CLEAN WATER ACTION
CALIFORNIA

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. Wind carries it through storm drains out to the ocean.[1]
- Exposure to sunlight and wind helps break EPS trash into smaller and smaller pieces.
- Marine animals easily mistake polystyrene for food.[2]
- The composition of conventional petroleum-based plastics as durable polymers means they will never disappear in the environment.[3]
- Roughly 80 percent of marine debris originates from land-based sources. Plastics comprise 90 percent of floating marine debris.[4]
- EPS is the second most abundant form of beach debris in California.[5]
- Styrene measured in sand and coastal waters off Japan comes in part from decomposition of polystyrene (PS) litter, which comprises 85% of beach debris measured in Japan.[6]

Local jurisdictions spend millions cleaning litter[7]

- 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.[8]
- Unfortunately, most jurisdictions do not conduct assessments of how much litter is reduced as a result of bans implemented.

PS <u>Food Packaging</u> is Not Recyclable

- According to the plastics industry (American Chemistry Council), PS food packaging is typically not clean enough to be recycled and it is economically not realistic to recycle it.[9]
- 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.[10]

Alternatives to Polystyrene for Food Packaging

- Reusable products are always preferable to disposable ones. They have less environmental impact and in the long run cost consumers and retailers less money.
- Better disposable alternatives include recycled paper and in communities where organic waste is collected for composting, compostable / biodegradable plastics.
- Compostable and biodegradable plastic does not break down in the marine environment.
- Compostable plastics are designed to degrade only in compost. Therefore, compostable plastic packaging should only be used in jurisdictions that collect organic waste curbside for composting. These products must meet ASTM standards and should be labeled as compostable to avoid contamination of materials collected for recycling.

Local Jurisdictions Responding with Prohibitions on PS Foodware

- Over 33 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.[11]
- The City of San Francisco has had only one complaint of economic hardship from any of the 4,000 businesses prohibited from using EPS- that company had a backlog of PS inventory and was given more time to come into compliance.

Human Health Effects from PS and Styrene

- EPS is made using the monomer, Styrene is a lab animal carcinogen and probable human carcinogen, according to the International Agency Research on Carcinogens. [12] US EPA and the US National Toxicology Program are currently evaluating the listing of styrene as carcinogen.
- 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.[13]
- Styrene residues are found in 100% of all samples of human fat tissue.[14]
- The Food and Drug Administration has determined that the styrene concentration in bottled drinking water should not exceed 0.1 part per million (ppm).[15] 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.[16]
- Styrene exposure increases the risk of leukemia and lymphoma and is a neurotoxin.[17]
- Workers in polystyrene products manufacturing are exposed to many harmful chemicals, including Styrene, Toluene, Xylene, Acetone, Methyl Chloride, and Methyl Ketone.[18]
- 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.[19]

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[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.), *MarineDebris—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] Saido, K. et al, Presentation at 238th ACS National Meeting, August 22-26,2009, Washington DC Environ.Divn. "New contamination derived from marine debris plastics."

[7] 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

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

[9] Erlich, R. "Economic Realities of Recycling," http://www.americanchemistry.com/s_plastics/sec_pfpg.asp?CID=1436&DID=5228#

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

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

[12] International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Overall Evaluations of Carcinogenicity: An Updating of IARC Monographs Volumes 1 to 42. Supplement 7. World Health Organization. Lyon, France. 1987.

[13] 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/crthalllist.php>. J.L. O'Donoghue, *Neurotoxicity of Industrial and Commercial Chemicals:* Vol. 2, CRC Press, Inc., Boca Raton, Florida, 1985, pages 127-137.

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

[15] Ibid.

[16] ASTDR (see note 7)

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

[18] CASRN, note 7.

[19] CASRN, note 7.