Next Generation Science Standards
Middle School

(These are the standards met by the entire Ecology Disrupted unit. If you use only a subset of the resources, fewer standards will be met.)

		Bighorn Sheep	Chesapeake Bay	Winter Roads
MS-LS1	**From Molecules to Organisms: Structures and Processes**			
MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms	■		■
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-LS2	**Ecosystems: Interactions, Energy, and Dynamics**			
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.		■	
MS-LS2-2.	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.		■	
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-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	■	■	■
MS-LS3	**Heredity: Inheritance and Variation of Traits**			
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-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.	■		

Disciplinary Core Ideas				
LS1.C: Organization for Matter and Energy Flow in Organisms	• 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)			
LS2.A: Interdependent Relationships in Ecosystems	• Organisms and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1) • In any ecosystem, organisms and populations with similar requirements for food, water oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth & reproduction.(MS-LS2-1) • Growth of organisms and population increases are limited by access to resources. (MS-LS2-1) • 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. (MS-LS2-2)			
LS2.B: Cycle of Matter and Energy Transfer in Ecosystems	• 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)			
LS2.C: Ecosystem Dynamics, Functioning, and Resilience	• 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. (MS-LS2-4) • 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-LS2-5)			
LS4.D: Biodiversity and Humans	• 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 to MS-LS2-5)			
LS3.A: Inheritance of Traits	• Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)			
LS3.B: Variation of Traits	• 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-LS3-1) • 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. (MS-LS3-2)			

Science and Engineering Practices			
Analyzing and Interpreting Data: • Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)			
Constructing Explanations and Designing Solutions: • Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2) • Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4)			
Obtaining, Evaluating, and Communicating Information: • Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. • 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. (MS-LS4-5)			
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop and use a model to describe phenomena. (MS-LS1-2) • Develop a model to describe unobservable mechanisms. (MS-LS1-7)			
Engaging in Argument from Evidence • Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing			

Crosscutting Concepts			
Scientific Knowledge is Based on Empirical Evidence: • Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)			
Patterns: • Patterns can be used to identify cause and effect relationships • Graphs, charts, and images can be used to identify patterns in data.			
Cause and Effect: • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability			
Systems and System Models: • Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3)			
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 and designed structures/systems can be analyzed to			

determine how they function. (MS-LS1-2)			
Stability and Change: • Small changes in one part of a system might cause large changes in another part. (MS- LS2-4),(MS-LS2-5)			
Influence of Science, Engineering, and Technology on Society and the Natural World: • The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5)			
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. (MS-LS2-3)			
Science Addresses Questions About the Natural and Material World: • Science knowledge can describe consequences of actions but does not make the decisions that society takes. (MS-LS2-5)			