



Lesson Plan

National Forest

Created: 07/2020 by the National FFA Organization

Cayla Miller's supervised agricultural experience (SAE) program is working in the Cherokee National Forest. Learn about the variety of skills she has developed through this SAE and how this has helped her understand more about our environment and ecosystem.

STUDENT LEARNING OBJECTIVES:

After completing these activities, students will ...

1. Describe the duties of conservationists who work in national forests.
2. Compare and contrast tropical, temperate and boreal forest ecosystems.
3. Draw a diagram of the ecosystem of a tropical or temperate forest.

TIME REQUIRED: 120 minutes

RESOURCES/REFERENCES:

1. Video: "National Forest SAE | Cayla Miller," <https://vimeo.com/377457887>
2. Website: The Forest Biome, <https://ucmp.berkeley.edu/exhibits/biomes/forests.php>
3. Article: "Information about a Forest Ecosystem," <https://sciencing.com/about-6325114-information-forest-ecosystem.html>
4. Article: "Food Chains in the Deciduous Forest," <https://sciencing.com/food-chains-deciduous-forest-7449795.html>
5. Article: "Taiga Biome Food Chain," <https://sciencestruck.com/taiga-biome-food-chain>
6. Article: "Rainforest," <https://education.nationalgeographic.org/resource/rain-forest/>
7. Article: "The Five Main Temperate Forest Layers – Forests Have Layers," <https://jakesnatureblog.com/2018/05/31/temperate-forest-layers-5-main-layers/>
8. Website: Concept, Structure, Components of Ecosystem, http://www.brainkart.com/article/Concept,-Structure,-Components-of-Ecosystem_7434/
9. Website: Explain the Vertical and Horizontal Ecological Structures of British Woodland, <https://myforestjourney.home.blog/2020/01/12/fspwe-1-1-explain-the-horizontal-ecological-structures-of-british-woodland/>
10. Website: Forest Ecosystems, <https://climate-woodlands.extension.org/forest-ecosystems/>

EQUIPMENT AND SUPPLIES NEEDED:

1. A copy of the "In the Forest" worksheet for each student
2. A copy of the "Forest Ecosystems" worksheet for each student
3. Internet access to play the video in real time or embed it in a PowerPoint ahead of time

STUDENT ACTIVITY SHEETS:

Direct access to student activity sheets without lesson plan or answer key for easy upload to learning management system or printing for classwork.

<https://ffa.box.com/s/yklaf1heso4nluhhoqst4exshxrn7eor> (Word)

<https://ffa.box.com/s/b5afo80vqpiuj4a53yrw8zkdm2uyr0jo> (PDF)

CROSS-CURRICULAR CONNECTIONS:

Science
Compare and contrast tropical, temperate and boreal forest ecosystems.
Draw a diagram of the ecosystem of a tropical or temperate forest.

THESE ACTIVITIES ARE ALIGNED TO THE FOLLOWING STANDARDS:

AFNR Performance Element

- NRS.02. Analyze the interrelationships between natural resources and humans.

FFA Precept

- FFA.PL-A.Action: Assume responsibility and take the necessary steps to achieve the desired results, no matter what the goal or task at hand.
- FFA.PG-J.Mental Growth: Embrace cognitive and intellectual development relative to reasoning, thinking and coping.
- FFA-CS-M.Communication: Effectively interact with others in personal and professional settings.

Common Career Technical Core

- AG-NR2 Analyze the interrelationships between natural resources and humans.

NASDCTEc

- AGPE01.03 Apply scientific principle and processes when planning and conducting natural resource management activities to determine the need, feasibility and application of logical, reasoned solutions to natural resource system problems and issues.

AFNR Cluster Skills

- CS.06. Analyze the interaction among AFNR system in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

Common Core – Reading: Informational Text

- CCSS.ELA-Literacy.RI.9-10.3 Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.

Common Core – Speaking and Listening

- CCSS.ELA-Literacy.SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Common Core – Science & Technical Subjects

- CCSS.ELA-Literacy.RST.9.10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CCSS.ELA-Literacy.RST.9.10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- CCSS.ELA-Literacy.RST.9.10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
- CCSS.ELA-Literacy.RST.9.10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
- CCSS.ELA-Literacy.RST.9.10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- CCSS.ELA-Literacy.RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- CCSS.ELA-Literacy.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Common Core – Literacy in Science & Technical Subjects: Writing

- CCSS.ELA-Literacy.WHST.9.10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- CCSS.ELA-Literacy.WHST.9.10.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- CCSS.ELA-Literacy.WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- CCSS.ELA-Literacy.WHST.9.10.9 Draw evidence from informational texts to support analysis, reflection, and research.

Next Generation Science

- HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- 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.

Green/Sustainability Knowledge and Skill Statements

- AFNR Career Cluster-Plant Systems Pathway, Statement 1 Understand how environment, economy, and social equity are integrated in plant systems.

AFNR Career Ready Practices

- CRP.02. Apply appropriate academic and technical skills. Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive.

- CRP.04. Communicate clearly, effectively, and with reason. Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods.
- CRP.06. Demonstrate creativity and innovation. Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization.
- CRP.07. Employ valid and reliable research strategies. Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies.
- CRP.08. Utilize critical thinking to make sense of problems and persevere in solving them. Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem.

Partnership for 21st Century Skills

- Communication
- Critical Thinking and Problem Solving
- Environmental Literacy
- Information Literacy
- Initiative and Self-Direction
- Productivity and Accountability

LESSON PLAN:

1. *Bell Ringer:* Is there a national forest near you? Have you ever visited it or another national forest? What are the purposes of national forests?
2. *Introduction:* Forests and their ecosystems play an important, vital role in our world. Today, we'll learn about an FFA member whose SAE involves working in a national forest. Her time there has helped her see how delicate our ecosystems are and how difficult it is to maintain the balance.
3. *Activity:* Each student needs a copy of the worksheet "In the Forest." Have students answer the questions as they watch the video "National Forest SAE | Cayla Miller," available at <https://vimeo.com/377457887>. Then, give each student a copy of the "Forest Ecosystems" worksheet. Students will complete several activities that will allow them to research, examine and compare the components of tropical, temperate and boreal forest ecosystems. They will also create a diagram that represents the ecosystems of either a tropical or a temperate forest.
4. *Follow-up:* Have students share their diagrams and discuss the numerous elements that work together to create an ecosystem.
5. *Optional – Extended Learning Opportunities (Not factored into time requirement):*
 - a. Either individually or in groups, have students research the national forests that are closest to your area. Have students search for a similar program to the Youth Conservation Corp and determine if they are eligible to participate.
6. *Exit Ticket:* Would you ever want to work in a national forest? Why or why not?

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In the Forest

Aligned to the following standards:

NRS.02; PL-A.; PG-J.; CS-M; AG-NR2; AGPE01.03; CS.06; CCSS.RI.9-10.3; CCSS.SL.9-10.1; CCSS.RST.9-10.1; CCSS.RST.9-10.2; CCSS.RST.9-10.4; CCSS.RST.9-10.8; CCSS.RST.9-10.9; CCSS.RST.11-12.1; CCSS.RST.11-12.8; CCSS.WHST.9.10.2; CCSS.WHST.9.10.7; CCSS.WHST.9.10.8; CCSS.WHST.9.10.9; HS-ESS3-1; HS-LS2-6; AFNR Career Cluster-Plant Systems Pathway, Statement 1; CRP.02; CRP.04; CRP.06; CRP.07; CRP.08

DIRECTIONS:

Answer the questions below as you watch the video "National Forest SAE | Cayla Miller," available at <https://vimeo.com/377457887>.

What is Cayla's SAE?

What two areas of agriculture are connected to her SAE?

Describe the tasks that Cayla has to complete as part of her job.



Why does she need to check the pH levels?

What is the process of electroshocking trout?



What is the Youth Conservation Corp?

What is Cayla's favorite SAE memory?

What did she learn from her SAE?



NAME: _____

Aligned to the following standards:
NRS.02; PL-A.; PG-J.; CS-M; AG-NR2; AGPE01.03; CS.06; CCSS.RI.9-10.3; CCSS.SL.9-10.1;
CCSS.RST.9-10.1; CCSS.RST.9-10.2; CCSS.RST.9-10.4; CCSS.RST.9-10.8; CCSS.RST.9-10.9;
CCSS.RST.11-12.1; CCSS.RST.11-12.8; CCSS.WHST.9.10.2; CCSS.WHST.9.10.7;
CCSS.WHST.9.10.8; CCSS.WHST.9.10.9; HS-ESS3-1; HS-LS2-6; AFNR Career Cluster-Plant
Systems Pathway, Statement 1; CRP.02; CRP.04; CRP.06; CRP.07; CRP.08

Forest Ecosystems

DIRECTIONS:

Complete the following activities to learn about forest ecosystems.

1. There are three types of forest ecosystems: tropical, temperate and boreal. Complete the table below to compare and contrast these ecosystems. (Suggested resource: The Forest Biome, <https://ucmp.berkeley.edu/exhibits/biomes/forests.php>)

	Tropical Forest	Temperate Forest	Boreal Forest
Average Temperature			
Precipitation			
Soil Quality			
Canopy			
Flora			
Fauna			
Further Subdivisions of This Group			

NAME: _____

2. The organisms in an ecosystem depend on each other for survival. They are broadly categorized by their role within the ecosystem, and there is some variance between the three types of forest ecosystems. Complete the table below to learn about the interdependence of organisms within each type of forest. (Suggested Resources: Tropical Forest, <https://sciencing.com/about-6325114-information-forest-ecosystem.html>; Temperate Forest, <https://sciencing.com/food-chains-deciduous-forest-7449795.html>; Boreal Forest, <https://sciencestruck.com/taiga-biome-food-chain>)

	Tropical Forest	Temperate Forest	Boreal Forest
Producers			
Consumers			
Decomposers			

NAME: _____

3. Forests are divided into layers, and each of these layers is slightly different depending on the type of forest. Use the table below to define the layers of the three forest types. (Suggested Resources: Tropical Forest, <https://education.nationalgeographic.org/resource/rain-forest/>; Temperate Forest, <https://jakesnatureblog.com/2018/05/31/temperate-forest-layers-5-main-layers/>)

Tropical Forest	Temperate Forest	Boreal Forest
Emergent Layer:	Canopy Layer:	A boreal forest has much less diversity so there is only a tree layer and ground layer, and neither layer has a broad range of plant or animal life.
Canopy Layer:	Small Tree/Sapling Layer:	
Understory Layer:	Shrub Layer:	
Forest Floor Layer:	Herb Layer:	
	Ground Layer:	

NAME: _____

4. Using the information gathered in Questions 1 through 3, **draw a diagram in the space below** that shows how the various components of a forest interact. Your diagram can be for either a tropical forest or a temperate forest. (Suggested Resources: Concept, Structure, Components of Ecosystem, http://www.brainkart.com/article/Concept,-Structure,-Components-of-Ecosystem_7434/; Forest Ecosystems, <https://climate-woodlands.extension.org/forest-ecosystems/>; Explain the Vertical and Horizontal Ecological Structures of British Woodland, <https://myforestjourney.home.blog/2020/01/12/fspwe-1-1-explain-the-horizontal-ecological-structures-of-british-woodland/>; Conduct a Google Image search for forest ecosystem diagrams)
- a. Your diagram should contain these components:
 - i. Include and label each layer of your chosen forest ecosystem.
 - ii. Draw the producers, consumers and decomposers.
 - iii. Use arrows or some other symbol to indicate how the producers, consumers and decomposers interact.
 - iv. Draw and color in examples of the flora and fauna of your chosen forest ecosystem.

NAME: _____

Aligned to the following standards:
NRS.02; PL-A.; PG-J.; CS-M; AG-NR2; AGPE01.03; CS.06; CCSS.RI.9-10.3; CCSS.SL.9-10.1;
CCSS.RST.9-10.1; CCSS.RST.9-10.2; CCSS.RST.9-10.4; CCSS.RST.9-10.8; CCSS.RST.9-10.9;
CCSS.RST.11-12.1; CCSS.RST.11-12.8; CCSS.WHST.9.10.2; CCSS.WHST.9.10.7;
CCSS.WHST.9.10.8; CCSS.WHST.9.10.9; HS-ESS3-1; HS-LS2-6; AFNR Career Cluster-Plant
Systems Pathway, Statement 1; CRP.02; CRP.04; CRP.06; CRP.07; CRP.08

KEY: In the Forest

DIRECTIONS:

Answer the questions below as you watch the video "National Forest SAE | Cayla Miller," available at <https://vimeo.com/377457887>.

What is Cayla's SAE?

Working in the Cherokee National Forest in Tennessee

What areas of agriculture are connected to her SAE?

Environmental science and natural resources management

Describe the tasks that Cayla has to complete as part of her job.



Checking pH balance of various waterways



Electroshocking trout



Returning to areas that had been prescribed burned to check the nutrients of the soil and see how the area reacted to the burn

Why does she need to check the pH levels?

She has to check the levels to make sure they were appropriate for consumption.

What is the process of electroshocking trout?



Go to the desired waterway



Send an electric current through the water and the fish rise to the surface



Check the breed, the length and the weight of each fish

What is the Youth Conservation Corp?

It is a program that helps students to better understand the environment and gain an overall knowledge of the subject.

What is Cayla's favorite SAE memory?

Working with other people her own age and learning how the environment works

What did she learn from her SAE?

Cayla learned how crucial it is to maintain our environment and how hard it can be to maintain such a small area.

NAME: _____

Aligned to the following standards:

NRS.02; PL-A.; PG-J.; CS-M; AG-NR2; AGPE01.03; CS.06; CCSS.RI.9-10.3; CCSS.SL.9-10.1; CCSS.RST.9-10.1; CCSS.RST.9-10.2; CCSS.RST.9-10.4; CCSS.RST.9-10.8; CCSS.RST.9-10.9; CCSS.RST.11-12.1; CCSS.RST.11-12.8; CCSS.WHST.9.10.2; CCSS.WHST.9.10.7; CCSS.WHST.9.10.8; CCSS.WHST.9.10.9; HS-ESS3-1; HS-LS2-6; AFNR Career Cluster-Plant Systems Pathway, Statement 1; CRP.02; CRP.04; CRP.06; CRP.07; CRP.08

KEY: Forest Ecosystems

DIRECTIONS:

Complete the following activities to learn about forest ecosystems.

- There are three types of forest ecosystems: tropical, temperate and boreal. Complete the table below to compare and contrast these ecosystems. (Suggested resource: The Forest Biome, <https://ucmp.berkeley.edu/exhibits/biomes/forests.php>)

	Tropical Forest	Temperate Forest	Boreal Forest
Average Temperature	Averages 20 to 25 degrees Celsius and varies little throughout the year	Varies from -30 degrees C to 30 degrees C	Very low temperatures
Precipitation	Evenly distributed throughout the year, with annual rainfall exceeding 200 cm	Precipitation (75-150 cm) is distributed evenly throughout the year.	Precipitation is primarily in the form of snow, 40-100 cm annually.
Soil Quality	Soil is nutrient-poor and acidic. Decomposition is rapid and soils are subject to heavy leaching.	Soil is fertile, enriched with decaying litter.	Soil is thin, nutrient-poor and acidic.
Canopy	Canopy in tropical forests is multilayered and continuous, allowing little light penetration.	Canopy is moderately dense and allows light to penetrate, resulting in well-developed and richly diversified understory vegetation and stratification of animals.	Canopy permits low light penetration, and as a result, understory is limited.
Flora	Flora is highly diverse: one square kilometer may contain as many as 100 different tree species. Trees are 25-35 m tall, with buttressed trunks and shallow roots, mostly evergreen, with large dark green leaves. Plants such as orchids, bromeliads, vines (lianas), ferns, mosses and palms are present in tropical forests.	Flora is characterized by 3-4 tree species per square kilometer. Trees are distinguished by broad leaves that are lost annually and include such species as oak, hickory, beech, hemlock, maple, basswood, cottonwood, elm, willow and spring-flowering herbs.	Flora consist mostly of cold-tolerant evergreen conifers with needle-like leaves, such as pine, fir and spruce.
Fauna	Fauna include numerous birds, bats, small mammals and insects.	Fauna is represented by squirrels, rabbits, skunks, birds, deer, mountain lion, bobcat, timber wolf, fox and black bear.	Fauna include woodpeckers, hawks, moose, bear, weasel, lynx, fox, wolf, deer, hares, chipmunks, shrews and bats.
Further Subdivisions of This Group	<i>evergreen rainforest</i>: no dry season <i>seasonal rainforest</i>: short dry period in a very wet tropical region (The forest exhibits definite seasonal changes as trees undergo developmental changes simultaneously, but the general character of vegetation remains the same as in evergreen rainforests.) <i>semievergreen forest</i>: longer dry season (The upper tree story consists of deciduous trees, while the lower story is still evergreen.) <i>moist/dry deciduous forest (monsoon)</i>: the length of the dry season increases further as rainfall decreases (All trees are deciduous.)	<i>moist conifer and evergreen broad-leaved forests</i>: wet winters and dry summers (Rainfall is concentrated in the winter months, and winters are relatively mild.) <i>dry conifer forests</i>: dominate higher elevation zones; low precipitation <i>Mediterranean forests</i>: Precipitation is concentrated in winter, less than 100 cm per year. <i>temperate coniferous</i>: mild winters, high annual precipitation (greater than 200 cm). <i>temperate broad-leaved rainforests</i>: mild, frost-free winters, high precipitation (more than 150 cm) evenly distributed throughout the year	Not Applicable

NAME: _____

2. The organisms in an ecosystem depend on each other for survival. They are broadly categorized by their role within the ecosystem, and there is some variance between the three types of forest ecosystems. Complete the table below to learn about the interdependence of organisms within each type of forest. (Suggested Resources: Tropical Forest, <https://sciencing.com/about-6325114-information-forest-ecosystem.html>; Temperate Forest, <https://sciencing.com/food-chains-deciduous-forest-7449795.html>; Boreal Forest, <https://sciencestruck.com/taiga-biome-food-chain>)

	Tropical Forest	Temperate Forest	Boreal Forest
Producers	The producer level is made up of organisms that can manufacture their own energy from solar input. Green plants conducting photosynthesis serve as the producers of a forest ecosystem, and in the tropical rainforest of the Amazon, typically arrange themselves in four layers.	The producers of food in a deciduous forest are the trees and plants that convert sunlight to mass and stored energy. These plants subsequently become the basic food source for the consumers above them in the food chain: for example, insects, birds, rodents and deer eat the leaves and other parts of the plants, taking on their stored energy as sustenance. However, symbiosis also occurs, whereby organisms of different species operate under a kind of cooperative arrangement, such as when honeybees pollinate plants as they collect nectar. In addition, bacteria in the soil break down nutrients to a form readily usable by the root systems of plants.	All the green plants having chlorophyll pigments are called producers. Categorized under the first trophic level in the food chain, they produce organic nutrient (glucose) by making use of inorganic sources (sunlight, water and carbon dioxide) through photosynthesis. The producers identified from the taiga biome are many, of which some common examples include fern, moss, jack pine, black spruce, white spruce and balsam fir.
Consumers (Primary and Secondary/Tertiary)	Primary consumers can't manufacture their own energy and instead obtain it by eating green plants. Scientists call such plant-eating animals herbivores. Herbivores may eat a wide variety of different plant materials depending on their physical adaptations and habitat preferences. Secondary consumers feed on primary consumers (aka herbivores) to obtain the energy originally produced by green plants, while tertiary consumers feed on other secondary consumers. These meat-eating animals are known as carnivores, and many act both as secondary and tertiary consumers depending on the creature they're preying on. The jaguar — the biggest mammalian carnivore in the Amazon — may prey on capybaras, a primary consumer, but also readily hunts such secondary consumers as caimans, in which case — as a carnivore eating a carnivore — it plays the role of a tertiary consumer.	Within the deciduous forest habitat's food chain, the consumers are organisms that are unable to produce their own food and must eat other organisms to survive. Consumers can be of a primary, secondary or tertiary type. Primary consumers include the insects, rodents and larger herbivores that eat mainly plants, grasses, seeds and berries. Secondary consumers include predatory birds, such as owls and hawks, and other small predators like foxes and skunks, which eat insects and rodents. Tertiary consumers, said to be at the "top" of the food chain, are predators that prey on smaller animals below them in the food chain.	The primary consumers are strictly herbivores, i.e., they feed on the green plants and their parts (leaves, roots, flowers and fruits) for deriving energy. Thus, they are exclusive plant eaters. Examples of primary consumers in the food chain of taiga biome are insects, birds, mice, rats, chipmunks, squirrels, porcupines, deer, moose and elk. Secondary consumers are heterotrophs and consume the herbivores for deriving their nutrients. Thus, secondary consumers are the meat-eaters, which belong to the third trophic level in the food chain. Common examples of secondary consumers in the taiga biome food chain are tarantula, scorpion, snake, some lizards, skunk and weasel. Tertiary consumers are carnivorous animals, which depend on other heterotrophs for food. But, the prime difference between the

NAME: _____

	Some secondary and tertiary consumers mix up an animal diet with plant matter.		secondary and tertiary consumers is the type of foods they feed on. Yes, tertiary consumers prey on the secondary consumers, thus occupying a higher trophic level in the taiga biome food chain. Animals falling in this group are lynx, hawk, fox and wolf.
Decomposers	The decomposers of the forest ecosystem break down dead plants and animals, returning the nutrients to the soil to be made usable by the producers. Apart from bacteria, ants and termites are important decomposers in the Amazon rainforest. Millipedes and earthworms also help to break down dead matter. The warm and moist climate of the Amazon is conducive for the decomposers to work at a rapid pace: dead matter is broken down within six weeks.	All living things have a life span, and without a way to recycle dead organisms, the ecosystem would soon be filled with the remains of plant and animal life. Decomposers break down such remains by converting them to smaller and smaller parts, which ultimately become new soil. Bacteria and insects perform this function, as do fungi and certain larger scavengers. The resultant nutrient-rich soil becomes ideally suited for seeds to grow, beginning the cycle of life again.	The decomposing organisms or the saprotrophs fall in the last trophic level. Though they are not commonly talked about in the food chain, the role of these organisms is crucial for overall functioning of the taiga biome. What these living entities do is break down the complex organic matter of dead organisms, feed on them and also, make the nutrients available for the producers. Examples are some fungi species and bacteria.

3. Forests are divided into layers, and each of these layers is slightly different depending on the type of forest. Use the table below to define the layers of the three forest types. (Suggested Resources: Tropical Forest, <https://www.nationalgeographic.org/encyclopedia/rain-forest/print/#:~:text=Most%20rainforests%20are%20structured%20in,%2C%20sunlight%2C%20and%20air%20circulation.>; Temperate Forest, <https://jakesnatureblog.com/2018/05/31/temperate-forest-layers-5-main-layers/>)

Tropical Forest	Temperate Forest	Boreal Forest
Emergent Layer: The top layer is the emergent layer. Here, trees as tall as 60 meters (200 feet) dominate the skyline. Foliage is often sparse on tree trunks but spreads wide as the trees reach the sunny upper layer, where they photosynthesize the sun's rays. Small, waxy leaves help trees in the emergent layer retain water during long droughts or dry seasons. Lightweight seeds are carried away from the parent plant by strong winds.	Canopy Layer: This is the highest level of the forest and consists of the tallest trees. The trees are all reaching up toward the sun, competing with each other to get as much sunlight as possible to live and grow. In a mature forest, the canopy can be very thick with leaves, making it hard to see the sky from the ground. Likewise, it makes it hard for sunlight to penetrate the canopy and make it to the ground. Each successive layer down in the forest receives less sunlight.	A boreal forest has much less diversity so there is only a tree layer and ground layer, and neither layer has a broad range of plant or animal life.
Canopy Layer: A deep layer of vegetation roughly six meters (20 feet) thick. The canopy's dense network of leaves and branches forms a roof over the two remaining layers. The canopy blocks winds, rainfall and sunlight, creating a humid, still and dark environment below. Trees have adapted to this damp environment by producing glossy leaves with pointed tips that repel water.	Small Tree/Sapling Layer: Slightly below the canopy are several smaller trees that are not quite as tall as the canopy, but taller than the shrubs below. This layer also consists of new trees that are growing and haven't yet reached the canopy because they are still young, really just saplings.	

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Understory Layer: Located several meters below the canopy, the understory is an even darker, stiller and more humid environment. Plants here, such as palms and philodendrons, are much shorter and have larger leaves than plants that dominate the canopy. Understory plants' large leaves catch the minimal sunlight reaching beyond the dense canopy. Understory plants often produce flowers that are large and easy to see, such as Heliconia, native to the Americas and the South Pacific. Others have a strong smell, such as orchids. These features attract pollinators even in the understory's low-light conditions.	Shrub Layer: This layer is lower and closer to the ground and consists of bushes and shrubs. Some of the bushes or shrubs you find in this layer may include the notorious poison oak or poison ivy.	
Forest Floor Layer: The forest floor is the darkest of all rainforest layers, making it extremely difficult for plants to grow. Leaves that fall to the forest floor decay quickly. Decomposers, such as termites, slugs, scorpions, worms and fungi, thrive on the forest floor. Organic matter falls from trees and plants, and these organisms break down the decaying material into nutrients. The shallow roots of rainforest trees absorb these nutrients, and dozens of predators consume the decomposers!	Herb Layer: This layer is made up of those perennial wildflowers and ferns. You can also find ground cover or other low-lying plants in this layer.	
	Ground Layer: The final and bottom layer of the forest is the ground layer. There is still lots of life to be found in this level, such as mosses, lichens and clubmosses. This layer is also made up of the fallen leaves, twigs and fungi that is decomposing the organic matter.	

NAME: _____

4. Using the information gathered in Questions 1 through 3, **draw a diagram in the space below** that shows how the various components of a forest interact. Your diagram can be for either a tropical forest or a temperate forest. (Suggested Resources: Concept, Structure, Components of Ecosystem, http://www.brainkart.com/article/Concept-Structure-Components-of-Ecosystem_7434/; Forest Ecosystems, <https://climate-woodlands.extension.org/forest-ecosystems/>; Explain the Vertical and Horizontal Ecological Structures of British Woodland, <https://www.forestschoollportfolio.com/unit-1-forest-school-programmes-and-the-woodland-environment/1-1-explain-the-vertical-and-horizontal-ecological-structures-of-british-woodland/>; Conduct a Google Image search for forest ecosystem diagrams)
- a. Your diagram should contain these components:
- Include and label each layer of your chosen forest ecosystem.
 - Draw the producers, consumers and decomposers.
 - Use arrows or some other symbol to indicate how the producers, consumers and decomposers interact.
 - Draw and color in examples of the flora and fauna of your chosen forest ecosystem.

Diagrams will vary, but they should include something similar to these diagrams, which are available on the websites from the suggested resources.

