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Coastal Engineering Technical Note

BIOLOGICAL EFFECTS OF BEACH RESTORATION PROJECTS ON THE SOUTH ATLANTIC U.S. COAST

PROBLEM: The Corps is being asked complex environmental questions about the effects of beach restoration projects (i.e., dredging and placement operations).

BACKGROUND: Beaches of suitable dimensions are an effective means of dissipating wave energy and, when they can be maintained to proper dimensions, afford protection for the adjacent upland, and are classed as shore-protection structures. Since protective beaches do not cause erosion problems of adjacent beaches, the Corps is using this alternative in developing solutions to these problems. Associated with the development of these solutions is the preparation of Environmental Impact Statements (EIS). This involves not only an evaluation of effects of the completed structure on the environment, but the effects of the construction operations as well.

SOLUTION: To broaden the data base on the effects of beach restoration operations, a study was undertaken at Hallandale (Broward County), Florida (see Figure 1). This study involved evaluating the environmental impacts of the operation on the nearshore area both during and after construction.

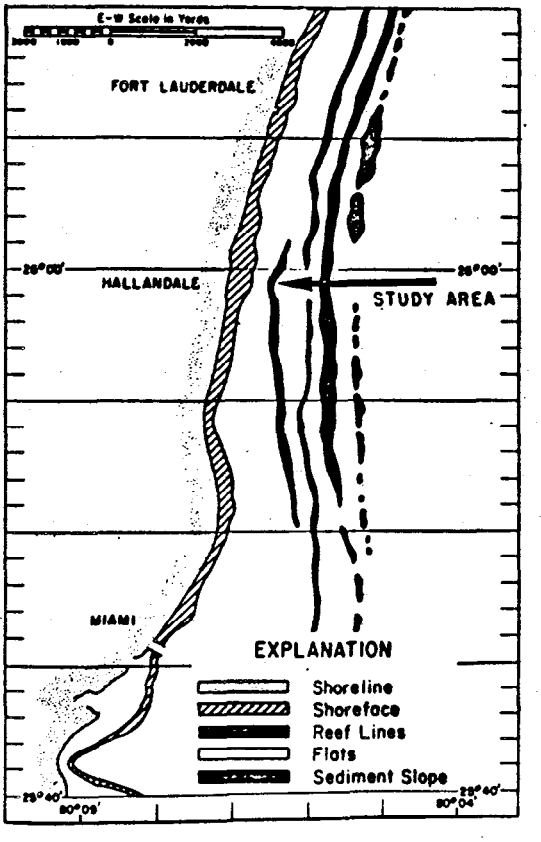

Figure 1 - Location of study area and Florida shelf morphology

The topography of the shelf at Hallandale is characterized by a series linear step-like sandflats separated by elevated limestone and coral reefs which generally parallel the shoreline. The outcrops of reefs are of Pleistocene origin. In the Hallandale area there are three reefs that parallel the shore. This study included the two nearshore reefs, the inshore and intermediate sandflats and the sandflat beyond the second reef. The borrow site (Figures 2 and 3) was located on the sandflat seaward of the second reef. The reefs were found to be rich in species of invertebrates, fishes and algae, particularly the second reef. The reefs appear richer than the sandflats; however, the sandflats are important to the reef inhabitants, many of which feed over them at night. The diversity and productivity of marine life in the area are thus dependent upon the preservations and vitality of the reefs.

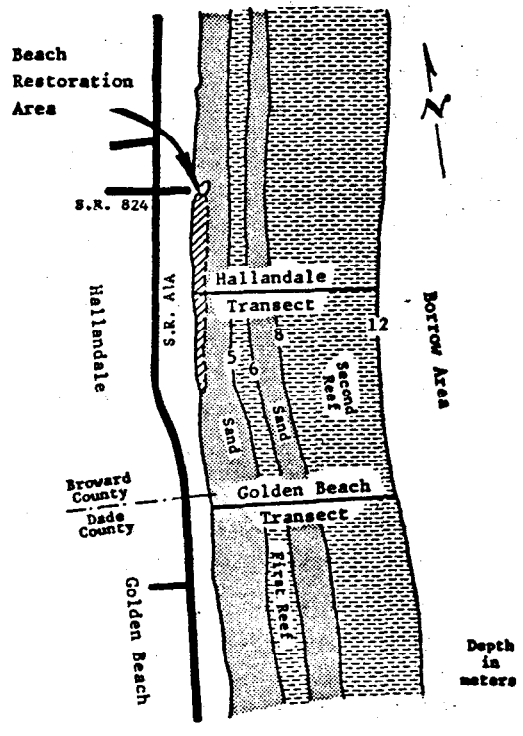

Figure 2 - Location of Hallandale and Golden Beach transects

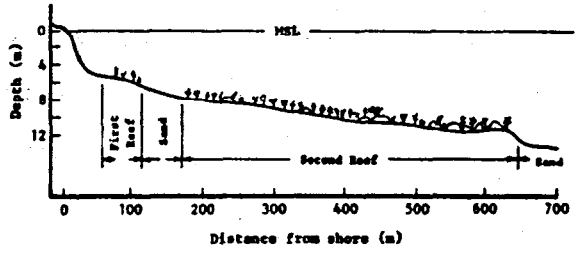

Figure 3 - Schematic profile of Hallandale showing configuration of reefs and sand

Dredging for borrow material seaward of the second reef produced many gorges, some as deep as 2 meters. During the dredging and beach restoration operation, turbidity of the water increased. These turbidities were most pronounced near the dredge and along the restored beach. Hard corals and reef animals adjacent to the offshore borrow site and the bottom animals covered by the dredged material were adversely impacted. Damage to the corals and limestone reefs resulted from scouring of the reef edge by the dredging equipment and siltation. Fish apparently vacated the areas of excessively high concentrations of suspended sediment resulting from both dredging and nourishment

as no ill effects were observed on fish populations. The greatest impact on fish appears to have been from the destruction or the covering of suitable habitat rather than suspended material. Seven years following beach restoration, a study was made comparing the during and after construction conditions at Hallandale. Golden Beach was also studied and used as a control area. The comparative study indicated that the benthic populations damaged or covered by the dredging and restoration operations had recovered and showed no evidence of damage. Fish species at Hallandale were found to be diverse and abundant. Certain fish such as the briddled goby, the rock beauty, and barred hamlet, which were absent or rarely seen during the construction study, were abundant. However, the dusky jawfish which was abundant during the construction study was absent from the restored beach. The jawfish which excavates permanent burrows in sandy areas at the base of reefs (but never on a level surface such as the sandflat) were not present in the disturbed study area. This may be attributed to the alteration of the substrate and its habitat.

CONCLUSION: Observations at Hallandale indicate that except for the jawfish which was probably displaced by an alteration of its habitat, the nearshore communities have recovered and show no lasting effects of beach restoration or offshore dredging operations.

ADDITIONAL INFORMATION: Contact the CERC-Coastal Ecology Branch (202) 325-7393.

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