

Design of a semi-autonomous boat for measurements of coastal sedimentation and erosion

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Abstract Measurement of sediment deposition and erosion in coastal areas is a challenge due to soft shifting sediments, but is critical to assessing loss or restoration of coastal sediments and wetlands. The aim of this project was to design and construct a semi-autonomous boat with water depth measuring capabilities. It was intended to map the depth of coastal wetlands to determine erosion rates and assess coastal restoration effects. Depth-measuring equipment was incorporated into an autonomous pontoon boat powered by solar panels. The propulsion system consisted of two paddlewheels and two-way motors to allow movement and positioning for measurements. Modifications included a lightweight, hard coating on the pontoons and powder-coating the frame to extend their usable life. A microcontroller controlled the boat and captured depth data from sensors and location data with a GPS system. The depth measuring system consisted of a pulley and counter system that completed each measurement in less than 45 seconds. This allowed the boat to take approximately 400 measurements per day. Net accuracy was approximately 3 cm in the tested configuration. The boat can continually measure the depth of specified areas in the wetlands; with this data, the change in depth can be monitored to see the effects of restoration projects.

Key words sediment measurement; coastal restoration; autonomous; coastal land accretion; monitoring; assessing