Climate Conference: The Deforestation Balancing Act Teaching Controversial Subjects in Geography

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Overview: The objective of the lesson is to examine the evidence linking deforestation to the controversial topic of climate change. Using the essential question, students will demonstrate an understanding of the causes of deforestation, including its role in global climate changes of the present and future. Students will conclude their investigations in a simulated climate conference, during which they will utilize geographic information and facts to support their views toward this controversial topic.

Essential Question:
How do we balance the needs of human development and preservation of the natural environment?

Supporting Question:
Why should sustainable use of the world's natural forests be accomplished?

Grade Level: 6th or 7th grade Middle School Geography classrooms;
(adaptable for upper elementary grade 4)

National Geographic Standards:

1. How to Use Maps and Other Geographic Representations, Tools, and Technologies to Acquire, Process, and Report Information from a Spatial Perspective.
3. How to analyze the spatial organization of people, places, and environments on Earth's surface.
9. The Physical Processes That Shape the Patterns of Earth's Surface.
14. How Human Actions Modify the Physical Environment.
15. How Physical Systems Affect Human Systems.
17. How to apply geography to interpret the past.
18. How to apply geography to interpret the present and plan for the future.

2012 Oklahoma Academic Standards for Social Studies	2019 Oklahoma Academic Standards for Social Studies
Literacy Skills Standard 1: The student will develop and demonstrate Common Core Social Studies reading literacy skills.	Social Studies Practices Standard 4: Read Critically and Interpret Informational Sources - Students will engage in critical, active reading of grade-level appropriate primary and secondary sources related to key social studies concepts, including frequent analysis and interpretation of informational sources.
A. 1. Cite specific textual evidence to support analysis of primary and secondary sources.	**4.A.** Students will comprehend, evaluate, and synthesize textual sources to acquire and refine knowledge in the social studies.
2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.	**3.A.6-8.3** Use multiple historical or contemporary primary sources to identify further areas of inquiry and additional relevant sources.
3 Identify key steps in a text's description of a process related to history/social studies.	**4.A.6-8.1** Paraphrase the main idea and cite evidence from primary and secondary sources;

	provide an accurate summary of a source distinct from prior knowledge or opinion.
Content Standard 5: The student will analyze the interactions of humans and their environment.	**6.4** The student will analyze the interactions of humans and their environment in the Western Hemisphere. **7.4** The student will analyze the interactions of humans and their environment in the Eastern Hemisphere.
2 Evaluate the effects of human modification of and adaptation to the natural environment.	**6.4.1** Describe the commercial agriculture and industrial regions that support human development. **6.4.2** Evaluate the effects of human modification on the natural environment through transformation caused by subsistence and commercial agriculture, industry, demand for energy, and urbanization. **7.4.4** Evaluate the effects of human modification of and adaptation to the natural environment through transformation caused by agriculture, the use of modern irrigation methods, industry, demand for energy, and urbanization.
3 Integrate visual information to analyze regional problems and policies having spatial dimensions.	**2.B.6-8.1** Draw upon gathered information to analyze how a specific problem can manifest itself in local, regional, and global levels over time, evaluating options for individual and collective solutions.

Five Themes of Geography:

Place, Human-Environment-Interaction, Movement, Region

Resources Needed:

Greenpeace Save the Rainforest Contest student poster
(one copy per pair of students or displayed digitally for whole-class viewing)
Five Themes of Geography Poster Analysis Guide (one copy per pair of students)
Landsat Images Comparison Photographs of Rondonia, Brazil (Amazon rainforest)
(one copy per pair of students or digital version for student mobile devices) Deforestation
Esri Story Map
https://www.arcgis.com/apps/MapSeries/index.html?appid=ba94f52f938d42e79046090088894834
Climate Conference Readings: (one set per group of four students)
Deforestation and Climate, Earth Day Network
A Breathing Planet Off Balance, NASA Earth Science Team
Modern-Day Plague, National Geographic Society
Tropical Deforestation and Global Warming, Union of Concerned Scientists
Infographic Samples (digital display for whole-class viewing)
Infographics Guidelines handout (one per student; can be reused for multiple classes)

Poster Paper and Markers; Option- Student mobile devices, internet access to free Infographic Apps such as Picktochart (https://piktochart.com/formats/infographics/), Venngage (https://venngage.com/) or Canva (https://www.canva.com/create/infographics/)

Livebinder of Lesson Components online at http://www.livebinders.com/play/play?id=2426719

Time Frame: 2-3 class periods

Procedures:

Engage-

1. Inform students that they will be investigating a topic of discussion and debate globally, one in which they may have heard about in the news. Without announcing the topic, ask students to work in pairs to discover the topic of study. Provide each pair of students with a copy of the Greenpeace student poster, drawing student attention to what this document is, who created it, and why it might have been created. Using the Five Themes of Geography Poster Analysis Guide, allow pairs time to examine the poster, noting their observations and conclusions on the guide. Encourage students to briefly share what they believe will be the topic for study, based on the poster.
2. Introduce the essential and supporting question to the class. Post the questions in a prominent place of the classroom and ask students to keep these questions in mind during the lesson in order to focus their investigations and conclusions.

Explore-

3. Explain to the class that they will be using satellite imagery of the Earth's surface to begin their investigations of the topic of deforestation. Provide each pair of students with a colored copy of the region known as Rondonia, located within the nation of Brazil and within the Amazon rainforest. (A digital version of the satellite images can be used for whole class viewing, if needed, or distributed to student mobile devices.
4. Provide five minutes for student pairs to compare the two images and discuss their observations. Develop a classroom list to note observations during a whole-class sharing session of approximately five minutes. Guide the sharing session using the following key questions:

A. What type of physical environment can be observed? How do you know?
B. What signs of human activities can be observed? Identify the clues.
C. What changes have occurred over time? Why did such changed occur?

Explain-

5. Using the Deforestation Esri Story Map developed for this lesson, conduct a whole-class instruction of the causes and impact of deforestation in various locations globally. Begin with clearly defining deforestation and identifying the multiple human needs being met by natural forests, both locally and through international markets for forest-related products. Continue instruction by exploring the Story Map's videoclips, maps, and charts, interacting with students and informally assessing understanding through this guided learning process. Option: Use only selected case studies of deforestation found in the Story Map, if desired, which relate to a specific course of study. (Case studies include deforestation examples in the Amazon and Congo River Basins, Indonesia, Madagascar, eastern Australia, and Mexico.)
6. Ask students to return their attention to the essential question. Ask students to respond by writing a brief paragraph, using information they have learned from the Story Map. Provide time, if desired, for students to read their paragraphs to the class.

Expand-

7. Inform students that they will be delving deeper into the topic of deforestation to gain a deeper understanding of the connection deforestation has to the global events of climate change. Divide the class into four groups. Each group will represent one of four key organizations who help research

deforestation and climate change, inform the public, and influence decision-makers about future policy toward environmental issues. Groups will be labeled according to the organizations they will represent: A. NASA, B. National Geographic Society, C. Union of Concerned Scientists, and D. Earth Day Network.

8. Provide each group member with a copy of reading articles summarizing their respective group's stance toward deforestation and climate change. Provide approximately ten minutes for groups to read their article and discuss the information found within the article. Groups will use the information in a simulated climate change conference. Ask students to revisit the essential and supporting questions. How would their respective organization respond to these questions?
9. Inform students that they will now assume the role of members of their respective organizations in order to conduct a simulated Climate Change Conference. Each group will designate two representatives to serve on an expert panel. Arrange the classroom into two circles of desks, if possible. The expert panel will be seated in an "inner circle" of eight desks, with remaining group members seated in an "outer circle" of desks. Allow each of the members of the expert panel one minute to announce the organization he/she represents and summarize its stance toward the causes, effects, and/or solutions of deforestation.
10. Assign one student (Option: Instructor) to serve as the conference chair. The conference chair will keep order during the panel discussion and encourage participation by all conference participants. Following the initial introductory statements made by the expert panel, the "outer circle" will be provided ten minutes to engage with the expert panel. The role of the "outer circle" of conference participants is to ask questions of the inner circle in order to elicit additional information from the experts.

Evaluate-

11. Return student attention to the poster created by an elementary student for an international Greenpeace poster contest. Ask students if they have heard the term "infographic" used to describe certain types of posters. What might be the goal of an "infographic?" Have they seen any posters in their community or in magazines which they might identify as an "infographic?" Display the two samples of infographics. Ask students to try to define the purposes of an infographic, based on the samples provided. What features do these two infographics share? What makes an infographic similar and different from the student's contest poster?
12. Student learning will be assessed through the creation of individual infographics about deforestation and its role in climate change. Use the Infographics Guidelines handout to clarify the expectations of the assessment.
13. Provide large paper and colored markers for students to produce their infographics. Option: Students make create digital infographics using one of the free recommended programs listed in the resources of this lesson. Encourage students to display their infographics in the classroom or through online publication.

Extension for Enrichment:

1. Encourage students to learn about the United Nations' Climate Change Conferences by exploring the website https://unfccc.int/. What is the goal of the conferences? What have been some of the accomplishments and agreements made among member nations?
2. Read the special section dedicated to land use and research being done regarding the "greenhouse effect" at https://unfccc.int/topics/land-use/the-big-picture/introduction-to-land-use. Do these findings support the research provided from the Deforestation Story Map? What additional information do these findings offer?
3. Watch the video (https://unfccc.int/climate-action/momentum-for-change) about a special project sponsored by the U.N. Climate Change Conference, known as the "Momentum for Change". Write an

editorial to the General Secretary of the United Nations, explaining your views toward the effectiveness of such projects in meeting the goals of sustainable use of the Earth's natural resources.

Sources:

USGS Earth Shots, https://earthshots.usgs.gov/earthshots/

NASA Earth Observatory,
https://earthobservatory.nasa.gov/Features/Deforestation/deforestation_update3.php
https://earthobservatory.nasa.gov/images/79276/deforestation-in-the-democratic-republic-of-thecongo

Earth Day Network, https://www.earthday.org/

National Geographic Society,
https://www.nationalgeographic.com/environment/global-warming/deforestation/
https://www.youtube.com/watch?v=Ic-J6hcSKa8

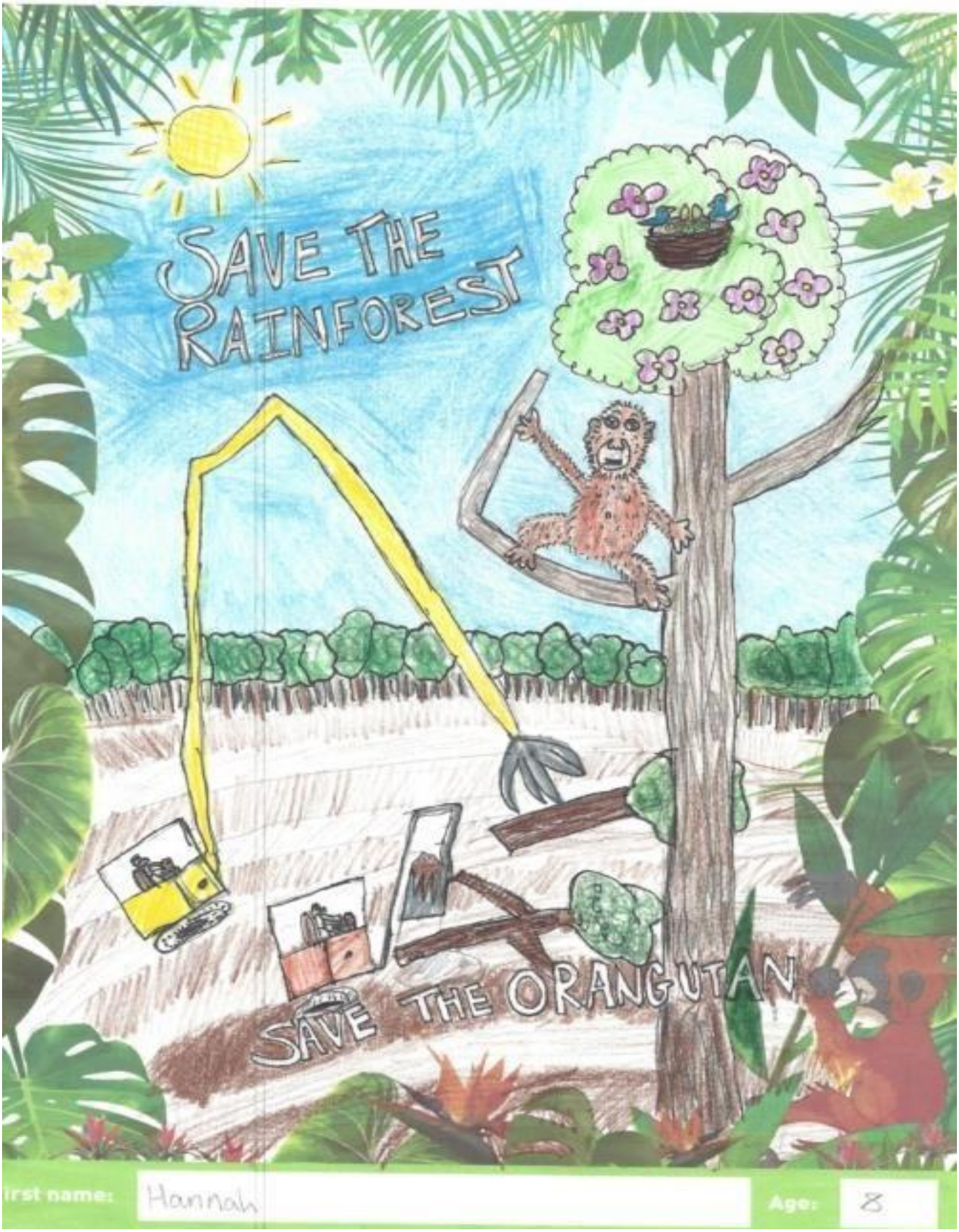
Union of Concerned Scientists, https://www.ucsusa.org/global-warming/

World Wildlife Fund,
http://www.abc.net.au/btn/story/s4682056.htm
https://youtu.be/Ap27y4QFyY4

Greenpeace, https://www.greenpeace.org/usa/forests/indonesia/

Wochit News, https://youtu.be/kqKZ9ZuJgAA

Afronline The Voice of Africa, https://youtu.be/mLtCX88jaCU



Source: Thorntree Primary School, Charlton, UK, Student Poster Contest, sponsored by Greenpeace, 2018.

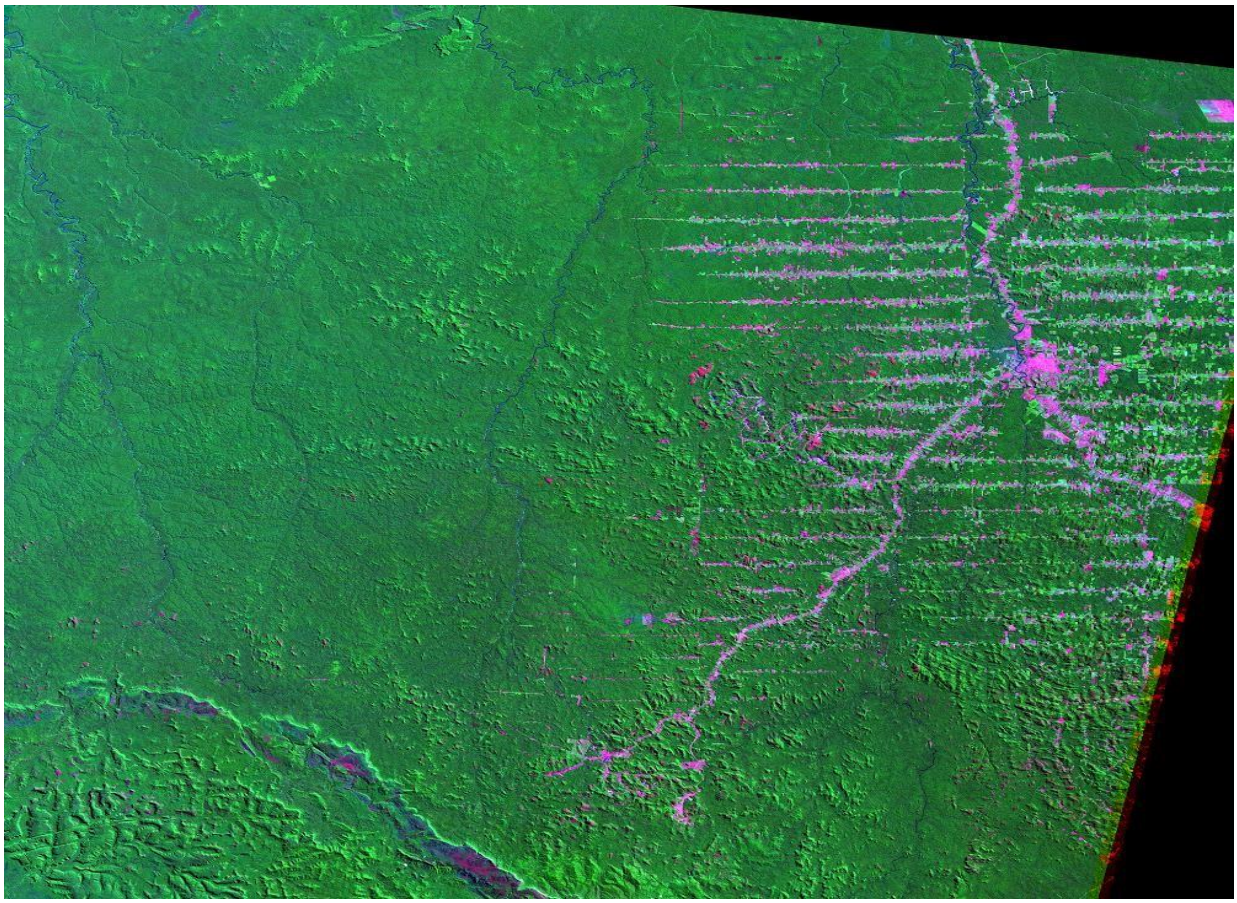
Five Themes of Geography: What Do I See?

Use your skills of observation and drawing conclusions to analyze the poster.

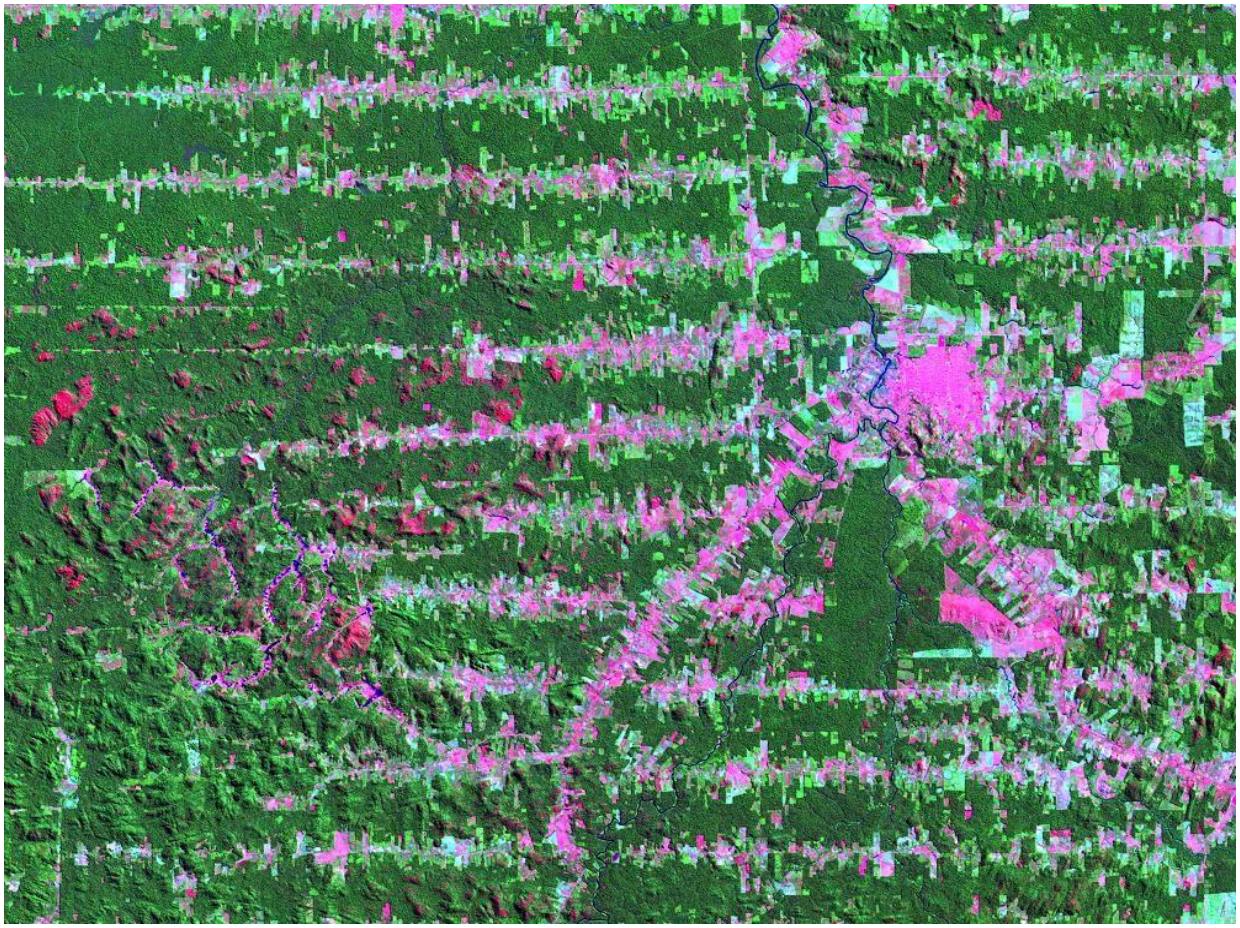
Place: *Describe the physical features of this place.*	Human-Environment-Interaction: *Describe how humans are adapting or modifying this place.*
Movement: *Describe the transportation of people, products, ideas, or technology occurring.*	Region: *Explain how this place is culturally or economically similar to other places.*

Location:

Based on your observations, where do you think the activities in this picture are occurring?



Landsat Image, July, 1986



Landsat Image, June, 1992

Climate Change Conference: NASA Scientists

Earth's oceans and land cover are doing us a favor. Half of the carbon dioxide released is removed from the air by the planet's vegetation ecosystems. As carbon dioxide levels in the atmosphere continue their rapid rise, NASA scientists are confronted with an important question for the future of our planet: How long can this balancing act continue? What does that mean for the pace of climate change in the coming century?

These questions are a major priority for NASA's Earth science research program, and the agency is preparing to ramp up its satellite monitoring to help answer them. NASA's Earth Science program works to improve our understanding of how carbon processes work in nature and how they could change in a warming world with increasing levels of emissions from human activities.

Carbon naturally cycles through Earth's environments. Trees and other plants take up carbon dioxide and turn it into the building blocks of roots, stems and leaves. For most of human history, carbon has been in a more or less steady cycle. This cycle has been thrown off balance as forests are cleared and soils are turned for agriculture. This deforestation contributes to increasing carbon emissions.

More carbon dioxide in the air means warmer global temperatures. An even more imbalanced carbon cycle will cause greater variability and consequences that are not yet fully understood. In some regions, forests are releasing more carbon than they're storing. Satellite images have also documented the transition of green, healthy forests through land clearing. This can flip the balance for forests from overall absorbers of carbon to an overall emitters of greenhouse gas.

Ultimately the goal of all of this work is to be able to predict what's going to happen with the carbon cycle. We need to know how that's going to change in the future."

Source: A Breathing Planet, Off Balance, by Kate Ramsayer, NASA's Goddard Space Flight Center, and Carol Rasmussen, NASA's Earth Science News Team, November, 2015

Climate Change Conference: National Geographic Society

Deforestation is clearing Earth's forests on a massive scale, often resulting in damage to the quality of the land. Forests still cover about 30 percent of the world's land area, but swaths half the size of England are lost each year. The world's rain forests could completely vanish in a hundred years at the current rate of deforestation.

The biggest driver of deforestation is agriculture. Farmers cut forests to provide more room for planting crops or grazing livestock. Often, small farmers will clear a few acres by cutting down trees and burning them in a process known as slash and burn agriculture.

Logging operations, which provide the world's wood and paper products, also cut countless trees each year. Forests are also cut as a result of growing urban sprawl as land is developed for dwellings. Not all deforestation is intentional. Some is caused by a combination of human and natural factors like wildfires.

Deforestation drives climate change. Trees help support the water cycle by returning water vapor to the atmosphere. Without trees to fill these roles, many former forest lands can quickly become barren deserts.

Removing trees deprives the forest of portions of its canopy, which blocks the sun's rays during the day, and holds in heat at night. This disruption leads to more extreme temperature swings that can be harmful.

Trees also play a critical role in absorbing the greenhouse gases that fuel global warming. Fewer forests means larger amounts of greenhouse gases entering the atmosphere.

The most feasible solution to deforestation is to carefully manage forest resources by eliminating clear-cutting to make sure forest environments remain intact. The cutting that does occur should be balanced by planting young trees to replace older trees felled. The number of new tree plantations is growing each year, but their total still equals a tiny fraction of the Earth's forested land.

Source: Modern-Day Plague, National Geographic Reference, 2018

Climate Change Conference: Earth Day Network

Deforestation is the second leading cause of global warming and produces about 24% of global greenhouse gas emissions. Some scientists say that deforestation of tropical rainforests adds more carbon dioxide to the atmosphere than the sum total of all the cars and trucks on the world's roads. Combatting deforestation has been identified as one of the most promising and cost-effective ways to lower emissions.

Reductions in the rate of deforestation have multiple benefits such as avoiding a huge source of carbon emissions. Globally, around 350 million people reside close to or within forests and rely on forests for their food and livelihood. Almost 60 million people, especially those living in indigenous communities, are entirely dependent on forests.

The Paris Climate Agreement in 2016 was the first time reducing deforestation and promoting forest conservation was prominently included in a global climate agreement. Now, the future is brighter for forests and their potential role in climate balance. New funding is coming in, the guidelines are clear, and governments and the scientific community are slowly closing the data gaps that have presented hurdles in the past. Countries finally have the resources they need to ramp up action on forests and reach a net-zero emissions goal in the second half of this century.

What can we do? Leave forests standing. Plant more trees. Reduce use of products made from trees including paper and cardboard.

Source: Deforestation and Climate Change, Earth Day Network, 2018

Climate Change Conference: Union of Concerned Scientists

Tropical forest trees, like all green plants, take in carbon dioxide and release oxygen during photosynthesis. When trees are cut down and burned, their stored carbon is released into the air as carbon dioxide. And this is how deforestation and forest degradation contribute to global warming.

Why does deforestation occur? Forests are cleared to make way for any of a long list of agricultural products and other human activities. But UCS analysis shows that a majority of tropical deforestation occurring today can be traced to just four globally traded commodities: beef, soybeans, palm oil, and wood products.

We need to protect tropical forests from deforestation and degradation if we want to reduce emissions to the levels needed to protect the planet against the worst global warming impacts. Ending deforestation will not solve global warming by itself, of course—urgent action is needed to cut the other 90 percent of emissions. But the problem cannot be solved if the role of tropical deforestation is ignored.

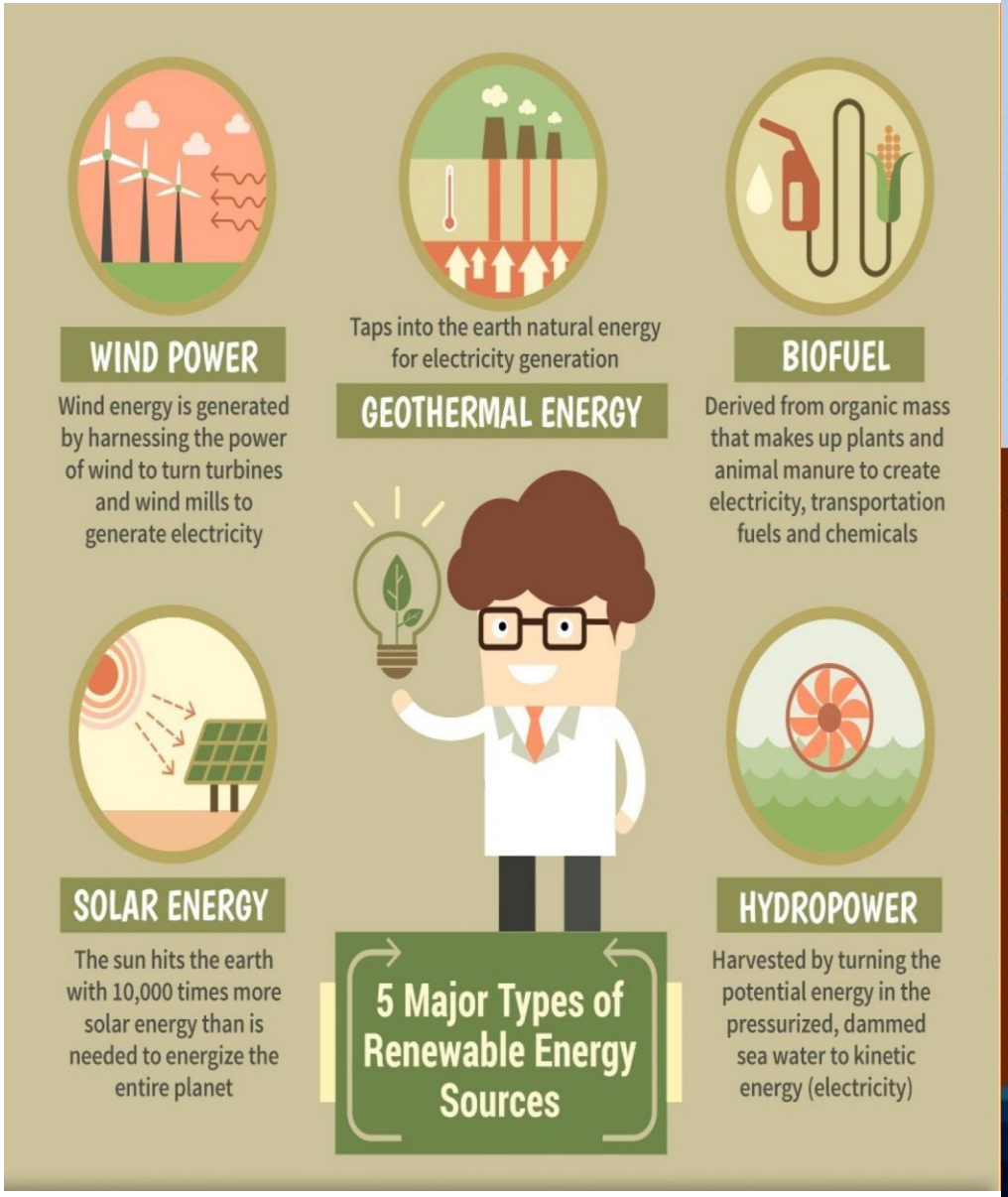
And reducing deforestation has other benefits. Tropical forests are home to many unique species of animals and plants. Tropical forests are crucial sources of food, medicine, and clean drinking water for people in developing countries. Tropical forests help regulate regional rainfall and prevent both floods and droughts. Reducing deforestation is not only a beneficial action against climate change—it also can make important contributions to saving biodiversity and supporting sustainable development.

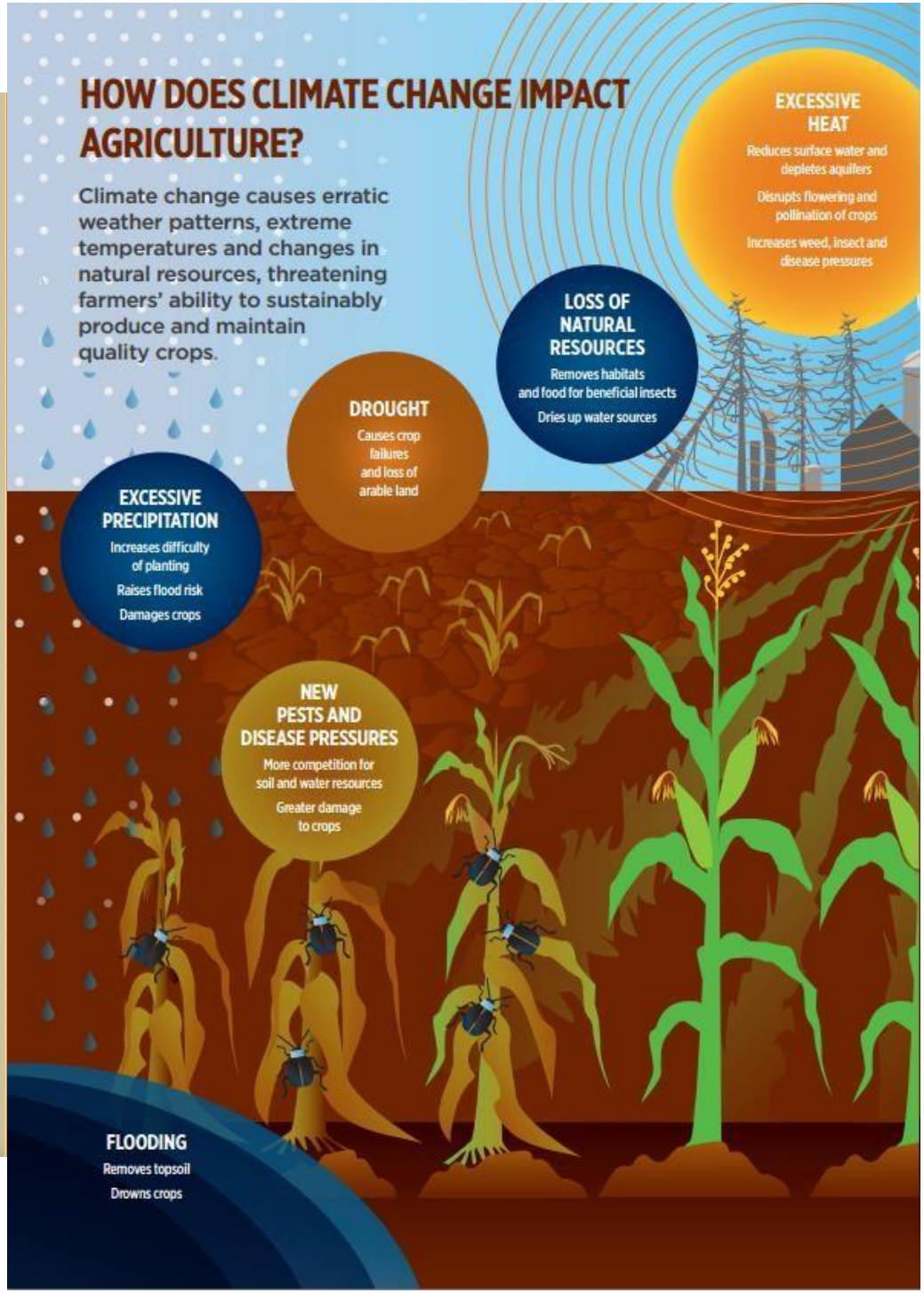
The good news is that tropical deforestation can be reduced—and, in many places, already is being reduced. A variety of approaches have shown promising results. Continuing progress will require a sustained commitment by governments, businesses, and consumers to the goal of ending—and, where possible, reversing—tropical deforestation.

Union of Concerned Scientists
Science for a Healthy Planet and Safer World

Source: Tropical Deforestation and Global Warming, by the Union of Concerned Scientists, 2018

Sample Infographics:





WHAT IS AN INFOGRAPHIC?

Information graphics or "infographics" are visual representations of information. These graphics are used where complex information needs to be explained quickly and clearly.

GUIDELINES for CREATING Your Own INFOGRAPHIC:

- Include a minimum of three key facts about the topic you have been investigating.
- Use one type of visual (drawing, icon, photograph, map, or graph) to illustrate each key fact.
- Include your own opinion or point of view toward the topic.
- Provide a clever or memorable title for the Infographic.
- Use colors and design layout effectively to help others understand your topic.
- List the sources used for the key facts at the bottom of the Infographic.