

Topic 5
**Greenhouse Gas
Emissions**

(1–2 lessons)



This lesson focuses on the greenhouse gases emitted by vehicles. Students will learn about greenhouse gases, discover how to correlate fuel economy with CO₂ emissions, and will conduct an experiment and answer questions about the greenhouse gases emitted by automobiles. They will choose a writing activity from a number of follow-up writing alternatives. Some of the academic tasks are: hypothesizing, expressing reasons and explanations,

describing developments and changes, writing instructions, drawing conclusions, presenting and discussing results, evaluating, defining terms, comparing and contrasting, asking questions, selecting relevant points, skimming and scanning, listening for specific information, and following instructions.

Outcomes

SLO 1.1 Engage with increasingly difficult oral and/or visual texts...

SLO 1.2 Respond to texts with increasing independence...

SLO 2.1.3 Use developing control of grammatical features...

SLO 2.1.4 Refine pronunciation to increase intelligibility...

SLO 2.2 Use several visual techniques...

SLO 4.5 Experience and consider academic texts...

SLO 6.1.1 Use advanced organization...

SLO 6.1.5 Use selective attention...

SLO 6.2.7 Use elaboration...

SLO 6.2.8 Use imagery in the form of mental or actual pictures...

SLO 6.2.9 Use summarization...

SLO 6.2.12 Use inferencing to guess the meanings...

SLO 6.3.1 Use questioning for clarification...

SLO 6.3.2 Use co-operation...

Instructional and Learning Sequence

Sequence 1

Activation

First, ask groups of four students to create a Word Splash that visually presents what they know about greenhouse gases. They can use graffiti-type writing and different colours that symbolically go with their words. As a class, look at the Word Splashes. Compare, contrast, and discuss.

Next, present students with **Handout 2-32**: “Greenhouse Gases: Background Information” (if you have visuals, use them at this stage). Ask: why is this a good article for using skimming and scanning? (*Title and subtitles help the reader predict the content of these sections.*) Students work in their quads, using skimming to get a feel for the organization of the article, and then scanning to answer the focus questions in **Handout 2-33**: “Focus Questions: Greenhouse Gases.”

Have students meet as a class to discuss and share their answers. Extend the discussion to ask students about how they contribute personally to the emission of greenhouse gases. To see how much carbon dioxide they produce, they can visit the American Forests website <www.americanforests.org> and click on “Personal Climate Change Calculator.” Remind them of the “Blowing Up Your World” activity from Topic 2A.

Language Features

Vocabulary

symbols for and names of greenhouse gases; acronyms for titles of organizations

Structures

Imperative verbs used in the questions: define, determine, explain, identify, suggest how, explore, contrast, hypothesize, list, place. These verbs occur in questions across the curriculum and are important for students to understand.

comparative and superlative forms, and use of definite article with superlatives in Handout 1

Student Learning Tasks

Assignment

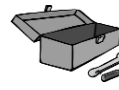
In groups of four, create a Word Splash that visually presents what you know about greenhouse gases. Use graffiti-type writing and different colours that symbolically go with your words. (G)

Look at the Word Splashes. Compare, contrast, and discuss. (C)

Use skimming to get a feel for the organization of the article, and then scanning to answer the focus questions in **Handout 2-33**: “Focus Questions: Greenhouse Gases.” (G) As a class, discuss and share answers. (C)

See how much carbon dioxide you produce by visiting the American Forests website <www.americanforests.org/> and clicking on “Personal Climate Change Calculator.”

Teacher Notes and References



Handout 2-32: “Greenhouse Gases: Background Information”

Handout 2-33: “Focus Questions: Greenhouse Gases”

Optional Website: American Forests at: <www.americanforests.org>

You may want to find graphs, visuals, or statistics about the effects of greenhouse gases to use as visual stimulators in the activation. The background material is provided.



Handout 2-33 includes a list of focus questions. You may choose to create others, based on the needs of students. These are only suggestions. The format of the article is appropriate for skimming and scanning.

Outcomes

SLO 1.1 Engage with increasingly difficult oral and/or visual texts...

SLO 1.2 Respond to texts with increasing independence...

SLO 2.1.3 Use developing control of grammatical features...

SLO 6.2.5 Use deduction and induction ...

SLO 6.2.12 Use inferencing to guess the meanings...

SLO 6.3.1 Use questioning for clarification...

SLO 6.3.2 Use co-operation...

SLO 1.1 Engage with increasingly difficult oral and/or visual texts...

SLO 1.3 Develop and express a personal position in a variety of ways...

SLO 2.1.3 Use developing control of grammatical features...

SLO 4.1 Use language to encourage...

SLO 6.3.1 Use questioning for clarification...

SLO 6.2.12 Use inferencing to guess the meanings...

SLO 6.2.7 Use elaboration...

SLO 6.3.2 Use co-operation...

Instructional and Learning Sequence

Sequence 2

Preparation for Main Activity

Step 1: Focus students’ attention on personal vehicles, such as cars, pick-up trucks, sport-utility vehicles (SUVs), and vans, as sources of anthropogenic greenhouse gases such as carbon dioxide (CO₂). Distribute **Handout 2-34:** “Investigating the Carbon Dioxide Emissions of Automobiles.” Review the parts of the activity with the students. Together, have students read over the following sections of the activity: Background Material, Problem, Materials, and Hypothesis.

Ask students to hypothesize: Which type of vehicles are the biggest sources of CO₂? Is the amount of CO₂ they produce linked to certain characteristics of the vehicles such as engine size, fuel consumption, or type of transmission (manual or automatic)? Record different hypotheses.

Ask students how they could test their hypotheses. (*various answers*)

Step 2: Divide the class into an appropriate number of dyads. Have each group reach a consensus about the hypothesis they would like to test. Under the appropriate section of the activity, have students record their hypotheses and explain the reasoning behind them. Select a variety of vehicles (the same number as your number of groups). Try to choose different models, makes, years, and types of vehicles.

Language Features

Vocabulary

anthropogenic, fuel consumption, hypothesis

Discourse Features

format of a report

Structures

irregular plural formation of some scientific terms: hypothesis~hypotheses, datum~data, etc.

Student Learning Tasks

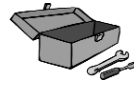
Read over the following sections of **Handout 2-34**: “Investigating the Carbon Dioxide Emissions of Automobiles”: Background Material, Problem, Materials, and Hypothesis. (C)

Hypothesize: Which cars are the biggest sources of annual CO₂ production? Is the amount of CO₂ they produce linked to certain characteristics of the vehicles such as engine size, fuel consumption, or type of transmission (manual or automatic)? Record your hypotheses. (C)

In dyads, reach a consensus about the hypothesis you would like to test.

Record your hypotheses and explain the reasoning behind them.

Select a particular type of vehicle that you would like to research.

Teacher Notes and References

Handout 2-34: “Investigating the Carbon Dioxide Emissions of Automobiles”

Outcomes

- SLO 1.1 Engage with increasingly difficult texts...
- SLO 1.2 Respond to texts with increasing independence...
- SLO 2.1.3 Use developing control of...features...
- SLO 3.2 Develop and implement a plan...
- SLO 4.2 Communicate effectively to work with others...
- SLO 4.4 Manage group action...
- SLO 4.6 Respond to and critique...perspectives...
- SLO 4.7 Use the English language to participate...
- SLO 6.3.2 Use co-operation...
- SLO 6.1.5 Use selective attention...
- SLO 6.1.7 Use problem identification...
- SLO 6.2.7 Use elaboration...
- SLO 6.2.11 Use transfer...
- SLO 6.3.1 Use questioning for clarification...
- SLO 6.3.2 Use co-operation...

Instructional and Learning Sequence

Main Activity

Introduce students to the Natural Resources Canada Fuel Consumption Ratings. (See Teacher Notes and References column.)

Students will require some time to become familiar with how to enter data to get the results they need. For instance, search results can sort vehicles according to model, fuel efficiency, or CO₂ emissions per year (with average driving habits). As an alternative, a complete guide can be downloaded and printed off for later use by students. This option will be very effective in instances where access to the Internet is limited by time or circumstances.

When the procedures are understood, have the students proceed with the activity in the dyads formed earlier. On returning to class, have a short discussion regarding their results.

Which hypotheses were supported by the research into CO₂ emissions? Were any of the hypotheses NOT supported by the data? Can you come up with any explanations as to why some of your initial ideas were not correct?

Have students research the fuel economy of the vehicle they have chosen by submitting its data to the website <www.fueleconomy.org>. This is in order to answer Part B questions in the Conclusions section of **Handout 2-34: "Investigating the Carbon Dioxide Emissions of Automobiles."**

Language Features

Vocabulary

carbon dioxide, emissions, fuel consumption ratings, greenhouse gases

Structures

- imperative verbs
- prepositions
- comparative and superlative forms
- listening for imperative verbs and prepositions

Student Learning Tasks

After completing the activity, discuss the results.

In dyads research the fuel economy of vehicles you have chosen by submitting its data to the website <www.fueleconomy.org>. Answer Part B questions in the conclusions section of the report (**Handout 2-34**: “Investigating the Carbon Dioxide Emissions of Automobiles”).

Teacher Notes and References

Handout 2-34: “Investigating the Carbon Dioxide Emissions of Automobiles”

Internet Resources:

Natural Resources Canada Fuel Consumption Ratings information on emissions from a wide variety of vehicles, can be accessed online at:

<<http://oee.nrcan.gc.ca/transportation/tools/fuelratings/ratings-results.cfm>>.

There, you can select the make, model, and year of the vehicle and bring up information on fuel consumption and CO₂ emissions in kilograms per year (kg/yr.) under average Canadian driving conditions.

See the complete emissions guide at:

<<http://oee.nrcan.gc.ca/transportation/tools/fuelratings/fuel-consumption-guide-2006.pdf>>.

The fuel economy of different vehicles can be compared at: <www.fueleconomy.org>.

Outcomes	Instructional and Learning Sequence
----------	-------------------------------------

- SLO 1.1** Engage with increasingly difficult oral and/or visual texts...
- SLO 1.2** Respond to texts with increasing independence...
- SLO 1.3** Develop and express a personal position...
- SLO 1.4** Show an awareness of organizational patterns...
- SLO 2.1.1** Analyze and edit texts...
- SLO 2.1.2** Use standard Canadian spelling...
- SLO 2.1.3** Use developing control...
- SLO 2.3** Produce a variety of short and extended text forms...
- SLO 2.3.1** Use the structures and language features...
- SLO 4.3** Use clear and respectful language...
- SLO 6.1.5** Use selective attention...
- SLO 6.1.8** Use self-evaluation to check...
- SLO 6.2.7** Use elaboration...
- SLO 6.2.9** Use summarization...

Writing Activities

Have each set of partners discuss the observation questions, then answer them individually using complete sentences and short paragraphs. Next, they should use the answers to the questions to help them formulate their conclusions. Questions 1 and 2 of the “Conclusions” section will require short paragraph answers and question 5 will require a longer answer. Ask students to use at least five new vocabulary words in these answers.

Language Features	Vocabulary
	emit, pollutants, concentration, investigation, in common
	Structures
	comparative and superlative forms, active and passive voice, appropriate use of tense in writing activities
	Discourse Features
	using the wording in questions to help formulate declarative sentences

Roundup

Have students create another Word Splash, individually this time, to show what they have learned about the human impact on global warming as a result of this lesson.

OR

Have students think about their own city or country of origin and predict what they think the effects of global warming will be for this particular area.



Student Learning Tasks**Teacher Notes and References****Assignment**

- a) Discuss the observation questions with a partner. **(P)**
- b) Answer questions individually using complete sentences and short paragraphs. **(I)**
- c) Use the answers to the questions to help formulate your conclusions. Questions 1 and 2 of the “Conclusions” require short paragraph answers and question 5 requires a longer answer. Use at least five new vocabulary words in these answers.

Assignment

Create another Word Splash to show what you have learned about the human impact on global warming as a result of this lesson. **(I)**

Greenhouse Gases: Background Information

Greenhouse gases are any gases that absorb infrared radiation and then emit that stored energy as heat. By trapping infrared radiation they contribute to warming of the atmosphere through a process known as the greenhouse effect.

1. Water Vapour (H₂O)

Water vapour is the largest contributor to the greenhouse effect. The amount of water vapour in the atmosphere is determined primarily by the water cycle rather than by human activity. Water evaporates from the surface. Eventually this water condenses and returns to the surface as precipitation. Once global warming begins to occur the amount of water vapour becomes subject to a positive feedback effect. The warmer the air gets the more water vapour it can hold and the more evaporation will occur.

2. Carbon Dioxide (CO₂)

Carbon dioxide is responsible for a majority (60%) of the anthropogenic greenhouse effect due to human activity. A small amount of carbon dioxide exists naturally in the atmosphere about 0.035% of all gases in the atmosphere. Humans also produce a lot of carbon dioxide. The United States produces the most on a per capita basis (over two tons per person annually). Visit the American Forests

website if you want to know how much carbon dioxide you produce. To some extent the amount of carbon dioxide in the atmosphere is determined by the carbon cycle. The oceans and plants absorb some carbon dioxide, but human activity produces it faster than it can be absorbed. Carbon dioxide may last 50 to 200 years in the atmosphere before being “scrubbed out” through rainfall as weak carbonic acid.

Sources

- **Fossil Fuel combustion:** The burning of fossil fuels (coal, oil, and natural gas) is the largest single source of greenhouse gases from human activity. Coal produces the most carbon dioxide of all the fossil fuels.
- **Deforestation:** Deforestation is the second largest source of greenhouse gases due to human activity. Destruction of the forests can release the carbon stored in trees if they are burned up. If trees are not replanted they cannot absorb carbon dioxide in the future.
- **Cement manufacturing:** Carbon dioxide is produced during the manufacture of cement. When lime (CaCO₃), an ingredient in cement, is heated carbon dioxide is released into the air. *(continued)*



Copyright 1998 Woodrow Wilson Environmental Science Institute. <www.woodrow.org/teachers/esi/1998/p/ghgases/background.htm>. Permission granted to reproduce materials for educational use.

Greenhouse Gases: Background Information (continued)

3. Methane (CH₄)

Methane, a hydrocarbon also known as natural gas, is used as a fuel in homes and industry.

Sources

- **Livestock:** Livestock produce methane through the process of “enteric fermentation” of food in their digestive tract, and through their manure. Cattle are the greatest source of methane through these processes, followed by swine.
- **Agriculture:** The main source of methane in agriculture is flooded rice paddies where microorganisms and bacteria decompose anaerobically in the soil.
- **Waste Dumps:** The anaerobic decomposition of wastes in land fills and dumps results in methane. Sometimes the methane is collected and used as a fuel.
- **Coal Mining and Natural Gas Production:** Methane can leak when coal is mined. Sometimes it leaks or is deliberately vented during natural gas production.
- **Wetlands:** The microorganisms and bacteria in wetlands create methane when they decompose anaerobically in the soil.

4. Other Greenhouse Gases

- **Nitrous Oxide (N₂O):** This greenhouse gas enters the atmosphere from fertilizers used in agriculture, and from automobile exhaust.
- **Chlorofluorocarbons (CFCs):** A very potent greenhouse gas. It is used as a propellant in aerosol cans, in creating foam plastics, coolant in refrigerators and air conditioners, as a solvent in cleaners, and as an ingredient in fire extinguisher materials. Because it destroys ozone, which is also a greenhouse gas, some of its contributions to the greenhouse effect are balanced out. Recently the levels of CFCs in the atmosphere have stabilized thanks to the Montreal Protocol of 1987 which restricts their use.
- **Ozone (O₃):** This much publicized gas is known more for its ability to block harmful ultra-violet radiation than its ability to absorb infrared rays, but is nonetheless a greenhouse gas. The amount of ozone is declining in the upper atmosphere but is found in increasing amounts near the earth’s surface as a pollutant.



Focus Questions: Greenhouse Gases

Work together to answer the following questions in point form:

1. Define greenhouse gases.

2. Determine which gas is the largest contributor to the greenhouse effect. Explain how it contributes to a natural warming of Earth.

3. Identify the sources of CO₂ that contribute to the anthropogenic component of the greenhouse effect.

4. Suggest how livestock add to the greenhouse effect.

5. Contrast the contribution of CFCs to global warming to that of high atmosphere ozone loss.

6. Contrast the present concentration of greenhouse gases with the pre-industrial concentration. Hypothesize about why these specific changes have occurred.

Investigating the Carbon Dioxide Emissions of Automobiles

Background Information: (Summary) Today humans release around 5 billion tonnes of carbon to the atmosphere every year through fossil burning and cement manufacture. Approximately another 1.36 billion tonnes per year are released through land use changes such as deforestation. These releases result in another increase of atmospheric CO₂ about 1% per year. This increase is the most plausible explanation for the warming trend we have seen since the mid-19th century.



Problem: Ask students to hypothesize: Which type of vehicles are the biggest sources of CO₂ emissions? Is the amount of CO₂ they produce linked to certain characteristics of the vehicles, such as engine size, fuel consumption, or type of transmission (manual or automatic)? Record different hypotheses.

Hypothesis: Before doing the experiment, make an educated guess about the outcome.

Briefly explain the reasoning behind your hypothesis.

Investigating the Sources of Greenhouse Gases Observations:

- 1. **Determine and explain** whether the cars that emit the highest level of CO₂ have anything in common.

- 2. **Determine and explain** whether the cars that emit the lowest level of CO₂ have anything in common.

- 3. a. **Name** the type and year of automobile that emitted the highest level of CO₂ (of those you chose to investigate).

(continued)

Copyright 1998 Woodrow Wilson Environmental Science Institute. Adapted from <www.woodrow.org/teachers/esi/1998/p/humansources/sourceslab-student.htm>. Permission granted to reproduce materials for educational use.

Investigating the Carbon Dioxide Emissions of Automobiles (continued)

b. The lowest?

4. Verify whether the automobile with the largest engine displacement also has the greatest CO₂ emissions.

5. Describe your level of confidence in the accuracy of this data.

6. Suggest a better way, if there is one, to do this investigation.

7. List and explain our sources of experimental error (if any).

(continued)

Investigating the Carbon Dioxide Emissions of Automobiles (continued)**Conclusions:****Part A:**

1. Was your hypothesis supported by this experiment? **Explain** why or why not.

2. **Suggest** ways that Canada can encourage people to drive less or use more efficient means of transportation as a way to reduce greenhouse gas emissions such as carbon dioxide.

Part B:

1. **Calculate** how many km your chosen car can go on 1ℓ of gasoline based on the data at <www.fueleconomy.org>.
2. **Given that** 10 kg of CO₂ are produced per 4ℓ of gasoline consumed, how many kg of CO₂ did your car produce from one tank of gas?
3. **Calculate** how many kg of CO₂ your car would produce in a year if you travel 300 kilometres per week.

(continued)



**Topic 6
Endangered
Species**

(2 lessons)

In this lesson, students will take notes from texts and oral presentations, view for information, conduct Mind Map research, organize and summarize information on a simple topic, analyze the use of language to hedge predictions, and write a letter or email in support of a cause. At the same

time, they will become familiar with some Canadian wildlife and the issue of biological diversity.

Outcomes

- SLO 4.1 Use language to encourage...
 - SLO 5.1 Identify common themes and symbols...
 - SLO 6.2.7 Use elaboration...
 - SLO 6.3.2 Use co-operation...
-
- SLO 1.5 Examine and interpret various visual media...
 - SLO 6.1.3 Use directed attention...
 - SLO 6.1.6 Use self-monitoring to check...
 - SLO 6.2.8 Use imagery in the form of mental or actual pictures...

Instructional and Learning Sequence

Sequence 1

Activation

Identify pictures of various Canadian animals, including several endangered species. Note the endangered ones.

Discuss the term “biological diversity.” Note that it includes plants and insects as well as animals. Have students name species at risk in their countries of origin.

Language Features	Vocabulary
	animal names, biological diversity, species, wildlife, extinct, extirpated, endangered, threatened, potential Note: In this lesson, “endangered” refers to threatened, extirpated, and endangered.

Optional: Have students view one of the *Hinterland Who’s Who* videos. View first without sound, then let students predict the subtopics and vocabulary that might be included in this short description of an animal. View again with sound to verify predictions.

Language Features	Vocabulary
	animal names, habitat, range, breed, mate, range, dwindling, exploitation, native vs. exotic, alter, disturb, decline, conservation, ecosystem, replenish, be aware of
	Discourse Features
	organization of a short documentary (listening)
	Academic Language Functions
	predicting listening for main ideas

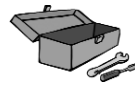
Student Learning Tasks

Discuss the term “biological diversity.” Name species at risk in your country of origin. (C)

Assignment

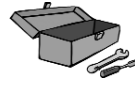
View video without sound to predict the subtopics and vocabulary that might be included in this short description of an animal. View again with sound to verify predictions.

Teacher Notes and References



Visuals from Canadian Wildlife Service at:

<<http://collections.ic.gc.ca/environmental/environment/g-endangered.html>>



Hinterland Who's Who videos are available for download at <www.hww.ca/index_e.asp>.



These videos are approximately one minute long. The picture quality is better viewed on an individual computer, but can be used with a projector. The sound quality is good.

This is an updated version of the CBC series familiar to many Canadians. The website has many additional lesson plans and resources that can be easily adapted for EAL.

Outcomes

SLO 1.2 Respond to texts with increasing independence...

SLO 1.4 Show an awareness of organizational patterns...

SLO 2.2 Use several visual techniques...

SLO 6.2.5 Use deduction and induction...

SLO 6.2.7 Use elaboration...

SLO 6.2.8 Use imagery in the form of mental or actual pictures...

SLO 1.1 Engage with increasingly difficult oral and/or visual texts...

SLO 1.4 Show an awareness of organizational patterns...

SLO 2.1 Show sufficient control over linguistic structures...

SLO 3.1 Seek, organize, and synthesize information...

SLO 6.1.5 Use selective attention...

SLO 6.2.1 Use resourcing to access...

SLO 6.2.4 Use note taking...

Instructional and Learning Sequence

Brainstorm: Why protect species at risk? What are the threats to biodiversity?

If students don't have any ideas, refer them to the World Resources Institute website. Note that this is a special interest group. Besides reading the introduction to the topic of biodiversity, examine the layout, topics, and possible bias. Ask the students what a reader would expect to find at this website.

Sequence 2

Have students select a species at risk in Canada and examine its fact sheet on the website. Scan for the following information:

- Species/Description (name and appearance)
- Range (distribution)
- Habitat Requirements (characteristics)
- Endangered Potential (threats to survival)
- Conservation (protection/management measures)

Individually or in a group, have students choose one species and research from the available information. Then record essential information using a T-List or Cornell notes.

Language Features

Vocabulary

words related to animals' physical characteristics and behaviour; height, length, weight

Discourse Features

Note taking: omission of "small" words

Student Learning Tasks

Brainstorm the Questions:

Why protect species at risk? What are the threats to biodiversity? **(C)**

If needed, look at the World Resources Institute website on biodiversity.

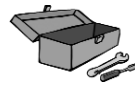
Assignment

Individually or in a group, select a species at risk in Canada and examine its fact sheet on the website. Scan for the following information:

- Species/Description (name and appearance)
- Range (distribution)
- Habitat Requirements (characteristics)
- Endangered Potential (threats to survival)

Record essential information using a T-List or Cornell notes. **(I)**
(G)

Teacher Notes and References



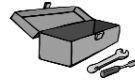
World Resources Institute
“Biodiversity and Protected
Areas” at:

<www.wri.org/biodiv/cwb-iii.html>



Try a Mind Map, placing
“threats to biological diversity”
in the middle and using the six
questions (5 Ws and H) as

spokes, or use a cause/effect organizer.



Publications on species at risk
at: <[www.speciesatrisk.gc.ca/
publications/ default_e.cfm](http://www.speciesatrisk.gc.ca/publications/default_e.cfm)>

Outcomes	Instructional and Learning Sequence
----------	-------------------------------------

- SLO 2.3.1 Use the structures and language features...
- SLO 6.2.9 Use summarization...
- SLO 6.2.13 Use recombination...

Writing Task

Collect the fact sheets. Then have students use their notes to write one or two paragraphs summarizing the description of the animal, the problem, and any possible solutions.

Language Features	Structures
	order of adjectives sentence combining
	Academic Language Functions
summarizing	

- SLO 1.1 Engage with increasingly difficult oral and/or visual texts...
- SLO 1.5 Examine and interpret various visual media...
- SLO 2.1 Show sufficient control over linguistic structures...
- SLO 2.1.4 Refine pronunciation to increase intelligibility...
- SLO 6.1.5 Use selective attention...
- SLO 6.1.6 Use self-monitoring to check...
- SLO 6.1.7 Use problem identification...
- SLO 6.1.8 Use self-evaluation to check...
- SLO 6.2.8 Use imagery in the form of mental or actual pictures...
- SLO 6.3.1 Use questioning for clarification...
- SLO 6.3.2 Use co-operation...

Optional Listening/Speaking: Distribute the list of species at risk and let students read their descriptions to the class or in small groups, while the other students attempt to identify the animal from the list.

OR

View one or more of the *Hinterland Who's Who* videos, using the dictogloss strategy. Ask students to compare their version with the printed transcripts.

Student Learning Tasks**Teacher Notes and References**

Read your descriptions to the class or in small groups, while the other students attempt to identify the animal from the list. **(G) (C)**

OR

View one or more of the *Hinterland Who's Who* videos and compare your version with the printed transcripts.

Assignment

Use your notes to write one or two paragraphs summarizing the description of the animal, the problem, and any possible solutions. **(I)**



For information of the dictogloss technique, see “Teaching and Learning EAL in the Senior Years” in the Appendices of this document.

Outcomes	Instructional and Learning Sequence
----------	-------------------------------------

- SLO 2.2** Use several visual techniques...
- SLO 2.3.3** Produce effective oral presentations.
- SLO 2.4** Use the steps of the writing process...
- SLO 3.2** Develop and implement a plan for researching...
- SLO 6.1.4** Use functional planning...
- SLO 6.2.1** Use resourcing to access...
- SLO 6.2.2** Use repetition to imitate a language model...
- SLO 6.2.7** Use elaboration...
- SLO 6.2.8** Use imagery in the form of mental or actual pictures...
- SLO 6.2.12** Use inferencing to guess the meanings...

Optional Presentation

Ask students to research a species at risk in their country of origin or elsewhere and present their findings to the class with the aid of a computer or poster presentation, using the outline from the beginning of the lesson as a structure.

Discuss: From researching these animals, what do you think are the biggest challenges facing Canadian (or world) wildlife? What can individuals and governments do to protect biological diversity?

Language Features	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Discourse Features</td> </tr> <tr> <td style="padding: 5px;">parallel structure in point form (for presentation)</td> </tr> </table>	Discourse Features	parallel structure in point form (for presentation)
Discourse Features			
parallel structure in point form (for presentation)			

Student Learning Tasks**Assignment**

Research a species at risk in your country of origin or elsewhere and present your findings to the class with the aid of a computer or poster presentation, using the outline from the beginning of the lesson as a structure.

Discuss: What do you think are the biggest challenges facing Canadian (or world) wildlife? What can individuals and governments do to protect biological diversity? **(I) (C)**

Teacher Notes and References

Websites, magazines, or books addressing species at risk (teacher-provided)



This can work well with a multi-level class; vary the degree of scaffolding for students. It can become the focal experience for the topic.

Outcomes

SLO 1.1 Engage with increasingly difficult oral and/or visual texts...

SLO 1.2 Respond to texts with increasing independence...

SLO 1.4 Show an awareness of organizational patterns...

SLO 1.6 Interpret a range of texts...

SLO 2.3 Produce a variety of short and extended text forms...

SLO 2.4 Use the steps of the writing process...

SLO 6.1.1 Use advanced organization...

SLO 6.1.5 Use selective attention...

SLO 6.1.6 Use self-monitoring to check...

SLO 6.2.2 Use repetition to imitate a language model...

SLO 6.2.4 Use note taking...

SLO 6.2.12 Use inferencing to guess the meanings...

Instructional and Learning Sequence

Sequence 3

Introduce **Handout 1: “Climate Change and Wildlife.”**

Read the first two paragraphs together and identify the main idea, source, intended audience, and purpose for writing. Predict the contents of the article. Note the use of future “will,” implying certainty in the first paragraphs. Watch for hedging terms in subsequent development. Ask students to continue to read independently, underlining every use of the future tense and hedging strategies.

Post-reading question: How does the article temper the initial predictions?

OR

Students can practise hedging strategies by imagining a different scenario: If global cooling occurs, what would be the effect on warmer countries? (speaking or writing)

Language Features

Vocabulary

adapt, hardest hit, shift, tundra, boreal, vulnerable, scenario, exacerbate, irreversibly, reproductive capacity, incubating

From AWL: abandon, adapt, affect, altered area, available, capacities, create, despite, displaced, diversity, emergence, energy, enhance, erosion, global, impact, individuals, isolated, layers, migration, physically, predict, primary, projected, ranges, react, region, regions, rely, require, restricted, scenarios, shift, significantly, source, virtually

Discourse Features

passive structures for distancing

language of prediction and various hedging strategies (is expected to, could be, if predictions of... come true, increase the likelihood, projected increases, will be... unless) subordinate adverb clauses to express contrast or cause (although the...; despite the...; since the...)

Student Learning Tasks

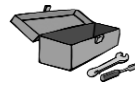
As a class or independently, read the first two paragraphs of **Handout 2-35: “Climate Change and Wildlife”** and identify the main idea, source, intended audience, and purpose for writing.

Predict the contents of the article. (C)

Continue to read independently, underlining every use of the future tense and hedging strategies.

OR

Practise hedging strategies by imagining a different scenario (speaking or writing): If global cooling occurs, what would be the effect on warmer countries?

Teacher Notes and References

Handout 2-35: “Climate Change and Wildlife”



The tone of certainty is a common journalistic technique to attract readers’ attention; therefore, readers should not necessarily jump to drastic conclusions based on headlines or lead paragraphs.

Outcomes

SLO 1.4 Show an awareness of organizational patterns...

SLO 1.6 Interpret a range of texts...

SLO 2.1.1 Analyze and edit texts...

SLO 6.2.12 Use inferencing to guess the meanings...

SLO 1.3 Develop and express a personal position in a variety of ways...

SLO 2.1 Show sufficient control over linguistic structures...

SLO 2.3 Produce a variety of short and extended text forms...

SLO 2.4 Use the steps of the writing process...

SLO 4.7 Use the English language to participate in community...

SLO 5.7 Select and present ideas ...keeping in mind the intended audience.

SLO 6.1.4 Use functional planning...

SLO 6.1.6 Use self-monitoring to check...

SLO 6.1.8 Use self-evaluation to check...

SLO 6.2.2 Use repetition to imitate a language model...

Instructional and Learning Sequence

Sequence 4

Preparation: Review students’ ideas about why species are at risk.

Introduce **Handout 2-36:** Gapfill Reading: “Why Do Some Species Become at Risk in Canada?”

Prepare by reading the first paragraph to determine the purpose of the reading.

Words from the AWL have been omitted in this version, but students could use one or two paragraphs as a listening exercise, omitting structure words.

Language Features

Vocabulary

abandon, affect, affected, affects, construction, conversion, decline, extraction, factor, factors, file, generation, identified, percent, restricts, status, survive, vehicle, vehicles
focus on word families

Sequence 5

Writing Task

Have students write a polite letter or an email to a government or public organization, supporting the protection of a species. Use business letter format or, if writing an email, note the public and more formal register required.

Language Features

Discourse Features

formal register for business; business letter and email format

Extension: Many other excellent activities are available at “Bagheera In the Wild.”

“Endangered Species” is an extensive collection of information and links to additional resources. It is U.S.-based, but with a world focus.

Student Learning Tasks

Assignment

Listen as **Handout 2-36**: “Gapfill Reading” is read (C) and use the selected words from the AWL to complete the reading.

Assignment

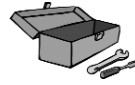
Write a polite business letter or an email to a government or public organization supporting the protection of a species. If writing an email, note the public and more formal register required. (I)

Teacher Notes and References



Handout 2-36: “Gapfill Reading: Why Do Some Species Become at Risk in Canada?”

Handout 2-37: “Gapfill Reading: Why Do Some Species Become at Risk in Canada? (Answer Key)”



Sample letters available from Animals Asia Foundation at:
<[www.animalsasia.org/beInvolved/create Change/cc003.html](http://www.animalsasia.org/beInvolved/createChange/cc003.html)>



Bagheera In the Wild at:
<[www.bagheera.com/inthewild/class_activities .htm](http://www.bagheera.com/inthewild/class_activities.htm)>
Endangered Species at: <<http://eelink.net/EndSpp/>>

Climate Change and Wildlife

Climate change caused by increasing emissions of greenhouse gases will affect the health and diversity of plants and animals in virtually every place on earth—and Canada's north is expected to be among the hardest hit.



Increases in surface temperatures, precipitation and the frequency of severe weather events, a rise in sea level and a decrease in sea-ice will cause many habitats to change ten times faster than they have since the last ice age.

These changes will force species to adapt or shift their ranges more quickly than they ever have in the past, or die off and be replaced by more adaptable species. Those at greatest risk of extinction are species that require different habitats at different stages of their lives, like amphibians, or that inhabit areas that are physically restricted, such as islands, isolated lakes, and mountain tops.



Hay River, south of Great Slave Lake, NT, Canada. Photo: Elaine Tucker

In keeping with predictions that changes will be greatest at high latitudes and altitudes, Canada's low Arctic tundra and Muskwa–Slave Lake boreal forests are among the most vulnerable regions in the world. Surface warming in the Arctic is expected to be significantly higher than in the rest of Canada and the world. The geographic ranges of plant and animal

species are also expected to shift northward and upward in altitude, increasing competition with species already found in the area.

It is expected that the tundra will shrink by as much as two-thirds as other plant species move in to replace native vegetation. Most climate change scenarios suggest that the zone suitable for boreal forests could be displaced as much as 550 kilometres northward over the next century.



Moose caught on road between huge snow banks. Heavy snowfalls in Mount Pearl, NF, March 2001. Photo: Randy and Judy Boone.

Although milder winters could enhance the reproductive capacities of caribou and other species, heavy winter snows and the melting and freezing of snow cover could force them to expend more energy feeding or prevent them from reaching their food. Ice and snow layers may also trap carbon dioxide in the burrows of small mammals, and either poison them or force them to the surface.

Warmer temperatures could create other problems for animals by causing changes in the timing and extent of sea-ice cover. Polar bears in western Hudson Bay, which rely on sea-ice for hunting seals, will disappear from the region if predictions that the ice will melt completely by 2100 come true. Earlier breakup of freshwater ice on lakes and rivers in spring could affect migration patterns, and increase the likelihood of drowning.

Reductions in sea ice also mean reductions in the ice edge around open water. This important part of the marine ecosystem supports a large population of fish, which provide food for a variety of marine birds and mammals.

(continued)

Environment Canada: Climate Change and Wildlife (continued)

Warming makes ecosystems more vulnerable to disease, parasites and insects and other pests. The earlier emergence of mosquitoes in northern Hudson Bay has already resulted in the death of some incubating seabirds, and forced others to abandon their nests.



Coastal erosion, Prince Edward Island.

Although Arctic ecosystems are expected to be the hardest hit, more southern regions of Canada will also be affected. Fish on both coasts and in rivers, lakes and streams are expected to head further north. Changes in river and stream runoff, due to less snow pack, an earlier ice break-up, a stronger spring flow, and a reduced summer flow, will also greatly impact aquatic ecosystems.

Both the Atlantic and Pacific coasts will see a rise in sea level if global warming continues, resulting in an increase in coastal erosion and flooding, and a loss of coastal wetlands. Fire patterns are expected to change in most of Boreal Canada, affecting forestry practices and habitat available to wildlife. As temperatures increase, crops such as wheat can be grown farther north, causing further losses of wildlife habitat.

Despite projected increases in precipitation, scientists expect there will be a decrease in water availability in many southern regions of the country—particularly the prairies—due to increased evaporation caused by warming. This will further exacerbate water level problems in aquatic ecosystems such as wetlands and marshes, and may cause some to dry up completely.

Although there is no way to predict exactly how certain species will react to climate change, our global biodiversity will be altered irreversibly unless immediate steps to reduce national and international emissions of greenhouse gases are taken. Since the burning of fossil fuels is a primary source of the greenhouse gas carbon dioxide, individuals can take action to reduce climate change by cutting down on fuel consumption—at home, at work, and on the road.

Gapfill Reading: Why Do Some Species Become at Risk in Canada?

Instructions: Fill each gap with the best word from the Word List. Note that some words are used more than once in different forms.

The single most prevailing _____ responsible for the endangerment of species today is habitat loss and degradation. In fact, about 60 _____ of species that the Committee on the _____ of Endangered Wildlife in Canada (COSEWIC) _____ as being at risk are _____ by habitat problems. If a species cannot find suitable conditions in which to live, it simply will not _____.

As the human population grows, development increases and spreads over the landscape to satisfy human wants and needs. The _____ of houses, buildings, and roads; logging of vast tracts of forest for paper and building materials; mineral _____ and _____ of wild habitats into agriculturally productive fields all mean that habitat for wild species shrinks. And when habitat shrinks, species are squeezed out.

A habitat does not have to be totally destroyed to make it unsuitable for some species. The mere presence of people and associated disturbance can cause some species to _____ certain habitat or prevent them from breeding successfully.

And human presence _____ species in many other ways as well. _____ on roads are particularly dangerous to some snakes that like to bask on the warm pavement and to some birds that tend to feed near roadways. The lights from _____ and from street lights and buildings have been shown to seriously _____ some moth populations. Control of water flow in rivers, usually for the _____ of electricity, changes conditions downstream, often rendering these water bodies unsuitable for certain species, or _____ their ability to travel to parts of the system they need for feeding or to reproduce. The building of dams or tilling of soil near rivers and streams causes siltation and increases water turbidity, _____ responsible in the _____ of some fish and mollusc populations.

Word List:

abandon

affect

affected

affects

construction

conversion

decline

extraction

factor

factors

file

generation

identified

percent

restricts

status

survive

vehicle

vehicles

Gapfill Reading: Why Do Some Species Become at Risk in Canada? (Answer Key)

The single most prevailing **factor** responsible for the endangerment of species today is habitat loss and degradation. In fact, about 60 **percent** of species that the Committee on the **Status** of Endangered Wildlife in Canada (COSEWIC) **identified** as being at risk are **affected** by habitat problems. If a species cannot find suitable conditions in which to live, it simply will not **survive**.

As the human population grows, development increases and spreads over the landscape to satisfy human wants and needs. The **construction** of houses, buildings, and roads; logging of vast tracts of forest for paper and building materials; mineral **extraction**; and **conversion** of wild habitats into agriculturally productive fields all mean that habitat for wild species shrinks. And when habitat shrinks, species are squeezed out.

A habitat does not have to be totally destroyed to make it unsuitable for some species. The mere presence of people and associated disturbance can cause some species to **abandon** certain habitat or prevent them from breeding successfully.

And human presence **affects** species in many other ways as well. **Vehicles** on roads are particularly dangerous to some snakes that like to bask on the warm pavement and to some birds that tend to feed near roadways. The lights from **vehicles** and from street lights and buildings have been shown to seriously **affect** some moth populations. Control of water flow in rivers, usually for the **generation** of electricity, changes conditions downstream, often rendering these water bodies unsuitable for certain species, or **restricts** their ability to travel to parts of the system they need for feeding or to reproduce. The building of dams or tilling of soil near rivers and streams causes siltation and increases water turbidity, **factors** responsible in the **decline** of some fish and mollusc populations.

