

LESSON 3 Changes in Environmental Conditions

Lesson at a Glance

Students view and think about images and information in a PowerPoint presentation to address the question: What are some current examples of changes in environmental conditions that cause problems for plants and animals?

The examples used in this lesson relate to recent and specific situations with which many students should be familiar, or which they can observe today. The purpose of these examples is to show that changes in environmental conditions may stem from natural causes or human actions, or a combination of the two. Changed environmental conditions may cause the decrease in some populations of plants and animals, particularly those endemic to Hawai‘i, but can also bring about increases which are detrimental to the natural state of the ecosystem.

Lesson Duration

One 45-minute period

Essential Question(s)

What do threatened and endangered Hawaiian animals need to survive?
How have changes in environmental conditions affected species in Hawai‘i?

Key Concepts

- Plants and animals are impacted by changes to the specific environmental conditions that they need to survive.
- Human actions, whether intentional or unintentional, contribute to changing the environmental conditions that organisms need to survive.

Instructional Objectives

- I can identify examples of changes in environmental conditions in Hawai‘i.
- I can describe how changes in environmental conditions have impacted the survival of Hawaiian plants and animals.
- I can give an example of a difference between observations of environmental change, and inferences as to their cause.
- I can describe how intentional or unintentional human actions impact the environment of Hawai‘i.

Related HCPSIII Benchmark(s):

Science SC.4.5.3
Describe how different organisms need specific environmental conditions to survive.

Science SC.4.3.2
Describe how an organism's behavior is determined by its environment.

Science SC. 4.1.2
Differentiate between an observation and an inference



Assessment Tools

Benchmark Rubric:

Topic		Scientific Knowledge	
Benchmark SC.4.1.2		Differentiate between an observation and an inference	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain the difference between an observation and an inference and give examples	Differentiate between an observation and an inference	Provide examples of observations and inferences	Define an observation and an inference
Topic		Interdependence	
Benchmark SC.4.3.2		Describe how an organism's behavior is determined by its environment	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain and give examples of how different organisms' behaviors are determined by their environments	Describe how an organism's behavior is determined by its environment	Identify a way that an organism's behavior is influenced by its environment	Recognize that an organism's behavior is influenced by its environment
Topic		Unity and Diversity	
Benchmark SC.4.5.3		Describe how different organisms need specific environmental conditions to survive	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain why different organisms need specific environmental conditions to survive	Describe how different organisms need specific environmental conditions to survive	List specific environmental conditions that organisms need to survive	Recall that organisms need specific environmental conditions to survive

Assessment/Evidence Pieces

Lesson

- Student Worksheet: *Changes in Environmental Conditions in Hawai'i*

Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> • Method to present PowerPoint • PowerPoint <i>Changes in Environmental Conditions in Hawai'i</i> 	<ul style="list-style-type: none"> • Posters, post cards, or other images of local environment to post on bulletin board 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Worksheet: <i>Changes in Environmental Conditions in Hawai'i</i>

Instructional Resources

Teacher Reading: *Changes in Environmental Conditions*

PowerPoint: *Changes in Environmental Conditions in Hawai‘i*

Student Worksheet: *Changes in Environmental Conditions in Hawai‘i*

Student Vocabulary Words

Endemic: native to a region and existing nowhere else.

Lesson Plan

Lesson Preparation

- Read the Science Background provided in the Unit’s Overview and Teacher Background: *Changes in Environmental Conditions*.
- Select a book to read aloud to the class. Ideally, this book should focus on Hawai‘i’s endangered (or threatened species), and should include suggestions provided under Teaching Resources. Since book resources at your library may vary, if a Hawai‘i-specific text is not available, it is all right to use a text that focuses on endangered species throughout the world.
- Familiarize yourself with the PowerPoint: *Changes in Environmental Conditions in Hawai‘i*.
- Make copies of the Student Worksheet: *Changes in Environmental Conditions in Hawai‘i* for all students.

I. *Why are there so many endangered species in Hawai‘i?*

- A. Remind students that in Lesson 1 they learned how Hawai‘i has more threatened and endangered species than any other state in the United States. In Lesson 1, students saw that monk seals, humpback whales, and some seabirds are endangered, and that green sea turtles and other seabirds are threatened.

Misconception alert:

Point out to students that changes in environmental conditions may bring about decreases in some populations of plants and animals, but also may cause increases in other populations.

Only a few of the plants and animals shown in this CD PowerPoint slide show depict currently threatened or endangered species. In fact, many of the organisms have flourished and present the problem of out-competing native and **endemic** species.

- B. Review with students their understanding to date of the term *environmental conditions*. Be sure that students realize that in addition to the natural plants, animals and physical conditions, humans, and their activities are also part of the environmental conditions. A simple example with which students will be familiar is a natural beach or shoreline as an example of a natural environmental condition. Compare this to an altered environmental condition in which humans have built houses and hotels along a shoreline.
- C. Write the question below on the board or posted on chart paper. Invite and record students’ ideas. Ask for specific examples. Then ask the students to keep this question in mind as they view the slide show: *What are some causes of changes to environmental conditions in Hawai‘i?*

- D. Distribute the Student Worksheet *Changes in Environmental Conditions in Hawai‘i*. Preview the worksheet items to prepare students for what they are to record as they view the PowerPoint slide show. Present and discuss the PowerPoint slide show *Changes in Environmental Conditions in Hawai‘i*.
- E. Have students investigate the effects of feral cats, chickens, pigs, rats, and other organisms that were once pets or farm animals, but which now live in the wild. What impacts do these organisms or animals have on native and endemic species? This would be a good time to have the students write a page about this problem and their suggested solutions.
- F. Option: Have students research a plant that is on the endangered or threatened list and find out why it is threatened, endangered or extinct, and propose a viable solution.

II. *Check for Understanding*

- A. Return to the two posted questions. Ask the students to work in groups to share their ideas on how to answer the questions, and to give specific examples as evidence:
 - 1) What are some causes of changes to environmental conditions in Hawai‘i?
 - 2) How has the size of plants or animal populations been impacted by changes in environmental conditions?
- B. Identify natural or unknown sources of changed environmental conditions, such as the parasitic wasp infestations that destroyed *wiliwili* trees. (In this example, the parasite appears to be specific to this one tree.) Point out that one of the most harmful changes was the accidental introduction of malaria when some birds were imported to Hawai‘i and the malaria was transmitted via mosquitoes to endemic birds, which had no resistance, and therefore accounted for a number of the now-extinct Hawaiian endemic birds.
- C. Discuss whether the intentional importing of live plants and animals is necessary or beneficial to Hawai‘i’s environment. Ask the students whether they, or their families, might in some way be responsible for intentionally importing alien species. Make a list of live plants and animals that are imported to Hawai‘i, which are alien species. These might include rabbits (like the *Aiea* Loop Trail bunnies), fir trees (Christmas), lilies, pumpkins, guinea pigs, bufo toads, and exotic birds (green parrots, or Java rice birds). Talk about what might happen if these animals and plants were released into the local environment.
- D. If students need assistance distinguishing between observations and inferences, stop here and perform step III “Observations versus Inferences” listed below and then return to this activity.
- E. Be ready to point out the inferences made by the students. For example, the observed evidence might show that cattle egrets were introduced to the islands. Until, or unless, there is specific evidence about changes in native and endemic populations, the students, at best, can infer that these alien birds may be out-competing native species for food.
- F. Remind students that all the organisms listed in Lesson 1 as threatened or endangered species are on the list based on evidence made by counting their populations and that counting is an observation, not an inference.

III. *Observations versus Inferences*

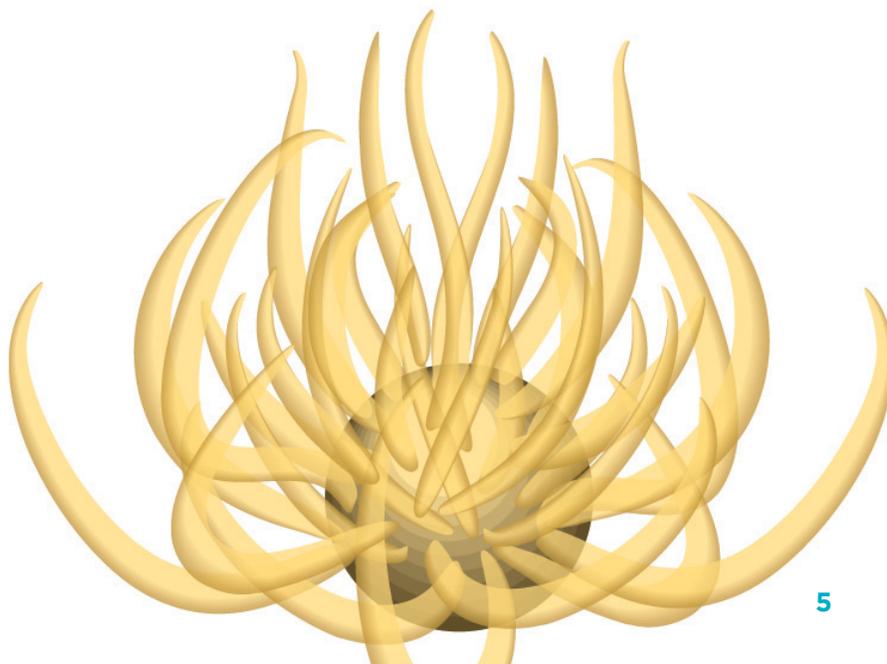
- A. Write the terms *observation* and *inference* on the board. Explain to the class that an observation is a statement or sketch of what is observed through the senses; an inference is a logical conclusion based on evidence. An inference, however, may not be a scientifically sound conclusion.

B. Give the students examples, as follows:

- 1) Suppose that there was a student in the class named Tim, and that he wore green four out of five days last week. Help students to come up with at least two possible inferences, ask what is the evidence for each of these possibilities, and what kind of evidence would be needed to go from an inference to a definite scientific conclusion:
 - a. Tim's favorite color is green. (Evidence: because he wears it so much.)
 - b. Tim wears green because that is the color of his favorite sports team.
 - c. Tim's green clothes are the easiest to launder, so he wears them more often than other clothes.
 - d. Tim was celebrating St. Patrick's day.
 - e. Tim does not have a real reason. (If we had observed Tim for several more weeks, we would have seen that Tim varies the colors that he wears.)
- 2) Check for understanding with the following:
 - a. My cat did not like his food because he always left at least half of it on his plate. (*inference*)
 - b. Before crossing the street the two girls looked left and right two times. (*observation*)
 - c. When the dog barked, Mom looked scared (*observation*). Mom looked scared because the dog barked (*inference*)

Extended Activities

1. Students investigate changes in local environmental conditions, including taking digital images, and the subsequent writing and drawing of observations.
2. Students do research on the impacts to the environmental conditions of fresh water streams and ponds, wetlands and brackish areas of released aquarium fish, mollusks, or plants.



LESSON 3

Teacher Reading

Changes in Environmental Conditions

In the United States, the primary causes of extinction (and endangered and threatened status) are habitat loss and degradation. However, the introduction of foreign or alien species can also impact a species negatively, which is particularly the case in Hawai‘i.

Pests and Diseases

Pests and diseases represent significant changes in environmental conditions. Pests, such as the wasp that attacks the *wiliwili* tree, make it impossible for the species to survive in the long-term. Diseases, such as avian malaria, can spread quickly with mosquitoes to native species, making it difficult for the species to survive.

Release of Alien Species

Hawai‘i suffers particularly from the intentional and unintentional release of invasive species. In particular, pets, such as turtles and guppies, and pet plant habitats, such as elodea used in aquariums, have been released into streams and wetlands. When enough of these animals are released together or find one another, they develop into a separate and invasive population that often threatens the native populations. Invasive species are problematic because they frequently have negative impacts on native plants and animals in multiple ways. These foreign invaders compete for resources (food, water, and habitat), or sometimes feed on native species. Both the mongoose and several types of snails have been intentionally imported to Hawai‘i in order to control other species. Because they are not native, they are often successful at controlling the species, but may also interfere with other species as well.

One example of a Hawaiian invasive species and the damage it causes is the mongoose. The mongoose was intentionally brought to the Hawaiian Islands in an attempt to control rats in farm fields. However, this attempt was unsuccessful, since rats are primarily active at night, while the mongoose is active during the day. Therefore the possibility that mongoose could prey on rats is very limited. However, the mongoose is very successful at raiding nests for eggs, especially those of ground nesting birds, such as the nene. It can also feed on eggs of endangered sea turtles.

Another example of invasives found in Hawai‘i are several species of algae, most of which were introduced accidentally by ships. The algae form dense colonies on coral reefs, which can smother and kill the coral. Once the coral dies, many of the other species that depend on the fragile reef habitat are also affected. In addition, tourism can be negatively impacted from both the loss of coral reefs and from the algae washing up on beaches.

For more information on invasive species in Hawai‘i, visit:

The Hawai‘i Invasive Species Partnership

<http://www.Hawaiiinvasivespecies.org/>

The U.S. Department of Agriculture’s National Invasive Species Information Center

<http://www.invasivespeciesinfo.gov/unitedstates/hi.shtml>

Loss and Degradation of Habitat

Development of coastal areas can interfere with breeding grounds of marine animals. When animals no longer have a safe place to breed, they often breed less often, or not at all, or their young are more likely to suffer injury or get killed. The degradation, including pollution, of habitat causes animals to have shorter lives in which they are less likely to breed, and their overall population decreases. Both of these changes in environmental conditions make it difficult for species to survive.

An example of a marine animal that is affected by upland development is sea turtles. Often, people attempt to protect waterfront property from erosion by building seawalls, or by putting riprap along the shore. When done on or near beaches, the upper beach area, where sea turtles dig their nests, often disappears. This results in sea turtles failing to lay eggs, or attempting to nest in areas where the eggs do not survive. Changing the natural plants that occur on beaches can also result in sea turtles losing nesting habitat.

Clearing of upland areas for agriculture or other development can also have negative impacts on marine life. Frequently, during rain storms, large amounts of soil erode from hillsides that have been cleared. This soil flows downstream, in many cases all the way into the ocean. The animals that form coral reefs and other near shore habitats become covered in a blanket of silt. This can kill corals directly, by smothering them, but it can also harm the other fish and animals that rely on the coral reef habitat for food, shelter, or breeding.

LESSON 3

Changes in Environmental Conditions in Hawai'i

NAME _____ Date _____

Directions: As you view the PowerPoint slide show, *Changes in Environmental Conditions in Hawai'i*, take notes below to answer the questions. Include sketches to illustrate changes in environmental conditions. Then write your notes in complete sentences to answer the questions.

1. Identify three examples of changes in environmental conditions in Hawai'i.

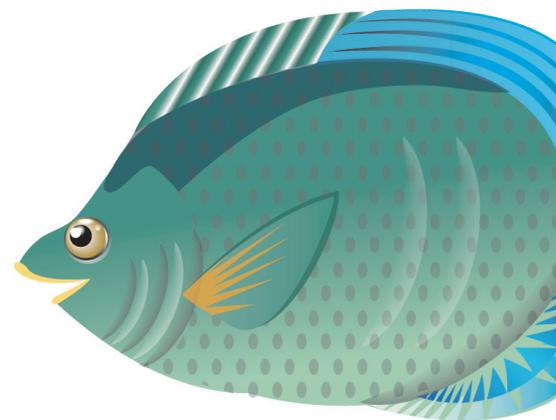
Notes:

Answer:

2. Describe how changes in environmental conditions have impacted the population size and survival of Hawaiian plants and animals. Give two examples.

Notes:

Answer:



NAME _____ Date _____

3. Describe how an intentional or unintentional importation of plants and animals to Hawai'i has affected the survival of native and endemic Hawaiian plant and animal species.

Notes:

Answer:

