

Name _____

AP Environmental Science Summer Assignment

Welcome to the 2022-2023 class of AP Environmental Science. I am very excited to meet and work with each of you. Environmental science has a problem. That “problem” is that it is an immense field of study. Not only is it a science in the traditional sense, it is complicated by societies, opinions, governments, beliefs, economics, laws and ethics. If you want to succeed in APES, you’ll need to constantly embrace this interdisciplinary perspective. To prepare, I expect you to complete a summer assignment. This assignment will get you prepared for what is expected in the class.

These are the expectations:

1. This is a college level course! Therefore, I expect college level work habits from my students. Plagiarism will NOT be tolerated. **All work submitted in the class MUST be your own original work.** This includes summer work, essays, vocabulary, reports and any other work submitted for credit. If the words are not yours, neither is the credit. Inclusion of work done by anyone other than yourself will receive a grade of zero.
2. **Your main goal should be to pass the AP exam on Tuesday May 2, 2023.** If you do not have the desire to pass the AP exam in May, perhaps you should look at other course options.
3. These assignments are mandatory. **Due dates will strictly be enforced.**

The summer assignment consists of 4 parts:

Part 1 Watch a Video!

Enter the link below into your browser.

<http://www.youtube.com/watch?v=jqxENMKaeCU&wide=1>

You will watch the video “Home.” It’s not a long film (about an hour and half), plan out when you can do this and watch it in its entirety (Invite friends! Talk about it!) I. There are some spectacular photography. I hope you find it moving.

As you watch Home, please take thorough notes on each important topics presented in the film. Your notes don’t need to be in full sentences- these are notes so short phrasing is fine.

When you finish the film, answer the following questions:

What do you think the take home message of this film is?

Describe your overall reaction to the film.

How do you think it will relate to our course?

🌍 Part 2 Read your Textbook!

- 🌍 Read the textbook **chapters 1 and 20.**
- 🌍 Please take notes on the chapters (handwritten only, in YOUR handwriting!!!) I am providing an outline to help you with the essential questions, but you should try to get as much detail as you can out of the reading.
- 🌍 **Make sure to read all of the tables, boxes and additional information given to pictures and graphs. You might want to re-write the graphs/charts to further understand their importance.**
- 🌍 You will have an EXAM on chapters 1 and 20 on Friday September 11.

Unit 1: Introduction to Environmental Science & Sustainability

Description:

The earth is one interconnected system. Humans are totally dependent on earth's resources for our survival, yet we have also altered the planet in many ways. In this unit, we will learn how environmental science can help us understand the complex relationships between humans and nature. To do this, we will need to examine sustainability, economic development, and the connections between social, economic and environmental issues in our world today. We will also focus on applying the Scientific Method to environmental problems.

Synthesis Question for Socratic Seminar & Synthesis Paper:

- Is it possible to provide the standard of living enjoyed by developed nations to everyone on Earth in a sustainable way when considering environmental, economic and social constraints?

Packet Contents:

Date	Graded/Due in Class	Read Tonight	RQ/VQ	Article
Due by 9/8	Unit Intro + Ch1 Lecture/Explainer	p.1-4	1A	Article #1 "The Anthropocene"
Due by 9/8	Env Indicators Activity	p.5-11		
Due by 9/8	*DUE: Reading/Video Qs 1A *Quiz 1A	p.12-15	1B	
Due by 9/8	Close Read: Why Carrying Capacity?			
Due by 9/8	COMP: Calculating Your Ecofootprint + Qs	p.15-21		
Due by 9/8	*DUE: Reading/Video Qs 1B, Article #1		20A	Article #2 "A Deeper Shade of Green"
Due by 9/8	*Quiz 1B + Ch 20 Lecture/Explainer	p.549-554		
Due by 9/8	LAB: Tragedy of the Commons	p.555-557 & p.77-80		
Due by 9/8	*DUE: Reading/Video Qs 20A *Quiz 20A	p.557-561	20B	
Due by 9/8	Ecoserv/Valuation Article Jigsaw	p.561-566		

Due by 9/8	*DUE: R/V Q's 20B, Article #2 *Quiz 20B	Study!	Study!	
9/11	*Unit 1 Test			

Chapter 1 Vocabulary List

Environment	
Environmental Science	
System	
Ecosystem	
Biotic	
Abiotic	
Environmentalist	
Environmental Studies	
Ecosystem Services	
Environmental Indicators	
Sustainability	
Biodiversity	
Speciation	
Background Extinction Rate	
Greenhouse Gases	
Anthropogenic	
Development	

Sustainable Development	
Ecological Footprint	
Scientific Method	
Hypothesis	
Null Hypothesis	
Replication	
Sample Size	
Uncertainty	
Inductive Reasoning	
Deductive Reasoning	
Critical Thinking	
Theory	
Natural Law	
Control Group	
Natural Experiment	
Environmental Justice	

Reading Questions 1A

- **Opening Story: The Mysterious Neuse River Fish Kill**
- **Environmental science offers important insights into our world and how we influence it.**
- **Humans alter natural systems.**
- **Environmental scientists monitor natural systems for signs of stress.**

1. What happened in the Neuse River, and how did it affect the local population & economy?
2. What is the importance of studying *systems* in environmental science? Why can't we just study isolated events or isolated individuals?
3. Environmental Science is interdisciplinary, in that it includes life sciences, natural sciences, and social sciences to study the interactions of living, nonliving and uniquely human systems to understand the world. How does this blending present both challenges and opportunities to environmental scientists?
4. Tool use and social cooperation have allowed humans to alter their environment enormously. What advantages do these traits give humans in outcompeting other species?
5. So far in history, technological development has led to both increased human well-being and increased environmental disruption. Why has this been the case?

6. List what you think are the 3 BIGGEST ways in which humanity has transformed nature, and evaluate what you think their benefits to us and their impacts on the environment have been.

Activity	Benefits of Activity	Environmental Impacts
1.		
2.		
3.		

7.

7. What advantages do ecosystems with higher species diversity have over those with lower species diversity?

8. There are at least 2 million species on Earth, and species have been naturally evolving and going extinct for billions of years (in fact, over 99% of all species that ever existed are now extinct!). Given these facts, why do we care if human activity is driving other species extinct as we grow?

9. Although total world grain production is increasing, per capita production remains flat. What factors have contributed to this situation?

10. What do you think is a higher priority: maximizing total food production, or maximizing equality of access to food for all people?

11. What two major human activities have had the greatest impact on the increase of greenhouse gases, and why?

12. Do you think it is ethical for countries to forcefully restrict their population's growth by limiting the ability of people to have as many children as they want? Explain.

13. What is the difference between renewable and nonrenewable resources?

14. How does resource use vary between developed countries and developing ones?

Video Questions 1A

Watch “*Let the Environment Guide Our Development*” (<http://www.youtube.com/watch?v=RgqtrlixYR4>)

(Or www.ted.com/talks/johan_rockstrom_let_the_environment_guide_our_development.html)

Read the Focus Questions in advance to help you catch key information. Take notes while watching, then summarize and answer the questions when you finish.

Take Notes as you watch:	Summarize Main Ideas
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Focus Questions:

1. What does Rockstrom mean by the need to “bend the curves”? (5:05)
2. What are the “planetary boundaries”, and why do we need to be aware of thresholds?
3. How can a “shift in mindset” turn crises in to opportunities?

Let the Environment Guide Our Development Respond with your own thoughts, questions, connections, and conclusions:

Reading Questions 1B

- **Human well-being depends on sustainable practices.**
 - **Science is a process.**
1. What happened on Easter Island, and why is it significant?
 2. What does sustainable development involve? How can we determine if an individual or society is living sustainably?
 3. How can we define what humans' basic needs truly are? Do they differ from one person to another?
 4. What does an ecological footprint measure?
 5. It has been estimated that the city of London has an ecological footprint 200x the size of its physical footprint. What does this mean?
 6. Humanity's ecological footprint is already overburdening the Earth, but, approximately 1/3 of the world population lives on less than \$2 per day. What are some possible solutions to providing sufficient resources for everyone without causing ecological collapse?

7. Why is the scientific method necessary in order to advance human understanding of the world?

8. Complete the following chart regarding the purpose of each step in the scientific method:

Step	Purpose/Importance
Observation	
Form Hypothesis	
Collect Data/Conduct Experiment	
Interpret Results	
Disseminate Findings	

9. What is the purpose of a control group in an experiment?

10. Why is peer review of research so important in establishing scientific theories?

11. Why might the results of a controlled experiment differ from the results of a natural experiment when trying to answer a given question?

12. Why are both natural AND controlled experiments necessary to increasing scientific understanding, and how do their roles in the scientific process differ?

13. What factors make research in environmental science particularly difficult?

14. What are the goals of the environmental justice movement, and why are they relevant to sustainability?

Video Questions 1B

Watch the video “Route to a Sustainable Future” (<http://www.youtube.com/watch?v=zjcX8tr7Eo4>)

(Or www.ted.com/talks/alex_steffen_sees_a_sustainable_future.html)

Read the Focus Questions in advance to help you catch key information. Take notes while watching, then summarize and answer the questions when you finish.

Take Notes as you watch:	Summarize Main Ideas
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Focus Questions:

1. What is problematic about the “Western Lifestyle” that other countries want to adopt?

2. What does Steffen mean by “On the one hand we have the unthinkable, and on the other hand we have the unimaginable”? (3:24)

3. Which sustainable solutions that Steffen presents can make the largest positive impact?

Respond with your own thoughts, questions, connections, and conclusions:
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Chapter 20 Vocabulary List

Well-being	
Economics	
Genuine progress Indicator (GPI)	
Technology Transfer	
Leapfrogging	
Natural Capital	
Human Capital	
Manufactured Capital	
Market Failure	
Environmental Economics	
Ecological Economics	
Ecological Economics	
Valuation	
Environmental Worldview	
Anthropocentric	
Stewardship	
Biocentric	
Ecocentric	
United Nations (UN)	

UNEP	
World Bank	
WHO	
UNDP	
EPA	
OSHA	
DOE	
Human Development Index (HDI)	
Human Poverty Index (HPI)	
Command-and-Control regulation	
Incentive-based regulation	
Triple Bottom Line	

Reading Questions 20A

- **Opening Story: Assembly Plants, Free Trade and Sustainable Systems**
 - **Sustainability is the ultimate goal of sound environmental science and policy.**
 - **Economics studies how scarce resources are allocated.**
 - **Economic health depends on the availability of natural capital and basic human welfare.**
 - **Ecosystems provide valuable services (p77-80).**
1. Do you think the expansion of maquiladoras has been more of a benefit or a harm to Mexico? Why?
 2. Why would environmental scientists be interested in social and economic issues that arise from the maquiladoras, as well as the environmental effects?

3. In a market economy, how are scarce resources distributed to satisfy unlimited wants?
4. What are externalities, and how do they typically affect the price of a good or service?
5. How are the wealth and productivity of a nation usually measured, and what other factors must be considered when evaluating the well-being of a nation's people?
6. In reference to the Kuznets Curve, why does the environmental degradation caused by a society typically increase as the country develops and then decrease as it becomes wealthy?
7. What is the difference between natural capital, human capital, and manufactured capital? Which one(s) do you think are most important to economic growth?
8. Why is valuation important in measuring and monitoring natural capital and ecological services?
9. How can ecological economics help us determine what major characteristics a sustainable economic system must have? How does our current system compare?
10. How can a "cradle-to-cradle" model of economic production help society achieve sustainability?
11. Free markets have enabled incredible economic growth for much of the world over the past few centuries. However, there are many critiques saying that they do not actually produce the best outcomes for everyone. Explain these critiques and to what extent you agree with them.

12. Complete the following chart regarding ecosystem services:

	Definition of these Ecoservices	Why are they important?
Provisions		
Regulating Services		
Support Systems		
Resilience		
Cultural Services		

Video Questions 20A

Watch the video “Put a Value on Nature” (<http://www.youtube.com/watch?v=A-QpKiU-NHo>)

(Or http://www.ted.com/talks/pavan_sukhdev_what_s_the_price_of_nature.html)

Read the Focus Questions in advance to help you catch key information. Take notes while watching, then summarize and answer the questions when you finish.

Take Notes as you watch:	Summarize Main Ideas
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Focus Questions:

1. What did Sukhdev discover in his 2008 report on “free” natural capital/services?

2. Why does an initial analysis show a \$9,000 advantage for shrimp farms over mangroves, but a full analysis shows a \$23,000 advantage for mangroves over shrimp? (8:40)

3. What conclusions does Sukhdev come to after his investigations?

Respond with your own thoughts, questions, connections, and conclusions:

Reading Questions 20B

- Agencies, laws and regulations are designed to protect our natural and human capital.
- There are several approaches to measuring and achieving sustainability.
- Two major challenges of our time are reducing poverty and stewarding the environment.
- Working Toward Sustainability: Reuse-A-Sneaker

1. What are the 3 major environmental worldviews, and what does each prioritize?

- 1.
- 2.
- 3.

2. Complete the following chart regarding major world and national organizations:

	Full Name	Priorities of this organization?
UNEP		
World Bank		

WHO		
UNDP		
EPA		
OSHA		
DOE		

3. What is the precautionary principle? Do you think it is a good idea to follow, or do you agree with critics that say it is an unnecessary barrier to the improvement of living conditions?

4. There are many global and national organizations that work to protect and improve Earth's natural and human resources, but resources are scarce and funding is limited. Which organization would you vote to give \$5 Billion in additional funding to accomplish their mission, and why?

5. What is the difference between command-and-control approach and the incentive-based approach to regulation? Which one do you think is more effective?

6. What is meant by finding solutions that meet the "triple bottom line"?

7. Throughout our study of the interactions of humans and natural systems, we will consider many possible changes to address various environmental challenges. However, there are strong constraints placed on these solutions by economics and social structures. Why must sustainable solutions to humanity's challenges meet the Triple Bottom Line?

8. What do you think are the main keys to economically developing a nation? What advice would you give a poor nation looking to develop sustainably?

9. What are the Millennium Development Goals, and why are they significant?

10. Two major challenges for our time are reducing poverty and protecting the environment. Can they both be accomplished? Or must progress towards one goal always go along with setbacks in the other?

11. What changes did Nike make to its shoe manufacturing process, and how does the Reuse-A-Shoe program exemplify corporate efforts to improve their environmental record?

Video Questions 20B

Watch the video “Abundance Is Our Future” (<http://www.youtube.com/watch?v=BltRufe5kkI>)

(Or http://www.ted.com/talks/peter_diamandis_abundance_is_our_future.html)

Read the Focus Questions in advance to help you catch key information. Take notes while watching, then summarize and answer the questions when you finish.

Take Notes as you watch:	Summarize Main Ideas
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Focus Questions:

1. Why does Diamandis contrast modern poverty with wealthy robber barons? (3:30)

2. What is the significance of Moore's Law and exponential technological increase?

3. What are the most important things for us to make "abundant" in the future?

Respond with your own thoughts, questions, connections, and conclusions:

Enter the Anthropocene—Age of Man

It's a new name for a new geologic epoch—one defined by our own massive impact on the planet. That mark will endure in the geologic record long after our cities have crumbled.

By Elizabeth Kolbert – March 2011



The path leads up a hill, across a fast-moving stream, back across the stream, and then past the carcass of a sheep. In my view it's raining, but here in the Southern Uplands of Scotland, I'm told, this counts as only a light drizzle, or smirr. Just beyond the final switchback, there's a waterfall, half shrouded in mist, and an outcropping of jagged rock. The rock has bands that run vertically, like a layer cake that's been tipped on its side. My guide, Jan Zalasiewicz, a British stratigrapher, points to a wide stripe of gray. "Bad things happened in here," he says.

The stripe was laid down some 445 million years ago, as sediments slowly piled up on the bottom of an ancient ocean. In those days life was still confined mostly to the water, and it was undergoing a crisis. Between one edge of the three-foot-thick gray band and the other, some 80 percent of marine species died out, many of them the sorts of creatures, like graptolites, that no longer exist. The extinction event, known as the end-Ordovician, was one of the five biggest of the past half billion years. It coincided with extreme changes in climate, in global sea levels, and in ocean chemistry—all caused, perhaps, by a supercontinent drifting over the South Pole.

Stratigraphers like Zalasiewicz are, as a rule, hard to impress. Their job is to piece together Earth's history from clues that can be coaxed out of layers of rock millions of years after the fact. They take the long view—the extremely long view—of events, only the most violent of which are likely to leave behind clear, lasting signals. It's those events that mark the crucial episodes in the planet's 4.5-billion-year story, the turning points that divide it into comprehensible chapters.

So it's disconcerting to learn that many stratigraphers have come to believe that *we* are such an event—that human beings have so altered the planet in just the past century or two that we've ushered in a new epoch: the Anthropocene. Standing in the smirr, I ask Zalasiewicz what he thinks this epoch will look like to the geologists of the distant future, whoever or whatever they may be. Will the transition be a moderate one, like dozens of others that appear in the record, or will it show up as a sharp band in which very bad things happened—like the mass extinction at the end of the Ordovician?

That, Zalasiewicz says, is what we are in the process of determining.

The word "Anthropocene" was coined by Dutch chemist Paul Crutzen about a decade ago. One day Crutzen, who shared a Nobel Prize for discovering the effects of ozone-depleting compounds, was sitting at a scientific conference. The conference chairman kept referring to the Holocene, the epoch that began at the end of the last ice age, 11,500 years ago, and that—officially, at least—continues to this day.

"Let's stop it," Crutzen recalls blurting out. "We are no longer in the Holocene. We are in the Anthropocene." Well, it was quiet in the room for a while. When the group took a coffee break, the Anthropocene was the main topic of conversation. Someone suggested that Crutzen copyright the word.

Way back in the 1870s, an Italian geologist named Antonio Stoppani proposed that people had introduced a new era, which he labeled the anthropozoic. Stoppani's proposal was ignored; other scientists found it unscientific. The Anthropocene, by contrast, struck a chord. Human impacts on the world have become a lot more obvious since Stoppani's day, in part because the size of the population has roughly quadrupled, to nearly seven billion. "The pattern of human population growth in the twentieth century was more bacterial than primate," biologist E. O. Wilson has written. Wilson calculates that human biomass is already a hundred times larger than that of any other large animal species that has ever walked the Earth.

In 2002, when Crutzen wrote up the Anthropocene idea in the journal *Nature*, the concept was immediately picked up by researchers working in a wide range of disciplines. Soon it began to appear regularly in the scientific press. "Global Analysis of River Systems: From Earth System Controls to Anthropocene Syndromes" ran the title of one 2003 paper. "Soils and Sediments in the Anthropocene" was the headline of another, published in 2004.

At first most of the scientists using the new geologic term were not geologists. Zalasiewicz, who is one, found the discussions intriguing. "I noticed that Crutzen's term was appearing in the serious literature, without quotation marks and without a sense of irony," he says. In 2007 Zalasiewicz was serving as chairman of the Geological Society of London's Stratigraphy Commission. At a meeting he decided to ask his fellow stratigraphers what they thought of the Anthropocene. Twenty-one of 22 thought the concept had merit.

The group agreed to look at it as a formal problem in geology. Would the Anthropocene satisfy the criteria used for naming a new epoch? In geologic parlance, epochs are relatively short time spans, though they can extend for tens of millions of years. (Periods, such as the Ordovician and the Cretaceous, last much longer, and eras, like the Mesozoic, longer still.) The boundaries between epochs are defined by changes preserved in sedimentary rocks—the emergence of one type of commonly fossilized organism, say, or the disappearance of another.

The rock record of the present doesn't exist yet, of course. So the question was: When it does, will human impacts show up as "stratigraphically significant"? The answer, Zalasiewicz's group decided, is yes—though not necessarily for the reasons you'd expect.

Probably the most obvious way humans are altering the planet is by building cities, which are essentially vast stretches of man-made materials—steel, glass, concrete, and brick. But it turns out most cities are not good candidates for long-term preservation, for the simple reason that they're built on land, and on land the forces of erosion tend to win out over those of sedimentation. From a geologic perspective, the most plainly visible human effects on the landscape today "may in some ways be the most transient," Zalasiewicz has observed.

Humans have also transformed the world through farming; something like 38 percent of the planet's ice-free land is now devoted to agriculture. Here again, some of the effects that seem most significant today will leave behind only subtle traces at best.

Fertilizer factories, for example, now fix more nitrogen from the air, converting it to a biologically usable form, than all the plants and microbes on land; the runoff from fertilized fields is triggering life-throttling blooms of algae at river mouths all over the world. But this global perturbation of the nitrogen cycle will be hard to detect, because synthesized nitrogen is just like its natural equivalent. Future geologists are more likely to grasp the scale of 21st-century industrial agriculture from the pollen record—from the monochrome stretches of corn, wheat, and soy pollen that will have replaced the varied record left behind by rain forests or prairies.

The leveling of the world's forests will send at least two coded signals to future stratigraphers, though deciphering the first may be tricky. Massive amounts of soil eroding off denuded land are increasing sedimentation in some parts of the world—but at the same time the dams we've built on most of the world's major rivers are holding back sediment that would otherwise be washed to sea. The second signal of deforestation should come through clearer. Loss of forest habitat is a major cause of extinctions, which are now happening at a rate hundreds or even thousands of times higher than during most of the past half billion years. If current trends continue, the rate may soon be tens of thousands of times higher.

Probably the most significant change, from a geologic perspective, is one that's invisible to us—the change in the composition of the atmosphere. Carbon dioxide emissions are colorless, odorless, and in an immediate sense, harmless. But their warming effects could easily push global temperatures to levels that have not been seen for millions of years. Some plants and animals are already shifting their ranges toward the Poles, and those shifts will leave traces in the fossil record. Some species will not survive the warming at all. Meanwhile rising temperatures could eventually raise sea levels 20 feet or more.

Long after our cars, cities, and factories have turned to dust, the consequences of burning billions of tons' worth of coal and oil are likely to be clearly discernible. As carbon dioxide warms the planet, it also seeps into the oceans and acidifies them. Sometime this century they may become acidified to the point that corals can no longer construct reefs, which would register in the geologic record as a "reef gap." Reef gaps have marked each of the past five major mass extinctions. The most recent one, which is believed to have been caused by the impact of an asteroid, took place 65 million years ago, at the end of the Cretaceous period; it eliminated not just the dinosaurs, but also the plesiosaurs, pterosaurs, and ammonites. The scale of what's happening now to the oceans is, by many accounts, unmatched since then. To future geologists, Zalasiewicz says, our impact may look as sudden and profound as that of an asteroid.

If we have indeed entered a new epoch, then when exactly did it begin? When did human impacts rise to the level of geologic significance?

William Ruddiman, a paleoclimatologist at the University of Virginia, has proposed that the invention of agriculture some 8,000 years ago, and the deforestation that resulted, led to an increase in atmospheric CO₂ just large enough to stave off what otherwise would have been the start of a new ice age; in his view, humans have been the dominant force on the planet practically since the start of the Holocene. Crutzen has suggested that the Anthropocene began in the late 18th century, when, ice cores show, carbon dioxide levels began what has since proved to be an uninterrupted rise. Other scientists put the beginning of the new epoch in the middle of the 20th century, when the rates of both population growth and consumption accelerated rapidly.

Zalasiewicz now heads a working group of the International Commission on Stratigraphy (ICS) that is tasked with officially determining whether the Anthropocene deserves to be incorporated into the geologic timescale. A final decision will require votes by both the ICS and its parent organization, the International Union of Geological Sciences. The process is likely to take years. As it drags on, the decision may well become easier. Some scientists argue that we've not yet reached the start of the Anthropocene—not because we haven't had a dramatic impact on the planet, but because the next several decades are likely to prove even more stratigraphically significant than the past few centuries. "Do we decide the Anthropocene's here, or do we wait 20 years and things will be even worse?" says Mark Williams, a geologist and colleague of Zalasiewicz's at the University of Leicester in England.

Crutzen, who started the debate, thinks its real value won't lie in revisions to geology textbooks. His purpose is broader: He wants to focus our attention on the consequences of our collective action—and on how we might still avert the worst. "What I hope," he says, "is that the term 'Anthropocene' will be a warning to the world."

Article #1 Analysis Questions

1. Annotate the text, underlining passages that are important striking, or confusing. Add a **checkmark** and a short summary next to important parts of the text, an **exclamation point** and your reaction to striking portions of the text, and a **question mark** and your question next to confusing parts of the text (same annotations as in English class!)
2. Select 3 passages which you think best articulate why the current time period can be identified as a unique geological epoch, the Anthropocene. Draw a box around the text of each passage (shoot for 2-4 sentences).
3. What are the human activities that are most likely to leave a mark in the geological record, and what kind of marks will each leave? Why are some activities expected to leave a much more clear and lasting mark than others?
4. What does this article have to say in relation to our Unit-Long Synthesis Question: *Can we provide the type of lifestyle currently enjoyed by people in developed countries to everyone on Earth in a sustainable way?*

Bill McKibben: A Deeper Shade of Green



Bill McKibben lives in a Vermont valley, where he puts his ideas for a new cultural environmentalism into practice.

*At times he can seem like a biblical prophet, lamenting how our human failings are destroying the planet. Yet listen more carefully to Bill McKibben—environmental essayist, activist, and author of the best seller *The End of Nature*—and you'll hear a redeeming message that transforms the idea of what "green" can mean.*

By Bill McKibben – August 2006

This is the year when we finally started to understand what we are in for. Exactly 12 months ago, an MIT professor named Kerry Emanuel published a paper in *Nature* showing that hurricanes had slowly but steadily been gaining in strength and duration for a generation. It didn't attract widespread attention for a few weeks—not until Katrina roared across the Gulf of Mexico and rendered half a million people refugees. The scenario kept repeating: Rita choking highways with fleeing Texans; Wilma setting an Atlantic Ocean record for barometric lows; Zeta spinning on New Year's Day. Meanwhile, other data kept

pouring in from around the planet: Arctic sea ice melting past an irrevocable tipping point; thawing permafrost in northeastern Siberia creating so much methane that lakes didn't freeze even in the depths of boreal winter; the NASA calculation that 2005 had been the warmest year on record.

In January, a trinity of announcements sealed the mood. First, British scientist James Lovelock, who invented the instrument that allowed us to detect our eroding ozone layer, published an essay predicting that we'd already added too much CO₂ to the atmosphere and that runaway global warming was inevitable. He predicted that billions will die this century. A few days later came a less dramatic but equally alarming announcement. The steady and long-serving NASA climatologist James Hansen defied federal attempts to gag him and told reporters that new calculations about, among other things, the instability of Greenland's ice shelf showed "we can't let it go on another ten years like this." If we did? Over time, the buildup of CO₂ emissions would "imply changes that constitute practically a different planet." Less than ten years to reverse course. Not our kids' lifetimes, or our grandkids'. Ours.

Finally, at month's end, even President Bush, as faithful a friend as the fossil fuel industry has ever had, announced America was "addicted to oil." Historians, I think, will look back on this as the time when denial finally began to crumble. When we finally began to understand that the planet as we've known it was at stake—and not from a possible scenario, like nuclear war, but from the consumption of the coal and oil and gas that power most of the actions of our lives. This is new. Humans have never faced a civilization-scale challenge before. Whether we deal with it gracefully or not depends, I believe, on what happens to that creed we call environmentalism.

Environmentalism is mostly an American invention, one of the most powerful ideas we've offered to the rest of the planet. It arose here for a simple reason. We came to full consciousness while we were still in the process of subduing the nation's forests and prairies. In much of Asia and Europe, the woods were cut and the rivers tamed before the age of writers. Here, though, Henry David Thoreau could see the line between man and nature on his daily walks. George Perkins Marsh could watch what happened to the flow of streams when New England forests were cut down. Aldo Leopold could look on as the fierce green fire turned dull in the eyes of a gunned-down wolf.

None of these environmentalists, or the hundreds of thousands of other women and men who believed passionately in such ideas, were able to slow the economic juggernaut that rushed across this continent, however. Most didn't think of that as their role; it didn't even cross their minds. They set up small islands of park and wilderness for the tide to rush around. And they worked, especially after Rachel Carson, to cure modernity's most toxic side effects, making sure certain chemicals were banned and the Clean Air Act passed. This movement has been remarkably effective. Even as our economy has grown larger, smog has also abated. We can swim in most of our rivers again. And our model has spread to the rest of the world. Other countries have adopted their own clean air acts, built their own national parks. And environmentalists can still win great victories: The Sierra Club and the Wilderness Society and all the rest have managed so far, for instance, to preserve the Arctic National Wildlife Refuge from drilling.

But when it came time to deal with global warming, this kind of environmentalism flunked. Despite 20 years of increasingly dire warnings, American carbon emissions continue to grow; we won't even engage in the Kyoto Protocol, the one international effort to bring carbon emissions under some kind of control. A few western European nations are doing better, but even they are having trouble meeting their reduction targets. And the developing world is starting to flood the atmosphere with CO₂ on an almost American scale. From 1990 to 2004, China's carbon emissions increased by 67 percent, nearly all of it the result of coal.

We're now starting to realize this failure was almost inevitable. Environmentalism's method of handling global warming is flawed.

The old paradigm works like this: We judge just about every issue by asking the question, Will this make the economy larger? If the answer is yes, then we embrace whatever is in question—globalization, factory farming, suburban sprawl. In this paradigm, the job of environmentalism is to cure the worst effects, and endless economic growth makes that job easier. If you're rich, you can more easily afford the catalytic converter for the end of the tailpipe that magically scrubs the sky above your city.

But it turns out that, above all else, endless economic growth is built on the use of cheap fossil fuel. The industrial revolution began the day in 1712 that Thomas Newcomen figured out how to use a steam engine to pump water out of a coal mine, so that it could be mined more cheaply and easily, thus allowing more steam engines. Coal, oil, and natural gas were, and are, miraculous—compact, easily transportable, crammed with Btu, and cheap. Dig a hole in the ground, stick a pipe in the right place, and you get all the energy you could ever need.

Precisely the same fuels that gave us our growth now threaten our civilization. Burn a gallon of gas and you release five pounds of carbon into the atmosphere. And as China demonstrates every day, the cheapest way to spur growth is by burning more fossil fuel. Even Benjamin Friedman, the Harvard economist who wrote a brilliant book last year defending the morality of economic growth, conceded that carbon dioxide is the one major environmental contaminant for which no study has ever found any indication of improvement as living standards rise.

Which means we might need a new idea. We need to stop asking, Will this make the economy larger? Instead, we need to start asking, Will this pour more carbon into the atmosphere? Some of the shift would be technological. If carbon carried a real price, then we'd be building windmills far faster than we are now. All cars would be hybrid cars, and all lightbulbs would be compact fluorescent. Every new coal plant would be paying the steep price to separate carbon from its exhaust stream and store it underground. All that would help—but not enough to meet Hansen's ten-year prognostication, not enough to reduce worldwide carbon emissions by the 70 percent required to stabilize the climate at its current degree of disruption.

For that to happen, we'd need to change as dramatically as our lightbulbs. We'd need to see ourselves differently—identity and desire would have to shift. Not out of a sense of idealism or asceticism or nostalgia for the '60s. Out of a sense of pure pragmatism.

For instance, we've gotten used to eating across great distances. Because it's always summer somewhere, we've accustomed ourselves to a food system that delivers us fresh produce 365 days a year. The energy cost is incredible—growing and transporting a single calorie of iceberg lettuce from California to the eastern U.S. takes 36 calories of energy. What would it take to get us back to eating more locally, to accepting what the seasons and smaller scale local farmers provide?

Or think about the houses we now build. They're enormous—more than double the size they were in 1950, despite the fact that the number of people in the average home continues to fall. Even a technologically efficient furnace or air conditioner struggles to heat or cool such a giant space—and the houses can only be built on big suburban lots, guaranteeing that their occupants will be entirely car-dependent. What

would it take to make us consider smaller homes, closer to the center of town, where we could use the bus or a bike for daily transportation?

It would require, I think, a movement that takes people's aspirations for good and secure and durable lives seriously. That takes those desires more seriously even than the consumer economy has taken them. We would need a kind of cultural environmentalism that asks deeper questions than we're used to asking.

How deep? Here's a data set just as interesting as the ongoing spike in planetary temperatures—and almost as depressing. Since researchers started trying to measure such things in the years after World War II, the percentage of Americans who consider themselves "very happy" with their lives has remained steady, even though the material standard of living has nearly tripled in the same period. More stuff is not making us happier—but we can't break out of the cycle that offers more stuff as our only real goal.

What we really seem to want, according to the economists and psychologists conducting such research, is more community. Standard economic theory has long assured us that we're insatiable bundles of desires. That may be true, but more and more it feels like our greatest wish is for more contact with other people. We've built the most hyper-individualized society the world has ever seen: According to some surveys, most Americans don't know their next-door neighbors, which is a truly novel idea for primates. That's contributed to the great success of our economy—each of us rises and falls based on our own efforts, which is a great motivator. But it's also contributed to that gathering sense of dissatisfaction, and to that cloud of carbon dioxide. If everyone has to drive their own car everywhere (and the biggest car possible, to maximize their own safety), then it's hard to reduce emissions. If our idea of paradise remains a 4,000-square-foot house on its own isolated lot, it's hard to imagine really rapid change.

But there are at least glimmers of another possible future. Consider food again. Last winter I conducted an experiment: Could I get through the cold months in my northern valley eating just the food grown in my county? As it turned out, I didn't simply survive; I thrived. There were plenty of potatoes and onions and beets and beef and cider and beer and wheat and eggs, and just enough tomatoes canned in the heat of summer, to see me through. I'm sure I saved lots of energy, though I can't calculate just how much. What I can list, though, are the new friends I made, and they numbered in the dozens. My food cost more in terms of time; it wasn't as convenient to go to the farmers market as to the Shop 'n Save. But that cost, thought of differently, was actually the biggest benefit of the whole experiment.

And I'm not alone. The number of farmers markets in the country has doubled in the past decade. Sales are growing at least 10 percent annually, making it among the fastest expanding parts of the food sector. A Saturday in Madison, Wisconsin, finds nearly 18,000 people shopping in the streets around the state capitol. In Burlington, Vermont's largest city, about 7 percent of the fresh food the populace eats is grown on just a hundred acres of community-supported farmland near the town's old dump. Some farmers markets cater to yuppies, and some are in housing projects; all bring people closer together.

And you can do the same kind of rethinking about many other parts of daily life, from transportation to housing to energy itself: Imagine a windmill at the end of your cul-de-sac, powering the ten homes along the street. You wouldn't be generating much carbon, and you would be generating lots of companionship.

Environmentalism has often been a somewhat grim business. (There is, after all, plenty to be grim about.) But a convivial environmentalism, one that asks us to figure out what we really want out of life, offers profound possibilities. Perhaps the most important of those possibilities is a new link with communities of faith in this country. Though they don't always live up to their ideals, churches and synagogues and

mosques are among the few institutions that can posit some idea for human existence other than accumulation. They understand that it's not just, as Bill Clinton's campaign asserted, "the economy, stupid." Their political help is crucial for making necessary legislative change—maybe the best news of the year was that some 90 prominent evangelical leaders broke ranks with Pat Robertson and his ilk to announce that they wanted to fight global warming, and fight it with their particular set of tools. "This is God's world," they said, which is a shocking idea for a culture that's come to think of everything as ours. It's precisely this ability of religious leaders of all stripes to see individuals as part of something larger than themselves that's so important. And also their commitment to taking care of the needy, because of course there are lots of people in the world who aren't rich. If we can't help them figure out some path to dignity other than our hyper-individualism, the math of global warming will never work.

We don't need to erase individualism; it is one of the glories of the American character. But environmentalists desperately need to learn how to celebrate community, too.

Environmentalism isn't dying. In fact, the need for it has never been greater. But it has to transform itself into something so different that the old name really won't apply. It has to be about a new kind of culture, not a new kind of filter; it has to pay as much attention to preachers and sociologists as it does to scientists; it has to care as much about the carrot in the farmers market as it does about the caribou on the Arctic tundra. That's what the printouts on atmospheric concentrations of carbon dioxide tell us, and it's a message echoed by the researchers studying happiness and satisfaction. We don't need a slightly rejiggered version of the world we now inhabit; we need to start working on changes on the scale of the problems we face.

Fear of what will happen unless we shift, desire for what might happen if we do—together they're creating new openings for a more thorough shake-up than any American thinker since Thoreau has envisioned. But ten years is not a lot of time; we'd best get started.

Article #2 Analysis Questions

- 1. Annotate the text, underlining passages that are important striking, or confusing. Add a checkmark and a short summary next to important parts of the text, an exclamation point and your reaction to striking portions of the text, and a question mark and your question(s) next to confusing parts of the text (same annotations as in English class!)**
2. Why does McKibben consider environmentalism to be mostly an American invention?
3. Why does McKibben think that the "old paradigm" of environmentalism (and the way it handles global warming) is flawed?

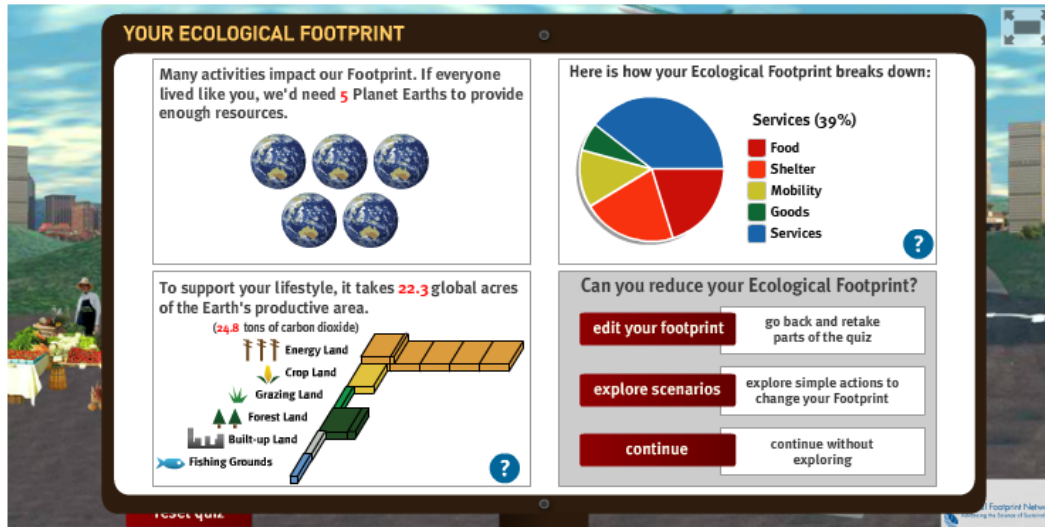
Part 3 Calculate your Ecological Footprint!

Calculating your ecological footprint

There are several sites you can use to get an idea about how much of an impact you and your lifestyle makes on the environment. Generally, these calculators ask you questions about your home, car and travel per year along with what you eat and buy. You will not be graded on your footprint, but you need to print out your results. You will be graded on the reflection piece you will turn in on Sept 4.

Footprint Calculator

How much land area does it take to support your lifestyle? Take this quiz to find out your Ecological Footprint, discover your biggest areas of resource consumption, and learn what you can do to tread more lightly on the earth.



<http://www.footprintnetwork.org/en/index.php/GFN/page/calculators/> In this one, you create an avatar for yourself.

<https://footprint.wwf.org.uk/#/>

<https://www.conservation.org/carbon-footprint-calculator#/>

Choose one of these quizzes to take. Print out your results or write them down. You will need them later.

Reflection Piece – Answer the following Questions

1. In your own words, what is an ecological footprint?
2. What types of data are used to calculate an ecological footprint?
3. What is your ecological footprint (include units of measure)? If every human had your footprint, how many Earths would be required to sustain the population? Assume that there are 4.5 acres available per human. Show your work here:

4. What steps could you take to decrease your footprint? To increase it?

5. **Create a data table that contains footprints for you, and the national average for one country from Central America, South America, Africa, The Middle East, Western Europe, Eastern Europe, and Asia.** Be sure that all are in the **same units (acres/person)**. You may need to convert from hectares (look it up if needed). Insert the data table here:

6. Using the data from #5, illustrate the footprints in some graphical manner. Be creative. Label accordingly.

7. Compare the biocapacity of the world with its ecological footprint. How is this possible? In your own words, what is meant by **sustainability**? Are we achieving it? How can this be accomplished?

Part 4 Take the AP Summer Challenge!

As you prepare to take AP Environmental Science next year, it is important to understand that your actions and choices everyday have a great effect on our environment.

This summer, **I challenge you to complete as many of the below as possible, keep a journal of what you did and tell me briefly how it made you feel.** Be prepared to discuss your experiences during the first week of class.

- Spend a whole day (24 hours) without using plastic ANYTHING - if plastic is a component of something, do not use it during this time either
- Spend a week without buying anything plastic - this includes things that come in plastic packaging
- Sleep outside for at least one night
- Spend a whole day outside - eat all three meals and snacks outside too
- Go for a hike in a State Park - find one
here: <https://www.dec.ny.gov/outdoor/82098.html>

- Spend a week without eating any animal products- NO meat, eggs, dairy, honey etc.
- Grow some of your own food - lettuce, basil, oregano etc can grow easily inside with little light if outdoor space is limited
- Spend a day (24 hours) without looking at a screen of any kind - no tv, cell phone, computer, video games etc.
- Take your own bags to the store - do not get a single use plastic bag
- Walk or bike somewhere you would usually drive to
- Spend an afternoon cleaning up a park near you
- Choose your own environmental actions and write about them!

If you have any questions about this assignment over the summer, feel free to email me at kdegnan@seaford.12.ny.us or keridegnan@gmail.com

Please don't wait until the very end of August to ask questions, I usually go away in August, and I do not have access to a computer. If you need help, and you wait until then, you are on your own!

Have a great summer and remember

The human spirit needs places where nature has not been rearranged by the hand of man.

AP Environmental Science Summer Assignment 2022 Ethics Pledge

By signing below, I, _____, hereby certify that:

1. I have completed the AP Environmental Science Summer 2022 assignment on my own and it is written in my own words.
2. I understand the meaning of plagiarism.
3. None of the assignment has been copied, in whole or in part, from any other source, including other students currently in or students who previously took this course (at other schools).
4. **I understand that I have the entire summer to complete this assignment and I understand late work will not be accepted. I understand late work is equal to a zero.**
5. I understand my summer reading assignments are due on the 1st day of class when the bell rings and no later.
6. I have read and understand the above guidelines.
7. I understand that failure to return this sheet, signed by myself and my parents/guardians with the assignment will result in an AUTOMATIC ZERO for the assignment.
8. I understand that if I have any questions over the summer I can email Mrs. Degnan at kdegnan@seaford.k12.ny.us (school email) or keridegnan@gmail.com (home email)

Student Signature _____

Student Printed Name _____

Parent Signature _____

Parent Printed Name _____