FOAMING OF SURFACE WATERS

What Causes the foaming of surface waters on some Ontario Lakes?

The foaming of surface waters on lakes is not a new phenomenon. It is a natural process that has been going on for a long time. All lakes contain organic matter, such as algae, rooted aquatic plants and leaves. When this organic matter decomposes through natural bacterial action, it releases cellular products to the water, which form a surfactant, or surface agent. A surfactant simply lessens the surface tension of water, making it susceptible to foaming. When the wind blows, the waves on the lake agitate this surface agent, thus transforming it into sudsy white foam.

Natural foam is most noticeable along beaches exposed to the prevailing wind direction. When the foam reaches the shoreline, it tends to form a loose line where it mixes with tiny pieces of organic matter, which act as a binding agent and give it stability.

Is This Foam Harmful to Fish Life or Humans?

Foam on the surface waters is a harmless by-product of our lakes. Its chemical makeup is 99 percent air and water, combined with one per cent or less surfactant.

What About Foam of a Pollutant Type that May Be Seen on some Lakes?

Back in the 1950's manufacturers of laundry detergents marketed a type of product that was highly resistant to chemical breakdown. As a result, there was a foaming problem in the vicinity of all sewage treatment plant outfalls. Rivers with a bit of turbulence would often sprout huge, foaming white islands. In the early 1960's, detergent manufacturers developed a new formula, which was designed to remain stable only for short periods of time before breaking down into its components. This largely solved the problem of the foaming of surface waters downstream of sewage treatment plants.

Phosphorus, contained in most detergents, also contributes to the foaming of surface waters. Scientists have recognized that phosphorus is the key nutrient in stimulating algal growth in lakes and streams. Algae is one of the organic matters present in lakes. Its natural decomposition leads to the creation of a surfactant in water, which is transformed into foam by wind agitation.

In past years, approximately 50 percent of the phosphorus in lakes and streams contributed by municipal sewage came from detergents. Federal regulations reduced the phosphate (P_2O_5) content in laundry detergents from approximately 50 percent to 20 percent on August 1, 1970, and to five percent on January 1, 1973. However automatic dishwashing compounds were not subject to government regulations and are consequently high in phosphorus. Many automatic dishwashers are present in resort areas - about 30 percent of the cottages in the Muskoka lakes, for example, have them. Cottagers, therefore, may unknowingly be contributing significant amounts of phosphorus to their lakes.

Why Does Natural Foaming Occur on the Surface of Some Lakes and Not on Others?

The appearance of natural foam on a lake is determined by the amount of organic plant material in the lake and the size of the area of open water (and thus its ability to provide extended wave action). Organic material, such as algae and vascular aquatic plants, lignins, tannins and fulvic acid, accumulate in lakes after periods of heavy rainfall. Decomposition of this organic material produces compounds that are similar to the fatty acids used in soaps. Softwater lakes of the pre-Cambrian shield have a greater amount of these compounds and a lower surface tension than hardwater Great Lakes, thus making them more susceptible to foaming.

In lakes where there is a long fetch (the distance from shore to shore in the direction of the wind), constant winds can induce a circulation pattern (Langmuir circulation) to occur. This circulation pattern causes foam, generated by wave action, to collect in long streaks (Langmuir streaks). Langmuir streaks are natural occurrences, composed of particulates and surface active materials collected together in long ridges. When Langmuir streaks impinge on a shore, piles of foam may accumulate.

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