



UNIVERSITY OF  
**REGINA**



**CLIMATE CHANGE EDUCATION SASKATCHEWAN**

# **Kindergarten to Grade 5 Mini Units**

## **Cross-Referenced to Saskatchewan Core Science and Social Studies**

Kindergarten  
Grade One  
Grade Two  
Grade Three  
Grade Four  
Grade Five

November 2003

Canada



Government of  
Saskatchewan

**SaskEnergy**  **SaskPower**



Saskatchewan  
Watershed  
Authority

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## **Climate Change Education Saskatchewan – Management, Advisory and Working Committee Members**

**Director:** Dan Beveridge, Saskatchewan Instructional Development and Research Unit (SIDRU), University of Regina (November 2001 – April 2004) succeeded by Lyle Benko, SIDRU, University of Regina (April – September 2004)

**Management Committee Members:** Dan Beveridge, SIDRU, University of Regina (November 2001-April 2004) succeeded by Lyle Benko, SIDRU, University of Regina (April-September 2004); Ed Dean, Saskatchewan Environment; Lynn Anderson succeeded by Dean Elliot, Saskatchewan Learning; Sharon Metz, Saskatchewan Watershed Authority; Leslie Gosselin, SaskEnergy; Sheila Harlos, SaskPower and Climate Change Action Fund represented by: Debby Corbin, Chief, Outreach Programs, and Annette Boudreau succeeded by Kathy Crate, Program Officer, Outreach and Communications Services Division, Office of Energy Efficiency, Natural Resources Canada, Government of Canada

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Thank you to everyone who has supported or promoted Climate Change Education Saskatchewan.

# **The One Tonne Challenge And the Climate Change Education Saskatchewan Mini-Units**

The mini-units in this package relate to specific curriculum areas that already have a fit with climate change. All of the lessons relate to climate change and use activities, readings and /or outdoor trips to teach the concept. Including the One Tonne Challenge as part of this unit of study will help the students identify ways that they can reduce their greenhouse gas emissions at home and at school. They love to protect the environment and will be keen to do all that they can for our climate.

The One Tonne Challenge, established by the Government of Canada, asks that every Canadian set the goal of reducing their personal greenhouse gas emissions by ONE TONNE (1,000 kilograms). How much is one tonne of GHG emissions? Enough to fill a two-storey 3-bedroom house with greenhouse gas!

How can individuals reduce? Use less energy. Conserve water & resources. Reduce waste. Fewer emissions means protecting our climate and having cleaner air and healthier Canadian communities.

The One Tonne Challenge website ([www.climatechange.gc.ca/onetonne/english/](http://www.climatechange.gc.ca/onetonne/english/)) has all of the information you will need to calculate your personal greenhouse gas emissions with a special calculator. You will be asked to answer questions about your daily activities and will get a personalized report about your GHG emissions. The report will identify the sources and where they come from and will show you how you compare to Canadians in general.

Once you have uncovered where you are contributing the greenhouse gas emissions you will move on to step 2; where you will be asked to select activities that you are willing to do in order to reduce your level of emissions. Get ideas from the Tips Guide and the section on Actions Taken by Canadians. There are lots of very practical and useable ideas for individuals, families and groups.

All of this is as easy as visiting the website and signing up. It only takes a few minutes to see where you fit in and to begin to think of ways that you can reduce GHG emissions. Give it a try!

[www.climatechange.gc.ca/onetonne/english/](http://www.climatechange.gc.ca/onetonne/english/)

**Go ahead! Take the Challenge! Reduce greenhouse gas emission!**

# Climate Change Modules

## Background Information

The earth's atmosphere creates a life-sustaining greenhouse effect, without which the earth's average temperature would be 33 degrees Celsius lower. We are now experiencing the problems associated with a greatly enhanced greenhouse effect. Ice core testing in the Arctic and Antarctic has enabled scientists to examine CO<sub>2</sub> in the atmosphere over hundreds of thousands of years. In 1905 the earth's atmosphere recorded its highest CO<sub>2</sub> concentration in 160,000 years. This of course was due to the Industrial Age. In the past 50 years however, levels have continued to rise dramatically. We have never seen CO<sub>2</sub> levels as high as they are today, nor do scientists know all the future effects of such levels. Most are certain that these very high levels are affecting our climate.

When comparing weather to climate, short-term versus long-term perspectives are examined. When scientists study climate patterns they analyze temperature and precipitation over large land areas, over long time periods of time. This is different from the variations in climatic patterns over the short term or even from varied trends over the long term.

Climate change is scarcely a matter of debate any longer. The growing season in Saskatchewan is 10 to 12 days longer than in 1960. The Arctic ice cap is 48% thinner than in 1970. The mean sea level in equatorial regions has risen 20 cm. since 1980.

In Saskatchewan we can expect:

1. Warmer temperatures.
2. Seasonally wetter winters and springs in Saskatchewan but **less** water in the landscape due to less precipitation and more evaporation
3. More storms with greater impact.
4. Ecosystems that shift with the climate

It is predicted that in Saskatchewan the ecosystems we identify with particular climatic regions will shift as climate changes. For example parkland will be replaced with grassland. The southern boreal forest will be replaced with parkland. As a result, Grassland and Parkland ecosystems will be fragmented and croplands will be in transition. Water availability and quality, both locally and from other sources, will be a concern for farmers, fishers, and rural and urban dwellers. (See Climate Change and Saskatchewan Water by Don Waite, attached)

Climate change will not affect all areas equally. There will likely be some cooling. It will affect groups of people and industries differently and the impact and effects will be variable. Climate Change Saskatchewan ([www.climatechange.sk.com](http://www.climatechange.sk.com)) informs us of the trends, helps us understand consequences of climate change and suggests action. Individual action can be geared towards **mitigation** and **adaptation**. Mitigating actions include acting responsibly to reduce the volume of greenhouse gases we produce. Adaptation will also be necessary as we learn how to do things differently in a changing environment. Both are addressed on the website.

## Information sources

1. *Climate Change, Prairie Biodiversity and Fragmentation- The Taxa Dispersal Model*  
David Gauthier, Ron Anderson and Lorena Patino - Canadian Plains Research Center  
Paul James, Kevin Murphy and Richard Espie - Fish and Wildlife Branch, SERM
2. *Climate and Climate Change: An Overview*  
Dr. Mark Johnston and Ms. Elaine Wheaton - Environment Branch, Sk Research Council

## Kindergarten to Grade Five Modules

The Kindergarten to Grade Five Modules are based upon some common understandings, which we feel are key, both in teaching about climate change and in working towards a healthier interaction with our environment. They are:

- \* Valuing the Earth
- \* Climate is patterns of weather
- \* The Earth is a greenhouse
- \* Climate is changing
  - Temperature is rising
  - Precipitation is down, evaporation up
  - Severe storms are occurring
- \* People are responsible for speeding up climate change (CO<sub>2</sub>, CH<sub>4</sub> - methane)
- \* People can influence climate change:
  - Mitigation (do it differently)
  - Adaptation (do something differently to adapt)

Barb Frazer, a botanist and teacher at the Saskatchewan Indian Federated College says her wish for Climate Change Education in Saskatchewan is that we, in introducing readings, include “the philosophy of care taking and stewardship that First Nations morality encapsulates.” She writes, “I keep pushing the 7 natural laws of how we are supposed to approach each other and the biosphere (**Respect, Honour, Trust, Courage, Honesty, Humility and Love**) as the basis for teaching science. The R in Respect leads nicely to reduce, recycle, reuse, etc. These laws are not applicable only to First Nations, but like Climate Change, it has no boundaries for all of humanity is affected.

Accordingly, the module for each grade begins with a story from Keepers of the Earth. As Climate Change Educators you are invited to take the 7 natural laws into your teaching and enjoy the journey with your students.

The Modules move from a basic study, in K and Grade 1, of earth cycles at work (the sun, water and the interconnectedness of all things on earth), to a look in Grade 2, at habitat (wetlands, grasslands, forest) and the positive and negative consequences to plants and animals, of an ever-changing environment. Upon this framework, the Grade 3 module introduces students to the greenhouse effect and the special needs of plants. Grade 4 then studies weather and changing climate patterns, and Grade 5 reintroduces the greenhouse effect and makes the connection to the precious resource of water.



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# **Kindergarten Mini Unit**

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## **Kindergarten**

The Kindergarten Climate Change unit attempts to help young children connect experientially, some of the understandings within the traditional circle teachings of First Nations philosophy, to the natural world of which they are part.

### **The Circle**

We begin with sitting for lessons and stories in a circle and discuss how all are of equal importance in the creation of a circle; there is no hierarchy of role. We continue, in the unit, to look at the spherical nature of our earth and our sun, the source of all life and the beginning of every food chain or "sun circle". Children will experience a gas cycle (oxygen and carbon dioxide exchange by plants and humans) and explore the idea of circles in their natural world. They are everywhere! As an art project they will create a large class mural of a medicine wheel containing the four traditional natural elements of air, water, earth and fire. Finally they will be exposed to the important concept of the interconnectedness of all life. Again we see the circle.

My hope is that you reawaken within yourselves as teachers, the beauty of discovery and the deep joy that comes with feeling our connection to the earth, and in helping others discover it. We begin the unit with a reading from Keepers of the Earth in keeping with our goal of "care-taking and stewardship".

## **Lesson 1 Nature: Who Needs It? We do!**

**Goal:** Understand that the air, water, food and shelter we need each day come from the Earth

**Materials:** Keepers of the Earth, flexible rubber hose, potted plant, paper, crayons

**Introduction:** Story: The Earth on a Turtle's Back found in Keepers of the Earth p. 25 (Onandaga - Northeast Woodlands)

**Activity:** "Nature: Who Needs It?" *Keepers*, p. 27  
The Gas Cycle: Tie the end of a flexible rubber hose in among the leaves of a large plant and every time students go by, they can exhale some carbon dioxide to the plant and inhale some oxygen from the plant. This symbolizes a life-giving gas cycle.

**Follow Up:** Class Mural - People/Kids & Trees and plants breathing each other's gases. Using arrows draw the cycle on the mural.

Go for a walk outdoors to examine the pores (breathing holes) on the leaves of plants and trees in the schoolyard or nearby park.

Continue the discussion of how nature meets our other needs for water, food and shelter. For example from water faucets go backwards to reservoir, to well or river. From yogurt, backwards to milk, to cow, to grass etc. Look at their homes for evidence of trees (wood), glass (sand), brick (clay), plastic (oil) etc.

## **Lesson 2 The Four Elements of Life**

**Goal:** To understand the all life on this planet comes from the four basic elements of Air, Water, Earth and Sunlight.

### **Background Information:**

The modern study of ecology corresponds to traditional views of many First Nations' people. Atmosphere (air), Hydrosphere (water sphere) Lithosphere (rock sphere) and energy from the sun are concepts taught in ecology. The Greeks also identified the same four elements of life. Each element may be represented by a certain direction and a colour although these vary among different peoples.

"An ecosystem is the web of life: the connections and interactions among the four elements and the variety of plants and animals. The largest ecosystem is the ecosphere - the living planet Earth. But we can look at

smaller ecosystems, like a forest or a prairie, which are parts of the larger ecosphere. Ecology is the study of ecosystems. In this view there is no distinction between living and non-living (biotic and abiotic) factors in an ecosystem. All four elements and their countless variations and combinations are part of life forms. For example, a rock is sometimes thought to be abiotic. But, as the rock breaks down, particles and minerals are absorbed by plants or animals. The rock becomes part of the plants and animals and contributes to its health and life. The first law of ecology is that everything is connected to everything else." (source: *Exploring the Boreal Forest - Understanding an Ecosystem* by Dave Glaze and Kay Willson, 1991, Saskatchewan Environmental Society, p. 8)

**Materials:** Any song about the Earth, four shoe boxes, large roll of white paper, crayons, magazines optional

**Introduction:** Song: Mother Earth Rap - Kim & Jerry Brody or any other song about the Earth. (Raffi, Karen Howe, Fred Penner to name just a few)

**Activity:** Mystery Boxes: Each of the boxes will contain one of the 4 elements.

Put a dish of soil in one, a dish of water in the second, air (sealed in a baggy) in the third, and nothing in the last. (The light will enter when the box is opened.)

Tell the students that everything on Earth needs these four things (elements), then ask them to guess what is in the boxes. Tell them that the last element will only enter when you take off the lid.

**Follow Up:** A Medicine Wheel illustrating the Four Elements (an activity adapted for kindergarten) from *Exploring the Boreal Forest p. 9*

Directions: First cut a large circle of paper and divide it into quarters by folding or use a dark marker. Then divide the class into four groups.

One group will cut out (or draw) pictures that represent **Air**, and paste them into the quadrant that faces north. Their colour is **white**.

The second group's element is **Fire**. They will cut out pictures that represent the sun, the energy for all living things. The plants need this to grow. This quadrant faces east and their colour is **red**.

The third group's element is **Earth**. They will cut out pictures that represent the land and soil, hills and prairie. Their colour is **yellow**.

The last group's element is **Water**. They cut out pictures of lakes, rivers, clouds and snow. Their colour is **black**.

This makes a very beautiful bulletin board. It serves as an important visual with which to discuss how the four quadrants are related and depend upon each other.

### **Lesson 3 Sun is the Source of all Energy**

**Goal:** To recognize that the sun is the original energy source for all life on earth.

**Introduction:** Song/Game - The Sun Powers All, *Earthchild* by Kathryn Sheehan and Mary Waidner, 1991 Council Oak Books

Sung to the tune of "Farmer in the Dell", these new words "The Sun Shines on the Earth" can allow the children to add their own verses as the song continues. For instance, "The grass grows in the sun ..... or The bird eats the worm....etc." Try to create an entire food chain. For the original words see *Earthchild* p. 32

**Activity:** We are Sun Powered, p. 29 *Earthchild*

This is a lovely visualization in which children imagine themselves to be a tiny grass seed buried in the soil and with the energy of the sun which is stored in them, they begin to grow. They grow tall and feed bugs, are nourished by rains and shaken by winds. The bug has an adventure of its own, the sunshine now part of him. He is washed into the river and eaten by a fish. A bear and a boy enter and the particles of energy from the sun continue their journey. The children truly love this story and can act it out when it is finished or draw a picture.

Sun Tea. This activity simply involves putting tea bags into a jar, which sits in the sun and is enjoyed with honey and milk. For a complete description, see *Earthchild* p. 27

**Follow Up:** Sunlight Pictures, *Earthchild* p27

The sun has the ability to fade construction paper quite quickly, so the children will enjoy experimenting with coloured pieces of paper and objects they find in the classroom such as pencils, blocks, and puzzles. They will see the effect of fading when these objects are placed on the paper in the sunlight.

## Lesson 4 Valuing the Earth: Conservation

**Goal:** We have only one earth. We must care for it.

**Materials:** *The Giving Tree* by Shel Silverstein, *Earthsongs* by Don Waite, small boxes or paper bags

**Introduction:** Song: "Ta Da Dump" *Earthsongs*

**Activity:** Story - "Once Upon a Place," This is a long story, but told in two parts with effective expression, kindergarten students can maintain their interest. *Keepers of the Earth* p. 27  
**or use *The Giving Tree*** by Shel Silverstein

Finding a Tree Friend: Take children outdoors and ask them to choose their own special tree. They can smell it, feel it, taste it, listen to it and observe it very, very closely. They can talk to it to encourage them to see details. For example, "I see your cracks tree. I see your leaves with breathing holes. I see your tiny spider friend." They can take a gift to their tree each time they visit. A pebble or a decomposing leaf to nourish it. Continue to visit their trees over time to see the effects of the seasons.

**Follow Up:** Sharing Boxes. By collecting a few things (unattached branches etc.) in little boxes, the children can create a sharing story circle. They can also use their sensory discoveries to write a story or poem as a group. What they heard, saw, felt, and smelt.

Teach the "Story of Paper" from the seedling/tree to the paper in the classroom.

## Lesson 5 Everything is Connected

**Goal:** To understand some of the relationships between the four elements and all life on Earth

**Materials:** *Earthsongs* by Don Waite, tape, paper and crayons or pictures of animals and plants, wool

**Introduction:** Song - "Water Rap: Fish Facts." *Earthsongs*

**Activity:** Story Circle

When creating a Story Circle, sit in a circle and begin the story. For example: The sun was shining brightly on the land. A gentle breeze blew a dandelion seed onto some dark soil near a pond.....

Each child takes a turn to continue the story in which you may try to create, yet again, a food chain to help children integrate the ideas in the unit.

**Follow Up:** Create a Web of Life Bulletin Board.

Using pictures the children have drawn, cut outs from magazines or pictures of animals and plants on hand, hang them on the bulleting board with the sun in the middle and create all the connections with wool. It will make a wonderful web and help students see visually, the ways in all things are connected.

At the unit's completion, create a slogan for you class to help children and parents remember the lessons. "Hug a Tree on Your Way Home Today" or "Soak in the Sun Today" or "Use your Senses Everyday and Love Mother Earth."



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# **Grade One Mini Unit**

## **Cross-Referenced to Saskatchewan Core Science and Social Studies**

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## **Grade 1**

In the Introductory Climate change unit (Kindergarten) we looked at earth cycles and our interconnectedness, with the Sun being the energy source of all life, and the primary focus.

The five lessons included in that unit are an excellent introduction to this unit. They are applicable for all grades K - 3.

In Grade One, we look at Water and connect activities to objectives listed in the Sask. Ed. Science Curriculum's unit "Earth". (The lessons include many Language Arts and Arts Ed. activities and in some cases could extend to the entire half day.)

Clean water is already scarce. We want children to be mindful of the origins of the water they use daily, to understand the water cycle, to appreciate water habitats, such as ponds, lakes and oceans and in Saskatchewan, to understand that many wetland habitats are in trouble because of drought and wetland draining.

This is not a comprehensive study of water, rather an exploration of some of the Gr. One curricular objectives from a climate change perspective. The understandings build and develop from Kindergarten through to Gr. 12.

## Lesson 1    **Origins of Water - An Earth Cycle at Work.**

Curriculum 3.4 Discuss the effects of wind and water on environment

**Goal:**            To explain the origins of water.  
                      To explain clean water is scarce.  
                      Living things need water.

**Materials:**    *Keepers of the Earth* (found in all school libraries in Sk.)  
                      *Earthcycles & Ecosystems* Beth Savan 1991 Kids Can Press  
                      Paper, pencils, clipboards or mini chalkboards with clips  
                      *You Are The Earth* by David Suzuki and Kathy Vanderlinden

### **Background information:**

Water covers nearly 75% of the earth's surface.

The human body is about 70% water, mostly locked in our cells. We lose water continually through sweating, breathing and elimination. We need between 1 and 2 liters a day to replace the water we lose. We are like plants in this way. Much of our water comes from our food and the rest we must drink. Finding clean water is becoming more and more difficult for many of the world's people. (Unicef estimates children die each year from unsafe water.)

The water we drink was once a drop of rain. The same water that is on the Earth today was on the Earth at the time of the dinosaurs. Maybe the water you drank today once trickled down a dinosaur's back. There is no more and no less water on the Earth than there was a million years ago. The water blows in the wind, soaks into the land, runs in rivers, flows into lakes and underground streams. Before it finds its way into your taps it picks up soil, plant and animal debris, factory chemicals, farm fertilizers and toxins from dumps.

There is more background information in *Keepers of the Earth* in the section on Water p. 84 and very **child friendly** information in *You Are the Earth* by David Suzuki and Kathy Vanderlinden in Chapter 2 – “Welcome to Planet Water” or *Eco-Fun* – Ch. 2 “Waterworks” by David Suzuki

**Introduction:** Read “Kaluscap and the Water Monster” in *Keepers of the Earth*, p. 81.  
                      Dramatize the story with the students if you wish.  
                      Or Read “Ahaiyata and the Cloud Eater” p. 30 in *You Are The Earth*

**Activity:**        **Sing or Listen** “Clean Rain” *Evergreen ,Everblue* by Raffi

Rain Making - *Keepers*, p. 85

In this activity, children simulate a rainstorm beginning with wind, adding drizzle, then hard rain and thunder until the storm gradually blows away.

They rub their hands, snap their fingers, slap their thighs, stamp their feet and then reverse these sounds for the storm's passing.

Visit a stream, pond or lake if possible See *Keepers*, p. 87

When they arrive, give students a time to observe and discuss with a partner what the stream offers people, plants and animals nearby. Students can create in partners or as a class a "Thank you" chant for the stream. Ask students to fill in the Aquatic Creature Card on p. 88 or to simply draw one water creature or plant and identify with pictures or words its size, its food, its predators, how it moves underwater, where it lives, and how it survives the winter. Discuss what would happen should the stream dry up.

**Follow Up:** Trace the source of water in our bodies using background information and class discussion.

Chart the many ways we use water: things we wear, food we eat, etc. Using *You are the Earth* (Suzuki) p. 40 compare how Laura (New York) uses Water and how Losero (Kenya) uses water. Excellent comparison.

Project Wild Water Wings activity p. 87 Children learn to illustrate the water cycle through a beautiful guided imagery, poetry and artwork. Excellent activity.

Life in a Pond – “Now a Person, Now an Insect” activity in *Keepers of the Earth* p. 57 One student is turned into an aquatic insect to demonstrate adaptations needed to survive in water.

**Action at home:**

Ask students to have a quick shower instead of a bath and save many liters of water. The average Canadian uses 25 L of water per shower. Ask students to keep a list of the ways they have saved water.

Try Water Meter Activity: *Project Wet*, p. 271.

## Lesson 2 Rainmaking

### Curriculum 3.6

**Goal:** Explain how wind and water can be useful.

**Materials:** *Keepers of the Earth*  
Earth Songs by Don Waite  
*The Water's Journey* by Eleonore Schmid, 1989 Excellent resource  
*Eco-Fun* by David Suzuki and Kathy Vanderlinden  
*Earthchild* by Kathryn Sheehan and Mary Waidner

**Introduction:** Rainmaking (Learned in Lesson 1)  
Song: "Rain, Rain" - Earth Songs - dramatize with children.

**Activities:** Story (visualization)  
"The Birth of a Raindrop" - *Keepers*, p. 86  
(Outdoors, if possible) This is beautiful story of a raindrop from dust to droplet which children can dramatize or illustrate at the end.

How Tall is Your Rain? P. 32 *Eco-Fun* (Suzuki) A simple rain gauge.

Rainy Day Hike (if possible) *Project Wet* p. 186 - see K-2 option, p. 189  
In this activity children work in groups to investigate flowing water on the school grounds and observe what is in the water. They can play with natural boats of sticks and leaves and have races. They imagine what will happen to the boat and water once it leaves the school ground, and discuss the importance of keeping the playground clean.

**Follow Up:** "Where Does Rain Come From?" *Earthchild*, p. 165 This is a simple kettle experiment using ice in an aluminum pan over the steam to illustrate condensation.

"Breathe a Cloud," *Earthchild*, p. 166. On a cold day children can "see their breath" and this is similar to how real clouds are made in nature, where warm moist air rising from lakes and rivers meets cold air and forms into tiny water droplets.

**Action At Home:**

"Rest Upon a Cloud," p. 166. *Earthchild* Cloud watching made interesting by encouraging children to see "pictures in the sky".

### **Lesson 3    Connecting with Mother Earth**

**Goal:** To establish a relationship and connection with the natural environment

**Materials:** C.D. *What a Wonderful World* by Louis Armstrong  
*Let's Help This Planet* by Kim and Jerry Brodey  
*Keepers of the Earth*  
*Project Wild*  
*Earthchild* by Kathryn Sheehan and Mary Waidner  
*Eco-Fun* by David Suzuki and Kathy Vanderlinden

**Introduction:** “What a Wonderful World”

Take time to put children into groups to create actions to each part.  
“Mother Earth Chant” *Let's Help This Planet* Also great with actions.

**Activity:** “Special Spots” In this very special activity called “Once upon a Place”, *Keepers of the Earth* (p. 22), students visit a natural area (park, field, creek side or coulee) and find their own special spot. There is quite a comprehensive list of ideas in the book to keep children engaged on their visits. Beautiful writing emerges from “Special Spots”. They become attached to their special place and in this natural bonding, the seeds of caring for our Earth are planted. Look for the interplay of wind and water in the spot you have chosen.

“Rest Upon a Cloud” See last lesson, at home follow up.

“Raindrop Relay,” *Earthchild*, p. 167 This is an exciting outdoor activity which demonstrates to young children the journey of a raindrop in a watercycle. Teams of five children, using a balloon (raindrop) make the journey from cloud to mountain to cloud. The cloud child holding the raindrop floats down to the mountain child. From there it goes to the stream child, the river child, the ocean child and the finally again to the cloud child, all children playing together to help the raindrop along its obstacle course, the water cycle.

**Follow Up:** “Aqua Words,” *Project Wild*, p. 55. This is a writing activity in which the children create a list of water words and/or ways living things depend upon water and then use that list as a basis for writing poetry.

**Action at Home:**

“How Tall is Your Rain” can be used as an at home activity  
p. 32 *Eco-Fun*

## Lesson 4 The Wind and the Rain Play Together

**Curriculum 3.5** Explain how wind and water can be helpful.

**Goal:** Wind energy helps to clean air, to bring clouds, to keep surfaces of water clean, and to spread seeds. Wind is renewable energy.

**Background Information:**

Wind is created because of the uneven heating and cooling of the Earth's surface. This causes differences in pressure. Air moves from areas of high pressure to areas of low pressure. Warm air is lighter than cold air and so it rises, and cool air rushes in to replace it.

**Materials:** *Celebration of Diversity* by Karen Howe (tape)  
*Keepers of the Earth*  
*Eco-Fun* by David Suzuki and Kathy Vanderlinden

**Introduction: Song:** “The Wind and the Rain” *Celebration of Diversity*

**Activities:** Story: “Gluscabi & the Wind Eagle,” *Keepers of the Earth* p. 67

The Water Cycle: Explain again how it works. Create a bulletin board if you wish. Remind students that wind moves water droplets and plays a role in the cycle.

Spread Seeds using the wind.

“Catch the Wind,” *Keepers* p. 72. In this activity students learn how wind helps to keep clean the surface of the waters on Earth.

The Wind and the Clouds Lie down and watch clouds disappear (evaporation), and see the role of the wind.

**Follow up:** If it is a very windy day take students out to lean into the wind, and to share experiences of being in a strong wind. Use this discussion to introduce the topic of wind energy, a renewable resource. Make pinwheels and take outdoors, fly a kite, or blow soap bubbles to see the power of the wind. See p. 88 *Eco-Fun* “Big Wheels”

## Lesson 5 Action/Reaction We Do Make a Difference

### Curriculum 3.6 Observe and Describe the Effects of Air or Water Pollution

#### Background Information:

With Acid Rain, the normally acidic nature of rain is made even more acidic with concentrations of sulfur dioxide and nitrous oxides in the air. Nitrous oxides are produced primarily by vehicle exhaust. Sulfur dioxide is produced by electrical generating plants, industry, the burning of coal and other fossil fuels. Sulfur dioxide and nitrous oxides combine with atmospheric water and produce acid rain, sleet, snow or fog, which is corrosive and deadly for plant and animal life. Lakes are poisoned, habitats altered, important soil nutrients leached away. The balance of ecosystems is ever more precarious in many areas.

**Introduction: Songs:** “Northern Skies” *Earth Songs* or “Let’s Help This Planet” on *Let’s Help This Planet*, Kim and Jerry Brodey

**Materials:** *Project Wild*,  
*Earth Songs*  
*Let’s Help This Planet*  
*Earthchild* by Kathryn Sheehan and Mary Waidner.  
*Eco-Fun* by David Suzuki and Kathy Vanderlinden

**Activity:** Deadly Skies (Acid Rain), *Project Wild*, p. 319 In this activity, even young children will be able to describe acid rain and describe the effects of acid rain. Children can taste maple syrup to get a first hand example of something wonderful (from the Sugar Maple tree) that is threatened in our country.  
Acid Rain, Go Away! *Eco –Fun* p. 34

**Follow Up:** Appreciating Trees  
“Dressed in Splendor,” *Earthchild*, p. 139 Children make a tree trunk vest using a brown paper bag, and using crayon tree bark rubbings for effect. They make leaf crowns and wrist bands.

“Be a Tree” p. 139 *Earthchild* Children can wear their tree clothing and experiment with what it feels like to be a tree using their imagination and listening skills as they dramatize a story “Be a Tree”.

“Are we Really Different from Trees?” p. 138 *Earthchild*. Children look at what a tree needs to survive and what it takes for us to survive. If children have adopted a tree as their Special Spot, they can compare themselves structurally with the tree: toes-roots, arms - branches, trunk - trunk, bark - skin, leaves - fingers, etc.

**Final Action Component:**

Teach children to realize that a tree's value does not end after it dies a natural death. It become home to thousands of decomposers, earth making insects, which will in time, with the help of water, create habitat for yet more life. The wonderful circle of life continues.

With family they can explore and not destroy, enjoy and not pollute, and finally they can protect (reduce, recycle, reuse) and learn more about their home, the Earth.

Children can explore with their families ways to walk and bike more, carpool, or use buses. See "A New King of Bus Afoot" p. 32 and "It Takes a Whole Bus to Educate a Child: A Reading p. 37 in *Teaching About Climate Change: Cool Schools Tackle Global Warming*, edited by Tim Grant and Gail Littlejohn Published by Green Teacher



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**CLIMATE CHANGE EDUCATION SASKATCHEWAN**

## **Grade Two Mini Unit**

**Cross-Referenced to Saskatchewan  
Core Science and Social Studies**

Linda Dodd

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## Climate Change: Grade 2

The Grade Two Module builds upon the Kindergarten and Grade One units in which children begin to understand earth cycles at work by looking at the sun, water, and the earth and the interconnectedness of all living things. In Grade Two we introduce the critical element of habitat and the positive and negative consequences of an ever-changing environment on wildlife, plant life and people. Basic concepts and activities from the K/1 modules can be taught to build understanding for the Grade Two unit.

### Lesson 1 Habitats

**Goal:** To identify students' own needs for food, water, shelter and space in suitable arrangements and to generalize that wildlife and other animals have the same needs.

**Materials:** *Project Wild*  
*You Are The Earth (David Suzuki) or Keepers of the Earth*

#### Activity: Introductory Story

Four Worlds: The Dine Story of Creation *Keepers of the Earth* p. 31  
or The Animal Canoe in *You Are The Earth* p. 78  
Introduce the term habitats. Habitats are also homes.  
What do all living things need for life?

What's That Habitat? page 36 of Project Wild

#### Follow Up:

Everybody Needs a Home (Habitats are also homes) p. 26 *Project Wild*  
Habitat Rummy ( a card game to ensure students understand the concepts of food, water, space, shelter and arrangement) Page 38 Project Wild

## **Lesson 2          Meeting the Habitats (part 1) WETLANDS**

**Goal:** To enable students to describe the characteristics of wetlands and to demonstrate their understanding of the importance of wetlands to wildlife and humans.

**Materials:** *Project Wild*,  
*Earthsongs* by Don Waite,  
*Marsh Monsters* (Ducks Unlimited)  
*Wetlands Explorer*(digital expeditions next best to nature) Earthseeker  
Multimedia Inc.

**Activity:** What lives in a wetland?  
What do things do in the wetland?

Wetland Metaphors, p. 168 Project Wild. In this activity students are presented with a selection of "hands on" objects as metaphors for natural functions of wetlands. They also discuss the variety of wetlands found in their local area.

**Follow up:**

“Water Critters” *EarthSongs* by Don Waite  
Students can begin looking more closely at aquatic critters, maybe even at a local pond.

\*Get copies of Marsh Monsters. This a 2 sided sheet of pictures and measurements for pond bugs from Ducks Unlimited.

### **Lesson 3          Meeting the Habitats (part 2) GRASSLANDS**

**Goal:** To enable students to recognize the characteristics of a grassland, to understand its importance to plant and animal life and to introduce them to the names of some of the species present in Saskatchewan grasslands.

**Materials:**

*Project Soils, Film, pictures of prairie grasses, birds and insects*

**Activities:**

What lives in a grassland?

What are the characteristics of plants on the prairies?

\*Get collection of laminated pictures of prairie grasses (Managing your Native Prairie Parcels), prairie mammals, common birds and insects.

This could be made into a scavenger hunt sheet to use on the culminating field trip.

At this point the children are beginning to look at what lives in the grassland and begin to learn some of their names.

What is the soil like in the grasslands?

**Activity:** Dirt Discoveries (p. 8 Project Soils)

**Activity:** Why do I Need a Soil? (p. 10 Project Soils )

**Follow Up:**

Field Trip, Scavenger Hunt using pictures, Film or video of grassland habitat

## **Lesson 4 Meeting the Habitats (part 3) WOODLANDS**

**Goal:** To enable students to understand the characteristics and plants of a woodland.

**Materials:**

*Focus on Forests, pictures of animals, plants and insects*

**Activities:**

What lives in a woodland?

What are the characteristics of plants in the woodland? How are they different from prairie plants?

**Activity:** Who Am I? (p. 139 Focus on Forests) An activity/game which gives students an opportunity to learn and organize components of a forest into categories through questioning.

**Activity:** Forest Food Webs ( p. 141 Focus on Forests) Helps students understand the importance of trees in a forest food web.

**Activity:** Mini-Forest in the School Yard (p. 115 Focus on Forests)

\*Develop collection of pictures of animals, plants and insects (considering regions - Parkland and Boreal Forest)

**Follow Up:**

Use. Forest in a Jar (p. 148 Focus on Forests) Students have the opportunity to observe and describe the process of succession ( the natural environment is constantly changing over time). Students can relate that to changes (positive and negative) in our community and city, and how people/children can create positive change.

## **Lesson 5 Is it Necessary to Look After our Own Habitat?**

**Goal:** Students will have an opportunity to understand the importance of managing our forests.

**Materials:**

*The Lorax by Dr. Seuss,*

*Focus on Forests*

*Seeds (optional)*

*Materials for dioramas*

**Activity:**

The Lorax (p. 222 Focus on Forests) Using drama, visual art and language arts skills students participate in an engaging activity designed to help them understand the different types of pollution and the cause/effect relationship on the environment of poor management.

(Note: This has also been made into a classroom drama - Dan Stoker -SEEDS)

**Follow Up:**

Create models/dioramas of a forest community

Integrate the ideas from the Lorax activity into language arts and drama and invite another class in for the presentations.

**Lesson 6      Critter Overload or Too Many Critters**

**Goal:** Students will understand the positive and negative effects, on wildlife and people, of crowding and begin to discuss behaviors, which will reduce negative consequences.

**Materials:**

*Project Wild*

**Activities:**

What happens when there isn't enough habitat? What causes habitat to disappear?

Activity: Too Close for Comfort (p. 286 Project Wild) A look at crowding and its effects.

Activity: Shrinking Habitat (p. 289) A look at human development on land areas and the resulting critical loss of habitat.

**Follow Up:**

Ask students to discuss at home how they manage and look after their own environments, how we do it in our communities and in our city.

**Lesson 7      Habitat Visit: Studying Three Habitats (Field Trip)**

**Goal:** To look at 2 or 3 habitats (on one site) and see what you recognize.

**Equipment:****Pond Kit:**

Ice cream pails  
Other smaller plastic containers  
Plastic white spoons  
Micro boxes  
Large white plastic sheet

**Woodland Kit:**

Thermometers  
Hand lenses  
Bug net  
Stethoscope  
Trowel

**Grassland Kit:**

Thermometers  
Hand lenses  
Bug net  
Bug eye goggles or viewer  
Trowel

**All Kits:**

Paper and crayons  
Milk carton and clipboards  
(monsters and mini beasts by Dan Stoker)

**Activity: Studying Three Habitats**

Eye Spy (p. 121 Focus on Forests)

Shelter Me (p. 136 Focus on Forests)

Sensational Experiences (p. 118 Focus on Forests)

**Directions:**

Divide the class into 3 groups, one for each habitat with an adult leader per group.

Each habitat group heads to their habitat zone:

The first group takes the kit to the area.

Spend around 30 minutes in each habitat, then rotate and exchange kits.

Time may permit only a visit to 2 habitats.

If sample collecting is necessary, do it sparingly and be very specific about what and who does the collecting. The children need to learn NOT to take things - teach LEAVE ONLY FOOTPRINTS. TAKE ONLY MEMORIES.

(Check kits after each rotation to make sure everything is there.)

At each habitat, have the children do a drawing of their favorite insect, plant, scene, etc. These can be used back at school to make a wall quilt/mural (add print comments too).

**Resources:**

For grassland birds (also has grasses): A Land Managers Guide to Grassland Birds of Saskatchewan) Sask. Wetland Con. Corp. 2002 ISBN: 1-896-793-29-0

***Wetland Explorer* (EarthSeeker Multimedia Inc. 2002)**

This excellent resource kit takes children on a virtual wetland experience complete with natural sounds in their ears. They explore a unique part of our world...our wetlands. Complete with C.D. and teacher guide this is appropriate for K through Gr. 6. I.S.B.N. 0-9689916-0-2



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**CLIMATE CHANGE EDUCATION SASKATCHEWAN**

## **Grade Three Mini Unit**

### **Cross-Referenced to Saskatchewan Core Science and Social Studies**

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## **Grade 3 - Climate Change and Plants**

In the Grade 3 Climate Change Module we move into a study of the greenhouse effect and the special needs of plants. We have moved from a basic appreciation of our earth in Kindergarten to an understanding of the interconnectedness of all living things in Grades 1 and 2. We began with cycles of the sun the rain, and their effects on the earth. Then children were invited to take a deeper look into Habitat in Grade 2 (wetland, grassland, and forest). In Grade 3 we build on these understandings, take a closer look at plants and introduce students to the concept of the greenhouse effect.

**Curriculum Connections: Science - Plant Structures and Adaptations  
Social Studies - Changes**

### **Introductory Story: Four Worlds: The Dine Story of Creation**

*Keepers of the Earth page 33*

#### **Lesson 1 The Value of Trees**

**Goal:** To help students understand that trees give us oxygen, food, beauty and wood; that they provide food and shelter for animals.

To help students understand that we nurture the soil by planting trees.

To help students understand the cycle of giving and receiving between soil and plants.

#### **Materials:**

Keepers of the Earth, The Giving Tree by Shel Silverstein

#### **Activity:**

Brother Soil - Sister Tree Keepers of the Earth page 35 This activity involves visiting a tree, hugging it, taking bark rubbings and leaf prints and in general, spending time with it.

#### **Follow Up:**

Children can plant a seedling at home, or in the schoolyard.

Children can go home and observe which plants and animals use a backyard tree for shelter or food.

Discuss with parents how to care for trees in their yards.

## Lesson 2 A Look At Seeds

**Goal:** Students will observe and describe seed germination

**Materials:**

Focus on Forests

**Activity:**

Here's Looking at Seed Germination (page 41) In this activity children predict and test the effects of light on seed germination.

**Follow Up:**

A forest or neighbourhood walk to observe which plants and trees grow in full sunlight and which grow in partial shade. Take an identification book along if you have one.

Discuss the value of light on all living things, the emotional as well as the physical effects of light. Imagine and discuss what it is like to live in Northern Canada.

## Lesson 3 Nutrients for Seedlings

**Goal:** Students will understand the role of water and nutrients in plant growth.

**Materials:**

Focus on Forests

**Activity:**

How Thirsty Are Seedlings p.45 and Digging into Soil p. 47

In these activities students experiment with water and a variety of liquids and soils as they try to support plant growth in their beans.

**Follow Up:**

Relate these understandings to our human situation and climate change.

Background: In Saskatchewan we have a growing season now 10 to 12 days longer than in 1960. We are experiencing weather extremes, more evaporation and precipitation is expected to decrease. When growing conditions change on the prairies how might crops be affected? People? What might be the negative consequences on our bodies, of an inability to provide ourselves with proper nutrients? What conditions might arise in which we would experience difficulty in caring for our needs?

**Song:** Rain Song *Earthsongs by Don Waite*



## **Lesson 4 The Greenhouse Effect**

**Goal:** Students will observe and explain how a greenhouse works, and see how the earth's atmosphere naturally acts like a greenhouse.

**Materials:**

*Our Changing Climate, Toronto Environmental Alliance*

**Activity:**

The Green house Effect *Our Changing Climate p. 22* In this activity students work cooperatively in a group activity to understand a diagram which explains how a greenhouse works as a system.

**Follow Up:**

Engage students in discussion about other systems: classroom, family, digestive, ecosystems, etc.

Investigate options available to make the school greener (eg. Destination Conservation or SaskPower seedlings)

## **Lesson 5 Simulating a Greenhouse**

**Goal:** To help students understand the functioning of a greenhouse.

**Materials:**

*Our Changing Climate, Toronto Environmental Alliance*

**Activity:**

Greenhouse Simulation Experiment p. 26 *Our Changing Climate*

In this activity students fill two pots with soil, encase one in a plastic bag with a thermometer and predict and observe the growth of alfalfa seeds, in order to help them see that a greenhouse traps heat and moisture in a similar way that carbon dioxide and other greenhouse gases trap heat inside our atmosphere.

**Follow Up:**

Students can clip newspaper articles on climate change and create a bulletin board.

Following this, a discussion regarding ways individuals can work to eliminate greenhouse gases would be appropriate.

See *Junior Green Guide by Pollution Probe* or  
*50 Simple Things Kids Can Do To Save The Earth* by Earthworks

See *Renewable Energy Grades K - 3* by Sue LeBeau  
(*Teaching About Climate Change* p. 30)



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**CLIMATE CHANGE EDUCATION SASKATCHEWAN**

## **Grade Four Mini Unit**

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## Grade 4 -Climate Change and Weather

The Grade 4 Module introduces students to the concept of climate change, how climate differs from weather, and how both affect human lifestyles. Students learn that climate change projections for the Prairies show an increase in temperature under global warming. Climate change definitely affects weather patterns on the prairies. Extreme events, increased summer temperatures and increased evaporation are three major consequences of Climate Change. This means that people in Saskatchewan will experience severe weather more often; tornadoes, hailstorms, heat waves, flooding, drought, winter storms and winter rain are expected. Students will learn how human activities are upsetting the balance of greenhouse gases, such as carbon dioxide, that individuals account for 28% of Canada's greenhouse gas emissions, and that students can effect change through small actions.

**Introductory Story: *Gluscabi and the Wind Eagle*** (Keepers of the Earth p.67)

### **Lesson 1 Introduction to Predicting Weather**

**Goal:** Students will begin to understand that people predict weather and have an opportunity to practice predicting the weather.

**Materials: The Blizzard,**

**Climate Change Information Sheets**

*Climate Change: Canada and the World*

*Climate Change: In Saskatchewan*

*Climate Change: Science*

See: [www.climatechange.gc.ca](http://www.climatechange.gc.ca) or call 1 800 O Canada  
or TTY 1 800 465-7735 and ask for a climate change kit  
Also [info@climatechangesask.ca](mailto:info@climatechangesask.ca)

**Activity:**

Use the story *The Blizzard* - Practicing the Law of Circular Interaction (Principle 3, Lesson 1) Teacher reads the story and students have an opportunity to make weather predictions.

Have a follow up lesson/discussion.

Discussion:

How do we predict weather?

Why is predicting weather useful?

How does climate differ from weather?

At this point teachers can introduce the causes and consequences of climate change, and specifically review effects in Saskatchewan.

**Follow Up:**

Using a graph, predict the weather for the next day based on observable things in the outdoor environment. Use type of clouds, direction of wind, time of year, etc. Students may research how, historically, Indigenous People predicted weather.

## Lesson 2 and Lesson 3

**Climate Patterns** (This activity will take at least two periods)

**Goals:** Students will locate global climates based on their interpretation of data.  
Students will provide reasons for the locations of climates.  
Students will identify how humans adjust to a diversity of climates.

**Materials:**

Project Wet (globe, flashlight, world map)

**Activity:**

Piece it Together p. 174 In this activity students analyze and plot global temperature and precipitation distributions to determine climate patterns and how they influence human lifestyles. Regional stories read by the teacher, help students understand the implications for children's lives in different climates.

**Follow Up:**

Students write their own story, using a typical winter day in Saskatchewan, including in their writing the ways we must adapt to weather changes in our province.

## Lesson 4 Is Climate Change Good for Us?

**Goal:** Students will explore how changes in climate could affect daily life and influence the economy of a region.

**Materials:**

*Teaching About Climate Change, Cool Schools Tackle Global Warming*  
produced by Green Teacher  
*EarthSongs* by Don Waite (C.D.)

**Activity:**

Is Climate Change Good for Us? (P. 17) A good deal of information and background is provided for teachers with this activity. It can be done individually or in groups. Children benefit from group discussions and have the opportunity to use charts to record the consequences of various climate changes. Perfect for junior students.

Sing "Temperature Rising" on *EarthSongs* C.D. by Don Waite

**Follow Up:**

Invite into the classroom a local farmer, fisher, scientist or businessperson. Children have the opportunity to ask questions to see that climate changes which some may consider desirable (more sun, more time on the beach), may not be beneficial to farmers, wildlife, or business.

## Lesson 5 Climate Connections

**Goal:** Students will understand the connection between climate change and wildlife.

**Materials:**

*Climate is Changing: Help Wildlife Weather the Storm* (2002)  
National Wildlife Week April 7 - 13, 2002  
See [www.wildeducation.org](http://www.wildeducation.org)  
[www.cwf-fcf.org](http://www.cwf-fcf.org) or email at [info@cwf-fcf.org](mailto:info@cwf-fcf.org)  
Phone Canadian Wildlife Federation at 1 800 563 WILD

*Teaching About Climate Change, Cool Schools Tackle Global Warming*  
(*Green Teacher*)

**Activity:**

Climate Connections  
Use lesson 4 in *Climate is Changing*

**Follow Up:**

The Clean Air Game p. 61 *Teaching about Climate Change (Green Teacher)*

This game initiates discussion about the importance of protecting the atmosphere and helps students understand distinctions between greenhouse gases and air pollutants. Can be played from 4<sup>th</sup> grade to high school.

Taking Action on Climate Change: Inside and Outside our Schools p. 53

*Teaching About Climate Change (Green Teacher)*

What Cool Schools Can Do p. 56 *Teaching About Climate Change*

*(Green Teacher)* These activities help students and staff recognize ways they can save energy and reduce carbon emissions.



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**CLIMATE CHANGE EDUCATION SASKATCHEWAN**

# **Grade Five Mini Unit**

## **Cross-Referenced to Saskatchewan**

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Don Waite

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## **Grade 5 - The Greenhouse Effect and Water**

In the Grade Five Module teachers will introduce students to the science behind the greenhouse effect and make vital connections to water. The activities are both engaging and thought provoking. Our thanks to Don Waite who knows science, music and kids.

### **Background Information**

## **Climate Change and Saskatchewan Water**

### **1 - Introduction**

The three main climate change factors that will effect aquatic systems on the prairies are: increased temperatures; decreased precipitation; and, changes in the time of year when precipitation falls (summer rain versus winter snow)

Saskatchewan has a large number of natural bodies of water within its borders. These include lakes, ponds, wetlands, rivers, streams and underground aquifers. There are also many artificial water bodies such as dugouts and reservoirs. Most of the lakes are located in the north, on the Canadian Shield. In the south, where most of the population lives, there are fewer natural lakes but many dugouts and reservoirs. These sources of water are essential for human consumption, agriculture, recreation, fisheries and wildlife including waterfowl. The southern waters tend to have higher concentrations of salts than those in the north and salt concentration affects the ways that they can be used. The following is a very brief description of the sources of water and the ways that predicted climate change may affect them and, subsequently, the water users.

### **2 - Sources of Water**

Saskatchewan has two sources of water: water which falls directly on the province as snow and rain; and water which falls outside of the province, primarily the Rocky Mountains, and enters Saskatchewan via major rivers such as the North and South Saskatchewan and Churchill Rivers.

## 2.1 - Water which falls directly on the province

The primary source of local water falls in the form of snow that melts in the spring, filling local lakes such as the Qu'Appelle Lakes as well as wetlands and dugouts. Some of this water percolates through the soil and recharges surficial aquifers (ground water sources which are close to the ground surface). The "flush" of spring water also flushes the lakes, reducing some of the salt content. Water also arrives as summer rain. This can fall directly on the lakes and add to their content but it is usually a minor contribution. The rain falling on the land is usually absorbed and evaporates rather than running into the lakes and streams. Many rural municipalities and residents depend on surficial aquifers as sources of drinking water and reduced local precipitation and percolation into these will cause them to dry up.

## 2.2 - Water entering the province from outside

There are three major rivers, the North and South Saskatchewan and Churchill Rivers, which bring water into the province. They receive water from melting snow that falls on the Rocky Mountains. Low snowfall in the Rockies can, then, greatly affect Saskatchewan. Some of the South Saskatchewan River water is diverted into the Qu'Appelle River and lakes from Lake Diefenbaker. This diversion provides part of the water supply for Regina and Moose Jaw. The city of Saskatoon receives its water from the South Saskatchewan R. and North Battleford and Prince Albert receive water from the North Saskatchewan R.

## **3 - The Impacts of Climate Change**

### 3.1 - Increased temperatures

Increased temperatures may, in some ways, seem to be a benefit to Saskatchewan. They will, however, result in increased evaporation from our surface waters (lakes, dugouts etc.). This will reduce water levels and may affect the surficial aquifers that are "recharged" from or connected to the surface water bodies. Increased water temperatures may increase the growth of problem organisms like toxic algae and may affect local fish populations that prefer cooler water.

### 3.2 - Reduced precipitation

Reduced precipitation, both locally and in the Rockies, will reduce the amount of water available in the province. This, combined with increased evaporation will make the effects severe.

### 3.3 - Change in the time of year when precipitation falls (summer rain versus winter snow)

When winter snows melt the water runs off of the frozen land, down streams and into wetlands, lakes etc. This serves two functions. It replenishes the water lost by evaporation during the summer. It also flushes, from the lakes, salts which dissolve from the land and which are concentrated by summer evaporation. Without flushing the salts

will build up, making the water less potable. Water flowing from the lakes supplies downstream users. Summer rains tend to percolate into or are directly evaporated from the soil and do not have the same contribution to lakes and streams. Increased salts will also make the water less suitable for fish, cattle and wildlife. Some lakes, such as Old Wives Lake, may completely dry up as happened in the 1980s.

#### **4 - Conclusions**

The impact of climate change will probably be

- 4.1 - reduction in lake volume
- 4.2 - increased salinity
- 4.3 - reduction or loss of current agricultural and recreational activities
- 4.4 - deterioration of fisheries and wildlife/waterfowl habitat and populations
- 4.5 - increased demand for external water supplies such as diversions from the South Saskatchewan River system
- 4.6 - increased growth of nuisance species such as blue-green algae and carp
- 4.7 - reduction of water in surrounding surficial aquifers, wetlands and dugouts

## Grade Five Lessons

The Grade Five Module is divided into two major sections, The *Greenhouse Effect (Level 1)* and *The Role of Water (Level 2)*. Each section is organized with Introductory Story, Goals, Activities and Follow up Action.

### **The Greenhouse Effect**

#### **Introductory Story:**

**How Grandmother Spider Stole the Sun** (*Keepers of the Earth*) p. 49

#### **Level 1:**

(The objectives and activities in this section will likely necessitate 2 to 3 periods.)

#### **Goals:**

To engage students in discussion about global warming

To help them understand some of the consequences of the greenhouse effect.

#### **Materials:**

*Our Changing Climate (Toronto Environmental Alliance)* ,

*Teaching about Climate Change (Green Teacher)*,

*Project Wet*

#### **Activities:**

##### 1. How the Greenhouse Effect Works p. 28 - 31 *Our Changing Climate*

These illustrated, reproducible pages explain clearly to students how some incoming light rays are absorbed and then converted to heat or reflected back into space, and how others become radiated heat which then is trapped by gases and reflected back down towards the Earth. (Excellent resource)

##### 2. Greenhouse effect and experiments

What follows are several different experiments in various resources which will help students to understand through participation and demonstration, the concept of the Earth as a greenhouse, the effects of increased carbon dioxide on the environment, how colour influences rate of sunlight absorption, and how gases travel through diffusion. Any or all may be used to foster understanding.

1. Greenhouse Experiments *Our Changing Climate (TEA)* page 33-36

2. Gases and Greenhouses: Simple Activities for Exploring Key Concepts  
(*Green Teacher*), page 11

## **Follow Up or At Home Activity:**

1. Solar Box Cooking *Teaching About Climate Change* page 25

## **The Role of Water**

**Introductory Stories: The Hero Twins and the Swallower of Clouds and/or Koluscap and the Water Monster** (Keepers of the Earth pages 79 and 81)

**Songs "Rain Rain" and "Greenhouse"** Earthsongs by Don Waite

### **Level 2:**

(These experiments and activities will likely require 5 - 7 science periods.  
There are opportunities for students to integrate into language arts and arts ed.)

### **Goals:**

- To relate the water cycle to different climates and ecosystems
- To help students understand the effect of reduced precipitation and increased evaporation
- To see how plants increase the rate of evaporation from land and wetlands
- To see how salts build up when water evaporates in a lake which doesn't flush
- To understand the effect of high salt concentrations on plants and animals

### **A. The Water Cycle**

#### **Activities:**

1. Water Models *Project Wet page 201* This first activity involves the use of student constructed models to help them understand how condensation and evaporation help water move through the environment. The last two, allow students to take their understandings and translate.
2. Imagine *Project Wet page 157* This activity allows students to use creative drama and writing to explore water as it changes forms and moves around the world.
3. Incredible Journey (optional) *Project Wet page 161* This is a movement oriented game played outdoors or in a large setting to simulate the movement of water within the water cycle.

### **B. Playing with Water: Don Waite's Experiments (see attached experiments)**

- 1) Water Budget (effect of reduced precipitation and increased evaporation on lakes)
- 2) Evapotranspiration. (how plants increase the rate of evaporation from land and wetlands)
- 3) Climate A' Salt' (how salts build up when water evaporates in a lake which doesn't flush) \* Use song "Salt" by Don Waite as a rap or choral reading to introduce or culminate this activity.
- 4) Osmosis (the effect of high salt concentrations on plants and animals)
- 5) Glacier Melting

**Other Resource Base Activities related to water include:**

1. Pass the Jug (water rights) *Project Wet* page 392 Saskatchewan Supplement
2. Branching Out (where water flows) *Project Wet* page 129
3. Amazing Water (urban additives) *Project Wet* page 219
4. Watershed (what watersheds do) *Project Wild* Sk Supplement p. 376
5. Capture, Store and Release (uses sponge as simulation to show how wetlands capture, store and release water)

**Follow up: Responsible Human Actions**

1. Hot Water (students debate water issue) *Project Wet* page 388
2. Alice in Waterland (students trace their water to source) *Project Wild* page 381
3. Rainy day hike (school on which watershed) *Project Wet* page 186)

**SUPPLEMENTARY RESOURCES:**

1. B.C. Water Stewardship Program (How to develop a water stewardship program including activities and school case studies. B.C. Minister of Environment-Lands & Parks
2. WOW! The Wonders of Wetlands
3. Saskatchewan Climate Change Pamphlet
4. Environmental Concern Inc. P>O> Box P St. Michaels MD21663-0480  
ISBN 1-888631-00-7

# Climate Change Experiments

## Introduction

Many lakes and streams on the prairies receive their water in the spring as a result of snow melt. Old Wives Lake and the lakes in the Qu'Appelle Valley are examples of lakes which receive most of their water from snow melt. In years with plentiful snow the streams flow into the lakes causing them to overflow from their outlets into downstream areas. Two things happen. The lakes become full of water for use during the rest of the year. Some water leaves the lakes supplying downstream users and also flushing salts from the lake, helping to reduce salt concentration in the lake. During the summer the water in lakes evaporates, reducing water level and concentrating salts. In the spring the cycle starts again.

Where do the salts come from? The land around each lake contains salt, a natural component. Some areas have saltier soils than others and the lakes in the saltier areas, around Watrous for example, tend to be quite salty. Many salts, for example table salt, are very soluble in water. When water passes over or through soil on the way to a stream the soil salts dissolve and they are carried into the streams and lakes. Salts can also dissolve into lakes from the sediments. In many areas ground water seeps into lakes and streams and this water tends to have much more salt than snow melt water. During the summer the water in lakes evaporates and salts become more concentrated.

In winters with lots of snow the snow melt will fill the lakes to overflowing, flushing salts out and supplying downstream users with water. In years with less snow the lakes may fill but not overflow. Salts will build up and downstream users will not receive any water. In years with very little snow melt the lakes will continue to evaporate in the summer and lake levels will become lower. The lakes will become saltier and downstream users will receive no water.

Climate change specialists predict that temperatures on the prairies will increase. This will cause the rate of evaporation to increase. Precipitation may decrease and fall as summer rains rather than as snow. Summer rain is more likely to evaporate rather than running into streams. If the water does run off the land it may cause soil erosion, carrying soil and salts into streams and lakes.

The purpose of the following experiments is to demonstrate:

- 1 - the effect of reduced precipitation and increased evaporation on lakes (**A Water Budget**);
- 2 - how plants increase the rate of evaporation from land and wetlands by pumping water into the air (**Evapotranspiration**)
- 3 - how salts build up when water evaporates in a lake which doesn't flush (**Climate A'Salt**); and,
- 4 - the effect of high salt concentrations on plants and animals (**Osmosis**).

## Experiment 1

# A Water Budget

For these demonstrations we will assume that almost of the water entering the lakes results from spring melting of snow (spring run-off)

### Materials

2 four-cup (1 liter) measuring cups with pouring spouts  
1 one-cup (250 ml) measuring cup  
1 half-cup (125 ml) measuring cup  
2 plastic containers to catch “lake runoff”  
1 large cookie sheet (pan) to prevent water spillage  
2 small blocks of wood to prop up the large measuring cups  
water

### Setting up the demonstration

1 - Place the two four-cup measuring cups, side by side, on one end (the upstream end) of the cookie sheet with their pouring spouts facing toward the other end (down stream) of the sheet. Prop up the sides of the cups with no spout using the wooden blocks. This will slant the cups so that the spouts of the cups are lower than the upstream sides of the cups. These will be our “lakes”. The pouring spouts represent the downstream outlets of the lakes. Place the two plastic containers under the spouts. These represent downstream water users such as municipal water supplies, irrigation farmers, cattle watering, recreational users and the plants and animals (like fish) which live in the downstream waterways. Begin each experiment by filling the lakes (cups) with water until they are about to overflow. Label the cups Lake A and Lake B.

### Demonstration 1 - The current situation where precipitation (spring run-off) is usually greater than summer evaporation

We start our experiment after spring run-off is complete and the lakes are full of water. Remove one half-cup of water from each lake to represent summer evaporation. Add one cup of water to each lake. Collect the lake discharge in the plastic containers and measure its volume. This is the water available for downstream users. This run-discharge will also help remove dissolved salts from the lakes. Repeat this for a second year of “normal precipitation”.

### Demonstration 2 - Evaporation rate increases but precipitation remains the same

We start our experiment with both lakes full of water. Lake A will be our “normal” or control lake and will experience the same evaporation and precipitation as in Demonstration 1. Lake B will experience the same precipitation but evaporation will increase. Evaporate (remove) one half-cup of water from Lake A and one cup of water from Lake B. Add one cup of water to each lake. Lake A will discharge but Lake B will not. Repeat for a second year. Both lakes will appear to be full but there is a difference.

Water users downstream from Lake A will receive normal water supplies and salts will flush from the lake. Water users downstream from Lake B will not receive any water. Because salts are not removed by evaporation they will continue to increase in concentration, making the water of Lake B less useful.

### Demonstration 3 - Evaporation rate increases and precipitation rate decreases

We start our experiment with both lakes full of water. Lake A will be our “normal” or control lake and will experience the same evaporation and precipitation as in Demonstration 1. Lake B will experience less precipitation and greater evaporation. Evaporate (remove) one half-cup of water from Lake A and one and one-half (1½) cups of water from Lake B. Add one cup of water to each lake. Lake A will discharge but Lake B will not. Continue this for two more years. Water levels in Lake B will slowly decline and salts will build up.

### Follow-up

Discuss with the class how increased evaporation and reduced precipitation may affect Saskatchewan lakes. A good example is Old Wives Lake, south of Moose Jaw, which became a dry salt flat in the 1990s. What might happen to lakes in the Qu’Appelle valley?

## Experiment 2

# Evapotranspiration

This experiment demonstrates how plants increase the rate of evaporation from land and wetlands by pumping water into the air (**Evapotranspiration**). Plants extract water from the soil through their roots. The water travels up the plant stems, carrying nutrients from the roots and the soil, and evaporates from the surfaces of the leaves.

### Demonstration 1 - Plants pump water out of their leaves

Materials - One small potted plant of any kind and a pot of soil with a stick of equal height stuck in it. Place a transparent plastic bag over the plant and tie it around the stem using tape or a twist tie. Make sure that the bottom of the bag is above the soil level. Place a similar bag on the stick. Water both pots of soil and place them in the classroom window. After a day or two, water will begin to condense on the inside of the bag with the plant but not on the one with the stick. You could actually measure the volume of water pumped out of the soil by the plant.

### Demonstration 2 - Water evaporates faster from soil with plants than from soil without plants.

You can use the same two pots with the plant and the stick. Place a soil moisture sensor, available from most stores that sell houseplants, in the soil of each pot. Water each pot until the water runs out of the bottom. Place each pot in the classroom window or under a grow light. Only water each pot when the moisture sensor indicated that is needed. If you can't find a moisture sensor you can always use your finger. Record how often you have to water the pot with the plant compared with the pot with the stick. Keep a record of how much water is added.

### Follow-up

Increased temperatures, as a result of climate change, may result in increased plant growth. Discuss how increased plant growth around lakes and in wetlands may result in increased evaporation of water in these areas. What areas in Saskatchewan might be affected.

## Experiment 3

# Climate A'Salt

Lakes usually “flush” each year, which means that they receive more water from their inlets than they can contain. As a result water is released from their outlet, flushing salts and providing downstream users with a water supply. If a lake does not flush and loses water by evaporation only the salts will slowly build up and this increased salt concentration may make the water unusable for human consumption, irrigation, cattle watering or fish reproduction and survival. The purpose of this experiment is to demonstrate the importance of lake flushing in avoiding salt build up in lakes. This experiment may take several days to do so you must plan ahead.

### Materials

2 beakers about 500 ml volume. Label them A and B. Beaker A will be the lake which flushes each year. Beaker B will not flush.

A hot plate or coffee warmer large enough for both beakers to fit side by side

### Demonstration

Fill both beakers, A and B, with tap water, place them on the hot plate and allow the water to evaporate until there is about 1 cm of water left.

Fill beaker A with water, pour half of the water out and then fill with water. Fill beaker B with water but do not pour any out. Place both beakers on the hot plate and allow the water to evaporate until there is about 1 cm of water left.

Repeat this until the beakers have been filled and evaporated five times.

After the last time allow both beakers to evaporate to dryness and visually determine which beaker contains the most salt.

In northern areas, where tap water has very low salt content, you may have to repeat this procedure for a total of ten filling/evaporation cycles to get a noticeable difference.

Modification 1 - The beakers can be placed in a warm sunny window and allowed to evaporate but this will take quite a long time, especially if this is to be repeated five times to allow visible salt build-up

Modification 2 - If you weigh the dry beakers at the beginning of the experiment and again at the end it is possible to determine the actual quantity of salt and the concentration.

### Follow-up

Discuss with the class the effect of salt build-up on a local lake, pond or wetland. You may wish to refer to Old Wives Lake, south of Moose Jaw, which became a salt flat during the drought of the 1980s.

## Experiment 4

# Osmosis - The Effect of Salts on Plants

Increasing salt concentrations in lakes, ponds and wetlands will have a detrimental effect on the plants and animals that live there. One of the reasons is that salt water will remove water from the plant and animal tissues. Plants and animals that live in fresh water have mechanisms to excrete water from their cells. The reason is that their body fluids contain more salts than the surrounding water and they tend to constantly absorb water. If they don't get rid of it their cells will burst. When plants, for example, are placed into salty water they lose water from their cells and become limp. This can be demonstrated in class with the help of celery sticks.

### Materials

3 containers (beakers, jars or plastic containers) about 500 ml volume

1 box of table salt

2 sticks of celery with the bottoms freshly cut with a sharp knife

### Demonstration

Fill one container about one third full of table salt. Then fill to the top with water and stir for about 5 minutes until most of the salt has dissolved. Let the remainder of the salt settle out.

Decant the salty water into a second container, leaving the salt residue behind. You won't need the container with the undissolved salt residue again. Label the salt-water container A

Fill the third container with as much water as container A and label it B.

Place a plastic bag or piece of plastic wrap over containers A and B and secure with elastic bands.

Cut the bottom ends from two fresh sticks of celery

Poke a hole into the plastic wrap and insert a celery stick into each container. Place the containers on a shelf and look at them after one or two days.

The celery in container A will be wilted and that in container B will still be firm.

### Follow-up

Discuss with the class the effect that increased salt might have on plants or animals in a local body of water. Discuss the plants and animals that live in oceans. They can tolerate salt concentrations higher than those of their body fluids. The reason is that they have special mechanisms that conserve body water. Compare this with freshwater plants and animals that excrete water.

## Experiment 5

# Glacier Melting

One result of climate change is that glaciers and ice caps will melt. The consequence is that the water levels in oceans will rise, flooding low-lying areas. While this may not directly affect people living in central North America, millions of people living in coastal areas will lose their land and living. Populations in Bangladesh, the Nile Delta, Florida, the Pacific Island states and, in Canada, Halifax and Vancouver will be forced to relocate. The purpose of this experiment is to demonstrate how water will rise when a glacier melts.

### Materials

1 cookie sheet with high sides (or you can extend the sides with duct tape)  
A block of wood, about 4 cm thick, to prop up one end of the cookie sheet  
4 or 5 small model houses, such as those used in Monopoly games, to represent cities or countries  
1 or 2 hair dryers or a warm sunny window as a heat source  
A tray of ice cubes, block of ice or a bucket of snow to make a glacier  
A sheet of plastic to catch drips and overflow

### Demonstration

Place the cookie sheet on a flat surface, in front of the window if “solar heating” is to be used  
Prop up one end of the cookie sheet with the wooden block

Locate cities and countries (the houses) along the length of the cookie sheet with those of higher elevation at the upper end (Saskatoon, Regina) and those of lower elevation at the lower end (Bangladesh, Disney World, Florida, Halifax). Leave enough room at the lower end to make our glacier. You can look up elevations for these areas and place the houses appropriately on the cookie sheet.

At the lower end of the cookie sheet pile the snow or ice cubes as high as you can get them.

Wait for the glacier to melt and observe  
You can use the hair dryers to speed up the melting process but it will probably be more effective as a teaching tool to let the solar power do it for you.

### Follow-up

Look up areas of the world that are likely to be most affected by glacial melting and rising ocean waters. How many people live in those areas?

Discuss how loss of these lands will affect residents there and how this, in turn might affect people living in your own community.