CETN-V-16
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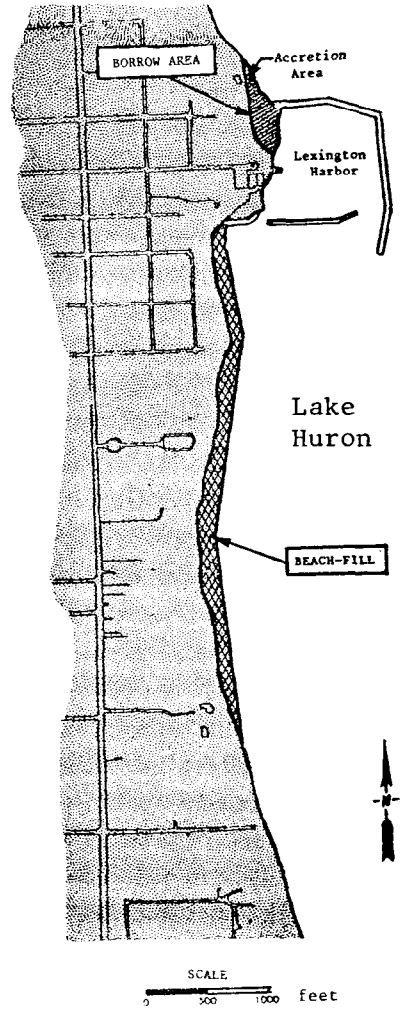
Coastal Engineering Technical Note

BIOLOGICAL EFFECTS OF BEACH RESTORATION ON THE GREAT LAKES SHORELINE

PROBLEM: The Great Lakes shoreline is characterized by areas of erosion and often the most environmentally desirable and cost effective solution for repairing an eroding shore is beach restoration. Considerable research has been done on the biological impacts of beach restoration projects along the Florida Gulf (CETN-V-3), Atlantic (CETN-V-5 and CETN-V-14) and Pacific (CETN-V-7) Coasts, but no prior research has been done in the Great Lakes.

BACKGROUND: In October 1980, about 54,000 cubic meters of material was deposited on an eroding beach south of Lexington Harbor, Michigan (see figure). About 19,000 cubic meters of the material was dredged from an accretion area at the shoreward end of the harbor's north breakwater. The remainder came from a borrow site on land (not shown).



Lexington Harbor, Michigan
Beach Restoration Project

EFFECTS OF BEACH RESTORATION: The eroding beach south of Lexington Harbor was studied before, during, and after the beachfill operation to evaluate the project impacts on the aquatic resources. Transects were established on the shoreline to be restored, and also north and south of the beachfill including one transect at the accreted beach to be used as a borrow site. Ponar grab samples (sediment samples

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from the top 0.3 meter of the bottom) were taken along each transect at 0.5-, 2-, 4-, and 5-meter depth contours. Sampling was conducted in June and July 1980 prior to beach restoration and in October 1980 immediately following restoration. Sampling was repeated in June, July and October 1981 to evaluate the impacts of the project.

Beachfill borrow material selected for this project was comparable with the natural beach sediments so it did not significantly alter the nearshore sediment grain sizes. The fill material did cover the existing rocky areas. Water quality was not significantly affected, although suspended sediments and turbidity both generally increased nearshore.

The macrozoobenthic populations were compared before, immediately after, and one year after the beach restoration operation. The major dissimilarity among the benthic communities before and after the operation was at the 0.5-meter depth contour. This dissimilarity, however, was evident at all transects and was determined not to be related to the beach restoration, but to a natural occurrence. The unstable conditions at the 0.5-meter depth were related to the surf action which resulted in low population densities and dissimilarity in community structures. Seine collections along the beach and gill net sets offshore of the restored beach and the adjacent beaches also revealed no adverse changes in fish populations attributable to beach replenishment operations. The accretion area that was dredged for beachfill borrow material was in a high energy area and rapidly filled and reverted to conditions prior to dredging.

CONCLUSION: It is evident that beach restoration impacts were of minor and short duration, and the macrozoobenthos and fish were able to recover within one year. These findings are consistent with those from other moderate to high energy coastal beaches. Adverse ecological impacts can be minimized when the grain-size characteristics of the beachfill material closely matches that of the natural beach sediments, and when the beachfill material is low in pollutants. Deposition of the beachfill material near the surf zone insures the least harm to the more stable, but less resilient offshore populations. In low energy areas, consideration should be given to shallow dredging for borrow material rather than deep dredging since a shallow pit would fill and recover quicker than a deep pit. In high energy areas, pits generally rapidly fill with sediments and revert to pre-dredging conditions. Fall appears to be a good period biologically for beach restoration operations in the Great Lakes.

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

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