Name KEY _____ Class _____ Date _____

Chapter 6: Humans in the Biosphere

Vocabulary Review

For Questions 1–10, match the term with its definition.

Definition

D _____ **1.** Any harmful material that can enter land, water, or air.

I _____ **2.** The removal of soil by water or wind

H _____ **3.** A loss in land productivity caused by drought, overgrazing, and farming

E _____ **4.** The process in which pollutants become more concentrated in the bodies of high trophic level organisms

I _____ **5.** The total of all genetically based variation in all organisms in the biosphere

F _____ **6.** An area where ecosystems and species face severe threat of destruction or extinction

C _____ **7.** The amount of land and water needed to provide resources and process wastes for an individual or a nation

B _____ **8.** A part of the atmosphere that blocks UV rays of the sun from reaching Earth's surface

A _____ **9.** The farming of fish and other aquatic organisms for food

G _____ **10.** A rise in Earth's average temperature

Term

A. aquaculture

B. ozone layer

C. ecological footprint

D. pollutant

E. biological magnification

F. ecological hot spot

G. global warming

H. desertification

I. biodiversity

J. erosion

For Questions 11–17, complete each statement by writing in the correct word or words.

11. A resource that can be produced or replaced by a healthy ecosystem is a(n) renewable resource.

12. Fossil fuels are examples of NONrenewable resources.

13. **Deforestation** can lead to severe soil erosion, especially on mountainsides.

14. Any harmful material that enters the biosphere is a(n) pollutant.

15. The mixture of chemicals that forms a gray-brown haze in the air of cities is smog.

16. The variety of habitats, communities, and ecological processes in the biosphere is ecosystem diversity.

17. The number of different species in an area is species diversity.

6.1 A Changing Landscape

The Effect of Human Activity

1. Name 2 ways urban and suburban development affects the environment and habitats?
Wastes need to be disposed of which can affect air, water, and soil. Development destroys or divides them into smaller fragments

2. From what type of fuel do we obtain most of the energy needed for **industrial growth**?
Fossil fuels

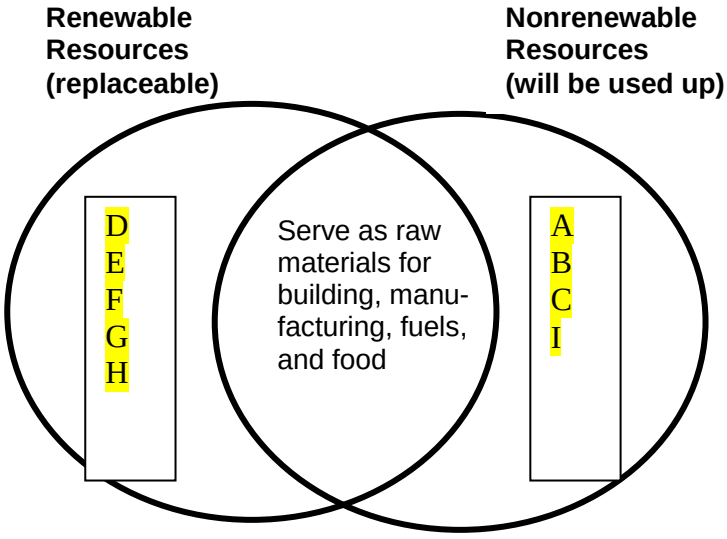
3. How is Earth like an island? Limited resources

Humans rely on Earth's life-support systems. We affect the environment when we obtain food, eliminate waste, and prepare places to live. Hawaii serves as a good example of this effect because of its small size. Island living also highlights an area's ability to care for humans.

Decide how each of the following activities by Hawaiian settlers affected the environment. In the column labeled "Effect," write a plus sign (+) if the effect was positive (helpful) and a negative sign (–) if the effect was negative or (harmful).

Consequences of Some Human Activities		
Human Activity	**Example in Hawaii**	**Effect (+ / -) ?**
Agriculture	Farmed monoculture crop of pineapples, straining water supply	-
	Imported invasive plant and animal species	-
Development	Cut down forest for housing and tourism	-
	Planted two coconut trees for every one coconut tree cut down	+
Industry	Prohibited fishing industry from fishing during spawning	+
	Allowed factory to spill waste into air, water, and soil	-

4. Use the word bank to complete the Venn diagram to compare renewable and nonrenewable resources.



Word Bank
a. Coal
b. Oil
c. Natural Gas
d. Wind
e. Pine Tree
f. Freshwater
g. Marsh Grass
h. Clean Air
i. Minerals

***Remember**: Renewable resources can be produced again, while nonrenewable resources cannot be produced within a reasonable amount of time.*

6. It is important to use natural resources in an environmentally conscious way to meet our needs without causing long term environmental harm. **Sustainable development** provides for human needs while preserving the ecosystems that produce natural resources.

7. The human population (currently around 7 billion) may reach 9 billion by 2100. Most of those people will live in cities. Predict the impact of city growth on natural ecosystems and farmland. What will happen if sustainable development is not achieved?

Levels of pollution will increase.

Sustainable Development

*Answer the questions. **Circle** the correct answer for Questions 1-3.*

1. Sustainable development is the wise use of …:

Renewable resources nonrenewable resources both renewable and nonrenewable resources

2. When fossil fuels are depleted, they are essentially gone…:

for a little while forever

3. A __?__ cannot be produced within a reasonable amount of time.

renewable resource nonrenewable resource

_____4. Which of the following is an example of sustainable development?

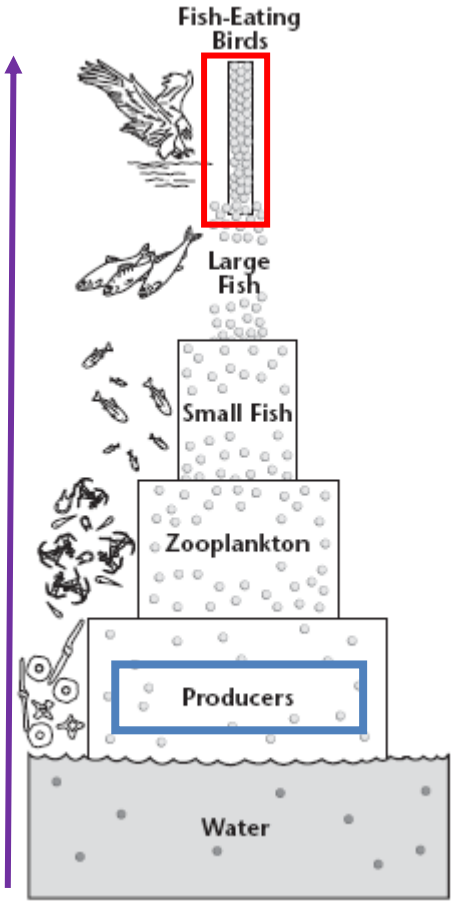
a) When building a new house, the builders leave many of the trees in place.
b) After they paint a building, the painters dump the leftover paint in a nearby stream.
c) A new highway goes through a wetland.

6.2 Using Resources Wisely

Soil Resources

1. What is topsoil? Mineral and nutrient-rich portion of soil
2. What type of interactions lead to the production of good topsoil? Long term interaction between soil and the plants growing in it.

3. Is topsoil a renewable or nonrenewable resource? Explain. **Renewable, if maintained/managed properly**



4. What is soil erosion? Removal of soil by water or wind
5. How does plowing land increase the rate of soil erosion? Soil erosion is often worse when land is plowed and left barren between plantings. When no roots are left to hold soil in place, it is easily washed away.
6. What happens to farmland during desertification? When soil is badly eroded, organic matter and minerals that make it fertile are often carried away with the soil. In parts of the world with dry climates, a combination of farming, overgrazing, seasonal drought, and climate change can turn farmland into desert
7. Are mature forests a renewable resource? Why or why not?

NON RENEWABLE, In some areas forests don't grow back at all after logging.

8. What can happen to soil as a result of deforestation? Severe erosion, can permanently change the soil and plant life

Freshwater Resources

Biological Magnification

Biological magnification is the process by which the strength of a pollutant increases as it moves up the levels of the food chain. The diagram below shows the biological magnification of the pollutant DDT.

Follow the directions.

1. Find the trophic level with the lowest concentration of DDT. Color it blue. (see box around producers)
2. Find the trophic level with the highest concentration of DDT. Color it red. (see box around birds)
3. Draw an arrow showing how the concentration of DDT increases in trophic levels
4. Name and describe the process that this diagram is illustrating.

This diagram illustrates the process of Biological magnification. As a pollutant moves up the levels of the food chain.

5. How do high DDT concentrations affect certain species of birds? Decreases the strength of egg shells.

6. Circle the organism that has a greater concentration of DDT in its body, according to the diagram.

zooplankton small fish

7. Think about your answer to item 6. Select the choice below that best explains the reasoning behind your answer.

A. Zooplankton has DDT. Small fish eat lots of zooplankton. Therefore DDT builds up in the bodies of the small fish.

B. Large fish eat small fish, and large fish have more DDT than small fish. Therefore small fish have the most DDT

8. Why is watershed management important to maintaining good water quality in a large river or lake?
Reduce pollution in the large river or lake that is fed by the ground water and streams in that area

Sewage

What are 2 reasons that sewage is harmful to water supplies?

a. Large amounts of sewage can stimulate blooms of bacteria and algae that rob water of Oxygen ("dead zones")
b. Raw sewage contains microbes that can spread disease.

Atmospheric Resources

For Questions 1–4, write the letter of the correct answer on the line at the left.

_____ **1.** Which is the name for the mixture of chemicals that forms as a gray-brown haze in the atmosphere?

A. dust **C.** ozone
B. smog **D.** radiation

_____ **2.** Which component of acid rain kills plants and harms soil?

A. carbon dioxide and water **C.** nitric and sulfuric acids
B. CFCs and fossil fuels **D.** ozone and particulates

_____ **3.** Which is the name for the bits of ash and dust put into the air by certain kinds of diesel engines?

A. particulates **C.** ozone layer
B. precipitation **D.** greenhouse gases

_____ **4.** Which is a pollutant of soil and water that is now dropping steadily due to laws that affected the automobile industry?

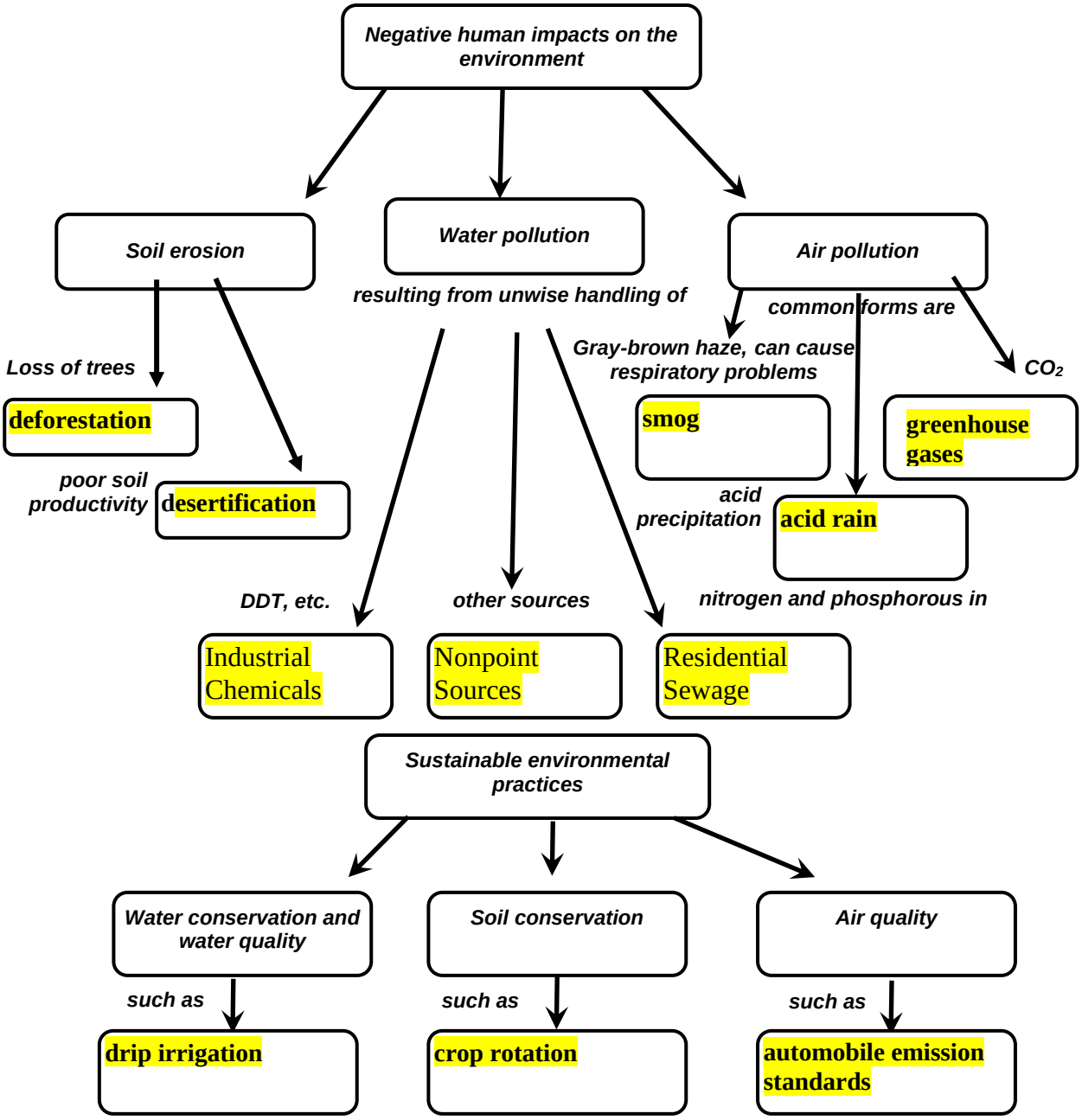
A. carbon **C.** nitrogen
B. lead **D.** ozone

BUILD Understanding

Concept Map A concept map can help you organize information and show you how ideas are connected.

acid rain	**desertification**	**nonpoint sources**
automobile emission standards	**drip irrigation**	**residential sewage**
crop rotation	**greenhouse gases**	**smog**
deforestation	**industrial chemicals**	

As you read the lesson, place the terms in the correct location in the concept maps.



Using Resources Wisely

Resources like soil, water, and air are not likely to run out. However, they can become too polluted too quickly to help support life on Earth. Humans can slow down negative effects on soil, water, and air resources.

Study the chart below. The first column lists three resources: soil, water, and air. The second column describes how humans have affected each resource. In the third column, you will find ways in which humans can slow down the effects. But read carefully! Label + or - for each blank.

Resource	Human Effect	Helpful (+) or Harmful (-) ??
Soil	Deforestation and continuous plowing lead to soil erosion.	+ Use contour plowing and terracing. + Tree farms / selectively harvest mature trees. - Clear-cut forests. + Leave stems and roots in the soil between plantings.
Water	Pesticides and too much sewage lead to limited supplies of fresh water.	- Dump sewage directly into rivers and streams. + Treat sewage and control pollution. + Protect watersheds by using less poisonous chemicals. + Conserve (use less) water.
Air	The burning of fossil fuels leads to air pollution.	+Use technology that reduces chemicals in the air. - Increase the burning of fossil fuels. + Walk more; drive less; help control automobile emissions. + Plant more trees to absorb carbon dioxide.

6.3 Biodiversity

The Value of Biodiversity

1. What is biodiversity?
   The total of all the genetically based variation in all organisms in the biosphere.
2. Why is biodiversity one of Earth's greatest natural resources?
   Species of many kinds provide us with foods, industrial products, and medicines. Diverse species play vital roles in the delivery of ecology goods and services.
3. Complete the table to define the types of biodiversity.

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Diversity in the Biosphere	
Type of Diversity	**Definition**
Ecosystem diversity	The variety of habitats, communities, and ecological processes in the biosphere
Species diversity	The number of different species in an area or in the biosphere
Genetic diversity	The total of all the genetic information carried by a particular species or by all organisms on earth.

Threats to Biodiversity

For Questions 4–8, write True if the statement is true. If the statement is false, change the underlined word or words to make the statement true.

FALSE 1000 **4.** The current rate of species loss is 10 times the typical rate of extinction.

FALSE SMALLER **5.** The smaller a habitat "island," the larger the number of species that can live there.

TRUE **6.** Ecological hot spot is a place where significant numbers of species and habitats are in immediate danger of extinction.

FALSE INTRODUCED **7.** Endangered species can become invasive and threaten biodiversity.

TRUE **8.** The increased concentration of carbon dioxide in air is making oceans more acidic and putting stress on coral reefs.

9. Biologists compare loss of biodiversity to destroying a library before its books are ever read. What are ways that human activity reduces biodiversity?

a. Altering habitats
b. Hunting
c. Introducing Invasive species
d. Releasing pollution into food webs
e. Contributing to climate change
f. All of these

10. Identify three reasons why endangered species are hunted.

food, hides/skins, medicines, or to sell as pets

Biodiversity's benefits to society include contributions to medicine and agriculture and the provision of ecosystem goods and services. Give an example of each.

Category	Benefits to Society
Medicine	Foxglove is the source of digitalin compounds used to treat heart disease
Agriculture	Wild relatives of crop plants may have useful genes that can be transferred
Ecosystem Services	Keystone species importance. Maintain a vital role is soil, water, and air quality.

11. How can introduced species lead to economic losses?
Loss of resources to native organisms, loss of native species

12. How does climate change threaten biodiversity?
Many organisms have specific tolerance ranges to temperature – if conditions change/are intolerable it could face extinction

13. What is habitat fragmentation and why is it a major threat to biodiversity?
When development splits ecosystems into pieces leaving habitat "islands"

14. What is CITES and what is its significance?
Convention on International Trade in Endangered Species – bans international trade in products from a list of endangered species

15. Why do you think it is difficult to enforce laws in remote wilderness areas?
Area is hard to reach (population is isolated), difficult geography which limits access (mountains

Conserving Biodiversity

16. What is the main thrust of global conservation efforts today?
To protect not just individual species, but entire ecosystems.

17. Why is it often difficult to get people to make efforts to protect biodiversity??
It often demands that individuals change their habits or the way they earn their living.

18. Provide 2 examples of reward/incentive strategies that encourage conservation.
Tax credit for solar panels, Australian farmers are paid to plant trees along certain rivers and streams.

19. Why is preserving entire ecosystems a better idea than protecting single species from extinction?
Maintain genetic diversity & ensuring that the ecosystem will continue to provide ecological goods and services.

6.4 Meeting Ecological Challenges

Lesson Summary

Ecological Footprints

The **ecological footprint** of an individual or a population is the amount of land and water needed to provide resources, absorb wastes, and render the wastes harmless.

Ecology in Action

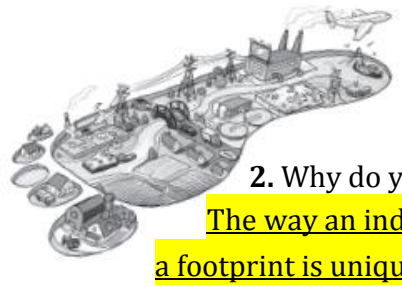
Three case studies illustrate the three steps of ecology in action: (1) recognize a change in the environment, (2) determine the cause of that change, and (3) change behavior to have a positive impact.

- **Case Study 1: Atmospheric Ozone** This gas blocks ultraviolet (UV) radiation.
  - Ozone gas blocks ultraviolet (UV) rediation.
  - The ozone layer is an area of relatively high concentration of ozone in the atmosphere, between 20 and 50 kilometers above Earth's surface. In the 1970s, a hole in the layer was observed.
  - Regulations reduced CFC use, and the hole may be slowly disappearing.
- **Case Study 2: North Atlantic Fisheries**
  - Commercial fish catches have declined in recent years.
  - The cause is overfishing.
  - Regulations closed some fishing grounds to allow fish stocks to replenish. In the mean time, **aquaculture**, or fish farming, also can provide food for people.

- **Case Study 3: Climate Change**
  - **Global warming**, the rise in the biosphere's average temperature, and climate change, a shift in Earth's overall weather patterns, has occurred.
  - Physical evidence includes rising sea levels due to melting ice. Biological evidence includes temperature-related behavior changes in organisms.
  - Using less fossil fuel will reduce greenhouse gases in the atmosphere.

Ecological Footprints

An analogy takes two things that seem to be different and shows how they can be similar. Study the illustration. The artist is making an analogy between a human footprint and an ecological footprint.



1. The illustration shows images of buildings, land use, and modes of transportation. How does each of those things affect the Earth? Buildings use electricity, water and fossil fuels. Farming & development affect biodiversity. Cars/planes/boats deplete and pollute natural resources.

2. Why do you think the artist chose to put those images within the shape of a footprint? The way an individual eats, travels, and consumes resources is a choice unique to each person alone, like a footprint is unique.

3. Based on the size of the footprint in the illustration, how do you think the artist feels about the way humans are treating the Earth? Big footprint = humans are leaving a dangerously large mark on the earth.

4. Using the analogy, why do you think it is better to make a small ecological footprint than a large one? Smaller footprint = more ecologically conscious decisions.

5. What are some ways you can make your ecological footprint smaller? By energy efficient products, drive less, eat local, conserve water

6. Explain this statement: The average American has an ecological footprint more than four times larger than the global average.

Average American uses more than 4x the amount of resources to live and process waste than the average global citizen does.

7. Explain why populations with the largest ecological footprints change the biosphere the most. Larger populations use more resources

Ecology in Action

Complete the table to summarize how the basic principles of ecology can lead to positive impacts on the environment.

Examples of Ecology in Action

Environmental Change	Cause	Behavior Change Needed
Hole in the ozone layer	CFC	Regulation of CFCs
Declining numbers of fish in the oceans	Over fishing	Regulation of fishing industry and aquaculture
Global warming and climate change	Increasing amounts of green house gases	Reduction of emissions of greenhouse gases

Case Study 1: Atmospheric Ozone

For Questions 5–7, complete each statement by writing the correct word or words.

5. The ozone layer is a high concentration of ozone at about 20-50km above Earth's surface.

6. The ozone layer is important to humans because it protects against exposure to UV Radiation from the sun.

7. UV radiation causes cancer ,damages eyes, and reduces resistance to disease.

Case Study 2: North Atlantic Fisheries

For Questions 8–10, complete each statement by writing the correct word or words.

8. Technologies that have led to large increases in the mass of ocean fish caught include large boats and high-tech fish locating equipment.

9. Overfishing caused the decline in fish catches since 1997.

10. An alternative to commercial fishing is aquaculture which produces large amounts of food with minimal environmental damage if properly managed.

Case Study 3: Climate Change

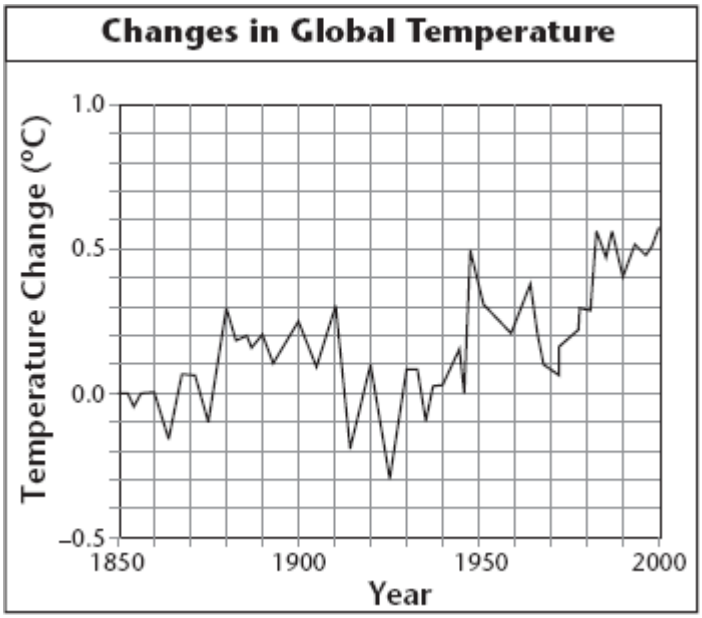
Compare/Contrast Table

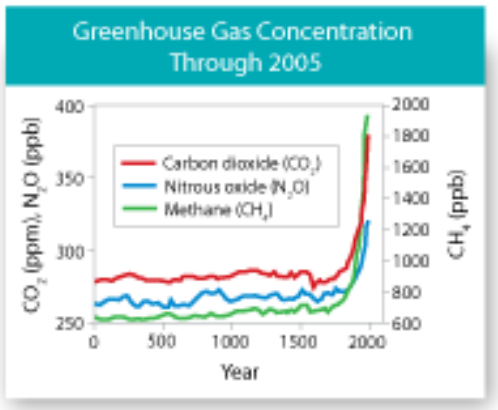
Use a compare/contrast table when you want to see the similarities and the differences between two or more objects or processes. As you read Lesson 4, complete the chart. An example has been provided.

Challenge Comparison			
Challenge	**Changes Observed**	**Causes Identified**	**Solutions**
Ozone layer	***Ozone is thinning.***	***CFCs***	***Put a ban on CFCs.***
Fisheries	# of cod is decreasing	Overfishing was the cause	Laws now limit commercial fishing
Global climate	Rising air temperature, melting glaciers, and changes in animal behavior	Increase in greenhouse gases	Increase efficiency of energy resources (such as electric cars)

Ecology in Action

The graph below shows how global temperature changed between 1850 and 2000. On the y-axis, the unit 0.0 represents the temperature in 1850. The other numbers show how much the temperature increased or decreased.





Use the graph to answer the questions.

1. What was the difference in global temperature between 1850 and 1880?
A. The global temperature in 1880 was about 0.3°C higher than in 1850.
B. The global temperature in 1880 was about 0.3°C lower than in 1850.
C. The global temperature was the same in both years.
D. The global temperature in 1850 was 10°C higher than in 1880.

2. Describe the overall trend in global temperature since 1850.
A. There is a decrease over time. **B.** There is an increase over time. **C.** It has not changed over time.

3. In which of the following years was the temperature the highest?
A. 2000 **B.** 1950 **C.** 1910

4. Factors that may have contributed to the trends shown in the graph include:
A. Natural Variation
B. Cutting and Burning Forest
C. Burning Fossil Fuels
D. All of these

5. Three possible effects of global warming on the future of the Biosphere include:
A. Floods
B. Droughts
C. Changes in local weather
D. All of these

6. Describe the relationship between the changes in Global Temperature and Green House Gas Concentration over the last 150 years.
Both went up