

Title	Roxbury High School AP Environmental Science
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Curriculum Writing History	
Notes	
Attachments	

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Type : Consensus

	September				October				November				December				January				February				March				April				May				June			
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September/Week 1 - October/Week 7																																								
Unit 1: Interdependence of Earth's Systems: Fundamental Concepts																																								
October/Week 8 - November/Week 11																																								
Unit 2: Human Population Dynamics																																								
November/Week 12 - December/Week 16																																								
Unit 3: The Search for Energy: Fossil Fuels, Nuclear, Renewable Energy, and Conservation																																								
January/Week 17 - March/Week 26																																								
Unit 4: Renewable and Non-renewable Resources: Water, soils, minerals, biodiversity, land, food																																								
March/Week 28 - May/Week 34																																								
Unit 5: Environmental Quality: Air pollution, water and soil pollution, pesticides, and waste																																								

Duration: September/Week 1 - October/Week 7

UNIT NAME: Unit 1: Interdependence of Earth's Systems: Fundamental Concepts

Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> • Science is a process. • Earth's landscapes are the result of interactions within Earth's natural systems. • Elements are constantly cycling through Earth's systems. • Humans must practice sustainable methodologies in order to conserve resources. • The Earth is one interconnected system. • The conversion of energy is the basis for all ecological systems. • Human use of Earth's resources varies according to many factors. • Humans alter natural systems. 	<ul style="list-style-type: none"> • What are the parts of experimental design? • What is proper safety in and out of the classroom? • How do weather, climate, and ocean circulation influence or affect the environment? • What physical, chemical, and biological factors influence climate? • How do elements cycle through the biosphere, hydrosphere, and geosphere? • What is sustainability and how is it a goal of environmental science? • What causes changes in ecosystems? • What is the process of natural selection? • How does biodiversity provide health to ecosystems? • How does energy flow through ecosystems? • What is the source for nearly all processes on Earth? 	<ul style="list-style-type: none"> • Materials and equipment used by environmental scientists. • Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • Composition of their local ecosystem. • The importance of physical, graphical, conceptual, and mathematical models in science. • Earth is an integrated system consisting of four interacting components; the geosphere, the atmosphere, the hydrosphere, and the biosphere. • Structure of their local ecosystem. • Biotic and abiotic limiting factors on populations. • Global and local examples of population decline and exponential growth. 	<ul style="list-style-type: none"> • Describe the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions. • Identify the major biomes of the world and their defining characteristics. • Diagram the major nutrient and mineral cycles and describe how humans have influenced these cycles. • Define ecology and distinguish between several ecological levels. • Draw and explain typical pyramids of numbers, biomass, and energy. • Explain several factors that affect changes in population size. • Describe the importance of biodiversity in a stable ecosystem. 		<p>HS.LS2.3-Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. (09-12)[Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS2.4-Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS2.5-Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS2.1-Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at</p>

	<ul style="list-style-type: none"> • What are the factors that influence population size? • What are ecosystem services and how do humans benefit from them? • How do Earth's landscapes change over time? • What impact does the increasing global population have on Earth's resources? • What impact does resource consumption have on Earth's atmosphere, watersheds, and ecosystems? 	<ul style="list-style-type: none"> • How evolution and natural selection are connected. • Trophic level roles of organisms. • Percentage of energy lost at each trophic level. • Pyramid of Biomass, Numbers and Energy. • How ecosystems and biomes are related • The characteristics and locations of the world's major biomes. • Shared characteristics of flora and fauna adaptations in each biome. • How humans benefit from Ecosystem services. 	<ul style="list-style-type: none"> • Design a management plan for an overpopulated or endangered species. • Discuss the cause and effect of deforestation and desertification. 		<p>different scales. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.2-Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.7-Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.2-Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.5-Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. (09-12)</p>
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					<p>[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.4-Use a model to describe how variations in the flow of energy into and out of Earth systems result in changes in climate. (09-12)</p> <p>[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.5-Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. (09-12)</p> <p>[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.1-Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. (09-12)[Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.ESS3.3-Create a computational simulation to illustrate the relationships among management of natural resources, the</p>
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					sustainability of human populations, and biodiversity. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.4-Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Duration: October/Week 8 - November/Week 11					
UNIT NAME: Unit 2: Human Population Dynamics					
Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> Human use of Earth's resources varies according to many factors. By their presence, humans alter natural systems. Humans must practice sustainable methodologies in order to conserve resources. 	<ul style="list-style-type: none"> What are the factors that influence population size? What impact does the increasing global population have on Earth's resources? How do you calculate the cost of pollution? What impact does resource consumption have on the Earth's atmosphere, watersheds, and ecosystems? 	<ul style="list-style-type: none"> The population of the United States has grown in the last century because of births and immigration. In the demographic transition model, countries progress through four stages of change in birth rates, death rates, and population sizes. When a growing population uses resources faster than they can be renewed, the resources most critically affected are fuelwood, water, and arable land. Some countries attempt to reduce birthrates through a variety of means. Biodiversity refers to the number of different species in a given area. Humanity benefits from biodiversity. Scientists are concerned that the loss of biodiversity may be the most challenging environmental issue. 	<ul style="list-style-type: none"> Relate human population size to hunger, natural resources, and economics. Compare energy consumption in highly developed and developing countries. Explain the importance of environmental sustainability. 		<p>HS.ESS3.3-Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.ESS3.4-Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.ESS3.6-Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.* (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS2.7-Design, evaluate, and refine a solution for reducing the impacts of human activities on the</p>

		<ul style="list-style-type: none">The United States has several regulatory acts to protect species and biodiversity.			environment and biodiversity.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS2.8-Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.LS4.3-Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Duration: November/Week 12 - December/Week 16

UNIT NAME: Unit 3: The Search for Energy: Fossil Fuels, Nuclear, Renewable Energy, and Conservation

Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> Human use of Earth's resources varies according to many factors. By their very presence, humans alter natural systems. Humans must practice sustainable methodologies in order to conserve resources. Minerals and minerals are important to our global economy. Mining creates many negative environmental consequences. The U.S. government has enacted legislation that regulates mining and attempts to minimize the impacts of mining on the environment. Energy patterns produce a great demand for fuel and energy. Economic factors often influence decisions on energy use and policy. 	<ul style="list-style-type: none"> What are the advantages and disadvantages of renewable and non-renewable resources? What impact does the increasing global population have on Earth's resources? What impact does resource consumption have on Earth's atmosphere, watersheds, and ecosystems? How can we improve sustainability in order to preserve Earth's resources? How can citizens influence environmental policy? What is a mineral and why are minerals important to us? What are the different methods of mining? What are some of the environmental consequences associated with mining? What are the federal laws that relate to mining and reclaiming mined land? 	<ul style="list-style-type: none"> Environmental consequences from mining have led to government legislature in an attempt to minimize impact. Most of the world's energy needs are met by fossil fuels. Fossil fuels are nonrenewable resources. The extraction, consumption, and transportation of fossil fuels cause air and water pollution and habitat destruction. Nuclear energy is energy that exists within the nucleus of an atom. Nuclear power is created by heating water to create steam that drives turbines. Nuclear power does not create many of the environmental problems associated with fossil fuels. Nuclear power produces nuclear waste which can be dangerous if not maintained properly. 	<ul style="list-style-type: none"> Distinguish between renewable and non-renewable sources of energy and explain several examples of each. Discuss the advantages and disadvantages of fossil fuel use. Distinguish between energy efficiency and conservation. Contrast the advantages and disadvantages of several sources of renewable energy. 		<p>HS.ESS3.5-Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.1-Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.2-Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.3-Create a computational simulation to illustrate the</p>

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<ul style="list-style-type: none"> • Decision making when it comes to nuclear power is very difficult because of numerous factors. • It is vital for the survival of our society to develop alternative sources of energy. • Many of our resources exist in finite quantities and conservation and sustainable practices must be developed to upkeep the quality of living in the US. 	<ul style="list-style-type: none"> • What is the difference between renewable and non-renewable resources? • What are fossil fuels and how are they formed? • How can you personally limit your use of fossil fuels? • What are the advantages and disadvantages of using fossil fuels to produce energy? • What causes the nuclear reaction in nuclear power plants? • What are some advantages and disadvantages of nuclear power plants? • What factors need to be considered for a long term storage site for spent nuclear fuel and why? • What alternative energy sources are being developed and how efficient are these sources? 	<ul style="list-style-type: none"> • Renewable energy is energy from sources that are constantly being formed. • Solar energy, wind, biomass, hydropower, and geothermal energy are examples of renewable energy. • Alternative energy sources are energy sources that are still in development. 			<p>relationships among management of natural resources, the sustainability of human populations, and biodiversity. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.4-Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.6-Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.* (09-12) [Regional:Next Generation Science Standards (NGSS)]</p>
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Plans:

Duration: January/Week 17 - March/Week 26

UNIT NAME: Unit 4: Renewable and Non-renewable Resources: Water, soils, minerals, biodiversity, land, food

Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> • Earth's landscapes are the results of interactions within Earth's natural systems. • By their very presence, humans alter natural systems. • Earth is one interconnected system. • Human use of Earth's resources varies according to many factors. • Humans must practice sustainable methodologies in order to conserve resources. 	<ul style="list-style-type: none"> • What impact does the increasing global population have on Earth's resources? • What impact does resource consumption have on Earth's atmosphere, watersheds, and ecosystems? • What is food security and why is it difficult to obtain? • How are ecosystems influenced by biotic and abiotic factors? • How do weather, climate, and ocean circulation influence or affect the environment? • What are Earth's most important resources? • What impact does the increasing global population have on Earth's resources? • What are the advantages and disadvantages of renewable and non-renewable resources? • How can we improve sustainability in order to preserve Earth's resources? 	<ul style="list-style-type: none"> • Only a small fraction of Earth's water is fresh water. • The two main sources of fresh water are surface water and groundwater. • Most water use is for agriculture. • Water conservation is necessary to maintain an adequate supply of fresh water. • Most water pollution in the United States is caused by nonpoint-source pollutants. • Government legislation protects our fresh water supplies. • Urban areas are mostly covered with houses, roads, businesses, and industrial and municipal structures. • Rural areas have less dense human populations and include forest land, cropland, and rangeland. • Urbanization is the migration of people from rural to urban areas. 	<ul style="list-style-type: none"> • Analyze the environmental quality of soil. • Describe the problems associated with agriculture and food production in today's world. • Describe successful organic farming practices and their implementation. • Analyze the environmental quality of the water. • Outline the process involved in water and sewage treatment. • Describe the current threats to freshwater and coastal areas. • Explain the human impact on water as a natural resource. • Distinguish between the characteristics of estuarine, marine, and aquatic ecosystems. • Distinguish between renewable and non-renewable sources of energy and explain several examples of each. 		<p>HS.ESS2.4-Use a model to describe how variations in the flow of energy into and out of Earth systems result in changes in climate. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.5-Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.1-Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.2-Evaluate competing design solutions for developing, managing, and utilizing</p>

	<ul style="list-style-type: none"> • How can citizens influence environmental policy? 	<ul style="list-style-type: none"> • Land-use planning is essential for urban areas to maintain a high quality of life. • National lands and wilderness lands are maintained and protected by the government. • Malnutrition occurs when people do not consume enough Calories or do not eat a sufficient variety of foods. • Poverty is the main reason for hunger today. • Modern agricultural methods have greatly improved farming productivity. • Soil conservation is important for protecting and managing soil. • Pests cause considerable crop damage. • Ways to control crop damage from pests include pesticides, integrated pest management, and genetic engineering. • Livestock are important for the production of food and other agricultural products. 	<ul style="list-style-type: none"> • Discuss the advantages and disadvantages of fossil fuel use. • Contrast energy efficiency and conservation. • Identify the advantages and disadvantages of several sources of renewable energy. 		<p>energy and mineral resources based on cost-benefit ratios.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.3-Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.4-Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.6-Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.* (09-12) [Regional:Next Generation Science Standards (NGSS)]</p>
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Plans:

Title : Roxbury High School AP Environmental Science

Type : Consensus

Duration: March/Week 28 - May/Week 34					
UNIT NAME: Unit 5: Environmental Quality: Air pollution, water and soil pollution, pesticides, and waste					
Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> Human use of Earth's resources varies according to many factors. By their very presence, humans alter natural systems. Humans must practice sustainable methodologies in order to conserve resources. Elements are constantly cycling through Earth's systems. The Earth is one interconnected system. Earth's landscapes are the results of interactions within the Earth's natural systems. 	<ul style="list-style-type: none"> What are the factors that influence population size? What impact does the increasing global population have on Earth's resources? How do you calculate the cost of pollution? What impact does resource consumption have on Earth's atmosphere, watersheds, and ecosystems? How has Earth changed over time? What are Earth's most important resources? How do elements cycle through the biosphere, hydrosphere, and geosphere? How have humans impacted Earth in both positive and negative ways? 	<ul style="list-style-type: none"> Primary and secondary pollutants have an impact on air quality. Most air pollution is caused by the burning of fossil fuels. Noise pollution affects our health. The short- and long-term effects of acid precipitation can alter an ecosystem. Climate is the long-term prevailing weather conditions at a particular place. The angle of the sun's rays cause seasons. Human activities have caused a thinning of the ozone layer. Thinning of the ozone layer increases the amount of ultraviolet radiation that reaches Earth's surface. Methane and carbon dioxide are important greenhouse gases. The Kyoto Protocol was established to improve air quality. Pests cause considerable crop damage. 	<ul style="list-style-type: none"> Relate human population size to hunger, natural resources, and economics. Compare energy consumption in highly developed and developing countries. Explain the importance of environmental sustainability. Identify the problems associated with the disposal of solid and toxic wastes. Analyze the environmental and ecological issues surrounding mineral use and recycling. Describe how mineral deposits are formed, discovered, extracted and processed. Analyze the environmental quality of the water. Explain the human impact on water as a natural resource. 		<p>HS.ESS2.5-Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.ESS2.6-Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.ESS2.4-Use a model to describe how variations in the flow of energy into and out of Earth systems result in changes in climate. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.ESS3.5-Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth</p>

		<ul style="list-style-type: none"> • Ways to control crop damage from pests include pesticides, integrated pest management, and genetic engineering. • How scientists determine the toxicity of a substance. • Most pollutants come from human activities. • What it means to be sustainable and the measures we can take to achieve sustainability. • Economics and environmental science are related. • The government has developed regulations to protect our health and our environment. • The media can distort information about the environment. 			<p>systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.1-Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.3-Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.4-Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.6-Use a computational representation to illustrate the relationships among Earth systems and how those relationships are</p>
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					being modified due to human activity.* (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					