SHUSWAP
watershed council

2021

WATER QUALITY REPORT

Photo Credit: Darren Robinson Photography / Shuswap Tourism

shuswapwater.ca

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Photo Credit: Darren Robinson Photography / Shuswap Tourism

Water quality is monitored at several locations in the Shuswap watershed, at different times of year, and by different organizations for different reasons.

Generally, there are many reasons for monitoring water quality:

- To observe and record water quality, repeatedly over a period of time, to create a baseline—a set of conditions against which future measurements can be compared
- To protect public health and manage risk by ensuring water is safe for drinking and recreation
- To identify change, trends, and existing or emerging water quality problems
- To identify sources of pollution
- To ensure compliance with pollution regulations or permit requirements
- To gather information so that pollution prevention or remediation programs can be designed
- To measure how goals or targets for water quality are being met
- To understand how specific activities affect water quality.

SHUSWAP watershed council

The Shuswap Watershed Council (SWC) is **a partnership of many organizations** with a responsibility or interest in **monitoring and improving water quality**. The SWC is pleased to present a summary of water quality information, monitoring results, and water quality protection projects in the Shuswap watershed on behalf of its partners for 2021.

In this sixth annual report on water quality from the SWC, you'll find monitoring results and information about:

- Shuswap Lake, Mara Lake, Mabel Lake, Sugar Lake, White Lake, and Adams Lake
- Salmon River and Shuswap River
- Popular beaches
- Forest fires in watersheds
- Algal blooms and cyanobacteria
- Aquatic invasive species, and how to prevent their spread
- The SWC's new Water Quality Grant Program, and its work with farms in the Shuswap to improve water quality
- Wastewater treatment plant upgrades
- A Phosphorus Action Plan for the Shuswap watershed
- Tips for reducing your impact on water quality.

The Shuswap watershed

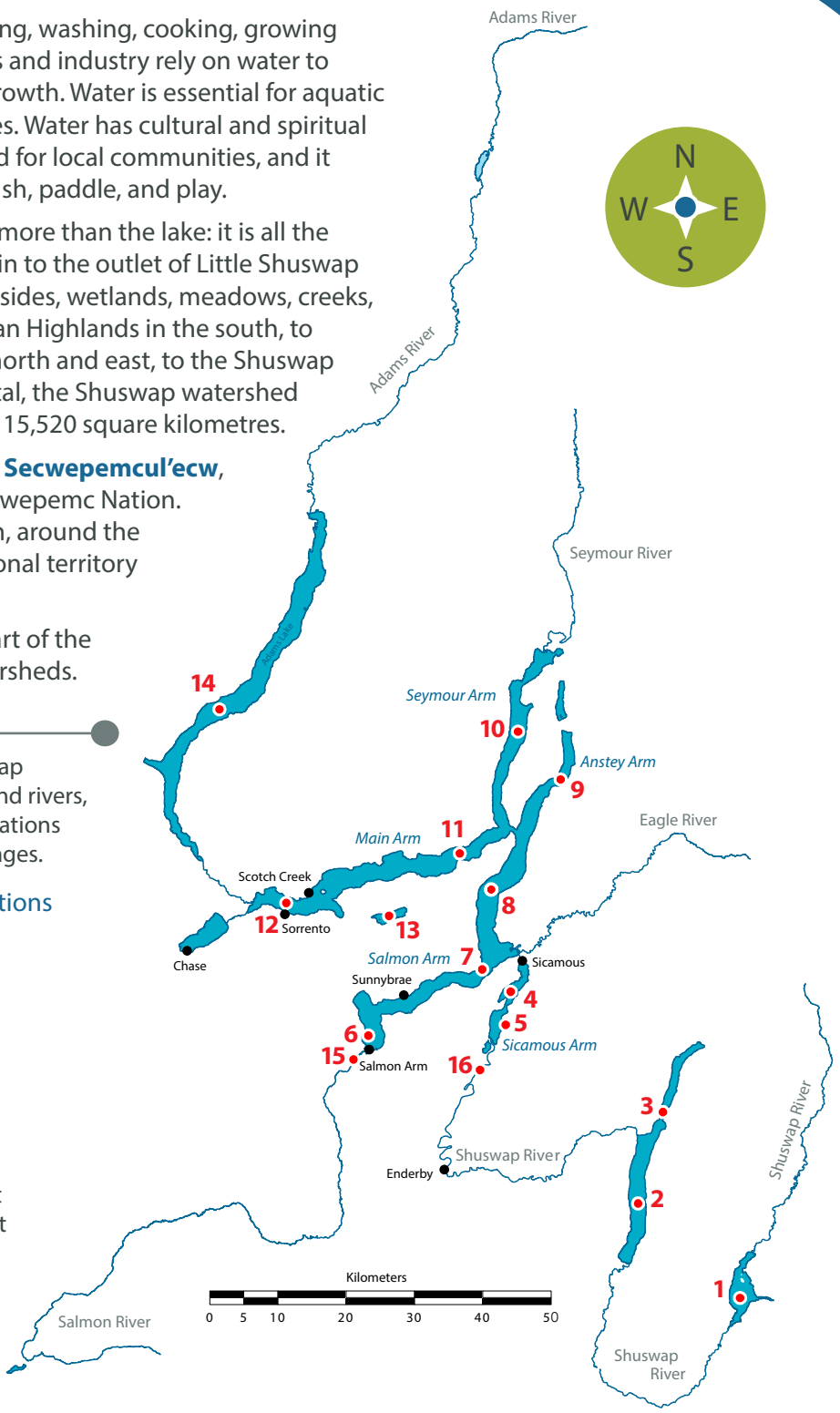
A watershed is an area of land defined by where rain and snow collect and run off into a common river, lake, or aquifer. Watersheds receive precipitation and over time, water drains through creeks, rivers, and lakes to the single lowest point in the watershed.

We all depend on water for drinking, washing, cooking, growing our food, and recreation. Business and industry rely on water to support tourism and economic growth. Water is essential for aquatic life, and for sustaining our fisheries. Water has cultural and spiritual values for Indigenous peoples and for local communities, and it provides opportunities to swim, fish, paddle, and play.

The Shuswap watershed is much more than the lake: it is all the land and bodies of water that drain to the outlet of Little Shuswap Lake. It includes forests, fields, hillsides, wetlands, meadows, creeks, rivers and lakes from the Okanagan Highlands in the south, to the Monashee mountains in the north and east, to the Shuswap Highlands in the northwest. In total, the Shuswap watershed covers over 1,552,000 hectares or 15,520 square kilometres.

The Shuswap watershed is within **Secwepemcul'ecw**, the traditional territory of the Secwepemc Nation. Part of the watershed in the south, around the Salmon River, is within the traditional territory of the Syilx (Okanagan) Nation.

The Shuswap watershed forms part of the larger Thompson and Fraser watersheds.



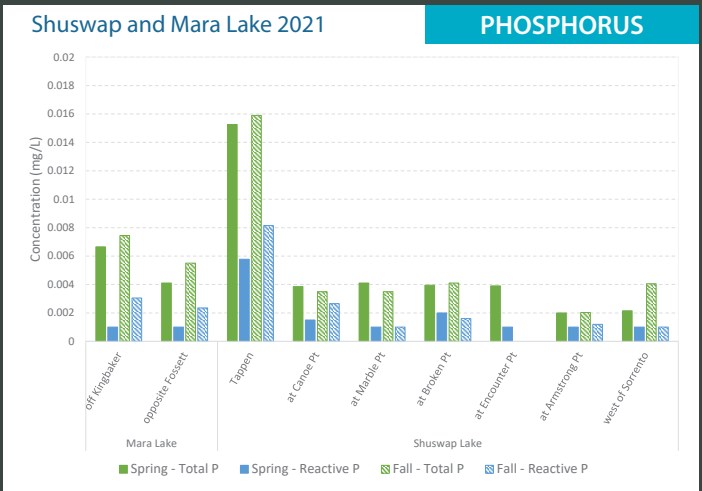
This is a simplified map of the Shuswap watershed. It shows the large lakes and rivers, and the water quality monitoring locations that are reported on the following pages.

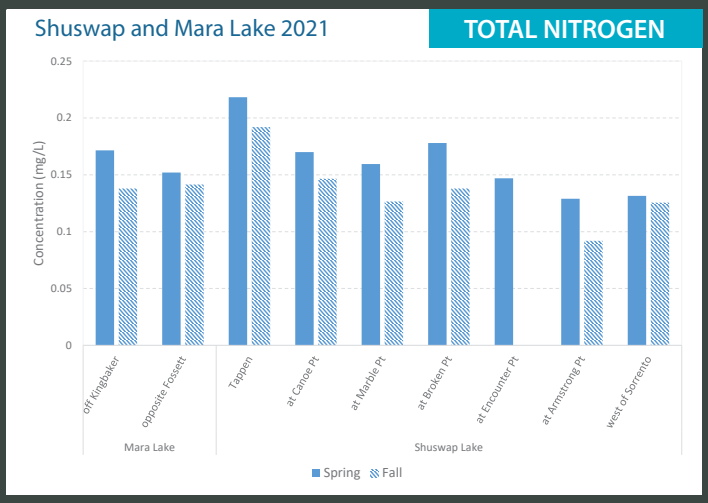
Select Water Quality Sample Locations

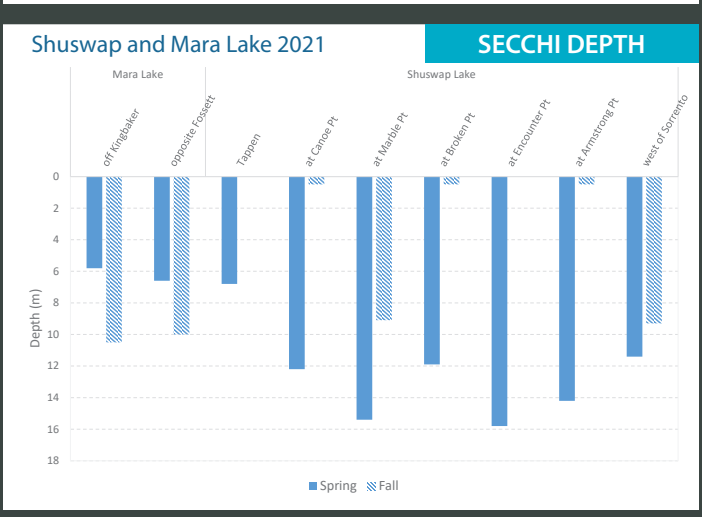
1. Sugar Lake
2. Mabel Lake—South End
3. Mabel Lake—Tsuius Creek
4. Mara Lake—Fossette
5. Mara Lake—S. Kingbaker
6. Shuswap Lake—Tappen
7. Shuswap Lake—Canoe Point
8. Shuswap Lake—Marble Point
9. Shuswap Lake—Broken Point
10. Shuswap Lake—Encounter Point
11. Shuswap Lake—Armstrong Point
12. Shuswap Lake—W. Sorrento
13. White Lake
14. Adams Lake
15. Salmon River
16. Shuswap River

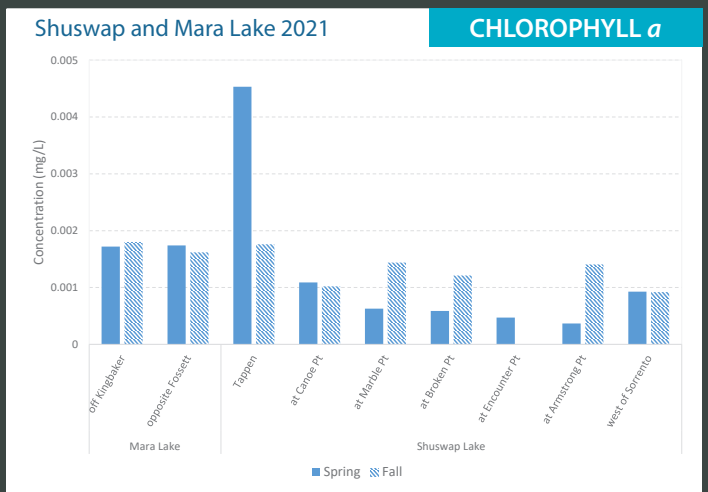
Shuswap and Mara Lakes

The BC Ministry of Environment & Climate Change Strategy monitored water quality at the lakes covered in this report. Here is a snapshot of water quality monitoring results from 2021.









Did you know?

Shuswap Lake has an average depth of 62 m, a maximum depth of 171 m, and a surface area of 310 km^2.

Why does water quality monitoring focus on nutrients?

Phosphorus (P) and Nitrogen (N) are important nutrients for many living things, and the concentrations of each really matter in an aquatic ecosystem. In some ways, a lake can be compared to a garden: if nutrients are added, plants will grow. In a lake, the first plant life to respond to nutrients is often phytoplankton, or algae. Algae—and other forms of aquatic life including invertebrates and fish—need these nutrients to grow and reproduce. In a healthy ecosystem, the give-and-take of nutrients is balanced. But, too many nutrients in an aquatic ecosystem can upset the balance and lead to excessive algae growth (an 'algal bloom'), odours, reduced water clarity, and it can compromise the quality of water for drinking and recreation.

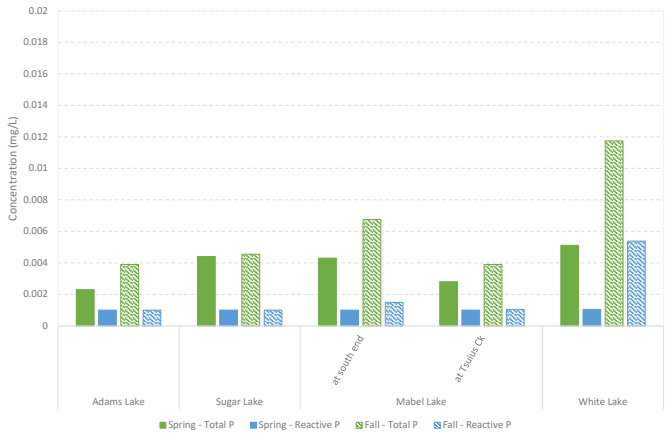
There are two types of P reported: Reactive P and **Total P.** Reactive P is a form of phosphorus that's immediately available (also known as "bioavailable") to plant life, such as algae and aquatic plants. Therefore, Reactive P is the form of P that has the potential to trigger an algal bloom.

Adams Lake, Sugar Lake, Mabel Lake, and White Lake

Photo Credit: K. Kaiser, Columbia Shuswap Invasive Species Society

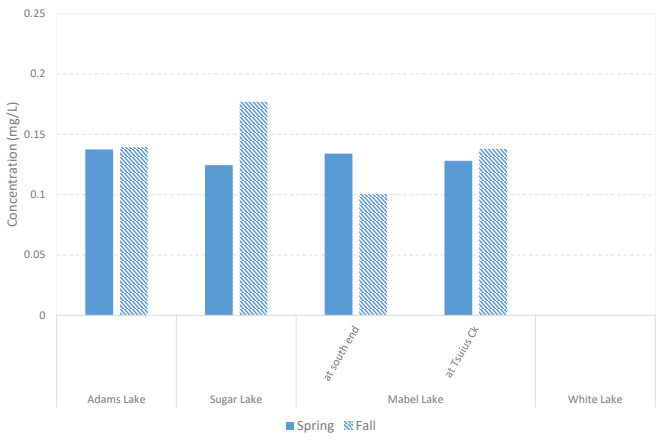
PHOSPHORUS

Adams, Sugar, Mabel, and White Lakes 2021



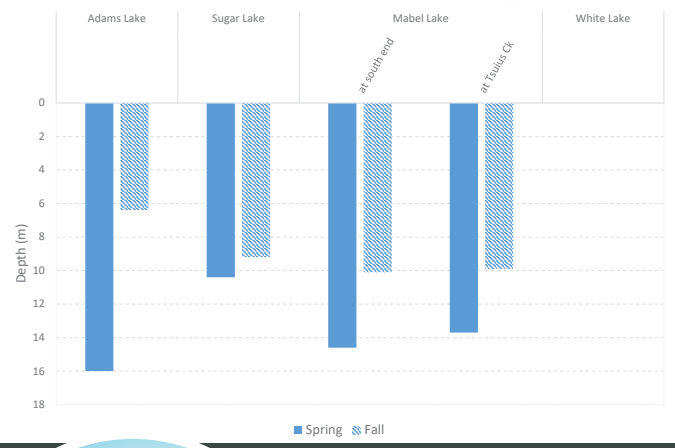
NITROGEN

Adams, Sugar, Mabel, and White Lakes 2021



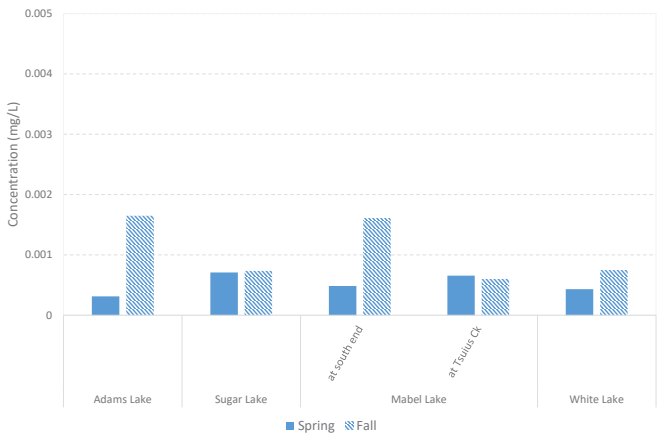
SECCHI DEPTH

Adams, Sugar, Mabel, and White Lakes 2021



CHLOROPHYLL *a*

Adams, Sugar, Mabel, and White Lakes 2021



Are you wondering where these sites are located? See the map on page 4 to find out.

Notice the differences in phosphorus and chlorophyll *a* between the lakes reported on this page, and Shuswap and Mara Lakes reported on the previous page. The values are lower for Mabel Lake, Sugar Lake and Adams Lake —this is indicative of the naturally very low-nutrient water quality in the upper reaches of the Shuswap watershed.

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Chlorophyll *a* is a pigment used by plants for photosynthesis. By measuring chlorophyll *a* in water samples, we can gain an understanding of how much algae there is.

A full water quality assessment report on Shuswap Lake, covering 20 years of water quality data, will be available from the BC Ministry of Environment & Climate Change Strategy later this year.

We all have a responsibility to ensure that we are not contributing excess nutrients to the watershed, where it could lead to water quality problems. Check out the tips on page 19.

An explanation of the lakes monitoring programs

Shuswap and Mara Lakes

The BC Ministry of Environment & Climate Change Strategy (MOE) routinely monitors several locations in the Shuswap watershed twice per year—spring and fall—to identify long-term water quality trends in the lakes. The water quality parameters reported here —nutrients, chlorophyll *a*, and Secchi depth—all relate to lake productivity (essentially, the ability of a lake to support the growth of plankton, plants, and animals). MOE's monitoring program also includes a suite of water chemistry parameters to support data interpretation and provide a comprehensive record of water quality trends over time. Some of these parameters include pH, temperature, turbidity, total suspended solids, hardness, sulphate, and alkalinity.

The importance and impacts of nutrients in a lake ecosystem

What is trophic condition?

Did you know that biologists classify lakes according to their productivity, or ability to support plant growth? This is referred to as a lake's 'trophic status' or 'trophic condition'. Generally, trophic condition ranges from oligotrophic (low levels of nutrients and productivity) to mesotrophic (moderate levels of nutrients and productivity) to eutrophic (high levels of nutrients and productivity). 'Eutrophication' is the progress of a lake toward a higher trophic condition, which naturally occurs very slowly over time, and can also be sped up by anthropogenic activities (people-caused) such as settlement and agriculture.

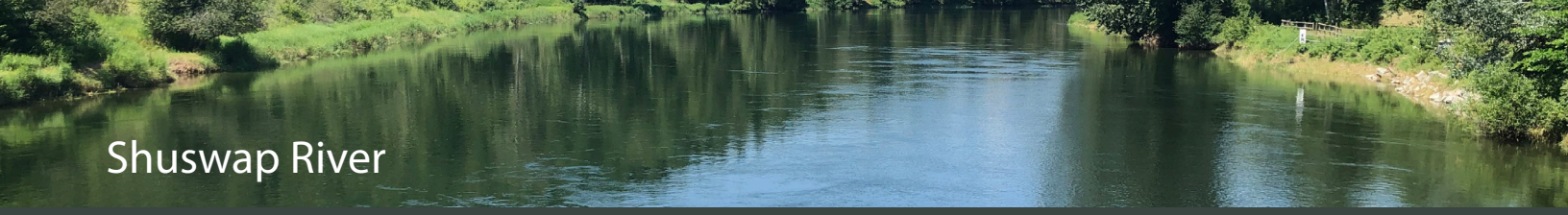
Influences on water quality

There are many activities which influence Shuswap Lake water quality. However, elevated nutrient levels are the primary water quality concern in Shuswap and Mara Lakes. The large rivers—the Shuswap, Salmon, and Eagle Rivers —are the largest sources of phosphorus and nitrogen to Shuswap and Mara Lakes.

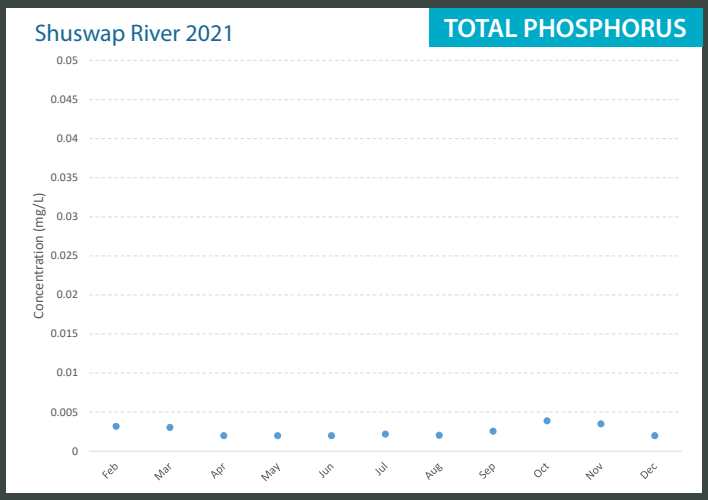
Agricultural operations dominate the landscape along the rivers and are a key contributor of nutrients to the lakes through fertilizer application to fields and manure from livestock. A small proportion of nutrients come from point-source discharges to surface water and groundwater (e.g., wastewater treatment plants). Private on-site wastewater (septic) systems are likely contributing nutrients to the lake in localized areas, especially around lakeshore areas and riparian habitat.

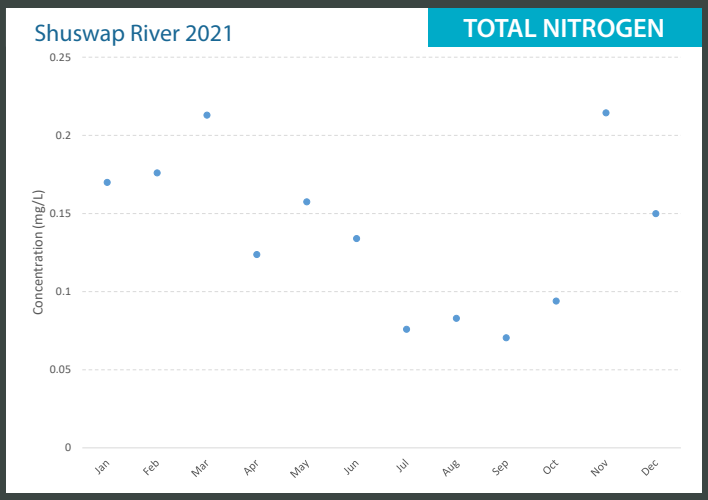
There are other anthropogenic activities in and around Shuswap Lake which may influence water quality. The lake provides significant recreational opportunities, and water quality could be impacted by activities around boat launches, docks, beaches, houseboats, and motorboats, as well as in parks and campgrounds. While the risk of impacts from recreation are highest during the summer months, the overall contributions of nutrients from these activities is considered low.

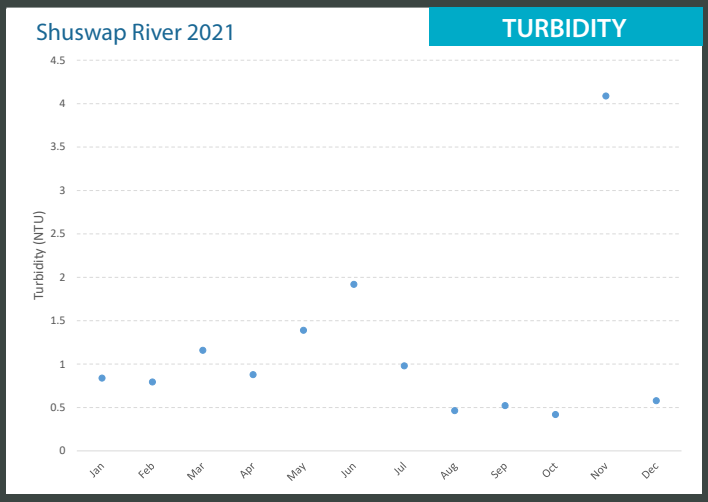
Source: BC Ministry of Environment & Climate Change Strategy Water Quality Objectives for Shuswap Lake (draft), 2022

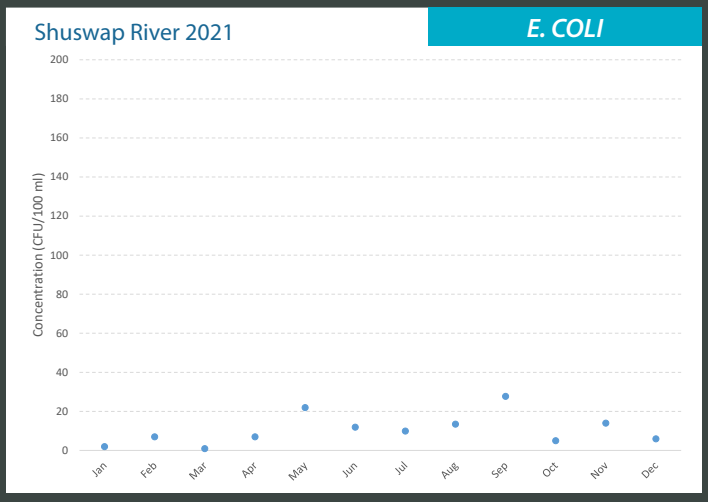


Shuswap River









Salmon and the Shuswap watershed

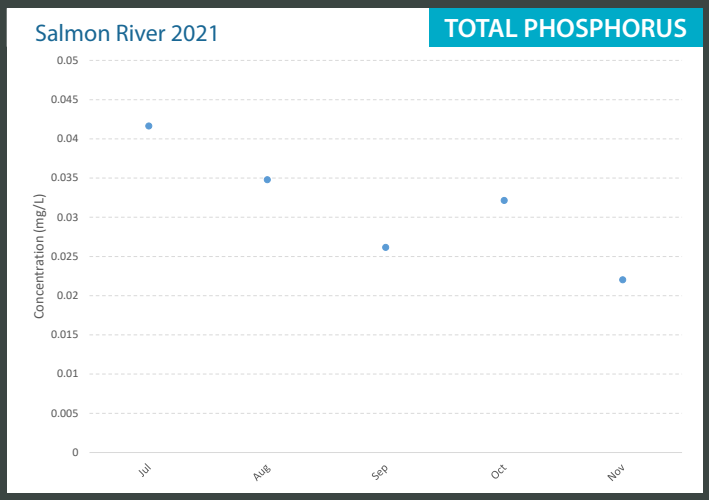
Did you know that the Shuswap watershed is important habitat for migration, spawning, and juvenile rearing for four species of Pacific salmon? The Lower Adams River is the most well-known, being the site of the world-famous Sockeye return and a quadrennial festival, the "Salute to the Sockeye", hosted at Tsutswecw Provincial Park. Many other rivers and creeks are important migration and spawning sites. The South Thompson River and Little River are 'salmon highways' into the Shuswap watershed, and both are significant for spawning by chinook, sockeye, and pink salmon.

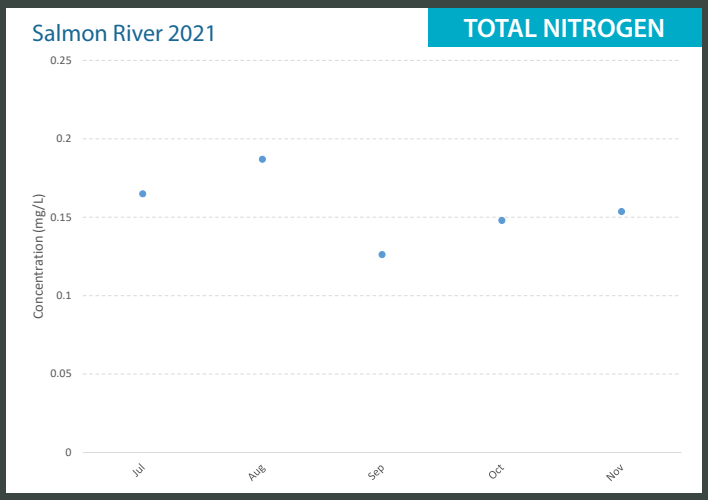
Some of the other dominant spawning sites include the Salmon River for sockeye, chinook and coho; the lower Shuswap River for sockeye and chinook; middle Shuswap River for chinook; Eagle River for sockeye and coho; Scotch Creek for sockeye; and Seymour River for sockeye and chinook.

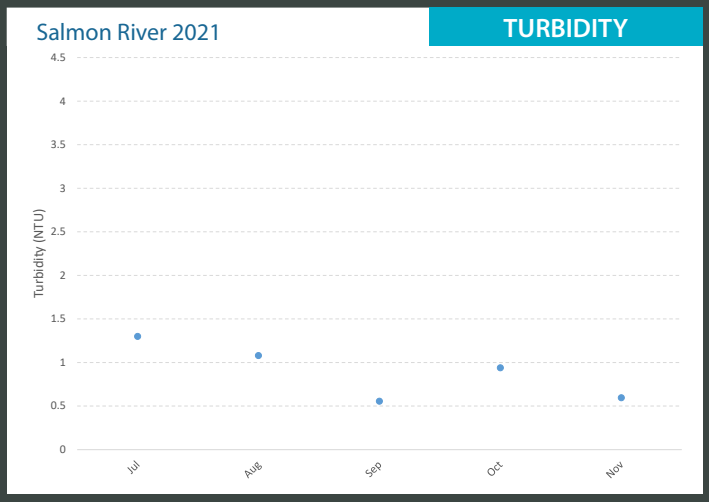
Smaller streams such as Bessette and Duteau Creeks in the Shuswap River drainage and small, groundwater-fed pools and wetlands are important for juvenile coho salmon. The nearshore zones of Mara, Shuswap, and Little Shuswap Lakes are also important for juvenile salmon rearing and lake trout spawning.

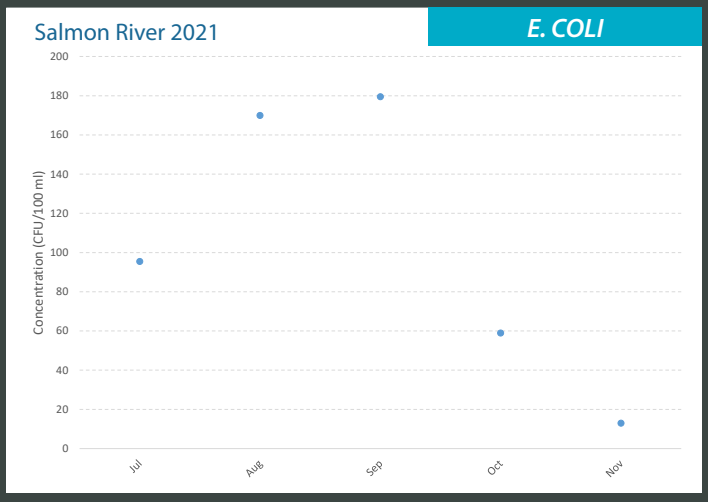
The Shuswap watershed with all its rivers, streams, wetlands and shorelines is very important in various stages of the salmon life cycle.

Salmon River









Salmon River attainment monitoring

A detailed water quality assessment for the Salmon River is now available from the BC Ministry of Environment & Climate Change Strategy

From 2005–2010 and again from 2016–2019, the BC Ministry of Environment & Climate Change Strategy (MOE) carried out thorough monitoring programs on the Salmon River that involved collecting water quality samples from up to seven sites on a monthly basis for the duration of the monitoring programs. These sampling campaigns served three key purposes:

- To assess if water quality objectives—established by the MOE for the Salmon River in 1998—are being met. This type of monitoring program is called **attainment monitoring**.
- To determine if water quality in the Salmon River is changing spatially (upstream to downstream) and over time
- To provide support for the nutrient research done by UBC-Okanagan and the Shuswap Watershed Council that was carried out on the river from 2016–2019 (see p. 12 for more information).

The results of the attainment monitoring programs have been assessed by MOE staff and contractors, and a full water quality assessment report describing how well the water quality objectives were met is now available.

Water Quality Objectives are benchmarks set by regulators (i.e., MOE) against which water quality measurements can be compared and evaluated. They are intended to protect water quality and can be used to direct policy or permitting processes.

What are the results of the Salmon River attainment monitoring program?

A snapshot of attainment monitoring results is presented in the table below. The Water Quality Objectives (WQO) are listed on the left, and the results are shown on the right in terms of how frequently water samples met the WQOs or not for each of the monitoring periods.

Met WQO

Did not meet WQO

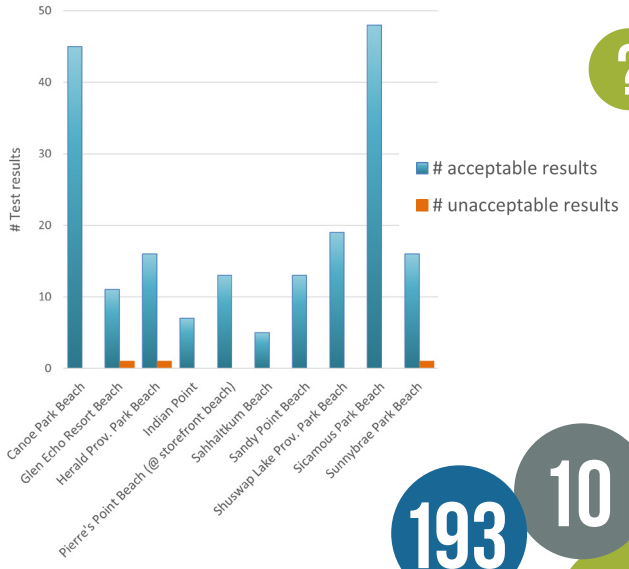
	2005–2010	2016–2019
Water temperature Long-term WQO 14.2C	86% met, 14% did not meet	82% met, 18% did not meet
Dissolved oxygen Long-term WQO 11 mg/L	68% met, 32% did not meet	48% met, 52% did not meet
pH Long-term WQO 8.5	98.4% met, 1.6% did not meet	94.1% met, 5.9% did not meet
Total phosphorus Long-term WQO 15 µg/L	94.1% met, 5.9% did not meet	83% met, 17% did not meet

Source: Chalifour et al., 2022.

Photo Credit: Victoria Haack / Shuswap Tourism

Swimming Beaches

Interior Health and First Nations Health Authority are the regulatory agencies that oversee water quality monitoring at popular swimming beaches in the Shuswap. Water samples are collected and tested throughout the summer months for *E. coli*, a type of bacteria that is an indicator of water contamination. Here are the results from their beach monitoring programs in 2021.



193 10 3

Some beaches are tested more frequently than others. Out of 193 water quality samples collected from these ten popular beaches in 2021, all but three met the federal water quality guideline for swimming and recreation.

What is an acceptable or unacceptable result?

There are federal guidelines for water quality for swimming and recreation that are different from guidelines for aquatic life or for drinking water. The recreation guidelines recommend that a safe bacteria level is less than 400 *E. coli* in a 100 mL sample, or an average of less than 200 *E. coli* in five consecutive 100 mL samples collected on a weekly basis. If results are above these, a swimming advisory may be issued.

Find the SWC's annual water quality summary reports—going back to 2016—on their website.

Shuswap Lake is one of only a few large lakes in BC without a dam or flow control structure on the outlet. The lake level fluctuates three to four metres annually!

About algae and algal blooms

Algae are a diverse group of simple plants that live in freshwater and marine environments. **Algae provide important ecosystem functions, including providing food for fish and supplying oxygen into the environment.**

When conditions for algae are favourable, algae reproduction and growth can be prolific resulting in a dense mass of algae called a bloom. It is difficult to predict algae growth or to pinpoint exact causes for it, but sunlight, water temperature, nutrients, and stable weather (i.e., minimal wind and wave action) can all contribute to algal blooms. Sometimes these favourable conditions occur naturally, other times they are caused by people through land use activities such as agriculture and horticulture, or by industrial or domestic waste waters.

It's not uncommon for small isolated pockets of algae to occur in Shuswap Lake or any of the smaller lakes in our region, especially in spring and early summer when a fresh supply of nutrients enters the lakes during spring run-off and there is more sunlight. That time of year there can also be organic debris such as pollen in the lakes, which can make identifying algae a challenge.

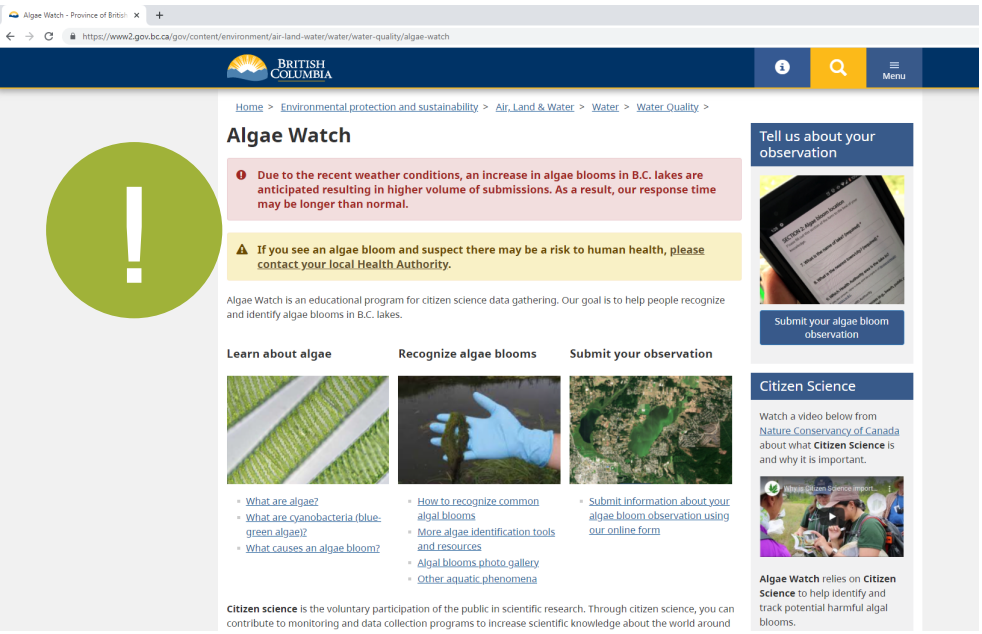
You can learn more about algae and how to recognize an algal bloom from a provincial website, Algae Watch: **www.gov.bc.ca/algaewatch**.

What are cyanobacteria?

Cyanobacteria, also known as blue-green algae, are microscopic bacteria that occur in lakes across BC and beyond. Similar to algae, when conditions for their growth and reproduction are favourable they can form a bloom. **Cyanoblooms are of particular concern because there are some species of cyanobacteria that are capable of producing toxins harmful to humans, pets, and livestock.** Not all cyanobacteria are toxic, and even toxic species do not always produce toxins.

In BC, there is a provincial protocol for monitoring and testing water quality for cyanobacteria, for both drinking and recreational purposes. The protocol describes maximum acceptable concentrations of microcystin, a toxin that can be associated with cyanobacteria. In the event of a cyanobloom, the local health authority may recommend or require a public notification. If a notification is required, the drinking water provider or beach owner/operator will post public notifications.

In the Shuswap, cyanoblooms are rare but they can happen. **You can reduce your risk of becoming exposed to cyanobacteria toxins by never drinking untreated water from lakes or ponds, and never swimming or recreating in water with a visible bloom.** When needed, Interior Health posts beach advisories online: **www.interiorhealth.ca/health-and-wellness/environmental-health-and-hazards/public-beaches**.



If you've spotted an algal bloom, submit your observations via the **BC Algae Watch** website. Your submission will go directly to staff at the BC Ministry of Environment & Climate Change Strategy. You can also view an **interactive map** of algae observations submitted by citizen scientists across BC.

www.gov.bc.ca/**algaewatch**

Photo Credit: North Shuswap Kicker

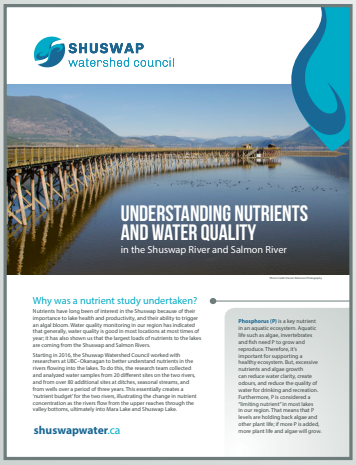
Water quality research in the Shuswap

Water quality monitoring in the Shuswap over the past several years has indicated that generally, water quality is good in most locations at most times of year. It has also shown us that nutrient-loading to Shuswap and Mara Lakes is one of the main threats to water quality, and that the largest loads of nutrients—phosphorus, in particular—are coming from the Shuswap and Salmon Rivers. Because of the significance of this, the Shuswap Watershed Council wanted to understand this better and then investigate ways to mitigate the risk to water quality associated with nutrient-loading.

The SWC worked with researchers at UBC-Okanagan to carry out two phases of research, beginning in 2016.

Would you like to learn more?

Check out this mini-report published by the SWC: **Understanding Nutrients and Water Quality in the Shuswap River and Salmon River.** Find it on the SWC website.



PHASE 1

PHASE 1 of the research took place from 2016-2019. It involved the collection and analysis of water samples by the research team from over 20 different sites on the Shuswap and Salmon Rivers, and from over 80 additional sites at ditches, seasonal streams, and wells.

This work created 'nutrient budgets' for the two rivers, illustrating the changing concentrations of nutrients in the water as the rivers flow through their watersheds and accumulate nutrients off the landscape. The results show that the highest concentrations of nutrients come from the settled valley bottoms, which are the areas most impacted by agriculture, housing, and commercial development. Therefore, these are the areas that we should focus our efforts at mitigating (decreasing) phosphorus inputs to the rivers to protect water quality for the long term.

PHASE 2

PHASE 2 of the research was carried out in 2018-2019. It involved the collection and analysis of a sediment core (lake-bottom mud collected in a long tube) from Mara Lake. Using a type of science called **Paleolimnology**, the research team determined the historic nutrient conditions in Mara Lake and discovered how nutrient-loading to the lake has changed over the past 150 years, since the time of settlement and land use changes in the Shuswap River valley. The results show that nutrient concentrations in Mara Lake have fluctuated in recent history, and that nutrient concentrations have been trending upward since the 1990s.

Water Quality Grant Program

The Shuswap Watershed Council launched a Water Quality Grant Program in early 2020. The grant program offers funds to assist farms, landowners, and stewardship groups with projects that protect and improve water quality, with a focus on mitigating the risks associated with nutrient-loading from land into surface waters. The grant program is administered through a call for applications, application review, and approval. Applications to the grant program must describe how their project will improve nutrient management on the landscape by retaining nutrients in the soil, and not washing off or leaching into nearby streams and rivers.

The SWC produced a short, informative video with Salmon Valley-based farms that received grant funding from the Council in 2020. Find the video on the SWC's YouTube channel!

2021 Water Quality Grant Funding recipients

Trinity Dairies completed field drainage improvements to mitigate the risk of floodwaters becoming nutrient-enriched in cropland adjacent to the Shuswap River.

Hillside Dreams Goat Dairy implemented a new grazing regime with multiple paddocks to better manage live-stock manure. Automatic waterers were installed in the paddocks to provide an off-stream water source, so livestock don't enter the nearby Salmon River which in turn reduces streambank erosion and manure deposition into the river.

The purpose of the SWC's Water Quality Grant Program is to assist agricultural producers and other land stewards to retain nutrients on land and in soil, and prevent nutrients from washing off into nearby creeks and rivers through rain, snowmelt, or flooding where it could contribute to water quality degradation.

A Phosphorus Action Plan for the Shuswap watershed

The levels of phosphorus and other nutrients in Shuswap and Mara Lakes have the potential to significantly impact water quality. In addition to researching phosphorus loading into the lakes and offering a water quality grant program to mitigate the risks associated with nutrients, the Shuswap Watershed Council is currently developing a **Phosphorus Action Plan** for the Shuswap watershed. The purpose of the plan is to provide guidance to diverse audiences in the Shuswap watershed on actions they can take to reduce phosphorus loading to water bodies. The plan will summarize phosphorus regulations, and it will identify new, innovative, and strategic solutions for phosphorus management. The Phosphorus Action Plan will be geared toward all audiences, so that everyone in the watershed can take action to reduce their 'phosphorus footprint': homeowners, boaters and recreationists, farms and agriculturalists, the forest industry, the transportation sector, all orders of government, and the Shuswap Watershed Council itself.

Keeping invasive Zebra and Quagga Mussels out of the Shuswap

CSISS collected 116 samples from 15 sites on 8 lakes throughout the Shuswap in 2021. Invasive mussels weren't detected at any of these locations!

116

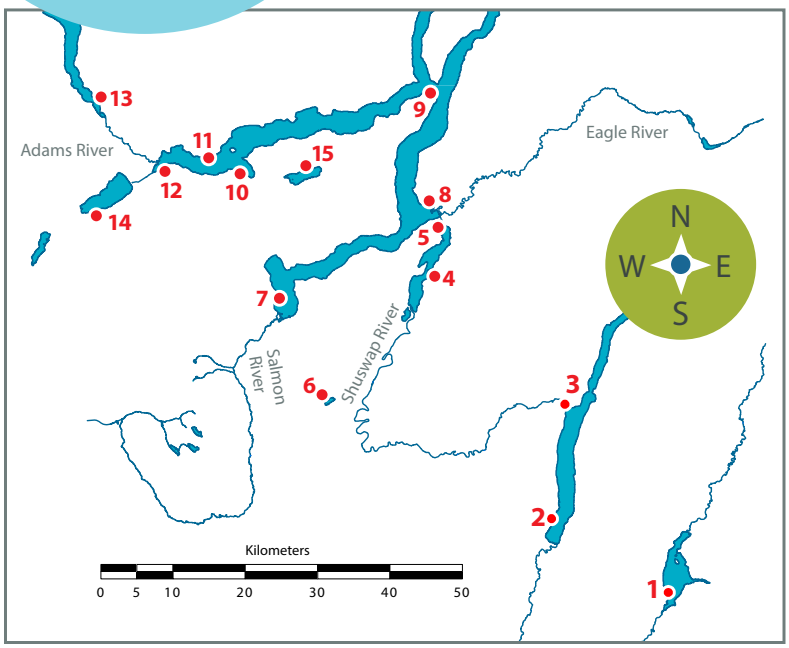
15

8

Zebra and quagga mussels are two species of freshwater mussels native to Europe and Asia with tremendous destructive potential due to their ability to attach and grow on objects in the water: boats, water supply pipes, irrigation systems, dock pilings, hydro-electric facilities, and more. They also litter beaches with their small razor-sharp shells, impact water quality and aquatic food webs, reduce biodiversity by out-competing native species for food and space, and produce foul odours.

Fortunately, **zebra and quagga mussels don't exist in the Shuswap**—or in any of BC's lakes—but they do occur in Ontario, Manitoba, and as far west as California. Since arriving in North America in the 1980s in ship ballast water, they have spread to new water bodies by 'hitch hiking' on boats and other watercraft. If we don't take necessary prevention steps, invasive mussels could spread to BC.

With financial support from the SWC and others, the Columbia Shuswap Invasive Species Society (CSISS) has monitored several sites throughout the Shuswap for invasive mussels for the past seven years. All their test results have been negative, meaning that invasive mussels have not been detected.



ZQM Monitoring Sites in 2021

1. Sugar Lake—2 Mile Rec Site
2. Mabel Lake—Provincial Park
3. Mabel Lake—Kingfisher
4. Mara Lake— Swansea Point
5. Mara Lake— Sicamous Narrows
6. Gardom Lake—Community Park
7. Shuswap Lake—Sandy Point/Pierre's Point
8. Shuswap Lake—Old Town Bay
9. Shuswap Lake—Cinnemousun Narrows
10. Shuswap Lake—Blind Bay
11. Shuswap Lake—Captain's Village Marina
12. Shuswap Lake—Little River Boat World
13. Adams Lake—Indian Point Resort
14. Little Shuswap Lake—Chase Memorial Park
15. White Lake—White Lake Provincial Park

Invasive freshwater clams in the Shuswap

In 2019, invasive freshwater clam shells were discovered on the shores of Shuswap Lake. Surveys done on beaches confirmed low-density populations of the clams at Sunnybrae and Canoe (in the Salmon Arm of Shuswap Lake). Invasive clams are very difficult to eradicate from a complex waterbody like Shuswap Lake.

Invasive freshwater clams have a light brown triangular shell, usually less than 2.5 cm in length with visible growth rings.

Photo credit: Columbia Shuswap Invasive Species Society

Did you know?

Shuswap Lake and other lakes in our region are at high risk of a mussel infestation because the temperature, pH levels, and calcium concentrations are well suited to mussel survival. Additionally, the high influx of watercraft that the Shuswap receives in the summer from outside of BC also puts our lakes at greater risk of an invasion.

I CLEAN DRAIN DRY
to prevent the spread of aquatic invasive species
cleandraindry.ca

Eurasian Water Milfoil in the Shuswap

Eurasian water milfoil (EWM) is an invasive aquatic plant that grows in water depths up to approximately 5 metres. Although aquatic plants are, in most cases, an important component of a lake ecosystem, EWM is problematic because it forms dense mats of plants which adversely affect swimming, boating, tow sports, fishing, fish spawning, irrigation, and drainage. Additionally, it spreads easily and rapidly to new areas, and it's almost impossible to permanently eliminate once it establishes.

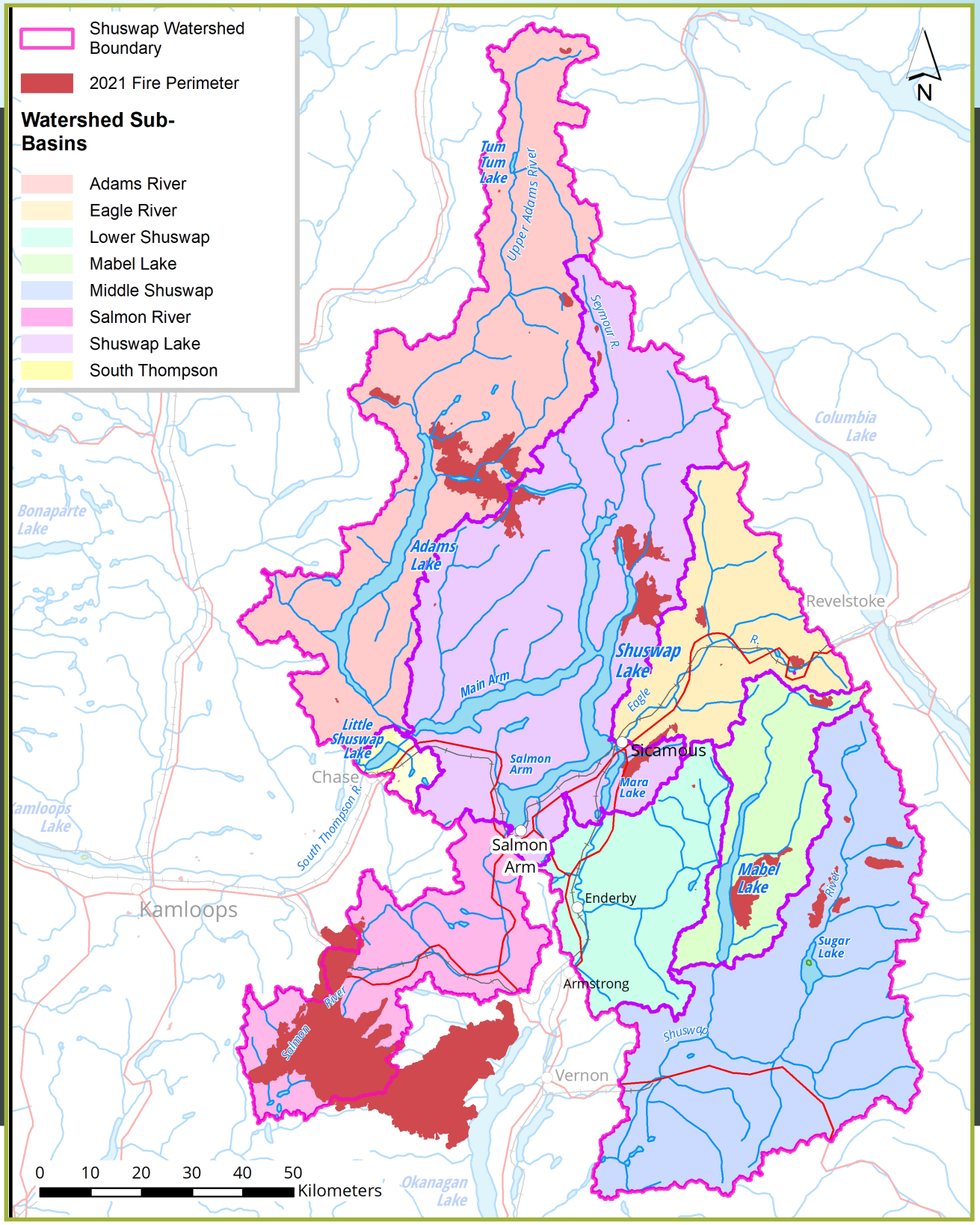
The Shuswap is not as badly infested with EWM as other lakes in BC, but it does exist in Shuswap Lake, Mara Lake, Little Shuswap Lake, and the Shuswap River. The largest infestation of it is in Salmon Arm Bay (Shuswap Lake).

The Columbia Shuswap Regional District manages EWM infestations with a combination of harvesting and rototilling treatments. Harvesting takes place in the summer to provide short-term relief in swimming and boating areas; rototilling takes place in autumn and winter when plants are dormant. Rototilling involves lifting the plants from the lake bottom so they can dry out and die—this is a proven technique to reduce the density of EWM.

What can you do? Help stop the spread of aquatic invasive species:

- Clean, drain and dry watercraft when moving from one waterbody to another
- Stop for watercraft inspection when travelling
- Don't use invasive species as fishing bait
- Never release or dump aquarium plants or animals into the environment or down a drain
- Report sightings of invasive clams and other invasive species using the Report Invasives BC app

2021 wildfires in the Shuswap watershed



2021 was a significant wildfire year in many regions across BC due to relatively dry spring conditions and prolonged high temperatures (referred to as the 'heat dome'). **This map shows the boundary of the Shuswap watershed with eight major sub-basins, and the wildfires within the Shuswap** (shown in red polygons). The White Rock Lake fire, in the southwest part of the watershed, was the largest fire within the Shuswap—although, as the map illustrates, about half of the fire was situated within the Okanagan watershed.

Forest fires and watersheds

The shield, the sponge, and the filter

In a healthy forested watershed, the trees and soil intercept and receive precipitation like a shield, a sponge, and a filter. When rain or snow falls, trees capture some of it and prevent it from falling to the ground and potentially from causing erosion. In this way, a forest acts like a shield. Some precipitation does fall to the ground directly, or flows down the stems of trees to the ground. Once on the ground, the soil soaks up and stores some of the precipitation just like a sponge would. As water moves downstream, the soil filters the water. **By acting like a shield, sponge, and filter, a forest is very important in a watershed: it stores water and regulates supply, it provides good quality water, and ultimately helps to lower the cost of drinking water treatment for communities downstream.**

What happens after a wildfire? The most obvious result after a wildfire is that the forest canopy has been removed, which in turn takes away the shield effect. Consequently, rain hits the ground at full speed and erosion is more likely to occur, causing ash and soil to wash off the landscape into creeks and rivers. Additionally, with the forest canopy removed more sunlight hits the ground and consequently the timing of snowmelt is earlier in the year. Furthermore, the rate of snowmelt increases, which in turn can cause erosion and flash flooding. After an especially intense wildfire, the forest soil structure is compromised. Soil may become hydrophobic (water-repellent), and instead of soaking up rain and snowmelt, water sits on the surface or runs directly off—thereby essentially removing the sponge and filter effects. As a result of these impacts, water quality is degraded and the overall storage capacity of the watershed decreases.

In the years following a wildfire, the plant community re-establishes and the shield, sponge, and filter effects return.

Source: Dr. Francois-Nicolas Robinne, Canadian Forest Service, Great Lakes Forestry Centre

How much burned?

1,552,678 hectares
The size of the Shuswap watershed

84,485 hectares
The total area burned within the Shuswap watershed in 2021

5.40%
Percentage of the Shuswap watershed burned in 2021

"It all begins at the source, everything that goes down the drain can affect the wastewater treatment plant and the environment."

Photo Credit: Darren Robinson Photography / Shuswap Tourism

Wastewater treatment plant upgrades

The **Salmon Arm Water Pollution Control Centre** (WPCC) Stage IV upgrade is underway. The upgrade will expand the current treatment capacity of the plant from an equivalent population of 15,000 to 20,000. A Site Selection Study, completed in 2021 with extensive public engagement, recommended that the expansion of the plant be constructed in the existing location with considerations in the design to maximize odour control and minimize footprint. A technology selection process commenced in 2021 to identify the ideal treatment process to be implemented through the expansion that would best meet the needs of the community as defined through regulatory requirements and outcomes of the Site Selection Study. The technology selection process included piloting a new technology, Aerobic Granulated Sludge at the WPCC to ensure treatment objectives could be achieved with the City's influent conditions. Recommendations are anticipated in mid-2022, after which the City will move forward with preliminary and detailed design. The design is anticipated to take two to three years, followed by construction which is anticipated to take two years.

The City of Salmon Arm is undertaking a **Source Protection Plan (SPP)** in 2022. The purpose of the SPP is to identify areas and activities that could affect the quality, quantity, and timing of the flow of the drinking water source. By identifying critical areas and activities, the City can influence planning and measure impact on their system. In addition, the plan is to reduce threats to water quality and provide an additional barrier for drinking water protection. This plan will complement the existing wastewater source control education plan which is designed to discourage, restrict or prohibit the discharge of harmful contaminants to the City's sewer collection system.

Source: City of Salmon Arm

The **District of Sicamous** began wastewater treatment plant upgrades in 2017 following a study done by Stantec that identified key issues including permit exceedances of some water quality attributes post-treatment. Stantec provided numerous recommendations to improve the treatment process. The project was completed in multiple phases over four years. Collection system improvements included the addition of a sanitary lift station at Old Town Bay and the addition of backup generators at numerous sanitary lift stations. Treatment plant improvements included decommissioning the complete mix tank, construction of a head works screening building to remove inorganic waste from entering the lagoon system, addition of a blower to increase air flow to the lagoons, replacement and addition of aeration within Lagoon 1, splitting Lagoon 1 by the addition of a baffle which in turn increases the retention time and improves biological treatment and settlement, desludging Lagoon 1 and the Phosphorus Lagoon, scarification of the rapid infiltration basins, and addition of a tertiary filtration building. These improvements reduce the total suspended solids and the total phosphorus in the effluent, and help protect the Eagle River and surrounding environment. All Stantec's recommendations have been implemented, and District staff will monitor the treatment plant to quantify the net benefit of the improvements completed.

Source: District of Sicamous

The importance of septic system maintenance

Where does your wastewater go? Many homes in the Shuswap use decentralized onsite septic systems for their wastewater. Keeping your septic system in good working order is the duty of the homeowner under the *Health Act*.

No matter how close you are to a stream or lake, maintaining your septic system is integral to protecting the Shuswap watershed. All wastewater from septic systems enters groundwater and stream water. Ensuring your septic system is operating as intended by its design is important for public and environmental safety, as well as for our recreation, tourism, and real estate. Here are some points to help you manage your septic system:

- Perform regular maintenance and pump-outs. Most systems require pumping approximately every three years. Maintenance schedules depend on the type of system and occupancy in your home. Hire a Registered Onsite Wastewater Practitioner (ROWP) maintenance provider to look after your system.
- Flows entering your septic system must match the design intent for the system. For example, a two-bedroom home septic system is designed for the wastewater flows of three people with the occasional larger gathering.
- Be conscious of your water use and what goes down the drain. Use water conserving fixtures, limit toilet paper use, do not flush foreign objects (wipes, hygiene products, etc.), and minimize oil and grease.
- Promote a healthy living environment for bacteria that breaks down your wastewater—this is done simply by using your system regularly. Do not use enzymes unless a ROWP recommends you do.
- Upgrade and create at-grade access to all components of your septic system to allow ease of ongoing maintenance and monitoring, which can potentially add significant lifespan to your system.
- For older systems, consider getting your septic system inspected by a ROWP who is a Private Inspector Residential for guidance on remediation/refurbishing verses replacement, and to avoid problems in the future. Even though a system appears to be working, it could be leaking underground or beginning to back up, potentially leading to a health hazard.
- For more ideas, see: The Septic Smart Homeowner's Guide —csrd.bc.ca/septicsmart/

Source: Natalya Melnychuk, SWC member and Registered Onsite Wastewater Practitioner

Help keep the Shuswap clean

- If you have a farm or agricultural operation of any kind, follow the provincial *Code of Practice for Agricultural Environmental Management*. This regulation was enacted by the BC Ministry of Environment & Climate Change Strategy in February 2019 to ensure agricultural practices are consistent with the protection of clean, safe drinking water. Learn more at **https://bit.ly/2ToGpu2**
- Ensure nothing harmful is entering storm drains from your yard or driveway, such as lawn fertilizer or soapy water and debris from washing your vehicle
- If you're a boat owner or have a watercraft of any kind, take the necessary steps to avoid accidentally moving invasive species from one waterbody to another. Always clean, drain, and dry your watercraft. When you travel, stop at watercraft inspection stations.
- Ensure your boat doesn't leak fuel or oil into the lake
- Properly dispose of unused medications. Don't throw them out or flush them—return them to a pharmacy.
- Don't ever flush personal care products such as wipes, floss, gloves, cotton swabs or hygiene products—not even if it says 'flushable' on the package
- Don't put fats, oils or grease down the drain. Cool it and dispose of it in your garbage. Large quantities of liquid fats and oils should be dropped off at a hazardous waste facility (e.g., Salmon Arm landfill).

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What do you think?

Would you like share your feedback on this report with us? Please contact the SWC, care of the Fraser Basin Council in Kamloops:

Erin Vieira
SWC Program Manager
evieira@fraserbasin.ca
250.314.9660

Photo Credit: North Shuswap Kicker

SHUSWAP watershed council

Who We Are

About the Shuswap Watershed Council

The SWC was established in 2014 as a watershed-based partnership of several organizations with an interest in or responsibility for protecting water quality. There are up to 22 members that represent three regional districts, two municipalities, the Secwepemc Nation, three provincial government agencies, and Shuswap communities. The SWC is a collaborative, non-regulatory group that focuses on strategic initiatives to protect, maintain, and enhance water quality and promote safe recreation in the Shuswap. The SWC works alongside organizations that have regulatory roles in managing the Shuswap watershed, complementing their work and carefully avoiding duplication.

Staff

The Fraser Basin Council, a provincial non-government organization, provides staff services to the Shuswap Watershed Council.

Our Vision

Enhanced water quality that supports human and ecosystem health and the local economy in the Shuswap watershed.

What We Do

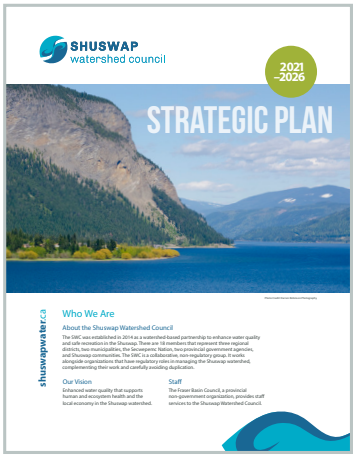
Our Goals

The SWC's goals are that water quality is maintained and improved in the Shuswap for the benefits of a healthy ecosystem, a thriving tourism economy, and a desirable lifestyle for residents; that the SWC is the trusted, go-to source for water quality information in the Shuswap; that people in the Shuswap practice safe water-based recreation; and that the SWC is a well-governed, transparent, collaborative organization.

The Work

The SWC's work on water quality, prevention of aquatic invasive mussels, and safe water-based recreation is guided by its Strategic Plan for 2021–26.

The SWC has a Strategic Plan for 2021–26. Find it on their website: shuswapwater.ca



Acknowledgments

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