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WONDERS OF WILDLIFE
NATIONAL MUSEUM &
AQUARIUM

Rainforests

Subject Area: Science – Natural Resources, Biodiversity

Grades:

Time: This lesson can be completed in.....

Essential Questions:

- What is a rainforest?
- Why are they important?
- Who lives there?
- How can we help manage it properly?



Purpose and Overview:

Classes will learn why we call them rainforests and what makes them such important natural resources for our planet. You will lead your students using videos from our team and materials provided to engage in an expedition through the Amazon rainforest ecosystem. At the end of the lesson, students will have a better understanding of rainforests and their roles in biodiversity, use as a natural resource, and sustainable management practices.

Introduction:

With this lesson students learn about the importance of one of the most unique biomes in the world, the rainforest. Students will explore the biodiversity of the rainforests by learning about some of the inhabitants found within the Amazon ecosystem. They will also learn about the threats the rainforests face and how they are being managed.

Rainforests are vital biomes that house crucial ecosystems and habitats for an immense variety of biological organisms. There are two main types of rainforests, tropical and temperate. With this lesson we will be focusing on the tropical rainforests and their characteristics. In a tropical rainforest there are four main layers: the forest floor, the understory, the canopy, and the emergent. Both plants and animals found in these different layers have very specific needs and rely on their specific layer for survival.

Rainforests are much more than homes for lots of organisms, they are also invaluable natural resources. These resources range from; foods and products, pharmaceuticals, woods, houseplants, fibers, oils, minerals, gums and resins. Rainforests are also very important to the carbon cycle and are some of the world's largest reservoirs for this element which is a key building block for all life.

Objectives:

- Describe what a rainforest is and its importance.
- Locate where rainforests are in the world.
- Build a diagram labeling the different layers of the rainforest.
- Examine the impacts the rainforests are facing and the importance of sustainable management.

Standards:

Next Generation Science Standards

Disciplinary Core Ideas

- ESS2.D: Weather and Climate
- ESS3.B: Natural Hazards
- LS1.A: Structure and Function
- ESS2.A: Earth Materials and Systems
- ESS2.3: Biogeology
- ESS3.A: Natural Resources
- LS2.A: Interdependent Relationships in Ecosystems
- LS2.B: Cycles of Matter and Energy Transfer in Ecosystems
- ESS3.C: Human Impacts on Earth Systems

Crosscutting Concepts

- Patterns
- Cause and Effect
- Systems and System Models

Science and Engineering Practices

- Evaluating and Communicating Information
- Constructing Explanations

Vocabulary

Abiotic: Parts of an ecosystem that are not made up of biological organisms. Air, soil, rocks, weather, water, and nutrients are all considered abiotic. They are not, and have never been, alive.

Adaptation: A characteristic or trait that allows an organism to be better suited for survival and reproduction within a given habitat.

Biodiversity: When many different types of animal and plant species live in a particular ecosystem or habitat.

Biodiversity Hotspot: An ecosystem or region with a significantly high amount of biodiversity that is also currently under threat of being destroyed.

Biome: Areas on earth that have similar climates, plants, and animals. Biomes are defined by their average precipitation rates and temperature.

Biotic: The parts of an ecosystem that are made from living or formerly living organisms. Plants, animals, and bacteria are all biotic. Even if something is rotting or decomposing, it is considered biotic.

Carbon: Carbon is an essential element for all life on Earth.

Carbon Sink: A natural part of our environment that absorbs and stores massive amounts of carbon from the atmosphere.

Carbon Sequestration: The process of capturing and storing atmospheric carbon dioxide.

Climate: The regular prevailing weather and temperature conditions of an area over a long period of time.

Deforestation: The removal of a large number of trees or even entire forests in order to use the land for other purposes.

Endangered Species: A species of animal or plant that is in danger of going extinct.

Erosion: The process of wind, water, or other natural forces breaking down something over a period of time.

Evaporation: The process by which liquid water becomes water vapor.

Extinction: Event when an entire species dies out and no longer exists.

Habitat: The natural home of a living thing.

Organism: An individual living thing.

Photosynthesis: The process whereby plants turn sunlight into food.

Pollution: When a harmful substance is out in the wrong place and/or in the wrong quantity and has a harmful effect on the environment.

Precipitation: Water vapor that has condensed to fall to earth as rain or snow.

Soil Death: Soil that has been depleted of all nutrients.

Sustainability: Use of the earth's resources without destroying or depleting them.

Materials:

Teacher:

- Computer, Project Printouts, Screen, Internet

Videos:

- Videos are located throughout the document. Load them prior for quick access.

Printouts:

Attached at the end of the lesson plan

Students:

- Writing Utensil, Note Paper
- Printouts (best for your grade level)

Individual Student Crafts: Each student will need the supplies listed below for each craft.

Snake Bracelet

- Paper plate
- Cardboard toilet paper roll
- Paints
- Paintbrush
- Markers
- Red paper
- Transparent tape
- Scissors

Layers of the Rainforest Flipbook

- Scissors
- Pipe Cleaners/yarn/brads (if using hole punch method)
- Stapler or Hole Punch

Where in the Rainforest Cut & Paste

- Glue/tape
- Printouts (Fact Slips & Cross Layers Page)
- Scissors

Rainforest Flipbook

- Construction paper (colored)
- Printouts (if utilizing)
- Markers or Colored Pencils
- Scissors
- Glue/tape
- Pipe Cleaners/brads

Classroom Discussion & Activities:

- I. To begin, start off by asking your students some engaging questions. They can either be in a group discussion or asked and have answers written down for later reference to see what they have learned after the lesson. Here are some questions you can ask...
 - a. Why do you think they are called rainforests?
 - b. Where in the world do you think they are found?
 - c. What types of animals and plants do you think live there?
 - d. How do you think people use the rainforests?

- II. With those questions answered and the discussion started, prepare video(s) and printouts for presentation to class.
 - a. Hand out desired printouts
 - b. https://www.youtube.com/watch?v=h_5ZlyYLZ8Q&t=1s
 - c. Tailor the structure for your class

What & Where

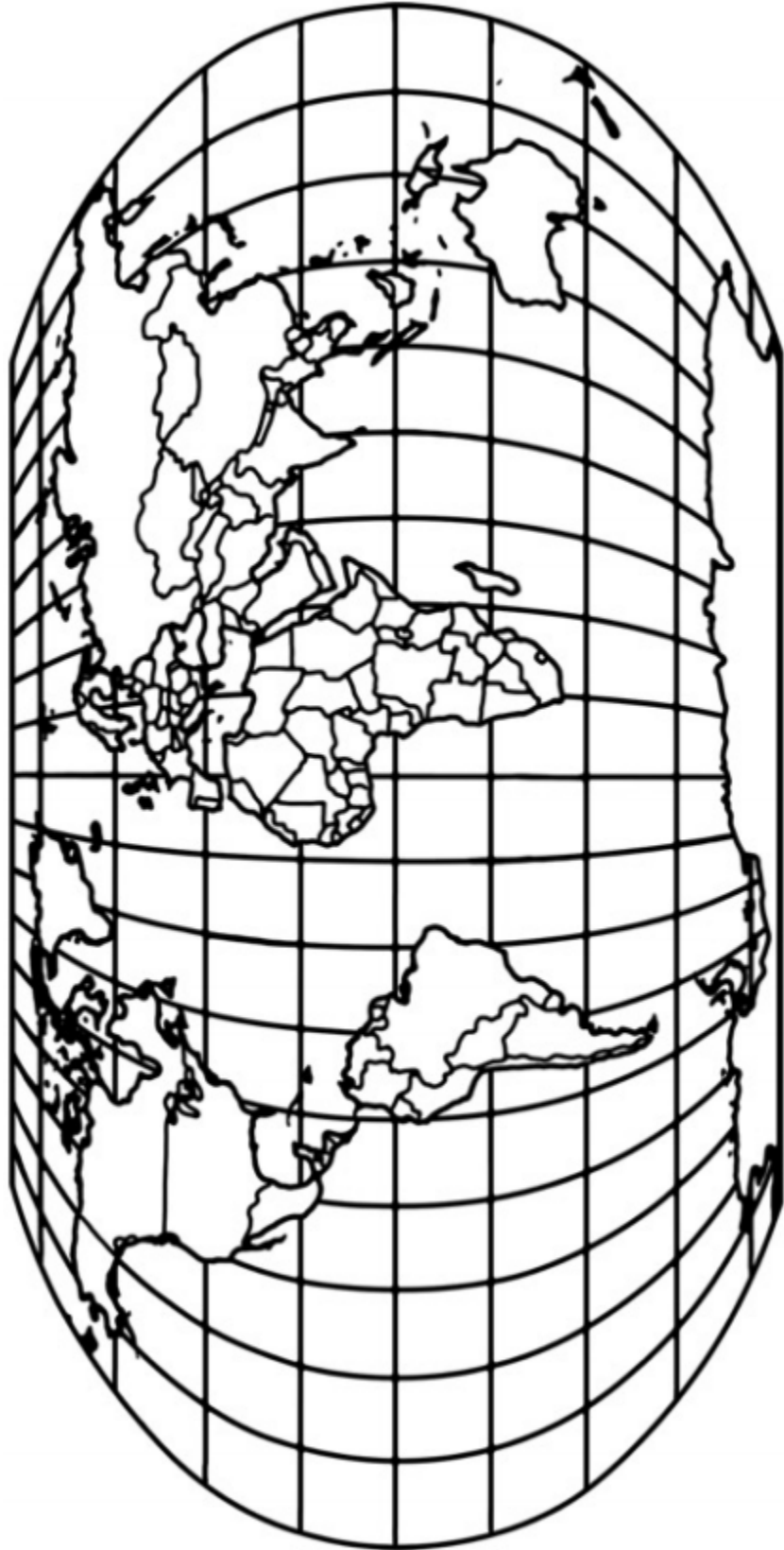
- III. What are rainforests and how are they classified?
- a. Rainforests get their name because out of all biomes on earth, they receive the most rainfall through the year. On average they can accumulate 79 to 394 inches of rain!
 - i. Provide students with the definition of a biome. A biome is an area on earth that has similar climates, plants, and animals. Biomes are defined by their average precipitation rates and temperature.
 - ii. Provide students with the definition of climate. The regular prevailing weather and temperature conditions of an area over a long period of time.
 - iii. Provide students with the definition of evaporation. The process by which liquid water becomes water vapor and returns to the atmosphere to become precipitation.
 - iv. Provide students with the definition of precipitation. Water vapor that has condensed to fall to earth as rain or snow.
 - b. There are two types of rainforests, temperate and tropical. Using a globe or the printout map, show students where each are located. Make note that the class will be focusing on the tropical rainforest of the Amazon in South America.
 - i. Tropical rainforests are found near the equator where temperatures are warmer. Within the tropic regions, sunlight is in abundance and hits almost directly and with the higher temperatures, provides more humidity within the air. They can be found throughout Central and South America, central Africa, and from Southeast Asia down through the islands to Northern Australia.
 - ii. Temperate rainforests are located further north and south of the equator where temperatures tend to be a little cooler than the tropical regions. Most are found in coastal regions with mountainous areas. These higher elevations help with precipitation gain. Temperate rainforests are found along the coasts of the Pacific Northwest in the US, Chile, Northern Europe, Japan, New Zealand, and southern Australia.
 - c. Have students color in on their map the regions where tropical rainforests are located. After that have them label the location of the Amazon rainforest.

Student Name:

Where in the WORLD are Rainforests!?

Color in on the map the regions tropical rainforests can be found.

Hint: The equator is the key!



Layers

- IV.** Now that you have located the Amazon, let us look at what organisms you could find there. Provide students with the definition of organism, an individual living thing.
- a.** Explain to students that a large portion of the world’s species of plants and animals are found within tropical rainforests, many of which can be found nowhere else on the planet. This factor makes them biodiversity hotspots and something that is worth protecting.
 - i.** Provide students with the definition of biodiversity. When many different types of animal and plant species live in a particular ecosystem or habitat.
 - ii.** Provide students with the definition of biodiversity hotspot. An ecosystem or region with a significantly high amount of biodiversity that is also currently under threat of being destroyed.
 - b.** Discover with students the layers of the rainforest and the organisms that live within them. Ask students how many layers they think the rainforest has and what kind of plants and animals they think live there.
 - i.** Start with the bottom most layer, the forest floor. This layer receives the least amount of sunlight and only plants that have adapted to low light can survive here. There are many places where the floor is clear of dense vegetation for this reason. Animals that you might find here are wild pigs, anteaters, smaller rodents, other hoofed mammals, and even jaguars on the hunt. The forest floor is also abundant with decomposers both plant and animal alike because this is where almost all the decaying organic matter from the forest gathers.
 - ii.** Moving up, the next layer you encounter is the understory layer. Plants you will start to see here have unique ways at surviving and reproducing. A lot of plants in the section will have exceptionally large umbrella like leaves compared to taller trees, to catch as much sunlight as possible that might creep through the canopy so they can undergo photosynthesis. They often produce incredibly large flowers with bright colors that are easy to see while others produce strong odors. These adaptations help to attract pollinators which increases their chance of reproduction. Jaguars can be found in this layer because it provides useful camouflage when they are resting.
 - 1.** Provide students with the definition of photosynthesis. The process whereby plants turn sunlight into food.

2. Provide students with the definition of an adaptation. A characteristic or trait that allows an organism to be better suited for survival and reproduction within a given habitat.
- iii. As we keep climbing, we will enter the canopy layer. This is the densest layer of the rainforest consisting of networks of connected treetops which almost completely shelter the layers below from sun, rain, and wind which is what makes those layers so humid. To help with seed dispersal, trees will encase them in sweet fruits which are irresistible to many of the animals living within this layer. Due to the abundance of food and lack of predators, the canopy has more animals living in it than any other. Often swinging through the branches, you can find a variety of primate species such as spider and howler monkeys as well as macaws and toucans.
- iv. The last and tip top layer of the rainforest is called the emergent layer. Plants that makeup this layer can reach heights up to 200ft! Their seeds are often very light so they can be carried away by strong winds. Many of the animals that live here must be flighted or very lightweight for the unstable top branches of the canopy layer to support them. Animals such as birds, bats, gliders, and butterflies live here.
- v. Support video which helps lead into next section.
 1. https://www.youtube.com/watch?v=h_5ZlyYLZ8Q&t=1s
- vi. These layers provide different and unique habitats for the entire rainforest.
 1. Provide students with the definition of habitat. The natural home of a living thing.

Activity

- For younger students they will cut the “Layers of the Rainforest” diagram and layers pages all the way from the right to just the end of the dashed line on the left. (do NOT cut all the way across and this will make flipping the individual pieces back difficult). The descriptions page should be left uncut.
- Students should color the “Layers of the Rainforest” diagram page and animals before gluing/taping occurs.
- The descriptions page will be the bottom followed by the layers on top followed by diagram on top of that with animals glued or taped on.
- Older students can use these pages later for the entire Rainforest Flipbook activity with the more realistic animal templates.

The emergent layer is the tallest part of the rainforest. The giant trees in this layer can grow to be over 200 feet tall with trunks that are 16 feet around! There's lots of sunshine up here!

The canopy layer is the second tallest part of the rainforest. It acts like a roof over the bottom two layers by blocking a lot of sunlight. This area is a maze of leaves, vines, and branches.

The understory layer is below the canopy and does not get a lot of sunshine. The plants have to grow very large leaves to absorb enough light. These leaves can be as big as an umbrella!

The forest floor is the ground level. Almost no plants grow here because there's hardly any sunlight. The forest floor is very dark which allows things to decay, or break down, very quickly.

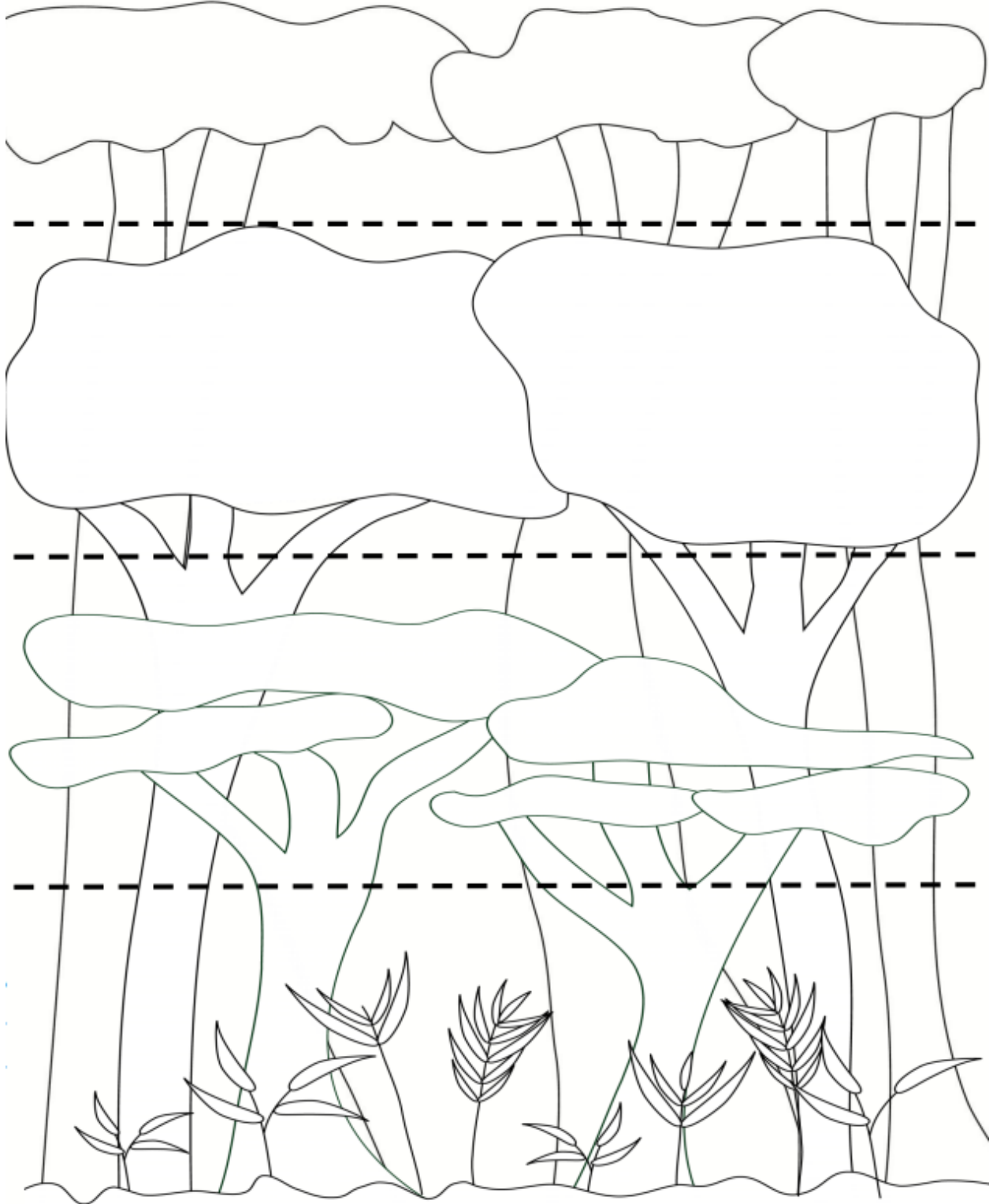
Emergent

Canopy

Understory

Forest
Floor

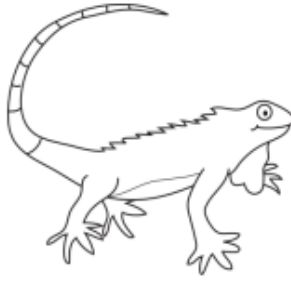
Layers of the Rainforest



Animal Cutouts For Rainforest Layer Flipbook



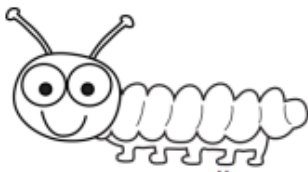
Boa Constrictor



Iguana



Macaw



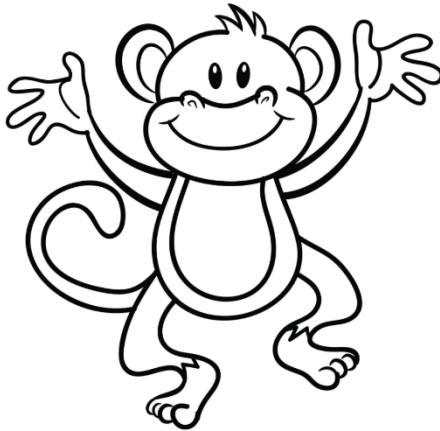
Caterpillar



Toucan



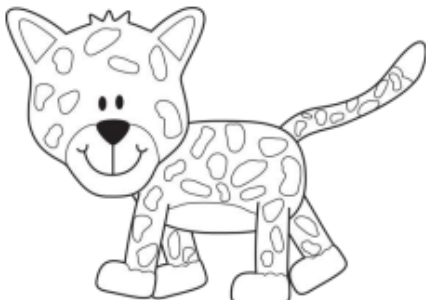
Tree Frog



Howler Monkey



Sloth

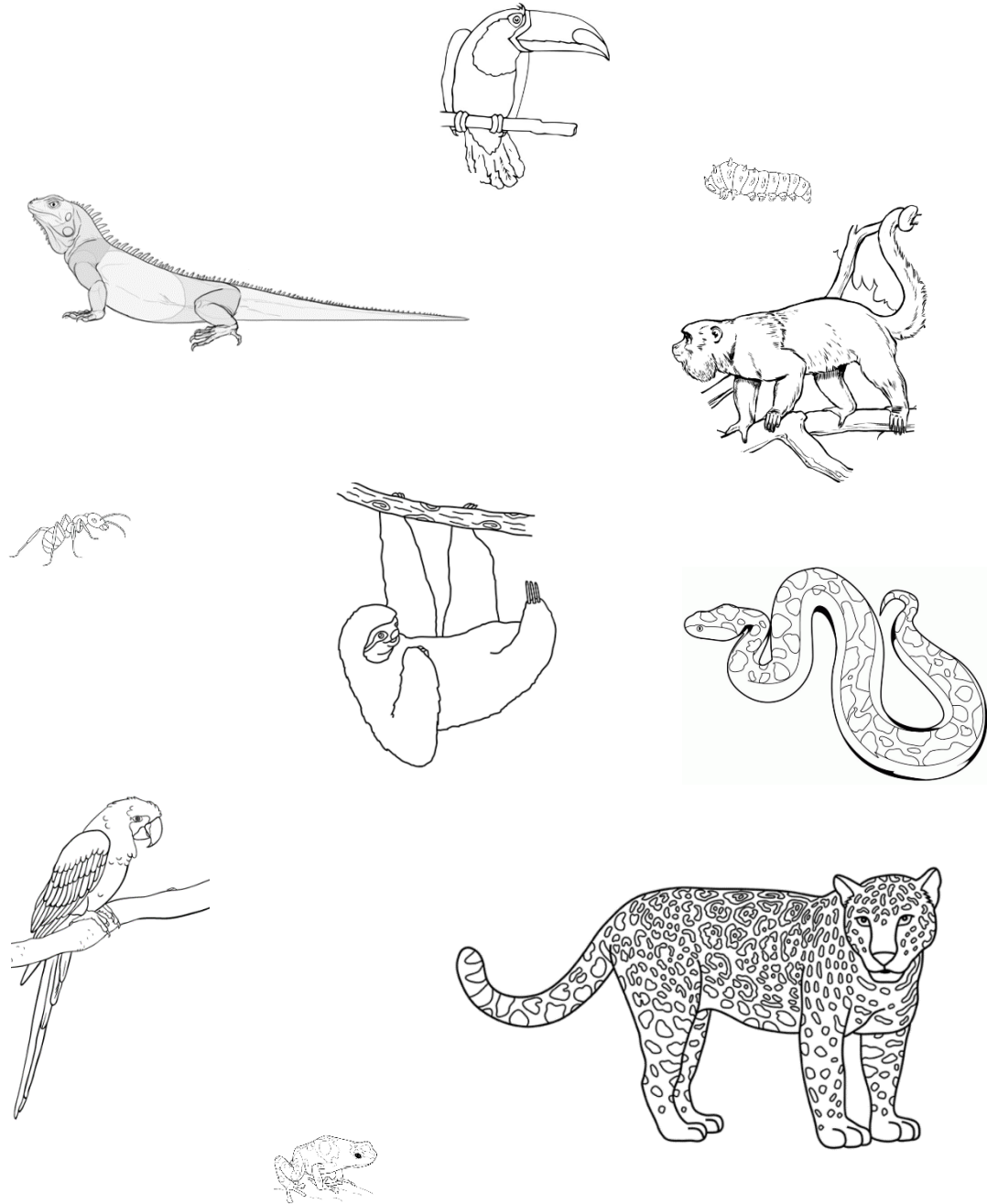


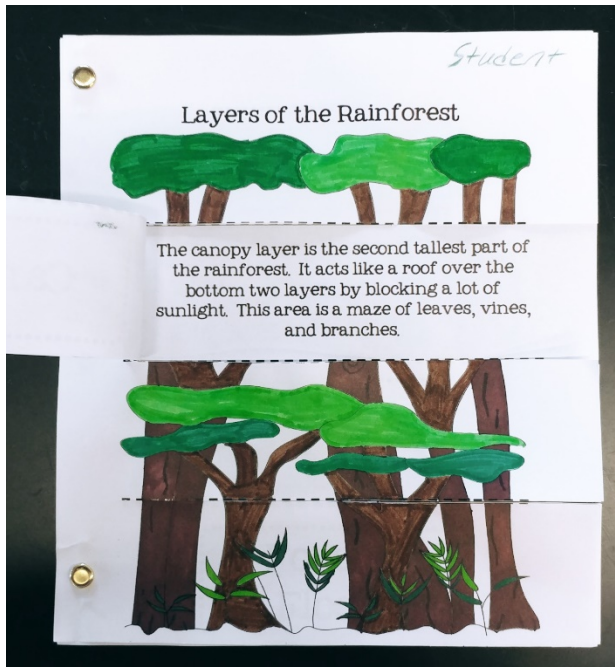
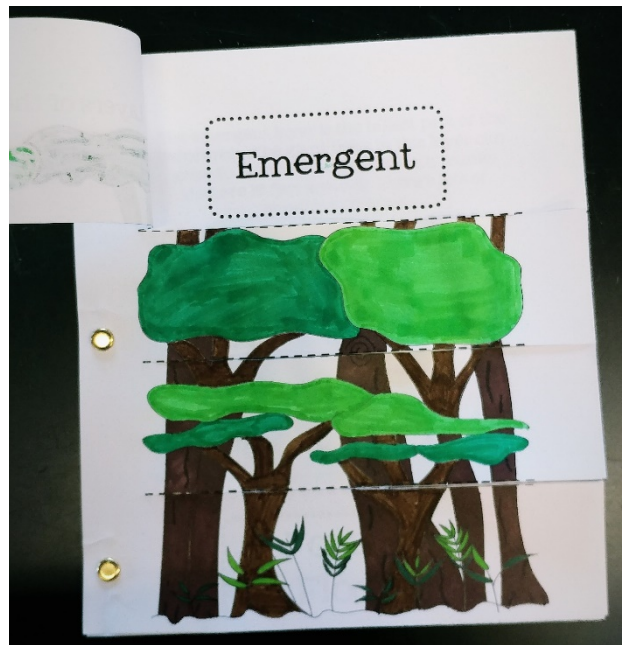
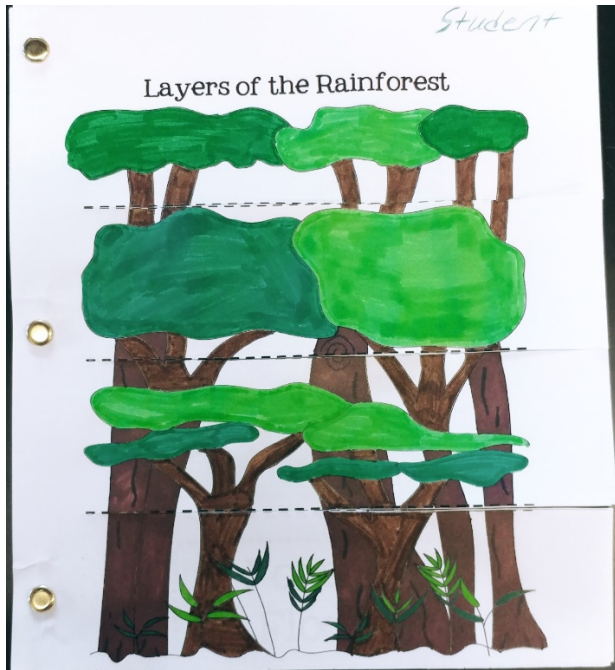
Jaguar



Ant

Animal Cutouts For Rainforest Flipbook





Where in the Rainforest?

Cut-and-Paste Pieces

DIRECTIONS: Cut out the pieces below. Read the description on each piece and glue it in the correct box on the other page.

birds, bats, and
butterflies

tallest layer

jaguars

ground level

directly below the
canopy

monkeys, birds, sloths

insects, frogs, snakes,
small mammals

has giant trees that can
grow to over 200 feet

acts like a roof blocking sun
from the bottom layers

large bright flowers

has almost no sunlight

has plants with leaves as
big as an umbrella

Student Name:

Rainforest Layers

EMERGENT

birds, bats, and
butterflies

tallest layer

has giant trees that can
grow to over 200 feet

CANOPY

has plants with leaves as
big as an umbrella

monkeys, birds, sloths

acts like a roof blocking sun
from the bottom layers

UNDERSTORY

directly below the
canopy

large bright flowers

jaguars

FOREST FLOOR

has almost no sunlight

ground level

insects, frogs, snakes,
small mammals

Benefits & Threats

- V. Discuss with students the other benefits the rainforests provide other than as a home for plants and animals, and the threats the rainforests are facing today. At the end of the video students were made aware of some of the harmful impacts that are happening. Ask them if they remember what was mentioned and list on the board (if possible) what the class comes up with. Have them be specific and explain what they think each thing means. Leave space for the benefits they provide!
- a. Rainforests are full of extremely valuable and useful natural resources such as food, oils, fibers, gums, resins, houseplants, and pharmaceuticals.
 - i. Discuss with students common things they might find at the store or at home that are impacted by the rainforests.
 - b. Rainforests also play an extremely important role in the carbon cycle. The immense forests act as large storage units called carbon sinks. They help regulate the release of carbon back into the atmosphere by collecting this element within the forest itself, a process called carbon sequestration. Too much carbon released at one time can have negative effects on climates all over the world.
 - i. Provide students with the definition of carbon. Carbon is an essential element for all life on Earth.
 - ii. Provide students with the definition of carbon sink. A natural part of our environment that absorbs and stores massive amounts of carbon from the atmosphere.
 - iii. Provide students with the definition of carbon sequestration. The process of capturing and storing atmospheric carbon dioxide.
 - c. The greatest threat to the Amazon today is deforestation. Provide students with the definition of deforestation. The removal of a large number of trees or even entire forests in order to use the land for other purposes. Both logging and clear cutting are forms of deforestation.
 - i. Illegal logging is critical to the rainforests because sites are not maintained and done without care to environmental impact. It is done for desired woods for production in high end products.
 - ii. Clear cutting is a practice used for development and infrastructure as well as agricultural farms. A major impact this has is that a lot of habitats become divided and made smaller or destroyed altogether. Placing stress on all the

organisms within that area and the surrounding ecosystem. Habitat loss can lead to a species becoming endangered. If practices continue and species are not monitored, it can lead to a species becoming extinct.

1. Provide student with the definition of endangered species. A species of animal or plant that is in danger of going extinct.
 2. Provide students with the definition of extinction. Event when an entire species dies out and no longer exists.
- iii. When looking at land management these practices are very harmful because when entire sections of trees are being removed so are all the nutrients they possess. The rainforest survives on the nutrients stored in all its biotic components. The soil found within the Amazon is part of its abiotic components and is extremely nutrient poor.
1. Provide students with the definition of abiotic. Parts of an ecosystem that are not made up of biological organisms. Air, soil, rocks, weather, water, and nutrients are all considered abiotic. They are not, and have never been, alive.
 2. Provide students with the definition of biotic. The parts of an ecosystem that are made from living or formerly living organisms. Plants, animals, and bacteria are all biotic. Even if something is rotting or decomposing, it is considered biotic.
- iv. Unsustainable agriculture is another main reason for large areas of forest to be cleared away. The reason these agricultural practices are unsustainable is because the farmers know they are only going to get a few crops harvests out of a given plot before the soil finally succumbs to soil death. Once a plot is used up, they will move onto another. It takes a long time for soil to regain growth properties again, sometimes they never do.
1. Provide students with the definition of soil death. Soil that has been depleted of all nutrients.
- v. Another biproduct of deforestation is erosion of soils which causes flooding in lowland areas and then pollutants piggyback off the uncontrolled water transfers, further destroying other habitats.
1. Provide students with the definition of erosion. The process of wind, water, or other natural forces breaking down something over a period of time.
 2. Provide students with the definition of pollution. When a harmful substance is out in the wrong place and/or in the wrong quantity and has a harmful effect on the environment.

Taking Action

- VI.** Engage with your students and ask them what are some sustainable practices that they can do to help their environment and to explain how they would go about it.
- a. Provide students with the definition of sustainability. Use of the earth's resources without destroying or depleting them.
 - b. Here are some practices to help get them going if they are having a difficult time thinking of something.
 - i. Educate
 - ii. Volunteering
 - iii. Alternative energy
 - iv. Reduce, reuse, recycle
 - v. Reduce landfill waste
 - vi. Sustainable agriculture
 - vii. Protect wildlife
 - viii. Conserve water
 - ix. Regulations
 - x. Sustainable fishing
 - xi. Manufacturing practices
 - xii. Speaking up, raise your voice
- VII.** Evaluate your students and see what they have learned.
- a. Pass out remaining chosen printout worksheets and have them complete them.
 - b. If you had the students write down the first questions and answer them, have them go back and answer the questions again to see if their answers have changed or stayed the same.
 - c. Additional post lesson questions to choose from to have students answer.
 - i. Why are rainforests important? What roles do they play?
 - ii. Name and explain 3 things rainforests are in danger of.
 - iii. Name 3 things that you learned about rainforests that you did not know before.
 - iv. Name each layer of the Amazon rainforest and an animal found in each (try to be specific if you can).
 - v. List 3 things you can do to help your world around you.

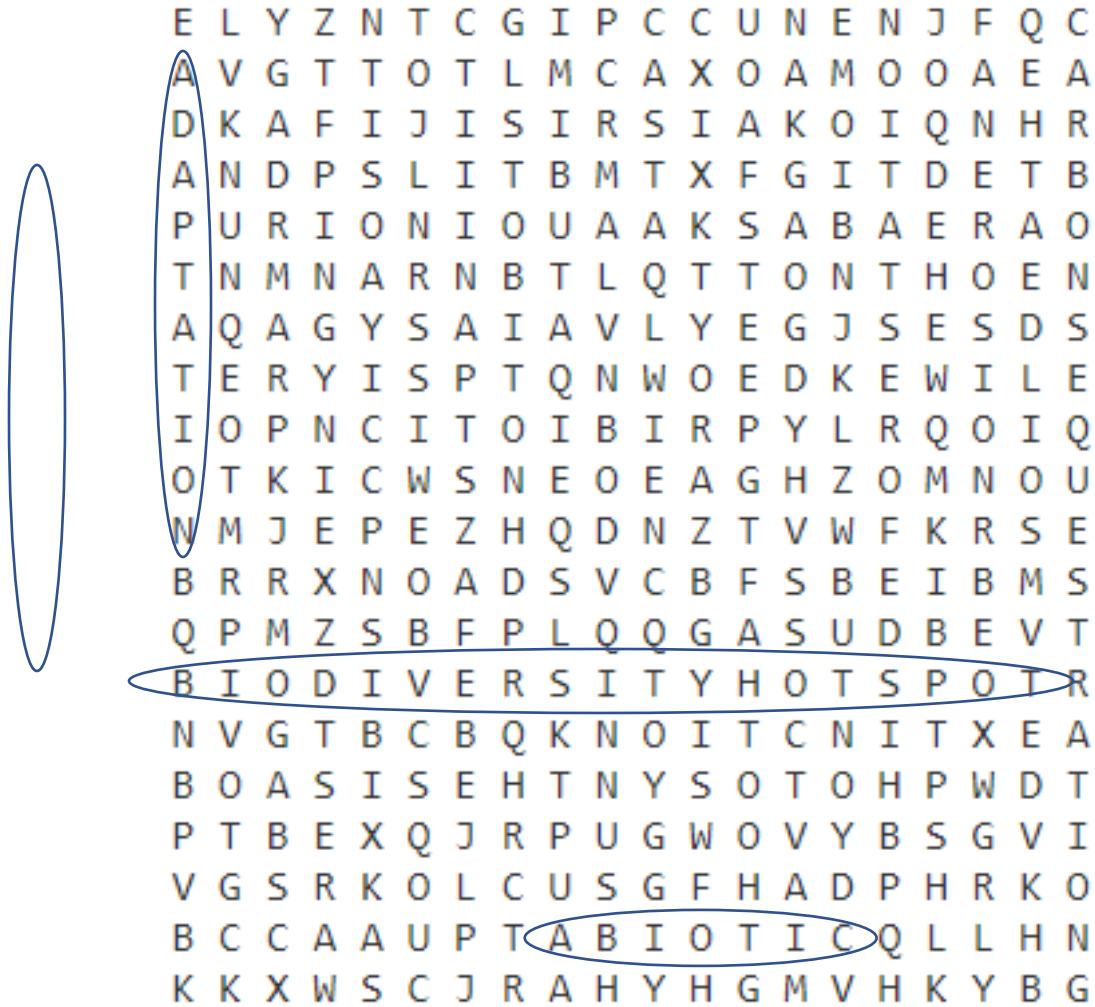
Additional Resources

Additional Videos:

- Meet lead keeper Olivia and the marmoset family!
 - <https://www.youtube.com/watch?v=gZWApkBB2O0>
- Meet lead aquarist Briana and some of our Amazon friends!
 - <https://www.youtube.com/watch?v=yqEayr46HYM>
- Meet education manager Sara and craft a snake bracelet!
 - <https://www.youtube.com/watch?v=idQK82mYLiE>
- Visit our partners at the Nature Conservancy for more conservation stories!
 - <https://www.youtube.com/watch?v=5T3AwmyZqxo>

Student Name:

Rainforest Word Search



Abiotic - Adaptation - Biodiversity - Biodiversity Hotspot - Biome - Biotic

Carbon - Carbon Sink - Carbon Sequestration - Climate - Deforestation

Endangered Species - Erosion - Evaporation - Extinction - Habitat

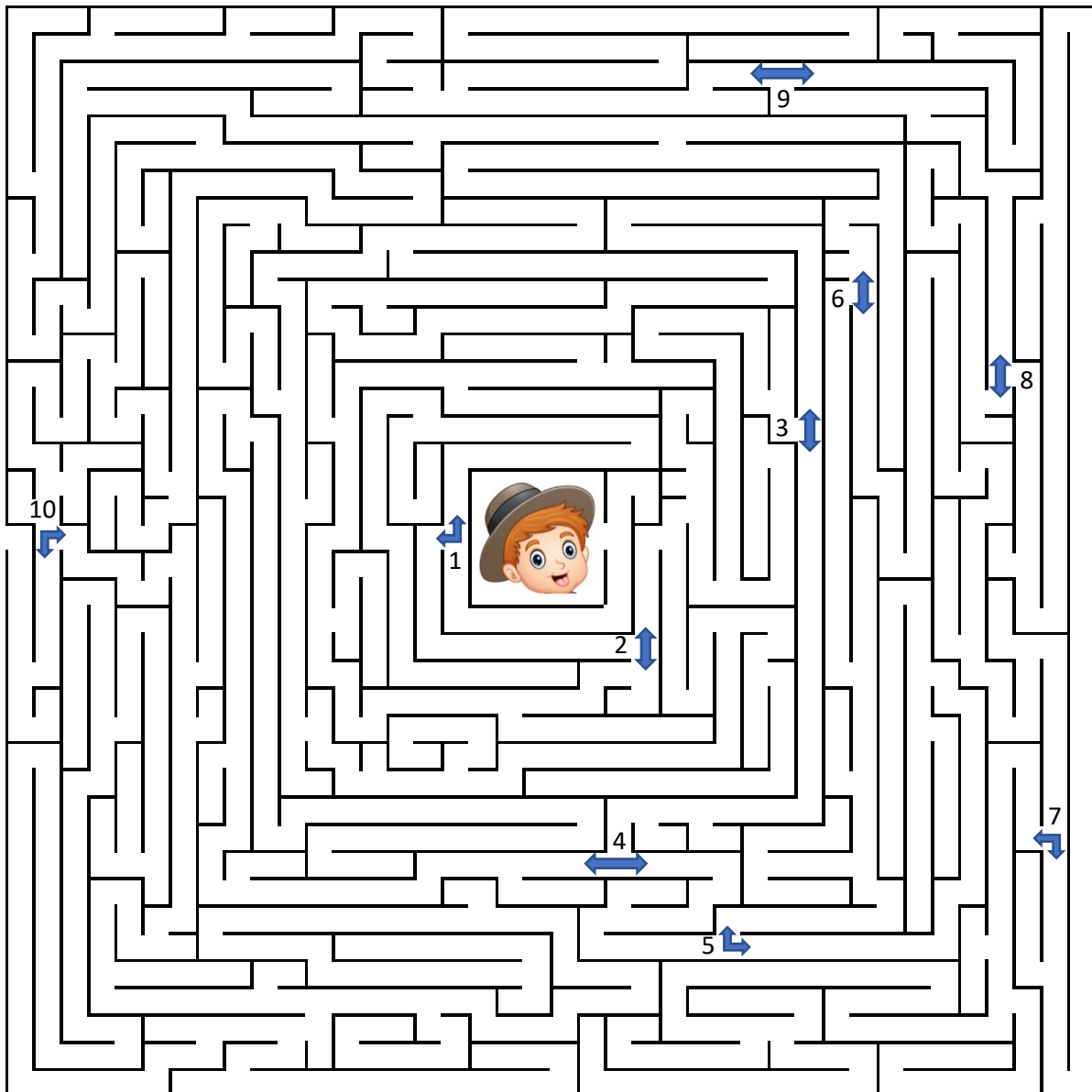
Organism - Photosynthesis - Pollution - Precipitation - Soil Death - Sustainability

Student Name:

Escape the Amazon Maze!

Hey there rainforest experts! You have had quite the journey today, are you up for one last challenge? Explorer Eric dropped his compass and needs your help! Can you help guide him back out of the dense jungle? You will have to use the knowledge you have learned today to help Explorer Eric back home. Goodluck adventurers!

Directions: When you reach a number, flip to the other page and answer the question to know which way to go! Travel through EVERY number before reaching the end! (Path based on direction traveled)



Student Name:

Escape the Amazon Maze Questions

Directions: Match corresponding number from maze with questions listed below. Use the knowledge you have gained today and your other projects to help you! (Circle your answer)

1. What best describes a rainforest?
 - a. Very Dry (Up)
 - b. **Very Wet (Left)**
2. Which type of rainforest is typically found along the equator?
 - a. **Tropical (Up)**
 - b. Temperate (Down)
3. What are characteristics of a tropical rainforest?
 - a. Colder and along the coasts (Up)
 - b. **Warm and humid (Down)**
4. This layer of the rainforest receives almost ZERO sunlight.
 - a. Understory (Left)
 - b. **Forest Floor (Right)**
5. Which layer is the topmost layer?
 - a. **Emergent (Up)**
 - b. Canopy (Right)
6. Where would you most likely find primates in the rainforest?
 - a. Understory Layer (Up)
 - b. **Canopy Layer (Down)**
7. What life giving cycle do rainforests play a vital role in?
 - a. **Carbon Cycle (Down)**
 - b. Cosmic Cycle (Left)
8. Rainforests are full of valuable natural resources.
 - a. **True (Up)**
 - b. False (Down)
9. _____: Use of the earth's resources without destroying or depleting them.
 - a. Deforestation (Right)
 - b. **Sustainability (Left)**
10. Who benefits from healthy rainforests?
 - a. **The Entire World (Down)**
 - b. No One (Right)

Rainforest Flipbook



- For a culminating activity you can have students build their own flip-book. (Utilizing previous worksheets and other resources)
- Younger students can utilize printouts from previous activities to paste onto their pages and/or have them draw their own pictures.
- Older students can be asked to provide sentences along with drawings to complete their pages.
 - Have them use critical thinking skills by asking them comprehensive questions for each section for them to relate back to what they learned in the lessons.