Science and Technology 11
Natural Resources and the Environment

Blackline Master

This blackline master package, which includes all section assignments, as well as selected worksheets, activities, and other materials for teachers to make their own overhead transparencies or photocopies, is designed to accompany Open School BC's ***Natural Resources and the Environment*** module. The course and blackline master were developed by BC teachers, instructional designers, graphic artists, and multimedia experts.

Please note that the rights to reproduce materials from the *Natural Resources and the Environment Blackline Master* is restricted to the individual user. Teachers may reproduce solely for use with their own classes.

The Science and Technology 11 course consists of 4 modules and a CD for each module. Science and Technology 11 is available in both print and online versions. This course can be purchased as individual products. All are available from Open School BC. There is no textbook required for this course or module.

To order, contact:

Open School BC Customer Service Team
Phone: 250-356-2820 (Victoria)

1 888 883 4766 (Toll-free)
info@openschool.bc.ca

or

Visit our website at
www.pss.gov.bc.ca/osbc

Section 1, Lesson A, Activity 1

Major Natural Resources in British Columbia

The following is a list of major natural resources found in British Columbia. Beside each resource, mark an R if it's renewable, or mark NR if it's non-renewable.

	1. Hydroelectricity
	2. Natural gas
	3. Oil
	4. Lumber
	5. Coal
	6. Diamonds
	7. Solar energy
	8. Wind
	9. Fruits, vegetables, wine, berries, canola
	10. Uranium, copper, zinc, gold, silver, sulfur, asbestos

Section 1, Lesson B, Activity 1

BC's Primary Industries

1. Which of the following is NOT a primary industry in BC?

   tourism

   forestry

   mining

   agriculture ( )

2. An open pit mine is

   a mine shaft drilled deep into the earth

   a large mining operation cut into the earth's surface

   a mine that has been exhausted and then abandoned

   a mine that is contaminated and no longer safe to operate ( )

3. What happens at a smelter?

   metals are melted down into gold and silver

   metals are separated down from each other and waste products are removed

   metals are removed from the earth using steam and hot water

   none of the above ( )

4. Mining was the most important primary industry when the first settlers arrived in BC.

   true

   false ( )

5. Fishing has always been very important to BC's First Nations.

   true

   false ( )

6. Fish became a major export industry when this was introduced.

   salt preservation

   sonar

   fish smokers

   canneries ( )

7. This was eventually replaced by

    refrigeration aboard ships

    fresh fish markets right at the docks

    freeze dried packaging

    all of the above ( )

8. The clearing of land for agricultural purposes in BC coincided with

    better farming technologies

    cheaper taxes for farmland

    the decline in importance of other primary industries

    the growth in BC's population ( )

9. Arable land is

    suitable for farming

    unsuitable for farming

    covered with trees

    none of the above ( )

10. Historically, BC's most important primary industry has always been

    fishing

    forestry

    mining

    agriculture ( )

Section 1, Lesson C, Activity 1

Production of a Pencil

Number the following information in the correct order. Start with the natural resources and move to the finished product.

	Sawmill
	Retail store
	Logging truck
	Blocks of wood
	Logger
	Shipping truck
	Slat factory
	Cedar tree
	Pencil factory
	Kiln

Section 1 Assignment: Part 1

What is a Natural Resource?

1. Define the following terms, in your own words.
    a. Non-renewable resource

    b. Renewable resource

2. State whether each of the following is a renewable resource (R) or a non-renewable resource (NR).
    a. Natural gas
    b. Biomass
    c. Oil
    d. Hydroelectricity
    e. Wind
    f. Solar energy
    g. Coal
    h. Diamonds
    i. Trees
    j. Geothermal energy
    k. Uranium

3. The following chart lists categories of natural resources such as trees and plants. For each category, list a specific example that could be found in your area. Think of the possible effects of people harvesting and using each of these natural resources, then fill in the last three columns of the chart. A well-completed chart will have an effect listed in each column. The first one is done for you as an example.

Read the rubric to understand how you will be evaluated before you start filling in your chart.

The Effects of Natural Resources of British Columbia

Resources	Specific products from your area	Personal effects	Economic effects	Environmental effects
Fish	salmon	yummy food	provides fisheries jobs	overfishing depletes the stocks and leaves less food for other animals
Trees				
Plants				

Minerals				
Oil				
Water				
Animals				

The following rubric will be used to evaluate your answer for this question.

	Underdeveloped	Competent	Well developed
Amount of Information	Almost no products or effects are listed for any resource. 1	Approx. two products and two effects are listed for each of the resources in the region. 3	At least four products and four effects are listed for each of the resources in BC. 5
Correct Type of Information	Virtually none of the effects are correctly classified personal, economic, or environmental. 1	Half of the effects are correctly classified as personal, economic, or environmental. 3	Every effect is correctly classified as personal, economic, or environmental. 5
Accurate Information	Much of the information is incorrect. 1	Several pieces of information are incorrect. 3	All of the information is correct. 5

Evaluation Guidelines	Marks
Question 1	4
Question 2	11
Question 3	15
Total Marks	**/30**

Section 1 Assignment: Part 2

What is it Made of?

A house is made up of many different products, each derived from natural resources. Match each part of a typical house to the natural resources used to make it. Put the correct letter beside the materials it is typically made from.

	asphalt (petroleum)	a. foundation b. roof c. gutters d. exterior walls e. interior walls f. floor g. insulation h. plumbing i. windows j. driveway
	concrete block, clay and aggregates, or aluminum siding	
	concrete: limestone, clay, shale, gypsum, aggregate	
	brass (copper and zinc), stainless steel (iron, nickel, chrome)	
	asphalt tiles from petroleum and a variety of coloured sands. Might be a metal roof (corrugated iron)	
	glass (silica, trona, sand, feldspar)	
	drywall, made from gypsum	
	galvanized steel (iron and zinc) or aluminum or plastic (petroleum) used on the exterior part of the house to collect water, leaves, etc.	

	lumber boards and the nails and screws to put the boards in place from iron ore and zinc	
	fibreglass, known as glass wool (silica, feldspar, trona) or expanded vermiculite used to keep your house warm	

Evaluation Guidelines	Marks
Matching Questions	10
Total Marks	**/10**

Section 1 Assignment: Part 3

BC's Forest Industry: The First Hundred Years

The technologies used to harvest timber have changed dramatically over time. To learn more, go to your *Natural Resources* CD and watch *BC's Forest Industry: The First Hundred Years*. Complete Option A or Option B based on what you've learned. Do not complete both.

Option A: My Life as a Logger

Imagine you were a logger in British Columbia during part of the period shown in the media presentation. The exact era is up to you but it should span at least twenty years of the period described.

Write a creative story to describe what life was like for you in British Columbia during the time period you've selected. Pay particular attention to the type of technology that would be available to you during your life as a logger and how the technologies changed over you career. Also make sure you describe how the changes in technology changed the way that logging was done.

Your creative story should include the following:

- a description of the time period you've chosen to write about
- a setting to describe where your logging career took place
- some of the technology that you would be using if you were a logger during this time period
- how technology changed over your career time as a logger: you are looking at a twenty to thirty year time span
- what technological developments helped to improve your job
- what problems you may have encountered as a logger

Your story should be 3-5 paragraphs long. Refer to the marking key before starting your assignment.

13-15 marks: Your story has three or more paragraphs and has more details than the minimum requirement. Your story is descriptive and details the time period you have chosen to write about. Your story describes the technologies encountered and is detailed in the technological changes that occurred over your logging career. You go above and beyond the criteria set out and actively describe what problems you may have encountered during the logging period. Your writing is well written and expressive.

9-12 marks: Your story is detailed and you meet all the required criteria as set out above. You have described the technologies that you would use as a logger and how they have changed over time. Your writing is acceptable and proficiently expresses in an organized manner your life as a logger.

5-8 marks: Your story is short and you only set out to meet the minimum amount of writing required. Your story lacks the details required to meet the learning outcomes in a clear manner. You strayed from the story line: the life of a logger. You may not have accurately describe the technological changes that would occur over a career time period. You meet some of the criteria. Your writing minimally meets expectations.

0-4 marks: Your assignment is incomplete or missing. You did not put in the effort to complete your story as to the criteria that has been set out. Your writing does not meet expectations.

Evaluation Guidelines	Marks
Option A: My Life as a Logger	15
Total Marks	**/15**

Option B: Questions and Answers

Answer the following questions using the information provided in the media presentation.

1. Describe two different technologies that were used to extract timber in British Columbia in the earliest years of the forest industry.

2. In *BC's Forest Industry: The First 100 Years*, you learned many different ways logs were extracted from the forest and sent to the mill. Explain four different types of technology that you learned about.

3. Explain how the technological advances of a brake system helped to improve the transportation of logs out of the forest during the winter. How did this improve animal safety?

Evaluation Guidelines	Marks
Option B: Question 1	4
Option B: Question 2	8
Option B: Question 3	3
Total Marks	**/15**

Section 1 Assignment: Part 4

From Natural Resource to Finished Product

Every product that you own or use is made from natural resources extracted from our environment. Most of these products go through some sort of processing and manufacturing to make them into useful items. You've already seen this already with the production of a common pencil.

In this assignment you'll describe the steps involved in the transformation of a natural resource (or resources) into a finished product. **You'll need access to the Internet to complete this assignment. If you don't have access, please contact your teacher to arrange an alternate assignment.**

Follow these steps to complete this assignment.

1. Go to the Science and Technology Module 1: Natural Resources and the Environment website (*http://www.openschool.bc.ca/courses/science/scitech11/mod1.html*). Under Section 1 Lesson C you'll see links to websites that describe how different products are manufactured. Explore some of these links now.

2. Choose one product and explain how it's made. Your description must begin at the raw material stage and describe all the major steps right through to completion. You can describe this raw to ready process in one of the following ways:

    a. Full paragraphs

    b. Numbered steps (like in an instruction manual) with an image or images if necessary

    c. A detailed flow chart that includes both text and visuals of how the product is made

    d. Please include the URL for the website that you found your information so your instructor can refer to it when assessing your work.

Do you have another idea? Talk to your instructor in advance if you have another idea for how you can present this.

Your teacher will use the following guidelines to mark your work. Please read these guidelines carefully so you know what is expected of you.

Information	Very few steps are included; natural resources used in the production process aren't mentioned or only very briefly 1	Most of the steps are included; natural resources used in the production process are adequately described 3	Excellent, full description of the key steps; natural resources used in the production process are thoroughly described 5
Presentation	Ideas are out of order or lacking in detail; information is hard to follow 1	Logical flow; easy to follow for the most part and understand, with only minor improvements required 3	Excellent presentation; logical flow; clear explanation of the production process; properly sequenced and accurately described 5

Evaluation Guidelines	Marks
From Natural Resource to Finished Product	10
Total Marks	**/10**

Section 2, Lesson A, Activity 1

Interactive Food Chain

In this activity you'll arrange four members of a forest food chain from the lowest trophic level (producer) to the highest (tertiary consumer). You'll then describe what would happen to the other members if one of them was to be removed from the food chain. As you'll see, removing one impacts the other members.

To complete this activity, go to your *Natural Resources CD* and select *Interactive Food Chain*.

Section 2, Lesson A, Activity 2

Interactive Food Web

In this activity you'll see how the removal of one member of a food web impacts other members.

Go to your *Natural Resources CD* and select *Interactive Food Chain*.

Notice how the members of this food web have been arranged in the four trophic levels. At the bottom are primary producers (plants, leaves, and trees). The next level has primary consumers (ants, flies, caterpillars, and mushrooms). The third level features secondary consumers (spiders, mice, squirrels, and beetles). The top level contains the tertiary consumers (foxes, owls, and badgers). The arrows show how each member of this food chain is connected to other members. Remember the arrows indicate the eating relationship. In your mind replace the arrow with the words "is eaten by" to see how two organisms joined by an arrow are connected. For example, the arrow pointing from the tree to the caterpillars shows that trees are eaten by caterpillars. In turn, caterpillars are eaten by mice, squirrels, and badgers. And so on up the food web.

Try the Interactive Food Web yourself. Select any organism within the web to see what happens when it's removed.

Section 2, Lesson B, Activity 1

First Nations View—Which is It?

Having watched the Nancy Turner video, you should have a better understanding of how the First Nations people feel about the natural environment and the resources it provides. Which of these statements best summarizes the First Nations view?

a. First Nations people take only what they need from the environment with little thought to the impact on its ecosystems.–

b. First Nations people believe in caring for and maintaining the biodiversity of the ecosystem, and that it is an important part of their survival and cultural responsibility.

c. First Nations people believe in caring for and maintaining biodiversity of the ecosystem but it is not necessarily a part of their cultural responsibility.

d. First Nations people believe in using whatever natural resources they need for survival.

Section 2, Lesson B, Activity 2

BC’s Resources and Sustainability

Now that you have been introduced to issues facing BC’s resources, check to see how much you have learned. After reading each statement, choose true or false.

	1. Despite environmental concerns, there are more mines and mine exploration in BC than ever before.
	2. ARD and AMD are not serious problems caused by mining, and can be easily remedied.
	3. The ALR was set up by the government so prime land could be sold to developers.
	4. Of all human activities, agriculture has had the greatest impact on BC’s natural environment.
	5. Sea lice and parasites on fish in fish farms threaten wild fish species.
	6. The most profitable type of fishing is aquaculture.
	7. Clear-cut logging was the cheapest but most destructive way to log.

Section 2, Lesson C, Activity 1

True or False History of Energy Use

	1. In prehistoric times people relied on the Sun for energy.
	2. About 5000 years ago, people developed windmills and watermills to harvest produce energy.
	3. During the Industrial Age, the amount of energy use increased 115 times more than that of prehistoric people.
	4. It's not important to understand how we our natural resources for energy.
	5. Oil and natural gas are the main sources of energy in British Columbia.

Section 2, Lesson C, Activity 2

Fossil Fuel vs. Biofuel

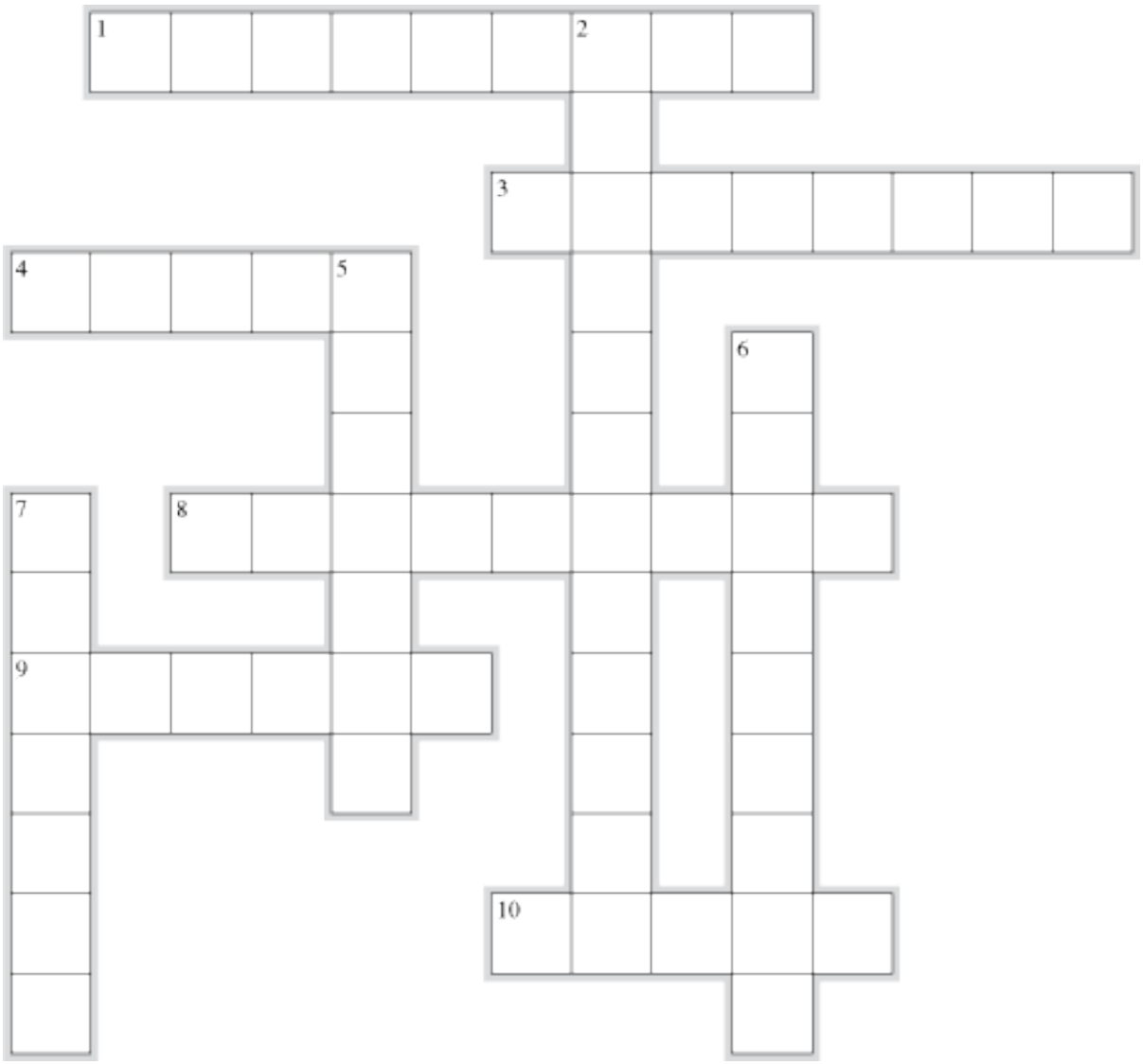
Write the definitions for each of the terms on the space provided and give an example for each:

Fossil fuel:

Biofuel:

Section 2 Assignment: Part 1

Ecology Crossword Puzzle



Across	Down
1. A community of interdependent plants and animals 3. An organism that cannot create its own food so it eats others 4. All the animals in an ecosystem 8. Plants that create their own food 9. The living parts of an ecosystem 10. All plant life in an ecosystem	2. Where an organism sits in a food chain 5. The non-living parts of an ecosystem 6. Organisms that eat only plants 7. Where an organism lives

Evaluation Guidelines	Marks
Ecology Crossword Puzzle	10
Total Marks	**/10**

Section 2 Assignment: Part 2

Food Chains and Food Webs

1. What is the difference between a food chain and a food web?

2. Identify and describe each trophic level in a typical food chain or food web. Begin with the lowest level and finish with the top level. You should have four answers.

3. Go back to your Natural Resources CD and watch Interactive Food Web again. Click on the red squirrel. What happens when the squirrel is removed from the food web?

4. Why is it important to study food chains and food webs? What does it have to do with human actions?

Evaluation Guidelines	Marks
Question 1	4
Question 2	4
Question 3	4
Question 4	3
Total Marks	**/15**

Section 2 Assignment: Part 3

Resource Use: First Nations vs. Early Settlers

1. Compare the traditional First Nations view on resource use vs. that of early settlers to BC. Which view is more sustainable, and why?

2. Fill in the blanks for each of these questions.

   a. The practice of taking only what you need from the environment is called

   _____.

   b. Harvesting entire sections of a forest is called _____.

   c. An alternative to c, in which only some trees are logged, is called

   _____.

   d. _____ is the rate at which trees can be sustainably harvested.

   e. Declining fish stocks are due to many factors, including _____,

   _____, and possibly _____.

   f. One possible solution to declining fish stocks is _____.

   g. _____ were introduced to prevent valuable farmland from being converted to other uses.

   h. A serious form of mining pollution is _____.

Evaluation Guidelines	Marks
Question 1	5
Question 2	10
Total Marks	**/15**

Section 2 Assignment: Part 4

Energy Use Over Time

1. Compare the 1800s with the current day. Imagine a family travels 50 kilometres to visit other family members for a special holiday get together. Describe and compare the resources required for travelling and for the preparation of a family meal.

Activity	1800s	Today
Travel How? Mode? Method? How long to get there? What fuel is needed? Is public transportation available?		
Food What resources are needed? What food would be on the table? Where did the food come from? How did the food get to the home? How was the food prepared? How was the food stored?		

2. Write a paragraph about the energy source that has the most impact on your life and why.

Evaluation Guidelines	Marks
Question 1	10
Question 2	5
Total Marks	**/15**

Section 2 Assignment: Part 5

Great Bear Rainforest Project

As the newly appointed advisor to the Minister of Environment, you must prepare a report with your recommendations for land use in the Great Bear Rainforest. You'll have to listen to the stakeholders, do some research, and come up with a set of recommendations based on what you've learned.

The following information outlines the expectations, format, and marking criteria for this project. Be sure to read through the information carefully.

Purpose

Using the information from the stakeholders in the media piece as a starting point, you'll establish a set of recommendations for land use in the Great Bear Rainforest. You must also provide the rationale for your set of recommendations.

Goals of the Recommendations

Your land-use recommendations must meet the following goals:

- Balance all stakeholders' interests
- Promote environmental sustainability
- Ensure economic sustainability

Things to Consider

Your report or presentation must clearly demonstrate how you plan to meet the above three goals. In order to address these goals, you should consider the following points:

- What are the ecological impacts of industrial, commercial, or residential development?
- How much land should be available for development? Why?
- What are the economic impacts of environmental protection?
- How much land do you recommend protecting? Why?
- Are there specific areas that are more suitable for development? Why?
- What specific recommendations would you give (if any) about the types of development that should be allowed? Are there specific practices that should be encouraged? Discouraged?
- How should stakeholder interests be balanced?

Research Steps and Guidelines

You are expected to conduct research for this project. Research using material from other sources. Though the media piece contained fictional people and organizations, the issues were based on real events. There is lots of information out there related to this topic. You may want to start at the Science and Technology 11 Web Site (*http://www.openschool.bc.ca/courses/science/scitech11/mod1.html*). You could also check out newspaper articles, archived news reports, etc.

Format

Your recommendations can be presented in any one of a variety of formats. You may want to write a formal report (500 words), prepare a video presentation, a podcast, or create a slideshow. Be sure to check with your teacher for acceptable formats.

Whatever format you choose, you must provide a list of your resources.

Objective/Criteria	**Performance Indicators**			
	Excellent (4 points)	**Good (3 points)**	**Satisfactory (2 points)**	**Unsatisfactory (1 point)**
Research and credits	Research is extensive and thorough. Materials are carefully chosen; multiple, diverse sources are used.	Research is thorough. Several, well-selected sources are used. Resources are listed with minimal errors.	Minimal research has been done. Few sources are used. Some resources are listed.	No resources are listed.

	Resources are listed without error.			
Recommendations meet desired goals and are realistic	Several detailed recommendations are made. Recommendations are relevant and meet desired goals.	Some recommendations are made. Recommendations are mostly relevant and meet the desired goals.	Some recommendations are made but lack relevance and/or do not meet all desired goals	Few recommendations are made.
Supporting evidence	Factual evidence clearly supports all of the recommendations. Evidence given is detailed.	Factual evidence supports most of the recommendations. Evidence given is sufficient.	Recommendations are not all supported by factual evidence. Evidence given is very limited.	Factual evidence is not presented or does not connect to recommendations.
Organization	Ideas are presented logically, leads the audience to a thorough understanding of the rationale supporting the recommendations.	Most ideas are presented logically. Minor flaws in organization do not detract. Rationale is clear.	Most ideas flow from one to another. Organizational problems prevent audience from fully understanding the rationale supporting the recommendations.	Ideas presented in no particular order. Lack of organization detracts from the report/ presentation.
Overall impact	Writing is exceptionally proficient. Arguments are rational and persuasive. Position is clear and consistent.	Writing is proficient. Arguments are rational. Position is stated and is mostly maintained.	Writing is acceptable. Arguments are either limited or lack persuasiveness. Position is stated but is not maintained.	Writing does not meet expectations. Arguments are unclear or missing. Position is unclear or missing.

Evaluation Guidelines	Marks
Great Bear Rainforest Project	20
Total Marks	**/20**

Section 3, Lesson A, Activity 1

How Global Warming Works

To see how the greenhouse effect causes global warming, go to your *Natural Resources CD* and click on *How Global Warming Works*.

Remember: Global warming is just one part of a bigger thing called climate change.

Section 3, Lesson A, Activity 2

The Effects of Global Warming

Which of these are likely effects of global warming? Check all that apply.

- Spreading disease ☐
- Earlier spring arrivals ☐
- Plant and animal range shifts in population ☐
- Downpours, heavy snowfalls, flooding ☐
- Droughts and fires ☐
- Heat waves and periods of unusually warm weather ☐
- Sea level rising ☐
- Coastal flooding ☐
- Glacier melting ☐
- Sea level rising ☐

Section 3, Lesson B, Activity 1

The Kyoto Protocol

1. Drawbacks of the Kyoto Protocol include:
   a. inability to monitor progress of large numbers of countries.
   b. no uniform means to establish cost cutting schemes for global warming.
   c. limited participation, rise in cost of living, short term economic costs.
   d. instability of programs due to costs and governments' ability to be innovative.

   ( )

2. Benefits of the Kyoto Protocol include:
   a. increased rate of global stimulations and better communication technologies.
   b. reduced rate of global warming, better environment and health conditions.
   c. international cooperation among developing countries.
   d. international competition among developing countries. ( )

3. Canada is:
   a. a member of the Kyoto Protocol.
   b. considering joining the Kyoto Protocol.
   c. not a member of the Kyoto Protocol.
   d. proposing amendments to the Kyoto Protocol. ( )

4. The Kyoto Protocol is designed to:
   a. reduce acid rain over North America.
   b. reduce greenhouse gases and minimize climate change.
   c. reduce pollution over Eastern regions of the United States.
   d. reduce ozone layer depletion over the Earth's polar regions. ( )

5. The Kyoto Protocol is:
   a. a North American agreement to reduce greenhouse gas emissions.
   b. a United Nations agreement to calculate greenhouse gas emissions.
   c. an international agreement to research greenhouse gas emissions.
   d. an international agreement to reduce greenhouse gas emissions. ( )

6. How is Canada doing with its Kyoto commitments?
    a. We've almost reached our promised reduction in greenhouse gas emissions.
    b. We're way behind– in fact our emissions have gone up substantially.
    c. We've withdrawn from the Kyoto Protocol, so it's no longer an issue.
    d. We've set a shining example for other nations in how to reduce greenhouse gas emissions.

( )

Section 3, Lesson B, Activity 2

Calculate Your Carbon Footprint

For this activity you will need access to the Internet. Please arrange for this before continuing.

The first step towards becoming carbon neutral is to determine your carbon footprint. Once you've determined this, you'll have a better sense of what you need to do to offset your impact on the environment.

There are many tools for calculating your carbon footprint. Go to the *Science and Technology 11 Companion Web Site* now and visit the links to some of these tools. Choose one of them and calculate your carbon footprint.

http://www.openschool.bc.ca/courses/science/scitech11/

Section 3, Lesson B, Activity 3

Choosing a Carbon Offset Investment

So, what did you find out about your carbon footprint? Is it large or small? How much do you need to invest in carbon reduction initiatives (i.e., carbon offsets) to become carbon neutral? The answer to these questions will vary from person to person.

Go back to the *Science and Technology 11 Companion Web Site* again. Visit some of the sites that encourage carbon offset investments. Which, if any of them, would you invest money in, and why?

http://www.openschool.bc.ca/courses/science/scitech11/

Section 3, Lesson C, Activity 1

Mountain Pine Beetle Animation

Go to your *Natural Resources CD* and watch *Mountain Pine Beetle Outbreak* (this is in the Ecology section). This animation shows how the beetle outbreak started quite small in the late 1990s but has grown dramatically since then. The projected spread of the beetle infestation in the future is also shown.

Notice the colours in the legend and what they indicate on the maps. The green in 1999 represents healthy pine forests in the province. From 2000 onward, the colours in these forests changes from green to pink and red, indicating up to thirty percent of the pine trees dying. As time continued brown and then greys appear. This indicates that up to one hundred percent of the trees are dying in a particular area due to the mountain pine beetle infestation.

Section 3, Lesson C, Activity 2

Mountain Pine Beetle Quiz

Choose the best answer for each question.

1. The main type of tree that the mountain pine beetle attacks is the:
    a. spruce
    b. poplar
    c. white pine
    d. lodgepole pine ( )

2. The term used to describe a major outbreak of the mountain pine beetle is:
    a. endemic
    b. epidemic
    c. devastation
    d. catastrophe ( )

3. The mountain pine beetle larvae feed on the _____ of the tree:
    a. phloem
    b. leaves
    c. bark
    d. sapwood ( )

4. Once female mountain pine beetles have successfully colonized a tree, how long does it usually take to kill that tree?
    a. immediately
    b. one to two months
    c. one season to one year
    d. one to two years ( )

5. Which of the following factors has NOT contributed to the mountain pine beetle epidemic?
    a. better control of forest fires
    b. fewer natural predators of the beetles
    c. global warming ( )

6. Flying above a forest, how can you tell that an area has a mountain pine beetle outbreak?
    a. The trees are black looking, like a burn after a forest fire.
    b. The trees are red from the needles changing colour as the tree dies.
    c. There are no branches left on the trees. ( )

7. What symptom on the outside of the tree indicates that it may be colonized by mountain pine beetles?
    a. Beetles swarming on the outside of the tree.
    b. Pitch tubes (sap dripping) and sawdust at the bottom of the tree.
    c. Blue trees from the blue stain fungus that travels on the beetle. ( )

Section 3 Assignment: Part 1

Climate Change

1. Many people think global warming and climate change are the same thing, but they're not. What's the difference between them?

2. In your own words, describe the greenhouse effect.

3. Lesson A describes many effects of global warming. Some have already occurred, others will happen in the future. Identify five of these effects.

4. Climate change is a serious, serious problem. Based on what you've learned, identify one group (business, industry, community, etc.) that may be negatively affected by climate change. Why will they be affected? What will the effects be? What will this group need to do to adapt?

Evaluation Guidelines	Marks
Question 1	5
Question 2	5
Question 3	5
Question 4	5
Total Marks	**/20**

Section 3 Assignment: Part 2

The Kyoto Protocol

1. The most important international initiative to fight climate change is the Kyoto Protocol. Summarize the intent of the Kyoto Protocol in 1-2 sentences.

2. Identify two positive effects of the Protocol, assuming it meets its goals.

3. Identify three negative effects of the Kyoto Protocol.

4. Is Canada honouring its Kyoto commitments? Explain your answer.

Evaluation Guidelines	Marks
Question 1	2
Question 2	2
Question 3	3
Question 4	3
Total Marks	**/10**

Section 3 Assignment: Part 3

Taking Action Against Climate Change

Many communities are taking steps to help fight climate change before it's too late. Read the following newspaper articles to learn what one community in northern BC is doing to reduce its carbon footprint.

SolarBC Program Launched in Dawson Creek

By Joei Warm, Northeast News Weekly, July 23, 2008 Volume 5 No. 30

DAWSON CREEK – The 100,000 Solar Roofs Program took a step forward last Thursday as $5 million in funding for SolarBC was announced in Dawson Creek. "It's the first phase of the big 100,000 Solar Roofs Program," said executive director Nitya Harris. SolarBC will run over the next three years and is intended to encourage the installation of solar hot water heaters in BC.

The 100,000 Solar Roofs program goal is to develop a strategy and action plan for installing 100,000 'Solar Roofs' by 2020 throughout BC and is sponsored by the Ministry of Environment and Ministry of Energy, Mines and Petroleum Resources.

The funding will support six SolarBC projects including: Residential Retrofit, Local Government Solar Thermal, First Nations Solar, Social Housing Solar, Solar for Schools and Solar Communities.

Five BC communities have the opportunity to be funded and designated as Solar Communities and Dawson Creek, in conjunction with West Moberly First Nation, has applied for that designation.

"We wanted to announce it (the SolarBC launch) in Dawson Creek because Dawson Creek has been a leader in British Columbia with solar energy," said [then Minister of the Ministry of Environment and Ministry of Energy, Mines and Petroleum Resources] Richard Neufeld.

The City Hall and Fire Hall now have solar hot water systems, and the RCMP, arenas, yards and the airport are scheduled next. The city has gathered an impressive number of awards over the last few years because of its commitment to sustainability and is now recognized nationally as an example of how it should be done.

"We know it will attract up to $20 million from other partners," said Neufeld. Training installers will be part of the SolarBC program and the whole package will in effect help "build and industry" for the province. There have been big changes in solar in the last few years said Harris. The whole idea of solar is gaining momentum and the province's funding supports their energy plan in a concrete way.

"The provincial goal is to get 90 per cent of its energy from clean sources across the province and solar is a clean source."

He noted that we are blessed in BC with the amount of electricity that comes from clean sources, nearly 90 per cent of it from water.

When asked if this kind of project could help alleviate the need for projects like Site C, he said it wouldn't. [Note to readers: as of 2008 Site C is a proposal for a new hydroelectric dam in Northern BC.]

"Solar and wind and all of those energies are important and we should use them but they're not going to replace what we need as good firm electricity across the province of British Columbia.

The SolarBC program is administered by the BC Sustainable Energy Association. For more information on the program, visit their website at www.solarbc.ca.

Partnering for Power

By Joei Warm, Northeast News Weekly, July 23, 2008 Volume 5 No. 30

DAWSON CREEK – A first of its kind partnership between West Moberly First Nation and the City of Dawson Creek reinforces the environmental leadership of this region says Chief Roland Wilson. Moreover, it helps change how people view First Nations.

"This is the leading edge of technology right now," said Wilson "First Nations have always been shown as running behind, getting in the way of progress."

The two have submitted a joint application to become one of five BC locations to be designated as a 'Solar Community'.

Each of the five successful applications will receive between $10,000 and $20,000 and assistance for marketing, training and solar policy development.

"It's about raising the visibility but it's also about what can we do what works for West Moberly, what can we learn from the experience and how do we take it to the next level," said Mayor Calvin Kruk.

Dawson Creek is a recognized leader in sustainable technology and has already demonstrated their commitment to visible support of solar hot water technology, one of the requirements of the application.

"West Moberly as far as I've known, we've always been a forward looking community and this partnership in solar energy just makes sense," said Wilson.

"If people figure out how to utilize it (the sun) and we start looking at other things like net metering and smart metering; if every house had a wind turbine and a solar panel sitting on it and houses generated their own energy and sold the rest back to the grid, we might be able to offset the need for Site C."

For Wilson, the elimination of a Site C option is one of the driving forces behind this partnership and as he pointed out, if people want to complain they need to be willing to come forward with solutions as well.

"It goes back to the same things: the reduction of impact on our environment, it goes to what kind of jobs and investment opportunities will be available, what training opportunities and ultimately if it saves taxpayers dollars and reduces our greenhouse gas we need to be encouraging that and seeing how far we can take it," said Kruk.

He is very optimistic that this partnership will be one of the five designated as a Solar Community at the Union of BC Municipalities convention in September. [Note: It was.]

1. What is Dawson Creek doing to become more sustainable and to reduce its carbon footprint?

2. If you lived in Dawson Creek, what effects might the SolarBC project have for you personally, economically, and environmentally?

Evaluation Guidelines	Marks
Question 1	5
Question 2	5
Total Marks	**/10**

Section 3 Assignment: Part 4

The Mountain Pine Beetle

Go to your *Natural Resources CD* and watch the video *British Columbia's Mountain Pine Beetle*. This is in the Ecology section. Answer these questions based on the video.

1. The lodgepole pine is an important economic resource for the province of British Columbia, providing _____ dollars in forest products each year.
    a. 7 million
    b. 7 billion
    c. 9 million
    d. 9 billion

2. Pine beetles, when under control, play an important role in the forest. Which of the following is NOT one of those positive roles?
    a. they make room for new trees to grow
    b. they make room for fungus to mature
    c. they kill old, diseased trees
    d. they kill young trees

3. Which of the following is NOT a cause of the current mountain pine beetle epidemic?
    a. effective forest fire management
    b. global warming
    c. a large number of young trees being planted
    d. none of the above

4. One of the few natural predator of the pine beetle is the _____.
    a. woodpecker
    b. owl
    c. magpie
    d. grizzly bear

5. Pine trees produce _____ to try to protect themselves from a beetle attack.
    a. pheromones
    b. poison
    c. pitch
    d. bark

6. Adult female beetles lay their eggs in long tunnels called
    a. pitch tubes
    b. beetle shafts
    c. girdles
    d. galleries

7. Young beetles eat their way around this layer of the tree.
    a. cambium
    b. xylem
    c. psylium
    d. phloem

8. When beetles bore into the tree, they also carry with them a _____, which also helps to kill the tree.
    a. fungus
    b. virus
    c. bacteria
    d. parasite

9. Which of the following is NOT a technology being used to control the outbreak where there are only a few infested trees?
    a. bark removal
    b. cut and burn
    c. tree removal
    d. none of the above

10. How will the removed beetle kill trees help BC's economy at first?
    a. More forestry jobs
    b. More wood products for sale
    c. a and b
    d. None of the above

Evaluation Guidelines	Marks
Multiple Choice Questions	10
Total Marks	**/10**

Section 3 Assignment: Part 5

Reflective Paragraph

The mountain pine beetle epidemic is affecting many parts of BC's economy. This includes tourism. As forests die, much of the natural beauty of our province that is so attractive to tourists dies with it.

Imagine you are a representative from the tourism industry in the interior of BC. Write a reflective paragraph on how your industry and the forest ecosystem are affected by the beetle-killed forests. Apply what you have learned about the pine beetle epidemic to answer the following questions in your paragraph:

- What are some concerns?
- What do you expect to happen in future years for your industry in the areas affected by the infestation? At best? At worst?
- What hazards might you be worried about?
- How has the beetle impacted the environment in your area?
- What technologies can you recommend to solve the problem of beetle kill in provincial parks?

Write a paragraph about this. Your writing is personal and opinions will vary. However make sure you have a clear introduction and that you have answered the questions in your writing using solid support from the lesson content. End with a clear, strong concluding sentence.

Evaluation Guidelines	Marks
Section 3 – Reflective Paragraph	5
Total Marks	**/5**

Section 4 Assignment: Part 1

Video Analyses

In this assignment you'll be watching several videos on the impact of technologies on the environment. Background information for each video is provided. Read each backgrounder then watch the video. The videos are on your *Natural Resources CD* in the section called *Technological Impact*. Complete the questions provided when you're ready.

Video 1: Fraser Valley Smog Hurting Crops

The Fraser Valley is one of BC's most important agricultural regions. But every year, crops are getting smaller. For years, scientists suspected that the cause was greenhouse emissions from cars and factories. Research is now confirming this. GHG emissions are blanketing the Fraser Valley in a layer of smog, which, in turn is stunting crop growth. The agricultural production lost to smog damage each year is estimated at several million dollars.

Watch the video *Fraser Valley Smog Hurting Crops* now. Answer the following questions based on what you've learned.

1. What is smog? What causes it, and what negative effects does it have? (2 marks)

2. How did scientists simulate the ground-level ozone in initial testing procedures? (2 marks)

3. What damage has been noted to specific crops in the Fraser Valley? (2 marks)

4. Describe the methods used to measure ground-level ozone in the Fraser Valley. (4 marks)

5. What factors have influenced the development of ozone in this specific locale? (2 marks)

6. In the video it is stated "injuries to plants are 'invisible'". Explain this statement. (2 marks)

7. Sunlight has two key effects that are linked – the growth of plants and ozone production. Why is this an "unkind" linking? (2 marks)

8. What is the cost of the loss of crop production to the Fraser Valley's agricultural production? (1 mark)

9. The video begins with a comment about driving to pick up the groceries and the effect this might have on vegetables. This introductory statement is to catch our attention to the issue. What is the issue? How are we contributing to the effects of global warming? What can be done at the individual, family and community levels to alleviate the situation? (3 marks)

Video 2: Bioremediation

In 1985, Canadian scientists discovered that adding fertilizer to an oil slicked beach helped break down the oil more quickly than nature could do on its own. This same strategy (known as bioremediation) was used four years later when the *Exxon Valdez* hit a reef off the coast of Alaska. The tanker spilled over 40 million litres of oil into the waters of Prince William Sound. Thousands of sea birds, otters, salmon, and other forms of marine life were killed. The introduction of fertilizer to the water and shore areas encouraged the growth of bacteria that eventually helped break down the oil.

Canadian scientists were curious to know if this same bioremediation strategy would work in wetlands and salt marshes as well. In 2002, scientists intentionally spilled oil in a controlled area off the coast of Nova Scotia then tested different ways to treat it. In this video you'll learn more about the methods these scientists used, and what they found out.

Watch the video *Bioremediation* now. Answer the following questions based on what you've learned.

1. In your own words, define the term "bioremediation." (1 mark)

2. In this study, scientists divided the area into several experimental plots. Each of them was subjected to different conditions. Why was this done? (1 mark)

3. Why did the scientists add fertilizer to some of the plots? What benefit did they think this would have? (1 mark)

4. Why did the scientists cut the plants down after they grew? (1 mark)

5. Why did the scientists regularly till one of the plots? (1 mark)

6. Why was one plot oiled and left undisturbed? (1 mark)

7. A scientific experiment involves testing different variables under controlled conditions, observing what happens, and determining cause-effect relationships between the variables. Explain what makes the Nova Scotia study a sound scientific experiment. (4 marks)

Video 3: Experimental Mines

Natural Resources Canada's Experimental Mine in Val-d'Or Quebec is a one-of-a-kind facility. This former working mine is now dedicated to developing and testing safe, cost-effective mining equipment. One of those pieces of equipment is a new kind of drill for blasting away at the rock.

Watch the video *Experimental Mines* now. Answer the following questions based on what you've learned.

1. How is this drill different from the conventional drill used in most mines? (1 mark)

2. Identify four advantages the Candrill has over conventional mining drills. (4 marks)

Video 4: Hibernia Drill Wastes

300 kilometres off the east coast of Newfoundland is the world's largest oil drilling platform, known as *Hibernia*. So far, over 50 oil wells have been drilled from the *Hibernia* platform. These wells are drilled deep into the ocean floor below.

Hibernia, and other platforms like it, is bringing oil and gas revenues to eastern Canada. But with economic benefits comes environmental concern. Government researchers are worried that the mud from all this drilling will have a negative effect on sea life in the surrounding area. To test this hypothesis, researchers have taken to the deep sea to study scallops near the platform.

Watch the video *Hibernia Drill Wastes* now. Answer the following questions based on what you've learned.

1. What makes scallops a good species to study? (2 marks)

2. What negative effects is exposure to the drilling wastes having on the scallops? Give three answers. (3 marks)

3. Well into the 20th century, coal miners would take canaries with them into coal mines. If the canaries became ill or died, the miners knew it wasn't safe to be in the mine. In the Hibernia video, Dr. Cranford wonders if the scallops could act like canaries in coal mines. What do you think this means? (2 marks)

4. Explain the design and testing equipment that scientists used in order to understand the effects of drilling waste. (3 marks)

Evaluation Guidelines	Marks
Video 1: Fraser Valley Smog Hurting Crops	24
Video 2: Bioremediation	10
Video 3: Experimental Mines	6
Video 4: Hibernia Drill Wastes	10
Total Marks	**/50**

Section 4 Assignment: Part 2

Reflective Paragraph

Congratulations on reaching the end of the *Natural Resources and the Environment* module...almost. There's one last assignment to go!

For your final task you're to reflect back on the key points you've learned in this module. The following are some of the key concepts that have been covered:

- what the major resources are in BC and how they've been used or misused in history
- the importance of sustainability
- the need for effective management of our natural resources
- changes to our environment due to human activities
- the impact on the environment of technologies used to extract those natural resources

In one or two well thought-out paragraphs, explain what you've learned about these very important concepts. What do you now know about natural resources and the environment that you didn't know before taking this module? And more importantly, what impact (if any) will this knowledge have on how you live your life in the future? Are you more passionate now about living a green, environmentally friendly life, and if so why? These are just some of the questions you may choose to address in your response.

Of course it's important to touch on specific content from the module. But even more important than factual content is how you apply it to your life. Your instructor will be looking to see how all this knowledge has affected you, and what you have gained from this module. Give this task some thought then put your best effort into it!

Evaluation Guidelines	Marks
Section 4 – Reflective Paragraph	10
Total Marks	**/10**