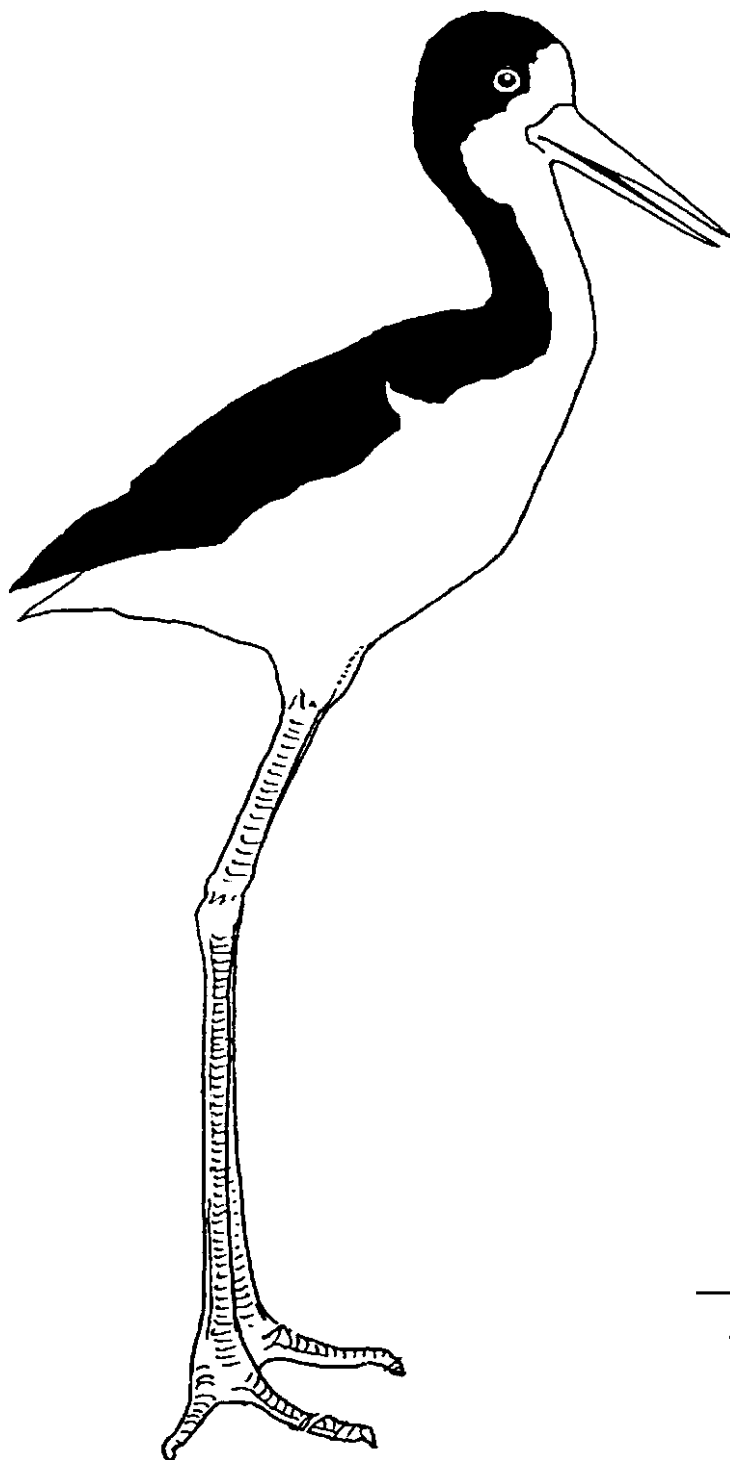


# MAKING MARSH CONNECTIONS



Grade 3



## Lesson at a Glance

Students play a food web game that illustrates interdependence in a marsh ecosystem.

## Key Concepts

Plants and animals in natural communities are interdependent. If plants or animals become endangered, interrelationships in a natural community can become unbalanced.

## Objectives

Students will be able to:

1. Describe some relationships between plants and animals in a marsh.
2. Write a story identifying how plant and animal relationships are affected when an imaginary creature invades a marsh.

## Time

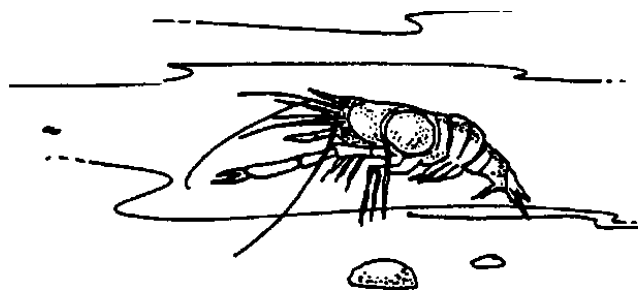
two class periods

## Subject Areas

science, math, Hawaiian studies, language arts

## Materials

student activity sheet (provided)  
3 skeins of different-colored yarn  
scissors  
whistle  
clipboard  
marking pen  
30 dried leaves\*

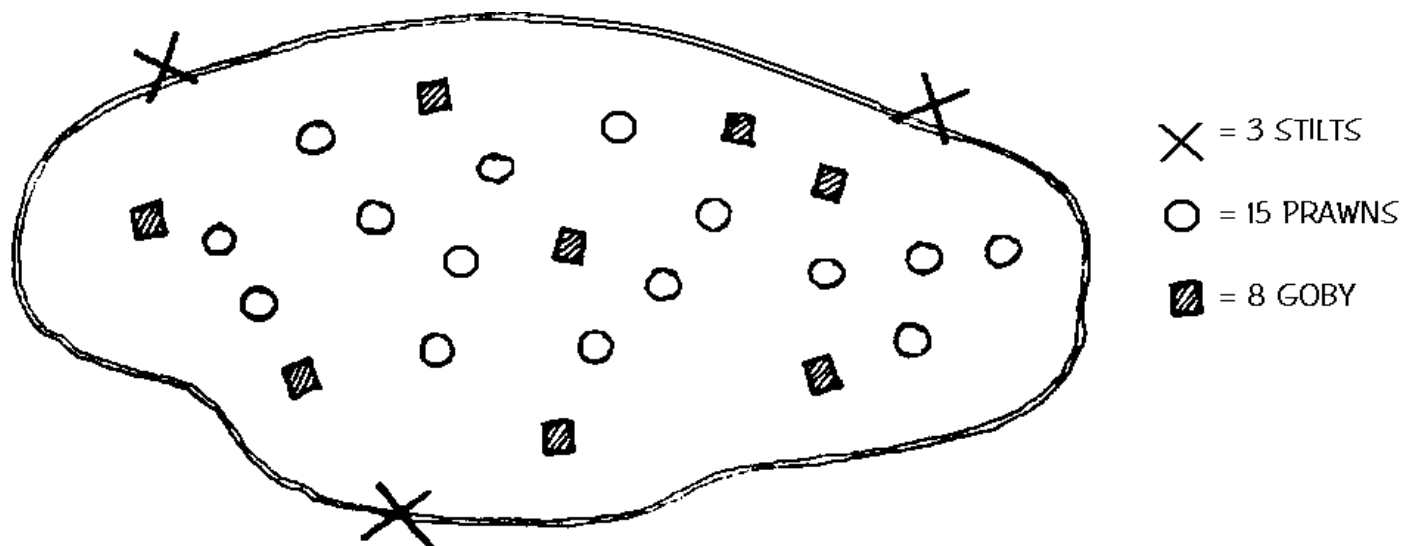


## Preparation

\*Collect some leaves to use as algae in the game or use any small objects, such as stones or twigs, that won't blow away and become litter. Cut yarn into strips to be used as arm bands in the food web game (see game setup on the following page). Use a different color for each type of animal and cut some extra arm bands for game variations.

### Food Web Game Setup

In a large grassy area, outline the boundaries of the water in the marsh with a long piece of yarn. The area should be at least 8 m (26 ft) in diameter. Clear the area of twigs or leaves if they resemble the objects used for algae. Players (adjust numbers for class size): 3 stilts, 8 goby fish, 15 prawns. As an alternative, have 1 stilt, 4 gobies and 8 prawns and let half of the class play the game at a time.



### Prerequisite

“A Wild Wetland Journey,” Plants and Animals, Grade 3.

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### Teacher Background

Plants and animals in a marsh are interdependent. Plants, such as algae, produce food using energy from the sun to convert carbon dioxide and water into simple sugars. The algae is eaten by animals, such as fish and prawns. These animals are eaten by large birds, such as the Hawaiian stilt. A feeding relationship where energy is transferred from green plants through a sequence of animals is defined as a food chain. When drawn as a diagram, a food chain has a series of arrows that point from a species to the animal that eats it. See example on the following page.

Many animals eat such an array of foods that independent food chains may be joined together forming an intricate **food web**. The game in this activity presents a simplified marsh food web, demonstrating interdependencies among some native Hawaiian marsh inhabitants. Following is a brief description of each animal:

**Prawn:** The native Hawaiian prawn, *‘ōpae ‘oeha ‘a*, has one large claw, which distinguishes it from the introduced Tahitian prawn that has two large claws of equal size. The *‘ōpae* uses its large claw to defend its territory. It feeds on algae and small pieces of animal matter. It is 13 cm (5 in) long. Native prawns and gobies found in Hawaiian wetlands spend part of their lives in the sea. As tiny larvae, they are washed out to sea where they metamorphose and return to fresh water as young adults.

**Goby:** Five species of freshwater gobies (*‘o ‘opu*) live in Hawaiian streams and wetlands. Four of these fish are true gobies. They have a fused pelvic fin that they use like a suction cup to cling to rocks and climb up the face of steep waterfalls as they make their way upstream from the sea. The fifth species is a closely related fish that lacks a fused pelvic fin. The largest and most common goby is the *‘o ‘opu nākea* that grows up to 46 cm (18 in) long.

**Stilt:** Long-legged Hawaiian stilts (*ae ‘o*) are 40 cm (16 in) tall. Their long legs and widely-spaced toes are well-suited for wading in marshes. Their long, pointed bills are used to seize small animals such as the prawns and gobies that live in the marsh. They also eat crabs, aquatic insects and worms.

The feeding relationships among the algae, prawns, gobies and stilts keep populations within the marsh community in a long-term balance. Each living thing is vital to the well-being of its **natural community**.

When mongooses, cats, rats or dogs are introduced to a Hawaiian marsh community the food web is disrupted and the balance of the entire community is adversely affected. For example, if the stilts were removed, populations of prawns and gobies would increase. More young prawns might then be eaten by gobies and their population would drop. Algae might also become scarce as gobies overpopulate the marsh.

Introduced animals and the loss of wetland habitat have caused five of the six native Hawaiian water birds to become endangered. These birds are officially listed by state and federal wildlife agencies as **endangered species** and as such are protected by law. This protection makes it illegal to hunt the birds or disturb their habitat. See “Spotlight on the Marsh,” *Humans and the Environment, Grade 3*, for more information on habitat management.

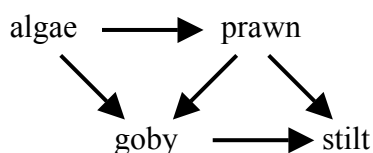
### Teaching Suggestions

1. Distribute the student activity sheets and introduce the plants and animals included in the marsh food web game. Have students try to solve the riddles and discuss their answers. The answers to the riddles are: a) algae, b) goby (*‘o ‘opu*), c) prawn (*‘ōpae oeha ‘a*) and d) stilt (*ae ‘o*).
2. Draw a simple food chain and a food web on the board using the information from the riddles. Explain that these are only a few of the many plants and animals in a marsh, and that there are many more relationships among plants and animals. Leave these diagrams on the board for a follow-up discussion.

#### Food Chain

algae → prawn → stilt

#### Food Web



3. Assign an animal role to each student and distribute arm bands, or if desired, have each student create some form of head decoration to wear in the game. Draw a sketch of the game setup on the board and ask each “animal” to make note of what it eats.
4. Explain the rules of the food web game.
  - a. Prawns and gobies move by hopping on one foot. They must stay within the water of the marsh and collect algae to eat. If they go outside of the water boundary they are out.
  - b. Gobies can tag (eat) prawns.
  - c. Stilts are wading birds. They move by walking fast, but keep one foot outside of the water boundary at all times.
  - d. Stilts can tag (eat) prawns and gobies.
  - e. Once an animal is eaten, it waits on the sidelines until the next round.
  - f. Prawns and gobies remaining in the game must have at least one piece of algae to stay alive.
  - g. When the whistle is blown everyone must freeze.
5. Take the class outside to the “marsh.” Show students the boundaries of the water in the marsh and randomly distribute the dried leaves as algae in the water. Before playing the game, make note of the number of each kind of animal. Play round one; blow the whistle after 30 seconds.
6. Have children count the number of animals that were eaten. Try increasing the number of gobies in another round of the game and prawns in a third round. Record the number of animals remaining after each trial.
7. Ask some of the prawns to become dogs that are not kept on a leash. Play the game again with the dogs tagging stilts. Dogs can run around, but not in the water. Set up boundaries for the stilts around the marsh. Record the number of animals remaining after the whistle is blown.
8. Return to the classroom. Explain that stilts are listed by the state and federal governments as endangered species and initiate a discussion. Erase the stilt from the food web diagram previously drawn on the board.

### **Discussion Questions**

- What happened to the balance of the marsh food web when there were more gobies?
  - What happened when there were more prawns?
  - What might happen to the populations of prawns and gobies if there were no stilts?
  - If you let your dog run loose in a marsh, what might happen to the food web?
  - What does it mean when we describe marsh plants and animals as being interdependent?
9. Ask students to draw a marsh food chain or web and write a short story describing what happens to the plants and animals in the marsh when a new “Marshian” creature invades from outer space.
  10. Ask students to share their stories and summarize their comments.

## Extended Activities

Put on a marsh play demonstrating how human changes have affected marsh communities. See “Spotlight on the Marsh,” *Humans and the Environment*, Grade 3.

Obtain a copy(ies) of *Native Animals of Hawai‘i Coloring Book* (see Unit Resources) and have students color the pictures of the stilt and goby according to the small colored pictures on the back cover of the book. Visit a marsh environment; see the Field Sites Appendix for suggested sites on your island.



## Making Marsh Connections

## Student Activity Sheet

Solve the riddles and color the marsh.

I don't eat bugs or fish  
Since they don't make a tasty  
dish!  
I make my own food as I wish!  
Who am I?  
a. \_\_\_\_\_

On the marsh bottom I can hide,  
Eating plants and animals by my  
side.  
I have a mouth that's very wide.  
Who am I?  
b. \_\_\_\_\_

I eat what's green and good for  
me.  
I'm pretty sharp as you can see.  
Better watch out, just let me be!  
Who am I?  
c. \_\_\_\_\_

I can spear what I eat.  
Fish and prawns are a favorite  
treat.  
I have long legs and big pink  
feet!  
What am I?  
d. \_\_\_\_\_

