

How Anthracite Coal Production Affected the Great Susquehanna Valley Region

In four local fields of Northeastern, Pennsylvania lay the largest source of anthracite coal in the country. These fields are known as the Northern, Eastern-middle, Western-middle, and Southern fields, and were largely important in the explosion of coal extraction. These fields cover an area of approximately 1,700 square miles in Pennsylvania (Corlsen, 1954). The largest of the four fields is the Southern coalfield. It has the greatest reserve of coal and exists near the city of Pottsville, in Schuylkill County (Corlsen, 1954). The Western coalfield encompasses the towns of Shamokin, Shenandoah, Mount Carmel, Mahanoy City and Ashland.

Formation

Three hundred million years ago, coal was formed through the fermentation of vegetable matter from swamps (Corlsen, 1954). This fermentation resulted in the emission of marsh gas, which created carbon in the decomposing vegetation (Corlsen, 1954). This matter then transformed into peat, which is the first stage in coal formation. High pressure and intense heat then transformed peat into lignite coal, which then morphed into bituminous coal (Corlsen, 1954). Finally, with more extreme heat and pressure, anthracite coal was formed. Its shiny, black properties and high carbon content create an almost smokeless heat, which is why has been used to heat homes throughout history.

Geology

The Pennsylvania Anthracite Region is located in the Valley and Ridge province of the Appalachian Mountains (Clark, 2011). The four fields are preserved in “synclinal basins” that are surrounded by sandstone ridges. The area is divided into two major formations, called the Pottsville and the Llewellyn, which contain many coal beds thousands of feet thick (Clark, 2011).

Over time, five billion tons of hard coal has been removed from these fields (Marsh, 1987). They lie mostly in the Susquehanna River basin, but also exist in the Delaware River basin (Clark, 2011). This region played a significant role in fueling the nation’s

Image from Marsh, 1987

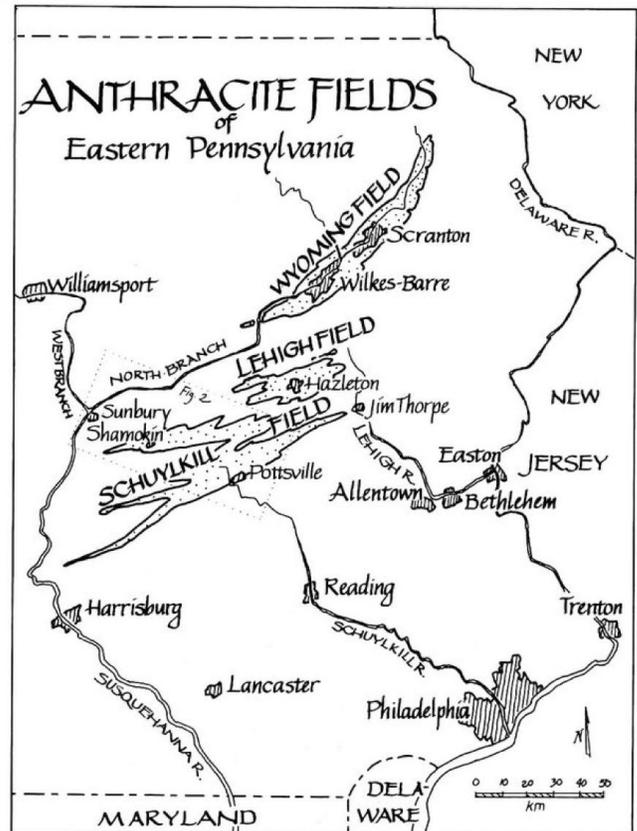


Figure 1. The anthracite fields of eastern Pennsylvania.

Industrial Revolution, as coal was the premier fuel source that was plentiful and accessible.

History

Small-scale mining of anthracite began in the late eighteenth century (Marsh, 1987). However, there were a few problems associated with mining and utilizing the coal. Initially, a poor market for this fuel existed because it burned differently than wood and soft coal (Marsh, 1987). Additionally, even though Anthracite was a clean fuel to burn and handle, it was hard to extract from the folded and faulted beds that characterized this Pennsylvania geology (Marsh, 1987). There was also doubt concerning the coal's usability. Anthracite's high ignition temperature was a new factor that had never been played into the fuel equation before.

In 1808, Judge Jesse Fell of Wilkes-Barre helped uncover the real potential of anthracite coal (Clark, 2011). He realized that Anthracite coal could be burned with his own invention, and this sparked the spike of coal mining. Following this, there was limited commercial production in the 1700s, but it wasn't until 1825 that coal became a significant and economic form of energy (Clark, 2011). With this, major changes in the nation's energy extraction began to unfold. In 1828, the "Reading Railroad" was constructed, which served as one of the major transportation methods for coal to move across the country (Marsh, 1987). The coal boom was at its peak until the year 1835, but coal companies continued to form until about 1875 (Clark, 2011). The 1800s served as the building period for coal mining, as it was a new and exciting fuel source that needed to be understood and examined by miners as well as the energy industry.

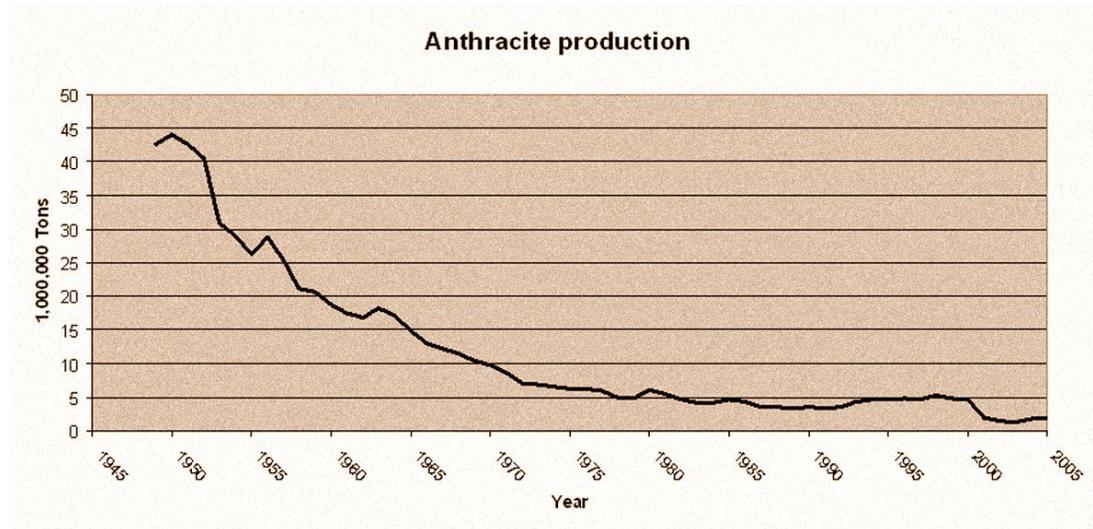
Image from Marsh, 1987



20049—Miners Going into the Slope, Hazleton, Pa., U. S. A.

Mining reached its peak in 1917, where around 181,000 miners in the Susquehanna region processed about 90 million tons of coal (Marsh, 1987). Specifically, the period between 1910 and 1930 represented the era of anthracite, as Pennsylvania's landscape was developed with deep mines, railroads, and coal towns (Marsh, 1987). There was a minimal spike in coal production during World War II, as younger men went to work while older men went to war. After WWII, production declined due to a number of reasons. The main cause of decline was due to the Depression (Marsh, 1987). Another significant factor was increased competition

from cheaper, cleaner fuels. There were also labor disputes that disrupted supplies, as well as an increase in the cost of mining methods. Due to heavy extraction, there was a depletion of accessible coals beds and a newfound liability for water treatment and environmental concerns (Clark, 2011). These setbacks caused the coal industry to suffer greatly, which then created problems for the coal towns that made their living off of extraction. Since this time, the coal industry has mined significantly less coal. This created a major decrease in employment, which then caused the coal towns to decline at an alarming rate (Marsh, 1987). Since 1920, a period of “out-migration” has been in effect, as more and more PA residents are moving elsewhere (Marsh, 1987).



Extraction

There are various ways to mine anthracite coal. Namely, there are two major methods. Deep, or underground, mining proved to be the most dangerous extraction technique during the coal-mining period. Larger coal companies utilized this method the most (Edmunds, 2002). Due to activities related to deep mining in the 1900s, 30,000 men died in Pennsylvania, including 4,500 teenagers, 179 men a day, and 6,200 men in a decade (Marsh, 1987). Deep mining involves a system of shafts, slopes, and rock tunnels connecting the veins being mined (Clark, 2011). Coal miners would go down in groups, at risk of machine collapses and unexpected drops. Larger “rooms” of coal were excavated, which left “pillars” of coal to hold up the roofs (Edmunds, 2002). This method left some original coal as waste, in the form of these pillars. Also, since then, discontinued deep mines have formed underground pools. This method has been the most detrimental to the environment due to waste as well as physical damage to the land.



Surface mining, or open pit mining, is another way to extract coal. This method is conducted on hillsides and is visible from the exterior. In open pit mining, exposed coal is blasted and then removed by giant shovels (Edmunds, 2002). Surface mining exposes the coal by a means of stripping away the ground concealing it (Clark, 2011). This method makes a significant visible impact on the landscape.



Image from Marsh

Aftermath

The coal-mining era not only had a large impact on the Northeastern region of Pennsylvania's landscape and economy, but it also had an extremely significant impact on the environment. Scarred lands and water quality impacts are two of the main issues that former coal towns are faced with today (Clark, 2011). There are many abandoned lands that once served as mines as well. In fact, there are almost sixty-four square miles of abandoned mine lands within the Susquehanna River Basin and five hundred and four miles of impaired streams (Clark, 2011). There is also a large amount of waste coal scattered amongst the four fields.



Image from Marsh

Water Pollution

Water pollution through acid mine drainage is another major environmental problem. AMD is a metal-rich water formed from the chemical reaction between water and rocks containing minerals (World Coal Association, 2012). This runoff dissolves heavy metals, such as copper, lead, and mercury into the ground and surface water. In particular, Shamokin Creek has been seriously impacted by local acid mine drainage from local underground mines. One of the main concerns associated with acid mine drainage is that it is easily hidden and difficult to find the source, unless the water is orange. This makes water unusable in local valleys, as well as creates an orange mine water that pollutes the major rivers of eastern Pennsylvania (Marsh, 1987). This then can dissolve bridges and harm other aspects of the river, like wildlife (Marsh, 1987).

Land and Noise Pollution

Land disturbance is evident, as mining practices can be extremely intrusive on both the interior and exterior of the land. Along with land disturbance comes dust and noise pollution. Dust from trucks and other machines causes temporary air pollution due to drilling and coal crushing operations (World Coal Association, 2012).

Waste Coal

Waste coal consists of low-energy discards from the coal mining industry (Ewall, 2007). It is referred to as “culm” in the Eastern Pennsylvania anthracite region and “gob” or “boney” in the bituminous coal mining regions, like Western Pennsylvania and West Virginia (Ewall, 2007). Waste coal is usually accumulated to appear as hills or small, dark mountains and appeared throughout 1900 to 1970. Problems associated with waste coal are numerous and significant. Not only can it leach iron, manganese, sulfur, mercury, and aluminum into waterways, but it can also cause acid drainage in nearby streams (Ewall, 2007). Piles can also catch fire and release toxic pollution into the air. Waste coal is less efficient than normal coal, as it takes more of it to produce the same amount of energy as normal anthracite (Ewall, 2007). This is why it is discarded and left to remain in the environment. Waste coal is one of the many environmental problems associated with Anthracite coal production in the local region.

Shamokin

Locally, environmental problems associated with coal mining are very present. Specifically, the environment and landscape of Shamokin has been greatly impacted. Near Shamokin Gap, there is much evidence of the once thriving coal boom. The world’s largest pile of anthracite waste coal, or culm, has an evident presence in this area (Marsh, 1987). In fact, there is an entire culm bank due to the Glen Burn Mine resting in the outskirts



Waste coal on fire in Shamokin, Image from Marsh

of Shamokin. This accumulation of waste coal is actually on fire in eight separate places, which is a clear environmental issue the needs to be addressed (Marsh, 1987). Other local towns are limited by valleys created by abandoned strip mines, and also deal with considerable amounts of waste coal (Marsh, 1987). There are also clear surface coal veins visible all over region that have been left uncovered by coal companies. The Shamokin region, including existing towns nearby, like Kulpmont, is the most disturbed rural landscape in Pennsylvania due to coal production (Marsh, 1987). Along with waste coal piles, there is unstable ground from undetermined mines, churned land, invasive species like black birch, and fractured roads due to subsidence (Marsh 1987). These problems provide daily issues for the residents of the ‘anthracite towns,’ even though the years of high production are long in the past.

By Elise Gorab

Pennsylvania Curriculum Standards Met

Academic Standards for Environment and Ecology

XI. INTRODUCTION

This document includes Environment and Ecology standards that describe what students should know and be able to do in these areas:

- o 4.1. Watersheds and Wetlands
- o 4.2. Renewable and Nonrenewable Resources
- o 4.3. Environmental Health
- o 4.4. Agriculture and Society
- o 4.5. Integrated Pest Management
- o 4.6. Ecosystems and their Interactions
- o 4.7. Threatened, Endangered and Extinct Species
- o 4.8. Humans and the Environment
- o 4.9. Environmental Laws and Regulations

Academic Standards for Environment and Ecology



Pennsylvania Department of Education

The Declaration of Rights, Article I of the Pennsylvania Constitution states in Section 27: "The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and aesthetic values of the environment. Pennsylvania's public natural resources are the common property of all people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people." To this end it is our responsibility to develop a citizenry that is aware of and concerned about the total environment and has the knowledge and skills to work toward solutions to current problems and the prevention of new ones.

Environment and Ecology is grounded in the complexity of the world we live in and our impact on its sustainability. The human interactions with the ecosystem and the results of human decisions are the main components of this academic area. Environment and Ecology examines the world with respect to the economic, cultural, political and social structure as well as natural processes and systems. This integration across systems is what sets this academic area apart from all others.

Environment and Ecology places its main emphasis in the real world. It allows students to understand, through a sound academic content base, how their everyday lives evolve around their use of the natural world and the resources it provides. As we move into a more technologically driven society, it is crucial for every student to be aware of his/her dependence on a healthy environment. The 21st century will demand a more sophisticated citizen capable of making sound decisions that will impact our natural systems forever.

Academic Standards for Environment and Ecology

4.2. Renewable and Nonrenewable Resources			
4.2.4. GRADE 4	4.2.7. GRADE 7	4.2.10. GRADE 10	4.2.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Identify needs of people.</p> <ul style="list-style-type: none"> • Identify plants, animals, water, air, minerals and fossil fuels as natural resources. • Explain air, water and nutrient cycles. • Identify how the environment provides for the needs of people. <p>B. Identify products derived from natural resources.</p> <ul style="list-style-type: none"> • Identify products made from trees. • Identify by-products of plants and animals. • Identify the sources of manmade products (e.g., plastics, metal, aluminum, fabrics, paper, cardboard). 	<p>A. Know that raw materials come from natural resources.</p> <ul style="list-style-type: none"> • Identify resources used to provide humans with energy, food, housing and water. • Explain how plants and animals may be classified as natural resources. • Compare means of growing or acquiring food. • Identify fiber and other raw materials used in clothing and shelter production. • Identify types of minerals and fossil fuels used by humans. <p>B. Examine the renewability of resources.</p> <ul style="list-style-type: none"> • Identify renewable resources and describe their uses. • Identify nonrenewable resources and describe their uses. • Compare finished products to their original raw material. • Identify the waste derived from the use of renewable and nonrenewable resources. • Determine how consumption may impact the availability of resources. • Compare the time spans of renewability for fossil fuels and 	<p>A. Explain that renewable and nonrenewable resources supply energy and materials.</p> <ul style="list-style-type: none"> • Identify alternative sources of energy. • Identify and compare fuels used in industrial and agricultural societies. • Compare and contrast the cycles of various natural resources. • Explain food and fiber as renewable resources. <p>B. Evaluate factors affecting availability of natural resources.</p> <ul style="list-style-type: none"> • Describe natural occurrences that may affect the natural resources. • Analyze technologies that affect the use of our natural resources. • Evaluate the effect of consumer desires on various natural resources. 	<p>A. Analyze the use of renewable and nonrenewable resources.</p> <ul style="list-style-type: none"> • Explain the effects on the environment and sustainability through the use of nonrenewable resources. • Evaluate the advantages and disadvantages of reusing our natural resources. <p>B. Analyze factors affecting the availability of renewable and nonrenewable resources.</p> <ul style="list-style-type: none"> • Evaluate the use of natural resources and offer approaches for using them while diminishing waste. • Compare the economics of different areas based on the availability and accessibility of the natural resources.

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<p>C. Know that some natural resources have limited life spans.</p> <ul style="list-style-type: none"> Identify renewable and nonrenewable resources used in the local community. Identify various means of conserving natural resources. Know that natural resources have varying life spans. <p>D. Identify by-products and their use of natural resources.</p> <ul style="list-style-type: none"> Understand the waste stream. Identify those items that can be recycled and those that can not. Identify use of reusable products. Identify the use of compost, landfills and incinerators. 	<p style="text-align: center;">alternative fuels.</p> <p>C. Explain natural resource distribution.</p> <ul style="list-style-type: none"> Distinguish between readily available and less accessible resources. Identify the locations of different concentrations of fossil fuels and mineral resources. Analyze the effects of management practices on air, land and water in forestry, agriculture, fisheries, wildlife, mining and food and fiber production that is unique to different climates. <p>D. Describe the role of recycling and waste management.</p> <ul style="list-style-type: none"> Identify materials that can be recycled in the community. Explain the process of closing the loop in recycling. Compare the decomposition rates of different organic materials. Describe methods that could be used to reuse materials for new products. Evaluate the costs and benefits of disposable products. 	<p>C. Analyze how man-made systems have impacted the management and distribution of natural resources.</p> <ul style="list-style-type: none"> Explain the complete cycle of a natural resource, from extraction to disposal, detailing its uses and effects on the environment. Analyze energy uses and energy conservation in different regions. Examine conservation practices in different countries. Analyze the costs and benefits of different man-made systems and how they use renewable and nonrenewable natural resources. Analyze the impact of information systems on management and distribution of natural resources. <p>D. Explain different management alternatives involved in recycling and solid waste management.</p> <ul style="list-style-type: none"> Analyze the manufacturing process (before, during and after) with consideration for resource recovery. Compare various methods dealing with solid waste (e.g., incineration, compost, land application). Differentiate between pre/post-consumer and raw materials. Illustrate how one natural resource can be managed through reduction, recycling, reuse or use. 	<p>C. Analyze factors that influence the availability of natural resources.</p> <ul style="list-style-type: none"> Compare the use of natural resources in different countries. Determine how delivery systems influence the availability of resources at the local, regional and national level. <p>D. Evaluate solid waste management practices.</p> <ul style="list-style-type: none"> Examine and explain the path of a recyclable material from collection to waste, reuse or recycling identifying the market forces. Understand current regulations concerning recycling and solid waste. Research new technologies in the use, reuse or recycling of materials.
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4.3. Environmental Health			
4.3.4. GRADE 4	4.3.7. GRADE 7	4.3.10. GRADE 10	4.3.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Know that plants, animals and humans are dependent on air and water.</p> <ul style="list-style-type: none"> Know that all living things need air and water to survive. Describe potentially dangerous pest controls used in the home. Identify things that cause sickness when put into the air, water or soil. Identify different areas where health can be affected by air, water or land pollution. Identify actions that can prevent or reduce waste pollution. <p>B. Identify how human actions affect environmental health.</p> <ul style="list-style-type: none"> Identify pollutants. Identify sources of pollution. Identify litter and its effect on the environment. Describe how people can reduce 	<p>A. Identify environmental health issues.</p> <ul style="list-style-type: none"> Identify various examples of long-term pollution and explain their effects on environmental health. Identify diseases that have been associated with poor environmental quality. Describe different types of pest controls and their effects on the environment. Identify alternative products that can be used in life to reduce pollution. <p>B. Describe how human actions affect the health of the environment.</p> <ul style="list-style-type: none"> Identify land use practices and their relation to environmental health. Explain how natural disasters affect environmental health. 	<p>A. Describe environmental health issues.</p> <ul style="list-style-type: none"> Identify the effects on human health of air, water and soil pollution and the possible economic costs to society. Describe how indoor pollution may affect human health (e.g., dust mites, fumes, cat dandruff). Explain the costs and benefits of cleaning up contaminants. Explain how common household cleaning products are manufactured and how to dispose of their by-products after use. <p>B. Explain how multiple variables determine the effects of pollution on environmental health, natural processes and human practices.</p> <ul style="list-style-type: none"> Explain how human practices affect the quality of the water and soil. 	<p>A. Analyze the complexity of environmental health issues.</p> <ul style="list-style-type: none"> Identify environmental health issues and explain how they have been addressed on a worldwide level. Analyze efforts to prevent, control and/or reduce pollution through cost and benefit analysis and risk management. Describe the impact of occupational exposures as they relate to environmental health issues. Identify invisible pollutants and explain their effects on human health. Explain the relationship between wind direction and velocity as it relates to dispersal and occurrence of pollutants. Explain the different disposal methods used for toxic and hazardous waste. <p>B. Analyze the local, regional and national impacts of environmental health.</p> <ul style="list-style-type: none"> Analyze the cost of natural disasters in both dollars and loss of natural habitat. Research and analyze the local, state and national laws that deal with

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<p>pollution.</p> <p>C. Understand that the elements of natural systems are interdependent.</p> <ul style="list-style-type: none"> Identify some of the organisms that live together in an ecosystem. Understand that the components of a system all play a part in a healthy natural system. Identify the effects of a healthy environment on the ecosystem. 	<ul style="list-style-type: none"> Identify residential and industrial sources of pollution and their effects on environmental health. Explain the difference between point and nonpoint source pollution. Explain how nonpoint source pollution can affect the water supply and air quality. Explain how acid deposition can affect water, soil and air quality. Explain the relationship between resource use, reuse, recycling and environmental health. <p>C. Explain biological diversity.</p> <ul style="list-style-type: none"> Explain the complex, interactive relationships among members of an ecosystem. Explain how diversity affects ecological integrity of the natural resources. 	<ul style="list-style-type: none"> Identify evidence of natural events around the world and their effects on environmental health (e.g., Yellowstone National Park fires). Identify local and state environmental regulations and their impact on environmental health. Analyze data and explain how point source pollution can be detected and eliminated. Identify and explain ways of detecting pollution by using state-of-the-art technologies. <p>C. Explain biological diversity as an indicator of a healthy environment.</p> <ul style="list-style-type: none"> Explain species diversity. Analyze the effects of species extinction on the health of an ecosystem. 	<p>point and nonpoint source pollution; evaluate the costs and benefits of these laws.</p> <ul style="list-style-type: none"> Explain mitigation and its role in environmental health. Explain industry's initiatives to meet state and federal mandates on clean air and water. Describe the impacts of point and nonpoint source pollution on the Chesapeake Bay. Identify and evaluate the costs and benefits of laws regulating air and water quality and waste disposal. <p>C. Analyze the need for a healthy environment.</p> <ul style="list-style-type: none"> Research the relationship of some chronic diseases to an environmental pollutant. Explain how man-made systems may affect the environment.
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<ul style="list-style-type: none"> underground. <p>B. Understand the concept of cycles.</p> <ul style="list-style-type: none"> Explain the water cycle. Explain the carbon dioxide/oxygen cycle (photosynthesis). <p>C. Identify how ecosystems change over time.</p>	<p>biomes and their characteristics.</p> <ul style="list-style-type: none"> Identify the relationship of abiotic and biotic components and explain their interaction in an ecosystem. Explain how different soil types determine the characteristics of ecosystems. <p>B. Explain the concepts of cycles.</p> <ul style="list-style-type: none"> Identify and explain cycles within an ecosystem. Analyze the role of different cycles within an ecosystem. <p>C. Explain how ecosystems change over time.</p> <ul style="list-style-type: none"> Explain how ecosystems change. Identify the succession stages of a given ecosystem. Explain how specific organisms may change an ecosystem. Explain a change in an ecosystem that relates to humans. 	<p>environments to sustain their needs.</p> <ul style="list-style-type: none"> Assess the effects of latitude and altitude on biomes. Interpret possible causes of population fluctuations. Explain how erosion and sedimentation have changed the quality of soil related habitats. <p>B. Explain how cycles affect the balance in an ecosystem.</p> <ul style="list-style-type: none"> Describe an element cycle and its role in an ecosystem. Explain the consequences of interrupting natural cycles. <p>C. Analyze how ecosystems change over time.</p> <ul style="list-style-type: none"> Identify and explain the succession stages in an ecosystem. Identify causes of succession. Analyze consequences of interrupting natural cycles. 	<p>B. Analyze the impact of cycles on the ecosystem.</p> <ul style="list-style-type: none"> Evaluate the materials necessary for natural cycles. Explain the processes involved in the natural cycles. <p>C. Analyze how human action and natural changes affect the balance within an ecosystem.</p> <ul style="list-style-type: none"> Analyze the effects of substances that move through natural cycles. Analyze the effects of natural occurrences and their effects on ecosystems. Analyze effects of human action on an ecosystem. Compare the stages of succession and how they influence the cycles existing in an ecosystem.
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4.8. Humans and the Environment			
4.8.4. GRADE 4	4.8.7. GRADE 7	4.8.10. GRADE 10	4.8.12. GRADE 12
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>			
<p>A. Identify the biological requirements of humans.</p> <ul style="list-style-type: none"> Explain how a dynamically changing environment provides for sustainability of living systems. Identify several ways that people use natural resources. <p>B. Know that environmental conditions influence where and how people live.</p> <ul style="list-style-type: none"> Identify how regional natural resources influence what people use. Explain the influence of climate on how and where people live. 	<p>A. Describe how the development of civilization relates to the environment.</p> <ul style="list-style-type: none"> Explain how people use natural resources in their environment. Locate and identify natural resources in different parts of the world. Compare and contrast how people use natural resources throughout the world. <p>B. Explain how people use natural resources.</p> <ul style="list-style-type: none"> Describe how natural resources are used for survival. Explain how natural resources and technological changes have affected the development of civilizations. Explain how climate and extreme weather events (e.g., drought, flood) influence people's lives. 	<p>A. Analyze how society's needs relate to the sustainability of natural resources.</p> <ul style="list-style-type: none"> Explain why some societies have been unable to meet their natural resource needs. Compare and contrast the use of natural resources and the environmental conditions in several countries. Describe how uses of natural resources impact sustainability. <p>B. Analyze the relationship between the use of natural resources and sustaining our society.</p> <ul style="list-style-type: none"> Explain the role of natural resources in sustaining society. Analyze the effects of a natural resource's availability on a community or region. 	<p>A. Explain how technology has influenced the sustainability of natural resources over time.</p> <ul style="list-style-type: none"> Describe how technology has changed the use of natural resources by business and industry. Analyze the effect of natural resource conservation on a product over time (e.g., automobile manufacturing, aluminum can recycling, paper products). <p>B. Analyze technology's role on natural resource sustainability.</p> <ul style="list-style-type: none"> Explain how technology has decreased the use of raw natural resources. Explain how technology has impacted the efficiency of the use of natural resources. Analyze the role of technology in the reduction of pollution.

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<p>C. Explain how human activities may change the environment.</p> <ul style="list-style-type: none"> Identify everyday human activities and how they affect the environment. Identify examples of how human activities within a community affect the natural environment. <p>D. Know the importance of natural resources in daily life.</p> <ul style="list-style-type: none"> Identify items used in daily life that come from natural resources. Identify ways to conserve our natural resources. Identify major land uses in the community. 	<p>C. Explain how human activities may affect local, regional and national environments.</p> <ul style="list-style-type: none"> Describe what effect consumption and related generation of wastes have on the environment. Explain how a particular human activity has changed the local area over the years. <p>D. Explain the importance of maintaining the natural resources at the local, state and national levels.</p> <ul style="list-style-type: none"> Explain how human activities and natural events have affected ecosystems. Explain how conservation practices have influenced ecosystems. Define the roles of Pennsylvania agencies that deal with natural resources. 	<p>C. Analyze how human activities may cause changes in an ecosystem.</p> <ul style="list-style-type: none"> Analyze and evaluate changes in the environment that are the result of human activities. Compare and contrast the environmental effects of different industrial strategies (e.g., energy generation, transportation, logging, mining, agriculture). <p>D. Explain how the concept of supply and demand affects the environment.</p> <ul style="list-style-type: none"> Identify natural resources for which societal demands have been increasing. Identify specific resources for which human consumption has resulted in scarcity of supply (e.g., buffalo, lobsters). Describe the relationship between population density and resource use and management. 	<p>C. Analyze how pollution has changed in quality, variety and toxicity as the United States developed its industrial base.</p> <ul style="list-style-type: none"> Analyze historical pollution trends and project them for the future. Compare and contrast historical and current pollution levels at a given location. <p>D. Analyze the international implications of environmental occurrences.</p> <ul style="list-style-type: none"> Identify natural occurrences that have international impact (e.g., El Nino, volcano eruptions, earthquakes). Analyze environmental issues and their international implications.
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Possible Classroom Lessons & Activities

<http://www.lessonplanet.com/search?keywords=anthracite+coal&media=lesson>

- This search engine provides lesson plans for teachers that have been reviewed by other teachers

<http://www.dcnr.state.pa.us/topogeo/classroom/Teachers/maps/pintro/elem6/index.htm>

- For this activity students will:
 - Be able to explain how coal is formed.
 - Observe how mountain building changed the shape of the coal seams and the qualities of the coal.
 - Describe the settings of bituminous and anthracite coal.

<http://www.susquehannahistory.com/>

- Educational Resources About the Susquehanna Valleys by Mark Temple and Van Wagner

<http://www.sciencekids.co.nz/sciencefacts/chemistry/coal.html>

- Facts about coal, lessons to go along with information

Resources from Van Wagner, a Lewisburg HS Science Teacher:

[co2 Emissions and Temperature.pdf](#)

[day 9 climate and co2#C9E3E.pdf](#)

Resources

Carl Corlsen, *Buried Black Treasure*, (Bethlehem, PA: F. A Owen Publishing Company, 1954), xiii-xv.

Clark, Tom. "Anthracite Region Mine Drainage Remediation Strategy." *Susquehanna River Basin Commission*, December (2011), 1-3.

Clark, Tom. "Anthracite Region Mine Drainage Remediation Strategy: Summary." *Susquehanna River Basin Commission*, December (2011), 1-8.

Edmunds, William. "Coal in Pennsylvania ." *Commonwealth of Pennsylvania Department of Conservation and Natural Resources*. 7. no. 4 (2002): 1-29.

Ewall, Mike. Energyjustice.net, "Waste Coal." Last modified November, (2007). Accessed April 19, 2012. <http://www.energyjustice.net/coal/wastecoal>.

Pennsylvania Department of Education. "Academic Standards for Environment and Ecology." *Final Form*. 22 Pa. Code, Ch. 4, Appendix B. 2002. Print

Marsh, Ben. "Continuity and Decline in the Anthracite Towns of Pennsylvania." *Annals of the Association of American Geographers* . 77. no. 3 (1987): 337-352.

Marsh, Ben. "Field Guide to Central Pennsylvania." *Eastern Historical Geographers Association Meetings*. (1987): 1-15.

World Coal Association. *World Coal Association*, "Coal Mining and the Environment." Last modified 2012. Accessed April 26, 2012. <http://www.worldcoal.org/coal-the->

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