

Facts about Styrofoam[®] Litter (Expanded Polystyrene Foam)

“Polystyrene Foam” in the Marine Environment

- Expanded polystyrene foam (EPS), (commonly known as Styrofoam[®]) is pervasive in the marine environment. Like most plastics, polystyrene is lightweight and floats. When littered, it is carried from streets and through storm drains out to the ocean.¹
- Plastics, including EPS, *photodegrade*. That is, they break down into smaller and smaller pieces and marine animals easily mistake polystyrene for food.²
- The lifetime of plastics in the marine environment is unknown. Some researchers feel that the composition of conventional petroleum-based plastics as durable polymers means they will degrade to increasingly smaller sizes but never disappear.³
- Roughly 80 percent of marine debris originates from land-based sources. Plastics comprise 90 percent of floating marine debris.⁴
- A study of beach debris at 43 sites along the Orange County coast found EPS was the second most abundant form of beach debris.⁵

Human Health Effects from PS and Styrene

- EPS is made using the monomer, Styrene, a suspected carcinogen and neurotoxin. Over 13 billion pounds of Styrene were produced in the US in 2006, 65% of it was used in manufacturing polystyrene.
- Styrene can migrate from polystyrene containers into food and beverages when heated, or in contact with fatty or acidic foods.⁶
- Styrene residues are found in 100% of all samples of human fat tissue.⁷
- The Food and Drug Administration has determined that the styrene concentration in bottled drinking water should not exceed 0.1 part per million (ppm).⁸ The U.S. EPA drinking water standard is 1 ppm.
- Styrene can be found in air, water, and soil after release from the manufacture, use, and disposal of styrene-based products.⁹
- Styrene exposure increases the risk of leukemia and lymphoma and is a neurotoxin.¹⁰
- Workers in polystyrene products manufacturing are exposed to many harmful chemicals, including Styrene, Toluene, Xylene, Acetone, Methyl Chloride, and Methyl Ketone.¹¹
- Occupational exposure to Styrene increases risk of lymphoma, leukemia, lung tumors, pancreatic cancer, urinary bladder cancer, prostate cancer, and colorectal cancer. High rates of neurotoxicological effects have been reported in workers, including slowed reaction time, effects on balance and spatial orientation, hearing problems, concentration problems, and decreased color discrimination. Some studies also show significant decrease in sperm count and increased sperm abnormality.¹²

Local jurisdictions spend millions cleaning litter¹³

- Caltrans spends approximately \$60 million a year to remove litter and debris from roadsides and highways.
- The County of Los Angeles (L.A.) spends \$18 million annually on litter cleanup and education.
- Some coastal communities spend considerable funds on beach cleaning. For example, L.A. County collects over 4,000 tons of trash annually on its beaches. In 1994, it cost the County over \$4 million to clean 31 miles of beaches.

- Since 2001, Southern California cities have spent in excess of \$1.7 billion cleaning trash out of storm drain systems leading to the L.A. River and Ballona Creek in order to comply with stormwater regulations.

PS Litter – Measureable Reductions from PS Foodware Ban

- One year after implementation of the San Francisco ordinance that prohibits the use of EPS foodware, San Francisco’s litter audit showed a 36% decrease in EPS litter.¹⁴

PS Food Packaging is Not Recyclable

- EPS food packaging is typically not “clean” enough to be recycled.¹⁵
- EPS has a very low recycling rate. According to a 2004 study by the California Integrated Waste Management Board, of the 377,580 tons of polystyrene produced in the state, only 0.8% is recycled. Of that, only 0.2% (310 tons) of polystyrene food service packaging is recycled.¹⁶

Alternatives to Polystyrene for Food Packaging

- Clean Water Action recommends alternatives such as recycled paper, recyclable plastic resins 1 and 2, and in communities where organic waste is collected for composting, compostable / biodegradable plastics.
- Clean Water Action does not support the use of non-recycled (virgin) paper products as this trades the environmental burden posed by EPS for a burden on precious forest resources- trees are absolutely essential to combat global warming and maintain healthy ecosystems.
- Compostable and biodegradable plastic does not break down in the marine environment.
- Compostable and degradable plastics are designed to degrade only in compost. Therefore, compostable and degradable plastic packaging should only be used in jurisdictions that collect organic waste curbside for composting. These products must meet ASTM standards.

Local Jurisdictions Responding with Prohibitions on PS Foodware

- Over 30 cities and counties in California have banned polystyrene food packaging.
- In the City of Santa Monica, for example, local businesses have successfully switched to more sustainable alternatives.¹⁷

¹ California Coastal Commission / Miriam Gordon (2006) “Eliminating Land-based Discharges of Marine Debris in California: A Plan of Action from The Plastic Debris Project,” at 2 and 15 www.plasticdebris.org

² J.G.B. Derraik, “The pollution of the marine environment by plastic debris: a review” *Marine Pollution Bulletin* 44 (2002): 843; Gregory, M.R., Ryan, P.G. “Pelagic plastics and other seaborne persistent synthetic debris: a review of Southern Hemisphere perspectives” in Coe, J.M. Rogers, D.B. (Eds.), *Marine Debris—Sources, Impacts and Solutions*, (1997) Springer-Verlag, New York, pp. 4 9-66.

³ Coastal Commission at 22; H. Kanehiro, T. Tokai, K. Matuda, “Marine litter composition and distribution on the seabed of Tokyo Bay,” *Fisheries Engineering* 31 (1995): 1 95-199.

⁴ U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Public and Constituent Affairs, (1999) "Turning to the Sea: America's Ocean Future;" United Nations Environment Programme (1995) "Global Programme of Action for the Protection of the Marine Environment from Land-based Activities." Note by the secretariat. UNEP (OCA) /LBA/IG.2/7.

⁵ S. Moore *et al.*, (2001) "Composition and Distribution of Beach Debris in Orange County, California," Marine Pollution Bulletin 42.3: 241-245. Plastic pellets used to manufacture plastic products was the most abundant type of debris.

⁶ Agency for Toxic Substances & Disease Registry, U.S. Department of Health and Human Services: *ToxFAQs for Styrene*, September 2007: <<http://www.atsdr.cdc.gov/tfacts53.pdf>>; International Agency for Research on Cancer, "Overall Evaluations of Carcinogenicity to Humans," <<http://monographs.iarc.fr/ENG/Classification/crthallist.php>>. J.L. O'Donoghue, *Neurotoxicity of Industrial and Commercial Chemicals*: Vol. 2, CRC Press, Inc., Boca Raton, Florida, 1985, pages 127-137.

⁷ *Styrene, CASRN: 100-42-5 (Human Health Effects)*. Toxnet Hazardous Substances Data Bank, National Library of Medicine, Revised November 1, 1994.

⁸ *Ibid.*

⁹ ASTDR (see note 6)

¹⁰ US EPA, Air Toxics Website, <http://www.epa.gov/ttn/atw/hlthef/styrene.html#ref3>; see also note 7.

¹¹ CASRN, note 7.

¹² CASRN, note 7.

¹³ Cost information cited from the following: Gordon Environmental Consulting and Ocean Protection Council,t "An Implementation Strategy for the California Ocean Protection Council Resolution to Reduce and Prevent Ocean Litter," November 2008, p. 4

¹⁴ City of San Francisco Streets Litter Re-Audit 2008. Available at: http://sfenvironment.org/downloads/library/2008_litter_audit.pdf.

¹⁵ *Ibid.*

¹⁶ California Integrated Waste Management Board (December 2004), "Use and Disposal of Polystyrene in California: A Report to the California Legislature," Table 4, Page 14.

¹⁷ City of Santa Monica Environmental Programs Division, "Container Successes," <http://www.smgov.net/epd/business/container_successes.htm> (Accessed 7/21/08).