

Flessa, K.W., Carriquiry, J.D., Avila-Serrano, G.E., Téllez-Duarte, M.A., Cintra-Buenrostro, C.E., Rowell, K. and Dettman, D.L., 2004. At the end of the river: Sedimentary and biotic effects of river management on the Colorado River Delta. Geological Society of America Abstracts with Programs 36: 551.

AT THE END OF THE RIVER: SEDIMENTARY AND BIOTIC EFFECTS OF RIVER MANAGEMENT ON THE COLORADO RIVER DELTA

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Once controlled by climatic and seasonal variation in precipitation, the Colorado River at its delta is now largely regulated by human activity. Although the accidental diversion of the river into the Salton Trough in 1905 mimicked natural diversions into prehistoric Lake Cahuilla, reservoirs and aqueducts have now strongly altered hydrologic regimes, sedimentary processes, habitats and biotas at the river's mouth. Lakes Mead and Powell eliminated seasonal floods and now trap most of the river's annual sediment load of 160 million metric tons. An extensive canal system for farms and cities has diverted almost all of the river's annual discharge of 16 billion cubic meters before it reaches the Gulf of California. Because few observations were made of the delta prior to extensive human alteration, sediments, death assemblages, and stable isotopes in skeletal remains provide baseline information for the nature of the delta in predambrian times.

Waves, tides and winds now control the supply and distribution of the delta's sediments. Lag deposits of shells form cheniers as previously-deposited muds and silts are re-suspended and transported into deeper water. Long-basinal sediment transport from the river has been replaced by cyclonic cross-basinal transport and an increased influx of sediments eroded from the Sonora coast.

The near-elimination of freshwater influx has increased salinity at the river's mouth and changed the estuary's circulation: instead of a freshwater plume extending 60 km into the Gulf, hypersaline water now forms and sinks at the river's mouth. Seasonal floods no longer reach into the supertidal zone to support ephemeral wetlands and driftwood is now rare.

These changes in sediments, flood regimes and salinity have profoundly altered the habitats of the delta and estuary. Stable isotopes in mollusk shells and fish otoliths document that many species formerly inhabited the brackish water of the predambrian estuary. Nursery areas for commercially important shrimp and fish have been greatly reduced. Live:dead comparisons document decreases in population sizes: the endemic bivalve *Mulinia coloradoensis* – a prey item for crabs and snails – has been reduced by 90%.

Restoration of the delta's habitats and species will depend on active management to simulate prior hydrologic and sedimentary regimes.