

7

Science Standard  
7.4.g.



# Extinction: Past and Present

## **California Education and the Environment Initiative**

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

California Environmental Protection Agency  
California Natural Resources Agency  
California State Board of Education  
California Department of Education  
Department of Resources Recycling and Recovery (CalRecycle)

### **Key Partners:**

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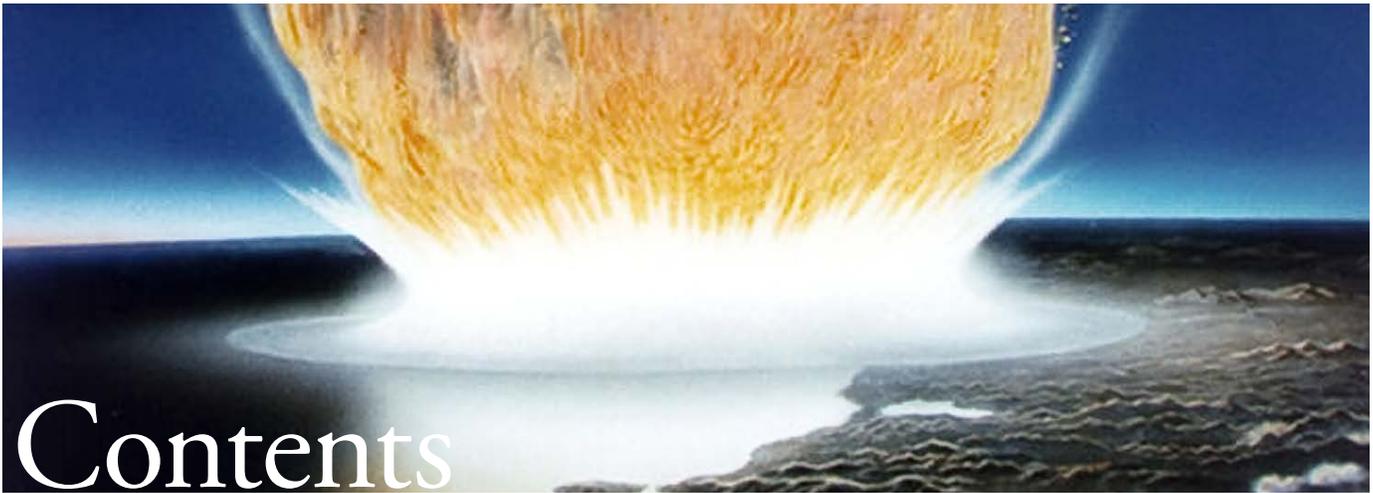
### **Office of Education and the Environment**

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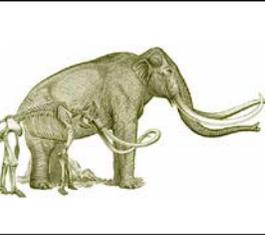
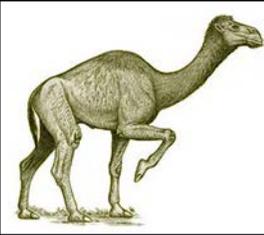
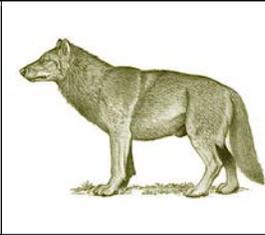
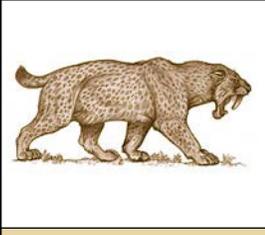
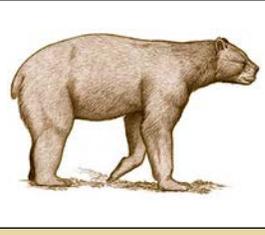
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## VA #1 Life in the Pleistocene

				
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

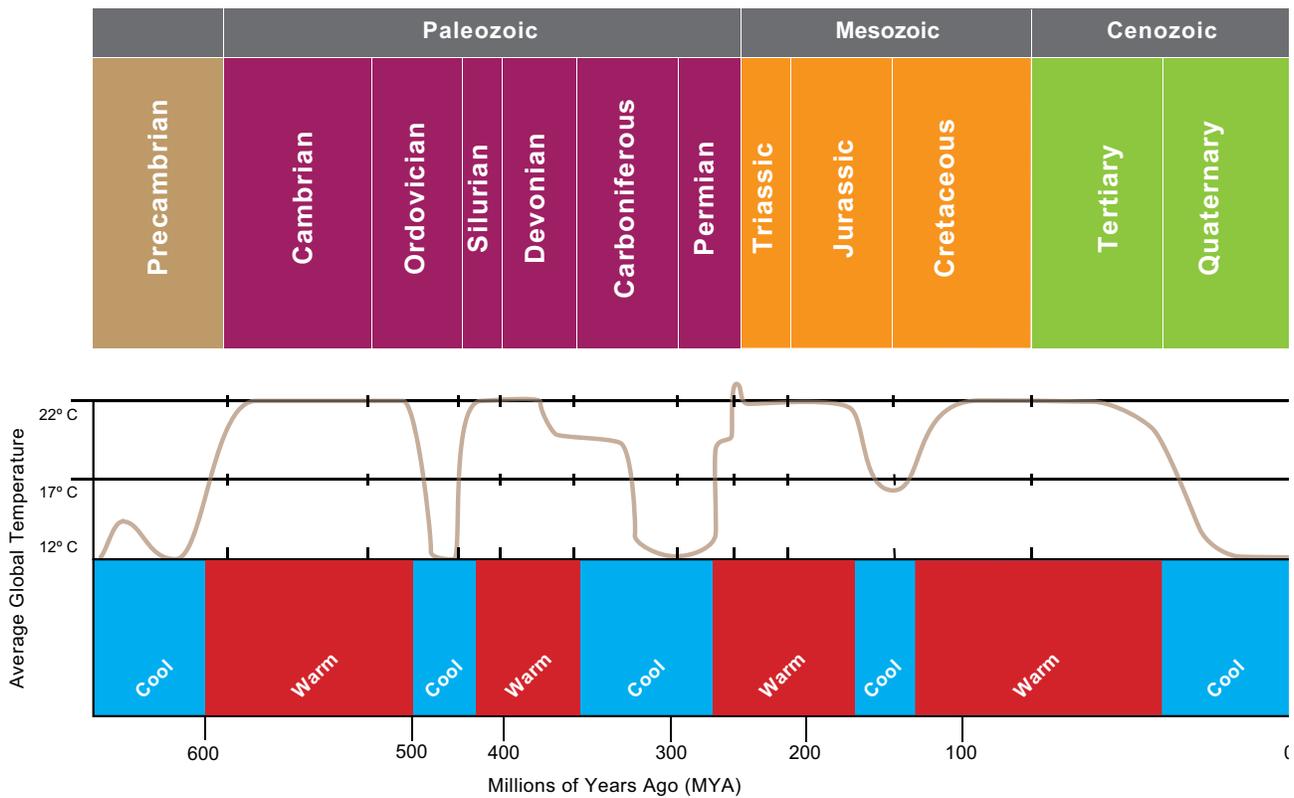
## VA #2 Changes Across Time 1

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

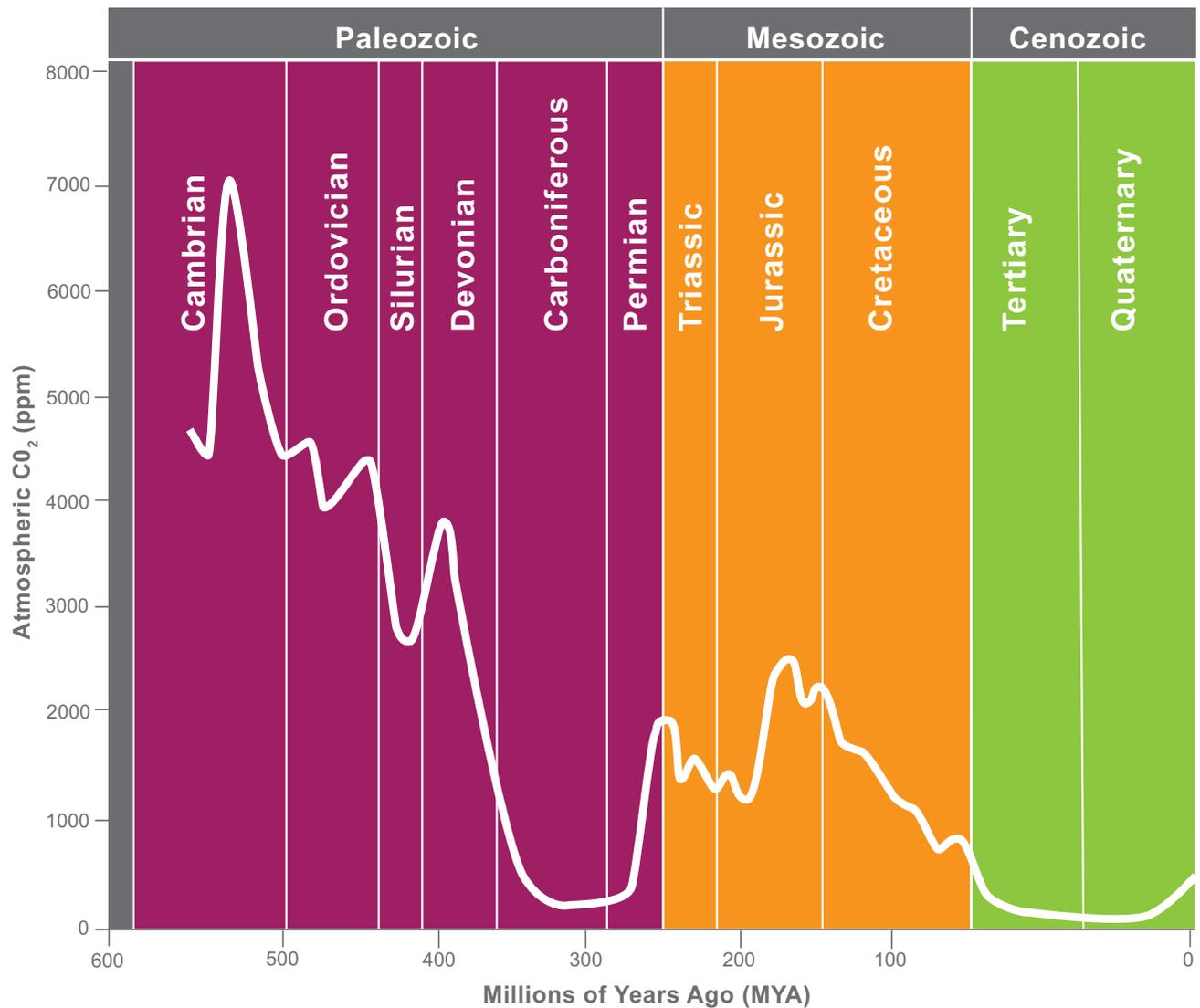
Mesozoic Era				Genozoic Era
	Triassic Period	Jurassic Period	Cretaceous Period	Tertiary and Quaternary Period
Time span				
Plants and Animals				
Climate				
Atmospheric Gases				

## VA #4 Data on Global Temperature



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

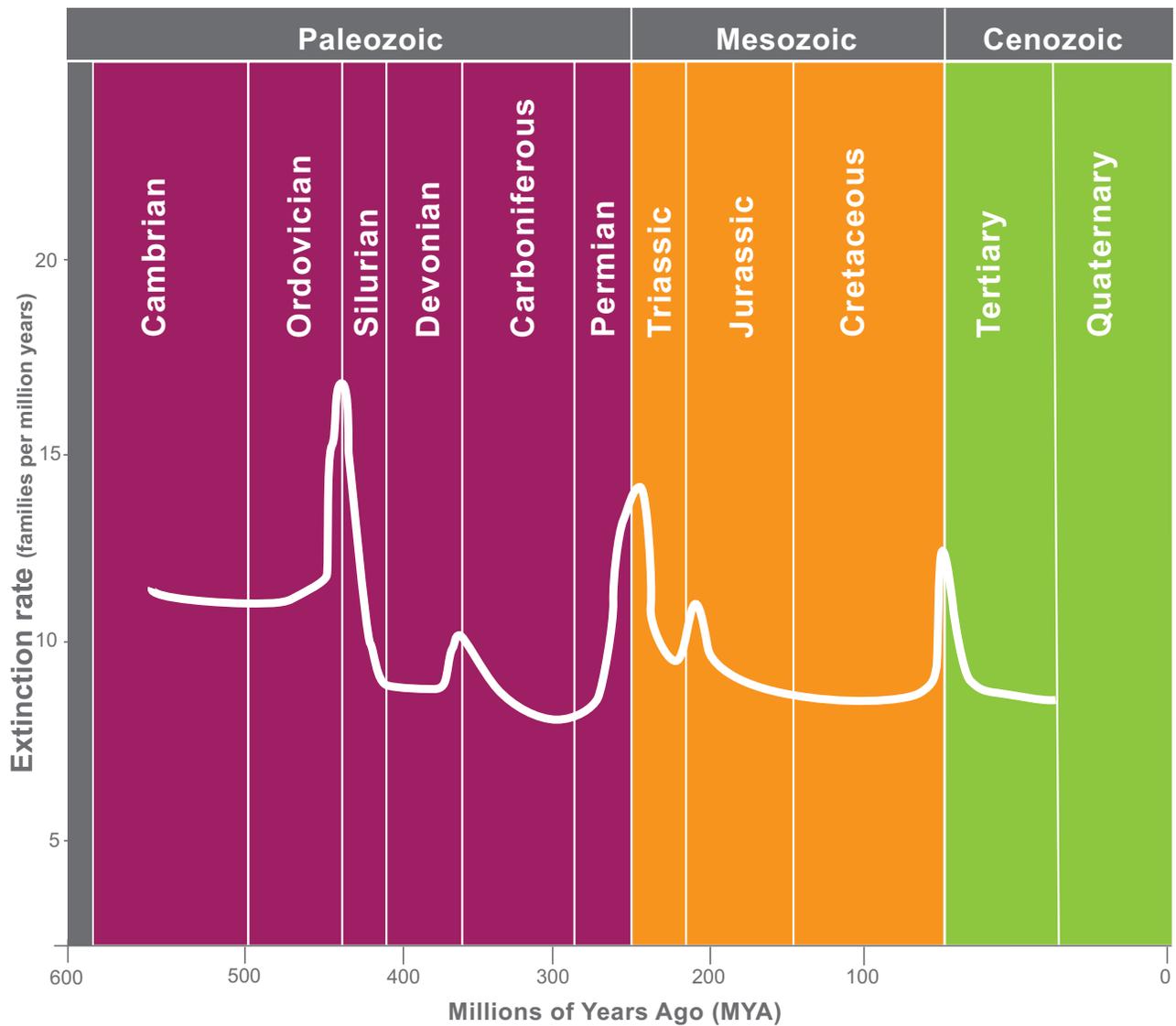
<http://www.scotese.com/climate.htm>

VA #5 Data on Atmospheric CO<sub>2</sub>

## VA #6 Fossil Data by Era and Period

		Era	Period	Fossil Evidence
Millions of Years Ago (MYA)	0	Cenozoic	Quaternary	<ul style="list-style-type: none"> <li>many mammal species, including marine mammals and humans</li> <li>no evidence of dinosaurs and certain marine invertebrates (ammonites)</li> </ul>
			Tertiary	
	65	Mesozoic	Cretaceous	<ul style="list-style-type: none"> <li>many flowering plant and bird species</li> <li>variety of dinosaurs (including pterosaur)</li> <li>marine invertebrates (ammonites)</li> </ul>
	144		Jurassic	<ul style="list-style-type: none"> <li>increasing variety of dinosaurs</li> <li>first birds and first flowering plants</li> <li>no evidence of marine reptiles or approximately 35% of other animal families from Triassic</li> </ul>
	206		Triassic	<ul style="list-style-type: none"> <li>early dinosaurs</li> <li>first mammals</li> <li>variety of marine reptiles</li> <li>no evidence of 90% of species, including trilobites—from Permian</li> </ul>
	248	Paleozoic	Permian	<ul style="list-style-type: none"> <li>first herbivores with skeletons</li> <li>increase in number of insect and amphibian species living during this time</li> </ul>
	290		Carboniferous	<ul style="list-style-type: none"> <li>first herbivores (insects)</li> <li>first reptiles and flying insects</li> <li>parts of scale trees and seed ferns</li> <li>no evidence of more than 70% of invertebrates—most notably marine invertebrates—from Devonian</li> </ul>
	354		Devonian	<ul style="list-style-type: none"> <li>number of land-based plants increased during this time</li> <li>first trees</li> <li>bony fish</li> <li>first amphibians</li> </ul>
	417		Silurian	<ul style="list-style-type: none"> <li>vascular plants</li> <li>number of jawless fish increased and spread</li> <li>evidence of large coral reefs in oceans</li> <li>no evidence of 60% of marine invertebrates from Ordovician</li> </ul>
	443		Ordovician	<ul style="list-style-type: none"> <li>first jawless fish</li> <li>lichens</li> <li>first land plants</li> </ul>
	490		Cambrian	<ul style="list-style-type: none"> <li>animals with (exo)skeletons</li> <li>algae</li> <li>fossils indicate the number of marine invertebrates (mostly trilobites) increased during this time</li> </ul>
543				

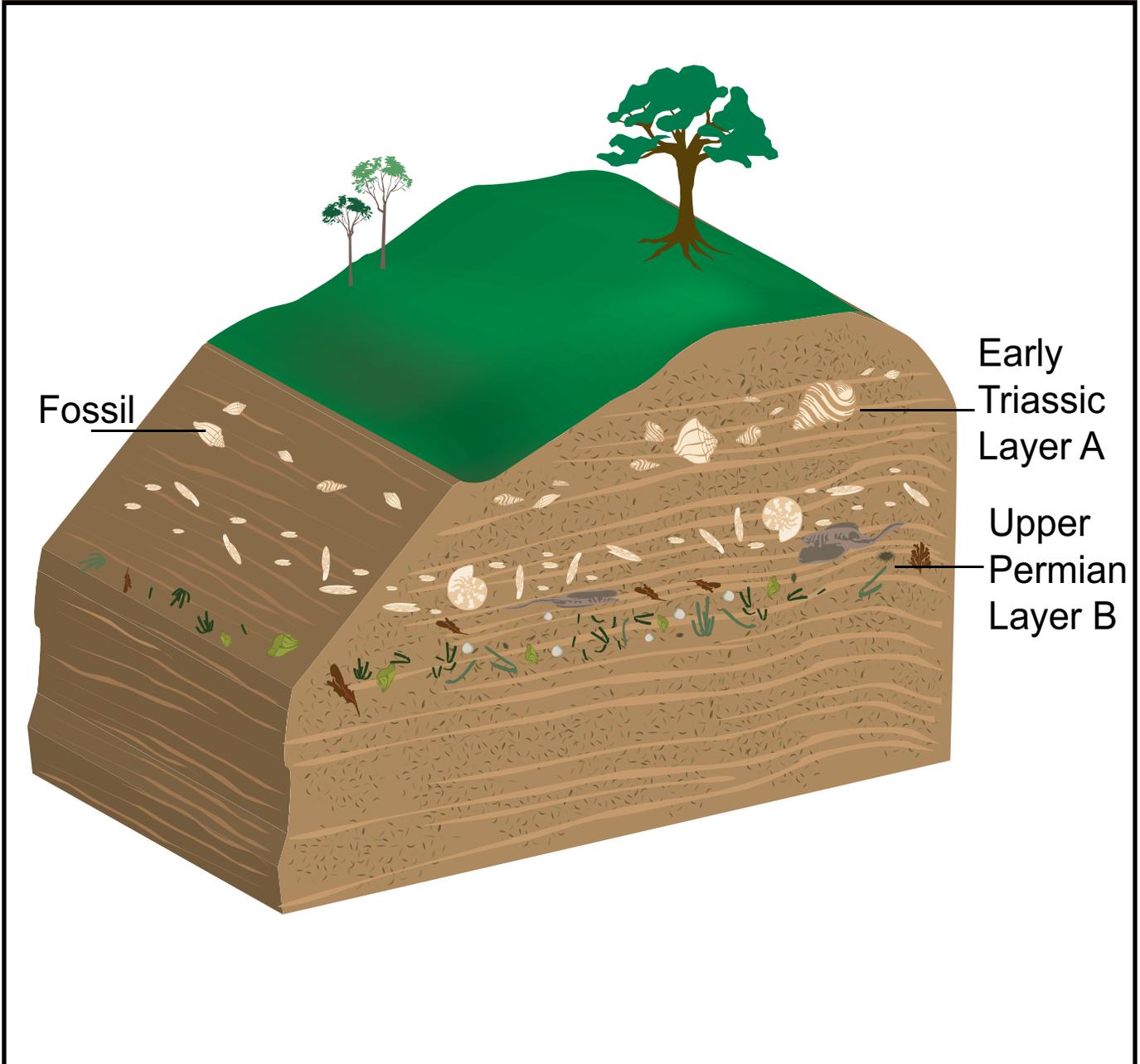
## VA #7 Extinction Rates



## 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)
<b>Permian</b>		<b>Circle one:</b>  yes  no	
<b>Mesozoic</b>		<b>Circle one:</b>  yes  no	
<b>Cretaceous</b>		<b>Circle one:</b>  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)
	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>1. Which fossils were found in all layers of your sample?</p> <hr/> <hr/> <p>2. Which fossils in your core sample are the youngest?</p> <hr/> <p>3. Describe some of the changes in organisms that are recorded in fossils and rock from layer to layer.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>4. Based on the evidence from your core sample, what changes to the number of species on Earth happened during this time? Explain why.</p> <hr/> <hr/> <hr/>
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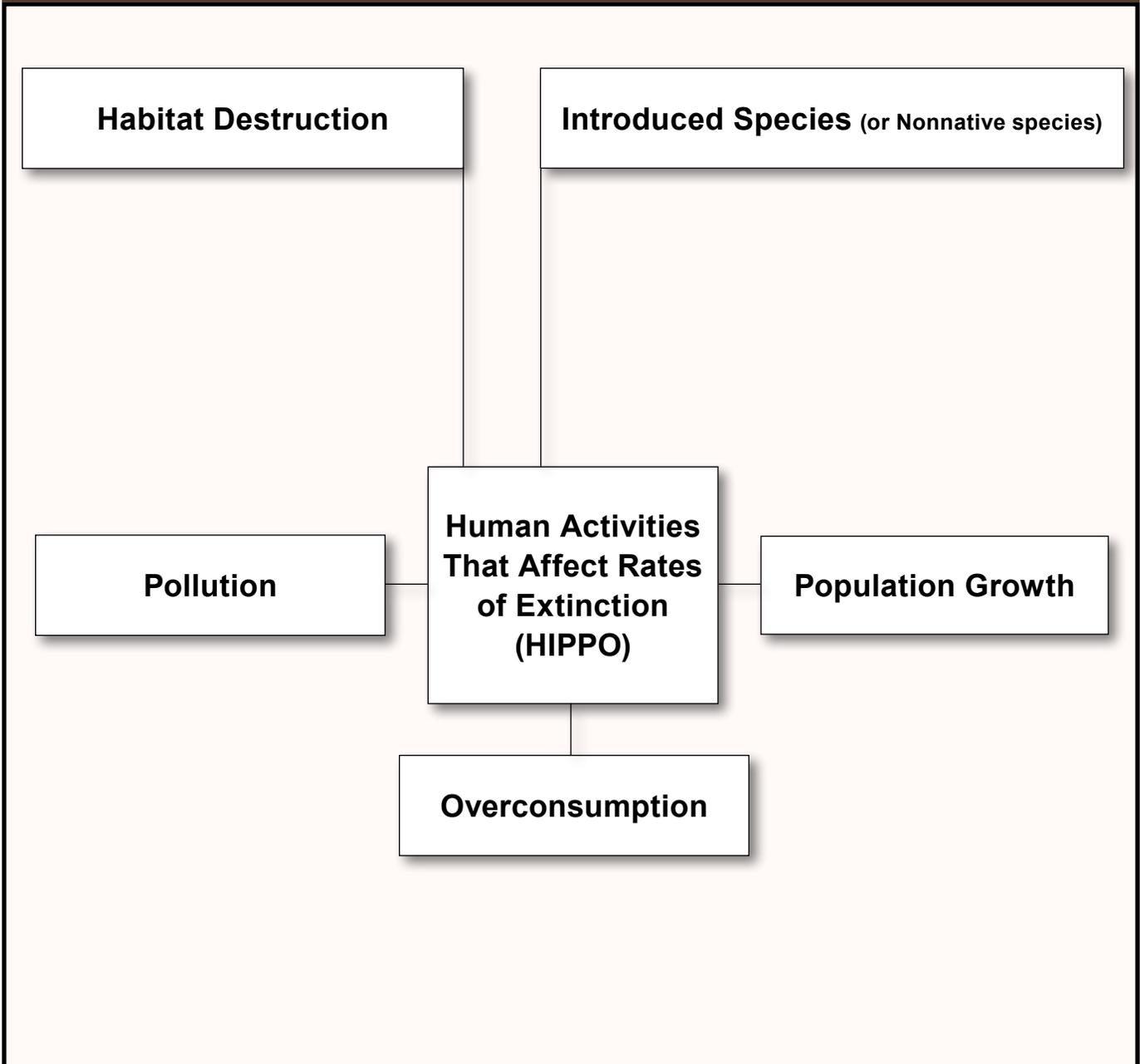
## VA #11 Digging Up the Past: Core Sample B

Age of Rock Layer	Fossils or Geological Evidence Found	Analysis (1 point each)
	<hr/> <hr/> <hr/> <hr/> <hr/>	<p>1. Which fossils were found in all layers of your sample?</p> <hr/> <hr/> <p>2. Which fossils in your core sample are the youngest?</p> <hr/> <p>3. Describe some of the changes in organisms that are recorded in fossils and rock from layer to layer.</p> <hr/> <hr/> <hr/> <hr/> <hr/>
	<hr/> <hr/> <hr/> <hr/> <hr/>	<p>4. Based on the evidence from your core sample, what changes to the number of species on Earth happened during this time? Explain why.</p> <hr/> <hr/> <hr/>

## VA #12 Digging Up the Past: Core Sample C

Age of Rock Layer	Fossils or Geological Evidence Found	Analysis (1 point each)
	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>1. Which fossils were found in all layers of your sample?</p> <hr/> <hr/> <p>2. Which fossils in your core sample are the youngest?</p> <hr/> <p>3. Describe some of the changes in organisms that are recorded in fossils and rock from layer to layer.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>4. Based on the evidence from your core sample, what changes to the number of species on Earth happened during this time? Explain why.</p> <hr/> <hr/> <hr/>

## 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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