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Microplastics in Lake Mead National Recreation Area, USA: Occurrence and biological uptake

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Abstract

Microplastics are an environmental contaminant of growing concern, but there is a lack of information about microplastic distribution, persistence, availability, and biological uptake in freshwater systems. This is especially true for large river systems like the Colorado River that spans multiple states through mostly rural and agricultural land use. This study characterized the quantity and morphology of microplastics in different environmental compartments in two large reservoirs along the Colorado River: Lakes Mead and Mohave, within Lake Mead National Recreation Area. To assess microplastic occurrence, surface water and surficial sediment were sampled at a total of nine locations. Sampling locations targeted different sub-basins with varying levels of anthropogenic impact. Las Vegas Wash, a tributary which delivers treated wastewater to Lake Mead, was also sampled. A sediment core (33 cm long, representing approximately 19 years) was extracted from Las Vegas Bay to assess changes in microplastic deposition over time. Striped bass (*Morone saxatilis*), common carp (*Cyprinus carpio*), quagga mussels (*Dreissena bugensis*), and Asian clams (*Corbicula fluminea*) were sampled at a subset of locations to assess biological uptake of microplastics. Microplastic concentrations were 0.44–9.7 particles/cubic meter at the water surface and 87.5–1,010 particles/kilogram dry weight (kg dw) at the sediment surface. Sediment core concentrations were 220–2,040 particles/kg dw, with no clear increasing or decreasing trend over time. Shellfish microplastic concentrations ranged from 2.7–105 particles/organism, and fish concentrations ranged from 0–19 particles/organism. Fibers were the most abundant particle type found in all sample types. Although sample numbers are small, microplastic concentrations appear to be higher in areas of greater anthropogenic impact. Results from this study improve our understanding of the occurrence and biological uptake of microplastics in Lake Mead National Recreation Area, and help fill existing knowledge gaps on microplastics in freshwater environments in the southwestern U.S.