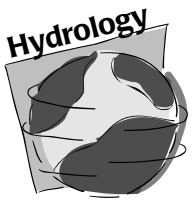
# Introduction




What is the condition of Earth's many surface waters – the streams, rivers, lakes, and coastal waters? How do these conditions vary over the year? Are these conditions changing from year to year?

Through the GLOBE *Hydrology Investigation*, you can help address these questions by monitoring the waters near your school. Our knowledge of global trends in water measurements is based on sampling at very few sites. This sampling has generally been done only a few times. For example, our information on many lakes is based on sampling done only once or twice more than ten years ago.

In order to evaluate water changes, we need access to reliable information on current and past conditions. If changes are already taking place, comparing multiple sites at different areas can help us understand what is happening.

## Why Investigate the Surface Waters?

We do not just drink water; we are water. Water constitutes 50 to 90 percent of the weight of all living organisms. It is one of the most abundant and important substances on Earth. Water sustains plant and animal life, plays a key role in the formation of weather, helps to shape the surface of the planet through erosion and other processes, and approximately 70% of Earth's surface is covered in water.

Measures of dissolved oxygen and pH directly indicate how hospitable a body of water is to aquatic life. It is interesting to both follow the annual cycle of water parameters, such as dissolved oxygen, alkalinity and pH, and to make comparisons between different water bodies. We can ask such questions as: are dissolved oxygen levels always at the maximum allowed by the temperature of the water, or are they depressed during part of the year? If they are low, we want to know the cause. We can see if pH becomes depressed right after a rain or when there is a lot of snowmelt running off into the lake or stream. If we do find a depression in pH, we would expect this water to have a low level of alkalinity. In fact, we would expect waters with a low alkalinity to have a depression in pH following rainfall or snowmelt. But we must take the measurement to confirm whether or not this really happens. Developing a database of water measurements will allow us to answer such questions.

Despite its abundance, we cannot use most of Earth's water. If we represent Earth's water as 100 liters, 97 of them would be seawater. Most of the remaining three would be ice. Only about 3 mL out of the whole 100 liters would be fresh water that we can consume; this potable water is pumped from the ground or taken from fresh water rivers and lakes.

In most countries current measurement programs cover only a few water bodies a few times during the year. We hope the GLOBE measurements you take will help fill this gap and improve our understanding of Earth's natural waters. This knowledge can help us make more intelligent decisions about how we use, manage and enjoy these resources.

# The Big Picture

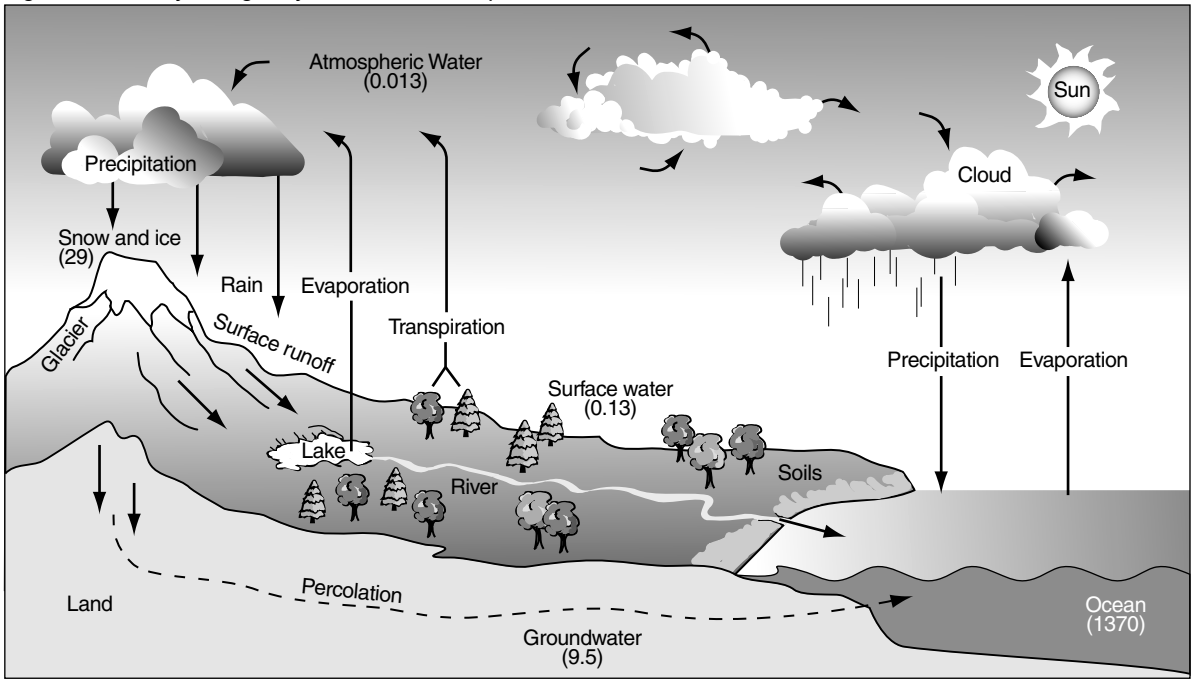
## *The Hydrologic Cycle*

Water continually circulates between Earth's surface and atmosphere in what is called the hydrologic cycle. The hydrologic, or water, cycle is one of the basic processes in nature. Responding to heat from the sun and other influences, water from oceans, rivers, lakes, soils and vegetation evaporates into the air and becomes water vapor. Water vapor rises into the atmosphere, cools, and turns into liquid water or ice to become clouds. When water droplets or ice crystals get large enough, they fall back to the surface as rain or snow. Once on the ground water filters into the soil and is either absorbed by plants or percolates downward to groundwater reservoirs. If water does not filter into the soil, it runs off into streams and rivers and eventually into oceans, while some of it evaporates.

Waters in a lake, snow on a mountain, humid air or drops of morning dew are all part of the same system. Total annual water loss from the surface equals Earth's total annual precipitation. Changing any part of the system, such as the amount of vegetation in a region or land cover, affects the rest of the system.

Water participates in many important chemical reactions and is a good solvent. Completely pure water rarely occurs in nature because it carries impurities as it travels through the hydrologic cycle. Rain and snow capture aerosols from the air. Acidic water slowly dissolves rocks, placing dissolved solids in water. Small but visible pieces of rocks and soils also can become suspended in water and make some waters turbid. When water percolates into the ground, more minerals dissolve into water. Dissolved or suspended impurities determine water's chemical composition.

*Figure HY-I-1: Hydrologic Cycle - Numbers in parentheses are the reservoirs of available water in $10^3$ $Km^3$.*




After Mackenzie and Mackenzie 1995, and Graedel and Crutzen, 1993