Grade 8

Cluster 4: Water Systems

Overview

In this cluster, students investigate the properties of water, its global manifestations, and its impacts. They compare and contrast fresh and salt water, describe factors that affect ocean currents, and recognize the impact of large bodies of water and ocean currents on regional climates. Features of the North American drainage system are identified, and factors that influence erosion and deposition in streams and large bodies of water are examined. Students determine causes of flooding and examine methods and technologies used to contain or prevent damage from erosion and floods. Sources of drinking water are identified, methods for treating water are discussed, and waste-water disposal systems are compared. Students explore water pollution problems and identify environmental, social, and economic factors important to the management of water resources.

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
8-4-01 Use appropriate vocabulary related to their investigations of water systems. Include: heat capacity, fresh water, salt water, convection, Coriolis effect, global water cycle, drainage system, watershed, continental divide, erosion, deposition, flow rate, tides, terms related to water treatment. GLO: C6, D5	Teacher Notes **Prior Knowledge** Students have had previous experiences related to this cluster in Grade 7, Cluster 2: Particle Theory of Matter, and in Grade 7, Cluster 4: Earth's Crust. ➢ Introduce, explain, use, and reinforce vocabulary throughout this cluster. ➢ **Word Cycle** Provide students with opportunities to use the Word Cycle strategy (Szabos, 1984) to develop their understanding of a term and how it relates to other terms within a general concept. To use this strategy, students must apply their knowledge of a word in order to create connecting words that show the relationship between terms. (For a BLM of the Word Cycle, see *SYSTH*, Attachment 10.1, or *Success*, p. 6.99.)

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

PRESCRIBED LEARNING OUTCOMES

Students will...

8-4-02 Demonstrate that water, as compared to other substances, has a high heat capacity and is able to dissolve a wide variety of solutes.

GLO: C1, C2, C5, D3

8-0-7f ⊂ Reflect on prior knowledge and experiences to construct new understanding and apply this new knowledge in other contexts. GLO: A2, C4 (ELA Grade 8, 1.2.1)

8-0-7h ⊂ Identify and evaluate potential applications of investigation results. GLO: C4

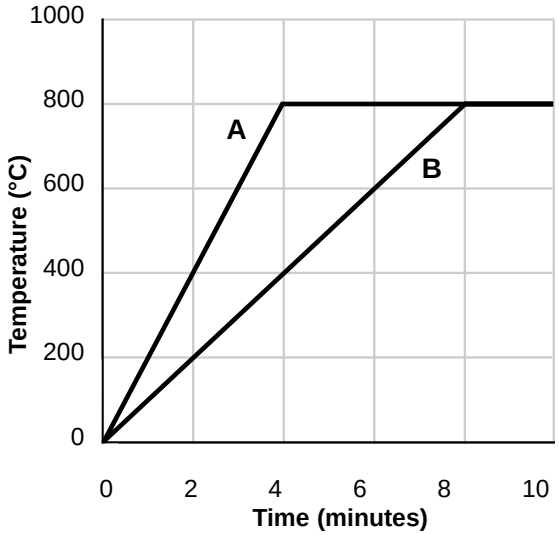
(continued)

SUGGESTIONS FOR INSTRUCTION

➢ **Heat Capacity**

Provide students with the following graph. Indicate that 1.0 kg of substance A and 1.0 kg of substance B were placed in an oven set at 800°C.

Heat Capacity of Substances



Have students refer to the graph to answer the following questions in their science notebooks:

1. How long did it take for substance A to heat up to 800°C? (Four minutes.) How long did it take for substance B? (Eight minutes.)
2. Which substance needed more heat energy to reach 800°C? (Substance B.)
3. Which variables were controlled in this experiment? (The controlled variables were the amount of substance—1 kg, and oven temperature.)
4. The heat capacity of an object indicates how much heat energy must be added to increase its temperature by 1º Celsius. If a substance has a large heat capacity, you must add a large amount of heat to increase its temperature just a little. You must also remove a large amount of heat to decrease its temperature just a little. High heat capacity often means a substance takes a long time to heat up or to cool down.

   Given this information, which substance has the higher heat capacity? (Substance B.)

(continued)

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Nelson Science & Technology 8: *Water Systems* (Section 4.13)

Sciencepower 8 (Section 12.1)

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
8-4-02 *(continued)*	*(continued)*

5. Imagine you are at the beach on a very hot day. You walk toward the water. The sand is extremely hot. When you reach the water, you find it is much cooler than the sand.
   a. Using the term *heat capacity,* explain why the sand is hot and the water is cool. (Sand has a lower heat capacity than water. It heats more quickly than water.)
   b. Predict what the air temperature would be relative to the sand and water temperatures. Explain your thinking using the term *heat capacity*. (The air would be hotter than the water but cooler than the sand because it has a higher heat capacity than sand, but a lower heat capacity than water.)

➢ **Accessing Prior Knowledge**

Have students review their knowledge of *solutions*, *solutes,* and *solvents* from Grade 7, Cluster 2: Particle Theory of Matter.

➢ **Universal Solvent**

Provide students with the following:

1. We rely on the fact that water is a universal solvent (dissolves numerous substances) in our day-to-day lives. Identify some ways in which water is useful to us as a universal solvent. (The ability of water to dissolve substances is useful in washing dishes, making coffee, tea, or carbonated drinks, processing foods, preparing hair care products, dissolving nutrients and gases in our blood, and mixing nutrients and chemicals.)
2. Sometimes we forget that water is able to dissolve substances. People add pollutants to soil, to the atmosphere, or to bodies of water without realizing the damage that could be done. Identify substances (all states of matter) that pollute water because of its trait as a universal solvent. (Phosphates from washing can dissolve and contaminate rivers. Agricultural fertilizers can dissolve and wash away during rains or run-off, causing algal blooms in lakes.)

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Restricted Response

Note: This learning activity could be used as an Exit Slip. Provide students with the following:

Heat Capacity Quiz

Indicate whether the following statements are true or false.

1. _____ Heat capacity indicates how much heat energy is needed to raise the temperature of a substance by 1° Celsius.
2. _____ If a substance has a high heat capacity you must add a small amount of heat energy to increase its temperature by 1° Celsius.
3. _____ If a substance has a high heat capacity you must remove a small amount of heat energy to decrease its temperature by 1° Celsius.
4. _____ Sand has a lower heat capacity than water, so it heats up more quickly on a hot day.
5. _____ If substance A has a higher heat capacity than substance B, substance A will heat up more slowly than substance B.

Look for:

1. true
2. false
3. false
4. true
5. true

PRESCRIBED LEARNING OUTCOMES

Students will...

8-4-03 Compare and contrast characteristics and properties of fresh water and salt water.

Examples: freezing point, density, dissolved materials, global distribution, relative amounts, biologically diverse components of each...

GLO: D3, D5, E1

8-0-2a ➲ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2)

8-0-2b Develop and use criteria for evaluating information sources. Include: distinguish between fact and opinion. GLO: C6, C8 (ELA Grade 8, 3.2.2, 3.2.3; TFS 2.2.2)

8-0-2c Make notes in point form, summarizing major ideas and supporting details and referencing sources. GLO: C6 (ELA Grade 8, 3.3.2)

(continued)

SUGGESTIONS FOR INSTRUCTION

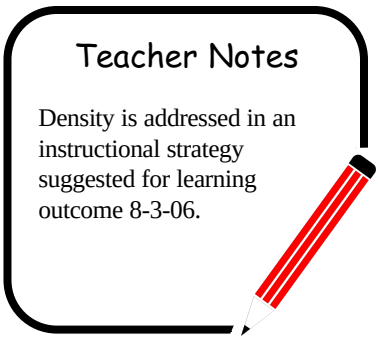
➢ Hydrometer

A *hydrometer* is an instrument that measures the density of a liquid in comparison to other liquids. Have students

- make a hydrometer by cutting a drinking straw in half and attaching a small ball of modelling clay to one end
- mark a scale (with increments of 5 mm) along the length of the straw
- place the hydrometer (the straw, with modelling clay end down) in a glass of water
- record the measurement at the point where the surface of the water meets the straw

Have students repeat the experiment with a glass of water with two tablespoons of salt dissolved in it. Ask them to answer the following questions in their science notebooks:

1. Did the hydrometer float higher in the salt water or in the fresh water? (It floated higher in the salt water.)
2. *Density* refers to how closely packed particles of a substance are in relation to its volume. The denser the liquid is, the better it is able to support the mass of other materials. Based on this knowledge, which of the two liquids is more dense? What in the hydrometer experiment indicated this? (The salt water is more dense than the fresh water because it supported the hydrometer to a greater height out of the water.)



3. What are the implications of a denser body of water for the possible size of load-carrying ships moving in water? (Load-carrying ships can be larger and carry greater loads on salt water than on fresh water. A boat in salt water will float higher than one in fresh water, assuming both boats are the same size and are carrying the same type and amount of loads.)

(continued)

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Nelson Science & Technology 8: *Water Systems* (Section 4.2)

Sciencepower 8 (Sections 10.3, 11.2)

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
8-4-03 *(continued)*	*(continued)* ➢ **Salt Water Versus Fresh Water** Have students research and/or view films about salt water and fresh water. Ask students to use a Concept Relationship Frame (Matchullis and Mueller, 1994) to organize their information about the differences between salt water and fresh water in terms of dissolved materials, biological components, density, global distribution, and relative amounts. (For a BLM of a Concept Relationship Frame, see *SYSTH*, Attachment 11.1, or *Success*, p. 6.104.)

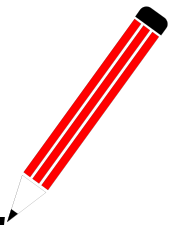
Teacher Notes

Fresh water

- is less dense than salt water
- comprises 2.5 percent of the world's water, some of which is trapped in the form of ice
- contains relatively low levels of salt
- can be soft or hard, depending on the amount of calcium carbonate, magnesium, or ferrous oxide dissolved within the water (These substances change the taste of water, affect the ability of soaps to cleanse and produce suds, cause build-up of mineral deposits in kettles and other appliances, and produce rust-coloured stains on surfaces exposed to water.)

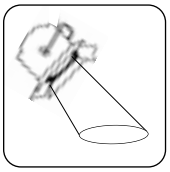
Salt water

- is more dense than fresh water
- makes up approximately 97 percent of the world's water (Oceans cover 71 percent of the Earth's surface.)
- contains approximately 33 grams of dissolved salts per litre (Most marine organisms have body fluids with salt content similar to that of seawater.)



SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES



The Cargo Ship

Provide students with the following:

The Cargo Ship

A large cargo ship loads up in Thunder Bay, Ontario, with prairie grain destined for European markets. It will travel through the Great Lakes and down the St. Lawrence River and then enter the Atlantic Ocean.

Using relative terms, describe where the waterline on the ship would be (how high or low the ship floats in the water) as it travels through each of the bodies of water. Explain why these differences occur.

Scoring Rubric	
Score	**Criteria: The response**
4	• indicates that the ship will float lower in the Great Lakes and St. Lawrence River than in the Atlantic Ocean • contains supporting evidence for the answer (e.g., the Great Lakes and St. Lawrence contain fresh water that is less dense than the Atlantic salt water, which is more dense and has a greater buoyant force) • is complete and clearly stated • indicates that the ship will begin to float higher as it approaches the Atlantic Ocean and the fresh water and the salt water begin to mix
3	• indicates that the ship will float lower in the Great Lakes and St. Lawrence River than in the Atlantic Ocean • contains supporting evidence for the answer (see above explanation) • is complete and clearly stated
2	• indicates that the ship will float lower in the Great Lakes and St. Lawrence River than in the Atlantic Ocean • contains supporting evidence for the answer (see above explanation), but the evidence may be incomplete and/or unclear
1	• indicates that the ship will float lower in the Great Lakes and St. Lawrence River than in the Atlantic Ocean

Prescribed Learning Outcomes

Students will...

8-4-04 Identify factors that can work individually or in combination to affect ocean currents.

Include: convection, Coriolis effect, prevailing winds, position of continents.

GLO: D5, E2

8-0-1b ⊂ Select and justify a method to be used in finding the answer to a specific question. GLO: C2 (ELA Grade 8, 3.2.3; Math: SP-II.1.8)

8-0-3a ⊂ Formulate a prediction/hypothesis that identifies a cause and effect relationship between the dependent and independent variables. GLO: A2, C2 (Math: SP-I.1.8)

8-0-3c ⊂ Create a written plan to answer a specific question. Include: apparatus, materials, safety considerations, steps to follow, and variables to control. GLO: C2 (ELA Grade 8, 3.1.4)

8-0-4a ⊂ Carry out procedures that comprise a fair test. Include: controlling variables, repeating experiments to increase accuracy and reliability. GLO: C2

8-0-7a ⊂ Draw a conclusion that explains investigation results. Include: explaining the cause and effect relationship between the dependent and independent variables; identifying alternative explanations for observations; supporting or rejecting a prediction/hypothesis. GLO: A1, A2, C2 (ELA Grade 8, 3.3.4)

Suggestions for Instruction

➢ Convection Current (Transfer of Heat through Water)

Demonstrate a *convection current* by completing the following as a class demonstration:

- Place a small stoppered jar of blue-coloured hot water at the bottom of a beaker of cold water. Have students predict what will happen to the blue-coloured hot water placed in the cold water when the stopper is removed.
- Remove the stopper. Have students establish a conclusion based on their observations. **Note:** If a commercial convection tube is available, use it for the demonstration and have students predict and draw conclusions. Have students document their predictions, conclusions, and the steps followed in their science notebooks. Ask them to draw a diagram of the demonstration.

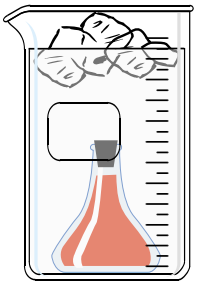
  Example:

Prediction: _____

Conclusion: The warm blue water rises and then sinks again as it cools.

Step 1. Place a small stoppered jar of blue-coloured hot water at the bottom of a beaker of cold water.

Step 2. Remove the stopper. (Dyed hot water will move upward and then downward again as it cools.)



Ask students how they could test whether their findings are accurate. Have the class select and carry out one (or more) method(s) to test their findings (e.g., have the water in the beaker the same temperature as the blue water).

➢ Ocean Currents

Have students view the "World Map: Ocean Currents" (BLM 8-F), read "Facts about Ocean Currents" (BLM 8-G), and answer the questions provided.

Suggestions for Assessment

Suggested Learning Resources

Ocean Currents

Provide students with the following:

Self-Assessment of Reading Strategies

Describe the reading strategies you used to gain information from the text "Facts about Ocean Currents" (BLM 8-G) (e.g., Did you preview and skim, take notes, use a graphic organizer, read out loud, predict?).

(For reading strategies, refer to *5-8 ELA,* learning outcome 2.1.2, Comprehension Strategies.)

Nelson Science & Technology 8: *Water Systems* (Section 4.12)

Sciencepower 8 (Section 11.3, 12.1)

PRESCRIBED LEARNING OUTCOMES

Students will...

8-4-05 Describe how the heat capacity of large bodies of water and the movement of ocean currents influence regional climates.

Examples: Gulf Stream effects, El Niño, lake effect...

GLO: D3, D5, E2

8-0-2a ⊂ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2)

8-0-2b Develop and use criteria for evaluating information sources. Include: distinguish between fact and opinion. GLO: C6, C8 (ELA Grade 8, 3.2.2, 3.2.3; TFS 2.2.2)

8-0-2c Make notes in point form, summarizing major ideas and supporting details and referencing sources. GLO: C6 (ELA Grade 8, 3.3.2)

8-0-7g ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 8, 4.4.1)

8-0-7h ⊂ Identify and evaluate potential applications of investigation results. GLO: C4

SUGGESTIONS FOR INSTRUCTION

➢ **El Niño**

Have students use the LINK (List-Inquire-Note-Know) strategy (Vaughan and Estes, 1986) to explore the El Niño current. To use the LINK strategy, provide students with the term *El Niño*, and then have students individually *list* everything that comes to mind. Compile their responses into a class chart. Have small groups of students *inquire* of each other (ask for clarification or more information) and make *notes* of what they have learned. Finally, have students read, view, or listen to confirm what they *know*.

(For a discussion of LINK, see *SYSTH*, pp. 9.18-9.19, or *Success*, p. 6.27.)

➢ **"Weather by the Water"**

Have students use the Fact-Based Article Analysis (Matchullis and Mueller, 1994) approach to analyze the information provided in "How Big Lakes and Oceans Affect Climate: Weather by the Water" (BLM 8-H). Using this approach, have students summarize the key concept, draw a figurative representation, list scientific facts, write a summary, list questions, identify key words, and discuss the relevance of the information presented.

(For a BLM of the Fact-Based Article Analysis frame, refer to *SYSTH*, Attachment 11.6, or *Success*, p. 6.114.)

Suggestions for Assessment

Suggested Learning Resources

Extended Response

Have students work in groups to complete the following:

Ocean Currents and Climate

Group members: _____

_____

Complete the following tasks with your group. You may use atlases, textbooks, and other references. One map and explanation sheet should be submitted per group.

1. Place the following cities on the map provided ("World Map: Ocean Currents," BLM 8-F):
   a. St. John's, NF
   b. Vancouver, BC
   c. San Francisco, CA
   d. Boston, MA
   e. Juneau, AK
   f. Washington, DC
2. On a separate sheet of paper, explain whether these cities would experience a warming or cooling effect on their climates because of the associated ocean currents. Provide reasons/supporting evidence for your responses.

Rating Scale					
Criteria	**Poor**			**Good**	**Excellent**
The group					
• locates cities on map	1	2	3	4	5
• identifies warming or cooling trends for cities	1	2	3	4	5
• provides reasons/supporting evidence for claims	1	2	3	4	5
• provides a clear and complete explaination	1	2	3	4	5

Nelson Science & Technology 8: *Water Systems* (Sections 4.11, 4.21)

Sciencepower 8 (Section 12.1)

PRESCRIBED LEARNING OUTCOMES
Students will...
8-4-06 Describe the components of the global water cycle and explain how it works. GLO: D3, D5, E2
8-0-7f ⊂ Reflect on prior knowledge and experiences to construct new understanding and apply this new knowledge in other contexts. GLO: A2, C4 (ELA Grade 8, 1.2.1) **8-0-7g** ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 8, 4.4.1)

SUGGESTIONS FOR INSTRUCTION

➢ The Water Cycle

Have students use their knowledge of the water cycle and global water systems to write a fictional account of a drop of water from 10 000 years ago to today. "The Incredible Journey" (BLM 8-I) provides a source of background information on this topic. Ensure that students include the following terms in their writing:

- *the Sun*
- *condensation*
- *evaporation*
- *precipitation*
- *runoff*
- *transpiration*
- *groundwater*
- *bodies of water*

Teacher Notes

Teachers may choose to address the concepts of the water cycle and global water systems following the learning experiences suggested for learning outcome 8-4-07.

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Extended Response

Provide students with the following:

The Water Cycle

Using a Word Cycle provided, show the relationships among the following terms that describe the water cycle:

- the Sun
- condensation
- evaporation
- precipitation
- runoff
- transpiration
- groundwater
- bodies of water

(For a BLM of a Word Cycle, see *SYSTH*, Attachment 10.1, or *Success*, p. 6.99.)

Scoring Rubric	
Score	**Criteria**
3	All connecting phrases succinctly and accurately explain the relationships between/among terms.
2	Most connecting phrases accurately explain the relationships between/among the terms.
1	Several connecting phrases are missing or show a lack of understanding of the relationships between/among terms.

Nelson Science & Technology 8: *Water Systems* (Sections 4.12-4.13)

Sciencepower 8 (Sections 11.3-12.2)

Prescribed Learning Outcomes

Students will...

8-4-07 Describe features of the North American drainage system.

Include: local and regional watersheds, direction of water flow, continental divide.

GLO: C6, D5

8-0-7f ↻ Reflect on prior knowledge and experiences to construct new understanding and apply this new knowledge in other contexts.
GLO: A2, C4 (ELA Grade 8, 1.2.1)

Suggestions for Instruction

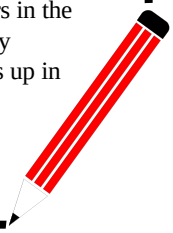
Teacher Notes

Background Information

Watersheds describe the flow of water within a region toward a common destination. Small watersheds lead to larger and larger watersheds and eventually into the oceans of the world.

Canadian waters eventually flow into the Atlantic, Pacific, or Arctic Ocean. These form the basis of Canadian watersheds, with waters in the North having two major subdivisions: the Arctic and Hudson Bay drainage systems. Most of the water in Manitoba eventually ends up in Hudson Bay.

Wetlands play an important role in Canadian watersheds and the global water cycle.



➢ Where Is the Watershed?

Use explicit instruction to introduce students to the concept of *watersheds*. Have students use the map, "North America: Watersheds" (BLM 8-J) to draw and label the major North American watersheds (Atlantic, Pacific, and Arctic, Hudson Bay, and Mississippi), the Continental Divide, and the following rivers: Mackenzie, Nelson, St. Lawrence, Mississippi, Red, Assiniboine, Saskatchewan, Fraser, and Thelon.

➢ Journey to the Sea (Hudson Bay)

Provide students with a topographical/physical map of Manitoba. Have students

- describe the route a pail of water would take from their home community to its ultimate destination
- trace the route that precipitation in the form of rainfall would take through the natural water drainage system, starting from various points in Manitoba

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

Restricted Response

Note: This quiz can be used as an Admit Slip or an Exit Slip. Provide students with the following:

North American Watersheds

1. The majority of Canadian waters flow into the following three large bodies of water:
   _____, _____, _____.
2. Most of the water in Manitoba eventually ends up in _____, part of the _____ Ocean.

Nelson Science & Technology 8: *Water Systems* (Section 4.9)

Sciencepower 8 (Section 10.1)

PRESCRIBED LEARNING OUTCOMES

Students will...

8-4-08 Describe how erosion and deposition are influenced by the flow rate of a stream or river, and contrast the related characteristics of young and mature streams.

Examples: meanders, oxbows, alluvial deposits, sandbars, flood plains, deltas...

GLO: C8, D5, E3

8-0-2a ⊂ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2)

8-0-2c Make notes in point form, summarizing major ideas and supporting details and referencing sources. GLO: C6 (ELA Grade 8, 3.3.2)

8-0-4c ⊂ Work cooperatively with team members to carry out a plan, and troubleshoot problems as they arise. GLO: C7 (ELA Grade 8, 5.2.2)

8-0-4e ⊂ Demonstrate work habits that ensure personal safety, the safety of others, and consideration for the environment. Include: keeping an uncluttered workspace; putting equipment away after use; handling glassware with care; wearing goggles when required; disposing of materials safely and responsibly. GLO: C1

8-0-5a ⊂ Make observations that are relevant to a specific question. GLO: A1, A2, C2

8-0-7g ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 8, 4.4.1)

8-0-9c ⊂ Demonstrate confidence in their ability to carry out investigations. GLO: C5

(continued)

SUGGESTIONS FOR INSTRUCTION

➢ How Water Affects Land

Have students read/view topographical maps, videos, CD-ROMs, Internet sources, books, magazines, or other reference materials to derive definitions, diagrams, and examples for the following terms: *meander, oxbow, alluvial deposit, sandbar, flood plain,* and *delta*. Have students record their information using the Three-Point Approach (Simons, 1991).

(For a BLM of the Three-Point Approach for Words and Concepts, see *SYSTH* Attachment 10.2, or *Success,* p. 6.101.)

➢ Stream Table Investigation

Provide students with stream tables. (Stream tables may be purchased or built using rectangular plastic containers such as plant trays, wallpaper trays, or storage boxes. Make a hole at one end of each container to drain water.) Have students

- observe the paths/features created in the stream tables by moving water
- experiment with variables such as flow rates, angles of elevation (gradients), and different materials through which the water could flow
- record their observations by indicating the variable they were testing and drawing a diagram of the results
- identify the features they have observed in the stream table (see the terms identified in the "How Water Affects Land" learning activity)

Note: In this investigation, students will readily identify deltas but may find it challenging to identify other features. After students have attempted to test each of the variables, demonstrate and discuss results.

Some possible findings:

- Large pebbles are deposited when a fast stream slows as it levels out (alluvial deposit). Fast-flowing water has more power than slow-moving water to carry heavy objects.
- A fast stream or river is deeper than a slow one and has sharper angles that have been cut into the terrain. The bottom of a slow river has a broader base than that of a fast river.
- Deltas are deposits of sand, soil, and rocks formed where a stream enters a lake or an ocean. This occurs because the speed of the water slows when it comes upon the relatively still water of the lake or ocean and therefore cannot hold as much material.

(continued)

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

PRESCRIBED LEARNING OUTCOMES
Students will...
8-4-08 *(continued)*

SUGGESTIONS FOR INSTRUCTION

(continued)

➢ Comparing Young and Mature Rivers

Have students use print and/or multimedia resources to develop posters illustrating and comparing the characteristics of young and mature rivers.

Example:

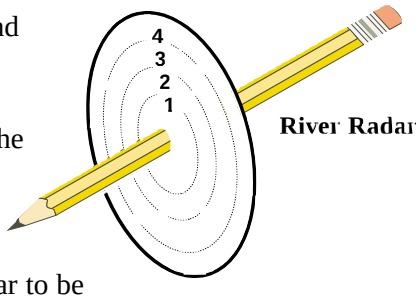
Characteristics of Young and Mature Rivers

Young Rivers	Mature Rivers
• flow fast	• move slowly
• are straight	• wind, meander
• carve out steep banks	• have gently sloping banks
• carry material of larger size	• carry material of smaller size, are full of sediment
• erode banks quickly	• erode banks slowly

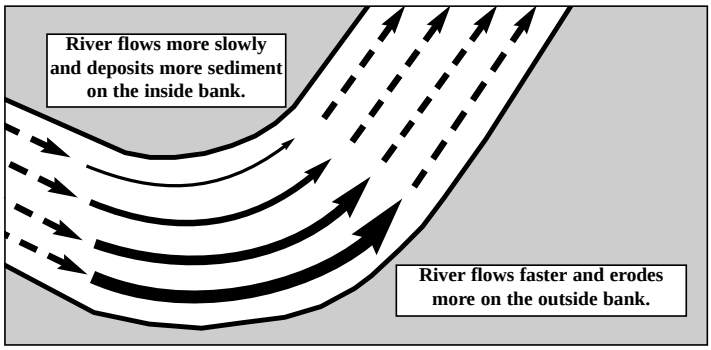
➢ River Radar

To illustrate how rivers flow around curves, have students follow these steps:

- Cut a disk out of cardboard and divide it into four numbered segments.
- Poke a hole in the middle of the disk, place a pen or pencil through the disk, and spin the disk.
- Observe which numbers appear to be moving faster than others. (The outside numbers appear to move faster.)
- Relate these observations to a meandering river and label the parts of a meander with respect to speed and eroding power.

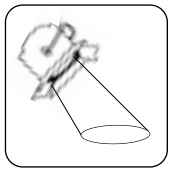


Example:



SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES



Where to Build?

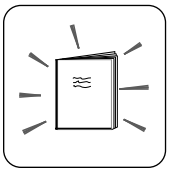
Provide students with the following:

Where to Build?

In your science notebook, explain whether it would be better to build a house on the banks of an outside curve of a river or on an inside curve of a river. Explain your reasoning.

Look for:

The water on the outside portion of a meander moves faster, causing more erosion. A house built on the outside bank may lose support as the river erodes the soil, and may therefore end up in the river. A house built on the inside bank will actually have material deposited around it, thus increasing the size of property.



As the River Runs

Have students create a comic strip, flip book, set of transparency overlays, or another similar product to show the sequence of the development of river features such as meander, oxbow, sandbar, and delta. The product should be suitable to share with students in a lower grade.

As a class, develop an assessment tool for this product, identifying what criteria will be included and whether it will include a self- or peer-assessment component.

Nelson Science & Technology 8: *Water Systems* (Sections 4.4, 4.9)

Sciencepower 8 (Section 10.1)

PRESCRIBED LEARNING OUTCOMES
Students will...
8-4-09 Describe how wave action and ice movement in large bodies of water cause erosion and deposition. GLO: D5, E3
8-0-2a ➲ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2) **8-0-2c** Make notes in point form, summarizing major ideas and supporting details and referencing sources. GLO: C6 (ELA Grade 8, 3.3.2) **8-0-5a** ➲ Make observations that are relevant to a specific question. GLO: A1, A2, C2

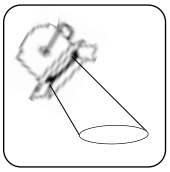
SUGGESTIONS FOR INSTRUCTION

➢ **Erosion and Deposition of Shorelines**

Have students use multimedia resources, field trips, or print resources to learn about erosion caused by large bodies of water. A field trip would allow students to make observations and gather information related to this learning outcome, as well as learning outcome 8-4-11. Students can also gather stories from family and friends about examples of effects of ice and wave action (e.g., a dock being broken up by the ice in spring). Have them describe, in their science notebooks, the factors that lead to the erosion and deposition of shorelines in large bodies of water.

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES



Lake Winnipeg Beaches

Have students apply their understanding of the movement of rivers, the erosion they cause, and the features they create to explain what takes place along shorelines of large bodies of water. Provide students with the following:

Lake Winnipeg Beaches

You are a researcher who has been studying the erosion of rivers for several years. You would now like to move into a new but related area of study: large bodies of water and their shorelines. Your specific area of study is Lake Winnipeg, and your focus is to explain the differences between the fine-grained shoreline at Grand Beach and the mixed pebble/sand shorelines at Winnipeg Beach and Gimli Beach.

Carry out any research you may think is necessary, consult with fellow scientists (students), and then prepare your report explaining the differences between the make-up of these beaches. Indicate what further information and/or research would be needed to confirm your theory.

Scoring Rubric	
Score	**Criteria**
4	The explanation is plausible, uses examples and/or evidence to support theory, applies prior learning related to river deposition, and contains evidence of higher-order thinking.
3	The explanation is plausible, uses examples and/or evidence to support theory, and applies prior learning related to river deposition.
2	The explanation is plausible, uses examples and/or evidence to support theory, but contains significant errors in thinking.
1	The explanation is implausible and/or contains major errors in thinking.

Nelson Science & Technology 8: *Water Systems* (Section 4.14)

Sciencepower 8 (Section 11.1)

PRESCRIBED LEARNING OUTCOMES

Students will...

8-4-10 Explain how tides are caused and describe their effects on shorelines.

GLO: D5, D6

8-0-2a ↻ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2)

8-0-2b Develop and use criteria for evaluating information sources. Include: distinguish between fact and opinion. GLO: C6, C8 (ELA Grade 8, 3.2.2, 3.2.3; TFS 2.2.2)

8-0-2c Make notes in point form, summarizing major ideas and supporting details and referencing sources. GLO: C6 (ELA Grade 8, 3.3.2)

SUGGESTIONS FOR INSTRUCTION

➢ All about Tides

Have students construct an Inquiry Chart (Hoffman, 1992) to investigate the causes and effects of tides. Teacher and student questions should drive the inquiry. The process of constructing Inquiry Charts (I-Charts) requires students to access prior knowledge, identify information sources, carry out research, generate summary statements for their findings, and record information.

(For further information related to I-Charts, refer to *5-8 ELA*, Strategies, p. 83. For strategies to aid students in using a variety of information sources, determining the usefulness of information, constructing meaning, recording information, and referencing and evaluating sources, refer to *5-8 ELA*, learning outcome 3.2.2–3.2.5 and 3.3.2–3.3.3.)

➢ Effects of Tides

Have students use a Word Splash (Saphier and Haley, 1993) to gather information about tides. (For a discussion of this strategy, see *Success*, p. 6.28.)

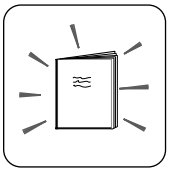
Divide students into groups of three and ask them to assign a recorder in the group. Give each group the title of the article "The Effects of Tides" and the corresponding "Word List: Tides" (BLM 8-K). Ask groups to

- make thought connections between different words on their list
- record their connections in note form or on a map
- identify connections they believe to be true and connections of which they are unsure

Review each group's thought connection notes or map, and then ask students to read the article "The Effects of Tides" (BLM 8-L). Once students have read the article, have each group meet and analyze their word connection notes or map and identify differences between their predictions and the actual information in the article.

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES



All about Tides

When assessing the "All about Tides" student inquiry, look for indications of the following:

All about Tides: Assessment Checklist		
Criteria The student	**Yes**	**No**
• uses pre-established criteria to evaluate information sources		
• self-questions to determine appropriateness of sources		
• discards inappropriate sources		
• differentiates between suitable and unsuitable information		
• recognizes that information serves different purposes		

Nelson Science & Technology 8: *Water Systems* (Section 4.15)

Sciencepower 8 (Section 11.1)

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
8-4-11 Describe examples of human interventions to prevent riverbank or coastal erosion. *Examples: vegetation, reinforcement (concrete, boulders), piers, breakwaters...* GLO: B2, B5, D5	➢ **Local Survey** Have students tour their community to identify examples of methods used to prevent riverbank or coastal erosion. Students should sketch and describe each example. Discuss safety issues prior to leaving the class. This learning experience can be supplemented (or replaced) with a presentation by a guest speaker (e.g., a member of the local public works department responsible for preventing riverbank erosion). Multimedia and/or print resources can also be used to illustrate different methods of riverbank or coastal erosion.
8-0-2a ⊂ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2)	
8-4-12 Identify factors that can cause flooding either individually or in combination. *Examples: heavy snow pack, quick thaw, rain in spring, lack of vegetation to remove water through transpiration, frozen ground preventing absorption, agricultural drainage systems, dams, diversions...* GLO: C8, D5	➢ **Recipe for a Flood** 1. Using multimedia, Internet, and print resources, have students determine the factors that lead to flooding in general, and the factors that led to the Manitoba Flood of 1997 in particular. 2. Have small groups of students create a recipe/scenario for a flood disaster that contains at least three steps. Provide students with key phrases such as the following: • Start with... • Add (or Remove)... • Result: Have students present their recipes/scenarios orally or on a large recipe card. Example: Start with a wet summer where the water tables are high. Add several heavy snowfalls in winter and a quick spring thaw where the ground is still frozen and cannot absorb the extra runoff. Add extra precipitation in the form of heavy rainfall within a short period. End off with a large frozen lake that impedes the movement of the runoff. Result: Backup of extra water/runoff and subsequent higher river levels that cause flooding.
8-0-2a ⊂ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2) **8-0-2b** Develop and use criteria for evaluating information sources. Include: distinguish between fact and opinion. GLO: C6, C8 (ELA Grade 8, 3.2.2, 3.2.3; TFS 2.2.2) **8-0-2c** Make notes in point form, summarizing major ideas and supporting details and referencing sources. GLO: C6 (ELA Grade 8, 3.3.2) **8-0-4c** ⊂ Work cooperatively with team members to carry out a plan, and troubleshoot problems as they arise. GLO: C7 (ELA Grade 8, 5.2.2) **8-0-7g** ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 8, 4.4.1)	

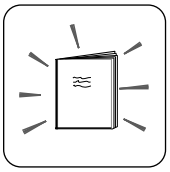
SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

‘Protecting Your Shorelands’ Canada Fisheries and Oceans Publication (Dept. of Fisheries and Oceans Central and Arctic Region, 501 University Crescent, Wpg. MB. R3T 2N6. Phone: 983-5108)

Nelson Science & Technology 8: *Water Systems* (Sections 4.14, Design Challenge)

Sciencepower 8 (Section 11.1)



Recipe for a Flood

When assessing students’ “Recipe for a Flood,” look for indications of the following:

Nelson Science & Technology 8: *Water Systems* (Section 4.8)

Sciencepower 8 (Section 10.1)

Rating Scale					
Criteria	**Poor**		**Good**		**Excellent**
The recipe					
• includes key causes of floods	1	2	3	4	5
• presents information in a recipe format	1	2	3	4	5
• uses clear, correct language	1	2	3	4	5

PRESCRIBED LEARNING OUTCOMES

Students will...

8-4-13 Provide examples of the way in which technology is used to contain or prevent damage due to flooding, and discuss related positive and negative impacts.

Examples: floodway, diversion, dike, levee...

GLO: A5, B1, D5

8-0-8d ⊂ Describe examples of how technologies have evolved over time in response to changing needs and scientific advances. GLO: A5, B1, B2

8-0-8g ⊂ Discuss societal, environmental, and economic impacts of scientific and technological endeavours. Include: local and global impacts. GLO: A1, B1, B3, B5

8-0-9e ⊂ Be sensitive and responsible in maintaining a balance between the needs of humans and a sustainable environment. GLO: B5

8-0-9f ⊂ Consider both immediate and long-term effects of their actions. GLO: B5, C4, E3

SUGGESTIONS FOR INSTRUCTION

➢ **Case Study: Manitoba Flood of 1997**

As a class, identify the major barriers used to prevent damage by flood water during the Manitoba Flood of 1997 (e.g., Red River floodway, Brunkild dike, levees, sandbags). Divide the class into groups and have each group

- describe each barrier used to prevent flood-water damage
- explain how each barrier worked
- highlight technology that made each barrier possible (e.g., the development of a new sandbagging machine)
- discuss the positive and/or negative impacts of each barrier
- give an oral presentation or create a poster featuring information gathered for this case study

(**Note:** *Red River Raging: The Flood of the Century, Manitoba 1997,* a video produced by CKND Newsline and Canwest Global System, can be obtained through the Manitoba Text Book Bureau.)

Suggestions for Assessment

Journal Reflection

Have students reflect, in their science journals, how they were affected (if at all) by the Manitoba Flood of 1997, or by subsequent floods.

Suggested Learning Resources

Nelson Science & Technology 8: *Water Systems* (Sections 4.4, 4.8)

Sciencepower 8 (Section 10.1)

Prescribed Learning Outcomes

Students will...

8-4-14 Identify sources of drinking water and describe methods for obtaining water in areas where supply is limited.

Examples: desalination, melting of ice, condensation...

GLO: B1, B2, B3, D5

8-0-7f ⊂ Reflect on prior knowledge and experiences to construct new understanding and apply this new knowledge in other contexts. GLO: A2, C4 (ELA Grade 8, 1.2.1)

8-0-7h ⊂ Identify and evaluate potential applications of investigation results. GLO: C4

8-0-8g ⊂ Discuss societal, environmental, and economic impacts of scientific and technological endeavours. Include: local and global impacts. GLO: A1, B1, B3, B5

8-0-9e ⊂ Be sensitive and responsible in maintaining a balance between the needs of humans and a sustainable environment. GLO: B5

(continued)

Suggestions for Instruction

➢ Sources of Drinking Water

Have students identify the source of their drinking water and the drinking water of neighbouring communities (e.g., specific lakes, rivers, or wells).

"Slow the Flow" available from Fort Whyte Centre (telephone 204-989-8358) contains student learning activities related to sources of drinking water across Manitoba and Canada.

Ask students to identify how/where they would obtain clean drinking water if they were

- on a canoe trip (They could obtain water directly from a lake or a swiftly running river, but might need to use water purifying tablets/filters or boil the water to ensure cleanliness.)
- on a winter camping trip (They could melt snow or ice. Explain that snow or ice should be melted to prevent hypothermia.)
- hiking in the desert (They could carry water.)

➢ Other Methods of Obtaining Clean Drinking Water

Part A: Distillation

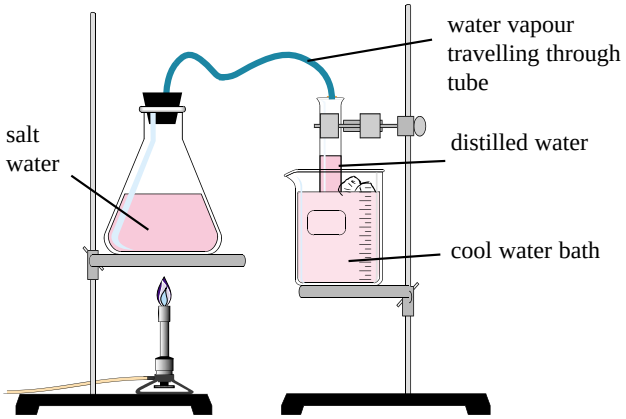
Place some salty water in one pan and distilled water in another pan. Have students compare pans after evaporation has occurred and cite proof as to whether the salt was separated from the water.

Teacher Notes

Prior Knowledge

Separating mixtures was addressed in Grade 7, Cluster 2: Particle Theory of Matter.

Demonstrate the distillation of salt water (as shown in the diagram below).



Have students explain whether there is the potential for large-scale use of distillation in the production of clean drinking water.

(continued)

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES

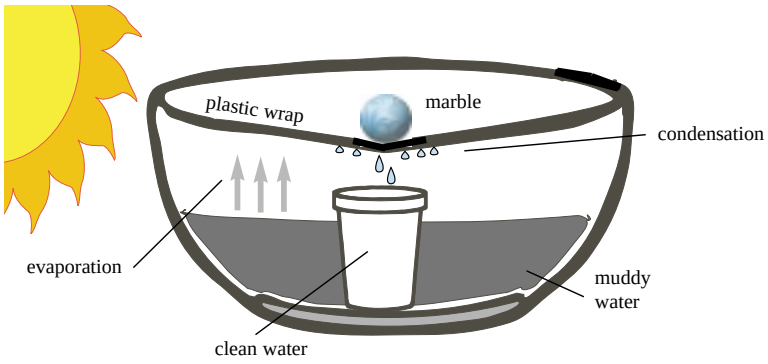
Nelson Science & Technology 8: *Water Systems* (Section 4.5)

Sciencepower 8 (Section 12.3)

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
8-4-14 *(continued)*	*(continued)*

Part B: Solar Still

Demonstrate the use of a solar still to obtain clean drinking water (see diagram below). Ask students to explain the process of obtaining the drinking water. Have them explain whether there is the potential for large-scale use of this method in the production of clean drinking water.



➢ **Role of Wetlands**

Have students investigate the role of wetlands in cleaning water and in recharging groundwater supplies. Nature centres such as Oak Hammock Marsh can provide resources on this topic and serve as field trip destinations.

➢ **Areas Where Water Supply Is Limited**

Have students, working in groups, research a variety of sources to determine areas where the supply of clean drinking water is limited (e.g., in areas of California where water may be contaminated due to natural disasters) and identify ways in which those communities are attempting to solve the problem (e.g., desalinization, boiling water, rationing, buying water from another country). Ask each group to create a short newspaper article in which they detail the location experiencing a water shortage, explain the problem, and describe the community's attempts to solve it.

Note: Students should recognize that clean-looking drinking water does not automatically mean that the water is free of bacteria—it may require boiling or disinfecting.

Suggestions for Assessment

Have students complete the "How I Worked in My Group" (BLM 8-M) for self-assessment purposes.

Suggested Learning Resources

PRESCRIBED LEARNING OUTCOMES
Students will...
8-4-15 Explain how and why water may need to be treated for use by humans. Include: filtration, settling, chlorination, fluoridation. GLO: B1, B3, D5
8-0-2a ↻ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2) **8-0-2c** Make notes in point form, summarizing major ideas and supporting details and referencing sources. GLO: C6 (ELA Grade 8, 3.3.2)

SUGGESTIONS FOR INSTRUCTION

➢ **Drinking Water: Guest Speaker**

Invite a guest speaker to talk to the class about the source and treatment of the local water supply. Have students prepare questions prior to the visit, actively listen to the speaker during the discussion, and take notes on the information provided. Ensure that students become familiar with the terms *filtration, settling, chlorination,* and *fluoridation.*

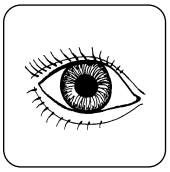
Note: Learning activities related to learning outcomes 8-4-15 and 8-4-17 may be found at the following websites:

- Learning for a Sustainable Future <http://www.schoolnet.ca/learning/teacher/classroom/index_en.html> (see Travelling Pollutants, Pollution Close to Home, and Poisoned Water)
- Environment Canada <http://www.ec.gc.ca/water_e.html>

Information can also be obtained from Manitoba Conservation, Water Quality Management Section (telephone 1-800-282-8069), and City of Winnipeg, Water and Waste Department (telephone 204-986-4478).

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES



Drinking Water: Guest Speaker

When assessing students' active listening skills, look for indications of the following:

Assessing Active Listening

Observed Behaviours	Student Names								
• looks at speaker									
• controls personal activity level									
• encourages the speaker with non-verbal cues (nodding, smiling)									
• asks relevant questions									
• shows respect for the speaker (does not interrupt, distract others)									

Nelson Science & Technology 8: *Water Systems* (Section 4.7)

Sciencepower 8 (Section 12.3)

Education for a Sustainable Future: A Resource for Curriculum Developers, Teachers, and Administrators (Teacher Reference)

PRESCRIBED LEARNING OUTCOMES

Students will...

8-4-16 Compare the waste-water disposal system within their communities to one used elsewhere.

Include: process involved, environmental impact, cost.

GLO: B2, B5

8-0-2a ➲ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2)

8-0-2c Make notes in point form, summarizing major ideas and supporting details and referencing sources. GLO: C6 (ELA Grade 8, 3.3.2)

8-0-7g ➲ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 8, 4.4.1)

SUGGESTIONS FOR INSTRUCTION

➢ Sewage Treatment Facility

Have the class visit a local sewage treatment facility or examine information pamphlets on its operation. Following the visit/study, have students answer the following questions in their science notebooks:

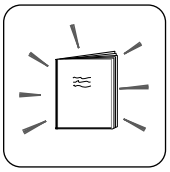
1. How does sewage get to the treatment plant?
2. What biological components can be used to help break down sewage?
3. What are some additional treatment steps taken to clean the water?
4. What happens to the cleaned (potable) water after treatment?
5. What steps are taken to ensure that the effluent meets environmental standards before it is reintroduced into the natural water system?
6. Where is the solid waste deposited after treatment?
7. Is it used for any other purpose?
8. Is the present sewage treatment facility working at capacity?
9. Is there a need for expansion or for building another facility to keep up with population demands? If so, what would it cost to upgrade the existing facility or to build a new one?

➢ Other Methods of Waste-Water Disposal

Have students research other methods (e.g., septic field and sewage pump-out system, ejector system with solid waste pump-out system, outhouse with pit for sewage) used for waste-water disposal. Ask students to draw a diagram, write a brief description of a specific disposal method, and describe the associated environmental impacts.

SUGGESTIONS FOR ASSESSMENT

SUGGESTED LEARNING RESOURCES



Other Methods of Waste-Water Disposal

When assessing students' work related to "Other Methods of Waste-Water Disposal," look for indications of the following:

Rating Scale			
Criteria	**Possible Points***	**Self-Assessment**	**Teacher Assessment**
Waste disposal method is clearly described.			
Diagram is labelled and effectively illustrates process.			
Environmental impacts are identified and discussed.			
A variety of resources are included.			
References are cited appropriately.			

* Relative weights should reflect the particular emphasis(es) of this assessment.

Nelson Science & Technology 8: *Water Systems* (Section 4.7)

PRESCRIBED LEARNING OUTCOMES

Students will...

8-4-17 Identify substances that may pollute water, related environmental and societal impacts of pollution, and ways to reduce or eliminate effects of pollution.

GLO: B2, B3, B5, D5

8-0-2a ↻ Access information, using a variety of sources. *Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet…* GLO: C6 (ELA Grade 8, 3.2.2)

8-0-2b Develop and use criteria for evaluating information sources. Include: distinguish between fact and opinion. GLO: C6, C8 (ELA Grade 8, 3.2.2, 3.2.3; TFS 2.2.2)

8-0-2c Make notes in point form, summarizing major ideas and supporting details and referencing sources. GLO: C6 (ELA Grade 8, 3.3.2)

SUGGESTIONS FOR INSTRUCTION

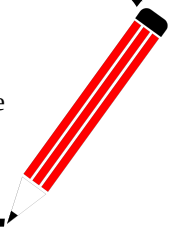
➢ **Identifying Water Pollution Issues**

Have students look for newspaper and/or magazine articles related to water pollution (e.g., the potential effects of hog farming, E. coli, oil spills). Have them use an Issue-Based or a Fact-Based Article Analysis sheet (Matchullis and Mueller, 1994) to record information as they read the articles.

(For a BLM of an Issue-Based and a Fact-Based Article Analysis sheet, see *SYSTH*, Attachments 11.5 and 11.6, or *Success*, pp. 6.114-6.115.)

Teacher Notes

This learning experience would be a good introduction to Public Hearing (an instructional strategy suggested for learning outcome 8-4-18), where students choose one issue to analyze and hear presentations from all parties involved in the issue.



Suggestions for Assessment

Journal Reflection

Have students reflect, in their science journals, on the importance of the issue of water pollution to society and the environment.

Suggested Learning Resources

Nelson Science & Technology 8: *Water Systems* (Sections 4.6, 4.17)

Sciencepower 8 (Sections 10.1, 10.3, 12.3)

PRESCRIBED LEARNING OUTCOMES

Students will...

8-4-18 Identify environmental, social, and economic factors that should be considered in the management of water resources.

Examples: ecosystem preservation, employment, recreation, industrial growth, water quality...

GLO: B5, D5

8-0-4c ⊂ Work cooperatively with team members to carry out a plan, and troubleshoot problems as they arise. GLO: C7 (ELA Grade 8, 5.2.2)

8-0-7b ⊂ Critically evaluate conclusions, basing arguments on fact rather than opinion. GLO: C2, C4

8-0-7f ⊂ Reflect on prior knowledge and experiences to construct new understanding and apply this new knowledge in other contexts. GLO: A2, C4 (ELA Grade 8, 1.2.1)

8-0-7g ⊂ Communicate methods, results, conclusions, and new knowledge in a variety of ways. *Examples: oral, written, multimedia presentations...* GLO: C6 (ELA Grade 8, 4.4.1)

8-0-7h ⊂ Identify and evaluate potential applications of investigation results. GLO: C4

8-0-8g ⊂ Discuss societal, environmental, and economic impacts of scientific and technological endeavours. Include: local and global impacts. GLO: A1, B1, B3, B5

8-0-9b ⊂ Express interest in a broad scope of science- and technology-related fields and issues. GLO: B4

8-0-9e ⊂ Be sensitive and responsible in maintaining a balance between the needs of humans and a sustainable environment. GLO: B5

8-0-9f ⊂ Consider both immediate and long-term effects of their actions. GLO: B5, C4, E3

SUGGESTIONS FOR INSTRUCTION

➢ Public Hearing

Have students prepare presentations for, and hold a public hearing on, an environmental issue that deals with the management of water resources, proceeding as follows:

1. Select an issue that affects a local or global water supply, such as:
   - locating a new landfill site on land near a creek
   - moving oil supertankers through the Arctic Ocean and the straits near Canada's northern islands
   - developing a gold mine by Shoal Lake (Winnipeg's water source)
   - building a river diversion for the purpose of irrigating farmland
   - selling fresh water to the United States
   - developing cottages on a lake that is used as a water supply by a population centre
   - building a new pulp and paper mill
   - diverting water from one watershed into another
2. Select five students to form a hearing panel, one of whom will serve as the chairperson. The role of the panel is to listen to all the presentations and ultimately come up with a decision following the hearings.
3. Research and create a presentation arguing either in favour of or in opposition to the selected issue, based on the following points of view:
   - government officials
   - company representatives
   - environmentalists
   - citizens who will be affected by the issue
   - other companies who might benefit if the proposal is accepted
   - local people who might benefit if the proposal is accepted
4. Students who are not on the hearing panel should role-play the presentations, addressing the hearing panel. (Each presentation should be approximately five minutes.)
5. Submit a hard copy (written or on a computer disk) to the panel/teacher upon completion of the presentation.

(For strategies and assessment suggestions to aid students in developing appropriate delivery skills for use in presentations, as well as public listening and viewing behaviours, refer to *5-8 ELA*, learning outcomes 4.4.2-4.4.3.)

SUGGESTIONS FOR ASSESSMENT

Presentation to the Hearing Panel

Provide students with the following self-assessment tool:

Self-Assessment of Presentation

Name _____

Issue _____

I represented/played the role of _____

1. I found it difficult to represent my character's side because _____
   _____
2. I especially represented my character well when I _____
   _____
3. Other characters whose views were similar to those of my character were _____
   _____
4. If I were to make a second presentation to the hearing panel, I might include other points of information such as _____
   _____
5. Topics I might have to research to obtain more pertinent information to present to the panel include _____
   _____
6. I could have improved my actual presentation in the following way(s) (e.g., spoken more clearly, dressed appropriately, provided visuals, looked at the panel while speaking) _____
   _____
7. As a student, I agreed with the conclusion of the panel. (Circle one and explain the reason for your answer.) Yes No _____
   _____
   _____

SUGGESTED LEARNING RESOURCES

Education for a Sustainable Future: A Resource for Curriculum Developers, Teachers, and Administrators. Winnipeg, MB: Manitoba Education and Training, 2000.

Nelson Science & Technology 8: *Water Systems* (Sections 4.6, 4.18, 4.21)

Sciencepower 8 (Section 12.3)

Prescribed Learning Outcomes

Students will...

8-4-19 Use the design process to develop a system to solve a water-related problem.

GLO: B2, B3, C3, D5

8-0-1c Identify practical problems to solve. *Examples: How can I make water flow uphill? Which type of bottled water should I buy?…* GLO: C3

8-0-1d ⊂ Select and justify a method to be used in finding a solution to a practical problem. GLO: C3 (Math: SP-II.1.8)

8-0-3d ⊂ Develop criteria to evaluate a prototype or consumer product. Include: function, aesthetics, environmental considerations, cost, efficiency. GLO: C3

8-0-3e ⊂ Create a written plan to solve a problem. Include: materials, safety considerations, three-dimensional sketches, steps to follow. GLO: C3, C6

8-0-4b ⊂ Construct a prototype. GLO: C3

8-0-5b ⊂ Test a prototype or consumer product, using predetermined criteria. GLO: C3, C5

8-0-6d ⊂ Identify and make improvements to a prototype, and explain the rationale for the changes. GLO: C3, C4

8-0-7d ⊂ Propose and justify a solution to the initial problem. GLO: C3

8-0-7e ⊂ Identify new practical problems to solve. GLO: C3

Suggestions for Instruction

➢ Design Process

Have students design a system to solve a water-related problem.

Examples:

- a filtration system to clean dirty water
- a way to clean an oil spill
- a way to prevent nitrates from entering streams and rivers
- a way to provide potable water on a camping trip or during an environmental emergency in an area where drinking water has been contaminated

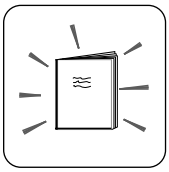
Ask students to create a written plan for the system, identify materials for a working model, and develop criteria for a successful design (e.g., removes 90% of the oil spill). When the plans are completed and the materials have been gathered, have students test the effectiveness of their designs, using evaluation criteria such as following:

- shows a reduction in pollutant
- includes detailed drawings

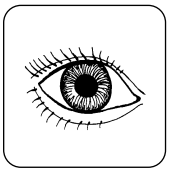
Students may use “Design Project Report” (BLM 8-O) to record their work.

Suggestions for Assessment

Refer to the following BLMs for assessment suggestions:



"Design Project Report: Assessment" (BLM 8-P)



"Constructing a Prototype: Observation Checklist" (BLM 8-N)

Suggested Learning Resources

Nelson Science & Technology 8: *Water Systems* (Design Challenge)

Sciencepower 8 (Section 12.3, Unit 4)

By Design: Technology Exploration & Integration (Design Process Reference and Tools)

Design and Technology System (Design Process Reference and Tools)

Mathematics, Science, & Technology Connections (Design Process Reference and Tools)

Notes