



Nitrogen and Phosphorus Data

Just like **plants**, **phytoplankton** need sunlight, carbon dioxide, water, and **nutrients** to produce their own food through photosynthesis. Nitrogen and phosphorus are common **nutrients** that phytoplankton need to grow. How many phytoplankton are growing in a lake is greatly influenced by the amount of nitrogen and phosphorus present in the waterbody.

Nitrogen comes in many different forms, both in the water and the air. For our purposes, we will be focusing on nitrate, the chemical form of nitrogen plants and **animals** can easily use. For phosphorus data, we will be looking at Total Phosphorus. Total Phosphorus includes all different types of phosphorus that are found in the water (both **biotic** and **abiotic**).

To measure nitrogen and its many forms, scientists use an **AutoAnalyzer** like the one shown in the photo below. The AutoAnalyzer puts the water sample through a reaction that produces a color change. The color change is measured by a photometer to see the amount of nitrogen that's in the sample.



AutoAnalyzers measure the amount of nutrients in a water sample. PC: Wikimedia Commons (CC BY-SA 4.0)

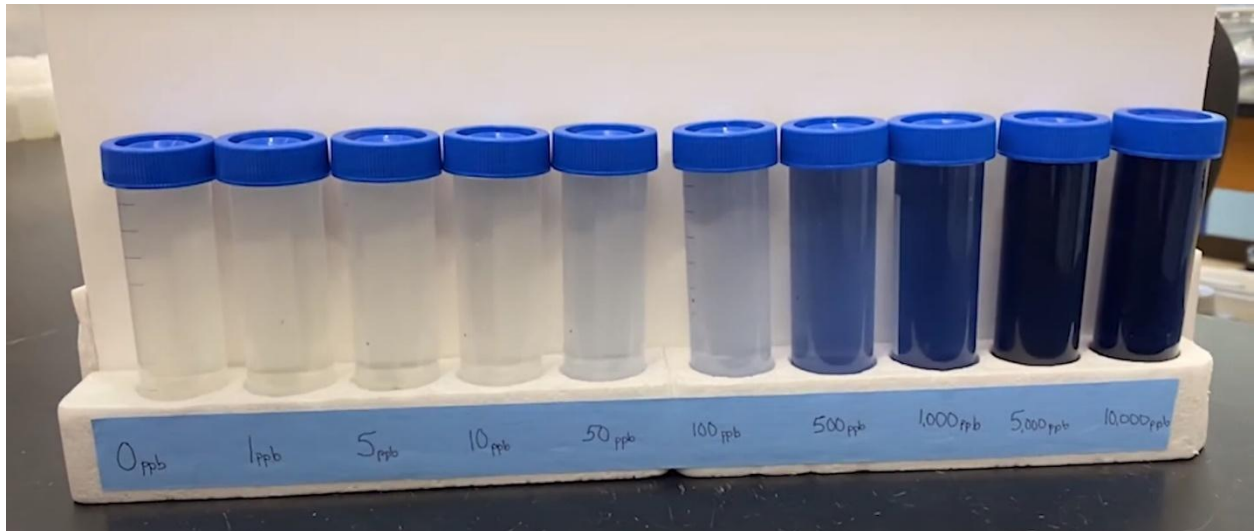
*The definitions of the bold words can be found in the Virtual Research Cruise Vocabulary document.





Virtual Research Cruise: Collecting Water Samples

To determine the amount of phosphorus in water samples, scientists add a substance into the water. This substance reacts with the phosphorus in the water, turning the water blue. The bluer the water turns, the more phosphorus that is present in the water. The sample is then placed into a **spectrometer**. A spectrometer measures wavelengths of light to determine the amount of phosphorus in each sample.



A phosphate test visually demonstrates the amount of phosphorus in a water sample going from clear when no phosphorus detected to dark blue when a lot of phosphorus is detected. PC: Flathead Lake Biological Station

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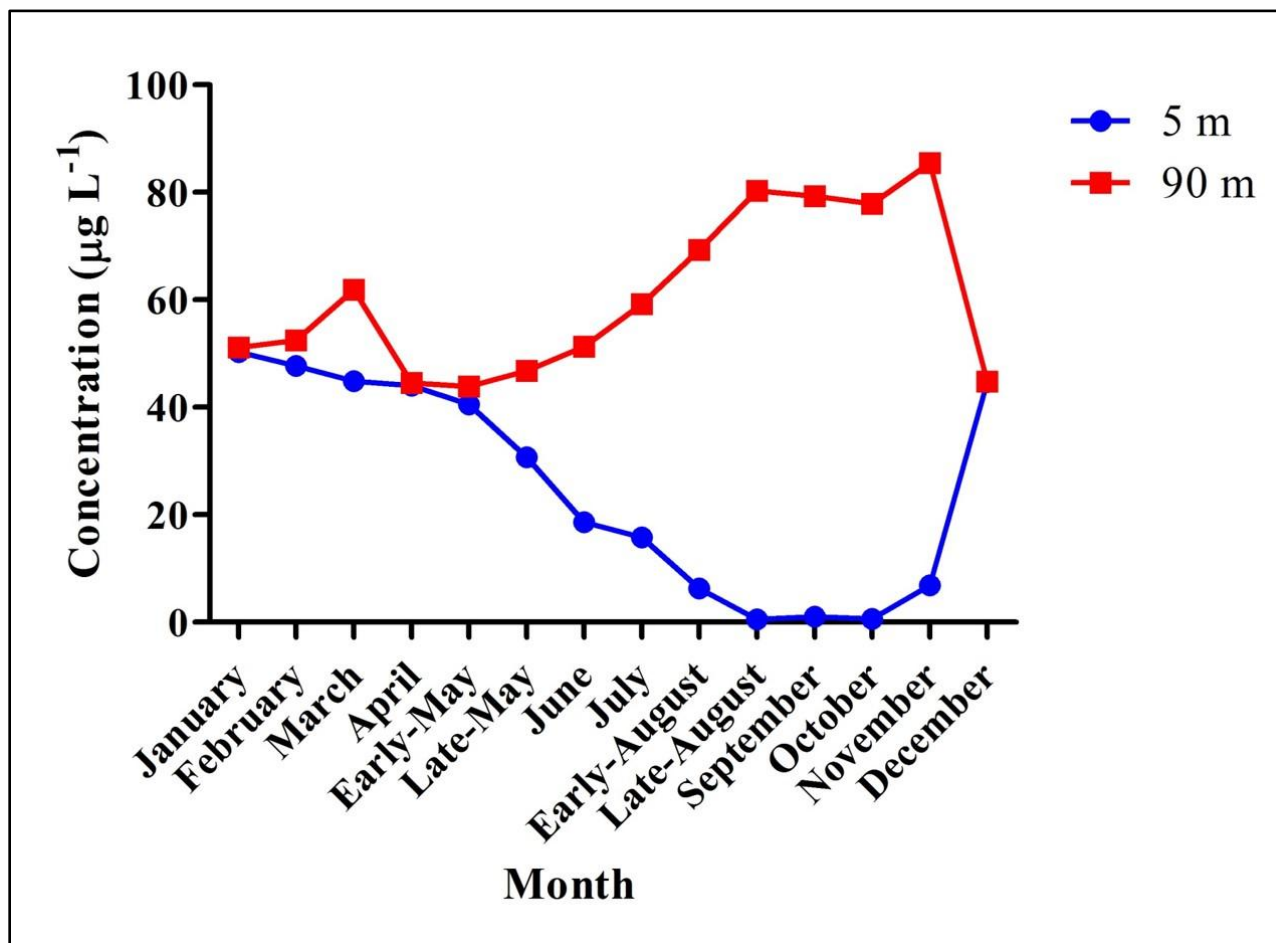


**FLATHEAD LAKE
BIO STATION**
UNIVERSITY OF MONTANA

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at the Flathead Lake Biological Station.



The following graph shows the amount of nitrate available in Flathead Lake at 5 meters and 90 meters of depth. Take a look and answer the questions to see how the amount of nitrate in Flathead Lake changes at each depth and throughout the year.



Graph of Nitrate Concentrations in Flathead Lake

*The definitions of the bold words can be found in the Virtual Research Cruise Vocabulary document.





Questions:

1. What happens to the nitrate concentrations at a depth of 5 meters in Flathead Lake from June to October?
2. What happens to the nitrate concentrations at a depth of 90 meters in Flathead Lake from June to October?
3. What may cause this difference in nitrate concentrations between depths of 5 meters and 90 meters (hint: it has something to do with living **organisms**)?

Measuring water samples for phosphorus and nitrogen concentrations helps scientists better understand the amount of nutrients in the lake. But how do these nutrients get into Flathead Lake? Read ahead to find out.

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How are Nutrients Entering Flathead Lake?

Many rivers and streams flow into Flathead Lake. These are referred to as the **tributaries** of Flathead Lake. These tributaries bring water, nutrients, and living things into Flathead Lake. The Flathead Lake Biological Station has been collecting data from some of the tributaries of Flathead Lake for decades. By monitoring these rivers and streams, scientists are able to see how connected the waters of the Flathead Basin are.

The two main tributaries that are routinely sampled include the mainstem of the Flathead River and the Swan River. The different forks of the Flathead River bring water all the way from Canada into Flathead Lake. All of the forks are combined by Columbia Falls and the mainstem flows through Kalispell. The Swan River flows from the Mission Mountains through Bigfork Dam before entering the lake.



Sampling the Swan River. PC: Flathead Lake Biological Station

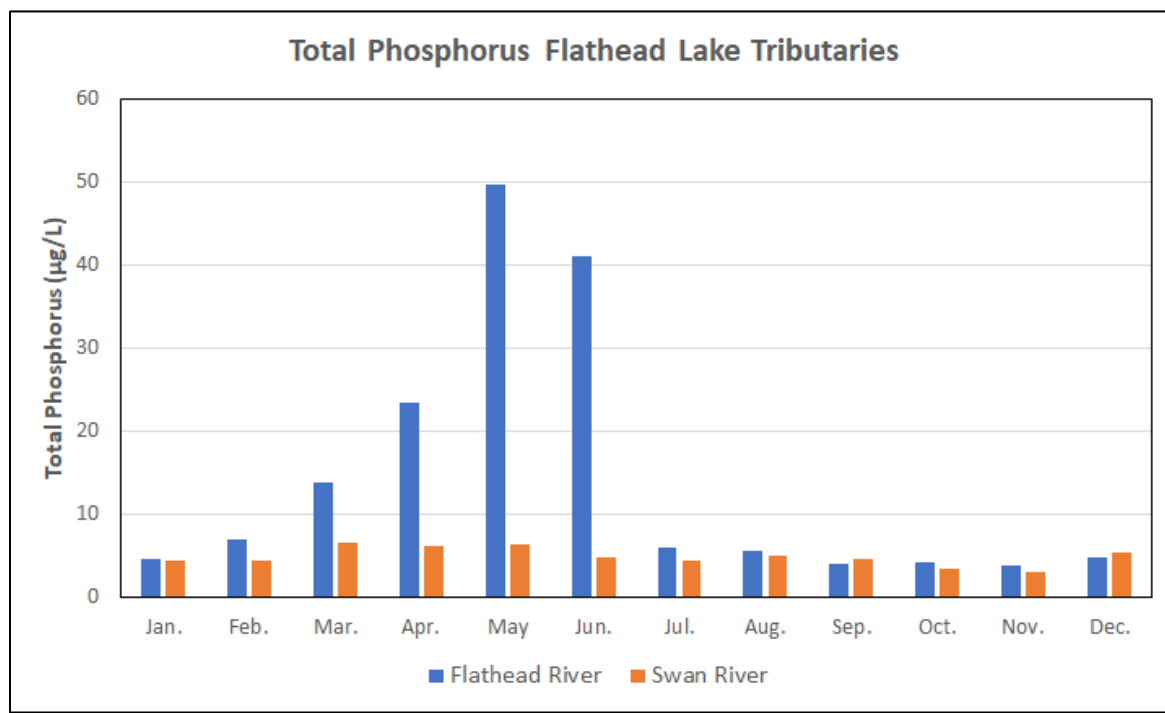
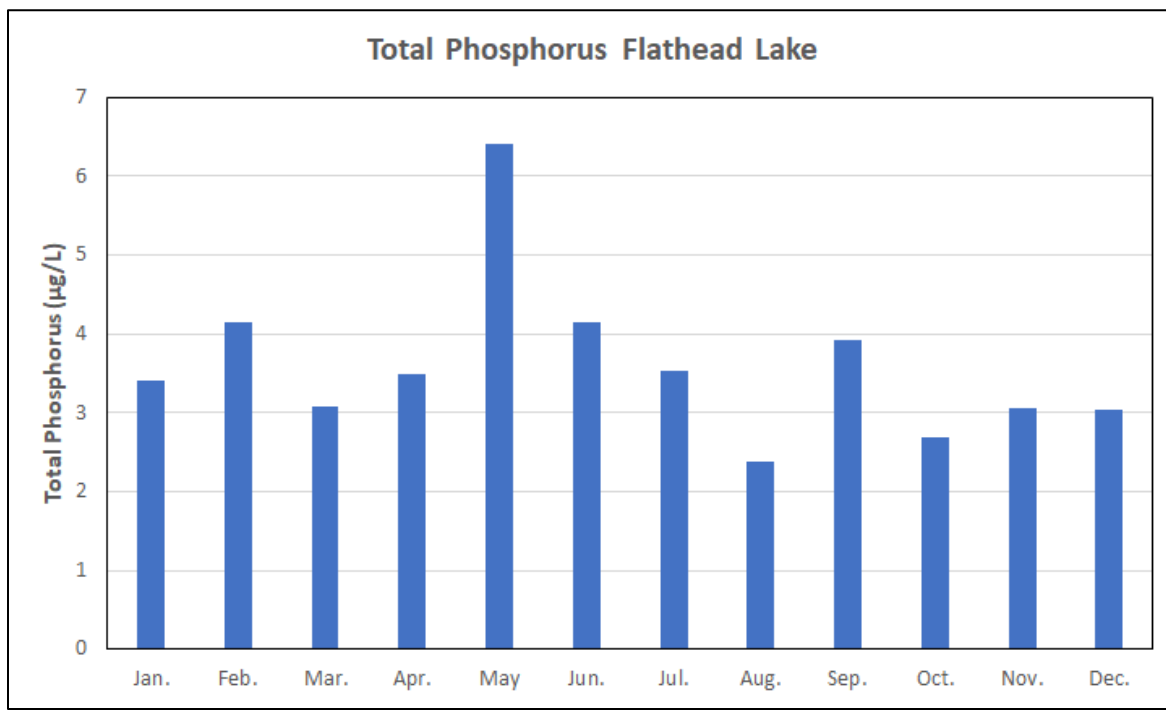
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Take a look at Graphs 2 and 3 to see how total phosphorus levels within Flathead Lake and its tributaries change throughout the year. This data is averaged from 2012 to 2017. Pay close attention to the scale on the y-axis.

Graphs 2 and 3



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Questions:

1. A.) During what month(s) did Flathead Lake have the most total phosphorus?

B.) During what month(s) did the Flathead Lake Tributaries have the most total phosphorus?
2. Why do you think the total phosphorus amounts are highest during these months? (Think of environmental events that may be happening during this time of year).
3. What other ways do you think phosphorus could get into the lake?

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