

TESTING YOUR COMPREHENSION

- What do renewable resources and nonrenewable resources have in common? How are they different? Identify two renewable and two nonrenewable resources.
- How and why did the agricultural revolution affect human population size? How and why did the industrial revolution affect human population size? Explain what environmental impacts have resulted.
- What is *the tragedy of the commons*? Explain how the concept might apply to an unregulated industry that is a source of water pollution.
- What is *environmental science*? Name several disciplines involved in environmental science.
- What are the two meanings of *science*? Name three applications of science.
- Describe the scientific method. What is its typical sequence of steps?
- Explain the difference between correlation and causation, and state how these concepts relate to manipulative and natural experiments.
- What needs to occur before a researcher's results are published? Why is this process important?
- Give examples of three major environmental problems in the world today, along with their causes. How are these problems interrelated? Can you name a potential solution for each?
- How can *sustainable development* be defined? What is meant by the *triple bottom line*? Why is it important to pursue sustainable development?

SEEKING SOLUTIONS

- Many resources are renewable if we use them in moderation but can become nonrenewable if we overexploit them. Order the following resources on a continuum of renewability (see Figure 1.1), from most renewable to least renewable: soils, timber, fresh water, food crops, and biodiversity. What factors influenced your choices? For each resource, what might constitute overexploitation, and what might constitute sustainable use?
- Why do you think the Easter Islanders did not or could not stop themselves from stripping their island of all its trees? What similarities do you perceive between the history of Easter Island and the modern history of our society? What differences do you see between their predicament and ours?
- What environmental problem do *you* feel most acutely yourself? Do you think there are people in the world who do not view your issue as an environmental problem? Who might they be, and why might they take a different view?
- If the human population were to stabilize tomorrow and never surpass 7 billion people, would that solve our

environmental problems? Which types of problems might be alleviated, and which might continue to worsen?

- Consider the historic expansion of agriculture and our ability to feed increasing numbers of people, as described in this chapter. Now ask yourself, "Are things getting better or worse?" Ask this question from four points of view: (1) the human perspective, (2) the perspective of other organisms, (3) a short-term perspective, and (4) a long-term perspective. Do your answers to this question change? If so, how?
- THINK IT THROUGH** You have become head of a major funding agency that disburses funding to researchers pursuing work in environmental science. You must give your staff several priorities to determine what types of scientific research to fund. What environmental problems would you most like to see addressed with research? Describe the research you think would need to be completed so that workable solutions to these problems can be developed. Would more than science be needed to develop sustainable solutions?

CALCULATING ECOLOGICAL FOOTPRINTS

Mathis Wackernagel and his many colleagues at the Global Footprint Network (www.footprintnetwork.org) have continued to refine the method of calculating ecological footprints—the amount of biologically productive land and water required to produce the energy and natural resources we consume and to absorb the wastes we generate. According to their most recent data, there are nearly 2.1 hectares (5.2 acres) available for every person in the world,

yet we use on average more than 2.7 ha (6.7 acres) per person, creating a global ecological deficit, or overshoot (p. 5), of about 30%.

Compare the ecological footprints of each nation listed in the table. Calculate their proportional relationships to the world population's average ecological footprint and to the area available globally to meet our ecological demands.

Nation	Ecological footprint (hectares per person)	Proportion relative to world average footprint	Proportion relative to world area available
Bangladesh	0.6	0.2 ($0.6 \div 2.7$)	0.3 ($0.6 \div 2.1$)
Tanzania	1.1		
Colombia	1.8		
Thailand	2.1		
Mexico	3.4		
Sweden	5.1		
United States	9.4		
World average	2.7	1.0 ($2.7 \div 2.7$)	1.29 ($2.7 \div 2.1$)
Your personal footprint (see Question 4)			

Data from *Living planet report 2008*. WWF International, Zoological Society of London, and Global Footprint Network.

1. Why do you think the ecological footprint for people in Bangladesh is so small?
2. Why is it so large for people in the United States?
3. Based on the data in the table, how do you think average per capita income affects ecological footprints?
4. Go to an online footprint calculator such as the one at <http://www.myfootprint.org> or http://www.footprintnetwork.org/en/index.php/GFN/page/personal_footprint, and take the

test to determine your own personal ecological footprint. Enter the value you obtain in the table, and calculate the other values as you did for each nation. How does your footprint compare to those of the average person in the United States? How does it compare to that of people from other nations? Name three actions you could take to reduce your footprint. (Note: Save this number—you will calculate your footprint again in Chapter 24 at the end of your course!)

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