



What's That Foam: Nature or Pollution?

Dr. Richard Whitman



It's a common question from both residents and visitors, "What is that foam floating on the water?". If you guessed seafoam, you're right. Some call it Sea Spit. And if you said nature or pollution, you're also correct. Confused? Let me explain.

Surfactants

The short answer is surfactants. The word stands for 'surface-active agents' that can occur naturally, but they can also be caused—directly or indirectly—by pollution.

Surfactants help two substances that normally don't mix, like oil and water, to interact. They do this by lowering surface tension, which normally makes "like things" stick together. With reduced surface tension, fats and oils can form tiny droplets that dissolve into water.

We rely on surfactants every day. They are the active ingredients in soaps, detergents, and dispersants. In our bodies, natural surfactants are essential for health: bile helps us digest fats, tears keep our eyes moist, and lung surfactants help us breathe properly. Even bacteria in our gut uses surfactants to break down food into nutrients our bodies can absorb.

A Little Chemistry

Surfactants are special because they contain two parts: a **hydrophilic** ("water-loving") end and a **hydrophobic** ("water-hating") end. This dual nature allows them to act as **emulsifiers**—mixing oils and water into an **emulsion**.

When waves and wind trap bubbles in an emulsion, seafoam forms. It's not just a marine phenomenon; it happens in freshwater too. Without bubbles, emulsions may appear as yellowish or tan slicks on the surface. These can be mistaken for oil spills, but there's an easy way to tell the difference: oil slicks reform quickly when disturbed, while natural emulsions break apart. Fresh petroleum slicks also have a telltale rainbow iridescence.

Nature's Source

So, who makes surfactants in nature? **Bacteria, fungi and yeasts** are key players. They use surfactants to break down organic matter—like fish remains, rotting plants, or algae—into fatty acids and other digestible portions. Together, they act as decomposers, recycling nutrients in ecosystems.

When decomposition, production, and consumption are in equilibrium, ecologists call this a dynamic metabolism or steady state of the estuary. Just like our own metabolism, estuaries like Charlotte Harbor must stay in equilibrium. Decomposers and animals consume oxygen and release carbon dioxide, while plants and algae do the reverse—producing oxygen and using carbon dioxide. Without decomposers and their surfactants, complex organic carbon would pile up, and the system's productivity would fail—affecting everything from seagrass to

shrimp, fish, and manatees. Animals would lack the oxygen they need, potentially suffocating. Certain toxins like ammonia would also endanger aquatic life.

Pollution

Unfortunately, not all foam is natural. When we see large amounts of it, it often signals **pollution**. Foam may result from die-offs of harmful algal blooms, fish kills, or wastewater discharges. In these cases, bacteria gorge on the sudden carbon feast, creating excessive emulsions and foam. But this comes at a cost: oxygen depletion, reduced water clarity, toxins, and foul odors. Foam from blue green bloom may be unhealthy. These foams may be formed by the blue green 'bacteria' *Microcystis* and contain toxins like microcystins. During heavy blue green blooms, **these foams should be avoided**.

This is not rare in Charlotte Harbor and its rivers, especially after heavy summer rains. These rains wash in lots of organic matter along the shores, the river and harbor.

Detergents can also cause foaming, and these are often worse. Detergent foams are often whiter and fluffier than natural foams. Natural forms only last a few hours, but detergent forms can last for days. Household detergents are toxic to aquatic life. Fish, for example, suffocate when detergents strip away the protective mucus lining on their gills. After Hurricane Ian, detergent foam was widespread in the Spring Lake canals, visible even in aerial photos. The source of the detergents is unclear, but possible origins include car washes, grey water, storm cleanup, wastewater, or spills.

Goldilocks Principle

Charlotte Harbor decomposers use surfactants for healthy function. Seafoam, and in quiet water, visible emulsions are byproducts. Decomposers help recycle organic matter and support the food web. But **too much organic matter**, from decaying plants, animals, sewage, boater waste or runoff, tips the balance. Manmade surfactants and detergents disrupt natural processes and can harm plants, fish, and wildlife. So, too much or too little is not good for living things.

What Can Be Done?

Centralize wastewater treatment and eliminate septic systems near the coast.

Prevent gray water (household wastewater) from entering canals, rivers, and estuaries.

Keep boat waste out of the watershed.

Improve stormwater control so land-based surfactants and detergents are captured or treated before reaching the Harbor.

Reduce nutrient pollution, which fuels harmful algal blooms that eventually die off and overload the system with carbon.

Use phosphate-free soaps especially living close to the water.

Educate others—share the difference between natural emulsions and seafoam and pollution-driven foam.

Volunteer for a Monitoring Program that tracks foam and water quality. Contact Heal Our Harbor, Florida Dept. of Environmental Protection, Charlotte County.

Community organizations like *Heal Our Harbor (HOH)*, *Sea Grant extension*, *Charlotte Harbor Environmental Center (CHEC)*, and *Coastal Heartland National Estuary Partnership (CHNEP)* provide resources and opportunities to get involved. Become an Ambassador with Heal Our Harbor's Charlotte Harbor Ambassador Program (CHAT) program, or become a citizen scientist by taking Sea Grant or CHEC classes. For more information on aquatic foams, see US EPA, NOAA, and Sea Grant.

Remember: **Healing our Harbor begins with each of us. Together, we can make a difference.**

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