate), millennial-or-greater (stable/refractory).

Probably because of its relatively short turnover times SOC is not abundant in the geologic record and is primarily included in material within a few meters of the Earth's surface. SOC that accumulates at the Earth's surface as a minor component of mineral soils, or as the major component of organic soils, can be easily enhanced by human intervention. Because of this, climate change studies that include the study of soil carbon generally focus on the size of the soil-carbon pool, the processes that affect the pool, and the subsequent interactions of soil carbon with the processes active in climate change.

Recent investigations on feedback loops between soil carbon and climate deal primarily with predicting changes in SOC storage as the result of increasing atmospheric CO_2 concentrations and the resultant rise in global temperatures. To date, the data are insufficient for making reliable predictions as to changes in soil carbon with change in climate, or as expressed by the European Science Foundation Web site (*http://www.bgc-jena.mpg.de/public/carboeur/workshop/workshop%20structure.doc*),

> Whether soils will act as a sink or a source of atmospheric CO_2, and moderate or accelerate climate change, is still a matter of debate. Much effort has gone into modelling potential soil carbon-climate interactions. However, no attempt has so far been made to directly monitor these interactions through repeated soil carbon stock measurements. Soil data currently available is not adequate to allow future detection of relatively small, but in terms of atmospheric CO_2, important changes. This is a great neglect, because once interactions have taken place, no retrospective analysis is possible without the availability of solid baseline studies.

Another debate centers on whether increasing the rate of terrestrial-carbon sequestration (organic and inorganic) will facilitate mitigation of atmospheric increases in greenhouse gas concentrations. Prentice and Fung (1990) suggested that soil and vegetation would act as a sink for atmospheric CO_2 if CO_2 concentration was double the present level. Schlesinger (1990) suggested that the sequestration of humus substances in soil only accounts for less than1 percent of the current net primary production of terrestrial carbon. Despite the differences in opinion among these and other investigators as to the degree that terrestrial carbon sequestration would mitigate the increase in atmospheric carbon, research on methods to increase the rate of terrestrial carbon sequestration, and specifically soil-carbon sequestration, continues and each year is the main subject of ongoing research and many publications (for example, articles in Rosenberg and others, 1999). Examples of the continuing interest in terrestrial carbon sequestration include (1) the elements 2–4 listed as "relevant technical areas of research" on the Department of Energy Web site (*http://cdiac2.esd.ornl.gov/scienceman.html#enchancing*),

> …retaining carbon and enhancing the transformation of carbon to soil organic matter; (3) reducing the emission of CO_2 from soils cause[d] by heterotrophic oxidation of soil organic carbon; and (4) increasing the capacity of deserts and degraded lands to sequester carbon…;

and (2) one of the major elements included in the Science Implementation Strategy for the North American Carbon Program (Denning and others, 2005).

> …Major elements of the diagnostic analysis of the carbon budget of North America will include.… Estimates of hydrologic transfers of carbon over land, transformations in estuaries, and sequestration in sediments on land and in coastal oceans.…

To accurately predict the potential for increased SOC sequestration in any region, it is necessary to have some idea of the current SOC storage, the rates of SOC sequestration, and the spatial and temporal variations in SOC accumulation rates by surface environment. Considerable attention has been given to global rates of SOC accumulation by broad ecosystem categories and to SOC sequestration processes and accumulation rates in specific agricultural and silvicultural ecosystems (Marland, 1988; Schlesinger, 1990; Birdsey and others, 1993; Birdsey and Heath, 1995, 2001; Lal and others, 1998, 2001; Post and others, 1999; Rosenberg and others, 1999; Follett and others, 2000; Bachelet and others, 2001, 2003, 2004; Heath and others, 2003). However, there have been few attempts to look at variation in SOC distribution and accumulation rates across a region-scale drainage basin. Each chapter of U.S. Geological Survey (USGS) Professional Paper 1686 reports on an aspect of the agency's effort to investigate SOC in one such regional-scale drainage basin, the Mississippi River Basin (MRB) of the United States (figs. 1–2). This chapter reports on SOC storage and sequestration rates in the emergent Mississippi River deltaic plain (MRDP). Definitions for many of the terms used in this report are included in the "Glossary."

Purpose and Scope

The Mississippi River drains an area of about 3.3 by 10^6 km^2 (1.27 by 10^6 mi^2), which places the Mississippi River Basin (MRB) among the largest of the world's river basins (figs. 1–2). The Mississippi River deltaic plain (MRDP) (about 10,800 km^2; fig. 3) is about 0.3 percent of the MRB. The MRDP is a composite of several coalescing Holocene deltas located in the southern part of the MRB at the river's terminus as it flows into the Gulf of Mexico (figs. 1–3). The MRDP is the extremely low-elevation, low-relief, largely water-covered region of southeastern Louisiana where the Mississippi River and the Atchafalaya River (with discharge from the Red and the Mississippi Rivers) flow into the Gulf of Mexico. The MRDP includes about 40 percent of all wetlands in the continental United States. The MRDP receives massive quantities of nutrient-laden sediment and freshwater from these rivers as they course through Holocene deltaic sediments. The present discharge and sediment/nutrient load that actually are distributed throughout the MRDP are only fractions of the discharge and load prior to the 1930s. At that time, high artificial levees began to be built along the Mississippi River and its major tributaries. Presently, most of the Mississippi River's discharge is funneled directly to the Gulf of Mexico without being dispersed throughout the MRDP.

The general stratigraphy, age, chemistry, and mineralogy of marshes in the MRDP have been the focus of many investigations for more than 30 years (references in following sections). Less attention has been given to study of other delta environments—swamps, backswamps, levees, and interdistributary channels. This report focuses on SOC distribution and rates of accumulation as recorded in each major environment of the MRDP and considers the sensitivity of these rates to changes in climate, hydrology, and land use. The results of this study may be pertinent to understanding changes in SOC storage/inventory in the MRDP associated with: (1) land-use change, such as restoration of bottomland hardwood habitat by conversion from marginal cropland; (2) land loss resulting from subsidence and/or sea-level rise, reduced sedimentation due to levees and channelization, and flooding due to increasing annual precipitation and storm frequency; and (3) vegetation changes resulting from regional increases in mean annual temperature and precipitation and/or increasing salinity due to sea-level rise, land subsidence, and/or channelization.

Base modified from U.S. Geological Survey 1:24,000-scale digital data

Figure 1. Locations of cores taken as part of the U.S. Geological Survey soil/sediment carbon studies, Mississippi River deltaic plain (MRDP), southeastern Louisiana. Extent of MRDP shown as dark green in figure 3*A*.

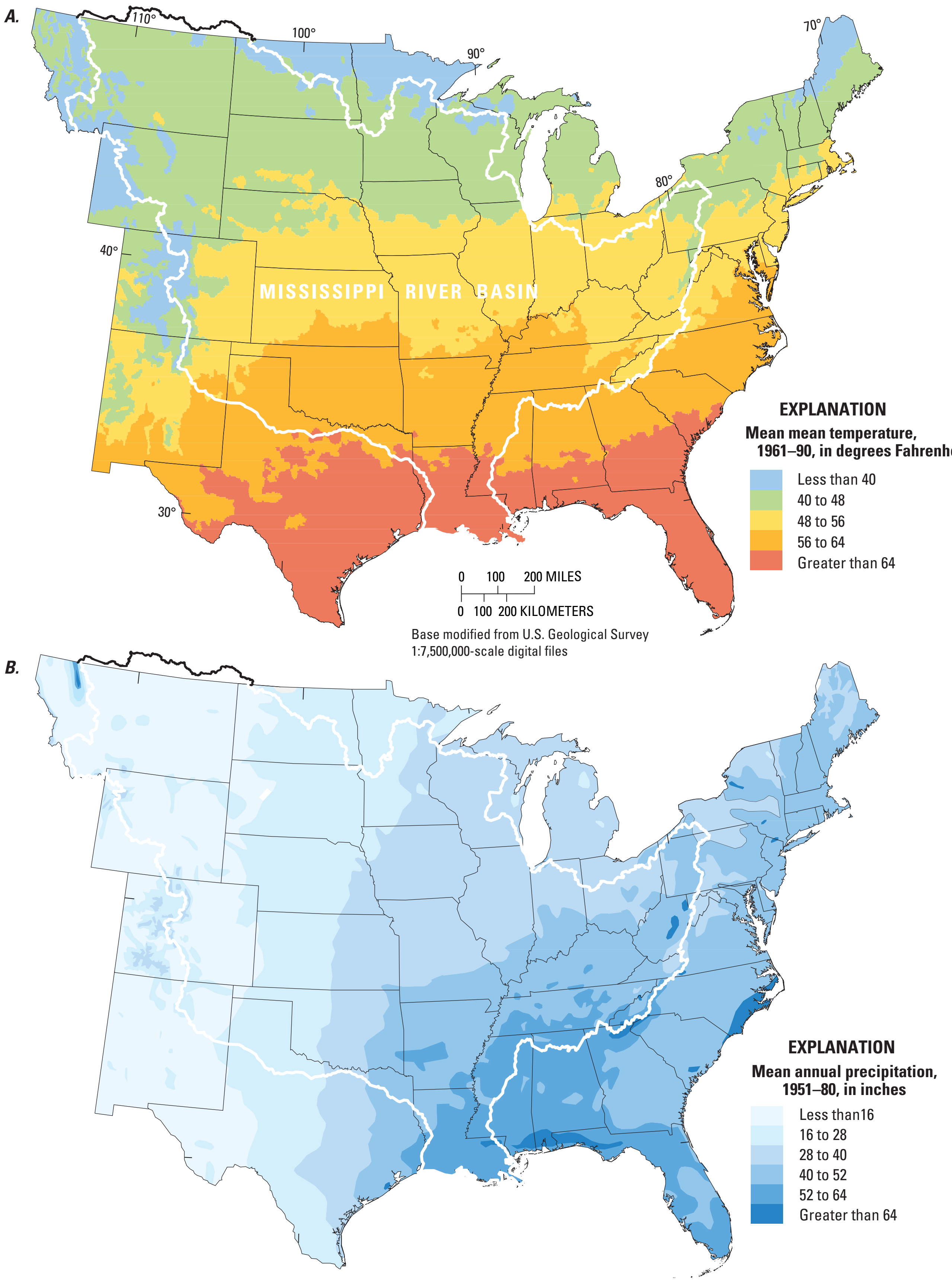


Figure 2. Climate in the Mississippi River Basin (MRB) in the United States. Data sources are for (*A*) the Spatial Climate Analysis Service (1999), and (*B*) U.S. Department of Interior (n.d.) and Daly and others (1994, 2001).

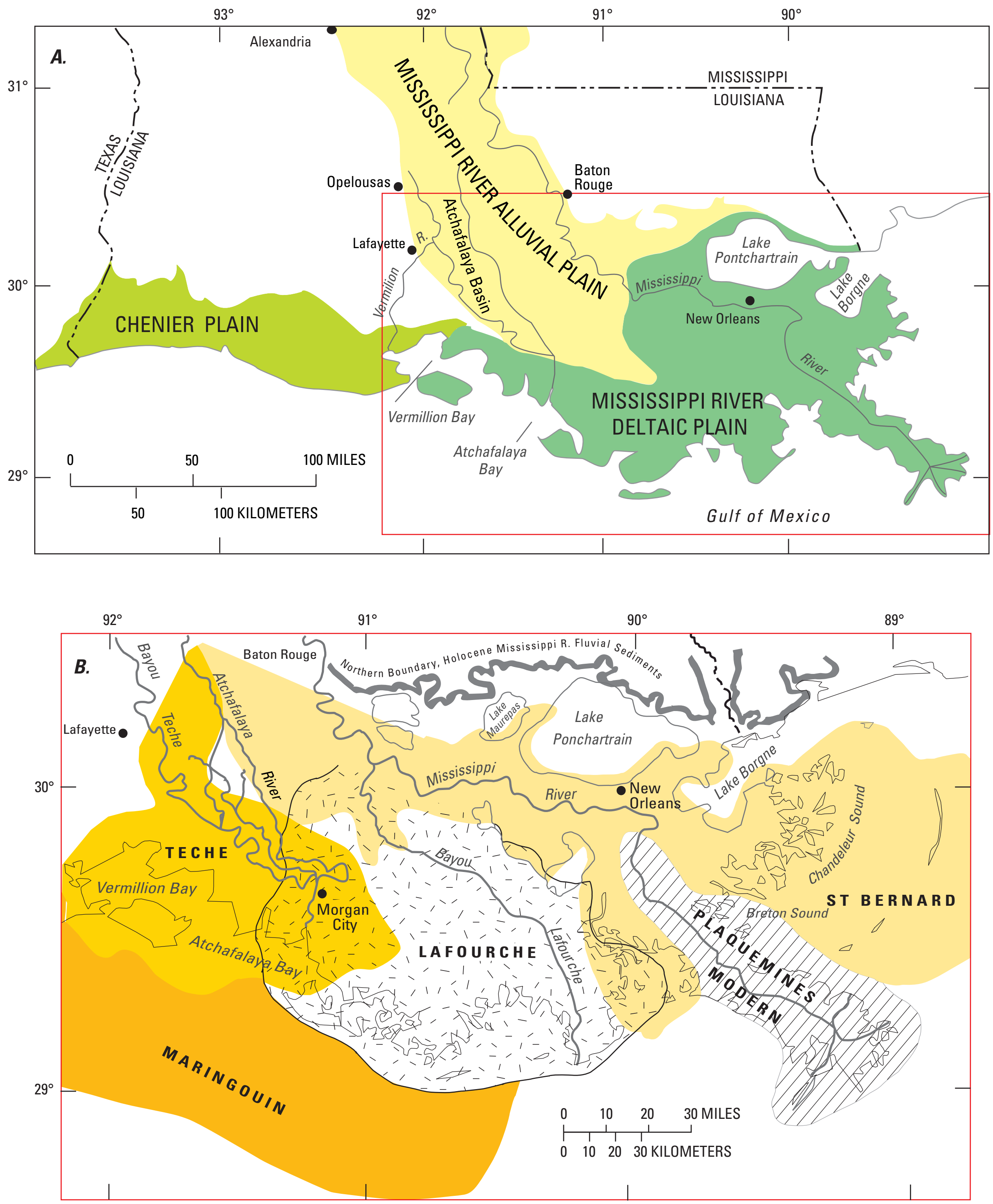


Figure 3. (*A*) The three major depositional environments in coastal and southeastern Louisiana modified from the digital overlay of the 1984 geologic map of Louisiana (U.S. Geological Survey, 2004), and (*B*) an enlargement of the area outlined in red in *A*, showing the major Holocene deltas of the Mississippi River (modified from Frazier, 1967).

Climate, Physiography, Geology, and Vegetation

By Louis D. Britsch, Helaine W. Markewich, and Douglas L. Dillon

Climate

The MRDP lies within Bailey's (1994 revised) subtropical ecoregion, is part of McNab and Avers (1994) "Louisiana Coast Prairies and Marshes" 99 of the "Outer Coastal Plain Mixed Forest" ecological subregion of the United States, and is primarily in the U.S. Department of Agriculture's (1997) hyperthermic soil-temperature regime. A succinct description of the climate is "hot, humid, and wet."

The range in mean-annual temperature is from 19 to 21°C (from 66 to 69°F) (fig. 2*A*), and mean minimum temperatures are generally above freezing. From 75 to 90 days per year have a maximum temperature above 32.2°C (90°F), and for most of the MRDP, there are more than 280 growing days between the annual dates when there is a 50-percent probability of freeze. Although every year has some freezing days, temperatures below –6.7°C (20°F) are unusual. The coldest recorded temperature at New Orleans was –10°C (14°F) on January 24, 1963.

The average midday humidity is between 60 and 70 percent; predawn humidity values are commonly 90 percent. Seven to 12 days each month receive measurable precipitation.

Greater than 60 percent of annual precipitation occurs April–September (Louisiana AgCenter Research & Extension, n.d.). The range in mean annual precipitation is from 1,422 to 1,626 mm (from 56 to 64 inches) with most of the MRDP receiving more that 1,575 mm (62 inches) of rain per year (fig. 2*B*). The maximum annual precipitation during the years from 1895–2002 was about 2,057 mm (81 inches); the minimum was about 762 mm (30 inches) (National Oceanic and Atmospheric Administration, n.d.). In general, precipitation is equitably distributed throughout the year. However, spring storms and late-summer to autumn tropical storms and hurricanes can produce unusually high daily (up to 254 mm, 10 inches) and monthly (about 508 mm, 20 inches) precipitation values. Using a simple definition of heavy precipitation as >50.8 mm (2 inches) in 1 day, Karl and others (1996) and Groisman and others (1999) have shown that values from Louisiana make up 15 percent of the nation's annual heavy precipitation daily values.

Physiography

Although the exact boundaries of the MRDP vary by use (physiographic, geologic, ecologic, and other), in general terms it is a fairly distinct triangular shaped, 15–50 mile (24–80 km)-wide physiographic area that covers about 10,800 km^2 (4,170 mi^2) (fig. 3*A*). The MRDP is in the "Mississippi Alluvial Plain" section of the "Coastal Plain Province" of Fenneman and Johnson (1946). The region is dominated by marshes, swamps, distributaries, lakes, and canals. Land-surface elevations range from about 12 m (40 ft) in the topographically higher inland areas (for example, St. Landry Parish) to below sea level in areas that have been drained for agricultural or urban use. New Orleans is an example of a densely populated, below-sea-level area protected from flooding by a complex system of dikes, levees, and pumps. Parts of the city have elevations of –3 m (–10 ft) and continue to sink.

The MRDP encompasses active and abandoned deltas of the Mississippi River and is bounded on the west by the coastal marshlands of the Chenier Plain, on the east and south by the Gulf of Mexico, and on the north by the Mississippi River alluvial valley and older gulfward-dipping Pleistocene deposits (Kolb and Van Lopik, 1966) (fig. 3). The most prominent physiographic feature is the vast expanse of fresh, intermediate, brackish, and salt marshes, comprising more than 60 percent of the MRDP surface. Natural-levee ridges along active and abandoned distributaries, inland swamps, tidal channels, shallow lakes and bays, and barrier islands and beaches comprise most of the remaining surface features. From 4- to 9-m (13–30 ft) storm surges or 1.8–2.7 m (6–9 ft) storm tides associated with major hurricanes occasionally drive saltwater inland and extensively erode the MRDP's coastal edge.

The modern Mississippi alluvial valley and the MRDP were formed by progradation of the present and former Mississippi River courses and deltas (fig. 3*B*). Each time the Mississippi River built a major delta lobe seaward, it subsequently abandoned the lobe in favor of a shorter, steeper, and more direct route to the sea. These river course (meander belt) changes, and accompanying shifts in centers of deposition, have resulted in the present distribution of deltaic sediments along the southeast Louisiana coast. Marine transgression, caused in part by compaction and subsidence of deltaic sediments and in part by sea-level rise, begins soon after a delta lobe is abandoned. However, for much of the Holocene, the net result between the advancing deltas and the encroaching sea has been an overall increase in the size of the deltaic plain (Kolb and Van Lopik, 1966). In contrast, during the last 50 to 60 years, human activities—such as construction of canals, ditches, levees, and diversion structures—have resulted in saltwater intrusion and reduced sediment input. These, in turn, have accelerated the natural effects of subsidence and erosion, so that there has been a net loss of land, primarily the marsh wetlands, at a rate close to 65 km^2 yr^{-1} (Britsch and Dunbar, 1993).

Mitsch and Gosselink (1986) considered wetland hydrology one of, if not the, "most important factor in the establishment and maintenance of specific types of wetlands and wetland processes." They also considered precipitation, inflow and outflow of surface water, exchanges in groundwater and surface water, and evapotranspiration as the dominant factors in wetland hydrology. It is these factors that in large part also control carbon accumulation rates in the wetland environments of the MRDP. Since land loss is an important process and problem in the MRDP, it has to be considered in SOC storage and inventory calculations. The per-year mean SOC-storage loss, resulting from the per-year land loss, has to be subtracted from any calculated per-year mean SOC-storage increase.

Geology

The geologic history of the MRDP has been interpreted from thousands of borings and hundreds of radiocarbon age determinations. Some important contributions to the understanding of the history of the MRDP include Fisk (1944, 1952, 1955), Fisk and McFarlan (1955a, b), McFarlan (1955, 1961), Kolb and Van Lopik (1958, 1966), Frazier (1967), May and others (1984), Smith and others (1986), May and Britsch (1987), and Saucier (many papers, see Saucier [1994a] for complete listing). Taking into consideration differences in calculations and interpretations of radiocarbon ages, the data indicate that during the past 8 k yr the Mississippi River has changed its course several times, resulting in formation of a complex deltaic plain.

Although Holocene sediments comprise the MRDP surface, discussion of the MRDP's geologic history has to start with the late Pleistocene. From about 26 to 12 ka (Martinson and others, 1987), continental ice accumulation caused sea level to be lowered some 90 m (295 ft) below its present level (Dillon and Oldale, 1978). As a result, the Louisiana shoreline was as far as 160 km (100 mi) south of its present position (Kolb and Van Lopik, 1958). Lowered sea level led to the entrenchment of gulfward-flowing streams and their tributaries into the newly exposed Pleistocene sediments, which were primarily deposited during the last major interglacial (Oxygen Isotope Stage 5) from about 130 to 60 ka (Martinson and others, 1987). Entrenchment of the ancestral Mississippi River into the Pleistocene sediments (Fisk, 1938) formed an alluvial valley, with branching tributary valleys, about 16–40 km (10–25 mi) wide, which trended southeast across the deltaic plain.

Sea level was at its lowest position about 18 ka (Martinson and others, 1987) and subsequently began to rise as a result of glacial melting and regional subsidence of the coast (Kolb and Van Lopik, 1966; Nummedal, 1983). Streams alluviated the entrenched valley with coarse sediments in order to adjust to the rise in base level. As sea level continued to rise, deposition of coarse sediments was forced farther up the alluvial valley. Closer to the Gulf of Mexico, shallow marine sediments were deposited over coarse basal fluvial sediments as the shoreline transgressed northward. As sea level continued to rise, both the quantity and grain size of detritus supplied to the streams decreased, leaving only fine sands, silts, and clays for deltaic deposition (Kolb and Van Lopik, 1966).

Between 8 and 4 ka, a sea-level stillstand occurred at about its present level (Nummedal, 1983). The Mississippi River began building a series of lobate deltas in a gulfward direction as a result of the stationary sea level, displacing Gulf of Mexico waters that had extended up the Mississippi River alluvial valley to the latitude of Baton Rouge, Louisiana (Kolb and Van Lopik, 1966). The Mississippi River and its associated deltas shifted several times during this gulfward growth of land, resulting in a deltaic plain composed of an active and several inactive deltaic complexes extending some 288 km (180 mi) across southeast Louisiana. From oldest to youngest, the MRDP deltaic complexes are the Maringouin, Teche, St. Bernard, Lafourche, and Plaquemines Modern (fig 3*B*). The relative ages of these complexes are well established, but the absolute ages are less accurate. Delta ages have been derived from radiocarbon analysis as well as archeological evidence (McIntire, 1958; McFarlan, 1961; Frazier, 1967; Törnqvist and others, 1996).

The earliest Holocene delta lobe, the Maringouin, is thought to have prograded sometime between 6 and 8 ka during a short stillstand when sea level was from about 12 to 18 m (from 40 to 60 ft) lower than its present level (Frazier, 1967). Frazier (1967) mapped the Maringouin as the most extensive delta lobe in the MRDP. Erosion, subsidence, and burial by subsequent deltaic deposition have made it difficult to reconstruct the exact limits, location, and upvalley extent of the Maringouin delta complex. Around 5.8 ka, the initial progradation of the Teche delta began in the western part of the MRDP (Frazier, 1967). Gradually, the major locus of Teche deposition shifted eastward depositing sediments in a southeastward direction. The Teche–Mississippi River System was actively depositing sediments in this area until about 3.5 ka when the primary flow of the Mississippi River shifted far to the east and began building the St. Bernard delta. The Mississippi River continued to build the St. Bernard delta until sometime between 2 ka (Frazier, 1967) and 1.4 ka (Törnqvist and others, 1996), when flow was diverted westward and the Lafourche delta began to prograde seaward. Abandonment of the Lafourche course for the Plaquemines Modern delta lobe occurred around 0.5 ka (Frazier, 1967) or as early as 1.3 ka as suggested by Törnqvist and others (1996).

The MRDP has a complex pattern of sediment distribution associated with the Holocene lobate (curved fan-shaped delta; convex outer margin faces the water body) and elongate distributaries and deltas (Fisher and others, 1969). In both delta types, distributary channels and adjacent levees are characterized by fine-sand- and silt-sized sediment. Interdistributary deposits are fine-silt- and clay-sized sediment. Distributary channels are generally straight, narrow, and filled with fine sand, silt, and clay. Point-bars and levees are also linear and sand-filled, but are generally disconnected bodies that formed during lateral migration of the adjacent distributary or major drainage. Crevasse channel deposits are also sands and sandy silts. They occur where levees are low and have been breached. The crevasse channels generally lead to fan-like deposits in the interdistributary areas. Interdistributary lake, bay, marsh, and swamp deposits are primarily fine silt and clay overlain by decomposed organics (peat). Combined, these interdistributary environments comprise the largest area of the MRDP. The pattern of sediment distribution is somewhat more complex in elongate deltas than in lobate deltas but in both delta types, the pattern of sediment distribution is the same with the sediment becoming progressively finer with increasing distance from the main or distributary channel (fig. 4). These surficial deposits generally overlie thick prodelta clays that serve as confining units for deeper sands used extensively for municipal, agricultural, and industrial water supplies.

For this study, cores were collected from the dominant depositional environments of the MRDP (fresh marsh, intermediate marsh, brackish marsh, natural levee, natural distributary, backswamp, and swamp) and are referred to as the MRDP cores. Figure 5*A*–*J* show a detailed map for each core site.

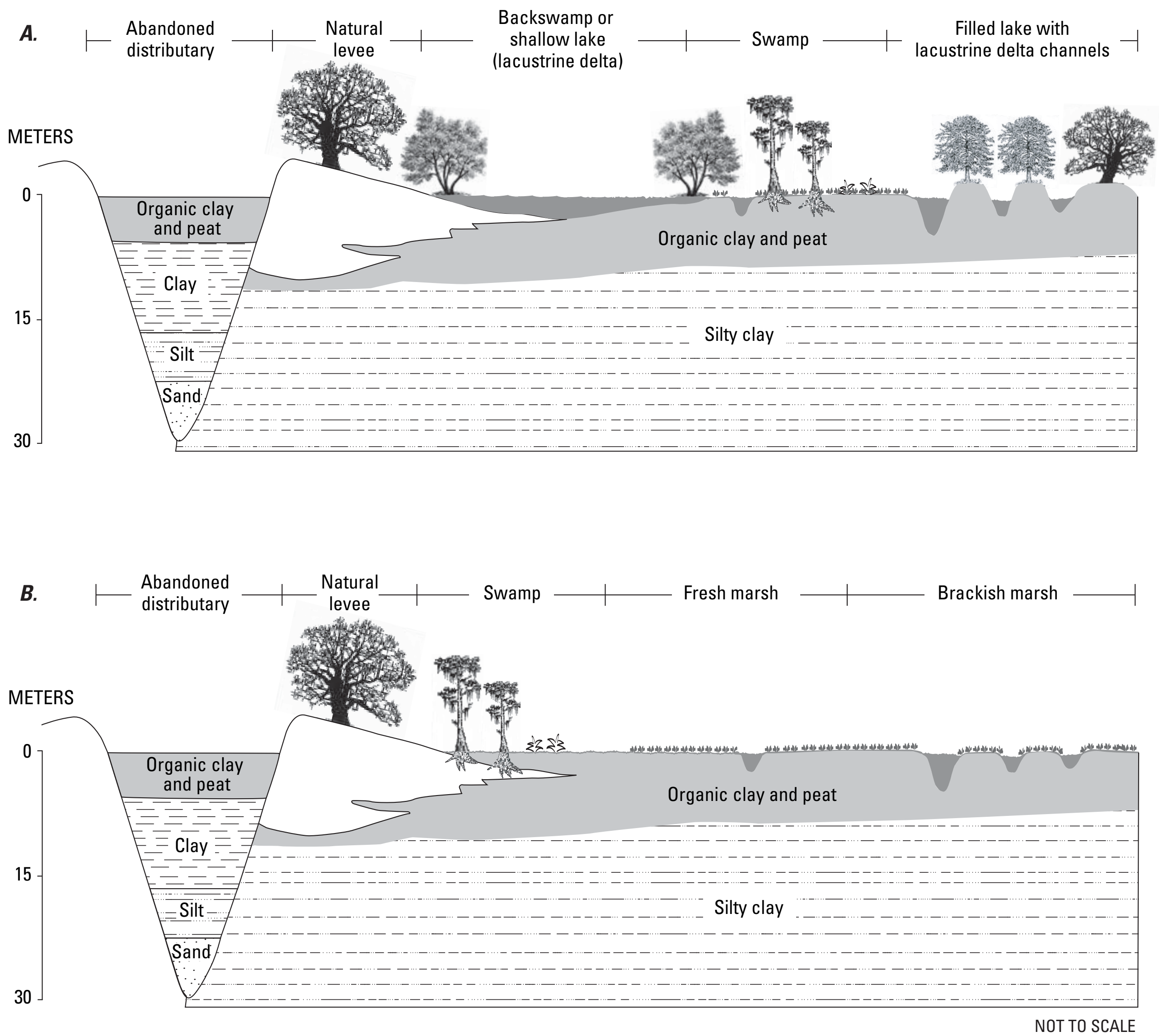


Figure 4. Depositional environments in (*A*) “interior basin” and (*B*) “lower basin” areas of the Mississippi River deltaic plain. Sediments in the “interior basin” show no evidence of marine influence; “lower basin” sediments have physical and chemical properties indicative of marine influence.

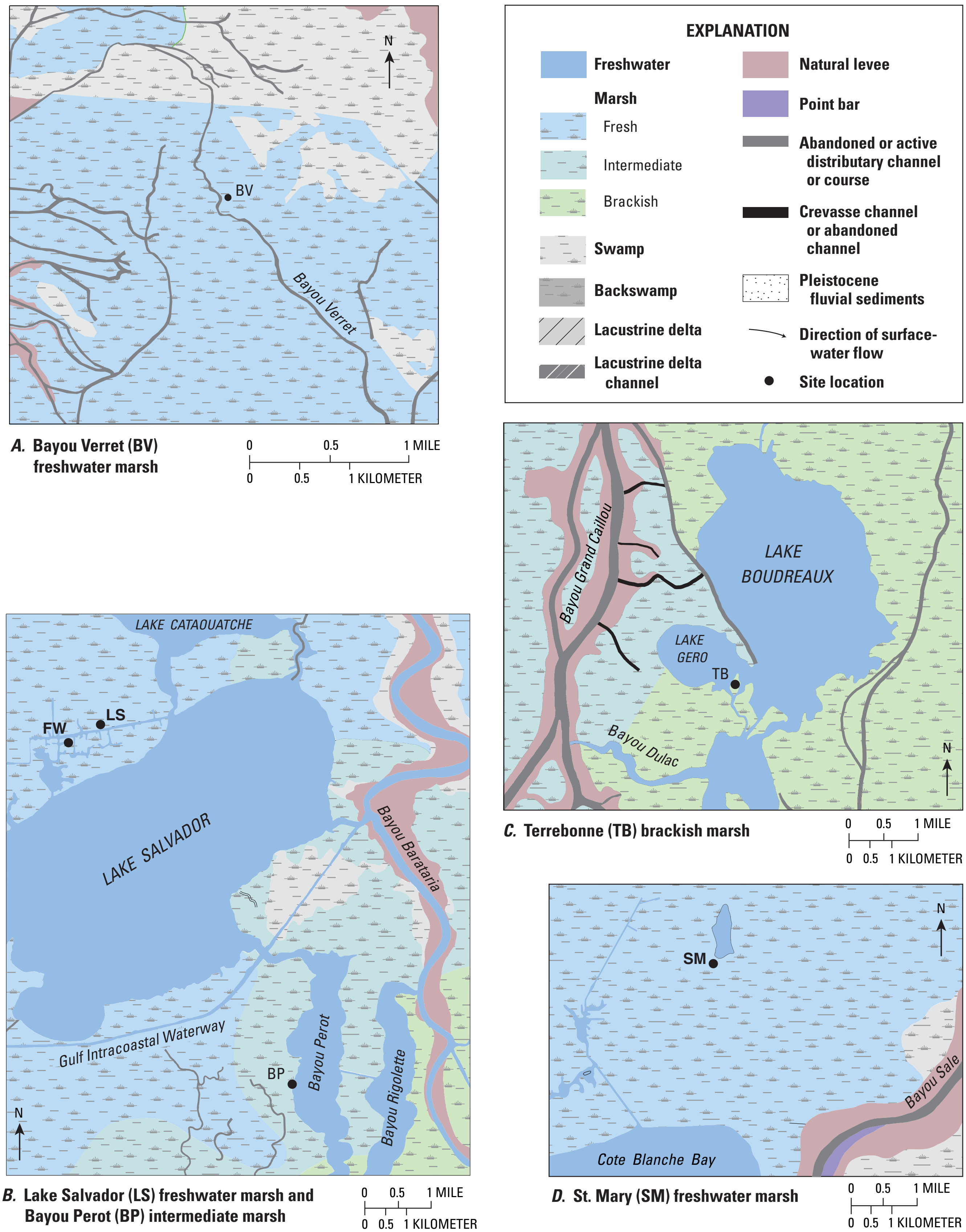


Figure 5. Localized geology and geography for each core locality sampled as part of U.S. Geological Survey soil/sediment carbon studies, Mississippi River deltaic plain (MRDP), southeastern Louisiana. Outline of MRDP shown in figure 3*A*. Locality information given in table 1.

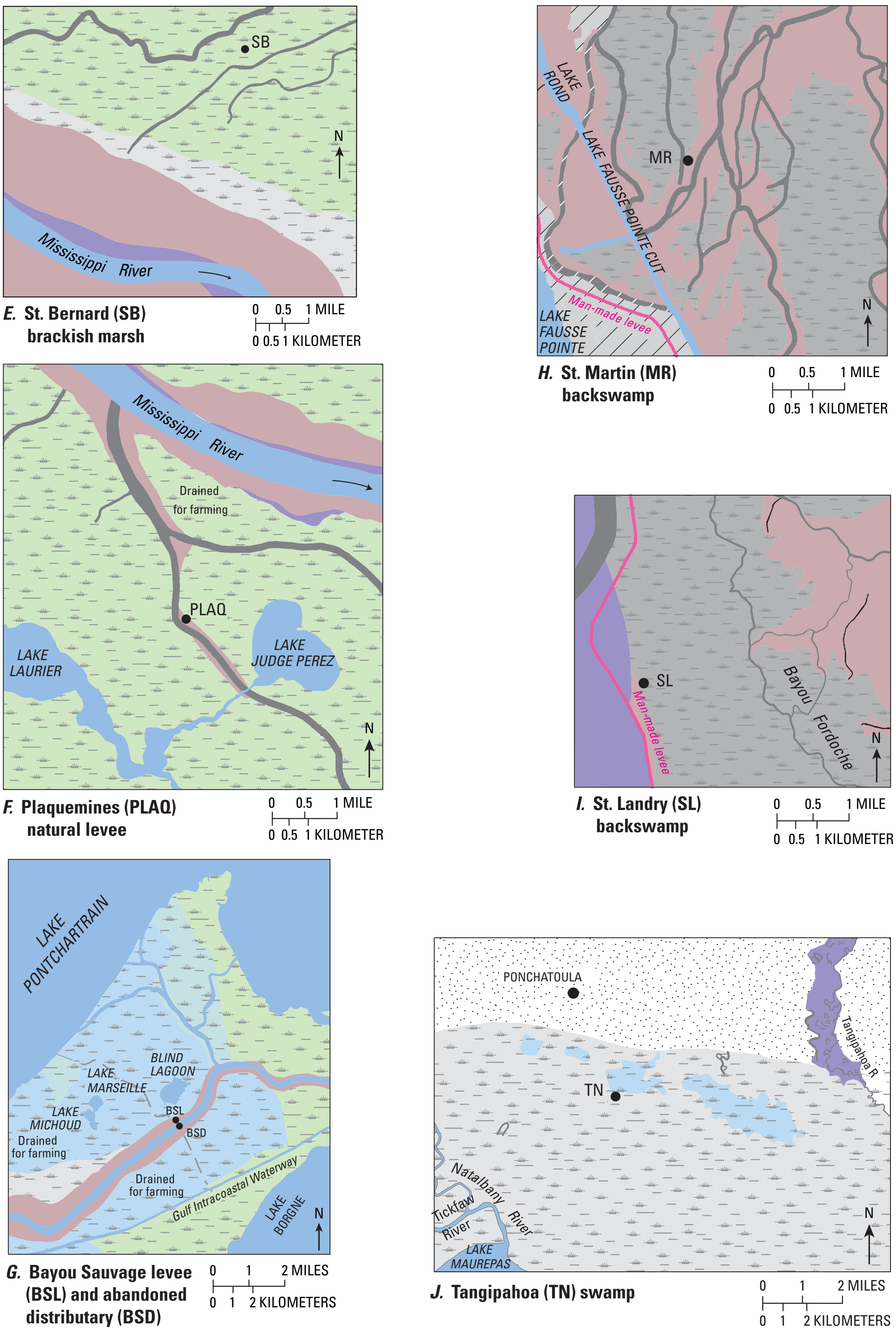


Figure 5. Localized geology and geography for each core locality sampled as part of U.S. Geological Survey soil/sediment carbon studies, Mississippi River deltaic plain (MRDP), southeastern Louisiana. Outline of MRDP shown in figure 3*A*. Locality information given in table 1—Continued.

Vegetation and Land-Use Change

Soil and vegetation that characterize the MRDP have developed in/on the Holocene deltaic sediments. The soil and vegetation patterns reflect formation during periods of warm temperate to subtropical climate in an area of relatively high sedimentation rates and low wave energy. Figure 6 shows the generalized distribution pattern for marsh vegetation in the MRDP. Site-specific location data, including vegetation and some parish land-use history, are included in table 1. Histosols are the dominant soil order in the MRDP. A figure showing the generalized distribution of soils in the study area is included in the section "Soil/Sediment Organic Carbon Landscape Distribution." SOC accumulation in the MRDP is directly related to natural processes, such as river flooding and flooding due to tropical storms and hurricanes. In turn, these processes directly affect vegetation type, distribution, and density. Because land use affects all naturally-occurring depositional and post-depositional processes, SOC accumulation also is directly related to land-use activities, including farming; cattle raising; logging; road building; dredging and filling/dumping associated with levee/canal building; as well as industrial (such as oil exploration, petrochemicals, and marine repair), commercial, and residential development.

Although the MRDP is the richest area of wetlands in the continental U.S., it has been affected by all the naturally-occurring and human-facilitated post-settlement activities mentioned previously. The period between World War I and World War II, the 1920s and 1930s, saw the beginnings of large-scale levee building and channelization of wetlands, which further increased during the post-World War II development boon (1940s and 1950s). It is now estimated that more than one million acres (4,047 km^2, 1,560 mi^2) of land in southern Louisiana have disappeared since the 1930s. This is an area somewhat larger than the size of Rhode Island and about one-thirtieth the size of present-day Louisiana. The current land-loss rate is estimated at about 65–90 $km^2\ yr^{-1}$ (25–35 $mi^2\ yr^{-1}$, 16,000–22,400 A yr^{-1}) and is thought to be primarily the result of channelization, levee building, erosion, altered hydrology, coastal subsidence, and sea-level rise (Britsch and Dunbar, 1993, 1996; The Coalition to Restore Coastal Louisiana, 1999; Penland and others, 2000; U.S. Geological Survey, n.d.; and many other reports). The SOC storage associated with this lost land is estimated in the section "Recent Trends in Soil/Sediment Organic Carbon Loss—Effects of Land Loss."

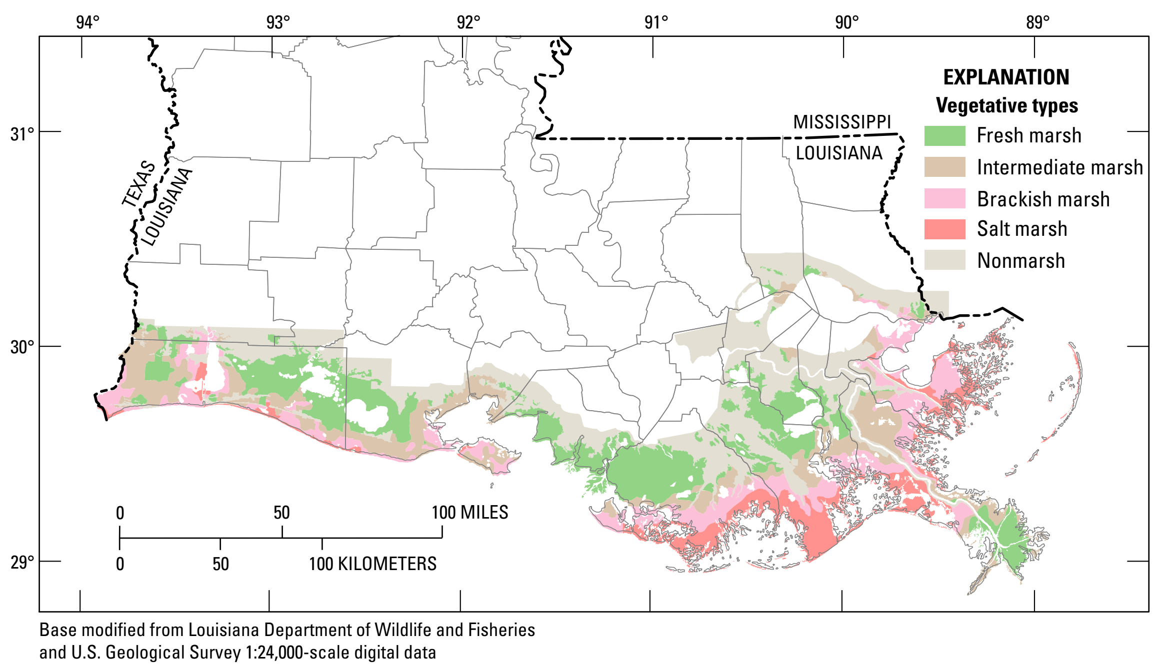


Figure 6. Marsh vegetation in southern Louisiana (Louisiana Department of Wildlife and Fisheries and U.S. Geological Survey, 1997).

Table 1. General information for core localities sampled as part of U.S. Geological Survey soil/sediment carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[ID(s), identifer(s); °, degree; ', minutes; ", second; MRDP, Mississippi River deltaic plain; GICWW, Gulf Intracoastal Waterway; MRGO, Mississippi River–Gulf Outlet; HNC, Houma Navigation Channel; >, greater than; ft, feet]

Site name and parish	Latitude/ longitude core ID(s)	Present vegetation	Parish land-use history[1] (not covered in text)	Delta lobe/ alluvial plain
		Fresh marsh		
Bayou Verret Jefferson Parish	29°54'00"N 90°15'48"W BV	Primarily *Panicum hemitomon* (maidencane) and *Sagittaria lancifolia* (bulltongue); some *Phragmites communis* (roseau), *Cladium mariscus jamaicense* (Jamaica swamp sawgrass), *Scirpus californicus* (bullwhip), *Alternanthera philoxeroides* (alligator weed), and *Eichhornia crassipes* (common water hyacinth).	Native habitats—levee-backswamp complexes with bottomland hardwood forests in north, fine-sand to silt beaches along the coast; core site in marsh complexes that characterize the middle part of the parish. 1930–1950s—parish primarily farms, dairy operations, and second growth forests in north and seaside comunities in south. 1950–present—densely populated suburb of New Orleans in north; seaside resorts and industrial communities in south; relatively unmodified bayous and marshes in middle.	St. Bernard/ Lafourche
Lake Salvador St. Charles Parish	29°46'89"N 90°16'15"W LSPa,b,c,e,f; LSHa,b,c; LSMa,b,c		Native habitats—levee-backswamp complexes with bottomland hardwood forests in the north; bayous and marshes in south. Lake Salvador is in the marsh complex. Oil refineries—in MRDP began during 1914; oil-export terminals began during 1922; oil discovered in parish during the late 1930s and early 1940s. Bonnet Carre Spillway (major control outlet for Mississippi River flooding)—completed during 1936. Chemical industry complexes—began during 1950s.	
St. Mary St. Mary Parish	29°40'24" 91°33'47" SM1a,b,c	Primarily *Panicum hemitomon* (maidencane) and *Sagittaria lancifolia* (bulltongue); some *Phragmites communis* (roseau), *Cladium mariscus jamaicense* (Jamaica swamp sawgrass), *Scirpus californicus* (bullwhip), *Alternanthera philoxeroides* (alligator weed), and *Eichhornia crassipes* (common water hyacinth).	Native habitats—levee-backswamp complexes with bottomland hardwood forest; some fresh-marsh predominates. Several hundred inhabitants by 1760s, several thousand by 1800. Plantations of indigo until 1780s, then cotton until 1820, when sugarcane became dominant. GICWW—cuts parish into northern and southern halves; primary construction during the mid-1900s. Modern business—agriculture, sugar mills, carbon black plants, shipbuilders, fabrication firms and seafood processors. Power plants—built during the 1950s and 1970s; fueled by natural gas and oil.	Teche
		Intermediate marsh		
Bayou Perot Lafourche Parish	29°37'41"N 90°10'36"W BPPa,b,c,f,g; BPHa,b,c; BPMa,b,c	*Spartina patens* (wiregrass), and *Vigna luteola* (deer pea); some *Sagittaria lancifolia* (bulltongue arrowhead), *Echinochloa walteri* (wild millet), *Scirpus californicus* (bullwhip), and *Cladium mariscus jamaicense* (Jamaica swamp sawgrass).	Native habitats—levee-backswamp complexes with bottomland hardwood forests in the north and middle axis along Bayou LaFourche, marsh complexes in the middle, fine-sand to silt beaches and salt marsh along the coast. GICWW—divides the parish into northwestern and southeastern halves; started during early 1900s, major improvements during late 1930s–1940s, semicontinuous modifications since.	St. Bernard/ Lafourche

Table 1. General information for core localities sampled as part of U.S. Geological Survey soil/sediment carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID(s), identifer(s); °, degree; ', minutes; ", second; MRDP, Mississippi River deltaic plain; GICWW, Gulf Intracoastal Waterway; MRGO, Mississippi River–Gulf Outlet; HNC, Houma Navigation Channel; >, greater than; ft, feet]

Site name and parish	Latitude/ longitude core ID(s)	Present vegetation	Parish land-use history[1] (not covered in text)	Delta lobe/ alluvial plain
Brackish marsh				
Fish & Wildlife St. Charles Parish	29°46'41"N 90°17'06" FW	Almost entirely *Spartina patens* (wiregrass); some *Volidus* (bulrush), *Typha latifolia* (broadleaf cattail), *Phragmites communis* (roseau), and *Scirpus americanus* (three-cornered grass)	See write-up for Lake Salvador St.Charles Parish.	St. Bernard
St. Bernard St. Bernard Parish	29°58'53"W 89°55'27" SB1a,b,c		Native habitats—primarily brackish and salt marsh. Early farming (1700s–early1800s)—provided New Orleans with most of its produce. MRGO (76-mile-long canal)—completed during 1965; direct route from New Orleans to the Gulf of Mexico.	
Terrebonne Terrebonne Parish	29°23'05"N 90°40'20"W TB1a,b,c. TB2a,b,c		Native habitats—levee-backswamp complexes with bottomland hardwood forest and some fresh marsh in east; fresh marsh in west-central; intermediate, brackish and salt marsh in south; few fine-sand and silt beaches along coast; core site is brackish marsh in east-central part of the parish. GICWW—traverses northern part of parish; finished to Bayou Terrebonne during 1923 and continuously improved since. HNC (30 miles long)—finished during 1961, links Terrebonne Bay to Gulf of Mexico. Recent construction—Port of Houma near the intersection of the GICWW and HNC.	Lafourche
Natural levee				
Plaquemines Plaquemines Parish	29°34'25" 89°54'04" PLAQa,b,c,d	Primarily young *Quercus virginiana* (live oak) and *Quercus nigra* (water oak) and *Celtis occidentalis* (common hackberry); some *Celtis laevigata* (sugarberry), *Acer rubrum* (red maple), *Liquidambar* styruciflua (sweetgum), and *Ulmus* spp. (elm).	Native habitats—fresh and brackish marshes, bottomland hardwood forests, chenieres, lagoons, and bayous; core site is remnant natural levee along abandoned distributary.	Plaquemines/ Modern
Bayou Savage Orleans Parish (near levee crest)	30°03'16" 89°52'53" BSL2a,b,c,d		Native habitats—fresh and brackish marshes, bottomland hardwood forests, chenieres, lagoons, and bayous. Levee breaks—1816, 1874, 1903, 1915, and 1927. Hurricanes and tropical storms—10 destructive and flooding storms during the 1700s, 3 during the early 1800s, and about 20 with winds ≥75 mph since 1886. New Orleans nearly destroyed by fire during 1788, 1792, and 1794. Area presently traversed by U.S. Highway 90, U.S. Highway 11, Interstate 10, and the GICWW. The part that is maintained as a wildlife refuge is mostly inside massive hurricane protection levees that help protect New Orleans from storm surges and maintain the city's water levels.	St. Bernard
Bayou Savage Orleans Parish (side slope, border of open lake)	30°03'19" 89°52'54" BSLa,b	>1 m (4 ft) high Cyperaceae (sedge) and Poaceae (grass) with *Salix* (willow) within 2.5 m (8 ft)		St. Bernard
Distributrary				
Bayou Savage Orleans Parish	30°03'10" 89°52'48" BSDb,c,d	Primarily *Salix* sp. (willow); some *Quercus* sp. and *Celtis occidentalis* (common hackberry)	See write-up for BSLa,b - Bayou Sauvage, Orleans Parish.	St. Bernard

Table 1. General information for core localities sampled as part of U.S. Geological Survey soil/sediment carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID(s), identifer(s); °, degree; ', minutes; ", second; MRDP, Mississippi River deltaic plain; GICWW, Gulf Intracoastal Waterway; MRGO, Mississippi River–Gulf Outlet; HNC, Houma Navigation Channel; >, greater than; ft, feet]

Site name and parish	Latitude/ longitude core ID(s)	Present vegetation	Parish land-use history[1] (not covered in text)	Delta lobe/ alluvial plain
Backswamp				
St. Martin St. Martin Parish	30°05'31" 91°35'17" MR1b, MR1c (splits 1 and 2), MR1d	Primarily *Celtis occidentalis* (common hackberry) and *Taxodium distichum* (baldcypress) with some *Quercus* sp.	Native habitats—backswamp and levees with bottomland hardwood forests, bayous, swamps, and lakes. Devastated by the 1927 Mississippi River flood—funneled water down the Atchafalaya Basin. Human-made levees and drainage canals—built since the 1930s in response to the 1927 flood and growing commercial needs. Old river structure—finished during 1963; controls the Mississippi River discharge into the Atchafalaya Basin and therefore is a major control on amount and mode of sediment deposition.	Alluvial plain
St. Landry St. Landry Parish	30°27'41" 91°51'38" SL1b,c	Primarily *Celtis occidentalis* (common hackberry) and *Nyssa aquatica* (water tupelo); some *Taxodium distichum* (baldcypress), *Quercus* sp.		
Swamp				
Tangipahoa Tangipahoa Parish	30°23'54" 90°25'38" TN1b,c,d 30°23'51" 90°25'30" TN2a,b 30°23'49" 90°25'40" TN2c	Primarily stumps and trees of *Taxodium distichum* (bald cypress); stumps left from cutting in early 1900s; trees no older than 90 years.	Native habitats—primarily pine, oak, gum ash, birch, holly, magnolia, poplar, myrtle, bay, and cypress. Railroads—introduced during the mid-1800s with commercial interests and towns developing along the railroads. Logging—By the late 1800s, much of the region's logged for timber needed as fuel, and for cypress lumber.	St. Bernard/ Lafourche

[1]Locations shown in figure 1. Outline of MRDP shown in figure 3*A*. Geologic and geographic settlings are shown in figure 5. Definition of environments given in the Glossary.

[2]Numerous references used, including:

a. Roth, David (n.d.), Louisiana Hurricane History: National Weather Service Lake Charles, Louisiana, accessed October 6, 2005, at *http://www.srh.noaa.gov/lch/research/*

b. Armstrong, Gladys Stovall (transcriber)—The 1915 Storm - extracted from stories in the Times Pacayune, accessed October 6, 2005, at *http://ftp.rootsweb.com/pub/usgenweb/la/plaquemi/history/hurc1915.txt*

c. Alperin (1983)

d. The Official Jefferson Parish, Louisiana Web site, accessed March 10, 2005, at *http://www.jeffparish.net/index.cfm?DocID=1071*

e. Louisiana Timeline of State History, accessed March 10, 2005, at *http://www.shgresources.com/la/timeline/*

f. St. Charles Parish, Parish history Web site, accessed March 10, 2005, at *http://www.stcharlesgov.net/departments/tourism.htm*

g. "St. Landry Parish: It Spanned South Louisiana": Lafayette, Louisiana, Daily Advertiser, "History of Acadiana, a publication dedicated to preserving Acadiana's heritage and culture," issue no. 4, September 30, 1997, accessed October 7, 2005, at *http://www.carencrohighschool.org/LA_Studies/ParishSeries/StLandryParish/StLandryParish.htm*

h. Perrin, W.H., "Southwest Louisiana Biographical & Historical, St. Martin Parish Chapter on History—Chapter III" (file prepared by Jan Craven), accessed October 7, 2005, at *http://ftp.rootsweb.com/pub/usgenweb/la/stmartin/history/swlastmr.txt*

i. Welcome to St. Mary Parish, Louisiana, accessed March 2005 at *http://www.rootsweb.com/~lastmary/*

j. Herbert (2001)

k. "History of Houma-Terrebonne," Web site of Terrebonne Parish Consolidated Government, accessed October 7, 2005, at *http://www.tpcg.org/main/about.asp*

l. Tangipahoa Parish Convention and Visitor's Bureau Web site, accessed October 20, 2006, at *http://www.tangi-cvb.org/site49.php*

m. Morris (n.d.)

n. Lafourche Parish Government, accessed March 2005 at *http://www.lafourchegov.org/lafourchegov/AboutLafourche.aspx*

o. U.S. Fish and Wildlife Service (n.d.)

Post-Native American settlement of the MRDP began during the early 1700s. Settlement patterns were mostly from the Gulf of Mexico upriver and westward. With the establishment of New Orleans during 1718 (McNabb and Madère, 2003), agriculture dominated the area's land use in order to supply food products to the city. By the mid-1700s, in parishes around New Orleans (Orleans, St. Charles, Jefferson, St. Bernard, Plaquemines), indigo plantations had been established. In these parishes, sugar cane had replaced indigo as a major crop by the early 1800s. By the mid-1800s, sugar cane had become the major commodity throughout the delta region. In some areas, such as the Atchafalaya Basin (for example, in St. Martin Parish), rice was also a major commodity.

Land clearing had begun with the establishment of farms and plantations on levees of various heights in the New Orleans region. Later, as cypress became a prized commodity, topographically lower and wetter areas were logged. By the 1840s, cypress logging rivaled sugar cane production as the dominant industry around and down river of New Orleans.

During the late 1800s and early 1900s, transportation changed from horse-, mule-, or oxen-and-wagon to steamboat, railroad, and automobile. Harvesting and processing lumber, and crops—such as sugarcane, rice, and cotton— came to rely on machines, such as the sugar mill and cotton gin. Transportation of lumber and crops required coal-, oil-, and gas-powered steamboats, trucks, and trains.

By the late 1800s, much of the MRDP had been logged. The timber was used locally for fuel (railroad or riverboat steam engines) or for building construction or was exported.

Railroad construction began in the New Orleans area by the late 1830s. Rail became the primary means of transportation to get goods to market. By the mid-1800s, railroads connected much of the area downriver of Baton Rouge (Baton Rouge shown in fig. 3*A*). Many commercial interests and towns developed along the railroads.

Road and interstate highway construction also has greatly modified the MRDP land surface. Interstate Highway 10 crosses the MRDP in the area of New Orleans. U.S. Highway 90 and I-49 provide east-west access to the entire lower delta (Lafourche, Terrebonne, St. Mary, and St. Martin Parishes).

Canal building accompanied the first land clearing for settlements and agriculture on land other than levees. In New Orleans, canal building first began around 1794. Throughout the delta region, canal construction has continued unabated. With time, the canals have gotten wider and deeper and have altered the natural interfaces between saltwater and freshwater environments. The several hundred mile Gulf Intracoastal Waterway (GICWW) (Alperin, 1983; parts shown in figure 5*B* and *G*) and the 66 mile (106 km) Mississippi River–Gulf Outlet channel (extends from the Gulf of Mexico northwest to the Inner Harbor Navigation Canal at the Port of New Orleans) are the largest and longest, navigable constructed waterways in the region.

Levee building, associated early with the establishment of communities and plantations and later with the need for ports, also has altered much of the natural surface-water flowpaths. As development increased in the delta region, so also did the number and height of levees. Modern levees along major watercourses are 4.8–9 m (16–30 ft) high.

Until the mid-1900s, levee breaks, primarily associated with Mississippi River flooding, were not uncommon and sometimes disastrous, eroding agricultural land that sometimes was subsequently abandoned. The region down river of New Orleans (Orleans, St. Bernard, Plaquemines Parishes) was particularly ravaged during the early 1800s. Since then there have been many major levee breaks in the delta region. The most destructive was during 1927, as a result of the Mississippi River flood, that is considered by many to be the worst flood in U.S. history (fig. 7).

Hurricanes also have played their part in land alteration and modification of freshwater and saltwater interfaces (Reed, 1989; Rappaport, 1993; Guiney, 1999; Lawrence, 1998, 2002; U.S. Geological Survey, 2002). Prior to the 1970s, the area along the Mississippi River, downstream of New Orleans, was flooded by every major hurricane or tropical storm to hit the Louisiana coast. The storm surge associated with the 1915 hurricane is said to have broken every major levee in the lower delta region. During 1965, Hurricane Betsy, like her 1915 counterpart, flooded New Orleans and temporarily made the southern part of Plaquemines, Jefferson, and St. Bernard Parishes part of the Gulf of Mexico. During the 1970s, major hurricane protection levees began to be built to protect the city of New Orleans and other communities from such surges. Recently, due to Hurricane Katrina, New Orleans and downstream parishes flooded despite the presence of the hurricane protection levees.

Although the levees have reduced Mississippi River flooding and flooding due to storm surge in the lower MRDP, the overall activities of levee and canal building have decreased the supply of sediment to, and increased the rate of, land loss in the MRDP. Most of the land lost to channelization has been marsh, the environment of highest SOC accumulation rates and storage.

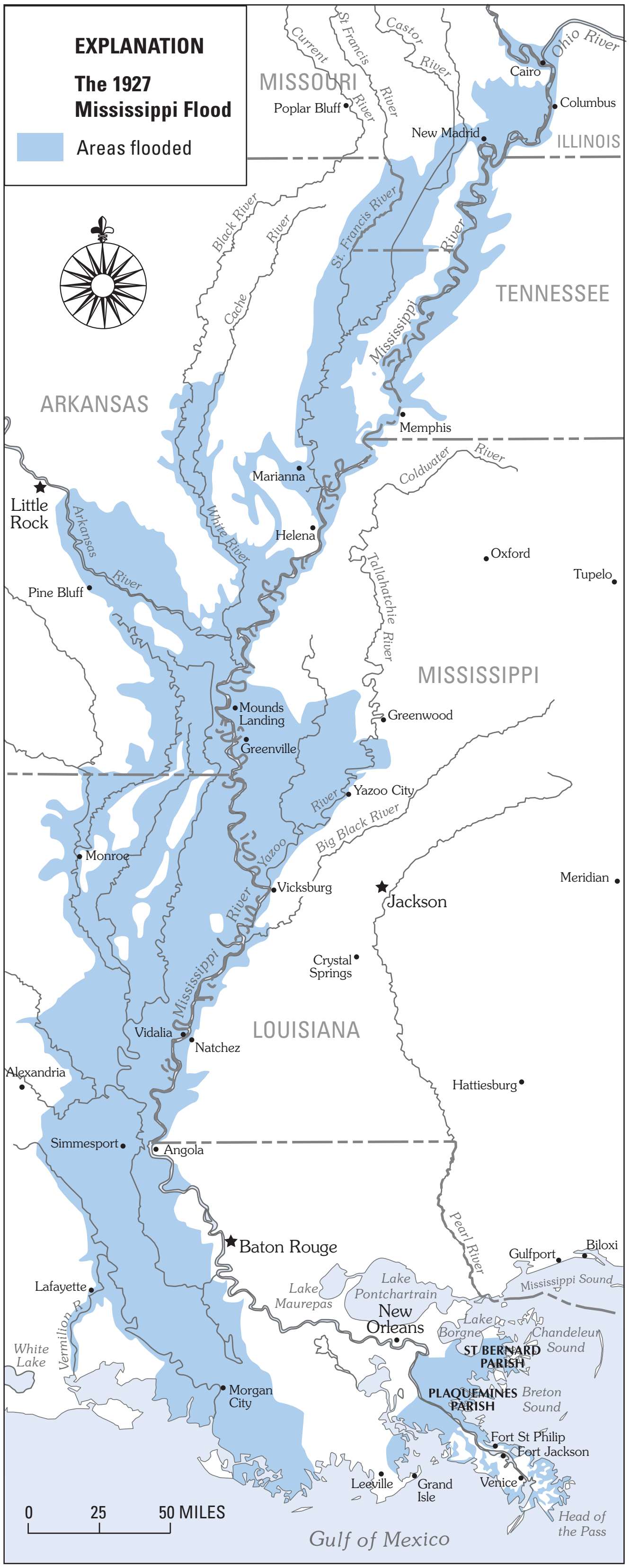


Figure 7. Area of the Lower Mississippi River Valley and the Mississippi River deltaic plain (MRDP) directly affected by the 1927 Mississippi River flood. Discharge estimated at 3 x 106 ft^{3}s^{-1} (85 x 103 m^{3}s^{-1}) downstream from the confluence of the Mississippi and Arkansas rivers. Area of MRDP shown in figure 3*A*. Louisiana State Museum Map Database, accessed November 16, 2005, at *http://lsm.crt.state.la.us/lsmmaps/mappic.asp?name=10786.jpg&title=Mississippi+River+Flood+of+1927* [ft^{3}s^{-1}, cubic feet per second; m^{3}s^{-1}, cubic meter per second]

Summary of Methods

By Helaine W. Markewich, Gary R. Buell, and Terry L. Fries

Study sites in the MRDP were chosen to include most of major geomorphic/ecological environments characteristic of the region. Some field and laboratory methods were used uniformly across all environments. However, not all field and/or laboratory methods were applicable to all environments. This section of the report gives only a brief summary of the field and laboratory methods used in all MRDP environments. Markewich (1998a, b) described in detail descriptions of these methods. This section specifically addresses field and laboratory methods that required modification depending on geomorphic/ecologic setting. It also discusses specific methods, such as those used to estimate bulk density, that are critical to calculating SOC storage/inventory.

Field Methods

Sampling and analyses were conducted during parts of the years 1996–2001. Equipment was disassembled and packed for transport to and from field sites either by truck or boat. Sampling methods primarily included the use of aluminum irrigation pipe for core collection; pipe diameter depended on sampling method. Multiple cores were taken from each locality for a better understanding of intrasite spatial variability. Core sites were located within a few meters (≤10 ft) of each other at each locality. A vibracore setup (fig. 8*A*) was used to take 7.62 cm (3 inches) outside diameter (OD), 3–5 m (9.84–16.4 ft) long cores in marsh sediment; short cores (generally 1–1.5 m, 3.28–4.92 ft) from marshes and other environments were hand-pushed, or in some cases, hand-pounded. In this report, cores taken for this study are referred to as MRDP cores.

Sampling Devices

At many core sites, to keep compaction to a minimum, half-rounds of irrigation pipe were pushed into the sediment, and a sharpened sheet of aluminum was pushed along the open face of the pipe to improve sample recovery. Then the pipe was dug out by hand. For all cores, except those collected at the Terrebonne brackish-marsh site, the included material was uniform enough with depth to allow a linear compaction correction to be applied through the entire length of the core. At the Terrebonne site, a linear compaction correction was only applied to the upper portions of push-core TB2a and vibracore TB2c, as the material in these upper sections was mostly peat. The deeper core sections were predominantly clay and sand; it was assumed that in these sections there was little to no compaction. Core descriptions and specific details on length, compaction, and sample analyses are given in Appendix 1, Site Data and Core Descriptions, tables 1-1 and 1-2.

Figure 8. Marsh samplers, Bayou Perot intermediate-marsh sample locality—(*A*) vibracore equipment; (*B*) Hargis sampler, and (*C*) McCauley peat borer (Russian peat borer).

Figure 8*B* shows a marsh-surface sample taken with a Hargis sampler (Hargis and Twilley, 1994). Figure 8*C* shows a deeper soil/sediment sample from the same marsh retrieved with a type of Russian peat borer known as a McCauley sampler (Day and others, 1979; U.S. Environmental Protection Agency, 1999a, b; *http://www.aquaticresearch.com/russian_peat_borer.htm*, accessed November 16, 2005). The Hargis and McCauley samplers, as well as pushed pipe and vibracore, were used in a small ancillary study to compare bulk-density and total-carbon values obtained by each sampling device. Each device was used to take samples from 3-m^2 (9.84-ft^2) plots in the floating-marsh (flotant) environments of Bayou Perot and Lake Salvador (Russell, 1942; O'Neil, 1949, Swarzenski and others, 1991; Swarzenski and Swenson, 1994; Swarzenski and Chmura, 1995). Descriptions of the field and laboratory techniques used for this small study are included in the following section. Data from this comparative study are included with other bulk-density and OC data in Appendix 2, Analytical and Derivative Soil/Sediment Organic Carbon Storage and Inventory Data, table 2-1.

Sampling for Comparison of Methods

Most bulk-density measurements for this study were made using the methods described in the section "Bulk Density—Sampling and Calculations" in Markewich (1998a). However, as mentioned in the preceding section, this study included one experiment that looked at the relation, if any, between the bulk-density value for an organic soil/sediment sample and the method/apparatus used to acquire the sample. Samples collected for bulk-density comparison also were used to compare total carbon (TC) determinations from coulometry, gas combustion-CO_2 analysis, and/or induction furnace mass spectrometry to loss-on-ignition (LOI) values for the same samples. Samples for bulk-density comparisons were taken using four sampling methods in different marsh environments. Samples taken to compare TC and LOI values were a subset of the bulk-density samples. Field methods included sampling with a sharpened 3-inch (7.62 cm) OD aluminum sampling tube (pushed-pipe technique), a Hargis sampler and a McCauley sampler.

Samples for bulk-density comparisons were taken from the Bayou Perot and Lake Salvador floating marshes. Sampling methods varied by depth interval as shown in table 2.

Table 2. Sampling protocol for bulk-density comparison study, Bayou Perot and Lake Salvador, Louisiana.

[Sampling method data given in Appendix 1, table 1-1; cm, centimeter]

Depth interval (cm)	Number of sites	Sampling methods (number of samples per sample method)
0–50	2	Push-core (3) Hargis sampler (3)
50–100	2	Push-core (3) Hargis sampler (3) McCauley (3 per sample interval; 1 interval)
100–400	2	Vibracore (1) McCauley (3 per sample interval; 4 intervals)

For the push-core and Hargis samples from the 0–50 cm depth, bulk density was determined on each 2-cm section. For the 50–100 cm depth, bulk density was determined on 2-cm sections taken every 4 cm (54–56, 60–62, 66–68, 72–74, 78–80, 84–86, 90–92, 96–98, 102–104 cm). Samples were taken at compaction corrected depths, or measured depth if there was no compaction. Bulk density was calculated using a compaction corrected volume if necessary. Sample bulk-density and OC data are given in Appendix 2, table 2-1.

For the 100–400 cm depth, bulk density was determined on 5-cm sections, taken every 50 cm (145–150, 195–200, 245–250, 295–300, 345–350, 395–400 cm). Samples were taken at compaction corrected depths (measured depth if no compaction). If a sample would cross an obvious stratigraphic or pedogenic boundary then a 5-cm sample was taken on either side, immediately above and below the boundary. Bulk density was calculated using a compaction corrected volume if necessary.

Laboratory Methods

Markewich (1998a, b) described analytical methods for TC, inorganic carbon (IC), organic carbon (OC), total nitrogen (TN), carbon-13 (^{13}C), nitrogen-15 (^{15}N), inorganic constituents, isotopes used in age estimations, and microstratigraphic markers. Sample preparation and analysis also are further discussed in the "Data" section of this report. Although several cores were taken at each locality, for most cores, not enough soil/sediment was available for sample replicates to be taken. Therefore, analytical variance for samples within a core could not be determined. Each core in a multiple-core set was used for a different suite of analyses, one core for C/N, inorganic constituents, and stable isotopes; a second core for cesium-137 (^{137}Cs), the third for carbon-14 (^{14}C), and the fourth core for microstratigraphic markers.

For all depth intervals, sample weights represent constant dry weights at 60°C unless the sediment was <10 percent by weight OC, then the sample was dried at 105°C. For OC comparisons, about 2 grams of a pulverized, homogeneous, oven-dry (60°C) sample was split. Organic carbon was determined by coulometry, gas combustion—CO_2 analysis, or infrared mass spectrometry on sample splits sent to the USGS laboratories in Menlo Park, California. LOI values were determined for sample splits sent to the USGS laboratory in Baton Rouge, Louisiana. Data for the bulk density and TC/LOI comparisons are included in Appendix 2, table 2-1. The methods used to determine OC concentration (mass-spectrometry, coulometry, and LOI) are comparable.

The reader is referred to earlier publications (Markewich, 1998a, b) for details on sample preparation, instrumentation, and analytical precision.

Approach to Developing Chronostratigraphy

Chronostratigraphic reconstruction of the prehuman development part of the geologic record relied on isotopic ^{14}C, compositional, and palynomorphic analyses. Construction of a chronostratigraphy for the post-human development part of the geologic record (year indicated with the prefix A.D.) involved most of the same analytical techniques; however, isotopic ^{137}Cs and ^{14}C bomb-spike analyses were used to establish "dated" horizons for the last 60 years. Summary plots and tables for isotopic analyses and bulk-density comparisons are included in the "Data" section and in the appendixes.

A detailed post-settlement history was available for the St. Bernard brackish-marsh locality. For St. Bernard, diagnostic microstratigraphic markers were used to identify horizons representing the time period from A.D. 1700 to A.D. 1900, a interval for which standard ^{14}C isotopic analysis is not reliable for age determinations. Special protocols were developed to separate, handle, and identify some of the microstratigraphic markers. Markewich (1998a, b) discussed the site history, as well as the laboratory procedures and methods developed/used, for the microstratigraphic marker analysis.

Data Reduction Methods

For this study, data reduction includes any technique or method used to convert raw data into more usable forms. Principally, all carbon data for the MRDP are for OC and/or for SOC storage and inventory calculations. SOC accumulation rates and inventory estimates were calculated using data from this study, data from published sources, and data from unpublished sources that were made available to this investigation. Buell and Markewich (2004) discussed the data reduction methods (analysis, standardization, and interpretation), as well as the calculations used to estimate SOC storage and inventory for the surface meter of mineral soil/sediment in MRB (standard units: from 0 to 10, from 10 to 20, from 20 to 50, from 50 to 100, and from 0 to 100 cm).

The database used for the estimations in Buell and Markewich (2004) is available the Internet (Buell and others, 2004). For this study, the methods described in Buell and Markewich (2004) were used to calculate SOC storage by MRDP environment, to rank by MRDP environment the current and potential storage of SOC, and to calculate the trend(s) in SOC mass through time for each MRDP environment. The database used for this report differs from that in Buell and others (2004) in that organic soils were included in the storage calculations. Revisions to data-reduction methods discussed in that report were made to accommodate the inclusion of organic-soil data and are described in the "Soil/Sediment Organic Carbon Landscape Distribution" section of this report.

Data and Results

The Analytical Data field in Appendix 1, table 1-1, gives the analytical data available for samples from each core taken as part of the MRDP study, All analytical data are included in Appendixes 1 through 5; however, only those data used for SOC storage and inventory estimations are discussed in this report.

This section presents summaries of bulk-density, carbon-content, isotope, inorganic-constituent, palynomorph, and SOC-storage and SOC-inventory data for the MRDP. Summary statistics for bulk density, carbon content, and mass accumulation are included in tables 3–5. Tables 6 and 7 summarize bulk-density, ^{137}Cs, ^{40}K, ^{14}C, and ^{13}C data for the Bayou Sauvage distributary locality. Inorganic-constituent content data for the MRDP cores are summarized in tables 8 (major elements) and 9 (minor elements).

Sample-specific bulk-density, carbon-content, carbon-isotope, inorganic-constituent, and SOC-storage and inventory data are presented for a few selected cores (figs. 9–17 and 32–39). All sample-specific ^{137}Cs and ^{40}K data are presented in figures 18–31. All sample-specific palynomorph data are presented in figures 40–57.

The "General Comments" section in Appendix 1 gives an overview of each MRDP environment and of specific conditions that affected coring methods and/or results. Core ID, date of acquisition, drive length, compaction and coring method are included in Appendix 1, table 1-1. This table also includes the type of analytical data available for each core. Core locations, environment, and stratigraphy are included in Appendix 1, table 1-2. Sample-specific data tables are in Appendixes 2–5.

Most of the core samples are of the surface meter of MRDP deposits. To varying degrees, these deposits have been affected by pedogenic alteration. Therefore, the term *soil/sediment* is used for all MRDP surface material. The surface material is operationally divided into two categories—organic or mineral. The soil/sediment is considered organic if the OC content is ≥12 percent by weight.

Bulk-Density Measurements

By Helaine W. Markewich, Terry L. Fries, and Gary R. Buell

Bulk density is reported in units of *grams per cubic centimeter*. Specifically, this unit is *grams of whole dry sediment per cubic centimeter of wet (bulk) sediment*. Bulk-density data for this study are included in Appendix 2, table 2-1. Bulk-density data for MRDP cores sampled for the comparative study are summarized in table 3 in the body of this report. Data are presented graphically in Appendix 6, figures 6-1 through 6-9.

As noted by R.D. Hall (Department of Geology, School of Science, Indiana University–Purdue University, Indianapolis), "Although bulk densities are seldom measured, they are important in quantitative soil studies" (Soil Geomorphology Laboratory Web site, accessed November 16, 2005, at *http://www.geology.iupui.edu/research/SoilsLab/procedures/bulk/Index.htm*). For this study, bulk density was measured for samples ≤5 cm thick from at least one core at each sample locality.

Many different methods are currently used for collection of organic-soil samples needed for bulk-density estimations. Coring is one of the common methods. Modifications to traditional coring techniques were used for this study. The reader is referred to Klute's "Method of Soil Analysis, Part I" (1986), the "Soil Survey Laboratory Methods Manual" (U.S. Department of Agriculture, 1996) and "Soil Survey Laboratory Information Manual" (U.S. Department of Agriculture, 1995) for discussions of bulk density and bulk-density sampling methods and analysis.

Bulk-density values for organic soil/sediment typical of marsh and swamp environments are considered by many researchers to be the most difficult to acquire. The soil/sediment in these environments commonly are saturated and have a high OC:mineral-matter ratio. Because bulk densities of organic soil/sediment generally are much lower than those of mineral soil/sediment, measurements of these values are more sensitive to error—regardless of the source of the error (field or laboratory). Major considerations in sampling and analysis of organic soil/sediment for bulk-density measurements include selection of (1) appropriate field methods to minimize compaction in cores/samples, (2) transport methods to minimize core/sample disturbance and/or compaction, and (3) laboratory methods most appropriate to sample type.

Table 3. Balanced analysis of variance looking at the effects of three coring techniques on bulk-density measurements for sediment from fresh- and intermediate-marsh environments, U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[g cm^{-3}, gram per cubic centimeter; ANOVA, analysis of variance; Pm, push-core measured bulk density (not corrected for compaction); Pc, push-core compaction-corrected bulk density; H, Hargis; M, McCauley; LS, Lake Salvador; BP, Bayou Perot; outline of Mississippi River deltaic plain shown in figure 3A; for locality information, see table 1 and figures 1 and 5]

Shallow-core comparison

Core site	Core	Number of intervals	Mean bulk density (g cm^{-3})			ANOVA results (alpha = 0.05)
			Pm	Pc	H	
LS	1	20	0.080	0.076	0.057	PmH–core, method; PcH–core, method
	2	20	0.095	0.090	0.072	
	3	20	0.092	0.087	0.056	
BP	1	18	0.088	0.077	0.064	PmH–method, core*meth PcH–nsd
	2	18	0.077	0.075	0.076	
	3	18	0.075	0.068	0.067	

Deep-core comparison

Core site	Core	Number of intervals	Mean bulk density (g cm^{-3})			ANOVA results (alpha = 0.05)
			Pm	Pc	M	
LS	1	7	0.213	0.152	0.088	PmM–method PcM–method
	2	7	0.166	0.115	0.091	
BP	1	11	0.185	0.138	0.154	PmM–nsd PcM–core
	2	11	0.290	0.230	0.189	

[1]Multiple cores were collected by three different methods at Lake Salvador (LS, fresh marsh, St. Charles Parish) and Bayou Perot (BP, intermediate marsh, Lafourche Parish). Three shallow cores were collected by push-core (P) and Hargis (H) methods and 2 deep cores by push-core (P, vibracore) and McCauley (M) methods. Each core was subsampled and bulk-density measurements made on selected depth intervals. Bulk-density measurements of the push-core samples were corrected for core compaction. Compaction was negligible in cores collected by the Hargis and McCauley methods.

ANOVA results listed indicate significant differences in mean bulk densities are due to spatial variability at the site (core), core-collection method (method), and(or) interaction between core and method (core*meth); nsd, no significant differences. The comparisons tested are PmH (push-core, measured, with Hargis), PcH (push-core, compaction-corrected, with Hargis), PmM (vibracore, measured, with McCauley), and PcM (vibracore, compaction-corrected, with McCauley).

Despite the difficulties in sample acquisition, samples for bulk-density measurements are critical to any investigation requiring estimations of mass-based characteristics/properties such as OC content. For this study, cores were taken at each locality using one or more of three methods—vibracore (fig. 8*A*) or push-core (cores ≤ 2 m in length, pushed by hand), Hargis sampler (fig 8*B*), and McCauley peat borer (fig. 8*C*) (for core-type information, see Appendix 1, table 1-1). At most localities, the cores were < 2 m apart. The sampling intervals for the Hargis and McCauley were summarized in the previous section "Sampling for Comparison of Methods." At many localities, such as Lake Salvador fresh marsh and Bayou Perot intermediate marsh, multiple cores were taken. Bulk-density measurements for samples from each core were compared. Results of the comparison are explained in detail in the section "Bulk-Density Comparisons—Bayou Perot Intermediate-Marsh and Lake Salvador Fresh-Marsh Cores."

Marsh and Swamp

The high water content and accompanying low density of marsh soil/sediment contribute both to the spatial variability of the physical marsh environment and to the many errors introduced in sample collection and measurement. Errors in bulk-density measurement contribute to error in mass-storage estimates in the very sediment with the highest organic-carbon content. Multiple cores were each collected by three methods at the Lake Salvador fresh-marsh site and the Bayou Perot intermediate-marsh site in order to determine the variability in bulk-density measurements for marsh soil/sediment.

A summary of all bulk-density measurements, for 20 of the 53 cores collected for this study of the MRDP, is given in table 4. The data are grouped for samples with OC content (in weight percent) <12 (group 1), ≥12<18 (group 2), ≥18<30 (group 3), ≥30 (group 4). Organic-carbon data and the relations between bulk density and OC are discussed in the section "Organic-Carbon Measurements and Soil/Sediment Organic Carbon Trends."

Table 4. Summary descriptive statistics for organic-carbon and bulk-density analyses of selected cores, U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[ocgrp, organic carbon group; ocgrp (by weight percent): 1, <12; 2, ≥12<18; 3, ≥18<30; 4, ≥30; <, less than; > greater than; ≥, less than or equal to; No., number of samples; g cm^{-3}, gram per cubic centimeter]

Core identifier[1]	ocgrp	Organic carbon					Bulk density				
		No.	Mean	Median	Minimum	Maximum	No.	Mean	Median	Minimum	Maximum
		Weight percent					g cm^{-3}				
Fresh marsh											
BV	1	5	8.75	9.28	5.82	10.70	5	0.19	0.19	0.13	0.28
	2	5	14.54	13.70	13.10	16.20	5	0.11	0.11	0.07	0.16
	3	2	20.88	20.88	19.60	22.15	2	0.11	0.11	0.07	0.14
LSPb	3	14	25.32	25.10	19.68	29.53	14	0.10	0.10	0.06	0.15
	4	18	37.27	36.58	30.21	43.79	18	0.07	0.06	0.03	0.11
LSPe	1	14	1.83	1.05	0.40	7.47	14	0.60	0.56	0.44	0.89
	2	2	13.91	13.91	13.61	14.22	2	0.26	0.26	0.24	0.29
	3	1	22.93	22.93	22.93	22.93	1	0.26	0.26	0.26	0.26
	4	10	39.22	39.72	30.34	45.77	10	0.15	0.16	0.10	0.22
SM1a	1	2	10.48	10.48	9.52	11.45	2	0.32	0.32	0.28	0.36
	2	8	14.93	15.57	12.36	16.62	8	0.23	0.21	0.17	0.36
	3	6	24.86	25.67	18.08	29.55	6	0.13	0.13	0.10	0.16
	4	13	40.09	41.21	32.96	42.92	13	0.10	0.10	0.07	0.13
SM1c	2	2	14.05	14.05	14.04	14.06	2	0.18	0.18	0.15	0.22
	3	8	24.46	25.16	18.18	28.83	8	0.15	0.12	0.07	0.30
	4	10	44.28	45.08	34.88	50.64	10	0.14	0.07	0.07	0.31
Intermediate marsh											
BPPb	4	29	39.43	39.67	30.89	48.62	29	0.07	0.07	0.05	0.09
BPPg	1	14	5.83	6.33	0.56	10.67	14	0.56	0.41	0.26	1.60
	2	4	17.19	17.20	16.60	17.78	4	0.21	0.21	0.17	0.25
	3	11	23.27	22.24	18.21	28.73	11	0.19	0.18	0.13	0.35
	4	7	38.25	38.44	32.21	44.79	7	0.12	0.12	0.08	0.17

Table 4. Summary descriptive statistics for organic-carbon and bulk-density analyses of selected cores, U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ocgrp, organic carbon group; ocgrp (by weight percent): 1, <12; 2, ≥12<18; 3, ≥18<30; 4, ≥30; <, less than; > greater than; ≥, less than or equal to; No., number of samples; g cm^{-3}, gram per cubic centimeter]

Core identifier[1]	ocgrp	Organic carbon					Bulk density				
		No.	Mean	Median	Minimum	Maximum	No.	Mean	Median	Minimum	Maximum
		Weight percent					g cm^{-3}				
Brackish marsh											
FW	2	1	15.00	15.00	15.00	15.00	1	0.10	0.10	0.10	0.10
	3	6	23.43	21.80	19.00	29.60	6	0.06	0.06	0.03	0.11
	4	2	31.60	31.60	30.50	32.70	2	0.04	0.04	0.03	0.04
SB1a	2	4	14.86	14.90	12.31	17.32	4	0.15	0.15	0.11	0.18
	3	16	26.63	26.22	23.09	29.98	16	0.11	0.11	0.08	0.16
	4	15	34.48	33.40	31.22	39.24	15	0.10	0.10	0.08	0.13
SB1c	1	3	7.65	10.23	1.84	10.89	3	0.19	0.21	0.12	0.23
	2	3	15.22	15.75	12.61	17.29	3	0.21	0.23	0.12	0.28
	3	7	22.73	22.23	20.94	26.10	7	0.20	0.18	0.14	0.29
	4	11	34.81	33.99	31.92	38.18	11	0.12	0.12	0.09	0.19
TB1a	1	6	10.72	10.65	10.27	11.47	6	0.11	0.10	0.10	0.14
	2	9	15.27	15.72	12.85	16.88	9	0.08	0.08	0.07	0.10
	3	3	21.50	21.38	20.58	22.54	3	0.08	0.07	0.06	0.10
TB2a	1	6	10.24	10.38	9.15	11.09	6	0.17	0.16	0.13	0.22
	2	14	14.96	15.20	12.37	17.27	14	0.12	0.12	0.10	0.17
	3	13	21.06	20.72	18.06	29.97	13	0.11	0.10	0.09	0.13
	4	15	36.27	37.63	30.32	39.88	15	0.07	0.07	0.06	0.09
TB2c	1	45	2.58	0.47	0.04	9.96	45	1.29	1.50	0.30	1.92
	2	6	14.38	13.97	13.00	16.63	6	0.11	0.10	0.07	0.15
	3	3	24.14	25.51	20.90	25.99	3	0.07	0.07	0.05	0.08
	4	11	38.27	39.25	31.50	40.86	11	0.05	0.05	0.04	0.06
Natural levee											
PLAQb	1	28	1.38	0.76	0.51	5.42	28	1.09	1.13	0.40	1.42
BSLa	1	29	3.03	2.50	0.73	9.03	29	0.93	0.84	0.34	1.43
	2	3	16.34	17.10	14.06	17.87	3	0.27	0.25	0.25	0.32
	3	9	22.88	23.23	19.27	25.79	9	0.28	0.26	0.21	0.37
BSL2b	1	27	2.07	1.48	0.73	10.62	27	0.91	0.94	0.41	1.13
	3	1	23.61	23.61	23.61	23.61	1	0.24	0.24	0.24	0.24
Distributary											
BSDb	1	6	8.33	8.55	5.51	11.24	6	0.53	0.53	0.46	0.59
	2	1	15.42	15.42	15.42	15.42	1	0.33	0.33	0.33	0.33
	3	19	26.95	27.12	19.91	29.92	19	0.20	0.19	0.14	0.32
	4	10	30.55	30.43	30.05	31.66	10	0.19	0.17	0.13	0.32
Backswamp											
MR1c	1	32	1.22	1.09	0.62	2.61	32	1.24	1.32	0.80	1.62
SL1b	1	31	1.71	0.97	0.37	6.40	31	1.31	1.35	0.55	2.05
Swamp											
TN1c	4	37	37.56	37.81	31.29	45.28	37	0.12	0.12	0.07	0.17

[1]For complete name and location of core, see table 1.

Bulk-Density Comparisons—Bayou Perot Intermediate-Marsh and Lake Salvador Fresh-Marsh Cores

Bulk-density data for Lake Salvador fresh-marsh and Bayou Perot intermediate-marsh soil/sediment are for discussion purposes considered representative of MRDP marshes and are graphically presented in figures 9–11. Three shallow cores were collected by the push-core and Hargis (Hargis and Twilley, 1994) methods and two deep cores by the push-core (vibracore) and McCauley methods. Each core was subsampled and bulk-density measurements were made on selected depth intervals. Bulk-density measurements of the push-core samples were corrected for core compaction. Compaction was assumed to be negligible in the cores collected by the Hargis and McCauley methods.

A two-way analysis of variance (ANOVA) with means comparisons was done to identify significant factors in the variability of the bulk-density measurements. Measured and compaction-corrected bulk-density values were compared within and across cores and across coring methods. To satisfy the conditions for a balanced ANOVA (same number of samples per core and consistent depth intervals for all cores), compaction-corrected bulk densities were interpolated to the original depth intervals (every 2 cm) used to sample the cores (table 3).

Cores were collected with the Hargis and McCauley samplers only at Lake Salvador and Bayou Perot and only for comparison with the push-core samples. ANOVA results (table 3, alpha = 0.05) show that the spatial variability in bulk density at each marsh site and the variability due to sampling method are likely contributors to statistically significant differences in bulk density. Mean shallow-core densities varied from 0.056 g cm^{-3} to 0.095 g cm^{-3}, whereas mean deep-core densities were slightly higher—0.088 g cm^{-3} to 0.290 g cm^{-3}. The Lake Salvador shallow cores varied significantly by core and sampling method (push-core versus Hargis) whether or not the push-core values were corrected for compaction. However, at Bayou Perot, significant differences in shallow-core densities by method and core-method interaction were not present when compaction-corrected push-core densities were compared with Hargis core densities. The presence of an interaction effect suggests that some of the observed spatial variability may be an artifact of sample collection. The Lake Salvador deep-core samples (vibracore versus McCauley) varied significantly by method (both measured and compaction-corrected push-core values) but not by core, whereas the Bayou Perot deep-core samples (compaction-corrected) varied by core but not by method.

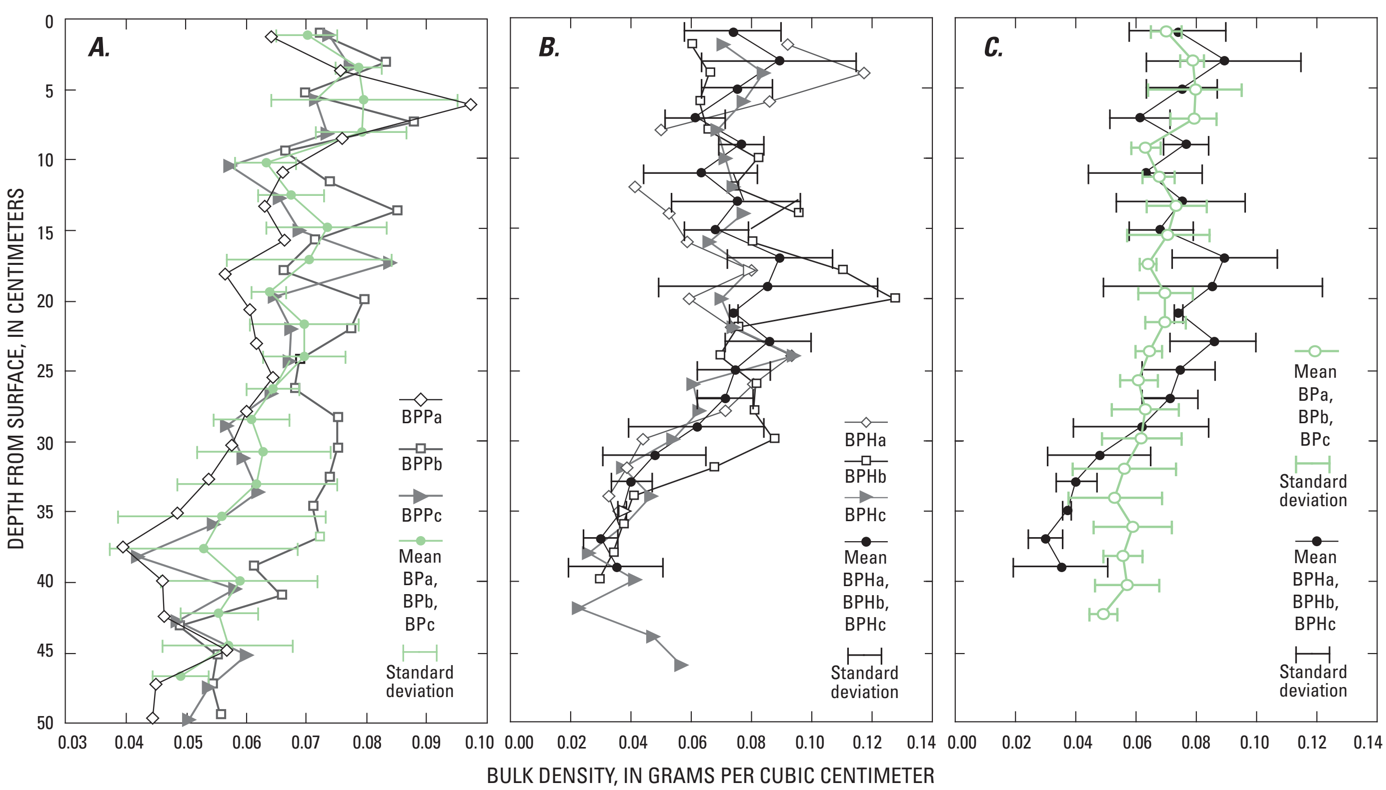


Figure 9. Comparison of Bayou Perot bulk-density values for samples from the surface 50 centimeters of marsh—(*A*) push-core samples, (*B*) Hargis samples, and (*C*) mean and standard deviation for push-core and Hargis samples (x-axis same as in *B*). The x-axis scales for *A* and *B* differ; *B* and *C* are the same. Note the greater range in bulk-density values for the Hargis samples in *C*. Data in Appendix 2, table 2-1.

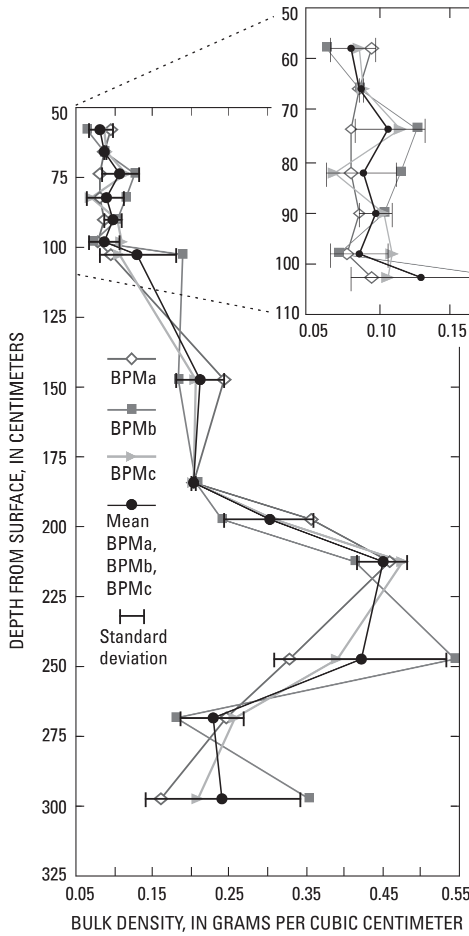


Figure 10. Bulk-density values for Bayou Perot intermediate-marsh McCauley-peat-borer samples. Smaller box is enlargement of the 50–110-centimeter depth interval. Data in Appendix 2, table 2-1.

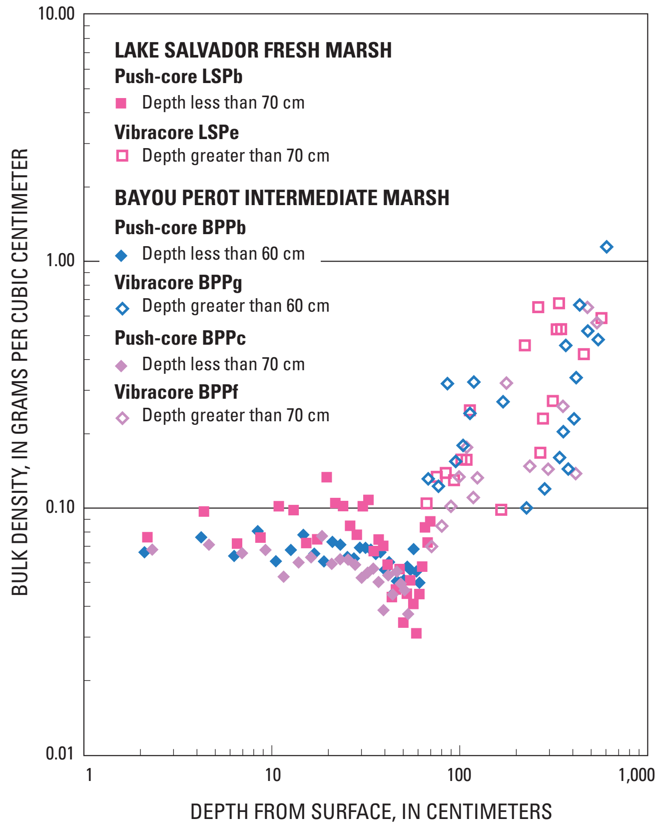


Figure 11. Bulk-density values for Lake Salvador fresh-marsh and Bayou Perot intermediate-marsh push-core and vibracore samples. Note decrease in bulk density in the 30–70-centimeter (cm) depth interval. Data in Appendix 2, table 2-1.

Statistically significant differences in bulk density were as likely to be related to spatial variability as to coring method. However, some of the variability within core sets could be due to inconsistency in the use and/or application of a particular type of sampler or to laboratory processing. In the laboratory, errors associated with sample-volume and weight measurement are possibly from 50 to 100 percent of the mean values reported in table 3. For this study, the push-core technique (hand-pushing for the shallow cores and vibracoring for the deep cores) was chosen as the sample collection method because the bulk-density values obtained using this method provided the least variable results.

Although there are apparent decreasing trends in bulk density in the near-surface portions of the Bayou Perot push-core and Hargis samples (fig. 9*A*–*B*), the overall variance is within the margin of error. A physically defensible statement is that the bulk density in the 0–50 cm depth is between 0.05 and 0.10 g cm^{-3}. Bulk-density data for Bayou Perot samples taken with a McCauley peat borer indicate that bulk density increases and decreases in a "step" pattern with depth (fig. 11), and that below 125 cm depth, all bulk-density values are ≥ 0.10 g cm^{-3}. In the deeper section of Bayou Perot and Lake Salvador marsh sediments, the patterns in bulk density are similar (fig. 11). Bulk-density values are generally less than 0.10 g cm^{-3} in the surface meter, decrease to about 0.04 g cm^{-3} at about 60 cm depth, and below 60 cm depth increase to a maximum value >1.0 g cm^{-3}.

Both Bayou Perot and Lake Salvador are floating-marsh environments in the Barataria Basin area of southeastern Louisiana. Marsh mats in this area have been studied by Swarzenski and others (1991), Swarzenski and Swenson (1994), and Swarzenski and Chmura (1995). Bulk-density data in figure 11 are similar to those shown in figure 3 of Swarzenski and Chmura (1995) for end-members of the range in floating marsh types. Their data for the "anchored" marsh type suggest a floating mat only 20 cm thick. The Bayou Perot and Lake

Salvador data presented here suggest that the very low bulk-density values at about 60 cm are most probably the base of a similar, but much thicker, floating mat. The increase in bulk density with increasing depth, to values near 1.0 g cm^{-3}, probably reflects increased compaction with depth in the nonfloating part of the marsh soil/sediment.

Comments on Marsh-Core Bulk-Density Data

The bulk-density data for MRDP marsh-core samples (Bayou Verret, Lake Salvador, and St. Mary fresh marsh; Bayou Perot intermediate marsh; Fish and Wildlife, St. Bernard, and Terrebonne brackish marsh) bring up many questions, most of which will not be answered by this study but directly affect SOC-mass calculations. These questions and some possible answers include:

- Why do push-core bulk-density data appear to be more internally consistent than data for samples collected by other methods (figs. 9 and 10)? In part, the data consistency may be due to reproducible preferential compaction of less dense layers within the cores. Assuming intra-core lithologic similarity, then the preferential compaction would be the same for each push-core. However, the lack of internal data (that is, within core) consistency for cores taken by other methods is not understood.

- At what value should bulk-density measurements be considered unreliable? Data suggest that values <0.06 g cm^{-3} probably have a standard error of ± 100 percent.

- Is the zone of low bulk-density values (from 30 to 70 cm depth) in Bayou Perot and Lake Salvador cores indicative of the floating-marsh base (fig. 11)?

These and other similar questions will be answered only as more bulk-density studies are started in marsh terrane.

Tangipahoa Swamp Cores TN1b and TN1c

Only one MRDP swamp locality was sampled for this study. Bulk-density values for the swamp soil/sediment were generally higher than values for marsh soil/sediment (see bulk-density values for ocgrp 4 in table 4). Bulk-density values for Tangipahoa swamp push-core TN1c range from 0.07 to 0.17 g cm^{-3}. Values for push-core TN1b, 0.06–0.12 g cm^{-3} are similar (Appendix 2, table 2-1).

Natural Levee, Distributary, and Backswamp

In the MRDP, bulk-density values for mineral soil/sediment are generally higher (>0.10<2.1 g cm^{-1} oven-dry; OC<10 percent) than those for organic soil/sediment (>0.03<0.30 g cm^{-1} oven-dry; OC>10 percent) (see table 4 and Appendix 2, table 2-1). Also, the relation between bulk-density values and depth from surface in mineral soil/sediment is more complex than for organic soil/sediment. Variation in bulk density is commonly due to variation in water content, post-depositional pedogenic alteration and (or), addition of allochthonous material by flooding. Commonly within the surface meter of mineral soil/sediment, bulk density can vary more than an order of magnitude. The St. Landry backswamp push-core SL1b is used here as an example (fig. 12).

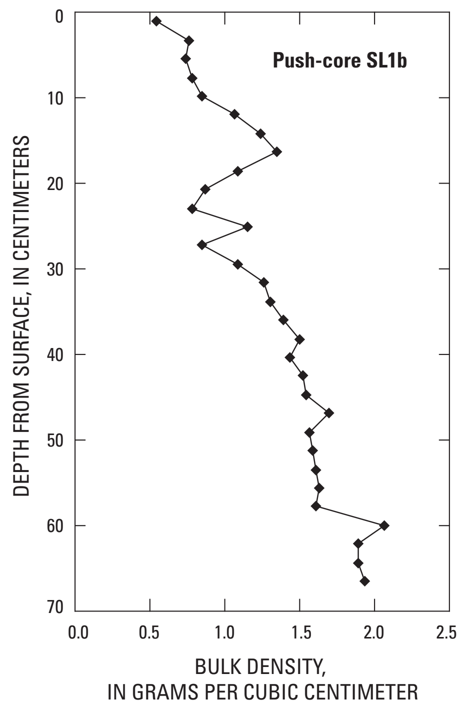


Figure 12. Bulk-density values for St. Landry backswamp push-core SL1b. Data in Appendix 2, table 2-1.

St. Landry Backswamp Core SL1b

The core description (Appendix 1, table 1-1) and iron content (Appendix 4, Major and Minor Inorganic-Constituent Content, table 4-2) suggest that the bulge in bulk-density values between 10 and 23 cm is probably due to pedogenic alteration. The sharper bulk-density "spikes" (23–27 cm; 58–63 cm) indicate an increase in clay-sized sediment. The overall increase in bulk density, from about 0.55 g cm^{-3} at the surface to greater than 2.0 g cm^{-3} at 60 cm depth, is probably due to compaction. This increase in bulk density with increasing depth from the surface is typical for low-OC-content mineral soil/sediment in the MRDP (Appendix 2, table 2-1).

Organic-Carbon Measurements and Soil/Sediment Organic Carbon Trends

By Helaine W. Markewich, Terry L. Fries, and Gary R. Buell

As mentioned in the "Laboratory Methods" section, TC content was determined by coulometry, gas combustion—CO_2 analysis, or infrared mass spectrometry, and TC values were comparable. Inorganic carbon did not exceed 0.5 weight percent in any MRDP sample. SOC-storage estimates vary with the organic-carbon content of soil/sediment. Incremental- and cumulative-SOC-storage values for individual core samples are included in Appendix 2, table 2-1. Bulk-density, incremental-SOC and cumulative-SOC trends for each core are presented in Appendix 6, figures 6-1 through 6-9.

Marsh and Swamp

As with the bulk-density data, OC data for Bayou Perot and Lake Salvador are representative of most marsh cores. As mentioned in the "Laboratory Methods" section, the OC concentration data for this study's MRDP samples are comparable. Figure 13 shows OC measured by coulometry (TC minus inorganic carbon [IC]) compared to TC measured by mass spectrometry for the Bayou Perot vibracore BPPg. Figure 14 shows organic matter measured by LOI analysis compared to OC measured by coulometry for samples from Bayou Perot push-core BPPb. Organic-carbon data from spectrometric and coulometric methods were used to calculate SOC storage and inventory for the MRDP cores. Loss-on-ignition measurements were made for samples from a few MRDP cores. Although not used for calculation of SOC storage, the regression model presented in figure 14 indicates that LOI data could be used to reliably estimate OC content in MRDP marsh environments.

There is a general trend for OC content to be inversely related to bulk density, but the relation is not readily apparent in sediment with a very high OC content (>30 percent by weight). If OC content is ≥30, then bulk density generally ranges from 0.055–0.095 g cm^{-3}. Bayou Perot intermediate marsh push-core BPPb data demonstrate the lack of correlation between OC and bulk density for samples with OC content >30 percent (fig. 15*A*).

The inverse relation between OC and bulk density is apparent in sediment with a greater range in OC content. Data for Lake Salvador fresh-marsh push-core LSPb shows a more typical range in OC content and bulk density for MRDP marsh (19–44 weight percent OC and 0.04–0.14 g cm^{-3} bulk density) and demonstrate the inverse relation between the two values (fig. 15*B*).

Figure 16 shows the incremental and cumulative SOC storage for push-cores BPPb and LSPb. One marked difference between the patterns for the two cores is the SOC per unit interval (1.0 cm). The mean incremental SOC for BPPb is 0.57 kg m^{-2}; for LSPb it is 0.52 kg m^{-2}. The maximum cumulative SOC is about the same for the two cores, 16.46 kg m^{-2} for BPPb and 16.72 kg m^{-2} for LSPb. The cumulative SOC for BPPb represents 60 cm; for LSPb, it represents 70 cm. The depth-interval difference results in a 0.27 g m^{-2} SOC unit value for BPPb compared to a 0.24 g m^{-2} SOC unit value for LSPb.

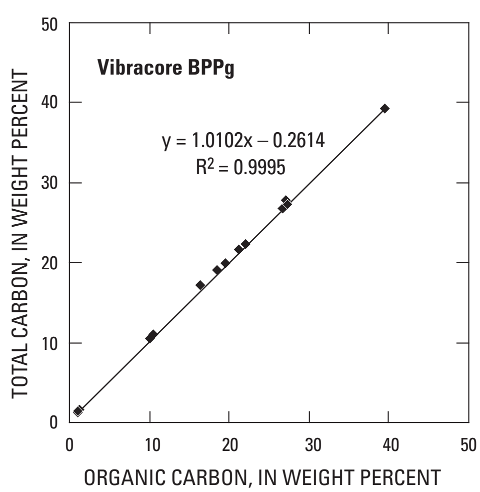


Figure 13. Bayou Perot vibracore BPPg organic carbon measured by coulometry (total carbon minus inorganic carbon) versus total carbon concentration in weight percent measured by mass spectrometry. Data in Appendix 2, table 2-1.

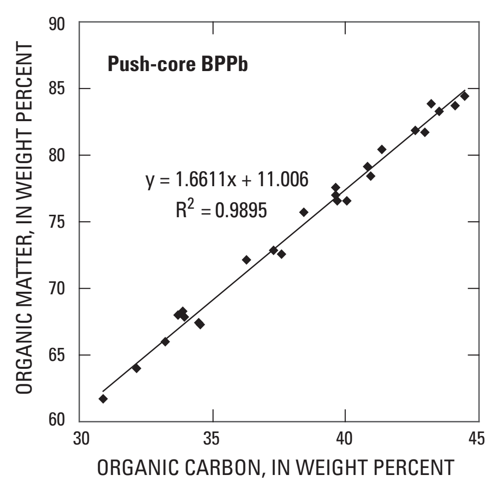


Figure 14. Bayou Perot push-core BPPb loss-on-ignition (LOI, organic matter) data versus organic-carbon concentration in weight percent. Note in least-square equation that axes intercept is not origin. Data in Appendix 2, table 2-1.

As noted in the section on bulk density, only one MRDP swamp locality, Tangipahoa, was sampled for this study. Like the bulk-density values for the swamp soil/sediment, the OC content was generally higher for swamp soil/sediment than for marsh soil/sediment (see OC values for ocgrp 4 in table 4). Organic-carbon values for Tangipahoa swamp push-core TN1c range from 31.29 to 45.28 weight percent (table 4). Incremental carbon-storage values for push-core TN1c range from 0.62 to 1.42 kg m^{-2} with an average of 0.97 kg m^{-2}, significantly greater values than those for the St. Mary fresh-marsh soil/sediment (0.57–1.42 kg m^{-2}, mean of 0.90 kg m^{-2}; Appendix 2, table 2-1) which has the highest OC content and incremental OC values of all sampled MRDP-marsh soil/sediment.

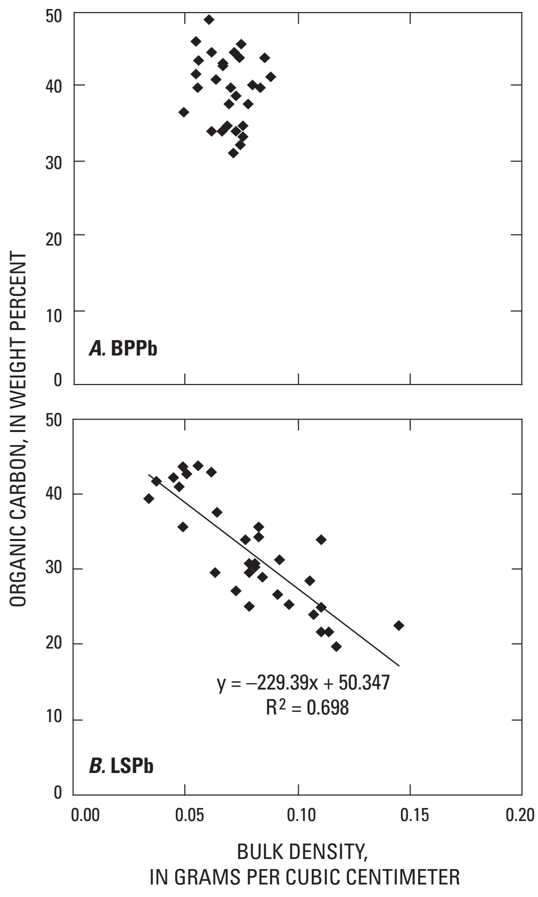


Figure 15. Bulk-density values versus organic-carbon (OC) concentration—(*A*) Bayou Perot intermediate-marsh push-core BPPb, and (*B*) Lake Salvador fresh-marsh push-core LSPb. OC concentration for BPPb is ≥30 weight percent; for LSPb, OC concentration varies and is inversely related to bulk density. Note that in B, OC (y-axis) minimum is 15 weight percent. Data in Appendix 2, table 2-1.

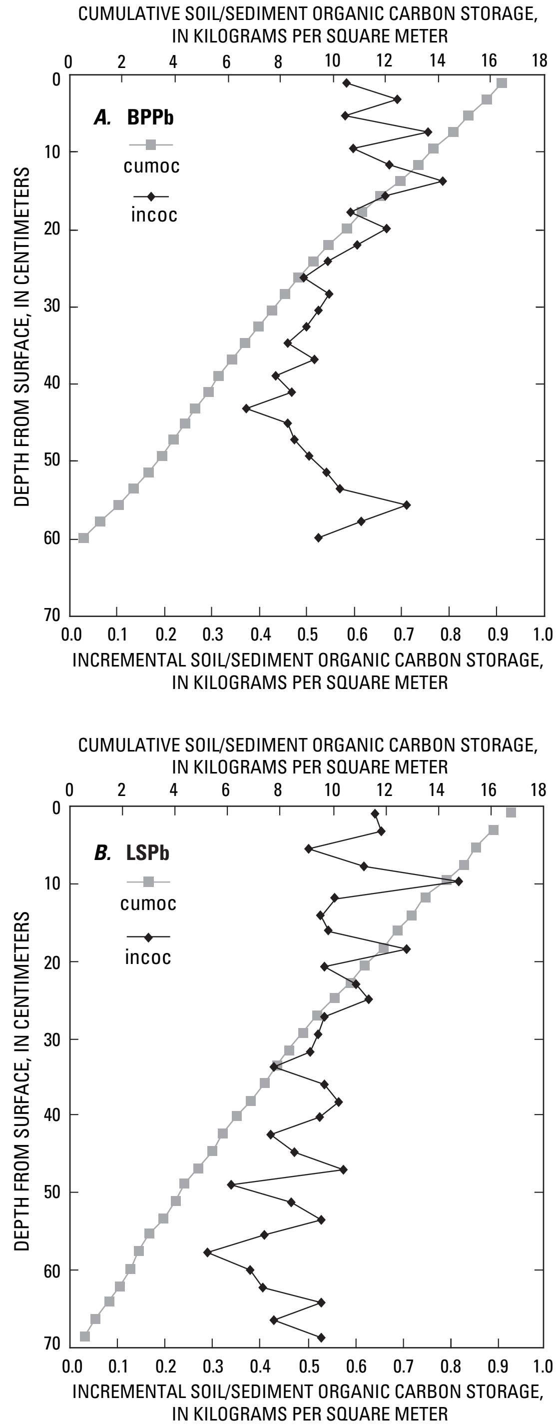


Figure 16. Incremental (incoc) and cumulative (cumoc) soil/sediment organic carbon (SOC) storage—(*A*) Bayou Perot intermediate-marsh push-core BPPb, and (*B*) Lake Salvador fresh-marsh push-core LSPb. SOC-storage and inventory values based on field-moist bulk density. Data in Appendix 2, table 2-1.

Natural Levee, Distributary, and Backswamp

Figure 17 shows SOC incremental and cumulative storage for St. Landry push-core SL1b (weight percent < 1.0 below 30 cm depth and no greater than 6.40 above 30 cm depth; Appendix 2, table 2-1). These are typical patterns for incremental and cumulative SOC storage in mineral soils developed in Holocene alluvium. These soils typically have more than half of their SOC cumulative storage in the surface 20 cm. These patterns differ markedly from those shown in figure 16 for marsh environments with high OC content.

The summary bulk-density and OC data in table 4 for backswamp, levee, and distributary environments show that the inverse relation between bulk density and OC also is seen in the low-OC mineral soil/sediment. The complete datasets are in Appendix 2, table 2-1.

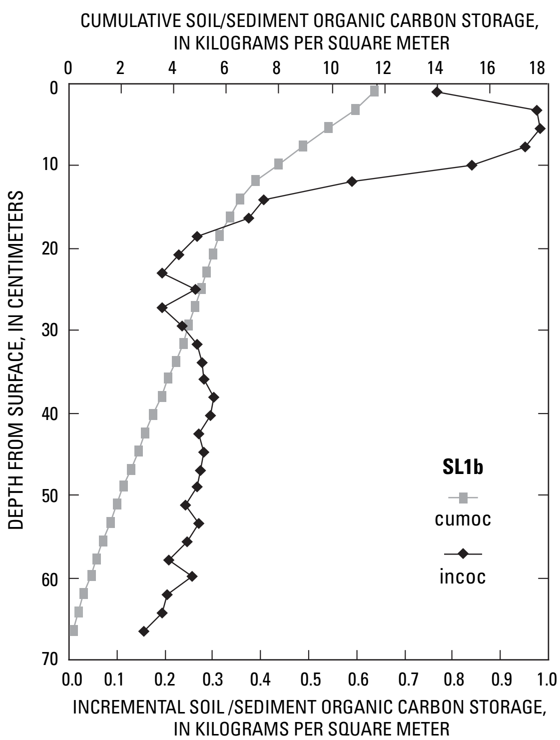


Figure 17. Incremental (incoc) and cumulative (cumoc) soil/sediment organic carbon storage for St. Landry backswamp push-core SL1b. Data in Appendix 2, table 2-1.

Cesium-137 and Potassium-40 Measurements

By John A. Robbins, Helaine W. Markewich, Gary R. Buell, and Nancy Morehead

Fallout ^{137}Cs ($t_{½}$ = 30.2 yr) has been used extensively as a sediment-age marker (DeLaune and others, 1978; Ritchie and McHenry, 1990; Dillon, 1998; Ritchie and Ritchie, 2003). The method makes use of the pulsed nature of ^{137}Cs deposition as fallout from above-ground nuclear weapons testing (NWT) that peaked between 1963 and 1964. Soil/sediment-core profiles that are ideally amenable to interpretation have sharply defined peaks in ^{137}Cs activity well below the air-water interface in stratigraphically uniform sediments. Because in most cases, ^{137}Cs is not directly transferred from air to sediment, but experiences long transit times across landscapes or in water bodies prior to incorporation in sediments, there is a broadening of the peak, particularly a significant post-fallout (upward) tail in distribution. In some cases, especially in highly organic sediment, radiocesium can diffuse within the sediment column. While this process broadens the profile, it generally has a minor effect on the location of the peak. In cases where there is neither significant post-depositional diffusion of the radionuclide nor sediment mixing, the horizon corresponding to onset of NWT during 1952, provides another age marker. Methods used for sample acquisition and analysis were included in Fries and Robbins (1998a, b), so only a summary is included in this report.

^{40}K ($t_{½}$ = 1. 3 x 10^9 yr), the long-lived radioactive isotope associated with stable potassium in earth's crustal material, is a potentially useful, environment-specific measure of the mineral content in sediment. To be strictly correct the term *K-minerals* is used, meaning any minerals that have potassium as part of their composition. These mostly are clays and clay-sized minerals in recent unconsolidated sediment. In combination with sediment bulk density, ^{40}K is used to identify down-core stratigraphic variations that could affect the validity of sediment-age assignments based on radiocesium profiles.

Figures 18–31 graphically present the ^{137}Cs and ^{40}K data for cores from the dominant MRDP environments. Data for these samples are in Appendix 3, table 3-1. In all figures, error bars for ^{137}Cs and ^{40}K are standard deviations (±1 σ) based on Poisson counting statistics.

Specific activity for ^{137}Cs and ^{40}K is given in disintegrations per minute per gram (d m^{-1} g^{-1}). The term *gram* in the specific activity unit actually means *gram of whole dry sediment*. As mentioned previously, bulk density is given in *grams per cubic centimeter*. The term *per cubic centimeter* in the bulk-density unit means *per cubic centimeter of wet (or bulk) sediment*.

In figures 18–31, the red line indicates the position of the radiocesium peak in each core (upper panels). The line is continued in lower panels as well to locate the peak with respect to bulk-density and ^{40}K profiles. This is done to help decide if a ^{137}Cs-peak location might be altered stratigraphically in that the depth-to-peak activity has not been altered by variable dilution of ^{137}Cs through anisotropic soil/sediment.

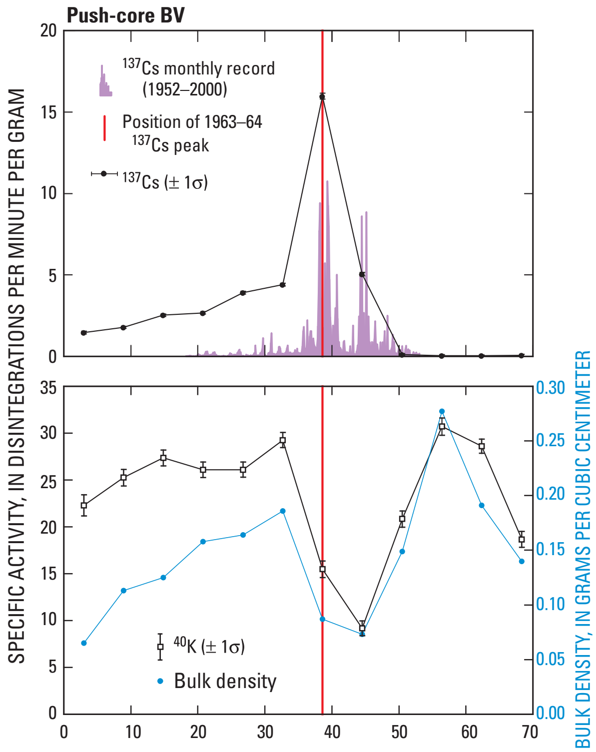


Figure 18. Bayou Verret fresh-marsh push-core BV profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

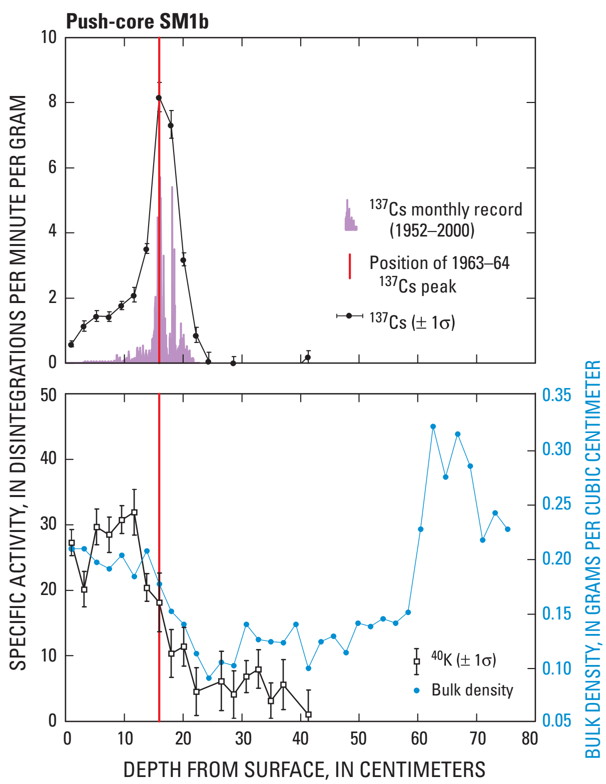


Figure 19. St. Mary fresh-marsh push-core SM1b profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

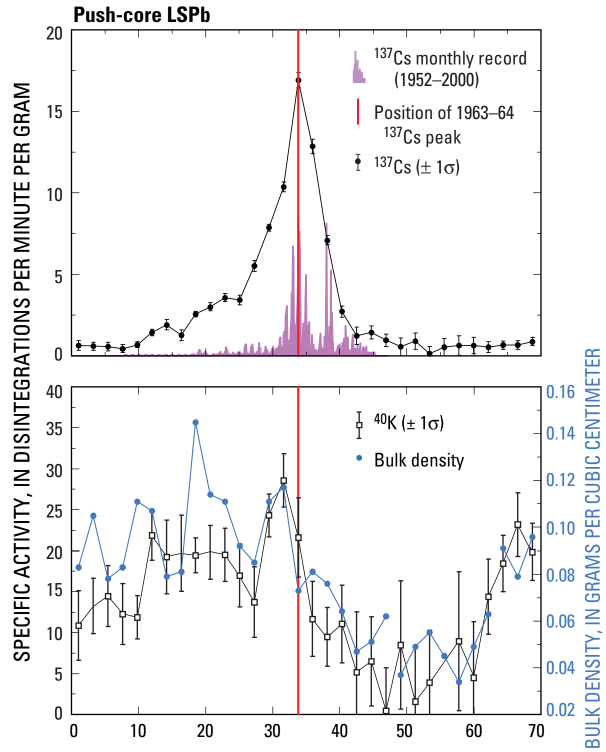


Figure 20. Lake Salvador fresh-marsh push-core LSPb profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

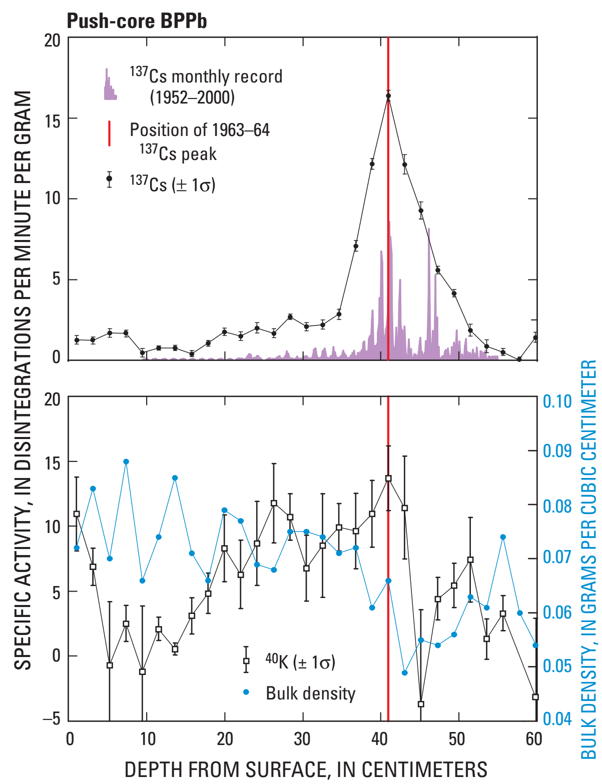


Figure 21. Bayou Perot intermediate-marsh push-core BPPb profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

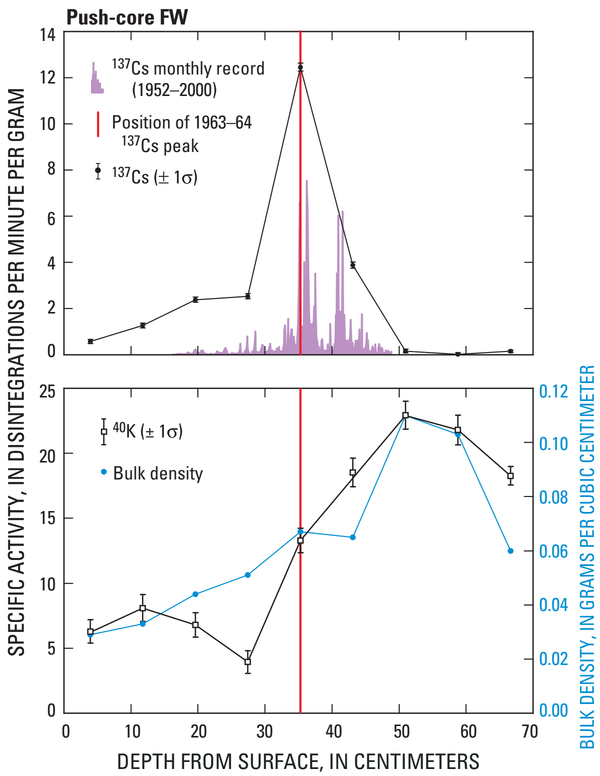


Figure 22. Fish and Wildlife brackish-marsh push-core FW profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

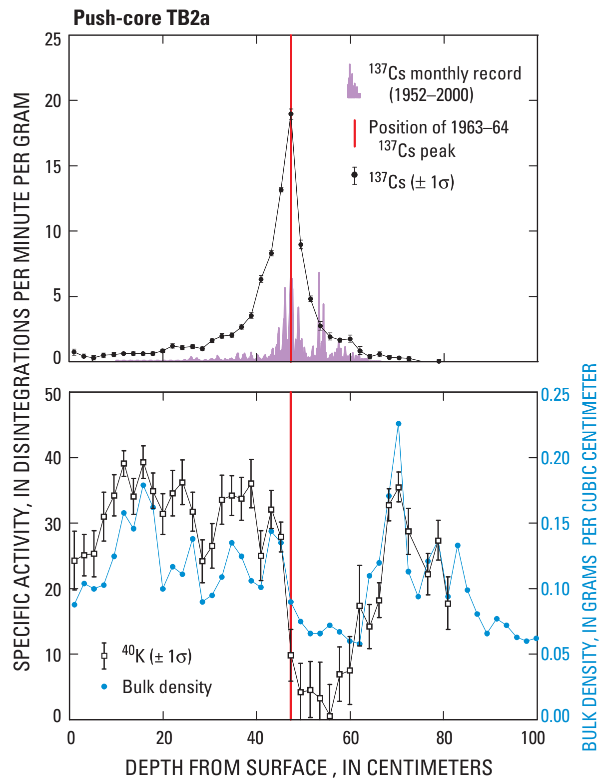


Figure 24. Terrebonne brackish-marsh push-core TB2a profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

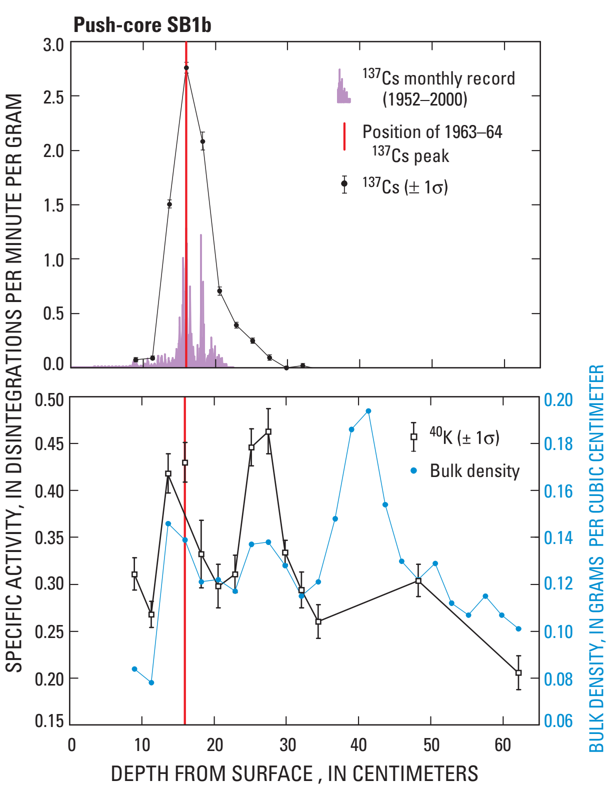


Figure 23. St. Bernard brackish-marsh push-core SB1b profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

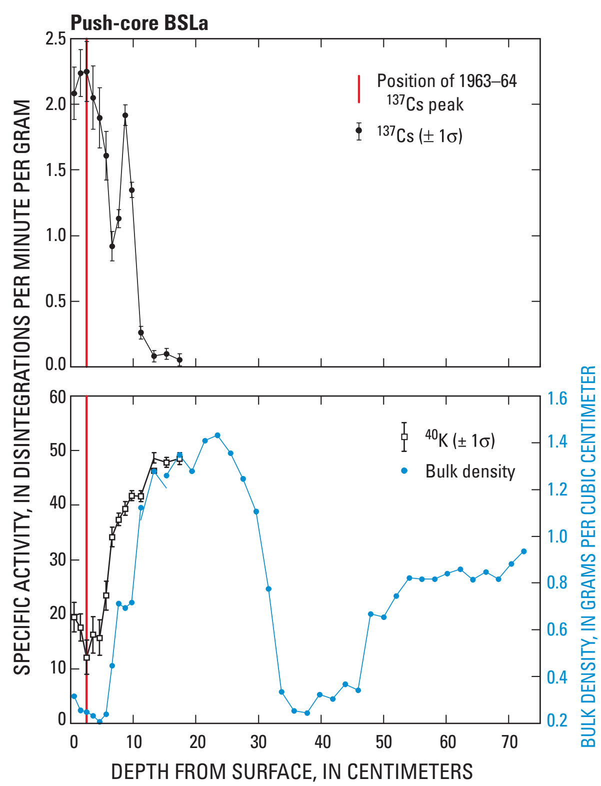


Figure 25. Bayou Sauvage levee push-core BSLa profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

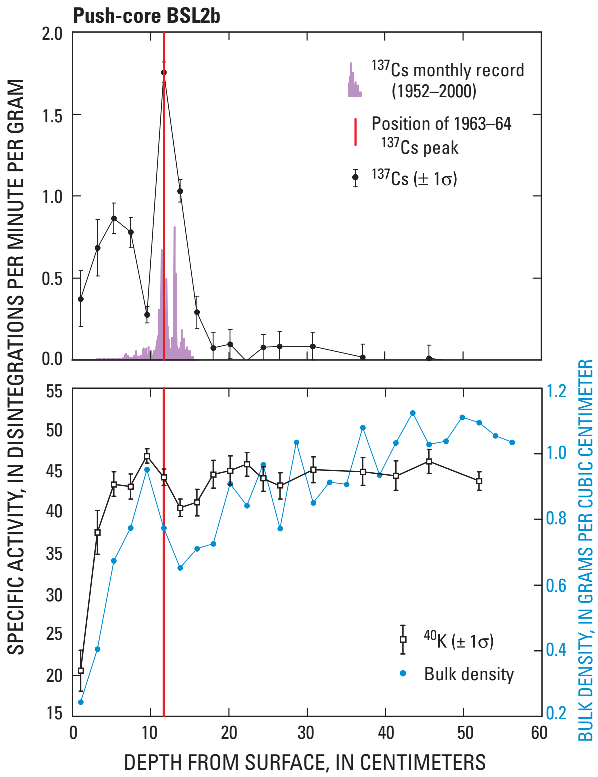


Figure 26. Bayou Sauvage levee push-core BSL2b profile. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

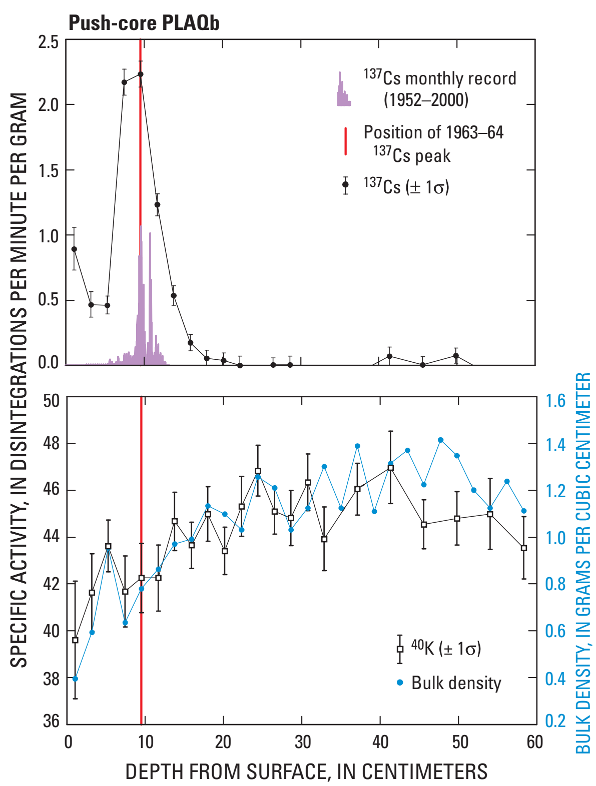


Figure 27. Plaquemines levee push-core PLAQb profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

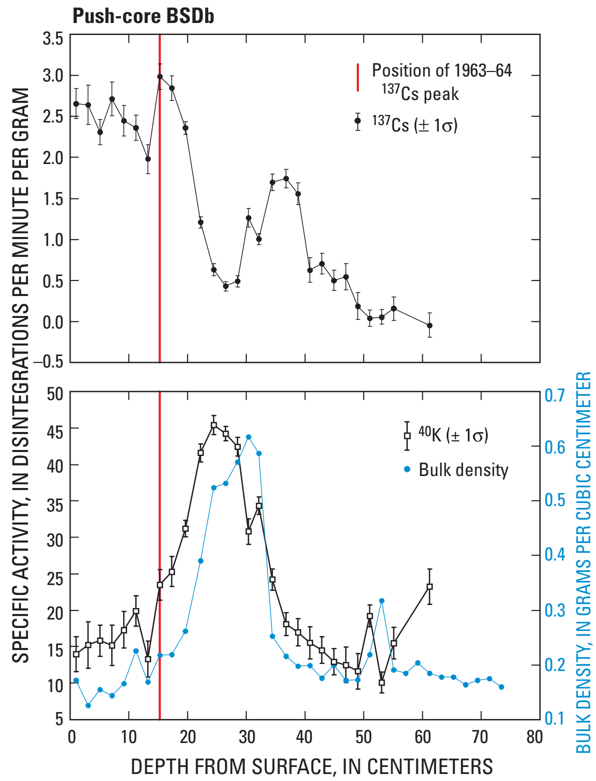


Figure 28. Bayou Sauvage distributary push-core BSDb profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

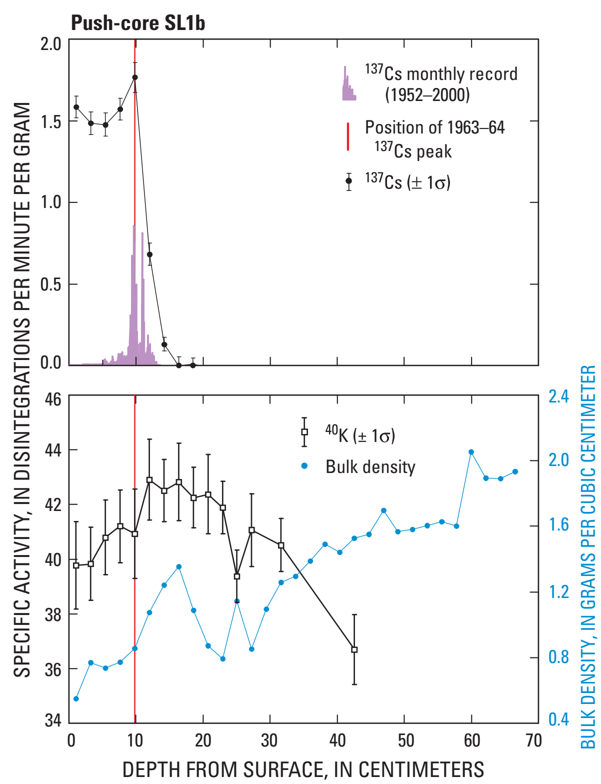


Figure 29. St. Landry backswamp push-core SL1b profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

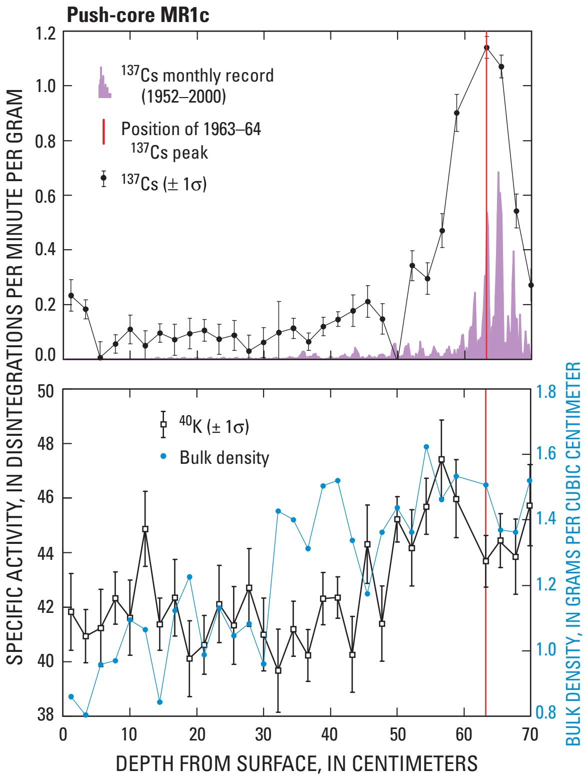


Figure 30. St. Martin backswamp push-core MR1c profiles. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

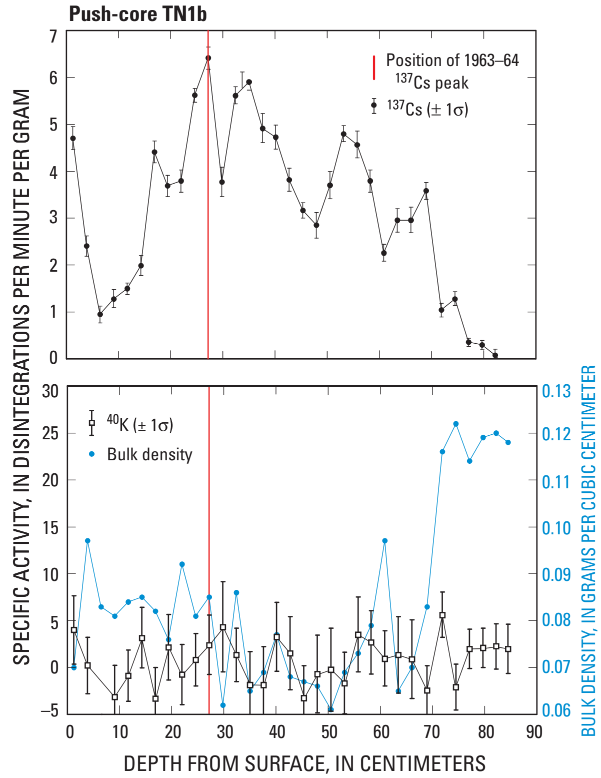


Figure 31. Tangipahoa swamp push-core TN1b—(*A*) no major stratigraphic features are near the cesium-137 maximum (red vertical line), and (*B*) potassium-40 pattern does not reflect the increase in bulk density at about 65 centimeter depth. Data in Appendix 3, table 3-1. [^{137}Cs, cesium-137; ^{40}K, potassium-40; ± 1 σ, plus or minus one sigma (standard devation)]

The histogram (shaded light purple) used in each figure approximates the monthly record of ^{137}Cs from atmospheric deposition across the study area. The histogram is shown only in those cases where there is confidence in assignment of radiocesium peak locations to the time of maximum deposition (1963–64). The histograms are plotted versus depth, based on the approximation of a linear rate of sediment accumulation. So depth is used as a proxy for time. As such, the histograms indicate core profiles that would be expected in a system where there are (1) no integration processes operating along the air-to-coring site pathway and (2) sediments faithfully record deposition with high resolution.

Differences in Cesium-137 and Potassium-40 by Environment

By environment, the least ambiguous ^{137}Cs profiles are in the marsh soil/sediment (figs. 18–24). Cesium-137 profiles in levee and distributary soil/sediment show the effects of intermittent allochthonous (fluvial) input and resuspension of sediment (figs. 25–28). Backswamp ^{137}Cs-activity signals seen in figures 29 and 30 show the variation that characterizes this environment. Figure 29 shows the effect of sediment resuspension on the ^{137}Cs profile. The ^{137}Cs profile for swamp soil/sediment at the Tangipahoa locality suggests constant disturbance during deposition (fig. 31). Early 1900 logging certainly played a part, but naturally-occurring events such as hurricanes could have caused some of the soil/sediment "churning" indicated by the ^{137}Cs profile.

Marsh

The ^{137}Cs peaks in push-cores BV, SM1b, LSPb, BPPb, FW, SB1b, and TB2a (figs. 18–24) are well defined and have peak widths that are consistent with the atmospheric fallout record.

Bulk-density and ^{40}K profiles for fresh-marsh push-cores BV, SM1b, and LSPb (figs. 18–20) are consistent with sediments with relatively high K-mineral content (^{40}K specific activity >25<50 d m^{-1} g^{-1}). In push-core BV, the K-mineral content and bulk density decline rapidly in the 12 cm interval from about 33–45 cm. The bulge in bulk density and ^{40}K below this depth suggest that at this site, pulses of material high in K-minerals alternating with periods of limited allochthonous input and high autochthonous production (low K-mineral content). The ^{40}K and bulk-density profiles for Lake Salvador push-core LSPb show a similar low allochthonous-content interval between 35 and 60 cm. St. Mary core samples show a similar trend in declining ^{40}K and bulk density from about 13–24 cm depth. In push-core SM1a, the ^{137}Cs peak falls in the middle of a zone (10–25 cm depth) of rapid uninterrupted decline in K-mineral content. Below 25 cm depth, there is no measurable bomb-spike ^{137}Cs; below 40 cm there is no measurable ^{40}K (Appendix 3, table 3-1). SM1b bulk-density data suggest that there is a significant change in sediment type (stratigraphic break) at about 60 cm depth which is also reflected in the OC data (Appendix 2, table 2-1).

Bulk-density and ^{40}K profiles for intermediate marsh push-core BPPb (fig. 21) are consistent with sediments with low K-mineral content (^{40}K specific activity <20 d m^{-1} g^{-1}). The bulk-density and ^{40}K values indicate minor stratigraphic changes at and just below the ^{137}Cs peak at about 41 cm depth, but do not indicate an alternation of low and high K-mineral content sediment deposition. The decrease in ^{40}K relative to the slight increase in bulk density in the 20–5 cm depth may indicate more quartz-rich sediment in this interval than in the rest of the core.

Bulk-density and ^{40}K profiles for brackish-marsh push-core FW (fig. 22) are similar to those for intermediate-marsh push-core BPPb. The ^{137}Cs, ^{40}K, and bulk-density profiles for brackish-marsh sediment in push-cores SB1b and TB2a differ significantly from each other and from the FW profiles (figs. 23 and 24). The ^{137}Cs profile for push-core SB1b shows a peak that is isolated and well defined with some downward tailing relative to the fallout record. The ^{137}Cs activities for push-core SB1b are similar to those of nonmarsh cores such as levee push-core PLAQb and distributary push-core BSDb (figs. 27 and 28) and are an order of magnitude less than for other marsh cores. The ^{137}Cs profile for push-core TB2a is "classic" in its peak isolation, degree of definition, and consistency with the fallout record, although radiocesium persists after fallout theoretically ceased (upward trailing edge). The ^{40}K and bulk-density profiles for push-core SB1b suggest some stratigraphic variability, and the SB1b ^{40}K profile suggests an extremely low K-mineral content (<0.5 d m^{-1} g^{-1}). The ^{40}K and bulk-density profiles for push-core TB2a, however, track closely and reveal a significant stratigraphic transition between 47 and 62 cm. The effect of this sediment pattern change on the TB2a ^{137}Cs profile is uncertain.

Natural Levee and Distributary

The ^{137}Cs, ^{40}K, and bulk-density profiles for natural levee cores are similar in that the ^{137}Cs activity is low, the ^{40}K activity, and therefore the K-mineral content, is high, and many bulk-density values are 1.0 g cm^{-3} or greater (figs. 25–27). The ^{137}Cs profile for Bayou Sauvage levee push-core BSLa (fig. 25) is not amenable to peak-age assignment. The profile suggests local erosion or reworking of the uppermost 10 cm of sediment. The ^{40}K and bulk-density profiles (fig. 25) reveal major stratigraphic transitions during the interval spanned by ^{137}Cs (about 15 cm). The bulk-density profile suggests several units with significantly different properties in the upper 70 cm of sediment.

The ^{137}Cs profile for Bayou Sauvage levee push-core BSL2b (fig. 26) superficially resembles that of adjacent push-core BSLa. Potassium-40 and bulk density (fig. 26) track closely through the length of the core. The depression in ^{137}Cs activity at 8–10 cm depth, associated with elevation in both ^{40}K and bulk density, is consistent with the presence of an isolated stratigraphic "anomaly"; and, like in push-core BSLa, the anomaly may be due to reworking of sediment and differential particle settling rates (a sort of graded bedding on the microscale).

The ^{137}Cs peak for Plaquemines levee push-core PLAQb (fig. 27) is well defined but has a width which is significantly broader on the trailing (down-core) side. This could be due either to post-depositional mobility, sediment mixing, or variable sediment accumulation. The ^{40}K and bulk-density profiles for push-core PLAQb (fig. 27) track well and increase gradually suggesting the absence of any stratigraphic effects.

The presence of ^{137}Cs through the whole length of the core, as well as the occurrence of multiple peaks, precludes establishment of a chronology for Bayou Sauvage distributary push-core BSDb (fig. 28). The broad peaks in ^{40}K activity and bulk density in the 15–35 cm depth correspond to a significant depression in ^{137}Cs activity and suggests a stratigraphic "lens" of high K-mineral content in this part of the core (fig. 28). The apparent offset in the ^{40}K and bulk-density profiles is probably due to a sampling/measurement error when sampling two halves of the same core.

Backswamp

The ^{137}Cs, ^{40}K, and bulk-density profiles for backswamp cores are similar to profiles for natural-levee and distributary cores in that the ^{137}Cs activity is low, the ^{40}K activity, and therefore the K-mineral content, is high, and many bulk-density values are 1.0 g cm^{-3} or greater (figs. 29 and 30). The solitary ^{137}Cs peak in St. Landry backswamp push-core SL1b is located close to the surface (fig. 29), suggesting very limited deposition and/or erosion since 1963–64. Specific activities for the four samples above the ^{137}Cs peak are only somewhat less than that of the peak, suggesting that the upper portion of the profile has been affected by near-surface mixing process. The ^{40}K and bulk-density profiles track in the core interval 20–3 cm, suggesting that there are no significant stratigraphic breaks in the interval which contains the radiocesium (fig. 29).

The ^{137}Cs profile is well defined in the St. Martin push-core MR1c. At 63 cm, the ^{137}Cs-peak activity is deep compared to the 10 cm peak depth for backswamp push-core SL1b (fig. 30). Cesium-137 activities from the surface to about 47 cm are small and close to the detection limit. The one nearly zero value between 5 and 6 cm is real. Both the ^{40}K and bulk-density profiles suggest a stratigraphic change at about 42 cm depth (fig. 30).

Swamp

Both ^{137}Cs and ^{40}K activities for Tangipahoa swamp push-core TN1b are intermediate to the activities in marsh and other nonmarsh soil/sediment (fig. 31). The ^{137}Cs profile for push-core TN1b indicates that there are no major stratigraphic features near the ^{137}Cs maximum noted by red vertical line. However, the presence of the ^{137}Cs radionuclide through most of the core length, as well as the occurrence of multiple peaks, suggests mixing and precludes establishment of a chronology. The ^{40}K profile mirrors the shape but not the intensity seen in the in bulk-density profile below 65 cm (fig. 31).

Post-1963–64 Trends in Soil/Sediment Deposition in Marsh, Levee, and Backswamp

There is no consistent trend in post-1964 soil/sediment deposition with type of marsh environment (table 5). Estimates of soil/sediment-mass accumulation from 1964 to sampling dates (1996–99) range from 16 to 56 kg m^{-2} (see Buell and Markewich, 2004, for calculation methods). Mean bulk-density values for the post-1964 interval at the sites range from 0.045 to 0.196 g cm^{-3} with the lowest bulk-density values measured for the intermediate marsh sites (push-cores BPPb and FW; 0.073 and 0.045 g cm^{-3}, respectively). Depth-to-peak ^{137}Cs activity ranged from 15.90 for St. Bernard push-core SB1b to 47.25 cm for Terrebonne push-core TB2a.

Levee sites at Bayou Sauvage and Plaquemines (push-cores BSLa, BSL2b, and PLAQb) show the effects of limited sediment supply (fluvial input) and limited accumulation of autochthonous material (peat). The depth-to-peak ^{137}Cs activity values were much closer to the land surface (2.55, 11.66, and 9.54 cm, respectively) than those for the marsh sites (from about 16 to >40 cm). The post-1964 mass-accumulation (deposition) values for the levees (7, 75, and 64 kg m^{-2}, respectively) are both less than and greater than the extreme values for the marsh sites. The large variation in quantity (mass) of sediment is consistent with fluvially dominated environments.

Backswamp sites (push-cores SL1b and MR1c) are similar to levee sites in that they are dominated by fluvial sediment, but differ from the levee sites in that the depth-to-peak ^{137}Cs activity has a broad range (9.81 and 63.27 cm, respectively). It is the depth-to-peak ^{137}Cs activity of 63.27 cm and the high mean bulk density (1.225 g cm^{-3}) that yield the very high 775 kg m^{-2} mass accumulation for the St. Martin backswamp site (push-core MR1c) in the Atchafalaya Basin.

Table 5. Vertical accretion, mean bulk density, and post-1963–64 cesuim-137 peak mass accumulation for cores taken as part of U.S. Geological Survey soil/sediment carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[cm, centimeter; VAR, vertical accretion rate; cm/yr^{-1}, centimeter per year; BD, bulk density; g cm^{-3}, gram per cubic centimeter; MA, sediment mass accumulation; kg m^{-2}, kilogram per square meter; MAR, mass-accumulation rate; kg m^{-2} yr^{-1}, kilogram per square meter per year; FM, fresh marsh; IM, intermediate marsh; BM, brackish marsh; L, natural levee; D, distributary; BS, backswamp; for sample data, see Appendix 2, table 2-1]

Environment/ core identifier	Depth-to-peak (cm)	VAR (cm yr^{-1})	Mean BD (g cm^{-3})	MA (kg m^{-2})	MAR (kg m^{-2} yr^{-1})
FM/BV	38.60	1.19	0.128	49	1.51
FM/SM1b	15.90	0.49	0.196	31	0.95
IM/BPPb	40.95	1.22	0.073	30	0.90
BM/FW	35.28	1.09	0.045	16	0.49
BM/SB1b	15.89	0.49	0.110	18	0.55
BM/TB2a	47.82	1.47	0.118	56	1.72
L/BSLa	2.55	0.07	0.287	7	0.20
L/BSL2b	11.61	0.33	0.640	75	2.11
L/PLAQb	9.50	0.27	0.674	64	1.80
D/BSDb	15.31	0.43	0.172	26	0.73
BS/SL1b	9.82	0.30	0.736	72	2.22
BS/MR1c	63.47	1.95	1.225	775	23.85

Carbon-14 Measurements

By John P. McGeehin and Helaine W. Markewich

The relatively long half-life of the carbon-14 (^{14}C) atom ($t_{1/2}$ = 5,730 years) and its natural occurrence in all living material make ^{14}C dating a useful tool for establishing chronology of plant matter deposited during a period of many thousands of years in the MRDP. Carbon-14 is incorporated into living plants through photosynthesis of CO_2 that includes ^{14}C atoms in proportion to atmospheric concentrations of the isotope at the time of growth. The zero year (0 yr BP or "years before present") for ^{14}C dating is A.D. 1950. Samples with activities equivalent to plants growing in A.D. 1950 are called *MODERN*. The year A.D. 1950 was chosen as the zero year for ^{14}C, in part, because it predates the onset of above-ground nuclear weapons testing. Counting back from A.D. 1950, samples of organic and inorganic carbon can be ^{14}C dated to about 50,000 yr BP. Calibration of ^{14}C dates for terrestrial and marine samples to correct for atmospheric fluctuations of ^{14}C concentrations over time (Bronk Ramsey, 1995, 2001) can be done in 0–26,000 CAL yr BP using the internationally ratified dataset "IntCal04" (Reimer and others, 2004a). Bomb carbon samples with >MODERN activities (greater than the zero year) cannot be calibrated. Analytical data for MRDP ^{14}C samples are given in Appendix 3, table 3-2. Values for pre-Modern ^{14}C ages used throughout this text are in yr BP; calibrated ages are in CAL yr BP (Appendix 3, table 3-2).

Like ^{137}Cs deposition, isotopic-^{14}C deposition in modern sediments is the result of fallout from above-ground NWT that peaked between 1963 and 1964. Measurements for samples with >MODERN ^{14}C activity as a result of NWT are reported as a $\Delta^{14}C$ value, which is the per mil deviation of the sample activity relative to the modern standard. For a more lengthy discussion of ^{14}C age determination, the reader is referred to McGeehin (1998a, b).

Where practical, $\Delta^{14}C$ bomb-peak values were used in concert with depth-to-peak ^{137}Cs activities to provide anchor points to which SOC cumulative storage could be indexed. The results for marsh sediment were the best, probably due to the relatively quick incorporation of excess atmospheric ^{14}C into fast-growing plant material. Bomb-spike $\Delta^{14}C$ values for soil/sediment from the distributary environment (Bayou Sauvage), with much lower OC content than the marsh environments, also corroborated the ^{137}Cs activity data.

Accurate ^{14}C age determination requires that plant carbon in sediment be formed in place with minimal transport and reworking. Because of the allochthonous input of ^{14}C in levee, swamp and backswamp environments, ^{14}C data for these MRDP environments were minimally useful for chronostratigraphic interpretation.

Figures 32–36 graphically show the ^{14}C data for MRDP cores from fresh- and brackish-marsh sites. Cesium-137 data for Bayou Sauvage distributary push-core BSDb are included in table 6. Isotopic ^{14}C and ^{13}C for the adjacent push-core BSDc are included in table 7.

Table 6. Bulk-density, cesium-137, and potassium-40 summary data for Bayou Sauvage distributary push-core core BSDb, Mississippi River deltaic plain, southeastern Louisiana.

[cm, centimeters; g cm^{-3}, grams per cubic centimeter; ^{137}Cs, cesium-137; d m^{-1} g^{-1}, disintegrations per minute per gram; ^{40}K, potassium-40; —, lost sample; 1s, 1 standard deviation; see Appendix 3, table 3-1 for complete ^{137}Cs and ^{40}K data]

Sample identifier	Corrected mid-point depth (cm)	Oven-dry bulk density (g cm^{-3})	^{137}Cs specific activity (d m^{-1} g^{-1})	^{40}K specific activity (d m^{-1} g^{-1})
BSDb-1	1.02	0.17	2.66	13.99
BSDb-2	3.06	0.13	2.64	15.23
BSDb-3	5.10	0.16	2.31	15.83
BSDb-4	7.14	0.14	2.71	15.2
BSDb-5	9.19	0.17	2.45	17.3
BSDb-6	11.23	0.23	2.36	19.92
BSDb-7	13.27	0.17	1.98	13.31
BSDb-8	15.31	0.22	2.99	23.51
BSDb-9	17.35	0.22	2.85	25.30
BSDb-10	19.65	0.26	2.36	31.18
BSDb-11	22.20	0.39	1.21	41.60
BSDb-12	24.50	0.52	0.63	45.41
BSDb-13	26.54	0.53	0.43	44.22
BSDb-14	28.58	0.57	0.49	42.44
BSDb-15	30.37	0.62	1.26	30.82
BSDb-16	32.16	0.59	1.00	34.35
BSDb-17	34.45	0.25	1.70	24.24
BSDb-18	36.75	0.22	1.75	18.11
BSDb-19	38.79	0.20	1.56	16.98
BSDb-20	40.83	0.20	0.63	15.53
BSDb-21	42.87	0.18	0.70	14.53
BSDb-22	44.92	0.20	0.50	12.94
BSDb-23	46.96	0.17	0.54	12.52
BSDb-24	49.00	0.17	0.19	11.63
BSDb-25	51.04	0.22	0.04	19.23
BSDb-26	53.08	0.32	0.06	10.12
BSDb-27	55.12	0.19	0.16	15.50
BSDb-28	57.17	0.18	—	—
BSDb-29	59.21	0.20	—	—
BSDb-30	61.25	0.18	0.00	23.25

St. Mary Fresh-Marsh Cores SM1a, SM1b, and SM1c

Figure 32 shows the ^{14}C and ^{137}Cs patterns for St. Mary fresh-marsh push-cores SM1a and SM1b. The patterns are matched closely (within a few centimeters), corroborating placement of the 1963–64 datum. This similarity of pattern is typical for many of the marsh sites. One explanation for the "offset" between ^{14}C and ^{137}Cs peak activities might be the error introduced during sampling of the cores which were ≤ 1 m distant. Another explanation may be the different pathways (and associated time scales) taken by the ^{14}C and ^{137}Cs isotopes from time of formation in the atmosphere until accumulation in local soil/sediment as mentioned in the previous section. This topic was discussed in detail in the section "Cesium-137 and Potassium-40 Measurements."

Carbon-14 ages for the fresh-marsh vibracore SM1c range from 280 to 3,100 CAL yr BP and are in chronostratigraphic order throughout the core (fig. 33). Projecting this data forward to the post-NWT period, represented by the ^{14}C and ^{137}Cs bomb curves for push-cores SM1a and SM1b (fig. 32), results in continued agreement despite the very different compaction rates and sampling intervals for the vibracore compared to push cores at the St. Mary's site. This agreement for the very young section of the cores and the chronostratigraphic continuity of older ^{14}C ages suggests that, at least for St. Mary marsh site, older markers based on ^{14}C dating of the vibracore samples can be used with some degree of confidence for calculating rates of SOC storage during long periods.

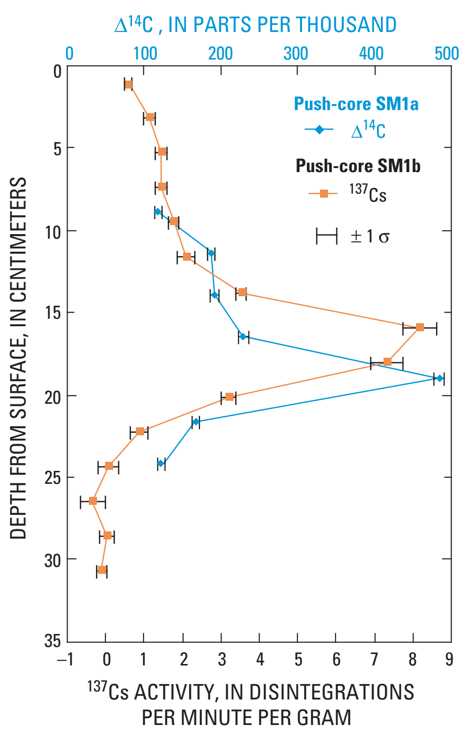


Figure 32. St. Mary fresh-marsh push-core SM1a bomb-spike Delta carbon-14 ($\Delta^{14}C$) activity and push-core SM1b bomb-spike cesium-137 (^{137}Cs) activity versus depth. For calculation of soil/sediment organic SOC mass accumulation rates, the 1963–64 datum is placed within the two isotopic peaks. The negative ^{137}Cs values can be viewed as "0." Data in Appendix 3, tables 3-1 and 3-2. [± 1 σ, plus or minus one sigma (standard devation)]

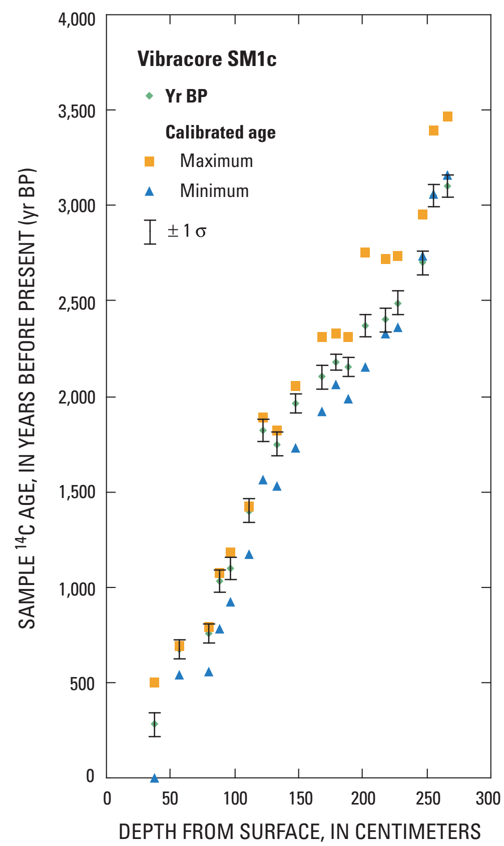


Figure 33. St. Mary fresh-marsh vibracore SM1c carbon-14 (14ᶜ) age, in calibrated years before present (CAL yr BP), versus depth. For a given depth from the surface, the 14ᶜ age falls within the calibrated age range maximum and minimum. Data in Appendix 3, table 3-2. [± 1 σ, plus or minus one sigma (standard devation)]

Table 7. Isotopic carbon-14 and carbon-13 data for Bayou Sauvage distributary push-core BSDc, Mississippi River deltaic plain, southeastern Louisiana.

[cm, centimeter; ID, identifier; ^{14}C, carbon-14; $\Delta^{14}C$, Delta carbon-14; $\delta^{13}C$, delta carbon-13; yr BP, years before present; ± , plus or minus; ‰, parts per thousand; >, greater than; —, no data; –, minus; do., ditto; for complete explanation of isotopic carbon data, see Appendix 3, table 3-2]

Corrected midpoint depth (cm)	Lab ID WW-	Material	^{14}C age		$\Delta^{14}C$		$\delta^{13}C$	Calibrated age range (yr BP)	
			Yr BP	±	‰	±	‰	Maximum	Minimum
9.18	1852	Peat	>MODERN	—	36.3	4.6	–26.4	—	—
11.22	1853	do.	do.	—	41.3	4.6	–26.8	—	—
13.26	1854	do.	do.	—	44.9	4.7	–26.7	—	—
15.30	1855	do.	do.	—	93.3	4.9	–26.4	—	—
17.34	1856	do.	do.	—	106.1	4.9	–26.0	—	—
19.38	1857	do.	>MODERN	—	127.6	4.2	–25.3	—	—
21.42	1858	do.	250	40	—	—	–26.0	440	0
35.70	1794	Plant material	250	40	—	—	–24.4	440	0
49.98	1795	do.	220	50	—	—	–24.4	430	–10
57.12	1796	do.	460	50	—	—	–26.8	630	320
62.22	1797	do.	490	50	—	—	–26.8	650	450
78.80	1798	do.	540	50	—	—	–27.0	650	500
78.80	1799	Charcoal	1,070	50	—	—	–25.0	1,090	910

Terrebonne Brackish-Marsh Cores TB2a and TB2c

Delta-^{14}C data results for Terrebonne brackish-marsh push-core TB2a and vibracore TB2c are similar to those for the fresh-marsh cores. Figure 34 shows a offset in the ^{14}C and ^{137}Cs depth-to-peak values for the two halves of push-core TB2a that is similar to the offset between ^{14}C and ^{137}Cs depth-to-peak values in St. Mary fresh-marsh push-cores SM1a and SM1b (fig. 32). The reasons for the offset in the two halves of Terrebonne push-core TB2a are similar to those for push-core SM1a and SM1b: (1) error due to sampling two halves of the same core; (2) different pathways (and associated time scales) taken by the ^{14}C and ^{137}Cs isotopes from time of formation until accumulation in local soil/sediment; or (3) some combination of the two. Regardless of the reason for the offset in isotopic maxima, for the purpose of calculating rates of SOC accumulation, the 1963–64 datum can be placed within a few-centimeter thick depth interval in brackish-marsh push-core TB2a.

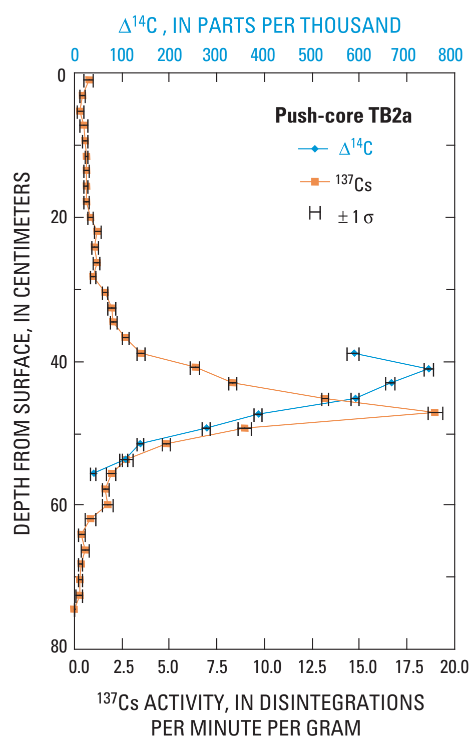


Figure 34. Terrebonne brackish-marsh push-core TB2a bomb-spike Delta carbon-14 ($\Delta^{14}C$) and cesium-137 (^{137}Cs) profiles. For calculation of SOC mass accumulation rates, the 1963–64 datum is placed within the two isotopic peaks. Data in Appendix 3, tables 3-1 and 3-2. [± 1 σ, plus or minus one sigma (standard devation)]

Comparing Δ14C data for the two halves of Terrebonne push-core TB2a to the data for vibracore TB2c is more problematic. Terrebonne vibracore TB2c includes about 270 cm of cross-bedded distributary sands at its base overlain by about a meter of clay grading upward (30-cm-thick transition zone) into 160 cm of peat. The corrected-depth interval between 138.8 and 161.9 cm is the transition zone between overlying peat and underlying clay (Appendix 1, table 1-2). As discussed in the section "Field Methods," the compaction correction for TB2c was applied only to the peat above this transition zone (midpoint of interval; Appendix 1, table 1-1, footnote 5 and table 1-2). It was assumed that the peat in the uppermost part of the core absorbed most of the compaction resulting from coring. The same assumption was applied to push-core TB2a even though the compaction correction was much less than for vibracore TB2c (base of peat; Appendix 1, table 1-1, footnote 4 and table 1-2). The resulting Δ14C curves have significant offset (9 cm), but yield closer results than if the compaction corrections had been applied linearly to the entire core lengths (fig. 35; Appendix 3, table 3-2).

The change of environment from distributary channel to delta clay to peat also has implications for all the wood ages. In fluvial environments (unless documented as part of a stratigraphic sequence such as a point-bar deposit) all wood fragment ages are viewed as no-older-than. Therefore, the 14C age data from 357.89 cm depth to core bottom have to be viewed as no-older-than data. Even with that caveat, most the pre-MODERN ages in vibracore TB2c are in sequence (Appendix 3, table 3-2). The "too young" peat/grass ages (490–150 CAL yr BP at 228.4 and 430 through –10 CAL yr BP at 283.9 cm), and the "too old" wood age (3,980–3,690 CAL yr BP at 494.9 cm) are exceptions. The peat/grass was probably dragged in during coring. The wood was probably reworked from an older fluvial deposit. Figure 36 is a plot of pre-MODERN 14C data for vibracore TB2c that are considered reliable.

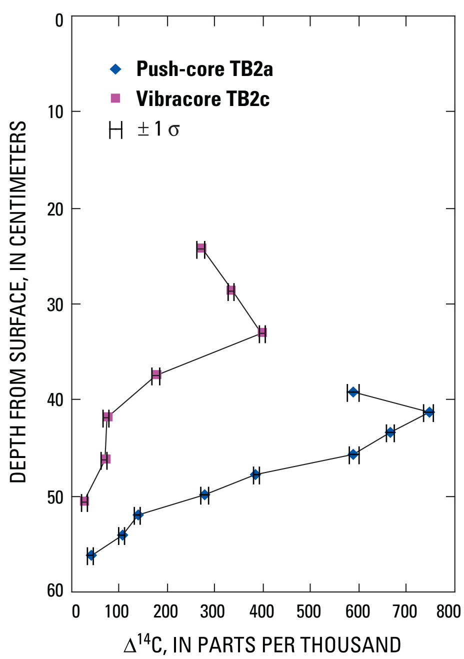


Figure 35. Bomb-spike Delta carbon-14 (Δ14C) data for Terrebonne brackish-marsh push-core TB2a and vibracore TB2c. Data in Appendix 3, table 3-2. [± 1 σ, plus or minus one sigma (standard devation)]

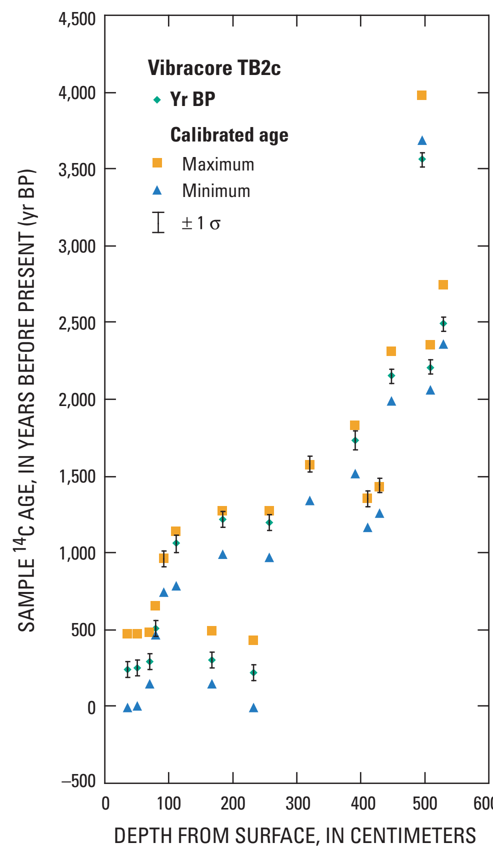


Figure 36. Terrebonne brackish-marsh vibracore TB2c carbon-14 (14C) age, in calibrated years before present (CAL yr BP). For a given depth from the surface, the 14C age falls within the calibrated age range maximum and minimum. Data in Appendix 3, table 3-2. [± 1 σ, plus or minus one sigma (standard devation)]

Bayou Sauvage Distributary

Bayou Sauvage was the only distributary locality in the MRDP sampled for this study. Summary isotopic and bulk-density data for Bayou Sauvage push-cores, BSDb and BSDc (tables 6 and 7) are discussed in the following paragraphs. Detailed sample data for Bayou Sauvage are included in Appendix 3, tables 3-1 and 3-2.

The relations between the ^{137}Cs and the ^{14}C peaks (push-cores BSDb and BSDc, respectively) suggest that they are comparable even though the ^{137}Cs peak is at 15.3 cm and the ^{14}C peak is at 19.4 cm. (For isotopic-peak depths by core, see Appendix 3, tables 3-1 and 3-2). The 15.3 cm ^{137}Cs peak is at an activity level of 2.99 d m^{-1} g^{-1}. The next deepest ^{137}Cs sample at 17.3 cm has an activity of 2.85 d m^{-1} g^{-1}, which overlaps the 15.3-cm activity at one sigma. This rather broad peak for ^{137}Cs might be the result of mixing during deposition or could indicate a period of very rapid deposition. Regardless of interpretation, statistically the ^{14}C and the ^{137}Cs peak depths are close enough to be considered the same.

In push-core BSDb, the ^{137}Cs activity drops appreciably between 17.3 and 22.2 cm. Similarly, in push-core BSDc, ^{14}C bomb-spike carbon drops abruptly from Δ^{14}C of 127.6 ppt (>MODERN) at 19.4 cm to none at 21.4 cm. One interpretation of the apparent age difference (from the peak >MODERN Δ^{14}C value to a ^{14}C age of 440 to 0 CAL yr BP) within 2 cm depth relates to the increase in bulk-density values in the same depth interval (from 0.327 g cm^{-3} at 19.65 cm to 0.489 g cm^{-3} at 22.2 cm) (fig. 28; Appendix 2, table 2-1). The increase in bulk density suggests an influx or mixing of very fine-grained clastic sediment in the basal peat. It is probable that *old* carbon is bound to clay minerals in the fine-grained sediment. The high weight percentage of this older carbon probably masks the bomb carbon associated with the younger Bayou Sauvage peat. Another line of evidence suggesting that the bomb carbon is being masked is the extremely low peak Δ^{14}C value (127.6 ppt) for push-core BSDc compared to the 400–700 ppt Δ^{14}C-peak values for peat from the Terrebonne, St. Bernard, Bayou Perot, and St. Mary marsh cores (Appendix 3, table 3-2). McGeehin and others (2004) showed that bulk-sediment combustion of reservoir sediment from Grenada Lake in Mississippi resulted in depressed Δ^{14}C activities that gave ages around 240 yr BP. Low temperature combustion of these same samples resulted in activities in the bomb carbon (>MODERN) range.

If the suppression of Δ^{14}C values, by the higher-weight percentage of older carbon bound to the peat's clastic components, is not considered, then ^{137}Cs and ^{14}C isotope data for push-cores BSDb and BSDc can be interpreted to indicate a hiatus in deposition or an erosional disconformity between 19.4 and 21.4 cm. Although there is no visible difference in the soil/sediment above and below 21.4 cm, the ^{14}C-concentration maximum for the >MODERN sediment at 19.4 cm directly overlies a 30-cm-thick interval (50.0–21.4 cm) with three ^{14}C ages between 630 and 0 CAL yr BP. This is the same interval of higher bulk-density and ^{40}K values seen in figure 28. Chronostratigrahically, the ^{14}C data for push-core BSDc show a normal sequence of ages from 78.8–57.1 cm. With either interpretation, the three ^{14}C age estimates for the three samples in the 50.0–21.4 cm interval (from 430 to –10, from 440 to 0, and from 440 to 0) are principally the same. This would suggest rapid deposition. Without having stepped-combustion ^{14}C age data to isolate the old carbon, the bomb-spike ^{14}C concentration maximum for push-core BSDb can only be said to represent the 1963–64 or younger datum.

Regardless of interpretation, ^{137}Cs and ^{14}C isotopic data for Bayou Sauvage distributary push-cores BSDb and BSDc do allow establishment of the 1963–64 NWT datum (Appendix 3, tables 3-1 and 3-2). However, because the data do not suggest a straight forward chronostratigraphic interpretation below 19.4 cm, calculations for SOC rates of accumulation are not simple. Therefore, for the Bayou Sauvage distributary locality, SOC accumulation rates, storage, and inventory values were calculated only for the upper 19.4 cm.

Natural Levee, Backswamp, and Swamp

Natural-levee and backswamp sediments are allochthonous in origin and have "composite" ^{14}C ages. Slow-deposition rates, remixing, and erosion in these environments result in the allochthonous distribution of sediment of disparate ages that are not chronostratigraphically accurate. Disturbance associated with the mechanisms of decomposition, tree-throw, and logging in swamp environments also results in a suite of ^{14}C ages that are not chronostratigraphically accurate.

As noted in the previous section, ^{137}Cs-activity data and bomb-spike ^{14}C data for samples for marsh, natural levee, and distributary environments do allow for the placement of the 1963–64 NWT datum (figs. 18–31). Carbon-14 data for natural levee, backswamp, and swamp environments did not allow any marker horizon or datum to be established. Pre-MODERN ^{14}C data for samples from these environments also were not amenable to establishing a chronology and may be indecisive due to problems with old carbon as discussed for Bayou Sauvage distributary cores.

There are also discrepancies in the ^{137}Cs and ^{14}C data for the natural levee, backswamp, and swamp environments. For example, Δ ^{14}C data for the sample at the base of push-core MR1d indicate a MODERN (A.D. 1950) age (58.76 cm; Appendix 3, table 3-2). This suggests a sedimentation rate of 1.32 cm yr^{-1}, which is significantly less than the 1.94-cm yr^{-1} rate indicated by the 1963–64 depth-to-peak ^{137}Cs activity in adjacent push-core MR1c (63.27 cm; Appendix 3, table 3-1; fig. 30).

Measurements for Inorganic Elemental Constituents

By Helaine W. Markewich

Selected core samples were analyzed for major and minor inorganic constituents to provide ancillary chemical data that might be used to establish temporal changes in soil/sediment deposition. It was hypothesized that local activity such as floods or industrial plants coming online or off-line or changes in source material related to land clearing or other human-caused activity might leave some chemical signature that could be used to better define changes in soil/sediment deposition. Such a deposition pattern might then be related to patterns in carbon deposition (DeLaune and others, 1981). Inorganic constituent data, and a short discussion of the data, are included in Appendix 4—major constituent data in table 4-2 and minor constituent data in table 4-3. Summary tables for major (table 8) and minor (table 9) inorganic constituents are included in this section.

Table 8. Summary statistics for core-sample major element concentrations, U.S. Geological Survey soil/sediment-carbon studies Mississippi River deltaic plain, southeastern Louisiana.

[Al, aluminum; Fe, iron; Mn, manganese; Ca, calcium; Mg, magnesium; Na, sodium; K, potassium; P, phosphorous; Ti, titanium; N, number of samples; MN, mean; MD, median; MI, minimum; MX, maximum; <, less than; concentrations in parts per million; for locality information, see table 1]

	Al	Fe	Mn	Ca	Mg	Na	K	P	Ti	Al	Fe	Mn	Ca	Mg	Na	K	P	Ti
Fresh marsh																		
	St. Mary push-core SM1a									*St. Mary vibracore SM1c*								
N	29	29	29	29	29	29	29	29	29	7	7	7	7	7	7	7	7	4
MN	9,074	8,468	127	7,401	4,062	760	1,837	281	50	3,706	3,709	109	8,394	6,597	2,453	741	156	28
MD	10,200	7,330	110	7,510	3,990	710	1,850	270	50	4,980	3,080	120	8,540	6,700	2,850	730	100	25
MI	2,600	3,260	70	3,570	3,140	400	460	190	40	820	2,370	60	4,510	4,050	900	80	60	10
MX	16,900	17,400	510	10,500	5,150	1,540	3,250	420	80	5,570	5,770	150	11,500	8,570	3,290	1,430	270	50
Brackish marsh																		
	St. Bernard push-core SB1a									*St. Bernard vibracore SB1c*								
N	34	34	34	34	34	34	34	34	34	8	8	8	8	8	8	8	8	8
MN	6,043	6,698	73	5,325	6,219	17,335	2,250	208	47	8,376	10,009	106	4,251	7,004	9,724	2,901	164	<1
MD	5,825	6,505	70	5,410	6,225	18,000	2,210	210	50	8,115	9,875	105	3,010	7,045	7,685	2,950	160	<1
MI	2,130	1,750	50	3,130	4,900	11,100	1,030	110	30	2,910	3,070	70	2,460	5,670	3,790	1,310	80	<1
MX	10,300	16,100	160	7,230	7,500	25,000	3,770	440	70	14,100	17,400	140	7,850	8,370	19,900	4,330	230	<1
	Terrebonne push-core TB1a									*Terrebonne push-core TB2a*								
N	18	18	18	18	18	18	18	18	18	48	48	48	48	48	48	48	48	48
MN	12,083	21,489	337	3,161	5,243	5,855	3,136	228	66	12,485	12,656	130	4,741	6,807	11,468	3,059	486	52
MD	12,200	20,100	375	3,190	5,150	5,865	3,055	240	70	14,000	12,750	120	4,100	6,685	9,480	3,230	475	50
MI	8,990	17,900	150	2,640	4,180	3,420	2,360	120	40	3,380	3,180	70	2,960	5,520	5,300	1,240	150	30
MX	15,400	29,000	440	3,670	6,650	8,380	3,800	330	90	21,300	23,000	290	8,820	9,020	21,300	4,570	750	90
	Terrebonne vibracore TB2c																	
N	24	24	24	24	24	24	24	24	24									
MN	11,420	13,286	225	5,577	6,540	7,396	3,188	452	83									
MD	7,105	11,250	185	5,390	6,215	4,635	2,265	440	65									
MI	2,200	3,800	90	2,860	3,390	410	860	280	30									
MX	26,800	33,400	520	10,200	9,680	23,400	6,830	710	180									
Backswamp																		
	St. Martin push-core MR1c									*St. Landry push-core SL1b*								
N	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MN	10,855	24,281	485	4,684	5,685	290	3,085	821	21	13,946	22,790	246	3,723	5,188	268	3,138	6,92	12
MD	10,300	24,000	430	4,620	5,350	290	2,960	820	20	13,200	22,900	200	3,560	4,710	270	2,890	630	10
MI	7,770	17,200	310	3,860	4,520	220	2,320	590	10	9,940	16,200	140	2,410	3,680	190	1,890	390	8
MX	14,500	32,300	1,390	5,950	7,080	360	4,020	1,010	30	18,300	27,100	590	5,250	8,160	360	5,240	1,100	20
Swamp																		
	Tangipahoa push-core TN1c																	
N	37	37	37	37	37	37	37	37	37									
MN	10,307	8,254	111	3,375	2,853	806	681	662	15									
MD	10,600	8,540	110	3,350	2,830	760	660	630	10									
MI	5,150	4,320	80	2,420	2,320	630	340	310	3									
MX	14,100	11,000	160	4,460	3,490	1,170	960	1,050	40									

Table 9. Summary statistics for core-sample minor element concentrations, U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[Li, lithium; V, vanadium; Cr, chromium; Co, cobalt; Ni, Nickel; Cu, copper; Zn, zinc; As, arsenic; Sr, strontium; Y, yttrium; Mo, molybdenum; Ag, silver; Cd, cadmium; Sn, tin; Ba, barium; La, lanthanum; Ce, cerium; Pb, palladium; Th, thorium; U, uranium; N, number of samples; MN, mean; MD, median; MI, minimum; MX, maximum; <, less than; concentration in parts per million]

	Li	V	Cr	Co	Ni	Cu	Zn	As	Sr	Y	Mo	Ag	Cd	Sn	Ba	La	Ce	Pb	Th	U
SM1a																				
N	29	29	28	29	29	29	27	29	29	29	21	0	0	2	29	29	29	29	29	29
MN	6	34	16	3	50	19	185	3	27	2	1	<1	<1	81	176	8	19	21	6	3
MX	20	60	40	6	190	60	470	6	40	3	2	0	0	160	260	20	40	200	10	9
MI	1	10	1	1	20	5	3	1	20	1	1	0	0	3	100	3	6	4	1	1
MD	4	30	20	3	40	20	100	3	30	2	1	<1	<1	81	170	8	20	10	6	2
SM1c																				
N	5	5	4	5	5	4	2	6	6	6	5	0	0	0	6	7	7	1	6	5
MN	5	11	3	2	7	5	155	2	115	4	13	<1	<1	<1	137	6	10	6	5	3
MX	10	20	3	3	20	8	280	3	160	6	40	0	0	0	190	10	20	6	9	10
MI	2	7	2	1	2	2	30	1	70	1	1	0	0	0	100	1	1	6	1	1
MD	4	9	3	1	4	5	155	1	105	4	2	<1	<1	<1	135	7	10	6	6	2
SB1a																				
N	34	34	34	34	34	34	28	34	34	34	34	0	24	34	34	34	34	31	34	34
MN	5	77	13	3	60	23	194	3	32	2	2	<1	1	12	46	6	16	20	5	6
MX	10	900	20	9	550	120	460	4	40	3	5	0	4	90	70	10	30	40	10	30
MI	1	20	5	1	10	4	3	2	20	1	1	0	1	2	40	2	5	1	1	2
MD	5	30	10	2	40	20	190	3	30	2	1	<1	1	7	40	6	15	20	4	4
SB1c																				
N	8	8	5	8	8	8	1	8	8	8	7	0	2	0	8	8	8	4	8	8
MN	9	19	11	4	16	16	40	4	73	8	11	<1	31	<1	148	14	25	11	15	7
MX	20	20	20	8	40	20	40	10	110	10	40	0	60	0	180	20	40	20	20	10
MI	2	10	5	1	7	6	40	2	50	3	3	0	1	0	100	4	8	7	4	4
MD	9	20	9	4	14	20	40	3	65	10	6	<1	31	<1	150	15	30	9	20	7
TB1a																				
N	18	18	18	18	18	18	18	18	18	18	13	0	2	16	18	18	18	18	18	18
MN	6	36	19	7	79	34	168	4	20	3	1	<1	1	3	259	10	27	18	9	4
MX	8	50	30	9	170	50	510	5	20	4	1	0	1	10	650	10	30	30	10	6
MI	4	20	5	5	20	20	20	2	20	2	1	0	1	1	90	9	20	7	7	3
MD	6	40	20	7	75	35	160	4	20	3	1	<1	1	3	145	10	30	20	9	4

Table 9. Summary statistics for core-sample minor element concentrations, U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued.

[Li, lithium; V, vanadium; Cr, chromium; Co, cobalt; Ni, Nickel; Cu, copper; Zn, zinc; As, arsenic; Sr, strontium; Y, yttrium; Mo, molybdenum; Ag, silver; Cd, cadmium; Sn, tin; Ba, barium; La, lanthanum; Ce, cerium; Pb, palladium; Th, thorium; U, uranium; N, number of samples; MN, mean; MD, median; MI, minimum; MX, maximum; <, less than; concentration in parts per million]

	Li	V	Cr	Co	Ni	Cu	Zn	As	Sr	Y	Mo	Ag	Cd	Sn	Ba	La	Ce	Pb	Th	U
TB2a																				
N	48	48	48	48	48	48	48	45	48	48	47	1	22	36	48	45	45	44	48	37
MN	12	29	13	5	18	15	51	4	80	4	3	2	2	2	297	8	19	12	5	4
MX	20	40	20	10	30	40	110	5	130	7	9	2	3	7	1020	10	30	30	8	7
MI	3	10	2	1	6	2	20	2	60	1	1	2	1	1	80	2	5	1	1	1
MD	10	30	15	4	20	20	40	4	80	5	2	2	2	1	180	9	20	10	6	4
TB2c																				
N	24	24	24	24	24	21	24	24	24	24	10	1	12	8	24	24	24	21	24	24
MN	12	29	17	11	22	13	47	4	41	5	2	1	1	1	174	10	26	9	7	2
MX	30	60	30	30	40	30	110	20	100	9	6	1	2	2	700	20	40	60	10	6
MI	3	9	6	4	9	1	7	1	10	1	1	1	1	1	50	2	5	1	2	1
MD	9	20	10	10	20	10	40	3	35	5	2	1	1	1	160	10	30	6	7	1
MR1c																				
N	31	31	31	31	31	31	31	31	31	31	0	0	0	0	31	31	31	31	31	31
MN	19	32	22	13	25	14	67	4	28	7	<1	<1	<1	<1	186	20	45	16	7	1
MX	20	40	30	20	40	20	90	7	40	9	0	0	0	0	250	20	50	20	9	1
MI	10	20	20	10	20	10	50	2	20	6	0	0	0	0	150	20	40	10	6	1
MD	20	30	20	10	20	10	70	3	30	7	<1	<1	<1	<1	180	20	40	20	7	1
SL1b																				
N	31	31	31	31	31	31	31	31	31	31	2	0	0	0	31	31	31	31	31	31
MN	17	32	24	11	22	17	51	2	31	8	1	<1	<1	<1	189	20	48	14	7	2
MX	30	40	30	20	30	30	80	4	40	10	1	0	0	0	250	20	50	30	8	10
MI	10	20	20	7	20	7	30	2	20	7	1	0	0	0	160	20	40	8	6	1
MD	20	30	20	10	20	20	50	2	30	8	1	<1	<1	<1	180	20	50	10	7	1
TN1c																				
N	37	37	37	37	37	37	37	37	37	37	36	0	0	21	37	37	37	37	37	37
MN	9	22	12	9	11	16	49	4	45	4	1	<1	<1	1	192	9	24	28	4	1

Differences in Inorganic Elemental Constituents by Environment

Major and minor constituent concentrations showed down-hole variations that relate to compositional/stratigraphic intervals. For example, in push-core TB2a, iron (Fe), aluminum (Al), and manganese, as well as most trace metals such as lead (Pb) and nickle (Ni), increase as bulk-density and ^{40}K-activity values increase and decrease as calcium (Ca), sodium (Na), and OC values decrease. There were no noticeable spatial regional patterns in major or minor core-constituent variation. Nor were there any obvious temporal patterns. Values for most minor constituents were close to the analytical detection limit. Cadmium (Cd) and silver (Ag) values were low enough to be below detection limit for most samples.

The relation of Fe to Al, K, Ca, and Na for fresh marsh (push-core SM1a), brackish marsh (push-core SB1a), and backswamp (push-core MR1c) MRDP environments are shown in figure 37. Elemental data were normalized to Fe because Fe was in such abundance it is considered to be a diluent for detrital inputs (allochthonous material). In general, the data are as would be expected for specific environments. Sodium (Na) is an order of magnitude higher in brackish-marsh soil/sediment than in fresh-marsh or nonmarsh soil/sediment, and the highest iron (Fe) values are for backswamp soil/sediment. Summary values for the minor constituents are presented in table 9.

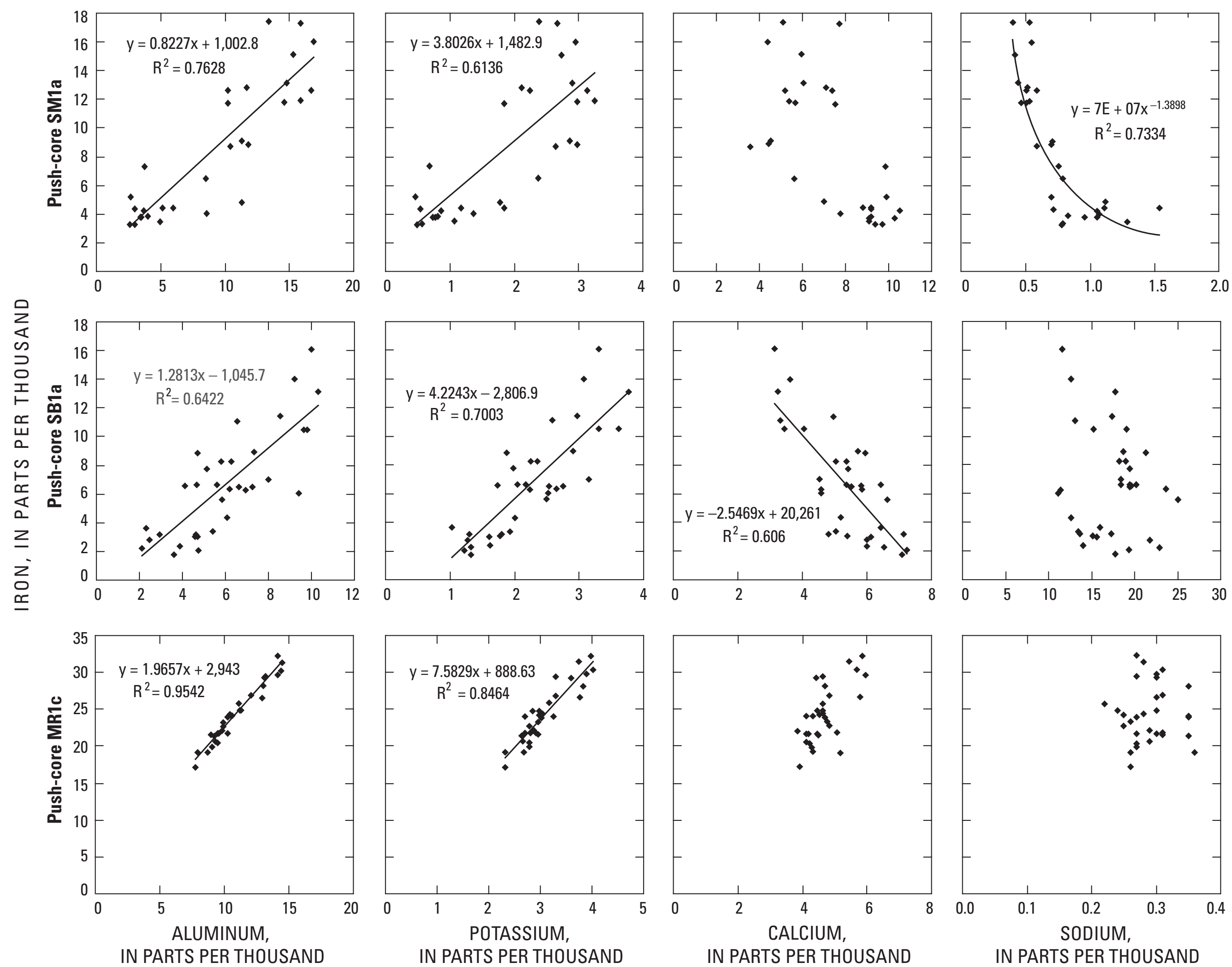


Figure 37. Covariance plots for St. Mary fresh-marsh push-core SM1a, St. Bernard brackish-marsh push-core SB1a, and St. Martin backswamp push-core MR1c. Trend lines and their formulas are included in plots where the variable association (R^2 value) is >0.6. Data in Appendix 4, table 4-2.

Some locality/environment-specific observations are included in the following sections. These observations relate primarily to the specific depositional history and individual compositional/stratigraphic intervals indicated by the inorganic constituent data. The inorganic-constituent profiles shown in figures 38 and 39 are characteristic for marsh (St. Mary fresh-marsh push-core SM1a) and nonmarsh (St. Martin backswamp push-core MR1c) soil/sediment in the MRDP. Some variation in down-core chemistry at each of the MRDP core localities is related to dissolution-induced ion exchange while some is due to differences in mineral provenance, production of autochthonous material, and/or transport history. These down-core compositional or stratigraphic intervals are best seen in the data presented in Appendix 4, tables 4-2 and 4-3. And, for most MRDP environments, the compositional/stratigraphic intervals apparent in the inorganic elemental-constituent data are also reflected in the OC data (Appendix 2, table 2-1).

Marsh—Major and Minor Elements

Major inorganic elemental concentrations (Appendix 4, table 4-2, push-cores SM1a, SB1a, TB1a, TB2a; fig. 37, push-cores SM1a and SB1a) show fairly typical patterns for marsh sediment. In general, Na concentrations increase with increasing Ca, and Fe increases with increasing Al and increasing K. However, the relations are complex and not specifically discussed in this report. Iron is inversely correlated to Ca in both the fresh- and brackish-marsh soil/sediment, but the brackish-marsh relation is tighter ($R^2 = 0.44$, fresh-marsh SM1a; $R^2 = 0.64$, brackish marsh). Iron is also inversely correlated with Na, but the relation is more complex than that of Fe to Ca. Fresh-marsh constituent data (push-core SM1a) show that the Fe-Na relation changes when Na is >1,000 µg/g (ppm) (trendline shown as a power function in figure 37). Brackish-marsh data (push-core SB1a, suggest a compositional/stratigraphic change at about 61.3 cm depth. The Fe-Na relation in the upper 60 cm of core is mirrored in the lowermost 30 cm, but the Fe concentration remains ≤6,000 ppm (Appendix 4, table 4-2). Brackish-marsh data for push-core TB2a and vibracore TB2c indicate that the Fe-Na relations are zonal and associated with compositional/stratigraphic changes within the core. It is probable that these threshold levels indicate changes in redoximorphic conditions related to soil/sediment composition. This also is indicated for short cores, such as SM1a, SB1a, TB1a, TB2a, that only sampled the uppermost meter or less of marsh soil/sediment.

One example of a change in chemical conditions within the uppermost meter of soil/sediment is seen in the data for St. Mary fresh-marsh push-core SM1a. Manganese (Mn) values indicate a change from an oxidizing to a reducing environment at about 10 cm depth. The sharp decrease in Fe and Al below 19 cm and the spikes in these elements at 27 and 50 cm depths suggest that there are significant chemical changes throughout the core. Data for brackish-marsh push-core SB1a show no appreciable change in Mn concentration throughout the core.

Terrebonne brackish-marsh push-core TB2a has a profile similar, but more complex, than fresh-marsh push-core SM1a. The TB2a Mn profile indicates at least two alternating oxidizing and reducing zones within the surface 25 cm. Iron, Al, and most minor constituent data for push-core TB2a indicate a distinct compositional/stratigraphic interval from about 45 to 67 cm, suggesting a three-unit partition for this core. This corroborates the bulk-density and ^{40}K profiles for push-core TB2a shown in figure 24. One possible explanation for the complexity of the push-core TB2a major-constituent profile is that the many alternating environments represent marsh surfaces churned by storm activity and subsequently reestablished. The OC data for push-core TB2a (Appendix 2, table 2-1) somewhat corroborate the disturbance theory in that weight-percent OC varies from 9 to 21 percent within the surface 25 cm and is the highest (between 35 and 40 weight percent) in the zone of lowest bulk-density and ^{40}K values (in the middle of the core).

Major constituent data for vibracore TB2c also indicate significant compositional breaks at 45 and 67 cm, as well as another compositional break at about 240 cm.

Although close to 160 km (100 mi) distant, similar trends are present in the minor constituents of St. Mary fresh- and St. Bernard brackish-marsh sediments (Appendix 4, table 4-3; push-cores SM1a, SB1a; fig. 38, push-core SM1a). The Fe, Al, and most minor constituent data indicate a compositional/stratigraphic break around 25 cm (from 24 to 29 cm, depending on the element) depth in push-core SM1a, yet the field description suggests a break at about 10 cm, which is reflected in the Al, Fe, K, Ba, Cr, Th, V, and Zn profiles (fig. 38). Data for push-core SB1a (Appendix 4, tables 4-2 and 4-3) indicate a break at about the same depth, but the overall down-core constituent profiles are more complex than for push-core SM1a.

- Uranium (U) concentration increases toward the surface in the St. Mary fresh-marsh and in the St. Bernard and Terrebonne brackish-marsh soil/sediment. In the St. Mary vibracore SM1c, values for U are ≥2≤10 ppm in the 275–240 cm depth and ≤2 in the 240–100 cm depth. In push-core SM1a from the same locality, U increases from <2 ppm at about 70 cm depth to >9 ppm at the surface. In the 400–100 cm depth in the St. Bernard vibracore SB1c, U values are ≤10. In push-core SB1a from the same locality, U values are ≤10 ppm from 100 to 15 cm depth. However, in the surface 15 cm, uranium increases to 30 ppm. In Terrebonne brackish-marsh vibracore TB2c, the trend is the similar. Concentrations gradual increase from detection limit at 271 cm to 4 ppm at 191.9 cm, and a 6-ppm peak occurs at 11.9 cm.

- Trends in barium (Ba) concentration are similar to the U trends in that there is generally a significant increase in the surface from 10 to 25 cm. In the St. Mary fresh-marsh vibracore SM1c, values for Ba range from detection limit to about 200 ppm. In push-core SM1a from the same locality, Ba steadily increases from about 100 ppm at about 70 cm depth to >250 ppm in the uppermost 15 cm. In the St. Bernard brackish-marsh vibracore SB1c, Ba gradually decreases from 180 ppm at 395 cm to 100 ppm at 118 cm. In push-core SB1a,

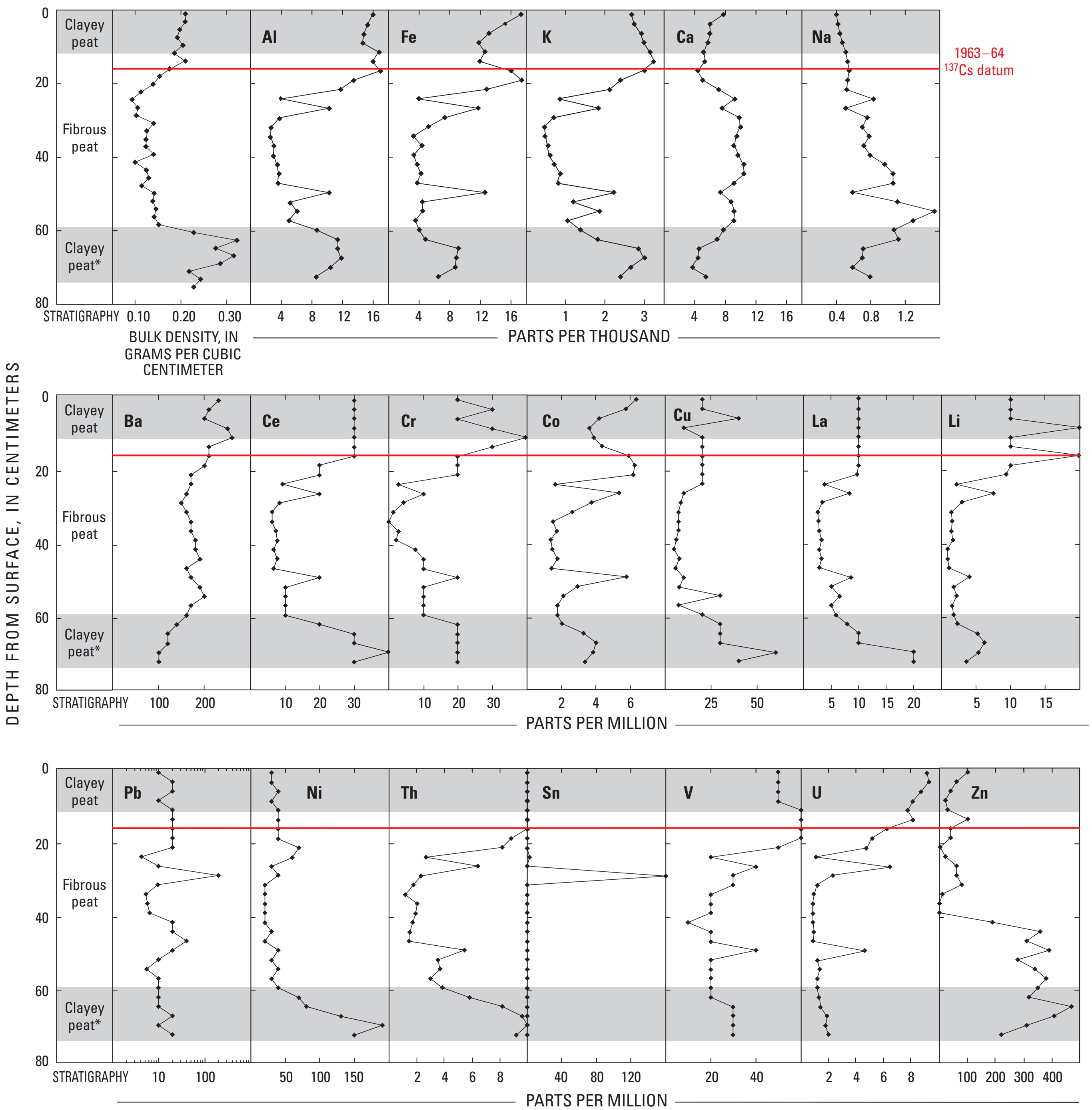


Figure 38. Stratigraphy and profiles of bulk density and selected major and minor inorganic constituents for St. Mary fresh-marsh push-core SM1a. The x-axis for Pb is a logarithmic scale. Data in Appendix 1, table 1-1; Appendix 2, table 2-1, Appendix 4, tables 4-2 and 4-3. The 1963–64 cesium-137 datum is for adjacent push-core SM1b. [*, based on laboratory data; BD, bulk density; Al, aluminum; Fe, iron; K, potassium; Ca, calcium; Na, sodium; Ba, barium; Ce, cerium; Cr, chromium; Co, cobalt; Cu, copper; La, lanthanum; Li, lithium; Pb, lead, Ni, nickel; Th, thorium; Sn, tin; V, vanadium; U, uranium; Zn, zinc; ^{137}Cs, cesium-137]

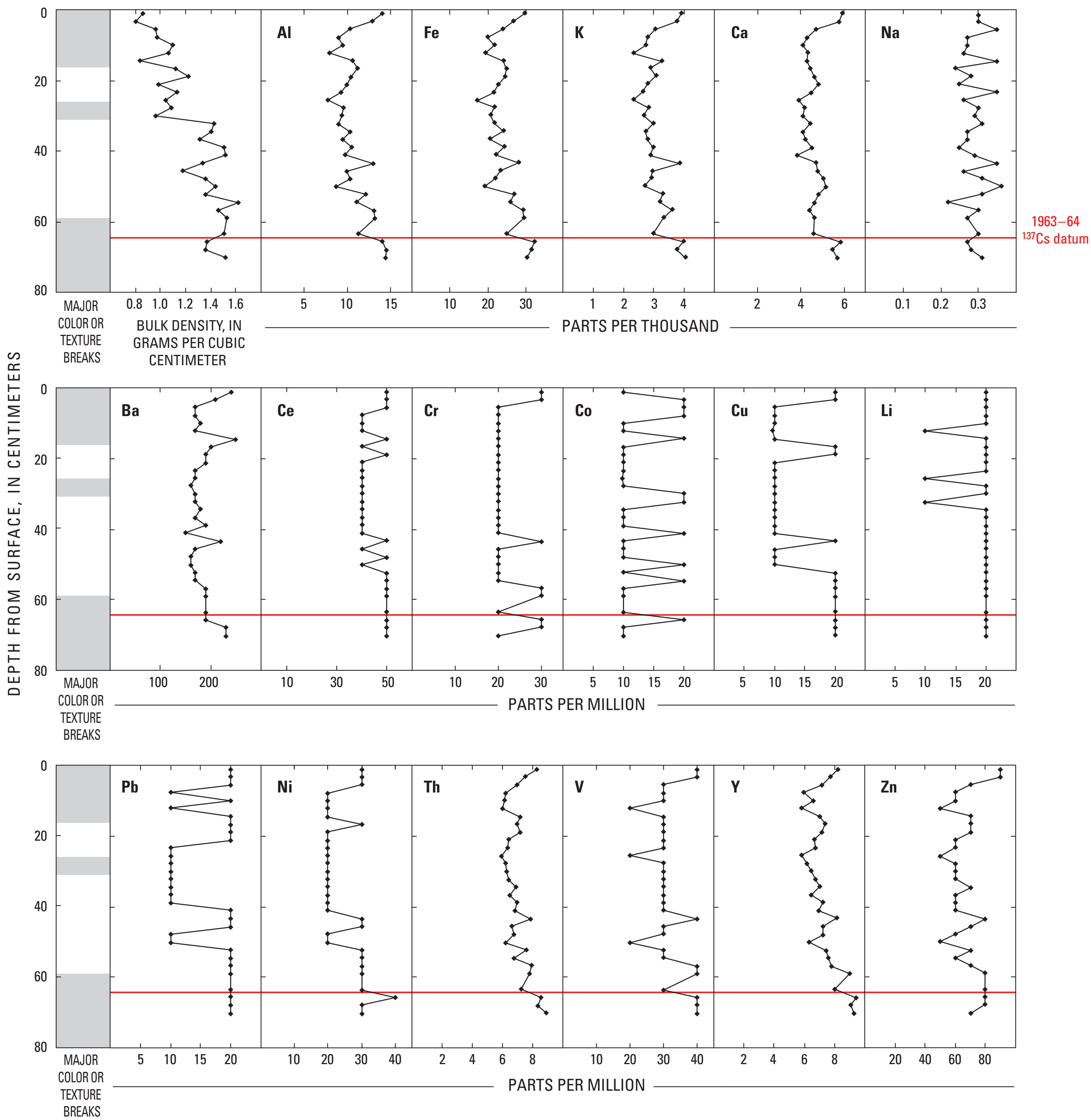


Figure 39. Color (and/or minor texture change) and core profiles of bulk density and selected major and minor inorganic constituents for St. Martin backswamp push-core MR1c. Data in Appendix 1, table 1-1; Appendix 2, table 2-1, Appendix 4, tables 4-2 and 4-3. [BD, bulk density; Al, aluminum; Fe, iron; K, potassium; Ca, calcium; Na, sodium; Ba, barium; Ce, cerium; Cr, chromium; Co, cobalt; Cu, copper; Li, lithium; Pb, lead, Ni, nickel; Th, thorium; V, vanadium; Y, Yttrium; Zn, zinc; ^{137}Cs, cesium-137]

Ba concentrations are <100 ppm throughout the core. In Terrebonne brackish-marsh vibracore TB2c, Ba concentrations are below 225 ppm except in the uppermost 12 cm where they increase to 700 ppm. In push-core TB1a, Ba gradually increases upward to 250 ppm at 35 cm, peaks at 650 ppm at 25 cm and declines to 470 ppm within 3 cm of the surface. Trends in push-core TB2a are similar. Ba stays between 100 and 200 ppm from 86 to 47 cm, increases to 500 ppm between 47 and 22 cm, peaks above 1,000 ppm at 5.2 cm and declines from there to the surface.

- St. Mary fresh-marsh and St. Bernard brackish-marsh push-cores SM1a and SB1a have relatively high Zn concentrations (between 150 and 500 ppm) in the 75–35 cm depth. The 1963–64 NWT peak in push-core SM1b and SB1b are at similar depths, 15.9 cm and 18.2 cm, respectively. Whatever the source(s) for Zn in these two cores, the Zn probably was incorporated into both the fresh- and brackish-marsh sediment during the late 1800s and early 1900s, based on the isotopic and mass-accumulation age data. There are distinct Zn spikes in the vibracores from St. Mary and St. Bernard marsh localities. At 155 cm depth in vibracore SM1c, Zn spikes from near detection limit to 280 ppm. In vibracore SB1c at about 120 cm, the spike is from near detection limit to 40 ppm. The Terrebonne brackish-marsh push-core TB2a has a much different pattern. Zinc concentrations are lower in TB2a than in push-cores SM1a or SB1a. Zinc is >60 ppm throughout the surface 43 cm, possibly the result of mixing due to storm activity (see previous discussion). The Zn spike to 110 ppm at 96.2 cm is probably the same 110 ppm high Zn value as present in vibracore TB2c at 103.7 cm. The 1963–64 NWT peak in push-core TB2a is at 46.2 cm depth, much deeper than in push-cores SM1a and SB1a suggesting a significantly different sedimentation history at Terrebonne than at the St. Mary or St. Bernard marsh localities.

Backswamp—Major and Minor Elements

Push-core MR1c data indicate that Fe increases as Al, Ca, phosphorous (P), and K increase but does not correlate with sodium. This is probably because of the low (<400 ppm) Na concentrations in the dominantly clastic backswamp environment.

Minor constituent data for backswamp soil/sediment do not show any significant trends with the exception of copper (Cu) and lead (Pb) increasing toward the surface to a maximum of 30 ppm in the St. Landry push-core SL1b.

Swamp—Major and Minor Elements

Only one core (TN1c) was analyzed for the MRDP swamp environment. Data for push-core TN1c indicate that Fe tracks Al and that there is no correlation of Fe with Ca, K, P, or Na. Both the major and minor constituent data suggest a compositional/stratigraphic break at about 27 cm, with significant increases in P, Mn, and Na from 27 cm to the swamp surface.

Palynomorph and Other Microstratigraphic Marker Data

By John H. Wrenn and Helaine W. Markewich

Wrenn and others (1998a) reported palynomorph and other stratigraphic marker data for the St. Bernard brackish-marsh vibracore SB1c. These data were used to establish a mass-accumulation time line for the St. Bernard locality. The palynomorph data in that publication were count data. In this report, all palynomorph data, including those data for vibracore SB1c, are plotted as absolute abundance. *Lycopodium* spore tablets were used as an outside index (spike) for determination of absolute-abundance values. The procedures for determining the absolute abundance data are included in Appendix 5 of this report.

Palynomorph data from selected core samples provide environmental data that for some MRDP environments establish temporal changes in soil/sediment deposition. Histograms of diversity and absolute abundance for total pollen and each pollen type (arboreal, herbaceous, and aquatic) and saw-tooth absolute-abundance diagrams are given for each of the MRDP cores analyzed for palynomorphs (figs. 40–57). Pollen zones were identified only for the longer vibracores from the St. Mary, St. Bernard, and Terrebonne marsh localities.

Taxonomy, common names, and descriptions of plants associated with palynomorphs can be found in Appendix 5, table 5-1). The term *indeterminate* refers to pollen or spores that cannot be identified to any taxonomic level due to poor preservation or folding. The collective term *TCT* was used for the pollen group that includes undifferentiable Taxodiaceae, Cupressaceae, or Taxaceae pollen. The pollen morphology for these gymnosperm families is so similar that genus level identification is commonly not possible. Since *Taxodium distichum* is the primary arboreal species in the southern Louisiana marsh, it is assumed to be and referred to as the dominant TCT species for the MRDP core samples.

Age data for each pollen zone in each core are given in Appendix 3; palynomorph data and taxonomy are included in Appendix 5, tables 5-1 and 5-2.

Palynomorph Age Indicators

As with other temporal indicators, the use of palynomorphs was directed at estimating the rate of SOC accumulation for a specific time interval and specific environment in the MRDP. It was hypothesized that changes in palynomorph content could be used to better define changes in soil/sediment deposition and subsequently to changes in organic-carbon deposition. A discussion on the use of palynomorph and other microstratigraphic markers, as well as other temporal indicators, for establishing mass-accumulation time lines is included in the section “Accumulation Rates—Temporal Trends in Mississippi River Deltaic Plain Soil/Sediment Organic Carbon Sequestration.”

Throughout the MRDP, post-settlement changes in genus/species abundance are primarily related to land use (tree harvesting, farming, canal building) and associated introduction of exotic plants. Taxa important to historical sediment-age estimates include *Alternanthera philoxeroides* (alligatorweed), *Sapium sebiferium* (Chinese tallow tree), and *Vigna unguiculata* (synonym: *Vigna sinesis* (L.) Savi ex Hassk.; cowpea, black-eyed pea).

The exotic plant *Alternanthera philoxeroides* originated in South America and may have made its way to the Gulf Coast in ship ballast (Schmitz and others, 1988). Its first reported occurrence in North America was in Florida during 1894 (Weldon, 1960). Shortly afterward, during 1897, it was collected in the Port of Mobile, Alabama (Coulson, 1977). This invasive aquatic weed may have been dumped in the bay along with ship ballast. Alligatorweed is tolerant of brackish water and has become naturalized in fresh to brackish coastal waters to the point where it now clogs waterways all across the Gulf Coast, including those of Louisiana. For MRDP soil/sediment, A.D. 1900 is used as a no-older-than age if *A. philoxeroides* is present.

Sapium sebiferium is a native of Japan and China that is said to have been imported during 1776 by Benjamin Franklin, who intended to use the vegetable tallow produced by the outer seed covering to produce soap and candles (accessed November 16, 2005, at *http://www.tulane.edu/~mrbc/2001/MRB%20Project/chinese_tallow.htm*). In the early years of the twentieth century, the Foreign Plant Introduction Division of the U.S. Department of Agriculture helped establish Chinese tallow tree in Florida and the Gulf Coast with the intent of launching a local soap industry (Scheld and Cowles, 1981). The program failed but the trees became naturalized and are now considered an invasive species (Scheld and Cowles, 1981).

Vigna unguiculata is also an introduced species. It is an Old World domesticate that made its first appearance in New Orleans area after its colonization during A.D. 1717. Its origin is uncertain, either Africa, Asia, and South America. During the 1600s, the Spanish planted *V. unguiculata* in the West Indies; and by the early 1700s, it had been introduced in the southern U.S. (accessed November 16, 2005, at *http://www.up.ac.za/academic/microbio/plant/research/pr_cowpea.html*). Wrenn and others (1998a) equated *Vigna luteola* (Jacq.) Benth. with the black-eyed pea. The currently accepted scientific name for the black-eyed pea, and the one used in this report, is Vigna unguiculata (L.) Walp. subsp. unguiculata (synonym for Vigna sinensis (L.) Savi ex Hassk.; *http://www.hort.purdue.edu/newcrop/nexus/Vigna_unguiculata_nex.html*). Vigna luteola (Jacq.) Benth. is the hairy cowpea, a native of North America, and not an introduced species.

Vegetation Classification

The vegetation classification used in the following discussion of palynomorphs in MRDP cores is the National Vegetation Classification Standard (NVCS) as modified by Fralish and Franklin (2002). Fralish and Franklin's naming strategy also is used. First cited are the plant community cover types of the Society of Forester's (SAF) as defined in the society's cover-type system (Eyre, 1980). The SAF cover-type designation is shown in bold font and is followed by the NVCS alliance name for that plant community as interpreted by Fralish and Franklin (2002), for example, the **Bald Cypress-Gum Cover Type** [NVCS *Taxodium distichum* var. *distichum-Nyssa biflora* (*Nyssa aquatica*) Saturated Forest Alliance].

Indicator categories of wetland plants are those recognized in the 1996 National List of Vascular Plant Species That Occur in Wetlands (Reed, 1988, as updated during 1996 [U.S. Fish and Wildlife Service, 1997]). These indicators provide as estimate of the approximate probability of a plant species occurring in a wetland rather than a non-wetland. The categories are based on anecdotal data and published reports of plant distribution, as well as field observations, rather than statistical analyses (Reed, 1988). The categories and criteria (Cowardin and others, 1979) recognized and cited by Reed (1988; U.S. Fish and Wildlife Service, 1997) include:

- Obligate Wetland (OBL). Occur almost always (estimated probability >99 percent) under natural conditions in wetlands.
- Facultative Wetland (FACW). Usually occur in wetlands (estimated probability 67–99 percent), but occasionally found in nonwetlands.
- Facultative (FAC). Equally likely to occur in wetlands or nonwetlands (estimated probability 34–66 percent).
- Facultative Upland (FACU). Usually occur in nonwetlands (estimated probability 67–99 percent), but occasionally found in wetlands (estimated probability 1–33 percent).
- Obligate Upland (UPL). Occur in wetlands in another region, but occur almost always (estimated probability >99 percent) under natural conditions in nonwetlands in the region specified.
- "+" or "–" following a faculative code indicates a tendency of a plant to occupy a wetter (+) or drier (–) portion of the plant's environmental range.

The assignment of Gulf Coast plants to the national Plant List categories follows Tiner (1993).

Common Cover Types

The **Bald Cypress-Gum Cover Type** [NVCS *Taxodium distichum* var. *distichum-Nyssa biflora* (*Nyssa aquatica*) Saturated Forest Alliance] of Fralish and Franklin (2002) is the primary cover type for each MRDP marsh core analyzed for palynomorphs. This cover type indicates a deep swamp associated with first bottoms of an alluvial system and is widespread in low lying areas, such as southeastern Louisiana, where the water table is higher than the soil surface for a greater or lesser part of the growing season (Fralish and Franklin, 2002). In this cover type, several taxa such as *Acer rubrum*, *Fraxinus profunda*, and *Salix nigra* that can tolerate deep and prolonged flooding may occur with *Taxodium distichum*[3] and *Nyssa aquatica*[4].

Arboreal pollen associates of the **Bald Cypress-Gum Cover Type** that commonly occur in areas less subject to deep, prolonged, or frequent flooding include *Carya*, *Fraxinus*, *Liquidambar*, *Magnolia*, *Nyssa sylvatica*, *Quercus*, and *Ulmus.* These genera occur on the shallower margins of the deep swamp, as well as on flats and ridges subject to periodic flooding of shorter duration. *N. sylvatica* is commonly found in tidal swamps, forested wetlands, and moist as well as dry forests in the Gulf Coast (Tiner, 1993). *Nyssa* is a relatively salt-intolerant genera; therefore, if absent in the **Bald Cypress-Gum Cover Type**, then intermittent and (or) prolonged intermediate- to brackish-water conditions are suggested. (For this study, *Acer* and *Fraxinus* pollen were not differentiated at the species level, but *Nyssa* pollen were differentiated by species.)

Cephalanthus (OBL), *Cornus* (FACW+), *Ilex* (FACW), and *Myrica* (FAC+) are understory plants in the **Bald Cypress-Gum Cover Type**. Pollen of these genera indicate that wet shrubs were present in the understory.

Components of the **Sweet Gum Cover Type** [(NVCS *Liquidambar styraciflua*-(*Acer rubrum*) Seasonally Flooded Forest Alliance, and *Liquidambar styraciflua* (*Lirodendron tulipifera, Acer rubrum*) Temporarily Flooded Forest Alliance] of Fralish and Franklin (2002) also are present in many pollen zones of MRDP marsh cores and are codominate with pollen of the **Bald Cypress-Gum Cover Type** in pollen Zone A of vibracore TB2c. The **Sweet Gum Cover Type** is presently widespread on first bottoms and terraces of the fluvial floodplains in the southeast and in the MRDP (Fralish and Franklin, 2002). *Liquidambar* is a pioneer species on floodplains and disturbed sites that are frequently flooded for short periods (Fralish and Franklin, 2002). It eventually becomes shaded out by other bottomland tree taxa as a mixed bottomland hardwood forest develops. The **Sweet Gum Cover Type** is typically replaced over time by *Celtis laevigata*, *Ulmus americana*, and/or *Fraxinus pennsylvanica* and diverse hardwoods (Fralish and Franklin, 2002).

In Zone A of brackish-marsh vibracore TB2c, the **Sweet Gum Cover Type** is codominate with the **Bald Cypress-Gum Cover Type**.

Along with the **Bald Cypress-Gum** and the **Sweet Gum**, a third cover type appears to be represented by pollen in at least one of the MRDP cores. The **Nuttall Oak-Overcup Oak Cover Type** [NVCS *Quercus texana*-(*Quercus lyrata*) Seasonally Flooded Forest Alliance] (Fralish and Franklin, 2002), is typical of river floodplains, though flooding occurs during shorter periods and less frequently than in settings typical of the **Bald Cypress-Gum Cover Type**. *Taxodium distichum*, *Nyssa aquatica*, *Liquidambar styraciflua*, *Fraxinus profunda*, *F. pennsylvanica*, *Celtis laevigata*, *Carya aquatica*, and *Gleditsia aquatica* are associated arboreal taxa with the **Nuttall Oak-Overcup Oak Cover Type**. This cover type develops on acidic, organic rich, brown silty loam and alluvial clay that are poorly drained (Fralish and Franklin, 2002). Pollen of most of the **Nuttall Oak-Overcup Oak Cover Type** genera, as well as *Quercus*, occurs in the St. Landry backswamp SL1c core (fig. 54).

Pinus may be associated with each of the cover types, but if local in origin, then the pollen are from pines mixed with hardwoods on the topographically higher position in the floodplain, such as bayou levees. Another interpretation is that *Pinus* pollen is at least in part sourced regionally and was introduced as pollen rain in runoff from the land.

The most abundant and commonly encountered herbaceous pollen in each of the cover types include *Ambrosia* (OBL, FACW, FAC), Asteraceae (OBL, FACW, FAC), ChenoAms (OBL, FACW, FAC, FACU), *Cladium*, Cyperaceae (OBL), and Poaceae (OBL, FACW, FAC), many of which tolerate brackish-water or freshwater conditions. These plants and others (that is, *Polygonum* (OBL), prefer perennially wet settings rather than deeply flooded sites. *Ambrosia* typically requires freshwater conditions, though germination and growth studies indicate some species of *Ambrosia* can tolerate, and even adapt to, elevated salinities in certain habitats. One such habitat includes roadside ditches exposed to annual winter road salting (DiTommaso, 2004; Salzman and Parker, 1985).

Aquatic pollen included in MRDP marsh core samples mostly are from emergent plants that project above the water surface, indicating a shallow-water setting. These include *Equisetum*, *Typha angustifolia* (OBL), *T. latifolia* (OBL), *Sagittaria* (OBL), and *Lemn*a (OBL).

Marsh

Palynomorph data for cores from fresh marsh (St. Mary) and brackish marsh (St. Bernard and Terrebonne) localites presented in the following sections. The paleoenvironment and age are discussed for each pollen zone identified in vibracores.

St. Mary Fresh-Marsh Vibracore SM1c

The St. Mary vibracore SM1c was taken in a freshwater marsh about 4 km (2.5 mi) north of Cote Blanche Bay (fig. 5*D*). The present-day vegetation (table 1) is dominated by grasses, sedges, emergent herbs, and exotic invasive water plants (for example, alligatorweed and water hyacinth). A diverse (42 taxa) and generally abundant palynomorph assemblage was collected from almost all 16 samples studied from the 2.7-m (8.86 ft)-long SM1c core. For purposes of environmental discussion, the SM1c vibracore can be divided into

[3] Although *Taxodium distichum* occurs in both deep and shallow water swamps, it dominates in sites subject to relatively shallow, if frequent and prolonged inundations (Fralish and Franklin, 2002). Such sites periodically need to experience subaerial exposure (though the soil may remain moist or wet) for *T. distichum* seeds to germinate and for young trees to become established before flooding occurs again (Kozlowski, 1997).

[4] In contrast to *Taxodium distichum*, *Nyssa* is better adapted to reproducing in wet settings than is *T. distichum* because it regenerates freely by sprouting as well as from seeds, which it produces in great abundance. (*Taxodium* does not sprout.) In addition, *Nyssa* seedlings grow faster, require a shorter dry period to become established, and can better survive flooding as seedlings than can *Taxodium* (Johnson, 1990; Fralish and Franklin, 2002).

four zones (A–D; figs. 40–42). In each zone, taxa are constituents of the **Bald Cypress-Gum Cover Type** [NVCS *Taxodium distichum* var. *distichum-Nyssa biflora* (*Nyssa aquatica*) Saturated Forest Alliance] of Fralish and Franklin (2002).

Pollen of *Nyssa*, the co-nominate species of the **Bald Cypress-Gum Cover Type** are notably absent from the assemblages in Zones A and D and are only intermittently present in Zones B and C. The absence of *Nyssa* suggests brackish-water conditions for periods sufficiently long to exclude the genus from environment.

Juglans is a component of the **Sweet Gum Cover Type** and is present only in Zone A of vibracore SM1c. *Pinus* appears in Zone B and becomes an important component of the pollen assemblage in Zones C and D, The abundance of *Pinus* in Zones C and D may indicate long distance transport by wind or water, or moisture-loving pines may have been interspersed within the hardwoods on the levees. Table 10 summarizes the palynomorph and paleoenvironment data for the SM1c core.

SM1c Zone A: Sample Depth 268.0 Centimeters

The lowest sample (268.0 cm) from St. Mary fresh-marsh vibracore SM1c is the only sample of Zone A soil/sediment. The 268.0-cm sample contains the most abundant pollen of any sample in the core and is dominated by herbaceous and to a lesser extent arboreal pollen (figs. 41–42; Appendix 5, table 5-2). The arboreal assemblage includes *Carya*, *Juglans*, *Liquidambar*, *Myrica*, *Quercus*, *Salix*, TCT (probably *Taxodium distichum*, bald cypress), and *Ulmus*.

Herbaceous pollen are particularly abundant in Zone A and include *Ambrosia*, Asteraceae, ChenoAms, Cyperaceae, *Iva,* and Poaceae. All of these are adapted to freshwater and brackish-water conditions, except perhaps *Ambrosia*.

Aquatic plants are represented by *Equisetum* and *Typha angustifolia* pollen. Both of these taxa are adapted to freshwater conditions, though *T. angustifolia* also grows in brackish marshes.

SM1c Zone A paleoenvironment and age. The pollen assemblage indicates the depositional site was a mixed forest, floodplain, and wetland setting at the time the lowest soil/sediment in the core accumulated. Some trees occupied high areas, such as bayou levees, while others grew in swamps associated with the coastal marshes. Poaceae, Cyperaceae, ChenoAms, Asteraceae, and *T. angustifolia* grew in the fresh-to-brackish marsh habitat. The absence of *Nyssa* pollen also suggests brackish-water conditions.

At 268.0 cm depth, the one sample for Zone A is stratigraphically below the lowest radiocarbon dated sample in the SM1c core (266.7 cm), which yielded maximum and minimum ^{14}C ages of 3,470 and 3,160 CAL yr BP (Lab ID WW-699; Appendix 3, table 3-2). This was a time when sea level was falling from a mid-Holocene high stand that occurred in the Gulf Coast about 6.7 ka (Blum and others, 2002). The regression began somewhat less than 4,000 ka as ice sheets in Antarctica and Greenland began expanding (Funder, 1989; Goodwin, 1998; Ingólfsson and others, 1998; Pudsey and Evans, 2001). Sea level would have been falling for less than a thousand years when the soil/sediment at 268.0 cm was deposited, which could account for the apparent brackish nature of the setting. Freshening of the environment followed this drop in sea level, as is indicated by the overlying assemblages.

The 3,470–3,160 CAL yr BP radiocarbon age range for the 266.7-cm sample is during the 3,500–3,000 yr BP time period suggested by Brown and others (1999) to be a period of Mississippi River megafloods to the Gulf of Mexico. The 3,470–3,160 CAL yr BP St. Mary soil/sediment only include brackish-water indicators; there is no evidence of significant freshwater influx. The evidence supports Frazier's 1967 model that the eastward switch/migration of the Teche–Mississippi River system had been completed by about 3.5 ka (Frazier, 1967). It is possible that the eastward shift of the Teche–Mississippi River system was started by the megafloods suggested by Brown and others (1999).

SM1c Zone B: Samples Depths 266.7, 246.1, 227.3, 217.2, 201.9, 189.2, and 179.1 Centimeters

The palynomorphs of St. Mary fresh-marsh vibracore SM1c Zone B are much less abundant than those of Zone A. Arboreal pollen abundance decreases in this interval. Several new taxa (for example, *Acer*, *Alnus*, *Fraxinus*, *Nyssa*, *Planera*, and *Populus*) appear, including small numbers of *Pinus*. The latter most likely represents the regional pollen rain. The most abundant arboreal pollen in Zone B are *Quercus*, *Liquidambar,* and *Taxodium*.

Herbaceous pollen, though less abundant than in the Zone A, are well represented. Particularly prominent are wetland taxa (for example, Cyperaceae, ChenoAms, *Cladium*).

Aquatic pollen are more diverse and are important environmental indicators for core SM1c Zone B. Most are emergent plants that project above the water surface, indicating a shallow-water setting.

SM1c Zone B paleoenvironment and age. The sharp decline in arboreal pollen indicates a decrease in elevated areas near the core site. This may reflect land subsidence and/or the switching/migration of the fluvial input from the core site to elsewhere in the MRDP, leading to an end of levee construction. This would be consistent with the continued demise of the Teche–Mississippi River System, beginning at about 3.5 ka, and construction of the St. Bernard–Mississippi River System from 144 to 160 km (from 90 to 100 mi) to the east.

Tree cover declined in Zone B, even though the deep swamp and its surrounding shallow woodlands continued to exist. Freshwater marshes occupied a larger part of the habitat than indicated in Zone A. Wetland herbs and emergent aquatics flourished. Brackish-water input continued, as indicated by the presence of salt-tolerant taxa, such as ChenoAms and *Iva*, though to a much lesser extent.

Seven radiocarbon ages are available for Zone B (Lab ID WW-826–WW-832, Appendix 3, table 3-2). The range of ages is from about 3,390 to 2,060 CAL yr BP, which includes the 2,500 yr BP time of megafloods to the Gulf of Mexico referred to by Brown and others (1999).

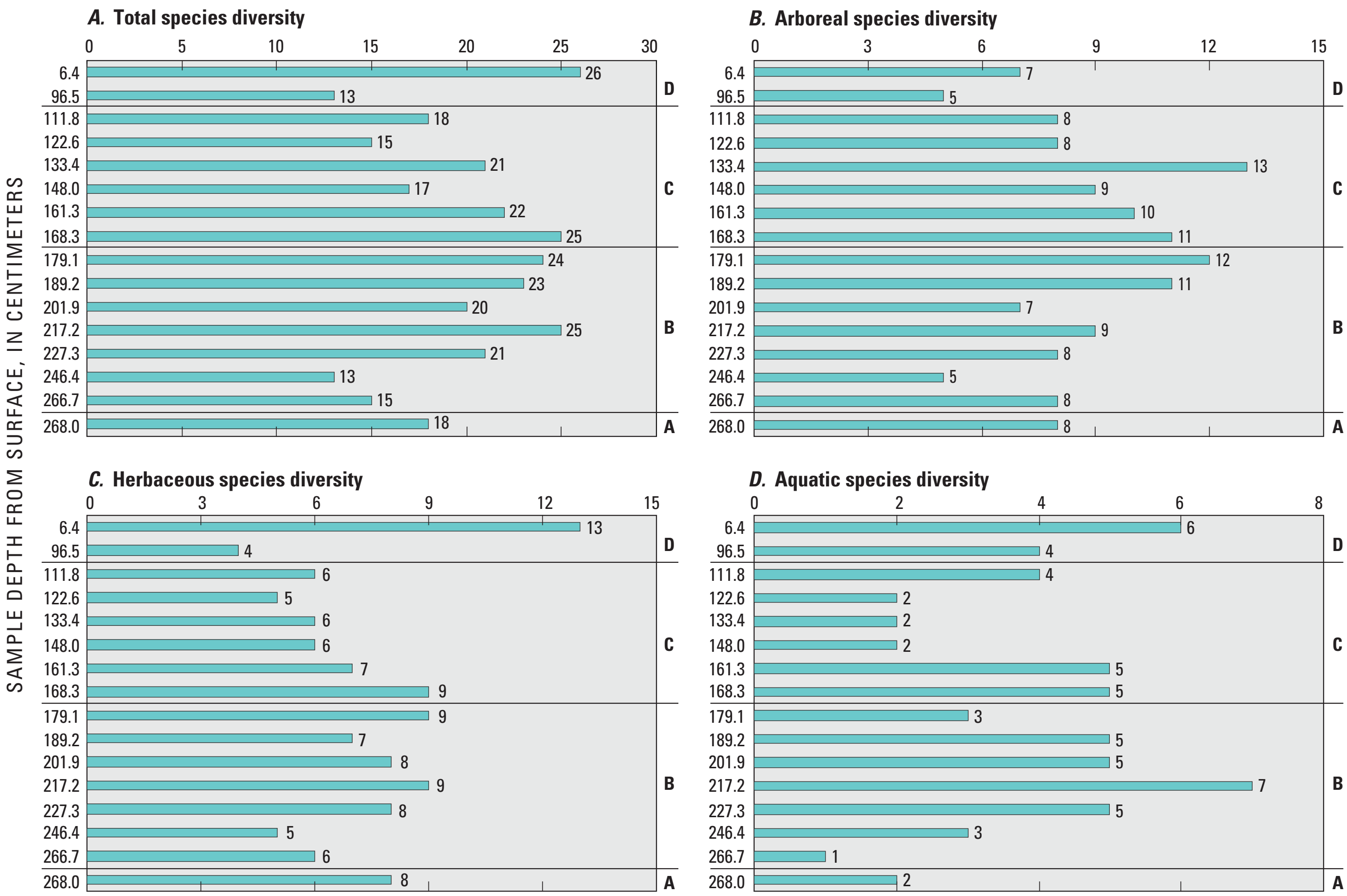


Figure 40. Pollen species diversity for St. Mary fresh-marsh vibracore SM1c. The number at the end of each bar equals the the computed number of species for each sample. Horizontal lines separate each pollen zone. Letters to the right of each plot are pollen-zone designations. Data for each zone are summarized in table 10.

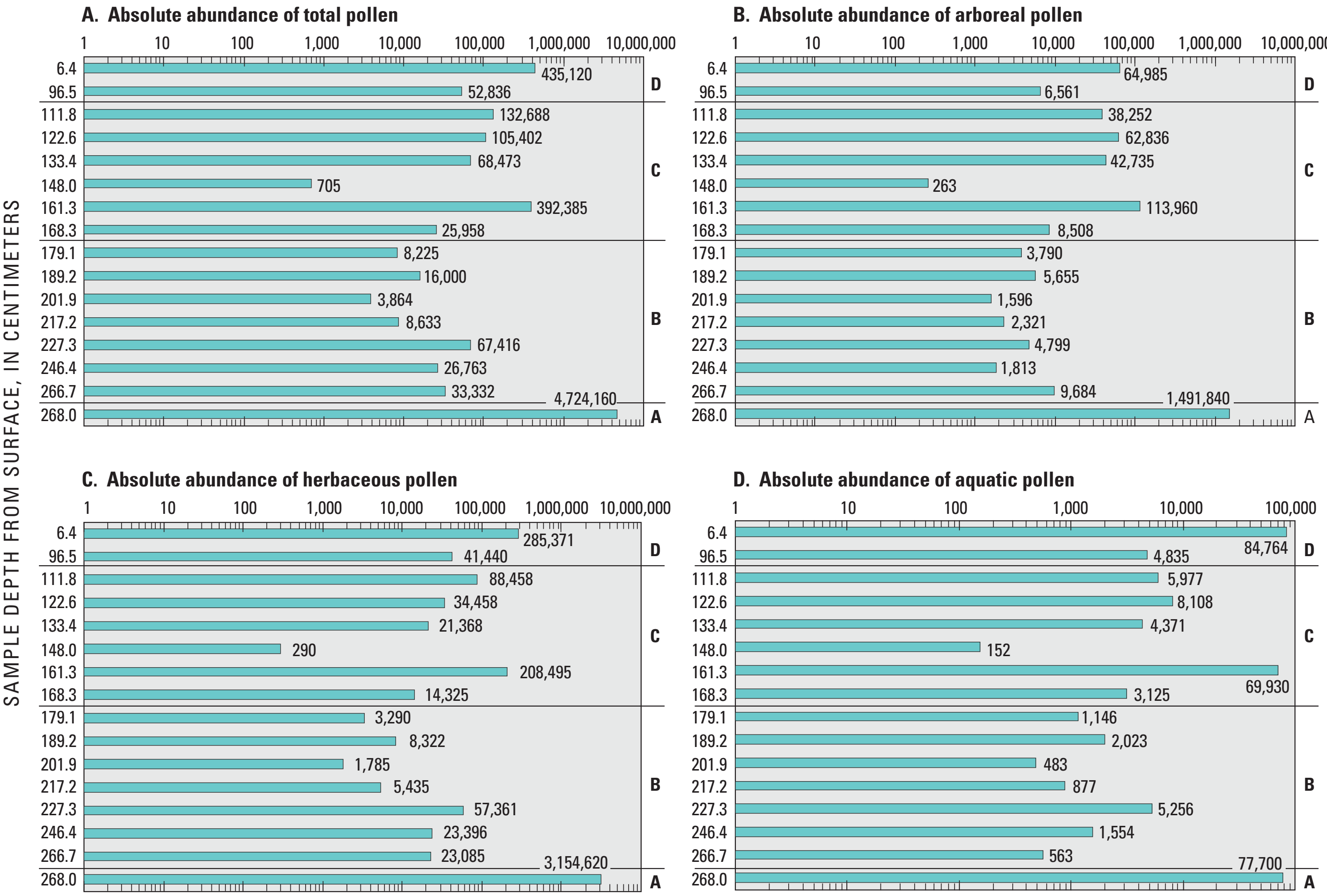


Figure 41. Pollen absolute abundance for St. Mary fresh-marsh vibracore SM1c. The number at the end of each bar equals the the computed number of specimens for each sample. Note that absolute abundance values are plotted on a log scale. Horizontal lines separate each pollen zone. Letters to the right of each plot are pollen-zone designations. Data for each zone are summarized in table 10.

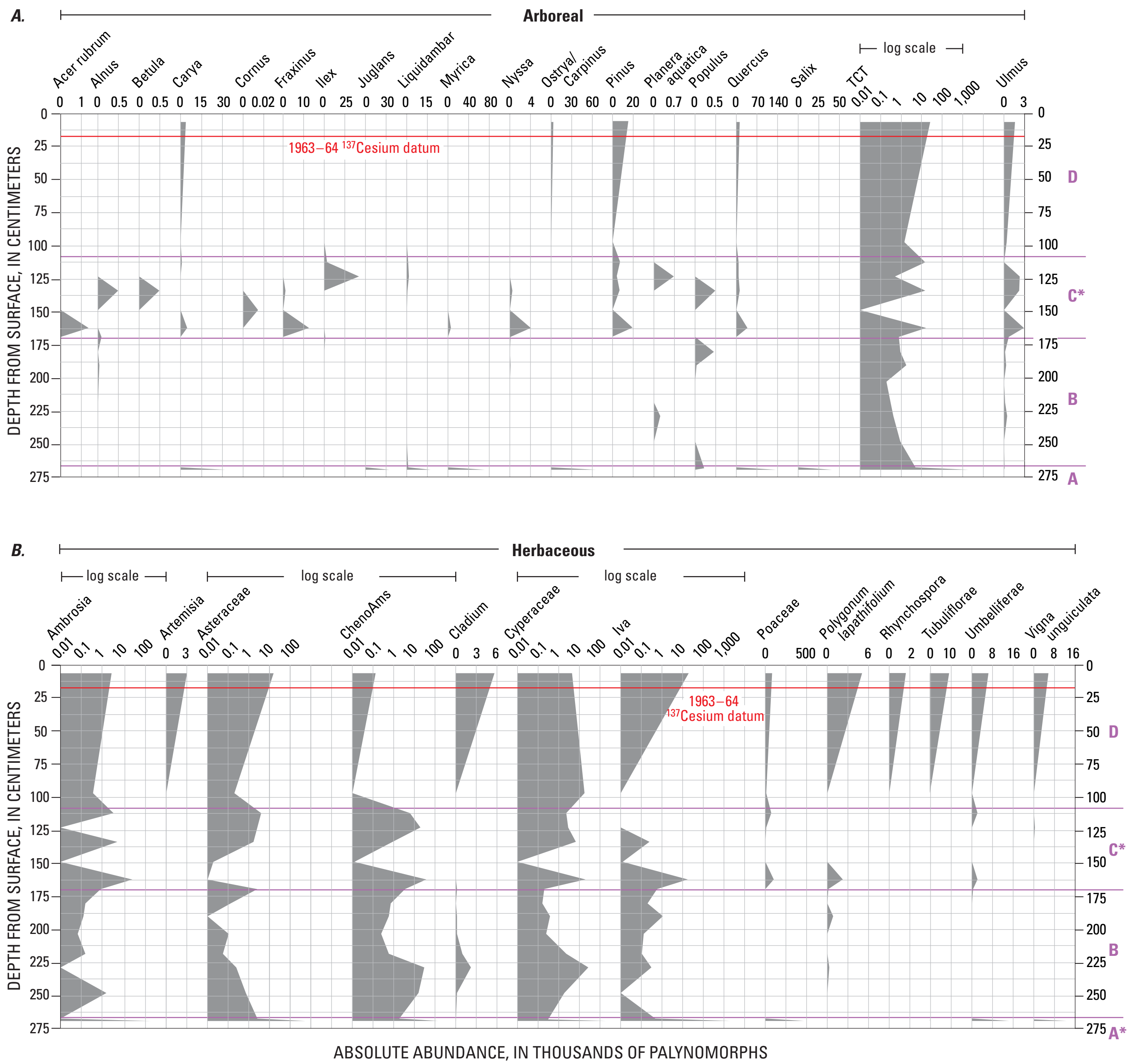


Figure 42. Absolute abundance data for selected palynomorphs from St. Mary fresh-marsh vibracore SM1c: (*A*) arboreal, (*B*) herbaceous, and (*C*) aquatic and other. Because of the broad range in values, TCT, Ambrosia, Asteraceae, ChenoAms, Cyperaceae, Iva, and Total Pollen data are shown on logarithmic scales. The Foraminifera occur in only two samples and are indicated by a separate bar at both sample levels. Palynomorph data are included in Appendix 5, table 5-2. The 1963–64 cesium-137 (^{137}Cs) datum is for the adjacent push-core SM1b. The palynomorph zones (A–D) are discussed in the text. [TCT = Taxodiaceae–Cupressaceae–Taxaceae; ChenoAms = a group of morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families; *, carbon-14 (^{14}C) age data in Appendix 3, table 3-2]

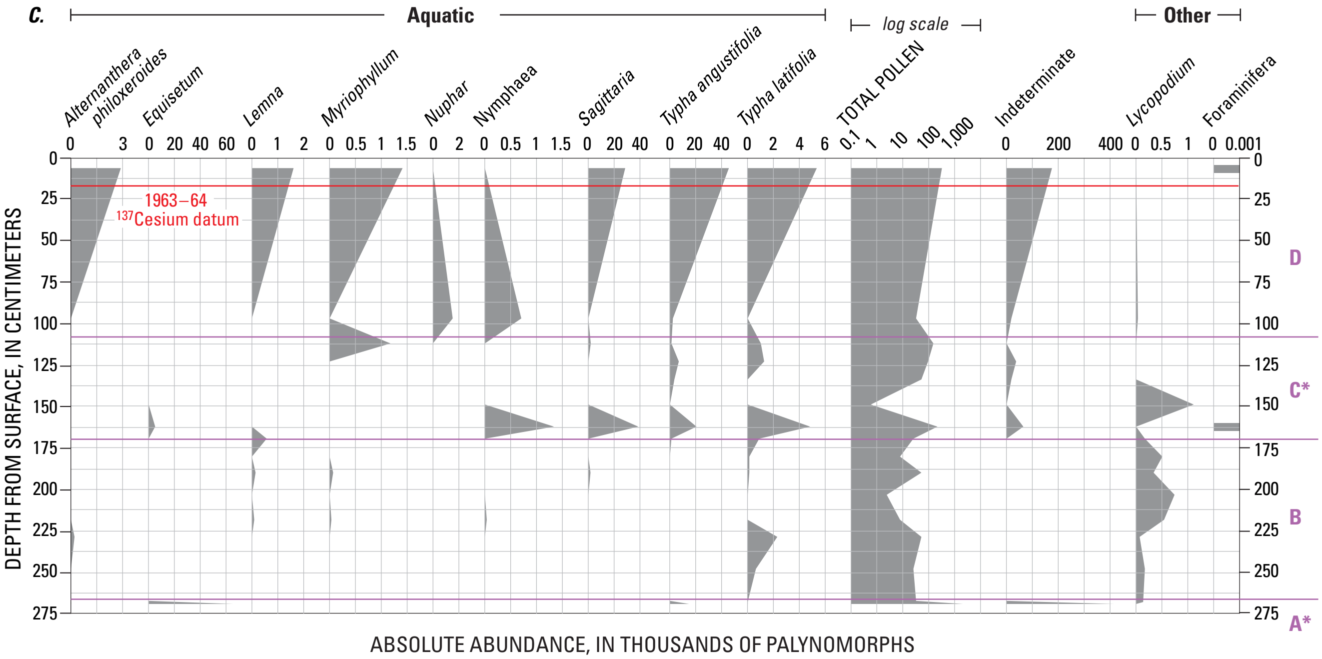


Figure 42. Absolute abundance data for selected palynomorphs from St. Mary fresh-marsh vibracore SM1c: (*A*) arboreal, (*B*) herbaceous, and (*C*) aquatic and other—Continued. Because of the broad range in values, TCT, Ambrosia, Asteraceae, ChenoAms, Cyperaceae, Iva, and Total Pollen data are shown on logarithmic scales. The Foraminifera occur in only two samples and are indicated by a separate bar at both sample levels. Palynomorph data are included in Appendix 5, table 5-2. The 1963–64 cesium-137 (^{137}Cs) datum is for the adjacent push-core SM1b. The palynomorph zones (A–D) are discussed in the text. [TCT = Taxodiaceae–Cupressaceae–Taxaceae; ChenoAms = a group of morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families; *, carbon-14 age data in Appendix 3, table 3-2]

Table 10. Summary discussion of pollen zones for St. Mary fresh-marsh vibracore SM1c, St. Mary Parish, southeastern Louisiana.

[cm, centimeter; <, less than; A.D., *anno Domini* (in the year of the Lord); TCT, combined pollen of the Taxodiaceae, Cupressaceae, and Taxaceae families; CAL yr BP, calibrated years before present; ChenoAms, combined pollen of Chenopodiaceae and Amaranthaceae families]

Palyno-morph zone	Zone depth (cm)	Sample depth (cm)	Age range	Taxa	Comments relating to figure 42 and to data in Appendix 5
D	0–112	6.4 96.5	< A.D. 1950 for sediment from 24–9 cm depth < 1,890 to > 0 CAL yr BP for sediment from 123–38 cm depth.	TCT and *Quercus* dominate the arboreal pollen in Zone D. *Carya*, *Pinus*, *Salix*, and *Ulmus* also are present. *Ostrya/carpinus* is common, as it is in Zone A. Herbacous pollen increases significantly in the uppermost sample of Zone D (6.4 cm). The aquatic pollen *Sagittaria* and *Typha* do the same. *Alternathera philoxeroides* first appears.	In the Zone D 6.4 cm sediment, • *Vigna unguiculata* suggests age deposition after the early A.D. 1700s. • *Alternathera philoxeroides* indicates an age no older that A.D. 1900. • *Sagittaria* and *Typha*, emergent aquatic plants, suggest a shallow freshwater environment similar to the present fresh marsh. • *Quercu*s, *Salix*, *Pinus*, and *Ulmus* indicate the presence of water tolerant species on slightly higher adjacent landforms (that is, bayou levees). In the 98.5 cm sediment, herbacous pollen (Cyperaceae and Poaceae) dominate. *Quercu*s, *Salix*, and *Ulmus* are present. Absence of *Nyssa*, suggests brackish water influence.
C	112–169	111.8 122.6 133.4 148.0 161.3 168.3	< 2,330 to > 1,170 CAL yr BP	Defined by the sharp increase in arboreal pollen diversity. *Carya*, *Fraxinus*, *Myrica*, *Nyssa*, *Pinus*, *Quercus*, and *Ulmu*s also increase in abundance. Herbacous and most aquatic pollen increase in abundance. Asteraceae, ChenoAms, Cyperaceae, *Iva*, Poaceae, and Tubilflorae are the most abundant. *Equisetum*, *Sagittaria*, *Typha angustifolia*, and *T. latifolia* increase.	Zone C probably represents an early stage in development of the modern marsh. • Above 133.4-cm salt-inolerant *Nyssa* absent. • Mixed hardwoods on adjacent higher ground (i.e., bayou levees). *Taxodium* and *Nyssa* (168.3–133.4 cm) suggest the presence of typical deep freshwater marsh/swamp. *Pinus* represents regional pollen rain and (or) water-tolerant conifers mixed with hardwoods on higher ground adjacent to marshes/swamps.
B	169–265	179.1 189.2 201.9 217.2 227.3 246.4 266.7	< 3,470 to > 2,060 CAL yr BP	The arboreal assemblage is similar to that of Zone A. *Liquidambar*, *Quercu*s, and *Taxodium* are still the most abundant arboreal pollen, but are less abundant than in Zone A. *Salix* and *Ulmus* are well represented. *Acer*, *Alnus*, *Fraxinus*, *Nyssa*, *Planera*, and *Populus* appear. Cyperaceae, ChenoAms, *Cladium*, and Poaceae dominate the herbaceous assemblage. Cyperaceae, ChenoAms, *Cladium*, and Asteraceae decline upsection within the zone.	Arboreal pollen abundance decreases. The appearance of *Nyssa* suggests a dominantly freshwater environment. Herbaceous pollen abundance also decreases. Wetland taxa (for example, Cyperaceae, ChenoAms, *Cladium*) suggest perennially wet conditions rather than periodic or seasonal flooding. Tree cover on relatively higher ground decreases. Deep freshwater swamps and shallow wetlands persist. *Pinus* probably represents regional pollen rain.
A	265–275⁺	268.0	< 3,470 to > 3,160 CAL yr BP	Arboreal assemblage includes *Carya*, *Liquidambar*, *Myrica*, *Quercu*s, *Salix*, and TCT (*Taxodium distichum*) with abundant *Juglans*. Herbacous pollen are especially abundant and include *Ambrosia*, Asteraceae, ChenoAms, Cyperaceae, *Iva,* and Poaceae. Aquatic pollen includes *Equisetum* and *Typha angustifolia*.	Most abundant pollen zone. Dominated by herbaceous with some arboreal taxa. All indicate mixed forest and wetlands associated with floodplains. *Carya*, *Liquidambar*, and *Quercu*s suggest some higher swamp-edge/levee positions. Herbaceous assemblage suggests fresh- to brackish-water coastal swamps and marshes. Salinity primarily low, but high enough for long enough intervals to preclude *Nyssa* . Deposition coeval with time of falling sea level due to ice-sheet expansion (Pudsey and Evans and others, 2001).

SM1c Zone C: Sample Depths 168.3, 161.3, 148.0, 133.4, 122.6, and 111.8 Centimeters

St. Mary fresh-marsh vibracore SM1c Zone C is marked by an increase in the diversity of arboreal pollen, and in the case of *Carya*, *Fraxinus*, *Myrica*, *Nyssa*, *Pinus*, *Quercus*, and *Ulmus*, a parallel increase in abundance. *Pinus*, *Quercus*, TCT, and *Ulmus* are all well represented with the first three taxa dominating the arboreal pollen. *Nyssa* is not present above the 133.4-cm sample, which may suggest some intermittent brackish conditions.

Herbaceous pollen increase within Zone C, many to the highest level since those encountered in Zone A. The most abundant and environmentally diagnostic taxa include Asteraceae, ChenoAms, Cyperaceae, *Iva*, Poaceae, and Tubiflorae. Species of these plants thrive in wet settings and many tolerate both brackish and freshwater conditions.

The sample at 148 cm depth yielded few pollen, herbaceous or otherwise.

Like the herbaceous pollen, many aquatic pollen also increase in Zone C (for example, *Equisetum*, *Sagittaria*, *Typha angustifolia*, and *T. latifolia*, and in one sample, *Nymphaea*).

SM1c Zone C paleoenvironment and age. Zone C represents an early stage in the development of the modern marsh (maximum and minimum calibrated age-range, 2,310–1,170 CAL yr BP; samples WW-821–WW-825, Appendix 3, table 3-2). Mixed hardwood trees grew on the better-drained levees and associated high-standing flats along bayous, such as can be seen along nearby Bayou Sale today. *Taxodium* and *Nyssa* pollen indicate that a typical deep-water swamp existed in the area and that the swamp was dominantly freshwater. Although waters were predominantly fresh, the position of this site near the coast suggests the probability that hurricane storm surges and very high tides carried brackish water or saltwater into the area. Most marsh plants noted in Zone C of vibracore SM1c will tolerate brackish water during the transitory time interval of such events.

SM1c Zone D : Sample Depths 96.5 and 6.4 Centimeters

Arboreal pollen present in St. Mary fresh-marsh vibracore SM1c Zone D include *Carya*, *Pinus*, *Quercus*, rare *Salix*, TCT, and *Ulmus*. TCT dominates the arboreal pollen in Zone D as in the deeper zones. *Nyssa* continues to be absent. *Ostrya/Carpinus* was common for the first time above Zone A and may indicate higher drier land in the adjacent area. *Pinus* increases in abundance to almost its high near the base of Zone C and was probably sourced locally as well as regionally.

Almost all herbaceous pollen increase significantly at the top of Zone D (6.4 cm); most show new highs or at least the highest value above Zone A. The pollen is indicative of plants that can grow well in moist or wet settings; many tolerate both brackish-water and freshwater conditions.

Aquatic plants—such as *Sagittaria*, *Typha angustifolia*, and *T. latifolia*—increase in abundance, and the latter two species attain their greatest concentration in Zone D. These taxa are the dominant emergent aquatic plants in vibracore SM1c.

SM1c Zone D paleoenvironment and age. As in Zones B and C, most represented aquatic genera are emergent plants that indicate a shallow-water setting. Zone D represents the development of the modern marsh at the St. Mary SM1c core site. Zone D palynomorphs indicate fresh marsh, though it is likely that hurricane storm surges and very high tides would have driven brackish water or saltwater into the area. Most of the marsh plants noted in Zone D will tolerate brackish water for short time intervals. The arboreal pollen assemblage is likely derived from trees growing on the levees and associated elevated areas along nearby Bayou Sale just east of the core site (fig. 5*D*).

Carbon-14 ages range from 1,890–0 CAL yr BP for vibracore SM1c samples from 122.6–38.1 cm. For push-core SM1a, ^{14}C data indicate that all samples (24.1–8.9 cm) are younger than the calendar year 1950. The presence of *Vigna unguiculata* suggests that marsh soil/sediment at and above 6.4 cm is younger than the early A.D. 1700s. *Alternanthera philoxeroides* pollen indicate that the 6.4 cm soil/sediment is no older that A.D. 1900.

St. Bernard Brackish-Marsh Vibracore SB1c

The St. Bernard core locality is in a brackish marsh between two abandoned distributaries northeast of the Mississippi River in St. Bernard Parish, Louisiana (table 1, fig. 5*E*). During the 1800s, the land was part of the Conseil Plantation of the Villeré family "in a region historically rich in agricultural products" (Markewich, 1998a). Sugar cane was the primary crop. Presently the area is primarily grasses, bulrush, and broadleaf cattail. However, the current vegetation reflects the effects of human-made coastal alteration. At least since the early 1960s, due to construction of the Mississippi River Gulf Outlet (MRGO), vegetation in the general area of the St. Bernard core locality has been modified by saltwater encroachment as reflected by the influx of foraminifera. Prior to canal building, intermediate-marsh vegetative types probably were dominant.

St. Bernard locality and core data (palynomorph and other microstratigraphic markers, isotope, and inorganic element) were included and discussed in Markewich (1998a). For a complete discussion, the reader is referred to that report.

Because *Sporomiellia* (fungus)[5] and monolete and trilete Pteridophyte (ferns) spores were identified in some of the St. Bernard SB1c vibracore samples, the data are included in the total-diversity and absolute-abundance values shown in figures 43 and 44 and in the sawtooth diagram shown in figure 45. *Sporomiellia* and Pteridophyte data are included with other palynomorph data for vibracore SB1c, in Appendix 5, table 5-2.

[5]Wrenn and others (1998a) noted that Sporomiella spores are commonly associated with the dung of herbivores and that domesticated livestock came with European settlement and cultivation. Cattle and horses were included in the first census of New Orleans, taken during November 1721 (DuFour, 1968). Davis (1987) identified the fungus Sporomiella as a palynological marker for determining the arrival of these animals

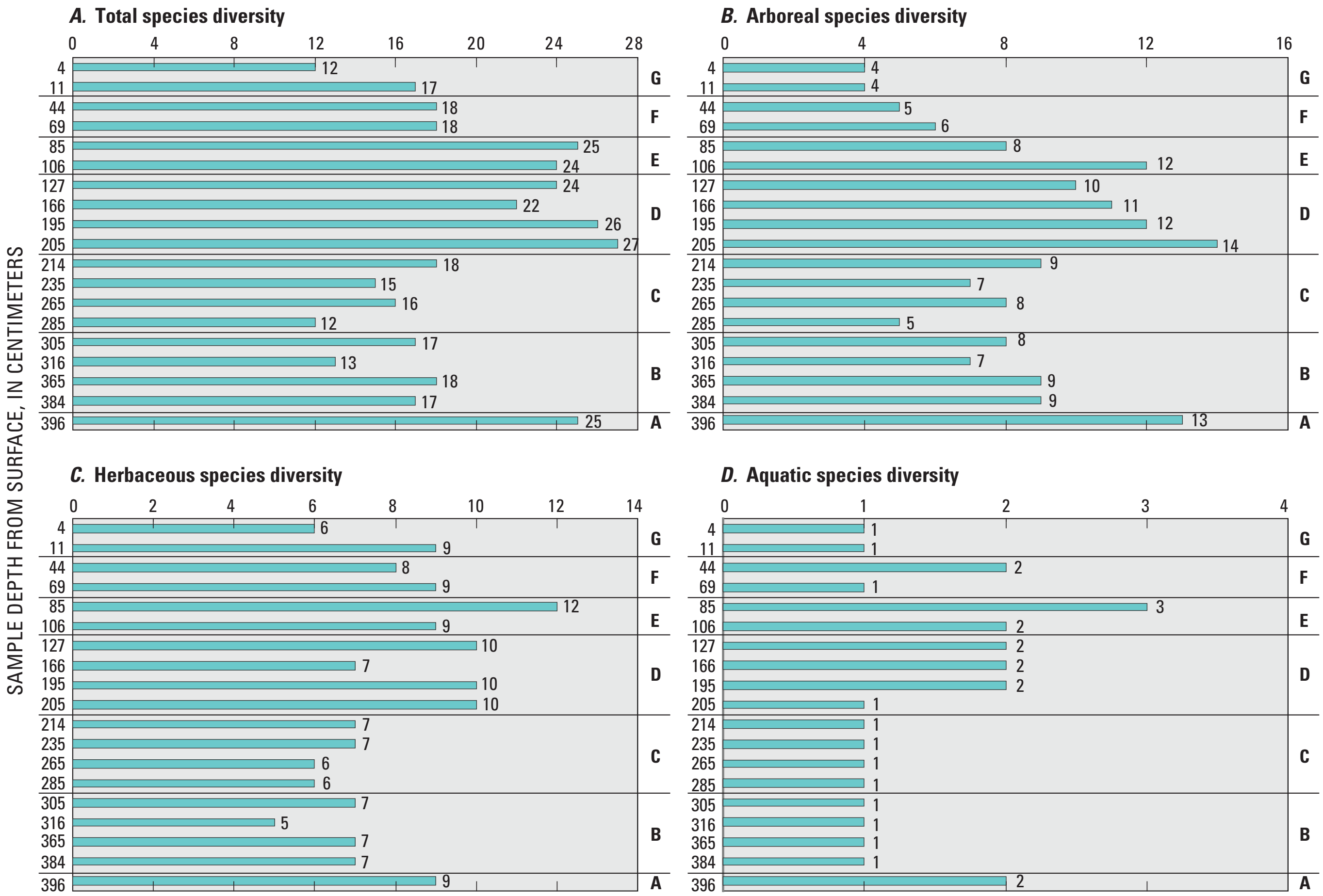


Figure 43. Pollen species diversity for St. Bernard brackish-marsh vibracore SB1c. The number at the end of each bar equals the computed number of species for each sample. The values in (*A*) total species diversity, include monolete and trilete spores and *Sporomeillia*. Horizontal lines separate each pollen zone. Letters to the right of each plot are pollen-zone designations. Data for each zone are summarized in table 11.

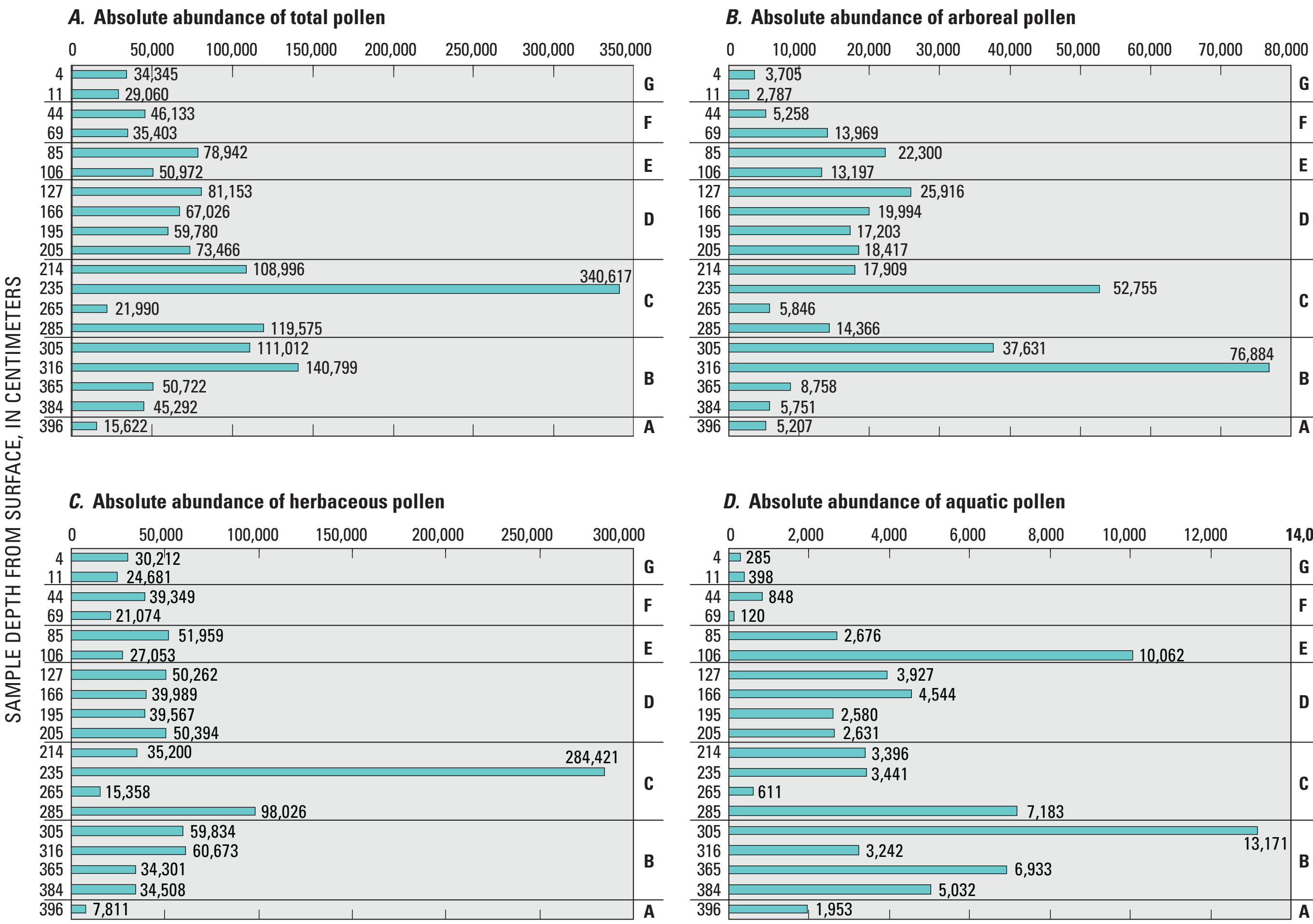


Figure 44. Pollen absolute abundance for St. Bernard brackish marsh vibracore SB1c. The number at the end of each bar equals the the computed number of specimens for each sample. Values in (*A*) absolute abundance of total pollen, include monolete and trilete spores and *Sporomeillia*. Horizontal lines separate each pollen zone. Letters to the right of each plot are pollen-zone designations. Data for each zone are summarized in table 11.

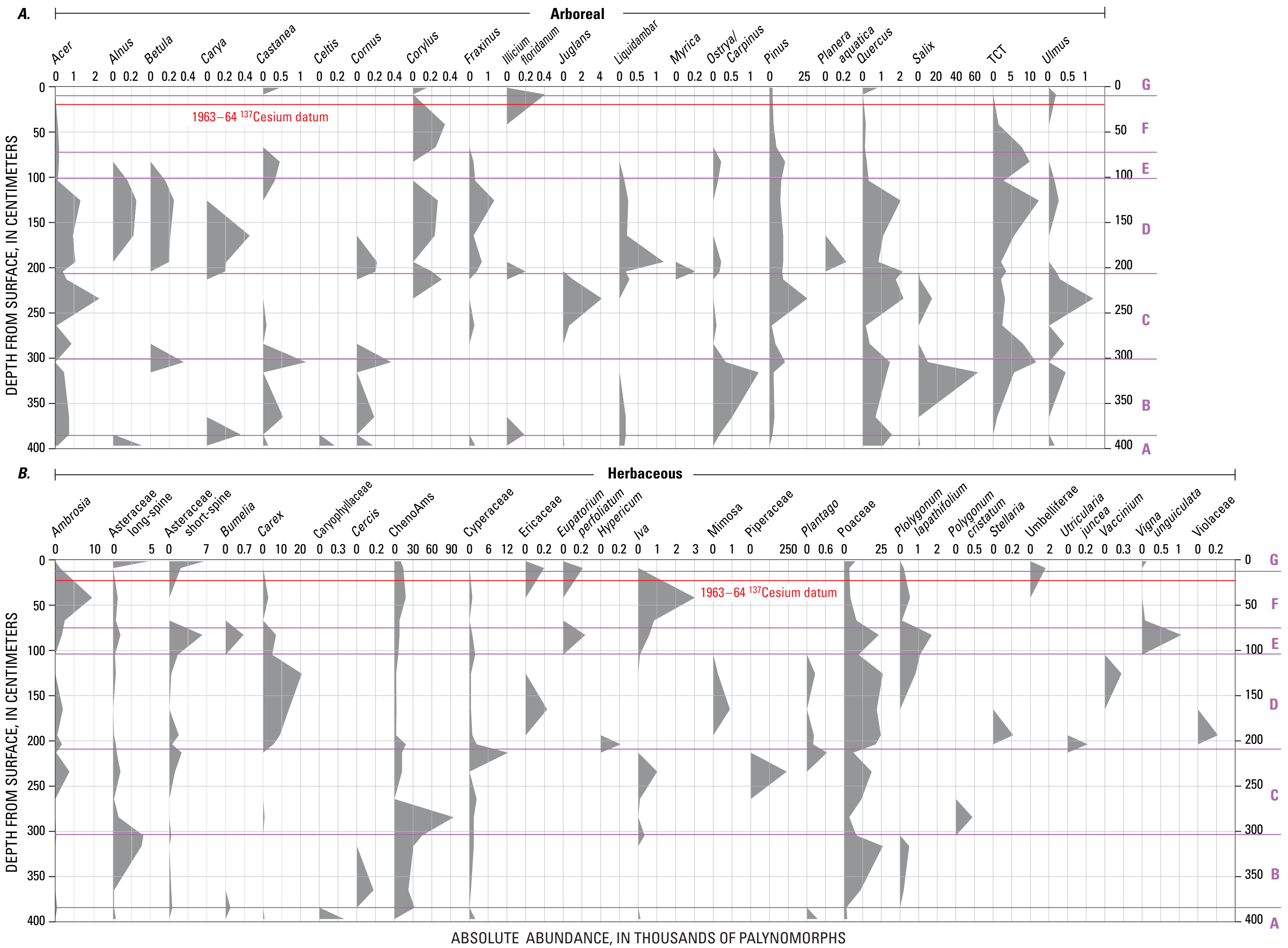


Figure 45. Absolute abundance data for selected palynomorphs from St. Bernard brackish-marsh vibracore SB1c: (*A*) arboreal; (*B*) herbaceous; and (*C*) aquatic, pteridophyte, and other. Because of the broad range in values, Monolete spore data are shown on a logarithmic scale. Palynomorph data are included in Appendix 5, table 5-2. The 1963–64 cesium-137 (^{137}Cs) datum is for push-core SB1b. [TCT = Taxodiaceae–Cupressaceae–Taxaceae; ChenoAms = a group of morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families]

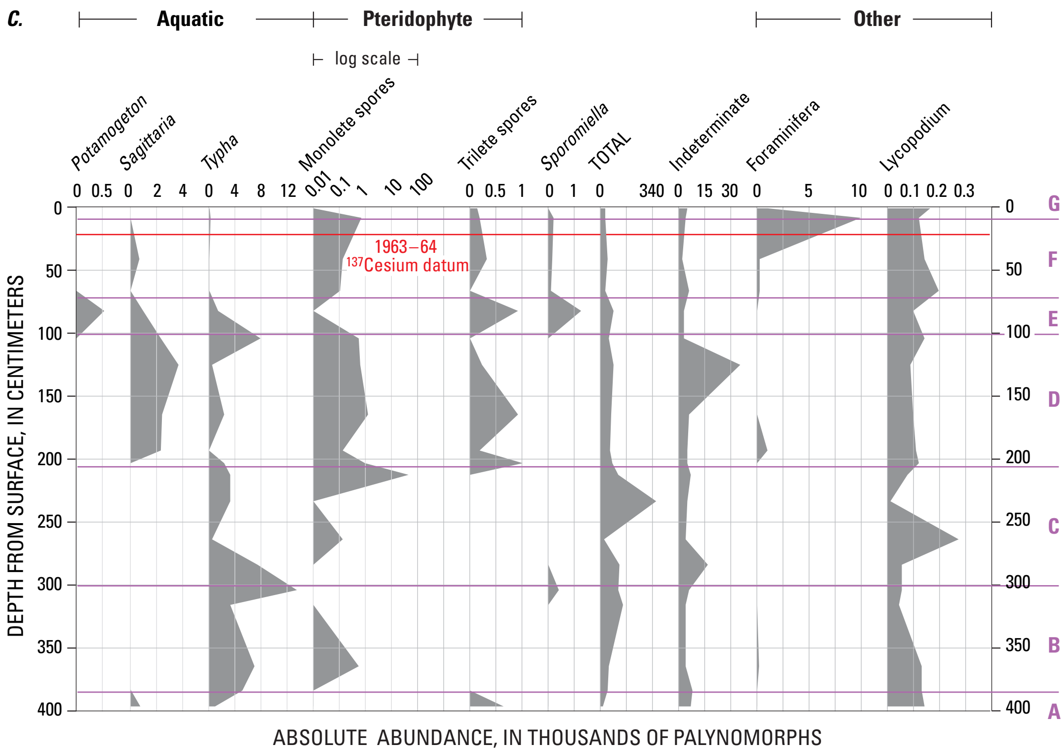


Figure 45. Absolute abundance data for selected palynomorphs from St. Bernard brackish-marsh vibracore SB1c: (*A*) arboreal, (*B*) herbaceous, and (*C*) aquatic, pteridophyte, and other. Because of the broad range in values, Monolete spore data are shown on a logarithmic scale. Palynomorph data are included in Appendix 5, table 5-2. The 1963–64 cesium-137 (datum is for push-core SB1b—Continued. [TCT = Taxodiaceae–Cupressaceae–Taxaceae; ChenoAms = a group of morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families]

The “Biochronostratigraphy” section of Wrenn and others (1998a) discussed in detail the use of pollen data, with data from other microstratigraphic markers, and the historical record to establish palynomorph zones. Because the analytical results for the cores from the St. Bernard locality were presented in that report, only a summary of the results are presented here. Modifications made to the data presented by Wrenn and others (1998a) are:

- Some core depths for St. Bernard vibracore SB1c were modified for this report as a result of recalculated compaction corrections.
- *Vigna unguiculata* (L.) Walp. subsp. *unguiculata* is the accepted name for the pollen identified as *Vigna luteola* (Jacq.) Benth. and is equated with the black-eyed pea and used in this report.
- Palynomorph zones were initially established for St. Bernard vibracore SB1c using count data and were discussed in table 6 of Wrenn and others (1998a). For this report, palynomorph count data were converted to absolute-abundance values (see Appendix 5 for conversion formula). The palynomorph zones were then modified using the absolute-abundance data.

Figures 43 and 44 show the species-diversity and absolute-abundance data for each sample taken from the St. Bernard brackish-marsh vibracore SB1c. Figure 45 graphically portrays the absolute-abundance data and the palynomorph zonation based on those data. Throughout the several thousand years represented by St. Bernard vibracore SB1c soil/sediment, vegetation reflected the **Bald Cypress-Gum Cover Type.** However, the absence of salt-intolerant *Nyssa* pollen is indicative of periodic and possibly long periods of brackish conditions.

Table 11 in this report is a modification of table 6 in Wrenn and others (1998a) and gives the depth and age ranges, distinctive palynomorphs, and authors’ comments for each of the seven palynomorph zones for St. Bernard vibracore SB1c. The following paragraphs summarize and paleoenvironment and age data for SB1c.

Table 11. Summary discussion of pollen zones for St. Bernard brackish-marsh vibracore SB1c, St. Bernard Parish, southeastern Louisiana.[1]

[cm, centimeter; A.D., *anno Domini* (in the year of the Lord); <, less than; ChenoAms, combined pollen of Chenopodiaceae and Amaranthaceae families; >, greater than; TCT, combined pollen of the Taxodiaceae, Cupressaceae, and Taxaceae families; OCS, organic carbon spherules; CAL yr BP, calibrated years before present; ^{14}C, carbon-14]

Palyno-morph zone	Zone depth (cm)	Sample depth (cm)	Age range	Taxa	Comments relating to figure 45 and to data in Appendix 5
G	0–11	4.0 11.0	A.D. 1996 to <A.D. 1963	Arboreal taxa are sparse and of low diversity compared to underlying zones. Asteraceae(both types), ChenoAms, and Poaceae are the most abundant non-arboreal pollen present. Coiled microforams increase in abundance.	Modern zone, defined by an increase in micro-foram linings, possibly resulting from the rise in salinity levels after construction of the Mississippi River/Gulf Outlet Canal in the late 1950s. Asteraceae, ChenoAms, and Poaceae indicate open, sunny freshwater to brackish-marsh conditions.
F	11–77	44.0 69.0	<A.D. 1963 to >A.D. 1830	Arboreal taxa are less abundant and diverse than in Zone E. Although TCT and *Pinus* also decline, they are the most abundant arboreal pollen in Zone F. The nonarboreal assemblage is similar to that of Zone E, but most taxa are less abundant. *Ambrosia*, ChenoAms, and *Iva* are exceptions: they are much more abundant.	Defined by the sharp decrease in TCT and *Pinus* and the large increase in sun-loving *Ambrosia*, ChenoAms, and *Iva*. The TCT values record the historic decline in *Taxodium distichum* resulting from intensive logging between A.D. 1890 and A.D. 1925 and the earlier, less extensive logging associated with the expansion of New Orleans. Continued increase of *Ambrosia*, ChenoAms, and *Iva* may result from greater open spaces created by logging and/or expanding settlements. OCS data indicate an A.D. 1900–1910 age for soil/sediment at 56 cm depth (Wrenn and others, 1998a).
E	77–106	85.0 106.0	<A.D. 1830 to <650 CAL yr BP	The arboreal assemblage is similar to that of Zone D, but specimens are less abundant. *Castanea* and *Quercus* occur in low numbers. *Ambrosia*, Asteraceae (both types), *Carex*, ChenoAms, *Iva*, and Poaceae increase upsection. *Carex* is less abundant than in Zone D. Cyperacea, *Sagittaria*, and *Typha* decline upsection within the zone. *Vigna unguiculata* and *Sporomiella* appear for the first time.	Most noticeable are the decrease in *Carex* and the increase in *Ambrosia*, Asteraceae (both types), ChenoAms, *Iva*, and *Typha*. The decrease in *Carex* indicates that drier conditions prevailed than in the underlying zone. The associated increase in the sun-loving Asteraceae supports the hypothesis that Zone E includes the period of colonization and clearing of the inner New Orleans area. Also notworthy is the appearance of *Vigna unguiculata* and the fungal spore *Sporomiella* at 85 cm. *V. unguiculata* (black-eyed pea), an introduced Old World domestic, suggesting a no-older-than age of A.D. 1717 for soil/sediment at and above 85 cm. *Sporomiella* may reflect the presence of domestic animals that would have been present on the plantation at the time the 85-cm marsh soil/sediment was accumulating. OCS data indicate a maximum age of A.D. 1830 for soil/sediment at 85 cm depth (Wrenn and others, 1998a).

Table 11. Summary discussion of pollen zones for St. Bernard brackish-marsh vibracore SB1c, St. Bernard Parish, southeastern Louisiana.[1]—Continued

[cm, centimeter; A.D., *anno Domini* (in the year of the Lord); <, less than; ChenoAms, combined pollen of Chenopodiaceae and Amaranthaceae families; >, greater than; TCT, combined pollen of the Taxodiaceae, Cupressaceae, and Taxaceae families; OCS, organic carbon spherules; CAL yr BP, calibrated years before present; ^{14}C, carbon-14]

Palyno-morph zone	Zone depth (cm)	Sample depth (cm)	Age range	Taxa	Comments relating to figure 45 and to data in Appendix 5
D	106–214	127.0 166.0 195.0 205.0	<1,390 to >650 CAL yr BP	*Pinus* is abundant in all samples. *Salix* decreases markedly whereas TCT increases markedly upsection. Asteraceae (both types combined) and ChenoAms decrease in abundance upsection. *Carex* becomes abundant upsection, but Cyperaceae are rare. Poaceae are very abundant in this zone. *Sagittaria* is abundant in the upper part of the zone. *Typha* is rare to common.	Abundant *Carex*, rare *Typha*, and the appearance of *Sagittaria* indicate shallow, freshwater-marsh conditions. The abundance of TCT suggests swamps were nearby. The abundance of *Carex*, Poaceae, and the appearance of *Sagittaria* suggest that the Zone D wetland has a stronger marsh character than Zone C. Zone D probably records the beginning of the disintegration of the St. Bernard delta plain following its maximum development.
C	214–305	214.0 235.0 265.0 285.0	<2,750 to >1,710 CAL yr BP	*Juglans* and Piperaceae occur only in this zone. *Pinus*, *Quercus*, *Salix*, and Asteraceae (short-spine) are rare to common, and more common in the upper half of Zone C. *Pinus* reaches a core maximum at 235.0 cm. TCT is common, but declines upsection by >50 percent. Asteraceae (long-spine), ChenoAms, Poaceae, and *Typha* decline upsection. Cyperaceae increases upsection, reaching a core maximum at 214.0 cm.	The presence of *Juglans* and Piperaceae indicates a shift to drier, more terrestrial, conditions than those reflected in Zone B. This is supported by a decline in the water-loving *Salix*. The presence of *Typha*, ChenoAms, and Cyperaceae suggest a freshwater to brackish coastal setting. Following the delta model (Coleman and Roberts, 1989), Zone C is composed of the vegetation of the mature delta plain. That is, as the delta prograded further seaward of the core site, the site became more terrestrial in character.
B	305–384	305.0 316.0 365.0 384.0	<3,550 to >2,750 CAL yr BP	*Pinus* and TCT increase upsection, peaking at 305.0 cm. *Quercus* is common. *Salix* is present to abundant and peaks at 319 cm. Asteraceae (long-spine), Poaceae, and *Typha* are present to abundant and peak near the top of the zone. Asteraceae (short-spine) and Cyperaceae are present in low numbers. ChenoAms are abundant and reach a maximum at 305.0 cm.	The presence of *Quercus*, *Salix*, and TCT reflects the proximity of floodplain forests. ChenoAms are typical of inland saline soils, irregularly flooded fields, and brackish to saline marshes. *Typha* occurs along freshwater streams, ponds, lakes, and tidal and nontidal freshwater marshes, but also can tolerate brackish water. The presence of Asteraceae (long-spine) and abundance of Poaceae are consistent with marsh environments found along delta margins. Zone B is synchronous with the developmental phase of the St. Bernard delta.
A	384–396+	396.0	9,540 to 9,270 CAL yr BP	All pollen are rare. Of the arboreal taxa, *Quercus* and *Salix* are the most common. ChenoAms, Cyperaceae, Poaceae, and *Typha* are the most common nonarboreal taxa encountered. Pyrite abundant in sample.	Nonarboreal pollen suggests a shallow, open, and likely a freshwater to brackish water marsh setting. Abundant pyrite supports input of saline water to the setting. ^{14}C age is old compared to previous work in the area (Frazier, 1967). The date, on decomposed plant fragments in the interdistributary clay, probably reflects older, redeposited, organic material.

[1]Modified from table 6 in Wrenn and others (1998a)

SB1c Zone A: Sample Depth 396.0 Centimeters

The one ^{14}C sample for Zone A at 396–384 cm has a > 9,000 CAL yr BP age that probably reflects the age of older, included redeposited organic material and not the actual age of sediment (interdistributary clay) deposition. Total- and arboreal-pollen diversity in Zone A are near their highest values, which occur at the base of Zone D. Absolute-abundance values for total pollen and for each pollen type are the lowest for the core.

SB1c Zone B: Sample Depths 305.0, 316.0, 365.0, and 384.0 Centimeters; and SB1c Zone C: Sample Depths 214.0, 235.0, 265.0, and 285.0 Centimeters

Zones B and C reflect the building period of the St. Bernard delta from about 3.5 to 2 ka (see "Geology" section). The pollen assemblage, specially the appearance of *Juglans* and Piperaceae, suggests that as the St. Bernard delta continued to prograde seaward, the area became more terrestrial in character.

SB1c Zone D: Sample Depths 127.0, 166.0, 195.0, and 205.0 Centimeters

The strong marsh character and age range (from <1,390 to >650 CAL yr BP) suggests that Zone D deposition was post-maximum development or possibly during breakup of the St. Bernard delta plain.

SB1c Zone E: Sample Depths 85.0 and 106.0 Centimeters

The pollen assemblage, especially the increase in Asteraceae, suggest that Zone E conditions at the St. Bernard locality were drier than during Zone D. Zone E's age range (from <A.D. 1830 to <650 CAL yr BP) indicate that at least the upper part of the zone is post-settlement of New Orleans during A.D. 1717. The organic-carbon spherule (OCS) data presented by Wrenn and others (1998a) indicate a maximum A.D. 1830 age for soil/sediment at and above 85 cm depth.

SB1c Zone F: Sample Depths 44.0 and 69.0 Centimeters; and SB1c Zone G: Sample Depths 4.0 and 11.0 Centimeters

Zones F and G reflect the development of intense agriculture and the associated logging in the MRDP. *Ambrosia* and other sun-loving herbaceous pollen increase at the expense of TCT and *Pinus*. OCS data suggest a very early A.D. 1900 age for soil/sediment at and above 56 cm depth. And, the increase in forams in zone G reflect an increase in canal building, specially the MRGO, from the late 1950s to the present.

Terrebonne Brackish-Marsh Vibracore TB2c

The Terrebonne cores were taken in a brackish marsh on the southeastern margin of Lake Gero, Louisiana, about 3.5 km east of Bayou Grand Caillou (table 1; fig. 5*C*). Grasses, sedges, and cattails dominate the present day vegetation (table 1). The first sample studied from the vibracore TB2c was taken at 66.1 cm, just below the ^{14}C bomb-spike maximum. Bomb-spike ^{14}C data (Appendix 3, table 3-2) indicate that (1) soil/sediment above 50.6 cm is >MODERN and (2) the age estimate for the sample from 66.1 cm is uncertain but is between 470 and –10 CAL yr BP (see discussion of ^{14}C ages for brackish-marsh vibracore TB2c in the section "Carbon-14 Measurements." Cesium-137 data for push-core TB2a from the same locality (fig. 24 and Appendix 3, table 3-1) support the bomb-spike ^{14}C data by indicating a younger-than-1950 age (>MODERN) for soil/sediment <50 cm below the marsh surface.

For discussion, vibracore TB2c below 60.1 cm can be divided into three palynomorph zones. Overall pollen diversity (fig. 46*A*) is greatest (34 taxa) in the lower part of the core between 433.4 and 357.9 cm (Zone A), with a secondary peak (27 taxa) in the first sample (66.1 cm, in Zone C). A similar trend is seen in the diversity of arboreal and herbaceous pollen (fig. 46*B* and *C*, respectively). The diversity of aquatic pollen (fig. 46*D*) increases from zero at the base of the core (Zone A) to a high of five species at 67.2 cm (Zone C). Above 67.2 cm, aquatic diversity decreases to two taxa. Arboreal pollen diversity is greater than herbaceous or aquatic pollen diversity in all vibracore TB2c samples except the 283.9-cm sample at the base of Zone B. Herbaceous pollen diversity is slightly greater than that of arboreal pollen in this sample.

The absolute abundance of palynomorphs is shown in Appendix 5, table 5-2 and in figure 47*A*–*D*. The total pollen abundance for vibracore TB2c is greatest between 146.5 and 66.1 cm (Zone C), with the maximum value of about 940,000 grains per 1.2 ml of soil/sediment recorded in the 93.6-cm sample. Total abundance has a hundredfold decrease upward to the 66.1-cm sample. The upward pattern of each pollen type in Zone C is similar (fig. 47) with the maximum value for herbaceous pollen also in the 93,6-cm sample and maxima arboreal and aquatic pollen in the 128.9-cm sample.

Below 146.5 cm, in Zones A and B, absolute-abundance values for all types of palynomorphs are low and decrease overall with depth. The highest value for any pollen type below 146.5 cm is <10,000 grains per 1.2 ml of soil/sediment.

Herbaceous pollen are more abundant than either arboreal or aquatic pollen in every sample of vibracore TB2c, except for the lowest three samples of Zone A (563.9, 433.4, and 357.8 cm) in which arboreal pollen values marginally exceed those of herbaceous pollen. Characteristics of the three zones are summarized in table 12.

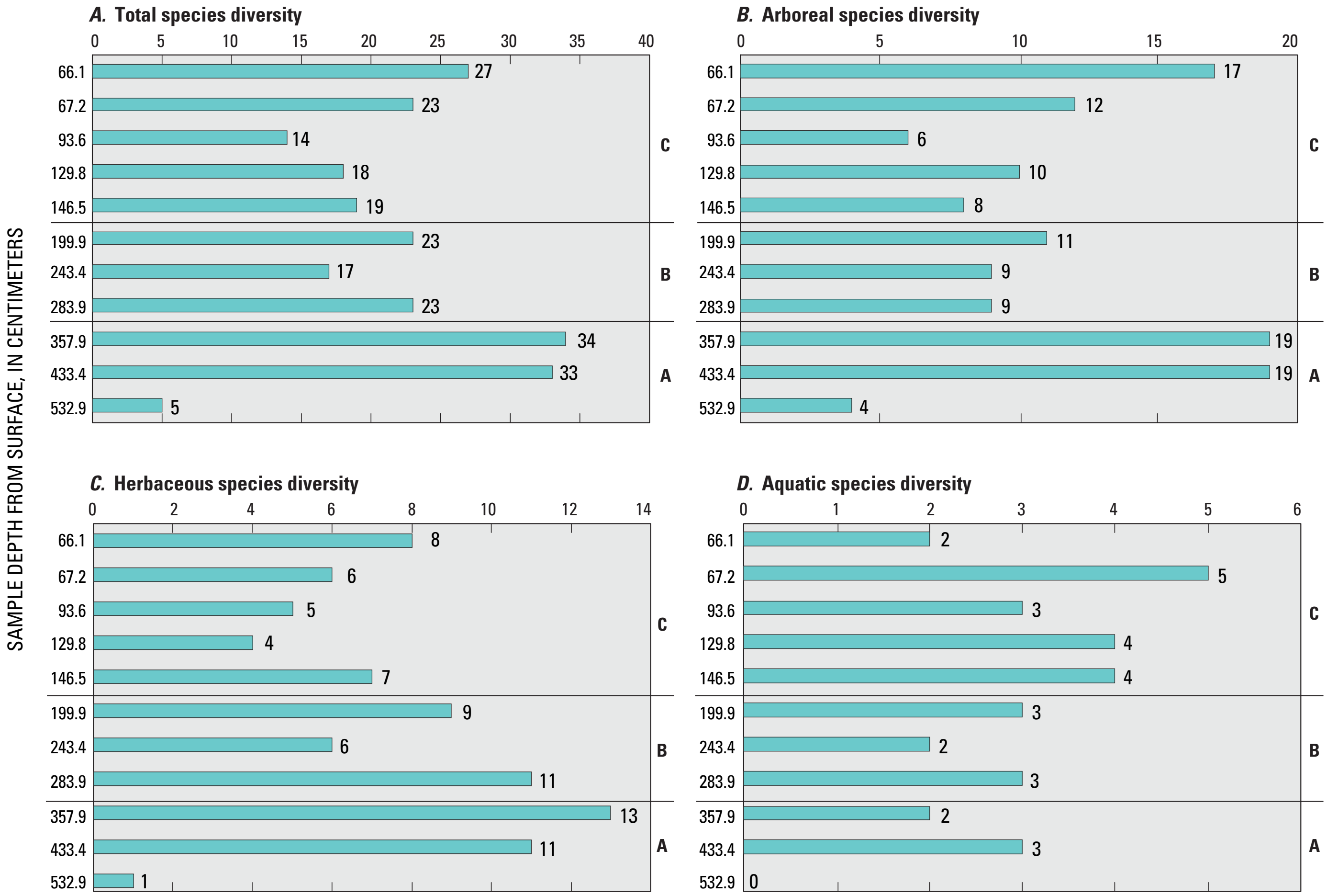


Figure 46. Pollen species diversity for Terrebonne brackish-marsh vibracore TB2c. The number at the end of each bar equals the the computed number of species for each sample. Letters to the right of each plot are pollen-zone designations. Data for each zone are summarized in table 12.

TB2c Zone A: Sample Depths 532.9, 433.4, and 357.9 Centimeters

Total pollen diversity as well as the diversity of arboreal and herbaceous pollen reach their highest values in Terrebonne brackish-marsh vibracore TB2c within Zone A (fig. 46*A–D*; Appendix 5, table 5-2). Aquatic pollen is at its lowest in this zone and the overlying Zone B. On the whole, pollen diversity increases from the bottom of Zone A to the top of the zone.

The absolute abundance of total pollen and each type of pollen (arboreal, herbaceous and aquatic) is lowest within Zone A (fig. 47*A–D*; Appendix 5, table 5-2). The richest sample in Zone A (433.4 cm) contains less than 9,000 pollen grains per 1.2 ml of soil/sediment. In contrast, the richest core sample (93.6 cm, Zone C) contains more than 938,000 pollen grains per 1.2 ml of soil/sediment.

The arboreal pollen assemblages consist of up to 26 taxa including those indicative of the **Bald Cypress-Gum Cover Type.** Of the arboreal associates of *Taxodium distichum*, the pollen of *Acer*, *Fraxinus*, and *Salix* were recovered in one or more samples of Zone A (fig. 48).

Arboreal components of the **Sweet Gum Cover Type** also were recovered. The **Sweet Gum Cover Type** is associated with somewhat higher areas adjacent to swamps and natural levees in the TB2c-core area. Pollen associates of this cover type that were recovered include *Liquidambar*, *Nyssa sylvatica*, *Acer rubrum*, and *Ulmus*.

The **Sweet Gum Cover Type** is typically replaced over time by *Celtis laevigata*, *Ulmus americana*, and/or *Fraxinus pennsylvanica* and diverse hardwoods (Fralish and Franklin, 2002). Pollen recovered from these genera of successional trees of the **Sweet Gum Cover Type** include: *Acer*, *Aesculus*, *Celtis*, *Carya*, *Fagus*, *Fraxinus*, *Juglans*, *Quercus*, *Platanus*, and the shrubs *Corylus* and *Ilex*.

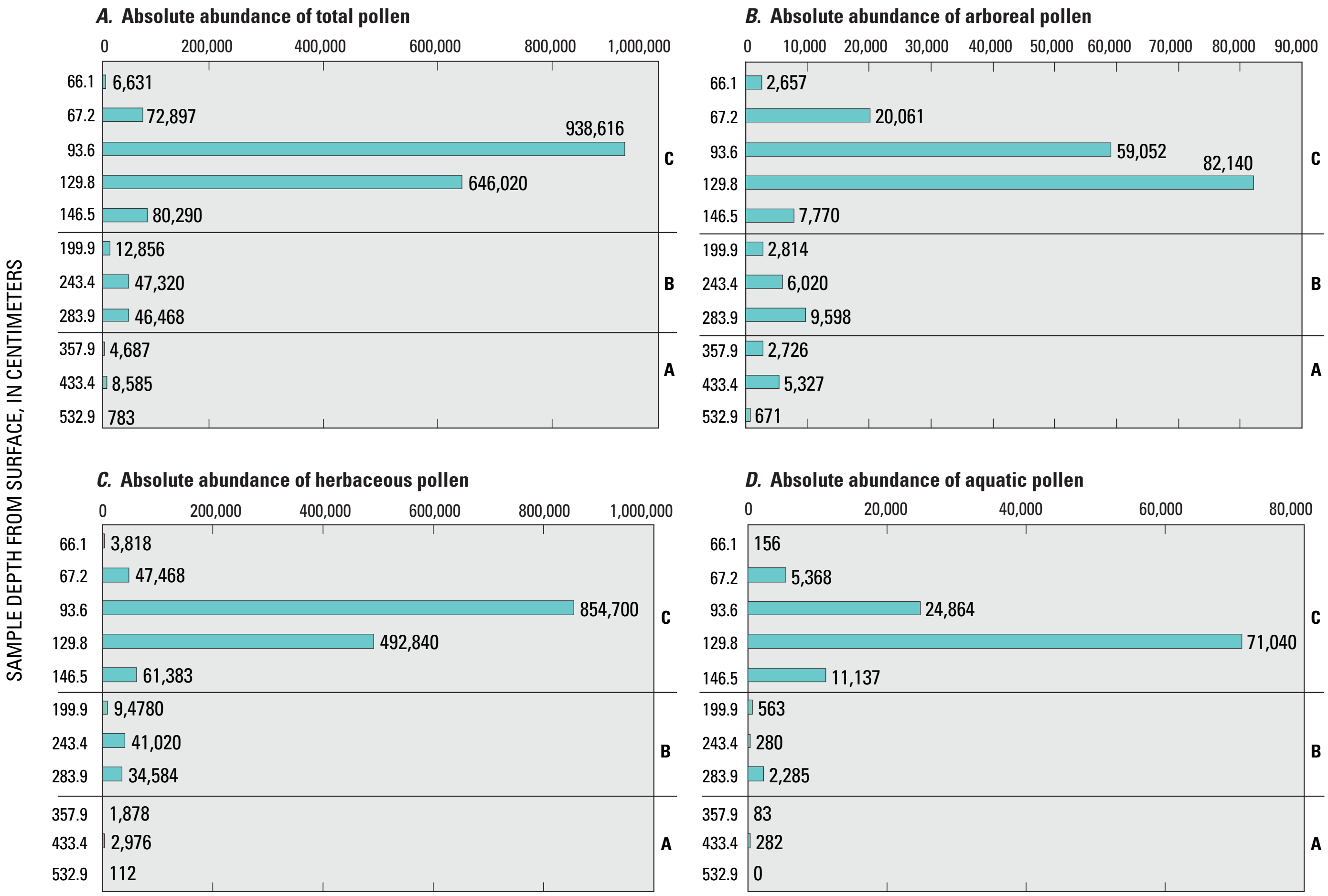


Figure 47. Pollen absolute abundance for Terrebonne brackish-marsh vibracore TB2c. The number at the end of each bar equals the the computed number of specimens for each sample. Letters to the right of each plot are pollen-zone designations. Data for each zone are summarized in table 12.

Table 12. Summary discussion of pollen zones for Terrebonne brackish-marsh vibracore TB2c (532.9–66.1 centimeters), Terrebonne Parish, southeastern Louisiana.

[cm, centimeter; A.D., anno Domini (in the year of the Lord); <, less than; >, greater than; CAL yr BP, calibrated years before present; ChenoAms, combined pollen of Chenopodiaceae and Amaranthaceae families; TCT, combined pollen of the Taxodiaceae, Cupressaceae, and Taxaceae families; NVCS, National Vegetation Classification Standard]

Palyno-morph zone	Zone depth (cm)	Sample depth (cm)	Age range	Taxa	Comments relating to figure 48 and to data in Appendix 5
C		66.1 67.2 93.6 129.8 146.5	>A.D. 1963 <650 CAL yr BP	Arboreal pollen primarily include *Fraxius*, *Pinus*, *Quercus*, *Salix*, *Taxodium distichum*, and *Ulmus*. *Sapium sebiferium* is present in the 66.1-cm sample. Herbaceous pollen are primarily Ambrosia, ChenoAms, and Poaceae with *Vigna unguiculata* present at 93.6 cm. Aquatic pollen inlcude the emergent *Lemna*, *Typha angustifolia* , and *T. latifolia*. *Alternanthera philoxeroides* is present in the 67.2-cm sample.	Aquatic pollen diversity is at maximum for vibracore TB2c. Highest absolute abundance of total pollen and each pollen type and shows extreme upsection decreases. The presence of the emergent aquatics and the absence of *Nyssa* indicate water levels similar to Zone B. The presence of *A. philoxeroides* indicates a younger than A.D. 1900 age for soil/sediment above 67.2 cm.
B		199.9 243.4 283.9	> about 800 < about 1,300 CAL yr BP (uncertain ages; Appendix 3, table 3-2)	*Taxodium distichum* (TCT), *Fraxinus*, *Pinus*, *Platanu*s, *Quercus*, and *Salix* are the most abundant arboreal pollen. *Nyssa aquatica* and *Nyssa sylvatica* are present in the lower third of the Zone B but rapidly decline upward. *Carya*, *Celtis*, *Myrica*, and *Ulmus* are present. Abundant herbaceous pollen includes *Ambrosia*, ChenoAms, *Cladium*, Cyperaceae, and Poaceae. Aquatic pollen include those of emergent plants—*Typha angustifolia*, *Typha latifolia*, and *Sagittaria*, and *Polygonum*.	Absolute abundance of total pollen and each pollen type is higher than in Zone A but lower than in Zone C. The presence of the emergent aquatics, The increased abundance of *Salix* and *Taxodium distichum*, and the absence of *Nyssa* suggest-water levels lower than in Zone A.
A		357.9 433.4 532.9	<2,740 to >1,340 CAL yr BP	Arboreal pollen assemblage of at least 18 taxa. *Taxodium distichum* (TCT), *Nyssa aquatica*, *Acer*, *Fraxinus*, and *Salix* are indicative of the **Bald Cypress-Gum Cover Type.** *Liquidambar*, *Acer rubrum*, and *Ulmus* are indicative of the **Sweet Gum Cover Type.** Other arboreal pollen include *Magnolia*, *Quercus*, *Carya*, *Nyssa sylvatica*, *Ilex* and *Myrica*. Herbaceous pollen include *Artemesia*, ChenoAms, *Cladium*, *Epheda*, Euphorbiaceae, Liliaceae, *Robina*, *Sabal*, *Sambucus*, Salonaceae, and *Symplocos*. *Nuphar* and *Typha angustifolia* are the most abundant aquatic pollen.	Highest total, arboreal, and herbaceous pollen diversity in TB2c, suggesting a more diverse environmental setting than indicated for overlying zones. Lowest absolute abundance of total pollen and each pollen type, which may be inpart due to the fluvial/distributary environment (cross-bedded very fine and fine sand). Abundance so low than not every genus shows on abundance plot (fig. 48). For data, see Appendix 5, table 5-2. The presence of pollen indicative of both the **Bald Cypress-Gum Cover Type** [NVCS *Taxodium distichum* var. *distichum-Nyssa biflora* (*Nyssa aquatica*) Saturated Forest Alliance] of Fralish and Franklin (2002) and the **Sweet Gum Cover Type** [(NVCS *Liquidambar styraciflua*-(*Acer rubrum*) Seasonally Flooded Forest Alliance, and *Liquidambar styraciflua*-(*Lirodendron tulipifera, Acer rubrum*) Temporarily Flooded Forest Alliance] of Fralish and Franklin (2002) precludes determining the specific source of particular grains.

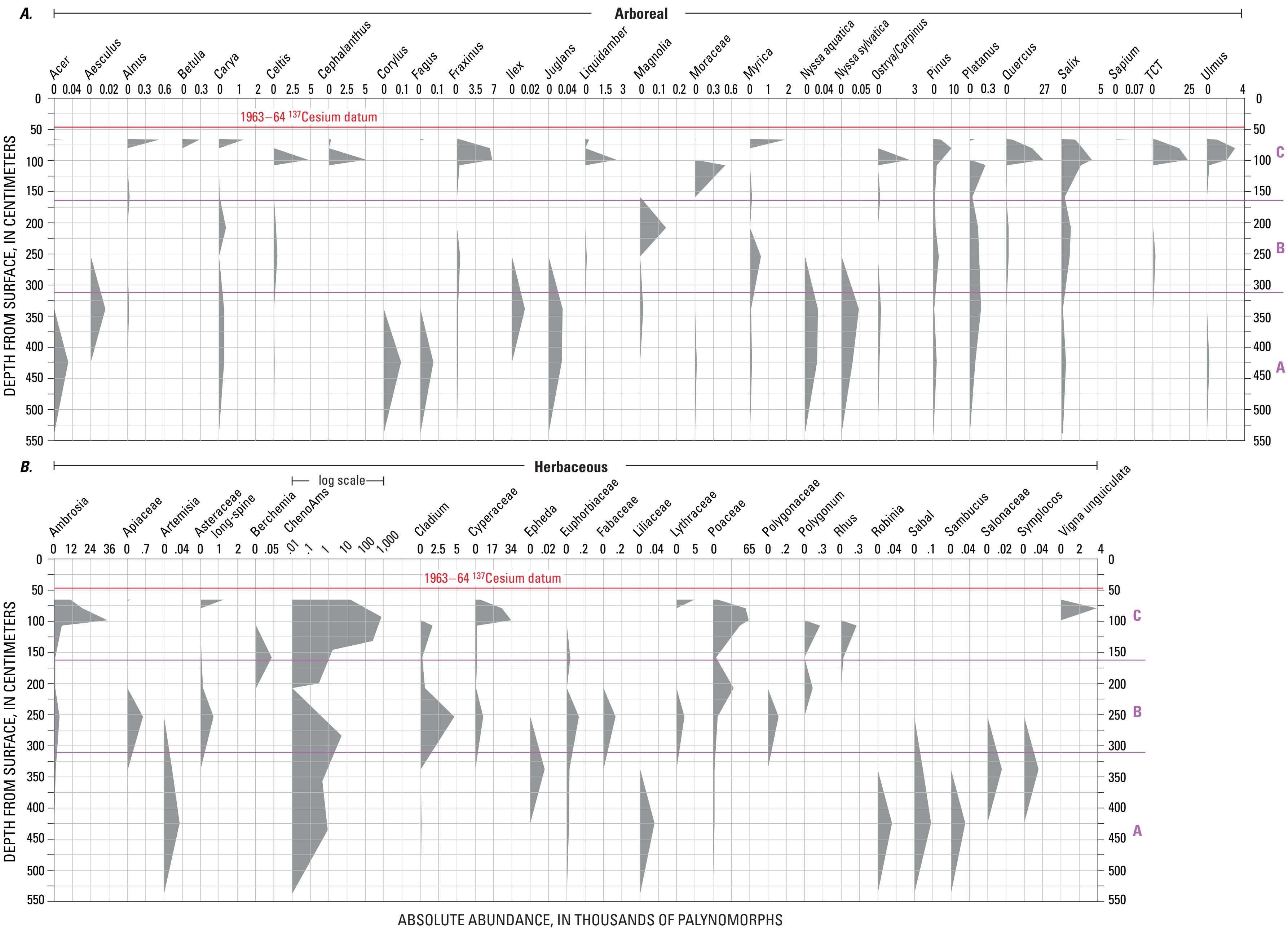


Figure 48. Absolute abundance data for selected palynomorphs from Terrebonne brackish-marsh vibracore TB2c: (*A*) arboreal, (*B*) herbaceous, and (*C*) aquatic and other. Because of the broad range in values, ChenoAms, Total Pollen, and Indeterminate data are shown on logarithmic scales. Palynomorph data are included in Appendix 5, table 5-2. The 1963–64 cesium-137 (^{137}Cs) datum is for push-core TB2a. [TCT = Taxodiaceae–Cupressaceae–Taxaceae; ChenoAms = a group of morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families]

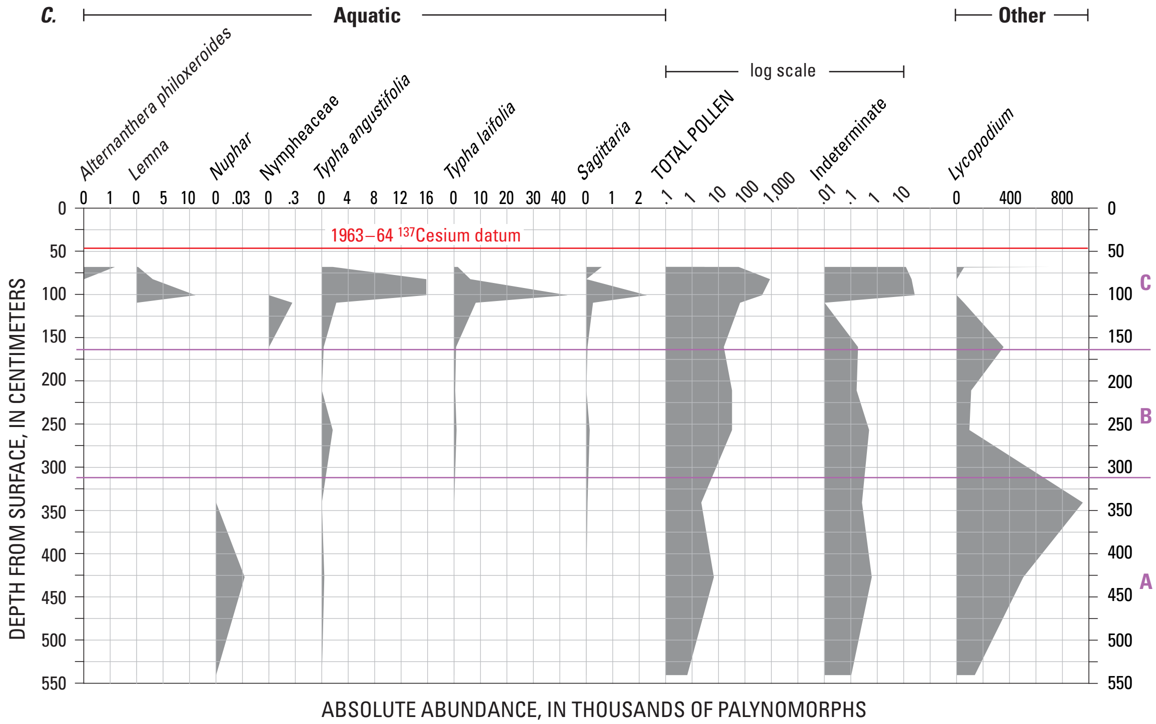


Figure 48. Absolute abundance data for selected palynomorphs from Terrebonne brackish-marsh vibracore TB2c: (*A*) arboreal, (*B*) herbaceous, and (*C*) aquatic and other. Because of the broad range in values, ChenoAms, Total Pollen, and Indeterminate data are shown on logarithmic scales. Palynomorph data are included in Appendix 5, table 5-2. The 1963–64 cesium-137 datum is for push-core TB2a. [TCT = Taxodiaceae–Cupressaceae–Taxaceae; ChenoAms = a group of morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families]

TB2c Zone A paleoenvironment and age. The potentially close proximity in the alluvial setting of the **Sweet Gum Cover** and the **Bald Cypress-Gum Cover** types precludes determining the specific source of particular pollen grains of plant taxa that occur in both cover types. Examples include *Carya*, *Fraxinus*, *Ilex*, *Liquidambar*, *Quercus*, and *Ulmus* pollen. However, distinctive pollen indicative of the **Sweet Gum Cover Type** (for example, *Liquidambar styraciflua*, *Aesculus*, *Celtis*, *Fagus*, *Juglans*, *Platanus*, and the shrub *Corylus*) and the **Bald Cypress-Gum Cover Type** (for example, *Taxodium distichum*, *Magnolia*, *Nyssa aquatica,* and *N. sylvatica*, and *Salix*) were recovered. These distinctive pollen indicate that both cover types contributed pollen to the deposits of Zone A.

The high diversity of pollen taxa in Zone A suggests they are derived from more diverse environmental settings than are represented in the overlying deposits and both emergent and submerged environments are represented. The sandy soil/sediment of this lower interval suggest deposition occurred in or adjacent to a channel, possibly one associated with the ancestral Bayou Grand Caillou. This mixture of pollen represents deep swamps (for example, *Nyssa*) as well as seasonally and temporarily flooded levees, flats, ridges and shallow marginal swamps (for example, *Aesculus*, *Carya*, *Celtis*, *Fagus*, *Fraxinus*, *Juglans*, *Quercus*, and *Ulmus*). *Taxodium distichum* occurs in both deep- and shallow-water swamps. *Pinus* pollen probably represents the regional pollen rain derived from outside the immediate depositional setting.

Minor, low-lying wetlands occurred between elevated levees and ridges, as indicated by rare herbaceous pollen of Poaceae, Cyperaceae, ChenoAms, Asteraceae, and *Typha latifolia*.

Calibrated ^{14}C ages for samples from Zone A indicate an age-range from a maximum of 2,740 to a minimum of 1,340 CAL yr BP (Appendix 3, table 3-2), during the period when the Mississippi River shifted westward, abandoning the St. Bernard delta lobe and building the LaFourche delta lobe (see the "Geology" section of this report).

TB2c Zone B: Sample Depths 283.9, 243.4, and 199.9 Centimeters

Total-, arboreal-, and aquatic-pollen diversity in Zone B of Terrebonne brackish-marsh vibracore TB2c are lower than or equal to the maximum diversity values in Zone A and Zone C (fig. 46*A*–*D*). Herbaceous-pollen diversity decreases from the base to the top of Zone B and is generally lower than that in Zone A, but marginally higher than that of Zone C.

On the whole, absolute-abundance values for total, arboreal, herbaceous, and aquatic pollen are higher, often substantially higher, in Zone B than in Zone A, but also substantially lower than in Zone C (fig. 47*A*–*D*).

The most abundant arboreal pollen in the Zone B are *Fraxinus*, *Pinus*, *Platanus*, *Quercus*, *Salix*, and *Taxodium distichum* (Appendix 5, table 5-2). Taxa that are less abundant but present in more than one sample include *Carya*, *Celtis*, *Myrica*, and *Ulmus*. Some of these taxa (that is, *Carya*, *Fraxinus*, *Quercus*, and *Ulmus*) are associates of both the **Bald Cypress-Gum** and the **Sweet Gum Cover** types and may have been sourced from either. *Platanus* was derived from the **Sweet Gum Cover Type**. *Pinus* is indicative of the regional pollen input.

Absolute-abundance values for the common herbaceous pollen (*Ambrosia*, ChenoAms, *Cladium*, Cyperaceae, and Poaceae) are higher than in Zone A, but lower than in Zone C.

TB2c Zone B paleoenvironment and age. The taxa present in Zone B samples suggest a freshwater setting, although most can tolerate slight brackish conditions. The increased abundance of *Salix* and *Taxodium distichum* and the absence of *Nyssa* pollen in Zone B indicate either that the water levels in the swamp/marsh were lower than in Zone A or the source of pollen input had changed relative to Zone A. Aquatic pollen are most abundant in the lowest sample (283.9 cm) of the zone, and the most consistently present are *Typha angustifolia*, *T. latifolia*, and *Sagittaria*. *T. angustifolia* and *T. latifolia* are particularly abundant. These emergent aquatic plants, as well as *Polygonum* sp. and *Sagittaria*, support the interpretation that swamp/marsh water levels had lowered by the time of Zone B soil/sediment deposition.

The increased abundance of obligate, facultative-wetland, and facultative upland herbaceous plants (for example, *Ambrosia*, ChenoAms, *Cladium*, Cyperaceae, and Poaceae) indicates a decrease in canopy and an increase in open space suitable for the growth of subaerial wetland herbs.

Calibrated ^{14}C ages suggest a narrow age range for Zone B from a maximum of 1,340 and a minimum of about 1,000 CAL yr BP (estimated from ^{14}C age data for Terrebonne brackish-marsh vibracore TB2c in Appendix 3, table 3-2), late in the development of the LaFourche delta lobe or early in the development of the Plaquemines Modern Mississippi River delta lobe (see the “Geology” section of this report).

TB2c Zone C: Sample Depths 146.5, 129.8, 93.6, 67.2, and 66.1 Centimeters

Total-, arboreal-, and herbaceous-pollen diversity values for Terrebonne brackish-marsh vibracore TB2c increase upsection in Zone C (fig. 46*A*–*D*). Total- and arboreal-pollen diversity values reach their second highest values in the core, peaking only slightly below those in Zone A. Herbaceous pollen diversity is generally lower than in zones A or B. Aquatic pollen diversity reaches its maximum value in Zone C, peaking in the 67.2-cm sample.

Total and herbaceous pollen reach their maximum absolute-abundance values in the 93.6-cm sample. The high total-pollen absolute-abundance values for Zone C reflect the high values for herbaceous pollen. Arboreal and aquatic absolute-abundance values in Zone C reach their core maximum at 129.8 cm and decrease upsection (fig. 47*A*–*D*).

Arboreal pollen (for example, *Fraxinus*, *Pinus*, *Quercus*, *Salix*, *Taxodium distichum*, and *Ulmus*) decreases upsection in Zone C. The maximum absolute abundance of about 82,000 grains per 1.2 ml of sample occurs in the 129.8-cm sample (fig. 47*B*); this is the maximum for the three zones as well as for Zone C. The decrease in absolute-abundance values from the lower part to the top of Zone C is extreme (for example, that of *Quercus* from 26,640 to 603 per 1.2 ml of soil/sediment; Appendix 5, table 5-2).

In Zone C, aquatic pollen (for example, *Lemna*, *Typha angustifolia*, *T. latifolia*) are less abundant than both arboreal and herbaceous pollen and show the same initial rise and then decrease in absolute abundance evident in those pollen types.

Pollen of the exotic, invasive plants *Sapium sebiferium* (Chinese tallow tree) and *Alternanthera philoxeroides* (alligatorweed) occur in Zone C (fig. 48*A*). *S. sebiferium* is present only in the 66.1-cm sample. It is a native of Japan and China that purportedly was imported by Benjamin Franklin into the American colonies by the late 1700s. *A. philoxeroides* is present in the at 67.2-cm sample. A native of South America whose first reported occurrence in North America was in Florida during 1894 (Weldon, 1960), its presence and that of *S. sebiferium* in soil/sediment of Louisiana indicate that the soil/sediment at and above 67.2 cm is no older than about A.D. 1900.

TB2c Zone C paleoenvironment and age. The reason for the upward decrease in all types of pollen is a mystery considering that the modern environment is characterized by abundant pollen producers: grasses, sedges, and cattails. The low pollen concentration at 60 cm may indicate that the depositional site was increasingly remote from sources of pollen input at the time the Zone C soil/sediment accumulated. Alternatively, the pollen may have been destroyed, winnowed out, or its concentration is diluted in the deposits by abundant, unaltered plant debris in the peaty soil/sediment.

Calibrated ^{14}C ages suggest that all Zone C soil/sediment is younger than 650 CAL yr BP. Soil/sediment at and above 67.2 cm are no older than about A.D. 1900 according to the co-occurrence of *A. philoxeroides* and *S. sebiferium*. The age range suggests deposition was during and affected by changing land use resulting from human activity in the region.

Backswamp

For alluvial deposits, the hydrodynamics of the fluvial system affects the included palynomorph distribution. Palynomorphs are hydrodynamically equivalent to silt and very fine sand sized particles (Traverse, 1988) and tend to move and be deposited with particles in that size range. Coarser soil/sediment (for example, fine sand, medium sand, and coarse sand) require more transportive energy in the system to keep the larger grains moving. As energy in the system begins to wane, the coarser soil/sediment is deposited before the silt, very fine sand, and most palynomorphs. Consequently, most palynomorphs continue to move with the very fine sand and silt and come to rest when those particles are deposited. All other things being equal, more palynomorphs will be deposited with soil/sediment composed of very fine sand or silt-sized particles.

The dynamic nature of floodplain settings, the diverse factors that influence plant community development on floodplains, and the wide range of influence of those factors obscure detailed distinctions between plant communities in living floodplain communities (Wharton and others, 1982). Soil type, water and soil pH, flooding (frequency, depth, and duration), nutrients present, nutrient recycling, light intensity, and plant disturbance all interact to determine what plant community will develop. Variations in these factors and others can produce different community structures composed of different plants or mixtures of plants in similar settings (Wharton and others, 1982). The detail at which interpretations can be made based on the fossil pollen is further limited by taphonomic as well as soil/sedimentologic processes.

However, broad, woody cover types can be approximated by reference to the anaerobic gradient generated by hydrological processes (Wharton and others, 1982). That is, some trees are more tolerant of flooding than others, which define the settings in which they normally grow. *Liquidambar* is among the least flood-tolerant tree taxa in the core, while *Taxodium distichum* is the most tolerant. Other arboreal taxa in the backswamp cores fall between these two extremes in their flood tolerance. All, however, are typical of floodplain settings and most of frequently flooded sites.

St. Martin Backswamp Push-Core MR1d

The St. Martin push-core MR1d was collected from a backswamp behind a natural levee northeast of Lake Fausee Point (fig. 5*H*). The present-day vegetation is primarily common hackberry, bald cypress, and several kinds of oak. The soil/sediment consists of very fine sand and silt from the land surface to a depth of 16 cm, and sandy silt or silty sand from 16 cm to the base of the core at 74.5 cm and contains little organic matter (see descriptive data for St. Martin backswamp push-core MR1d in Appendix 1, table 1-2 and TC, IC, and OC data for push-core MR1c in Appendix 2, table 2-1).

Total-, arboreal-, and herbaceous-pollen diversity decrease slightly from the base of the core to the top (fig. 49). Arboreal-pollen diversity (fig. 49*B*) is greater than that of the herbaceous plants throughout the core (fig. 49*C*).

The absolute abundance of total, arboreal, and herbaceous pollen (figs. 50 and 51) is greatest in the upper 13 cm of the core. The absolute abundance of arboreal pollen is greater than herbaceous pollen throughout the core, though the relative difference between these pollen types is much less pronounced below than it is above 13 cm (fig. 50*B*–*C*).

The most consistently present and abundant-arboreal pollen are *Carya*, *Fraxinus*, *Pinus*, *Quercus*, *Salix*, and TCT (Appendix 5, table 5-2; fig. 51). Of these, *Quercus*, *Salix*, and especially TCT are the most abundant in the upper two samples. This assemblage is compatible with the **Bald Cypress-Gum Cover Type**. Notably absent is *Nyssa* pollen. Wet shrubs typically associated with the **Bald Cypress-Gum Cover Type** on the margins of shallow swamps, and which were noted in the MR1d core, include *Cephalanthus*, *Cornus*, *Ilex*, and *Myrica*.

Herbaceous pollen and spores occur throughout the core including *Ambrosia*, ChenoAms, and Poaceae. Cyperaceae are present in most samples, though in low numbers. Pteridophyte spores are present in all samples, with Polypodiaceae, and undifferentiated trilete spores being the most abundant (Appendix 5, table 5-2).

No aquatic plant pollen or modern exotic pollen were noted in this core (fig. 51).

MR1d Paleoenvironment and Age

The arboreal pollen in St. Martin backswamp push-core MR1d are consistent with a freshwater backswamp depositional setting and indicate that it is a shallow swamp dominated by *Taxodium*. The co-occurrence of shallow swamp associates of the **Bald Cypress-Gum Cover Type**, such as *Carya*, *Fraxinus*, *Liquidambar*, and *Quercus* support this interpretation. The abundance of *Pinus* suggests a more distal and regional source for these grains.

Although shrub pollen are present in low numbers, they too indicate a freshwater setting. *Cephalanthus* and *Cornus* commonly occur in swamps, tidal and nontidal fresh marshes, and other wet areas such as along streams and shores of lakes or ponds (Tiner, 1993). *Ilex* and *Myrica* occur in similar freshwater settings but also tolerate brackish-marsh conditions (Tiner, 1993). *Myrica* is the only shrub present in most samples, even though it is not abundant.

The herbaceous pollen (for example, *Ambrosia*, Cyperaceae, and Poaceae) are typical of tidal and nontidal fresh-to-brackish marsh, and other wet environments. ChenoAms also may grow in saline soils, salt marshes, and mangrove swamps (Tiner, 1993).

The lithology of the upper two samples (2 and 13 cm) is very fine sand or silt, whereas below 13 cm the soil/sediment are coarser and consist of sandy silt or silty sand. The increasing sand content of the core down section is reflected by a decrease in the absolute abundance and a slight increase in the diversity of all types of palynomorphs. Palynomorphs below 16 cm are commonly 10 times less abundant than above 16 cm (fig. 50).

The increased absolute abundance of palynomorphs and the decrease in grain size in the upper part of the core attest to their co-deposition in an increasingly low energy, quite depositional environment such as a backswamp. These palynomorphs likely represent the local flora. The slightly higher diversity at depth may result from transported palynomorphs carried into the depositional setting by floodwaters resulting in overbank deposition.

The bomb-spike ^{14}C signal for the 58.76-cm sample from St. Martin backswamp push-core MR1d indicates a MODERN (1950) age. This suggests that soil/sediment from samples deeper in the core (64.5 and 68.6 cm) is older but was probably deposited within the last 100 years (Appendix 3, table 3-2). Bomb-spike ^{14}C data for adjacent push-core MR1c suggests some resuspension but places the NWT 1963–64 datum between 54.39 and 58.83 cm. Cesium-137 data for push-core MR1c indicate an even deeper 1963–64 datum at 63.47 cm (fig. 30; Appendix 3, table 3-1). Both isotopic datasets show that the surface 75 cm of soil/sediment at the St. Martin locality is <100 years old.

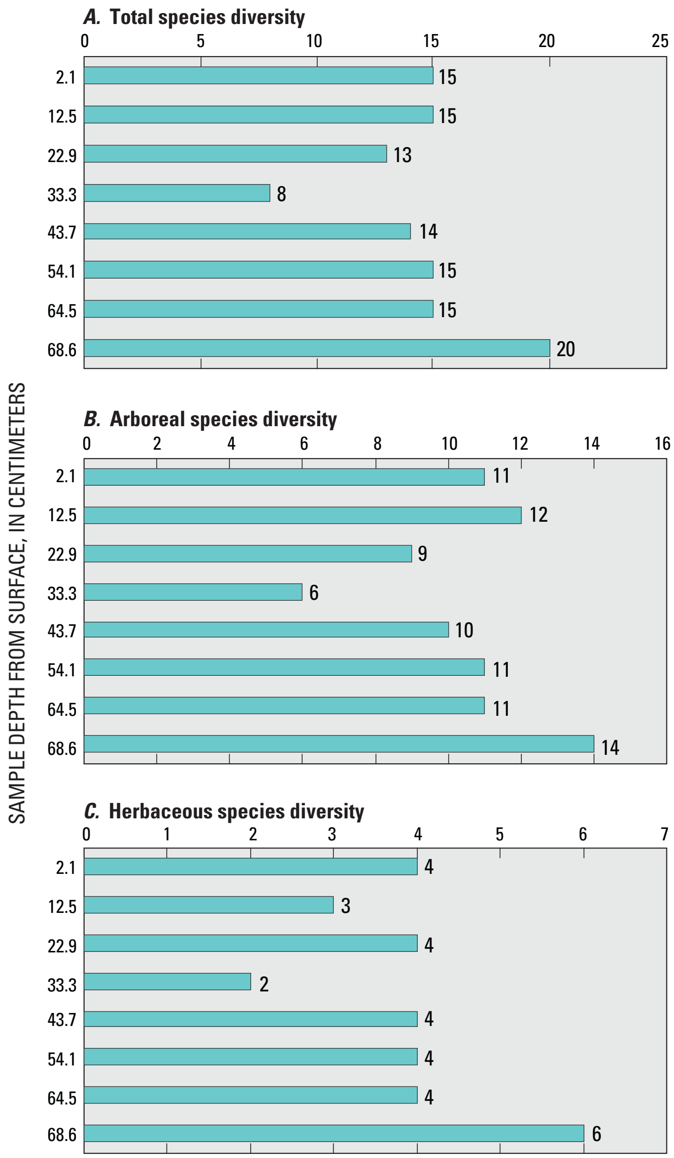


Figure 49. Pollen species diversity for St. Martin backswamp push-core MR1d. The number at the end of each bar equals the the computed number of species for each sample.

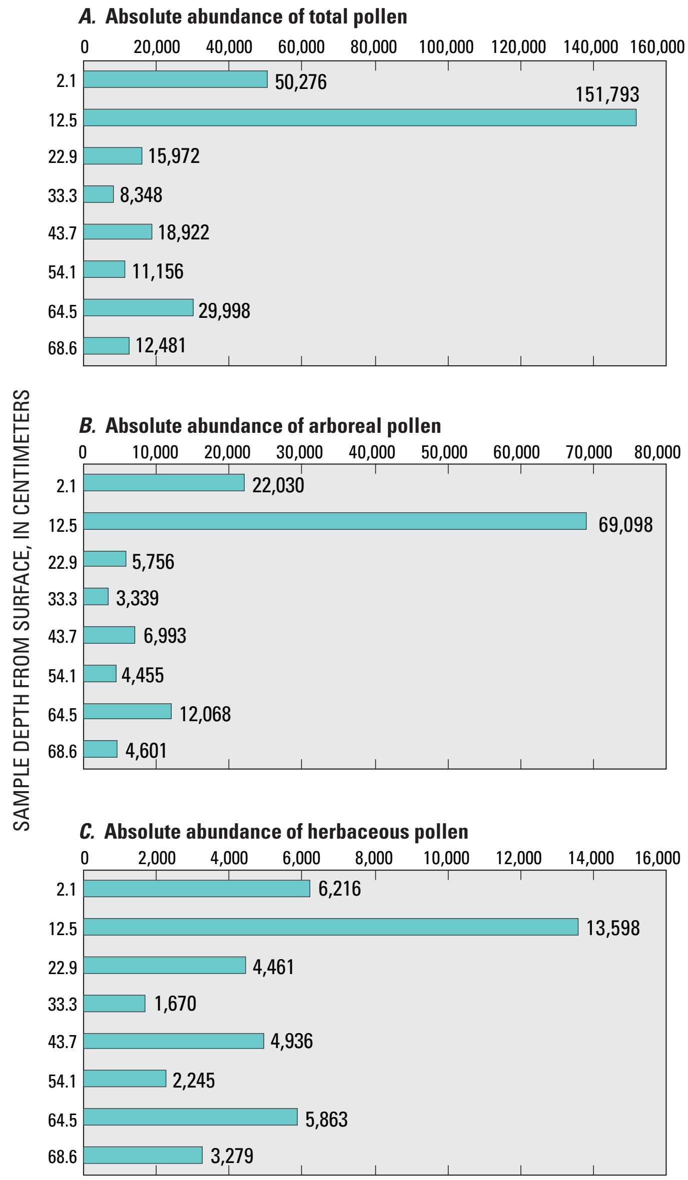


Figure 50. Pollen absolute abundance for St. Martin backswamp push-core MR1d. The number at the end of each bar equals the the computed number of specimens for each sample.

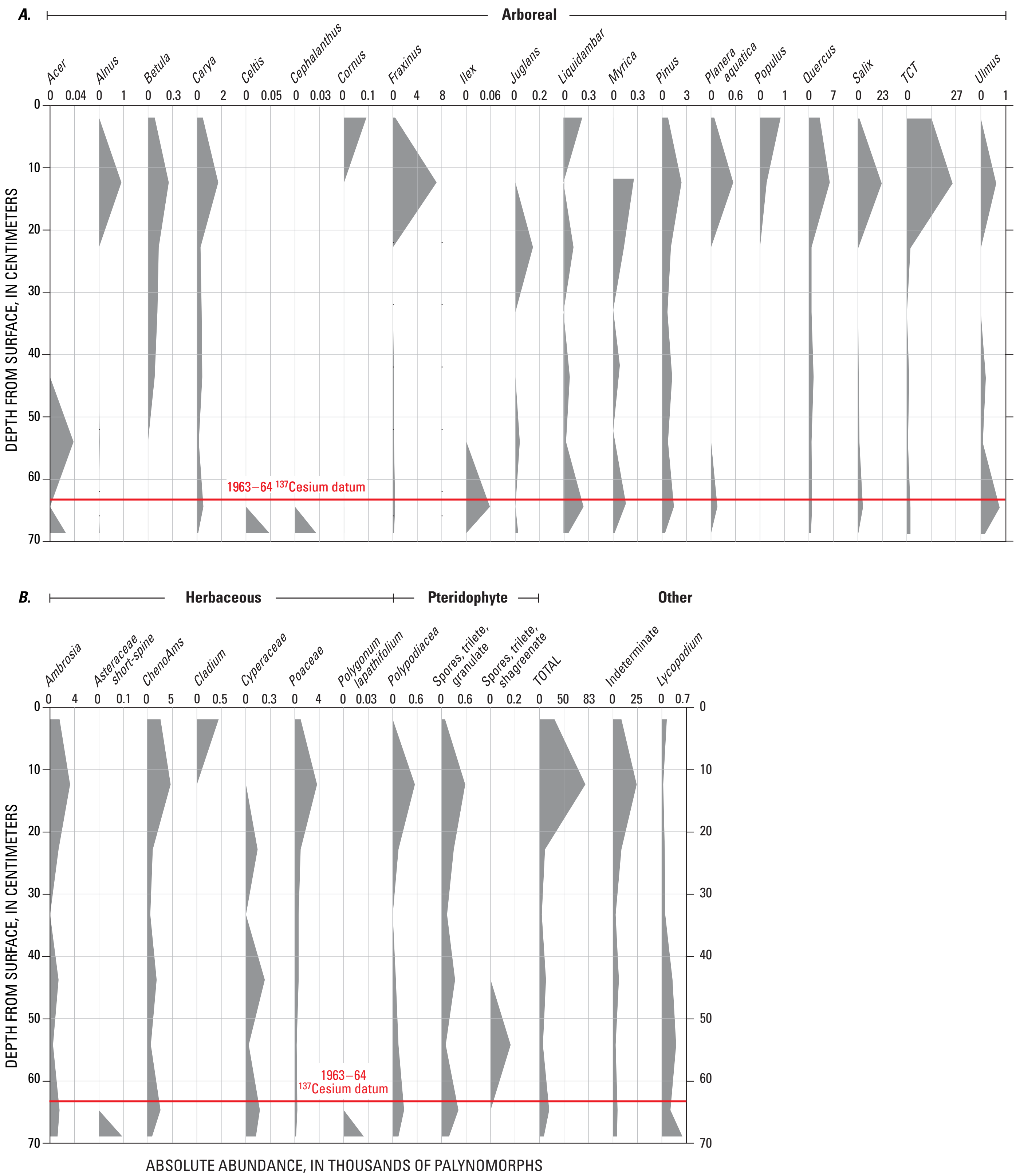


Figure 51. Absolute abundance data for selected palynomorphs from St. Martin backswamp push-core MR1d: (*A*) arboreal and (*B*) herbaceous, pteridophyte, and other. Palynomorph data are included in Appendix 5, table 5-2. The 1963–64 cesium-137 (^{137}Cs) datum is for push-core MR1c. [TCT = Taxodiaceae–Cupressaceae–Taxaceae; ChenoAms = a group of morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families]

St. Landry Backswamp Push-Core SL1c

St. Landry push-core SL1c was collected from an overflow backswamp (fig. 5*I*) in the Atchafalaya Basin (see descriptive data for St. Landry backswamp push-core SL1c in Appendix 1, table 1-1 and push-core SL1b in Appendix 1, table 1-2; see TC, IC, and OC data for push-core SL1b in Appendix 2, table 2-1). The St. Landry core site was an open area amongst bottomland hardwoods (for example, *Celtis occidentalis*, *Nyssa aquatica*, *Taxodium distichum*, and *Quercus*; see table 1). The area is covered with low herbaceous plants, such as Poaceae and Asteraceae.

For all pollen types and for total pollen, species diversity varied little in the top four samples (1.0, 11.0, 21.0, and 31.0 cm). In the 41.0-cm sample, diversity was less, and commonly much less, than in the four overlying samples (fig. 52). For instance, total pollen varies only by 16 percent in the upper four samples, but maximum diversity is nearly three times greater than that of the 41.0-cm sample (fig. 52). A similar relationship is seen in arboreal pollen diversity. Herbaceous and aquatic pollen diversity are both low. However, excepting the aquatic pollen in the 11.0-cm sample, herbaceous and aquatic pollen diversity are higher in the 1.0-, 11.0-, 21.0-, and 31.0-cm samples than in the 41.0-cm sample. These data indicate a difference in the pollen record and prob-ably environmental conditions post-deposition of the 41.0-cm soil/sediment.

The absolute abundance of total pollen and that of the individual pollen types (arboreal, herbaceous, and aquatic) increases steadily from the bottom to the top of the core except for the aquatic pollen in the 11.0-cm sample (fig. 53). The absolute abundance for each pollen type doubles upsection, or nearly doubles, between each sample. The lowermost sample contains very few pollen of any type. As is the case with pollen diversity, there is a clear difference in absolute abundance of pollen between the lowermost and the overlying samples.

Among the most abundant arboreal pollen in most samples are *Carya*, *Fraxinus*, *Pinus*, *Quercus*, and *Taxodium distichum* (fig. 54; Appendix 5, table 5-2). Other, less abundant arboreal taxa present include *Acer*, *Celtis*, *Liquidambar*, *Planera aquatica*, *Populus*, *Salix*, and *Ulmus*. Surprisingly, *Nyssa* pollen was not recovered and *Celtis* is less abundant than would be expected since both are important components in the modern forest growing at the site (table 1). Wetland shrubs present include *Ilex* and *Myrica*.

Herbaceous pollen increases from the base of the core to the top, with *Ambrosia*, Cyperaceae, and Poaceae being the most common (figs. 53*C* and 54). Occasional specimens of Asteraceae and Poaceae are present in most samples.

Aquatic pollen are not well represented, though *Equisetum*, *Lemna*, and *Sagittaria* are present in low number (figs. 53*D* and 54).

No exotic pollen were noted in this core.

SL1c Paleoenvironment and Age

There are two cover types with which the pollen assemblages in SL1c seem compatible. The **Bald Cypress-Gum Cover Type** occurs where soils are inundated during part of the growing season and are poorly drained silty loam or pure clay (Fralish and Franklin, 2002). Germination of *Taxodium-distichum* only occurs during drought conditions when the swamp floor is exposed for an extended period of time. Arboreal pollen associates that are present include *Acer*, *Carya*, *Fraxinus*, *Liquidambar*, *Planera aquatica*, *Populus*, *Quercus*, *Salix*, and *Ulmus*, as well as that of the shrub *Ilex*.

The other cover type, **Nuttall Oak-Overcup Oak**, is typical of river floodplains, though flooding occurs during shorter periods and less frequently than in settings typical of the **Bald Cypress-Gum Cover Type**. The alluvium is generally poorly drained, acidic, organic-rich, brown silty loam and clay (Fralish and Franklin, 2002). Pollen of many associated arboreal taxa of this cover type are present in the SL1c push-core. These include *Taxodium distichum*, *Liquidambar*, *Fraxinus*, *Celtis*, *Carya*, as well as *Quercus* (fig. 54). The pollen in the uppermost core samples and the dynamic nature of the floodplains suggest that a mixture of both cover types exist and existed in the core area.

All arboreal taxa in push-core SL1c are typical of floodplain settings and most of frequently flooded sites. Herbaceous pollen are not a major component of the assemblage but are abundant enough to indicate that openings in the forest provided conditions in which to grow. Forest openings may result from various disturbances in the forest, such as wind throw, flooding, fire, biotic (for example, browsing, disease, insect infestations), lumbering, or farming (Wharton and others, 1982).

As discussed for Bayou Sauvage distributary push-core BSDb in the section “Carbon-14 Measurements,” age data for the St. Landry push-cores (Appendix 3, table 3-2) are indecisive and bring up the problem of *old carbon bound to clay minerals in fine-grained sediment*. The result is that the St. Landry age data do not allow much correlation between nearly adjacent cores. The ^{14}C data (Appendix 3, table 3-2) suggest that the entire SL1a push-core is older than MODERN (1950). If correct, then the 55.0-cm sample from push-core SL1a has an age between 2,120 and 2,350 CAL yr BP, considerably older than the overlying samples that range in age from about 740 CAL yr BP to MODERN. The ^{14}C data suggest a depositional hiatus or disconformity in the 32-cm interval between 55.0 and 23.0 cm. This hiatus/disconformity may be represented in push-core SL1c by the differences in species-diversity and absolute-abundance values between the 41.0- and 31.0-cm samples. The scarcity of pollen in the 41.0 cm may be the result of poor pollen preservation or of deposition in a different setting under different hydrologic and sorting conditions.

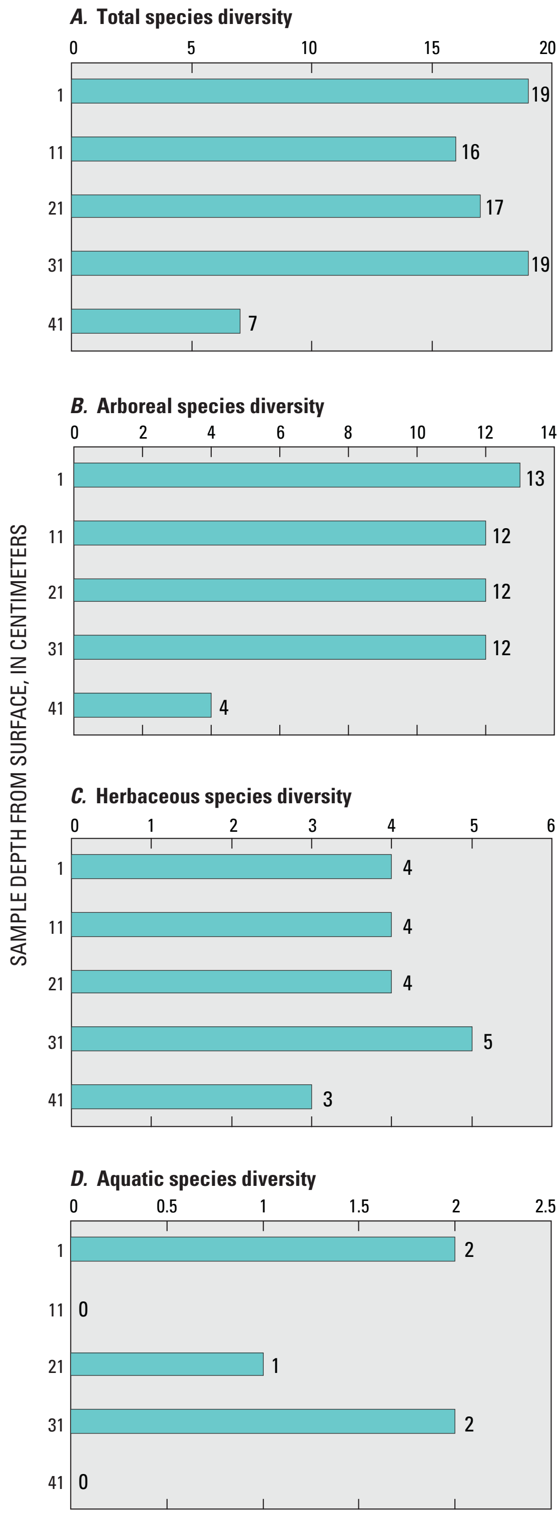


Figure 52. Pollen species diversity for St. Landry backswamp push-core SL1c. The number at the end of each bar equals the the computed number of species for each sample.

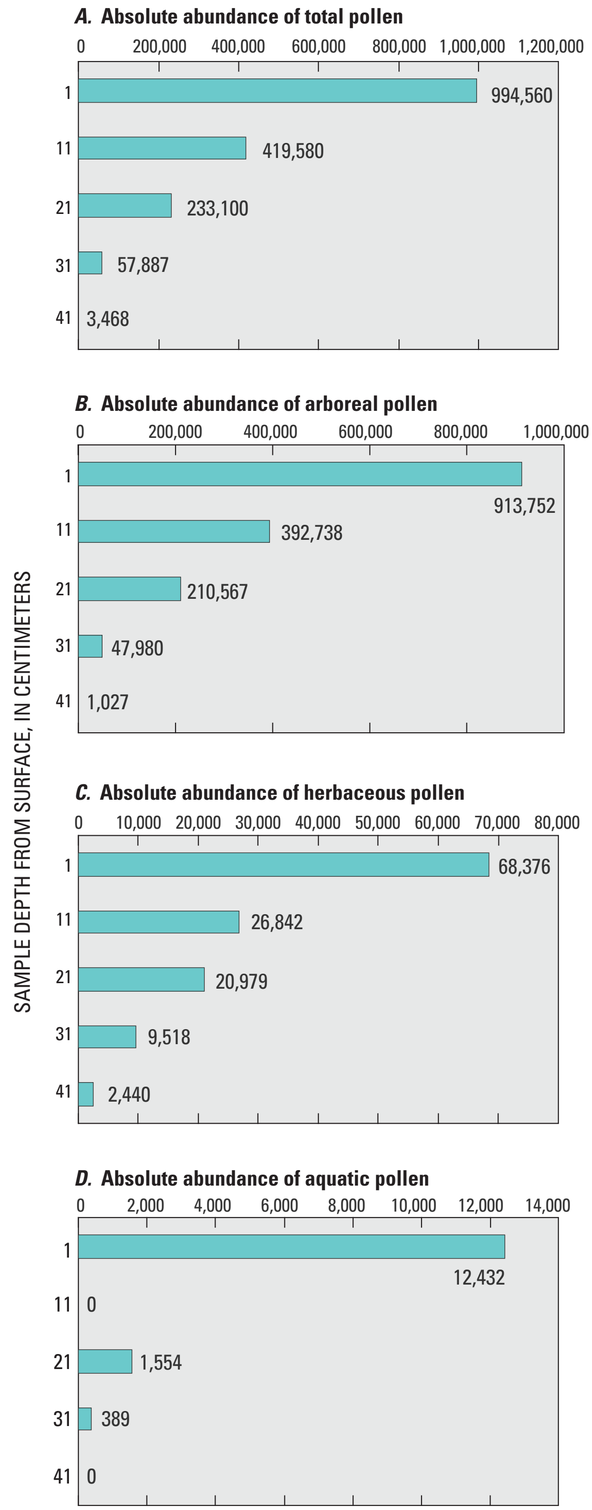


Figure 53. Pollen absolute abundance for St. Landry backswamp push-core SL1c. The number at the end of each bar equals the the computed number of specimens for each sample.

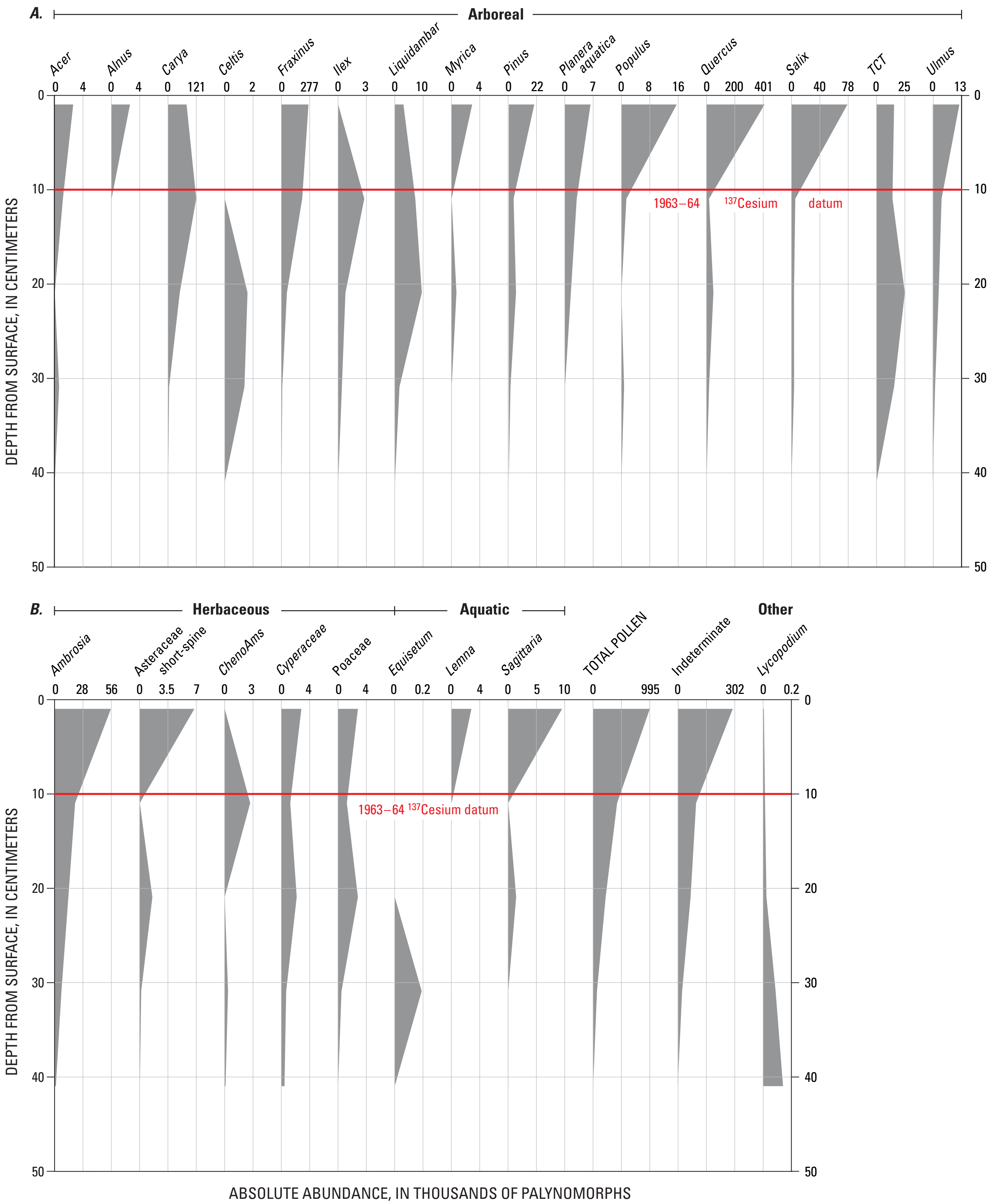


Figure 54. Absolute abundance data for selected palynomorphs from the St. Landry backswamp push-core SL1c: (*A*) arboreal and (*B*) herbaceous, aquatic, and other. Palynomorph data are included in Appendix 5, table 5-2. The 1963–64 cesium-137 datum (^{137}Cs) is for push-core SL1b. [TCT = Taxodiaceae–Cupressaceae–Taxaceae; ChenoAms = a group of morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families]

Cesium-137 age data (Appendix 3, table 3-1; fig. 29) for St. Landry push-core SL1a indicate that soil/sediment age above 16.0 cm is >MODERN (deposited since 1950).

The low ^{210}Pb values are typical for river delta sediment and agree with the overall low OC values (Appendix 2, table 2-1) for St. Martin and St. Landry backswamp core samples. Interpretation of the low ^{210}Pb values, however, is difficult in that the highest surface ^{210}Pb, values are only about 10 d m^{-1} g^{-1} and the background levels are between 2 and 3 d m^{-1} g^{-1}. If the background is one-fifth to one-third of the d m^{-1} g^{-1} maximum, then a very small counting error could produce a large percentage change in the d m^{-1} g^{-1} values and accompanying interpretation.

Lead-210 data (Appendix 3, table 3-1) for St. Landry push-core SL1b indicate an almost steady decrease in activity with depth from the surface to 16.35 cm and an interval of no net decrease in overall very low ^{210}Pb activity values between 16.4 cm and the deepest core sample at 66.5 cm. The break in depositional patterns above and below 16 cm, as indicated by the unsupported ^{210}Pb, is at about the same depth as suggested by the ^{137}Cs data to represent the calendar year 1950 (see sections "Cesium-137 and Potassium-40 Measurements" and "Carbon-14 Measurements").

Swamp—Tangipahoa Swamp Push-Core TN1d

Tangipahoa swamp push-core TN1d was collected from a swamp in Tangipahoa Parish that borders Lake Maurepas (fig. 5*J*) (see descriptive data for Tangipahoa swamp locality in table 1). It was the only MRDP swamp core analyzed for palynomorphs. Pollen diversity values are shown in figure 55; absolute abundance values in figure 56. The Tangipahoa core site was in the proximity of an elevated walkway in the Joyce Wildlife Management Area. This area is characterized by the Louisiana State Department of Wildlife and Fisheries as "a cypress-tupelo swamp with a dense shrub-marsh community of red maple (*Acer rubrum*), wax myrtle (*Myrica*), red bay (*Persea borbonia*), and younger cypress-tupelo (*Taxodium distichum - Nyssa aquatica*)" (accessed November 16, 2005, at *http://www.wlf.state.la.us/hunting/wmas/wmas/list.cfm?wmaid=27*).

The present arboreal palynomorph assemblage at the Tangipahoa locality is similar to that for St. Mary fresh-marsh vibracore SM1c. The Tangipahoa swamp push-core TN1d arboreal assemblage includes *Acer rubrum*, *Alnus*, *Celtis*, *Gleditsia aquatica*, *Liquidambar*, *Myrica*, *Nyssa*, *Pinus*, *Quercus*, *Salix*, TCT, and *Ulmus*. *Myrica* and *Taxodium distichum* are the dominant arboreal vegetation (table 1; fig. 57; and Appendix 5, table 5-2). *Carya* is present in samples below 17.3 cm. *Castenea* is present in the 65.6-cm sample. In the late 1800s and early 1900s, the area was extensively logged for cypress timber.

For all pollen types and for total pollen, species diversity varied little. Herbaceous pollen diversity was six times greater in the near surface sample (1.2 cm) than in the deepest sample (65.6 cm) but varied in other samples (fig. 55*C*). Species diversity for total, arboreal and aquatic pollen was greatest in the 28.8-cm sample. For aquatic pollen, species diversity increased from three to six in the lowermost six samples (from 65.6 to 28.8 cm) and decreased from six to two in the overlying seven samples (fig. 55*D*).

The absolute abundance of total pollen and that of the individual pollen types (arboreal, herbaceous, and aquatic) was greatest in the middle seven samples (sample depths 31.1, 28.8, 26.5, 24.2, 21.9, 19.6, and 17.3 cm) (fig. 56). The absolute abundance for total, arboreal, and herbaceous pollen is greatest in the 19.6-cm sample. The aquatic-pollen absolute-abundance maxima are nearly equal in the 28.8- and 31.1-cm samples. For the total absolute abundance and that of each pollen type (arboreal, herbaceous, and aquatic) the maximum is at least an order of magnitude greater than the minimum value (for example, 2,369,850 versus 179,905 for total pollen; fig. 56*A*).

The absolute abundance of arboreal pollen is an order of magnitude greater than that of herbaceous and aquatic pollen. As shown in figure 57, this is due in large part to the abundance of *Myrica* (for data, see Appendix 5, table 5-2).

Neither herbaceous nor aquatic pollen are well represented in the lowermost 4 core samples.

Alternanthera philoxeroides has a strong presence in the surface 20 cm.

TN1d Paleoenvironment and Age

The pollen assemblage of Tangipahoa swamp push-core TN1d is representative of the **Bald Cypress-Gum Cover Type**, which is supported by the present-day vegetation at the site.

The presence of ^{137}Cs in the uppermost 75 cm suggests an age >A.D. 1963 for almost the entire core. However, as noted in the section "Cesium-137 and Potassium-40 Measurements," "the presence of the ^{137}Cs radionuclide through most of the whole core length, as well as the occurrence of multiple peaks, precludes establishment of a chronology" for Tangipahoa push-core TN1d. The ^{14}C data only indicate a >MODERN age for the surface 20 cm of push-core TN1d.

The consistent presence of *Alternanthera philoxeroides* in the upper 20 cm of the Tangipahoa swamp push-core TN1d indicates the deposits at and above this depth are younger than A.D. 1900 (see discussion of Zone C of the Terrebonne brackish-marsh vibracore TB2c).

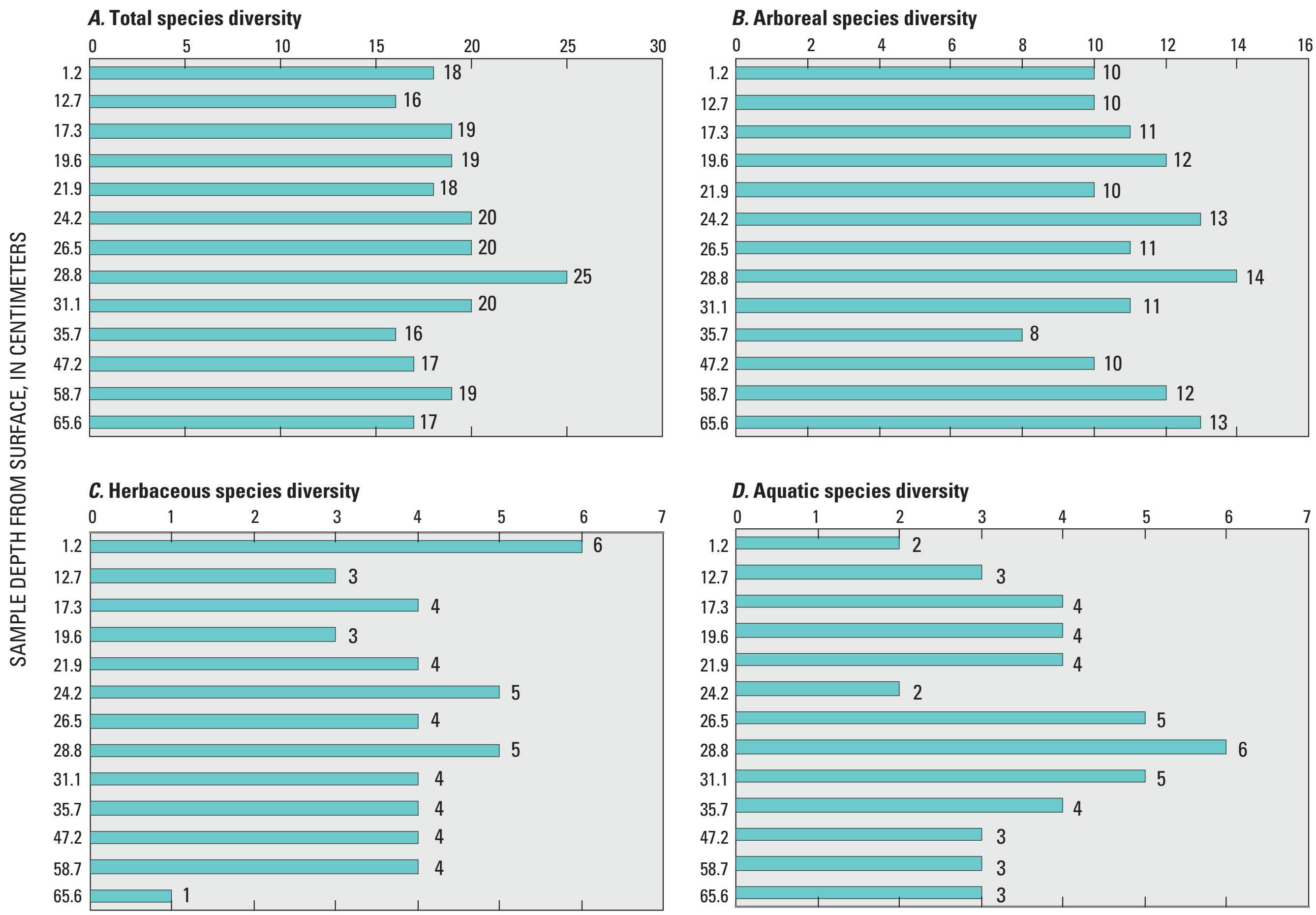


Figure 55. Pollen species diversity for Tangipahoa swamp push-core TN1d. The number at the end of each bar equals the computed number of species for each sample.

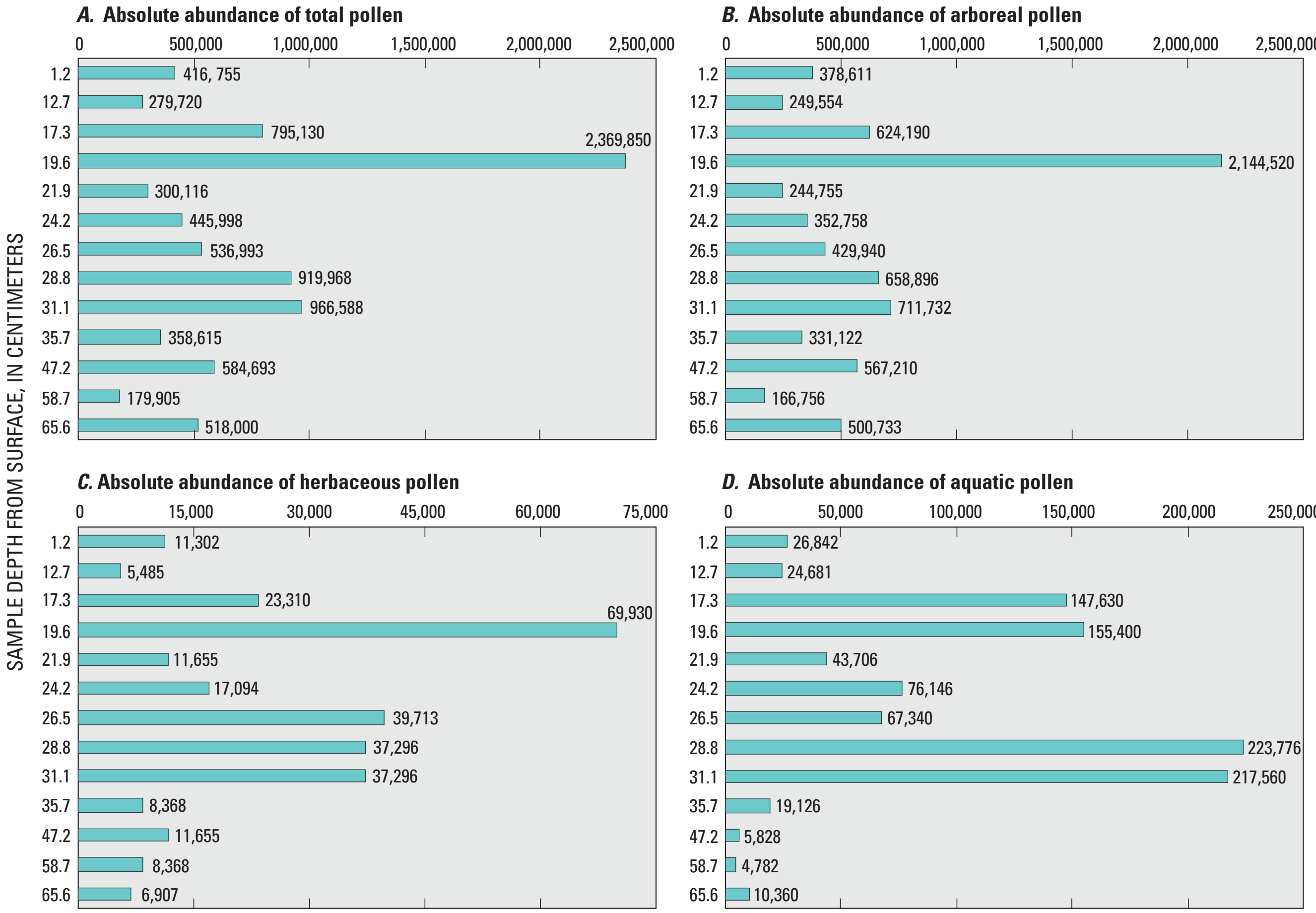


Figure 56. Pollen absolute abundance for Tangipahoa swamp push-core TN1d. The number at the end of each bar equals the the computed number of specimens for each sample.

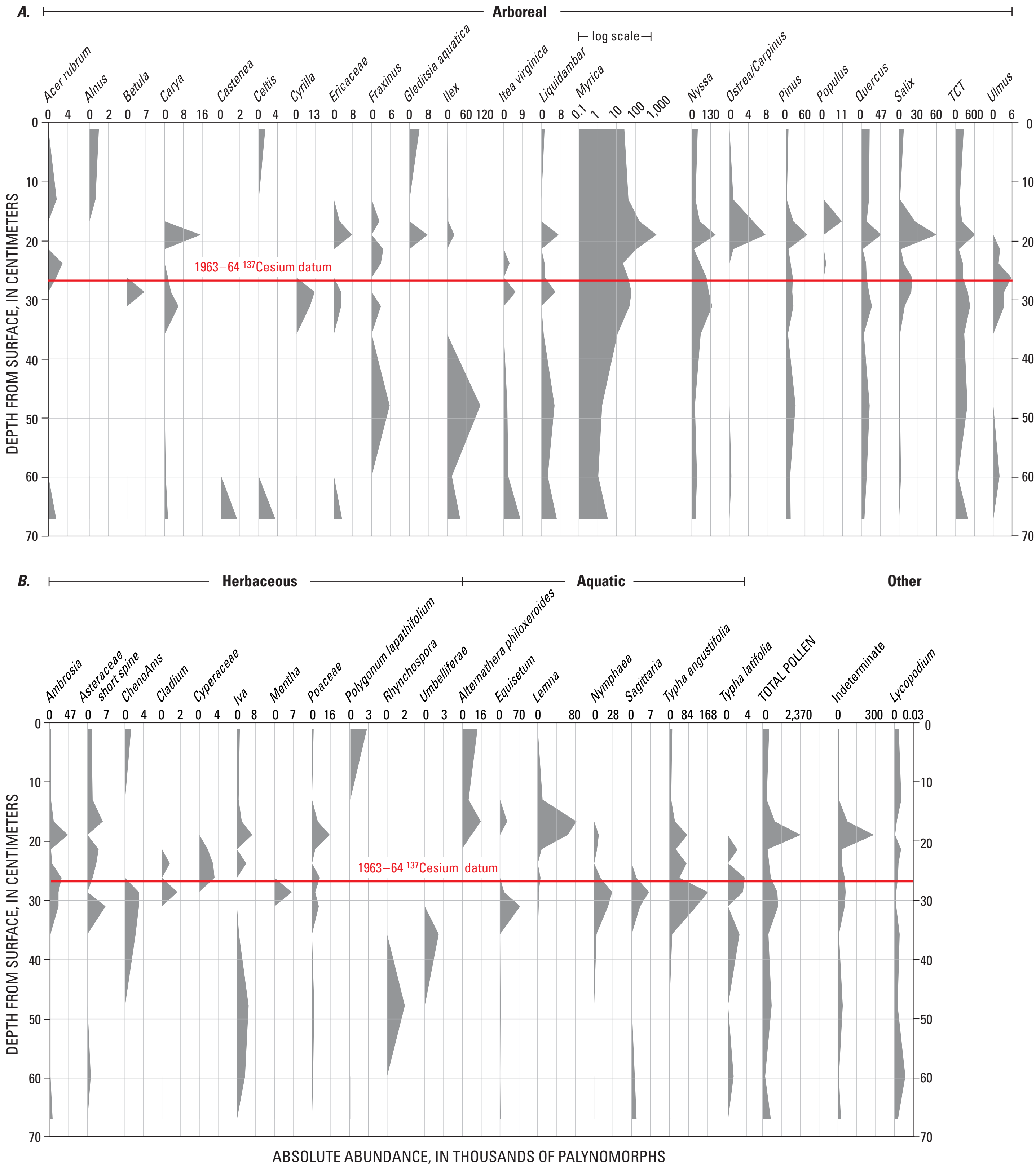


Figure 57. Absolute abundance data for selected palynomorphs from Tangipahoa swamp push-core TN1d: (*A*) arboreal and (*B*) herbaeous, aquatic, and other. Because of the broad range in values, the data for *Myrica* are plotted on a logarithmitic scale. Palynomorph data are given in Appendix 5, table 5-2. The 1963–64 cesium-137 maximum is for push-core TN1b. The maximum is not necessarily the 1963–64 datum (see discussion in section "Cesium-137 and Potassium-40 Measurements)." [ChenoAms = a group of morphologically similar pollen grains of the Chenopodaceae and Amaranthaceae families; TCT = Taxodiaceae–Cupressaceae–Taxaceae]

Soil/Sediment Organic Carbon Landscape Distribution

By Gary R. Buell and Helaine W. Markewich

Physiographically, the MRDP is one of the largest, if not the largest, SOC reservoir in the Mississippi River Basin (MRB). Soil/sediment organic carbon storage in the MRDP is driven by the high biological productivity of marshes and swamps, the predominate coastal Louisiana environments. The high productivity and accompanying organic matter accumulation are major contributors to the formation of the organic soils (Histosols) that constitute much of coastal Louisiana. Of the marsh environments (fresh, intermediate, brackish, and saline), only the saline marsh is not characterized by organic soil/sediment (fig. 58).

For this study, long and short cores were collected in each representative MRDP environment (brackish marsh, intermediate marsh, fresh marsh, distributary, natural levee, backswamp, and swamp) in order to characterize both geographic patterns and temporal changes in SOC storage.

Soil/sediment organic carbon data presented in this report include estimates of (1) incremental and cumulative storage for various depths for MRDP cores (table 13; Appendix 2, table 2-1); and (2) site-specific storage (estimated using all available core and pedon data) for the 0–100 cm depth applied to SSURGO map units to derive regional estimates of SOC storage and inventory (table 14). Patterns in the geographic distribution of SOC by environment (fig. 59) were estimated using core-specific data (table 13), soil-pedon data available from the National Soil Laboratory (U.S. Department of Agriculture, 2004a), and the database of Buell and others (2004). The pedon database assembled by Buell and others (2004) included only data for mineral soils in the MRB. For this study, the database of Buell and others (2004) was updated with pedon data for Histosols and histic members of the mineral-soil orders and with site-specific data for MRDP cores taken as part of this study.

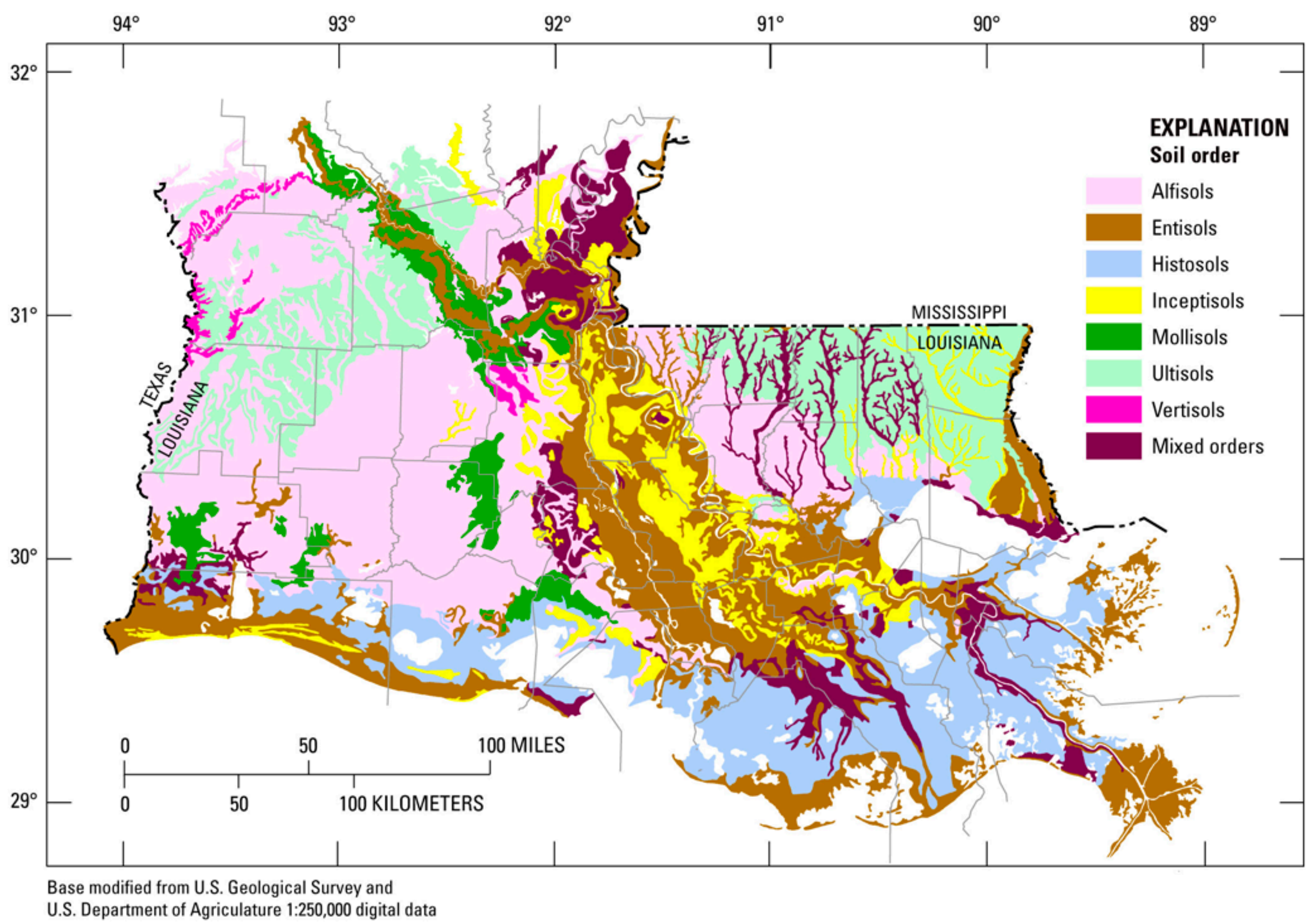


Figure 58. Dominant soil orders of southern Louisiana soils based on STATSGO map unit (U.S. Department of Agriculture, 2006); if one order was not dominant, the map unit is considered “mixed.”

Table 13. Organic-carbon concentration and soil/sediment organic-carbon storage data for core samples from selected environments, U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[MRDP, Mississippi River deltaic plain; ID, identifier; cm, centimeter; SOC, soil/sediment organic carbon; kg m^{-2}, kilogram per square meter; <, less than; >, greater than; %, percent; maximum values for each site are in bold]

MRDP core ID site name	Mass-weighted[1] mean organic-carbon concentration (weight percent) in indicated depth interval (cm)					SOC storage[2] (kg m^{-2}), 0- to 100-cm depth interval, based on indicated bulk density[3]		Enrichment factor for percent of total SOC storage in indicated depth interval[4]			
	0 to 10	10 to 20	20 to 50	50 to 100	0 to 100	1/3-bar	Field moist	0 to 10	10 to 20	20 to 0	50 to 100
Fresh marsh											
BV—Bayou Verret	**13**	**13**	**13**	10	12	12.1	20.1	0.56	0.81	0.87	**1.2**
LSPb—Lake Salvador	**32**	26	29	**32**	30	17.4	24.1	**1.2**	**1.2**	0.98	0.94
SM1a—St. Mary	17	16	**37**	19	23	25.1	37.9	0.88	0.70	0.97	**1.1**
SM1c—St. Mary	14	14	22	**36**	30	44.0	62.6	0.48	0.34	0.41	**1.6**
Group mean	19	17	**25**	24	24	24.7	36.2	0.78	0.76	0.81	**1.2**
Intermediate marsh											
BPPb—Bayou Perot	40	43	36	**45**	39	17.7	26.2	**1.2**	**1.2**	0.91	0.98
Brackish marsh											
FW—Fish & Wildlife	30	**32**	23	18	22	7.7	13.5	0.66	0.89	**1.1**	1.0
SB1a—St. Bernard	26	19	24	**32**	28	21.5	30.6	1.0	0.80	0.87	**1.1**
SB1c—St. Bernard	32	32	32	**33**	33	21.9	34.1	0.97	0.97	0.92	**1.1**
TB1a—Terrebonne	11	11	13	**17**	14	7.5	13.0	0.80	0.83	0.87	**1.2**
TB2a—Terrebonne	17	10	17	**25**	20	13.6	21.2	0.82	0.74	0.88	**1.2**
TB2c—Terrebonne	14	14	23	**39**	26	9.3	16.4	0.83	0.76	0.93	**1.1**
Group mean	22	20	22	**27**	24	13.6	21.5	0.85	0.83	0.93	**1.1**
Natural levee											
PLAQb—Plaquemines	**3.5**	1.8	0.7	0.5	1.1	10.0	9.6	**2.5**	1.8	0.88	0.62
BSLa—Bayou Sauvage	**13**	0.9	4.2	2.7	3.6	28.6	28.0	**1.9**	0.44	1.3	0.78
BSL2b—Bayou Sauvage	**5.7**	3.0	1.4	0.82	2.0	14.0	13.5	**2.5**	1.7	0.98	0.58
Group mean	**7.4**	1.9	2.1	1.3	2.2	17.5	17.0	**2.3**	1.3	1.1	0.66
Distributary											
BSDb—Bayou Sauvage	**30**	23	15	28	21	59.2	50.9	0.88	**1.0**	**1.0**	**1.0**

Table 13. Organic-carbon concentration and soil/sediment organic-carbon storage data for core samples from selected environments, U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[MRDP, Mississippi River deltaic plain; ID, identifier; cm, centimeter; SOC, soil/sediment organic carbon; kg m^{-2}, kilogram per square meter; <, less than; >, greater than; %, percent; maximum values for each site are in bold]

MRDP core ID site name	Mass-weighted[1] mean organic-carbon concentration (weight percent) in indicated depth interval (cm)					SOC storage[2] (kg m^{-2}), 0- to 100-cm depth interval, based on indicated bulk density[3]		Enrichment factor for percent of total SOC storage in indicated depth interval[4]			
	0 to 10	10 to 20	20 to 50	50 to 100	0 to 100	1/3-bar	Field moist	0 to 10	10 to 20	20 to 0	50 to 100
Backswamp											
MR1c—St. Martin	**1.9**	1.5	1.1	0.92	1.2	14.2	14.3	**1.3**	1.1	0.95	0.96
SL1b—St. Landry	**5.7**	1.8	0.93	0.58	1.4	14.2	13.9	**3.0**	1.5	0.86	0.59
Group mean	**3.8**	1.7	1.0	0.75	1.3	14.2	14.1	**2.2**	1.3	0.91	0.78
Swamp											
TN1c—Tangipahoa	**39**	37	38	37	38	30.7	44.8	0.75	0.93	**1.1**	1.0

[1]Weights based on ratio of dry-soil mass for each sample depth interval to total dry-soil mass in the standard depth interval.

[2]Organic-carbon storage calculated according to methods described in Buell and Markewich (2004).

[3]The field-moist bulk-density values are those obtained for each set of core samples in the laboratory and are based on the original core-slice volumes. Third-bar bulk-density values were estimated by regression on oven-dry bulk-density values calculated from the weight percent of water lost on sample drying. The 1/3-bar-derived values are used for data comparability with pedon data (Buell and others, 2004) used in regional storage and inventory estimates for the Mississippi River deltaic plain.

[4]The enrichment factor represents the deficit (values < 1) or surplus (values > 1) in storage relative to the mass that would be present in each standard interval with uniform distribution throughout the core (10%, from 0 to 10 cm; 10%, from 10 to 20; 30%, from 20 to 50; and 50%, from 50 to 100). This factor is a measure of depth bias in organic-carbon storage. Enrichment factors are calculated for storage values based on field-moist bulk-density data.

Core-specific comparisons of SOC storage (standard depth intervals) by environment are presented in table 13. Regionalized estimates of SOC storage and inventory for coastal Louisiana that are based on both MRDP core data and available pedon data are presented in table 14 and shown in figure 59. Site-specific and regional calculations of SOC storage and inventory were based on methods described in Buell and Markewich (2004).

Estimation of Soil/Sediment Organic Carbon Inventory

As previously stated, the pedon database used is an updated version of the database for mineral soils in the MRB by Buell and others (2004). This unpublished updated version includes National Soil Survey Laboratory pedon data for organic soils (U.S. Department of Agriculture, 2004a) in the MRB and MRDP core data. The storage data, derived from this revised pedon database, were then linked by soil taxonomy to SSURGO map units (U.S. Department of Agriculture, 1998–2005) to generate a regional map of SOC storage for the surface meter of coastal southeastern Louisiana (fig. 59). Buell and Markewich (2004) described procedures used for linking pedon data with SSURGO. A similar approach was taken by Bliss and others (1995) in developing a SOC inventory of the United States using STATSGO data and map units (U.S. Department of Agriculture, 2006).

Buell and Markewich (2004) linked pedon data at the soil-series level. For coastal Louisiana, there are some dominant soil series (mostly in salt-marsh areas) for which no storage data are available. Because of this, the SOC-storage data from the revised pedon database were aggregated to the taxonomic subgroup level rather than to the soil-series level. This higher-level taxonomic linkage permitted a larger spatial coverage of the map area.

The geographic distribution of SOC by marsh-vegetation type (table 14) was examined by merging the SOC storage data for the MRDP cores with pedon-storage data for the same geographic area and assigning SOC storage values to marsh types based on the combined databases. The inventory by marsh type was done by intersecting the regional SOC storage map with a 1997 coastal Louisiana vegetation survey (Louisiana Department of Wildlife and Fisheries and U.S. Geological Survey, 1997) and summing storage for the total land area in each marsh type—fresh, intermediate, brackish, salt, and "other." The "other" category is a catch-all grouping for nonmarsh areas that includes backswamp, natural levee, and distributary.

Table 14. Soil/sediment organic-carbon storage and inventory in the surface meter of soil/sediment, U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

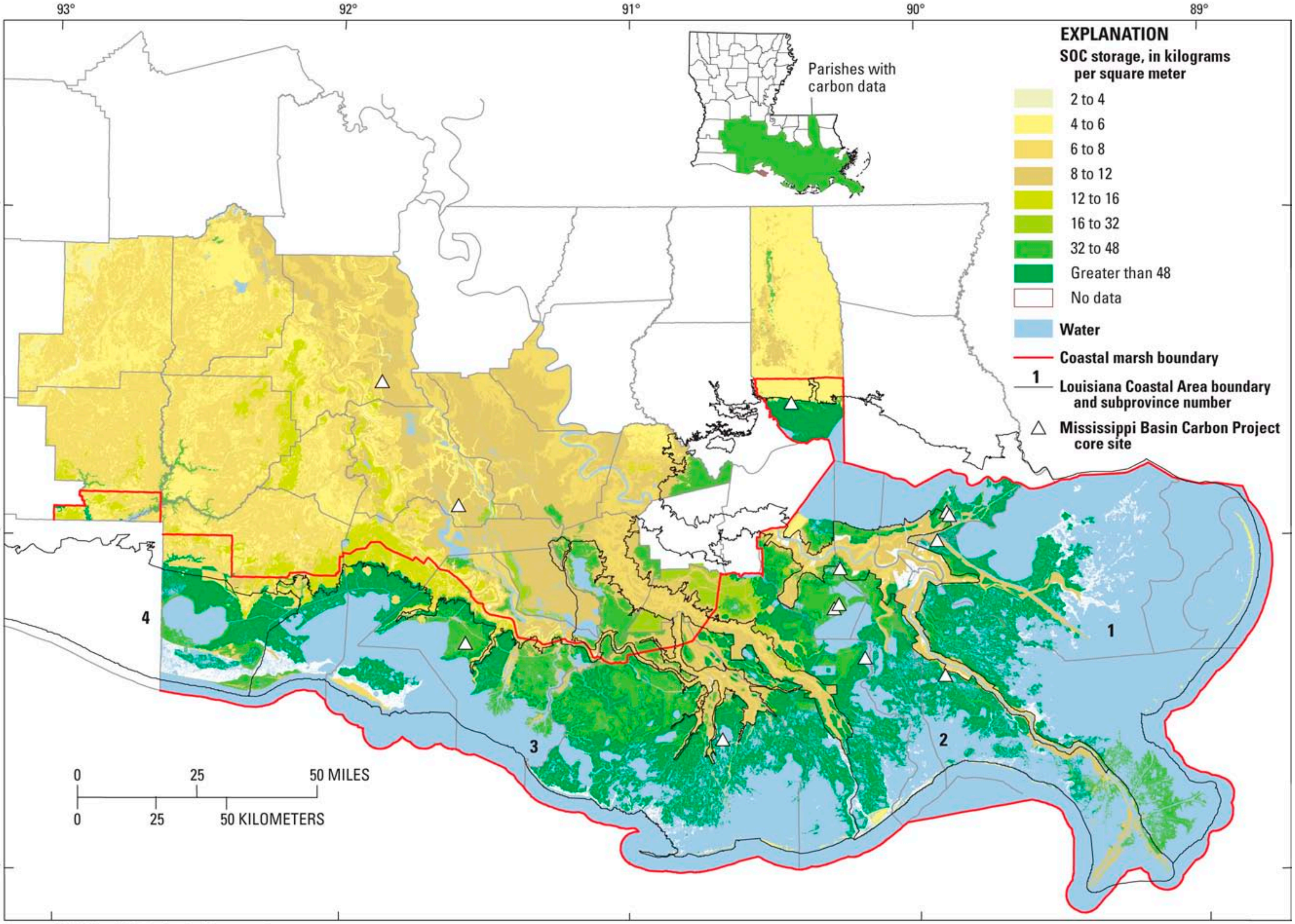
[SOC storage and inventory estimates are based on the linkage of site-specific storage values to USDA–NRCS SSURGO map-unit components (U.S. Department of Agriculture, 1998–2005) at the subgroup taxonomic level. Site-specific storage values are based on MRDP core data from this study, pedon data from Buell and others (2004), and pedon data from U.S. Department of Agriculture (2004). Median storage values for all pedons in each subgroup were used to attribute the SSURGO map units. Procedures for calculation of pedon-based storage values and attribution of SSURGO map units are described in Buell and Markewich (2004). Data presented in this table represent the geographic area mapped for marsh vegetation (Louisiana Department of Wildlife and Fisheries and the U.S. Geological Survey, 1997) within an 12-parish area for which SSURGO data are available: Iberia, Jefferson, Jefferson Davis, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. Mary, Tangipahoa, Terrebonne, and Vermilion Parishes; SOC, soil/sediment organic carbon; USDA, U.S. Department of Agriculture; NRCS, Natural Resources Conservation Service; SSURGO, Soil Survey Geographic; km^2, square kilometer; ha, hectares; kg m^{-2}, kilogram per square meter; Tg, teragrams (1 Tg = 10^{12} grams); MRDP, Mississippi River delatic plain]

Marsh type[1]	Areal extent (km^2)	Percent of total area	Number and size of SSURGO map units used for SOC storage and inventory calculations			SOC storage (kg m^{-2})[2]				SOC inventory (Tg)	Percent of total inventory	SOC storage, selected MRDP cores[3] (kg m^{-2})
			Number	Mean area (ha)	Median area (ha)	10th percentile	Mean	Median	90th percentile			
Fresh	3,383	25	9,717	34.75	2.14	34	53	35	85	181	30	BV (12.1), LSPb (17.4), SM1a (25.1), SM1c (44.0)
Intermediate	1,880	14	11,537	14.60	0.57	15	73	85	89	137	20	BPPb (17.7)
Brackish	1,672	13	8,290	17.27	1.10	34	79	87	89	131	19	TB1a (7.5), **FW** (7.7), TB2c (9.3), TB2a (13.6), **SB1a** (21.5), **SB1c** (21.9)
Salt	1,542	12	6,990	15.52	1.51	10	80	88	89	123	14	No samples taken
Other	4,759	36	7,143	65.35	10.87	6	22	10	85	105	17	Levee—PLAQb (10.0), BSL2b (14.0), BSLa (28.6); swamp—TN1c (30.7); distributary—BSDb (59.2)
Total	**13,236**	**100**	**43,677**	**28.08**			**51**			**677**	**100**	

[1]Marsh types are based on the "1997 Louisiana Coastal Marsh Vegetative Type Map" (Louisiana Department of Wildlife and Fisheries and the U.S. Geological Survey, 1997).

[2]The percentiles and mean and median values for organic-carbon storage are the weighted values for the set of attributed SSURGO map units in each marsh-type area. Map-unit area was used as the weight variable. The large skew in the distribution of storage values across map units is partly due to the aggregating effect of linking the pedon data at a more generalized taxonomic level (subgroup rather than soil series). The subgroup level was chosen to increase geographic coverage—no pedon data are available for many of the soil series in the map area.

[3]Site names and locations for the core IDs are given in Appendix 1, table 1-1. Assignment of core locations to marsh vegetation types was based on field observation of current vegetation. In most cases, this assignment is in agreement with the mapped marsh type. However, the core IDs shown in bold represent locations where the current vegetation differs from the historical vegetation: FW was historically fresh marsh, SB1a and SB1c were historically intermediate marsh. The inferred increase in salinity is most likely the result of changes in coastal hydrology related to construction of the Bayou Couba Oil Field Canal, St. Charles Parish (FW) and the Mississippi River Gulf Outlet Canal, St. Bernard Parish (SB1a and SB1c).



Base modified from U.S. Geological Survey and
U.S. Department of Agriculture 1:250,000 digital data

Figure 59. Mississippi River deltaic plain soil/sediment organic carbon (SOC) storage in the surface meter of soil/sediment. Storage values are for Louisiana parishes (boundaries in gray) with available SSURGO coverage (U.S. Department of Agriculture, 1998–2005). SSURGO map-unit attribution is at the subgroup taxonomic level. Although not located within the MRDP as shown in figure 3*A*, the St. Landry, St. Martin, and Tangipahoa core data were included in the SOC storage and inventory analysis because the cores represent environments of the major Mississippi River deltas as mapped by Frazier (1967; figure 3*B*).

Geographic Trends in Soil/Sediment Organic Carbon Inventory

Soil/sediment organic carbon storage in the surface meter of soil/sediment in the MRDP increases with the salinity of the marsh environment from a median storage of 35 kg m^{-2} in fresh marsh to 88 kg m^{-2} in salt marsh (table 14). The storage gradient is continuous across marsh types of increasing salinity—fresh marsh, mean SOC storage, 53 kg m^{-2}; intermediate, 73; brackish, 79; salt, 80 (table 14, fig. 59). Salt marshes are highly productive (Chmura and others, 2001). Because healthy tidal marsh systems accrete with rising sea level, the lower-elevation higher-salinity marshes generally have a larger storage capacity than the higher-elevation lower-salinity and fresh marshes (Connor and others, 2001).

When geographic patterns are examined (fig. 59), the coastal marshes generally have SOC storage values greater than 16 kg m^{-2} and the backswamp and distributaries have values less than 16 kg m^{-2}. The Bayou Sauvage distributary push-core BSDb is an exception—the BSDb core has the highest SOC storage value for the surface meter of all the MRDP cores (50.9 kg m^{-2}, table 13). This apparent contradiction to the pattern shown in figure 59 is related to hydraulic connectivity. Bayou Sauvage distributary is inactive (hydraulically disconnected) and is functionally a swamp with high autochthonous organic production (discussed in section "Accumulation Rates—Temporal Trends in Mississippi River Deltaic Plain Soil/Sediment Organic Carbon Sequestration"). Active and generally larger distributaries are periodically flushed of fine organic material during floods and hurricanes (Reed, 1989; Cahoon and others, 1995). These distributaries also receive allochthonous inputs of mineral sediment which dilute the SOC content of the surface soil/sediment.

The "other," or nonmarsh, category (table 14) has a median storage of 10 kg m^{-2} and a mean of 22 kg m^{-2}, much lower than the marsh areas. This result is consistent with the core-specific results (table 13) where the lowest storage values are for natural levee (mean, n=3, 17.0 kg m^{-2}) and backswamp (mean, n=3, 14.1 kg m^{-2}) environments. Fresh-to-brackish marsh and swamp environments had the highest SOC storage values.

The MRDP core-specific data (table 13) for the Louisiana coastal environments do not show the systematic increase in SOC storage with salinity that is evident when SOC storage is mapped by linking pedon data to SSURGO (table 14, fig. 59). In fact, for MRDP cores, the gradient actually goes in the other direction with storage decreasing as salinity increases. The mean SOC storage of fresh-marsh cores is 36.2 kg m^{-2} (n=4), intermediate marsh is 26.2 kg m^{-2} (n=1), and brackish marsh is 21.5 kg m^{-2} (n=6) (table 13). The difference between the SURGO-based and the MRDP core-based storage gradients is probably related to the small sample sizes for both datasets and the typically large spatial variability of SOC content in tidal marsh soils (Hussein and Rabenhorst, 1999).

The total SOC inventory (surface meter) (fig. 59) for the SSURGO-mapped portion of Louisiana's coastal-marsh-vegetative-type map area (13,236 km^2, fig. 6; Louisiana Department of Wildlife and Fisheries and U.S. Geological Survey, 1997) is 677 Tg (table 14)—slightly greater than 2 percent of the SOC inventory for the MRB (30,289 Tg)[6]. About half of the mapped coastal-marsh land area in Louisiana (6,180 km^2, fig. 3*A*; U.S. Geological Survey, 2004) is located within the MRDP with an estimated SOC inventory of 397 Tg[7] (1.3 percent of the MRB SOC inventory). However, the MRDP land area is only 0.3 percent of the MRB, suggesting that the MRDP is a critical area for SOC sequestration.

In all but the saline portion of the MRDP, organic matter occupies more soil/sediment volume than does mineral matter and is the primary driver for vertical marsh accretion (Kosters and Bailey, 1983; Nyman and others, 1990; Nyman and others, 1993). Fresh marsh accounts for 30 percent of the SOC inventory, intermediate marsh for 20 percent, brackish marsh for 19 percent, and salt marsh for 14 percent (table 14). The other category (predominantly natural levee, distributary, and swamp) accounts for 17 percent of the SOC inventory, slightly less than the intermediate- and brackish-marsh types, but includes from 2 to 3 times the land area of either of these marsh types. Geomorphic features directly affected by fluvial inputs, such as levees and backswamps, are depleted in SOC when compared to marsh areas.

Mississippi River Deltaic Plain Soil/Sediment Organic Carbon Storage by Environment

Table 13 summarizes the OC concentration and SOC-storage data for this study's MRDP cores. SOC-storage values and mass-weighted-mean OC concentrations were calculated for 16 push-cores and 2 vibracores collected in MRDP environments—11 marsh, 3 levee, 1 distributary, 2 backswamp, and 1 swamp. Estimates were calculated for storage and concentration for standard depth intervals within the surface meter of soil/sediment according to methods described in Buell and Markewich (2004). Adjustment to standard intervals was done to allow comparison of results for different cores and analysis of storage patterns with depth. Two sets of SOC storage-values are presented—one based on estimated 1/3-bar bulk-density values, the other based on field-moist bulk-density values (U.S. Department of Agriculture, 2005a). The field-moist bulk-density values are those obtained for each set of core samples in the laboratory and are based on the original core-slice volumes. Third-bar bulk-density values were estimated by regression on oven-dry bulk-density values calculated from the weight percent of water lost on sample drying. The 1/3-bar-derived values were used in the regional estimates of

[6]The MRB SOC inventory is based on the pedon database for mineral soils in the basin (Buell and others, 2004) updated with data for organic soils and histic mineral soils (U.S. Department of Agriculture, 2004; MRDP cores). An earlier inventory estimate for the MRB included just the mineral soils in the basin (Buell and Markewich, 2004).

[7]The entire MRDP (including water) has an area of 10,800 km^2. Using the ratio of *total MRDP area to mapped MRDP land area* as an adjustment to the 397 Tg land inventory, the MRDP SOC inventory (land plus water) is about 694 Tg, an amount comparable to the inventory for the entire mapped coastal-marsh land area. This larger estimate is probably more realistic because it can be assumed that marsh soil/sediment overlain by shallow water has comparable SOC storage to subaerially exposed soil/sediment. Using these estimates as a range, the MRDP SOC inventory is 1.3 to 2.3 percent of the entire MRB inventory. The fact that from 1.3 to 2.3 percent of the MRB SOC inventory lies in MRDP coastal wetlands spotlights the importance of coastal wetlands in SOC sequestration.

SOC storage and inventory because they are consistent with the other pedon data used in the regional analysis (Buell and others, 2004; U.S. Department of Agriculture, 2004a). For this discussion, where site-specific comparisons are made, the field-moist-derived values are used because they represent the storage conditions at the time of this study.

The marsh, swamp, and distributary environments generally have higher mean weight-percent OC concentrations and SOC storage in the surface meter than do the natural-levee and backswamp environments. When grouped by environment and ranked by mean OC concentration (from 0 to 100 cm interval), cores collected from intermediate marsh had the highest OC concentration (39 percent), followed by swamp (38 percent), fresh marsh and brackish marsh (24 percent), distributary (21 percent), natural levee (2.2 percent), and backswamp (1.3 percent).

Data Comparisons

The MRDP OC-concentration data can be compared to data for southern Louisiana from Brupbacher and others (1973) (Appendix 2, table 2-2). Brupbacher and others (1973) collected cores along north-south transects along the entire Louisiana coastline to characterize the physical and chemical characteristics of marsh soils (fig. 60). Their dataset was generated by analyzing samples from these regularly spaced cores, located about every 3.2 km (2 miles) along each transect. Transects were located at 7.5-minute longitudinal intervals. As such, the data provide a good measure of the spatial variability in OC concentration across marsh types. Mean OC concentrations in the top 20 cm decreased from 33.8 percent for fresh marsh (n = 81) to 24.5 percent for brackish marsh (n = 115) to 19.0 percent for salt marsh (n = 26) (Appendix 2, table 2-2). When grouped by texture class within marsh type, cores collected from peat and mucky peat had the largest mean OC concentrations. For peat the OC concentrations ranged from 37.3 for brackish marsh (n=23) to 44.8 percent for fresh marsh (n = 40). For mucky peat, the OC concentration ranged from 31.8 for salt marsh (n = 3) to 37.3 percent for fresh marsh (n = 14) (Appendix 2, table 2-3).

The mean OC concentrations for standard depth intervals in MRDP cores are included in table 13. Averaging the mass-weighted OC concentration values for the 0–10 and 10–20 cm intervals, MRDP data generally agree with the data of Brupbacher and others (1973). The four fresh-marsh cores have OC concentrations ranging from 13 to 29 percent. This range of values is between the 10th percentile (10.8) and median (39.6) concentrations reported by Brupbacher and others (1973) for fresh marsh (Appendix 2, table 2-2). Brupbacher did not have an intermediate-marsh category, but the mean OC concentration for the 0–20 cm interval for Bayou Perot intermediate-marsh push-core BPPb (41.5 percent, table 13) is in upper half of the interquartile range (from 39.6 to 46.2 percent; Appendix 2, table 2-2) for the fresh-marsh category of Brupbacher and others, 1973. The six MRDP push-cores collected in brackish marsh have OC concentrations ranging from 11 to 32 percent in the same 0–20 cm interval (table 13). This range of values is between the 10th (11.0) and 75th (33.6) percentile concentrations reported by Brupbacher and others (1973) for brackish marsh (Appendix 2, table 2-2). For this study, no cores were taken in the salt-marsh environment.

Depth Trends in Organic-Carbon Concentration

Organic-carbon concentration patterns with depth for subintervals within the surface meter (table 13) show that the marsh environments typically have relatively even distributions of OC with depth or higher OC concentrations at depth. Exceptions are Lake Salvador fresh-marsh push-core LSPb and Fish and Wildlife brackish-marsh push-core FW. In push-core LSPb, the highest OC concentrations are near the surface (from 0 to 10 cm interval) and at depth (from 50 to 100 cm interval). In push-core FW, the highest OC concentrations are only near the surface (from 0 to 10 cm interval). Although Bayou Sauvage distributary push-core BSDb has an OC profile distribution similar to that of Lake Salvador push-core LSPb, the intermediate-depth OC concentrations (from 10 to 20 cm and from 20 to 50 cm intervals) are lower. Cores for levee and backswamp environments generally have much higher OC concentrations near the surface.

When ranked by SOC storage (table 13), Bayou Sauvage distributary push-core BSDb had the highest SOC storage in the surface meter (50.9 kg m^{-2}), followed by Tangipahoa swamp push-core TN1c (44.8 kg m^{-2}). However, data were available for only one core from each of these environments. Ranking for group-mean SOC storage for cores from other MRDP environments is as follows: fresh marsh (36.2 kg m^{-2}), intermediate marsh (26.2 kg m^{-2}), brackish marsh (21.5 kg m^{-2}), natural levee (17.0 kg m^{-2}), and backswamp (14.1 kg m^{-2}) (table 13).

Figure 61 shows cumulative SOC storage with depth for each of the MRDP cores for which SOC storage was estimated (*A*, vibracores; *B*, push-cores). The same general trend is shown when graphically comparing push-core accumulation rates with marsh, swamp, and distributary environments accumulating more SOC than natural levee and backswamp (fig. 61*B*). With the exception of Bayou Sauvage levee push-core BSLa, the accumulation of SOC with depth is close to linear. The higher SOC accumulation rates in the 0-to-5 and 35-to-45 cm depths of push-core BSLa indicate layers of organic-rich sediment interbedded with fluvial deposits. OC concentrations in these intervals are several times higher and bulk-density values several times lower than those in the rest of the core (Appendix 2, table 2-1; fig. 25, bulk-density plot). Nonlinear patterns in SOC deposition are more evident in the vibracores (fig. 61*A*), particularly Terrebonne vibracore TB2c where the portion of the core below 280 cm is higher-density, low-carbon, clastic material.

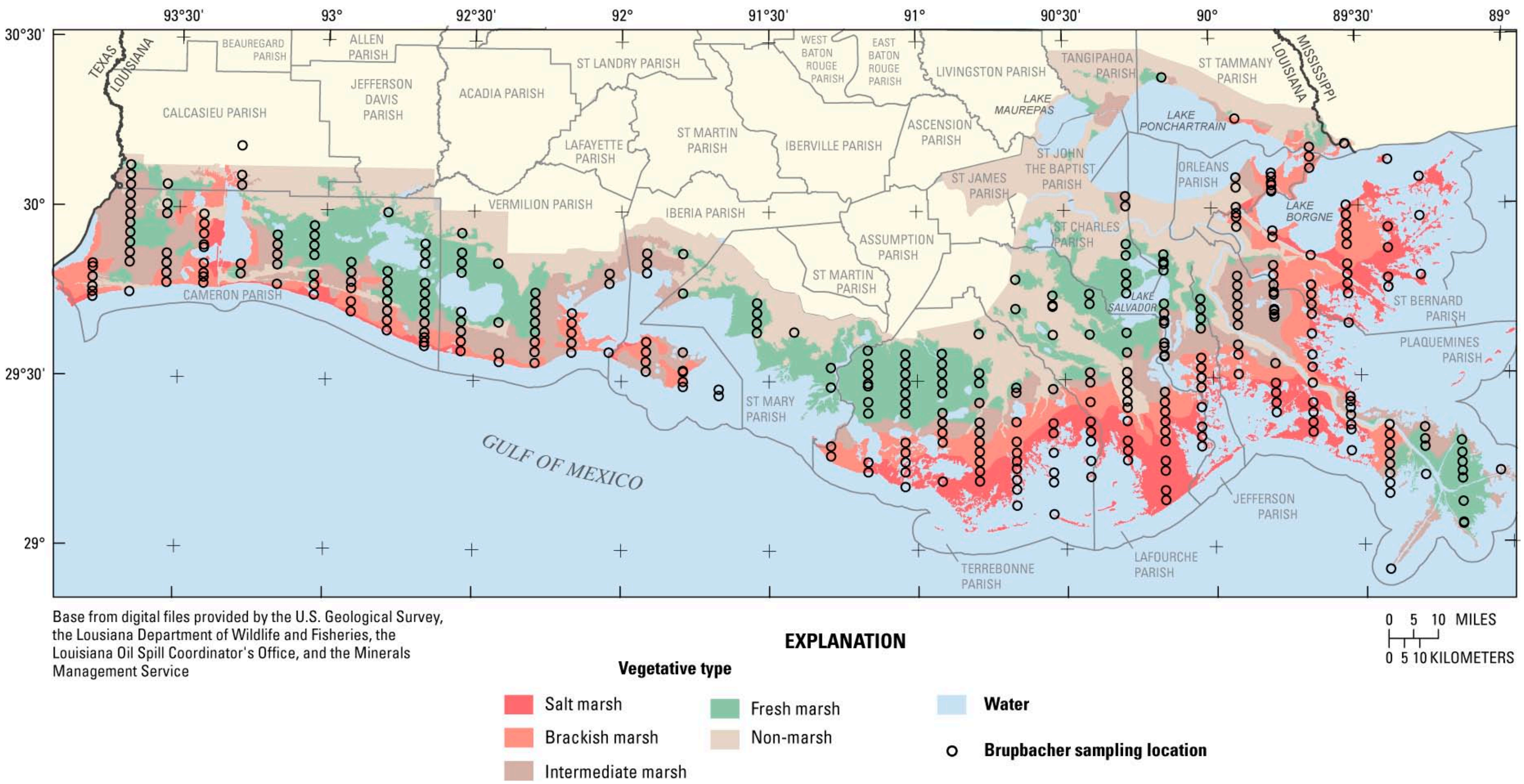


Figure 60. Marsh-transect sampling localities of Brupbacher and others (1973) for which there are organic-carbon data. Data for each site are given in Appendix 2, tables 2-2 and 2-3. Vegetative-type data from Louisiana Department of Wildlife and Fisheries and U.S. Geological Survey (1997).

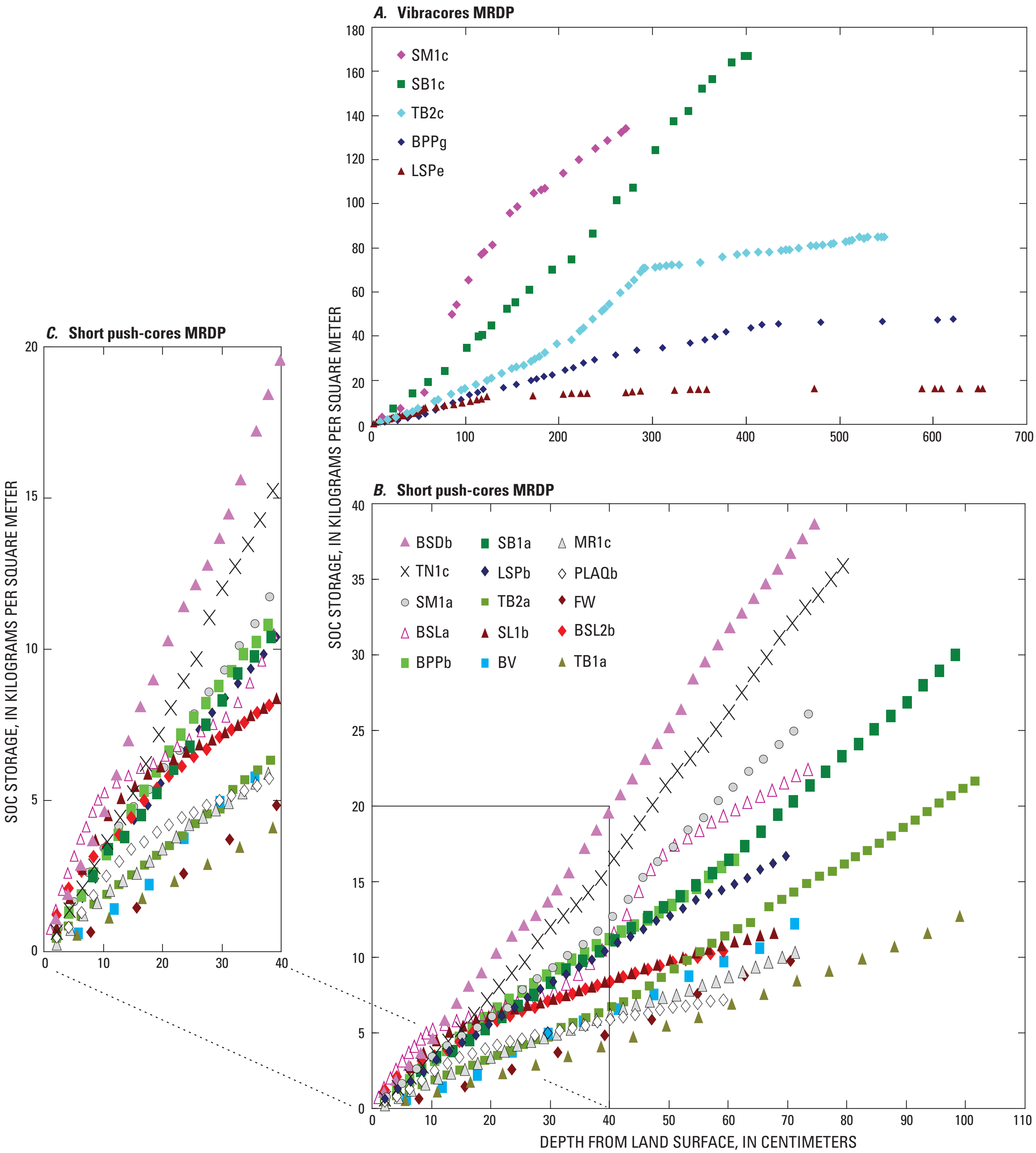


Figure 61. Soil/sediment organic carbon (SOC) storage for (*A*) vibracores and (*B*) push-cores from the Mississippi River deltaic plain (MRDP). SOC storage data based on field-moist bulk-density values. Data are in Appendix 2, table 2-1. (*C*) portion of *B,* inside rectangle (exaggerated vertically). [SM, St. Mary fresh marsh; SB, St. Bernard brackish marsh; TB, Terrebonne brackish marsh; BP, Bayou Perot intermediate marsh; LS, Lake Salvador fresh marsh; BSD, Bayou Sauvage distributary; TN, Tangipahoa swamp; BSL, Bayou Sauvage levee; SL, St. Landry backswamp; BV, Bayou Verret fresh marsh; MR, St. Martin backswamp; PLAQ, Plaquemines levee; FW, Fish and Wildlife, brackish marsh]

Soil/sediment organic carbon storage with depth was examined by calculating an enrichment factor that represents the deviation from a uniform distribution with depth (table 13). Enrichment factors were calculated for each standard interval with values >1 indicating a surplus (enrichment) and values <1 a deficit (depletion) in SOC mass relative to the mass required for a uniform distribution. Depth patterns in SOC enrichment/depletion are similar to concentration patterns for the same cores. Deeper intervals had disproportionately higher SOC storage in the marsh, swamp, and distributary environments, as did the surface interval (from 0 to 10 cm) in the levee and backswamp environments. The Lake Salvador fresh-marsh push-core LSPb and the Bayou Perot intermediate-marsh push-core BPPb were exceptions for the marsh environments, as the surface SOC storage for these cores was disproportionately high, a pattern more similar to the natural-levee and backswamp environments.

Carbon losses through oxidation and respiration could partially account for the observed patterns with depth in the marsh and swamp cores where the surface intervals generally had proportionately less SOC mass than the deeper intervals. Root-zone soil/sediment oxidation (Howes and others, 1986) and bioturbation (Kostka and others, 2002) provide favorable conditions for the mineralization of organic matter and thus would tend to reduce shallow SOC storage. In salt-marsh environments, a positive feedback between plant production and root-zone soil/sediment oxidation has been suggested where plant-water uptake increases drainage and soil/sediment aeration, which in turn promotes soil/sediment oxidation and plant production (Howes and others, 1986; Stribling and Cornwell, 2001). This productivity-drainage-oxidation loop probably also applies to fresh-, intermediate-, and brackish-marsh environments as a driver for mineralization of recently formed or deposited SOC. Similarly, Neubauer and others (2002) demonstrated that soil/sediment metabolism could remove close to one-third of recently deposited carbon within a month in a Virginia tidal fresh marsh.

Accumulation Rates—Temporal Trends in Mississippi River Deltaic Plain Soil/Sediment Organic Carbon Sequestration

Temporal changes in SOC storage were estimated for each MRDP environment by comparing SOC mass-accumulation rate (MAR) estimates. The SOC MAR estimates are based on soil/sediment age markers, primarily ^{137}Cs, ^{14}C, and indicative palynomorphs (Appendixes 3 and 5). Isotopic data (bomb-spike ^{137}Cs, bomb-spike Δ^{14}C, and to a lesser degree cosmogenic ^{14}C), indicative palynomorphs, and other stratigraphic data provided age markers for estimating SOC MARs on decadal-to-millennial scales (table 15).

Soil organic carbon MAR values (MARs) were calculated to define recent (decadal-scale) depositional trends based on bomb-spike ^{137}Cs. For localities, where data for more than one type of soil/sediment age marker were available, SOC MARs could be corroborated (that is, MARs based on ^{137}Cs data corroborated by MARs based on bomb-spike Δ^{14}C data). Longer-term (century-to-millennial-scale) MAR trends were based on calibrated cosmogenic ^{14}C age estimates and, where practical, palynomorph and other stratigraphic markers (table 15).

Bomb-Spike Cesium-137

For this study, fourteen cores (collected at 13 sites) were analyzed for ^{137}Cs activity—Bayou Verret (BV), Lake Salvador (LSPb), and St. Mary (SM1b) fresh marsh; Bayou Perot (BPPb) intermediate marsh; Fish and Wildlife (FW), St. Bernard (SB1b), and Terrebonne (TB2a) brackish marsh; Plaquemines (PLAQb) and Bayou Sauvage (BSLa, BSL2b) natural levee; Bayou Sauvage (BSDb) distributary; St. Martin (MR1c) and St. Landry (SL1b) backswamp; and Tangipahoa (TN1b) swamp. The analytical results, and inferences about recent soil/sediment deposition, are discussed in the section “Cesium-137 and Potassium-40 Measurements.”

Of the 14 cores sampled for ^{137}Cs analyses, 3 cores could not be used to estimate SOC accumulation rates. Cesium-137 and bulk-density measurements were made for samples from all 14 cores. However, ^{137}Cs was present throughout push-core TN1b, giving a pattern of multiple peaks (fig. 31). Since only one core from the Tangipahoa swamp locality had been sampled for ^{137}Cs, no chronology could be established for this swamp environment. Organic-carbon concentrations were measured for samples from all but two cores, SM1b and SB1b. No estimates of SOC accumulation could be made for these two cores.

Based on the ^{137}Cs results, SOC MAR data for all MRDP cores except push-core TN1b (table 15), show no apparent recent (post-A.D. 1963–64) trend or environmental gradient. The SOC MARs ranged from 59 g m^{-2} yr^{-1} at the Bayou Sauvage levee site (BSLa) to 342 g m^{-2} yr^{-1} at the Bayou Perot intermediate-marsh site (BPPb). When the range for just the marsh environments is used (from 131 to 342 g m^{-2} yr–^{1}), results from this study are comparable to decadal-scale values reported by Neubauer and others (2002) for a Virginia tidal fresh marsh (224±45 g m^{-2} yr^{-1}) and Smith and others (1983) for fresh marsh (224 g m^{-2} yr^{-1}) and brackish marsh (296 g m^{-2} yr^{-1}) in Barataria Basin, Louisiana. DeLaune and others (1981) measured decadal rates of 393 and 237 g m^{-2} yr^{-1} for streamside and inland salt marsh in Barataria Basin.

The lack of a trend or environmental gradient in the post-NWT period (A.D. 1963–64 to date of core acquisition) is possibly due to spatial variability in the (1) rates of soil/sediment accumulation, (2) OC content of the soil/sediment, and (3) rate of OC decomposition. Singularly or in combination these factors could offset underlying environmental gradients in productivity, which typically rank swamp environments with the highest productivity, followed by marsh environments of decreasing salinity, followed by the fluvially dominated environments (levee, backswamp, and, to a lesser extent, distributary).

Although the second highest post-NWT period (A.D. 1963–64) interval SOC MAR was calculated for St. Martin backswamp push-core MR1c (289 g m^{-2} yr^{-1}, table 15), a much lower MAR was calculated for St. Landry backswamp push-core SL1b (139 g m^{-2} yr^{-1}). The higher SOC MAR value for push-core MR1c is due to the relatively high mean bulk density (1.23 g cm^{-3}; Appendix 2, table 2-1) for the 63.47 cm depth from peak ^{137}Cs activity to the surface. The higher mean bulk density more than offset the low OC content (mean concentration, 1.25 percent; Appendix 2, table 2-1) to produce a high SOC MAR value. The St. Landry core had a higher mean OC concentration (5.70 percent) and a lower mean bulk density (0.74 g cm^{-3}) for the post-NWT period (A.D. 1963–64) interval than the St. Martin core. The lower SOC MAR value for push-core SL1b is primarily due to the lower post-NWT period (A.D. 1963–64) soil/sediment-deposition rate (SL1b, 2.22 kg m^{-2} yr^{-1}; MR1c, 23.85 kg m^{-2} yr^{-1}; table 15).

The Bayou Sauvage distributary (BSDb) has an SOC MAR of 240 g m^{-2} yr^{-1} (table 15), which is approximately the mean value calculated for five marsh sites. The depth-to-peak ^{137}Cs activity for Bayou Sauvage distributary push-core BSDb is shallow (15.31 cm, table 15), but the OC concentrations in the depth interval from 15.31 cm to the surface are high (from 25.19 to 31.65 percent). As discussed in the section "Geographic Trends in Soil/Sediment Organic Carbon Inventory," these OC values suggest that this distributary, in terms of SOC accumulation, is comparable to a swamp environment. This interpretation is possibly applicable to other infrequently active or abandoned distributaries in the MRDP. (For OC and bulk-density data, see Appendix 2, table 2-1.)

No definable ^{137}Cs peak was obtained for the Tangipahoa swamp cores (TN1b, d). However, the *swamp* environment is one of high productivity that in the southeastern U.S. has MAR values similar to other nutrient-enriched coastal environments. One example is the Everglades with post-NWT period (A.D. 1963–64) SOC MARs >200 g m^{-2} yr^{-1} (Craft and Richardson, 1998).

Bomb-Spike Delta Carbon-14

Bomb-spike Δ^{14}C activity peaks were determined for 10 MRDP cores (table 15). At the start of the project, it was not clear whether ^{137}Cs or Δ^{14}C would produce better, more consistent, or even usable results, so both techniques were used. Fourteen cores were analyzed for Δ^{14}C activity; 9 of 14 were collected from localities where cores for ^{137}Cs analysis were also collected. Direct data comparisons were made for cores from three marsh localities (BV, FW, TB2a) and one backswamp locality (MR1c). For each site, the same core was analyzed for Δ^{14}C and ^{137}Cs. Although six cores (SM1a, BPPa, SB1a, TB2c, BSDc, and TN1d) collected for Δ^{14}C analysis were in close proximity to cores collected for ^{137}Cs analysis, samples from just one push-core per locality were analyzed for OC content. Therefore no isotopic-methods comparison relevant to SOC accumulation could be made for these six localities. No chronology could be established for four of the cores (TB1c, PLAQd, BSL2a, and MR1d) collected for Δ^{14}C analysis. At the Terrebonne brackish-marsh locality, both push-core TB2a and vibracore TB2c were analyzed for Δ^{14}C and OC in order to provide data on intrasite variability using the same dating technique. TB2a also was analyzed for ^{137}Cs to provide data for an inter-method comparison.

The range in SOC MARs, based on the Δ^{14}C post-NWT period (A.D. 1963–64), was from 62 g m^{-2} yr^{-1} (FW) to 249 g m^{-2} yr^{-1} (MR1c). This is comparable to SOC MAR values obtained using the ^{137}Cs data (from 59 to 342 g m^{-2} yr^{-1}). As with the SOC MARs obtained using ^{137}Cs age estimates, there was no clear trend in SOC MARs with environment using the Δ^{14}C data. Intermediate SOC MAR values were calculated for fresh-marsh push-cores Bayou Verret BV (188 g m^{-2} yr^{-1}) and St. Mary SM1a (176 g m^{-2} yr^{-1}), for brackish-marsh push-cores St. Bernard SB1a (138 g m^{-2} yr^{-1}) and Terrebonne TB2a (216 g m^{-2} yr^{-1}), and for brackish-marsh vibracore Terrebonne TB2c (163 g m^{-2} yr^{-1}).

As with SOC MAR values for cores from different localities but in the same environment (for example, backswamp push-cores MR1c and SL1b), different SOC MAR values for cores from the same locality are due to differences in depth-to-Δ^{14}C peak activity and in OC content. The higher SOC MAR for push-core TB2a compared to vibracore TB2c is due in part to the greater depth-to-Δ^{14}C peak value, 41.34 cm versus 33.00 cm (table 15). The higher value for TB2a is also due in part to a slightly higher OC content (14.78 percent, TB2a; 13.99 percent, TB2c; Appendix 2, table 2-1).

There was also some difference when calculating SOC MARs for the same core but using different methods. A higher SOC MAR was obtained for TB2a using the depth-to-peak ^{137}Cs activity (265 g m^{-2} yr^{-1}) than was obtained using the depth-to-peak Δ^{14}C activity (216 g m^{-2} yr^{-1}). The reasons are the same as for differences between cores—greater depth-to-peak ^{137}Cs activity (47.82 cm, table 15) and higher OC content (15.67 percent, Appendix 2, table 2-1).

The method-based differences in measured depths-to-peak activity are discussed in greater detail in the previous section, "Carbon-14 Measurements." Probable causes for different peak locations include physical differences between separate cores, offsets created by subsampling the same core, vertical movement of radionuclides after deposition, depletion or enrichment of radionuclides by allochthonous inputs, and variable depletion of ^{14}C through metabolic pathways.

Cosmogenic Carbon-14

Cosmogenic ^{14}C activity was measured in eight MRDP cores to provide age markers for estimating century-to-millennial-scale rates of SOC accumulation (table 15). However, because of conflicting age data, no chronology was established for three of the eight cores, PLAQd (natural levee), MR1b (backswamp), and TN2a (swamp) (for discussion, see section "Carbon-14 Measurements").

Table 15. Cesium-137 and carbon-14 isotopic age markers, soil/sediment-carbon mass, and soil/sediment-carbon mass-accumulation rates for cores from selected environments, U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[^{137}Cs, cesium-137; ID, identifier; cm, centimeter; SOC, soil/sediment organic carbon; kg m^{-2}, kilogram per square meter; MAR, mass-accumulation rate; g m^{-2} yr^{-1}, gram per square meter per year; Δ^{14}C, Delta carbon-14; CAL yr BP, calibrated years before present (MODERN); MODERN, calendar year A.D. (*anno Domini*) 1950; yr PM, years post-MODERN; na, not analyzed; nc, no chronology established; data for entire core in bold]

Bomb-spike ^{137}Cs					Bomb-spike Δ^{14}C				Cosmogenic ^{14}C				
^{137}Cs core ID[1]	Core sample year	^{137}Cs peak depth (cm)	SOC mass[3] (kg m^{-2}), 1963.5 to sample year	SOC MAR (g m^{-2} yr^{-1}), [2]1963.5 to sample year	Δ^{14}C core ID[1]	Δ^{14}C peak depth (cm)	SOC mass[3] (kg m^{-2}), [2]1963.5 to sample year	SOC MAR (g m^{-2} yr^{-1}), 1963.5 to sample year	^{14}C core ID[1]	Age range (CAL yr BP or yr PM)[2]	Depth range (cm)	SOC mass[3] (kg/m^2)	SOC MAR (g/m^2/yr)
Fresh marsh													
BV	**1996**	**38.60**	**6.12**	**188**	**BV**	**38.60**	**6.12**	**188**					
LSPb	**1997**	**33.78**	**9.12**	**272**					**LSPe**	**3,065 to 47 yr PM**	**322.0 to 71.3**	**28.17**	**9**
										615 to 47 yr PM	71.3 to 0.0	3.43	5
										1,075 to 615	108.1 to 71.3	10.47	23
										1,340 to 1,075	116.2 to 108.1	2.12	8
										1,540 to 1,340	123.1 to 116.2	1.83	9
										1,865 to 1,540	154.1 to 123.1	1.77	5
										2,450 to 1,865.	196.7 to 154.1	2.04	3
										2,630 to 2,450	281.8 to 196.7	5.00	28
										2,980 to 2,630	305.9 to 281.8	1.12	3
										3,065 to 2,980	322.0 to 305.9	0.39	5
SM1b	**1996**	**15.90**	**na**	**na**	**SM1a**	**19.05**	**5.71**	**176**	**SM1c**	**3,315 to 46 yr PM**	**266.7 to 0.0**	**133.66**	**40**
										615 to 46 yr PM	57.2 to 0.0	32.29	49
										925 to 615	88.3 to 57.2	21.80	70
										1,295 to 925	111.8 to 88.3	22.99	62
										1,725 to 1,295	122.6 to 111.8	3.32	8
										1,890 to 1,725	148.0 to 122.6	17.42	106
										2,153 to 1,890	179.1 to 148.0	8.74	33
										2,508 to 2,153	217.2 to 179.1	14.64	41
										2,845 to 2,508	246.4 to 217.2	7.88	23
										3,315 to 2,845	266.7 to 246.4	4.58	10
Intermediate marsh													
BPPb	**1997**	**41.00**	**11.46**	**342**	**BPPa**	**30.25**	**na**	**na**	**BPPg**	**3,260 to 47 yr PM**	**402.3 to 0.0**	**43.59**	**13**
										325 to 47 yr PM	48.6 to 0.0	3.76	10
										1,090 to 325	108.5 to 48.6	10.45	14
										1,415 to 1,090	153.7 to 108.5	4.06	12
										2,540 to 1,415	305.7 to 153.7	16.50	15
										3,100 to 2,540	369.5 to 305.7	5.83	10
										3,260 to 3,100	402.3 to 369.5	2.99	19

Table 15. Cesium-137 and carbon-14 isotopic age markers, soil/sediment carbon mass, and soil/sediment carbon mass-accumulation rates for cores from selected environments, U.S. Geological Survey soil/sediment carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[^{137}Cs, cesium-137; ID, identifier; cm, centimeter; SOC, soil/sediment organic carbon; kg m^{-2}, kilograms per square meter; MAR, mass-accumulation rate; g m^{-2} yr^{-1}, grams per square meter per year; Δ^{14}C, Delta carbon-14; CAL yr BP, calibrated years before present (MODERN); MODERN, calendar year A.D.(*anno Domini*) 1950; yr PM, years post-MODERN; na, not analyzed; nc, no chronology established; data for entire core in bold]

Bomb-spike ^{137}Cs					Bomb-spike Δ^{14}C				Cosmogenic ^{14}C				
^{137}Cs core ID[1]	Core sample year	^{137}Cs peak depth (cm)	SOC mass[3] (kg m^{-2}), 1963.5 to sample year	SOC MAR (g m^{-2} yr^{-1}), [2]1963.5 to sample year	Δ^{14}C core ID[1]	Δ^{14}C peak depth (cm)	SOC mass[3] (kg m^{-2}), [2]1963.5 to sample year	SOC MAR (g m^{-2} yr^{-1}), 1963.5 to sample year	^{14}C core ID[1]	Age range (CAL yr BP or yr PM)[2]	Depth range (cm)	SOC mass[3] (kg/m^2)	SOC MAR (g/m^2/yr)
Brackish marsh													
FW	**1996**	**35.28**	**4.27**	**131**	**FW**	**19.60**	**2.03**	**62**					
SB1b	**1996**	**15.89**	**na**	**na**	**SB1a**	**14.95**	**4.49**	**138**	**SB1c**	**3,405 to 46 yr PM**	**383.5 to 0.0**	**165.69**	**48**
										575 to 46 yr PM	105.8 to 0.0	39.12	63
										800 to 575	126.9 to 105.8	8.17	36
										1,080 to 800	166.4 to 126.9	16.36	58
										1,855 to 1,080	235.5 to 166.4	29.31	38
										1,935 to 1,855	265.1 to 235.5	12.92	162
										2,450 to 1,935	304.6 to 265.1	26.60	52
										2,805 to 2,450	345.5 to 304.6	19.52	55
										3,405 to 2,805	383.5 to 345.5	13.69	23
TB2a	**1996**	**47.82**	**8.62**	**265**	**TB2a**	**41.34**	**7.03**	**216**	**TB2c**	**1,125 to 46 yr PM**	**251.1 to 0.0**	**37.81**	**32**
					TB2c	**33.00**	**5.30**	**163**		315 to 46 yr PM	129.8 to 0.0	5.30	15
										1,125 to 315	251.1 to 129.8	32.51	40
Natural levee													
PLAQb	**1999**	**9.50**	**2.52**	**71**	**PLAQd**	**nc**	**nc**	**nc**	**PLAQd**	**nc**	**nc**	**nc**	**nc**
BSLa	**1997**	**2.55**	**1.99**	**59**									
BSL2b	**1999**	**11.61**	**3.87**	**109**	**BSL2a**	**nc**	**nc**	**nc**					
Distributary													
BSDb	**1997**	**15.31**	**8.05**	**240**	**BSDc**	**19.38**	**na**	**na**					
Backswamp													
MR1c	**1996**	**63.47**	**9.38**	**289**	**MR1c**	[4]**54.39**	**8.10**	**249**	**MR1b**	**nc**	**nc**	**nc**	**nc**
					MR1d	**nc**	**nc**	**nc**					
SL1b	**1996**	**9.82**	**4.52**	**139**									
Swamp													
TN1b	**1996**	**nc**	**nc**	**nc**	TN1d	[4]**19.55**	na	na	**TN2a**	**nc**	**nc**	**nc**	**nc**

[1] Core IDs referenced in Appendix 1, table 1-1.

[2] The A.D. 1963-1964 NWT peak datum is noted as A.D. 1963.5 for calculations.
Age-calibration procedure (Reimer and others, 2004a, b) referenced in the section on "Carbon-14 Measurements." The calibrated ages listed in this table are the median values of the calibrated-age ranges reported in Appendix 3, table 3-2. Uncalibrated calendar-year ages are reported as years post-MODERN--unless indicated as such, ages are calibrated.

[3] SOC mass calculations based on measured field-moist bulk-density values.

[4] Peak locations for St. Martin push-core MR1c and Tangipahoa push-core TN1d are uncertain because of reworking and allochthonous sediment input. In the case of TN1d, the highest Δ^{14}C value occurs adjacent to a calibrated age of 500 years BP. See section "Carbon-14 Measurements" for further discussion.

The other five cores were all collected from marsh environments—LSPe, SM1c (fresh marsh); BPPg (intermediate marsh); and SB1c, TB2c (brackish marsh). For these five cores, SOC MARs for time periods ranging from 1,171 to 3,451 years[8] varied between 9 and 48 g m^{-2} yr^{-1} (table 15), an order of magnitude lower than the recent decadal-scale SOC MARs estimated from bomb-spike markers (from 59 to 342 g m^{-2} yr^{-1}). This trend was also documented by Neubauer and others (2002) for a Virginia tidal fresh-marsh bordering Chesapeake Bay. They reported a recent mean-annual SOC-accumulation rate of 517 ± 353 g m^{-2} yr^{-1} and a decadal rate (based on ^{137}Cs) of 224 ± 45 g m^{-2} yr^{-1}. Neubauer and others (2002) did not have sufficient bulk-density data to convert from linear sedimentation to SOC mass-accumulation. Therefore, although they calculated century-to-millennial-scale sediment accretion rates based on ^{14}C, these rates could not be converted to SOC MARs.

Neubauer and others (2002) and Reed (1989) discussed the broad range in long-term sequestration rates. Lower long-term rates could result from OC losses through oxidation and decomposition or from the periodic flushing of organic matter from coastal marshes during storm periods. Both recent and long-term sequestration rates measured in this study are in agreement with results obtained in a transect study of carbon sequestration in accreting coastal marshes adjacent to Chesapeake Bay, Dorchester County, Maryland (Hussein and others, 2004). Hussein and others (2004) reported a mean sequestration rate for the last 150 years of 83.5 ± 23 g m^{-2} yr^{-1} and predicted a long-term mean sequestration rate (before the last few hundred years) of 29.2 ± 5.35 g m^{-2} yr^{-1}.

The long-term (millennial-scale) SOC-sequestration rates calculated for the MRDP marsh cores are time-averaged rates based on the basal ^{14}C age marker and the present-day land surface. In this study, a sufficient number of intermediate ^{14}C ages were determined on four of the long marsh vibracores (LSPe, SM1c, BPPg, and SB1c) to examine nonlinear trends in carbon sequestration. At the Lake Salvador (LSPe) and St. Mary (SM1c) fresh-marsh sites and the St. Bernard (SB1c) brackish-marsh site there were several decadal-to-century-scale departures greater than 100 percent of the long-term (millennial-scale) linear accumulation rate. The Lake Salvador linear rate during 3,065 CAL yr BP to 47 yr PM (sample year 1997; Appendix 1, table 1-1) was 9 g m^{-2} yr^{-1} (table 15). However, during a 460-yr period from 1,075 to 615 CAL yr BP, the rate was 23 g m^{-2} yr^{-1} and during a 180-yr period from 2,630 to 2,450 CAL yr BP, the rate was 28 g m^{-2} yr^{-1}. At the St. Mary site, the linear rate from 3,315 CAL yr BP to 46 years PM (sample year 1996; Appendix 1, table 1-1) was 40 g m^{-2} yr^{-1}—the range for the eight age-dated subintervals was from 8 to 106 g m^{-2} yr^{-1} (table 15). The maximum St. Mary rate occurred for 165 years from 1,890 to 1,725 CAL yr BP. The most active period of carbon accumulation at the St. Bernard site occurred during a brief 80-yr period from 1,935 to 1,855 CAL yr BP when the deposition rate was 162 g m^{-2} yr^{-1}, more than 3 times the 48 g m^{-2} yr^{-1} long-term linear rate. Periods of relatively high carbon accumulation suggest that these areas were either (1) relatively inactive interdistributaries with interim marsh/swamp deposition within an actively prograding delta or (2) interlobe basins with actively accreting marsh deposits (Kosters and others, 1987; Tye and Kosters, 1986).

Palynomorphs and Other Stratigraphic Markers

Bomb-spike ^{137}Cs, bomb-spike $\Delta^{14}C$, and cosmogenic ^{14}C provide isotopic age markers with good temporal resolution for recent decadal-scale (from A.D. 1950 to present; Ritchie and McHenry, 1990; Reimer and others, 2004b) and older millennial scale (from about 500 to 26,000 yr BP; Stuiver and Polach, 1977; Stuiver and others, 1998; Reimer and others, 2004a) age assignments. However, application of these dating techniques leaves a century-scale gap from 1950 to a few hundred years BP. This period, particularly the early 1700s to the mid-1900s, encompassed a time of major land-use change that affected sedimentation and carbon cycling in the MRDP. An attempt was made to fill this gap with palynomorph and other stratigraphic marker data such as phytoliths, diatoms, spores, charcoal fragments, and carbonaceous spherules. Results of this analysis—primarily based on the palynomorph data from marsh vibracores SM1c, SB1c, and TB2c and swamp push-core TN1d (table 1)—are presented and discussed in the previous section "Palynomorph and Other Microstratigraphic Marker Data." The St. Bernard vibracore SB1c is the only core that was analyzed for other markers (results discussed in Markewich, 1998a; Wrenn and others, 1998a).

Pollen assemblages for specific depth intervals, in concert with ^{14}C age estimates, provide good corollary evidence for millennial-scale changes in marsh and swamp environment related to changes in climate and vegetation. For a few localities, relatively certain age assignments also could be made for the intermediate century-scale period. *Alternanthera philoxeroides* was present in the St. Mary fresh-marsh vibracore SM1c only at the 6.4 cm depth in Zone D (figs. 42*C*, 63; Appendix 5, table 5-2), indicating an soil/sediment age no older than A.D. 1900. The next Zone D sample in SM1c is at a depth of 96.5 cm with a ^{14}C age range from 1,295 to 925 CAL yr BP (table 15; Appendix 3, table 3-2). The bomb-spike ^{137}Cs peak depth for the St. Mary locality is 15.90 cm (push-core SM1b, table 15) and the bomb-spike $\Delta^{14}C$ peak depth is 19.05 cm (push-core SM1a, table 15). The occurrence of *A. philoxeroides* in only the surface interval of SM1c is consistent with these age assignments based on isotopic data.

In Wrenn and others (1998a), evidence based on carbonaceous spherules suggested that soil/sediment at 56 cm in the St. Bernard vibracore SB1c was deposited in about A.D. 1900. Soil/sediment at 85 cm was deposited in about A.D. 1830. Based on these age assignments, three SOC MARs can be calculated for SB1c—a composite rate for the calen-

[8] Carbon-14 ages reported in this section and in table 15 are calibrated pre-MODERN ages. For the purposes of discussion, the median values of the calibrated age ranges for each sample are used. Post-MODERN ages (younger than A.D. 1950) are reported as calendar-year (A.D.) ages.

dar years from 1830 to 1996 (sample year) and rates from A.D. 1830 to 1900 and from A.D 1900 to 1996. The composite SOC MAR is 196 g m^{-2} yr^{-1}. The rate for each time period SOC MARs are 173 g m^{-2} yr^{-1} (from A.D. 1830 to 1900) and 212 g m^{-2} yr^{-1} (from A.D. 1900 to 1996). All three rates are higher than the most-recent SOC MARs based on bomb-spike $\Delta^{14}C$ for push-core SB1a (138 g m^{-2} yr^{-1}, 32.5 years precedent to sample year; table 15) and cosmogenic ^{14}C for push-core SB1c (63 g m^{-2} yr^{-1}, 621 years precedent to sample year; table 15). The higher SOC MARs rates for the post-A.D. 1830 period suggest a higher productivity for the St. Bernard marsh at a time when disturbance related to development near New Orleans possibly provided more sediment to the marsh. The completion of the Mississippi River–Gulf Outlet Canal in the mid-1960s (U.S. Army Corps of Engineers, 2004) diverted much of the sediment supply from the area around the St. Bernard locality and thus could partly explain the lower SOC MAR for the post-A.D. 1963–64 period. Some of the difference in SOC MARs could also be due to sampling and analysis of different cores. The post-A.D. 1963–64 period is also the time period when the St. Bernard locality most likely converted from intermediate to brackish marsh. Following completion of the Mississippi River–Gulf Outlet Canal, saltwater intrusion and erosion have degraded large expanses of fresh and intermediate marsh and converted fresh to intermediate and intermediate to brackish marsh (U.S. Army Corps of Engineers, 2004).

As discussed in the section "Palynomorph Age Indicators," the occurrence of *Sapium sebiferium* and *Alternanthera philoxeroides* in Zone C of Terrebonne brackish-marsh vibracore TB2c provides an age assignment of about A.D. 1900 to the 66.1–67.2 cm depth (fig. 48*A*, *C*; Appendix 5, table 5-1). If the 67.2-cm depth is used to calculate a SOC MAR for the TB2c vibracore from A.D. 1900 to 1996, the rate is 115 g m^{-2} yr^{-1}. This rate is lower than post-NWT period (A.D. 1963–64) bomb-spike ^{137}Cs SOC MAR estimate of 265g m^{-2} yr^{-1}. It is also lower than the bomb-spike $\Delta^{14}C$ estimate of 216 g m^{-2} yr^{-1} for push-core TB2a. The 115 g m^{-2} yr^{-1} rate is also lower that the bomb-spike $\Delta^{14}C$ SOC MAR estimate of 163 g m^{-2} yr^{-1} for vibracore TB2c. It is higher than the most-recent cosmogenic ^{14}C SOC MAR estimate of 15 g m–2 yr –1 for vibracore TB2c (for the 361 years precedent to sample year; table 15). The Terrebonne core data are consistent with the general trend toward lower sequestration rates for longer time scales also noted by Neubauer and others (2002) and Hussein and others (2004).

Uncertainties in Age Assignments

Although ages are assigned to specific depths, mass-based estimates of accumulation with time require both accurate depth-age assignments and bulk-density measurements. The accurate assignment of ages to specific depths in core samples can be offset by errors introduced in the field and laboratory. Field errors associated with sample collection include incorrect adjustments for core compaction, physical loss of material, interpretations based on the collection and comparison of physically different cores, and variability related to choice of core-collection technique. Laboratory errors can be many, but commonly include inaccurate subsampling (depth measurements) and weighing of subsamples. Both of these errors directly affect bulk-density measurements (briefly discussed in section "Bulk-Density Measurements"). Instrument detection limits also can be an issue, particularly when using very small samples or when the element concentration (for example, OC concentration) is very low. Each error contributes to the total overall error for any sample. Errors are also associated with any age estimate. For example, in the case of samples taken for ^{14}C analysis, sample composition is commonly of both *old* and post-NWT period (A.D. 1963–64) carbon (discussed in section "Carbon-14 Measurements"). Exotic pollen may be misidentified or may be associated with allochthonous sediment, resulting in an inaccurate age assignment.

When a composite temporal record is constructed from several techniques such as those just discussed (bomb-spike ^{137}Cs, bomb-spike $\Delta^{14}C$, cosmogenic ^{14}C, and palynomorphs), the errors are compounded and, when different cores are used, spatial variability in soil properties also becomes a factor. To illustrate the uncertainty problem, Pb profiles for St. Landry backswamp push-core SL1b (Appendix 4, table 4-3, fig. 62*A*) and St. Mary fresh-marsh push-core SM1a (Appendix 4, table 4-3, fig. 63) were annotated with pollen, bomb-spike ^{137}Cs, bomb-spike $\Delta^{14}C$, cosmogenic ^{14}C, and ^{210}Pb (St. Landry only) age markers (table 15) and an atmospheric-lead source function (Eisenreich and others, 1986; Graney and others, 1995; Robbins and others, 2000). In both sets of cores, the deposition of soil/sediment and OC was close to linear with depth, so it was reasonable to fit the lead source-function curve to the Pb profile using two reference depths. Because the ^{137}Cs peaks for SL1b (fig. 29) and SM1b (fig. 19) are sharp and well-defined, the ground surface (sample year 1996, for both sites) and the A.D. 1963–64 datum were chosen for scaling. There was no corroborative evidence based on palynomorph or other stratigraphic markers for the St. Landry cores; however, a no-older-than pollen indicator genera was present in a core from St. Mary fresh-marsh locality.

The elemental Pb profile for push-core SL1b (fig. 62) has a major peak at 5.5 cm. The Pb gradually decreases from this depth to about 30 cm, and then remains relatively constant to the bottom of the core. This profile closely matches the Pb-source-function profile which largely reflects changes in the use of leaded gasoline with peak use and maximum atmospheric concentrations occurring in the early 1970s. Both peaks are more recent than the A.D. 1963–64 ^{137}Cs datum.

Because ^{210}Pb analytical data are also available for push-core SL1b, an additional set of ages were calculated for the upper 70 cm. Unsupported ^{210}Pb activity decreased in the SL1b profile from 10.39 d m^{-1} g^{-1} at the surface to 2.35 d m^{-1} g^{-1} at 16.4 cm, below which depth we can assume an equilibrium activity of <4 d m^{-1} g^{-1} (fig. 62*B*). Lead-210 data for the surface 16 cm were used to estimate a linear sedimentation rate of 0.35 cm yr^{-1}, according to methods described in Robbins and others (2000) and Patterson and others (2003).

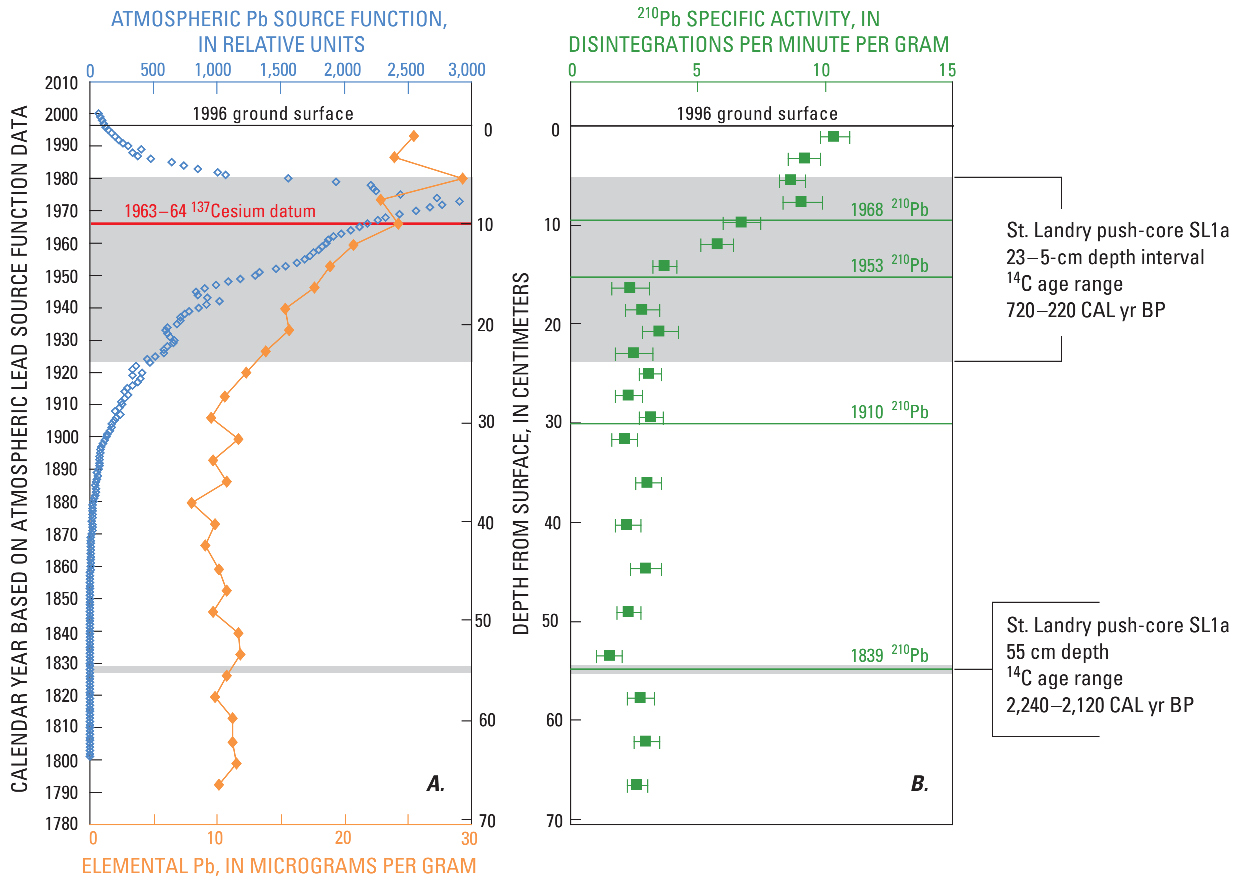


Figure 62. Temporal indicators for St. Landry backswamp push-cores SL1a and SL1b: (*A*) elemental lead (Pb) concentration (SL1b), Pb source function data for the United States (Eisenreich and others, 1986; Graney and others, 1995; Robbins and others, 2000), 1963–64 cesium-137 (^{137}Cs) datum (SL1b) (see fig. 29) and carbon-14 (^{14}C) data (SL1a, gray bars); and (*B*) lead-210 (^{210}Pb) data (SL1b). For elemental Pb data, see Appendix 4, table 4-3; for ^{137}Cs and ^{210}Pb data, see Appendix 3, table 3-1; for ^{14}C data, see Appendix 3, table 3-2. [CAL yr BP, calibrated years before present; cm, centimeter]

The sedimentation rate of 0.35 cm yr^{-1} corroborates the 0.30 cm yr^{-1} sedimentation-rate estimate based on the ^{137}Cs peak depth (table 5). The one-sigma range for the sedimentation rate is 0.30 to 0.39 cm yr^{-1}. Ages (with one-sigma ranges) based on ^{210}Pb were calculated for four depths—9.8 cm (^{137}Cs peak depth), A.D. 1968 (from A.D. 1963 to 1971); 15.0 cm, A.D. 1953 (from A.D. 1946 to 1958); 30.0 cm, A.D. 1910 (from A.D. 1896 to 1919); and 55.0 cm, A.D. 1839 (from A.D. 1813 to 1855). Although age estimates probably should not be extended below 30 cm (that portion of the core deposited from more than 100 to 200 years ago), all values agree well with the lead source-function chronology. However, when the calibrated ^{14}C ages determined for St. Landry push-core SL1a are applied to SL1b, the core material appears to be much older. The 5-to-23 cm interval of SL1a has ^{14}C ages ranging from 220 to 720 CAL yr BP (Appendix 3, table 3-2) whereas the calendar-year age range for this interval, based on the lead-source-function data, is from about A.D. 1925 to 1980. The 55 cm depth for SL1a has a ^{14}C age of 2,240 CAL yr BP—for SL1b, the lead-source-function calendar-year age for this depth is in the late 1820s and the ^{210}Pb age is A.D. 1839. The most probable explanation for the disagreement in age assignments is the presence of *old* carbon bound to allochthonous clay (see discussion for Bayou Sauvage distributary push-core BSDc in section "Carbon-14 Measurements"). For the 5-to-23 cm interval of push-core SL1b, the ^{14}C ages are not in chronostratigraphic order—a result typical of backswamp environments where allochthonous sediment input, remixing of sediments, and erosional transport and redistribution of sediments all contribute to "composite" ^{14}C ages that are chronostratigraphically inaccurate. Although the ^{14}C ages are for a different core (SL1a) than the ^{210}Pb ages (SL1b), the age differences are too large for the registration between SL1a and SL1b to be a plausible explanation.

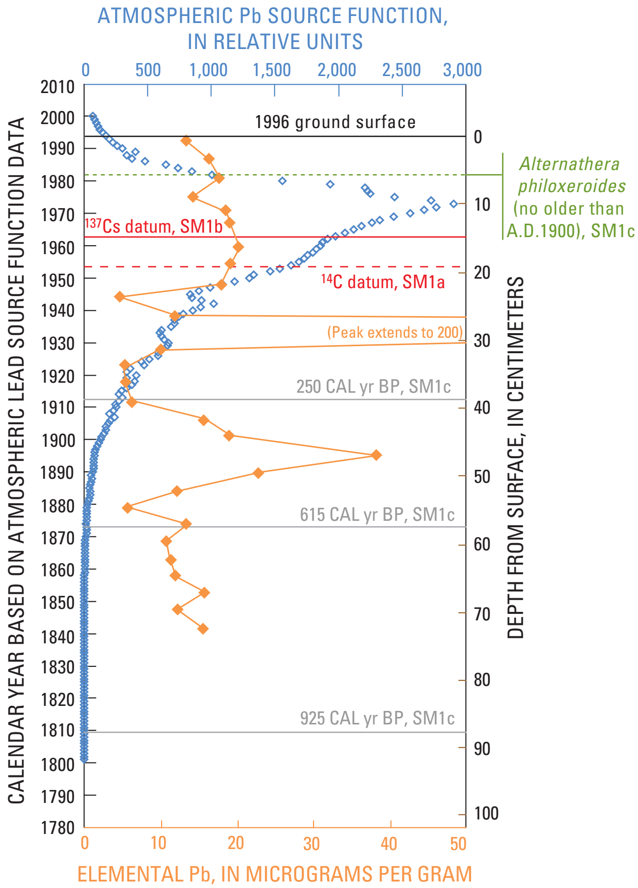


Figure 63. Elemental lead (Pb) concentration for St. Mary fresh-marsh push-core SM1a versus Pb source-function data for the United States (see Eisenreich and others, 1986; Graney and others, 1995; Robbins and others, 2000) and other age-indicator data for adjacent cores. For elemental Pb data, see Appendix 4, table 4-3; for cesium-137 (^{137}Cs) data (SM1b, see figures 19 and 32 and Appendix 3, table 3-1; for pollen data (SM1c), see figure 42*C* and Appendix 5, table 5-2; for isotopic carbon-14 (^{14}C) data (SM1c), see Appendix 3, table 3-2). [A.D., *anno Domini*]

The elemental Pb profile for St. Mary fresh-marsh push-core SM1a (fig. 63) differs markedly from the St. Landry backswamp Pb profile. Although each core is located away from large urban areas, St. Mary push-core SM1a shows major variations in Pb concentration with multiple peaks and spikes. Even at the maximum value of 200 µg g^{-1}, the Pb values do not indicate any significant accumulation. However, the additional peaks in the lower portion of the core may allow for establishing a time datum lower in the profile than the A.D. 1963–64 isotopic datum based on ^{137}Cs or Δ^{14}C. The smeared Pb peak between 15 and 20 cm depth is from about 10 to 15 years earlier than would be expected (about A.D. 1960 versus the early 1970s) if the upper Pb profile primarily mirrored consumptive gasoline use. The lead-source function was fit to the SM1a Pb profile using the surface and the ^{137}Cs peak depth in SM1b for scaling. However, the Δ^{14}C bomb-spike peak for SM1a is 3.2 cm deeper in the profile (fig. 63) and, if the Δ^{14}C datum had been used to scale the lead-source-function curve, the fit would have been closer.

Allowing for considerable error in estimating deposition rates for push-core SM1a, the lead-concentration spike to 200 µg g^{-1} at 29.2 cm and the corresponding Sn spike to 160 µg g^{-1} at this depth (Appendix 4, table 4-3) could have resulted from any one or more of the major businesses in the region of St. Mary Parish (Bayou Teche, Atchafalaya Bay, and cities in Iberia and St. Martin Parishes) that were operating in the late 1920s through the early 1940s. These include, but are not restricted to, fabrication of petroleum-processing equipment and oil derricks/platforms, as well as ship-building and carbon-black production. The Pb peak of about 40 µg g^{-1} at 47 cm (Appendix 4, table 4-3) does not have a corresponding peak in Sn and is probably due to fuel burning associated with steamboat and rail transportation. At that time, the economy in the middle Louisiana Gulf-Coast region heavily depended on transportation to New Orleans along Bayou Teche, and many connecting waterways and lakes, to the Mississippi River. These scenarios corroborate the chronology based on the Pb source function. However, as with the St. Landry cores, when ^{14}C ages determined for St. Mary vibracore SM1c are superimposed on the SM1a Pb profile, there is a century-scale disjoint. The 57.2 cm depth in SM1c has a ^{14}C age of 615 CAL yr BP (compared to about A.D. 1875 based on lead-source-function data) and the 88.3 cm depth has a ^{14}C age of 925 CAL yr BP (Appendix 3, table 3-2; compared to about A.D. 1810 based on lead-source-function data). Reasons for the age discrepancies in the St. Mary cores are less evident than for St. Landry. Although marshes are less likely to receive allochthonous fluvial input than are backswamps and distributaries, a potential source of *old* carbon is the periodic flooding of coastal marshes by severe storms and hurricanes (Reed, 1989; Cahoon and Reed, 1995; Cahoon and others, 1995). These events could introduce substantial amounts of clay-bound *old* carbon.

The multiple-lines-of-evidence data presented for the St. Landry and St. Mary cores illustrate some of the problems encountered when attempts are made at constructing a composite chronology based on soil/sediment cores. All of the sources of error listed at the beginning of this section (field and laboratory errors, comparison of different cores, different core-collection techniques, bulk-density measurement errors, and different age-dating techniques) provide plausible explanations for the apparent and(or) real discrepancies in age assignments.

An additional source of error produced by merging calendar-year age assignments based on isotopic markers with calibrated ^{14}C ages is the potential temporal offset introduced by calibration. In table 15, composite chronologies for long-term deposition of OC were estimated from the calibrated ^{14}C ages for selected marsh vibracores. MARs for the most recent interval in each core were based on a recent calibrated ^{14}C age and the year of core collection and therefore bracketed the zero year for cosmogenic ^{14}C (A.D. 1950). Because the post-modern interval of each core is dated in uncalibrated calendar years, the correct procedure for calculation of MARs that bracket A.D. 1950 would be to separately calculate pre- and post-A.D. 1950 rates. However, this was not possible because a calibrated A.D. 1950 datum could not be established. The error introduced by spanning A.D. 1950 would increase with the nonlinearity of soil/sediment deposition—the greater the difference between pre- and post-A.D. 1950 rates, the greater the potential error.

Recent Trends in Soil/Sediment Organic Carbon Loss—Effects of Land Loss

Land-Loss Estimates

During the past 25 years, many investigations (Hatton and others, 1983; Britsch and Kemp, 1990, 1991; Nyman and others, 1990, 1993; Nyman and DeLaune, 1991; DeLaune and others, 1992; Britsch and Dunbar, 1993, 1996; U.S. Geological Survey, n.d.) have shown that much of the United States' coastal-marsh loss is occurring in Louisiana. As mentioned in the section "Climate, Physiography, Geology, and Vegetation," canal, ditch, levee, and diversion-structure construction, and reduced sediment input has resulted in an acceleration of the natural effects of subsidence and erosion in coastal Louisiana (Coleman, 1988, Cahoon and Turner, 1989). The result has been a net loss of land. The loss has been primarily in the marsh wetlands (Bourne, 2000). Britsch and Dunbar (1993) estimated a rate of about 65 km^2 yr^{-1} for coastal Louisiana.

The Louisiana Coastal Area (LCA) Ecosystem Restoration Study (U.S. Army Corps of Engineers, 2004) was started in response to the large-scale loss of coastal wetlands in Louisiana (U.S. Army Corps of Engineers, 1984; Reed and Foote, 1997). A systematic and coordinated approach such as the LCA study was recommended because of the magnitude of the problem (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1999). As part of the LCA study, Barras and others (2004) did a GIS analysis of satellite imagery data for coastal Louisiana collected during 1978, 1990, and 1999–2002. They used these "snapshots" to estimate coastal land loss from 1978 to 1990 and from 1990 to 2000. They also modeled projected land loss from 2000 through 2050.

As a result of their analysis, Barras and others (revised 2004) estimated that 1,343 km^2 of land were lost from the MRDP (LCA subprovinces 1–3)[9] during the period 1978–2000. Of the 1,343 km^2, 865 km^2 were lost during the period 1978–1990; 478 km^2 were lost during the period 1990–2000. The cumulative loss was 10.5 percent of the 1978 land area (table 16). The LCA study found that by subprovince, the greatest percentage of land lost during the period 1978–2000 was 16 percent from subprovince 2 (table 16). Subprovince 2 includes Barataria Basin. In an earlier land-loss study (Barras and others, 1994), Barataria Basin was found to have had, for that period (1978–1990), the greatest annual loss rate (28.8 km^2 yr^{-1}) of all the Louisiana coastal basins. The annual land-loss rate for Terrebonne Basin at 26.4 km^2 yr^{-1} was close to that of Barataria Basin. Together, these two basins accounted for 61 percent of land lost from the LCA study area during the period 1978–1990 (Barras and others, 1994).

[9] When using the LCA land-loss estimates, it is important to note that the LCA boundaries for subprovinces 1–3, which include most of the MRDP, are consistent with the delta-lobe model of Frazier (1967) but differ from the MRDP boundaries as delineated in the 1984 Geologic Map of the State of Louisiana (digital version, U.S. Geological Survey, 2004) and used in this report. The difference is important because the total year-2000 land area for LCA subprovinces 1–3, and used in Barras and others (revised 2004), is 11,447 km^2 (table 16). The MRDP as delineated in the 1984 Geologic Map of the State of Louisiana has an area of 10,800 km^2.

Estimates of Soil/Sediment Organic Carbon Loss and Potential Gain

Aside from the ecological benefits of coastal marsh restoration (Britsch and Dunbar, 1990; Reed and Foote, 1997), accreted marsh has been shown to be a potential terrestrial-carbon sink (Hussein and Rabenhorst, 2002; Hussein and others, 2004) and has been proposed as a carbon-sequestration strategy for mitigation of recent increases in atmospheric CO_2 (Raynaud and others, 1993; Sundquist, 1993; Falkowski and others, 2000). When used as a framework, Barras and others (revised 2004) provides a basis for looking at recent trends in the loss of SOC and for predicting future gains that could result from marsh restoration. Recent soil/sediment carbon loss in coastal Louisiana related to land loss was estimated from the inventory derived from SSURGO-linked pedon data (table 16). The numbers presented in the following discussion are for the surface meter of soil/sediment. Because the peat deposits in many areas are meters thick, it is probable that the land-loss estimates presented in Barras and others (2004) include areas where much more than the surface meter of material was eroded. Therefore, the SOC-loss estimates should be conservatively viewed as a lower bound on soil/sediment carbon depletion resulting from coastal erosion.

As discussed at the beginning of the section "Estimation of Soil/Sediment Organic Carbon Inventory," pedon data were linked to SSURGO map units to calculate the SOC content of marsh and nonmarsh areas along the Louisiana coast (tables 13 and 14). This inventory was then applied to the areas delineated in the LCA subprovinces (table 16) and a baseline year of 2000 was assigned to the inventory. A mean SOC storage was calculated for each subprovince as the ratio of inventory to land area. The mean SOC storage was then multiplied by land-area loss to estimate SOC loss. In calculating the LCA inventory, assumptions were made as to (1) how well the sampled areas in each subprovince represented the subprovince as a whole and (2) the appropriateness of the assigned reference year for estimates of SOC loss and projected gain.

Because SSURGO data were not available for all of the LCA study area, an adjustment was made to estimate the inventory for the unsampled areas—38 percent for subprovince 1, 12 percent for subprovince 2, and 79 percent for subprovince 4. For this exercise, the unsampled areas in subprovinces 1, 2, and 4 were assumed to be similar in environment (carbon content, chemistry, vegetation, and other characteristics) to the sampled areas. Therefore, total inventories were calculated by adjusting the partial inventories in proportion to the unsampled areas. Subprovince 3 had no unsampled area, so no adjustment was made.

Table 16. Estimated land loss (from 1978 to 2000), projected land loss (from 2000 to 2050), and land-associated soil/sediment organic-carbon loss for the Louisiana Coastal Area.

[LCA, Louisiana Coastal Area, as defined in Barras and others (2004) and U.S. Army Corps of Engineers (2004); SOC, soil/sediment organic carbon; km^2, square kilometer; Tg, teragram (1 Tg = 10^{12} grams); MRDP, Mississippi River deltaic plain; SSURGO, soil survey geographic]

LCA subprovince[1]	Net land loss and SOC loss[3]			Land area and SOC inventory[2] during 2000	Percent loss			2050 projections[3]		
	1978 to 1990	1990 to 2000	1978 to 2000		1978 to 1990	1990 to 2000	1978 to 2000	Land area and SOC inventory	Net loss, 2000 to 2050	Percent loss, 2000 to 2050
Land area (km^2)										
1	135	124	259	3,447	3.6	3.5	7.0	3,289	158	4.6
2	383	168	551	2,885	11.1	5.5	16.0	2,403	482	16.7
3	347	186	533	5,115	6.1	3.5	9.4	4,522	593	11.6
MRDP subtotal	**865**	**478**	**1,343**	**11,447**	**6.8**	**4.0**	**10.5**	**10,214**	**1,233**	**10.8**
4	220	140	360	3,706	5.4	3.6	8.9	3,610	96	2.6
Total	**1,085**	**618**	**1,703**	**15,153**	**6.4**	**3.9**	**10.1**	**13,824**	**1,329**	**8.8**
SOC inventory (Tg)										
1	8.2	7.5	15.7	209	3.6	3.5	7.0	199	9.6	4.6
2	20.7	9.1	29.8	156	11.1	5.5	16.0	130	26.1	16.7
3	18.9	10.1	29.0	278	6.1	3.5	9.4	246	32.2	11.6
MRDP subtotal	**47.8**	**26.7**	**74.5**	**643**	**6.7**	**4.0**	**10.4**	**575**	**67.9**	**10.6**
4	12.8	8.1	20.9	215	5.4	3.6	8.9	209	5.6	2.6
Total	**60.5**	**34.8**	**95.4**	**858**	**6.3**	**3.9**	**10.0**	**785**	**73.4**	**8.6**

[1] Subprovinces 1–3, going from east to west, are in the MRDP. Subprovince 4 is in the Chenier Plain to the west of the MRDP.

[2] SOC inventory for 2000 is based on an intersection of SSURGO-linked pedon data with the LCA subprovince boundaries. For subprovinces 1, 2, and 4, the calculated inventories did not apply to the entire subprovince areas so the partial inventories were adjusted in proportion. Subprovince 3 was completely represented so no adjustment was made to the calculated inventory.

[3] Land-loss data from Barras and others (2004). Historical net SOC-inventory-loss estimates and projected loss estimates through 2050 are referenced to the 2000 SOC inventory values. Inventory-loss estimates were derived from subprovince land areas and SOC inventories for 2000 by applying a mean SOC storage for that year to the land-loss estimates. Mean SOC storage for 2000 was calculated as the ratio of SOC inventory to land area.

The assignment of an appropriate reference year to the SSURGO-based SOC subprovince inventories is problematic. The publication dates for online SSURGO soil surveys range from 1989 for Jefferson Davis Parish to 2004 for Vermilion Parish, and the original certification dates (see metadata for SSURGO databases; for example, Terrebonne Parish, accessed November 16, 2005, at *http://soildatamart.nrcs.usda.gov/Metadata.aspx?Survey=LA109&UseState=LA*) range from 1973 for Iberia Parish to 1999 for St. Mary Parish. Since land has been lost during this period, assigning the year 2000 to the SOC inventory adds a potential positive bias to the estimates of SOC loss that could range from 0 to >10 percent (cumulative percent land loss from 1978 to 2000 ranges from 7 percent for LCA subprovince 1 to 16 percent for subprovince 2, table 16).

Using the 2000 reference year, the MRDP portion (subprovinces 1–3) of the LCA study area had an estimated SOC inventory of 643 Tg during 2000 (table 16), about 89.6 percent of the 1978 inventory of 717.5 Tg. The SOC loss during this 22-yr interval was 74.5 Tg (annual loss rate, 0.50 percent). The land-loss rate decreased in this 22-yr period—from 6.7 percent (in the period from 1978 to 1990) to 4 percent (in the period from 1990 to 2000). Even though there was a decrease in the SOC-loss rate, a conservative projection is for an additional 68 Tg of SOC to be lost through coastal erosion in the next 50 years (table 16, fig. 64). The projected SOC-loss rate is about 0.20 percent per year.

When the SOC-loss rate is converted to SOC MAR units the SOC-loss rate for the MRDP portion (subprovinces 1–3) of the LCA study area from 1978 to 2000 is 2,540 g m^{-2} yr^{-1}. The projected SOC-loss rate for the same area for the period from 2000 to 2050 is 1,101 g m^{-2} yr^{-1}.

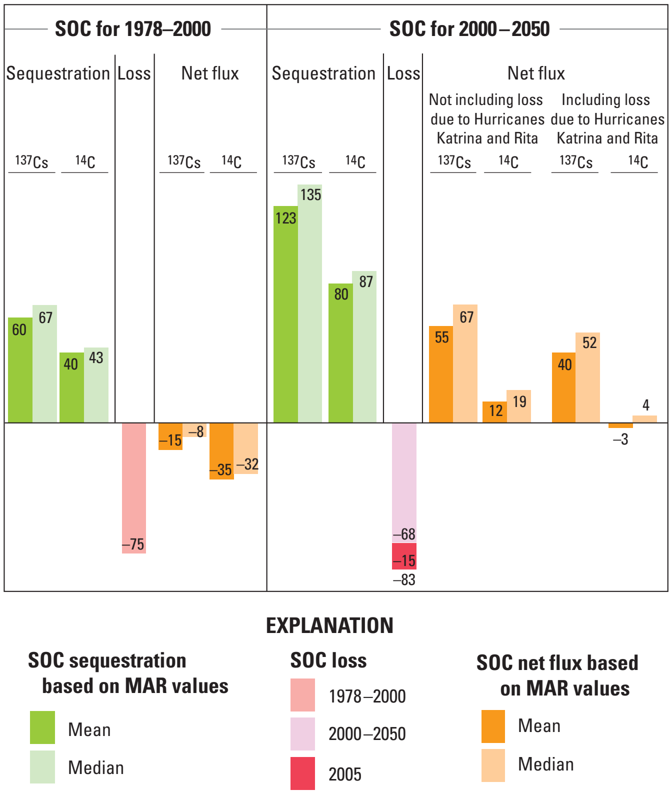


Figure 64. Historical and predicted soil/sediment organic carbon (SOC) sequestration, loss due to land loss, and net flux for the Mississippi River deltaic plain (MRDP) portion of the Louisiana Coastal Area. SOC sequestration was estimated using SOC mass-accumulation rates (MARs). SOC loss was estimated by applying SOC storage values to the surface meter of land lost from the MRDP by erosion for1978–2000 and to the MRDP predicted land loss for 2000–2050 (Barras and others, 2004). The SOC loss due to Hurricanes Katrina and Rita (15 teragrams) is based on the estimated loss of 259 km^2 (100 mi^2) of coastal marsh resulting from these August and September 2005 cyclonic storms (U.S. Geological Survey, 2005). [^{137}Cs, cesium-137; ^{14}C, carbon-14; km^2, square kilometer; mi^2, square mile]

Soil/Sediment Organic Carbon Source or Sink

The SOC MAR-equivalent loss rates can be compared to SOC sequestration rates for the MRDP (LCA subprovinces 1–3) based on data for MRDP cores collected as part of this study. This comparison will provide a mass-balance estimate of net carbon flux during the period 1978–2050. The mass-balance for the MRDP can indicate whether or not the region is functioning as an SOC source or sink. Figure 64 graphically shows the results of the mass-balance approach using SOC MARs based on ^{137}Cs and ^{14}C age markers applied to SOC loss rates.

Using Cesium-137 Data

Based on bomb-spike ^{137}Cs, the post-NWT period (A.D. 1963–64) SOC-sequestration rates for MRDP marsh cores range from 131 g m^{-2} yr^{-1} (Fish and Wildlife brackish-marsh push-core FW) to 342 g m^{-2} yr^{-1} (Bayou Perot intermediate-marsh push-core BPPb) (table 15). Intermediate values were calculated for Bayou Verret fresh-marsh push-core BV (188 g m^{-2} yr^{-1}), Terrebonne brackish-marsh push-core TB2a (265 g m^{-2} yr^{-1}), and Lake Salvador fresh-marsh push-core LSPb (272 g m^{-2} yr^{-1}) (table 15). The mean sequestration rate for these cores, 240 g m^{-2} yr^{-1}, is an order of magnitude less than the 1978-to-2000 SOC-loss rate (2,540 g m^{-2} yr^{-1}) for the MRDP and half an order of magnitude less than the projected SOC-loss rate for the MRDP for the period from 2000 to 2050 (1,101 g m^{-2} yr^{-1}).

Assuming that the characteristic SOC sequestration rate for the MRDP varies between the mean (240 g m^{-2} yr^{-1}) and median (265 g m^{-2} yr^{-1}) rates calculated for the MRDP cores, then the net SOC loss from 1978 to 2000 would range from 8 to 15 Tg (fig. 64). In other words, SOC production on the remaining 11,447 km^2 of marsh (2000 land area, table 16) sequestered an estimated 60 to 67 Tg of SOC from 1978 to 2000 (fig. 64)—an annual gain from about 0.40 to 0.45 percent. Therefore, the SOC loss by coastal erosion was 80-to-90 percent offset by SOC gain.

If this logic is applied to the projected loss from 2000 to 2050, there would be a net gain in SOC during this time period of 55 to 67 Tg (fig. 64). The projected loss of 68 Tg during the 50 years would be offset by 123 to 135 Tg of SOC sequestered on the 10,214 km^2 of MRDP remaining in 2050 (table 16). This net SOC gain translates to a 0.38 to 0.42 percent gain per year. When compared to the historical period (from 1978 to 2000), the reduction in the annual SOC erosion-loss rate from 0.50 percent to 0.20 percent converts the MRDP from a SOC source to a SOC sink.

Using Carbon-14 Data

Applying the same logic but using the bomb-spike Δ^{14}C peak depths instead of the ^{137}Cs peak depths, the projected SOC sequestration values for the MRDP (LCA subprovinces 1–3) are less. Using the bomb-spike Δ^{14}C peak depths, the mean SOC MAR for six MRDP marsh cores (table 15) is 157 g m^{-2} yr^{-1}. The median is 170 g m^{-2} yr^{-1}. The net historical SOC loss, using these values, ranged from 32 to 35 Tg from 1978 to 2000 (fig. 64). The SOC loss of 75 Tg by erosion (table 16) would have been offset by a gain of 40 to 43 Tg (from 0.26 to 0.28 percent per year).

The projected net SOC gain from 2000 to 2050, based on Δ^{14}C peak depths, would be from 12 to 19 Tg (fig. 64). The loss of 68 Tg by erosion would be offset by an annual gain of 0.25–0.27 percent resulting in a cumulative gain of 80–87 Tg. In general, the bomb-spike Δ^{14}C peak depths are less than the peak depths based on bomb-spike ^{137}Cs. As previously discussed in “Uncertainties in Age Assignments,” method-based differences in depths-to-peak-fallout activity could be due to variability in replicate sampling, different pathways and time scales inherent to incorporation of the ^{137}Cs and ^{14}C isotopes in soil/sediment, or some combination of the two. Even with the shallower depths-to-peak $\Delta^{14}C$ activity, the MRDP is still predicted to switch from being an SOC source to sink by 2050. With the calculated rates/mass of marsh SOC sequestration, the reduced rate of coastal erosion (Barras and others, 2004; table 16 in this report) is sufficient to produce the change.

With no change in coastal land management, the projected SOC erosion-loss rate of 0.20 percent per year, offset by a gain of 0.38–0.42 percent per year, suggests that the MRDP SOC pool will continue to increase. Potential mitigation by implementation of restoration programs such as those proposed in the Coast 2050 program (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1999) and the LCA Ecosystem Restoration Study (U.S. Army Corps of Engineers, 2004) should increase the SOC sequestration rate and strengthen the MRDP SOC sink.

Hurricanes Katrina and Rita—Effects on Soil/Sediment Organic Carbon Projections

The recent hurricanes Katrina and Rita (Graumann and others, 2005; National Oceanic and Atmospheric Administration, 2005), which devastated the Louisiana coast during late August and late September, 2005, transformed about 259 km^2 (100 mi^2) of marsh to open water (U.S. Geological Survey, 2005). To the extent that some or all of this land loss is permanent, this result equates to a SOC loss of about 15 Tg (fig. 64). This estimate is based on the 15,153 km^2 year-2000 land area for the LCA study area that includes LCA subprovince 4. Subprovince 4 is not considered part of the MRDP.

Using the year 2000 land area, the LCA study area had an estimated SOC inventory of 858 Tg (table 16). The estimated 15 Tg SOC loss attributable to Hurricanes Katrina and Rita (fig. 64) is 1.7 percent of the year-2000 LCA inventory and 2.3 percent of the year-2000 MRDP (LCA subprovinces 1–3) inventory. If this SOC loss is included in the projection for the year 2050, then the MRDP would either remain a source with a net SOC loss of 3 Tg or become a weak sink with a net SOC gain of 4 Tg (fig. 64). Again, these estimates are lower bounds for potential SOC flux because they are only for the surface meter of landmass.

Summary and Conclusions

Summary

The main focus of this study was to acquire adequate data to estimate SOC storage and inventory by environment for the MRDP's dominant environmental categories and to estimate SOC accumulation rates for specific MRDP environments. Additionally, in the section "Recent Trends in Soil/Sediment Organic Carbon Loss—Effects of Land Loss," SOC accumulation rates were used to assess the rate of SOC loss for coastal Louisiana since 1978 and to estimate future loss to 2050. Relevant published and unpublished data needed for estimating SOC storage were compiled and then evaluated for accuracy and comparability. Control values for OC concentration and bulk density were determined by comparative analyses of core samples using different field-collection and laboratory methods. Age data were acquired by analysis of core samples for isotopic ^{137}Cs, ^{14}C, and palynomorphs. A few cores were sampled for age estimation using ^{210}Pb. Soi/sediment organic carbon storage and inventory values were estimated using the methods in Buell and Markewich (2004). The range in values for SOC storage for each major MRDP environment and SOC inventory were calculated by linking core and (or) pedon data for each locality to map areas delineated on the marsh-vegetation map of southern Louisiana (Louisiana Department of Wildlife and Fisheries and U.S. Geological Survey, 1997), the 1984 Geologic Map of the State of Louisiana (digital version, U.S. Geological Survey, 2004), and (or) the SSURGO[10] data for parishes in southern Louisiana (U.S. Department of Agriculture, 1998–2005). Both sediment and SOC MARs were determined for specific environments and used to estimate net SOC gain or loss since 1978 and to predict net SOC gain or loss through 2050. Soil/sediment organic carbon loss due to the late-summer 2005 hurricanes (Katrina and Rita) also was estimated. Each aspect of the study—methods, data, and storage and inventory estimation—resulted in specific conclusions.

[10]SSURGO is the acronym for the Soil Survey Geographic Database developed and distributed by U.S. Department of Agriculture, Natural Resources Conservation Service. A SSURGO dataset includes digital map data, attribute data, and metadata.

Conclusions

Palynomorph and OC data indicate that despite significant changes in land use (i.e., levee building and channelization) and extreme natural events (that is, floods and hurricanes), SOC accumulation has been nearly constant for at least the last several thousand years in all the dominant environments of the MRDP. This constancy in SOC accumulation and the order-of-magnitude differences between the ratio of SOC inventories and land areas of the MRDP and the MRB (1.3, SOC inventory; 0.3, land area) emphasize the importance of the MRDP to the overall MRB SOC inventory. The fact that 1.3 percent of the MRB SOC inventory lies in MRDP coastal wetlands spotlights the importance of coastal wetlands in SOC sequestration.

With these values as a background, major conclusions of this study include (1) SOC storage and inventory estimates for the MRDP and the MRDP's dominant environments, (2) estimates of SOC accumulation rates for those same environments, and (3) estimates of SOC loss from the MRDP since 1978 and predicted SOC gain/loss estimates through 2050. These estimates are summarized in this section, but many other observations and conclusions are presented in hopes that they will be of interest to those involved in coastal restoration and land-use planning and in further investigation of SOC accumulation in coastal environments.

- The total SOC inventory (surface meter) for the MRDP as delineated on the 1984 Geologic Map of the State of Louisiana (10,800 km^2; digital version, U.S. Geological Survey, 2004) is 694 Tg, slightly more than 2 percent of the MRB SOC inventory (30,289 Tg; Buell and Markewich, 2004).
- The total SOC inventory (surface meter) for the SSURGO-mapped portion of the coastal-marsh vegetative-type map (13,236 km^2) is 677 Tg slightly greater than 2 percent of the SOC inventory for the MRB.
- The estimated SOC inventory for the land portion of the MRDP included in the coastal-marsh vegetative-type map is 397 Tg, which is about 1.3 percent of the total MRB SOC inventory.
- The Louisiana coastal marshes, including salt-marsh, generally have SOC storage values greater than 16 kg m^{-2}, whereas the levees, backswamps, and distributaries typically have values less than 16 kg m^{-2} (fig. 59).
- Century-to millennial-scale SOC MARs (from 9 to 48 g m^{-2} yr^{-1}) were generally lower than decadal scale rates (from 59 to 342 g m^{-2} yr^{-1}) (table 15).
- A total of 1,101 g m^{-2} yr^{-1} SOC (gross) is projected to be lost from coastal Louisiana (LCA subprovinces 1–4) through coastal erosion from 2000 to 2050. The projected SOC-loss rate is about 0.20 percent (gross) per year.
- Even with large-scale coastal land loss in Louisiana during the last few decades, the marshes are a functioning as a SOC sink. With coastal-marsh restoration efforts the sink potential will increase.

Other conclusions related to SOC storage and inventory estimations include:

- When the decadal-scale range for just the marsh environments is used, SOC MARs for MRDP localities (from 62 to 342 g m^{-2} yr^{-1}) are comparable to values ranging from 200 to 300 g m^{-2} yr^{-1} reported by other investigators for coastal Louisiana and Virginia.
- Uncertainties in ages assigned to core-depth intervals are compounded when multiple age-dating techniques are used for different depths of the same core or for different cores taken from the same locality. The temporal errors introduced make it difficult to reconstruct accurate sediment/SOC-deposition chronologies and accurately estimate SOC MAR values for certain environments.
- One explanation for the order-of-magnitude difference between century and millennial scale SOC MAR values is the loss of OC through oxidation, decomposition, and erosion.
- Century-to-millennial scale variability in long-term SOC MARs may indicate important geologic changes or changes in land use.
- Based on the ^{137}Cs results, SOC MAR data for all MRDP cores except push-core TN1b (table 15), show no apparent recent (post-NWT period, A.D. 1963–64) trend or environmental gradient.
- The cores collected from fresh-to-brackish marsh and swamp environments had the highest SOC storage values. Storage values for these cores decreased as the salinity of the environment increased (swamp to fresh marsh to brackish marsh). This is opposite the systematic increase in SOC storage with salinity that is evident when SOC storage is mapped by linking pedon data to SSURGO map units. One possible explanation for the opposing trends is the large spatial variability in SOC distribution both within and between soil series. Differences in areal extent of specific marsh environments also would contribute to SOC storage variability.
- Bayou Sauvage distributary SOC-storage data suggest that in terms of SOC accumulation abandoned distributaries are comparable to swamp environments.

Specific conclusions related to field and laboratory methods used for this study include:

- Short push-cores (≤ 1.5 m in length) were half-rounds of irrigation pipe with an angled, sharpened leading edge that were pushed into soil/sediment (short push-core method). This method resulted in the least compaction when compared to other coring methods. A sharpened sheet of aluminum pushed along the open face of the pipe improved core recovery. Digging out the pipe by hand also improved core recovery.
- Comparative studies are needed to determine which field and laboratory methods result in the most accurate and reproducible bulk-density values for each marsh environment (fresh, intermediate, brackish, salt).
- Values derived from sample-collection and/or laboratory analysis can easily be in error by a factor of two or more and occasionally by an order of magnitude.
- For the sampled MRDP environments, methods used to determine OC concentration—mass spectrometry, coulometry, and loss on ignition (LOI)—are comparable.
- For some cores, vertically adjacent marsh-core samples show a "step" increase in bulk density even though the bulk-density values are still very low (for example, from 0.06 g cm^{-3} at 62.69 cm to 0.11 g cm^{-3} at 65.39 cm depths in Terrebonne brackish-marsh push-core TB2a; Appendix 2, table 2-1). Step increases in bulk density in organic soil/sediment cores are often associated with clay-bound *older* carbon intermixed with younger plant-material-bound bomb-spike carbon. Accurate ^{14}C age estimates for these cores may require low-temperature stepped combustion techniques such as those described by McGeehin and others (2004).

Conclusions related specifically to data are:

- Bulk-density data for cores taken by the "short push-core method" are more internally consistent than data for samples collected by other methods.
- Data suggest that measured bulk-density values < 0.06 g cm^{-3} probably have a standard error of ± 100 percent.
- There is no apparent relation between bulk density and OC concentration when OC concentration is > 30 weight percent. If OC concentration is < 30 weight percent there is an inverse relation between OC and bulk density.
- By environment, ^{137}Cs profiles for marsh soil/sediment are the least ambiguous. Levee and distributary ^{137}Cs profiles show the effects of intermittent allochthonous input and/or sediment resuspension.
- For marsh environments, ^{137}Cs and ^{210}Pb data gave the most consistent and interpretable information for age estimations of soil/sediment deposited during the 1900s.
- Isotopic ^{137}Cs and ^{14}C data allowed the A.D 1963–64 NWT peak-activity datum to be placed within a few-centimeter depth interval in most MRDP cores.
- In cores where samples within a short depth interval (such as 2–3 cm) have markedly different ^{14}C ages, there was usually a "step" increase in bulk density. The *too old* ^{14}C age is the probable result of *old carbon* bound to clay minerals in the increased fine-grained sediment content. The high weight percentage of this older carbon apparently masks the much younger bomb carbon.
- With few exceptions, inorganic constituent data were not useful indicators of soil/sediment age.
- Elemental Pb coupled with Pb source-function data allowed age estimation for soil/sediment that accumulated during the late 1920s through the 1980s.
- Exotic pollen (for example, *Vigna unguiculata* and *Alternanthera philoxeroides*) and other microstratigraphic indicators (for example, carbon spherules) allowed age estimations for marsh soil/sediment deposited after the settlement of New Orleans, Louisiana, during 1717.

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Appendixes 1 through 6. USGS Soil/Sediment Organic Carbon Studies, Mississippi River Deltaic Plain, Southeastern Louisiana

The following appendixes include text and tables that provide some of the data and other support material referred to in the text. Additional explanations are provided by the “Glossary.”

Appendix 1. Site Data and Core Descriptions

By Helaine W. Markewich

General Comments

For this study, general and specific locations and environmental settings for each core site are shown in figures 1 and 5 in the text. Specific location information (geographic coordinates, vegetation, land-use history, and so on) for each core taken at a core site is given in table 1 of the text.

Marsh Environments

The marsh environment (fresh, intermediate, brackish, and salt) is the primary component (80 percent of the area) of the area referred to as the Mississippi River deltaic plain (MRDP). This estimate is based on an overlay of the digital geology of Louisiana (U.S. Geological Survey, 2004) with the "1997 Louisiana Coastal Marsh Vegetative Type Map" (Louisiana Department of Wildlife and Fisheries and U.S. Geological Survey, 1997). Most of the MRDP is in the area covered by this vegetation map.

This study did not include sampling salt marshes; however, cores were taken in all other marsh environments. Personnel and gear were transported to all marsh sample localities by boat. In every case, at least one human-made canal was used as a means of ingress and egress. This is typical for the region and demonstrates the pervasiveness of the human-made canal network (fig. 1-1) and the problems of saltwater encroachment and accelerated marsh erosion/deterioration that are now endemic to the MRDP. Because of the canal system, it can be argued that there is no part of the MRDP marsh that has not been affected by either (1) encroachment of more salt-rich water than was characteristic prior to canal construction or (2) sediment loss/redistribution due to erosion and along-canal transport. Despite these modern modifications to the MRDP marsh, for this study, every attempt was made to select sites that had little to no evidence of human-induced disturbance.

In general, the MRDP marsh surface at most is about 30.48 cm (1 ft) above the water surface. However, if a strong wind, especially from the north, blows for several days, the water surface lowers due to the water being blown southward out of the marsh. On these occasions, marsh surface elevation can be as much as 1 meter above the water surface.

The St. Mary fresh-marsh site is a good example of a sample locality where the water surface was very low on the day (March 21, 1996) that cores (SM1a, SM1b, and SM1c) were taken. This locality is very close to the Gulf of Mexico (figs. 1 and 5*D*, in text), yet the main water body is still fresh. The site itself is situated on the flank of a natural bayou. Normal site elevation is about 30.48 cm (1 ft) above the water surface; site elevation was 91.44 cm (3 ft) on the day sampled. The very low tide at the site made for deep grass mounds and very dry ground. Terrebonne brackish-marsh push-core TB1a was taken during similar weather conditions in February of the same year.

Short push-cores in the marsh generally remained in peat or muck. The longer vibracores commonly included interlayered peat and organic clay. Figure 1-2 shows a typical vibracore laid out in the sediment laboratory at the US Army Corps of Engineers New Orleans District headquarters.

Figure 1-1. Typical human-made canal, St. Bernard Parish, southeastern Louisiana. Photograph of Lake Leary, Louisiana, taken by Dr. Terry McTigue, National Oceanic and Atmospheric Administration, National Ocean Service, Office of Response and Restoraton, May 16, 1994; image ID: line 1223, America's Coastlines Collection, accessed November 14, 2005, at *http://www.photolib.noaa.gov/coastline/images/big/line1223.jpg*

Levee and Distributary Environments

About 2 percent of the MRDP surface area is mapped as levee; less than 1 percent is mapped as distributary. These estimates are based on an overlay of the digital geology of Louisiana (U.S. Geological Survey, 2004) with a digital version of the geomorphology and Quaternary geology of the lower Mississippi Valley (from Saucier, 1994a, b; Saucier and Snead, 1989; digital files provided by the U.S. Army Corps of Engineers, Vicksburg District, May 1998). A small portion of the MRDP is outside the Saucier map area.

The Bayou Sauvage levee and distributary sample localities (fig. 1-3, levee; fig. 1-4, distributary) are located within the 23,000 acre Bayou Sauvage National Wildlife Refuge (map of area not shown), an area adjacent to Lakes Pontchartrain and Borgne in Orleans Parish (figs. 1 and 5*G* in text). Sample analyses from the first cores taken at the Bayou Sauvage levee site (BSL1) indicated that the area was disturbed and did not have a natural sequence of sediments. After returning to the site and trenching several different areas, an undisturbed sample location was selected. The core site for push-cores BSL2a and BSL2b is northeast (toward the visitor's center) of the original levee site by about 200 yards. The new site is topographically higher than the original site, closer to the crest of the natural levee (see figures 1-3 and 1-4). The cores (BSL2a, BSL2b), taken at this second locality, do not contain the second (deeper) organic zone that seemed to be out of place in the BSLa core.

The Bayou Sauvage distributary core site, shown in figure 1-4, is an abandoned tributary adjacent to the Bayou Sauvage levee.

Backswamp Environment

In terms of percent area, backswamp also is a minor component (<5 percent) when compared to marsh coverage in the MRDP. Two localities were sampled as representative of the MRDP backswamp environment. Both localities, St. Martin and St. Landry, are in the Atchafalaya Basin Floodway (table 1 in text), an area that includes more than one-half million acres of contiguous bottomland. Here, the vegetation is predominantly hardwood, but cypress stands, marshes and bayous are common. The US Army Corps of Engineers is responsible for the Floodway System, which was designed to protect south Louisiana from Mississippi River floods. A welcome by-product is protection and restoration of large near-pristine tracts of land characteristic of the MRDP.

Figure 1-2. Both halves of Lake Salvador fresh marsh vibracore LSPe on the right, and the Bayou Sauvage distributary push-core BSDc on the left to the rear of the laboratory table. Core descriptions for each site are in table 1-1. A U.S. Geological Survey scientist, standing with his back to the camera, holding a Munsell color book in his right hand. Photograph taken on September 8, 1997.

Figure 1-3. A U.S. Army Corps of Engineers, New Orleans District, employee at the Bayou Sauvage levee core site. The Bayou Sauvage distributary site is just out of the picture to the right and shown in figure 1-4. Core descriptions for each site are in table 1-1. Photograph taken on September 11, 1997.

Figure 1-4. A U.S. Army Corps of Engineers, New Orleans District, employee with global positioning unit at the Bayou Sauvage distributary core site. The Bayou Sauvage levee site is just out of the picture to the right near the tree line (fig. 1-3). Core descriptions for each site are in table 1-1. Photograph taken on September 11, 1997.

The flood history of individual reaches of any river system can differ significantly. Isotopic ^{137}Cs data (Appendix 3, table 3-1; figs. 29 and 30) indicate very different sedimentary histories for the St. Martin and St. Landry backswamp localities (figs. 1, 5*H*, and 5*I*), although both localities are in the floodplain of the Atchafalaya River. Figure 1-5 is a photograph of push-core MR1d taken at the St. Martin locality. The sediment is typical for the coarser facies in MRDP backswamp environments. No description is available for the St. Landry cores.

Swamp Environment

The swamp environment is similar to the levee environment in that it makes up less than 3 percent of the MRDP. This study included only one swamp locality, located in the Joyce Wildlife Management Area, Tangipahoa Parish, south of Hammond, Louisiana. The management area is a tupelo-cypress dominated wetland in the Pontchartrain Basin. Access to the management area is limited, so for this study, specific cores were located near an elevated *swamp walk*. Specifically, this part of the management area is characterized by cypress regrowth with old cypress stumps everywhere at and just below the land surface. These stumps are remnants. Early in the 1900s, most of the cypress was logged for timber. No detailed core descriptions were made for cores from Tangipahoa Parish. Types of available data are listed in table 1-1.

Site and Core Descriptions

Site and core descriptions were made by several different USGS personnel both in the field and in the laboratory. The descriptions vary in style and completeness depending on the person who was taking notes at the field site or in the laboratory and the purpose for which the core was taken. Sample identification (ID) also varies depending on the reason the sample was taken. Some laboratories wanted the ID by uncorrected depth interval, others by sequence number. There was also no attempt made to identify the coarse fragments in any peat sample. Palynomorph data are included in Appendix 5, Palynomorph Data and Taxonomy.

Table 1-1 includes core-specific details and the type of analytical data that are available for the each core. Table 1-2 includes descriptions for at least one core from each field locality (exceptions are the Bayou Verret and Fish and Wildlife localities) and interval depths for some organic-carbon and/or bulk-density samples.

Figure 1-5. St. Martin backswamp push-core MR1d, St. Martin Parish, southeastern Louisiana (three overlapping photographs spliced together). Typical backswamp sediment in the region are dominantly very fine sand and silt with zones of higher organic carbon content that probably indicate the presence of buried soil A horizons. Delta ^{14}C data for a sample in the lower third of push-core MR1d indicate a MODERN (about 1950) age (58.76 cm; Appendix 3, table 3-2). This suggests a sedimentation rate of 1.32 centimeters per year (cm/yr), which is significantly less than the 1.94 cm/yr rate indicated by the 1963 depth-to peak ^{137}Cs activity in adjacent push-core MR1c (63.27 cm; table 3-1; fig. 28, in text). A discussion on the difficulties inherent in using organic carbon, that is associated with fluvially deposited mineral sediment, for age estimations is included in the "Carbon-14 Measurements" section of the text. Field-moist colors are included in the description for push-core MR1d in table 1-2. The small boreholes evident in the core are for 1-cm depth x 1-cm diameter samples taken for bulk-density analysis.

Table 1-1. Descriptive data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[ID, identifier; ft, feet; cm, centimeter; %, percent; in, inch; ^{137}Cs, cesium-137 activity; ^{40}K, potassium-40 activity; ^{14}C, carbon-14 activity; BD, bulk density; H_2O, water; TC, total carbon; ^{13}C, carbon-13; ^{15}N, nitrogen-15; IC, inorganic carbon; OCd, organic carbon by difference (TC minus IC); TN, total nitrogen; LOI, loss on ignition; MMT, major, minor, and trace inorganic elemental constituents; P, palynomorph; MSI, non-palynomorph microstratigraphic indicators; ^{210}Pb, lead-210 activity]

Core ID site name and date sampled	Core type/ field sampling method[1]	Drive length[2]		Core length[2]		Compaction[2]			Correction factor[2]	Cateogry of Analytical data
		ft	cm	ft	cm	ft	cm	%		
					Fresh marsh					
BV Bayou Verret February 1996	Test core for ^{137}Cs signal; pushed whole core	2.45	74.68	1.65	50.29	0.80	24.38	32.65	1.48	^{137}Cs, ^{40}K, ^{14}C, BD, H_2O, TC
LSPa Lake Salvador September 8, 1997	Pushed half core	1.70	51.82	1.60	48.77	0.10	3.05	5.88	1.06	BD
LSPb Lake Salvador September 8, 1997	Pushed half core	2.43	74.07	2.23	67.97	0.20	6.10	8.23	1.09	^{137}Cs, ^{40}K, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, LOI, pH
LSPc Lake Salvador September 8, 1997	Pushed half core	2.00	60.96	1.90	57.91	0.10	3.05	5.00	1.05	BD
LSPe Lake Salvador September 8, 1997	Whole vibracore	21.33	650.14	18.58	566.32	2.75	83.82	12.89	1.15	^{14}C, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, LOI, pH
LSPf Lake Salvador September 8, 1997	Whole vibracore	21.48	654.71	19.33	589.18	2.15	65.53	10.01	1.11	BD
LSHa Lake Salvador September 8, 1997	Hargis sampler[3]			1.31	40.00					BD
LSHb Lake Salvador September 8, 1997	Hargis sampler			1.44	44.00					BD
LSHc Lake Salvador September 8, 1997	Hargis sampler			1.64	50.00					BD
LSMa,b, and c cores Lake Salvador September 8, 1997	McCauley auger[4]; 3 cores; 5 drives per core: 1.64–3.28 ft (50–100 cm), 3.28–4.92 ft (100–150 cm), 4.92–6.56 ft (150–200 cm), 6.56–8.20 ft (200–250 cm), 8.20–9.84 ft (250–300 cm)									BD
SM1a St. Mary March 21, 1996	Pushed half core	2.50	76.20	2.50	76.20	0	0.	0	0	^{14}C, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, pH

Table 1-1. Descriptive data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ft, feet; cm, centimeter; %, percent; in, inch; ^{137}Cs, cesium-137 activity; ^{40}K, potassium-40 activity; ^{14}C, carbon-14 activity; BD, bulk density; H_2O, water; TC, total carbon; ^{13}C, carbon-13; ^{15}N, nitrogen-15; IC, inorganic carbon; OCd, organic carbon by difference (TC minus IC); TN, total nitrogen; LOI, loss on ignition; MMT, major, minor, and trace inorganic elemental constituents; P, palynomorph; MSI, non-palynomorph microstratigraphic indicators; ^{210}Pb, lead-210 activity]

Core ID site name and date sampled	Core type/ field sampling method[1]	Drive length[2]		Core length[2]		Compaction[2]			Correction factor[2]	Cateogry of Analytical data
		ft	cm	ft	cm	ft	cm	%		
Fresh marsh—Continued										
SM1b St. Mary March 21, 1996	Pushed half core	2.65	80.77	2.50	76.20	0.15	4.57	5.66	1.06	^{137}Cs, ^{40}K, BD, H_2O
SM1c St. Mary March 21, 1996	Whole vibracore	8.9	271.27	7.00	213.36	1.90	57.91	21.35	1.27	^{14}C, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, P
Intermediate marsh										
BPPa Bayou Perot September 9, 1997	Pushed half core	1.70	51.82	1.40	42.67	0.30	9.14	17.65	1.21	^{14}C, ^{13}C, BD
BPPb Bayou Perot September 9, 1997	Pushed half core; top few cm soupy (not sampled),	2.05	62.48	1.95	59.44	0.10	3.05	4.88	1.05	^{137}Cs, ^{40}K, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, LOI
BPPc Bayou Perot September 9, 1997	Pushed half core	1.85	56.39	1.60	48.77	0.25	7.62	13.51	1.16	BD
BPPf Bayou Perot September 9, 1997	Whole vibracore	19.55	595.88	16.55	504.44	3.00	91.44	15.35	1.18	BD
BPPg Bayou Perot September 9, 1997	Whole vibracore; lost half of surface sample	20.52	625.45	18.12	552.30	2.40	73.15	11.70	1.13	^{14}C, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, LOI
BPHa Bayou Perot September 9, 1997	Hargis sampler			1.12	34.00					BD
BPHb Bayou Perot September 9, 1997	Hargis sampler			1.44	44.00					BD
BPHc Bayou Perot September 9, 1997	Hargis sampler			1.51	46.00					BD
[4]BPMa,b,c Bayou Perot September 9, 1997	McCauley auger[4]; 3 cores; 5 drives per core: 1.64–3.28 ft (50–100 cm), 3.28–4.92 ft (100–150 cm), 4.92–6.56 ft (150–200 cm), 6.56–8.20 ft (200–250 cm), 8.20–9.84 ft (250–300 cm); no correction for compaction.									BD

Table 1-1. Descriptive data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ft, feet; cm, centimeter; %, percent; in, inch; ^{137}Cs, cesium-137 activity; ^{40}K, potassium-40 activity; ^{14}C, carbon-14 activity; BD, bulk density; H_2O, water; TC, total carbon; ^{13}C, carbon-13; ^{15}N, nitrogen-15; IC, inorganic carbon; OCd, organic carbon by difference (TC minus IC); TN, total nitrogen; LOI, loss on ignition; MMT, major, minor, and trace inorganic elemental constituents; P, palynomorph; MSI, non-palynomorph microstratigraphic indicators; ^{210}Pb, lead-210 activity]

Core ID site name and date sampled	Core type/ field sampling method[1]	Drive length[2]		Core length[2]		Compaction[2]			Correction factor[2]	Cateogry of Analytical data
		ft	cm	ft	cm	ft	cm	%		
Brackish marsh										
FW Fish & Wildlife February 1996	Initial ^{137}Cs test core; pushed whole core	2.45	74.68	1.25	38.10	1.20	36.58	48.98	1.96	^{137}Cs, ^{40}K, ^{14}C, BD, TC
SB1a St. Bernard March 18, 1996	Pushed whole core; top and bottom 5 cm not sampled	3.30	100.58	3.07	93.57	0.23	7.01	6.97	1.07	^{14}C, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O , pH
SB1b St. Bernard March 18, 1996	Pushed whole core, top and bottom 5 cm not sampled	3.38	103.02	3.08	93.88	0.30	9.14	8.88	1.10	^{137}Cs, ^{40}K, BD, H_2O
SB1c St. Bernard March 18, 1996	Whole vibracore	13.05	397.76	9.25	281.94	3.80	115.82	29.12	1.41	^{14}C, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, P, MSI
TB1a Terrebonne March 19, 1996	Pushed whole core	2.60	79.25	1.20	36.58	1.40	42.67	53.85	2.17	^{13}C, ^{15}N, TC, TN, BD, H_2O, pH
TB1b Terrebonne March 19, 1996	Pushed whole core	2.68	81.69	1.48	45.11	1.20	36.58	44.78	1.81	^{137}Cs
TB1c Terrebonne March 19, 1996	Pushed whole core	4.20	128.02	2.00	60.96	2.20	67.06	52.38	2.10	^{14}C, ^{13}C, ^{15}N, TC, OCd, IC, OC, TN
TB2a Terrebonne September 9, 1996	2 half cores pushed face-to-face; dug out and frozen as whole core	3.45	105.16	3.30	100.58	0.15	[5]4.57	5.89	1.06	^{137}Cs, ^{40}K, ^{14}C, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, pH
TB2c Terrebonne September 9, 1996	Whole vibracore	18.0	548.64	15.10	460.25	2.90	[6]88.39	54.60	2.20	^{14}C, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, P

Table 1-1. Descriptive data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ft, feet; cm, centimeter; %, percent; in, inch; ^{137}Cs, cesium-137 activity; ^{40}K, potassium-40 activity; ^{14}C, carbon-14 activity; BD, bulk density; H_2O, water; TC, total carbon; ^{13}C, carbon-13; ^{15}N, nitrogen-15; IC, inorganic carbon; OCd, organic carbon by difference (TC minus IC); TN, total nitrogen; LOI, loss on ignition; MMT, major, minor, and trace inorganic elemental constituents; P, palynomorph; MSI, non-palynomorph microstratigraphic indicators; ^{210}Pb, lead-210 activity]

Core ID site name and date sampled	Core type/ field sampling method[1]	Drive length[2]		Core length[2]		Compaction[2]			Correction factor[2]	Cateogry of Analytical data
		ft	cm	ft	cm	ft	cm	%		
Natural levee										
PLAQb Plaquemines May 12, 1999	Pounded half core	1.90	57.91	1.80	54.86	0.10	3.05	5.26	1.06	^{137}Cs, ^{40}K, ^{210}Pb, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O
PLAQc Plaquemines May 12, 1999	Pounded half core	1.90	57.91	1.80	54.86	0.10	3.05	5.26	1.06	MSI
PLAQd Plaquemines May 12, 1999	Pounded half core	2.00	60.96	1.90	57.91	0.10	3.05	5.00	1.05	^{14}C
BSLa Bayou Sauvage September 11, 1997	Pushed half core	2.47	75.29	2.42	73.76	0.05	1.52	2.02	1.02	^{137}Cs, ^{40}K, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, pH
BSLb Bayou Sauvage September 11, 1997	Pushed half core	2.63	80.16	2.63	80.16	0.00	0.00	0.00	0.00	^{14}C, ^{13}C
BSL2a Bayou Sauvage May 11, 1999	Pounded half core	2.46	74.98	2.41	73.46	0.05	1.52	2.03	1.02	^{14}C, ^{13}C
BSL2b Bayou Sauvage May 11, 1999	Pounded half core	1.90	57.91	1.80	54.86	0.10	3.05	5.26	1.06	^{137}Cs, ^{40}K, ^{210}Pb, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O,
BSL2d Bayou Sauvage May 11, 1999	Pounded half core	1.95	59.44	1.70	51.82	0.25	7.62	12.82	1.15	MSI

Table 1-1. Descriptive data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ft, feet; cm, centimeter; %, percent; in, inch; ^{137}Cs, cesium-137 activity; ^{40}K, potassium-40 activity; ^{14}C, carbon-14 activity; BD, bulk density; H_2O, water; TC, total carbon; ^{13}C, carbon-13; ^{15}N, nitrogen-15; IC, inorganic carbon; OCd, organic carbon by difference (TC minus IC); TN, total nitrogen; LOI, loss on ignition; MMT, major, minor, and trace inorganic elemental constituents; P, palynomorph; MSI, non-palynomorph microstratigraphic indicators; ^{210}Pb, lead-210 activity]

Core ID site name and date sampled	Core type/ field sampling method[1]	Drive length[2]		Core length[2]		Compaction[2]			Correction factor[2]	Cateogry of Analytical data
		ft	cm	ft	cm	ft	cm	%		
Distributary										
BSDb Bayou Sauvage September 10, 1997	Pushed half core	2.45	74.68	2.40	73.15	0.05	1.52	2.04	1.02	^{137}Cs, ^{40}K, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, pH
BSDc Bayou Sauvage September 10, 1997	Pushed half core	2.59	78.94	2.54	77.42	0.05	1.52	1.93	1.02	^{14}C, ^{13}C
BSDd Bayou Sauvage September 10, 1997	Pushed half core	2.60	79.25	2.55	77.72	0.05	1.52	1.92	1.02	MSI
Backswamp										
MR1b St. Martin September 11, 1996	Pounded half core	2.95	89.92	2.50	76.20	0.45	13.72	15.25	1.18	^{14}C, ^{13}C
MR1c-splits1 and 2. St. Martin September 11, 1996	Pounded half cores with plate between	2.45	74.68	2.20	67.06	0.25	7.62	10.20	1.11	^{137}Cs, ^{40}K, ^{14}C, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, pH
MR1d St. Martin September 11, 1996	Pounded half core	2.35	71.63	2.25	68.58	0.10	3.05	4.26	1.04	P
SL1a St. Landry September 12, 1996	Pounded half core	1.85	56.39	1.85	56.39	0.00	0.00	0.00	0.00	^{14}C, ^{13}C
SL1b St. Landry September 12, 1996	Pushed half core	2.40	73.15	2.20	67.06	0.20	6.10	8.33	1.09	^{137}Cs, ^{40}K, ^{210}Pb, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, LOI, pH
[5]SL1c St. Landry September 12, 1996	Pushed half core	1.55	47.24	1.35	41.15	0.00	0.00	0.00	0.00	P

Table 1-1. Descriptive data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ft, feet; cm, centimeter; %, percent; in, inch; ^{137}Cs, cesium-137 activity; ^{40}K, potassium-40 activity; ^{14}C, carbon-14 activity; BD, bulk density; H_2O, water; TC, total carbon; ^{13}C, carbon-13; ^{15}N, nitrogen-15; IC, inorganic carbon; OCd, organic carbon by difference (TC minus IC); TN, total nitrogen; LOI, loss on ignition; MMT, major, minor, and trace inorganic elemental constituents; P, palynomorph; MSI, non-palynomorph microstratigraphic indicators; ^{210}Pb, lead-210 activity]

Core ID site name and date sampled	Core type/ field sampling method[1]	Drive length[2]		Core length[2]		Compaction[2]			Correction factor[2]	Cateogry of Analytical data
		ft	cm	ft	cm	ft	cm	%		
					Swamp					
TN1b Tangipahoa September 10, 1996	Pushed half core	2.64	80.47	2.04	62.18	0.60	18.29	22.73	1.29	^{137}Cs, ^{40}K,
TN1c Tangipahoa September 10, 1996	Pushed half core	2.95	89.92	2.75	83.82	0.20	6.10	6.78	1.07	^{137}Cs, ^{13}C, ^{15}N, TC, IC, OCd, TN, BD, H_2O, pH
TN1d Tangipahoa September 10, 1996	Pushed, 6 inch outside diameter, steel half core	2.25	68.58	1.95	59.44	0.30	9.14	13.33	1.15	^{14}C, ^{13}C, P
[4]TN2a Tangipahoa March 22, 2000	McCauley auger[4]; four drives: 0–1.68 ft (0–51.20 cm), 1.68–3.36 ft (51.20–102.40 cm), 3.36-5.04 ft (102.40–153.60 cm), 5.04–6.72 ft (153.60–204.80 cm)									^{14}C, ^{13}C
TN2b Tangipahoa March 22, 2000	McCauley auger[4]; one drive: 5.14–6.82 ft (156.70–207.90 cm) for basal ^{14}C date									^{14}C, ^{13}C

[1] Unless otherwise indicated, 2 7/8 inch (7.3 cm) inside diameter aluminum pipe was used to take the cores. The pipe was sharpened on one end. For pushed half cores, a sharpened sheet of aluminum was used to cut along the core face; then the core was dug out by hand.

[2] Compaction = drive length - sample (core) length; Compaction % = (1 – (sample length/drive length)) x 100;
Correction factor = drive length/sample length.

[3] Hargis, T.G., and Twilley, R.R., 1994, Improved coring device for measuring soil bulk density in a Louisiana deltaic marsh: Journal of Sedimentary Research, v. 64A, n. 3, p. 681–683.

[4] McCauley auger core segments have no depth correction. The stem is driven to a known depth with the sample flange in the “open” position. At the wanted depth, the flange is rotated which in turn encloses the sediment sample in the sample case (see fig. 8*C* in text).

[5] The 4.57 cm compaction (1.06 compaction-correction factor) was applied to measured depths in sediment between the marsh surface and 73 cm depth; No compaction correction value was applied, but a 4.57-cm offset value was added, to all measured sediment depths >73 cm.

[6] The 88.39 cm compaction (2.20 compaction-correction factor) was applied to measured depths in sediment between the marsh surface and 73.5 cm depth; No compaction correction value was applied, but a 88.39-cm offset value was added, to all measured sediment depths >73.5 cm.

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
FRESH MARSH					
Bayou Verret					
Push-core BV—Jefferson Parish—Core taken in February 1996 29°54'00" North latitude, 90°15'48" West Longitude					
No core description available. Push-core BV was taken as a "test core," sealed on site, and shipped for ^{137}Cs analysis. (12 samples taken every 4 cm; for sample depths, see Appendix 2, table 2-1)					
Lake Salvador					
Vibracore LSPe—Lake Salvador, St. Charles Parish—Core taken on September 8, 1997 29°47'06.7" North latitude, 90°16'12.7" West longitude					
LSPe (0–2)	0.00	2.30	0.00	5.75	Modern root mat
LSPe (2–4)	2.30	4.59			
[4]LSPe (4–6)	4.59	6.89	5.75	12.65	Modern root mat grading to fibrous peat with very dark grayish-brown (10YR 3/2) matrix
LSPe (6–8)	6.89	9.18			
LSPe (8–10)	9.18	11.48			
[4]LSPe (10–12)	11.48	13.78	12.65	25.30	Very dark brown (10YR 2.5/2) to black (10YR 2.5/1) fibrous peat; more decomposed and finer grained than overlying layers; many modern roots
LSPe (12–14)	13.78	16.07			
LSPe (14–16)	16.07	18.37			
LSPe (16–18)	18.37	20.66			
LSPe (18–20)	20.66	22.96			
LSPe (20–22)	22.96	25.26			
LSPe (22–24)	25.26	27.55	25.30	39.0	Dark gray (5YR 3/1) to dark reddish-brown (5YR 3/2) fibrous peat; more fibrous with less matrix than overlying layer; many modern roots
LSPe (24–26)	27.55	29.85			
LSPe (26–28)	29.85	32.14			
LSPe (28–30)	32.14	34.44			
LSPe (30–32)	34.44	36.74			
LSPe (32–34)	36.74	39.03			
LSPe (34–36)	39.03	41.33	39.0	69.0	Black (10YR 2.5/1), fine-grained, decomposed peat; some modern roots
LSPe (36–38)	41.33	43.62			
LSPe (38–40)	43.62	45.92			
LSPe (40–42)	45.92	48.21			
LSPe (42–44)	48.21	50.51			
LSPe (44–46)	50.51	52.81			
LSPe (46–48)	52.81	55.10			
LSPe (48–50)	55.10	57.40			
LSPe (56–60)	64.29	68.88			
LSPe (64–68)	73.47	78.06	69.0	115.0	Fibrous black (10YR 2.5/1) peat, less fibrous, denser, and finer grained than overlying layer
LSPe (72–76)	82.65	87.25			
LSPe (80–84)	91.84	96.43			
LSPe (88–92)	101.02	105.61			
LSPe (96–98)	110.21	112.50			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
					FRESH MARSH—Continued
					Lake Salvador—Continued
					Vibracore LSPe—Lake Salvador, St. Charles Parish—Core taken on September 8, 1997 29°47'06.7" North latitude, 90°16'12.7" West longitude
LSPe (100–102)	114.80	117.09	115.0	118.5	Black (10YR 2–2.5/1) peat with dark gray (N4 –5Y 4/1) lens of organic silty clay in center 1 cm
LSPe (105–107)	120.54	122.83	118.5	208.2	Black (10YR 2/1), dense, fine-grained peat with abundant fibrous plant fragments
LSPe (145–150)	166.46	172.20			
LSPe (176–178)	202.04	204.34			
LSPe (184–186)	211.23	213.52	208.2	213.5	Transitional zone from black (10YR 2.5/1) fibrous peat to dark-gray (N4/), organic silty clay; zone looks turbulently mixed with swirled ribbons of silt and organics (ribbon thickness ≥0.5 cm)
LSPe (192–194)	220.41	222.71	213.5	274.3	Dark gray (N4–5Y 4/1) silty clay; large clasts of fibrous, straw-colored, “fresh-looking” plant fragments (stems and grass blades) evenly distributed throughout
LSPe (195–200)	223.85	229.59			
LSPe (234–236)	268.63	270.92			
LSPe (240–242)	275.51	277.81	274.3	331.2	Abrupt boundary; black (10YR 2/1, fine-grained peat with smaller, more decomposed plant fragments and higher silty-clay content than in the overlying layer
LSPe (245–250)	281.25	286.99			274.3.5–278.9 black (10YR 2/1) fibrous peat 278.9–291.0 black (10YR 2/1 fine-grained fibrous peat with high dark-gray (5Y 2/2) silty clay content in matrix; peat is decomposed but has 0.5-1 cm thick chunks of reddish woody debris
LSPe (280–282)	321.43	323.73			291.0–331.2 black (10YR 2/1) fine-grained decomposed peat with few recognizable plant fragments.
LSPe (294–296)	337.50	339.80	331.2	346.2	Transitional zone from black (10YR 2.5/1) fine-grained fibrous peat to dark gray (N4/–5Y 4/1), organic silty clay; zone is turbulently mixed with swirled ribbons of silt and organics
LSPe (302–304)	346.69	348.98	346.2	350.8	Uniform dark gray (5Y 4/1) silty clay; massive, no layering or structures apparent; streaks of dark brown (N4–5Y 4/1) organics randomly distributed throughout section
LSPe (310–312)	355.87	358.17	350.8	604.9	Discontinuous lenses of dark gray, fine sand and silty clay 377–414 cm; large light gray/tan (5Y 5/2) silty clay blobs; elongated, vertical linear structure that could be filled burrows;
LSPe (410–412)	470.67	472.97			426–497 cm; discontinuous lenses of dark gray (N4–5Y 4/1), fine sand dispersed throughout section;
LSPe (510–512)	585.47	587.76			497–576 cm large, 2–3 cm wide, vertical, elongated blob of dark gray (N4–5Y 4/1), fine sand and silt that is probably a filled burrow
LSPe (522–524)	599.24	601.54			
LSPe (528–530)	606.13	608.43	604.9	652.1	Similar to overlying layer with increase in number of dark gray (N4–5Y 4/1), fine-sand and silt lenses
LSPe (545–547)	625.65	627.94			
LSPe (562–564)	645.16	647.46			
LSPe (567–569)	650.90	653.20	652.1	655.5	Angular contact with overlying fine sand; horizontal layering apparent in alternating 1–2-mm thick bands of olive gray (5Y 5/2) and gray (N6) to dark gray (5Y 6/1) silty clay

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
FRESH MARCH—Continued					
Lake Salvador—Continued					
Vibracore LSPf (about 3 m West of vibracore LSPe)—Lake Salvador, St. Charles Parish—Core taken on September 8, 1997 29°47'06.7" North latitude, 90°16'12.7" West longitude					
LSPf			0	61.1	Gray-brown fibrous peat with modern roots 48.8–66.6 very large reddish-brown root (2–3 cm thick, 15 cm long); root lies across the lower boundary.
LSPf (64–68)	71.04	75.48	61.1	235.3	Black (10YR 2.5/1), decomposed peat with fibrous plant material; reddish-brown (5YR 3/3) rounded clasts (~2 cm diameter) of root-mat material scattered throughout the unit (at 101, 115, and 222 cm depths) 144–152 clayey-silt lens
LSPf (72–76)	79.92	84.36			
LSPf (80–84)	88.80	93.24			
LSPf (88–92)	97.68	102.12			
LSPf (96–98)	106.56	108.78			
LSPf (100–102)	111.00	113.22			
LSPf (145–150)	160.95	166.50			
LSPf (195–200)	216.45	222.00			
LSPf			235.3	240.9	Transition from black organics to dark gray silty clay; interlayering of silty clay and peat with individual layers from 1 to 5 cm thick
LSPf (245–250)	271.95	277.50	240.9	295.3	Dark gray clayey silt; higher clay content than in overlying layer; homogeneous; abundant fibrous plant material; individual fibers about 2 mm thick and from 10–20 cm long, giving a “stringy” appearance
LSPf (262–264)	277.50	293.04			
LSPf (294–296)	326.34	328.56	295.3	338.6	Abrupt boundary; very dark brown to black decomposed fine-grained peat; few plant fragments 300.8–326.3 dark gray to brown fine-grained peat with discontinuous lenses of silty clay 326.3–338.6 very dark brown to black fine-grained peat that is uniform throughout
LSPf (302–304)	335.22	337.44			
LSPf (310–312)	344.10	346.32	338.6	377.4	Transition zone from organics to silty clay with clay increasing downward
LSPf (322–324)	357.42	359.64			
LSPf (348–350)	386.28	388.50	377.4	571.7	Discontinuous lenses of dark gray fine sand and silty clay
LSPf (410–412)	455.10	457.32			
LSPf (510–512)	566.10	568.32			
LSPf			571.7	654.9	Alternating fine-sand and silty clay lenses with fine-sand lenses increasing in number and thickness with depth

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
FRESH MARCH—Continued					
St. Mary					
Vibracore SM1c—St. Mary Parish—Core taken on March 21, 1996 29°40'24" North latitude, 91°33'47" West longitude					
SM1c (0–8.5)	0.00	10.81	0.00	10.81	Dark gray (5YR 2.5/1) "clayey" fibrous peat with matrix of very fine disseminated organics
SM1c (8.5–24)	10.81	30.51	10.81	85.82	Black (5YR 2/1) coarse fibrous peat forming a dense mat; mat becomes less dense with depth 55.94–85.82 black (5YR 2/0)
SM1c (24–44)	30.51	55.94			
SM1c (44–67.5)	55.94	85.82			
SM1c (67.5–71.5)	85.82	90.91	85.82	90.91	Black (5YR 2/0) "clayey" coarse fibrous peat with matrix of very fine disseminated organics
SM1c (71.5–81)	90.91	102.99	90.91	116.97	Coarse fibrous peat with matrix of very fine disseminated organics
SM1c (81–92)	102.99	116.97			
SM1c (92–94.25)	116.97	119.83	116.97	129.05	Black to dark gray (7.5YR 2–2.5/0) clayey peat or organic-rich clay
SM1c (94.25–101.5)	119.83	129.05			
SM1c (101.5–116)	129.05	147.49	129.05	172.92	Black fibrous peat that is similar to the 8.5–67.5 cm interval but has coarser fibers, some gelatinous material associated with wood fragment at lower contact
SM1c (116–122.5)	147.49	155.75			
SM1c (122.5–136)	155.75	172.92			
SM1c (136–142.5)	172.92	181.18	172.92	185.00	Black to dark gray (7.5YR 2–2.5/0) fibrous peat; less coarse than overlying layer; no wood
SM1c (142.5–145.5)	181.18	185.00			
SM1c (145.5–160.5)	185.00	204.07	185.00	221.23	Black, very coarse fibrous peat
SM1c (160.5–174)	204.07	221.23			
SM1c (174–188)	221.23	239.03	221.23	251.75	Same as overlying layer but has many more coarse fragments
SM1c (188–198)	239.03	251.75			
SM1c (198.0–209.5)	251.75	266.37	251.75	271.46	Organic clay, slight color variations between indistinct horizontal beds, color probably related to clay and/or OC content, fibrous peat aligned along bedding planes
SM1c (209.5–213.5)	266.37	271.46			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
INTERMEDIATE MARSH					
Bayou Perot					
Vibracore BPPg—West edge of Bayou Perot in Lafourche Parish—Core taken on September 9, 1997 29°37'41" North latitude, 90°10'36" West longitude					
BPPg			0	5.7	Black (7.5YR 2.5/0), fine organic slop
BPPg (10–12)	11.30	13.56	5.7	15.8	Same as 0–5 cm interval; water content decreases with depth, becoming a more consolidated mixture of extremely coarse plant material with a fine organic matrix
BPPg (22–24)	24.86	27.12	15.87	27.1	Black (7.5YR 2.5/0) peat; water content decreases with depth, unconsolidated organic mixture of fine organics and very coarse fibrous plant material, percent of plant material increasing with depth
BPPg (32–34)	36.16	38.42	27.1	44.0	Black (7.5YR 2.5/0), dense peat with coarse grass and plant debris and a less fine-grained matrix 27–33 (7.5YR 2.5/0) 33–44 (10YR 2.5/1)
BPPg (42–44)	47.46	49.72	44.0	101.7	Sharp contact; black (10YR 2.5/1), mottled (5YR 2.5/1), fine-grained organic matrix with fine, stringy plant fragments; clay content increases below 79.1 cm 44.0–50.5, 5YR 2.5/1 dominant color 50.5–79.1, 10YR 2.5/1 dominant color 79.1–101.7, 5Y 1/1 clay-rich fine-grained organics; clay content increases with depth
BPPg (48–50)	54.24	56.50			
BPPg (56–60)	63.28	67.80			
BPPg (64–68)	72.32	76.84			
BPPg (74–76)	83.62	85.88			
BPPg (80–84)	90.40	94.92			
[4]BPPg (88–92)	99.44	103.96	101.7	148.0	Transitional zone from clayey organics to organic clay 101.7–113.0, 5Y 1/1 clay-rich fine-grained organics; clay content increasing with depth 113.0–140.1, dark-gray (N4–5Y 4/1) clay lenses (115.3–116.4 cm and 122.0–124.3 cm depths) alternating with lenses of black (10YR 2.5/1) clayey, fine-grained peat 140.1–148.0, black (10YR 2.5/1), clay-rich, fine-grained organics between lenses of dark gray (N4/ 5Y 4/1) organic clay (color varies with clay content)
BPPg (96–100))	108.48	113.00			
BPPg (100–105)	113.00	118.65			
BPPg (120–124)	135.60	140.12			
BPPg (132–136)	149.16	153.68	148.0	193.2	Black (10YR 2.5/1) 4–6-cm thick lenses of decomposed, fine-grained peat interlayered with 3-5 cm-thick lenses of dark gray (N4–5Y 4/1) organic-rich clay; clay layers thicken with depth.
BPPg (145–150)	163.85	169.50			
BPPg (153–155)	172.89	175.15			
BPPg (160–162)	180.80	183.06			
BPPg (168–170)	189.84	192.10			
BPPg (178–182)	201.14	205.66	193.2	212.4	Thick, fine-grained organic matrix with medium to fine plant fragments
BPPg (188–190)	212.44	214.70	212.4	215.8	Dark gray to black (10YR 2.5/1) lens of clay-rich fine-grained organics
BPPg (195–200)	220.35	226.00	215.8	235.0	Similar to the 193.2–212.4 depth interval but the plant fragments are smaller and color is dominantly 10YR 2/1
[4]BPPg (207–210)	233.91	237.30	235.0	236.7	Dark gray (10YR 3/1) organic clay
BPPg (226–230)	255.38	259.90	236.7	283.63	Black (10YR 2/1) fine-grained organics with abundant fine plant fragments and some large (~2 cm diameter) reddish-brown woody fragments in the 248.3–252.0 cm and 265.6–271.2 cm depth intervals
BPPg (245–250)	276.85	282.5			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
INTERMEDIATE MARSH—Continued					
Bayou Perot—Continued					
Vibracore BPPg—West edge of Bayou Perot in Lafourche Parish—Core taken on September 9, 1997 29°37'41" North latitude, 90°10'36" West longitude					
BPPg (270–274)	305.1	309.62	283.6	328.8	Mottled zone of black (2.5Y 2.5/0) fine-grained organics grading downward to black (10YR 2.5/1) fine-grained organics and dark gray (N5, 5Y 5/1) clay; abundant highly decomposed plant fragments, some appeared to be charred
BPPg (295–300)	333.35	339.00	328.8	360.5	Dark gray (10YR 3/1) fine-grained clay-rich peat with highly decomposed plant fragments throughout
BPPg (310–314)	350.30	354.82			339.0–342.4 Dark gray (10YR 3/1) organic clay
BPPg (320–324)	361.60	366.12	360.5	366.7	Dark gray (10YR 4/1) organic clay with gradational upper boundary
BPPg (330–334)			366.7	406.8	Sharp contact; very rich organic clay to 368.9 cm 368.9–373.5, black (7.5YR 2.5/2) with more fibrous plant fragments
BPPg (354–358)					373.5–406.8, organic-rich black (10YR 2–2.5/1) clay with variable organic content and number of charred plant fragments
BPPg (364–368)	411.32	415.84	406.8	418.1	Very dark gray (5Y 3/1) organic clay with less fine organics than overlying layer with large (6.5 cm x 5 cm) clasts of charred plant/root debris
BPPg (380–384)	429.40	433.92	418.1	457.7	Gradational contact to medium gray (N4–5Y 4/1) clay with few large charred plant clasts near upper contact and increasing in number with depth
BPPg (420–424)	474.60	479.12	457.7	492.7	Mottled dark brown (5Y 3/1) and gray (N5/ 5Y 5/1) clay; charred plant fragments near lower contact
BPPg (478–482)			492.7	595.5	Medium to dark gray (N4/ 5Y 4/1) clay with charred plant fragments throughout
BPPg (530–534)	598.90	603.42	595.5	606.81	Sharp contact; alternating layers of dark gray (N4/ 5Y 4/1) and medium gray (N5/ 5Y 5/1) silty sand; 1–5-mm thick sand layers; 4–10 mm thick clay layers
BPPg (545–549)	615.9	620.37	606.81	620.4	Dark gray (N4/ 5Y 4/1) silty sand; lenses pinch-out laterally; clasts of with olive gray (5Y 5/1.5) clay; at 617 cm a transition to horizontal interlayers of medium gray (N5/ 5Y 5/1) and dark gray (N5/ 5Y 5/1) very fine sand
BRACKISH MARSH					
Fish and Wildlife					
Push-core FW—Jefferson Parish—Core taken in February 1996 **29°46'41" North latitude 90°17'06" West longitude**					
No core description available. Push-core FW was taken as a "test core," sealed on site, and shipped for ^{137}Cs analysis. (9 samples taken every 4 cm; for sample depths, see Appendix 2, table 2-1)					

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
BRACKISH MARSH—Continued					
St. Bernard					
[5]Vibracore SB1c—St. Bernard Parish—Core taken on March 18, 1996 **29°58'53" North latitude 89°55'27" West longitude**					
SB1c-10 (0–15.75)	0.00	22.22	0.0	77.6	Fibrous peat; more compact with depth; plant fragments (reeds and grass) more degraded with depth; few very small seeds, no wood; black (10YR 2.5/1) to very dark gray (5Y 3/1) in upper 10 cm, black (2.5Y 2.5/0) in lower 67.6 cm
SB1c-(21.5) (15.75–30.75)	22.22	43.38			
SB1c-(40) (30.75–42.5)	43.38	59.96			
SB1c-45 (42.5–55)	59.96	77.60			
SB1c-(65) (55–72)	77.60	101.58	77.6	97.3	Same black (2.5Y 2.5/0) fibrous peat as in overlying interval, but more compact
SB1c-(79) (72–81)	101.58	114.28	97.3	116.3	Fibrous peat as above, but color changes to black (5YR 2/1.5)
SB1c-(83) (81–83.5)	114.28	117.80	116.3	122.0	Very dark gray (5Y 3/1) clay; abrupt upper and lower boundaries
SB1c-84 (83.5–90.5)	117.80	127.68			
SB1c-(97) (90.5–102.5)	127.68	144.61	122.0	170.6	Black (7.5YR 2.5/1) fibrous compact peat; sulphurous odor; finer textured than surface peat with fewer plant fragments; abrupt to clear lower boundary
SB1c-108 (102.5–109)	144.61	153.78			
SB1c-(110) (109–119)	153.78	167.89			
SB1c-(128) (119–136.5)	167.89	192.58	170.6	198.1	Black (7.5YR 2.5/0) peat; dominantly finely disseminated organics in uppermost 7 cm and lowermost 5 cm; numerous fine to coarse plant fragments in middle; abrupt to clear lower boundary
SB1c-(145) (136.5–151)	192.58	213.74	198.1	229.1	Black (7.5YR 2.5/0) organic clay; organic content decreases with depth; very few plant fragments; clear lower boundary
[4]SB1c-158 (151.5–167.5)	213.74	236.31			
SB1c-(177) (167.5–185.5)	236.31	261.71	229.1	307.4	Black (7.5YR 2.5/0) fibrous peat; clay content decreases with depth; 1-cm thick clay lens at 270 cm
SB1c-194 (185.5–198)	261.71	279.35			
SB1c-(202) (198–214.75)	279.35	302.98			
SB1c-227.5 (214.75–228.25)	302.98	322.02	307.4	329.2	Black (7.5YR 3/0) organic clay; indistinct bedding; more organic and fibrous in basal 5 cm with some plant fragments throughout; bioturbated throughout; clear to abrupt lower boundary
[4]SB1c-(229) (228.25–239.5)	322.02	337.90			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
BRACKISH MARSH—Continued					
St. Bernard—Continued					
[5]Vibracore SB1c—St. Bernard Parish—Core taken on March 18, 1996 **29°58'53" North latitude 89°55'27" West longitude**					
SB1c-(250 (239.5–250.5)	337.90	353.41	329.2	390.6	Black (7.5YR 3/0 peat); very finely disseminated organics with only a few visible plant fragments; large 4 by 6 cm burrows at upper boundary; 0 to 1 cm thick organic clay lens in middle of unit; bioturbation and clay content increases with depth below the clay lens; abrupt "stepped"/offset lower boundary
SB1c-251 (250.5–258)	353.41	364.00			
SB1c-(265) (258–272.5)	364.00	384.45			
SB1c-280 (272.5–282)	384.45	397.86	390.6	402.1	Gray (N4) prodelta clay; small organic clasts and plant fragments throughout
SB1c-(284) (282–285)	397.86	402.09			
Terrebonne					
Vibracore TB2c—Southwest edge of Lake Boudreaux in Terrebonne Parish—Core taken on September 11, 1996 29°23'05" North latitude, 90°40'20" West longitude					
TB2c-1 bd (0–4)	0.00	8.81	0	37.5	Black (10YR 2/1) loosely packed fibrous peat with fragments of thin, straw-colored reed-like grasses and very fine roots
TB2c-1 tc (4–7.5)	8.81	16.52			
TB2c-2 tc (7.5–11.5)	16.52	25.33			
[4]TB2c-2 bd (11.5–17)	25.33	37.44			
TB2c-3 bd (17–19.5)	37.44	42.95	37.5	49.6	Somewhat more dense black (10YR 2/2) fibrous peat with larger grass fragments
TB2c-3 tc (19.5–22.5)	42.95	49.56			
TB2c-30 ^{14}C (22.5–30.5)	49.56	67.18	49.6	84.8	Black (5YR 2/1) fibrous peat with abundant grass (thick stems and blades) and root fragments
TB2c-4 tc (30.5–32)	67.18	70.48			
TB2c-4 bd (32–38.5)	70.48	84.80			
TB2c-42.5 ^{14}C (38.5–43.25)	84.80	95.26	84.8	138.8	Black (7.5YR 2/0), dense, fibrous peat; more decomposed than overlying layers; many grass stems and blades visible but slightly less abundant than in overlying layers in a fine muck
TB2c-5 tc (43.25–45)	95.26	99.12			
TB2c-5 bd (45–50.5)	99.12	111.23			
[4]TB2c-6 bd (50.5–56)	111.23	123.35			
TB2c-6 tc (56–58)	123.35	127.75			
[4]TB2c-59 ^{14}C (58–63)	127.75	138.77			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
BRACKISH MARSH—Continued					
Terrebonne—Continued					
Vibracore TB2c—Southwest edge of Lake Boudreaux in Terrebonne Parish—Core taken on September 11, 1996 29°23'05" North latitude, 90°40'20" West longitude					
TB2c-66.5 ^{14}C (63–67.75)	138.77	149.23	138.8	161.9	Black (7.5YR 2/0), highly decomposed peat transitioning to organic-rich clay; numerous visible plant fragments
TB2c-7 bd (67.75–70)	149.23	154.19			
TB2c-7 tc (70–73.5)	154.19	161.89			
TB2c-77.5 ^{14}C (73.5–81.25)	161.89	169.64	161.9	184.4	Black (10YR 3/1) organic clay; disseminated very small plant fragments; fewer plant fragments in lower half of unit
TB2c-8 bd (81.25–86)	169.64	174.39			
[4]TB2c-8 tc (86–90.25)	174.39	178.64			
TB2c-93.5 ^{14}C (90.25–96)	178.64	184.39			
TB2c-9 bd (96–109)	184.39	197.39	184.4	212.9	Gray (10YR 5/0) organic clay; sticky, "pudding-" or "frosting-"like texture; plant clast at 107 cm near sliced surface of core (was probably dragged in during coring); angled contact from 210 to 215 cm
TB2c-9 tc (109–124.5)	197.39	212.89			
TB2c-10 tc (124.5–134)	212.89	222.39	212.9	279.9	Black (10YR 3/0) organic clay; bioturbated to 227 cm and 243–251 cm, possibly throughout; numerous large plant clasts (charcoal) from 212–225 cm
TB2c-10 bd (134–137.75)	222.39	226.14			
[4]TB2c-140.5 ^{14}C (137.75–147.75)	226.14	236.14			
TB2c-155 ^{14}C (147.75–157)	236.14	245.39			
TB2c-11 bd (157–160)	245.39	248.39			
TB2c-11 tc (160–165.75)	248.39	254.14			
TB2c-170.5 ^{14}C (165.75–177.25)	254.14	265.64			
TB2c-12 tc (177.25–185.5)	265.64	273.89			
TB2c-12 bd (185.5–191.5)	273.89	279.89			
TB2c-195.5 ^{14}C (191.5–198.25)	279.89	286.64	279.9	292.4	Black to dark gray (10YR 4/0.5) very fine to fine sand; large (5 cm diameter) peat "clast" between 280 and 287 cm that" appears to be in place based on upper and lower boundaries
TB2c-13 bd (198.25–202)	286.64	290.39			
TB2c-13 tc (202–204)	290.39	292.39			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
BRACKISH MARSH—Continued					
Terrebonne—Continued					
Vibracore TB2c—Southwest edge of Lake Boudreaux in Terrebonne Parish—Core taken on September 11, 1996 29°23'05" North latitude, 90°40'20" West longitude					
TB2c-14 bd (204–214)	292.39	302.39	292.4	307.4	Interbedded black to dark gray (10YR 4/0.5) clay and well sorted, very fine to fine sand; clay is more dense and less "fluffy" than overlying clay intervals; thin lenses/laminae of organics or manganese at 294–296 cm
TB2c-14 tc (214–219)	302.39	307.39			
TB2c-15 bd (219–226.5)	307.39	314.89	307.4	320.4	Gray (10YR 5/1) well-sorted fine to medium sand; some heavies and dark green grains
TB2c-15 tc (226.5–232)	314.89	320.39			
TB2c-16 bd (232–239.5)	320.39	327.89	320.4	390.4	Interbedded/laminated gray (10YR 5/1) sand and dark gray (10YR 4/1) clay 327–338 cm – clay >90% of interval; sand intervals ≤0.25 cm thick 338–342 fine to medium sand 342–357 clay and very fine to fine sand; clay beds ≤2 cm thick, sand beds ≤4 cm thick 357–364 fine to medium sand 364–367 clay and very fine to fine sand 367–369 fine to medium sand 369–390 sand and clay; clay ≤3.5 cm thick, sand ≤2 cm thick
TB2c-16 tc (239.5–263)	327.89	351.39			
TB2c-17 bd (263–286.5)	351.39	374.89			
TB2c-17 tc (286.5–302)	374.89	390.39			
TB2c-18 bd (302–312)	390.39	400.39	390.4	413.4	Gray (10YR 5/1) fine to medium sand; bedding evident by very slight changes in color
TB2c–18 tc (312–325)	400.39	413.39			
TB2c-328.5 ^{14}C 325–336.75)	413.39	425.14	413.4	456.4	Interbedded/laminated gray (10YR 5/1) sand and dark gray (10YR 4/1) clay; small organic clasts in the clay beds/laminae 413–415 clay 415–416 sand 416–417 carbonized grass mat; vitreous, charred appearance, visible plant fragments 417–428 interbedded very fine to fine and fine to medium sand; very fine to fine sand intervals ≤ 3.5 cm thick, fine to medium sand intervals ≤3 cm thick 420 subrounded quartz pebble about 0.5 cm diameter 421 shell fragment approximately the same size as the pebble 424 smaller shell fragments 428–437 interbedded very fine to fine and fine to medium sand and clay 433–434 dark organic clast with plant fragments parallel to bedding 437–456 interbedded sand (as above), except: 448–450 clay lens with small plant clast parallel to bedding
TB2c-345 ^{14}C (336.75–349)	425.14	437.39			
TB2c-19 bd (349–354)	437.39	442.39			
TB2c-19 tc (354–357.75)	442.39	446.14			
TB2c-360.5 ^{14}C (357.75–368)	446.14	456.39			
TB2c-376.5 (368-380.75)	456.39	469.14	456.4	481.4	Interbedded very fine to fine and fine to medium, gray (10YR 5/1) sand and dark gray (10YR 4/1) clay; sand intervals ≤2 cm thick, clay intervals ≤1 cm thick; very fine to fine sand and clay dominant; small organic clasts associated with the very fine to fine sand and clay
TB2c-20 tc (380.75-386)	469.14	474.39			
TB2c-20 bd 386-393)	474.39	481.39			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
BRACKISH MARSH—Continued					
Terrebonne—Continued					
Vibracore TB2c—Southwest edge of Lake Boudreaux in Terrebonne Parish—Core taken on September 11, 1996 29°23'05" North latitude, 90°40'20" West longitude					
TB2c-21 bd (393-402)	481.39	490.39	481.4	505.9	Interbedded gray (10YR 5/1) sand and grayish-brown (10YR 5/2) clay; similar to overlying interval except that the beds are distorted; clay intervals ≤1.5 cm thick; 2.5 cm diameter organic clasts below 493 cm; clay is dark gray (10YR 4/1) and distorted beds dominate lower half of interval
TB2c-21 tc (402-404.75)	490.39	493.14			
TB2c-406.5 ^{14}C (404.75-417.5)	493.14	505.89			
TB2c-22 bd 417.5-422)	505.89	510.39	505.9	540.4	Interbedded gray (10YR 5/1) very fine to fine and fine to medium sand and dark gray (10YR 4/1) clay; sand dominant; horizontal beds; organic clasts throughout clay intervals; clay intervals ≤1 cm thick, sand intervals ≤4.5 cm thick
TB2c-22 tc (422-425.25)	510.39	513.64			
TB2c-427.5 425.25-432.25)	513.64	520.64			
TB2c-23 bd (432.25-438)	520.64	526.39			
TB2c-23 tc (438-441.75)	526.39	530.14			
TB2c-444.5 ^{14}C (441.75-452)	530.14	540.39			
TB2c-24 bd (452-456)	540.39	544.39	540.4	547.9	Gray (10YR 5/1) well-sorted very fine to fine sand; no visible bedding
TB2c-24 tc (456-459.5)	544.39	547.89			
NATURAL LEVEE					
Plaquemines					
Push-core PLAQd—Mississippi River distributary channel southeast of New Orleans, Plaquemines Parish—Core taken on May 12, 1999 29°34'25" North latitude, 89°54'04" West longitude					
[6]PLAQb-1	0.00	2.11	0.0	3.7	Very dark gray to black (5YR 2.5/1) muck; abundant plant fragments
[4, 6]PLAQb-2	2.11	4.22			
[6]PLAQb-3	4.22	6.33	3.7	13.7	Dark gray (10YR 4/1) silty clay with abundant plant fragments; has the consistency of cake frosting
[6]PLAQb-4	6.33	8.44			
[6]PLAQb-5	8.44	10.56			
[6]PLAQb-6	10.56	12.67			
[4, 6]PLAQb-7	12.67	14.78			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
NATURAL LEVEE—Continued					
Plaquemines—Continued					
Push-core PLAQd—Mississippi River distributary channel southeast of New Orleans, Plaquemines Parish—Core taken on May 12, 1999 29°34'25" North latitude, 89°54'04" West longitude					
[6]PLAQb-8	14.78	16.89	13.7	38.9	Very dark grayish-brown (10YR 3/2) silty clay; dense ; considerable oxidation; few plant fragments
[6]PLAQb-9	16.89	19.00			
[6]PLAQb-10	19.00	21.11			
[6]PLAQb-11	21.11	23.22			
[6]PLAQb-12	23.22	25.33			
[6]PLAQb-13	25.33	27.44			
[6]PLAQb-14	27.44	29.55			
[6]PLAQb-15	29.55	31.67			
[6]PLAQb-16	31.67	33.78			
[6]PLAQb-17	33.78	35.89			
[6]PLAQb-18	35.89	38.00			
[6]PLAQb-19	38.00	40.11	38.9	59.9	Dark grayish-brown (10YR 4/2) silty clay grading to sandy silt with considerable oxidation and some woody root-like plant fragments
[6]PLAQb-20	40.11	42.22			
[6]PLAQb-21	42.22	44.33			
[6]PLAQb-22	44.33	46.44			
[6]PLAQb-23	46.44	48.55			
[6]PLAQb-24	48.55	50.67			
[6]PLAQb-25	50.67	52.78			
[6]PLAQb-26	52.78	54.89			
[6]PLAQb-27	54.89	57.00			
[6]PLAQb-28	57.00	59.11			
Bayou Sauvage					
Push-core BSLb—South of Blind Lagoon, Orleans Parish—Core taken on September 11, 1997 30°03'19.30" North latitude, 89°52'54.24" West longitude					
[7]BSLa-1	0.00	1.02	0.00	10.00	Dark organic soil horizon; clay content increases with depth; abundant modern rootlets
[7]BSLa-2	1.02	2.04			
[7]BSLa-3	2.04	3.06			
[7]BSLa-4	3.06	4.08			
[7]BSLa-5	4.08	5.10			
[7]BSLa-6	5.10	6.12			
[7]BSLa-7	6.12	7.14			
[7]BSLa-8	7.14	8.16			
[7]BSLa-9	8.16	9.19			
BSLa-10	9.19	10.21			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
NATURAL LEVEE—Continued					
Bayou Sauvage—Continued					
Push-core BSLb—South of Blind Lagoon, Orleans Parish—Core taken on September 11, 1997 30°03'19.30" North latitude, 89°52'54.24" West longitude					
BSLa-11	10.21	12.25	10.0	29.0	Alternating, 4- to 5-cm thick, dark gray to very dark gray to dark gray (10YR 3.5/1) silty clay and light grayish reddish brown, "weak red" (2.5YR 5/2) fine-sand lenses with large modern rootlets throughout; many oxidized root channels in the 12–31-cm depth interval
BSLa-12	12.25	14.29			
BSLa-13	14.29	16.33			
[7]BSLa-14	16.33	18.37			
[7]BSLa-15	18.37	20.41			
[7]BSLa-16	20.41	22.45			
[7]BSLa-17	22.45	24.49			
[7]BSLa-18	24.49	26.54			
[7]BSLa-19	26.54	28.58			
[4, 7]BSLa-20	28.58	30.62			
[7]BSLa-21	30.62	32.66	29.0	31.5	Abrupt upper boundary; very dark gray (10YR 3/1) clay; vertical mottles suggest oxidation along former roots and rootlets.
[7]BSLa-22	32.66	34.70	31.5	45.0	Sharp upper boundary oxidized and crumbly above, black (10YR 2.5/1) buried soil with abundant rootlets below; soil is very dry and crumbly to 39 cm
[7]BSLa-23	34.70	36.74			
[7]BSLa-24	36.74	38.78			
[7]BSLa-25	38.78	40.82			
[7]BSLa-26	40.82	42.87			
[7]BSLa27	42.87	44.91			
[4, 7]BSLa-28	44.91	46.95			
[7]BSLa-29	46.95	48.99	45.0	50.0	Black (2.5YR 2.5/0) organic clay with abundant charred plant material
[4, 7]BSLa-30	48.99	51.03			
[7]BSLa-31	51.03	53.07	50.0	68.0	Dark gray (2.5YR 4/0) clay with percent charred plant material decreasing with depth; no noticeable plant fragments below 68 cm
[7]BSLa-32	53.07	55.11			
[7]BSLa-33	55.11	57.15			
[7]BSLa-34	57.15	59.20			
[7]BSLa-35	59.20	61.24			
[7]BSLa36-	61.24	63.28			
[7]BSLa-37	63.28	65.32			
[7]BSLa-38	65.32	67.36			
[4, 7]BSLa-39	67.36	69.40			
[7]BSLa-40	69.40	71.44	68.0	81.0	Dark gray (2.5YR 4/0) clay; no visible plant material; oxidation indicated by numerous mottle
[7]BSLa-41	71.44	73.48			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
NATURAL LEVEE—Continued					
Bayou Sauvage—Continued					
Push-core BSL2a—South of Blind Lagoon, Orleans Parish—Core taken on May 11, 1999 30°03'16" North latitude, 89°52'53" West longitude.					
[8]BSL2b-1	0.00	2.12	0.0	2.0	Black (10YR 2/1), organic layer composed of twigs, leaves and rootlets
[8]BSL2b-2	2.12	4.24	2.0	15.3	Very dark gray (5YR 3/1), very sticky, organic clay; abundant plant fragments
[8]BSL2b-3	4.24	6.36			
[8]BSL2b-4	6.36	8.48			
[8]BSL2b-5	8.48	10.60			
[8]BSL2b-6	10.60	12.72			
[8]BSL2b-7	12.72	14.84			
[4, 8]BSL2b-8	14.84	16.96			
[8]BSL2b-9	16.96	19.08	15.3	36.7	Dark gray (10YR 4/1) organic clay; less sticky than overlying layer; considerable oxidation; few identifiable plant fragments
[8]BSL2b-10	19.08	21.20			
[8]BSL2b-11	21.20	23.32			
[8]BSL2b-12	23.32	25.44			
[8]BSL2b-13	25.44	27.56			
[8]BSL2b-14	27.56	29.68			
[8]BSL2b-15	29.68	31.80			
[8]BSL2b-16	31.80	33.92			
[8]BSL2b-17	33.92	36.04			
[8]BSL2b-18	36.04	38.16			
[8]BSL2b-19	38.16	40.28	36.7	55.1	Very dark gray (10YR 3/1), slightly sticky organic clay; considerable oxidation
[8]BSL2b-20	40.28	42.40			
[8]BSL2b-21	42.40	44.52			
[8]BSL2b-22	44.52	46.64			
[8]BSL2b-23	46.64	48.76			
[8]BSL2b-24	48.76	50.88			
[8]BSL2b-25	50.88	53.00			
[8]BSL2b-26	53.00	55.12			
[8]BSL2b-27	55.12	57.24	55.1	74.5	Abrupt upper boundary; variable dark gray (10YR 4/1) and dark grayish-brown (10YR 4/2) silty clay; considerable oxidation; minimal plant fragments
[8]BSL2b-28	57.24	59.36			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
DISTRIBUTARY					
Bayou Sauvage					
Push-core BSDc—South of Blind Lagoon, Orleans Parish—Core taken on September 9, 1997 30°03'10.4" North latitude, 89°52'48" West longitude					
[9]BSDb-1	0.00	2.04	0.0	19.4	Black (2.5YR 2.5/0), dense, very fine peat; some visible grass stalks, abundant fine rootlets
[9]BSDb-2	2.04	4.08			
[9]BSDb--3	4.08	6.12			
[9]BSDb-4	6.12	8.16			
[9]BSDb-5	8.16	10.20			
[9]BSDb-6	10.20	12.24			
[9]BSDb-7	12.24	14.28			
[9]BSDb-8	14.28	16.32			
[9]BSDb-9	16.32	18.36			
[4, 9]BSDb-10	18.36	20.91	19.4	21.4	Black (2.5YR 2.5/0), dense, very fine peat grading downward to dark-gray (5YR 4/1) sticky organic clay
[9]BSDb-11	20.91	23.46	21.4	29.6	Dark-gray (5YR 4/1) sticky organic clay, fibrous plant fragments visible disseminated throughout
[9]BSDb-12	23.46	25.50			
[9]BSDb-13	25.50	27.54			
[9]BSDb-14	27.54	29.58			
[9]BSDb-15	29.58	31.11	29.6	33.7	Dark gray (5YR 4/1) sticky organic clay grading to coarser peat with very fine sand and silt; fine organic material disseminated throughout lowermost 2 cm
[9]BSDb-16	31.11	33.15			
[4, 9]BSDb-17	33.15	35.70	33.7	46.9	Black (10YR 2.5/1) coarse, fibrous peat from 33.7–39.8 cm with wood clasts that crumble to the touch; coarser very dark gray (5YR 3/1) peat from 39.8–46.9 cm
[9]BSDb-18	35.70	37.74			
[9]BSDb-19	37.74	39.78			
[9]BSDb-20	39.78	41.82			
[9]BSDb-21	41.82	43.86			
[9]BSDb-22	43.86	45.90			
[4, 9]BSDb-23	45.90	47.94			
[9]BSDb-24	47.94	49.98	46.9	50.5	Very dark gray (10YR 3/1) coarse, fibrous peat as from 33.7–39.8 cm, abundant well-preserved thick yellow coarse plant fragments (stems)
[4, 9]BSDb-25	49.98	52.02	50.5	58.7	Very dark gray (5YR 3/1) dense, coarse, fibrous peat with plant fragments larger than in overlying layer, plant fragments crumble to the touch
[9]BSDb-26	52.02	54.06			
[9]BSDb-27	54.06	56.10			
[9]BSDb-28	56.10	58.14			
[4, 9]BSDb-29	58.14	60.18	58.7	80.1	Very dark gray (5YR 3/1) coarse, fibrous peat, numerous fine plant fragments; plant fragments larger below 71.4 cm; charcoal fragment ≤1 cm diameter at 78.5 cm
[9]BSDb-30	60.18	62.22			
[9]BSDb-31	62.22	64.26			
[9]BSDb-32	64.26	66.30			
[9]BSDb-33	66.30	68.34			
[9]BSDb-34	68.34	70.38			
[9]BSDb-35	70.38	72.42			
[9]BSDb-36	72.42	74.46			

Table 1-2. Descriptive data for cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeter; °, degree; ', minute; ", second; ^{137}C, cesium-137; %, percent; ≥, greater than or equal to; m, meter; OC, organic carbon; mm, millimeter; ^{14}C, carbon-14; ~, is similar to; ≤, is less than or equal to]

Sample ID [1] (uncorrected depth interval in cm)	Sample-depth interval corrected for compaction [2]		Unit-depth interval corrected for compaction		Description[3]
	Top depth (cm)	Bottom depth (cm)	Top depth (cm)	Bottom depth (cm)	
BACKSWAMP					
St. Martin					
Push-core MR1d—West of Alligator Bayou in St. Martin Parish—Core taken on September 11, 1996 30°05'31" North latitude, 91°35'16.30" West longitude					
MR1c (32 samples taken every 2 cm; for depths see Appendix 2, table 2-1)			0.0	74.5	Laminated very fine sand, silty very fine sand and sandy silt Apparent large-scale down-core variations: Very dark gray (10YR 3/1, 40%), brown to dark brown (7.5YR 4/4, 25%), brown (7.5YR 5/4, 10%) and yellowish red (5YR 4/8, 25%) very fine sand and silt from 0 to 16 cm Dark reddish-brown (5YR 3/4) sandy silt from 16 to 24 cm Brown (7.5YR 5/4) silty sand from 24 to 32 cm Brown to dark brown (7.5YR 4/4) silty sand from 32 cm to 59 cm Dark yellowish brown (10YR 4/4) from 59 cm to base of core
St. Landry					
Push-core SL1b—Overflow basin backswamp, Atchafalaya Basin, St. Landry Parish—Core taken on September 12, 1996 30°27'41" North latitude, 91°51'38" West longitude					
SL1b (31 samples taken every 2 cm; for depths, see Appendix 2, table 2-1)			0.0	67.6	No description available
SWAMP					
Tangipahoa					
Push-core TN1b—Cypress swamp, Joyce Wildlife Management area north of Lake Maurepas, Tangipahoa Parish—Core taken on September 10, 1996 30°23'54" North latitude, 90°25'37.30" West longitude					
TN1b (33 samples taken every 2 cm; for depths, see Appendix 2, table 2-1)			0.0	103.8	Chaotic mixture of cypress pieces and various small roots and stems in an organic muck
Push-core TN1c—Cypress swamp, Joyce Wildlife Management area north of Lake Maurepas, Tangipahoa Parish—Core taken on September 10, 1996 30°23'54" North latitude, 90°25'37.30" West longitude;					
TN1c (37 samples taken every 2 cm; for depths, see Appendix 2, table 2-1)			0.0	89.7	Chaotic mixture of cypress pieces and various small roots and stems in an organic muck

[1]Sample ID generally includes a core identifier and either the sample number in sequence (starting at the top of the core) or the uncorrected depth interval for the sample.

[2]Intervals are primarily for samples analyzed for organic carbon and/or bulk density.

[3]The term *clayey* when used as a modifier for peat means clay-sized particles of inorganic or organic composition. If organic, then the interval has a high disseminated organic-matter content.

[4]Sample includes material from adjacent unit-depth intervals.

[5]The description for St. Bernard brackish marsh vibracore SB1c is modified from that in Markewich (1998a).

[6]Sample ID and corrected sample-depth values are for push-core PLAQb. Corrected unit-depth values and description are for push-core PLAQd.

[7]Sample ID and corrected sample-depth values are for push-core BSLa. Corrected unit-depth values and description are for push-core BSLb.

[8]Sample ID and corrected sample-depth values are for push-core BSL2b. Corrected unit-depth values and description are for push-core BSL2a.

[9]Sample ID and corrected sample-depth values are for push-core BSDb. Corrected unit-depth values and description are for push-core BSDc.

Appendix 2. Analytical and Derivative Soil/Sediment Organic Carbon Storage and Inventory Data

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
FRESH MARSH															
Bayou Verret push-core BV															
BV-0-4	2.97	13.70	—	—	—	0.53	0.53	—	—	—	79.91	80.92	0.07	0.06	—
BV-4-8	8.91	13.10	—	—	—	0.88	1.40	—	—	—	80.73	81.84	0.12	0.11	—
BV-8-12	14.85	10.70	—	—	—	0.80	2.20	—	—	—	77.35	78.57	0.13	0.13	—
BV-12-16	20.79	16.00	—	—	—	1.50	3.70	—	—	—	76.44	77.68	0.17	0.16	—
BV-16-20	26.73	9.96	—	—	—	0.97	4.68	—	—	—	72.32	73.47	0.17	0.16	—
BV-20-24	32.67	9.28	—	—	—	1.03	5.70	—	—	—	72.40	73.88	0.20	0.19	—
BV-24-28	38.60	16.20	—	—	—	0.84	6.54	—	—	—	84.51	85.49	0.09	0.09	—
BV-28-32	44.54	22.15	—	—	—	0.96	7.51	—	—	—	86.92	87.84	0.08	0.07	—
BV-32-36	50.48	13.70	—	—	—	1.21	8.72	—	—	—	77.09	78.38	0.16	0.15	—
BV-36-40	56.42	5.82	—	—	—	0.96	9.67	—	—	—	64.39	65.93	0.29	0.28	—
BV-40-44	62.36	8.01	—	—	—	0.91	10.58	—	—	—	71.49	73.09	0.20	0.19	—
BV-44-48	68.30	19.60	—	—	—	1.63	12.21	—	—	—	78.29	79.84	0.15	0.14	—
Lake Salvador push-core LSPa															
LSPa-1	1.06	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
LSPa-2	3.19	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPa-3	5.31	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
LSPa-4	7.44	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
LSPa-5	9.56	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPa-6	11.69	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPa-7	13.81	—	—	—	—	—	—	—	—	—	—	—	—	0.10	—
LSPa-8	15.94	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPa-9	18.06	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPa-10	20.19	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPa-11	22.31	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPa-12	24.44	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
LSPa-13	26.56	—	—	—	—	—	—	—	—	—	—	—	—	0.10	—
LSPa-14	28.69	—	—	—	—	—	—	—	—	—	—	—	—	0.12	—
LSPa-15	30.81	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPa-16	32.94	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
LSPa-17	35.06	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
LSPa-18	37.19	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
LSPa-19	39.31	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPa-20	41.44	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPa-21	43.56	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPa-22	45.69	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
LSPa-23	47.81	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
LSPa-24	49.94	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, kilogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
FRESH MARSH—Continued															
Lake Salvador push-core LSPb															
LSPb-1	1.09	35.56	<0.01	35.56	74.07	0.64	0.64	–27.62	2.77	1.11	—	91.25	—	0.08	4.00
LSPb-2	3.27	28.44	<0.01	28.44	60.87	0.65	1.3	–27.63	2.33	0.78	—	91.79	—	0.11	4.00
LSPb-3	5.45	29.53	<0.01	29.53	61.62	0.50	1.80	–26.91	2.19	0.43	—	93.63	—	0.08	4.00
LSPb-4	7.63	34.31	<0.01	34.31	70.08	0.62	2.42	–26.92	2.33	0.40	—	94.52	—	0.08	4.00
LSPb-5	9.81	33.88	<0.01	33.88	68.75	0.82	3.23	–27.44	2.11	0.51	—	89.55	—	0.11	4.00
LSPb-6	11.99	23.93	<0.01	23.93	49.78	0.56	3.79	–27.72	1.66	0.96	—	88.13	—	0.11	4.00
LSPb-7	14.17	30.79	<0.01	30.79	62.75	0.53	4.32	–27.48	1.84	1.05	—	89.95	—	0.08	4.00
LSPb-8	16.35	30.71	<0.01	30.71	61.81	0.54	4.86	–27.80	1.59	0.64	—	89.76	—	0.08	4.00
LSPb-9	18.52	22.41	<0.01	22.41	46.37	0.71	5.57	–27.67	1.61	0.69	—	91.32	—	0.15	5.00
LSPb-10	20.70	21.58	<0.01	21.58	43.22	0.54	6.11	–27.61	1.71	1.14	—	87.71	—	0.11	5.00
LSPb-11	22.88	24.90	<0.01	24.90	49.60	0.60	6.71	–27.34	1.70	0.66	—	86.43	—	0.11	6.00
LSPb-12	25.06	31.27	<0.01	31.27	60.63	0.63	7.34	–27.40	1.93	0.50	—	88.66	—	0.09	5.00
LSPb-13	27.24	28.95	<0.01	28.95	57.36	0.53	7.87	–27.72	2.08	0.79	—	89.76	—	0.08	5.00
LSPb-14	29.42	21.60	<0.01	21.60	42.60	0.52	8.39	–27.63	1.80	1.18	—	86.86	—	0.11	6.00
LSPb-15	31.60	19.68	<0.01	19.68	38.95	0.50	8.90	–27.82	1.49	0.84	—	89.62	—	0.12	6.00
LSPb-16	33.78	27.05	<0.01	27.05	53.33	0.43	9.33	–27.84	2.02	0.80	—	93.26	—	0.07	5.00
LSPb-17	35.96	30.21	<0.01	30.21	58.95	0.53	9.86	–27.71	2.19	1.20	—	92.65	—	0.08	5.00
LSPb-18	38.14	33.92	<0.01	33.92	65.69	0.57	10.43	–27.32	2.16	0.48	—	93.25	—	0.08	6.00
LSPb-19	40.32	37.60	<0.01	37.60	72.63	0.53	10.95	–27.04	2.03	–0.02	—	91.96	—	0.06	6.00
LSPb-20	42.50	40.93	<0.01	40.93	79.97	0.42	11.37	–26.86	2.18	–0.11	—	89.69	—	0.05	6.00
LSPb-21	44.68	42.63	<0.01	42.63	82.54	0.47	11.85	–26.86	2.14	–0.34	—	93.06	—	0.05	5.50
LSPb-22	46.86	42.90	<0.01	42.90	83.00	0.58	12.42	–26.80	2.08	–0.70	—	93.50	—	0.06	5.00
LSPb-23	49.04	41.67	<0.01	41.67	80.28	0.34	12.76	–26.74	2.10	–0.56	—	94.22	—	0.04	5.50
LSPb-24	51.22	43.61	<0.01	43.61	83.81	0.46	13.23	–26.54	2.17	–0.02	—	94.18	—	0.05	5.00
LSPb-25	53.39	43.79	<0.01	43.79	82.95	0.53	13.76	–26.17	2.12	–0.31	—	94.57	—	0.06	5.00
LSPb-26	55.57	42.14	<0.01	42.14	—	0.41	14.16	–26.11	2.14	0.01	—	94.24	—	0.04	5.00
LSPb-27	57.75	39.42	<0.01	39.42	—	0.29	14.45	–26.03	1.99	0.05	—	94.24	—	0.03	5.00
LSPb-28	59.93	35.56	<0.01	35.56	—	0.38	14.83	–26.14	1.83	–0.14	—	93.18	—	0.05	6.00
LSPb-29	62.11	29.52	<0.01	29.52	66.95	0.41	15.24	–26.19	1.62	0.11	—	91.38	—	0.06	6.00
LSPb-30	64.29	26.62	<0.01	26.62	53.78	0.53	15.77	–26.26	1.53	0.33	—	90.91	—	0.09	6.00
LSPb-31	66.47	24.97	<0.01	24.97	51.61	0.43	16.20	–26.29	1.46	0.06	—	91.07	—	0.08	6.00
LSPb-32	68.65	25.23	<0.01	25.23	50.46	0.53	16.72	–26.41	1.49	0.17	—	90.83	—	0.10	5.00
Lake Salvador push-core LSPc															
LSPc-1	1.05	—	—	—	—	—	—	—	—	—	—	—	—	0.10	—
LSPc-2	3.16	—	—	—	—	—	—	—	—	—	—	—	—	0.12	—
LSPc-3	5.26	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPc-4	7.37	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
LSPc-5	9.47	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
LSPc-6	11.58	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
LSPc-7	13.68	—	—	—	—	—	—	—	—	—	—	—	—	0.12	—
LSPc-8	15.79	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
FRESH MARSH—Continued															
Lake Salvador push-core LSPc—Continued															
LSPc-9	17.89	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPc-10	20.00	—	—	—	—	—	—	—	—	—	—	—	—	0.13	—
LSPc-11	22.11	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPc-12	24.21	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
LSPc-13	26.32	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPc-14	29.47	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPc-15	30.53	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPc-16	31.58	—	—	—	—	—	—	—	—	—	—	—	—	0.15	—
LSPc-17	34.74	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
LSPc-18	36.84	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
LSPc-19	38.95	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPc-20	41.05	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPc-21	43.16	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPc-22	45.26	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPc-23	47.37	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
LSPc-24	49.47	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
LSPc-25	51.58	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
LSPc-26	53.68	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
LSPc-27	55.79	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
Lake Salvador Hargis core LSHa															
LSHa	2	—	—	—	—	—	—	—	—	—	—	—	—	0.044	—
LSHa	4	—	—	—	—	—	—	—	—	—	—	—	—	0.074	—
LSHa	6	—	—	—	—	—	—	—	—	—	—	—	—	0.057	—
LSHa	8	—	—	—	—	—	—	—	—	—	—	—	—	0.075	—
LSHa	10	—	—	—	—	—	—	—	—	—	—	—	—	0.078	—
LSHa	12	—	—	—	—	—	—	—	—	—	—	—	—	0.059	—
LSHa	14	—	—	—	—	—	—	—	—	—	—	—	—	0.041	—
LSHa	16	—	—	—	—	—	—	—	—	—	—	—	—	0.066	—
LSHa	18	—	—	—	—	—	—	—	—	—	—	—	—	0.061	—
LSHa	20	—	—	—	—	—	—	—	—	—	—	—	—	0.057	—
LSHa	22	—	—	—	—	—	—	—	—	—	—	—	—	0.089	—
LSHa	24	—	—	—	—	—	—	—	—	—	—	—	—	0.036	—
LSHa	26	—	—	—	—	—	—	—	—	—	—	—	—	0.044	—
LSHa	28	—	—	—	—	—	—	—	—	—	—	—	—	0.057	—
LSHa	30	—	—	—	—	—	—	—	—	—	—	—	—	0.108	—
LSHa	32	—	—	—	—	—	—	—	—	—	—	—	—	0.043	—
LSHa	34	—	—	—	—	—	—	—	—	—	—	—	—	0.034	—
LSHa	36	—	—	—	—	—	—	—	—	—	—	—	—	0.030	—
LSHa	38	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LSHa	40	—	—	—	—	—	—	—	—	—	—	—	—	0.044	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
FRESH MARSH—Continued															
Lake Salvador Hargis core LSHb															
LSHb	2	—	—	—	—	—	—	—	—	—	—	—	—	0.080	—
LSHb	4	—	—	—	—	—	—	—	—	—	—	—	—	0.067	—
LSHb	6	—	—	—	—	—	—	—	—	—	—	—	—	0.108	—
LSHb	8	—	—	—	—	—	—	—	—	—	—	—	—	0.065	—
LSHb	10	—	—	—	—	—	—	—	—	—	—	—	—	0.046	—
LSHb	12	—	—	—	—	—	—	—	—	—	—	—	—	0.036	—
LSHb	14	—	—	—	—	—	—	—	—	—	—	—	—	0.120	—
LSHb	16	—	—	—	—	—	—	—	—	—	—	—	—	0.056	—
LSHb	18	—	—	—	—	—	—	—	—	—	—	—	—	0.071	—
LSHb	20	—	—	—	—	—	—	—	—	—	—	—	—	0.073	—
LSHb	22	—	—	—	—	—	—	—	—	—	—	—	—	0.078	—
LSHb	24	—	—	—	—	—	—	—	—	—	—	—	—	0.058	—
LSHb	26	—	—	—	—	—	—	—	—	—	—	—	—	0.094	—
LSHb	28	—	—	—	—	—	—	—	—	—	—	—	—	0.035	—
LSHb	30	—	—	—	—	—	—	—	—	—	—	—	—	0.078	—
LSHb	32	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LSHb	34	—	—	—	—	—	—	—	—	—	—	—	—	0.085	—
LSHb	36	—	—	—	—	—	—	—	—	—	—	—	—	0.067	—
LSHb	38	—	—	—	—	—	—	—	—	—	—	—	—	0.065	—
LSHb	40	—	—	—	—	—	—	—	—	—	—	—	—	0.071	—
LSHb	42	—	—	—	—	—	—	—	—	—	—	—	—	0.072	—
LSHb	44	—	—	—	—	—	—	—	—	—	—	—	—	0.067	—
LSHb	46	—	—	—	—	—	—	—	—	—	—	—	—	0.058	—
Lake Salvador Hargis core LSHc															
LSHc	2	—	—	—	—	—	—	—	—	—	—	—	—	0.039	—
LSHc	4	—	—	—	—	—	—	—	—	—	—	—	—	0.066	—
LSHc	6	—	—	—	—	—	—	—	—	—	—	—	—	0.032	—
LSHc	8	—	—	—	—	—	—	—	—	—	—	—	—	0.052	—
LSHc	10	—	—	—	—	—	—	—	—	—	—	—	—	0.093	—
LSHc	12	—	—	—	—	—	—	—	—	—	—	—	—	0.064	—
LSHc	14	—	—	—	—	—	—	—	—	—	—	—	—	0.059	—
LSHc	16	—	—	—	—	—	—	—	—	—	—	—	—	0.060	—
LSHc	18	—	—	—	—	—	—	—	—	—	—	—	—	0.070	—
LSHc	20	—	—	—	—	—	—	—	—	—	—	—	—	0.070	—
LSHc	22	—	—	—	—	—	—	—	—	—	—	—	—	0.056	—
LSHc	24	—	—	—	—	—	—	—	—	—	—	—	—	0.078	—
LSHc	26	—	—	—	—	—	—	—	—	—	—	—	—	0.072	—
LSHc	28	—	—	—	—	—	—	—	—	—	—	—	—	0.058	—
LSHc	30	—	—	—	—	—	—	—	—	—	—	—	—	0.028	—
LSHc	32	—	—	—	—	—	—	—	—	—	—	—	—	0.025	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; δ^{13}C, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; δ^{15}N, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	δ^{13}C (per mil)	TN (%)	δ^{15}N (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
FRESH MARSH—Continued															
Lake Salvador Hargis core LSHc—Continued															
LSHc	34	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LSHc	36	—	—	—	—	—	—	—	—	—	—	—	—	0.030	—
LSHc	38	—	—	—	—	—	—	—	—	—	—	—	—	0.071	—
LSHc	40	—	—	—	—	—	—	—	—	—	—	—	—	0.075	—
LSHc	42	—	—	—	—	—	—	—	—	—	—	—	—	0.065	—
LSHc	44	—	—	—	—	—	—	—	—	—	—	—	—	0.063	—
LSHc	46	—	—	—	—	—	—	—	—	—	—	—	—	0.059	—
LSHc	50	—	—	—	—	—	—	—	—	—	—	—	—	0.063	—
Lake Salvador vibracore LSPe															
LSPe-0-2	1.15	—	—	—	—	—	—	—	—	—	—	—	—	0.15	—
LSPe-2-4	3.44	—	—	—	—	—	—	—	—	—	—	—	—	0.15	—
LSPe-4-6	5.74	—	—	—	—	—	—	—	—	—	—	—	—	0.12	—
LSPe-6-8	8.04	—	—	—	—	—	—	—	—	—	—	—	—	0.10	—
LSPe-8-10	10.33	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPe-10-12	12.63	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPe-12-14	14.92	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPe-14-16	17.22	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
LSPe-16-18	19.52	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPe-18-20	21.81	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPe-20-22	24.11	—	—	—	—	—	—	—	—	—	—	—	—	0.10	—
LSPe-22-24	26.40	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPe-24-26	28.70	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
LSPe-26-28	31.00	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPe-28-30	33.29	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPe-30-32	35.59	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPe-32-34	37.88	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPe-34-36	40.18	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPe-36-38	42.48	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPe-38-40	44.77	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPe-40-42	47.07	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPe-42-44	49.36	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
LSPe-44-46	51.66	—	—	—	—	—	—	—	—	—	—	—	—	0.12	—
LSPe-46-48	53.96	—	—	—	—	—	—	—	—	—	—	—	—	0.13	—
LSPe-48-50	56.25	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
LSPe-56-60	66.58	44.19	<0.01	44.19	80.39	—	—	–27.06	2.70	–0.45	—	—	—	0.11	—
LSPe-64-68	75.77	36.03	<0.01	36.03	68.86	—	—	–27.15	2.56	0.21	—	—	—	0.14	—
LSPe-72-76	84.95	35.83	<0.01	35.83	66.80	—	—	–27.08	2.44	0.61	—	—	—	0.15	—
LSPe-80-84	94.13	43.39	<0.01	43.39	79.42	—	—	–27.22	2.53	0.24	—	—	—	0.14	—
LSPe-88-92	103.32	42.84	<0.01	42.84	78.87	—	—	–27.38	2.44	–0.17	—	—	—	0.17	—
LSPe-96-98	111.35	42.80	<0.01	42.80	—	—	—	–27.20	2.54	0.32	—	—	—	0.17	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, kilogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
FRESH MARSH—Continued															
Lake Salvador vibracore LSPe															
LSPe-100-102	115.95	22.93	<0.01	22.93	43.13	—	—	–27.17	1.09	–0.90	—	—	—	0.26	—
LSPe-105-107	121.69	36.64	<0.01	36.64	—	—	—	–27.01	1.69	–1.21	—	—	—	0.22	—
LSPe-145-150	169.33	45.77	<0.01	45.77	86.08	—	—	–27.16	2.44	–0.69	—	—	—	0.10	—
LSPe-176-178	203.19	34.31	<0.01	34.31	—	—	—	–27.31	1.68	–1.38	—	—	—	0.18	—
LSPe-184-186	212.38	7.47	<0.01	7.47	—	—	—	-27.24	0.37	–0.32	—	—	—	0.44	—
LSPe-192-194	221.56	2.42	<0.01	2.42	—	—	—	–26.50	0.16	0.85	—	—	—	0.55	—
LSPe-195-200	226.73	2.54	<0.01	2.54	11.30	—	—	–26.22	0.16	1.03	—	—	—	0.48	—
LSPe-234-236	269.77	2.80	0.06	2.74	—	—	—	–25.63	0.19	1.51	—	—	—	0.69	—
LSPe-240-242	276.66	30.38	0.04	30.34	—	—	—	–25.92	2.05	0.12	—	—	—	0.18	—
LSPe-245-250	284.12	13.61	0.01	13.60	28.19	—	—	–23.97	1.20	0.20	—	—	—	0.24	—
LSPe-280-282	322.58	14.23	0.01	14.22	—	—	—	–24.09	1.17	1.08	—	—	—	0.29	—
LSPe-294-296	338.65	3.77	0.01	3.76	—	—	—	–23.91	0.34	0.81	—	—	—	0.56	—
LSPe-302-304	347.84	1.79	0.03	1.76	6.51	—	—	–23.13	0.18	1.04	—	—	—	0.71	—
LSPe-310-312	357.02	1.56	0.07	1.49	—	—	—	–22.63	0.14	1.33	—	—	—	0.56	—
LSPe-410-412	471.82	1.07	0.45	0.62	5.28	—	—	–15.35	0.06	3.37	—	—	—	0.44	—
LSPe-510-512	586.61	0.91	0.47	0.44	4.68	—	—	–13.04	0.05	4.45	—	—	—	0.62	—
LSPe-522-524	600.39	1.10	0.51	0.59	—	—	—	–13.73	0.06	3.90	—	—	—	0.46	—
LSPe-528-530	607.28	0.87	0.47	0.40	—	—	—	–12.34	0.04	3.72	—	—	—	0.55	—
LSPe-545-547	626.79	0.87	0.46	0.41	—	—	—	–12.26	0.04	4.63	—	—	—	0.76	—
LSPe-562-564	646.31	0.96	0.50	0.46	—	—	—	–12.51	0.04	4.23	—	—	—	0.89	—
LSPe-567-569	652.05	1.05	0.49	0.56	—	—	—	–14.39	0.04	3.55	—	—	—	0.72	—
Lake Salvador vibracore LSPf															
LSPf-64-68	73.34	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPf-72-76	82.23	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
LSPf-80-84	91.12	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
LSPf-88-92	100.01	—	—	—	—	—	—	—	—	—	—	—	—	0.13	—
LSPf-96-98	107.79	—	—	—	—	—	—	—	—	—	—	—	—	0.14	—
LSPf-100-102	112.23	—	—	—	—	—	—	—	—	—	—	—	—	0.14	—
LSPf-145-150	163.91	—	—	—	—	—	—	—	—	—	—	—	—	0.10	—
LSPf-195-200	219.47	—	—	—	—	—	—	—	—	—	—	—	—	0.12	—
LSPf-245-250	275.03	—	—	—	—	—	—	—	—	—	—	—	—	0.48	—
LSPf-280-282	302.26	—	—	—	—	—	—	—	—	—	—	—	—	0.68	—
LSPf-294-296	327.81	—	—	—	—	—	—	—	—	—	—	—	—	0.27	—
LSPf-302-304	336.70	—	—	—	—	—	—	—	—	—	—	—	—	0.24	—
LSPf-310-312	345.59	—	—	—	—	—	—	—	—	—	—	—	—	0.34	—
LSPf-322-324	358.93	—	—	—	—	—	—	—	—	—	—	—	—	0.66	—
LSPf-348-350	387.82	—	—	—	—	—	—	—	—	—	—	—	—	0.80	—
LSPf-410-412	456.72	—	—	—	—	—	—	—	—	—	—	—	—	0.98	—
LSPf-510-512	567.84	—	—	—	—	—	—	—	—	—	—	—	—	0.78	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

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Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
FRESH MARSH—Continued															
Lake Salvador McCauley core LSMa															
LSMa	60	—	—	—	—	—	—	—	—	—	—	—	—	0.037	—
LSMa	68	—	—	—	—	—	—	—	—	—	—	—	—	0.027	—
LSMa	76	—	—	—	—	—	—	—	—	—	—	—	—	0.101	—
LSMa	84	—	—	—	—	—	—	—	—	—	—	—	—	0.077	—
LSMa	92	—	—	—	—	—	—	—	—	—	—	—	—	0.046	—
LSMa	100	—	—	—	—	—	—	—	—	—	—	—	—	0.042	—
LSMa	150	—	—	—	—	—	—	—	—	—	—	—	—	0.088	—
LSMa	200	—	—	—	—	—	—	—	—	—	—	—	—	0.146	—
LSMa	205	—	—	—	—	—	—	—	—	—	—	—	—	0.157	—
LSMa	233	—	—	—	—	—	—	—	—	—	—	—	—	0.124	—
LSMa	250	—	—	—	—	—	—	—	—	—	—	—	—	0.132	—
LSMa	255	—	—	—	—	—	—	—	—	—	—	—	—	0.180	—
LSMa	265	—	—	—	—	—	—	—	—	—	—	—	—	0.643	—
LSMa	300	—	—	—	—	—	—	—	—	—	—	—	—	0.962	—
Lake Salvador McCauley core LSMb															
LSMb	60	—	—	—	—	—	—	—	—	—	—	—	—	0.028	—
LSMb	68	—	—	—	—	—	—	—	—	—	—	—	—	0.041	—
LSMb	76	—	—	—	—	—	—	—	—	—	—	—	—	0.098	—
LSMb	84	—	—	—	—	—	—	—	—	—	—	—	—	0.072	—
LSMb	92	—	—	—	—	—	—	—	—	—	—	—	—	0.067	—
LSMb	100	—	—	—	—	—	—	—	—	—	—	—	—	0.092	—
LSMb	150	—	—	—	—	—	—	—	—	—	—	—	—	0.093	—
LSMb	200	—	—	—	—	—	—	—	—	—	—	—	—	0.131	—
LSMb	205	—	—	—	—	—	—	—	—	—	—	—	—	0.143	—
LSMb	233	—	—	—	—	—	—	—	—	—	—	—	—	0.123	—
LSMb	250	—	—	—	—	—	—	—	—	—	—	—	—	0.135	—
LSMb	255	—	—	—	—	—	—	—	—	—	—	—	—	0.154	—
LSMb	265	—	—	—	—	—	—	—	—	—	—	—	—	0.455	—
LSMb	300	—	—	—	—	—	—	—	—	—	—	—	—	0.775	—
Lake Salvador McCauley core LSMc															
LSMc	60	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LSMc	68	—	—	—	—	—	—	—	—	—	—	—	—	0.047	—
LSMc	78	—	—	—	—	—	—	—	—	—	—	—	—	0.027	—
LSMc	84	—	—	—	—	—	—	—	—	—	—	—	—	0.031	—
LSMc	92	—	—	—	—	—	—	—	—	—	—	—	—	0.052	—
LSMc	100	—	—	—	—	—	—	—	—	—	—	—	—	0.103	—
LSMc	150	—	—	—	—	—	—	—	—	—	—	—	—	0.071	—
LSMc	200	—	—	—	—	—	—	—	—	—	—	—	—	0.142	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

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Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
FRESH MARSH—Continued															
Lake Salvador McCauley core LSMc–Continued															
LSMc	205	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LSMc	233	—	—	—	—	—	—	—	—	—	—	—	—	0.119	—
LSMc	250	—	—	—	—	—	—	—	—	—	—	—	—	0.144	—
LSMc	255	—	—	—	—	—	—	—	—	—	—	—	—	0.133	—
LSMc	265	—	—	—	—	—	—	—	—	—	—	—	—	0.244	—
LSMc	300	—	—	—	—	—	—	—	—	—	—	—	—	0.704	—
St. Mary push-core SM1a															
SM1a-1	1.27	18.08	<0.01	18.08	—	0.74	0.74	–24.9	1.22	3.7	77.42	78.74	0.16	0.16	4.00
SM1a-2	3.81	16.58	<0.01	16.58	—	0.91	1.64	–25.0	1.10	2.3	76.74	78.02	0.22	0.22	4.00
SM1a-3	6.35	16.62	<0.01	16.62	—	0.91	2.56	–25.1	1.18	2.6	79.33	80.49	0.22	0.22	4.00
SM1a-4	8.89	16.52	<0.01	16.52	—	0.81	3.37	–23.9	1.13	4.8	79.79	80.90	0.20	0.19	6.00
SM1a-5	11.43	15.99	<0.01	15.99	—	0.73	4.10	–25.2	0.99	2.6	81.35	82.38	0.18	0.18	6.00
SM1a-6	13.97	15.15	<0.01	15.15	—	0.68	4.79	–24.5	0.94	3.4	79.63	80.79	0.18	0.18	5.00
SM1a-7	16.51	13.51	<0.01	13.51	—	0.57	5.36	–24.6	0.90	5.2	80.15	81.17	0.17	0.17	5.00
SM1a-8	19.05	23.03	<0.01	23.03	—	0.69	6.05	–23.3	1.38	0.6	85.00	85.88	0.12	0.12	4.00
SM1a-9	21.59	21.14	<0.01	21.14	—	0.58	6.62	–24.3	1.68	0.0	85.90	86.73	0.11	0.11	4.00
SM1a-10	24.13	29.02	<0.01	29.02	—	1.19	7.82	–23.5	2.21	0.1	79.11	80.33	0.16	0.16	4.00
SM1a-11	26.67	29.55	<0.01	29.55	—	0.71	8.53	–25.2	1.79	–0.1	87.59	88.41	0.10	0.10	4.00
SM1a-12	29.21	41.21	<0.01	41.21	—	0.75	9.28	–26.4	2.44	–2.4	90.55	91.29	0.07	0.07	4.00
SM1a-13	31.75	40.83	<0.01	40.83	—	0.77	10.06	–25.6	2.62	0.4	90.01	90.75	0.08	0.07	4.00
SM1a-14	34.29	39.98	<0.01	39.98	—	0.77	10.82	–24.3	2.63	–3.9	89.84	90.56	0.08	0.08	4.00
SM1a-15	36.83	41.39	<0.01	41.39	—	0.84	11.66	–23.1	2.42	–4.4	89.50	90.26	0.08	0.08	4.00
SM1a-16	39.37	41.93	<0.01	41.93	—	1.04	12.70	–22.8	2.48	0.1	87.15	88.16	0.10	0.10	4.00
SM1a-17	41.91	42.69	<0.01	42.69	—	1.10	13.79	–23.1	2.36	–4.9	87.16	88.11	0.10	0.10	4.00
SM1a-18	44.45	42.92	<0.01	42.92	—	1.41	15.21	–22.8	2.39	–5.1	84.39	85.53	0.13	0.13	4.00
SM1a-19	46.99	41.34	<0.01	41.34	—	1.08	16.29	–22.8	2.40	1.0	86.74	87.68	0.10	0.10	4.00
SM1a-20	49.53	39.16	<0.01	39.16	—	0.97	17.26	–24.9	1.80	–2.7	87.50	88.40	0.10	0.10	4.00
SM1a-21	52.07	41.94	<0.01	41.94	—	1.12	18.39	–22.7	1.92	–3.5	86.96	87.89	0.11	0.11	4.00
SM1a-22	54.61	32.96	<0.01	32.96	—	0.83	19.22	–22.8	1.93	–3.1	87.32	88.22	0.10	0.10	4.00
SM1a-23	57.15	40.24	<0.01	40.24	—	1.10	20.32	–23.0	2.08	0.9	87.17	88.10	0.11	0.11	4.00
SM1a-24	59.69	34.62	<0.01	34.62	—	0.91	21.22	–23.1	1.88	–2.7	86.14	87.11	0.10	0.10	4.00
SM1a-25	62.23	28.31	<0.01	28.31	—	1.05	22.27	–22.7	1.58	–2.6	83.85	84.99	0.15	0.15	—
SM1a-26	64.77	11.45	<0.01	11.45	—	0.82	23.10	–19.4	0.66	5.1	72.03	73.41	0.29	0.28	—
SM1a-27	67.31	12.36	<0.01	12.36	—	0.92	24.02	–20.1	0.58	1.7	71.22	72.65	0.30	0.29	—
SM1a-28	69.85	9.52	<0.01	9.52	—	0.86	24.88	–21.3	0.42	1.6	66.01	67.35	0.36	0.36	—
SM1a-29	72.39	12.69	<0.01	12.69	—	1.15	26.03	–22.4	0.79	4.5	—	—	0.36	0.36	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
							FRESH MARSH—Continued								
							St. Mary push-core SM1b								
SM1b-1	1.06	—	—	—	—	—	—	—	—	—	77.31	78.43	0.22	0.21	—
SM1b-2	3.18	—	—	—	—	—	—	—	—	—	78.82	79.73	0.22	0.21	—
SM1b-3	5.30	—	—	—	—	—	—	—	—	—	79.75	80.49	0.20	0.20	—
SM1b-4	7.42	—	—	—	—	—	—	—	—	—	80.12	81.01	0.20	0.19	—
SM1b-5	9.54	—	—	—	—	—	—	—	—	—	80.80	81.44	0.21	0.20	—
SM1b-6	11.66	—	—	—	—	—	—	—	—	—	81.41	81.99	0.19	0.18	—
SM1b-7	13.78	—	—	—	—	—	—	—	—	—	82.37	82.90	0.21	0.21	—
SM1b-8	15.90	—	—	—	—	—	—	—	—	—	82.06	82.64	0.18	0.18	—
SM1b-9	18.02	—	—	—	—	—	—	—	—	—	85.69	86.25	0.16	0.15	—
SM1b-10	20.14	—	—	—	—	—	—	—	—	—	87.62	88.01	0.14	0.14	—
SM1b-11	22.26	—	—	—	—	—	—	—	—	—	89.18	89.67	0.12	0.11	—
SM1b-12	24.38	—	—	—	—	—	—	—	—	—	90.48	90.98	0.10	0.09	—
SM1b-13	26.50	—	—	—	—	—	—	—	—	—	90.56	90.80	0.11	0.10	—
SM1b-14	28.62	—	—	—	—	—	—	—	—	—	89.39	89.93	0.11	0.10	—
SM1b-15	30.74	—	—	—	—	—	—	—	—	—	87.97	88.59	0.15	0.14	—
SM1b-16	32.86	—	—	—	—	—	—	—	—	—	87.35	88.23	0.13	0.13	—
SM1b-17	34.98	—	—	—	—	—	—	—	—	—	87.66	88.05	0.13	0.12	—
SM1b-18	37.10	—	—	—	—	—	—	—	—	—	88.08	88.36	0.13	0.12	—
SM1b-19	39.22	—	—	—	—	—	—	—	—	—	87.13	88.11	0.15	0.14	—
SM1b-20	41.34	—	—	—	—	—	—	—	—	—	88.09	88.91	0.11	0.10	—
SM1b-21	43.46	—	—	—	—	—	—	—	—	—	87.98	88.74	0.13	0.12	—
SM1b-22	45.58	—	—	—	—	—	—	—	—	—	87.71	88.52	0.14	0.13	—
SM1b-23	47.70	—	—	—	—	—	—	—	—	—	88.17	88.98	0.12	0.11	—
SM1b-24	49.82	—	—	—	—	—	—	—	—	—	86.50	87.44	0.15	0.14	—
SM1b-25	51.94	—	—	—	—	—	—	—	—	—	86.72	87.60	0.15	0.14	—
SM1b-26	54.06	—	—	—	—	—	—	—	—	—	86.33	87.01	0.15	0.14	—
SM1b-27	56.18	—	—	—	—	—	—	—	—	—	85.34	86.28	0.15	0.14	—
SM1b-28	58.30	—	—	—	—	—	—	—	—	—	84.84	85.80	0.16	0.15	—
SM1b-29	60.42	—	—	—	—	—	—	—	—	—	78.93	80.18	0.24	0.23	—
SM1b-30	63.07	—	—	—	—	—	—	—	—	—	77.09	78.15	0.22	0.21	—
SM1b-31	65.72	—	—	—	—	—	—	—	—	—	75.86	76.94	0.29	0.27	—
SM1b-32	67.84	—	—	—	—	—	—	—	—	—	72.65	73.86	0.33	0.31	—
SM1b-33	69.96	—	—	—	—	—	—	—	—	—	76.34	77.44	0.30	0.28	—
SM1b-34	72.08	—	—	—	—	—	—	—	—	—	77.38	78.50	0.23	0.22	—
SM1b-35	74.20	—	—	—	—	—	—	—	—	—	75.70	76.94	0.25	0.24	—
SM1b-36	76.32	—	—	—	—	—	—	—	—	—	78.31	79.48	0.24	0.23	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
FRESH MARSH—Continued															
St. Mary vibracore SM1c															
SM1c-5	5.40	14.1	<0.01	14.1	—	3.26	3.26	–23.6	0.95	2.18	—	—	—	—	—
SM1c-13	20.66	14.0	<0.01	14.0	—	4.01	7.27	–23.9	0.88	0.72	—	—	—	—	—
SM1c-35	43.23	27.1	<0.01	27.1	—	7.19	14.46	–24.3	1.44	0.86	—	—	—	—	—
SM1c-53	70.88	38.2	<0.01	38.2	—	35.30	49.75	–25.0	2.01	0.83	—	—	—	—	—
SM1c-69	88.37	28.8	<0.01	28.8	—	4.36	54.11	–26.2	1.48	–0.20	—	—	—	—	—
SM1c-80	96.95	34.9	<0.01	34.9	—	11.29	65.40	–26.0	1.93	0.46	—	—	—	—	—
SM1c-82.0	109.98	34.9	<0.01	34.9	—	11.42	76.82	—	—	—	—	—	—	—	—
SM1c-92.5	118.40	18.2	<0.01	18.2	—	1.18	78.00	—	—	—	—	—	—	—	—
SM1c-96	124.44	18.2	<0.01	18.2	—	3.45	81.45	–24.9	0.60	0.51	—	—	—	—	—
SM1c-110	138.27	47.9	<0.01	47.9	—	14.24	95.69	–25.5	1.22	–0.32	—	—	—	—	—
SM1c-123	151.62	50.6	<0.01	50.6	—	2.91	98.618	—	—	—	89.8	—	0.06	—	—
SM1c-127	164.34	50.6	<0.01	50.6	—	6.06	104.66	–25.5	1.38	–0.48	—	—	—	—	—
SM1c-141	177.05	28.4	<0.01	28.4	—	1.64	106.30	–25.9	1.04	0.17	—	—	—	—	—
SM1c-144	183.09	28.4	<0.01	28.4	—	0.76	107.06	—	—	—	89.7	—	—	—	—
SM1c-163	194.53	50.6	<0.01	50.6	—	6.73	113.79	—	—	—	—	—	0.06	—	—
SM1c-168	212.65	50.6	<0.01	50.6	—	6.06	119.84	–25.7	1.54	–0.05	—	—	—	—	—
SM1c-186	230.13	42.2	<0.01	42.2	—	5.24	125.089	–21.9	2.00	–0.30	—	—	—	—	—
SM1c-190	245.39	42.2	<0.01	42.2	—	3.74	128.82	—	—	—	87.6	—	0.06	—	—
SM1c-206	259.06	23.3	<0.01	23.3	—	3.52	132.34	–17.3	1.14	–0.49	—	—	—	—	—
SM1c-213	268.91	23.3	<0.01	23.3	—	1.70	134.04	—	—	—	85.1	—	0.13	—	—
INTERMEDIATE MARSH															
Bayou Perot push-core BPPa															
BPPa-1	1.21	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPa-2	3.64	—	—	—	—	—	—	—	—	—	—	—	—	0.10	—
BPPa-3	6.07	—	—	—	—	—	—	—	—	—	—	—	—	0.13	—
BPPa-4	8.50	—	—	—	—	—	—	—	—	—	—	—	—	0.10	—
BPPa-5	10.93	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
BPPa-6	13.36	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPa-7	15.79	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
BPPa-8	18.21	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPa-9	20.64	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPa-10	23.07	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPa-11	25.50	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPa-12	27.93	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPa-13	30.36	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPa-14	32.79	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPa-15	35.22	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
BPPa-16	37.64	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
BPPa-17	40.07	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
BPPa-18	42.50	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
BPPa-19	44.93	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPa-20	47.36	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
BPPa-21	49.79	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
INTERMEDIATE MARSH—Continued															
Bayou Perot push-core BPPb															
BPPb-1	1.05	38.42	<0.01	38.42	75.8	0.58	0.58	–24.86	2.23	–0.02	—	90.96	—	0.07	5.00
BPPb-2	3.15	39.62	<0.01	39.62	77.0	0.69	1.27	–24.73	2.22	–0.18	—	90.72	—	0.08	5.00
BPPb-3	5.26	39.67	<0.01	39.67	76.6	0.58	1.85	–24.87	2.28	–0.21	—	91.01	—	0.07	5.00
BPPb-4	7.36	40.95	<0.01	40.95	78.4	0.76	2.61	–24.96	2.29	–0.23	—	91.46	—	0.09	5.00
BPPb-5	9.46	42.99	<0.01	42.99	81.8	0.60	3.21	–24.56	2.13	–0.26	—	91.67	—	0.07	5.00
BPPb-6	11.56	43.49	<0.01	43.49	83.3	0.67	3.88	–24.44	2.05	–0.25	—	91.76	—	0.07	5.00
BPPb-7	13.67	44.11	<0.01	44.11	83.7	0.79	4.67	–24.09	1.95	–0.41	—	91.37	—	0.08	5.00
BPPb-8	15.77	44.48	<0.01	44.48	84.4	0.67	5.34	–23.65	1.87	–0.44	—	91.22	—	0.07	5.00
BPPb-9	17.87	42.58	<0.01	42.58	81.8	0.59	5.93	–23.86	1.98	–0.37	—	91.52	—	0.07	5.00
BPPb-10	19.97	40.03	<0.01	40.03	76.6	0.67	6.60	–24.70	2.24	–0.21	—	91.42	—	0.08	5.00
BPPb-11	22.08	37.29	<0.01	37.29	72.9	0.61	7.20	–25.30	2.30	–0.30	—	91.78	—	0.08	5.00
BPPb-12	24.18	37.58	<0.01	37.58	72.5	0.54	7.75	–25.35	2.34	–0.26	—	91.84	—	0.07	6.00
BPPb-13	26.28	34.49	<0.01	34.49	67.4	0.49	8.24	–25.60	2.27	–0.16	—	91.23	—	0.07	5.00
BPPb-14	28.39	34.52	<0.01	34.52	67.2	0.55	8.79	–25.40	2.33	–0.10	—	91.36	—	0.08	6.00
BPPb-15	30.49	33.21	<0.01	33.21	66.1	0.52	9.31	–25.84	2.15	–0.11	—	91.52	—	0.08	6.00
BPPb-16	32.59	32.15	<0.01	32.15	64.0	0.50	9.81	–25.64	2.05	–0.30	—	91.22	—	0.07	7.00
BPPb-17	34.69	30.89	<0.01	30.89	61.8	0.46	10.27	–25.09	1.99	–0.45	—	91.28	—	0.07	7.00
BPPb-18	36.80	33.96	<0.01	33.96	67.9	0.51	10.79	–22.27	1.91	–0.78	—	91.61	—	0.07	7.00
BPPb-19	38.90	33.73	<0.01	33.73	67.9	0.43	11.22	–21.96	1.96	–0.50	—	92.15	—	0.06	7.00
BPPb-20	41.00	33.86	<0.01	33.86	68.3	0.47	11.69	–22.47	2.14	–0.35	—	92.84	—	0.07	7.00
BPPb-21	43.10	36.26	<0.01	36.26	72.1	0.37	12.06	–23.48	2.19	–0.66	—	93.62	—	0.05	7.00
BPPb-22	45.21	39.65	<0.01	39.65	77.6	0.46	12.52	–24.45	2.27	–0.44	—	93.60	—	0.06	7.00
BPPb-23	47.31	41.38	<0.01	41.38	80.4	0.47	12.99	–24.31	2.29	–0.58	—	93.48	—	0.05	7.00
BPPb-24	49.41	43.19	<0.01	43.19	83.9	0.50	13.50	–24.59	2.34	–0.61	—	93.37	—	0.06	7.00
BPPb-25	51.51	40.81	<0.01	40.81	79.2	0.54	14.04	–24.03	2.48	–0.42	—	93.43	—	0.06	7.00
BPPb-26	53.62	44.23	<0.01	44.23	—	0.57	14.61	–24.14	2.36	–0.68	—	93.13	—	0.06	7.00
BPPb-27	55.72	45.46	<0.01	45.46	—	0.71	15.32	–24.69	2.52	–0.55	—	92.45	—	0.07	7.00
BPPb-28	57.82	48.62	<0.01	48.62	—	0.62	15.93	–25.64	2.07	–1.51	—	93.05	—	0.06	7.00
BPPb-29	59.92	45.98	<0.01	45.98	—	0.52	16.46	–24.29	2.63	–0.82	—	93.32	—	0.05	7.00
Bayou Perot push-core BPPc															
BPPc-1	1.16	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPc-2	3.47	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPc-3	5.78	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPc-4	8.09	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPc-5	10.41	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
BPPc-6	12.72	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPc-7	15.03	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPc-8	17.34	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPc-9	19.66	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
BPPc-10	21.97	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
INTERMEDIATE MARSH—Continued															
Bayou Perot push-core BPPc—Continued															
BPPc-11	24.28	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
BPPc-12	26.59	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPc-13	28.91	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPc-14	31.22	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPc-15	33.53	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPc-16	35.84	—	—	—	—	—	—	—	—	—	—	—	—	0.07	—
BPPc-17	38.15	—	—	—	—	—	—	—	—	—	—	—	—	0.04	—
BPPc-18	40.47	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
BPPc-19	42.78	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
BPPc-20	45.09	—	—	—	—	—	—	—	—	—	—	—	—	0.06	—
BPPc-21	47.40	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
BPPc-22	49.72	—	—	—	—	—	—	—	—	—	—	—	—	0.05	—
BPPc-23	52.03	—	—	—	—	—	—	—	—	—	—	—	—	0.04	—
Bayou Perot Hargis core BPHa															
BPHa	2	—	—	—	—	—	—	—	—	—	—	—	—	0.092	—
BPHa	4	—	—	—	—	—	—	—	—	—	—	—	—	0.117	—
BPHa	6	—	—	—	—	—	—	—	—	—	—	—	—	0.086	—
BPHa	8	—	—	—	—	—	—	—	—	—	—	—	—	0.050	—
BPHa	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BPHa	12	—	—	—	—	—	—	—	—	—	—	—	—	0.042	—
BPHa	14	—	—	—	—	—	—	—	—	—	—	—	—	0.052	—
BPHa	16	—	—	—	—	—	—	—	—	—	—	—	—	0.059	—
BPHa	18	—	—	—	—	—	—	—	—	—	—	—	—	0.080	—
BPHa	20	—	—	—	—	—	—	—	—	—	—	—	—	0.059	—
BPHa	22	—	—	—	—	—	—	—	—	—	—	—	—	0.073	—
BPHa	24	—	—	—	—	—	—	—	—	—	—	—	—	0.094	—
BPHa	26	—	—	—	—	—	—	—	—	—	—	—	—	0.081	—
BPHa	28	—	—	—	—	—	—	—	—	—	—	—	—	0.072	—
BPHa	30	—	—	—	—	—	—	—	—	—	—	—	—	0.044	—
BPHa	32	—	—	—	—	—	—	—	—	—	—	—	—	0.039	—
BPHa	34	—	—	—	—	—	—	—	—	—	—	—	—	0.033	—
BPHa	36	—	—	—	—	—	—	—	—	—	—	—	—	0.036	—
Bayou Perot Hargis core BPHb															
BPHb	2	—	—	—	—	—	—	—	—	—	—	—	—	0.060	—
BPHb	4	—	—	—	—	—	—	—	—	—	—	—	—	0.066	—
BPHb	6	—	—	—	—	—	—	—	—	—	—	—	—	0.062	—
BPHb	8	—	—	—	—	—	—	—	—	—	—	—	—	0.065	—
BPHb	10	—	—	—	—	—	—	—	—	—	—	—	—	0.082	—
BPHb	12	—	—	—	—	—	—	—	—	—	—	—	—	0.074	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
INTERMEDIATE MARSH—Continued															
Bayou Perot Hargis core BPHb—Continued															
BPHb	14	—	—	—	—	—	—	—	—	—	—	—	—	0.095	—
BPHb	16	—	—	—	—	—	—	—	—	—	—	—	—	0.080	—
BPHb	18	—	—	—	—	—	—	—	—	—	—	—	—	0.110	—
BPHb	20	—	—	—	—	—	—	—	—	—	—	—	—	0.127	—
BPHb	22	—	—	—	—	—	—	—	—	—	—	—	—	0.076	—
BPHb	24	—	—	—	—	—	—	—	—	—	—	—	—	0.069	—
BPHb	26	—	—	—	—	—	—	—	—	—	—	—	—	0.082	—
BPHb	28	—	—	—	—	—	—	—	—	—	—	—	—	0.081	—
BPHb	30	—	—	—	—	—	—	—	—	—	—	—	—	0.088	—
BPHb	32	—	—	—	—	—	—	—	—	—	—	—	—	0.068	—
BPHb	34	—	—	—	—	—	—	—	—	—	—	—	—	0.041	—
BPHb	36	—	—	—	—	—	—	—	—	—	—	—	—	0.037	—
BPHb	38	—	—	—	—	—	—	—	—	—	—	—	—	0.034	—
BPHb	40	—	—	—	—	—	—	—	—	—	—	—	—	0.029	—
Bayou Perot Hargis core BPHc															
BPHc	2	—	—	—	—	—	—	—	—	—	—	—	—	0.071	—
BPHc	4	—	—	—	—	—	—	—	—	—	—	—	—	0.084	—
BPHc	6	—	—	—	—	—	—	—	—	—	—	—	—	0.077	—
BPHc	8	—	—	—	—	—	—	—	—	—	—	—	—	0.069	—
BPHc	10	—	—	—	—	—	—	—	—	—	—	—	—	0.071	—
BPHc	12	—	—	—	—	—	—	—	—	—	—	—	—	0.074	—
BPHc	14	—	—	—	—	—	—	—	—	—	—	—	—	0.078	—
BPHc	16	—	—	—	—	—	—	—	—	—	—	—	—	0.066	—
BPHc	18	—	—	—	—	—	—	—	—	—	—	—	—	0.079	—
BPHc	20	—	—	—	—	—	—	—	—	—	—	—	—	0.070	—
BPHc	22	—	—	—	—	—	—	—	—	—	—	—	—	0.074	—
BPHc	24	—	—	—	—	—	—	—	—	—	—	—	—	0.094	—
BPHc	26	—	—	—	—	—	—	—	—	—	—	—	—	0.061	—
BPHc	28	—	—	—	—	—	—	—	—	—	—	—	—	0.062	—
BPHc	30	—	—	—	—	—	—	—	—	—	—	—	—	0.054	—
BPHc	32	—	—	—	—	—	—	—	—	—	—	—	—	0.037	—
BPHc	34	—	—	—	—	—	—	—	—	—	—	—	—	0.047	—
BPHc	36	—	—	—	—	—	—	—	—	—	—	—	—	0.038	—
BPHc	38	—	—	—	—	—	—	—	—	—	—	—	—	0.026	—
BPHc	40	—	—	—	—	—	—	—	—	—	—	—	—	0.041	—
BPHc	42	—	—	—	—	—	—	—	—	—	—	—	—	0.023	—
BPHc	44	—	—	—	—	—	—	—	—	—	—	—	—	0.047	—
BPHc	46	—	—	—	—	—	—	—	—	—	—	—	—	0.056	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
INTERMEDIATE MARSH—Continued															
Bayou Perot vibracore BPPf															
BPPf-60	68.52	—	—	—	—	—	—	—	—	—	—	—	—	0.08	—
BPPf-68	77.97	—	—	—	—	—	—	—	—	—	—	—	—	0.09	—
BPPf-76	87.42	—	—	—	—	—	—	—	—	—	—	—	—	0.11	—
BPPf-84	96.87	—	—	—	—	—	—	—	—	—	—	—	—	0.15	—
BPPf-92	106.32	—	—	—	—	—	—	—	—	—	—	—	—	0.19	—
BPPf-100	115.77	—	—	—	—	—	—	—	—	—	—	—	—	0.12	—
BPPf-105	121.09	—	—	—	—	—	—	—	—	—	—	—	—	0.19	—
BPPf-150	174.25	—	—	—	—	—	—	—	—	—	—	—	—	0.35	—
BPPf-200	233.31	—	—	—	—	—	—	—	—	—	—	—	—	0.16	—
BPPf-250	292.38	—	—	—	—	—	—	—	—	—	—	—	—	0.16	—
BPPf-300	351.45	—	—	—	—	—	—	—	—	—	—	—	—	0.28	—
BPPf-350	410.51	—	—	—	—	—	—	—	—	—	—	—	—	0.71	—
BPPf-405	475.49	—	—	—	—	—	—	—	—	—	—	—	—	0.15	—
BPPf-455	534.55	—	—	—	—	—	—	—	—	—	—	—	—	0.61	—
Bayou Perot vibracore BPPg															
BPPg-10-12	12.46	34.77	<0.01	34.77	—	1.08	1.08	–24.51	2.08	–0.26	—	88.45	—	0.14	—
BPPg-22-24	26.05	41.60	<0.01	41.60	—	.75	1.83	–19.62	2.32	–0.47	—	92.07	—	0.08	—
BPPg-32-34	37.37	44.79	<0.01	44.79	—	1.14	2.98	–16.21	1.86	–1.33	—	90.43	—	0.11	—
BPPg-42-44	48.70	17.78	<0.01	17.78	—	0.79	3.77	–27.29	1.05	–1.25	—	79.63	—	0.20	—
BPPg-48-50	55.49	23.42	<0.01	23.42	—	0.96	4.73	–27.18	1.54	–0.48	—	83.29	—	0.18	—
BPPg-56-60	65.69	27.50	<0.01	27.50	56.00	1.78	6.51	–27.57	1.83	–0.48	—	85.72	—	0.14	—
BPPg-64-68	74.75	26.80	<0.01	26.80	54.11	1.62	8.13	–27.92	1.64	–0.88	—	86.40	—	0.13	—
BPPg-74-76	84.94	19.65	<0.01	19.65	40.50	1.55	9.68	–27.54	1.03	–1.36	—	82.70	—	0.35	—
BPPg-80-84	92.87	21.50	<0.01	21.50	43.29	1.64	11.31	–26.28	1.08	–1.03	—	83.14	—	0.17	—
BPPg-88-92	101.93	22.24	<0.01	22.24	45.07	1.97	13.28	–21.00	0.92	–1.66	—	82.07	—	0.20	—
BPPg-96-100	110.99	10.67	<0.01	10.67	25.43	1.27	14.56	–19.60	0.50	–0.96	—	73.10	—	0.26	—
BPPg-100-105	116.08	6.29	<0.01	6.29	—	1.26	15.81	–20.66	0.34	–1.15	—	66.71	—	0.35	—
BPPg-120-124	138.17	6.36	<0.01	6.36	—	0.93	16.74	–21.69	0.35	–1.45	—	67.60	—	0.32	—
BPPg-132-136	151.76	17.09	<0.01	17.09	—	1.30	18.05	–21.49	0.91	–1.02	—	79.33	—	0.17	—
BPPg-145-150	167.04	10.39	<0.01	10.39	21.81	1.73	19.77	–21.07	0.45	–1.57	—	69.44	—	0.29	—
BPPg-153-155	174.41	8.76	<0.01	8.76	—	0.82	20.59	–20.53	0.39	–1.01	—	69.61	—	0.41	—
BPPg-160-162	182.33	32.21	<0.01	32.21	—	1.20	21.79	–22.70	1.43	–1.28	—	86.62	—	0.16	—
BPPg-168-170	191.39	8.61	<0.01	8.61	—	0.79	22.59	–23.03	0.39	–1.12	—	71.74	—	0.41	—
BPPg-178-182	203.85	36.16	<0.01	36.16	—	1.98	24.57	–21.95	1.70	–1.34	—	87.60	—	0.12	—
BPPg-188-190	214.04	18.21	<0.01	18.21	—	0.97	25.54	–20.76	0.76	–2.22	—	79.87	—	0.24	—
BPPg-195-200	223.67	39.76	<0.01	39.76	79.19	2.46	27.99	–21.90	1.89	–1.09	—	87.88	—	0.11	—
BPPg-207-210	236.13	21.72	<0.01	21.72	—	1.40	29.40	–24.01	1.03	–1.04	—	81.23	—	0.19	—
BPPg-226-230	258.21	38.44	<0.01	38.44	—	2.22	31.62	–21.09	2.03	–1.24	—	86.53	—	0.13	—
BPPg-245-250	280.29	27.40	<0.01	27.40	55.15	2.02	33.64	–26.80	1.45	–0.99	—	83.79	—	0.13	—
BPPg-270-274	308.04	8.46	<0.01	8.46	—	1.24	34.87	–26.40	0.42	–0.19	—	69.25	—	0.32	—
BPPg-295-300	336.92	18.77	<0.01	18.77	39.69	1.86	36.73	–23.44	0.97	–0.48	—	79.91	—	0.17	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

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Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
INTERMEDIATE MARSH—Continued															
Bayou Perot vibracore BPPg—Continued															
BPPg-310-314	353.34	17.30	<0.01	17.30	—	1.74	38.47	–27.07	0.87	–0.30	—	76.43	—	0.22	—
BPPg-320-324	364.67	5.60	<0.01	5.60	—	1.26	39.73	–26.77	0.33	0.29	—	59.27	—	0.50	—
BPPg-330-334	375.99	28.73	<0.01	28.73	—	2.04	41.77	–27.25	1.34	–0.19	—	83.34	—	0.16	—
BPPg-354-358	403.17	16.60	<0.01	16.60	33.46	1.88	43.65	–27.62	0.79	–0.55	—	75.81	—	0.25	—
BPPg-364-368	414.50	9.89	<0.01	9.89	—	1.65	45.30	–27.98	0.54	0.03	—	69.25	—	0.37	—
BPPg-380-384	432.62	1.22	0.13	1.09	6.27	0.36	45.66	–23.06	0.10	2.64	—	43.40	—	0.73	—
BPPg-420-424	477.92	2.65	0.18	2.47	—	0.64	46.29	–23.74	0.18	1.39	—	51.41	—	0.57	—
BPPg-478-482	543.60	1.77	0.12	1.65	—	0.39	46.69	–18.07	0.12	3.25	—	51.55	—	0.52	—
BPPg-530-534	602.49	1.43	0.57	0.86	5.03	0.49	47.17	–15.05	0.07	2.98	—	29.34	—	1.25	—
BPPg-545-549	619.48	1.20	0.64	0.56	4.56	0.41	47.58	–12.32	0.05	3.45	—	23.91	—	1.60	—
Bayou Perot McCauley core BPMa															
BPMa	60	—	—	—	—	—	—	—	—	—	—	—	—	0.094	—
BPMa	68	—	—	—	—	—	—	—	—	—	—	—	—	0.088	—
BPMa	76	—	—	—	—	—	—	—	—	—	—	—	—	0.081	—
BPMa	84	—	—	—	—	—	—	—	—	—	—	—	—	0.080	—
BPMa	92	—	—	—	—	—	—	—	—	—	—	—	—	0.086	—
BPMa	100	—	—	—	—	—	—	—	—	—	—	—	—	0.079	—
BPMa	105	—	—	—	—	—	—	—	—	—	—	—	—	0.096	—
BPMa	150	—	—	—	—	—	—	—	—	—	—	—	—	0.244	—
BPMa	187	—	—	—	—	—	—	—	—	—	—	—	—	0.204	—
BPMa	200	—	—	—	—	—	—	—	—	—	—	—	—	0.358	—
BPMa	215	—	—	—	—	—	—	—	—	—	—	—	—	0.459	—
BPMa	250	—	—	—	—	—	—	—	—	—	—	—	—	0.327	—
BPMa	271	—	—	—	—	—	—	—	—	—	—	—	—	0.245	—
BPMa	300	—	—	—	—	—	—	—	—	—	—	—	—	0.160	—
Bayou Perot McCauley core BPMb															
BPMb	60	—	—	—	—	—	—	—	—	—	—	—	—	0.065	—
BPMb	68	—	—	—	—	—	—	—	—	—	—	—	—	0.088	—
BPMb	76	—	—	—	—	—	—	—	—	—	—	—	—	0.126	—
BPMb	84	—	—	—	—	—	—	—	—	—	—	—	—	0.115	—
BPMb	92	—	—	—	—	—	—	—	—	—	—	—	—	0.105	—
BPMb	100	—	—	—	—	—	—	—	—	—	—	—	—	0.072	—
BPMb	105	—	—	—	—	—	—	—	—	—	—	—	—	0.189	—
BPMb	150	—	—	—	—	—	—	—	—	—	—	—	—	0.184	—
BPMb	187	—	—	—	—	—	—	—	—	—	—	—	—	0.208	—
BPMb	200	—	—	—	—	—	—	—	—	—	—	—	—	0.241	—
BPMb	215	—	—	—	—	—	—	—	—	—	—	—	—	0.414	—
BPMb	250	—	—	—	—	—	—	—	—	—	—	—	—	0.545	—
BPMb	271	—	—	—	—	—	—	—	—	—	—	—	—	0.182	—
BPMb	300	—	—	—	—	—	—	—	—	—	—	—	—	0.354	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
INTERMEDIATE MARSH—Continued															
Bayou Perot McCauley core BPMc															
BPMc	60	—	—	—	—	—	—	—	—	—	—	—	—	0.087	—
BPMc	68	—	—	—	—	—	—	—	—	—	—	—	—	0.089	—
BPMc	76	—	—	—	—	—	—	—	—	—	—	—	—	0.116	—
BPMc	84	—	—	—	—	—	—	—	—	—	—	—	—	0.070	—
BPMc	92	—	—	—	—	—	—	—	—	—	—	—	—	0.105	—
BPMc	100	—	—	—	—	—	—	—	—	—	—	—	—	0.109	—
BPMc	105	—	—	—	—	—	—	—	—	—	—	—	—	0.108	—
BPMc	150	—	—	—	—	—	—	—	—	—	—	—	—	0.207	—
BPMc	187	—	—	—	—	—	—	—	—	—	—	—	—	0.202	—
BPMc	200	—	—	—	—	—	—	—	—	—	—	—	—	0.307	—
BPMc	215	—	—	—	—	—	—	—	—	—	—	—	—	0.476	—
BPMc	250	—	—	—	—	—	—	—	—	—	—	—	—	0.392	—
BPMc	271	—	—	—	—	—	—	—	—	—	—	—	—	0.258	—
BPMc	300	—	—	—	—	—	—	—	—	—	—	—	—	0.210	—
BRACKISH M ARSH															
Fish and Wildlife push-core FW															
FW0-4	3.92	29.60	—	—	—	0.37	0.37	—	—	—	91.54	92.17	0.03	0.03	—
FW4-8	11.76	30.50	—	—	—	0.45	0.82	—	—	—	90.63	91.31	0.04	0.03	—
FW8-12	19.60	32.70	—	—	—	0.64	1.45	—	—	—	89.10	89.89	0.05	0.04	—
FW12-16	27.44	27.25	—	—	—	0.61	2.07	—	—	—	87.15	88.13	0.06	0.05	—
FW16-20	35.28	22.40	—	—	—	0.67	2.74	—	—	—	85.48	86.50	0.07	0.07	—
FW20-24	43.12	21.10	—	—	—	0.61	3.35	—	—	—	84.95	86.49	0.07	0.06	—
FW24-28	50.96	19.00	—	—	—	0.95	4.30	—	—	—	78.35	79.72	0.12	0.11	—
FW28-32	58.80	15.00	—	—	—	0.70	5.01	—	—	—	79.84	81.15	0.11	0.10	—
FW32-36	66.64	21.20	—	—	—	0.57	5.57	—	—	—	86.38	87.27	0.06	0.06	—
St. Bernard push-core SB1a															
SB1a	2.73	No measured data for this sample				1.68	1.17	No measured data for this sample							
SB1a-1	6.83	26.22	<0.01	26.22	—	0.84	2.53	–15.8	1.54	2.46	86.69	87.61	0.12	0.12	6.00
SB1a-2	9.56	26.36	<0.01	26.36	—	0.83	3.36	–15.0	1.32	2.91	86.37	87.30	0.12	0.12	7.00
SB1a-3	12.29	14.84	<0.01	14.84	—	0.44	3.80	–14.6	0.91	3.29	86.58	87.70	0.11	0.11	7.00
SB1a-4	15.02	14.97	<0.01	14.97	—	0.71	4.51	–19.8	0.85	4.03	80.84	81.68	0.18	0.17	6.00
SB1a-5	17.75	25.96	<0.01	25.96	—	0.77	5.28	–21.5	1.55	4.71	86.73	87.86	0.11	0.11	6.00
SB1a-6	20.48	27.80	<0.01	27.80	—	0.79	6.07	–18.3	1.68	2.12	86.54	87.65	0.11	0.10	6.00
SB1a-7	23.21	28.83	<0.01	28.83	—	0.71	6.78	–19.2	1.77	2.14	88.74	89.61	0.09	0.09	7.00
SB1a-8	25.94	27.33	<0.01	27.33	—	0.73	7.51	–23.0	1.99	1.97	88.52	89.44	0.10	0.10	7.00
SB1a-9	28.67	25.59	<0.01	25.59	—	0.80	8.31	–21.7	1.70	1.86	86.32	87.30	0.12	0.11	7.00
SB1a-10	31.40	23.71	<0.01	23.71	—	0.88	9.19	–21.0	1.37	1.60	84.62	85.68	0.14	0.14	8.00
SB1a-11	34.13	12.31	<0.01	12.31	—	0.55	9.74	–22.8	0.79	2.64	81.79	82.99	0.17	0.16	8.00
SB1a-12	36.86	17.32	<0.01	17.32	—	0.66	10.40	–23.1	1.22	3.12	84.19	85.30	0.14	0.14	8.00
SB1a-13	39.59	23.09	<0.01	23.09	—	0.74	11.15	–21.1	1.38	1.14	87.19	88.15	0.12	0.12	8.00

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
Brackish marsh—Continued															
St. Bernard push-core SB1a—Continued															
SB1a-14	42.32	29.80	<0.01	29.80	—	0.79	11.94	–20.2	1.74	1.01	88.74	89.62	0.10	0.10	8.00
SB1a-15	45.05	29.98	<0.01	29.98	—	0.69	12.63	–20.5	1.84	0.78	89.49	90.36	0.09	0.08	7.00
SB1a-16	47.78	29.65	<0.01	29.65	—	0.70	13.33	–20.3	1.81	0.70	89.73	90.54	0.09	0.09	7.00
SB1a-17	50.51	31.22	<0.01	31.22	—	0.69	14.02	–20.2	1.76	0.30	90.57	91.07	0.08	0.08	8.00
SB1a-18	53.24	31.72	<0.01	31.72	—	0.75	14.77	–21.6	1.89	0.58	90.27	91.13	0.09	0.09	7.00
SB1a-19	55.97	32.75	<0.01	32.75	—	0.81	15.58	–21.3	1.89	0.45	90.27	91.14	0.09	0.09	8.00
SB1a-20	58.70	33.40	<0.01	33.40	—	0.84	16.42	–21.6	1.96	0.39	89.41	90.32	0.09	0.09	8.00
SB1a-21	61.43	35.38	<0.01	35.38	—	0.94	17.36	–19.5	2.11	–0.18	89.39	90.35	0.10	0.10	8.00
SB1a-22	64.16	38.10	<0.01	38.10	—	0.98	18.34	–22.0	2.12	–0.92	90.74	91.60	0.09	0.09	8.00
SB1a-23	66.89	39.24	<0.01	39.24	—	1.08	19.42	–23.0	2.18	–0.56	90.85	91.72	0.10	0.10	8.00
SB1a-24	69.62	36.76	<0.01	36.76	—	0.91	20.33	–23.2	2.22	0.06	90.47	91.41	0.09	0.09	7.00
SB1a-25	72.35	39.24	<0.01	39.24	—	1.04	21.37	–24.5	1.96	–0.01	89.77	90.86	0.10	0.10	7.00
SB1a-26	75.08	35.98	<0.01	35.98	—	0.88	22.24	–23.2	1.82	–0.79	89.74	90.80	0.09	0.09	7.00
SB1a-27	77.81	32.79	<0.01	32.79	—	1.06	23.31	–21.4	1.67	–0.06	86.90	88.20	0.12	0.12	7.00
SB1a-28	80.54	26.22	<0.01	26.22	—	0.78	24.09	–21.2	1.36	–1.23	87.59	88.66	0.11	0.11	7.00
SB1a-29	83.27	33.38	<0.01	33.38	—	0.97	25.06	–19.5	1.69	–1.04	87.78	88.85	0.11	0.11	7.00
SB1a-30	86.01	33.61	<0.01	33.61	—	0.90	25.96	–20.1	1.76	–1.04	88.36	89.40	0.10	0.10	7.00
SB1a-31	88.74	31.88	<0.01	31.88	—	0.94	26.89	–21.5	2.01	–0.84	87.61	88.76	0.11	0.11	6.00
SB1a-32	91.47	31.70	<0.01	31.70	—	1.09	27.99	–22.0	1.63	–1.18	85.43	86.73	0.13	0.13	6.00
SB1a-33	94.19	25.72	<0.01	25.72	—	0.98	28.97	–22.9	1.51	–0.74	84.20	85.55	0.14	0.14	7.00
SB1a-34	96.93	23.61	<0.01	23.61	—	1.03	30.00	–22.7	1.44	–0.56	83.95	85.38	0.16	0.16	7.00
St. Bernard push-core SB1b															
SB1b-1	6.67	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SB1b-2	8.98	—	—	—	—	—	—	—	—	—	88.79	—	0.09	—	—
SB1b-3	11.28	—	—	—	—	—	—	—	—	—	88.71	—	0.08	—	—
SB1b-4	13.59	—	—	—	—	—	—	—	—	—	85.11	—	0.15	—	—
SB1b-5	15.89	—	—	—	—	—	—	—	—	—	84.24	—	0.15	—	—
SB1b-6	18.20	—	—	—	—	—	—	—	—	—	85.29	—	0.13	—	—
SB1b-7	20.50	—	—	—	—	—	—	—	—	—	87.01	—	0.13	—	—
SB1b-8	22.81	—	—	—	—	—	—	—	—	—	86.98	—	0.12	—	—
SB1b-9	25.11	—	—	—	—	—	—	—	—	—	85.85	—	0.14	—	—
SB1b-10	27.41	—	—	—	—	—	—	—	—	—	85.40	—	0.14	—	—
SB1b-11	29.72	—	—	—	—	—	—	—	—	—	85.89	—	0.13	—	—
SB1b-12	32.02	—	—	—	—	—	—	—	—	—	87.31	—	0.12	—	—
SB1b-13	34.33	—	—	—	—	—	—	—	—	—	87.28	—	0.13	—	—
SB1b-14	36.63	—	—	—	—	—	—	—	—	—	84.09	—	0.15	—	—
SB1b-15	38.94	—	—	—	—	—	—	—	—	—	78.03	—	0.20	—	—
SB1b-16	41.24	—	—	—	—	—	—	—	—	—	81.24	—	0.20	—	—
SB1b-17	43.55	—	—	—	—	—	—	—	—	—	83.44	—	0.16	—	—
SB1b-18	45.85	—	—	—	—	—	—	—	—	—	85.93	—	0.14	—	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; δ^{13}C, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; δ^{15}N, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	δ^{13}C (per mil)	TN (%)	δ^{15}N (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
Brackish marsh—Continued															
St. Bernard push-core SB1b—Continued															
SB1b-19	48.16	—	—	—	—	—	—	—	—	—	86.59	—	0.13	—	—
SB1b-20	50.46	—	—	—	—	—	—	—	—	—	85.91	—	0.14	—	—
SB1b-21	52.77	—	—	—	—	—	—	—	—	—	87.78	—	0.12	—	—
SB1b-22	55.07	—	—	—	—	—	—	—	—	—	87.80	—	0.11	—	—
SB1b-23	57.37	—	—	—	—	—	—	—	—	—	87.77	—	0.12	—	—
SB1b-24	59.68	—	—	—	—	—	—	—	—	—	87.85	—	0.11	—	—
SB1b-25	61.98	—	—	—	—	—	—	—	—	—	89.08	—	0.11	—	—
St. Bernard vibracore SB1c															
SB1c-10	11.11	—	—	—	—	7.38	7.38	—	—	—	89.02	—	0.10	—	—
SB1c(21.5)	32.80	31.92	<0.01	31.92	—	6.62	14.00	–15.8	1.88	0.57	—	—	—	—	—
SB1c(40)	51.67	33.99	<0.01	33.99	—	5.18	19.18	–19.0	1.89	0.34	—	—	—	—	—
SB1c-45	68.78	—	—	—	—	5.04	24.22	—	—	—	89.73	—	0.09	—	—
SB1c(65)	89.59	32.67	<0.01	32.67	—	10.58	34.80	–20.0	1.79	–1.53	—	—	—	—	—
SB1c(79)	107.93	20.94	<0.01	20.94	—	4.89	39.69	–20.5	1.1	–1.65	—	—	—	—	—
SB1c(83)	116.04	10.89	<0.01	10.89	—	0.89	40.58	–23.5	0.61	–0.71	—	—	—	—	—
SB1c-84	122.74	—	—	—	—	4.39	44.97	—	—	—	63.42	—	0.28	—	—
SB1c(97)	136.15	21.16	<0.01	21.16	—	7.49	52.46	–19.4	0.93	–1.45	—	—	—	—	—
SB1c-108	149.20	—	—	—	—	2.88	55.34	—	—	—	80.75	—	0.14	—	—
SB1c(110)	160.84	26.10	<0.01	26.10	—	5.67	61.01	–19.9	1.25	–1.29	—	—	—	—	—
SB1c(128)	180.23	21.59	<0.01	21.59	—	9.22	70.23	–20.2	1.04	–0.88	—	—	—	—	—
SB1c(145)	203.16	10.26	<0.01	10.26	—	4.55	74.78	–16.0	0.35	–0.89	—	—	—	—	—
SB1c(145)	203.16	10.23	<0.01	10.23	—	—	—	—	—	—	—	—	—	—	—
SB1c-158D	225.03	—	—	—	—	—	—	—	—	—	71.38	—	0.23	—	—
SB1c-158	225.03	—	—	—	—	11.49	86.27	—	—	—	—	—	0.23	—	—
SB1c(177)	249.01	38.18	<0.01	38.18	—	15.32	101.59	–19.7	1.63	–1.03	—	—	—	—	—
SB1c-194	270.53	—	—	—	—	5.75	107.33	—	—	—	85.70	—	0.09	—	—
SB1c(202)	291.16	37.67	<0.01	37.67	—	16.82	124.16	–26.0	2.26	–0.33	—	—	—	—	—
SB1c-227.5	312.50	—	—	—	—	13.21	137.37	—	—	—	62.38	—	0.29	—	—
SB1c(229)	329.96	12.61	<0.01	12.61	—	4.66	142.03	–26.1	0.72	–0.43	—	—	—	—	—
SB1c(250)	345.66	37.28	<0.01	37.28	—	10.07	152.10	–26.8	2.1	–0.58	—	—	—	—	—
SB1c-251	358.71	—	—	—	—	4.35	156.45	—	—	—	81.22	—	0.12	—	—
SB1c(265)	374.22	32.73	<0.01	32.73	—	7.77	164.22	–26.5	1.99	–0.09	—	—	—	—	—
SB1c-280	391.15	—	—	—	—	2.69	166.90	—	—	—	—	—	—	—	—
SB1c(284)	399.97	1.85	0.01	1.84	—	0.09	166.99	–28.2	<0.05	5.05	—	—	—	—	—
Terrebonne push-core TB1a															
TB1a 1	2.75	10.27	—	—	—	0.56	0.56	–22.5	0.70	1.50	—	—	—	—	7.00
TB1a 2	8.26	10.80	—	—	—	0.58	1.14	–23.1	0.75	3.29	80.27	81.45	0.10	0.09	7.00
TB1a 3	13.76	10.64	—	—	—	0.61	1.75	–22.1	0.73	5.20	80.04	81.32	0.11	0.10	6.00
TB1a 4	19.26	10.65	—	—	—	0.58	2.33	–23.0	0.67	4.66	80.14	81.39	0.10	0.09	6.00

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, kilogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
Brackish marsh—Continued															
Terrebonne push-core TB1a															
TB1a 5	24.77	10.50	—	—	—	057	2.90	–21.7	0.65	5.02	80.03	81.26	0.10	0.09	6.00
TB1a 6	30.27	13.62	—	—	—	0.58	3.47	–19.9	0.77	6.06	82.19	83.22	0.08	0.07	7.00
TB1a 7	35.77	13.29	—	—	—	0.66	4.14	–20.7	0.73	0.81	82.36	83.42	0.09	0.08	7.00
TB1a 8	41.28	12.85	—	—	—	0.60	4.73	–20.4	0.75	1.94	82.94	83.89	0.09	0.08	6.00
TB1a 9	46.78	15.40	—	—	—	0.73	5.47	–20.7	0.75	5.45	83.37	84.32	0.09	0.08	6.00
TB1a 10	52.29	15.72	—	—	—	0.59	6.06	–20.5	0.89	5.00	84.33	85.27	0.07	0.06	6.00
TB1a 11	57.79	16.88	—	—	—	0.85	6.91	–21.6	1.00	1.52	82.26	83.32	0.09	0.08	6.00
TB1a 12	63.29	16.21	—	—	—	0.67	7.58	–22.6	0.97	3.22	81.63	82.71	0.08	0.07	7.00
TB1a 13	68.80	11.47	—	—	—	0.86	8.44	–23.7	0.72	3.71	72.67	74.05	0.14	0.12	6.00
TB1a 14	74.30	16.88	—	—	—	0.71	9.15	–22.0	0.84	2.16	83.69	84.74	0.08	0.07	6.00
TB1a 15	79.81	20.58	—	—	—	0.77	9.92	–21.7	1.16	3.45	83.00	84.09	0.07	0.06	6.00
TB1a 16	85.31	22.54	—	—	—	0.80	10.72	–22.0	1.23	3.79	82.95	84.03	0.07	0.06	7.00
TB1a 17	90.81	16.60	—	—	—	0.90	11.62	–23.2	1.12	0.45	81.62	82.74	0.10	0.09	6.00
TB1a 18	96.32	21.38	—	—	—	1.16	12.78	–23.4	1.33	1.32	—	—	—	—	7.00
Terrebonne push-core TB1c															
TB1c-19-21	42.00	15.21	<0.01	15.21	—	—	—	–22.6	0.87	0.36	—	—	—	—	—
TB1c-25.5	53.55	27.95	<0.01	27.95	—	—	—	–17.0	1.22	–0.57	—	—	—	—	—
TB1c-31.5	66.15	17.76	<0.01	17.76	—	—	—	–21.7	1.15	0.32	—	—	—	—	—
TB1c-36.5	76.65	34.75	<0.01	34.75	—	—	—	–21.1	2.02	–0.23	—	—	—	—	—
TB1c-43	90.30	38.76	<0.01	38.76	—	—	—	–20.9	2.22	–0.17	—	—	—	—	—
TB1c-51.5	108.15	38.41	<0.01	38.41	—	—	—	–17.0	2.56	–0.38	—	—	—	—	—
TB1c-57.5	120.75	24.85	<0.01	24.85	—	—	—	–22.7	1.82	–0.05	—	—	—	—	—
Terrebonne push-core TB2a															
TB2a-1	1.06	20.72	<0.01	20.72	—	0.38	0.38	–17.2	1.39	0.41	83.69	83.90	0.09	0.09	7.00
TB2a-2	3.19	18.06	<0.01	18.06	—	0.39	0.77	–16.6	1.19	0.90	82.04	82.05	0.10	0.10	7.00
TB2a-3	5.31	17.04	0.02	17.02	—	0.35	1.13	–16.6	1.12	0.85	80.75	81.00	0.10	0.10	7.00
TB2a-4	7.44	17.13	0.01	17.12	—	0.37	1.50	–16.7	1.10	0.97	81.91	81.92	0.10	0.10	7.00
TB2a-5	9.56	12.90	0.01	12.89	—	0.34	1.83	–18.2	0.92	0.53	78.10	78.39	0.12	0.12	7.00
TB2a-6	11.69	10.15	0.02	10.13	—	0.34	2.17	–20.3	0.81	1.05	76.30	76.49	0.16	0.16	6.00
TB2a-7	13.81	9.70	0.02	9.68	—	0.30	2.46	–21.7	0.81	0.73	75.86	76.21	0.15	0.14	6.00
TB2a-8	15.94	9.15	0.02	9.13	—	0.34	2.81	–22.2	0.74	0.63	74.29	74.55	0.18	0.18	7.00
TB2a-9	18.06	10.75	0.01	10.74	—	0.36	3.17	–21.7	0.89	0.24	76.82	77.09	0.16	0.16	6.00
TB2a-10	20.19	14.51	<0.01	14.51	—	0.30	3.47	–19.4	1.16	0.59	83.04	83.30	0.10	0.10	7.00
TB2a-11	22.31	14.04	<0.01	14.04	—	0.34	3.82	–18.9	1.12	0.50	82.46	82.71	0.12	0.12	6.00
TB2a-12	24.44	14.71	<0.01	14.71	—	0.34	4.16	–18.0	1.05	0.46	83.13	83.43	0.11	0.11	6.00
TB2a-13	26.56	12.37	<0.01	12.37	—	0.36	4.52	–18.9	0.93	0.35	80.58	80.88	0.14	0.14	6.00
TB2a-14	28.69	20.92	<0.01	20.92	—	0.39	4.91	–16.8	1.31	0.04	86.51	86.58	0.09	0.09	6.00
TB2a-15	30.82	19.25	<0.01	19.25	—	0.38	5.29	–17.0	1.25	–0.11	86.47	86.63	0.09	0.09	7.00
TB2a-16	32.94	15.77	<0.01	15.77	—	0.36	5.65	–17.0	1.12	–0.31	85.08	85.16	0.11	0.11	7.00

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
BRACKISH MARSH—Continued															
Terrebonne push-core TB2a—Continued															
TB2a-17	35.07	11.09	<0.01	11.09	—	0.31	5.96	–18.6	0.85	–0.27	81.11	81.35	0.13	0.13	7.00
TB2a-18	37.19	13.01	<0.01	13.01	—	0.34	6.31	–18.5	0.97	–0.52	83.42	83.58	0.12	0.12	7.00
TB2a-19	39.32	16.02	<0.01	16.02	—	0.36	6.66	–18.4	1.14	–0.61	85.14	85.36	0.11	0.10	7.00
TB2a-20	41.44	18.23	<0.01	18.23	—	0.38	7.05	–19.8	1.37	–0.56	86.21	86.40	0.10	0.10	7.00
TB2a-21	43.57	15.70	<0.01	15.70	—	0.47	7.52	–20.1	1.16	–0.43	83.20	83.32	0.14	0.14	6.00
TB2a-22	45.69	18.78	<0.01	18.78	—	0.53	8.05	–16.8	1.49	–0.79	84.33	84.57	0.13	0.13	6.00
TB2a-23	47.82	30.32	<0.01	30.32	—	0.57	8.62	–17.0	2.03	–0.74	88.46	88.49	0.09	0.09	6.00
TB2a-24	49.94	38.06	<0.01	38.06	—	0.60	9.22	–16.2	2.25	–1.13	89.86	89.88	0.07	0.07	6.00
TB2a-25	52.07	37.63	<0.01	37.63	—	0.52	9.74	–15.4	2.15	–1.25	91.29	91.44	0.07	0.06	6.00
TB2a-26	54.19	39.88	<0.01	39.88	—	0.55	10.29	–14.8	2.21	–1.23	90.71	90.87	0.07	0.06	7.00
TB2a-27	56.32	39.56	<0.01	39.56	—	0.60	10.88	–14.9	2.23	–1.40	91.01	91.18	0.07	0.07	6.00
TB2a-28	58.44	37.52	<0.01	37.52	—	0.53	11.41	–15.4	2.19	–1.46	91.28	91.43	0.07	0.07	6.00
TB2a-29	60.57	34.52	<0.01	34.52	—	0.43	11.84	–16.7	2.34	–1.23	91.82	91.85	0.06	0.06	6.00
TB2a-30	62.69	33.56	<0.01	33.56	—	0.41	12.25	–19.4	2.20	–0.93	91.73	91.76	0.06	0.06	7.00
TB2a-31	65.35	29.97	<0.01	29.97	—	1.03	13.28	–19.5	1.70	–0.95	88.59	88.60	0.11	0.11	7.00
TB2a-32	68.01	21.75	<0.01	21.75	—	0.54	13.83	–20.0	1.50	–0.62	86.70	86.79	0.12	0.12	7.00
TB2a-33	70.13	13.08	<0.01	13.08	—	0.47	14.29	–21.7	0.95	–0.29	79.29	79.44	0.17	0.17	6.00
TB2a-34	72.26	10.62	<0.01	10.62	—	0.50	14.80	–22.8	0.80	–0.28	74.61	74.95	0.23	0.22	6.00
TB2a-35	74.38	20.97	<0.01	20.97	—	0.49	15.29	–20.0	1.42	–0.75	86.14	86.17	0.11	0.11	6.00
TB2a-36	76.51	—	—	—	—	0.39	15.68	—	—	—	88.18	88.40	0.09	0.09	—
TB2a-37	78.57	18.15	<0.01	18.15	—	0.46	16.13	–20.0	1.32	–0.46	85.37	85.62	0.13	0.13	6.00
TB2a-38	80.57	15.85	<0.01	15.85	—	0.46	16.59	–20.7	1.26	–0.55	83.26	83.31	0.14	0.14	6.00
TB2a-39	82.57	23.29	<0.01	23.29	—	0.46	17.05	–21.0	2.00	–0.69	88.28	88.45	0.10	0.10	7.00
TB2a-40	84.57	17.27	0.01	17.26	—	0.48	17.53	–22.6	1.40	–0.56	84.02	84.14	0.14	0.14	7.00
TB2a-41	86.57	24.07	<0.01	24.07	—	0.50	18.02	–23.2	2.10	–0.85	87.82	87.95	0.10	0.10	7.00
TB2a-42	88.57	32.15	<0.01	32.15	—	0.55	18.57	–23.6	2.70	–0.95	90.14	90.27	0.09	0.08	7.00
TB2a-43	90.57	32.83	<0.01	32.83	—	0.45	19.02	–24.1	2.54	–0.92	90.78	90.95	0.07	0.07	7.00
TB2a-44	92.57	35.36	<0.01	35.36	—	0.57	19.59	–24.5	2.81	–0.70	91.36	91.50	0.08	0.08	6.00
TB2a-45	94.57	38.42	<0.01	38.42	—	0.58	20.17	–24.6	3.04	–0.56	91.39	91.49	0.08	0.08	6.00
TB2a-46	96.57	37.81	<0.01	37.81	—	0.50	20.67	–25.1	3.04	–0.66	91.86	91.96	0.07	0.07	7.00
TB2a-47	98.57	37.63	<0.01	37.63	—	0.47	21.14	–24.9	2.67	–0.70	92.43	92.49	0.06	0.06	7.00
TB2a-48	100.57	38.76	<0.01	38.76	—	0.50	21.64	–25.2	2.79	–0.65	92.15	92.27	0.07	0.06	7.00
Terrebonne vibracore TB2c															
TB2c-1	4.41	—	—	—	—	1.22	1.22	—	—	—	76.38	78.54	0.110	0.100	—
TB2c-1	12.67	13.89	0.02	13.87	—	0.98	2.20	–19.1	0.29	–0.02	—	—	—	—	—
TB2c-2	20.93	14.09	0.02	14.07	—	1.04	3.24	–19.9	0.43	0.16	—	—	—	—	—
TB2c-2	31.39	—	—	—	—	1.92	5.17	—	—	—	81.23	83.19	0.085	0.076	—
TB2c-3	40.20	—	—	—	—	0.72	5.89	—	—	—	85.65	87.40	0.058	0.051	—
TB2c-3	46.26	37.56	<0.01	37.56	—	1.24	7.13	–20.6	0.90	–1.5	—	—	—	—	—
TB2c-30	58.37	—	—	—	—	3.37	10.50	–22.7	—	—	—	—	—	—	—
TB2c-4	68.83	39.55	<0.01	39.55	—	0.64	11.14	–22.7	0.90	–1.4	—	—	—	—	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

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Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
BRACKISH MARSH—Continued															
Terrebonne vibracore TB2c—Continued															
TB2c-4	77.64	—	—	—	—	2.72	13.86	—	—	—	88.66	90.25	0.056	0.048	—
TB2c-42.5	90.03	—	—	—	—	1.81	15.67	–18.6	—	—	—	—	—	—	—
TB2c-5	97.19	38.95	<0.01	38.95	—	0.62	16.28	–18.4	1.64	–1.5	—	—	—	—	—
TB2c-5	105.18	—	—	—	—	1.74	18.03	—	—	—	90.20	91.72	0.044	0.037	—
TB2c-6	117.29	—	—	—	—	1.99	20.02	—	—	—	89.67	91.22	0.049	0.041	—
TB2c-6	125.55	40.86	<0.01	40.86	—	0.86	20.88	–17.8	1.69	–1.6	—	—	—	—	—
TB2c-59)	133.26	—	—	—	—	2.21	23.09	–26.4	—	—	—	—	—	—	—
TB2c-66.5	144.00	—	—	—	—	2.04	25.13	–27.1	—	—	—	—	—	—	—
TB2c-7	151.71	—	—	—	—	0.89	26.02	—	—	—	84.39	86.24	0.078	0.069	—
TB2c-7	158.04	16.64	0.01	16.63	—	0.88	26.90	–26.1	1.23	0.79	—	—	—	—	—
TB2c-77.5	165.77	—	—	—	—	1.69	28.59	–26.9	—	—	—	—	—	—	—
TB2c-8	172.02	—	—	—	—	0.91	29.50	—	—	—	86.63	87.85	0.162	0.147	—
TB2c-8	176.52	8.50	0.02	8.48	—	1.07	30.56	–26.2	0.81	0.83	—	—	—	—	—
TB2c-93.5	181.52	—	—	—	—	1.81	32.37	–26.1	—	—	—	—	—	—	—
TB2c-9	190.89	—	—	—	—	3.98	36.35	—	—	—	55.87	59.09	0.641	0.594	—
TB2c-9	205.14	2.46	0.06	2.40	—	2.11	38.46	–25.3	0.19	1.05	—	—	—	—	—
TB2c-10	217.64	7.57	0.03	7.54	—	3.86	42.32	–26.5	0.44	0.28	—	—	—	—	—
TB2c-10	224.27	—	—	—	—	1.53	43.85	—	—	—	61.59	64.93	0.561	0.511	—
TB2c-140.5	231.14	—	—	—	—	3.92	47.78	–19.1	—	—	—	—	—	—	—
TB2c-155	240.77	—	—	—	—	3.42	51.20	–27.2	—	—	—	—	—	—	—
TB2c-11	246.89	—	—	—	—	1.03	52.23		—	—	70.01	72.85	0.417	0.378	—
TB2c-11	251.27	9.96	<0.01	9.96	—	2.46	54.70	–27.8	0.61	–0.35	—	—	—	—	—
TB2c-170.5	259.89	—	—	—	—	5.05	59.75	–27.5			—	—	—	—	—
TB2c-12	269.77	7.48	0.01	7.47	—	3.28	63.03	–27.3	0.44	0.32	—	—	—	—	—
TB2c-12	276.89	—	—	—	—	2.33	65.36	—	—	—	56.39	59.21	0.626	0.584	—
TB2c-195.5	283.27	—	—	—	—	3.77	69.14	–22.3	—	—	—	—	—	—	—
TB2c-13	288.52	—	—	—	—	1.73	70.87	—	—	—	21.42	22.52	1.618	1.595	—
TB2c-13	291.39	0.46	0.35	0.11	—	0.03	70.90	–15.3	<0.01	—	—	—	—	—	—
TB2c-14	297.39	—	—	—	—	0.30	71.20				26.56	28.35	1.364	1.330	—
TB2c-14	304.89	1.02	0.53	0.49	—	0.40	71.60	–14.5	0.04	–1.65					—
TB2c-15	311.14	—	—	—	—	0.47	72.08	—	—	—	12.04	12.60	1.934	1.922	—
TB2c-15	317.64	0.29	0.25	0.04	—	0.04	72.12	–13.2	<0.01	—	—	—	—	—	—
TB2c-16	324.14	—	—	—	—	0.16	72.27	—	—	—	17.94	18.94	1.756	1.735	—
TB2c-16	339.64	0.64	0.36	0.28	—	1.10	73.37	–13.2	0.02	–1.56	—	—	—	—	—
TB2c-17	363.14	1.02	0.36	0.66	—	2.51	75.88	–18.1	0.04	–1.51	—	—	—	—	—
TB2c-17	382.64	—	—	—	—	1.26	77.15	—	—	—	22.28	23.65	1.586	1.559	—
TB2c-18	395.39	—	—	—	—	0.68	77.83	—	—	—	14.02	14.50	1.923	1.912	—
TB2c-18	406.89	0.31	0.26	0.05	—	0.12	77.95	–12.5	<0.01	—	—	—	—	—	—
TB2c-328.5	419.27	—	—	—	—	0.29	78.24	–23.3	—	—	—	—	—	—	—
TB2c-345	431.27	—	—	—	—	0.48	78.73	–27.9	—	—	—	—	—	—	—
TB2c-19	439.89	—	—	—	—	0.27	78.99	—	—	—	15.31	16.08	1.768	1.752	—
TB2c-19	444.27	0.80	0.33	0.47	—	0.30	79.29	–16.4	0.02	–2.29	—	—	—	—	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, kilogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
BRACKISH MARSH—Continued															
Terrebonne vibracore TB2c—Continued															
TB2c-360.5	451.27	—	—	—	—	0.73	80.02	–29.1	—	—	—	—	—	—	—
TB2c-376.5	462.77	—	—	—	—	0.82	80.83	–26.4	—	—	—	—	—	—	—
TB2c-20	471.77	0.74	0.37	0.37	—	0.28	81.11	–16.6	0.03	–1.13	—	—	—	—	—
TB2c-20	477.89	—	—	—	—	0.33	81.44	—	—	—	19.56	21.01	1.395	1.371	—
TB2c-21	485.89	—	—	—	—	0.41	81.84	—	—	—	22.73	24.24	1.502	1.472	—
TB2c-21	491.77	0.63	0.39	0.24	—	0.10	81.94	–12.7	0.02	–2.16	—	—	—	—	—
TB2c-406.5	499.52	—	—	—	—	0.80	82.74	–21.9	—	—	—	—	—	—	—
TB2c-22	508.14	—	—	—	—	0.40	83.14	—	—	—	18.70	20.31	1.550	1.520	—
TB2c-22	512.02	1.34	0.40	0.94	—	0.46	83.60	–18.8	0.04	–0.35	—	—	—	—	—
TB2c-427.5	517.14	—	—	—	—	0.43	84.04	–27.9	—	—	—	—	—	—	—
TB2c-23	523.52	—	—	—	—	0.76	84.80	—	—	—	8.19	8.80	1.502	1.491	—
TB2c-23	528.27	0.38	0.33	0.05	—	0.03	84.83	–10.5	<0.01	—	—	—	—	—	—
TB2c-444.5	535.27	—	—	—	—	0.10	84.92	–27.7	—	—	—	—	—	—	—
TB2c-24	542.39	—	—	—	—	0.05	84.97	—	—	—	4.37	4.69	1.890	1.882	—
TB2c-24	546.14	0.33	0.26	0.07	—	0.05	85.02	–7.7	<0.01	—	—	—	—	—	—
NATURAL LEVEE															
Plaquemines push-core PLAQb															
PLAQb-1	1.06	5.42	0.01	5.41	—	0.46	0.46	–27.38	0.46	3.91	53.15	55.20	0.42	0.40	—
PLAQb-2	3.17	2.73	0.02	2.71	—	0.34	0.80	–27.18	0.23	2.89	42.61	45.19	0.62	0.60	—
PLAQb-3	5.28	2.38	0.03	2.35	—	0.48	1.28	–26.94	0.21	3.53	37.09	39.89	1.00	0.96	—
PLAQb-4	7.39	4.46	0.02	4.44	—	0.60	1.88	–26.49	0.38	3.82	43.78	46.41	0.67	0.64	—
PLAQb-5	9.50	3.91	0.00	3.91	—	0.65	2.52	–26.29	0.35	4.06	44.39	47.12	0.82	0.78	—
PLAQb-6	11.61	2.42	0.00	2.42	—	0.44	2.97	–26.06	0.24	4.29	37.15	40.15	0.91	0.87	—
PLAQb-7	13.72	1.88	0.00	1.88	—	0.39	3.35	–26.10	0.19	4.65	34.19	37.25	1.02	0.97	—
PLAQb-8	15.83	1.47	0.00	1.47	—	0.31	3.66	–26.03	0.16	4.91	31.39	34.60	1.04	1.00	—
PLAQb-9	17.94	1.25	0.00	1.25	—	0.30	3.96	–26.25	0.13	4.64	29.73	33.14	1.20	1.14	—
PLAQb-10	20.05	1.08	0.00	1.08	—	0.25	4.22	–26.49	0.12	5.21	27.84	31.41	1.16	1.10	—
PLAQb-11	22.17	0.89	0.00	0.89	—	0.19	4.41	–25.86	0.10	5.09	26.99	30.81	1.09	1.04	—
PLAQb-12	24.28	0.82	0.00	0.82	—	0.22	4.63	–25.78	0.10	5.11	26.48	30.24	1.33	1.26	—
PLAQb-13	26.39	0.78	0.00	0.78	—	0.20	4.83	–25.43	0.09	5.20	26.11	29.94	1.28	1.22	—
PLAQb-14	28.50	0.76	0.00	0.76	—	0.17	4.99	–25.33	0.09	5.63	27.02	30.69	1.09	1.04	—
PLAQb-15	30.61	0.75	0.00	0.75	—	0.18	5.17	–25.28	0.08	5.40	25.88	29.68	1.19	1.13	—
PLAQb-16	32.72	0.70	0.00	0.70	—	0.19	5.36	–25.04	0.08	5.45	25.25	28.90	1.37	1.31	—
PLAQb-17	34.83	0.66	0.00	0.66	—	0.16	5.52	–24.89	0.08	5.66	25.26	28.69	1.18	1.13	—
PLAQb-18	36.94	0.63	0.00	0.63	—	0.19	5.71	–24.54	0.07	5.51	24.88	28.29	1.46	1.40	—
PLAQb-19	39.05	0.61	0.00	0.61	—	0.14	5.85	–25.23	0.07	5.28	24.97	28.33	1.17	1.12	—
PLAQb-20	41.17	0.58	0.00	0.58	—	0.16	6.01	–24.63	0.07	4.85	23.84	27.17	1.38	1.32	—
PLAQb-21	43.28	0.59	0.00	0.59	—	0.17	6.19	–24.94	0.07	5.41	24.52	27.95	1.44	1.38	—
PLAQb-22	45.39	0.56	0.00	0.56	—	0.15	6.33	–25.03	0.07	5.40	23.85	27.43	1.29	1.23	—
PLAQb-23	47.50	0.58	0.01	0.57	—	0.17	6.50	–24.89	0.07	5.28	24.04	27.74	1.49	1.42	—
PLAQb-24	49.61	0.57	0.01	0.56	—	0.16	6.67	–25.00	0.07	5.45	24.11	28.38	1.43	1.35	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, kilogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
NATURAL LEVEE—Continued															
Plaquemines push-core PLAQb—Continued															
PLAQb-25	51.72	0.55	0.00	0.55	—	0.14	6.81	–24.92	0.07	4.84	23.92	27.88	1.27	1.21	—
PLAQb-26	53.83	0.51	0.00	0.51	—	0.12	6.93	–24.80	0.06	5.25	23.95	27.32	1.18	1.13	—
PLAQb-27	55.94	0.52	0.00	0.52	—	0.14	7.07	–24.63	0.06	4.52	24.64	28.20	1.31	1.25	—
PLAQb-28	58.05	0.53	0.00	0.52	—	0.12	7.19	–25.03	0.06	4.27	25.99	29.80	1.18	1.12	—
Bayou Sauvage levee push-core BSLa															
BSLa-1	0.51	22.81	<0.01	22.81	—	0.74	0.74	–26.59	1.89	2.02	66.14	67.02	0.321	0.317	5.00
BSLa-2	1.53	23.87	<0.01	23.87	—	0.62	1.36	–26.64	1.95	2.06	66.45	67.21	0.259	0.256	5.00
BSLa-3	2.55	24.46	<0.01	24.46	—	0.62	1.99	–26.51	2.01	2.30	65.42	66.27	0.254	0.250	5.00
BSLa-4	3.57	25.33	<0.01	25.33	—	0.60	2.59	–26.89	2.00	2.11	57.71	58.50	0.235	0.232	5.00
BSLa-5	4.59	25.79	<0.01	25.79	—	0.55	3.14	–26.87	2.00	2.06	39.23	40.14	0.213	0.208	4.00
BSLa-6	5.61	23.23	<0.01	23.23	—	0.57	3.71	–27.02	1.95	2.14	24.15	25.16	0.250	0.240	4.00
BSLa-7	6.63	9.03	<0.01	9.03	—	0.41	4.12	–26.86	0.79	2.41	22.21	23.52	0.473	0.446	4.00
BSLa-8	7.65	6.45	<0.01	6.45	—	0.47	4.59	–26.72	0.54	2.58	21.19	22.43	0.754	0.712	5.00
BSLa-9	8.68	5.36	<0.01	5.36	—	0.38	4.97	–24.35	0.45	2.72	19.43	21.10	0.753	0.694	5.00
BSLa-10	9.70	3.73	<0.01	3.73	—	0.27	5.24	–24.40	0.28	2.03	19.21	21.40	0.797	0.716	5.00
BSLa-11	11.23	1.42	<0.01	1.42	—	0.33	5.56	–25.44	0.09	0.81	17.70	20.06	1.271	1.122	5.00
BSLa-12	13.27	0.98	<0.01	0.98	—	0.27	5.83	–25.87	0.06	0.76	17.52	19.16	1.456	1.331	5.00
BSLa-13	15.31	0.86	<0.01	0.86	—	0.22	6.05	–25.55	0.05	0.76	16.65	19.09	1.443	1.259	5.00
BSLa-14	17.35	0.73	<0.01	0.73	—	0.20	6.25	–22.33	0.03	1.05	14.60	16.38	1.513	1.349	6.00
BSLa-15	19.39	0.84	<0.01	0.84	—	0.22	6.47	–21.64	0.04	0.78	18.71	21.16	1.447	1.279	5.00
BSLa-16	21.43	1.01	<0.01	1.01	—	0.29	6.76	–22.46	0.04	0.73	29.40	31.08	1.489	1.408	5.00
BSLa-17	23.47	0.90	<0.01	0.90	—	0.26	7.02	–21.61	0.04	1.40	42.27	43.69	1.480	1.432	5.00
BSLa-18	25.52	0.87	<0.01	0.87	—	0.24	7.26	–20.99	0.03	0.68	46.34	48.58	1.422	1.356	5.00
BSLa-19	27.57	0.75	<0.01	0.75	—	0.19	7.46	–22.03	0.03	0.40	51.48	53.21	1.287	1.246	5.00
BSLa-20	29.60	1.12	<0.01	1.12	—	0.25	7.71	–26.61	0.06	1.34	59.01	61.22	1.148	1.106	5.00
BSLa-21	31.64	3.48	<0.01	3.48	—	0.55	8.26	–24.30	0.29	1.86	59.88	62.35	0.807	0.775	4.00
BSLa-22	33.68	9.01	<0.01	9.01	—	0.62	8.88	–25.17	0.82	1.67	61.46	63.86	0.349	0.336	5.00
BSLa-23	35.72	14.06	<0.01	14.06	—	0.73	9.60	–26.17	1.22	1.22	58.47	59.47	0.258	0.254	5.00
BSLa-24	37.76	17.10	<0.01	17.10	—	0.85	10.46	–26.20	1.34	1.15	47.83	48.63	0.249	0.245	4.00
BSLa-25	39.80	17.87	<0.01	17.87	—	1.18	11.64	–26.22	1.33	1.66	43.83	44.62	0.328	0.323	4.00
BSLa-26	41.85	19.27	<0.01	19.27	—	1.20	12.83	–26.07	1.38	1.49	41.21	42.35	0.313	0.304	4.00
BSLa-27	43.89	20.69	<0.01	20.69	—	1.55	14.39	–26.17	1.41	0.77	41.00	41.80	0.375	0.368	4.00
BSLa-28	45.93	20.42	<0.01	20.42	—	1.43	15.82	–26.30	1.36	0.83	40.52	41.35	0.350	0.343	5.00
BSLa-29	47.97	7.04	<0.01	7.04	—	0.96	16.78	–26.94	0.51	1.93	38.90	40.71	0.699	0.668	4.00
BSLa-30	50.01	4.68	<0.01	4.68	—	0.63	17.40	–26.62	0.34	1.94	37.96	39.98	0.690	0.655	5.00
BSLa-31	52.05	3.29	<0.01	3.29	—	0.50	17.90	–26.43	0.27	2.06	37.66	39.27	0.777	0.745	5.00
BSLa-32	54.09	3.01	<0.01	3.01	—	0.50	18.41	–25.96	0.21	1.43	36.67	38.61	0.865	0.821	5.00
BSLa-33	56.13	3.07	<0.01	3.07	—	0.51	18.92	–26.49	0.19	2.50	37.17	38.57	0.849	0.818	5.00
BSLa-34	58.18	2.50	<0.01	2.50	—	0.42	19.33	–27.03	0.16	2.04	36.28	38.55	0.868	0.817	5.00
BSLa-35	60.22	2.58	<0.01	2.58	—	0.44	19.78	–27.17	0.17	1.98	37.44	39.07	0.877	0.840	5.00
BSLa-36	62.26	2.85	<0.01	2.85	—	0.50	20.28	–26.96	0.17	1.30	36.20	38.60	0.915	0.859	5.00

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; δ^{13}C, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; δ^{15}N, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	δ^{13}C (per mil)	TN (%)	δ^{15}N (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
NATURAL LEVEE—Continued															
Bayou Sauvage levee push-core BSLa—Continued															
BSLa-37	64.30	2.40	<0.01	2.40	—	0.40	20.68	–27.26	0.16	1.95	37.55	39.39	0.853	0.814	5.00
BSLa-38	66.34	2.26	<0.01	2.26	—	0.39	21.07	–27.19	0.16	1.70	37.26	38.89	0.884	0.847	5.00
BSLa-39	68.38	3.02	<0.01	3.02	—	0.50	21.57	–26.75	0.17	2.01	35.68	38.09	0.872	0.817	5.00
BSLa-40	70.42	2.39	<0.01	2.39	—	0.43	22.00	–27.72	0.15	1.54	34.80	36.82	0.933	0.882	5.00
BSLa-41	72.46	2.23	<0.01	2.23	—	0.43	22.43	–27.76	0.14	2.72	34.20	36.67	1.003	0.936	5.00
Bayou Sauvage levee push-core BSL2b															
BSL2b-1	1.06	23.62	0.01	23.61	—	1.22	1.22	–28.20	1.66	3.76	65.51	69.44	0.28	0.24	—
BSL2b-2	3.17	10.62	<0.01	10.62	—	0.91	2.13	–27.93	0.82	3.99	54.93	58.64	0.44	0.41	—
BSL2b-3	5.28	3.64	<0.01	3.64	—	0.52	2.65	–27.38	0.33	4.68	38.78	42.27	0.72	0.68	—
BSL2b-4	7.39	2.92	<0.01	2.91	—	0.48	3.13	–27.22	0.26	4.63	35.16	38.59	0.82	0.78	—
BSL2b-5	9.50	1.67	<0.01	1.67	—	0.34	3.46	–27.34	0.14	3.34	29.55	32.92	1.00	0.96	—
BSL2b-6	11.61	2.51	<0.01	2.51	—	0.41	3.87	–25.41	0.23	4.16	37.40	41.64	0.83	0.78	—
BSL2b-7	13.72	3.94	<0.01	3.94	—	0.55	4.42	–24.71	0.35	4.60	41.95	46.41	0.71	0.66	—
BSL2b-8	15.83	3.75	<0.01	3.75	—	0.56	4.98	–25.94	0.32	4.83	40.31	44.89	0.77	0.71	—
BSL2b-9	17.94	2.81	<0.01	2.81	—	0.43	5.42	–26.65	0.25	4.97	37.32	41.82	0.78	0.73	—
BSL2b-10	20.05	2.04	<0.01	2.04	—	0.39	5.81	–26.97	0.19	5.10	33.58	38.26	0.98	0.91	—
BSL2b-11	22.17	1.90	<0.01	1.90	—	0.34	6.15	–26.89	0.17	5.19	32.32	37.24	0.91	0.85	—
BSL2b-12	24.28	1.61	<0.01	1.61	—	0.33	6.48	–26.82	0.16	5.38	31.81	36.77	1.05	0.97	—
BSL2b-13	26.39	1.53	<0.01	1.53	—	0.25	6.73	–26.89	0.15	5.08	31.77	36.86	0.84	0.78	—
BSL2b-14	28.50	1.55	<0.01	1.54	—	0.34	7.07	–26.81	0.16	5.41	30.60	35.84	1.13	1.04	—
BSL2b-15	30.61	1.39	<0.01	1.39	—	0.25	7.32	–26.92	0.14	5.26	29.46	34.65	0.92	0.85	—
BSL2b-16	32.72	1.48	<0.01	1.48	—	0.29	7.61	–26.61	0.14	5.31	29.64	34.80	0.99	0.92	—
BSL2b-17	34.83	1.35	<0.01	1.35	—	0.26	7.87	–26.76	0.13	5.17	33.26	38.14	0.98	0.91	—
BSL2b-18	36.94	1.36	<0.01	1.36	—	0.31	8.18	–27.14	0.13	5.12	27.43	32.64	1.17	1.08	—
BSL2b-19	39.05	1.23	<0.01	1.23	—	0.24	8.42	–27.13	0.12	5.11	26.52	31.75	1.01	0.94	—
BSL2b-20	41.17	1.16	<0.01	1.16	—	0.25	8.67	–27.12	0.10	5.18	25.33	30.75	1.12	1.04	—
BSL2b-21	43.28	1.18	<0.01	1.18	—	0.28	8.96	–27.05	0.10	5.04	24.45	30.01	1.22	1.13	—
BSL2b-22	45.39	1.12	<0.01	1.12	—	0.24	9.20	–26.96	0.09	4.69	24.20	29.68	1.11	1.03	—
BSL2b-23	47.50	1.05	<0.01	1.05	—	0.23	9.43	–27.03	0.09	4.46	24.34	29.92	1.13	1.04	—
BSL2b-24	49.61	0.88	<0.01	0.88	—	0.21	9.64	–27.18	0.08	4.20	23.69	29.25	1.20	1.12	—
BSL2b-25	51.72	0.87	<0.01	0.87	—	0.20	9.84	–27.06	0.08	4.42	23.49	29.12	1.19	1.10	—
BSL2b-26	53.83	0.87	<0.01	0.87	—	0.20	10.04	–26.98	0.08	4.15	23.41	29.03	1.14	1.06	—
BSL2b-27	55.94	0.79	<0.01	0.79	—	0.17	10.21	–27.20	0.07	3.72	23.46	29.40	1.13	1.04	—
BSL2b-28	58.05	0.73	0.01	0.73	—	0.16	10.37	–27.05	0.07	4.26	23.00	—	—	—	—

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
DISTRIBUTARY															
Bayou Sauvage distributary push-core BSDb															
BSDb-1	1.02	30.19	<0.01	30.19	—	1.06	1.06	–26.14	2.10	1.16	80.28	81.26	0.174	0.172	4.00
BSDb-2	3.06	30.29	<0.01	30.29	—	0.78	1.84	–25.98	2.08	1.29	81.20	82.15	0.127	0.126	4.00
BSDb-3	5.10	29.92	<0.01	29.92	—	0.95	2.79	–26.00	2.05	1.40	82.10	83.10	0.157	0.155	4.00
BSDb-4	7.15	29.60	<0.01	29.60	—	0.87	3.66	–26.29	2.01	1.31	82.42	83.38	0.146	0.144	4.00
BSDb-5	9.19	27.67	<0.01	27.67	—	0.94	4.59	–26.39	1.80	1.48	81.32	82.29	0.168	0.166	4.00
BSDb-6	11.23	26.91	<0.01	26.91	—	1.24	5.84	–26.83	1.83	1.57	79.98	81.25	0.230	0.226	4.00
BSDb-7	13.27	31.65	<0.01	31.65	—	1.09	6.93	–26.66	1.79	1.70	79.30	80.16	0.171	0.169	4.00
BSDb-8	15.31	25.19	<0.01	25.19	—	1.12	8.05	–26.35	1.72	1.64	79.02	79.84	0.220	0.218	4.00
BSDb-9	17.35	20.57	<0.01	20.57	—	0.92	8.97	–25.95	1.53	2.22	75.92	77.25	0.223	0.219	3.00
BSDb-10	19.65	15.42	<0.01	15.42	—	1.29	10.26	–25.27	1.15	2.05	69.20	71.97	0.341	0.327	4.00
BSDb-11	22.20	9.18	<0.01	9.18	—	1.15	11.40	–25.76	0.63	1.38	59.06	61.74	0.511	0.489	5.00
BSDb-12	24.50	6.66	<0.01	6.66	—	0.71	12.12	–26.03	0.45	1.50	55.05	56.81	0.541	0.524	5.00
BSDb-13	26.54	5.51	<0.01	5.51	—	0.60	12.72	–26.69	0.37	1.75	55.82	57.86	0.552	0.532	5.00
BSDb-14	28.58	7.92	<0.01	7.92	—	0.92	13.64	–25.90	0.48	1.66	59.13	60.84	0.587	0.571	6.00
BSDb-15	30.37	11.24	<0.01	11.24	—	0.80	14.44	–24.15	0.60	1.07	59.74	62.39	0.484	0.463	4.00
BSDb-16	32.16	9.47	<0.01	9.47	—	1.13	15.57	–24.60	0.46	1.38	51.82	54.13	0.613	0.587	4.00
BSDb-17	34.45	19.91	<0.01	19.91	—	1.61	17.18	–24.22	1.18	1.60	70.58	73.04	0.328	0.317	4.00
BSDb-18	36.75	27.03	<0.01	27.03	—	1.19	18.37	–24.39	1.58	1.36	78.43	79.43	0.219	0.216	4.00
BSDb-19	38.79	27.91	<0.01	27.91	—	1.13	19.50	–24.20	1.59	1.45	78.88	79.75	0.200	0.198	4.00
BSDb-20	40.83	29.25	<0.01	29.25	—	1.19	20.69	–23.87	1.63	1.12	79.56	81.00	0.203	0.199	4.00
BSDb-21	42.87	30.96	<0.01	30.96	—	1.11	21.80	–23.98	1.66	1.29	80.25	81.21	0.178	0.176	4.00
BSDb-22	44.92	30.25	<0.01	30.25	—	1.23	23.04	–24.58	1.74	1.25	80.14	81.33	0.203	0.200	3.00
BSDb-23	46.96	30.79	<0.01	30.79	—	1.08	24.12	–24.20	1.71	1.37	81.65	82.54	0.174	0.172	3.00
BSDb-24	49.00	30.59	<0.01	30.59	—	1.08	25.20	–24.41	1.77	1.32	81.30	82.58	0.176	0.173	3.00
BSDb-25	51.04	25.95	<0.01	25.95	—	1.16	26.37	–26.12	1.44	1.59	78.60	79.74	0.223	0.219	4.00
BSDb-26	53.08	30.57	<0.01	30.57	—	1.98	28.35	–26.43	1.42	1.90	71.40	72.37	0.322	0.318	4.00
BSDb-27	55.12	30.11	<0.01	30.11	—	1.17	29.52	–27.19	1.58	1.56	79.61	80.48	0.193	0.191	4.00
BSDb-28	57.17	29.11	<0.01	29.11	—	1.10	30.62	–26.75	1.47	1.52	79.72	80.83	0.187	0.185	4.00
BSDb-29	59.21	27.07	<0.01	27.07	—	1.13	31.74	–26.70	1.36	1.47	78.69	80.08	0.207	0.204	4.00
BSDb-30	61.25	27.12	<0.01	27.12	—	1.02	32.77	–26.81	1.42	1.58	80.18	81.26	0.187	0.185	4.00
BSDb-31	63.29	26.85	<0.01	26.85	—	0.97	33.74	–26.99	1.47	1.52	80.36	81.45	0.180	0.178	4.00
BSDb-32	65.33	26.26	<0.01	26.26	—	0.96	34.70	–26.82	1.38	1.49	78.92	80.36	0.182	0.178	4.00
BSDb-33	67.37	28.36	<0.01	28.36	—	0.95	35.64	–26.98	1.44	1.53	81.02	82.47	0.167	0.164	4.00
BSDb-34	69.42	28.81	<0.01	28.81	—	1.01	36.66	–27.03	1.55	1.48	81.05	82.42	0.175	0.172	4.00
BSDb-35	71.46	28.56	<0.01	28.56	—	1.02	37.68	–27.23	1.73	1.53	82.27	83.07	0.176	0.175	4.00
BSDb-36	73.50	30.05	<0.01	30.05	—	0.98	38.66	–27.08	1.66	1.75	82.03	83.00	0.162	0.160	4.00

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, kilogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
BACKSWAMP															
St. Martin push-core MR1c															
MR1c-1	1.11	1.58	0.10	1.47	—	0.28	0.28	–21.8	0.12	5.62	32.32	33.26	0.869	0.857	7.00
MR1c-2	3.34	2.68	0.06	2.61	—	0.47	0.75	–25.4	0.19	5.23	35.20	35.34	0.803	0.801	7.00
MR1c-3	5.57	2.18	0.05	2.13	—	0.45	1.20	–25.6	0.15	5.02	30.64	31.61	0.969	0.955	7.00
MR1c-4	7.80	1.86	0.05	1.81	—	0.39	1.59	–25.8	0.14	5.28	30.50	30.80	0.971	0.967	7.00
MR1c-5	10.02	1.73	0.04	1.69	—	0.41	2.00	–25.4	0.13	5.08	29.49	29.58	1.092	1.090	7.00
MR1c-6	12.25	1.51	0.04	1.47	—	0.35	2.35	–24.7	0.09	4.91	25.33	25.90	1.069	1.060	7.00
MR1c-7	14.48	1.37	0.04	1.33	—	0.25	2.60	–24.5	0.11	5.62	28.18	28.90	0.849	0.840	7.00
MR1c-8	16.70	1.64	0.04	1.60	—	0.40	3.00	–24.8	0.13	5.35	29.68	30.72	1.136	1.119	7.00
MR1c-9	18.93	1.36	0.04	1.32	—	0.36	3.36	–23.3	0.11	5.42	29.40	30.46	1.241	1.222	7.00
MR1c-10	21.16	2.01	0.05	1.96	—	0.43	3.79	–25.3	0.15	5.39	31.82	32.44	0.994	0.985	7.00
MR1c-11	23.39	1.51	0.04	1.47	—	0.37	4.16	–25.7	0.12	5.26	28.46	28.65	1.130	1.127	7.00
MR1c-12	25.61	1.16	0.06	1.10	—	0.26	4.41	–24.7	0.09	5.40	26.26	26.41	1.045	1.043	7.00
MR1c-13	27.84	1.15	0.04	1.11	—	0.27	4.68	–24.2	0.09	5.56	25.87	27.05	1.097	1.080	7.00
MR1c-14	30.07	1.07	0.04	1.03	—	0.22	4.90	–24.0	0.09	5.52	25.46	26.42	0.968	0.956	7.00
MR1c-15	32.29	1.02	0.05	0.97	—	0.31	5.21	–23.7	0.08	5.23	26.03	26.20	1.425	1.422	7.00
MR1c-16	34.52	1.16	0.05	1.11	—	0.35	5.55	–24.4	0.09	5.48	27.27	27.65	1.403	1.396	7.00
MR1c-17	36.75	1.16	0.05	1.11	—	0.32	5.87	–24.8	0.09	5.70	26.16	27.22	1.326	1.307	7.00
MR1c-18	38.98	1.08	0.06	1.02	—	0.34	6.21	–23.1	0.09	5.34	26.70	27.49	1.515	1.499	7.00
MR1c-19	41.20	1.17	0.06	1.11	—	0.37	6.59	–24.5	0.09	5.33	26.89	27.06	1.519	1.515	7.00
MR1c-20	43.43	1.02	0.08	0.94	—	0.28	6.87	–23.3	0.09	5.38	27.14	28.20	1.352	1.332	7.00
MR1c-21	45.66	0.94	0.08	0.86	—	0.22	7.09	–22.7	0.08	5.58	26.36	26.37	1.170	1.170	7.00
MR1c-22	47.88	0.95	0.11	0.84	—	0.25	7.35	–22.0	0.07	5.40	25.66	26.80	1.380	1.359	7.00
MR1c-23	50.11	0.71	0.09	0.62	—	0.20	7.54	–19.5	0.05	5.20	24.96	25.13	1.437	1.433	7.00
MR1c-24	52.34	1.04	0.06	0.98	—	0.30	7.84	–23.2	0.09	5.44	27.83	28.71	1.374	1.357	7.00
MR1c-25	54.57	0.83	0.04	0.79	—	0.28	8.12	–23.1	0.08	6.14	25.35	26.44	1.642	1.618	7.00
MR1c-26	56.79	0.91	0.05	0.86	—	0.28	8.40	–23.6	0.08	5.89	27.79	27.92	1.460	1.457	7.00
MR1c-27	59.02	0.93	0.01	0.92	—	0.31	8.72	–23.4	0.09	5.32	27.50	28.63	1.552	1.528	7.00
MR1c-28	61.25	No measured data for this sample				0.32	9.04	No measured data for this sample							
MR1c-29	63.47	1.03	0.03	1.00	—	0.33	9.38	–23.0	0.08	5.29	25.28	26.43	1.525	1.502	7.00
MR1c-30	65.70	1.11	0.04	1.07	—	0.32	9.70	–20.6	0.10	5.82	30.41	30.98	1.376	1.365	7.00
MR1c-31	67.93	0.97	0.05	0.92	—	0.28	9.98	–21.1	0.10	5.38	30.42	30.73	1.364	1.357	7.00
MR1c-32	70.16	0.98	0.06	0.92	—	0.31	10.29	–21.3	0.09	5.56	29.91	30.07	1.520	1.516	7.00
St. Landry push-core SL1b															
SL1b-1	1.09	6.44	0.04	6.40	17.85	0.77	0.77	–27.1	0.47	3.23	48.05	48.47	0.554	0.549	7.00
SL1b-2	3.27	5.86	0.04	5.82	16.79	0.98	1.74	–27.0	0.42	3.35	47.45	47.71	0.773	0.769	7.00
SL1b-3	5.45	6.15	0.02	6.13	17.39	0.98	2.73	–27.1	0.45	3.24	47.86	48.72	0.747	0.735	7.00
SL1b-4	7.64	5.64	0.01	5.64	16.03	0.95	3.68	–27.1	0.41	3.13	47.57	47.73	0.775	0.772	7.00
SL1b-5	9.82	4.52	0.01	4.51	13.94	0.84	4.52	–26.8	0.37	3.16	45.74	45.88	0.858	0.856	7.00
SL1b-6	12.00	2.53	<0.01	2.52	9.33	0.59	5.11	–26.7	0.23	3.91	38.96	39.80	1.089	1.074	7.00

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, kilogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
BACKSWAMP—Continued															
St. Landry push-core SL1b—Continued															
SL1b-7	14.18	1.50	<0.01	1.49	7.13	0.40	5.51	–26.4	0.15	3.98	33.68	33.95	1.247	1.242	7.00
SL1b-8	16.36	1.27	<0.01	1.27	6.56	0.37	5.89	–26.4	0.13	4.16	32.49	32.54	1.355	1.354	7.00
SL1b-9	18.54	1.13	<0.01	1.13	6.07	0.27	6.16	–26.2	0.12	3.41	30.98	31.55	1.097	1.088	7.00
SL1b-10	20.73	1.20	<0.01	1.20	6.07	0.23	6.38	–26.4	0.12	3.47	31.73	31.81	0.875	0.874	7.00
SL1b-11	22.91	1.13	<0.01	1.13	5.68	0.19	6.58	–26.4	0.11	3.35	29.71	29.94	0.796	0.793	7.00
SL1b-12	25.09	1.06	<0.01	1.06	5.74	0.26	6.84	–26.5	0.11	3.3	27.14	27.73	1.156	1.146	7.00
SL1b-13	27.27	1.05	<0.01	1.05	5.49	0.20	7.04	–26.6	0.10	3.51	28.14	28.37	0.854	0.851	7.00
SL1b-14	29.45	0.99	<0.01	0.99	5.48	0.24	7.28	–26.4	0.10	3.43	28.49	29.76	1.115	1.096	7.00
SL1b-15	31.64	0.97	<0.01	0.97	5.56	0.27	7.54	–26.7	0.10	3.66	30.95	31.13	1.262	1.259	7.00
SL1b-16	33.82	0.99	<0.01	0.99	5.46	0.28	7.82	–26.7	0.09	3.3	30.33	31.61	1.318	1.294	7.00
SL1b-17	36.00	0.93	<0.01	0.93	5.29	0.28	8.10	–26.4	0.09	3.27	29.78	30.84	1.408	1.386	7.00
SL1b-18	38.18	0.93	<0.01	0.93	5.22	0.30	8.40	–26.4	0.09	3.54	29.48	30.11	1.506	1.492	7.00
SL1b-19	40.36	0.95	<0.01	0.94	5.02	0.30	8.70	–26.5	0.08	3.51	29.88	30.25	1.450	1.442	7.00
SL1b-20	42.54	0.82	<0.01	0.82	4.58	0.27	8.97	–26.3	0.07	3.17	27.15	28.55	1.556	1.526	7.00
SL1b-21	44.73	0.84	0.01	0.83	4.48	0.28	9.25	–26.1	0.05	3.02	26.36	27.52	1.576	1.551	7.00
SL1b-22	46.91	0.75	<0.01	0.74	4.43	0.28	9.53	–24.8	0.06	3.85	27.25	27.64	1.705	1.696	7.00
SL1b-23	49.09	0.79	<0.01	0.78	4.84	0.27	9.80	–23.1	0.07	4.42	28.53	28.76	1.571	1.566	7.00
SL1b-24	51.27	0.71	<0.01	0.71	5.01	0.24	10.04	–21.7	0.06	4.41	27.64	28.72	1.606	1.582	7.00
SL1b-25	53.45	0.78	<0.01	0.78	5.30	0.27	10.31	–22.7	0.07	3.7	28.78	29.38	1.618	1.604	7.00
SL1b-26	55.63	0.70	<0.01	0.70	5.17	0.25	10.56	–22.9	0.06	3.73	28.54	29.34	1.647	1.629	7.00
SL1b-27	57.82	0.60	<0.01	0.60	4.83	0.21	10.77	—22.9	0.05	3.55	28.59	29.14	1.612	1.599	7.00
SL1b-28	60.00	0.58	<0.01	0.57	4.72	0.26	11.03	–23.4	0.06	4.2	29.04	29.20	2.059	2.054	7.00
SL1b-29	62.18	0.50	<0.01	0.50	4.50	0.21	11.23	–22.5	0.05	2.77	26.45	26.60	1.896	1.892	7.00
SL1b-30	64.36	0.47	<0.01	0.47	4.17	0.19	11.43	–22.9	0.05	2.96	24.81	25.03	1.894	1.889	7.00
SL1b-31	66.54	0.37	<0.01	0.37	3.83	0.15	11.58	–22.4	0.04	3.04	22.34	23.36	1.958	1.933	7.00
SWAMP															
Tangipahoa push-core TN1c															
TN1c-1	1.07	39.78	<0.01	39.78	—	0.62	0.62	–28.8	2.08	–1.22	89.60	90.34	0.078	0.072	5.00
TN1c-2	3.22	39.93	<0.01	39.92	—	0.76	1.38	–29.3	2.14	–1.27	89.60	90.35	0.096	0.089	5.00
TN1c-3	5.36	40.23	<0.01	40.23	—	0.70	2.07	–29.0	2.20	–1.72	91.41	92.01	0.087	0.081	4.00
TN1c-4	7.51	37.81	<0.01	37.80	—	0.78	2.85	–28.4	2.32	–1.75	89.73	90.46	0.104	0.096	5.00
TN1c-5	9.66	39.62	<0.01	39.62	—	0.75	3.61	–28.8	2.27	–1.93	90.94	91.61	0.096	0.089	5.00
TN1c-6	11.80	35.48	<0.01	35.47	—	0.83	4.43	–28.4	2.24	–1.87	89.72	90.49	0.117	0.108	5.00
TN1c-7	13.95	39.47	<0.01	39.46	—	0.83	5.26	–28.2	2.06	–2.04	88.44	89.24	0.105	0.098	5.00
TN1c-8	16.09	38.45	<0.01	38.45	—	0.93	6.19	–27.7	2.00	–1.93	87.85	88.71	0.121	0.112	4.00
TN1c-9	18.24	35.80	<0.01	35.80	—	1.02	7.21	–27.2	1.69	–1.23	84.83	85.85	0.142	0.132	4.00
TN1c-10	20.38	36.32	<0.01	36.32	—	0.90	8.10	–27.3	1.68	–1.27	85.60	86.58	0.123	0.115	5.00
TN1c-11	22.53	34.76	<0.01	34.76	—	0.83	8.94	–27.3	1.78	–1.23	85.34	86.36	0.120	0.112	4.00
TN1c-12	24.67	39.27	<0.01	39.26	—	0.71	9.65	–27.0	1.39	–1.35	85.20	86.19	0.090	0.084	5.00

Table 2–1. Analytical and derivative data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[Cores were taken for different purposes. For instance, cores LSPa, LSPc, and the upper 60 cm of LSPe were part of a test comparing bulk density determinations among sampling methods. Samples from core LSPb, however, were used for a suite of analyses. Therefore, data fields vary by core. ID, identifier; cm, centimeter; TC, total carbon; IC, inorganic carbon; OC, organic carbon; TC–IC, total carbon minus inorganic carbon; LOI, loss on ignition; %, percent; SOC, soil/sediment organic carbon; incoc, organic carbon incremental storage; kg m^{-2}, killogram per square meter; cumoc, organic carbon cumulative storage; $\delta^{13}C$, delta isotope carbon-13; per mil, per thousand; TN, total nitrogen; $\delta^{15}N$, delta isotope nitrogen-15; H_2O, water; BD, bulk density; °C, degree celsius; g cm^{-3}, grams per cubic centimeter; SU, standard unit; –, minus; <, less than; —, no data]

Sample ID	Corrected sample-midpoint depth (cm)	TC (%)	IC (%)	OC (TC–IC) (%)	LOI (%)	SOC incoc[1] (kg m^{-2})	SOC cumoc[2] (kg m^{-2})	$\delta^{13}C$ (per mil)	TN (%)	$\delta^{15}N$ (per mil)	H_2O air dry (%)	H_2O 65°C (%)	BD air dry (g cm^{-3})	BD 65°C (g cm^{-3})	pH (SU)
SWAMP—Continued															
Tangipahoa push-core TN1c—Continued															
TN1c-13	26.82	45.28	<0.01	45.28	—	1.42	11.07	–26.9	1.11	–1.43	83.33	84.51	0.157	0.146	4.00
TN1c-14	28.96	40.38	<0.01	40.37	—	0.93	11.99	–26.8	1.35	–1.30	84.69	85.76	0.115	0.107	4.00
TN1c-15	31.11	36.01	<0.01	36.00	—	0.73	12.73	–27.5	1.73	–1.07	86.85	87.76	0.102	0.095	5.00
TN1c-16	33.26	34.92	<0.01	34.92	—	0.76	13.49	–27.2	1.65	–0.83	87.80	88.63	0.109	0.102	5.00
TN1c-17	35.40	34.45	0.01	34.45	—	0.80	14.28	–27.4	1.68	–0.81	86.78	87.72	0.116	0.108	4.00
TN1c-18	37.55	33.34	<0.01	33.33	—	0.96	15.24	–27.2	1.69	–0.36	84.95	85.95	0.144	0.134	4.00
TN1c-19	39.69	36.09	<0.01	36.08	—	1.31	16.55	–26.8	1.66	0.19	81.66	82.85	0.181	0.169	5.00
TN1c-20	41.84	38.82	<0.01	38.81	—	1.08	17.63	–27.3	1.96	0.37	85.92	86.87	0.139	0.129	4.00
TN1c-21	43.98	39.44	<0.01	39.43	—	1.26	18.89	–26.9	1.59	0.10	84.24	85.32	0.160	0.149	4.00
TN1c-22	46.13	38.93	<0.01	38.93	—	1.19	20.08	–27.3	1.97	0.30	84.86	85.84	0.153	0.143	4.00
TN1c-23	48.27	37.51	<0.01	37.51	—	1.27	21.35	–27.3	1.95	0.35	83.56	84.68	0.169	0.158	4.00
TN1c-24	50.42	38.19	<0.01	38.18	—	1.00	22.36	–27.3	2.02	0.51	84.47	85.56	0.132	0.123	4.00
TN1c-25	52.56	37.32	<0.01	37.32	—	0.76	23.11	–27.2	1.80	–0.24	86.03	87.00	0.101	0.094	4.00
TN1c-26	54.71	37.76	<0.01	37.76	—	0.96	24.07	–27.0	2.12	0.38	85.95	86.95	0.128	0.119	4.00
TN1c-27	56.85	39.83	<0.01	39.82	—	0.98	25.06	–27.2	2.11	–0.06	84.34	85.30	0.123	0.115	4.00
TN1c-28	59.00	40.49	<0.01	40.49	—	1.19	26.25	–27.3	2.07	–0.08	86.32	87.14	0.146	0.137	4.00
TN1c-29	61.15	40.35	<0.01	40.35	—	1.22	27.47	–27.2	2.06	–0.15	87.11	87.91	0.150	0.141	4.00
TN1c-30	63.29	40.93	<0.01	40.92	—	1.26	28.73	–27.3	1.98	–0.23	85.86	86.75	0.153	0.143	4.00
TN1c-31	65.44	38.59	<0.01	38.58	—	1.08	29.81	–27.4	1.89	–0.20	85.90	86.74	0.139	0.131	4.00
TN1c-32	67.58	35.92	<0.01	35.91	—	1.28	31.09	–27.6	1.71	–0.18	84.02	84.91	0.175	0.166	4.00
TN1c-33	69.73	35.30	<0.01	35.29	—	0.97	32.06	–27.6	1.73	–0.25	86.11	86.79	0.135	0.128	—
TN1c-34	71.87	35.36	<0.01	35.36	—	1.09	33.14	–27.6	1.42	0.13	84.07	84.87	0.151	0.143	—
TN1c-35	74.02	32.06	<0.01	32.06	—	0.83	33.98	–27.6	1.58	0.08	85.88	86.61	0.128	0.121	—
TN1c-36	76.16	31.29	<0.01	31.29	—	1.00	34.97	–27.2	1.50	0.26	82.24	83.23	0.157	0.149	—
TN1c-37	78.31	34.42	<0.01	34.42	—	0.93	35.90	–27.2	1.49	–0.08	85.21	86.05	0.133	0.125	—

[1]Mass storage based on field-moist bulk density.

Buell and Markewich (2004) calculated incremental organic carbon (SOC incremental) as

$MI = \rho^b * 10 * (d_{bh} - d_{th}) * (oc/100) * f_s$ where

MI = incremental SOC mass, in kilograms per square meter (kg m^{-2}) (total matrix, organic carbon)

ρ_b = soil bulk density, in grams per cubic centimeter (g cm)

10 = factor for conversion from g cm^{-3} to kg m^{-2}

d_{bh} = depth of soil layer/horizon bottom, in centimeters

d_{th} = depth of soil layer/horizon top, in centimeters

oc = soil organic carbon concentration, in weight percent

f_s = fraction of the profile volume occupied by soil

[2]Cumulative SOC mass calculated as the sum of incremental SOC masses (intervals from the land surface to the basal depth of the current interval are included in each cumulative sum).

Table 2-2. Summary statistics and percentiles by environment and soil type for organic carbon, organic nitrogen, and selected inorganic constituents in coastal Louisiana marshes as reported by Brupbacher and others (1973).

[N, number of observations; MI, minimum; MX, maximum; MN mean; MD, median; P10, 10th percentile; P25, 25th percentile; P75, 75th percentile; P90, 90th percentile; organic carbon and organic nitrogen are in weight percent; phosphorous, potassium, calcium, magnesium, sodium are in parts per million]

Element	Soil type	N	MI	MX	MN	MD	P10	P25	P75	P90
				Fresh marsh						
Organic carbon	Organic	81	9.34	51.6	33.8	39.6	10.8	20.2	46.2	49.3
	Mineral	33	0.90	9.20	5.18	4.74	2.02	3.49	7.18	8.96
Organic nitrogen	Organic	81	0.53	3.35	2.02	2.24	0.79	1.30	2.65	2.90
	Mineral	33	0.09	0.88	0.43	0.39	0.15	0.26	0.62	0.69
Carbon-to-nitrogen ratio	Organic	81	10.3	28.2	16.6	16.6	12.9	14.6	17.9	20.5
	Mineral	33	8.00	18.2	12.4	12.2	9.70	11.2	13.5	14.4
Phosphorus	Organic	81	15.0	183	56.9	49.0	24.0	37.0	68.0	108
	Mineral	33	5.00	371	116	85.0	15.0	39.0	159	244
Potassium	Organic	81	78.0	948	309	250	136	194	398	470
	Mineral	33	78.0	720	343	316	128	220	460	612
Calcium	Organic	81	500	11,300	4,960	4,930	2,220	3,660	6,580	7,640
	Mineral	33	296	5,460	1,880	1,600	820	1,040	2,360	3,460
Magnesium	Organic	81	580	7,950	2,910	2,400	1,330	1,760	3,740	5,370
	Mineral	33	100	3,210	1,890	1,920	600	1,460	2,470	2,970
Sodium	Organic	81	200	20,600	4,970	3,040	588	1,180	7,000	11,700
	Mineral	33	160	3,580	1,600	1,580	340	630	2,450	2,750
				Brackish marsh						
Organic carbon	Organic	115	9.30	49.7	24.5	23.6	11	15.2	33.6	40.4
	Mineral	49	0.91	8.82	5.96	6.11	3.56	4.58	7.19	8.48
Organic nitrogen	Organic	115	0.54	3.10	1.44	1.33	0.73	0.90	1.88	2.44
	Mineral	49	0.08	0.68	0.42	0.43	0.23	0.30	0.53	0.61
Carbon-to-nitrogen ratio	Organic	115	10.4	36.2	17.2	16.8	13.1	15.0	18.2	20.5
	Mineral	49	9.90	23.4	14.7	13.8	11.7	12.4	16.5	19.7
Phosphorus	Organic	115	14.0	264	102	89.0	44.0	56.0	142	181
	Mineral	49	15.0	371	173	171	64.0	120	229	264
Potassium	Organic	115	260	2,260	1,100	1,080	548	792	1,320	1,760
	Mineral	49	204	1,830	813	780	466	650	972	1,140
Calcium	Organic	115	580	11,300	2,850	1,950	1,110	1,410	4,130	5,260
	Mineral	49	204	24,000	1,600	1,060	400	760	1,510	1,800
Magnesium	Organic	115	2,620	12,400	5,350	4,970	3,350	4,030	6,240	7,720
	Mineral	49	1,120	4,540	2,670	2,490	1,560	1,970	3,210	3,980
Sodium	Organic	115	2,150	96,000	19,300	19,000	6,150	11,500	24,500	29,300
	Mineral	49	1,390	16,000	7,060	6,800	2,870	4,210	8,650	12,600

Table 2-2. Summary statistics and percentiles by environment and soil type for organic carbon, organic nitrogen, and selected inorganic constituents in coastal Louisiana marshes as reported by Brupbacher and others (1973).—Continued.

[N, number of observations; MI, minimum; MX, maximum; MN mean; MD, median; P10, 10th percentile; P25, 25th percentile; P75, 75th percentile; P90, 90th percentile; organic carbon and organic nitrogen are in weight percent; phosphorous, potassium, calcium, magnesium, sodium are in parts per million]

Element	Soil type	N	MI	MX	MN	MD	P10	P25	P75	P90
Salt marsh										
Organic carbon	Organic	26	9.81	44.5	19.0	15.6	10.0	11.9	21.9	36.2
	Mineral	33	2.22	9.42	5.84	5.65	3.37	4.75	7.08	8.62
Organic nitrogen	Organic	26	0.43	2.97	1.07	0.8	0.64	0.67	1.28	2.07
	Mineral	33	0.10	0.72	0.37	0.36	0.23	0.28	0.43	0.51
Carbon-to-nitrogen ratio	Organic	26	12.2	43.8	18.6	17.5	14.4	15.3	20.3	22.8
	Mineral	33	12.1	26.0	16.3	15.0	12.9	13.8	17.9	22.2
Phosphorus	Organic	26	49.0	264	149	148	63.0	107	190	220
	Mineral	33	55.0	386	221	220	152	181	254	298
Potassium	Organic	26	496	2,600	1,450	1,340	710	1,060	1,760	2,480
	Mineral	33	108	1,830	1,040	1,000	716	864	1,200	1,600
Calcium	Organic	26	384	6,800	2,820	2,290	806	1,600	4,250	5,540
	Mineral	33	490	19,400	2,140	1,190	620	976	2,090	3,430
Magnesium	Organic	26	1,900	12,400	5,320	4,370	3,500	3,770	6,700	8,620
	Mineral	33	1,640	4,000	2,810	2,720	2,100	2,470	3,150	3,660
Sodium	Organic	26	9,100	56,800	25,600	20,700	16,300	17,600	36,000	43,000
	Mineral	33	7,040	22,500	12,200	11,900	8,900	9,950	14,000	15,700

Table 2-3. Summary statistics and percentiles by environment and texture class for organic carbon, organic nitrogen, and selected inorganic constituents in coastal Louisiana marshes as reported by Brupbacher and others (1973).

[N, number of observations; MI, minimum; MX, maximum; MN, Mean; MD, Median; P10, 10th percentile; P25, 25th percentile; P75, 75th percentile; P90, 90th percentile; organic carbon and organic nitrogen are in weight percent; phosphorous, potassium, calcium, magnesium, sodium are in parts per million]

	Texture class	N	MI	MX	MN	MD	P10	P25	P75	P90
					Fresh marsh					
Organic carbon	Clayey muck	3	9.88	10.8	10.4	10.6	9.88	9.88	10.8	10.8
	Peaty muck	8	15.9	22.6	18.7	18.6	15.9	16.2	20.5	22.6
	Muck	5	18.1	32.8	23.3	21.2	18.1	20.4	23.9	32.8
	Silty peat	1	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
	Clayey peat	10	9.34	14.6	11.4	10.4	9.36	9.64	13.4	14.3
	Mucky peat	14	28.3	46.7	37.3	37.1	28.7	31.7	43.0	46.5
	Peat	40	30.8	51.6	44.8	46.0	37.6	41.6	49.0	50.6
	Sandy clay	2	0.90	2.34	1.62	1.62	0.90	0.90	2.34	2.34
	Clay	18	1.36	5.60	3.58	3.73	1.69	2.10	4.65	5.08
	Mucky clay	2	7.23	7.39	7.31	7.31	7.23	7.23	7.39	7.39
	Peaty clay	11	6.71	9.20	8.05	8.55	6.90	7.03	9.10	9.19
Organic nitrogen	Clayey muck	3	0.53	0.98	0.73	0.69	0.53	0.53	0.98	0.98
	Peaty muck	8	0.95	1.53	1.20	1.19	0.95	1.03	1.35	1.53
	Muck	5	1.41	2.70	1.78	1.49	1.41	1.49	1.81	2.70
	Silty peat	1	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
	Clayey peat	10	0.64	1.13	0.84	0.78	0.69	0.74	0.98	1.07
	Mucky peat	14	1.17	3.35	2.32	2.43	1.77	1.89	2.64	2.95
	Peat	40	1.69	3.23	2.54	2.59	1.84	2.30	2.81	3.11
	Sandy clay	2	0.09	0.14	0.12	0.12	0.09	0.09	0.14	0.14
	Clay	18	0.13	0.62	0.31	0.29	0.15	0.16	0.39	0.57
	Mucky clay	2	0.62	0.69	0.66	0.66	0.62	0.62	0.69	0.69
	Peaty clay	11	0.38	0.88	0.63	0.63	0.52	0.52	0.72	0.80
Carbon-to-nitrogen ratio	Clayey muck	3	11.0	18.6	15.0	15.3	11.0	11.0	18.6	18.6
	Peaty muck	8	14.1	17.3	15.7	15.7	14.1	14.6	16.8	17.3
	Muck	5	12.1	14.5	13.2	13.2	12.1	12.1	14.2	14.5
	Silty peat	1	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7
	Clayey peat	10	11.6	17.0	13.6	13.3	12.1	12.7	14.1	15.8
	Mucky peat	14	10.3	24.2	16.6	16.2	15.3	15.8	17.0	18.5
	Peat	40	14.0	28.2	18.0	17.6	15.1	16.4	18.9	21.1
	Sandy clay	2	10.0	16.7	13.4	13.4	10.0	10.0	16.7	16.7
	Clay	18	8.00	17.9	12.1	12.4	8.20	10.6	13.4	14.4
	Mucky clay	2	10.5	11.9	11.2	11.2	10.5	10.5	11.9	11.9
	Peaty clay	11	9.70	18.2	13.1	12.9	11.5	11.9	14.1	14.4
Phosphorus	Clayey muck	3	44.0	54.0	48.7	48.0	44.0	44.0	54.0	54.0
	Peaty muck	8	15.0	108	58.8	57.0	15.0	31.5	85.0	108
	Muck	5	20.0	108	59.4	49.0	20.0	22.0	98.0	108
	Silty peat	1	110	110	110	110	110	110	110	110
	Clayey peat	10	15.0	112	63.6	58.5	24.5	35.0	100	111
	Mucky peat	14	20.0	74.0	47.1	47.5	23.0	37.0	63.0	64
	Peat	40	16.0	183	57.3	49.0	29.5	39.0	68.0	101
	Sandy clay	2	5.00	15.0	10.0	10.0	5.00	5.00	15.0	15.0
	Clay	18	10.0	371	140	99.5	15.0	32.0	234	366

Table 2-3. Summary statistics and percentiles by environment and texture class for organic carbon, organic nitrogen, and selected inorganic constituents in coastal Louisiana marshes as reported by Brupbacher and others (1973).—Continued.

[N, number of observations; MI, minimum; MX, maximum; MN, Mean; MD, Median; P10, 10th percentile; P25, 25th percentile; P75, 75th percentile; P90, 90th percentile; organic carbon and organic nitrogen are in weight percent; phosphorous, potassium, calcium, magnesium, sodium are in parts per million]

	Texture class	N	MI	MX	MN	MD	P10	P25	P75	P90
					Fresh marsh—Continued					
Phosphorus—continued	Mucky clay	2	35.0	39.0	37.0	37.0	35.0	35.0	39.0	39.0
	Peaty clay	11	45.0	244	112	85.0	60.0	72.0	123	210
Potassium	Clayey muck	3	304	428	375	392	304	304	428	428
	Peaty muck	8	178	948	357	272	178	208	386	948
	Muck	5	440	934	545	442	440	440	470	934
	Silty peat	1	368	368	368	368	368	368	368	368
	Clayey peat	10	130	408	302	325	158	240	380	403
	Mucky peat	14	78.0	730	293	236	104	194	346	724
	Peat	40	98.0	700	271	212	133	178	349	475
	Sandy clay	2	84.0	180	132	132	84.0	84.0	180	180
	Clay	18	78.0	720	338	262	80	194	514	632
	Mucky clay	2	240	370	305	305	240	240	370	370
	Peaty clay	11	160	708	396	354	240	242	596	612
Calcium	Clayey muck	3	2,480	5,560	3,880	3,600	2,480	2,480	5,560	5,560
	Peaty muck	8	1,160	7,200	3,520	3,290	1,160	2,040	4,580	7,200
	Muck	5	500	6,700	3,740	4,080	500	2,920	4,500	6,700
	Silty peat	1	794	794	794	794	794	794	794	794
	Clayey peat	10	1,300	5,570	3,020	2,380	1,360	2,220	4,080	5,290
	Mucky peat	14	2,530	9,180	5,590	5,120	2,730	4,420	7,400	8,820
	Peat	40	1,700	11,300	5,840	5,440	3,680	4,810	7,130	8,100
	Sandy clay	2	844	2,740	1,790	1,790	844	844	2,740	2,740
	Clay	18	296	4,270	1,790	1,660	394	880	2,650	3,460
	Mucky clay	2	1,500	1,760	1,630	1,630	1,500	1,500	1,760	1,760
	Peaty clay	11	900	5,460	2,100	1,600	918	1,220	2,360	4,080
Magnesium	Clayey muck	3	1,590	4,360	3,230	3,740	1,590	1,590	4,360	4,360
	Peaty muck	8	1,350	3,000	2,180	2,160	1,350	1,760	2,620	3,000
	Muck	5	2,150	7,950	5,590	5,890	2,150	5,120	6,820	7,950
	Silty peat	1	2,060	2,060	2,060	2,060	2,060	2,060	2,060	2,060
	Clayey peat	10	1,160	3,980	2,490	2,450	1,210	1,360	3,460	3,880
	Mucky peat	14	1,180	7,920	3,680	3,080	1,350	1,970	5,060	7,220
	Peat	40	580	6,380	2,560	2,270	1,090	1,630	3,140	4430
	Sandy clay	2	450	450	450	450	450	450	450	450
	Clay	18	100	2,990	1,820	1,870	600	1,280	2,550	2,910
	Mucky clay	2	1,560	2,970	2,270	2,270	1,560	1,560	2,970	2,970
	Peaty clay	11	1,460	3,210	2,200	2,250	1,510	1,600	2,430	3,190
Sodium	Clayey muck	3	200	2,750	1,700	2,160	200	200	2,750	2,750
	Peaty muck	8	550	10,500	4,070	2,470	550	844	7,460	10,500
	Muck	5	1,180	11,600	5,960	6,900	1,180	2,210	7,900	11,600
	Silty peat	1	3,210	3,210	3,210	3,210	3,210	3,210	3,210	3,210
	Clayey peat	10	490	5,500	2,170	2,200	520	550	3,040	4,620
	Mucky peat	14	430	20,600	7,020	6,550	680	1,200	11,700	15,000

Table 2-3. Summary statistics and percentiles by environment and texture class for organic carbon, organic nitrogen, and selected inorganic constituents in coastal Louisiana marshes as reported by Brupbacher and others (1973).—Continued.

[N, number of observations; MI, minimum; MX, maximum; MN, Mean; MD, Median; P10, 10th percentile; P25, 25th percentile; P75, 75th percentile; P90, 90th percentile; organic carbon and organic nitrogen are in weight percent; phosphorous, potassium, calcium, magnesium, sodium are in parts per million]

	Texture class	N	MI	MX	MN	MD	P10	P25	P75	P90
				Fresh marsh—Continued						
Sodium—continued	Peat	40	480	19,000	5,290	4,070	900	1,320	7,100	13,300
	Sandy clay	2	1,280	3,580	2,430	2,430	1,280	1,280	3,580	3,580
	Clay	18	160	3,250	1,330	1,040	290	410	2,300	2,700
	Mucky clay	2	900	1,580	1,240	1,240	900	900	1,580	1,580
	Peaty clay	11	270	2,930	1,950	2,350	1,110	1,180	2,520	2,750
				Brackish marsh						
Organic carbon	Clayey muck	3	10.0	14.9	12.5	12.5	10.0	10.0	14.9	14.9
	Peaty muck	27	16.1	24.4	19.1	19.0	16.3	17.4	20.1	23.3
	Muck	3	17.2	23.6	19.3	17.3	17.2	17.2	23.6	23.6
	Clayey peat	27	9.30	15.7	11.9	11.3	10.1	10.5	12.8	15.1
	Mucky peat	32	23.6	49.7	32.2	30.2	24.4	25.6	38.1	43.4
	Peat	23	29.2	48.0	37.3	38.4	30.5	32.3	40.9	42.5
	Sandy clay	2	0.91	1.19	1.05	1.05	0.91	0.91	1.19	1.19
	Clay	17	2.76	5.48	4.36	4.44	3.41	3.99	4.85	5.12
	Mucky clay	10	5.81	8.54	7.20	7.15	6.07	6.38	7.96	8.29
	Peaty clay	20	5.94	8.82	7.19	6.96	6.04	6.21	8.13	8.67
Organic nitrogen	Clayey muck	3	0.63	1.07	0.80	0.70	0.63	0.63	1.07	1.07
	Peaty muck	27	0.84	1.68	1.15	1.11	0.89	0.97	1.32	1.48
	Muck	3	0.96	2.27	1.48	1.22	0.96	0.96	2.27	2.27
	Clayey peat	27	0.54	1.16	0.78	0.78	0.57	0.65	0.85	0.99
	Mucky peat	32	1.15	2.83	1.88	1.81	1.35	1.52	2.22	2.57
	Peat	23	1.06	3.10	2.03	1.95	1.35	1.65	2.44	2.64
	Sandy clay	2	0.08	0.12	0.10	0.10	0.08	0.08	0.12	0.12
	Clay	17	0.18	0.49	0.30	0.27	0.21	0.25	0.37	0.47
	Mucky clay	10	0.34	0.68	0.54	0.57	0.37	0.43	0.61	0.68
	Peaty clay	20	0.31	0.66	0.49	0.49	0.34	0.44	0.55	0.62
Carbon-to-nitrogen ratio	Clayey muck	3	14.0	17.9	15.9	15.9	14.0	14.0	17.9	17.9
	Peaty muck	27	11.7	22.2	17.0	17.1	12.5	15.7	18.2	20.5
	Muck	3	10.4	18.0	14.2	14.1	10.4	10.4	18.0	18.0
	Clayey peat	27	12.3	21.7	15.6	15.0	13.1	13.5	16.8	19.8
	Mucky peat	32	10.7	32.1	17.5	17.2	14.8	15.9	18.6	20.5
	Peat	23	11.0	36.2	19.4	17.7	15.4	16.3	20.5	24.4
	Sandy clay	2	9.90	12.0	11.0	11.0	9.90	9.90	12.0	12.0
	Clay	17	10.4	23.4	15.2	14.2	10.9	11.7	17.2	21.9
	Mucky clay	10	10.5	17.1	13.7	13.3	11.4	12.8	14.8	16.5
	Peaty clay	20	11.8	20.6	15.1	14.9	12.1	13.0	16.7	18.7
Phosphorus	Clayey muck	3	14.0	107	50.0	29.0	14.0	14.0	107	107
	Peaty muck	27	46.0	195	110	108	53.0	71.0	151	171
	Muck	3	30.0	129	66.7	41.0	30.0	30.0	129	129
	Clayey peat	27	56.0	264	147	151	72.0	115	181	205

Table 2-3. Summary statistics and percentiles by environment and texture class for organic carbon, organic nitrogen, and selected inorganic constituents in coastal Louisiana marshes as reported by Brupbacher and others (1973).—Continued.

[N, number of observations; MI, minimum; MX, maximum; MN, Mean; MD, Median; P10, 10th percentile; P25, 25th percentile; P75, 75th percentile; P90, 90th percentile; organic carbon and organic nitrogen are in weight percent; phosphorous, potassium, calcium, magnesium, sodium are in parts per million]

	Texture class	N	MI	MX	MN	MD	P10	P25	P75	P90
					Brackish marsh—Continued					
Phosphorus—continued	Mucky peat	32	15.0	224	89.2	82.0	44.0	56.5	110	142
	Peat	23	20.0	205	68.2	55.0	37.0	44.0	78.0	112
	Sandy clay	2	35.0	136	85.5	85.5	35.0	35.0	136	136
	Clay	17	15.0	371	212	212	105	159	259	356
	Mucky clay	10	30.0	254	132	119	47.0	81.0	190	253
	Peaty clay	20	24.0	264	169	169	116	137	211	237
Potassium	Clayey muck	3	560	1,140	940	1,120	560	560	1,140	1,140
	Peaty muck	27	500	1,940	1,180	1,110	564	1,020	1,500	1,700
	Muck	3	552	1,100	739	566	552	552	1,100	1,100
	Clayey peat	27	422	1,700	979	1,030	470	792	1,160	1,270
	Mucky peat	32	266	2,260	1,240	1,050	704	795	1,800	2,100
	Peat	23	260	2,150	1,040	942	436	680	1,400	1,650
	Sandy clay	2	204	298	251	251	204	204	298	298
	Clay	17	242	1,140	748	748	414	588	960	1,140
	Mucky clay	10	466	1,830	932	918	516	594	1,000	1,570
	Peaty clay	20	520	1,460	865	820	664	733	988	1,060
Calcium	Clayey muck	3	1,180	3,460	2,180	1,900	1,180	1,180	3,460	3,460
	Peaty muck	27	588	6,010	1,850	1,720	1,040	1,310	1,960	2,790
	Muck	3	2,180	3,630	2,910	2,920	2,180	2,180	3,630	3,630
	Clayey peat	27	580	3,460	1,420	1,280	796	1,030	1,680	2,180
	Mucky peat	32	1,160	9,500	3,880	3,850	1,750	2,010	5,210	5,800
	Peat	23	1,130	11,300	4,350	4,460	1,730	3,800	5,080	5,800
	Sandy clay	2	204	700	452	452	204	204	700	700
	Clay	17	320	24,000	2,390	1,140	400	620	1,510	1,800
	Mucky clay	10	400	3,060	1,210	869	418	778	1,760	2,470
	Peaty clay	20	360	3,880	1,230	1,080	681	805	1,460	1,720
Magnesium	Clayey muck	3	4,430	8,780	5,880	4,430	4,430	4,430	8,780	8,780
	Peaty muck	27	2,920	6,940	4,980	4,950	4,030	4,450	5,440	6,180
	Muck	3	4,570	5,840	5,060	4,770	4,570	4,570	5,840	5,840
	Clayey peat	27	2,620	6,680	3,920	3,790	2,780	3,480	4,380	5,030
	Mucky peat	32	2,850	12,400	6,170	5,910	3,480	4,640	7,340	9,270
	Peat	23	2,940	10,800	6,300	6,240	4,200	4,970	7,350	8,140
	Sandy clay	2	1,120	1,290	1,210	1,210	1,120	1,120	1,290	1,290
	Clay	17	1,490	3,410	2,300	1,950	1,520	1,740	2,890	3,390
	Mucky clay	10	2,430	4,540	3,460	3,590	2,460	2,680	4,280	4,440
	Peaty clay	20	1,750	4,110	2,730	2,560	2,070	2,260	3,080	3,920
Sodium	Clayey muck	3	7,600	12,000	10,200	11,000	7,600	7,600	12,000	12,000
	Peaty muck	27	3,400	33,000	18,600	19,000	4,790	16,100	23,000	27,000
	Muck	3	6,150	15,300	10,300	9,350	6,150	6,150	15,300	15,300
	Clayey peat	27	2,860	96,000	15,800	13,000	3,250	8,000	19,000	22,500
	Mucky peat	32	2,150	42,700	22,900	23,400	10,000	17,800	27,200	36,900

Table 2-3. Summary statistics and percentiles by environment and texture class for organic carbon, organic nitrogen, and selected inorganic constituents in coastal Louisiana marshes as reported by Brupbacher and others (1973).—Continued.

[N, number of observations; MI, minimum; MX, maximum; MN, Mean; MD, Median; P10, 10th percentile; P25, 25th percentile; P75, 75th percentile; P90, 90th percentile; organic carbon and organic nitrogen are in weight percent; phosphorous, potassium, calcium, magnesium, sodium are in parts per million]

	Texture class	N	MI	MX	MN	MD	P10	P25	P75	P90
					Brackish marsh—Continued					
Sodium—continued	Peat	23	9,000	36,000	21,600	22,000	10,600	16,500	28,500	30,000
	Sandy clay	2	2,990	3,520	3,260	3,260	2,990	2,990	3,520	3,520
	Clay	17	1,390	9,800	5,530	6,000	2,820	3,580	6,380	8,200
	Mucky clay	10	2,780	16,000	7,230	6,150	3,250	4,120	9,800	13,500
	Peaty clay	20	2,850	15,000	8,660	7,800	4,050	7,000	11,300	13,400
					Salt marsh					
Organic carbon	Clayey muck	2	10.0	11.0	10.5	10.5	10.0	10.0	11.0	11.0
	Peaty muck	7	16.5	21.9	18.9	18.9	16.5	17.0	19.8	21.9
	Silty peat	1	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
	Clayey peat	10	9.81	14.4	11.8	12.0	9.83	10.1	13.0	13.9
	Mucky peat	3	28.4	36.2	31.8	30.8	28.4	28.4	36.2	36.2
	Peat	3	29.5	44.5	37.5	38.5	29.5	29.5	44.5	44.5
	Silty clay	2	2.22	5.04	3.63	3.63	2.22	2.22	5.04	5.04
	Clay	15	3.29	5.77	4.42	4.75	3.36	3.52	5.33	5.65
	Mucky clay	5	5.32	8.54	7.07	7.03	5.32	5.95	8.53	8.54
	Peaty clay	11	5.83	9.42	7.61	8.02	5.97	6.06	8.97	9.11
Organic nitrogen	Clayey muck	2	0.75	0.82	0.79	0.79	0.75	0.75	0.82	0.82
	Peaty muck	7	0.76	1.28	1.01	1.02	0.76	0.78	1.28	1.28
	Silty peat	1	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
	Clayey peat	10	0.43	0.98	0.68	0.67	0.54	0.64	0.69	0.86
	Mucky peat	3	1.82	2.14	2.01	2.07	1.82	1.82	2.14	2.14
	Peat	3	0.88	2.97	1.90	1.84	0.88	0.88	2.97	2.97
	Silty clay	2	0.10	0.39	0.25	0.25	0.10	0.10	0.39	0.39
	Clay	15	0.21	0.39	0.29	0.28	0.22	0.23	0.34	0.39
	Mucky clay	5	0.28	0.63	0.46	0.47	0.28	0.43	0.50	0.63
	Peaty clay	11	0.35	0.72	0.46	0.43	0.35	0.37	0.51	0.60
Carbon-to-nitrogen ratio	Clayey muck	2	12.2	14.7	13.5	13.5	12.2	12.2	14.7	14.7
	Peaty muck	7	15.3	25.4	19.3	18.5	15.3	17.1	21.7	25.4
	Silty peat	1	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
	Clayey peat	10	13.5	22.8	17.8	17.8	14.1	15.7	20.3	21.7
	Mucky peat	3	14.4	17.5	15.8	15.6	14.4	14.4	17.5	17.5
	Peat	3	15.0	43.8	24.9	16.0	15.0	15.0	43.8	43.8
	Silty clay	2	12.9	22.2	17.6	17.6	12.9	12.9	22.2	22.2
	Clay	15	12.1	22.2	15.6	15.0	12.2	13.7	17.0	21.0
	Mucky clay	5	13.6	22.6	16.5	14.1	13.6	13.8	18.2	22.6
	Peaty clay	11	13.1	26.0	16.9	15.2	13.6	13.9	19.2	21.7
Phosphorus	Clayey muck	2	176	264	220	220	176	176	264	264
	Peaty muck	7	98.0	181	132	132	98.0	107	156	181
	Silty peat	1	100	100	100	100	100	100	100	100
	Clayey peat	10	118	259	181	183	128	161	195	240
	Mucky peat	3	49.0	129	79.0	59.0	49.0	49.0	129	129
	Peat	3	63.0	220	124	88.0	63.0	63.0	220	220
	Silty clay	2	298	332	315	315	298	298	332	332
	Clay	15	133	386	224	220	142	178	254	332
	Mucky clay	5	181	283	229	229	181	195	259	283

Table 2-3. Summary statistics and percentiles by environment and texture class for organic carbon, organic nitrogen, and selected inorganic constituents in coastal Louisiana marshes as reported by Brupbacher and others (1973).—Continued.

[N, number of observations; MI, minimum; MX, maximum; MN, Mean; MD, Median; P10, 10th percentile; P25, 25th percentile; P75, 75th percentile; P90, 90th percentile; organic carbon and organic nitrogen are in weight percent; phosphorous, potassium, calcium, magnesium, sodium are in parts per million]

	Texture class	N	MI	MX	MN	MD	P10	P25	P75	P90
					Salt marsh—Continued					
Phosphorus—continued	Peaty clay	11	55.0	268	194	200	161	166	229	251
	Peaty muck	7	1,040	2,480	1,770	1,600	1,040	1,360	2,430	2,480
	Silty peat	1	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
	Clayey peat	10	678	1,760	1,230	1,190	694	1,000	1,600	1,760
	Mucky peat	3	1,330	2,600	2,180	2,600	1,330	1,330	2,600	2,600
	Peat	3	496	1,070	762	720	496	496	1,070	1,070
	Silty clay	2	582	1,120	849	849	582	582	1,120	1,120
	Clay	15	108	1,270	874	904	618	744	1,080	1,200
	Mucky clay	5	1,000	1,650	1,310	1,150	1,000	1,120	1,600	1,650
	Peaty clay	11	844	1,830	1,170	1,030	864	874	1,390	1,650
Calcium	Clayey muck	2	1,240	2,120	1,680	1,680	1,240	1,240	2,120	2,120
	Peaty muck	7	384	3,440	2,280	3,070	384	624	3,380	3,440
	Silty peat	1	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750
	Clayey peat	10	806	6,800	2,460	1,640	1,100	1,560	2,830	5,530
	Mucky peat	3	4,370	6,180	5,100	4,750	4,370	4,370	6,180	6,180
	Peat	3	2,450	5,540	4,150	4,460	2,450	2,450	5,540	5,540
	Silty clay	2	660	3,570	2,120	2,120	660	660	3,570	3,570
	Clay	15	490	5,000	1,360	1,120	616	740	1,350	2,090
	Mucky clay	5	620	2,890	1,400	1,360	620	750	1,390	2,890
	Peaty clay	11	572	19,400	3,550	1,730	1,110	1,110	3,230	3,430
Magnesium	Clayey muck	2	3,210	3,500	3,360	3,360	3,210	3,210	3,500	3,500
	Peaty muck	7	3,890	7,720	5,500	4,420	3,890	4,360	7,020	7,720
	Silty peat	1	5,990	5,990	5,990	5,990	5,990	5,990	5,990	5,990
	Clayey peat	10	1,900	4,810	3,740	3,770	2,720	3,680	4,120	4,480
	Mucky peat	3	6,860	12,400	9,910	10,400	6,860	6,860	12,400	12,400
	Peat	3	5,480	8,620	6,710	6,020	5,480	5,480	8,620	8,620
	Silty clay	2	2,720	2,770	2,750	2,750	2,720	2,720	2,770	2,770
	Clay	15	1,640	3,840	2,690	2,550	1,920	2,100	3,640	3,660
	Mucky clay	5	2,580	3,290	2,890	2,920	2,580	2,610	3,050	3,290
	Peaty clay	11	2,360	4,000	2,950	2,920	2,430	2,520	3,310	3,440
Sodium	Clayey muck	2	9,100	17,600	13,400	13,400	9,100	9,100	17,600	17,600
	Peaty muck	7	18,300	43,000	28,200	21,500	18,300	18,400	39,300	43,000
	Silty peat	1	39,200	39,200	39,200	39,200	39,200	39,200	39,200	39,200
	Clayey peat	10	9,550	22,000	17,500	17,700	12,900	16,900	18,300	21,800
	Mucky peat	3	31,500	56,800	45,400	48,000	31,500	31,500	56,800	56,800
	Peat	3	20,300	43,000	30,200	27,500	20,300	20,300	43,000	43,000
	Silty clay	2	8,900	9,950	9,430	9,430	8,900	8,900	9,950	9,950
	Clay	15	7,040	22,500	10,900	10,500	7,690	9,000	11,900	12,600
	Mucky clay	5	10,500	15,700	13,500	13,700	10,500	13,400	14,500	15,700
	Peaty clay	11	9,400	18,100	14,000	14,000	11,100	11,900	15,300	17,400

Appendix 3. Isotopic Data Used for Sample-Age Estimations

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
FRESH MARSH								
Bayou Verret push-core BV								
BV0-4	2.97	0.07	—	—	1.45	0.09	22.29	1.11
BV4-8	8.91	0.11	—	—	1.78	0.08	25.26	0.89
BV8-12	14.85	0.13	—	—	2.53	0.07	27.36	0.84
BV12-16	20.79	0.16	—	—	2.67	0.07	26.09	0.82
BV16-20	26.73	0.16	—	—	3.92	0.09	26.11	0.81
BV20-24	32.67	0.19	—	—	4.41	0.09	29.26	0.81
BV24-28	38.60	0.09	—	—	15.97	0.18	15.48	0.89
BV28-32	44.54	0.07	—	—	5.05	0.11	9.18	0.79
BV32-36	50.48	0.15	—	—	0.11	0.06	20.83	0.87
BV36-40	56.42	0.28	—	—	0.05	0.05	30.70	0.93
BV40-44	62.36	0.19	—	—	0.05	0.04	28.62	0.76
BV44-48	68.30	0.14	—	—	0.06	0.06	18.66	0.85
Lake Salvador push-core LSPb								
LSPb-1	1.09	0.08	—	—	0.63	0.29	10.85	4.25
LSPb-2	3.27	0.11	—	—	0.58	0.24	13.26	3.37
LSPb-3	5.45	0.08	—	—	0.56	0.26	14.45	3.70
LSPb-4	7.63	0.08	—	—	0.45	0.26	12.27	3.73
LSPb-5	9.81	0.11	—	—	0.68	0.19	11.88	2.67
LSPb-6	11.99	0.11	—	—	1.43	0.21	21.91	3.04
LSPb-7	14.17	0.08	—	—	1.90	0.32	19.24	4.49
LSPb-8	16.35	0.08	—	—	1.26	0.33	19.69	4.63
LSPb-9	18.52	0.15	—	—	2.56	0.15	19.43	2.13
LSPb-10	20.70	0.11	—	—	3.00	0.25	19.81	3.26
LSPb-11	22.88	0.11	—	—	3.57	0.26	19.50	3.26
LSPb-12	25.06	0.09	—	—	3.41	0.29	16.96	3.85
LSPb-13	27.24	0.08	—	—	5.52	0.34	13.73	4.28
LSPb-14	29.42	0.11	—	—	7.86	0.21	24.33	2.62
LSPb-15	31.60	0.12	—	—	10.36	0.31	28.57	3.25
LSPb-16	33.78	0.07	—	—	16.90	0.46	21.63	4.83
LSPb-17	35.96	0.08	—	—	12.85	0.45	11.69	4.59
LSPb-18	38.14	0.08	—	—	7.09	0.27	9.50	3.60
LSPb-19	40.32	0.06	—	—	2.72	0.35	11.06	4.73
LSPb-20	42.50	0.05	—	—	1.23	0.54	5.19	7.32
LSPb-21	44.68	0.05	—	—	1.43	0.39	6.50	5.44
LSPb-22	46.86	0.06	—	—	0.95	0.38	0.47	5.24
LSPb-23	49.04	0.04	—	—	0.55	0.55	8.47	7.83
LSPb-24	51.22	0.05	—	—	0.90	0.50	1.61	6.89
LSPb-25	53.39	0.06	—	—	0.12	0.45	3.93	6.37
LSPb-26	55.57	0.04	—	—	0.52	0.55	–3.29	7.87
LSPb-27	57.75	0.03	—	—	0.63	0.61	8.98	8.49
LSPb-28	59.93	0.05	—	—	0.63	0.49	4.53	6.84

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
FRESH MARSH—Continued								
Lake Salvador push-core LSPb—Continued								
LSPb-29	62.11	0.06	—	—	0.53	0.32	14.39	4.55
LSPb-30	64.29	0.09	—	—	0.66	0.24	18.43	3.43
LSPb-31	66.47	0.08	—	—	0.67	0.27	23.20	3.89
LSPb-32	68.65	0.10	—	—	0.87	0.25	19.87	3.51
Saint Mary push-core SM1b								
SM1b-1	1.06	0.21	—	—	0.59	0.10	27.26	1.98
SM1b-2	3.18	0.21	—	—	1.14	0.15	20.19	2.67
SM1b-3	5.30	0.20	—	—	1.45	0.16	29.70	2.72
SM1b-4	7.42	0.19	—	—	1.43	0.15	28.49	2.72
SM1b-5	9.54	0.20	—	—	1.77	0.12	30.78	2.13
SM1b-6	11.66	0.18	—	—	2.10	0.23	31.93	3.46
SM1b-7	13.78	0.21	—	—	3.53	0.15	20.42	2.11
SM1b-8	15.90	0.18	—	—	8.17	0.44	18.14	4.46
SM1b-9	18.02	0.15	—	—	7.33	0.42	10.36	3.63
SM1b-10	20.14	0.14	—	—	3.19	0.20	11.41	2.91
SM1b-11	22.26	0.11	—	—	0.86	0.23	4.55	3.63
SM1b-12	24.38	0.09	—	—	0.07	0.26	–1.25	4.08
SM1b-13	26.50	0.10	—	—	–0.34	0.33	6.17	4.51
SM1b-14	28.62	0.10	—	—	0.02	0.19	4.13	3.60
SM1b-15	30.74	0.14	—	—	–0.11	0.13	6.85	2.43
SM1b-16	32.86	0.13	—	—	–0.22	0.16	8.00	2.93
SM1b-17	34.98	0.12	—	—	–0.14	0.14	3.17	2.70
SM1b-18	37.10	0.12	—	—	–0.48	0.26	5.63	3.78
SM1b-19	39.22	0.14	—	—	0.00	0.00	0.00	0.00
SM1b-20	41.34	0.10	—	—	0.19	0.19	1.11	3.69

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
INTERMEDIATE MARSH								
Bayou Perot push-core BPPb								
BPPb-1	1.05	0.07	—	—	1.27	0.27	10.94	4.78
BPPb-2	3.15	0.08	—	—	1.24	0.14	6.88	3.39
BPPb-3	5.26	0.07	—	—	1.70	0.27	–0.68	4.90
BPPb-4	7.36	0.09	—	—	1.65	0.20	2.52	3.66
BPPb-5	9.46	0.07	—	—	0.48	0.26	–1.20	5.08
BPPb-6	11.56	0.07	—	—	0.76	0.14	2.10	3.67
BPPb-7	13.67	0.08	—	—	0.76	0.16	0.57	3.49
BPPb-8	15.77	0.07	—	—	0.41	0.19	3.12	4.07
BPPb-9	17.87	0.07	—	—	1.05	0.17	4.84	4.24
BPPb-10	19.98	0.08	—	—	1.76	0.24	8.31	4.40
BPPb-11	22.08	0.08	—	—	1.49	0.26	6.29	4.54
BPPb-12	24.18	0.07	—	—	2.01	0.32	8.70	5.25
BPPb-13	26.28	0.07	—	—	1.67	0.29	11.77	5.02
BPPb-14	28.39	0.08	—	—	2.70	0.17	10.73	3.76
BPPb-15	30.49	0.08	—	—	2.09	0.25	6.77	4.65
BPPb-16	32.59	0.07	—	—	2.21	0.27	8.51	4.64
BPPb-17	34.69	0.07	—	—	2.85	0.31	9.93	5.38
BPPb-18	36.80	0.07	—	—	7.08	0.33	9.64	4.86
BPPb-19	38.90	0.06	—	—	12.17	0.33	10.97	4.97
BPPb-20	41.00	0.07	—	—	16.37	0.34	13.70	4.63
BPPb-21	43.10	0.05	—	—	12.13	0.60	11.43	7.08
BPPb-22	45.21	0.06	—	—	9.28	0.53	–3.67	7.24
BPPb-23	47.31	0.05	—	—	5.58	0.24	4.43	5.07
BPPb-24	49.41	0.06	—	—	4.15	0.22	5.46	4.92
BPPb-25	51.51	0.06	—	—	1.85	0.37	7.42	5.88
BPPb-26	53.62	0.06	—	—	0.87	0.39	1.34	6.12
BPPb-27	55.72	0.07	—	—	0.51	0.21	3.31	4.24
BPPb-28	57.82	0.06	—	—	–0.02	0.23	–5.46	4.88
BPPb-29	59.92	0.05	—	—	1.38	0.32	–3.13	6.07

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
BRACKISH MARSH								
Fish and Wildlife push-core FW								
FW0-4	3.92	0.03	—	—	0.58	0.09	6.29	0.90
FW4-8	11.76	0.03	—	—	1.26	0.11	8.09	1.03
FW8-12	19.60	0.04	—	—	2.38	0.11	6.80	0.95
FW12-16	27.44	0.05	—	—	2.53	0.11	3.94	0.87
FW16-20	35.28	0.07	—	—	12.46	0.17	13.28	0.94
FW20-24	43.12	0.07	—	—	3.88	0.13	18.53	1.10
FW24-28	50.96	0.11	—	—	0.15	0.08	22.93	1.08
FW28-32	58.80	0.10	—	—	0.01	0.08	21.79	1.15
FW32-36	66.64	0.06	—	—	0.14	0.06	18.27	0.72
St. Bernard push-core SB1b								
SB1b-1	6.67	—	—	—	0.00	0.00	0.00	0.00
SB1b-2	8.98	0.08	—	—	0.08	0.02	0.31	0.02
SB1b-3	11.28	0.08	—	—	0.09	0.02	0.27	0.01
SB1b-4	13.59	0.15	—	—	1.51	0.04	0.42	0.02
SB1b-5	15.89	0.14	—	—	2.76	0.05	0.43	0.02
SB1b-6	18.20	0.12	—	—	2.08	0.08	0.33	0.04
SB1b-7	20.50	0.12	—	—	0.71	0.04	0.30	0.02
SB1b-8	22.81	0.12	—	—	0.39	0.03	0.31	0.02
SB1b-9	25.11	0.14	—	—	0.25	0.02	0.45	0.02
SB1b-10	27.41	0.14	—	—	0.10	0.02	0.46	0.02
SB1b-11	29.72	0.13	—	—	0.00	0.01	0.33	0.01
SB1b-12	32.02	0.12	—	—	0.02	0.02	0.29	0.02
SB1b-13	34.33	0.12	—	—	–0.01	0.02	0.26	0.02
SB1b-14	36.63	0.15	—	—	—	—	—	—
SB1b-15	38.94	0.19	—	—	—	—	—	—
SB1b-16	41.24	0.19	—	—	—	—	—	—
SB1b-17	43.55	0.15	—	—	—	—	—	—
SB1b-18	45.85	0.13	—	—	—	—	—	—
SB1b-19	48.16	0.12	—	—	–0.08	0.02	0.30	0.02
SB1b-20	50.46	0.13	—	—	—	—	—	—
SB1b-21	52.77	0.11	—	—	—	—	—	—
SB1b-22	55.07	0.11	—	—	—	—	—	—
SB1b-23	57.37	0.12	—	—	—	—	—	—
SB1b-24	59.68	0.11	—	—	—	—	—	—
SB1b-25	61.98	0.10	—	—	–0.04	0.02	0.21	0.02

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
BRACKISH MARSH—Continued								
Terrebonne push-core TB2a								
TB2a-1	1.06	0.09	—	—	0.75	0.23	24.32	4.48
TB2a-2	3.19	0.10	—	—	0.44	0.14	25.13	3.13
TB2a-3	5.31	0.10	—	—	0.30	0.17	25.35	3.51
TB2a-4	7.44	0.10	—	—	0.50	0.19	31.00	3.76
TB2a-5	9.56	0.12	—	—	0.54	0.15	34.24	3.14
TB2a-6	11.69	0.16	—	—	0.63	0.07	39.12	1.96
TB2a-7	13.81	0.15	—	—	0.61	0.13	34.07	2.73
TB2a-8	15.94	0.18	—	—	0.61	0.12	39.30	2.51
TB2a-9	18.06	0.16	—	—	0.63	0.13	34.95	2.71
TB2a-10	20.19	0.10	—	—	0.85	0.12	31.40	3.10
TB2a-11	22.31	0.12	—	—	1.22	0.17	34.56	3.50
TB2a-12	24.44	0.11	—	—	1.07	0.16	36.23	3.43
TB2a-13	26.57	0.14	—	—	1.16	0.15	31.78	2.98
TB2a-14	28.69	0.09	—	—	1.00	0.14	24.20	3.27
TB2a-15	30.82	0.10	—	—	1.61	0.15	26.53	3.40
TB2a-16	32.94	0.11	—	—	1.97	0.20	33.60	3.74
TB2a-17	35.07	0.14	—	—	2.05	0.17	34.23	3.03
TB2a-18	37.19	0.13	—	—	2.68	0.19	33.72	3.30
TB2a-19	39.32	0.11	—	—	3.52	0.21	36.04	3.71
TB2a-20	41.44	0.10	—	—	6.33	0.26	25.04	3.83
TB2a-21	43.57	0.14	—	—	8.30	0.22	32.09	2.88
TB2a-22	45.69	0.13	—	—	13.17	0.16	27.91	2.30
TB2a-23	47.82	0.09	—	—	18.97	0.39	9.85	3.93
TB2a-24	49.94	0.08	—	—	8.98	0.35	4.20	4.45
TB2a-25	52.07	0.07	—	—	4.83	0.20	4.58	4.28
TB2a-26	54.19	0.07	—	—	2.73	0.33	3.32	5.49
TB2a-27	56.32	0.07	—	—	1.93	0.27	0.55	4.81
TB2a-28	58.44	0.07	—	—	1.64	0.15	6.96	4.12
TB2a-29	60.57	0.06	—	—	1.76	0.26	7.52	5.17
TB2a-30	62.69	0.06	—	—	0.85	0.31	17.41	6.17
TB2a-31	65.35	0.11	—	—	0.37	0.18	14.23	3.36
TB2a-32	68.01	0.12	—	—	0.57	0.19	18.24	2.67
TB2a-33	70.13	0.17	—	—	0.34	0.11	32.78	2.47
TB2a-34	72.26	0.23	—	—	0.29	0.10	35.53	2.28
TB2a-35	74.38	0.11	—	—	0.25	0.17	28.73	3.55
TB2a-36	76.51	0.09	—	—	0.00	0.00	0.00	0.00
TB2a-37	78.57	0.12	—	—	–0.10	0.16	22.22	3.18
TB2a-38	80.57	0.14	—	—	0.03	0.15	27.39	3.00
TB2a-39	82.57	0.09	—	—	–0.16	0.21	17.78	4.03

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
NATURAL LEVEE								
Plaquemines push-core PLAQb								
PLAQb-1	1.06	0.40	6.62	0.51	0.89	0.16	39.61	2.51
PLAQb-2	3.17	0.59	4.61	0.48	0.47	0.10	41.63	1.66
PLAQb-3	5.28	0.95	4.33	0.39	0.46	0.07	43.63	1.12
PLAQb-4	7.39	0.64	8.03	0.50	2.17	0.10	41.69	1.51
PLAQb-5	9.50	0.78	6.45	0.49	2.23	0.10	42.26	1.48
PLAQb-6	11.61	0.86	4.70	0.46	1.23	0.09	42.26	1.41
PLAQb-7	13.72	0.97	3.33	0.49	0.54	0.08	44.68	1.24
PLAQb-8	15.83	0.99	2.75	0.44	0.17	0.06	43.66	0.99
PLAQb-9	17.94	1.13	3.85	0.41	0.05	0.06	44.99	1.17
PLAQb-10	20.05	1.10	2.79	0.44	0.04	0.06	43.42	1.01
PLAQb-11	22.17	1.03	3.00	0.50	0.00	0.07	45.32	1.29
PLAQb-12	24.28	1.26	2.61	0.45	–0.05	0.06	46.84	1.08
PLAQb-13	26.39	1.21	1.87	0.44	0.01	0.06	45.10	0.97
PLAQb-14	28.50	1.03	1.67	0.44	0.01	0.07	44.82	1.17
PLAQb-15	30.61	1.12	2.75	0.44	–0.01	0.07	46.34	1.21
PLAQb-16	32.72	1.30	—	—	–0.03	0.07	43.93	1.36
PLAQb-17	34.83	1.12	—	—	—	—	—	—
PLAQb-18	36.94	1.39	—	—	–0.06	0.06	46.05	1.10
PLAQb-19	39.05	1.11	—	—	—	—	—	—
PLAQb-20	41.17	1.32	—	—	0.07	0.07	46.98	1.55
PLAQb-21	43.28	1.37	—	—	—	—	—	—
PLAQb-22	45.39	1.22	—	—	0.01	0.06	44.55	1.06
PLAQb-23	47.50	1.42	—	—	—	—	—	—
PLAQb-24	49.61	1.35	—	—	0.08	0.06	44.81	1.13
PLAQb-25	51.72	1.20	—	—	—	—	—	—
PLAQb-26	53.83	1.12	—	—	–0.07	0.07	44.99	1.51
PLAQb-27	55.94	1.24	—	—	—	—	—	—
PLAQb-28	58.05	1.11	—	—	0.00	0.07	43.54	1.33
Bayou Sauvage levee push-core BSLa								
BSLa-1	0.51	0.32	—	—	2.08	0.20	19.44	2.68
BSLa-2	1.53	0.26	—	—	2.24	0.18	17.58	2.49
BSLa-3	2.55	0.25	—	—	2.25	0.23	12.10	3.16
BSLa-4	3.57	0.23	—	—	2.05	0.24	16.26	3.34
BSLa-5	4.59	0.21	—	—	1.90	0.23	15.71	3.21
BSLa-6	5.61	0.24	—	—	1.61	0.19	23.44	2.64

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
NATURAL LEVEE—Continued								
Bayou Sauvage levee push-core BSLa—Continued								
BSLa-7	6.63	0.45	—	—	0.92	0.11	34.19	1.80
BSLa-8	7.65	0.71	—	—	1.13	0.07	37.36	1.15
BSLa-9	8.68	0.69	—	—	1.92	0.08	39.37	1.25
BSLa-10	9.70	0.72	—	—	1.35	0.06	41.71	0.91
BSLa-11	11.23	1.12	—	—	0.26	0.05	41.60	0.99
BSLa-12	13.27	1.33	—	—	0.08	0.04	48.65	0.96
BSLa-13	15.31	1.26	—	—	0.10	0.04	47.80	0.91
BSLa-14	17.35	1.35	—	—	0.05	0.05	48.52	1.07
Bayou Sauvage levee push-core BS2b								
BSL2b-1	1.06	0.24	17.09	0.58	0.37	0.17	20.57	2.51
BSL2b-2	3.17	0.40	12.08	0.54	0.68	0.17	37.42	2.65
BSL2b-3	5.28	0.68	5.34	0.50	0.86	0.09	43.31	1.48
BSL2b-4	7.39	0.77	4.64	0.45	0.78	0.09	43.02	1.52
BSL2b-5	9.50	0.95	3.72	0.42	0.28	0.05	46.74	0.87
BSL2b-6	11.61	0.77	4.09	0.52	1.75	0.06	44.13	0.99
BSL2b-7	13.72	0.65	3.38	0.58	1.03	0.07	40.43	1.08
BSL2b-8	15.83	0.71	3.23	0.48	0.29	0.10	41.06	1.61
BSL2b-9	17.94	0.73	2.67	0.56	0.07	0.10	44.51	1.68
BSL2b-10	20.05	0.91	1.45	0.45	0.10	0.09	44.96	1.76
BSL2b-11	22.17	0.84	1.87	0.37	–0.01	0.08	45.72	1.43
BSL2b-12	24.28	0.97	2.09	0.49	0.08	0.08	43.93	1.49
BSL2b-13	26.39	0.77	1.83	0.51	0.08	0.09	43.09	1.62
BSL2b-14	28.50	1.04	2.26	0.43	—	—	—	—
BSL2b-15	30.61	0.85	2.30	0.51	0.08	0.08	45.05	1.55
BSL2b-16	32.72	0.91	2.71	0.44	—	—	—	—
BSL2b-17	34.83	0.91	2.54	0.45	—	—	—	—
BSL2b-18	36.94	1.08	2.35	0.37	0.02	0.08	44.85	1.68
BSL2b-19	39.05	0.93	2.02	0.38	—	—	—	—
BSL2b-20	41.17	1.03	2.84	0.67	–0.16	0.09	44.34	1.79
BSL2b-21	43.28	1.13	—	—	—	—	—	—
BSL2b-22	45.39	1.03	2.67	0.55	0.01	0.08	46.07	1.48
BSL2b-23	47.50	1.04	—	—	—	—	—	—
BSL2b-24	49.61	1.11	3.11	0.45	—	—	—	—
BSL2b-25	51.72	1.10	0.00	0.00	–0.03	0.07	43.69	1.15
BSL2b-26	53.83	1.06	3.34	0.71	—	—	—	—
BSL2b-27	55.94	1.03	—	—	—	—	—	—
BSL2b-28	58.05	—	3.09	0.52	–0.06	0.16	46.23	2.79

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
DISTRIBUTARY								
Bayou Sauvage distributary push-core BSDb								
BSDb-1	1.02	0.17	—	—	2.66	0.18	13.99	2.41
BSDb-2	3.06	0.13	—	—	2.64	0.24	15.23	3.20
BSDb-3	5.10	0.16	—	—	2.31	0.15	15.83	2.12
BSDb-4	7.14	0.14	—	—	2.71	0.21	15.20	2.77
BSDb-5	9.19	0.17	—	—	2.45	0.19	17.30	2.51
BSDb-6	11.23	0.23	—	—	2.36	0.15	19.92	2.11
BSDb-7	13.27	0.17	—	—	1.98	0.18	13.31	2.44
BSDb-8	15.31	0.22	—	—	2.99	0.16	23.51	2.10
BSDb-9	17.35	0.22	—	—	2.85	0.15	25.30	2.06
BSDb-10	19.65	0.26	—	—	2.36	0.08	31.18	1.13
BSDb-11	22.20	0.39	—	—	1.21	0.07	41.60	1.24
BSDb-12	24.50	0.52	—	—	0.63	0.07	45.41	1.31
BSDb-13	26.54	0.53	—	—	0.43	0.06	44.22	0.95
BSDb-14	28.58	0.57	—	—	0.49	0.07	42.44	1.30
BSDb-15	30.37	0.62	—	—	1.26	0.11	30.82	1.75
BSDb-16	32.16	0.59	—	—	1.00	0.07	34.35	1.17
BSDb-17	34.45	0.25	—	—	1.70	0.10	24.24	1.46
BSDb-18	36.75	0.22	—	—	1.75	0.11	18.11	1.58
BSDb-19	38.79	0.20	—	—	1.56	0.13	16.98	1.89
BSDb-20	40.83	0.20	—	—	0.63	0.15	15.53	2.19
BSDb-21	42.87	0.18	—	—	0.70	0.13	14.53	1.85
BSDb-22	44.92	0.20	—	—	0.50	0.12	12.94	1.78
BSDb-23	46.96	0.17	—	—	0.54	0.16	12.52	2.46
BSDb-24	49.00	0.17	—	—	0.19	0.16	11.63	2.46
BSDb-25	51.04	0.22	—	—	0.04	0.10	19.23	1.51
BSDb-26	53.08	0.32	—	—	0.06	0.09	10.12	1.41
BSDb-27	55.12	0.19	—	—	0.16	0.14	15.50	2.16
BSDb-28	57.17	0.18	—	—	—	—	—	—
BSDb-29	59.21	0.20	—	—	—	—	—	—
BSDb-30	61.25	0.18	—	—	–0.05	0.15	23.25	2.45

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
BACKSWAMP								
St. Martin backswamp push-core MR1c								
MR1c-1	1.11	0.86	—	—	0.23	0.06	41.83	1.41
MR1c-2	3.34	0.80	—	—	0.18	0.04	40.94	0.98
MR1c-3	5.57	0.96	—	—	0.01	0.06	41.23	1.42
MR1c-4	7.80	0.97	—	—	0.06	0.03	42.34	0.97
MR1c-5	10.02	1.09	—	—	0.11	0.05	41.61	1.38
MR1c-6	12.25	1.06	—	—	0.05	0.05	44.87	1.38
MR1c-7	14.48	0.84	—	—	0.10	0.03	41.38	0.96
MR1c-8	16.70	1.12	—	—	0.07	0.06	42.34	1.40
MR1c-9	18.93	1.23	—	—	0.09	0.06	40.11	1.39
MR1c-10	21.16	0.99	—	—	0.11	0.04	40.62	1.07
MR1c-11	23.39	1.13	—	—	0.07	0.06	42.11	1.42
MR1c-12	25.61	1.05	—	—	0.09	0.06	41.33	1.43
MR1c-13	27.84	1.08	—	—	0.03	0.06	42.72	1.44
MR1c-14	30.07	0.96	—	—	0.06	0.06	41.00	1.34
MR1c-15	32.29	1.43	—	—	0.10	0.11	39.67	1.52
MR1c-16	34.52	1.40	—	—	0.11	0.04	41.20	1.00
MR1c-17	36.75	1.31	—	—	0.06	0.03	40.23	0.94
MR1c-18	38.98	1.50	—	—	0.12	0.03	42.31	0.96
MR1c-19	41.20	1.52	—	—	0.15	0.03	42.35	0.76
MR1c-20	43.43	1.34	—	—	0.18	0.06	40.26	1.39
MR1c-21	45.66	1.17	—	—	0.21	0.06	44.31	1.44
MR1c-22	47.88	1.36	—	—	0.15	0.06	41.40	1.38
MR1c-23	50.11	1.44	—	—	–0.01	0.03	45.22	0.82
MR1c-24	52.34	1.36	—	—	0.34	0.06	44.18	1.40
MR1c-25	54.57	1.62	—	—	0.30	0.06	45.69	1.03
MR1c-26	56.79	1.46	—	—	0.47	0.06	47.43	1.43
MR1c-27	59.02	1.53	—	—	0.90	0.07	45.97	1.43
MR1c-28	61.25	—	—	—	0.00	0.00	0.00	0.00
MR1c-29	63.47	1.51	—	—	1.14	0.04	43.68	0.95
MR1c-30	65.70	1.37	—	—	1.07	0.04	44.44	0.99
MR1c-31	67.93	1.36	—	—	0.54	0.06	43.85	1.38
MR1c-32	70.16	1.52	—	—	0.27	0.06	45.73	1.49

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
Backswamp—Continued								
St. Landry push-core SL1b								
SL1b-1	1.09	0.55	10.39	0.56	1.58	0.07	39.77	1.59
SL1b-2	3.27	0.77	9.19	0.62	1.49	0.07	39.83	1.34
SL1b-3	5.45	0.73	8.70	0.50	1.48	0.07	40.80	1.37
SL1b-4	7.64	0.77	9.10	0.78	1.57	0.07	41.20	1.33
SL1b-5	9.82	0.86	6.72	0.72	1.77	0.09	40.93	1.64
SL1b-6	12.00	1.07	5.76	0.62	0.68	0.07	42.90	1.47
SL1b-7	14.18	1.24	3.69	0.48	0.13	0.04	42.50	1.14
SL1b-8	16.36	1.35	2.35	0.75	0.00	0.06	42.83	1.41
SL1b-9	18.55	1.09	2.84	0.69	0.01	0.04	42.26	1.11
SL1b-10	20.73	0.87	3.52	0.71	–0.02	0.06	42.37	1.45
SL1b-11	22.91	0.79	2.50	0.75	–0.08	0.03	41.88	0.96
SL1b-12	25.09	1.15	3.13	0.47	–0.08	0.04	39.37	0.96
SL1b-13	27.27	0.85	2.30	0.54	–0.08	0.05	41.06	1.32
SL1b-14	29.43	1.10	3.17	0.47	0.00	0.00	0.00	0.00
SL1b-15	31.64	1.26	2.12	0.52	–0.05	0.03	40.51	0.97
SL1b-16	33.82	1.29	—	—	—	—	—	—
SL1b-17	36.00	1.39	3.05	0.48	—	—	—	—
SL1b-18	38.18	1.49	—	—	—	—	—	—
SL1b-19	40.36	1.44	2.23	0.51	—	—	—	—
SL1b-20	42.54	1.53	—	—	–0.03	0.05	36.70	1.27
SL1b-21	44.73	1.55	2.98	0.61	—	—	—	—
SL1b-22	46.91	1.70	—	—	—	—	—	—
SL1b-23	49.05	1.57	2.30	0.46	—	—	—	—
SL1b-24	51.27	1.58	—	—	—	—	—	—
SL1b-25	53.45	1.61	1.52	0.51	—	—	—	—
SL1b-26	55.63	1.63	—	—	—	—	—	—
SL1b-27	57.82	1.60	2.75	0.51	—	—	—	—
SL1b-28	60.00	2.06	—	—	—	—	—	—
SL1b-29	62.18	1.89	2.99	0.52	—	—	—	—
SL1b-30	64.36	1.89	—	—	—	—	—	—
SL1b-31	66.54	1.93	2.63	0.42	—	—	—	—

Table 3-1. Isotopic lead-210, cesium-137, and potassium-40 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; ^{210}Pb, lead-210; ^{137}Cs, cesium-137; ^{40}K, potassium-40; °C degree Celsuis; cm, centimeters; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; ±, plus or minus; 1σ, 1 standard deviation; –, minus; —, lost sample/no data]

Sample ID	Corrected midpoint depth (cm)	Oven-dry bulk density 65°C (g cm^{-3})	^{210}Pb specific activity (d m^{-1} g^{-1})[1, 2]	^{210}Pb counting error (±1 σ)	^{137}Cs specific activity (d m^{-1} g^{-1})[1, 2]	^{137}Cs counting error (± 1 σ)	^{40}K specific activity (d m^{-1} g^{-1})[1, 2]	^{40}K counting error (±1 σ)
SWAMP								
Tangipahoa push-core TN1b								
TN1b-1	1.30	0.07	—	—	4.71	0.24	4.01	3.64
TN1b-2	3.89	0.10	—	—	2.41	0.21	0.21	3.02
TN1b-3	6.48	0.08	—	—	0.95	0.18	–5.13	3.21
TN1b-4	9.07	0.08	—	—	1.29	0.19	–3.14	3.35
TN1b-5	11.66	0.08	—	—	1.50	0.12	–0.86	2.73
TN1b-6	14.25	0.08	—	—	1.99	0.21	3.17	3.24
TN1b-7	16.84	0.08	—	—	4.42	0.24	–3.34	3.36
TN1b-8	19.43	0.08	—	—	3.69	0.23	2.17	3.50
TN1b-9	22.02	0.09	—	—	3.79	0.24	–0.75	3.20
TN1b-10	24.61	0.08	—	—	5.62	0.15	0.80	2.79
TN1b-11	27.20	0.09	—	—	6.41	0.24	2.40	3.18
TN1b-12	29.79	0.06	—	—	3.77	0.32	4.34	4.80
TN1b-13	32.38	0.09	—	—	5.62	0.18	1.34	2.85
TN1b-14	34.97	0.07	—	—	5.90	0.17	–1.86	3.53
TN1b-15	37.56	0.07	—	—	4.92	0.31	–1.84	4.09
TN1b-16	40.15	0.08	—	—	4.73	0.26	3.29	3.67
TN1b-17	42.74	0.07	—	—	3.82	0.24	1.52	3.92
TN1b-18	45.33	0.07	—	—	3.17	0.16	–3.23	3.39
TN1b-19	47.92	0.07	—	—	2.85	0.27	–0.68	4.15
TN1b-20	50.51	0.06	—	—	3.70	0.29	–0.21	4.44
TN1b-21	53.10	0.07	—	—	4.80	0.17	–1.66	3.28
TN1b-22	55.69	0.07	—	—	4.57	0.29	3.52	4.00
TN1b-23	58.28	0.08	—	—	3.79	0.24	2.69	3.40
TN1b-24	60.87	0.10	—	—	2.26	0.18	0.96	2.94
TN1b-25	63.46	0.07	—	—	2.96	0.25	1.36	4.09
TN1b-26	66.05	0.07	—	—	2.96	0.27	0.89	4.22
TN1b-27	68.96	0.08	—	—	3.58	0.18	–2.46	2.66
TN1b-28	71.87	0.12	—	—	1.05	0.14	5.63	2.43
TN1b-29	74.46	0.12	—	—	1.28	0.15	–2.08	2.45
TN1b-30	77.05	0.11	—	—	0.36	0.09	2.00	2.08
TN1b-31	79.64	0.12	—	—	0.30	0.10	2.12	2.11
TN1b-32	82.23	0.12	—	—	0.08	0.13	2.27	2.42
TN1b-33	84.50	0.12	—	—	–0.23	0.11	2.00	2.64

[1] Negative values result when the background count of disintegrations per minute is greater than the sample's specific activity in disintegrations per minute. A negative value is considered as analytical zero.

[2] A dash (—) indicates that either there was no sample taken for the particular analysis or that a decision was made that the analysis was not needed.

Table 3–2. Isotopic carbon-14 and carbon-13 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[cm, centimeter; ID, identifier; ± , plus or minus; Δ14C, Delta carbon-14; δ13C, delta carbon-13; ‰, parts per thousand; CAL yr BP, calibrated years before present; do., ditto; —, no data; >, greater than]

Corrected depth (cm)	Lab ID WW-[1]	Material	^{14}C age[2]		Δ^{14}C[3]		δ^{13}C[4]	Calibrated age range[5] (CAL yr BP)	
			yr BP	±	‰	±	‰	Maximum	Minimum
				FRESH MARSH					
				Bayou Verret push-core BV					
20.79	5030	Peat	>MODERN	—	173.12	7.65	–25	—	—
26.73	5031	do.	do.	—	254.38	7.85	–25	—	—
32.67	5032	do.	do.	—	257.86	8.05	–25	—	—
38.60	5026	do.	do.	—	760.17	10.63	–25	—	—
44.54	5027	do.	do.	—	14.26	6.36	–25	—	—
50.48	5028	do.	do.	—	79.63	6.76	–25	—	—
56.42	5029	do.	do.	—	78.64	6.76	–25	—	—
				Lake Salvador push-core LSPe					
71.30	1592	Peat	680	50	[6]—	—	–25	690	540
108.10	1593	do.	1,160	40	—	—	–25	1,180	970
116.15	1596	do.	1,430	50	—	—	–25	1,420	1,260
123.05	1595	do.	1,620	50	—	—	–25	1,690	1,390
154.10	1594	do.	1,930	50	—	—	–25	2,000	1,730
196.65	1597	do.	2,330	50	—	—	–25	2,750	2,150
281.75	1598	do.	2,590	50	—	—	–25	2,790	2,470
305.90	1599	do.	2,850	50	—	—	–25	3,170	2,790
322.00	1600	do.	2,920	50	—	—	–25	3,240	2,890
8.89	1306	Peat	>MODERN	—	115.5	5.5	–23.9	—	—
				St. Mary push-core SM1a					
11.43	1307	do.	do.	—	187.6	5.9	–25.2	—	—
13.97	1308	do.	do.	—	190.0	6.6	–24.4	—	—
16.51	1309	do.	do.	—	229.2	7.9	–24.6	—	—
19.05	1310	Peat/grass	do.	—	482.1	8.1	–23.3	—	—
21.59	1311	Peat	do.	—	167.1	5.7	–24.3	—	—
24.13	1312	do.	do.	—	119.9	5.0	–23.5	—	—
				St. Mary vibracore SM1c					
38.10	686	Peat	280	60	—	—	–23.2	500	[7]0
57.15	817	do.	670	50	—	—	–25.5	690	540
80.01	818	do.	760	50	—	—	–26.8	790	560
88.27	819	do.	1,030	60	—	—	–27.1	1,070	780
96.02	820	do.	1,100	60	—	—	–26.5	1,180	920
111.76	821	do.	1,400	60	—	—	–26.7	1,420	1,170
122.56	822	do.	1,820	60	—	—	–25.3	1,890	1,560
133.35	823	do.	1,750	60	—	—	–26.4	1,820	1,530
147.96	824	do.	1,960	50	—	—	–26.6	2,050	1,730
167.64	825	do.	2,100	60	—	—	–27.7	2,310	1,920
179.07	826	do.	2,180	40	—	—	–26.3	2,330	2,060
189.23	827	Peat	2,150	50	—	—	–26.6	2,310	1,990
201.93	828	do.	2,370	60	—	—	–26.4	2,750	2,150
217.17	829	do.	2,400	60	—	—	–26.3	2,720	2,330
227.33	830	do.	2,490	60	—	—	–23.5	2,740	2,360
246.38	831	do.	2,700	60	—	—	–17.7	2,950	2,740
255.27	832	do.	3,050	60	—	—	–17.3	3,390	3,060
266.70	699	do.	3,100	60	—	—	–20.2	3,470	3,160

Table 3–2. Isotopic carbon-14 and carbon-13 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; ID, identifier; ± , plus or minus; $\Delta^{14}C$, Delta carbon-14; $\delta^{13}C$, delta carbon-13; ‰, parts per thousand; CAL yr BP, calibrated years before present; do., ditto; —, no data; >, greater than]

Corrected depth (cm)	Lab ID WW-[1]	Material	^{14}C age[2]		$\Delta^{14}C$[3]		$\delta^{13}C$[4]	Calibrated age range[5] (CAL yr BP)	
			yr BP	±	‰	±	‰	Maximum	Minimum
INTERMEDIATE MARSH									
Bayou Perot push-core BPPa									
27.83	2543	Peat	>MODERN	—	488.9	8.4	–25.0	—	—
30.25	2542	do.	do.	—	581.9	9.4	–25.0	—	—
32.67	2541	do.	do.	—	399.7	7.3	–25.0	—	—
35.09	2461	do.	do.	—	432.5	6.0	–24.0	—	—
37.51	2462	do.	do.	—	196.7	3.9	–23.0	—	—
39.93	2463	do.	do.	—	60.3	4.4	–22.0	—	—
42.35	2464	do.	MODERN	—	—	—	–24.0	—	—
44.77	2465	do.	>MODERN	—	20.4	3.6	–24.0	—	—
47.19	2466	do.	MODERN	—	—	—	–24.0	—	—
48.59	1966	Peat	300	55	—	—	–27.3	500	150
108.48	1967	do.	1,155	55	—	—	–19.6	1,230	950
153.68	1968	do.	1,515	60	—	—	–21.5	1,530	1,300
279.11	1969	do.	2,400	55	—	—	–26.8	2,720	2,330
332.22	1970	do.	2,510	60	—	—	–23.4	2,750	2,360
369.51	1971	do.	2,930	65	—	—	–27.0	3,320	2,880
402.28	1972	do.	3,085	60	—	—	–27.6	3,450	3,070
BRACKISH MARSH									
Fish and Wildlife push-core FW									
3.92	5015	Peat	>MODERN	—	200.34	7.45	–25	—	—
11.76	5018	do.	do.	—	204.91	7.45	–25	—	—
19.60	5019	do.	do.	—	446.03	8.94	–25	—	—
27.44	5020	do.	do.	—	325.72	8.15	–25	—	—
35.28	5021	do.	do.	—	276.44	7.95	–25	—	—
43.12	5022	do.	do.	—	251.70	7.75	–25	—	—
50.96	5023	do.	do.	—	232.92	7.65	–25	—	—
58.80	5024	do.	do.	—	70.59	6.76	–25	—	—
66.64	5025	do.	do.	—	116.39	6.95	–25	—	—
St. Bernard push-core SB1a (peat)									
6.79	796	Peat	>MODERN	—	124.09	9.1	–18.5	—	—
9.51	797	do.	do.	—	201.39	8.2	–17.9	—	—
12.23	798	do.	do.	—	262.74	7	–17.5	—	—
14.95	763	do.	do.	—	520.3	8.4	–17.2	—	—
17.67	764	do.	do.	—	287.8	7.1	–26.8	—	—
20.38	765	do.	do.	—	26.2	6.7	–17.3	—	—
23.10	766	do.	90	60	–16.5	6.5	–17.2	280	–10
25.82	767	do.	250	60	—	—	–24.1	480	–10
28.54	768	do.	370	50	—	—	–22.2	510	310
31.25	769	do.	400	50	—	—	–21.2	530	310
33.97	770	do.	420	60	—	—	–20.6	540	310
36.69	771	do.	410	60	—	—	–22.4	540	310

Table 3–2. Isotopic carbon-14 and carbon-13 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; ID, identifier; ± , plus or minus; $\Delta^{14}C$, Delta carbon-14; $\delta^{13}C$, delta carbon-13; ‰, parts per thousand; CAL yr BP, calibrated years before present; do., ditto; —, no data; >, greater than]

Corrected depth (cm)	Lab ID WW-[1]	Material	^{14}C age[2]		$\Delta^{14}C$[3]		$\delta^{13}C$[4]	Calibrated age range[5] (CAL yr BP)	
			yr BP	±	‰	±	‰	Maximum	Minimum
BRACKISH MARSH—Continued									
St. Bernard push-core SB1a (grass)									
6.79	799	Grass	>MODERN	—	114.08	7.1	–16.5	—	—
9.51	800	do.	do.	—	182.56	7.6	–14.5	—	—
12.23	801	do.	do.	—	232.91	8	–16.1	—	—
14.95	772	do.	do.	—	544.4	10	–15.9	—	—
17.67	773	do.	do.	—	543.2	9.9	–17.0	—	—
20.38	774	do.	do.	—	456	9.4	–16.7	—	—
23.10	775	do.	do.	—	114.6	6.3	–15.4	—	—
25.82	776	do.	220	60	—	—	–17.3	440	[6]–10
28.54	777	do.	220	50	—	—	–14.9	430	–10
31.25	778	do.	270	50	—	—	–14.0	470	0
34.97	779	do.	280	50	—	—	–15.0	480	0
36.69	780	do.	220	50	—	—	–14.3	430	–10
St. Bernard push-core SB1a (seeds)									
25.82	781	Seeds	250	60	-36	6.1	–27.8	480	–10
St. Bernard vibracore SB1c									
43.71	685	Peat	240	60	—	—	–20.0	470	–10
69.09	746	do.	220	60	—	—	–20.5	440	–10
84.60	747	do.	330	60	—	—	–21.9	510	280
84.60	748	Grass	220	50	—	—	–15.9	430	–10
105.75	749	Peat	550	50	—	—	–20.0	650	500
126.90	750	do.	870	60	—	—	–20.1	920	680
166.38	751	do.	1,140	60	—	—	–20.1	1,230	930
194.58	752	do.	1,000	60	—	—	–20.2	1,060	760
235.47	753	do.	1,920	60	—	—	–17.6	2,000	1,710
265.08	754	do.	1,980	50	—	—	–21.5	2,060	1,810
304.56	755	do.	2,360	60	—	—	–26.6	2,750	2,150
345.45	756	Peat	2,670	50	—	—	–27.8	2,880	2,730
345.45	757	Grass	2,630	50	—	—	–25.8	2,860	2,500
383.52	698	Peat	3,180	50	—	—	–22.0	3,550	3,260
396.21	802	Clay	8,420	60	—	—	–24.9	9,540	9,270
Terrebone push-core TB1c									
53.55	683	Grass	>MODERN	—	49.1	6.7	–13.5	—	—
66.15	684	do.	170	60	—	—	–14.8	310	–10

Table 3–2. Isotopic carbon-14 and carbon-13 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; ID, identifier; ± , plus or minus; Δ¹⁴C, Delta carbon-14; δ¹³C, delta carbon-13; ‰, parts per thousand; CAL yr BP, calibrated years before present; do., ditto; —, no data; >, greater than]

Corrected depth (cm)	Lab ID WW-[1]	Material	^{14}C age[2]		Δ^{14}C[3]		δ^{13}C[4]	Calibrated age range[5] (CAL yr BP)	
			yr BP	±	‰	±	‰	Maximum	Minimum
			BRACKISH MARSH—Continued						
			Terrebone push-core TB2a						
39.22	1331	Peat	>MODERN	—	586.7	12.9	–18.4	—	—
41.34	1332	do.	do.	—	745.0	9.6	–19.8	—	—
43.46	1333	do.	do.	—	665.0	9.2	–20.1	—	—
45.58	1334	do.	do.	—	589.5	8.8	–16.8	—	—
47.70	1335	do.	do.	—	385.7	7.7	–17.0	—	—
49.82	1336	do.	do.	—	276.9	7.1	–16.2	—	—
51.94	1337	do.	do.	—	137.8	6.3	–15.4	—	—
54.06	1338	do.	do.	—	105.9	6.1	–14.8	—	—
56.18	1339	do.	do.	—	39.2	5.9	–14.9	—	—
			Terrebone vibracore TB2c						
24.20	1364	Peat	>MODERN	—	270.0	7.0	–20	—	—
28.60	1365	do.	do.	—	331.8	7.3	–20	—	—
33.00	1366	do.	do.	—	396.9	6.6	–20	—	—
37.40	1367	do.	do.	—	175.8	8.0	–20	—	—
41.80	1368	do.	do.	—	71.8	7.5	–20	—	—
46.20	1369	do.	do.	—	67.8	6.0	–20	—	—
50.60	1370	do.	do.	—	26.5	5.8	–20	—	—
66.00	1022	do.	240	50	—	—	–22.7	470	–10
93.50	1023	Peat/sediment	250	50	—	—	–18.6	470	0
129.80	1024	Organic sediment	290	50	—	—	–26.4	480	150
146.30	1025	do.	510	50	—	—	–27.1	650	470
165.89	1026	do.	960	50	—	—	–26.9	960	740
181.89	1027	do.	1,060	60	—	—	–26.1	1,140	790
228.89	1028	Peat/grass	300	50	—	—	–19.1	490	150
243.39	1029	Organic sediment	1,220	50	—	—	–27.2	1,270	990
258.89	1030	do.	1,200	50	—	—	–27.5	1,270	970
283.89	1031	Peat/grass	220	50	—	—	–22.3	430	–10
357.89	990	Wood	1,580	50	—	—	–25.0	1,570	1,340
416.89	1032	do.	1,730	60	—	—	–23.3	1,820	1,520
433.39	1033	do.	1,350	50	—	—	–27.9	1,350	1,170
448.89	1034	do.	1,440	50	—	—	–29.1	1,420	1,260
464.89	1035	Wood	2,150	50	—	—	–26.4	2,310	1,990
494.89	1036	do.	3,560	50	—	—	–21.9	3,980	3,690
515.89	1037	do.	2,210	50	—	—	–27.9	2,350	2,060
532.89	1038	do.	2,490	50	—	—	–27.7	2,740	2,360

Table 3–2. Isotopic carbon-14 and carbon-13 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; ID, identifier; ± , plus or minus; Δ14C, Delta carbon-14; δ13C, delta carbon-13; ‰, parts per thousand; CAL yr BP, calibrated years before present; do., ditto; —, no data; >, greater than]

Corrected depth (cm)	Lab ID WW-[1]	Material	^{14}C age[2] yr BP	±	Δ^{14}C[3] ‰	±	δ^{13}C[4] ‰	Calibrated age range[5] (CAL yr BP) Maximum	Minimum
Natural levee									
Bayou Sauvage push-core BSL2a									
45.90	2526	Wood	>MODERN	—	—	—	–25	—	—
64.26	2527	do.	do.	—	—	—	–25	—	—
Plaquemines push-core PLAQd									
36.75	2524	Humin	5,980	50	—	—	–25	6,950	6,670
36.75	2525	Humate	5,050	50	—	—	–25	5,920	5,660
55.65	2521	Wood	>MODERN	—	499.6	7.8	–25	—	—
55.65	2522	Humin	6,710	50	—	—	–25	7,680	7,470
55.65	2523	Humate	7,070	50	—	—	–25	7,980	7,750
Distributary									
Bayou Sauvage push-core BSDc									
9.18	1852	Peat	>MODERN	—	36.3	4.6	–26.4	—	—
11.22	1853	do.	do.	—	41.3	4.6	–26.8	—	—
13.26	1854	do.	do.	—	44.9	4.7	–26.7	—	—
15.30	1855	do.	do.	—	93.3	4.9	–26.4	—	—
17.34	1856	do.	do.	—	106.1	4.9	–26.0	—	—
19.38	1857	do.	do.	—	127.6	4.2	–25.3	—	—
21.42	1858	do.	250	40	—	—	–26.0	440	0
35.70	1794	Plant material	250	40	—	—	–24.4	440	0
49.98	1795	do.	220	50	—	—	–24.4	430	–10
57.12	1796	do.	460	50	—	—	–26.8	630	320
62.22	1797	do.	490	50	—	—	–26.8	650	450
78.80	1798	do.	540	50	—	—	–27.0	650	500
78.80	1799	Charcoal	1,070	50	—	—	–25.0	1,090	910
Backswamp									
St. Martin push-core MR1b									
75.52	1652	Low-organic sediment	3,380	50	—	—	–25	3,810	3,470
St. Martin push-core MR1c									
52.17	1609	Low-organic sediment	>MODERN	—	961.70	9.60	–25	—	—
54.39	1610	do.	do.	—	2,318.70	16.90	–25	—	—
56.61	1611	do.	do.	—	1,010.60	9.70	–25	—	—
58.83	1612	do.	do.	—	2,237.80	18.80	–25	—	—
63.27	1613	do.	do.	—	900.30	10.30	–25	—	—
65.49	1614	do.	do.	—	1,533.50	14.70	–25	—	—
67.71	1615	do.	do.	—	1,268.90	10.70	–25	—	—
69.93	1616	do.	do.	—	1,175.10	10.20	–25	—	—
St. Martin push-core MR1d									
58.76	1713	Low-organic sediment	MODERN	—	–7.9	5.5	–25	—	—
St. Landry push-core SL1a									
5.00	1190	Organic sediment	240	50	—	—	–27.1	470	–10
7.00	1191	do.	360	60	—	—	–27.1	510	300
9.00	1192	do.	340	40	—	—	–26.8	500	300
11.00	1193	do.	520	60	—	—	–26.7	650	470

Table 3–2. Isotopic carbon-14 and carbon-13 data for cores taken as part of the U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; ID, identifier; ± , plus or minus; $\Delta^{14}C$, Delta carbon-14; $\delta^{13}C$, delta carbon-13; ‰, parts per thousand; CAL yr BP, calibrated years before present; do., ditto; —, no data; >, greater than]

Corrected depth (cm)	Lab ID WW-[1]	Material	^{14}C age[2]		$\Delta^{14}C$[3]		$\delta^{13}C$[4]	Calibrated age range[5] (CAL yr BP)	
			yr BP	±	‰	±	‰	Maximum	Minimum
				Backswamp—Continued					
				St. Landry push-core SL1a—Continued					
13.00	1194	do.	450	50	—	—	–26.4	560	320
15.00	1195	do.	510	60	—	—	–26.4	660	460
17.00	1302	do.	220	50	—	—	–26.2	430	–10
19.00	1303	do.	720	50	—	—	–26.4	740	550
21.00	1304	do.	650	40	—	—	–26.4	670	550
23.00	1305	do.	540	50	—	—	–26.5	650	500
55.00	1326	do.	2,240	50	—	—	–23.4	2,350	2,120
				Swamp					
				Tangipahoa push-core TN1d					
3.45	1313	Peat	>MODERN	—	164.6	6.4	–29	—	—
5.75	1314	do.	do.	—	207.3	6.6	–29	—	—
8.05	1315	do.	do.	—	229.4	6.7	–29	—	—
10.35	1316	do.	do.	—	247.4	6.8	–29	—	—
12.65	1317	do.	do.	—	252.5	6.9	–28	—	—
14.95	1318	do.	do.	—	176.7	5.8	–28	—	—
17.25	1319	do.	do.	—	218.8	7.4	–28	—	—
19.55	1320	do.	do.	—	379.0	7.6	–27	—	—
21.85	1340	do.	500	50	—	—	–27	650	460
24.15	1341	do.	1,240	70	—	—	–27	1,290	980
26.45	1342	do.	630	50	—	—	–27	670	540
28.75	1343	do.	630	50	—	—	–27	670	540
65.55	1321	do.	310	60	—	—	–27	510	150
				Tangipahoa push-core TN2a					
151.75	2805	Charcoal	4,720	60	—	—	–25	5,590	5,320
151.75	2806	Plant material	1,050	50	—	—	–25	1,070	790
161.25	2807	do.	570	70	—	—	–25	670	500
175.10	2808	Organic sediment	2,700	40	—	—	–25	2,870	2,740
151.65	2910	Humic acid	2,140	50	—	—	–25	2,310	1,990
161.25	2911	do.	2,210	40	—	—	–25	2,340	2,120
175.10	2912	Humic acid	2,750	40	—	—	–25	2,950	2,770
202.10	2809	Plant material	790	40	—	—	–25	790	660

[1]The WW number is the identification assigned to a sample by the USGS ^{14}C laboratory.

[2]Carbon-14 ages were determined at the Center for Accelerator Mass Spectrometry (CAMS), Lawrence Livermore National Laboratory, Livermore, California. The quoted age is in radiocarbon years (BP) using the Libby half life of 5,568 years; quoted values are ± 1σ.

[3]The $\Delta^{14}C$ results represent the ratio of the sample activity to the activity of the modern standard corrected to the year of measurement from the "zero" year for ^{14}C of 1950, in parts per thousand (‰) (Stuiver and Polach, 1977). This expression is used only where sample activity is greater than the modern standard (for example, "bomb carbon" samples).

[4]Values reported for ^{13}C are the assumed values according to Stuiver and Polach (1977) when given without decimal places. Values measured for the material itself are given with a single decimal place.

[5]Minimum and maximum calibrated age values represent the range of possible ages in calibrated years before present at 2-σ uncertainty. These values were calculated using the Oxcal software version 3.9 (Bronck Ramsey, 1995, 2001) in conjunction with the INTCAL98 ^{14}C calibration dataset (Stuiver and others, 1998).

[6]A dash (—) indicates that data are not relevant (for example, calibrated ages for modern or >modern samples) or not available (for example, $\Delta^{14}C$ results for samples that are not >modern).

[7]Zero or negative values in the minimum calibrated age field indicate the sample may be MODERN or >MODERN.

Appendix 4. Major and Minor Inorganic-Constituent Content

Inorganic Elemental Analyses

As discussed in the Laboratory Methods section of Markewich (1998b), a Perkin-Elmer 6000 inductively coupled plasma mass spectrometer (ICP-MS) was used for determination of inorganic elemental concentration. Analytical precision was generally better than 10-percent relative standard deviation. Exceptions were Zn and As for which relative standard deviations were 38 percent and 16 percent, respectively. Table 5 from that manuscript is reproduced here with a corrected title (in error in Markewich, 1998b). Data for the inorganic elemental analyses of major and minor constituents in the Mississippi River deltaic plain sediments are included in the following tables. Values are reported as parts per million (micrograms per gram). Results are not included for the analyses of silver (Ag) and cadmium (Cd). With only two exceptions, all measurements for Ag and Cd were within analytical error of the method used (ICP-MS). The exceptions were for a surface sample (4 ppm) and a sample from 320.8 cm depth (60 ppm) from St. Bernard push-core SB1a and vibracore SB1c, respectively.

Table 4-1. Precision for inorganic elemental analyses expressed as relative standard deviation for core samples from southeastern Louisiana.[1]

[% RSD, percent relative standard deviation; Li, lithium; Ti, titanium; Cu, copper; Cd, cadmium; Na, sodium; V, vanadium; Zn, zinc; Sn, tin; Mg, magnesium; Cr, chromium; As, arsenic; Ba, barium; Al, aluminum; Mn, manganese; Sr, strotium; La, lanthanum; P, phosphorous; Fe, iron; Y, yttrium; Ce, cerium; K, potassium; Co, cobalt; Mo, molybdenum; Pb, lead; Ca, calcium; Ni, nickel; Ag, silver; Th, thorium; U, uranium]

Element	% RSD	Element	% RSD	Element	% RSD	Element	% RSD
Li	3.6	Ti	8.0	Cu	4.5	Cd	3.6
Na	4.6	V	8.6	Zn	37.6	Sn	11.7
Mg	7.2	Cr	7.8	As	16.1	Ba	2.6
Al	3.1	Mn	6.9	Sr	2.6	La	2.6
P	7.8	Fe	7.5	Y	3.0	Ce	5.2
K	5.2	Co	5.8	Mo	3.9	Pb	3.3
Ca	6.1	Ni	7.5	Ag	2.6	Th	4.5
U	3.6						

[1]Modified from table 5 in Markewich, 1998b.

Table 4-2. Major inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[ID, identifier; cm, centimeters; Al, aluminum; Fe, iron; Mn, manganese; Ca, calcium; Mg, magnesium; Na, sodium; K, potassium; P, phosphorous; Ti, titanium; <, less than; all data are in parts per million (ppm), equivalent to micrograms per gram. In most cases, values should be considered as minima (see Markewich 1998b for sample preparation methods.)]

Sample ID	Corrected mid-point depth (cm)	Al	Fe	Mn	Ca	Mg	Na	K	P	Ti
FRESH MARSH										
St. Mary push-core SM1a										
SM1a 1	1.3	15,900	17,300	510	7,720	5,010	400	2,670	390	40
SM1a 2	3.8	15,300	15,100	260	5,930	5,150	420	2,740	420	40
SM1a 3	6.4	14,800	13,100	180	6,070	4,980	440	2,900	390	40
SM1a 4	8.9	14,600	11,800	130	5,660	5,020	470	2,980	320	50
SM1a 5	11.4	16,700	12,600	110	5,200	4,830	510	3,140	250	50
SM1a 6	14.0	15,900	11,900	110	5,400	4,820	530	3,250	240	50
SM1a 7	16.5	16,900	16,000	110	4,370	4,860	550	2,950	240	60
SM1a 8	19.1	13,400	17,400	90	5,110	4,130	530	2,390	220	80
SM1a 9	21.6	11,700	12,800	130	7,090	3,990	520	2,120	240	60
SM1a 10	24.1	3,980	3,830	90	9,190	3,140	830	810	210	50
SM1a 11	26.7	10,200	11,700	130	7,510	4,250	510	1,850	270	60
SM1a 12	29.2	3,770	7,330	100	9,880	3,370	760	680	250	40
SM1a 13	31.8	2,670	5,180	90	9,910	3,330	700	460	220	40
SM1a 14	34.3	2,600	3,260	100	9,370	3,140	780	490	220	40
SM1a 15	36.8	3,010	4,350	170	9,210	3,190	720	540	250	40
SM1a 16	39.4	2,960	3,290	110	9,730	3,220	790	570	260	40
SM1a 17	41.9	3,420	3,750	100	10,300	3,820	960	730	330	40
SM1a 18	44.5	3,660	4,230	110	10,500	3,740	1,060	860	340	40
SM1a 19	47.0	3,520	3,750	100	9,090	3,640	1,060	780	360	60
SM1a 20	49.5	10,200	12,600	140	7,370	4,080	590	2,250	340	70
SM1a 21	52.1	5,140	4,410	90	8,810	3,790	1,110	1,180	280	40
SM1a 22	54.6	5,980	4,450	90	9,210	3,990	1,540	1,850	270	40
SM1a 23	57.2	4,930	3,490	90	9,090	4,100	1,290	1,070	360	50
SM1a 24	59.7	8,600	4,020	110	7,740	3,610	1,070	1,370	290	60
SM1a 25	62.2	11,300	4,820	130	7,020	3,710	1,120	1,780	270	50
SM1a 26	64.8	11,300	9,090	80	4,540	4,530	710	2,860	220	40
SM1a 27	67.3	11,800	8,850	80	4,410	4,440	700	2,980	190	40
SM1a 28	69.9	10,400	8,690	70	3,570	3,960	590	2,640	230	70
SM1a 29	72.4	8,500	6,480	70	5,640	3,950	790	2,380	270	80
St. Mary vibracore SM1c										
SM1c-82	110.0	5,070	2,680	80	6,470	4,450	1,610	620	270	10
SM1c-92.5	118.4	5,570	2,980	60	4,510	4,050	900	1,080	260	<1
SM1c-123	151.6	820	2,370	110	11,500	8,090	3,290	140	230	50
SM1c-144	183.1	4,980	5,770	120	8,670	7,630	2,130	1,110	80	<1
SM1c-163	194.5	1,040	3,830	150	11,400	8,570	3,250	80	60	30
SM1c-190	245.4	3,280	3,080	120	8,540	6,690	3,140	730	90	20
SM1c-213	268.9	5,180	5,250	120	7,670	6,700	2,850	1,430	100	<1

Table 4-2. Major inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Al, aluminum; Fe, iron; Mn, manganese; Ca, calcium; Mg, magnesium; Na, sodium; K, potassium; P, phosphorous; Ti, titanium; <, less than; all data are in parts per million (ppm), equivalent to micrograms per gram. In most cases, values should be considered as minima (see Markewich 1998b for sample preparation methods.)]

Sample ID	Corrected mid-point depth (cm)	Al	Fe	Mn	Ca	Mg	Na	K	P	Ti
BRACKISH MARSH										
St. Bernard push-core SB1a										
SB1a 1	6.8	9,810	10,500	100	4,060	5,970	15,200	3,300	440	40
SB1a 2	9.6	9,640	10,500	80	3,440	6,160	19,100	3,610	300	40
SB1a 3	12.3	10,300	13,100	110	3,240	5,990	17,800	3,770	230	30
SB1a 4	15.0	6,530	11,100	80	3,320	4,900	13,100	2,590	190	50
SB1a 5	17.7	7,350	8,950	160	5,720	7,240	18,700	2,910	170	30
SB1a 6	20.5	7,270	6,500	60	5,520	6,750	19,400	2,750	210	40
SB1a 7	23.2	6,200	6,320	60	5,840	7,460	23,600	2,650	250	40
SB1a 8	25.9	5,850	5,600	50	6,630	7,500	25,000	2,490	260	40
SB1a 9	28.7	6,610	6,510	50	5,520	6,710	19,600	2,530	250	50
SB1a 10	31.4	8,010	7,020	50	4,540	6,290	18,400	3,150	230	50
SB1a 11	34.1	10,000	16,100	130	3,130	5,520	11,600	3,310	150	40
SB1a 12	36.9	9,200	14,000	130	3,620	5,550	12,600	3,070	250	40
SB1a 13	39.6	8,540	11,400	100	4,960	6,540	17,400	2,970	220	40
SB1a 14	42.3	5,800	8,240	80	5,050	6,160	18,200	2,360	280	50
SB1a 15	45.1	5,610	6,610	60	5,360	6,460	19,400	2,180	250	50
SB1a 16	47.8	6,270	8,240	70	5,360	6,460	19,000	2,250	260	50
SB1a 17	50.5	5,130	7,760	70	5,430	6,730	19,400	1,980	230	50
SB1a 18	53.2	4,650	6,610	70	6,420	6,720	20,200	2,040	300	60
SB1a 19	56.0	4,690	8,830	70	5,940	6,560	21,300	1,880	240	70
SB1a 20	58.7	4,130	6,590	70	5,820	6,120	18,400	1,740	240	60
SB1a 21	61.4	2,460	2,770	50	6,010	6,540	21,800	1,270	170	40
SB1a 22	64.2	2,130	2,250	50	6,530	6,960	22,900	1,330	180	50
SB1a 23	66.9	3,600	1,750	70	7,090	6,560	17,800	1,320	210	50
SB1a 24	69.6	4,750	2,050	90	7,230	7,000	19,300	1,220	150	40
SB1a 25	72.4	2,330	3,650	50	6,440	6,100	16,000	1,030	140	60
SB1a 26	75.1	2,940	3,190	50	7,140	6,290	17,300	1,300	170	50
SB1a 27	77.8	3,900	2,370	50	6,010	6,000	14,000	1,620	150	50
SB1a 28	80.5	5,420	3,360	50	5,030	5,400	13,500	1,930	130	50
SB1a 29	83.3	4,640	3,190	50	4,810	5,290	13,600	1,800	110	70
SB1a 30	86.0	4,590	3,040	50	5,390	5,810	15,100	1,780	140	50
SB1a 31	88.7	4,710	2,990	60	6,120	5,980	15,600	1,610	160	40
SB1a 32	91.5	6,080	4,330	70	5,190	5,280	12,600	2,000	120	50
SB1a 33	94.2	6,930	6,280	70	4,570	5,020	11,400	2,240	140	40
SB1a 34	96.9	9,400	6,020	80	4,580	5,430	11,100	2,520	160	50
St. Bernard vibracore SB1c										
SB1c-84	122.7	14,100	11,400	80	2,970	8,120	7,380	4,000	130	<1
SB1c-108	149.2	6,280	5,810	90	5,400	7,310	11,800	2,290	230	<1
SB1c-158.D	225.0	8,340	8,040	70	2,790	5,670	7,940	2,730	110	<1
SB1c-158	225.0	7,890	8,850	80	3,050	5,790	7,430	3,170	140	<1
SB1c-194	270.5	2,910	3,070	130	7,850	8,370	19,900	1,550	230	<1
SB1c-227.5	312.5	12,200	10,900	120	2,820	7,420	5,450	4,330	80	<1
SB1c-251	358.7	4,390	17,400	140	6,670	6,780	14,100	1,310	210	<1
SB1c-280	391.2	10,900	14,600	140	2,460	6,570	3,790	3,830	180	<1

Table 4-2. Major inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Al, aluminum; Fe, iron; Mn, manganese; Ca, calcium; Mg, magnesium; Na, sodium; K, potassium; P, phosphorous; Ti, titanium; <, less than; all data are in parts per million (ppm), equivalent to micrograms per gram. In most cases, values should be considered as minima (see Markewich 1998b for sample preparation methods.)]

Sample ID	Corrected mid-point depth (cm)	Al	Fe	Mn	Ca	Mg	Na	K	P	Ti
BRACKISH MARSH—Continued										
Terrebonne push-core TB1a										
TB1a 1	2.8	14,900	19,900	430	3,570	6,650	8,380	3,800	330	50
TB1a 2	8.3	13,800	20,000	420	3,550	6,000	6,150	3,780	310	60
TB1a 3	13.8	13,400	20,200	430	3,320	5,530	5,550	3,530	260	80
TB1a 4	19.3	13,600	19,200	440	3,390	6,200	7,140	3,470	280	70
TB1a 5	24.8	13,700	19,100	400	3,410	5,540	6,410	3,390	290	80
TB1a 6	30.3	14,900	18,800	370	3,100	5,750	8,280	3,630	300	80
TB1a 7	35.8	15,400	17,900	280	2,680	5,870	5,560	3,770	270	60
TB1a 8	41.3	13,900	18,900	240	2,640	5,810	6,380	3,420	250	50
TB1a 9	46.8	12,700	18,300	230	3,130	5,210	5,050	3,150	240	40
TB1a 10	52.3	10,500	18,500	230	3,250	5,090	6,510	2,700	240	40
TB1a 11	57.8	10,700	29,000	150	3,110	4,540	5,110	2,780	190	70
TB1a 12	63.3	9,610	22,700	160	3,020	4,330	4,630	2,850	160	90
TB1a 13	68.8	11,400	23,300	360	2,700	4,730	3,490	2,960	150	80
TB1a 14	74.3	11,700	22,900	400	2,650	4,180	3,420	2,910	190	70
TB1a 15	79.8	8,990	24,600	390	3,020	4,220	5,420	2,610	200	80
TB1a 16	85.3	9,380	23,600	380	3,670	4,990	6,180	2,560	140	60
TB1a 17	90.8	9,320	22,900	390	3,310	4,800	5,770	2,770	180	70
TB1a 18	96.3	9,600	27,000	370	3,370	4,940	5,960	2,360	120	50
Terrebonne push-core TB2a										
TB2a-1	1.1	12,900	12,800	140	4,200	6,400	7,090	3,210	730	50
TB2a-2	3.2	14,400	10,700	90	3,780	6,540	7,020	3,250	660	90
TB2a-3	5.3	14,600	11,500	90	3,650	6,590	7,310	3,620	610	70
TB2a-4	7.4	13,700	10,200	80	3,250	6,430	6,930	3,430	500	40
TB2a-5	9.6	16,900	13,000	90	2,960	6,520	5,650	3,710	430	50
TB2a-6	11.7	17,800	19,100	170	3,080	7,370	5,610	4,350	440	50
TB2a-7	13.8	16,300	22,300	230	3,230	6,690	5,300	4,080	480	60
TB2a-8	15.9	17,200	22,500	290	3,400	6,940	5,520	4,260	440	50
TB2a-9	18.1	15,400	20,700	290	3,370	6,720	5,510	3,830	410	40
TB2a-10	20.2	16,700	16,400	230	3,700	7,060	7,850	4,170	530	40
TB2a-11	22.3	15,600	15,500	190	3,340	6,690	7,720	3,720	630	40
TB2a-12	24.4	14,700	13,700	170	3,490	6,610	8,030	3,740	630	30
TB2a-13	26.6	16,200	16,200	160	3,180	6,240	6,430	4,070	520	60
TB2a-14	28.7	15,500	12,700	150	3,630	6,670	9,020	3,730	530	60
TB2a-15	30.8	17,900	11,200	130	3,870	6,640	9,630	3,640	550	40
TB2a-16	32.9	18,600	11,800	130	3,560	7,050	8,400	4,270	530	70
TB2a-17	35.1	19,100	12,500	120	3,160	7,250	7,610	4,470	400	30
TB2a-18	37.2	20,500	14,600	130	3,180	7,710	8,720	4,570	480	50
TB2a-19	39.3	19,300	18,000	170	3,610	7,650	9,330	4,340	530	40
TB2a-20	41.4	15,300	14,300	150	3,930	6,680	9,820	3,820	530	90
TB2a-21	43.6	15,000	11,300	130	3,910	6,980	8,370	3,560	410	90
TB2a-22	45.7	11,900	10,000	110	4,000	6,380	9,050	2,910	410	50
TB2a-23	47.8	7,260	8,350	100	4,880	6,030	13,700	1,980	450	40
TB2a-24	49.9	4,290	5,240	100	5,590	6,300	16,100	1,350	370	40
TB2a-25	52.1	5,490	5,410	100	5,970	6,350	18,100	1,920	460	50
TB2a-26	54.2	4,220	3,180	70	5,340	5,780	16,400	1,450	350	50
TB2a-27	56.3	3,920	3,220	80	5,310	6,010	17,400	1,440	350	50

Table 4-2. Major inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Al, aluminum; Fe, iron; Mn, manganese; Ca, calcium; Mg, magnesium; Na, sodium; K, potassium; P, phosphorous; Ti, titanium; <, less than; all data are in parts per million (ppm), equivalent to micrograms per gram. In most cases, values should be considered as minima (see Markewich 1998b for sample preparation methods.)]

Sample ID	Corrected mid-point depth (cm)	Al	Fe	Mn	Ca	Mg	Na	K	P	Ti
BRACKISH MARSH—Continued										
Terrebonne push-core TB2a—Continued										
TB2a-28	58.4	5,790	6,140	100	5,370	6,320	19,100	1,710	420	50
TB2a-29	60.6	7,780	7,340	100	5,380	6,950	19,200	2,110	550	50
TB2a-30	62.7	8,400	7,680	100	5,680	6,990	19,900	2,440	750	60
TB2a-31	65.3	21,300	8,310	190	5,660	6,410	13,300	2,540	650	60
TB2a-32	68.0	17,700	12,800	150	4,800	6,570	11,000	3,180	420	50
TB2a-33	70.1	14,100	13,000	80	3,570	5,710	7,160	3,620	240	40
TB2a-34	72.3	13,900	14,000	90	3,260	5,520	6,070	3,740	150	40
TB2a-35	74.4	11,200	13,800	80	4,760	6,220	10,800	2,950	410	50
TB2a-36	76.5	11,400	10,300	80	4,210	5,970	9,080	3,050	350	50
TB2a-37	78.6	18,400	12,800	140	4,730	6,880	11,200	3,260	400	50
TB2a-38	80.6	10,600	11,600	80	3,770	5,540	8,650	2,790	380	60
TB2a-39	82.6	11,700	12,800	90	5,180	6,750	11,600	3,070	560	50
TB2a-40	84.6	17,400	12,500	90	4,590	7,170	9,970	4,150	370	50
TB2a-41	86.6	12,500	12,600	90	5,760	7,050	11,100	3,080	430	50
TB2a-42	88.6	8,550	13,100	110	7,710	7,950	17,900	2,650	660	50
TB2a-43	90.6	7,280	20,400	120	6,950	7,890	19,000	2,220	640	70
TB2a-44	92.6	5,800	23,000	140	7,970	7,830	20,300	1,810	640	60
TB2a-45	94.6	3,790	14,300	130	8,620	7,940	20,000	1,380	580	50
TB2a-46	96.6	4,000	14,000	140	8,820	9,020	21,300	1,460	570	60
TB2a-47	98.6	3,380	10,000	110	7,490	7,230	16,800	1,240	350	40
TB2a-48	100.6	3,640	10,600	140	8,710	8,540	19,400	1,500	470	50
Terrebonne vibracore TB2c										
TB2c-1	12.7	15,400	12,200	110	3,160	6,560	8,010	4,250	460	30
TB2c-2	20.9	21,000	16,900	220	4,030	8,080	10,900	5,660	710	30
TB2c-3	46.3	6,840	5,630	140	4,720	5,850	15,400	2,160	530	50
TB2c-4	68.8	6,050	3,800	120	5,120	6,340	19,000	1,930	520	30
TB2c-5	97.2	4,820	7,510	150	7,300	7,990	21,200	1,880	470	50
TB2c-6	125.6	4,170	14,600	180	7,260	7,820	23,400	1,710	430	50
TB2c-7	158.0	20,800	20,300	170	3,990	8,590	11,100	5,230	280	30
TB2c-8	176.5	26,300	33,400	380	3,310	9,480	9,300	6,550	410	30
TB2c-9	205.1	26,800	23,900	440	2,860	8,870	19,400	6,830	410	30
TB2c-10	217.6	26,000	22,700	280	3,400	9,680	7,030	6,530	430	30
TB2c-11	251.3	22,600	23,900	160	3,110	8,610	8,940	5,780	400	30
TB2c-12	269.8	21,400	25,000	190	3,050	8,280	7,360	5,490	450	30
TB2c-13	291.4	5,620	7,580	160	6,700	4,900	1,190	1,830	420	150
TB2c-14	304.9	11,200	14,000	520	10,200	6,250	1,830	3,040	490	110
TB2c-15	317.6	3,160	4,430	90	4,470	3,390	560	910	300	140
TB2c-16	339.6	7,340	10,700	300	6,640	5,340	1,390	1,920	480	150
TB2c-17	363.1	8,610	10,800	290	7,880	6,050	1,900	2,390	530	180
TB2c-18	406.9	4,830	6,410	120	5,180	4,060	940	1,450	400	150
TB2c-19	444.3	6,870	8,530	200	6,710	5,100	1,530	1,920	390	140
TB2c-20	471.8	9,140	11,700	320	8,410	6,180	2,030	2,370	540	140
TB2c-21	491.8	4,250	9,630	230	6,520	5,410	1,610	1,790	480	90
TB2c-22	512.0	5,680	12,400	370	7,610	5,920	2,240	2,690	570	80
TB2c-23	528.3	3,010	7,620	150	6,620	4,360	830	1,340	420	110
TB2c-24	546.1	2,200	5,220	100	5,600	3,850	410	860	330	130

Table 4-2. Major inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Al, aluminum; Fe, iron; Mn, manganese; Ca, calcium; Mg, magnesium; Na, sodium; K, potassium; P, phosphorous; Ti, titanium; <, less than; all data are in parts per million (ppm), equivalent to micrograms per gram. In most cases, values should be considered as minima (see Markewich 1998b for sample preparation methods.)]

Sample ID	Corrected mid-point depth (cm)	Al	Fe	Mn	Ca	Mg	Na	K	P	Ti
BACKSWAMP										
St. Martin push-core MR1c										
MR1c-1	1.1	14,100	29,700	610	5,950	5,650	300	3,900	880	20
MR1c-2	3.3	12,900	26,600	520	5,800	6,130	300	3,760	920	10
MR1c-3	5.6	10,300	23,900	390	4,700	5,140	350	3,020	790	20
MR1c-4	7.8	9,020	19,900	340	4,290	4,520	270	2,780	720	20
MR1c-5	10.0	9,470	21,700	360	4,120	4,970	270	2,710	750	20
MR1c-6	12.3	7,890	19,200	340	4,330	4,900	260	2,320	700	20
MR1c-7	14.5	10,600	24,100	500	4,310	5,450	350	3,260	850	20
MR1c-8	16.7	11,200	24,800	440	4,450	5,290	240	2,860	870	20
MR1c-9	18.9	10,400	24,400	440	4,630	5,400	280	3,050	860	20
MR1c-10	21.2	9,950	22,700	430	4,840	5,170	250	2,780	790	20
MR1c-11	23.4	9,250	21,400	340	4,500	5,310	350	2,640	740	20
MR1c-12	25.6	7,770	17,200	340	3,920	4,720	260	2,320	590	20
MR1c-13	27.8	9,550	21,700	430	4,180	5,330	300	2,800	820	30
MR1c-14	30.1	9,340	20,600	430	4,110	5,190	290	2,650	730	20
MR1c-15	32.3	8,970	21,600	330	4,450	5,580	310	2,960	770	20
MR1c-16	34.5	10,300	24,000	360	4,110	5,110	270	2,710	870	20
MR1c-17	36.7	9,440	20,400	430	4,210	5,210	270	2,780	810	20
MR1c-18	39.0	10,500	24,200	450	4,540	5,340	250	2,980	800	20
MR1c-19	41.2	9,800	22,100	410	3,860	4,750	290	2,870	840	20
MR1c-20	43.4	13,000	28,100	800	4,710	6,660	350	3,830	880	20
MR1c-21	45.7	9,920	23,300	500	4,780	5,350	260	2,950	720	20
MR1c-22	47.9	10,300	21,800	410	5,070	6,590	310	2,920	800	20
MR1c-23	50.1	8,730	19,100	310	5,160	6,380	360	2,690	750	20
MR1c-24	52.3	12,100	26,900	360	4,850	6,370	310	3,290	860	30
MR1c-25	54.6	11,100	25,800	500	4,630	6,830	220	3,180	800	20
MR1c-26	56.8	13,100	29,300	390	4,430	6,770	300	3,600	970	20
MR1c-27	59.0	13,200	29,400	500	4,640	6,090	270	3,300	1,010	30
MR1c-29	63.5	11,300	24,800	470	4,620	5,090	300	2,980	890	20
MR1c-30	65.7	14,100	32,300	1,390	5,840	6,950	270	3,970	900	20
MR1c-31	67.9	14,500	31,400	820	5,460	6,930	280	3,750	900	20
MR1c-32	70.2	14,400	30,300	690	5,700	7,080	310	4,020	880	20
St. Landry push-core SL1b										
SL1b-1	1.1	17,400	23,000	260	5,060	7,680	220	4,820	860	10
SL1b-2	3.3	18,300	22,600	240	5,060	7,750	260	4,630	830	10
SL1b-3	5.5	18,000	24,700	260	5,250	8,160	250	5,240	890	10
SL1b-4	7.6	16,800	21,200	200	4,720	7,130	230	4,450	780	10
SL1b-5	9.8	17,900	21,600	180	4,420	7,730	270	4,590	820	10
SL1b-6	12.0	17,300	19,200	140	3,790	6,300	220	4,480	660	9
SL1b-7	14.2	16,600	23,700	140	3,410	5,940	230	4,160	590	10
SL1b-8	16.4	15,100	25,600	150	3,390	5,370	200	3,620	690	20
SL1b-9	18.5	15,100	26,300	170	3,420	5,360	250	3,890	740	20
SL1b-10	20.7	15,900	26,100	170	3,280	5,640	300	4,020	700	20
SL1b-11	22.9	13,000	22,300	170	3,310	4,990	230	3,240	550	10
SL1b-12	25.1	13,800	19,100	150	3,490	5,200	280	3,440	630	10
SL1b-13	27.3	11,100	16,200	140	2,860	4,470	220	2,710	520	10

Table 4-2. Major inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Al, aluminum; Fe, iron; Mn, manganese; Ca, calcium; Mg, magnesium; Na, sodium; K, potassium; P, phosphorous; Ti, titanium; <, less than; all data are in parts per million (ppm), equivalent to micrograms per gram. In most cases, values should be considered as minima (see Markewich 1998b for sample preparation methods.)]

Sample ID	Corrected mid-point depth (cm)	Al	Fe	Mn	Ca	Mg	Na	K	P	Ti
BACKSWAMP—Continued										
St. Landry push-core SL1b—Continued										
SL1b-14	29.5	12,000	19,200	150	3,080	4,710	270	2,890	550	8
SL1b-15	31.6	11,900	21,700	170	3,290	4,890	300	2,800	610	10
SL1b-16	33.8	12,500	21,100	170	3,310	4,760	220	2,910	620	10
SL1b-17	36.0	11,900	22,100	180	3,240	4,610	260	2,970	550	10
SL1b-18	38.2	9,940	17,700	170	2,410	3,680	190	2,250	390	9
SL1b-19	40.4	13,100	23,900	230	3,350	4,750	330	3,050	630	10
SL1b-20	42.5	11,500	21,300	190	3,320	4,010	260	2,340	560	10
SL1b-21	44.7	12,000	21,700	590	3,530	4,120	350	2,490	500	10
SL1b-22	46.9	11,100	19,900	220	3,560	3,990	280	2,290	510	10
SL1b-23	49.1	13,100	23,800	490	4,260	4,400	300	2,370	540	10
SL1b-24	51.3	12,400	25,000	410	3,810	4,000	270	2,030	410	10
SL1b-25	53.5	14,100	26,400	390	4,010	4,650	350	2,420	1,100	20
SL1b-26	55.6	12,700	24,400	450	4,030	4,200	290	2,200	470	10
SL1b-27	57.8	13,200	26,800	270	3,960	4,550	270	2,280	920	20
SL1b-28	60.0	14,100	24,000	270	3,590	4,420	280	2,250	940	10
SL1b-29	62.2	15,300	27,100	300	3,780	4,650	360	2,280	950	20
SL1b-30	64.4	13,500	25,900	310	3,810	4,710	320	2,270	1,050	10
SL1b-31	66.5	11,700	22,900	310	3,600	4,000	260	1,890	890	20
Swamp										
Tangipahoa push-core TN1c										
TN1c-1	1.1	6,780	6,820	160	4,000	2,650	960	700	1,050	10
TN1c-2	3.2	6,360	5,950	150	3,570	2,620	940	630	970	20
TN1c-3	5.4	7,230	6,270	140	3,160	2,830	1,040	640	920	9
TN1c-4	7.5	9,830	6,900	130	4,460	3,130	1,040	710	920	40
TN1c-5	9.7	8,630	6,520	130	3,360	2,950	1,080	670	950	9
TN1c-6	11.8	10,000	7,470	140	3,980	3,490	1,170	780	980	20
TN1c-7	13.9	9,020	6,240	120	3,630	2,940	810	660	710	10
TN1c-8	16.1	8,590	6,420	120	3,260	2,910	710	650	650	8
TN1c-9	18.2	10,600	6,800	110	3,290	3,050	740	810	590	5
TN1c-10	20.4	10,900	7,230	120	3,500	3,210	760	870	590	10
TN1c-11	22.5	10,600	7,190	110	3,350	3,400	940	830	630	10
TN1c-12	24.7	8,770	6,210	100	3,780	2,850	760	600	470	30
TN1c-13	26.8	5,150	4,320	90	3,160	2,320	710	340	310	10
TN1c-14	29.0	6,750	5,200	90	3,070	2,570	640	440	380	10
TN1c-15	31.1	10,600	8,540	120	4,440	3,220	890	850	600	20
TN1c-16	33.3	10,800	9,790	120	3,900	3,220	940	860	650	20
TN1c-17	35.4	12,000	9,320	110	3,360	3,470	940	780	660	10
TN1c-18	37.5	12,300	10,400	110	4,160	3,070	850	880	620	20
TN1c-19	39.7	10,900	7,810	90	2,540	2,640	730	960	510	10
TN1c-20	41.8	10,800	7,170	100	3,380	2,620	780	710	620	20
TN1c-21	44.0	9,680	8,740	90	3,310	2,530	650	610	530	20
TN1c-22	46.1	9,990	9,030	100	2,750	2,640	690	580	570	10
TN1c-23	48.3	10,200	10,500	100	3,590	2,770	750	660	610	20
TN1c-24	50.4	10,800	9,260	100	2,740	2,770	750	650	660	20
TN1c-25	52.6	10,900	9,820	100	2,670	2,830	790	600	540	10

Table 4-2. Major inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Al, aluminum; Fe, iron; Mn, manganese; Ca, calcium; Mg, magnesium; Na, sodium; K, potassium; P, phosphorous; Ti, titanium; <, less than; all data are in parts per million (ppm), equivalent to micrograms per gram. In most cases, values should be considered as minima (see Markewich 1998b for sample preparation methods.)]

Sample ID	Corrected mid-point depth (cm)	Al	Fe	Mn	Ca	Mg	Na	K	P	Ti
SWAMP—Continued										
Tangipahoa push-core TN1c1—Continued										
TN1c-26	54.7	12,400	10,900	110	3,880	3,020	870	790	730	20
TN1c-27	56.9	12,800	8,430	120	3,830	2,680	650	600	710	20
TN1c-28	59.0	11,200	9,550	110	3,900	2,660	830	590	800	20
TN1c-29	61.1	9,580	8,660	100	3,050	2,700	770	420	660	10
TN1c-30	63.3	11,600	10,700	110	3,020	2,840	790	550	760	20
TN1c-31	65.4	10,300	11,000	90	2,720	2,620	690	470	630	10
TN1c-32	67.6	14,100	10,200	100	2,830	2,860	760	730	880	20
TN1c-33	69.7	12,600	8,550	90	2,420	2,660	660	630	600	8
TN1c-34	71.9	11,000	9,400	80	2,940	2,430	760	650	480	3
TN1c-35	74.0	14,000	9,760	100	3,200	2,870	670	850	590	20
TN1c-36	76.2	12,400	10,000	110	3,450	2,820	630	770	510	20
TN1c-37	78.3	11,200	8,330	120	3,230	2,690	670	690	440	9

Table 4-3. Minor inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[ID, identifier; cm, centimeters; Li, lithium; V, vanadium; Cr, chromium; Co, cobalt; Ni, nickel; Cu, copper; Zn, zinc; As, arsenic; Sr, strontium; Y, yttrium; Mo, molybdenum; Ag, silver; Cd, cadmium; Sn, tin; Ba, barium; La, lanthanum; Ce, cerium; Pb, lead; Th, thorium; U, uranium; <, less than; all data are in parts per million (ppm); samples were analyzed for cadmium and silver. For all but two samples, values were below the detection limit of the method used. Therefore, the results are not included in this table.]

Sample ID	Corrected midpoint depth (cm)	Li	V	Cr	Co	Ni	Cu	Zn	As	Sr	Y	Mo	Sn	Ba	La	Ce	Pb	Th	U
FRESH MARSH																			
St. Mary push-core SM1a																			
SM1a-1	1.3	10	50	20	6	30	20	100	4	30	3	<1	<1	230	10	30	10	10	9
SM1a-2	3.8	10	50	30	6	30	20	60	3	20	3	<1	<1	210	10	30	20	10	9
SM1a-3	6.4	10	50	20	4	40	40	40	3	20	3	2	<1	200	10	30	20	10	9
SM1a-4	8.9	20	50	30	4	30	10	20	2	20	3	1	<1	250	10	30	10	10	8
SM1a-5	11.4	10	60	40	4	40	20	30	2	20	3	2	<1	260	10	30	20	10	8
SM1a-6	14.0	10	60	30	4	40	20	100	2	20	3	<1	<1	210	10	30	20	10	8
SM1a-7	16.5	20	60	20	6	40	20	40	4	20	3	<1	<1	210	10	30	20	10	6
SM1a-8	19.1	10	60	20	6	40	20	40	5	20	3	1	<1	200	10	20	20	9	5
SM1a-9	21.6	9	50	20	6	70	20	3	4	20	2	2	<1	170	10	20	20	8	5
SM1a-10	24.1	2	20	3	2	60	20	20	3	30	1	1	3	170	4	9	4	3	1
SM1a-11	26.7	7	40	10	5	30	10	60	4	30	2	1	<1	160	8	20	10	6	6
SM1a-12	29.2	3	30	4	4	40	9	60	5	30	1	2	160	150	3	8	200	2	2
SM1a-13	31.8	1	30	1	3	20	7	80	6	30	1	2	<1	160	3	6	9	2	1
SM1a-14	34.3	1	20	<1	1	20	7	10	4	30	1	1	<1	170	3	6	5	1	1
SM1a-15	36.8	1	20	3	2	20	7	<1	4	30	1	1	<1	170	3	7	6	2	1
SM1a-16	39.4	2	20	2	1	20	6	<1	3	30	1	1	<1	180	3	8	6	2	1
SM1a-17	41.9	1	10	8	1	20	5	190	3	30	1	2	<1	180	3	7	20	2	1
SM1a-18	44.5	1	20	10	2	30	8	360	3	30	1	1	<1	190	3	8	20	1	1
SM1a-19	47.0	1	20	10	1	20	6	310	3	30	1	1	<1	160	3	7	40	1	1
SM1a-20	49.5	4	40	20	6	40	10	390	5	30	2	<1	<1	170	9	20	20	5	5
SM1a-21	52.1	2	20	10	3	30	8	280	3	30	1	1	<1	190	5	10	10	4	1
SM1a-22	54.6	2	20	10	2	40	30	340	3	30	1	<1	<1	200	7	10	5	4	1
SM1a-23	57.2	1	20	10	2	30	7	380	2	40	1	1	<1	170	5	10	10	3	1
SM1a-24	59.7	2	20	10	2	40	20	350	2	30	1	1	<1	160	6	10	10	4	1
SM1a-25	62.2	2	20	20	2	70	30	320	2	30	2	1	<1	140	8	20	10	6	1
SM1a-26	64.8	5	30	20	3	80	30	470	2	20	2	<1	<1	120	10	30	10	8	1
SM1a-27	67.3	6	30	20	4	130	30	410	1	20	2	1	<1	120	10	30	20	10	2
SM1a-28	69.9	5	30	20	4	190	60	310	1	20	3	<1	<1	100	20	40	10	10	2
SM1a-29	72.4	4	30	20	3	150	40	220	1	30	3	1	<1	100	20	30	20	9	2
St. Mary vibracore SM1c																			
SM1c-82	110.0	6	9	2	1	4	5	<1	1	100	4	20	<1	110	7	10	<1	3	1
SM1c-92.5	117.6	10	10	2	1	2	4	30	1	70	6	2	<1	100	10	20	6	6	2
SM1c-123	155.1	<1	<1	3	3	2	<1	280	1	150	1	40	<1	100	1	1	<1	<1	<1
SM1c-144	183.1	4	9	<1									-		8	10	<1	8	2
SM1c-163	194.5	<1	<1	<1	<1	<1	<1	<1	1	160	1	1	<1	160	1	1	<1	1	<1
SM1c-190	241.6	2	7	<1	1	5	2	<1	2	110	4	1	<1	160	5	10	<1	5	2
SM1c-213	268.9	4	20	3	3	20	8	<1	3	100	6	<1	<1	190	9	20	<1	9	10

Table 4-3. Minor inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Li, lithium; V, vanadium; Cr, chromium; Co, cobalt; Ni, nickel; Cu, copper; Zn, zinc; As, arsenic; Sr, strontium; Y, yttrium; Mo, molybdenum; Ag, silver; Cd, cadmium; Sn, tin; Ba, barium; La, lanthanum; Ce, cerium; Pb, lead; Th, thorium; U, uranium; <, less than; all data are in parts per million (ppm); samples were analyzed for cadmium and silver. For all but two samples, values were below the detection limit of the method used. Therefore, the results are not included in this table.]

Sample ID	Corrected midpoint depth (cm)	Li	V	Cr	Co	Ni	Cu	Zn	As	Sr	Y	Mo	Sn	Ba	La	Ce	Pb	Th	U
BRACKISH MARSH																			
St. Bernard push-core SB1a																			
SB1a-1	6.8	9	50	20	5	60	50	270	4	20	2	5	5	40	10	20	40	7	20
SB1a-2	9.6	9	60	20	4	80	40	80	4	20	2	5	3	40	10	20	40	9	30
SB1a-3	12.3	10	40	20	8	240	80	60	3	20	3	5	4	40	10	30	30	10	20
SB1a-4	15.0	6	40	20	9	550	120	<1	2	20	2	3	3	40	10	30	30	7	10
SB1a-5	17.7	6	50	20	4	160	50	10	3	40	2	3	7	50	8	20	40	6	9
SB1a-6	20.5	6	40	20	2	60	40	80	2	30	2	4	4	40	7	20	30	5	7
SB1a-7	23.2	6	900	20	2	50	30	50	2	40	2	2	4	40	7	20	40	4	8
SB1a-8	25.9	5	50	10	2	40	20	190	3	40	2	1	9	40	7	20	30	2	5
SB1a-9	28.7	6	700	20	3	40	20	80	2	30	2	1	8	40	7	20	20	3	5
SB1a-10	31.4	8	40	20	2	50	30	120	3	30	2	2	10	50	9	20	20	7	4
SB1a-11	34.1	10	40	20	6	20	20	150	3	20	3	1	2	50	10	30	30	10	5
SB1a-12	36.9	9	40	20	5	20	20	350	4	20	3	1	5	50	10	30	30	9	5
SB1a-13	39.6	8	40	20	5	60	30	260	3	30	3	2	10	50	10	20	30	7	5
SB1a-14	42.3	5	40	10	4	40	20	360	3	30	2	2	8	40	7	20	30	5	4
SB1a-15	45.1	5	30	10	3	40	20	300	3	30	2	3	10	40	6	10	20	4	4
SB1a-16	47.8	5	30	10	3	40	20	170	3	30	2	1	30	40	6	10	30	4	5
SB1a-17	50.5	5	30	10	3	50	20	190	3	30	1	1	20	40	5	10	20	3	4
SB1a-18	53.2	3	30	10	3	40	20	170	4	40	1	2	20	40	5	10	20	3	4
SB1a-19	56.0	4	30	10	2	40	20	190	3	30	1	1	90	40	5	10	10	3	3
SB1a-20	58.7	3	30	10	2	30	10	340	3	40	1	2	20	40	5	10	10	3	3
SB1a-21	61.4	2	20	5	1	10	6	250	4	40	1	1	5	40	3	6	6	1	2
SB1a-22	64.2	1	20	5	1	20	6	460	3	40	1	1	4	40	2	5	10	1	2
SB1a-23	66.9	1	20	9	1	20	6	150	3	40	1	1	5	40	3	7	9	2	2
SB1a-24	69.6	1	20	6	1	30	10	370	3	40	1	2	3	40	3	7	10	2	2
SB1a-25	72.4	1	20	5	1	20	5	310	2	40	1	1	30	40	2	5	9	2	2
SB1a-26	75.1	1	20	6	1	10	4	<1	4	40	1	1	30	40	3	7	<1	2	2
SB1a-27	77.8	3	20	7	1	20	7	<1	3	40	1	1	8	50	4	10	<1	3	2
SB1a-28	80.5	4	20	10	1	40	10	<1	3	30	1	1	9	50	6	10	<1	5	2
SB1a-29	83.3	4	20	7	1	20	10	<1	2	30	1	2	7	50	5	10	1	4	2
SB1a-30	86.0	4	20	7	1	20	10	<1	3	30	1	1	7	50	5	10	2	4	2
SB1a-31	88.7	3	20	7	1	20	10	20	3	30	1	1	5	60	6	10	6	4	3
SB1a-32	91.5	5	20	10	2	30	9	3	3	30	2	1	2	60	7	20	7	5	3
SB1a-33	94.2	6	30	10	2	40	10	190	2	30	2	1	5	70	8	20	9	7	3
SB1a-34	96.9	8	30	20	2	30	10	270	3	30	2	3	10	70	8	20	10	7	4

Table 4-3. Minor inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Li, lithium; V, vanadium; Cr, chromium; Co, cobalt; Ni, nickel; Cu, copper; Zn, zinc; As, arsenic; Sr, strontium; Y, yttrium; Mo, molybdenum; Ag, silver; Cd, cadmium; Sn, tin; Ba, barium; La, lanthanum; Ce, cerium; Pb, lead; Th, thorium; U, uranium; <, less than; all data are in parts per million (ppm); samples were analyzed for cadmium and silver. For all but two samples, values were below the detection limit of the method used. Therefore, the results are not included in this table.]

Sample ID	Corrected midpoint depth (cm)	Li	V	Cr	Co	Ni	Cu	Zn	As	Sr	Y	Mo	Sn	Ba	La	Ce	Pb	Th	U
									BRACKISH MARSH—Continued										
									St. Bernard vibracore SB1c										
SB1c-84	122.7	20	20	9	4	40	20	40	2	70	9	40	<1	100	10	30	7	20	10
SB1c-108	149.2	8	20	<1	2	7	9	<1	2	110	8	3	<1	130	10	20	<1	10	5
SB1c-158	222.0	8	20	5	3	8	20	<1	2	50	10	9	<1	120	20	30	8	20	7
SB1c-158	222.0	10	20	10	3	8	20	<1	3	60	10	4	<1	130	20	30	9	20	7
SB1c-194	270.5	2	10	<1	1	8	6	<1	4	100	3	6	<1	170	4	8	<1	4	4
SB1c-227.5	312.5	10	20	20	4	20	20	<1	2	50	10	6	<1	180	20	30	20	20	8
SB1c-251	358.7	4	20	<1	5	20	10	<1	10	90	5	8	<1	170	7	10	<1	8	10
SB1c-280	391.2	10	20	9	8	20	20	<1	4	50	10	<1	<1	180	20	40	<1	20	4
									Terrebonne push-core TB1a										
TB1a-1	2.8	7	40	30	8	70	30	510	5	20	4	<1	1	470	10	30	30	10	3
TB1a-2	8.3	7	40	20	7	20	20	50	4	20	4	<1	6	550	10	30	20	10	3
TB1a-3	13.8	7	40	30	6	20	20	20	5	20	3	<1	3	540	10	30	10	9	3
TB1a-4	19.3	6	40	20	7	20	20	60	5	20	4	<1	6	600	10	30	10	10	3
TB1a-5	24.8	6	40	20	6	20	20	110	4	20	3	<1	9	650	10	30	10	10	3
TB1a-6	30.3	7	40	20	7	80	40	150	3	20	3	1	10	390	10	30	20	9	4
TB1a-7	35.8	8	50	30	7	60	30	190	3	20	3	1	1	210	10	30	20	10	5
TB1a-8	41.3	7	40	20	7	60	30	220	3	20	3	1	1	200	10	30	20	10	5
TB1a-9	46.8	6	40	20	7	70	50	120	3	20	3	1	<1	160	10	30	30	10	5
TB1a-10	52.3	6	30	20	7	80	40	200	3	20	3	1	2	130	10	30	20	9	5
TB1a-11	57.8	5	30	20	5	80	30	130	4	20	2	1	3	110	10	20	20	8	6
TB1a-12	63.3	5	30	20	5	100	40	100	4	20	2	1	2	100	10	20	20	8	5
TB1a-13	68.8	7	40	20	9	160	50	190	5	20	4	1	1	90	10	30	20	9	3
TB1a-14	74.3	6	30	20	7	160	50	170	4	20	3	1	<1	100	10	30	20	9	4
TB1a-15	79.8	4	30	10	6	110	40	340	3	20	2	1	3	90	9	20	20	7	5
TB1a-16	85.3	4	30	10	6	90	40	170	3	20	3	1	2	90	10	20	20	7	4
TB1a-17	90.8	6	30	10	6	170	40	260	4	20	3	1	1	90	10	20	10	8	4
TB1a-18	96.3	5	20	5	6	60	20	40	2	20	2	1	3	90	10	20	7	7	5
									Terrebonne push-core TB2a										
TB2a-1	1.1	10	30	20	4	20	20	70	3	80	5	1	<1	660	9	20	6	5	<1
TB2a-2	3.2	10	40	20	4	20	20	60	3	80	5	1	1	880	10	20	7	6	<1
TB2a-3	5.3	10	30	20	4	20	20	70	3	80	5	1	1	1,020	10	30	7	6	5
TB2a-4	7.4	10	30	20	4	20	20	60	3	80	5	1	1	840	10	20	3	6	4
TB2a-5	9.6	10	30	20	5	20	20	60	3	70	6	1	<1	930	10	30	8	7	3
TB2a-6	11.7	20	40	20	8	20	20	90	5	70	7	1	3	680	10	30	10	8	2
TB2a-7	13.8	20	30	20	8	20	20	90	5	70	7	1	1	670	10	30	10	7	<1
TB2a-8	15.9	20	30	20	8	20	20	90	5	60	7	<1	1	620	10	30	10	8	2
TB2a-9	18.1	20	30	20	8	20	20	80	5	70	6	1	<1	800	10	30	10	8	2
TB2a-10	20.2	20	40	20	6	20	20	70	3	70	6	1	1	520	10	20	9	7	4
TB2a-11	22.3	20	30	20	6	20	20	110	3	60	6	2	4	490	10	30	10	7	<1
TB2a-12	24.4	20	40	20	6	20	20	80	3	70	6	1	2	370	10	30	10	8	5
TB2a-13	26.6	20	40	20	7	20	30	90	3	60	6	2	4	320	10	30	20	7	<1

Table 4-3. Minor inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Li, lithium; V, vanadium; Cr, chromium; Co, cobalt; Ni, nickel; Cu, copper; Zn, zinc; As, arsenic; Sr, strontium; Y, yttrium; Mo, molybdenum; Ag, silver; Cd, cadmium; Sn, tin; Ba, barium; La, lanthanum; Ce, cerium; Pb, lead; Th, thorium; U, uranium; <, less than; all data are in parts per million (ppm); samples were analyzed for cadmium and silver. For all but two samples, values were below the detection limit of the method used. Therefore, the results are not included in this table.]

Sample ID	Corrected midpoint depth (cm)	Li	V	Cr	Co	Ni	Cu	Zn	As	Sr	Y	Mo	Sn	Ba	La	Ce	Pb	Th	U
BRACKISH MARSH—Continued																			
Terrebonne push-core TB2a—Continued																			
TB2a-14	28.7	20	40	20	5	20	20	80	4	70	5	2	6	250	9	20	20	5	7
TB2a-15	30.8	20	40	20	5	20	20	70	4	70	5	1	2	230	10	20	20	6	<1
TB2a-16	32.9	20	40	20	4	20	20	80	3	60	5	1	1	210	10	20	20	6	6
TB2a-17	35.1	20	40	20	5	20	20	70	2	60	6	1	1	210	10	30	20	8	5
TB2a-18	37.2	20	40	20	5	20	20	80	3	60	6	1	1	200	10	30	20	7	<1
TB2a-19	39.3	20	40	20	7	30	20	80	4	70	6	2	2	200	10	30	20	6	5
TB2a-20	41.4	10	40	20	5	20	20	80	3	70	5	2	7	230	10	20	10	6	5
TB2a-21	43.6	20	30	20	4	20	20	60	<1	80	5	1	<1	200	<1	<1	10	7	4
TB2a-22	45.7	10	30	10	4	20	20	40	<1	70	5	2	<1	220	<1	<1	10	5	4
TB2a-23	47.8	7	20	7	3	10	6	20	4	70	3	2	2	180	5	10	3	3	4
TB2a-24	49.9	4	20	3	2	9	4	30	5	90	2	3	1	140	3	7	1	2	3
TB2a-25	52.1	5	20	5	2	10	5	40	5	80	2	2	1	130	3	7	<1	2	3
TB2a-26	54.2	4	20	2	1	6	4	30	5	80	1	3	2	120	3	6	<1	1	3
TB2a-27	56.3	3	20	3	1	7	7	20	5	80	1	4	1	120	2	5	<1	1	3
TB2a-28	58.4	4	20	3	3	10	7	20	5	90	2	5	1	130	3	7	<1	2	4
TB2a-29	60.6	6	20	5	3	10	10	20	4	90	2	5	1	160	4	9	1	2	5
TB2a-30	62.7	6	30	8	2	10	10	20	5	100	3	5	1	160	4	10	5	2	5
TB2a-31	65.3	8	30	8	2	10	40	30	<1	90	3	5	<1	160	<1	<1	5	3	<1
TB2a-32	68.0	10	30	10	3	10	30	30	5	80	5	2	1	180	9	20	7	6	<1
TB2a-33	70.1	10	30	20	3	10	20	40	3	60	4	1	<1	150	10	20	3	8	2
TB2a-34	72.3	10	30	20	4	10	20	30	3	70	5	1	<1	130	10	20	3	7	1
TB2a-35	74.4	10	30	10	3	10	10	30	5	80	5	2	<1	150	9	20	10	5	3
TB2a-36	76.5	10	30	10	3	10	10	30	3	80	5	1	1	130	9	20	20	6	3
TB2a-37	78.6	10	30	10	3	10	30	30	5	90	5	2	1	190	9	20	5	6	<1
TB2a-38	80.6	10	20	10	3	10	10	30	3	70	5	2	1	130	10	20	20	5	<1
TB2a-39	82.6	10	30	10	3	20	10	30	4	100	5	3	1	140	8	20	30	4	4
TB2a-40	84.6	20	30	20	4	20	6	30	3	80	5	1	<1	140	9	20	20	6	3
TB2a-41	86.6	10	30	10	4	20	6	20	3	100	5	2	1	130	8	20	30	5	4
TB2a-42	88.6	7	20	10	6	20	8	30	4	100	5	5	1	80	7	20	30	4	5
TB2a-43	90.6	6	20	9	10	30	9	20	5	100	4	8	1	110	6	10	30	3	6
TB2a-44	92.6	4	20	6	9	30	8	20	5	100	4	9	<1	120	5	10	20	2	4
TB2a-45	94.6	3	10	5	10	30	2	40	4	130	3	7	1	90	3	7	8	1	4
TB2a-46	96.6	3	10	6	10	30	3	110	4	110	2	6	1	110	3	6	6	1	4
TB2a-47	98.6	3	10	2	6	20	3	30	3	90	2	4	<1	100	3	6	1	1	3
TB2a-48	100.6	3	10	5	4	20	4	20	3	120	2	5	2	110	2	5	2	1	3
Terrebonne vibracore TB2c																			
TB2c-1	12.7	10	40	20	6	20	20	50	5	60	6	1	<1	700	10	30	10	8	3
TB2c-2	20.9	20	50	30	10	30	30	80	3	60	6	2	<1	290	10	20	60	8	6
TB2c-3	46.3	6	20	10	5	10	7	30	3	70	2	3	1	180	4	8	7	3	3
TB2c-4	68.8	5	20	8	20	9	5	10	3	70	2	3	1	150	3	7	2	2	2
TB2c-5	97.2	4	10	7	4	10	5	7	2	100	1	3	1	160	2	5	<1	2	2

Table 4-3. Minor inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Li, lithium; V, vanadium; Cr, chromium; Co, cobalt; Ni, nickel; Cu, copper; Zn, zinc; As, arsenic; Sr, strontium; Y, yttrium; Mo, molybdenum; Ag, silver; Cd, cadmium; Sn, tin; Ba, barium; La, lanthanum; Ce, cerium; Pb, lead; Th, thorium; U, uranium; <, less than; all data are in parts per million (ppm); samples were analyzed for cadmium and silver. For all but two samples, values were below the detection limit of the method used. Therefore, the results are not included in this table.]

Sample ID	Corrected midpoint depth (cm)	Li	V	Cr	Co	Ni	Cu	Zn	As	Sr	Y	Mo	Sn	Ba	La	Ce	Pb	Th	U
Brackish marsh—Continued																			
Terrebonne vibracore TB2c—Continued																			
TB2c-6	125.6	4	20	6	7	10	10	20	4	90	1	6	<1	100	2	5	<1	2	3
TB2c-7	158.0	20	50	30	9	30	20	60	4	60	6	1	<1	150	9	20	7	8	3
TB2c-8	176.5	30	60	30	10	40	30	110	8	50	8	1	<1	170	10	30	10	10	3
TB2c-9	205.1	30	60	30	10	40	20	100	5	40	9	<1	<1	180	10	30	10	10	2
TB2c-10	217.6	30	60	30	10	40	30	100	6	50	9	<1	<1	210	10	30	20	10	3
TB2c-11	251.3	20	50	30	9	30	30	80	9	50	7	1	<1	200	10	30	9	10	4
TB2c-12	269.8	20	50	30	10	40	20	80	20	40	8	1	<1	200	10	30	8	10	2
TB2c-13	291.4	7	10	10	10	10	<1	20	2	20	5	<1	<1	100	10	30	<1	7	1
TB2c-14	304.9	10	30	20	10	20	10	50	2	30	7	<1	<1	160	20	40	7	9	1
TB2c-15	317.6	3	9	8	20	10	<1	10	1	10	4	<1	<1	50	10	20	1	4	1
TB2c-16	339.6	8	20	10	9	20	4	40	2	20	5	<1	<1	120	10	30	5	7	1
TB2c-17	363.1	10	20	10	10	20	7	40	3	30	6	<1	<1	160	10	30	5	8	1
TB2c-18	406.9	4	10	10	30	20	<1	20	1	10	4	<1	1	70	9	20	2	4	1
TB2c-19	444.3	7	20	10	9	20	8	30	2	20	5	<1	<1	110	10	30	5	6	1
TB2c-20	417.8	10	20	20	10	20	8	50	3	30	6	<1	<1	130	10	30	6	7	1
TB2c-21	491.8	8	20	10	8	20	5	40	2	20	5	<1	2	170	20	40	4	7	1
TB2c-22	512.0	9	20	10	8	20	10	50	3	30	7	<1	2	230	20	40	6	8	1
TB2c-23	528.3	5	10	10	20	20	1	20	1	20	4	<1	1	110	10	30	1	5	1
TB2c-24	546.1	4	9	10	10	20	1	20	1	10	4	<1	1	70	10	30	1	5	1
Backswamp																			
St. Martin push-core MR1c																			
MR1c-1	1.1	20	40	30	10	30	20	90	5	30	8	<1	<1	240	20	50	20	8	1
MR1c-2	3.3	20	40	30	20	30	20	90	3	30	8	<1	<1	210	20	50	20	8	1
MR1c-3	5.6	20	30	20	20	30	10	70	3	30	7	<1	<1	170	20	50	20	7	1
MR1c-4	7.8	20	30	20	20	20	10	60	2	20	6	<1	<1	170	20	40	10	6	1
MR1c-5	10.0	20	30	20	10	20	10	60	3	20	7	<1	<1	180	20	40	20	6	1
MR1c-6	12.2	10	20	20	10	20	10	50	2	20	6	<1	<1	170	20	40	10	6	1
MR1c-7	14.5	20	30	20	20	20	10	70	3	30	7	<1	<1	250	20	50	20	7	1
MR1c-8	16.7	20	30	20	10	30	20	70	4	30	7	<1	<1	200	20	40	20	7	1
MR1c-9	18.9	20	30	20	10	20	20	70	4	30	7	<1	<1	190	20	50	20	7	1
MR1c-10	21.2	20	30	20	10	20	10	60	3	30	7	<1	<1	190	20	40	20	6	1
MR1c-11	23.4	20	30	20	10	20	10	60	2	30	7	<1	<1	170	20	40	10	6	1
MR1c-12	25.6	10	20	20	10	20	10	50	2	20	6	<1	<1	170	20	40	10	6	1
MR1c-13	27.8	20	30	20	10	20	10	60	3	20	6	<1	<1	160	20	40	10	6	1
MR1c-14	30.1	20	30	20	20	20	10	60	3	20	6	<1	<1	170	20	40	10	6	1
MR1c-15	32.3	10	30	20	20	20	10	60	3	20	7	<1	<1	170	20	40	10	6	1
MR1c-16	34.5	20	30	20	10	20	10	70	4	30	7	<1	<1	180	20	40	10	7	1
MR1c-17	36.7	20	30	20	10	20	10	60	3	20	6	<1	<1	170	20	40	10	6	1
MR1c-18	39.0	20	30	20	10	20	10	60	4	30	7	<1	<1	190	20	40	10	7	1
MR1c-19	41.2	20	30	20	20	20	10	60	3	20	7	<1	<1	150	20	40	20	7	1
MR1c-20	43.4	20	40	30	10	30	20	80	4	30	8	<1	<1	220	20	50	20	8	1
MR1c-21	45.7	20	30	20	10	30	10	70	4	30	7	<1	<1	170	20	40	20	7	1
MR1c-22	47.9	20	30	20	10	20	10	60	3	30	7	<1	<1	160	20	50	10	7	1

Table 4-3. Minor inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Li, lithium; V, vanadium; Cr, chromium; Co, cobalt; Ni, nickel; Cu, copper; Zn, zinc; As, arsenic; Sr, strontium; Y, yttrium; Mo, molybdenum; Ag, silver; Cd, cadmium; Sn, tin; Ba, barium; La, lanthanum; Ce, cerium; Pb, lead; Th, thorium; U, uranium; <, less than; all data are in parts per million (ppm); samples were analyzed for cadmium and silver. For all but two samples, values were below the detection limit of the method used. Therefore, the results are not included in this table.]

Sample ID	Corrected midpoint depth (cm)	Li	V	Cr	Co	Ni	Cu	Zn	As	Sr	Y	Mo	Sn	Ba	La	Ce	Pb	Th	U
Backswamp—Continued																			
St. Martin push-core MR1c—Continued																			
MR1c-23	50.1	20	20	20	20	20	10	50	3	30	6	<1	<1	160	20	40	10	6	1
MR1c-24	52.3	20	30	20	10	30	20	70	5	30	7	<1	<1	170	20	50	20	8	1
MR1c-25	54.6	20	30	20	20	30	20	60	4	30	8	<1	<1	170	20	50	20	7	1
MR1c-26	56.8	20	40	30	10	30	20	70	4	30	8	<1	<1	190	20	50	20	8	1
MR1c-27	59.0	20	40	30	10	30	20	80	5	30	9	<1	<1	190	20	50	20	8	1
MR1c-29	63.5	20	30	20	10	30	20	80	4	30	8	<1	<1	190	20	50	20	7	1
MR1c-30	65.7	20	40	30	20	40	20	80	7	40	9	<1	<1	190	20	50	20	9	1
MR1c-31	67.9	20	40	30	10	30	20	80	5	40	9	<1	<1	230	20	50	20	8	1
MR1c-32	70.2	20	40	20	10	30	20	70	5	40	9	<1	<1	230	20	50	20	9	1
St. Landry push-core SL1b																			
SL1b-1	1.1	30	40	30	9	30	30	80	2	40	9	<1	<1	230	20	50	30	8	10
SL1b-2	3.3	30	40	30	10	30	30	80	2	40	8	<1	<1	210	20	50	20	8	2
SL1b-3	5.5	30	40	30	10	30	30	80	2	40	10	<1	<1	240	20	50	30	8	2
SL1b-4	7.6	20	40	30	9	20	30	80	2	30	8	<1	<1	210	20	50	20	7	1
SL1b-5	9.8	20	40	30	8	20	30	70	2	30	9	<1	<1	220	20	50	20	8	1
SL1b-6	12.0	20	40	20	7	20	20	60	2	30	8	<1	<1	220	20	50	20	8	2
SL1b-7	14.2	20	40	30	10	20	20	60	2	30	8	<1	<1	200	20	50	20	8	2
SL1b-8	16.4	20	30	30	9	20	20	60	3	30	8	<1	<1	180	20	50	20	8	2
SL1b-9	18.5	20	30	30	10	20	20	50	3	30	8	<1	<1	170	20	50	20	8	2
SL1b-10	20.7	20	40	20	10	20	20	60	3	30	8	1	<1	170	20	50	20	7	2
SL1b-11	22.9	20	30	30	9	20	20	50	2	30	8	<1	<1	160	20	50	10	7	2
SL1b-12	25.1	20	30	30	10	20	20	50	2	30	8	<1	<1	180	20	50	10	7	2
SL1b-13	27.3	20	20	20	10	20	20	40	2	30	7	<1	<1	190	20	40	10	7	2
SL1b-14	29.5	20	30	20	10	20	20	50	2	30	7	<1	<1	180	20	50	9	7	1
SL1b-15	31.6	20	30	20	10	20	20	50	2	30	7	<1	<1	180	20	40	10	7	1
SL1b-16	33.8	20	30	20	10	20	10	50	2	30	8	<1	<1	180	20	50	10	7	2
SL1b-17	36.0	20	30	20	20	20	20	40	2	30	7	<1	<1	170	20	40	10	7	1
SL1b-18	38.2	10	20	20	7	20	10	30	2	20	7	<1	<1	200	20	40	8	6	1
SL1b-19	40.4	20	30	20	10	20	10	40	2	30	7	<1	<1	160	20	50	10	7	2
SL1b-20	42.5	10	30	20	9	20	10	30	2	30	7	<1	<1	160	20	40	9	7	1
SL1b-21	44.7	10	30	20	20	20	8	40	2	30	7	<1	<1	190	20	40	10	6	1
SL1b-22	46.9	10	30	30	10	20	7	30	3	30	7	1	<1	160	20	50	10	7	1
SL1b-23	49.1	10	30	20	20	20	10	40	3	30	8	<1	<1	170	20	50	10	7	1
SL1b-24	51.3	10	30	20	10	20	10	40	3	30	8	<1	<1	180	20	50	10	7	1
SL1b-25	53.5	20	30	20	10	30	10	50	3	30	8	<1	<1	160	20	50	10	7	1
SL1b-26	55.6	10	30	20	10	20	10	40	3	30	8	<1	<1	180	20	50	10	7	1
SL1b-27	57.8	10	30	20	10	20	10	50	3	40	8	<1	<1	170	20	50	10	7	1
SL1b-28	60.0	10	30	20	10	20	10	40	4	30	8	<1	<1	170	20	50	10	7	1
SL1b-29	62.2	10	30	30	10	30	10	50	3	30	7	<1	<1	160	20	50	10	7	1
SL1b-30	64.4	10	30	20	20	20	10	50	3	30	8	<1	<1	250	20	50	10	7	1
SL1b-31	66.5	10	30	20	10	20	7	40	3	30	8	<1	<1	250	20	40	10	7	1

Table 4-3. Minor inorganic-constituent concentrations for U.S. Geological Survey core samples taken as part of soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[ID, identifier; cm, centimeters; Li, lithium; V, vanadium; Cr, chromium; Co, cobalt; Ni, nickel; Cu, copper; Zn, zinc; As, arsenic; Sr, strontium; Y, yttrium; Mo, molybdenum; Ag, silver; Cd, cadmium; Sn, tin; Ba, barium; La, lanthanum; Ce, cerium; Pb, lead; Th, thorium; U, uranium; <, less than; all data are in parts per million (ppm); samples were analyzed for cadmium and silver. For all but two samples, values were below the detection limit of the method used. Therefore, the results are not included in this table.]

Sample ID	Corrected midpoint depth (cm)	Li	V	Cr	Co	Ni	Cu	Zn	As	Sr	Y	Mo	Sn	Ba	La	Ce	Pb	Th	U
SWAMP																			
Tangpahoa push-core TN1c																			
TN1c-1	1.1	5	20	10	8	10	10	40	3	50	3	1	<1	180	6	10	30	2	1
TN1c-2	3.2	5	20	9	5	10	10	40	3	50	3	1	<1	170	5	10	30	2	1
TN1c-3	5.4	6	20	10	20	20	20	50	4	50	3	2	1	170	7	20	50	3	1
TN1c-4	7.5	9	30	10	6	20	20	50	4	50	4	2	<1	200	8	20	60	3	1
TN1c-5	9.7	7	20	10	9	20	20	60	5	50	4	2	2	170	8	20	50	3	1
TN1c-6	11.8	9	30	10	4	10	20	60	5	60	4	1	1	200	8	20	70	4	1
TN1c-7	13.9	7	20	10	6	10	20	50	5	50	4	1	<1	180	8	20	50	3	1
TN1c-8	16.1	8	20	10	9	10	20	60	4	50	4	2	2	180	8	20	60	3	1
TN1c-9	18.2	10	20	10	9	10	20	50	3	50	4	1	1	210	9	20	40	4	1
TN1c-10	20.4	10	20	20	6	10	20	50	4	50	4	1	1	210	10	20	40	4	1
TN1c-11	22.5	10	30	10	6	10	20	60	4	50	5	1	1	240	10	30	50	5	1
TN1c-12	24.7	9	20	10	5	10	10	50	3	50	3	1	<1	200	8	20	30	3	1
TN1c-13	26.8	5	10	6	8	8	20	60	3	50	2	1	1	170	5	10	20	2	1
TN1c-14	29.0	7	20	8	10	9	20	50	3	50	3	1	1	180	7	20	30	3	1
TN1c-15	31.1	10	20	10	10	10	20	40	4	50	5	2	2	240	10	30	50	5	1
TN1c-16	33.3	10	20	20	10	10	20	50	4	50	4	1	<1	240	10	30	40	4	1
TN1c-17	35.4	10	20	20	6	10	20	50	3	50	5	1	1	230	10	30	40	5	1
TN1c-18	37.5	10	20	10	7	10	20	50	4	50	4	1	<1	220	10	30	30	5	1
TN1c-19	39.7	10	20	20	6	10	10	40	3	40	4	1	<1	250	10	20	30	5	1
TN1c-20	41.8	10	20	10	10	10	10	40	3	40	4	1	<1	200	10	30	20	4	2
TN1c-21	44.0	10	20	10	9	10	10	40	5	40	4	1	1	180	9	20	20	4	1
TN1c-22	46.1	10	20	10	9	10	10	40	4	40	4	1	1	190	10	30	10	5	1
TN1c-23	48.3	10	20	10	6	10	10	40	4	40	5	1	2	200	10	30	20	6	2
TN1c-24	50.4	10	20	10	7	10	10	40	4	40	5	1	<1	190	10	30	20	5	2
TN1c-25	52.6	10	20	10	10	10	20	50	5	40	4	1	1	170	9	20	20	5	2
TN1c-26	54.7	10	30	10	20	10	20	40	4	40	4	1	1	170	10	30	10	5	1
TN1c-27	56.9	10	20	10	8	10	10	30	3	40	5	1	<1	160	10	30	6	5	2
TN1c-28	59.0	9	20	10	7	10	10	40	4	40	5	1	<1	180	10	30	10	6	2
TN1c-29	61.1	8	20	9	7	10	10	40	3	40	4	1	1	170	10	30	10	6	1
TN1c-30	63.3	9	30	10	8	10	20	40	4	40	5	1	<1	170	10	30	10	5	2
TN1c-31	65.4	9	20	10	7	10	20	60	4	40	4	1	1	190	10	30	20	6	2
TN1c-32	67.6	10	30	20	8	10	10	40	3	40	4	1	<1	190	9	20	8	4	2
TN1c-33	69.7	10	20	10	30	10	10	40	3	40	4	1	1	180	9	20	10	6	1
TN1c-34	71.9	10	20	20	8	10	20	50	4	30	4	1	<1	160	9	20	10	4	1
TN1c-35	74.0	10	30	20	10	10	20	70	3	40	4	1	1	190	10	20	10	7	2
TN1c-36	76.2	10	20	20	8	10	10	80	4	40	5	1	<1	150	10	30	10	6	2
TN1c-37	78.3	10	20	10	8	9	10	70	4	40	5	<1	1	210	10	30	9	7	2

Appendix 5. Palynomorph Data and Taxonomy

Data

Wrenn and others (1998b) described the analytical procedures used for USGS soil/sediment-carbon research in the Mississippi River deltaic plain (MRDP). Included in the descriptions are the palynomorph and other microstratigraphic marker analytical procedures. Generally, palynomorph data are presented in one of three ways—count data, percentage data, or absolute-abundance data. The palynomorph data in Markewich (1998a, b) are count data. The palynomorph data in this report are absolute-abundance data (table 5-2). The following is a brief explanation of the three different ways of data reporting.

Count data are raw data that lists the number of specimens of each species counted per sample. For count data, the goal is to count the first 300 specimens of spores and pollen encountered per sample. That number is referred to as the "pollen sum."

Count data can be converted into percentage data by dividing each taxa count in a sample by the total number of pollen/spores counted for that sample. For example: If 20 pollen grains of a particular taxon were counted in a sample and the pollen sum was 302, the percentage of that taxon in the sample would be:

$$20/302 = 0.0662251 \times 100 = 6.6\%$$

The problem with percentage data is that it is a closed system. When comparing samples down a core, as the percentage abundance of one taxa increases, the percentage abundance of one or more other taxa must decrease so that the total is always 100 percent. Therefore, with percentage data, changes in the palynomorph sawtooth diagrams may indicate internal changes in the data rather than actual changes in vegetation or climate.

To avoid comparing data in a closed system, an outside standard or index is used (Stockmarr, 1971). This is done by adding a "spike" to the sample. The spike used for the MRDP samples is *Lycopodium* spore tablets produced specifically for this purpose. *Lycopodium* is a boreal spore that does not grow in the Southern United States; therefore, it would not occur naturally in MRDP samples. The spike is added at the beginning of processing, so that the tablet(s) undergoes the same processing steps (for example: oxidation, heavy liquid separation, repeated decanting, and so on) as the palynomorphs in the sample. Theoretically, any loss or destruction of palynomorphs during processing would be accompanied by a proportional loss or destruction of the spike.

For counting, a "spiked" sample is treated the same as a unspiked sample. The pollen sum, which consists of whatever total number (e.g., 300 specimens) of pollen and spores deamed appropriate for the study, is counted. Simultaneously, but separately, count the *Lycopodium* spores. Thus, the data collected will include the pollen sum and a separate tabulation of all the *Lycopodium* spores seen while counting the pollen sum.

The spike acts as an outside index of comparison and permits the absolute number of each taxa in a sample to be calculated (Stockmarr, 1971). This is done using the following formula:

Absolute number of pollen grains of a particular taxa (APG) equals the number of *Lycopodium* spores added to the sample (LA) divided by the number of *Lycopodium* spores counted (LC), and this number multiplied by the number of a particular pollen taxon counted (PC)

One of the *Lycopodium* tablets used contains 15,540 spores (on average) (Stockmarr, 1971). Therefore, if

15,540 (1 tablet) *Lycopodium* spores were added at the start of processing; and

20 pollen grains of a particular taxon were counted in a sample while counting the pollen sum; and

5 *Lycopodium* spores were counted while counting the pollen sum; then

Absolute abundance of the taxon =

$$(15{,}540\ (LA) / 5\ (LC)) \times 20\ (PC) = 62{,}160$$

The absolute abundance of the taxon is not influenced from sample to sample by changing abundances of other taxa because it is referenced to the *Lycopodium* spores, not the other palynomorphs in the sample. Absolute-abundance data is thought to more closely approximate the real nature of change in the sample than does percentage data. The plots may be similar, but they usually differ significantly in some regards.

Common Names

Table 5-1 gives the common names for the palynomorph source plants included in table 5-2.

Table 5-1. Generalized taxonomy and common names for identified palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.[1]

[cm, centimeter; undiff., undifferentiated]

Taxonomy				
Family		Genus/species		Other designations, comments, and notes on limited occurrence
Scientific name	Common name	Scientific name	Common name	
Arboreal taxa				
Aceraceae	Maple	*Acer*	Maple	
Aceraceae	Maple	*Acer rubrum*	Red maple	
Aquifoliaceae	Holly	*Ilex*	Holly	
Betulaceae	Birch	*Alnus*	Alder	
Betulaceae	Birch	*Betula*	Birch	
Betulaceae	Birch	*Carpinus*	Hornbeam	
Betulaceae	Birch	*Corylus*	Hazelnut	
Betulaceae	Birch	*Ostrya*	Hophornbeam	
Cornaceae	Dogwood	*Cornus*	Dogwood	
Cupressaceae, Taxaceae, and Taxodiaceae	Cypress, yew, and redwood			TCT is the designation for pollen of the combined Taxodiaceae, Cupressaceae, and Taxaceae families
Cyrillaceae	Cyrilla	*Cyrilla*	Titi	Present only in push-core TN1d
Ericaceae	Heath			
Euphorbiaceae	Spurge	*Sapium*	Tallowtree	Present only in vibracore TB2c at 66.1 cm depth
Fabaceae	Pea	*Gleditsia aquatica*	Water locust	Present only in push-core TN1d
Fagaceae	Beech	*Castanea*	Chestnut	
Fagaceae	Beech	*Fagus*	Beech	Present only in vibracore TB2c at 433.4 cm depth
Fagaceae	Beech	*Quercus*	Oak	
Grossulariaceae	Currant	*Itea virginica*	Virginia sweetspire	Present only in push-core TN1d
Hamamelidaceae	Witch hazel	*Liquidambar*	Sweetgum	
Hippocastanaceae	Horse chestnut	*Aesculus*	Buckeye	Present only in vibracore TB2c at 357.9 cm depth
Illiciaceae	Star anise	*Illicium floridanum*	Florida anisetree	Present only in vibracore SB1c
Juglandaceae	Walnut	*Carya*	Hickory	
Juglandaceae	Walnut	*Juglans*	Walnut	
Magnoliaceae	Magnolia	*Magnolia*	Magnolia	Present only in vibracore TB2c at 243.4 and 357.9 cm depths
Moraceae	Mulberry			
Myricaceae	Bayberry	*Myrica*	Bayberry/Myrtle	
Nyssaceae	Sour gum	*Nyssa*	Tupelo	
Nyssaceae	Sour gum	*Nyssa aquatica*	Water tupelo	
Nyssaceae	Sour gum	*Nyssa sylvatica*	Blackgum	Present only in vibracore TB2c in the 350- to about 430-cm depth interval
Oleaceae	Olive	*Fraxinus*	Ash	
Pinaceae	Pine	*Pinus*	Pine	
Rubiaceae	Madder	*Cephalanthus*	Buttonbush	
Salicaceae	Willow	*Populus*	Cottonwood	
Salicaceae	Willow	*Salix*	Willow	
Ulmaceae	Elm	*Celtis*	Hackberry	
Ulmaceae	Elm	*Planera aquatica*	Planertree	
Ulmaceae	Elm	*Ulmus*	Elm	

Table 5-1. Generalized taxonomy and common names for identified palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.[1] —Continued

[cm, centimeter; undiff., undifferentiated]

Taxonomy				
Family		Genus/species		Other designations, comments, and notes on limited occurrence
Scientific name	Common name	Scientific name	Common name	
Herbaceous taxa				
Anacardiaceae	Sumac	*Rhus*	Sumac	Present only in vibracore TB2c in the 120–200-cm depth interval
Apiaceae	Carrot			
Apiaceae undiff.	Carrot or parsley			Present only in vibracore TB2c at 195.5 cm depth
Arecaceae	Palm	*Sabal*	Palmetto	Present only in vibracore TB2c in the 350- to 450-cm depth interval
Asteraceae	Aster	*Ambrosia*	Ragweed	
Asteraceae	Aster	*Artemisia*	Sagebrush	
Asteraceae	Aster	*Eupatorium perfoliatum*	Common boneset	Present only in the uppermost 100 cm of vibracore SB1c
Asteraceae	Aster	*Iva*	Marshelder	
Asteraceae	Sunflower/safflower			Present in the surface few centimeters of vibracore SM1c
Asteraceae undiff.	Aster			
Asteraceae, long-spine undiff.	Aster			
Asteraceae, short-spine undiff.	Aster			
Caprifoliaceae	Honeysuckle	*Sambucus*	Elderberry	Present only in vibracore TB2c at 433.4 cm depth
Caryophyllaceae	Pink	*Stellaria*	Starwort	Present only in vibracore SB1c at 195 cm depth
Caryophyllaceae	Pink			Present only in vibracore SB1c at 396 cm depth
Chenopodiaceae and Amaranthaceae	Goosefoot and Amaranth			ChenoAm
Clusiaceae	Mangosteen	*Hypericum*	St. Johnswort	Present only in vibracore SB1c at 205 cm depth
Cyperaceae	Sedge	*Carex*	Sedge	
Cyperaceae	Sedge	*Cladium*	Sawgrass	
Cyperaceae	Sedge	*Rhynchospora*	Beaksedge	Present in the surface few centimeters of vibracore SM1c and at about 50 cm depth in push-core TN1d
Cyperaceae undiff.	Sedge			
Ephedraceae	Mormon-tea	*Ephedra*		Present only in vibracore TB2c at 357.9 cm depth
Ericaceae	Heath	*Vaccinium*	Blueberry	Present only in vibracore SB1c at 127 cm depth
Ericaceae undiff.	Heath			
Euphorbiaceae undiff.	Spurge			Present only in vibracore TB2c below 200 cm depth
Fabaceae	Pea	*Cercis*	Redbud	Present only in vibracore SB1c at 365 cm depth
Fabaceae	Pea	*Mimosa*	Mimosa	Present only in vibracore SB1c in the 100–200 cm depth interval
Fabaceae	Pea	*Robinia*	Locust	Present only in vibracore TB2c at 433.4 cm depth

Table 5-1. Generalized taxonomy and common names for identified palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.[1]—Continued

[cm, centimeter; undiff., undifferentiated]

Taxonomy				
Family		Genus/species		Other designations, comments, and notes on limited occurrence
Scientific name	Common name	Scientific name	Common name	
Herbaceous taxa—Continued				
Fabaceae	Pea	*Vigna luteola*	Hairypod cowpea	
Fabaceae	Pea	*Vigna unguiculata* (L.) Walp. subspecies *unguiculata*	Blackeyed pea	
Fabaceae undiff.	Pea			Present only in vibracore TB2c at 283.9 cm depth
Lamiaceae	Mint	*Mentha*	Mint	Present only in push-core TN1d at 28.8 cm depth
Lentibulariaceae	Bladderwort	*Utricularia juncea*	Southern bladderwort	Present only in vibracore SB1c at 205 cm depth
Liliaceae undiff.	Lily			Present only in vibracore TB2c at 433.4 cm depth
Lythraceae undiff.	Loosestrife			Present only in vibracore TB2c in the uppermost 70 cm and at 283.9 cm depth
Piperaceae undiff.	Pepper			Present only in vibracore SB1c at 235 cm depth
Plantaginaceae	Plantain	*Plantago*	Plantain	Present only in vibracore SB1c below 125 cm depth
Plantanaceae	Plane-tree	*Platanus*	Sycamore	Present only in vibracore TB2c, primarily below 120 cm
Poaceae undiff.	Grass			
Polygonaceae undiff.	Buckwheat			
Polygonaceae	Buckwheat	*Polygonum*	Knotweed	
Polygonaceae	Buckwheat	*Polygonum cristatum*	Climbing false buckwheat	
Polygonaceae	Buckwheat	*Polygonum lapathifolium*	Curlytop knotweed	
Rhamnaceae	Buchthorn	*Berchemia*	Supplejack	Present only in vibracore TB2c at 199.9 cm depth
Sapotaceae	Sapodilla	*Bumelia*		
Solanaceae undiff.	Potato			Present only in vibracore TB2c at 357.9 cm depth
Symplocaceae	Sweetleaf	*Symplocos*	Sweetleaf	Present only in vibracore TB2c at 357.9 cm depth
Violaceae	Violet/pansy			Present only in vibracore SB1c at 195 cm depth
Aquatic taxa				
Alismataceae	Water plantain	*Sagittaria*	Arrowhead	
Amaranthaceae	Amaranth	*Alternanthera philoxeroides*	Alligatorweed	
Equisetaceae	Horsetail	*Equisetum*	Horsetail	
Lemnaceae	Duckweed	*Lemna*	Duckweed	
Haloragaceae	Water Milfoil	*Myriophyllum*	Watermilfoil	Present only in vibracore SM1c
Nymphaeaceae	Water-lily	*Nuphar*	Pond-lily	Present only in vibracore SM1c at 96.5 cm depth and in vibracore TB2c at 433.4 cm depth

Table 5-1. Generalized taxonomy and common names for identified palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.[1]—Continued

[cm, centimeter; undiff., undifferentiated]

Taxonomy				
Family		Genus/species		Other designations, comments, and notes on limited occurrence
Scientific name	Common name	Scientific name	Common name	
		Aquatic taxa—Continued		
Nympheaceae undiff.	Water-lily			Present only in vibracore TB2c at 146.5 cm depth
Nympheaceae	Water-lily	*Nymphaea*		
Polypodiaceae	Fern			Present only in push-core MR1d
Potamogetonaceae	Pondweed	*Potamogeton*	Pondweed	Present only in vibracore SB1c at 85 cm depth
Typhaceae	Cattail	*Typha angustifolia*	Narrowleaf cattail	
Typhaceae	Cattail	*Typha latifolia*	Broadleaf cattail	
Typhaceae	Cattail	*Typha*	Cattail	
		Pteridophyte taxa		
There are many thousands species and about 40 families of ferns.			Monolete spores Trilete spores Trilete spores, shagreenate	
		Other taxa		
Lycopodiaceae	Club-moss	*Lycopodium*	Clubmoss	Used as a spike in each sample
Sporormiaceae	Fungi	*Sporomiella*	Dung fungus	Present only in vibracore SB1c

Phylum		
Scientific name	Common name	Comments
Foraminifera	Forams	Indicators of brackish, marginal-marine, or open-marine conditions

[1] The primary taxonomic data sources used are two U.S. Department of Agriculture (USDA) online databases that are referenced in the “References Cited” section of this report (U.S. Department of Agriculture, 2004b, 2005b).

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

FRESH MARSH

St. Mary vibracore SM1c

Aboreal

Depth (cm)	Acer rubrum	Alnus	Betula	Carya	Cornus	Fraxinus	Ilex	Juglans	Liquidambar	Myrica
6.4	0	0	0	4,238	0	0	0	0	0	0
96.5	0	0	0	0	0	0	0	0	0	0
111.8	0	0	0	1,195	0	0	3,586	0	1,195	1,195
122.6	0	0	0	0	0	0	41,215	0	1,351	0
133.4	0	486	486	486	0	971	0	0	486	971
148.0	0	0	0	28	14	41	0	0	28	14
161.3	1,295	0	0	5,180	0	10,360	0	0	0	6,475
168.3	0	87	0	260	0	260	1,910	0	434	260
179.1	0	0	0	88	0	88	147	0	235	29
189.2	0	46	0	46	0	46	0	0	414	0
201.9	0	21	0	42	0	0	0	0	63	42
217.2	28	0	0	113	0	0	0	0	170	28
227.3	0	0	0	0	0	229	0	0	229	229
246.4	0	0	0	0	0	0	0	0	173	86
266.7	0	0	0	113	0	0	0	0	450	1,013
268.0	0	0	0	31,080	0	0	0	31,080	15,540	77,700

Arboreal—Continued

Depth (cm)	Nyssa	Ostrya/Carpinus	Pinus	Planera aquatica	Populus	Quercus	Salix	TCT	Ulmus
6.4	0	2,825	15,540	0	0	14,127	11,302	15,540	1,413
96.5	0	0	345	0	0	3,108	345	2,417	345
111.8	0	0	7,172	0	0	9,563	1,195	13,149	0
122.6	0	0	4,054	676	0	11,486	1,351	676	2,027
133.4	486	0	6,799	0	486	14,083	1,457	13,598	1,943
148.0	14	0	14	0	0	83	0	0	28
161.3	3,885	0	19,425	0	0	40,145	11,655	12,950	2,590
168.3	174	0	0	0	0	3,473	87	955	608
179.1	0	29	264	0	441	1,058	176	1,058	176
189.2	138	0	138	0	46	1,655	230	2,575	322
201.9	0	0	0	0	0	924	0	462	42
217.2	28	0	0	0	0	1,132	57	623	142
227.3	0	0	229	229	0	2,514	0	686	457
246.4	0	0	0	0	0	259	259	1,036	0
266.7	0	0	225	0	225	901	0	6,644	113
268.0	0	62,120	0	0	0	139,860	46,620	1,087,800	0

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

FRESH MARSH—Continued									
St. Mary vibracore SM1c—Continued									
Herbaceous									
Depth (cm)	**Ambrosia**	**Artemisia**	**Asteraceae**	**ChenoAms**	**Cladium**	**Cyperaceae**	**Iva**	**Poaceae**	**Polygonum lapathifolium**
6.4	4,238	2,825	29,667	89,002	5,651	7,064	36,731	79,113	5,651
96.5	691	0	345	0	0	26,936	0	13,468	0
111.8	4,782	0	7,172	8,368	0	2,391	0	63,355	0
122.6	0	0	5,405	12,837	0	2,703	0	12,837	0
133.4	5,828	0	2,914	971	0	7,770	486	3,399	0
148.0	0	0	28	41	41	28	14	138	0
161.3	20,720	0	0	56,980	0	20,720	15,540	89,355	2,590
168.3	955	0	1,476	6,251	174	260	781	3,646	260
179.1	206	0	264	734	0	206	294	1,263	88
189.2	138	0	0	690	184	598	1,057	4,598	1,057
201.9	84	0	147	378	231	420	189	273	63
217.2	85	28	85	679	1,076	2,717	170	481	113
227.3	229	0	457	34,965	2,285	13,712	457	4,799	457
246.4	0	0	950	18,044	173	2,935	0	1,295	0
266.7	1,239	0	5,856	3,941	0	563	7,995	3,491	0
268.0	170,940	0	777,000	170,940	0	108,780	1,476,300	419,580	0

Herbaceous—Continued				
Depth (cm)	**Rhynchospora**	**Tubuliflorae**	**Umbelliferae**	**Vigna unguiculata**
6.4	1,413	9889	7,064	7,064
96.5	0	0	0	0
111.8	0	0	2,391	0
122.6	0	0	0	676
133.4	0	0	0	0
148.0	0	0	0	0
161.3	0	0	2,590	0
168.3	0	0	521	0
179.1	0	0	206	29
189.2	0	0	0	0
201.9	0	0	0	0
217.2	0	0	0	0
227.3	0	0	0	0
246.4	0	0	0	0
266.7	0	0	0	0
268.0	0	0	15,540	15,540

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

FRESH MARSH—Continued

St. Mary vibracore SM1c—Continued

	Aquatic										
Depth (cm)	**Alternanthera philoxeroides**	**Equisetum**	**Lemna**	**Myrio-phyllum**	**Nuphar**	**Nymphaea**	**Sagittaria**	**Typha angustifolia**	**Typha latifolia**	**TOTAL POLLEN**	**Indeter-minate**
6.4	2,825	0	1,413	1,413	0	0	28,255	45,207	5,651	435,120	178,004
96.5	0	345	0	0	1,381	691	0	2,417	0	52,836	18,993
111.8	0	0	0	1,195	0	0	2,391	1,195	1,195	132,688	0
122.6	0	0	0	0	0	0	0	6,757	1,351	105,402	41,890
133.4	0	486	0	0	0	0	0	3,885	0	68,473	26,709
148.0	0	55	0	0	0	0	0	97	0	705	277
161.3	0	5,180	0	0	0	1,295	37,555	20,720	5,180	392,385	71,225
168.3	0	174	521	0	0	0	174	1,302	955	25,958	5,469
179.1	0	0	0	0	0	0	59	881	206	8,225	4,230
189.2	0	0	92	92	0	0	1,057	644	138	16,000	1,931
201.9	0	105	42	0	0	0	63	147	126	3,864	1,008
217.2	0	255	85	57	0	57	142	198	85	8,633	1,727
227.3	229	914	0	0	0	0	686	914	2,514	67,416	7,541
246.4	0	691	0	0	0	0	0	173	691	26,763	2,245
266.7	0	563	0	0	0	0	0	0	0	33,332	7,320
268.0	0	62,160	0	0	0	0	0	15,540	0	4,724,160	404,040

	Other	
Depth (cm)	**Foraminifera**	**Lycopodium**
6.4	1	11
96.5	0	45
111.8	0	13
122.6	0	23
133.4	0	32
148.0	0	1,124
161.3	1	12
168.3	0	179
179.1	0	529
189.2	0	338
201.9	0	740
217.2	0	549
227.3	0	68
246.4	0	180
266.7	0	138
268.0	0	1

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

BRACKISH MARSH

St. Bernard vibracore SB1c

Arboreal

Depth (cm)	Acer	Alnus	Betula	Carya	Castanea	Celtis	Cornus	Corylus	Fraxinus	Illicium floridanum	Juglans
4.0	0	0	0	0	428	0	0	143	0	0	0
11.0	0	0	0	0	0	0	0	0	0	398	0
44.0	170	0	0	0	0	0	0	339	0	0	0
69.0	241	0	0	0	0	0	0	241	0	0	0
85.0	223	0	0	0	446	0	0	0	223	0	0
106.0	165	165	165	0	330	0	0	0	330	0	0
127.0	1,309	262	262	0	0	0	0	262	1,309	0	0
166.0	909	227	227	454	0	0	0	227	227	0	0
195.0	1,075	0	215	215	0	0	215	0	645	0	0
205.0	405	0	0	202	0	0	202	202	405	202	0
214.0	618	0	0	0	0	0	0	309	0	0	926
235.0	2,294	0	0	0	0	0	0	0	0	0	3,441
265.0	87	0	0	0	87	0	0	0	262	0	524
285.0	845	0	0	0	0	0	0	0	0	0	0
305.0	0	0	376	0	1129	0	376	0	0	0	0
316.0	463	0	0	0	0	0	0	0	0	0	0
365.0	730	0	0	0	547	0	182	0	0	0	0
384.0	719	0	0	359	0	0	0	0	0	180	0
396.0	163	325	0	0	163	163	163	0	325	0	163

Arboreal—Continued

Depth (cm)	Liquidambar	Myrica	Ostrya/Carpinus	Pinus	Planera aquatica	Quercus	Salix	TCT	Ulmus
4.0	0	0	0	2,280	0	855	0	0	0
11.0	0	0	0	1,990	0	0	0	199	199
44.0	0	0	0	3,053	0	170	0	1,526	0
69.0	0	0	0	4,817	0	120	482	8,068	0
85.0	0	0	223	10,258	0	223	446	10,258	0
106.0	165	0	165	7,753	0	330	330	3,134	165
127.0	262	0	0	7,068	0	2,094	0	12,827	262
166.0	227	0	0	9,543	0	1,136	909	5,907	0
195.0	1,290	0	215	9,032	215	860	860	2,365	0
205.0	202	202	202	8,703	0	2,226	1,417	3,643	202
214.0	309	0	0	9,572	0	1,853	1,544	2,470	309
235.0	0	0	0	25,231	0	2,294	14,909	3,441	1,147
265.0	0	0	87	1,832	0	175	0	2,792	0
285.0	0	0	0	4,225	0	423	0	8,451	423
305.0	0	0	376	10,537	0	1,505	11,289	12,042	0
316.0	0	0	1,389	2,779	0	1,389	64,378	6,021	463
365.0	182	0	547	3,649	0	730	912	1,277	0
384.0	180	0	180	1,977	0	1,618	359	180	0
396.0	163	0	0	488	0	1,139	1,627	163	163

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

BRACKISH MARSH—Continued

St. Bernard vibracore SB1c—Continued

Herbaceous

Depth (cm)	Ambrosia	Asteraceae, long-spine	Asteraceae, short-spine	Bumelia	Carex	Caryophyllaceae	Cercis	ChenoAms	Cyperaceae
4.0	0	5,273	6,698	0	0	0	0	9833	285
11.0	1,194	0	2,189	0	0	0	0	14,928	199
44.0	8,819	678	0	0	3,053	0	0	17,639	1,018
69.0	2,408	482	0	0	361	0	0	8,189	241
85.0	1,561	1,115	6,244	669	6,913	0	0	8,028	892
106.0	165	330	1,650	0	5,114	0	0	7,093	1,815
127.0	0	524	524	0	20,157	0	0	1,309	785
166.0	1,818	0	0	0	13,405	0	0	1,818	454
195.0	645	215	1,935	0	9,247	0	0	1,290	1,075
205.0	1,619	405	607	0	5,464	0	0	18,012	2,429
214.0	309	618	2,470	0	0	0	0	12,968	12,042
235.0	3,441	1,147	1,147	0	0	0	0	12,615	0
265.0	0	262	175	0	0	0	0	611	2,618
285.0	0	845	0	0	423	0	0	91,266	1,690
305.0	376	4,516	376	0	0	0	0	44,029	1,505
316.0	0	4168	0	0	0	0	0	29,179	1,389
365.0	0	182	365	0	0	0	182	21,895	730
384.0	539	180	539	180	0	0	0	31,094	180
396.0	0	488	163	0	651	325	0	1,627	1,790

Herbaceous—Continued

Depth (cm)	Ericaceae	Eupatorim perfoliatum	Hypericum	Iva	Mimosa	Piperaceae	Plantago	Poaceae	Polygonum cristatum
4.0	0	0	0	0	0	0	0	7,980	0
11.0	199	199	0	0	0	0	0	3,981	0
44.0	0	0	0	3,223	0	0	0	4,410	0
69.0	0	0	0	963	0	0	0	8,189	0
85.0	0	223	0	669	0	0	0	22,969	0
106.0	0	0	0	165	0	0	0	9,733	0
127.0	0	0	0	0	262	0	262	25,393	0
166.0	227	0	0	0	909	0	0	21,358	0
195.0	0	0	0	0	0	0	215	24,514	0
205.0	0	0	202	0	0	0	202	21,251	0
214.0	0	0	0	0	0	0	618	6,175	0
235.0	0	0	0	1,147	0	246,574	0	18,350	0
265.0	0	0	0	175	0	0	0	11,518	0
285.0	0	0	0	0	0	0	0	3,380	423
305.0	0	0	0	376	0	0	0	8,655	0
316.0	0	0	0	0	0	0	0	25,473	0
365.0	0	0	0	0	0	0	0	10,765	0
384.0	0	0	0	0	0	0	0	1,797	0
396.0	0	0	0	163	0	0	325	2,278	0

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

BRACKISH MARSH—Continued							
St. Bernard vibracore SB1c—Continued							
Herbaceous—Continued							
Depth (cm)	Polygonum lapathifolium	Stellaria	Umbelliferae	Utricularia juncea	Vaccinium	Vigna unguiculata	Violaceae
4.0	0	0	0	0	0	143	0
11.0	199	0	1,592	0	0	0	0
44.0	509	0	0	0	0	0	0
69.0	120	0	0	0	0	120	0
85.0	1,561	0	0	0	0	1,115	0
106.0	990	0	0	0	0	0	0
127.0	785	0	0	0	262	0	0
166.0	0	0	0	0	0	0	0
195.0	0	215	0	0	0	0	215
205.0	0	0	0	202	0	0	0
214.0	0	0	0	0	0	0	0
235.0	0	0	0	0	0	0	0
265.0	0	0	0	0	0	0	0
285.0	0	0	0	0	0	0	0
305.0	0	0	0	0	0	0	0
316.0	463	0	0	0	0	0	0
365.0	182	0	0	0	0	0	0
384.0	0	0	0	0	0	0	0
396.0	0	0	0	0	0	0	0

	Aquatic			*Pteridophyte*			TOTAL POLLEN	Indeter-minate	*Other*	
Depth (cm)	Potamo-geton	Sagittaria	Typha	Monolete spores	Trilete spores	Sporomiella			Foraminifera	Lycopodium
4.0	0	0	285	0	143	0	34,345	4,703	285	169
11.0	0	0	398	796	199	199	29,060	3,782	8,957	121
44.0	0	678	170	170	339	170	46,133	2,374	339	142
69.0	0	0	120	120	0	120	35,403	5,419	241	200
85.0	446	892	1,338	0	892	1,115	78,942	2,676	0	108
106.0	0	2,144	7,918	660	0	0	50,972	2,969	0	146
127.0	0	3,403	524	785	262	0	81,153	32,723	0	92
166.0	0	2,272	2,272	1,590	909	0	67,026	5,907	0	106
195.0	0	2,150	430	215	215	0	59,780	5,161	1,075	112
205.0	0	0	2,631	1,012	1,012	0	73,466	4,655	0	119
214.0	0	0	3,396	52,491	0	0	108,996	7,102	0	78
235.0	0	0	3,441	0	0	0	340,617	4,587	0	21
265.0	0	0	611	175	0	0	21,990	4,276	0	276
285.0	0	0	7,183	0	0	0	119,575	15,211	0	57
305.0	0	0	13,171	0	0	376	111,012	5,645	0	64
316.0	0	0	3,242	0	0	0	140,799	4,168	0	52
365.0	0	0	6,933	730	0	0	50,722	4,379	182	132
384.0	0	0	5,032	0	0	0	45,292	7,728	0	134
396.0	0	651	1,302	0	651	0	15,622	6,997	0	148

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

BRACKISH MARSH—Continued

Terrebonne vibracore TB2c

Arboreal

Depth (cm)	Acer	Aesculus	Alnus	Betula	Carya	Celtis	Cephalanthus	Corylus	Fagus	Fraxinus
66.1	22	0	22	0	67	22	0	0	22	45
67.2	0	0	565	283	1,413	0	283	0	0	848
93.6	0	0	0	0	0	0	0	0	0	6,216
130.0	0	0	0	0	0	4,440	4,440	0	0	6,660
146.5	0	0	0	0	0	0	0	0	0	518
199.9	0	0	43	0	43	0	0	0	0	87
243.4	0	0	0	0	420	280	0	0	0	140
283.9	0	0	0	0	0	457	0	0	0	609
357.9	0	17	33	0	299	50	0	0	0	166
433.4	31	0	0	0	313	125	0	94	63	219
532.9	0	0	0	0	0	0	0	0	0	0

Arboreal—Continued

Depth (cm)	Ilex	Juglans	Liquidambar	Magnolia	Moraceae	Myrica	Nyssa aquatica	Nyssa sylvatica	Ostrya/Carpinus
66.1	0	0	22	0	22	179	0	0	22
67.2	0	0	283	0	0	1,978	0	0	0
93.6	0	0	0	0	0	0	0	0	0
130.0	0	0	2,220	0	0	0	0	0	2,220
146.5	0	0	0	0	518	0	0	0	0
199.9	0	0	0	0	0	130	0	0	173
243.4	0	0	0	140	0	0	0	0	0
283.9	0	0	152	0	0	609	0	0	0
357.9	17	33	33	17	0	66	33	50	233
433.4	0	31	63	0	31	157	31	31	157
532.9	0	0	0	0	0	0	0	0	0

Arboreal—Continued

Depth (cm)	Pinus	Platanus	Quercus	Salix	Sapium	TCT	Ulmus
66.1	1,116	89	603	112	67	201	22
67.2	3,956	0	4,803	1,978	0	2,543	1,130
93.6	9,324	0	18,648	3,108	0	18,648	3,108
130.0	4,440	0	26,640	4,440	0	24,420	2,220
146.5	1,813	259	1036	2,849	0	518	259
199.9	1,039	43	346	519	0	346	43
243.4	1,400	140	1,820	1,400	0	280	0
283.9	2,895	152	1,828	1,219	0	1676	0
357.9	615	183	416	266	0	116	83
433.4	1,911	94	721	689	0	439	125
532.9	224	0	112	224	0	112	0

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

BRACKISH MARSH—Continued

Terrebonne vibracore TB2c—Continued

Herbaceous

Depth (cm)	Ambrosia	Apiaceae	Artemisia	Asteraceae, long-spine	Berchemia	ChenoAms	Cladium	Cyperaceae	Ephedra
66.1	1,005	156	0	67	0	514	335	469	0
67.2	11,019	0	0	1,130	0	16,105	0	4,803	0
93.6	18,648	0	0	0	0	749,028	0	24,864	0
130.0	35,520	0	0	0	0	359,640	0	33,300	0
146.5	5,180	0	0	0	0	2,331	1,554	1,813	0
199.9	952	0	0	43	43	519	260	1,558	0
243.4	840	0	0	140	0	0	560	1,400	0
283.9	4,114	609	0	609	0	6,551	4,418	7,161	0
357.9	249	33	17	17	0	615	17	249	17
433.4	470	0	31	0	0	877	94	533	0
532.9	112	0	0	0	0	0	0	0	0

Herbaceous—Continued

Depth (cm)	Euphorbiaceae	Fabaceae	Liliaceae	Lythraceae	Poaceae	Polygonaceae	Polygonum	Rhus
66.1	0	0	0	848	424	0	0	0
67.2	0	0	0	4,521	9,889	0	0	0
93.6	0	0	0	0	59,052	0	0	0
130.0	0	0	0	0	64,380	0	0	0
146.5	0	0	0	0	49,987	0	259	259
199.9	43	0	0	0	6,017	0	0	43
243.4	0	0	0	0	37,940	0	140	0
283.9	152	152	0	1,981	8,684	152	0	0
357.9	33	0	0	0	532	0	0	0
433.4	31	0	31	0	752	0	0	0
532.9	0	0	0	0	0	0	0	0

Herbaceous—Continued

Depth (cm)	Robinia	Sabal	Sambucus	Solanaceae	Symplocos	Vigna unguiculata
66.1	0	0	0	0	0	0
67.2	0	0	0	0	0	0
93.6	0	0	0	0	0	3,108
130.0	0	0	0	0	0	0
146.5	0	0	0	0	0	0
199.9	0	0	0	0	0	0
243.4	0	0	0	0	0	0
283.9	0	0	0	0	0	0
357.9	0	50	0	17	33	0
433.4	31	94	31	0	0	0
532.9	0	0	0	0	0	0

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

BRACKISH MARSH—Continued

Terrebonne vibracore TB2c—Continued

	Aquatic								
Depth (cm)	**Alternanthera philoxeroides**	**Lemna**	**Nuphar**	**Nympheaceae**	**Typha angustifolia**	**Typha latifolia**	**Sagittaria**	**TOTAL POLLEN**	**Indeter-minate**
66.1	0	0	0	0	112	45	0	6,631	134
67.2	1,130	283	0	0	1,695	1,695	565	72,897	11,302
93.6	0	3,108	0	0	15,540	6,216	0	938,616	31,080
130.0	0	11,100	0	0	15,540	42,180	2,220	646,020	37,740
146.5	0	0	0	259	2,331	8,288	259	80,290	0
199.9	0	0	0	0	303	216	43	12,856	173
243.4	0	0	0	0	140	140	0	47,320	140
283.9	0	0	0	0	1,828	305	152	46,468	762
357.9	0	0	0	0	17	0	66	4,687	299
433.4	0	0	31	0	219	0	31	8,585	846
532.9	0	0	0	0	0	0	0	783	112

	Other
Depth (cm)	**Lycopodium**
66.1	696
67.2	55
93.6	5
130.0	7
146.5	60
199.9	359
243.4	111
283.9	102
357.9	935
433.4	496
532.9	139

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

BACKSWAMP

St. Martin push-core MR1d

Arboreal

Depth (cm)	Acer	Alnus	Betula	Carya	Celtis	Cephalanthus	Cornus	Fraxinus	Ilex	Juglans
2.1	0	0	91	457	0	0	91	366	0	0
12.5	0	833	278	1,665	0	0	0	7,215	0	0
22.9	0	0	144	288	0	0	0	0	0	144
33.3	0	0	128	385	0	0	0	0	0	0
43.7	0	0	91	411	0	0	0	320	0	0
54.1	36	36	0	143	0	0	0	249	0	36
64.5	0	0	0	512	0	0	0	512	57	0
68.6	24	24	0	122	49	24	0	269	0	24

Arboreal—Continued

Depth (cm)	Liquidambar	Myrica	Pinus	Planera aquatica	Populus	Quercus	Salix	TCT	Ulmus
2.1	274	0	731	91	823	3,291	1,737	14,077	0
12.5	0	278	2,220	555	278	6,383	22,755	26,085	555
22.9	144	144	1,007	0	0	863	432	2,590	0
33.3	0	0	642	0	0	899	642	642	0
43.7	91	91	1,188	0	0	1,508	1,325	1,783	183
54.1	36	0	677	0	0	891	1,354	927	71
64.5	285	171	1,366	171	0	968	5,009	2,334	683
68.6	73	24	392	0	0	636	612	2,178	147

Herbaceous

Depth (cm)	Ambrosia	Asteraceae, short-spine	ChenoAms	Cladium	Cyperaceae	Poaceae	Polygonum lapathifolium	Polypodiaceae
2.1	1,737	0	2,834	457	0	1,097	0	0
12.5	3,608	0	4,995	0	0	3,885	0	555
22.9	1,583	0	1,295	0	144	1,007	0	144
33.3	0	0	771	0	0	771	0	0
43.7	1,600	0	2,011	0	229	686	0	91
54.1	535	0	891	0	36	356	0	143
64.5	1,708	0	2,846	0	171	455	0	285
68.6	1,395	98	1,077	0	122	245	24	147

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

BACKSWAMP—Continued

St. Martin push-core MR1d—Continued

	Pteridophyte		TOTAL POLLEN	Indeterminate	*Other*
Depth (cm)	Trilete spores, granulate	Trilete spores, shagreenate			Lycopodium
2.1	91	0	28,246	9,050	170
12.5	555	0	82,695	24,975	56
22.9	288	0	10,216	8,921	108
33.3	128	0	5,009	2,697	121
43.7	320	0	11,929	6,399	340
54.1	107	178	6,701	2,851	436
64.5	398	0	17,931	4,668	273
68.6	171	0	7,880	4,136	635

St. Landry push-core SL1c.

	Arboreal										
Depth (cm)	Acer	Alnus	Carya	Celtis	Fraxinus	Ilex	Liquidambar	Myrica	Pinus	Planera aquatica	Populus
1.0	3,108	3,108	74,592	0	276,612	0	3,108	3,108	21,756	6,216	15,540
11.0	1,413	0	120,082	0	213,322	2825	7,064	0	4,238	2,825	1,413
21.0	0	0	48,951	1,554	54,390	777	9,324	777	6,216	1,554	0
31.0	777	0	6,605	1,360	9,324	389	1,748	0	1,360	0	583
41.0	0	0	385	0	0	0	0	0	128	0	0

	Arboreal—Continued				*Herbaceous*				
Depth (cm)	Quercus	Salix	TCT	Ulmus	Ambrosia	Asteraceae, short-spine	ChenoAms	Cyperaceae	Poaceae
1.0	400,932	77,700	15,540	12,432	55,944	6,216	0	3,108	3,108
11.0	15,540	5,651	14,127	4,238	21,191	0	2,825	1,413	1,413
21.0	55,167	3,885	24,864	3,108	13,986	1,554	0	2,331	3,108
31.0	8,741	777	15,734	583	7,576	194	389	777	583
41.0	128	0	385	0	1,798	0	128	514	0

	Aquatic			TOTAL POLLEN	Indeterminate	*Other*
Depth (cm)	Equisetum	Lemna	Sagittaria			Lycopodium
1.0	0	3,108	9,324	994,560	301,476	5
11.0	0	0	0	419,580	100,304	11
21.0	0	0	1,554	233,100	76,146	20
31.0	194	0	1,940	57,887	26,030	50
41.0	0	0	0	3,468	0	121

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

SWAMP

Tangipahoa push core TN1d

Arboreal

Depth (cm)	Acer rubrum	Alnus	Betula	Carya	Castenea	Celtis	Cyrilla	Ericaceae	Fraxinus	Gleditsia aquatica	Ilex
1.2	0	1,413	0	0	0	1,413	0	0	0	4,238	0
12.7	1,828	914	0	0	0	0	0	0	0	0	5,485
17.3	0	0	0	0	0	0	0	2,590	2,590	0	5,180
19.6	0	0	0	15,540	0	0	0	7,770	0	7,770	23,310
21.9	0	0	0	0	0	0	0	0	3,885	0	1,943
24.2	3,108	0	0	0	0	0	0	0	3,108	0	3,108
26.5	1,727	0	0	1,727	0	0	0	0	0	0	1,727
28.8	0	0	6,216	3,108	0	0	12,432	3,108	0	0	3,108
31.1	0	0	0	6,216	0	0	9,324	3,108	3,108	0	0
35.7	0	0	0	0	0	0	0	0	0	0	1,195
47.2	0	0	0	0	0	0	0	0	5,828	0	110,723
58.7	0	0	0	598	0	0	0	0	0	0	18,528
65.6	1,727	0	0	1,727	1,727	3,453	0	3,453	0	0	43,167

Arboreal—Continued

Depth (cm)	Itea virginica	Liquidambar	Myrica	Nyssa	Ostrya/ Carpinus	Pinus	Populus	Quercus	Salix	TCT	Ulmus
1.2	0	1,413	50,858	31,080	0	7,064	0	19,778	7,064	254,291	0
12.7	0	0	65,816	20,111	914	1,828	0	18,282	1,828	132,547	0
17.3	0	0	310,800	41,440	5,180	20,720	10,360	12,950	23,310	189,070	0
19.6	0	7,770	1,188,810	132,090	7,770	62,160	0	46,620	54,390	590,520	0
21.9	0	0	109,751	11,655	971	6,799	0	3,885	3,885	100,039	1,943
24.2	3,108	1,554	35,742	41,958	0	13,986	1,554	10,878	7,770	225,330	1,554
26.5	0	1,727	62,160	81,153	0	18,993	0	12,087	18,993	224,467	5,180
28.8	6,216	6,216	71,484	121,212	0	18,648	0	18,648	18,648	366,744	3,108
31.1	0	0	65,268	130,536	0	21,756	0	24,864	9,324	435,120	3,108
35.7	0	1,195	11,954	47,815	0	4,782	0	5,977	2,391	255,812	0
47.2	1,943	5,828	3,885	27,195	0	27,195	0	19,425	1,943	363,248	0
58.7	2,391	2,988	1,195	31,678	598	11,954	0	13,149	2,988	78,895	1,793
65.6	8,633	6,907	6,907	20,720	0	13,813	0	6,907	0	381,593	0

Table 5-2. Absolute-abundance data for selected palynomorphs from cores taken as part of U.S. Geological Survey soil/sediment-carbon studies, Mississippi River deltaic plain, southeastern Louisiana.—Continued

[cm, centimeter; TCT, Taxaceae, Cupressaceae, and Taxodiaceae; ChenoAms, combined pollen of Chenopodaceae and Amaranthaceae families]

SWAMP—Continued

Tangipahoa push core TN1d—Continued

	Herbaceous										
Depth (cm)	Ambrosia	Asteraceae, short spine	ChenoAms	Cladium	Cyperaceae	Iva	Mentha	Poaceae	Polygonum lapathifolium	Rhyncho-spora	Umbel-liferae
1.2	2,825	1,413	1,413	0	0	1,413	0	1,413	2,825	0	0
12.7	2,742	1,828	0	0	0	914	0	0	0	0	0
17.3	10,360	5,180	0	0	0	2,590	0	5,180	0	0	0
19.6	46,620	0	0	0	0	7,770	0	15,540	0	0	0
21.9	3,885	3,885	0	0	971	971	0	2,914	0	0	0
24.2	6,216	3,108	0	1,554	1,554	4,662	0	0	0	0	0
26.5	29,353	1,727	0	0	1,727	0	0	6,907	0	0	0
28.8	21,756	0	3,108	3,108	0	0	6,216	3,108	0	0	0
31.1	21,756	6,216	3,108	0	0	0	0	6,216	0	0	0
35.7	2,391	0	2,391	0	0	1,195	0	0	0	0	2,391
47.2	1,943	0	0	0	0	5,828	0	1,943	0	1,943	0
58.7	1,793	1,195	0	0	0	4,184	0	1,195	0	0	0
65.6	6,907	0	0	0	0	0	0	0	0	0	0

	Aquatic									*Other*
Depth (cm)	Alterna-theraphilox-eroides	Equisetum	Lemna	Nymphaea	Sagittaria	Typha angustifolia	Typha latifolia	TOTAL POLLEN	Indeterminate	Lycopodium
1.2	12,715	0	0	0	0	14,127	0	416,755	12,715	11
12.7	5,485	0	10,969	0	0	8,227	0	279,720	10,969	17
17.3	15,540	25,900	80,290	0	0	25,900	0	795,130	80,290	6
19.6	7,770	0	62,160	7,770	0	77,700	0	2,369,850	295,260	2
21.9	0	0	9,713	4,856	0	27,195	1,943	300,116	31,080	16
24.2	0	0	1,554	0	0	74,592	0	445,998	37,296	10
26.5	0	0	6,907	10,360	1,727	44,893	3,453	536,993	56,980	9
28.8	0	15,540	3,108	27,972	6,216	167,832	3,108	919,968	62,160	5
31.1	0	71,484	3,108	21,756	3,108	118,104	0	966,588	55,944	5
35.7	0	0	1,195	3,586	0	11,954	2,391	358,615	10,758	13
47.2	0	1,943	1,943	0	0	1,943	0	584,693	38,850	8
58.7	0	0	0	0	1,195	2,391	1,195	179,905	8,368	26
65.6	0	3,453	0	0	1,727	5,180	0	518,000	25,900	9

Appendix 6. Supplementary Figures

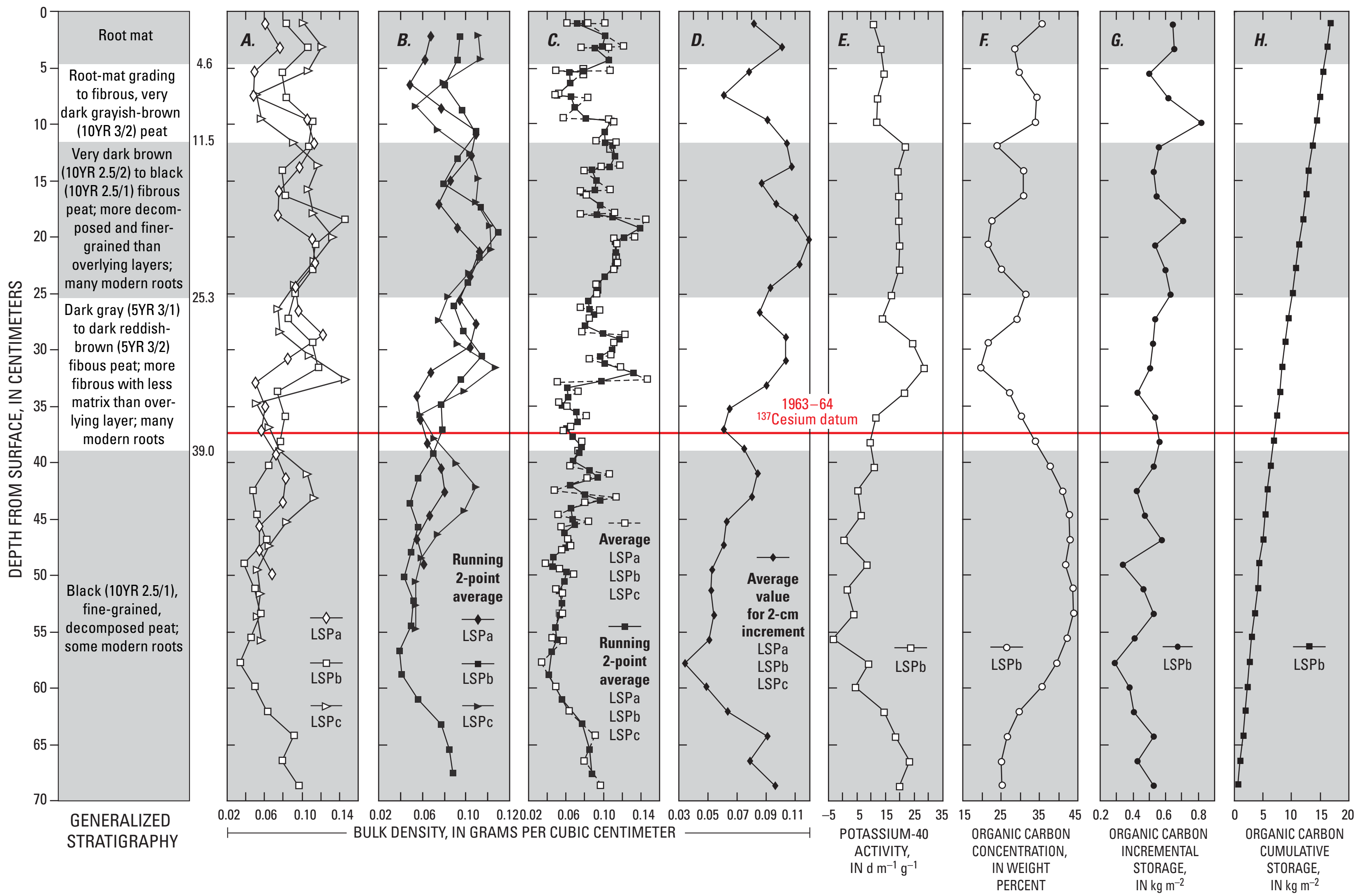


Figure 6-1. Generalized stratigraphy and sample properties versus sample midpoint depths for Lake Salvador fresh-marsh push-cores—LSPa, LSPb, LSPc. In C and D, data for cores LSPa, LSPb, and LSPc; data are combined and treated as one core. The 1963–64 cesium-137 datum is for core LSPb. [d m^{-1} g^{-1}, disintegrations per minute per gram; kg m^{-2}, kilograms per square meter]

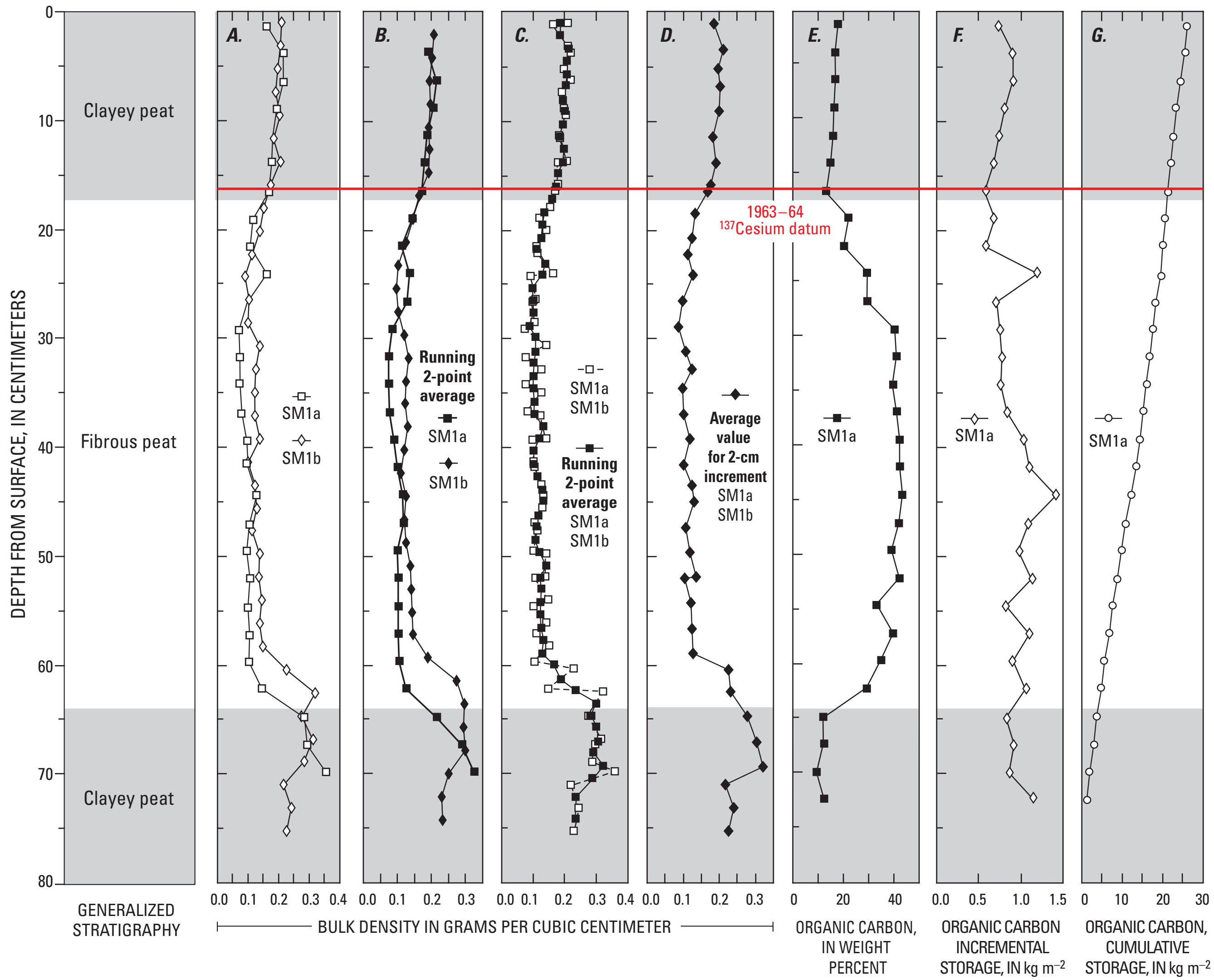


Figure 6-2. Generalized stratigraphy and sample properties versus sample midpoint depths for St. Mary fresh-marsh push-cores SM1a and SM1b. In plots *C* and *D*, data for cores SM1a and SM1b are combined and treated as one core. Stratigraphy and the 1963–64 cesium-137 datum is for push-core SM1b taken a few feet (about a meter) from core SM1a. [cm, centimeter; kg m^{-2}, kilograms per square meter]

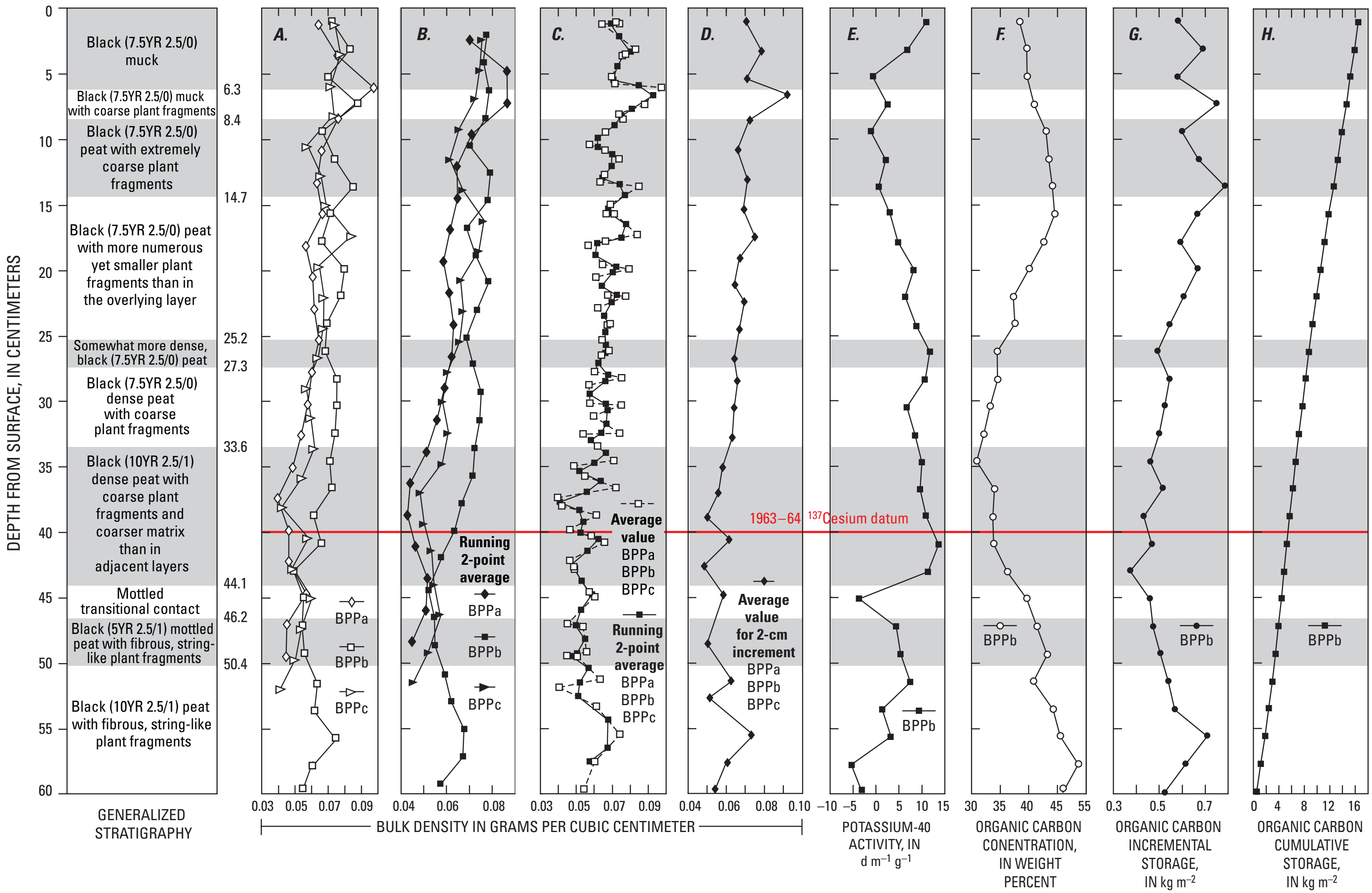


Figure 6-3. Generalized stratigraphy and sample properties versus sample midpoint depths for Bayou Perot intermediate-marsh push cores BPPa, BPPb, and BPPc. In *C* and *D*, data for cores BPPa, BPPb, and BPPc are combined and treated as one core. The 1963–64 cesium-137 datum is for core BPPb. [cm, centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; kg m^{-2}, kilograms per square meter]

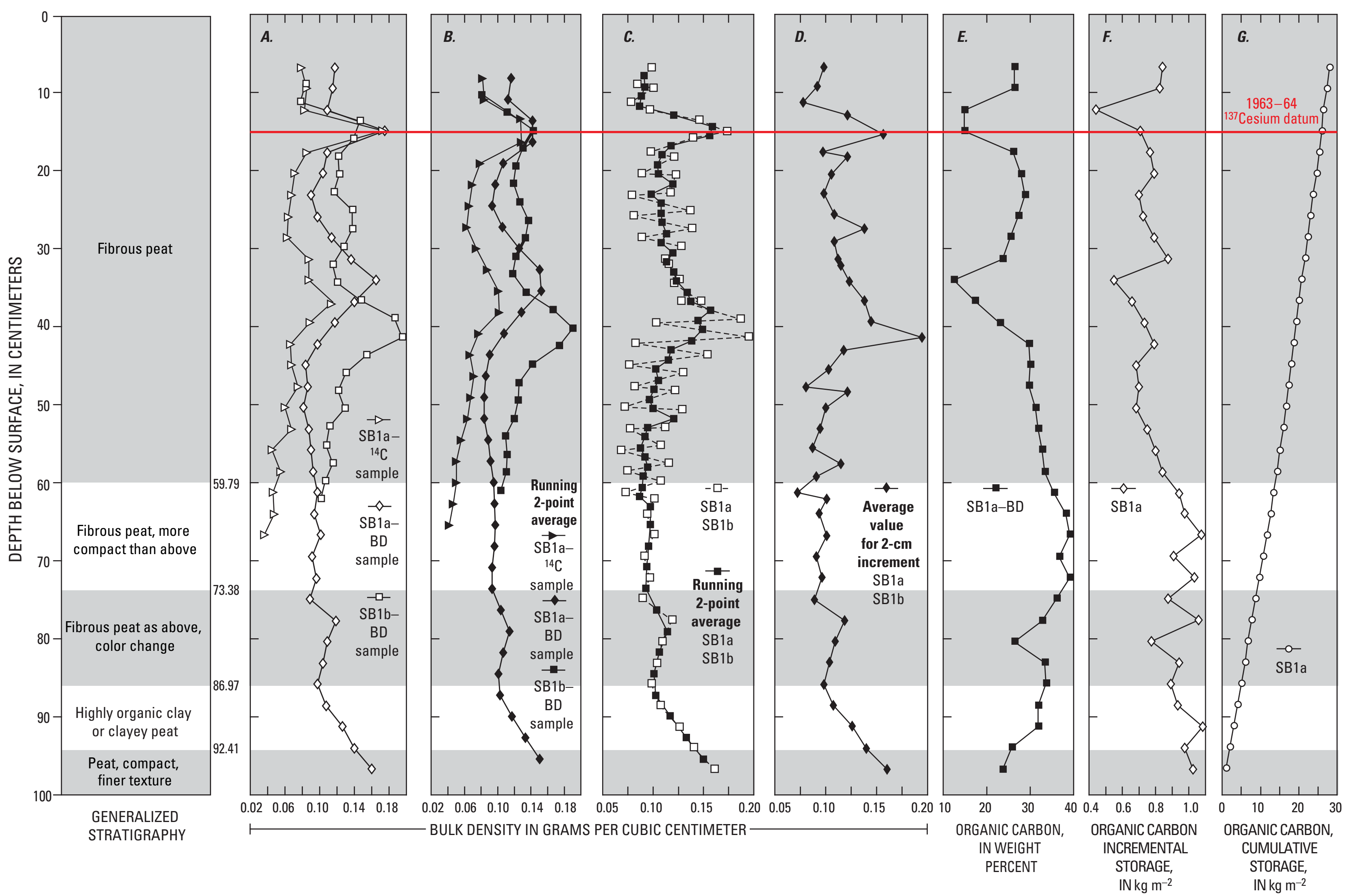


Figure 6-4. Generalized stratigraphy and sample properties versus sample midpoint depths for St. Bernard push-cores SB1a (two halves, SB1a–^{14}C and SB1a–BD [bulk density]) and SB1b. In plot *C*, the bulk-density values for cores SB1a–^{14}C and SB1a–BD are shown as SB1a, and the running two-point average bulk density versus average sample-midpoint depths are for SB1a and SB1b data combined and treated as one core. In plot *D*, data for SB1a and SB1b are combined and treated as one core. Stratigraphy is for core SB1a; the 1963–64 cesium-137 (^{137}Cs) datum is for core SB1b. [^{14}C, carbon-14; cm, centimeter; kg m^{-2}, kilograms per square meter]

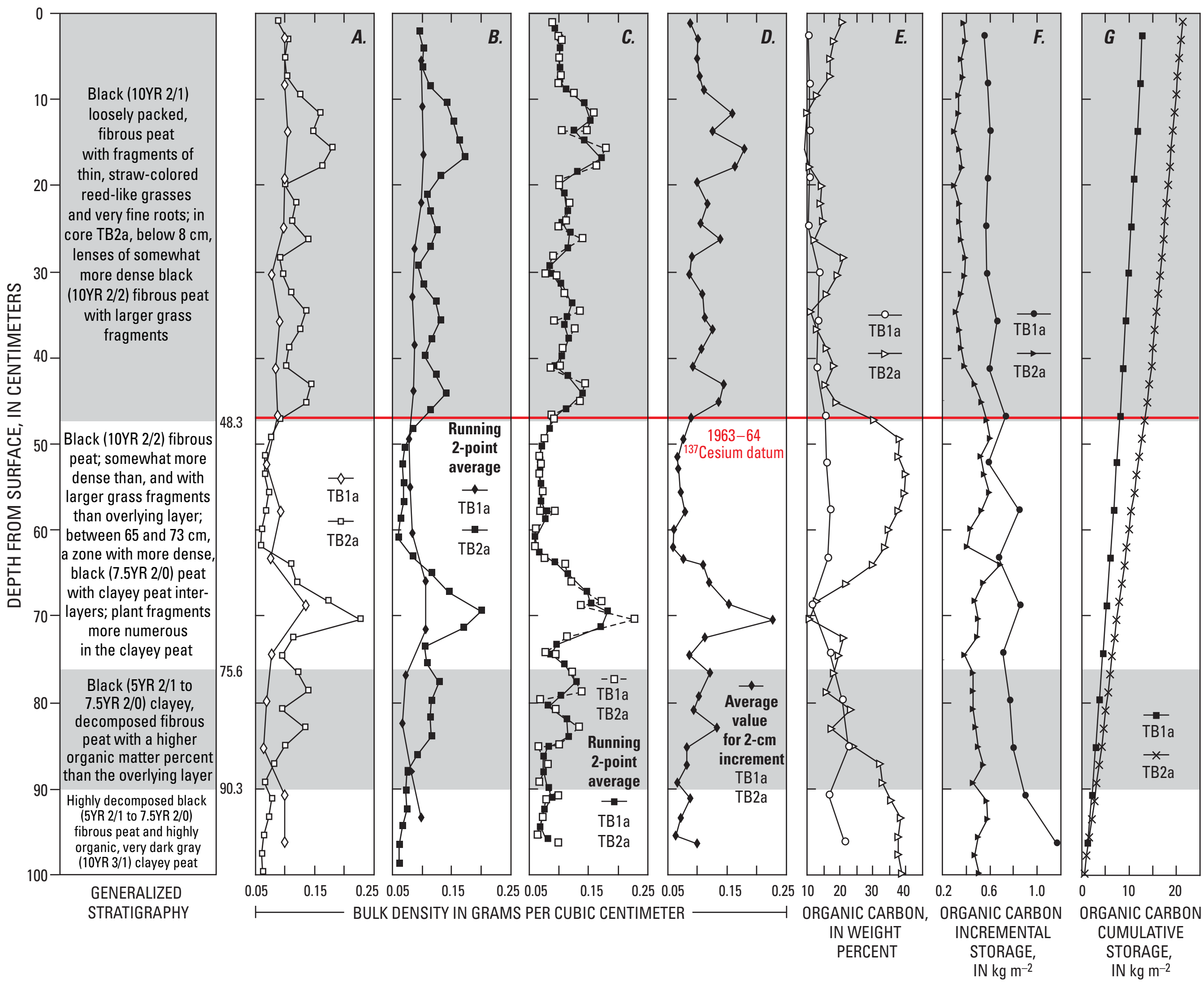


Figure 6-5. Generalized stratigraphy and sample properties versus sample midpoint depths for Terrebonne brackish-marsh push-cores TB1a and TB2a. In *C* and *D*, data for push-cores TB1a and TB2a are combined and treated as one core. Stratigraphy is for core TB1c; the 1963–64 cesium-137 datum is for core TB2a. [cm, centimeter; kg m^{-2}, kilograms per square meter]

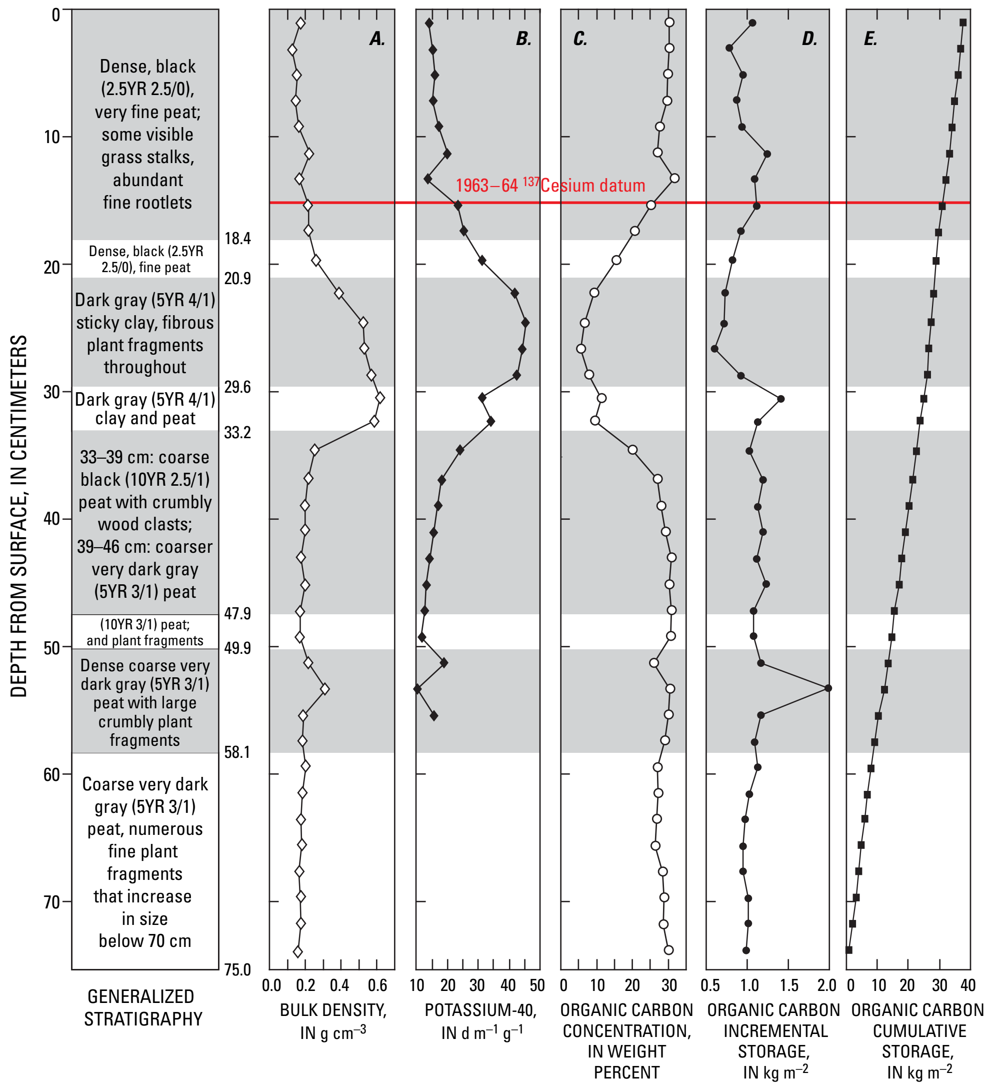


Figure 6-6. Generalized stratigraphy and sample properties versus sample midpoint depths for Bayou Sauvage distributary push-core BSDb. [cm, centimeter; g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; kg m^{-2}, kilograms per square meter]

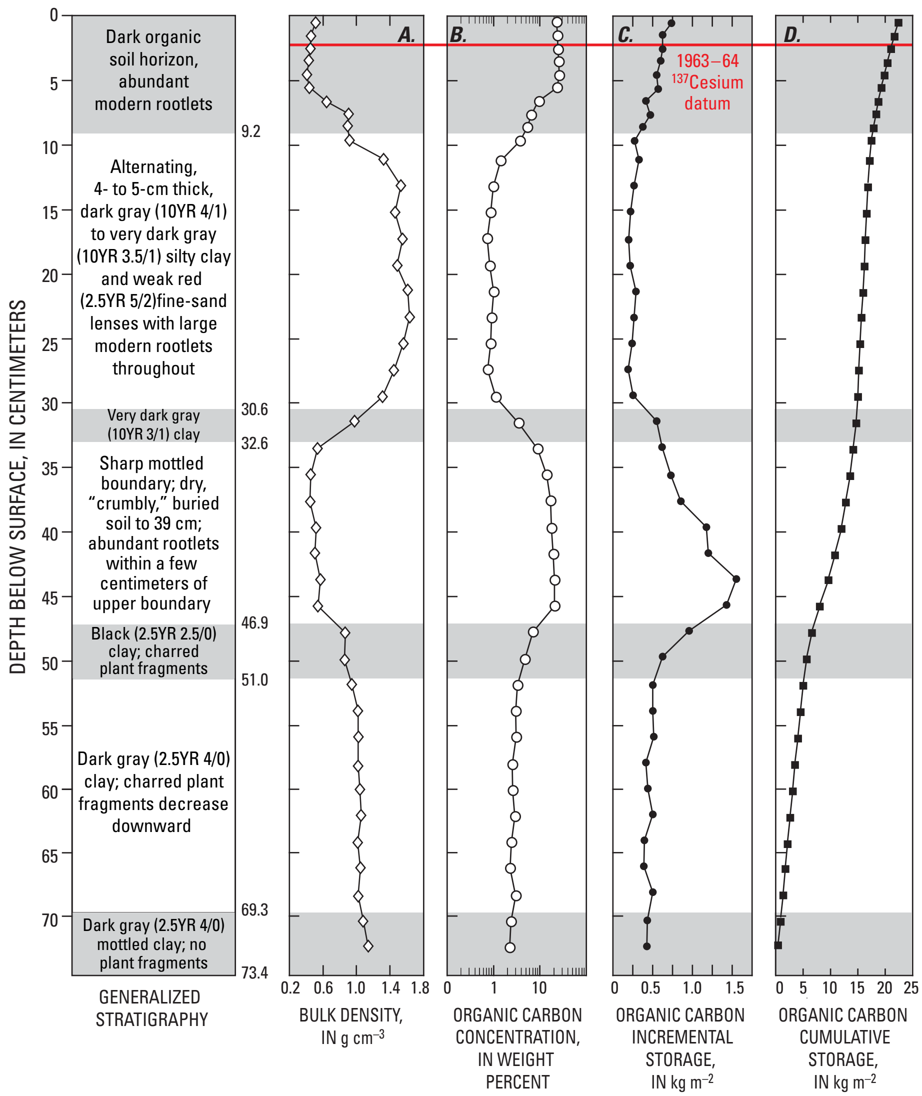


Figure 6-7. Generalized stratigraphy and sample properties versus sample midpoint depths for Bayou Sauvage levee push-core BSLa. The x-axis in plot *B* is logarithmic. [cm, centimeter; ^{137}Cs, cesium-137; g cm^{-3}, grams per cubic centimeter; kg m^{-2}, kilograms per square meter]

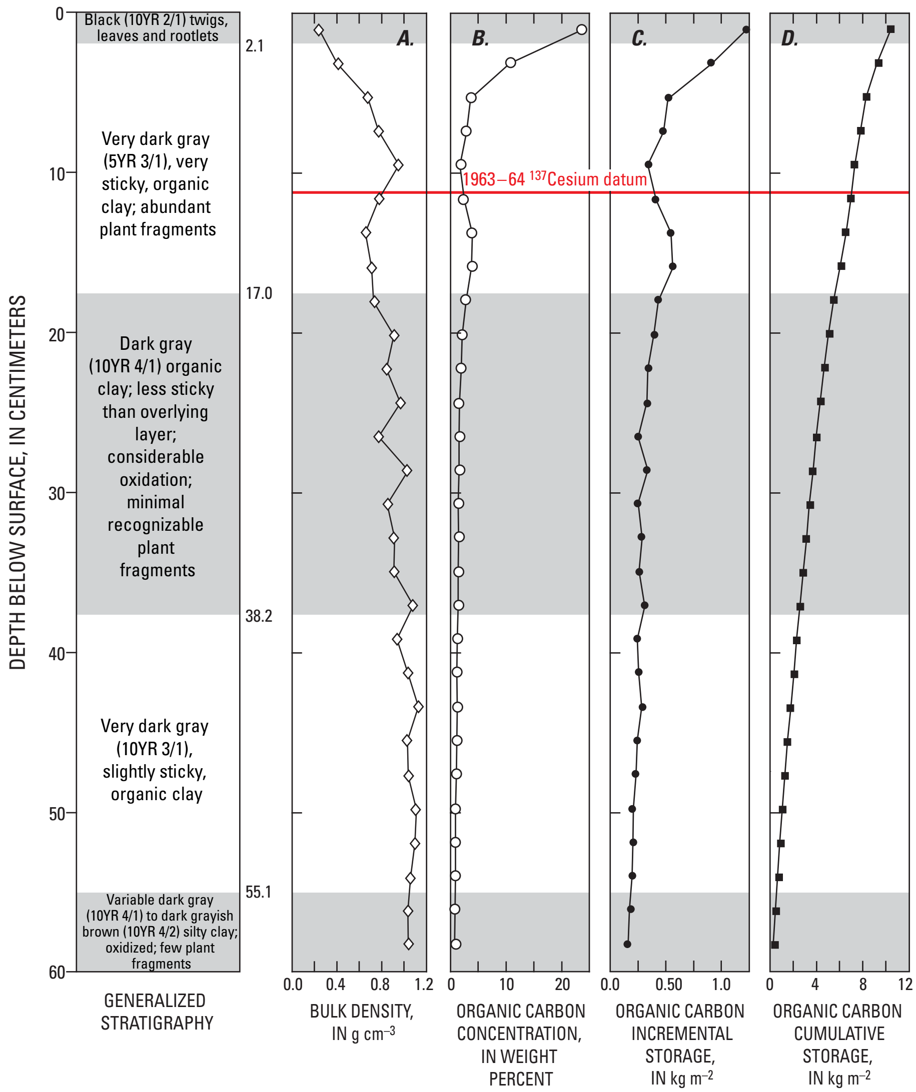


Figure 6-8. Generalized stratigraphy and sample properties versus sample mid-point depths for Bayou Sauvage levee push-core BSL2b. [^{137}Cs, cesium-137; g cm^{-3}, grams per cubic centimeter; kg m^{-2}, kilograms per square meter]

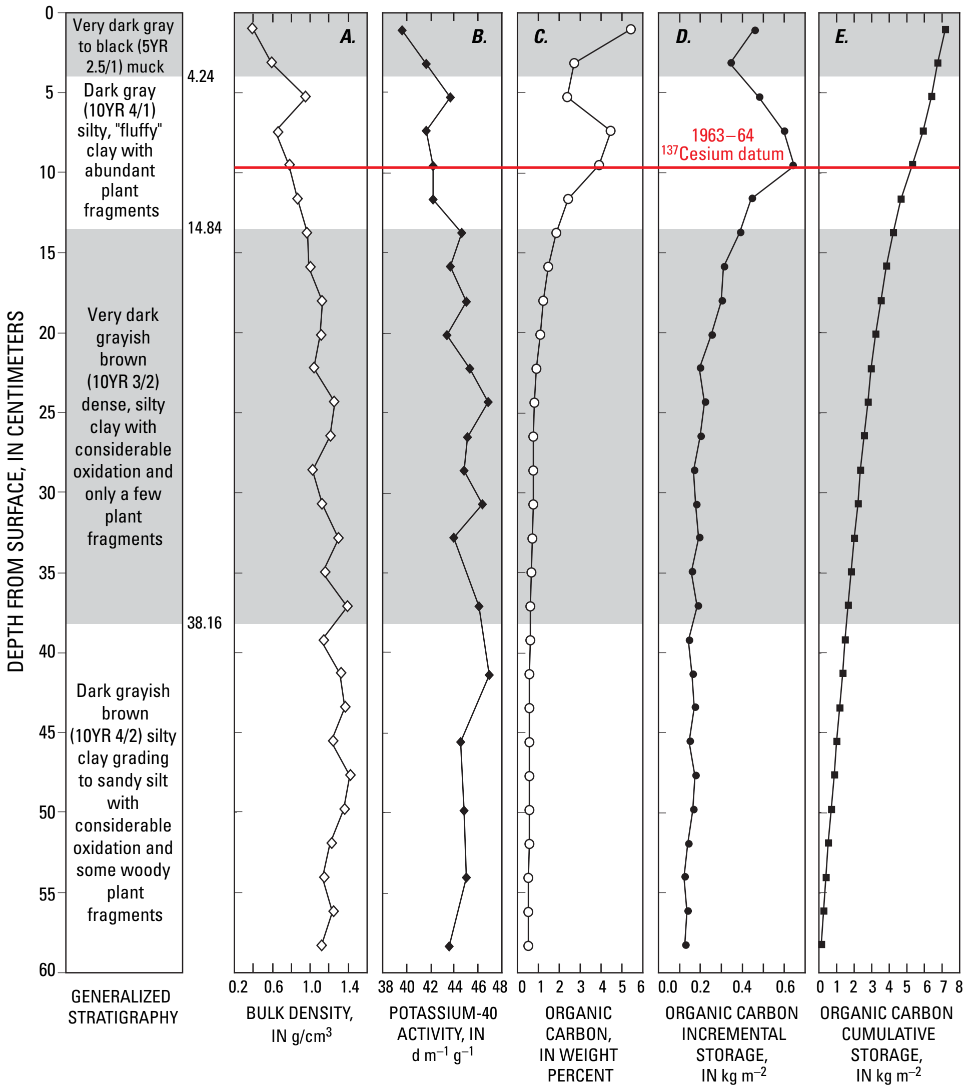


Figure 6-9. Generalized stratigraphy and sample properties versus sample midpoint depths for Plaquemines push-core PLAQb. [g cm^{-3}, grams per cubic centimeter; d m^{-1} g^{-1}, disintegrations per minute per gram; kg m^{-2}, kilograms per square meter]

Glossary

By Louis D. Britsch, Helaine W. Markewich, and Douglas L. Dillon

Mississippi River Deltaic Plain Depositional Environments

A

abandoned channel An abandoned channel is a natural cutoff that usually forms during times of flood. Abandoned channels are particularly common along large rivers, such as the Mississippi River, and its larger tributaries. They form in two ways. A highly sinuous meandering channel may cut off a single loop by cutting through its narrow neck and plugging the arms of the abandoned channel with its bed-load material (usually sand). These "neck cutoffs" result in the formation of an "oxbow" lake, which fills slowly with fine-grained sediment. Abandoned channels may also form during high flow when the main flow is diverted through a prominent swale or chute on the point bar or accretion bank, or the flow breaks through the natural levee of a loop and rejoins the main course on the opposite, downstream segment of the loop. As flow becomes concentrated in this new channel, the old channel is gradually abandoned and filled with sediment.

abandoned course An abandoned course is a relict river channel segment, which generally contains at least several connected meanders. The major difference between an abandoned channel and an abandoned course is the mode of abandonment. Unlike the abandoned channel, the abandoned course is formed when the main flowpath is diverted to a completely new position on the floodplain creating a new "meander belt" consisting of the course and its associated point bar and abandoned channel deposits. The abandonment process is known as channel diversion or avulsion and may happen gradually or in response to a single flood. Channel diversions usually occur gradually as an increasing amount of flow is diverted through the new, more hydraulic-efficient channel and the old channel progressively fills with sand, silt, and clay.

B

backswamp A backswamp is a poorly drained, tree-covered low area, bounded on all sides by natural levee ridges and/or Pleistocene upland surfaces. The term *backswamp* is restricted to floodplain rather than deltaic environments. Similar areas, not bounded on all sides by natural levee and confined to areas predominantly deltaic in origin, are known as inland swamps or swamps and are discussed in the swamp glossary entry.

Backswamp areas receive fine-grained sediment during periods of high flow when the natural levees are overtopped, and floodwaters bring fine-grained suspended sediment into low areas away from the active channel. Backswamp deposits are typically composed of massive, bioturbated clay sequences. Backswamp clays range in color from light yellow or dark brown to dark gray and black, depending on drainage characteristics. In general, better drained backswamp deposits are characterized by oxidizing conditions, lighter colors, mottling, and little organic matter. Poorly drained swamp deposits in contrast are characterized by reducing conditions, darker colors, and a much higher content of preserved organic matter, particularly in the form of roots, wood fragments, and often peat layers. Backswamp deposits contain abundant concretionary matter in the form of carbonate ($CaCO_3$) or siderite ($FeCO_3$) nodules and disseminated sulfides, particularly pyrite (FeS_2).

C

crevasse channel A crevasse channel is an ephemeral channel originating as a break in the natural levee of an active river during periods of high flow. Crevasse channels extend away from the main channel and are generally shallow and usually characterized by broad natural levees. These small channels usually terminate in the backswamps or low areas flanking the active main channel and discharge flood flow and sediment into these areas. In a general sense, crevasse channels function similar to the much larger distributary channel except on a much smaller or localized scale and usually receive flow only during high discharge periods. Numerous crevasse channels and splays are found adjacent to the Mississippi River. Crevasse channels that carry flood flow for extended periods become distributary channels.

D

distributary channel A distributary channel is a channel that diverges from the trunk river channel dispersing or "distributing" flow away from the main course. Distributary channels originate initially as crevasse channels during high flow periods when the trunk channel is unable to accommodate the large volume of discharge. If the flood is of sufficient duration, a permanent distributary channel is soon established through the initial crevasse channel. Active distributary channels are distinguished from the smaller crevasse channel by two fundamental differences. Distributary channels have perennial flow and generally terminate at a semipermanent base level (a large body of open water). In contrast, crevasse channels, have flow during high discharge periods and lead into adjacent swamps or marsh. Distributary channels typically diverge from the main channel at low angles (usually less than 60 degrees) and may carry a substantial amount of flow (from 20 to 40 percent of main-channel discharge) from the main channel. Crevasse channels usually break at right angles through natural levees and typically carry no more than 10 percent of main channel discharge. Abandonment of the distributary channel or distributary network occurs, either as a major course shift up valley or by flood flow crevassing a short distance upstream of the abandoned channel segment. Abandonment usually occurs because of an improved gradient advantage by the new course to the base level.

L

lacustrine and lacustrine delta Lacustrine means having to do with lakes. In the Mississippi River deltaic plain (MRDP), lacustrine sedimentation is characterized primarily by fine-grained deposition onto the lake bottoms, which generally average less than 4.6 m (15 ft) in depth. The initial lake filling phase consists of deposition of a uniform clay sequence that settles out of suspension, far removed from the locus of sediment introduction into the lake. The initial sedimentation cycle is primarily dominated by vertical, subaqueous accretion. The lacustrine environment is generally characterized by quiet water conditions, abundant fresh-water marine life, and occasional wind-generated waves and currents.

Lacustrine deposits in the study area consist of gray to dark gray clays with occasional silt lenses. The most prominent characteristic of the lacustrine environment is the parallel and the lenticular laminations displayed on the x-radiograph.

The second mode of the lake-filling process is the growth of the relatively coarse lacustrine-delta facies. Separating the purely lacustrine deposits from the overlying coarser lacustrine-delta deposits is difficult, as no sharp boundary exists between the two facies. Instead, the transition is gradual with a general coarsening upward sequence as the locus of sediment contribution (channel mouth) becomes closer. Lacustrine-delta sedimentation is the product of a fluvial system prograding into shallow, open water. This facies is characterized by subaqueous deposition of coarse (silt and sand) sediment at the river's mouth and the continued horizontal and vertical growth of the coarse facies into the open lake.

lacustrine-delta channel Lacustrine-delta channels are historic distributary channels associated with lacustrine-delta deposition. Lacustrine-delta channels are distinguished from distributary channels by their association with lacustrine-delta deposits. A second distinction separating the lacustrine-delta channels from distributary channels is based on origin. Lacustrine-delta channels are formed as a result of flow separation through the development of small elliptical lacustrine delta lobes. In contrast, distributary channels originate primarily because of crevassing and eventual abandonment of the former course for the more hydraulic-efficient newer course. In the MRDP, most lacustrine-delta channels are present in the Atchafalaya Basin, a former primary course of the Mississippi River.

M

marsh In the MRDP, marsh is a nearly flat expanse where the only vegetation consists of grasses and sedges. More than 80 percent of the deltaic plain is covered by marsh. Organic sedimentation plays an important role in the formation of marsh deposits. Peat, organic ooze, and humus are formed as marsh plants die and are buried. Decay is largely due to anaerobic bacteria; and in stagnant water, thick deposits of organic materials are formed. Vegetative growth maintains the surface elevation at a fairly constant level and the marsh deposits thicken as a result of subsidence (Kolb and Van Lopik, 1958).

Peat is the most common form of marsh strata and consist of black fibrous masses of partly decomposed plant remains. Detrital organic particles carried in by marsh drainage and vegetative tissues make up the so-called mucks. Mucks are watery oozes that can support little or no weight. Inorganic sedimentation takes place in the marsh when fluvial floodwater overtops the natural levees, depositing clays and silts onto the marsh surface. Inorganic sediments are also brought to the marshes during lunar tides, wind tides, and hurricane tides when sediment-laden marine waters inundate the marsh surface.

The type of marsh vegetation is largely dependent on the degree of water salinity and the elevation of the marsh.

fresh marsh Fresh marsh consists of a vegetative mat usually 10–35 cm (4–14 in) thick, underlayed by finely divided muck or organic ooze 0.9–4.6 m (3–15 ft) thick grading to clay with depth. The floating marsh or flotant is a common marsh type in the MRDP. The most common fresh-marsh species are *Panicum hemitomon* (maidencane), *Phragmites communis* (roseau), *Claldium jamaicense* (sawgrass), *Sagittaria lancifolic* (bulltongue), *Scirpus californicus* (bullwhip), *Alternanthera philoxeroides* (alligator weed), and *Eichhornia crassipes* (common water hyacinth).

intermediate-marsh Intermediate-marsh is very similar to fresh marsh, except that it exists in areas with slightly higher salinities. Generally, intermediate-marsh contains less peat material than fresh marsh. Common intermediate-marsh species are *Spartina patens* (wiregrass), *Vigna repens* (deer pea), *Sogittaria lancifolic* (bulltongue), *Echinochloa walteri* (wild millet), *Scirpus californicus* (bullwhip), and *Cladium jamaicense* (sawgrass).

brackish marsh Brackish marsh is very similar to intermediate marsh except that it exists in areas with higher salinities and generally contains less peat material than fresh or intermediate marsh. The typical soils sequence consists of a root mat 10–20 cm (4–8 in) thick underlain by parallel laminated peats with small zones of silty clay, which in turn are underlain by blue-gray clay. Common brackish-marsh vegetation types are *Scirpus validus* (bulrush), *Typha latifolia* (broadleaf cattail), *Phragmites communis* (roseau), and *Scirpus americanus* (three-cornered grass).

N

natural levee A natural levee is a low, wedge-shaped ridge adjacent to a river or distributary that is formed by vertical accretion when the river or distributary overtops its banks during flood stage and sediment suspended in the flood flow is deposited adjacent to the channel. Thickness of the levee and size of the sediment forming the levee decrease away from the channel.

Natural levees adjacent to the Mississippi River and abandoned distributaries are the most prominent surface features in the MRDP. Natural levees adjacent to the Mississippi River are from 0.8 to 6.5 km (from 0.5 to 4 mi) in width and up to 10 m (33 ft) in thickness. Distributary natural levees in the northern portion of the deltaic plain are well exposed at the surface, while those in the southern portion have only the crests of the levees remaining above the surface due to subsidence and erosion. In the MRDP, the width of distributary natural levees is generally <1.6 km (1 mi), and levee thickness ranges from 1.5 to 7.6 m (from 5 to 25 ft).

In the MRDP, natural levee deposits are composed of clay, silt, and fine sand. These deposits are generally coarser grained near the channel and become finer grained farther away from the channel, grading toward uniform clay. Color varies from reddish brown or brown near the surface to various shades of gray with depth. Organic content is generally low and is in the form of small roots and disseminated wood fragments. Frequently associated with natural levee deposits are small calcareous (containing $CaCO_3$) nodules, formed as a result of ground water percolating through permeable soils. Natural levee soils are well drained, have relatively low water contents, and generally have a medium to very stiff consistency.

P

point bar A point bar is a landform composed of a series of ridges and swales that commonly dominates the landscape of an alluvial valley formed by an actively meandering river. Rivers migrate laterally to attain a dynamic equilibrium relationship between the various flow conditions, type and amount of sediment load, bed and bank materials, and the channel slope. Channel migration occurs as the outside bank or “cut bank” is eroded, and a lateral sandbar is deposited along the inside bank. As migration progresses, the inside of the meander becomes a series of ridges (relict lateral bars) and swales (resulting troughs between the ridges). Collectively, the series of ridges and swales comprises the point bar landform. Point bar deposits are as thick as the total depth of the channel that formed them and fine upward texturally from the maximum size of the bed load material (fine gravel and coarse sand) through sand, silt, and clay (at the top of the deposit). The sand in the base of the point bar is deposited through lateral accretion (channel migration), and the finer silt and clay deposits overlying the coarse base are the product of vertical (overbank) accretion during floods. Point bar deposits are located along the Mississippi River, along former Mississippi River courses, and along the major distributaries in the study area.

S

swamp In the MRDP, swamps generally are poorly drained areas that generally border natural levee ridges and receives freshwater and sediment from overflow during seasonal flooding. Fine-grained sediments settle out of suspension and are deposited in these inland swamps during flooding, forming the thick clay sequences that are characteristic of the deposits.

Inland swamps are concentrated in the northern and central portions of the deltaic plain, along the Mississippi River and near the largest abandoned distributaries. Further south, saltwater intrusion and lower surface elevation due to subsidence has destroyed most swamps. Where intact, the swamp surface is from about 0.3 to 0.9 m (from 1 to 3 ft) higher than the surrounding marsh. The general elevation of the most seaward swamps approximate that of the marsh.

Swamps are identified on aerial photographs by a change in color tone, reflecting an elevation change from well-drained to poorly drained areas and the corresponding change in vegetation types. In the subsurface, the occurrence of medium consistency, massive clays containing some wood and pyritized roots permits the identification of inland swamp deposits. Swamp deposits generally consist of organic clay with less than 30 percent organic mater. However, peat and layers of decayed wood are not uncommon. Organic-matter content is a reflection of the proximity of the stream that supplied the clays during overbank flow. Organic-matter content can be expected to increase with distance from the stream.

Taxodium distichum (bald cypress or swamp cypress) is the dominant swamp vegetation type.

Other Terms Used in this Report

carbon sink In general terms, a carbon sink is any reservoir that receives and stores more carbon than it transfers to another reservoir; there is a net gain in the amount of stored carbon.

carbon source In general terms, a carbon source is any reservoir that loses or transfers more carbon to another reservoir than it receives or stores; there is a net loss in the amount of stored carbon.

hyperthermic soil temperature class Soils that have a difference of 5°C or more between mean summer (June, July, and August in the northern hemisphere) temperature and mean winter (December, January, and February in the northern hemisphere) temperature, and a mean annual soil temperature that is ≥22°C (U.S. Department of Agriculture, Natural Resources Conservation Service, 2005; *http://soils.usda.gov/technical/handbook/contents/part618p4.html*).

Mississippi River deltaic plain (MRDP) For the purposes of this study, the MRDP is considered to be the 10,000–14,000 km^2 (3,861–5,405 mi^2) coastal section of the emergent upper surface of the Mississippi River delta (U.S. Geological Survey, 2004; Saucier, 1994a, b; Coleman, 1988). The MRDP has an intricate network of distributary channels and natural levees that radiate outward from the main channel of the Mississippi River near Baton Rouge. Natural environments of the MRDP include levees, distributary channels, backswamps, swamps, and marshes. As defined the MRDP includes about one-third of the coastal wetlands of Louisiana.

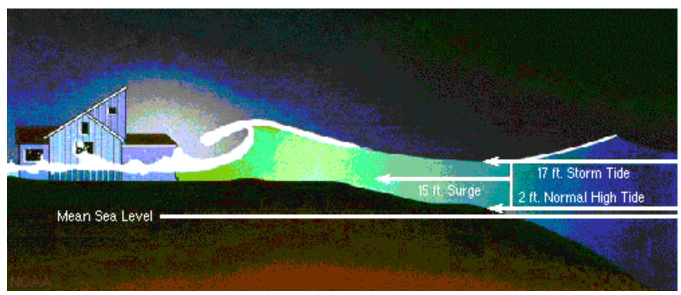
Pleistocene deposits Pleistocene deposits in southeastern Louisiana consist of sand, silt, and clay deposited during the Pleistocene period. Where exposed, they are highly weathered and reworked often making it difficult to determine their environment of deposition. Pleistocene deposits generally are fluvial or deltaic in origin. They are generally stiff, oxidized, have low water content and high compressive strength.

productivity In general terms, the productivity of an ecosystem is defined and measured as the change in live plant material during an annual cycle.

relative standard deviation The standard deviation of a sample divided by the mean for the sample set and multiplied by 100 (rsd = 100* [sample standard deviation/sample set mean]).

storm surge According to the National Oceanic and Atmospheric Administration, the definition and graphic of a storm surge is as follows:

> ...the water that is pushed toward the shore by the force of the winds swirling around the storm. This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the mean water level 15 feet or more ... wind waves can superimpose on the storm tide ... can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides....



Accessed November 16, 2005, at *http://www.nhc.noaa.gov/HAW2/english/storm_surge.shtml*

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