

Ecology: The Ebb and Flow of Natural Systems

Name:

Teacher:

Class:

Life Science (Lower Middle)
Unit 4
Lab Notebook

Lesson 1: Ticks on the Loose!

Directions:

Adapted from Chapter 5: Designing Solutions in [*Disruptions in Ecosystems from NGSS Lead States*](#). 2013. Next Generation Science Standards: For States. Washington, DC: The National Academies Press.

1. Brainstorm and record a list of questions you have for the campsite staff to learn more about the tick problem affecting the campsite.
2. Read each control method and list advantages and disadvantages for each solution.

Data:

Questions for the Campsite Staff

Lesson 1

Chemical Control: A pesticide would be sprayed on the plants and the soil. The pesticide is very effective at killing any tick it touches. It is also poisonous to many other insects and some small animals. The effectiveness of the pesticide decreases rapidly over time. The insecticide would have to be reapplied frequently over a two-month period.

Advantages	Disadvantages

Relocate the Campsite: The campsite would move to a new location several hundred miles away. This would involve selling the campsite. It is uncertain if the campsite could be sold for enough money to buy another campsite in a new location. If not, then the staff would have to find different jobs.

Advantages	Disadvantages

Lesson 1

Biological Control: Toads will be used to control the ticks. The toads eat many types of small organisms, such as frogs, lizards, snakes, mice, snails, and insects. They have been used successfully to control insect pests in several other countries. The toads are not native to the area. Thirty toads will be brought to the campsite and released in the fields.

Advantages	Disadvantages

Physical Removal: All of the campsite would be burned. This would kill all the plants but also the insects, including the grubs that live in the soil. The ground would be left bare for one year. Workers would be hired to monitor the fields and to trap and remove any of the ticks found there. After one year, the buildings and surrounding area would be repaired. Workers would continue to monitor the campsite for ticks until the next group of scholars came to visit the following year.

Advantages	Disadvantages

Lesson 1**Discussion Questions:**

1. What factors did you consider when deciding which solution to recommend?
2. What other information would have been useful when you were examining solutions?

Additional Notes:

Exit Ticket: Write a recommendation for the solution that you believe is best to solve the campsite problem. Explain why you chose this solution using specific evidence from the disadvantages and advantages in your notes. Justify and support your response with your knowledge of science.

Lesson 2: What Is an Ecosystem?

Directions:

1. Classify each part of the ecosystem as abiotic or biotic and record the number of each part in the data table below.
2. Analyze the data from 2000 to 2015 and construct a hypothesis on what has caused the tick population to increase.

Data:

	Part of Ecosystem	Number in 2000	Number in 2015
Biotic			

Lesson 2

	Part of Ecosystem	Number in 2000	Number in 2015
Biotic			

	Part of Ecosystem	Number in 2000	Number in 2015
Abiotic			

Discussion Questions:

1. How do the biotic and abiotic factors interact with each other?
2. What makes an ecosystem a *system*?
3. What changed in the ecosystem over the last 15 years?
 - How might this relate to the increase in the tick population?

Lesson 2

Hypothesis: Explain what has caused the tick population to increase in the last 15 years. Use evidence from the data and justify your response with your knowledge of science.

Peer Feedback:

Revised Hypothesis:

Lesson 3: What's for Dinner?

Directions: Use the organisms feeding data to determine how the organisms of the campsite ecosystem fit together in a food web.

Data: Copy your completed food web into the space below and add the sun to your food web.

A large, empty rectangular box with a thin black border, intended for students to draw their completed food web. The box is currently blank.

Lesson 3

Discussion Questions:

1. Where do producers get their energy from?
 - How do they use this energy to survive?
2. Where do consumers get their energy from?
 - Do all consumers eat the same type of food?
3. Where do decomposers get their energy from?
4. What is the main source of energy for the ecosystem?
5. What do the direction of the arrows in the food web represent?

Additional Notes:

Lesson 4:

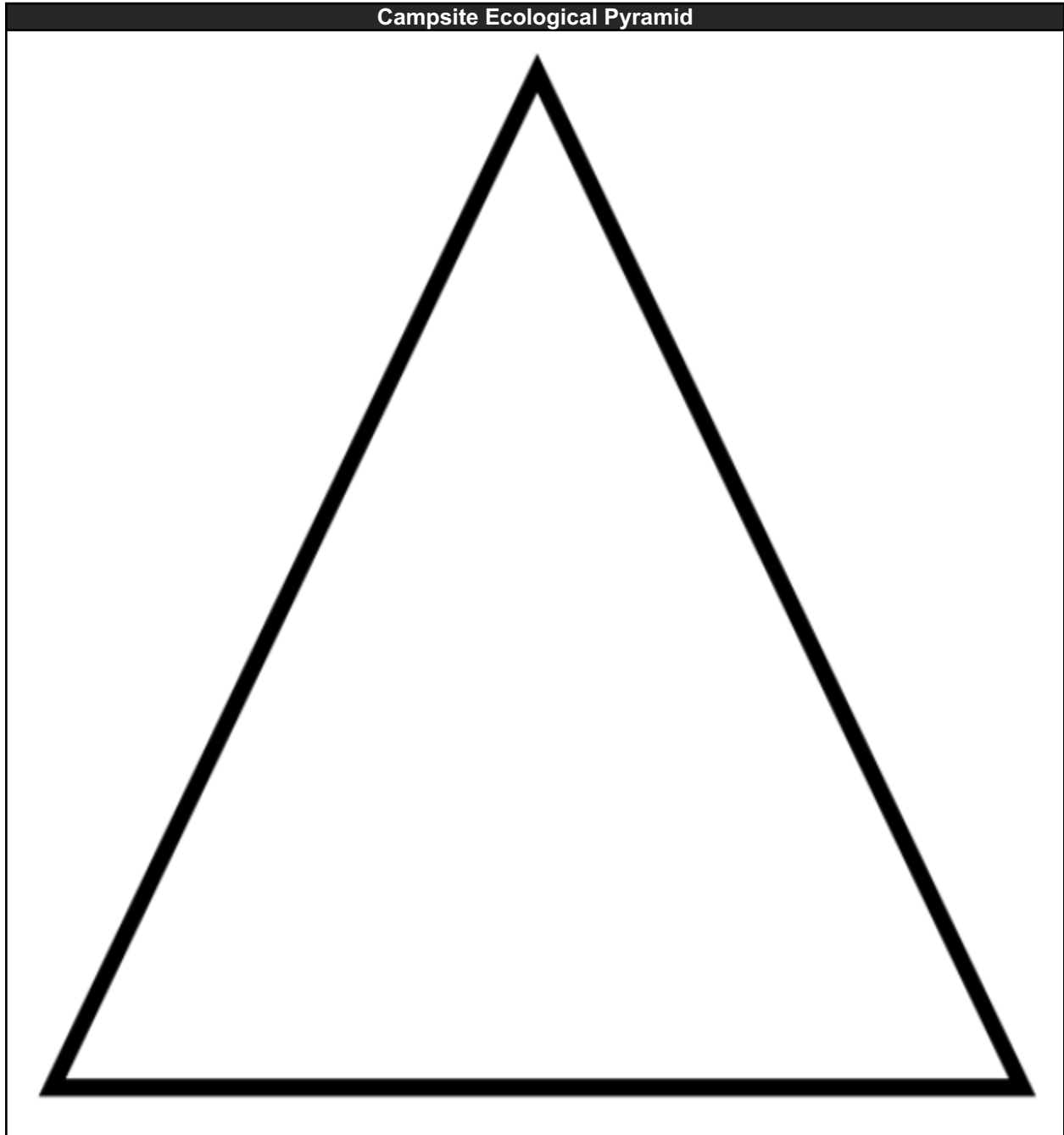
The Great Pyramids: Energy and Matter Flow

Procedure:

1. Determine how many levels of energy the ecological pyramid can have by completing the procedure below.
 - Place 1000 mL of water into the first cup and label "Level 1."
 - Calculate 10% of 1000 mL and then transfer that amount from the first cup into a second cup. Label the second cup "Level 2."
 - Complete this process with as many additional energy levels you can create with the tools you have.
2. Draw in the number of levels you created above in the ecological pyramid below.
3. Use the food web from Lesson 3 to determine which organisms fall into each energy level. Only include consumers and producers in your ecological pyramid.

Lesson 4

Data:



Lesson 4**Discussion Questions:**

1. What kind of organisms carry the most energy for the entire ecosystem?
2. What kind of organisms carry the least energy for the entire ecosystem?
 - Why do these organisms carry the least energy for the entire ecosystem?
3. What happens to the energy after the last level?
4. Where do decomposers fall on the ecological pyramid?

Additional Notes:

Lesson 5: Feast or Famine?

Directions:

1. Read your Role Card and record your information in the table below.
2. With your group, read the rules of the game to understand your job.
3. Before each round of the game, record your prediction of what will happen.
4. After each round of the game, record the results and the impact of the scenario on the ecosystem.

Data:

Role	Goal

Lesson 5

Wait for your teacher to read each scenario out loud before making your prediction below.

Scenario	Prediction	Results and Impact
1		
2		
3		
4		

Lesson 6:

The Crittercam Files: Ecological Relationships

Directions:

1. Use the Crittercam footage to take notes and identify which symbiotic relationship is being represented in the marine ecosystem.
2. Choose one interaction between two organisms in the Crittercam footage and construct an explanation on what type of symbiotic relationship they have.

Data:

Crittercam Footage	Notes	Symbiotic Relationship (mutualism, commensalism, parasitism)
<i>"Caribbean Cleaners"</i>		
<i>"Giving Fish a Bath"</i>		

Lesson 6

Crittercam Footage	Notes	Symbiotic Relationship (mutualism, commensalism, parasitism)
<i>“Clownfish and Sea Anemone Partnership”</i>		
<i>“Lemon Shark”</i>		

Analysis Question: Choose two organisms from the Crittercam footage and describe which ecological relationship they have. Include evidence from the footage to support and justify your response. [3]

Lesson 7: Time for a Checkup: Ecosystem Health

Directions:

1. Read your Role Card and record your information in the table below.
2. With your group, read the rules of the game to understand how to survive.
3. After each round of the game, record whether you think the ecosystem is healthy.
4. When you are eliminated from the game, record your answers to the analysis questions below.

Data:

Role	Adaptation	Energy Source

Lesson 7

Round	Notes	Is the Ecosystem Healthy? Why or why not?
0		
1		
2		
3		
4		

Lesson 7

Analysis Questions:

What allowed your organism to survive in the ecosystem from the beginning of the game?

What caused your organism to become eliminated from the ecosystem?

What determines the health of an overall ecosystem?

Lesson 8: Succeeding in Succession

Directions:

1. Read the game rules with your group and complete steps 1 and 2. Record the information on your game role in the table below.
2. With your group, follow the instructions to play the game. Record the information on what happened each time someone pulls a JENGA® block with a red sticker in the second table below.

Data:

Player #	Role	Notes on Role

Lesson 8

Effect of Red Card on Tower	Reason for Change

Discussion Questions:

1. How do the red cards affect the building of your JENGA® tower?
 - Why do some players move the blocks differently than others?
2. What is the difference between primary and secondary succession cards?
3. Why do you think all players must work together to create a 1-foot-tall tower to win the game?
 - What does the tower represent?

Lesson 9: Chaotic Campsite

Directions:

1. Read the Campsite Policy Changes and take notes on possible reasons for the ecological problems seen at the campsite.
2. Read the Eyewitness Accounts and take notes on possible evidence for the reasons outlined in step 1.
3. Discuss the cause of the problem and possible solutions for the campsite with your group.
4. Write a letter back to the campsite to explain the cause of their problems and possible solutions to help!

Data:

Change to Campsite Policy	Possible Reason for Causing Ecological Problems

Lesson 9

Eyewitness Account	Evidence for Ecological Problems

Discussion Questions:

1. What policy changes impact the ecosystem?
2. How do the Eyewitness Accounts help you to determine the cause of the ecological problems?
3. What should the campsite do to solve its ecological problems?

Lesson 9

Letter to Campsite:

Lesson 10: Smart Solutions

Directions:

Activity adapted from Chapter 5 Designing Solutions in *Disruptions in Ecosystems from NGSS Lead States*. 2013. Next Generation Science Standards: For States. Washington, DC: The National Academies Press.

1. Read the Designing Solutions article and discuss the purpose of each factor of ecological decision-making with your group.
2. Collect evidence for each solution from throughout the unit and online.
3. Choose which solution is best for the campsite and construct an argument to share during the whole-class debate.

Data:

Solution	Economic Impact	Social Impact	Environmental Impact
Chemical Control			

Lesson 10

Solution	Economic Impact	Social Impact	Environmental Impact
Relocate the Campsite			
Biological Control			

Lesson 10

Solution	Economic Impact	Social Impact	Environmental Impact
Physical Removal			

Analysis Question: Construct an argument to persuade the campsite on the best solution to use to solve its increasing tick population problem. Include at least two pieces of evidence to support and justify your response.
