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Biology Standard
B.8.b.

Student Workbook

California Education and the Environment Initiative

Biological Diversity: The World's Riches

California Education and the Environment Initiative
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California Environmental Protection Agency
California Natural Resources Agency
Office of the Secretary of Education
California State Board of Education
California Department of Education
California Integrated Waste Management Board

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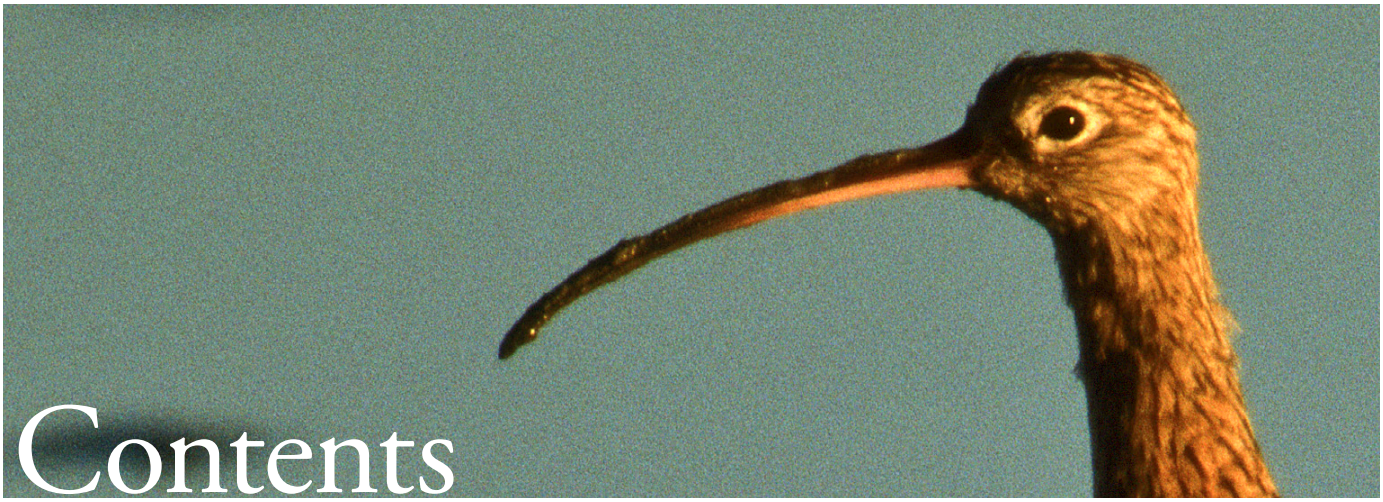

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Biodiversity hotspot: A region containing at least 1,500 endemic species of vascular plants that has lost 70% of its original habitat, making it a priority for conservation efforts.

Biological diversity (biodiversity): A measure of the number of different species of organisms in a specific area, it is also used as a general description of species richness, ecosystem complexity, and genetic variation.

Biome: Large regions of Earth's surface that share similar characteristics of climate and vegetation.

Ecosystem: A specific area, such as a kelp forest, that contains a characteristic set of interdependent species that interact with each other and the abiotic components found there.

Ecosystem services: The functions and processes that occur in natural systems, such as pollination, that support or produce ecosystem goods and help sustain human life, economies, and cultures.

Endemic species: A species that is present in and limited to a particular region.

Estuary: A coastal body of water created where the mouth of a river empties into the ocean or a bay and mixes with salt water.

Gene pool: The set of genetic information that collectively defines a species or a population.

Genotype: The genetic makeup of an organism.

Geographic extent: The area through which a species or ecosystem is distributed.

Habitat: The environment in which an organism lives and meets its needs.

Microclimate: A localized climatic condition that differs from the general surroundings due to the local conditions.

Microhabitat: A small and specialized habitat, such as a crevices in caves and undersides of logs, occupied by a species.

Natural system: The interacting components, processes, and cycles within an environment, as well as the interactions among organisms and their environment.

Niche: A description of how a species functions within an ecosystem, such as the types and sizes of foods eaten and the specific habitats occupied.

Primary production: The amount of new organic material that is synthesized through photosynthesis and chemosynthesis, and is available to organisms in an ecosystem.

Range: The entire region in which an organism or ecosystem is naturally found.

Resource extraction: The removal of a natural resource from an area by human practices, such as logging and mining.

Territory: The area that an animal defends that contains a nest, den, or mating site, and food resources.

Topography: The physical features of the land, such as elevation and relative location.

Name: _____

Instructions: Use information from this lesson to answer the following questions. (5 points each)

1. What did you observe about the diversity of California's ecosystems as you looked at the **Biological Diversity** wall map?

2. Why is California considered a biodiversity hotspot?

3. What have you observed about the distribution of biomes around the world?

4. As you compare the number of biomes with the number of vegetation types and ecosystems in California, what can you conclude about biological diversity in California?

Name: _____

5. According to the **Diversity of Life** wall map, what biome can be found in North America, South America, Africa, Asia, and Australia?

6. What characteristics common to many of California's ecosystems lead to the state's high biological diversity?

Name: _____

Part 1

Instructions: Describe and compare the three deserts by completing the following chart. (1 point per cell)

	Great Basin	Mojave	Sonoran
Precipitation (Amount and Patterns)			
Climate (Degrees and Patterns)			
Location (Elevation and Latitude)			
Plants and Animals (Variety and Distribution)			

Name: _____

Part 2

Instructions: Use the chart in Part 1 to compare the three deserts and answer the following questions.

1. Can deserts have varying levels of biological diversity? Explain, using the Sonoran, Mojave, and Great Basin deserts as examples. (3 points)

2. Which of these three deserts has the highest biological diversity? Explain your answer. (2 points)

3. What factors lead to higher levels of biological diversity in desert ecosystems? (3 points)

Name: _____

Part 1

Instructions: The grids on pages 1 and 2 show where and how many different species live in the same size area in two different biomes, a desert and a tropical rainforest. The letters in the plots within each grid represent different species living in the area. For example, "A" might represent a cholla cactus and "B" might represent a kangaroo rat. Analyze the species data in all the plots and complete the data summaries below the charts on pages 1 and 2. Use the data on these grids to answer the questions on pages 3 and 4.

Desert			
Plot 1 A, B, C, D, E, F, G	**Plot 2** A, B, C, D, E, F, G, H, I	**Plot 3** A, B, C, D, E, F, G, H, I	**Plot 4** A, B, C, D, E, F, G, H, I
Plot 5 A, B, C, D, E, F, G	**Plot 6** A, B, C, D, E, F, G, H, I	**Plot 7** A, B, C, D, E, F, G, H, I	**Plot 8** A, B, C, D, E, F, G, H, I
Plot 9 A, B, C, D, E, F, G	**Plot 10** A, B, C, D, E, F, G, H, I	**Plot 11** A, B, C, D, E, F, G, H, I	**Plot 12** A, B, C, D, E, F, G, H, I
Plot 13 A, B, C, D, E, F, G, H, I	**Plot 14** D, E, F, G, H, I	**Plot 15** A, B, C, D, E, F, G, H, I	**Plot 16** A, B, C, D, E, F, G, H, I

How many total species are found in the 16 desert plots? _____

How many plots is each species found in?

A = _____ B = _____ C = _____

D = _____ E = _____ F = _____

G = _____ H = _____ I = _____

Name: _____

Tropical Rainforest			
Plot 1 AA, BB, CC, DD, EE, FF, GG, HH, II, JJ, KK	**Plot 2** AA, CC, DD, EE, FF, GG, HH, II, JJ, KK, LL, MM, NN	**Plot 3** EE, FF, GG, HH, II, JJ, KK, LL, MM, NN, OO, PP, QQ, RR	**Plot 4** AA, CC, DD, FF, HH, II, KK
Plot 5 II, JJ, KK	**Plot 6** CC, II, JJ, KK, LL, MM, OO, QQ	**Plot 7** FF, GG, HH, II, JJ, LL, MM, NN, OO, PP, QQ, RR, SS, TT	**Plot 8** DD, FF, HH, II, SS, TT
Plot 9 II, JJ, KK, LL	**Plot 10** II, JJ, KK, LL, MM, NN, OO, PP, QQ, RR, SS, TT, UU	**Plot 11** DD, II, PP, RR, SS	**Plot 12** DD, FF, II, KK
Plot 13 AA, BB, CC	**Plot 14** AA, CC, DD, EE, FF, GG, HH, II, JJ, KK	**Plot 15** GG, HH, II, JJ, KK	**Plot 16** DD, FF, HH, II, SS, TT

How many total species are found in the 16 rainforest plots? _____

How many plots is each species found in?

AA = _____ BB = _____ CC = _____

DD = _____ EE = _____ FF = _____

GG = _____ HH = _____ II = _____

JJ = _____ KK = _____ LL = _____

MM = _____ NN = _____ OO = _____

PP = _____ QQ = _____ RR = _____

SS = _____ TT = _____ UU = _____

Name: _____

Part 2

Instructions: Answer the following questions in the spaces provided.

1. Which of these two biomes has greater biodiversity? How do you know?

2. Which species in the tropical rainforest has the greatest geographic extent (broadest distribution)? Explain your reasoning.

3. Which species in either biome has the smallest geographic extent (distribution)? Which biome does it live in? Explain your reasoning.

4. How does the species distribution differ between the two biomes?

Name: _____

5. Why does the species distribution differ between these two biomes?

6. What can you conclude about the biological diversity of ecosystems within these two biomes? (Be prepared to explain your answer to the rest of the class.)

Name: _____

Instructions: The grid below shows where and how many different species live in a study area in the redwood forest, a temperate coniferous forest biome. This study area is the same size as the desert and rainforest study areas. The letters in the plots within each grid represent different species living in the area. For example, "AAA" might represent a giant sequoia and "BBB" might represent a banana slug. Analyze the species data in the plots and complete the data summary below the chart. Use the data on these grids to answer the questions on page 2.

Redwood Forest			
Plot 1 AAA, BBB, CCC, DDD, EEE, FFF, GGG, HHH	**Plot 2** AAA, CCC, DDD, EEE, FFF, GGG, HHH, III, JJJ	**Plot 3** AAA, CCC, DDD, FFF, HHH, III, KKK	**Plot 4** AAA, CCC, DDD, FFF, HHH, III, KKK
Plot 5 AAA, BBB, III, JJJ, KKK, NNN, OOO	**Plot 6** FFF, GGG, HHH, III, JJJ, KKK, LLL, MMM, OOO	**Plot 7** FFF, GGG, HHH, III, JJJ, LLL, MMM, NNN, OOO	**Plot 8** EEE, FFF, III, JJJ, KKK, LLL, MMM, NNN, OOO
Plot 9 AAA, BBB, III, JJJ, KKK, LLL	**Plot 10** III, JJJ, KKK, LLL, MMM, NNN, OOO	**Plot 11** AAA, BBB, DDD, III, NNN, OOO	**Plot 12** DDD, FFF, III, KKK, NNN, OOO
Plot 13 AAA, BBB, CCC, FFF, GGG, III, JJJ, KKK	**Plot 14** AAA, CCC, DDD, EEE, FFF, GGG, HHH	**Plot 15** GGG, HHH, III, JJJ, KKK, MMM, NNN	**Plot 16** DDD, FFF, HHH, III, NNN, OOO

How many total species are found in the 16 redwood forest plots? _____

How many plots is each species found in?

AAA = _____ BBB = _____ CCC = _____

DDD = _____ EEE = _____ FFF = _____

GGG = _____ HHH = _____ III = _____

JJJ = _____ KKK = _____ LLL= _____

MMM = _____ NNN = _____ OOO = _____

Name: _____

1. Compare the species distribution in the redwood forest to that of the desert and tropical rainforest biomes. List the biomes in order by level of biological diversity. (1 point each)

   Lowest: _____

   Midlevel: _____

   Highest: _____

2. Explain how you decided on this order. (3 points)

3. Why are tropical rainforest biomes considered to have high levels of biological diversity? (3 points)

4. Why do the geographic extent and biological diversity of ecosystems vary in different biomes? (4 points)

Name: _____

Instructions: Complete the following chart during class discussion.

Natural Event or Human Practice	Description	Effects on Natural System	Effects on Species Composition	Effects on Local Geographical Extent of Rainforest
Tropical Storm				
Drought				

Name: _____

Natural Event or Human Practice	Description	Effects on Natural System	Effects on Species Composition	Effects on Local Geographical Extent of Rainforest
Farming				
Logging				
Mining				

Name: _____

Part 1

Instructions: Complete the following chart during class discussion.

Natural Event/ Human Practice	**Scope** (Local, regional, or national)	**Scale** Small-scale (tens to hundreds of acres), large-scale (thousands of acres)	**Duration** Length of time (short-term, ongoing, indefinite)	**Byproducts or Effects**	**Recovery or Capacity to Adjust**
Tropical Storm					
Drought					

Name: _____

Natural Event/ Human Practice	**Scope** (Local, regional, or national)	**Scale** Small-scale (tens to hundreds of acres), large-scale (thousands of acres)	**Duration** Length of time (short-term, ongoing, indefinite)	**Byproducts or Effects**	**Recovery or Capacity to Adjust**
Farming					
Logging					
Mining					

Name: _____

Part 2

Instructions: Use examples from **Events and Practices That Affect Rainforests** on pages 13–14 and your work in Part 1 to answer the following questions.

1. How do natural events and human practices influence the local geographic extent of rainforest ecosystems? (5 points)

2. How do natural events and human practices affect the species composition of rainforests? (5 points)

Name: _____

3. Describe one natural event and one human practice discussed in this lesson. Explain which of the two affords rainforest ecosystems a better chance of recovery. (10 points)

Name: _____

Instructions: Use information from **Kingfisher Background Information** (Student Edition, pages 9–11) to answer the questions below. (5 points each)

1. What is the correlation between the size of a kingfisher and the size of fish it eats?

2. What types of human activity could cause a major environmental change that could affect kingfishers?

3. A human practice has eliminated all fish of a particular size needed by the Amazon kingfisher.
   a. What happens to this species of kingfisher?
   b. How many kingfisher species remain?
   c. What happens to the overall range of characteristics and adaptations (gene pool) of kingfishers in this ecosystem?

4. A human practice has eliminated all fish of the size needed by the belted kingfisher.
   a. What happens to this species of kingfisher?
   b. How many species of kingfisher remain in this ecosystem?
   c. What happens to the gene pool of kingfishers in this ecosystem?

Name: _____

5. In which natural system, the rainforest of Panama or the North American woodland, is there a better chance that some species of kingfishers will survive major changes in the environment?

Why?

Instructions: Answer the following question after the class discussion.

6. Which biomes on Earth are being affected by human practices?

Why?

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