LSWC Fact Sheet:

Water Quality in Lesser Slave Lake

Water Quality Concerns

Water quality is a concern for everyone who uses the waters of a lake or river. People who get their drinking water from Lesser Slave Lake need the water to be safe and to taste good. Fisheries and recreational anglers want lake waters that can support a healthy fish population. Boaters, swimmers and other recreational users want clear, clean water that is free from too much algae and weeds. Before 1991, there was very little information available on the water quality of Lesser Slave Lake, but as development around the lake increased, people living in the watershed became more and more concerned. Because of this concern, Alberta Environment completed two major water quality surveys, one from 1991 to 1993 and a second from 2000 to 2001.

Lesser Slave Lake

Lesser Slave Lake is the second largest Alberta lake that lies completely in Alberta. (Lake Athabasca is larger but part of it actually lies within Saskatchewan.) Lesser Slave Lake covers an area of 1,160 square kilometres. It has two main sub-basins, the east basin and the west basin, separated near the middle of the lake by the Narrows. Buffalo Bay is a third sub-basin at the north-west end of the lake that is connected to the main lake by the Grouard Channel. The east basin is deeper and has steeper slopes than the west basin which has large shallow areas where aquatic plants thrive. Buffalo Bay is a delta area which several rivers flow into, depositing a lot of sediment, silt, mud and debris. The waters there are very shallow and the shoreline shrinks or expands dramatically depending on the water level.

Water Quality Monitoring

Water samples are collected by trained personnel and kept on ice in coolers until they reach the lab. The lab analyzes the samples for all sorts of things like nutrient levels, contaminants, oxygen levels, clarity, etc.

The Surveys

The 2000-2001 survey collected lake water samples from the east and west basins of Lesser Slave Lake in July, August, October and February. More frequent samples were collected from the lake outflow to the Lesser Slave River. The 1991-1993 survey collected samples once a month when the lake was free of ice and once when it was frozen. They also collected water samples from the Lesser

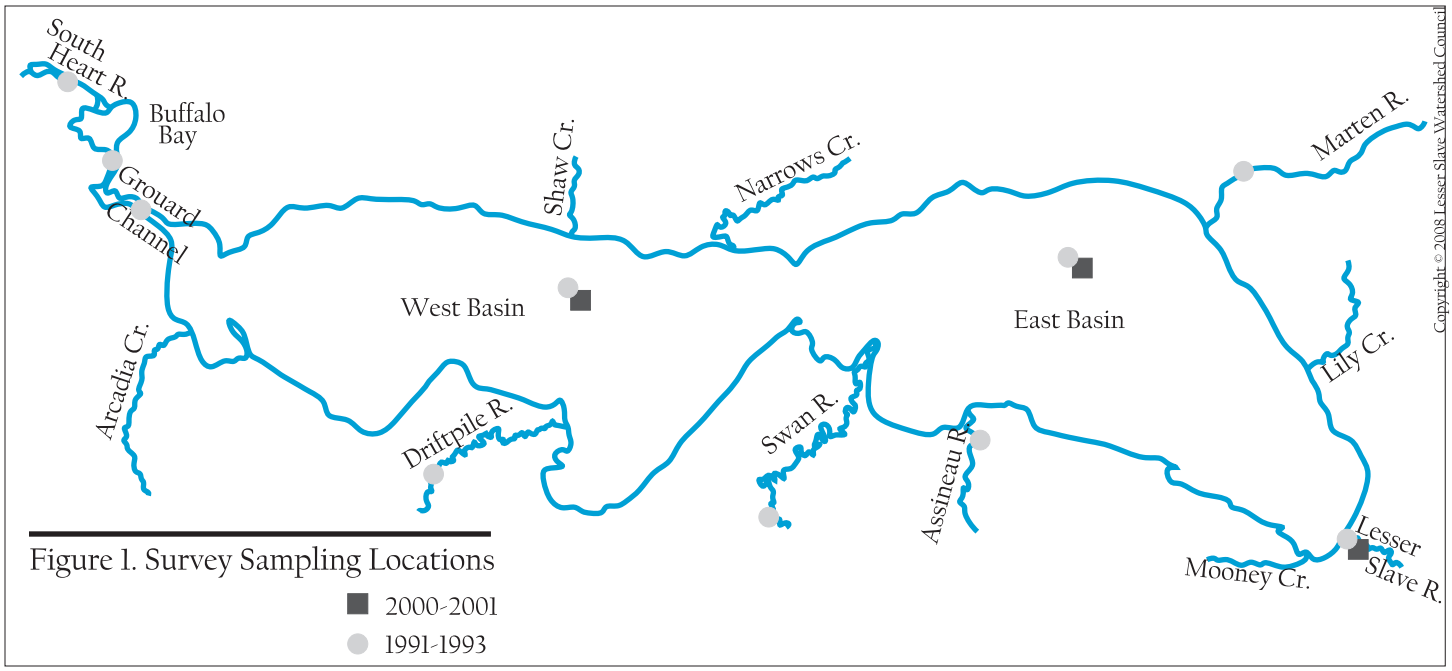


Figure 1. Survey Sampling Locations

Slave River, Buffalo Bay, Grouard Channel and five tributaries of Lesser Slave Lake—the South Heart River, the Driftpile River, the Swan River, the Assineau River and Marten Creek (Figure 1).

Results

The water quality surveys looked at a wide range of variables such as water temperature, dissolved oxygen, pH, water clarity, nutrients like nitrogen or phosphorus, organic compounds like pesticides and metals like mercury or iron. They compared the results to the Alberta Surface Water Quality Guidelines published in 1999. The guidelines give general guidance; some lakes may naturally have levels of certain metals or nutrients that are above the guidelines. This doesn't necessarily mean that the water quality is poor but it does mean that it might deserve a closer look.

Water Temperature

Deep lakes often undergo what scientists call thermal stratification in the summer. This means that three separate layers of water form—an upper warm layer, a deep cold layer and a middle layer where the temperature changes quickly. Both surveys found that Lesser Slave Lake rarely does this and that when it does undergo thermal stratification, it's very weak and doesn't last long (Figure 2). This shows that the lake waters are very well mixed—mostly from the typical windy conditions in the area.

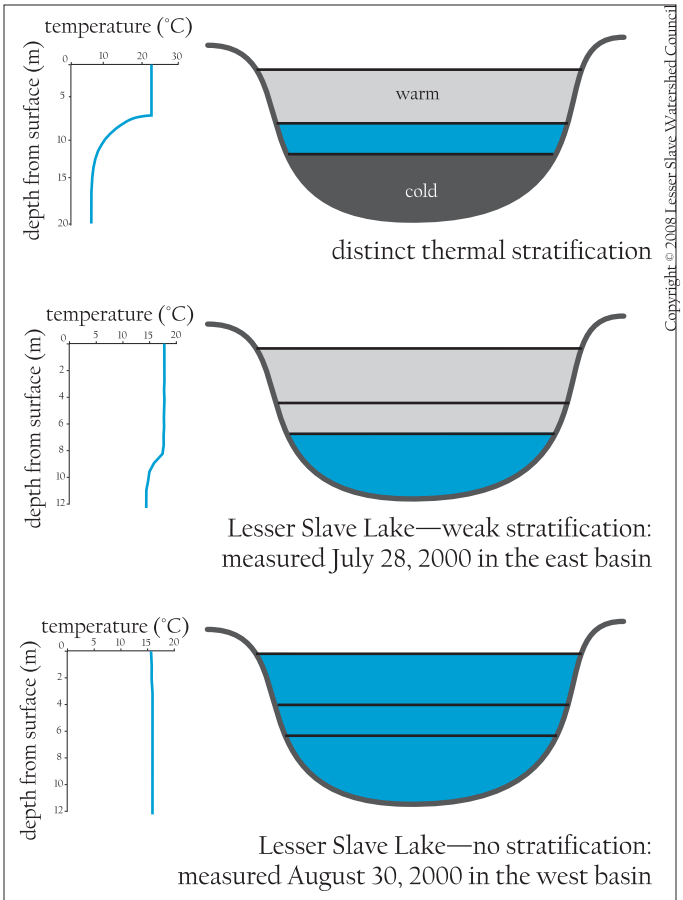


Figure 2. Thermal Stratification Scenarios

Oxygen

Fish and other aquatic life don't breathe air like land animals do but they do use oxygen that is dissolved in the water to live. Low levels of oxygen can be fatal for aquatic life. The waters of Lesser Slave Lake showed high levels of dissolved oxygen during both surveys, often containing the maximum amount that the water could hold and with fairly high levels even in the deeper waters where oxygen levels are often found to be low.

Nutrients

Gardeners know that phosphorus and nitrogen are critical nutrients for plants growing on land. These same nutrients, along with organic carbon, are also critical for the growth of aquatic plants and algae. Phosphorus is usually the limiting factor for algae growth, meaning that levels of nitrogen and carbon are usually high enough to allow for much more algae to grow, and the reason the algae stops growing is because the phosphorus gets low. Levels of nitrogen and phosphorus were sometimes above the levels recommended by the water quality guidelines, especially at the end of the summer (Figure 3). This causes unattractive algae blooms that are a concern for residents around the lake.

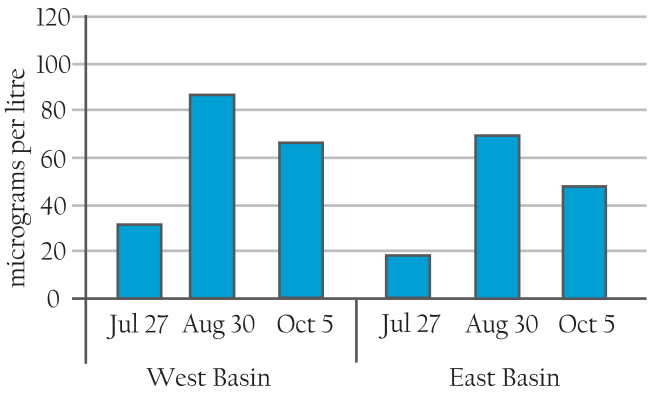
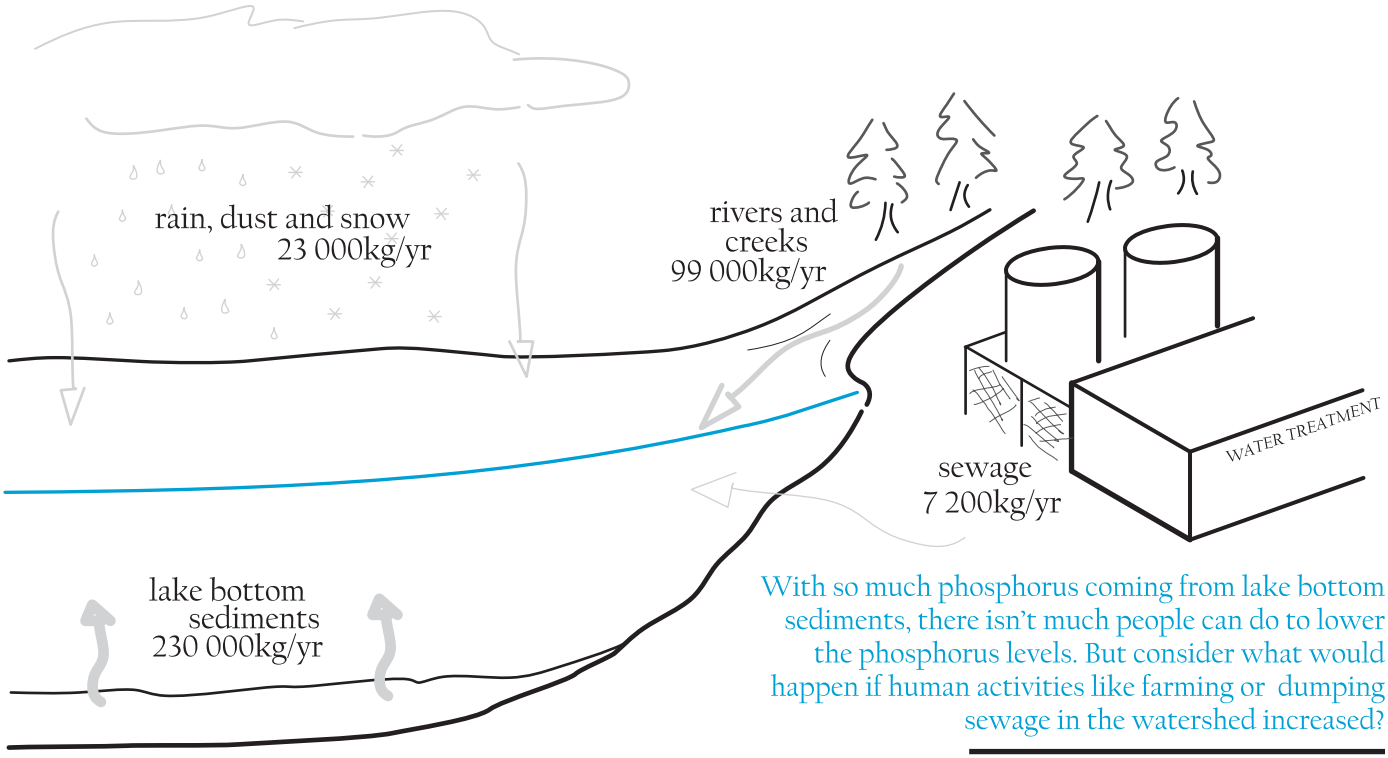


Figure 3. Annual Phosphorus Levels

Phosphorus levels are low over the winter and increase over the summer, generally peaking in August. Values measured in 2000.

So where does all the phosphorus come from? Take a look at Figure 4 below to see the sources of phosphorus found in Lesser Slave Lake.



With so much phosphorus coming from lake bottom sediments, there isn't much people can do to lower the phosphorus levels. But consider what would happen if human activities like farming or dumping sewage in the watershed increased?

Figure 4. Sources of Phosphorus
in kilograms per year

Metals, Organics, and Water Chemistry

In the 2000 survey, lake water samples were analyzed for 29 different metals, 40 different known pesticide compounds and 27 other measures of water quality. Samples from the lake outflow into Lesser Slave River were analyzed for 33 water quality measurements and 119 different organic compounds. With the occasional exception of nitrogen and phosphorus levels, all the results were better than the levels recommended by the water quality guidelines. In fact, the vast majority of pesticides and organic compounds were not even found at all.

So Is the Water Safe?

The results of the two different water quality surveys were nearly identical and both found that the water quality of Lesser Slave Lake is generally very good. Algae blooms and high levels of phosphorus and nitrogen are some things that need to be watched in the future but they seem to be a natural phenomenon. Research is going on right now to find out what the lake was like before human development began in the watershed.

Environmental awareness is increasing, and more and more people are concerned about the impact environmental factors can have on their health. For now though, the water in the Lesser Slave Lake is generally good, and safe for swimmers, boaters, anglers and all those who use it.

Water quality monitoring is an ongoing project of the Lesser Slave Watershed Council. Water sampling is currently being done to help us discover if the water quality is getting better, getting worse, or is staying the same.

References

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Lesser Slave Watershed Council

This fact sheet about water quality in the Lesser Slave Watershed is one of a series of informational brochures about the Lesser Slave Watershed produced by the Lesser Slave Watershed Council.
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