

PRINCIPLES OF LAKE HEALTH MANAGEMENT © 2010

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ECOPROBIOTICS®, of the Bacta-Pur® System, are beneficial communities of natural bacteria, which have been on earth for millions of years and have been selected for their synergistic ability to biodegrade pollutants and to improve water quality. *ECOPROBIOTICS®* increase biodiversity. Just as people take probiotic yogurt for its' ability to assure the presence of the optimal community for digestion and immunity, *ECOPROBIOTICS®* improve ecosystem health. EVERY PRODUCTION of Bacta-Pur® products is analyzed and cleared for shipment ONLY after passing all performance tests and being CERTIFIED PATHOGEN FREE using techniques from the food industry. *ECOPROBIOTICS®* are purely natural and beneficial; they NEVER contain added chemicals such as surfactants, emulsifiers or enzymes..., nor do they contain genetically modified (GMO) or deliberately mutated organisms. *ECOPROBIOTICS®* are safe and beneficial. Disease causing organisms are never used, as others do or permit. All bacterial cultures in the Bacta-Pur® product are listed on the Canadian DSL.

A lake can be beautiful, but it is much more than that. A lake is home to a multitude of wildlife; it can also be a source of drinking water for many communities. A lake's health, however, can be fragile. Lake management should consider intergenerational equity. Decisions should consider that the lake not only belongs to our generation but also to posterity.

Lakes are living entities, which evolve and age. If left alone, lakes gradually fill in and become swamps and then meadows. This is natural. This process can take thousands of years or just a few depending largely on the geomorphology of the lake and activities around the lake. People may think that they want a "natural" lake, but what they really want is to maintain the lake in a relatively young condition rather than letting it age and transform into a swamp and then a field. This is not different than what many people try to achieve around their homes. Considerable time and money are spent maintaining gardens in a particular age or trophic state rather than letting them evolve naturally to brush and woods. Lakes also require knowledge and maintenance to assure their health and continued beauty.

Lakes are affected by, and their future depends on, not only on the activities on its waters and around its shores but also activities upstream along rivers and brooks feeding the lake. Lake health management requires examination of activities, within the drainage basin feeding the lake. It is much easier to treat concentrated pollution, prior to it being diluted in the lake. Any serious effort to restore water quality or to prevent pollution should begin at the source of the pollution.

Managing a lake or water body, requires definition of the goals and activities for the lake. Does the community want high-speed boats, just fishing or sailing...? Does the community want swimming...? Does the community want to use the lake for drinking water? Does the management plan include nutrient / eutrophication control, sludge reduction...? These are only some of the issues to be addressed – some are technical others are sociological. Some goals may conflict with others. Once the goals are defined a program can be developed.

Some pollution is easy to see, such as bays filling in. What of unseen pollutants? There can be a wide range, but one of the most problematic to lakes is phosphorus. Aquatic plants (macrophytes and unicellular algae) need less physical support than their terrestrial cousins. Aquatic plants have higher water content and therefore small amounts of phosphorus go a long way to stimulating proliferation of aquatic plants. Merely two kilograms of phosphorus can result in a metric ton of plants. Algae are plants, which have no roots and take all of their nutrition from the water. They may be unicellular and planktonic (free floating); they may be attached as multicellular filamentous (hair-like structures), or they may resemble higher plants attached to the bottom. Higher plants have roots by which they take up nutrients; these plants also can have flowers for reproduction. Algae and higher plants are an essential part of an aquatic ecosystem. Plants help oxygenate the water and provide habitat for fishes and invertebrates. Having plants in a lake is beneficial; the problem



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is their excess. Growth of aquatic plants is limited in clean water by a lack of nutrients, principally phosphorus. Plant proliferation is a symptom of a larger problem, excessive amounts of soluble phosphorus.

Phosphorus comes from many sources: human wastewater, fertilizers (domestic and agricultural) and animal wastes *etc.* Run-off from lawns and fields vary with many factors including timing of fertilizer with rain and seasons and what systems are in place to trap the nutrients and keep on land where they are desired. Even a well designed and well managed sewage treatment plant, which receives wastewater from only a 1000 people, will release enough phosphorus each year to produce an additional 18 metric tons of plants. This does not include residences, full or part time, without adequate wastewater treatment. This does not include fertilizer runoff. This does not include agricultural run-off; one cow produces 16 times more waste than a human.

Once phosphorus gets into a lake, plants rapidly consume it. Most is not washed out. Phosphorus accumulates. That is why once plants and algae start to spread they often take over all habitats available to them. Shallow areas can be of particular problem; plants spread rapidly and interfere with swimming and boating, at least, to reach the shore and docks. Algae and other aquatic plants produce cell mass from carbon dioxide, by the process of photosynthesis. Plant death combined with accumulation of leaves from shoreline trees and shrubs results increases organic deposits or sludge within the lake. Excessive plant growth usually results in rapid accumulation of sludge, filling in and aging of the lake and even in production of noxious odors and bad flavor in the fishes and fish kills.

We all contribute to the pollution. More people means more pollution. All lakes have limits of what they can accept before they deteriorate; this is called the carrying capacity. Sustainable development is an oxymoron. Agriculture, industries and life can be sustainable, but growth has limits.

If we value a lake and its tributaries and the remaining forest and woods and we wish to share them with our children and grandchildren, and subsequent generations then we **MUST** become stewards of the lake. We must resist myopic exploitation of this fragile environment for short-term pleasure or profit.

People must decide what they want: unlimited development, destruction of green zones or preservation of the unique beauty of a water body.

There are concrete measures we can all take to reduce pollution entering the lake.

1. Treat pollution at the source.
2. Protect and restore shrubs along shorelines.
3. Minimize use of fertilizers near the lake and streams; if you must fertilize use time-release fertilizers — ideally they should be worked into the soil. Aquatic weeds make great mulch in the garden. This removes nutrients from the water and helps conserve water.
4. Avoid drainage ditches, which send runoff straight down hills; use sedimentation basins if at all possible to settle erosion and solids before they enter the lake. Use of Bactapur® accelerates sludge digestion, improves water clarity and channels nutrients into the faunal food web producing more food for fishes while reducing pollutants which generate aquatic weeds.

