

CARLISLE AREA SCHOOL DISTRICT

Carlisle, PA 17013

HONORS ENVIRONMENTAL SCIENCE

GRADES 11 and 12

Date of Board Approval: June 19, 2014

CARLISLE AREA SCHOOL DISTRICT

PLANNED INSTRUCTION COVER PAGE

TITLE OF COURSE: Honors Environmental Science **SUBJECT:** Science **GRADE LEVEL:** 11 and 12
COURSE LENGTH: 1 academic year **DURATION:** 50 minutes **FREQUENCY:** 5 pds/week
PREREQUISITES: Geoenvironmental I, Biology I, Chemistry I or Honors **CREDIT:** 1 credit **LEVEL:** Honors
Chemistry (may be taken concurrently)

Course Description/Objectives:

This course, formerly known as Geoenvironmental Science II, will be project/research based and cover content in: Aquatics, Forestry, Wildlife, Soils, Energy and Geologic Resources, all within the broader context of Pennsylvania's physiography. Content presented by the instructors will be interpreted by the students "in-the-field" or in lab. Research projects, oral presentations, group and individual discussions, team labs, and a culminating project will provide the basis for evaluation, in addition to tests and quizzes. Students electing this course should be highly motivated learners with a strong interest in pursuing the Geoenvironmental sciences at the college level. Students should also be prepared to spend significant hours outside of class, included some weekends, in order to meet the course requirements.

Text: None

Curriculum Writing Committee: Mr. Kevin J. Spicer and Mr. Bruce E. Rowland

COURSE TIME LINE

Unit 1: Course Orientation/Establishing Themes/Safety Awareness

- Earth Systems and our Place in Space
- Fundamental Laws of Matter and Energy
- Resource Classifications
- Foundational Environmental Principles
- Fundamental safe practices for lab and field work

3 weeks

Unit 2: Physiographic Regions of Pennsylvania

- Evolution of Landscape
- Geologic and Topographic Features
- Geologic History of Pennsylvania
- Unique Pennsylvania Geologic and State Park Sites
- Eras and periods of geologic time.

4 weeks

Unit 3: Energy Resources of Pennsylvania

- Energy Classification
- Energy Conservation
- Energy Resources Extraction, Utilization, Economics, and Impact
- Pennsylvania Energy Profile and Issues

3 weeks

Unit 4: Mineral Resources of Pennsylvania

- Processes of rock and mineral formation
- Metallic and Non Metallic Mineral Resources of Pennsylvania
- History of Iron Ore Industry in PA
- Mineral Resources Extraction, Utilization, Economics, and Impact

5 weeks

Unit 5: Aquatics

- Aquatic Ecosystems: structure and function
- Aquatic Resource Issues
- Aquatic Resource Management and Protection

4 weeks

Unit 6: Forestry

- Anatomy and Physiology of Trees
- Tree Identification
- Timber Assessment
- Forest Ecology
- Forest Benefits and Resources
- Forest Management and Protection

5 weeks

Unit 7: Wildlife

- Identification of Birds and Mammals
- Understanding Wildlife Ecology
- Conservation and Management of Wildlife
- Issues Involving Wildlife and Society

5 weeks

Unit 8: Soils and Land Use

- Basic Soils Knowledge
- Understanding Maps, Surveys and Landforms
- Land Use
- Decision-Making and Protection of Soils

5 weeks

TOTALS: 34 weeks

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 days

UNIT # 1: Course Orientation/Establishing Themes/Safety Awareness

GRADE: 11 and 12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.9-10.A
 - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.B
 - 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 summary of the text.
- CC.3.5.9-10.C
 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.D
 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.9-10.E
 - Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- CC.3.5.9-10.F
 - Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
- CC.3.5.9-10.G
 - 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.
- CC.3.5.9-10.H
 - 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.
- CC.3.5.9-10.I
 - Compare and contrast findings presented in a text to those from other sources (including their own experiments) noting when the findings support or contradict previous explanations or accounts.
- CC.3.5.9-10.J
 - By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Writing:

- CC.3.6.9-10.A
 - Write arguments focused on discipline-specific content.
- CC.3.6.9-10.B
 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 days

UNIT # 1: Course Orientation/Establishing Themes/Safety Awareness

GRADE: 11 and 12

- | | |
|---------------|---|
| CC.3.6.9-10.C | • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| CC.3.6.9-10.D | • Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| CC.3.6.9-10.E | • Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| CC.3.6.9-10.F | • Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| CC.3.6.9-10.G | • Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| CC.3.6.9-10.H | • Draw evidence from informational texts to support analysis, reflection, and research. |
| CC.3.6.9-10.I | • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |

PA Academic Standards:

- | | |
|-----------|--|
| 3.3.10.A1 | • Explain how the Earth is composed of a number of dynamic, interacting systems exchanging energy or matter. |
| 3.3.10.A2 | • Analyze the effects on the environment and the carbon cycle of using both renewable and nonrenewable sources. |
| 3.3.10.B1 | • Explain how gravity is responsible for planetary orbits. Explain what caused the sun, Earth, and most of the other planets to form between 4 and 5 billion years ago. Provide evidence to suggest the Big Bang Theory. Describe the basic nuclear processes involved in energy production in a star. |
| 3.3.12.A1 | • Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy. |
| 3.3.12.A2 | • Analyze the availability, location, and extraction of Earth's resources. Evaluate the impact of using renewable and nonrenewable energy resources on the Earth's system. |
| 3.1.12.A8 | • Describe and interpret dynamic changes in stable systems. |
| 3.1.12.A9 | • Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and |

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 days

UNIT # 1: Course Orientation/Establishing Themes/Safety Awareness

GRADE: 11 and 12

precision in making valid measurements. Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument.

3.3.12.B1

- Describe the **life cycle** of stars based on their mass. Analyze the influence of **gravity** on the formation and **life cycles** of galaxies, including our own Milky Way **galaxy**; stars; planetary **systems**; and residual material left from the creation of the **solar system**. Relate the **nuclear processes** involved in energy production in stars and supernovas to their **life cycles**.

College and Career Readiness Standards:

Key Ideas and Details:

CCSS.ELA-Literacy.RST.11-12.1

- 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.

CCSS.ELA-Literacy.RST.11-12.2

- Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

CCSS.ELA-Literacy.RST.11-12.3

- Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure:

CCSS.ELA-Literacy.RST.11-12.4

- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.

CCSS.ELA-Literacy.RST.11-12.5

- Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

CCSS.ELA-Literacy.RST.11-12.6

- Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas:

CCSS.ELA-Literacy.RST.11-12.7

- Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-Literacy.RST.11-12.8

- Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CCSS.ELA-Literacy.RST.11-12.9

- Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity:

CCSS.ELA-Literacy.RST.11-12.10

- By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 days

UNIT # 1: Course Orientation/Establishing Themes/Safety Awareness

GRADE: 11 and 12

UNDERSTANDINGS

Natural resources consist of energy and materials which are derived from the earth and needed by humans.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

KNOW

- Review of Earth Systems and our Place in Space
- Fundamental Laws of Matter and Energy
- Resource Classifications
- Foundational Environmental Principles
- Vocabulary: sustainable yield, depletion, perpetual, recycle, renewable resources, nonrenewable resources, perpetual resources, hydrosphere, geosphere, atmosphere, anthrosphere, biosphere, nebular theory, singularity

DO

- Identify branches of spheres of the earth system by labeling and describing the elements of local photographed landscape. (writing)
- Provide an explanation of solar system and universe creation.
- Describe the life cycle of a star relative to the HR Diagram.
- Apply the scientific method to a variety of questions.
- Create a scaled, labeled, model of the earth's structure based upon the concept of differentiation.
- Evaluate the role of direct and indirect observation in understanding scientific inquiry (thinking).
- Compare and contrast renewable, nonrenewable, and perpetual resources by writing a report which focuses on a particular resource (writing).
- Analyze the impact of resource utilization (thinking).

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 1: Course Orientation/Establishing Themes/Safety Awareness

GRADE: 11 and 12

STANDARDS:

PA Core Standards:

- CC.3.5.9-10.C
 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.H
 - 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.
- CC.3.6.9-10.B
 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes
- CC.3.6.9-10.C
 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

PA Academic Standards:

- 3.2.C.A6
 - Evaluate experimental information for relevance and adherence to science processes.

College, Career Readiness Standards:

- CCSS.ELA-Literacy.CCRA.W.4
 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-Literacy.CCRA.W.10
 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 1: Course Orientation/Establishing Themes/Safety Awareness

GRADE: 11 and 12

UNDERSTANDINGS

Students will understand how to work and conduct laboratory experiments safely in the lab setting.

Common Misconceptions within the Unit:

Nothing bad can happen to them while they are in the lab; however, by not following specific safety measures and protocols, accidents can happen within the lab setting. Safety measures will be stressed.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

Take and pass the safety quiz – Students must achieve a 100% on the quiz in order to work on labs.
Draw a room map/layout of all safety equipment as well as how to properly use all safety equipment in the event of an emergency

KNOW

- Identify proper laboratory behavior.
- Identify lab equipment that will be used throughout the course of the year.
- How to correctly use lab equipment that will be used throughout the course of the year.

DO

- Correctly identify the location of safety equipment in the lab and know how to properly use in the event of an emergency.
- Successfully read an GHS sheet.
- Successfully identify the parts and ratings of the NFPA diamond.
- Create a poster and safety poem about the safety rules

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 2: Physiographic Regions of Pennsylvania

GRADE: 11 and 12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.9-10.A
 - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.B
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- CC.3.5.9-10.C
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- CC.3.5.9-10.D
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- CC.3.5.9-10.F
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- CC.3.5.9-10.I
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- CC.3.5.9-10.J
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Writing:

- CC.3.6.9-10.A
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- CC.3.6.9-10.B
 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 2: Physiographic Regions of Pennsylvania

GRADE: 11 and 12

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|---------------|---|
| CC.3.6.9-10.C | • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| CC.3.6.9-10.D | • Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| CC.3.6.9-10.E | • Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| CC.3.6.9-10.F | • Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| CC.3.6.9-10.G | • Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| CC.3.6.9-10.H | • Draw evidence from informational texts to support analysis, reflection, and research. |
| CC.3.6.9-10.I | • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |

PA Academic Standards:

- | | |
|-----------|--|
| 3.1.12.A8 | • Describe and interpret dynamic changes in stable systems. |
| 3.1.12.A9 | • Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and precision in making valid measurements. Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument. |
| 3.3.12.A1 | • Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy |
| 3.3.12.A3 | • Describe the absolute and relative dating methods used to measure geologic time, such as index fossils, radioactive dating, law of superposition, and crosscutting relationships. |
| 3.3.12.A7 | • MODELS Interpret and analyze a combination of ground-based observations, satellite data, and computer models to |

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 2: Physiographic Regions of Pennsylvania

GRADE: 11 and 12

demonstrate Earth systems and their interconnections. **CONSTANCY/CHANGE** Infer how human activities may impact the natural course of Earth's cycles. **PATTERNS** Summarize the use of data in understanding seismic events, meteorology, and geologic time.

College and Career Readiness Standards:

Key Ideas and Details:

CCSS.ELA-Literacy.RST.11-12.1

- 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.

CCSS.ELA-Literacy.RST.11-12.2

- Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

CCSS.ELA-Literacy.RST.11-12.3

- Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure:

CCSS.ELA-Literacy.RST.11-12.4

- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.

CCSS.ELA-Literacy.RST.11-12.5

- Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

CCSS.ELA-Literacy.RST.11-12.6

- Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas:

CCSS.ELA-Literacy.RST.11-12.7

- Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-Literacy.RST.11-12.8

- Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CCSS.ELA-Literacy.RST.11-12.9

- Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity:

CCSS.ELA-Literacy.RST.11-12.10

- By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 2: Physiographic Regions of Pennsylvania

GRADE: 11 and 12

UNDERSTANDINGS

The earth's landforms have a significant impact on the distribution and behavior of wildlife, past and present.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

KNOW

- Evolution of Landscape
- Geologic and Topographic Features
- Geologic History of Pennsylvania
- Unique Pennsylvania Geologic and State Park Sites
- Eras and periods of geologic time.
- Vocabulary: piedmont, ridge and valley, orogeny, rifting, Grenville, Taconic, Acadian, Alleghenian, Triassic Lowlands, isotope

DO

- Identify the physiographic provinces of PA and provide a short description of the related geomorphology, (writing)
- Explain the significance of the ridge and valley province to the annual migration of raptors through the state. (thinking)
- Collect fossils found in rock samples as molds, casts, or imprints and use the fossils to propose a relative age for the rock.
- Appreciate the vastness of geologic time through the use of a model (thinking).
- Summarize the geologic history of PA and correlate the geologic history to the physiographic regions of PA by composing a two-paragraph summary (writing).

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 3: Energy Resources of Pennsylvania

GRADE: 11 and 12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.9-10.A
 - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.B
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- CC.3.5.9-10.J
 - By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Writing:

- CC.3.6.9-10.A
 - Write arguments focused on discipline-specific content.
- CC.3.6.9-10.B
 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 3: Energy Resources of Pennsylvania

GRADE: 11 and 12

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|---------------|---|
| CC.3.6.9-10.C | • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| CC.3.6.9-10.D | • Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| CC.3.6.9-10.E | • Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| CC.3.6.9-10.F | • Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
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| 3.3.12.A1 | • Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy. |
| 3.3.12.A3 | • Describe the absolute and relative dating methods used to measure geologic time, such as index fossils, radioactive dating, law of superposition, and crosscutting relationships. |
| 3.3.12.A7 | • MODELS Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate |

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 3: Energy Resources of Pennsylvania

GRADE: 11 and 12

Earth systems and their interconnections. **CONSTANCY/CHANGE** Infer how human activities may impact the natural course of Earth's cycles. **PATTERNS** Summarize the use of data in understanding seismic events, meteorology, and geologic time.

College and Career Readiness Standards:

Key Ideas and Details:

- CCSS.ELA-Literacy.RST.11-12.1 • 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.
- CCSS.ELA-Literacy.RST.11-12.2 • Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- CCSS.ELA-Literacy.RST.11-12.3 • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure:

- CCSS.ELA-Literacy.RST.11-12.4 • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.
- CCSS.ELA-Literacy.RST.11-12.5 • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CCSS.ELA-Literacy.RST.11-12.6 • Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas:

- CCSS.ELA-Literacy.RST.11-12.7 • Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-Literacy.RST.11-12.8 • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CCSS.ELA-Literacy.RST.11-12.9 • Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity:

- CCSS.ELA-Literacy.RST.11-12.10 • By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 3 weeks

UNIT # 3: Energy Resources of Pennsylvania

GRADE: 11 and 12

UNDERSTANDINGS:

The energy used by human societies for electrical production, heating, industry, and transportation comes primarily from fossil fuels.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

KNOW

- Energy Classification
- Energy Conservation
- Energy Resources Extraction, Utilization, Economics, and Impact
- Pennsylvania Energy Profile and Issues
- Vocabulary: potential and kinetic energy, work, lignite, bituminous, anthracite, peat, surface and subsurface mining, oil trap, acid mine drainage, dilithium crystals, yellow boy, hydrocarbon, oil shale, tar sand, uranium, isotope, radiation, enrichment, yellow cake, TMI, radioactive waste, acid deposition, acid mitigation, global climate change, photovoltaic, “green energies”

DO

- Identify stage of coal formation and assess productivity of each material.
- Evaluate various energy resources in regard to renewability and environmental impact.
- Identify process and structures associated with nuclear energy.
- Summarize Pennsylvania’s significance in fossil fuel production and use.
- Conduct a home energy audit and summarize findings. (writing and thinking)
- Design and build a solar oven and evaluate its efficiency. (writing and thinking)

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 4: Mineral Resources of Pennsylvania

GRADE: 11 and 12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.9-10.A • Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.B • 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 summary of the text.
- CC.3.5.9-10.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.D • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.9-10.E • Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- CC.3.5.9-10.F • Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
- CC.3.5.9-10.G • 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.
- CC.3.5.9-10.H • 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.
- CC.3.5.9-10.I • Compare and contrast findings presented in a text to those from other sources (including their own experiments) noting when the findings support or contradict previous explanations or accounts.
- CC.3.5.9-10.J • By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Writing:

- CC.3.6.9-10.A • Write arguments focused on discipline-specific content.
- CC.3.6.9-10.B • Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- CC.3.6.9-10.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.9-10.D • Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 4: Mineral Resources of Pennsylvania

GRADE: 11 and 12

- | | |
|---------------|---|
| CC.3.6.9-10.E | <ul style="list-style-type: none">• Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| CC.3.6.9-10.F | <ul style="list-style-type: none">• Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| CC.3.6.9-10.G | <ul style="list-style-type: none">• Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| CC.3.6.9-10.H | <ul style="list-style-type: none">• Draw evidence from informational texts to support analysis, reflection, and research. |
| CC.3.6.9-10.I | <ul style="list-style-type: none">• Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |

PA Academic Standards:

- | | |
|-----------|--|
| 3.1.12.A8 | <ul style="list-style-type: none">• Describe and interpret dynamic changes in stable systems. |
| 3.1.12.A9 | <ul style="list-style-type: none">• Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and precision in making valid measurements. Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument. |
| 3.3.10.A1 | <ul style="list-style-type: none">• Explain how the Earth is composed of a number of dynamic, interacting systems exchanging energy or matter. |
| 3.3.10.A2 | <ul style="list-style-type: none">• Analyze the effects on the environment and the carbon cycle of using both renewable and nonrenewable sources. |
| 3.3.12.A3 | <ul style="list-style-type: none">• Describe the absolute and relative dating methods used to measure geologic time, such as index fossils, radioactive dating, law of superposition, and crosscutting relationships. |
| 3.3.12.A1 | <ul style="list-style-type: none">• Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy. |
| 3.3.12.A2 | <ul style="list-style-type: none">• Analyze the availability, location, and extraction of Earth's resources. Evaluate the impact of using renewable and nonrenewable energy resources on the Earth's system. |

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 4: Mineral Resources of Pennsylvania

GRADE: 11 and 12

- 3.3.12.A4
 - Classify Earth’s internal and external sources of energy such as radioactive decay, gravity, and solar energy. Relate the transfer of energy through radiation, conduction, and convection to global atmospheric processes.
- 3.3.12.A5
 - Explain how the ocean dominates the Earth’s carbon cycle.
- 3.3.12.A7
 - MODELS Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections. CONSTANCY/CHANGE Infer how human activities may impact the natural course of Earth’s cycles. PATTERNS Summarize the use of data in understanding seismic events, meteorology, and geologic time.

College and Career Readiness Standards:

Key Ideas and Details:

- CCSS.ELA-Literacy.RST.11-12.1
 - 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.
- CCSS.ELA-Literacy.RST.11-12.2
 - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- CCSS.ELA-Literacy.RST.11-12.3
 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure:

- CCSS.ELA-Literacy.RST.11-12.4
 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.
- CCSS.ELA-Literacy.RST.11-12.5
 - Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CCSS.ELA-Literacy.RST.11-12.6
 - Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas:

- CCSS.ELA-Literacy.RST.11-12.7
 - Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-Literacy.RST.11-12.8
 - Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CCSS.ELA-Literacy.RST.11-12.9
 - Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity:

- CCSS.ELA-Literacy.RST.11-12.10
 - By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 4: Mineral Resources of Pennsylvania

GRADE: 11 and 12

UNDERSTANDINGS

Geologic processes have led to deposits of economically-important rocks and minerals throughout the physiographic provinces of PA, and extracting these materials has had a significant impact on the geography and ecology of PA.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

KNOW

- Processes of rock and mineral formation.
- Metallic and Non Metallic Mineral Resources of Pennsylvania
- History of Iron Ore Industry in PA
- Mineral Resources Extraction, Utilization, Economics, and Impact
- Vocabulary: silicates, carbonates, rock cycle, cleavage, fissile, native, conchoidal, klingonite, porosity, permeability, stratification, silica tetrahedron, ore mineral, gangue, tailings, spoil, overburden, leachate, fluxing agent, slag

DO

- Identify rock and mineral samples based on physical and chemical properties and prepare a data table to present this information
- List the key components to the definition of a mineral and a rock.
- Identify the basic ingredients of the iron furnace industry and describe the positive and negative economic and environmental impacts.
- Explain the specific use for three minerals, especially metallic ore minerals, by writing a report (writing).
- Analyze regional rock and mineral samples and relate to Pennsylvania Physiographic providence.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 4 weeks

UNIT # 5: Aquatics

GRADE: 11 and 12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.9-10.A • Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.B • 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 summary of the text.
- CC.3.5.9-10.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.D • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.9-10.E • Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
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- CC.3.5.9-10.I • Compare and contrast findings presented in a text to those from other sources (including their own experiments) noting when the findings support or contradict previous explanations or accounts.
- CC.3.5.9-10.J • By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Writing:

- CC.3.6.9-10.A • Write arguments focused on discipline-specific content.
- CC.3.6.9-10.B • Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- CC.3.6.9-10.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.9-10.D • Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 4 weeks

UNIT # 5: Aquatics

GRADE: 11 and 12

- CC.3.6.9-10.E
 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- CC.3.6.9-10.F
 - Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- CC.3.6.9-10.G
 - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- CC.3.6.9-10.H
 - Draw evidence from informational texts to support analysis, reflection, and research.
- CC.3.6.9-10.I
 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

PA Academic Standards:

- 3.1.12.A2
 - Evaluate how organisms must derive energy from their environment or their food in order to survive.
- 3.1.12.A8
 - Describe and interpret dynamic changes in stable systems.
- 3.1.12.A9
 - Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and precision in making valid measurements. Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument.
- 3.3.12.A1
 - Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy.
- 3.3.12.A2
 - Analyze the availability, location, and extraction of Earth's resources. Evaluate the impact of using renewable and nonrenewable energy resources on the Earth's system.
- 3.3.12.A7
 - MODELS Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections. CONSTANCY/CHANGE Infer how human activities may impact the natural course of Earth's cycles. PATTERNS Summarize the use of data in understanding seismic events, meteorology, and geologic time.
- 4.1.10.A
 - 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

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 4 weeks

UNIT # 5: Aquatics

GRADE: 11 and 12

factors cause organisms to become extinct.

- 4.1.10.B
 - Explain the consequences of interrupting natural cycles.
- 4.1.10.C
 - 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).
- 4.1.10.E
 - Analyze how humans influence the pattern of natural changes (e.g. primary /secondary succession and desertification) in ecosystems over time.
- 4.1.12.A
 - Analyze the significance of biological diversity in an ecosystem. Explain how species adapt to limiting factors in an ecosystem. Analyze the differences between natural causes and human causes of extinction. Research wildlife management laws and their effects on biodiversity.
- 4.1.12.B
 - Research solutions to problems caused by interrupting natural cycles.
- 4.1.12.C
 - Research how humans affect energy flow within an ecosystem. Describe the impact of industrial, agricultural, and commercial enterprises on an ecosystem.
- 4.1.12.E
 - Research solutions addressing human impacts on ecosystems over time.
- 4.2.10.A
 - 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.
- 4.2.10.B
 - Examine how human interactions impact wetlands and their surrounding environments. Describe how land use decisions affect wetlands
- 4.2.10.C
 - 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.
- 4.2.12.A
 - Examine environmental laws related to land use management and its impact on the water quality and flow within a watershed.
- 4.2.12.B
 - Analyze the effects of policies and regulations at various governmental levels on wetlands and their surrounding environments. Examine various public policies relating to wetlands. Investigate the intended and unintended effects of public polices and regulations relating to wetlands.
- 4.2.12.C
 - Analyze the effects of policies and regulations at various governmental levels on water quality. Assess the intended and unintended effects of public polices and regulations relating to water quality.
- 4.2.12.D
 - Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes .Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 4 weeks

UNIT # 5: Aquatics

GRADE: 11 and 12

- 4.5.10.D
 - Research practices that impact biodiversity in specific ecosystems .Analyze the relationship between habitat changes to plant and animal population fluctuations.
- 4.5.12.D
 - Analyze the effects of new and emerging technologies on biodiversity in specific ecosystems. Evaluate the impact of laws and regulations on reducing the number of threatened and endangered species.

College and Career Readiness Standards:

Key Ideas and Details:

- CCSS.ELA-Literacy.RST.11-12.1
 - 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.
- CCSS.ELA-Literacy.RST.11-12.2
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- CCSS.ELA-Literacy.RST.11-12.3
 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure:

- CCSS.ELA-Literacy.RST.11-12.4
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- CCSS.ELA-Literacy.RST.11-12.5
 - Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CCSS.ELA-Literacy.RST.11-12.6
 - Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas:

- CCSS.ELA-Literacy.RST.11-12.7
 - Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-Literacy.RST.11-12.8
 - Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CCSS.ELA-Literacy.RST.11-12.9
 - Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity:

- CCSS.ELA-Literacy.RST.11-12.10
 - By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 4 weeks

UNIT # 5: Aquatics

GRADE: 11 and 12

UNDERSTANDINGS:

Aquatic ecosystems are dynamic in nature and indicative of environmental quality.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

KNOW

- Aquatic Ecosystems: structure and function
- Aquatic Resource Issues
- Aquatic Resource Management and Protection
- Vocabulary: heat capacity, watershed, riparian buffer, tributary, hydrological cycle, load, levee, saltation, discharge, carrying capacity, porosity, permeability, zones of aeration and saturation, capillary fringe, water table, artesian well, cone of depression, karst, sinkhole, point/nonpoint, dissolved oxygen, nitrates, phosphates, eutrophication, oxidation, hydration, heavy metals, riparian system, point and nonpoint pollution, indicator species.

DO

- Identify stream morphologies of erosion and deposition.
- Explain the nature and components of a groundwater/artesian system through a sketch and a two paragraph essay. (writing)
- Describe karst features and processes and recognize such features on maps and photographs.
- Recognize features caused by running water on a topographic map.
- Identify factors contributing to the flood risk of an area.
- Identify sources of water pollutions and the affect of individual pollutants on water quality.
- Conduct /analyze chemical and biological surveys of local water ways and devise a mitigation plan to improve water quality. (thinking)
- Identify Pennsylvania’s six watersheds and their related river systems. Identify the stream order of three or more given watercourses in a particular watershed and locate them on a map.
- Describe the life cycle of three or more specific aquatic organisms. and list three adaptations and explain the advantage of each
- List three functions or values of wetlands.
- Compare and contrast the flow of energy in two different aquatic food chains.
- List at least three invasive or introduced species and discuss their affects on the aquatic ecosystem.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 6: Forestry

GRADE: 11 and 12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.9-10.A • Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.B • 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 summary of the text.
- CC.3.5.9-10.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.D • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.9-10.E • Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- CC.3.5.9-10.F • Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
- CC.3.5.9-10.G • 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.
- CC.3.5.9-10.H • 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.
- CC.3.5.9-10.I • Compare and contrast findings presented in a text to those from other sources (including their own experiments) noting when the findings support or contradict previous explanations or accounts.
- CC.3.5.9-10.J • By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Writing:

- CC.3.6.9-10.A • Write arguments focused on discipline-specific content.
- CC.3.6.9-10.B • Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- CC.3.6.9-10.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.9-10.D • Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 6: Forestry

GRADE: 11 and 12

- CC.3.6.9-10.E
 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.
- CC.3.6.9-10.F
 - Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- CC.3.6.9-10.G
 - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- CC.3.6.9-10.H
 - Draw evidence from informational texts to support analysis, reflection, and research.
- CC.3.6.9-10.I
 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

PA Academic Standards:

- 3.1.12.A2
 - Evaluate how organisms must derive energy from their environment or their food in order to survive.
- 3.1.12.A8
 - Describe and interpret dynamic changes in stable systems.
- 3.1.12.A9
 - Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and precision in making valid measurements. Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument.
- 3.3.12.A1
 - Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth’s systems. Classify Earth’s internal and external sources of energy such as radioactive decay, gravity, and solar energy.
- 3.3.12.A2
 - Analyze the availability, location, and extraction of Earth’s resources. Evaluate the impact of using renewable and nonrenewable energy resources on the Earth’s system.
- 3.3.12.A3
 - Describe the absolute and relative dating methods used to measure geologic time, such as index fossils, radioactive dating, law of superposition, and crosscutting relationships.
- 3.3.12.A6
 - Explain how the unequal heating of the Earth’s surface leads to atmospheric global circulation changes, climate, local short term changes, and weather. Relate the transfer of energy through radiation, conduction, and convection to global atmospheric processes.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

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UNIT # 6: Forestry

GRADE: 11 and 12

3.3.12.A7	<ul style="list-style-type: none">• MODELS Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections. CONSTANCY/CHANGE Infer how human activities may impact the natural course of Earth's cycles. PATTERNS Summarize the use of data in understanding seismic events, meteorology, and geologic time.
3.3.12.A8	<ul style="list-style-type: none">• Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes .Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument.
3.1.12.A9	<ul style="list-style-type: none">• Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and precision in making valid measurements. Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument.
4.1.10.A	<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.
4.1.10.B	<ul style="list-style-type: none">• Explain the consequences of interrupting natural cycles.
4.1.10.C	<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).
4.1.10.E	<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.
4.1.12.A	<ul style="list-style-type: none">• Analyze the significance of biological diversity in an ecosystem. Explain how species adapt to limiting factors in an ecosystem. Analyze the differences between natural causes and human causes of extinction. Research wildlife management laws and their effects on biodiversity.
4.1.12.B	<ul style="list-style-type: none">• Research solutions to problems caused by interrupting natural cycles.
4.1.12.C	<ul style="list-style-type: none">• Research how humans affect energy flow within an ecosystem. Describe the impact of industrial, agricultural, and commercial enterprises on an ecosystem.
4.1.12.E	<ul style="list-style-type: none">• Research solutions addressing human impacts on ecosystems over time.
4.1.12.F	<ul style="list-style-type: none">• Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

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UNIT # 6: Forestry

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- 4.5.10.D Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument.
- Research practices that impact biodiversity in specific ecosystems. Analyze the relationship between habitat changes to plant and animal population fluctuations.
- 4.5.12.D
- Analyze the effects of new and emerging technologies on biodiversity in specific ecosystems. Evaluate the impact of laws and regulations on reducing the number of threatened and endangered species.

College and Career Readiness Standards

Key Ideas and Details:

- CCSS.ELA-Literacy.RST.11-12.1
- 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.
- CCSS.ELA-Literacy.RST.11-12.2
- Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- CCSS.ELA-Literacy.RST.11-12.3
- Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- Craft and Structure:
- CCSS.ELA-Literacy.RST.11-12.4
- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.
- CCSS.ELA-Literacy.RST.11-12.5
- Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CCSS.ELA-Literacy.RST.11-12.6
- Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas:

- CCSS.ELA-Literacy.RST.11-12.7
- Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-Literacy.RST.11-12.8
- Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CCSS.ELA-Literacy.RST.11-12.9
- Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity:

- CCSS.ELA-Literacy.RST.11-12.10
- By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 6: Forestry

GRADE: 11 and 12

UNDERSTANDINGS

Forest and forest management are essential components of human existence providing both consumptive and non-consumptive values.

COMMON ASSESSMENTS/CULMINATING ACTIVITY

KNOW

- Anatomy and Physiology of Trees
- Tree Identification
- Timber Assessment
- Forest Ecology
- Forest Benefits and Resources
- Forest Management and Protection
- Vocabulary: silviculture, xylem, phloem, cambium, dendrochronology, dendroclimatology, DBH, clinometers, increment borer, even-aged stand, browse line, invasive, board foot, succession, intolerant species, clearcut, select tree cut, seed tree cut, shade tree cut, wildfire

DO

- Calculate the timber requirements and economic and environmental impact of the charcoal industry for local iron works.
- Explain the Information Technology used to monitor and productively manage forests, and give specific examples of how this technology is being utilized in all aspects of forest management.
- Be able to describe the parts and tissues of a tree and their arrangements and functions. Recognize defects that effect a tree's health, quality and resource potential.
- Explain typical tree growth and life cycle.
- Explain the cause and effect relationships between environmental factors, (light, soil and moisture) and tree growth.
- Be able to interpret these effects in the growth rings of a sample of wood (either a "tree cookie" or core taken with an increment borer).
- Identify common species without a key and specific or unusual species of trees or shrubs using a botanical key.
- Demonstrate the use of common forestry equipment (Biltmore stick, diameter tape and clinometers), to measure tree diameter and height. Be able to calculate wood volume.
- Explain general forest typing based on the dominant tree species. Describe major forests types found in Pennsylvania. Analyze and type a specific forest site.
- Explain typical forest structure (canopy, under story and ground layers) and crown classes.
- Explain typical forest succession from open areas to closed canopy and back again. Analyze the successional stage of a specific forest site.
- Explain how wildlife habitat relates to the forest plant community (i.e. tree species present, age structure, snags and dead-and-down trees, availability of food and riparian zones).

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

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UNIT # 6: Forestry

GRADE: 11 and 12

- Evaluate species diversity and its importance. Explain biological diversity as an indicator of a healthy environment as well as analyze the effects of species extinction on the health of an ecosystem.
- Identify and describe the life cycle and impacts of common forest pests and invasive plants. Research integrated pest management strategies for selected pests.
- Predict how human or natural action can produce change to which an organism cannot adapt (Gypsy Moth, Chestnut blight, invasive species, etc.)
- Explain the role of fire in forest ecosystems. Describe the basic principles of wildfire prevention and control.
- Identify and describe the life cycle of forest pests and invasive plants and describe their impact to a forest ecosystem. Research integrated pest management strategies for selected pests.
- Examine a “tree cookie” or core sample taken with an increment borer to determine the age, growing conditions, insect and disease damage, and past weather conditions.
- Describe values and benefits of forests for recreation, wildlife and watershed quality.
- Describe the benefits of maintaining trees in urban and suburban communities and factors effecting their health and survival.
- List products and uses of the following commercial species grown in Pennsylvania: Red and White oaks, Black cherry, White ash, hickories
- Explain the uses of these silviculture techniques in even-aged and uneven-aged forest management: thinning, clear-cutting, seed-tree method, shelter wood method, and selection method.
- Describe the practices of “high grading” and “diameter limit” cutting.
- Describe the impact that various forest practices can have on the surrounding landscape.
- Describe how trees can record past climatic evidence.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 7: Wildlife

GRADE: 11 and 12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.9-10.A • Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.B • 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 summary of the text.
- CC.3.5.9-10.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.D • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.9-10.E • Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- CC.3.5.9-10.F • Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
- CC.3.5.9-10.G • 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.
- CC.3.5.9-10.H • 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.
- CC.3.5.9-10.I • Compare and contrast findings presented in a text to those from other sources (including their own experiments) noting when the findings support or contradict previous explanations or accounts.
- CC.3.5.9-10.J • By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Writing:

- CC.3.6.9-10.A • Write arguments focused on discipline-specific content.
- CC.3.6.9-10.B • Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- CC.3.6.9-10.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.9-10.D • Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 7: Wildlife

GRADE: 11 and 12

- CC.3.6.9-10.E
 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.
- CC.3.6.9-10.F
 - Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- CC.3.6.9-10.G
 - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- CC.3.6.9-10.H
 - Draw evidence from informational texts to support analysis, reflection, and research.
- CC.3.6.9-10.I
 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

PA Academic Standards:

- 3.1.12.A2
 - Evaluate how organisms must derive energy from their environment or their food in order to survive.
- 3.1.12.A8
 - Describe and interpret dynamic changes in stable systems.
- 3.1.12.A9
 - Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and precision in making valid measurements. Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument.
- 3.3.12.A1
 - Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth’s systems. Classify Earth’s internal and external sources of energy such as radioactive decay, gravity, and solar energy.
- 3.3.12.A2
 - Analyze the availability, location, and extraction of Earth’s resources. Evaluate the impact of using renewable and nonrenewable energy resources on the Earth’s system.
- 3.3.12.A7
 - **MODELS** Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections. **CONSTANCY/CHANGE** Infer how human activities may impact the natural course of Earth’s cycles. **PATTERNS** Summarize the use of data in understanding seismic events, meteorology, and geologic time.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

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UNIT # 7: Wildlife

GRADE: 11 and 12

- 4.1.10.A
 - 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.
- 4.1.10.B
 - Explain the consequences of interrupting natural cycles.
- 4.1.10.C
 - 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).
- 4.1.10.E
 - Analyze how humans influence the pattern of natural changes (e.g. primary /secondary succession and desertification) in ecosystems over time.
- 4.1.12.A
 - Analyze the significance of biological diversity in an ecosystem. Explain how species adapt to limiting factors in an ecosystem. Analyze the differences between natural causes and human causes of extinction. Research wildlife management laws and their effects on biodiversity.
- 4.1.12.B
 - Research solutions to problems caused by interrupting natural cycles.
- 4.1.12.C
 - Research how humans affect energy flow within an ecosystem. Describe the impact of industrial, agricultural, and commercial enterprises on an ecosystem.
- 4.1.12.E
 - Research solutions addressing human impacts on ecosystems over time.
- 4.1.12.F
 - Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes.
- 4.5.10.D
 - Research practices that impact biodiversity in specific ecosystems. Analyze the relationship between habitat changes to plant and animal population fluctuations.
- 4.5.12.D
 - Analyze the effects of new and emerging technologies on biodiversity in specific ecosystems. Evaluate the impact of laws and regulations on reducing the number of threatened and endangered species.

College and Career Readiness Standards

Key Ideas and Details:

- CCSS.ELA-Literacy.RST.11-12.1
 - 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.
- CCSS.ELA-Literacy.RST.11-12.2
 - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- CCSS.ELA-Literacy.RST.11-12.3
 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 7: Wildlife

GRADE: 11 and 12

Craft and Structure:

- CCSS.ELA-Literacy.RST.11-12.4 • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.
- CCSS.ELA-Literacy.RST.11-12.5 • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CCSS.ELA-Literacy.RST.11-12.6 • Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas:

- CCSS.ELA-Literacy.RST.11-12.7 • Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-Literacy.RST.11-12.8 • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CCSS.ELA-Literacy.RST.11-12.9 • Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity:

- CCSS.ELA-Literacy.RST.11-12.10 • By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

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UNIT # 7: Wildlife

GRADE: 11 and 12

UNDERSTANDINGS:

Wildlife is dependent upon habitats which vary with geologic and climatic condition; humans can have a great impact, both positive and negative, upon wildlife existence.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

KNOW

- Identification of Birds and Mammals
- Understanding Wildlife Ecology
- Conservation and Management of Wildlife
- Issues Involving Wildlife and Society
- Vocabulary: limiting factor, biological carrying capacity, cultural carrying capacity, territory, home range, population, community, succession).

DO

- Answer questions concerning the natural history of wild bird and mammal species and identify birds and mammals if given natural history information.
- Identify and be able to group animals that would be associated with specific ecosystems or specific habitat.
- Describe various roles of birds and mammals in their ecosystems and be able to cite examples.
- Identify wildlife species from mounted specimens, pictures or silhouettes.
- Identify wildlife species based on signs including: fur, hair, feathers, gnawings, rubbings, pellets, tracks*, skulls ♦ and scat. (Tracks for *animals only and skulls for ♦ animals)
- Identify birdcalls of bird species commonly found in our area.
- Identify basic needs required by wildlife.
- Identify, describe, and explain specific anatomical, physiological and/or behavioral adaptations of wildlife to the environment and how they help the animal survive. (i.e. migration, hibernation, defense posturing, strong beak, webbed feet, etc.)
- Describe predator-prey relationships, discuss physical adaptations of predator vs. prey species, and be able to cite examples.
- Describe and be able to model food chains, food webs, trophic levels - be able to cite examples.
- Describe factors that limit or enhance population growth.
- Define and explain terms associated with wildlife biology and wildlife populations. (i.e. natality, mortality, precocial, altricial, crepuscular, nocturnal, delayed implantation, carnivore, niche, herbivore, insectivore,

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

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	<p>omnivore, producer, primary consumer, secondary consumer, etc.).</p> <ul style="list-style-type: none">• Define and explain basic ecological concepts and terminology• Identify and describe methods that can be used to evaluate a habitat.• Identify and describe methods that can be used to determine the abundance and distribution of wildlife.• Describe the role of the Game Commission as the agency responsible for the protection, conservation, and management of wild birds and mammals of Pennsylvania.• Identify the need and history of federal laws/acts and instrumental individuals associated with wildlife conservation• Describe ways each person can help in the protection, conservation management and enhancement of wild bird and mammal populations• Describe ways habitat can be managed/improved for specific birds and mammals.• Define biodiversity and provide examples of how biodiversity is important to people and wildlife.• Identify and explain the major causes of loss of biodiversity in our state and worldwide.• Explain the relationship of deer and deer management with biodiversity in our state.• Identify and explain the terms used in endangered and threatened species, for example: extinct, extirpated, endangered, threatened, candidate species, and reintroduction• Identify wild birds and mammals that are listed as endangered, extirpated, threatened or candidate species. Know natural history and habitat requirements. Describe the main causes that have led to the depleted populations and describe measures being taken to help their recovery.• Identify and explain factors that have led to species becoming endangered and threatened.• Identify and explain factors which can make a species more likely to become endangered and threatened.• Identify and explain methods that are used to save an endangered or threatened species.• Describe major causes of habitat loss in Pennsylvania and how habitat loss affects wildlife.
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KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 8: Soils and Land Use

GRADE: 11 and 12

STANDARDS:

PA Core Standards:

Reading:

- CC.3.5.9-10.A • Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- CC.3.5.9-10.B • 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 summary of the text.
- CC.3.5.9-10.C • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.D • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.9-10.E • Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- CC.3.5.9-10.F • Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
- CC.3.5.9-10.G • 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.
- CC.3.5.9-10.H • 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.
- CC.3.5.9-10.I • Compare and contrast findings presented in a text to those from other sources (including their own experiments) noting when the findings support or contradict previous explanations or accounts.
- CC.3.5.9-10.J • By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Writing:

- CC.3.6.9-10.A • Write arguments focused on discipline-specific content.
- CC.3.6.9-10.B • Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- CC.3.6.9-10.C • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CC.3.6.9-10.D • Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 8: Soils and Land Use

GRADE: 11 and 12

- CC.3.6.9-10.E • Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- CC.3.6.9-10.F • Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- CC.3.6.9-10.G • Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- CC.3.6.9-10.H • Draw evidence from informational texts to support analysis, reflection, and research.
- CC.3.6.9-10.I • Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

PA Academic Standards:

- 3.3.12.A1 • Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy.
- 3.3.12.A2 • Analyze the availability, location, and extraction of Earth's resources. Evaluate the impact of using renewable and nonrenewable energy resources on the Earth's system.
- 3.3.12.A6 • Explain how the unequal heating of the Earth's surface leads to atmospheric global circulation changes, climate, local short term changes, and weather. Relate the transfer of energy through radiation, conduction, and convection to global atmospheric processes.
- 3.3.12.A7 • MODELS Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections. CONSTANCY/CHANGE Infer how human activities may impact the natural course of Earth's cycles. PATTERNS Summarize the use of data in understanding seismic events, meteorology, and geologic time.
- 3.1.12.A8 • Describe and interpret dynamic changes in stable systems.
- 3.1.12.A9 • Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models. Explain the importance of accuracy and precision in making valid measurements. Examine the status of existing theories. Evaluate experimental information for relevance and adherence to science processes. Judge that conclusions are consistent and logical with experimental conditions. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

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UNIT # 8: Soils and Land Use

GRADE: 11 and 12

scientific argument.

College and Career Readiness Standards

Key Ideas and Details:

- CCSS.ELA-Literacy.RST.11-12.1 • 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.
- CCSS.ELA-Literacy.RST.11-12.2 • Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- CCSS.ELA-Literacy.RST.11-12.3 • Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure:

- CCSS.ELA-Literacy.RST.11-12.4 • Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.
- CCSS.ELA-Literacy.RST.11-12.5 • Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- CCSS.ELA-Literacy.RST.11-12.6 • Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas:

- CCSS.ELA-Literacy.RST.11-12.7 • Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-Literacy.RST.11-12.8 • Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- CCSS.ELA-Literacy.RST.11-12.9 • Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity:

- CCSS.ELA-Literacy.RST.11-12.10 • By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

KNOW, UNDERSTAND, DO

COURSE: Honors Environmental Science

TIME FRAME: 5 weeks

UNIT # 8: Soils and Land Use

GRADE: 11 and 12

UNDERSTANDINGS:

Soil is a substance comprised of inorganic and organic material and is generally classified by particle size. Soil understanding and management is essential.

COMMON ASSESSMENTS/CULMINATING ACTIVITY:

KNOW

- Basic Soils Knowledge
- Understanding Maps, Surveys and Landforms
- Land Use
- Decision-Making and Protection of Soils

DO

- Explain the concept and processes of the rock cycle.
- Identify the stages of soil formation and distinguish between residual and transported soil.
- Compose a three paragraph essay which summarizes three soil conservation techniques (writing).
- Analyze a local soil sample (thinking).
- Explain the role that geology plays in soil formation, the kinds of soils that are formed, identify the parts of a soil profile, and soil characteristics including texture, pH, color, and structure.
- Explain how soil is alive, and how biological diversity is important for soil health and hence human, plant, and environmental health.
- Use a soil survey or web-soil survey data to evaluate land use in Pennsylvania. Show how information in soil surveys can help the land user predict or avoid problems like sinkholes, or regions prone to landslides, flooding, drought, or soil instability.
- Explain the importance of soils as a natural resource which must be managed properly in order to sustain a healthy society. Understand that soils are in some ways nonrenewable, and what effect gross mismanagement of soils has had historically.
- Compare different kinds of land uses and conservation practices on erosion and sedimentation.

<https://www.pdesas.org/Standard/Views#117|792|0|0>

Adaptations/Modifications for Students with I.E.P.s

Adaptations or modifications to this planned course will allow exceptional students to earn credits toward graduation or develop skills necessary to make a transition from the school environment to community life and employment. The I.E.P. team has determined that modifications to this planned course will meet the student's I.E.P. needs.

Adaptations/Modifications may include but are not limited to:

INSTRUCTION CONTENT

- Modification of instructional content and/or instructional approaches
- Modification or deletion of some of the essential elements

SETTING

- Preferential seating

METHODS

- Additional clarification of content
- Occasional need for one to one instruction
- Minor adjustments or pacing according to the student's rate of mastery
- Written work is difficult, use verbal/oral approaches
- Modifications of assignments/testing
- Reasonable extensions of time for task/project completion
- Assignment sheet/notebook
- Modified/adjusted mastery rates
- Modified/adjusted grading criteria
- Retesting opportunities

MATERIALS

- Supplemental texts and materials
- Large print materials for visually impaired students
- Outlines and/or study sheets
- Carbonless notebook paper
- Manipulative learning materials
- Alternatives to writing (tape recorder/calculator)