Exploring Freshwater Ecosystems

Grades 5/6 • Pen Pals for Water

Lesson Details	
Grades	**5-6**
Subjects	**Science** ***Note:*** *Curriculum connections vary by grade and province/territory. Refer to the Curriculum Connections document for more information.*
Topic	**Understanding Freshwater Ecosystems**
Lesson 3	**60 to 80 minute lesson**
Date Taught	

LEARNING GOALS

By the end of this lesson, students will:

- Identify living (biotic) and non-living (abiotic) components of freshwater ecosystems (lakes, rivers, streams, ponds, wetlands).
- Explain how food webs support freshwater systems.
- Investigate how human activities and climate change affect freshwater

habitats.
- Make predictions about how freshwater ecosystems may change in the future and explain factors that influence their health.
- Develop critical thinking skills through observation, discussion, and reflection.

MATERIALS

- Lake Zones student worksheets
- Lake ecosystem zones Image
- Observation sheet
- Chart paper or whiteboard for mind map
- Projector or Smart board
- Pencil crayons or markers
- Large paper or poster paper for group drawings
- Optional: sticky notes for brainstorming
- Optional: Clip boards (for outdoor activity)

Lesson Flow – Quick Guide

1. **Ecosystem Exploration Mind Map (15 minutes)**
   Purpose: Identify freshwater ecosystems, components, and human interactions.
   Activity: Students work together to build a class mind map about freshwater ecosystems, identifying biotic and abiotic components, human uses of freshwater, and threats to ecosystem health.
2. **Who Lives Where? Exploring Lake Zones (20–25 minutes)**
   Purpose: Help students understand that lake ecosystems contain different zones, each with specific plants and animals that work together to keep an entire ecosystem healthy.
   Activity: Using a projected lake zone diagram and a worksheet, students identify the aquatic, riparian, and upland zones and discuss which species live in each area. Students complete the worksheet using prior knowledge and peer-to-peer discussion.
3. **Future Lake Scenarios: Draw & Predict (Creative Activity) (25-30 minutes)**
   Purpose: Encourage students to think critically and creatively about how freshwater ecosystems change over time and how human actions affect them.
   Activity: In small groups, students draw a lake ecosystem as it looks today, 50 years from now, and 100 years from now. They consider how factors such as climate change, pollution, habitat restoration, and environmental stewardship may affect the ecosystem over time.. Groups share their predictions with the class and discuss what changes seem realistic and what actions could help or harm freshwater ecosystems.

Assessment

- **Formative:** Participation in class mind mapping, lake zone worksheet completion, and group discussions during future scenario planning.
- **Summative:** Evaluate completed lake zone worksheets, future lake drawings (today/50 years/100 years), and group presentations for understanding of ecosystem change and human impacts.
- **Self-Assessment:** "One new thing I learned about freshwater ecosystems is..." and "One action humans can take to protect lakes is...".

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Lesson Info and Teaching Steps

Teaching note — Reinforce that ecosystems are made of interacting living (biotic) and nonliving (abiotic) parts, and that changes to one part can affect the whole system.

Activity 1: Ecosystem Exploration Mind Map

Purpose: Identify freshwater ecosystems, components, and human interactions.

Activity Steps:

1. On the white board draw a central circle: *"Freshwater Ecosystems"*.
2. Create four branches extending from the centre:
   a. Lakes
   b. Rivers & Streams
   c. Ponds
   d. Wetlands .
3. Begin by asking students: "What is an ecosystem?"
   a. Explain: An ecosystem is a geographic area where plants, animals, and

other organisms, as well as weather and landscapes, work together to form a bubble of life.

4. Ask students to brainstorm:
   a. What plants and animals live in a freshwater ecosystem?
      - Include examples that live in or near the water (fish, frogs, insects, algae, ducks, birds, beavers, cattails)
      - Discuss briefly how each species plays a role in maintaining a healthy ecosystem (food, shelter, water filtration, oxygen production).
   b. How do humans use these ecosystems?
      - Recreation, Fishing and hunting, water sources for personal use, development
   c. What challenges or threats exist?
      - Any impacts that humans have on these ecosystems
5. Record student responses on the mind map and sort them into the following categories: Biotic (living), Abiotic (non-living), Human Uses, Threats & Conservation.

Activity 2: Who Lives Where? Exploring Lake Zones

Purpose: Help students understand that lake ecosystems contain different zones, each with specific plants and animals that work together to keep an entire ecosystem healthy.

Activity steps: Display this image on the projector and have students identify the different zones and who lives where using the provided worksheet. Each student gets a worksheet and must use what they know and peer to peer discussion to fill out their worksheet.

[Lake Ecosystem Zones Image]

Use this table to guide the class discussion and support students as they explore each zone.

Zone	Key Details
Aquatic Zone **Location:** The water itself, including lakes, ponds, rivers, streams, and wetlands.	• **This zone is permanently or regularly covered by water. Conditions such as water depth, temperature, sunlight, oxygen, and water movement influence what can live there.** **Why is it important?** Aquatic habitats provide food, shelter, breeding areas, and other essential habitat for freshwater organisms. They also support food webs that connect aquatic and land-based ecosystems.
Riparian Zone **Location:** The area of land directly beside a lake, river, stream, pond, or wetland. It forms the transition between aquatic and upland environments.	• **Soils are often wetter than surrounding upland areas, and vegetation is influenced by its proximity to water. Plants may include grasses, sedges, shrubs, and moisture-loving trees.** **Why is it important?** Riparian vegetation can stabilize shorelines and stream banks, provide shade, slow runoff, trap sediment, and provide habitat and food for wildlife. This zone is an important connection between land and water.
Upland Zone **Location:** Higher or drier land beyond the riparian zone and farther away from the water's edge.	• **This zone is generally less influenced by the immediate presence of surface water. Depending on the location, it may include forests, grasslands, shrublands, rocky areas, or other terrestrial habitats.** **Why is it important?** Upland areas are still connected to freshwater. Rain and snow falling here can eventually move toward streams, wetlands, and lakes as surface runoff or groundwater. Healthy soils and vegetation can slow water movement, reduce erosion, and provide habitat throughout the watershed.

Activity 3: Future Lake Scenarios: Draw & Predict (Creative Activity)

Purpose: Encourage students to think critically and creatively about how freshwater ecosystems may change over time and how human actions influence those changes.

Activity Steps: Group Work - Students work in small groups.

1. Divide students into small groups and provide each group with a large sheet of paper
2. Ask groups to create three drawings of the same lake ecosystem:
   a. Today
   b. 50 years from now
   c. 100 years from now
3. Encourage students to consider factors such as:
   a. Climate change (temperature changes, droughts, floods)
   b. Pollution (trash, chemicals, runoff)
   c. Restoration projects (cleanups, habitat improvements)
   d. Human stewardship (how humans care for the water and land)
4. Be Creative: Encourage imagination, possibilities could include:
   a. Extreme scenarios (e.g.“aliens have moved in”)
   b. Ecosystem recovery or decline
   c. Unusual species adaptations due to environmental changes
5. Share Predictions**:** Groups present their drawings and ideas to the class.
   a. Discuss:
      - Which changes were realistic?
      - What human actions helped or harmed the ecosystem?
      - How do plants, animals, and humans interact in these scenarios?

Optional Activity 4: *Outdoor Exploration*: Stream or Pond Walk

Purpose: Practice real-world observation skills and connect classroom learning to a local freshwater environment and identify biotic and abiotic components.

Activity:

1. Walk to a nearby stream, pond, wetland, or other freshwater area.
2. Provide students with clipboards, pencils, and an observation sheet.
3. Ask students to observe plants, animals, water features, and human impacts (trails, trash, runoff, etc.).
    a. Record observations under:
        - Biotic (living things)
        - Abiotic (non-living things)
        - Human Uses / Impacts
4. Back in the classroom, students share their observations and compare their findings to the class mind map and lake zone activities.

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Teacher Cheat Sheet: Freshwater in Canada

Big Idea

Freshwater ecosystems (lakes, rivers, streams, ponds, wetlands) support life across Canada, but they are limited and require care and protection.

> **Teaching tip** —Let students add ideas freely first during the mind map.
> Use this cheat to deepen thinking, clarify misconceptions, and connect ideas to real examples in Canada.

Key Vocabulary (Student-Friendly)

- **Freshwater:** Water from lakes, rivers, streams, ponds, and wetlands
- **Ecosystem:** Living and non-living things working together
- **Biotic:** Living things (plants, animals)
- **Abiotic:** Non-living things (water, rocks, temperature)
- **Wetland:** Land that is often wet and full of plants and animals

Stewardship: Caring for the environment responsibly

Key Messages to Share with Students

1. Life In and Near Water
Help students notice specific plants and animals that live in or near freshwater and understand how each contributes to a healthy ecosystem.

- Each species plays a role in the ecosystem, for example:
  - Fish, insects, and frogs are part of the food chain.
  - Birds and ducks may feed on insects or plants and help spread seeds.
  - Beavers create dams, which provide habitats for other animals.
  - Algae and aquatic plants produce oxygen and filter water.
  - Cattails and wetland plants stabilize shorelines and clean water.

2. Canada's Freshwater

Canada has many lakes, rivers, streams, and wetlands that support diverse plant and animal life. These freshwater systems also help sustain surrounding

ecosystems.

3. Why Freshwater Is Important

- Freshwater provides habitats for fish, insects, birds, and plants.
- People depend on freshwater for:
  - Drinking water and food production
  - Recreation (swimming, boating, fishing)
  - Transportation and industry

Freshwater helps reduce flooding and supports healthy land.

4. Freshwater Is Not Unlimited

- Even though Canada has a lot of freshwater, not all of it is easy to access.
- Some freshwater is frozen in glaciers or stored underground.

Freshwater takes time to refill, so it must be used carefully.

5. Threats to Freshwater Ecosystems

- Freshwater ecosystems can be harmed by:
  - Pollution (garbage, chemicals, runoff)
  - Farming and city runoff
  - Building too close to water
  - Dams and water diversions
  - Invasive species

Wetlands are especially vulnerable because they can be drained or filled in.

6. Protecting Freshwater

- Humans can help protect freshwater by:
  - Keeping pollution and garbage out of water
  - Protecting wetlands and shorelines
  - Using water wisely

Learning from Indigenous knowledge about caring for water

Protecting freshwater helps plants, animals, and people now and in the future.

7. Biotic vs. Abiotic

Biotic (Living things)

- Definition: Organisms that are alive and interact with each other and their environment.
- Canadian Freshwater Examples:
  - Fish (trout, bass, perch)
  - Amphibians (frogs, salamanders)
  - Insects (dragonflies, mayflies, water beetles)
  - Birds (ducks, herons, kingfishers)
  - Mammals (beavers, muskrats)

Aquatic plants and algae (pondweed, cattails, duckweed)

Abiotic (Non-living things)

- Definition: Elements of the environment that are not alive but affect living things.
- Canadian Freshwater Examples:
  - Water temperature and flow
  - Rocks, sand, and soil
  - Sunlight and shade
  - Oxygen levels in water
  - Nutrients and minerals in the water
  - Weather events (rain, wind, snow)

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Worksheet 1: Lake Zones

Name: _____

Date: _____

Part 1: Identify the Zones

Use the lake diagram provided to label the three zones below:

Aquatic Zone

Who lives here? _____

Why is it important? _____

Riparian Zone

Who lives here? _____

Why is it important? _____

Upland Zone

Who lives here? _____

Why is it important? _____

Part 2: Biotic and Abiotic

Fill in examples for each category you see in the lake ecosystem:

Biotic (Living things)**:** _____

Abiotic (Non-living things)**:** _____

Part 3: Human Impacts

How do humans use lakes? _____

What challenges or threats exist to this lake? _____

One way humans could help protect this lake: _____

Part 4: Reflection

Write one new thing you learned about lake zones today:

Worksheet 2: Outdoor Freshwater Observation Sheet

Name: _____
Date: _____
Location: _____

Part 1: Observation

Take notes as you explore the stream, pond, or wetland.

Biotic (Living things observed):

Plants: _____

Animals / Insects / Birds: _____

Abiotic (Non-living things observed):

Water features (depth, water clarity, flow): _____

Soil / rocks / sunlight / weather: _____

Human Uses / Impacts observed:

Part 2: Sketch

Draw a small image of the area you observed. Include:

- Water body (pond, stream, etc.)
- Plants and animals you saw
- Any human impacts (paths, trash, signs, etc.)

Part 3: Reflection

What surprised you about this freshwater ecosystem and why?

How does this ecosystem compare to what we learned in class?

One action humans could take to protect this freshwater ecosystem: