

THE MARBLE BEACHES OF TUSCANY*

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ABSTRACT. Beach-nourishment operations designed to replace sediment lost through erosion change the identity and meaning of coastal landscapes. Seven beaches in Tuscany, nourished with marble-quarry waste, reveal how an industrial byproduct is naturalized by particle rounding and sorting and can become a positive symbol of human-altered nature. The marble was placed on formerly sandy beaches, resulting in different grain size and color of sediments, beach morphology, and value for human use. The abrasion rate of marble makes the nourished beaches unsatisfactory when viewed solely as protection structures, but the rapid particle rounding and aesthetic appeal of marble increase the acceptability of the beaches for recreation. *Keywords:* abrasion, beach nourishment, gravel beach, mine waste, shore protection, Tuscany.

Nearly all landscapes bear the imprint of humans, and the dichotomy between the ways human and natural landscapes are interpreted and managed is breaking down (Graf 2001; Vogel 2003; Heyd 2005). The likelihood that a landscape will be subject to direct human manipulation is related to economic or social objectives. These objectives may be incompatible with environmental objectives in creating landforms as functional and sustainable natural systems (Saurí-Pujol and Llurdés i Coit 1995; Graf 2001). One of the most vulnerable natural landscapes is a sandy coast, where beaches have great recreational and commercial value and where landforms are easily reshaped or replaced by earth-moving machinery.

Construction and protection of human facilities close to the water on eroding coasts is eliminating many beaches. Concurrently, the intensity of beach use is growing, placing greater demand on remaining beach space and increased economic value on beaches (Beachmed, 2004; Reid and others 2005). The principal solution for managing erosion on coasts developed for tourism is artificial beach nourishment (Hanson and others 2002). The beach may be replaced, but the high cost of obtaining, transporting, and emplacing fill material often leads to use of sediment that differs considerably from native sediment in provenance or size (Pacini, Pranzini, and Siritto 1997; Nordstrom 2000).

Engineering works can be catalysts for reconfiguring the relationship between nature and humans (Kaika 2006), but considerable debate occurs about how nature should be perceived and appreciated (Schein 1997; Crist 2004; Ross 2005). Many beaches nourished with sand are mechanically graded into flat recreation platforms.

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