

Hague & Gunflint Lakes Report Summary

2017
Friends of Cortes Island

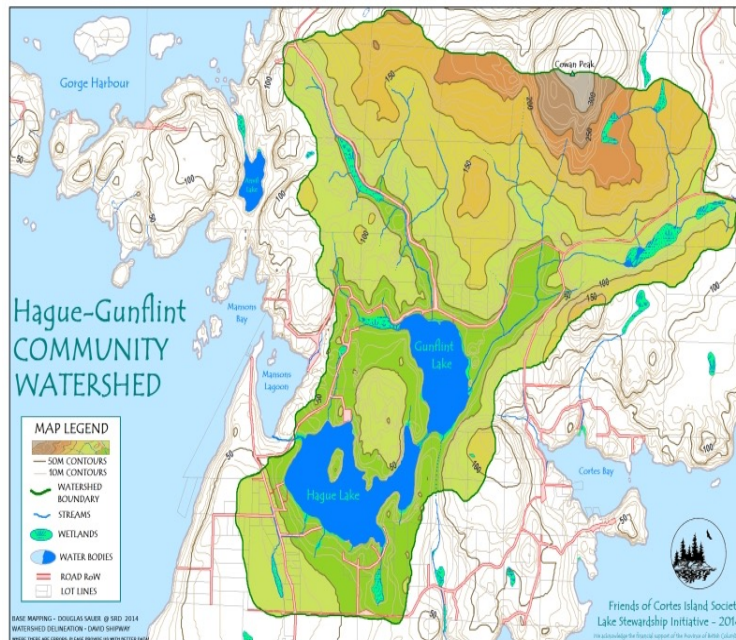


Text prepared by Rex Weyler and Friends of Cortes Island (FOCI) with data and analysis Cortes Island residents and expert advisors (see References)

IN 2014, HAGUE AND GUNFLINT LAKES experienced an historically large spring algae bloom, causing fish die-off and a noxious smell. Lakeside residents and Friends of Cortes Island (FOCI), with help from the BC Ministry of Environment and Dr. Eric Demers from Vancouver Island University, began a long-term lake monitoring program.

Cortes residents and visiting biologists collected water samples and determined the presence of Volvox algae, dinoflagellates, and diatoms, all non-toxic to humans, although blooms can deplete the lake's oxygen. Samples also revealed "blue-green" bacteria, *Nostoc sp.*, which is toxic and E. coli bacteria, which can cause human health concerns.

Lake health is the product of the local watershed, influenced by weather, geology, plant and animal inhabitants, and natural nutrient cycles. A human community within the watershed can influence a lake through land use changes and the waste flow of nutrients, bacteria, and pollutants.



The 13.6 km² Hague-Gunflint watershed. (map by David Shipway)

Over centuries, lakes typically transform from low-productive reservoirs of water to overly-productive, swamp-like conditions that deplete oxygen and may choke on their own growth. Annually, lake waters mix with spring and autumn winds, but stratify in the winter and summer extreme temperatures. Spring and summer algal blooms are normal, but the size of these blooms will vary with climate and nutrient flows, most significantly phosphorus and nitrogen.

Nutrient loading: Human nutrient and bacteria loading typically arrives through the water table from septic fields, livestock, fertilizers, and phosphate soaps, leading to severe algal blooms. Bacteria arrives from farm animals and human septic. Other toxins may arrive from pesticides, oils, paint, and other pollutants. Land-use changes, such as lakeshore clearing, roads, and logging can also effect nutrient and bacteria flows.

Algae gives off oxygen as it grows, and then depletes oxygen in the lake as it dies, accounting for the unpleasant smell and taste. Algal blooms have virtually killed hundreds of lakes around the world, such as Lake Erie between Canada and the US, Green Lake in Washington State, and St. Mary and Cusheon Lakes on Saltspring Island

Dr. Rosie Barlak from the BC Ministry of Environment and Dr. Eric Demers, lake biologist from Vancouver Island University have helped FOCI take water samples and design a monitoring. Barlak and Demers told the community that these lakes remain relatively healthy, although they are experiencing accelerated algae and bacteria bloom cycles and that there is risk that the lakes could become dangerously over-productive.

In the spring of 2014, 2015, and 2016, FOCI collected phosphorus and nitrogen readings from various depths in both lakes. Readings were not alarming in the summer months, but in the spring, phosphorus levels in both lakes reached the high-productivity levels, consistent with the large spring algae blooms. Hague and Gunflint Lakes appear healthy, but in a transition phase from low to higher productivity, which serves as a warning sign.

Bacteria: Human communities and their livestock also contribute bacteria to the lakes. Tests by Cortes residents Fred Zwickle and Ron Croda (1991-97) confirmed *Escherichia coli* (*E. coli*) in both Hague and Gunflint lakes, an indicator of fecal contamination and potential disease. The highest counts were found along the west shore of Gunflint Lake at the mouth of creeks that can carry contaminants from throughout the watershed, and along the north shore of Hague Lake, from the foot of Austin Drive, along the sandy beach, to the foot of Christensen Road.

In 2003, the Regional District of Comox-Strathcona commissioned a "Water Quality Study" for Hague and Gunflint Lakes, that revealed fecal coliform in 50-of-129 samples from Hague Lake and in 51 of 79 samples from Gunflint Lake. The report concluded that livestock and human septic contamination may be contributing to coliform counts.

A 2014 test (Shelling, Demers, BC MOE, FOCI) suggested a significant increase in coliform bacteria from the 1990s and 2003 samples. The highest 2014 readings from the October 26 samples showed *E. coli* at levels exceeding minimum health standards in both lakes. Without more source data, we cannot determine the extent of human *E.coli* in the lakes, but the samples confirm some sources from human septic and livestock. More source testing should be a long-term priority.

Land use: The 2015 BC Ministry of Environment report, "Water Quality Monitoring Program, Hague and Gunflint Lakes, 2014-15," urged the community to consider that roadways, parking lots, driveways, and other disturbances to the land and water-flow can decrease the watershed's permeability, greatly diminishing its natural capacity to filter runoff or absorb nutrients and bacteria before they reach our lake. Lakeside residents can help by replanting disturbed shoreline with local, natural plants. Some residents have begun planting cattails, which are good for consuming nutrients.

Agriculture, Logging, Land clearing: Erosion from land cleared for agriculture, logging, or other purpose can contribute to the nitrogen and phosphate load in the lakes. Nitrogen fertilizers are a particularly common source of nutrients to the lakes. Even organic fertilizers and manure can contribute these nutrients, so all fertilizers should be used sparingly.

Septic: Properly installed and operating septic systems with drainage fields will effectively treat human waste. However, The Ministry of Environment report warns that "Failure of onsite septic systems can cause significant nutrient and pathogenic waste to

enter the water body and can be dangerous to human and animal health.” Nutrients from septic will increase the extent of algae blooms.

Biological remediation: Biologists have learned that excess nutrients and bacteria can be taken up and neutralized by biological remediation techniques that use microbes (bacteria, fungi) and plants to remove or metabolize pollutants. In some cases microbes can remove industrial chemicals, petroleum products, and pesticides. Bioremediation occurs naturally in healthy ecosystems, and can be enhanced by design.

Smart farmers and communities have used simple bioremediation for millennia. Even simple composting is a form of bioremediation that can kill unwanted bacteria or pathogens in soils. The simplest form of bioremediation for our lakes would be to replant disturbed shoreline in native species. At Lake Winnipeg in Manitoba suffered from high levels of phosphorus loading from the surrounding community, causing severe algae. Researchers planted cattail to reduce nutrient flows, and are now harvesting cattail as a heating fuel, further increasing the nutrient removal. Other forms of bio-remediation might include floating vegetation wetlands and biofilters using fungi or other organisms along the shoreline.

Future monitoring of our lakes: The visiting biologists in 2014-15 — Eric Demers and Rosie Barlak — confirmed that the Cortes community was responding early and correctly to these risks. Dr. Demers advised the community to continue with our remedies – septic upgrades, replanting disturbed shoreline, and eliminating phosphate cleaners. Both Barlak and Demers believe that we can stabilize the algae and bacteria blooms, and even reverse the trend with careful water quality management.



Hague Lake from the west, over Mansons Lagoon: The Hague-Gunflint lake system is fed from a 13.6 km² watershed, stretching north to Cowen Peak and Squirrel Cove Road, east past Easter Bluff to Mary Point Road, and northwest to Lagoon Road and the wetlands near the Kwas Park trailhead. The lakes are connected by a narrow channel, and they empty eastward via underground channels and lowlands toward Cortes Bay and westward through a stream into Mansons Lagoon.

Recommendations for Household and Community Actions

The short, high-priority list (see the full report for complete recommendations):

1. **Septic:** Inspect, pump, and maintain your septic system
2. **Livestock:** manage livestock, manure, and domestic pets
3. **Fertilizer:** Avoid nitrogen fertilizers, and use all fertilizer and manure sparingly
4. **Lakeshore:** Replant disturbed shoreline, plant water plants along shoreline
5. **Cleaners:** Eliminate phosphate soaps

Other actions:

Monitor: FOCI is committed to working with the community to continue lake monitoring, sampling, and testing programs to collect, collate, and analyze data. Dye tests for individual septic systems can be done with help from the Regional District, if desired.

Volunteer: You can help with FOCI's Water Monitoring Project. To volunteer or make a donation, contact Friends of Cortes Island: PO Box 278, Manson's Landing, BC, V0P 1K0 or contact Helen at: friendsofcortes@gmail.com or 935-0087.

See the full Report for references and links.

Special Thanks to:

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