

Polystyrene Foam Food and Beverage Containers should be replaced with safer and more sustainable materials

Evidence regarding the sustainability and toxicity of expanded polystyrene (EPS) single-use containers supports replacing them with a more sustainable and safe material. EPS food and beverage containers are single-use, yet persistent and not economically feasible to recycle. Thus, millions of single-use EPS items are sent to a landfill each day, where they will remain for hundreds to thousands of years. Moreover, its lightweight makes it difficult to manage which is one reason EPS is one of the top litter items found on beaches and in the environment. Lastly, EPS containers may pose a hazard. Some studies have found they can leach chemicals into our food and others have demonstrated that their leachate is toxic to laboratory animals. Replacing EPS with a more sustainable material supports a healthy environment for both wildlife and people.

Background on EPS

Expanded polystyrene (EPS; often referred to as Styrofoam®) is often used to make single-use food and beverage containers. Made from petroleum products, they are cheap, durable and don't need to be rewashed after each use. EPS food and beverage containers are generally used for roughly 30 minutes and then discarded – most often to landfill.

Polystyrene foam containers are not sustainable. EPS has a low recycling rate. Although recycling is possible, it is not economically viable due to the cost of hauling the lightweight, high volume waste and the lack of a market for the material (Ragan, 2007; Nguyen, 2012). Thus, single-use EPS that is with people for ~30 minutes are sent to a landfill where they may last an estimated 500 – 1,000,000 years. In the United States, millions of EPS products are used per day (Fela, 2015). Their lightweight may enable them to escape waste management via wind and end up in the environment. EPS food containers are of the most common litter items found on beaches globally (Zhou et al., 2011).



Photo courtesy of Heal The Bay

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Policy Recommendations

1. Pass a ban on or regulation of EPS for single-use food and beverage containers to help ensure these materials are not littered into the environment.
2. Substitute EPS with non-disposable food and beverage containers or single-use food and beverage containers made with materials that are more sustainable and inert.

We support legislation banning or regulating the use of single-use polystyrene foam food and beverage containers—a measure that supports a more sustainable planet and healthy wildlife and people.

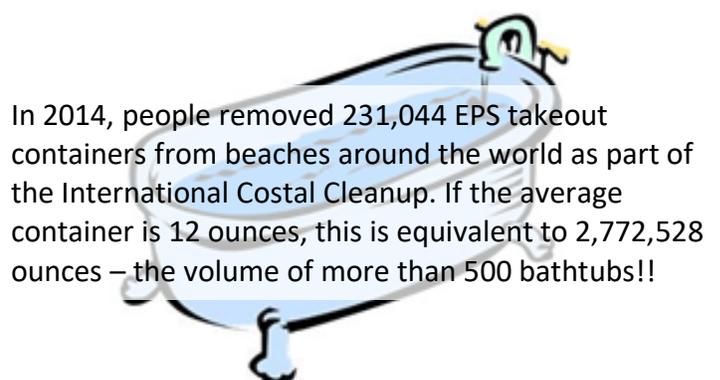
EPS contamination and harm

There is widespread contamination of EPS in the environment. Plastic debris has become an issue of concerns for aquatic habitats globally. Of most concern, are single-use plastic items, which are commonly found littered on beaches. This includes expanded polystyrene foam. In fact, polystyrene has been reported as one of the top items of debris recovered from shorelines and beaches worldwide (Ocean Conservancy, 2016), including in remote Antarctica (Convey et al., 2010). EPS is also found in the stomach of many species of wildlife (Boerger et al., 2010; Schuyler et al., 2014; see image below). When polystyrene does not become litter, it is placed into a landfill where it will remain for a long time taking up valuable space.

Polystyrene foam may be hazardous to humans and wildlife. EPS products are made out of a polymer that is composed of some chemicals of concern (Lithner et al., 2011) - styrene and benzene. Both EPS and styrenes are reported in ocean water and sediments globally. The styrenes are suspected to be from polystyrene products weathering and leaching in the oceans (Kwon et al., 2015). This may be problematic for aquatic animals, as studies have determined that polystyrene microplastic and the leachate from EPS can lead to mortality and decreased reproduction in aquatic invertebrates (Cole et al., 2015; Sussarellu et al., 2016; Thaysen et al., 2018). Under certain conditions, styrenes have also been found to leach into food and drink for human consumption, sometimes at levels above those listed as permissible by the World Health Organization (Sanagi et al., 2008; Tawfik and Huyghebaert, 1998). This may be problematic, as styrenes have been suggested to have carcinogenic properties (Erickson, 2011).



A piece of EPS debris removed from the gut content of a ring-billed gull. Courtesy of C. M. Rochman.



In 2014, people removed 231,044 EPS takeout containers from beaches around the world as part of the International Coastal Cleanup. If the average container is 12 ounces, this is equivalent to 2,772,528 ounces – the volume of more than 500 bathtubs!!

References: Boerger, et al. *Marine Pollution Bulletin*, 60, 2275-2278 (2010); Cole et al. *Environmental Science and Technology*, 49, 1130-1137 (2015); Convey et al. *Polar Biology*, 25, 612-617 (2002); Erickson, B. E. *Chemical & Engineering News*, 89, 11 (2011); Fela, J. *Frontiers in Ecology and Evolution*, 13, 348-352 (2015); Kwon et al. *Journal of Hazardous Materials*, 300, 359-367 (2015); Lithner, D. et al. *Science of the Total Environment* 409, 3309-3324 (2011); Nguyen, L. D. Masters Thesis SJSU (2012); Ocean Conservancy. *International Coastal Cleanup Report* (2016); Ragan, G. A. *Journal of Chemical Health and Safety* 14, 17-20 (2007); Sanagi, M. et al. *The Malaysian Journal of Analytical Sciences* 12, 542-551 (2008); Schuyler, Q. et al. *Conservation Biology*, 28, 129-139 (2014); Sussarellu, R. et al. *PNAS* 113, 2430-2435 (2016); Tawfik & Huyghebaert. *Food Additives Contaminants*, 15, 592-599 (1998); Thaysen et al. *Frontiers in Marine Science*, in press; Zhou, P. et al. *Marine Pollution Bulletin* 62, 1998-2007 (2011).