

Important Concepts . . .

Preview Review



Science

Grade 8 TEACHER KEY

W3 - Lesson 5: Water Quality

Important Concepts of Grade 8 Science

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W1 - Lesson 2	Solubility and Saturation Points
W1 - Lesson 3A.....	Viscosity, Flow Rate, and Buoyancy
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W1 - Lesson 4	Gears, Mechanical Advantage, Speed Ratios, and Efficiency
W1 - Lesson 5	Hydraulics and Pneumatics
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W3 - Quiz	

Textbook:
*Science in
Action 8*

Science Grade 8

Version 5

Preview/Review W3 - Lesson 5 TEACHER KEY

Publisher: Alberta Distance Learning Centre

Author: Kevin De Clerq

In-House Teachers: Barb Philips and Norene Pinder

Project Coordinator: Dennis McCarthy

Preview/Review Publishing Coordinating Team: Nina Johnson,

Laura Renkema, and Donna Silgard



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Preview/Review Concepts for Grade Eight Science

TEACHER KEY



*W3 - Lesson 5:
Water Quality*

OBJECTIVES

By the end of this lesson, you should

- name and define various features of water quality
- explain how those features affect water quality
- name and explain some water quality problems
- explain some ways that water quality is determined

GLOSSARY

effluent - fluid that flows into a body of water from human activity

spillway - a passage for water, fish, etc., to go around a dam

water quality - the purity of a sample of water

watershed - area of land that drains into a body of water

W3 - Lesson 5: Water Quality

Welcome to W3 - Lesson 5. This lesson is designed to teach you what water quality means to the survival of a species. It should take about 1 hour to complete this lesson. Before you go home, you will write a short quiz on what you learned this week.



Water Quality

Water quality refers to the level of impurities in the water and the amount of life it will support. In Alberta, many lakes, rivers, and streams are monitored regularly to ensure that the water quality is suitable for living organisms. This quality of water can be affected by both natural and artificial means.

Within the environment are natural changes such as spring run off, that allow decayed plant materials to become trapped in the river. This causes changes in the quality and levels of the water. An artificial means of change is acid rain created from products of combustion, causing acid levels to affect various ecosystems.

Turbidity is best described as how clear the water is. Increased sediment makes water very murky looking, and is described as having high turbidity. In the spring, flooding rivers tend to have high turbidity to the point where a city's or a town's water could look quite brown.

Fish also have a problem with high turbidity because fish may not see their predators and food supply in murky water. High levels of suspended sediment could also clog gills.

Salinity also has a key role in the quality of water whether it be in fresh or salt water. The amount of salts and other minerals that have dissolved in the water have a direct affect on the type of organism that can survive in that body of water. If there are high levels of calcium and magnesium, the water is said to be **hard**. Soft water contains sodium and potassium. As water travels through a river system, it collects more salts and minerals the further it moves; therefore, when it reaches an ocean the water may contain high levels of salinity.

Fresh water species have difficulty living in salt water due to the high levels of salts. Salt water species have a struggle to survive in fresh water because of the low levels of salts.

Flow rate can affect water quality and the type of species capable of surviving in a particular body of water. The faster the water is flowing, the fewer the organisms able to survive the turbulence of the water. Most game species of fish such as trout require pea-sized gravel to lay their eggs in streams and rivers. The flowing water provides oxygen to those eggs and removes sediments from the gravel. If the flow rate is too low, the suspended load of sediments in the water deposits onto the pea gravel, and cover the eggs with silt. This prevents oxygen from getting to the eggs, preventing them from hatching.

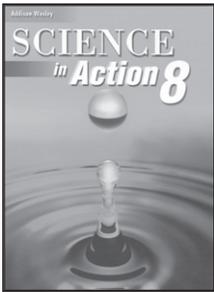
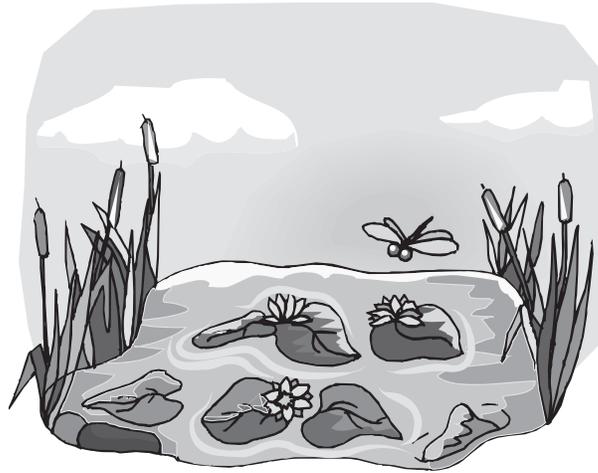


Water levels also affect water quality for fish and other aquatic organisms. If pools are not deep enough in a river in the summer, the fish have difficulty surviving because the water warms and releases dissolved oxygen. One factor that affects water levels is the amount of vegetation growing along the river banks and on the watershed. Trees actually slow the melt rates of snow so that runoff is longer and more even.

Clearing along the river wall allows the snow to melt away quickly, causing a week or two of flooding and then very little runoff for the remainder of the year.

Man has used artificial means to help control the water levels by building dams on some major rivers for the purpose of irrigation or flood control. These dams provide a constant flow of water at the **spillway**. This is good for fish species that are down river, but it interferes with migration of fish.

Reservoirs behind dams may cause problems resulting from fluctuating water levels. In the spring, the dams are at full capacity and by the fall the water level may have dropped as much as 10 metres. Most aquatic plants grow in certain depths of water. When the depths change dramatically, these plant species have difficulty growing.



Activity 1

Read and understand the previous paragraphs and pages 386 and 388 in *Science in Action 8*. Then, answer the following questions.

1. What are four factors that affect water quality?

Turbidity, salinity, flow rates, and water levels

2. In a slow-flowing river, what is one thing that kills fish eggs?

Depositing sediments prevent oxygen from getting to the eggs.

3. What is the danger to aquatic ecosystems created by farmers using herbicides and pesticides on their crops?

These chemicals can run off the fields when the fields are saturated and end up in lakes, rivers, and streams and affect the life in them.

4. What happens to water in a river when it reaches and flows into an ocean?

The flow rate decreases and sediments are deposited.

5. Why are fresh water organisms unable to live in salt water?

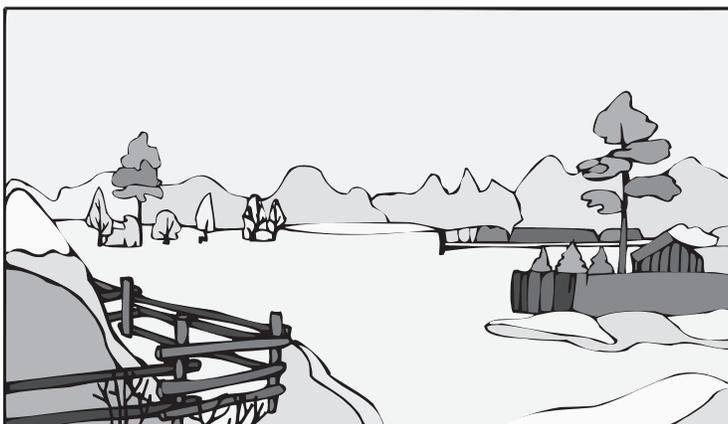
The high levels of salt in the water actually pulls fluid from their organs.

Water Quality Problems

A problem that the province of Alberta has encountered on some of its rivers has to do with **effluent**. Effluent is the water that comes from industrial and sewage plants and runs into rivers, streams, or lakes. The province has set minimum standards so that this effluent is relatively safe for plants and animals. However, constant monitoring and strict guidelines for industry must be established and followed to help improve already delicate aquatic ecosystems.

Sewage treatment plants have difficulty processing **phosphates**. Phosphates are found in some detergents and soaps. In water, they act like a fertilizer and promote excessive amounts of algae.

Phosphate levels are usually high in rivers downstream from sewage treatment plants, causing an over-abundance of algae. This growth chokes other forms of plant life that fish survive on, thus reducing the levels of fish in the stream. Decomposition of dead plant matter also robs the water of oxygen.



Acid rain is also a factor that reduces water quality and can destroy all aquatic life in a lake. Many industries burn coal. Electricity in Alberta is mostly produced by coal-burning plants. When coal and other high sulfur fuel are burned, pollutants such as sulfur are released into the atmosphere. These pollutants combine with water vapor to turn rain slightly acidic. When acid rain gets into a watersystem where there is no base to counteract it, pH levels drop. Organisms need a specific pH range for survival. Above or below that, the organism is harmed or killed.

Activity 2

Use the above reading to answer the following questions.

1. Why is it important to humans and aquatic life to keep pollutants out of water?

Pollutants kill most life.

2. What do you suggest could be done to bring lakes that have been killed by acid rain back to normal?

The pH must be increased. Stop the polluting industry

from using coal-fired processes, and have them switch

to propane. Put something in the lake that may have an

effect on the acid to neutralize the acid.



Determining Water Quality

Today, researchers can determine the water quality of a body of water. This usually means going out to the lake, river, or stream and looking for various indicators such as the following:

- What is there for the fish to eat?
- What bugs are there?
- What is the flow rate?
- What is the turbidity of the water?
- What is the dissolved oxygen level?

Another way to determine water quality is to do some electrofishing and look at the health of fish in the water. A researcher takes a device that sends an electric current into the water to stun fish. The stunned fish are collected and data is recorded such as weight, length, evidence of parasites, the number of fish collected in a certain area. Even the age of the fish can be determined—by collecting and examining scales. The fish can then be released back into the water.

All of this information gives researchers better understanding of how well game species are doing in a particular body of water and how healthy the system is. As a result of this data, various artificial means can be introduced to improve the water quality.

Activity 3

Read and understand the above readings and pages 400 to 401. Then answer the following questions.

1. The Bow River has some of the best trout fishing in Alberta. This river supplies the people of Calgary with all their water needs. This includes both industrial and residential water. Most people who fish the Bow River do not eat the fish they catch. Why do you think the fish are returned to the river?

Industrial and residential uses of the Bow River have _____

released many toxins into the water. These chemicals _____

build up in the fish making them dangerous to consume. _____

Therefore, the fish are caught for sport and released, _____

causing some very big trout to exist in this river. _____

- 2. In your area, perhaps a project is underway to enhance a body of water, be it a lake, river, stream, or wetland. If you know about one such project, name it and describe what was done to enhance aquatic life.

Answers will vary. It could be something like stocking a certain lake with fish, stabilizing slopes of a river or creating wetlands.

- 3. What can the information from monitoring be used for?

To develop regulations and technology to protect the environment.

- 4. What does a change in the number of species an aquatic environment tell us?

The environment has changed.

Take some time to review the material you learned this week. You will be writing a short quiz before you go home.

