

Pigeon Lake Water Quality

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As lake users look forward to another season at Pigeon Lake, many people are starting to wonder if a blue-green bloom, similar to the one experienced in 2006, will occur again. Before answering this question, there are a few things to keep in mind.

Pigeon Lake is typical of most lakes within Central Alberta. The surrounding upland areas have soils that are naturally rich in nutrients such as phosphorus and nitrogen. Runoff from rainfall and snowmelt carry these nutrients into the lake, where they contribute to algal growth. Microscopic invertebrates feed on these algae, keeping the algae population in check. Smaller fish then feed on the invertebrates, which are then consumed by larger sport fish like walleye. So without some nutrient inputs into the lake, it is unlikely a very significant sport fish population would exist.

The delicate balance that exists in Pigeon Lake between nutrient inputs from upland areas and the food chain that those nutrients help to support is easily upset by human activities around the lake. By removing natural vegetation for development or farming, applying fertilizers to crops or lawns, and mismanagement of human, pet or livestock waste, all contribute to additional nutrients entering the lake. These new inputs into the lake often create an imbalance between phosphorus and nitrogen. Because Pigeon Lake takes a long time to fully “flush” out (on the order of 100 years), the additional nutrients sit in the lake where they can contribute to nuisance algal blooms.

From a water quality perspective, Pigeon Lake is in relatively good health. Nutrient levels have remained relatively stable over the last twenty years. However, increased use of the lake will ultimately result in an increase in nutrients entering the lake. Factor in increased periods of drought and lower lake levels that may result in longer flushing times, and the right conditions may exist in the future for more nuisance algal blooms.

Because Pigeon Lake is one of the most heavily used recreational lakes in Alberta large-scale blooms tend to generate a lot of calls to Alberta Environment. Among the more common questions raised about blue-green blooms, include:

1. What is an Algal Bloom?

Blue-green algae are not really algae at all, but bacteria containing the same pigment (chlorophyll) as algae. This pigment allows them to harvest sunlight and convert it into energy for growth and reproduction. There are dozens of species of blue-green algae naturally occurring in lakes throughout Alberta. Because the levels of these algae are low lake users don't notice them. But under the right conditions they can quickly grow to form blooms that can be a nuisance and may, in some cases, be a health hazard.

2. Why do they form blooms?

Blue-green algae require several conditions to form blooms. These include:

- Nutrients
- Sunlight
- Warm, calm conditions

Because Pigeon Lake has plenty of nutrients (most other Central Alberta lakes do!) to support the growth and reproduction of blue-green algae, prolonged periods of calm, hot weather will allow a bloom to occur. In 2006, these conditions occurred early in the year and persisted throughout the summer, contributing to the significant bloom observed.

Blue-green algae also have the unique ability to use atmospheric nitrogen when nitrogen in the lake is in short supply. This means that an imbalance in the nutrients entering the lake (i.e., more phosphorus than nitrogen), it favours the growth of blue-green algae.

3. Why do blooms smell so bad?

There are a couple of reasons for this. First, blue-green algae float to the surface. Once at the surface, they generally cannot move downwards since other algae underneath them are rising to the surface. Trapped at the surface, the blue-green algae are literally cooked by the sun, causing a rotting smell.

Also, when blue-green algae die, bacteria decompose them. One of the by-products of this process is ammonia, which humans can smell in very small quantities.

4. Why do snails or fish die during a bloom?

Again, there are two possible reasons for this. The first may be that since some snail species and all fish require oxygen to breathe, the decomposition of the blue-green algae by bacteria sucks the oxygen out of the water essentially suffocating the snails and fish. The second reason may be that toxins the blue-green algae form are directly killing snails and fish.

5. Why do blue-green algae form toxins? Why don't these invertebrates eat the algae?

Toxins are produced by blue-green algae as a defense mechanism against small invertebrates that would otherwise eat them. In large enough concentrations, these toxins can represent a health risk to other organisms (snails, fish, wildlife, livestock, pets and humans). The blue-green algae also have a number of other defense mechanisms to prevent themselves from being eaten by the small invertebrates, which can include producing jellylike membranes around themselves, forming large colonies, and producing other structures that make it difficult for the invertebrates to feed on them. As well, their rapid growth under the right conditions is far faster than the invertebrates growth rate.

6. What should I be concerned with if I see a blue-green algal bloom?

The biggest human health concern is the toxins the blue-green algae produce. These toxins can include skin irritants, hepatotoxins (liver damaging) and neurotoxins (damages the nervous system). Contact/consumption of the lake water in the vicinity of blue-green blooms should be avoided. Pets and children are especially susceptible given their smaller body masses relative to adults. Toxins produced by the blue-green algae are broken down over time by bacteria and exposure to sunlight.

7. *Will a bloom occur in 2007?*

Because blue-green algae require hot, calm conditions as well as nutrients for a bloom to occur it is possible to have another bloom this summer. There are already enough nutrients in Pigeon Lake, so a bloom could occur if we experience an extended period of hot, calm conditions this summer.

8. *What can be done?*

While we can't control the weather, we can control the amount of nutrients entering into Pigeon Lake. By maintaining natural riparian zones, which absorb nutrients before they enter the lake, choosing to avoid using fertilizers, ensuring your septic system works properly, planting lower-maintenance long-rooted vegetation to minimize erosion, and cleaning up your pets waste you can help reduce the nutrient levels in Pigeon Lake.

Sadly, there is no magic bullet solution to blue-green blooms. It is likely Pigeon Lake experienced blooms long before any settlement in the area, and will continue to experience blooms in the future as well. You can ensure the blooms are minimized by minimizing your impacts on the lake itself.

Further Resources

Alberta Environment Surface Water Quality: FAQ's – Lakes
(<http://www3.gov.ab.ca/env/water/SWQ/faqs01.cfm>)

Alberta Environment Pigeon Lake Water Quality Data
(http://www3.gov.ab.ca/env/water/reports/water_quality_reports.cfm)

Living by Water Project (<http://www.livingbywater.ca/>)

Alberta Lake Management Society (<http://www.alms.ca/>)

Contacts

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