Lac La Biche County has an annual program to monitor the water quality of lakes located within its boundaries. The water sampling events are conducted during the winter and summer of each year and has been ongoing since 2002. A total of five lakes are monitored each year by Lac La Biche County. Certain lakes may not be monitored by Lac La Biche County if they are already being monitored by environmental organizations such as the Alberta Lake Management Society (data may be shared upon request between Lac La Biche County and these organizations).

Each lake is sampled for various parameters (see Table 1 for a detailed explanation) using different techniques. Monitoring begins at the deepest point of each lake where a secchi depth is taken and then a multi-probe is used to measure pH, temperature, specific conductivity, and dissolved oxygen. A composite sample is then taken from a combination of 10 different locations throughout each lake. Finally, a Kemmerer device is then used to obtain samples of water from specific depths through the lake water column. Kemmerer sampling is only completed twice per year, once in the winter and again in the late summer. The Kemmerer samples and composite samples are tested for routine water chemistry, total phosphorus, total nitrogen and total dissolved metals.

The lake quality parameters are used to characterize the trophic state of each lake and further identify any potential concerns. Trophic State Index (TSI) is a classification system designed to rate lakes based on the amount of biological activity they sustain. The concentrations of nutrients (nitrogen and phosphorous) are the primary determinants of TSI. Increased concentrations of nutrients tend to result in increased plant growth, followed by an increase in subsequent trophic level. Nurnberg (1996) used parameters including Secchi depth, total nitrogen and total phosphorus concentrations in lake waters to determine the trophic state of the lakes, which is provided as Table 1 in Appendix A. TSI is a useful tool for evaluation and management of lake health and setting objectives including sport and recreational activities related to the lake.

There are four classes of trophic states which include: Oligotrophic which would be the highest quality of water with low productivity, nutrients and algae; Mesotrophic which is fair quality water with some productivity, nutrients and algae; Eutrophic which is relatively poor quality water with high productivity, nutrients and algae; and Hypereutrophic which is the poorest quality water with excessive productivity, nutrients, and algae.

The protection of water quality in Canadian lakes is a federal, provincial and territorial responsibility. Therefore, lake waters in Alberta are regulated by federal and provincial guidelines and fall under the jurisdiction of Canadian Council of Ministers of the Environment (CCME), Alberta Environment and Parks (AEP), and Health Canada.

The results of the lake water quality monitoring can be found in the annual lake reports. These reports can be found on the Lac La Biche County's website under Environmental Services.

The water quality parameters measured and a brief description of each parameter with the reason for monitoring are provided in the table below:

Table 1: Parameters Affecting Lake Water Quality

Water Quality Parameter	Description and Reason for Measuring
pH	The pH of water determines the solubility and biological availability of chemical constituents such as nutrients and heavy metals. The ability of a lake to neutralize these hydrogen ions is referred to as a buffering capacity. Any lake with a total alkalinity of more than 100 mg/L is considered to have high buffering capacity (Mitchell and Prepas 1990). The high alkalinity in Alberta lakes is derived from the rich calcareous glacial till over which the lakes have formed.
Temperature	Temperature of water affects different physical, biological and chemical characteristics of a lake and determines the behavior of many parameters responsible for water quality. The solubility of oxygen and other gases decrease as temperature increases. An increase in water temperature decreases the concentration of dissolved oxygen required for the survival of aquatic organisms.
Secchi Depth	Secchi depth is a measure of the transparency of water and trophic state of a lake. A Secchi disk is generally a disk of 20 cm diameter with alternating black and white quadrants. It is lowered into the lake water until it can no longer be seen. This depth of disappearance is called the Secchi depth.
Dissolved Oxygen	Dissolved oxygen is required by aquatic plants and animals for respiration. Survival of aquatic life such as fish, generally depends on an adequate amount of dissolved oxygen for respiration. As dissolved oxygen levels in the water drop below 5.0 mg/L, aquatic life is subjected to stress. Oxygen levels that consistently remain below 1-2 mg/L can result in the loss of large populations of fish.
Nutrients	Total nitrogen (N) and phosphorus (P) are principal nutrients in lake water and are representative of all forms of N and P present in the water. There are various sources of N and P both natural (geological) and anthropogenic (coming from humans) point and nonpoint sources. Point sources are a single, identifiable source of nutrients where as nonpoint sources come from a vast area and are not easily identifiable. These nutrients are a major cause of eutrophication, decreasing dissolved oxygen concentrations and are detrimental to lake water quality.
Metals	Metals enter the lake waters through natural and anthropogenic point and non-point sources. Point sources are a single, identifiable source of nutrients where as nonpoint sources come from a vast area and are not easily identifiable. Certain metals such as lead and mercury, are toxic to aquatic life and can bio-accumulate in the tissues and organs of aquatic organisms, becoming a part of the food chain. This may lead to loss of aquatic life and further affect human health.

Thermotolerant coliforms	Thermotolerant coliforms is the group of coliform bacteria also referred to as “fecal coliforms” and is an indicator for the sanitary quality of water. The term “thermotolerant coliforms” is gaining acceptance over fecal coliform. The presence of these microbes indicate contamination from excreta of warm-blooded animals including humans, and may pose serious and immediate health risks.