Unit 1: Ecosystems				
How does a system of living and non-living things operate to meet the needs of the organisms in an ecosystem?				
Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Biomes	What is the relationship between living organisms and abiotic factors? How is human activity affecting Earth's biomes?	LS2.A.1 Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. **LS2.C.2 Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems.* The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. **LS2.C.1 Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.* **LS4.C.1 Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.*	MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	Analyzing and Interpreting Data: Analyze and interpret data to provide evidence for a phenomena. *Constructing Explanations* Cause and Effect: Cause and effect relationships may be used to predict phenomena in natural or designed systems.
	Notes: Earth is full of diverse organisms that are uniquely adapted to their physical environment. These organisms depend on their interactions with abiotic factors like temperature, precipitation, and the region's geology to grow and reproduce. Human activities have impacted Earth's biomes.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Interactions and Interdependence in Ecosystems	How do organisms survive in their environment? How do interactions between organisms affect individual survival and population levels?	LS2.A.1 Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. LS2.A.3 Growth of organisms and population increases are limited by access to resources. LS2.A.4 Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. LS2.C.2 Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. LS1.B.3 Genetic factors as well as local conditions affect the growth of organisms.	MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. *MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	Constructing Explanations and Designing Solutions: Construct an explanation that includes qualitative and quantitative relationships between variables that predict phenomena. *(Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.)* *Patterns: Patterns can be used to identify cause and effect relationships.
	Notes: Organisms interact in predictable ways within ecosystems, and these interactions affect the individual survival and reproduction of organisms. On a larger scale, these interactions can impact populations.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Energy Transfer in Ecosystems	How does energy enter an ecosystem? How does energy move through an ecosystem?	LS2.B.1 Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3) LS1.C. 1 Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. PS3.D.1: The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary)	MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	Developing and Using Models: Develop a model to describe a phenomena. Constructing Explanations: Construct a scientific explanation based on valid and reliable evidence obtained from sources (including experiments) and the assumption of theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. *Energy and Matter: The transfer of energy can be tracked as energy flows through a natural system. // Within a natural system, the transfer of energy drives the motion and/or cycling of matter.
	Notes: The sun is the source of energy in ecosystems. Plants use energy from the sun to produce sugars that are used for plant growth. These sugars are passed on through the food chain, cycling energy from producers to consumers to decomposers.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Cycling of Matter in Ecosystems	How does matter cycle through an ecosystem? How does the cycling of matter in ecosystems affect organisms and populations?	LS2.B.1 Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)	MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	Developing and Using Models Constructing Explanations *Energy and Matter: The transfer of energy can be tracked as energy flows through a natural system. // Within a natural system, the transfer of energy drives the motion and/or cycling of matter. *Scientific Knowledge Assumes an Order and Consistency in Natural Systems: Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.
	Notes: Some of the sugars plants make are stored for later use in biomass. This biomass is then passed on through the food chain from producers to consumers to decomposers. Decomposers break down dead organisms and return nutrients to the soil. Matter is constantly cycling through living and nonliving parts of an ecosystem.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Changes In Ecosystems	How can a small change in an ecosystem cause large changes? How can ecosystems recover after significant disruptions? How do human activities impact populations in ecosystems?	LS2.C.1 Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. LS2.C.2 Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. *LS4.D.1 Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary)* *ETS1.B.1 There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary)*	MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*	Engaging In Argument From Evidence: Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. *Stability and Change: Small changes in one part of a system might cause large changes in another part.
	Notes: Organisms are dependent on the living and nonliving parts of their ecosystem. Small changes in an ecosystem can result in large changes in populations and communities. Humans have significantly impacted ecosystems in a number of ways -- from pollution to the spread of invasive species to habitat loss/fragmentation. Humans have removed important species, introduced and reintroduced species, and caused an overall decline in biodiversity on Earth. Sometimes, ecosystems are able to recover after a disruption. In other situations, changes are too dramatic or happen to quickly for ecosystems to rebound.			

Unit 2: Diversity of Life				
How are living things similar and different?				
Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Classification	What is biodiversity? Why is biodiversity important? What are the characteristics of life? How is life on Earth diverse?	LS1.A.1 All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) LS2.C.2 Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.	MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.	Planning and Carrying Out Investigations: Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. *Scale, Proportion, and Quantity: Phenomena that can be observed at one scale may not be observable at another scale.
	Notes: Biodiversity is the variety of species found on Earth. While all organisms share certain characteristics, there is an abundance of different forms of life on Earth. Scientists have attempted to classify organisms based on characteristics and roles. However, new technologies have brought up a number of questions regarding the classification of various organisms.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Animal Behavior	How do animals physical and behavioral traits help them survive?	LS1.B.1 Animals engage in characteristic behaviors that increase the odds of reproduction. **LS4.B.1 Natural selection leads to the predominance of certain traits in a population, and the suppression of others.*	MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. *MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.*	Engaging In Argument From Evidence: Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. *Cause and Effect: Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
	Notes: While life on Earth is extremely diverse and organisms differ in many ways, some organisms have developed similar patterns of behavior that increase their odds of survival and reproduction. Physical traits and characteristic behaviors improve the likelihood of survival and reproduction for some animals.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Reproduction	How does reproduction ensure a species survival? What are some reproduction strategies species have developed?	LS1.B.1 Animals engage in characteristic behaviors that increase the odds of reproduction. LS1.B.1 Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary)	MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	Engaging In Argument From Evidence: Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.
	Notes: Reproduction is vital to the survival of a species. Animals have developed a number of reproductive strategies that increase the likelihood of species survival.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Plant Structure and Function	How do plant structures increase the probability of survival and reproduction? How do plants depend on other organisms for survival and reproduction? Why are plants vital to continued life on Earth?	LS1.B.2 Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.	MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	Engaging In Argument From Evidence: Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.
	Notes: While plants do not necessarily engage in the same "behaviors" as animals, they have developed special structures to increase the probability of survival and reproduction. Many of these structures are designed to attract animals to assist in the process - such as the role of bees in pollinating many plants. Plants are vital to life on Earth, moving energy from the sun into the food chain.			

Unit 3: Genetics and Heredity				
How do organisms pass traits from one generation to the next?				
Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Genetics	What makes you *you*? Why does a sunflower seed become a sunflower? Why can't you make a cat-dog?	LS3.A.1 Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. LS1.B.2 Genetic factors as well as local conditions affect the growth of the adult plant.	MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	Developing and Using Models: Develop and use a model to describe phenomena. *Structure and Function: Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.
	Notes: Genes are responsible for determining the traits of individuals. Changes to traits (mutations) can affect the traits of an organism in harmful, beneficial, or neutral ways. In addition to genes, environmental factors can influence the growth of organisms. Environmental factors can also impact the expression of genes (concept briefly introduced).			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Heredity	How are traits passed on? How can reproduction result in variation in traits?	LS1.B.1 Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary) LS3.A.1 Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. LS3.B.1 In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. LS3.B.2 In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.	MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	Developing and Using Models: Develop and use a model to describe phenomena. *Cause and Effect: Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
	Notes: Organisms method of reproduction determines how genetic information is passed on. In sexually reproducing organisms, the offspring inherits half of its genes from each parent. During this process, genes can be altered through mutation, which can have positive, negative, or neutral consequences for the organism.			

Unit 4: Natural Selection and Evolution				
How do organisms change over time in response to changes in the environment?				
Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Adaptation	How does adaptation explain Earth's great diversity?	LS4.B.1 Natural selection leads to the predominance of certain traits in a population, and the suppression of others. *LS.4.C.1 Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.*	MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	Constructing Explanations and Designing Solutions: Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. *Cause and Effect: Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
	Notes: Within a population, there is a natural variety of traits. Some traits are more beneficial than others in that environment, which results in a higher likelihood of survival and reproduction. These traits become more common as they are passed on to subsequent generations of offspring. This occurs across all environments on Earth, so that organisms in each biome are uniquely adapted to survive the biotic and abiotic conditions of the region.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Mechanisms of Natural Selection	How did Earth's great diversity arise?	LS.4.C.1 Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.	MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [	Using Mathematics and Computational Thinking: Use mathematical representations to support scientific conclusions and design solutions. *Cause and Effect: Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
	Notes: Over generations, traits that support survival become more common, shifting the distribution of traits in a population.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Artificial Selection	How do humans influence the characteristics of organisms? How can scientific knowledge be applied to improve the human experience? What are some ethical challenges related to scientific advances?	LS4.B.2 In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring.	MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	Obtaining, Evaluating, and Communicating Information: Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.
	Notes: Through artificial selection, humans can influence the characteristics of an organism. This process has changed over time as technology has improved our ability to manipulate the traits that are passed on. While science can determine what can or may happen, it does not determine what *should* happen. There are many ethical issues that can be explored.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Evidence of Common Ancestry	What evidence supports the theory of evolution?	LS4.A.1 The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. LS4.A.2 Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. LS4.A.3 Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully formed anatomy.	MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. MS-LS4-3 Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.	Analyzing and Interpreting Data: Analyze and interpret data to determine similarities and differences in findings. // Analyze displays of data to identify linear and nonlinear relationships. Constructing Explanations: Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. *Patterns: Graphs, charts, and images can be used to identify patterns in data.
	Notes: While a great diversity of life exists today, many more organisms have existed in Earth's long history. The fossil record documents their existence and extinction. Scientists have identified similarities and differences in the anatomy of these fossilized remains and organisms today and are able to use this information to reconstruct evolutionary history and infer lines of descent. Embryological development offers additional clues in the reconstruction of the evolution of life on Earth.			

Unit 5: Cell Biology				
How does life result from the structure and function of cells?				
Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Cellular Structure	How do cell structures support the functioning of cells? How do cells support life?	LS1.A.2 Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.	MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.	Develop and Use A Model: Develop and use a model to describe phenomena. *Structure and Function: Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.
	Notes: Cells are the basic building block of all life, and within a cell, organelles perform special functions that are vital to survival.			

Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Cellular Processes	How do cellular processes support the survival and growth of an organism?	LS1.C.1 Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6) LS1.C.2 Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7) PS3.D.1 The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6) PS3.D.2 Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)	MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	Constructing Explanations: Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Developing and Using Models: Develop a model to describe unobservable mechanisms. *Energy and Matter: Within a natural system, the transfer of energy drives the motion and/or cycling of matter. // Matter is conserved because atoms are conserved in physical and chemical processes.
	Notes: Cellular processes are vital to the growth and survival of organisms. Photosynthesis in plants and cellular respiration in plants and animals are two important processes that support life. These processes involve chemical reactions with oxygen, water, carbon dioxide, and other chemicals. These reactions form new molecules, support growth, and release energy.			

Unit 6: Health and the Human Body				
How does a system of living and non-living things operate to meet the needs of the organisms in an ecosystem?				
Sub Unit	Essential Question	Science Concepts	Performance Expectations	Science Practices & CC
Body Systems	What body functions are necessary to support human life? How do your body systems work together to keep you alive?	LS1.A.3 In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.	MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	Engaging In Argument From Evidence: Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. *Systems and System Models: Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
	Notes: Multicellular organisms are (by definition) composed of many cells that work together to form tissues, organs, and organ systems. These systems perform specific body functions that are vital to survival.			