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# The importance of benthic nutrient flux in supporting eutrophication in an intermittently tidal coastal lagoon

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## ABSTRACT

Coastal lagoons are unique coastal environments, occupying about 13% of coastal areas world-wide. Coastal lagoons are often poorly flushed and, as a consequence, sensitive to eutrophication. This sensitivity is heightened in lagoons that are intermittently closed to oceanic exchange. We investigated the seasonal patterns of sediment nitrogen (N) and phosphorus (P) biogeochemistry in Malibu Lagoon, an intermittently tidal coastal lagoon in Los Angeles County, California, USA. Wet season sediment deposition to the lagoon was hypothesized to provide a dry season source of nutrients through the remobilization of pore water nutrients to surface waters, thus fueling blooms of aquatic plants. The objectives of the study were to: 1) characterize seasonal patterns of bulk sediment and pore water N and P and relative cover of primary producer communities, 2) estimate wet season and average annual sediment deposition rates and associated particulate N and P load to the Lagoon using radioisotopes beryllium-7 (7Be) and lead-210 (210Pb), and 3) estimate the benthic flux of nutrients to surface waters during five sampling periods over an annual cycle. Malibu Lagoon sediment nutrient content was within the range of several of the most eutrophic systems worldwide. During the wet season, the lagoon inlet was open, the system well flushed, and primary producer cover low. During the dry season, flows diminished and the inlet closed, causing a decrease in salinities, an increase in water level, and the growth of dense beds of *Ruppia maritima*. During the wet season, an estimated 3 ± 1 cm of sediment was deposited in the Western Lagoon, bringing an associated 3300 kg of total nitrogen (TN) and 830 kg of total phosphorus (TP). Estimates of pore water diffusive fluxes predicted a net dry season release of 673 lbs of TN and 52 lbs of TP. Comparison with other dry season nonpoint sources indicates that sediment release represented 22% of the TN sources and 7% of the TP from nonpoint source inputs to the Lagoon during the dry season. Thus, remobilization of nutrients from sediment helped to support dry season eutrophication and hypoxia in this intermittently tidal coastal lagoon.

## Full Text

ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/AnnualReports/2009AnnualReport/AR09_075_095.pdf