### POPULATIONS IN BALANCE

#### SCIENCE ACTIVITIES

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#### FOCUS WORDS

Examining the Focus Words Closely | 18
Setting: Elena, Rachel, and Miles are waiting outside to be picked up from school. Elena spots Rachel’s dad’s car, but doesn’t recognize the driver.

Elena: Where’s your dad? Who’s that driving his car?

Rachel: My dad can’t pick us up today, so my cousin is driving.

Miles: What? Didn’t your cousin just graduate eighth grade last year?

Rachel: No, my other cousin, Rob. He’s a pilot in the navy and is visiting us while he’s on leave.

Elena: Was he in a war zone?

Rachel: You should ask him. Hi, Rob!

Rob: Hey, Rachel! Long time no see! Uncle Steve sent me over to pick you and your friends up. Hop in.

Rachel: Yeah, I know. He texted me. Thanks.

Elena, Rachel, and Miles get into the car.

Elena: I hope I’m not being rude by asking, but were you in Afghanistan?

Rob: Nope, I’m stationed in Guam.

Miles: Guam? Where’s Guam?

Rob: It’s kind of near Hawaii.

Miles: Must be a nice place.

Rob: It’s okay, but it’s full of snakes.

Elena: No way! I hate snakes!

Rob: No kidding. Especially the brown tree snakes; they’re everywhere! They’re in the trees, in the bushes... Heck, I even found one in my bed once.

Elena: Do not tell me that.

Rachel: Can’t people just get rid of the snakes?

Rob: They’re trying. A lot of people use snake traps or dogs but nothing seems to work. You’re not going to believe this, but just before I came here the Navy had me fly a helicopter over the jungle, and folks were chucking dead mice stuffed with poison out of the helicopter. The idea was to kill the snakes by having them consume the dead mice.

Elena, Miles, and Rachel: WHAT?

Elena: Did that really work? Do snakes eat dead mice? I thought they just ate live ones.

Rob: I knew you’d be interested in that, Rachel. Check out the newspaper article I brought you. It’s there on the dash.

Rachel: (reading)

Government Drops Dead Poisoned Mice from Sky in Another Attempt to Kill Tree Snakes

The U.S. Department of Agriculture experimented with a new method to reduce the population of the invasive brown tree snake. They put Tylenol tablets into dead mice, attached the dead mice to long strips of paper, and dropped them out of helicopters into the jungle. Acetaminophen is a chemical used in Tylenol and other drugs. It’s safe for humans in normal doses but it is poisonous to snakes.

This environmental disturbance is due to snakes brought to Guam from the Solomon Islands by the military after World War II. Since then, the brown tree snake population has exploded. Government officials say Guam now has one of the densest populations of snakes in the world.

Miles: That’s crazy!

Rob: Yeah. They cause huge problems. Sometimes the power goes out because a snake damages the wires. They prey on pets and livestock. Keep reading.

Miles: Give me that newspaper, Elena! (grabs it)

Miles: (reading)

The non-native brown tree snake eats reptiles, birds, and mammals. It is credited with driving many native bird species into extinction. Bird species such as the Sihek (Micronesian kingfisher), Chuguangguang (Guam flycatcher), Ko’ko (Guam rail), and chichirika (Rufous fantail) were all wiped out by the tree snakes. A few birds were captured before they went completely extinct. The Sihek and Ko’Ko are now being bred in captivity, with the hope that someday these species can be reintroduced to Guam once the island’s ecosystem begins its recovery.

Scientists have also reported a huge decline in the populations of local mammals and birds. And since trees rely on birds to spread their seeds, the trees are also affected, thus demonstrating the interdependence of species on the island.

Elena: I thought this was just disgusting at first, but it’s actually a serious problem isn’t it?
Reader’s Theater

Comprehension Questions

Rob: When I left Guam they had snake-sniffing dogs at the airport.

Elena: That's to prevent the snakes from going other places, right? That would be really bad!

Rob: I know that people in Hawaii are really worried about the tree snakes showing up there and wiping out the native wildlife.

Rachel: I don't get why snakes are such a problem. Aren't there some birds or animals that eat the snakes?

Rob: There's nothing on the island that eats snakes.

Elena: There aren't any predators? No wonder the snake population is so big!

Rachel: Wait, couldn't they just bring a predator from somewhere else to wipe out the snakes? Is there some sort of animal that preys on snakes?

Miles: Like a hawk? Couldn't they just bring those to Guam to eat the snakes?

Rob: There's no native hawk species on Guam. Wouldn't bringing another non-native species cause even more problems?

Elena: Hawks might eat other things, too. I guess you can't tell them to just eat snakes.

Miles: What about using a disease that affects snakes?

Rob: That sounds kind of sketchy.

Rachel: Maybe the people on Guam should just eat the snakes.

Miles and Elena: Eww!

Rob: It's actually not bad.

Elena: I did NOT just hear that.

Respond in writing to the questions. Then compare and discuss your answers with someone else.

Complete the following sentence to summarize the problems on Guam: The government is trying to kill the brown tree snake because _________________.

The newspaper article mentions that the brown tree snake population has exploded. This means that the brown tree snake population has:

a) disappeared quickly
b) decreased
c) blown up
d) increased dramatically

The newspaper says that the brown tree snake "is credited with driving many native bird species into extinction." This means that the species:

a) no longer exist
b) are hiding
c) were driven to another place
d) are threatened

Discuss these questions with a partner:

The article mentioned that Guam has "one of the densest populations of snakes in the world." Can you explain this in a different way?

How might the government find out if dropping poisoned mice from helicopters is effective?

Plants depend on bees for pollination, and bees depend on plants for food. This is an example of interdependence. What are some other examples?

Do you think bringing a predator that preys on brown tree snakes to Guam is a good idea? Why or why not?
**Speaking Scientifically**

**Are ecological disturbances good or bad?**

*It depends.*

The situation you read about on Guam is an example of a disturbance of an ecosystem. A disturbance is when something happens that messes up the normal way an ecosystem functions. We tend to think that disturbances are bad, and in the case of the snakes on Guam, it does indeed look like a difficult situation that is causing serious problems.

But in other cases, ecosystems depend on disturbances to maintain their health. Let’s consider forest fires. In California, redwood trees don’t get killed by forest fires. In fact, the tiny cones on the tree (like pine cones) drop their seeds during fires because that’s the best time for the seeds to sprout into new trees. When a fire clears away all the dense underbrush, seeds have a much better chance of growing into trees. Only then does sunlight shine all the way to the forest floor.

The entire ecosystem depends on fire. Pretty amazing. The illustrations below are like a timeline of a fire. Try to complete the captions to explain how fire benefits the redwood tree and its ecosystem.

---

On a ridge about a kilometer away from a redwood grove, lightning strikes the dry grass and ____________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

The fire spreads to ____________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

The tiny redwood cones react to the heat of the fire and ____________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

Since the forest floor is cleared of brush, ____________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________
A **disturbance** is when something happens that messes up the normal way an ecosystem functions.

→ Sometimes **disturbances** to ecosystems are caused by humans, but other times they occur naturally.

→ Sometimes **disturbances** benefit ecosystems, but other times they are harmful.

Read the chart below with a partner and see if you can think of an example to add in the final column.

<table>
<thead>
<tr>
<th>Examples:</th>
<th>What's another example you can think of?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>True</strong></td>
<td>Damming of a creek by a beaver</td>
</tr>
<tr>
<td>False</td>
<td></td>
</tr>
<tr>
<td><strong>True</strong></td>
<td>Development of land for farming or housing</td>
</tr>
<tr>
<td>False</td>
<td></td>
</tr>
<tr>
<td><strong>True</strong></td>
<td>Swarms of native beetles feeding on dead and dying trees</td>
</tr>
<tr>
<td>False</td>
<td></td>
</tr>
<tr>
<td><strong>True</strong></td>
<td>Accidental introduction of a non-native species without predators</td>
</tr>
<tr>
<td>False</td>
<td></td>
</tr>
</tbody>
</table>

**After a disturbance, a recovery usually follows.**

An ecosystem that goes through a **disturbance** is usually able to “fix itself” over time. This process is called a **recovery**.

→ Sometimes **recoveries** occur naturally.

→ Sometimes **recoveries** involve humans who are trying to help.

Read the chart below with a partner and see if you can think of an example to add in the final column.

<table>
<thead>
<tr>
<th>Examples:</th>
<th>What's another example you can think of?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>True</strong></td>
<td>New trees sprouting from seeds after a forest fire</td>
</tr>
<tr>
<td>False</td>
<td></td>
</tr>
<tr>
<td><strong>True</strong></td>
<td>Non-native species of snakes poisoned on island</td>
</tr>
<tr>
<td>False</td>
<td></td>
</tr>
</tbody>
</table>
The Chesapeake Bay is the largest estuary in the United States. The bay’s health is not good, but communities near the bay in Maryland and Virginia are trying to turn things around. They are doing all kinds of things to remind people about ways to keep the bay water cleaner. They really want the oysters in the Chesapeake Bay to thrive again like they did many years ago.

Why is a little oyster such a big deal?

The Heroic Chesapeake Bay Oyster!

Oysters filter water through their systems in order to feed on microscopic floating plants and animals called plankton. But as the oysters filter the water for food, they also make the water clearer. With clearer water, sunlight can shine through the water and nourish more plants in the water. With more sunlight, the plankton population is healthier, so the oysters have enough to eat. It’s a great example of interdependence.

However, the oyster’s population has declined. Some say it’s because fishermen are taking too many. Others say it’s because of pollution. Scientists think the problem is a combination of a lot of factors.

The area of the bay populated with oysters used to be 200,000 acres. Now the area is reduced to about 36,000 acres. Some estimate that many years ago oysters could filter the bay in four days. Now it takes 325 days.
Why is the oyster's job so important?

Oysters are shown in the food web above in the bivalves group. Oysters not only eat plankton, they also make the water better for plankton. Above you can see two types of plankton that many other animals depend upon. Zooplankton are tiny animals and phytoplankton are tiny plants.

Looking at the Chesapeake Bay Food Web above, use the arrows to trace a single food chain. Then fill in this chart:

<table>
<thead>
<tr>
<th>Phytoplankton</th>
<th>are eaten by...</th>
<th>Smaller Fish</th>
<th>are eaten by...</th>
<th>Larger Fish</th>
<th>are eaten by...</th>
<th>Ospreys</th>
</tr>
</thead>
</table>

Discuss with a partner all the problems that could occur if there were not enough of those little oysters. Imagine that the water were too cloudy for the sun to reach the plankton and the submerged aquatic vegetation. Could this affect a top **predator** such as the osprey or the bald eagle?
Consider the events of this cartoon from a scientific perspective:

**A Chicken Hawk Just Killed Another One of Our Chickens! This Must Not Stand!**

**Let's Shoot All the Hawks, and Take Down Their Nests.**

**That'll Work.**

**Don't Count Your Chickens Before They're Hatched!**

**Huh?**

**What does that expression mean, anyway?**

**Yeah!**

**Help!**

**CLUCK!**

**SAVE US!**

**That'll work...**

**Don't count your chickens before they're hatched.**

**Go get 'em!**

**KA-BLAM!**

**Get lost, you chicken-thieving sky pirates!!!**

**Darn it!**

**POW!**

**POP!**

**I SAID, DON'T COUNT YOUR CHICKENS BEFORE THEY'RE HATCHED.**

**That'll work.**

**What does that expression mean, anyway?**

**I said, don't count your chickens before they're hatched.**

**Now, do you understand what “Don't count your chickens before they're hatched” means?**

**I'm afraid so: don't be too sure a plan is going to work out the way you planned it.**

**Giddy up!**

**CLUCK!**

**Eat up, gang! Looks like we've got clear skies.**

**Later...**

**This is horrible! We're overrun with rodents, and they're eating all our grain!**

**That didn't work...**

**Now do you understand what “Don't count your chickens before they're hatched” means?**

**I'm afraid so: don't be too sure a plan is going to work out the way you planned it.**

**Are you lookin' at me?**

**CLUCK!**

**Later...**
Could there be a connection between the hawk problem and the rodent problem? Hmmm....

The farmer’s daughter, Maria, decided to investigate. She knew that when her father got out the shotgun to kill the hawks, she saw a lot fewer hawks around. But she wasn’t sure about the mice. So for one year, she spent two hours each month observing for hawks and two hours observing for mice.

Here is the spreadsheet where she kept her data:

Looking at her spreadsheet, she was still having trouble making sense of her data. So she graphed it.

In studying her graphs, Maria started to think she had some scientific evidence. But of what? Discuss with a partner what you think can be concluded from Maria’s data.

Write your conclusions here:

__________________________
__________________________
__________________________
__________________________
__________________________
__________________________

Enter the rest of Maria’s mice data into the graph.
Today your class is going to simulate a **town hall meeting**.

Here’s the situation: Just as Maria thought, hawks are indeed helpful in controlling mice and other rodents. Therefore, the fish and game warden of Cluck County made a new rule and put up the sign shown on the right.

Of course, different people in the community have different opinions about this new rule.

**Meeting attendees:**

- **farmers**
  - The farmers are confused and angry about the rule. If a hawk is on THEIR private property, they should have every right to kill it. Losing chickens to these nasty predators is expensive, stressful, and very harmful to their business. Poultry farmers produce eggs and chickens consumed by people all over the state. They realize that the new rodent problem might be due to fewer hawks, but they prefer to try other ways to control the rodents.

- **environmental activists**
  - The environmental activists consider the hawk to be a beautiful bird with an especially important place in the community. They worry about hawks becoming an endangered species. They know that ecosystems are complicated and **interdependent**, and they worry that other people don’t think about unintended consequences. Furthermore, they are suspicious that the farmers will use poison to control the rodents, which they think could be very harmful.

- **fish and game warden/biologists**
  - The fish and game warden and wildlife biologists want to prevent harmful disturbances to the environment and to protect native species. They are concerned about the rodent population becoming too large, thereby hurting natural grasslands and farm crops. They are not sure how long the ban on hawk-killing should last. They are a bit worried that the county counselors will change the rule because of complaints and not because of scientific evidence.

- **county counselors**
  - The county counselors are the elected representatives of the people of Cluck County. They want to do the responsible thing, but they also want to keep everyone happy. They are worried about the rule disturbing the farmers’ businesses. They respect the scientists and the game warden, but wonder if they overreacted by banning all killing of hawks and birds of prey. They are also somewhat concerned that the environmental activists will organize demonstrations against the rule, which they believe would make the county look bad.

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SciGen Unit 7.4
Rules for the town hall meeting:

Each team gets times to:

- make an opening statement
- comment on or question what other teams say
- make a closing statement

There will be two town hall meeting simulations. You will participate as a character during one of them. During the other, you will observe and fill out a checklist.

To prepare to PARTICIPATE in the town hall meeting simulation:

1. Find out from your teacher which team you are on.
   - farmers
   - environmental activists
   - game warden/biologists
   - county counselors
2. Read the mindsets of each team very carefully so you can play the role well. Remember, you are representing a character, not your own opinion.
3. Get together with the other members of your team and develop good arguments that you can make during the meeting. If you are on the county counselor team, think about ground rules you would like to share at the beginning of the meeting so that people with different opinions about the issue will handle themselves appropriately.
4. Decide who on your team will present an opening statement and who on your team will present a closing statement. The remaining members of your team will handle questions from other groups or the counselors.

To prepare to OBSERVE the town hall meeting simulation:

1. Study the form on the next page.
2. While you observe the other group’s town hall meeting simulation, write a check mark when you hear someone from a team make a good point. Jot a few words to remind yourself of any really good points. Attempt to note at least one good point from each team in the other group.
3. Also listen for the week’s focus words. If you hear them used correctly by anybody participating in the simulation, circle them in the appropriate place on the form.
4. Be ready to comment on what you observed after the simulation.
Below are forms for you to use while you are observing the town hall meeting (when it is not your turn to participate).

I heard the farmer team make some really good points:

☐ Good point #1:
☐ Good point #2:

I noticed that the farmer group used some of this week's focus words:

native population prey
disturbance recovery consumer
producer predator interdependence

I heard the fish and game warden/biologist team make some really good points:

☐ Good point #1:
☐ Good point #2:

I noticed that the fish and game warden/biologist group used some of this week's focus words:

native population prey
disturbance recovery consumer
producer predator interdependence

I heard the county counselors team make some really good points:

☐ Good point #1:
☐ Good point #2:

I noticed that the county counselors group used some of this week's focus words:

native population prey
disturbance recovery consumer
producer predator interdependence
You are a customer service representative at Island Airways. You just received this email from a customer who is complaining about missing his flight.

Dear Island Airways,

I am irate! I made it to the Guam airport in just enough time to catch my flight to Hawaii. However, I was forced to comply with some stupid inspection rule. Airport officials wanted to see if I had fresh fruit in my luggage. I told them I didn’t, but they went ahead and looked through my stuff anyway. When I told them that I would miss my flight, they just shook their heads and kept searching through my stuff. They said that they were especially worried about insect eggs getting off the island. Ridiculous! What nonsense! I want my money back and I’m never flying your crazy airline again!

Your boss has asked you to respond in a respectful way to help this customer understand the importance of these inspections to protect the populations on other islands. Wow! You have a tough job, teaching science to an angry customer. Best of luck to you!
Analogies can be very helpful in science. They use something we’re familiar with to help us understand something we’re less familiar with. Discuss each analogy below with a partner and respond to the questions in writing.

How are a beehive and an apartment building similar?
______________________________________________
______________________________________________

But, of course no analogy is perfect. What are important differences between the two?
______________________________________________
______________________________________________

How are a bird and an airplane similar?
_____________________________________________
_____________________________________________

But, of course no analogy is perfect. What are important differences between the two?
_____________________________________________
_____________________________________________

How are a computer’s hard drive and a human brain similar?
_____________________________________________
_____________________________________________

But, of course no analogy is perfect. What are important differences between the two?
_____________________________________________
_____________________________________________
The white area on this map represents the area of land that drains into the Chesapeake Bay. This area is called the bay’s watershed.

This part of the United States has large population centers with paved roads. When rainwater flows from these roads and eventually reaches the bay, this contributes to the disturbance of the bay’s ecosystem.

In an attempt to help the bay recover, cities like Baltimore and Washington label storm drains to remind people not to dump pollutants.

The chart below shows what percentage of the storm drain pollution in the bay comes from each area.

<table>
<thead>
<tr>
<th>State</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delaware</td>
<td>1%</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>1%</td>
</tr>
<tr>
<td>Maryland</td>
<td>29%</td>
</tr>
<tr>
<td>New York</td>
<td>3%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>23%</td>
</tr>
<tr>
<td>Virginia</td>
<td>41%</td>
</tr>
<tr>
<td>West Virginia</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: EPA Phase 5.3 Chesapeake Bay Watershed Model 2009 Scenario

Consider this: You hear a student who looked at these data say:

“Delaware and D.C. do a much better job keeping storm pollution out of the bay than Maryland and Virginia!”

There is a MAJOR problem with this student’s logic. What is it? What would you say to help someone understand that looking at the percentages alone could be misleading?
Positions on a Spectrum

1. “Hunting is an important tradition that helps the environment.”
2. “Killing animals for sport is barbaric.”

Let’s consider some information about deer hunting in the United States:

A century ago, the deer population was endangered due to the environmental disturbances brought on by the development of cities and towns. In recent years, however, the deer population has increased dramatically. In fact, most native deer species in the United States have recovered.

Hunting advocates say that the recovery of the deer population is partly due to all the money that hunters pay in licenses and fees to be able to hunt. This money goes to local governments and is used to create safe habitats for native animals, like deer, to thrive.

Deer overpopulation in some areas can cause problems for humans who live in or near their habitat. Deer collisions with cars can cause serious injury. Deer can damage gardens and crops. Hunters argue that hunting helps with these problems by reducing the number of deer to a natural level. They say that if you care about helping native species, you should accept the role that hunting can play in their survival.

Other people believe that it is unnatural for humans to hunt at all. They point out that when a tiger preys on a wild boar in nature, it does not need a shotgun. They say that the argument that it is natural for humans to hunt makes no sense at all. Still others think that hunting is moral only if you consume the animal that you kill.

What do you think?

Below is a spectrum that shows simplified positions at each end. Most people in the U.S. would take a position somewhere between the two extremes. Jayden and Mya are two seventh graders who found their place on the spectrum by thinking carefully about the issue. Can you do the same?

If hunting is part of your culture and you eat the meat, I think it’s okay. But otherwise people should not hunt.

Hunting is good.

With proper regulation, hunting can be a major help in maintaining healthy ecosystems.

Hunting is bad.

1. Discuss the issue and write your position as Mya and Jayden have done here:
2. Why do you hold the position that you hold?
3. What kinds of evidence or arguments might move you in one direction or the other?
### Examining the Focus Words Closely

<table>
<thead>
<tr>
<th>Focus Words</th>
<th>Scientific or Everyday Use</th>
<th>Definition</th>
<th>Try using the word...</th>
</tr>
</thead>
<tbody>
<tr>
<td>native</td>
<td>adjective</td>
<td>originally from a place</td>
<td>The elderberry tree is native to Cape Cod in Massachusetts. Do you know of a native tree in your area?</td>
</tr>
<tr>
<td>native</td>
<td>noun</td>
<td>a person who is originally from a place</td>
<td>A person who was born in Boston is a native of Boston. Describe yourself as a native of somewhere.</td>
</tr>
<tr>
<td>population</td>
<td>noun</td>
<td>a group of animals or plants of the same species in an ecosystem</td>
<td>The population of brown tree snakes on Guam is increasing because of the lack of predators. What populations are declining?</td>
</tr>
<tr>
<td>populate</td>
<td>verb</td>
<td>to live in or occupy a place</td>
<td>Who populates the area around colleges and universities?</td>
</tr>
<tr>
<td>interdependence</td>
<td>noun</td>
<td>when two or more parts depend on each other</td>
<td>Interdependence is demonstrated by the Chesapeake Bay oyster. How?</td>
</tr>
<tr>
<td>disturbance</td>
<td>noun</td>
<td>an interruption in the normal way an ecosystem works</td>
<td>Are disturbances to ecosystems always bad?</td>
</tr>
<tr>
<td>disturb</td>
<td>verb</td>
<td>to change the arrangement of something; to bother someone or something</td>
<td>The detectives on the TV show C.S.I. are careful not to disturb the evidence at a crime scene. How?</td>
</tr>
<tr>
<td>recovery</td>
<td>noun</td>
<td>the process when an ecosystem returns to normal</td>
<td>Do you think recovery from the snake infestation on Guam is possible?</td>
</tr>
<tr>
<td>recover</td>
<td>verb</td>
<td>to return to a normal condition after a problem</td>
<td>Haiti is still recovering from a devastating earthquake. What other countries are recovering from disasters?</td>
</tr>
<tr>
<td>consumer</td>
<td>noun</td>
<td>an animal that eats other living things (like plants or other animals)</td>
<td>Do higher level consumers eat more plants or more animals?</td>
</tr>
<tr>
<td>producer</td>
<td>noun</td>
<td>a living thing that makes its own food through light and very simple substances</td>
<td>Seaweed is an example of a producer in an ocean ecosystem. What are some producers in a desert ecosystem?</td>
</tr>
<tr>
<td>produce</td>
<td>verb</td>
<td>to make something happen or develop</td>
<td>How do effective coaches produce results?</td>
</tr>
<tr>
<td>predator</td>
<td>noun</td>
<td>an animal that preys on (hunts and eats) other animals</td>
<td>Eagles and ospreys are considered top predators in the Chesapeake Bay ecosystem. Why?</td>
</tr>
<tr>
<td>prey</td>
<td>noun</td>
<td>an animal that is hunted and killed for food by a predator</td>
<td>Can you think of some examples of prey that are larger than their predators?</td>
</tr>
</tbody>
</table>