Coastal structures and the future: Examples at Sandy Hook

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Recent studies have identified the need to adapt to climate change by allowing landforms and habitats to migrate landward, although implementation of actual adaptation responses is limited (Nordstrom et al. in press). The increasing vulnerability of infrastructure to damage from coastal storms and the increasing losses of coastal habitat have heightened the need to reevaluate where and how hard shore protection structures best function (Nordstrom 2014). Removing the barriers that shore protection structures create between coastal and upland habitats can reestablish exchanges of sediment and the ecological functions of the natural ecotone. The potential for removing structures to achieve restoration goals was evaluated in 12 US national parks using the following criteria: condition of structures, influence of natural processes, environmental benefits, public safety, and visitor access and use (Nordstrom et al. in press). We found that 145 structures out of 407 in the 12 parks could be removed or allowed to deteriorate. At Sandy Hook, 19 shore-parallel walls are present along the ocean and bay shore of a 10 km long portion of the spit managed by the National Park Service (Nordstrom and Jackson 2013). Most of the shore protection structures here were built when the spit was formerly used by the US Army, and many bulkheads on the bay shore have deteriorated. The site of the ferry dock and chapel is an example of multiple generations of structures in different stages of deterioration.

New habitat can be created by removing structures, allowing erosion of coastal formations to provide the sediment source. Allowing shore protection structures to deteriorate is less expensive than removing them but will leave human infrastructure in the landscape. Removing structures is more costly but can result in a more rapid reversion to a natural system. The time horizon is critical in determining the social, political and economic feasibility of removing structures and the expectations for geomorphic and habitat change. The feasibility of protecting threatened buildings and roads will decrease in the future as sea level rises and the existing protection structures degrade or fall below new design standards. One suggestion is to allow functional buildings with less historic value to remain in use until threatened by erosion. Little reason exists to build new structures to protect them. Allowing developed sites to revert to natural processes can establish a precedent and provide good demonstration areas for promoting stakeholder acceptance of retreat strategies. The chapel site is one location where this option could be tested.

Many reasons exist for not taking a more pro-active approach to removing protection structures, including (1) conflicting policy directives; (2) presence of key access roads and critical archaeological and historic sites; (3) lack of data; (4) lack of funds and human resources; (5) reluctance to replace known problems with unknown problems; 6) consideration of visitor desires; and (7) reluctance to allow erosion to occur. Projects to remove protection structures are likely to be viewed as successful only if results are specified as a positive product, and the distinction between the concept of loss (erosion of existing landforms and habitats) and the concept of gain (evolution of new landforms and habitats) is made clear.

References

Nordstrom, K.F. 2014. Living with shore protection structures: a review. *Estuarine Coastal and Shelf Science*, 150: 11-23.

Nordstrom, K.F. and N.L. Jackson. 2013. Removing shore protection structures to facilitate migration of landforms and habitats on the bayside of a barrier spit. *Geomorphology*, 199: 179-191.

Nordstrom, K.F., N.L. Jackson, C.T. Roman. Facilitating landform migration by removing shore protection structures: opportunities and constraints. *Environmental Science and Policy*, in press.