Sea Life Rebounds After Beach Nourishment

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Final results of the Biological Monitoring Program (BMP) for Beach Nourishment Operations in Northern New Jersey (Manasquan Inlet to Asbury Park Section) indicate that all forms of animal and plant life essentially recover fully from the effects of beach nourishment in a relatively short time.

Since the U.S. Army Corps of Engineers first initiated beach nourishment projects in the 1960s, there has been concern about the long-term environmental impacts from these projects. To address these concerns, the New York District and the state of New Jersey began a massive biological monitoring study in 1993. The study cost approximately $8.5 million and was done over a 7-year period. The project where the study was performed covered approximately 21 miles of exposed high-energy beaches. More than 19 million cubic meters of sand were placed on the beaches since 1994, making this the largest nourishment project ever constructed by the Corps.

In cooperation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, and the New Jersey Division of Fish and Game, the 7-year BMP addressed concerns about potential ecological impacts due to beach nourishment. Monitoring included nourishment operations between Manasquan Inlet and Shark River in 1997 and a second nourishment operation between Shark River Inlet and Asbury Park in 1999-2000. A section of unnourished beach extending from Asbury Part to the northern edge of Deal acted as a control site.

Previous studies concluded that, in most cases, adverse impacts from beach nourishment were short term, minor, and were outweighed by the benefits of shore protection and recreation. Effects of beach nourishment were typically confined to the borrow (dredge) and beach (fill) areas. The adverse impacts include reduced abundance of animals that inhabit the sediment, altered animal community structure, increased turbidity, and altered feeding habits among fishes of commercial, recreational, or ecological importance. The goal of the BMP was to assess the effects of dredging and filling on aquatic life and to apply these findings to subsequent renourishment operations and similar projects.

In addition to monitoring the intertidal animal life, several less traditional monitoring components were incorporated into the BMP, including several recommended by the National Research Council. Monitoring was expanded from intertidal habitats to include nearshore depths (the area just off the beach) to determine if nourishment impacts extended beyond the immediate fill area. Suspended sediment plumes were measured at active fill sites and control areas as well as during storm events. Surf zone and

borrow area fish assemblages were characterized and the food habits of bottom-feeding fish were examined to detect potential consequences of bottom disturbance due to sand excavation on foraging success. Likewise, ichthyoplankton (larval fish) and juvenile fish assemblages were studied to evaluate the importance of the surf zone as a nursery area. Surveys of fishermen using jetties, groins, and sandy beaches evaluated the effects on recreational fishing. Finally, effects to threatened and endangered species were evaluated.

The results of the study can be summarized as follows:

Intertidal and Nearshore Animal Life: Animal life in the intertidal area was similar to that reported from the other mid-Atlantic coast sandy beaches. Beach nourishment resulted in short-term declines in abundance (numbers of animals), biomass (weight of animals), and taxa richness (numbers of different kinds of animals). Recovery was complete within 2 to 6.5 months after filling (the same time period noted in previous studies). Differences in recovery rates were most likely due to differences in the timing when nourishment was complete. No impact could be detected to nearshore fauna during the 1997 nourishment, although abundance and biomass values were still depressed 6 months after the 1999 nourishment.

Ichthyoplankton: There were no obvious differences between reference and nourished beaches in larval fish abundance, size, or species composition.

Surf Zone Fish: The surf zone fish assemblage was similar to those of other mid-Atlantic beaches. The only observed responses to nourishment operations included low bluefish (*Pomatomus saltatrix*) abundances in the vicinity of active fill discharge sites, interpreted as an avoidance response, and attraction of northern kingfish (*Menticirrhus americana*) to the nourishment area. There were no discernable long-term impacts to surf zone finfish distribution and abundance patterns.

Surf Zone Fish Food Habits: There was no indication of negative impacts related to beach nourishment on food habits of several dominant species (kingfish and silversides). The percentage of fish with filled stomachs was comparable at both control and nourished beaches, as was the composition of prey in their stomachs.

Turbidity and Suspended Sediments: Effects of beach fill operations on short-term turbidity appeared to be limited to a relatively narrow swath of beach front, with a lateral extent of several hundred meters. Suspended sediments were prominent in the swash zone in the immediate area of the operation, but appeared to decay rapidly with dispersal through the surf zone. With the exception of swash zone samples, the increase in turbidity over normal conditions appeared negligible. Total suspended sediment concentrations outside the swash zone seldom exceeded 25 milligrams per liter, a value comparable to concentrations many species experience in estuaries or during storms.

Offshore Invertebrate Life: Offshore animal assemblages were typical of medium sand habitats in the New York Bight. The most commonly found creature by far in this area is the sand dollar *Echinarachnius parma.* Dredging resulted in decreased total abundance, biomass, taxa richness, and average size of sand dollars. Immediately after dredging, the abundance of sand dollars declined and that of the spionid polychaete *Spiophanes bombyx* increased. Sand dollar abundance recovered quickly after both dredging operations (1997 and 1999) with no detectable difference between dredged and control (undisturbed) areas by the following spring. Biomass required 2 to 2.5 years for recovery.

Offshore Fishes: The borrow area finfish assemblage was similar to that for shelf areas between Delaware Bay and Cape Cod. There were no substantive differences in species composition or catch-per-unit-effort among borrow areas in pre-, during, and post-dredging samples.

Offshore Fish Food Habits: Analysis of the food habits of selected bottom-oriented fishes at the borrow areas (winter flounder, *Pleuronectes americanus;* summer flounder, *Paralichthys dentatus*; and scup, *Stenotomus chrysops*) indicated that no shifts in quantity or composition of diets occurred in relation to dredging operations.

Recreational Fishing Surveys: Recreational anglers fished primarily from the river inlet jetties and relatively few rock groins, apparently due to the ease of access to these structures. Segments of sandy beaches between structures were the least utilized fishing areas. Striped bass, flounder, and bluefish were the species most frequently targeted by anglers during the sampling periods, although some anglers (19 percent) fished for "anything that bites." An overwhelming number of anglers felt that fishing was better (71.1 percent) after construction, compared to the 29.4 percent who considered that fishing conditions had improved prior to construction or during construction (23.8 percent). Fishing access to stone groins is limited due to either their burial or notching, which was done to restore the natural littoral drift.

Threatened and Endangered Species: The affects of beach nourishment to threatened and endangered species appeared to be mostly positive. Beach nourishment has provided suitable nesting and growing habitat for the Federally-listed threatened piping plover (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*), and the state-listed endangered least tern (*Sterna altillarum*). Productivity rates of the piping plover in the project area have exceeded national and average state recovery rates, but appear to have reached their peak. Newly restored beaches have provided nesting habitat to support some of the largest least tern colonies in New Jersey. However, recent colonies are much smaller due primarily to the increase in density of vegetation on the beaches. Seabeach amaranth, which was last identified in New Jersey in 1913, has been identified on nourished beaches in years 2000 and 2001.

Conclusions: Impacts of beach nourishment to intertidal and nearshore fauna, larval and juvenile fish assemblages, and fish food habits were minor and short term. Suspended sediment and turbidity plumes associated with placement were limited to within a few hundred meters of the discharge pipe and concentrations were less than those experienced during storms. Borrow area animal life was significantly reduced after dredging, but most species recovered quickly, and the biomass of all species recovered within about 2 to 2.5 years. Borrow area fish showed no detectable changes in abundance, species composition, or feeding habits. Important bottom-feeding fish did not appear to rely on the borrow area for food. Beach nourishment provided suitable nesting and rearing habitat for threatened and endangered species. There was no apparent difference in recreational fishing except for limited access to notched stone groins.

For further information or questions regarding this study, contact either Mr. Mark Burlas at 212-264-4663, Dr. Gary Ray at 601-634-2589, or Dr. Douglas Clarke at 601-634-3770. Copies of the final report are available only on CD and can be obtained by contacting Mr. Tony Martin at 334-633-6100.