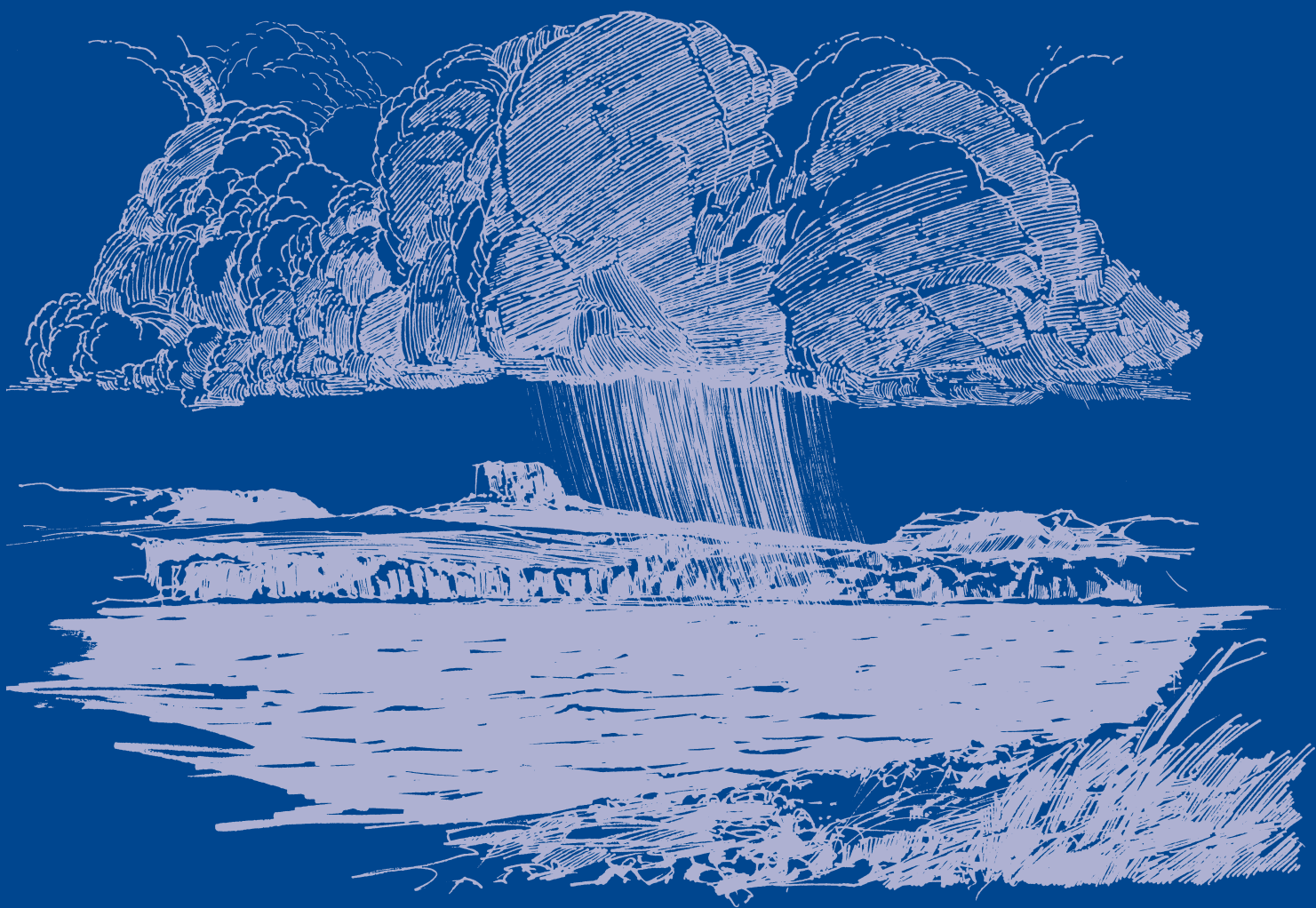


PARKS AND PROTECTED AREAS

Weather Watch: The Living Systems



This publication is part of a series of field study programs produced through the Environmental Education Program of Alberta Community Development in Kananaskis Country and Fish Creek Provincial Park. Funding for this publication has been provided by the Alberta Sport, Recreation, Parks & Wildlife Foundation in cooperation with the Friends of Kananaskis Country. The publications have been written to address the mandate of Alberta Community Development and increase students' environmental awareness, understanding, interaction, and responsibility for the natural world in which they live.

The publications are produced by environmental education staff in a close working relationship with teachers, community educators, Parks & Protected Areas staff, and program writers. Programs focus on the areas of environmental education, science, social studies, and language arts, and emphasize elements of environmental understanding, lifestyle, and citizenship.

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Or visit us on the World Wide Web:
www.cd.gov.ab.ca/parks/kananaskis

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Kananaskis Country Environmental Education Series
Wetlands: A Field Study

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The Big Picture

Field Studies in Protected Areas

Protected areas are legislated lands that have varying degrees of protection, based upon the uniqueness of the areas, their diversity, traditional uses and natural features. Field studies in protected areas offer a unique series of educational opportunities, allowing visitors to study and appreciate natural communities and systems over many years of change.

By recognizing the diversity and beauty of these lands, visitors can develop a sense of stewardship and an appreciation for their continued existence. The actions and attitudes developed in the exploration of protected areas can also influence the decisions we make as a society about land use and conserving other lands outside of protected areas.

Why Study Weather and Climate?

Ralph Waldo Emerson once said “the sky is the daily bread of the eyes”. It is certainly true, for there is a changing and mysterious drama that unfolds in our atmosphere every day. If we take the time to notice, the weather offers us one of the most accessible windows on the natural environment. Observing clouds, listening to the wind, feeling the changes in temperature and moisture in the air - these experiences connect us with some of the most powerful rhythms of life.

When weather patterns are averaged over time, a distinct climate begins to develop. In Alberta, there are six climatic zones, reflecting six distinct natural regions: the dry and warm Grassland; the cold and wet Boreal Forest; the windswept alpine of the Rocky Mountain region; the rolling terrain of the Foothills; the varied vegetation of The Parkland; and the ancient Canadian Shield region. The differences in climate within each of these natural regions have created very different conditions for life. Weather and climate are inextricably linked to vegetation and wildlife.



“Life in Alberta is composed of nine months of winter and three months of poor skiing!”

- author unknown

This field study unit is intended to help your students see weather and climate through new eyes. It complements the grade five Weather Watchers unit of the Alberta Program of Studies, and also connects to other disciplines and program areas.

The essence of this guide is a one-day outdoor field study. Its main emphasis is on experience - observing, sensing, exploring, and reflecting on the influence weather and climate have on the environment. To support this field experience we have included background information and classroom activities supporting the outdoor experience. At the conclusion of this booklet is an appendix of support materials and additional resources.



The Advantages of a Field Study

"The average (North) American child seldom comes into direct contact with nature. In school he/she learns a few dates from books, to press a button, to step on an accelerator; but is still in danger of losing contact with primitive realities -- with the world, with the space about us, with fields, and with the problems of getting shelter and of obtaining food that have always conditioned life and that still do." (John Dewey)

We don't have to solve problems with our students of "getting shelter" and "obtaining food", but still the realities of our world extend far beyond the walls of the classroom. Canadians spend an average of less than five per cent of their lives in natural settings. And yet, in order to truly learn about life, students need opportunities to directly experience the excitement, wonder, and mystery of the natural world. There are great lessons to be learned through direct contact with natural communities and processes.

To a great extent we see the natural environment as disconnected from ourselves, something to be overcome or exploited. The planet is suffering as a result of this. One way of rekindling our relationship with the natural world is by allowing the outdoor environment to become an extension of the classroom. If students have direct, positive experiences in natural settings, not only will their knowledge levels change, but also their attitudes and hopefully their behaviour as well. By feeling that the natural world is familiar, and not separate from them, they will be more likely to treat it with respect and care.

It is important to understand that you don't have to be an expert in natural history or environmental issues to lead a successful field study. Facts and scientific knowledge are less important than the attitudes you, as a teacher, carry with you. One of the most important parts you play in a student's life is that of a role model. Your students will remember you for who you are and how you act, not only for what you have told them.

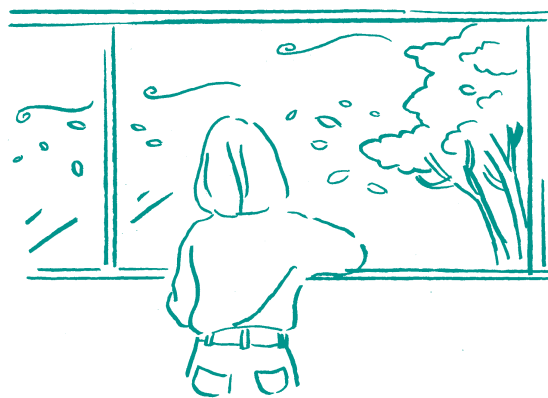


"The sun, with all those planets revolving around it, can still ripen a bunch of grapes as if it had nothing else in the universe to do."

Galileo

So... relax. The goal is not necessarily to find all the answers, but to know which questions to ask. Remember that each student in your class brings something special and unique to each learning experience. You will be giving your students a life-long gift if you can open their eyes to the wonders of the natural world and inspire them to act on their curiosity to learn more.

(For more information on conducting field studies, contact Kananaskis Country for a copy of A Guide to Planning Successful Field Studies.)



Kananaskis Country Environmental Education Program
Weather Watch: The Living Systems

At a Glance

Topic

Weather and its relationship to natural areas, plants, and animals.

Program Level

This booklet has been designed to be used by any Alberta Elementary teacher as a field study component of Grade 5 Science, Topic D: Weather Watch.

Note: This program can also be adapted to teach some components of Grade 4 Science, Topic E: Plant Growth and Change Unit and Division III science and geography.

Time Required

Pre-Field Study: 5 hours

Field Study: Full day (approximately 7 hours)

Post-Field Study: 5 hours

Staff Requirements for Field Study

One teacher, plus one volunteer for each group of five students.

Best Season for Field Study

Spring, summer, or fall is ideal.

Suggested Locations

Large natural area such as a provincial protected area, large municipal park, or natural area near your school



The Chicago Tribune reported that one of the hottest leisure activities in Asia are frigid warehouses called snow gardens. In sweltering Malaysia, Taiwan and Hong Kong - local residents pay \$16 each for the privilege of getting cold and playing in snow that falls from the roof!



Curriculum Tie-Ins

Science: Topic D - Weather Watch

Students will be able to:

- Predict where, within a given indoor or outdoor environment, one is likely to find the warmest and coolest temperatures.
- Describe patterns of air movement, in indoor and outdoor environments, that result when one area is warm and another area is cool.
- Describe evidence that air contains moisture and dew and other forms of precipitation that come from moisture in the air.
- Identify some common types of clouds, and relate them to weather patterns.
- Describe the effects of the Sun's energy on daily and seasonal changes in temperature - 24 hour and yearly cycles of change.
- Recognize that weather systems are generated because different surfaces on the face of the Earth retain and release heat at different rates.
- Understand that climate refers to long-term weather trends in a particular region and that climate varies throughout the world.
- Appreciate how important it is to be able to forecast weather and to have suitable clothing or shelter to endure various types of weather.



Did you know...
Medicine Hat, AB, has the
greatest number of hours
of sunshine per year in
Canada with 2,433?

Social Studies: Topic A - Mapping

- Study colour contour and visual relief maps, and visualize the nature of the areas shown.
- Organize information using different types of charts or graphs.

Language Arts

- Formulating hypothesis.
- Posing questions to organize investigations.

Art

- Demonstrate an ability to express through images.

Drama

- Develop an ability to discuss and share experiences.
- Recognize using the body and voice as communication tools.

Physical Education

- Experience success and enjoyment through participation in outdoor activities.
- Understand the use of clothing and footwear appropriate to outdoor activities.



Pre-Field Study Activities

The following activities to be conducted in or around your school, are intended as a preparation for the outdoor field study. The first two activities not only introduce the topic, but are also ongoing throughout the unit.

Tracking the Weather

Objective

Students will observe, predict, and analyze weather on a daily basis through journal-writing exercises.

Materials

- Notebooks and pencils.
- Handout entitled Daily Journal Entries (end of activity).

Time Required

One hour for *Once Upon A Weather Story*

Approximately 20 minutes/day for daily journal entries (homework)

Background

There is no better way to begin understanding the weather than through observing it on a daily basis. Journal-writing is a good way to encourage this. Pass journals out at the beginning of the unit. Give clear instructions for what is expected in terms of weather recording, but also make it clear that, as in any journal-writing exercise, this is an opportunity for personal expression. Students should feel free to express themselves through drawing, poetry, stories - to be limited only by their imaginations. However, it is important that you tell students beforehand that their journals will be handed in for review at the end of the unit so they are not surprised or embarrassed to learn that someone else will be seeing their work. As a guideline, have the students divide their work in the journals between the front and the back page; research will be written in the front, while personal reflections are on the back pages. Only the front pages will be evaluated.



In 1996, ungulates (hooved wildlife) in Alberta began to feed on the hay in farmers' fields as a result of the deep snow of that winter. To avoid the depletion of the farmers' livestock feed, the Alberta Government began an "intercept feeding" program for the animals. Fish and Wildlife officials determined the locations where wildlife would travel to get at livestock feed, and intercepted them by leaving another food source along the way. It is estimated that the Alberta Government spent \$1 million to help feed deer, elk and moose over the course of that harsh winter.



Instructions

1. Journal Entry #1:

“Once Upon a Weather Story”

The first journal exercise is an introduction to the powerful effect weather can have on our lives. Students are asked to write a short story (one or two paragraphs) describing their most memorable weather experience. Then have them read their stories aloud to others in class, followed up with a class discussion on the different influences weather has on our lives. How does weather affect our recreational activities, agriculture, forestry, transportation, communications, or health?

Also in this introductory session, you might suggest that your students create an interesting cover page for their journals, with a title and illustrations.

2. Daily Entries

The main and ongoing function for your students' journals is to provide a record of the daily weather, throughout the duration of the unit. At the end of this activity you will find a handout entitled **Daily Journal Entries**. Pass this out to students to serve as a template for their records.

Take your students outside with the **Daily Journal Entries** handout and their journals so they can go through the process of making their first journal entry. This will allow them to get an idea of what will be needed and how they should record information.

Daily weather observations can be conducted in the morning before school or during the first period. Short descriptive phrases can be given to record observations of sky and cloud cover, precipitation, wind, temperature, and humidity. (Note: These are intentionally NOT measured observations using weather instruments. If these measurements are required for other aspects of your study, select an individual student to record this data.)



February 3, 1947, was the coldest day ever recorded in North American history at Snag, Yukon. The temperature was -63 Celcius. It was so cold that axes bounced off ice, metal broke in half, wood became petrified and rubber was the hardness of concrete.

The focus of this activity is to encourage students to begin sensing the oftentimes subtle differences in day to day weather - to raise their level of sensory awareness. Students can be asked as a class to develop symbols as “shorthand” for their observations. (See examples on Daily Journal Entries handout sheet). Drawings or photographs can also be encouraged.

Following their observational descriptions, students can be asked to make predictions of the weather for the remainder of the day and into the next day. Will it rain? Will the temperature go up or down? Will the winds pick up? and so on. An evening review, at home, of predictions can be made, based upon the day's occurrences and evening weather reports.

The final entry each day will be an analysis of how closely their predictions matched the day's actual weather conditions; and whether they would adjust their predictions for the next day.

* Please note: The identification of clouds has not been included. Please consult your curriculum guide or teaching resource manual for this material. There are also many resources available on the Internet. Visit some of the websites listed on p. 61.



3. During the Field Study:

Students will be requested to bring their journals on the day of the field study. A number of the activities will direct students to record their observations and findings in the journal.

4. After the Field Study:

One of the final activities in the unit (after the field study) is a review of all their daily journal entries. This activity leads to an open class discussion on the changes, if any, that students noticed in their observational and prediction abilities.



February 1875, Richard Newitt, the first surgeon in Fort McLeod, described a chinook in Lethbridge. "In the morning, it was still cold with about 15 cm of snow on the ground. Around 4:30, a strong wind from the west arrived and in 9 minutes the temperature had risen 20 degrees Celcius from -15 to +5!"



Daily Journal Entries Handout

Your journal will be a daily record of your weather observations. The idea is to work on your powers of observation and description. Every day, make notes about the weather based on what you see and feel, following the instructions below. Feel free to take photographs, make drawings, or add any of your own creative interpretations of the weather. Remember, this is YOUR journal. (Journals will be handed in to your teacher for review at the end of the unit.)

In the Morning-Weather Observations:

Use symbols and short descriptive sentences to record the following:

1. Cloud Cover:

How much of the sky is covered in clouds?
Use the symbols on the left of this page to represent the amount.

2. Types of Clouds:

What do the clouds look like? Describe them and use the symbols on the left of this page to represent them.

3. Precipitation:

Is it raining? Snowing? Hailing? Record what kind of precipitation is happening and develop a symbol to represent it.

4. Temperature:

Without using a thermometer, describe the temperature of the air in relation to how it usually feels at this time of year.

5. Humidity:

Describe how the air feels. Is it dry, sticky, damp, muggy or moist?

6. Wind Speed and Direction:

Describe how strong the wind is and develop a symbol for representing its speed. Use a compass or ask a parent or friend to tell you where the direction North is. Make a note about which direction the wind is coming from.

In the Morning-Your Weather Prediction:

After you have recorded all your weather observations, make a prediction about how, or if, the weather will change. Will it rain? Will it clear up? Will everything stay the same? Will the winds get stronger? Write one or two short sentences with your prediction for what the weather will do for the rest of the day and for the next day.

At the End of the Day... How Did You Do?

At the end of the day, listen to the weather report on the news. Compare the meteorologist's report and forecast with your own. Look again at your predictions for the next day. Would you make any changes? (Remember, the weather reporter doesn't always get it right!)



Sky Cover Symbols

○ No clouds	⊖ 5/8
⦿ 1/8 or less	⦿ 6/8
◐ 2/8	◑ 7/8
◒ 3/8	● 8/8 overcast
◓ 4/8	⊗ sky obscured

Major Cloud Type Symbols

High clouds (base above 6000m)

	Thin Cirrus
	Thick Cirrus
	Tufted Cirrus
	Cirrus
	Cirro-stratus
	Cirro-cumulus

Middle Clouds- base between 2000-6000m

	Thin Alto-stratus
	Alto-cumulus
	Alto-cumulus (small patches)
	Alto-cumulus in bands
	Alto-cumulus & Alto-stratus

Low Clouds- base below 2000-6000m

	Fair Weather Cumulus
	Swelling Cumulus
	Cumulo-Nimbus
	Cumulus flattened to Strato-cumulus
	Strato-cumulus
	Strato Fractus or Cumulus Fractus

Weather in the News



Which of the following media personalities did not begin their career as a weather broadcaster:

- a.) CBC's Shelagh Rodger's
- b.) Hockey Night in Canada's Ron MacLean
- c.) Mr. Dress Up, Ernie Coombs
- d.) CBC's Knowlton Nash
- e.) David Letterman

Answer: c.) Mr. Dress Up

Objective

Students review, select, and report upon weather news stories from a variety of media sources.

Materials

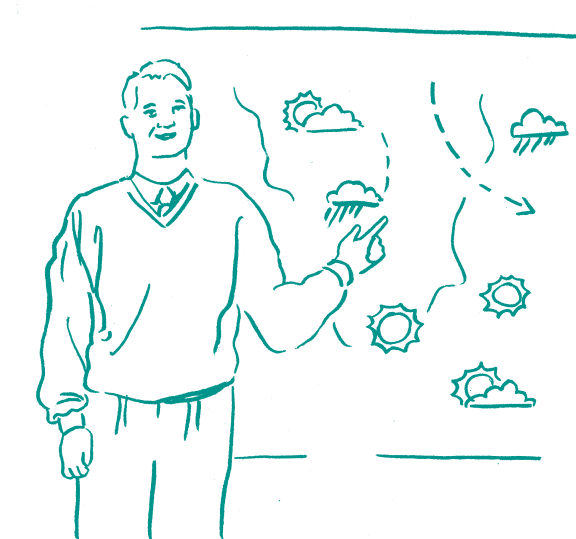
- Bulletin board or wall
- Banner with heading **Weather in the News**
(Students could make this.)

Time Required

20 minutes for introduction; 20 minutes/day for verbal reports

Background

Weather is always in the news. Locally, regionally, nationally, and internationally - it is often in the headlines either because of severe storms, or disasters caused by weather-related phenomena, or climate change news. Because it is a topic of great interest, it provides an excellent opportunity for your students to research and explore a variety of media resources. Newspapers, magazines, the Internet -- students are given the challenge of reporting to the class about weather news findings, and then posting their articles in a collage format in the classroom.



Instructions

1. Divide the class into groups of four or five students each. Every day, from the beginning of the unit until the end, ask a different group to bring in and report upon four or five weather news stories (ie, each student finds one story). Encourage them to search for news from a variety of media sources including newspapers, magazines, the Internet, television and radio. If non-print media is the source, request that students write out the story. Have students bring the complete story to class, and also write out a one-paragraph summary of the main points covered and this summary will serve as their posted report.
2. On their assigned day, each group presents their top news stories in the style of a meteorology news report. One student introduces the full report with "And now, our top weather stories of the day...". Each person then provides their short synopsis, followed by, "Over to you, (Bob)" to introduce the next meteorologist. It is important that you stress to your students that, as television reporters, they must present their report clearly and in as interesting a way as possible. This should also be stressed in terms of how they write their summary - a selection of the most important and interesting facts.
3. After the group has finished their report, they can post their stories under the banner "Weather in the News". You could also extend the activity by having students make illustrations for their stories or bring in pictures to add to the collage.



Brain “Storming” the Weather

This is an introductory activity that helps students appreciate the many facets of weather. Individually and as a class, students identify and categorize weather-related terms. Follow-up discussion deals with questions of how we define weather, how weather differs from climate, and some of the different ways in which weather affects life on Earth.

Objective

Students will identify a variety of weather words through a brainstorming activity; students can appreciate the distinction between weather and climate.

Materials

- Paper and pencils.
- Blackboard and chalk.

Time Required

One hour



On April 27th, 1903, 76 people died tragically in the southwestern Alberta Town of Frank when an entire slope of Turtle Mountain gave way and buried the community. The limestone debris covered homes in the valley below under 100's of metres of rock. Weather conditions may have contributed to the tragedy as 3 days earlier, 14 cm of snow had fallen and the temperature plunged from 22 degrees to -9 degrees.

Background

The term weather is used to describe the day-to-day changes that occur in the thin envelope of air called the atmosphere, which surrounds the Earth. Weather results from the combined elements of air, water, sun and earth. Essentially, the sun heats up air and water and circulates it in ever-changing patterns over the land and oceans. Variations occur in temperature, humidity, cloud cover, wind, and precipitation. Living things on the planet experience heat, cold, wind, dryness, moisture, storms, and calm. Weather has a profound effect on the lives of plants and animals, including ourselves.

Climate is a term used to describe long-term weather patterns. Simply put, the climate of an area is an averaging of all the weather variables for a particular area. Climate also changes, but generally over much longer periods of time.

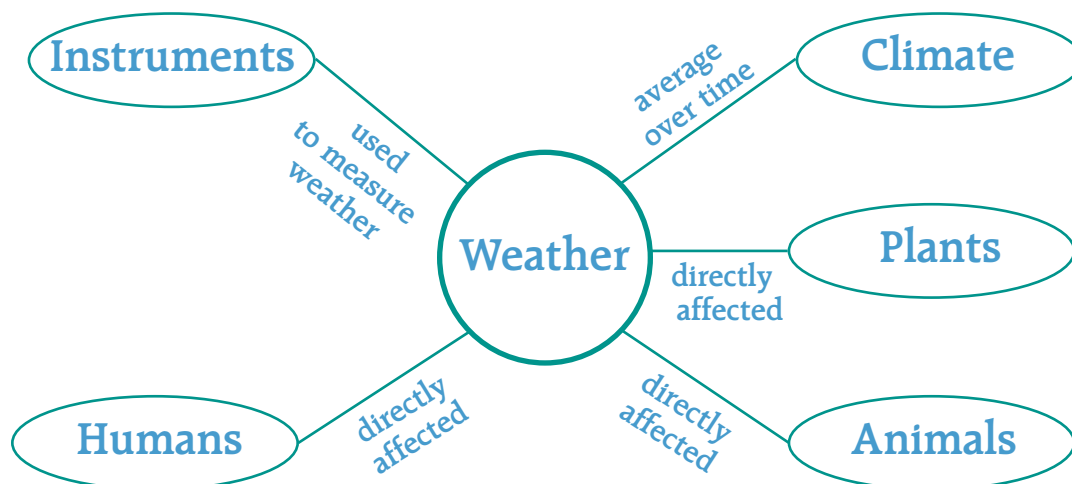


Instructions

1. On a blank piece of paper, students print the alphabet from A to Z along the left side of the page. Allow ten to fifteen minutes for them to write down weather-related words beginning with each letter. (If they finish early, suggest they write down more than one word per letter.) Emphasize that the point of this activity is to define weather as broadly as possible and to select words that relate to weather either directly or indirectly. They can use nouns, verbs, or adjectives (for example: atmosphere, blowing, cloud). A list of some weather-related words is provided at the end of this activity.
2. Once their lists are completed, direct their attention to the blackboard. Draw a circle with the word WEATHER in the middle. Tell the class that together they are going to create a weather word map. Ask students to look at their lists and, through a class discussion, identify different ways of categorizing and dividing up their words. (Examples might be: unusual weather; weather instruments; weather patterns; weather and animals; weather and plants; effects of weather; people and weather; long term weather/climate, etc.).
3. Write these headings on the board as spokes extending out from the centre circle. Identify what forms the link between the topic and the heading (ie, if there was a link with climate then the link would be that climate is the averaging of weather over time). Ask students to add their words under each heading, beginning with the words that begin with 'A', until you start to build up a significant number of words overall. (Don't collect ALL words -- you'll be there all day. The idea is to begin to paint a picture with broad brush strokes of what is meant when we talk about the weather.)
4. After about 20 minutes, stop listing words and ask the class to look at what's there. Lead into a class discussion: What do these words tell us about weather? What influence does weather have on our lives, and on other living things? What is the difference between weather and climate?



In 1943, during the Second World War, both the Canadian and United States Governments banned publishing or broadcasting weather information for fear of their enemies using it to plot an attack. During a particularly rainy baseball game, sportscaster suggested listeners look out their window if they wondered why the game was delayed.



Some Weather Words

Abiotic - something that is non-living (rocks, water, temperature, air, sunlight).

Atmosphere - the mass of air held close to the Earth by gravity.

Biotic - something that is living (dog, bird, human, tree, grass).

Blizzard - a severe storm characterized by low temperatures, strong winds, and blowing snow.

Chinook - a warm dry wind that descends from the eastern slopes of the Rocky Mountains, causing a rapid rise in temperature.

Cirrus - a high altitude and patchy cloud found at altitudes of 6 kilometres or higher.

Climate - the characteristic weather conditions that prevail in a particular place or region.

Cumulo-Nimbus - an large anvil shaped cloud that usually indicates heavy rain and thunderstorms.

Dew - water vapour which condenses into droplets as the warm moist air near the ground cools at night.

Estivate - to spend hot periods in an inactive and dormant state.

Forecast - a description of weather conditions expected during the current and following days.

Front - the boundary between two different air masses.

Gale - a strong wind.

Hail - precipitation in the form of pellets of ice-hard snow, associated with thunderstorms.

Hibernate - to spend cold periods in an inactive and dormant state

Hoar Frost - frozen dew that forms a white coating on surfaces.

Humidity - a measure of the amount of water vapour in the air expressed as a percentage.

Meteorologist - a scientist who studies weather and weather conditions.

Meteorology - the science dealing with the phenomena of the atmosphere, specifically weather and weather conditions.

Micro-Climate - the climate of a specific small area, as contrasted with the general climate of the area.

Migrate - moving seasonally from one region or climate to another.

Natural Regions / Sub-Regions -

an area that shares the same basic living conditions, eg. geology, landscape, climate, soils, vegetation, and wildlife.

Sub-regions are smaller units within each natural region, classified on the basis of specific natural characteristics.

Nimbus - a uniformly gray rain cloud that covers the sky.

Nival - describes something that grows under the snow.

Phenology - the study of periodic or seasonal biological phenomena related to climate, such as flowering, breeding, and migration.

Prevailing Winds - the wind direction most frequently observed during a given period.

Stratus - a low altitude cloud often resembling a horizontal layer of fog.

Weather - the state of the atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness; measured in terms of temperature, pressure, humidity, cloud cover, wind, precipitation and fog.



In June, 1996, a Calgary student missed her exams when lightening struck within a few cm of her. Just after 5 a.m., as a storm thundered across the city, a bolt of lightening entered her bedroom, scorched some furniture, tore a hole in the roof, and set her bed ablaze. The girl escaped with only minor burns to her elbow and hand.



Weather Fact or Fiction



Legend has it that if a famous weather forecasting groundhog sees his shadow on February 2nd, we can expect another 6 weeks of winter. If he doesn't, spring is just around the corner. Some of the more famous groundhogs who have this forecasting talent are Manitoba's Merv, Alberta's Balzac Billy, and of course Punxsutawney Phil in the United States.

Objective

Students create their own weather folklore based upon weather patterns within their natural region.

Materials

- Paper (could be journals), and pencils.
- Maps of the Natural Regions and Urban Areas of Alberta (Appendix) prepared as an overhead.
- Banner with the heading **Our Natural Regions - A Study**.

• Optional:

Natural Regions, Subregions and Natural History Themes of Alberta: A Classification for Protected Areas Management. (1994)

Alberta Environment Information Centre
Ph: (403) 422-2079.

Time Required

One and a half hours

Background

The first part of this activity begins with a look at some popular weather folklore sayings, serving as an introduction to the idea that, throughout the ages, people have been observing and drawing conclusions about the weather.

The second half of the activity continues along this vein - discussions of local weather and climatic conditions. Using a map of the natural regions of Alberta, students identify which region they live in, and then review some of the climatic details related to that natural region. Using key words from the climate description, as well as individual observations about weather patterns, students invent their own "folklore" expressions to illustrate local weather patterns.

Instructions

1. Begin this lesson with a class discussion about folklore. Are they always true? How were stories passed from generation to generation before t.v.'s, radios, newspapers, or the Internet? Why would weather be an important theme in folklore?
2. Write down on the blackboard any expressions or folklore beliefs about weather that students can think of. Here are a few examples:
 - "Red sky at night, sailor's delight; red sky in the morning, sailors take warning";
 - "When the wind is in the east, 'tis neither good for man nor beast; when the wind is in the west, then the wind is at its best";
 - "Aches and pain, coming rain";
 - "When the dew is on the grass, rain will never come to pass."
 - *Other weather folklore such as Groundhog Day; robins as a sign of spring, or raining cats and dogs.*
3. Use these folklore sayings as a basis for a class discussion. What were these sayings based upon? (Your students should begin to appreciate that these ideas, whether or not they were true, were based on peoples' observations of locally occurring events or cycles in their natural world.)



4. Next, ask the class to think about some of the distinctive weather patterns and cycles in their area. (They might suggest things like chinooks, dust storms, summer thunderstorms, hail, hoar frost, strong winds, snow in the mountains in July; or the appearance of different plants or animals marking a shift in the weather). It is not important that students have names for whatever they suggest - it is only important that their suggestions are based on their life experiences and observations.
5. Since folklore develops at a local level, the next step is for students to learn something more about the natural area in which they live. On an overhead transparency, show a Map of the Natural Regions of Alberta alongside an urban areas map of the province (both in Appendix). Ask students to identify what natural region they live in. Read out loud the description of the climate for that region (located in bottom left corner of the maps) and have students determine what some of the key descriptive words are. Write these on the board, alongside the students' earlier observations.

6. Now it's time to put it all together. Tell your students that their job is to design a folklore expression or rhyme or idea which includes the name of their natural region and explains one or more of the weather patterns or descriptive words identified on the blackboard. Encourage creativity here; you could suggest that they add a visual element to accompany their writing. Allow time for at least some of the work to be read out loud in front of the class.
7. Place their finished expressions under the banner **Our Natural Regions - A Study**. Information on other activities can also be displayed here, resulting in a collage of research, knowledge, and connections to the place students call home.



March 11, 1997 was election day in Alberta and a winter storm caused terrible driving conditions that led to 165 province-wide accidents on a single day. Blowing snow, bad roads and freezing temperatures kept many Alberta voters away from the polling stations.



Mapping Plants

In this teacher-directed activity, students choose three plants and research the abiotic requirements for each one. As the teacher explains the climate of each of Alberta's Natural Regions, students determine if their plants can be found in any of these landscapes. The concluding discussion focuses on the relationship of the climatic and environmental factors with the six distinct natural regions.

Objective

Students examine the relationships of a number of different climatic and environmental factors in defining natural regions.

Materials

- Overhead projector
 - Map of the Natural Regions of Alberta (see Appendix) and printed onto clear overhead sheet
 - Class set of standard Canadian school atlases
 - Blank map of Alberta
 - Field Guide to plants of Alberta
- Suggested resources:
Plants of the Western Boreal Forest
and Aspen Parkland (Johnson, Et al)
Plants of the Rocky Mountains
(Kershaw, Mackinnon, Pojar)

Time Required

Two classroom periods of 40 minutes

Instructions

First Class

1. Begin with a general class discussion on the concept of natural regions. (This continues from the Weather Fact or Fiction use of the Alberta natural regions map.) Why do students think that there are six different regions in the province? How are these regions different from one another? What factors make them distinctive? Are the plants and animals the same from one region to another? Why or why not? (Students can begin to consider abiotic factors such as elevation, temperature, precipitation, frost free period, and winds).
2. Assign each student to choose three (3) plants and use field guides or other resources to determine the abiotic factors for each one. The students can choose any plants they wish, as the point of the exercise is to determine the abiotic requirements of plant species relative to climate. Once the students have three plants (eg. palm tree, raspberry plant, and wild rose) have them use the school atlases and determine the following abiotic requirements for each:
 - Elevation
 - Temperature
 - Precipitation
 - Frost Free Period
 - Winds
3. If the students have not completed their lists, assign them for homework.



In March 1996, unseasonably warm temperatures resulted in melting ice and snow in southern Alberta and Saskatchewan. In Cochrane, Alberta, drinking water had to be boiled when muddy run-off contaminated the water supply.



Second Class

4. Ask the students to select one of their plants and follow along as you lead the discussion.
5. Using the overhead projector, lead the class through a discussion on each of the Natural Regions of Alberta (see appendix). As each of the Natural Regions Maps are placed on the overhead - refer to the abiotic factors indicated on each one. Ask students to volunteer their selected plant species and decide if the abiotic requirements of that particular plant match with the climate of each natural region.
6. Make a list of those plants which can grow in Alberta.
7. Place a large outline of the Province of Alberta divided into each of the Natural Regions at the front of the class. Ask the students to come forward and indicate where their plants can be found.
8. How does the location of different plants tell students about the make-up of a natural region? What is the relationship between the various factors in each natural region? What are the characteristics of the natural region? What do these maps tell us about the influence of climate on the environment? Can we draw any conclusions about ways in which plants and animals might be affected by the region in which they live?

At the end of the lesson, there should be a broad list of plants that can grow in Alberta's Natural Regions. Students will know where these species can grow and identify the limiting factors that determine their whereabouts.



Did you know...

The migration of Golden Eagles along the Eastern slopes of the Rocky Mountains from their summer range in Alaska down to the southern United States begins as early as September and goes as late as December. When flying conditions are perfect, the eagles have been known to travel 600 km in a single day!



Wildlife Charades

Objective

Students dramatize adaptations of wildlife species to various weather and climatic conditions; students also research the climatic needs of an animal living within their natural region.

Materials

- Wildlife Charades cards— on following pages (one per group of students)
- Journals
- Plants and Animals of Alberta's Natural Regions (see Appendix)

Time Required

One hour for activity, plus research time.

Background

Working in groups, students act out various wildlife species, as they are described on the Wildlife Charades cards. Each card provides a description of the animal, its setting, an overview of the type of climate it lives in, and the way(s) in which it has adapted to that climate. While one group acts out the animal, the rest of the class tries to guess its identity, the weather / climatic characteristics of where it lives, and its specific adaptation(s). After everyone has played, the animals are discussed in more detail. The activity is extended by students working in small groups, each group researching one animal that lives in their natural region and its specific adaptations to the region. The group can develop their own wildlife cards so the class can play charades again, this time using the students' cards to guess from.

Instructions

1. Begin this activity with a general discussion about the needs of animals. Food, water, shelter and space vary from region to region around the world, even around this province. For this reason animals have developed specific adaptations, many of them specific to climatic and weather conditions.
2. Divide the class into groups of four to six students each. Assign each group a number. Pass out one Wildlife Charades card to each group. Explain that they will be acting out a particular animal in a particular setting and the other groups will have to try to guess what it is. Tell them that the first thing each group must do when it is their turn, is to read the piece on their card that says: "setting the scene". Students are not to read anything else on the card - that information is to help them play the charade. Members of the group will dramatize the environment and type of weather or climate described on their card. Once the scene is set, one of the members of the same group calls out "Action! Animal!". At this point the animal either enters the scene or comes to life within the scene.



A farmer near Rycroft, AB, awoke one morning to discover 32 hectares of his wheat field had mysteriously dropped 50 metres, creating a huge crater. Heavy rains had likely caused the lower layers of soil to slide into the adjacent Burnt river, allowing the top layer to slump. The crater was dry, and the wheat was still growing, but there was no way to bring a harvester down to the crop.



3. Give students 15 to 20 minutes to plan and rehearse their scenarios. Before they begin it is important that everyone be made aware of the scoring for the game (see below). There are points given to groups for correctly guessing the setting, the animal and its adaptations. Students should not shout out their answers, but just watch carefully what is going on, and take some notes in their journal. It is important that you make it clear that they do not have to know the animal's name - they can describe the animal and its adaptations instead.

After each dramatization, give groups about 5 minutes to discuss their ideas and come up with one group answer (written down in one of their journals). As the group's answers are announced, the students that put on the skit listens to each answer without comment until all the answers are in. They then read to everyone their wildlife and weather card, saving the animal's name for last. Scores are then awarded, as indicated below.

Scoring

- a) For groups that are guessing:
 - One point each for guessing the correct environmental conditions (type of setting/location, season, weather or climatic conditions).
 - One point for guessing the correct animal (or for describing what the animal looks like).
 - One point each for describing specific adaptations that allow that animal to live in its particular habitat.
- b) For groups that are dramatizing:
 - One point if other groups correctly guess the setting.
 - One point if other groups correctly guess the animal.

4. The groups then have a chance to discuss what was happening in each skit in more detail. How was the animal adapted to its climate? How was its food source affected by climate and weather? What strategies did it have for surviving in its environment?
5. The research component to this activity involves a preliminary discussion / review of the natural region in which students are located (see Appendix) Ask students to think of what kinds of wildlife live in their region. If necessary, refer to "Plants and Animals of Alberta's Natural Regions" in the appendix.

6. Divide students into small groups and ask each group to research one of these wildlife species, a different animal per group. They are to develop their own wildlife card, similar to the ones used in their charades game. In what kind of climate and environment does the animal live? In what ways is the animal adapted to its setting? How would this animal survive in the winter? How would it survive in a severe storm?
7. With the students' new wildlife cards, and experience in developing a skit, have students play the charades again. Add props or costumes and invite another class to play along.



Did you know...

It is not uncommon for bears to wake up during their winter sleep. During unseasonably warm conditions, bears have been observed emerging from their slumber for a walk around their denning area. Once the temperature becomes cool, the bears generally return to their dens and continue to sleep.



Wildlife Charades Cards

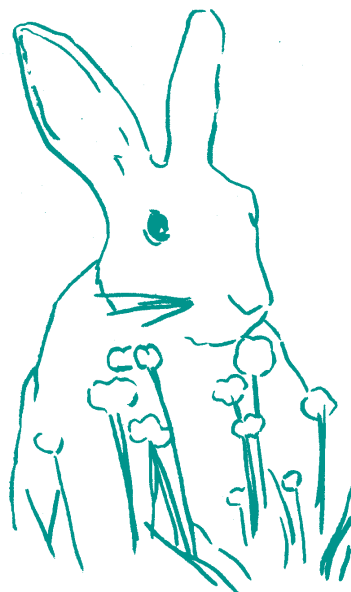


1. Snowshoe Hare

Setting the Scene:

Northern Boreal Forest in winter. Deep snow.

Camouflage and big feet are my best adaptations to life in a northern environment. I live in the boreal forest. During the summer my brown fur blends in perfectly with my surroundings. Then in late fall my fur turns completely white so I can blend in with my winter environment. I have large feet with spread-out toes covered with long stiff hairs and this allows me to travel easily on top of deep snow. There isn't much food available in wintertime in the boreal forest, but I can survive by eating the bark and twigs of trees. Sometimes you can see my tracks in the snow or markings on the sides of trees where I have been gnawing with my teeth.



2. Pika

Setting the Scene:

Rocky Mountains; rock pile den at the bottom of a mountain cliff. Late fall. Temperatures are getting colder and winter is approaching.

I am a kind of rodent but my ears and my body are much smaller than most rabbits. I make my home deep inside rock piles at the bottom of mountain cliffs. Because I live so high up, the temperature is cooler. By having a smaller body and ears, I conserve body heat because there is less surface area for it to escape. I also have long thick fur on my body and fur on the soles of my feet. However, the colder climate also means fewer sources of food. Since my small size doesn't allow me to develop enough fat reserves to hibernate, I have to find another way of surviving the long cold winter. I have to continue to eat.

My strategy is to store food in my den throughout the summer. Sometimes you will see bits of grass or flowers laid out on a rock. That's me drying my food to store for the winter.





3. Woodchuck

Setting the Scene:

Northern reaches of Aspen Parkland Region, a mix of open area and forest. A hot summer day.

I am the repairman of the animal world. I live in a constant state of home improvement. I dig extensive tunnels and burrows with several different entrances covered with fresh soil. I make my tunnels under the meadows or clearings so I can travel there safely and pop up for brief periods to feed on the lush green vegetation. These tunnels not only keep me safe from predators, but also help me avoid the intense summer heat and nasty weather. In August and September I am eating so much that I begin to collect fat on my body. By the time the first frosts arrive in October I have already sealed myself in my burrow for the long, cold winter.



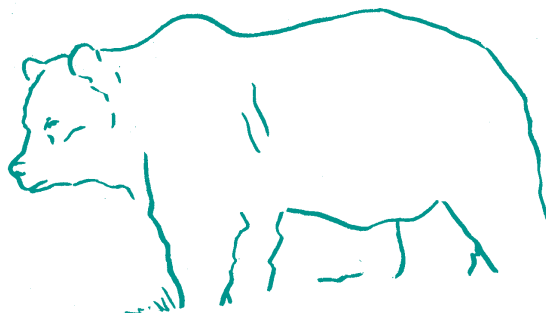
4. Grizzly Bear

Setting the Scene:

A den, on a sheltered slope in the mountains.
Progression from spring through fall.

I used to live in areas all across this province, but now I am mostly found only in the mountains and foothills of Alberta. In early spring I awake from my winter-long deep sleep or hibernation. (I lose almost a quarter of my body's weight while I'm sleeping in my winter den.) My search for high energy food is the most important thing at this time of year. I dig up roots and eat them. When the fresh green grass, flowers, and leaves begin to grow, I eat them. Later in the summer, when the berries ripen, I eat them. If I can find fish in the rivers, I eat them. Then in mid-November when the snow begins to fly I go back to my winter den in a sheltered slope in the

mountains where the snowdrifts will form and insulate my winter home from the cold weather and storms. That's where I stay all winter long. My heart rate and breathing slow down to conserve energy, and my thick fur and fat reserves help keep me warm.





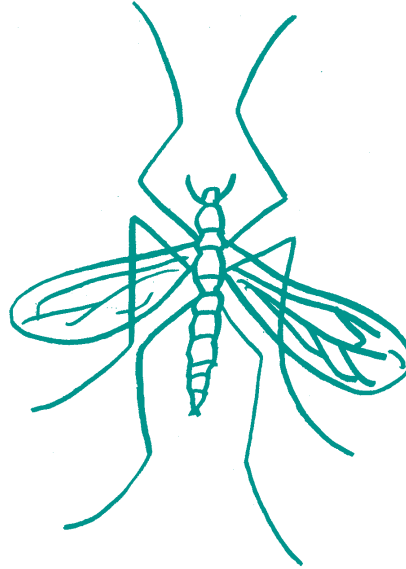
5. Mosquito

Setting the Scene:

A bog in the Northern Boreal Forest. Progression from spring through winter.

I begin my life as a tiny egg on the surface of boggy water in the boreal forest. Since the water is very shallow, it freezes in the winter. My egg survives the winter in the frozen water and in the spring when the water thaws, I hatch into a tiny swimming larva that begins life lying just under the surface of the water. I then change into a pupa which swims around the bog. Eventually I grow up to be a flying adult. When that happens you've got to be on the lookout for me. If I'm a female, I'm out for your blood! (Males are nice guys and don't bite.)

Unfortunately as an adult I can't survive the winter but, not to worry, because I have laid eggs and that will continue my cycle for many seasons to come.



6. Woodland Caribou

Setting the Scene:

The edges of the Boreal Forest. Fall, moving into winter.

I am well adapted to my life in the snowy north. My entire body is covered with hollow hairs which form an insulating layer between me and the cold weather. My wide feet allow me to walk on snow. In the summer I spend my time with the rest of the herd feeding on lichens, grasses and herbs in open alpine ridges and meadows where there is plenty of food to browse on. In the fall we travel towards forested areas where we can spend the winter feeding mainly on lichens that hang from spruce and fir trees above the snow-covered ground.



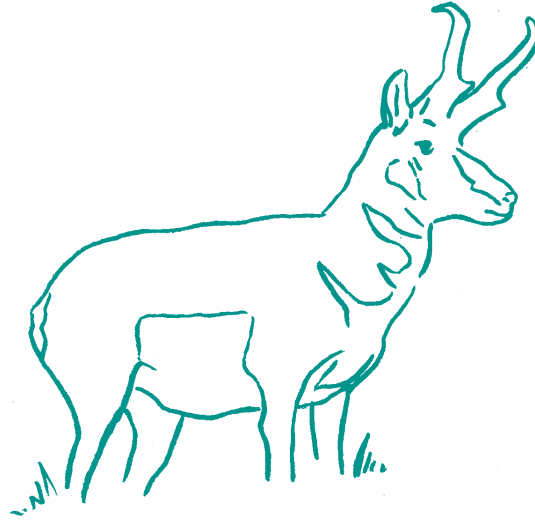


7. Pronghorn Antelope

Setting the Scene:

Dry prairie grasslands. Early winter, a big snowstorm.

I live in herds on the flat rolling prairies, feeding on shrubs, herbs and other plants. Since I live in the driest part of the prairies, getting water is one of my biggest challenges. One of my strategies is to eat the kinds of plants with leaves and stems which hold a lot of moisture. Also my light coat helps to reflect the sun so I don't get too hot, and I blend in well with the dusty brown colours of the grasslands. Another one of my strategies for survival is to be very fast - I can run up to 85 kilometres an hour to escape predators. I am not well adapted to snowy environments so in the winter I travel in herds, looking for exposed areas where the vegetation rises above the snow.



8. Mountain Goat

Setting the Scene:

Steep mountain ridge. Late winter, early spring.
Danger of avalanches.

I live year round on wind-blown snowy ridges and slopes in the rugged mountain environment. I have a well insulated coat which keeps me warm in the long cold winters. I am a browser – I eat twigs, buds and leaves from shrubs. In the winter my strong hooves allow me to paw through the snow to find food. One of the good things about living up here is that I don't need to worry much about predators. Even though I am a very agile climber one of my biggest dangers is slipping on icy cliffs or getting caught in an avalanche.



Create a Plant

Objective

Students demonstrate, through graphic and written form, the adaptations of plants to various climatic and weather conditions. Using the scripts for individual plants, groups create plants based upon the described characteristics, weather, climate and environmental factors. Students then compare their illustrations and adaptations with actual plants from the same environment.

Materials

- Role-play scripts - Plants and Weather (see following pages)
- Journals
- Flip chart paper
- Colouring pens
- Plants and Animals of Alberta's Natural Regions (see Appendix)

Time Required

One hour

Instructions

1. This activity begins with a general discussion on the needs of plants; how are plants affected by weather? Plants, like animals, are uniquely adapted to specific climatic conditions resulting from precipitation, temperature, and sunlight.
2. Ask students to imagine that they are a plant living in a very dry and hot climate. What would some of their biggest challenges be? What kinds of adaptations might they develop to cope with those challenges? What if they lived in a very wet climate with lots of rain? Or high winds? Or cold temperatures?
3. Divide the students into groups of 3 to 5. Give each group one of the plant scripts and a large sheet of flip chart paper and colouring pens. After they have reviewed the script, ask students to do the following;
 - Invent, create, imagine a plant living in the described location
 - What adaptations would the plant have to cope with the described environmental factors, the climate and their own reproduction?
 - Do a rough sketch on scrap paper, and draw the final product on the large flip chart paper. Colour and label the plant parts.



Did you know...

Despite the harsh weather conditions of the Rocky Mountain climate, there are some 1500 plant species, 211 species of birds and 44 species of fish that can be found in this region.



4. After completing the illustrations reassemble the class and display their drawings. Ask students to describe their drawings, noting the environmental factors, climatic conditions and adaptations they imagined their plant would require to survive and reproduce.
5. What kind of weather and climate challenges do plants face in each natural region?

Ask students to review the list of plants from the *Plants and Animals of Alberta's Natural Regions* handout. Have each group of students pick one plant from their own natural region and research how that plant is adapted to the climate and environmental factors of their region. Each student can research a different aspect of the plant's adaptive strategies; focusing on reproduction, physical structure, responses to precipitation, temperature and light. Students could present their results in a written format and place it on display for other students to read.

6. Optional Activity:
Prairie Plant Watch
In the *Supplementary Resources* section there is reference to a program called *Prairie Plant Watch*. Every year the University of Alberta monitors flowering times for key indicator plant species and electronically collects information from schools and volunteers. The web site provides an excellent introduction to plant phenology (the study of the seasonal timing of plant life cycles). If you are conducting your field study in the spring, *Plant Watch* could be a good supplement to this activity on weather and plants, to begin in the classroom and continue on the day of your field study. For more information, refer this web site:

<http://www.biology.ualberta.ca/devonian.hp/pwatch.htm>



As hardy as many of Alberta's plant species are against a wide variety of weather conditions, they cannot cope with being removed from their environment. Picking flowers is against the law in many of Alberta's Protected Areas - and for good reason. Some areas have millions of visitors, and if each one took home a bouquet of wildflowers, it would not be very long before there were few, if any, left. Picking delicate species like the Western Wood Lily and Lady Slipper has all but eliminated them from some areas of their former ranges. As a general rule, bring the eye to the flower, not the flower to the eye.



Role-Play Scripts: Plants and Weather



1. A Rocky Mountain Plant:

You are high on a mountain. It is very, very cold. You are way up on a rocky ridge, exposed to the wind. Feel the strength of the wind, trying to blow you off the mountain. To keep from blowing away, you have developed an amazing array of structures and behaviours. It is also dry up here, as the wind blows away any moisture that is exposed around you. Your roots grow to hold you down to the earth and help absorb any moisture that is there. Feel the wind blow you now. It blows and blows, but has little effect. Your ability to cling to life on the edge is truly amazing!

Now the wind dies down, and the sun shines its warm rays. Feel the heat. It becomes more and more intense. The heat brings a burning and drying sensation. You cannot afford to lose any of your precious moisture to evaporation.

Your leaves do their work well in such a harsh environment - they gather carbon dioxide, preserve moisture and produce glucose to fuel all your life processes. Your adaptations protect tender plant tissues from the heat and light. Just relax and enjoy the sun and that fresh mountain air!

Note: Good examples of alpine plants that demonstrate some interesting adaptations include: purple saxifrage, moss campion, alpine hawksbeard, shrubs of the heather family (yellow heather, white mountain heather, red heather), and white mountain avens.



2. A Bog Plant

You live in a bog - a very soggy place most of the time. Imagine that you are the cell of a plant living in that bog and it has just begun to rain. Gradually you can feel yourself getting filled up with water and you begin to expand, feeling larger and heavier with the increase in moisture. You are also taking in nutrients from the rain water - becoming so full it almost feels like you could explode!

Then... the rain stops and the sun comes out. As the heat of the sun warms you, you begin to lose (evaporate) some of that moisture. Very slowly, your cell begins to get smaller again, shrinking as you dry out. You continue to get smaller and smaller until it feels like you will dry out completely and disappear.

Soon a cold wind blows and it begins to snow. Winter is coming. Your bog begins to freeze!

You can feel the pressure inside your cell as the ice crystals form. The water inside you is turning to ice... and expanding. Again, you feel yourself getting bigger and bigger. It feels like you are being stretched as the ice crystals push outwards. You are afraid you are going to crack!

Ah, at last, spring thaw is here! Your ice crystals begin to melt and your cell shrinks back, slowly, until you are once again resting in the comfort of your bog, surrounded by many other plants who share your home.

Note: Bog plants, such as sphagnum moss - grow in dense thick carpets on boggy ground. Their bodies contain large hollow cells and this allows them to survive freezing temperatures, immersion in standing water, and avoid becoming completely dried out. Sphagnum moss can hold 20 times its weight in water during the spring thaw and rains.





3. A Grassland Plant

You live in the driest part of the province - the grasslands. You look around and for as far as you can see you are surrounded by grasses, and the occasional shrub. Some of the other plants are shorter, some are taller. Feel the wind blow you. The other grasses protect you from being blown around too much. Together you sway with the wind in a beautiful dance.

But it is very dry. It has not rained in weeks. Your roots search for precious life-giving water and are adapted to store moisture and nutrients from the soil. In a world where water can be scarce, you have developed structures and behaviours to ensure survival in times of drought.

Oh no - what is coming towards you?! Four long legs and a... big mouth tearing and trying to pull you out of the ground! A pronghorn antelope has just snacked on you! Phew, there he goes. Lucky for you, he only grazed the top. Your roots were too strong for him to pull you right out of the ground. No problem, you will just sprout a new shoot and grow up tall and strong again in no time flat. Here goes, growing taller, and taller, and taller. Ah, what a view from up here!

Note: The name "mixed-grass" comes from the presence of both short and mid-height grasses that are found in our grasslands. Examples are spear grass, western wheat grass, June grass, blue grama, and rough fescue. The largest percentage of all grasses are hidden underground -- an extensive, deep and thick root system that stores nutrients, collects limited moisture from the soil, and is able to recover quickly from overgrazing or fire by sprouting new shoots.



Plants that live in the Alpine zone (above 2000m) must be well adapted to live in an area that can experience as few as 14 frost-free days a year. Many light coloured plants have a waxy coating on them that shields them from harmful UV light rays. (The waxy coating also prevents excess moisture loss through their leaves and blooms, from the drying wind that constantly blows). Plants with a darker pigment do not require this natural form of 'sunscreen'.



Field Study Activities

The following activities are designed as a guide to a field study for **Weather Watch: The Living Connections**. They are presented in an order and format intended to move students from a place of sensory awareness towards a better understanding and appreciation of the effects of weather on the natural world. Feel free to adapt them to your own situation.

It is recommended that you read Kananaskis Country's "Guide to Planning Successful Field Studies" in advance of your field study day. It provides background information to assist in your field study preparations.



Together We Are Weather



Objective

Students appreciate the interconnectedness of the four elements of air, water, sun and earth, in terms of generating weather.

Materials

Two copies (eight cards in total) of bristol board cards (20 cm X 30 cm) with the following labels printed on them, exactly as shown (i.e., note upper and lower case lettering):

- Water
- EArTH
- sunshinE
- aiR

Time Required

Thirty minutes

Background

This activity is an adaptation of the "Lap Sit" or "Trust Sit". It serves as a good introductory activity to loosen everyone up and get them working together in a cooperative way. It also provides a tangible overview of the day's weather theme. Students take on the identity of one of the four elements of Air, Water, Sun, and Earth. They form a self-supporting circle to demonstrate the interdependent relationships between these elements, and their combined role in creating weather. When one of the four elements is removed (steps out of the circle), the whole thing falls apart.

In July, 1991, weeks of heavy rain produced several large puddles and ponds throughout the prairies. With a soil largely made of clay, poor drainage resulted in an ideal breeding ground for mosquitoes. Sampling traps in areas such as Winnipeg captured 4600 mosquitoes - 5 times more than the previous record in 1984! There were so many insects that exposed skin could be bitten in less than 1 minute.



Instructions

1. Before beginning, discuss with your students what four elements are the basis for all weather. (Air, water, sun, and the earth.) Inform them they are about to demonstrate the importance of these four elements, and their combined role in forming our weather.
2. Divide the class into two groups (i.e. about 15 students in each group). Have each group form a tight circle, shoulder to shoulder, facing inwards. Stand in the middle of one of the circles and hand out the four weather cards. Give the card with the word "Water" to any student. Give the card marked "EArTH" to the next person to the right. Keep going in this direction with "sunshinE" and "aiR". (Do the same thing with the second circle and the other set of weather cards.)
3. Continue around the circle, moving in the same direction, and have everyone identify themselves as one of the four elements. Tell the class that they are about to demonstrate how strong the connections are between these four elements and how, together, they create the interdependent relationships which form weather.
4. Make sure the circle is very tight and round. Now ask everyone to make a quarter turn to their right, so everyone is facing someone's back. Have everyone take one baby step (about 20 cm) in towards the centre of the circle to tighten it a bit more. This is the moment where they must trust each other and believe in the weather! Have students put their hands on the shoulders of the person in front of them. (The 4 people with cards can lay them down beside them inside the circle.) Then, on the count of three, ask everyone to gently sit back on the lap of the person behind them. Everyone has to do it at the same time for it to work. Slowly say, "1, 2, 3 ... Sit."

5. If it worked, the circle should be completely supported in this seated position, and everyone should be quite comfortable. If it didn't work, just try again with whatever adjustments are needed to the circle. When everyone is seated and comfortable, pass the cards back to the students who were holding them. Have everyone read out each of the cards and ask them to call out the word that is spelled with only the capitalized letters. WEATHER!
6. This gives a physical demonstration of the connected relationships between the elements and their combined effect in creating weather. The final part of the activity is intended to demonstrate that if any one of the elements were missing, we would not experience weather. Choose one of the students holding the cards. Ask them to gently pull themselves out of the circle to one side or the other. You will see that soon there is no more WEATHER!



In September, 1998, a province-wide bear alert was issued by Alberta Environmental Protection. A poor wild berry crop, from extremely dry conditions, resulted in bears being forced to scrounge for food. The warning was particularly directed to hunters, as their game could attract hungry bears shortly after dressing their kill.



A Climate Scavenger Hunt

Objective

Students use their senses to explore for signs of climate and micro-climate variation.

Materials

- Hand-out Weather and Climate Scavenger Hunt List (end of activity)
- Journals and pencils
- Inexpensive outdoor thermometers (1 per group of 3 to 5 students)

Time Required

One hour

Background

If you look closely in any natural area, many signs of climate and weather can be found. The direction of the prevailing winds, lower temperature, and higher humidity is evident in the growth of coniferous trees; different types of vegetation indicate varying temperatures and moisture amounts; many wildlife species are adapted to specific climatic conditions. In this activity, students “search” for evidence of weather and its many effects on the living and non-living components of a natural community. The scavenger hunt list has students:

- describe various natural places and things
- reflect upon their sensory experiences
- create an illustration of their discoveries

Instructions

1. Begin this activity with a discussion. Ask your students to think of ways in which climate and weather are “painted” on the natural world. What are some of the signs of wind and rain, freezing and thawing, sunlight and shade, dryness and moisture?
2. Establish some identifiable boundaries to outline where this activity will occur. Divide the class into groups of three to five students each and give each group a Weather and Climate Scavenger Hunt List and a thermometer. Students do not have to complete the list, but rather should be encouraged to observe and write down their thoughts for a later discussion. Ask each group to select a recorder (this can be a shared role), and someone who will make notes and illustrations of the group’s findings in a journal. Ideally, there would also be one adult per group to assist where necessary.

Note: It is important that this primarily be a student-led experience as they explore and discover together. Adults should facilitate the experience but not lead it.



On August 30, 1996, a powerful storm with destructive winds caused much damage in the Jasper National Park region. Winds with speeds of up to 100 km/h blew over thousands of trees. The damage was extensive in several campgrounds south of the town of Jasper as trees fell on campers and blocked several roads - leaving scores of vacationers trapped.

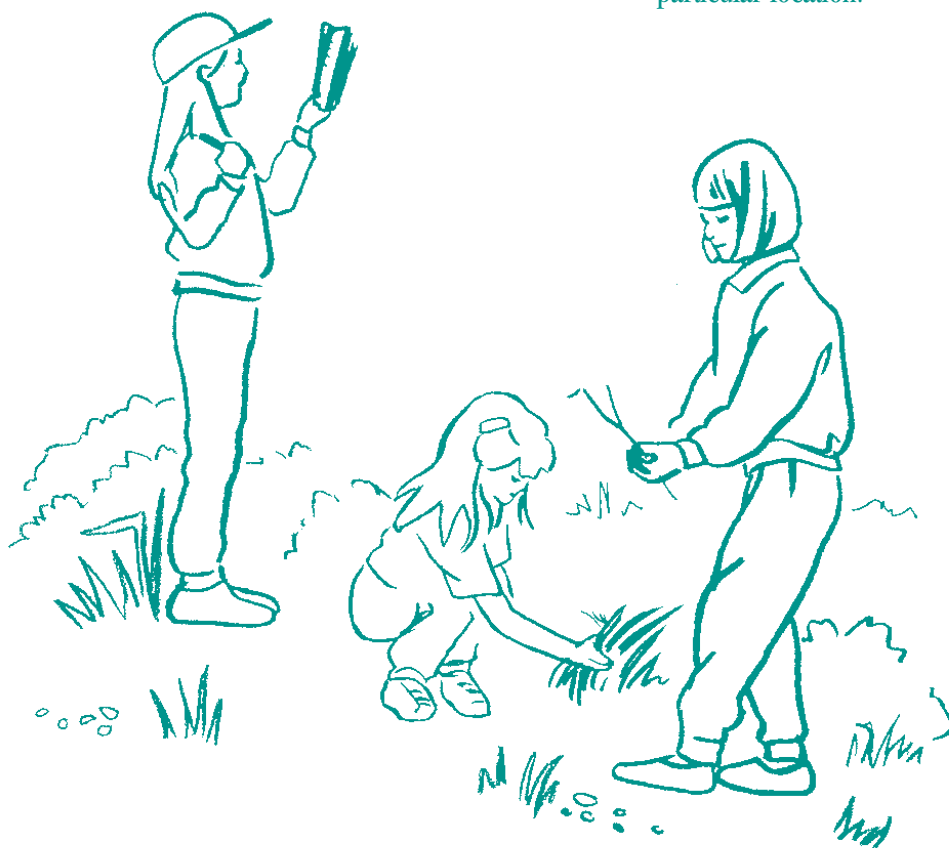


3. Emphasize this is not a race. Send the groups off for about 30 minutes (you can gauge the time by monitoring their progress), with the understanding that when their time is up, you will clap your hands to indicate a return to the start area.

4. When everyone is back together again, go through the list. Ask students what they think the term micro-climate means. Explain that many of the variations that they have observed and recorded are examples of micro-climatic differences. Throughout the discussion of students' observations, offer questions of "Why?" and "Where?" and "What?" to dig deeper into ways that weather and climate influence the landscape. Additional points of discussion could also include the difference between the effects of weather and climate. For example: "Why does one area receive more sunlight than another? How do you think the rocks in some areas become cracked? Why do you think flowers or trees grow here? What causes trees to slump over or blow down in a particular location?"



Hot and dry conditions in Alberta during the summer of 1998 resulted in a rare phenomenon that affected many lakes and fisheries. Clear skies and a lack of rain resulted in low levels of oxygen in some of Alberta's stagnant and shallow lakes. This caused a 'summer kill' as fish succumbed to the depleted oxygen levels and died - littering lake surfaces with their remains.



Weather and Climate Scavenger Hunt List

Your group mission is to search for examples of how weather and climate affect the living and non-living components of a natural community. You may or may not find everything on the list. For each item that you find, describe the following things about it:

- Where did you find this example of the effect of weather or climate?
- What was the result of this weather or climate effect on the living and non-living components?

- Why does this example of weather or climate effect occur here?
- Are these **weather** signs (occurred over a short period of time - such as a tree that has blown down) or a **climate** signs (occurred over a long period of time - such as the type of trees growing)?

Be sure to fill out both sides of this list. Using a thermometer, measure the temperatures wherever necessary. If your group finds more than one thing for each example on the list - even better!

Find an example of:	Where?	What?	Why?
A windy place (Example)	top of hill	trees, short, bent over, very little soil left on windswept ground	exposure to strong westerly winds
A sheltered place			
Winds blowing mostly from one direction (prevailing winds)			
A place receiving sunlight all day			
A salty place			
A dry area			



Find an example of:	Where?	What?	Why?
A moist area			
Precipitation			
Freezing and thawing			
A sandy place			
A plant that is adapted to living in a dry place			
A plant that is adapted to living in a moist place			
Plants that reproduce with the help of wind			
A plant that is adapted to living in direct sunlight			
A plant that is adapted to living in shade			
An animal living in a dry environment			
An animal living in a moist environment			
The hottest area you can find			
The coldest area you can find			



Connecting with the Elements: The Envelope Please...

Objective

Students will appreciate their connections to the air, sun, water, and earth - the elements of weather and climate - through a solo experience and a creative writing / drawing exercise.

Materials

Journals

One envelope per student, filled with the following:

- One blank sheet of paper
- Page of student's instructions (Here's What To Do...)
- Four different coloured pencils

Time Required

Varies from 20 - 40 minutes

Background

This activity is one which encourages a period of quiet contemplation in a natural setting - a time to foster a connection to the elements of air, water, sun, and earth. Students are led to different locations within the field study area where they can be alone and quiet. Once they are settled, they open their envelope and follow the instructions inside which leads them to explore the four elements and the relationships between them. When a signal is heard, students return to a circle for a discussion on the activity.



In October, 1995, thousands of ducks and assorted shorebirds perished from an outbreak of botulism near Lake Pakowki, 90 km SW of Medicine Hat. It was the second consecutive year that botulism spores lifted off the muddy bottom of the lake when water temperatures rose in the spring. Spring flooding may also have contributed to the die-off.



Instructions

1. The important thing to focus on in this activity is the mystery envelope. Inform students that they will be spending some time in a spot by themselves and everything they need to know about the activity is contained in the envelope. (Do not hand out the envelopes at this time; only hold one up for students to see.)
2. Explain to students that they will be led to a special place where they are to sit down quietly by themselves, open their envelope, and follow the instructions inside. They are not to return to the circle until they hear a signal or until an adult comes to get them.
3. Divide the class into groups of five or six each so that each group can be led by one adult volunteer. Provide each adult with enough envelopes for everyone in their group. Groups should head off in different directions, stopping along the way to deliver students to their solo locations and out of sight of each other. Students may open the envelope and read its contents as soon as they are comfortably seated. Adults should remain in the general area of their group, but only interact if necessary.
4. Allow students at least twenty minutes for their solo experience. Signal the students when you want them to return to the circle. Once everyone is back in the circle again, ask students how they felt about their solo experience. How did it feel to be quiet for so long? What did they do after they finished their activity? What kinds of observations did they make? Tell students that at the end of the day you hope they will share what they wrote or drew with the rest of the class in the *Sharing Circle* activity.
5. Ask students to keep their hand-outs in their journals until after the Sharing Circle. Depending on the student's wishes, these can be collected and placed on the wall of the classroom when you return to school.



Did you know...

Ten times the amount of salt that goes into food and salt shakers is dumped each winter on our snowy roads in North America.



Here's What to Do...

This page of instructions will take you on a journey – and you won't have to move a centimetre! You will be asked to use the coloured pencils to do five different things on the blank page in your envelope. Let your imagination run free.

1. Find a comfortable spot to sit or lie down. Begin by closing your eyes, take a few deep breaths - and listen. Concentrate on the sounds around you. Breathe deeply and smell. Open your eyes and look up at the sky. Watch the clouds drift by. Feel the air on your face. Now focus your attention only on the air around you. Is it moving? Does it feel warm or cool? How does it feel on your face? Can you hear it? Can you smell it? Can you see it? Can you see signs of it? Where is it going? Choose one of the pencils to make a drawing about the air around you.
2. Focus on water. Can you sense moisture in the air? On the ground? On plants? Look up at the sky. Can you see signs of water there? Do you see water anywhere around you? Is it moving? What is the relationship between water on the ground and water in the sky? Choose another pencil to write a poem about the water all around you.
3. Focus on the earth. How does it feel underneath you? Does it feel warm or cold? Does it feel wet or dry? Do you see how plants relate to the earth? Or animals? What kinds of non-living things do you see on the earth around you? Choose another pencil and make rubbings of at least three non-living things on the earth within your reach. (To do a rubbing, place your paper over the object and rub the pencil over it. It should make the pattern of the object on your paper.)
4. Focus on the sun. Close your eyes and turn your face towards the sky and feel the sun's rays. Can you feel their warmth? Is there any wind? Does the movement of the air affect the temperature you feel from the sun? How does the sun make you feel? Open your eyes again. Can you see signs around you of life reaching towards the sun? Choose the last pencil to write a one-paragraph story of the sun relating to the plants near you and the animals that might be hiding somewhere close by.
5. Focus on the relationships which are happening between the sun, the air, the earth, and the water around you. How are they linked together? What combinations of these elements can you feel around you right now? How do they relate to one another to form the weather? How is this weather affecting the plants and animals nearby? Use the pencils to draw a border around your page that represents the relationships between the four elements of sun, air, earth, and water.



What Grows Where?

Objective

Students compare plants living in a sheltered environment and plants living in an exposed environment; students then explore the differences in the abiotic (or non-living) factors contributing to growth in the two areas.

Materials

- Tracking Trees and Shrubs of Kananaskis Country
- Guide to Trees and Shrubs of Alberta
- Data Sheet (end of activity)
- Pencils
- Compass
- Clinometre (instructions on following pages)

Time Required

20 - 30 minutes

Background

Students, working in small groups, search for examples of plants adapted to life in a sheltered area, and plants adapted to life in an open area. They compare the abiotic factors of:

- water
- sun
- air
- earth

as represented by:

- precipitation
- temperature
- wind
- slope/aspect

for each area. With the assistance of a field guide, they can attempt to identify the names of the plants.

Instructions

1. Review some of the ways in which plants are adapted to living in different climates. Ask students to look around them and suggest areas where there might be some slight differences in climate. Consider how these variations reflect differences in the: water, sunlight, air, and earth. Discussion can focus on the location's amount of:
 - precipitation, (water)
 - temperature (sun)
 - wind (air)and its elevation and aspect on the earth (on a sloped or flat area and facing away from or towards the sun.) How might students expect plants to show different adaptations between different areas?



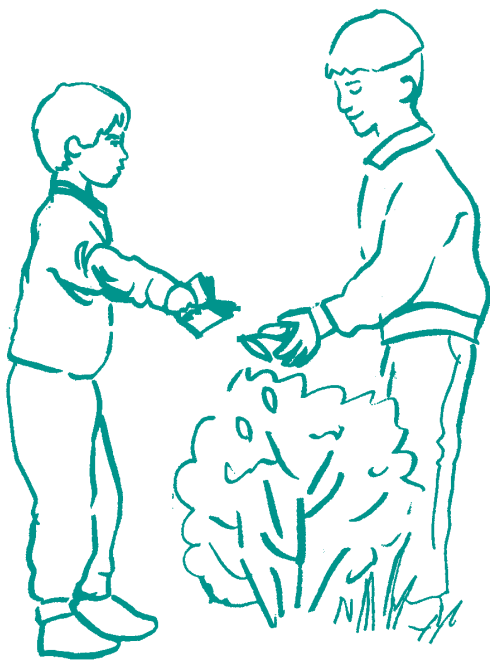
During the winter of 1971-72, Canada recorded its greatest snow accumulation for a single season at Revelstoke/Mt. Copeland, B.C. - 2,447 cm!



2. Divide the class into groups of two or three. Give each student a field guide and a copy of the data sheet. Review what they will be doing together. Inform them that they will be exploring two different areas – an open exposed area and a sheltered treed area. They will have twenty minutes to complete their data sheet with half of the time spent in one area and half in the other.

When the groups arrive in their first area, they will begin by looking at the abiotic factors. Under the main headings of **Plant Information**, **Wind Information**, **Slope or Aspect Information**, and **Soil Information**, groups make general observations about the influence that each of these factors has on the area.

After twenty to thirty minutes, have the groups return to discuss their findings.



3. When time is up, call the students back to the circle to discuss their findings. Beginning with the open area, students present information to the rest of the class regarding the types of plants they found, and how they are adapted to that area.



Did you know...

The world's extreme temperatures:

The coldest... -89.6 c° Antarctica

The Warmest... +58.0 c° Libya

...a difference of 147.6 degrees!

A general discussion can follow identifying the climatic features of the study location. The same is done for the sheltered area. While facilitating the discussion, here are some things to consider:

- How did the two areas differ in terms of climatic features and plant life? How did that affect the plants' adaptations?
 - Were there differences in the diversity of plant life between the two areas? Why or why not?
 - Did you find plants at the levels of your:
 - feet
 - waist
 - eyes
 - What might this activity indicate in terms of the relationship between climate and plants?
4. Using the Student Data Sheets, ask students the following questions:
- What are some similarities that plants found in the open area share?**
Answer: Low to the ground, twisted together, smaller leaves.
 - What are some similarities that plants found in the sheltered area share?**
Answer: Taller, spaced apart, broader leaves.
 - Which areas would remain moist after rain for a long period of time?**
Answer: Forest. Sheltered from the drying effect of wind and sun. Tell students to wet two fingers and blow on one. Which finger dries quicker? Why?



d) How would water remain on a slope?

Answer: Water always flows downhill. The steeper the slope, the quicker water will drain off. The amount of vegetation can reduce the speed at which water can drain off the slope, but it cannot stop the downhill flow.

e) How does the aspect of slope affect plant growth for north, south, east and west?

Answer:

- **Less exposure to sunlight (north face)**

North facing slopes do not receive direct sunlight. They are not as dry as south-facing slopes. In the spring, north-facing slopes are easy to find because the snow melts much slower in the absence of direct sunlight.

- **More exposure to sunlight (south face)**

In the Northern Hemisphere, the sun tracks over slopes that are south-facing—therefore south-facing slopes are typically drier and warmer than north-facing slopes.

- **More exposure to wind (west face)**

The weather we experience in Alberta is brought to us by prevailing winds from the west. This means west-facing slopes are in the path of wind that blows across Alberta from mountain top to prairie. West-facing slopes are typically drier.

- **Less exposure to wind (east face)**

East-facing slopes lie in the lee of the prevailing winds. They are not as dry as west-facing slopes.

f) Describe how well these soil types could retain water.

Sand: not well

Gravel: poor

Clay: very well

Mostly dead plants:

very well

Mixture of dead plants and sand: very well.

(good combination to hold water and air for roots)

Mixture of dead plants and gravel: excellent

(excellent combination to hold water and air for roots)

Mixture of dead plants and clay: good

(but very moist soil would require special adaptations for some species of plants)

g) Which soil can retain water better, soil that sticks together in your hand, or soil that falls apart in your hand?

Answer: Soil that sticks together will hold water much better.



Did you know...

Edmonton holds the Canadian cities' record for the fewest number of days with fog over the course of a year - 18.

Conclusion:

Weather and climate are the major limiting factors that affect plant growth. Varying amounts of abiotic factors such as air, water, sun and slope/aspect cause plants to adopt certain adaptations that allow them to survive in a particular area. Some plants are capable of growing in both open and sheltered areas, while other species depend on a certain set of conditions in one of these areas. The ability of plants to grow in either open or shaded areas based on these conditions is one of the features that helps to define the natural regions of Alberta.



Constructing a Clinometer

Objective

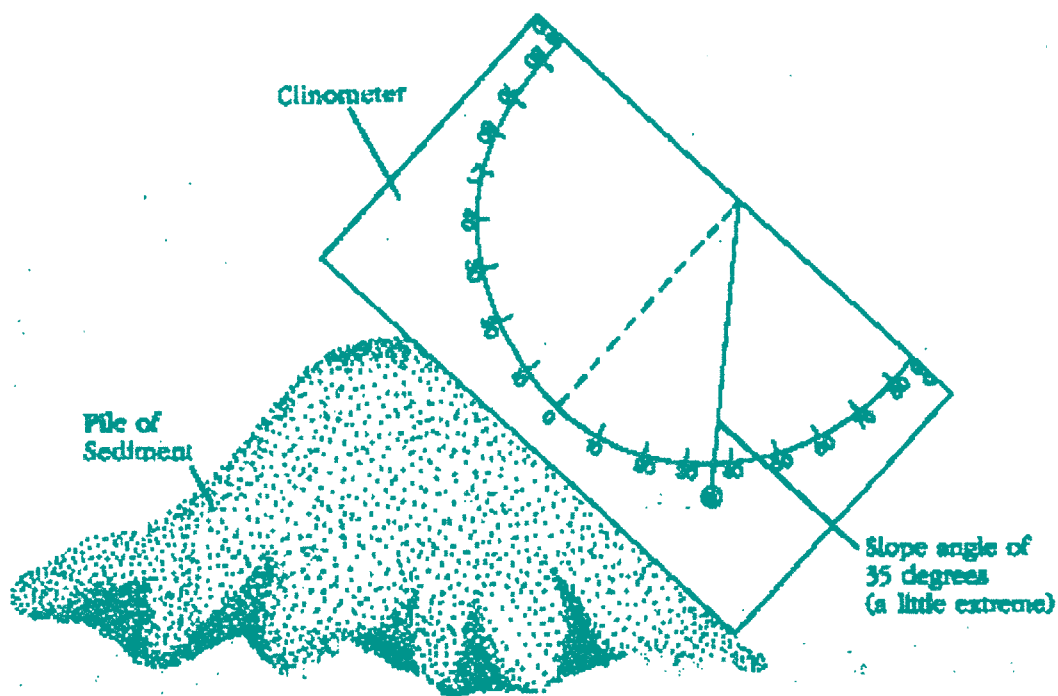
To build a clinometer that will be used by students to measure the slope of an area they will study.

Materials

photocopies of the clinometer faceplate
cardboard backing
string or fishing line
small metal washers
glue
scissors
single hole punchers

Assembly

1. Photocopy the required number of clinometer faceplates (on following page).
2. Cut out the clinometer template and a cardboard backing that is the same size.
3. Glue the clinometer template to the cardboard backing.
4. Punch a hole in the clinometer at the centre of the base line.
5. Measure and cut a piece of string or fishing line about 11 cm long.



Building a Clinometre

Weather Watchers:

The Living Systems

Clinometre Faceplates

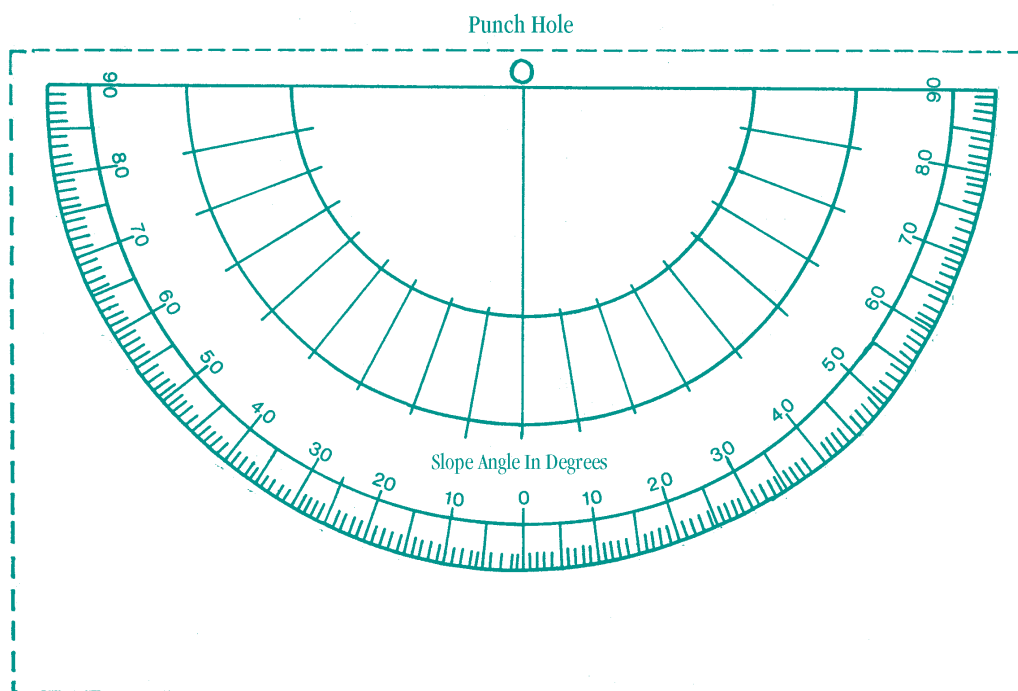
Photocopy as many faceplates as required.

Assembly

1. Photocopy the required number of clinometre faceplates.
2. Cut out the clinometre template and a cardboard backing that is the same size.
3. Glue the clinometre template to the cardboard backing.
4. Punch a hole in the clinometre at the centre of the base line.
5. Measure and cut a piece of string or fishing line about 11 cm long.
6. Tie a small washer onto one end of the string and tie the other end through the hole in the base line.
7. Set the length of the string such that the scale appears inside the hole in the washer when the washer is hanging down the front of the clinometre.

How to use a clinometre

1. Hold the base of the clinometre up so that it runs parallel with the slope being measured or one end on the base line points to the top of an object being measured for height.
2. Note the degree of slope to which the plumb line falls. This is the angle or degree of slope for the hillside being measured. This is referred to as the aspect of the slope.



Student Data Sheet

Name: _____

Abiotic Factors and Plant Growth

Compare an OPEN area with a SHADED area

Find a location that is open to the sun, where there are no buildings or trees to provide shade. Then find a location that is shaded, where the sun cannot shine through. Compare the plants in both of these areas and complete the following questions with an X under the area that fits the description. You may find that some plants can be found in both areas, however the abiotic factors that affect their growth are quite different.

Plant Information

	Open Area	Shaded Area
1. Plants grow taller in the	_____	_____
2. Plants that grow near the ground receive the most sunlight in	_____	_____
3. There are more grass-like plants in the	_____	_____
4. There are more shrubs in the	_____	_____
5. There are more trees in the	_____	_____

Wind Information

1. The winds blows consistently strongest in the	_____	_____
2. Why is this the case? _____		

3. There are more things that can deflect or block the wind in the	_____	_____

Slope and Aspect Information

Answer the following questions if the area you are exploring is on a slope:

1. Which direction does the hill face? (use compass)	_____	_____
2. How steep is the slope? (use clinometer)	_____	_____
3. On a clear hot day, the warmer area would be the	_____	_____

Answer this question if the area you are exploring is on flat ground:

1. On a clear hot day, the warmer area would be the	_____	_____
---	-------	-------

Soil Information

- Choose one of the options below to describe the soil in the open area
mostly clay____ mostly sand____ mostly gravel____ mostly dead plant material____
- Choose one of the options below to describe the soil in the shaded area
mostly clay____ mostly sand____ mostly gravel____ mostly dead plant material____
- If you squeeze a small amount of soil from the open area in your hand does it
stick together____ fall apart____ other (describe)_____
- If you squeeze a small amount of soil from the shaded area in your hand does it
stick together____ fall apart____ other (describe)_____

Other information

If you have identified any of the plants found in either area,
draw and label them on the back of this page



Signs of Wildlife

Objective

Students explore the climatic and environmental features of the field study area to determine whether or not certain wildlife species could survive there.

Materials

- Wildlife cards (from **Wildlife Charades**) – 4 cards per group of 4 students and /or the students' own wildlife cards from same activity if completed
- Journals and pencils

Time Required

One hour

Background

Students, working in small groups will use a pre-assigned number of wildlife cards to determine whether or not the climatic conditions in the field study area would support each of the different species. They record their observations in their journals and then come together again with the rest of the class to compare their results.

Instructions

1. Ask students if they can remember the different wildlife species that they dramatized in the *Wildlife Charades* activity. What do they think the possibilities are for those animals living in this kind of environment? Inform students that in this activity they will be searching for evidence to help determine if these animals can live in this area.
2. Divide the class into groups of four students each. Explain that within each group they need to identify a specific scientific role for each person. Each student chooses to be one of the following kinds of scientists and writes it at the top of a blank page in their journal.
 - Climatologist (responsible for determining the main climatic conditions.)
 - Botanist (responsible for determining the main types of vegetation.)
 - Zoologist (responsible for determining available food, shelter, camouflage and other conditions for wildlife.)
 - Ecologist (responsible for determining the overall environment: the relationships between living things and their non-living environment.

Discuss what roles each of the scientists play, and the types of questions they try to answer.



"All we need is a meteorologist who has once been soaked to the skin without ill effect. No one can write knowingly of the weather who walks bent over on wet days."

E.B. White



3. Hand out four wildlife cards to every group. Each group will be assigned to one specific location within the field study area and they remain in that area for the duration of the activity. When they arrive at their assigned location, the first task is to write down information about the area according to their specific scientific roles.

For example,

The Climatologist will:

- assess whether the area receives a lot of sunlight,
- is it dry?
- is it wet?
- is it hot?
- is it cold?

The Botanist will:

- assess the major types of vegetation
- trees?
- grasses?
- tall?
- short?

The Zoologist will assess the conditions for supporting wildlife

- determine if there is there shelter?
- determine if there is there cover?
- what kind of food is available?

The Ecologist will:

- work with the other three scientists to determine relationships between animals and plants that may live in the area, and the influence of environmental factors on the area's living community.

4. After their initial assessments of the area one student in the group reads one of the wildlife cards. Each person writes the name of the animal under their initial description of the area. Then they compare the animal's needs with their individual assessment of the area and draw a conclusion about whether the animal could live there or not. If so, why? If not, why not? After each student has made a decision, there is a group discussion to arrive at an overall consensus about the suitability of the area for that animal.

5. The activity continues in this way until groups have discussed all of the wildlife cards given to them at the beginning of the activity. Students are then called back to the circle for a follow-up discussion. Which animals did they believe were adapted to living in any of the assessed areas? What evidence was there to support that? Which animals were not adapted? What were the reasons? Did the student scientists within each group generally agree on the suitability (or not) of each of the animals? If so, why? If not, why not? What did students learn from this activity?



Did you know...

Edmonton and Calgary are tied for eighth place for the most days per year with thunderstorms (25).

London, Ontario is first with 36.



Rain, Rain, Come Again

(Optional – in case of rain!)

Objective

Students experience, and reflect during a walk in the rain. In doing so, they extend their awareness to a better understanding of ways in which plants and animals survive and thrive in the rain.

Materials

- Rain! (But not during a thunderstorm.)
- Extra rain gear
- Popcorn and raisins (optional)

Time Required

One hour

Background

There is no better way to learn about weather than to go out and get your feet wet! This is a “rainy day” activity in the true sense of the phrase - an optional activity in case it rains during your field study. The idea is to change the attitude that rain means “bad” weather, and instead to instill the idea that rain can be fun, beautiful, and nourishing. Students will also learn that rain is essential to all life, and that many plants and animals have developed adaptations to make the most of a rainy day.

Instructions

1. If it rains at any time during your field study, this activity can be added in. (You should be prepared for the fact that not all your students will have come with raincoats and boots; so have some extras on hand.)
2. This activity is intended mainly as a sensory exploration. The following are a few guiding questions, but add your own, and listen to the things your class comes up with as well: (You might consider dividing the class into small groups and giving each group a laminated card with some of these questions on it to help guide their explorations.)
 - How does the rain feel?
 - Is it cold?
 - Does it feel different after you’ve been in it for a while?
 - Are there places that are wetter or drier?
 - Where is the best shelter from the rain?
 - Do you get wetter or drier by running in the rain?
 - Does it make any difference if you huddle together with a few friends?
 - Can you see the rain?
 - Can you smell it?
 - Can you taste it?
 - Close your eyes.
 - Can you hear the rain?
 - (Pass out the popcorn and raisins.)
 - What is it like to eat in the rain?
 - What happens to rain when it hits the earth or rocks?
 - What happens to trees and other plants?
 - Can you feel any wind?
 - Get down close to the soil. Can you smell anything?
 - What happens to rain over water?
 - Do you see birds or any other wildlife?



3. Bring everyone back together in a dry place to continue your discussion. Begin with questions relating directly to the experience. Did your students' attitudes change about being in the rain? Was it fun? Did they stay dry under their rain gear?
4. Ask your students to imagine they are a wild animal. What strategies might they use to keep from getting wet and cold? "Clothing" is important for animals too - most fur-bearing animals in Alberta have coats which are well-insulated. This is to protect them not only from the cold and wet, but also from the heat of the summer sun. The feathers of birds are used in the same way to help regulate temperature. Smaller animals retreat underground for shelter from the rain, while larger animals seek shelter in the trees. The large grazing animals of the Grasslands region herd together and move towards the rain because it brings the essential moisture that supports the plants upon which they feed.
5. Ask the students to imagine they are a plant. How would the rain feel after a hot day in the sun? How would they make the most of the rain if they lived in a dry climate such as the Grasslands? (Most Grasslands plants have deep, thick and extensive root systems so they can collect the limited moisture from a larger area of the soil.)

As plants, how would they cope with rain at higher altitudes, such as in a mountain environment?

In the alpine region of the Rocky Mountains, the rain often turns to snow, even in the summer. This would kill most plants in other regions because new growth is much more fragile. One adaptation for alpine plant survival is to grow small and close to the ground, so less energy and time is expended in growing new tissue in the summer while the snow serves as an insulation layer in winter. This adaptation of growing close to the ground also limits the effects of the constant wind of the alpine region. Some alpine plants store their most sensitive parts in a bulb underground, called a corm, safe from the rain, snow, and wind.



Did you know...

Life in Prince Rupert must be really tough. Not only is it the wettest place in Canada, but it also has another record of being the cloudiest place in Canada with 6,123 hours of overcast skies in a single year! There are 8,760 hours in a year.



A Sharing Circle

Objective

To provide an opportunity for students to reflect upon the day's activities.

Materials

- Journals
- An inspirational reading or poem, if desired
- A weather-beaten rock

Time Required

Twenty to thirty minutes

Background

This concluding exercise serves as an opportunity to discuss and reflect upon the day's activities. Students are given an opportunity to talk over what they learned and felt about their experiences. They are encouraged to share their creative writing with the rest of the class. A couple of readings are suggested that provide references to weather - its effects, its presence in our lives, and the lives of all creatures. These may offer ideas for further discussion, reflection or bringing closure to the day.

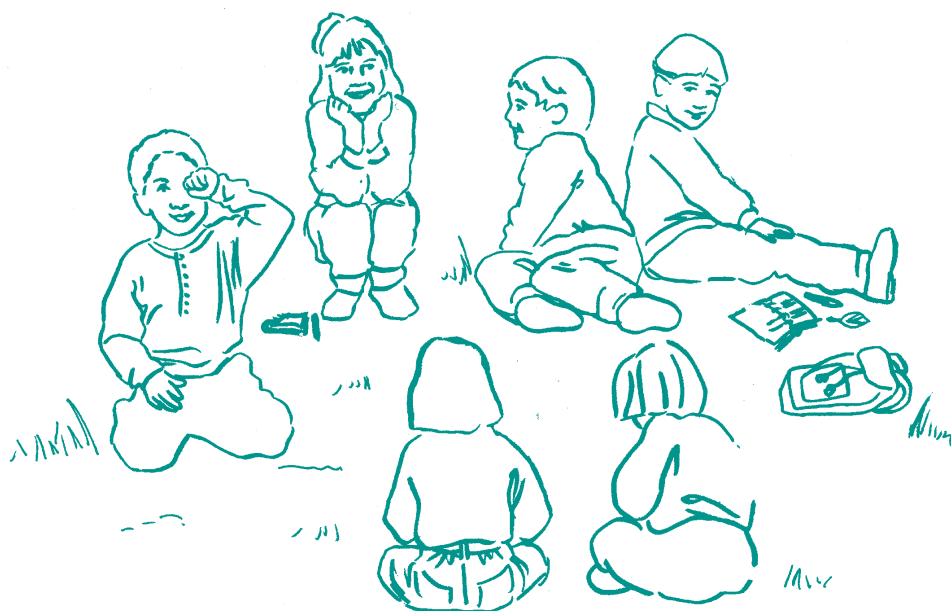
Instructions

1. Gather the class together for one last time in a circle.
Explain that the activities are over for the day, and this last discussion will be a chance for people to talk about what they have observed, learned, and felt. This activity provides some time for reflection.
2. There are several ways you could approach this session. You could begin with an inspirational reading or poem (see sample poem on next page). Or you could simply begin with a discussion:
 - Do students see weather in any different light than before the day began?
 - What were their discoveries and ideas on weather and climate that they did not think of before today?
 - Do they feel any closer connection to the natural world? To plants and animals?
 - What were their most interesting observations of the day?



"Everyone talks about the weather - but no one ever does anything about it."

Unknown





"May the road rise up to
meet you,
May the wind be always
at your back,
May the sun shine warm
upon your face,
May the rain fall soft
upon your fields
Until we meet again.

An Irish blessing

3. This is also an important time to allow for your students' creativity to be expressed. Ask if anyone would like to share his or her poems, thoughts, or drawings from the solo experience. Create an atmosphere of trust, warmth, and encouragement. Show your students the weather-beaten rock and explain that this is to be passed around to anyone who would like to contribute something to the circle. Only the person holding the rock can speak.

4. It is important to the whole day's experience that you end on a positive note. You will have accomplished a great thing if you have helped your students to feel a positive association with the natural world. You might consider closing the circle with a reading such as the following:

Here is an example of an inspirational poem relating to weather; this one on the theme of mountains by Lama Anagrika Gouinda.

*"To see the greatness of a mountain,
one must keep one's distance;
To understand its form,
one must move around it,
To experience its mood,
one must see it at sunrise and sunset,
At noon and at midnight,
in sun and in rain,
in snow and in storm,
In summer and in winter
and in all other seasons.*

*One who can see the mountain like this
Comes near to the life of the mountain,
A life that is as intense and varied
as that of a human being.*

*Mountains grow and decay,
they breathe and they pulsate with life
They attract and collect invisible energies
from their surroundings,
The forces of the air, of the water,
of electricity and magnetism.
They create winds, clouds, thunderstorms,
rains, waterfalls, and rivers.*

*They fill their surroundings
with active life
and give shelter and food
to innumerable beings."*



Post Field Study Activities

Writer's Workshop: Constructing A Reference Book on Weather

Objective

This is a ten-step process intent on producing a high quality piece of writing that actively involves students, while educating about a particular concept.

Materials

These vary according to the availability and variety of writing materials that can be obtained by the teacher.

Time

Varies greatly on the resources used.

Instructions

1. Introduce the students to a variety of writing styles such as
 - circular stories
 - linear stories
 - narratives
 - poems
 - information / research books
 - picture books
 - biographies/ autobiographies
 - news format

Using, a topic related to weather, climate and natural communities, ask the students to select a writing style.

Some story topics might include:

Weather and Plants

Weather and Animals

A Day in the Life of our Local Weather

Climate and Weather

Weather Phenomena

People and Weather

Climate Change

Severe Weather

Weather and Catastrophes



The fire season in 1998 was one of the worst in Alberta's history of fire fighting. Total fire bans were common in Protected Areas around the province as a result of hot and dry weather. Alberta spent over \$200 million in men, resources and equipment to fight the fires from April to October. In all, 7,607 square kilometres of the province's forests burned - a total area that is roughly the equivalent of 3/4 the size of Jasper National Park!



2. Develop a storyline.

Use a storyboard format to develop a page by page layout of the storyline. This may require some research, depending on the topic. This step can be introduced early in the unit and students can gather information as the lessons unfold. This storyline is only a plan that establishes the plotline of the story - it is not the detailed written version. Be sure students include information about:

- main characters
- secondary characters
- settings
- conclusion

Share the storyboards with others in the class. Have students talk about their stories with others, gather input from them and revise the storyboard into the best possible storyline. Be sure to leave space in each panel of the storyboard for graphics that will be developed later.

3. Draft I

Follow the storyboard outline to write the first draft. Be sure to follow the order established in the storyboard and include all the information that has been gathered.

4. Self Edit

With the input of the class, develop a criteria sheet (rubric) that students could use to self edit their first draft. The criteria is developed by the class, and it will be used as the students read through and evaluate each others work.

5. Draft II

Rewrite Draft I based on self edit and criteria sheet.

6. Peer and Parent Edit

Share the stories around the class and have other students edit the second drafts of stories using the criteria sheet developed in step 4. Take the second draft home and have it edited by a family member as well.



“The Earth laughs in flowers.”

Ralph Waldo Emerson

7. Final Draft

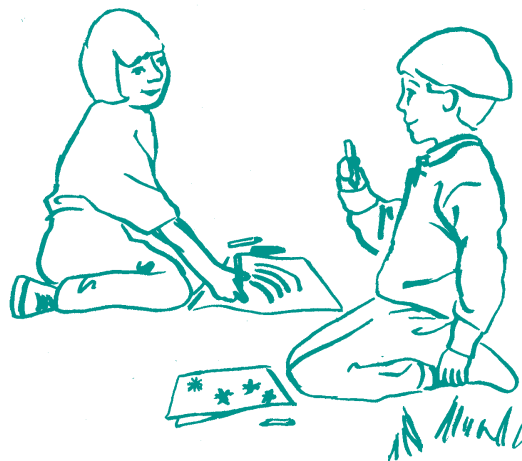
Write the final draft of the story that reflects input from all the previous steps.

8. Illustration

Design an illustration or graphic style and use the original storyboard to develop initial drawings and plans that support the storyline. These could include a variety of book construction techniques as well as wheels, tabs, windows, flaps, or shapes.

9. Develop a fully illustrated final draft of the story.

10. Celebrate the books that have been developed with an author's reading event. Invite parents and other classrooms to listen to students reading their stories.



Summing Up the News

Objective

Students review the top weather stories from their collage of articles, and search for evidence of larger weather or climate patterns occurring in the world.

Materials

- Weather in the News collage of articles
- Blackboard

Time Required

One hour

Background

This activity is essentially a review of the *Weather in the News* sessions. Students call out headlines from their collage and note any patterns they see emerging. Final discussion will focus on the powerful presence of weather and climate in the lives of everyone and everything on the planet.



Did you know...

Because 75% of the body's heat exits through the top of your head, wearing a toque in winter is an important way to stay warm.

Instructions

1. One by one students will go up to the Weather in the News collage and simply call out a headline that catches their eye. Two other students serve as scribes, writing down the headlines on the blackboard. This should be done fairly quickly. The idea is to create a broad brush painting of the weather as it was reported in the news.
2. After each student has contributed something, direct everyone's attention to the blackboard. Look over all the headlines.
 - Is the weather that is reported usually good or bad?
 - What do you think the reason is for that?
 - What are the most common kinds of stories?
 - Are there an equal number of stories that are about plants and animals as there are about people being affected by weather?
 - Why?
 - Are there particular themes or patterns that arise in the news?
 - Are there particular regions of the world that are experiencing unusual weather?
3. Lead the discussion in the direction of a final question: "What would the world be like without weather?"



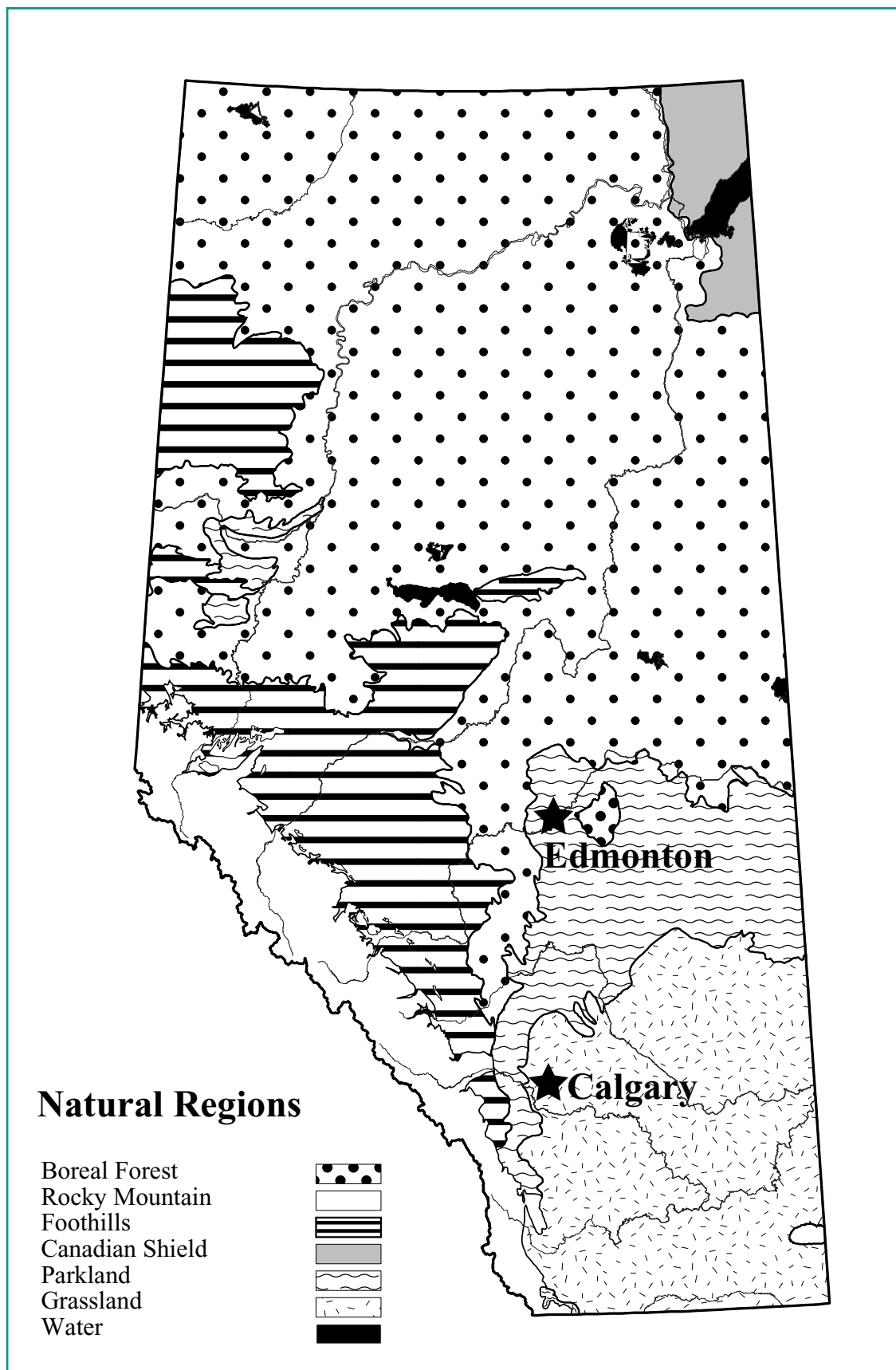
Appendix

The Natural Regions of Alberta

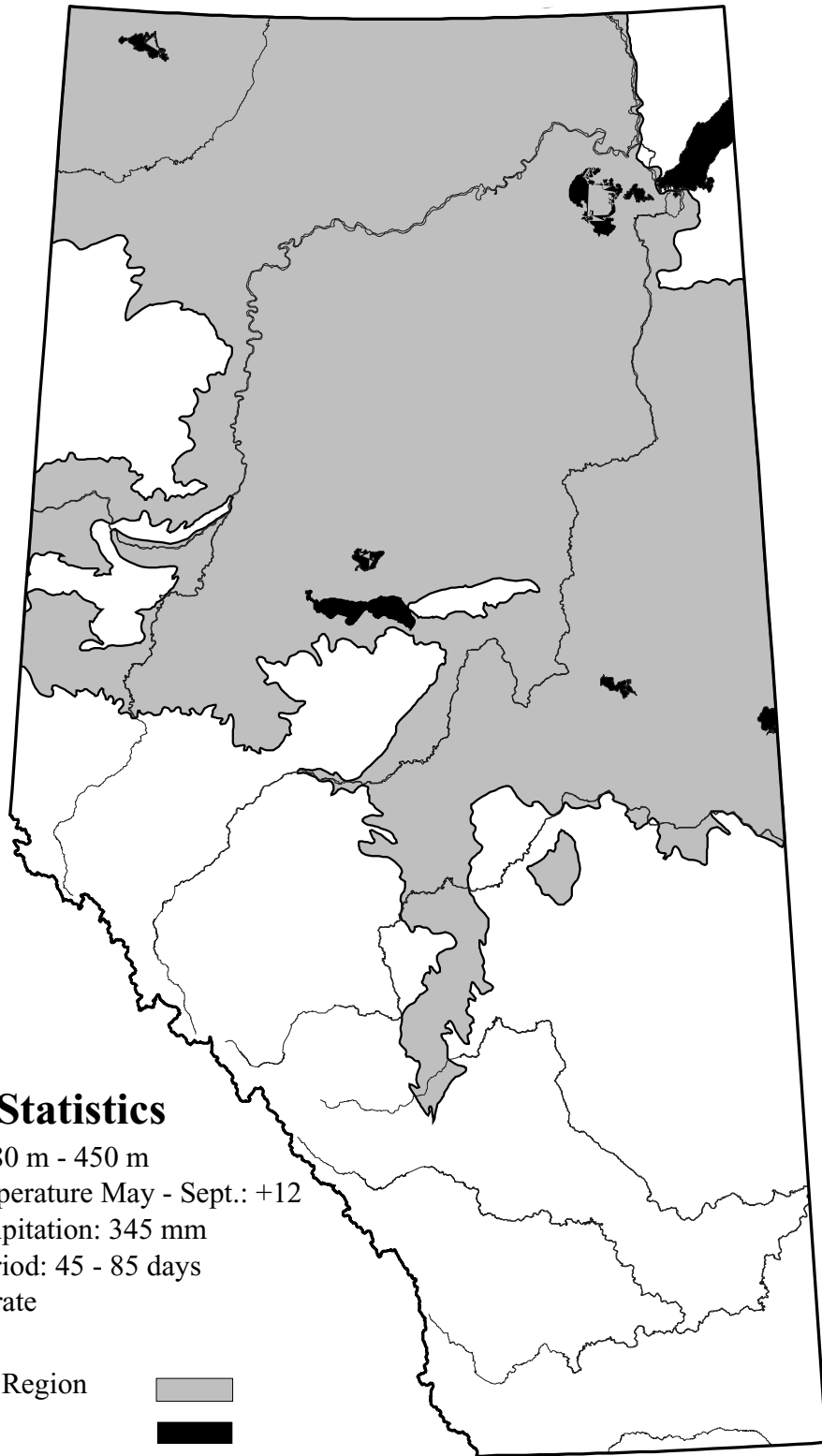
- Grassland
- Aspen Parkland
- Boreal Forest
- Foothills
- Rocky Mountain
- Canadian Shield



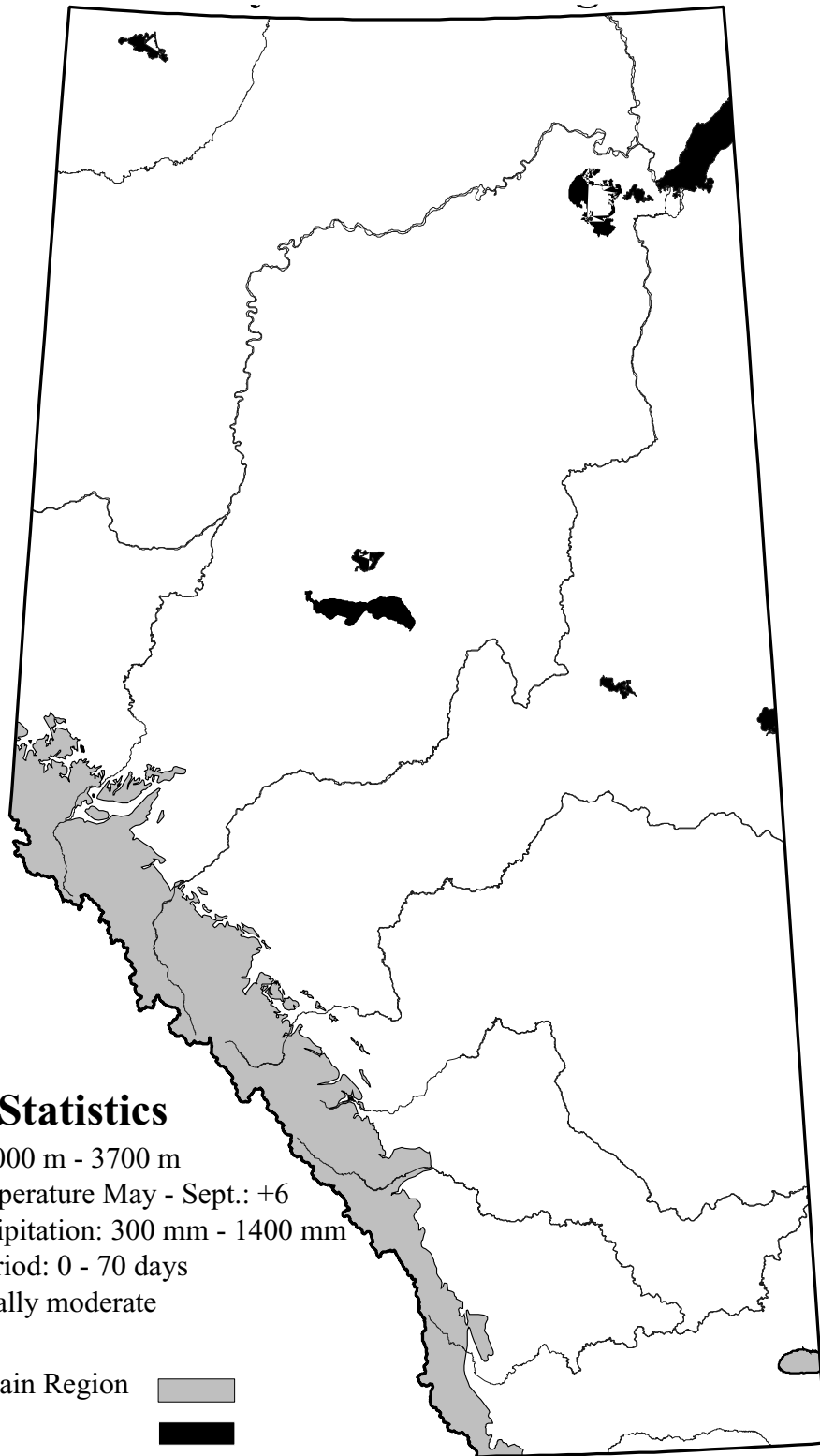
The Natural Regions of Alberta



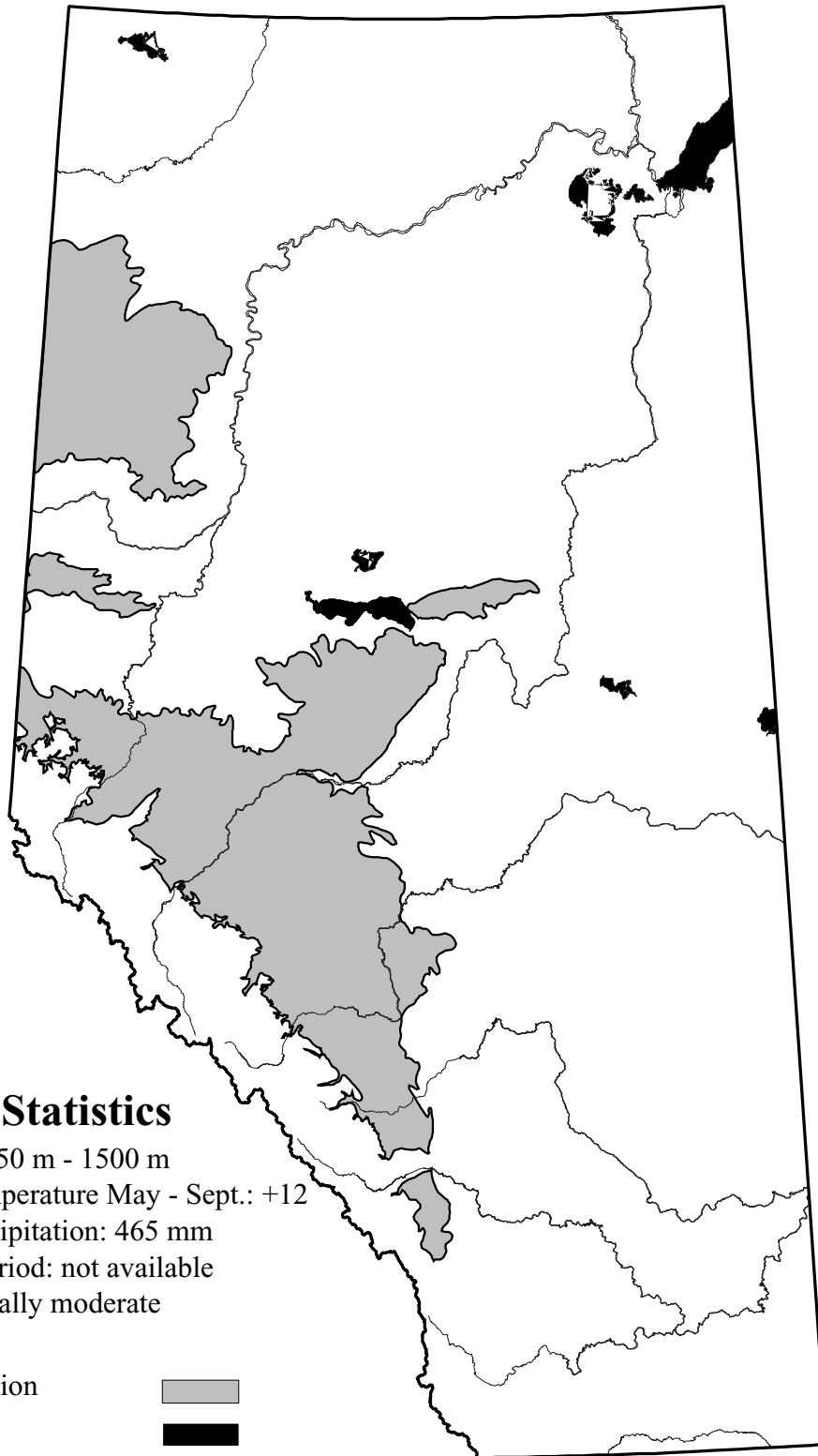
Boreal Forest Region

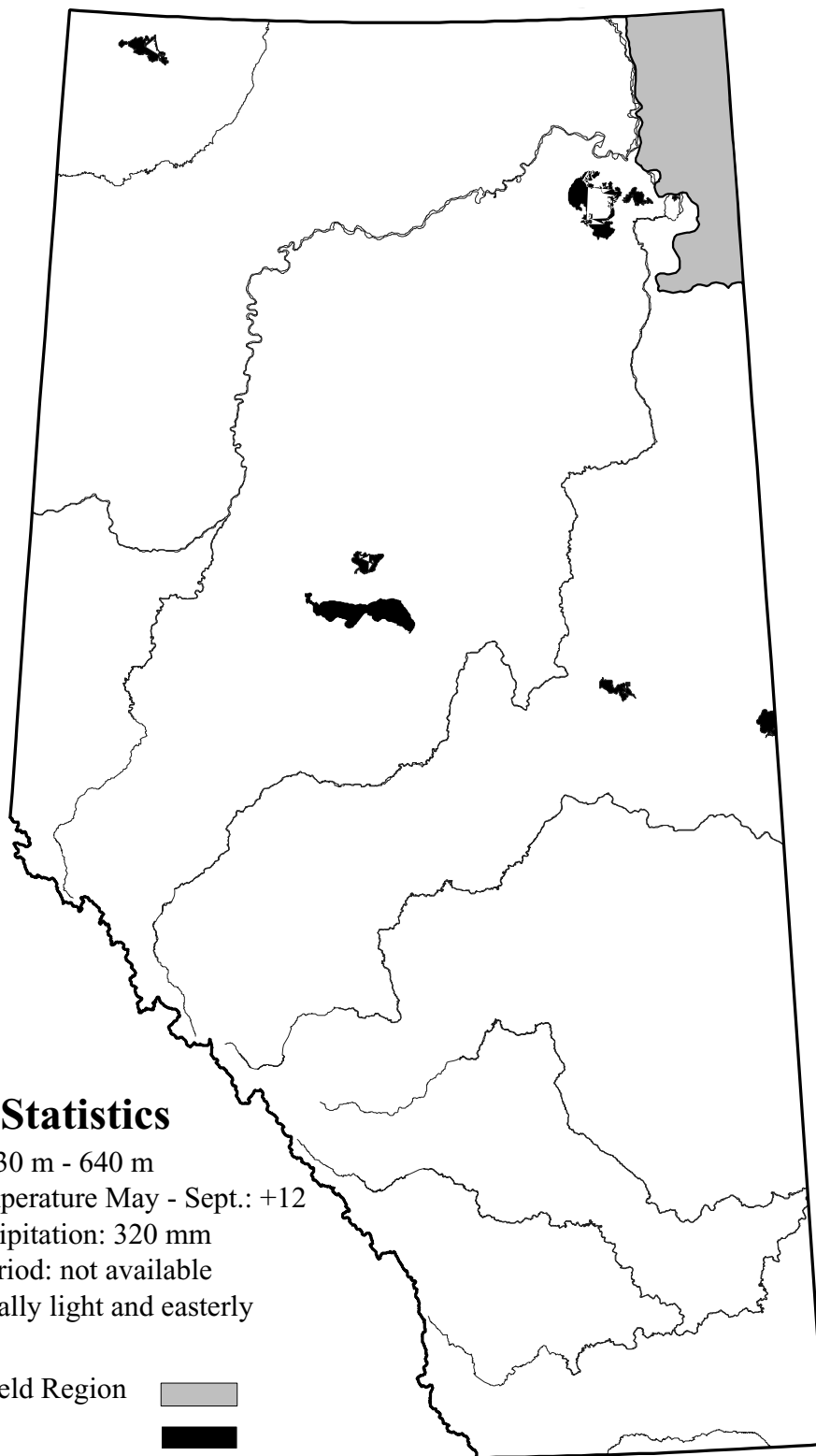


Rocky Mountain Region



Foothills Region





Climate Statistics

Elevations: 230 m - 640 m

Average Temperature May - Sept.: +12

Average Precipitation: 320 mm

Frost Free Period: not available

Winds: generally light and easterly

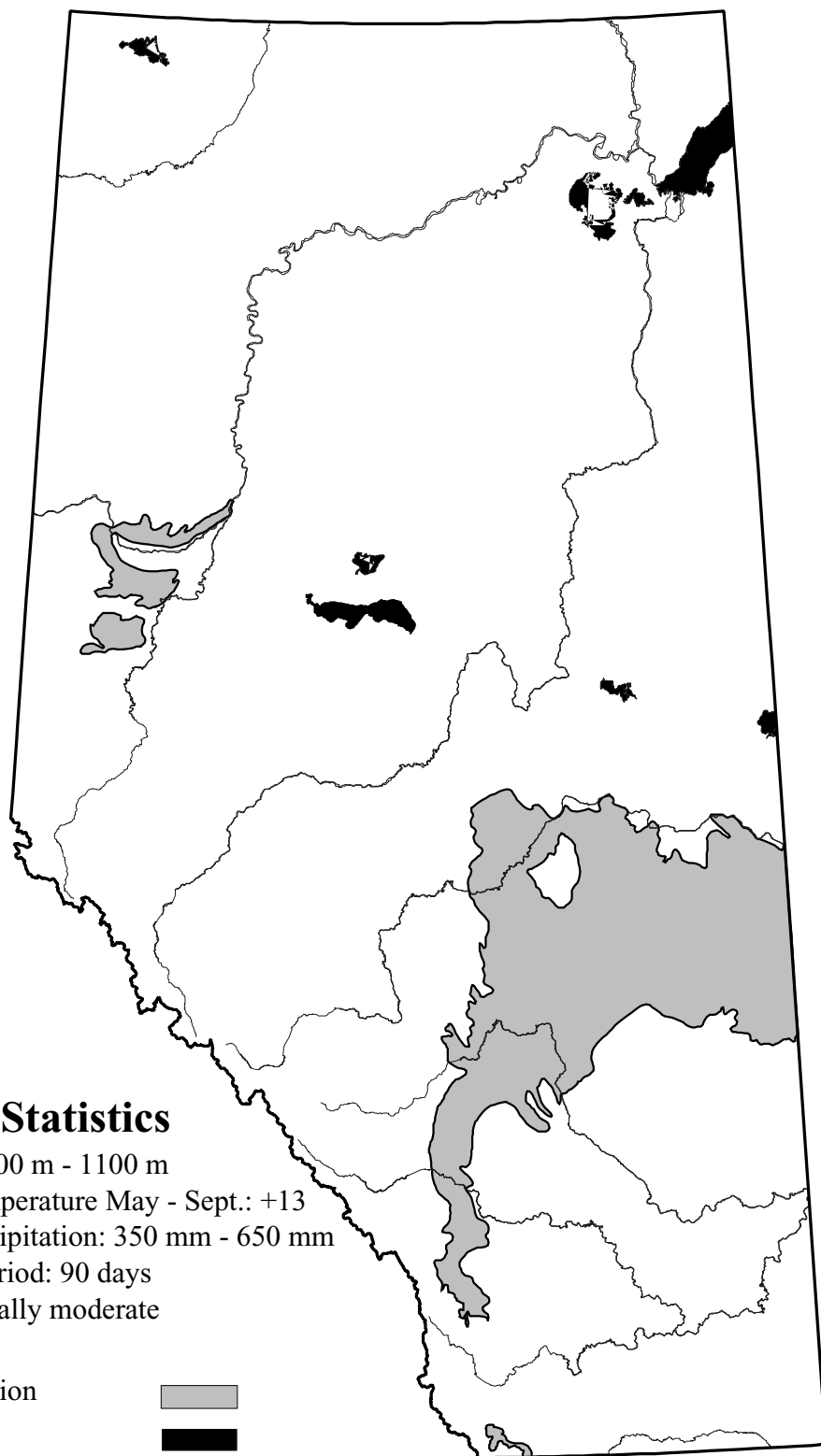
Canadian Shield Region



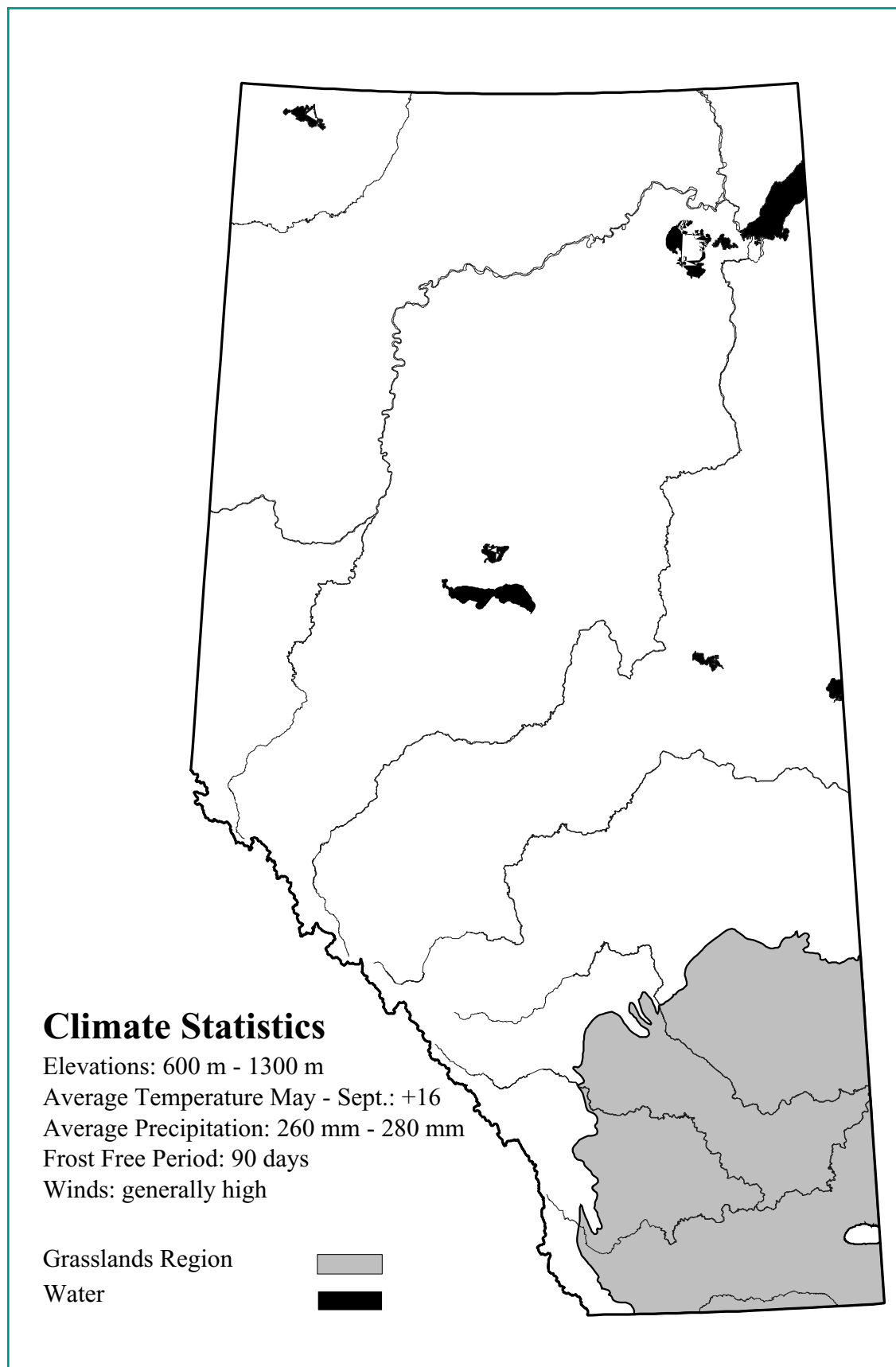
Water



Parkland Region



Grasslands Region



Plants and Animals of Alberta's Natural Regions

Natural Region	Mammals and Birds	Plants
Aspen Parkland 12% of the province	Richardson's ground squirrel, snowshoe hare, coyote, fox, deer, weasel, beaver, meadow vole, deer mouse, Swainson's hawk, ruffed grouse, saw-whet owl, magpie, sparrow, warbler, chickadee, northern oriole	aspen, willow, saskatoon, prickly rose, fescue grass, sedges, dogwood, prairie rose, yarrow, False Solomon's seal, goldenrod, wood lily, milk vetch, prairie crocus, moss, bracket fungus, saskatoon, cranberry
Canadian Shield 2.7% of the province	moose, beaver, mink, lynx, hare, black bear, bald eagle, osprey, peregrine falcon, sandhill crane, arctic and caspian tern, gray jay, chickadee, robin, loon	jack pine, white and black spruce, tamarack, bearberry, saskatoon, cranberry, bunchberry, Labrador tea, peatmoss, swamp laurel, water sedge, reindeer lichen,
Foothills 12.9% of the province	grizzly and black bear, cougar, coyote, lynx, elk, moose, mule deer, fox, marten, red squirrel, porcupine, snowshoe hare, beaver, marsh hawk, peregrine falcon, grouse, gray jay, pine siskin, sparrow, flicker	lodgepole pine, white and black spruce, balsam fir, aspen, balsam poplar, birch, willow, buffaloberry, yarrow, fireweed, raspberry, bunchberry
Grassland 13.7% of the province	pronghorn antelope, deer, badger, skunk, coyote, weasel, rabbit, Richardson's ground squirrel, muskrat, kangaroo rat, heron, burrowing owl, grouse, pintail duck, prairie falcon, peregrine falcon, swallow, garter snake, toad, short-horned lizard	cottonwood, balsam poplar, sedges, fescue grass, sagebrush, prairie rose, prickly pear cactus, prairie crocus, prairie clover, creeping juniper, yucca, buffaloberry, cattail, bulrush,
Northern Forest (Boreal Forest) 51.9% of the province	moose, beaver, muskrat, deer, otter, mink, wolf, lynx, black and grizzly bear, squirrel, fox, snowshoe hare, vole, loon, osprey, grouse, gull, geese, woodpecker, raven, western tanager, chickadee, warbler, wood frog,	white and black spruce, jack pine, aspen, balsam poplar, birch, larch, willows, dogwood, fireweed, cranberry, saskatoon, bunchberry, yellow pond lily, sphagnum moss, lichen, cattail, bulrush, sedges, horsetail
Rocky Mountains 6.8% of the province	grizzly and black bear, elk, wolf, coyote, wolverine, pika, mountain goat, bighorn sheep, marmot, Columbian ground squirrel, raven, dipper, ptarmigan, Steller's jay, sparrow	grasses, Douglas fir, limber pine, aspen, lodgepole pine, Engelmann spruce, willow, bearberry, subalpine fir, lichen, moss campion, cinquefoil, mountain aven, paintbrush



Supplementary Resources

Teaching Resources / Activity Guides:

Explorations in Science, Level 5,
Whatever the Weather
Campbell, Steve. Addison Wesley:
Don Mills, Ontario. 1993
ISBN 0-201-881764

Weather Watchers
Environment Canada
and Alberta Environmental Protection.
Free Copy available by calling 310-0000, 422-2079.

A Learning Unit on Weather Reading
Kananaskis Country. 1994. Out of Print.

Science Activity Books:
Be Your Own Weather Expert
Kelly, Janet.
Simon & Schuster Young Books: Belgium. 1991.
ISBN 0-7500-0847-4

Delta Science Modules:
Weather Instruments, Teacher's Guide
Paldy, Lester.
Delta Education: New Hampshire. 1988.

Innovations in Science,
Process and Inquiry, Level 5
Peturson, Rod and McAllister, Neil.
Harcourt, Brace and Company: Canada. 1996.
ISBN 1-85234-32222

Project Earth Science: Meteorology
Smith, Sean and Ford, Brent.
National Science Teachers Association:
Arlington, Virginia. 1994.
ISBN 0-87355-123-0



Kananaskis Country Environmental Education Program
Weather Watch: The Living Systems

Internet Sites and Resources:

Prairie Plantwatch:
The University of Alberta's
Devonian Botanic Garden

[http://www.biology.ualberta.ca/
devonian.hp/pwatch.htm](http://www.biology.ualberta.ca/devonian.hp/pwatch.htm)

Every year the University of Alberta monitors flowering times for key indicator plant species and electronically collects information from schools and volunteers. Their website provides an excellent introduction to plant phenology (the study of the seasonal timing of plant life cycles). If you are conducting your field study in the spring, "*Plant Watch*" would be a good supplement to the activities on weather and plants.

The Weather Channel's Education Site:
<http://www.weather.com>

Environment Canada's Prairie
and Northern Region
<http://www.mb.ec.gc.ca/ENGLISH>

Environment Canada
On-line Weather Forecast
www.weatheroffice.com

Environment Canada Weather Information:
<http://weather.ec.gc.ca/>

Weather and Global Monitoring Information:
<http://www.csu.edu.au/weather.html>

WeatherNet
<http://cirrus.sprl.umich.edu/wxnet>



Kananaskis Country Environmental Education Program
Weather Watch: The Living Systems

Selected References

Natural Regions, Subregions and Natural History Themes of Alberta.

Achuff, Peter L.

Alberta Environmental Protection, December, 1994.

The Nature Company Guides: Weather.

Burroughs, William., Crowder, Bob., Robertson, Ted., Vallier, Eleanor., Talbot, Richard Whitaker.

Time-Life Books, 1996.

ISBN 0-8094-9374-8

Handbook of the Canadian Rockies.

Gadd, Ben.

Corax Press: Jasper. 1995.

Plants of the Western Boreal Forest and Aspen Parkland

Johnson, Derek., Kershaw, Linda.,

MacKinnon, Andy., Pojar, Jim.

Lone Pine: Edmonton. 1995.

ISBN 1-55105-058-7

The Canadian Weather Trivia Calendar.

Phillips, Dave.

Fifth House Publishers: Calgary. 1998.

Wildflowers of the Canadian Rockies

Scotter, George W. and Flygare, Halle.

Hurtig Publishers,

McClelland and Stewart: Toronto. 1986.

ISBN 0-88830-286-X

Wild Animals of Western Canada.

Van Tighem, Kevin.

Altitude Publishing: Banff. 1992.

ISBN 0-919381-97-9

The Weather Sourcebook.

Wagner, Ronald and Adler, Bill Jr..

The Globe Pequot Press,

Old Saybrook: Connecticut, 1994

ISBN 1-7627-0080-7

Prairie Plants

and Their Environment

Weaver, J.E.

University of Nebraska Press: 1968

Library of Congress Card Catalogue Number 67-19160

But It's a Dry Cold!

Weathering the Canadian Prairies

Wheaton, Elaine.

Fifth House Publishers: Calgary. 1998

ISBN 1-894004-01-9

