

What The Foam?!

How to Keep Plastic
Foam Foodware Out
of Our Ocean



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Introduction

Through my work at Ocean Conservancy, I have seen almost every type of plastic pollution imaginable, from giant tangles of ghost fishing gear pulled from the deep, to hundreds of thousands of cigarette butts on beaches, to the odd refrigerator found on a shoreline. Still, there's one material that irks me like no other: plastic foam.

Plastic foam, known scientifically as “expanded polystyrene” and colloquially by the brand name “Styrofoam,” has been around for decades and become a part of everyday life. At some point, we've all had a beverage in a foam cup, eaten a meal off a foam plate or received a package filled to the brim with foam packing peanuts. But its ubiquity belies the fact that plastic foam is among the worst kinds of plastic pollution for our environment.

Plastic foam breaks apart easily and can be blown by the wind and dispersed as pollution. I've visited beaches that appear to be white sand but are actually coated with tiny pieces of plastic foam. It can also be found almost anywhere you look: Plastic foam foodware items are among the most common items collected by Ocean Conservancy's International Coastal Cleanup® volunteers. In fact, in 2022, plastic foam takeout containers were the seventh most common item collected globally, the highest it has ranked since we started tracking it as a stand-alone category ten years ago. Plastic foam is also not recyclable, meaning anytime it is mistakenly placed in a recycling bin (which occurs all too often, as we'll show later in this report) that stream of materials becomes contaminated.

To all of us at Ocean Conservancy, this adds up to just one question: What The Foam?!

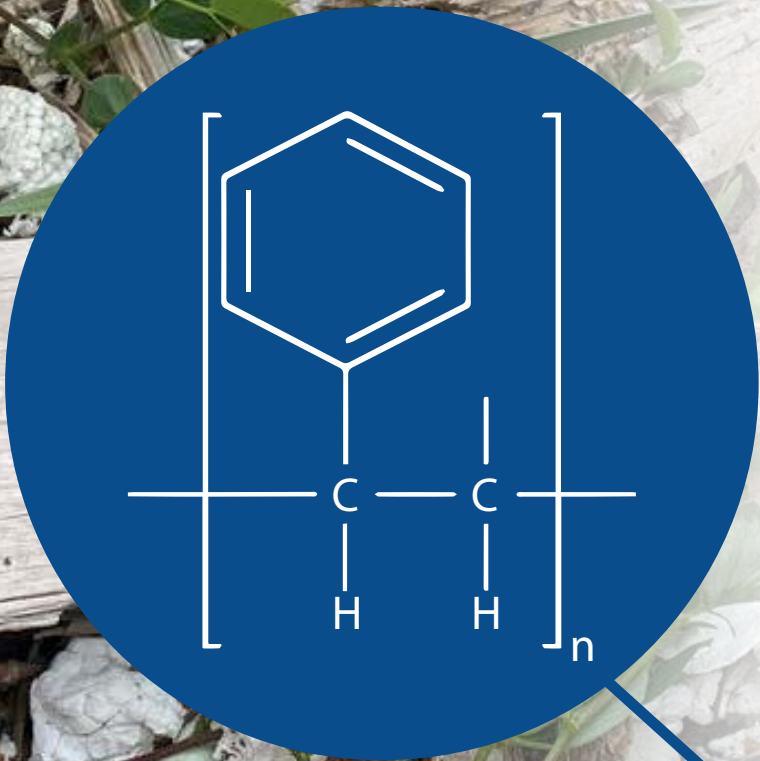
The good news is momentum to eliminate this material in the last decade has increased tremendously with many national, state and local governments phasing out plastic foam. At the same time, our ocean needs bigger and bolder action now. That's why Ocean Conservancy is calling on Congress to say, “What The Foam” and pass a national ban on this single-use material, starting with foodware.

America seems ready to say “WTF” to plastic foam, too: New Ocean Conservancy polling found that three quarters of Americans are concerned about plastic foam as a source of litter and over 70% would support a national ban on plastic foam foodware.

So ahead of this year's International Coastal Cleanup, we invite you to be a part of the movement to get this plastic foam off our beaches for good. As you're collecting ocean trash and data in the coming months, take note of the plastic foam that you're finding—chances are, it'll add up, and you'll want to say WTF, too.



For our ocean,
Nicholas Mallos,
*Vice President of Conservation,
Ocean Plastics,
Ocean Conservancy*



NC Coast Federation

Defining Plastic Foam

Expanded polystyrene, or EPS, is a type of polystyrene, or plastic #6.

Polystyrene is made from the chemical styrene, which is a possible human carcinogen⁴. EPS is then developed by trapping tiny air bubbles inside plastic. EPS is about 95% air by volume, which makes it lightweight and easily transportable and an effective insulator for food and other products⁵.

Like most plastics, plastic foam contains many chemical additives—from flame retardants to colorants to stabilizers and processing agents—to give it the material properties needed for its many uses. These additives are not chemically bound to the plastic, meaning under the right conditions, they can leach out from the plastic foam into food, beverages or the environment. These chemicals leaching from plastic foam have been found to be toxic to aquatic organisms⁶.

The chemical components of EPS also contribute to this type of plastic being nonrecyclable at the end of a product's life.



Rachel Murray / Getty Images



SeaPak / Ocean Conservancy



Patricia Chambers

The Many Formats of Plastic Foam

Plastic foam goes by many names. Its technical name is expanded polystyrene (EPS), but most of us probably knows this material as Styrofoam. Styrofoam is a brand name for an EPS product that is primarily used in shipping packaging, construction and floating infrastructure, such as docks. For the purposes of this report, we will be referring to EPS as plastic foam unless we are referring to specific products made with a specific brand name.

Plastic foam is used in several different ways. The primary focus of this report is on plastic foam foodware items, like cups, plates, and takeout containers; but other uses are outlined in this section.

Foodware Products

Plastic foam is widely used in the food-service industry because of its insulating properties. This is one of the reasons it is used to make disposable cups, plates, bowls and takeout containers (sometimes called “clamshells” for their stark similarity to the marine bivalves). It is also used to make semi-rigid trays, like those that are used to transport and package meats, as well as coolers that insulate food and beverages.

Foodware products are the most common way Americans interact with plastic foam. According to polling by Ocean Conservancy conducted in

July 2023, 80% of Americans reported receiving plastic foam foodware with their takeout and delivery orders in the two week period before the survey, and about the same amount of people reported purchasing plastic foam cups or plates during that timeframe.

Packaging

Plastic foam is also frequently used as packaging or protection in shipping. Plastic foam packaging may take the form of blocks, sheets, peanuts and inserts for boxes. Plastic foam is often chosen because it is lightweight, moisture-proof and easily moldable and shaped to fit snugly around electronics or other breakable items.

This type of plastic foam is also commonly encountered by consumers: Over 80% of Americans reported receiving a package that used plastic foam packing materials in a two week period. This type of plastic foam has also been found to end up on beaches and waterways: International Coastal Cleanup volunteers have recorded collecting 4,604,736 pieces of plastic/foam packaging globally since 1986.

Fishing/Docks

Because it's full of so many tiny air pockets, plastic foam is highly buoyant, making it a common material used in the aquatic environment. It is often used to make buoys for fishing,

as well as for flotation for docks and floating homes. Since 1986, ICC volunteers have collected 1,902,399 fishing buoys, pots and traps from shorelines around the world. While this data category is not broken down by material, anecdotal evidence suggests a large percentage of buoys collected are made from plastic foam.

When used in the water, many areas mandate that plastic foam be encapsulated (or coated) to keep the material from breaking apart in the water. Encapsulating all “white bead” foam used in docks, boathouses or floating homes can prevent foam pieces from breaking off and entering the water.¹

Construction/Insulation

Plastic foam is also used for construction. While there are many different brands and types of plastic foam used for construction, this is the most common application of Styrofoam™. The material is good at retaining heat and is often used for insulation. It is also used for structural purposes and in buildings for roofing, exterior walls, ceilings and flooring. Plastic foam, like all plastics, is highly flammable, as it is ultimately just a solid form of fossil fuel. When used in construction, flame retardant chemicals, often halogenated compounds that have known human health impacts, are added to the material.^{2,3}

Plastic Foam Pollution by the Numbers

Plastic foam is frequently found littering our beaches and waterways worldwide. Compared to other plastics, plastic foam is extremely lightweight, consequentially, it is easily blown by the wind and dispersed as pollution. Plastic foam is also especially prone to breaking up into tiny pieces of microplastics (plastic pieces less than 5 mm in size or anything smaller than the width a pencil eraser). Foam microplastics can lead to beaches and waterways appearing speckled with what looks like white snow but what are actually foam fragments that can ultimately harm birds and other animals when ingested.

Foam foodware—including cups, plates and takeout containers—are among the most common types of trash littering our beaches. For nearly 40 years, Ocean Conservancy has mobilized the International Coastal Cleanup, one of the world's largest volunteer efforts on behalf of the ocean. Since 1986, the effort has mobilized nearly 18 million volunteers to collect over 350 million

pounds of trash from beaches and waterways worldwide. Volunteers also collect data on every piece of trash, totaling over 381 million items since the effort began.

International Coastal Cleanup volunteers have collected **8,709,519 plastic foam cups, plates and takeout containers** globally. In 2022, plastic foam takeout containers ranked as the **seventh most common item** found around the world, with 463,269 collected in total. This is the highest this category of litter has ranked since it was introduced as a category in 2012.

The experience of those conducting cleanups bears out this data. In a survey of global International Coastal Cleanup organizers, all of those polled reported finding at least one type of plastic foam trash item during their cleanups. Three quarters of respondents reported that they commonly collect plastic foam take-away containers, foam cups and plates, as well as tiny foam pieces.



Plastic Foam Animal Impacts

A wide range of marine animals have been found to ingest foam, mistakenly identifying it for food. These animals include seabirds (albatrosses, petrels, gulls and fulmars), marine mammals (seals, sea lions and porpoises), and turtles (green and loggerhead) as well as commercially important seafoods such as fish and shellfish.⁸ Consuming foam can cause internal blockages or physical damage to internal organs in animals. If they eat enough, animals can experience false satiation—a feeling of fullness from non-nutritional plastics and not the actual food they depend on for sustenance—which can lead to starvation. Moreover, these tiny foam pieces carry with them the harmful chemical additives that can impact an animal's ability to grow, forage or reproduce.⁹

Plastic Foam Pollution by the Numbers

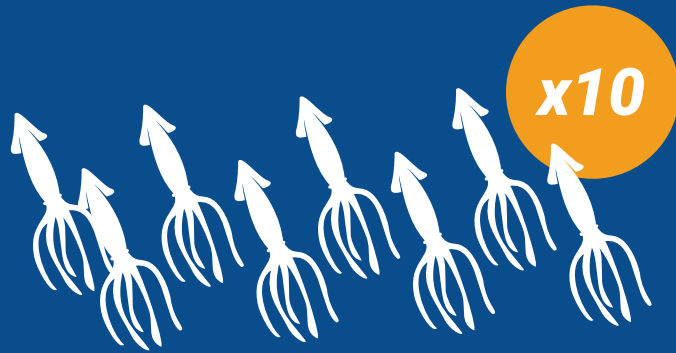
Since the effort began in 1986, International Coastal Cleanup volunteers have collected over 160 thousand pounds worth of plastic foam cups, plates, and takeout containers.

Put another way, that's:

Tiny Trash

Because of foam's propensity to break up or fragment in the environment, it is often collected in bits and pieces of varying sizes. Since 2013, Ocean Conservancy has tracked the types of "tiny trash" items volunteers collect from beaches and waterways. Within that time, **29,082,728 foam pieces** have been recorded globally.

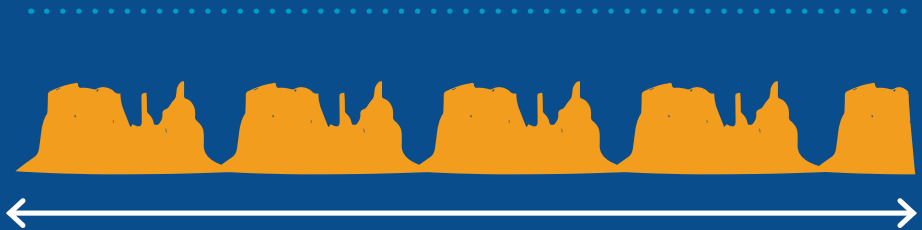
Plastic foam pieces also present a problem upstream, on land and in rivers and lakes. Ocean Conservancy and University of Toronto Trash Team's International Trash Trap Network—founded in 2021 as a consortium of trash-capture devices operating in rivers and other inland bodies of water—also records data on "tiny trash." For two years running, foam pieces have been **the top tiny trash item collected** by the Network, with 49,801 pieces recorded in 2022.⁷



The weight of over 80 giant squids.



Enough plastic foam to fill nearly four 747 planes.



Enough foam cups to span the length of the Grand Canyon four and a half times.



Chemical Recycling

Chemical recycling (also known as advanced recycling or molecular recycling)—refers to a suite of technologies that use nonmechanical processes to break down plastics. Chemical recycling technologies can be broken down roughly into three categories:

1. Systems that use high heat and pressure to break bonds in plastic to produce fuels (conversion, e.g., pyrolysis, gasification, incineration).
2. Systems that use chemicals to break bonds in plastics and produce monomers or feedstocks (decomposition, e.g., solvolysis, chemolysis, enzymatic).
3. Systems that use chemicals to dissolve plastics to recover polymers (purification).

Chemical recycling is often put forth as a solution to nonrecyclable products like plastic foam.

However, the truth is that right now chemical recycling technologies (namely, conversion technologies) functionally are simply burning plastics for energy, emitting greenhouse gases and countless toxic chemicals into the surrounding communities and the environment in the process. Currently, none of these technologies recover plastic material and should therefore not be considered as recycling.



Plastic Foam End-of-Life

Many of the qualities that set plastic foam apart from other plastic materials are the same qualities which make it a low-value item for recyclers.

Plastic foam takes up a lot of space in collection trucks and recycling centers but results in very little material actually recovered. In addition, foam foodware is generally contaminated because of its contact with food, adding to the challenges of recycling the material. These challenges mean that very few recycling systems around the globe accept foam foodware. Combined with the lack of a recycling end-market to reprocess and effectively turn this material into new products, foam foodware is widely considered nonrecyclable. In fact, plastic foam was categorized by the U.S. Plastics Pact—whose members include local governments, nonprofits and those working in the plastics industry—as nonrecyclable on its 2022 problematic and unnecessary materials list.¹⁰

While some municipalities offer drop-off plastic foam recycling programs, the majority of these programs do not actually recycle plastic foam into new plastic materials. Instead, plastic foam that is dropped off is either incinerated or “chemically recycled” (see callout box for more on chemical recycling)—a highly unfavorable outcome for plastic product processing.

In 2018, nearly twice as much plastic waste in the U.S. was incinerated (15.8%) as was recycled (8.7%).¹¹ Meanwhile, incineration is approximately four times as emissions-intensive as mechanical (i.e., traditional) recycling. A recent study found that 79% of the incinerators in the country are located in predominantly minority or low-income communities.¹² Burning plastics emits greenhouse gases and countless toxic chemicals and incentivizes industry to continue unfettered plastics production instead of investing in a working recycling system.

Unfortunately, the message that plastic foam is nonrecyclable has not reached most Americans.

- More than half of Americans report putting plastic foam products in their recycling bins on a regular basis.
- More than half of Americans reported putting plastic foam in their recycling bin in the last two weeks; and 35% reported that they always attempted to recycle foam.
- Using 2021 Ocean Conservancy survey results^[13] that found 22% of all U.S. takeout and food delivery orders included plastic foam foodware packaging, Ocean Conservancy estimates that at least **5.6 billion pieces of plastic foam** are used by Americans each year – and of that, at least **2.5 billion pieces of foam foodware** are mistakenly put into recycling systems each year.

This is problematic because the presence of nonrecyclable items like foam in the recycling waste stream complicates the material-sorting process. If these items aren't separated before recycling, they wind up as contamination in the content coming out of the recycling process. Contaminated recycled content is harder to use, which leads to manufacturers choosing virgin plastic over recycled content. Contamination also means this recycled content fetches a lower price, so more of the costs of recycling end up falling on municipalities (and eventually, taxpayers) to keep their processes operational.

Policy Recommendations

Banning or phasing out the use of plastic foam foodware is the single most effective policy to deal with this material. Since 2012, 15 countries around the world have banned EPS. Haiti was among the first countries to take this bold action, followed by Australia, Germany, and India.

In the U.S. as of September 2023, 12 states and Washington, D.C., already have passed legislation to ban or phase out foam foodware in the near term. In addition, as of December 2019, bans are now in effect in nearly 250 U.S. cities, towns and counties covering nearly 13% of the nation's population.¹⁴

Maryland was the first state to ban EPS foam foodware with House Bill 109 in May 2019. The law has prohibited the sale of EPS foam foodware products since October 2020 (after a three-month delay due to the COVID-19 pandemic).

These bans are extremely effective in curbing production and resulting pollution of EPS. In the four years between 2017 and 2021, EPS used in food packaging and foodware in the U.S. decreased 14%, with increased regulations and prohibitions on EPS at the state and local levels being significant factors for this decline.¹⁵

The American public is displaying an appetite for policies that tackle foam foodware. 2023 Ocean Conservancy polling found that 76% of Americans

are concerned about microplastic pollution from plastic foam. Seventy percent of Americans would support a ban or phaseout of plastic foam foodware; only about 10% would actively oppose such a ban.

Eradicating plastic foam products is just the first step. In many cases, plastic foam foodware ends up being replaced with other single-use plastic materials, often PET (polyethylene terephthalate). While PET products are slower to break up into microplastics when they enter the environment, PET cups, plates and takeout containers are also generally not accepted by curbside recyclers due to their shape and size. Thus, they are also effectively nonrecyclable. This is also true for paper cups and plates, which are typically lined with a thin layer of plastic.

Eliminating plastic foam provides governments and corporations with an opportunity to avoid regrettable substitutions by implementing reuse systems for foodware products. Nearly 70% of Americans polled in the July 2023 survey said they would be very or somewhat willing to participate in a reusable foodware system with local restaurants. Coupled with policies that hold producers accountable for making their products actually recyclable, banning plastic foam can be a great first step towards creating a truly circular economy and keeping this material out of our ocean.

Reusable System Successes

Los Angeles County passed an [ordinance](#) in 2022 that requires full-service restaurants to use reusable foodware (e.g., cups, plates) for dine-in customers beginning in 2023. While the upfront cost to purchase reusable foodware is often higher than the cost of purchasing single-use plastics, mandating reusable foodware can help save businesses money in the long run. One nonprofit in California has helped 251 businesses incorporate reusables since 2018, helping these businesses collectively save roughly more than \$650,000 each year.¹⁶

California's De Facto Plastic Foam Ban

California is among the most recent U.S. states to limit foam foodware. California's Senate Bill 54¹⁷ prohibits the sale of EPS foodware after January 1, 2025, unless the state meets a 25% EPS mechanical recycling rate. That rate is unlikely to be met, especially considering that Los Angeles County, the largest county in the state, reports an EPS foodware recycling rate at below 1%. Since EPS foodware is currently not economical to recycle and the material is already banned or restricted in over [129 jurisdictions](#)¹⁸ in California, including the state's two largest cities, this provision is a de facto statewide ban of EPS foodware.

Want to join Ocean Conservancy in saying **#WhatTheFoam?**

Start with these three steps.

1

Take Action

Visit Ocean Conservancy's [action center](#) and add your voice to the chorus of people calling for a national ban on plastic foam.

2

Research Reusables

Investing in reusable straws, bags, cups and cutlery is a great place to start. Take it another step further by finding out which restaurants in your area participate in reusable container programs.

3

Join Ocean Conservancy's International Coastal Cleanup

Visit [SignuptoCleanup.org](#) to find out how you can join the world's largest international effort for clean beaches and waterways this September and beyond.

Table of Existing U.S. Plastic Foam Bans

State	Plastic Foam Item(s) Banned	Year Passed	Date Effective	Policy & Source
California	plastic foam foodware	2022	January 1, 2025	S.B.54
Colorado	plastic foam foodware	2021	January 1, 2024	H.B.21-1162
Delaware	plastic foam foodware	2023	July 1, 2025	S.B.51
Maine	plastic foam foodware	2019	July 1, 2021	H.P. 213
Maryland	plastic foam foodware	2019	October 1, 2020	H.B.109
New Jersey	plastic foam foodware	2020	May 4, 2022	S. 864
New York	plastic foam foodware, packing peanuts	2020	January 1, 2022	Title 30
Oregon	plastic foam foodware, packing peanuts, single-use coolers	2023	January 1, 2025	S.B. 543
Vermont	plastic foam foodware	2019	July 1, 2020	Act 69
Virginia	plastic foam foodware	2021	Vendors with >20 locations: July 1, 2028 Vendors with <20 locations: July 1, 2030	HB 1902
Washington	plastic foam foodware, packing peanuts, single-use coolers	2021	June 1, 2024	S.B. 5022
Washington DC	plastic foam foodware	2014	January 1, 2016	D.C. ACT 20-385

Endnotes

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- ⁴ ["Styrene - ToxFAQs™."](#) Agency for Toxic Substances and Disease Registry. Accessed July 31, 2023.
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- ⁶ Thaysen, C., Stevack, K., et al (2018). ["Leachate From Expanded Polystyrene Cups Is Toxic to Aquatic Invertebrates \(Ceriodaphnia dubia\),"](#) *Frontiers in Marine Science*. 2018, 5:71.
- ⁷ Black, M. (April 4, 2023). ["International Trash Trap Network doubles in size, increases trash collection by over 6,000 times."](#) Ocean Conservancy Newsroom.
- ⁸ Turner, A. (2020). ["Foamed Polystyrene in the Marine Environment: Sources, Additives, Transport, Behavior, and Impacts,"](#) *Environmental Science & Technology*. 2020, 54, 17, 10411–10420
- ⁹ Van, A., Rochman, C. M., Flores, E. M., et al. (2012). ["Persistent organic pollutants in plastic marine debris found on beaches in San Diego, California,"](#) *Chemosphere*, 86, 3, 258-263
- ¹⁰ ["U.S. Plastics Pact's problematic and Unnecessary Materials List."](#) (2023). US Plastics Pact.org.
- ¹¹ ["Plastics: Material-Specific Data."](#) (2018). United States Environmental Protection Agency.
- ¹² ["Baptista, A. Perovich, A., et al. \(2019\). "U.S. Municipal Solid Waste Incinerators: An Industry in Decline,"](#) *Tishman Environment and Design Center*
- ¹³ Black, M. (September 13, 2021). ["35 Years of International Coastal Cleanup Data Demonstrate a Recyclability Crisis."](#) Ocean Conservancy Newsroom.
- ¹⁴ ["Wagner, T. P. \(2020\). "Policy Instruments to Reduce Consumption of Expanded Polystyrene Food Service Ware in the USA,"](#) *Detritus* 11–26.
- ¹⁵ ["DSM Environmental Services, Inc. \(August 2022\). "Top Ten Plastic Items Found on US Beaches: Estimating US Consumption of Beach Litter Items."](#)
- ¹⁶ ["ReThink Disposable."](#) Rethink Disposables.org. Accessed July 31, 2023.
- ¹⁷ ["California Senate Bill No. 54, "An act to amend Section 41821.5 of, to add Chapter 3 \(commencing with Section 42040\) to Part 3 of Division 30 of, and to repeal Section 42064 of, the Public Resources Code, relating to solid waste."](#) California Legislative Information.
- ¹⁸ ["List of California Jurisdictions with Polystyrene Ordinances."](#) Californians Against Waste. Accessed December 13, 2022.

