Introduction

Texas is blessed with 367 miles of gulf-fronting beaches, over 3,300 miles of bay shoreline and has the third longest coastline in the nation, with one of the highest rates of coastal erosion in the country. Approximately 64 percent of the Texas Gulf Coast is experiencing long-term critical erosion.

In 1999, the 76th Texas Legislature passed Senate Bill 1690, creating the Coastal Erosion Planning and Response Act (CEPRA) to combat erosion. Implemented by the GLO, the CEPRA program entails a coordinated effort of state, federal, and local entities to conduct coastal erosion response projects and studies. To mitigate for beach erosion, good quality sand sources are indispensible. It is estimated that more than 30 million cubic yards of sand are needed for upper Texas coast beach nourishment projects in the next 10 years. During the course of 5 biennial cycles, more than 20 CEPRA funded projects involved both on- and offshore sand source investigations along the coast. Many geotechnical cores of sediments have been collected and provided to the GLO.

For many years, the Corps' Galveston District—as well as several academic entities, such as Rice University and the Bureau of Economic Geology of the University of Texas at Austin (UT-BEG)—have been collecting geotechnical cores and grab samples of sediments during routine navigational channel dredging for other coastal construction projects and academic research purposes. Such information has never been centralized to allow for better data sharing, standardization of data collecting practices, and planning.

In 2009, the GLO obtained a federal Coastal Impact Assistance Program (CIAP) grant for a project entitled Sediment Resources Investigations Along the Texas Coast to begin development of TxSed. The GLO and the Corps' Galveston District have entered an agreement wherein the Corps will provide its channel dredging-related sediment coring data to help the GLO populate TxSed. In addition, the GLO will include data collected under CEPRA and other coastal projects. Once the database is created and operational, it is anticipated that other governmental and private entities will participate as stake holders, data contributors, and users.

Methodology

TxSed is an enterprise relational database management system (RDBMS) comprised of three components:

- A SQL Server database that stores sediment coring/sampling data, including latitude and longitude for locations
- 2. A DocuShare collection that stores PDF documents containing geotechnical information such as boring logs, grain-size analysis, etc., associated with individual sediment cores/samples
- 3. An ArcSDE feature dataset that displays the location of all sediment coring/sampling

A Web site containing an interactive map interface using ArcGIS Server technology will allow users to view, query, and save TxSed data for a particular area or category of sediments.

Texas Coastal Sediments Geodatabase Project (TxSed)

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Restore America's Estuaries: 5th National Conference on Coastal and Estuarine Habitat Restoration, Galveston, Texas, November 13-17, 2010



TxSed Support Decision Making Process

Between Sediments and Projects

TxSed: Original Data

ark-gray, soft, cohesive clay

Back Bolivar Peninsula
Core ID: BBP-90-3
Core Location: 1st floor, condition is poor, some sections unchecked, top of third rack after MB's
Comments: Sept. 27, 1990, length=447cm

TxSed: Data Processing

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ontain personal information unless it is in a restricted collection. F

This collection is part of the TxSed Geodatabase put together by th

Xerox DocuShare®

TexSed Testing Folder

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Sample_Points

Personal GeoDatabase Feature Class

Description Spatial Attributes

Details for Sample_Points

SampleMethod

SampleDepthUnits

SampleTopUnits

SampleBaseUnits

CoreLengthUnits

PhysicalDescription

Summary

The Texas General Land Office (GLO) is building a systematic inventory of sediment-related geospatial and geotechnical data called the Texas Coastal Sediments Geodatabase (TxSed). The primary users of TxSed will be resource managers within governmental agencies or non-profit organizations interested in identifying compatible sediment resources for proposed beach nourishment or habitat restoration projects. It will also aid in the permitting/regulatory processes for such projects. A pilot TxSed project has been developed and tested for the greater Galveston Bay region, and now expanded to cover the entire

This project will leverage existing efforts and coordinate the integration of data from the GLO, the U.S. Army Corps of Engineers' (Corps) Galveston District and the Engineer Research and Development Center (ERDC), relevant navigation and port authorities, universities and other local, state, and federal entities. It is anticipated that this effort will be used as a basis for the development of a unified regional sediment management (RSM) approach for the Texas coast. The compilation of existing data will aid and facilitate some of the regulatory agencies, navigation districts, ports, non-profit organizations, private firms, and local governments in identifying available offshore and onshore sediments to protect and restore bay-gulf ecosystems, build coastal dunes and eroding beaches, and enhance bay and barrier island habitats. The GLO will make the database accessible to all partners/stake holders and the general public through the Internet.

TxSed Components

Source

Current Status and Future Work

With the CIAP grant, we are able to complete the conceptual database design and implement it in the front end personal geodatabase and a SQL database in the testing environment. We tested the entire work flow in a pilot project for the Greater Galveston Bay region and started converting available sediment data for the database, which now covers the entire Texas coastal area. So far, 22 projects with sediment information have been processed and loaded into the Access and SQL database.

Currently, we are working with Texas A&M University at Galveston (TAMUG), which will help GLO acquire an electronic copy of the Corps' historical channel dredging sediment data from their archives for TxSed. It is anticipated that the TxSed website will be up and running no later than July 2011 when the grant ends.

GLO will seek further funding for the maintenance, enhancement, and upgrade of TxSed's functionality as needed. Hopefully, TxSed will not only serve as a data repository and data sharing portal, but also provide a framework to promote standardization in data collection and presentation as well as facilitate coordination and cooperation among partners/stake-holders for better RSM practices.

Data Processing and Work Flow

The first step is data exploration. We are continuously looking for sources and partners who can enter into an agreement with GLO and contribute sediment-related data, historical and recent, to be included in TxSed.

Once the original data arrive, usually in electronic format as scanned or converted PDF documents, we will analyze and dissect the information to create and clean-up ESRI shapefile and, when applicable, generate individual PDF documents before populating the personal geodatabase and DocuShare collection.

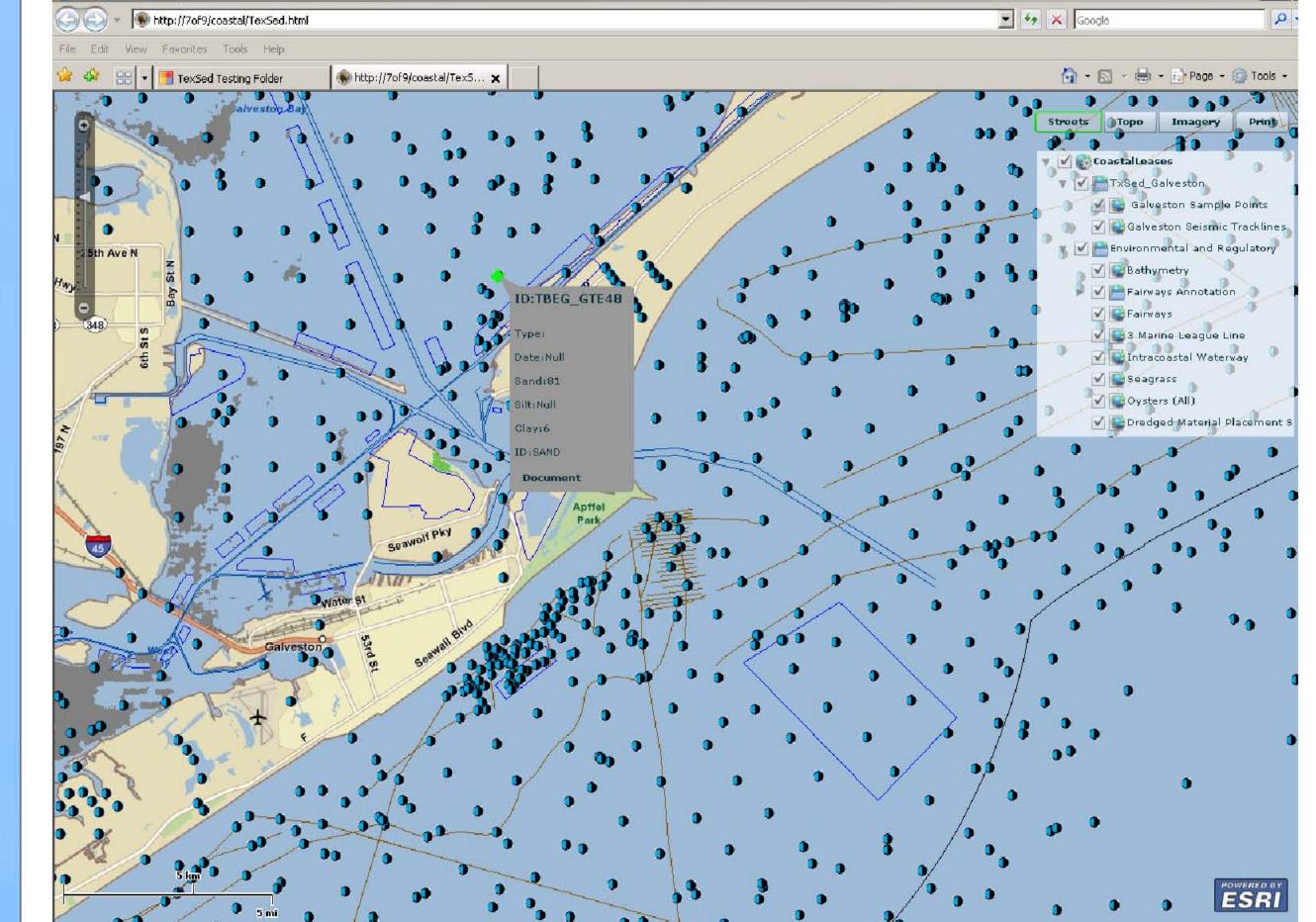
After QA/QC on each individual project data entry, it is loaded into a centralized personal geodatabase (Microsoft Access database) before being uploaded into the SQL database. A script is written to load the geospatial portion of the data from SQL into ArcSDE for the creation of the ArcGIS Server map service.

Finally, a password protected website will be created for the viewing, querying, and saving of TxSed data for all end users.

TxSed Work Flow Internet Databases Servers



TxSed ArcGIS Server Map Viewer



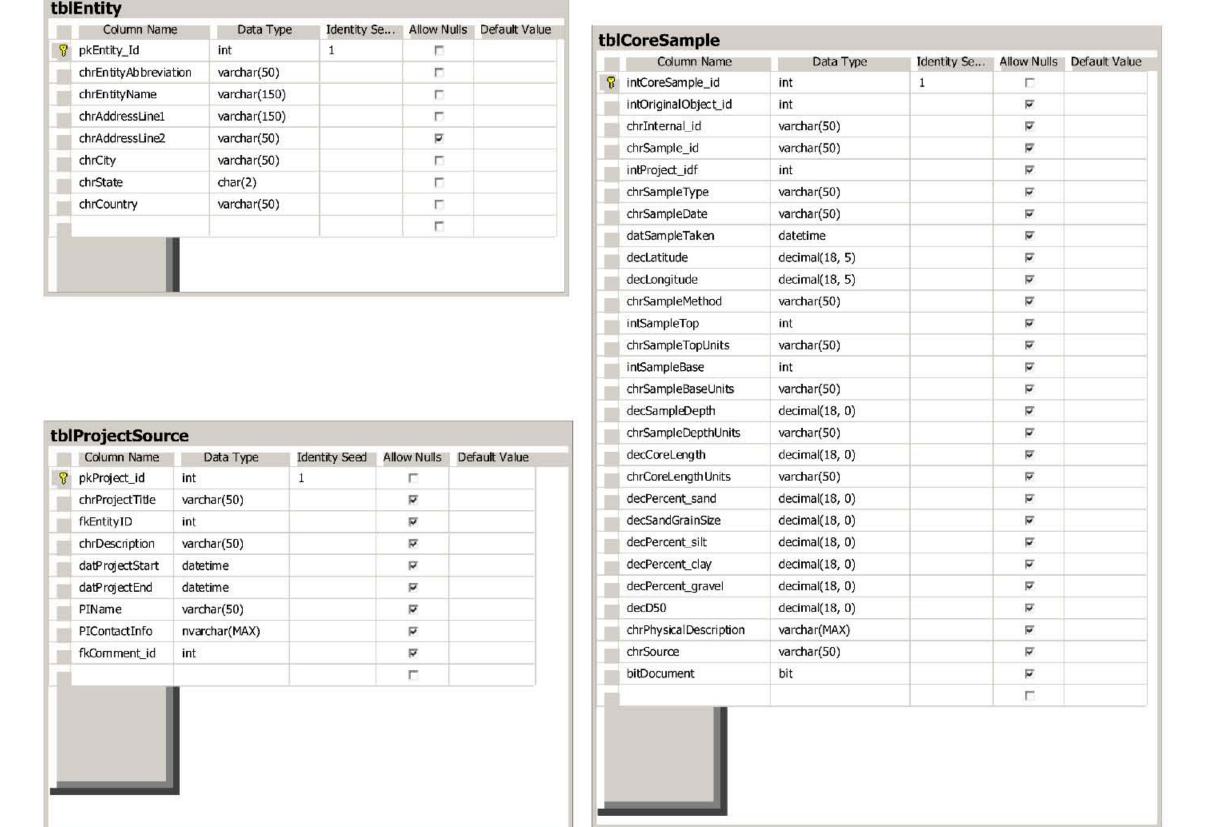
Data Source and Database Design

Geotechnical information of sediment cores and samples has been generated for a variety of different purposes, conducted by different entities and labs, and presented in various ways and formats. Some are GIS ready, but most often not. For example, coring samples collected by geologists in academic and research institutions, such as Rice University and UT-BEG, are described and presented quite differently from those by coastal engineering firms and the laboratories they use to conduct the grain-size analysis, both of which are also different from data from the Corps' channel dredging surveys.

In order to accommodate the wide range of data sources and accurately present the useful information as it is, we have taken a 'minimum common denominator' approach to the designing of the fields for the sediment sample data table in the SQL database. Also, in addition to location information (latitude and longitude), we try to avoid doing any data interpretation, but instead present it in its original state, as much as possible. This means that whenever available, the original grain-size analysis tables, coring logs, photos, and graphs that are associated with a particular sample are stored in one PDF document and made accessible through DocuShare.

The coring/sampling location data also come in various formats. Some are GPS readings (latitude/longitude), some are plotted on hard copy maps, and some are based on distances from pre-defined survey station markers. Great effort and care are taken when geocoding and digitizing them into GIS-ready formats. A front-end ArcGIS personal geodatabse is created for geospatial data preparation before loading into the SQL database in production.

TxSed SQL Database Schema



Acknowledgement

TxSed is an enterprise database made possible by a CIAP grant. In addition to the support of GLO's management, many GLO technical and project management personnel, including student interns, have contributed to the design, creation, and population of the database. We would like to acknowledge with profound gratitude the following GLO employees and their specific roles in the TxSed project: Scot Friedman, Coastal GIS Team Leader; Kathy Smartt, CIAP Grant Administrator; Laura Wisdom, Coastal Information Architect and DocuShare Administrator; Kate Laura, Lance Plummer, and Keith Corkran, Information System Database Administrators; Robert Brennen, ArcSDE Administrator; and Jeff Perkins, ArcGIS Server Administrator. Last but not least, a group of student GIS interns helped process data for TxSed, including: Lauren Heller (UT-Austin), Roxana Estrada (UT-Austin), David Hickman (Texas State University-San Marcos), Sergey Reid (Texas A&M University-Corpus Christi), Brynn Carlile (UT-Austin), Hyunwoo Kim (UT-Austin), and Mark Pillion (Texas State University-San Marcos).

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