

ID: W2026252750

TITLE: Restoring marsh elevation in a rapidly subsiding salt marsh by thin-layer deposition of dredged material

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ABSTRACT:

Thin-layer deposition of dredged material on coastal marsh by means of high-pressure spray dredging (Jet-Spray®2) technology has been proposed as a mechanism to minimize wetland impacts associated with traditional bucket dredging technologies and to restore soil elevations in deteriorated marshes of the Mississippi River delta. The impact of spray dredging on vegetated marsh and adjacent shallow-water habitat (formerly vegetated marsh that deteriorated to open water) was evaluated in a 0.5-ha *Spartina alterniflora*-dominated salt marsh in coastal Louisiana. The thickness of dredged sediment deposits was determined from artificial soil marker horizons and soil elevation change was determined from sedimentation/erosion tables (SET) established prior to spraying in both sprayed and reference marshes. The vertical accretion and elevation change measurements were made simultaneously to allow for calculation of shallow (~5 m depth) subsidence (accretion minus elevation change). Measurements made immediately following spraying in July 1996 revealed that stems of *S. alterniflora* were knocked down by the force of the spray and covered with 23 mm of dredged material. Stems of *S. alterniflora* soon recovered, and by July 1997 the percent cover of *S. alterniflora* had increased three-fold over pre-project conditions. Thus, the layer of dredged material was thin enough to allow for survival of the *S. alterniflora* plants, with no subsequent colonization by plant species typical of higher marsh zones. By February 1998, 62 mm of vertical accretion accumulated at this site, and little indication of disturbance was noted. Although not statistically significant, soil elevation change was greater than accretion on average at both the spray and reference marshes, suggesting that subsurface expansion caused by increased root biomass production and/or pore water storage influence elevation in this marsh region. In the adjacent shallow water pond, 129 mm of sediment was deposited in July 1996 as a result of spraying, and despite initial shallow subsidence and continual erosion through February 1998, water bottom elevation was raised sufficiently to allow *S. alterniflora* to invade via rhizome growth from the adjacent marsh. Hence, thin-layer deposition of dredged material at this site was effective at restoring and maintaining marsh elevation after 1.5 years. However, if the open water sediment deposits are not soon completely stabilized via further vegetative colonization, erosion may eventually lower elevations to the level where emergent vegetation cannot persist.

SOURCE: Ecological engineering

PDF URL: None

CITED BY COUNT: 137

PUBLICATION YEAR: 1999

TYPE: article

CONCEPTS: ['*Spartina alterniflora*', 'Marsh', 'Dredging', 'Salt marsh', 'Wetland', 'Hydrology (agriculture)', 'Environmental science', 'Deposition (geology)', 'Accretion (finance)', 'Sediment', 'Elevation (ballistics)', 'Geology', '*Spartina*', 'Subsidence', 'Oceanography', 'Geomorphology', 'Ecology', 'Geotechnical engineering', 'Biology', 'Physics', 'Geometry', 'Mathematics', 'Structural basin', 'Astrophysics']