Westside High School
Environmental Science Curriculum Map
2018-2019

Teacher: Hoots **Revised: 5-30-18**

Map is still under construction and will be revised throughout the year.

WESTSIDE HIGH SCHOOL SCIENCE CURRICULUM MAP

Teacher:

Quarter 1

Topic: Systems

Essential Questions:

Students will consider……How do Earth's major systems interact?
Students examine data to develop models to analyze and determine explanations for changes in Earth systems that took place in the past and are occurring in the present. Students will use this information/evidence to inform how Earth's systems interact and may undergo change in the future. Students investigate water including its properties, unique role in earth systems, and intricate support of various life forms. Students use quantitative models specifically to illustrate the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. Students argue from evidence relating the simultaneous co-evolution of systems to life on our planet. Engineering and technology play a large role within this topic for obtaining and analyzing data as well as aiding in the development of models.

Students will…..

- Create a map of the area and observe the different plants, insects, animals and other evidence of the outdoor classroom. Evaluate the map and relate the information gathered to the video: Planet in Peril.
- Share out on projects - create a "master" food web

AR STANDARDS / SKILLS

CONTENT VOCABULARY WITHIN THE STANDARD WILL BE TAUGHT THROUGHOUT DAILY OBJECTIVES / GOALS.

* EVS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [AR Clarification Statement: Emphasis is on Arkansas-specific biodiversity and nonbiodiversity, water habitats, and native vegetation. Evaluation techniques could include the use of quantitative analyses and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Arkansas examples could include predator/prey relationships (bass/feeder fish), biodiversity (cave systems and endangered species such as the Ozark Big-Eared bat), producer/consumer relationship (pine tree/Japanese beetle).]
* EVS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and

populations in ecosystems of different scales. [AR Clarification Statement: Examples of mathematical representations could include finding the average, determining trends, and using graphical comparisons of multiple sets of data (Arkansas macroinvertebrates stream data).] [Assessment Boundary: Assessment is limited to provided data.]
* EVS-LS2-6 Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.* [AR Clarification Statement: Emphasis is on both ancient and modern conditions. Examples of changes in ecosystem conditions could include Arkansas habitat loss and its impact on the bobwhite population or fossil evidence of exosystems (leaf-margin analyses).]
* EVS-LS2-8 Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce. [AR Clarification Statement: Emphasis is on the relationship of human activity with the environment: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include human population dynamics, ant or bee colonies, and copperhead mating behaviors.]
* EVS3-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. [AR Clarification Statement: Solutions to complex real world issues could include Arkansas wildlife management practices and river management programs susceptible to natural hazards (e.g., erosion, flooding, tornadoes, and earthquakes).]

Science/Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts:	
Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s). § Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (EVS-ESS2-3, EVS-ESS2-6) **Planning and Carrying Out Investigations** Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. § Plan and conduct an investigation individually and collaboratively to	**ESS2.A: Earth Materials and Systems** § Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (EVS-ESS2-2) § Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (EVS-ESS2-3) **ESS2.B: Plate Tectonics and**	**Energy and Matter** § The total amount of energy and matter in closed systems is conserved. (EVS-ESS2-6) § Energy drives the cycling of matter within and between systems. (EVS-ESS2-3) **Structure and Function** § The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. (EVS-ESS2-5) **Stability and Change** § Feedback (negative or positive) can stabilize or destabilize a system. (EVS-ESS2-2)	

produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (EVS-ESS2-5) **Analyzing and Interpreting Data** Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. § Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (EVS-ESS2-2) **Asking Questions and Defining Problems** Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. § Analyze complex real-world problems by specifying criteria and constraints for successful solutions. (EVS1-ETS1-1) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are	**Large-Scale System Interactions** § The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (EVS-ESS2-3) **ESS2.C: The Roles of Water in Earth's Surface Processes** § The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (EVS-ESS2-5) **ESS2.D: Weather and Climate** § The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (EVS-ESS2-2) § Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (EVS-ESS2-6) § Changes in the atmosphere due to human activity have increased	-- ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** § Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (EVS-ESS2-3) **Influence of Engineering, Technology, and Science on Society and the Natural World** New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs § and benefits is a critical aspect of decisions about technology. (EVS-ESS2-2, EVS1-ETS1-1, EVS1-ETS1-3)	

supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles and theories. § Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (EVS1-ETS1-3) -- ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** § Science knowledge is based on empirical evidence. (EVS-ESS2-3) § Science disciplines share common rules of evidence used to evaluate explanations about natural systems. (EVS-ESS2-3) Science includes the process of coordinating patterns of evidence with current theory. (EVS-ESS2-3	carbon dioxide concentrations and thus affect climate. (EVS-ESS2-6) **PS4.A: Wave Properties** § Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. (EVS-ESS2-3) **ETS1.A: Defining and Delimiting Engineering Problems** § Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (EVS1-ETS1-1) Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global § challenges also may have manifestations in local communities. (EVS1-ETS1-1) **ETS1.B: Developing Possible Solutions** § When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (EVS1-ETS1-3)		
Activities/Skills	**Assessments**	**Resources**	**Vocabulary**
AR EVS-LS2-1 AR EVS-LS2-2 AR EVS-LS2-6	Research Labs	* Internet * Text * Videos	• Trophic cascade • Keystone species •

AR EVS-LS2-8 AR EVS3-ETS1-3		* Lab *Outdoor classroom: The specific dependencies the biotic and abiotic factors on each other.	

Quarter 2 **Topic: · Energy**
Essential Questions: Students will consider…How is energy transferred and conserved within Earth's systems? Students design investigations to provide evidence of the transfer of energy in closed systems, develop models to illustrate and explain energy on a macroscopic level and how this energy is associated with both the motion and position of particles. Students create computational models to calculate the changes in the energy of a system when selected components are manipulated. Students engage in the engineering process to design, build, and refine a device that, given constraints, converts one form of energy into another form of energy. Technology plays a role in obtaining data and applying evidence to the development of models that explain the phenomena associated with energy.
I will….. ● Investigate how plate tectonics are related to the convection currents. ● How are the convection currents related to the Earth's 'spheres? ● Create a model of the interior ● Create a google slides presentation with 20+ slides with the following information.

- 1. Describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere which includes the cycling of carbon through the ocean, atmosphere, rock cycle,and biosphere. (4-6 slides)
- 2. Describe the cycling of matter by thermal convection through plate-tectonics and the 4 "spheres" (4-6 slides)
- 3. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems (4-6 slides)
- 4. Conclusion: explain how all this connects together: the inside of the Earth to the outside of the Earth. Show how the previous information (1-3) is connected together.

AR STANDARDS / SKILLS

CONTENT VOCABULARY WITHIN THE STANDARD WILL BE TAUGHT THROUGHOUT DAILY OBJECTIVES / GOALS

EVS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrences of natural hazards, and changes in climate have influenced human activity. [AR Clarification Statement: Emphasis is on sustainability of natural resources, extracting natural resources, and how human societies are economically impacted by these phenomena.]
EVS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* [AR Clarification Statement: Emphasis is on conservation, sustainability (e.g., recycling and reuse of resources), and minimizing impacts (e.g., Low Impact Design).]
EVS-ESS3-3 Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. [AR Clarification Statement: Emphasis is on Arkansas-specific management and conservation of, costs of implementation and regulation of, and land use of (agriculture, mining, recreation, and urbanization) natural resources.]
EVS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [AR Clarification Statement: Examples of data on the impacts of human activities could include the sequencing of traffic lights, adding lanes to main traffic arteries, docking and dredging of waterways, transportation of goods to market, use of drones, and use of alternative energies.]
EVS-ESS3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. [AR Clarification Statement: Examples of evidence for both data and climate model outputs for climate changes and their associated impacts can be found at NOAA, National Weather Service and United States Geological Survey.]
EVS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [AR Clarification Statement: Emphasis in this course is on Arkansas-specific solutions. Examples of human activities can include land use (agriculture, forestry, recreation, industry); sustainable and nonsustainable practices (crop rotations, eradication of invasive species); and solution resources may include Low Impact Design (LID) or bioremediation (Faulkner County, AR; Gulf of Mexico hypoxia zone.)]
EVS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* [AR Clarification Statement: Emphasis is on designing solutions for a proposed problem (e.g., microbead pollution, invasive species, effects of sedimentation on the Arkansas fatmucket, White-nose Syndrome affecting bat populations, and environmental pollution from hormones and antibiotics).]
EVS4-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. [AR Clarification Statement: Modeling complex real world problems using computer software could include simulating future population growth in terms of limited resources or evaluating water flow through different Earth and geoengineered materials.]

Science/Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts:	
Using Mathematics and Computational Thinking Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. · Create a computational model or simulation of a phenomenon, designed device, process, or system. (EVS-PS3-1) **Developing and Using Models** Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. · Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (EVS-PS3-2) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent	LS2.C: Ecosystem Dynamics, Functioning, and Resilience • Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (EVS-LS2-7) LS4.C: Adaptation • Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (EVS-LS4-6) LS4.D: Biodiversity and Humans • Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (EVS-LS2-7) • Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to	**Systems and System Models** · Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models. (EVS-PS3-1) · When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (EVS-PS3-4) - ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** · Science assumes the universe is a vast single system in which basic laws are consistent. (EVS-PS3-1) **Energy and Matter** · Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems. (EVS-PS3-2) · Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and	

student-generated sources of evidence consistent with scientific ideas, principles, and theories. <u>Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.</u>(EVS-PS3-3, EVS2-ETS1-2) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. · Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (EVS-PS3-4)	supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (EVS-LS2-7, EVS-LS4-6) ESS2.D: Weather and Climate • Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (EVS-ESS3-6) ESS3.A: Natural Resources • Resource availability has guided the development of human society. (EVS-ESS3-1, EVS-ESS3-2) ESS3.B: Natural Hazards • Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (EVS-ESS3-1) ESS3.C: Human Impacts on Earth Systems • Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (EVS-ESS3-3, EVS-ESS3-4) ESS3.D: Global Climate Change • Through computer simulations	within that system. (EVS-PS3-3) - ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering and Technology on Society and the Natural World** · Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (EVS-PS3-3)	

	and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (EVS-ESS3-6) ETS1.B: Developing Possible Solutions • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (EVS-ESS3-2, EVS-ESS3-4, EVS-LS4-6, EVS-LS2-7) • Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (EVS-LS4-6)		
Activities/Skills	**Assessments**	**Resources**	**Vocabulary/Terms**
• AR EVS-LS2-1, • AR EVS-LS2-2, • AR EVS-LS2-6, • AR EVS-LS2-8, • AR EVS3-ETS1-3	• Lab • Research	• Internet • Text • Videos • Lab	

Quarter 3

Topic: Populations

Essential Questions:

Students will consider…How do organisms interact with components of living and nonliving environments to obtain matter and energy?

Students engage in the use of mathematical or computational representations to support and revise explanations based on evidence regarding factors that affect carrying capacity, biodiversity, and populations of ecosystems at different scales. Students evaluate evidence to understand the role of group behavior on individual and species ability to survive and reproduce. Following the example of professional scientists, students evaluate claims, evidence, and reasoning regarding the complexities of the interactions that occur in ecosystems. Students explore how any change in conditions can impact an ecosystem. Engineering and technology play a role in obtaining relevant data and creating mathematical and computational representations to support scientific arguments.

I will…..

- Create a map of the area and observe the different plants, insects, animals and other evidence of the outdoor classroom. Evaluate the map and relate the information gathered to the video: Planet in Peril.
- Share out on projects - create a “master” food web

AR STANDARDS / SKILLS

CONTENT VOCABULARY WITHIN THE STANDARD WILL BE TAUGHT THROUGHOUT DAILY OBJECTIVES / GOALS.

EVS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [AR Clarification Statement: Emphasis is on Arkansas-specific biodiversity and nonbiodiversity, water habitats, and native vegetation. Evaluation techniques could include the use of quantitative analyses and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Arkansas examples could include predator/prey relationships (bass/feeder fish), biodiversity (cave systems and endangered species such as the Ozark Big-Eared bat), producer/consumer relationship (pine tree/Japanese beetle).]

EVS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [AR Clarification Statement: Examples of mathematical representations could include finding the average, determining trends, and using graphical comparisons of multiple sets of data (Arkansas macroinvertebrates stream data).] [Assessment Boundary: Assessment is limited to provided data.]

EVS-LS2-6 Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.* [AR Clarification Statement: Emphasis is on both ancient and modern conditions. Examples of changes in ecosystem conditions could include Arkansas habitat loss and its impact on the bobwhite population or fossil evidence of exosystems (leaf-margin analyses).]

EVS-LS2-8 Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce. [AR Clarification Statement: Emphasis is on the relationship of human activity with the environment: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include human population dynamics, ant or bee colonies, and copperhead mating behaviors.]

EVS3-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. [AR Clarification Statement: Solutions to complex real world issues could include Arkansas wildlife management practices and river management programs susceptible to natural hazards (e.g., erosion, flooding, tornadoes, and earthquakes).]

Science/Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts:	
Using Mathematics and Computational Thinking Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. ● Use mathematical and/or computational representations of	**●LS2.A: Interdependent Relationships in Ecosystems** · Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of	**Scale, Proportion, and Quantity** · The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (EVS-LS2-2) **Stability and Change** Much of science deals with constructing explanations of how· they remain stable. (EVS-LS2-6) **Cause and Effect** · Empirical evidence is required to differentiate between cause and correlation	

phenomena or design solutions to support and revise explanations. (EVS-LS2-1, EVS-LS2-2) **Engaging in Argument from Evidence** Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science. ● Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (EVS-LS2-6, EVS-LS2-8) ***Connections to Nature of Science*** **Scientific Knowledge is Open to Revision in Light of New Evidence** ● Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (EVS-LS2-2) ● Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation. (EVS-LS2-6, EVS-LS2-8)	individuals) of species in any given ecosystem. (EVS-LS2-1, EVS-LS2-2) **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** · 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. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (EVS-LS2-2, EVS-LS2-6) **LS2.D: Social Interactions and Group Behavior** · Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (EVS-LS2-8) **ETS1.A: Defining and Delimiting an Engineering Problem** · Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets	and make claims about specific causes and effects. (EVS-LS2-8) **<u>Scale, Proportion, and Quantity</u>** · The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (EVS-LS2-2) **<u>Stability and Change</u>** Much of science deals with constructing explanations of how ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering and Technology on Society and the Natural World** · Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (EVS-PS3-3)	

	them. (EVS-PS3-3)		
Activities/Skills	**Assessments**	**Resources**	**Vocabulary/Terms**
• AR EVS-ESS2-2 AR EVS-ESS2-3 AR EVS-ESS2-5 AR EVS-ESS2-6 AR EVS-ESS3-5 AR EVS1-ETS1-1	• Research Labs	• Internet • Text • Videos • Lab	

Quarter 4 **Topic:Sustainability**
Essential Questions: Students will consider…… How do Earth's surface processes and human activities affect each other? · How do humans depend on Earth's resources? Students construct explanations based on evidence for how the availability of natural resources, the existence of natural hazards, and changes in climate have influenced human activity. Students evaluate competing design solutions related to the management and utilization of natural resources and energy. Students use or create computational simulations to illustrate the relationships among Earth's systems and to determine how relationships are being modified due to human activity. Students explore and analyze the management of natural resources, the sustainability of human populations, and biodiversity. Students design, evaluate, and refine solutions for reducing the impacts of human activities on the environment and biodiversity.

I will…..

- TEXTILE PROJECT
- Research each item using the following guidelines: (200 pts) (must use and cite at least 3 sources) EACH TOPIC WILL HAVE 5-7 SENTENCES AND THE CITATIONS WILL BE IN EACH BOX..
    - Where is it made?
    - What processes are used to create this material? (this is going to be extensive)
        - How is it “harvested”?
        - What kinds of chemicals are used to treat it?
        - How much water is used?
        - How far does the material travel? (from harvest, to treatment, to creating the clothing, to selling)
        - What impact does the total travel of the material have on the environment? (land, air and/or sea)
        - How does the government regulate the manufacturing and distribution of this material?
    - How is this material typically disposed?
    - Can this material be recycled? If so, how? Where? Can it be recycled here in Jonesboro? What are the environmental repercussions for recycling this material? (in other words which is worse on the environment: recycling or throwing it away?)
    - How can this material be reused? (describe 3 ways it can be repurposed)
    - What are some alternatives to this material that have less of an ecological impact?

AR STANDARDS / SKILLS

CONTENT VOCABULARY WITHIN THE STANDARD WILL BE TAUGHT THROUGHOUT DAILY OBJECTIVES / GOALS.

Students who demonstrate understanding can:
EVS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrences of natural hazards, and changes in climate have influenced human activity. [AR Clarification Statement: Emphasis is on sustainability of natural resources, extracting natural resources, and how human societies are economically impacted by these phenomena.]
EVS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* [AR Clarification Statement: Emphasis is on conservation, sustainability (e.g., recycling and reuse of resources), and minimizing impacts (e.g., Low Impact Design).]
EVS-ESS3-3 Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. [AR Clarification Statement: Emphasis is on Arkansas-specific management and conservation of, costs of implementation and regulation of, and land use of (agriculture, mining, recreation, and urbanization) natural resources.]
EVS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [AR Clarification Statement: Examples of data on the impacts of human activities could include the sequencing of traffic lights, adding lanes to main traffic arteries, docking and dredging of waterways, transportation of goods to market, use of drones, and use of alternative energies.]
EVS-ESS3-5

EVS-ESS3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. [AR Clarification Statement: Examples of evidence for both data and climate model outputs for climate changes and their associated impacts can be found at NOAA, National Weather Service and United States Geological Survey.]

EVS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [AR Clarification Statement: Emphasis in this course is on Arkansas-specific solutions. Examples of human activities can include land use (agriculture, forestry, recreation, industry); sustainable and nonsustainable practices (crop rotations, eradication of invasive species); and solution resources may include Low Impact Design (LID) or bioremediation (Faulkner County, AR; Gulf of Mexico hypoxia zone.)]

EVS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* [AR Clarification Statement: Emphasis is on designing solutions for a proposed problem (e.g., microbead pollution, invasive species, effects of sedimentation on the Arkansas fatmucket, White-nose Syndrome affecting bat populations, and environmental pollution from hormones and antibiotics).]

EVS4-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. [AR Clarification Statement: Modeling complex real world problems using computer software could include simulating future population growth in terms of limited resources or evaluating water flow through different Earth and geoengineered materials.]

Science/Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts:	
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories. · Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** · Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (EVS-LS2-7) **LS4.C: Adaptation** · Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence	**Cause and Effect** · Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (EVS-ESS3-1, EVS-LS4-6) **Stability and Change** · Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (EVS-ESS3-3, EVS-ESS3-4) · Much of science deals with constructing explanations of how things change and how	

operate today as they did in the past and will continue to do so in the future. (EVS-ESS3-1) · Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (EVS-ESS3-4, EVS-LS2-7) **Engaging in Argument from Evidence** Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed world(s). Arguments may also come from current scientific or historical episodes in science. · Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (EVS-ESS3-2) **Using Mathematics and Computational Thinking** Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical	of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (EVS-LS4-6) **LS4.D: Biodiversity and Humans** · Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (EVS-LS2-7) · Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. *(*EVS-LS2-7, EVS-LS4-6) **ESS2.D: Weather and Climate** · Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated	they remain stable. (EVS-LS2-7) **Systems and System Models** · When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (EVS-ESS3-6) - ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the Natural World** · Modern civilization depends on major technological systems. (EVS-ESS3-1, EVS-ESS3-3) · Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (EVS-ESS3-2) · Analysis of costs and benefits is a critical aspect of decisions about technology. (EVS-ESS3-2) · New technologies can have deep impacts on society	

analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. · Create a computational model or simulation of a phenomenon, designed device, process, or system. (EVS-ESS3-3) · Use a computational representation of phenomena or design solutions to describe and/or support claims and/or explanations. (EVS-ESS3-6) · Create or revise a simulation of a phenomenon, designed device, process, or system. (EVS-LS4-6)	greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (EVS-ESS3-6) **ESS3.A: Natural Resources** · Resource availability has guided the development of human society. (EVS-ESS3-1, EVS-ESS3-2) **ESS3.B: Natural Hazards** · Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (EVS-ESS3-1) **ESS3.C: Human Impacts on Earth Systems** · Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (EVS-ESS3-3, EVS-ESS3-4) **ESS3.D: Global Climate Change** · Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities.	and the environment, including some that were not anticipated. (EVS-ESS3-3) · Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (EVS-ESS3-4) -***Connections to Nature of Science*** **Science Addresses Questions About the Natural and Material World** · Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions. · Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. · Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (EVS-ESS3-2) **Science is a Human Endeavor** Science is a result of human endeavors, imagination, and	

	(EVS-ESS3-6) **ETS1.B: Developing Possible Solutions** · When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (EVS-ESS3-2, EVS-ESS3-4, EVS-LS4-6, EVS-LS2-7) · Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (EVS-LS4-6)	creativity. (EVS-ESS3-3)	
Activities/Skills	**Assessments**	**Resources**	**Vocabulary/Terms**
AR EVS-PS3-1 AR EVS-PS3-2 AR EVS-PS3-3 AR EVS-PS3-4 AR EVS-ESS2-4 AR EVS2-ETS1-2	• Research • Labs	• Internet • Text • Videos • Lab	