

BIG QUESTION

How can we use Earth's
resources sustainably?

Lesson 1 ?

How can we manage
renewable resources for
sustainable use?

Lesson 2 ?

How can resource managers
strike a balance between
the ecological and economic
value of forest resources?

Lesson 3 ?

What steps toward sustainable
forestry have been taken in
the last 100 years?

LESSON 1 Resource Management

- People need to manage the harvesting of renewable resources in order to ensure their availability.
- Resource management approaches include maximum sustainable yield (MSY), ecosystem-based management, and adaptive management. The aim of MSY is to harvest the maximum amount of a resource without reducing the amount of future harvests. The goal of ecosystem-based management is to harvest resources in ways that minimize impact on the ecosystems and ecological processes that provide the resource. Adaptive management involves scientifically testing different management approaches in an area and then customizing an approach based on the results.

resource management (325)

maximum sustainable yield (MSY) (328)

ecosystem-based management (328)

adaptive management (328)

LESSON 2 Forests and Their Resources

- Forest resources have great ecological and economic value. More than one third of forests are used mostly for timber production. But forests also help conserve biodiversity; protect soil and water quality; maintain biogeochemical cycles; and provide food, medicine, and social services.
- Timber harvesting methods include clear-cutting, seed-tree and shelterwood approaches, and selection systems. Clear-cutting is cheapest and safest, but it reduces biodiversity. Selection systems best conserve biodiversity but are more expensive and more dangerous than clear-cutting.
- Deforestation may help nations develop, but it can be ecologically destructive in the long run.

even-aged (333)

uneven-aged (333)

clear-cutting (334)

seed-tree approach (334)

shelterwood approach (334)

selection system (334)

deforestation (335)

old-growth forest (335)

LESSON 3 Forest Management

- Logging in national forests is managed by the Forest Service, but profits go to the timber companies.
- Most logging in the United States today takes place on tree plantations owned by timber companies. These plantations are usually monocultures, or large-scale plantings of a single variety, which host little biodiversity.
- Suppression of all wildfires can endanger ecosystems, property, and people. Some plants, such as the jack pine, depend on fire to begin their growth cycle. Prescribed burns can help the populations of plants and animals, such as Kirtland's warbler, that depend upon fire.
- The response of timber companies to consumer demand is helping to promote sustainable forestry. The Forest Stewardship Council and other organizations certify wood and wood products from sustainably harvested forests.

multiple use (338)

monoculture (340)

prescribed burn (341)

salvage logging (342)

sustainable forestry certification (343)



INQUIRY LABS AND ACTIVITIES

• Making Recycled Paper

Make new paper from old and compare the fibers under a microscope.

• How Much Lumber?

Measure a tree's diameter. Then use geometric formulas to estimate the volume of its lumber.

• Your National Forests

Find out which national forests are near you. Investigate how they are managed.

Chapter Assessment For answers to the Chapter Assessment, see page A-17 at the back of the book.



Make Your Case

The Central Case in this chapter has explored the challenges of harvesting the timber we need while preserving irreplaceable forests. Based on what you have learned, how would you recommend that residents of areas with such forests respond to timber harvesting proposals? Use examples from the Central Case and the lessons to support your ideas.

Review Concepts and Terms

- Soil, fresh water, wild animals, and timber are examples of
 - renewable resources.
 - inexhaustible resources.
 - nonrenewable resources.
 - forest resources.
- Maximum sustainable yield, ecosystem-based management, and adaptive management are three approaches to
 - poaching.
 - overharvesting.
 - resource management.
 - none of the above.
- Most of the world's remaining forests are either boreal forest or
 - tropical rain forest.
 - temperate forest.
 - tree plantations.
 - chaparral.
- Which of the following logging methods would most likely result in regrowth such as that shown below?
 - clear-cutting
 - a selection system
 - the a seed-tree approach
 - the a shelterwood approach
- Clear-cutting is a timber harvesting method in which
 - trees that provide shelter to seedlings are left uncut.
 - only some mature trees in an area are cut.
 - only immature trees in an area are cut.
 - all of the trees in an area are cut.
- Deforestation has the greatest impact on biodiversity
 - on private lands.
 - in tropical areas and arid regions.
 - in densely populated urban areas.
 - on public lands.
- The Healthy Forests Restoration Act
 - encourages salvage logging and prescribed burning on national forest land.
 - requires that timber companies produce certified wood from national forest land.
 - does not require environmental impact statements for logging on national forest land.
 - requires adaptive management on national forest land.
- Salvage logging can
 - decrease soil erosion.
 - decrease commercial logging.
 - promote wildfires.
 - speed up forest regrowth.
- The policy of multiple use requires that national forests be managed for
 - timber.
 - wildlife habitat.
 - recreation.
 - all of the above.
- When paper has a Forest Stewardship Council logo on it, the paper is
 - made from rainforest wood.
 - not made from wood.
 - made from sustainably harvested wood.
 - recycled.



Modified True/False

Write true if the statement is true. If the statement is false, change the underlined word or words to make the statement true.

11. The aim of adaptive management is to harvest the maximum amount of a resource without reducing future harvests.
12. Forests cover about 15 percent of Earth's land surface.
13. Clear-cutting results in mostly even-aged stands of trees.
14. Deforestation is still occurring rapidly in some developing nations.
15. Most logging in the United States today takes place on public lands.

Reading Comprehension

Read the following selection and answer the questions that follow.

Natural disasters are unavoidable. People in various regions of the United States must worry about mudslides, fires, hurricanes, tornadoes, and floods. Disasters such as these can directly kill thousands of organisms, including people. Natural disasters also drastically alter habitats of many organisms because the soil, air, and water are all affected.

Unfortunately, people's environmental decisions can worsen the damage done by natural disasters. For example, suppressing all wildfires can lead to larger, more destructive fires because these fires can use fuel that has built up for many years. Another example is deforestation, which makes forest soil more susceptible to erosion. With heavy rain, deforested hillsides can result in mudslides or can increase the risk of floods.

16. Which of the following factors would most likely contribute to an increase in large, destructive forest fires?
 - a. an increase in prescribed burns
 - b. a decrease in federal funding to fight forest fires in national parks
 - c. a decrease in campgrounds
 - d. long-term suppression of all fires

17. People's environmental decisions
 - a. cause all natural disasters.
 - b. could prevent all natural disasters.
 - c. can worsen damage from natural disasters.
 - d. have no effect on damage from natural disasters.
18. Which of the following human activities most directly contributes to an increased incidence of mudslides?
 - a. aquifer depletion
 - b. application of nitrogen-containing fertilizers
 - c. hunting
 - d. deforestation

Short Answer

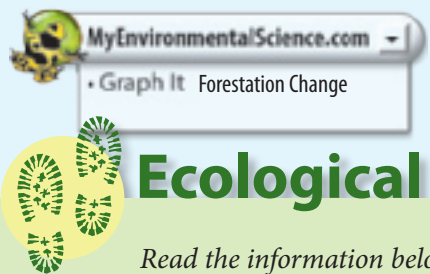
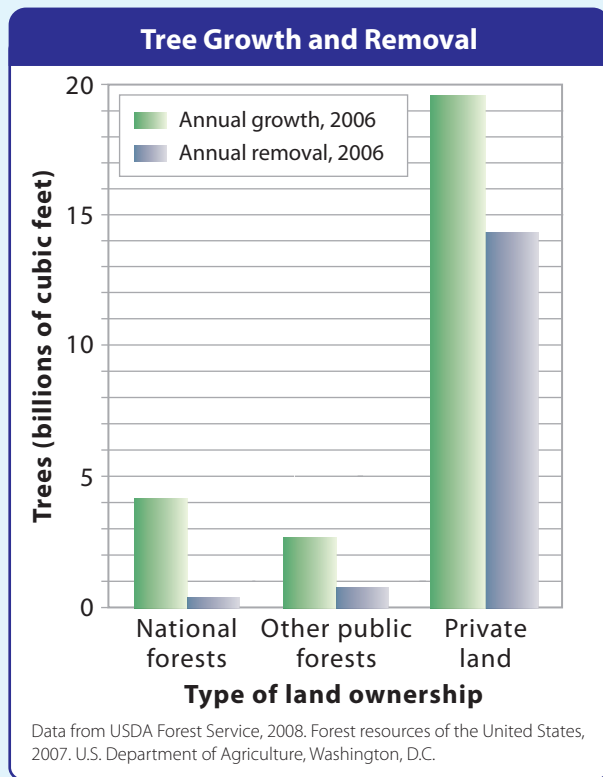
19. What is the challenge of resource management?
20. Describe the goal of maximum sustainable yield in terms of the logistic growth curve.
21. What is the goal of ecosystem-based management?
22. List six steps in the cycle of adaptive management.
23. Why do uneven-aged stands of trees offer more biodiversity?
24. What was the primary requirement of the National Forest Management Act in 1976?
25. What is a monoculture?

Critical Thinking

26. **Apply Concepts** When managing resources, do you think it is more important to focus on a specific resource or to consider the entire ecosystem of which the resource is one part? Explain.
27. **Form an Opinion** Would you support legislation that banned timber companies from logging in national forests? Explain.
28. **Explain** Why do most ecologists and foresters view tree plantations as croplands?
29. **Compare and Contrast** Explain how wildfires and prescribed burns differ.
30. **Synthesize** How does consumption relate to resource management?

Analyze Data

The graph below compares tree growth and tree removal in the United States in 2006. Private land includes that owned by timber companies, other organizations, and individuals. Use the data to answer the questions.



Ecological Footprints

Read the information below. Copy the table into your notebook, and record your calculations in it. Then, answer the questions that follow.

	Population in 2000 (millions)	Total paper consumed in 2000 (millions of tons)	Paper consumed per person in 2000 (pounds)
Africa	840	6	14
Asia	3766		
Europe	728		
Latin America	531		
North America	319	105	
Oceania	32	5	
World	6216	351	113

Source: Population Reference Bureau

- Interpret Graphs** From which type of land was the most timber harvested?
- Interpret Graphs** On which type of land were trees growing the fastest? (*Hint:* Find the lowest ratio of removed trees to new growth.) What was the approximate ratio of removed trees to tree growth on that type of land?
- Draw Conclusions** “Private land” includes both land owned by individuals and land owned by timber companies and other organizations. On land owned by individuals, removal greatly exceeds growth. Of the three resource management approaches, which approach would you expect is most often used on timber company land? Explain your reasoning.

Write About It

- Persuasion** Suppose that you were building a new house, and you wanted to use certified wood. A friend tries to discourage you, saying that you never know if it’s really sustainably produced, and it’s not worth the extra cost. How would you respond to your friend?
- Apply the BIGQUESTION** Sketch a new social network Web page for the Forest Service that promotes sustainable use of forest resources. Select one graph and two photographs that support your message. List at least three facts about timber. Also provide a link to Web sites with more information.

Using the graph in the Real Data activity on page 332 and data already in the table at left, complete the table. Recall that 1 ton is equal to 2000 pounds. You will need to estimate the total amount of paper that each region consumed in 2000.

- How many more pounds of paper does a North American use each year compared to an African?
- About how many tons of paper would North Americans save each year if they consumed paper at the rate of Europeans?
- About how much paper would be consumed if everyone in the world used as much paper as the average European? As the average North American?
- Why do you think people in other regions consume less paper, per person, than North Americans?