Anglophone School District - North

Grade 8 Science - Unit Lesson Guide

Water Systems on Earth

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The Aim of Science Education - Scientific Literacy

The aim of science education in the Atlantic Provinces is to develop scientific literacy.

Scientific Literacy is an evolving combination of the science-related attitudes, skills, and knowledge students need to develop inquiry, problem-solving, and decision-making abilities; to become lifelong learners; and to maintain a sense of wonder about the world around them. To develop scientific literacy, students require diverse learning experiences that provide opportunities to explore, analyze, evaluate, synthesize, appreciate, and understand the interrelationships among science, technology, society, and the environment.

The Three Processes of Scientific Literacy

An individual can be considered Scientifically Literate when he/she is familiar with, and able to engage in, three processes: Inquiry, problem solving, and decision making.

Inquiry

Scientific inquiry involves posing questions and developing explanation for phenomena. While there is a general agreement that there is no such sing as the scientific method, students require certain skills to participate in the activities of science. Skills such as questioning, observing, inferring, predicting, measuring, hypothesizing, classifying, designing experiments, collecting data, analysing data, and interpreting data are fundamental to engaging science. These activities provide students with opportunities to understand and practise the process of theory development in science and the nature of science.

Problem Solving

The process of problem solving involves seeking solutions to human problems. It consists of proposing, creating, and testing prototypes, products, and techniques to determine the best solution to a given problem.

Decision Making

The process of decision making involves determining what we, as citizens, should do in a particular context or in response to a given situation. Decision-making situations are important to their own right, and they also provide a relevant context for engaging in scientific inquiry and/or problem solving.

Science Assessment Overview

Science is a hybrid term that houses different disciplines such as: Physics, Chemistry, Biology, Environmental Studies, Engineering, Math, etc. Given this broad spectrum, it is not realistic that we can paint science assessment with a single brush in terms of probes that work for every science activity. However, regardless of school subject, let alone science, the frequency of assessment should be unbalanced with formative assessment occupying 80% of practise and summative with the remaining 20%.

80% Formative - 20% Summative

Formative Assessment
Formative assessment is a range of formal and informal assessment procedures employed by teachers during their learning process in order to modify teaching and learning activities to improve student attainment. It typically involves qualitative feedback (rather than scores) for both students and teacher that focuses on the detail of content and performance. Feedback is the central function of formative assessment. It typically involves a focus on the detailed content of what is being learnt.

Science Formative Assessment falls into 2 distinct categories, and they are divided about how feedback is given. Please be aware that an activity could be informal or formal, it is the purpose of the task that determines purpose.

Informal Formative
Informal Formative Science Assessment acts as a monitoring probe and is distinct because it is not graded.

Formal Formative
Formal Formative Science Assessment provides specific feedback to students, the teachers corresponds via anecdotal feedback, rubrics, and written responses to offer progress to student attainment.

Summative Assessment
Summative assessment seeks to monitor educational outcomes, often for the purposes of external accountability. Usually occurring at the end of a learning unit and determines if the content being taught was retained.

Water System on Earth

Focus and Context

The focus of this unit is inquiry. Students should also have the opportunities to investigate how the oceans and the shorelines interact, what relationships exist between ocean currents, wind, and climates, and how these abiotic factors impact upon life in and around the oceans. The context of this unit could include the local coastlines in a region, as well as how the ocean and local coastlines interact.

Unit Instructional Overview

Waves, Tides, and Water Currents	Shorelines	Ocean Basins and Continental Drainage Systems	Oceans and Species Distribution	Glaciers and Polar Icecaps
Prior Knowledge	Effects of Waves and Tides on Shorelines	Understanding the Ocean Floor	Bodies of Water as Systems	Climate Change affecting Sea Level
Access Prior Knowledge	Understanding Shoreline Formation		Why Do Species Thrive in their Environments?	
1st Cycle - Activity – Heat Transfer			Social Issues Affecting Ocean Species	
2nd Cycle - Activity - Heat Capacity of Water				
3rd Cycle - Activity - Ocean Currents, Winds and Regional Climates				
Make a tide model				

* - EECD Grade 8 Inquiry package - available at https://portal.nbed.nb.ca/tr/lr/k-8Science/Pages/default.aspx

Water Systems on Earth - Curriculum Outcomes

Waves, Tides, and Water Currents	209-1 carry out procedures in order to investigate how temperature differences in water cause currents	209-4, 210-11 state a conclusion based on experimental data about the formation of water currents
311-10a explain how waves and tides are generated	208-7 formulate operational definitions, on the basis of investigations of waves for: Wave Length, Wave Height, Crest, Trough	
Shorelines	209-5, 311-11 select and integrate information, from various print and electronic sources, related to processes of erosion and deposition that result from wave action and water flow	311-10b explain how waves and tides interact with shorelines
112-3 provide examples of various technologies designed to contain damage due to waves and tides	211-2, 211-4 prepare a presentation or report on the effect of tides and waves on a shoreline, and evaluate individual and group processes used in planning and completing the task	
Ocean Basins and Continental Drainage Systems	311-7 describe processes that lead to the development of ocean basins and continental drainage systems: Glaciation, Continental Drift, Erosion, Volcanic Action	111-3, 209-5 select and integrate information from various print and electronic sources to provide examples of technologies that have enabled scientific research involving ocean basins
110-8 provide examples of how technologies used to investigate the ocean floor have improved over time	210-3 identify some strengths and weaknesses of technologies used to investigate the ocean floor	112-5 provide examples of public and private Canadian institutions that support scientific and technological research involving the ocean
Oceans and Species Distribution	111-6 apply the concept of systems to show how changes in one component of a body of water causes change in other components in that system	311-9 describe the interactions of the ocean currents, winds, and regional climates
311-8 analyze factors that affect productivity and species distribution in marine and fresh water environments: temperature, pollution, overfishing, upwelling	210-4, 210-6 predict and interpret trends in populations of marine species from graphical data by interpolating and extrapolation data	
113-2 describe some positive and negative effects of marine technologies in the ocean	113-10 provide examples of problems related to the oceans that cannot be resolved using scientific and technological knowledge	
Glaciers and Polar Icecaps	311-12 describe factors that affect glaciers and polar icecaps, and describe their consequent effects on the environment	210-16 identify new questions that arise from the study of glaciers and polar icecaps

Water Systems on Earth
Strand - Waves, Tides, and Water Currents

General Curriculum Outcomes	Specific Curriculum Outcomes
209-1 carry out procedures in order to investigate how temperature differences in water cause currents	209-1 carry out procedures in order to investigate how temperature differences in water cause currents
209-4 organize data using a format that is appropriate to the task or experiment	209-4, 210-11 state a conclusion based on experimental data about the formation of water currents
210-11 state a conclusion based on experimental data, and explain how evidence gathered supports or refutes and initial idea	
311-10 explain how waves and tides are generated and how they interact with shorelines	311-10a explain how waves and tides are generated
208-7 formulated operational definitions of major variables and other aspects of their investigations	208-7 formulate operational definitions, on the basis of investigations of waves for: wavelength, wave height, crest, trough

* 311-9 Describe the interactions of the ocean currents, winds, and regional climates

Prior Knowledge:

- Students learned about transferring heat by convection, conduction and radiation in the grade 7 “Heat” unit.
- Heat capacity of water and cooking oil is part of the “Heat” unit in grade 7.
- Students may know about temperature differences causing wind from grade 8 Social Studies and also temperature differences causing lift from grade 6 unit on “Flight”.

Common Misconceptions:

- Ocean currents are caused by the wind blowing on the water.

Did You Know?

The focus is of this portion of the Water Systems unit is that the sun affects the temperature of the Earth and is the driving force for many processes on Earth including ocean currents, wind and regional climates.

The angle of the sunlight reaching Earth causes uneven heating of the Earth’s surface. Heat is transferred by convection from the equator to the poles via both wind and water.

Ocean currents are created by temperature differences and also by salinity differences.

The terms “heat capacity” and “specific heat capacity” or “specific heat” are often used interchangeably. However, they are not exactly the same thing.

The “heat capacity” is the quantity of heat necessary to raise the temperature of a material 1^{o}C. For example, a lake will have a higher heat capacity than a glass of water, even though it is made of the same material since the quantity of the material is greater in the lake. Heat capacity is expressed in Joules/degrees Celsius. (J/^{o}C).

Specific heat capacity is the heat required to raise the temperature of *1 gram* of a material 1^{o}C. The specific heat capacity of a lake and the specific heat capacity of a glass of water are identical because the heat required to heat one gram of each will be the same. Specific heat capacity is expressed in Joules/gram degree Celsius (J/g ^{o}C).

There is a Science Object available through the NSTA website about ocean currents and their impact on climate and weather. It can be found at: http://learningcenter.nsta.org/search.aspx?action=quicksearch&text=ocean%20currents

Instructional Plan

Access Prior Knowledge

Activity

To determine the level of knowledge and any misconceptions, have students do a "Think, Pair, Share" where students first think about and write their answers individually; then discuss with a partner and add or modify their ideas; then share with the larger group. Record their answers on chart paper (or in another way) so that these "facts" can be revisited in later lessons. Accept all ideas and record in a way that these ideas can be revisited in later lessons. Do not indicate whether the suggestions are correct or incorrect at this time. If students disagree with each other, allow them to express their thinking and reasons to each other. See the tips on supporting class discussion on pages 20-21.

Ask students:

- *Why isn't every place on earth the same temperature?*
- *Why is the earth so warm during the day and cooler at night?*
- *How does the ocean affect temperatures?*

Discussion point: the sun affects temperatures of water, air, and land and therefore, climate.

✓ **Assessment:**
Note the concepts and misconceptions students are expressing. You will need to know these to plan effective questions for subsequent activities and discussions so that students will examine and adjust their alternate conceptions.

Post student versions of curricular outcomes on chart paper (see page 23).
Inform students that these outcomes will be addressed over the next portion of the unit. Point out to students which outcomes are being addressed in each activity.

1st Cycle

✪ Curriculum Outcomes

209-1 Carry out procedures in order to investigate how temperature differences in water cause currents.
209-4 Organize data using a format that is appropriate to the task or experiment.
210-6 Interpret patterns and trends in data, and infer and explain relationships among the variables.
210-11 State a conclusion based on experimental data, and explain how evidence gathered supports or refutes and initial idea.
211-2 Communicate questions, ideas, intentions, plans, and results, using lists, notes in point form, sentences, data tables, graphs, drawings, oral language, and other means.
311-9 Describe the interactions of the ocean currents, winds, and regional climates.

Demonstrate convection by placing a food-coloured ice cube in a glass of water. Add two to four drops of a dark colour of food colouring when making the ice cubes. The temperature of the water in the glass should be in the cold to lukewarm range.

- Have students make a journal entry predicting what they think will happen. Students may be familiar with this from the grade 7 “Heat” unit.
- After several minutes of observation, have a class discussion about what they saw and ask for ideas of how to explain why the food colouring seemed to fall to the bottom of the glass.

The discussion should raise the idea of the difference in temperature between the ice cube and water being important. The discussion tips on page 20-21 may be helpful.

Activity – Heat Transfer

Students will carry out their own experiments to determine what affects the rate of convection – the mixing of the food colouring with the rest of the water. Students may have done similar experiments in grade 7 as part of the “Heat” unit. However, the focus here is for students to develop their own experiments with controlled variables.

Note that if the rubric is to be used for assessing student work, it should be given to students and discussed **before** the investigation. Examples of previous experimental write ups should be displayed. If this is new to students, the process should be modeled by the teacher several times before expecting students to complete one independently.

Materials:

Glasses, beakers, shallow (clear) dishes
Coloured ice cubes
Food colouring
Different temperatures of water or ability to heat and cool water (if they are not able to get very hot and very cold water from the faucets - kettle, hot plate, ice bath)
Tongs or gloves for handling hot glassware
Thermometers (if available)
Salt

Method:

Ask the students to think about factors that may cause convection and/or factors that affect the rate of convection.

- Have students in small groups write a question that they could test and make a prediction that reinforces their choice of variable.
- They should outline materials they need, their procedure with projected amounts, how they will make measurements and record them, and/or time needed. Ensure students understand that the experiment needs to be fair, with variables controlled.
- Students then do their experiment.

To get a variety, have a class chart where students record their choice before starting and can record their observations and results. Seeing what other groups are testing may also help groups struggling to design an experiment. (Digital photos of results may be helpful for sharing results with the whole class or referring to results on subsequent days.) If time remains they can try another variable or combination not already tried.

ⓘ Teacher note: Possible tests may include: ice cubes in cold, warm, or hot water; a small container of varying temperatures of water being immersed in larger container of varying temperatures of either tap water or salt water; containers used could be tall or short glasses or beakers, shallow dishes where ice cubes or water is added to the sides of the dish, etc; water can be tap water or salt water.

Make sure the students place ice cubes **gently** into the containers (not drop) and if pouring water, they pour along the edge of the container very **slowly**. Instead of pouring, we recommend having the water in another container that can be tipped, uncorked or have a hole poked in it (e.g. a paper cup) or a glass container covered by plastic wrap.

✓ **Assessment:**
During the student activity, make notes on outcomes (or parts of outcomes) you observe being addressed. Process skill outcomes are part of the curriculum and should be assessed. Using the observation chart or the checklist (see pages 32-34) on a clipboard may be helpful to you. Develop your own code for quick notes.

A suggested code:
√ observed and appropriate,
WD with difficulty,
RTT refused to try,
A absent.

This chart may be used on multiple days, using a different coloured pen or pencil each day and putting the date in the corner. You may not have a symbol or note for every child every day. Some teachers like to focus on a group or two each time. However you choose to make note of your observations, you will always have a sense of who you need to take more notice of and who might need extra support. The information will also help you when it is reporting time.

Students should write up their question, materials and procedure to hand in. Remind them the procedure has to be detailed enough for another researcher to follow successfully. The following rubric may be helpful in assessing their work. Results could be shared by having students present an overview of their experiments to the class through pictures, video or repeating the experiment.

Have students self-assess their write up before handing it in to you. Give students the guidelines (see “got it” column) and ask them to comment on how well their work meets each criteria. The third column will be for you to give feedback (see sheet on page 31).

✓ **Assessment:**
Note if students are able to write up a lab report or if mini-lessons on specific parts of the report are needed. The following rubric may be helpful.

Got it	Nearly there	Not yet
Question is **stated clearly** and in a **testable** form.	Question is **clear** but not in a testable form.	Question is **unclear**.
Materials list includes **all necessary** and **appropriate** items.	Materials list **incomplete**.	Materials list **incomplete** and contains **unnecessary** items.
Written steps **are detailed** and in **sequential order**. Steps are detailed enough that **variables are controlled**. Procedure **could be replicated.**	Some steps **are unclear or missing** and/or steps are **out of order**. **Missing** some **details** that would **control one or more variables** during the replication.	Steps are **not accurate** or there is **not enough detail** to replicate procedure.
Spelling and grammar **errors are absent or rare**.	**Some** spelling and grammar **errors**.	Spelling and grammar **errors common**.

Reflection: Class Discussion

As students share their experiments with the class, they should identify the variables they controlled. This also provides the opportunity to discuss variables as controlled, independent and dependent. Ask students: *Are there changes which might have improved the procedure? Are there other testable questions arising from our work?*

Note that thinking about other “questions arising from our work” is part of the nature of science. For scientists, further research is decided by doing just this. Sometimes scientists are continuing their own work and sometimes they investigate questions raised by other people’s work.

Revisit information on the chart from the Accessing Prior Knowledge activity (on page 4). Ask: *Is there anything that should be added to or revised? Is there other information we could add?*

Reflection: Journals

Based on the results from your experiments, how do you think a hot air balloon works?

or

Show a summarizing kind of video and get to students to write a journal entry highlighting what they learned from the video.

ⓘ Teacher note: At least one of the video clips below should be shown to the students. It will help put convection in the larger context of its impact on global temperatures and climate.

http://www.brainpop.com/science/earthsystem/oceancurrents/

http://videos.howstuffworks.com/hsw/5669-atmosphere-earths-rotation-video.htm

The Bill Nye video called “Oceanography” which explores ocean currents including salinity, wind and the sun may be useful here. It is available at http://learning.aliant.net/ Type oceanography into the search box.

Videos are available free of charge at this site. You need to register, however registration is free. If you try to watch the video without logging in, you are prompted to do so. Note that a table of contents opens beside the video so that you may select only certain sections for viewing if you wish. There is also an option to watch the video full screen.

✓ **Assessment:**

Journal entries should not receive a score or mark. A positive comment followed by a question to refocus attention or suggest the next step in learning is very effective.

Take note of which students show understanding and what misconceptions are being expressed by others.

Convection

Our idea of how to affect the rate of mixing between food-coloured ice/water and water:

Materials required:

Procedure:

Explanation:

2nd Cycle

✪ Curriculum Outcomes

209-4 Organize data using a format that is appropriate to the task or experiment.
210-11 State a conclusion based on experimental data, and explain how evidence gathered supports or refutes and initial idea.
211-2 Communicate questions, ideas, intentions, plans, and results, using lists, notes in point form, sentences, data tables, graphs, drawings, oral language, and other means.
311-9 Describe the interactions of the ocean currents, winds, and regional climates.

Activity - Heat Capacity of Water

Ideally, one or two groups per class should carry out one of the following experiments then share their results with other groups. Students may have done similar experiments in grade 7 as part of the “Heat” unit. However, they are worth repeating since the application of the resulting information is different.

Materials:

Activity	**Materials**	**Anticipated results** (for teacher only)
2 liquids heated and cooled	Cooking oil, water, 2 small containers such as 35mm film canisters or test tubes with saran 1 straw Food colouring Stick tack or playdough Ruler Hot water bath between 70-80^{o}C Timing device	The cooking oil heats up and expands (moves up the straw) more quickly than the water and also cools down (contracts and moves down the straw) at a faster rate than water. Students should watch the rate of movement of the liquids as opposed to the absolute level attained by both. Water takes longer to heat up and to cool down.
Water and air cooled	2 Beakers or test tubes Water Ice bath thermometers	Water takes longer to cool down and to heat up
Soil and water heated and cooled	2 small containers Water Soil Lamp with 100W bulb min. thermometer Timing device	Soil heated up faster and to a higher temperature than water and cooled down much faster than water

Directions for each experiment can be found in the student directions pages beginning at page 25. In general, each experiment can be split into two 5-10 minute observation periods with temperature being measured every 30 seconds. For example:

- Oil and water in hot water bath for 5-10 minutes measuring the level of each liquid every minute followed by 5-10 minutes on the table measuring the level of each liquid.
- Cup with water and cup with air in cold water bath for 5-10 minutes taking temperatures followed by 5-10 minutes on the table taking temperatures of each.
- Lamp on for 5-10 minutes and students take temperatures, then lamp off for 5-10 minutes with students taking temperatures.
- Students will graph their results.

✓ **Assessment:**
On observation chart (or other record), note how students are performing on the skill outcomes.

- Optional demo following student clean-up of their own experiments:

  Balloon over a flame: Blow up a balloon and use tongs to hold it over a lit candle. Goggles would also be a good idea and set a very good example for the students. It will pop. Take another balloon, fill it ½ - ¾ full of water, add a little air, tie it off then hold it over the candle. The balloon will not pop. The water is absorbing the heat and thus protecting the rubber in the balloon from melting.

Use the jigsaw method to have students share their results with groups that did different experiments. Students should notice the similarities and differences between the experiments. After a short discussion, the original group can come together to share information about experiments performed by the other groups. In their small groups, the students will determine how their experiment was similar to and different from the other experiments that were carried out in the class.

Reflection: Class Discussion

Ask students to share their results and how their experiment was similar to experiments carried out by other groups. Try to elicit comments that will steer them towards the idea that water takes a lot of energy to heat and holds that heat better than other substances.

Revisit information on the chart from the Accessing Prior Knowledge activity (on page 4). Ask: *Is there anything that should be added to or revised? Is there other information we could add?*

Reflection: Journaling

Have students write a quick entry (5-7 minutes) in their science journal or notebook answering the following questions:

How does the fact that water takes a long time to heat up and cool down affect global temperatures?

*How does the heat capacity of water relate to what they learned about convection and ocean currents? (*the idea is that water holds the heat and helps transfer that heat from the equator to the northern and southern regions of the planet).

✓ **Assessment:**

Journal entries should not receive a score or mark. A positive comment followed by a question to refocus attention or suggest the next step in learning is very effective.

When reading the journal entries, note which students are getting the idea that water will absorb and carry heat from the equator towards the North and South poles.

http://sciencearound.com/2009/06/07/air-vs-water-heat-capacity-experiment/ talks about global warming due to the high heat capacity of water and the ocean's role in global warming. It also shows the balloon/water/candle demo. (The following link is another way to get to the same video clip http://climate.nasa.gov/globalwarming/index.cfm)

Heating and Cooling Two Different Liquids

Materials:

Cooking oil and water
2- 35mm film canisters with holes in the lids
Heat source – hot water bath 70-80^{o}C
Ruler for measuring level of liquid
Food colouring
1 straw
Stick tack
Timing device

Method:

1. Using two film canisters, fill one ¾ full of room temperature water, one with ¾ full with cooking oil.
2. Cut the straw in half.
3. Make a hole in the film canister lid, just large enough to fit the straw.
4. Slide the straw through the hole so that approximately half of the straw will be inside the container and half will be outside the container.
5. On the top of the lid, place stick tack around the straw to seal any gaps or holes between the straw and the lid.
6. Snap the lid onto the container. Careful. Some liquid may come out the top of the straw. You should be able to see a little bit of the liquid just above the lid. If you cannot, fill add more liquid to each container so they are filled roughly to the same level.
7. Add two drops of food colouring to the top of the straw. This should help you see the top of the liquid.
8. Place the samples in very hot water and measure the change in the level of the liquid in the straw every 30 seconds. Record.
9. After 5 minutes, remove the samples, place them on the table (or in an ice bath if available) and continue measuring the change in the level of the liquid in the straw every 30 seconds and recording it.
10. Plot your results on a graph.
11. Which sample had the fastest change in the level of the liquid when heated?
12. Which sample had the fastest change in the level of the liquid when cooled?
13. What does this tell you about the heating of different liquids?

Water and Air Cooled

Materials:

2 containers, beakers or test tubes
Water
Ice bath
Thermometers

1. Fill one container with approximately 50 mL of room temperature water, and leave the other container empty.
2. Take the temperature of each sample. They should both be close to room temperature before starting.
3. Place the samples in the ice bath or in the fridge.
4. For 5 minutes, take the temperature of each sample every 30 seconds and record. Note: if using an ice bath, you may need to add ice to keep it cold.
5. After 5 minutes, remove the samples, place them on the table (or in a hot water bath if available) and continue taking the temperature every 30 seconds and recording it.
6. Graph your results.
7. Which sample had the lowest temperature after 5 minutes of cooling? Which sample had the highest?
8. Which sample had the lowest temperature after 5 minutes of warming? Which sample had the highest?

Soil and Water Heated and Cooled

Materials:

2 small containers
Water
Soil
Lamp with 100W bulb min.
Thermometer
Timing device

1. Fill one container with approximately 4 cm of soil and the other container with an equal amount of water (approximately 4 cm deep).
2. Take the temperature of each sample in two different depths – once near the top of the container, once near the bottom of the container. Pat the soil back into place after taking the temperature.
3. Place the samples under the lamp so they are equal distances from the bulb.
4. For 5 minutes, take the temperature of each sample every 30 seconds and record.
5. After 5 minutes, remove the samples, place them on the table (or in an ice bath if available) and continue taking the temperature every 30 seconds and recording it.
6. Graph your results.
7. Were the samples the same temperatures at different depths? Explain.
8. Which sample, the soil or the water, had the highest temperature after 5 minutes of heating?
9. Which sample had the highest temperature after 5 minutes of cooling down?

3rd Cycle

✪ Curriculum Outcomes

209-4 Organize data using a format that is appropriate to the task or experiment.
209-5 Select and integrate information from various print and electronic sources or from several parts of the same source.
210-6 Interpret patterns and trends in data, and infer and explain relationships among the variables.
210-11 State a conclusion based on experimental data, and explain how evidence gathered supports or refutes and initial idea.
211-2 Communicate questions, ideas, intentions, plans, and results, using lists, notes in point form, sentences, data tables, graphs, drawings, oral language, and other means.
311-9 Describe the interactions of the ocean currents, winds, and regional climates.

Activity - Ocean Currents, Winds and Regional Climates

Part I

Using the table of July maximum temperatures and January minimum temperatures from a variety of Canadian communities, have students locate each community on a map and then explain why there are such variations even in a small province like New Brunswick.

Part II

Using:

- the table of various July maximum temperatures and January minimum temperatures from communities around the world,
- a world map
- a diagram that shows ocean currents and the relative temperatures and locations of each current.

Have students locate each community on a world map. This could be done in small groups or as a class on a large map.

Students will answer questions (see student directions on page 29-30) related to community location and the impact on its climate due to the ocean current. Below is a list of several internet sites for an ocean currents map.

http://www.physicalgeography.net/fundamentals/8q_1.html

http://www.classzone.com/books/earth_science/terc/content/visualizations/es2401/es2401page01.cfm?chapter_no=visualization This map also shows global winds.

http://www.windows.ucar.edu/tour/link=/earth/Water/ocean_currents.html&edu=elem

✓ **Assessment:**
On observation chart (or other record), note how students are performing on the skill outcomes.

Reflection: Class Discussion

Have students share the reasoning about if and how the ocean affects the climate of the places they located. The discussion tips on pages 20-21 may be helpful.

You may wish to use these sites to add to the discussion:

- The Explore Learning site has simulations called Gizmos. The link below takes you to a Gizmo showing land and sea breezes which can be explained in terms of convection.

  http://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=438

  The "Gizmo" site allows unregistered users to run each Gizmo for 5 minutes a day. It is also possible to sign up for a free trial. Membership is not free.

- A video called "Going With the Flow" discusses the redistribution of heat by oceans, how ocean currents are affected by wind and the Coriolis Effect, El Nino, and technologies past and present for measuring ocean currents

  It is available at http://learning.aliant.net/ Type the title into the search box.

  Videos are available free of charge at this site. You need to register, however registration is free. If you try to watch the video without logging in, you are prompted to do so. Note that a table of contents opens beside the video so that you may select only certain sections for viewing if you wish. There is also an option to watch the video full screen.

Revisit information on the chart from the Accessing Prior Knowledge activity (on page 4). Ask: *Is there anything that should be added to or revised? Is there other information we could add?*

Reflection: Journaling

Using the ocean currents map, ask students to make a journal entry that describes how they think the temperatures on the East coast of Australia differ from the temperatures on the west coast of Australia.

Part I: Regional Communities and Average Monthly Temperatures

Community	Average Maximum July Temperature	Average Minimum January Temperature
Bathurst, NB	24.5	-15.4
Fredericton, NB	25.6	-16.8
St. Leonard, NB	24.2	-17.0
Charlottetown, PEI	23.7	-9.8
Yarmouth, NS	20.7	-5.8
Maniwaki, QC	27.0	-25.5
Churchill Falls, NF & L	20	-23.5
St. John's, NF & L	21.0	-5.7
Ottawa, ON	27.7	-16.4
Timmins, ON	26.8	-25.8

1. Locate each community on a map.
2. Based on what you have learned so far, explain why some communities have such a huge average temperature "swing" while others do not.
3. Why are average high temperatures for the months July and average low temperatures for January selected for comparisons?

Part II: Communities Around the World

City	Latitude	Minimum low for January (°C)	Maximum high for July (°C)
Seattle, Washington	47°	1.8	24
St. John's, NF	47°	-8.6	20.3
Goose Bay, NL	53°	-23.3	20.9
Galway, Ireland	53°	1.8	18.5
Salvador, Brazil	12°	23.7	26.2
Lima, Peru	12°	19.1	18.7

1. Using a map showing ocean currents as well as a world map, locate each community.

2. Explain why communities at the same latitude have very different temperature ranges.

Make a tide model

311-10 Explain how waves and tides are generated and how they interact with shorelines.

Make a tide model

1. The students will make a model for tides. It is important to explain how models represent some aspects of reality but not all. Before giving any additional instructions, tell the students to do PART 1 of the lab.

2. Once your students are finished drawing the third picture, you will need to discuss that gravity is an invisible force. Tell them to pretend the magnet's force is gravity and to pretend the magnet is the moon and the paperclips (on strings) are water on Earth. They can move the magnet around and the water (paperclips) moves in tidal action. They will need to record their findings.

3. When students finish, you can suggest they read pages 352-354 in SCIENCEPOWER 8 while you wait for the others to finish their work.

Activity 2: Importance of tides

1. Students will analyze high tide announcements. They will be given a table with tide times and ship docking times. They will be asked some questions regarding the information on the table.

2. Students will watch the movie clip from aliant.net. As a teacher, you may sign up free of charge. The video is called "Cycle and Seasons" and you will show the part called "Tides". After, the students can discuss what they learned from the movie in groups of 2 or 3.

Additional Activity

This activity is to explain why the tides at the Bay of Fundy are so high. This activity is on page 355 of the SCIENCEPOWER 8 textbook. The teacher will have a wide beaker and a narrow graduated cylinder. The graduated cylinder will be filled with water and then poured into the wide beaker. The teacher will demonstrate this a few times and then ask them these questions:

- What features of a container produce the greatest depth in a given volume of water?
- What features of a container produce the smallest depth in a given volume of water?
- The graduated cylinder is compared to the Bay of Fundy and the beaker is compared to the Gulf of Mexico. What are differences between the two? Why does the Bay of Fundy have such high tides?

Tide table info for many NB communities

http://foundlocally.com/Fredericton/Sports/Rec-TideTables.htm

Satellite photos of high and low tide in the Bay of Fundy http://earthobservatory.nasa.gov/IOTD/view.php?id=6650

Tide simulation at Chichester Harbour, southern England

http://www.conservancy.co.uk/wind/tide_simulations.asp

How moon causes tides

http://www.brainpop.com/science/earthsystem/tides/

Shows how the moon keeps the water bulged towards it but it is the Earth rotating through the high and low tide twice a day

http://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=368

Possible journal/assessment questions:
Draw what happened to the paperclips (water) with the magnet (moon) in 3 different kinds of places

Have students draw (complete) diagrams with Earth, moon and explain.

Making a tide model

PART 1

Material:

- Paperclips (10-15)
- Cardboard (1)
- String (30 cm)
- Push pins (1)
- Magnet (1)

Instructions:

1. Gather your material.
2. Attach your paper clips to the piece of string.
3. Attach the string around the push pin.
4. Insert the push pin in the middle of the cardboard.
5. Try to move the paperclips with the magnet without touching the paperclips.
6. Draw what happened to the paperclips with the magnet in 3 different kinds of places.

PART 2

Instructions:

1. Now you will pretend that the magnet is the Moon and the paperclips consist of the water on Earth.

   On your three pictures, draw the moon and the water at the appropriate place.

Activity 2: Tides

The table below shows different times for low and high dates over 10 days. During those days, the Irving Oil ship docked at the times shown in the table. Observe the table and discuss the relationship between low and high tides times along with the ship docking times.

Date	Time: Low tides	Time: High tides	Ship docking times
May 1st	11:31	17:37	16:48
May 2nd	12:37	18:46	18:55
May 3rd	13:41	19:49	19:07
May 4th	14:43	20:46	19:54
May 5th	15:42	21:40	21:52
May 6th	16:36	22:37	22:07
May 7th	17:36	23:40	23:50
May 8th	18:12	00:49	00:18
May 9th	18:55	01:45	01:59
May 10th	19:39	02:26	02:46

1. What information does the table give? Explain.

2. Why do some people want to know about this?

3. What jobs need to consider the high and low tides?

   3.

Waves, Tides and Ocean Currents Resources

How do waves Form?
http://www.livescience.com/38361-how-do-ocean-waves-form.html

Wave Simulator
http://education.nationalgeographic.com/education/multimedia/interactive/wave-simulator/?ar_a=1

How are tides formed?
http://www.enchantedlearning.com/subjects/ocean/Tides.shtml

Tide Simulator
http://astro.unl.edu/classaction/animations/lunarcycles/tidesim.html

How are Ocean Currents formed?
http://oceanexplorer.noaa.gov/facts/currents.html

Water Systems on Earth
Strand - Shorelines

General Curriculum Outcomes	Specific Curriculum Outcomes
209-5 select and integrate information from various print and electronic sources or from several parts of the same source	209-5, 311-11 select and integrate information, from various print and electronic sources, related to processes of erosion and deposition that results from wave action and water flow
311-11 describe processes of erosion and deposition that results from wave action and water flow	
311-10 explain how waves and tides are generated and how they interact with shorelines	311-10b explain how waves and tides interact with shorelines
112-3 explain how society's needs can lead to developments in science and technology	112-3 provide examples of various technologies designed to contain damage due to waves and tides
211-2 communicate questions, ideas, intentions, plans, and results, using notes in point form, sentences, data tables, graphs, drawings, oral language, and other means	211-2, 211-4 prepare a presentation or report on the effect of tides and waves on a shorelines, and evaluate individual and group processes used in planning and completing the task
211-4 evaluate individual and group processes used in planning, problem-solving, decision-making, and completing a task	

Effects of Waves and Tides on Shorelines

Outcomes:
311-10b explain how waves and tides interact with shorelines
112-3 provide examples of various technologies designed to contain damage due to waves and tides

Lesson Activity Overview
This lesson is intended to bridge students understanding of how tides work to understanding how the action of tides interacts with shorelines. Students have previously created models of tides, using that understanding, this lesson is intended to explain how waves and tides interact with shorelines (311-10b). The connection is erosion. Erosion is studied at various levels of elementary and middle level science, so this should not be a concept you need to go into much detail about.

Next, the learning should focus on places where erosion is a negative thing. Students should develop a list of different regional places (houses on banks, beaches, wharfs, etc.) that fear erosion of shorelines. Based on these places students should explain the different types of technologies designed to contain the damage due to waves erosion (112-3).

Tasks

Prepare a multi-media presentation that illustrates the effects of waves and tides on a shoreline (209-5, 311-10b)

Create three-dimensional models of structures and technologies used to contain damage due to wave and tidal action. (112-3, 209-5)

Journal
Connect the effect of a tide that causes erosion of a shoreline and why we would want to contain that damage, leading to what we use to contain it.

Assessment:Informal Formative
Ensure that students have connected previous understanding of tides work to how they interact with shorelines (311-10b)

Ensure that students have participated in the creation of a presentation (in various roles) about the effects of waves and tides on shorelines (311-10b)

Ensure that students have participated in the creation of model of various structures designed to contain damage due to waves and tidal action (112-3)

Assessment:Formal Formative

Ensure that students have responded to a journal entry that details how waves Connect the effect of a tide that causes erosion of a shoreline and why we would want to contain that damage, leading to what we use to contain it. (311-10b)

Understanding Shoreline Formation

Outcomes:
209-5, 311-11 select and integrate information, from various print and electronic sources, related to processes of erosion and deposition that result from wave action and water flow
211-2, 211-4 prepare a presentation or report on the effect of tides and waves on a shoreline, and evaluate individual and group processes used in planning and completing the task

Lesson Activity Overview
This lesson is intended for students to study the different types of shorelines. By beginning with a focus on shorelines and how they are different and yet similar in many ways, students can begin to explore the reasons for the differences and similarities.

The focus of the two outcomes is as follows:
Students are expected to use pictures and videos of shorelines from various sources during research (209-5), to demonstrate how erosion and deposition result from wave action and water flow. (311-11)
Ensure that students are advancing beyond just showing pictures of a shorelines and that they are relating the image to how erosion and deposition have shape that land.

Tasks
Students should prepare a presentation or report of their investigation into the effects of waves and tides on shorelines. They may do this individually or in small groups. Each groups should select one of the following tasks to complete.

Prepare a photo essay that depicts erosion and deposition due to wave action and water flow. (209-5, 311-11)

Research the history of a local shoreline to determine its evolution over time. Report on its changes in a report or in sketches. (211-2, 311-11)

Through a series of sketches/drawings, describe how a local shoreline or waterway has been modified owing to the processes of erosion and disposition as a result of wave action or water flow. (211-2, 311-11)

Journal
Relate the process of erosion and deposition that result from waves and tides (311-11)

Assessment:Informal Formative
Ensure that students have participated in the creation of of a task that related to erosion and deposition 311-11

Assessment:Formal Formative
Ensure that students have completed a journal entry to overview their understanding of how erosion and deposition result form waves and wave action. 311-11

Water Systems on Earth
Strand - Ocean Basins and Continental Drainage Systems

General Curriculum Outcomes	Specific Curriculum Outcomes
311-7 describe processes that lead to the development of ocean basins and continental drainage systems	311-7 describe processes that lead to the development of ocean basins and continental drainage systems: glaciation, continental drift, erosion, volcanic action
111-3 provide examples of technologies that have enabled scientific research	111-3, 209-5 select and integrate information form various print and electronic sources to provide examples of technologies that have enabled scientific research involving ocean basins
209-5 select and integrate information from various print and electronic sources or from several parts of the same source	
110-8 describe examples of how technologies have been improved over time	110-8 provide examples of how technologies used to investigate the ocean floor have improved over time
210-3 identify strengths and weaknesses of different methods of collecting and displaying data	210-3 identify some strengths and weaknesses of technologies used to investigate the ocean floor
112-5 provide examples of public and private Canadian institutions that support scientific and technological research and endeavors	112-5 provide examples of public and private Canadian institutions that support scientific and technological research involving the oceans

Understanding the Ocean Floor

Outcomes:
311-7 describe processes that lead to the development of ocean basins and continental drainage systems: glaciation, continental drift, erosion, volcanic action
111-3, 209-5 select and integrate information from various print and electronic sources to provide examples of technologies that have enabled scientific research involving ocean basins
110-8 provide examples of how technologies used to investigate the ocean floor have improved over time
210-3 identify some strengths and weaknesses of technologies used to investigate the ocean floor
112-5 provide examples of public and private Canadians institutions that support scientific and technological research involving the oceans

Lesson Activity Overview
The purpose of this lesson is for students to understand how the ocean floor was formed, how it is changing and the methods we use to collect this information.

First, students need to understand how concepts like glaciation and continental drift (plate tectonics) has lead to the formation of ocean basins. This should not be so in-depth that students originate at the beginning of time. However they should understand how local rivers, bays, other water systems were possibly formed.

Next, the focus should turn to how these water systems in question are changing via erosion, sea floor spreading, volcanic activity, etc. In the previous lessons students have in-depthly studied erosion and the interactions with shorelines, this should lead to where the moving rock goes to and how that can change the ocean floor. Keep in mind how ice in our region can impact erosion as well. Expand this concept by including sea floor spreading (plate tectonic) and volcanic activity to the changing of the ocean floor. 311-7

<u>Tasks</u>
Create a poster that illustrates sea-floor spreading in the Atlantic ocean basin. (209-5, 311-7)

Create a three-dimensional model that illustrates major drainage systems in North America. (311-7)

Journal
Describe the processes (glaciation, plate tectonic activity, erosion) have lead to the development and changes of the sea floor. (311-7)

Once students are comfortable with the development of ocean basins, the focus will shift to how we collect this information (111-3). In doing so, students will have to use different sources to collect this information (209-5). During this investigation, students should come to the realization that technologies in the past evolve over time to be more effective (110-8). Keep a point of emphasis on finding Canadian Agencies that support this research (112-5).

Task

Research a technology used to explore and survey the ocean floor and prepare a presentation that illustrates the major topographical features found in oceans.(111-3, 209-5)

Students should come to realize through investigations, research and/or discussions that all technologies have their own particular strengths and weaknesses. Classroom activities designed to gather data using indirect observation would allow students to extrapolate their experiences to a greater scale. A closed shoebox filled with Plasticine or a variety of other objects at varying depths can be investigated indirectly, for example, by making small holes in the top at various regular intervals and using a measuring device such as a calibrated straw (in cm) to collect data on the unseen "bottom." Students could then graph their data in various ways to get cross-sectional views of the "bottom." Students should be encouraged to identify the strengths and weaknesses in these types of data collection activities. Students will see that they can determine relative depths but are unable to identify the composition of the "bottom," using this method. (210-3)

Journal

In a journal entry, list or discuss the benefits and limitations of using technologies that allow humans to study the ocean floor indirectly (sonar) as opposed to directly (bathyoliths). (110-8, 111-3)

Assessment:Informal Formative

Ensure that students understand how water systems were formed (311-7)

Ensure that students understand how ocean floor is continuously changing because of erosion and plate tectonics (311-7)

Ensure that students have participated in a task related to the formation of the sea floor (311-7)

Ensure that students have researched a technology used to explore and survey the ocean floor and prepare a presentation that illustrates the major topographical features found in oceans.(111-3, 209-5)

Ensure that students have participated in a simulation the sea floor exploration (210-3)

Assessment:Formal Formative
Ensure that students have describe the processes (glaciation, plate tectonic activity, erosion) have lead to the development and changes of the sea floor. (311-7)

Ensure that students are able to list or discuss the benefits and limitations of using technologies that allow humans to study the ocean floor indirectly (sonar) as opposed to directly (bathyoliths). (110-8, 111-3)

Water Systems on Earth
Strand - Oceans and Species Distribution

General Curriculum Outcomes	Specific Curriculum Outcomes
111-6 apply the concept of systems as a tool for interpreting the structure and interactions of natural and technological systems	111-6 apply the concept of systems to show how changes in one component of a body of water cause change in other components in that system
311-9 describe the interactions of the ocean currents, winds, and regional climates	311-9 describe the interaction of the ocean currents, winds, and regional climates
311-8 analyze factors that affect productivity and species distribution in marine and fresh water environments	311-8 analyze factors that affect productivity and species distribution in marine and fresh water environments: temperature, pollution, overfishing, upwelling
210-4 predict the value of a variable by interpolating or extrapolating from graphical data	210-4, 210-6 predict and interpret trends in populations of a marine species from graphical data by interpolating and extrapolating data
210-6 interpret patterns and trends in data, and infer and explain relationships among the variables	
113-2 describe possible positive and negative effects of a particular scientific or technological development, and explain how different groups in society may have different needs and desires in relation to it.	113-2 describe some positive and negative effects of marine technologies in the ocean
113-10 provide examples of problems that arise at home, in an industrial setting, or in the environment that cannot be solved using scientific and technological knowledge	113-10 provide examples of problems related to the oceans that cannot be resolved using scientific and technological knowledge

* 311-9 describe the interactions of the ocean currents, winds, and regional climates was the focus of the Inquiry documents and thus covered in Stand 1 - Waves, Tides, and Water Currents

Bodies of Water as Systems

Outcomes:
111-6 apply the concept of systems to show how changes in one component of a body of water causes change in other components in that system
*311-9 describe the interactions of the ocean currents, winds, and regional climates

Lesson Activity Overview
The focus of this lesson is for students to understand how ocean water is distributed into smaller bodies of water and thus the effect on the species that live in those bodies of water.

Students can investigate how the salinity of a body of water affects the types of organisms that live in a particular region.

Discuss with students how the Salinity measurements from Atlantic Ocean, Northumberland Strait, Miramichi Bay, Main Miramichi River, Smaller Branches of Miramichi River will vary due to the dilution from fresh water. Students should be able to understand that The Atlantic Ocean would have higher concentration of salinity while the Smaller Branches of the Miramichi, that are directly fed from fresh water from mountains, would have lower concentrations of salinity. A key for students to understand is that the tides end where fresh and salt water meet.

In terms of species distribution, students could investigate the lifecycle of the Atlantic Salmon to better understand the interaction between salt and fresh water throughout their lifecycle. This investigation would also yield other species that live in these areas, based on the food webs that Atlantic Salmon are involved with.

http://asf.ca/life-cycle.html
http://www.miramichisalmon.ca/education/atlantic-salmon/
http://salmonatlas.com/

Journal
Relate the various stages of the lifecycle of the Atlantic Salmon to the Body of Water (Fresh or Salt) in which they inhabit. 111-6

See Worksheet - Understanding Dissolved Gases
Demonstration

Investigations that enable students to see the relationship between water temperature and its ability to hold dissolved gases (for example warm and cold pop) permit them to better understand a particular relationship.

This simulation should lead students to understanding how dissolved gases like oxygen are affected by change in water temperature.

Students can also investigate relationships such as changes in water temperature and species distribution or how the local climate might be affected.

Journal
Explain how a change in the temperature of the surface water could affect the other regions in a body of water. (111-6)

Assessment:Informal Formative
Ensure that students have had a discussion on how the distribution of salinity varies at different points in a body of water (111-6)

Ensure that students have been exposed to the life cycle of the Atlantic Salmon (111-6)

Ensure that students have participated in the demonstration - Understanding Dissolved Gases 111-6

Assessment:Formal Formative
Ensure that students have responded to the Journal - Relate the various stages of the lifecycle of the Atlantic Salmon to the Body of Water (Fresh or Salt) in which they inhabit. 111-6

Ensure that students have made a hypothesis in relation to Understanding Dissolved Gases

Ensure that students have recorded observations in relation to Understanding Dissolved Gases

Ensure that students have responded to to conclusions in relation to Understanding Dissolved Gases.

Ensure that students have responded to the Journal - Explain how a change in the temperature of the surface water could affect the other regions in a body of water. (111-6)

Understanding Dissolved Gases

Purpose:
This investigation enables students to see the relationship between water temperature and its ability to hold dissolved gases.

Hypothesis:
If *the temperature of the same type of soda pop is changed*, then the _____ temperature will have a faster rate of releasing dissolved gases. Because _____

_____

_____

Design:
If possible, use a slow motion camera to capture the opening of a bottle of soda pop. Do this at significantly different temperatures, one cold (2-5 degrees Celsius) and one hot (30-40 degrees Celsius). Students should observe that at different temperature the difference in rates of FIZZ (which is a sign of holding dissolved gases).

Observations:

Conclusion:
What does this simulation of temperatures of our water systems and the amount of dissolved oxygen lead us to understand?

_____

_____

_____

_____

Why Do Species Thrive in their Environments?

Outcomes:
311-8 analyze factors that affect productivity and species distribution in marine and fresh water environments
210-4, 210-6 predict and interpret trends in population of a marine species from graphical data by interpolating and extrapolating data

Lesson Activity Overview
Students should be using their previous understanding of how water temperature affects dissolved gases and how salinity varies in a water system to investigate data in this section.

The focus of this lesson is for students to investigate how factors such as water temperature, salinity, ocean currents, pollution, and upwelling affect productivity and species distribution in marine environments and freshwater environments. 311-8

The use of population graphs of certain species over time permit students to interpolate and extrapolate populations from the graphs. Students can even compare population graphs with graphs of water temperature and salinity, for example, and suggest possible relationships. 210-4, 210-6

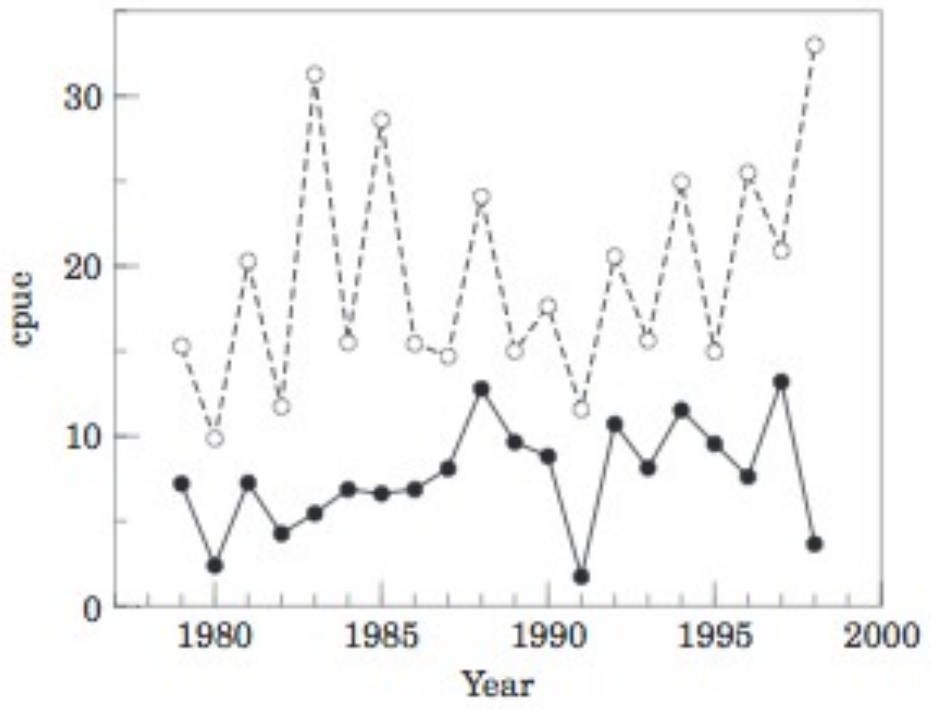
Task
Using graphical data presented on the following pages to predict populations of a chum Salmon species by interpolating and extrapolating data 210-4, and to interpret trends in data to explain their relationships 210-6

Assessment:Informal Formative
Ensure that students have used their previous understanding to the focus of this lesson 311-8

Assessment:Formal Formative
Ensure that students have used the graphical data presented to predict populations of a chum Salmon species by interpolating and extrapolating data 210-4, and to interpret trends in data to explain their relationships 210-6

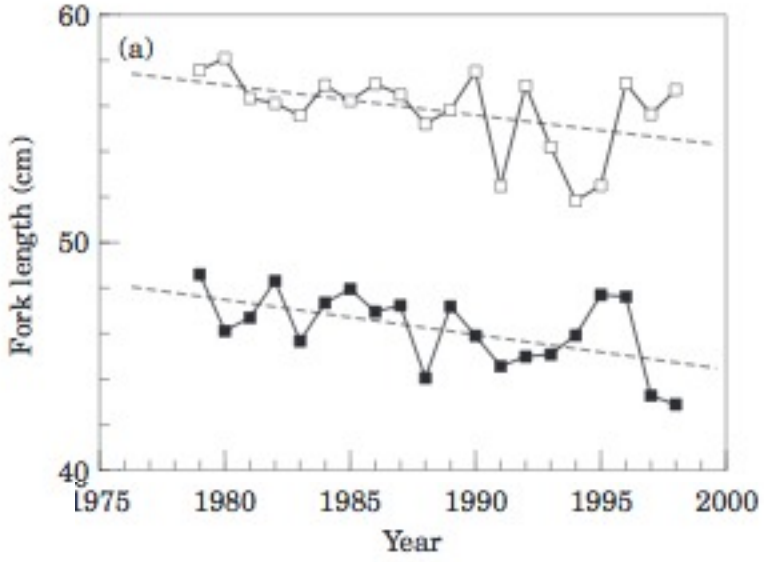
Data for this section is taken from:
Growth of chum Salmon (Oncorhynchus keta) correlated with sea-surface salinity in the North Pacific
Sholo H. Morita, Kentaro Morita, and Hiroyuki Sakano
ICES Journal of Marine Science, 58: 1335-1339, 2001
http://icesjms.oxfordjournals.org/content/58/6/1335.full.pdf

Figure 1. Salmon cpue in the central North Pacific Ocean.



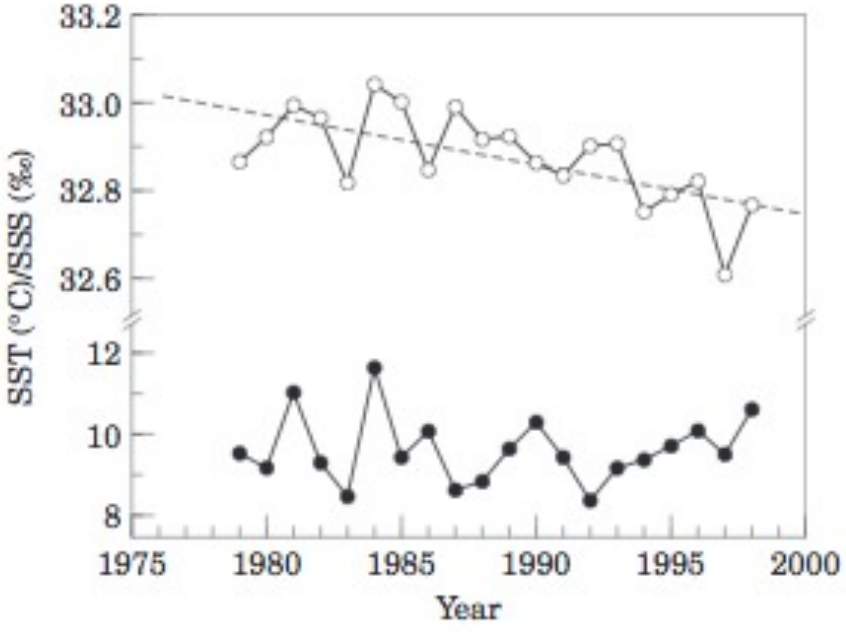
cpue (catch per unit effort)
The broken line indicated total salmon cpue
The continious line indicates chum salmon cpue.

Figure 2. Fork length of Chum Salmon



Filled squares indicate age 2
Open squares indicate age 3

Figure 3. Changes in sea-surface temperature (SST) and sea-surface salinity (SSS) over time.



Filled squares indicate SST
Open squares indicate SSS

Social Issues Affecting Ocean Species

Outcomes:
113-2 describe some positive and negative effects of marine technologies in the ocean
113-10 provide examples of problems related to the oceans that cannot be resolved using scientific and technological knowledge

Lesson Activity Overview
The focus of this lesson is to use what they have learned about ocean species and how waves and tides interact and make use in real world application. Students should understand how water from ocean flows into rivers and back out again. Also, they should understand how species move between different bodies of water.

Students are expected to be able to identify positive and negative effects of structures like the Confederation Bridge. The focus of the learning should center around the need for a structure like the bridge to move people versus the impact on the species that live in that water during construction and moving forward. A similar discussion could take place around the Mactaquac Hydro Dam.

From this general discussion, a possible area of greater discussion would be around oil drilling in the Ocean. This will force students to use knowledge from previous learning about plate tectonics.

Task
Research and report on the effects oil spills have had on coastlines in Canada. (113-2)

Next, students will be asked to relate what they have learned and apply it to critically think about issues that cannot be answered using science and technology.

Task
Choose an important issue or problem related to oceans or ocean resources that has been or is being studied. Create a chart in which different positions and points of view are put forth regarding the issue. (for example, the seal hunt, cod fishery, aquaculture development, oil exploration, ...) (113-10)
*This task could be done as a class debate. Having the research of both points of view already available to students and have each side debate. Assessment for this would be in the form of a refection journal.

Assessment:Informal Formative
Ensure that students have discussed actual technologies like bridge building and oil drilling and the positive and negative effects on the ocean 113-2

Ensure that discussion also involved social problems that cannot always be answered using science 113-10

Assessment:Formal Formative

Ensure that students have done research and reported on actual oil spills near Canada and the effects they had. 113-2

Ensure that students have investigated an important issue related to the ocean and they put forth different points of view 113-10

Water Systems on Earth
Strand - Glaciers and Polar Icecaps

General Curriculum Outcomes	Specific Curriculum Outcomes
311-12 analyze factors that affect productivity and species distribution in marine and fresh water environments	311-2 describe factors that affect glaciers and polar icecaps, and describe their consequent effects on the environment
210-16 identify new questions and problems that arise from what was learned	210-16 identify new questions that arise from the study of glaciers and polar icecaps

Climate Change affecting Sea Level

Outcomes:
311-12 describe factors that affect glaciers and polar icecaps, and describe their consequent effects on the environment
210-16 identify new questions that arise from the study of glaciers and polar icecaps

Lesson Activity Overview
This lesson is not intended to be a geography lesson to identify where glaciers and polar icecaps exists. However, it may be of relevance that students understand the near each pole they exist. The focus is however on how issues like climate change affect the sea level. Initial conversations should focus around these concepts.

As in inquiry activity, have students design and carry out an activity in which the effects of heat on the volume of water can be observed. (311-12) A typical on can be adding ice cubes to to beaker of water.

The ice cubes being added to the beaker act as shelves of ice falling off of into the ocean and thus creating a rising sea level

Journal
Write a newspaper article about the effects a rise in sea level would have on cities like Campbellton, Dalhousie, Bathurst, or Miramichi 311-12

Next, students could view “An Inconvenient Truth”. Since they will already have the understanding of how adding ice to water raises the volume and sea level this segments of this video will make it relevant for students. (It is not suggested that they need to view the entire video, only the segments that deal with the Science of climate change need be view, politics can be left out.)

Students should have the chance to debrief for what they have viewed as it is a controversial topic throughout the world. Students should also have take the time to understand Canada’s stand point on climate change.

Journal
Speculate on what might happen to your community with an increase in the mean annual temperature. What types of new questions or problems might be posed or created with an increase in the mean annual temperature? (210-16)

Assessment:Informal Formative
Ensure that students have discussed what climate change is and how raising temperatures affect sea level 311-12

Ensure that students have either debriefed or were given a worksheet if they viewed “An Inconvenient Truth” 311-12

Assessment:Formal Formative
Ensure that students have completed an activity in which they measure the volume change of water when ice is added 311-12

Ensure that students have written a journal about the effects that a rise in sea level would have on local communities in Northern New Brunswick 311-12

Ensure that students have written a journal that identifies new questions based on what they have learned in the lesson 210-16.

Ice's Effect on Water Volume

Purpose: To identify how adding different amounts of ice will affect the volume of a measured amount of water.

Hypothesis: If we add ____ pieces of ice to a measure amount of water, then _____

_____.

Because _____

_____.

Method:

1. Using a Beaker or another measure quantity container, fill the container to approximately 2/3 full. Record the number of ml water
2. Add the number of ice cubes stated in the hypothesis to the container or water.
3. Record the new number of ml of water.
4. Using the concept of displacement, determine the volume of the ice.

Data:

Initial amount of water _____ ml

Amount of water after adding ice _____ml

Volume of Ice (displacement calculations)

Concluding Question

How does the adding of ice to the beaker of water translate to glaciers and polar icecaps and the current climate change?