



Lesson Plan

Theme: Aquatic ecosystems are vibrant and diverse biological communities. We can measure the health of these communities and determine how human activities are affecting them.

Length of Lesson:

Introduction: 25 minutes

Field and Interpretive Center (IC) Activities: 80 minutes

Conclusion: 15 minutes

Minnesota Academic Science Standards/Benchmarks:

- (5.1.1.2.1) - Identify and collect relevant evidence, make systematic observations and accurate measurements, and identify variables in a scientific investigation.
- (5.3.4.1.3) - Compare the impact of individual decisions on a natural system.
- (5.4.2.1.1) - Describe a natural system in Minnesota such as a wetland, prairie or garden, in terms of the relationships among its living and nonliving parts, as well as inputs and outputs.
- (5.4.2.1.2) - Explain what would happen to a system such as a wetland, prairie or garden if one of its parts were changed.
- (5.4.4.1.1) - Give examples of harmful human interactions with natural systems.

Excellence in EE: Guidelines for Learning Standards:

- Grades (5-8) - Strand 1 Questioning, Analysis, and Interpretation Skills, C) Collecting Information, G) Drawing Conclusions and Developing Explanations
- Grades (5-8) - Strand 2.2 The Living Environment, A) Organisms, Populations, and Communities
- Grades (5-8) - Strand 2.4 Environment and Society, A) Human/Environment Interactions

Objectives (Students will be able to...):

- identify the components of an aquatic ecosystem and determine how they interact.
- identify factors that impact the health of an aquatic ecosystem.
- explain how aquatic ecosystems are impacted by human activities.
- collect and interpret data regarding the water quality of an aquatic ecosystem.

Background Information :

Located at the end.

*Helping people discover, enjoy,
understand, and preserve the incredible
natural world that surrounds us.*

Introduction:

Goals: Welcome students to River Bend, introduce the River Bend leaders, and introduce the program content.

Key points:

- Welcome
- Define an aquatic ecosystem
- *Who dirtied the water?* activity
- Set expectations for the day

Activities:

1. Pond Study

Goal: To study the animals that live in the pond and get a basic understanding of what they're finding means in terms of health of the ecosystem.

Key points:

- Students will dip net to collect and identify creatures in the pond.
- Use provided materials to hypothesize on the health of the ecosystem.

Assessment: Check for an understanding that diversity typically means healthy ecosystems. Ask students what other factors can play into the overall health of the ecosystem/

2. Aquatic Ecology Investigation

Goal: To identify macroinvertebrates and what they are able to tell us about the overall health of the ecosystem

Key points:

- Students will be use microscopes and keys to identify macroinvertebrates.
- In small groups they will make their assessment of the health of the ecosystem based on the animals they identified.

Assessment: Group discussion on what they found and what it tells us. Students should be able to state why they came to the conclusion they did.

3. Water Quality Testing

Goal: To use tools and collect data to come to a conclusion regarding the overall health of the ecosystem.

Key Points:

- Students will test pH, turbidity, and dissolved oxygen

Assessment: Check for understanding by asking students to link this activity to the previous ones. Can the reasoning behind recording data and making an assessment be clearly stated?

4.

4. Dragonfly Pond

Goal: To understand how human actions impact our aquatic ecosystems.

Key points:

- Students will develop an area of land and determine what will have the least impact on the watershed.

Assessment: Discuss with students what was challenging about this task. What real life examples can they think of?

5. Build a filter

Goal: To build a filter that will remove pollutants from the water.

Key points:

- Students will work in small groups to come up with a filter design.
- Students will build and test the filter.

Assessment: Ask students to relate pollution to real life. How would they clean up a lake in real life? What is the best way to deal with pollution?



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Background Information

What is an aquatic ecosystem?

Aquatic systems are those that contain plants and animals that predominantly depend on a significant amount of water to be present for at least part of the year. But a perfect definition is tough to make. How many weeks a year does an area need to show standing water in order to be a pond? How about a bird bath or dog water dish, as both can breed aquatic insects if left undisturbed for a few days? For our purposes, we have a number of aquatic systems that hold water all year (in most cases) and are impacted to different degrees by activities on the surrounding landscape.

What are a few components of an aquatic ecosystem?

Pond layers - Like in a forest, the top, middle, and bottom of a pond can be vastly different from each other, and even the layers in between. Under different temperature or light conditions the water in a pond can vary greatly in oxygen, clarity, and other factors that affect where plants and animals might live. The air above the pond and the land below the pond are important as well, as those provide space for animals to live, plants to root, and predators and prey to interact.

Diversity - while many people think of a pond as just a small lake with frogs and fish, there are thousands of different species of plants and animals living together in a natural pond. The more diverse a pond is (more species that it has) the stronger and healthier it is.

Micro-organisms - some of the most important plants and animals in a pond are so small they are difficult to see without a microscope. They are called "micro-organisms" (micro=small, organism=life form) and while a few may cause disease, almost all are very beneficial and important to a pond ecosystem. While bigger animals may fly, walk, or swim away to other ponds, micro-organisms are always present in large numbers.

Macro-organisms - larger plants and animals that are easy to see on a pond are called "macro-organisms" (macro=large). They are the plants and animals that we often notice first, and can more easily spread from pond to pond.

What aquatic systems can be found at River Bend?

- Marsh - shallow water with non-woody plants growing above water level
- Swamp - like a marsh but with bushes and trees growing from the water as well
- Pond - a small and shallow body of water with plants growing above water level only on the edges; generally freezes solid during winter.
- River - a moving body of water that flows from one place to another.
- Stream - smaller than a river, may even dry up sometimes
- Puddles - any body of water that lasts for a few days or more may attract aquatic life
- Spring - area where underground water is discharged onto the land surface forming a pond or stream

What other types of aquatic systems can be found on Earth?

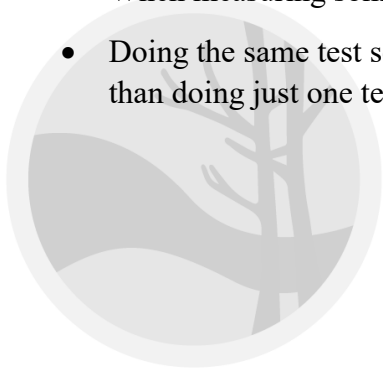
You may research any of these that don't seem familiar:

- ◆ lake
- ◆ sea
- ◆ flood plain
- ◆ ocean
- ◆ glacier
- ◆ bog
- ◆ creek
- ◆ tidal pool
- ◆ estuary
- ◆ lagoon
- ◆ geyser
- ◆ aquifer

What are some basic principles of a scientific investigation?

Science is often a process of performing scientific tests to investigate and learn things. For example, we can test a sample of water to see how much oxygen is present in a pond. In order for such tests to have any meaning, there are some rules (or "principles") that we must remember:

- Follow all directions and safety instructions for a test carefully.
- Do each test the same way each time you do it.
- When measuring something, be as exact as possible.
- Doing the same test several times and taking an average can give you a better answer to a question than doing just one test.



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