STEMscopes™ CA NGSS 3D
K-12 SCIENCE

7TH GRADE
LESSON SAMPLE

ECOSYSTEM BIODIVERSITY

LESSON SAMPLE

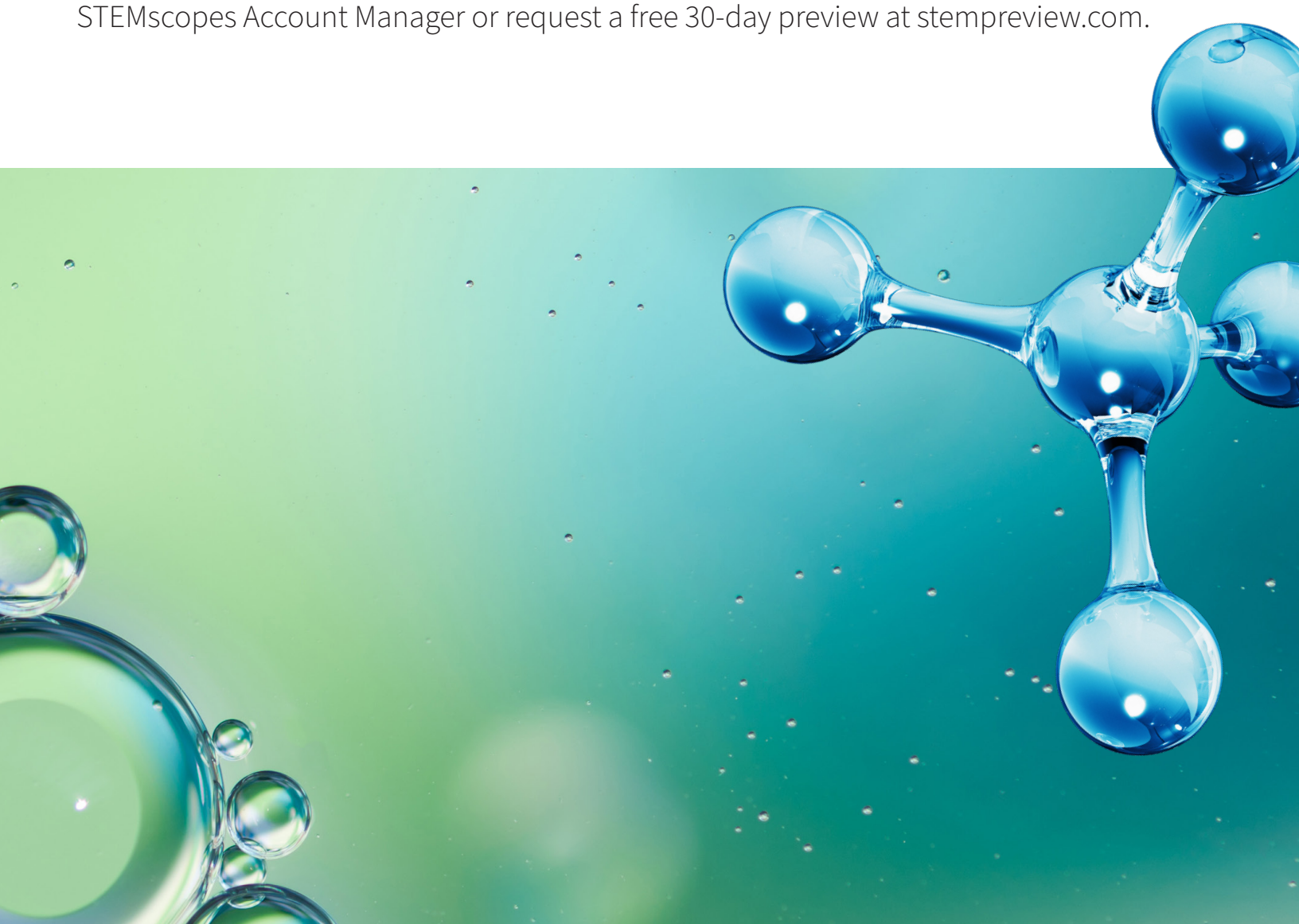
www.acceleratelearning.com/science/ca

Welcome to STEMscopes Science!

Using the proven 5E learning model, STEMscopes California NGSS 3D allows teachers to seamlessly align their instruction with California's Next Generation Science Standards with hands-on activities and inquiry-based lessons.

The lesson sample includes activities from the Ecosystem Biodiversity scope of our 7th Grade science curriculum. These hands-on activities are found within the Explore section of the scope. You'll notice a teacher set-up video, materials list, and facilitation points, as well as the student handouts that coincide with each activity.

To learn more about the STEMscopes California NGSS 3D curriculum, reach out to your STEMscopes Account Manager or request a free 30-day preview at stempreview.com.



Ecosystem Biodiversity

Investigative Phenomena

STEMscopes in Action

Facilitating Questioning and Discourse

Site

Description

The Investigative Phenomena is designed to help engage students in working toward the goal of figuring out why or how something happens. Students should build their knowledge and understanding of the phenomena as they move through the scope.

Materials

1 Investigative Phenomena Table (per student or class)
1 Investigative Phenomena Video (per class)

Preparation

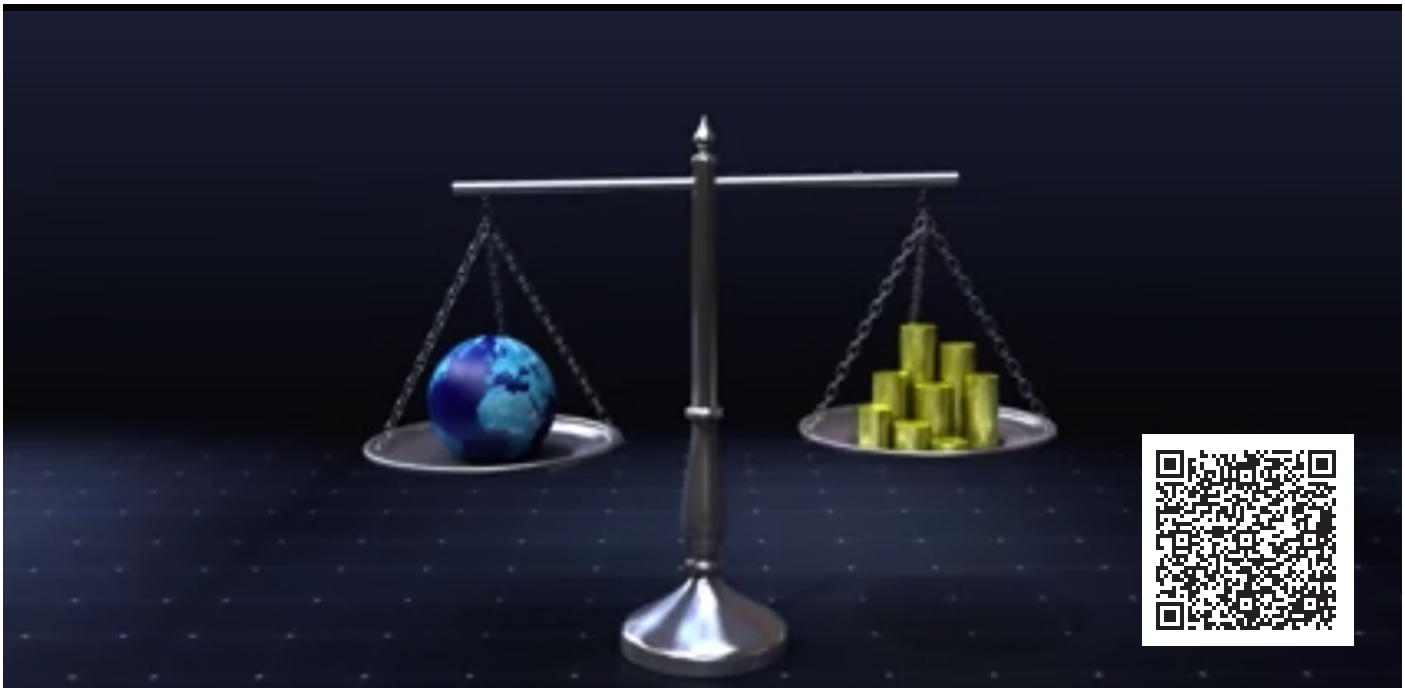
- Display or project the Investigative Phenomena video.
- The Investigative Phenomena Table can be printed for each student, or the Student Wondering of Phenomena question can be written on the board to be referred to throughout the scope.

Teacher note: These are sample phenomena events and possible Student Wondering of Phenomena questions. You may choose to adapt or change these to meet the needs of your students or allow students to generate their own questions.

Facilitation

Part I: At the Beginning of the Scope

1. Allow students to view the following video.



2. Ask students if they have ever wondered how much money an ecosystem is worth? Allow students time to generate possible answers to the question or even generate their own questions. You could record the student responses to create a driving question board.
3. Let students know that, in order to explain the phenomena they have just seen, they are going to be investigating why biodiversity is important in an ecosystem.
4. Introduce students to the sample Student Wondering of Phenomena question below:
    a. Why is biodiversity important in an ecosystem?
5. Let students know that, as they move through the scope, they will be doing a number of activities to help them answer the Student Wondering of Phenomena question and to learn the information needed to help them describe the events happening in the Investigative Phenomena. The content they learn during the scope can be recorded on the Investigative Phenomena Table. Each time they learn something new, they should discuss how the information relates to the Investigative Phenomena question and record their ideas in the Investigative Phenomena Table.
6. Students will interact with the following everyday phenomena:
    a. How can biodiversity be compared to a parking lot?
    b. How does an area of low biodiversity compare to an area of high biodiversity?
    c. How can changing the biodiversity of ocean life affect the food chains?
    d. Why should we protect wetlands?
    e. What caused the population of California condors to change over time?
7. When the scope is completed, have students look back at the Investigative Phenomena. As you lead them in answering the question, encourage them to use the information they learned throughout the scope. Ask students to record their responses and ideas in the last column of the Investigative Phenomena Table prior to completing the summative CER assessment.
8. Encourage students to ask any additional questions about this or other related phenomena.

Part II: During the Scope

1. Each time the students complete one of the elements in the scope, they should revisit the Investigative Phenomena and revise their thinking. Each time they learn something new, they should discuss how the information relates to the Student Wondering of Phenomena question and record their ideas.
2. When the scope is complete, have students look back at the Investigative Phenomena. As you lead them in answering the question, encourage them to use the information they learned throughout the scope. Ask students to record their responses and ideas prior to completing the summative Claim-Evidence-Reasoning assessment.
3. Encourage students to ask any additional questions about this or other related phenomena.

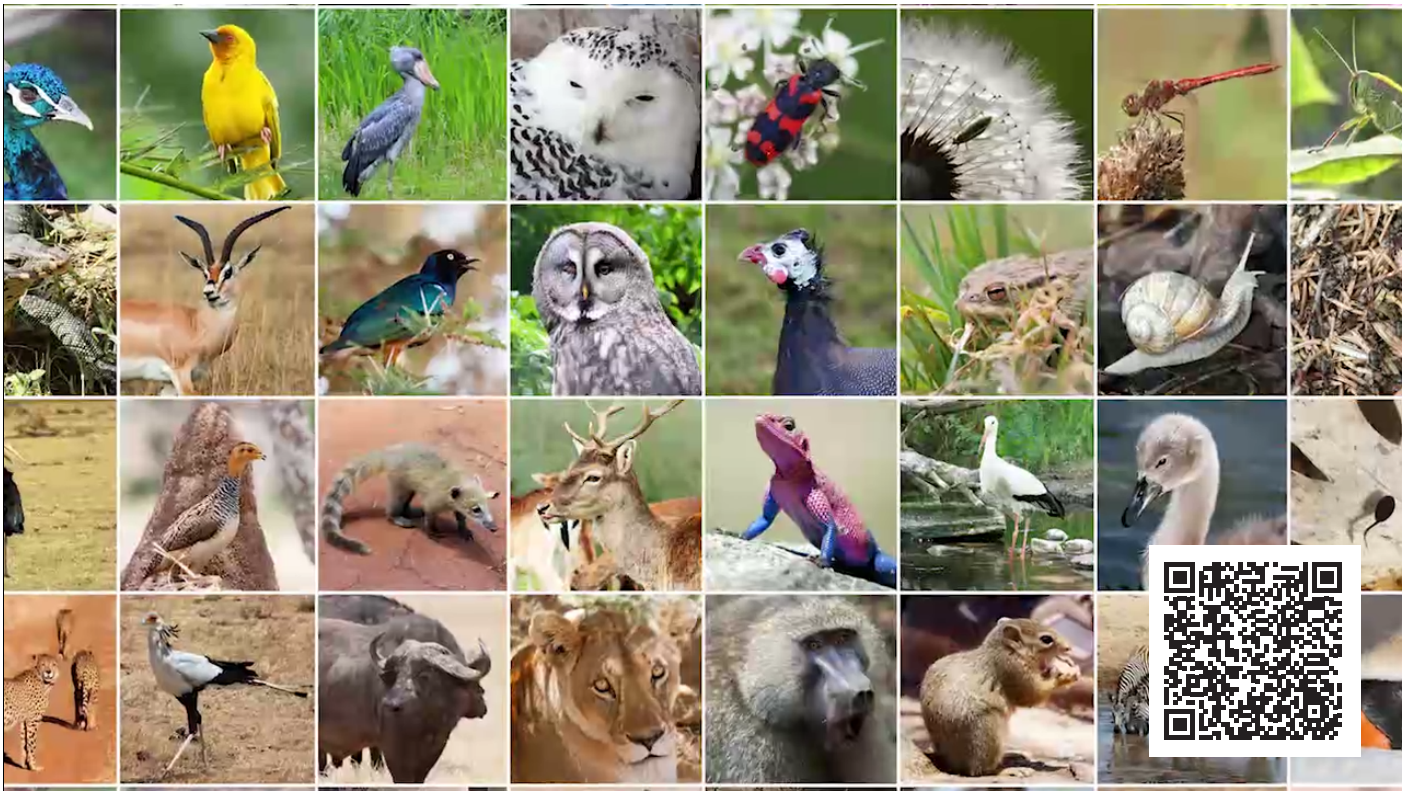
Ecosystem Biodiversity

Hook - Parking Lot Diversity

Everyday Phenomena

How can biodiversity be compared to a parking lot?

Setup Video



Description

Students are introduced to the concept of biodiversity by observing the variety of cars in a parking lot.

ESTIMATED

15 min - 30 min

Materials

Printed Materials

1 Parking Lot Diversity (per pair or group)

Preparation

- Print one copy of Parking Lot Diversity for each pair or group.
- Make sure you review safety issues if you plan on taking the students through the parking lot.

STEMcoach in Action

One of the essential goals of education is to prepare students for the world outside the classroom. In addition to preparing students, making connections to the real world provides them with a framework for demonstrating the relevance of their learning. When we say "connecting learning outside the classroom", we are describing those practices that encourage students to see the connection between the content of the classroom and the world outside the school. For further information on Connecting Learning Outside the Classroom, please click the provided link.

Site

Procedure and Facilitation Points

1. What does the word “diversity” mean? Accept all ideas. The definition of diversity is variety.
2. Discuss the data and questions together as a class.
    a. What did you conclude about the variety, or diversity, of cars in the parking lot? Let the students share their answers. You may need to give them some terms to use such as very similar, similar, different, or very different. Students should come to the conclusion that there were many similar cars and many that were different.
    b. Pretend the parking lot represents a local wilderness area or park. If the cars represent different animals in this area, would you think the area was very diverse? Accept all ideas based on students’ observations. Yes, there were many different types of vehicles. This is a good time to review that an ecosystem is a system comprising all the biotic and abiotic factors in an area and all the interactions among them.
    c. The term “biodiversity” is often applied to regions and ecosystems. Can you come up with a definition for biodiversity? Create a class definition and have the students write the class definition as their answer. Biodiversity refers to the variety of life in a geographical region.
    d. What do you think is the importance of biodiversity in an ecosystem and on Earth? Let students explore this idea. The greater the biodiversity, the more resilient an ecosystem or Earth is in the face of change.

Connection to the Investigative Phenomena

Once students have completed the activity, have them refer to the Investigative Phenomena question, anchor their learning, and revise their thinking.

English Language Development

Acrostic

Have students write an acrostic poem using the word “diversity.” Encourage the use of synonyms and figurative language. Hold a gallery walk or have students present their poems to the class.

Ecosystem Biodiversity

Explore 1: Scientific Investigation - Biodiversity

Everyday Phenomena

How does an area of low biodiversity compare to an area of high biodiversity?

Setup Video

Description

Students model the spread of disease in an area of low biodiversity compared to an area of high diversity and then calculate the biodiversity index of a lawn ecosystem compared to a grassland in order to determine if areas of high or low biodiversity are healthier.

ESTIMATED

1 hr - 2 hrs

Materials

Printed Materials

1 Biodiversity (per student)
1 Biodiversity CER (per student)

Reusable

2 Index cards (per student)
2 Quart-sized plastic bags (per group)
100 Small items, such as beans, paper clips, beads, all the same (per group)
5 Small items, different from above, all the same (per group)
12 Small items, different from above, such as beans, lentils, tokens, pennies, two of each (per group)

1 Black marker (per teacher)
1 Calculator (per group)

Preparation

- Print one copy of Biodiversity and Biodiversity CER for each student.
- For Round One index cards: For every 10 students, mark one of the cards with an X.
- For Round Two index cards:
  - On one side, there should be one of five different geometric shapes. For example, circle, square, triangle, rectangle, and diamond.
  - There should be roughly the same number of each shape. For example, if you have a class of 20, make four cards of each shape.
  - All the Xs on Round Two index cards should go on cards with the same geometric shape.
  - For every 10 students, mark one of the cards with an X.
  - For example, the cards that have the X could all go on circle cards.
- Label the two plastic storage bags, one for each habitat: lawn and grassland.
- You will need 12 different small items to represent species.
- For the lawn container: Two species only. Combine 100 of one species (small items) and five of another for a total of 105 organisms. The index will be 2/105= .019.
- For the grassland container: 12 species, two of each for a total of 24 organisms. The index will be 12/24= .5.

STEMcoach in Action

The skills inherent in designing and implementing a scientific investigation are applicable to many situations outside of the science classroom. Skills such as observing, asking questions, collecting and analyzing data, and drawing and communicating reasonable conclusions are important to all individuals. When we say "cultivating scientific investigation" we are describing the practices that help students develop the skills associated with scientific investigation. For more information on Cultivating Scientific Investigations, please click on the provided link.
Site

Procedure and Facilitation Points

1. When humans went from being hunters and gatherers to an agricultural society, they changed the biodiversity in the ecosystem in which they farmed. What do you think biodiversity means? (You can break down this definition for the students.) Bio – life; Diversity – variety
2. When a farmer plants a field for harvest, how many different types of crops does the farmer most commonly plant in that field? Generally, the farmer plants one crop, i.e., planting a cornfield or a wheat field.
3. If a field is left to grow naturally, how many types of organisms will grow? Many different types of plants will grow.
4. Which field would have the greater biodiversity? The natural field
5. In addition to food crops, trees are also grown as crops in many places. One type, such as white pine, is planted and later harvested to make various wood products. Trees are resources that humans rely on. Remember, a resource is a source or supply from which benefit is produced.
6. Introduce the question: Is an area with greater biodiversity or lower biodiversity healthier for an ecosystem?
7. Have students complete their hypothesis.
8. Guide students through the following steps to complete Part I:

Round One

1. We are going to model a forest ecosystem. Forests are considered terrestrial ecosystems. Terrestrial ecosystems are ecosystems on the land as opposed to in the water.
2. Give each student an index card.
3. Have all students get up and shake hands with at least three different people. Students cannot shake the hands of their group members. Make sure they get up and move around.
4. Once students have shaken hands with three different people, have them return to their seats.
5. Once everyone is seated, have students that have an X on their card stand up. Imagine that the class is a forest of white pine trees. The students that are standing just got attacked by a pine beetle that affects white pine trees. The beetles damage the tree so much that they cannot be used as lumber.

6. Not only that, but the disease can spread. Thus, students who shook hands with any of the three standing students have now become infected and must stand.
7. Again, if any of the seated students shook hands with any of the standing students, then they are now infected. Have these students stand up.
8. Repeat this until all of the students are standing.
9. Return all of the cards and sit back down.
10. Discuss the Round One questions together as a class.
    i. Why did everyone end up with pine beetles? They are the same species of tree, and the disease can spread easily. This is a good time to review that a species is a group of organisms with similar characteristics that are able to interbreed or exchange genetic material.
    ii. What can farmers do to prevent similar pest spreads from happening in agricultural fields? Farmers can spray crops with chemicals to prevent infestations. Some farmers use natural organic chemicals, while others use man-made chemicals. Farmers can also plant a diversity of species using the principles of permaculture. Permaculture is a new method of farming that uses the principle of biodiversity to create better farming practices.
9. Instruct students to read the directions for Part II and complete the activity.

Round Two

1. This will be very similar to round one. This time, give students the cards with the different geometric shapes. There will be one or two that have a card with an X.
2. Repeat steps 2–3 from Round One.
3. Have students with cards that have an X stand up. These students should all have the same geometric figures, which represent white pines that have been infected with the pine beetle. The other figures represent different pine and tree species that are grown in the same area as the white pine.
4. Have students with the same geometric figure that shook hands with the students that are standing stand up. As in Round One, if they are the same shape, they are the same tree species, and pine beetles will also infect them.
5. Discuss the following Round Two questions together.
    i. How was Round Two different from the Round One? There were more species of trees, so the loss of usable lumber was less severe.
    ii. Which ecosystem would be healthier and more resilient? Explain. The second would be more resilient because if one species dies out, there are more species that may survive and carry on.
6. Use the table to record your data.
7. Open one of the bags and count the items that represent different plant species. Record the type of habitat and the data in your data table.
8. Return all of the items into the bag before you open the second bag. This will keep the items from getting mixed up.
9. Open the next bag and repeat the process in Step 2.
10. You have now completed the count of different species in a lawn and grassland. Now you can calculate the biodiversity index. Use the calculator and divide the number of species by the total number of organisms. The answer will be a decimal. The closer the number is to 1, the greater the biodiversity. A rainforest will have a number of .75–1.
10. Give students time to compare data with other groups. Then discuss the following questions:
    a. Which habitat had the highest biodiversity index? Explain. The grassland had the highest biodiversity because it had a larger variety of plants and animals.
    b. Why do you think a rainforest has such a high biodiversity index? The rainforest has a large number of different species of plants and animals.
    c. Which ecosystem would be able to survive a disease better? Why? The grassland would be able to survive a disease better because of its large number of different plants.
11. Give students a copy of Biodiversity CER and have them write a scientific explanation describing the advantages of a polyculture forest (high diversity).

Connection to the Investigative Phenomena

After completing this activity, students revisit the Investigative Phenomena and discuss how biodiversity helps ecosystems better withstand environmental disruptions that are communicable, like pests and diseases (i.e., species that are not susceptible to the contagion create a buffer, or spacing, between organisms that are susceptible to the contagion, thereby helping to prevent the contagion from spreading from organism to organism).

English Language Development

Claim-Evidence-Reasoning

Have students work in pairs to develop their CER. After completing the CER, have students read another student's reasoning and ask questions to make sure they understand what was written. Then have students write a rebuttal or reflection based on the other student's CER responses. Allow students to complete the following sentence stems before the discussion portion: -My claim is _____. -My evidence is _____. -My reasoning is _____. -I heard you say _____, and I haven't thought about that before. However, I think _____.

Foster Care Support

Behavior

Coping Behaviors

Unfortunately students in foster care do not have strong role models in their life and therefore they may have problems coping in many different personal and interpersonal situations. Teachers can help students learn appropriate coping behaviors and how to react appropriately to situations with other people that are difficult to handle. Teachers need to be extremely supportive and encouraging when it comes to interacting with students in foster care. Students in foster care can have low self-esteems and teachers can do wonders by positively reinforcing appropriate behaviors and teaching students how to cope and deal with struggles and conflicts both at school and at home.

Explore

Name: _____ Date: _____

Biodiversity

Question

Will an ecosystem be able to tolerate a disease better if it has more biodiversity or less biodiversity?

Hypothesis

Procedure

Part I: Tree Diversity
Round One

1. Follow your teacher's directions as they take you through this activity.
2. Complete the following questions at the end of the activity.
    a. Why did everyone end up with pine beetles?

    b. What can farmers do to prevent similar pest spreads from happening in agricultural fields?

Round Two

1. Follow your teacher's directions as they take you through Round Two.
2. Complete the following questions at the end of Round Two.
    a. How was Round Two different from Round One?

    b. Which ecosystem would be healthier and more resilient? Explain.

Explore

Part II: Biodiversity Index

1. Use the table to record your data.
2. Open one of the bags and count the items that represent different plant species. Record the type of habitat and the data in your data table.

Ecosystem	Number of Different Species	Total Organisms in Bag	Biodiversity Index
Grassland			
Lawn			

3. Return all of the items into the bag before you open the second bag. This will keep the items from getting mixed up.
4. Open the next bag and repeat the process in Step 2.
5. You have now completed the count of different species in a lawn and grassland. Now you can calculate the biodiversity index. Use the calculator and divide the number of species by the total number of organisms. The answer will be a decimal. The closer the number is to 1, the greater the biodiversity. A rainforest will have a number of .75–1.
6. Complete the following questions.

    a. Which habitat had the highest biodiversity index? Explain.

    b. Why do you think a rainforest has such a high biodiversity index?

    c. Which ecosystem would be able to survive a disease better? Why?