URBAN COAST

Special Issue: State of the Bay

Volume 5 Issue 1 *Article 4.2*

December 2015

Looking Ahead: Sediment Management

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The *Urban Coast* multidisciplinary scientific journal is a product of the Center for Santa Monica Bay Studies, a partnership of Loyola Marymount University's Seaver College of Science and Engineering and The Bay Foundation.

Recommended Citation:
Martin, K. and G. Wang (2015). State of the Bay Report. "Looking Ahead: Sediment Management." *Urban Coast* 5(1): 175-179.

Available online: http://urbancoast.org/

ISSN 2151-6111 (print)
ISSN 2151-612X (online)

4.2 Sediment Management

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There has been growing recognition that the health of the Bay's coastal and upland habitats depends on sediment transport processes in the watershed, and the transport of sediments up and down the coast (Yates et al. 2009). Addressing these issues is becoming increasingly urgent as predictions related to climate change indicate that sea level rise and more intense storm surges will likely cause additional beach erosion (Bird 2000, Zhang et al. 2004, Griggs et al. 2005, McLachlan and Brown 2006). Furthermore, warmer temperatures and altered rainfall patterns may increase the range and frequency of wildfires, potentially leading to more erosion and changing sediment loading in affected upper watershed areas.

The Bay's sandy beaches provide a great example of what might be to come. Several large erosion events with intense waves and storm surges have removed sand from many beaches (Orme et al. 2011). Coastal construction of houses and roads have been followed by installation of seawalls and rock revetments that protect structures, but increase the reflection of waves, and contribute to a higher erosion rate (Runyan and Griggs 2005, Griggs 2005). Beach widths in areas with armoring and coastal construction tend to shrink over time, a classic example of "Coastal Squeeze" (Feagin et al. 2005, Defeo et al. 2008, Dugan and Hubbard 2006, Dugan et al. 2008).

One response to sand erosion is to bring in new sand and replenish the beach, either from an offshore location or a distant source inland. The ecological impacts of these methods are now recognized as more significant than previously believed (Lawrenz-Miller 1991, Moiser and Witherington 2002, Manning et al. 2013, Manning et al. 2014). If offshore subtidal sand is used, its removal disturbs the dwellers of the soft sediments at the source. Placing the sand in a coastal location may bury or smother existing beach life, and recovery may take months or years for some species, particularly if sand grading and raking continue after the initial placement (Martin et al. 2005, Peterson et al. 2000, Peterson et al. 2014). Sediment plumes from the project site can also impact nearby ecosystems, such as rocky intertidal areas or kelp forests (Peterson et al. 2006).

The carbon footprint of moving sand between locations is also extensive. For offshore sand, it means a barge and dredge operate around the clock for months, travelling between the borrow site and the project. Use of an inland sand source requires many trips by dump trucks; at 10 cubic yards per truck, a 100,000 cubic yard project requires 10,000 round trips between the sand source and the drop location. Some proposed projects are 4 times that size, or more.

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LOOKING AHEAD: Sediment Management

An unexpected concern has developed in the past few years regarding the source of sand for beach replenishment projects. In the past it was assumed that sand would be available in sufficient quantities, and of sufficient quality, for any project that could afford to obtain it (Griggs et al. 2005, Flick and Ewing 2009). However, as municipalities begin assessing future needs for sand, this sand will become harder to come by, as a private project proposal to protect homes at Broad Beach recently discovered. To date, no offshore sand sites have been made available for purchase for this project. Municipalities and the county of Los Angeles stressed the importance of those sand reserves for potential future projects on public beaches, making them unobtainable for private projects (Orme et al. 2011, Pilkey and Cooper 2014).

While beach communities desperately try to hold onto the limited sand supplies, the region's flood control agencies constantly worry about how to get rid of the vast amount of sediments accumulated behind the huge network of dams and debris basins along the foothills of the region's mountain range. They run into strong opposition against upland disposal due to the negative impacts from trucking activities and the loss of natural habitat at the disposal sites. Meanwhile, transporting sediments from upper watersheds to beaches via either the existing flood control channel or through mechanical transportation such as trucking have been deemed unfeasible technically and economically.

Sediment accumulated behind dilapidated dams such as Rindge Dam on Malibu Creek is another potential source of material for beach replenishment (Sherman et al. 2002). However, there are still many challenges to address, including environmental impact review and funding, before removal of the dam and the transport of the sediments trapped behind it can flow, or be taken to the coast via trucking or conveyor belt.

It will take a paradigm shift in sediment management to effectively address these challenges and concerns. A holistic, watershed-based approach is required to restore the natural sediment transport process, which is considered the best long-term solution to the problem. This means a shift from dealing with sediment solely as a flooding risk to considering sediment as a resource for our waterways, floodplains, beaches and reefs. It also means changing the management principles that emphasize disposing sediments as waste to places such as landfills, moving toward keeping the sediments within the natural system where they are needed to maintain a balanced sediment budget and the ecological functions of riparian, wetland and beach habitats.

No doubt this shift will be highly controversial and challenging, due to the difficulty in modifying the existing flood control system, institutional barriers, and potential socio-economic impacts. Still, public agencies with sediment management responsibilities should be encouraged to think out of the box and consider taking an integrated and resource-focused approach to sediment management. An important step toward this approach is the incorporation of additional environmental impacts and values into cost-benefit analyses for various sediment management alternatives. One example is the transport and placement of sediment accumulated in upper watershed for beach nourishment. While the cost of this alternative compared to trucking to a landfill may be high from the Flood Control District's standpoint, the cost-benefit equation could shift if the economic benefits of replenishing beaches with natural material are taken into account. Benefits may also include: protection of coastal areas from erosion, flooding, and future sea-level rise scenarios; ecological and recreational benefits of replenished beaches; reduction of carbon footprints; and nutrient cycling. Another important step is to encourage more collaboration among county departments and other agencies to reduce and break regulatory and operational barriers. In addition, more studies and pilot projects should be carried out to promote flow-assisted sediment transport (FAST), or other kinds of sluicing as a mechanism for restoring some natural sediment transport through the system.

Figure 4.2-1. Los Angeles County Department of Beaches and Harbors using bulldozers to protect infrastructure on Dockweiler Beach in preparation for a storm in September 2011. *Photo Credit: Lia Protopapadakis, The Bay Foundation.*

Figure 4.2-2. Sandbags protecting property and contributing to beach erosion on Broad Beach, circa 2008. *Photo Credit: Lia Protopapadakis, The Bay Foundation*

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