



Ticks, Biodiversity, and Climate

Teacher Information

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Summary

Follow a student as she volunteers at a local veterinary hospital. During the course of her internship, she helps diagnose a patient with a tick-borne disease. Examine the data to figure out why the incidence of tick-borne diseases is on the rise. What factors contribute to increases in ticks and the diseases they carry?

Core Concepts

- The increased risk of tick-borne pathogens may be related to biodiversity and climate change.
- Tick-borne pathogens pose a growing risk to human health.
- A One Health approach identifies and seeks solutions to problems that affect the health of humans, animals, and the environment.

Time Required

3-4 forty-minute class periods

Kit Contains

- **Tick Identification Key**
- **Tick Photographs**
- **Human Diseases Transmitted by Ticks**
- **Tick Pathogens Detection Instructions**
- Simulated Electrophoresis Gel
- Plastic bag with DNA Stain (simulated)
- Small measuring cup
- **Ticks and Climate Data**
- **Complex Interactions Model**
- **Steps to Infection** transparency sheet
- Dry erase marker

Teacher Provides

- Access to internet

Warning: Choking Hazard

This Science Take-Out kit contains small parts. Do not allow children under the age of seven to have access to any kit components.

Teacher Resources

- **Centers for Disease Control and Prevention (CDC) – One Health**
<https://www.cdc.gov/onehealth/index.html>
- **Centers for Disease Control and Prevention (CDC) – Ticks**
<https://www.cdc.gov/ticks/index.html>
- **Climate and Tick Behavior**
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5226345/>
- **Lyme Disease Geographic Distribution and Tick Behavior**
<https://www.usgs.gov/news/it-s-heat-and-humidity-new-study-finds-why-lyme-disease-common-north-rare-south>
- **Tick Life Cycle and Ecology**
<https://www.pnas.org/content/109/27/10942>
- **One Health Commission**
<https://www.onehealthcommission.org/>

Teacher Suggestions

- Internationally, there is a growing focus on utilizing One Health approaches to solve problems that involve the health of humans, animals, and the environment. One Health problems are complex and solutions to these problems require the collaboration of people from a variety of disciplines. It is important that students are exposed to this type of interdisciplinary and collaborative thinking.
- The increase in tick-borne diseases is a One Health problem that involves the health of humans, animals, and the environment. An optional Part 6 on the following two pages helps students understand what One Health means and see the importance of taking a One Health approach to solving the problem of tick-borne diseases. Students will need access to the internet to view this YouTube video:
<https://www.youtube.com/watch?app=desktop&v=TG0pduAYESA>
- You may want to ask students to brainstorm examples of other One Health problems and explain how the One Health approach may involve a collaboration of people who have careers in human health, environmental health, and animal health.

Part 6: One Health and tick-borne diseases

One Health

The State Health Department is suggesting that local governments should take a collaborative One Health approach to solving complex local problems, such as tick-borne diseases. A One Health approach uses the idea that complex problems often involve the health of people, animals, and the environment. Therefore, solutions to One Health problems must be designed to protect the health of people, animals, and the environment.



1. Use the information in the text box above to explain what must be involved in a complex problem for it to be considered a One Health problem.

2. Watch this video from the CDC (Centers for Disease Control). The video provides a brief introduction to One Health and why it is important for public health professionals, veterinarians, ecologists, and environmental health professionals to work together.

Scan this QR code with your smartphone or tablet camera app to link to the video.



3. State one interesting or important thing that you learned about One Health from watching the video.

To support adoption of a One Health approach, the health department officials want to create a series of slides to provide examples of One Health problems in the community. Your team has been hired to create three slides to answer the question, **“Why is the increase in tick-borne diseases a One Health problem?”**

Remember how the CDC video used images with captions (short descriptions) to help people understand what One Health problems and solutions involve. Using pictures and captions in your slides will help people understand and remember what the One Health approach involves.

4. Use the information in the text box above, what you learned from the video, and what you learned about ticks and tick-borne diseases to develop three slides that show why the increase in tick-borne diseases is a One Health problem. You should create three slides:
 - Slide 1: A picture or pictures and a caption to explain how **animals** are involved in the problem.
 - Slide 2: A picture or pictures and a caption to explain how **humans** are involved in the problem.
 - Slide 3: A picture or pictures and a caption to explain how **the environment** is involved in the problem.

Reusing the Kit

Teachers will need to instruct students on how to handle cleanup and return of the reusable kit materials. For example, teachers might provide the following information for students:

Discard	Return to kit bag
<ul style="list-style-type: none">• Simulated Electrophoresis Gel• Plastic bag	<ul style="list-style-type: none">• Tick Identification Key• Tick Photographs• Human Diseases Transmitted by Ticks• Tick Pathogens Detection Instructions• Small measuring cup• Ticks and Climate Data• Complex Interactions Model• Steps to Infection transparency sheet• Dry erase marker

Refills for **Ticks, Biodiversity, and Climate** kits are available at www.sciencetakeout.com. The **10 Kit Refill Pack** includes the following materials:

- **10 Simulated Electrophoresis Gels**
- 10 plastic bags
- DNA Stain (simulated)
- Small measuring scoop

NGSS Correlation

<p>Working Towards Performance Expectations</p> <p>MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.</p> <p>MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.</p> <p>HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.</p>		
<p>Science and Engineering Practices</p> <p>Constructing Explanations</p> <ul style="list-style-type: none"> Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. 	<p>Disciplinary Core Ideas</p> <p>LS2.A: Interdependent Relationships in Ecosystems</p> <p>Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.</p> <p>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</p> <p>A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.</p> <p>Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.</p>	<p>Cross Cutting Concepts</p> <p>Patterns</p> <p>Patterns can be used to identify cause and effect relationships.</p> <p>Stability and Change</p> <p>Much of science deals with constructing explanations of how things change and how they remain stable.</p> <p>Small changes in one part of a system might cause large changes in another part.</p> <p>Cause and Effect</p> <p>Cause and effect relationships may be used to predict phenomena in natural or designed systems.</p>

Kit Contents Quick Guide

Human Diseases Transmitted by Ticks

Disease	Transmitted by
Anaplasmosis	Blacklegged
Babesiosis	Blacklegged, Brown
Ehrlichiosis	Brown, Lone
Lyme disease	Blacklegged
Rocky Mountain Spotted Fever	Brown, Lone, American
"Star" encephalitis	Lone
Tularemia	American

Tick Identification Key

- Does the rear edge of the tick have a band that appears segmented plates known as festoons? (See illustration below.)
 YES: Go to 3
 NO: Go to 2
- Are the mouthparts long enough that they extend out from the body and are visible when looking at the tick from above?
 YES: This may be a blacklegged tick, also known as the "deer tick" (Ixodes scapularis). They range from dark brown to bright red and have black legs.
 NO: This is a "soft tick" (Argasidae). These ticks are soft, while all other ticks mentioned here are "hard ticks." Soft ticks belong to a different family of ticks and are often associated with domestic animals upon which they feed.
 YES: This is the lone star tick (Amblyomma americanum). Their mouthparts and their coxae are somewhat round in shape shaped like other ticks.
 NO: This may be a brown dog tick (Dermacentor variator). Their mouthparts and their coxae are somewhat round in shape and they feed primarily on dogs. This tick vector ticks or transmits
- Are there several irregular silvery-white marks in the center of the body?
 YES: This is an American dog tick (Dermacentor variator). It and other small mammals, but will bite people. The silver marks across the backs of males. On females, the silvery white in the scutum. These ticks are oval shaped and their mouthparts and forest.
 NO: Go to 4
- Are there white markings on the rear edge of the tick's back OR a line across the back?
 YES: This is the lone star tick (Amblyomma americanum). Their mouthparts and their coxae are somewhat round in shape shaped like other ticks.
 NO: This may be a brown dog tick (Dermacentor variator). Their mouthparts and their coxae are somewhat round in shape and they feed primarily on dogs. This tick vector ticks or transmits

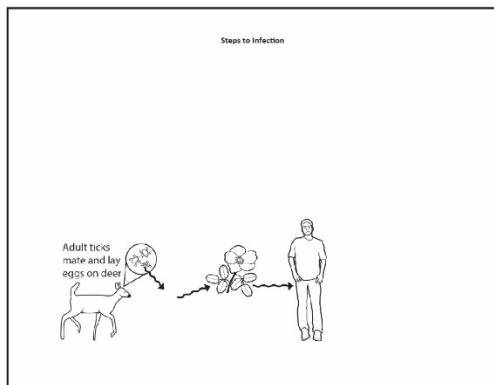
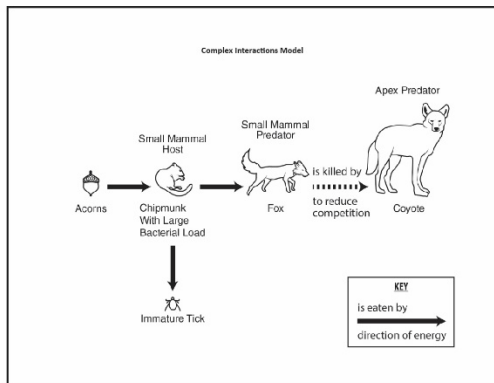
Tick Photographs

Tick removed from Lalney

Tick removed from Max

Tick removed from Daisy

Ticks and Climate Data

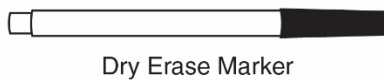


Tick Pathogen Detection Instructions

- Use the small measuring cup to add 20 ml of water to the plastic bag labeled DNA Stain.
- Seal the plastic bag and gently swirl the contents of the bag to dissolve the white DNA Stain powder that is in the bag.
- Put the Simulated Electrophoresis Gel into the plastic bag with the dissolved DNA Stain.
- Seal the plastic bag then lay it flat on your desk or table.
- Wait about 3 minutes then observe the banding patterns (pink bands) for each of the dogs (Max, Daisy, Lalney).

Tick Pathogen Standard Key

Band #	Borrelia burgdorferi	Duffyella Croftensis	Francoella Noveboracensis	Anaplasma phagocytophilum
13				
12				
11				
10				
9				
8				
7				
6				
5				
4				
3				
2				
1				



DNA Stain

Simulated Electrophoresis Gel

	Max	Daisy	Lalney
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1			

Read these instructions before using Science Take-Out kits

Parental or Adult Supervision Required

This kit should be used only under the supervision of an adult who is committed to ensuring that the safety precautions below, and in the specific laboratory activity, are followed.

Chemicals Used in Science Take-Out Kits

Every effort has been made to reduce the use of hazardous chemicals in Science Take-Out kits. Most kits contain common household chemicals or chemicals that pose little or no risk. Safety Data Sheets (SDS) provide specific safety information regarding the chemical contents of the kits. SDS information for each kit is provided in the accompanying teacher instructions. We encourage students to adopt safe lab practices when performing laboratory activities involving chemicals.

Warning: Choking and Chemical Hazard

Science Take-Out kits contain small parts that could pose a choking hazard and chemicals that could be hazardous if ingested. Do not allow children under the age of seven to have access to any kit components.

No blood or body fluids from humans or animals are used in Science Take-Out kits. Chemical mixtures are substituted as simulations of these substances.

General Safety Precautions

1. Never taste, smell, or ingest any chemicals provided in the kit – they may be hazardous.
2. Chemicals used in Science Take-Out experiments may stain or damage skin, clothing or work surfaces. If spills occur, wash the area immediately and thoroughly.
3. Report any chemical spills or contact with chemicals to your teacher.
4. Work in a clean, uncluttered area. Cover the work area to protect the work surface.
5. Read and follow all instructions carefully.
6. Pay particular attention to following the specific safety precautions provided by your teacher or included in the kit activity instructions.
7. Do not use the contents of this kit for any other purpose beyond those described in the kit instructions.
8. Do not leave experiment parts or kits where they could be used inappropriately by others.
9. Do not eat, drink, or apply make-up or contact lenses while performing experiments.
10. Wash your hands before and after performing experiments.

Ticks, Biodiversity, and Climate

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Part 1: What kinds of ticks are present in the ecosystem?

Jada's high school required twenty hours of community service in order to graduate. Jada was interested in a career as a veterinary technician ("vet tech"). Vet techs assist veterinarians in diagnosing and treating animals. To learn what is involved in the job of a vet tech, Jada decided that she would volunteer at her local veterinarian's office. Dr. Louis, the veterinarian, encouraged Jada to join her during most pet examinations.

The first patient of the morning was Max, a large sheepdog mix. As Dr. Louis examined Max's ears, she noticed a small white "bump". Dr. Louis showed Jada and explained that this bump was actually a tick. Ticks are tiny animals that embed their pointy mouth parts in their host's skin to feed on blood. Dr. Louis immediately removed the tick from Max's ear and placed it in a petri dish. Dr. Louis said that the tick could be carrying diseases that could harm Max. In order to find out if the tick was dangerous, they would first need to identify what kind of tick was on Max.



1. Use the **Tick Photographs** and the **Tick Identification Key** to identify the tick found on Max. What type of tick was found on Max?

2. Support your identification by checking the characteristics the tick had that helped in identification.

_____ Festoons

_____ Long mouth parts

_____ Several silver markings

_____ One single white spot

3. Use the **Human Diseases Transmitted by Ticks** reference page to determine what diseases, if any, this kind of tick is likely to transmit to humans.

Part 2: What pathogens can ticks carry?

Dr. Louis was concerned that the ticks might be carrying pathogens (viruses and other disease-causing microorganisms) that could harm the dogs. These pathogens would be living inside of the tick's body and transmitted to the dog during the tick bite. Dr. Louis packaged the ticks into sealed plastic bags and sent them to the local veterinary laboratory for analysis.

To test for pathogens, a lab technician places DNA samples from the ticks into different wells on an electrophoresis gel. Gel electrophoresis separates DNA fragments (pieces) on the basis of size. Large DNA fragments move slowly through the gel. Small DNA fragments move quickly through the gel.

Your lab kit contains a simulated paper version of the electrophoresis gel that you will use to test for pathogens in each of the ticks removed from Max, Lainey and Daisy. You can't see the DNA pieces on this gel because DNA is colorless. In order to see the DNA, you will need to add a DNA stain to the gel. This stain will attach to the DNA fragments on the gel and turn them pink.

1. Follow the **Tick Pathogen Detection Instructions** to determine if any of the ticks removed from Dr. Louis' patients were carrying pathogens. Record the banding pattern on the diagram of the simulated electrophoresis gel below.

	Max	Daisy	Lainey
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1			

The **Tick Pathogen Standard Key** displays banding patterns for common tick-borne pathogens. Compare the banding patterns of the tick samples on the simulated electrophoresis gel to the banding patterns on the **Tick Pathogen Standard Key**.

- Complete the laboratory form to return the results to Dr. Louis by placing an “X” in the box where pathogens were detected.

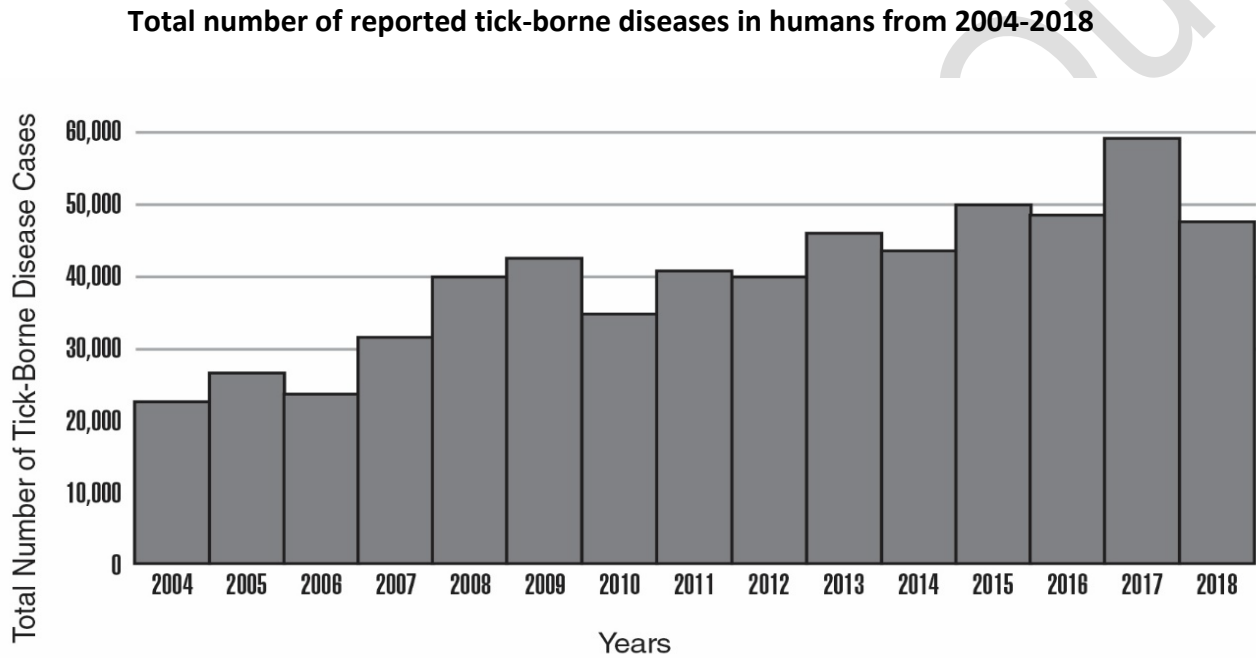
Patient's Name	Type of Pathogen Detected			
	Borrelia burgdorferi <i>(Lyme Disease)</i>	Ehrlichia chaffeensis <i>(Ehrlichiosis)</i>	Francisella tularensis <i>(Tularemia)</i>	Anaplasma phagocytophilum <i>(Anaplasmosis)</i>
Max				
Daisy				
Lainey				

- Which pet's owners should be notified of possible pathogen transmission to their dog?

- During a follow up visit with Lainey, Dr. Louis was informed that Lainey's owner was walking through the woods with Lainey when she was bitten by the tick. Dr. Louis was concerned that Lainey's owner may also have been exposed to the pathogen through a tick bite. List some of the symptoms that Lainey's owner might exhibit if he was exposed to this pathogen.

Part 3: Analyzing patterns in tick-borne diseases

The veterinary lab that Dr. Louis uses participates in a research project that collects data on tick-borne diseases in dogs. The US Centers for Disease Control and Prevention (CDC) collects similar data on tick-borne diseases in humans. Researchers can use this data to recognize patterns in the dog and human tick-borne infections.



Modified from CDC <https://www.cdc.gov/ticks/data-summary/index.html>

1. Use the graph above to describe the overall *trend* in the incidence of tick-borne diseases in the United States from 2004 to 2018.

Base your answers to questions 2 through 6 on the information in the **Ticks and Climate Data** sheet.

Researchers decided to focus on the blacklegged tick because this tick can carry several diseases that are transmissible to humans, including the pathogen that causes Lyme disease. In 2018, the CDC developed a map to illustrate the geographic distribution of the blacklegged tick in the United States.

2. Based on the **Map of Blacklegged Tick Distribution**, in what part of the United States would you most likely find blacklegged ticks?

Locate the **Distribution of Tick-borne Diseases Maps**. Dots on the maps of the United States illustrate the geographic distribution for several blacklegged tick-borne diseases in humans. The data was collected in 2016.

3. On the map below, circle the region of the United States that researchers should focus on because blacklegged tick-borne diseases are prevalent there.



4. Does the incidence of these diseases correlate with the entire geographic range of the blacklegged tick? Support your answer.

The first step in determining a cause for the trend in tick-borne diseases is to find non-living, environmental factors (abiotic factors) related to the tick's life cycle that correlate with the trend. The first data studied by the scientists was temperature data. The scientists wondered if changes in annual average temperature for the region could explain the trend in tick-borne diseases.

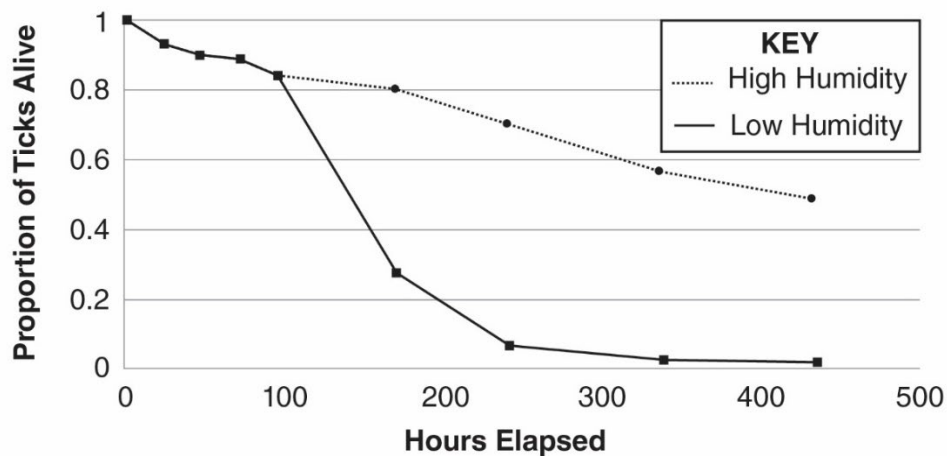
5. Locate the map showing the **Change in Average Annual Temperature**. What is the trend in annual temperature in the region you identified as important to tick-borne diseases?

6. Can this pattern in temperature change provide an explanation for the increase in tick-borne diseases in this entire region? Support your answer with information from the **Change in Average Annual Temperature** map and the previous maps.

Researchers noticed that the overall relative humidity of the northeast U.S. remains lower than the relative humidity of the southeast. **The researchers hypothesized that this lower relative humidity in the northeast promotes tick survival and reproduction** leading to the increase in disease. To test this idea, scientists placed ticks in environments with different humidity levels and monitored their survival rate over time.

Relative humidity is a measure of the amount of water in the air.

This graph represents the data that the scientists collected:



Modified from PLoS ONE <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5226345/>

7. According to the data and graph on the previous page, what effect does relative humidity have on the proportion of ticks alive after 200 hours?

8. Does the data support the scientists' hypothesis? Why or why not?

In addition to abiotic (non-living) factors like temperature, rainfall and humidity, researchers also investigated factors related to living things (biotic factors). The scientists discovered that ticks from the northeast U.S. behave differently compared to ticks in the southeast. Ticks in the southeast tend to hide under leaf litter located on the ground. Ticks in the northeast climb on plant stems.

9. Explain how this difference in behavior could lead to more tick-borne pathogens spreading to humans in the northeast.

Part 4: Do living things influence the pattern of tick-borne diseases?

The researchers involved in studying the patterns in tick-borne diseases realized that this was a very complex problem that may involve even more factors. They decided to enlist the help of an environmental scientist. Environmental scientists use their knowledge of science to protect the environment. They gather data and monitor environmental conditions related to ecosystems, which are an intertwined web of interacting abiotic and biotic factors. The environmental scientist explained that ticks are part of a complex system of interactions. **Models** are a way to visualize interactions within an ecosystem. Scientists use models to help answer the question, “Are biotic factors in the ecosystem involved in the pattern of tick-borne diseases?”

1. Locate the **Complex Interactions Model** sheet. According to this model, what organism do immature ticks feed on?

2. What effect would an increase in acorns have on the number of ticks in the environment? Explain your answer.

3. What effect would an increase in the number of small mammal predators have on the number of ticks? Explain your answer.

4. Locate the clear plastic sheet called **Steps to Infection**. Place this clear plastic sheet directly on top of the **Complex Interactions Model** sheet. The squiggly arrows represent the movement of ticks through the ecosystem.
5. Using a dry erase marker, draw a circle on the clear plastic sheet to show where the bacteria that causes Lyme disease is transferred to the tick.

6. Use the information from the **two diagrams** to explain how Lainey and her owner were most likely exposed to *Borrelia burgdorferi*, the bacteria that causes Lyme disease. Write numbers (2–8) on the lines to place the events in the correct order.

_____ Immature tick feeds on chipmunk.

_____ Ticks bite Lainey and her owner.

 1 Adult ticks mate on deer.

_____ Immature ticks leave deer to find a small mammal host.

_____ Tick leaves small mammal host, waits for new host on plants.

_____ Bacteria are transferred from chipmunk to tick.

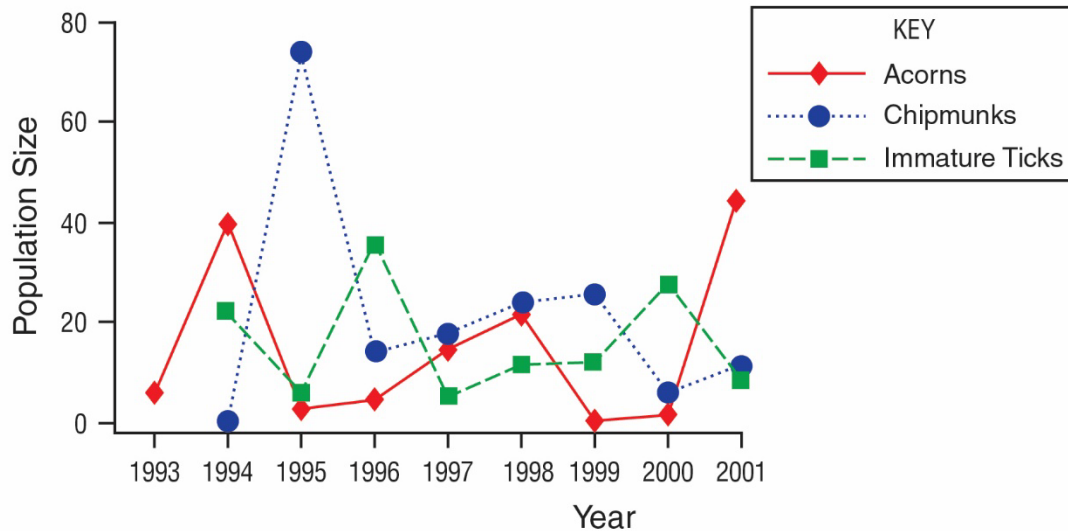
_____ Immature ticks hatch from eggs on deer.

_____ Ticks leave the plant for a dog or human host.

 9 Tick bites transfer bacteria to Lainey and her owner.

7. People often read in news articles that when deer populations are high, there is an increased risk for tick-borne diseases. Explain why a large deer population *may* increase the transmission of tick-borne diseases.

The environmental scientist had been monitoring the number of small mammal hosts, acorns, and ticks for eight years. Her data are below:



Modified from PLoS Biology <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1457019/>

8. Below is a timeline that will help make sense of events in this ecosystem. Use information in the graph above to:

- Place a letter **A** in the box on the timeline below corresponding to each year there was a peak in the number of **acorns**.
- Place a letter **C** in the box on the timeline below corresponding to each year there was a peak in the number of **chipmunks**.
- Place a letter **T** in the box on the timeline below corresponding to each year there was a peak in the number of immature **ticks**.

1993	1994	1995	1996	1997	1998	1999	2000	2001

9. Describe how the pattern of peaks in the chipmunk population compares to the pattern of peaks in the acorn population.

10. Provide an explanation for this pattern.

11. Describe how the pattern of peaks in the chipmunk population compares to the pattern of peaks in the tick population.

12. Provide an explanation for this pattern.

13. In what 2 years (between the years of 1993 and 2001) would you expect to see an increase in tick-borne diseases? Explain why.

14. Assume that 2001 is a peak in the acorn population. What year, following this peak, would you warn people about a potential increase in tick-borne diseases? Explain why.

The environmental scientist explained that increasing the number and kinds of small mammal predators (fox) is important in controlling the transmission of tick-borne diseases. She said that some environmental scientists think that the key to controlling the number of ticks is the size of the population of apex predators such as coyotes and other animals at the top of the food chain.

15. Would environmental scientists worried about tick-borne diseases recommend an increase or a decrease in the population of apex predators?

16. Explain why environmental scientists would make this recommendation.

17. Provide at least two additional actions an environmental scientist might suggest to decrease the number of tick-borne diseases that are transmitted to humans, based on the complex interactions in this ecosystem.

- _____
- _____

Part 5: What should pet owners know about tick-borne diseases?




Dr. Louis, the veterinarian, was not surprised at the positive results. She has been seeing an increase in tick-borne diseases within the last few years. She keeps a visual reminder in her office to inform her clients about the increase in these diseases. Every time she receives a positive result back, she places a plastic coin in a jar on her office's welcome counter labeled, "Positive for Tick-borne Disease." Next to the jar, Dr. Louis posted this statement from the American Veterinary Medical Association:

People and their pets often spend time in the same environments where ticks are found that transmit Lyme disease and other diseases. Because of this, the American Veterinary Medical Association (AVMA) and the American Academy of Pediatrics (AAP) are working together to offer advice to households with both children and pets. People who have been diagnosed with Lyme disease should consult their veterinarian to determine their pet's risk based on the animal's lifestyle and possible environmental exposures. Likewise, people whose animals have been diagnosed with Lyme disease may want to consult their physician about their own or their children's risk if they have concerns that the animals and family members might have been exposed to similar environmental risks.

Increasingly, Dr. Louis's clients have been inquiring about tick-borne diseases because of the doctor's visual reminder. Dr. Louis asked Jada to develop a FAQ (frequently asked questions) sheet to display on the veterinarian's website.

1. The following questions were identified by Dr. Louis as being **most** important to address for her veterinary clients.
 - What should I do if I see a tick on my pet?
 - What kind of precautions can I take to prevent tick bites on me?
 - What kind of precautions can I take to prevent tick bites on my pet?
 - If my pet is diagnosed with a tick-borne disease, why should I contact my own doctor?
2. Use the internet resources provided in the chart on the next page to develop well-written responses to the questions that can be included in the FAQ sheet for Dr. Louis.

Scan the QR codes with your smartphone or tablet camera app to link to the internet resources.

Question	Internet Resource - QR Code	Answer
<p>What should I do if I see a tick on my pet?</p>		
<p>What kind of precautions can I take to prevent tick bites on me?</p>		
<p>What kind of precautions can I take to prevent tick bites on my pet?</p>		
<p>If my pet is diagnosed with a tick-borne disease, why should I contact my own doctor?</p>	