



Activity 4.3: Calculating Your Ecological Footprint

Grades 7–9

Description: Students will calculate their ecological footprint and determine how many Earths would be needed if everyone on Earth lived the same lifestyle as they do. By doing this, students will begin to understand the individual impacts they personally have on the environment. Students will then discuss ways that they can lower their ecological footprint.

Time: One class period

Materials:

- Computers with Internet access
- Excel spreadsheet
- Calculators
- LCD projector

National Science Education Standards:

F3.b Human activities can also introduce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal.

F4.d Important personal and social decisions are made based on perceptions of benefits and risks.

AAAS Benchmarks:

3C/M7 Societies influence what aspects of technology are developed and how these are used. People control technology (as well as science) and are responsible for its effects.

5D/H3 Human beings are part of the Earth's ecosystems. Human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems.

3C/H4 The human species has a major impact on other species in many ways: reducing the amount of the Earth's surface available to those other species, interfering with their food sources, changing the temperature and chemical composition of their habitats, introducing foreign species into their ecosystems, and altering organisms directly through selective breeding and genetic engineering.

4B/H9 Although the Earth has a great capacity to absorb and recycle materials naturally, ecosystems have only a finite capacity to withstand change without experiencing major ecological alterations that may also have adverse effects on human activities.

4B/H6 ...The burning of fossil fuels in the last century has increased the amount of greenhouse gases in the atmosphere, which has contributed to Earth's warming.

Guiding Questions:

- What is the impact of my lifestyle on the planet?
- What steps can I take to reduce my impact on the planet?

Assessments:

- As a homework assignment, students complete the exit slip and bring it into the next class as an entrance slip: Here are five ways my family and I decided that we could realistically reduce our carbon footprints.



CHICAGO BOTANIC GARDEN

- As prep for Activity 4.4, have students record information about their home, apartment, etc. How many square feet is their home? Do they have gas or electric stoves and water heaters? Are their windows one pane of glass or two? Have they installed any compact fluorescent light bulbs in any of their lights or lamps? Have students make a list of things they use around their home that consume energy.
- Students' completion of class work, exit slips.

Background Information: This lesson focuses on student choices and their impact on the planet. They will first look at their personal contribution to greenhouse gases by calculating their “carbon footprint.” Carbon dioxide (CO₂) emissions are what contribute to a person’s carbon footprint. Students should be familiar with the following terms in order to calculate a carbon footprint: primary footprint, secondary footprint, carbon offsets, and carbon credits. Your primary footprint is what you have directly emitted, such as the carbon dioxide given off as you drive your car. Your secondary footprint is CO₂ that is emitted from things you use or purchase. For example, if you eat a steak, your secondary footprint would include the vast amount of fossil fuels burned to raise the feed corn, ship the cow to market, etc. Once students are more aware of the impact of their daily habits, they can begin to look at positive steps they can take to help reduce climate change. This will be the focus of days 2 through 5 of the unit.

Lesson alternative: For younger students, the idea of a “carbon footprint” may be a little harder to grasp than their ecological footprint. This is a broader calculation of their entire resource use. There are many ecological footprint calculators online (see links below) and they typically tell the user how many planets we would need if everyone lived as they did. This “number of planets” type answer may be more accessible than tons of carbon. The lesson described below can be completed with either calculator. You could also have students calculate both footprints—the carbon footprint and the ecological footprint—and compare the two.

Pre-Activity

- Become familiar with the EPA carbon footprint calculator

Procedure:

1. Trace a footprint with construction paper and leave it on the board in front of the class. Begin with the conversation starter: *What does this footprint mean to you and how does it relate to climate change? You may have heard about carbon footprints in the news, what does it mean to you?*
2. Walk class through the process of creating a one-minute carbon footprint to understand the complex process of an extensive carbon footprint. You can use the one created at Berkeley (<http://coolclimate.berkeley.edu/carboncalculator>) or by the World Wildlife Federation (<http://footprint.wwf.org.uk/>). Both are fairly simple calculations.
3. After you have walked students through the process, make sure they are familiar with key vocabulary terms: primary footprint, secondary footprint, carbon offsets, and carbon credits.



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4. Have students individually calculate their own carbon footprint and then their family's carbon footprint. Use the environmental protection agency (EPA) carbon calculator.
http://www.epa.gov/climatechange/ghgemissions/ind-calculator.html#c=homeEnergy&p=reduceOnTheRoad&m=calc_instructions
5. In small groups, students will calculate the whole group's carbon footprint. Compare the similarities and differences.
6. Have each group present their group and individual carbon footprints. Have students explain how they will reduce their carbon footprint in realistic ways.
7. If there is extra time, Google "carbon footprint calculator." Have a discussion about the different calculators available. Why would an oil company be interested in a carbon footprint calculator? Nonprofit? Government agency? Have students investigate the biases of each of the agencies' carbon footprint calculators. Regardless of biases, ask students which website has the most user-friendly carbon footprint calculator.
8. Closure: Give students an exit slip. Here are ten ways my family and I decided that we could realistically reduce our carbon footprints.

NOTES:

If you are unable to use many computers for the carbon footprint, photocopy worksheets with all the categories and have students calculate footprints without the computer.

Extensions

- Calculate the carbon footprint for your whole school, or the administrative building.
- Calculate the carbon footprint of a business in your community within a half mile.
- Create a tracking system for students' monthly carbon footprint. Have a contest for those students who are able to reduce their footprint each month. Have the students with the lowest carbon footprint present to the class to share their insights. A month later, you can have the students who have had the greatest reduction in their carbon footprint present on how they made the changes.

Useful Websites

- <http://www.reducingcarbonemissions.org/resources/glossary-of-terms>
This site has definitions of common carbon footprint terms.
- <https://lnt.org/learn/7-principles>
Leave No Trace organization has tips to learn environmental awareness skills and programs.
- <http://www.epa.gov/statelocalclimate/local/local-examples/action-plans.html>
This is list of city climate change action plans
- <http://www.epa.gov/climatechange/ghgemissions/ind-calculator.html>
A carbon footprint calculator.



Name: _____ Date: _____ Room: _____

Calculating your Carbon Footprint

1. Define the following terms in your own words:
 - a. Primary footprint

 - b. Secondary footprint

 - c. Carbon offsets

 - d. Carbon credits

2. Have students individually calculate their own and their family's carbon footprint.
<http://www.epa.gov/climatechange/ghgemissions/ind-calculator.html>
 - a. What is your footprint? Your family's?

 - b. What aspect of your life increases your and your family's footprint the most?

3. What are the differences between your family's footprint, and the others in your group?

4. What are the similarities?

5. On the back of this sheet or in your notebook, list five things you and your family can do to reduce your carbon footprint.