
Lake Champlain

Water Quality Monitoring

This lesson is designed to allow you to make connections between climate change and various water issues in the Lake Champlain watershed. At 120 miles long and 400ft. deep at its deepest point, Lake Champlain is the 13th largest lake by surface area in the United States, containing about 6.8 trillion gallons of water. The watershed itself is even bigger – covering 8,234 square miles, it contains areas in New York, Vermont, and Quebec. In this lesson we are going to dive deeper into the challenges facing the lake and its watershed, discover our place in the watershed, and learn more about what can be done to protect the lake and those dependent on it.

Climate change is adding additional stress to our already impacted waterways. As the climate continues to warm these additional impacts have the ability to dramatically change many aspects of life throughout the region. The average temperature in New York State has risen about 2.4°F since 1970. Annual snowfall in the Adirondacks is around 175 inches. It's projected that there will be 28% fewer snowstorms per year throughout the region.

It's also estimated that the amount of snow or frozen precipitation per storm would decrease by one-third by the 2090s. By the 2050s, sea level is expected to be as much as 30 inches (2.5 feet) higher in New York's coastal area. By 2100, New York's coast could see up to 6 feet of sea-level rise. These high sea-levels will lead to severe coastal flooding and storm surges. New York is taking steps to mitigate the harmful effects of climate change through community planning, greenhouse gas reduction programs, investing in renewable energy, and creating green jobs. Unfortunately, we have already begun to see the effects of climate change across the world. In the Lake Champlain watershed we are seeing the effects of climate change impact our local lakes, streams, and rivers. In this lesson we will discuss two topics that are connected to the health of our waterbodies: road salt, and temperature. These topics are heavily influenced by the complications that climate change is creating.

Instructions:

We are going to evaluate the complex relationships in the Lake Champlain watershed by collecting our own data. In particular, we will evaluate several parameters that will serve as indicators to the health of our waterbodies. These parameters can give us insight into changes occurring within the watershed, which ultimately impacts our waterbodies and our communities.

Water Quality Monitoring Parameters:

During your community science water quality monitoring trip, you will measure turbidity, dissolved oxygen, % DO saturation, pH, and Chloride. These terms are defined below to help give you a better understanding of their relation to water quality.

Temperature:

As water temperature rises, so does metabolic activity of aquatic organisms including the rates of growth, respiration, and decomposition. Most aquatic organisms have a preferred temperature range, for example, trout need water temperatures at around 20° C (68°F) or less to survive and reproduce.

Turbidity:

The amount of suspended particulate matter in the water column directly dictates the cloudiness or opaqueness of the water. This is referred to as turbidity and generally reflects an inundation of sediment into the system.

Dissolved Oxygen:

Dissolved oxygen (DO) is essential to all aquatic life. In a stream environment, aquatic organisms such as trout and their food sources (mayflies, stoneflies) require DO levels at or above 6 mg/l (equivalent to ppm). While humans and terrestrial animals breathe oxygen from the air, aquatic animals use oxygen that is dissolved in water.

% DO saturation:

Saturation indicates how many dissolved oxygen molecules the water can hold at a given temperature and atmospheric partial pressure. Example: colder water has the ability to hold more dissolved oxygen than warmer water.

pH:

pH in the aquatic environment is driven by many factors including acidic rainfall, photosynthesis by plants, and the “buffering capacity” of the stream watershed soils and bedrock. pH is a measure of hydrogen concentration, with a range of 0-14 (no units). The pH scale is used to quantify acidity, with 0 being the most acidic and 14 the most alkaline. A value of 7 is neutral. Solutions with a pH of less than 7 are acids, while those with a pH greater than 7 are bases. A decrease in pH represents an increase in acidity, and an increase in pH represents a decrease in acidity. The scale is also logarithmic, meaning that a one-unit change actually represents a tenfold change.

Chloride:

Measuring chloride can be important to understand water quality as a result of possible contamination from road salts (either $NaCl$ or $CaCl_2$). Other sources of chlorides include both ground and surface waters, specifically wastewater treatment plants that use chlorine to disinfect water before it is discharged, agricultural runoff (fertilizers and animal waste), water softeners, discharge from landfills and septic tanks. Although not usually harmful to people, chloride drinking water standards are set a limit at 250 ppm. The same is true for most aquatic organisms in freshwater environments. Whereas low levels may not harm aquatic life, high levels over a long period of time may cause acute toxicity. Elevated chloride levels may inhibit plant growth, impair reproduction, and decrease diversity of stream biota. The NYS standard for safe levels of chlorides in stream environments is <250 ppm to ensure the health of aquatic organisms.

YOUTH FOR CLIMATE AND WATER ACTION
WATER QUALITY MONITORING

Data Sheet:

Name: Date: Time:

Waterbody and location:

Air temperature: Water temperature:

Site description:

After making your observations, create a Hypothesis for what you expect your data to demonstrate:

Don't forget to take photos- upstream and downstream.

Resources (monitorwater.org) Earth Echo Monitoring Kit Instructions (English) (Spanish)

Test Name	Test 1	Test 2	Test 3	Average
Turbidity				
Dissolved Oxygen				
% DO Saturation				
pH				
Chloride				

Analyze and synthesize your results.
Compare results with the other groups or locations.

Submit your data: www.monitorwater.org

NE IW PCC · Lake Champlain Basin Program · Paul Smith's College · Paul Smith's College Adirondack Watershed Institute

Post Field Trip Data Analysis:

Answer the following questions:

a) Does the data support your hypothesis? Explain why or why not.

a) What is the present-day situation for the waterbody that you monitored?

b) Create a hypothesis for what you would expect to see if you were to sample this waterbody again in 10 years.

b) d) What do you think needs to happen now for the waterbody you sampled to be healthy in the future?

Submit your data: www.monitorwater.org