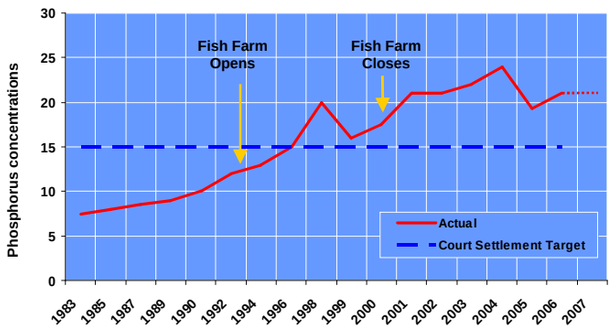
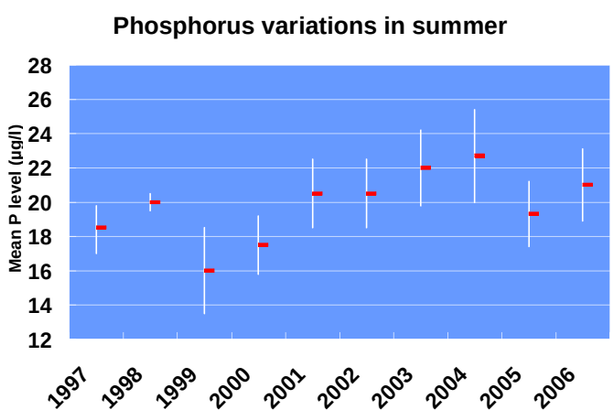
Lac Heney Rehabilitation
Background Information

No signs of recovery

Monitoring of phosphorus levels in Lac Heney have indicated that the lake is not showing any signs of recovery since the closure of the fish farm 7 years ago.





High levels of phosphorus (above 20 micrograms per litre) produce more algae and other organic matter throughout the year, which leads to algae blooms and suspended organic matter in the water. The water is less transparent and frequently unpleasant for swimming and other water activities.

The increase in organic matter provides more material for decomposition at the bottom of the lake, using up oxygen quicker and making for poorer conditions for certain types of fish such as the gray trout (touladi). If conditions continue to worsen, large algae blooms can lead to the products that may be harmful, for example certain types of cyanobacteria (blue-green algae).

"The role of phosphate in the degradation of lakes and streams is known under the name of eutrophication, which is the premature aging of lakes and streams. In addition to destroying aquatic life, this phenomenon also has impacts on human activities."

The Green Pages, MRC de la Vallée-de-la-Gatineau, June 2007

Some of these conditions are part of the normal functioning of lakes in our area. However, Lac Heney had greater transparency and fewer algae blooms before the operation of the fish farm.

It was somewhat of a surprise to find that phosphorus levels actually increased after the closure of the fish farm and then showed no significant decrease, despite the fact that the lake was receiving approximately one-third less phosphorus than when the fish farm was operating.

Phosphorus cycle in the lake

Phosphorus is an essential nutrient for plant growth and is the controlling factor for algae in Lac Heney. In the normal cycle of a lake such as Lac Heney, some of the phosphorus in the water column reacts with iron in late fall to form an iron-phosphorus complex that settles to the bottom.

During the summer, the deeper layers of the lake tend lose their oxygen through the actions of bacteria that use oxygen as they decompose the organic matter that has died and dropped to the bottom. When there is no longer any oxygen at the bottom, the iron-phosphorus complex breaks down, releasing iron and phosphorus into the water column, where the phosphorus can be used to produce more organic matter and the iron becomes available to complex some phosphate in the late fall. (The lack of oxygen also leads to a different form of decomposition that produces gases and unpleasant odours.)

Due to the extra phosphorus loading from the operation of the fish farm, the normal cycle in Lac Heney has been disturbed and an excessive amount of the phosphorus remains in the water column over winter. This additional phosphorus promotes organic growth as soon as the ice melts resulting in a significant spring algae bloom. Thus more organic matter is produced early in the year than would normally be the case. This organic matter eventually dies, falls to the bottom, is decomposed by the bacteria thus depleting the bottom layers of oxygen sooner than would normally happen and leading to the release of more phosphorus.

In fact, the iron in the sediment of Lac Heney is so overwhelmed by the additional phosphorus that some of the iron-phosphorus complexes break down while there is still oxygen in the deeper water, as demonstrated in the regular monitoring carried out by our scientists.

The conclusion that we are led to is that phosphorus will not decrease to more acceptable levels (12 to 15 micrograms per litre) without some form of intervention.

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The solution

The approach that our studies have led us to is to increase the iron-phosphorus ratio by adding iron chloride. Both iron and chloride ions are naturally occurring elements present in Lac Heney. The amount that would be added – a small portion of the amounts already in the lake – has been calculated to react with the active phosphorus in late fall, forming a complex that settles to the bottom of the lake. This will remove a substantial amount of phosphorus from the water column so that it would not be available to promote growth of organic matter.

This conclusion comes after 10 years of study and monitoring of Lac Heney by Professors Bird, Prairie and Carignan, laboratory tests on the safety to aquatic communities of adding the amount of iron chloride being proposed, and a pilot project in a small bay in the north end of the lake.

The pilot project

In the pilot project, the bay was separated from the lake by a curtain, and iron chloride was spread on the surface from a boat in the same way as is being proposed. A reddish suspension was formed as the iron chloride was introduced into the water which quickly dissipated with no physical changes to the water or shoreline and no affect on fish in the bay. Monitoring indicated a short term drop in pH which quickly returned to normal and a decrease in phosphorus levels inside the bay when compared to the main lake. Further monitoring in the spring showed no appreciable change to the populations of a dozen microscopic organisms living in the bay.

All of the reports on the lake were then collected and reviewed by three independent scientists knowledgeable in lake chemistry. The conclusion of the five scientists who conducted or reviewed the technical work was that:

a) the lake is not likely to recover significantly without some intervention;

b) there is a good possibility that a treatment with iron chloride will improve the iron-phosphorus ratio to its pre-fish farm values; and

c) an iron treatment will not harm the lake.

The plan for rehabilitation

The environmental engineering firm, Envir-Eau, has been engaged to undertake the planning phase for a treatment of the lake in November and to obtain the necessary Certificates of Approval from the appropriate provincial and federal departments. Current planning calls for 2,000 tonnes (50 trucks) of iron chloride to be delivered throughout the month of November to Whitefish Lodge. Using marine barges, it will be spread over the deeper parts of the lake from during 3 weeks in late November when the lake is little used. Our scientific advisor will be monitoring the treatment to ensure that the iron chloride is being properly applied as well as the impact of the treatment over the next 3 years.

Both during and following the treatment there will be no risks to residents who come into contact with the lake water or take domestic water – including drinking water, as long as it is treated in normal fashion – from the lake, i.e. no iron taste to the water, no impact on washing clothes.

By next spring the iron chloride will be fully integrated into the lake and will pose no threat to swimmers, anglers, boaters or shoreline residents.

Public information sessions will be held in early July for members of the association as well as other cottagers, residents and officials of the municipalities before any final decision to proceed with a treatment intervention is taken by the Board.

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