

Ecosystems Research Journal

TEACHER'S GUIDE

The *Ecosystems Research Journal* series takes readers on a journey through an ecosystem, using journal text type to convey information from the perspective of a research scientist. Each book focuses on how the parts of an ecosystem work together and the threats that the ecosystem faces, and uses a variety of features—from status reports and data presented in graphs to field notes and sketches—to impart information to students.

The lessons in the *Ecosystems Research Journal* Teacher's Guide will help students understand how the living and nonliving things in an ecosystem work together. Students will also explore how human activity impacts the living things in an ecosystem, and the efforts being made by differing stakeholders to protect and conserve the living things in an ecosystem. They will understand that they are an important part of the ecosystems in which they live. Students participating in these lessons will also learn about the journal text type and be able to interpret information presented in different formats, such as maps, diagrams, and graphs.

The lessons in this Teacher's Guide are multimodal and inquiry-based. They are aligned for grades 4 and 5, some with extensions that apply to grade 6 standards. Lessons can be taught as stand-alone lessons—sequential order is not required—but key concepts such as the function and features of ecosystems may need to be pre-taught or reviewed. Reproducible worksheets and assessment tools, as referenced in the lesson plans, can be found at the end of each lesson. The titles in *Ecosystems Research Journal* include:

Amazon Rainforest Research Journal

Arctic Research Journal

Atacama Desert Research Journal

Bamboo Forest Research Journal

Everglades Research Journal

Galapagos Island Research Journal

Great Barrier Reef Research Journal

Great Lakes Research Journal

Mississippi River Research Journal

Rocky Mountains Research Journal

Serengeti Research Journal

Sonoran Desert Research Journal

PACING CHART AND VOCABULARY

Lesson Plan Title	Pacing	Vocabulary
Hello! My name is. . .	2-3 class periods*	Amazon Rain Forest ecosystem everglade Great Lakes living things nonliving things soil Sonoran Desert species Sun rocks water lesson-specific species
Exploring the Human Impact on an Ecosystem	2-3 class periods	chart data ecosystem Federal Contaminated Sites (extension) graph human impact scrapbook Superfund site (extension) text features lesson-specific impacts shown in pictures, such as oil sands
Write a Journal Entry	2-3 class periods	characteristics ecosystem features field journal first-person language journal observation point of view
Exploring Ecosystem Restoration and Protection	3-4 class periods	ecosystem Great Lakes groundwater invasive species protection native species restoration
Getting to Know Biosphere Reserves	1-2 class periods	Biosphere reserve characteristics ecosystem model serengeti sustainable
Role-play to Protect an Ecosystem	3-4 class periods	Arctic Arctic-specific species chosen for role-play focus, such as polar bears, seals, caribou, etc. climate change ecosystem government greenhouse gases hunters Inuit peoples oil companies researchers

* 1 class period = 40-60 minutes

ACCOMMODATION STRATEGIES

Accommodations provide equal access to learning and equal opportunity to demonstrate what is learned. Accommodations allow a student access to the subject or course without any changes to the knowledge and skills the student is expected to demonstrate.

Educators are encouraged to adapt the instructional approach, activities, and assessments included in this guide to best meet the diverse interests, needs, and abilities of their students. Possible accommodations may include:

Instructional Strategies

- Break tasks into parts with accompanying time lines
- Provide extra time for processing of oral information.
- Pair oral instructions with visual ones (writing or symbols)
- Pre-teach new vocabulary and regularly review previously taught vocabulary
- Provide model of completed work
- Frequently check with the student to get him/her started
- Provide oral and visual instructions and examples
- Provide a checklist of tasks for the student

Environmental Strategies

- Proximity to teacher
- Strategic seating
- Flexible or mixed-ability grouping
- Provide an alternative setting for learning that is free from visual and auditory distractions.

Assessment Strategies

- Build in extra time to allow student to process questions asked and answers given
- Provide written instructions and rubrics for assignments
- Offer a choice of assessment activities so that the student can choose one suited to their strengths
- Space out or extend assignments to prevent student feeling overwhelmed
- Reduce the number of tasks used to assess skill or concept
- Allow students to use assistive devices or technology

LESSON 1

Hello! My name is...

Curriculum Correlations

**Ontario Science and Technology Standards—
Understanding Life Systems: Habitats and Communities**
2.3, 2.5, 3.1, 3.4

Ontario Language Arts—Grade 4 and 5 Writing
1.3, 1.6, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6,

Next Generation Science Standards
3-LS4-3. —This lesson reviews, reinforces, and extends this grade 3 concept
5-LS1-1., 5-PS3-1.

Common Core State Standards

CCSS.ELA-LITERACY.W.4.1.A

CCSS.ELA-LITERACY.W.4.2

CCSS.ELA-LITERACY.W.4.2.A

CCSS.ELA-LITERACY.W.4.2.B

CCSS.ELA-LITERACY.W.4.2.D

CCSS.ELA-LITERACY.W.4.4

CCSS.ELA-LITERACY.W.4.7

Materials

- *Hello! My name is...* instruction sheet
- *Hello! My name is...* rubric
- Devices with Internet access
- Chart paper and markers
- 4 titles from *Ecosystems Research Journal* series. Suggested titles in lesson plan.
- Pictures of species from each of the 4 *Ecosystems Research Journal* titles—1 per student—see suggestions in lesson plan. Can photocopy pages from books or use copyright-free images found online.

Setting the Stage

Facilitate four corners activity to introduce students to ecosystems and some of the plants and animals that can be found in the books in the series.

Post a chart paper titled with the name of an ecosystem in each of the 4 corners of the classroom. Teacher can choose four ecosystems depending on class interest. Suggested ecosystems are: Amazon Rain Forest, Everglades, Great Lakes, and Sonoran Desert.

Each student gets one picture of a living thing that can be found in one of the four ecosystems. Leave one picture face down on each of the students' desks, and instruct them to not look at the picture until they are told. Some suggestions are as follows:

- Amazon Rain Forest Research Journal
 - ▶ Great South-American river turtle, Harpy eagle, Epiphytes, Two-toed sloth, Spix's macaw
- Everglades Research Journal
 - ▶ American alligator, Florida manatee, Atlantic goliath grouper, Orchid, Sea turtle
- Great Lakes Research Journal
 - ▶ Sturgeon, American eel, Spotted turtle, Piping plover, River otter
- Sonoran Desert Research Journal
 - ▶ Saguaro cactus, Thick-billed parrot, Jaguar, Turkey vulture, Lesser long-nosed bat

Students will look at their picture of a living thing and go to the corner with the name of the ecosystem in which they think their living thing can be found. When they have found their correct ecosystem, they will share their pictures with the other students and talk about why they all belong in that corner.

- If any students are having difficulty finding their corner, have the whole class work together to place that living thing in the correct ecosystem.
- Review which living things should be found in each corner of the classroom to make sure each student is in the correct place.

When students are in the correct corners, hand each group a copy of the *Ecosystems Research Journal* title that features their ecosystem, chart paper, and a marker. Instruct students to use information from the books to list living and nonliving things found in their ecosystem. They can begin by writing the living things on their pictures.

Objectives

Students will:

- Define ecosystem, describe the parts that make up an ecosystem, and explain how the parts of an ecosystem work together.
- Describe how living things depend on both living and nonliving things to survive in an ecosystem.
- Write in role to introduce a living thing in a chosen ecosystem and describe the living and nonliving things it depends on to survive.

Activity #1

Bring each of the chart paper lists to the front of the class and post them on the wall. Talk about the common living and nonliving things on each list. Then hold a class discussion about the plants and animals that live together or come from the same place. Explain that each group is a community within their ecosystem. **A community is a group of interacting species that shares a common habitat.** Ask students:

- What similarities do the four ecosystems have?
 - ▶ Both living and nonliving things.
 - ▶ Soil, rocks, water, Sun
 - ▶ Plants and animals
- What is an ecosystem?
 - ▶ **An ecosystem is a community of plants, animals, and their environment.**
- What do plants and animals need to survive in an ecosystem?
 - ▶ Plants and animals need both living and nonliving things to survive in an ecosystem.
 - ▶ They need the Sun to provide energy for plants to grow.
 - ▶ They need water to drink and grow.
 - ▶ Plants depend on Sun, water, and soil to grow, and animals depend on plants for food and shelter.
 - ▶ They need rocks, soil, and plants such as grass and trees for shelter.
 - ▶ They need plants and other animals to eat.

Hand students *Hello! My name is...* instruction sheet. Review the activity instructions. Students will write a paragraph in the role of one of the animal species in their ecosystem. They need to introduce themselves and answer the question: what living and nonliving things do I depend on to survive?

Students can use the books as starting points, then they will need to use devices to conduct research on their species. They can type or write out their paragraph.

Review success criteria with students:

- Information is well researched and a source list is included.
 - ▶ Specify to students that any information taken from the Internet should be sourced. They will make a list of the websites that they used and include the list under the paragraph.
- Paragraph clearly identifies the species chosen and gives the species a fun name.
- Paragraph clearly identifies in which ecosystem the species lives.
- Paragraph identifies at least two living and at least two nonliving things that the species need to survive.
- Paragraph explains how the parts of the specific ecosystem work together.
- Paragraph uses clear, science-specific language.
- Paragraph is edited and proofread—words are spelled correctly and correct punctuation is used.

Review research techniques and skills with students, such as:

- Set time limits and stay focused.
- Use reliable websites, such as those that end in .gov, .org, and .edu
- Keep track of the web sources that you take information from.

Extensions

- Invite students to present their writing-in-role activity to the class. Can have a fun class presentation in which students read and speak in the role of their species

Wrap-Up

Have students hand in their paragraphs for assessment. Hold class discussion to consolidate core concepts in the lesson. Ask students:

- How do the different living and nonliving things work together in an ecosystem?
- How do living things depend on both living and nonliving things in their ecosystem?

Assessment

Assess paragraphs using *Hello! My name is...* rubric.

Date: _____ Name: _____

Hello! My name is Instruction Sheet

Choose one of the animal species in your ecosystem. Give the animal a creative name, and write a paragraph from the perspective of that species, introducing yourself to those who might be unfamiliar with you!

Use the books in the Ecosystems Research Journal series and your device to research the information you need.

You can use the sentence starters below to help you write your paragraph. Refer to the checklist below to make sure that your paragraph includes all of the required parts. Remember to include a list of the sources you used to get your information.

HELLO
my name is

I am a _____.

name of species

I live in _____. In my ecosystem, _____.

explain the parts that work together

I depend on _____ to survive because _____.

Success Criteria Self-Checklist

Does my paragraph...	Yes	No
Reflect well-researched information and include a source list?		
Clearly identify the type of species and give it a creative name?		
Clearly identify the ecosystem in which the species lives?		
Clearly identify at least two nonliving things the species needs to survive?		
Clearly identify at least two living things the species needs to survive?		
Explain how the parts of the ecosystem in which the species lives work together?		
Use topic-specific vocabulary?		
Use correct spelling and grammar?		

Date: _____ Name: _____

Hello! My name is.... Rubric

Level 1	Level 2	Level 3	Level 4
Information in paragraph has not been researched. No source list is included.	Information in paragraph has been researched, but the sources used are questionable. Source list is incomplete.	Information in paragraph has been researched and comes from reputable sources. Source list is included.	Information in paragraph has been well researched and comes from reputable sources. Clearly-organized source list is included.
Species is not identified.	Species is identified, but unclear at first read.	Species is identified and given a name.	Species is clearly identified and given a creative name.
Ecosystem in which species lives is not identified.	Ecosystem in which species lives is identified, but is unclear in the beginning of the paragraph.	Ecosystem in which species lives is identified.	Ecosystem in which species lives is clearly identified and appears near the beginning of the paragraph.
Student does not identify living and nonliving things that the species depends on.	Student identifies less than 2 living and less than 2 nonliving things that the species depends on.	Student identifies 2 living and 2 nonliving things that the species depends on.	Student identifies more than 2 living and more than 2 nonliving things that species depends on.
Student does not explain how the parts of the ecosystem work together.	Student explains how the parts of the ecosystem work together with some clarity issues, or a lack of insight on the connections between parts of the system.	Student clearly explains how the parts of the ecosystem work together.	Student clearly explains how the parts of the ecosystem work together, showing insight on the connections between parts of the system.
Student does not use science and topic-specific language.	Student uses a limited amount of science and topic-specific language.	Student uses an adequate amount of science and topic-specific language.	Student uses a high amount of science and topic-specific language.
Paragraph has not been edited and proofread and has many spelling and grammar error.	Paragraph has been edited and proofread in some way and spelling and grammar has some errors.	Paragraph has been edited and proofread and uses adequately-correct spelling and grammar.	Paragraph has been edited and proofread and uses fully-correct spelling and grammar.

LESSON 2

Exploring the Human Impact on an Ecosystem

Curriculum Correlations

Ontario Social Studies

**Ontario Science and Technology Standards—
Understanding Life Systems: Habitats and Communities**
1.1, 1.2, 2.5, 2.6, 3.10

Ontario Language Arts—Grade 4 and 5 Reading
2.3

Grade 4 and 5 Writing
Overall Expectation 2

Next Generation Science Standards
4-ESS3-2

Common Core State Standards
CCSS.ELA-LITERACY.RI.4.7

Materials

- Digital or printed images representing examples of human impacts on environments. See image suggestions in lesson below.
- Whiteboard and dry-erase markers
- Books in *Ecosystems Research Journal* series
- Devices with Internet access
- Printer
- Drawing paper
- Construction paper
- Pencil crayons and markers
- Decorative craft materials, such as stickers
- *Human Impact Scrapbook* information sheet
- *Human Impact Exit Card*
- *Human Impact Scrapbook Assessment Checklist*

Setting the Stage

Engage class in discussion. Ask them, how do our actions impact the environment around us?

Show images of human impact on environment to spark discussion. Suggested images:

- A clear-cut forest; Oil sands; City sprawl; Railroads and tunnels; Bridge; Air, land, and water pollution; Trees being planted; Agriculture; Wildlife preservation area

Teacher may prompt discussion about the pictures using the following prompts:

- What is this?
- How does this change the ecosystem?
- What impact does this have on plants and animals?
- What negative effects does this have on the ecosystem? What positive effects might this have on the ecosystem?

Explain to students that humans are part of the ecosystems in which they live. Use Think, Pair, Share method to brainstorm ways that students impact their local ecosystems. Have pairs come to whiteboard and write down their ideas. Review all ideas as a class.

Objectives

Students will be able to:

- Describe how humans impact the environment around them.
- Identify a number of ways humans impact a specific ecosystem, and represent the information using pictures and data.

Activity

Distribute *Ecosystems Research Journal* titles and have short class discussion on how the text features in the book help convey information. Allow students in small groups to flip through one of the books and then share their ideas on how photos, illustrations, captions, and data in graphs and charts help convey information and support learning.

- Focus on the data about the ecosystem. How do the graphs and charts support learning? What kind of information is displayed in chart or graph format?

Explain to students that they will use pictures, captions, and data to display information about the human impact on one ecosystem.

Hand students *Human Impact Scrapbook* information sheet and review activity together. Students will choose one of the ecosystems featured in one of the *Ecosystems Research Journal* books and imagine that they are creating a scrapbook about the ecosystem after having been a visitor there. Their scrapbook will include one page that shows and describes the human impact on that ecosystem. Students will use the books and conduct outside research on devices to gather their information.

Review success criteria. Scrapbook page has . . .

- A title—Human impact on [ecosystem]—and the student's name.
- A minimum of 2 pictures that show the human impact on that ecosystem. Pictures can be hand-drawn or printed from reputable Internet sources.
 - ▶ Review reputable sources with students.
- One descriptive caption to accompany each picture.
- One correctly labeled graph or chart that shows data about the human impact on the ecosystem. Here, teacher may review the parts of a graph or chart. Teacher should also review examples of the type of information students could display using a chart—see *Human Impact Scrapbook* information sheet for examples.
- A caption on the graph or chart that describes the data displayed.
- A separate reference sheet that lists the web links on which data and photographs were found.
- A clear design that is easy to read, and some decoration to show creativity.

Show students examples of creative scrapbook pages to inspire their creations.

Extensions

- Establish stronger connection to local or nearby community by examining Superfund Sites or Federal Contaminated Sites nearby. Have students examine one of the sites and write about how human impact resulted in the creation of that site. Discuss how humans are working to rectify the problems and clean up the site.

- ▶ <https://bit.ly/2JVujEp>
- ▶ <https://bit.ly/2s9LPwD>
- ▶ <https://bit.ly/2IC6Mew>

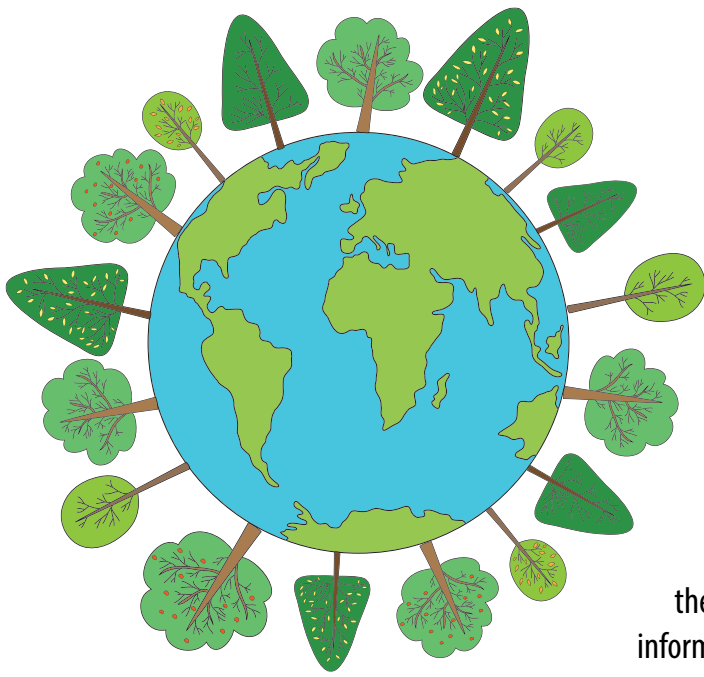
Wrap-Up

When students have completed their scrapbook pages, post the pages on the walls of the classroom. Invite students to take part in a gallery walk and examine each of the scrapbook pages. Hold class discussion about what they learned about how humans impact ecosystems around the world.

Hand out *Human Impact Exit Card* for students to complete and hand in.

Assessment

Assess scrapbook page using *Human Impact Scrapbook Assessment Checklist*.



Date: _____

Name: _____

Human Impact Scrapbook Information Sheet

You have just returned from an amazing trip to an ecosystem featured in the *Ecosystems Research Journal* series. You are creating a scrapbook to show others all of the amazing things you saw there. Your task is to create a page that shows others the impact that humans have on that ecosystem. To display your information, make sure your scrapbook page has:

1. A title and your name.
2. A minimum of two pictures that each represent one way that humans impact the ecosystem.
 - a. Your pictures can be hand-drawn or printed from a reputable Internet source.
3. A descriptive caption on each picture.
 - a. Your captions should describe the human impact shown in the picture.
4. One graph or chart that shows data about how humans impact the ecosystem.
 - a. Your graph or chart needs to be clearly drawn and labeled.
 - b. Refer to books in *Ecosystems Research Journal* for example of information to include in graphs or charts. Some examples include:
 - i. Numbers that show how the size of an ecosystem has decreased over the last 10 years because of urban sprawl.
 - ii. Numbers that show how the population of a species has decreased over the last 10 years due to habitat loss.
 - iii. Changes in the number of trees over a period of time due to deforestation or a tree-planting effort.
 - iv. Number of animals of different species treated for an oil spill.
 - v. Numbers that show an increase in species population over time after a wildlife reservation was created.
5. A descriptive caption on the graph.
 - a. Your caption should describe how the data represents human impact.

Use the provided craft materials to give your scrapbook page an appealing design.

You are also required to submit a separate reference page in which you list all of the websites you used to gather information.

Date: _____ Name: _____

Human Impact Exit Card

Describe, using detail, two impacts that humans have or had on the ecosystem you chose for the scrapbook activity. /4

Write one way you impact our local ecosystem in a positive way. /2

Write one way you impact our local ecosystem in a negative way. /2

Date: _____ Name: _____

Human Impact Scrapbook Assessment Checklist

Criteria	Yes	No
Scrapbook page is well-organized, easy to read, and includes a title and the student's name.		
Scrapbook page includes some stylistic elements inspired by photos shown. Student utilized craft materials to display creativity.		
Student included 2 pictures with captions that show the human impact on the ecosystem.		
Student included 1 graph or chart with a caption that shows data about the human impact on the ecosystem.		
Student included a separate reference page on which sources used are clearly identified.		

Notes: _____

LESSON 3

Write a Journal Entry

Curriculum Correlations

Ontario Science and Technology

Grade 4—Understanding Life Systems: Habitats and Communities

2.3, 2.5, 2.6, 3.1, 3.4

Ontario Language Arts

Writing, Grade 4 and 5

1.1, 1.4, 2.1, Overall and specific expectation(s) 3 (except: Grade 5 3.8)

Next Generation Science Standards

3-LS4-3

Common Core State Standards

CCSS.ELA-LITERACY.W.4.5

CCSS.ELA-LITERACY.W.4.3

CCSS.ELA-LITERACY.W.4.2

Materials

- Notebook and pencil—1 per student
- 2-4 different *Ecosystems Research Journal* titles
Suggested: Titles focused on North American ecosystems that will be relatable to students or are most closely related to local ecosystems—Great Lakes Research Journal, Mississippi River Research Journal, Rocky Mountains Research Journal, Sonoran Desert Research Journal
- Photocopies of journal entries (one spread) from 2-4 different books—1 photocopy per pair or small group of students
- *Write a Journal Entry Information Sheet*
- *Write a Journal Entry Rubric*
- Whiteboard and dry-erase markers
- Chart paper and markers
- Pens, pencils, and paper or computers and a printer

Objectives

Students will:

- Identify the features and function of journals and field journals.
- Write a journal entry detailing the observations they made about their local ecosystem.

Setting the Stage

As a class, read one journal entry from one *Ecosystems Research Journal* title.

Hold class discussion about journals and how they are useful to readers. Ask students:

- What is a journal?
 - ▶ **A journal is a personal record of events—showing the writer’s point of view.**
- What is a field journal?
 - ▶ **Writing that details observations about the natural world**
- Why are journals, and specifically field journals, useful to readers? What can we learn from journals that we cannot learn from regular non-fiction texts?
 - ▶ Point of view or opinion of author
 - ▶ Details events and observations as they happen
 - ▶ Shows progression of events and observations as they happen over time (Often written daily, dated)

Using the journal entry example, explain that journals have features. Features are the parts of a piece of writing. On an anchor chart or on the whiteboard, write a list of the features a journal must have:

- A date or marker of time, such as “Field Journal Day 1”
- First-person language, such as “I”
- Observations about the natural world as the author sees them
- Details that paint a picture of the author’s point of view
- Conclusions about the observations that were made

Hand out photocopies of other journal entries in 2-4 different *Ecosystems Research Journal* titles—1 per pair or small group. Give students 8-10 minutes to read the page and circle and label the different features used in the entry.

Review the students’ thoughts in a class discussion. Discuss how the features help us as readers gain insight on that ecosystem.

- Ask students what types of observations were included in the journal entry.
- Ask students what conclusions the author made about how different species survive in the ecosystem.
 - ▶ Remind students: Animals need the Sun, water, food, and shelter to survive.

Activity #1

Explain to students that they will write their own journal entries by taking a trip around the school grounds, a nearby park, or any approved location that will allow students to observe their local ecosystem, writing down observations about the plants and animals that live there, then turning those observations into a journal entry in which they draw conclusions about the ecosystem.

Hand out *Write a Journal Entry Information Sheet* to students and review the instructions and criteria together. Students will:

- Tour the local ecosystem with a notebook and pencil.
- Write down observations about the plants and animals they see there. Observations could include:
 - ▶ Characteristics of plants or animals, such as size, shape, color, and physical features.
 - ▶ Where species was found or observed
 - ▶ Time of day or weather at the time species was found or observed
 - ▶ Information from the senses—what can I see, hear, or smell?
*Remind students that touching and tasting are not appropriate during this activity.
- Turn the observations in the field journal into a journal entry.
 - ▶ Choose the most important or appropriate observations to include in the journal.
 - ▶ Add features such as date and time
- Choose one species in the ecosystem and draw a conclusion that answers the question: How does this species get what it needs to survive in the ecosystem?

Begin the trip into the local ecosystem. Teacher should survey the site beforehand to ensure that it is safe and free from hazards and pollution. Conference with students during the field trip to provide them with support and assess for understanding using anecdotal notes.

When the trip is completed, instruct students to use their field notes to write a journal entry. Remind students of the features of a journal. Refer them to list on anchor chart or on whiteboard. Instruct them to use the success criteria checklist on the *Write a Journal Entry Information Sheet* to make sure their journal fits criteria. Students can write their journal entries by hand on paper, or on a computer to be printed out.

Extensions

- Revisit ecosystem in coming days and weeks to create more journal entries and compare them with older ones to observe changes in the ecosystem over time.
- Create class website on site such as WordPress to publish the journal entries. Have students review, through editing and proofreading individually or peer-to-peer, writing works before publishing.

Wrap-Up

Invite students to share their journal entry with a partner, then compare the details that they included with the details included by their partner. Instruct students to give feedback on their partner's journal entry based on the success criteria found on the *Write a Journal Entry Information Sheet*. Students should then revise their journal entry based on the feedback they received, and hand it in for assessment.

Assessment

Assess student comprehension by conferencing with them during field trip and making anecdotal notes. Assess journal entries using *Write a Journal Entry Rubric*.

Date: _____ Name: _____

Write a Journal Entry Information Sheet

It's your turn to step into the shoes of an ecosystem researcher and write your own journal entry! Follow the instructions below to write your entry.

1. In the notebook provided, write down observations about the plants and animals you see in our local ecosystem. Observations could include:
 - a. Characteristics of plants or animals, such as size, shape, color, and physical features.
 - b. Where species was found or observed
 - c. Time of day or weather at the time species was found or observed
 - d. Information from the senses—what can I see, hear, or smell?
2. Turn the observations in the field journal into a journal entry.
 - a. Choose the most important or appropriate observations to include in your journal entry. Describe them using full sentences.
 - b. Add features to your entry such as date and time
3. Choose one plant or animal species found in the ecosystem. At the end of your journal entry, draw a conclusion that answers the question: How does the chosen species get what it needs to survive in its ecosystem?

Success Criteria Checklist

Does my journal entry...	Yes	No
Include a date?		
Include observations about the ecosystem—such as physical characteristics of plant and animal species, time of day and weather, and information from the senses.		
Use first-person language, such as “I”?		
Details that show my point of view as an author?		
A conclusion about how one species in the ecosystem finds what it needs to survive there?		
Use scientific vocabulary, such as habitat, population, food, water, shelter, and community.		

Date: _____ Name: _____

Write a Journal Entry Rubric

Level 1	Level 2	Level 3	Level 4
Journal entry does not include any basic features.	Journal entry is missing some basic features.	Journal entry includes most basic features such as date, time, point of view, and first-person language.	Journal entry includes all basic features such as date, time, point of view, and first-person language.
Journal entry does not include observations about the plants and animals in the ecosystem.	Journal entry includes only 1 or 2 different observations about the plants and animals in the ecosystem.	Journal entry includes 3 different observations about the plants and animals in the ecosystem.	Journal entry includes more than 3 different observations about the plants and animals in the ecosystem.
Journal entry does not include a conclusion about how one species meets its needs in the ecosystem.	Journal entry includes a somewhat-clear or incomplete conclusion about how one species meets its needs in the ecosystem.	Journal entry includes a well-explained conclusion about how one species meets its needs in the ecosystem.	Journal entry includes a clearly explained and detailed conclusion about how one species meets its needs in the ecosystem.
Student does not use scientific vocabulary	Student uses limited scientific vocabulary.	Student uses scientific vocabulary when necessary.	Student uses scientific vocabulary throughout journal entry.

LESSON 4

Exploring Ecosystem Restoration and Protection

Curriculum Correlations

Ontario Science and Technology Grade 4—Understanding Life Systems: Habitats and Communities

1.1, 1.2, 2.5, 2.6, 3.10

Ontario Social Studies Grade 4—People and Environments: Political and Physical Regions of Canada

B2.2, B2.5, B2.6

Ontario Social Studies Grade 5—People and Environments: The Role of Government and Responsible Citizenship

B1.1, B3.5

Ontario Language Arts

Oral Communication Grades 4 and 5

Overall Expectation 2

Reading Grades 4 and 5

Overall Expectation 1, Specific 1.4

Ontario Drama Expectations Grades 4 and 5

Overall Expectation B1

Next Generation Science Standards

4-ESS3-2., 5-ESS3-1.

Common Core State Standards

CCSS.ELA-LITERACY.RI.4.2

CCSS.ELA-LITERACY.RI.5.2

CCSS.ELA-LITERACY.SL.4.4

CCSS.ELA-LITERACY.SL.5.4

Materials

- *Great Lakes Research Journal* title in *Ecosystems Research Journal* series
- Devices with Internet access for research
- Video recording tools, such as teacher-approved devices or school video cameras
- Projection tool, such as a SmartBoard
- Approximately 5-8 printed copies of articles or article excerpts about Great Lakes Areas of Concern—1 per group of 4 students. See suggested article links in lesson plan below.
- *Ecosystem Protection News Broadcast Information Sheet*
- *Ecosystem Protection News Broadcast Levelled Checklist*
- Chart paper and markers
- Timer or teacher-approved device that can time

Setting the Stage

As a class, read *Great Lakes Research Journal*. Have a short class discussion about the different ways that humans are working to restore and protect various parts of the Great Lakes ecosystem. Examples of human restoration and protection efforts appear on the following pages: 8-9, 11, 12, 14, 16-17, 19, 22-23, 28-29.

Teacher may decide to review human impact on ecosystems with students. Explain that although humans have had negative impacts on ecosystems, such as habitat encroachment or devastation and pollution, they are also an integral part of working to restore and protect ecosystems around the world.

Explain that most of the book's examples of humans working to protect Great Lakes ecosystems are part of an international agreement between the United States and Canada called the **US-Canada Great Lakes Water Quality Agreement**. Discuss the agreement in class together.

The agreement identifies Great Lakes Areas of Concern, or AOCs.

- ▶ AOCs are locations where environmental conditions resulting from human activities have limited some uses of lakes—uses that people depend on, such as fishing.

This agreement was signed firstly in 1972 and amended in 2012.

As a part of the 2012 amendment, 9 objectives were agreed on. On SmartBoard or other tool, project objectives of Agreement for class viewing and explain each of the nine objectives in student-friendly language. <https://binational.net/glwqa-aqegl/> Suggested student-friendly steps are below.

The waters of the Great lakes should:

1. Be safe to drink
 2. Be safe for swimming and recreation
 3. Allow for humans to safely eat fish or other animals living there
 4. Be free from pollution that would harm humans, animals, or plants
 5. Support habitats that allow native species to survive. **Native species are natural to the ecosystem.**
 6. Be free from human pollution that causes algae to grow and harm ecosystems
 7. Be free from invasive species. **Invasive species are not natural in an ecosystem and cause harm to the native species there.**
 8. Be free from polluted groundwater. **Groundwater is water held in soil or between rocks underground.**
- Be free from any other polluting substances or materials that harm the ecosystem.

Objectives

Students will:

- Identify and understand the positive and negative impacts humans have on ecosystems.
- Write and perform a role-playing activity that explains how humans are working to preserve one ecosystem.

- Teacher may display map of AOCs at this link: <https://bit.ly/2rTteFF>

Visit the following links for further information on the agreement:

- 4 http://ijc.org/en_/aoc/AOC_Intro
- 4 <https://www.epa.gov/great-lakes-aocs>
- 4 <https://bit.ly/2rTteFF>
- 4 <https://binational.net/>

Explore the human efforts to restore and protect Great Lakes Areas of Concern in more detail as a class. Split the students into groups of 4 and give each group an article or article excerpt that examines one specific human conservation effort. Instruct students to summarize the article in 3 sentences. Tell them that their summary must include the people involved in the effort, the restoration or protection plan, and the result of the effort. Students should write their summaries on the chart paper.

Teacher should choose articles and excerpts based on class ability. Some suggested articles or excerpts are:

- Excerpts on Randle Reef: <http://www.randlereef.ca/> ; <https://bit.ly/2lYsj0e>
- Two Michigan AOCs delisted: <https://on.freep.com/2rZkwox>
- Funding provided to clean up Saginaw Bay: <https://bit.ly/2KJ8Gqf>
- Niagara River Remedial Action Plan: <http://ourniagarariver.ca/about/>
- Great Lakes Legacy Act: <https://bit.ly/2lCM1v9>
- Michigan Volunteer River, Stream and Creek Cleanup Program: <https://bit.ly/2kcBGvf>
- Great things happening on the Great Lakes: <https://bit.ly/2kel4Di>
- Great Lakes Clean-Up Tracking Effort Underway: <https://ihr.fm/2x1YR4V>

Post each group's chart paper at the front of the classroom and talk about the efforts being made to clean up some Areas of Concern and the results that have come from the agreement. **Emphasize the importance of international collaboration in this effort and the combined efforts of many different stakeholders.**

Activity

Hand students *Ecosystem Protection News Broadcast Information Sheet* and review the activity together. Students will take part in a role-play activity in which they will record a "news broadcast" explaining an ecosystem cleanup project. Students will work in pairs. One will be the ecosystem expert, and one will be the news journalist who interviews them. News broadcast should be approximately 3-5 minutes in length.

Questions should address the following information:

- Why the ecosystem was at risk or designated as an area of concern
- The groups working together to fix the problem
- A brief description of the plan of action to restore or protect the ecosystem
- If relevant, the result of the plan or project.

Give students 1-2 class periods to write a script for their news broadcast. They will use devices to conduct any research they need. As students prepare their scripts, conference with them to assess understanding and guide them on the right track. When pairs are ready, teacher will videotape their role-play. They are not required to memorize their scripts.

Extensions

- Extend the news broadcast to include the perspectives of other stakeholders on the project. In addition to the ecosystem expert, news broadcaster could also interview people from the local community, Indigenous peoples if relevant, a corporate interest (such as the fishing industry), and an advocate for a certain species.
- Present news broadcasts to another class and explain to them what they learned about the importance of human collaboration to conserve an ecosystem.
- Create a local collaborative effort to restore or protect a local or nearby ecosystem that is facing challenges.

Wrap-Up

Hold a "class viewing" day in which each group will present their news broadcast videos. After each presentation, invite students to ask questions or share thoughts.

Assessment

Use *Ecosystem Protection News Broadcast Levelled Checklist* to assess news broadcast.

Ecosystem Protection News Broadcast Information Sheet

Show what you know about an ecosystem clean-up effort by broadcasting your own news report! You are creating a news segment to inform the public about an ecosystem clean-up effort. In pairs, one person will be the news journalist, and the other will be an ecosystem expert. The journalist will interview the expert about the clean-up effort.

- Choose one ecosystem clean-up effort.
- One Great Lakes clean-up effort.
 - One effort described in any of the Ecosystems Research Journal books.
 - A local clean-up effort in your community.
- Your teacher must approve your topic. When you have chosen one, review it with your teacher.
- Your news segment will be approximately 3 to 5 minutes long. Use the provided timers or teacher-approved devices to time your script before you tape it!

- You are required to:
- Write a script of the questions and answers that you will read in your broadcast.
 - Record a video of the interview. You may read your script in the video.
 - Show your video to the class and answer any questions that your classmates have about it.
 - Hand in your script to the teacher.

- The questions in your script must address or include the following information:
- The different people and organizations involved in the effort.
 - When the effort began and when it will end, if there is an end date.
 - The goals of the effort and the plan in place to meet those goals.

Date: _____ Name: _____

Ecosystem Protection News Broadcast Levelled Checklist

Category	Criteria	Level 1	Level 2	Level 3	Level 4
Script	Script includes key information such as stakeholders involved, the effort's beginning and end dates, the goals of the effort, and the plan in place.				
	Script has a clear question-and-answer structure.				
	Script has been edited for proper spelling and grammar.				
	Script uses appropriate scientific language.				
Presentation	Student speaks clearly and with appropriate language				
	Student engages with role-play by exploring elements, such as posture, emphasis, speaking tone, which reflects their character.				
	Student shows effective communication through the video camera medium, using appropriate eye contact and body language.				
	Student engages in discussion about presentation by answering any questions from peers or responding to thoughts.				

LESSON 5

Getting to Know Biosphere Reserves

Curriculum Correlations

Ontario Science and Technology

Grade 4—Understanding Life Systems: Habitats and Communities

1.1, 2.3, 2.5, 3.1, 3.4

Grade 6—Understanding Life Systems: Biodiversity

1.1

Ontario Social Studies

Grade 4—People and Environments: Political and Physical Regions of Canada

B1.3, B2.1, B2.2, B2.5

Grade 5—People and Environments: The Role of Government and Responsible Citizenship

B1.1, B2.1

Ontario Language Arts

Grades 4 and 5 Reading

1.1, 1.4

Next Generation Science Standards

5-ESS3-1.

Common Core State Standards

CCSS.ELA-LITERACY.RI.4.2

CCSS.ELA-LITERACY.RI.5.2

CCSS.ELA-LITERACY.W.4.2.A

CCSS.ELA-LITERACY.W.4.2.D

CCSS.ELA-LITERACY.W.5.2.B

CCSS.ELA-LITERACY.W.5.2.D

Materials

- *Serengeti Research Journal* book in *Ecosystems Research Journal* series (page 8-9)
- *Exploring a Biosphere Reserve Information Sheet*
- *Exploring a Biosphere Reserve Checklist*
- Whiteboard and markers
- 8x11 pieces of paper
- Large poster board or chart paper
- Writing and decorating utensils
- Projection device, such as a SmartBoard
- Devices with Internet access for research

Setting the Stage

Review concepts related to humans' impact on ecosystems. Talk about some ways that humans work to restore and protect ecosystems. Use "Think, Pair, Share" method to allow students to talk about and share answers.

Read pages 8-9 in *Serengeti Research Journal*. These pages introduce the Ngorongoro Conservation Area, which was named an international biosphere reserve by UNESCO in 1959.

Facilitate a class discussion:

- What is a biosphere reserve?
 - ▶ **Biosphere reserves are models of how we should live with nature. They work to protect biodiversity of species in the ecosystem and promote sustainable actions by humans.**
- How do the species in the Ngorongoro Conservation Area, and the humans who use and rely on the area, benefit from the area's designation as a biosphere reserve?
 - ▶ Use the book to examine the Ngorongoro biosphere reserve.
- The species benefit from actions that keep the area free from human encroachment.
- Lush grassland has grown there.
- The ecosystem includes the correct numbers of predators and prey, keeping the populations there healthy.
- Tourists are able to view unique species and their money helps fund initiatives in the area, such as wildlife corridors that link animal habitats and research that looks at the amount of human impact the ecosystem can take.
- Teacher may need to introduce UNESCO. This is the United Nations Educational, Scientific, and Cultural Organization. The United Nations is an international organization of countries that work together to make the world a better place. UNESCO focuses on fostering international cooperation to solve issues and promote celebration in educational, scientific, and cultural areas. Biosphere reserves fall under scientific area.

Explain that biosphere reserves are an example of a way that humans work to protect ecosystems. They are an international, large-scale example.

Display map of Biosphere Reserves around the world, found at the link below. Tell students that there are 669 biosphere reserves on Earth, found in 120 countries. There are 18 biosphere reserves in Canada. There are 30 biosphere reserves in the United States.

<https://bit.ly/2rYODNt>

Objectives

Students will:

- Explain that biospheres are collaborative efforts to protect an ecosystem and model how we should live with nature.
- Describe how biospheres benefit and protect the plant and animal species living there.
- Explore one biosphere in detail and work with their group to present key information about that biosphere on a 4-part poster.

Activity

Hand students *Exploring a Biosphere Reserve Information Sheet*. Review the instructions together. In groups of 4, students will create a 4-part poster that gives information on all aspects of a biosphere reserve of their choice. Each student is responsible for one 8x11 page section. Each section requires the student to research and write information about a different aspect of the biosphere reserve.

1. Identify the general characteristics of the chosen biosphere in point form: the name, location, and year it was created. Describe the main characteristics of a biosphere. Answer the questions:
 - a. What is the goal of a biosphere?
 - b. Why did UNESCO create biospheres?
2. Describe the background behind the chosen biosphere. Answer the questions:
 - a. Why was it created?
 - b. What are its goals?
3. Name the people and organizations involved and describe their collaborative effort to promote sustainability. Answer the question:
 - a. How are sustainable actions promoted in the ecosystem?
4. Choose one species in the biosphere and describe how it is able to survive in the biosphere. Answer the question:
 - a. How does the species get what it needs to survive in the biosphere reserve?

Divide students into groups of 4 and provide each group with the materials they need to create their 8x11 pages and their poster board. Their poster board should be titled with the name of their biosphere reserve.

Direct students to the UNESCO site for a list of biosphere reserves and information about each biosphere reserve. Tell students that they can also conduct research on outside websites to learn more about the biosphere reserve.

<https://bit.ly/1AsvK07>

Extensions

- Use the UNESCO website and map to identify the nearest biosphere reserve to the class. Explore the biosphere reserve together. Invite each student to research one species that lives in that biosphere reserve and explore how it survives and thrives there.

Wrap-Up

Display the poster boards around the classroom. Conduct a classroom gallery walk, allowing students to view the poster boards of each of their classmates. Have a class discussion about the information on the poster boards. Around the room, ask each student to share one new thing that they learned from the gallery walk.

Assessment

Use *Exploring a Biosphere Reserve Checklist* to assess the poster boards.

Exploring a Biosphere Reserve Information Sheet

Visit the UNESCO website for a list of biosphere reserves and choose one that interests all members of your group. Together with your group, create a 4-part poster about the biosphere of your choice.

Your poster should have the following:

The name of your chosen biosphere reserve at the top of the poster board.

4 information pages—each member of your group creates one. As a group, decide who will complete each information page.

1. Identify the general characteristics of the chosen biosphere in point form: the name, location, and year it was created. Describe the main characteristics of a biosphere. Answer the questions:
 - a. What is the goal of a biosphere?
 - b. Why did UNESCO create biospheres?
2. Describe the background behind the chosen biosphere. Answer the questions:
 - a. Why was the biosphere created?
 - b. What are its goals?
3. Name the people and organizations involved and describe their collaborative effort to promote sustainability. Answer the question:
 - a. How are sustainable actions promoted in the ecosystem?
4. Choose one species in the biosphere and describe how it is able to survive in the biosphere. Answer the question:
 - a. How does the species get what it needs to survive in the biosphere reserve?

Each information page should have the following:

- Your name
- Appropriate scientific vocabulary, such as habitat, population, biosphere reserve, sustainable, and species
- Clear and readable writing, with correct spelling and grammar. Don't forget to proofread!
- A minimum of three sentences that meet the expectations above.

When you are finished, post each of the 4 information pages on your poster board. Then, decorate the poster board to reflect your creativity!

Date: _____ Student Name: _____

Exploring a Biosphere Reserve Checklist

Criteria	Level 1	Level 2	Level 3	Level 4
Information page is clearly written and has correct spelling and grammar.				
Information page uses scientific vocabulary appropriately.				
Information page has a minimum of three sentences that meet the criteria established.				
In class discussion following gallery walk, student participated by sharing one new piece of information they learned about a biosphere.				

LESSON 6

Role-play to Protect an Ecosystem

Curriculum Correlations

Ontario Science and Technology

Grade 4—Understanding Life Systems: Habitats and Communities

1.1, 2.3, 2.5, 3.10

Grade 6—Understanding Life Systems: Biodiversity

1.1

Ontario Social Studies

Grade 4—People and Environments: Political and Physical Regions of Canada

B1.2, B1.3, B2.1, B2.2, B2.5, B2.6

Grade 5—People and Environments: The Role of Government and Responsible Citizenship

B1.1, B1.3, B2.1, B2.2, B2.5

Ontario Language Arts—Oral Communication, Grades 4-6

Overall expectations 1, 2

Ontario Arts—Drama, Grades 4-6

Overall expectation B1

Next Generation Science Standards

4-ESS3-2.

5-ESS3-1.

Common Core State Standards

CCSS.ELA-LITERACY.SL.4.1

CCSS.ELA-LITERACY.SL.5.1

CCSS.ELA-LITERACY.SL.6.1

Materials

- Whiteboard or chart paper, and markers
- Devices with Internet access
- Video projection tool, such as a SmartBoard
- *Arctic Research Journal* title in *Ecosystems Research Journal* series
- *Climate Change in the Arctic Placemat*
- *Create a Protection Plan Perspective Sheet*
- *Create a Protection Plan Self-Assessment*
- *Create a Protection Plan Levelled Checklist*

Setting the Stage

Show students “Climate Change Basics” video at the following link: <https://www3.epa.gov/climatechange//kids/index.html>

Have class discussion about climate change. Ask students:

- What is climate change?
- What causes climate change?
- What are greenhouse gases and where do they come from?
- What impacts does climate change have on Earth’s ecosystems?
- What impacts does climate change have on the people who rely on their local ecosystems?

Explain that we will be examining the effects of climate change on the Arctic ecosystem and the different groups of people who rely on it. On whiteboard or chart paper, recreate a class version of *Climate Change in the Arctic Placemat*.

Read *Arctic Research Journal* as a class. *Note: This lesson can be applied to any of the books in the series, based on student interest or class initiatives.

Ask students:

- Who are the different stakeholders who are involved in or affected by climate change in the Arctic? *Note: Tell students that the stakeholders do not have to be human.

As students share their ideas, invite them to come up to the class placemat and write down that stakeholder in one of the empty boxes. A full placemat should include:

- Inuit peoples
- Local hunters
- Oil companies
- Animal species in the ecosystem
- Researchers studying the Arctic
- US or Canadian government, depending on school location

Split students into groups of 6. Hand each group their own copy of the *Climate Change in the Arctic Placemat*. Each group member must choose one of the stakeholders and fill in one section of the placemat describing, in point form, their perspective on the issue of climate change in the Arctic. They will use the *Arctic Research Journal* book only to complete this portion of the lesson.

Objectives

Students will:

- Identify different perspectives on an issue faced by an ecosystem.
- Research and prepare a role-play that represents one perspective on the issue.
- Collaboratively brainstorm and create a plan to protect the ecosystem.

Activity

Review each stakeholder perspective with students. Invite them to share the points they wrote down. Then, have students form new groups—with the other students in the class who also wrote about that stakeholder.

Explain to students that in their groups, they will take on the role of their stakeholder and participate in a collaborative meeting that addresses Arctic climate change.

Co-create success criteria with students. Criteria might include:

- Participate fairly and to the best of their ability in the role-play meeting.
- Act in role and represent their stakeholder’s perspective.
- Listen to classmates respectfully and respond to their ideas.
- Use scientific vocabulary appropriately, such as ecosystem, species, habitat, Arctic, etc.

Hand students *Create a Protection Plan Perspective Sheet*—1 per student. Instruct students to use the *Arctic Research Journal* book and their devices, for any outside research, to answer the questions. Students are encouraged to complete the perspective sheet in collaboration with their groups, but each need to write down answers on their own sheets. They will keep the perspective sheet with them during the role-play meeting to refer to.

When students have completed the *Create a Protection Plan Perspective Sheet*, move desks so there is a large space to arrange chairs for each student in a circle. Have the students sit together in their groups.

In role, teacher leads “meeting” as a facilitator.

- Teacher takes on the role of narrator in the *Arctic Research Journal* book and explains that they have brought together Inuit peoples, Arctic researchers, local hunters, oil company representatives, government representatives, and animal species representatives to come up with a plan that can help protect the Arctic ecosystem from the effects of climate change, while also meeting the needs of the people who rely on the ecosystem.

Teacher facilitates the meeting in role.

- Each group introduces themselves and explains how climate change affects them.
- Then, the teacher (facilitator) asks specific groups questions, and group members should respond in role.
- Teacher (facilitator) invites other groups to respond when appropriate.
- Finally, teacher (facilitator) asks each group to share a solution that would meet their needs.
 - ▶ Teacher writes each solution on chart paper or whiteboard and allows for other groups to respond to the solutions.
- After hearing and discussing possible solutions, class should create an “Arctic Protection Plan” that will work for each stakeholder.

Extensions

- Invite students to write a journal entry, in role, reflecting on the meeting that took place. They should describe how well they feel their needs will be met by the solution. They should also identify, from their stakeholder perspective, any worries they feel about the solution.

Wrap-Up

Have a class discussion in which students can reflect on the activity and share their thoughts. Ask students:

- What is something that you feel worked well in our group discussion?
- What is something that could have been improved?
- Do you feel that meetings such as this one would be useful in the real world? Why or why not?

Hand students *Create a Protection Plan Self-Assessment* to complete and hand in.

Assessment

Use *Create a Protection Plan Levelled Checklist* to assess students’ participation and performance in the role-play meeting. Assess students’ self-assessment for level of comprehension and their participation in group work.

Name: _____

Climate Change in the Arctic Placemat

Stakeholders affected by
climate change in the Arctic

Name: _____

Create a Protection Plan Perspective Sheet

You have been invited to take part in a collaborative meeting with other groups affected by climate change in the Arctic. Use the *Arctic Research Journal* book and your devices to answer the questions below. Each question helps you prepare to share your perspective in the meeting.

Name the stakeholder group you represent _____

Describe your needs. How do you rely on the Arctic ecosystem to meet your needs?

Name 3 ways you affect and/or are affected by climate change in the Arctic.

Describe how you feel about the challenges facing the Arctic ecosystem due to climate change.

We need to find a solution that will protect the Arctic ecosystem from the effects of climate change. Describe a solution that would protect the ecosystem but also allow you to meet your needs.

Date: _____ Name: _____

Create a Protection Plan Self-Assessment

<p>What did you excel at in the role-playing activity today?</p>	<p>What is one thing you would have done differently?</p>
<p>Name one way that you were a positive and helpful group member today.</p>	<p>What did you learn about the importance of collaboration to help protect ecosystems?</p>

Name: _____

Create a Protection Plan Levelled Checklist

Criteria	Level 1	Level 2	Level 3	Level 4
Student participated fairly and to the best of their ability during role-play activity.				
Student acted in role and clearly and accurately communicated their stakeholder's perspective.				
Student spoke clearly and used scientific vocabulary appropriately.				
Student listened respectfully to classmates and showed appropriate listening comprehension skills by responding to classmates' ideas.				
Student contributed to the creation of a class Arctic protection plan.				