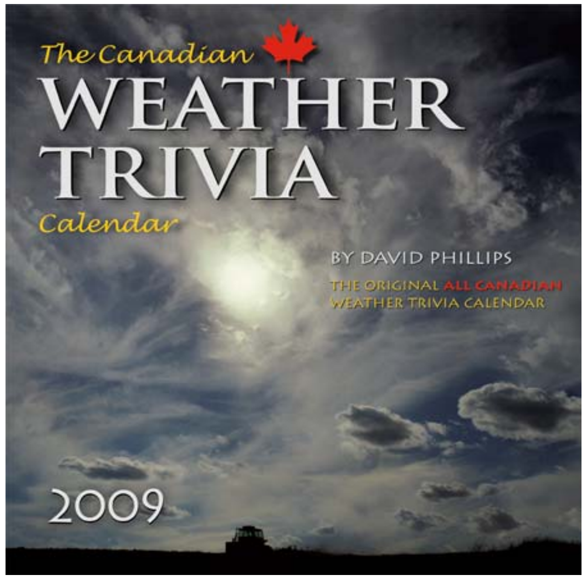

Teacher's Guide

A free, downloadable guide to *The 2009 Canadian Weather Trivia Calendar* available at { HYPERLINK "http://www.fitzhenry.ca" }

FIFTH HOUSE

Teacher's Guide
The 2009 Canadian Weather Trivia Calendar

The Calendar

"Sunshine is delicious, rain is refreshing, wind braces us up, snow is exhilarating; there is really no such thing as bad weather, only different kinds of good weather."—John Ruskin

All the different kinds of good Canadian weather can be found within the pages of this twenty-first edition of *The Canadian Weather Trivia Calendar*. Join Weather Wizard David Phillips of Environment Canada as he continues to bring you a whole year full of new and fascinating weather information. Phillips has collected some of the most amazing Canadian weather stories for your reading (and learning) pleasure, from gale-force historical tidbits to lightning-bright trivia and thunderous photos and cartoons. Canada's weather awaits you between the covers.

The author, David Phillips

Environment Canada senior climatologist David Phillips has been called "a genuine Canadian legend" and "our unofficial weather guru," but prefers to think of himself as Canada's weather ambassador. He has been studying Canadian climates and promoting the importance of weather and climate in this country for thirty-nine years.

The Teacher's Guide

The Canadian Weather Trivia Calendar Teacher's Guide 2009 is an instructor resource that correlates to *The Canadian Weather Trivia Calendar 2009*. Offering four distinct components—activities, discussion questions, self-directed research, and "Time to Reflect" segments—this guide can be used individually or as a series of lessons, depending on the requirements of the teacher. Some activities have an added dimension, "Extending the Exercise," in which teachers can choose to continue with the activity in question with further discussion or student research. The activities in this guide are drawn from the Earth Sciences curriculum shared by Canada's provinces and territories for grades five to eight.

Activity One: Avalanche

Calendar Connection

Read the entries for January 16, February 10 and 13, and the section on the last page of the calendar that discusses the "odds of being killed by weather." All of these selections relate to avalanches in Canada.

Objective

Students will discover that friction between snow, rocks, and ground holds snow in place on a slope, preventing avalanches. Through this demonstration, students will discover that "lubricants," such as ice, water, and sand, can stop friction by making a surface slippery and easy to move over. What is the lubricant that is the most "slippery"? This activity can be performed as a teacher demonstration for the entire class, rather than an activity for individuals or groups of students.

Backgrounder

Tell students that there are three main types of snow avalanches that happen on Canadian slopes: powder avalanches (consisting of loosely packed snow that begins to slide with a piece of falling ice or rock); wet avalanches (consisting of a flow of snow, rock, and ice that is set off by thaw); and slab avalanches (consisting of a mass of snow and ice that slides when a large slab of snow breaks free from the layers of snow and ice beneath it). While an avalanche is not a weather event, it is a dangerous event that is caused by weather.

Materials Required

- old textbook
- plastic bag
- piece of wood 40 cm wide and 60 cm long
- metre stick
- newspaper
- tape
- cornstarch or talcum powder
- sand
- pebbles
- marbles

Procedure

1. Ask students to define "avalanche." They should know that an avalanche involves deep snow breaking free from the underlying layer of snow on the slope it had been lying on.
2. Then, ask students to create a list of possible causes of avalanches. What has to change on the slope for an avalanche to occur? Tell

students that this experiment will test their answers to this question.
3. Fold up the newspaper and spread it on the floor.
4. Place the piece of wood flat on the floor on top of the paper and stand the metre stick at one end of the piece of wood so you can measure upward.
5. Place the book on the wood near the metre stick.
6. Ask one student to help you slowly lift the end of the board, creating a slope, until the book begins to slide.
7. Ask another student to record the height of the board at the moment the book began sliding.
8. Repeat this procedure after putting cornstarch (or talcum powder), then sand, then pebbles, then marbles beneath the book. Record the height at which the book began slide with each new substance.

Extending the Exercise

Ask students to write a brochure, a radio spot, a page-long magazine advertisement, or a fictional interview with a ski-resort manager that emphasizes the safety of a fictional ski resort. What kinds of safety features might this resort have that will encourage skiers to visit?

Self-directed Research

Divide the students in the class into four groups and assign each group a name from the following list of Canadian avalanche researchers and avalanche prevention champions:

Chris Stetham
Margaret Trudeau
Dr. David McClung
Dr. Bruce Jamieson

Have each group research their subject and give a short presentation on how their work expanded the field of knowledge on the science of avalanches and avalanche prevention and safety. Encourage students to be creative with their presentations. For example, students may script and act out a play regarding their avalanche expert's eureka moment. Students may also create their own experiment that mimics their subject's line of research regarding avalanches. Encourage students to include information on avalanche safety in their presentations.

Activity Two: Melting and Freezing

Calendar Connection

Many of the calendar entries this year relate to the effects of melting and freezing water, either in the form of snow, sleet, ice, or rain. Some examples include the entries for January 8, January 12, February 5, March 18, April 3, May 20, and November 22.

Objective

Students will discover two concepts that are central to understanding the water cycle: that water is able to take different forms, including liquid and solid; and that according to the law of conservation of matter, when a substance (in this case, water) changes from a solid to a liquid, or a liquid to a solid, the mass or weight of the substance does not change. This activity can be performed by groups of students.

Backgrounder

While some students may know that water can exist as a solid, liquid, or a gas, depending on its temperature and pressure, they may not know that the weight or mass of ice or water will not change after it undergoes melting or freezing. The law of conservation of matter or mass states that the mass of a substance in a closed system will remain constant, regardless of the processes acting inside the system. In other words, though matter may change form, it can be neither created nor destroyed.

To introduce the activity in class, make a T-chart or Venn diagram on the board and have the students list the properties of ice on one side and liquid water on the other side. Explain to the students that weight is a property of matter. Ask them: “If I took a bag of water and froze it, would it weigh more before it was frozen or after it was frozen?”

Materials Required

For each group of students:

- access to a scale
- 1 plastic locking storage bag
- access to a freezer
- measuring cup
- permanent marker

Procedure

Co-operative groups of 3-5 students should complete the following:

1. Using the permanent marker, label the plastic storage bag with the group’s identification.

2. Measure 250 ml of water using the measuring cup. Pour the water into the storage bag and seal the bag.
3. Make an estimate of the combined weight of the bag and the water. Record the estimate.
4. Weigh the bag of water and record the actual weight. Compare the actual weight and the estimated weight.
5. Place the bag of water in a freezer.
6. Record a prediction of what the weight of the water and the bag will be after the water has frozen.
7. Once the bag of water is completely frozen, weigh the bag of water. Record the weight of the frozen bag of water and compare the frozen weight with the liquid weight.
8. Write a statement that explains the relationship of the weight of the water and the ice.
9. Predict what the weight of the water will be once it melts. Let the water in the bag melt and check the prediction.

Extending the Exercise

After students have discovered that a specified quantity of water has the same weight, whether as a solid or a liquid, have the groups of students conduct the same experiment on other types of matter (these types of matter should be ones that can be melted and frozen at temperatures that can safely be attained in the classroom with lab equipment). Examples of other types of matter could include chocolate, butter, wax, and ice cream.

Self-directed Research

The law of conservation of matter or mass is also known as the Lomonosov-Lavoisier law. Have students research who Mikhail Lomonosov and Antoine Lavoisier were with these specific questions in mind:

- Why are both scientists credited with formulating the law of conservation of matter? Were they contemporaries? If not, who was the first to formulate the law?
- How was the law important to advancing discoveries in chemistry and science in general?
- Does this law apply to all substances? In what instances does it not apply?

Activity Three: Hurricanes

Calendar Connection
The calendar entries for August 24 and 26 describe how hurricanes can wreak havoc on both property and human lives. The “Hurricane Tidbits” section at the back of the calendar contains hurricane trivia, including a list of some of the different names given to hurricanes occurring in the western hemisphere.

Objective
Students will discover that wind speed increases the height of ocean waves in a hurricane, and that higher waves occur in shallower water. This activity can be performed by groups of students.

Backgrounder
Entries in the calendar describe hurricanes as powerful storms that bring heavy rains, winds, and flooding to a region. Hurricanes are tropical cyclones with winds greater than 65 knots (121 km/h). One of the ingredients for hurricanes is warm, moist air. That is why they will only form over really warm ocean water at temperatures of 26.5°C or more. Another ingredient is wind, which must be blowing in the same direction and at the same speed from the ocean surface up to 9,000 m above sea level. As the wind passes over the ocean’s surface, water evaporates and rises. As the water vapour rises, it cools and condenses back into large water droplets, forming large cumulonimbus clouds. While hurricanes form near the equator, they will not form any closer than 500 km to the equator. Hurricanes need the influence of Earth’s rotation to initiate a spinning circulation (the Coriolis effect), which becomes too weak near the equator.

While hurricanes form over warm water, they can move around, lasting for days or weeks and moving long distances. In Canada, the effects of hurricanes are most often felt in the Maritimes, since the hurricanes that affect North America usually form in the eastern Atlantic Ocean. However, most hurricanes weaken before they reach Canada—most of them will stay out over open ocean away from land, and those that do reach land will weaken and die once they no longer have their energy source (warm water). Yet, even though they have weakened, once hurricanes hit land they will often bring lots of rain and high winds that cause a lot of damage, examples of which are contained in many of the calendar’s entries.

Materials Required
For each group of students:

- baking dish measuring approximately 23 cm x 33 cm
- flexible straw
- duct tape
- water
- ruler

Procedure

Co-operative groups of 3-5 students should complete the following:

1. Place the baking dish on a desktop.
2. Bend the straw so that it forms an L shape.
3. Place the straw inside the baking dish in the middle of one of the sides of the dish, so that the shorter end of the straw faces straight up, touching the side of the dish, and the longer end is suspended about 2.5 cm over the bottom of the dish. Tape the straw to the inside of the dish to hold it in place.
4. Pour water into the dish until it reaches just below the straw.
5. One group member should then blow very gently into the end of the straw that is sticking straight up to create a "wind" over the water in the dish.
6. Once a group member starts blowing through the straw, another group member should observe the water at the opposite end of the straw and mark the wave heights on the outside of the dish.
7. Measure and record the wave heights in the dish with the ruler, starting the measurements from the desktop.
8. Repeat the procedure two more times, having the group member blow harder each time into the straw. Record the measurements to assess the effect of wind speed on the height of waves.
9. Remove the water from the dish, and move the straw up near the top of the dish and refill the dish with water until it reaches just under the straw. Repeat the procedure to compare wave height in deeper and shallower water.

Self-directed Research

The "Hurricane Tidbits" section at the back of the calendar talks about hurricane names and hurricanes falling along a scale of different "categories." Have students research answers to the following questions:

- The "Hurricane Tidbits" section at the back of the calendar talks about hurricane names being repeated in cycles (i.e., hurricane names for 2009 to be repeated in 2015 and 2021). How do meteorologists come up with the names for hurricanes and why are they repeated every six years?
- The Saffir-Simpson Hurricane scale is the classification system used to measure the intensity of most western hemisphere tropical cyclones. How many "categories" make up the Saffir-Simpson scale? What do the categories measure?

- What distinguishes a hurricane from a tropical disturbance, a tropical depression, and a tropical storm?

Activity Four: Floods

Calendar Connection

Floods and flooding, as well as the damage and ruin they cause, make numerous appearances in the calendar entries. Some examples include the entries for January 17; April 3, 22, and 27; May 22 and 29; June 23; July 19; August 21; September 15 and 17; October 6; November 4; and December 2 and 11.

Objective

Students will discover that different types of soil have different capacities for retaining water, and that if the soil in an area will not hold enough water, flooding will ensue. This activity can be performed by groups of students.

Backgrounder

As described in several of the calendar's entries, flooding is a natural event that can occur as a result of melting snowpack, spring thaws and runoff, record rainfalls, ice jams, and tropical storms like the "Pineapple Express" (see the calendar entry for December 2). When rivers rise over their banks or when coastal tides surge, the excess water cannot always be restrained by natural boundaries, such as river embankments.

Floods can also occur when rainwater collects on the ground and cannot find a source to drain into, or when the ground cannot absorb any more water. This type of surface water flooding often happens in urban areas where there is little open ground to absorb rainfall, particularly if sewers or drainage systems have become blocked or overloaded. However, another determining factor for surface water flooding can be the type of soil in the area.

Materials Required

For each group of students:

- three soil samples: sand, potting soil, and clay
- water
- 3 measuring cups
- funnel
- filter paper

Procedure

Co-operative groups of 3-5 students should complete the following:

1. Test each type of soil sample in its dry state by measuring the same amount of each soil, in turn, into a funnel lined with filter paper and then pouring a measured amount of water through it.

The same amount of water should be used for each soil sample. The water that drains through each type of soil should be collected in another measuring cup and the amount recorded.

2. Repeat the procedure for each type of soil in their saturated states.
3. Discuss which soil held the most water when dry and which soil held the most water when saturated. Discuss which type of soil would be most likely to cause flooding problems.
4. Each group of students should answer the following question: How do different soil types affect the speed at which water is absorbed and how much water is retained? (The answer will involve a discussion of the size and chemical characteristics of soil particles and how tightly they are packed together.)

Personal Connection

Ask students to consider the geography around where they live and whether there are any aspects of the local geography (rivers, coastlines, hills, etc.) that could put their homes at risk of flooding. Next, consider local weather patterns and soil conditions. If cyclical flooding has occurred in the local area, discuss the efforts governments (municipal, provincial, and federal), as well as citizens have made to prevent flooding. Students could then debate whether people should be allowed to rebuild homes in areas where serious flood damage has occurred time and time again.

Time to Reflect

While floods are natural events, human activities, including the man-made production of greenhouse gases and the changes humans have made to the landscape, have increased the likelihood of flooding in some areas. Discuss how changes to the landscape and global warming relate to floods and flooding.

Filename: 2009.01.06 2009 WTC TG
Directory: C:\Documents and Settings\Editor_\Desktop
Template: C:\Documents and Settings\Editor_\Application Data\Microsoft\Templates\Normal.dot
Title: Activity ____: Convection Currents
Subject:
Author: Gerry Baier
Keywords:
Comments:
Creation Date: 1/6/2009 9:20 AM
Change Number: 2
Last Saved On: 1/6/2009 9:20 AM
Last Saved By: Fifth House Ltd.
Total Editing Time: 12 Minutes
Last Printed On: 1/6/2009 9:23 AM
As of Last Complete Printing
Number of Pages: 11
Number of Words: 2,646 (approx.)
Number of Characters: 15,083 (approx.)