|  |
| --- |
| **Unit Overview Template** |
| **Content Area:** Science  |
| **Unit Title:** Cycles |
| **Target Course/Grade Level:**  Environmental Science/grade 12 |
| **Unit Summary:** Students learn how the sun, water cycle, carbon/oxygen cycle and nutrient cycle provide essential elements for life as we know it on earth. |
| **Primary interdisciplinary connections:** Art, Math, Chemistry |
| **21st century themes:** Global Awareness |
| **Unit Rationale:** Cycles continue to support life on Earth and man is interrupting the natural cycles’ normal pathways.  |
| **Learning Targets** |
| **Standards:** **5.1.12.A** Understand Scientific Explanations **5.2.12.A** Properties of Matter**5.4.12.G** Biogeochemical Cycles**9.1.12.A** Critical Thinking and Problem Solving |
| **Content Statements:*** Mathematical, computational and physical tools are used to search for and explain core scientific concepts and principles.
* Revisions of predictions and explanations are based on systematic observations, accurate measurements, and structured data/evidence.
* Acids and bases are important in numerous chemical processes that occur around us, from industrial to biological processes, from the laboratory to the environment.
* Earth is a system in which chemical elements exist in fixed amounts and move through the solid Earth, oceans, atmosphere and living things as part of geochemical cycles.
* The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
 |
| **CPI #** |  **Cumulative Progress Indicator (CPI)** |
| 5.1.12.A.1 | Refine interrelationships among patterns of evidence |
| 5.1.12.A.3 | Use scientific principles and theories to build and refine standards for data collection, posing controls and presenting evidence |
| 5.2.12.A.6 | Relate the pH scale to the concentrations of various acids and bases.  |
| 5.3.12.G.7 | Relate information to detailed models of the hydrologic, carbon, nitrogen, phosphorus, sulfur, and oxygen cycles, identifying major sources, sinks, fluxes, and residence times.  |
| 9.1.12.A.1 | Apply critical thinking and problem-solving strategies during structured learning experiences.  |
|  |  |
|  |  |
| **Unit Essential Questions*** How can acids and bases be neutralized?
* How can we balance the cycles?
 | **Unit Enduring Understandings*** Small changes in an environment can have large consequences.
* All natural cycles should be balanced.
 |
|  |  |
| **Unit Learning Targets***Students will ...** Identify the parts of 3different natural cycles of earth.
* Differentiate between an acid and base in relationship to the pH scale.
* Collect and identify particulate pollution.
* Collect and analyze the pH of rain water.
 |
| **Evidence of Learning** |
| **Summative Assessment (4 weeks):**Water cycle poster, acid rain cartoon, carbon/oxygen game. Lab activities: pH “soup” lab which includes mapping the acid rain figures on a Haddon Township map, collection and analysis of particulates in Petri dishes. |
| **Equipment needed:** Colored pencils and markers; universal indicator charts, rain collection dishes or vials, laminated Haddon Township map, plastic Petri dishes, petroleum jelly; textbooks and online materials |
| **Teacher Resources:** Holt McDougal *Environmental Science* by Heithaus & Arms, 2013; ancillary materials |
| **Formative Assessments:**Warm-up questions, quizzes, test |

|  |
| --- |
| **Unit Overview Template** |
| **Content Area:** Science |
| **Unit Title:** Adaptations |
| **Target Course/Grade Level:** Environmental Science/grade 12 |
| **Unit Summary** Students use tectonic plate models to understand how land masses move. They research how changing the environment changes the species that can survive in an area. Students will look at several kinds of evidence for evolution. They will research a specific pre-human species**.** |
| **Primary interdisciplinary connections:** Math, Art, Social Studies |
| **21st century themes:** Global Awareness |
| **Unit Rationale** Students should understand the connection between our natural cycles and the conditions of resources on Earth today. |
| **Learning Targets** |
| **Standards** **5.1.12.B** Generate Scientific Evidence Through Active Investigations**5.1.12.C** Reflect on Scientific Knowledge**5.4.12.B** History of Earth**5.4.12.D** Tectonics |
| **Content Statements:** * Empirical evidence is used to construct and defend arguments.
* Data and refined models are used to revise predictions and explanations.
* Absolute dating, using radioactive isotopes on rocks, makes it possible to determine how many years ago a given rock sample formed.
* Convection currents in the upper mantle drive plate motion. Plates are pushed apart at spreading zones and pulled down into the crust at subduction zones.
 |
| **CPI #** |  **Cumulative Progress Indicator (CPI)** |
| 5.1.12.B.3 | Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models and theories.  |
| 5.1.12.C.2 | Use data representations and new models to revise predictions and explanations.  |
| 5.4.12.B.3 | Account for the evolution of species by citing specific absolute-dating evidence of fossil samples. |
| 5.4.12D.1 | Explain the mechanisms for plate motions using earthquake data, mathematics, and conceptual models. |
|  |  |
|  |  |
|  |  |
| **Unit Essential Questions*** How did life as we know evolve on Earth?
* What is the evidence for evolution?
 | **Unit Enduring Understandings*** Species must adapt to their environments in order to survive.
* Species are continually evolving**.**
 |
| **Unit Learning Targets***Students will ...** Gain an understanding of geological time.
* Describe how landforms change.
* Compare DNA sequences to determine what a species is.
* Research and present an extinct species of human ancestry.
 |
| **Evidence of Learning** |
| **Summative Assessment** (3 weeks) Oral presentation, written presentation, and the timeline of existence of an extinct species of human ancestry.  |
| **Equipment needed:** Portable computers to run Plate Tectonics CD, library or computer with Internet access to research the extinct species, fossils, DNA sequencing charts; textbooks and online materials. |
| **Teacher Resources:** Holt McDougal *Environmental Science* by Heithaus & Arms, 2013; ancillary materials**Formative Assessments:**Warm-up questions, quizzes, test |

|  |
| --- |
| **Content Area**: Science |
| **Unit Title:** Populations, Food Webs and Ecosystems |
| **Target Course/Grade Level**: Environmental Science / grade 12 |
| **Unit Summary**Students learn about carrying capacity of different biomes by understanding food chains, food webs and energy pyramids**.** Students will examine major land biomes and food webs within each. Students will dissect a barn owl pellet to construct a food web based on findings in the pellet. |
| **Primary interdisciplinary connections:** Art, math, social studies |
| **21st century themes:** Global awareness |
| **Unit Rationale:** Organisms that live in an area are restricted to certain food choices and they must adapt when choices change. At present thehuman population is too large for Earth to properly carry without negative consequences. An understanding of carrying capacity and energy relationships will provide students with a conceptual model of Earth’s limits. |
| **Learning Targets** |
| **Standards****5.3.12.C** Interdependence**5.3.12.E** Evolution and Diversity |
| **Content Statements**:* Biological communities in ecosystems are based on stable interrelationships and interdependence of organisms.
* Stability in an ecosystem can be disrupted by natural or human interactions.
* Evolution occurs as a result of a combination of the following factors: ability of a species to reproduce; genetic variability of offspring due to mutation and recombination of genes; finite supply of the resources required for life.
 |
| **CPI #** |  **Cumulative Progress Indicator (CPI)** |
| 5.3.12.C.1 | Students will analyze the interrelationships and interdependence among different organisms, and explain how these relationships contribute to the stability of the ecosystem. |
| 5.3.12.C.2 | Model how natural and human- made changes in the environment will affect individual organisms and the dynamics of populations. |
| 5.3.12.E.4 | Account for the evolution of new species by citing specific evidence of biological mechanisms. |
|  |  |
|  |  |
|  |  |
|  |  |
| **Unit Essential Questions*** Why do organisms live where they do?
* What happens when an environment changes?
 | **Unit Enduring Understandings*** Nature is a complex web of relationships.
* Human activity can upset this web, and are responsible for the increase in the rate of extinction of species.
 |
| **Unit Learning Targets***Students will ...** Identify organisms based on mouth structure.
* Explain why an omnivore has the best chance of evolutionary survival.
* Diagram a complex food web.
 |
| **Evidence of Learning** |
| **Summative Assessment (**3 weeks): Owl pellet dissection, with completed prey skeleton, 2 graphs, and a food web diagram based on class data. Comparison of prey and biomass graphs, noting differences. |
| **Equipment needed:** owl pellets, dissection tools and tray, stereoscopic scopes, charts to identify bones; textbook and online materials |
| **Teacher Resources:** Holt McDougal *Environmental Science* by Heithaus & Arms, 2013; ancillary materials**Formative Assessments:**Warm-up questions, quizzes, test |

|  |
| --- |
| **Content Area:** Science |
| **Unit Title:** Energy |
| **Target Course/Grade Level:** Environmental Science/grade 12 |
| **Unit Summary:**The different forms of energy that humans use will be examined and compared. The feasibility and present use of alternative fuels will also be investigated. |
| **Primary interdisciplinary connections:** Social studies |
| **21st century themes:** Global Awareness |
| **Unit Rationale:** The Earth is showing the negative effects of long term usage of fossil fuels and humans must slow this reaction and impact. |
| **Learning Targets** |
| **Standards:** **5.1.12.C** Reflect on Scientific Knowledge **5.2.12.A** Properties of Matter**5.4.12.G** Biogeochemical Cycles**9.2.12.F** Civic Financial Responsibility |
| **Content Statements:*** Refinement of understandings, explanations, and models occurs as new evidence is incorporated.
* Data and refined models are used to revise predictions and explanations.
* Science is a practice in which an established body of knowledge is continually revised, refined, and extended as new evidence emerges.
* In a neutral atom, the positively charged nucleus is surrounded by the same number of negatively charged electrons. Atoms of an element whose nuclei have different numbers of neutrons are called isotopes.
* Natural and human activities impact the cycling of matter and flow of energy through ecosystems.
* Scientific, economic, and other data can assist in assessing environmental risks and benefits associated with societal activity.
* The potential for building and using personal wealth includes responsibility to the broader community and an understanding of the legal rights and responsibilities of being a good citizen.
 |
| **CPI #** |  **Cumulative Progress Indicator (CPI)** |
| 5.1.12.C.1 | Reflect on and revise understandings as new evidence emerges. |
| 5.1.12.C.2 | Use data representations and new models to revise predictions and explanations. |
| 5.1.12.C.3 | Consider alternative theories to interpret and evaluate evidence-based arguments. |
| 5.2.12.A.4 | Explain how the properties of isotopes, including half-lives, decay modes and nuclear resonances lead to useful applications of isotopes |
| 5.4.12.G.4 | Compare over time the impact of human activity on the cycling of matter and energy through ecosystems. |
| 5.4.12.G.6 | Assess (using scientific, economic, and other data) the potential environmental impact of large-scale adoption of emerging technologies (e.g. wind farming, harnessing geothermal energy). |
| 9.2.12.F.4 | Analyze how citizen decisions and actions can influence the use of economic resources to achieve societal goals and provide individual services.  |
| **Unit Essential Questions*** How do we presently reduce our CO2 emissions? Can we improve upon this?
* What is the long term effect of burning fossil fuels?
 | **Unit Enduring Understandings*** We live in a global society.
* Each of us has a responsibility to live as environmentally efficient as possible.
 |
| **Unit Learning Targets***Students will** Describe the forms of energy that humans have used to meet their needs since the beginning of the 20th century.
* Compare advantages and disadvantages of each source of energy.
* Distinguish between fossil fuels and alternative energy forms.
* Illustrate how a nuclear power plant works.
 |
| **Evidence of Learning** |
| **Summative Assessment (2 weeks):**Energy Research: Choose 2 forms of energy to meet ALL U.S. energy needs in the 21st century and compare advantages and disadvantages of each source of energy in a written report and Power Point presentation. |
| **Equipment needed:** Internet access for research and Power Point software; textbook and online materials. |
| **Teacher Resources:** Holt McDougal *Environmental Science* by Heithaus & Arms, 2013; ancillary materials**Formative Assessments:**Warm-up questions, quizzes, test |

|  |
| --- |
| **Content Area:** Science |
| **Unit Title:** Toxic and Solid Waste |
| **Target Course/Grade Level**: Environmental Science /grade 12 |
| **Unit Summary:**Society produces many forms of waste, and waste products should be disposed of properly. Landfills are still being used as a principle means to dispose of waste, but other forms are available. Alternatives should be explored, but society has a responsibility to question the pros and cons of these options.  |
| **Primary interdisciplinary connections:** economics, social studies |
| **21st century themes:** Global awareness |
| **Unit Rationale:** Disposing of waste is a growing problem worldwide. The negative impacts of improper waste disposal have already become evident. Producing less waste, recycling materials, and composting are just several ways by which humans can reduce waste problems. |
| **Learning Targets** |
| **Standards:** **5.4.12.G** Biogeochemical Cycles**9.2.12.F** Civic Financial Responsibility |
| **Content Statements:*** Movement of matter through Earth’s system is driven by Earth’s internal and external sources of energy and results in changes in the physical and chemical properties of the matter.
* Natural and human activities impact the cycling of matter and the flow of energy through ecosystems.
* Human activities have changed Earth’s land, oceans, and atmosphere, as well as its populations of plant and animal species.
* Scientific, economic and other data can assist in assessing environmental risks and benefits associated with societal activity.
* The potential for building and using personal wealth includes responsibility to the broader community and an understanding of the legal rights and responsibilities of being a good citizen.
 |
| **CPI #** |  **Cumulative Progress Indicator (CPI)** |
| 5.4.12.G.3 | Demonstrate using models, how internal and external sources of energy drive the hydrologic, carbon, nitrogen, phosphorous, sulfur and oxygen cycles. |
| 5.4.12.G.4 | Compare over time the impact of human activity on the cycling of matter through ecosystems |
| 5.4.12.G.5 | Assess (using maps, local planning documents, and historical records) how the natural environment has changed since humans have inhabited Earth |
| 5.4.12.G.6 | Assess (using scientific, economic, and other data) the potential environmental impact of large scale adoption of emerging technologies (e.g., wind farming, harnessing geothermal energy).  |
| 9.2.12.F.4 | Analyze how citizen decisions and actions can influence the use of economic resources to achieve societal goals and provide individual services. |
|  |  |
|  |  |
| **Unit Essential Questions*** How can we reduce the impact our waste has on Earth?
* How do we live with the toxins that are already present in the air, land and water?
 | **Unit Enduring Understandings*** We are each responsible for waste and we are therefore responsible for properly disposing of our waste.
* There are environmental hazards associated with landfills. Reducing, recycling, and composting waste materials can minimize our reliance on landfills.
 |
| **Unit Learning Targets***Students will ...** Identify at least one characteristic that makes a material biodegradable.
* Learn the necessary functions of a package.
* Describe how a modern landfill works.
* Name two environmental problems associated with landfills.
* Compare and contrast sanitary landfills and trash-to-steam plants.
* List alternatives to toxic chemicals.
* Identify several benefits to recycling and composting.

  |
| **Evidence of Learning** |
| **Summative Assessment (1 week):** Students record their trash for 1 week and categorize it by methods of disposal. They will identify ways that their trash could have been minimized, recycled or composted. As a result, they will critically examine a trashed package that they used and design a new, environmentally-friendly package.  |
| **Equipment needed:** Textbook and online materials |
| **Teacher Resources:** Holt McDougal *Environmental Science* by Heithaus & Arms, 2013; ancillary materials**Formative Assessments:**Warm-up questions, quizzes, test |

|  |
| --- |
| **Content Area:** Science |
| **Unit Title:** Ground Water |
| **Target Course/Grade Level:** Environmental Science/grade 12 |
| **Unit Summary** Students learn where their water originates, learn how to test for pollution, and debate methods to clean a polluted water source. |
| **Primary interdisciplinary connections:** Social studies |
| **21st century themes:** Global Awareness |
| **Unit Rationale:** Water is of utmost importance to our survival, but there is only a small percentage of clean, fresh water on Earth. It is easier to prevent groundwater pollution than to clean a source of water, like an aquifer. Unfortunately, pollution and misuse have caused fresh water to become one of our most threatened resources.  |
| **Learning Targets** |
| **Standards:** **5.4.12.G** Biogeochemical Cycles**9.1.12.A** Critical Thinking and Problem Solving**9.1.12.B** Creativity and Innovation**9.1.12.F** Accountability, Productivity, and Ethics |
| **Content Statements** * Natural and human-made chemicals circulate with water in the hydrologic cycle.
* Natural ecosystems provide an array of basic functions that affect humans. These functions include maintenance of the quality of the atmosphere, generation of soil, control of the hydrologic cycle, disposal of wastes, and recycling of nutrients.
* Natural and human activities impact the cycling of matter and flow of energy through ecosystems.
* Human activities have changed Earth’s land, oceans, and atmosphere, as well as its populations of plant and animal species.
* The ability to recognize a problem and apply critical thinking and problem-solving skills to solve the problem is a lifelong skill that develops over time.
* Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
* Ethical behaviors support human rights and dignity in all aspects of life.
 |
| **CPI #** |  **Cumulative Progress Indicator (CPI)** |
| 5.4.12. G.1 | Analyze and explain the sources and impact of a specific industry on a large body of water (e.g., Delaware or Chesapeake Bay).  |
| 5.4.12. G.2 | Explain the unintended consequences of harvesting natural resources from an ecosystem. |
| 5.4.12. G.4 | Compare over time the impact of human activity on the cycling of matter through ecosystems. |
| 5.4.12. G.5 | Assess (using maps, local planning documents, and historical records) how the natural environment has changed since humans have inhabited the region. |
| 9.1.12.A.1 | Apply critical thinking and problem-solving strategies during structured learning experiences.  |
| 9.1.12.B.2 | Create and respond to a feedback loop when problem solving.  |
| 9.1.12.F.2 | Demonstrate a positive work ethic in various settings, including the classroom and during structured learning experiences.  |
| **Unit Essential Questions*** Where does drinking water originate?
* How does drinking water become contaminated?
* In what ways can we clean drinking water?
 | **Unit Enduring Understandings*** Everything put onto or into the ground will eventually seep into the aquifers.
* Once an aquifer is contaminated it is impossible to clean it to its original pristine state.
 |
| **Unit Learning Targets***Students will ...** Predict and observe how liquids move through solids.
* Explain why fresh water is one of Earth’s limited resources.
* Describe the relationship between groundwater and surface water in a watershed.
* Explain how water is treated so that it can be used for drinking purposes.
* Identify five ways that water can be conserved.
* Explain why groundwater pollution is difficult to clean up.
* Analyze a pollution problem and choose a clean-up method.
 |
| **Evidence of Learning** |
| **Summative Assessment (2 weeks):** Fruitvale lab activity: assess the aquifer design of the town of Fruitvale, determine the location and cause of water pollution of the town’s water source, select a viable clean-up method. Draw a map and present data table of well testing results; analyze results and suggest solutions by answering lab questions. Newton Creek lab activity: test the abiotic qualities of Newton Creek and compare the results to those of another water source to determine water quality. Report results and answer analysis questions.  |
| **Equipment needed:** CEPUP kit FRUITVALE, town maps, graduated cylinders; Hach water testing kits; textbook and online materials |
| **Teacher Resources:** CEPUP kit answer keys; Holt McDougal *Environmental Science* by Heithaus & Arms, 2013; ancillary materials**Formative Assessments:**Warm-up questions, quizzes, test |

|  |
| --- |
| **Content Area:** Science |
| **Unit Title:** New Jersey Pinelands and Tidal Marshes  |
| **Target Course/Grade Level:** Environmental Science/ grade 12 |
| **Unit Summary:** The Pinelands Preserve of New Jersey, the country’s first preserve and only a half hour drive away, and tidal marshes of New Jersey are investigated. There is a unique history behind the Pinelands and the area is managed by a comprehensive usage plan. There are plants and animals there that live nowhere else. In addition, there are plants and animals with special characteristics to allow them to live in the different tidal zones of New Jersey’s fresh and salt water tidal marshes.  |
| **Primary interdisciplinary connections:** Social studies |
| **21st century themes:** Global Awareness |
| **Unit Rationale:**New Jersey needs advocates to help preserve the Pinelands and tidal marshes, since these habitats perform many environmental functions and support many plant and animal species. Sadly, pollution, development, and overuse threaten these ecosystems if not managed properly.  |
| **Learning Targets** |
| **Standards:** **5.3.12.C** Interdependence**9.1.12.B** Creativity and Innovation |
| **Content Statements:** * Biological communities in ecosystems are based on stable interrelationships and interdependence of organisms.
* Stability in an ecosystem can be disrupted by natural or human interactions.
* Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
 |
| **CPI #** |  **Cumulative Progress Indicator (CPI)** |
| 5.3.12.C.1 | Analyze the interrelationships and interdependencies among different organisms and explain how these interrelationships contribute to the stability of the ecosystem |
| 5.3.12.C.2 | Model how natural and human-made changes in the environment will affect individual organisms and the dynamics of populations. |
| 9.1.12.B.1 | Present resources and data in a format that effectively communicates the meaning of the data and its implications for solving problems, using multiple perspectives.  |
|  |  |
|  |  |
|  |  |
|  |  |
| **Unit Essential Questions*** Why is a tidal marsh so productive?
* Why should we preserve the marsh?
* What is the Pinelands Preserve? What qualities make the Preserve so special?
 | **Unit Enduring Understandings*** Most of the productivity of the marsh occurs beneath the surface of the water.
* Many species, particularly migrating shorebirds, need the marshes to survive.
* The Pinelands is unique at this latitude.
* The Pinelands is dependent on the Cohansey Aquifer.
 |
| **Unit Learning Targets***Students will ...** Describe the cycle of tides.
* Describe the factors that determine where an organism lives in an aquatic ecosystem like a tidal marsh.
* Explain why an estuary is a very productive system.
* Identify the location of the Pinelands on a map of New Jersey.
* Identify at least one unique plant and one unique animal species that live in one of the regions of the Pinelands.
 |
| **Evidence of Learning** |
| **Summative Assessment (X days)**:Create New Jersey travel brochures that entice vacationers and travelers to visit our state in order to experience the Pinelands and tidal marshes found here.  |
| **Equipment needed:** Internet access for research, colored pencils and markers, construction paper, maps; textbooks and online materials |
| **Teacher Resources:** DVD on the Pinelands, brochure grading rubric; Holt McDougal *Environmental Science* by Heithaus & Arms, 2013; ancillary materials**Formative Assessments:**Warm-up questions, quizzes, bird migration game questions, test |