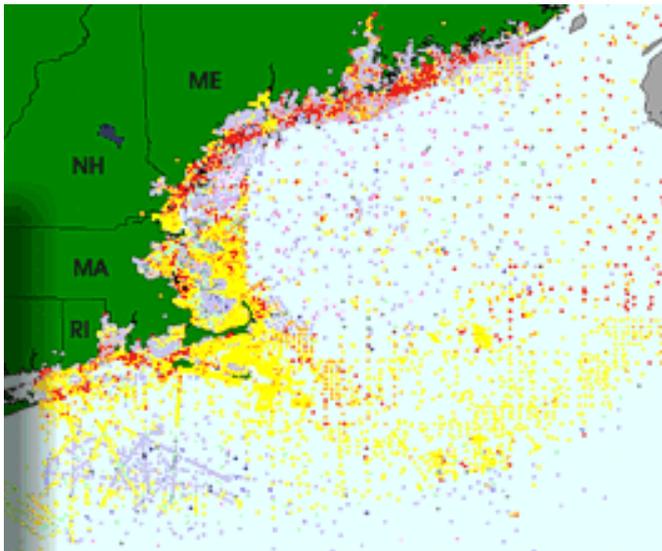


Marine Aggregate Resources and Processes

SUMMARY:

Coastal erosion and landloss are widespread for all regions of the U.S., affecting more than 80 percent of coastal regions over the long term. Developed coasts and recreation beaches are particularly vulnerable. People are continuing to move to the coastal zone and beaches are increasingly popular tourist destinations. With the prospects of future climate change causing increasing storminess and accelerating sea-level rise, coastal regions are likely to experience even greater erosion in future decades. Beach nourishment is being increasingly used in many regions as a means of mitigating coastal erosion, providing flood protection, and restoring degraded coastal ecosystems. For a beach nourishment project to be successful, however, large volumes of high quality sand (ie. good texture, composition, color) are necessary, ideally in close proximity to the project beach to reduce sand transport costs. Marine sand bodies on the inner to mid-shelf are attractive targets for sand dredging for beach nourishment. However, the geologic character and distribution of sand bodies are often highly variable depending on the sea-level rise history and marine processes that have affected shelf margins by multiple marine transgressions and regressions over the past 20,000 years. Also, marine sand bodies can be relict landforms, no longer connected to modern coastal and nearshore processes, while many are dynamic and actively linked to coastal sediment budgets. This distinction is important. Dredging of active sand bodies close to the coast can cause environmental harm and exacerbate erosion by altering wave patterns and sediment transport pathways. Detailed seafloor sediment character maps for most regions and cross sections depicting seafloor and subbottom sedimentary character and stratigraphy are not readily available to scientists, engineers and managers. The Corps of Engineers (USACE) and Minerals Management Service (MMS) supported state contracts have produced significant results and products from several offshore regions, but the data are scattered, mostly within very nearshore areas, and often only available as gray literature or in agency files. These organizations currently lack resources to compile and integrate their respective data sets with those of USGS, NOAA/NOS/NGDC, Navy, NSF, universities, and coastal states into an integrated national sediment data base. The central role of the USGS in this is to provide the scientific expertise and interpretation of these data. These USGS products and methodologies can then form the basis for leasing and regulation of offshore sand by the MMS and coastal engineering uses of offshore sand by the USACE.



Aggregate image

INVESTIGATORS:

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DESCRIPTION:

The Marine Aggregate Resources and Processes Project is an important component of the USGS mission to conduct research and assess offshore mineral deposits. The project objective is to improve scientific understanding of the sedimentary character of U.S. continental margins and provide guidance to the Nation on the potential availability of marine sand and gravel aggregate resources. Several additional scientific objectives are to improve our understanding of how sand bodies form and evolve over various time scales, their possible links to the underlying geologic framework, and their importance to coastal and nearshore processes and sediment budgets. As such, this study is implementing a series of regional studies that involves generating GIS maps of the seafloor sedimentary character and assessing marine sand and gravel resources using the latest geospatial statistics. Results of the various regional assessments will ultimately comprise a national assessment of marine sand and gravel. This study is responding to increasing demand for web-accessible GIS-type data and interpreted geologic map information on the sedimentary character of the seafloor. This demand is driven mostly by the need for data and information on availability of aggregate resources suitable for beach nourishment and coastal restoration, as well as seafloor sediment texture information for benthic habitat mapping and sediment transport

modeling. Each regional study includes tasks to synthesize, interpret, map, and ultimately disseminate available coastal and shelf sediment and geologic framework data from the USGS's Coastal and Marine Geology program as well as cooperating organizations (eg. NOAA, MMS,USACE, Navy/ONR, state agencies, academia, industry). Interpretations in reports and maps result from integrating sedimentary data from the usSEABED system, and hi-res gridded NOS bathymetric data. The project is fostering cooperation with other federal ocean agencies, as well as with various coastal state agencies. Four themes are emphasized: -- Marine Geologic and Geophysical Data Compilation -- Evaluation and Synthesis of Existing Maps and Reports -- Understanding Processes of Sand Body Development and Geologic Evolution -- Data Rescue, Integration/Interpretation/Dissemination of Results To address these themes, the Marine Aggregates project consists of the following primary tasks: 1. National marine sediment data base compilation and development, data rescue using usSEABED and LASEDS 2. Regional assessments for Louisiana, New York Bight and Gulf of Maine 3. Planning and coordinating within USGS and with external federal, state and local, university, industry partners

START DATE OF PROJECT:

October 1, 1999

END DATE OF PROJECT:

September 30, 2008

TOPIC:

Resources and the Environment

APPROACH:

The Marine Aggregates Project has developed and implemented a scientifically rigorous means of producing a series of regional mappings of seafloor sedimentary character and is developing robust geospatial statistics, based on computer programs and models for assessing onshore aggregate resources, for use in conducting assessments of marine sand and gravel resources. The regional studies as they are completed ultimately will comprise a national assessment. Four themes are emphasized: -- Marine Geologic and Geophysical Data Compilation -- Evaluation and Synthesis of Existing Maps and Reports -- Understanding Processes of Marine Sand Body Development -- Data Integration/Interpretation/Dissemination To address these themes, the Marine Aggregates project consists of three primary tasks: 1. Development of National Marine Sediment Data Bases(usSEABED/LASEDS) 2. Regional Assessments: Louisiana and New York Bight 3. Planning and Coordinating with other USGS seafloor mapping and mineral projects and external federal, state, industry, and academic partners Work will continue on each of these tasks by USGS investigators as well as by collaborators in other Federal and state agencies and at UNO and CU/INSTAAR. The principal activities for FY 2006 will be completion of developing the methodology for carrying out assessments. This is being done in collaboration with Jim Bliss (Minerals Prog/Tucson) and others who have programs and models for doing onshore assessments of industrial minerals like aggregates. GIS maps and assessment reports for New York Bight and south-central Louisiana will be completed. Results of the Louisiana OFA sand inventory studies (Flocks/Kindinger)are being included in the Louisiana regional assessment. Future regional assessment studies are being considered for North Carolina, South Carolina, California and Florida using the methodologies developed. Decisions on future studies will be driven by the needs of Federal and state resource agencies and availability of USGS staff. The development of the dbSEABED processing system and the usSEABED database through a coop agreement with C.Jenkins (CU/INSTAAR) is being done in conjunction with the west coast Benthic Habitats project(Jane Reid)and will continue.

IMPACT/RESULTS:

The major products of the Marine Aggregates Project consist of the national usSEABED database for the Atlantic, Gulf, Pacific, Alaska, and Hawaii EEZ regions and a series of interpretative GIS grid map and report products and methodologies (web-based and hard copy) characterizing and describing the seafloor and subbottom sedimentary character of U.S. shelf margins. These reports include assessments of the sand and gravel resources contained in sand bodies at the surface and in the subbottom of the shelf. The products have most immediate and direct application to meet the needs for managing and planning protection of coastal resources, including considerations for beach nourishment, but they will also serve the larger marine science community by providing seafloor sediment information useful for many purposes such as characterizing benthic habitats and better understanding the history and evolution of U.S. continental margins. Outcome Statement: In Louisiana, results of this study are finding direct application by the Corps of Engineers and LADNR in long term planning and designing barrier island nourishment projects as part of the Coast-2050/Louisiana Comprehensive Area (LCA) Restoration Program to mitigate high rates of coastal erosion, wetland loss, and sea-level rise. Results of this project are also being used by the USACE/New York District in the Fire Island to Montauk Point shoreline plan.

PUBLICATIONS:

- ◆ Kulp,M., Penland,S., Williams,S.J., Jenkins, C.,Flocks, J., and Kindinger. J., 2005, Geologic Framework, Evolution and Sediment Resources for Restoration of the Louisiana Coastal Zone, Jour. Coastal Research, Special Issue no. 44, p. 56-71.
- ◆ Magoon, O.T., Williams, S.J., Lent, L. K., Richmond, J. A., Treadwell, D. D., Douglas, S. L., Edge, B. L., Ewing, L. C.,

and Pratt, A. T., 2004, Economic impacts of anthropogenic activities on coastlines of the United States, Proceedings of the 29th International Conf on Coastal Engineering, Lisbon, Portugal, pp 3022-3035.

- ◆ Poppe, L., Paskevich, V., Williams, S.J., Hastings, P., Kelly, J., Belknap, D. Ward, L., FitzGerald, D., and Larsen, P., 2003, Surficial sediment data from the Gulf of Maine, Georges Bank and vicinity: a GIS compilation, USGS OFR 03-001.
- ◆ Williams, S.J., Hampton, M., Jenkins, C., Currence, J.M., Poppe, L., Penland, S., Reid, J. A., Flocks, J., Kindinger, J., Kulp, M., Manheim, F., Polloni, C., and Rowland, J., 2003, New digital geologic maps of US continental margins: insights to seafloor sedimentary character and processes, tools for assessing marine aggregate resources, Coastal Sediments '03, The Fifth International Symposium on Coastal Engineering and Science of Coastal Sediment Processes, Proceedings, Clearwater Beach, FL.
- ◆ Williams, S.J., Reid, J.M., Cross, V.A. and Polloni, C.F., 2003, Coastal erosion and wetland change in Louisiana: selected USGS products, USGS DDS 79.
- ◆ Williams, S.J., Reid, J.M., and Manheim, F.T., 2004, A bibliography of selected references to US marine sand and gravel resources, USGS OFR 03-300.

RELATED:

- ◆ [Williams, S.J., and Reid, J.M., 2003, Marine Aggregates Resources and Processes project, USGS web-based homepage](#)