# **Environmental Science East Chicago Central High School**

# **Environmental Science**

Units of Study					
<u>Unit 1:</u>	Environmental Systems	🕓 25 days			
<u>Unit 2:</u>	Flow of Matter and Energy	<ul><li>25 days</li></ul>			
<u>Unit 3:</u>	Natural Disasters	🕓 15 day			
<u>Unit 4:</u>	Environmental Policy	🕓 15 days			
<u>Unit 5:</u>	Biodiversity	<ul><li>25 days</li></ul>			
<u>Unit 6:</u>	Population	🕓 15 days			
<u>Unit 7:</u>	Pollution	<ul><li>20 days</li></ul>			
<u>Unit 8:</u>	Natural and Anthropogenic Resource Cycles	<ul><li>20 days</li></ul>			
Appendices					

**Appendix A:** Curriculum Refinement Form

**Green:** Priority Standards

**/Pink:** Supporting Standards

**Gray:** Additional Standards

		UNITS							
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	1.2								
	1.3								
	1.4								
	1.5								
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Environme ntal	4.1								
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	4.1				
Content	4.2				
Area Literacy	4.3				
Litteracy	5.1				
	5.2				
	6.1				
	6.2				
	7.1				
	7.2				
	7.3				

Biotic and abiotic events occur in rotational cycles that we can observe and measure enabling us to understand changes that occur on earth.

# **Priority Standards**

- Env.1.1: Understand and explain that ecosystems have cyclic fluctuations, such as seasonal changes or changes in population, as a result of migration, birth, and mortality.
- Env.1.5: Identify and measure biological, chemical, and physical (abiotic and biotic) factors within an ecosystem.

#### **Supporting Standards**

- Env.1.2: Understand and explain that human beings are part of Earth's ecosystems and give examples of how human activities can, deliberately or inadvertently, alter ecosystems.
- Env.1.3: Recognize and describe the difference between systems in equilibrium and systems in disequilibrium. Describe how steady state is achieved through negative and positive feedback loops.
- Env.1.6: Describe the difference between weather and climate. Locate, identify, and describe the major Earth biomes. Explain how biomes are determined by climate (temperature and precipitation patterns) that support specific kinds of plants.

# **Content Area Literacy Standards**

• 9-10.LST.4.1: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

# **Enduring Understandings**

- Ecological cycles describe environmental processes that work in balance and are responsible for carrying away waste materials and replenishing the ecosystem with the nutrients necessary to sustain life.
- Physical, chemical, and biological processes are influenced by the amount and timing of light include temperature and weather conditions, photoactivation of chemicals, mutations, and the timing of reproductive cycles.

#### **Essential Questions**

- How have humans caused the endangerment and extinction of species and how does this affect an ecosystem?
- How does society impact the ecosystem?

# **Key Concepts**

- I can explain that ecosystems have cyclic fluctuations. (Env.1.1)
- I can identify biological factors within an ecosystem. (Env.1.5)
- I can identify chemical factors within an ecosystem. (Env.1.5)
- I can identify physical factors within an ecosystem.
- I can measure biological factors within an ecosystem. (Env.1.5)
- I can measure chemical factors within an ecosystem. (Env.1.5)
- I can measure physical factors within an ecosystem. (Env.1.5)

### **Related Concepts**

- I can explain that human beings are part of Earth's ecosystems. (Env.1.2)
- I can give examples of how human activities can alter ecosystems. (Env.1.2)
- I can identify the difference between systems in equilibrium and systems in disequilibrium. (Env.1.3)
- I can describe the difference between systems in equilibrium and system in disequilibrium. (Env.1.3)
- I can describe how steady state is achieved through negative feedback loops. (Env.1.3)
- I can describe how steady state is achieved through positive feedback loops. (Env.1.3)
- I can describe the difference between weather and climate. (Env.1.6)
- I can locate the major Earth biomes. (Env.1.6)
- I can identify the major Earth biomes. (Env.1.6)
- I can describe the major Earth biomes. (Env.1.6)
- I can explain how biomes are determined by temperature and precipitation patterns that support specific kinds of plants. (Env.1.6)

# **Science and Engineering Process Standards**

- Abiotic
- Biome
- Biotic

		<ul> <li>Climate</li> <li>Cyclic fluctuation</li> <li>Disequilibrium</li> <li>Ecosystem</li> <li>Equilibrium</li> <li>Negative feedback loop</li> <li>Positive feedback loop</li> <li>Precipitation</li> <li>Steady state</li> <li>System</li> </ul>
		<ul><li>Temperature</li><li>Weather</li></ul>
	Supplemental Resou	
Resources & Materials	Texts & Articles	Videos & Media
•	•	•
	School Resources	
Textbook Pearson Environmental Science	Formati	ve Assessments

The sun is the primary and essential source of supply of energy for the earth. The transfer of solar energy of the sun enables life to exist on this planet.

#### **Priority Standards**

- Env.2.1: Describe how matter cycles through sources and sinks and how energy is transferred. Explain how matter and energy move between and within components of an environmental system.
- Env.2.7: Differentiate between renewable and nonrenewable resources, and compare and contrast the pros and cons of using nonrenewable resources.

# Supporting Standards

- Env.2.2: Identify the different forms of energy and understand that energy may be converted from one form to another, but cannot be created or destroyed.
- Env.2.3: Recognize and explain that the amount of life any environment can support is limited by the available energy, water, oxygen, nutrients and minerals, and by the ability of ecosystems to recycle organic materials from the remains of dead organisms.
- Env.2.4: Recognize and describe the different sources of energy, including fossil fuels, nuclear, and alternative sources of energy provided by water, wind, geothermal, biomass/biofuels, and the sun.
- Env.2.8: Cite examples of how all fuels, renewable and nonrenewable, have advantages and disadvantages that society must question when considering the trade-offs among them, such as how energy use contributes to the rising standard of living in the industrially developing nations. However, explain that this energy use also leads to more rapid depletion of Earth's energy resources and to environmental risks associated with the use of fossil and nuclear fuels.
- Env.2.9: Describe how decisions to slow the depletion of energy sources through efficient technologies can be made at many levels, from personal to national, and these technologies involve trade-offs of economic costs and social values.

# **Content Area Literacy Standards**

- 9-10.LST.4.1: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- .9-10.LST.4.2: Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

# **Enduring Understandings**

- The movement of energy from autotrophs to heterotrophs to decomposers and back, characterizes the majority of life and its regenerative process on
- Government concern over the use of non-renewable energy resources has escalated as concerns about global warm are being evidenced in weather change

#### **Essential Questions**

- How does energy flow from the Sun throughout an ecosystem and what happens to that energy along the way?
- How is energy transferred and transformed in an ecosystem?
- How do ecosystems establish themselves and how do they recover if disturbed?
- How have humans caused the endangerment and extinction of species and how does this affect an ecosystem?
- How does population density and dispersion affect the carrying capacity of the ecosystem?
- How is energy and matter cycled and conserved on Earth?
- How are organisms dependant on each other?

# **Key Concepts**

- I can describe how matter cycles through sources. (Env.2.1)
- I can describe how matter sinks. (Env.2.1)
- I can describe how energy is transferred. (Env.2.1)

# **Related Concepts**

- I can identify the different forms of energy. (Env.2.2)
- I can describe how energy is converted from one form to another but cannot be created or destroyed. (Env.2.2)

- I can explain how matter moves between and within components of an environmental system. (Env.2.1)
- I can explain how energy moves between and within components of an environmental system. (Env.2.1)
- I can differentiate between renewable and nonrenewable resources. (Env.2.7)
- I can compare and contrast the pros and cons of using nonrenewable resources. (Env.2.7)
- I can describe how the amount of life any environment can support is limited by the available energy, water, oxygen, nutrients and minerals. (Env.2.3)
- I can explain that the amount of life any environment can support is limited by the available energy, water, oxygen, nutrients and minerals. (Env.2.3)
- I can describe how the amount of life any environment can support is limited by the ability of ecosystems to recycle organic materials from the remains of dead organisms. (Env.2.3)
- I can explain that the amount of life any environment can support is limited by the ability of ecosystems to recycle organic materials from the remains of dead organisms. (Env.2.3)
- I can identify different sources of energy. (Env.2.4)
- I can describe different sources of energy. (Env.2.4)
- I cite examples of how all fuels, renewable and nonrenewable, have advantages and disadvantages that society must question when considering trade-offs among them. (Env.2.8)
- I can explain that energy use also leads to more rapid depletion of Earth's energy resources and to environmental risks associated with the use of fossil and nuclear fuels. (Env.2.8)
- I can describe how decisions to slow the depletion of energy sources through efficient technologies can be made at many levels, from personal to national. (Env.2.9)
- I can describe how technologies involve trade-offs of economic costs and social values. (Env.2.9)

# **Science and Engineering Process Standards**

#### Vocabulary

- Biofuel
- Biogeochemical cycle
- Biomass
- Conservation of energy
- Economic Costs
- Energy
- Environmental Risks
- Fossil fuel
- Fossil Fuels
- Fuel
- Hydrothermal energy
- Matter
- Nonrenewable
- Nonrenewable Energy
- Nonrenewable resources
- Nuclear
- Nuclear Fuels
- Renewable
- Renewable Energy
- Renewable resources
- Sinks
- Social Values
- Solar energy
- Technologies
- Wind energy

# **Supplemental Resources**

**Resources & Materials Texts & Articles** Videos & Media

School Resources					
Textbook	Formative Assessments				
Pearson Environmental Science					

In this unit we will discuss changes in the configuration of the surface of the earth known as the geomorphic processes. Exogenic processes; changes in the configuration of the surface of the earth such as weathering, mass wasting, erosion and deposition are dealt with in detail

# **Priority Standards**

• Env.3.1: Identify and describe geomorphic processes controlled by tectonics (i.e. volcanic activity, uplift, and shaping of landforms).

# **Supporting Standards**

- Env.3.2: Identify and describe tornado formation with the use of a weather map.
- Env.3.3: Read and describe a weather map in terms of pressure systems, fronts, and changing weather patterns.
- Env.3.4: Identify natural Earth hazards, such as earthquakes and hurricanes, and identify the regions in which they occur as well as the short-term and long-term effects on the environment and on people.

# **Content Area Literacy Standards**

• 9-10.LST.4.1: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words

# **Enduring Understandings**

• Exogenic geomorphic processes restructure earth's surface and sets the stage for global evolution

#### **Essential Ouestions**

#### **Key Concepts**

- I can identify geomorphic processes controlled by tectonics. (Env.3.1)
- I can describe geomorphic processes controlled by tectonics. (Env.3.1)

# **Related Concepts**

- I can identify tornado formation with the use of a weather map. (Env.3.2)
- I can describe tornado formation with the use of a weather map. (Env.3.2)
- I can use a weather map to identify and describe pressure systems. (Env.3.3)
- I can use a weather map to identify and describe fronts. (Env.3.3)
- I can use a weather map to identify and describe changing weather patterns. (Env.3.3)
- I can identify natural Earth hazards. (Env.3.4)
- I can identify regions in which specific Earth hazards occur. (Env.3.4)
- I can identify the short-term effects of Earth hazards on the environment. (Env.3.4)
- I can identify the long-term effects of Earth hazards on the environment. (Env.3.4)
- I can identify the short-term effects of Earth hazards on people. (Env.3.4)
- I can identify the long-term effects of Earth hazards on people. (Env.3.4)

#### **Science and Engineering Process Standards**

- Cumulonimbus cloud
- Earthquake
- Fronts
- Geomorphic processes
- Hook
- Hurricane
- Pressure
- Pressure systems
- Radar
- Tectonics
- Uplift
- Weather patterns

Supplemental Resources								
Resources & Materials	Texts & Articles		Videos & Media					
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	School Resources							
Textbook		Formative Assessm	ments					
Pearson Environmental Science								
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In this unit environmental policies are discussed. Topics focus on environmental protection, conservation of natural resources, affordable energy, as well as economic growth and employment.

#### **Priority Standards**

• Env.4.1: Explain environmental policies/organizations (Clean Water Act. Clean Air Act. Endangered Species Act, Species Survival Plan, Resource Conservation and Recovery Act, Department of Energy, and the World Health Organization) and identify their impact.

# **Supporting Standards**

• Env.4.2: Understand that environmental policies/decisions have negative and positive impacts on people, societies, and the environment.

#### **Content Area Literacy Standards**

• 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.

# **Enduring Understandings**

• The activities of governments and people needs to be regulated to preserve the existence of all life.

# **Essential Questions**

# **Key Concepts**

- I can explain environmental policies/organizations. (Env.4.1)
- I can identify the impact of environmental policies/organizations. (Env.4.1)

# **Related Concepts**

- I can describe how environmental policies/decisions have negative and positive impacts on people.
- I can describe how environmental policies/decisions have negative and positive impacts on societies.
- I can describe how environmental policies/decisions have negative and positive impacts on the environment. (Env.4.2)

# **Science and Engineering Process Standards**

# Vocabulary

- Clean Air Act
- Clean Water Act
- Department of Energy
- Endangered Species Act
- Environmental policy
- Resource Conservation and Recovery Act
- Species Survival Plan
- World Health Organization

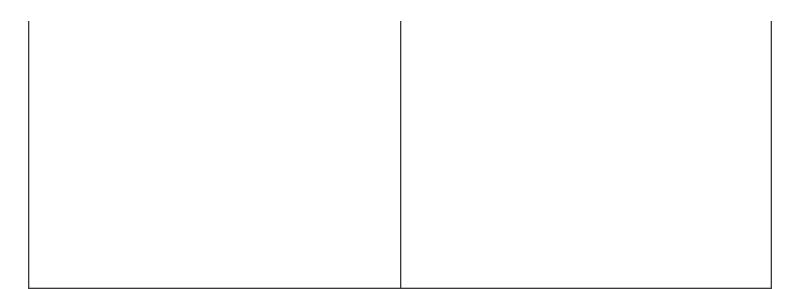
# **Supplemental Resources**

**Resources & Materials Texts & Articles** Videos & Media

# **School Resources**

Textbook Pearson Environmental Science

**Formative Assessments** 



This unit considers the pros and cons of genetic variation; differences among the genomes of members of the same species

#### **Priority Standards**

• Env.5.1: Explain how variation within a species increases the chances of survival of the species under changing environmental conditions.

#### **Supporting Standards**

- Env.5.2: Explain how the great diversity of species increases the chance that at least some living organisms will survive in the event of major global changes.
- Env.5.3: Explain genetic engineering and identify implications on the environment and society.
- Env.5.4: Describe, provide examples, and contrast GMO products, organic products, and conventional products. Describe and explain the environmental concerns associated with GMOs.
- Env.5.5: Identify the indirect and direct threats to biodiversity (e.g. habitat loss and destruction, invasion by exotic species, commercial over fishing and hunting, pollution, climate change, and bioaccumulation and biomagnification of toxins).

# **Content Area Literacy Standards**

- 9-10.LST.2.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.

# **Enduring Understandings**

• Debate exist regarding the ability of an organism to evolve into a new and different species. Some argue that this is possible.

# **Essential Questions**

# **Key Concepts**

• I can explain how variation within a species increases the chances of survival of the species under changing environmental conditions. (Env.5.1)

# **Related Concepts**

- I can explain how the great diversity of species increases the chance that at least some living organisms will survive during major global changes. (Env.5.2)
- I can explain genetic engineering. (Env.5.3)
- I can identify the implications of genetic engineering on the environment and society. (Env.5.3)
- I can describe GMO, organic, and conventional products. (Env.5.4)
- I can provide examples of GMO, organic, and conventional products. (Env.5.4)
- I can contrast GMO, organic, and conventional products. (Env.5.4)
- I can describe the environmental concerns associated with GMOs. (Env.5.4)
- I can explain the environmental concerns associated with GMOs. (Env.5.4)
- I can identify indirect threats to biodiversity. (Env.5.5)
- I can identify direct threats to biodiversity. (Env.5.5)

# **Science and Engineering Process Standards**

- Bioaccumulation
- Climate change
- Conventional products
- Direct threats
- Diversity

	Supplement	al Resources	<ul> <li>Exotic species</li> <li>Genetic Engineering</li> <li>GMO products</li> <li>Habitat loss</li> <li>Indirect threats</li> <li>Organic products</li> <li>Overfishing</li> <li>Pollution</li> <li>Species</li> </ul>
Resources & Materials	Texts & Articles		Videos & Media
•	•		•
	School R	esources	
Textbook		Formative Assessm	ents
Pearson Environmental Science			

▲ <u>Units of Study</u>

In this unit demographics of size, status, and behavior of populations is analyzed. Population size, growth and stability will be considered.

#### **Priority Standards**

• Env.6.1: Demonstrate, calculate, and explain how factors such as birth rate, death rate, and migration rate determine growth rates of populations.

# **Supporting Standards**

- Env.6.2: Explain how the size and rate of growth of the human population in any location is affected by economic, political, religious, technological, and environmental (resource availability) factors.
- Env.6.3: Describe and give examples about how the decisions of one generation both provide and limit the range of possibilities open to the next generation.
- Env.6.4: Explain how the carrying capacity of an ecosystem may change as availability of resources changes.

# **Content Area Literacy Standards**

• 11-12.LST.2.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

# **Enduring Understandings**

• The exponential increase in human population has caused governmental concern regarding how many people the earth can support

# **Essential Questions**

# **Key Concepts**

- I can demonstrate how factors such as birth rate, death rate, and migration rate determine growth rates of populations. (Env.6.1)
- I can calculate how factors such as birth rate, death rate, and migration rate determine growth rates of populations. (Env.6.1)
- I can explain how factors such as birth rate, death rate. and migration rate determine growth rates of populations. (Env.6.1)

# **Related Concepts**

- I can explain how the size and rate of growth of the human population in any location is affected by economic, political, religious, technological, and environmental factors. (Env.6.2)
- I can describe how the decisions of one generation both provide and limit the range of possibilities open to the next generation. (Env.6.3)
- I can give examples about how the decisions of one generation both provide and limit the range of possibilities open to the next generation. (Env.6.3)
- I can explain how the carrying capacity of an ecosystem may change as availability of resources changes. (Env.6.4)

#### **Science and Engineering Process Standards**

# Vocabulary

- Birth Rate
- Carrying Capacity
- Death Rate
- Migration Rate
- None
- Population Growth
- Resources

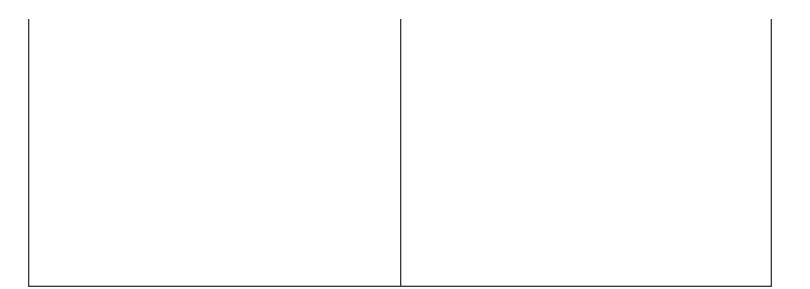
# **Supplemental Resources**

**Resources & Materials Texts & Articles**  Videos & Media

# **School Resources**

Textbook Pearson Environmental Science

Formative Assessments



The focus on this unit is environmental pollution and pollutants originating from human activity. also called anthropogenic emissions.

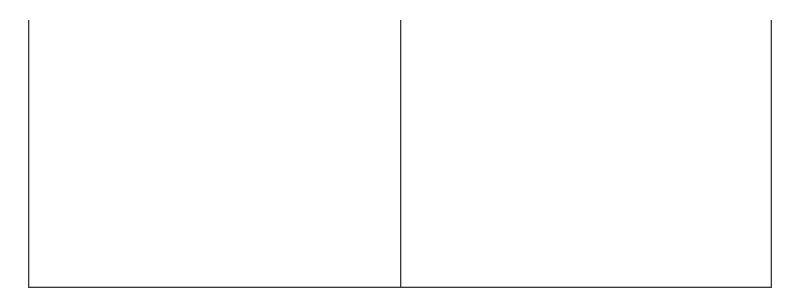
Priority Standards  • Env.7.1: Identify evidence, conseque prevention for climate change product anthropogenic sources.	ed by	<ul> <li>Supporting Standards</li> <li>Env.7.6: Understand and explain how the burning of fossil fuels releases energy, waste heat, and matter (air pollutants).</li> <li>Env.7.7: Describe and explain the product life cycle and waste stream and its implications to waste management. Explain the difference between reduce, reuse, and recycle.</li> </ul>		
	Content Area Lit	teracy Standards		
• 11-12.LST.2.2: Determine the central information presented in a text by part			·	
Enduring Understandings		<b>Essential Questions</b>		
Anthropogenic changes affect the ab sustain life on its surface.	ility of the earth to	•		
Key Concepts		Related Concepts		
• I can identify evidence, consequences, and prevention for climate change produced by anthropogenic sources. (Env.7.1)		<ul> <li>I can explain how the burning of fossil fuels releases energy. (Env.7.6)</li> <li>I can explain how the burning of fossil fuels releases waste heat. (Env.7.6)</li> <li>I can explain how the burning of fossil fuels releases matter. (Env.7.6)</li> <li>I can give examples of how the burning of fossil fuels releases energy. (Env.7.6)</li> <li>I can give examples of how the burning of fossil fuels releases waste heat. (Env.7.6)</li> <li>I can give examples of how the burning of fossil fuels releases matter. (Env.7.6)</li> <li>I can describe the product life cycle and waste stream and its implications to waste management. (Env.7.7)</li> <li>I can explain the product life cycle and waste stream and its implications to waste management. (Env.7.7)</li> <li>I can explain the difference between reduce, reuse, and recycle. (Env.7.7)</li> </ul>		
Science and Engineering Process Standa  •		Vocabulary  Anthropogenic  Energy Fossil Fuels Heat Product life cycle Recycle Reduce Reduce Reuse Waste stream		
	Supplement	al Resources		
Resources & Materials	Texts & Articles		Videos & Media	
•	•		•	

**School Resources** 

**Formative Assessments** 

Pearson Environmental Science

**Textbook** 



This unit considers phylogeny; the study of determining evolutionary relationships, or patterns of descent of organisms.

#### **Priority Standards**

• Env.8.3: Recognize and explain that in evolutionary change, the present arises from the materials of the past and in ways that can be explained, such as the formation of soil from rocks and dead organic matter.

# **Supporting Standards**

- Env.8.5: Describe and examine how water is controlled in developed and undeveloped nations.
- Env.8.6: Understand and describe the concept and the importance of natural and human recycling in conserving our natural resources.
- Env.8.7: Understand and explain that waste management includes considerations of quantity, safety, degradability, and cost. Also understand that waste management requires social and technological innovations because waste-disposal problems are political and economic as well as technical.

#### **Content Area Literacy Standards**

• 11-12.LST.2.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

# **Enduring Understandings**

• Changes on the earth's surface provide homeostasis and enable life to exist in balance with abiotic counterparts

# **Essential Questions**

# **Key Concepts**

• I can explain that in evolutionary change, the present arises from the materials of the past in ways that can be explained. (Env.8.3)

# **Related Concepts**

- I can describe how water is controlled in developed and undeveloped nations. (Env.8.5)
- I can analyze how water is controlled in developed and undeveloped nations. (Env.8.5)
- I can identify the concept and the importance of natural recycling in conserving our natural resources. (Env.8.6)
- I can identify the concept and the importance of human recycling in conserving our natural resources. (Env.8.6)
- I can describe the concept and the importance of natural recycling in conserving our natural resources. (Env.8.6)
- I can describe the concept and the importance of human recycling in conserving our natural resources. (Env.8.6)
- I can explain that waste management includes consideration of quantity, safety, degradability, and cost. (Env.8.7)
- I can explain that waste management requires social and technological innovations because waste-disposal problems are political and economic as well as technical. (Env.8.7)

# **Science and Engineering Process Standards**

- Conserving
- Developed Nations
- Evolutionary Change
- Human Recycling
- Natural Recycling
- Natural Resources
- Undeveloped Nations
- Quantity

			<ul> <li>Safety</li> <li>Degradability</li> <li>Waste Management</li> <li>Social Innovation</li> <li>Technological Innovations</li> </ul>
			Waste-disposal
	Supplement	al Resources	
Resources & Materials	Texts & Articles		Videos & Media
•	•		•
	School R	lesources	
Textbook Pearson Environmental Science		Formative Assessm	ents