

# Power of Forests

What role do forests play in regulating the global climate?

## Purpose

This three-part learning guide takes students on a journey to some of the world's most vital and diverse forest ecosystems to learn how they support the health of our planet. From the lush rainforests of Borneo, to the temperate deciduous forests of Appalachia, to the ancient Mayan Forests of Central America, each landscape reveals how forests regulate the global climate, sustain biodiversity and help people and wildlife thrive. The series also highlights the challenges facing forests across the globe, and how Indigenous Peoples and communities are leading efforts to conserve these critical habitats.

## Students Will:

1. Students will dive deep into the ecological importance of forests by exploring different forest ecosystems and their ability to sequester carbon and other greenhouse gases.
2. They will also connect the challenges of climate change and biodiversity loss to real-world conservation solutions, including traditional sustainable forestry practices utilized by Indigenous Peoples and communities.

Next Generation  
Science Standards +

## Lessons

- 1 Storing Carbon
- 2 Protecting Biodiversity
- 3 Sustainable Forestry
- 4 Resources

## Learning Guide

Power of Forests

### Grades & Performance Expectation

#### **Middle School, Grades 6-8**

**MS-LS2:** Ecosystems: Interactions, Energy, and Dynamics

**MS-ESS3:** Earth and Human Activity

**ESS3.C:** Human Impacts on Earth Systems

### Disciplinary Core Ideas

**LS2.A:** Interdependent Relationships in Ecosystems

**LS2.B:** Cycle of Matter and Energy Transfer in Ecosystems

**LS2.C:** Ecosystem Dynamics, Functioning, and Resilience

**LS4.D:** Biodiversity and Humans

**ETS1.B:** Developing Possible Solutions

**ESS3.A:** Natural Resources

### Crosscutting Concepts

- Patterns
- Energy and Matter
- Cause and Effect
- Stability and Change

### Science & Engineering Practices

- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

### Activities in this lesson can help support achievement of these Performance Expectations

#### **Middle School:**

**MS-LS2-3:** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

**MS-LS2-4:** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

**MS-LS2-5:** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

**MS-ESS3-3:** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

**Common Core  
Standards: 6th–8th  
Grade Science and  
Technical Subjects**

**CCSS.ELA-Literacy.RST.6–8.1:** Cite specific textual evidence to support analysis of science and technical texts.

**CCSS.ELA-Literacy.RST.6–8.4:** 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.

**CCSS.ELA-Literacy.RST.6–8.7:** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

**CCSS.ELA-Literacy.SL.8.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

**CCSS.ELA-Literacy.SL.8:** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

**Common Core  
Standards: 6th–8th  
Grade English and  
Language Arts  
Standards for Writing**

**CCSS.ELA-LITERACY.WHST.6–8.2. A:** Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

**CCSS.ELA-LITERACY.WHST.6–8.2. B:** Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

**CCSS.ELA-LITERACY.WHST.6–8.2. D:** Use precise language and domain-specific vocabulary to inform about or explain the topic.

**CCSS.ELA-LITERACY.WHST.6–8.6** – Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

## Storing Carbon

# Background

**Background**

## Vocabulary



## Questions



## Activities


- 1 Smoke in a Jar
- 2 Watch & Reflect

Think about driving on a hot summer day. What happens if you don't open your windows or turn on the AC? Does the ride become unbearably hot? This is called the **greenhouse effect**. The heat from the sun enters through the windshield and gets trapped, making the car—and you—much warmer than the air outside!


The same thing can happen on Earth. Gases like **carbon dioxide**, methane and nitrous oxide occur naturally and keep the planet warm enough to support life. For decades, human activity like driving, flying and operating factories have been adding more of these heat-trapping gasses to the **atmosphere**. When these gases accumulate, the planet heats up, causing extreme weather such as heatwaves, wildfires, storms, and floods to become more intense and more dangerous. This is known as **climate change**.

Luckily, forests have the incredible ability to absorb the **greenhouse gas** carbon dioxide through a process called **carbon sequestration**. By doing so, they help keep the planet cool. The vast rainforests on the island of Borneo in Southeast Asia are a prime example. Home to thousands of species of plants and animals, Borneo's forests are true climate champions due to their old-growth trees that have the power to absorb large amounts of carbon. But the size of these forests has decreased in recent decades due to deforestation and palm oil production, which contributes to climate change. Indigenous Peoples and communities on the Island are using traditional and sustainable forestry practices to protect the island's resources for generations to come.

## Storing Carbon

 Background

 **Vocabulary**

 Questions

 Activities

1 Smoke in a Jar

2 Watch & Reflect

# Vocabulary

**Atmosphere** A layer of gases that surrounds the Earth

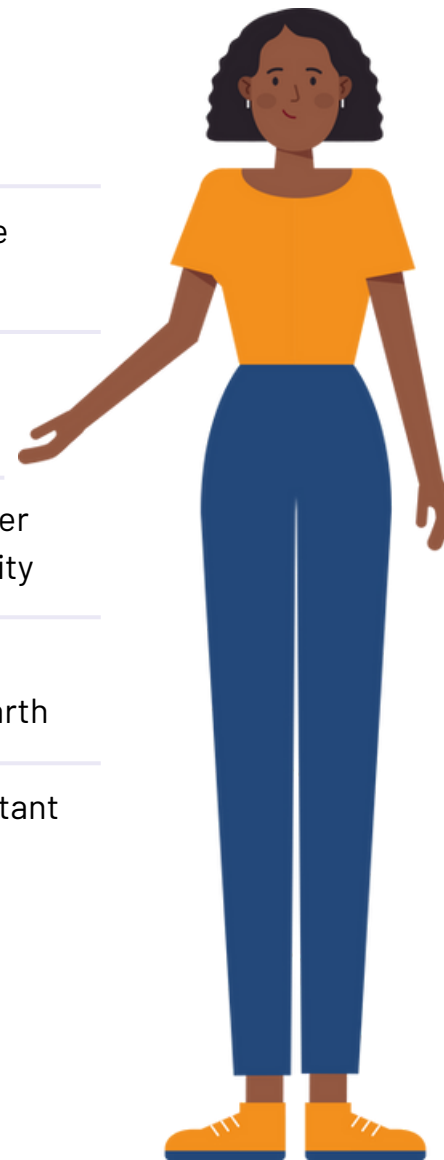
**Carbon dioxide** A naturally occurring gas that consists of one carbon and two oxygen atoms

**Carbon sequestration** The process of capturing and storing carbon from the air

**Climate change** Long-term shifts in temperatures and weather patterns that are resulting from human activity

**Greenhouse effect** A process through which certain gases, such as carbon dioxide, trap heat and warm the Earth

**Greenhouse gas** Naturally-occurring gases that play an important role in regulating Earth's temperature



## Storing Carbon



Background



Vocabulary



**Questions**



Activities

- 1 Smoke in a Jar
- 2 Watch & Reflect

# Questions

- 1 Why are greenhouse gases important to life on Earth?

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- 2 What role do forests play in regulating greenhouse gases?

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- 3 What happens when forests are cut down?

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- 4 How can we manage forests more sustainably?

## ACTIVITY 1



## DEMONSTRATION

## Storing Carbon



Background



Vocabulary



Questions



## Activities

## 1 Smoke in a Jar

## 2 Watch &amp; Reflect

# Smoke in a Jar


- 1 Place the two glass jars side by side and label one "control" and the other "greenhouse gases."
- 2 Place a lamp at an equal distance from both jars.
- 3 Light a match or small candle, then blow it out inside the "greenhouse gas" jar to fill it with smoke.
- 4 Cover the opening immediately with plastic wrap to trap the smoke inside. Do the same with the "control" jar.
- 5 Insert a thermometer through the plastic wrap on each jar, ensuring the probes are inside but do not affect the experiment setup.
- 6 Turn on the lamp and start the timer.
- 7 Ask students to record the temperature in both jars every minute for 10–15 minutes.
- 8 After the time limit, have students compare the temperature in the greenhouse gases jar to the control jar.
- 9 Ask them to consider which jar has a higher temperature. Why do they think this happened?





## Materials

- ☐ 2 large clear glass jars
- ☐ Plastic wrap
- ☐ 2 thermometers
- ☐ Matches or a small candle
- ☐ A lamp or heat source
- ☐ Timer or stopwatch
- ☐ Alternative option:  
Baking soda and vinegar  
(to generate CO<sub>2</sub> gas as an alternative to smoke)

## Storing Carbon

 Background

 Vocabulary

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 **Activities**

1 Smoke in a Jar

**2 Watch & Reflect**

### ACTIVITY 2

 HANDS-ON LEARNING

# Watch & Reflect

- 1 Watch [The Incredible Power of Forests: Borneo](#).
- 2 Complete the [Watch Guide](#) to capture primary points and reflection.

### Downloads

The Incredible Power of Forests: Borneo Watch Guide





## Protecting Biodiversity



### Background



### Vocabulary



### Questions



### Activities

- 1 Forest Food Web
- 2 Watch & Reflect

# Background


In big **ecosystems** like the Appalachian Mountains, you'll find many different kinds of **habitats**, from forests to wetlands to mountain meadows. Different species call these places home. The way they survive and interact with each other is through a **food web**.

In a food web, energy is passed from one living thing to another when something small is eaten by something bigger. For example, a tiny pond fly might start its life eating leaves at the bottom of creek. That pond fly could be eaten by a dragonfly, which is eaten by an owl. This is how energy moves up the food web, when one **consumer** gets its energy from another organism.


Plants, like trees, are called **producers** because they form the foundation of the food web. Using sunlight, water and carbon dioxide, they make their own food through **photosynthesis**. At the top of the food web are large animals like eagles, wolves and bears, which are called **apex predators**. In healthy habitats, you'll find a variety of plants and animals in the food web. This is called **biodiversity**.

Trees are **adapted** to different ecosystems, meaning they need the right balance of sun, rain, heat and cold to survive and keep the food web thriving. When their environment changes, this not only affects tree, but the wildlife and the entire food web that depends on them. Trees are able to send their seeds to new, more suitable locations through **dispersion**. Some wildlife may be able to follow, but others may face **extinction** if their habitats are not protected.

## Protecting Biodiversity

 Background

 **Vocabulary**

 Questions

 Activities

1 Forest Food Web

2 Watch & Reflect

# Vocabulary

**Adaptation** A physical characteristic that helps a plant or animal meet its basic needs

**Apex predator** An animal at the top of the food web with no natural predators of its own

**Biodiversity** Variety of life that is found on Earth

**Consumer** A living organism that eats other living things for energy

**Dispersion** The process by which seeds move away from the parent plant to a new location, allowing them to germinate and establish new plants

**Ecosystem** A biological community of living organisms (including plants, animals and microbes) that interact with each other and their physical environment

**Extinction** The fact or process by which a species, family or group of organisms has no living members

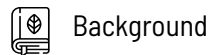
**Food web** The interconnection of different species through the transfer of energy when one life form consumes another

**Habitat** The natural home or environment of an animal, plant or other organism

**Photosynthesis** The process through which plants use sunlight to turn water and carbon dioxide into food

**Producer** A living organism that makes its own food using sunlight, like a plant or tree. Producers are the base of every food web

## Protecting Biodiversity



Background



Vocabulary



**Questions**



Activities

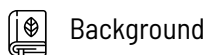
1 Forest Food Web

2 Watch & Reflect

# Questions

- 1 How do changes in forests impact the food web?
- 2 What kind of threats do forests like those in the Appalachian Mountains currently face?
- 3 How can a forest respond and adapt to these threats?
- 4 What happens to different species if a forest shifts its range?

## Protecting Biodiversity



Background



Vocabulary



Questions



Activities

### 1 Forest Food Web

### 2 Watch & Reflect

#### ACTIVITY



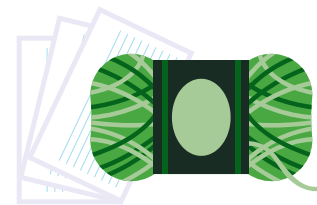
#### GROUP WORK

# Forest Food Web

**Prep Work:** Make index cards that list the following plants and animals. If possible, include a photo! Then, give each student a card and ask them to do a little research on their organism. Where does it live? What does it eat? Is it prey for another organism? (You may need more or less cards depending on the size of your class)

- 1 Assign each student a card. Talk about how each organism gets its energy: What does it eat? Is it a consumer or a producer?
- 2 Have students stand in a large circle. Using yarn, create a food web by having students toss the yarn to another organism they are directly connected to (e.g., sun to tree, tree to squirrel, squirrel to hawk and so on). Each student will hold their piece of yarn for the entirety of the exercise.
- 3 After the forest food web is fully formed, simulate a disruption. Disruptions can include logging or development that cuts down trees, forest fires that reduce habitat or changes in rainfall, such as drought, that impact insect populations.
- 4 As each affected “organism” feels their connection tugged or removed, have them sit down or raise their hand to show that they’ve been impacted.
- 5 Ask students: What happens when one part of the food web is removed? How does this affect the rest of the forest?

Extension Activity: Introduce the concept of keystone species. Share an example (e.g., wolves as predators, starfish in intertidal ecosystems, or sea otters as predators.) Ask students: What might happen if a keystone species is removed from this web? Let students brainstorm what role a keystone species might play in their own food web.



#### Materials

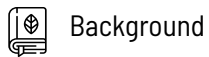
- ☐ Yarn or string
- ☐ Index cards or labels that feature the different organisms listed below:

Sun

(Note – this card is for the instructor to keep and use it to begin the activity)

|            |            |
|------------|------------|
| Tree       | Mouse      |
| Wildflower | Salamander |
| Cattails   | Fox        |
| Bumblebee  | Hawk       |
| Dragonfly  | Owl        |
| Cricket    | Deer       |
| Beaver     | Wolf       |
| Squirrel   | Fish       |

## Protecting Biodiversity



Background



Vocabulary



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**Activities**

1 Forest Food Web

**2 Watch & Reflect**

### ACTIVITY 2



HANDS-ON LEARNING

# Watch & Reflect

- 1 Watch [The Incredible Power of Forests: Appalachia](#).
- 2 Complete the [Watch Guide](#) to capture primary points and reflection.

### Downloads

The Incredible Power  
of Forests: Appalachia  
Watch Guide



## Sustainable Forestry



### Background



### Vocabulary



### Questions



### Activities

- 1 Milpas Farming
- 2 Watch & Reflect

# Background

In addition to regulating the climate and creating habitat for a wide diversity of species, forests also provide jobs and goods that support local economies. While it might seem that logging trees and protecting forests are inherently at odds, **sustainable forestry** gives us a way to do both.

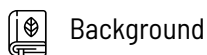
An example of sustainable forestry can be found in the Maya Forest in Central America. **Indigenous Peoples** have stewarded this land since time immemorial, and hold **traditional ecological knowledge** that is thousands of years old. They have long used sustainable forestry to meet their needs and the needs of nature.

In traditional **Milpa farming**, for example, three crops are planted together. First, beans are planted. They add nitrogen to the soil, which helps other plants grow. Corn stalks are then added to give the bean vines a stem to grow around. The third crop, squash, is planted to provide the bean seeds with shade, help the ground retain moisture and keep weeds at bay. The flowers from these plants provide pollen and nectar to honeybees and habitat for wildlife. The system also intersperses tree stands with the crop fields, which means unlike other agricultural practices that are contributing to **deforestation**, milpa fields can be maintained without cutting new trees.

But that's not all: Milpa farming supports communities by providing food to eat and a way to earn money. Indigenous communities maintain sustainable bee hives that are fueled by the flowers in the fields. These hives produce honey, which these communities can turn into a variety of products to take to market.

As we seek to solve the dual challenges of climate change and biodiversity loss, sustainable forestry methods will be an essential part of protecting places like the Maya forest—and nature across the world—for future generations.

## Sustainable Forestry



Background



**Vocabulary**



Questions



Activities

- 1 Milpas Farming
- 2 Watch & Reflect

# Vocabulary

## Deforestation

The cutting down or removal of trees from a forest, often to make space for human activities such as farming or development

## Indigenous Peoples

Inhabiting or existing in a land from the earliest times and during and after the arrival of colonists

## Indigenous stewardship

Indigenous Peoples have the right to maintain and strengthen their distinctive relationship with their traditionally owned or otherwise occupied and used lands, territories, waters and coastal seas and other resources and to uphold their responsibilities to future generations in this regard

## Milpa farming

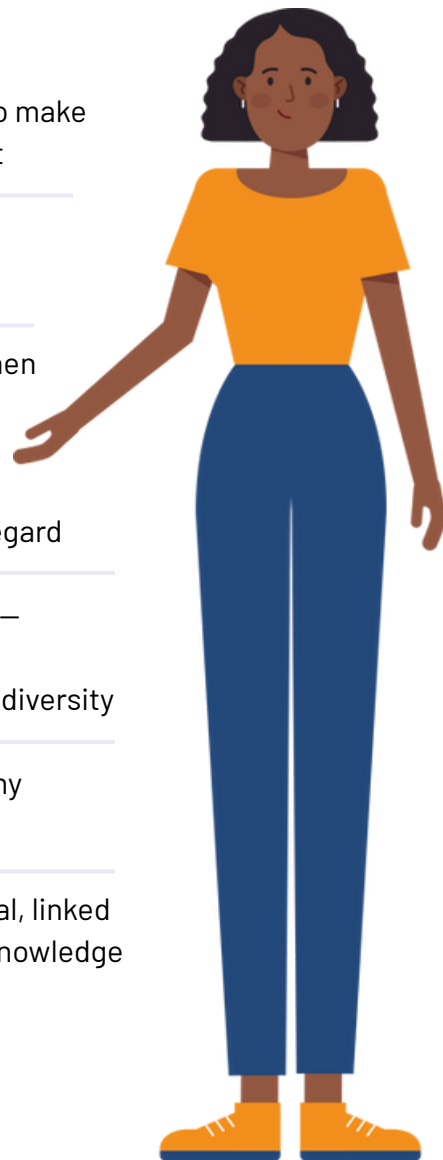
A traditional Indigenous practice that grows multiple crops—like corn, beans, and squash—within forested land without clear-cutting in order to support both food security and biodiversity

## Sustainable forestry

A method of managing forests to ensure they remain healthy and productive for future generations

## Traditional ecological knowledge

Traditional knowledge is dynamic, holistic, intergenerational, linked to experience on traditional lands and the integrity of the knowledge depends on maintaining the “integrity of the land itself”





## Sustainable Forestry



Background



Vocabulary



**Questions**



Activities

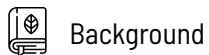
- 1 Milpas Farming
- 2 Watch & Reflect

# Questions

- 1 What is traditional ecological knowledge?
- 2 What is sustainable forestry and how is it different than other methods?
- 3 How have the Indigenous Peoples who steward the Maya forest succeeded in protecting a high percentage of natural habitat?
- 4 How does this approach also benefit local communities?



## Sustainable Forestry



Background



Vocabulary



Questions



Activities

**1 Milpas Farming**

2 Watch & Reflect

### ACTIVITY 2



HANDS-ON LEARNING

# Milpas Farming

**Prep Work:** Print cards on heavier-weight paper or cardstock. Cut out all 20 cards and shuffle. Farmers may each have their own deck of cards or the educator may use one deck of cards and reveal them for the whole class to follow. Print out a copy of the field for each farmer.

- 1 Draw 4 cards from your shuffled deck and look for the letter and number on the bottom of the cards. This is where you'll plant your trees.
- 2 Draw 1 card at a time and follow the instructions as shown. Continue until there are no more cards.
- 3 Always aim to farm in balance by planting your crops next to trees to form a milpa. Once you create a milpa, draw a line around it to show it's protected.
- 4 Once all cards have been drawn, count up your points. How balanced is your farm?

*Milpa game created by Sam and Atticus Pugh, Decatur, Georgia.*

### Materials

- ☐ Scissors
- ☐ Cardstock paper
- ☐ Pencil with eraser for each farmer


### Downloads


Milpas: Farming in Balance Game





## Sustainable Forestry

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 **Activities**

1 Milpas Farming

**2 Watch & Reflect**

### ACTIVITY 2



### HANDS-ON LEARNING

# Watch & Reflect

- 1 Watch [The Incredible Power of Forests: Maya Forest.](#)
- 2 Complete the [Watch Guide](#) to capture primary points and reflection.

### Downloads

The Incredible Power  
of Forests: Maya  
Forest Watch Guide





## Nature Lab Sustainability Commitment

Each component of a Nature Lab collection is designed to embrace the concepts of recycling, upcycling and sustainability.

# Additional Resources

[Visit \[nature.org/NatureLab\]\(https://www.nature.org/NatureLab\)](https://www.nature.org/NatureLab) for more educator resources.

[Sign up for our e-newsletters](#) to stay up-to-date on the latest teaching guides and videos.

[Follow @TNCNatureLab](#) on your favorite social channel to see how people and nature thrive together.



## Working Trees: Reforestation and Responsible Forestry

In this virtual field trip, students will take a deep dive into responsible forest management and gain a better understanding of how conservation and environmental stewardship can tackle the effects of deforestation.



## Climate Heroes: The Power of Trees

This virtual field trip provides a closer look at how exactly photosynthesis helps trees survive, clean the air we breathe and remove carbon from the atmosphere.



## Climb It Change

Explore how climate change is impacting alpine ecosystems and go on a climbing adventure with scientists who take you to some of the most stunning mountain ranges in the United States.

## The Incredible Power of Forests

# Borneo

← [Back to instructions](#)

### Watch "The Incredible Power of Forests: Borneo" and fill in the blanks below.

Trees can store greenhouse gases in their \_\_\_\_\_ and their \_\_\_\_\_. The \_\_\_\_\_ the forest and its trees, the more \_\_\_\_\_ it can store. If a forest is cut down or burned, \_\_\_\_\_ is released into the air. It's not just the size of the forest that matters, it's also the \_\_\_\_\_ of its trees. We can protect forests by \_\_\_\_\_.

### Reflect & Discuss

The forests of Borneo might be far from where you live. Why is it important to protect them?

### What can you do to help?

In the video, we learned that we not only rely on forests to remove carbon from the air, but to produce certain goods that we all need, as well as power local economies and provide jobs. Victoria, the video narrator, mentioned that you can help protect forests by choosing products that display the Forest Stewardship Council (FSC) logo.

Think about the products you use every day, like paper towel and tissues, that come from forests. Take a moment to learn a little more about the FSC certification. What extra steps do FSC certified companies take to protect forests? How can you look for the FSC certification badge the next time you visit the store?



#### VOCABULARY

##### **Atmosphere**

**n.** A layer of gases that surrounds the Earth

##### **Carbon dioxide**

**n.** A naturally occurring gas that consists of one carbon and two oxygen atoms

##### **Carbon sequestration**

**n.** The process of capturing and storing carbon from the air

##### **Climate change**

**n.** Long-term shifts in temperatures and weather patterns that are resulting from human activity

##### **Greenhouse effect**

**n.** A process through which certain gases, such as carbon dioxide, trap heat and warm the Earth

##### **Greenhouse gas**

**n.** Naturally-occurring gases that play an important role in regulating Earth's temperature

## The Incredible Power of Forests

# Appalachia

[← Back to instructions](#)

## Watch "The Incredible Power of Forests: Appalachia" and fill in the blanks below.

Appalachian forests contain an incredible diversity of \_\_\_\_\_, which means they provide homes to many different \_\_\_\_\_. The trees found in the Appalachians have \_\_\_\_\_ to the unique conditions of their environment. If climate change impacts those conditions, forests will eventually \_\_\_\_\_. Some species may become \_\_\_\_\_ if their \_\_\_\_\_ aren't protected.

## Reflect & Discuss

In the video, an interview with a forest program manager reveals that the Appalachians have a special role to play as the climate changes. What about the Appalachians makes them unique? How will they help protect a wide variety of species in the future?

## What can you do to help?

Planting native species in your school garden, in your front yard, or even on a balcony can help bumblebees, butterflies and other wildlife. Do some research to find out:

What are some common native plants found where you live? What part of the food web do they support? Where could you plant some of these species?



### VOCABULARY

**Dispersion**

**n.** The process by which seeds move away from the parent plant to a new location, allowing them to germinate and establish new plants

**Ecosystem**

**n.** A biological community of living organisms (including plants, animals and microbes) that interact with each other and their physical environment

**Habitat**

**n.** the natural home or environment of an animal, plant or other organism

**Photosynthesis**

**n.** The process through which plants use sunlight to turn water and carbon dioxide into food

## The Incredible Power of Forests

# Maya Forest



[← Back to instructions](#)

## Watch "The Incredible Power of Forests: Maya Forest" and fill in the blanks below.

Forests provide the following four benefits:

- 1.
- 2.
- 3.
- 4.

While many forests face the threat of deforestation, 61% of the Maya forest is stewarded by \_\_\_\_\_. These communities use \_\_\_\_\_ to protect both the forest and the people who rely on it. One of the traditional practices they use is called \_\_\_\_\_. Through this method, three crops are planted: \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. In addition to supporting soil health, these crops produce food for people and flowers that feed \_\_\_\_\_, which in turn produce \_\_\_\_\_ that local communities use to make products that support their local economies.

## Reflect & Discuss

How do the Indigenous People who steward the Maya forest able to meet their needs while also protecting nature? Why is this approach important in today's global fight against climate change and biodiversity loss?

## What can you do to help?

Across the world, farmers like those in the Maya forest are working to grow food in sustainable ways that protect the Earth. Learn about these practices and find out where you can purchase products that are grown or made sustainably. For example, is there a farmer's market in your neighborhood? Buy local, in season produce from vendors that use sustainable agricultural practices. Diversify the food you eat to support farmers who grow diverse crops, which are better for soil health. For example, instead of white rice and wheat, try grains like oats, buckwheat, quinoa and barley. If feasible, try growing your own produce. If you have enough room, you could even plant your own mini-milpa farm! Even small balconies and kitchen window sills can support herbs like basil, parsley and chives.

# Milpas: Farming in Balance

## Setup:

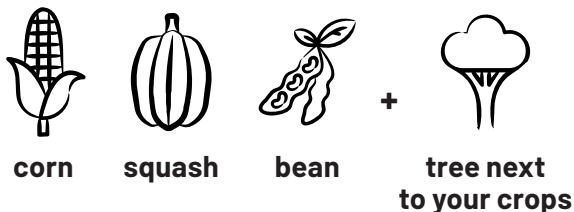
Before you start, you will need:

**Scissors | Pencil with an eraser | Printed game**

- 1 Each farmer may have their own deck of cards or the educator may use one deck for the whole class. Cut out all cards and shuffle.
- 2 Each farmer will need a copy of an empty field, score card, scissors and a pencil with an eraser.

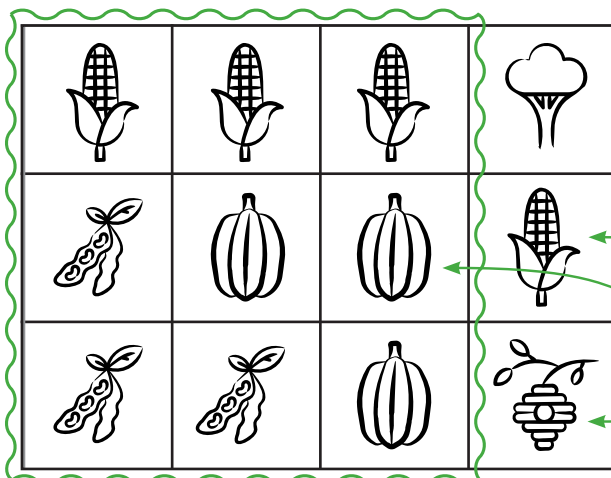
## Introduction:

The goal of this game is to create **milpas**. You create a milpa by planting at least 1 of each crop:



Once all your crops have been planted, count up all the points. **How balanced is your farm?**

*Example milpa:*



## How to play/farm:

- 1 **Plant your trees:** Draw 4 cards from your deck. Each card has a letter and number in the bottom right corner. This is where you'll plant your trees in your empty field.
- 2 **Plant your crops:** Draw 1 card at a time and follow the instructions as shown. Continue until there are no more cards.

### Types of cards:

**Crops:** Plant crops like beans, squash or corn in a shape of three spaces. They can be drawn on any empty spaces in the field fitting the shape shown. Crops count as one point each.

**Beehive:** Set up a beehive in any empty space. Beehives along the side of a milpa count as five points.

**Hazard! (flood or drought):** An unexpected hazard has whiped out some of your crops. Erase all crops as indicated on your card unless crops are protected in a milpa.

- 3 **Create milpas:** Always aim to farm in balance by planting your crops next to trees. A milpa is created when at least 1 corn, bean and squash crop is planted next to a tree. Once you create a milpa, draw a line around it to show it's protected. Beware: milpas can have empty spaces and still be a milpa. But once you've drawn your line, you can't plant any more crops there.
- 4 **Count up your points:** Once all the cards have been drawn, add up your points.
  - Crops = 1 point each
  - Crops inside a milpa = 2 points each
  - Beehives = 5 points each if next to a milpa (otherwise, 0)

|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| A |   |   |   |   |   |   |   |   |
| B |   |   |   |   |   |   |   |   |
| C |   |   |   |   |   |   |   |   |
| D |   |   |   |   |   |   |   |   |
| E |   |   |   |   |   |   |   |   |
| F |   |   |   |   |   |   |   |   |
| G |   |   |   |   |   |   |   |   |
| H |   |   |   |   |   |   |   |   |

## Legend

### Crops

(not in a milpa)

x1

### Milpa Crops

x2

### Beehives

(must be next to a milpa, otherwise 0)

x5



**Trees** are needed to draw a milpa, the tree should be on the outside of the milpa shape.



**Beehives** count as five points if they are on the outside of a milpa shape.



**Corn, beans and squash** are crops. Individual crops count as one point or two points if within a milpa. Remember, crops within a milpa are protected from floods and droughts!



**Milpas** may be drawn around spaces with at least one of each crop on the inside and a tree on the outside. Inside spaces may be empty, but you cannot draw crops on the inside once the milpa is drawn.

## Total Points





## Crops



Plant **bean** crops  
Remember to draw a milpa if you can!

A 1

## Crops

Plant **bean** crops

Remember to draw a milpa if you can!

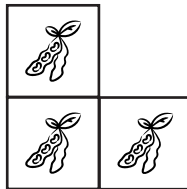


A 8

## Crops

Plant **bean** crops

Remember to draw a milpa if you can!

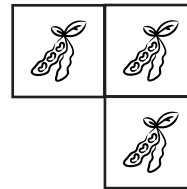


B 3

## Crops

Plant **bean** crops

Remember to draw a milpa if you can!

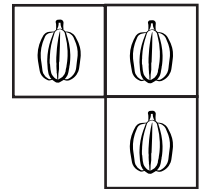


B 6

## Crops

Plant **squash** crops

Remember to draw a milpa if you can!



B 8

## Crops



Plant **corn** crops  
Remember to draw a milpa if you can!

C 1

## Crops

Plant **corn** crops

Remember to draw a milpa if you can!

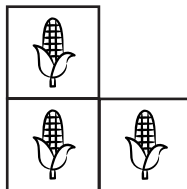


C 4

## Crops

Plant **corn** crops

Remember to draw a milpa if you can!

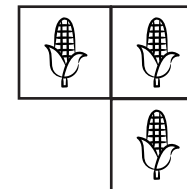


C 5

## Crops

Plant **corn** crops

Remember to draw a milpa if you can!



D 2

## Beehive

Help your farm by setting up a **beehive**

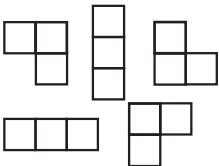


D 7

## Crops

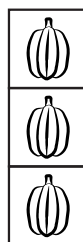
Plant **3 of any one crop** in any connected shape.

Remember to draw a milpa if you can!



E 3

## Crops



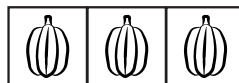
Plant **squash** crops  
Remember to draw a milpa if you can!

E 6

## Crops

Plant **squash** crops

Remember to draw a milpa if you can!

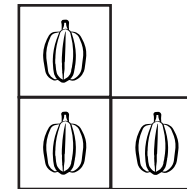


F 1

## Crops

Plant **squash** crops

Remember to draw a milpa if you can!



F 5

## Beehive

Help your farm by setting up a **beehive**

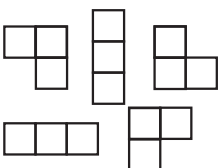


F 8

## Crops

Plant **3 of any one crop** in any connected shape.

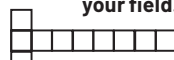
Remember to draw a milpa if you can!



G 2

## Hazard!

**A drought has damaged your field.**



Go to the discharge pile and find the column number and row on the last card used.  
**Erase all crops in that column and row** unless protected by a milpa.

G 4

## Hazard!

**A flood has damaged your field.**

Go to the discharge pile and find the column number on the last card used.  
**Erase all crops in that column** unless protected by a milpa.



G 7

## Hazard!

**A flood has damaged your field.**



Go to the discharge pile and find the row letter on the last card used.  
**Erase all crops in that row** unless protected by a milpa.

H 4

## Beehive

Help your farm by setting up a **beehive**



H 5