

Foam on Surface Waterbodies

Q. Why do we see foam on our lakes and streams?

A. Foam is a natural phenomenon that occurs on many lakes and streams. Foam is produced when organic matter decomposes and releases fatty acids that act as surfactants or surface active agents. Smaller amounts of dissolved organic matter are also released from living organisms. These foam producing molecules have one end that repels water and another end that attracts water and work to reduce the surface tension on the water surface. These fatty acids are lighter than water so float on the surface of the water as a thin film. Turbulence from waves or currents cause the fatty acids to entrain small bubbles that constitute the foam. In lakes and large rivers the wind causes the foam to form into parallel streaks, due to wind induced surface currents (Langmuir circulation). Large amounts of foam will accumulate on downwind beaches and coves, in stream eddies or against docks, logs, and other floating objects.

Q. Where does the organic matter that makes the foam come from?

A. The organic matter in surface waters comes mostly from decomposing vegetation such as algae and terrestrial plants, but could also include other natural sources such as spawned out salmon. Anthropogenic sources of organic matter include sewage and agriculture, pulp mill and other organic discharges. In rivers, spring freshet commonly causes a lot of foam as decomposed vegetation (i.e. leaves and needles) are washed out of backchannels and small streams. Along the north coast the brown water that drains bogs and wetlands are high in organic compounds due to the high productivity and slow breakdown of plant material in these ecosystems.

Q. Is the foam natural or man-made?

A. While it is possible that humans are to blame, it is more likely the foam is just a natural phenomenon. Natural foam is generally white, breaks down relatively quickly and smells like fish or earth. If there is a lot of soil erosion the foam may be a dirty brown and contain small bits of organic matter. During periods of high pollen release, (in B.C. usually from coniferous trees), the foam may have a yellow colour. If the source of the foam is from detergents or other personal care products, then the foam may have a sweet or perfume smell. Whether the organic matter is from natural or man-made sources the main foam constituents are the same. To identify man-made sources of organics some form of tracer compound would need to be sampled, such as chlorinated compounds or the musks used as scents. Man made foam should accumulate near its source, not over large areas, will not persist, will dissipate quickly (once the discharge stops) and is generally not associated with rain storms or winds. Synthetic detergents developed after the Second World War were not biodegradable so this resulted in large accumulations of persistent foam during the 1950's and 1960's. Modern detergents must be biodegradable so they do not persist, quickly lose their ability to cause foam and are unable to produce the long-lasting foam found along some shores.

Q. Is foam hazardous?

A. Foam is usually harmless. The foaming agents are primarily proteinaceous or carbonaceous matter. It only takes a small amount of fatty acids or other foaming agents to produce a large amount of foam. Only about 1 % of the foam is made up of the foaming agent, the remaining 99 % being air and water. Small streams can have pockets of foam where fish hide from predators. However, foam can accumulate compounds that are repelled by water (hydrophobic), so foam can be enriched significantly with particulate organic and inorganic compounds such as nutrients (N, P, C), cations (K, Na, Ca, Mg), heavy metals (Cd, Cu, Fe, Pb, Zn) and chlorinated hydrocarbons. The organisms that inhabit the surface layer would be more exposed to these contaminants and this could form a pathway to introduce contaminants into the food web.

Q. Where have there been problems with excessive foam in British Columbia?

A. Foam complaints are infrequent but occur regularly on streams and lakes in British Columbia. Foam issues are typically more common on productive eutrophic lakes and brown tannin rich and turbid streams. However, low productivity oligotrophic lakes and relatively pristine high elevation lakes and streams have also had incidents with foam.

There have been several historical foam events that were related to specific circumstances. A recent discharge of manure contaminated runoff into Coldstream Creek created large banks of foam. A cyanobacteria bloom on Loon Lake was blown to the outlet where the thick algae mash constituted most of the flow in Loon Creek. Large banks of foam resulted from the release of algae organics downstream of turbulent reaches of the stream. Some foam complaints are blamed on discharges from pulp mills. On the Thompson River, downstream of the Kamloops pulpmill, foam was collected and analyzed for pulp tracer chemicals. No connection to the pulpmill effluent was found.

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