7

Science Standard
7.4.g.

Visual Aids

California Education and the Environment Initiative

Extinction: Past and Present

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:

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

Key Leadership for the Education and Environment Initiative:

Linda Adams, Secretary, California Environmental Protection Agency
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Key Partners:

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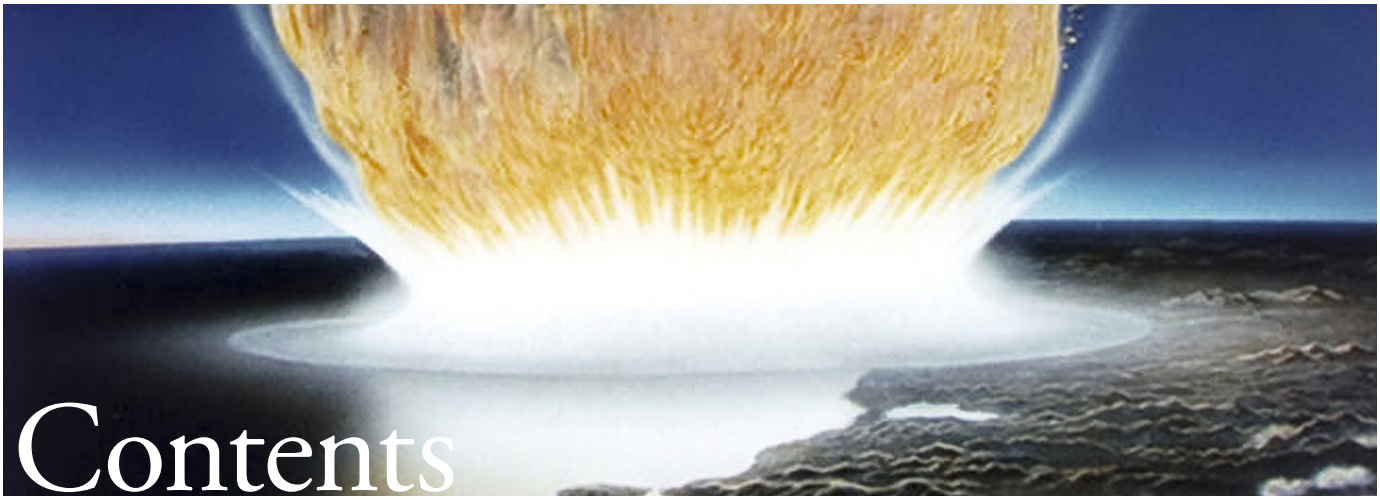

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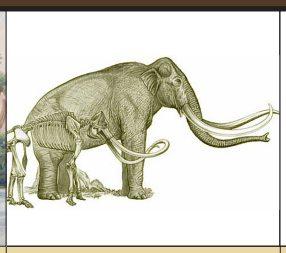
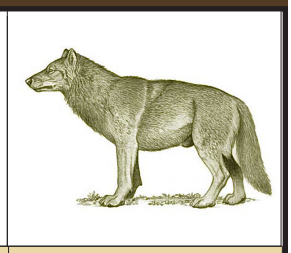
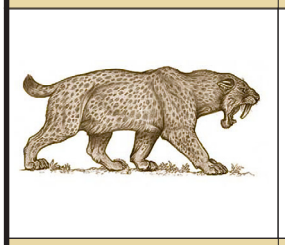
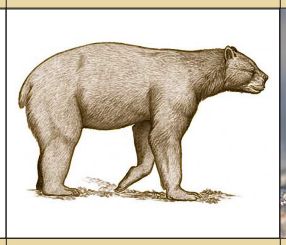
VA #1 Life in the Pleistocene

				
American mastodon	Columbian mammoth	ancient bison	western camel	dire wolf
				
saber-toothed cat	short-faced bear	grasshopper	fly	scorpion
gopher snake	coyote	bobcat	weasel	ground sloth
coast live oak	incense cedar	cottonwood	coast redwood	raspberry

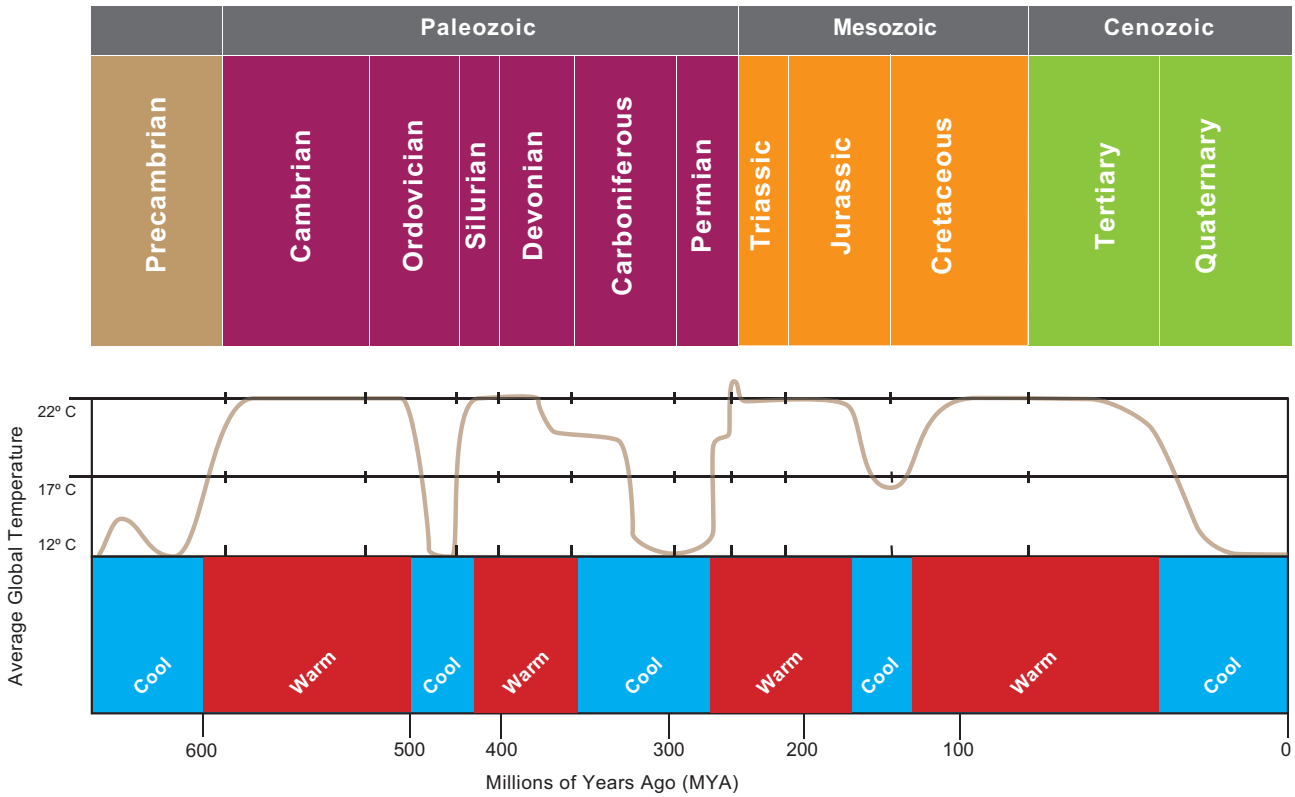
VA #2 Changes Across Time 1

Paleozoic Era						
	Cambrian Period	Ordovician Period	Silurian Period	Devonian Period	Carboniferous Period	Permian Period
Time span						
Plants and Animals						
Climate						
Atmospheric Gases						

VA #3 Changes Across Time 2

	Mesozoic Era			Cenozoic Era
	Triassic Period	Jurassic Period	Cretaceous Period	Tertiary and Quaternary Period
Time span				
Plants and Animals				
Climate				
Atmospheric Gases				

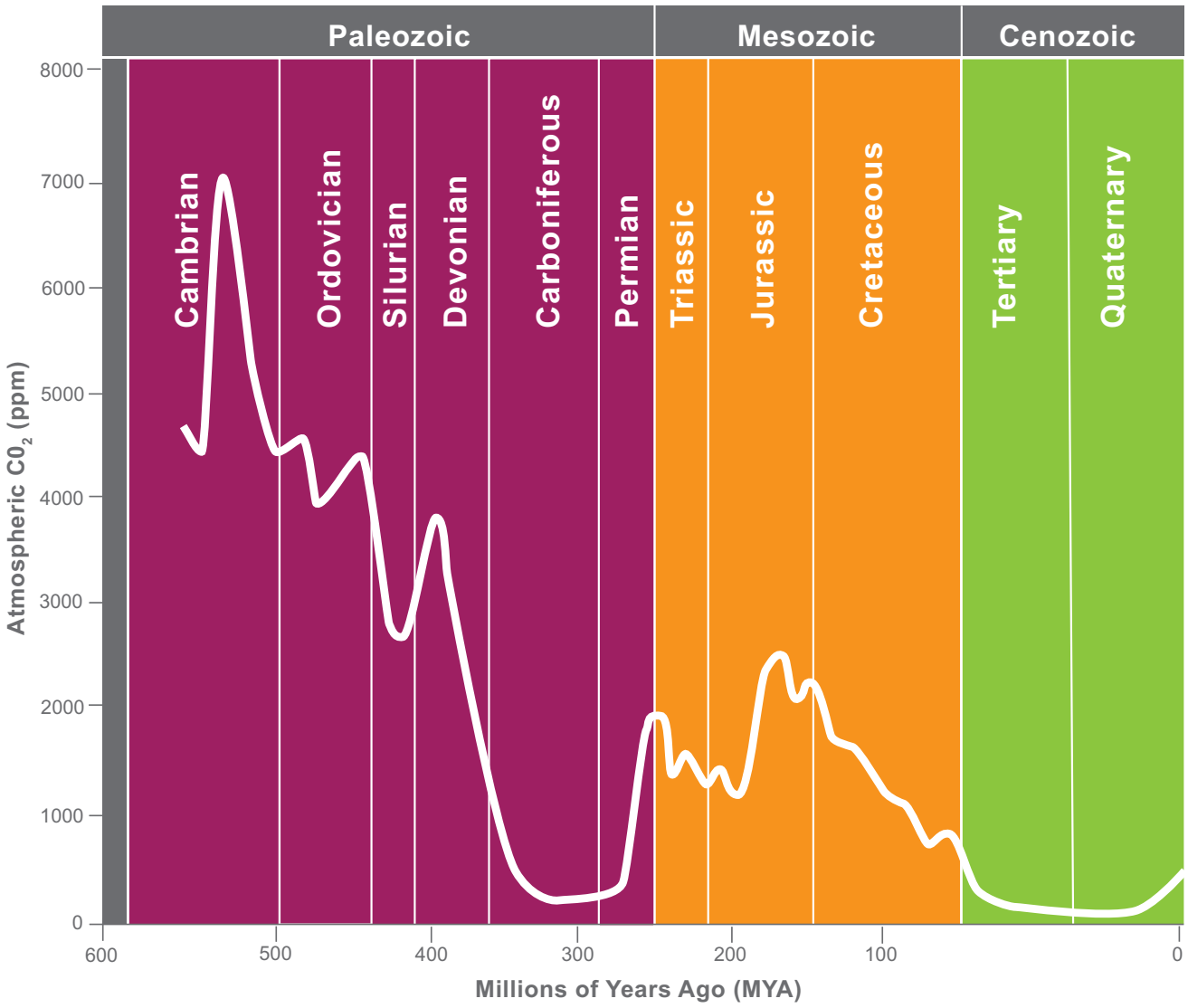
VA #4 Data on Global Temperature



Source: Scotese, christopher R. "Paleomap Project: Climate History."

http://www.scotese.com/climate.htm

VA #5 Data on Atmospheric CO_2

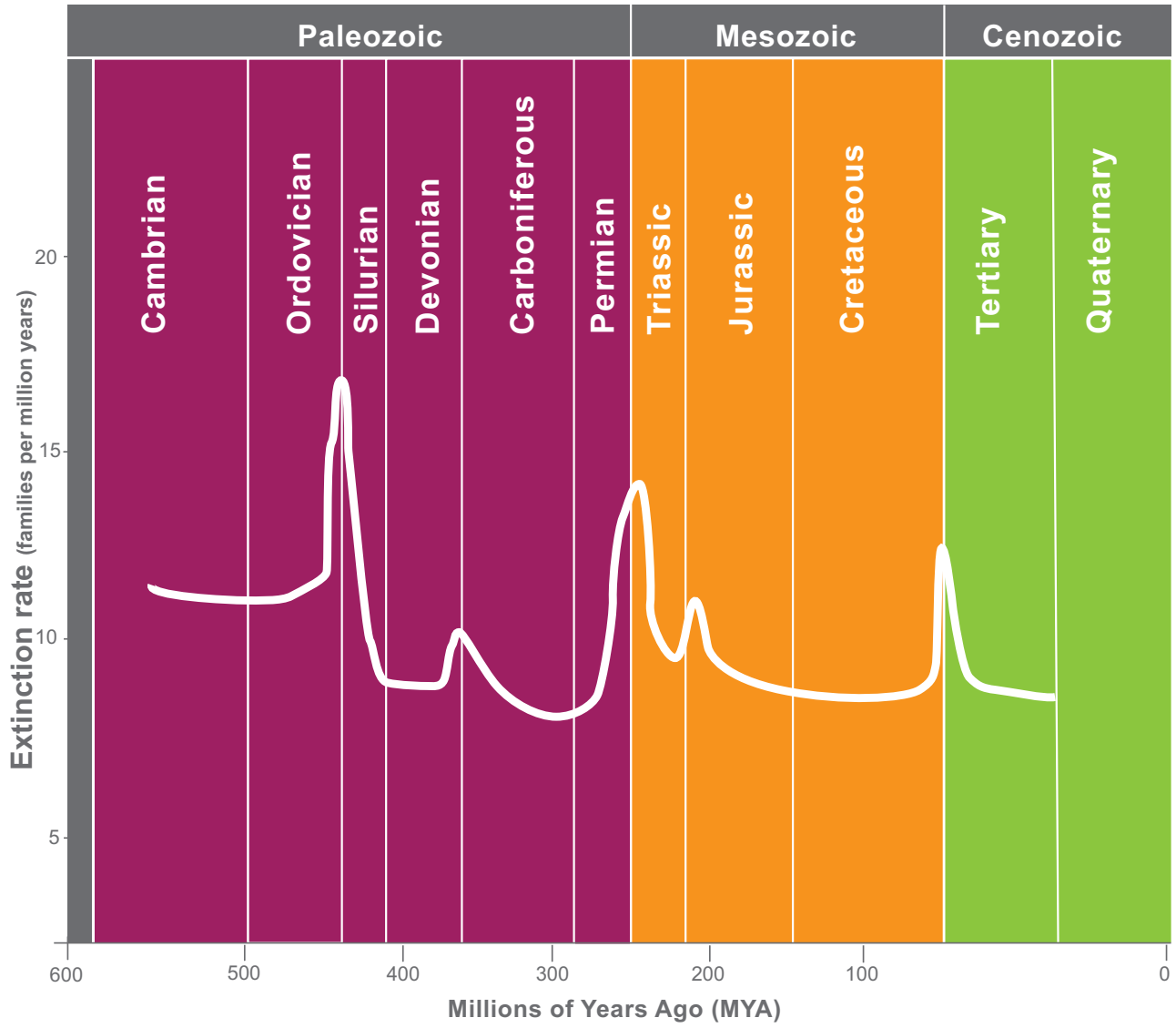


VA #6 Fossil Data by Era and Period

Millions of Years Ago (MYA): 0, 65, 144, 206, 248, 290, 354, 417, 443, 490, 543

Era	Period	Fossil Evidence
Cenozoic	Quaternary	■ many mammal species, including marine mammals and humans ■ no evidence of dinosaurs and certain marine invertebrates (ammonites)
Cenozoic	Tertiary	
Mesozoic	Cretaceous	■ many flowering plant and bird species ■ variety of dinosaurs (including pterosaur) ■ marine invertebrates (ammonites)
Mesozoic	Jurassic	■ increasing variety of dinosaurs ■ first birds and first flowering plants ■ no evidence of marine reptiles or approximately 35% of other animal families from Triassic
Mesozoic	Triassic	■ early dinosaurs ■ first mammals ■ variety of marine reptiles ■ no evidence of 90% of species, including trilobites—from Permian
Paleozoic	Permian	■ first herbivores with skeletons ■ increase in number of insect and amphibian species living during this time
Paleozoic	Carboniferous	■ first herbivores (insects) ■ first reptiles and flying insects ■ parts of scale trees and seed ferns ■ no evidence of more than 70% of invertebrates—most notably marine invertebrates—from Devonian
Paleozoic	Devonian	■ number of land-based plants increased during this time ■ first trees ■ bony fish ■ first amphibians
Paleozoic	Silurian	■ vascular plants ■ number of jawless fish increased and spread ■ evidence of large coral reefs in oceans ■ no evidence of 60% of marine invertebrates from Ordovician
Paleozoic	Ordovician	■ first jawless fish ■ lichens ■ first land plants
Paleozoic	Cambrian	■ animals with (exo)skeletons ■ algae ■ fossils indicate the number of marine invertebrates (mostly trilobites) increased during this time

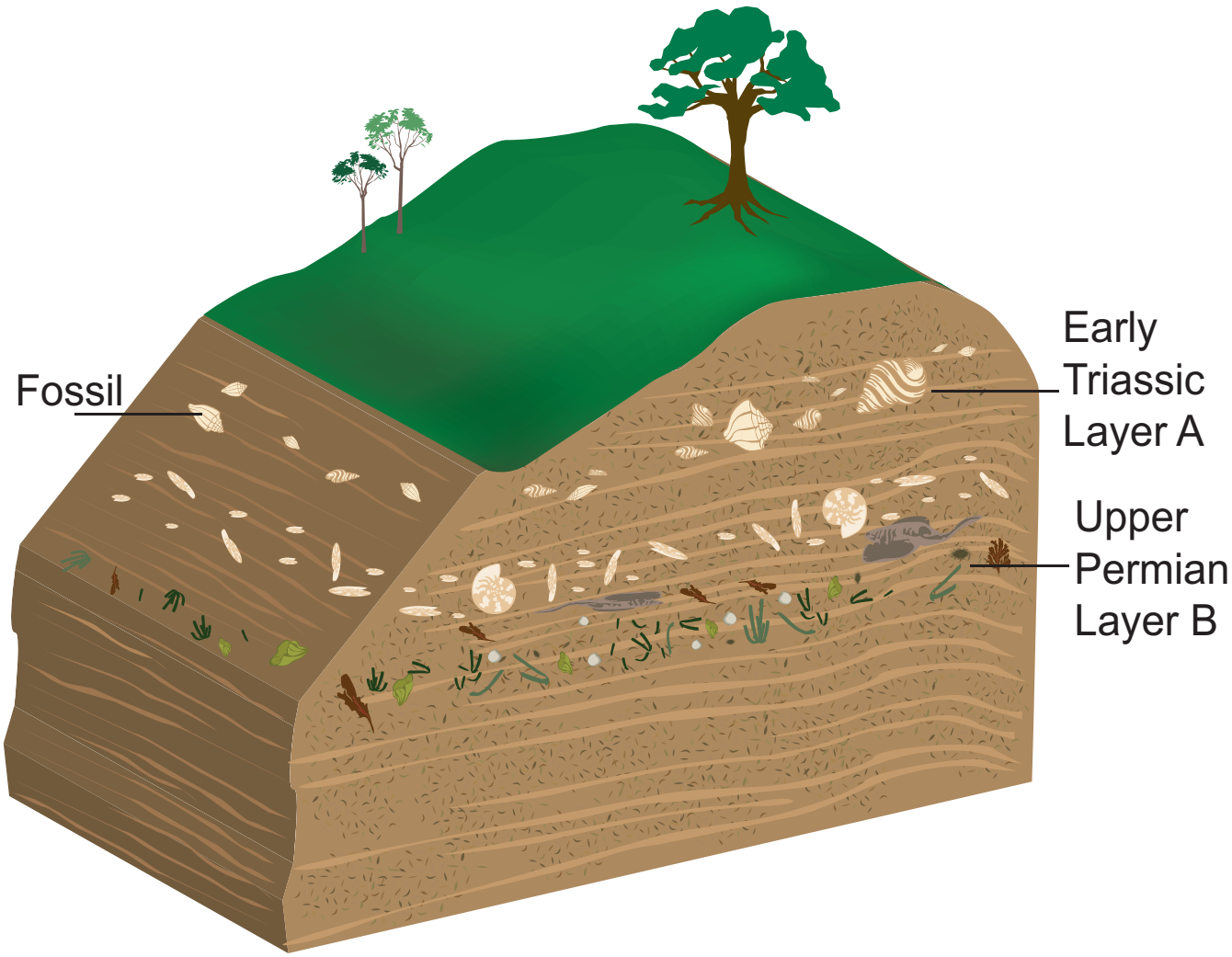
VA #7 Extinction Rates



VA #8 Cases and Causes of Extinction

Case Study	Organism(s) That Went Extinct (1 point each)	Was This a Mass Extinction or Not? (1 point each)	Other Changes That Occurred During This Time (4 points each)
Permian		**Circle one:** yes no	
Mesozoic		**Circle one:** yes no	
Cretaceous		**Circle one:** yes no	

VA #9 Late-Permian Extinction Evidence



VA #10 Digging Up the Past: Core Sample A

Age of Rock Layer	Fossils or Geological Evidence Found
	_____ _____ _____ _____ _____
	_____ _____ _____ _____
	_____ _____ _____ _____

Analysis (1 point each)

1. Which fossils were found in all layers of your sample?

   _____

   _____

2. Which fossils in your core sample are the youngest?

   _____

3. Describe some of the changes in organisms that are recorded in fossils and rock from layer to layer.

   _____

   _____

   _____

   _____

   _____

4. Based on the evidence from your core sample, what changes to the number of species on Earth happened during this time? Explain why.

   _____

   _____

VA #11 Digging Up the Past: Core Sample B

Age of Rock Layer	Fossils or Geological Evidence Found
	_____ _____ _____ _____ _____
	_____ _____ _____ _____
	_____ _____ _____ _____

Analysis (1 point each)

1. Which fossils were found in all layers of your sample?

   _____

   _____

2. Which fossils in your core sample are the youngest?

   _____

3. Describe some of the changes in organisms that are recorded in fossils and rock from layer to layer.

   _____

   _____

   _____

   _____

   _____

4. Based on the evidence from your core sample, what changes to the number of species on Earth happened during this time? Explain why.

   _____

   _____

VA #12 Digging Up the Past: Core Sample C

Age of Rock Layer	Fossils or Geological Evidence Found
	_____ _____ _____ _____ _____
	_____ _____ _____ _____
	_____ _____ _____ _____

Analysis (1 point each)

1. Which fossils were found in all layers of your sample?

   _____

   _____

2. Which fossils in your core sample are the youngest?

   _____

3. Describe some of the changes in organisms that are recorded in fossils and rock from layer to layer.

   _____

   _____

   _____

   _____

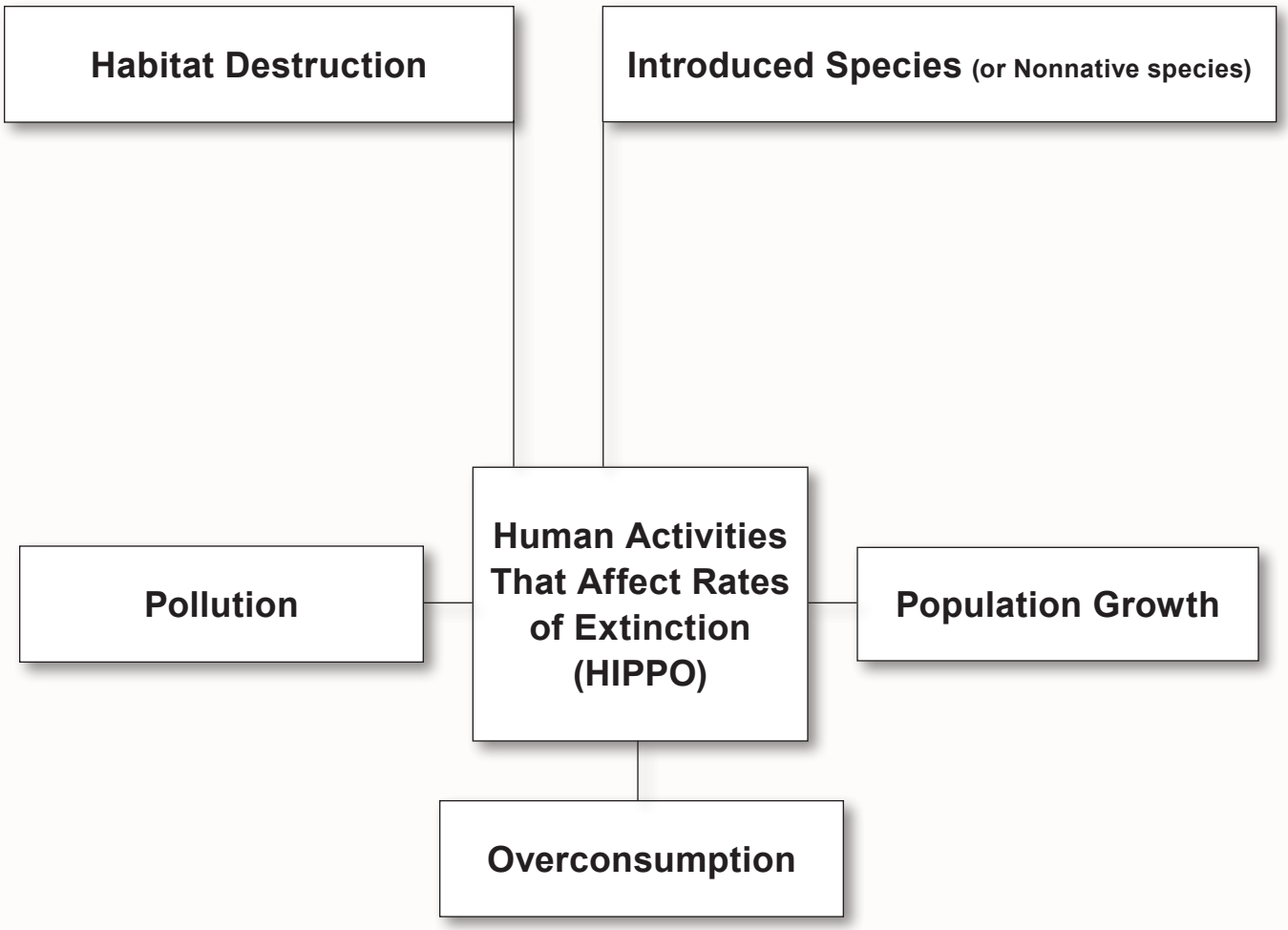
   _____

4. Based on the evidence from your core sample, what changes to the number of species on Earth happened during this time? Explain why.

   _____

   _____

VA #13 Human Activities and Extinction



VA #14 Human Influence on Earth's Natural Systems 1

- Over 85% of the world's forests have been cut down.
- More than 75% of the land around rivers and streams has been developed for human use.
- Almost 95% of grasslands and prairies have been converted to farming and ranching.
- More than 50% of all wetlands in the world have been drained or filled in. In California, 94% of wetlands have been drained or filled in.
- Human population has increased. The United Nations predicts the human population on Earth will grow by over 2 billion in the next 40 years.
- Humans have put thousands of tons of carbon dioxide and other gases into the atmosphere over the last 150 years (from the Industrial Revolution through now).

VA #15 Holocene Extinction Statistics

- Scientists estimate there are between 5 to 30,000,000 species on Earth.
- Humans have seen only 1,900,000 of these species. Others have not yet been discovered.
- Scientists have only studied the extinction rates of 47,500 of the 1,900,000 known species. This number represents only 2.5% of all the species scientists know about.

Of the species scientists have studied, they consider many to be in danger of extinction.

Group	Percent of Known Species in Danger of Extinction
Cycads (an ancient group of plants)	52% (one in two)
Amphibians	32% (one in three)
Birds	12% (one in eight)
Conifers (cone-bearing seed plants)	25% (one in four)
Mammals	24% (one in four)

VA #16 Human Influence on Earth's Natural Systems 2

- Government agencies, businesses, and individuals worldwide are working to improve management practices that affect Earth's natural systems.
- Many countries (for example, the United States, Australia, and China) are focusing on reforestation efforts and have made significant increases to their total forestland.
- Government agencies are developing and enforcing rules that protect rivers and streams.
- Many companies, government agencies, and non-governmental organizations are initiating programs to restore damaged watersheds.
- Countries have passed laws to significantly reduce their carbon emissions. In the United States, many states, including California, are enforcing laws to improve air quality.
- Individuals are implementing air, water, and land conservation practices.

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