

<b>Title</b>	<b>Roxbury High School Environmental Science A</b>
Type	Consensus
Document	Map
Authors	Denise Glenn, Robin Dunn, Justin Kulick
Subject	Science
Course	Environmental Science
Grade(s)	11 , 12
Location	Roxbury High School
Curriculum Writing History	
Notes	
Attachments	

**Title : Roxbury High School Environmental Science A**  
**Type : Consensus**

	September				October				November				December				January				February				March				April				May				June			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
September/Week 1 - September/Week 4																																								
<b>Unit 1: What is Environmental Science?</b>																																								
October/Week 5 - November/Week 12																																								
<b>Unit 2: Ecology</b>																																								
December/Week 13 - January/Week 20																																								
<b>Unit 3: Populations</b>																																								
February/Week 21 - March/Week 28																																								
<b>Unit 4: Water, Air, and Land</b>																																								
April/Week 29 - May/Week 36																																								
<b>Unit 5: Mineral and Energy Resources</b>																																								
June/Week 37 - June/Week 40																																								
<b>Unit 6: Our Health and Our Future</b>																																								

**Duration: September/Week 1 - September/Week 4**

**UNIT NAME: Unit 1: What is Environmental Science?**

Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> <li>• Science is the study of learning more about the world.</li> <li>• Environmental science is an interdisciplinary science.</li> <li>• Environmental science constantly changes the way we understand the world.</li> <li>• Scientific inquiry requires formulating a hypothesis around primary observations.</li> <li>• Scientists apply statistics to data to gain further knowledge of an unknown.</li> <li>• Earth consists of rock, air, water, and living things that all interrelate with each other.</li> <li>• Earth is surrounded by a mixture of gases known as the atmosphere.</li> <li>• The hydrosphere includes all the water on or near Earth's surface.</li> </ul>	<ul style="list-style-type: none"> <li>• What is environmental science and what are the five major fields of study that contribute to environmental science?</li> <li>• What is the law of supply and demand?</li> <li>• How do you measure the cost of pollution?</li> <li>• What is sustainability and how is it a goal of environmental science?</li> <li>• What are methods of observation in the field?</li> <li>• What is the scientific method?</li> <li>• How is scientific research performed and how are the results analyzed?</li> <li>• What are the layers of Earth and what elements are found in each layer?</li> <li>• How are earthquakes and volcanoes related?</li> <li>• What processes have altered Earth's surface?</li> <li>• What constitutes the atmosphere and why is it important?</li> <li>• What are the steps involved in the hydrologic cycle?</li> </ul>	<ul style="list-style-type: none"> <li>• Materials and equipment used by environmental scientists.</li> <li>• Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.</li> <li>• Composition of their local ecosystem.</li> <li>• The importance of physical, graphical, conceptual, and mathematical models in science.</li> <li>• Earth is an integrated system consisting of four interacting components; the geosphere, the atmosphere, the hydrosphere, and the biosphere.</li> </ul>	<ul style="list-style-type: none"> <li>• Define environmental science and compare environmental science with ecology.</li> <li>• List the five major fields of study that contribute to environmental science.</li> <li>• Distinguish between renewable and nonrenewable resources.</li> <li>• Describe "The Tragedy of the Commons".</li> <li>• Explain the law of supply and demand.</li> <li>• Distinguish between developed and developing countries.</li> <li>• Explain what sustainability is and describe why it is a goal of environmental science.</li> <li>• List and describe the steps of the experimental method.</li> <li>• Describe the composition and structure of Earth.</li> <li>• Explain the correlation between plate tectonics, earthquakes, and volcanoes.</li> </ul>		<p>HS.ESS2.1-Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. (09-12)            [Regional:Next Generation Science Standards (NGSS)]</p> <p>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)]</p> <p>HS.ESS2.3-Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. (09-12)            [Regional:Next Generation Science Standards (NGSS)]</p> <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</p>

			<ul style="list-style-type: none"> <li>• Describe the composition of the Earth's atmosphere.</li> <li>• Describe the layers of Earth's atmosphere.</li> <li>• Explain three mechanisms of heat transfer in Earth's atmosphere.</li> <li>• Describe the greenhouse effect.</li> <li>• Identify the major processes in the water cycle.</li> <li>• Describe the properties of ocean water.</li> <li>• Explain how the ocean regulates Earth's temperature.</li> </ul>		<p>Science Standards (NGSS)          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)]          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)]          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>
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Plans:

<b>Duration: October/Week 5 - November/Week 12</b>					
<b>UNIT NAME: Unit 2: Ecology</b>					
<b>Enduring Understandings</b>	<b>Essential Questions</b>	<b>Knowledge</b>	<b>Skills</b>	<b>Assessment</b>	<b>Standards</b>
<ul style="list-style-type: none"> <li>• Different species living in similar environments often share evolutionary adaptations.</li> <li>• Wildlife species have specific adaptations for the region or biome in which they live.</li> <li>• Environmental factors determine the rate of growth or decline of a wildlife species.</li> <li>• Organisms live as populations of one species in communities with other species.</li> <li>• Each species has its own habitat.</li> <li>• Sunlight is the ultimate energy source for nearly all living things.</li> <li>• Energy conversions underlie all ecological processes.</li> <li>• Energy cannot be created it must come from somewhere.</li> <li>• All energy flows through systems and at each step more of it becomes unusable.</li> <li>• All food energy can be traced back to the sun.</li> </ul>	<ul style="list-style-type: none"> <li>• What is Ecology?</li> <li>• What is an ecosystem?</li> <li>• What factors (biotic and abiotic) limit the rate at which populations of organisms can grow? Are these different for different ecosystems?</li> <li>• What is a habitat, and what are its components?</li> <li>• What is natural selection and how do species adapt?</li> <li>• How is energy measured?</li> <li>• What is the main source of energy for all terrestrial organisms?</li> <li>• What types of organisms have the ability to harness energy directly from the sun?</li> <li>• How is energy lost in an ecosystem?</li> <li>• What properties define a biome?</li> <li>• What climatic conditions of a region determine its biome?</li> <li>• What are some characteristics of forest biomes?</li> <li>• How are grasslands, desert, and tundra biomes different?</li> </ul>	<ul style="list-style-type: none"> <li>• Structure of their local ecosystem.</li> <li>• Biotic and abiotic limiting factors on populations.</li> <li>• Global and local examples of population decline and exponential growth.</li> <li>• How evolution and natural selection are connected.</li> <li>• Trophic level roles of organisms.</li> <li>• Percentage of energy lost at each trophic level.</li> <li>• Pyramid of Biomass, Numbers and Energy.</li> <li>• How ecosystems and biomes are related</li> <li>• The characteristics and locations of the world's major biomes.</li> <li>• Shared characteristics of flora and fauna adaptations in each biome.</li> <li>• How humans benefit from Ecosystem services.</li> </ul>	<ul style="list-style-type: none"> <li>• Distinguish between the biotic and abiotic factors in an ecosystem.</li> <li>• Describe how a population differs from a species.</li> <li>• Explain how habitats are important for organisms.</li> <li>• Explain the processes of evolution by natural selection.</li> <li>• Explain the concept of adaptation.</li> <li>• Identify the steps by which a population of insects becomes resistant to a pesticide.</li> <li>• Describe how energy is transferred from the sun to producers and then to consumers.</li> <li>• Recognize how consumers depend on producers.</li> <li>• Contrast food chain and food web.</li> <li>• Explain why an energy pyramid is a representation of trophic levels.</li> <li>• Illustrate the carbon, nitrogen, and phosphorus cycles.</li> <li>• Explain how human activities affect the biogeochemical cycles.</li> </ul>		<p>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)]</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.ESS2.7-Construct an argument based on evidence about the simultaneous co-evolution of Earth systems and life on Earth. (09-12)            [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS1.5-Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. (09-12)            [Regional:Next Generation Science Standards (NGSS)]</p>

**Title : Roxbury High School Environmental Science A**  
**Type : Consensus**

<ul style="list-style-type: none"> <li>• Biomass and energy pyramids can be graphically represented as pyramids.</li> <li>• Ecosystems are constantly changing.</li> <li>• Biodiversity is important for ecosystem and environmental stability.</li> <li>• Humans are altering ecosystems faster than they can naturally regenerate.</li> <li>• Human activity has resulted in the loss of biodiversity at a faster rate than ever before.</li> </ul>	<ul style="list-style-type: none"> <li>• What are the factors that determine where an organism lives in an aquatic system?</li> <li>• How are freshwater and marine ecosystems different?</li> </ul>		<ul style="list-style-type: none"> <li>• Contrast the different types of ecological succession.</li> <li>• Explain how a pioneer species contributes to ecological succession.</li> <li>• Describe why vegetation is used to name a biome.</li> <li>• Explain how latitude and altitude affect which plants grown in an area.</li> <li>• Recognize the tropical rain forest, temperate rain forest, temperate deciduous forest, and taiga.</li> <li>• Identify the savanna, temperate grassland, chaparral, desert, tundra, and permafrost.</li> <li>• List the factors that determine where an organism lives in an aquatic system.</li> <li>• Contrast the various zones of a freshwater body.</li> <li>• Explain why wetlands are important.</li> <li>• Compare salt marshes and mangrove swamps.</li> <li>• Explain why an estuary is a very productive ecosystem.</li> </ul>		<p>HS.LS1.6-Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. (09-12)          [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS1.7-Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. (09-12)          [Regional:Next Generation Science Standards (NGSS)]</p> <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)</p>
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					<p>[Regional:Next Generation Science Standards (NGSS)] 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)</p> <p>[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)</p> <p>[Regional:Next Generation Science Standards (NGSS)] HS.LS2.1-Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. (09-12)</p> <p>[Regional:Next Generation Science Standards (NGSS)] HS.LS2.6-Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain</p>
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					<p>relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. (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.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.LS4.6-Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS3.2-Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations</p>
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					<p>through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (09-12)[Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS3.3-Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS4.2-Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS4.3-Apply concepts of statistics and probability to support explanations</p>
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					<p>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)]</p> <p>HS.LS4.4-Construct an explanation based on evidence for how natural selection leads to adaptation of populations. (09-12)[Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS4.5-Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p>
<b>Plans:</b>					

**Duration: December/Week 13 - January/Week 20**

**UNIT NAME: Unit 3: Populations**

Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> <li>• Each population has specific properties, including size, density, and pattern of dispersion.</li> <li>• A population is dependent on its carrying capacity.</li> <li>• The human population of Earth has grown faster in the 20<sup>th</sup> century than ever before.</li> <li>• Humans alter natural systems.</li> <li>• Humans have had an impact on the earth for millions of years.</li> <li>• Technology and population growth have enabled humans to increase both the rate and the scale of the impact on the environment.</li> <li>• Environmental problems have a cultural and social context.</li> <li>• Human population growth is the root cause of all environmental problems.</li> </ul>	<ul style="list-style-type: none"> <li>• What is demography?</li> <li>• What are the factors that produce changes in human population size?</li> <li>• How has the human population changed throughout history?</li> <li>• What is the difference between highly and lesser-developed countries?</li> <li>• What is the environmental impact of human overpopulation?</li> <li>• What are problems associated with rapid growth of urban areas?</li> <li>• What methods have various governments used to try to slow human population growth?</li> <li>• What role do humans play in the loss of biodiversity?</li> <li>• How is biodiversity measured locally as well as globally?</li> <li>• What are some common uses for plants and animals?</li> <li>• How do genetic, species and ecosystem diversity differ?</li> </ul>	<ul style="list-style-type: none"> <li>• A population is all the members of a species living in the same place at the same time.</li> <li>• Carrying capacity is the maximum population a habitat can support over a long period of time.</li> <li>• A population that grows rapidly may be subject to density-dependent regulation.</li> <li>• The niche of an organism is its pattern of use of its habitat and its interactions with other organisms.</li> <li>• Interactions between species are categorized based on the relative benefit or harm that one species causes the other.</li> <li>• Competition between species occurs when their niches overlap.</li> <li>• The population of the United States has grown in the last century because of births and immigration.</li> </ul>	<ul style="list-style-type: none"> <li>• Identify the main properties of a population.</li> <li>• Calculate exponential population growth.</li> <li>• Explain how population sizes in nature are regulated.</li> <li>• Contrast niche and habitat.</li> <li>• Contrast parasitism and predation.</li> <li>• Explore how symbiotic relationships may evolve.</li> <li>• Identify how the size and growth rate of the human population has changed over time.</li> <li>• Define the properties that scientists use to predict population sizes.</li> <li>• Make predictions about population trends based on age structure.</li> <li>• Explain why different countries may be at different stages of the demographic transition.</li> <li>• List the problems caused by rapid human population growth.</li> </ul>		<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.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.ESS3.3-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.ESS3.1-Construct an explanation based on evidence for how the availability of natural resources, occurrence of</p>

**Title : Roxbury High School Environmental Science A**  
**Type : Consensus**

<ul style="list-style-type: none"> <li>• Global carrying capacity is determined by the overall population, coupled with rates of consumption and waste.</li> <li>• Biodiversity is important for ecosystem and environmental stability.</li> <li>• Sustainability in our ecosystems specifically when dealing with game and wild species as well as forestry.</li> <li>• Human activity has resulted in the loss of biodiversity at a faster rate than ever before.</li> </ul>	<ul style="list-style-type: none"> <li>• What are the major laws and acts that help protect species biodiversity?</li> <li>• How do you manage a wild population?</li> <li>• What are ecosystem services and how do we benefit from them?</li> <li>• What are characteristics common to endangered and threatened species?</li> <li>• What are invasive species and what effect do they have on native ecosystems?</li> </ul>	<ul style="list-style-type: none"> <li>• In the demographic transition model, countries progress through four stages of change in birth rates, death rates, and population sizes.</li> <li>• When a growing population uses resources faster than they can be renewed, the resources most critically affected are fuelwood, water, and arable land.</li> <li>• Some countries attempt to reduce birthrates through a variety of means.</li> <li>• Biodiversity refers to the number of different species in a given area.</li> <li>• Humanity benefits from biodiversity.</li> <li>• Scientists are concerned that the loss of biodiversity may be the most challenging environmental issue.</li> <li>• The United States has several regulatory acts to protect species and biodiversity.</li> </ul>	<ul style="list-style-type: none"> <li>• Contrast population growth problems in more-developed countries to less-developed countries.</li> <li>• Identify the diversity of species types on Earth, relating the difference between known numbers and estimated numbers.</li> <li>• List three levels of biodiversity.</li> <li>• Explain the ways in which biodiversity is important to humans and ecosystems.</li> <li>• Provide examples of endangered and threatened species.</li> <li>• Identify areas of the world that have high levels of biodiversity and many threats to species.</li> <li>• List several types of efforts to save individual species.</li> <li>• Describe the main provisions of the Endangered Species Act.</li> <li>• Discuss ways in which efforts to protect endangered species can lead to controversy.</li> <li>• Describe three examples of worldwide cooperative efforts to prevent extinctions.</li> </ul>		<p>natural hazards, and changes in climate have influenced human activity. (09-12)[Regional:Next Generation Science Standards (NGSS)]          HS.LS2.1-Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at 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.LS2.6-Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. (09-12)          [Regional:Next Generation Science Standards</p>
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					<p>(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.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.LS4.6-Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.LS3.2-Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (09-12)[Regional:Next Generation Science Standards (NGSS)]</p>
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					<p>HS.LS3.3-Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS4.1-Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. (09-12)[Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS4.2-Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. (09-12) [Regional:Next Generation Science Standards (NGSS)]</p> <p>HS.LS4.3-Apply concepts of statistics and probability</p>
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<b>Plans:</b>					

**Duration: February/Week 21 - March/Week 28**

**UNIT NAME: Unit 4: Water, Air, and Land**

Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> <li>• Only 3% of Earth's water is fresh water.</li> <li>• The three main types of water use are residential, industrial, and agricultural.</li> <li>• Water can become polluted by chemical, physical, or biological agents.</li> <li>• Government legislation, including the Clean Water Act and the Clean Air Act, has succeeded in reducing pollution.</li> <li>• Most air pollution comes from the burning of fossil fuels.</li> <li>• Air pollution has both long- and short-term effects on human health.</li> <li>• Climate is the long-term prevailing weather conditions at a particular place.</li> <li>• Human activities have impacted the ozone layer.</li> <li>• Global warming could cause a number of severe environmental problems.</li> </ul>	<ul style="list-style-type: none"> <li>• Why is it important to protect our water sources?</li> <li>• How do our water sources become polluted?</li> <li>• How is drinking water purified in the US?</li> <li>• What laws were enacted to reduce water pollution?</li> <li>• What are the impacts of poor water quality on human health?</li> <li>• How can we as individuals help to reduce water pollution?</li> <li>• What are some examples of water diversion in the world?</li> <li>• What is air pollution and how is it caused?</li> <li>• What are the effects of exposure to air pollution?</li> <li>• How are humans impacting our climate?</li> <li>• What are some proposed ideas on the causes of global warming?</li> <li>• How is soil essential to our every day lives?</li> <li>• What are the physical and living parts of soil?</li> </ul>	<ul style="list-style-type: none"> <li>• Only a small fraction of Earth's water is fresh water.</li> <li>• The two main sources of fresh water are surface water and groundwater.</li> <li>• Most water use is for agriculture.</li> <li>• Water conservation is necessary to maintain an adequate supply of fresh water.</li> <li>• Most water pollution in the United States is caused by nonpoint-source pollutants.</li> <li>• Government legislation protects our fresh water supplies.</li> <li>• Primary and secondary pollutants have an impact on air quality.</li> <li>• Most air pollution is caused by the burning of fossil fuels.</li> <li>• Noise pollution affects our health.</li> <li>• The short- and long-term effects of acid precipitation can alter an ecosystem.</li> <li>• Climate is the long-term prevailing weather conditions at a particular place.</li> </ul>	<ul style="list-style-type: none"> <li>• Illustrate the distribution of Earth's water resources.</li> <li>• Contrast surface water and groundwater.</li> <li>• Illustrate how a watershed works.</li> <li>• Identify patterns of global water use.</li> <li>• Explain how water is treated so that it can be used for drinking.</li> <li>• Identify how water is used in homes, in industry, and in agriculture.</li> <li>• List the pros and cons of dams and water diversion projects.</li> <li>• Contrast point-source pollution and nonpoint-source pollution.</li> <li>• Identify the different types of water pollutants.</li> <li>• Explain why groundwater pollution is difficult to clean up.</li> <li>• Describe the major sources of ocean pollution and explain the effects of pollution on ecosystems.</li> <li>• List six major laws designed to improve water quality in the United States.</li> </ul>		<p>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)]</p> <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</p>



**Title : Roxbury High School Environmental Science A**  
**Type : Consensus**

<ul style="list-style-type: none"> <li>• Poor management of land can lead to numerous environmental problems.</li> <li>• Preserving and conserving land is important for the sustainability of our land.</li> <li>• Grains are the greatest amounts of food produced worldwide.</li> <li>• An increasing amount of food is needed each year to feed the world's growing population.</li> <li>• The basic processes of farming include plowing, fertilization, irrigation, and pest control.</li> <li>• Soil conservation methods are important for protecting and maintaining topsoil and reducing soil erosion.</li> <li>• Livestock are important for the production of food and other products.</li> </ul>	<ul style="list-style-type: none"> <li>• What is percolation rate and how does this relate to environmental quality?</li> <li>• What is the relationship between agriculture, erosion and soil pollution?</li> <li>• What are the effects of population on land resources?</li> <li>• Why is it important to preserve land resources?</li> <li>• How will agriculture support growing populations?</li> <li>• What practices are used for soil conservation and management?</li> <li>• How can we improve sustainability in order to feed the world?</li> <li>• What are some issues associated with the use of pesticides?</li> <li>• How do pesticides get into the food chain and then magnify?</li> <li>• What was the green revolution?</li> <li>• What is Integrated Pest Management?</li> <li>• What are some environmental issues associated with raising livestock?</li> </ul>	<ul style="list-style-type: none"> <li>• The angle of the sun's rays cause seasons.</li> <li>• Human activities have caused a thinning of the ozone layer.</li> <li>• Thinning of the ozone layer increases the amount of ultraviolet radiation that reaches Earth's surface.</li> <li>• Methane and carbon dioxide are important greenhouse gases.</li> <li>• The Kyoto Protocol was established to improve air quality.</li> <li>• Urban areas are mostly covered with houses, roads, businesses, and industrial and municipal structures.</li> <li>• Rural areas have less dense human populations and include forest land, cropland, and rangeland.</li> <li>• Urbanization is the migration of people from rural to urban areas.</li> <li>• Land-use planning is essential for urban areas to maintain a high quality of life.</li> <li>• National lands and wilderness lands are maintained and protected by the government.</li> </ul>	<ul style="list-style-type: none"> <li>• Contrast primary and secondary pollutants and provide examples of each.</li> <li>• Name the major sources of air pollution in urban areas.</li> <li>• Identify the way in which smog forms.</li> <li>• List the effects of air pollution on human health.</li> <li>• Explain what causes indoor air pollution and how it can be prevented.</li> <li>• Describe the health problems associated with noise pollution.</li> <li>• Explain the causes of acid precipitation and how it affects ecosystems.</li> <li>• Describe how other countries are working to solve the problem of acid precipitation.</li> <li>• Contrast weather and climate.</li> <li>• Identify the factors that determine climate.</li> <li>• Explain what causes seasons.</li> <li>• Compare Earth's atmosphere to the glass of a greenhouse.</li> <li>• Correlate carbon dioxide fluctuations with seasons and determine factors that may be causing an increase.</li> </ul>		<p>(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.ESS3.3-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</p>
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		<ul style="list-style-type: none"> <li>• Malnutrition occurs when people do not consume enough Calories or do not eat a sufficient variety of foods.</li> <li>• Poverty is the main reason for hunger today.</li> <li>• Modern agricultural methods have greatly improved farming productivity.</li> <li>• Soil conservation is important for protecting and managing soil.</li> <li>• Pests cause considerable crop damage.</li> <li>• Ways to control crop damage from pests include pesticides, integrated pest management, and genetic engineering.</li> <li>• Livestock are important for the production of food and other agricultural products.</li> </ul>	<ul style="list-style-type: none"> <li>• Identify one possible explanation for the increase in average global temperature.</li> <li>• Illustrate what a warmer Earth may be like.</li> <li>• Explain how the ozone layer protects Earth.</li> <li>• Describe the human impacts on the ozone layer.</li> <li>• Describe the damaging effects of ultraviolet radiation.</li> <li>• Distinguish between urban and rural land.</li> <li>• Explain the concept of ecosystem services.</li> <li>• Describe the urban crisis, and explain what people are doing to deal with it.</li> <li>• List how urban sprawl affects the environment.</li> <li>• Identify how open spaces provide urban areas with environmental benefits.</li> <li>• Explain the heat-island effect.</li> <li>• Clarify how people use technology as a tool for land-use planning.</li> <li>• Explain the benefits of preserving farmland.</li> <li>• Contrast farmland and rangeland.</li> <li>• Illustrate the environmental effects of deforestation.</li> </ul>		<p>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)]        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.LS4.6-Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* (09-12)[Regional:Next Generation Science Standards (NGSS)]</p>
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<b>Plans:</b>					

**Duration: April/Week 29 - May/Week 36**

**UNIT NAME: Unit 5: Mineral and Energy Resources**

Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> <li>• Minerals and minerals are important to our global economy.</li> <li>• Mining creates many negative environmental consequences.</li> <li>• The U.S. government has enacted legislation that regulates mining and attempts to minimize the impacts of mining on the environment.</li> <li>• Energy patterns produce a great demand for fuel and energy.</li> <li>• Economic factors often influence decisions on energy use and policy.</li> <li>• Decision making when it comes to nuclear power is very difficult because of numerous factors.</li> <li>• It is vital for the survival of our society to develop alternative sources of energy.</li> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• What is a mineral and why are minerals important to us?</li> <li>• What are the different methods of mining?</li> <li>• What are some of the environmental consequences associated with mining?</li> <li>• What are the federal laws that relate to mining and reclaiming mined land?</li> <li>• What is the difference between renewable and non-renewable resources?</li> <li>• What are fossil fuels and how are they formed?</li> <li>• How can you personally limit your use of fossil fuels?</li> <li>• What are the advantages and disadvantages of using fossil fuels to produce energy?</li> <li>• What causes the nuclear reaction in nuclear power plants?</li> <li>• What are some advantages and disadvantages of nuclear power plants?</li> </ul>	<ul style="list-style-type: none"> <li>• A mineral is a naturally occurring, inorganic solid, with a definite structure and unique chemical composition.</li> <li>• Metals are important for their electrical and thermal conductivity, durability, and corrosion resistance.</li> <li>• Minerals may form from the cooling of magma, from evaporation of water that contain salts, or from the circulation of hot-water solutions in rocks.</li> <li>• Subsurface and surface mining are two mining methods.</li> <li>• Environmental consequences from mining have led to government legislature in an attempt to minimize impact.</li> <li>• Most of the world's energy needs are met by fossil fuels.</li> <li>• Fossil fuels are nonrenewable resources.</li> </ul>	<ul style="list-style-type: none"> <li>• Define the term mineral and provide 3 examples.</li> <li>• Contrast metal and non metal, and give examples of each.</li> <li>• Illustrate the processes by which ore minerals form.</li> <li>• Describe how mining companies explore for new mineral deposits.</li> <li>• Contrast the methods of subsurface mining and surface mining.</li> <li>• Explain the steps that take place in smelting an ore.</li> <li>• Explore the important potential environmental consequences of mining and list several examples.</li> <li>• Identify the federal laws that relate to mining and reclaiming mined land.</li> <li>• Describe the ways in which state governments regulate mining.</li> <li>• Identify the factors that influence the value of a fuel.</li> </ul>		<p>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.ESS3.6-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)]            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.ESS3.3-Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human</p>

	<ul style="list-style-type: none"> <li>• What factors need to be considered for a long term storage site for spent nuclear fuel and why?</li> <li>• What alternative energy sources are being developed and how efficient are these sources?</li> <li>• What is solid waste and how do we dispose of solid waste?</li> <li>• What alternatives are available for waste disposal?</li> <li>• What is hazardous waste and how is it disposed of?</li> </ul>	<ul style="list-style-type: none"> <li>• The extraction, consumption, and transportation of fossil fuels cause air and water pollution and habitat destruction.</li> <li>• Nuclear energy is energy that exists within the nucleus of an atom.</li> <li>• Nuclear power is created by heating water to create steam that drives turbines.</li> <li>• Nuclear power does not create many of the environmental problems associated with fossil fuels.</li> <li>• Nuclear power produces nuclear waste which can be dangerous if not maintained properly.</li> <li>• Renewable energy is energy from sources that are constantly being formed.</li> <li>• Solar energy, wind, biomass, hydropower, and geothermal energy are examples of renewable energy.</li> <li>• Alternative energy sources are energy sources that are still in development.</li> <li>• The difference between solid waste and hazardous waste.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain how fuels are used to generate electricity in an electric power plant.</li> <li>• Map how fossil fuels form and how they are used.</li> <li>• Compare the advantages and disadvantages of fossil-fuel use.</li> <li>• Explore the future of fossil-fuel use.</li> <li>• Describe nuclear fission.</li> <li>• Map how a nuclear power plant works.</li> <li>• Explore the advantages and disadvantages of nuclear power.</li> <li>• List the various forms of renewable energy, and compare their advantages and disadvantages.</li> <li>• Contrast passive solar heating, active solar heating, and photovoltaic energy.</li> <li>• Describe the current state of wind energy technology.</li> <li>• Explore the differences in biomass fuel use between developed and developing nations.</li> <li>• Contrast how hydroelectric energy, geothermal energy, and geothermal heat pumps work.</li> </ul>		<p>populations, and biodiversity. (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.LS4.6-Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* (09-12)[Regional:Next Generation Science Standards (NGSS)]</p>
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			<ul style="list-style-type: none"><li>• Identify the characteristics of hazardous waste.</li><li>• Describe the laws that govern hazardous waste.</li><li>• Describe the ways to treat hazardous waste safely.</li></ul>		
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**Plans:**

**Title : Roxbury High School Environmental Science A**  
**Type : Consensus**

Duration: June/Week 37 - June/Week 40					
UNIT NAME: Unit 6: Our Health and Our Future					
Enduring Understandings	Essential Questions	Knowledge	Skills	Assessment	Standards
<ul style="list-style-type: none"> <li>• Toxic chemicals from both natural and human activities can harm human health.</li> <li>• Toxicology is used to determine how poisonous a substance is.</li> <li>• Improper waste disposal pollutes the environment.</li> <li>• Pathogens from environmental sources causes disease.</li> <li>• Many emerging diseases have made cross-species transfers from animals to humans.</li> <li>• To achieve sustainability requires cooperation and communication at all levels.</li> <li>• Economics drives environmental decisions.</li> <li>• Public pressure has a powerful impact on environmental decisions and policy.</li> <li>• How one chooses to live will have an impact on the environment.</li> <li>• Environmental decisions will have an impact on the future.</li> </ul>	<ul style="list-style-type: none"> <li>• How do we as humans impact our environment?</li> <li>• How are toxic chemicals harming our health and how do scientists determine their toxicity?</li> <li>• What role does the environment play in the transmission of infectious diseases?</li> <li>• What are the steps involved to achieve sustainability?</li> <li>• What are the goals of international agreements and how do they impact us?</li> <li>• How can citizens influence environmental policy?</li> <li>• How is environmental policy developed?</li> <li>• How do consumers affect the environment?</li> <li>• Who are some of environmental “bellringers” and why are they important?</li> </ul>	<ul style="list-style-type: none"> <li>• How scientists determine the toxicity of a substance.</li> <li>• Most pollutants come from human activities.</li> <li>• What it means to be sustainable and the measures we can take to achieve sustainability.</li> <li>• Economics and environmental science are related.</li> <li>• The government has developed regulations to protect our health and our environment.</li> <li>• The media can distort information about the environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Identify five pollutants, their sources, and their possible effects on human health.</li> <li>• Contrast toxicology and epidemiology.</li> <li>• Explain how pollution can come from both natural sources and human activities.</li> <li>• Connect waste, pollution, and human health and how they are related to the environment.</li> <li>• Explain why the environment is an important factor in the spread of cholera.</li> <li>• Identify two changes in the environment that can lead to the spread of infectious diseases.</li> <li>• List some of the challenges to achieving sustainability.</li> <li>• Identify several major international meetings and agreements relating to the environment.</li> <li>• Explain how economics and environmental science are related.</li> </ul>		<p>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.ESS3.6-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.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.ESS3.3-Create a computational simulation to illustrate the relationships among management of natural resources, the</p>



			<ul style="list-style-type: none"> <li>• List the ways that governments influence economics.</li> <li>• Identify two major developments in U.S. environmental history.</li> <li>• Provide examples of three federal agencies that have environmental responsibilities.</li> <li>• Explain the purpose of an Environmental Impact Statement.</li> <li>• Evaluate the media as a source of information about the environment and provide examples.</li> </ul>		<p>sustainability of human populations, and biodiversity. (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.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.LS4.6-Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* (09-12)[Regional:Next Generation Science Standards (NGSS)]</p>
<p><b>Plans:</b></p>					