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LAND TO SEA
MICROPLASTICS
CONSORTIUM

MANAGING MICROPLASTIC POLLUTION IN THE SAN FRANCISCO BAY-DELTA

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ISSUE

Microplastics are a pervasive and persistent class of pollutants found across aquatic environments. An estimated 19–23 million metric tons of plastic enter aquatic systems each year, a figure projected to rise substantially if current production and waste management practices remain unchanged. Their enormous diversity in size, shape, polymer type, weathering, and chemical composition presents significant challenges for monitoring, comparing findings across studies, and developing effective regulations.

California is an international leader in microplastics research and policy. In 2020, the State Water Resources Control Board became the first agency globally to formally define microplastics for drinking water, and California has since developed statewide monitoring strategies. Yet challenges remain in translating research into effective management. We use the San Francisco Bay–Delta as a case study because of its extensive monitoring infrastructure and diverse urban, agricultural, industrial, wastewater, and stormwater inputs. Our review draws on research from California and beyond, as well as a 2025 symposium hosted by the Delta Science Program and UC Daivs that brought together researchers, policymakers, and other regional stakeholders.

KEY RESEARCH FINDINGS

Urban stormwater runoff is a major pathway for microplastic pollution in the San Francisco Bay. Regional monitoring found approximately 140-fold higher mean microplastic concentrations in stormwater than in treated wastewater effluent. Tire wear particles and synthetic fibers are important sources, with household dryers representing an additional, often overlooked pathway for microfiber emissions.

Microplastic exposure can disrupt biological processes across multiple levels of organization. Documented effects include altered growth, reproduction, metabolism, behavior, and tissue health. Toxicity varies with particle characteristics and weathering, while population- and ecosystem-level impacts remain uncertain.

Lack of standardized methods and environmentally realistic studies limits ecological risk assessment and management. Inconsistent sampling and analytical methods, unrealistic laboratory exposures, and insufficient long-term toxicity data hinder comparisons across studies and the development of reliable risk thresholds for regulatory decision-making.

RECOMMENDED ACTIONS

To strengthen microplastic pollution prevention and management, we recommend the following actions:

Prioritize upstream source reduction, reducing unnecessary plastic production and use, redesigning high-emission products such as tires, textiles, and paints, and moving beyond product-by-product regulation toward broader, essential-use approaches.

Strengthen standardized monitoring and accessible data, supporting consistent analytical methods, environmentally realistic toxicity testing, long-term monitoring, and publicly accessible data to inform ecological risk assessment and management.

Invest in and evaluate targeted pollution-control strategies, including stormwater treatment, microfiber filtration, and other source-specific interventions, with an emphasis on demonstrating effectiveness under real-world conditions.

MORE INFORMATION

This brief summarizes findings from the article “From Sources to Solutions: The San Francisco Bay-Delta System as a Microcosm for Microplastic Science,” by Christina Pasparakis and colleagues, available at https://doi.org/10.1021/acsestwater.6c01560. For more information, contact Christina Pasparakis at cpasparakis@ucdavis.edu.

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