

Measuring Shoreline Change along Bays and Oceans Using Historical Aerial Photography and Airborne Topographic LIDAR Surveys

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Abstract

In 1999, the Texas State Legislature passed the Coastal Erosion Planning and Response Act. This act authorized the Texas General Land Office (GLO) to implement a comprehensive coastal erosion response program. The Bureau of Economic Geology (Bureau) is working with the GLO to identify critical coastal erosion areas. The goal of the Texas Shoreline Change Project is to establish a state-of-the-art, shoreline-monitoring and shoreline-change analysis program that will help guide coastal-erosion and storm-hazard-mitigation projects along bay and Gulf shorelines.

The rate of shoreline change is determined by comparison of historical shoreline positions. Vertical aerial photography since the 1930's is scanned and co-registered with 1995 digital orthophotos produced by the Texas Orthophotography Program. Shorelines and vegetation lines are then interpreted and digitized on the computer screen.

During 2000/01, the Bureau conducted LIDAR surveys along the Gulf of Mexico shoreline. A 1-m digital elevation model (DEM) was constructed from the laser points. A grid of the G99SSS gravimetric geoid model was subtracted from the DEM to obtain heights above the geoid. The height of the water level, as displayed in the DEM, was then compared with water levels recorded by open-coast tide gauges during the survey. This allowed the correlation of geoid heights to heights above a local tidal datum. Comparison of beach profiles and the wet/dry line as shown by LIDAR intensity data was used to pick levels to represent the shorelines (+.6 to +1 m MSL). These shorelines correspond to those mapped by using aerial photography.