

The Gap Game

Grades 9-12

Lesson at a Glance: Students play a game that reviews information presented in the unit and highlights the gaps in the system for preventing and controlling unwanted alien species.

Key Concepts: Hawai'i is being invaded by introduced pests due to four major factors:

1. We are the primary shipping link in the Pacific.
2. Our environment is exceptionally vulnerable.
3. There is a lack of public awareness.
4. There are gaps in the system to prevent alien introductions. Stopping the influx of new pests and containing their spread is essential to Hawai'i's future well-being.

Objectives: Students will be able to:

1. Describe why invasive alien species are a problem in Hawai'i.
2. Identify the most unwanted alien species.

Time: one - two class periods

Subject Areas: science, social studies, language arts

- Materials:**
- paper and pens
 - *Gap List* (provided)
 - *Cargo and Chance Cards* (provided)
 - alien species *Unwanted Cards* (provided)
 - *Stop the Alien Invasion* handout
 - a small box (to hold chance cards)



Preparation:

1. Copy and cut out the *Cargo and Chance Cards* and place *Chance Cards* in a small box.
2. Copy a set of the *Unwanted Cards* for each of the four teams.
3. Make a copy of the *Stop the Alien Invasion* handout.
4. Have four student groups cut three sheets of writing paper into quarters. Students will use these to write responses to the 12 game questions.

Prerequisite: *Guam's Snake Story* and *The Silent Invasion*

Teacher Background: Hawai'i is being overrun by alien pests due to four major factors (excerpts from *The Silent Invasion* guide):

1. **Hub of the Pacific.** Hawai'i is the primary shipping link between the mainland U.S., Asia, and other Pacific Rim ports, handling nearly 19 million tons of cargo each year. Honolulu International Airport averages one arriving flight every 1.3 minutes. And more than 80 percent of the goods consumed in Hawai'i are imported. Inevitably, cargo shipments, passenger flights, military transports, mail, and other traffic entering Hawai'i bring with them living plants, animals, and microbes that would have been unable to reach the Islands on their own.

2. **An Exceptionally Vulnerable Environment.** The same natural circumstances that have made Hawaiji such a paradise now make the Islands exceptionally vulnerable to new pest species. For millions of years, Hawaiji was isolated from the rest of the world by 2,000+ miles of open ocean. Plants and animals succeeded in crossing the ocean and colonizing Hawaiji very infrequently, perhaps as seldom as once in 50,000 years. Those that did survive this incredible journey found a pleasant climate, fertile soils, few competitors, and fewer diseases or predators.

The first Polynesian navigators to arrive in Hawaiji found an especially gentle and fertile land. Even today, the Islands are free of most tropical diseases, dangerous predators, and nuisance pests. Many crops thrive here, free of the pests and diseases that limit their growth elsewhere. As a result of this gentle environment, many native species lost their natural defenses because they had no need to escape or protect themselves from predators. But now a new pest reaches Hawaiji once every 18 days on average. Like other species, they, too, benefit from Hawaiji's lush environment. Free of the competitors and natural diseases that kept them in check in their own native environments, these foreign pests sometimes explode in Hawaiji, overwhelming native species, harming valuable crops, and sometimes threatening the Islands' people as well.

3. **Lack of Public Awareness:** Most pest introductions occur quite innocently. The majority of Hawaiji's residents and visitors simply are not aware that foreign plants and animals pose a significant threat. They don't know how easy it is to accidentally bring in something via cargo, a box of fruit, or even on their hiking boots. Air passengers do not appreciate the importance of the airline agricultural declaration form. Most people do not know how to identify or report foreign species they may spot.
4. **Gaps in the System:** Over the past 100 years, agency programs have arisen as needed to address specific pest concerns (e.g., preventing rabies from entering the state, stopping pests of coffee, sugar and other major crops, or controlling pest species on a particular nature reserve). The result is a set of programs that are generally effective within their own jurisdictions but which, taken together, leave many gaps and leaks for pest entry and establishment. In some cases, better pest prevention is a matter of more funds for inspectors and equipment; in others, jurisdictional gaps or conflicts must be overcome so that agencies can work better together to get the job done. Gaps in the system are summarized on the game instructions provided with this activity.

Teaching Suggestions:

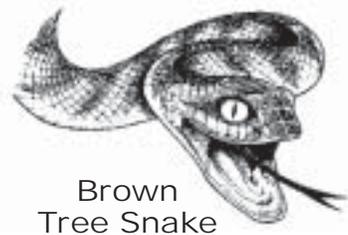
1. Divide the class into four teams. Explain that each is a team of inspectors who will be playing *The Gap Game*. Distribute the *Unwanted Cards* and ask the inspectors to read them before the game as training for their new roles.
2. Review the rules of *The Gap Game* and designate yourself as the Gap Master. Read the introduction. (See Game Instructions on page 4.)
3. Begin the game by reading the first *Cargo Card* and challenging each team of inspectors to answer the gap question.
4. When the game is complete, review any unanswered gap questions and ask students to research the answers.
5. Ask students to summarize the gaps in the system to prevent the invasion and spread of alien species. How do they think these gaps should be closed to stop the invasion? Discuss their ideas.

Extended Activities:

- Encourage students to write letters to legislators and/or the editor of your local newspaper about their ideas for closing the gaps in the system.
- Take a field trip to the U.S. Customs office. Call 522-8083 to arrange a trip for your students to learn more about the role of inspectors and to see some of the items they intercept.
- On Oʻahu, call the Dept. of Agriculture Plant quarantine office at 586-0844 to request a visit from one of their inspectors. Speakers are available to come to your class and bring one of the dogs they use to search for snakes. They also have brown tree snakes preserved in jars.

On the Big Island, Maui, and Kauaʻi, call the Dept. of Agriculture Plant Quarantine office on those islands to request a class visit by an inspector.

- Pass *The Gap Game* along to some of the after school clubs to use or make the game available for students to play during lunch.
- Encourage students to write an article about the threat of invasive alien species for the school newspaper or produce a public service announcement about the problem.
- Obtain a declaration form from the Dept. of Agriculture and have students edit it with suggestions for strengthening the message to incoming airline passengers.



Brown Tree Snake



Killer Bees



Piranha



Queensland Fruit Flies

The Nine Most Unwanted Alien Species



Fire Ants



Any New Termite Species



Biting Sand Flies and Midges (*no-no* flies)



Malaria-Carrying Mosquitos



Miconia

The Gap Game

Game Instructions

Objectives:

- To prevent pests from arriving in the Islands.
- To control the spread of new pests that slip through the gaps in the system.

Players:

- (4) teams of inspectors
- (1) Gap Master (teacher)

Game Set-up: Place a table in the front of the playing area where the Gap Master will be stationed. Put the box of *Chance Cards* and stack of *Cargo Cards* with *The Gap List* on the table. Have a score sheet available with teams 1 - 4 labeled. Also place a copy of the *Stop the Alien Invasion* handout at the table.

How to Play

1. The Gap Master introduces the game and explains the point system.
2. The Gap Master reads the first card and if a *Gap* is indicated, reads the challenge to the players.
3. Teams quickly write a response. The first team to get its response to the Gap Master's table has the opportunity to receive points. (If team members take turns writing responses, you may have better participation by each student.) Alternatively, have teams discuss the answer and signal by having all players on a team raise hands when ready to answer.
4. ***If the team answers correctly and fully***, the inspectors receive the amount of points indicated on the *Cargo Card*. If the answer is only partially correct, the Gap Master may award fewer points.
5. ***If the team answers incorrectly***, the other teams may try to answer and receive the points. If the second team answers incorrectly, the question is put aside for student research after the game.
6. If the *Cargo Card* has "*Chance*" indicated on the bottom, the team that answered correctly must either draw a *Chance Card* from the box and accept the gain or loss of points or select another team to take the Chance (before it is read!).

To Start the Game:

The Gap Master should read the following introduction:

- You represent four teams of inspectors. Your challenge is to keep new species from entering the Islands and becoming pests and to control any new invaders that slip through the gaps.
- You have four lines of defense against alien species: 1) pre-entry prevention; 2) port-of-entry prevention; 3) new pest control; and 4) long-term pest control.
 - **Pre-entry Prevention** includes agreements with other countries to prevent pests from leaving their borders. This is handled by your administrative office and is out of your control. You will have to focus on the other three lines of defense. However, there are gaps in each one and you must be ready to meet the challenge.

- **Port-of-Entry Prevention** is your chance to inspect arriving cargo and find pests before they invade Hawai'i. If you are successful, you will receive 6 points for each port-of-entry prevention.

Gaps at this point are: lack of funding for inspectors and voluntary self-reporting by passengers who are uninformed of the potential threats.

- **New Pest Control** is your next line of defense to keep an invader from spreading. If you are successful in this line of defense you will receive 4 points.

Gaps in the system include lack of court enforcement of stiff penalties for illegal introductions, delays due to uncertainty of responsibility by government agencies, and lengthy requirements for adding a new species to the prohibited list and pressure from merchants to get Christmas trees unloaded quickly.

- **Long-Term Pest Control** is the final line of defense. If you are successful in this effort, you will receive 2 points. In this case, invasive aliens need to be managed to reduce the damage they may cause.

Gaps include lack of funding for expensive control measures such as fencing, lack of adequate controls to prevent spread of pests interisland, and inadequate funding for biological controls.

To End the Game: Once all *Cargo Cards* have been drawn, the Gap Master should add up each team's points and announce the scores. Teams then have an option to participate in a bonus round.

Bonus Round:

- The Gap Master will read a bonus question to the teams. The first team to signal will have an opportunity to answer.
- *If they answer correctly*, the inspectors gain the points indicated.
- *If they answer incorrectly*, they lose the points and the question is marked for further discussion after the game.

- *The game ends when all bonus questions have been presented.*
- *The winning team is the group of inspectors with the most points.*



To be presented by the Gap Master when cargo cards indicate a Gap.

1. Killer Bees GAP: Your inspection team is understaffed due to budget cuts. To prevent this invader, you must persuade the public to support funding for your office. Explain why Hawaiji's environment is so vulnerable to invasion by pests.

Native plants and animals evolved in isolation and have no defenses against introduced diseases, insects and large grazing or browsing animals. 6 points

2. Queensland Fruit Fly GAP: You don't have enough inspectors and there isn't enough help from the Coast Guard to handle private boats. To prevent this invader, you lobby the legislature for additional funding and explain how alien species could affect our economy. How do you explain this?

New pests could affect farmer's crops; harmful animals or new diseases could hurt tourism and health costs could increase with new diseases. 6 points

3. Biting Sand Flies GAP: Your education program is helping to close the gap in public awareness. To control this new invader, chose two of the four factors that cause Hawaiji to be overrun by alien pests and explain why they are factors.

The four factors are: 1) hub of the Pacific; 2) an exceptionally vulnerable environment; 3) lack of public awareness; and 4) gaps in the system. 4 points

4. Fire Ants GAP: The passengers need to be educated about the threat of introduced species. Voluntary reporting is not adequate. To prevent the invasion, persuade the airline industry to show a new video you have developed about alien species. How do you explain why alien species are a problem?

Alien species can affect our economy, our health and lifestyles, and our environment. So much of Hawaiji's native have been altered or replaced by alien species. The ecosystems that remain are home to a number of endangered species that are vulnerable to introduced plants, animals and diseases. 6 points

5. Brown Tree Snake GAP: Your office receives a budget increase to control the brown tree snake, name three ways that you will put the added funds to good use.

Increase inspectors in Guam; increase inspectors in Hawaiji; increase surveys near harbors and airports; train and maintain Snake Watch Attack Teams on each island; conduct more research on effective snake controls. 6 points

6. Root Aphid GAP: An island farmer calls to report on an unfamiliar insect on the stalks of his *kalo* plants. Your office isn't sure if it has jurisdiction over this type of pest in this area but you decide to take action anyway. How do you handle the problem?

You ask the farmer to collect the insect and bring it to your office with information on where and when it was found and you consult with scientists (entomologists) to determine if it is alien and should be controlled. 4 points

7. Brown Tree Snake GAP: To control this invader, you need to educate more island residents. You are making a presentation to a public gathering about what to do if they find a snake in the Islands. You tell them:
- a) *Command their dog to attack the snake.*
 - b) *Hit the snake with a blunt object behind the head.*
 - c) *Place a heavy object behind its head to contain it.*
 - d) *Call ASK-2000 and report it.*
 - e) *Scream and run for help.*
- Choose all that apply: b, c & d - 4 points*
8. Rats GAP: Rats are found in many environments in Hawaiji. In the native forest, they are feeding on endemic tree snails that are endangered. To prevent more loss of tree snails, your office needs funding to hire researchers who can work on this problem. Describe why your office should receive funding to control rats.
- The native snails live nowhere else in the world and they are threatened with extinction. Each species lost affects the entire ecosystem. More research is needed for rat control not just for the snail, but for birds and other species affected by rats. 2 points*
9. Garden Plant GAP: You suspect that the garden plant imported by this nursery could become a pest, but it is not on the prohibited list. To shorten the lengthy review process for adding this plant and others to the list, you lobby state legislators. What do you tell them about the impact that invasive plants can have on native ecosystems?
- Alien plants are usually brought in without the natural controls that exist in their place of origin. So these plants can spread rapidly and compete with or replace native plants. Native animals dependent on the native plants will also decline. 6 points*
10. Aquarium Fish GAP: A student calls your office to report that her neighbor let his pet fish loose in a stream because he is sick of cleaning the tank. You don't have enough staff to visit the site and capture the released fish. What do you tell the caller and her neighbor about releasing pet fish into the wild?
- Try to catch the fish and take them to a pet store or the Humane Society. Aquarium animals can compete with native fish for food and habitat. They tend to multiply and upset the natural balance in a stream. They may also prey on native invertebrate streamlife and the eggs or young of native fish. 4 points*
11. Fire Ant GAP: More inspectors are hired, helping to close the gap so that more parcels can be inspected. To train the new inspectors, you explain how invading fire ants could have affected our economy, lifestyles, health and native species. Choose two of these areas and describe how fire ants could impact each one.
- a) *economy - sting beneficial farm insects, threaten tourism;*
 - b) *lifestyles - limit outdoor recreation sites;*
 - c) *health - cause allergic reactions; some deaths; or*
 - d) *native species - prey on or injure native species; kill ground-nesting birds. 6 points*

12. Snake GAP: You catch an islander bringing an illegal pet snake home to the Islands and turn him in. But he receives only a small fine because the judge does not understand the seriousness of the offense. Your office designs an educational program for justices. In this program you describe why people who knowingly bring in illegal plants or animals should receive stiff penalties. What is your most persuasive argument?

Stiff penalties will help to prevent people from bringing in illegal species. This is important because alien species are the number one threat to the Islands' remaining native ecosystems. Many species are endangered and could be pushed into extinction by new invasive plants or animals. In addition, new invasive species can hurt the economy by invading farms, by threatening tourists and by causing property damage. Human health and lifestyles could also be affected, especially by species that inflict wounds, inject toxins or swarm and bite. 6 points

BONUS POINTS:

- An island resident calls to report a sighting of a beautiful, unfamiliar plant in the forest. It has large leaves with purple undersides and berries with many seeds. You advise the caller to:
 - a) ***take some of its seeds and spread them to a barren hillside that is eroding;***
 - b) ***dig it up and plant it at home;***
 - c) ***bring a sample of its leaves to your office and note its location;***
 - d) ***call the Miconia hotline.***

It's Miconia - c & d 2 points
- You are giving a talk to high school students about ways they can help to stop the invasion of alien species. What do you tell them?
(Gap Master: Refer to Stop the Alien Invasion handout.)
1 point for each correct item on the list.
- A new pest reaches Hawaiji every ___ days on average:
 - a) ***2 days;***
 - b) ***18 days;*** 2 points
 - c) ***50 days;***
 - d) ***365 days.***
- Federal agents inspect Hawaiji's mail bound for California, but Mainland mail is not inspected before being delivered in Hawaiji.
True or False? *True* - 2 points
- People have introduced approximately 4,600 plant species to the Hawaiian Islands. Eight hundred of these species have become naturalized. Approximately how many of the 800 have become serious pests?
 - a) ***400 (50%);***
 - b) ***40 (5%);***
 - c) ***80 (10%);*** 2 points
 - d) ***200 (25%)***

The Gap Game

Cargo Cards

Cargo Card 1

Port of Entry: Harbor



Invader: *Killer bees*

Arrival: Stowed away on ship from California



GAP
(Chance)

Cargo Card 2

Port of Entry: Harbor



Invader: *Queensland fruit flies*

Arrival: In a shipment of kiwi fruits on a private boat from Australia.



GAP

Cargo Card 3

Port of Entry: Harbor



Invader: *Biting sand flies*

Arrival: Private boat comes in with illegal soil and plant material containing flies.



GAP
(Chance)

Cargo Card 4

Port of Entry: Airport



Invader: *Fire ants*

Invasion: An incoming passenger from the U.S. does not declare the plant material in his luggage. He doesn't know there are ants in the soil.



GAP
(Chance)