



Human Impact on Ecosystems: A Lesson to Support Science 10

by
Lana Lorensen

2008

S106.6

Teaching Materials
from the
Stewart Resources
Centre



Government of
Saskatchewan



These units were developed by the following team of teachers, Elders, and cultural advisors: Yvonne Chamakese, David Hlady, Anna-Leah King, Duane Johnson, Marcia Klein, Lana Lorensen, Sally Milne, Joseph Naytowhow, Lamarr Oksasikewiyin, Stuart Prosper, Ron Ray, Ted View, John Wright, and Laura Wasacase.

All resources used in these lessons are available through the Stewart Resources Centre:
http://www.stf.sk.ca/services/stewart_resources_centre/online_catalogue_unit_plans/index.html

Information regarding the protocol when inviting Elders into the classroom can be found in the document: *Elders in the Classroom* by Anna-Leah King (attached as Appendix A). Further information can be found in the Saskatchewan Learning document: *Aboriginal Elders and Community Workers in Schools*.

Table of Contents

Overview	4
Foundational Objectives	4
Timeframe	4
Resources	4
Human Impact on Ecosystems	5
• Foundational Objectives	5
• Key Understandings	5
• Essential Questions	5
• Learning Objectives	5
• Assessment Evidence	5
• Notes to the Teacher	6
• Lesson Plan	6
• Possible Extension Activities	7
Key Concepts	8
• Student Handout	8
• Teacher’s Answer Key	10
Writing a Story/Legend on How the Ecosystem Affects Humans	11
• Guiding Questions Student Handout	11
• Teacher’s Key of Possible Answers	12
Evaluation Rubric	14
Appendix A – Elders in the Classroom	15



Overview

Many cultures around the world, including the First Nations and Métis cultures of Canada, use stories as teaching tools. MacLean and Wason-Ellam (2006) state that storytelling indigenizes the curriculum and is an empowering link to a sense of identity and the traditional knowledge of Indigenous people.

This lesson has a story as its central point. Although the lesson is based on one specific story, teachers are encouraged to look for books in their own libraries with similar themes. The legend tells the story of a young deer who speaks to hunters to let them know what they must do in order to hunt animals with the long-term effects of hunting in mind.

This lesson incorporates objectives from the unit entitled Life Science: Sustainability of Ecosystems (SE) in the *Science 10 Curriculum Guide*.

Foundational Objectives

SE2 Examine biodiversity within local ecosystems.

SE5 Investigate human impact on ecosystems.

Source: These and other objectives are found in the following document:
Saskatchewan Learning. (2005). *Science 10 curriculum guide*.
Regina: Saskatchewan Learning.

Timeframe

1-2 hours.

Resources

Caduto, M. J., & Bruchac, J. (1989). Awi Usdi, the little deer. In *Keepers of the earth: Native stories and environmental activities for children*. Saskatoon: Fifth House.

Gibb, T., et al. (2002). *Science 10: Concepts and connections*. Toronto: Nelson Thomson Learning.

Grace, E. et al. (2000). *Sciencepower 10: Science, technology, society, environment*. Toronto: McGraw-Hill Ryerson.

MacLean, M., & Wason-Ellam, L. (2006). *When Aboriginal and Métis teachers use storytelling as an instructional practice: A grant report to the Aboriginal Education Research Network*. Regina, SK: Saskatchewan Learning.

These titles are available for borrowing from the Stewart Resources Centre of the Saskatchewan Teachers' Federation.

Human Impact on Ecosystems

Foundational Objectives

- SE2** Examine biodiversity within local ecosystems.
- SE5** Investigate human impact on ecosystems.

Key Understandings

- Scientific and technological developments impact every person's life, as well as the ecosystem.
- Some of the effects are desirable, and some are not.

Essential Questions

1. How do human actions impact ecosystems?
2. What are examples of short-term and long-term stresses on an ecosystem?
3. How does protecting at-risk species help to improve an ecosystem's health?

Learning Objectives (LO)

Students will be able to:

- SE2** LO4 Examine how the biodiversity of an ecosystem contributes to its sustainability.
- SE2** LO6 Describe the mechanisms of bioaccumulation and biomagnification.
- SE2** LO9 Demonstrate a sense of personal and shared responsibility for maintaining a sustainable environment.
- SE5** LO5 Propose a course of action on social issues related to sustainability, taking into account human and environmental needs.
- SE5** LO6 Predict the personal, social, and environmental consequences of a proposed action.

Assessment Evidence

1. Journal entry: How the environment affects humans.
2. Questions and discussion on key concepts and terms.

Notes to the Teacher

- This lesson uses a First Nations' legend to capture the students' interest in order to introduce ideas, to inspire creativity with a purpose, and to ignite the imagination of the students.
- The purpose of this lesson is for the students to begin to experience empathy for the ecosystem. Through personification of the biotic and abiotic components of the ecosystem, students are brought closer to the realities of survival in the environment. As they begin to realize the threats of human impact on the environment and the ecosystem, only then can students begin to "feel" the pain of the ecosystem.

Lesson Plan

1. Introduce the Essential Questions through classroom discussion.
2. Define, discuss, and/or take notes on key concepts and terms relating to biodiversity (*Science 10 Curriculum Guide*, pp. 32-33).
 - Student handout included - *Key Concepts*.
 - Teacher's key included - *Possible Definitions*.
3. Read and answer questions about how bioaccumulation and biomagnification can affect an organism, a species, a food chain, and a food web:
 - *Sciencepower 10* - DDT in a Food Chain, pp. 30-32.
 - *Nelson Science 10* - Case Study 2.2 - Pesticides, p. 57.
4. Read the legend "Awi Usdi, the Little Deer" from the book *Keepers of the Earth* (p. 173) to the students. Have a class discussion about the legend using the Discussion section in the book on p. 174. You may choose to assign the questions on p. 175 as an opener to the background information needed for this lesson.
5. Distribute handout and explain the writing of a story/legend to the students, discussing examples for the guiding questions as you go.
 - Student handout included - *Guiding Questions for Writing Your Story/Legend on How the Ecosystem Affects Humans*.
 - Teacher copy included - *Examples for Writing a Story/Legend on How the Ecosystem Affects Humans*.
6. Give the students time to start on the questions and/or assign for homework.
7. Allow at least one hour, either in the classroom or in the library, for students to develop their story/legend and possibly to do some research on species at risk in Saskatchewan and/or Canada.

Possible Extension Activities

- Create a game (board game, drama game, etc.) that demonstrates a threat to an ecosystem and/or an organism.
- Extensions in *Keepers of the Earth*, pp. 173-178:
 - Questions, Activities: Caring for Animals: Inside and Outside, p. 175.
 - Helping a Species in Need, p. 177.
 - Extending the Experience, p. 178.



KEY CONCEPTS



NAME: _____

Define the following terms:

1. Extinct species:

2. Endangered species:

3. Vulnerable species:

4. Threatened species:

5. Extirpated species:

6. Introduced species:

7. Invasive species:

8. Bioaccumulation:

9. Biomagnification:



KEY CONCEPTS

(Teacher Answer Key of Possible Definitions)

Refer to *Science 10 Curriculum Guide*, p. 33.

1. Extinct species:
A species that is no longer found on Earth.
2. Endangered species:
A species that is close to extinction in all parts of Canada or in a significantly large location.
3. Vulnerable species:
A species that is at risk due to low or declining numbers in some restricted area or range.
4. Threatened species:
A species that is likely to become endangered if factors that make it vulnerable are not reversed.
5. Extirpated species:
A species that no longer exists in a particular area, but still exists in other locations.
6. Introduced species:
An organism that is not native to an ecosystem where it is introduced and instead has been accidentally or deliberately transported to the new location by human activity.
7. Invasive species:
An alien species whose introduction does, or is likely to, cause economic or environmental harm, or harm to human health.
8. Bioaccumulation:
The increase in concentration of a pollutant from the environment to the first organism in a food chain.
9. Biomagnification:
The tendency of pollutants to become concentrated in successive trophic levels.

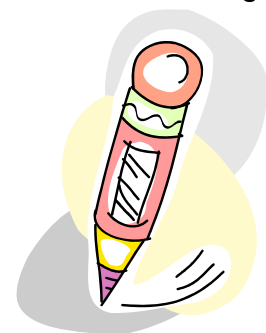


Guiding Questions for Writing Your Story/Legend on How the Ecosystem Affects Humans

Read the story “Awi Usdi, the Little Deer” from the book *Keepers of the Earth* (p. 173).

You will be required to write a story/legend that attempts to explain how the environment and/or organisms can affect humans. Answer the following questions to help you write your legend:

1. Today, the threats to the environment and organisms in the ecosystems are much more numerous and complicated than in the legend we just read. Can you brainstorm a list of at least five of these threats?
2. Choose one of the threats from question 1 and write about how the environment and/or organisms in the ecosystem that are affected by the threat could possibly retaliate. You will research the species at risk in Saskatchewan and/or Canada and incorporate this information (and possibly some images) into your story. Don't forget to reference this information in your story.
3. Imagine that you are part of this retaliation and that you are one of the organisms (plant, animal, bird, fish, or insect) or even part of the abiotic environment (wind, air, water, river, soil, etc.). Give your character a name, an identity, and a personality.
4. Express how you feel as this character, trying to survive this threat. Describe how you, your friends, and others in the ecosystem have been affected by the threat. Think of ways to create empathy for your cause. You want the reader to be on your character's side.
5. In the story, the humans must show respect by asking permission and by asking for pardon from the animal spirits. Describe what the humans have to do in order to escape the retaliation of your character(s). Make a plan using whatever means necessary (except human weapons) to get your message across. You can even use magic, as the deer in the story did.
6. Think of a title for your story/legend that will catch the reader's attention. Now you are ready to write your story/legend. Use the answers you have created for the previous questions to help you write a minimum of one page. Illustrations and/or images acquired elsewhere will add a great deal to your legend. If you wish to present your legend in another format, talk to your teacher to arrange it (example: song, dance, drama, etc.).



Examples for Writing a Story/Legend on How the Ecosystem Affects Humans

(Teacher's Key of Possible Answers)

You will be required to write a story/legend that attempts to explain how the environment and/or organisms can affect humans. Answer the following questions to help you write your legend:

1. Today, the threats to the environment and organisms in the ecosystems are much more numerous and complicated than in the legend we just read. Can you brainstorm a list of at least five of these threats?
 - *Air pollution - acid rain (nitric oxide), smog, electromagnetic fields around power lines, carbon dioxide levels = increase in greenhouse gases = greenhouse effect = global warming = climate change*
 - *Water pollution - oil spills, herbicides and pesticides = bioaccumulation and biomagnification*
 - *Habitat depletion - deforestation through forest fires and clear cutting*
2. Choose one of the threats from question 1 and write about how the environment and/or organisms in the ecosystem that are affected by the threat could possibly retaliate. You will research the species at risk in Saskatchewan and/or Canada and incorporate this information (and possibly some images) into your story. Don't forget to reference this information in your story.
 - *Various pollutants may cause some forms of allergies; you could do some research to find out which specific types of allergies are related directly to pollutants.*
3. Imagine that you are part of this retaliation and that you are one of the organisms (plant, animal, bird, fish, or insect) or even part of the abiotic environment (wind, air, water, river, soil, etc.). Give your character a name, an identity, and a personality.
 - *The wind named Little Cloud calls together the winds from the east, west, north, and south to discuss what can be done about the air pollutants. They try to blow the pollutants away, but just end up blowing them toward one another.*
4. Express how you feel as this character, trying to survive this threat. Describe how you, your friends, and others in the ecosystem have been affected by the threat. Think of ways to create empathy for your cause. You want the reader to be on your character's side.
 - *The winds are very frustrated and get angry. This causes hurricanes, tornadoes, and severe storms all over the world. Mother Earth puts an end to the storms and suggests the winds find another way to retaliate because innocent organisms (animals, birds, plants, etc.) are being harmed.*

5. In the story, the humans must show respect by asking permission and by asking for pardon from the animal spirits. Describe what the humans have to do in order to escape the retaliation of your character(s). Make a plan using whatever means necessary (except human weapons) to get your message across. You can even use magic, as the deer in the story did.
- *The winds agree with Mother Earth and come up with the plan of visiting those humans and their relations who they think are responsible for the air pollution; then, using their magic, they give these humans allergic problems. The only way the humans can escape the wrath of the winds is to make up for the pollutants they contribute by doing some other environmentally-friendly activities to balance it - for example, recycling and conservation.*
6. Think of a title for your story/legend that will catch the reader's attention. Now you are ready to write your story/legend. Use the answers you have created for the previous questions to help you write a minimum of one page. Illustrations and/or images acquired elsewhere will add a great deal to your legend. If you wish to present your legend in another format, talk to your teacher to arrange it (example: song, dance, drama, etc.).
- *The title for the legend is "Little Cloud Fights Pollution."*



Evaluation Rubric

	Level 4	Level 3	Level 2	Level 1
Scientific and technological developments impact human lives and affect the ecosystem.	The student demonstrates a thorough understanding of how humans impact the ecosystem.	The student demonstrates a solid understanding of how humans impact the ecosystem.	The student demonstrates some understanding of how humans impact the ecosystem.	The student is still acquiring an understanding of how humans impact the ecosystem.
Some of the effects of scientific and technological developments are desirable, and some are undesirable.	The student demonstrates a thorough understanding of the possible desirability or undesirability of scientific and technological developments.	The student demonstrates a solid understanding of the possible desirability or undesirability of scientific and technological developments.	The student demonstrates some understanding of the possible desirability or undesirability of scientific and technological developments.	The student is still acquiring an understanding of the possible desirability or undesirability of scientific and technological developments.
Using the guiding questions as a reference for a story/legend, the student should: identify one threat to the environment, show how the environmental threat affects the ecosystem, personify an organism or abiotic element, and show what the humans in the story have to do to escape retaliation from the threat.	The story/legend incorporates all four of the elements from the guiding questions.	The story/legend incorporates three of the elements from the guiding questions.	The story/legend incorporates two of the elements from the guiding questions.	The story/legend incorporates one of the elements from the guiding questions.



APPENDIX A

Elders in the Classroom

by
Anna-Leah King

It is the Elders' responsibility to guard sacred knowledge and to maintain the ceremonial oral tradition of knowledge transmission. In Saskatchewan, the territory is home to four First Nations, namely Cree, Saulteaux, Dene, and Oceti Sakowin - Dakota/Nakoda/Lakota.

Source: Office of the Treaty Commissioner. (2002). *Teaching treaties in the classroom: Participants manual*. Saskatoon, SK: Office of the Treaty Commissioner.

All of these First Nations have a home here and it is entirely appropriate to represent any or all of these First Nations when approaching curriculum content. The Elders bring with them traditional knowledge and perspective passed down from generation to generation through the oral tradition. The reference to Elders' wisdom has lately been termed "Indigenous knowledge" or "traditional knowledge." Their traditional knowledge and wisdom will give insight to teachers willing to reshape curriculum and validating First Nations content and perspective.

Inviting the Elders

Protocol

The Elders would expect to be approached in the traditional way, respecting traditional protocol. They are given a small offering of tobacco in exchange for their commitment to invest their time and energy into the work at hand. They can be asked to lead the gatherings with prayer and ceremony. First Nations gatherings always begin with prayer and ceremony. It is entirely appropriate to ask this of them. It may not be what you are familiar with, but you will soon realize the benefits of respecting First Nations protocol and ceremonial practice. The Elders may want to begin with a smudge on the first gathering and offer prayer for the task at hand and the team that has been brought together. The Elders are well aware that any given group put together is there to learn from one another and so blessings towards this endeavour are prayed for. Sometimes, depending on the size of the project, a pipe ceremony may be requested. Each Elder may have a slightly different approach to opening and closing ceremony. Some may speak for a while. Others will ask you to share so they can become more familiar with everyone. Simply inviting them with an offering of tobacco and asking that they open and close the gatherings is enough. The Elder will take it from there.

Elder Expectation

When you invite Elders, it is important that you are clear on what you expect from them. If you are asking them to contribute with their knowledge, wisdom, and guidance, then say so. They may not all be familiar with education and what teachers and curriculum writers are trying to do, so explaining what curricula is and what is needed of them is essential to a good working relationship. You want them to contribute First Nations and Métis content and perspective. The Elders need to feel confident that they will be of assistance. Let them know that you see their role as wisdom keepers and they need to draw upon their personal experience, cultural knowledge, and teachings to contribute to the process. The Elders will share what is acceptable and give caution for what they view as sacred knowledge that is only to be shared in the context of ceremony.

Elders need time to think before they answer. Do not be impatient and feel they are not answering soon enough, as they will answer your questions in time. Some Elders are reflective, philosophical thinkers. They will review holistically what you have asked of them. A concept that you think is simple and straightforward has many different dimensions to a First Nations speaker, and they must put the concept into the context of the whole and analyze the dimension of its interrelatedness. Sometimes they translate what you are saying to themselves in their language. They think things out in their mother tongue first and then find the words of closest approximation in English. Not all words and concepts are readily translatable. That is why letting the Elder know what is expected of them beforehand is important because it gives them time to think it over and to find some area of common ground.

Elder Care

Elders do not expect anything but it would be nice to assign one person to see to their needs. Offer them a comfortable seat and debrief them on the expectations for the gathering. Introduce them to everyone and generally make them feel welcome. See to it that they have water, juice, coffee, or tea. It is good to have a snack for them at coffee break. Invite them to pray over the food before you eat. Allow them to be first in line for lunch or let them know you will serve them. This is an example of First Nations protocol. These are small things, but kind gestures go a long way with Elders. They appreciate when younger people make efforts to lighten their load. These gestures make the Elder feel welcome and cared for in a respectful way.

Gifts

It is appropriate to have a small gift for the Elders. If they are paid for their time, this would be considered the gift. Some give a small gift in addition to the honorarium, such as a basket of teas or jams.

- Further information can be found in the document: *Aboriginal Elders and Community Workers in the Classroom*, available from the First Nations and Métis Branch of the Ministry of Education.