Earth Science **Designed by: Laura Charles and Cindy Klein**

To Be Taught in No Particular Order of Units

Atmosphere Unit: Layers of the Earth's Atmosphere, Weather & Climate

Brief Summary of Unit:

PRE-REQUISITE SKILLS: Basic graphing skills (X & Y axis and plot 2 variables) and general laboratory skills (measurement and utilization of basic science equipment), basic navigation on the internet for gathering research materials.

Once students have mastered the understanding the Atmosphere (gasses surrounding the Earth) is one of several interrelated spheres [Geosphere (surface and the entire mass of the Earth); Hydrosphere (water); Biosphere (plants & animals); Exosphere (space); and Anthrosphere (humans)], the students will be able to investigate the processes of the atmosphere and how the processes interrelate to other spheres.

The primary focus of this unit is to understand the processes of the atmosphere. The processes include: Layers of the atmosphere, heating & wind circulation patterns global & local) in the atmosphere, air pressure, water (humidity and precipitation) in the atmosphere, cloud formation, air masses, fronts, weather, severe weather (thunderstorms, hurricanes & tornadoes), forcasting weather, and climate, El Nino and La Nina.

BELOW LEVEL ACTIVITIES: If students are struggling with this material, differentiation of instruction could include use of fewer, more simplified vocabulary words and definitions; chunked content with notes outline; a simplified, graphic organizer for key concepts.

EXTENSION ACTIVITIES for advanced learners could include real data that would require more complex graphical representation and breakdown of data; more complex examples; more complex activities; and additional article research via scientific online resources.

Materials and Resources

- AGS – Earth Science (General Earth Science – modified curriculum for comprehension / reading struggling students)
- McDougal Littell Earth Science – General level textbook
- McDougal Littell Earth Science (Spaulding/Namowtz)- Academic level textbook

Materials necessary to complete the performance tasks:

- Internet Access
- Graphing paper
- Graphic organizers for illustrations
- Weather Cycler activity kits
- El Nino & La Nina activity kits
- Weather maps
- Weather bug program & data
- Models of cold and warm fronts
- Cloud image references - web or poster
- Heat transfer lab materials
- Unequal heating lab materials
- Cloud formation apparatus
- Cotton balls / construction paper / glue
- Heat lamps
- Hurricane tracking activity

ELIGIBLE CONTENT

- **S11.D.2.1.1 Analyze** how the **transfer of energy and substances** between Earth's atmosphere and its surface **influence regional or global weather or climate.**

Students will be able to use their learning independently to:

- **S11.D.2.1.1** Describe how changes in concentration of minor components (eg O2, CO2, dust, pollution) in Earth's atmosphere may be linked to climate change.
- **S11.D.2.1.2** Compare the transmission, reflection, absorption and radiation of solar energy to and by the Earth's surface under different environmental conditions (eg major volcanic eruptions greenhouse effect, reduction of ozone layer, increased global cloud cover).
- **S11:D.2.1.3** Explain weather patterns and seasonal changes using the concepts of heat and density.
- **S11.D.2.1.4** Analyze **weather maps and weather data** (eg air masses, fronts, temperature, air pressure, wind speed, wind direction, precipitation) to predict regional or global weather events.

Understandings	**Essential Questions**
• Greenhouse effect (pros & cons) • Effects of increased / decreased greenhouse gases • Effects of pollution on the climate (volcanic, factories, ozone) • Heat transfer processes • Local and global winds • Fronts, air masses & pressure areas • Weather map interpretation & forecasting • Effect of heat and humidity on air pressure • Climate Zones and major factors (elevation, water, latitude, wind direction, and ocean currents)	• How does the greenhouse effect influence Earth's temperatures? • How does the fluctuation of greenhouse gases affect Earth's temperatures? • How do volcanic eruptions, man-made pollutions & ozone effect the climate? • What affect does the atmosphere have on the radiation from the sun? • What are the driving forces of the local & global winds? • How do the conditions of air masses influence the formation of fronts and pressure areas (lows/highs)? • How does a weather map provide clues to predict weather? • How are climate zones influenced by elevation, water, latitude, wind direction and ocean currents?
Knowledge	**Skills**
• <u>Vocabulary:</u> Greenhouse effect, greenhouse gases, pollution, particulates, ozone, radiation, convection, conduction, transmission, reflection, refraction, absorptions, troposphere, stratosphere, mesosphere, thermosphere, ionosphere, exosphere, prevailing winds, trade winds, land / sea breezes, mountain / valley breezes, cold / warm/stationary fronts, continental polar, maritime tropical, high / low pressure systems, humidity, relative humidity, climate, climate zones Koppean Climate zones, precipitation, hurricanes, tornadoes, thunderstorms, blizzards, tropical storm, tropical depression, tropical disturbance, Fujita scale EF1-5, categories 1-5 hurricane.	• Forecast weather based on weather maps • Analyze global temperature effects from fluctuating greenhouse gases, pollution, and changes of ozone • Create then compare climatographs to climate zones • Create model of layers of the atmosphere indicating characteristics and temperature • Compare formation of precipitations (conditions of atmosphere) • Construct model of cloud formations • Diagram & illustrations of: global / local winds; fronts & pressures • Research of major climate zones (webquest format) • Compare impact of severe storms, tornadoes & hurricanes

Evidence of Understanding

Performance Tasks
• Written assessments: vocabulary quizzes, unit tests (with SAS questions), • Graphing: atmospheric layers altitude Vs temperature, climatographs • Illustrations of layers of the atmosphere, heat transfer, cloud formation, precipitation, low/high pressure, water cycle, warm/cold fronts, storm formation, weather forecasting, global/local winds • Laboratory sessions on: properties of air, modeling cloud form & precipitation, differential heat lab (surfaces & color), weather cycler, El Nino & La Nina, • Internet simulations: Weather bug achieve, severe weather webquest, climate webquest • Build models of: layers of atmosphere, cloud with cotton balls

Other Evidence of Understanding*

Assessment Measures	**Assessment Tasks**
• Bellringers • Correct/Incorrect model. • Laboratory reports • Simulation summaries. • Graphing	• Written assessments: vocabulary quizzes, unit tests (with SAS questions), • Graphing: atmospheric layers altitude Vs temperature, climatographs • Illustrations of layers of the atmosphere, heat transfer, cloud formation, precipitation, low/high pressure, water cycle, war /cold fronts, storm formation, weather forecasting, global / local winds • Laboratory sessions on: properties of air, modeling cloud form & precipitation, differential heat lab (surfaces & color), weather cycler, el Nino & La Nina, • Internet simulations: weather bug achieve, severe weather webquest, climate webquest • Build models of: layers of atmosphere, cloud with cotton balls,

*can be embedded into formative and summative assessments.

Integration of ELA Common Core Standards ***(The tasks below are meant to serve as sample activities regarding the integration of the standard listed. Related up-to-date material can be substituted)***

Reading/Writing in Science and Technical Subjects

CCSS.ELA-Literacy.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

- Students will read and analyze an article from an online science journal, regarding human activity that is thought to affect climate change. Students will write a one-two paragraph summary of the article, focusing only on two of the specific examples of evidence involving human activity and climate change.

CCSS.ELA-Literacy.RST.9-10.2 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.

- Students will read and analyze an article from an online science journal, regarding the dangers of introducing nonnative species into an ecosystem. Students will write a one page summary of the article, explaining what a nonnative species is and the effects they have on ecosystems when introduced.

CCSS.ELA-Literacy.RST.9-10.3 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.

CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.

- In an effort to further stress the difference between biotic and abiotic factors, students will complete an activity in which students, given a list of living and nonliving factors, will write a narrative explanation as to why each factor should be classified and "biotic" or "abiotic."

CCSS.ELA-Literacy.RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).

CCSS.ELA-Literacy.RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CCSS.ELA-Literacy.RST.9-10.7 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.

CCSS.ELA-Literacy.RST.9-10.8 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.

CCSS.ELA-Literacy.RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CCSS.ELA-Literacy.WHST.9-10.1 Write arguments focused on *discipline-specific content*.

CCSS.ELA-Literacy.WHST.9-10.1a 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.

CCSS.ELA-Literacy.WHST.9-10.1b 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.

CCSS.ELA-Literacy.WHST.9-10.1c 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.

CCSS.ELA-Literacy.WHST.9-10.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.1e Provide a concluding statement or section that follows from or supports the argument presented.

CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

CCSS.ELA-Literacy.WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

CCSS.ELA-Literacy.WHST.9-10.2b Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

CCSS.ELA-Literacy.WHST.9-10.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

CCSS.ELA-Literacy.WHST.9-10.2d Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

CCSS.ELA-Literacy.WHST.9-10.2e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.2f Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the

significance of the topic).
CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-Literacy.WHST.9-10.5 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.
CCSS.ELA-Literacy.WHST.9-10.6 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.
CCSS.ELA-Literacy.WHST.9-10.7 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.
CCSS.ELA-Literacy.WHST.9-10.8 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.
CCSS.ELA-Literacy.WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.
CCSS.ELA-Literacy.WHST.9-10.10 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.

Earth Science **Designed by: Laura Charles and Cindy Klein**

Ecology / Biosphere Unit: The Plants and Animals

Brief Summary of Unit:

PRE-REQUISITE SKILLS: Once students have mastered the understanding the Biosphere (plants & animals) is one of several interrelated spheres [Hydrosphere (water); Atmosphere (gases surrounding the Earth); Geosphere (surface and the entire mass of the Earth); Exosphere (space); and Anthrosphere (humans)], the students will be able to investigate the processes of the Biosphere and how the processes interrelate to other spheres.

The primary focus of this unit is to understand the processes of the biosphere. The processes include:

BELOW LEVEL ACTIVITIES: If students are struggling with this material, differentiation of instruction could include use of fewer, more simplified vocabulary words and definitions; chunked content with notes outline; a simplified, graphic organizer for key concepts.

EXTENSION ACTIVITIES for advanced learners could include real data that would require more complex graphical representation and breakdown of data; more complex examples; more complex activities; and additional article research via scientific online resources.

Materials and Resources

- AGS – Earth Science (General Earth Science – modified curriculum for comprehension / reading struggling students)
- McDougal Littell Earth Science – General level textbook
- McDougal Littell Earth Science (Spaulding/Namowtz)- Academic level textbook
- Project WET (Water Education for Teachers) – Curriculum & activity Guide
- The Watercourse Western Regional Environmental Education Council - Project WILD – Activity Guide
- Eugene Kutscher – Hands-On Environmental Science Activities Teacher's edition

Materials necessary to complete the performance tasks:

- Internet Access
- Graphing paper
- Graphic organizers for illustrations
- Activity kit: Wards Scientific - Biome Bag
- Activity kit: Wards Scientific - detergent & fertilizers as pollutants: Algae bloom
- Activity kit: Wards Scientific - Envirolab2: Geological chem - Carterville population explosion
- Activity kit: Wards Scientific - Ocean Wave demonstrator
- Activity kit: Wards Scientific – Chemical cycles in Biosphere DVD
- Activity kit: Science Kit - Wildfire Ecology Kit
- Activity kit: Science Kit – Predator and food chain bingo
- Activity kit: Science Kit – Into the forest food chain game
- Activity kit: Science Kit - Symbiosis Poster
- Activity kit: Science Kit – Global Warming science kits

ELIGIBLE CONTENT

- **S11.B.3.1** Use evidence or examples to explain the characteristics of and interactions within an ecosystem.

Students will be able to use their learning independently to:

- **S11.B.3.1.1** Explain the significance of diversity in ecosystems.
- **S11.B.3.1.2** Explain the biotic (i.e., plant, animal, and microbial communities) and abiotic (i.e., soil, air, temperature, and water) components of an ecosystem and their interaction.
- **S11.B.3.1.3** Describe how living organisms affect the survival of one another.
- **S11.B.3.1.4** Compare the similarities and differences in the major biomes (e.g., desert, tropical rain forest, temperate forest, coniferous forest, tundra) and the communities that inhabit them.
- **S11.B.3.1.5** Predict how limiting factors (e.g., physical, biological, chemical) can affect organisms.

Understandings	**Essential Questions**
• Energy flow, food chains, food pyramids, geo-biochemical cycles, levels of organization of the ecosystem including biomes, ecosystem interactions (symbiosis), ecosystem changes due to natural factors, populations.	• What are the levels of the food chain, food pyramids, levels of biosphere (biomes & population communities)? • How do the components of the food web and the geo-bio-chemical cycles interact? • How does the ecosystem change due to natural factors? • What is the effect of limiting factors on populations?
Knowledge	**Skills**
• Vocabulary: individual population, community, ecosystem, biome, biosphere, biotic & abiotic, carbon bonding, photosynthesis, respiration, nitrogen fixation, food chains, food webs, energy pyramids, herbivores, carnivores, omnivores, decomposers, trophic levels, predator, prey, competition, symbiosis, succession, parasitic, mutualism, commensalism, limiting factors, immigration, emigration, carrying capacity, threatened, endangered & extinct, biodiversity.	• Describe the levels of the food chain, food pyramids, levels of biosphere (biomes & population communities). • Compare the components of the food web and the geo-bio-chemical cycles interactions. • Compare the similarities and differences in the major biomes. • Predict how limiting factors affect organisms.

ELIGIBLE CONTENT

- **BIO.B.4.2** Describe interactions and relationships in an ecosystem**.**
- **BIO.B.4.2.1** Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).

Overarching Understandings:

- All organisms are linked through their relationships, interactions, and flow of energy through an ecosystem.

Understandings	**Essential Questions**
• Ecosystem relationships exist and energy flows through an ecosystem. • Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions.	• How does energy flow through an ecosystem? • How are food chains related to food webs? • Why is a pyramid used to represent energy flow in an ecosystem? • How do organisms interact with their environment and what are the effects of these interactions?
Knowledge	**Skills**
• <u>Vocabulary:</u> bioenergetics, ecosystem, energy pyramid, food chain, food web. • Energy drives the cycling of matter within and between systems. • Relationships in the ecosystem can be expressed through ecological pyramids. • Energy drives the cycling of matter within and between systems.	• Construct a food chain, food web, and energy pyramid for a given ecosystem (e.g. rainforest, tundra etc.) • Using an energy pyramid, illustrate how and why energy flows in an ecosystem. • Use data to develop mathematical models to describe the flow of matter and energy between organisms and the ecosystem. • Critique a given energy pyramid for possible errors or flaws, providing an improved version of the pyramid if applicable.

ELIGIBLE CONTENT

- **BIO.B.4.2** Describe interactions and relationships in an ecosystem.
- **BIO.B.4.2.2** Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).

Overarching Understandings:

- There are various biotic interactions and relationships in an ecosystem.

Understandings	**Essential Questions**
• Organisms obtain necessary resources through interdependent relationships with other organisms. • Competition among species is ultimately competition for the matter and energy needed for life.	• How do organisms compete for resources in the environment? • How does the predator/prey relationship stabilize the ecosystem? • What are the similarities and differences among the types of symbiosis?
Knowledge	**Skills**
• Vocabulary: abiotic, biotic, competition, ecosystem, predation, symbiosis, commensalism, mutualism, parasitism, neutralism, amensalism • Organisms compete for food, mates, habitat, etc. • Some organisms in ecosystems feed on others in predator/prey relationships. • Five forms of symbiosis include commensalism, mutualism, parasitism, neutralism, and amensalism	• Analyze the different causes of competition within an ecosystem. • Apply concepts about predator/prey relationship for a given ecosystem. • Describe examples of the five types of symbiosis in a given environment and hypothesize how these relationships evolved.

ELIGIBLE CONTENT

- **BIO.B.4.2** Describe interactions and relationships in an ecosystem.
- **BIO.B.4.2.3 Describe** how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle

Overarching Understandings:

- Matter is recycled within and between ecosystems.

Understandings	**Essential Questions**
• Biogeochemical cycles are interrelated within an ecosystem. • The elements that make up organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways.	• What are the means by which water, carbon, oxygen and nitrogen are cycled through the environment? • What is the importance of each cycle to the environment?
Knowledge	**Skills**
• <u>Vocabulary:</u> biochemical conversion, ecosystem, carbon cycle, nitrogen cycle, oxygen cycle, water cycle, biogeochemical factors, transpiration, evaporation, condensation • Matter moves through the following cycles: a. Water Cycle b. Carbon Cycle c. Nitrogen Cycle d. Oxygen Cycle	• Construct a diagram detailing the components of the ecosystem involved in the water cycle, carbon cycle, oxygen cycle and nitrogen cycle. • Describe the changes that occur within each cycle. • Provide evidence to support explanations of how elements and energy are conserved as they cycle through ecosystems. • Given a scenario, predict the consequences of changes to these cycles.

ELIGIBLE CONTENT

- **BIO.B.4.2** Describe interactions and relationships in an ecosystem.
- **BIO.B.4.2.4** Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).

Overarching Understandings:

- Humans and natural disturbances effect the environment.

Understandings	**Essential Questions**
• Humans depend on the living world for the resources and other benefits provided by biodiversity. • Human activity may have adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. • Sustaining biodiversity is essential to supporting and enhancing life on Earth by aiding humanity by preserving landscapes of recreational or inspirational value. • Anthropogenic changes (induced by human activity) in the environment can disrupt an ecosystem and threaten the survival of some species • Natural disturbances have the potential to disrupt the balance to an ecosystem.	• How do the activities of humans both positively and negatively affect the environment? • How do overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change affect the environment? • What factors influence climate change? • What is the impact of introducing nonnative species into an ecosystem? • How do fires affect an ecosystem? • What resiliency exists in an ecosystem to resist change?
Knowledge	**Skills**
• Vocabulary: habitat, environment, isolating mechanisms, nonnative species, succession, temperature, climate change, biological magnification, pollution, fires • Humans depend on the living world for the resources and other benefits provided by biodiversity. • Increasing use and misuse of resources leads to environmental degradation. • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. • Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	• Describe both the immediate and long term effects of human disturbances in specific environments. • Differentiate between primary and secondary succession • Identify contributing factors to climate change and how human activity attributes to the accumulation of greenhouse gases. • Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. • Design solutions for creating or maintaining the sustainability of local ecosystems.

ELIGIBLE CONTENT

- **BIO.B.4.2** Describe interactions and relationships in an ecosystem.
- **BIO.B.4.2.5** Describe the effects of limiting factors on population dynamics and potential species extinction.

Overarching Understandings:

- Limiting factors exert stresses on a population which can alter the population dynamics and potentially drive species extinctions.

Understandings	**Essential Questions**
• Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations that an ecosystem can support. • Living and nonliving resources are limited due to challenges such as predation, competition, and disease. • Demand always exceeds supply; therefore, competition will always be present and control populations.	• How and why do organisms interact with their environment and what are the effects of these interactions? • How can limiting factors lead to species extinction? • What is the difference between density-dependent and density-independent limiting factors?
Knowledge	**Skills**
• <u>Vocabulary:</u> Population, exponential growth, logistic growth, carrying capacity, limiting factor, competition, population density, geographic distribution, age structure, consumer, growth rate, death rate, density-dependent limiting factor, density-independent limiting factor, demographic transition, ecosystem, endemic species, extinction, habitat, predator, prey, population dynamics, producer • Several factors exist that can limit a population size; these factors may be density dependent or density independent.	• Interpret population growth charts and project future growth trends. • Identify limiting factors in specific environments and classify them as being density dependent or density independent. • Calculate population density in a given area. • Evaluate data to explain resource availability and other environmental factors that affect carrying capacity of ecosystems. • Plan and carry out investigations to make mathematical comparisons of the populations and bio diversities of two similar ecosystems at different scales.

Evidence of Understanding

Performance Tasks
• Written assessments: vocabulary quizzes, unit tests (with SAS questions), • Graphing: carrying capacity interpretation,climatographs • Illustrations of water cycle, carbon cycle, CO2-Oxygen cycle, nitrogen cycle, food web/food chains, levels of ecosystem organization, energy loss in trophic level pyramid. • Laboratory sessions on wildfire ecology, Biome Bags, Owl pellet lab • Internet simulations: Biotic & Abiotic • Build models of: food web/chain (into the woods)

Other Evidence of Understanding*

Assessment Measures	**Assessment Tasks**
• Bellringers • Correct/Incorrect model. • Laboratory reports • Simulation summaries.	• Written assessments: vocabulary quizzes, unit tests (with SAS questions), • Graphing: carrying capacity interpretation,climatographs • Illustrations of water cycle, carbon cycle, CO2-Oxygen cycle, nitrogen cycle, food web/food chains, levels of ecosystem organization, energy loss in trophic level pyramid. • Laboratory sessions on wildfire ecology, Biome Bags, Owl pellet lab • Internet simulations: Biotic & Abiotic • Build models of: food web/chain (into the woods)

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CCSS.ELA-Literacy.RST.9-10.2 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.

- Students will read and analyze an article from an online science journal, regarding the dangers of introducing nonnative species into an ecosystem. Students will write a one page summary of the article, explaining what a nonnative species is and the effects they have on ecosystems when introduced.

CCSS.ELA-Literacy.RST.9-10.3 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.

CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.

- In an effort to further stress the difference between biotic and abiotic factors, students will complete an activity in which students, given a list of living and nonliving factors, will write a narrative explanation as to why each factor should be classified and "biotic" or "abiotic."

CCSS.ELA-Literacy.RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force*, *friction*, *reaction force*, *energy*).

CCSS.ELA-Literacy.RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

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CCSS.ELA-Literacy.WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

CCSS.ELA-Literacy.WHST.9-10.2b Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

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CCSS.ELA-Literacy.WHST.9-10.8 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.
CCSS.ELA-Literacy.WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.
CCSS.ELA-Literacy.WHST.9-10.10 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.

Earth Science

Designed by: Cindy Klein & Laura Charles
(Luzerne IU framework)

Basic Chemistry

Brief Summary of Unit:

The primary focus of this unit is the development of understanding as related to the chemical basis of life. Classroom activities will begin with the concepts that all living and nonliving things are composed of matter and this matter is composed of atoms.

Through the development and use of models, students will be able to

- Relate the composition of atoms and molecules to chemical compounds through the various forms of bonds.
  Experiment with water to determine its unique properties that enable it to support life on Earth.

Extension activities for accelerated students:

- Research of articles related to topics discussed in class

Differentiation for the non-advanced students:

- Readings with text, study hall remediation, hands on skill to concrete main ideas

Materials and Resources

• AGS – Earth Science (General Earth Science – modified curriculum for comprehension / reading struggling students) • McDougal Littell Earth Science – General level textbook • McDougal Littell Earth Science (Spaulding/Namowtz)- Academic level textbook	Materials necessary to complete the performance tasks: • Periodic tables • Models / manipulatives - covalent bonding • Models / manipulatives – ionic bonding • Properties of water lab materials

ELIGIBLE CONTENT

- **BIO.A.2** The Chemical Basis for Life
- **BIO.A.2.2** Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, and molecules)

Overarching Understandings:

- The biomolecule structures of organisms enable life's functions.

Understandings	**Essential Questions**
• The role protons, neutrons and electrons play in an atomic model. • The actions at a subatomic level by which an isotope/radioisotope is formed as a function of atomic structure and its stability. • The differences and similarities between the various types of chemical bonding.	• What is the structural composition of an atom? • How are bonds formed in chemistry?
Knowledge	**Skills**
• Vocabulary: subatomic particles, isotopes, bonding. • The atomic number of an atom is the number of protons found in the nucleus. • Recognize the names and chemical symbols of the most common elements found in living organisms. (CHOPKNS café Mg) • Isotopes are two or more atoms with the same number of protons but different number of neutrons. If they are unstable and emit particles or energy in the form of radiation, they are called radioisotopes. • Hydrogen bonds are weak attractions between a hydrogen atom with a slight positive charge and another atom with a slight negative charge • A molecule is a chemical structure held together by covalent bonds. • Covalent bonds occur when electrons are shared between atoms. • Ionic bonds form when electrons are transferred between atoms creating oppositely charged ions. • Ionic bonds are the strongest bonds and most difficult to separate.	• Quantify the relationship between an element's atomic weight and atomic number. • Create models to explain the connection between subatomic particles, isotopes, and bonding. • Generate diagrams that describes a carbon atom's structure and its potential as a bonding agent. • Use molecular formulas when writing the products and reactants in a chemical equation.

ELIGIBLE CONTENT

- **BIO.A.2** The Chemical Basis for Life
- **BIO.A.2.1** Describe how the unique properties of water support life on Earth.
- **BIO.A.2.1.1** Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).

Overarching Understandings:

- The interaction of water with other objects or uncontrolled systems to evolve towards more stable states.
- Water supports life on Earth using the concepts of energy transfer, conservation of matter, and molecular bonding.

Understandings	**Essential Questions**
• Water has molecular characteristics that lead to its cohesive and adhesive properties. • The physical changes in water at a molecular level that causes it to evaporate. • The benefits of water to life as universal solvent.	• How do the properties of cohesion and adhesion in water support life? • How do the properties of water that characterize it as the universal solvent foster survival in living organisms?
Knowledge	**Skills**
• Vocabulary: evaporation, transpiration, cohesion, adhesion, polarity, solution, solute, solvent, mixtures, capillary action • Molecular structure of water. • Properties of water: solvent, buffer, polarity, high specific heat, density • Acids/Bases/pH Buffers (pH Scale) • Recognize and label a structural diagram of water.	• Compare and contrast cohesion and adhesion. • Explain why water is a polar molecule and how that makes it unique. • Compare and contrast an acidic and basic solution. • Differentiate between solute and solvent. • Relate the pH value of a substance to its alkalinity/acidity.

Evidence of Understanding

Performance Tasks
• Complete models, worksheets, manipulatives for bonding exercises • Laboratory lab activity testing for properties of water • Laboratory lab activity testing for pH • Project based assessment of students work as they complete powerpoint, poster boards, word art on topics from chemistry unit • Bell ringers or other post class writing assessments on topics discussed during class period.

Other Evidence of Understanding*

Assessment Measures	**Assessment Tasks**
• Rubric for assessing student work • Writing assignments • Student centered tasks -posters, projects, powerpoints, etc. • Student response to demonstrations • Check for completion of assign work • Completion of correctly built molecular model	• Analyze text readings for comprehension • Construct ball and stick models of all life molecules. (CHOPKNS café Mg) • Make conclusions regarding how temperature and pH affect quality of water • Understanding of key unit terms (atoms, molecules, ionic bonds, covalent bonds, adhesion, cohesion, pH, etc.)

*can be embedded into formative and summative assessments.

Integration of ELA Common Core Standards ***(The tasks below are meant to serve as sample activities regarding the integration of the standard listed. Related up-to-date material can be substituted)***

Reading/Writing in Science and Technical Subjects
CCSS.ELA-Literacy.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. CCSS.ELA-Literacy.RST.9-10.2 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. CCSS.ELA-Literacy.RST.9-10.3 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. CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. CCSS.ELA-Literacy.RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*). CCSS.ELA-Literacy.RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. CCSS.ELA-Literacy.RST.9-10.7 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. CCSS.ELA-Literacy.RST.9-10.8 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. CCSS.ELA-Literacy.RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. CCSS.ELA-Literacy.WHST.9-10.1 Write arguments focused on *discipline-specific content*. CCSS.ELA-Literacy.WHST.9-10.1a 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. CCSS.ELA-Literacy.WHST.9-10.1b 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. CCSS.ELA-Literacy.WHST.9-10.1c 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. CCSS.ELA-Literacy.WHST.9-10.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. CCSS.ELA-Literacy.WHST.9-10.1e Provide a concluding statement or section that follows from or supports the argument presented. CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. CCSS.ELA-Literacy.WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. CCSS.ELA-Literacy.WHST.9-10.2b Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. CCSS.ELA-Literacy.WHST.9-10.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. CCSS.ELA-Literacy.WHST.9-10.2d Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. CCSS.ELA-Literacy.WHST.9-10.2e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. CCSS.ELA-Literacy.WHST.9-10.2f Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic). CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. CCSS.ELA-Literacy.WHST.9-10.5 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. CCSS.ELA-Literacy.WHST.9-10.6 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.
CCSS.ELA-Literacy.WHST.9-10.7 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.
CCSS.ELA-Literacy.WHST.9-10.8 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.
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Earth Science **Designed by: Laura Charles and Cindy Klein (Luzerne IU framework)**

Ecology

Brief Summary of Unit:

PRE-REQUISITE SKILLS: Basic graphing skills (X & Y axis and plot 2 variables) and general laboratory skills (measurement and utilization of basic science equipment), basic navigation on the internet for gathering research materials.

Once students have mastered the understanding of the ecology of the biosphere (plants & animals) is one of several interrelated spheres the Hydrosphere (water) [Geosphere (surface and the entire mass of the Earth); Atmosphere (gasses surrounding the Earth); Exosphere (space); and Anthrosphere (humans)], the students will be able to investigate the processes of the hydrosphere and how the processes interrelate to other spheres.

Once students have mastered the biochemical aspects of the curriculum along with the levels of organization (cell, tissue, organ, organ system, organism) students are prepared to gain a firm understanding of ecology. The foci of this unit is to:

- Analyze the interactions amongst the biotic and abiotic factors of an ecosystem.
- Investigate the biogeochemical cycles and the interactions between organisms
- Cite evidence of human disturbances and natural disturbances that affect the environment.
- Describe various limiting factors and their effect on the ecosystem
- Examine the energy flow in an ecosystem

Differentiation for the non-advanced students:

- A simplified, graphic organizer representation of the ecological level
- Population activities using reduced numbers

Extension activities for accelerated students:

- Population activities with larger quantities of real data in regards to city, state, and country populations that would require more complex graphical representation and breakdown of data
- Create complex food web and energy pyramid
- More complex activities regarding biotic and abiotic factors and how they relate to one another
- Research a human or natural disturbance affecting the ecosystem in which you live
- Simplified food webs
- Graphic organizers for the biogeochemical cycles

Materials and Resources

- AGS – Earth Science (General Earth Science – modified curriculum for comprehension / reading struggling students)
- McDougal Littell Earth Science – General level textbook
- McDougal Littell Earth Science (Spaulding/Namowtz)- Academic level textbook
- Globe Fearon Pearson Learning Group - Environment and Ecology for Pennsylvania – Meeting the Standards
- The Watercourse Western Regional Environmental Education Council - Project WET (Water Education for Teachers) – Curriculum & activity Guide
- The Watercourse Western Regional Environmental Education Council - Project WILD – Activity Guide

Materials necessary to complete the performance tasks:

- Internet Access
- Graphing paper
- Graphic organizers for illustrations
- Activity kit: Wards Scientific - Biome Bag
- Activity kit: Wards Scientific - detergent & fertilizers as pollutants: Algae bloom
- Activity kit: Wards Scientific - Envirolab2: Geological chem - Carterville population explosion
- Activity kit: Wards Scientific - Ocean Wave demonstrator
- Activity kit: Wards Scientific – Chemical cycles in Biosphere DVD

• Eugene Kutscher – Hands-On Environmental Science Activities Teacher's edition	• Activity kit: Science Kit - Wildfire Ecology Kit • Activity kit: Science Kit – Predator and food chain bingo • Activity kit: Science Kit – Into the forest food chain game • Activity kit: Science Kit - Symbiosis Poster • Activity kit: Science Kit – Global Warming science kits

ELIGIBLE CONTENT

- **BIO.B.4.1** Describe ecological levels of organization in the biosphere.
- **BIO.B.4.1.1** Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
- **BIO.B.4.1.2** Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.

Overarching Understandings:

- There are multiple levels of ecological organization.
- There exists living and nonliving components of an ecosystem which contribute to its diversity.

Understandings	**Essential Questions**
• There are levels of organization that exist within an ecosystem that range from simple to complex. • Both living and nonliving components contribute to an ecosystem. • Aquatic and terrestrial ecosystems exist with their own characteristics.	• How are the ecological levels of organization arranged in terms of increasing complexity? • How are biotic and abiotic factors related in the environment? • How are aquatic and terrestrial ecosystems similar and different in terms of supporting life?
Knowledge	**Skills**
• Vocabulary: abiotic, aquatic, biotic, ecology, terrestrial, organism, population, community, ecosystem, biome, and biosphere • Biotic and abiotic factors that affect both aquatic and terrestrial ecosystems.	• Given a list of environmental factors, students will be able to distinguish between biotic and abiotic factors. • Construct a pyramid detailing the levels of organization in the biosphere. • Compare and contrast the components of various types of ecosystems.

ELIGIBLE CONTENT

- **BIO.B.4.2** Describe interactions and relationships in an ecosystem.
- **BIO.B.4.2.1** Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).

Overarching Understandings:

- All organisms are linked through their relationships, interactions, and flow of energy through an ecosystem.

Understandings	**Essential Questions**
• Ecosystem relationships exist and energy flows through an ecosystem. • Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions.	• How does energy flow through an ecosystem? • How are food chains related to food webs? • Why is a pyramid used to represent energy flow in an ecosystem? • How do organisms interact with their environment and what are the effects of these interactions?
• **Knowledge**	• **Skills**
• <u>Vocabulary:</u> bioenergetics, ecosystem, energy pyramid, food chain, food web. • The movement of energy through an ecosystem flows in one direction through food chains and food webs. • Relationships in the ecosystem can be expressed through ecological pyramids. • Energy drives the cycling of matter within and between systems.	• Construct a food chain, food web, and energy pyramid for a given ecosystem (e.g. rainforest, tundra etc.) • Using an energy pyramid, illustrate how and why energy flows in an ecosystem. • Use data to develop mathematical models to describe the flow of matter and energy between organisms and the ecosystem. • Critique a given energy pyramid for possible errors or flaws, providing an improved version of the pyramid if applicable.

ELIGIBLE CONTENT

- **BIO.B.4.2** Describe interactions and relationships in an ecosystem.
- **BIO.B.4.2.2** Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).

Overarching Understandings:

- There are various biotic interactions and relationships in an ecosystem.

Understandings	**Essential Questions**
• Organisms obtain necessary resources through interdependent relationships with other organisms. • Competition among species is ultimately competition for the matter and energy needed for life.	• How do organisms compete for resources in the environment? • How does the predator/prey relationship stabilize the ecosystem? • What are the similarities and differences among the types of symbiosis?
Knowledge	**Skills**
• Vocabulary: abiotic, biotic, competition, ecosystem, predation, symbiosis, commensalism, mutualism, parasitism, neutralism, amensalism • Organisms compete for food, mates, habitat, etc. • Some organisms in ecosystems feed on others in predator/prey relationships. • Five forms of symbiosis include commensalism, mutualism, parasitism, neutralism, and amensalism	• Analyze the different causes of competition within an ecosystem. • Apply concepts about predator/prey relationship for a given ecosystem. • Describe examples of the five types of symbiosis in a given environment and hypothesize how these relationships evolved.

ELIGIBLE CONTENT
BIO.B.4.2 Describe interactions and relationships in an ecosystem.
BIO.B.4.2.3 Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).

Overarching Understandings:
- Matter is recycled within and between ecosystems

Understandings	**Essential Questions**
• Biogeochemical cycles are interrelated within an ecosystem. • The elements that make up organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways.	• What are the means by which water, carbon, oxygen and nitrogen are cycled through the environment? • What is the importance of each cycle to the environment?
Knowledge	**Skills**

• <u>Vocabulary:</u> biochemical conversion, ecosystem, carbon cycle, nitrogen cycle, oxygen cycle, water cycle, biogeochemical factors, transpiration, evaporation, condensation
• Matter moves through the following cycles:
  • Water Cycle
  • Carbon Cycle
  • Nitrogen Cycle
  • Oxygen Cycle
	• Construct a diagram detailing the components of the ecosystem involved in the water cycle, carbon cycle, oxygen cycle and nitrogen cycle.
	• Describe the changes that occur within each cycle.
	• Provide evidence to support explanations of how elements and energy are conserved as they cycle through ecosystems.
	• Given a scenario, predict the consequences of changes to these cycles.

ELIGIBLE CONTENT

- **BIO.B.4.2** Describe interactions and relationships in an ecosystem.
- **BIO.B.4.2.4** Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).

Overarching Understandings:

- Humans and natural disturbances affect the environment.

Understandings	**Essential Questions**
• Humans depend on the living world for the resources and other benefits provided by biodiversity. • Human activity may have adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. • Sustaining biodiversity is essential to supporting and enhancing life on Earth by aiding humanity by preserving landscapes of recreational or inspirational value. • Anthropogenic changes (induced by human activity) in the environment can disrupt an ecosystem and threaten the survival of some species • Natural disturbances have the potential to disrupt the balance to an ecosystem.	• How do the activities of humans both positively and negatively affect the environment? • How do overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change affect the environment? • What factors influence climate change? • What is the impact of introducing nonnative species into an ecosystem? • How do fires affect an ecosystem? • What resiliency exists in an ecosystem to resist change?
Knowledge	**Skills**
• <u>Vocabulary:</u> habitat, environment, isolating mechanisms, nonnative species, succession, temperature, climate change, biological magnification, pollution, fires • Humans depend on the living world for the resources and other benefits provided by biodiversity. • Increasing use and misuse of resources leads to environmental degradation. • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. • Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	• Describe both the immediate and long term effects of human disturbances in specific environments. • Differentiate between primary and secondary succession • Identify contributing factors to climate change and how human activity attributes to the accumulation of greenhouse gases. • Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. • Design solutions for creating or maintaining the sustainability of local ecosystems.

ELIGIBLE CONTENT

- **BIO.B.4.2** Describe interactions and relationships in an ecosystem.
- **BIO.B.4.2.5** Describe the effects of limiting factors on population dynamics and potential species extinction.

Overarching Understandings:

- Limiting factors exert stresses on a population which can alter the population dynamics and potentially drive species extinctions.

Understandings	**Essential Questions**
• Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations that an ecosystem can support. • Living and nonliving resources are limited due to challenges such as predation, competition, and disease. • Demand always exceeds supply; therefore, competition will always be present and control populations.	• How and why do organisms interact with their environment and what are the effects of these interactions? • How can limiting factors lead to species extinction? • What is the difference between density-dependent and density-independent limiting factors? • How does the predator-prey relationship affect the population size?
• **Knowledge**	• **Skills**
• Vocabulary: Population, exponential growth, logistic growth, carrying capacity, limiting factor, competition, population density, geographic distribution, age structure, consumer, growth rate, death rate, density-dependent limiting factor, density-independent limiting factor, demographic transition, ecosystem, endemic species, extinction, habitat, predator, prey, population dynamics, producer • Several factors exist that can limit a population size; these factors may be density dependent or density independent.	• Interpret population growth charts and project future growth trends. • Identify limiting factors in specific environments and classify them as being density dependent or density independent. • Calculate population density in a given area. • Evaluate data to explain resource availability and other environmental factors that affect carrying capacity of ecosystems. • Plan and carry out investigations to make mathematical comparisons of the populations and bio diversities of two similar ecosystems at different scales.

Evidence of Understanding

Performance Tasks
• Written assessments: vocabulary quizzes, unit tests (with SAS questions), • Graphing: carrying capacity interpretation,climatographs • Illustrations of water cycle, carbon cycle, CO2-Oxygen cycle, nitrogen cycle, food web/food chains, levels of ecosystem organization, energy loss in trophic level pyramid. • Laboratory sessions on wildfire ecology, Biome Bags, Owl pellet lab • Internet simulations: Biotic & Abiotic • Build models of: food web/chain (into the woods)

Other Evidence of Understanding*

Assessment Measures	**Assessment Tasks**
• Bellringers • Correct/Incorrect model. • Laboratory reports • Simulation summaries. • Graphing	• Written assessments: vocabulary quizzes, unit tests (with SAS questions), • Graphing: carrying capacity interpretation,climatographs • Illustrations of water cycle, carbon cycle, CO2-Oxygen cycle, nitrogen cycle, food web/food chains, levels of ecosystem organization, energy loss in trophic level pyramid. • Laboratory sessions on wildfire ecology, Biome Bags, Owl pellet lab • Internet simulations: Biotic & Abiotic • Build models of: food web/chain (into the woods)

*can be embedded into formative and summative assessments.

Evidence of Understanding

Performance Tasks
Population Density Research: In this activity, students use an online resource to calculate population densities, given specific countries' population data and area dimensions. After calculating the population densities of the given countries, the students construct bar graphs to display their findings, using Microsoft Excel or a comparable program. Bean Lab: This activity highlights how competition affects growth in bean plants. Using pinto beans, potting soil, and plastic cups, students plant designated numbers of pinto beans to observe how growth is or is not affected by competition.

Integration of ELA Common Core Standards ***(The tasks below are meant to serve as sample activities regarding the integration of the standard listed. Related up-to-date material can be substituted)***

Reading/Writing in Science and Technical Subjects

CCSS.ELA-Literacy.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

- Students will read and analyze an article from an online science journal, regarding human activity that is thought to affect climate change. Students will write a one-two paragraph summary of the article, focusing only on two of the specific examples of evidence involving human activity and climate change.

CCSS.ELA-Literacy.RST.9-10.2 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.

- Students will read and analyze an article from an online science journal, regarding the dangers of introducing nonnative species into an ecosystem. Students will write a one page summary of the article, explaining what a nonnative species is and the effects they have on ecosystems when introduced.

CCSS.ELA-Literacy.RST.9-10.3 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.

CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.

- In an effort to further stress the difference between biotic and abiotic factors, students will complete an activity in which students, given a list of living and nonliving factors, will write a narrative explanation as to why each factor should be classified and "biotic" or "abiotic."

CCSS.ELA-Literacy.RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).

CCSS.ELA-Literacy.RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CCSS.ELA-Literacy.RST.9-10.7 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.

CCSS.ELA-Literacy.RST.9-10.8 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.

CCSS.ELA-Literacy.RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CCSS.ELA-Literacy.WHST.9-10.1 Write arguments focused on *discipline-specific content*.

CCSS.ELA-Literacy.WHST.9-10.1a 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.

CCSS.ELA-Literacy.WHST.9-10.1b 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.

CCSS.ELA-Literacy.WHST.9-10.1c 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.

CCSS.ELA-Literacy.WHST.9-10.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.1e Provide a concluding statement or section that follows from or supports the argument presented.

CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

CCSS.ELA-Literacy.WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

CCSS.ELA-Literacy.WHST.9-10.2b Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

CCSS.ELA-Literacy.WHST.9-10.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

CCSS.ELA-Literacy.WHST.9-10.2d Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

CCSS.ELA-Literacy.WHST.9-10.2e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.2f Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCSS.ELA-Literacy.WHST.9-10.5 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.

CCSS.ELA-Literacy.WHST.9-10.6 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.

CCSS.ELA-Literacy.WHST.9-10.7 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.
CCSS.ELA-Literacy.WHST.9-10.8 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.
CCSS.ELA-Literacy.WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.
CCSS.ELA-Literacy.WHST.9-10.10 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.

Earth Science **Designed by: Laura Charles and Cindy Klein**

Exosphere Unit: Astronomy

Brief Summary of Unit:

PRE-REQUISITE SKILLS: Basic graphing skills (X & Y axis and plot 2 variables) and general laboratory skills (measurement and utilization of basic science equipment), basic navigation on the internet for gathering research materials.

Once students have mastered understanding the Exosphere (space) is one of several interrelated spheres [Geosphere (surface and the entire mass of the Earth); Hydrosphere (water); Biosphere (plants & animals);Atmosphere (gases surrounding the Earth) and Anthrosphere (humans)], the students will be able to investigate the processes of the atmosphere and how the processes interrelate to other spheres.

The primary focus of this unit is to understand the processes of the atmosphere. The processes include: Layers of the atmosphere, heating & wind circulation patterns global & local) in the atmosphere, air pressure, water (humidity and precipitation) in the atmosphere, cloud formation, air masses, fronts, weather, severe weather (thunderstorms, hurricanes & tornadoes), forcasting weather, and climate, El Nino and La Nina.

BELOW LEVEL ACTIVITIES: If students are struggling with this material, differentiation of instruction could include use of fewer, more simplified vocabulary words and definitions; chunked content with notes outline; a simplified, graphic organizer for key concepts.

EXTENSION ACTIVITIES for advanced learners could include real data that would require more complex graphical representation and breakdown of data; more complex examples; more complex activities; and additional article research via scientific online resources.

Materials and Resources

• AGS – Earth Science (General Earth Science – modified curriculum for comprehension / reading struggling students) • McDougal Littell Earth Science – General level textbook • McDougal Littell Earth Science (Spaulding/Namowtz)- Academic level textbook	Materials necessary to complete the performance tasks. • Planetarium • Spectra scopes • H-R Diagram Resources • Doppler Resources • Discovery Learning - internet source of video clips

ELIGIBLE CONTENT
- 3.3.10 Origin and Evolution of the Universe
- B1: Organization and Structure

Students will be able to use their learning independently to:
- Explain how gravity is responsible for planetary orbits.
- Explain what causes the sun, Earth, and most of the other planets to form between 4 and 5 billion years ago.
- Provide evidence to suggest the Big Bang Theory.
- Describe the basic **nuclear processess** involved in energy production in a star.

Understandings	**Essential Questions**
• Definition & properties of stars • Diagram life-cycles of stars based on mass • Interpret H-R diagrams • Know the effect of the Doppler Effect on the star spectrum (red/blue shift) • Stages of the formation of the solar system • Kepler's Laws of Planetary Motion - Inertia & Gravity • Provide evidence for the Big Bang Theory (Doppler Red shift)	• What are the properties of stars and how do they vary? • What determines the life cycle of stars? • How are luminosity and temperature related on the HR diagram? • How can the Doppler Effect support the Big Bang Theory and describe stellar motion? • How does the HR diagram reflect star properties? • What roll does gravity play in the formation of the solar system? • How do inertia and gravity play a roll in the shape of the orbits?
Knowledge	**Skills**
• <u>Vocabulary:</u> Doppler Effect, red shift, blue shift, Big Bang Theory, H-R Diagram, luminosity (absolute brightness), apparent brightness, fission, fusion, nebula theory, inertia, gravity, star, main sequence, (black/ white) dwarf, giant (supergiant) nova, supernova, black hole, planetary nebula	• Interpret H-R diagram • Identify stages in formation of stars • Distinguish between absolute & apparent brightness • Recognize how the Big Bang Theory is supported by the expanding universe • Describe how fusion plays a role in a star's energy production • Model the planetary orbits based on Kepler's Laws

Evidence of Understanding

Performance Tasks
• Written assessments: Vocabulary quizzes, unit tests (with SAS questions) • Graphing: HR diagram • Illustrations of Illustrations of electromagnetic spectra, parallax, Big Bang Theory, Milky Way & other galaxy shapes • Laboratory sessions on: Activity - identify Galaxies, Stellar Parallax Activity • Internet simulations: Stellar Spectra, Discovery Learning Big Bang Theory

Other Evidence of Understanding*

Assessment Measures	**Assessment Tasks**
• Bellringers • Correct/Incorrect model. • Laboratory reports • Simulation summaries. • Graphing	• Written assessments: Vocabulary quizzes, unit tests (with SAS questions) • Graphing: HR diagram • Illustrations of Illustrations of electromagnetic spectra, parallax, Big Bang Theory, Milky Way & other galaxy shapes • Laboratory sessions on: Activity - identify Galaxies, Stellar Parallax Activity • Internet simulations: Stellar Spectra, Discovery Learning Big Bang Theory

*can be embedded into formative and summative assessments.

Integration of ELA Common Core Standards ***(The tasks below are meant to serve as sample activities regarding the integration of the standard listed. Related up-to-date material can be substituted)***

Reading/Writing in Science and Technical Subjects

CCSS.ELA-Literacy.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

- Students will read and analyze an article from an online science journal, regarding human activity that is thought to affect climate change. Students will write a one-two paragraph summary of the article, focusing only on two of the specific examples of evidence involving human activity and climate change.

CCSS.ELA-Literacy.RST.9-10.2 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.

- Students will read and analyze an article from an online science journal, regarding the dangers of introducing nonnative species into an ecosystem. Students will write a one page summary of the article, explaining what a nonnative species is and the effects they have on ecosystems when introduced.

CCSS.ELA-Literacy.RST.9-10.3 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.

CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.

- In an effort to further stress the difference between biotic and abiotic factors, students will complete an activity in which students, given a list of living and nonliving factors, will write a narrative explanation as to why each factor should be classified and "biotic" or "abiotic."

CCSS.ELA-Literacy.RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).

CCSS.ELA-Literacy.RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CCSS.ELA-Literacy.RST.9-10.7 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.

CCSS.ELA-Literacy.RST.9-10.8 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.

CCSS.ELA-Literacy.RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CCSS.ELA-Literacy.WHST.9-10.1 Write arguments focused on *discipline-specific content*.

CCSS.ELA-Literacy.WHST.9-10.1a 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.

CCSS.ELA-Literacy.WHST.9-10.1b 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.

CCSS.ELA-Literacy.WHST.9-10.1c 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.

CCSS.ELA-Literacy.WHST.9-10.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.1e Provide a concluding statement or section that follows from or supports the argument presented.

CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

CCSS.ELA-Literacy.WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

CCSS.ELA-Literacy.WHST.9-10.2b Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

CCSS.ELA-Literacy.WHST.9-10.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

CCSS.ELA-Literacy.WHST.9-10.2d Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

CCSS.ELA-Literacy.WHST.9-10.2e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.2f Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the

significance of the topic).
CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-Literacy.WHST.9-10.5 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.
CCSS.ELA-Literacy.WHST.9-10.6 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.
CCSS.ELA-Literacy.WHST.9-10.7 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.
CCSS.ELA-Literacy.WHST.9-10.8 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.
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CCSS.ELA-Literacy.WHST.9-10.10 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.

Earth Science **Designed by: Laura Charles and Cindy Klein**

Geosphere Unit: Earth's Surface and The Changing Earth

Brief Summary of Unit:

PRE-REQUISITE SKILLS: ???

Once students have mastered the understanding the Geosphere (surface and the entire mass of the Earth) is one of several interrelated spheres [Hydrosphere (water); Atmosphere (gases surrounding the Earth); Biosphere (plants & animals); Exosphere (space); and Anthrosphere (humans)], the students will be able to investigate the processes of the Geosphere and how the processes interrelate to other spheres.

The primary focus of this unit is to understand the processes of the geosphere. The processes include: properties and formations of minerals and rocks; physical and chemical processes that form the Earth – including physical / chemical weathering, formations of soil; and interpretation of historical geology; formation and properties of Earth's layers of the Earth including natural resources; Movement of Earth's Crust caused by plate techtonics contributes to changes in the Earth's surface including earthquakes, volcanoes and mountain building. . Analyze the impact of modern technology on the study of the Earth and it's place in the universe and how human's impact the geosphere positively and negatively.

BELOW LEVEL ACTIVITIES: If students are struggling with this material, differentiation of instruction could include use of fewer, more simplified vocabulary words and definitions; chunked content with notes outline; a simplified, graphic organizer for key concepts.

EXTENSION ACTIVITIES for advanced learners could include real data that would require more complex graphical representation and breakdown of data; more complex examples; more complex activities; and additional article research via scientific online resources.

Materials and Resources

• AGS – Earth Science (General Earth Science – modified curriculum for comprehension / reading struggling students) • McDougal Littell Earth Science – General level textbook • McDougal Littell Earth Science (Spaulding/Namowtz)- Academic level textbook	Materials necessary to complete the performance tasks. • Rock and mineral kits • Rock ID and Mineral ID test kits (streak, hardness, color, fracture, cleavage, etc) • Rock Cycle Poster or Reference • Flowcharts for Rock & Mineral ID • Internet access for research • Mystery of the Far Flung Fossil • World Map (??? 3D map) • Website: http://www.sciencecourseware.org/eec/earthquake/ • Mountain building models • Models of volcanic eruptions • Stream tables (with sand) • Soil samples • Soil testing kits (topsoil tour)

ELIGIBLE CONTENT

- **S11.D.1.1** Explain and analyze the forces in the lithosphere that continually shape Earth.

Students will be able to use their learning independently to:

- **S11.D.1.1.1** Classify and describe major types of rocks (i.e., igneous – granite, basalt, obsidian, pumice; sedimentary – limestone, sandstone, shale, coal; and metamorphic – slate, quartzite, marble, gneiss) and minerals (e.g.,quartz, calcite, dolomite, clay, feldspar, mica, halite, pyrite) by their origin and formation.

Understandings	**Essential Questions**
• Rock Cycle • Rock classification • Mineral formation / identification	• How do rocks change from one form to another? • How are igneous, metamorphic and sedimentary rocks classified? • How are mineral properties used to identify a mineral? • How are minerals formed?
Knowledge	**Skills**
• Vocabulary: Sedimentation (deposition), cementation, metamorphism, burial, melting, solidification, magma vs lava, intrusive Vs extrusive, streak, color, hardness, fracture, cleavage, crystalline structure, crystallization, precipitation and evaporation.	• Utilize flowcharts / laboratory analysis to identify rocks. • Utilize flowcharts / laboratory analysis to identify minerals. • Compare sedimentary rocks by: chemical, clastic, organic formations. • Compare igneous rocks by: intrusive and extrusive • Compare metamorphic rocks by: foliated and non-foliated.

ELIGIBLE CONTENT

- **S11.D.1.1** Explain and analyze the forces in the lithosphere that continually shape Earth.

Students will be able to use their learning independently to:

- **S11.D.1.1.2** Explain the processes that take place at **plate boundaries** and how these processes continue to shape Earth (e.g., volcanic activity, earthquakes, mountain building, mid-ocean ridges, deep-sea trenches, new land being formed).
- **S11.D.1.1.3** Analyze features caused by the interaction of processes that change Earth's surface (e.g., wind and moving water help break down rock into soil; **plate movement**, earthquakes, and volcanic activity help cause mountains and valleys to form; flowing water and deposition of material help form deltas).

Understandings	**Essential Questions**
• Interactions at plate boundaries and land formations associated with the interactions. • Plate tectonics are driven by convection currents in the asthenosphere. • Density differences of continental vs. oceanic crust.	• What motions are associated with convergent, divergent & transform boundaries? • What land features are associated with convergent, divergent & transform boundaries? • What mechanism drives plate tectonics? • What effect does crustal density have on colliding plates?
Knowledge	**Skills**
• <u>Vocabulary:</u> Convergent, divergent & transform boundaries, subduction, convection currents, asthenosphere, lithosphere, mid-ocean ridges, rift valley, folded mountains, transform faults, trenches, volcanic island arcs.	• Identify features associated with each boundary type and examples of each (i.e. Mt. St. Helens) • Reconstruct land masses using simulated fossil evidence.

ELIGIBLE CONTENT

- **S11.D.1.1** Explain and analyze the forces in the lithosphere that continually shape Earth.

Students will be able to use their learning independently to:

- **S11.D.1.1.2** Explain the processes that take place at plate boundaries and how these processes continue to shape Earth (e.g., volcanic activity, **earthquakes, mountain building**, mid-ocean ridges, deep-sea trenches, new land being formed).
- **S11.D.1.1.3** Analyze features caused by the interaction of processes that change Earth's surface (e.g., wind and moving water help break down rock into soil; plate movement, **earthquakes, and volcanic activity help cause mountains and valleys to form;** flowing water and deposition of material help form deltas).

Understandings	**Essential Questions**
• Mountain formations: folding, faulting & volcanic • Volcanic quiet vs explosive eruptions • Earthquake activity – damage, location & fault types	• How do mountains form? • How do volcanic eruptions differ? • How do pressure & magma properties effect eruptions? • Relate magnitude of an earthquake to fault type.
Knowledge	**Skills**
• <u>Vocabulary:</u> Folding, faulting, volcanic mountains, cinder, composite & shield volcanoes, seismographs, seismic waves, epicenter, focus, richter scale, magnitude, tsunami, normal fault, reverse fault, strike-slip (transform) fault.	• Analyze seismic data for magnitude and location. • Determine type of volcanic cone based upon type of eruption. • Model types of mountain formation

ELIGIBLE CONTENT

- **S11.D.1.1** Explain and analyze the forces in the lithosphere that continually shape Earth.

Students will be able to use their learning independently to:

- **S11.D.1.1.2** Explain the processes that take place at plate boundaries and how these processes continue to shape Earth (e.g., volcanic activity, earthquakes, mountain building, mid-ocean ridges, deep-sea trenches, new land being formed).
- **S11.D.1.1.3** Analyze features caused by the interaction of **processes that change Earth's surface** (e.g., wind and moving water help **break down rock into soil;** plate movement, earthquakes, and volcanic activity help cause mountains and valleys to form**; flowing water and deposition of material help** form deltas).

Understandings	**Essential Questions**

• Erosion / deposition features by:
  • Wind
  • Water
  • Glaciers
  • Gravity
• Chemical & physical weathering
• Soil formation and layers
	• How do wind, water, glaciers & gravity carve the Earth's surface?
	• What are examples of chemical & physical weathering?
	• How do the layers of soil form?

Knowledge	**Skills**
• <u>Vocabulary:</u> Loess, abrasion, sand dunes, glacial grooves, cirques, moraines, kettle lakes, horn, valley glacier, continental glacier, U shaped valley, mass wasting, slump, creep, land-slides, mud-slides, chemical weathering, carbonization, oxidation, physical weathering, ice wedging, root wedging, exfoliation, horizons A-B & C , bedrock, organic matter (Humus), mineral matter, parent rock.	• Analyze soil for nutrients • Model stream erosion • Identify chemical vs physical weathering processes • Identify land features by source of erosion / deposition

ELIGIBLE CONTENT

- **S11.D.1.1** Explain and analyze the forces in the lithosphere that continually shape Earth.
- **S11.D.1.2** Analyze how human-made systems impact the management and distribution of natural resources.

Students will be able to use their learning independently to:

- **S11.D.1.2.1** Evaluate factors affecting availability, location, extraction, and use of **natural resources**.
- **S11.D.1.2.2** Explain the **impact of obtaining and using natural resources** for the production of energy and materials

Understandings	**Essential Questions**
• Renewable VS Non-renewable resources • Environmental impacts from resource extraction • The geology of natural resources • Conservation of natural resources	• What is the difference between renewable and non-renewable resources? • What is the impact environmentally from resource extraction? • What geological process(es) created the natural resources? • How / why are conservation efforts effective?
Knowledge	**Skills**
• Vocabulary: Renewable, non-renewable, ore, fossil fuels, conservation, recycle, reuse, reduce, energy sources, air, land, & water pollution, fossil fuel formation, point and non-point pollution, Marcellus Shale, Coal.	• Identify conservation efforts. • Summarize steps of fossil fuel formation. • Draw conclusion in a presentation about environmental impact of resource extraction.

Evidence of Understanding

Performance Tasks
Created models of: volcanoes, streams erosions, faults, Laboratory sessions: identify minerals& rocks, Identify plate boundaries utilizing volcano & earthquake data, stream table studies, Far-Flung Fossil, Soil testing (topsoil tour), Web based simulations: earthquake, oxbow lake formations, plate tectonics Research projects: Birthstone, Marcellus shale, conservation of resources / energy

Other Evidence of Understanding*

Assessment Measures	**Assessment Tasks**
• Bellringers • Correct/Incorrect model. • Laboratory reports • Simulation summaries. •	• Written assessments: vocabulary quizzes, unit tests (with SAS questions), • Illustrations of soil horizons, folding / faulting mts, erosion landscapes, rock cycle • Laboratory sessions on: Soil, Far Flung Fossil, stream erosion, mineral properties, rock ID • Internet simulations: Earthquakes, classzone.com (textbook online companion site), • Build models of: volcanoes

*can be embedded into formative and summative assessments.

Integration of ELA Common Core Standards ***(The tasks below are meant to serve as sample activities regarding the integration of the standard listed. Related up-to-date material can be substituted)***

Reading/Writing in Science and Technical Subjects
CCSS.ELA-Literacy.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. • Students will read and analyze an article from an online science journal, regarding human activity that is thought to affect climate change. Students will write a one-two paragraph summary of the article, focusing only on two of the specific examples of evidence involving human activity and climate change. CCSS.ELA-Literacy.RST.9-10.2 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. • Students will read and analyze an article from an online science journal, regarding the dangers of introducing nonnative species into an ecosystem. Students will write a one page summary of the article, explaining what a nonnative species is and the effects they have on ecosystems when introduced. CCSS.ELA-Literacy.RST.9-10.3 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. CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. • In an effort to further stress the difference between biotic and abiotic factors, students will complete an activity in which students, given a list of living and nonliving factors, will write a narrative explanation as to why each factor should be classified and "biotic" or "abiotic." CCSS.ELA-Literacy.RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*). CCSS.ELA-Literacy.RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. CCSS.ELA-Literacy.RST.9-10.7 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. CCSS.ELA-Literacy.RST.9-10.8 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. CCSS.ELA-Literacy.RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. CCSS.ELA-Literacy.WHST.9-10.1 Write arguments focused on *discipline-specific content*. CCSS.ELA-Literacy.WHST.9-10.1a 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. CCSS.ELA-Literacy.WHST.9-10.1b 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. CCSS.ELA-Literacy.WHST.9-10.1c 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. CCSS.ELA-Literacy.WHST.9-10.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. CCSS.ELA-Literacy.WHST.9-10.1e Provide a concluding statement or section that follows from or supports the argument presented. CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. CCSS.ELA-Literacy.WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. CCSS.ELA-Literacy.WHST.9-10.2b Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. CCSS.ELA-Literacy.WHST.9-10.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. CCSS.ELA-Literacy.WHST.9-10.2d Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

CCSS.ELA-Literacy.WHST.9-10.2e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
CCSS.ELA-Literacy.WHST.9-10.2f Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-Literacy.WHST.9-10.5 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.
CCSS.ELA-Literacy.WHST.9-10.6 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.
CCSS.ELA-Literacy.WHST.9-10.7 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.
CCSS.ELA-Literacy.WHST.9-10.8 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.
CCSS.ELA-Literacy.WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.
CCSS.ELA-Literacy.WHST.9-10.10 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.

Earth Science **Designed by: Laura Charles and Cindy Klein**

Hydrosphere Unit: Water

Brief Summary of Unit:

PRE-REQUISITE SKILLS: Basic graphing skills (X & Y axis and plot 2 variables) and general laboratory skills (measurement and utilization of basic science equipment), basic navigation on the internet for gathering research materials.

Once students have mastered the understanding the Hydrosphere (water) is one of several interrelated spheres [Geosphere (surface and the entire mass of the Earth); Atmosphere (gasses surrounding the Earth); Biosphere (plants & animals); Exosphere (space); and Anthrosphere (humans)], the students will be able to investigate the processes of the hydrosphere and how the processes interrelate to other spheres.

The primary focus of this unit is to understand the processes of the hydrosphere. The processes include: surface water, groundwater, freshwater vs salt water, wetlands, abiotic vs biotic factors, stream order, drainage basins, groundwater, porosity vs. permeability, water pollution.

BELOW LEVEL ACTIVITIES: If students are struggling with this material, differentiation of instruction could include use of fewer, more simplified vocabulary words and definitions; chunked content with notes outline; a simplified, graphic organizer for key concepts.

EXTENSION ACTIVITIES for advanced learners could include real data that would require more complex graphical representation and breakdown of data; more complex examples; more complex activities; and additional article research via scientific online resources.

Materials and Resources

- AGS – Earth Science (General Earth Science – modified curriculum for comprehension / reading struggling students)
- McDougal Littell Earth Science – General level textbook
- McDougal Littell Earth Science (Spaulding/Namowtz)- Academic level textbook
- Globe Fearon Pearson Learning Group - Environment and Ecology for Pennsylvania – Meeting the Standards
- USGS.gov
- Project wet

Materials necessary to complete the performance tasks.

- Internet Access
- Graphing paper
- Graphic organizers for illustrations
- Stream tables with sand
- Maps of PA & USA
- Topographic maps
- Water test kits
- Guest speaker – watersheds & water quality testing
- Porosity / permeability lab materials

ELIGIBLE CONTENT

- S11.D.1.3 – Explain the significance and contribution of water as a resource to living things and the shaping of the land.

Students will be able to use their learning independently to:

- S11.D.1.3.1 Explain the multiple functions of different water systems in relation to landforms (e.g., buffer zones, nurseries, food production areas, habitat, water quality control, biological indicators).
- S11.D.1.3.2 Explain relationships among physical characteristics, vegetation, topography, and flow as related to water systems.
- S11.D.1.3.3 Explain factors (e.g., nutrient loading, turbidity, rate flow, rate or deposition, biological diversity) that affect water quality and flow through a water system.

Understandings	**Essential Questions**
• Define River system • Describe characteristic of a stream –Abiotic & biotic • Analyze water quality for biological, chemical & physical factors • Factors that affect water quality (flooding, agriculture, usage) • Compare salt water, brackish, & fresh water	• What are river system? • What types of river systems are there? • What factors affect water quality? • How are the functions of water systems different?
Knowledge	**Skills**
• <u>Vocabulary</u>: buffer zones, turbidity, habitat, water quality, nutrient loading, biological diversity, macro-invertebrates, micro-invertebrates, discharge, velocity, gradient, drainage basin, divide, watershed, tributary, dendritic, radial, trellis, rectangular, flood, stream order.	• Describe how topography & vegetation affect water flow. • Identify physical features of a river by labeling a diagram • Analyze water for quality • Extrapolate impact of water quality factors on the ecosystem

ELIGIBLE CONTENT

- S11.A.3.1 Analyze the parts of a simple system, their roles, and their relationships to the system as a whole.

Students will be able to use their learning independently to:

- S11.A.3.1.1 Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts.
- S11.A.3.1.2 Analyze and predict the effect of making a change in one part of a system on the system as a whole.
- S11.A.3.1.3 Use appropriate qualitative data to describe or interpret a system (e.g., biological indices)

Understandings	**Essential Questions**
• Define oceans • Properties of ocean water e.g. salinity, temperature, density • Movement of ocean water e.g. currents, waves & tides	• How did the ocean form? • How has the ocean changed over time? • What mechanisms cause ocean currents?
Knowledge	**Skills**
• Vocabulary: salinity, waves, currents, density, thermocline, tides, oceans, density currents, surface (wind) currents,	• Analyze the cause of ocean currents • Identify the effect of salinity & temperature on density • Compare warm and cold ocean currents

ELIGIBLE CONTENT

- S11.A.3.1 Analyze the parts of a simple system, their roles, and their relationships to the system as a whole.

Students will be able to use their learning independently to:

- **S11.A.3.1.1:** Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts.

Understandings	**Essential Questions**
• Explain the water cycle • Explain how porosity & permeability effect storage & movement of groundwater • Describe the water table and the features associated with it. • Explain, diagram artesian water systems	• What is the water cycle • How do porosity & permeability effect the storage & movement of groundwater? • How do the features of the water table change? • What are the parts of the water table? • How does water enter / exit the water table? • How does the topography effect water systems (artesian)?
Knowledge	**Skills**
Vocabulary: porosity, permeability, groundwater, recharge, draw, water table, artesian formation, well, spring, aquifer, pervious, impervious, capillary fringe.	• Diagram & label the water cycle • Diagram & label an artesian well system • Diagram & label parts of the water table • Identify sources of recharge & draw of water table • Perform lab analysis comparing porosity & permeability

Evidence of Understanding

Performance Tasks
• Written assessments: vocabulary quizzes, unit tests (with SAS questions), • Graphing: • Illustrations of • Laboratory sessions on • Internet simulations: • Build models of:

Other Evidence of Understanding*

Assessment Measures	**Assessment Tasks**
• Bellringers • Correct/Incorrect model. • Laboratory reports • Simulation summaries. • Graphing	• Written assessments: • Graphing: • Illustrations of layers • Laboratory sessions on: • Internet simulations: • Build models of:

*can be embedded into formative and summative assessments.

Integration of ELA Common Core Standards ***(The tasks below are meant to serve as sample activities regarding the integration of the standard listed. Related up-to-date material can be substituted)***

Reading/Writing in Science and Technical Subjects

CCSS.ELA-Literacy.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

- Students will read and analyze an article from an online science journal, regarding human activity that is thought to affect climate change. Students will write a one-two paragraph summary of the article, focusing only on two of the specific examples of evidence involving human activity and climate change.

CCSS.ELA-Literacy.RST.9-10.2 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.

- Students will read and analyze an article from an online science journal, regarding the dangers of introducing nonnative species into an ecosystem. Students will write a one page summary of the article, explaining what a nonnative species is and the effects they have on ecosystems when introduced.

CCSS.ELA-Literacy.RST.9-10.3 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.

CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.

- In an effort to further stress the difference between biotic and abiotic factors, students will complete an activity in which students, given a list of living and nonliving factors, will write a narrative explanation as to why each factor should be classified and "biotic" or "abiotic."

CCSS.ELA-Literacy.RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).

CCSS.ELA-Literacy.RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CCSS.ELA-Literacy.RST.9-10.7 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.

CCSS.ELA-Literacy.RST.9-10.8 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.

CCSS.ELA-Literacy.RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CCSS.ELA-Literacy.WHST.9-10.1 Write arguments focused on *discipline-specific content*.

CCSS.ELA-Literacy.WHST.9-10.1a 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.

CCSS.ELA-Literacy.WHST.9-10.1b 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.

CCSS.ELA-Literacy.WHST.9-10.1c 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.

CCSS.ELA-Literacy.WHST.9-10.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.1e Provide a concluding statement or section that follows from or supports the argument presented.

CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

CCSS.ELA-Literacy.WHST.9-10.2a Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

CCSS.ELA-Literacy.WHST.9-10.2b Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

CCSS.ELA-Literacy.WHST.9-10.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

CCSS.ELA-Literacy.WHST.9-10.2d Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

CCSS.ELA-Literacy.WHST.9-10.2e Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.WHST.9-10.2f Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the

significance of the topic).
CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-Literacy.WHST.9-10.5 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.
CCSS.ELA-Literacy.WHST.9-10.6 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.
CCSS.ELA-Literacy.WHST.9-10.7 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.
CCSS.ELA-Literacy.WHST.9-10.8 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.
CCSS.ELA-Literacy.WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.
CCSS.ELA-Literacy.WHST.9-10.10 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.