

2. WATER WAYS

(1) Be a Water Monitor



Conducting water tests helps students learn about the **water quality** at Bottomless Lakes State Park. (Field Trip / 60 min)

Connecting with Science Standards			
Strand/Category	Grade	Standard(s)	Benchmark(s)
Scientific Thinking/Practice	4	Methods	Instruments, findings, observation, interpret
	5		Investigations, appropriate technology, communicating steps and results
Earth & Space science	5	Structure of earth	Water on earth's surface

Goal: Students will learn how to conduct non-hazardous chemical water tests, record results and will share results with staff at Bottomless Lakes Park.

Objectives:

- Students will organize and implement water monitoring at BLSP.
- Students will collect and analyze water samples.
- Students will use test results to analyze **data** and determine water quality.
- Students will present data and form conclusions.

Materials:

- Monitoring Kit, including test tabs for testing **coliform bacteria, salinity, dissolved oxygen, nitrate, pH, phosphate, temperature, and turbidity.**
- Water thermometer
- Data collection sheets
- Clip boards
- Pencils

Background

About 80% of the Earth's surface is covered by water, but only 1% of that is fresh water that can directly be used for domestic, industrial, commercial, and recreational purposes. Although there is the same amount of water as millions of years ago, the demand for water has increased dramatically. Increased demand for water has put enormous stress on our water supply, its quality and the aquatic life and **habitats** it sustains. Through the process of the **water cycle**, the same water is continually recycled and re-circulated.

Pollution from human activities upsets this delicate natural **purification** process. Land and water use are interconnected and water quality is affected by how the surrounding land is used. Almost everything we do on the land impacts the water. Farming can contribute to erosion and high nutrient levels in surface and ground water. In suburbs, septic system waste and lawn fertilizer run-off from millions of homes enter waterways. Water that is used by industrial processes is often put back into rivers or lakes at a higher temperature or polluted. The water quality of streams, lakes, rivers, estuaries, and coastal and ocean waters has declined due to human pollution. Every day, more of us become aware of how pollution impacts aquatic life and water quality. Even naturally-occurring environmental factors, such as saline, can also affect water quality.

Monitoring helps us assess the present level of water quality and our need to keep water "clean" prompts us to actively protect and preserve our finite resources.

Water Ways

Be a Water Monitor



Procedure:

1. Accompany students to the pre-determined sampling site(s). Keep access and safety in mind. Record weather information on the student data sheet.
2. Take the temperature of the water in degrees Celsius.
3. Use a water sampler or a bucket to obtain a representative water sample. Perform chemical tests for dissolved oxygen, pH, nitrate-nitrogen, phosphate, total **alkalinity** and turbidity immediately. All test procedures should be performed promptly. If immediate analysis is not possible, follow instructions for the dissolved oxygen test to “fix” sample. Fill water sample collection container to the top with the water sample and cap for later analysis of remaining test factors.
4. Follow dissolved oxygen test procedure to determine dissolved oxygen concentration of the water sample. For better accuracy, collect and “fix” two samples from each site. Test each sample twice.
5. Follow pH test procedure to determine pH of water sample. Perform the test twice for better accuracy.
6. Follow nitrate-nitrogen test procedure to determine nitrate-nitrogen concentration of the sample. Perform the test twice for better accuracy.
7. Follow phosphate test procedure to determine phosphate concentration. Perform the test twice for better accuracy. Avoid washing glassware and apparatus with detergents that contain phosphates.
8. Follow total alkalinity test procedure to determine the alkalinity of the water sample. Perform the titration twice for better accuracy.
9. Follow turbidity procedure to determine turbidity of the water sample. Perform the test twice for better accuracy. If time elapses between sampling and measurement, be sure to shake the sample well to suspend the particles before performing the test.
10. Record test results and observations for each site on a data sheet.
11. Analyze data to determine water quality.
12. Report data to Park staff.

WATER WAYS / Water Monitor

Glossary

Alkalinity: a measure of the ability of a solution to neutralize acids to a neutral pH (see below).

Coliform bacteria: a bacterium usually found in the intestinal tracts of animals, including humans. Their presence in the water supply indicates recent contamination by human or animal feces. Chlorination is the most common preventive water treatment.

Data: a collection of facts usually gathered as the result of experience, observation, experiment, or processes.

Dissolved Oxygen: the relative measure of the amount of oxygen (O_2) dissolved in water.

Habitat: an ecological or environmental area that is inhabited by a particular animal or plant species. It is the natural environment in which an organism lives, or the physical environment that surrounds a species population.

Nitrate: an inorganic compound composed of one atom of nitrogen (N) and three atoms of oxygen (O); the chemical symbol for nitrate is NO_3 . Nitrate is one of the most frequent groundwater pollutants in rural areas. The origin of nitrate in groundwater is primarily from fertilizers, septic systems, and manure storage or spreading operations.

pH: a measure of the acidity or alkalinity of a solution. Measured on a scale from 0-14. A measurement of 7 is neutral pH, while below 7 is considered acid and above 7 is considered basic.

Phosphate: an inorganic (lacking carbon) chemical, is a salt of phosphoric acid. Inorganic phosphates are mined to obtain phosphorus for use in agriculture and industry.

Purification: the process of rendering something pure, i.e. clean of foreign elements and/or pollution.

Salinity: the saltiness or dissolved salt content in a substance, such as water.

Temperature: the measurement of how hot or cold something is.

Turbidity: the cloudiness or haziness of a fluid caused by individual particles that are generally invisible to the naked eye, similar to smoke in air. The measurement of turbidity is a key test of water quality.

Water cycle: also known as the **hydrologic cycle**. Describes the continuous movement of water on, above, and below the surface of the Earth. Since the water cycle is truly a "cycle," there is no beginning or end. Water can change states among liquid, vapor, and ice at various places in the water cycle.

Water quality: the physical, chemical and biological characteristics of water in relationship to a set of standards.



Be a Water Monitor

Student Activity Sheet



Student/Team Name: _____

Site Information

Date: _____

Air temperature: Cold Cool Warm Hot

If you know the actual air temperature, write it here: _____

Wind:
(Circle the best description)



Calm



Light breeze



Moderate wind



Strong wind

Cloud cover:
(Circle the best description)



Sunny



Mostly sunny



Partly Cloudy



Cloudy

Sample Location	Temp.	pH	Turbidity	Dissolved O ₂	Nitrate-Nitrogen	Phosphate	Total alkalinity

