

Hazard Literacy Center

Hazard Literacy Education Program

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Too Many or Too Few: Climate Change and Ecosystem Imbalance



1. Program Overview

This program is designed to help students understand ecosystem changes and ecosystem imbalance caused by climate change. Through news and everyday examples, students explore cases in which certain species become too abundant or too scarce, habitats shift, or seasonal life cycles change, and consider what ecosystem imbalance means. They learn that ecosystem change involves not only increases or decreases in population size, but also changes in food relationships, breeding periods, habitats, and ecosystem functions connected to human life. Recent studies also show that climate change affects species distribution and abundance, seasonal patterns, and interactions among species, and that these changes, together with biodiversity loss, can affect human quality of life. The program also encourages students to consider why these changes occur and how we can respond, rather than viewing ecosystem problems simply as dangerous or abnormal events. Instead of attributing increases or decreases in a species to a single cause, students consider multiple interacting factors such as habitat change, pollution, invasive species, disease, and climate change. They also examine responsible choices and actions humans can take as part of ecosystems. Through these activities, students view ecosystem change from the perspective of ecological citizenship and explore ways to conserve biodiversity and take action in daily life.

Grade Level	Grades 6-9	Instructional Methods	Lecture, Discussion
Learning Environment	Classroom	Duration	90 minutes (45 minutes × 2 class periods)
Required Materials	Digital devices for watching videos		

2. Learning Objectives (Hazards Literacy Framework)

① Explain ecosystem changes caused by climate change and the meaning of ecosystem imbalance.
② Understand interactions and changes within ecosystems through examples such as changes in populations, habitats, and seasonal patterns.
③ Explore ways to take action as ecological citizens by considering how humans and nature can coexist.

Learning Objectives	Knowledge & Understanding		Reasoning & Skills					Values & Attitudes			Psychology & Emotion			Behavioral & Practical Enagement		
	A1	A2	B1	B2	B3	B4	B5	C1	C2	C3	D1	D2	D3	E1	E2	E3
Objective ①	O		O					O							O	
Objective ②		O	O	O					O							
Objective ③								O		O		O				

3. Key Concpets

· Climate Change and Changes in Habitats and Populations

· Food Relationships and Changes in Ecosystem Balance

· Connections Between Biodiversity and Ecosystem Functions

· Ecological Citizens' Responsibility and Action for Ecosystem Change

4. Program Sequence

Learning Activities	
Introduction	·Recognize ecosystem changes through news and everyday examples ·Discuss: "Why is it a problem when populations become too large or too small?"
Development 1	·Explore the meaning of ecosystem imbalance ·Understand the difference between simple population changes and ecosystem imbalance ·Identify connections among food relationships, habitats, reproduction, and seasonal patterns
Development 2	·Explore examples of habitat shifts, population changes, and seasonal changes caused by climate change ·Understand relationships among climate change, biodiversity, and ecosystem functions ·Discuss how ecosystem changes caused by climate change are connected to human life
Development 3	·View ecosystem change as an issue connected to both nature and humans ·Discuss possible actions from the perspective of ecological citizenship ·Classify actions that can be taken by individuals, schools, and communities
Wrap-up	·Review the relationship between climate change and ecosystem imbalance ·Reflect on the role of ecological citizens in responding to ecosystem change

5. Theoretical Background and Activity Design for Disaster Education

Climate change involves more than rising temperatures. It can change species' habitats, breeding periods, timing of appearance, populations, and interactions among species, affecting the balance of entire ecosystems. Recent studies and reports show that climate change and biodiversity loss are closely connected and that these changes can affect not only ecosystem functions but also human quality of life. In addition, increases or decreases in a species are difficult to explain by a single cause, and multiple factors such as habitat change, pollution, invasive species, disease, and climate change may act together.

The program therefore begins by asking students to consider, through their own experiences and news examples, why having "too many or too few" organisms can be a problem. Students then understand ecosystem imbalance not simply as a change in population size, but in terms of interactions between organisms and their environment. Next, they consider how climate change can affect habitats, breeding periods, timing of appearance, and populations. Finally, they identify specific actions that individuals and communities can take to reduce ecosystem imbalance. This sequence is designed to help students understand ecosystem change as an issue involving coexistence between humans and nature and to explore their responsibilities and actions as ecological citizens.

6. Instructional Considerations

Teachers should ensure that students do not understand ecosystem imbalance simply as "an increase or decrease in the number of a certain organism." Students should be guided to consider how population changes are connected to food relationships, habitats, seasonal changes, and human life. When discussing whether ecosystem changes caused by climate change should be distinguished from naturally occurring changes, teachers should encourage students to consider multiple possible causes rather than attributing changes to a single factor. In the action-planning activity, students should also be encouraged to describe specific actions by including when, where, and how often they can carry them out, rather than writing only abstract commitments.

7. References

- Gibbons, J. W., Scott, D. E., Ryan, T. J., Buhlmann, K. A., Tuberville, T. D., Metts, B. S., Greene, J. L., Mills, T., Leiden, Y., Poppy, S., & Winne, C. T. (2000). The global decline of reptiles, déjà vu amphibians. BioScience, 50(8), 653–666.
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, & Intergovernmental Panel on Climate Change. (2021). Scientific outcome of the IPBES-IPCC co-sponsored workshop on biodiversity and climate change.
- Biodiversity Foundation, & Greenpeace. (2021). Research report on climate change and biodiversity: Portraits of things disappearing.

Lesson 1: Too Many or Too Few

Theme	Climate Change and Ecosystem Imbalance
What Will We Learn?	① Explain ecosystem changes caused by climate change and the meaning of ecosystem imbalance. ② Understand interactions and changes within ecosystems through examples such as changes in populations, habitats, and seasonal patterns. ③ Explore ways to take action as ecological citizens by considering how humans and nature can coexist.

1 Let's Think!

- Have you ever heard in the news or noticed in daily life that certain plants or animals have become too abundant or too scarce? Why do you think this can be a problem?

2 What Is Ecosystem Imbalance?

- Express in words or pictures what you think it means when an ecosystem becomes unbalanced.

- Answer the questions below with your teacher.

1) What is ecosystem imbalance?

2) Why can a change in one organism affect other organisms or the environment in an ecosystem?

3) How is ecosystem imbalance different from simply having more or fewer organisms?

3 Connecting to Climate Change

- What changes can occur because of climate change?

- How can climate change affect where organisms live, when they reproduce or appear, and their populations?

- How can ecosystem changes caused by climate change affect human life?

〈Think About It〉
Should we distinguish ecosystem changes caused by climate change from those that occur naturally?

4 What Can We Do?

- What can you do to help reduce ecosystem imbalance?
  (Be specific about when, where, and how many times a week you can do it.

- What can you do together with friends, family, or neighbors at school or in your community?

- Write one action you would like to take to help keep ecosystems healthy, and explain why.