

The Big Picture: An Overview of Coastal Resources and Federal Projects

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Coastal geology plays an integral role in determining the ecological impacts of artificial beach construction and maintenance projects. The physical habitat of the coastal ecosystem is controlled by the underlying geology, and ecological processes are dependent on physical parameters. Ecological impacts occur on complex spatial and temporal scales. Direct impacts are repeated with each maintenance event and indirect impacts persist beyond both the project life and area. Beach nourishment creates an artificial substrate on the beach and shoreface, exposes a new substrate in the borrow pit, and introduces large volumes of sediment to the transport system. Higher erosion rates of the fill material increase the dynamism of coastal habitats.

Surf zone, nearshore and offshore fish are lethally and sublethally impacted by beach nourishment both in the short-term and long-term. Removal of offshore benthic habitat in the borrow area destroys the prey base for fish and alters the suspended sediment load. Dewatering of the slurry increases turbidity in the nearshore environment, and heavy equipment on the beach compacts, crushes and impedes movement of fauna. To the extent that turbidity reduces the penetration of sunlight, primary production by photosynthesis is reduced.

The manmade beach substrate lacks the internal stratigraphy and geomorphology of the natural beach, burying invertebrate fauna and hindering reconstruction of burrows. Migratory, nesting and overwintering shorebirds feed on intertidal invertebrates. Sea turtles nests rely upon sediment moisture, organic content, gas diffusion rates, and substrate temperature. Contaminants in the fill material may permeate into turtle eggs, erosional escarpments can block female turtles from reaching the back beach, and construction lighting can disorient turtle hatchlings.

Many birds prefer overwash areas, which are prevented with an artificial berm and levee system. Levee construction buries the seed base of coastal vegetation, creates a monoculture, and alters salt and windflow patterns. Maintenance and stabilization of the levees reduces aeolian transport, prevents formation of early successional habitat and encourages succession of plant communities behind the levee.