

LESSON 1: WHY TROPICAL RAINFORESTS ARE IMPORTANT

Lesson plan overview

This lesson examines why tropical rainforests like the Amazon and Congo Basin are so important for people and nature—from oxygen production and rainfall generation to critical carbon storage and vital natural resources, like food and medicine. Students will analyze different ecosystem services and real-world data on tree cover loss, using graphs and infographics to visualize their findings. This reinforces skills in data interpretation and reasoning, while connecting math and art to environmental science.

Educational materials

- **Videos:** ‘Why Rainforests Matter to the Whole Planet’; ‘Rainforests Around the World: From the Amazon to Australia’; ‘Ecosystem Services: The Hidden Benefits of Rainforests’
- **Worksheet:** Global rainforest map; Rainforest ecosystem services
- **Quiz:** Region matching (Amazon, Congo Basin, Southeast Asia) and multiple-choice on ecosystem services provided
- **Math tie-in:** Tracking tree loss across continents
- **Art tie-in:** Ecosystem services infographic
- **Classroom discussion questions:**
 - How are rainforests connected to ecosystems on the other side of the world?
 - What services do they provide that humans rely on?

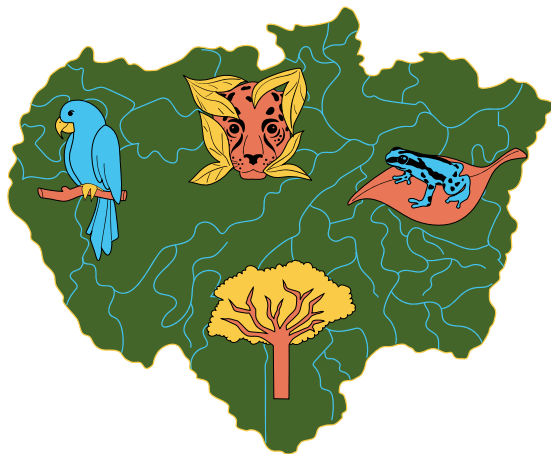
WORKSHEET: Global Rainforest Map



Name: _____ Date: _____

Instructions:

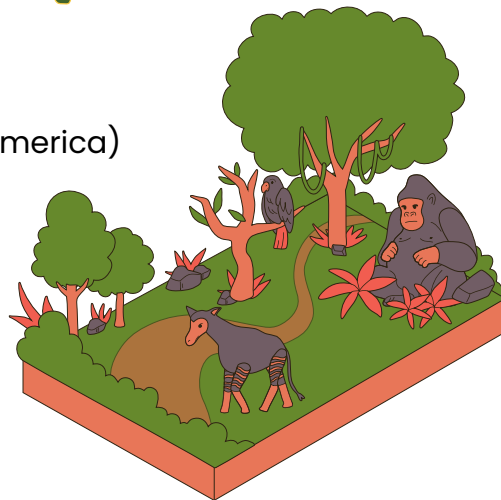
1. On the blank world map provided, color in the three largest tropical rainforest regions (outlined in grey):
 - **Amazon Basin (South America)**
 - **Congo Basin (Central Africa)**
 - **Southeast Asia (Indonesia, Malaysia, Papua New Guinea)**
2. Label each region with its name and continent.
3. Add one fact you learned about each region (e.g., Amazon = world's largest rainforest).
4. Extension (optional): Label smaller rainforest regions (e.g., Central America, Madagascar, Pacific Islands).



Amazon Basin (South America)



Southeast Asia
(Indonesia, Malaysia,
Papua New Guinea)



Congo Basin
(Central Africa)

COLOR IN AND LABEL THE GLOBAL RAINFOREST RANGE



MY RAINFOREST FUN FACTS

Amazon Basin (South America): _____

Congo Basin (Central Africa): _____

Southeast Asia (Indonesia, Malaysia, Papua New Guinea): _____

WORKSHEET: Rainforest Ecosystem Services



Name: _____ Date: _____

Part 1: Match the service

Draw a line to connect the ecosystem service with the correct description.

Oxygen production

A. Rainforests provide fruits, medicines, nuts, and timber.

Biodiversity

B. Trees release water vapor that helps create rain clouds.

Rainfall generation

C. Forests capture CO₂ and store it in trees and soil.

Carbon storage

D. Millions of plant and animal species live here.

Resources for people

E. Forests absorb carbon dioxide and release oxygen.

Part 2: Real-life examples

Circle the examples that match each service:

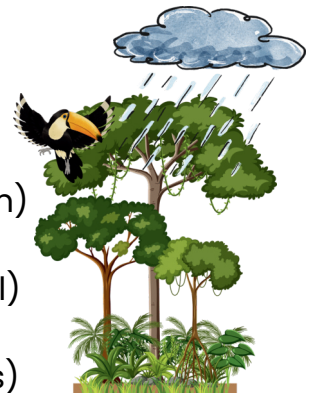
Oxygen production: (Chocolate tree / waterfall / rubber tree)

Biodiversity: (Jaguar / airplane / poison dart frog)

Rainfall generation: (Tree transpiration / rain barrel / river dam)

Carbon storage: (Living trees / plastic bag / dead leaves in soil)

Natural resources: (Bananas / penicillin from fungi / textbooks)



Part 3: Think and discuss with your classmates

- Which ecosystem service do you think humans depend on most every day?
- Which ecosystem service would you miss most if rainforests disappeared? Why?
- Can you think of an ecosystem service in your own community (outside the rainforest)?

QUIZ: Rainforests as Global Systems



Name: _____ Date: _____

Part A: Multiple choice (choose the best answer)

What percentage of Earth's surface do tropical rainforests cover?

- a) 20%
- b) 6%
- c) 12%
- d) 1%



The Amazon Basin spans how many countries?

- a) 3
- b) 5
- c) 9
- d) 12

Which of the following is an ecosystem service provided by rainforests?

- a) Plastic production
- b) Carbon storage
- c) Car manufacturing
- d) Oil drilling

What term describes the water vapor released by rainforest trees that helps generate rainfall?

- a) Condensation
- b) Precipitation
- c) Transpiration
- d) Evaporation

Which rainforest stores more carbon per hectare than the Amazon?

- a) Congo Basin
- b) Southeast Asia
- c) Central America
- d) Madagascar



Part B: Matching



Match the rainforest region to its key feature:

Amazon	A. Home to orangutans and rafflesia flowers
Congo Basin	B. World's largest rainforest, with over 400 Indigenous groups
Southeast Asia and New Guinea	C. Known for lemurs and 90% species endemism
Madagascar	D. Called Earth's "second lung," home to forest elephants

Part C: Short answer

Explain how rainforests act as part of the Earth's life-support system.

Give one example of a medicine that has come from rainforest plants and explain why biodiversity is important for future medicines.

How do rainforests help regulate global climate and rainfall patterns?

What are two human benefits of sustainable farming practices (e.g., shade-grown cocoa or coffee)?

QUIZ: ANSWER KEY



Rainforests as Global Systems

Part A: Multiple choice

- b) 6% → Rainforests cover about 6% of Earth's land surface.
- c) 9 → The Amazon Basin spans nine countries in South America.
- b) Carbon storage → An example of an ecosystem service. (Plastic production and oil drilling are human activities that harm forests.)
- c) Transpiration → The process of trees releasing water vapor that helps form clouds and rainfall.
- a) Congo Basin → The Congo Basin stores more carbon per hectare than the Amazon rainforest.

Part B: Matching

Amazon → B. World's largest rainforest, with over 400 Indigenous groups
Congo Basin → D. Called Earth's "second lung," home to forest elephants
Southeast Asia & New Guinea → A. Home to orangutans and rafflesia flowers
Madagascar → C. Known for lemurs and 90% species endemism

Part C: Short answer

Life-support system

Rainforests absorb carbon dioxide during photosynthesis and release oxygen. They help regulate the planet's atmosphere, store carbon, and maintain the balance of gases humans and animals need to survive.

Medicine example

Quinine (malaria), rosy periwinkle (cancer treatment), or curare (surgery). Biodiversity ensures new potential discoveries because each species could hold chemical compounds important for medicine.

Climate and rainfall regulation

Through transpiration, trees release water vapor that helps form clouds and rain. This influences local weather and global patterns—like the Amazon's "flying rivers" that affect rainfall in distant regions.

Benefits of sustainable farming

Protects biodiversity by maintaining tree cover.
Supports farmer livelihoods by promoting climate resilience.
Improves soil health and reduces chemical use.
Consumers get products grown in nature-friendly ways.

MATH TIE-IN



Tracking Tree Loss Across Continents

Students will analyze real-world data on tree cover loss in rainforest regions (Amazon, Congo Basin, Southeast Asia) and use graphs to visualize patterns. This reinforces skills in data interpretation, graphing, and reasoning while connecting math to environmental science.

Materials

- Dataset: Tree cover loss (in millions of hectares) over a period of years
- Graph paper or spreadsheet software (Excel, Google Sheets)
- Colored pencils or digital chart tools



Tree cover loss (in millions of hectares, 2001–2020, rounded)

Year	Amazon	Congo Basin	Southeast Asia
2005	2.5	0.8	1.2
2010	2	0.9	1.5
2015	3.1	1.2	1.9
2020	4.2	1.5	2.3



Disclaimer: Numbers are fictional and to be used only for the purpose of the student activity.

Activity steps



- Graph the data
 - Students plot bar graphs or line graphs showing tree cover loss for each region over time.
 - Use different colors for each rainforest region.
- Analyze patterns
 - Which region shows the fastest increase in loss?
 - Which region had the highest tree loss in 2020?
 - Are there periods where tree loss slowed down?
- Calculate change
 - Find the percentage increase in tree cover loss for each region from 2005 to 2020.
 - Compare the rate of increase between regions.



Discussion connection

How does tree cover loss affect the ecosystem services discussed in the video (carbon storage, rainfall, biodiversity)?

Why is math important in understanding and solving global environmental challenges?

Extension (advanced)

Students create a stacked bar chart showing total tree loss globally (adding all regions together). They can then calculate what fraction of total loss each region represents.

MATH TIE-IN (FOR TEACHERS)



Tracking Tree Loss Across Continents

A) Graphing checks

Students' line or bar graphs should show:

- Amazon Basin: down (2005→2010), then up (2010→2015→2020).
- Congo Basin: steady increase each period.
- Southeast Asia: steady increase each period.

B) Identify patterns

Which region shows the fastest increase in tree cover loss (2005→2020)?

- By percent increase: Southeast Asia (~91.7%), then Congo Basin (~87.5%), then Amazon Basin (~68.0%).
- By absolute increase: Amazon Basin (+1.7 Mha), then Southeast Asia (+1.1 Mha), then Congo Basin (+0.7 Mha).

Which region had the highest tree cover loss in 2020?

- Amazon Basin: 4.2 Mha (highest).

Any periods where loss slowed or fell?

- Amazon decreased from 2.5 → 2.0 (2005→2010).
- Congo and Southeast Asia show no declines in the provided years.

C) Percent-change calculations (2005→2020)

$$\% \text{ change} = \frac{\text{Final} - \text{Initial}}{\text{Initial}} \times 100$$

$$\text{Amazon: } (4.2 - 2.5)/2.5 \times 100 = 1.7/2.5 \times 100 = 68.0\%$$

$$\text{Congo Basin: } (1.5 - 0.8)/0.8 \times 100 = 0.7/0.8 \times 100 = 87.5\%$$

$$\text{Southeast Asia: } (2.3 - 1.2)/1.2 \times 100 = 1.1/1.2 \times 100 \approx 91.7\%$$

D) Optional: Step-by-step interval changes



Amazon:

- 2005→2010: $2.0 - 2.5 = -0.5$ (-0.5 Mha; -20.0%)
- 2010→2015: $3.1 - 2.0 = +1.1$ (+55.0%)
- 2015→2020: $4.2 - 3.1 = +1.1$ (+35.5%)

Congo Basin:

- 2005→2010: $0.9 - 0.8 = +0.1$ (+12.5%)
- 2010→2015: $1.2 - 0.9 = +0.3$ (+33.3%)
- 2015→2020: $1.5 - 1.2 = +0.3$ (+25.0%)

Southeast Asia:

- 2005→2010: $1.5 - 1.2 = +0.3$ (+25.0%)
- 2010→2015: $1.9 - 1.5 = +0.4$ (+26.7%)
- 2015→2020: $2.3 - 1.9 = +0.4$ (+21.1%)

E) Extension (stacked totals and shares)

Total tree cover loss by year (sum of three regions):

- 2005: $2.5 + 0.8 + 1.2 = 4.5$ Mha
- 2010: $2.0 + 0.9 + 1.5 = 4.4$ Mha
- 2015: $3.1 + 1.2 + 1.9 = 6.2$ Mha
- 2020: $4.2 + 1.5 + 2.3 = 8.0$ Mha

Regional share of 2020 total (8.0 Mha):

- Amazon: $4.2/8.0 = 52.5\%$
- Congo: $1.5/8.0 = 18.75\%$
- Southeast Asia: $2.3/8.0 = 28.75\%$

F) Discussion connections (sample points)

Carbon storage: Rising tree loss reduces carbon sinks, increasing atmospheric CO₂.

Rainfall and climate: Tree loss weakens transpiration and regional “moisture recycling,” destabilizing rainfall.

Biodiversity: Habitat loss accelerates species declines; undermines ecosystem resilience and potential medicines.

Human systems: Impacts on agriculture, water security, and communities in and beyond rainforest regions.

ART TIE-IN



Rainforest Ecosystem Services Infographic

Students will create a visual infographic that illustrates the “invisible services” rainforests provide to the world. This blends science with art, helping students communicate complex concepts in a clear, creative way.

Instructions

Choose your service(s)

→ Pick at least two ecosystem services from the lesson

Brainstorm visual symbols

- Carbon storage: a tree with arrows showing CO₂ moving in?
- Oxygen release: people breathing clean air?
- Biodiversity: animals and plants circling the forest?
- Rainfall generation: water vapor rising from trees forming clouds?
- Community resources: chocolate bar, banana bunch, or medicine bottle?



Design your infographic

- Use posters or digital tools (like Canva or Google Slides).
- Include labels, arrows, or captions that explain what each part represents.
- Be colorful and creative! Use collage, drawings, or even mixed media if you'd like.
- Add a message!
 - At the bottom, write a one-sentence advocacy statement such as:
“Rainforests support life around the world—protect them, protect us.”

Extensions

Group project option: Create a mural where each student contributes one ecosystem service, forming a giant “rainforest services map.”

Class display: Hang infographics around the room as an “ecosystem services gallery.”