## Knowledge-based Learning Outcomes

Upon completion of *Nutrient Pollution*, students should be able to:

1. Name three types of organisms commonly found in lakes and describe the trophic position of each one.
2. Explain why nutrients are important to individual organisms and to ecosystems.
3. Describe nutrient limitation.
4. Define eutrophication.
5. Understand that algal blooms can be harmful to aquatic systems in two different ways: by lowering dissolved oxygen, and sometimes also by releasing toxins.
6. Describe the chain of events initiated by an increase in a limiting nutrient, which leads to reduced oxygen and ultimately a fish kill.
7. Identify decomposition of phytoplankton as the cause of hypoxia in eutrophic lakes.
8. Define biomagnification.
9. Reduce the expression of the misconception that algal blooms result in hypoxic conditions because algae consume oxygen.
10. Explain why the growth of different types of primary producers (i.e., algae and cyanobacteria) may be limited by different nutrients.

## Skills-based Learning Outcomes

Upon completion of *Nutrient Pollution*, students should be able to:

1. Predict how increasing the availability of a limiting nutrient will impact organisms that directly use that nutrient.
2. Conduct and interpret simple experiments to determine if a given nutrient is limiting a particular population of phytoplankton.
3. Predict how the effects of nutrient pollution will be indirectly modified by adding or removing higher trophic levels.
4. Predict how concentrations of a biomagnifying molecule in a population will qualitatively change over time, depending on the population's trophic level.
5. Determine whether a toxin biomagnifies, based on a graph showing its average concentration in the tissue of organisms at different trophic levels.
6. Interpret graphical data from an experiment with a single quantitative independent variable.