

**Grade 7
Science
Unit 4: Ecology**



Time Frame: Approximately two weeks

Unit Description

In this unit, activities will focus on biomes and their characteristics; distinguishing among ecosystems, communities, populations, species, habitats, and niches; symbiotic relationships; and the impact of population changes on ecosystems.

Student Understandings

This study of ecology requires that students understand and recognize various biomes around the world, the dynamics of populations and factors that influence populations, the impact of human intervention, and the levels of organization within ecosystems.

Guiding Questions

1. Can students list, locate, describe, compare, and contrast the eight major biomes of Earth?
2. Can students describe ecological/symbiotic relationships among plants and animals?
3. Can students describe the components of a habitat and a niche and how they differ?
4. Can students predict the impact on ecosystems as changes in populations occur through natural events or human interventions?

Unit 4 Grade-Level Expectations (GLEs)

GLE #	GLE Text and Benchmarks
Science as Inquiry	
<i>Note: The following Science as Inquiry GLEs are embedded in the suggested activities for this unit. Other activities incorporated by teachers may result in additional SI GLEs being addressed during instruction on the Ecology unit.</i>	
1.	Generate testable questions about objects, organisms, and events that can be answered through scientific investigation (SI-M-A1)
2.	Identify problems, factors, and questions that must be considered in a scientific investigation (SI-M-A1)
3.	Use a variety of sources to answer questions (SI-M-A1)

GLE #	GLE Text and Benchmarks
11.	Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
13.	Identify patterns in data to explain natural events (SI-M-A4)
14.	Develop models to illustrate or explain conclusions reached through investigation (SI-M-A5)
15.	Identify and explain the limitations of models used to represent the natural world (SI-M-A5)
19.	Communicate ideas in a variety of ways (e.g., symbols, illustrations, graphs, charts, spreadsheets, concept maps, oral and written reports, equations) (SI-M-A7)
22.	Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)
26.	Use and describe alternate methods for investigating different types of testable questions (SI-M-B1)
27.	Recognize that science uses processes that involve a logical and empirical, but flexible, approach to problem solving (SI-M-B1)
28.	Recognize that investigations generally begin with a review of the work of others (SI-M-B2)
33.	Evaluate models, identify problems in design, and make recommendations for improvement (SI-M-B4)
34.	Recognize the importance of communication among scientists about investigations in progress and the work of others (SI-M-B5)
37.	Critique and analyze their own inquiries and the inquiries of others (SI-M-B5)
38.	Explain that, through the use of scientific processes and knowledge, people can solve problems, make decisions, and form new ideas (SI-M-B6)
39.	Identify areas in which technology has changed human lives (e.g., transportation, communication, geographic information systems, DNA fingerprinting) (SI-M-B7)
40.	Evaluate the impact of research on scientific thought, society, and the environment (SI-M-B7)
Life Science	
25.	Locate and describe the major biomes of the world (LS-M-C3)
26.	Describe and compare the levels of organization of living things within an ecosystem (LS-M-C3)
27.	Identify the various relationships among plants and animals (e.g., mutualistic, parasitic, producer/consumer) (LS-M-C4)
28.	Differentiate between ecosystem components of habitat and niche (LS-M-C4)
29.	Predict the impact changes in a species' population have on an ecosystem (LS-M-C4)

Sample Activities

Activity 1: Biome Field Trip Simulation (SI GLEs: 3, 13, 14, 15, 33; LS GLE: 25)

Materials List: Pictures of biomes, variety of materials for the construction of biome display model by students, video clips of at least two different natural habitats, Biome Field Trip BLM (for teacher)

Allow students to view at least 2 short clips from a video or movie showing a scene that depicts a natural habitat such as an ocean, forest, desert, etc., discuss the observations from each, and allow students to compare and contrast the different habitats. Introduce the term *biome* by providing each student a picture of one of the major world biomes and a graph showing the annual average precipitation. As they make inferences about the biome, they should relate precipitation, climate, and plant growth to the types of animals that can inhabit that area. Group students according to common biomes to research design and construct a display model (with approval) of their biome. (Biomes could be assigned across groups in several classes, as long as they are researched.) Assign guidelines for their display model.

Display models must include the dominant plant and animal species, products, resources, and unique characteristics that distinguish the biome from others in the world. Students should identify patterns in nature that allow organisms to survive uniquely within their biome.

Instruct students to develop activities to help their classmates experience the biomes. For example, when students visit the rain forest, they might see a puppet show, listen to a native healer, eat dishes prepared from bananas, or walk on logs to simulate the destruction of the rain forest. Host students may serve as the tour guides and teach the environmental responsibilities, habitats, and human roles in the various ecosystems. When preparing to tour the biome displays, students should create a *split-page note taking* ([view literacy strategy descriptions](#)) sheet to record information. The *split-page note taking* sheet is created by drawing a line from top to bottom approximately 2 to 3 inches from the left edge on a sheet of notepaper. It is useful for student note taking, and should also be used to review information studied. Their *split-page note taking* sheet should include information that will provide students with a physical description of the biome, characteristics, plant and animal species, and products. The Biome Field Trip BLM is provided to give the teacher an example of what students might develop.

Conduct a discussion with students on the use of models, i.e., they are good tools to use, what are their limitations and inherent problems with design, etc., Critique student biome models for proper representation of characteristics and organisms.

Use various areas around the school for the displays; if possible or if room is unavailable, students can create a classroom collage of their biome.

As a review of information presented, students should use the information from their split-page note taking sheet to develop questions regarding their biome that will be used in a game created for an informative assessment (e.g., a Jeopardy®- type game). After all of the groups have toured

the biomes, students will participate in the game. The split-page note taking sheet may also be used as a study guide; students should cover one side of the sheet and answer questions that relate to the information.

Activity 2: Panda Bears in Louisiana (SI GLEs: 2, 14, 26, 27, 28, 34, 37; LS GLE: 28)

Materials List: large newsprint or bulletin board paper, markers, colored pencils, pictures of young and adult panda bears

Introduce panda bears to students with a brief description of their habitat and habits along with accompanying pictures of young and adult bears. An organism's *habitat* refers to the actual location in the environment where the organism lives. It consists of all the physical and biological resources available; it can also be defined as the organism's address. A *niche* is the way in which an organism fits into an ecological community or ecosystem, the organism's job within that address.

Tell the students they will design a zoo enclosure for a panda bear that is being moved to Louisiana from its natural habitat in China. Elicit questions about designing a zoo enclosure that is conducive to the panda's native habitat. Explain how a zoo enclosure is limited as compared to the natural habitat of the panda. Discuss with students how models can be used in science. Remind students to consider creating an enclosure that will benefit both the panda bears and the zoo visitors. Students should first review what other zoos have done to house Pandas and what research shows are the needs of the Panda in captivity. Local zoo personnel can be useful to provide excellent resources about the planning and designing of an animal enclosure, when accessible.

Students are to create on paper, an environment that replicates, to the extent possible, the characteristics of the environment for which the bear is naturally adapted. Students should also compare and contrast the two environments (China and Louisiana) and identify and describe the bear's habitat needs. They are to include what can be done to meet those needs in Louisiana. Students should list the major features they would like to see in the enclosure, such as ponds or water troughs, grass area, trees, and sleeping quarters, and draw the enclosure on large sheets of paper. Groups should carousel around to view each drawing and discuss the merits and drawbacks of each. Discuss with students some of the problems panda bears face living in captivity and people's responsibilities to meet animals' habitat needs in captivity. Students should explain the problems that pandas are facing in their natural environment and the environmental effects of removing all pandas and placing them in captivity.

Review and discuss current conservation efforts for the panda in light of the panda's habitat and niche. Describe the logical approach that scientists are using to address the problem of how to increase their population. Identify two zoos that are currently involved in the panda bear conservation project, such as the National Zoo in Washington, DC, the San Diego Zoo, and Zoo Atlanta. Compare the conservation efforts of each zoo and discuss how scientists must collaborate in order to sustain the panda population.

An excellent video for both the teacher and students is LPB's *A Zoo View*, available through the LPB Cyberchannel. Access to the teacher guide that accompanies this video can be obtained at <http://www.lpb.org/education/classroom/itv/envirotacklebox/>. Once at this site, scroll down the page and then select *A Zoo View*. Many school libraries and individual teachers have copies of the video. If this resource is not available, use a similar video that describes how care and placement of animals are considered when planning a zoo.

Note: Students can watch live "Panda cams" at the websites of the three above-mentioned zoos. See links in Resource section.

Activity 3: My Niche (SI GLEs: 1, 19; LS GLE: 28)

Materials List: chart paper or poster board, markers or colored pencils

Begin the activity by asking students to list various jobs in the community. Ask students to generate questions about the specific jobs, for example, what does the job do for the community? How does the job provide a service? What time schedule does the job follow? What other professions or jobs are dependent for the functioning of the job? What contribution does the job make to other professions? What special skills are required to perform the job? Have each student select a job and answer the agreed-upon list of student-generated questions. Introduce the term *niche* and ask students to relate it to the community job they just described.

Have students brainstorm a variety of animals living in a particular community (e.g., forest, stream, swamp). Make sure that the list includes predators, prey, scavengers, etc. Have students, either individually or in groups, answer the same questions they did for the jobs in the community so they can see the relationship metaphor. Review the term *niche* and explain the relationship between the community to that of a habitat and an organism's niche.

Working in groups, students will develop an advertisement for recruiting individuals into a certain ecological niche, highlighting special opportunities and advantages of the niche.

Activity 4: What's the Connection? (SI GLEs: 11, 19; LS GLEs: 26, 28)

Materials List: What's The Connection? BLM (for teacher), yarn, card stock or index cards

Now that students have studied biomes and habitats, introduce the terms *biosphere*, *ecosystems*, *community*, *population*, and *species* by instructing them to sequence them in a *graphic organizer* ([view literacy strategy descriptions](#)) format from general to specific without any guidance. This strategy involves showing information in a graphic format that relates concepts. Concepts are arranged in hierarchy with the most general concept at the top. The previous activities can also be connected with readings, Internet searches, and instruction. After a discussion of these terms, allow students to rearrange them in their graphic organizers, if needed; then allow students to present their graphic organizers to demonstrate their understanding, using local examples.

After a review of the concepts, these terms may also be presented as a hanging mobile, created by attaching yarn to connect the concepts and allowing them to hang from the ceiling or wall.

The What's The Connection? BLM is provided as an example of one type of graphic organizer that can be utilized in this activity.

Activity 5: I Depend on You (SI GLEs: 3, 11, 19, 22; LS GLE: 27)

Materials List: Symbiotic Relationships BLM (one per student)

Begin the discussion by asking students to recall seeing cows in a pasture and the egrets that are usually seen near them or even on their backs! Ask students to describe this relationship, accepting all logical answers. Now introduce the term *symbiosis* (living together) and provide each student a copy of the Symbiotic Relationships BLM to *brainstorm* ([view literacy strategy descriptions](#)) other pairs of organisms that live together. This literacy strategy involves students arranging their thoughts about a concept in an organized arrangement. There are several brainstorming formats available, the sample Symbiotic Relationship BLM has been provided for use. Point out that organism pairs can be either plants or animals. Accept all suggestions. Students will then use information from the Internet or textbooks to identify the three major types of symbiotic relationships—*mutualism*, *commensalisms*, and *parasitism*. Divide the brainstormed list or a teacher-made list and have students determine if the pairs of organisms actually have a symbiotic relationship. Each group of students should select a pair of organisms that exhibit symbiosis and identify the type of symbiotic relationship between the two organisms, their interactions, and the effect of their interactions on both organisms.

Present students with the following scenario and ask them to respond: In the ocean, the clownfish lives among the stinging tentacles of the sea anemone, protected from predators that cannot tolerate the anemone's sting. The clownfish also chases away certain anemone eating fish that can damage or kill the anemone. Because of the popularity of an animated movie about clownfish, there has been a sharp increase in the demand for the clownfish in pet stores. This has resulted in a substantial increase in the capture of these clownfish by companies that sell tropical fish. Direct students to create a *RAFT* ([view literacy strategy descriptions](#)) letter to a tropical fish company, explaining why it is important to limit the number of clownfish they are capturing and how the anemone population may be affected if it disappears. A *RAFT* writing assignment allows students the freedom to project themselves into unique roles and look at content from unique perspectives. From these roles and perspectives, *RAFT* writing should be used to explain processes or describe a point of view. This kind of writing assignment is intended to be creative and informative.

Ask students to work in pairs to write the following *RAFT*:

R- (Role of the writer) scientist

A- (Audience, to whom or what the *RAFT* is being written) tropical fish company

F- (Form the writing will take, as in a letter, song, brochure, etc.) letter or news conference

T- (Topic or the subject focus of the writing) the topic focus should discuss the importance of limiting the capture of clownfish due to the possible negative effect on the anemone population.

If technology is available, students can create their *RAFT* as an electronic presentation. Where technology is not available, students can present this information using a visual display. Students should listen for accuracy and logic in their classmates' *RAFTs* as they are read aloud in class.

Activity 6: Parachuting Cats into Borneo (SI GLEs: 11, 19, 38, 39, 40; LS GLE: 29)

Materials List: chart paper, markers or colored pencils

Explain to students that they have talked a lot about ecosystems and what happens to populations of animals in ecosystems. Ask probing questions, such as Does a population always has the same number of organisms in it, or can it change? If it changes, how does it change—yearly, monthly, once in a great while? What might cause changes at these intervals? Does change help or hurt an ecosystem? Why or why not? Gather reactions to the idea of change in ecosystems.

Read the following true story, *Parachuting Cats into Borneo*:

In the early 1950s, there was an outbreak of the serious disease malaria among the Dayak people in Borneo. The World Health Organization tried to solve the problem by spraying large amounts of a chemical called DDT to kill the mosquitoes that carried the malaria parasite. The mosquitoes died and there was less malaria. That was good. However, there were side effects. One of the first effects was that the roofs of the people's houses began to fall down on their heads. It turned out that the DDT also killed a parasitic wasp that ate thatch-eating caterpillars. (The roofs were made of thatch.) Without the wasps to eat them, there were more and more thatch-eating caterpillars. Worse than that, the insects that died from being poisoned by DDT were eaten by geckoes, which were then eaten by cats. The cats started to die, and the rat population began to flourish. The people were then threatened by outbreaks of two new serious diseases carried by the rats, plague and typhus. To cope with these problems the World Health Organization parachuted over 14,000 live cats into Borneo.

Using the think-pair-share strategy, have students discuss what they think happened and why. Have students work in pairs to make a diagram showing what happened and the interdependencies among the populations and how, through the use of scientific knowledge, the problem was solved.

Explain the ecological changes that occurred as a result of the introduction of the chemical DDT. Allow students to discuss alternative methods to eliminate the mosquitoes. Discuss the increased concern of the mosquito population in Louisiana and the methods and treatments being devised to contain the situation. Ask students to imagine that the mosquito could be totally eliminated in Louisiana and to predict what impact this would have on the ecosystem.

Explain that the story shows how balance can be important in an ecosystem. Often people think that ecosystems must be balanced in order to be healthy; however, change, or flux is not always harmful for an ecosystem. Balance *and* flux are parts of the dynamic of ecosystems.

Sample Assessments

General Guidelines

Assessment will be based on teacher observation/checklist notes of student participation in unit activities, the extent of successful accomplishment of tasks, and the degree of accuracy of oral and written descriptions/responses. Journal entries provide reflective assessment of class discussions and laboratory experiences. Performance-based assessment should be used to evaluate displays and presentations. All student-generated work, such as drawings, data collection charts, models, etc., may be incorporated into a portfolio assessment system.

- Students should be monitored throughout the work on all activities.
- All student-developed products should be evaluated as the unit continues.
- When possible, students should assist in developing any rubrics that will be used and should be provided with the rubric during task directions.

General Assessment

- The student will design an appropriate zoo enclosure for pandas kept in Louisiana.
- The student will create an ecological niche advertisement.
- The student will write a letter explaining importance of preserving both organisms in a symbiotic relationship.
- The student will create a diagram illustrating and describing interdependencies among populations.

Activity-Specific Assessments

- Activity 1: Provide students with a description of a biome, and ask them to identify the biome based upon the description. Students should list at least two types of adaptations needed for organisms to survive in this biome.
- Activity 4: Provide students with the terms and pictures of *biosphere*, *ecosystems*, *communities*, *populations*, *species*, and *habitats*. They should arrange the terms and pictures according to hierarchy.
- Activity 5: Provide students with descriptions of different types of symbiotic relationships and ask that they identify the correct relationship based upon the descriptions. Evaluate for accuracy.

Resources

- *Causal Patterns in Ecosystems*. Available online at http://www.pz.harvard.edu/ucp/curriculum/ecosystems/s6_lessonplan.htm
- *GEMS: On Sandy Shores*.
- *Panda View*. Available online at http://www.sandiegozoo.org/zoo/ex_panda_station.html
- Georgia's Panda Project. Available online at http://www.zooatlanta.org/animals_panda_cam.php4
- National Zoo-Washington, DC <http://nationalzoo.si.edu/Animals/GiantPandas/default.cfm>
- *Symbiotic Relationships*. Available online at <http://magma.nationalgeographic.com/ngexplorer/0601/articles/mainarticle.html>
- *A Zoo View* Louisiana Public Broadcasting Unitedstreaming www.lpb.org/cyberchannel
- *Biomes-Habitat*. Available online at <http://www.enchantedlearning.com/biomes/Ecology>