

"Not all who wander are lost."

-J. R. R. Tolkien

2020-2021 AP Environmental Science Summer Assignment

Welcome to AP Environmental Science (APES)!

I am very excited for next year, and I hope you are too! The purpose of this summer assignment is to introduce you to Environmental Science and the important legislation that impacts the discipline. The assignment is broken into 3 parts:

1. Part 1 will help you become aware of some of the major environmental threats we will need to face in the coming future.
2. Part 2 will help us cover the legislation required for the AP exam next May.

If you have any questions about this work over the summer, please feel free to email me at sepp@houstonisd.org. Thanks in advance for the time you invest in these assignments. Also know that I'm picking the most important things for you to work on since I want you to have plenty of time to enjoy your summer break!

- Ms. Epp



**"The mountains are calling and I
must go."
-John Muir-**

"Not all who wander are lost."

-J. R. R. Tolkien

ASSIGNMENT #1: 20 points

Summer Reading: The Sixth Extinction

"The Sixth Extinction" by Elizabeth Kolbert

Here are just a few purchasing options:

Amazon: \$10.87 (https://www.amazon.com/Sixth-Extinction-Unnatural-History/dp/1250062187/ref=sr_1_2?crid=3MXTW05LZTGR6&keywords=the+sixth+extinction&qid=1560778665&s=gateway&sprefix=The+sixth+Extinction%2Caps%2C124&sr=8-2)

Barnes and Noble: \$15.30 (<https://www.barnesandnoble.com/w/the-sixth-extinction-elizabeth-kolbert/1116282618?ean=9781250062185#/>)

New or used books are perfectly ok. You can also look into the public library system for a copy.

The first assignment has two parts.

1. The first is to read the book, "The Sixth Extinction" by Elizabeth Kolbert . The book talks about many of the environmental issues that species are facing today. The problem is so bad that scientists are beginning to suggest that we are currently experiencing a mass extinction event. There have been 5 mass extinctions in Earth's history, the last being the asteroid impact that wiped out the dinosaurs (called the K-T Extinction Event).
2. Once you have finished reading, you are to write a letter to the author. In your letter you should:
 - a. Introduce yourself and explain why you're taking AP Environmental Science.
 - b. Describe a moment from the book that really resonated with you and why.
 - c. Explain how has this book influenced the way you see the world. If the book didn't influence the way you see the world, explain why and how the book could be improved.

Your letter should be ***at least*** one full page long, size 12 of any standard font (no comic sans, Pacifico, caveat, etc.), double spaced.

IMPORTANT: There will be an quiz on the book within the first two weeks of class.

- **I have included a set of guiding questions to help you focus while reading (these begin on page 5). These are a guide to help you key in on while you read.**
- **These questions will not be collected or graded, but they may help your do better on the quiz.**

"Not all who wander are lost."

-J. R. R. Tolkien

ASSIGNMENT #2: 10 points

ENVIRONMENTAL LEGISLATION

Construct a table (like my example below) that organizes important information regarding environmental legislation for the laws/treaties listed below. Include the following information:

- Name of Law or Treaty
- Draft Year and Amendment Years
- Is it International (world) or National (just the U.S)
- Describe the Function. What Environmental Issues are affected by this Legislation?
- Agency/Group Responsible for Regulation and Enforcement (United Nations, Department of Interior, EPA, etc.)

This list will help you and will be referenced throughout the year.

EXAMPLE:

Name	Date Draft & Amendment Year(s)	International or US?	Summarized Description	Issue(s) Affected	Agency
Clean Air Act	1963, 1977, 1990	US	To monitor and control air pollutants such as sulfur dioxide, nitrogen oxides, carbon monoxide, particulate matter, ozone, lead, carbon dioxide, volatile organic compounds, mercury. Meant to protect public welfare and health and regulate emissions of dangerous air pollutants.	Air pollution, Human health	EPA

Table Hints:

- You may find it easier to do this in landscape orientation.
- You can use online SCHOLARLY resources to find the information. Since these are governmental in nature, .gov sites are best!

*****You will have a QUIZ on this material within the first two weeks of school, so be prepared! ***
(Make flashcards and study them).**

These are the laws you need to look up

Clean Air Act (CAA)	General Mining Act of 1872	Wilderness Act
Clean Water Act (CWA)	Surface Mining Control & Reclamation Act	Fish and Wildlife Act
Safe Drinking Water Act	General Mining Act of 1872	Energy Policy Act
Kyoto Protocol	Soil & Water Conservation Act	National Wildlife Refuge System Act
Montreal Protocol	Resource Conservation & Recovery Act (RCRA)	Lacey Act (1900)
National Environmental Policy Act (NEPA)	Comprehensive Environmental Response, Compensation Liability Act (CERCLA)	Endangered Species Act (ESA)
Federal Food, Drug, and Cosmetic Act (FFDCA, FDCA, or FD&C)	Oil Pollution Act (OPA)	Marine Mammal Protection Act (MMPA)
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	Oil Spill Prevention & Liability Act	Marine Protection, Research, and Sanctuaries Act (MPRSA)
Corporate Average Fuel Economy (CAFE standards)	Ocean Dumping Ban Act	Convention on the International Trade in Endangered Species (CITES)
Pollution Prevention Act (PPA)	Toxic Substances Control Act (TSCA)	National Energy Act
	Solid Waste Disposal Act	Energy Policy Act

"Not all who wander are lost."

-J. R. R. Tolkien

Both assignments are due by the end of the first week of school. They may be submitted on the HUB or as paper copies during class.

"The Sixth Extinction" by Elizabeth Kolbert

Reading Guide

These questions are meant to serve as a guide to help you key in on key pieces of information while you read. This part will not be collected and it will not be graded.

Remember: There will be an assessment on this book in the first two weeks of school. This guide can help you prepare.

Prologue

"Not all who wander are lost."

-J. R. R. Tolkien

Questions:

- 1) What species is the author describing in the opening paragraphs?
- 2) What are some ways that this species affects the environments they inhabit (i.e. live in)?
- 3) How many major extinctions have there been before the current one? What happens to the planet during these?
- 4) What is the first part of the book concerned with? The second part?
- 5) What is the author's hope for her readers?

Chapter I: The Sixth Extinction

Questions:

- 1) Explain how the "Frog Hotel" and EVACC are similar.
- 2) Explain the importance of the EVACC.
- 3) Why are amphibians known as the "planet's greatest survivors"? How have they evolved over time?
- 4) What is *Batrachochytrium dendrobatidis* (Bd)? What is its effect on frogs? How it was discovered?
- 5) Explain why Bd is global a threat to amphibians. Is EVACC only a temporary solution? Justify your response with a quote.
- 6) Compare and contrast background extinction and mass extinction.
- 7) Identify and describe the two theories ("Out of Africa" and "frog-leg soup") behind the global spread of Bd.

Chapter II: The Mastodon's Molars

Questions:

- 1) Explain when, where, and how the first mastodon bones were discovered.
- 2) Who were the first naturalists to acknowledge the idea of extinction? How was it established as a fact?
- 3) Explain how Cuvier used the teeth of the fossil to figure out its species.
- 4) Explain the significance of Charles Willson Peale in the U.S.
- 5) How did fossilist Mary Anning challenge Cuvier?
- 6) Define the study of stratigraphy and explain its significance to understanding the geologic history of the planet.

"Not all who wander are lost."

-J. R. R. Tolkien

- 7) What major insight did Cuvier gain after his discovery of different fossils in different layers of rock?
- 8) Explain Cuvier's stance on evolution, who challenged his anatomic viewpoint? Include a summary of both Cuvier's and his challenger's claim.
- 9) Identify and describe what Cuvier believed to be the causes of extinction. What sources did Cuvier cite to support his position?
- 10) What was responsible for the "revolution" Cuvier suggested wiped out the American mastodon along with other megafauna?

Chapter III: The Original Penguin

Questions:

- 1) Explain what Charles Lyell meant when saying, "The present is the key to the past".
- 2) Identify and cite two examples in which Lyell influenced Darwin and his studies.
- 3) How did the coral reef draw Darwin's understanding of the interplay between biology and geology?
- 4) Explain Darwin's connective theory of extinction and evolution. Include a quote that supports your explanation.
- 5) Identify and explain one theory that Lyell and Darwin disagreed upon.
- 6) The example of the extinction of Auk sheds light on the issue of human-induced extinction, in your opinion do you think humans deserve a "special status" as a creature outside of nature? Justify your argument with a quote.

Chapter IV: The Luck of the Ammonites

Questions:

- 1) Explain the importance of forams and how they were used in Alvarez's studies.
- 2) Explain the significance of the spike in iridium in the clay samples taken by Alvarez.
- 3) Explain the Alvarezes' hypothesis for such spikes in iridium. Include a quote to support your response.
- 4) In what way did the scientific community react to the Alvarezes' impact hypothesis?
- 5) Identify and describe the three "chapters of life".
- 6) How did the viewpoints on breaks in the fossil record differ between Phillips and Lyell?

"Not all who wander are lost."

-J. R. R. Tolkien

- 7) Explain the significance of the Alverezes' challenging the "uniformitarian viewpoint".
- 8) What influences "preservation potential"? Include a definition in your response.
- 9) What are the Signor-Lipps and Lilliput effect?
- 10) Explain how catastrophes challenge Darwin's ideas of adaptation and fitness. Include a quote to justify your response.

Chapter V: Welcome to the Anthropocene

Questions:

- 1) Explain how "catastrophes" relate to the theories of both Darwin and Cuvier.
- 2) Explain the following quote on the Ordovician radiation, "Had the list of survivors been one jot different, then so would the world today." (pg. 97)
- 3) What qualities make graptolites a useful index fossil?
- 4) Explain the significance of the change in color of the stone studied by Zalasiewicz.
- 5) What did the two paleontologists from the University of Chicago discover about the possible cause and pattern of extinctions?
- 6) Identify the biggest extinction of the Big Five. Explain what caused it and why it was the biggest.
- 7) Explain the current theory for why fossil records show signs of extinction near the end of the Ordovician period.
- 8) Describe the theory of how glaciation caused the end-Ordovician extinction.
- 9) What does Zalasiewicz believe humans will leave in the sedimentary record?
- 10) What did Paul Crutzen discover and how is this discovery related to the "Anthropocene"?
- 11) Do you think we are in the "Anthropocene"? Why or why not?

Chapter VI: The Sea Around Us

Questions:

- 1) What can happen when CO₂ dissolves in water?
- 2) What is expected to happen if CO₂ emissions continue at the current rate? Should these consequences be of concern?
- 3) Explain what happens when water and air come into contact. What is happening to cause the equilibrium to become lopsided?
- 4) How does Castello Aragonese exemplify what our future oceans could look like?

Adapted from: 2018-2019 AP Environmental Science Summer Assignment, Mr. Mai and Adapted from: Jennifer Thomas, Saint Francis High School

"Not all who wander are lost."

-J. R. R. Tolkien

- 5) Explain the effects of ocean acidification on both organisms and entire aquatic ecosystems.
- 6) Which group of organisms will be most impacted by ocean acidification? In what ways are these organisms affected?
- 7) What is most significant about the rate in which CO₂ is currently entering the atmosphere? Why is this rate concerning?
- 8) Reflect on the following quote: "Continuing along this path for much longer, [...] 'is likely to leave a legacy of the Anthropocene as one of the most notable, if not cataclysmic events in the history of our planet'" (pg 124).

Chapter VII: Dropping Acid

Questions:

- 1) Compare Lyell's and Darwin's theory of coral reef formation.
- 2) Why are coral reefs an important aquatic ecosystem?
- 3) Explain the property of "saturation state with respect to calcium carbonate".
- 4) Explain the relationship between the growth rate of the corals and the saturation state of the water. Why is it important to keep saturation levels above 2?
- 5) What is predicted to happen to coral reefs if current emissions trends continue?
- 6) Explain how coral reefs support aquatic ecosystems.
- 7) Identify four human activities that are threatening corals.
- 8) How does the temperature of water affect the function of corals? (i.e. explain "coral bleaching")
- 9) Describe One Tree Island and the research that is being done there. What do you think about the messages left by research groups?

Chapter VIII: The Forest and the Trees

Questions:

- 1) Explain what is meant by "latitude diversity gradient".
- 2) Describe three theories that explain why biodiversity increases near the equator
- 3) What is the Birnam Wood Scenario?
- 4) Identify and explain the believed cause of the ice age
- 5) Why is the current rate of warming causing more impacts than previous warming periods? What is its effect on organisms?

"Not all who wander are lost."

-J. R. R. Tolkien

6) In ecology, what is meant by "species-area relationship"? 7) How does Silman's work suggest that global warming will "reconstruct" ecological communities?

Chapter IX: Islands on Dry Land

Questions:

- 1) What happened between ranchers and the Brazilian government that resulted in the creation of the BDFFP?
- 2) Explain how "wild lands" are no longer truly "wild".
- 3) Why are islands typically less diverse?
- 4) What trend did Jared Diamond find when specializing with the birds of New Guinea? What did he deem was the main predator driving local extinction?
- 5) What is the given explanation for the phenomenon of "relaxation"?
- 6) Explain Cohn-Haft's theory for why life in the tropics is so diverse.
- 7) What are some possible reasons that predictions on the number of species going extinct don't match observations in the field?
- 8) How has change in land use affected the atmosphere? What are the implications of this on a global scale?
- 9) Identify and describe two defining features of the Anthropocene.
- 10) Explain the significance in the relationship between army ants and ant-following birds and how it demonstrates ecosystem interconnectedness.

Chapter X: The New Pangaea

Questions:

- 1) What was the reason for the white powder on the bats? Where did it come from?
- 2) What did Darwin's "theory of descent with modification" say about species origins? In what ways do humans challenge this theory?
- 3) Explain how physical isolation can result into biological disparity (i.e. species becoming different).
- 4) How have humans affected geographic distribution and geographic separation of species?
- 5) How does the *Geomyces destructans* fungus kills bats?
- 6) Explain how the movement of species is a "high-stakes game". What are the possible outcomes?
- 7) Explain the term "enemy release" and how it relates to invasive species.

"Not all who wander are lost."

-J. R. R. Tolkien

- 8) What are the possible consequences of introducing an invasive species in order to kill off a previous invasive species?
- 9) Explain what biologists mean when referring to the "New Pangea".
- 10) Which species is "arguably the most successful invader in biological history"? Pick two distinct pieces of evidence from the book to support your claim.
- 11) Why do humans deliberately import "foreign varieties" of species?
- 12) What is the global effect of the sudden increase in movement of species?

Chapter XI: The Rhino Gets an Ultrasound

Questions:

- 1) What happened in 1984 that saved the Sumatran rhino from extinction? Was the effort successful?
- 2) Identify and explain two reasons for the mystery of the missing megafauna.
- 3) What did Wallace believe was the reason for the rapid extinction of large mammals? If true, how does this heighten the effects of current climate change?
- 4) With what other events have the sequence of megafauna extinction pulses been aligned?
- 5) What evidence was found that challenged the idea that climate drives extinction?
- 6) Explain how humans "challenged the rules of the survival game".
- 7) What was the evolutionary advantage of megafauna? (i.e. why did they grow so large)
- 8) What did paleontologist John Alroy and others find out about human actions using computer simulations?

Chapter XII: The Madness Gene

Questions:

- 1) What event is linked to the disappearance of Neanderthals?
- 2) Who invented the study of ancient DNA? Which ancient organisms did he study?
- 3) What happens to the genetic material of organisms after they die?
- 4) What was found when comparing the human genome to the Neanderthal genome?
- 5) Explain the "Out of Africa" theory of human evolution.
- 6) Explain the "leaky replacement" hypothesis? What does this hypothesis provide evidence for?
- 7) What characteristic do apes lack that is central to human society?
- 8) According to the archaeological record, in what location did Neanderthals evolve?

"Not all who wander are lost."

-J. R. R. Tolkien

- 9) What did Paabo discover from the DNA of the fragment figure bone?
- 10) What are "the hobbits" and the "Denisovans"? How is their fate similar to the great apes of today?

Chapter XIII: The Thing with Feathers

Questions:

- 1) What is the Frozen Zoo? What is its importance?
- 2) How does the bird Kinohi exemplify how serious human take extinction?
- 3) What do the "ups and downs of history" reveal about life?
- 4) What is the sole cause of the sixth extinction?
- 5) Explain the logic behind the Hall of Biodiversity's idea that human will be undone by our "transformation of the ecological landscape".
- 6) Explain the quote, "In pushing other species to extinction, humanity is busy sawing off the limb on which it perches" .