



climate change

CREATING SOLUTIONS FOR OUR FUTURE

EDUCATION KIT



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- The activities in this unit develop each lesson's theme. Educators may choose to use all of the activities or to select some from each lesson.*

LESSON DESCRIPTIONS/OVERVIEW

Lesson 1: Picturing Climate Change

Lesson 1 provides an overview of the history of climate change, starting 65 million years ago. Students learn why human activity has contributed to climate change in the past 250 years, and about the United Nations Framework on Climate Change.

Lesson 2: The Heat Is On

Lesson 2 explores what the students currently know about climate change and the greenhouse effect. Students participate in a “game show” measuring their knowledge of global climate change, and begin to think about Environmental Heroes.

Lesson 3: World In A Bottle

In lesson 3, students create “World in a Bottle”. Gravel, charcoal and soil lightly mixed with sand are carefully layered in a large jar, into which plants are nestled. A light mist provides the needed rainfall, and the jar is closed up and set in a window. This model of the Earth and its atmosphere – a closed system – helps students visualize how the “World in a Bottle” is a model of the world’s climate.

Lesson 4: The World Wide Web:

The Internet

Scientists are adding to their understanding of climate change daily. One way to keep up with new information is through reputable sites on the Internet. In this lesson, students are guided through several web sites designed specially for children. Through animated pictures, short readings, and interactive activities, they learn about the probable causes of climate change, and actions they can take to cut down on greenhouse gas emissions.

Lesson 5: The World Wide Web:

Human Interactions

In this lesson, students learn how trees, soil, water and human activities are interconnected in a “World Wide Web”. They also learn how people in Mali, West Africa are working to combat desertification and what they can do in their own community.

Lesson 6: Choose Your Challenge

In this lesson, students are challenged to continue thinking about positive actions of Environmental Heroes. The lesson includes an evaluation tool to test students’ learning. Finally, students are challenged to become involved in their school and community, sharing their knowledge, enthusiasm and vision.

curriculum fits

PAN-CANADIAN SCIENCE FRAMEWORK FOR CANADIAN SCIENCE EDUCATION

The Pan-Canadian Science Framework for Canadian Science Education is a partnership framework of the Council of Ministers of Education which is intended to guide the development and revision of science curriculum across the country. The full text of the framework can be viewed at www.cmecc.ca/science/framework/index.htm.

The following goals for Canadian science education have been established for the purposes of this framework. Specifically, science education aims to:

- > encourage students at all grade levels to develop a critical sense of wonder and curiosity about scientific and technological endeavours
- > enable students to use science and technology to acquire new knowledge and solve problems, so that they may improve the quality of their own lives and the lives of others
- > prepare students to critically address science-related societal, economic, ethical, and environmental issues
- > provide students with a foundation in science that creates opportunities for them to pursue progressively higher levels of study, prepares them for science-related occupations, and engages them in science-related hobbies appropriate to their interests and abilities
- > develop in students of varying aptitudes and interests a knowledge of the wide variety of careers related to science, technology, and the environment

General Learning Outcomes, Grades 4 to 6 – Science, Technology, Society, and the Environment

By the end of grade 6, it is expected that students will:

- > demonstrate that science and technology use specific processes to investigate the natural and constructed world or to seek solutions to practical problems
- > demonstrate that science and technology develop over time
- > describe ways that science and technology work together in investigating questions and problems and in meeting specific needs
- > describe applications of science and technology that have developed in response to human and environmental needs
- > describe positive and negative effects that result from applications of science and technology in their own lives, the lives of others, and the environment.

Specific Outcomes, Grade 4 – Life Science: Habitats and Communities

Social and environmental contexts of science and technology

- > identify positive and negative effects of familiar technologies (e.g., identify the effects of clear cutting of forests on erosion)
- > describe how personal actions help conserve natural resources and care for living things and their habitats (e.g., describe examples of programs designed to protect habitats in other areas of the world)
- > identify their own and their family's impact on natural resources (e.g., identify the potential impact of their lifestyle on animal populations).

Specific Outcomes, Grade 4 – Rocks, Minerals, and Erosion

*Social and environmental contexts of science
and technology*

- > provide examples of how science and technology have been used to solve problems in the home and at school (e.g., describe techniques for preventing erosion)
- > identify positive and negative effects of familiar technologies (e.g., identify the positive and negative effects of open-pit mining on the immediate environment; discuss the impact of building highways and airports on the availability of farmland)
- > describe how personal actions help conserve natural resources and care for living things and their habitats (e.g., demonstrate respect for the habitats of animals and the local environment when collecting rocks)
- > identify their own and their family's impact on natural resources (e.g., identify steps in maintaining the soil base required for supporting plant and animal life).

Specific Outcomes, Grade 5 – Earth and Space Science: Weather

*Social and environmental contexts of science
and technology*

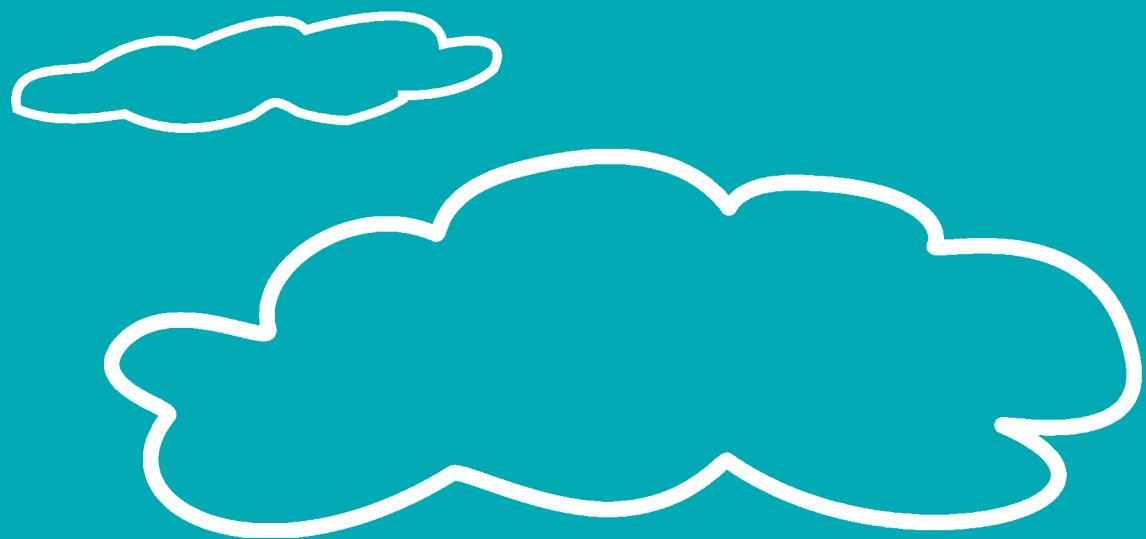
- > describe and compare tools, techniques, and materials used by different people in their community and region to meet their needs (e.g., describe the relationship between scientific techniques and aboriginal methods of predicting weather)
- > provide examples of how science and technology have been used to solve problems in their community and region (e.g., explain how farmers use weather predictions when preparing for seeding and harvesting)

- > describe examples of technologies that have been developed to improve their living conditions (e.g., describe examples, such as the use of CFC-free aerosols, to reduce ozone depletion)
- > identify scientific discoveries and technological innovations of people from different cultures (e.g., give examples of hats designed for specific weather conditions)
- > identify positive and negative effects of familiar technologies (e.g., suggest effects of using air conditioners; identify advantages and disadvantages of relying on weather predictions).

Specific Outcomes, Grade 6 – Diversity of Life

*Social and environmental contexts of science
and technology*

- > describe how personal actions help conserve natural resources and protect the environment in their region (e.g., describe how composting can reduce the need for synthetic fertilizers and topsoil)
- > describe the potential impact of the use by humans of regional natural resources (e.g., identify the possible impact on the local deer population).

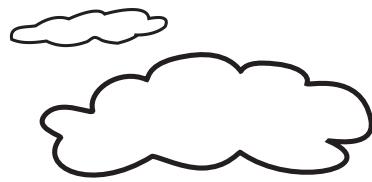


lesson 1

PICTURING CLIMATE CHANGE







Lesson 1

PICTURING CLIMATE CHANGE

Lesson 1 provides an overview of the history of climate change, starting 65 million years ago. Students learn why human activity has contributed to climate change in the past 250 years, and about the United Nations Framework on Climate Change.

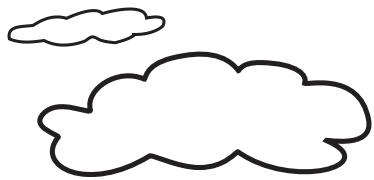
BACKGROUND

Most scientists around the world agree on three points: climate is changing; the concentration of carbon dioxide gases in the atmosphere is increasing; and human activity is the most probable cause. In 1992, 154 countries signed the United Nations Framework Convention on Climate Change. The treaty aims to slow climate change by reducing emissions of the greenhouse gases around the Earth that are believed to contribute to climate change. Since the signing of the framework, there has been a growing public interest in climate change and the need for action.

OBJECTIVES

Students will be able to:

- > demonstrate their understanding of climate change through a variety of activities
- > understand climate change so they are motivated to learn more about it
- > synthesize the information presented on the history of climate change and analyse possible reasons for temperature changes
- > explain how and why the Earth is like a greenhouse
- > list two of the greenhouse gases that, due to human activities, have increased in the atmosphere
- > design a picture that represents a segment of the climate change story (optional).



activity 1

LESSON 1 PICTURING CLIMATE CHANGE TEACHER GUIDE

Climate change is a multi-faceted issue connected to Science, Technology and Society. It has significant potential as an organizing idea. Students come to understand that the burning of fossil fuels, such as oil & gas, increases levels of carbon dioxide in the atmosphere and that these increasing levels contribute to climate change. They learn for example that every time they use an electrical appliance, they are indirectly releasing CO₂ into the atmosphere and that human activities contribute to climate change. They can take individual and collective actions to slow down this process.

OBJECTIVES

Students will be able to:

- > describe the historical relationship to the current climate change environmental issue
- > describe the difference between “natural” greenhouse effect and “enhanced” greenhouse effect
- > identify personal and community actions to help reduce the effects of climate change.

MATERIALS

- > Aquarium or glass jar (empty)
- > Plastic wrap
- > Thermometer
- > Climate Change story, in segments
- > Books and pamphlets on climate change
- > Magnets or tape for attaching story segments to the board

PROCEDURE

Introduce students to the topic of climate change and ask students if they have heard of this environmental issue. Discuss with students the differences between “natural” greenhouse effect and “enhanced” greenhouse effect and how this relates to climate change.

In this unit students will learn about climate change and how their actions can help reduce its effects.

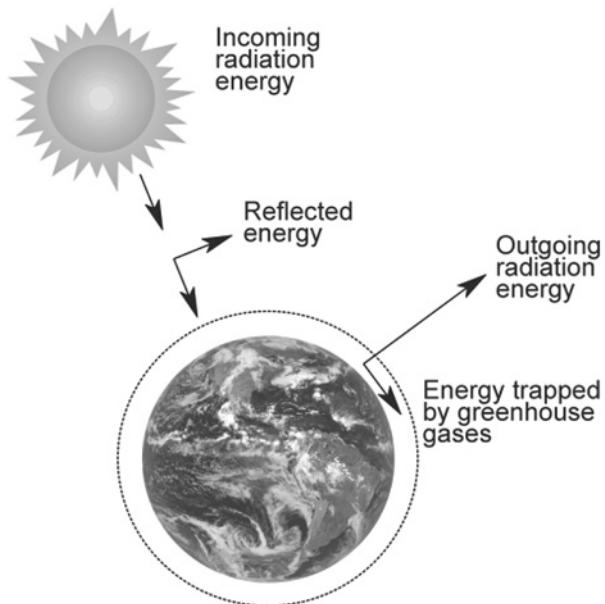
1. **What is a greenhouse?** Discuss with students why we use greenhouses to grow many flowers and vegetables. Greenhouses are enclosed structures, made of glass or plexiglass, that are used for the growth of plants. Temperature and light are controlled in a greenhouse so that the plants within them can be grown out of season. By trapping the sun’s light and heat within the walls of the greenhouse, we can produce plants like tomatoes in Canada, even in the winter.
2. **Greenhouse Model** Show students the empty aquarium or bottle. Ask students for ways that this is like a greenhouse (e.g., it is made of glass, sunlight can pass through the glass, it would get warm inside if it had a roof, etc.).

Ask for a student volunteer to take a reading of the temperature in the “greenhouse” model. Record this temperature on the board. Then, cover the top of the aquarium with plastic wrap, with the thermometer inside. Plan to take another temperature reading at the end of the class.

Please refer to figures 1, 2 and 3. These diagrams may be photocopied for overhead transparencies.

What is the Greenhouse effect?

The greenhouse effect is the natural process that warms our atmosphere and allows for life on Earth. As with the glass in a greenhouse, most of the energy from the sun passes through the atmosphere as if it were transparent. The energy is absorbed by the surface of the Earth and then radiated back into the atmosphere as heat. Much of the heat is then trapped by the so-called “greenhouse gases” in the atmosphere. This is the process that keeps the Earth at an average temperature of +15 °C. If we did not have the natural greenhouse effect, the average temperature of the Earth would be -18 °C, a difference of 33 °C! Without the natural greenhouse effect, life as we know it would not exist on Earth.



3. **What is a Model?** Tell students that this bottle is a model of the Earth's ecosystem. It is a small *representation* of the larger Earth. Scientists also use models to describe climate change and to predict its impact. In this case, a model is a simplified description of a complex entity or process. Computer programs are designed based on these models to help scientists with the complex calculations required to determine possible and probable results of climate change.
4. **The Earth as a Greenhouse** Explain to students how climate is a result of the sun's energy being trapped in the atmosphere, in a way similar to how a greenhouse creates a suitable environment for growing plants. Instead of a lid on a jar or plastic wrap on the aquarium, a blanket of greenhouse gases in the atmosphere creates our global greenhouse. As the amount of greenhouse gases such as carbon dioxide increases, the 'blanket' gets thicker.
Climate has always changed naturally. Over the past 250 years, humans have become significant contributors to climate change.
5. **The Story of Climate Change** Write these categories across the top of the board, with spaces below where the story segments can be placed. Pass out the 20 segments of the story of climate change. The students decide into which time frame their segment fits.

 - > Long, long ago
 - > Long ago
 - > Today
 - > Probable future (not-so-happy outcome)
 - > Preferred future (happy outcome)
6. Students place their segment under the proper heading with a magnet. When all story segments are on the board, pose questions such as the following to stimulate discussion and reflection:

 - > What are the differences between climate changing naturally and the way climate change is occurring now?
 - > What is happening in each time frame? Choose 5 words or phrases to describe each time frame.
 - > Compare the timeframe long, long ago to today. What are the differences and similarities on how climate has changed?
 - > Compare today with the probable future. Which looks better? Why?

Brainstorm about what students see in each timeframe category above. Compare and contrast.

Ground Rules for Brainstorming

- > Every contribution is worthwhile. Even weird, way out ideas; even confusing ideas; especially silly ideas.
- > Suspend judgement. We won't evaluate each other's ideas; we won't censor our own ideas; we'll save these ideas for later discussion.
- > Help each other. Repeating someone else's idea is okay; "piggybacking" on someone else's idea is okay; silence is okay.

FIGURE 1

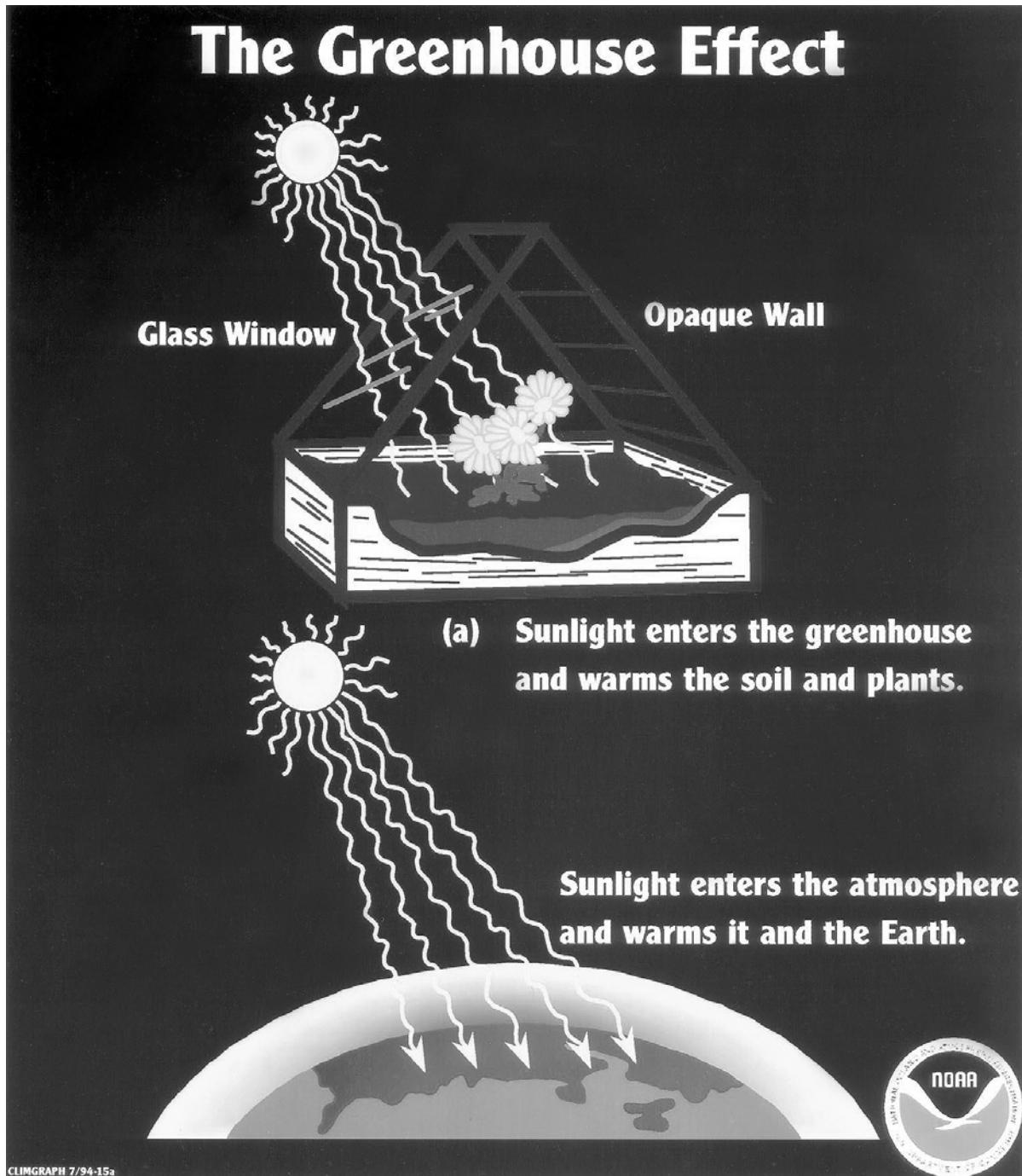


FIGURE 2

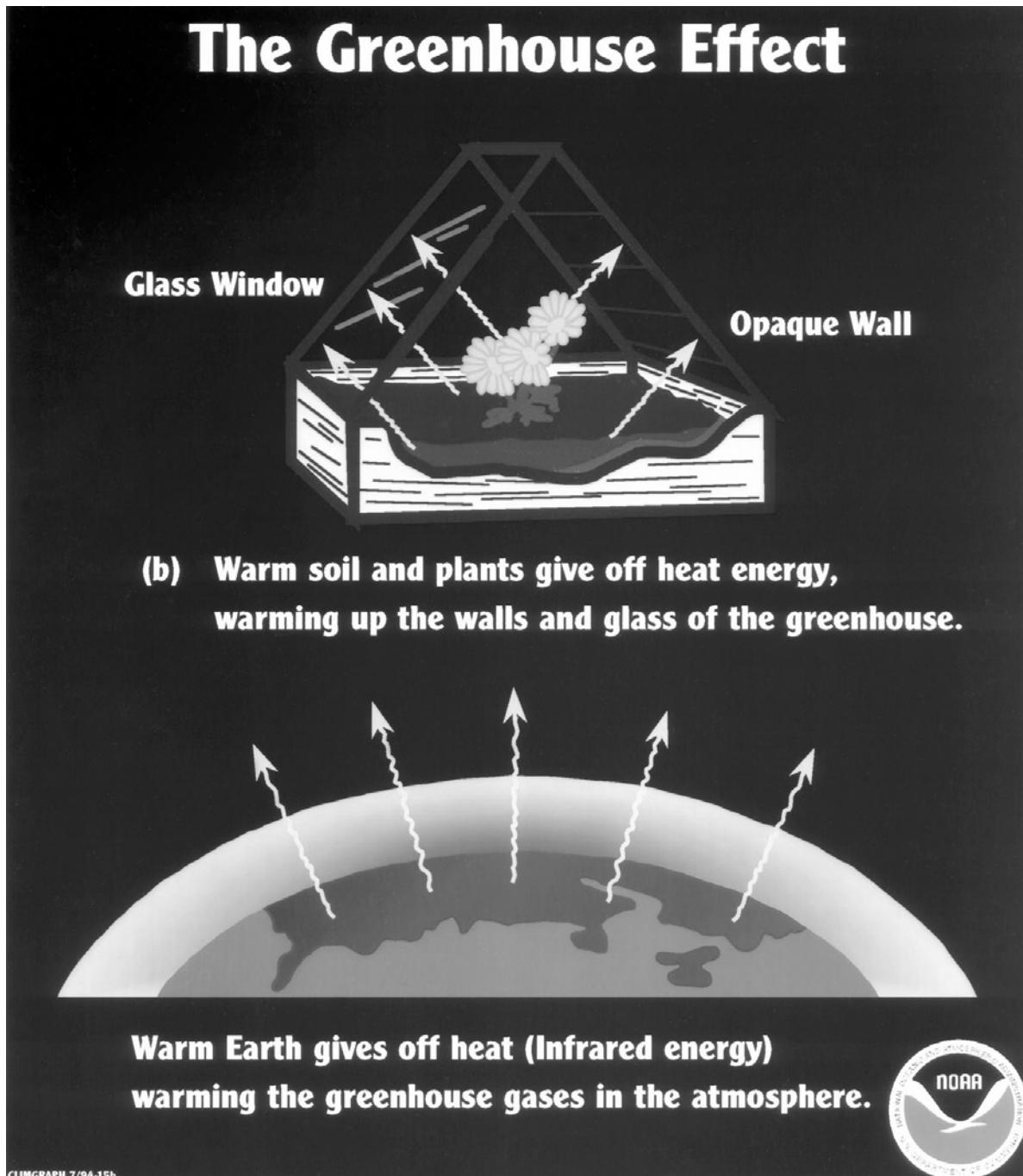
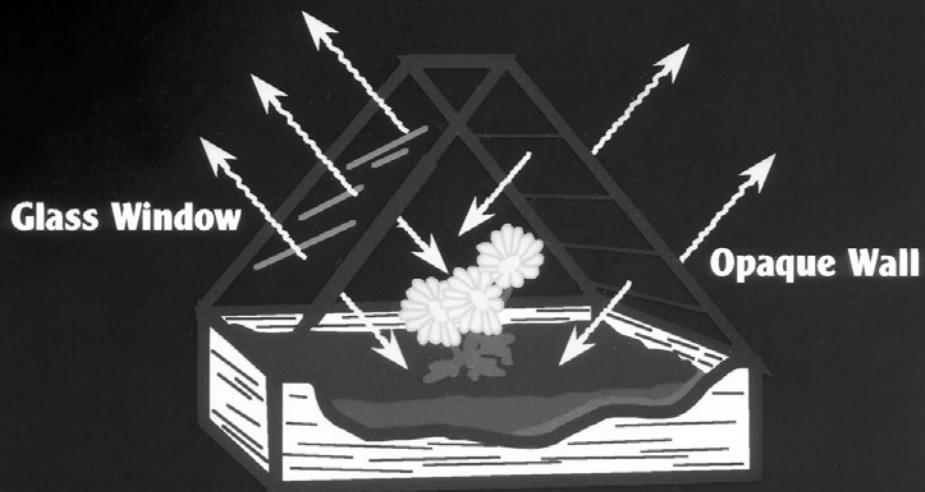
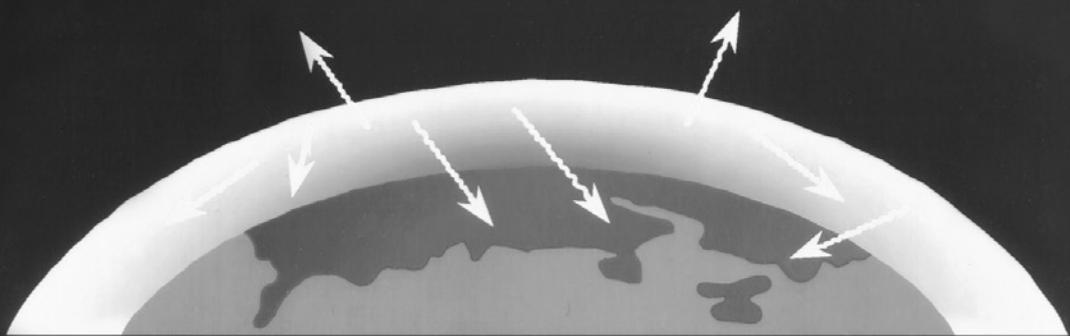


FIGURE 3

The Greenhouse Effect



(c) When the windows and walls give up their heat, some of it escapes to the air outside, and some of it goes back into the greenhouse.



When the greenhouse gases give up their heat, some of it escapes to space and some of it goes back to warm the Earth further.



CLIMGRAPH 7/94-15c

CLIMATE CHANGE STORY SEGMENTS

TEACHER REFERENCE

Note: The text listed before the parenthesis is the text that will be placed on the front of the story segment cards for students.

(*The text in parenthesis and italics*) represents further information which can be shared by the teacher with students.

- > Once upon a time, 65 million years ago, a giant asteroid crashed into the Earth. The explosion created a thick cloud of dust that completely blocked the sun for three years. Because the sun did not shine, animals like the dinosaurs died off. (*Natural changes in climate in the past caused certain plants and animals to become extinct. Climate change today will affect plants and animals but also humans.*)
- > Fifteen thousand years ago, most of Europe and North America were covered with ice. This “ice age” caused widespread hunger because it was too cold for plants to grow. (*Natives of Greenland and Iceland had to move south, to a warmer climate.*)
- > Climate changes naturally, and people adapt so that they can live in their environment. (*For example, Inuit people living in northern Canada are used to fishing through holes in ice sheets. People that live in Lethbridge are used to very windy weather.*)
- > During the pioneer days, people made what they needed by hand. They grew their own food and raised animals for meat, milk and work.
- > In the 1700’s, humans invented machines to do the work people used to do by hand. (*Machines in factories performed tasks like making cloth, cutting wood and processing food.*)
- > Early factories were powered by burning coal. Today, we still use coal as well as oil and natural gas to provide us with electricity. These energy sources are called “fossil fuels”. (*Millions of years ago, coal was formed from primitive trees. These primitive trees were covered by soil and rock and over thousands and thousands of years of heat and pressure, formed coal. Oil and natural gas were formed in the same way, except they were originally the bodies of ancient sea creatures. These processes took place extremely slowly. The energy within them was originally from the sun.*)
- > These factories sent huge amounts of invisible gases into the air. These gases are: carbon dioxide (CO₂), methane and nitrous oxide. (*This period in history is known as the “Industrial Revolution”. These three gases, which were spewed in large amounts into the air, are called “greenhouse gases”.*)
- > Greenhouse gases are vital to our survival in small amounts. These gases trap heat energy leaving the Earth. (*The amount of carbon dioxide in a planet’s atmosphere affects the temperature on that planet. The Earth has just the right amount of carbon dioxide in its atmosphere for life to thrive.*)
- > Greenhouse gases in our atmosphere act like a big fluffy blanket around the Earth. Without these gases our planet would be as cold as the North Pole all over! (*The planet Mars is about the same distance from the sun as the Earth. It is miserably cold there because Mars has a very thin atmosphere, with much less greenhouse gas.*)
- > This warming effect of greenhouse gases is called the “Greenhouse Effect”. These invisible gases warm the Earth in the same way that heat from the sun gets trapped behind glass in a greenhouse.

CLIMATE CHANGE STORY SEGMENTS TEACHER REFERENCE (CONTINUED)

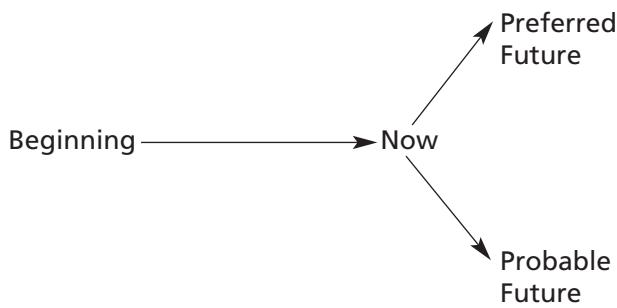
- > The problem is that more and more greenhouse gases are being emitted into the atmosphere. (*Since the Industrial Revolution, and because of human demands for more energy, more powerful cars, better houses and more space for building and farming, the atmosphere is being “overloaded” with greenhouse gases.*)
- > This is scary. In the past, Earth's climate changed humans. Now humans are changing the climate. (*The condition of our atmosphere has been just right for humans for thousands of years. By making the air “thicker” we are making it warmer.*)
- > What will be the effects of climate change? Scientists predict that more frequent and more severe drought, flooding and violent storms will occur in certain parts of the world. (*People depend on rain for water and farming. Drought will lead to even greater poverty and hunger in Third World countries. This is unfair because these people did not contribute as much to climate change as people in the richer countries have, and they will likely suffer more because of it.*)
- > What else could happen with global warming? A hotter world could pose a serious health risk to the very young, old and sick. (*Countries that are already hot could get hotter.*)
- > Global warming could cause ice sheets near the north and south poles to melt. This change could occur too quickly for many plant and animal species to adjust. (*Right now, in Canada, there are 328 species that, without our help, could disappear forever.*)
- > In the 1980's, people began to realize what was happening to our fragile and beautiful planet Earth. Meetings were held with people from all over the world, to talk about human-caused climate change and what should be done to stop it. (*The 1992 United Nations Framework Convention on Climate Change was one of the results.*)
- > Agreements were made to reduce the use of fossil fuels which result in greenhouse gas emissions by:
 - finding other ways of making electricity
 - reducing our demands for energy
 - protecting forests, in which CO₂ is stored. (*One way of making electricity without burning fossil fuels is by harnessing renewable energy such as solar energy, wind energy, wave energy and thermal energy.*)
- > These agreements were fair because they recognized that the rich countries of the world should pay most of the bill to set the problem of climate change right.
- > It was also decided that scientific technology and ideas would be shared between all the countries of the world.
- > That's nearly the end of the story, but not quite. It's not enough to leave governments with all of the action. We should ALL get involved! There are plenty of ways we can help.
 - Use a bike instead of a car.
 - Switch off lights to save electricity.
 - Plant trees.
 - Use less energy by recycling.
 - Turn off leaky taps.

(There are 48,000 tonnes of carbon dioxide being emitted by humans EVERY MINUTE! We can all help to lower this number.)
- > Humans don't want to go the same way as the dinosaurs. We only have one chance, and one planet.

FUTURE TIME LINES

Students should be aware that there are a range of alternative futures open to humanity, and that they can make a contribution to the realization of their personally preferred future. While current global lifestyles and resource consumption trends may appear to be on a pre-determined time line, students can be empowered to reflect upon possible, probable and preferred futures. Once students can express and contemplate a variety of future possibilities, they can be equipped with the skills and knowledge needed to take them in that direction.

- > Students prepare time lines. Between the Beginning point and the Now point is the history of climate change. Have students mark five major events on that part of the time line, including when they were born.



- > Individually or in groups:
 - On the line from Now to Probable Future, students write what they think might happen to their community/their world in their lifetime if we don't take action on climate change.
 - On the line from Now to Preferred Future, students write what they would like the future of their community/world to be.

In pairs or small groups, students then determine what will be necessary to change the probable future to the preferred future.

CONCLUSION

Have a student take a final temperature reading inside the greenhouse model aquarium. Discuss the temperature difference and ask for reasons for this change. Explain to students that in the next lesson on climate change, they will be playing a game that involves much of the information they have learned today. Ask the students, when they go home today, to share one part of the climate change story with a family member or friend.

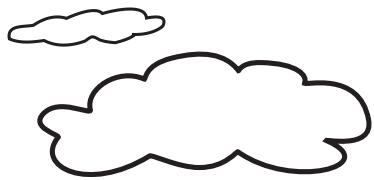
EXTENSIONS

If you have good weather you can do this activity outside.

- > Find sidewalk squares and number them from 1-20.
- > Separate the class into students or groups, enough for all 20 squares.
- > Put each of the 20 sections of the Story of Climate Change on a separate sheet of paper, using a large font.
- > Laminate the sheets of paper, or place them in plastic sleeves.
- > Mount laminated sheets on stakes and push into the grass adjacent to each sidewalk square.
- > Have the students draw their section in pavement chalk.

The students could design posters, representing their story segment. These could be hung on the walls outside the classroom, in chronological order. The rest of the school could benefit from this lesson.

The students could be encouraged to write a story of how they have changed with time. They could suggest things they could do to promote a happy future for themselves.



activity 1

LESSON 1 PICTURING CLIMATE CHANGE STUDENT MATERIALS

The following materials can be photocopied for the students.

Once upon a time, 65 million years ago, a giant asteroid crashed into the Earth. The explosion created a thick cloud of dust that completely blocked the sun for three years. Because the sun did not shine, animals like the dinosaurs died off.



Fifteen thousand years ago, most of Europe and North America were covered with ice. This “ice age” caused widespread hunger because it was too cold for plants to grow.

Climate changes naturally, and people adapt so that they can live in their environment.



During the pioneer days, people made what they needed by hand. They grew their own food and raised animals for meat, milk and work.

In the 1700's, humans invented machines to do the work people used to do by hand.



Early factories were powered by burning coal. Today, we still use coal as well as oil and natural gas to provide us with electricity. These energy sources are called "fossil fuels".

These factories sent huge amounts of invisible gases into the air. These gases are: carbon dioxide (CO_2), methane and nitrous oxide.



Greenhouse gases are vital to our survival in small amounts. These gases trap heat energy leaving the Earth.

Greenhouse gases in our atmosphere act like a big fluffy blanket around the Earth. Without these gases our planet would be as cold as the North Pole all over!



This warming effect of greenhouse gases is called the “Greenhouse Effect”. These invisible gases warm the Earth in the same way that heat from the sun gets trapped behind glass in a greenhouse.

The problem is that more and more greenhouse gases are being emitted into the atmosphere.



This is scary. In the past, Earth's climate changed humans. Now humans are changing the climate.

What will be the effects of climate change? Scientists predict that more frequent and more severe drought, flooding and violent storms will occur in certain parts of the world.



What else could happen with global warming? A hotter world could pose a serious health risk to the very young, old and sick.

Global warming could cause ice sheets near the north and south poles to melt. This change could occur too quickly for many plant and animal species to adjust.



In the 1980's, people began to realize what was happening to our fragile and beautiful planet Earth. Meetings were held with people from all over the world, to talk about human-caused climate change and what should be done to stop it.

Agreements were made to reduce the use of fossil fuels which result in greenhouse gas emissions by:

- finding other ways of making electricity
- reducing our demands for energy
- protecting forests, in which CO₂ is stored



These agreements were fair because they recognized that the rich countries of the world should pay most of the bill to set the problem of climate change right.

It was also decided that scientific technology and ideas would be shared between all the countries of the world.



That's nearly the end of the story, but not quite. It's not enough to leave governments with all of the action. We should ALL get involved! There are plenty of ways we can help.

- Use a bike instead of a car.
- Switch off lights to save electricity.
- Plant trees.
- Use less energy by recycling.
- Turn off leaky taps.

Humans don't want to go the same way as the dinosaurs. We only have one chance, and one planet.





lesson 2

THE HEAT IS ON





lesson 2



THE HEAT IS ON

Lesson 2 explores what the students currently know about climate change and the greenhouse effect. Students participate in a “game show”, measuring their knowledge of global climate change, and begin to think about Environmental Heroes.

BACKGROUND

Human activity is changing our atmosphere. There is widespread concern that even small increases in atmospheric temperature will have profound effects (both positive and negative) on our lives and the natural systems upon which we depend. Increased numbers of severe storms, flooding and drought are some examples of negative possible impacts resulting from climate change. Although not as apparent, an example of a positive possible impact would be lengthening of the growing season in some areas.

OBJECTIVES

Students will be able to:

- > recall the information they learned about climate change in lesson 1
- > explain the basic concepts of weather, climate, climate change, the greenhouse effect, and influences on climate change
- > justify their selection of a real Environmental Hero in their life.

ACTIVITIES

- > Game show
- > Environmental Hero Program

OPTIONAL ACTIVITIES

- > Green Eye Energy Audit
- > School Questions:
 - Ask the Principal or Custodian
 - > Teacher Questions: How Green is Your School?

activity 1



GAME SHOW

LESSON 2 THE HEAT IS ON TEACHER GUIDE

In lesson 1, students learned about the history of climate change on Earth. Lesson 2, activity 1 gives students and teachers a fun way to test their current knowledge of climate change and provides factual information on the subject.

OBJECTIVES

Students will be able to:

- > demonstrate their knowledge of climate change
- > work cooperatively as a team to learn about climate change.

MATERIALS

- > Game show questions
- > Environmental Hero meter drawn on the board
- > Game leader “costume” (e.g., sparkly bow tie)
- > Our Climate is Changing hand-out
- > 3 “50/50” cards
- > 3 “teacher” cards
- > 3 “booklet” cards
- > Game show music with applause for entrance and exit of host (optional)
- > Roulette-style spinning wheel

PROCEDURE

1. Review the basic concepts of climate change from lesson 1.
2. Split class into 2-3 teams (between 6-10 on each team).
3. Inform students that random points will be assigned to teams who are quiet in between their questions. Give students a few minutes to come up with a name for their team.

At this point, the teacher should draw an “Environmental Hero metre” on the board (from 0-10) for each team, with the team names written above.

The rules of the game are as follows:

- > One team will be selected to start.
- > Ask a team member to spin the roulette wheel to determine the category of question to be asked.
- > Ask the team a game question (you may need to repeat the question to ensure all team members heard and understand).
- > Together the whole team decides on the correct answer.
- > One person is chosen to give the answer.
- > Remind students to remain quiet in between turns and not to volunteer answers unless asked.
- > Each team gets 3 “life lines” to help them if they don’t know the answer: they can call on their teacher, consult materials on climate change, or ask for a 50/50 (half of the answers are taken away so that 2 (1 right) are left). For “Fill in the blank” questions, the 50/50 option is written beside the correct answer. True/false questions do not have a 50/50 option.

4. If the team answers correctly (“Is that your final answer?”), they move up 1 point on the Environmental Hero metre. An incorrect answer moves the team down 1 point (teams cannot go below zero on the Environmental Hero metre).

After the team has given their final answer, ensure all students understand the question and answer by reading the explanation on each card aloud.

5. Repeat the question and answer process with each of the teams.
6. Finish by introducing other ways that groups or individuals may be deemed “Environmental Heroes”. Have students begin thinking about who in their life is an Environmental Hero and why.



Spin for a category on “So You Want to Be an Environmental Hero.”

GAME SHOW QUESTIONS

TEACHER REFERENCE

Note: Correct answers are shown in **bold text**.
(Text in parenthesis and italics) after the question is additional information that the teacher can read to the students after the correct answer has been given.

Climate Science Category

Air is made up of:

- a) 100% oxygen
- b) 50 % oxygen, 50% carbon dioxide
- c) 78% nitrogen, 21% oxygen, and 1% other**
- d) 50 % nitrogen, 50 % oxygen

Source: Harry McNaught, 1975. *A Golden Guide to Weather*. Golden Press Publishing, New York. 160 pp.

Climate is

- a) the weather you can expect to have in a certain place**
- b) only the weather that is happening today
- c) something that never changes
- d) only influenced by the sun

Source: David Suzuki. 1988. *Looking at Weather*. New Data Enterprises and Barbara Hehner. 96 pp.

Climate change is

- a) something that scientists know everything about
- b) the differences in typical weather between the future and the past**
- c) sure to make everywhere in the entire world hotter
- d) not going to affect the way we live.

Source: www.unfccc.de/resource/iuckit/fact05.html

Scientists think that by the year 2100, the global temperature (that is the average temperature around the world) will:

- a) rise 10 to 12 °C
- b) stay the same
- c) rise 1 to 3 °C**
- d) fall 1 to 3 °C

(Current predictions suggest the global temperature (the average of all of the temperatures in the world) will increase 2 °C. Some areas will warm, and some will be colder; however, the average of them all will be an increase.)

Source: www.unfccc.de/resource/iuckit/fact05.html

Which is the main greenhouse gas that is leading to rising temperatures?

50/50 question: methane or **carbon dioxide**

(Carbon dioxide is released mostly through human activities such as burning fossil fuels and is the main contributor to climate change.)

Source: Government of Canada, Global Climate Change. 1999. *Our Climate is Changing*. Her Majesty the Queen in Right of Canada. 4 pp.

The three gases that are of most concern to scientists are the ones that are related to things humans do. These gases are:

- a) carbon dioxide, methane, and nitrous oxide**
- b) oxygen, carbon dioxide, and methane
- c) oxygen, nitrogen, and carbon dioxide
- d) carbon dioxide, nitrogen, and water vapour

(These three gases are all associated with human activities and create a barrier in the atmosphere that traps heat. This is what is causing climate change.)

Source: Government of Canada, Global Climate Change. 1999. *Our Climate is Changing*. Her Majesty the Queen in Right of Canada. 4 pp.

The condition of the atmosphere at a specific place and time is the definition for:

50/50 question: climate or **weather**

(Weather is a set of short-term properties at any spot on Earth that include temperature, pressure, humidity, precipitation, sunshine, cloud cover, and wind direction and speed. Climate is the long-term average weather of an area; it is a region's general pattern of atmospheric or weather conditions, seasonal variations, and weather extremes over a long period (at least 30 years).)

Source: *Environmental Science: Working With the Earth*, by G.T. Miller, Jr., Wadsworth Publishing, 1995.

The Earth's atmosphere is made up of nitrogen, oxygen, and a small amount of other gases such as carbon dioxide. How many kilometers above the Earth does the atmosphere go?

- a) 1 km
- b) 10 km
- c) 100 km
- d) 1000 km**

(The highest mountain in the world is about 8 km high. The atmosphere goes very far into space and protects the Earth from the sun's harmful rays, and the freezing temperatures in space.)

Source: David Suzuki. 1988. *Looking at Weather*. New Data Enterprises and Barbara Hehner. 96 pp.

The atmosphere filters harmful UV rays from the sun. What is one other thing that the atmosphere does?

50/50 question: cools the Earth down or **keeps the Earth warm**

(The atmosphere acts like a blanket to insulate the Earth. It traps heat energy from the sun, keeping the Earth warm.)

Source: David Suzuki. 1988. *Looking at Weather*. New Data Enterprises and Barbara Hehner. 96 pp.

How far is the sun from the Earth?

- a) 150 km
- b) 1500 km
- c) 150 000 km
- d) 150 000 000 km**

Source: David Suzuki. 1988. *Looking at Weather*. New Data Enterprises and Barbara Hehner. 96 pp.

In the next 100 years, scientists expect that the average sea level will rise:

- a) 5 cm
- b) 50 cm**
- c) too much to count
- d) not at all

(The uncertainty is large! The range is between 15 to 95 cm. The main cause of the rise will be that the upper layers of the ocean will expand as it warms up. There will also be some contribution from melting glaciers.)

Source: www.unfccc.de/resource/iuckit/fact05.html

Global climate change happens:

- a) very gradually, over long periods of time**
- b) within one year
- c) within 10 years
- d) I don't know. Climate change has never happened before.

(The Earth's climate changes naturally, and has gone through changes in the past (for example, the ice age was a major climate change event. Global climate change normally occurs over very long periods of time. The upper layers of the ocean adjust in a few seasons, but changes to the deep parts of the ocean take centuries. Animal and plant life change in decades. Changes in snow and ice sheets take centuries. The Earth itself changes over millions of years through events like mountain building and continental drift.)

Source: www.unfccc.de/resource/iuckit/fact08.html

Fossil fuels:

- a) are oil, coal, and natural gas
- b) were once ancient forests and sea creatures
- c) started forming millions of years ago
- d) all of the above**

Source: www.davidsuzuki.org

During the last ice age, 20,000 years ago, the average temperature of the planet was lower than today. How many degrees lower was it?

- a) 0 °C
- b) 2 °C
- c) 5 °C**
- d) 7 °C

(The global temperature was only 5 °C lower and the Earth's climate was much different. It was cold enough for a sheet of ice over a mile thick to cover eastern Canada, New England, much of the Midwest, northeastern United States and Western Canada, and large portions of Europe, and the Southern Hemisphere.)

Source: *The Next 100 Years*, by Jonathan Weiner, published by Bantam, 1990.

Human Influences on Climate Change Category

Compared to pre-industrial times, the amount of carbon dioxide in the atmosphere today is:

- a) higher**
- b) lower
- c) the same
- d) I don't know. Carbon dioxide can't be measured.

(Monitoring began in 1957, and concentrations had risen almost 10% by 1985. If people keep using fossil fuels as scientists think they will, carbon dioxide in the atmosphere could double within 75 years.)

Source: *5000 Days: Environmental Perspectives and Human Choices*. Course manual prepared by Professor Keith Ronald and Jane Dougan for the Institute for Environmental Policy and Stewardship, 1991

Which of these activities releases carbon dioxide (a greenhouse gas) into the atmosphere?

- a) driving your car
- b) turning on the lights in your bedroom
- c) using your computer
- d) all of the above**

(Any activity that uses fossil fuels, such as coal, oil or natural gas, releases carbon dioxide into the atmosphere. This gas is the largest single source of greenhouse gas emissions from human activities.)

Source: www.unfccc.de/resource/iuckit/fact22.html

Methane, another greenhouse gas which affects climate, is released into the atmosphere by:

- a) cow farts
- b) rice farming
- c) garbage dumps
- d) all of the above**

(Methane is produced through anaerobic (without oxygen) fermentation. All of these choices decompose anaerobically.)

Source: www.unfccc.de/resource/iuckit/fact22.html

The human population in the world has _____ since 1950.

- a) doubled
- b) tripled
- c) dropped
- d) stayed the same

(More people have been added to the Earth during the past 40 or 50 years than have been added since the dawn of humans.)

Sources: *The Next 100 Years*, by Jonathan Weiner Bantam, 1990; *It's a Matter of Survival*, by Anita Gordon and David Suzuki, Stoddart, 1990.

What percentage of greenhouse gas emissions do individual Canadians (that's you and me) contribute to Canada's total emissions?

- a) none, it is all done by factories
- b) 25%
- c) 75%
- d) 100%

(Individual Canadians contribute 25% of emissions by driving our cars, heating our homes, using our computers, etc. Anything that we do that uses fossil fuels releases carbon dioxide. This works out to 5 tonnes per person.)

Source: Government of Canada, Global Climate Change. 1999. *Our Climate is Changing*. Her Majesty the Queen in Right of Canada. 4 pp.

Every litre of gasoline you use in your car produces this much carbon dioxide (and other pollutants):

- a) none
- b) 1 gram
- c) 1 kilogram
- d) 2.5 kilograms

Source: Government of Canada, Global Climate Change. 1999. *Our Climate is Changing*. Her Majesty the Queen in Right of Canada. 4 pp.

To help decrease carbon dioxide emissions, you should:

- a) ride your bike or walk when you can
- b) turn off power-using appliances (like your stereo, computer, and TV) when you are not using them
- c) put on a sweater instead of turning up the heat
- d) **all of the above**

(All of these things would use less fossil fuels. This will help to decrease the amount of carbon dioxide released into the air.)

Appliances and lights were responsible for 3% of our personal greenhouse gas emissions in 1990. Name two things you can do to save electricity:

turn off lights, TVs, stereos, do laundry or dishwashing at none-peak electricity hours, use cold water to do laundry, use alternative energy...

Source: www.sierraclub.ca/national/climate/climprot.html

Compared to making products from raw materials, products from recycled paper and plastic take this much energy:

- a) the same
- b) more energy
- c) **less energy**
- d) it can't be measured

(Recycled paper and plastic goods take 50% less energy than making products from raw materials. Recycling your paper and plastic goods can help slow down climate change!)

Source: www.sierraclub.ca/national/climate/climprot.html

Buying fruits and vegetables that have been grown locally can:

- a) save gas that would be used to move the food here
- b) stop carbon dioxide from going into the air because trucks would not drive as far
- c) help local farmers
- d) **all of the above**

(Canadians import 50% of our vegetables, and up to 90% of our fruit. Almost all of it is brought by big trucks over long distances. These trucks use a lot of fuel and emit a lot of carbon dioxide and other air pollutants. Buying locally (from farmers' markets) would help slow climate change.)

Source: www.sierraclub.ca/national/climate/climprot.html

Which of these things will not help decrease carbon dioxide emissions?

- a) **letting your car idle to warm up so it'll drive properly**
- b) slowing down when you are driving
- c) giving your car a tune up
- d) keeping your tires inflated

(You should not let your car idle for more than a minute. Letting your car idle for more than a minute burns more fuel than turning off the engine and restarting it! Slowing down when you're driving burns fuel more efficiently. For example, the most efficient highway speed for cars is 90 km/h. Keeping your car tuned ensures that it will be most fuel efficient. Keeping your tires properly inflated saves fuel by making it easier for your car to drive without drag.)

Sources: www.ucssusa.org/transportation/driving.tips.html
www.sierraclub.ca/national/climate/climprot.html

The Kyoto Protocol is:

- a) the name of a city in China where potatoes are grown
- b) a treaty created 100 years ago to encourage industrialization of Eastern nations
- c) **a treaty in 1997 to try to lower the amount of greenhouse gases going into the atmosphere**
- d) none of the above

(The Kyoto Protocol was a treaty made in Kyoto, Japan in 1997. The goal is to legally commit industrialized countries to decrease their greenhouse gas emissions. The hope is that it will prevent the climate from changing at an unnaturally fast pace. Canada signed the treaty in December 1997 and has promised to decrease our emissions to 6% below 1990 levels during 2008-2012. This is difficult because between 1990 and 1997 Canada's emissions rose 14%. If no action is taken, Canada's emissions could be as high as 25% above 1990 levels by 2010.)

Sources: www.piad.ab.ca/default.htm
www.cnie.org/nle/clim-3html

The Global Picture Category

Climate change may cause a decrease in _____

- a) **the types and kinds of plants and animals on Earth**
- b) global temperature
- c) hurricanes
- d) none of the above

(Climate change may cause forests to die because they will not have the right amount of water and sunlight anymore. This could cause some kinds of plants and animals to die if they no longer have the right living requirements. Fish could die as temperatures get higher in streams and lakes.)

Source: *Environmental Science: Working With the Earth*, by G.T. Miller, Jr., Wadsworth Publishing, 1995.

An increase of 5 to 10 °C in polar temperatures will eventually melt the ice caps on:

- a) Greenland
- b) Antarctica
- c) **both of the above**
- d) none of the above

(The Greenland and Antarctic ice sheets act like enormous mirrors reflecting sunlight back into space. If warmer temperatures melted some of this ice, exposed darker ground would absorb more sunshine. This would cause warming to speed up. On the other hand, the early stages of global warming might actually increase the amount of the Earth's water stored as ice. Warmer air would carry more water vapor, which could drop more snow on some glaciers. The patterns of ocean currents keep Europe warm. Cold, salty water in the North Atlantic sinks, driving an ocean current from near North America to Europe. Without the current, Europe would be in a deep freeze.)

Sources: *Environmental Science: Working With the Earth*, by G.T. Miller, Jr., Wadsworth Publishing, 1995; The Lethbridge Herald, from Associated Press in Washington, Nov 29, 1997

The equivalent population of another Canada (approximately 30 million people) is added to the Earth every _____

- a) **4 months**
- b) year
- c) 10 years
- d) 100 years

(More people have been added to the Earth during the past 40 to 50 years than have been added since the dawn of humanity. Each year, 95 million people are added to the world's population.)

Source: *It's a Matter of Survival*, by Anita Gordon and David Suzuki, Stoddart, 1990

Climate change could lead to changes in _____

- a) human activity
- b) food production
- c) conversation
- d) **all of the above**

(Some areas may improve their ability to grow food; others may experience drought, flood or pests like insects. Plants may not be able to continue to grow where we know them today. Instead they may shift north by 100-150 km for each 1 °C rise in global temperature. Computer models have projected drops in the global yield of food crops ranging from 30% to 70%. Ultimately this will affect how people live and what they talk about.)

Source: *Environmental Science: Working With the Earth*, by G.T. Miller, Jr., Wadsworth Publishing, 1995)

Which of these things will not be a result of climate change?

- a) drop in the number of Pacific salmon in North America
- b) disappearance of frogs in Central America
- c) **healthier coral reefs in the ocean**
- d) birds laying their eggs earlier

(In fact, scientists believe that within 100 years, global warming could eliminate coral from most areas of the world. These reefs are homes to 25% of all ocean fish species. The impact of global warming on Australia's Barrier Reef is expected to become severe in the next 50 years. All of the other statements are also thought to be caused by climate change.)

Source: www.davidsuzuki.org/speciessurvival.htm

Fact or Fiction Category

Weather and climate have the same definition.
True or False

(Weather is what is happening at the specific moment in a specific place whereas climate is the average weather that an area has over time.)

Source: David Suzuki. 1988. *Looking at Weather*. New Data Enterprises and Barbara Hehner. 96 pp.

Climate is influenced by energy from the sun.
True or False

(The sun sends huge amounts of heat to the Earth where it is turned into heat. That heat is absorbed by the oceans and the land and is released into the atmosphere.)

Source: David Suzuki. 1988. *Looking at Weather*. New Data Enterprises and Barbara Hehner. 96 pp.

Greenhouse gases trap the sun's heat keeping the Earth warm.

True or False

(The Earth's atmosphere is made up of a mixture of gases that trap heat like the windows of a greenhouse. These gases are necessary for life on Earth to exist. Without them the Earth would not be able to support life that requires heat. When the amounts of these gases change, it changes the amount of heat that is kept in the atmosphere. Higher levels of greenhouse gases mean higher temperatures. Lower levels mean lower temperatures.)

Source: Government of Canada, Global Climate Change. 1999. *Our Climate is Changing*. Her Majesty the Queen in Right of Canada. 4 pp.

Scientists know for a fact, all of the effects that a changing climate will have on the way humans live.

True or False

(Scientists can use models to try to predict what the effects of climate change will have. However, no one can be certain what the exact impacts will be or how long they will take to occur.)

Source: www.unfccc.de/resource/iuckit/fact05.html

The Earth's climate changes naturally.

True or False

(The Earth's climate changes naturally, and has gone through changes in the past (for example, the last ice age was a major climate change event). Global climate change normally occurs over very long periods of time. The upper layers of the ocean adjust in a few seasons, but changes to the deep parts of the ocean take centuries. Animal and plant life change in decades. Changes in snow and ice sheets take centuries. The Earth itself changes over millions of years through events like mountain building and continental drift.)

Source: www.unfccc.de/resource/iuckit/fact08.html

Burning fossil fuels such as oil, coal and natural gas releases carbon dioxide, which is affecting the climate.

True or False

(The single human activity that is most likely to have a large impact on the climate is the burning of "fossil fuels". These fuels contain carbon and burning them makes carbon dioxide gas. Since the 1800's, the amount of carbon dioxide in the atmosphere has risen 30%, and the average global temperature has gone up 0.6–1.0 °C.)

Source: www.gcrio.org/gwcc/part1.html

The hole in the ozone layer and climate change are the exact same thing.

True or False

(In fact they are not closely related. The ozone layer protects the Earth from harmful ultraviolet light that can cause skin problems (like cancer). The main cause of the hole in the ozone layer is chlorofluorocarbons (CFCs). These are used in refrigerators, air conditioners, and in industry. Climate is influenced by greenhouse gases (such as carbon dioxide, methane, and nitrous oxide) trapping heat, just as the windows of a green house do. As more carbon dioxide is added to the air, the heat from the sun has more trouble escaping. This makes the average temperature increase.)

Source: www.gcrio.org/gwcc/part1.html

Aerosol spray cans are a major contributor to climate change.

True or False

(Aerosol spray cans have almost no effect on climate change. In the past, aerosol spray cans contained chlorofluorocarbons (CFCs), which destroy the ozone layer. This is not the same as global warming.)

Source: www.gcrio.org/gwcc/misconceptions.html

Deforestation (cutting down trees) is the second largest source of carbon dioxide.

True or False

(When forests are cleared, carbon dioxide is released into the atmosphere through burning or decomposing trees. It is estimated that 600 to 2.6 billion tonnes of carbon are released from deforestation globally, each year.)

Source: www.unfccc.de/resource/iuckit/fact22.html

Methane is another greenhouse gas that influences climate.

True or False

(In fact methane is the second most important greenhouse gas after carbon dioxide.)

Source: www.unfccc.de/resource/iuckit/fact22.html

Spring has advanced by an average of one month.

True or False

(Not yet! It has advanced by 5 days over the last 30 years according to an article in the Globe and Mail, March 13, 1999. Researchers at the International Phenological Gardens have noted the spring dates when buds appear, leaves unfold, plants flower, and fall dates when leaves turn colour and fall.)

The average temperature of the Earth has increased since the Industrial Revolution, which was 200 years ago.

True or False

(Scientists estimate that the average temperature of the Earth has increased almost 1 °C since the Industrial Revolution.)

Source: *It's a Matter of Survival*, by Anita Gordon and David Suzuki, Stoddart, 1990.

The average truck emits the same amount of greenhouse gases as the average car.

True or False

(The average truck today emits 43% more greenhouse gases than the average car and 50% more smog forming exhaust. In the past 20 years, the sale of trucks has gone up from 1/5 of automobile sales to 1/2! This equals the same amount of emissions as 40 million cars.)

Source: www.ucsusa.org

All areas of the Earth are going to experience warmer temperatures because of climate change.

True or False

(Some areas will experience hotter temperatures while others may experience colder temperatures.)

Source: www.davidsuzuki.org/climatedamage.htm

On average, every Canadian is responsible for more than 5 tonnes (5000 kg) of greenhouse gas emissions into the atmosphere each year.

True or False

(This is an average based on the amount we drive, the energy we use in our houses, and even the amount of garbage we throw away. All of these things contribute to greenhouse gases.)

Source: www.davidsuzuki.org

Saving energy helps to slow global warming.

Saving energy also helps solve other environmental problems like acid rain and smog.

True or False

Electricity only comes from fossil fuels such as coal. **True or False**

(Electricity also can be made from water, the sun, and wind. Wind energy is something that people are starting to look at as an alternative to fossil fuel energy, especially in southern Alberta, where there is a lot of wind!)

Source: www.greenenergy.com/PRNNOV12.html



activity 1

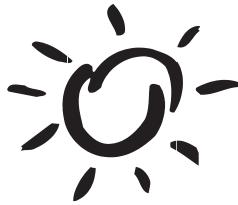


GAME SHOW

LESSON 2 THE HEAT IS ON STUDENT MATERIALS

The following materials can be photocopied for the students.

CLIMATE SCIENCE

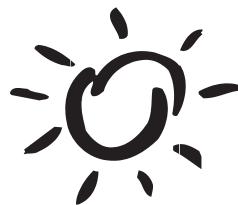


Air is made up of:

- a) 100% oxygen
- b) 50% oxygen, 50% carbon dioxide
- c) 78% nitrogen, 21% oxygen,
and 1% other
- d) 50 % nitrogen, 50% oxygen



CLIMATE SCIENCE



Climate is

- a) the weather you can expect to have
in a certain place
- b) only the weather that is happening today
- c) something that never changes
- d) only influenced by the sun



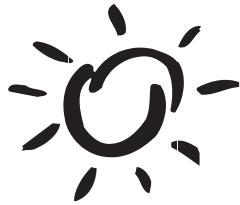
CLIMATE SCIENCE



Climate change is

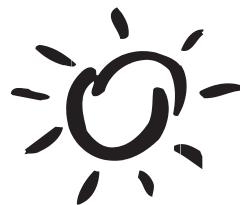
- a) something that scientists know everything about
- b) the differences in typical weather between
the future and the past
- c) sure to make everywhere in the entire
world hotter
- d) not going to affect the way we live.





Scientists think that by the year 2100, the global temperature (that is the average temperature around the world) will:

- a) rise 10 to 12 °C
- b) stay the same
- c) rise 1 to 3 °C
- d) fall 1 to 3 °C



Which is the main greenhouse gas that is leading to rising temperatures?

50/50 question: methane or carbon dioxide

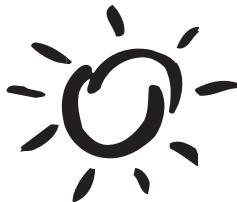


The three gases that are of most concern to scientists are the ones that are related to things humans do.

These gases are:

- a) carbon dioxide, methane, and nitrous oxide
- b) oxygen, carbon dioxide, and methane
- c) oxygen, nitrogen, and carbon dioxide
- d) carbon dioxide, nitrogen, and water vapour

CLIMATE SCIENCE



The condition of the atmosphere at a specific place and time is the definition for:
50/50 question: climate or weather



CLIMATE SCIENCE



The Earth's atmosphere is made up of nitrogen, oxygen, and a small amount of other gases such as carbon dioxide. How many kilometers above the Earth does the atmosphere go?

- a) 1 km
- b) 10 km
- c) 100 km
- d) 1000 km

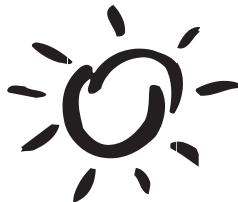


CLIMATE SCIENCE



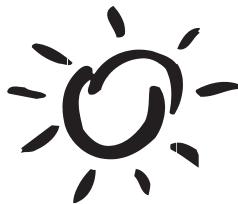
The atmosphere filters harmful UV rays from the sun.
What is one other thing that the atmosphere does?
50/50 question: cools the Earth down or keeps the Earth warm





How far is the sun from the Earth?

- a) 150 km
- b) 1500 km
- c) 150 000 km
- d) 150 000 000 km



In the next 100 years, scientists expect that the average sea level will rise:

- a) 5 cm
- b) 50 cm
- c) too much to count
- d) not at all



Global climate change happens:

- a) very gradually, over long periods of time
- b) within one year
- c) within 10 years
- d) I don't know. Climate change has never happened before.

CLIMATE SCIENCE

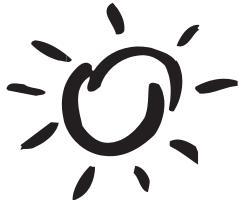


Fossil fuels:

- a) are oil, coal, and natural gas
- b) were once ancient forests and sea creatures
- c) started forming millions of years ago
- d) all of the above



CLIMATE SCIENCE

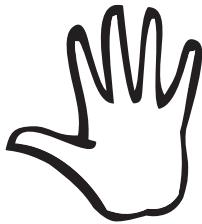


During the last ice age, 20,000 years ago, the average temperature of the planet had a lower temperature than today. How many degrees lower was it?

- a) 0 °C
- b) 2 °C
- c) 5 °C
- d) 7 °C



HUMAN INFLUENCES ON CLIMATE CHANGE

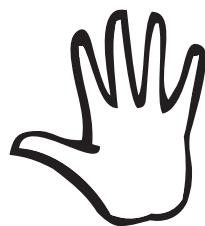


Compared to pre-industrial times, the amount of carbon dioxide in the atmosphere today is:

- a) higher
- b) lower
- c) the same
- d) I don't know. Carbon dioxide can't be measured.



HUMAN INFLUENCES ON CLIMATE CHANGE

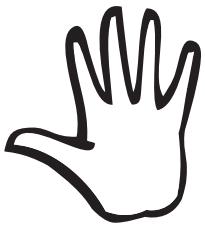


Which of these activities releases carbon dioxide (a greenhouse gas) into the atmosphere?

- a) driving your car
- b) turning on the lights in your bedroom
- c) using your computer
- d) all of the above



HUMAN INFLUENCES ON CLIMATE CHANGE

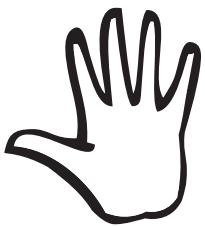


Methane, another greenhouse gas which affects climate, is released into the atmosphere by:

- a) cow farts
- b) rice farming
- c) garbage dumps
- d) all of the above



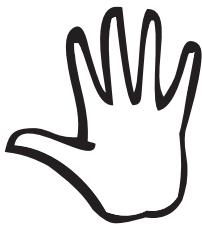
HUMAN INFLUENCES ON CLIMATE CHANGE



The human population in the world has _____ since 1950.

- a) doubled
- b) tripled
- c) dropped
- d) stayed the same

HUMAN INFLUENCES ON CLIMATE CHANGE

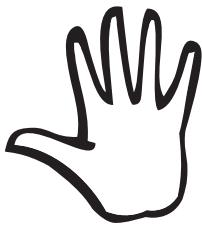


What percentage of greenhouse gas emissions do individual Canadians (that's you and me) contribute to Canada's total emissions?

- a) none, it is all done by factories
- b) 25%
- c) 75%
- d) 100%



HUMAN INFLUENCES ON CLIMATE CHANGE

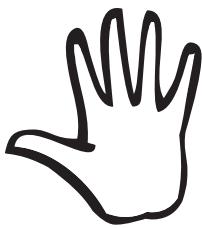


Every litre of gasoline you use in your car produces this much carbon dioxide (and other pollutants):

- a) none
- b) 1 gram
- c) 1 kilogram
- d) 2.5 kilograms



HUMAN INFLUENCES ON CLIMATE CHANGE



To help decrease carbon dioxide emissions, you should:

- a) ride your bike or walk when you can
- b) turn off power-using appliances (like your stereo, computer, and TV) when you are not using them
- c) put on a sweater instead of turning up the heat
- d) all of the above



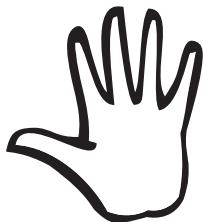
HUMAN INFLUENCES ON CLIMATE CHANGE



Appliances and lights were responsible for 3% of our personal greenhouse gas emissions in 1990. Name two things you can do to save electricity.



HUMAN INFLUENCES ON CLIMATE CHANGE

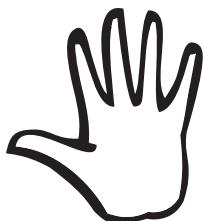


Compared to making products from raw materials, products from recycled paper and plastic take this much energy:

- a) the same
- b) more energy
- c) less energy
- d) it can't be measured



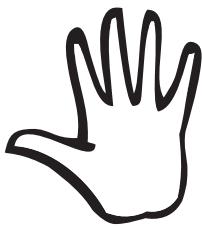
HUMAN INFLUENCES ON CLIMATE CHANGE



Buying fruits and vegetables that have been grown locally can:

- a) save gas that would be used to move the food here
- b) stop carbon dioxide from going into the air because trucks would not drive as far
- c) help local farmers
- d) all of the above

HUMAN INFLUENCES ON CLIMATE CHANGE

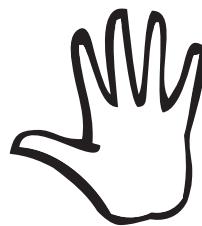


Which of these things will not help decrease carbon dioxide emissions?

- a) letting your car idle to warm up so it'll drive properly
- b) slowing down when you are driving
- c) giving your car a tune up
- d) keeping your tires inflated



HUMAN INFLUENCES ON CLIMATE CHANGE



The Kyoto Protocol is:

- a) the name of a city in China where potatoes are grown
- b) a treaty created 100 years ago to encourage industrialization of Eastern nations
- c) a treaty created in 1997 to try to lower the amount of greenhouse gases going into the atmosphere
- d) none of the above



THE GLOBAL PICTURE



Climate change may cause a decrease in:

- a) the types and kinds of plants and animals on Earth
- b) global temperature
- c) hurricanes
- d) none of the above



THE GLOBAL PICTURE



An increase of 5 to 10 °C in polar temperatures will eventually melt the ice caps on:

- a) Greenland
- b) Antarctica
- c) both of the above
- d) none of the above



THE GLOBAL PICTURE



The equivalent population of another Canada (approximately 30 million people) is added to the Earth every:

- a) 4 months
- b) year
- c) 10 years
- d) 100 years



THE GLOBAL PICTURE



Climate change could lead to changes in:

- a) human activity
- b) food production
- c) conversation
- d) all of the above

THE GLOBAL PICTURE



Which of these things will not be a result of climate change?

- a) drop in the number of Pacific salmon in North America
- b) disappearance of frogs in Central America
- c) healthier coral reefs in the ocean
- d) birds laying their eggs earlier



FACT OR FICTION



Weather and climate have the same definition.

True or False



FACT OR FICTION

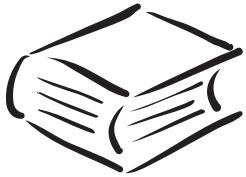


Climate is influenced by energy from the sun.

True or False



FACT OR FICTION



Greenhouse gases trap the sun's heat keeping the Earth warm.

True or False



FACT OR FICTION



Scientists know for a fact, all of the effects that a changing climate will have on the way humans live.

True or False



FACT OR FICTION



The Earth's climate changes naturally.

True or False

FACT OR FICTION



Burning fossil fuels such as oil, coal and natural gas releases carbon dioxide, which is affecting the climate.

True or False



FACT OR FICTION



The hole in the ozone layer and climate change are the exact same thing.

True or False



FACT OR FICTION



Aerosol spray cans are a major contributor to climate change.

True or False



FACT OR FICTION



Deforestation (cutting down trees) is the second largest source of carbon dioxide.

True or False



FACT OR FICTION



Methane is another greenhouse gas that influences climate.

True or False



FACT OR FICTION



Spring has advanced by an average of one month.

True or False

FACT OR FICTION



The average temperature of the Earth has increased since the Industrial Revolution, which was 200 years ago.

True or False



FACT OR FICTION



The average truck emits the same amount of greenhouse gases as the average car.

True or False



FACT OR FICTION



All areas of the Earth are going to experience warmer temperatures because of climate change.

True or False



FACT OR FICTION



"On average, every Canadian is responsible for more than 5 tonnes (5000 kg) of greenhouse gas emissions into the atmosphere each year."

True or False



FACT OR FICTION

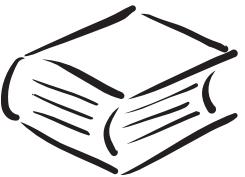


Saving energy helps to slow global warming.
Saving energy also helps solve other environmental problems like acid rain and smog.

True or False



FACT OR FICTION



Electricity only comes from fossil fuels such as coal.

True or False

activity 2



ENVIRONMENTAL HERO PROGRAM

LESSON 2 THE HEAT IS ON TEACHER GUIDE

People can make a difference in the world, both individually and as a group. As students think about Environmental Heroes in their own circle, they can begin to recognize that they, too, can be Environmental Heroes.

OBJECTIVES

Students will:

- > feel confident in their ability to make a positive contribution by noticing and reporting environmental efforts of individuals within their class or school
- > recognize simple positive changes that can be made to improve energy efficiency and reduce greenhouse gases
- > develop team work, discussion and decision-making skills.

MATERIALS

- > Environmental Hero Nomination Forms
- > Environmental Hero Certificates
- > Solid Waste Student Survey
- > School Questions: Ask the Principal or Custodian

PROCEDURE

1. Pose the question to your students: “Who in your class/school/community has shown/exhibited environmentally responsible actions/activities helping in the reduction of greenhouse gases?” Throughout this climate change study, you will investigate and nominate an Environmental Hero.
2. Explain to students that they will be investigating who, in their school and community, are Environmental Heroes.
3. Divide the class into groups of three or four.
4. Distribute the Solid Waste Student Survey and School Questions: Ask the Principal or Custodian. Arrange for students to complete the surveys. (Be sure to discuss with principal and/or custodian ahead of time.) The questions on the surveys will help students find people who might be Environmental Heroes. They will also learn about actions their school is taking to promote conservation.
5. As the groups investigate their Environmental Heroes, have students prepare an “Environmental Hero Log Book” outlining their investigation and explaining why each person deserves to be called an Environmental Hero. Details that students could include are:
 - > Name
 - > Date
 - > Activity
 - > Environmental benefits
 - > Witnesses (testimonials)
 - > Evidence
 - > Clues
6. In their groups, students will discuss, observe and decide on one Environmental Hero that has shown responsible action towards reducing greenhouse gases.
7. Have the students in the group fill in the Environmental Hero Reporting Form for their candidate.
8. Post Environmental Heroes, with report, on the Hero Board throughout the lessons/weeks/months. An optional activity for the nominators would be to diagram the activity and include photos of the action and/or nominee with their report.

TEACHER QUESTIONS: HOW GREEN IS YOUR SCHOOL?

1. Do you have an environmental club at your school? **Yes** **No**
2. Are you a member of the program called Destination Conservation? **Yes** **No**
3. Does your school subscribe to the Green Teacher Magazine? (Hundreds of lesson ideas!) **Yes** **No**
4. Does your school integrate the environmental curriculum into other curriculum areas, i.e. Math, Language Arts, Science, etc. **Yes** **No**
5. Do you have a regular ground clean-up at your school that is a positive event, as opposed to garbage pick-up because of misbehaviour? **Yes** **No**
6. Do you have a problem with the amount of environmentally unfriendly products displayed or in use at your school? **Yes** **No**
7. Do you promote re-useable lunch bags at your school? Try selling them as a fundraiser. **Yes** **No**
8. Do you think that achieving and maintaining a 'Green School Rating' is important at your school? **Yes** **No**

Name(s):

Date:

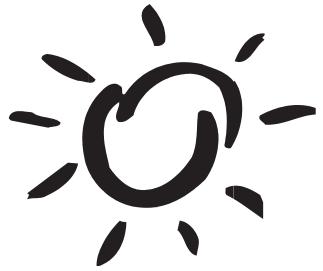
activity 2



ENVIRONMENTAL HERO PROGRAM

**LESSON 2 THE HEAT IS ON
STUDENT MATERIALS**

The following materials can be photocopied for the students.

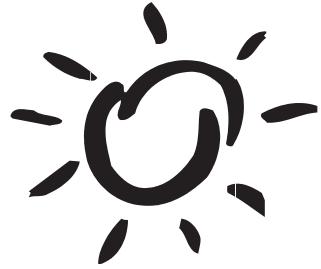


solid waste student survey

1. Does your school have an environmental club? Yes No
2. Does your school do something together for Earth Day? Yes No
3. Is your outside playground free of litter most of the time? Yes No
4. Do your friends care if you drop litter on the school grounds during recess? Yes No
5. Does your custodian or teacher separate paper from other solid waste? Yes No
6. Does your school have a litterless lunch program? Yes No
7. Do you recycle all of your classroom paper? Yes No
8. Do you talk to your mom or dad about bringing less food to school,
so that you don't waste any? Yes No
9. Do you take uneaten food from your lunch home? Yes No
10. Do you have a share box or table in your room for leftover food? Yes No

Name(s):

Date:

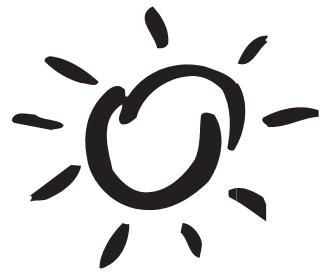


school questions: ask the principal or custodian

1. During the warm months of the school year does the school turn off heat-producing machines like furnaces, photocopiers and computers when not in use? Yes No Some
2. Do the computers have an energy-saving sleep mode? Yes No Some
3. Is the juice/pop machine turned off or unplugged during the summer? Yes No Some
4. Has the school installed ceiling fans in areas like the gym to circulate air in hot months? Yes No Some
5. Is the heat (furnace) turned down during the weekends? Yes No Some
6. Does the school have regular 'cool school' days? Yes No Some
7. Has your school become a member of the Destination Conservation program? Yes No Some
8. Does the custodian(s) only turn on the lights in the rooms they are working in at night? Yes No Some
9. Do your gym lights get turned on only when the first Phys. Ed. class arrives? (as opposed to earlier by the custodian) Yes No Some
10. Do you have double-glazed windows in your building? Yes No Some

Name(s): _____

Date: _____



environmental hero log book

Name: _____

Date: _____

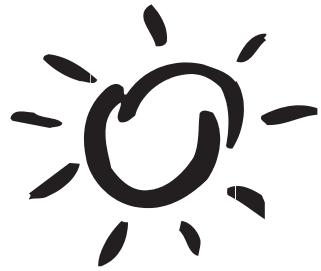
Activity: _____

Environmental Benefits: _____

 Witnesses (Testimonials):

 Evidence:

 Clues:



environmental hero reporting form

Name or Names of Environmental Hero Nominee:

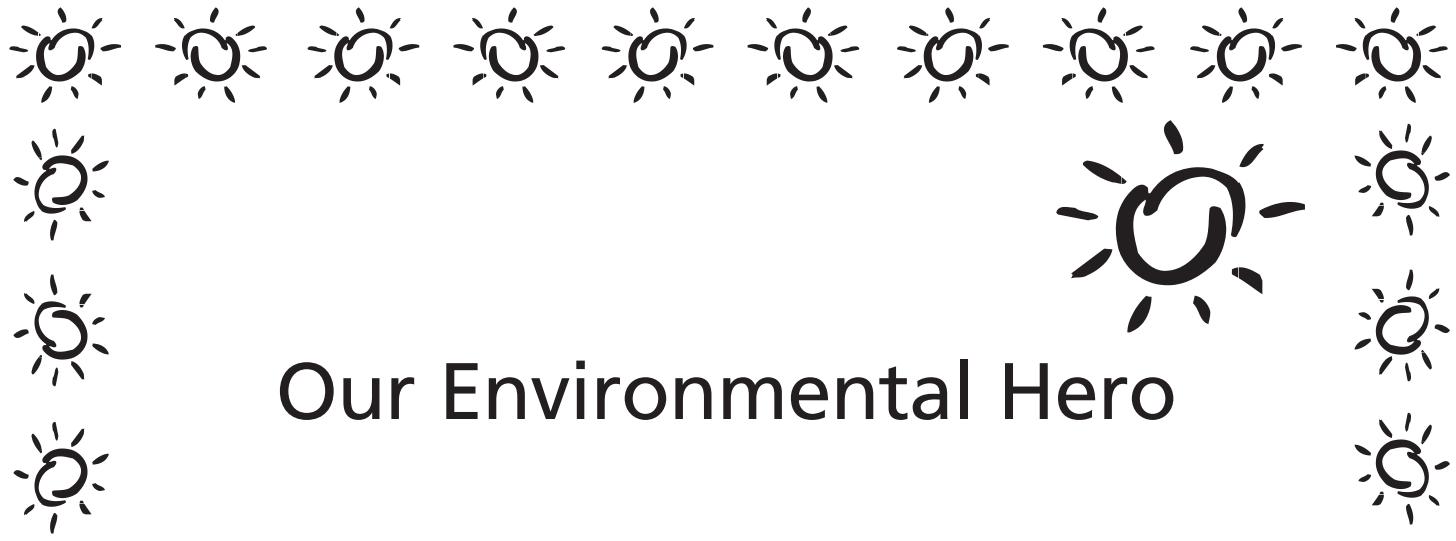
Class/School:

Activity Title:

Why is this work a positive contribution to the environment and reducing Greenhouse gases?
Explain in four or five sentences.

Date:

Nominators:



Our Environmental Hero

is recognized by

for making a valuable contribution to the protection
and enhancement of the environment by



Awarded this date:

Signature:





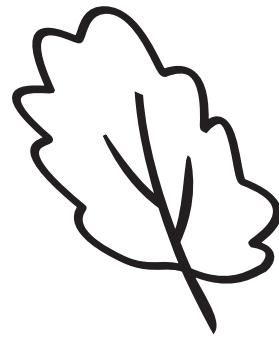
lesson 3

WORLD IN A BOTTLE





Lesson 3



WORLD IN A BOTTLE

In lesson 3, students create a World in a Bottle. Gravel, charcoal and soil lightly mixed with sand are carefully layered in a large jar, into which plants are nestled. A light mist provides the needed rainfall, and the jar is closed up and set in a window. This model of the Earth and its atmosphere – a closed system – helps students visualize how the “World in a Bottle” is a model of the world’s climate.

BACKGROUND

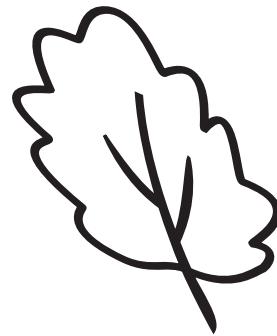
To understand climate change, it is important to understand the basics of climate. The Earth’s climate is influenced by many factors, including sunlight, water, land, and plants, as well as human activities that release carbon dioxide into the atmosphere.

OBJECTIVES

Students will be able to:

- > explain the difference between climate and weather
- > list the factors that influence climate
- > compare the climate system in the World in a Bottle to that of the Earth’s climate
- > discuss how all human actions have an impact on the world, and that humans will be required to deal with the consequences.

activity 1



WORLD IN A BOTTLE

LESSON 3 WORLD IN A BOTTLE TEACHER GUIDE

This activity is designed to illustrate the interrelationships of air, soil, vegetation and water, and how they work together to influence our climate and weather. It will also illustrate to students how human activities can influence these systems, and that we each make a contribution to these impacts.

OBJECTIVES

Students will be able to:

- > list the factors influencing climate
- > explain the difference between climate and weather
- > understand how human activities influence the climate
- > understand how all components of the environment work together to create our climate.

MATERIALS

- > Large plastic water container (20 L purified water jug) or 4 L glass pickle jar
 - > 3 L of small gravel
 - > 1 L of activated charcoal
 - > 4-6 L of potting soil
 - > 3-5 house plants that prefer humid environments (e.g., ivy, fern or spider plant cuttings, or greenhouse bedding-out plants)
 - > Water spray bottle
 - > Wooden dowel: 1 metre long
 - > Plastic funnel
 - > Small pieces of driftwood, pine cones, pebbles
 - > Optional: video, *Inuit Observations on Climate Change*, available for sale from the International Institute for Sustainable Development, or to view on their Web site at <http://iisd1.iisd.ca/casl/projects/inuitobs.htm>
- Follow the links.



PROCEDURE

1. Start by discussing with students the difference between **climate** and **weather**.

Weather

- > The conditions that occur from minute to minute at a given location
- > Can change a lot in a short period of time
- > What we hear about through radio, TV, etc.; for example, the changes in precipitation, barometric pressure, temperature, wind at a given location.

Note for the teacher: Weather is the state of the atmosphere at any given time. Specifically, weather is the state of water vapour in the atmosphere. Without water vapour there would be no weather in the atmosphere. Weather is essentially the transfer of heat and water vapour through the atmosphere and around the globe.

Climate

- > Average of weather over several years in a given location
- > Can change, but over long periods of time
- > Climate describes the total of all weather occurring over a period of years in a given place. Climate tells us what it's usually like in the place where we live (e.g., normal winter, spring, summer and fall conditions)

Note for the teacher: Climate can be considered average weather, but according to the World Meteorological Organization, you need a minimum of 30 years of record in a locality before you can establish a "climatic normal". A good way to differentiate between weather and climate is "climate is what we expect" and "weather is what we get". David Phillips of Environment Canada likes to use the term "the weather we expect" for

climate and climate change becomes "a change in the weather we expect over a given time period". Climate can change over short (a relative term) periods of time. In Edmonton, we have seen the 30-year normal rise over 1.4 °C from 1931-60 to 1971-2000.

2. Show students the video, "Inuit Observations on Climate Change". This will prepare them for the World in a Bottle activity. Before the film begins, ask students to record all the changes they hear about from the Inuit people in the video. Discuss these changes as a class.

Climatic changes in the Arctic:

- > Water is not freezing.
- > Ice is thinner.
- > There are cracks in the ice.
- > Traveling on the ice is more risky than before.
- > There are fewer seals because of melting ice.
- > Mud slides and ground drops off cliffs as permafrost melts.
- > Lakes are disappearing.
- > There are recent, previously rare, occurrences of thunderstorms.
- > Weather is hard to predict.



3. Diagram the carbon cycle on the board as well as the water cycle, oxygen cycle and photosynthesis, as time and student interest permits.

Information on these cycles can be found on the following web sites:

Water cycle:

www.epa.gov/OGWDW/kids/cycle.html
www.kidzone.ws/water/

Carbon cycle:

www.geog.ouc.bc.ca/physgeog/contents/9r.html
www.ucar.edu/learn/1_4_2_15t.htm

Oxygen cycle:

www.barc.usda.gov/psi/vl/bpdkids/oxygen_slide.html
<http://bioag.byu.edu/aghort/214pres/geochem/sld010.htm>

Photosynthesis:

www.mi.mun.ca/mi-net/enviro/photo.htm
<http://tqjunior.thinkquest.org/3715/photo3.html?tqskip=1>

Using a picture of a “wild” place, have students identify the components that influence climate (such as the sun, plants, carbon dioxide, water, topography of land, animals, people). As each component is identified, explain to the students how each contributes to climate.

4. Show the students what you will be using to build your “world” climate on a smaller scale: gravel, charcoal, sand, dirt, plants, the atmosphere (bottle), water (spray bottle), and sunlight. Compare these to the world’s climate components. Discuss with students the one thing we can’t put into the bottle: humans.

The World in a Bottle is a model of the Earth’s ecosystem. It is a small *representation* of the larger Earth. Scientists also use models to describe climate change and to predict its impact. In this case, a model is a simplified description of a complex entity or process. Computer programs are designed based on these models to help scientists with the complex calculations required to determine possible and probable results of climate change.

5. Make the World in a Bottle, following the steps below. Ask for student volunteers as you move through all of the steps. As the bottle is being assembled, have students diagram the process by drawing a bottle and adding each step, with labels, so that they will be able to repeat this experiment themselves.
- In your bottle, layer gravel, charcoal, sand and dirt.
 - Using the wooden doweling, dig holes for each of your plants. Drop the plants into the bottle and use the doweling to move them into place. Ensure that all of the roots are covered.
 - Mist the plants with the water spray bottle. **It is important not to overwater the plants**, so mist only until the top of the soil is wet.
 - Scatter the pebbles and pine cones along the surface of the soil.
 - Allow students to give the world a “message”, or to simply blow inside the glass jar before it is sealed. This represents the carbon dioxide in the atmosphere of our world in a bottle, and gives the plants a good start.
 - Cap the bottle, making sure that it is completely sealed. Set it in an area that receives sunlight, but not direct sunlight.



A student monitors the closed system in “World in a Bottle.”



6. Throughout the activity, focus on the following ideas:
- > The bottle is like the Earth in that both are basically closed systems. This means that aside from light transfer, everything that is needed is inside the bottle.
All matter (i.e., carbon, water, nitrogen, and oxygen) is finite and must be recycled for future use in the system.
 - > The World in a Bottle will reach a balance of energy leaving and entering, just as the Earth does.
 - > The World in a Bottle will generate its own climate that will be separate from the room around it. It will have its own temperature and humidity. Changes in light or temperature around the bottle will affect the climate within.
7. Discuss with the class the following questions. (*Text in parenthesis and italics*) after the question is additional information that the teacher can read to the students after the correct answer has been given.
- > How will the plants get water if we are not continually adding it? (*water cycle*)
 - > Plants make oxygen and food using carbon dioxide and sunlight. How do you think these plants are going to have enough carbon dioxide to continually make food?
(*Carbon dioxide is released by decomposing plants and microbial animals in the soil. The plants also produce some carbon dioxide as they grow. Plants respire (breathe) which releases some carbon dioxide.*)
- > What do you think would happen if we put this bottle in a very sunny window? What would happen to the temperature inside the bottle? (*The temperature would rise because the bottle would have to absorb the heat. This bottle is much smaller than the Earth, and it does not have oceans to help mediate the temperature. The temperature would probably become too high for the plants and they would die.*)
 - > What would happen to the plants in the bottle if we increased the amount of carbon dioxide in the air of the bottle?
(*Since carbon dioxide is one of the components that plants use to make food, the plants would grow very quickly. Eventually the plant growth would stabilize to match the increased carbon dioxide.*)
 - > If plants are able to absorb carbon dioxide, why are we concerned about increased levels of carbon dioxide in the atmosphere?
(*So much vegetation has been cut down across the planet that there are not enough trees and other plants to absorb all the carbon dioxide released when fossil fuels are burned. Tree cover reflects sunlight back into space, whereas bare earth absorbs the energy from the sun contributing further to climate change.*)
 - > If we were to put a message in the bottle, what would it be?



lesson 4

THE WORLD WIDE WEB





Lesson 4



THE WORLD WIDE WEB

Scientists are adding to their understanding of climate change daily. One way to keep up with new information is through reputable sites on the Internet. In this activity, students are guided through several Web sites designed specially for children. Through animated pictures, short readings, and interactive activities, they learn about the climate history of the Earth, the probable causes of climate change, and actions they can take to cut down on greenhouse gas emissions.

Note: The number of sites a class will be able to look at in one class period will vary according to the proficiency of the students, the number and speed of computers available to them, etc. For this reason, some of the activities are suggested for advanced classes, and can be used by the teacher as extension or enrichment activities. The sites used in this lesson were on-line as of May 2004.

BACKGROUND

There are a number of excellent climate change Web sites on the Internet that have been designed specially for children. In this activity, students review why the climate is changing by looking at an animated page showing the effects of increasing greenhouse gas emissions.

They then learn what causes increased carbon dioxide emissions and what activities can reduce those emissions. Finally, they study pages that explain how food supply may change as a result of climate change, and they are introduced to the term “desertification” and the country of Mali, West Africa.

OBJECTIVES

Students will be able to:

- > use the World Wide Web to learn about climate change
- > complete a worksheet assignment.

ACTIVITIES

- > Why will the Earth become hot?
- > Can we change the climate?
- > Do we all contribute the same amount of greenhouse gas?
- > How will climate change affect Mali, West Africa?
- > The signs, they are a-changin'
- > We can make a difference!

WEB SITE INFORMATION

The following web sites are used in this lesson – you may wish to book mark them in advance of starting the activities.

1. Book mark the following web sites on the students' computers:

- > <http://unfccc.int/cop3/fccc/kids/kids.html>
Why will the Earth become hot?
- > www.climateark.org
The ClimateArk is a climate change portal and search engine dedicated to promoting public policy that addresses global climate change through reductions in carbon dioxide and other emissions, renewable energy, energy conservation and ending deforestation.
- > www.climatehotmap.org/index.html
Map details significant climate changes experienced at all locations shown.
- > www.nrcanrncan.gc.ca/kids/index_e.html
Natural Resources Canada web site for kids, including a youth version of the One-Tonne Challenge.
- > http://news.bbc.co.uk/cbbcnews/hi/world/newsid_2687000/2687039.stm
Background information on Mali, West Africa
- > www.kensingtontv.com/go/riverofsand/
Details Bruce Cockburn's trip to Mali, West Africa with USC Canada. Click on Images of Mali, West Africa, then Gono for information about desertification and climate change in Mali, West Africa.
- > www.epa.gov/globalwarming/kids/difference/.html
Kids' Site: We Can Make a Difference!
- > www.climcalc.net/eng/Calculator/Start.html#emissions
Environment Canada Web site that helps you calculate your personal carbon dioxide emissions, compare them to others and find ways to reduce them.
- > www.epa.gov/globalwarming/kids/change.html
United States Environmental Protection Agency Kids' Site: Can We Change the Climate?



activity 1



WHY WILL THE EARTH BECOME HOT?

LESSON 4 THE WORLD WIDE WEB TEACHER GUIDE

Students will access an animated page on the United Nations Framework Convention on Climate Change (UNFCC) Web site to determine some of the human activities that cause CO₂ emissions.

OBJECTIVES

Students will be able to:

- > use the World Wide Web to learn about climate change
- > list 5 things that cause CO₂ emissions.

MATERIALS

- > Computer lab with enough computers for individual or small group work
- > Desertification web sites (for further information)
- > Climate change on the World Wide Web (for further information)

PROCEDURE

Use the following web site for this activity:

<http://unfccc.int/cop3/fccc/kids/kids.html>

List 5 things that cause CO₂ emissions from the animated site on why the Earth will become hot.
Explain why.



activity 2



CAN WE CHANGE THE CLIMATE?

LESSON 4 THE WORLD WIDE WEB TEACHER GUIDE

CO₂ emissions are produced largely through the conversion of fossil fuels like coal, oil and gas to energy by burning them. Many of our daily activities have an effect on the Earth's climate because they burn fossil fuels.

OBJECTIVES

Students will be able to:

- > use the World Wide Web to learn about climate change
- > discuss the relationship between fossil fuel burning and climate change.

MATERIALS

- > Computer lab with enough computers for individual or small group work
- > Climate change on the World Wide Web (for further information)

PROCEDURE

1. Use the following web sites for this activity:
www.epa.gov/globalwarming/kids/change.html
and www.nrcan.gc.ca/kids/index_e.html
2. Ask students to suggest some activities they do in their daily lives that might have an effect on the Earth's climate.
3. Have students read the introductory page at this site, up to "When Do You Send Greenhouse Gases into the Air?". Discuss the statement that energy, like the energy that makes cars run and much of the energy used to light and heat our homes, comes from fuels such as coal and oil – fossil fuels. Burning these fuels releases greenhouse gases.
4. Discuss how we heat our homes in Alberta (usually with natural gas), and how we generate electricity (through burning coal). Ask again what activities they do that might affect the climate.
5. Continue to read to the end of the section showing how fossil fuels are formed.
6. The next section explains why climate change is a concern. Continue to read on and to discuss each section.

OTHER KIDS' SITES

> www.climatechange.gc.ca/english/workroom/students/projects.shtml

For students who want to do a project on climate change, this site includes slides, maps and links to other sites.

> www.climcalc.net/eng/Calculator/start.html#emissions

Students can calculate their own carbon dioxide emissions and compare to the average person's carbon dioxide emissions in their region.

> <http://edugreen.teri.res.in/index.asp>

Edugreen is a web site from India with lots of environmental information, games and activities for children. Students can see that climate change is important to children in India, too.

> <http://ecokids.earthday.ca/pub/index.cfm>

Ecokids is Earth Day Canada's environmental education program for youth who care about the planet. There are lots of interactive, fun educational games and activities to help children get involved.



activity 3



DO WE ALL CONTRIBUTE THE SAME AMOUNT OF GREENHOUSE GAS?

LESSON 4 THE WORLD WIDE WEB TEACHER GUIDE

The Government of Canada's Climate Change Impacts and Adaption Program Web site provides information about the possible impacts of climate change in each geographic region of Canada.

OBJECTIVES

Students will be able to:

- > use the World Wide Web to learn about climate change
- > use information about their geographic region to determine possible impacts of climate change
- > rate their region's CO₂ emissions compared to those from 10 countries from around the world.

MATERIALS

- > Computer lab with enough computers for individual or small group work
- > Paper copies of all Web sites that have been book marked
- > Climate change on the World Wide Web (for further information)

PROCEDURE

1. Use the following web site for this activity:
www.adaptation.nrcan.gc.ca/posters/home-acceuil_en.asp
2. Click on the poster of your region.
3. Look through the poster about your region for at least one example of how climate change will affect three of the following:
 - > Water supplies
 - > Plants
 - > Animals
 - > Temperature
 - > Sea level
 - > Growing season
 - > Weather
4. Provide students a list of 10 countries from various continents around the world.
 - > E.g. North America - Canada,
Asia - China, South America - Chile,
Europe - Germany, Africa - Mali, etc.
5. Ask students to guess how each country would rate on a scale from one to ten with respect to how much carbon dioxide each country emits (number one is the most and number ten is the least).
6. On the above site, click on your geographic region within Canada, then click 'How do we measure up?'
7. Give students time to compare their rating to what is shown on the web site.
8. Discuss the following questions with students:
 - > How does your rating compare with the table on the web site?
 - > What did you expect?
 - > Which country did you think would have the highest emissions?
 - > What are the differences between the countries that make their emissions higher or lower?
 - > Were you surprised by the actual results on the graph?



activity 4



HOW WILL CLIMATE CHANGE AFFECT MALI?

LESSON 4 THE WORLD WIDE WEB TEACHER GUIDE

Mali, West Africa is one example of a country that demonstrates the effects of on-going drought, over-grazing, topsoil erosion, harsh desert winds, and deforestation, all of which will become worse as the climate changes.

OBJECTIVES

Students will be able to:

- > use the World Wide Web to learn about climate change
- > discuss the tree planting project of school children in Gono.

MATERIALS

- > Computer lab with enough computers for individual or small group work
- > Climate change on the World Wide Web (for further information)

PROCEDURE

1. Use the following web site for this activity:
[http://news.bbc.co.uk/cbbcnews/hi/world/
newsid_2687000/2687039.stm](http://news.bbc.co.uk/cbbcnews/hi/world/newsid_2687000/2687039.stm)
 - > Locate Mali, West Africa on the map on this web page. Read the Fascinating Fact: Mali, West Africa is rapidly being swallowed up by the Sahara desert – about 65% of the country is now desert or semi-desert. On-going drought, over-grazing, topsoil erosion, harsh desert winds, and the scavenging of trees for firewood are all to blame.
 - > Desertification is increasing in Mali, West Africa and other places in the world as climate changes.
 - > Look at this web site on Rivers of Sand in Mali, West Africa. Click on “Images of Mali”, then “Gono”.
2. Next, look at the following site for more information regarding climate change and Mali, West Africa:
www.kensingtontv.com/go/riverofsand/

While this web site is no longer interactive, the information and photos in Gono are a good description of some of the effects of climate change and desertification in Mali, West Africa, and what young people there are doing to help stop desertification by planting trees. Read through the information about Gono.



activity 5



THE SIGNS THEY ARE A-CHANGIN' LESSON 4 THE WORLD WIDE WEB TEACHER GUIDE

The Climate Hot Map explores some of the signs, or harbingers, of climate change around the world. By clicking on thumbnail sketches, students can compare what the effects of climate change may be in various parts of the world.

OBJECTIVES

- Students will be able to:
- > use the World Wide Web to learn about climate change
 - > list early warning signs of climate change in a city near them, in Mali, West Africa and in two other places in the world.

MATERIALS

- > Computer lab with enough computers for individual or small group work
- > Pencils for worksheet assignment
- > Copies of the “Early Warning Signs” chart
- > Climate change on the World Wide Web (for further information)

PROCEDURE

1. Use the following web site for this activity:
www.climatehotmap.org/index.html
2. Students can either click directly on the map or on the list of locations, provided beside the map, in order to access the finger prints and harbingers of climate change at this site.
3. Have students select a city close to their own. Have students record the early warning signs of climate change observed at this site, in the chart on the worksheet. Next, have students locate a city in or near Mali, West Africa, and continue recording the changes here. Students can select any two additional places of interest to them, to complete the chart on early warning signs below.



activity 5



THE SIGNS THEY ARE A-CHANGIN' LESSON 4 THE WORLD WIDE WEB STUDENT MATERIALS

The following materials can be photocopied for the students.



early warning signs chart

City near where you live:

Early warning signs of climate change:

City near Mali, West Africa:

Early warning signs of climate change:

Your choice:

Early warning signs of climate change:

Your choice:

Early warning signs of climate change:



activity 6



WE CAN MAKE A DIFFERENCE!

LESSON 4 THE WORLD WIDE WEB TEACHER GUIDE

The United States Environmental Protection Agency web site shows examples of things we can do to reduce our own contributions to climate change.

OBJECTIVES

Students will be able to:

- > use the World Wide Web to learn about climate change
- > complete a worksheet on actions they can take to reduce climate change.

MATERIALS

- > Computer lab with enough computers for individual or small group work
- > Pencils for worksheet assignment
- > We Can Make a Difference! worksheet
- > Climate change on the World Wide Web (for further information)

PROCEDURE

1. Use the following web site for this activity:
www.epa.gov/globalwarming/kids/difference.html
2. Ask students to make a commitment to do one thing they haven't done before to reduce their own contribution to climate change. List ideas.
3. As a group, choose at least one thing to do as a class in this school. Discuss what the class could do in your community.



activity 6



WE CAN MAKE A DIFFERENCE!

**LESSON 4 THE WORLD WIDE WEB
STUDENT MATERIALS**

The following materials can be photocopied for the students.



we can make a difference! ideas

What I can do:

What we can do at home:

What we can do at school:

What we can do in our community:

Global efforts:



information



WEB SITE LISTINGS

LESSON 4 THE WORLD WIDE WEB TEACHER GUIDE

The following web sites provide background and supplementary information for both teachers and students.

CLIMATE CHANGE ON THE WORLD WIDE WEB: AN ANNOTATED LIST OF WEB SITES

TEACHER SITES

Climate Change Calculator

www.climcalc.net

An interactive software tool designed to raise people's awareness of the greenhouse gases they produce through their daily activities and lifestyle choices. This Canada-specific tool will help people of all ages learn about their contributions to greenhouse gas emissions and will suggest measures they can take to reduce emissions.

Climate Change Solutions:

Pembina Institute, Alberta

www.climatechangesolutions.com

A how-to site for individuals, families, communities and organizations.

Coal Association of Canada

www.coal.ca/class.htm

“Worldwide, coal is second only to oil as an energy source. About 70% of the world’s coal production is used to generate 40% of the world’s electricity. Learn more about coal from an industry perspective.” Suitable for students as well.

Discovery Channel School on Global Warming

School.discovery.com/schooladventures/globalwarming

“Mapping the Gases” activity helps students compare populations of major nations with their greenhouse gas emissions.

Environment Canada

www.ec.gc.ca

Follow the links to

www.ec.gc.ca/ind/english/energy/Tech_Sup/ecsup_p3_e.cfm for a chart showing Canadian consumption of Oil, Natural Gas and Coal from 1958-1994

Environment Canada Sustainability Report

www.sustreport.org/signals/can_energy.html

This page contains a graph showing total energy consumed per year by Canadians from 1958-1994.

Pembina Institute

www.pembina.org

Provides positive suggestions for personal actions to reduce greenhouse gas emissions.

www.re-energy.ca

A new Pembina Institute site on sustainable and renewable resources

Power Scorecard

www.powerscorecard.org/technologies.cfm

Electricity Generating Technologies: Where does our electricity come from? Pages on this site describe the following technologies for producing electricity: biomass, coal, geothermal, hydro, landfill gas, municipal solid waste, natural gas, nuclear, oil, solar, and wind.

The Renewable Resource Data Centre

rredc.nrel.gov/

The RReDC provides information on several types of renewable energy resources in the United States, in the form of publications, data, and maps. An extensive dictionary of renewable energy related terms is also provided. The News section announces new products on the RReDC.

Schoolyard Habitats

www.nwf.org/habitats/schoolyard

Suggestions and activities for improving your schoolyard habitat in environmentally friendly ways.

Sierra Club of Canada

www.sierraclub.ca/national/climate/index.html

Sierra Club’s climate change campaign, links to Climate Action Network groups across Canada.



United Nations Environment Program

www.unep.ch/iucc/fs127.htm

UNEP's mission is to provide leadership and encourage partnerships in caring for the environment by inspiring, informing and enabling nations and people to improve their quality of life without compromising that of future generations. This specific page looks at climate and food security.

United Nations Framework Convention on Climate Change

www.unfccc.de/resource/iuckit/fact12.html

This is Climate Change Information Sheet 12, on biological diversity and ecosystems, and covers deforestation and desertification.

www.unfccc.de/resource/iuckit/fact10.html

This is Climate Change Information Sheet 10, on agriculture and food security.

United States Environmental Protection Agency

www.epa.gov/globalwarming

Follow the links to www.epa.gov/globalwarming/emissions/individual/index.html for a graph showing 1995 greenhouse gas emissions per capita.

VisionQuest Alternative Energy

www.greenenergy.com

Looks at green energy, clean energy and emissions reduction.

World Health Organization

www.who.int

"Global climate change will have a wide range of potential health impacts. Some health impacts would result directly from increases in heatwaves and increases in floods, droughts and storms. The transmission of many infectious diseases are particularly sensitive to climate or weather conditions, especially those that are transmitted by mosquitoes, e.g. malaria. Other health impacts would be secondary to the impacts of climate change upon ecological and social systems,

and would include changes in local food production and the various health consequences of population displacement and economic disruption."

World Wildlife Fund Climate Change Campaign

www.panda.org/climate

Includes pages describing climate causes, climate impacts and climate solutions.

STUDENT SITES

A Beginner's Guide to the UN Framework Convention on Climate Change – For Kids

www.cop3.de/fccc/kids/children.htm

A simplified survey of the causes of climate change.

www.cop3.de/fccc/kids/kids.html

Animated explanations of why the Earth will become hot, and the relationship between ozone depletion and global warming.

Action by Canadians on Climate Change

www.energy.ca/ABC.html

The actions of individual Canadians directly account for some 28 percent of national greenhouse gas emissions. For Canada to reduce these emissions, government and industry action alone will not be enough – individuals must be engaged in the solution. Recognizing this, the Energy Council of Canada has launched its program, Action By Canadians on climate change – the ABC Program. The ABC Program is a national-level public education and action initiative designed to engage Canadians in voluntarily reducing their individual greenhouse gas emissions.

The Canada Country Study: Climate Impacts and Adaptation

www.ec.gc.ca/climate/ccs/ccs_e.htm

A province-by-province look at the impact of climate change.

Energy Quest

www.energy.ca.gov/education/index.html

Lots of quizzes, puzzles and information for kids.

Environment Canada's Climate Change site

www.ns.ec.gc.ca/co2/worksheet.html

Student and teacher site. Calculate your personal CO₂ emissions. Businesses, families, and schools can also find tips on becoming more energy-efficient.

Environment Canada

www.ec.gc.ca/climate/resource/index_e.html

Calculate your CO₂ emissions, read about what people in Canada are doing, take the weather quiz – lots of good information on this site.

Environmental Protection Agency (USA)

www.epa.gov/globalwarming/kids/difference.html

Includes pages on global warming, climate and weather, greenhouse effect, climate system, “Climate’s come a long way”, “The climate detectives”, “Can we change the climate?”, “So what’s the big deal?” and “We can make a difference.”

Food and Agriculture Organization (FAO) Factfile

www.fao.org/news/factfile/fctlib-e.htm

Numerous excellent charts showing effects of global warming, desertification, global nutrition patterns, refugees, etc.

Global Warming: Focus on the Future

www.enviroweb.org/edf/games/index.html

Excellent interactive pages, information and games on climate change.

www.enviroweb.org/edf/isproblem/index.html

Explores issues of tainted water, disease carriers, food and water, and possible future scenarios.

Global Warming Wordsearch

www.enviroweb.org/edf/games/wordsearch/index.html

Government of Canada's site on Climate Change

www.climatechange.gc.ca/info

Student and teacher site.

www.climatechange.gc.ca/english/html/links.html

provides numerous links to provincial, national and international sites connected to climate change.

Green Guide to Cars and Trucks

www.greenercars.com

Student and teacher site. Ranks vehicles according to their environmental friendliness. Although it's based on American standards, it is a useful tool to compare cars by their environmental impacts, including air pollution, global warming, and fuel efficiency.

Greenhouse Gas Emissions

www.grida.no/db/maps/collection/climatechange/index.htm

Student and teacher site. Shows charts and tables of country-by-country reductions of greenhouse gas emissions required to fulfill the Kyoto Protocol.

United States Environmental Protection Agency Kids' Site

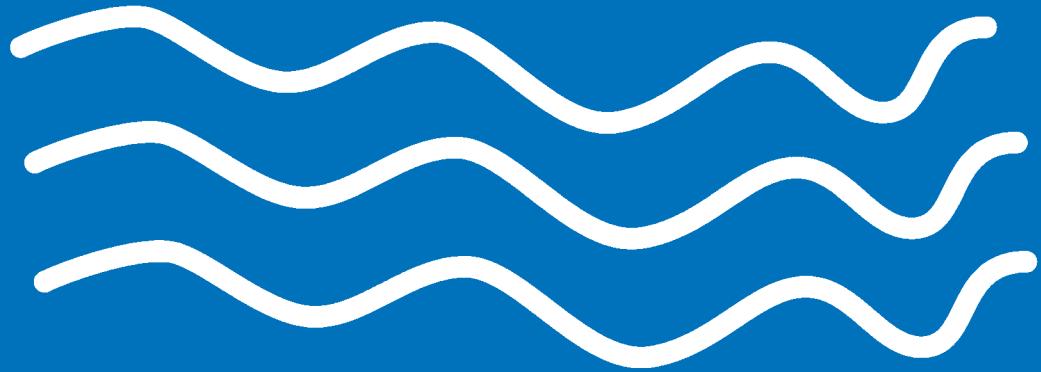
www.epa.gov/globalwarming/kids/difference.html

We Can Make a Difference!

www.epa.gov/globalwarming/kids/change.html

Can We Change the Climate?

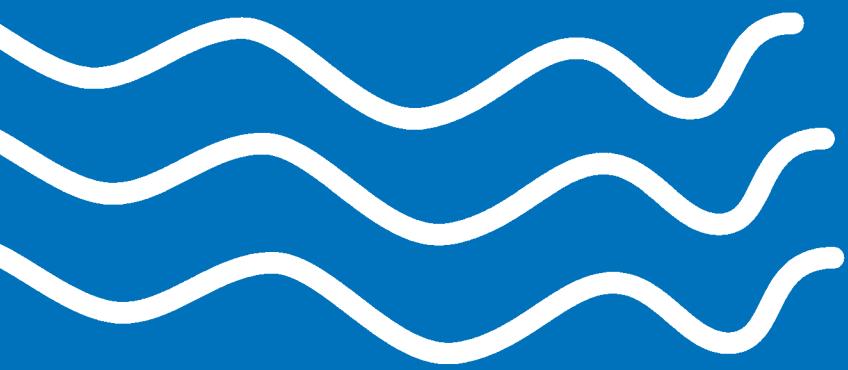


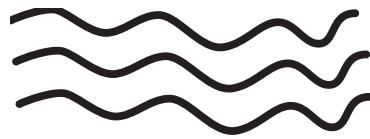


lesson 5

**THE WORLD WIDE WEB PART TWO:
HUMAN INTERACTIONS**







Lesson 5

THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS

In this lesson, students learn how trees, soil, water, and human activities are inter-connected in a different kind of World Wide Web. They also learn how people in Mali, West Africa are working to combat desertification, and what they can do in their own community.

BACKGROUND

Deforestation, over-cultivation of agricultural land, and overgrazing of land by livestock are human activities that lead to both **desertification** and **climate change**.

Desertification is the degradation of drylands, often to such an extent that it is impossible to make the soil productive again. It is due mainly to unpredictable climatic variations and unsustainable human land-use practices. The most commonly cited forms of unsustainable land use are over-cultivation, overgrazing, deforestation, and poor irrigation practices by communities who, in their struggle to survive, overexploit agricultural, forest and water resources.

Climate changes are likely to be severe in areas prone to desertification. The most certain effect is more drought. People depend on rain for water and farming. Drought will lead to greater poverty and hunger for the poorest people in the world, forcing these people to continue with farming practices that lead to further desertification and climate change. Canada – especially the southern Prairies – is one of 110 countries subject to desertification.

OBJECTIVES

Students will be able to:

- > explain the idea of the Earth as a World Wide Web
- > list the elements that affect climate
- > relate how human actions can affect climate
- > define desertification
- > compare the climate in Canada's Prairies with that of Mali, West Africa.

ACTIVITIES

- > The World Wide Web
- > Challenges in Arid Lands
 - Extension activity: desertification posters

OPTIONAL ACTIVITIES

- > Question This
- > Frog's Eye View
- > Frogopoly
- > It's Not Easy Being Green!
- > Leaping into Green

TRIALOGUE APPETIZERS: CLIMATE CHANGE, BIODIVERSITY AND DESERTIFICATION

The three Conventions on Climate Change, Biodiversity and Desertification are the result of the Rio Summit, a United Nations conference on Environment and Development that was held in Brazil in 1992. The Conventions are intrinsically linked, each affecting and being affected by the other two. The following information demonstrates the inter-connectedness of the three Conventions, all of which are represented in this education kit.

Climate Change

Information from the UN Framework Convention on Climate Change

- > All 10 of the warmest years on record have occurred in the last 15 years.
- > Even a modest rise of 1.1°C to 1.7°C could have dramatic effects. Temperatures of only 2°C to 2.3°C cooler than those today resulted in the last ice age, in which northern regions were covered by a kilometer of ice.

Union of Concerned Scientists

- > There are many factors, both natural and of human origin, that determine the climate of the Earth. Ultimately, climate is a result of the way the atmosphere redistributes the sun's energy. *A Primer on Climate Change*
- > The United States is responsible for 21.9% of the world's carbon dioxide emissions but has only 4.6% of the world's population.

World Resources, 1996-7

Biodiversity

Information from the UN Convention on Biological Diversity

- > December 29 has been designated as "International Biodiversity Day"
- > Biodiversity refers to the number, variety and variability of living organisms. Biodiversity is often addressed at three levels: ecosystems, species and genes. *Environment Canada*
- > Why do conversion and degradation of natural environments occur? Natural environments are converted either to enhance production and consumption of goods or services, or as an investment in an alternative asset that earns a greater return to the party responsible.
Amy Whiting
- > The loss of biological diversity may take many forms but at its most fundamental and irreversible it involves the extinction of species. Humans may exterminate species directly (hunting, collection and persecution), or indirectly (habitat destruction and modification). *Source unknown*

Desertification

Information from the UN Convention to Combat Desertification

- > June 17 has been designated as the "World Day to Combat Desertification"
- > Worldwide nearly 130 million hectares – about the land area of France, Italy and Spain combined – are 'lost' for ever due to degradation and can no longer be used for food production. *World Atlas of Desertification*
- > "Desertification" is not the spread of deserts but the creation of desert-like conditions in the dry lands, which make up 35% of the Earth's land surface. Desertification may threaten the livelihoods of as many as 1 billion people.
EarthAction

- > Desertification occurs when the natural vegetation cover is reduced and the topsoil becomes susceptible to erosion. This initiates a number of other problems including increased surface runoff and stream discharge, reduction of water infiltration and groundwater recharge, change in surface microclimate or reduction in native plants.

Geography course outline

For more information on The Trialogue on Climate Change, Biodiversity and Desertification visit: www.gdrc.org/uem/Triologue/frames.html

BACKGROUND INFORMATION: DESERTIFICATION, GLOBAL CHANGE, AND SUSTAINABLE DEVELOPMENT

The Convention to Combat Desertification cannot be viewed in isolation from other efforts to promote sustainable development.

The Convention text refers frequently to sustainable development, climate change, biological diversity, water resources, energy sources, food security, and socio-economic factors. The interactions between these issues and desertification are often not fully understood, but they are clearly important. The Convention therefore emphasizes the need to coordinate desertification-related activities with the research efforts and response strategies inspired by these other concerns.

Efforts to combat desertification complement efforts to protect biological diversity.

While many people tend to identify the issue of biodiversity with tropical rain forests, dryland ecosystems also contain a rich biota, including plant and animal species not found elsewhere. Many of humanity's most important food crops, such as barley and sorghum, originated in drylands. Though fast disappearing, indigenous varieties remain a vital resource for plant breeders

because of their resistance to stresses such as disease. Dryland species also provide drugs, resins, waxes, oils, and other commercial products. For example, drylands supply one-third of the plant-derived drugs in the U.S. Finally, drylands provide critical habitats for wildlife, including large mammals and migratory birds. These habitats are particularly vulnerable to land degradation.

Land degradation affects the quantity and quality of freshwater supplies.

Drought and desertification are associated with lower water levels in rivers, lakes, and aquifers. For example, unsustainable irrigation practices can dry the rivers that feed large lakes; the Aral Sea and Lake Chad have both seen their shorelines shrink dramatically in this way. Water crises are raising political tensions in many parts of the world, particularly where rivers and lakes are shared across borders. Land degradation is also a leading source of land-based pollution for the oceans, as polluted sediment and water washes down major rivers.

Natural climate variations can strongly affect drought patterns.

Currently the best understood link between global climate variability and drought involves sea-surface temperature patterns. For example, the El Niño-Southern Oscillation, or ENSO, events, are associated with a warming of the eastern equatorial Pacific; they were especially frequent in the 1980's and early 1990's and occurred in tandem with widespread droughts in southern Africa and elsewhere. Research into such climate patterns is starting to improve seasonal rainfall predictions. Efforts to strengthen predictions are an important part of national action programmes to combat desertification and will help dryland farmers and herders to better prepare for droughts.

Climate change could worsen the effects of desertification.

According to the United Nations Framework Convention on Climate Change, “countries with arid and semi-arid areas or areas liable to floods, drought and desertification... are particularly vulnerable to the adverse effects of climate change.” Scientists cannot yet predict how rising atmospheric levels of greenhouse gases will affect the global rate of desertification. What they can predict is that changes in temperature, evaporation, and rainfall will vary from region to region. As a result, desertification is likely to get worse in some critical areas but eased in other places.

Desertification may temporarily affect climate change.

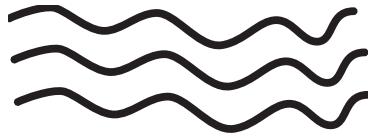
Land degradation tends to reduce surface moisture. Moist land absorbs heat as the sun’s energy is used for evaporation. Dry land reflects heat, raising surface temperatures and heating the lower atmosphere. Drylands are also more prone to wind erosion than moist areas. Wind erosion in drylands releases dust and other particulates into the atmosphere. By absorbing the sun’s rays or reflecting them back out into space, particles may help to cool the Earth’s surface. However, the energy they absorb can heat the lower atmosphere and reduce temperature differences between the atmosphere’s vertical layers; this can lead to fewer rain showers and thus drier land. Finally, the periodic burning of arid and semi-arid grasslands, often associated with unsustainable slash-and-burn agriculture, emits greenhouse gases. So does the unsustainable use of fuel-wood and charcoal, a major cause of land degradation. An important way to combat land degradation is reforestation, which is likely to have a cooling effect.

Desertification exacerbates poverty and political instability.

It contributes significantly to water scarcity, famine, the displacement of people within countries, migration between countries, and social breakdown. This is a recipe for political instability, for tensions between neighboring countries, and even for armed conflict. Evidence is mounting that there is often a strong correlation between civil strife and conflict on the one hand and environmental factors such as desertification on the other.

For more information on United Nations Conventions visit:

www.unccd.int/publicinfo/factsheets/fs10-eng.html



activity 1

THE WORLD WIDE WEB

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS TEACHER GUIDE

Desertification is a threat to crop production and the ability of people to feed themselves in 110 areas of the world.

Two of those are Mali, a sub-Saharan country in West Africa, and the southern Prairies in Canada.

OBJECTIVES

Students will be able to:

- > explain the idea of the Earth as a World Wide Web of human and natural interactions
- > list the elements that affect climate
- > relate how human actions can affect climate
- > define desertification.

MATERIALS

- > 3.5 x 5" index cards, one for each student.
Make equal numbers of each of the following categories (e.g., for a class of 30 students, 6 of each category):
 - atmosphere
 - water (e.g., ocean or precipitation-like ideas)
 - plants
 - humans
 - soil
- > A poster of a desert that the teacher will place at the front of the classroom
- > A poster of an environment displaying a forest, a lake, a city, clouds and a bright sun that will be placed near the students
- > Ball of yarn
- > List of Desertification Web sites

PROCEDURE

1. Review climate change with the students, using the biosphere bottle created in lesson 3. (*The text in parenthesis and italics*) represents the correct answer which can be shared by the teacher with students.
 - > Why did we make the biosphere bottle?
(It made us think about how the climate of the Earth is created; it helped us to understand the various cycles that support life.)
 - > What did we learn about nature's cycles?
(It showed us how nature recycles water, CO₂, oxygen, energy and organic matter. Everything we need for life is here on this planet. It is a closed system.)
 - > What were the elements that we needed to think about and include in order to create a world in a bottle? (Write these answers on the board around a circle with climate in the middle.)
 - > What was the one thing we couldn't put in the bottle? (*Humans*)
2. Push the desks back to create a large space down the center of the room.
3. The front of the classroom symbolizes a desert. Hang the poster of the desert at the front. The teacher stands at the front of the classroom. The students line up at the back of the classroom, which symbolizes a pristine environment that will gradually be degraded. Hang the second poster, showing a pristine landscape, at the back.
4. Give each student a card. On the board, draw a circle with the five categories – atmosphere, water, plants, humans, soil – around the circle. See The World Wide Web Statements/Categories Teacher Reference on the next page. Explain the following rules:
 - > The teacher will read a statement. (See the list below; read statements at random.)
 - > Any student who thinks that their category is affected by or causes the statement to happen will raise their hand.
 - > One student will be chosen to explain how their category is affected.
 - > Once a clear explanation has been expressed the student will join the desert.
 - > The game will continue until all the students are in the “desert”. All will have been affected by “desertification”.
5. When the activity is complete, ask the students what this game symbolized and the interconnections between human actions and the environment. Ensure that they understand that as the environment deteriorates, the land becomes desert-like, and the effects on people, their lives, and the environment become more and more detrimental.

THE WORLD WIDE WEB STATEMENTS/ CATEGORIES TEACHER REFERENCE

- > Statement: Trees are cut down.
Categories: Plants, humans
- > Statement: Trees are cut down for firewood.
Categories: Plants, humans
- > Statement: Trees “breathe in” carbon dioxide and “breathe out” oxygen
Categories: Plants, atmosphere
- > Statement: Humans “breathe in” oxygen and “breathe out” carbon dioxide
Categories: Humans, atmosphere
- > Statement: Soil contains plant food.
Categories: Soil, plants
- > Statement: Plants grow best in good soil.
Categories: Plants, soil
- > Statement: Some trees help improve soil.
Categories: Plants, soil
- > Statement: Trees keep soil from blowing away.
Categories: Plants, soil
- > Statement: Chemical fertilizers are used to feed the soil.
Categories: Humans, soil
- > Statement: Chemical fertilizers are expensive.
Category: Humans
- > Statement: Fertilizers and pesticides can harm the environment.
Categories: Humans, soil
- > Statement: Organic farmers use natural fertilizers.
Categories: Humans, soil
- > Statement: Trees and undergrowth are burned to clear land.
Categories: Humans, plants
- > Statement: Burning trees release carbon dioxide into the atmosphere.
Categories: Humans, atmosphere.
- > Statement: More carbon dioxide in the atmosphere increases temperatures.
Category: Atmosphere
- > Statement: Less rain means fewer crops.
Categories: Atmosphere, plants, water
- > Statement: Climate change will increase drought.
Categories: Humans, atmosphere, water
- > Statement: Trees need rain to live.
Categories: Plants, atmosphere, water
- > Statement: People leave their land if there isn’t enough food.
Categories: Humans, plants, soil
- > Statement: Many poor people cannot find enough work in the city.
Category: Humans
- > Statement: Windbreaks help prevent soil erosion.
Categories: Plants, soil
- > Statement: 20 million tonnes of top soil are lost every year.
Category: Soil
- > Statement: Most of our food is composed of water.
Categories: Plants, water
- > Statement: We need two litres of water a day.
Categories: Humans, water
- > Statement: Water on Earth affects global weather.
Categories: Water, atmosphere
- > Statement: Recycle paper and cardboard.
Category: Humans

- > Statement: Use less electricity.
Categories: Humans, plants
 - > Statement: Most of Alberta's electricity is produced by burning coal.
Categories: Humans, plants
 - > Statement: Coal is formed from plants.
Category: Plants
 - > Statement: Burning coal releases carbon dioxide.
Categories: Plants, atmosphere
 - > Statement: Carbon dioxide is a greenhouse gas.
Category: Atmosphere
- 4.** Read a statement about “desertification” and students who think their category is affected by or causes the statement to happen will raise a hand.
- 5.** One student will be chosen to explain how their category is affected.
- 6.** Once a clear explanation has been expressed the students will explain the connections.
- 7.** The game will continue for about 30 minutes. All will have been affected by “desertification”.
- 8.** Once everyone is “connected”, the teacher will cut the web of yarn at a few points, demonstrating for example:
- > where trees are cut down
 - > where soil is blowing away
 - > where it is raining less
 - > where people use chemical fertilizers
- 9.** When the activity is complete, ask the students what this game symbolized and the interconnections between human actions and the environment. Ensure that they understand that as the environment deteriorates, the land becomes desert-like, and the effects on people, their lives, and the environment become more and more detrimental.

ALTERNATIVE PROCEDURE: CREATING THE WORLD WIDE WEB WITH A BALL OF YARN

1. Explain the index cards, the categories, and the game. Discuss guidelines for the game:
 - > Only the teacher will select a student with their hand up.
 - > Only the teacher will toss the ball of yarn.
 - > Everyone will get a chance to be part of the web.
 - > When a student receives the yarn, they will hold on to the ball until the teacher comes to toss it to the next student.
 - > All students will hold onto the yarn once they are part of the web.
 - > When students put up their hand they are to first name their category and then explain how they think it connects to the statement read.
2. Give each student a card.
3. Check by a show of hands that students know their category.

DESERTIFICATION WEB SITES

Bright Edges of the World

www.nasm.edu/drylands/

An “electronic exhibit” on drylands, sponsored by UNEP and the Smithsonian Institute.

With numerous photographs, this attractive, basic introduction to drylands issues around the globe is especially nice for children.

Canadian International Development Agency (CIDA)

www.acdi-cida.gc.ca/index.htm

This site offers information about CIDA’s services and programs to support sustainable development around the world. Follow the links through Major Global Issues to Combatting Desertification.

The Convention to Combat Desertification (CCD)

www.unccd.de/

An indispensable site hosted by the Interim Secretariat for the CCD. This is THE source for information on the CCD, with links to the full text of the Convention, fact sheets about the Convention and its various provisions, information on current ratification status, contact information, press releases, and more.

Food and Agriculture Organization

www.fao.org/desertification

Provides high-level backgrounders for senior students.

www.fao.org/news/factfile/fctlib-e.htm

Includes charts and maps on desertification, children and nutrition, forest loss, global hunger, and many more.

Green Teacher Magazine

www.web.net/~greentea/

Green Teacher is a magazine by and for educators to enhance environmental and global education across the curriculum at all grade

levels. With fifty pages of ideas and activities, four times a year; “We’re not slick... just resource-full.”

International Development Research Centre

www.idrc.ca/

The International Development Research Centre is a public corporation created by the Canadian government to help communities in the developing world find solutions to social, economic, and environmental problems through research.

The International NGO Network on Desertification and Drought (RIOD)

www.unsystem.org/ngls/documents/publications_en/voices.africa/number6/vfa6.07.htm

RIOD is a network that was set up in November 1994 by the NGOs involved in the negotiations towards the CCD (Convention to Combat Desertification). RIOD’s view is that through exchange of information, experiences and ideas, NGOs and CBOs (community based organisations) will be more effective in their efforts to contribute to humane and sustainable livelihoods for people living in drylands.

Trialogue on Climate Change, Biodiversity and Desertification

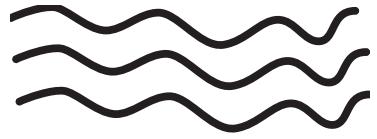
www.gdrc.org/uem/Trialogue/appetizers.html

An outgrowth of the Rio Summit on Environment and Development in 1992, this site demonstrates the interconnections between these three areas.

USC Canada

www.usc-canada.org

USC is a non-profit voluntary organization committed to the enhancement of human development through an international partnership of people linked in the challenge to eradicate poverty. USC is a member of Solidarity Canada-Sahel, and participates actively in June 17: World Day to Combat Desertification.

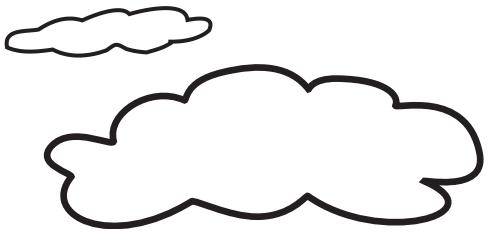


activity 1

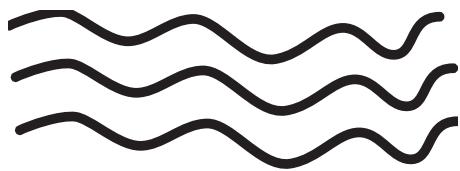
THE WORLD WIDE WEB

LESSON 5 THE WORLD WIDE WEB
PART TWO: HUMAN INTERACTIONS
STUDENT MATERIALS

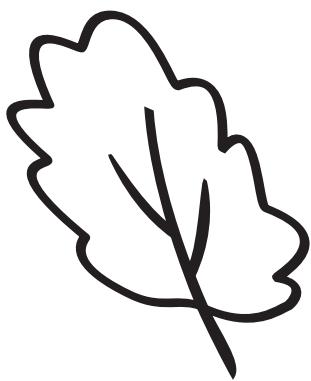
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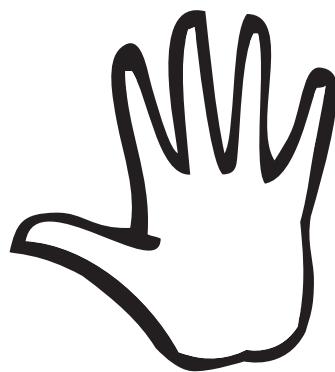
atmosphere



water



plants

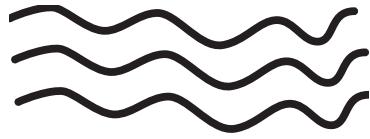


humans



soil





activity 2

CHALLENGES IN ARID LANDS

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS TEACHER GUIDE

Farmers in Mali, West Africa are faced with the challenges of coping with desertification. The USC Canada video, *Challenges in Arid Lands*, examines the causes and effects of desertification in Mali, and what the local people are doing to combat this environmental problem.

OBJECTIVES

Students will be able to:

- > explain the idea of the Earth as a World Wide Web of human and natural interactions
- > explain the causes and effects of desertification, its connection to climate change, and the solutions people in Mali, West Africa have developed to combat its effects
- > compare the climate in Canada's Prairies with that of Mali, West Africa.

MATERIALS

- > USC Canada Video, *Challenges in Arid Lands*. This video is available for purchase for \$5.00 from:
USC Canada
Suite 705, 56 Sparks Street
Ottawa, ON K1P 5B1
Tel: 1-800-5656-USC
- > Student chart to fill out the causes, effects and solutions of desertification along with desertification problems: Mali, West Africa vs. Canada's Prairies

PROCEDURE

1. Explain to the students that they are going to see a short video, *Challenges in Arid Lands*. This video shows an example of how the World Wide Web facts are inter-connected. The video was filmed in Mali, West Africa (show students where Mali is on the map, and point out where the Sahara Desert is).
2. Explain that the film was made by a Canadian organization called USC Canada, which works with farmers in Mali, West Africa to help them protect their environment so that they can have a better life.
3. On the black board, draw a chart showing the causes, effects, and solutions to desertification. Explain that after the film, the class will fill out the chart. Before watching the video, assign students a job:
 - > group one will record the causes of desertification
 - > group two will record the effects of desertification (i.e., what happens when desertification occurs)
 - > group three will record solutions people in Mali, West Africa use to fight desertification
 - > group four will record how the problems in Mali's environment compare with the problems of desertification in Canada's Prairies. See <http://adaptation.nrcan.gc.ca/posters/> for information pertinent to your geographic area.

4. After viewing the film, fill out the chart with the students.
5. Discuss with students: At the beginning of the class we reviewed what we know about climate change. What can we add to our list of what we know, now that we have studied desertification and climate change?

CONCLUSION

Summarize how human activities on Earth can contribute to global environmental problems such as climate change and desertification. End on a hopeful note that through education we can also heal the Earth, as farmers do in Mali, West Africa.

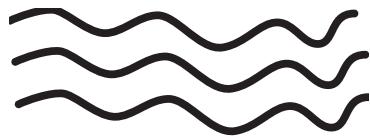
<http://adaptation.nrcan.gc.ca/posters/>

EXTENSION ACTIVITY

Divide the class into groups of three. Assign a cause of desertification to each group. Have them make a poster using pictures to show the cause (human action or climate change), the effect and the solution. Display the posters on a bulletin board.

TEACHER REFERENCE — ACTIONS AT HOME AND AROUND THE WORLD: DESERTIFICATION AND CLIMATE CHANGE IN ALBERTA AND MALI, WEST AFRICA

Climate Change Factor	Alberta	Mali
Trees breathe in carbon dioxide and breathe out oxygen.	Southern Alberta has very few native trees. Most trees here have been planted. People in Lethbridge plant trees for beauty and for shelter from the wind. Many of Alberta's trees have been cut down.	Parts of Mali used to have huge forests. Changing climate, desertification, and people cutting down the trees for firewood have greatly reduced the number of trees. Replanting trees helps preserve the soil and improves the local environment.
Plants hold soil in place and reduce wind erosion.	Shelter belts of trees are planted on the windy side of fields so that the wind will not be able to blow the soil away.	Farmers are learning to use local varieties of trees to hold soil in place and to actually improve the soil (e.g., the Acacia Albida tree puts nutrients in the soil so that the crops can grow).
Burning trees and fossil fuels, which are made from plants and animals that lived in pre-historic times, releases CO ₂ into the atmosphere, causing global climate change.	In Alberta, fossil fuels and trees are used for: <ul style="list-style-type: none"> - building homes; electricity (coal generated); heating water (natural gas); automobiles (oil, gas) 	In Mali, fossil fuels and trees are used for: <ul style="list-style-type: none"> - building homes; feeding goats and camels; firewood for cooking; firewood for heating water; automobiles
Overtcultivation of land can cause the soil to degrade so that it can no longer support food crops.	Farmers used to plow crop stubble under ground. This caused a lot of wind and soil erosion. Now farmers leave the stubble in the field. This holds the soil in place. Fewer passes with farm machinery keep the soil from breaking down.	Farmers in Mali are learning how to use local varieties of seeds, which grow well in the soils. They are learning about natural fertilizers and pesticides, which cost very little and don't harm the environment when used properly.
Improper irrigation of land can cause erosion and degrading of the soil.	Too much irrigation can cause salts to dissolve in the soil and rise to the surface. This makes the soil unusable for plants and causes desertification. Farmers and scientists are studying ways to improve irrigation practices.	Farmers make small dykes and dams to hold water. This helps prevent water erosion, where the good topsoil is washed away. Water is carefully conserved, and is used to grow vegetables so that families have a balanced diet, they can sell surplus in the market for money, and the children do not need to leave the family's village.
Environmental Education teaches us the science of climate change, how people are involved, and the choices we have to make a difference.	Students study climate change in grade 5 Science. Students become Environmental Heroes by promising to take action to reduce greenhouse gases.	Students study environmental education by planting local varieties of trees in their schoolyard and by taking care of the trees.



activity 2

CHALLENGES IN ARID LANDS

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS STUDENT MATERIALS

The following materials can be photocopied for the students.



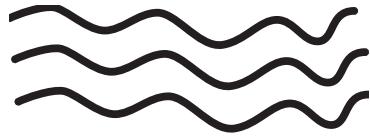
desertification

Causes:

Effects:

Solutions:

Problems – Mali, West Africa compared to Canada's Prairies:



activity 3

QUESTION THIS

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS TEACHER GUIDE

Amphibians, with their porous skin, are an early warning system on changing climates. Frog species are disappearing all over the world. One reason for their disappearance is that they are very easily affected by changes in their environment, such as climate change.

OBJECTIVES

Students will be able to:

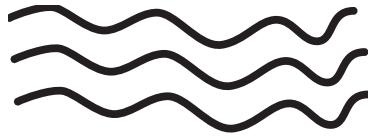
- > demonstrate their understanding of the interactions between climate change and the environment by asking appropriate questions of characters representing the community.

MATERIALS

- > Costumes
- > Masks or hats to represent local species
- > Fake microphone
- > Character cards

PROCEDURE

1. Ask students if they know the connections between climate change and the disappearance of frogs around the world.
 - > Most scientists think that the average temperature of the world will go up between 1°C and 3.5°C over the next one hundred years.
 - > For Canada, many scientists think that temperatures could go up between 5°C and 10°C.
 - > Climate change is more than changes to weather. Climate affects the environment that people, and wildlife (plants and animals) depend on. This means climate change is also about plants, animals and all the other living and non-living things (like soil, rocks, oceans, and lakes).
 - > Climate change could affect everyone and everything around the world, both good and bad.
 - > Frog species are disappearing around the world. One reason for their disappearance is that they are very easily affected by changes in their environment, such as climate change.
2. Select 4 volunteers. Have them leave the room with you to dress up as a Cactus, a Fish, a Frog, and a Human. When you re-enter, pretend to be on a talk show with some very special guests. How does climate change affect us here in our community? Why don't we ask some of our very own local species? Proceed to interview the guests and allow the audience to ask questions. Give the volunteers character cards so they know how to answer the questions.

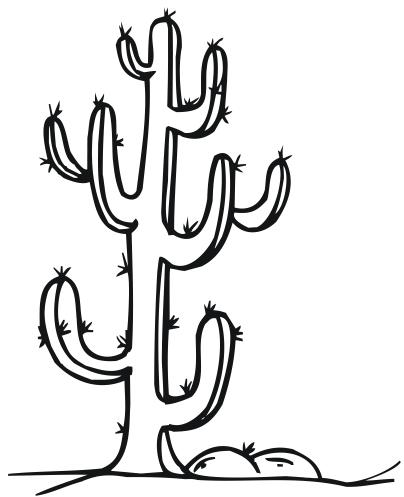


activity 3

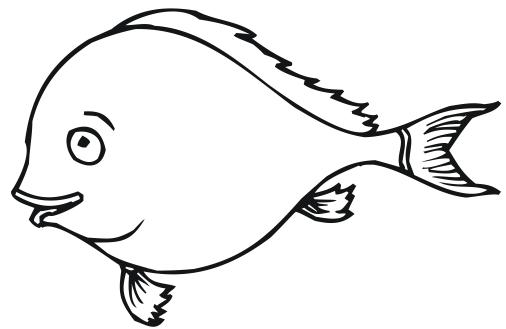
QUESTION THIS

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS STUDENT MATERIALS

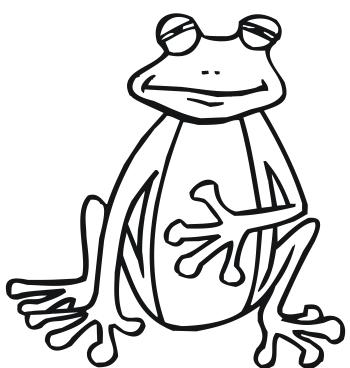
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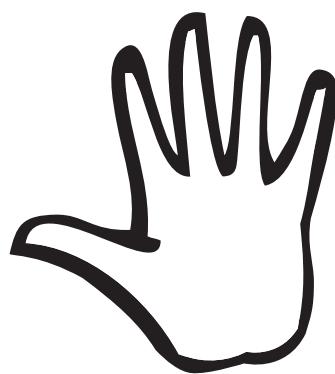
cactus



fish



frog



human

front of cards

fish

Some of the ways climate change will affect you:

- > There will be less food for you (rodents, frogs, other fish)
- > The water may get too warm for you to survive.
- > The amount of water in the river may be too small for you to survive.

cactus

Some of the ways climate change will affect you:

- > More rain will drown you out
- > More rain will cause your coulee home to slump and crush your roots
- > Insects that help spread your pollen may not survive and you will not be able to reproduce.



human

Some of the ways climate change will affect you:

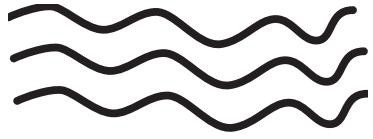
- > Extreme weather (floods, drought, storms, hurricanes)
- > Less wild things to enjoy
- > Water supply will be in great danger

frog

Some of the ways climate change will affect you:

- > Drought will cause your pond to dry up...you will be homeless!
- > Acid rain caused by pollution makes you sick.
- > As the Earth heats up, people may move to your home and steal your habitat.

back of cards



activity 4

FROG'S EYE VIEW

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS TEACHER GUIDE

Frogs are like the canary in the coal mine: they are harbingers of changes in our ecology.

OBJECTIVES

Students will:

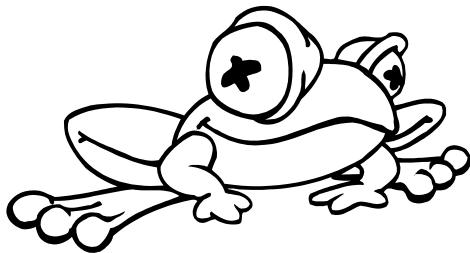
- > see how climate change is affecting a local species.

MATERIALS

- > Frog
- > Leopard Frog Story from Teacher's Guide, Species at Risk Brochure: Northern Leopard Frog
- > Large pictures of local amphibians

PROCEDURE

1. Show the children a real frog. If this is not available, use a puppet/costume character to narrate from the amphibian's point of view how climate change has affected them.
2. Talk about characteristics of amphibians that make them especially susceptible to climate change. You could use the enclosed story "The Forget-Me-Not Frog" to tell the story of the Northern Leopard Frog and hand out the special brochure about it from Alberta Environment.



the forget-me-not frog

INTRODUCTION

This is a story about a very special kind of frog. Not the kind that if you kissed it, it would turn into a handsome prince, but a frog that lives in Alberta. It is a frog that needs our help. It is called the northern leopard frog.

ONE: LET'S MEET THIS UNFORGETTABLE FROG

Leopard frogs are beautifully coloured. In Alberta, they are metallic, shiny green on top and pearly white underneath. A light-coloured line extends from behind each eye, down its back. Its spots are dark green or brown and are circled with a narrow yellow line. In other parts of North America, there are a lot of different leopard frogs with different colours and patterns; some are even yellow.

In Alberta, the northern leopard frog is sometimes confused with the wood frog and spotted frog. The northern leopard frog has spots that are round like those on the spotted coat of a leopard, while the pickerel frog's are square shaped. The wood frog is smaller and has a dark mask through its eyes and often has a white stripe down its back. The spotted frog has small dark spots, sometimes has a face mask, and doesn't have stripes down its back. The large spotted frog can be found in the mountainous areas of Alberta.

Frog Feet

Frog feet can tell you a lot about how a frog lives. Frogs can have digging feet, grasping feet, sticky feet or swimming feet. On the northern leopard frog's back feet, you will notice that the toes are webbed. The toes are connected with a thin skin called membrane. These webs of skin mean the frog is a good swimmer. The frog spreads its toes and pushes against the water to swim forward.

Frog Talk

For a quiet and shy animal, the frog finds its way into our conversations. Can you think of any? How about a game of leapfrog? Or when a person has something caught in their throat, they say, "There's a frog in my throat." And have you ever heard of a frogman? The term "frogman" was developed during World War II when military scuba divers were trained to move quickly and quietly underwater.

TWO: THE BEGINNING

Life for the leopard frog begins in the water. The male sings mating songs (similar to love songs) to attract a female. During late April to early June, the males start to sing for the females. The male has a pair of vocal sacs over the front arms. The sacs enlarge (get bigger) with air when the males sing for females.

Each kind or species of frog has its own special call. A female chooses her mate by sight, but mostly by sound. She will only listen to male leopard frogs because she only recognizes her own species' sound. When the male and female

get together, the female lays about 6,000 eggs covered in jelly (also called spawn). She lays them right in the water, on underwater plants, logs or rocks. The male covers them with sperm and that fertilizes them. Now the eggs will develop into leopard frogs. It takes 10 to 20 days for the eggs to hatch and become tadpoles. The tadpoles grow into adults in late July or early August.

Leopard frogs have a life cycle which begins with an egg, which hatches into a tadpole (also called a larva) which becomes a froglet, which grows to become a full-grown adult. This amazing change is called metamorphosis (met-uh-MORE-fah-sis). As the frog grows, it sheds its skin regularly. Some frogs eat the old skin, to recycle the nutrients.

Frogs are amphibians (am-FIB-ee-uns) which means they start their life in the water and move to land as they grow into an adult. The adult leopard frog also needs water in the winter so it can safely hibernate.

Seasonal Cycle

Like all amphibians, the northern leopard frog is cold-blooded. That means their body temperature changes with the temperature of their surroundings. When it's hot their bodies get warmer; when the weather is cold, their bodies get colder. Frogs cannot make heat inside their bodies like humans and other mammals can. So when it gets cold, out, the frog's body works more slowly and it moves less.

As late October approaches, the leopard frog becomes less active. The frog needs to find clear, clean water where it can hibernate for the winter. The pond must have two special conditions. The first is that the pond should not freeze solid to the bottom or the frog will also freeze and die. Second, the pond water should have lots of

oxygen in it during the winter. Since the leopard frog breathes through its skin, even when it hibernates, the water must have some movement, either by a current or a spring to supply the oxygen.

Spectacular Skin

An adult frog breathes oxygen from the air through its lungs and lining of its mouth. It also takes in some oxygen through its moist skin (approximately one-quarter of its oxygen needs).

A frog doesn't drink water through its mouth. It doesn't have to because it absorbs water through its skin. For that reason, frogs have to stay fairly close to water all their lives.

The leopard frog will venture, at the most, about 0.5 kilometre away from water. When they are away from water they stay under cover in tall grass and in the shade away from the sun. If they become too hot, their skin and body will dry out and they will die within hours.

Hands Off!

It is important for humans to remember that frogs have sensitive skin and should be handled as little as possible. If you have insect repellent or lotion on your hands, please do not touch frogs. The chemicals in repellent can be absorbed, which can kill the frog or damage the animal's skin. Also, remember that, like other frogs, leopard frogs may also carry skin toxins. Besides, you never know where the frog has been!

Catch Me If You Can

You have probably noticed already that the leopard frog has great camouflage. Its colouration helps it to blend in with its surroundings, in the water and on land. Another thing you may have noticed about the frog is that pair of big eyes on the top of its head, positioned on each side. They may look odd, but they sure are useful to

the frog. It can have its entire body safely underwater and still be able to see above the surface.

"My, What Big Legs You Have"

The northern leopard frog has powerful back legs to propel it quite a distance in the water and on land. The northern leopard frog has been known to jump 1.1 metres horizontally along the ground.

A leopard frog is very difficult to catch on land. It quickly zigs and zags to escape danger. And if captured, it will leave a watery reminder in your hand.

THREE: A DAY IN THE LIFE OF A LEOPARD FROG

Dawn

As soon as the sun rises after the cool night, the leopard frog moves into the sun around the pond, to warm up.

Noon

If the glaring sun is too hot and dry for the leopard frog, it just moves into the shade or jumps into the water to cool off. It usually has a quiet day, sitting in the water with the top of its body out of the water. Or, it sits right at the edge of the shore. It may catch an insect or spider that wanders past.

Dusk

As the sun goes down, the frog comes out of the shade to catch the last rays of warmth from the sun. It gets ready to go on its nightly hunting trip. In spring, the males move to their territories at the breeding ponds and begin a night of calling.

Midnight

The leopard frog has a munching feast of worms, moths, spiders, and small water creatures. The later it gets, the cooler the frog becomes so it will take a rest until the sun comes up in the morning.

Adults (Outside and Around the Pond)

The northern leopard frog hunts mainly by sight. They sit in the shade during the day and wait for their meal to "walk" by. Their large eyes can clearly see any tiny movement. If the prey stops moving, the frog loses interest. Northern leopard frogs take only live, moving prey. The frog's hunting weapon is its tongue. The tongue is attached to the lower front part of its mouth and has a sticky tip.

The frog flicks out the long sticky tongue to snatch its meal. This happens so fast that if we saw it happen, we wouldn't even see the tongue!

The frog swallows its food whole. It does have a set of very tiny teeth on its upper jaw but they are used to make sure that the prey doesn't get away. Once it has pulled the insect into its mouth, it blinks its eye as it swallows. The eyeball helps to force the food down because the eye sockets project down into the roof of the mouth. It mostly feeds on land and at night.

A leopard frog lays about 6,000 eggs, yet only one or two survive long enough to become breeding adults. It can take two or three years for the northern leopard frog to become a breeding adult.



FOUR: UNSOLVED MYSTERY: DISAPPEARING ACT

Amphibians are disappearing all around the world and no one is quite sure why. Some people think it is because of pollution. Another cause may be the loss of habitat. If there are no proper places for adult frogs to hibernate and have young, how can they survive?

Some scientists think that because frogs have such sensitive skin that too much of the harmful ultraviolet (UV) rays from the sun are coming through the thin ozone layer to Earth and affecting the frogs. Frogs cannot use sunblock on their sensitive skin to protect it like humans do. The UV rays affect the hatching success of eggs.

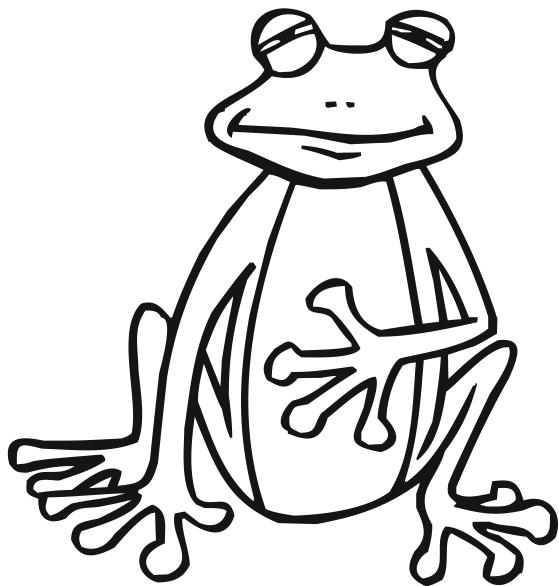
What Can We Do?

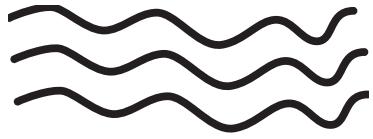
Humans can do a better job keeping the environment clean and protecting habitat for animals. We can learn more about frogs and other wildlife that need our help.

Here are a few ways you can help frogs.

Do not take wild frogs home for pets. If you want a frog for a pet, buy frogs raised just for that purpose. If you buy your frog at a pet store, do not release it into the wild. The frog will not survive in its new environment. If it does live, it will harm amphibians native to Alberta. Look around your neighbourhood for ponds in which frogs might live. Go and see what lives there. Learn more about other kinds of amphibians that live in your area. Tell others what you have learned about frogs and how they can help to protect them. Protect the habitat of leopard frogs. Tell other people about them. Anything you can do to help the environment will also help frogs. Can you think of other things you can do?

From Alberta Environment, Printed March 1997





activity 5

FROGOPOLY

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS TEACHER GUIDE

The Northern Leopard Frog was once one of the most widespread frog species in North America. Numbers began to decline in the mid 1960's. In Alberta, most populations remained healthy until about 1979 when they mysteriously disappeared from many sites in Alberta.

In this activity, students play a game that teaches them about factors causing the disappearance of frogs.

OBJECTIVES

Students will be able to:

- > look at the limiting factors that local amphibians face.

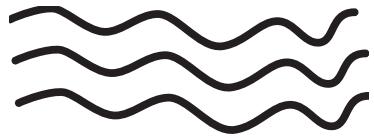
MATERIALS

- > Frog Pawns
- > Dice
- > Large pictures of local amphibians
- > Large obstacle cards

PROCEDURE

Climate change is kind of like a game. No one is certain of the outcome. One thing we do know is that climate change is already affecting creatures like amphibians. Will amphibians be able to overcome the obstacles that climate change creates? Find out by playing the game...

1. Create a classroom-sized board game with pictures of different amphibians as some of the spaces on the board. Use stuffed frogs as pawns.
2. Make 2-4 teams with the students.
3. Use an oversized fuzzy dice and let teams alternate moving their pawns. They get a bonus role if they can identify what kind of amphibian they land on. Between the pictures, set out cards representing the obstacles amphibians face due to climate change. If a team's pawn lands on an obstacle, they must do what the card says.

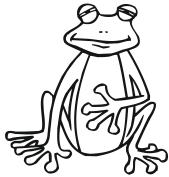


activity 5

FROGOPOLY

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS STUDENT MATERIALS

The following materials can be photocopied for the students.



Frogs for the future

A park has been created to protect your wetland.

Leap ahead 3 spaces



High and dry!

Global warming causes a bad drought and your pond dries up.

Start over



Three is the key!

You need 3 kinds of habitat to survive: a springtime breeding pond, vegetation to hide in the summer, and stream for hibernating in the winter.

Roll "3" on the dice and you're safe! Roll any other number, you must move back 2 spaces.



Acid meltdown!

The snow that piled up all winter had acid rain in it. Now spring is here and the snow is melting all at once into your pond, making you a little "green".

Move back 2 spaces



Chemical warfare

Pesticides and herbicides are polluting your pond and making you sick.

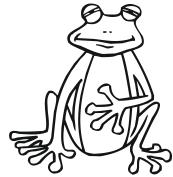
Move back 2 spaces



Where's the wetland?

A farm expanded into your wetland habitat, leaving less room for you.

Move back 1 space



Froggy power!

You were designated as a threatened species and will be given special treatment and attention.



Leap ahead 4 spaces



The O-zone

Damage to the ozone layer has allowed UVB rays to damage your eggs!

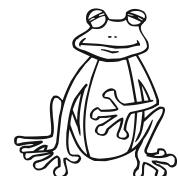


Skip your next turn



Moooving out

Cattle are trampling the shoreline, pond plants, and your eggs. You have to move to another pond.



Move back 3 spaces



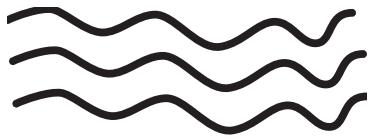
Stress test

Climate change is making you feel stressed. Your ability to fight off disease is at risk.



Roll doubles and you can go ahead 2. If not, go back 2.





activity 6

IT'S NOT EASY BEING GREEN!

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS TEACHER GUIDE

It can be difficult to be "green" in the way we live. This activity is a version of the game "Concentration".

OBJECTIVES

Students will be able to:

- > develop creative community solutions for climate change.

MATERIALS

- > Frog sounds on tape
- > Cassette player

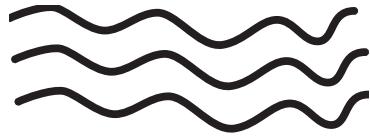
PROCEDURE

1. We can “concentrate” on making some changes in our own community. What are some you can think of? Brainstorm ideas together and write them on the board.

Some examples:

- > plant a tree
- > ride a bike
- > don't idle your vehicle
- > use wind energy
- > walk
- > use solar power
- > turn lights off
- > reduce, reuse, recycle
- > buy products with less packaging
- > buy in bulk
- > take the bus
- > car pool
- > compost
- > get a worm bin
- > pack a garbage-less lunch
- > put on a sweater
- > use all parts of a piece of paper

2. Have the students gather in a circle.
3. Introduce Community Solutions
Concentration – it is played just like the game of concentration (keep the rhythm going, lap lap clap clap snap snap) and go around the circle, each person adding their solution.
4. Play amphibian sounds in the background to add to the challenge.



activity 7

LEAPING INTO GREEN

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS TEACHER GUIDE

The best way to make changes in our communities is to take action now! In other words...leapfrog into solutions for climate change!

OBJECTIVES

Students will:

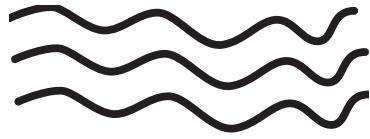
- > make as many origami frogs as they can
- > write a creative climate change solution on each frog.

MATERIALS

- > Green paper
- > Leap frog origami instructions

PROCEDURE

1. Hand out green paper and, using the attached guidelines, show the students step-by-step how to make origami leap-frogs.
2. Once they are done folding, each student must put a creative community solution on their frog.



activity 7

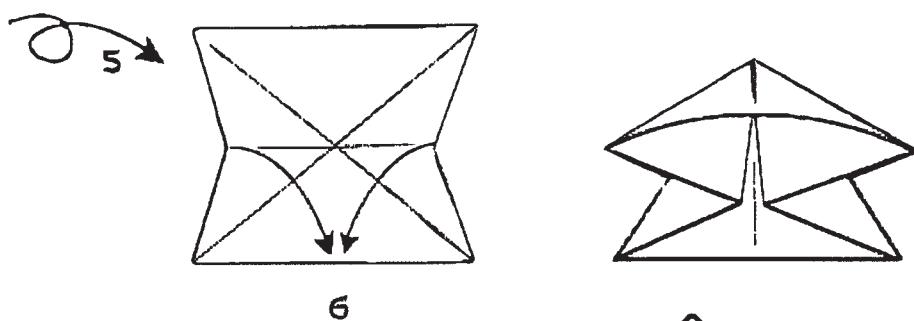
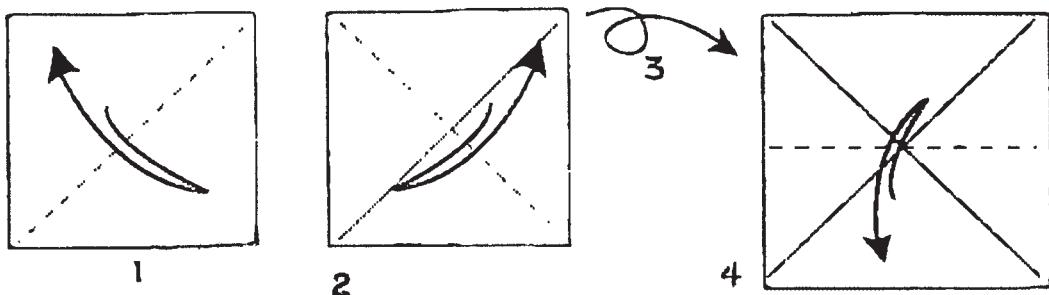
LEAPING INTO GREEN

LESSON 5 THE WORLD WIDE WEB PART TWO: HUMAN INTERACTIONS STUDENT MATERIALS

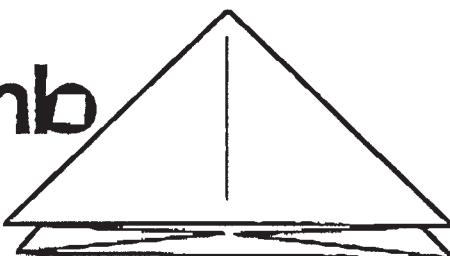
The following materials can be photocopied for the students.



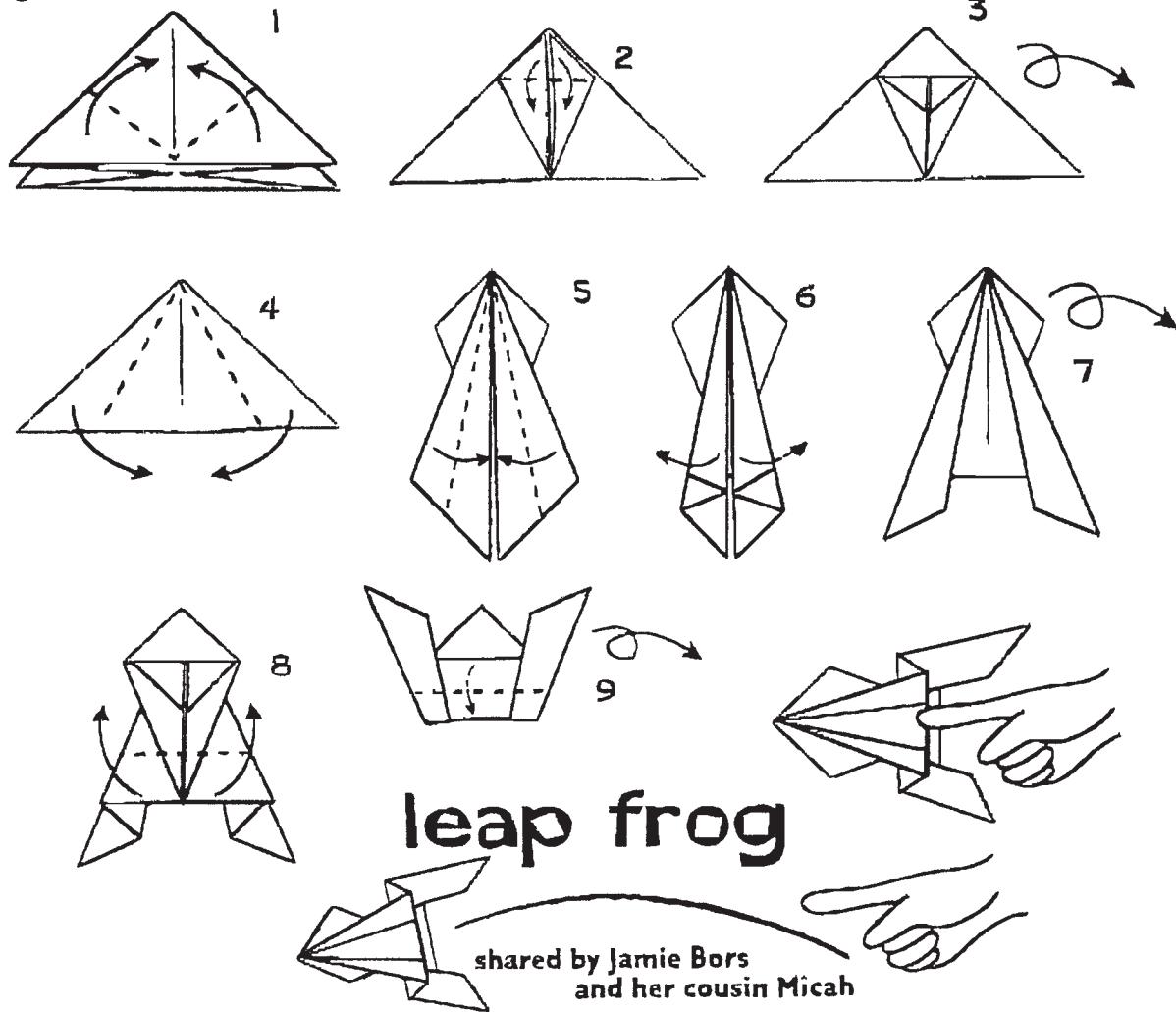
leap frog origami instructions



**Water Bomb
Base**



begin with a water bomb base





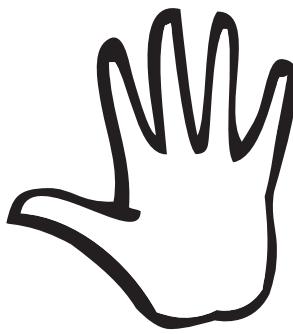
lesson 6

CHOOSE YOUR CHALLENGE





Lesson 6



CHOOSE YOUR CHALLENGE

In this lesson, students are challenged to continue thinking about positive actions of Environmental Heroes. The lesson includes an evaluation tool to test students' learning. Finally, students are challenged to become involved in their school and community, sharing knowledge, enthusiasm and vision.

BACKGROUND

Over the past five lessons, students have been learning about the issues of weather, climate, their effect on the environment, and what we can do to help reduce greenhouse gases produced by human activities. Climate change is one of the most important environmental, economic, and political challenges of the twenty first century. Knowledge of the issue is a first step towards making a commitment to positive action.

OBJECTIVES

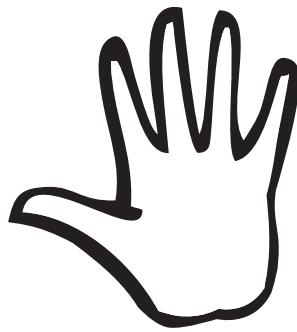
Students will:

- > design a light switch cover that reflects their concept of climate change
- > describe what they have learned, how they feel, and what they can do about climate change
- > encourage community action and involvement
- > create a class charter on climate change.

ACTIVITIES

- > Climato-Quiz
- > Switching off Climate Change
- > Community Event
- > Head, Heart, Hands
- > Children's Charter on Climate Change
- > Game Show
- > Create a Site Plan of the Schoolyard

activity 1



CLIMATO-QUIZ!

LESSON 6 CHOOSE YOUR CHALLENGE TEACHER GUIDE

This activity can be used by teachers as an evaluation tool.

The questions in the Climato-Quiz test students' knowledge of climate change now that they are almost finished the unit.

OBJECTIVES

Students will:

- > correctly match questions and answers to climate change
- > work cooperatively to solve the Climato-Quiz question match-ups.

MATERIALS

- > Climato-Quiz questions and answer key.
You may wish to laminate the Quiz questions so they last longer. To make sure the questions are not confused with the answers, you can photocopy the questions on one colour of paper and the answers on another colour. Leaving them all the same colour will increase the challenge in the activity.
- > 6 medium-sized brown envelopes

PROCEDURE

1. Review the key components of climate, weather, greenhouse gases and human influences (refer to the previous lessons and the introduction to climate change article at the beginning).
2. Divide the class into 5-6 equal groups.
3. Distribute one Climoto-Quiz envelope to each group (with questions and answers already cut and separated).
4. Explain to the students that they are to separate the questions from the answers (two separate piles) and line them up side by side.
5. Challenge your students to match the correct answer with the question. This activity can also be done as a race between groups.
6. When students have matched ALL questions with the correct answers, review the answers and discuss.
7. As a continuation of the Climoto-Quiz, have the students develop NEW questions to be asked of the other students. Use the resource materials that have been handed out throughout the previous lessons.



CLIMATO-QUIZ ANSWER KEY

TEACHER REFERENCE

Note: Correct answers are shown in *italic text*

> Climate is....?

The weather you can expect to have in a certain place.

> Climate change is...?

The differences in typical weather between the future and the past.

> Weather is...?

The condition of the atmosphere at a specific place and time.

> The three gases that are of most concern to scientists are the ones that are related to things humans do.

Carbon dioxide, methane, and nitrous oxide.

> The Kyoto Protocol is...?

A treaty created in 1997 to try and lower the amount of greenhouse gases going into the atmosphere.

> The Earth's climate changes naturally.

True

> Burning fossil fuels such as coal, oil and natural gas releases carbon dioxide into the atmosphere, possibly affecting the climate.

True

> Electricity only comes from fossil fuels such as coal.

False

> The average truck emits the same amount of greenhouse gases as the average car.

False

> Global climate change takes how long?

Happens very gradually, over long periods of time.

> Reducing greenhouse gases can begin at home by...

Recycling, turning off lights, riding your bike or turning down the furnace.

> The greenhouse effect occurs naturally.

True

> Desertification is...?

The changing of the landscape by a decrease in the amount of plant life, usually as a result of overuse by humans and their domestic animals.

> Methane is released into the atmosphere by...?

Rotting plants, garbage dumps, rice farming, and cow farts.

> Scientists predict the Earth's temperature in the next 50-100 years is going to increase...?

1-3 °C.

> During the last ice age, the average temperature was how many degrees lower than today...?

5 °C.

> Climate change may cause a decrease in ...?

The types and kinds of plants and animals on Earth.

> Greenhouse gases trap the sun's heat keeping the Earth warm.

True

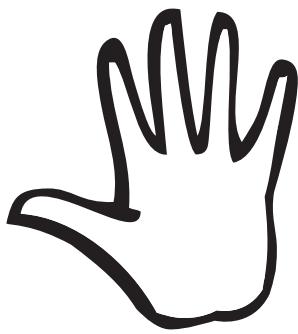
> Aerosol spray cans (with chlorofluorocarbons) are a major contributor to climate change.

False

> The hole in the ozone and climate change are exactly the same thing.

False

activity 1



CLIMATO-QUIZ!

LESSON 6 CHOOSE YOUR CHALLENGE STUDENT MATERIALS

The following materials can be photocopied for the students.

Q

Climate is....?



Q

Climate change is...?



Q

Weather is...?



Q

The three gases that are of most concern to scientists are the ones that are related to things humans do.



Q

The Kyoto Protocol is...?



Q

The Earth's climate changes naturally.



Q

Burning fossil fuels such as coal, oil and natural gas releases carbon dioxide into the atmosphere, possibly affecting the climate.



Q

Electricity only comes from fossil fuels such as coal.



Q

The average truck emits the same amount of greenhouse gases as the average car.



Q

Global climate change takes how long?



Q

Reducing greenhouse gases can begin at home by...



Q

The greenhouse effect occurs naturally.



Q

Desertification is...?



Q

Methane is released into the atmosphere by...?



Q

Scientists predict the Earth's temperature in the next
50-100 years is going to increase...?



Q

During the last ice age, the average temperature
was how many degrees lower than today...?



Q

Climate change may cause a decrease in...?



Q

Greenhouse gases trap the sun's heat, keeping the Earth warm.



Q

Aerosol spray cans (with chlorofluorocarbons) are a major
contributor to climate change.



Q

The hole in the ozone and climate change are exactly
the same thing.



A

The weather you can expect to have in a certain place.



A

The differences in typical weather between the future and the past.



A

The condition of the atmosphere at a specific place and time.



A

Carbon dioxide, methane, and nitrous oxide.



A

A treaty created in 1997 to try to lower the amount of greenhouse gases going into the atmosphere.



A

True



A

True



A

False



A

False



A

Happens very gradually, over long periods of time.



A

Recycling, turning off lights, riding your bike
or turning down the furnace.



A

True



A

The changing of the landscape by a decrease in the amount of plant life,
usually as a result of overuse by humans and their domestic animals.



A

Rotting plants, garbage dumps, rice farming, and cow farts.



A

1-3 °C.



A

5 °C.



A

The types and kinds of plants and animals on Earth.



A

True



A

False

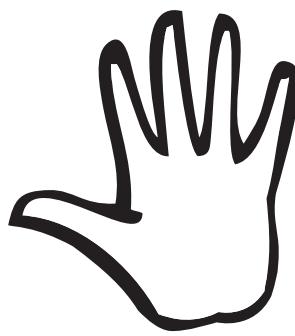


A

False



activity 2



SWITCHING OFF CLIMATE CHANGE

LESSON 6 CHOOSE YOUR CHALLENGE

TEACHER GUIDE

Throughout the climate change lessons, students recognize that their individual actions are linked to the causes of climate change. Activities that use fossil fuel energy, such as coal-fueled electricity and automobiles, lead to increased CO₂ emissions, the largest contributor to the greenhouse effect.

This activity gives students the opportunity to influence the amount of CO₂ they contribute to the atmosphere. Students will be able to remind themselves, and others, of a simple way to decrease emissions and conserve energy through this easy craft project.

OBJECTIVES

Students will:

- > demonstrate their understanding of the connections between energy use and climate change through designing messages for light switch covers
- > encourage one another to follow through with their suggestions for cutting energy use.

MATERIALS

- > Light switch covers (hardware stores are often willing to donate these)
- > Acrylic paints in various colours
- > Small paint brushes
- > Water containers
- > Newspapers (to protect work surfaces)
- > Paper for students to plan their design
- > Stickers, felts, material, etc.

PROCEDURE

1. Discuss ways students can help limit the amount of greenhouse gases released into the atmosphere.
2. Show students examples of designs they could use for a switch plate cover.
3. Pass out paper light switch covers so students can plan their design. Emphasize the importance of students choosing only a few words for maximum effect. Once their plans have been okayed they can begin on the actual light switch cover.
4. As students complete their paintings, display them on the blackboard ledge.

Thanks to Cedar Drive Elementary School in Port Coquitlam, British Columbia for the light switch activity – seen on the National Film Board video *Turning Down The Heat*.

This video can be ordered through the National Film Board: 1-800-267-7710.



make a



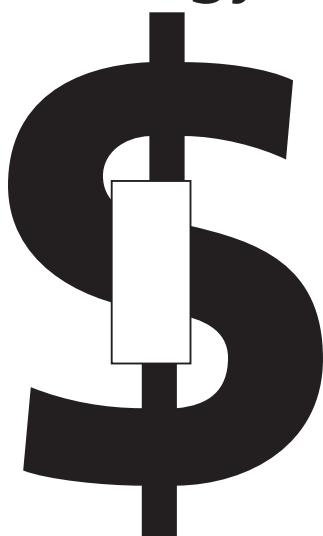
difference

reduce reuse



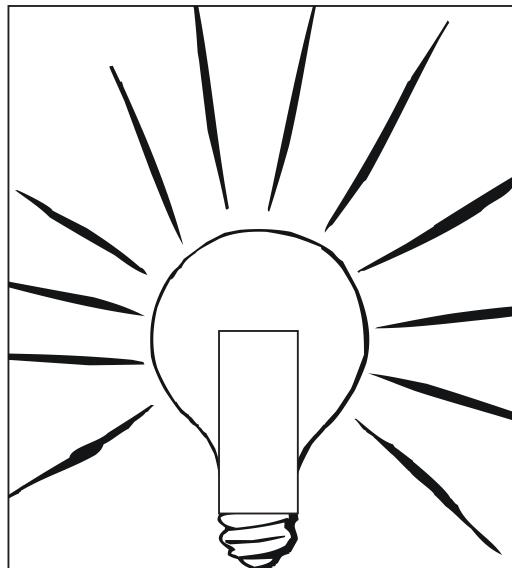
recycle

energy

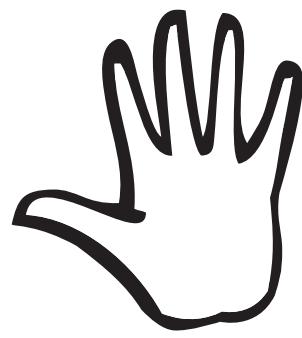


costs us!

conserve
energy



activity 2

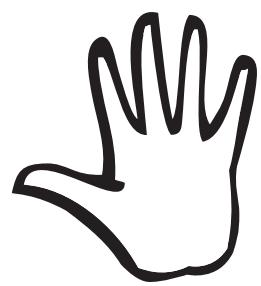


SWITCHING OFF CLIMATE CHANGE

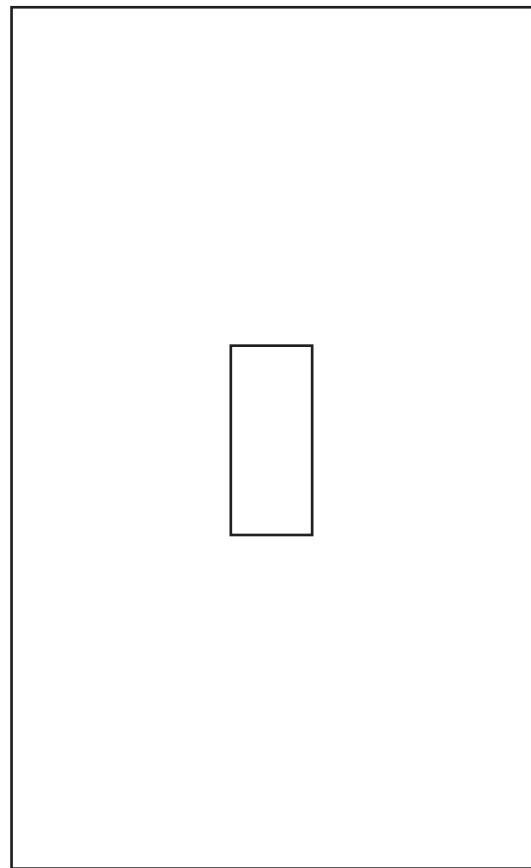
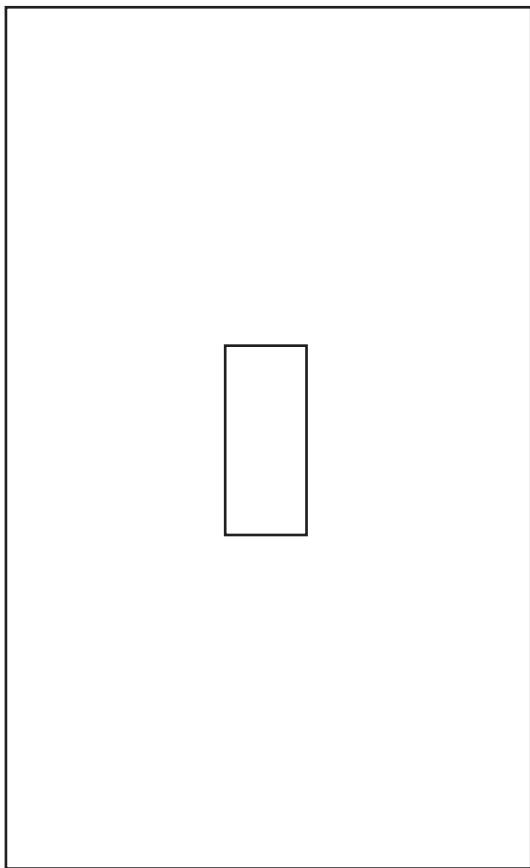
LESSON 6 CHOOSE YOUR CHALLENGE

STUDENT MATERIALS

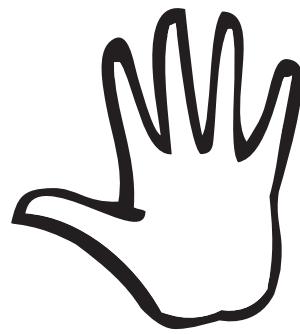
The following materials can be photocopied for the students.



light switch template



activity 3



COMMUNITY EVENT

LESSON 6 CHOOSE YOUR CHALLENGE TEACHER GUIDE

Most cities host an annual Environment Festival. This event is one way your class and school can participate in community events to increase awareness and promote personal action to reduce greenhouse gas emissions.

OBJECTIVES

Students will:

- > put into words their personal commitment to reducing greenhouse gas emissions
- > prepare display/presentation/activity to share what they know about climate change and what they are doing to reduce greenhouse gas emissions
- > take their presentation “on the road” to share with others in their school and/or community.

MATERIALS

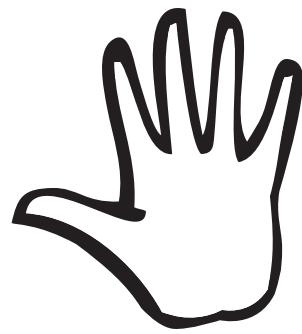
- > Environmental Hero certificates from lesson 2
- > How Green is Your School? checklist from lesson 2
- > Poster paper, markers, glue, scissors, etc., for creating a display

PROCEDURE

1. Have your class review their Environmental Heroes and prepare a summary on what steps they are taking to reduce greenhouse gas emissions. Review the 'How Green is Your School?' checklist in lesson 2.
2. Divide the class in pairs or threes to discuss their personal commitment (lesson 4) to reduce greenhouse gases.
3. Prepare the Environmental Hero display/presentation to bring to the Environment Festival and share with the community.
4. Challenge another school or class to the 'How Green is Your School?' Challenge. Share these results in the community.



activity 4



HEAD, HEART, HANDS

LESSON 6 CHOOSE YOUR CHALLENGE TEACHER GUIDE

Students are provided with a tool to reflect on what they have learned over the course of this climate change unit, and to evaluate and synthesize what they have learned.

OBJECTIVES

Students will:

- > reflect on lessons in the unit
- > describe how they feel about the information, the choices they make and their future.

MATERIALS

- > Head, Heart, Hands Silhouette
- > Pens, pencils, markers

PROCEDURE

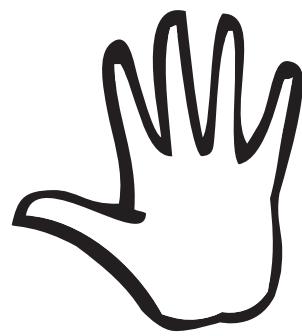
After reviewing the information you have introduced in the past four lessons, take the body diagram on page 180 and discuss the following statements with the students.

- > **Head** – What have you learned? List three facts you have learned.
- > **Heart** – How do you feel about what you now know?
- > **Hands** – What can YOU do to help?
What will you try to convince your family to do?

Take body silhouettes and post them around the room with the other exercises and Environmental Hero certificates.



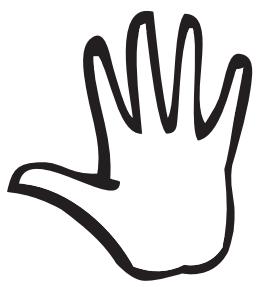
activity 4



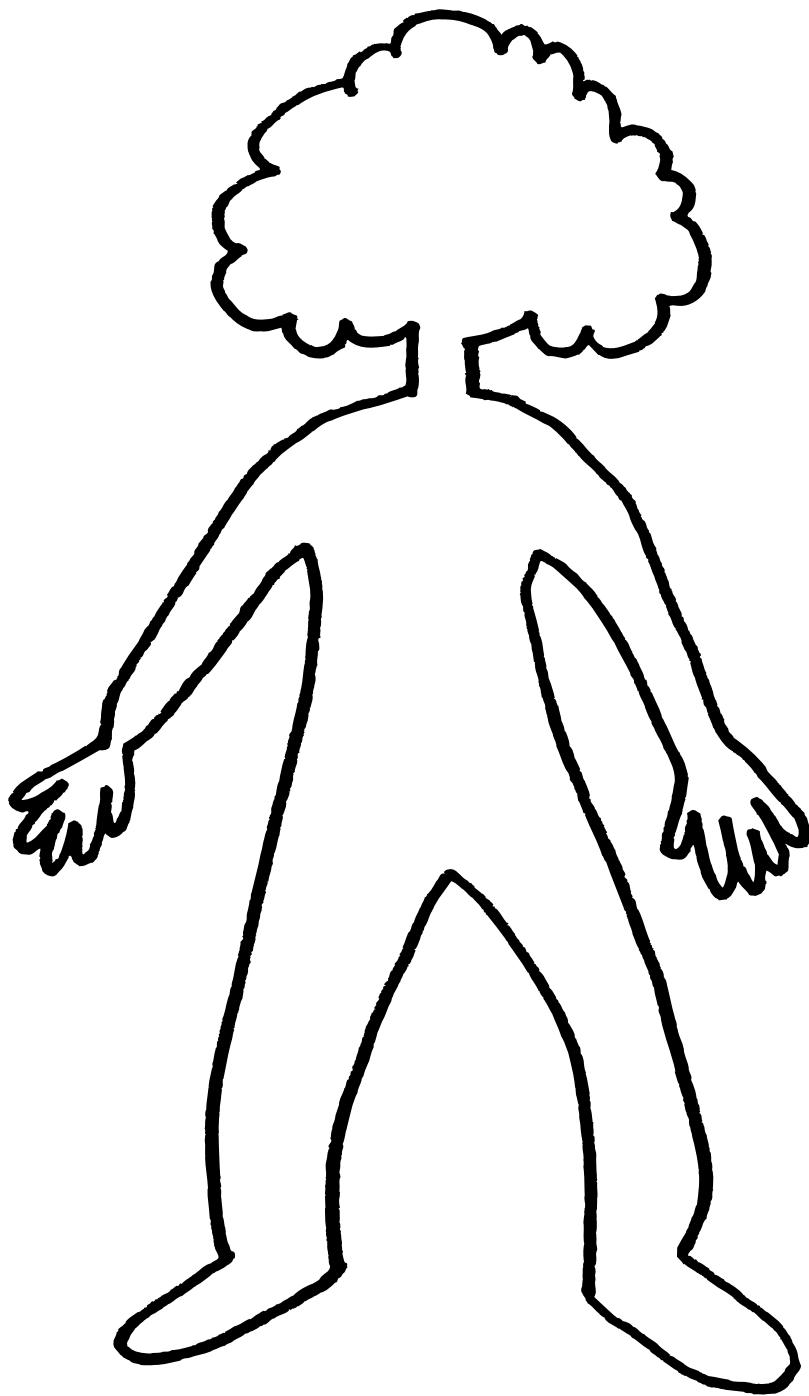
HEAD, HEART, HANDS

**LESSON 6 CHOOSE YOUR CHALLENGE
STUDENT MATERIALS**

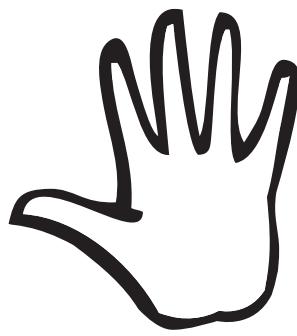
The following materials can be photocopied for the students.



head, heart, hands



activity 5



CHILDREN'S CHARTER ON CLIMATE CHANGE

LESSON 6 CHOOSE YOUR CHALLENGE

TEACHER GUIDE

The Children's Charter on Climate provides an opportunity for your class to take action and identify a level of commitment to the action. The Charter will bring your class together and provide a sense of accomplishment. Background to the Class Charter follows.

OBJECTIVES

Students will:

- > write a class Charter on climate change
- > arrange to present their Charter to a representative of their local government.

MATERIALS

- > Charter Certificate
- > Pens, pencils
- > Camera (optional – for taking a picture of the class for the certificate.)

PROCEDURE

Creating a Charter on Climate Change

As part of The Energy Resources Institute (teri) of India's efforts to involve youngsters in spreading the message of protecting the environment, school children of Delhi prepared a charter on October 23, 2002 at the India Habitat Centre.

One hundred and twenty students from 25 schools in Delhi, representing the future generation of the world, discussed the main impacts of climate change and suggested simple ways to reduce greenhouse gas emissions at home, school and in the neighborhood. The children made an appeal to world leaders to save the Earth for them by way of the Charter, which was presented to COP 8 delegates in the high-level segment on October 30, 2002.

The Ministry of Environment and Forests, Government of India and the United Nations Environment Programme supported this event.

For a PDF copy of the Charter and a picture of the Indian students, visit

www.teriin.org/events/docs/charter.pdf

1. Ask students if there is anything they would change in the Charter. Have students write a class Charter and arrange to present it to a representative of their local government.

teri's Charter on Climate Change

Children's Charter on Climate Change
October 23, 2002, New Delhi, India

Presented to the United Nations Framework Convention on Climate Change during COP-8, the Eighth session of the Conference of Parties to the Convention.

We, the young citizens of India, deeply concerned about:

- > The increase in greenhouse gases due to human activities, leading to global warming;
- > The impacts of sea level rise on ecosystems, economic losses and displacement of coastal inhabitants; and
- > The threat to flora and fauna, and impacts on livelihoods in agrarian economies.

Have agreed upon the efficacy of the following remedial measures:

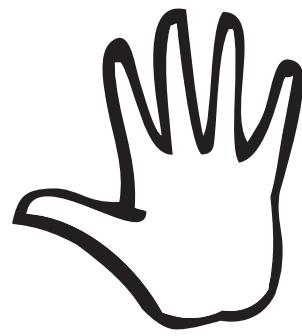
- > Conservation of energy, use of cleaner fuels, and public transportation;
- > Encouragement of forestation through individual efforts and mass awareness; and
- > Sensitization of people about the need to adopt renewable energy resources.

We resolve to make every effort at our level to further this climate-friendly outlook and urge the global leaders present here today to harness their combined influence to maximize the benefits for a safer and more secure Earth.

Supported by the United Nations Environment Program (UNEP), the United Nations Framework Convention on Climate Change (UNFCCC), and Ministry of Environment and Forests India (MoEF).



activity 5



CHILDREN'S CHARTER ON CLIMATE CHANGE

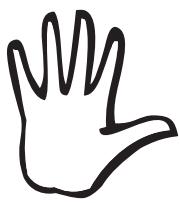
LESSON 6 CHOOSE YOUR CHALLENGE

STUDENT MATERIALS

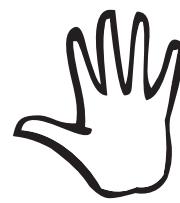
The following materials can be photocopied for the students.



class picture



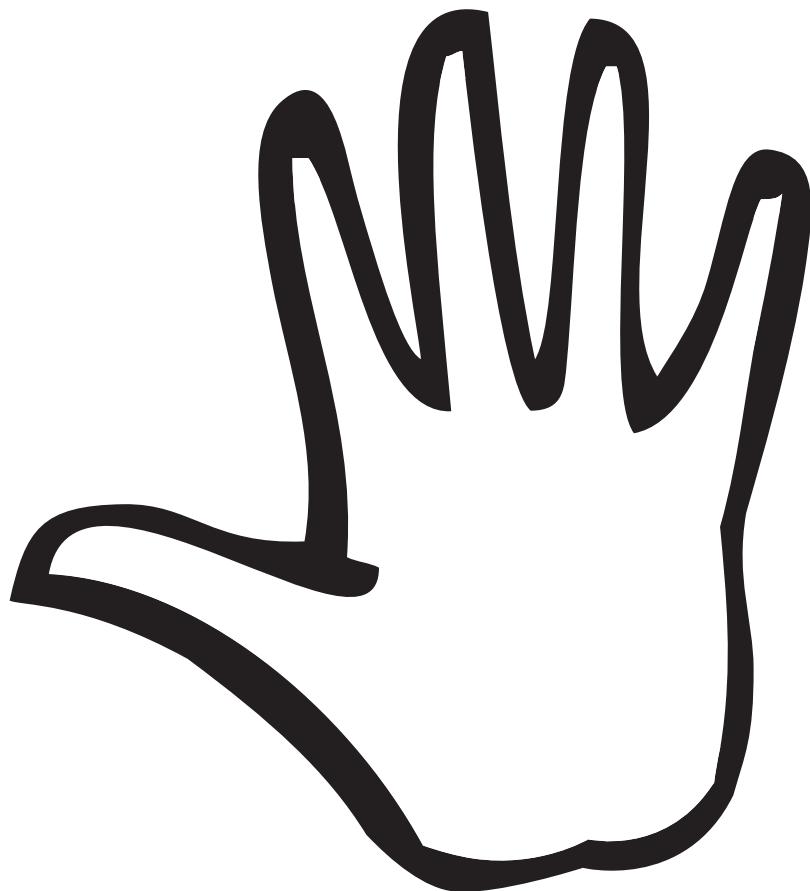
Children's Charter on Climate Change



Date

Signature

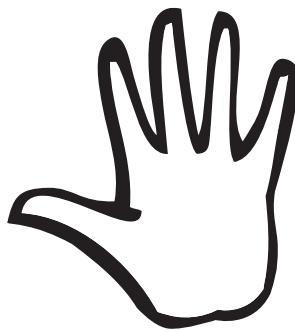




post-unit activities

The following activities will help students continue to increase their awareness of historical and natural causes of greenhouse gas emissions and climate change, and how their personal actions can make a difference.

activity 1



GAME SHOW

LESSON 6 POST-UNIT ACTIVITIES TEACHER GUIDE

This activity provides students with an opportunity to develop questions for a game show on the topic of climate change.

This game show may be presented in class, to other classes, or at community events, such as an Environment Festival.

By creating questions about climate change, the students will gain a greater understanding of the science of climate change.

This also provides the educator with a measure for evaluating what the students have learned from this package.

OBJECTIVES

Students will:

- > create questions and answers for their own game show on climate change
- > challenge others to participate in the game
- > demonstrate their knowledge of climate change.

MATERIALS

- > Cards for game show questions
- > Paper, blackboard or other props for game show board
- > Bells, dice or wheel for indicating turns
- > Costume for game show host – e.g. bow tie, vest, hat

PROCEDURE

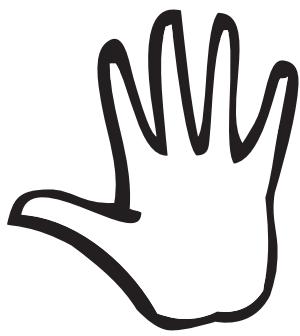
1. Have the students gather information on climate change. Suggested resources include:
 - > the annotated web site list included in this package.
 - > The Government of Canada has up-to-date materials on climate change, including kits for classroom use. Call the government toll free line: 1-800-O-CANADA (1-800-622-6232).
 - > material from the lessons presented from this package.
 - > school and community library, newspapers, magazines.
2. Have each student develop 4 questions on the topic of climate change.
3. Use the questions that students have developed to create a game show. Students may want to develop their own rules for the game show, or they could follow the format of the game show listed in lesson 2 of this package.
4. Allow students to play their game. They could play as a class, against another class, or with community members at a local community event, such as an environment festival.
5. Have students evaluate their game show, and adjust questions accordingly.

REFERENCES FOR THE GAME SHOW ON CLIMATE CHANGE

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- > McNaught, Harry. 1975. *A Golden Guide to Weather*. Golden Press Publishing, New York. 160 pp.
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- > Ronald, Keith and Jane Dougan. 1991. *5000 Days: Environmental Perspectives and Human Choices*. Course manual prepared for the Institute for Environmental Policy and Stewardship.
- > Suzuki, David. 1988. *Looking at Weather*. New Data Enterprises and Barbara Hehner. 96 pp.
- > Weiner, Jonathan. 1990. *The Next 100 Years*. Bantam Publishing.
- > www.cnie.org/nle/clim-3html
- > www.davidsuzuki.org/climatedamage.htm
- > www.davidsuzuki.org/speciessurvival.htm
- > www.gcrio.org/gwcc/misconceptions.html
- > www.greenenergy.com/prnnow12.html
- > www.piad.ab.ca/default.htm
- > www.sierraclub.ca/national/climate/climprot.html
- > www.ucsusa.org/transportation/driving.tips.html
- > www.ucsusa.org
- > www.unfccc.de/resource/iuckit/fact01.html



activity 1



GAME SHOW

LESSON 6 POST-UNIT ACTIVITIES STUDENT MATERIALS

The following materials can be photocopied for the students.

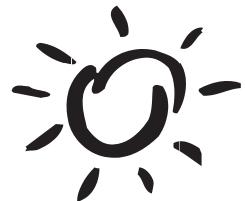
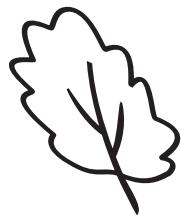
question 1

question 2

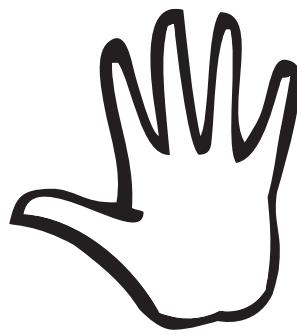


question 3

question 4



activity 2



CREATE A SITE PLAN OF THE SCHOOLYARD **LESSON 6 POST-UNIT ACTIVITIES** **TEACHER GUIDE**

One way schools in Canada can demonstrate their commitment to the environment is to apply their knowledge to their buildings and school yards. Students can assist in planning and creating environmentally friendly school yards. In this activity, students develop a site plan of their school yard, and apply what they have learned about the environment to the plan.

Note to the Teacher: Check out the Schoolyard Habitats Program at www.nwf.org/habitats/schoolyard for lots of ideas about getting involved in creating environmentally friendly schoolyards.

OBJECTIVES

Students will:

- > apply mapping skills to the development of a site plan of the school yard
- > work cooperatively to make suggestions for making their school yard more environmentally friendly
- > describe the principles of xeriscaping and apply them to their plan.

MATERIALS

- > 11" x 17" paper
- > Pencils, markers, rulers and compasses

PROCEDURE

1. Explain to the students that they are going to develop a site plan of the school yard in groups of two.
2. Based on what they have learned about climate change and desertification, what should be shown on the site plan? How will they recognize, for example, the effects of erosion?
 - > trees
 - > other plants
 - > grass
 - > effects of erosion
 - > soil deterioration
 - > cement
 - > buildings
 - > fences
 - > trash
3. Pair the students. Give each pair of students a sheet of 11 x 17 paper. As a class, determine the cardinal directions and draw the school in the appropriate place and approximate size.
4. Allow the students 10-15 minutes to create their site plan, showing the items in point 2.
5. Back in the classroom, form groups of two pairs (groups of four) and compare site plans. What positive things are being done on the school yard to create a healthy environment? What changes could be made to improve environment?
6. Draw a new site plan showing the proposed changes.
7. Display the new site plans on the bulletin board. Have each group explain their ideas.
8. Encourage the students to make a presentation to the school council and/or the school administration with their suggestions for “greening the school yard”.



WHAT IS XERISCAPING?

Xeriscaping is a practical, common-sense approach to landscaping that reduces water and chemical use in the garden. While the word 'Xeriscape' combines the Greek words for 'zero' and 'landscape' it does not mean no water is used in the garden. Certain zones of a garden, such as turf areas, may still require irrigation.

Principles of Xeriscaping

Xeriscaping applies seven simple principles to reduce water use:

1. Plan for your climate and local conditions.
2. Improve soil (e.g., adding organic material).
3. Select the right plants for the right place.
4. Reduce turf (grass) and use it in a practical way.
5. Mulch plants to reduce evaporation and weeds.
6. Irrigate efficiently to avoid wasting water.
7. Maintain your garden appropriately.

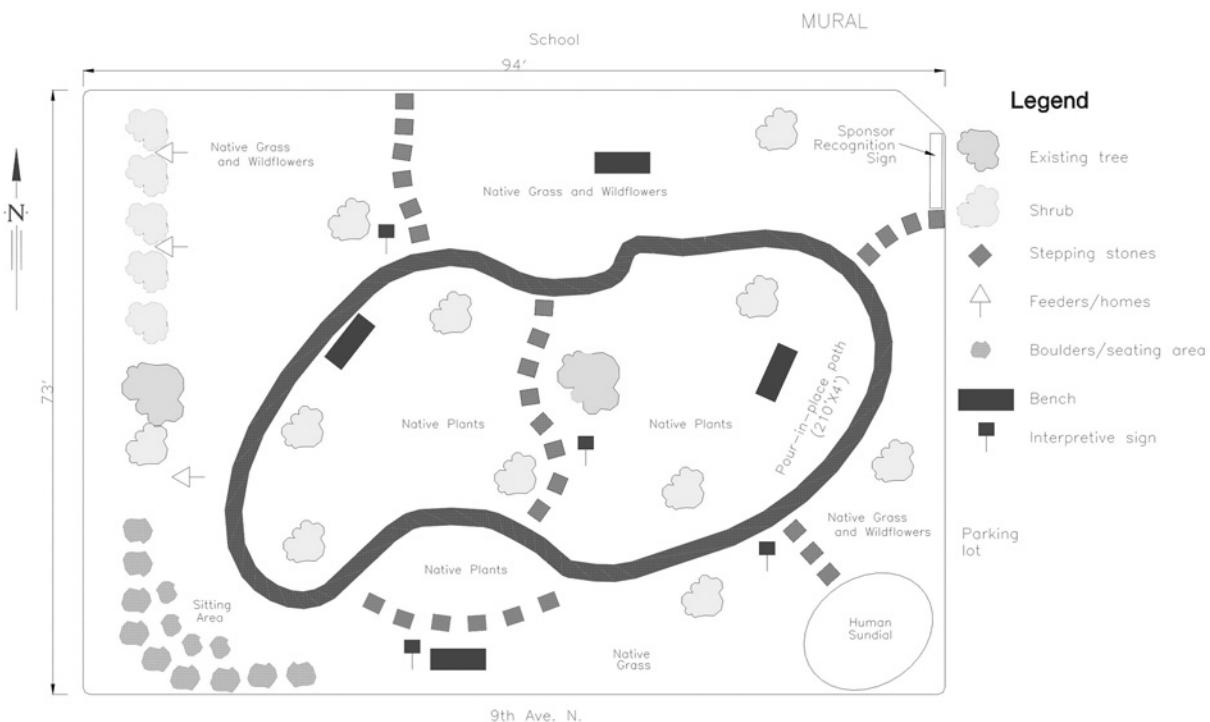
Why Xeriscape?

There are four main reasons that Xeriscaping makes sense: practicality, responsible use of shared water resources, reducing pollution and maintaining biodiversity.

Practicality: Droughts are a fact of life in many arid and semi-arid ecosystems. Gardens that are adapted to local conditions will suffer less during water restrictions than gardens that are designed to need large amounts of water.

Responsibility: World populations are putting increased pressure on our water sources, whether they are rivers or aquifers. Approximately 50 per cent of residential water used in most urban areas during summer is poured onto lawns and gardens. Xeriscaping can dramatically reduce the amount of water that we use.

Wilson Middle School Xeriscape Project (Lethbridge, Alberta)



Sustainability: Herbicides, pesticides and fertilizers from lawns and gardens are a major source of contamination of our water supply. Insect and weed infestations are often a symptom that a garden is under stress. Plants that are well maintained and adapted to local conditions will suffer less stress and require fewer chemicals. Improving the soil with organic material will reduce or eliminate the need for chemical fertilizers.

Biodiversity: Xeriscaping can be a good way to incorporate naturescaping into the schoolyard. Naturescaping is a way of bringing nature back into our everyday lives by using native species in our parks, schoolyards or home gardens. Naturescaping enriches our lives and environments by providing pockets of habitat for species that are being pushed out by development, and giving us an opportunity for ongoing observation and interaction with the natural world.

While most naturescaped landscapes are Xeric, not all Xeric gardens are naturescapes. What's the difference? A Xeriscape can incorporate non-native species that are adapted to local climatic conditions, or use some plants with higher water needs that are grouped together for more efficient irrigating. Combining the two concepts of Xeriscaping and naturescaping in a schoolyard can result in a practical space that allows for a variety of educational and recreational experiences.



CLIMATE CHANGE: CREATING SOLUTIONS FOR OUR FUTURE EDUCATION KIT

evaluation form

Your feedback is important to us! *Climate Change: Creating Solutions for Our Future* will be used by teachers across Canada, and we would like to know what works and what doesn't work for you! Feedback also helps us improve the quality of the materials we offer. We welcome all comments and suggestions for change.

Did this teaching unit make a positive contribution to your teaching about climate change?

Did the material in this teaching unit meet the objectives of your program of studies?

Which activites of this teaching unit did you and/or your students find the **most** useful?

Which activites of this teaching unit did you and/or your students find the **least** useful?



Have you told others about this resource?

Do you have any other comments?

Name (optional):

Location:

E-mail address:

Thank you! Please return this form by fax to:

Cheryl Dash, Fax: 403.382.4428

Louella Cronkhite, Fax: 403.381.8952

For additional feedback, comments or questions you can also contact:

Cheryl Dash, E-mail: cheryl.dash@gov.ab.ca

Louella Cronkhite, E-mail: Lcronkhite@shaw.ca

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Alberta Environment's Mission is to steward the use and ensure the protection of our diverse environments to sustain a natural eco-system, a prosperous economy, healthy Albertans and strong communities.

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