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Government of Alberta

STEWARDSHIP

Energy, Climate and You

teacher's guide

awknowledgements & table of contents

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introduction

Using This Resource

Stewardship: Energy, Climate and You is designed to help students in grades 4 through 7 make the connection between energy use and climate change with a focus on personal action and becoming stewards of our environment and natural resources.

About the Poster

The illustration depicts both potential and currently used sources of energy as well as images of energy uses and activities occurring in western Canada and beyond. A number of stewardship activities are also portrayed throughout the poster with a focus on energy conservation. Suns  appear next to sources of energy and Hearts  appear next to stewardship activities. The back of the poster contains several short articles discussing climate change, energy and stewardship that inform the reader and encourage personal action.

About this Teacher's Guide

This teacher's guide contains lessons for grades 4-7 plus two supplementary activities. Each of the lessons is connected to an Alberta Program of Studies. Through the activities in the teacher's guide, students are encouraged to look at their own lives and examine where they can make changes to reduce their use of energy.

alberta curriculum connections

Grade 4 Science

Topic A: Waste and Our World

12. Develop and implement a plan to reduce waste, and monitor what happens over a period of time.

Grade 5 Science

Topic D: Weather Watch

12. Recognize that human actions can affect climate, and identify human actions that have been linked to the greenhouse effect.

Topic A: Electricity and Magnetism

9. Interpret and explain the reading on a household electrical meter, efficiency labels on electrical appliances.

Grade 6 Social Studies

Unit 6.1: Citizens Participating in Decision Making

6.1.6 analyze how individuals, groups and associations within a community impact decision-making of local and provincial governments by exploring and reflecting upon the following questions and issues: How can individuals, groups and associations within a community participate in the decision-making process regarding current events or issues (i.e., lobbying, petitioning, organizing and attending local meetings and rallies, contacting elected representatives)?

Grade 7 Science

Unit A: Interactions and Ecosystems

1. Investigate and describe relationships between humans and their environments, and identify related issues and scientific questions.
   - identify examples of human impacts on ecosystems, and investigate and analyze the link between these impacts and the human wants and needs that give rise to them (e.g., identify impacts of the use of plants and animals as sources of food, fibre and other materials; identify potential impacts of waste products on environments)

4. Describe the relationships among knowledge, decisions and actions in maintaining life-supporting environments.
   - identify intended and unintended consequences of human activities within local and global environments (e.g., changes resulting from habitat loss, pest control or from introduction of new species; changes leading to species extinction)

hearts and suns

Description
This is a fun game you can play with your students in any grade to help them become familiar with some of the different elements of the poster in a short amount of time.

Objective
To familiarize students to the *Stewardship* poster and to set groundwork for future discussions of stewardship, climate change, energy use and conservation.

Duration: 15 minutes (or longer if you can come up with your own riddles!)

Materials: *Stewardship: Energy, Climate and You posters*

Procedure
Divide students into small groups, providing each group with a copy of the *Stewardship, Energy, Climate and You* poster.

Have each group come up with a sound they might hear if they were out of doors, in nature. It might be the sound of the wind (whsssssh) or an animal call (caw of a crow). This will be their "buzzer" sound when they have a correct answer.

Read the clues aloud and award points to the team with the correct answer.

Part 2
Have the students in their groups try to make their own rhymes for two hearts, and two suns. Have students submit their clues to you and play the same game again, using their clues!

If you would like to share the creative clues that your students have come up with, feel free to send them to info@insideeducation.ca

Have fun!

Hearts - *Actions to reduce greenhouse gases*	
You might think this would make you and your rubber ducky have to run around in the tub, but this gizmo will get you plenty wet, using less water! What am I?	18. Low-flow shower head
The nickel they give you is outta sight, but taking your empties here -- well that's just right. What am I?	7. Recycling Centre
You might find your old toys here at bargain prices. Buying cool used stuff is sometimes the nicest! Where am I?	2. Yard Sale *(bonus for Thrift Store)*
When you come to school on me, you'll often wear a pack. But make sure when you park, you put me in the rack! What am I?	17. Bicycle
An easy way to save, and an important one too. Sure it's cold outside, but grab a sweater and turn me down -- It's a stewardship thing to do! What am I?	6. Thermostat
I spend my summers where tree stumps abound, when I'm done my stewardship, there'll be seedlings in the ground! Who am I?	8. Tree Planter
Suns - *Energy sources*	
It's breezy, it's easy! I use the wind to spin, spin, spin and for many people this green power is a stewardship win! What am I?	h) Wind Turbine
There's oil in them there sands! What am I?	c) Oil sands
I am a strong source of energy all through the day, I keep the Earth warm while you run and play.	a) The Sun
I am found in the ground, and my color is the shade darker than brown. I'm often used to power towns and cities, because I can be burned to make electricity-- What am I?	k) Coal
A river runs through it -- I just slow it down a little and at the same time I manage to make electricity. What am I?	g) Hydroelectric power
There's a flow through me, but water it's not. I transport oil and gas underground, and the reclaimed land over me will probably mean you don't even know I'm there. What am I?	e) Pipeline

reducing waste = reducing energy use

Curriculum Connection

Grade 4 Science

Topic A: Waste and Our World

12. Develop and implement a plan to reduce waste, and monitor what happens over a period of time.

Objective

Students will identify personal goals for reducing waste and engage in a school-wide initiative to reduce waste and energy consumption.

Duration: 1.5 hours

Materials: paper, coloured pencils

Background

Almost everything we have, use or do requires energy. Reducing the amount of products we consume, and ultimately, the waste we produce can reduce the amount of energy we consume. When we reuse things, new things do not need to be made. When we recycle, fewer raw materials are needed and extracted to make new products. When we conserve water, less water needs to be treated. When we use less energy in all parts of our lives, fewer greenhouse gases are emitted into the atmosphere.

Procedure

1. Introductory activity- On a projector or smart board show the *Hearts and Suns* slide presentation found at ***www.insideeducation.ca/Stewardship_poster.*** Ask students to identify each slide as either an energy source or a stewardship activity. If it is an energy source have them make an 'O' shape with their two hands and hold their hands over their head (like the sun in the sky). If it is a stewardship action have them place their hand over their heart. You may want to consider dividing the class into two teams and keeping score.
2. Distribute poster paper to students (legal size-paper will do in a pinch – even better if it's already been used on one side!) Using the title "My One Simple Act," have students divide their paper in half and draw two separate images of themselves, one half entitled "Today" the other "Tomorrow."
    - On the **Today** side, students will draw a picture of one simple activity they will do to reduce their energy consumption, and have them caption this action.
    - On the **Tomorrow** side, students will draw another, somewhat more difficult action they will commit to *trying to do* in the future. Have them caption this action.

You may want to brainstorm some ideas prior to engaging students in the activity. However, the poster depicts many good ideas you can draw from. Samples:

- Today – Turning off the water when I brush my teeth.
- Tomorrow – Taking shorter showers.
- Today – Remember to recycle plastic bottles.
- Tomorrow – Carry a reusable water bottle.

3. ONE SIMPLE ACT! Brainstorm stewardship activities everyone in your school can do together. Think about energy and water conservation activities that could be initiated, such as:
    - reusing school materials;
    - reusing water bottles;
    - bringing litter free lunches;
    - placing plastic containers of water in the tanks of the school's toilets to reduce water and energy use;
    - recycling; or
    - holding a swap/flea market for clothes, sports equipment or other items.

reducing waste = reducing energy use
continued

As a class, create an action plan for your school-wide program. Make a list of things that need to be done and materials you will need to do them. Consider what steps it will take to enact your idea

- Does the class need to have the permission of the principal?
- How will they go about getting that? Write a letter? Make a presentation?
- How long will the project take?
- What needs to be done first? Second?
- How will you let the rest of the school know about your project?
- Are there creative ways to spread the word that will not create waste?
- What criteria you will use to know if your plan was successful? (e.g.,: 30% more students bring litter-less lunches, reduce school-wide use of paper by 25%, and so forth)

Assign tasks to individuals or small groups of students. Refer to the sample action plan template at the end of this lesson.

Closure

At different stages of your program, take some time to discuss progress

- How did it go/is it going?
- What resources did you need to implement the action plan?
- Is it easy to make these changes? Why or why not?
- What were some challenges participants faced in participating? How did you overcome these challenges?
- Was it easier to implement the action plan with many people participating?
- Did you have to change your action plan as you went along? What adjustments did you have to make and why?

Remember, reducing waste = reducing energy use. Discuss with students that in all activities described, energy resources are being conserved.

- By reducing, reusing and recycling the products we use, fewer new products are required, meaning less energy resources are needed to produce and transport these new products.
- By reducing, reusing and recycling products less waste needs to be transported to and treated at waste facilities.
- By limiting the amount of water we use every day, the amount of energy needed to heat hot water (using natural gas) and to treat dirty water is reduced.

sample action plan
for school stewardship

What do we need to do? Brainstorm required tasks. Consider the order in which things need to be done. Post your action plan in the classroom to be updated regularly.

	Task	Assigned to	Completed	Notes
1.				
2.				
3.				
4.				
5.				
6				
7.				
8.				
9.				
10.				

What materials will we need?

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

stewardship meter

Curriculum Connections
Grade 5 Science
Topic D: Weather Watch
12. Recognize that human actions can affect climate, and identify human actions that have been linked to the greenhouse effect.

Topic A: Electricity and Magnetism
9. Interpret and explain the reading on a household electrical meter, efficiency labels on electrical appliances.

Objective
Students will understand some of the key elements of effective stewardship; Awareness, Attitude, and Action. Students will examine energy use in their home and look for ways to conserve energy and reduce their personal contribution to greenhouse gas emissions.

Duration: 60 minutes plus work at home

Materials: *Stewardship* posters, "Energy Efficiency Scavenger Hunt" and " Track Your Use of Electricity" worksheets

Background
Refer to the poster article *What is Stewardship?* for a quick summary of the three elements of effective stewardship. Students will put these elements into practice by learning about the relationship between electricity, conservation and climate change.

We use energy every day - to extract the raw materials we use to make products, to transport products to stores, or to actually use some products (electricity-powered alarm clock or battery-powered flashlight). Energy is also used at the end of a product's life to recycle or dispose of it.

Much of our energy use, especially in heating our homes, manufacturing goods, transportation and even developing our energy resources creates atmospheric emissions. Perhaps the most discussed of these is *carbon dioxide* (CO_2). Carbon dioxide is a greenhouse gas that is of great concern due to the increasing volume of it in our atmosphere. As our global energy use increases, so too does the volume of atmospheric CO_2 we produce.

Reducing waste and water consumption also saves energy. The more things we can reuse, the more energy we save by not having to constantly replace items. As well, energy is used to treat municipal water, as well as heating it for hot showers, so the less water we use, the more energy we save.

Procedure
Awareness and Attitude
Part 1
1. Divide students into small groups. Write the terms "greenhouse effect," "global warming" and "climate change" on the white board. As a class, discuss what students think these terms mean. Record their answers on the board. It is not recommended you correct students whose answers seem misguided. An outcome of this activity is to appreciate that there is confusion about, and misuse of, the terms.

2. Distribute posters to each group. Direct students to the article "Greenhouse Effect, Global Warming and Climate Change" on the back of the *Stewardship: Energy, Climate and You* poster. Are there differences in the students' perceptions of the terms from the definitions in the articles? Discuss these differences as a class and point out that these are terms that are often misunderstood by grown ups, and that the first step to solving a problem is to learn more about it.

> ***Note to Teacher:***
> *The three terms are often used interchangeably, when in reality they are connected in the science and issues surrounding climate change. The enhanced greenhouse effect (caused by humans contributing high concentrations of greenhouse gases to the atmosphere) leads to the warming of the Earth – we are making the Earth's natural 'greenhouse' too effective! This unnatural increase in the Earth's temperature, most scientists believe will lead to, and is leading to rapidly changing climates all over the world. These changing climates can result in an increased occurrence of severe weather such as droughts, violent storms, and abnormal temperatures.*

3. Direct students to the front of the poster. Ask them to identify human activities that use energy as depicted on the poster. You can make a list of their ideas on chart paper, as well as have them copy down their ideas. Examples include transportation, development of natural resources, electricity and heat in the home, and products we use. Encourage students to be specific in the activities they identify!

4. Explain to students that many forms of energy create emissions, particularly in the form of carbon dioxide (CO_2). Whenever we can reduce the amount of energy we use, we reduce the amount of CO_2 going into the atmosphere. Reducing the amount of CO_2 in the atmosphere can help reduce the enhanced greenhouse effect, which in turn will help reduce global warming and slow climate change.

Action

Part 2

- Make copies of the "Energy Efficiency Scavenger Hunt" worksheet, one per student – consider copying on already-used paper. Point out to students that you have done this, and describe your motivation for doing so!
- Distribute one copy per student and have them put the worksheet in their binders.
- There are many ways to save energy around our homes. Use the list on the "Energy Efficiency Scavenger Hunt" worksheet as a starting place. Blanks are included on the worksheet should your students have other ideas.
- Have students examine energy use in their home and do an energy audit with their family using the"Energy Efficiency Scavenger Hunt" worksheet.
- As a class, discuss findings. Consider creating a chart for your class, recording what is being done at home, what could be done and track any changes through the unit (or even throughout the year!)

> ***Note to Teacher:***
> *It is important students not be made to feel guilty – nor should they 'blame' their parents for activities at home. Instead, it is important for students to understand there are always ways for us to improve our lifestyles and reduce our carbon footprint.*

Part 3

Students can determine the success of behaviour changes with regard to energy use by monitoring their household electrical meter. The worksheet "Track Your Use of Electricity" outlines how they can do this. Show students how to read an electrical meter. Have them practice "reading" meter numbers a few times in class. Remind students that the readings should be taken on the same day and time each week. By measuring the decrease in electricity use, students are measuring the effectiveness of their stewardship actions, therefore they now can think of this as their *stewardship meter*!

Closure

As a class, review why it is important for us to be aware of our household and personal energy use. What are some of the challenges we face in reducing our energy use? Are some of these challenges easier to overcome than others? Was it difficult to change your attitude toward electricity conservation? Are there creative ways to overcome some of these challenges?

Extensions

Other tracking tools (including savings with CFL lightbulbs) can be found here:
http://www.atcoenergysense.com/ - click on "Tools and Resources."

energy efficiency scavenger hunt

One place we use a lot of energy is our home. Do an energy efficiency scavenger hunt to find the things your family are already doing to reduce energy consumption. There are extra lines for you to add some of your own ideas!

Energy Efficiency Opportunity	Already Do	Could do
Use energy efficient appliances.		
Use compact fluorescent light bulbs.		
Turn off the lights when we a room is empty.		
Unplug electrical appliances when not in use.		
Turn off the water while brushing teeth.		
Wash clothes in cold water		
Keep the thermostat turned down at night and when no one is home, to around 16-18 Celsius.		
Keep the furnace filter clean.		
Keep your water heater temperature at 55° Celsius (130° F).		
Only run the clothes dryer when it is full.		
Hang some clothes to dry.		
Keep showers under 5 minutes.		
Only run the dishwasher when it is full.		
Use LED Christmas lights.		
Collect and recycle our recyclables (paper, plastics, deposit containers).		

track your use of electricity

The electrical meter on your house is one way to tell if you have successfully reduced your use of electricity.

To begin, you need to find out how much electricity your family uses in one week. Ask your parents to help you find your household electrical meter. You will need to take a measurement of the amount of electricity used once a week, for three weeks in a row.

Take your readings exactly one week apart. Also try to take them at the same time of day. Subtract your first meter reading from your second meter reading. This will tell you how much electricity you used during that week. Talk with your family and decide on some ways to reduce your use of electricity. Take another meter reading at the end of the second week and compare your first week with your second week. How much electricity did you save after you and your family took action?

How to Read Your Electrical Meter

- Start with the dial on the left. Find the needle.
- Record the number the needle points to.
- If the needle falls between numbers, choose the lower number, except if the needle falls between 0 and 9, then choose 9.

4 6 3 9 2

First meter reading: Date: _____ Time: _____

Meter reading: | | | | | |

Second meter reading: Date: _____ Time: _____

Meter reading: | | | | | |

Third meter reading: Date: _____ Time: _____

Meter reading: | | | | | |

Do the math:

Second meter reading			
First meter reading	−		
The amount of electricity your family used this week	=		**kWh**

Third meter reading			
Second meter reading	−		
The amount of electricity your family used this week	=		**kWh**

Did you reduce your use of electricity? Was it by a little or by a lot? Was it easy to make changes? Why or Why not?

making a difference

Curriculum Connection
Grade 6 Social Studies
Unit 6.1: Citizens Participating in Decision Making
6.1.6 analyze how individuals, groups and associations within a community impact decision-making of local and provincial governments by exploring and reflecting upon the following questions and issues:

- How can individuals, groups and associations within a community participate in the decision-making process regarding current events or issues *(i.e., lobbying, petitioning, organizing and attending local meetings and rallies, contacting elected representatives)?*

Objective

Students will identify a local issue in their community with regards to energy stewardship, form an action plan to influence local community and/or government and execute their action plan.

Duration: several class periods, plus time outside of class.

Materials: Internet access, other materials will depend on action chosen.

Lobbying: the act of expressing your point of view directly to a government official to influence public policy. Lobbying is regulated in Canada and lobbyists are often professionals hired by companies or organizations to work on their behalf.

Petition: a petition can be a document signed by many people to express their support for the point of view expressed in the document. Different levels of government often have rules regarding who can sign a petition and what information about them needs to be collected. For example you may need to be over 18 years old and you may need to provide a phone number or address.

Rally: an event where large numbers of people gather to express their support for a point of view.

Procedure

1. Begin with a class discussion identifying ways that community members can participate in decision-making processes other than elections. Your list might include lobbying, petitioning, rallies and letter-writing campaigns. Discuss the pros and cons of different methods, with attention given to money required, organization, number of people involved, and effectiveness of the activity.

2. As a class, brainstorm local issues regarding energy stewardship. Use the S*tewardship, Energy, Climate and You* poster for some ideas. Decide on an issue – local in your school or local in your community - on which your class will take action.

   Possible approaches include:
   Encouraging your school to:
   - reducing the furnace's temperature at night, while no one is in the school;
   - retrofitting water fountains so water bottles can be easily refilled; or
   - placing signs up outside the school, asking drivers not to idle their engines while picking up and dropping off students.

   Encouraging your city or town to:
   - support greater use of carpooling, public transit, walking or bicycles;
   - begin a curb-side recycling program; or
   - pass a bylaw restricting idling engines.

3. Based on the opening discussion, decide which form of action will be most effective for your local issue. If your idea requires money, are you able to do fundraising? Do you have enough people to organize it? Will your class need more help? Can you ask other classes or students to help you?

4. Have the students thoroughly research the issue. Students should understand all the perspectives and demonstrate they have considered all sides of an issue. A well-researched and presented case is more likely to be successful. Have students keep their research in a duo-tang or binder for easy referral.

5. As a class, create a list of everything that needs to be done and a timeline for when they will be completed. Determine the list of supplies. What do you need to carry out your action plan? Ensure each student gets a copy of this list, for later referral. Assign tasks to individuals or small groups. Make sure to have regular check-ins to be sure everyone is on track.

Tips for Success

When deciding upon a local issue, maximize the chances of success of the campaign by directing students toward very specific actions, like promoting an anti-idling bylaw rather than large general ideas that are very complex, such as trying to stop global warming.

If students decide to embark on a letter writing campaign, remind them that personal letters are the most effective. Brainstorm some ideas for content as a class but discourage students from taking a form letter approach.

Closure

When you have completed your campaign have a debriefing session to discuss how it went. Where you successful? Why or why not? Were there things that could have been done differently?

Extension

Consider applying for an environmental action grant from the Alberta Emerald Foundation to help with your project – visit: *http://www.emeraldfoundation.ca/programs/youth_program*

does it matter if the climate changes?

Curriculum Connection

Grade 7 Science

Unit A: Interactions and Ecosystems

1. Investigate and describe relationships between humans and their environments, and identify related issues and scientific questions.
   - identify examples of human impacts on ecosystems, and investigate and analyze the link between these impacts and the human wants and needs that give rise to them *(e.g., identify impacts of the use of plants and animals as sources of food, fibre and other materials; identify potential impacts of waste products on environments)*

4. Describe the relationships among knowledge, decisions and actions in maintaining life-supporting environments.
   - identify intended and unintended consequences of human activities within local and global environments *(e.g., changes resulting from habitat loss, pest control or from introduction of new species; changes leading to species extinction)*

Objectives

Students will investigate the possible impacts caused by a changing climate.

Students will consider the potential impacts of climate change in Canada and how they would be affected by different changes in our climate.

Duration: 60 minutes

Materials: *Stewardship* poster; "Climate Change Impacts" worksheet; Internet connection; projector and/or SMART Board™

Background

Humans, plants and animals have adapted to live in most of the climates of the world. Climate is reflected in our customs, shelter, clothing, food preferences, agriculture, transportation, recreation and settlements. If Canada's climate changes it will have an impact on all areas of Canadian life.

The weather determines much about our way of life. The way we live, the food we can grow and how we get other foods, and what we do for work are all affected by Canada's unique mix of climates. Canada has a wide variety of resources and industries that are directly affected by climate such as forestry, agriculture, fisheries, tourism and energy extraction.

Scientists have predicted a large number of impacts that may occur as our climate changes. They include:

- Hotter summers which will increase stress on wildlife, plants and human beings;
- Warmer winters which may reduce demand for energy to heat our homes;
- Early break up of arctic ice affecting wildlife and Inuit hunters;
- Changes in precipitation patterns possibly leading to drought or severe storms;
- Reduced snow in the mountains which could affect the flow of rivers;
- Rising sea levels, which could affect coastal regions;
- Increase in growing seasons, possibly allowing for different crops to be grown;
- Invasion of pest species;
- Increased frequency of severe weather events, such as tornados, ice storms and hurricanes; and
- Reduced ice on rivers and lakes in winter, which reduces winter road access to resources and remote communities.

does it matter if the climate changes?

continued

Procedure

1. Project the webpage ***www.adaptation.nrcan.gc.ca*** and click on *Adaptation 101* in the navigation sidebar on the left. Read through the pages in *Adaptation 101* as a class and explore the possible impacts to Canada's environment caused by climate change. Use the navigation sidebar on the right to move through the complete document.

2. Working in small groups, have students use the *Climate Change Impacts* worksheet to work through the list of potential effects climate change may have on plants, wildlife, human health, jobs, settlements, recreation and transportation, and decide whether or not the changes might have a positive, negative, or unknown effect.

Closure

When students have completed the chart, review it as a class and discuss their responses.

Discuss:

- Did everyone come to the same conclusions?
- Did group members agree on whether the effects were negative or positive? Why or why not?
- Did any impacts have both potentially positive and negative effects?
- Did any impacts have only positive or negative effects? Why?

By the end of the activity, students should understand that when considering issues related to a changing climate there are no absolute answers. Climate change is a complex problem. After completing this activity, students should also recognize that people will have differing perceptions on how climate change will affect them, Canada, and Earth.

Extension

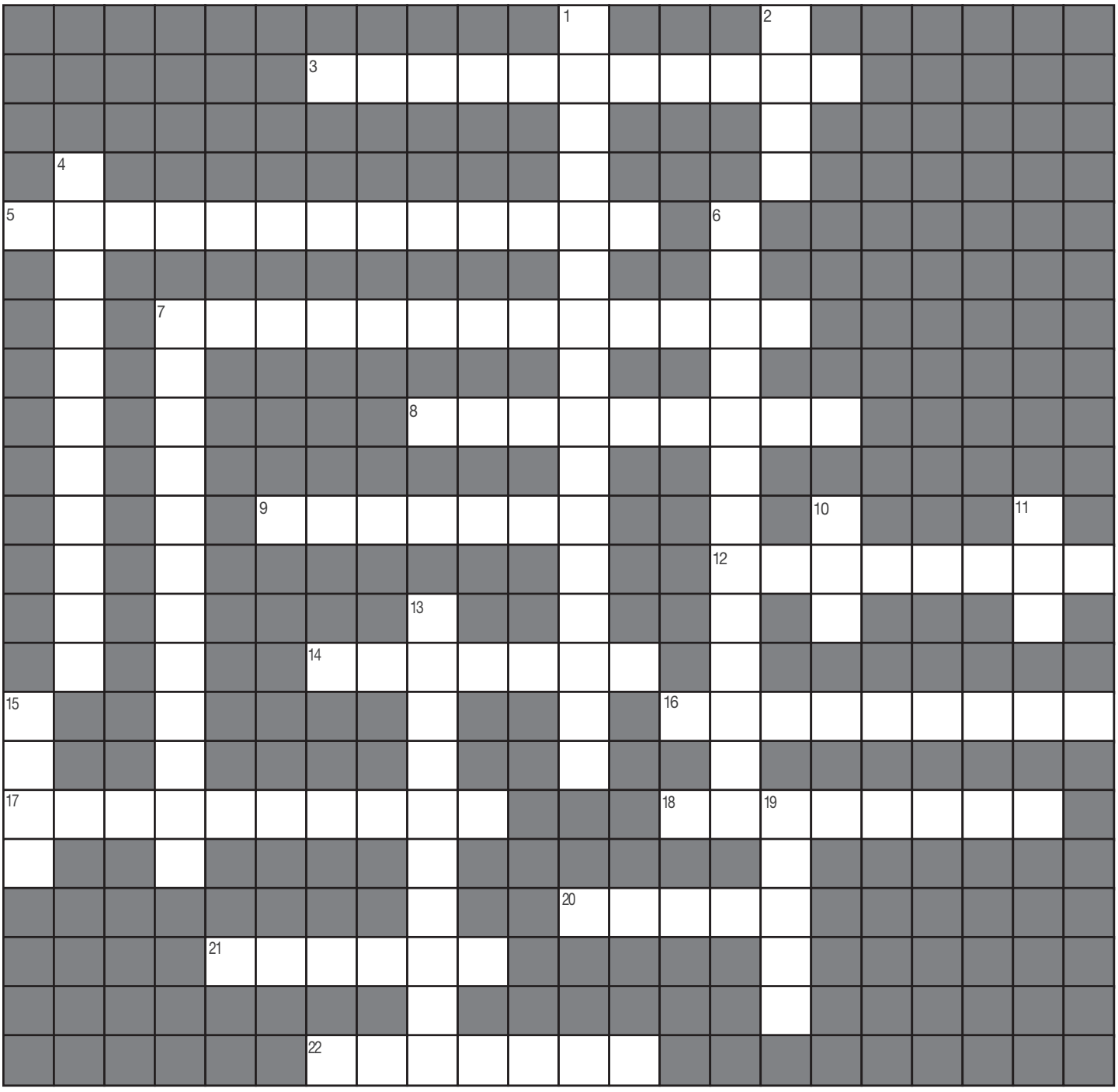
Students could choose one possible climate change impact to investigate further. They will research in greater detail how the potential impact could affect one of the categories from the *Climate Change Impacts* worksheet.

climate change impacts

Read the following list of possible impacts of climate change and decide for each category whether or not the possible change to the climate would have a positive effect, a negative effect, or an unknown effect. Write a **+** for positive, **-** for negative and a **?** for unknown.

	Possible Impacts of Climate Change	Positive, Negative or Unknown Effects of Climate Change								
		Plants	Wildlife	Human	Health	Jobs	Towns/Cities	Recreation	Transportation	Agriculture
1.	Hotter temperatures during the summer months.									
2.	Reduced rainfall and/or snowfall.									
3.	Rise in sea levels in coastal regions.									
4.	More severe weather events (tornadoes, blizzards, ice storms, etc.).									
5.	Less extreme cold weather in the winter and reduced ice on northern lakes, rivers and oceans.									
6	Increase in the temperature of rivers, lakes, oceans.									
7.	Infestations of insect and/or other pest populations not normally expected in Alberta.									
8.	Reduced ice on northern lakes, rivers and oceans.									
9.	Warmer temperatures in northern Canada.									
10.	Changes to growing seasons.									
11.	Increase in the amount of land that can be farmed and crops grown in a season.									

stewardship crossword puzzle



stewardship crossword puzzle
continued

Across

3. Looking after something you really care about.
5. Increasing temperatures all over the Earth (2 words).
7. There is more of this greenhouse gas in our atmosphere than any other (2 words).
8. Some of the stuff left over when a fuel is burned.
9. Weather patterns measured over a long period of time.
12. A collection of facts that proves an idea.
14. What is happening in the atmosphere right now.
16. Scientists can "read" these to find out about growing conditions hundreds of years ago (2 words).
17. All the air that surrounds our planet.
18. This cool stuff can tell scientists what the atmosphere was like thousands of years ago (2 words).
20. Energy from the sun.
21. Everything we have and do requires this in one form or another.
22. This "hard" evidence can tell scientists what life was like millions of years ago.

Down

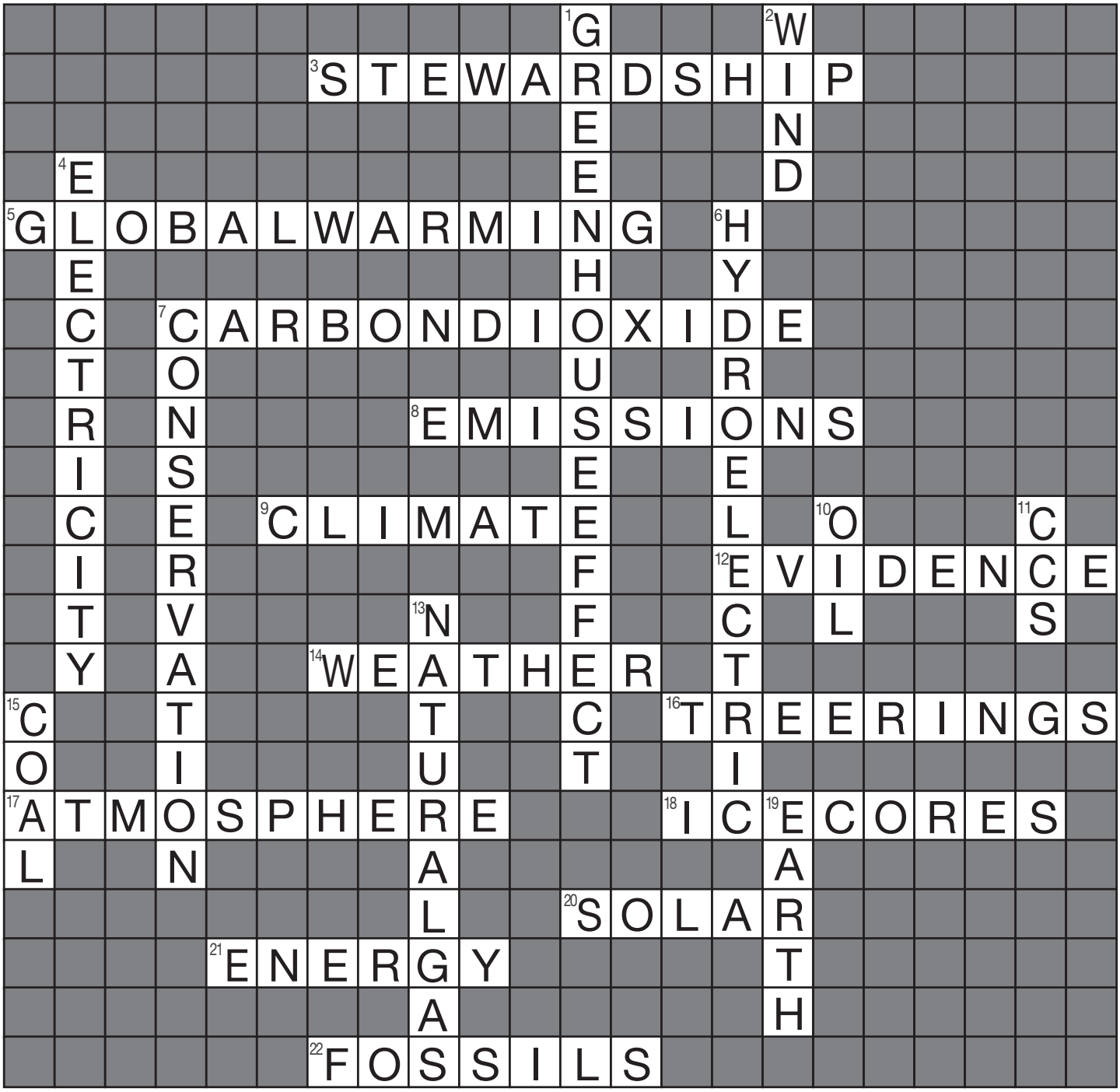
1. The process where some of the sun's energy is trapped in the atmosphere that keeps Earth warm (2 words).
2. An emission-free energy source that gets a lot of "air" play.
4. We can use wind, water, sunshine, coal or natural gas to make this "shocking" stuff.
6. Water "power."
7. Using something carefully to make it last or protect it from damage.
10. Alberta is famous for this stuff that we use to make gasoline for our cars.
11. A possible way to store a greenhouse gas underground (acronym).
13. This fuel from nature burns cleaner than coal (2 words).
15. Many power plants in Alberta use this "ancient" form of energy to create electricity.
19. The home we all share.

Word list

Evidence
Wind
Fossils
Stewardship
Electricity
Solar
Hydroelectric
Tree Rings
Atmosphere
Emissions
Ice Cores
Oil
Weather
Carbon dioxide
Natural Gas
Coal
Energy
CCS
Global Warming
Earth
Greenhouse Effect
Conservation
Climate

stewardship crossword puzzle

answer key



glossary

adapt • to become used to a new environment by changing what you do or how you do it

atmosphere • the envelope of gases that surround Earth

carbon dioxide (CO2) • a chemical compound made up of carbon and oxygen most commonly found as a gas

climate • general weather patterns observed over long periods of time

climate change • a large-scale change in average weather over a time period of at least 30 years

conservation • protecting something from change, loss or damage

ecosystem • a group of interdependent organisms and their habitat

enhanced greenhouse effect • an increase in the natural greenhouse effect resulting from an excess in greenhouse gas concentration likely caused by human activities

environment • the natural world which all living things depend upon

global warming • the rise of the average temperature of Earth's atmosphere

greenhouse effect • the natural warming of Earth's atmosphere where the sun's warmth is trapped by gases in the atmosphere

greenhouse gas • a gas that helps trap the sun's warmth in the atmosphere

solar energy • heat and light energy from the sun

stewardship • to look after something that is important to you

weather • what is happening in the atmosphere at any given time. eg: rain, wind, sun, clouds

additional resources

Understanding Weather, Climate and Climate Change

Climate and weather are two terms that are commonly misunderstood. **Weather** describes the current atmospheric conditions. Examples of weather are wind and sunshine, precipitation events such as rain, snow, or sleet and extreme weather events include thunderstorms, tornadoes and hurricanes. Weather changes constantly. It can even change within a single day or even an hour. It can rain in the morning but by afternoon it is clear and sunny.

By contrast, climate changes much more slowly. **Climate** describes general weather patterns over a long period of time. In Canada, for example, we know that during the summer months we can expect warmer temperatures than during the winter months. We do not normally expect snow during the summer months. This is a general pattern of weather that we have seen occur regularly over at least a generation.

Climate change is a large-scale change in average weather over a time period of at least 30 years. Climate change occurs naturally, because of a number of factors such as changes in the Earth's orbit, volcanic eruptions, or changes in energy from the sun. However, climate change is also effected by humans. By burning fossil fuels, such as coal, natural gas or oil, humans increase the amount of naturally occurring greenhouse gases in the atmosphere. Most scientists now agree human activity is most likely responsible for most temperature increases over the past 250 years. The biggest concern is the speed at which these changes are happening.

Weather events that are not characteristic of a particular season occasionally happen. Sometimes we do experience weather events such as snow in June or spring-like temperatures in December. While a single weather event does not prove or disprove climate change, it is believed that global warming, and the resulting change in climate, could result in a greater frequency of uncharacteristic weather events -- like snow in June.

Recommended websites

Simple on-line games

Game format	Topic; Difficulty level	Organization and link
Send an 'enviro' e-card	Variety of cards to choose from; easy to use (Grade 4 +)	Green Learning http://www.greenlearning.ca/ecards
Many types of games	(Grade 4 +)	Earth Day Canada EcoKids http://www.ecokids.ca

Recommended on-line climate change science activities for students Grade 8 and up

Game format	Topic; Difficulty level	Organization and link
Interactive Canada-specific Climate Change resource for high school	Video plus lesson plans, extension activities	Seeds Foundation http://www.seedsfoundation.ca/climateofchange.html
Build and analyze a wind turbine plus other renewable energy activities	Fairly quick activity; basic understanding of turbines helpful; Grade 10 +	• Re-Energy • http://www.re-energy.ca
Interactive maps and associated information to understand the big picture of climate change in Canada	Detailed; prepare students for graphic description of effects of climate change; Grade 10 +	Natural Resources Canada http://atlas.nrcan.gc.ca/site/english/maps/climatechange/potentialimpacts/sensitivityriverregions

additional resources

Supplemental Resources

Alberta's One Simple Act

It's easy to be environmentally friendly. In fact, it's simple.
The choices we make at home, at work and at school all add up to make a big difference. Together we can have a big impact on Alberta's environment. Whether you're making a pledge to start a new green routine at home or installing eco-friendly technology at your office, Alberta Environment invites you to share your commitment with us.
www.onesimpleact.alberta.ca

Inside Education

Canada's largest natural resources and environment education society, Inside Education has education programs and services related to energy, water, land and stewardship. We also provide in-school programs and no-cost teacher professional development workshops related to climate change, energy and other topics.
www.insideeducation.ca

Climate Change Central

Climate Change Central is a non-profit organization that empowers Albertans to take action on climate change through consumer rebate programs, demonstration projects and educational outreach. Their website contains a lot of information about energy efficiency ideas at the home and the work place.
www.climatechangecentral.com

Green Schools – The SEEDS Foundation

This program encourages students to be environmentally responsible and to take personal action at school and with their families. Classes undertake projects to communicate about or to enhance the environment. Classes then log their project results and report them to SEEDS. By keeping records of their achievements, schools gradually work towards 100 projects to become recognized as an environmental Green School. Some schools go on to achieve Jade status (250), Emerald status (500) and ultimately Earth School with 1,000 completed projects. There are 246 Earth Schools in Canada.
www.seedsfoundation.ca/greenschools.html

A+ for Energy - BP Canada

BP Canada awards grants to Alberta teachers who develop and deliver innovative energy education programs in their classrooms and schools. Teachers select a source of energy, renewable or non-renewable and design education programs for their students – grants of up to $10,000 are available for these innovative projects. Teachers also receive scholorships towards an energy education conference.
www.aplusforenergy.ca

www.insideeducation.ca

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