Wallenpaupack Area School District
Planned Course Curriculum Guide

Department: Science

Name of Course: 9th Grade Science CP
9th Grade Science Honors*

Course Description:

9th Grade Science – This course will help students to understand the environmental and ecological aspects of the world around them. Topics studied in this course are the science basics, ecosystems, biodiversity, environmental adaptations, agricultural concepts, water resources, renewable and nonrenewable resources, and pollution issues. The Academic Standards for Science and Technology and Engineering Education, Academic Standards for Environment and Ecology, as well as the Academic Standards for Reading in Science and Technology were utilized to make this course an integrated sequence of the studies of interactions of humans and the world around them. The relational study develops a culminating view of humans faced with comprehensive problems of resource depletion as well as technological and socioeconomic decision-making. The focal point of this course is to better prepare our high school students to investigate and understand these topics as they are related to the Pennsylvania State Science Standards and the Common Core.

Revision Date: June 2014

Wallenpaupack Area School District Curriculum	
COURSE: 9th Grade Science	GRADE/S: 9th
UNIT 1: Science, Matter and Energy (Chapter 2 – Basic Chemistry and the Scientific Method)	TIMEFRAME: 8 classes

PA COMMON CORE/PA SCIENCE STANDARDS:

3.1.10.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.

3.1.12.A5: Analyze how structure is related to function at all levels of biological organization from molecules to organisms.

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.

3.2.10.A1: Predict properties of elements using trends of the periodic table.

Identify properties of matter that depend on sample size.

Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth.

3.2.12.A2: Distinguish among the isotopic forms of elements.

Explain the probabilistic nature of radioactive decay based on subatomic rearrangement in the atomic nucleus.

Explain how light is absorbed or emitted by electron orbital transitions.

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.J: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
CC.3.5.11-12.B: 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.
CC.3.5.11-12.C: 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.
CC.3.5.11-12.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 11–12 texts and topics.
CC.3.5.11-12.E: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
CC.3.5.11-12.G: 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.
CC.3.5.11-12.I: 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.
CC.3.5.11-12.J: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.
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.
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CC.3.6.11-12.H: Draw evidence from informational texts to support analysis, reflection, and research.

UNIT OBJECTIVES (SWBATS):
Students are expected to

- Identify how scientists collect data, and develop theories, models, and laws about how nature works.
- Decipher how matter consists of elements and compounds, which intern are made up of atoms, ions or molecules.
- Explain the law of conservation of matter and energy.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

- Bell Ringers
- PowerPoints and Notes
- Worksheets – Scientific Method Review crossword puzzle
- Laboratory Activity – Scientific Method (The Paper Tower Challenge, Nail Activity) and Basic Chemistry (Matter and Atomic Structure)
- Small and Large Group Discussions – Identifying the Controls and Variables
- Group Work – Case Studies (Experiment/Scientific Method)
- Independent Work – Can You Spot the Independent Method
- Written Assignments – Book Chapter Questions
- Current Event Activities

ANCHOR VOCABULARY: atom, cell, chromosomes, compounds, elements, gene, hypothesis, matter, molecules, organic molecules, organisms, pH, principal, radioactive decay, scientific theory, scientific law

ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):

- CDTS (Diagnostic)
- Formative Assessments
- Summative Assessments

EVIDENCE OF MASTERY/Cut Score:

- Formative Assessments score of 70% or better
- Summative Assessments score of 70% or better

DIFFERENTIATED INSTRUCTION (Remediation/Extension) (Process, Product or Content)
Struggling Student – Remediation
Teacher /student individualized instruction to include...

- typed notes
- guided questions
- textbook interactive flashcards
- textbook review and tutorial quizzes
- animations and videos

Advanced Student – Extension
Teacher /student individualized instruction to include...

- textbook guest essays and topics
- specialized projects
- enrichment topics found in the textbook chapters in "What can you do"…sections, frontier research, green careers, and explore more

*Honors Course – Student assignments are more in-depth, greater levels of thinking, increased independent work, and more challenging assessments.

RESOURCES (Websites, Blogs, Videos, Whiteboard Resources, etc.):
Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Textbook
Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Teacher Resources
Environmental Science Interactive Website www.cengagebrain.com

RESOURCE SPECIFIC VOCABULARY: acidity, atom, atomic number, atomic theory, cell, cell theory, chemical formula, chemical reaction, chromosome, clear-cutting, compound, data, element, experiment, frontier science, genes, geosphere, high quality matter, hydropower, inorganic compounds, ions, isotopes, low-quality matter, mass number, matter, matter quality, model, molecule, neutron, nuclear change, nuclear fission, nucleus, organic compounds, peer review, pH, physical change, proton, radioactive decay, reliable science scientific hypothesis, scientific law, scientific theory, tentative science, trait, unreliable science

Wallenpaupack Area School District Curriculum	
COURSE: 9th Grade Science	GRADE/S: 9th
UNIT 2: Ecosystems (Chapter 3 – Ecosystems: What Are They and How Do They Work?)	TIMEFRAME: 10 days

PA COMMON CORE/PA SCIENCE STANDARDS:

3.1.10.A1: Explain the characteristics of life common to all organisms.

3.1.12.A1: Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.

3.1.12.A2: Evaluate how organisms must derive energy from their environment or their food in order to survive.

3.1.12.A5: Analyze how structure is related to function at all levels of biological organization from molecules to organisms.

3.2.10.A1: Predict properties of elements using trends of the periodic table.

Identify properties of matter that depend on sample size.

Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth.

3.3.10.A2: Analyze the effects on the environment and the carbon cycle of using both renewable and nonrenewable sources of energy.

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.D: Research practices that impact biodiversity in specific ecosystems.

Analyze the relationship between habitat changes to plant and animal population fluctuations.

Assessments

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.

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.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.J: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

CC.3.5.11-12.B: 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.

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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.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.

CC.3.6.11-12.A: Write arguments focused on discipline-specific content.

Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

Provide a concluding statement or section that follows from or supports the argument presented.

CC.3.6.11-12.B: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Introduce a topic and organize complex ideas, concepts, and information so that each new

element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

CC.3.6.11-12.C: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CC.3.6.11-12.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.
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UNIT OBJECTIVES (SWBATS):
Students are expected to

- Identify and compare the four major components of the earth's life-support system that are the atmosphere, hydrosphere, the geosphere, and the biosphere.
- Summary the flow of energy from the sun through the biosphere, the cycling of nutrients within the biosphere, and gravity.
- Identify organisms that produce, consume, and recycle nutrients back to producers.
- Explain how energy flows through ecosystems in food chains and webs, based on the amount of chemical energy available to organism at each successive feeding level decreases.

- Create food chains and food webs.
- Evaluate how matter, in the form of nutrients, is cycled within and among ecosystems and the biosphere, with human activities altering these chemical cycles.
- Identify how scientists use both field research and laboratory research, as well as mathematical and other models to learn about ecosystems.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

- Bell Ringers
- PowerPoints and Notes
- Worksheets
- Laboratory Activity – Pond Water Web, Properties of Water Laboratory, Photosynthesis Internet Activity (Website)
- Small and Large Group Discussions
- Group Work – Carbon Cycle Laboratory (Website)
- Independent Work – Ecosystems, Build Your Own Ecosystem (Website)
- Written Assignments - Book Chapter Questions
- Projects and Presentations
- Current Event Activities

ANCHOR VOCABULARY: abiotic, biochemical, biogeochemical cycle, biotic, biosphere, carbon cycle, consumers, decomposers, ecological communities, ecology, ecosystems, energy pyramid, energy transformation, food chain, food web, hydrogen bonds, hydrologic cycle, hydrosphere, organism, photosynthesis, population, producers, trophic level, water cycle

ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):

- CDTS (Diagnostic)
- Formative Assessments
- Summative Assessments

EVIDENCE OF MASTERY/Cut Score:

- Formative Assessments score of 70% or better
- Summative Assessments score of 70% or better

DIFFERENTIATED INSTRUCTION (Remediation/Extension) (Process, Product or Content)
Struggling Student – Remediation
Teacher /student individualized instruction to include...

- typed notes
- guided questions
- textbook interactive flashcards
- textbook review and tutorial quizzes
- animations and videos

Advanced Student – Extension
Teacher /student individualized instruction to include...

- textbook guest essays and topics
- specialized projects
- enrichment topics found in the textbook chapters in “What can you do”…sections, frontier research, green careers, and explore more

*Honors Course – Student assignments are more in-depth, greater levels of thinking, increased independent work, and more challenging assessments.

RESOURCES (Websites, Blogs, Videos, Whiteboard Resources, etc.):

Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Textbook Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Teacher Resources Environmental Science Interactive Website www.cengagebrain.com Build Your Own Ecosystem http://educypedia.karadimov.info/library/virtual_ecosphere.swf Carbon Cycle Laboratory http://fc.deltasd.bc.ca/~ mannandale/sc10/hw/EP_carbon_cycle.swf Photosynthesis Internet Activity http://www.pbs.org/wgbh/nova/methuselah/photosynthesis.html#
RESOURCE SPECIFIC VOCABULARY: aerobic respiration, atmosphere, autotroph, biogeochemical cycle, biological community, biomass, biosphere, carbon cycle, carnivore, community, consumer, decomposer, detritivore, detritus, detritus feeder, ecological tipping point, evaporation, food chain, food web, GPP, greenhouse effect, greenhouse gases, gross primary productivity (GPP), herbivore, heterotroph, hydrologic cycle, hydrosphere, microorganisms, net primary productivity (NPP), nitrogen cycle, NPP, nutrient cycle, omnivore, phosphorus cycle, photosynthesis, phytoplankton, population, precipitation, primary consumer, primary productivity, producer, pyramid of energy flow, secondary consumer, stratosphere, sulfur cycle, tertiary (higher-level) consumers, transpiration, trophic level, troposphere, water cycle, zooplankton.

Wallenpaupack Area School District Curriculum	
COURSE: 9th Grade Science	GRADE/S: 9th
UNIT 3: Biodiversity (Chapter 4 - Biodiversity and Evolution and Chapter 5 - Biodiversity, Species, Interactions, and Population Control)	TIMEFRAME: 14 days

PA COMMON CORE/ PA SCIENCE STANDARDS:

3.1.10.A1: Explain the characteristics of life common to all organisms.

3.1.12.A2: Evaluate how organisms must derive energy from their environment or their food in order to survive.

3.1.10.C1: Explain the mechanisms of biological evolution.

3.1.10.C3: CONSTANCY AND CHANGE: Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution.

3.1.12.C1: Analyze how natural selection leads to speciation.

3.1.12.C2: Analyze how genotypic and phenotypic variation can result in adaptations that influence an organism's success in an environment.

3.3.10.A4: Relate geochemical cycles to conservation of matter.

Explain how the Earth's systems and its various cycles are driven by energy.

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.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.

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.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.J: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

CC.3.5.11-12.B: 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.

CC.3.5.11-12.D: Determine the meaning of symbols, key terms, and other domain-specific

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CC.3.5.11-12.E: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
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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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CC.3.6.11-12.H: Draw evidence from informational texts to support analysis, reflection, and research.

UNIT OBJECTIVES (SWBATS):
Students are expected to

- Explain how biodiversity found in genes, species, ecosystems, and ecosystem processes are vital to sustaining life on earth.
- Interpret how the scientific theory of evolution explains how life on earth changes over time due to changes in the genes of populations.
- Predict how populations evolve when genes mutate and give some individuals genetic traits that enhance their abilities to survive and to produce offspring with these traits.

- Examine how tectonic plate movements, volcanic eruptions, earthquakes, and climate change have shifted wildlife habitats, wiped out large numbers of species, and created opportunities for the evolution of new species.
- Infer that as environmental conditions change, the balance between the formation of new species and the extinction of existing species determines the earth's biodiversity.
- Evaluate how human activities are decreasing biodiversity by causing the extinction of many species and by destroying or degrading habitats needed for the development of new species.
- Recognize that each species plays a specific ecological role called its niche.
- Compare and contrast how any given species may play one or more of four important roles – native, nonnative, indicator, or keystone – in a particular ecosystem.
- Compare and contrast the five types of interactions among species – interspecific competition, predation, parasitism, mutualism, and commensalism – and how it affect the resources used and the population sizes of the species in an ecosystem.
- Correlate that no population can continue to grow indefinitely because of limitations on resources and because of competition among species for those resources.
- Explain and predict how the structure and species composition of communities and ecosystems change in response to changing environmental conditions through a process called ecological succession.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

- Bell Ringers
- PowerPoints and Notes
- Worksheets – Salamander Classification, Evolution Word Search, Hunters and Hunted (Video Worksheet), Trials of Life: Hunting and Escaping (Video Worksheet)
- Laboratory Activity - The Lynx Eats the Hare Laboratory, Primary vs Secondary Succession
- Small and Large Group Discussions – Survival of the Sneakiest
- Group Work – What Good Are Thumbs?
- Independent Work – So, What Does a T-Rex Taste Like? (Website), Pepper Moth Survey (graphing activity), Evolution (Website), Mechanisms: The Processes of Evolution (Website)
- Written Assignments - Book Chapter Questions, Biological Warfare and the Coevolutionary Arms Race (Website)
- Projects and Presentations – The Ultimate Animal (Websites), The Evolution of Canis pedatus, Design a Symbiotic Relationship
- Current Event Activities

ANCHOR VOCABULARY: adaptation, biodiversity, biome, carrying capacity, competition, endangered species, endemic species, evolution, extinction, fossils, habitat, limiting factors, mutations, natural selection, nonnative species, population, predatory, prey, speciation, species, succession, symbiotic relationship, theory of evolution

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Environmental Science Interactive Website www.cengagebrain.com
The Ultimate Animal http://buildyourwildself.com and http://switchzoo.org
So, What Does a T-Rex Taste Like?
www.ucmp.berkeley.edu/education/explorations/tours/Trex/index.html
Evolution http://ats.doit.wisc.edu/Biology/lessons.htm
Mechanisms: The Processes of Evolution
http://evolution.berkeley.edu/evolibrary/article/0_0_0/evo_14
Biological Warfare and the Coevolutionary Arms Race
http://evolution.berkeley.edu/evolibrary/article/biowarfare_01
Hunters and Hunted BBC Life – Department Copy
Trials of Life: Hunting and Escaping – VHS – Library Copy

RESOURCE SPECIFIC VOCABULARY: adaptation, adaptive trait, background extinction, biodiversity, biological evolution, biome, carrying capacity, coevolution, commensalism, ecological diversity, ecological niche, ecological succession, endemic species, environmental resistance, evolution, extinction, fossils, functional diversity, generalist species, genetic diversity, geographic isolation, habitat, indicator species, immigration, inertia (persistence), interspecific competition, invasive species, keystone species, limiting factor, logistic growth, mass extinction, mutation, mutualism, native species, natural selection, niche, nonnative species, parasitism, persistence, population, population crash, population density, predation, predator, predator-prey relationship, prey primary ecological succession, reproductive isolation, resilience, resource partitioning, secondary ecological succession, specialist species, speciation, species, species diversity, theory of evolution, theory of island biogeography

Wallenpaupack Area School District Curriculum	
COURSE: 9th Grade Science	GRADE/S: 9th
UNIT 4: Biodiversity (Chapter 7 – Climate and Biodiversity and Chapter 8 – Sustaining Biodiversity)	TIMEFRAME: 14 days

PA COMMON CORE/PA SCIENCE STANDARDS:

3.1.10.A1: Explain the characteristics of life common to all organisms.

3.1.12.A1: Relate changes in the environment to various organisms' ability to compensate using homeostatic mechanisms.

3.1.12.A2: Evaluate how organisms must derive energy from their environment or their food in order to survive.

3.1.12.A8: CHANGE AND CONSTANCY: Describe and interpret dynamic changes in stable systems.

3.1.12.C2: Analyze how genotypic and phenotypic variation can result in adaptations that influence an organism's success in an environment.

3.3.10.A5: Explain how there is only one ocean.

Explain the processes of the hydrologic cycle.

Explain the dynamics of oceanic currents and their relationship to global circulation within the marine environment.

3.3.10.A6: Interpret meteorological data to describe and/or predict weather.

Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns.

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.D: Research practices that impact biodiversity in specific ecosystems.
- Analyze the relationship between habitat changes to plant and animal population fluctuations. 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.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.

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.

4.2.10.B: Examine how human interactions impact wetlands and their surrounding environments.
Describe how land use decisions affect wetlands.

4.5.10.C: Analyze real-world data and explain how point and non-point source pollution can be detected and eliminated.
Compare and contrast the environmental effects of different industrial strategies.

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.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.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.J: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
CC.3.5.11-12.B: 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.
CC.3.5.11-12.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 11–12 texts and topics.
CC.3.5.11-12.E: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
CC.3.5.11-12.G: 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.
CC.3.5.11-12.I: 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.
CC.3.5.11-12.J: By the end of grade 12, read and comprehend science/technical texts in the

grades 11–12 text complexity band independently and proficiently.
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.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.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.
CC.3.6.11-12.C: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CC.3.6.11-12.E: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
CC.3.6.11-12.G: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
CC.3.6.11-12.H: Draw evidence from informational texts to support analysis, reflection, and research.

UNIT OBJECTIVES (SWBATS):
Students are expected to

- Explain key factors that influence an area's climate are incoming solar energy, the earth's rotation, global patterns of air and water movement, gases in the atmosphere, and the earth's surface features.
- Identify the cause and effect that occur due to the differences in long-term average annual precipitation and temperature that leads to the formation of tropical, temperate, and cold deserts, grasslands, and forests, and largely determine their locations.
- Analyze that in many areas, human activities are disrupting ecological and economic services provided by the earth's deserts, grasslands, forests, and mountains.
- Recognize that saltwater and freshwater aquatic life zones cover almost three-fourths of the earth's surface, and oceans dominate the planet.
- Categorize how saltwater ecosystems are irreplaceable reservoirs of biodiversity, providing major ecological and economic services that are being threatened by human activities.
- Summarize how freshwater lakes, rivers, and wetlands provide important ecological and economic services that are being disrupted by human activities.
- Explain why species are becoming extinct 100 to 1,000 times faster than they were before

modern humans evolved, and by the end of this century, the extinction rate is expected to be 10,000 times higher than it was before humans arrived.
- Evaluate why we should avoid speeding up the extinction of wild species because of the economic and ecological services they provide, and because wild species have a right to exist regardless of their usefulness to us.
- Place in order that the greatest threats to any species are loss or degradation of habitat, harmful invasive species, human population growth, pollution, climate change, and overexploitation.
- Determine how we can reduce the rising rate of species extinction and help to protect overall biodiversity by establishing and enforcing national environmental laws and international treaties, creating a variety of protected wildlife sanctuaries, and taking precautionary measures to prevent such harm.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:
- Bell Ringers
- PowerPoints and Notes
- Worksheets - Biomes
- Laboratory Activity
- Small and Large Group Discussions – Lion King (Website)
- Group Work
- Independent Work – Biomes: Color by Number, Biome Video Four Square sheet(Website), Pest Log web search, Biodiversity Hotspots Web Quest, Extinction Concept Map
- Written Assignments - Book Chapter Questions
- Projects and Presentations – Land Biomes Project (Website), One and Alive Endangered Species (Website), One and Dead Evasive Species
- Current Event Activities

ANCHOR VOCABULARY: aquatic, biome, extinction, habitat, species, stream order, watershed, wetlands

ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):
- CDTS (Diagnostic)
- Formative Assessments
- Summative Assessments

EVIDENCE OF MASTERY/Cut Score:
- Formative Assessments score of 70% or better
- Summative Assessments score of 70% or better

DIFFERENTIATED INSTRUCTION (Remediation/Extension) (Process, Product or Content)
Struggling Student – Remediation
Teacher /student individualized instruction to include...
- typed notes
- guided questions
- textbook interactive flashcards
- textbook review and tutorial quizzes
- animations and videos

Advanced Student – Extension
Teacher /student individualized instruction to include...

- textbook guest essays and topics
- specialized projects
- enrichment topics found in the textbook chapters in "What can you do"…sections, frontier research, green careers, and explore more

*Honors Course – Student assignments are more in-depth, greater levels of thinking, increased independent work, and more challenging assessments.

RESOURCES (Websites, Blogs, Videos, Whiteboard Resources, etc.):
Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Textbook
Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Teacher Resources
Environmental Science Interactive Website www.cengagebrain.com
Land Biomes Project
http://snideasides.files.wordpress.com/2010/03/survivorcompletechallengeguidev1/pdf
Lion King http://www.NewYorkScienceTeacher.com/movies
Biome Video Four Square - United Streaming Video – Science Department Folder
One and Alive Endangered Species https://worldwildlife.org

RESOURCE SPECIFIC VOCABULARY: aquatic life zone, bioaccumulation, biological extinction, biomagnification, biome, broadleaf deciduous plant, broadleaf evergreen plants, climate, coastal wetland, coastal zone, coniferous evergreen plants, coniferous trees, coral reef, cultural eutrophication, desert, drainage basin, endangered species, estuary, eutrophic lake, evergreen plants, extinction rate, forest, freshwater life zones, grassland, greenhouse gases, habitat fragmentation, HIPPCO, inland wetland, lake, mangrove forest, marine life zone, mass extinction, monoculture, natural greenhouse effect, nitric oxide (NO), ocean currents, oligotrophic lake, open sea, permafrost, plankton, prairie, precautionary principle, rain shadow effect, runoff, salinity, surface water, threatened species, watershed (drainage basin), weather

Wallenpaupack Area School District Curriculum	
COURSE: 9th Grade Science	GRADE/S: 9th
UNIT 5: Environmental Quality (Chapter 10 – Sustaining Resources and Environmental Quality)	TIMEFRAME: 8

PA COMMON CORE/PA SCIENCE STANDARDS:

3.1.10.A3: Compare and contrast the life cycles of different organisms.
3.1.12.A8: CHANGE AND CONSTANCY: Describe and interpret dynamic changes in stable systems.
3.1.10.B4: Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture.
3.1.12.B4: Evaluate the societal impact of genetic engineering techniques and applications.
3.1.10.C1: Explain the mechanisms of biological evolution.
3.1.12.C1: Analyze how natural selection leads to speciation.
3.4.10.E2: Compare and contrast how the engineering design and management of agricultural systems require knowledge of artificial ecosystems and the effects of technological development on flora and fauna.
3.4.10.E5: Analyze the development of transportation services and methods and their impact on society.
4.1.10.B: Explain the consequences of interrupting natural cycles.
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.C: Research how humans affect energy flow within an ecosystem.
Describe the impact of industrial, agricultural, and commercial enterprises on an ecosystem

4.4.10.A: Explain the relationships between and among the components of the food and fiber system. (i.e., production, processing, research and development, marketing, distribution, and regulations.)
4.4.10.B: Analyze the effects of agriculture on a society's economy, environment, standard of living, and foreign trade.
4.4.10.C: Analyze how agricultural sciences and technologies strive to increase efficiency while balancing the needs of society with the conservation of our natural resources.
4.4.10.D: Evaluate the use of technologies to increase plant and animal productivity.
4.5.10.A: Explain how public policy encourages or discourages the sustainable use of natural resources.
Research laws and policies that address the sustainable use of natural resources (e.g., solid and liquid waste management, industry, agriculture and enterprise).

4.5.10.B: Describe the impact of integrated pest management practices on the environment.
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.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.J: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
CC.3.5.11-12.B: 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.
CC.3.5.11-12.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 11–12 texts and topics.
CC.3.5.11-12.G: 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.
CC.3.5.11-12.I: 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.
CC.3.5.11-12.J: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.
CC.3.6.9-10.A: Write arguments focused on discipline-specific content.

Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.

Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

Provide a concluding statement or section that follows from or supports the argument presented.

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.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.
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.
CC.3.6.11-12.C: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CC.3.6.11-12.E: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
CC.3.6.11-12.G: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
CC.3.6.11-12.H: Draw evidence from informational texts to support analysis, reflection, and research.

UNIT OBJECTIVES (SWBATS):
Students are expected to

- Compare and contrast why many people in less-developed countries have health problems from not getting enough food, while many people in more developed countries suffer health problems from eating too much.
- Identify that the greatest obstacles to providing enough food for everyone are poverty, corruption, political upheaval, war, bad weather, and the harmful environmental effects of industrialized food production.
- Acknowledge that high-input industrialized agriculture and lower-input traditional agriculture have greatly increased food supplies.
- Predict that future food production may be limited by soil erosion and degradation, desertification, irrigation water shortages, air and water pollution, climate change from greenhouse gas emissions, and loss of biodiversity.
- Explain why we can sharply cut pesticide use without decreasing crop yields by using a mix of cultivation techniques, biological pest control, and small amounts of selected chemical pesticides as a last resort (integrated pest management).
- Identify how we can improve food security by reducing poverty and chronic malnutrition, relying more on locally grown food, and cutting food waste.
- Explain how we can produce food more sustainably by using resources more efficiently, sharply, decreasing the harmful environmental effects of industrialized food production, and eliminating government subsidies that promote such harmful impacts.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

- Bell Ringers
- PowerPoints and Notes
- Worksheets
- Laboratory Activity
- Small and Large Group Discussions – What are Genetically Modified Foods?
- Group Work

- Independent Work – IPM Pyramid, History of the Harvest Video and Worksheet
- Written Assignments - Book Chapter Questions
- Projects and Presentations
- Current Event Activities

ANCHOR VOCABULARY: agriculture, desertification, food and fiber system, integrated pest management, organic, pest

ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):

- CDTS (Diagnostic)
- Formative Assessments
- Summative Assessments

EVIDENCE OF MASTERY/Cut Score:

- Formative Assessments score of 70% or better
- Summative Assessments score of 70% or better

DIFFERENTIATED INSTRUCTION (Remediation/Extension) (Process, Product or Content)
Struggling Student – Remediation
Teacher /student individualized instruction to include...

- typed notes
- guided questions
- textbook interactive flashcards
- textbook review and tutorial quizzes
- animations and videos

Advanced Student – Extension
Teacher /student individualized instruction to include...

- textbook guest essays and topics
- specialized projects
- enrichment topics found in the textbook chapters in "What can you do"…sections, frontier research, green careers, and explore more

*Honors Course – Student assignments are more in-depth, greater levels of thinking, increased independent work, and more challenging assessments.

RESOURCES (Websites, Blogs, Videos, Whiteboard Resources, etc.):
Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Textbook
Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Teacher Resources
Environmental Science Interactive Website www.cengagebrain.com
History of the Harvest Video – Department Copy

RESOURCE SPECIFIC VOCABULARY: alley cropping, animal manure, aquaculture, artificial selection, chronic malnutrition, chronic undernutrition, commercial inorganic fertilizer, compost, conservation-tillage farming, contour farming, conventional-tillage farming, crop rotation, desertification, EPA, feedlot, fishery, food insecurity, food security, genetic engineering, genetically modified organism (GMO), green manure, green revolution, high-input agriculture, industrialized agriculture, integrated pest management (IPM), irrigation, malnutrition, no-till farming, organic agriculture, organic farming, organic fertilizer, overnutrition, perennial, pest, pesticide, plantation agriculture, polychlorinated biphenyls (PCBs), polyculture, salinization, saltwater life zones, soil, soil conservation, soil erosion, soil horizons, soil profile, strip-cropping, traditional intensive agriculture, traditional subsistence agriculture, undernutrition, waterlogging, windbreak

Wallenpaupack Area School District Curriculum	
COURSE: 9th Grade Science	GRADE/S: 9th
UNIT 6: Water Resources (Chapter 11 – Water Resources and Water Pollution)	TIMEFRAME: 7

PA COMMON CORE/PA SCIENCE STANDARDS:

3.2.10.A1: Predict properties of elements using trends of the periodic table.

Identify properties of matter that depend on sample size.

Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth.

3.3.10.A5: Explain how there is only one ocean.

Explain the processes of the hydrologic cycle.

Explain the dynamics of oceanic currents and their relationship to global circulation within the marine environment.

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

4.1.10.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.

4.2.10.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 policies 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 policies and regulations relating to water quality.

4.5.10.A: Explain how public policy encourages or discourages the sustainable use of natural resources.

Research laws and polices that address the sustainable use of natural resources (e.g., solid and liquid waste management, industry, agriculture and enterprise).

4.5.10.C: Analyze real-world data and explain how point and non-point source pollution can be detected and eliminated.

Compare and contrast the environmental effects of different industrial strategies.

4.5.12.D: Evaluate waste management practices.

Analyze current solid waste regulations.

Research the impact of new and emerging technologies in the use, reuse, recycling and disposal of materials.

Evaluate ways that waste could be reduced during the production of specific product.

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.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.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.J: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
CC.3.5.11-12.B: 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.
CC.3.5.11-12.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 11–12 texts and topics.
CC.3.5.11-12.I: 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.
CC.3.5.11-12.J: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.
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.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.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.
CC.3.6.11-12.C: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CC.3.6.11-12.E: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
CC.3.6.11-12.G: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
CC.3.6.11-12.H: Draw evidence from informational texts to support analysis, reflection, and research.

UNIT OBJECTIVES (SWBATS):
Students are expected to

- Explain how we are using available freshwater unsustainably by wasting it, polluting it, and underpricing this irreplaceable natural resource.
- Recognize that one of every six people does not have adequate access to clean water, and this situation will almost certainly get worse.
- Describe how groundwater used to supply cities and grow food is being pumped from aquifers in some areas faster than it is renewed by precipitation.
- Interpret how using dams, reservoirs, and water transfer projects to provide water to arid regions has increased water supplies in some areas but has disrupted ecosystems and displaced people.
- Recall how salty ocean water can be converted to freshwater, but the cost is high and the resulting large volume of salty brine must be disposed of without harming aquatic terrestrial ecosystems.
- Summarize how we can use freshwater more sustainably by cutting water waste, raising water prices, slowing population growth, and protecting aquifers, forests, and other ecosystems that store and release freshwater.
- Explain how we can lessen the threat of flooding by protecting more wetlands, and natural vegetation in watersheds, and by not building in areas subject to frequent flooding.
- Recognize that reducing water pollution requires that we prevent it, work with nature to treat sewage, cut resource use and waste, reduce poverty, and slow population growth.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

- Bell Ringers
- PowerPoints and Notes
- Worksheets
- Laboratory Activity – Water Pollution (Website)
- Small and Large Group Discussions – Ecological/Ethical Dilemmas, Troubled Water (Video)
- Group Work – Fowl Water Laboratory

- Independent Work
- Written Assignments - Book Chapter Questions
- Projects and Presentations – Don't Pollute Our Waters, Is It In the Water?
- Current Event Activities

ANCHOR VOCABULARY: adhesion, cohesion, decomposer, non-point source pollution, point source pollution

ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):

- CDTS (Diagnostic)
- Formative Assessments
- Summative Assessments

EVIDENCE OF MASTERY/Cut Score:

- Formative Assessments score of 70% or better
- Summative Assessments score of 70% or better

DIFFERENTIATED INSTRUCTION (Remediation/Extension) (Process, Product or Content)
Struggling Student – Remediation
Teacher /student individualized instruction to include...

- typed notes
- guided questions
- textbook interactive flashcards
- textbook review and tutorial quizzes
- animations and videos

Advanced Student – Extension
Teacher /student individualized instruction to include...

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- specialized projects
- enrichment topics found in the textbook chapters in "What can you do"…sections, frontier research, green careers, and explore more

*Honors Course – Student assignments are more in-depth, greater levels of thinking, increased independent work, and more challenging assessments.

RESOURCES (Websites, Blogs, Videos, Whiteboard Resources, etc.):
Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Textbook
Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Teacher Resources
Environmental Science Interactive Website www.cengagebrain.com
Water Pollution Dry Laboratory http://water.epa.gov/polwaste/nps/kids/
Is It In the Water? http://who.int/en/ and http://www.cdc.gov/
Troubled Water Video – Department Copy

RESOURCE SPECIFIC VOCABULARY: aquifer, cultural eutrophication, dam, desalination, drainage basin, drought, eutrophication, floodplain, freshwater, groundwater, nonpoint source, point source, primary sewage treatment, reliable surface runoff, reservoir, secondary sewage treatment, septic tank, subsidence, surface runoff, surface water, virtual water, water footprint, water pollution, water table, zone of saturation

Wallenpaupack Area School District Curriculum	
COURSE: 9th Grade Science	GRADE/S: 9th
UNIT 7: Renewable and Nonrenewable Resources (Chapter 12 – Geology and Nonrenewable Minerals and Chapter 13 - Energy)	TIMEFRAME: 12

PA COMMON CORE/PA SCIENCE STANDARDS:

3.1.12.A8: CHANGE AND CONSTANCY: Describe and interpret dynamic changes in stable systems.

3.2.12.A2: Distinguish among the isotopic forms of elements.

Explain the probabilistic nature of radioactive decay based on subatomic rearrangement in the atomic nucleus.

Explain how light is absorbed or emitted by electron orbital transitions.

3.3.10.A1: Relate plate tectonics to both slow and rapid changes in the earth's surface.

Describe the rock cycle and the processes that are responsible for the formation of igneous, sedimentary, and metamorphic rocks.

Relate geochemical cycles to the conservation of matter.

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 of energy.

3.3.10.A7: SCALE/MODELS: Interpret and create models of the Earth's physical features in various mapping representations. .CONSTANCY AND CHANGE: Relate constancy and change to the hydrologic and geochemical cycles. SCALE: Apply an appropriate scale to illustrate major events throughout geologic time. CONSTANCY/CHANGE:Describe factors that contribute to global climate change.

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.

3.4.12.E3: Compare and contrast energy and power systems as they relate to pollution, renewable and non-renewable resources, and conservation.

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

4.3.10.A: Evaluate factors affecting the use of natural resources.

Evaluate the effect of consumer demands on the use of natural resources.

Analyze how technologies such as modern mining, harvesting, and transportation equipment affect the use of our natural resources.

Describe how local and state agencies manage natural resources.

4.3.10.B: Analyze how humans manage and distribute natural resources.

Describe the use of a natural resource with an emphasis on the environmental consequences of extracting, processing, transporting, using, and disposing of it.

Analyze the impact of technology on the management, distribution, and disposal of natural resources.

4.3.10.C: 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.

4.3.12.A: Evaluate the advantages and disadvantages of using renewable and nonrenewable resources.

Explain how consumption rate affects the sustainability of resource use.

Evaluate the advantages and disadvantages of using renewable resources such as solar power, wind power, and biofuels.

4.5.10.A: Explain how public policy encourages or discourages the sustainable use of natural resources.

Research laws and polices that address the sustainable use of natural resources (e.g., solid and liquid waste management, industry, agriculture and enterprise).

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.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.J: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

CC.3.5.11-12.B: 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.

CC.3.5.11-12.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 11–12 texts and topics.

CC.3.5.11-12.G: 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.

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style are appropriate to task, purpose, and audience.
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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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CC.3.6.11-12.H: Draw evidence from informational texts to support analysis, reflection, and research.

UNIT OBJECTIVES (SWBATS):
Students are expected to

- Examine dynamic processes that move matter within the earth and on its surface, and can cause volcanic eruptions, earthquakes, tsunamis, erosion, and landslides.
- Compare and contrast the three major types of rock found in the earth's crust – sedimentary, igneous, and metamorphic – are recycled very slowly by the processes of erosion, melting, ad metamorphism.
- Evaluate how we can make some minerals in the earth's crust into useful products, but extracting and using these resources can disturb the land, erode soils, produce large amounts of solid waste, and pollute the air, water, and soil.
- Recognize that all nonrenewable mineral resources exist in finite amounts, and as we get closer to depleting any mineral resources, the environmental impacts of extracting it generally becomes more harmful.
- Predict that raising the price of a scarce mineral resource can lead to an increase in its supply, and the environmental limits to this effect.
- Research substitutes for scarce resources, reduce resource waste, and recycle and reuse minerals.
- Recognize that energy resources vary greatly in their net energy yields, the amount of high-quality energy available from each resource minus the amount of energy needed to make it available.

- Identify that oil, natural gas, and coal are currently abundant and relatively inexpensive, and explain that using them causes air and water pollution, degrades large areas of land, and releases greenhouse gases to the atmosphere.
- Research nuclear power has a low environmental impact and a very low accident risk, though its use has been limited by high costs, fear of accidents, long-lived radioactive wastes, and the potential for spreading nuclear weapons technology.
- Recall improving energy efficiency could save the world at least a third of the energy it uses, and it could save the United States up to 43% of the energy it uses.
- Explain how using a mix of renewable energy resources— especially sunlight, wind, flowing water, sustainable biomass, and geothermal energy—can drastically reduce pollution, greenhouse gas emissions, and biodiversity losses.
- Evaluate that we can make the transition to a more sustainable energy future by greatly improving energy efficiency, depending more on a mix of renewable energy resources, and including the environmental costs of energy resources in their market prices.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

- Bell Ringers
- PowerPoints and Notes
- Worksheets
- Laboratory Activity
- Small and Large Group Discussions – Green Energy Video
- Group Work
- Independent Work – Energy Information Administration (Website), Cow Power (Website)
- Written Assignments - Book Chapter Questions
- Projects and Presentations – Compare and Contrast Renewable and Nonrenewable Resources
- Current Event Activities

ANCHOR VOCABULARY: biofuels, convection, electricity, geology, igneous, metamorphic, rock cycle, lithosphere, nanotechnology, natural resources, nonrenewable resources, nuclear processes, nuclear reactions, renewable resource, sedimentary

ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):

- CDTS (Diagnostic)
- Formative Assessments
- Summative Assessments

EVIDENCE OF MASTERY/Cut Score:

- Formative Assessments score of 70% or better
- Summative Assessments score of 70% or better

DIFFERENTIATED INSTRUCTION (Remediation/Extension) (Process, Product or Content)
Struggling Student – Remediation
Teacher /student individualized instruction to include...

- typed notes
- guided questions
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Advanced Student – Extension
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Environmental Science Interactive Website www.cengagebrain.com
Energy Information Administration http://www.eia.gov
Cow Power http://www.cowpowerinc.com
Green Energy Video – Department Copy

RESOURCE SPECIFIC VOCABULARY: active solar heating system, area strip mining, asthenosphere, biofuel, coal, coal gasification, coal liquefactions, cogeneration, combined heating and power (CHIP), combined heat and power (CHP) production, contour strip mining, core, crude oil, crust, earthquake, energy efficiency, erosion, fossil fuel, fracking, geology, geothermal energy, high-grade ore, hydraulic fracturing, igneous rock, liquefied natural gas (LNG), liquefied petroleum gas (LPG), lithosphere, low-grade ore, mantle, metamorphic rock, mineral, mineral resource, mountaintop removal mining, nanotechnology, natural gas, net energy yield, nuclear fuel cycle, nuclear fusion, oil sand, open-pit mining, ore, overburden, passive solar heating system, peak production, petrochemicals, petroleum, photovoltaic (PV) cell, radioactive waste, reserves, rock, rock cycle, sedimentary rock, shale oil, smelting, solar cell, spoils, strip-mining, subsurface mining, surface mining, tailings, tar sand, tectonic plates, transform fault, tsunami, volcano, wind farm

Wallenpaupack Area School District Curriculum	
COURSE: 9th Grade Science	GRADE/S: 9th
UNIT 8: Environmental Health (Chapter 14 – Environmental Hazards and Human Health and Chapter 15 – Air Pollution, Climate Disruption, and Ozone Depletion)	TIMEFRAME: 12

PA COMMON CORE/PA SCIENCE STANDARDS:

3.3.10.A4: Relate geochemical cycles to conservation of matter.

Explain how the Earth's systems and its various cycles are driven by energy.

3.3.10.A7: SCALE/MODELS: Interpret and create models of the Earth's physical features in various mapping representations. .CONSTANCY AND CHANGE: Relate constancy and change to the hydrologic and geochemical cycles. SCALE: Apply an appropriate scale to illustrate major events throughout geologic time. CONSTANCY/CHANGE: Describe factors that contribute to global climate change.

4.1.12.B: Research solutions to problems caused by interrupting natural cycles.

4.5.10.A: Explain how public policy encourages or discourages the sustainable use of natural resources.

Research laws and polices that address the sustainable use of natural resources (e.g., solid and liquid waste management, industry, agriculture and enterprise).

4.5.10.E: Describe the impact of occupational exposure to pollutants.

Analyze laws and regulations designed to protect human health.

Analyze efforts to prevent, control, and/or reduce pollution through cost and benefit analysis and risk management.

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CC.3.6.11-12.H: Draw evidence from informational texts to support analysis, reflection, and research.

UNIT OBJECTIVES (SWBATS):
Students are expected to

- Identify how we face health hazards from biological, chemical, physical, and cultural factors, and from the lifestyle choices we make.
- Research the most serious biological hazards we face are infectious diseases such as flu, AIDS, tuberculosis, diarrheal diseases, and malaria.
- Conclude that there is growing concern about chemicals in the environment that can cause cancers and birth defects, and disrupt the human immune, nervous, and endocrine systems.
- Recognize that scientists use live laboratory animals, case reports of poisonings, and epidemiological studies to estimate the toxicity of chemicals, but these methods have limitations.
- Examine that many health scientists call for much greater emphasis on pollution

prevention to reduce our exposure to potentially harmful chemicals.

- Recognize that we can reduce the major risks we face by becoming informed, thinking critically about risks, and making careful choices
- Compare and contrast the two innermost layers of the atmosphere are the troposphere, which supports life, and the stratosphere, which contains the protective ozone layer.
- Explain the three major outdoor air pollution problems are *industrial smog* primarily from burning coal, *photochemical smog* from motor vehicle and industrial emissions, and *acid deposition* from coal burning and motor vehicle exhaust.
- Identify that the most threatening indoor air pollutants are smoke and soot from wood and coal fires (mostly in less developed countries), cigarette smoke, and chemicals used in building materials and cleaning products.
- Infer legal, economic, and technological tools can help us to clean up air pollution, but the best solution is to prevent it.
- Conclude that considerable scientific evidence indicates that the earth's atmosphere is warming because of a combination of natural effects and human activities, and that this warming is likely to lead to significant climate disruption during this century.
- Summarize that the projected rapid change in the atmosphere's temperature could have severe and long-lasting consequences, including increased drought and flooding, rising sea levels, and shifts in the locations of croplands and wildlife habitats.
- Evaluate how we can reduce greenhouse gas emissions and the threat of climate disruption while saving money and improving human health if we cut energy waste and rely more on cleaner renewable energy resources.
- Identify how widespread use of certain chemicals has reduced ozone levels in the stratosphere, which has allowed more harmful ultraviolet radiation to reach the earth's surface.
- Recognize that to reverse ozone depletion, we must stop producing ozone-depleting chemicals and adhere to the international treaties that ban such chemicals.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

- Bell Ringers
- PowerPoints and Notes
- Worksheets
- Laboratory Activity
- Small and Large Group Discussions
- Group Work – Dust Busters (Website)
- Independent Work – Smog City (Website)
- Written Assignments - Book Chapter Questions
- Projects and Presentations
- Current Event Activities

ANCHOR VOCABULARY: atmosphere, mitigation, risk management, technology

ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):

- CDTS (Diagnostic)
- Formative Assessments
- Summative Assessments

EVIDENCE OF MASTERY/Cut Score:

- Formative Assessments score of 70% or better

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Environmental Science 2014 by G. Tyler Miller and Scott E. Spoolman Teacher Resources
Environmental Science Interactive Website www.cengagebrain.com
Dust Busters http://epa.gov
Smog City http://smogcity.com

RESOURCE SPECIFIC VOCABULARY: acid deposition, acid rain, air pollution, bacteria, buffer, carbon capture and storage (CCS), carbon oxides, carcinogen, chlorofluorocarbons (CFCs), climate change tipping point, dose, dose-response curve, epidemiology, global warming, industrial smog, infectious disease, inversion, median lethal dose (LD50), mutagen, nitrogen dioxide, nitrogen oxides, nontransmissible disease, ozone, ozone depletion, ozone layer, particulates, pathogen, photochemical smog, probability, response, risk, risk analysis, risk assessment, risk communication, risk management, secondary pollutant, stratosphere, sulfur dioxide, sulfuric acid, temperature inversion, teratogen, toxic chemical, toxicity, toxicology, transmissible disease, troposphere, virus, volatile organic compounds (VOCs)

Wallenpaupack Area School District Curriculum	
COURSE: 9th Grade	GRADE/S: 9
UNIT Lake Trip: Lake Wallenpaupack Watershed Trip	TIMEFRAME: 5

PA COMMON CORE/PA SCIENCE STANDARDS:

3.1.10.A3: Compare and contrast the life cycles of different organisms.

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.

4.2.10.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 policies 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 policies and regulations relating to water quality.

4.5.10.C: Analyze real-world data and explain how point and non-point source pollution can be detected and eliminated.

Compare and contrast the environmental effects of different industrial strategies.

4.5.12.D: Evaluate waste management practices.

Analyze current solid waste regulations.

Research the impact of new and emerging technologies in the use, reuse, recycling and disposal of materials.

Evaluate ways that waste could be reduced during the production of specific product.

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.

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CC.3.6.11-12.H: Draw evidence from informational texts to support analysis, reflection, and research.

UNIT OBJECTIVES (SWBATS):
Students are expected to

- Test water quality.
- Identify macro-invertebrates.
- Monitor lake water quality.
- Compare and identify wetland soil samples.
- Collect and classify micro-invertebrates.
- Learn about the economic impact of the lake.
- Understand the importance of lake quality to the local economy.
- Analyze best watershed management practices.
- Observe a hydroelectric plant.
- Use equipment to perform basic limnology techniques.
- Measure the quality of the lake through the use of equipment.
- Make inferences in the quality of the lake through the collection and interpretation of individually collected data.
- Perform population sampling and classify organisms.

INSTRUCTIONAL STRATEGIES/ACTIVITIES:

- Bell Ringers
- PowerPoints and Notes
- Worksheets – Wallenpaupack HS Sewage Treatment Plant/Septic System, Lake Trip Crossword #1, Lake Trip Crossword #2
- Laboratory Activity – Hands on Stations
- Small and Large Group Discussions
- Group Work – Lake Trip Jeopardy Review Questions
- Independent Work – Prior Packet Activities, Hydroelectric Dams, Activity 3 Make Up Assignment on Rivers, Streams, and Aquatic Macro Invertebrates , Activity 3 Make Up Assignment on Sampling of Water Quality
- Written Assignments – Thank You Letter Assignment, Explanatory Letter Assignment
- Projects and Presentations – Lake Wallenpaupack Trip Project
- Current Event Activities

ANCHOR VOCABULARY: abiotic, agriculture, best management practices, biodiversity, biotic, buffer zone, ecosystem, electricity, environment, habitat, hydrologic cycle, non-point source pollution, species, organism, point source pollution, technology, water cycle, watershed, wetlands

ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):

- CDTS (Diagnostic)
- Formative Assessments
- Summative Assessments

EVIDENCE OF MASTERY/Cut Score (Keystone Exam):

- Formative Assessments score of 70% or better
- Summative Assessments score of 70% or better

DIFFERENTIATED INSTRUCTION (Remediation/Extension) (Process, Product or Content)

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RESOURCES (Websites, Blogs, Videos, Whiteboard Resources, etc.):
Lake Wallenpaupack: A Resource Worth Protecting Student Activity Packet
Lake Trip Study Guide
Sewage Treatment Plant PowerPoint Note Taking
Lake Trip Speakers
Lake Trip Tests – Modified, CP, Honors

RESOURCE SPECIFIC VOCABULARY: acid, algae, aquatic ecosystem, base, biochemical oxygen demand (BOD), biomagnification, canopy, carnivore, detention, detritus, detrivore, dissolved oxygen, dissolved oxygen/temperature meter, Eckman dredge, effluent, electrofishing, embeddedness, emergent plants, epilimnion, eutrophication, evaporation, floating plants, ground water, habitat, headwaters, herbivore, hydric soils, hydrology, hydrophytic plants, hydroelectric power, hypolimnion, influent, macroinvertebrate, meanders, multi-depth water sampler, mosses, pathogenic bacteria, percolation, pH, pH test kit, phytoplankton, plankton net, point source, pollution, pool, precipitation, primary sewage treatment, nonpoint source, reservoir, retention, riffle, riprap, run, secchi disk, secondary sewage treatment, submergent plants, substrate, tertiary sewage treatment, thermometer, thermal stratification, thermocline, watershed, watershed management, wetland, zooplankton