



Surficial Sediment Character of the Louisiana Offshore Continental Shelf Region: a GIS Compilation

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Introduction

Setting

The Louisiana coastal zone, comprising the Mississippi River delta plain stretching nearly 400 km from Sabine Pass at the Texas border east to the Chandeleur Islands at the Mississippi border, represents one of North America's most important coastal ecosystems in terms of natural resources, human infrastructure, and cultural heritage. At the same time, this region has the highest rates of coastal erosion and wetland loss in the Nation due to a complex combination of natural processes and anthropogenic actions over the past century. Comparison of historical maps dating back to 1855 and recent aerial photography show the Louisiana coast undergoing net erosion at highly variable rates. Rates have increased significantly during the past several decades. Earlier published statewide average shoreline erosion rates were >6 m/yr; rates have increased recently to >10 m/yr. The increase is attributable to collective action of storms, rapid subsidence, and pervasive man-made alterations of the rivers and the coast. In response to the dramatic landloss, regional-scale restoration plans are being developed by a partnership of federal and state agencies for the delta plain that have the objectives of maintaining the barrier islands, reducing wetland loss, and enhancing the natural sediment delivery processes.

There is growing awareness that the sustainability of coastal Louisiana's natural resources and human infrastructure depends on the successful restoration of natural geologic processes. Critical to the long term success of restoration is scientific understanding of the geologic history and processes of the coastal zone region, including interactions between the rivers, wetlands, coast, and inner shelf.

A variety of geophysical studies and mapping of Late Quaternary sedimentary framework and coastal processes by U.S. Geological Survey and other scientists during the past 50 years document that the Louisiana delta plain is the product of a complex history of cyclic delta switching by the Mississippi River and its distributaries over the past ~10,000 years that resulted in laterally overlapping deltaic depocenters. The interactions among riverine, coastal, and inner shelf processes have been superimposed on the Holocene transgression resulting in distinctive landforms and sedimentary sequences.

Four Holocene shelf-phase delta complexes have been identified using seismic reflection data and vibrocores. Each delta complex is bounded by transgressive surfaces. Following each cycle of deposition and abandonment, the delta lobes undergo regional subsidence and marine reworking that forms transgressive coastal systems and barrier islands. Ultimately, the distal end of each of the abandoned delta lobes is marked by submerged marine sand bodies representing drowned barriers. These sand bodies (e.g. Ship Shoal, Outer Shoal, Trinity Shoal, Tiger Shoal, St.

Bernard Shoal) offer the largest volumes and highest quality sand for beach nourishment and shoreline and wetlands restoration.

These four large sand shoals on inner continental shelf, representing the reworked remnants of former prograded deltaic headlands that existed on the continental shelf at lower sea level, were generated in the retreat path of the Mississippi River delta plain during the Holocene transgression. Penland and others (1989) have shown these sand bodies represent former shoreline positions associated with lower still stands in sea level. Short periods of rapid relative sea-level rise led to the transgressive submergence of the shorelines which today can be recognized at the -10 m to -20 m isobaths on the Louisiana continental shelf. Trinity Shoal and Ship Shoal represent the -10 m middle-to-late Holocene shoreline trend, whereas Outer Shoal and the St. Bernard Shoals define the -20 m early Holocene shoreline trend (Penland and others, 1989). Collectively, these sand shoals constitute a large volume of high quality sandy sediment potentially suitable for barrier island nourishment and coastal restoration.

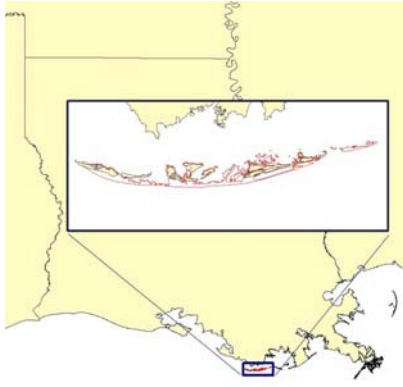
The USGS has actively supported coastal and wetlands geologic research for the past two decades in partnership with universities (e.g., Louisiana State University, University of New Orleans), state agencies (e.g. Louisiana Geological Survey, Louisiana Department of Natural Resources), and private organizations (Williams and others, 1992a,b; Williams and Cichon, 1993; List and others, 1994). These studies have focused on regional-scale mapping of coastal and wetland change and developing a better understanding of the processes that cause coastal erosion and wetlands loss, particularly the rapid deterioration of Louisiana's barrier islands, estuaries, and wetlands environments. With a better understanding of these processes, the ability to model and predict erosion and wetlands loss will improve. More accurate predictions will, in turn, allow for proper management of coastal resources. Improved predictions will also allow for better assessments of the utility of different restoration alternatives.

Note: Much of the preceding descriptive material is from the recent publication, "Mississippi River Delta Plain, Louisiana Coast and Inner Shelf: Holocene Geologic Framework and Processes". Please refer to that report for more information about the delta plain geologic history and processes and a complete listing of references, many of which are included in the references section of this report.

Citation: Williams, S.J., Kulp, M., Penland, S., Kindinger, J.L., and Flocks, J.G., (in press), Mississippi River Delta Plain, Louisiana Coast and Inner Shelf: Holocene Geologic Framework and Processes, chapter in Gulf of Mexico, its origins, water, biota, and human impacts (C. Holmes and W. Tunnell, eds.), Texas A&M Press Books.

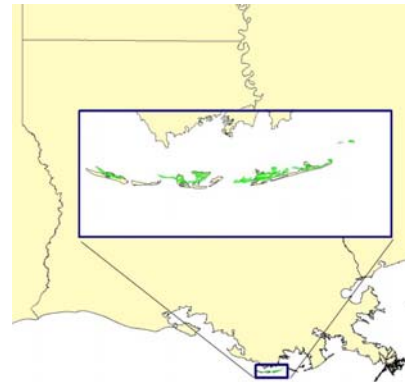
The shoreline change maps of the Isles Derniers below are examples from U.S. Geological Survey Digital Data Series 79 (Williams and others, 2003), Coastal Erosion and Wetland Change in Louisiana: Selected USGS Products, depict historic shoreline change of the Louisiana coast and are provided as additional information demonstrating how the delta plain has undergone dramatic change due to a complex combination of natural and man-made processes.

Shoreline for Isles Dernieres Barrier Island Arc, 1887 (republished from Williams and others, 2003; U.S. Geological Survey Digital Data Series 79)



1887

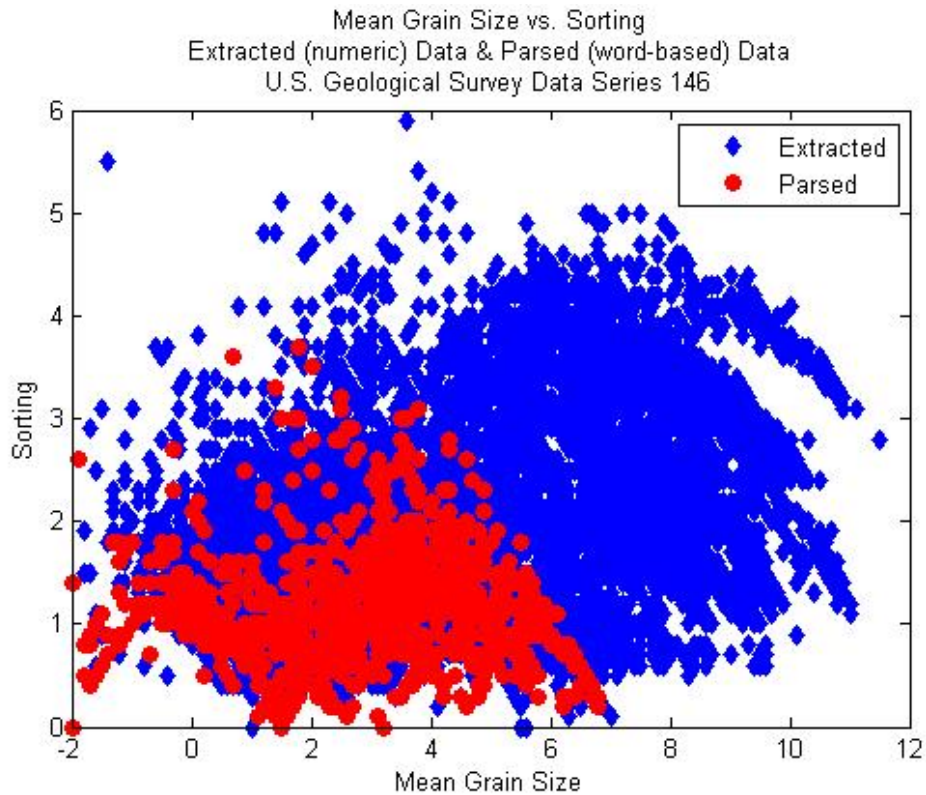
Shoreline for Isles Dernieres Barrier Island Arc, 1996 (republished from Williams and others, 2003; U.S. Geological Survey Digital Data Series 79)



1996

Data at a Glance

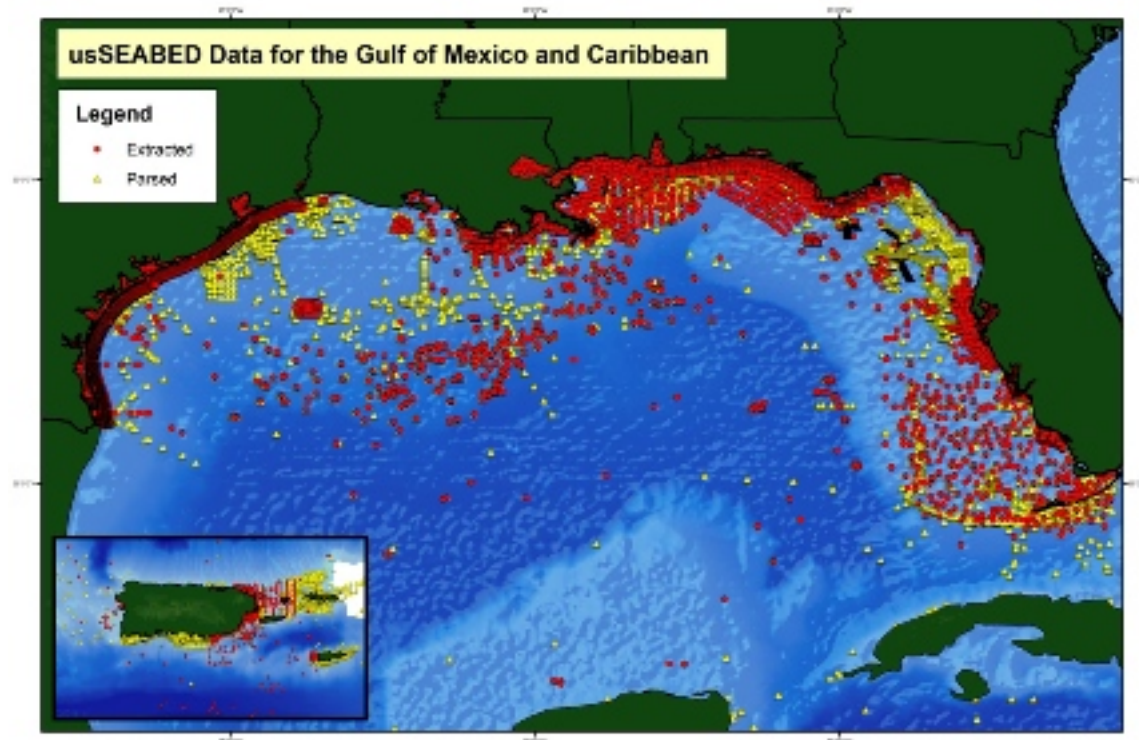
Scatter diagram of superimposed plots of mean sediment grain size (x-axis) vs. sorting (y-axis) for the Extracted data (in blue) and the Parsed data (in red) along the Louisiana coastal margin from USGS Data Series 146.



usSEABED Overview

Publications in the usSEABED data release series, represent the combined efforts of the USGS and several other government agencies and universities to provide a unified resource for accessing and preserving records of sea floor geologic information and sediment texture data.

This publication illustrates the uses of the usSEABED database for GIS applications, while offering additional insight into the resources and data available from the USGS and its collaborative institutions.



Sediment data points along the Gulf coast of the United States (Buczowski and others, 2006).

This report focuses on the Louisiana delta plain offshore region, an area that has been intensely studied by the USGS for many years. The goal of these studies has been to better understand the geologic history and processes of the coastal and wetland landscape features as well as offshore components of the delta plain.

The objectives of the Marine Aggregate Resources and Processes project are to produce a series of new geologic maps and reports of the sea floor that will provide scientific insights into the character and geologic development of U.S. continental margins and to use these maps and information to assess the potential availability of offshore sand and gravel resources. The mapping and aggregate resource assessments are being conducted on a national scale using the usSEABED data base as described in Williams and others (2003b). Potential uses for these data include: (1) defining the geological variability of the sea floor, in relation to benthic habitat diversity; (2) improving our understanding of the processes that control the distribution and transport of bottom sediments and benthic habitats; (3) locating aggregate resources for beach nourishment and industrial applications; and (4) providing a detailed geospatial framework for future marine science research, monitoring, and management activities. The initial assessments are in progress for the New York Bight and Louisiana offshore areas.

This report is based on data contained in U.S. Geological Survey Data Series 146 (Buczowski and others, 2006) and shows examples of GIS products that are possible using usSEABED. All data are intended to be GIS-ready; that is the data should not require any additional cleanup, formatting, or renaming of fields in order to use the data in a Geographic Information System. This project employs the Environmental Systems Research Institute's (ESRI) ArcView™ software. Many of these maps were made as part of the ongoing USGS study to assess marine aggregate resources offshore Louisiana, but these maps can serve many other purposes. The marine science community, educators, students and others are encouraged to use these data to generate GIS products for their own purposes.

Applications of usSEABED Data

The usSEABED data set has many potential uses. Illustrated here are three applications of how the data may be used. Further examples of maps that may be made with the data included on this CD-ROM may be found in the Browse Maps section of this publication.

Since the passing of the Sustainable Fisheries Act of 1996, Regional Fishery Management councils around the U.S. have been describing and identifying essential fish habitat (EFH) in their respective regions to more effectively manage the Nation's fisheries. Congress defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."

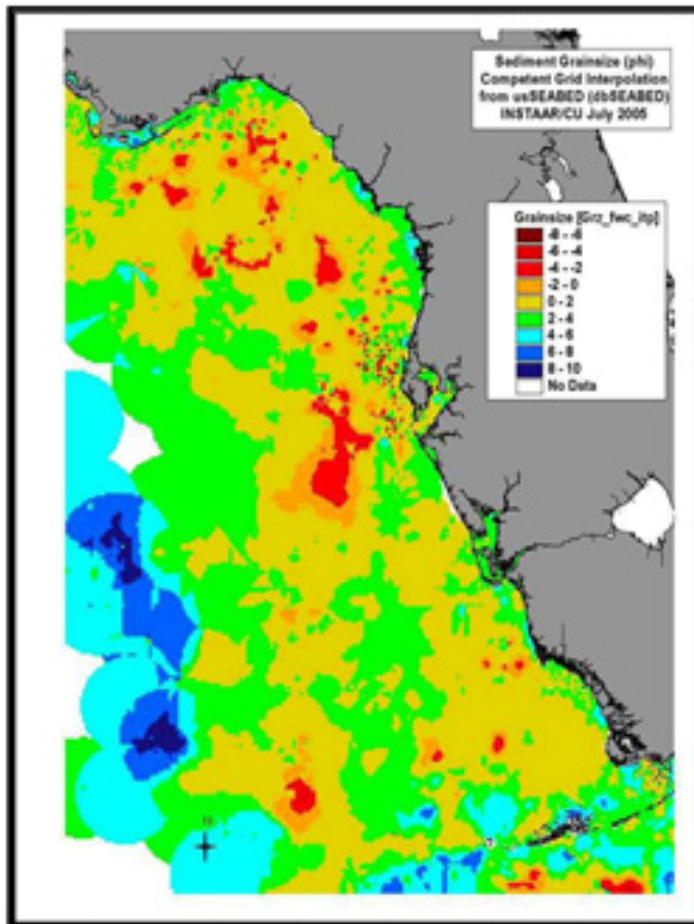
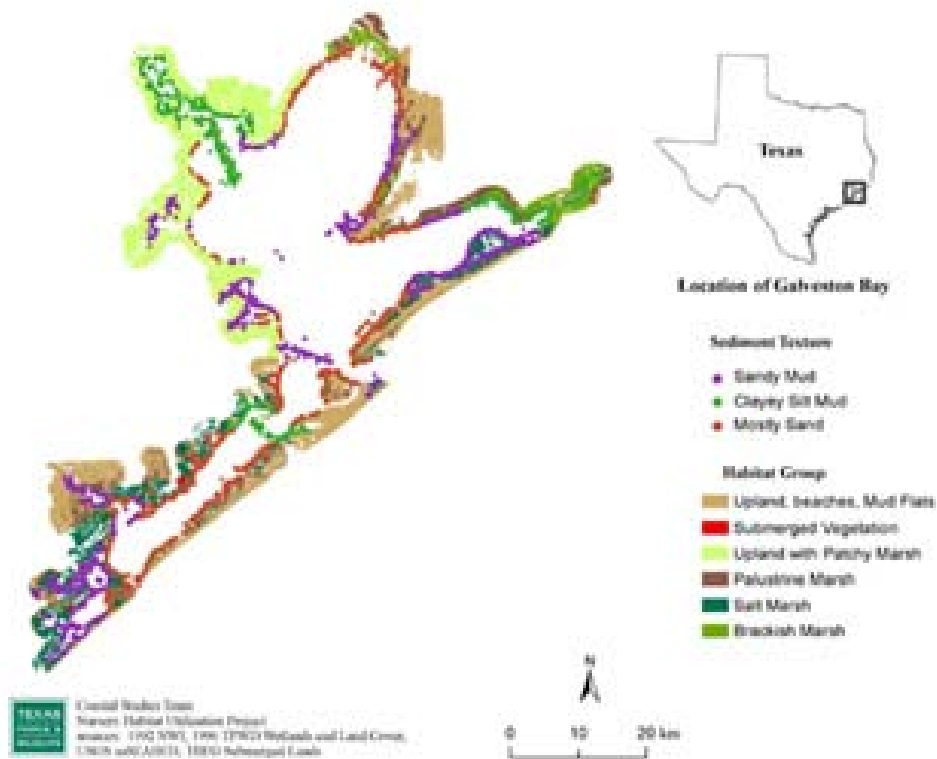


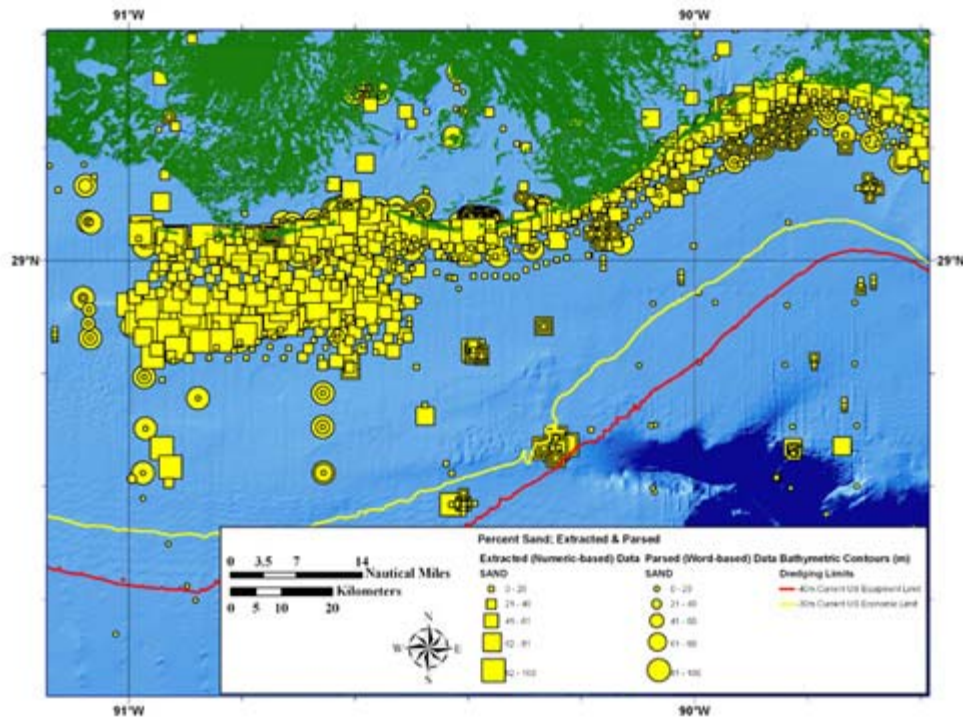
Figure 21b. Map produced depicting the range of mean grain sizes (phi values) based on analyses by INSTAAR.

43

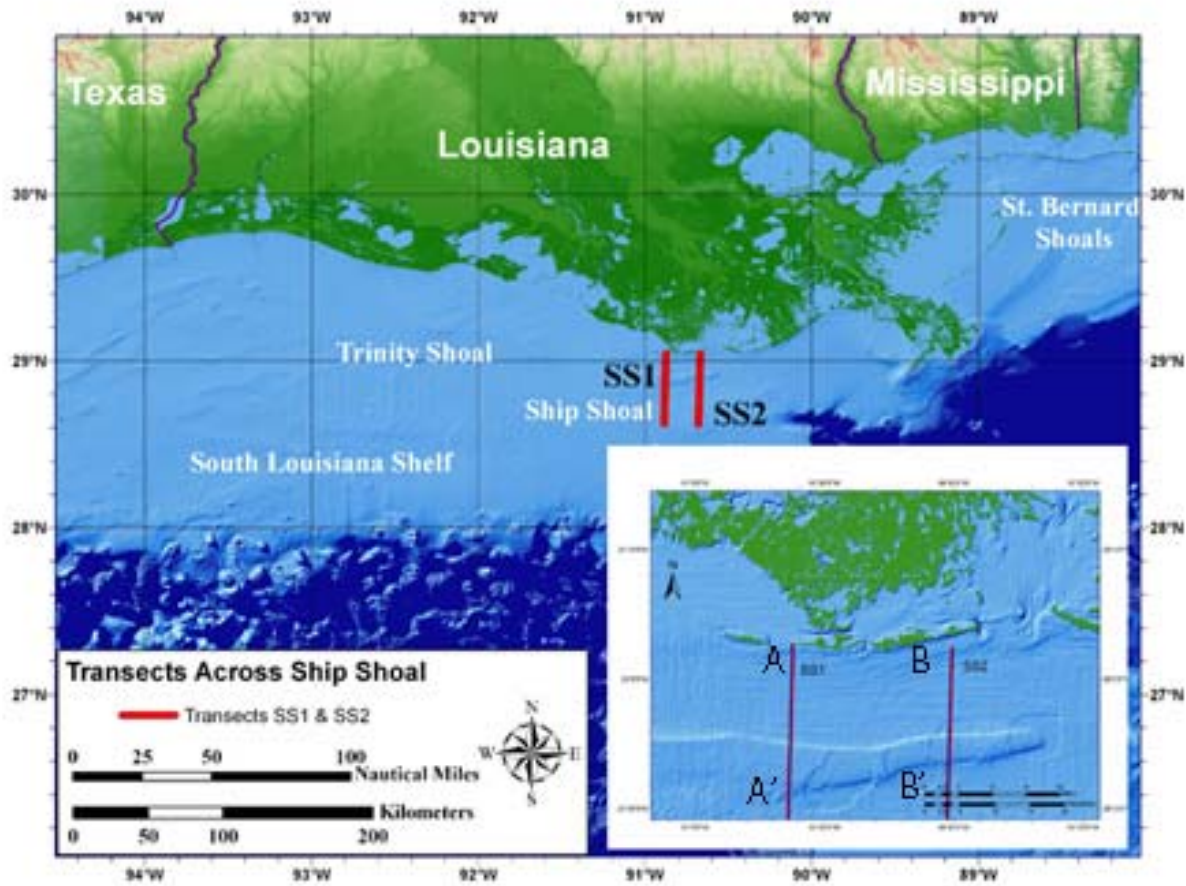
Fish Habitat Mapping -The Florida Fish and Wildlife Conservation Commission in collaboration with other groups modeled and mapped water-column and benthic habitat data in relation to catch and effort data associated with the pink shrimp fishery on the West Florida Shelf (WFS). Some of the water-column habitat data included bottom temperature, bottom current speed and current direction. Sediment distribution maps produced using usSEABED data were produced by INSTAAR of the University of Colorado at Boulder. Suitability functions created from the fishery data were used to predict catch rates (CPUEs) in relation to depth, aspect, bottom type, bottom temperature, bottom current speed, current direction, and VMS zones. Habitat suitability models (HSM) linked to geographic information systems (GIS) were used to predict spatial distributions and abundances of pink shrimp monthly from March 2004 to June 2005. This multi-institution project is intended to foster new relationships between public institutions and private business, and can benefit both the fishing industry and fisheries management (Rubec and others, 2005).



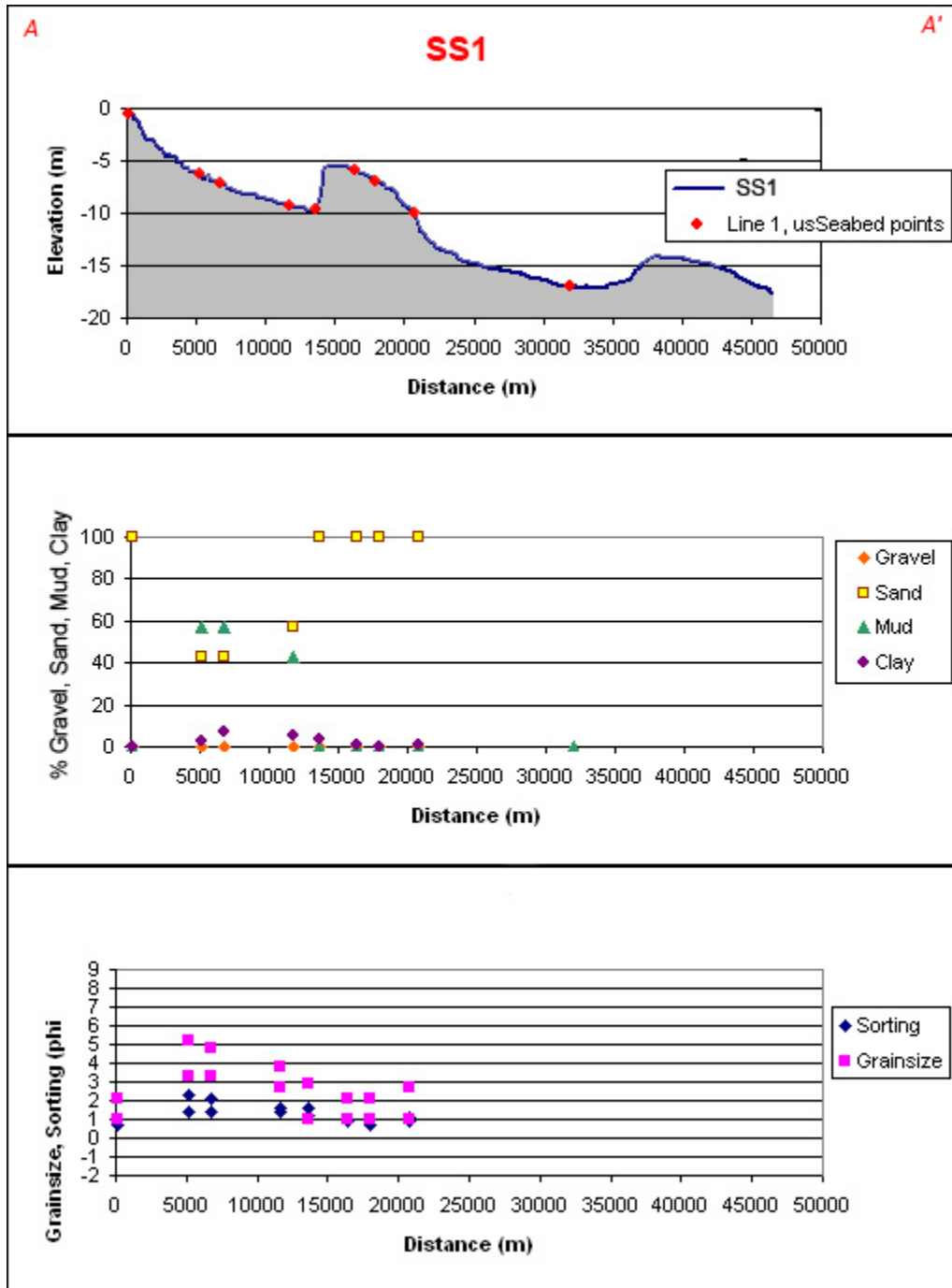
The Texas Parks and Wildlife Department, funded in part by a US Fish and Wildlife Service Wildlife Grant, is conducting a spatial and temporal evaluation of fish and shellfish nursery habitat in two Texas bay systems: Galveston and San Antonio. The Department’s Coastal Fisheries Division, Coastal Studies Team is using usSEABED sediment information from USGS DS-146, in part to characterize shoreline bottom texture (sand, silt, mud, clay, or a mixture), which aids in differentiating back-bay habitats.

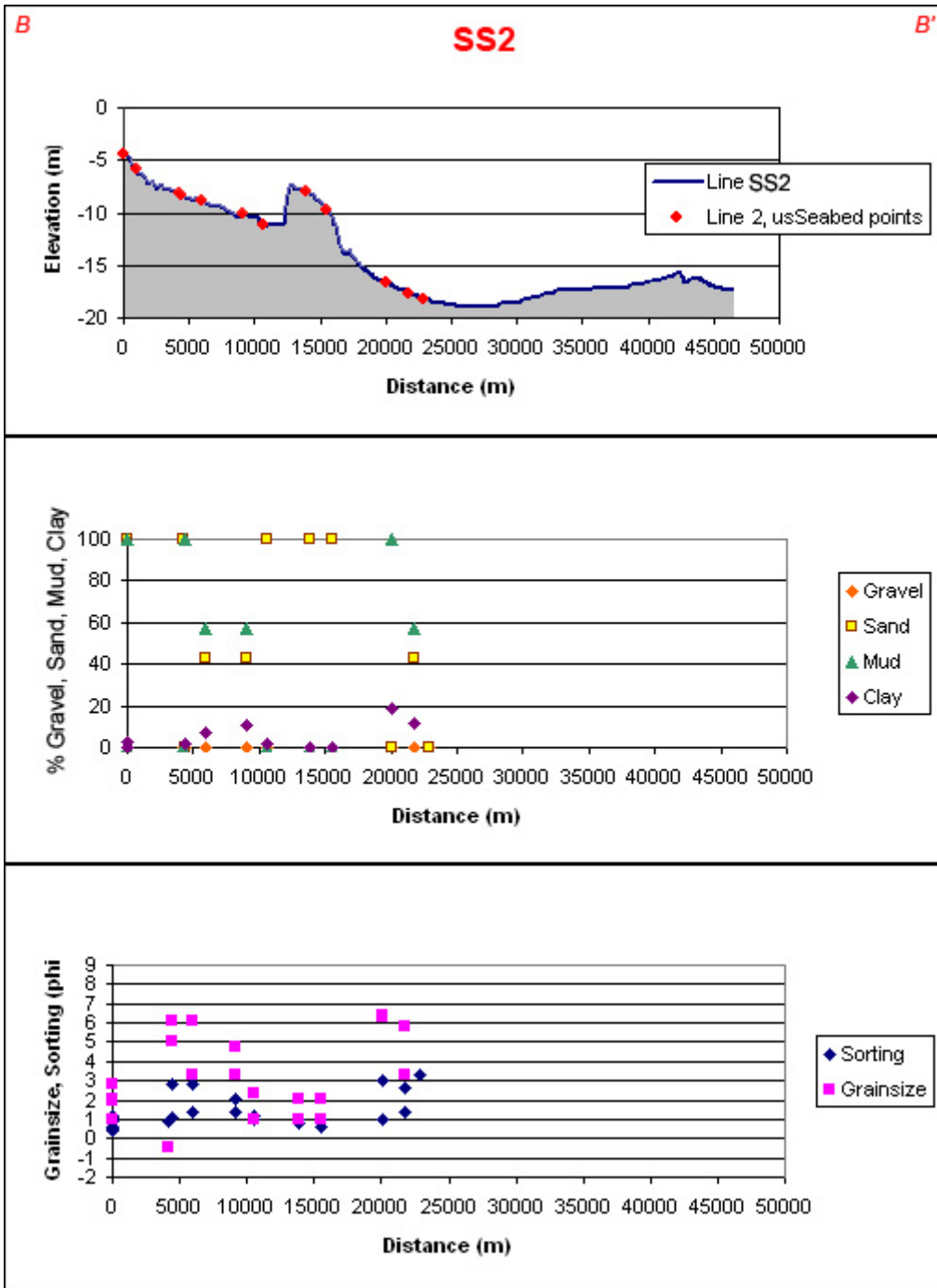


Sand and Gravel Resources for Beach Nourishment - Beach nourishment, a method of dredging sand from offshore areas and pumping it ashore to widen and elevate beaches and dunes is often viewed as a cost-effective and environmentally acceptable method for use on developed coasts to mitigate erosion, reduce storm and flooding risk, enhance recreation, and restore degraded ecosystems. For beach nourishment to be viable, however, large volumes of high quality sand are necessary and the sand deposits must be located reasonably close to the beaches being nourished. Also, the sand deposits ideally should be in water depths ranging from approximately -10 m, an approximate “close-out depth” for nearshore sediment transport, to -40 m, an approximate current limit of U.S. commercial dredging. The map above shows the percent sand composition of usSEABED data points on the Louisiana inner shelf in relation to the current water depth dredge limits. For beach nourishment, >90 % sand is optimal for best performance .



Planning Sea-Floor Routes and Utilities Placement - The Louisiana shelf is the product of a complex geologic history and dynamic oceanographic processes, dominated by the Holocene marine transgression during the past 20,000 years and cyclic shifts of the Mississippi River over the past 7,000 years. Engineering activities (i.e., oil and gas production, LNG facilities, pipeline and cable routes, potential wind-energy-generation sites) are increasing within these regions as infrastructure and resource planning tries to keep pace with growing demands. The shore-normal profiles SS1 and SS2 depict the seafloor morphology from the shoreface to 50 km seaward of Ship Shoal. Plots of sediment character below the profiles show the shoreface is predominantly muddy sand and Ship Shoal is nearly 100 percent sand.





Nomenclature

Nomenclature describing sediment texture distributions is important to geologists and sedimentologists because grain size is the most basic attribute of sediments. Traditionally, geologists have divided sediments into four size fractions that include gravel, sand, silt, and clay, and classified these sediments based on ratios of the various proportions of the fractions. Definitions of the fractions have long been standardized to the grade scale described by Wentworth (1922), and the size data compiled in this report conform to these definitions. Specifically, according to the Wentworth grade scale (PDF version) gravel-sized particles have a nominal diameter of 2 mm; sand-sized particles have nominal diameters from <2 mm to >62.5 μm ; silt-sized particles have nominal diameters from <62.5 μm to >4 μm ; and clay is < 4 μm .

Although several classification schemes have been adopted to describe the approximate relationship between the size fractions, most sedimentologists use one of the systems described either by Shepard (1954) or Folk (1954, 1974). The original scheme devised by Shepard (1954) utilized a single ternary diagram with sand, silt, and clay in the corners to graphically show the relative proportions among these three grades within a sample. This scheme, however, does not allow for sediments with significant amounts of gravel. Therefore, Shepard's classification scheme was subsequently modified by the addition of a second ternary diagram to account for the gravel fraction (Schlee, 1973). The system devised by Folk (1954, 1974) is also based on two triangular diagrams, but it has 21 major categories, and uses the term mud (defined as silt plus clay). The patterns within the triangles of both systems differ, as does the emphasis placed on gravel. For example, in the system described by Shepard, gravelly sediments have more than 10 percent gravel; in Folk's system, slightly gravelly sediments have as little as 0.01 percent gravel. Folk's classification scheme stresses gravel because its concentration is a function of the highest current velocity at the time of deposition, together with the maximum grain size of the detritus that is available; Shepard's classification scheme emphasizes the ratios of sand, silt, and clay because they reflect sorting and reworking (Poppe and others, 2005).

Although most source data sets in this compilation (see the Data Catalog) contain raw grain size data, several provide only verbal descriptions of the sea-floor character. Some of these verbal descriptions are somewhat detailed, such as in the lithologic descriptions file from the USGS Continental Margin Program; others are quite abbreviated, as in the one-word descriptors supplied with the NOAA Hydrographic Database. Furthermore, most source data sets contain sediment classifications that were assigned by scientists as part of the original study. These word-based data sets have been related to numeric values for inclusion in the usSEABED data sets. Users are encouraged to review the Data Dictionary section and the usSEABED website for a thorough explanation.

Most of the samples compiled in this report were collected using some type of grab sampler, but some were obtained by coring or with dredges. When core samples are included, or when changes in the sediment type with depth are present in a grab sample, only the analysis from the uppermost sediment type was used when mapping surficial sediment distributions. Similarly, samples collected with chain dredges are probably texturally biased and care must be taken with the use of this data.

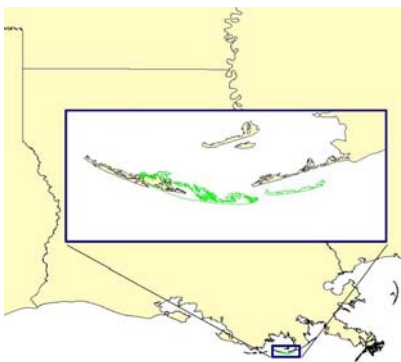
The USGS has traditionally defined surficial samples as those sediments collected from the interval 0-2 cm below the sediment/water interface. Although many of the samples in this compilation conform to this standard, some of the studies did not define this interval or reported intervals with slightly greater bottom depths (e.g. 0-5 cm). Concerned users should consult the original source references or the metadata files provided in this report.

Plotting routines (Matlab based) for the Shepard and Schlee classifications mentioned above, are available in the For Educators section of this publication. These routines allow users to plot their own ternary diagrams.

Coastal Change in Louisiana

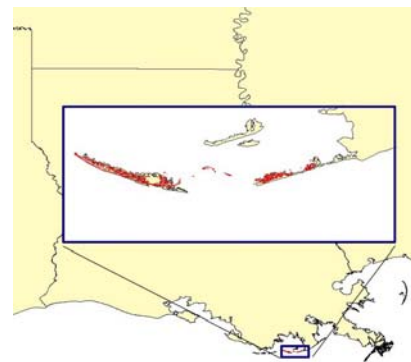
These maps depicting historic shoreline change of the Louisiana coast, from U.S. Geological Survey Digital Data Series DDS-79 (Williams and others, 2003), Coastal Erosion and Wetland Change in Louisiana: Selected USGS Products ONLINE, are provided as additional information.

The USGS, as the Nation's primary science organization, has conducted research, mapping studies and monitoring in Louisiana for many years. Three of the major studies undertaken were the Louisiana Barrier Island Erosion Study, a cooperative effort with the Louisiana Geological Survey that spanned 1986 to 1990. A second study, the Louisiana Wetland Loss Study, was done cooperatively with the USGS National Wetlands Research Center Lafayette and scientists at Louisiana State University. The third and most recent study involved University of New Orleans scientists and was focused on the geologic framework and processes of the Lake Pontchartrain basin. Additional studies by the USGS and partners are continuing to map shoreline and wetland change, investigate subsidence processes responsible for the high rates of relative sea-level rise across the south Louisiana region, and assess offshore sand resources.



1887

Shoreline for Timbalier
Barrier Island Arc,
1887 and 1996



1996

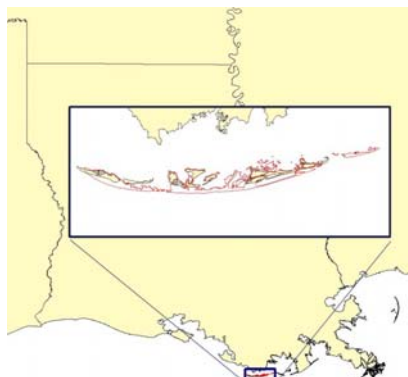


1884

Shoreline for Plaquemines
Barrier Island System, 1884 and
1996



1996

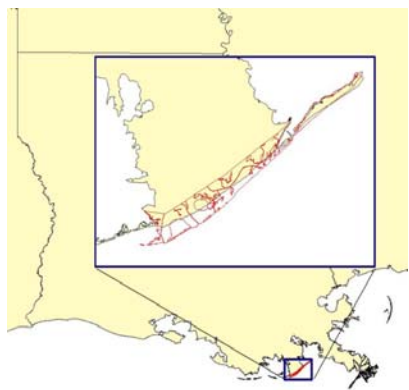


1887

Shoreline for Isles Dernieres
Barrier Island Arc, 1887 and 1996



1996

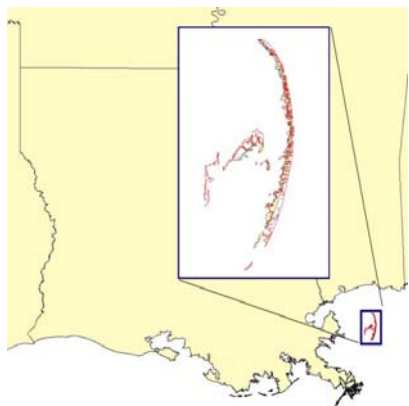


1887

Shoreline for Caminada-Moreau Headland, 1887 and 1996

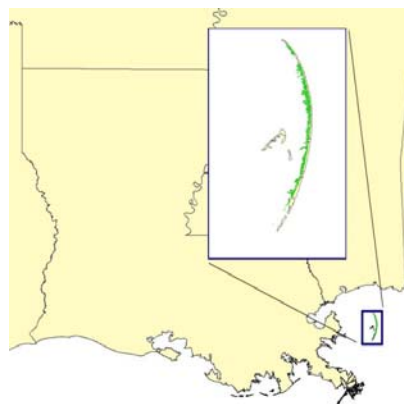


1996

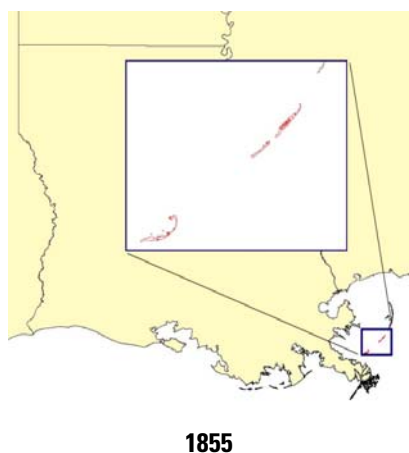


1855

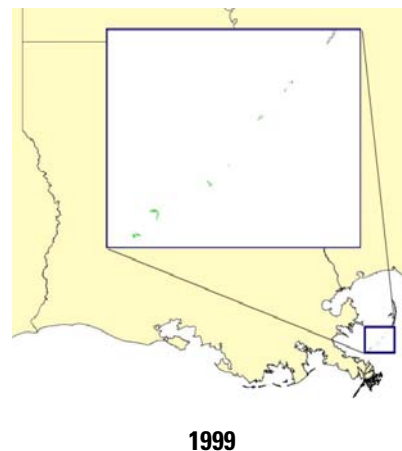
Shoreline for North Chandeleur Barrier Island Arc, 1855 and 1999



1999



Shoreline for South Chandeleur
Barrier Island Arc, 1855 and 1999



Data Dictionary

Geologic sedimentary-character data included within this Open-File Report were previously released as part of the USGS Data Series-146, usSEABED: Gulf of Mexico Surficial Sediment Data Release (Buczowski and others, 2006). That publication was the first release of the Gulf of Mexico coast data from the usSEABED database. That database contains data and information that forms the scientific foundation for the sediment characterization found within that publication. Below you will find a description of the categories, themes and units held within the dataset.

usSEABED information is categorized into 12 data themes. A list of data themes is given in *Table A*. The thematic basis of the values found in the outputs can be found in field 11 ("DataType")(*Table B*) of the extracted (_EXT), parsed (_PRS), and calculated (_CLC) output files. Information on contribution of each source report is in the accompanying metadata files.

Table A. **Key to data themes in usSEABED output files**

Acronym	Meaning
ACU	Acoustic properties
BIO	Biota
CMP	Sediment composition analyses
COL	Color
GRZ	Grain size analysis results
GTC	Geotechnic properties
LTH	Lithology
MSL	Multisensor core logger

PET	Grain petrology
SFT	Seafloor type descriptions
TXG	Graphical texture statistics
TXR	Texture statistics

Relational Keys

The usSEABED data file types are linked relationally by the foreign keys: DataSetKey (for individual data sets), SiteKey (for individual sites), and the SampleKey (for individual analyses). The DataSetKey field gives the relationship of the data to the original source. The tables can be loaded into a relational database (RDB), relationships may be constructed, and the tables may be joined using the keys.

Source data(_SRC)

Information about the original data are in the source (*_SRC*) file, including links to metadata about the original data. Each of the output data files discussed below is linked to the *_SRC* file by the *DataSetKey* field.

Textural and other basic information (_EXT, _PRS, _CLC)

Textural, statistical, geochemical, geophysical, dominant component, and color information are held in three separate, but similar, data files, based on the type of data: *_EXT*, *_PRS*, *_CLC*. The three data file types have the same fields (*Table B*) and can be combined for more extensive coverage of the seafloor. It is important for users to understand the inherent limitations of each type of file in order to choose the best data file, or combination of data files appropriate for a particular use.

Extracted data (_EXT)

The data file with the *_EXT* tag is the extracted data: those data from strictly performed, lab-based, numeric analyses. Most data in this file are listed as reported by the source data report; only minor unit changes are performed or assumptions made about the thickness of the sediment analyzed based on the sampler type. Typical data themes include textural classes and statistics (TXR: gravel, sand, silt, clay, mud, and various statistics), phi grain-size classes (GRZ), chemical composition (CMP), acoustic measurements (ACU), color (COL), and geotechnical parameters (GTC). The *_EXT* file is based on rigorous lab-determined values and forms the most reliable data sets. Limitations, however, exist due to the uncertainty of the sample tested. For example, were the analyses performed on whole samples or only on the matrix, possibly with larger particles ignored?

Parsed data (_PRS)

Numeric data obtained from verbal logs from core descriptions, shipboard notes, and (or) photographic descriptions are held in the parsed data set (*_PRS*). The input data are maintained using the terms employed by the original researchers and are coded using phonetically sensible terms for easier processing by dbSEABED. Longer descriptions may have the data divided by

theme (*Table A*). The descriptions often include information on associated biota, sea floor features, and structure. Typical data themes for the parsed data set are lithologic descriptions (LTH), biology (BIO), color (COL), and (or) sea floor type (SFT, descriptions from photos or videos). The values in the parsed data file are calculated using the dbSEABED parser that assigns field values based on the form and content of a description. See the original *DS-146* publication (Buczowski and others, 2006) for additional information on the processing and fuzzy set theory.

The parsing process has been tested and calibrated by comparing the outputs against analytical results for the same samples. Due to the nature of visual descriptions by observers and the use of fuzzy set theory in the parser, the output data show the degree of representation in the sample, or percent abundance values. An assumption in the process is that the output degrees of representation reflect absolute abundances to some degree of accuracy. The calibrations provide information on that accuracy. Although at first sight the descriptive results in the parsed file may seem less accurate than measured values in the extracted file, they are frequently more representative of the sample and seabed as a whole, as they include description of objects such as shells, stones, algae, and other objects (*Table C*) that are a textural component of the seabed and which are often left out of laboratory analyses, particularly when a machine analysis is employed.

Calculated data (_CLC)

For the extracted and parsed data, some values are not reported by the original source, but can be calculated directly or estimated by standard derivative equations using assumptions about the conditions or variables. These values are reported in the calculated (_CLC) data files. Although the calculated (_CLC) data can be combined with the extracted and the parsed (*Table B*), they are the least reliable of the three data file types and should be used with caution.

Component/feature and facies data (_CMP, _FAC)

Two usSEABED data files contain information about the presence of certain sea floor features, compositional content, biota, and sediment structure. These use major synonyms defined by the thesaurus in the dbSEABED parsing software, which clusters comparable descriptive terms together (granite represents granite, aplite, granodiorite, pegmatite, while laminated represents laminated, laminations, or lamina). Individual components and features (terms like feldspar, phosphorite, bivalves, seagrass, and wood) are held in the _CMP data file (*Table D*). Appropriately combined components are held in the facies (_FAC) data files (*Table E*). As with the parsed data files, the values held within the _CMP and _FAC files are the results of filters based on fuzzy set membership to chosen sets, and represent a measure of truth about the attribute, not percentages or defined values. These files only indicate presence, not absence, of material; it is rare that a report might state, "no bivalves" or "no phosphorite."

The _CMP file contains information about compositional content (individual minerals, rocks), genesis (terrigenous, carbonate), and certain biota. These components are internally evaluated and the value for each attribute is based solely on the relationships of attributes within the original description. The flora and fauna included in the compositional components are those that may have an effect on textural determinations in the _PRS data file, such as halimeda, bivalves, or foraminifera (*Table C*). The values within these attribute fields range between 0 (no membership, probably due to no information), to 100 (complete membership, shell hash = 100 to the shell debris set).

The _CMP file also includes information on sea floor features such as bedforms, fissures, internal structure (bedding, bioturbation), and other flora and fauna. Unlike the compositional

content information, which is construed as an abundance within the sample, these attributes are an intensity of development or density of occurrence relative to scales of development or density of occurrence observed elsewhere. The flora and fauna included in the feature category are soft-bodied, for example, those that do not have an input on the textural determination within the `_PRS` data files, such as kelp, ophiuroids, or annelids. Values within the attribute fields range from 0 (no membership, possibly due to no information) up to 100% (maximum development). In contrast to the situation with component abundances, the sum of feature intensities in a sample is allowed to exceed 100%.

The 100 most common components in the U.S. EEZ are given in the `_CMP` file, and those attributes with "`_F`" denote features. *Table D* lists the components and gives basic forms of descriptive terms that may trigger membership for each. Included in this file are 27 components that are included in the facies (`_FAC`) file only.

The second file, the facies file (`_FAC`), is created from components only, similar to the `_CMP` file. This file configures multiple components into appropriate groups or facies, such as igneous, metamorphic, ooze, foraminifera, and others. The dbSEABED processing software is restricted to a maximum of six components per facies. *Table E* lists the facies type and the components that comprise each facies group.

Again, these files only indicate presence, not absence, of material; it is rare that a report might state, "no bivalves" or "no phosphorite". The values within this attribute field range between 0 (no membership, probably due to no information), to 100 (complete membership, for example, schist = 100 to the metamorphic set).

Relationship between the `_PRS` and `_CMP` outputs

The dbSEABED processing software recognizes that many skeletonized biota, such as halimeda, rhodoliths, shells (broken and unbroken), and others often comprise a sediment sample. Such biological terms are included in the parsing of the textural values. To see the selected biota with textural implications, see *Table C*. When using the parsed data, it may be important to cross-check with the component file using the relational foreign keys (SiteKey, SampleKey) to determine if biota are to be included in the textural outputs.

Within the `_PRS` file, the "seabed class" and "class membership" fields indicate the dominant compositional class and the fuzzy set membership of a sample to that class. Other components and mined information may also be listed for that sample in the `_CMP` file, linked by the relational keys.

Table B. Field parameters, format, units, range, meaning, and comments for `_EXT`, `_PRS`, `_CLC` data files

Field Name	Parameter	Data Format	Units, Range, Meaning	Comment
Latitude	Latitude	Decimal 00.00000	Decimal degrees, 90° to - 90° range	WGS 84 Spheroid.

Longitude	Longitude	Decimal 000.00000	Decimal degrees, -180° to 180° range	WGS 84 Spheroid.
WaterDepth	Water depth	Integer 00000	Meters	Not always corrected for tides.
SampleTop	Sample top	Decimal 000.00	Meters below seabed surface	Sample top as noted in source report.
SampleBase	Sample base	Decimal 000.00	Meters below seabed surface	Sample bottom as noted in source report.
SiteName	Site name	Character XXX: XXX	Survey or laboratory code for the sampling site	Not unique; site name as given in report; sometimes linked to cruise name or other information to decrease site name overlap.
DataSetKey	Dataset number key	Integer 000	For audit only	Relational key to _SRC file; _SRC file contains links to source metadata.
SiteKey	Site number key	Integer 0000000	For audit only	Relational key to other data files. Each site counted sequentially as total output; core data may have more than one sample per site.
SampleKey	Sample number key	Integer 0000000	For audit only	Relational key to other data files. Each site counted sequentially as total output; Multiple samples may be at each site (i.e., in core).
Sampler	Sampler type	Character Xxxxxxxx....	Type of sampling device	As given in source report; recovery (rcvy) or penetration ('pen') length appended if given in source report. For more complete information on sampler, see source metadata.
DataType	Data types	Character XXX: XXX	For audit principally	Source data types (Table A).
Gravel	Gravel	Integer 000	Gravel grain size fraction, %	Textural class.
Sand	Sand	Integer 000	Sand grain size fraction, %	Textural class.
Mud	Mud	Integer 000	Mud grain size fraction, %	Textural class.
Clay	Clay	Integer 000	Clay grain size fraction, %	Textural class; output for '_EXT' only, as clay value can be determined only by analysis.
grain size	grain size	Decimal 00.00	Phi characteristic grain size	Consensus of mean and median grain sizes.
Sorting	Sorting	Decimal 0.00	Phi grain size dispersion	Standard deviation, sorting only.
SeafloorClass	Seafloor class	Character Xxxxx...	That class (or ' <i>facies</i> ') with	Output for '_PRS' table only.

			the maximum fuzzy membership, if above 30%	
ClassMbrshp	Class membership	Decimal 000	Fuzzy membership (%) of the class (or 'facies'), noted above	Output for '_PRS' table only.
Folk classification; Shepard classification	Folk classification; Shepard classification	Character xx.XX...		
RockMbrshp	Rock index	Integer 000	Fuzzy membership (%)	Membership of sample to 'rock fuzzy set'; reported only in _PRS data.
WeedMbrshp	Weed index	Integer 000	Fuzzy membership (%)	Membership of sample to 'weed fuzzy set'; reported only in _PRS data.
Carbonate	Carbonate	Integer 000	%; may be Fuzzy membership (_PRS).	
MunsellCode	Munsell color code	Character XXXXX	Standard alphanumeric coding of color partitioned into Hue, Value, and Chroma	Ex: '5YR 6/4', See Rock-Color Chart (Geological Society of America, 1991).
OrganicCarbon	Organic carbon	Integer 000	%	Minimum value from descriptions (PRS tables) is 0.1%.
ShearStrength	Log shear strength	Decimal 00.0	kiloPascals, undrained, unconfined	From a variety of instrumentation.
Porosity	Porosity	Decimal 00.00	%	
P-waveVelocity	P-wave velocity	Decimal 00.0	m/sec	Usually not corrected for P/T effects.
Bottom roughness	Roughness	Decimal 0000.00	Coded to express the height and length of the bottom feature with greatest aspect ratio	In a coding that expresses the height and length of the bottom feature with greatest aspect ratio; a coded output representing the V:H of the roughness element with greatest aspect ratio, values expressed as (rounded) integer log2.
Critical shear stress	Log critical shear stress	Decimal 0000.00	Log10 of Tau in kPa,	Log 10 of Tau in kPa, being the shear stress required to initiate easily observable erosion and

				transport, whether by traction or suspension; taken from a compilation of published relationships ranging from large boulder to muds, through a range of grain shapes (eg. shell).
Sample phase	Where in sample the data are from	Character Xxxxx....	Where sample is from	Records whether the results are for the whole, bulk sediment, or just to some special part like: inside a nodule, burrow-infill, the sand fraction, porewater (chemistry), a layer in the core, a gradient observed in the core, badly preserved, a layer that is not properly located, or sample with questionable location; also may report a type of analysis or observation if that is special or potentially unrepresentative (for example, XRD, smear slide). Output is as a word-based description that may involve numerics. This field will need to be selected against when GIS mappings of the bulk sediment characters are being mapped. Only blank entries should be included in such a mapping.

Table C. Most frequently occurring biological components that may have textural implications (U.S. waters only)

barnacles	coralline algae	fish debris_F	pteropods	serpulids
bivalves	corals	forams	radiolaria	shells
brachiopods	crabs	halimeda	razor clams	sponges_F
bryozoa	crustaceans	molluscs	reefs	worm tubes_F
calcareous algae	diatoms	nannofossils	scaphopods	
clypeasts	echinoids			

Table D. Components (features*) processed within usSEABED

Only the descriptive terms found in source reports are defined in the dbSEABED thesaurus. Conversely, as usSEABED uses the same thesaurus as its sister data compilations (auSEABED, goSEABED), some terms listed below may not occur within U.S. waters. Only one of possible variations are listed below, for example, laminated (laminae, lamination); mollusc (mollusk,

mollusca), etc.	
Major synonym	Triggering words (word variations not included)
andest	andesite, augite andesite, benmoreite, trachyandesite
anmne_F	anemone, tube anemone, cerinth, cerianthid, coryanactid
annld_F	annelid, arenicola, beachworm, bloodworm, bristleworm, funnelworm, nereid worm, polychaete, polynoid
aren_frm	arenaceous foraminifera, agglutinated foramifera, ammobaculite, ammodiscus, textularid foraminifera
artif_F	artificial, soot, anchor, brass, cinder, coal, contaminated, lumber, obstruction, petroleum, oil-gas, rubber band, snag, tar, wood chip, wreck
asterd_F	asteroid, basket star, briseaster, sea star, starfish
barit	barite (-concretion -vein)
baslt	basalt, diorite, metabasalt, scoria, trap rock, trachybasalt
bioturb	bioturbation
bitumn	bitumin
biv	bivalve, arctica, astarte, cardium, chama, chione, chlmys, clam (-shell -flat material -hash -valves), cockle (-anadara -shell), donax, glycymeris, katalysia, lamellibranch, macoma, mercenaria, mulinia, mussel (-bed -bank -shell), mya, mytilus, nucula, pelecypod, quahog, rangia, seep mytilid, slipper shells, surf clam, tellina, tellinid, venerid, venus clams, vesicomysid, yoldia
bluschst	blue schist, crossite-albite schist, crossite-quartz schist, glaucophane, quartz crossite schist, quartz glaucophane schist
bnth_frm	benthic foraminifera, archaias, bolivina, bulimina, coralline forams, discorbis, eponides, homotrema, hyaline, lenticulina, loxostema, miliolid, nodosirid, nonien, notosirid, peneroplis, porcellanous, rotaiid, uvigerina
borng_F	boring, bioeroded
brach	brachiopod, lingula
brncl	barnacle
bryz	bryozoa, polyzoa
burw_F	burrow, chondrite, clam siphon, crab hole, lebensspurren, Thalassinoides
c_alg	calcareous algae, purple algae, red algae
calc_ooz	calcareous ooze, nannofossil -mud -ooze, pteropod -mud -ooze, foraminiferal -marl -ooze -mud, globigerina -mud -ooze
calerst	calcareous crust, tufa
calct	calcite (-cement -core -filling -veinlets)
carb	allogenic grain, authigenic carbonate, biogenic, calcareous, calcilutite, calcarenite,

	calcirudite, calcareous biogenic, carbonate, limey, marl, skeletal micrite
chrcoal_F	charcoal, fire debris
chrt	chert, flint, porcellanite
claymin	clay mineral, bentonite, chlorite, collophane, illite, kaolinite
clypeast	clypeasteriod, sand dollar
coal	coal, lignite, bituminous
coralgl	algal coral, coralgal
crab	crab, hermit crab, sand crab, spider crab, swimming crab
crinod_F	crinoid, basket star
crl	coral, Acropora palmata, brain coral, Dendrophyllia, Madrepore, Manicina, Porite, sea twig
crl_dbr	coral debris
crlrf	coral reef, coral heads, shingle bank, reefal shoal
crnalg	coralline algae, calcareous algae, lithothamnion
crustac	crustacea, decapods, lobster, shrimp shell
defrm_F	deformation, convolute, flame structure, flow structure, load -cast -structure, pull apart
diat	diatom, diatomite/diatomaceous
dolmt	dolomite, ankerite, molar magnesium carbonate
echnd	echinoid, heart urchin, keyhole urchin, sea urchin, spiny urchin
echndrm_F	echinoderm
fault_F	fault
fces	feces, coprolite
ferug	ferruginous, iron fragment, iron (-cement -streak -flake -stain), iron stone, laterite, limonite
flasr_bed_F	flaser bed
fld	feldspar, albite, andesine, anorthorite, K-feldspar, labradorite, orthoclase, plagioclase
frm	calcareous foramifera, foraminifera, globigerina bit, planktonic
gas	foamy, gas
gbbro	gabbro, diabase, diorite, dolerite, meta-dolerite, monzodiorite, monzonite, quartz diorite
glac1	glacial, diamicton, erratic, moraine, till
glauc	glauconite, greensand

gniss	gneiss, diorite gneiss, granite gneiss
gradd_F	coarsening upward, fining upward, increasing grain size, normally graded, reverse graded
granit	granite, aplite, granodiorite, pegmatite
grnschst	greenschist
gstrpd	gastropod, cerithium, conch, turitella, snail, nassarius, olivella, tenebrae, turitella
h2s	hydrogen sulfide, hydrogen sulfide -odor -smell, sulfur odor
halmda	halimeda, Peyssonnelia
holoth	holothurian, sea cucumber
hvy_min	heavy mineral, anatase, andalusite, apatite, black sand, brookite, cassiterite, clinozoisite, corundum, dumortierite, epidote, garnet, ilmenite, jadeite, kyanite, leucoxene, magnetite, monazite, ore mineral, piedmontite, rutile, sillimanite, sphene, spinel, staurolite, titanomagnetite, titanite, tourmaline, topaz, zircon, zoisite
hydrt	hydrate, gas hydrate
ign_rck	igneous rock, acidic rock, alkali basinite, augite plagioclase porphyry, augite porphyry, basic rock, dacite, felsite, olivine plagioclase clinopyroxene, olivine plagioclase phytic, plagioclase andesite porphyry, plagioclase augite porphyry, plagioclase porphyry, plutonic rock, porphyry, rhyolite, syenite, trachyte
klp_F	kelp, brown algae, ecklonia, M. vertebralis, red brown algae
lamintd_F	laminated
lenticlr_bed	lenticular bed, lenticular mass
limstn	limestone, beach rock, bioclastic -floatstone -grainstone -limestone -rudstone, boundstone, bryozoan -floatstone -grainstone -rudstone, calcareous -chip -rubble -rock, coral limestone, floatstone, grainstone, packstone, rudstone, wackestone
lmp_F	lump, aggregate, ball, cast, clump, compact clot, intraclast, pellet, pisolitic, peloid
lrg_frm	large foram, foraminiferal gravel, amphistegina, heterostegina, macro foraminifera, marginopora
maf	mafic, actinolite, aegirite, amphibole, augite, (brown- green- basaltic-) hornblende, bronzite, clinopyroxene, ferromagnesian, hypersthene, olivine, orthopyroxene, oxyhornblende, pyroxene, titanaugite, titaniferous, tremolite
met	metamorphic, calcsilicate, granitized, mylonite, porphyroblast, saussurite
methne	methane
metlif	metalliferous
mica	mica, biotite, chlorite, muscovite, sericite, talc
mlsc	mollusc
mn_crst	manganese crust, manganese iron oxide crust, manganese nodule, manganese pavement, manganese phosphate material

mn_nod	manganese nodule, iron manganese nodule, manganese concretion, micronodule
mnox	manganese oxide, iron-manganese (-coat -stain -veneer), iron-manganese oxide
motl_F	mottle, chickwire mottle
mudlmp_F	mud lump, armored mud ball, silty lump, clay (-aggregate -ball -chip -clast -gall -lump -mass -pod), mud (-aggregate -ball -chunk -clump -clot -clast -lump -pebble -pellet, claystone -chip -gall), sandstone fragment, soft pebble, shale (-fragment -concretion)
mudstn	mudstone, calcareous (-mudstone- siltstone), clay (-rock -shale -stone), marlstone, mud (-rock -stone), pelite, shale, siliceous shale, siltstone
nan	nannofossil coccolith, nannofossil (-coccolith -ooze), silicoflagellate
nod_F	nodule, concretion
odr	odor, anoxic, fetid, foul, fishy, organic, sewage, smell
oil	oil, oil glob, oil sheen
ool	oolite, sporbo
ooz	ooze
ophiurd_F	ophiuroid, brittle star, ophiomusium
orgcbrn	organic carbon, carbonaceous, organic (-streak -detritus -matter -mud -content -enriched -material -part -particle -rich -rimmed), sapropel
oyst	oyster, jingle shell
peat	peat, lignite
pelag	pelagic, hemipelagic, planktic, planktonic
phspht	phosphate, phosphorite
pit_F	pit, crater, feeding depression, hole, pockmark, mound, resting trace
planr_bed_F	planar bed
plnk_frm	planktonic foraminifera, globulina, globorotalid, planktic foraminifera
plnt_F	plant, mangrove, root, vegetation, weed, root
ptr	pteropod
pumc	pumice, ash
pyrt	pyrite, marcasite
qtz	quartz, arkosic sand, calcareous quartz sand, milky vein quartz, quartz (-content -fragment -grain -granule -groundmass -mass -rich -vein -veinlet -crystal), quartzose, quartzite (-cobble -gravel -pebble), sandstone (-chunk -fragment), silica
rad	radiolaria
ripl	ripple, bedform
rlct_F	relict

root_struct	root structure, root clast, root trace
rzt_clm	razor clam, ensis, pinna, pteria, pelecypod
schst	schist, -albite -chlorite -epidote, -albite -chlorite, -albite -mica, -albite -quartz -chlorite, -biotite -quartz, -chlorite -albite, -chlorite -quartz -albite, -chlorite, -phyllitic, -quartz -albite, -quartz -albite -chlorite, -quartz -biotite, -quartz -chlorite
scllp	scallop, astropecten, pecten, placopecten
scour	scour, crag and tail, erosional, lag deposit
scphpd	scaphopod, dentalium
seagr_F	seagrass, acetabularia, amphibolis, batophora, eel grass, grass, halophila, heterozostera, phyllospadix, posidonia, sargassum, strap grass, syringodium, manatee grass, thalassia, zostera
sft_alg_F	soft algae, algal (-scum -filament -mush -strand), Bossea, green algae, macrophytic, red algae
sftcr_F	soft coral, alcynacian, ascidian, coelenterate, gorgonian, hydrozoa
shl	shell, shell (-bed -bank -carpet -fraction -content -material), shellfish, valves
shl_dbr	shell debris, shell hash, coquina, shell (-bit -conglomerate -fragments -festoon -grit -lag -mash -material -piece -particle)
shrm_F	shrimp, amphipod, ampelisca, copepod, isopod, tanid
sidrt	siderite, siderite nodule
sil_ooz	siliceous ooze, siliceous mud
slte	slate, phyllite, quartzite, metamorphic rock
sndstn	sandstone, gritstone, graywacke, labile sandstone, sandstone reef, wacke
sol_crl	solitary coral, cup coral, disc coral, horn coral, lophelia coral
spng_F	sponge, calcareous sponge, glass sponge, hard sponge, hexactinellid sponge, porifera, Thalassodendron sponge
spoil_F	spoil, brick, coke, dumped sediment
srpul	serpulid, serpulid tube, serpulid worm tube
sulf	sulfide, chalcopyrite
trail_F	trail, trace (animal), track
trrg	terrigenous, lithic, inorganic
umafic	ultramafic, amphibolite, anorthosite, dunite, greenstone, harzburgite, lherzolite, norite, orthopyroxenite, peridotite, picrite, pyroxenite, serpentinite, troctolite, wehrlite
vol_rck	volcanic rock, volcanic (-cobble -pebble)
volgls	volcanic glass, obsidian, hyaloclastite, pyroclastic, quenched, vitric, subvitreous
volrck	volcanic rock, welded tuff

volsed	volcanic sediment, ash, tuff, lapilli
wood	wood, bark, twig
wrm_F	worm, chordate, echiurid, fan -flat (-glob -juicy -long -sand -tube worm), maldanid, pogonophora, priapulida, sliverfish, siphunculid, tunicate
wrm_tbe_F	worm tube, agglutinated worm tube, amphipod tube, annelid worm tube, arenicola, chitinous worm tube, diopatra worm tube, polychaete worm tube, pogonophoran tube worm, vestimentiform tube worm
wavy_bed_F	wavy bed

Table E. Facies and their component makeup

Facies values are determined by a combination of components and their mined values from word-based descriptions. Numeric textural, geochemical, and geophysical information held in _PRS data files. Values represent memberships to fuzzy sets, given as percents. A minimum of 30% component presence is required to trip a given facies, and a component may trip more than one facies. See _FAC files for actual data, and table C for component information. Facies notes presence only, not absence.

Field name	Parameter	Data format, units	Information/triggering components
Latitude*	Latitude	Decimal 00.00000	Decimal degrees, 90° to -90° range
Longitude*	Longitude	Decimal 000.00000	Decimal degrees, -180° to 180° range
WaterDepth*	Water depth	Integer 00000	Meters
SampleTop*	Sample top	Decimal 000.00	Meters below seabed surface
SampleBase*	Sample base	Decimal 000.00	Meters below seabed surface
SiteName*	Site name	Character XXX: XXX	Survey or laboratory code for the sampling site
DataSetKey*	Dataset number key	Integer 000	Relational key to _SRC file; _SRC file contains links to source metadata
SiteKey*	Site number key	Integer 0000000	Relational key to other data files. Each site counted sequentially as total output; core data may have more than one sample per site.
SampleKey*	Sample number key	Integer 0000000	Relational key to other data files. Each site counted sequentially as total output; Multiple samples may be at each site (i.e., in core).
Terrigenous	Terrigenous	(%)	Fld, hvy_min, maf, mica, qtz, trrg

Carbonate	Carbonate	(%)	Calcrst, calct, carb, dolmt, limstn, sidrt
Igneous	Igneous	(%)	Andest, baslt, gbbro, granit, ign_rck, umafic
Volcanic	Volcanic	(%)	Baslt, pumc, vol_rck, volgls, volrck, volsed
Metamorphic	Metamorphic	(%)	Bluschst, gniss, grnschst, met, schst, slte
Mineralized	Mineralized	(%)	Barit, metlif, phspht, pyrt, sulf
AuthFeMn	Authigenic Fe Mn	(%)	Mn_crust, mn_nod, mnoxid, ferug
Ooze	Ooze	(%)	Ooz, calc_ooz, sil_ooz
Carbon	Carbon	(%)	Coal, bitumn, orgcbn, peat
GeochemSignal	Geochemical signal	(%)	Gas, h2s, hydrt, methne, odr, oil
Forams	Forams	(%)	Aren_frm, bnth_frm, frm, lrg_frm, plnk_frm
OtherCalcPelag	Other calcareous pelagics	(%)	Nan, ptr, calc_ooz
SilcPelag	Siliceous pelagics	(%)	Diat, rad, sil_ooz
Shell	Shell	(%)	Shl, shl_dbr
Coral	Coral	(%)	Crl, crl_dbr, crlrf, sol_crl
HardPlant	Hard plants	(%)	C_alg, coralgl, crnalg, halmda

Data Catalog

Data provided in this publication include geographic coordinates to allow for integration into a Geographic Information System (GIS). A GIS is defined as a system of hardware and software to support the display, manipulation, and analysis of spatial data for mapping and complex data solving. This integrated package provides researchers the ability to integrate, analyze, and map the various data sets as an aid to scientific research, and policy-making decisions tied to the environment.

The five individual sediment/seafloor data layers along with additional basemap data layers have been compiled into an ArcView™ project file (la.apr) that is located at the top-level directory of this publication. The project file is intended to be opened and the data viewed with the Environmental Systems Research Institute, Inc. (ESRI) ArcView™ or ArcGIS™ software. The project file has been modified to reflect relative paths to the archived data as organized for this publication. To open the supplied project file and view the datasets, the user must start the appropriate software, navigate to the top-level of this publication and open the project file (la.apr).

For those who do not have the ESRI software or a compatible GIS data browser available on their computer, a free viewer, ArcExplorer™, is available from ESRI. Please note that the ArcExplorer™ software is limited to the Microsoft Windows operating system.

Each GIS data layer from this publication is cataloged in the table below for easy access. The individual data layers are described and include the shapefile name (e.g. _EXT is extracted data) which is linked to a browse graphic showing the data layer extent and coverage.

Federal Geographic Data Committee (FGDC) metadata for the individual data layers is provided in three versions (HTML, FAQ, and text). Selecting associated metadata files from the table below will open the information in a new browser window.

A 'zip' compressed, downloadable archive file containing the ArcView™ shapefile for each data layer is also provided. Compressed downloadable files were created using the Windows program WINZIP v8.0. For those users who do not have software capable of uncompressing the archived zip files, they may obtain a free version of the software from Winzip Computing, Inc. or Pkware, Inc. In addition to the ArcView™ shapefile, the sediment data layers are available in an ASCII text format and a Microsoft Excel spreadsheet format to allow users who may not have access to GIS software to read the shapefile and examine the datasets. The first record of the ASCII file and Excel spreadsheet contains the name of the data fields for that file.

usSEABED DATA

DIRECTORY: data/usSEABED

Data Layer Name and Description	Metadata	Files
<i>LA_PRS</i> - usSEABED parsed (word-based) data for the Louisiana region. An explanation of the individual data sets may be found in the <i>Data Dictionary</i> section.	<i>HTML</i> <i>FAQ</i> <i>text</i>	<i>zip</i> <i>Excel</i> <i>text</i>
<i>LA_EXT</i> - usSEABED extracted data for the Louisiana region . An explanation of the individual data sets may be found in the <i>Data Dictionary</i> section.	<i>HTML</i> <i>FAQ</i> <i>text</i>	<i>zip</i> <i>Excel</i> <i>text</i>
<i>LA_CLC</i> - usSEABED calculated data for the Louisiana region. An explanation of the individual data sets may be found in the <i>Data Dictionary</i> section.	<i>HTML</i> <i>FAQ</i> <i>text</i>	<i>zip</i> <i>Excel</i> <i>text</i>
<i>LA_FAC</i> - usSEABED facies data for the Louisiana region. An explanation of the individual data sets may be found in the <i>Data Dictionary</i> section.	<i>HTML</i> <i>FAQ</i> <i>text</i>	<i>zip</i> <i>Excel</i> <i>text</i>
<i>LA_CMP</i> - usSEABED component data for the Louisiana region. An explanation of the individual data sets may be found in the <i>Data Dictionary</i> section.	<i>HTML</i> <i>FAQ</i> <i>text</i>	<i>zip</i> <i>Excel</i> <i>text</i>
<u>GMX_SRC</u> - usSEABED source data for the Gulf Coast. An explanation of the individual data sets may be found in the <i>Data Dictionary</i> section.	<i>Online</i> <i>text</i>	<i>Online</i> <i>html</i>

BATHYMETRY

DIRECTORY: data/bathymetry

Data Layer Name and Description	Metadata	Files
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gmx_grd.sid – Coastal Relief Model Bathymetry for the Gulf of Mexico.

HTML
FAQ
text

zip

BASEMAPS

DIRECTORY: data/basemaps

Data Layer Name and Description	Metadata	Files
<i>eez</i> - Boundaries of the U.S. Exclusive Economic Zone (US EEZ) of the Louisiana project area, extending 200 nautical miles offshore.	<i>HTML</i> <i>FAQ</i> <i>text</i>	<i>zip</i>
<i>Federal Boundary</i> - The 9 nautical mile boundary between state and federal waters off Louisiana.	<i>HTML</i> <i>FAQ</i> <i>text</i>	<i>zip</i>
<i>state_bounds</i> - Internal US state boundaries	<i>HTML</i> <i>FAQ</i> <i>text</i>	<i>zip</i>
<i>nos80k</i> - US states map	<i>HTML</i> <i>FAQ</i> <i>text</i>	<i>zip</i>

COASTAL CHANGE ATLAS

DIRECTORY: online

Data Layer Name and Description	Metadata	Files
<i>coastal change</i> - USGS Digital Data Series 79	<i>online</i>	<i>online</i>

Google Earth KML files

Data Layer Name and Description	Information	Files
<i>Google Earth Files</i>		



A KMZ file is available for download and use with Google Earth!

Gulf of Mexico Data

Browse Maps

Overview

The images and maps in this Open-File Report serve as examples of products that may be generated using the usSEABED data provided in the *Data Catalog* section. A wide array of additional gridded maps and plots of sea floor sediment texture, character, and related geologic attributes from the Louisiana offshore region can be constructed from the usSEABED data using various Geographic Information Systems (GIS) applications (e.g. ArcView™, ArcExplorer™, MapInfo™). Several examples are shown below, but the data are in no way limited to these few displays.

For this section of the publication, we have chosen to focus on *Extracted* and *Parsed* data within the usSEABED collection. Extracted data: those data from strictly performed, lab-based, numeric analyses. The _EXT file is based on rigorous lab-determined values and forms the most reliable data sets. Numeric data obtained from verbal logs from core descriptions, shipboard notes, and (or) photographic descriptions are held in the parsed data set (_PRS). The input data are maintained using the terms employed by the original researchers and are coded using phonetically sensible terms for easier processing by dbSEABED. For expanded definition of these data sets, please consult the *Data Dictionary* section of this publication.

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Related Websites

This report is a product of The USGS Marine Aggregate Resources and Processes Project, and is the second of a series of such publications using usSEABED data to generate example GIS maps directed at promoting a better understanding of sea floor composition, texture, and geologic character.

The U.S. Geological Survey data and products included in this open file report have come from a collection of Federal and state agencies and academic research groups found at the links below.

USGS Links:

USGS Woods Hole Science Center
USGS Minerals Resources Program
usSEABED Home
USGS Center for Coastal and Watershed Studies
USGS Western Coastal and Marine Geology
USGS Wetlands Research Center

The collaborators listed below have contributed to the usSEABED dataset, and continue to to be involved in the future developments of the project.

Our Collaborators:

U.S. Army Corps of Engineers
NOAA National Marine Fisheries Service
NOAA National Ocean Service
Minerals Management Service
U.S. Environmental Protection Agency
Louisiana Geological Survey
Texas Bureau of Economic Geology
dbSEABED at INSTAAR/University of Colorado
University of New Orleans
Louisiana Department of Natural Resources



For Educators

The U.S. Geological Survey provides scientific information intended to help educate the public about natural resources, natural hazards, geospatial data, and issues that affect our quality of

life. The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; and enhance and protect our quality of life.

The materials and websites below represent the combined efforts of the USGS and our collaborating institutions to reach the ever growing needs of the public. The products and web links below are to serve as a starting point for educators to see what types of materials are available to assist in lesson planning, public presentations, and increasing the scientific understanding of our dynamic planet.

References: References on marine sand and gravel studies and resources can be found in *USGS Open File Report 2003-300* (Williams and others, 2004) and can help provide background information on the geologic framework of continental shelf sediments and processes.

Plotting: Plotting sediment data from the usSEABED program can be done using Matlab routines available on the user contributed code library of the *Mathworks* website (*shepard.m*, *schlee.m*, *Folk_S_Classification.m*). These scripts were written by members of the Woods Hole Science Center staff to help visualize the compositional components of sediment samples on a ternary diagram.

Movie: *New Orleans - THE NATURAL HISTORY* - by *Walter Williams*. Walter Williams has filmed New Orleans on many occasions, including this pre-Hurricane Katrina documentary on the natural forces surrounding New Orleans. The movie may also be found in *U.S. Geological Survey Digital Data Series 79* (Williams and others, 2003) low resolution version is available on DVD courtesy of Mr. Williams.

Additional Resources Available Online:

USGS maintains a webpage of *Educational Resources*, (including *A Primer On Natural Aggregate*, and *Schoolyard Geology*).

USGS Coastal and Marine Geology Program provides additional information and educational resources that are available on their *website*, searchable by the term 'Educational Materials'.

The *NOAA Coastal Services Center* is an office within the National Oceanic and Atmospheric Administration devoted to serving the nation's state and local coastal resource management programs.

Minerals Management Service maintains a *Kids' Pages* with excellent materials on a number of scientific topics, including *The Ocean's Sand, A Natural Resource* (Adobe pdf format)

U.S. Army Corps of Engineers has an *Education Center* which includes lessons and materials in *navigation, sedimentation*, and many other topics tied to engineering in the coastal environment.

GIS in Louisiana

Louisiana Statewide GIS Atlas
Louisiana Dept. of Environmental Quality GIS Center
Louisiana State Land Office GIS Lab

GIS in Florida

Florida DEP Geographic Information Systems
Florida Geographic Data Library
Florida GIS Data

GIS in Texas

Texas Geographic Information Council
Texas Natural Resources Information System
Texas Natural Resource Conservation Commission
East Texas GIS and GPS Users Group
North Central Texas GIS Coordinating Council
Round Rock GIS Data Sets

GIS in Alabama

Geological Survey of Alabama GIS Group
Alabama Coastal Hazards Assessments GIS
Alabama Land Resource Information Center
Alabama Geographic Alliance

GIS in Mississippi

Mississippi Automated Resource Mapping System (MARIS)

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Readme

Background

This report contains a compilation of available textural data and numeric data based on lithologic descriptions generated from surficial sediment samples from offshore the Louisiana coast of the United States. These data are a subset of the usSEABED data for the Gulf of Mexico as

described in Buczkowski and others (2006). More than 340,500 samples containing sediment grain size and lithology have been compiled as part of the *U.S. Geological Survey's Marine Aggregate Resources and Processes* and *National Benthic Habitats* projects. These data are being used to update the current maps on surficial sediment distribution for the Louisiana/Ship Shoal region.

Many of these data layers were compiled using gray literature or unpublished sources and have not been available in digital form prior to publication of USGS DS-146. These data have been converted to Environmental Systems Research Institute, Inc. (*ESRI*) "shapefile" format for use in the project Geographic Information System (GIS), and data are supplied with complete FGDC compliant metadata. Sediment data and sample identifiers are also supplied in flat-file format and Microsoft Excel spreadsheet files for those users who may not have GIS access.