Nutrients in Lakes: Too much of a good thing

External Nutrient Loading

Nutrients are added to the lake from human and natural external sources from water by run-off, interflow and from particles in the air

Urban Development
Increased paved surfaces, reduced natural water filtration, use of fertilizers and pesticides

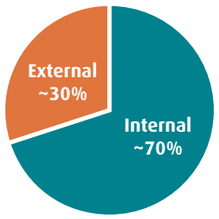
Forestry
Altered water flow, reduced natural water filtration

Septic Systems
Leaky and non-functional systems

Agriculture
Use of fertilizers, and pesticides on farmland

Erosion
Wind and water remove nutrients from soils and rocks and deposit them into the lake

Current Nutrient Contribution



Internal Nutrient Loading

Nutrients are released from sediments and recycled back into the water column under low oxygen conditions or due to sediment disturbance

Decomposition
Plants and cyanobacteria die and decompose, using up oxygen and releasing phosphorus into lake sediments

Rapid growth
Aquatic plants and cyanobacteria grow rapidly with enough phosphorus and sunlight

Stressors

The following factors further contribute to high levels of nutrients and algal growth

Water Impoundment
Dams reduce flow of water and nutrients out of the lake, increasing amount of nutrients in the lake

Climate Change
- Heavier winter rains increases nutrient inputs into the lake
- Warmer temperatures and longer growing seasons improve conditions for algae and aquatic plant growth

Invasive Species
Invasive plants (eurasian milfoil) thrive in high phosphorus conditions, outcompeting native plant species

P-Burial
Phosphorus is bound to compounds in the sediments under high oxygen conditions

P-Release
Phosphorus bonding in sediments is weakened in low oxygen conditions, and released into water

High nutrient levels in a lake are the result of a natural process called **Eutrophication**. This process is sped up by human activities on land that add more nutrients into the lake. Nutrients are important for the growth and survival of organisms, but too many nutrients, particularly phosphorus can cause problems. Phosphorus, and other nutrients are carried by water, sediments and air particles and deposited into the lake from external sources, known as **External Nutrient Loading**. Phosphorus in the water settles and collects in lake sediments (P-burial), and is released back into the water (P-release) during low oxygen conditions in a process known as **Internal Nutrient Loading**.

High phosphorus levels in the water contribute to potentially harmful Blue-Green Algae blooms and aggressive growth of aquatic plants. Following rapid growth of algae and plants, large volumes die and decompose using up available oxygen. These low oxygen conditions are unsuitable for fish and aquatic invertebrates, and allow the release of more phosphorus from the sediments, back into the water. Addressing both internal and external sources of nutrient loading is important for reducing algae blooms, managing aquatic plant growth and improving habitat for fish and other aquatic wildlife.

Making a difference...together