WATCH YOUR STEP!

EARTH matters
Studies For Our Global Future

introduction

When we hike in the forest, walk on the beach, or play in the snow, we leave behind a mark – our footprint. But the outline of our shoe is not the true size of the impact we make on the Earth. Less often seen, yet more important, is our **ecological footprint**.

An ecological footprint is a measure of the amount of natural resources that are required to sustain the material standard of living of a human population or individual. Everyone has an impact on the Earth because we consume products, goods, and services derived from nature. The ecological footprint measures how much land and water are required to both produce the resources we consume and to absorb our wastes. Countries with larger per capita footprints, like the U.S., have a smaller share of the global population, while regions with lower per capita footprints, like China, generally account for a larger share of the global population.

Every action affects the planet's ecosystems. This is of little concern as long as human use of resources does not exceed what the Earth can renew. However, humanity's current ecological footprint is over 50 percent larger than what the planet can regenerate. In other words, it now takes more than one and a half years for the Earth to regenerate what we use in a single year.

Vocabulary: carrying capacity, ecological footprint, hectare

materials

- Student Worksheet
- Personal computers/tablets

procedure

1. Ask students if they think they have an eco-friendly lifestyle and explain why. You might also ask the class to hypothesize if they think their ecological footprint is larger, smaller, or about the same as the average American's footprint. What about the average global footprint?

2. Distribute the Student Worksheet, one per student, and if needed, give students time to gather the listed information so they can accurately complete the quiz.

concept

By measuring the ecological footprint of a population or an individual, students can assess the impact humans have on the Earth and explore ways to manage ecological assets more carefully.

objectives

Students will be able to:

- Calculate their own ecological footprints as a measure of the impact they have on the Earth.
- Identify ways human lifestyles affect the environment and the Earth's carrying capacity.
- Suggest ways to reduce individual and global ecological footprints.

subjects

Environmental Science (General and AP), AP Human Geography, Geography, Economics

skills

Critical thinking, comparing and evaluating, reading comprehension, creating an action plan

method

Students take an online ecological footprint quiz to determine their resource use and test how changes to their daily actions impact its size.

3. Instruct students to complete Global Footprint Network's online Footprint Calculator (http://www.footprintcalculator.org) to estimate how much land and water it takes to support their lifestyle. Encourage students to enter detailed information to get a more accurate footprint estimate. Students should answer the "Explore the Data" questions on their Worksheets after completing the quiz.

4. Ask students if they are surprised by the size of their footprint. In pairs, have students brainstorm ways they might reduce their footprints' size.

5. Challenge students to find *realistic* ways to reduce their footprints via the website. They could do this by retaking the quiz a few times, in each instance making one realistic change. Or, students could select the option to "Explore Scenarios" at the end of the quiz to find out additional ways to become more efficient in the things we do and what we use.

discussion questions

1. What are the environmental impacts of a typical American diet and lifestyle?

   Americans' resource intensive diets and lifestyles has big impacts on the environment. Reliance on animal products, processed goods, and industrial agricultural leads to higher carbon emissions, greater use of fertilizers/pesticides that can run-off into waterways, greater amounts of waste in packaging, etc. Energy intensive lifestyles (through transportation, manufacturing, electricity use, etc.) further increase Americans' ecological footprints.

2. What would happen if the rest of the world adopted an American lifestyle?

   If everyone on the planet consumed resources like a typical person in the U.S., 5.1 Earths would be needed to sustain everyone. (If you look at consumption of the entire world population as a whole, 1.8 Earths are needed.) Given there is only one Earth and the current global population is already consuming beyond a sustainable rate, increasing all people's consumption to match that of an American would be detrimental to the health of the planet. It would mean an even higher demand for resources, more waste created, and a greater impact on wildlife.

3. In what ways were your grandparents' (or other members of earlier generations) lifestyles different from your lifestyle?

   Resource use, and the the amount of land required for that use, has risen over time, so grandparents (when they were young) most likely had smaller footprints than current students. Several of the ways in which grandparents likely had smaller footprints can be seen by looking at the questions in the quiz: our grandparents probably did not use cars as much, nor have access to as much processed food, to give just two examples.

4. Why do processed foods affect the Earth more than locally produced, non-processed foods?

   Processed foods use much more energy to produce the final product, and the machines that do the processing typically run on non-renewable fuels. The packaging also increases the food's footprint over unprocessed food, which probably does not have packaging. Locally produced food has lower transportation costs than food produced elsewhere.

5. No one wants to give up all the things that make our lives comfortable, but what are some important changes we can make that would reduce the size of our footprints?

   In particular, there have been many advances in energy efficiency in the last several years. Upgrading to more efficient appliances can make a big difference in a house's footprint. Another alternative is to use energy from renewable resources, such as wind and solar power. Reducing car use can also reduce footprints significantly; carpooling, grouping car trips together, biking or walking to nearby places, using public transportation, and switching to a car with better fuel economy can all make a difference.

6. Think about your own community. What changes are happening that might create a larger footprint? What changes might decrease the community's footprint?

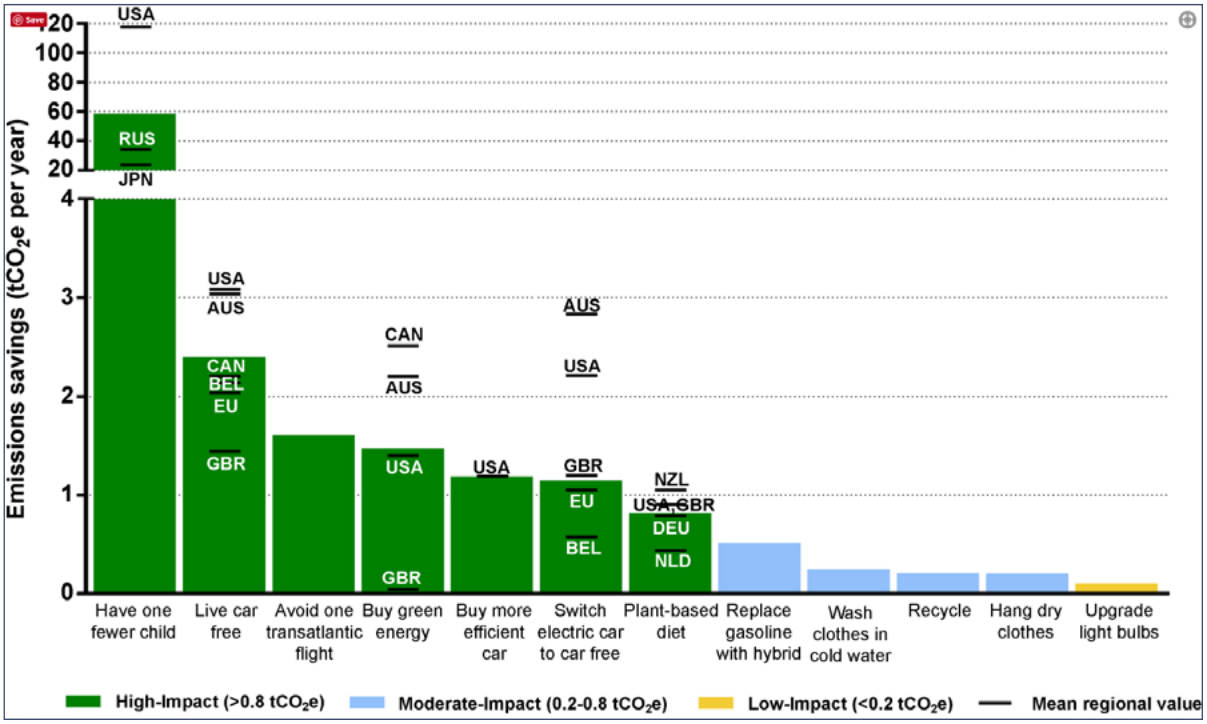
   Answers will vary. Students might note that if the community population is increasing or decreasing, the community's footprint might also increase or decrease respectively. If the community is experiencing sprawl, the ecological footprint might increase as well. The addition of sustainable city features – such as public transportation, local farm produce, green roofing, etc. – could mean the community's footprint is decreasing.

assessment

Students work in groups to create a public service announcement (podcast, website, or poster) advocating ways to reduce individual and/or global ecological footprints. Assess students' on comprehension based on their solutions to reducing ecological footprints.

follow-up activity

The graph below compares the amount of emissions reduction from various individual actions. Project and discuss the graph with your students.



Source: Environmental Research Letters. (2017, July 12). *The climate mitigation gap: education and government recommendations miss the most effective individual actions.*

Keep in mind:

- The height of the bar represents the mean of all studies identified in developed nations, while black lines indicate mean values for selected countries or regions where data was available from specific studies.
- Actions are classified as high (green), moderate (blue), and low (yellow) impact in terms of greenhouse gas emissions reductions.
- Note the break in the y-axis.

WATCH YOUR STEP! | student worksheet

Name: _____ **Date:** _____

Complete Global Footprint Network's Footprint Calculator using data about you and your family's lifestyle and habits. After gathering the information below, go to www.footprintcalculator.org to take the quiz.

Vocabulary

Hectare: a metric unit used to measure area, equivalent to 10,000 square meters or 2.47 acres.

Carrying capacity: the maximum number of people a given area can support without degrading the natural social, cultural, and economic environment for present and future generations.

You'll need to know or estimate the following information to fill out the calculator:

1. How often your family consumes animal-based products, including dairy products.

2. How much of your diet consists of fresh produce, unpackaged goods, or locally grown food from within 200 miles of your town.

3. Your family's shopping and recycling habits.

4. The type of home you and your family live in:
   a. Size and building materials used to build your house
   b. A typical electric and gas bill amount
   c. If any of your energy comes from a renewable source

5. Your weekly transportation habits: the type of vehicle, how many miles you drive, and the gas mileage of your car.

6. How many hours per year you fly in airplanes.

Explore the Data – Answer the following questions after you've completed the quiz:

1. How many global hectares are required to support your lifestyle? _____

2. How does your footprint compare to the U.S. national average? How close is your use of resources to the world average?

3. Using the Footprint Networks' Ecological Footprint Explorer (http://data.footprintnetwork.org/#/), determine how other countries compare to you and to each other. Which country has the lowest ecological footprint? Which country has the highest ecological footprint?