

Teacher: Sarah Gates	Course: Environmental Science	Grade Level(s): 9
	Topic(s): Ecology	
Content/Big Ideas	<p>Living things depend on their habitat to meet their basic needs.</p> <p>The survival of living things is dependent upon their adaptations and ability to respond to natural changes in and human influences on the environment.</p>	
Essential Questions	<p>When investigating different systems (e.g., agriculture, terrestrial, aquatic), how does a habitat meet the needs of a species?</p> <p>How is the survival of species and their ability to adapt affected by natural and human induced environmental changes?</p>	

Concepts

Air, soil, water, and indoor pollution affect human health in a variety of ways.

Wetlands play an important part in pollution control, water quality and human health issues.

The misuse of natural resources can negatively affect the sustainability of society.

There are costs and benefits associated with cleaning up contaminants.

Common household cleaning products and their by-products have specific manufacturing and disposal requirements.

Because natural resources like coal, water, oil and timber have economic influences, their availability can determine the local community's prosperity.

Pennsylvania's food and fiber industry is a major factor in state economy.

There are a variety of laws related to the food and fiber industry.

A steady or increased demand for a particular natural resource can affect the environment.

New technologies used in industries can increase the efficiency and prolong the supply of some natural resources.

Diverse biomes exist in Pennsylvania.

The biotic and abiotic components within an ecosystem interact.

Organisms have specific roles in ecosystems.

Specific habitat management practices influence the success or failure of species.

Scientists use specific criteria to categorize organisms as threatened, endangered or extinct.

Species must be able to adapt to changes within their ecosystem in order to survive.

The degree of specialization of a species can cause it to become threatened, endangered, or extinct.

Animal species can be classified as generalists or specialists in their eating habits.

Habitat destruction can lead to species loss or termination.

The intervention of humans has influenced the survival of species through management practices.

	<p>Human endeavors and changes in natural cycles have caused species to become threatened, endangered, or extinct.</p> <p>Environmental laws and regulations have been implemented in an attempt to protect species diversity.</p>
Competencies	<p>Recognize that the quality of human health in our society is affected by air, water, soil, and indoor pollution.</p> <p>Discuss how economic factors affect human health issues like pollution control, clean-up and contaminant disposal.</p> <p>Explain how agriculture plays a major role in the economy and culture of the United States.</p> <p>Describe in detail how the living and non-living components of an ecosystem interrelate and directly impact food chains and energy flow.</p> <p>Explain how specialization and generalization influence a species' survival.</p> <p>Analyze how human attempts at species management have influenced the species' success or failure.</p> <p>Describe how a species' adaptability determines its ability to survive rapid environmental changes due to human activities.</p> <p>Analyze the positive and negative impacts of an environmental law on a given species and society.</p>

Standards/Benchmarks	<p>4.1.10.A.</p> <ul style="list-style-type: none"> • Examine the effects of limiting factors on population dynamics. • Analyze possible causes of population fluctuations. • Explain the concept of carrying capacity in an ecosystem. • Describe how organisms become classified as threatened or endangered. • Describe how limiting factors cause organisms to become extinct. <p>4.1.10.B.</p> <ul style="list-style-type: none"> • Explain the consequences of interrupting natural cycles. <p>4.1.10.C.</p> <ul style="list-style-type: none"> • Evaluate the efficiency of energy flow within a food web. • Describe how energy is converted from one form to another as it moves through a food web (photosynthetic, geothermal). <p>4.5.10.D.</p> <ul style="list-style-type: none"> • Research practices that impact biodiversity in specific ecosystems. • Analyze the relationship between habitat changes to plant and animal population fluctuations. <p>4.1.10.E.</p> <ul style="list-style-type: none"> • Analyze how humans influence the pattern of natural changes (e.g. primary / secondary succession and desertification) in ecosystems over time.
Activities & Assessments	<p>Activities and assessments will vary for this unit based on student engagement, materials availability, and other factors and will include (but is not limited to):</p> <ul style="list-style-type: none"> • Lecture • Homework • Labs (virtual and/or physical) • Projects • Quizzes/Tests <p>Activities and assessments are subject to change at instructor’s discretion.</p>

Teacher: Sarah Gates	Course: Environmental Science	Grade Level(s): 9
	Topic(s): Watersheds & Wetlands	
Content/Big Ideas	Aquatic, terrestrial and human-made ecosystems consist of diverse living and non-living components that change over time and among geographic areas.	

<p>Essential Questions</p>	<p>How do changes within living and non-living components of aquatic, terrestrial and human systems affect the balance within and between them?</p>
<p>Concepts</p>	<p>Scientists use a variety of physical, chemical and biological parameters to determine water quality.</p> <p>Land use within a particular watershed will influence water quality.</p> <p>A wide variety of wetland types exist within Pennsylvania.</p> <p>Wetlands serve a number of beneficial functions for humans, plants, animals, and the environment as a whole.</p> <p>Watershed boundaries can include a variety of habitats, ecosystems, and human influences.</p> <p>Biotic and abiotic components within a habitat change, or differ, based on their location and topography.</p> <p>Natural and human events can affect aquatic, terrestrial, and wetland environments in a variety of ways.</p> <p>Organisms within an ecosystem interact with other biotic components, abiotic components and within populations.</p> <p>Abiotic components are critically important for maintaining an ecosystem's homeostasis.</p> <p>Limiting factors affect the carrying capacity of an ecosystem.</p> <p>Ecosystems and their components change over time.</p> <p>A variety of cycles exist within an ecosystem and each helps maintain balance within the ecosystem.</p> <p>Every living organism is uniquely suited to fulfill a role within its ecosystem.</p> <p>Biological diversity directly impacts the stability of an ecosystem.</p>

Competencies	<p>Compare and contrast how adaptations allow a species to fulfill a role in their environment. 1. Analyze the water quality of a particular body of water and infer possible causes for those results based upon land use in the surrounding watershed.</p> <p>Describe the importance of wetlands for humans, plants, and animals.</p> <p>Analyze the effect of natural and human events, topography, and geographic location on wetlands, watersheds, aquatic and terrestrial ecosystems.</p> <p>Explain in detail the complex interactions that occur among biotic and abiotic components within an ecosystem.</p>
Standards/Benchmarks	<p>4.2.10.A.</p> <ul style="list-style-type: none"> • Examine the interactions between abiotic and biotic factors within a watershed. • Describe how topography influences the flow of water in a watershed. • Describe how vegetation affects water runoff. • Investigate and analyze the effects of land use on the quality of water in a watershed. <p>4.2.10.B.</p> <ul style="list-style-type: none"> • Examine how human interactions impact wetlands and their surrounding environments. • Describe how land use decisions affect wetlands <p>4.2.10.C.</p> <ul style="list-style-type: none"> • Explain the relationship between water quality and the diversity of life in a freshwater ecosystem. • Explain how limiting factors affect the growth and reproduction of freshwater organisms
Activities & Assessments	<p>Activities and assessments will vary for this unit based on student engagement, materials availability, and other factors and will include (but is not limited to):</p> <ul style="list-style-type: none"> • Lecture • Homework • Labs (virtual and/or physical) • Projects • Quizzes/Tests <p>Activities and assessments are subject to change at instructor's discretion.</p>

Teacher: Sarah Gates	Course: Environmental Science	Grade Level(s): 9
	Topic(s): Natural Resources	

Content/Big Ideas	Sustainable use of natural resources is essential to provide for the needs and wants if all living things now and in the future.
Essential Questions	How are the needs and wants of all living things (including humans) directly connected to successful management of natural resources?
Concepts	<p>Pennsylvanians can choose from a variety of alternative energy sources.</p> <p>Each energy source has positive and negative environmental impacts.</p> <p>Agriculture and industry use a variety of fossil fuels.</p> <p>Pennsylvanians use different food and fibers as renewable resources.</p> <p>Natural occurrences in Pennsylvania's past and future affect natural resources.</p> <p>New technologies affect the use and management of our natural resources.</p> <p>Consumer needs and desires affect the use of our natural resources.</p> <p>Natural resource cycles include extraction, disposal, use and reuse.</p> <p>Different regions of the United States as well as other countries use energy sources, fuels and natural resources differently.</p> <p>Solid waste disposal is an important part of resource management.</p> <p>Natural resources can be managed through reduction, recycling, reuse and use.</p> <p>Technological advancements have both increased and decreased society's ability to be sustainable.</p> <p>Humans can cause changes directly and indirectly to ecosystems over time.</p>

Competencies	<p>Recognize that renewable and nonrenewable natural resources are invaluable in supplying energy and materials used by people.</p> <p>Discuss how the availability of our natural resources is dependent on climatic occurrences, available technologies and consumer wants and desires.</p> <p>Explain how managing natural resources with man-made systems has both limits and economic impacts.</p> <p>Describe in detail how sustainability balances the needs of humans and society with the needs of a natural system.</p>
Standards/Benchmarks	<p>4.3.10.A.</p> <ul style="list-style-type: none"> • Evaluate factors affecting the use of natural resources. • Evaluate the effect of consumer demands on the use of natural resources. • Analyze how technologies such as modern mining, harvesting, and transportation equipment affect the use of our natural resources. • Describe how local and state agencies manage natural resources. <p>4.3.10.B.</p> <ul style="list-style-type: none"> • Analyze how humans manage and distribute natural resources. • Describe the use of a natural resource with an emphasis on the environmental consequences of extracting, processing, transporting, using, and disposing of it. • Analyze the impact of technology on the management, distribution, and disposal of natural resources
Activities & Assessments	<p>Activities and assessments will vary for this unit based on student engagement, materials availability, and other factors and will include (but is not limited to):</p> <ul style="list-style-type: none"> • Lecture • Homework • Labs (virtual and/or physical) • Projects • Quizzes/Tests <p>Activities and assessments are subject to change at instructor’s discretion.</p>

Teacher: Sarah Gates	Course: Environmental Science	Grade Level(s): 9
	Topic(s): Agriculture & Society	
Content/Big Ideas	Humans depend on the management and practices of agricultural systems.	

<p>Essential Questions</p>	<p>In what ways are human societies and cultures impacted by management and practices of agricultural systems?</p>
<p>Concepts</p>	<p>Agriculture has influenced culture, standard of living and foreign trade.</p> <p>Laws and regulations affect conservation and management of food and fiber production.</p> <p>Agricultural science influences farming practices, efficiency, and nutrition over time.</p> <p>Technological advancements increase efficiency in production and environmental impacts of agriculture.</p> <p>Integrated pest management (IPM) carries both benefits and risks when associated with agriculture.</p> <p>Growing conditions throughout the United States determine which plants and animals are most suitable to each region.</p> <p>Society's needs and standard of living directly impact the sustainability of natural resources.</p> <p>Natural resource use and availability affect the sustainability of society.</p> <p>Technological advancements have changed society's standard of living and affected the sustainability of natural resources.</p> <p>Human activity affects ecosystems for better or worse.</p> <p>Human and societal supply and demand impact the environment in a variety of ways.</p>
<p>Competencies</p>	<p>Identify how agriculture is vitally important in meeting the needs of society and maintaining the economy of Pennsylvania.</p> <p>Recognize that agricultural sciences and technologies strive to increase efficiency while balancing the needs of society with the conservation of our natural resources.</p> <p>Describe how agricultural components and systems affect – and are affected by – social, political, environmental, and economic factors.</p> <p>Recognize that sustainability of natural resources fluctuates based on society's needs or wants and the technological advances used.</p> <p>Discuss and describe how human activities cause changes within ecosystems – positively, negatively, or both.</p>

Standards/Benchmarks	<p>4.4.10.A.</p> <ul style="list-style-type: none"> • Explain the relationships between and among the components of the food and fiber system. (i.e., production, processing, research and development, marketing, distribution, and regulations.) <p>4.4.10.B.</p> <ul style="list-style-type: none"> • Analyze the effects of agriculture on a society's economy, environment, standard of living, and foreign trade. <p>4.4.10.C.</p> <ul style="list-style-type: none"> • Analyze how agricultural sciences and technologies strive to increase efficiency while balancing the needs of society with the conservation of our natural resources. <p>4.4.10.D.</p> <ul style="list-style-type: none"> • Evaluate the use of technologies to increase plant and animal productivity
Activities & Assessments	<p>Activities and assessments will vary for this unit based on student engagement, materials availability, and other factors and will include (but is not limited to):</p> <ul style="list-style-type: none"> • Lecture • Homework • Labs (virtual and/or physical) • Projects • Quizzes/Tests <p>Activities and assessments are subject to change at instructor's discretion.</p>

Teacher: Sarah Gates	Course: Environmental Science	Grade Level(s): 9
	Topic(s): Humans and the Environment	
Content/Big Ideas	<p>The health of all living things is directly related to the quality of the environment.</p> <p>People acting individually and/or as groups influence the environment.</p> <p>Environmental laws and regulations impact humans, the environment, and the economy in both positive and negative ways.</p>	
Essential Questions	<p>How does the quality of the environment affect the health of all living things within it?</p> <p>How do humans influence the environment?</p> <p>What are the positive and negative effects of environmental laws and regulations on humans, the environment, and the economy?</p>	

Concepts

Human health is affected by pollution.

Pollution sources can be categorized as either point or non-point.

Remediation of pollutants can improve environmental quality for organisms within an ecosystem.

Environmental health and biological diversity are affected by human practices.

Environmental laws and regulations are developed to aid the health of the environment and all living things including humans.

Advances in technologies have determined our ability to extract and utilize natural resources.

Consumer desires influence resource availability.

A variety of methods exist to process natural resources for human use.

Regional availability of natural resources affects its use and conservation.

Information systems impact management and distribution of natural resources.

Man-made systems have inherent costs and benefits that influence how renewable and nonrenewable resources are used.

Human practices can lead to water, air, soil, and indoor pollution.

Development and enforcement of laws and regulations targeting pollution have influenced environmental health.

A variety of technologies have been developed and implemented to detect point and non-point source pollution.

Various technologies and methods exist to manage solid waste (composting, incinerating, land application, and recycling).

Different land use practices and nutrient management systems affect environmental quality.

Laws and regulations affect conservation and management practices of food and fiber production.

There are benefits to the environment and society associated with alternative practices used in IPM.

Human actions affect ecosystems.

Management strategies exist for the protection of threatened and endangered species.

Integrated Pest Management strategies are intended to minimize the detrimental economical and ecological effects of pests including invasive species.

Laws and regulations exist to protect humans and the environment.

Environmental issues lead to environmental laws and regulations.

Local, state, and federal governments play a role in the development of environmental laws and regulations.

Disobeying laws and regulations carries consequences for individuals and groups.

Conflicts may exist between property owners and environmental laws and regulations.

Environmental laws and regulations influence the actions of people.

Environmental laws and regulations can change over time.

Competencies

Analyze the effect of air, water, soil and indoor pollution on society.

Identify sources of pollution and explain how they affect the health of the organisms within the ecosystem.

Analyze the effects of human activities on the health of organisms in an ecosystem (e.g., agricultural, construction, transportation, and industrial practices).

Analyze how environmental laws and regulations have contributed to the quality and health of ecosystems.

Describe how naturally occurring changes in earth's systems alter habitats and therefore affect the health of living things.

Differentiate and describe how availability of natural resources is affected by consumer desires and extracting technologies.

Recognize that humans play a significant role in the management and distribution of resources.

Compare and contrast how human practices affect the health of the environment.

Explain how advances in agriculture sciences have influenced farming practices and therefore environmental health.

Describe how human actions affect the balance within an ecosystem.

Recognize that laws and regulations exist to protect humans and the environment.

Detail and describe how environmental laws and regulations are developed and enacted.

Analyze both the positive and negative effects environmental laws and regulations have on society and industry.

Identify how changes in economic conditions and advances in technology/scientific/environmental knowledge spur change in laws and regulations.

Standards/Benchmarks	<p>4.5.10.A.</p> <ul style="list-style-type: none"> • Explain how public policy encourages or discourages the sustainable use of natural resources. • Research laws and polices that address the sustainable use of natural resources (e.g., solid and liquid waste management, industry, agriculture and enterprise) <p>4.5.10.B.</p> <ul style="list-style-type: none"> • Describe the impact of integrated pest management practices on the environment <p>4.5.10.C.</p> <ul style="list-style-type: none"> • Analyze real world data and explain how point and non-point source pollution can be detected and eliminated. • Compare and contrast the environmental effects of different industrial strategies. <p>4.3.10.D.</p> <ul style="list-style-type: none"> • Evaluate various methods of managing waste as related to economic, environmental, and technological factors. <p>4.5.10.E.</p> <ul style="list-style-type: none"> • Describe the impact of occupational exposure to pollutants. • Analyze laws and regulations designed to protect human health. • Analyze efforts to prevent, control, and/or reduce pollution through cost and benefit analysis and risk management
Activities & Assessments	<p>Activities and assessments will vary for this unit based on student engagement, materials availability, and other factors and will include (but is not limited to):</p> <ul style="list-style-type: none"> • Lecture • Homework • Labs (virtual and/or physical) • Projects • Quizzes/Tests <p>Activities and assessments are subject to change at instructor's discretion.</p>