Environmental Science Curriculum Maps

Grade: 9 **Subject:** Environmental Science	**Unit 1: An Introduction to Environmental Science**
Big Idea/Rationale	• Environmental science shows us how Earth's systems function and how we influence these systems, giving us a big-picture understanding of the world and our place within it.
Enduring Understanding (Mastery Objective)	• We can use science to study and understand the complex interactions between humans and their environments.

Essential Questions (Instructional Objective)	• How do scientists uncover, research, and solve environmental problems?
	  ○ (1.1) How does environmental science help us understand the natural world?
	  ○ (1.2) What does it mean to "do science"?
	  ○ (1.3) What happens to a scientific study after data have been gathered and the results are analyzed?
	• How can we best balance our own interests and needs with the health of the environment?
	  ○ (2.1) How is sustainability affected by economics?
	  ○ (2.2) How do environmental policies protect the environment?
	  ○ (2.3) How can governments work with each other and citizens to form sound environmental policy?
	• How do the nonliving parts of Earth's systems provide the basic materials to support life?
	  ○ (3.2) What types of systems play roles in environmental science?
	  ○ (3.3) What are the characteristics of Earth's geosphere, biosphere, atmosphere, and hydrosphere?
	  ○ (3.4) How do nutrients cycle through the environment?

Content (Subject Matter)	• Explain the focus of environmental science. • Describe the recent trends in human population and resource consumption. • Explain what science is. • Describe the process of science • Describe the major roles of the scientific community in the process of science. • Explain the study of environmental ethics. • Describe two basic concepts of economics. • Explain the relationship between economics and the environment. • Describe ways that economics are working toward sustainability. • Explain the purpose of environmental policy. • Describe the history of U.S. environmental policy. • Describe the direction of current U.S. environmental policy.

	• Identify major international institutions involved in environmental policy. • Discuss different approaches to environmental policy. • List the steps involved in the environmental policy process. • Differentiate among an atom, an element, a molecule, and a compound. • Discuss how various macromolecules are essential to life. • Identify some unusual properties of water. • Describe two major ways that Earth's systems interact. • Define Earth's geosphere, lithosphere, biosphere, atmosphere, and hydrosphere. • Describe the parts of Earth's geosphere. • Describe Earth's biosphere and atmosphere. • Discuss the water cycle. • Explain how the law of conservation of matter applies to the behavior of nutrients in the environment. • Describe the carbon cycle. • Describe the events of the phosphorus cycle. • Explain the importance of bacteria to the nitrogen cycle.
Skills/ Benchmarks (CCSS Standards)	• 5.4.12.G.1: Analyze and explain the sources and impact of a specific industry on a large body of water (e.g., Delaware or Chesapeake Bay). • 5.4.12.G.2: Explain the unintended consequences of harvesting natural resources from an ecosystem. • 5.4.12.G.4: Compare over time the impact of human activity on the cycling of matter and energy through ecosystems. • 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams. • 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare. • 5.3.12.B.1: Cite evidence that the transfer and transformation of matter and energy links organisms to one another and to their physical setting.
Materials and Resources	**Technology** • MyEnvironmentalScience.com

	• Graph It: An Introduction to Graphing • www.understndingscience.org- UC Berkeley
Notes	

Grade: 9 **Subject:** Environmental Science	**Unit 2: Ecology**
Big Idea/Rationale	• Describe the diversity of ecosystems, populations, and biomes.
Enduring Understanding (Mastery Objective)	• Life on Earth depends on interactions among organisms and between organisms and their environments.

Essential Questions (Instructional Objective)	• (4) How do changes in population size relate to environmental conditions?
	  ○ (4.1) How do ecologists organize and study life?
	  ○ (4.2) What are the important characteristics of populations?
	  ○ (4.3) What factors determine whether, and how, a population's size changes?
	• (5) How do organisms affect one another's survival and environment?
	  ○ (5.1) What roles does the environment play in an organism's survival and reproduction?
	  ○ (5.2) How do species interact in nature?
	  ○ (5.3) How do energy and nutrients move through communities?
	  ○ (5.4) How do communities respond to a disturbance?
	• (6) How does the environment affect where and how an organism lives?
	  ○ (6.1) What abiotic and biotic factors are used to classify biomes?
	  ○ (6.2) What conditions and organisms characterize the world's biome?
	  ○ (6.3) What conditions and organisms characterize the world's aquatic ecosystems?
	• (7) Why is it important to protect biodiversity?
	  ○ (7.1) What is biodiversity?
	  ○ (7.2) Why is global biodiversity decreasing?
	  ○ (7.3) How can we protect and preserve biodiversity?

Content (Subject Matter)	• (4.1) Describe the different levels of organization studied by ecologists. • Explain the difference between biotic and abiotic factors. • Discuss how an organism's habitat relates to its survival. • (4.2) Explain the usefulness of tracking population size. • Define population density. • Describe the three ways populations can be distributed. • Explain what age structure diagrams tell you about a population. • (4.3) Describe the factors that influence a population's growth rate. • Explain exponential growth and logistic growth. • Explain how limiting factors and biotic potential affect population growth. • Short or skip (5.1) Describe the four primary mechanisms of biological

	evolution. • Describe how speciation and extinction affect the diversity of life on Earth. • (5.2) Discuss the factors that influence an organism's niche. • Compare and contrast predation, parasitism, and herbivory. • Describe mutualism and commensalism. • (5.3) Explain the difference between a producer and a consumer. • Explain the effect of inefficient energy transfer on community structure. • Describe how feeding relationships can have both direct and indirect effects on community members. • (5.4) Describe what happens to a community after a disturbance. • Explain the conditions necessary for a species to become invasive. • (6.1) Explain how biomes are characterized. • Describe how net primary production varies among biomes. • (6.2) Explain how organisms are adapted to the conditions of their biomes. • (6.3) Describe the criteria ecologists use to classify aquatic ecosystems. • List the major categories of freshwater ecosystems. • Explain the ecological importance of estuaries. • List the three major zones of the ocean. • (7.1) Differentiate the components of biodiversity. • Explain two ways in which biodiversity varies across groups or geography. • Describe the economic benefits of biodiversity. • (7.2) Describe how biodiversity is monitored and explain current biodiversity trends. • List the major causes of biodiversity loss. • (7.3) Explain legal actions nations can take to protect biodiversity. • Explain the goal of Species Survival Plans • Describe three strategies for managing whole ecosystems and habitats.
Skills/ Benchmarks (CCSS Standards)	• 5.4.12.C.1: Model the interrelationships among the spheres in the Earth systems by creating a flow chart. • 5.4.12.G.1: Analyze and explain the sources and impact of a specific industry on a large body of water (e.g., Delaware or Chesapeake Bay). • 5.4.12.G.2: Explain the unintended consequences of harvesting natural resources from an ecosystem. • 5.1.12.A.3: Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.

	• 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories. • 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams. • 5.1.12.D.3: Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.
Materials and Resources	• MyEnvironmentalScience.com • Video of rainforest to go with Central Case
Notes	

Grade: 9 **Subject:** Environmental Science	**Unit 3: Humans and the Environment**
Big Idea/Rationale	• Humans and the environment are linked in many complex ways.
Enduring Understanding (Mastery Objective)	• Humans affect the global environment more than any other species alive today.

Essential Questions (Instructional Objective)	• (8) How does the human population affect the environment?
	  ○ (8.1) Why do we study human populations?
	  ○ (8.2) How might the human population's growth rate change in the future?
	  ○ (8.3) What factors influence the impact a population has on its environment?
	• (9) What is the relationship between environmental health and our own health?
	  ○ (9.1) What is environmental health?
	  ○ (9.2) How do biological and social factors in the environment affect human health?
	  ○ (9.3) How do chemicals in our environment affect our health?
	  ○ (9.4) How can physical events in the environment affect our health?
	• (10) How can we balance our needs for housing and jobs with the needs of the environment?
	  ○ (10.1) How do we use the land we live on?
	  ○ (10.2) How can the effects of urbanization lead to sprawl?
	  ○ (10.3) What are the characteristics of a sustainable city?

Content (Subject Matter)	• (8.1) Describe how technological advances have contributed to human population growth.
	  ○ Explain recent trends in population growth.
	  ○ Identify characteristics of human population that are studied by demographers.
	• (8.2) Describe total fertility rates and replacement fertility.
	  ○ Explain how the age structure and sex ratio of a population define its potential for growth.
	  ○ Describe the demographic transition.
	  ○ Discuss social factors that affect population growth.
	  ○ (8.3) Describe how humans impact their environments.
	  ○ Discuss the negative and positive impacts of technology.
	• (9.1) List the types of environmental health hazards.
	  ○ Compare and contrast epidemiology and toxicology.

	○ Describe the reasons why individuals respond differently to the same environmental hazards. ○ Discuss risk assessment. • (9.2) Describe how infectious diseases spread. ○ Explain why emerging diseases are important to monitor and control. ○ Differentiate between social hazards that are lifestyle choices and those that cannot be controlled. • (9.3) Explain what makes chemicals hazardous. ○ Discuss how chemical hazards affect human health. ○ List some indoor chemical hazards. ○ Discuss where chemical hazards can be found in the environment. ○ Describe biomagnification. • (9.4) Discuss how earthquakes affect structures on Earth's surface. ○ Discuss how volcanoes affect human lives and property. ○ Describe tornadoes, hurricanes, and thunderstorms. ○ Discuss the dangers of avalanches. • (10.1) Differentiate between land cover and land use, and describe how people affect both. ○ Explain how and where urbanization occurs. ○ Describe the environmental impacts of urbanization. • (10.2) Describe the contributors to sprawl and its patterns. • Explain the impacts sprawl has on an area. • (10.3) Describe four different components of city planning. ○ Explain the importance of mass transit options to a city and its residents. ○ Explain the importance of open space to a livable city. ○ Differentiate green buildings from conventional buildings. ○ Discuss the progress toward sustainability some cities have made and its importance to the world.
Skills/ Benchmarks (CCSS Standards)	• 5.4.12.F.2: Explain how the climate in regions throughout the world is affected by seasonal weather patterns, as well as other factors, such as the addition of greenhouse gases to the atmosphere and proximity to mountain ranges and to the ocean. • 5.4.12.G.1: Analyze and explain the sources and impact of a specific industry on a large body of water (e.g., Delaware or Chesapeake Bay). • 5.4.12.G.5: Assess (using maps, local planning documents, and historical records) how the natural environment has changed since humans have inhabited the region. • 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • 5.1.12.A.3: Use scientific principles and theories to build and refine

	standards for data collection, posing controls, and presenting evidence. • 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. • 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams.
Materials and Resources	**Technology** • US and World Population Clocks- updates quickly (every minute) http://www.census.gov/main/www/popclock.html • Engineers Without Borders- Water pumping project http://www.ewb-usa.org/projects/locate-project/project_681 • Heat Island Graph- Students can determine our area heat island graph pg. 296 • 10.2- MyEnvironmentalScience.com • Real Data- Population Density and Carbon Emissions – pg. 302
Notes	Possibly video "Outbreak" Ebola, *E. coli* and the increasing mobility of diseases

Grade: 9 **Subject:** Environmental Science	**Unit 4: Earth's Resources**
Big Idea/Rationale	• All of Earth's renewable and nonrenewable resources are important for humans to both use and protect for future use.
Enduring Understanding (Mastery Objective)	• Humans need to use Earth's finite resources in a sustainable way.

Essential Questions (Instructional Objective)	• (11) How can we use Earth's resources sustainably?
	  ○ (11.1) How can we manage renewable resources for sustainable use?
	  ○ (11.2) How can resource managers strike a balance between the ecological and economic value of forest resources?
	  ○ (11.3) What steps toward sustainable forestry have been taken in the last 100 years?
	• (12) How can we balance our growing demand for food with our need to protect the environment?
	  ○ (12.1) What is soil?
	  ○ (12.2) How do erosion, desertification, and soil pollution affect the productivity of soil?
	  ○ (12.3) How has agriculture evolved?
	  ○ (12.4) How can we produce enough food for a rapidly growing population while sustaining our ability to produce it?
	• (13) At what point do the costs of mining outweigh the benefits?
	  ○ (13.1) Where do minerals come from?
	  ○ (13.2) How are mineral resources accessed?
	  ○ (13.3) How can we reduce the negative impacts of mining and manage mined resources?
	• (14) Why are we running out of water?
	  ○ (14.1) Where is all of our water?
	  ○ (14.2) How can we change the way we use water?
	  ○ (14.3) How does water pollution affect humans and ecosystems?
	• (15) How can we ensure everyone has clean air to breathe?
	  ○ (15.1) How can we describe Earth's atmosphere?
	  ○ (15.2) What are the sources of air pollution?
	  ○ (15.3) What measures can limit and prevent pollution of the atmosphere?

Content (Subject Matter)	• (11.1) Explain the importance of managing specific renewable resources. ○ Describe three resource management approaches. • (11.2) List some of the ecological and economical values of forest

	resources. o Describe the costs and benefits of the different methods of timber harvesting. o Discuss the current levels of deforestation in the United States and in developing nations. • (11.3) Explain how logging is managed in U.S. national forests. o Describe where most logging in the United States takes place. o Discuss the potential effects of fire suppression on an ecosystem and on future fires. o Explain how consumer demand is important to sustainable forestry. o Explain how logging is managed in U.S. national parks. • (12.1) Explain three processes by which soil forms. o Describe the horizons that make up a soil profile. o List the four characteristics used to classify soil. • (12.2) Describe some practices that can lead to soil erosion and some that can prevent it. o Identify the causes and effects of desertification. o Discuss the activities of U.S. and international agricultural organizations. o Explain how irrigation and pesticide use can cause soil pollution. • (12.3) Discuss the beginnings of agriculture. o Explain the importance of industrial agriculture and the green revolution. o Identify different types of pest control. o Explain the importance of pollinators to agriculture. • (12.4) Explain why the world needs to grow more food and to grow it sustainably. o Discuss genetically modified food. o Describe the advantages and disadvantages of industrial food production. o Discuss sustainable agriculture. • (13.1) Explain what a mineral is. o Describe how minerals form. o Identify types of rocks and the stages of the rock cycle. • (13.2) Identify the types of resources that are mined. o Describe different methods used for mining. o Explain how metals are processed. • (13.3) Describe the negative impacts of mining on the environment and society. o Explain how mining is regulated. o Describe ways that mineral use can become more responsible. • (14.1) Discuss how fresh water can be both renewable and limited. o Explain the significance of a watershed. o Explain how most groundwater is accessed.

	• (14.2) List the three primary categories of freshwater use.
	  ○ Relate the causes of surface water depletion to their effects.
	  ○ Explain the major causes and effects of groundwater depletion.
	  ○ Describe strategies for addressing water depletion.
	• (14.3) Discuss the main categories of water pollution.
	  ○ Explain why groundwater pollution is difficult to clean up.
	  ○ Discuss the sources and effects of major pollutants found in the ocean.
	  ○ Describe how water is regulated and treated.
	• (15.1) Describe the properties of the atmosphere.
	  ○ Identify the four main layers of the atmosphere.
	  ○ Explain heat transfer and the interaction of air masses in the troposphere
	• (15.2) Explain how both natural processes and human activities can cause air pollution
	  ○ Describe how air pollutants affect human health
	  ○ Explain what causes smog and how temperature inversions affect it and other forms of air pollution
	  ○ Explain how acid deposition occurs and describe its effects
	• (15.3) Explain how the provisions of the Clean Air Act have reduced air pollution in the United States.
	  ○ Describe international efforts to reduce the ozone hole

Skills/ Benchmarks (CCSS Standards)	• 5.3.12.B.1: Cite evidence that the transfer and transformation of matter and energy links organisms to one another and to their physical setting. • 5.3.12.B.3: Predict what would happen to an ecosystem if an energy source was removed. • 5.4.12.C.1: Model the interrelationships among the spheres in the Earth systems by creating a flow chart. • 5.4.12.C.2: Analyze the vertical structure of Earth's atmosphere, and account for the global, regional, and local variations of these characteristics and their impact on life. • 5.4.12.F.2: Explain how the climate in regions throughout the world is affected by seasonal weather patterns, as well as other factors, such as the addition of greenhouse gases to the atmosphere and proximity to mountain ranges and to the ocean. • 5.4.12.G.1: Analyze and explain the sources and impact of a specific industry on a large body of water (e.g., Delaware or Chesapeake Bay). • 5.4.12.G.2: Explain the unintended consequences of harvesting natural resources from an ecosystem. • 5.4.12.G.4: Compare over time the impact of human activity on the cycling of matter and energy through ecosystems. • 5.4.12.G.5: Assess (using maps, local planning documents, and historical records) how the natural environment has changed since humans have inhabited the region.

	• 5.4.12.G.7: Relate information to detailed models of the hydrologic, carbon, nitrogen, phosphorus, sulfur, and oxygen cycles, identifying major sources, sinks, fluxes, and residence times. • 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams.
Materials and Resources	Technology • http://scienceteachingideas.blogspot.com/2008/11/tree-cookies.html- Video of the Bristle Cone Pine tree- oldest living thing on Earth- California • MyEnvironmentalScience.com- Study how –Forest Stewardship Council- FSC-certified products are collected. They have the strictest certification process that certifies forest products.- motto- "Helping you to protect the world's forest" –(through your purchases) • 21st Century Skills- Arcata Marsh and Wildlife Sanctuary- Research- build to treat a community's water supply • Research- Find Out More- (Your world, your turn) Research the mining industry in your state. pg. 399 • Focus- Watch the ABC News video **Great Wall or Great Disaster?-** About China's Three Gorges Dam • 21st Century Skills- The Clean Air Act and Acid Rain- Use the internet to find out how much sulfur dioxide was emitted in your state last year. • http://www.eia.gov/state/state-energy-profiles-data.cfm?sid=NJ#Environment • State Projects- Pick a state to find their Quick Facts to tell the group • New Jersey Forces Pennsylvania Power Plant to Clean Up its Act http://www.njspotlight.com/stories/11/0404/2159/#
Notes	• Students may be interested in tree-sitting activists like Julia "Butterfly" Hill, etc. • What other activists are currently active? In the US? In other countries?

	• Have students read an actual RMP- Resource Management Plan. –pg. 338-339

Grade: 9 **Subject:** Environmental Science	**Unit 5: Toward a Sustainable Future**
Big Idea/Rationale	• The activities that humans take part in today will either help or hurt the environment of tomorrow.
Enduring Understanding (Mastery Objective)	• Today's decisions define our future environment.

Essential Questions (Instructional Objective)	• (16) What are the causes and consequences of a warming Earth?
	  ○ (16.1) What factors determine Earth's climate?
	  ○ (16.2) What evidence shows that global climate change is occurring, and why is it happening?
	  ○ (16.3) What are the effects of climate change?
	  ○ (16.4) How can we respond to climate change?
	• (17) Can we depend on nonrenewable energy resources for our energy needs?
	  ○ (17.1) What is energy and how is it used?
	  ○ (17.2) How did fossil fuels form, and how are they obtained and used?
	  ○ (17.3) What problems are associated with fossil fuel use?
	  ○ (17.4) What are the advantages and disadvantages of nuclear energy?
	• (18) What are the potential uses and limitations of renewable energy sources?
	  ○ (18.1) How can we use biomass energy and geothermal energy?
	  ○ (18.2) How can water be used to address energy needs?
	  ○ (18.3) How can we rely on the sun and wind for power?
	  ○ (18.4) How can we use hydrogen as a source of energy?
	• (19) How do our choices as consumers and waste producers affect our environment?
	  ○ (19.1) How does our current waste disposal impact our environment?
	  ○ (19.2) What is the best way to manage our solid waste?
	  ○ (19.3) How can we best reduce the impact of hazardous waste?

Content (Subject Matter)	• (16.1) Describe factors that affect how the sun warms Earth.
	  ○ Discuss the role of wind patterns in determining climate.
	  ○ Explain how the oceans affect climate.
	  ○ Describe how climate is affected by topography, volcanoes, regional vegetation, and periodic changes in Earth's orbit.
	• (16.2) Identify evidence of global warming.
	  ○ Explain three methods used to study climate change.

	○ State the probable cause of global climate change. • (16.3) State ways in which the warming atmosphere affects ecosystems and organisms. ○ Explain how climate change is affecting people now. ○ Predict future effects of climate change on people. • (16.4) List ways to reduce greenhouse gases related to the use and generation of electricity. ○ Describe some of the ways of reducing greenhouse gases related to transportation. ○ Describe other strategies for reducing greenhouse gases. ○ Explain how nations are working together to try to address climate change. • (17.1) Define energy and differentiate between kinetic and potential energy. ○ Identify different forms of energy. ○ Describe how human society uses energy resources. • (17.2) Explain how fossil fuels formed. ○ Describe the uses of coal and how it is removed from the ground. ○ Describe the uses of oil and how it is extracted. ○ Explain the characteristics and uses of natural gas. ○ Predict the future of fossil fuels. • (17.3) Explain how pollutants released by fossil fuels damage health and the environment. ○ Describe the environmental and health effects of mining and drilling. ○ Explain the implications of dependence on foreign nations for fossil fuels. ○ Explain why energy conservation is important. • (17.4) Relate nuclear fission to the production of energy. ○ Describe how a nuclear power plant generates electricity. ○ Identify the advantages and disadvantages of nuclear power. ○ Contrast nuclear fusion with nuclear fission, and explain the issues related to nuclear fusion. • (18.1) Explain the benefits and current status of renewable energy resources. ○ Define biomass energy and explain how it is used. ○ Describe how geothermal energy is harnessed and used. • (18.2) Explain how river water can be used to generate electricity. ○ Identify benefits and costs of hydropower. ○ Describe how energy from the ocean can generate electricity. • (18.3) Describe techniques for using solar energy to heat buildings and generate electricity. ○ Analyze the benefits and costs of solar energy. ○ Explain how wind energy can be used to produce electricity.

	○ Analyze the benefits and costs of wind energy. • (18.4) Describe how hydrogen fuel can be produced. ○ Explain the way fuel cells work and how they are used. • (19.1) Identify the three categories of waste. ○ Describe conventional waste disposal methods. • (19.2) Discuss the importance of reducing waste. ○ Describe how composting and recycling help reduce the amount of waste. • (19.3) Define hazardous waste. ○ Describe some of the sources of hazardous wastes. ○ Describe current methods for hazardous waste disposal. ○ Describe the danger of radioactive wastes. ○ Identify agencies that regulate hazardous waste.
Skills/ Benchmarks (CCSS Standards)	• 5.3.12.B.3: Predict what would happen to an ecosystem if an energy source was removed. • 5.4.12.C.1: Model the interrelationships among the spheres in the Earth systems by creating a flow chart. • 5.4.12.C.2: Analyze the vertical structure of Earth's atmosphere, and account for the global, regional, and local variations of these characteristics and their impact on life. • 5.4.12.F.2: Explain how the climate in regions throughout the world is affected by seasonal weather patterns, as well as other factors, such as the addition of greenhouse gases to the atmosphere and proximity to mountain ranges and to the ocean. • 5.4.12.G.1: Analyze and explain the sources and impact of a specific industry on a large body of water (e.g., Delaware or Chesapeake Bay). • 5.4.12.G.4: Compare over time the impact of human activity on the cycling of matter and energy through ecosystems. • 5.4.12.G.5: Assess (using maps, local planning documents, and historical records) how the natural environment has changed since humans have inhabited the region. • 5.1.12.A.2: Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • 5.1.12.A.3: Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • 5.1.12.B.1: Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • 5.1.12.B.2: Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. • 5.1.12.B.3: Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.

	• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.C.1: Reflect on and revise understandings as new evidence emerges. • 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams.
Materials and Resources	Technology • (16.3) MyEnvironmentalScience.com- Inquiry- Students investigate the effects of Hurricane Katrina • (16.4) Science Behind the Stories- Climate Clues in Ice- pg. 509- the story of Ice Cores • (17.1) MyEnvironmentalScience.com- Differentiated Instruction- Provide visual examples of potential and kinetic energy • (17.3) MyEnvironmentalScience.com- Inquiry- Students observe a demo modeling the effects of mountaintop removal. • (17.4) 21st Century Skills- Media Literacy- Clean Coal Research • 21st Century Skills- Communication Skills- Support of oppose building new ethanol plants in your state.
Notes	