

A Teacher's Guide for Grade 5 Science
Spring/Summer Poster



**Whatever the
Weather...
BE READY!**

Morris River
Rivière Morris





Severe Weather Awareness in Manitoba

**A Teacher's Guide for
Grade 5 Science**

Spring/Summer Poster

2010
Manitoba Education

Manitoba Education Cataloguing in Publication Data

Severe weather awareness in Manitoba : a teacher's guide for
Grade 5 science. Spring/summer poster
[electronic resource]

ISBN-13: 978-0-7711-4662-6

1. Meteorology—Manitoba—Study and teaching (Elementary).
 2. Storms—Manitoba—Study and teaching (Elementary).
 3. Emergency management—Manitoba—Study and teaching (Elementary).
 4. Spring—Manitoba—Safety measures—Study and teaching (Elementary).
 5. Summer—Manitoba—Safety measures—Study and teaching (Elementary).
 6. Manitoba—Climate—Study and teaching (Elementary).
 7. Weather—Study and teaching (Elementary).
- I. Manitoba. Manitoba Education.
551.6

Copyright © 2010, the Government of Manitoba, represented by the Minister of Education.

Manitoba Education
School Programs Division
Winnipeg, Manitoba, Canada

Every effort has been made to acknowledge original sources and to comply with copyright law. If cases are identified where this has not been done, please notify Manitoba Education. Errors or omissions will be corrected in a future edition. Sincere thanks to the authors, artists, and publishers who allowed their original material to be used.

All images found in this document are copyright protected and should not be extracted, accessed, or reproduced for any purpose other than for their intended educational use in this document.

Any websites referenced in this document are subject to change. Educators are advised to preview and evaluate websites and online resources before recommending them for student use.

This resource and the posters are available on the Manitoba Education website at www.edu.gov.mb.ca/k12/cur/science/index.html.

Print copies of the set of two posters (spring/summer and fall/winter) can be purchased from the Manitoba Text Book Bureau (stock number 80662). Order online at www.mtbb.mb.ca.

Ce document est disponible en français.

Contents

INTRODUCTION	1
SEVERE WEATHER AWARENESS IN MANITOBA: SPRING/SUMMER POSTER	3
Lightning and Thunder	3
Spring Floods and Heavy Rains	4
Hailstorms	5
Clouds as a Clue to Severe Weather	6
Tornadoes	7
SEVERE WEATHER PHENOMENA IN MANITOBA	9
Being Prepared for Severe Summer Weather	9
STUDENT LEARNING ACTIVITIES	11
The Properties of Air	11
Severe Spring/Summer Weather Phenomena and Personal Safety	14
MANITOBA EMERGENCY MEASURES ORGANIZATION	17
Why Should We Know about Manitoba EMO?	17
GOVERNMENT OF CANADA RESOURCES	19
Environment Canada	19
IMAGE CREDITS	21



Introduction

Manitoba Education has acted on the recommendation from the Manitoba Emergency Measures Organization (EMO) to provide learning resource supports for teachers and students directed toward severe weather awareness and response by developing two Severe Weather Awareness in Manitoba posters. The posters feature

- spring/summer severe weather phenomena in Manitoba
- fall/winter severe weather phenomena in Manitoba

Severe Weather Awareness in Manitoba: A Teacher's Guide for Grade 5 Science—Spring/Summer Poster is intended to support teachers in addressing the specific learning outcomes identified in the weather unit of the Grade 5 Science curriculum and the general weather awareness strategies encouraged by EMO. This guide includes information on a variety of severe weather phenomena experienced in Manitoba during spring and summer, and suggests student learning experiences aligned with Manitoba's Grade 5 curricula. The links to online resources found throughout this guide are intended to assist teachers and students in becoming regular observers of the skies and in gaining familiarity with the conditions and warning signs of imminent severe weather.







Severe Weather Awareness in Manitoba: Spring/Summer Poster

The Severe Weather Awareness in Manitoba spring/summer poster illustrates several severe weather conditions that we experience in Manitoba in spring and in summer. These images were selected to support student discussions and explorations of the variety of weather phenomena that can occur in Manitoba. Descriptions and explanations of the images represented on the poster follow.

Lightning and Thunder

The upper right corner of the poster features lightning, a common sight in warm, humid summer conditions in Manitoba. Lightning—a luminous discharge caused by an accumulation of electric charges in the clouds—is perhaps the most spectacular weather phenomenon we are accustomed to seeing (and hearing). When an accumulation of electric charges becomes rather large, there can be a large voltage between the clouds and the ground below. The flash of a lightning bolt is caused by the fast warming of the air. One could call lightning an “electric shock” between the clouds and the Earth. Lightning can be directed from the cloud to the ground or from the ground to the cloud. However, a lightning flash can also be directed between two clouds or inside the same cloud. The thunder we hear is the noise caused by the fast expansion of the air due to the heat produced by the lightning. Because the light travels many times more quickly than the sound, we see the flash well before hearing the thunder.



Resource Link

For more information about lightning, refer to the following website:
Environment Canada. “Summer Hazards.” *Weather and Meteorology*.
<www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=6C5D4990-1>.

Spring Floods and Heavy Rains

The image at the bottom of the poster shows a scene from around the town of Morris, Manitoba, during the flood of the Red River in spring 2009. In Manitoba, this type of flooding is generally caused by rapid melting of the winter snow pack, along with heavy spring rains. Since the ground is often still frozen at depth until May, water from melting snow often simply runs off into local waterways. Moreover, when the Red River ice pack has broken up in the south before the ice has done so in the north, large ice floes can block runoff and increase the rise of water levels by ice damming. The Red River Valley is particularly prone to floods because it has very flat relief and a weak slope toward the north. Floods are frequent because water can easily spread out over a wide area when it leaves the riverbanks, and remains on the ground for a long time before finally discharging into Lake Winnipeg.

4



* © Environment Canada.

Hailstorms

One photograph near the centre of the poster shows a hail-damaged windshield. Hail first forms at great heights within cumulonimbus clouds during a thunderstorm. Small particles of ice fall through a thundercloud and can then be made to go upward by powerful ascending currents of air (updrafts) within the cloud. When a crystal of ice meets water droplets, the latter freeze onto the “seed crystal.” Ice is added layer upon layer as the hailstone goes up and down repeatedly. When the hailstone becomes too heavy, or the strong updrafts cease, it falls toward the ground. The size of hailstones depends on the number of times they ascend and descend inside the cloud during the storm. They can range from the size of a few millimetres to the size of a baseball (around 10 centimetres). Hail can also cause significant damage to crops, vehicles, and houses, and can even wound living creatures.



© Environment Canada.



Resource Link

For advice on ways of avoiding damage due to hail, refer to the following website:

Environment Canada. “Summer Hazards.” *Weather and Meteorology*.

www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=6C5D4990-1.



Clouds as a Clue to Severe Weather

Clouds provide a great amount of information about impending weather conditions. Indeed, without the formation of clouds, there would be no rain, or snow, or hail to prepare for. The appearance of the clouds (their form, colour, movements, and so on), along with other factors such as their altitude, can give us important information on the current state of the atmosphere.

For instance, large cumulonimbus clouds whose tops have the flat shape of an anvil, can announce the arrival of a severe summer storm. The photograph framed on the left side of the poster represents mammatus clouds (a tribute to their appearance as rounded and bulbous). These clouds resemble large bags that hang with the bottom of the cumulonimbus cloud deck, and can seem worrisome to people. A popular belief is that these clouds can give rise to tornadoes, but that is not the case. Mammatus clouds are often associated with storms, but we generally see them after the storm has passed.



6



Resource Links

For information on identifying the various types of clouds and the weather phenomena associated with these clouds, refer to websites that include weather information along with daily news, as well as to websites such as the following:

Environment Canada. *Sky Watchers*.

www.on.ec.gc.ca/skywatchers/index_e.html.

———. *Sky Watchers Guide to Cloud Identification*.

www.on.ec.gc.ca/skywatchers/swtc_docs/cloud_guide/cloud_identification_e.html.

———. Meteorological Service of Canada. *Project Atmosphere Canada*.

www.msc.ec.gc.ca/education/teachers_guides/toc_e.html.



Tornadoes

For the majority of people, the most spectacular weather event in hot weather is the formation of a funnel cloud. When a funnel cloud touches the ground, we speak of it as being a tornado. An event such as a tornado is always associated with an intense rotating storm, called a supercell thunderstorm. The tornado itself is a narrow airstream that spins rapidly and is connected to the ground below the cloud deck. This airstream moves upward, rather than downward, as it often appears to do.



Each year in Canada, about 50 to 75 tornadoes are identified, the majority of which cause little or no damage to people because they are formed in remote areas. However, on occasion a tornado threatens to touch down in an inhabited area. In Manitoba, on June 22, 2007, a powerful funnel cloud touched the ground close to Elie. A photograph of this event on the poster was taken from the Trans-Canada Highway that day. Although the Elie tornado was classified as a Force 5 (strongest winds for a tornado), no one was injured. This tornado was one of a number of violent weather events in southern Manitoba during a three-day period ending on June 24, 2007.



Resource Link

What should we do if we see a funnel cloud forming? For more information on how to report a severe weather event properly, refer to the following website:

Environment Canada. Meteorological Service of Canada. "How to Call in Your Report." *Severe Weather Watcher Handbook*.
<www.msc-smc.ec.gc.ca/education/severe_weather/report_e.cfm>.



© Environment Canada.



Severe Weather Phenomena in Manitoba

Being Prepared for Severe Summer Weather

During summer on the prairies, the most common severe weather events are thunderstorms and heavy rainfalls. Our best defence against having something go wrong as a result of severe weather is knowing what to do, where to seek shelter, and how to read signs in the sky such as clouds, winds, time of day, and temperature.

For a powerful summer storm to happen, three ingredients are needed: a collision between warm and cool air, strong steady breezes, and plenty of sunshine to put energy into the atmosphere. Since it is often hard to tell when the ingredients are just right for a severe weather event to occur, it is important to be near a source of weather information – especially when planning to do outdoor activities that are in the open, far away from safe shelters.





Student Learning Activities

The following suggested learning activities align with Manitoba's Grade 5 curricula.

The Properties of Air

Specific Learning Outcomes

Grade 5 Science

- 5-4-08 Describe the key features of a variety of weather phenomena.
- 5-4-09 Provide examples of severe weather forecasts, and describe preparations for ensuring personal safety during severe weather and related natural disasters.

Science Skills and Attitudes

- 5-0-1A Formulate, with guidance, specific questions that lead to investigations.
- 5-0-2C Record information in own words and reference sources appropriately.
- 5-0-5A Make observations that are relevant to a specific question.
- 5-0-5F Record and organize observations in a variety of ways.
- 5-0-7G Communicate methods, results, conclusions, and new knowledge in a variety of ways.

Activating

■ Predictions of Cloud Formations

Students view pictures of cloud formations and hypothesize what will happen in each weather scenario, giving reasons for their predictions.



Resource Links

GLOBE Canada. "Studying Clouds." *Activities*.

<www.globecanada.ca/globe/english/activities/clouds.cfm>.

Royal Meteorological Society. "Cloudwatch: Cloud Descriptions." *CloudWatch Europe 2000*. <<http://atschool.eduweb.co.uk/radgeog/cloudwatch/chart/clouds.html>>.

■ Weather Maps

Students view weather maps that include symbols for cold air masses, warm air masses, and fronts. They discuss what these symbols may represent and hypothesize the resulting weather conditions.

Teacher Tip

Weather maps with their associated symbols can be found in daily newspapers or on the Environment Canada website.



Resource Link

Environment Canada. "Canadian Weather at a Glance." *Weatheroffice*.

<www.weatheroffice.gc.ca/jet_stream/index_e.html>.

Aquiring

■ Research—Air Masses and Fronts

Using print and electronic resources, students research warm and cold air masses and define and describe what happens along a front. Students record information in their science journals, including labelled diagrams and related properties of air.



Resource Links

Environment Canada. “Canadian Weather at a Glance.” *Weatheroffice*.

<www.weatheroffice.gc.ca/jet_stream/index_e.html>.

———. *Sky Watchers Guide to Cloud Identification*.

<www.on.ec.gc.ca/skywatchers/swtc_docs/cloud_guide/cloud_identification_e.html>.

———. *Understanding Fronts and Frontal Weather*.

<www.on.ec.gc.ca/skywatchers/swtc_docs/frontal_poster/front_weather_e.html>.

———. Meteorological Service of Canada. *Severe Weather Watcher Handbook*.

<www.msc-smc.ec.gc.ca/education/severe_weather/index_e.cfm>.

The United Kingdom Environmental Change Network. “Fronts.” *ECN Weather and Climate Change Tutorials*.

<www.ecn.ac.uk/Education/fronts.htm>.

WW2010 (Weather World 2010 Project). “Air Masses and Fronts.”

The Online Guides: Meteorology.

<[http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/mtr/af/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/af/home.rxml)>.





Applying

■ Multimedia Presentation—Weather and Properties of Air

Cooperative groups of students create a Weather and Properties of Air multimedia presentation. Students list the properties of air and describe investigations or real-life situations that demonstrate each property. They then explain how the properties of air create warm and cold fronts, and describe what happens when these air masses meet along a front. Students include images illustrating the properties of air and related components of weather. Compile group presentations into a whole-class presentation or a small science symposium.

■ Rebus Story—Properties of Air

Using word-processing, students create a rebus story describing as many of the properties of air as possible. They compose statements and insert images illustrating each of the properties of air.

Example

The pictures below provide an example of a rebus story: **Properties of Air**

Air is composed of



mass (weight)

and



volume

Severe Spring/Summer Weather Phenomena and Personal Safety

Specific Learning Outcomes

Grade 5 Science

- 5-4-08 Describe the key features of a variety of weather phenomena.
- 5-4-09 Provide examples of severe weather forecasts, and describe preparations for ensuring personal safety during severe weather and related natural disasters.

Science Skills and Attitudes

- 5-0-2A Access information using a variety of sources.
- 5-0-2B Review information to determine its usefulness using predetermined criteria.
- 5-0-2C Record information in own words and reference sources appropriately.
- 5-0-7G Communicate methods, results, conclusions, and new knowledge in a variety of ways.
- 5-0-7H Identify, with guidance, connections between the investigation results and everyday life.

Grade 5 Mathematics: Statistics and Probability (Data Analysis)

- 5.SP.3 Describe the likelihood of a single outcome occurring, using words such as impossible, possible, certain.
- 5.SP.4 Compare the likelihood of two possible outcomes occurring, using words such as less likely, equally likely, more likely.

Grade 5 Mathematics: Patterns and Relations

Use patterns to describe the world and solve problems.

- 5.PR.1 Determine the pattern rule to make predictions about subsequent elements.



Activating

■ Brainstorming—Weather Phenomena

Students brainstorm a variety of spring/summer weather phenomena and examples of severe weather by answering questions such as the following:

- Can you give some examples of severe weather events?
- Which of these are often experienced here in Manitoba?
- Do you have a personal experience related to severe weather that you would like to share? What happened?

■ Interview—Severe Weather Experiences

Students compose weather-related questions and interview family members to determine their experiences with severe weather phenomena, including key features of the phenomena and examples of preparations to ensure personal safety. Students then share experiences with peers.

Teacher Tip

The term *phenomenon* may need to be defined as a directly observable and unusual or extraordinary occurrence. Encourage students to distinguish between *weather phenomena* and *severe weather events*.

Aquiring

■ Research and Presentation—Severe Weather Poster or Graphic Display

Invite students to work in teams to research the main features of a severe weather event (e.g., thunderstorm cell). To determine the main features, each team can study a particular phenomenon associated with the storm (e.g., vortex, wind shear, hail, wall cloud, gust front, anvil-shaped thunderhead, rain curtain, funnel cloud, lightning). Ensure that students access a variety of sources, such as books, videos, and CD-ROMs, in addition to online resources. Ask students to present the results of their research in the form of a poster or a graphic display, and prepare a brief talk related to aspects of their display.

■ Brochure/Booklet—Thunderstorm Observations

Invite students to choose a weather phenomenon associated with the formation of severe storms and develop their knowledge, skills, and competencies in scientific communication by preparing a brochure or a booklet on observations of a thunderstorm, which could be produced by a small group of students. The elements of the storm could include the kinds of clouds associated with the event, the formation of hail, tornadic activity, and so on. Students can then design and write a brochure or a booklet that describes the conditions present during the development of a particular weather event, and give advice on the best way of preparing for a storm and how to react during the severe weather event.

- **Illustrated News Bulletin—Severe Weather Event**

Students choose an example of a severe weather event and prepare an illustrated news bulletin that demonstrates their understanding of the potential weather-related catastrophes associated with the event, including examples of precautionary measures to be taken during the event for personal safety.

Teacher Tip

Ensure that students note the terminology used in forecasts, such as *weather statement*, *watch*, *advisory*, and *warning*.



Resource Links

Environment Canada. *Sky Watchers*. <www.on.ec.gc.ca/skywatchers/index_e.html>. ———. Meteorological Service of Canada. *Severe Weather Watcher Handbook*. <www.msc-smc.ec.gc.ca/education/severe_weather/index_e.cfm>.

- **Graphic Display—Weather Phenomena**

Using concept mapping (either by hand or with a technology solution), students create a Weather Phenomena web or graphic organizer. Students include a variety of phenomena featuring both severe (unusual) and predictable (usual) weather conditions. They list the features of each phenomenon, include images of the phenomenon, and describe associated human-impact emergency situations and appropriate safety preparations.

- **Ask an Expert—Web 2.0 Applications**

Students compose questions and interview an expert who is experienced with weather phenomena and severe weather in particular (e.g., meteorologist, emergency measures personnel) to determine key features of a variety of weather phenomena and preparations for ensuring personal safety during severe weather and related natural disasters. Students may conduct the interview in person, by email, or by accessing an online Web 2.0 portal (e.g., twitter, MySpace). Students discuss responses and record and share information in a variety of formats related to their interests. As an Exit Slip, students list safety preparations identified by the expert.



Resource Link

An online question-and-answer service is available on the following website: AllExperts. “Weather.” *Science*. <www.allexperts.com/cl2/691/science/Weather/>.

- **Q & A Game—Guess My Weather Phenomenon**

Using presentation software, students create a Guess My Weather Phenomenon rapid-fire class quiz. Cooperative groups of students create a series of slides that include a description of the features of the severe weather phenomenon, associated disasters, important safety preparations, an image representing the weather phenomenon, and its name. Students set the timing feature so that the description appears first, followed in three to five seconds by associated disasters, followed in three to five seconds by safety features, and followed about five seconds later by the word (i.e., the name of the weather phenomenon) and an image representing the phenomenon. Compile group presentations in a class presentation. Students call out their guesses during the presentation. The objective is to guess the word before it is given to the group.

Manitoba Emergency Measures Organization

The Manitoba Emergency Measures Organization was established in 1959 with the original purpose of developing emergency procedures for dealing with events related to a nuclear attack from the Soviet Union. Over the years, as the threat of nuclear war diminished and the risk of both natural and human-caused disasters increased, the emphasis shifted toward peacetime emergencies. In fall 1996, the organization was amalgamated with the Manitoba Disaster Assistance Board to form the Manitoba Emergency Management Organization, broadening its scope to all phases of disaster management—from preparedness and response to recovery. In 2001, the organization was renamed the Manitoba Emergency Measures Organization (EMO).

EMO assists with the preparation, review, and enhancement of emergency preparedness programs in Manitoba, training exercises, and resource development for municipalities, school divisions, government departments and agencies, and the private sector. EMO also reviews and recommends amendments to emergency measures legislation and ensures that departmental, municipal, and private sector emergency plans are consistent with existing legislation.

17

Why Should We Know about Manitoba EMO?

EMO assists with major emergencies and disasters through coordination of the disaster response process, including the coordination of provincial, federal, and non-government agency resources to assist municipalities. Services provided to the municipalities include consulting, planning assistance, post-emergency reports, and public information on response activities.

With respect to severe weather events such as catastrophic overland flooding from unusually heavy rainfall (such as the 2005 and 2007 Manitoba Interlake floods), the EMO serves in the important role of disaster financial assistance and recovery for Manitoba's citizens. The purpose of the disaster financial assistance is to assist victims, municipalities, government departments, and other agencies to recoup some of the costs incurred with respect to mitigating the consequences of disaster. Activities include coordination of partners in community recovery, developing and implementing guidelines for the evaluation, approval, and payment of disaster assistance claims.





Resource Links

To obtain more information about preparing for, and coping with, severe weather events, refer to the following publications on the EMO website at www.gov.mb.ca/emo/general/downloads.html.

Government of Canada. *Natural Hazards of Canada: A Historical Mapping of Significant Natural Disasters*. Ottawa, ON: Government of Canada, 2001.

———. Public Safety and Emergency Preparedness Canada, in cooperation with Canadian Red Cross. *Self-Help Advice: Be Prepared, Not Scared: Preparedness Starts with You*. Ottawa, ON: Public Safety and Emergency Preparedness Canada, Sept. 2005.

———. Public Safety and Emergency Preparedness Canada, in cooperation with Environment Canada. *Self-Help Advice: Severe Storms*. Ottawa, ON: Public Safety and Emergency Preparedness Canada, Sept. 2005.

Manitoba Emergency Measures Organization. *Family Emergency Handbook: Think Safety*. Winnipeg, MB: Manitoba EMO, Oct. 2003.

Manitoba Emergency Measures Organization, and The Winnipeg Humane Society. *Your Pets and Emergency Preparedness*. Winnipeg, MB: Manitoba EMO, n.d.



Government of Canada Resources

Canada is a vast country with extreme weather conditions and dramatic geological features that influence weather phenomena. The following websites provide information on a wide variety of natural hazards in Canada, including spring and summer weather. The Government of Canada resources also focus on emergency preparedness for Canadians.



Resource Links

Government of Canada. *Is Your Family Prepared?* <www.getprepared.gc.ca/index-eng.aspx>.

———. *Natural Hazards of Canada: A Historical Mapping of Significant Natural Disasters.* <www.publicsafety.gc.ca/res/em/nh/hazardsmap.pdf>.

———. Public Safety and Emergency Preparedness Canada, in cooperation with Canadian Red Cross. *Self-Help Advice: Be Prepared, Not Scared: Preparedness Starts with You.* Ottawa, ON: Public Safety and Emergency Preparedness Canada, Sept. 2005. <www.gov.mb.ca/emo/home/be_prep_e.pdf>.

———. Public Safety and Emergency Preparedness Canada, in cooperation with Environment Canada. *Self-Help Advice: Severe Storms.* Ottawa, ON: Public Safety and Emergency Preparedness Canada, Sept. 2005. <www.gov.mb.ca/emo/home/storm_e.pdf>.

Public Safety Canada. “Natural Hazards of Canada.” *Publications.* <www.publicsafety.gc.ca/res/em/nh/index-eng.aspx>.

Environment Canada

Weatheroffice

Environment Canada’s *Weatheroffice* is a comprehensive online source for gathering severe weather awareness resources on the Government of Canada website. By following the “Educational Resources” links from the home page, you can navigate among a host of information panes that will assist you and your students to conduct background research.



Resource Link

Environment Canada. *Weatheroffice.* <www.weatheroffice.gc.ca/canada_e.html>.

Meteorological Service of Canada

Acting under the guidance of Environment Canada, the Meteorological Service of Canada provides teachers with a wide variety of guides for doing background research and for developing classroom learning activities.



Resource Links

Environment Canada. Meteorological Service of Canada. *MSC Education Publications.* <www.msc-smc.ec.gc.ca/education/teachers_guides_e.cfm>.

———. *Severe Weather Watcher Handbook.* <www.msc-smc.ec.gc.ca/education/severe_weather/index_e.cfm>.

Sky Watchers

Environment Canada's *Sky Watchers* program provides curriculum-aligned teacher resources. From the home page, you can navigate a variety of resources, including the following:

■ **Teachers' Corner**

This section of the *Sky Watchers* website provides the following resources:

- student activities and experiments, information on making weather instruments, and forms and log sheets for recording daily weather
- "Curriculum Correlations" provides outcome-by-outcome correlations to Manitoba's Grade 5 Science curriculum
- "Free Teacher's Guides" provides access to laminated large-format weather log charts and a weather map of Canada, as well as resources such as *Sky Watchers Guide to Weather* and *Project Atmosphere Canada Teacher's Guide*
- "Virtual Weather Office" offers tours for classrooms that do not have ready access to an airport weather station or to Environment Canada facilities

■ **Traditional Ecological Knowledge**

If you have an interest in exploring traditional ecological knowledge as it connects to Grade 5 weather learning experiences, *Expanding the Circle: Traditional Ecological Knowledge and Weather* will take you on a journey with Elders' weather wisdom and many drawings done by students describing their relationship to the land.

■ **Sky Watchers Weather**

This link enables you and your students to engage actively with other schools across Canada in real-time weather watching, including the ability to upload students' weather observations. Once you have signed up to the *Sky Watchers* program, you can download archived weather data that has been posted by other schools for graphing and mapping purposes and view the weather reports submitted by other schools across Canada—a great way to network about weather phenomena.

■ **Sky Watchers Glossary**

This glossary defines and explains weather-related terminology.



Resource Links

Environment Canada. *Expanding the Circle: Traditional Ecological Knowledge*.

<www.on.ec.gc.ca/skywatchers/skywtek/default.html>.

———. *Sky Watchers*. <www.on.ec.gc.ca/skywatchers/index_e.html>.

———. "Sky Watchers Glossary." *Sky Watchers*.
<www.on.ec.gc.ca/skywatchers/swGlossary_e.html>.

———. "Sky Watchers Weather." *Sky Watchers*.
<www.on.ec.gc.ca/skywatchers/swWeather_e.html>.

———. "Teachers' Corner." *Sky Watchers*.
<www.on.ec.gc.ca/skywatchers/teachersCorner_e.html>.

Image Credits

Spring/Summer Poster Images (Teacher's Guide: Front Cover)

- © Environment Canada: Clouds (Poster: top left; Teacher's Guide: front cover and verso, p. ii). Used with permission.
 - © Environment Canada: Hailstones (Poster: inset 3; Teacher's Guide: front cover; pp. 1, 3, p. 5, top right, background). Used with permission.
 - © Robert Moore, June 22, 2007: Elie Tornado (Poster: inset 1; Teacher's Guide: front cover, pp. 1, 3, p. 7, top right, background). Used with permission.
 - © jschlade, January 30, 2007: Clouds Route 1.jpg (Poster: inset 2; Teacher's Guide: front cover, pp. 1, 3, p. 6, top right, background). Creative Commons (CC) licence.
 - © paperandglue /Jenny, April 12, 2009: Signage (Poster: bottom; Teacher's Guide: front cover, pp. 1, 3, p. 4, top left, background). CC licence.
- Page 2 © Warren Tyrer, May 20, 2009: Lightning over Table Mountain (p. 2). CC licence.
- Page 4 © paperandglue/Jenny, April 12, 2009: Signage (p. 4, top left, background). CC licence.
 © Loozrboy, June 28, 2009: Legislature (p. 4, centre left). CC licence.
 © Environment Canada: Flood (p. 4, all photos except top and centre left and background). Used with permission.
- Page 5 © Environment Canada: Hailstones (p. 5, top right). Used with permission.
 © Mrelia, March 25, 2009: Hail Stone (p. 5, centre right). CC licence.
 © Northfielder/Steve Moses, April 25, 2009: Hail Storm 012 (p. 5, bottom left). CC licence.
 © Northfield.org, August 24, 2006: Orchard Street Hail 10.JPG (p. 5, bottom right). CC licence.
- Page 6 © jschlade, January 30, 2007: Clouds Route 1.jpg (p. 6, top right, background). CC licence.
 © Quiplash!/Ryan Schultz, July 7, 2005: Sunrise after the Storm, July 7th, 5:00 a.m. (p. 6, bottom left). CC licence.
 © accent on eclectic/Patrick Feller, September 7, 2009: Funnel Cloud, East of Downtown Houston, Texas 0906091602 (p. 6, bottom, second from left). CC licence.
 © Nicholas_T, March 29, 2009: Pouchy (2) (p. 6, bottom, second from right; p. 24; pp. 17, 18, 19, 20, background). CC licence.
 © tlindenbaum/Tim, September 20, 2008: Birth of an Illinois Storm Part II (p. 6, bottom right). CC licence.
- Page 7 © Robert Moore, June 22, 2007: Elie Tornado (p. 7, top right, background).
 © kjtittle84, July 6, 2001: Myrtle Beach Tornado (p. 7, bottom left). CC licence.
 © Librarian by Day/Bobbi Newman, August 24, 2008: Tornado in Parker Colorado (p. 7, bottom centre). CC licence.
 © Environment Canada: Tornado (p. 7, bottom right). Used with permission.
- Page 8 © Jordon/Jordan Cooper, April 18, 2003: Tornado in Outlook, Saskatchewan (p. 8; p. 9, background). CC licence.
- Page 9 © Quiplash!/Ryan Schultz July 9, 2005: Winnipeg Folk Festival: Friday Sunset (p. 9, bottom left). CC licence.
 © sparty lea, July 23, 2007: Stormy Monday (p. 9, bottom right). CC licence.
- Page 10 © Environment Canada: Tornado (p. 10). Used with permission.
- Page 12 © Environment Canada: Flood (p. 12, bottom left). Used with permission.
 © Steve took it/ Steve Wall, July 19, 2009: Harry Potter Clouds (p. 12, bottom right). CC licence.
- Page 17 © umbrau44, April 15, 2009: Red River Flood 2009 (p. 17, bottom). CC licence.
- Page 21 © tlindenbaum/Tim, November 10, 2007: A Shed, a Cloud, a Rainbow (p. 21, background). CC licence.

