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Evaluating the environmental impact of cleaning the North Pacific Garbage Patch

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Ocean plastic pollution is a pressing environmental challenge and removal of legacy plastic pollution is needed to avoid long-term ecological damage in our oceans. At the same time, cleanups need to ensure that there is a net environmental benefit, i.e., that the harm reduction achieved by removing plastic pollution exceeds potential environmental damage caused by the cleanup. Here, we present a novel plastic pollution impact assessment framework and apply it to evaluate whether cleanups targeting legacy plastic pollution accumulated in the North Pacific Garbage Patch (NPGP) can provide a net environmental benefit to marine life and carbon cycling in the North Pacific subtropical gyre, using The Ocean Cleanup as a case study. Our findings suggest that cleaning the NPGP may have a net positive impact on marine life in the area, with largest benefits for seabirds, marine mammals and zooplankton. It may further mitigate possible long-term impacts on regional carbon cycling by avoiding the generation of secondary microplastics, which have the potential to modify carbon flows through food webs. However, the long-term benefits of plastics removal to ocean carbon sequestration remain uncertain and require improved estimation of the persistence of ocean plastic pollution and its influence on carbon fluxes. Our framework provides a critically needed tool to assess impacts of environmental remediations on marine ecosystems. Such frameworks will remain especially useful and timely to evaluate the outcomes of the United Nations Treaty on Biodiversity Beyond National Jurisdiction and the Global Plastics Treaty.

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