Modular Gabion Systems

Project

Location:

Patrick Air Force Base, Florida

Engineer:

AMEC

Owner:

Patrick Air Force Base

Project Date:

May-June, 2001

At the Family Camp site, over 2,000 feet of shoreline was experiencing severe erosion, with several feet of shoreline lost in the last few years and some campsites were threatened. It was determined that the ideal defense for the beach wetland ecosystem against attrition was a network of Black and Red Mangrove roots from Black and Red Mangrove trees. Establishing a mature mangrove network would require initial stabilization of the beach from erosion to give plantings an opportunity to grow.

To accomplish this, a row of stainless steel Modular Gabion Systems gabion baskets was buried below the existing grade parallel to the shoreline, landward of an established wetlands. The installation site was prefitted with filter fabric, gabion baskets were placed and filled with locally quarried Coquina stone. The lids of the baskets were then closed and the void spaces between the stone were filled with sand. An additional layer of sand, six inches thick, was placed over the gabions. Red and Black mangrove trees were then planted on top of and seaward of the gabion structure in biodegradable cardboard tubes, and the remaining disturbed areas were seeded.

Burying the gabions allows the beach to retain its natural appearance. The baskets will not normally be seen yet still provide erosion protection for the estuary. In a severe storm event, the gabions will protect the beach and the upland in two ways. First, if overtopped, the gabions will act as a retaining wall, preventing soil from behind the gabion structure from washing into the river. Second, if a storm event causes erosion of the frontal beach, the gabion structure will absorb the energy from the storm waves, thereby impeding beach loss. It is possible that this gabion basket system could be exposed during storm events. However, once the wave action subsides, naturally-occurring sand deposition will restore much of the last sand.

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Project, continued...

A minimal amount of imported sand can be used to recover the tops of the baskets if needed.

The gabion structure will provide protection of the shoreline until the mangroves can establish extensive root networks in and around the Coquina Rock fill. The application of stainless steel wire for construction of the gabion baskets will guarantee their longevity through repetitive salt-water incursion by the Banana River Estuary or exposure to other corrosive environments.

Combining the soil stabilizing effect of indigenous vegetation with the engineered structure of a gabion basket in an environmentally sensitive wetlands while maintaining an all natural appearance is an innovative approach to shoreline stabilization.

Project Update

The 2004 Hurricane Season brought unprecedented devastation to the state of Florida in a two-month barrage of storms. Hurricanes Charley and Ivan made landfall on the western side of the state; Frances and Jeanne tracked across the Florida Peninsula to make landfall within 100 miles of Patrick Air Force Base.

In the aftermath of these storms, all the beaches in the area were closed and were to remain so until the following May. In November however, just weeks after the storms, the beaches at Patrick AFB had regained 3-feet of sand and were reopened.

With predictions from the National Hurricane Center for continued escalation of hurricane activity in the years to come, it is important to note that here, where the beaches benefitted from re-nourishment and protection projects, the shoreline fared substantially better than at other, unprotected, beaches.

Compare the photos at top left (construction phase, 2001) and top right (pre-construction, 2001) with the photos at bottom left and bottom right taken from similar vantage points on November 11, 2004 following the hurricanes. The photo mid-right shows the established mangrove trees.

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