PATTERNS OF GULF OF MEXICO SHORELINE CHANGE IN TEXAS

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Shoreline Length

Gulf = 600 km
Bays = 9,400 km
SHORELINE CHANGE MEASUREMENTS

Goal: Determine how the shoreline is likely to change during the next 60 years.

• Compute average annual rate of shoreline change by linear regression of select historical shoreline positions.

• Qualitative evaluation of alongshore trend of the standard error of shoreline positions at each transect (standard error is measured relative to the linear regression line).

• Exclude earlier shorelines from calculation based on above evaluation and knowledge of sediment-budget altering engineering works.
Data Sources

Before 1930:
Maps from the mid to late 1800’s produced by the U.S. Coast Survey – “high-water line mapped.”

Generally not used:
Engineering structures altered sediment budget since 1900.
Data Sources

1930’s to 1990’s - Vertical Aerial Photographs
Shoreline Interpretation
Wet/Dry Line

Gulf of Mexico
Airborne Topographic Lidar

- GPS satellites
- Aircraft GPS
- ALTM laser and IMU
- Laser scan lines
- Flight direction
- GPS ground reference station
Lidar Digital Elevation Model
1 - m grid

BEG-02
Beach profile
Landward boundary
MHHW
+0.6 m msl
Geotube

Gibeaut_CCC_Jan31_2002
QA496
Lidar Intensity Draped on Topography

- **BEC02**
- Shoreline at +0.6 m MSL
- Wet/dry line
- Ridge of sargassum
Representative Wet/Dry Elevation
0.6 m along Upper Tx  Gulf Coast
Shoreline Shape and Projection Program
ArcView Interface
Shoreline Change Rate

- Mid-term/linear regression rate
- Long-term end point rate


Meters from first year

Advance

Retreat

Shoreline

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SHORELINE CHANGE, 1930 - 2000
UPPER COAST

Shoreline change rate
Shoreline change rate error, linear
Shoreline change rate error, non-linear
Shoreline standard error
Shoreline change rate - adjusted
Shoreline standard error - adjusted

Shoreline change rate
Shoreline change rate error, linear
Shoreline change rate error, non-linear
Shoreline standard error
Shoreline change rate - adjusted
Shoreline standard error - adjusted

Shoreline Standard Error, m

Bolivar Roads
San Luis Pass
Brazos R.
Colorado R.
Freeport
Sabine Pass

Distance Alongshore, km
southwest
distance
landward
northeast
Shoreline Change Rate
multiple shorelines 1930 - 2000

Shoreline change rate
Shoreline change rate error, linear
Shoreline change rate error, non-linear
Shoreline position standard deviation

San Luis Pass
GULF OF MEXICO SHORELINE CHANGE STATISTICS

• 11,708 measurement locations = 585.4 km of shoreline length
• Some gaps include recurved spits and washover channels
• Stable = 173.6 km, 29.6%
• Advancing = 46.3 km, 7.9%, mean = 5.4 m/yr
• Retreating = 365.6 km, 62.4%, mean = -2.6 m/yr
High (>2m/yr) retreat rates = red

Galveston Bay
Matagorda Bay
Colorado River
Pass Cavallo
Corpus Christi Bay
Aransas Pass
Baffin Bay
Brazos Santiago Pass
Sabine Pass
Bolivar Roads
High (>2m/yr) retreat rates = red
Moderate retreat rates (0.61 to 2 m/yr) = orange
High (>2m/yr) retreat rates = red
Moderate retreat rates (0.61 to 2 m/yr) = orange
Stable rates (<0.61 m/yr) = blue
EXPECTED GULF-SIDE LAND CHANGE
2000 TO 2030

• Loss of 28.5 square kilometers = 7,043 acres
• Gain of 7.5 square kilometers = 1,853 acres
• Net loss of 21 square kilometers = 5,189 acres
• Land along the Gulf shoreline is being lost at a rate of 235 acres per year
2060 Projected Shoreline
1961 post Carla Photo over 2002 photo
www.beg.utexas.edu/coastal

The Texas Shoreline Change Project

Introduction

In June 1999, Governor Bush signed into law the Coastal Erosion Planning and Response Act (CEPRA). This act provides funds for coastal erosion projects. It authorized the Texas General Land Office (GLO) to implement a comprehensive coastal erosion response program that can include designing, funding, building, and maintaining erosion projects. The GLO is named in the act as the entity that will monitor shoreline change rates with the assistance of the Bureau of Economic Geology and local governments. The Texas Shoreline Change Project is addressing requirements of the CEPRA regarding (1) the identification of "critical coastal erosion areas", (2) the monitoring of historical shoreline erosion rates, (3) making data accessible on the Internet, and (4) increasing public awareness of coastal erosion issues. This is an active website. Users should check periodically for additional data and reports. Send comments to Jim Gibbons at jim.gibbons@beg.utexas.edu.

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