- The story of the King of Prussia Inn in southeastern Pennsylvania, which dates back to 1719, is a great example of a historic building that encountered, and successfully survived, suburban sprawl (the National Park Service provides more information on the Inn's story at **www.nps.gov/history/nR/twhp/wwwlps/lessons/119king/index.htm)**. Share this story with students, and then ask them to research a historic hotel, inn or other landmark in their area. Students can prepare a brief report on the building that includes information on the age, function and historical importance of the building, how modern development affected the building and how the building is currently being used (or, if the building no longer exists, a description of the circumstances that led to the building's destruction).
- From socks made from soda bottles to tables and chairs made from reclaimed wood, many "green" products are entering the marketplace and capturing the attention of consumers who are concerned about the environment. Invite students to select a "green" product and investigate what makes it "green." Compare it to similar products and assess how it contributes to sustainability.
- Different cultures have different values and traditions that relate to sustainability and the environment. In Japan, there is the tradition of *mottainai*, or not being wasteful. In Hawaii, people talk about *malama 'aina*, or caring for the land so it provides all that is needed for people now and in the future. Have students research these and other environmental traditions and prepare a short presentation summarizing their findings. As an extension, engage students in a discussion of how cultural values and traditions can affect efforts for sustainability.

Suggested Internet Resources

Periodically, Internet Resources are updated on our website at www.LibraryVideo.com.

- **www.seattle.gov/environment/cag/index.html**
  The "Green Seattle Guide," a website and downloadable PDF document from the Seattle Office of Sustainability and Environment, contains 101 examples of how to maintain a healthy urban environment.
- **www.prb.org**
  The Population Reference Bureau provides current population information about domestic and international locations and offers documents that detail future population predictions.
- **www.epa.gov/greenkit/student.htm**
  The Environmental Protection Agency's "Students and Sustainability" website contains links to resources for teachers and students in grades K-12.

TEACHER'S GUIDE

Suggested Print Resources

- Redlin, Janice. *Understanding Global Issues: Land Abuse and Soil Erosion*. Weigl Publishers Inc., New York, NY; 2006.
- Stille, Darlene. *Soil: Digging Into Earth's Vital Resource*. Coughlan Publishing, Mankato, MN; 2005.
- Wyman, Bruce and L. Harold Stevenson. *The Facts On File Dictionary of Environmental Science (Third Edition)*. Facts On File, Inc., New York, NY; 2007.

TEACHER'S GUIDE

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TEACHER'S GUIDE

Environmental S·C·I·E·N·C·E for Students™

SUSTAINABILITY IN THE 21ST CENTURY

Grades 5–12

An understanding of the environment and the relationship that humans, plants and animals have with it is instrumental in developing environmental literacy. Such awareness can help to shape future understandings of the Earth and our actions as informed citizens. For this reason, as students engage in a study of the environment, it is important to present them with accurate explanations, global examples and balanced viewpoints. In addition, the environment's link to human health, the economy and society should also be examined to make clear the interconnected nature of these components. *Environmental Science for Students* will help viewers to understand the science behind their changing world as well as consider multiple perspectives. This six-part series explores the causes and effects of issues facing our environment in the 21st century and explores the short- and long-term potential of possible solutions.

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Program Overview

Humans in the 21st century use vastly more resources than those in the past did. In order to ensure that future generations have resources available, people today must find ways to balance the resources they use with how quickly those resources can be replenished, a practice known as sustainability. One of the key components of sustainability is ensuring that Earth's natural habitats and the resources they provide are protected. The rainforest is one example of a natural habitat that has come under threat in modern times. While the indigenous people of the rainforest have used their environment in a sustainable manner for thousands of years, human activity is beginning to threaten the sustainability of the area.

The impact people have on the world they live in is measured by their ecological footprint. Increased use of, and dependence on, Earth's resources in the 20th and 21st centuries, caused by factors such as advances in technology and increases in population, have dramatically increased the overall human ecological footprint. When considering the sustainability of a region's resources, both the number of people in the region and the distribution of the region's population are important factors to consider. As populations spread from urban areas into suburban and rural areas, sustainable development of land can be threatened.

Fortunately, there are efforts underway to develop land and use resources in a more sustainable manner. Cities like Portland, Oregon have enacted smart growth policies that seek to maximize benefits for both humans and the environment. On a personal level, actions like recycling used materials and making informed decisions regarding energy use aid in the efficient and effective use of Earth's resources. On a larger scale, buildings that incorporate alternative energy sources and use and recycle resources appropriately are helping to build a sustainable future.

Vocabulary

sustainability — The ability to provide for the needs of the world's current population without harming future generations' ability to provide for themselves.

rainforest — A biome marked by a continuous canopy formed by broad-leaved evergreen trees. Rainforests have an annual rainfall of at least 80 inches (200 centimeters) and are located mostly in tropical climates. Tropical rainforests have the greatest biodiversity of all biomes.

biodiversity — The number of different plant and animal species found in an ecosystem.

ecological footprint — A measure of the demand placed on nature by humans. The ecological footprint of humans is determined by many factors, including the rate of consumption of natural resources as well as harmful effects on the environment caused by human activities.

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carrying capacity — The maximum population an area can support on a long-term basis without experiencing negative effects. In addition to population size, carrying capacity also takes into account pollution levels and the ability to maintain resources.

population density — The distribution of the population in an area. The more people living in a given area, the higher the population density.

suburban sprawl — The outward expansion of a metropolitan area that transforms rural land into suburbs.

smart growth — The efficient development and use of land in urban areas that attempts to maximize benefits for both humans and the environment.

Pre-viewing Discussion

- How has the use of resources changed over the years? Imagine you are living in your community in the 1800s. Write a brief paragraph that describes land use in the community and the kinds of natural resources people rely upon. How does this description compare to current use of land and natural resources in your community?
- What resources did you use yesterday? Ask students to make a list of the items they use on a daily basis (e.g., notebook, textbook, desk, bus, food, etc.). Next to each item, describe the resource from which the item is made (for example, a textbook is made from paper, which comes from trees). Students can share their lists with the rest of the class and then create a master list of resources they use.
- Select a natural resource and discuss how the lives of humans and other organisms would be affected if the supply of that resource decreased significantly (for example, what would happen if the available supply of wood decreased by half?).

Focus Questions

1. What is sustainability?
2. What is biodiversity?
3. Why is the rainforest such a valuable ecosystem? How did human activity in the 20th century begin to threaten the sustainability of the rainforest?
4. What is the ecological footprint? How has the ecological footprint of humans changed over the past few hundred years?
5. How does overpopulation strain a community's resources?
6. How do lifestyle choices and personal consumption affect sustainability?
7. What is carrying capacity? How does carrying capacity affect sustainability and the use of resources?
8. What is population density? How can a country that is not overpopulated still have problems with sustainability?
9. What is suburban sprawl? How can smart growth limit sprawl?

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10. What are some ways to reduce wasteful consumption and help sustain Earth's resources?

Follow-up Discussion & Activities

- Throughout modern history, individuals, including John Muir, Theodore Roosevelt, Gifford Pinchot, Aldo Leopold, Rachel Carson and Marjory Stoneman Douglas, have sought to protect the environment and raise awareness of environmental issues. Research the life of one of these individuals and write a short biography of the person that highlights the environmental issues important to that person and how the person's actions helped protect the environment.
- Advances in agriculture from the 1940s to the 1960s, which resulted in significant increases in agricultural production, are often referred to as the "green revolution." Have students create a pamphlet about the green revolution that includes a brief description, a discussion of how the green revolution contributed to sustainability and a two-column chart that lists the benefits and limitations of the agricultural advances and techniques. Students can also discuss green revolutions in other countries and use what they have learned to make a list of three suggestions to farmers and scientists for the future.
- When studying populations of living organisms, scientists are often unable to count every single member of a population and must find an appropriate way to make an estimation. Introduce students to the method of population sampling with the following activity. Using masking tape, section part of the classroom floor into a 4-foot by 5-foot grid with 20 squares of equal area. Place different amounts of one object (for example, buttons or coins) in each square, and then cover each square with a plate or bowl. Ask students to select one square, remove the cover, count the population inside the square and then estimate the population of the entire grid based on the population in that square (the estimate would be the population in the uncovered square times 20). Next, have students uncover a second square, count the population inside the square and revise their estimate accordingly (the estimate would be the population of both uncovered squares times 10). Repeat this process for 4, 5 and 10 uncovered squares, and then uncover all 20 squares and have students determine the actual population. How did each estimate compare to the actual population? Were some estimates more accurate than others? Based on their results, have students discuss how much of an area, like a portion of a rainforest, they would sample in order to obtain a reasonable estimate of the population of an organism living there.

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