Chapter 12

Communities and Populations Worksheets

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- **Lesson 12.1: Community Interactions**
- **Lesson 12.2: Characteristics of Populations**
- **Lesson 12.3: Human Population Growth**
- **Lesson 12.4: The Biodiversity Crisis**
- **Lesson 12.5: Natural Resources and Climate Change**

12.1 Community Interactions

Lesson 12.1: True or False

Name_____ **Class**_____ **Date**_____

Write true if the statement is true or false if the statement is false.

_____ 1. All biomes, except a desert, have populations of interacting species.

_____ 2. Camouflage is an adaptation that has evolved through natural selection.

_____ 3. Predation is a relationship in which the prey consumes the predator.

_____ 4. Interspecific competition occurs between members of the same species.

_____ 5. Interspecific competition often leads to extinction, or it may lead to greater specialization.

_____ 6. A keystone species is one that plays an especially important role in its population.

_____ 7. Rock that hardens from lava is an example of primary succession.

_____ 8. Mutualism is a symbiotic relationship in which both species benefit.

_____ 9. The first species to colonize a disturbed area such as this are called primary species.

_____ 10. If a parasite kills its host, the parasite may also die.

_____ 11. Intraspecific competition leads to the evolution of better adaptations within a species.

_____ 12. Secondary succession may occur after a forest fire.

_____ 13. A population consists of all the communities of all the species in the same area.

_____ 14. There are three major types of community interactions: predation, competition, and selection.

_____ 15. Lichens that can live on bare rock may be pioneer species after a flood.

Lesson 12.1: Critical Reading

Name_____ **Class**_____ **Date**_____

Read these passages from the text and answer the questions that follow.

Symbiotic Relationships

Symbiosis is a close relationship between two species in which at least one species benefits. For the other species, the relationship may be positive, negative, or neutral. There are three basic types of symbiosis: mutualism, commensalism, and parasitism.

Mutualism

Mutualism is a symbiotic relationship in which both species benefit. An example of mutualism involves goby fish and shrimp (see figure below). The nearly blind shrimp and the fish spend most of their time together. The shrimp maintains a burrow in the sand in which both the fish and shrimp live. When a predator comes near, the fish touches the shrimp with its tail as a warning. Then, both fish and shrimp retreat to the burrow until the predator is gone. From their relationship, the shrimp gets a warning of approaching danger. The fish gets a safe retreat and a place to lay its eggs.

The multicolored shrimp in the front and the green goby fish behind it have a mutualistic relationship. *(Image courtesy of Haplochromis and under the Creative Commons license CC-BY-SA 3.0.)*

Commensalism

Commensalism is a symbiotic relationship in which one species benefits while the other species is not affected. One species typically uses the other for a purpose other than food. For example, mites attach themselves to larger flying insects to get a "free ride." Hermit crabs use the shells of dead snails for homes.

Parasitism

Parasitism is a symbiotic relationship in which one species (the **parasite**) benefits, while the other species (the **host**) is harmed. Many species of animals are parasites, at least during some stage of their life. Most species are also hosts to one or more parasites. Some parasites live on the surface of their host. Others live inside their host. They may enter the host through a break in the skin or in food or water. For example, roundworms are parasites of mammals, including humans, cats, and dogs. The worms produce huge numbers of eggs, which are passed in the host's feces to the environment. Other individuals may be infected by swallowing the eggs in contaminated food or water.

Some parasites kill their host, but most do not. It's easy to see why. If a parasite kills its host, the parasite is also likely to die. Instead, parasites usually cause relatively minor damage to their host.

Questions

1. What is symbiosis?

2. What is mutualism? Give an example.

3. What is commensalism? Give an example.

4. What is parasitism? Give an example.

5. Why don't most parasites kill their host?

Lesson 12.1: Multiple Choice

Name_____ **Class**_____ **Date**_____

Circle the letter of the correct choice.

1. Which of the following would NOT be a community?
   (a) All the plants, insects, and soil in your back yard.
   (b) All the many varieties of dogs in your neighborhood.
   (c) All the fish in an aquarium.
   (d) none of the above
2. Community interactions include
   (a) predation.
   (b) competition.
   (c) symbiosis.
   (d) all of the above.
3. Which is an example of a predator-prey relationship?
   (a) The relationship between a duck and a pond of water.
   (b) The relationship between a lion and a zebra.
   (c) The relationship between a bee and a flower.
   (d) The relationship between a hen and a rooster.
4. The main difference among the types of symbiotic relationships is
   (a) how many species either benefit or are harmed.
   (b) how many species are eaten.
   (c) how many species are protected.
   (d) all of the above.
5. An example of interspecific competition is
   (a) two male birds competing for the same female.
   (b) two male lions competing to lead the same pride.
   (c) two species of big cats competing for the same antelope.
   (d) all of the above.
6. Which of the following is a parasite?
   (a) the goby fish
   (b) the hermit crab
   (c) the shrimp
   (d) the roundworm
7. Which could possibly be a pioneer species during primary succession?
   (a) the first grass on new soil
   (b) the first lichen on new rock
   (c) the first layer of grass in a new park
   (d) the first trees to grow in a new forest
8. Camouflage is
   (a) an adaptation that evolved through natural selection.
   (b) a necessary trait for commensalism.
   (c) part of a well-adapted pioneer species traits.
   (d) all of the above.

Lesson 12.1: Vocabulary I

Name_____ **Class**_____ **Date**_____

Match the vocabulary word with the proper definition.

Definitions

_____ 1. a species that plays an especially important role in its community

_____ 2. a symbiotic relationship in which both species benefit

_____ 3. a final stable stage

_____ 4. occurs in an area that has never before been colonized

_____ 5. the species that consumes members of another species

_____ 6. a symbiotic relationship in which one species benefits while the other species is not affected

_____ 7. the species that is consumed

_____ 8. the first species to colonize an area that has never before been colonized

_____ 9. the change in the numbers and types of species that live in a community over time

_____ 10. species that benefits in a symbiotic relationship in which another species is harmed

_____ 11. occurs in a formerly inhabited area that was disturbed

_____ 12. occurs between members of the same species

_____ 13. species that is harmed in a symbiotic relationship in which another species benefits

_____ 14. occurs between members of different species

Terms

a. climax community

b. commensalism

c. ecological succession

d. host

e. interspecific competition

f. intraspecific competition

g. keystone species

h. mutualism

i. parasite

j. pioneer species

k. predator

l. prey

m. primary succession

n. secondary succession

Lesson 12.1: Vocabulary II

Name_____ **Class**_____ **Date**_____

Fill in the blank with the appropriate term.

1. A glacier retreating is an example of _____ succession.
2. _____ is a relationship in which one species benefits while the other species is harmed.
3. Lions feed on the South African Cape buffalo: the lions are the _____, and the buffalo are the _____.
4. Symbiosis is a close relationship between two species in which at least one species _____.
5. Specialization occurs when competing species evolve different _____.
6. _____ is a relationship between organisms that strive for the same resources in the same place.
7. Pioneer species includes _____ that can live on bare rock.
8. A keystone species is one that plays an especially important role in its _____.
9. _____ is an adaptation that in prey helps them hide from predators.
10. _____ competition occurs between members of different species.
11. A community consists of all the populations of all the _____ in the same area.
12. All _____ have populations of interacting species.

Lesson 12.1: Critical Writing

Name_____ **Class**_____ **Date**_____

Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.

Compare and contrast mutualism, commensalism, and parasitism.

12.2 Characteristics of Population

Lesson 12.2: True or False

Name_____ **Class**_____ **Date**_____

Write true if the statement is true or false if the statement is false.

_____ 1. A clumped population distribution always has more individuals than a uniform distribution.

_____ 2. Population growth rate is how fast a population changes in size over time.

_____ 3. A population's age-sex structure influences population growth, as older people are more likely to reproduce.

_____ 4. Dispersal refers to offspring moving away from their parents.

_____ 5. With a type I survivorship curve, most of the offspring survive to adulthood so they can reproduce.

_____ 6. Populations gain individuals through births and emigration.

_____ 7. Logistic growth levels out at the carrying capacity.

_____ 8. *K*-selected population growth is controlled by density-dependent factors.

_____ 9. Most populations live under ideal conditions, so they grow at exponential rates.

_____ 10. Immigration is the regular movement of individuals or populations each year during certain seasons.

_____ 11. The carrying capacity is the largest population size that can be supported in an area without harming the environment.

_____ 12. With a type III survivorship curve, parents produce moderate numbers of offspring and provide some parental care.

_____ 13. With a random population distribution, organisms are clustered together in groups.

_____ 14. A positive population growth rate means a population is increasing.

_____ 15. Species that live in unstable environments are usually *r*-selected, and their population size is usually well below the carrying capacity.

Lesson 12.2: Critical Reading

Name_____ **Class**_____ **Date**_____

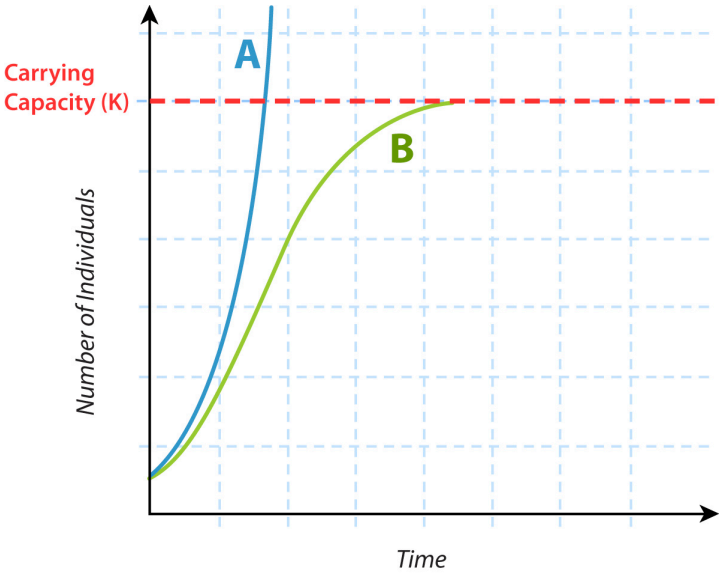
Read these passages from the text and answer the questions that follow.

Patterns of Population Growth

Populations may show different patterns of growth. The growth pattern depends partly on the conditions under which a population lives.

Exponential Growth

Under ideal conditions, populations of most species can grow at exponential rates. Curve A in the graph below represents **exponential growth**. The population starts out growing slowly. As population size increases, the growth rate also increases. The larger the population becomes, the faster it grows.



Exponential and Logistic Growth. Curve A shows exponential growth. Curve B shows logistic growth. *(Image courtesy of CK-12 Foundation and under the Creative Commons license CC-BY-NC-SA 3.0.)*

Logistic Growth

Most populations do not live under ideal conditions. Therefore, most do not grow exponentially. Certainly, no population can keep growing exponentially for very long. Many factors may limit growth. Often, the factors are density-dependent. These are factors that kick in when the population becomes too large and crowded. For example, the population may start to run out of food or be poisoned by its own wastes. As a result, population growth slows and population size levels off. Curve B in graph above represents this pattern of growth, which is called **logistic growth**.

At what population size does growth start to slow in the logistic model of growth? That depends on the population's carrying capacity (see graph above). The **carrying capacity (K)** is the largest population size that can be supported in an area without harming the environment. Population growth hits a ceiling at that size in the logistic growth model.

K-Selected and *r*-Selected Species

Species can be divided into two basic types when it comes to how their populations grow.

- Species that live in stable environments are likely to be ***K*-selected**. Their population growth is controlled by density-dependent factors. Population size is generally at or near the carrying capacity.

These species are represented by curve B in the graph above.

- Species that live in unstable environments are likely to ***r*-selected**. Their potential population growth is rapid. For example, they have large numbers of offspring. However, individuals are likely to die young. Thus, population size is usually well below the carrying capacity. These species are represented by the lower part of curve A in the graph above.

Questions

1. What is exponential growth?

2. What is logistic growth?

3. What is the carrying capacity?

4. Define K- selected and r-selected. What is the main difference between them?

Lesson 12.2: Multiple Choice

Name_____ **Class**_____ **Date**_____

Circle the letter of the correct choice.

1. Which would represent a population?
   (a) All the fish in an aquarium.
   (b) All the dogs in your neighborhood.
   (c) All the animals in the local zoo.
   (d) all of the above
2. The age-sex structure of a quickly growing population would probably have
   (a) a wide base, showing many young individuals.
   (b) a wide top, showing many older individuals.
   (c) a wide middle area, showing many middle-aged individuals.
   (d) all of the above
3. Humans have a type _____ survivorship curve, as _____.
   (a) II, parents produce moderate numbers of children.
   (b) III, most of the offspring survive to adulthood so they can reproduce.
   (c) I, most of the offspring survive to adulthood so they can reproduce.
   (d) I, parents produce moderate numbers of children.
4. Population growth can be represented by the equation $r =$
   (a) $(b + e)$ - $(d + i)$
   (b) $(b + i)$ - $(d + e)$
   (c) $(b + d)$ - $(i + e)$
   (d) $(d + i)$ - $(b + e)$
5. During exponential growth,
   (a) the larger the population becomes, the slower it grows.
   (b) population growth eventually slows and population size levels off.
   (c) as population size increases, the growth rate also increases.
   (d) all of the above
6. The carrying capacity of a population
   (a) is reached as resources become limiting.
   (b) is reached at the end of exponential growth.
   (c) is reached in *r*-selected populations.
   (d) is reached when the environment begins to be harmed.
7. Which of the following are examples of density-dependent factors? (1) food, (2) disease, (3) rainfall, (4) temperature.
   (a) 1 only
   (b) 1 and 2
   (c) 1, 2, and 3
   (d) 1, 2, 3, and 4
8. When organisms must compete for resources, they will usually have a _____ distribution.
   (a) uniform
   (b) random

(c) clumped
(d) competitive

Lesson 12.2: Vocabulary I

Name_____ **Class**_____ **Date**_____

Match the vocabulary word with the proper definition.

Definitions

_____ 1. represents the age-sex structure of a population

_____ 2. coming into the population from somewhere else

_____ 3. population growth under limiting conditions

_____ 4. the average number of individuals in a population per unit of area or volume

_____ 5. species whose population size is usually well below the carrying capacity

_____ 6. leaving the population for another area

_____ 7. the largest population size that can be supported in an area without harming the environment

_____ 8. graphs that represent the number of individuals still alive at each age

_____ 9. population growth under ideal conditions

_____ 10. how fast a population changes in size over time

_____ 11. species whose population growth is controlled by density-dependent factors

_____ 12. the regular movement of individuals or populations each year during certain seasons

Terms

a. carrying capacity

b. emigration

c. exponential growth

d. immigration

e. *K*-selected

f. logistic growth

g. migration

h. population density

i. population growth rate

j. population pyramid

k. *r*-selected

l. survivorship curve

Lesson 12.2: Vocabulary II

Name_____ **Class**_____ **Date**_____

Fill in the blank with the appropriate term.

1. The population is the unit of natural selection and _____.
2. The purpose of migration usually is to find food, mates, or other _____.
3. Species that live in _____ environments are likely to be K-selected.
4. Population _____ may be clumped, random, or uniform.
5. The carrying capacity is the _____ population size that can be supported in an area.
6. A _____ curves represents the number of individuals still alive at each age.
7. The two main factors affecting population _____ are the birth rate and death rate.
8. The age-sex structure influences _____ growth because usually young individuals reproduce and older individuals die.
9. Under ideal conditions, populations of most species can grow at _____ rates.
10. Population _____ is the number of individuals in a population.
11. The formula for population _____ is $r = (b + i)$ - $(d + e)$.
12. Species that live in _____ environments are likely to r-selected.
13. Dispersal refers to offspring moving _____ from their parents.
14. A _____ is a group of organisms of the same species that live in the same area.

Lesson 12.2: Critical Writing

Name_____ **Class**_____ **Date**_____

Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.

Compare and contrast exponential and logistic growth.

12.3 Human Population Growth

Lesson 12.3: True or False

Name_____ **Class**_____ **Date**_____

Write true if the statement is true or false if the statement is false.

_____ 1. Human populations are fast growing.

_____ 2. Stage 5 may be a new stage of the demographic transition, raising issues for some populations.

_____ 3. The human population has had a pattern of logistic growth.

_____ 4. The development of agriculture let humans settle down in villages and cities.

_____ 5. In the 1700s, advances in science and technology led to lower death rates in humans.

_____ 6. The human population is now growing by about 20,000 people a day.

_____ 7. Today only a few countries remain in Stage 1 of the demographic transition.

_____ 8. Stage 1 of the demographic transition has high birth and death rates, which lead to fast population growth.

_____ 9. In stage 3 of the demographic transition, birth rate starts to fall, so population growth starts to slow.

_____ 10. Some countries are stuck in stage 2 of the demographic transition as their birth rates are still high.

_____ 11. By 2050, the world's population may be close to its carrying capacity.

_____ 12. In some areas, birth rates fell when children were forced to go to school.

Lesson 12.3: Critical Reading

Name_____ **Class**_____ **Date**_____

Read these passages from the text and answer the questions that follow.

Demographic Transition

Major changes in the human population first began during the 1700s in Europe and North America. First death rates fell, followed somewhat later by birth rates.

Death Rates Fall

Several advances in science and technology led to lower death rates in 18^{th} century Europe and North America:

- New scientific knowledge of the causes of disease led to improved water supplies, sewers, and personal hygiene.
- Better farming techniques and machines increased the food supply.
- The Industrial Revolution of the 1800s led to new sources of energy, such as coal and electricity. This increased the efficiency of the new agricultural machines. It also led to train transport, which improved the distribution of food.

For all these reasons, death rates fell, especially in children. This allowed many more children to survive to adulthood, so birth rates increased. As the gap between birth and death rates widened, the human population grew faster.

Birth Rates Fall

It wasn't long before birth rates started to fall as well in Europe and North America. People started having fewer children because large families were no longer beneficial for several reasons.

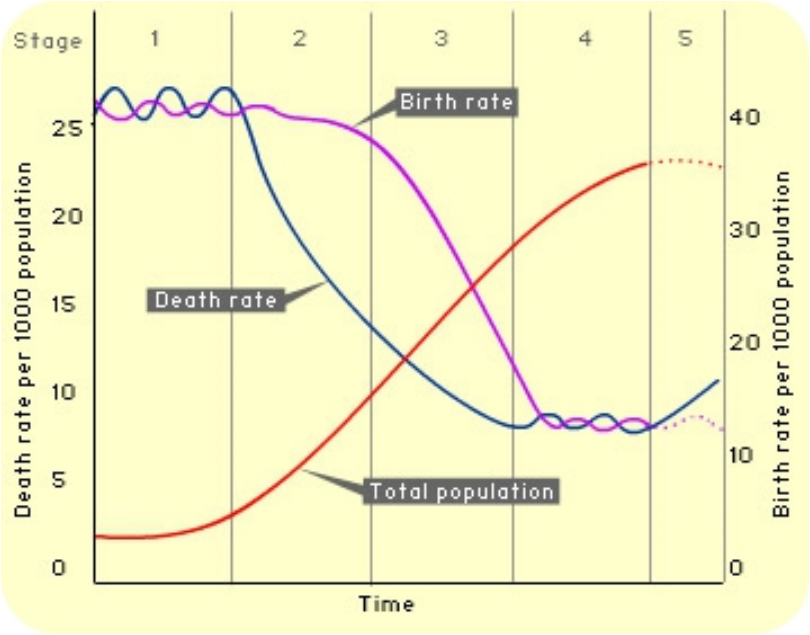
- As child death rates fell and machines did more work, farming families no longer needed to have as many children to work in the fields.
- Laws were passed that required children to go to school. Therefore, they could no longer work and contribute to their own support. They became a drain on the family's income.

Eventually, birth rates fell to match death rates. As a result, population growth slowed to nearly zero.

Stages of the Demographic Transition

These changes in population that occurred in Europe and North America have been called the **demographic transition**. The transition can be summarized in the following four stages, which are illustrated in the graph below:

- Stage 1 — High birth and death rates lead to slow population growth.
- Stage 2 — The death rate falls but the birth rate remains high, leading to faster population growth.
- Stage 3 — The birth rate starts to fall, so population growth starts to slow.
- Stage 4 — The birth rate reaches the same low level as the death rate, so population growth slows to zero.



Stages of the Demographic Transition. In the demographic transition, the death rate falls first. After a lag, the birth rate also falls. How do these changes affect the rate of population growth over time? *(Image courtesy of Charmed88 and under the public domain.)*

Questions

1. Why did death rates fall in the 1700s?

2. Why did birth rates fall in Europe and North America?

3. What is the demographic transition?

4. What are the main differences between the stages of the demographic transition?

Lesson 12.3: Multiple Choice

Name_____ **Class**_____ **Date**_____

Circle the letter of the correct choice.

1. During the time when humans moved from Africa throughout the world,
   (a) birth and death rates were both fairly low.
   (b) population growth was rapid.
   (c) population growth was slow.
   (d) there was no population growth.
2. The invention of agriculture
   (a) led to an increased birth rate and death rate.
   (b) provided a more dependable food supply.
   (c) allowed people to settle down in villages.
   (d) all of the above
3. Lower death rates in the 1700s resulted from
   (a) new scientific knowledge of the causes of disease.
   (b) better use of coal and electricity.
   (c) the Industrial Revolution.
   (d) all of the above.
4. Stage 2 of the demographic transition is represented by
   (a) slow population growth.
   (b) fast population growth.
   (c) no population growth.
   (d) high birth and death rates.
5. A stage 5 population can be dangerous, as
   (a) there is a large aging population.
   (b) there is a large young population.
   (c) the population has reached its carrying capacity.
   (d) all of the above
6. Most developed nations are in which stage of the demographic transition?
   (a) stage 1
   (b) stage 2
   (c) stage 3
   (d) stage 4
7. The human population is now growing by more than _____ people a day.
   (a) 20,000
   (b) 100,000
   (c) 200,000
   (d) 300,000
8. The carrying capacity for the human population may be about
   (a) 8 billion people.
   (b) 9 billion people.
   (c) 10 billion people.
   (d) Humans do not have a carrying capacity.

Lesson 12.3: Vocabulary I

Name_____ **Class**_____ **Date**_____

Match the vocabulary word with the proper definition.

Definitions

_____ 1. the birth rate starts to fall, so population growth starts to slow

_____ 2. the death rate falls but the birth rate remains high, leading to faster population growth

_____ 3. may be 9 billion people for the human population

_____ 4. diagram that shows the age-sex structure of a population

_____ 5. high birth and death rates lead to slow population growth

_____ 6. the birth rate reaches the same low level as the death rate, so population growth slows to zero

_____ 7. a four stage model of population growth

Terms

a. carrying capacity

b. demographic transition

c. population pyramid

d. stage 1

e. stage 2

f. stage 3

g. stage 4

Lesson 12.3: Vocabulary II

Name_____ **Class**_____ **Date**_____

Fill in the blank with the appropriate term.

1. Stage 3: The birth rate starts to fall, so population growth starts to _____.
2. The human population has had a pattern of _____ growth.
3. Most _____ nations have entered Stage 4 of the demographic transition.
4. Today, no country remains in Stage _____ of the demographic transition.
5. *Homo sapiens* arose only about _____ years ago in Africa.
6. Stage _____: High birth and death rates lead to slow population growth.
7. Stage 4: The birth rate reaches the same low level as the death rate, so population growth slows to _____.
8. The human population is now growing by about 200,000 people a _____.
9. Many _____ countries seem to be stuck in Stage 2 of the demographic transition.
10. Stage 2: The death rate falls but the birth rate remains high, leading to _____ population growth.
11. Humans invented _____ about 10,000 years ago.
12. Like weeds, human _____ are fast growing and disperse rapidly.

Lesson 12.3: Critical Writing

Name_____ **Class**_____ **Date**_____

Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.

Outline the stages of the demographic transition.

12.4 The Biodiversity Crisis

Lesson 12.4: True or False

Name_____ **Class**_____ **Date**_____

Write true if the statement is true or false if the statement is false.

_____ 1. Biodiversity refers to the variety of life and its processes.

_____ 2. Scientists have identified about 1.9 million species alive today.

_____ 3. Many of the most important prescription drugs come from wild species.

_____ 4. Biodiversity helps ensure that at least some species will survive major environmental changes.

_____ 5. Plants and algae maintain the atmosphere; during photosynthesis, they add carbon dioxide and remove oxygen.

_____ 6. Evidence shows that the fifth mass extinction is occurring now.

_____ 7. It is possible that in 1000 years, we could lose more than half of Earth's species.

_____ 8. The single biggest cause of extinction today is habitat loss due to forest fires.

_____ 9. Global climate change, largely due to the burning of fossil fuels, threatens the existence of many species.

_____ 10. Exotic species introduced by humans into new habitats have resulted in extinction of native species.

_____ 11. Plants fixing nitrogen and making it available to animals is an important ecological service due to biodiversity.

_____ 12. Most species alive today have yet to be identified.

Lesson 12.4: Critical Reading

Name_____ **Class**_____ **Date**_____

Read these passages from the text and answer the questions that follow.

Why Is Biodiversity Important?

Human beings benefit in many ways from biodiversity. Biodiversity has direct economic benefits. It also provides services to entire ecosystems.

Economic Benefits of Biodiversity

The diversity of species provides humans with a wide range of economic benefits:

- Wild plants and animals maintain a valuable pool of genetic variation. This is important because domestic species are genetically uniform. This puts them at great risk of dying out due to disease.
- Other organisms provide humans with many different products. Timber, fibers, adhesives, dyes, and rubber are just a few examples.
- Certain species may warn us of toxins in the environment. When the peregrine falcon nearly went extinct, for example, it warned us of the dangers of DDT.
- More than half of the most important prescription drugs come from wild species. Only a fraction of species has yet been studied for their medical potential.
- Other living things provide inspiration for engineering and technology.

Ecosystem Services of Biodiversity

Biodiversity generally increases the productivity and stability of ecosystems. It helps ensure that at least some species will survive environmental change. It also provides many other ecosystem services. For example:

- Plants and algae maintain the atmosphere. During photosynthesis, they add oxygen and remove carbon dioxide.
- Plants help prevent soil erosion. They also improve soil quality when they decompose.
- Microorganisms purify water in rivers and lakes. They also return nutrients to the soil.
- Bacteria fix nitrogen and make it available to plants. Other bacteria recycle the nitrogen from organic wastes and remains of dead organisms.
- Insects and birds pollinate flowering plants, including crop plants.
- Natural predators control insect pests. They reduce the need for expensive pesticides, which may harm people and other living things.

Questions

1. List and describe three examples of the economic benefits of biodiversity.

2. List and describe four examples of ecosystem services of biodiversity.

Lesson 12.4: Multiple Choice

Name_____ **Class**_____ **Date**_____

Circle the letter of the correct choice.

1. Biodiversity refers to
   (a) the variety of life and its processes.
   (b) the variety of life and its processes, including the variety of living organisms.
   (c) the variety of life and its processes, including the variety of living organisms, and the genetic differences among them.
   (d) the variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.
2. Scientists have identified about _____ species alive today.
   (a) 1.9 billion
   (b) 1.9 million
   (c) 5 million
   (d) 30 million
3. Economic benefits of biodiversity include
   (a) the prevention of soil erosion.
   (b) a valuable pool of genetic variation.
   (c) the natural pollination of flowering plants.
   (d) all of the above.
4. How have exotic species affected biodiversity?
   (a) They have resulted in the extinction of native species.
   (b) They have resulted in the over-harvesting of fish, trees, and other organisms.
   (c) They have resulted in global climate change.
   (d) all of the above
5. What is the biggest cause of extinction today?
   (a) pollution
   (b) exotic species
   (c) global warming
   (d) habitat loss
6. Biodiversity is beneficial to ecosystems in which of the following ways?
   (a) the natural prevention of soil erosion
   (b) the natural purification of water in rivers and lakes
   (c) the natural control of insect pests
   (d) all of the above
7. Scientists estimate that there may be up to _____ species alive today.
   (a) 30 billion
   (b) 30 million
   (c) 1.9 million
   (d) 1.9 billion
8. It is likely that Earth could lose half of its species in the next _____ years.
   (a) 50
   (b) 100

(c) 500
(d) 1000

Lesson 12.4: Vocabulary I

Name_____ **Class**_____ **Date**_____

Match the vocabulary word with the proper definition.

Definitions

_____ 1. the variety of life and its processes

_____ 2. species that may out-compete native species

_____ 3. valuable benefit of biodiversity found in wild plants and animals

_____ 4. mass extinction due to human actions

_____ 5. identified species alive today

_____ 6. beginning of the sixth mass extinction

_____ 7. single biggest cause of extinction today

_____ 8. can result in crowding out other species

Terms

a. 1.9 million

b. biodiversity

c. exotic species

d. genetic variation

e. habitat loss

f. overpopulation

g. Pleistocene

h. sixth mass extinction

Lesson 12.4: Vocabulary II

Name_____ **Class**_____ **Date**_____

Fill in the blank with the appropriate term.

1. The single biggest cause of extinction today is _____ loss.
2. Biodiversity generally increases the productivity and stability of _____.
3. Scientists have identified about _____ million species alive today.
4. _____ mass extinctions are recorded in the fossil record.
5. The sixth mass extinction is due to _____ actions.
6. _____ species may carry disease, prey on native species, and disrupt food webs.
7. Over 99 percent of all species that ever lived on Earth have gone _____.
8. _____ refers to the number of species in an ecosystem or the biosphere as a whole.
9. Global _____ change is raising Earth's air and ocean temperatures.
10. Pollution causes widespread harm to _____.

Lesson 12.4: Critical Writing

Name_____ **Class**_____ **Date**_____

Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.

Define biodiversity. Discuss three reasons why biodiversity is important.

12.5 Natural Resources and Climate Change

Lesson 12.5: True or False

Name_____ **Class**_____ **Date**_____

Write true if the statement is true or false if the statement is false.

_____ 1. A natural resource is something supplied by nature that helps support life.

_____ 2. Biodiversity is an important natural resource.

_____ 3. Living things are considered to be nonrenewable — when they die, they cannot be replaced.

_____ 4. Renewable resources can be replenished by natural processes as quickly as humans use them.

_____ 5. Nonrenewable resources include fossil fuels such as petroleum, coal, natural gas, soil and water.

_____ 6. Of all the water on Earth, only a few percent is fresh, liquid water.

_____ 7. The greenhouse effect is a artificial feature of Earth's atmosphere, caused by the burning of fossil fuels.

_____ 8. Soil takes up to hundreds of millions of years to form.

_____ 9. Global warming is caused by too much carbon dioxide in the atmosphere.

_____ 10. About 1 billion people worldwide do not have adequate freshwater.

_____ 11. Global warming has caused the decline in the polar bear population.

_____ 12. Bad ozone is causing the hole in the ozone layer to expand.

Lesson 12.5: Critical Reading

Name_____ **Class**_____ **Date**_____

Read these passages from the text and answer the questions that follow.

The Atmosphere

The atmosphere plays an important part in maintaining Earth's freshwater supply. It is part of the water cycle. It refills lakes and rivers with precipitation. The atmosphere also provides organisms with gases needed for life. It contains oxygen for cellular respiration and carbon dioxide for photosynthesis.

Air Pollution

Earth's atmosphere is vast. However, it has been seriously polluted by human activities. **Air pollution** consists of chemical substances and particles released into the atmosphere, mainly by human actions. The major cause of outdoor air pollution is the burning of fossil fuels. Power plants, motor vehicles, and home furnaces all burn fossil fuels and contribute to the problem (see **Table** 12.1). Ranching and using chemicals, such as fertilizers, also cause air pollution. Erosion of soil in farm fields and construction sites adds dust particles to the air as well. Fumes from building materials, furniture, carpets, and paint add toxic chemicals to indoor air.

Table 12.1: **Pollutant Problems**

Pollutant	Example/Major Source	Problem
Nitrogen oxides (NO_x)	Motor vehicle exhaust	Acid Rain
Carbon monoxide (CO)	Motor vehicle exhaust	Poisoning
Carbon dioxide (CO_2)	All fossil fuel burning	Global Warming
Smog	Coal burning	Respiratory problems; eye irritation
Ground-level ozone	Motor vehicle exhaust	Respiratory problems; eye irritation

In humans, air pollution causes respiratory and cardiovascular problems. In fact, more people die each year from air pollution than from automobile accidents. Air pollution also affects ecosystems worldwide by causing acid rain, ozone depletion, and global warming. Ways to reduce air pollution from fossil fuels include switching to nonpolluting energy sources (such as solar energy) and using less energy. What are some ways you could use less energy?

Ozone Depletion

There are two types of ozone. You can think of them as bad ozone and good ozone. Both are affected by air pollution.

- Bad ozone forms near the ground when sunlight reacts with pollutants in the air. Ground-level ozone is harmful to the respiratory systems of humans and other animals.
- Good ozone forms in a thin layer high up in the atmosphere, between 15 and 35 kilometers above Earth's surface. This ozone layer shields Earth from most of the sun's harmful UV radiation. It plays an important role in preventing mutations in the DNA of organisms.

Unfortunately, the layer of good ozone is being destroyed by air pollution. The chief culprits are chlorine and bromine gases. They are released in aerosol sprays, coolants, and other products. Loss of ozone has created an **ozone hole** over Antarctica. Ozone depletion results in higher levels of UV radiation reaching Earth. In humans, this increases skin cancers and eye cataracts. It also disturbs the nitrogen cycle, kills

plankton, and disrupts ocean food webs. The total loss of the ozone layer would be devastating to most life. Its rate of loss has slowed with restrictions on pollutants, but it is still at risk.

Questions

1. Describe two important roles of the atmosphere.

2. What is air pollution? What is the major cause of air pollution?

3. List three pollutants the burning of fossil fuels adds to air. What are the sources of these three pollutants?

4. What is good ozone?

5. What are the major effects of the ozone hole?

Lesson 12.5: Multiple Choice

Name_____ **Class**_____ **Date**_____

Circle the letter of the correct choice.

1. Which of the following is a nonrenewable resource?
   (a) aluminum
   (b) wind
   (c) coal
   (d) bamboo
2. How much water on Earth is fresh, liquid water?
   (a) 1%
   (b) 2%
   (c) 5%
   (d) 10%
3. A dead zone can form in areas where
   (a) low oxygen levels have killed all ocean life.
   (b) algal blooms have formed.
   (c) in areas of excessive nutrient-enriched runoff.
   (d) all of the above
4. What is the major cause of outdoor air pollution?
   (a) erosion of soil in farm fields
   (b) excessive cigarette smoke
   (c) the burning of fossil fuels
   (d) excess acid rain
5. Acid rain
   (a) can disrupt homeostasis by altering protein function.
   (b) can lower the pH of lakes.
   (c) can cause the death of plants and aquatic organisms.
   (d) all of the above
6. The ozone hole
   (a) results in higher levels of UV radiation reaching Earth.
   (b) is located over the Arctic Circle.
   (c) is being destroyed by the greenhouse effect.
   (d) all of the above
7. Global warming
   (a) refers to a recent decrease in Earth's average surface temperature.
   (b) has caused a decrease in the greenhouse effect.
   (c) is caused by more carbon dioxide in the atmosphere.
   (d) none of the above
8. Effects of global climate change include
   (a) the melting of glaciers and rising sea levels.
   (b) more droughts and water shortages.
   (c) increasing severity of storms.
   (d) all of the above.

Lesson 12.5: Vocabulary I

Name_____ **Class**_____ **Date**_____

Match the vocabulary word with the proper definition.

Definitions

_____ 1. something supplied by nature that helps support life

_____ 2. hole over Antarctica that results in higher levels of UV radiation reaching Earth

_____ 3. natural resources that exist in fixed amounts

_____ 4. the use of resources in a way that meets the needs of the present and preserves the resources for the future

_____ 5. precipitation that may damage soil and soil organisms

_____ 6. occurs where low oxygen levels have killed all ocean life

_____ 7. can be replenished by natural processes

_____ 8. consists of chemical substances and particles released into the atmosphere

_____ 9. a mixture of eroded rock, minerals, partly decomposed organic matter, and other materials

_____ 10. a recent increase in Earth's average surface temperature

_____ 11. caused by an excessive growth of algae

_____ 12. occurs when gases in the atmosphere radiate the sun's heat back down to Earth's surface

Terms

a. acid rain

b. air pollution

c. algal bloom

d. dead zone

e. global warming

f. greenhouse effect

g. natural resource

h. nonrenewable resource

i. ozone hole

j. renewable resource

k. soil

l. sustainable use

Lesson 12.5: Vocabulary II

Name_____ **Class**_____ **Date**_____

Fill in the blank with the appropriate term.

1. Petroleum, coal, and natural gas are _____ resources.
2. All life relies on a relatively narrow range of _____, or acidity.
3. A natural resource is something supplied by nature that helps support _____.
4. The _____ layer shields Earth from most of the sun's harmful UV radiation.
5. _____ resources are in no danger of being used up.
6. During the past century, the temperature has risen by almost _____.
7. Of all the water on Earth, only _____ percent is fresh, liquid water.
8. Most scientists agree that global warming is caused by an increase of _____ in the atmosphere.
9. If acid _____ falls into lakes, it lowers the pH of the water and kills aquatic organisms.
10. One of the biggest sources of water _____ is runoff.
11. Global _____ has resulted in a decline in cold-adapted species, such as polar bears.
12. Without the _____ effect, Earth's surface temperature would be too cold to support life.

Lesson 12.5: Critical Writing

Name_____ **Class**_____ **Date**_____

Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.

Distinguish between renewable and nonrenewable resources.