One Mouthful at a Time: How Forest Elephants Fight Climate Change

Grades: 8-12th

Issue or Problem: Elephants are known as a keystone species, they have a large effect on their environment and impact the biodiversity surrounding them. Recent research shows that the forest elephants of Africa provide unique ecosystem services that help mitigate climate change. However, Africa's forest elephants are under constant threat from poaching and their numbers have been declining along with other African and Asian elephants. On top of this elephants, are impacted by habitat destruction and like humans, or impacted by climate change.

Objectives: By the end of the lesson, students will:

- Explore aspects of the global carbon cycle and how trees contribute to carbon sequestration.
- Increase critical thinking skills.
- Gain newspaper article literacy by reading several newspaper articles and dissecting them.
- Be empowered to teach others about elephants and issues they face through persuasive (Op-Ed) writing.
- Actively engage in raising awareness for the protection of Africa's forest elephants and other elephants around the world.

Background Information for Teachers:

The African forest elephant is one of two elephant subspecies that is found on the continent of Africa. The other is the larger African savannah or bush elephant and the two subspecies look very similar and until recently they were considered to be the same species. The African savannah elephant is mainly found in the plains and grasslands of central and southern Africa while the African forest elephant mainly lives in the tropical dense jungles of central Africa's forests where their smaller size allows them to move through the thick vegetation more easily. Forest elephants have rounder ears and straighter tusks than the savannah elephant and has a different number of toenails (like the Asian elephant the African forest elephant has 5 toenails on the front feet and 4 on the back while savannah elephants have 4 sometimes 5 on the front feet and only 3 on the back). Deforestation in the habitat of the forest elephant means it loses both food and shelter making them increasingly vulnerable and are listed on the Endangered Species List.

Forest elephants like other elephants provide several positive benefits in their environment. When forest elephants eat, they create openings in the vegetation allowing new plants to grow. This also creates pathways for other smaller animals to move easily in the forest. Elephants are also a major way that seeds are dispersed, and some tree species rely entirely upon the elephants for seed dispersal. However, recent research has shown that African forest elephants also help with climate mitigation, efforts to reduce or prevent emission of greenhouse gases, by promoting the growth of large trees that excel at storing carbon. Forest elephants prefer to eat softwood trees that tend to grow faster and as they move and feed in the forests they knock down trees with a diameter of 12 inches or less. These two behaviors help to clear the understory of vegetation resulting in an ecosystem that favors the large, slow-growing hardwood trees that store significantly more carbon than the smaller softwood trees. There are less than 100,000 forest elephants left in Africa with 60% of them living in the country of

Gabon in Central Africa. The illegal killing of elephants for the ivory trade is the principle threat in the region. Forest elephants provide a unique ecosystem service, a positive benefit that wildlife or ecosystems provide to people, by the way they eat and move through the forest. If forest elephants go extinct, not only will we lose one of the world's most charismatic and majestic species, but it is expected that Africa's vast rain forest (second in size only to the Amazon's) will increasingly lose the ability to sequester carbon. This loss will not only impact African elephants but will impact the rest of the world's elephants and humans as well.

Note to teachers: Students should have an understanding of the following principles:

- *"Carbon is an abundant element that is necessary for life on Earth. The carbon cycle is the exchange of carbon between all of the Earth's components- the atmosphere, oceans and rivers, rocks and sediments and living things. The processes of photosynthesis and respiration are the basis of the carbon cycle. In photosynthesis, plants use energy from the sun and carbon dioxide (CO2) gas from the atmosphere to create carbohydrates (sugars) and oxygen (O2). Carbohydrates are then sequestered in their leaves, stems and roots as plants live and grow.*
- *The greenhouse effect is a process that occurs when gases in Earth's atmosphere trap the Sun's heat. This process makes Earth much warmer than it would be without an atmosphere. The greenhouse effect is one of the things that makes Earth habitable. Carbon dioxide is a major greenhouse gas.*
- *When we burn fossil fuels like coal and gas, we pump more and more carbon dioxide into the atmosphere, and this build-up creates a blanket effect, trapping in heat around the world. This blanket effect leads to the warming of the planet, and the atmospheric balance that keeps the climate stable is disrupted. Climate change is affecting all life on Earth including elephants and humans.*
- *Carbon sequestration, the process where CO2 is pulled from the atmosphere and stored for a long period of time, may be one way to slow or reverse the accumulation of CO2 in the atmosphere. Forests sequester large amounts of CO2.*

This lesson contains fact sheets for the Carbon Cycle, Carbon Sequestration and Climate Change that can be used by students if needed with additional background information resources noted in the lesson plan resource section.

***Materials*:** **All student reading articles are found online or in the Student Reading PDF attached to this lesson. **

- ✓ Online access to https://www.awf.org/wildlife-conservation/forest-elephant or printed copies of AWF Forest Elephant 101 PDF.
- ✓ PPT- Forests as Carbon Sinks. *If you prefer you could use this as student reading homework "Forests as Carbon Sinks" by Loose Leaf, the official blog of American Forests, also included in the student readings.* https://www.americanforests.org/blog/forests-carbon-sinks/
- ✓ Copies of the following articles for student groups:
    - The Thick Gray Line https://www.nytimes.com/2019/08/19/science/elephants-climate-change.html

- Loss of Forest Elephant May Make Earth 'less Inhabitable for Humans https://news.mongabay.com/2018/10/loss-of-forest-elephant-may-make-earth-less-inhabitable-for-humans/
- Forest Elephants are Allies in the Fight Against Climate Change https://theconversation.com/forest-elephants-are-our-allies-in-the-fight-against-climate-change-finds-research-120440
- African Forest Elephants Fight Climate Change—But they Need Our Help https://www.peacefuldumpling.com/african-forest-elephants-fight-climate-change
- Why Forest Elephant Extinction Will Make Climate Change Worse https://www.weforum.org/agenda/2019/08/elephants-fight-climate-change

- ✓ Strategy of Understanding Newspaper Articles (attached at the end of this lesson)
- ✓ Graphic Organizer for Newspaper Articles (attached at the end of this lesson)
- ✓ How to write an Op-ed pdf (also found in the resources) https://shorensteincenter.org/wp-content/uploads/2012/07/HO_NEW_HOW-TO-WRITE-AN-OPED-OR-COLUMN.pdf
- ✓ Student reading ***Cynicism Sells*** by Teaghan Duff
- ✓ Copies of Guide to Persuasive Writing Activity Sheet for each student (attached at the end of the lesson)

Activities:

Activity 1: What and Where are the Forest Elephants

1. Ask your students to name the species of elephant found around the world. If they only come up with Asian and African elephants explain that scientists now believe there are two subspecies of African elephants the Savannah or Bush elephant and the Forest elephant. Communicate to your students that they will be learning about African forest elephants and the role they play in helping to combat climate change.
2. If you have online access pull up https://www.awf.org/wildlife-conservation/forest-elephant and walk your students through this page together as a large group or have them review the site in small groups. If you don't have online access, pass out the AWF Forest Elephant 101 PDF which contains the same information as the web page.
3. After reviewing the information, ask your students what they learned about forest elephants. Ask your students to brain storm ways in which forest elephants may help combat climate change. Record their answers. Explain to your students that to fully understand how forest elephants help combat climate change they will need to understand how forests sequester carbon.

Activity 2: Forests as Carbon Sinks- *(students will work in small groups for this activity)*

1. Write the following words on the board: Mitigation, Adaptation, Greenhouse Gas, Sequestration, Biomass, Carbon Sink. Having your students work in small groups have them research and create a definition for each of the words. After each group has finished their

research and written their definitions, have them share out their definitions to the larger group. Discussion should follow until the class agrees on a definition for each word.

2. Share with your students the PPT-Forests as Carbon Sinks. *If you prefer you can have your students read the article as homework the night before.* https://www.americanforests.org/blog/forests-carbon-sinks/
3. Review with your students how forests act as carbon sinks
4. Discuss with your students the following question: What could be done to help increase natural carbon sinks?
    a. Ideas include: – Planting trees – Slowing deforestation – Adopting better agricultural practices – Gaining more knowledge about how to protect and enhance carbon sinks—protecting the African forest elephant.

Activity 3: Forest Elephants and Climate Change: The News

1. Now that your students have learned about African forest elephants and understand carbon sinks, it's time to review some newspaper articles that discuss how forest elephant behavior helps fight climate change based on a new scientific study on African forest elephants.
2. Ask your students the following questions:
    a. How many of you have read a newspaper or news magazine article (either in a physical newspaper/news magazine or online) in the last month? Last week?
    b. What did they read about? If they haven't read a newspaper article why not?
    c. Why do some people believe that newspapers are important to society?
3. Explain to your students that newspapers are a major resource for keeping citizens informed on local, national, and world issues. Newspaper articles are meant to be read with efficiency, so they follow a style that is sometimes called an "inverted pyramid."
4. Let them know that they will be dissecting newspaper articles as they review articles written on African forest elephants and how they help fight climate change.
5. Working back in their small groups, pass out a copy of each of the five articles (or however many you choose to use) to each group. Then pass out a copy of the Graphic Organizer for Newspaper Articles to each student.
6. Review the Strategy of Understanding Newspaper Articles (found in the materials list of this lesson) with your students. You may choose to use one of the articles included to review with the entire class first depending on grade level and level of understanding.
7. Working in their groups have each student read their article and fill in the Graphic Organizer. When each of them is done with their article. Have them share within their group the following questions.
    a. What type of lead did your article use? Were there items that were in one article that weren't in others? Did some articles have more quoted sources than others? Was the tone of each articles the same? Did some articles have more details than others? If so, why do you think this was?
    b. After they discuss in small groups you may want to have them discuss as a large group adding additional questions such as what did you learn from the article? Did the article make you want to learn more? Did any of the articles leave you with unanswered questions? Etc.

Activity 4: Op-Ed Writing

1. Write the following prompt on the board: *Think of examples from your life when it was important to clearly state an opinion and support it with facts, reasons and examples.*
2. Have your students write down their examples. When they are finished writing a couple of examples have a short discussion about the prompt. Ask your students to:
    a. Share some examples they recorded
    b. Explain why it is important to be able to clearly state an opinion
    c. Explain why it is necessary to support an opinion with facts, reasons and examples
3. Ask your students if they know what an Op-ed is? Pass out the Guide to Persuasive Writing Activity Sheet. Review the editorial **Cynicism Sells** by 16 year old Teaghan Duff. Have your students answer the questions in Part 1 of the Guide to Persuasive Writing Activity Sheet. Have your students share some of their answers.
4. Explain to you students they will be writing their own Op-Ed piece on elephants with the intention of getting their editorial printed in the school or local newspaper.
5. Have students visit https://elephanatics.org/ to kick off their research to come up with their Op-Ed topic if they don't already have one (there are a number of articles on the education page). Have students research their topic and fill out Part 2 of the Guide to Persuasive Writing Activity Sheet. Additional research websites are found in the resource section of this lesson plan.
6. Have students write their Op-Ed. There is an optional grading rubric in the persuasive writing resource section of this lesson plan.

Additional Activities:

- Have your students participate in fundraising for an organization that helps to protect African or Asian elephants in their habitats. Ideas can be found at www.elephanatics.org They could choose to adopt an elephant through an organization such as The David Sheldrick Wildlife Trust or donate their funds to a place like The Elephant Nature Park or Boon Lott's Elephant Sanctuary.
- Have your students participate in a local tree planting
    - You can get free trees through the Arbor Tree Foundation (US) https://www.arborday.org/
    - You can order trees through https://treecanada.ca/ (Canada)
    - Or contact a local nursery or environmental center
- Have students read- Smithsonian Global *Student Citizen Scientists Track Climate Change in the Forests of Gabon* and discuss the work the students are doing.
- What Do Trees Have to Do with Climate Change Lesson Plan Students measure leafed out deciduous trees and estimate carbon storage. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5108749.pdf

Resources:

Forest Elephants:

- African Wildlife Foundation: https://www.awf.org/wildlife-conservation/forest-elephant
- World Wildlife Fund: https://www.worldwildlife.org/species/forest-elephant
- Wildlife Conservation Society: https://congo.wcs.org/Wildlife/Forest-Elephant.aspx
- The Forest Elephants video: https://www.youtube.com/watch?v=TzBYT79-oPE

Climate Change:

- Essential Information for Educators: http://www.nea.org/climatechange
- Frequently Asked Questions about Global Warming and Climate Change, Back to Basics: https://www.pacificclimatechange.net/sites/default/files/documents/Climate_Basics.pdf

Carbon Cycle and Sequestration:

- NASA video: The Carbon Cycle-Essential for Life on Earth https://www.youtube.com/watch?v=hgFpvDNfXOk
- Natural Resources Canada-Forest Carbon: https://www.nrcan.gc.ca/climate-change/impacts-adaptations/climate-change-impacts-forests/forest-carbon/13085
- Forests as Carbon Sinks: https://www.americanforests.org/blog/forests-carbon-sinks/ (easy to digest overview)
- Canadian Council of Forest Ministers Fact Sheet- Canada's forests: CO2 Sink or Source? https://www.sfmcanada.org/images/Publications/EN/C02_Sink_EN.pdf

Persuasive writing:

- NOW Classroom Persuasive Writing: Take a Stand Lesson http://www.pbs.org/now/classroom/lessonplan-04.html
- Writing the Persuasive Essay PDF https://1.cdn.edl.io/dcK2wWL8OtnuxUJxjWa28KTXv4WFT1CpvFdiHeJIshvuy6p5.pdf
- How to Write and Op Ed or Column https://projects.iq.harvard.edu/files/hks-communications-program/files/new_seglin_how_to_write_an_oped_1_25_17_7.pdf
- An Op-Ed Grading Rubric https://www.nactateachers.org/images/TeachingTips/An_Op-Ed_Grading_Rubric_-_Improving_Student_Output_and_Professor_Happiness.pdf

Elephants: The following organizations are helping to protect elephants for future generations. You can learn more about the issues facing Asian and African elephants, and how you can help, by visiting their websites.

Elephanatics: https://elephanatics.org
Mara Elephant Project: www.maraelephantproject.com
IFAW: http://www.ifaw.org/united-states
The David Sheldrick Wildlife Trust: http://www.sheldrickwildlifetrust.org/
The Northern Rangeland Trust: http://www.nrt-kenya.org/
Elemotion: http://www.elemotion.org/elephant-tourism/

Eleaid Asian Elephant Conservation Charity: http://www.eleaid.com/
Elephant Asia Rescue and Survival Foundation (EARS): www.earsasia.org
Elephant Voices: https://www.elephantvoices.org/
Save Elephant Foundation: http://www.saveelephant.org/
International Elephant Foundation: https://elephantconservation.org/
WildlifeDirect: http://wildlifedirect.org
Tsavo Trust: http://tsavotrust.org/
Save the Elephants: http://www.savetheelephants.org/
Elephant Voices: https://www.elephantvoices.org/

Activity 3 adapted from "Strengthen Newspaper Literacy with this Sample teaching Strategy"
https://inservice.ascd.org/strengthen-newspaper-literacy-with-this-sample-teaching-strategy/
Activity 4 adapted from NOW Classroom's Persuasive Writing: Take a Stand
http://www.pbs.org/now/classroom/lessonplan-04.html

Teacher Info: Information for Activity 3

Strategy of Understanding Newspaper Articles

Step 1: Explain that each newspaper article begins with a "lead" that grabs the reader's attention and could be one of several types. Write the following types of leads on the board: leads that create an *impact*, leads that reveal a *quote*, leads that ask a *question*, and leads that are *indirect* because they create an *impression* before getting to the "details" of the article.

Step 2: Draw an upside-down pyramid on the board. Tell students that most news articles are written in a style known as an "inverted pyramid." Following the lead, newspaper writers give details in a descending order. Large, important ideas are presented first and supporting details are presented later. This style helps readers read more efficiently.

Step 3: Using one of the articles (or any other article of your choosing) read the first paragraph aloud to demonstrate how the lead works. Ask students to guess what type of lead they think is used in this article.

Step 4: Depending on grade level or student understanding, you may choose to read the rest of the article with the students or just walk students through the graphic organizer Understanding Newspaper Articles.

Student Page: Graphic Organizer for Newspaper Stories

Date and time of article:

Location where story took place:

What is the lead of the article?

What is the type of lead?

As you read the article, record the article details in the following chart.

Who	What	When	Where	Why/How

Student Page: Graphic Organizer for Newspaper Stories Cont.

To support the information in the given in the article, article authors will often quote their sources.

Write down the quotes or sources of information used in the article. Record the person(s)/source(s) and what the quote(s) or sources from the article below:

Person/Source	**Quote Details**

In a sentence or two summarize the main topic or issue:

In a sentence or two that describes your opinion, reaction or evaluation of the article:

Student Pages: Guide to Persuasive Writing Activity Sheet

Part 1- What makes a great editorial?

1. *After reading the editorial that was passed out use it to answer the following questions.*

What was the opinion that was stated?

What were the reasons stated to support the author's opinion?

List the facts that support the stated opinion.

What are the authors suggestions for dealing with topic of the editorial?

2. What is the writer's purpose for writing the editorial?

3. What form of writing is used when someone writes an Op-ed?

4. What types of topics should be chosen when decides to write an Op-Ed?

5. Discuss the role of research and the presentation of facts in an effective Op-Ed.

6. Before writing an editorial, why is it important to create a list of arguments that both support your point of view as well as those that differ from you point of view? How will doing this help you to construct a stronger Op-Ed?

Part 2: Creating Your Own Editorial

You have seen examples of persuasive writing done in the form of an editorial and have written a paper based on NOW content. Now it's your turn to conceive and create and editorial of your own. Follow the steps below to help you organize your thoughts before writing.

Step 1:
Select an appropriate topic about which you can form an opinion. Be sure to choose a topic you are interested in and that can be researched so you can find facts and examples to support your opinions. It's best to choose a topic you already feel strongly about.

Step 2:
Utilize the articles you've used in class as well as other resources to gather research for your editorial. Record specific facts, examples, quotes, etc., noting relevant information about the resource used. Pay attention to the information provided on the websites and periodicals you use for your research to ensure that you are using reliable resources.

Step 3:
Make a list of arguments that support your opinion and those that contradict it. That way you will be able to address differing points of view in your essay.

Step 4:
Develop your editorial. Pay attention to key information you will place in each part of the editorial. Keep in mind your newspaper's specific guidelines for publishing editorials. Below is the information you will include in each paragraph.

Part 1: State your opinion and develop a good opening "hook" to grab the reader's interest

Part 2: Introduce arguments that support your opinion and document them with supporting reasons, facts, examples, and details

Part 3: Address strong counterarguments to your point of view and rebut them using reasons, facts and examples.

Part 4: Offer your specific suggestions for what can be done to deal with the topic you have chosen for your editorial.

Part 5: Summarize your opinion and supporting arguments and leave the reader with a powerful closing statement about why they should agree with your point of view

Step 5:
Construct a rough draft of your editorial. Be sure to note your sources when citing facts, examples, quotes, etc.

Step 6:
Read over your work and make revisions. Reading aloud will help you to hear areas that don't flow smoothly or make sense. Your main goal during revision is to evaluate the content of your editorial. Be sure to use a variety of precise word choices and sentence structures to make your editorial interesting for the reader.

Step 7:
Careful editing is critical to the success of your editorial. Take time to carefully check all spelling, grammar, usage, punctuation, and capitalization and make the necessary corrections.

Step 8:
Complete the final copy of your editorial. Be prepared to share it with classmates and receive feedback from them about the content and structure of your editorial.

Step 9:
Submit your editorial to your school or local newspaper for publication. Many local papers include submission information. If not, contact the editor. The piece can be a full editorial or letter-to-the-editor.