Shelby County Schools Science Vision

Shelby County Schools' vision of science education is to ensure that from early childhood to the end of the 12th grade, all students have heightened curiosity and an increased wonder of science; possess sufficient knowledge of science and engineering to engage in discussions; are able to learn and apply scientific and technological information in their everyday lives; and have the skills such as critical thinking, problem solving, and communication to enter careers of their choice, while having access to connections to science, engineering, and technology.

To achieve this, Shelby County Schools has employed The Tennessee Academic Standards for Science to craft meaningful curricula that is innovative and provide a myriad of learning opportunities that extend beyond mastery of basic scientific principles.

Introduction

In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination 2025. In order to achieve these ambitious goals, we must collectively work to provide our students with high quality standards aligned instruction. The Tennessee Academic Standards for Science provide a common set of expectations for what students will know and be able to do at the end of each grade, can be located in the Tennessee Science Standards Reference. Tennessee Academic Standards for Science are rooted in the knowledge and skills that students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curricula provides instructional planning designed to help students reach these outcomes. The curriculum maps contain components to ensure that instruction focuses students toward college and career readiness. Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

Our collective goal is to ensure our students graduate ready for college and career. Being College and Career Ready entails, many aspects of teaching and learning. We want our students to apply their scientific learning in the classroom and beyond. These valuable experiences include students being facilitators of their own learning through problem solving and thinking critically. The Science and Engineering Practices are valuable tools used by students to engage in understanding how scientific knowledge develops. These practices rest on important "processes and proficiencies" with longstanding importance in science education. The science maps contain components to ensure that instruction focuses students toward understanding how science and engineering can contribute to meeting many of the major challenges that confront society today. The maps are centered around five basic components: the Tennessee Academic Standards for Science, Science and Engineering Practices, Disciplinary Core Ideas, Crosscutting Concepts, and Phenomena.

The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, [A Framework for K-12 Science Education](#) as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science classrooms. Thinking about science had become memorizing concepts and solving mathematical formulae. Practicing science had become prescribed lab situations with predetermined outcomes. The framework proposes a three-dimensional approach to science education that capitalizes on a child's natural curiosity. The Science Framework for K-12 Science Education provides the blueprint for developing the effective science practices. The *Framework* expresses a vision in science education that requires students to operate at the nexus of three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The *Framework* identified a small number of disciplinary core ideas that all students should learn with increasing depth and sophistication, from Kindergarten through grade twelve. Key to the vision expressed in the *Framework* is for students to learn these disciplinary core ideas in the context of science and engineering practices. The importance of combining Science and Engineering Practices, Crosscutting Concepts and Disciplinary Core Ideas is stated in the *Framework* as follows:

Standards and performance expectations that are aligned to the framework must take into account that students cannot fully understand scientific and engineering ideas without engaging in the practices of inquiry and the discourses by which such ideas are developed and refined. At the same time, they cannot learn or show competence in practices except in the context of specific content. (NRC Framework, 2012, p. 218)

To develop the skills and dispositions to use scientific and engineering practices needed to further their learning and to solve problems, students need to experience instruction in which they use multiple practices in developing a particular core idea and apply each practice in the context of multiple core ideas. We use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Students in grades K-12 should engage in all eight practices over each grade band**.** Crosscutting concepts have application across all domains of science. As such, they are a way of linking the different domains of science. Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. There are seven crosscutting concepts that bridge disciplinary boundaries, uniting core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas and develop a coherent and scientifically based view of the world.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery.

Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.

Science and Engineering Practices

1. Asking questions & defining problems
2. Developing & using models
3. Planning & carrying out investigations
4. Analyzing & interpreting data
5. Using mathematics & computational thinking
6. Constructing explanations & designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, & communicating information

Disciplinary Core Ideas

<u>Physical Science</u>
PS 1: Matter & its interactions
PS 2: Motion & stability: Forces & interactions
PS 3: Energy
PS 4: Waves & their applications in technologies for information transfer

<u>Life Sciences</u>
LS 1: From molecules to organisms: structures & processes
LS 2: Ecosystems: Interactions, energy, & dynamics
LS 3: Heredity: Inheritance & variation of traits
LS 4: Biological evaluation: Unity & diversity

<u>Earth & Space Sciences</u>
ESS 1: Earth's place in the universe
ESS 2: Earth's systems
ESS 3: Earth & human activity

<u>Engineering, Technology, & the Application of Science</u>
ETS 1: Engineering design
ETS 2: Links among engineering, technology, science, & society

Crosscutting Concepts

1. Patterns
2. Cause & effect
3. Scale, proportion, & quantity
4. Systems & system models
5. Energy & matter
6. Structure & function
7. Stability & change

Learning Progression

At the end of the elementary science experience, students can observe and measure phenomena using appropriate tools. They are able to organize objects and ideas into broad concepts first by single properties and later by multiple properties. They can create and interpret graphs and models that explain phenomena. Students can keep notebooks to record sequential observations and identify simple patterns. They are able to design and conduct investigations, analyze results, and communicate the results to others. Students will carry their curiosity, interest and enjoyment of the scientific world view, scientific inquiry, and the scientific enterprise into middle school.

At the end of the middle school science experience, students can discover relationships by making observations and by the systematic gathering of data. They can identify relevant evidence and valid arguments. Their focus has shifted from the general to the specific and from the simple to the complex. They use scientific information to make wise decision related to conservation of the natural world. They recognize that there are both negative and positive implications to new technologies.

As an SCS graduate, former students should be literate in science, understand key science ideas, aware that science and technology are interdependent human enterprises with strengths and limitations, familiar with the natural world and recognizes both its diversity and unity, and able to apply scientific knowledge and ways of thinking for individual and social purposes.

Structure of the Standards

- Grade Level/Course Overview: An overview that describes that specific content and themes for each grade level or high school course.
- Disciplinary Core Idea: Scientific and foundational ideas that permeate all grades and connect common themes that bridge scientific disciplines.
- Standard: Statements of what students can do to demonstrate knowledge of the conceptual understanding. Each performance indicator includes a specific science and engineering practice paired with the content knowledge and skills that students should demonstrate to meet the grade level or high school course standards.

Purpose of Science Curriculum Maps

This map is a guide to help teachers and their support providers (e.g., coaches, leaders) on their path to effective, college and career ready (CCR) aligned instruction and our pursuit of Destination 2025. It is a resource for organizing instruction around the Tennessee Academic Standards for Science, which define what to teach and what students need to learn at each grade level. The map is designed to reinforce the grade/course-specific standards and content (scope) and provides *suggested* sequencing, pacing, time frames, and aligned resources. Our hope is that by curating and organizing a variety of standards-aligned resources, teachers will be able to spend less time wondering what to teach and searching for quality materials (though they may both select from and/or supplement those included here) and have more time to plan, teach, assess, and reflect with colleagues to continuously improve practice and best meet the needs of their students.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.

6th Grade Quarter 2 Curriculum Map							
Quarter 1	**Quarter 2**		Quarter 3				Quarter 4
Unit 1 Energy	**Unit 2 Relationships Among Organisms**	Unit 3 Earth's Biomes and Ecosystems	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	**4 weeks**	5 weeks	3 weeks	2 weeks	1 week	3 weeks	9 weeks

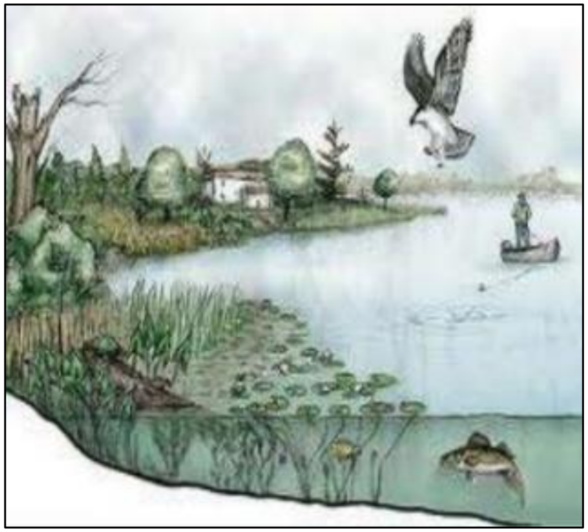
UNIT 2: Relationships Among Organisms (4 weeks)

Overarching Question(s)

How and why do organisms interact with the living and nonliving environments to obtain matter and energy?

Unit 2, Lesson 1	Lesson Length	Essential Question	Vocabulary
Introduction to Ecology	1 week	How are different parts of the environment connected?	ecology, population, ecosystem, niche, biotic factor, species, biome, abiotic factor, community, habitat

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 6.LS2.1 Evaluate and communicate the impact of environmental variables on population size. 6.LS2.4 Using evidence from climate data, draw conclusions about the patterns of abiotic and biotic factors in different biomes, specifically the tundra, taiga, deciduous forest, desert, grasslands, rainforest, marine, and freshwater ecosystems.	**Learning Outcomes** • Describe the field of ecology. • Distinguish between abiotic and biotic factors. • Describe the different levels of organization in an environment. • Describe the factors that characterize a biome. • Relate ecosystems to biomes. • Identify major land biomes. • Identify major aquatic ecosystems. • Describe why populations live in a specific location.	**Curricular Materials** HMH Tennessee Science TE, Unit 2, Lesson 1 pp. 84-97 Engage • Living or Nonliving? Activity, TE p. 86 • Engage Your Brain #s 1 and 2, SE p. 73 • Active Reading #s 3 and 4, SE p. 73 Explore Ecology • Recognizing Relationships Activity, TE p. 86 Levels of Organization in an Environment • Which Abiotic and Biotic Factors Are Found in an Ecosystem? Quick Lab, TE p. 87

Explanation(s) Support of Standard(s) from TN Science Reference Guide 6.LS2.1 Organisms have needs for similar resources: food, water, and habitat. The abundance of a particular resource can have an impact on an individual organism. So, by extension, the abundance of that resource may also impact the population as a whole. Students should be exposed to multiple sources and types of data on populations (e.g. size, reproductive rates, and growth information over time). Students should use their evaluations of both individual organisms and populations as functions of a particular environmental variable to communicate whether observed patterns indicate causation or merely correlation. Increasing population sizes result in increased competition for these resources. An ecosystem will increase in size until it reaches its carrying capacity. Examples may include a population of antelope decreasing because of a drought and then the lion population decreasing also as a result. Another example could include the relationship between deer and wolf populations: When the deer population increases, the wolf population will increase until it causes the deer population to decrease, which in turn causes the wolf population to decrease, and the cycle continues. Each of these variables dictates the niche of the organism, for	**Suggested Phenomenon**  Ecology includes interactions among organisms and their environment. This picture represents several biotic factors but also includes abiotic factors needed for the organisms' survival. Students can complete a See Think Wonder Template after examining the picture. Possible Guiding Question(s): What are the living and nonliving items pictured? What is the relationship between those items?	Biomes • Which Biome? Quick Lab, TE p. 87 • Classifying Biomes Virtual Lab, TE p. 87 Explain Ecology • Active Reading #5, SE p. 75 • Visualize It! #6, SE p. 75 • Visualize It! #7, SE p. 75 Levels of Organization in an Environment • Active Reading #8, SE p. 76 • Visualize It! #9, SE p. 77 • Visualize It! #10, SE p. 77 Biomes • Active Reading #11, SE p. 78 • Think Outside the Book #12, SE p. 78 • Visualize It! #13, SE p. 79 Habitat and Niche • Relate #14, SE p. 80 • Visualize It! #15, SE p. 80 • Hermit Crabs Discussion, TE p. 86 Extend Reinforce and Review • Cluster Diagram Graphic Organizer, TE p. 90 • Visual Summary, SE p. 82 Going Further • Social Studies Connection, TE p. 90 Why It Matters, SE p. 81 Evaluate Formative Assessment

example, the wolf is the carnivore and tertiary consumer in its ecosystem. 6.LS2.4 Ecosystems can be seen as "organisms" with specific needs for energy similar to individual organisms. Just as organisms have identifiable characteristics, so too do ecosystems. Ecosystems are identifiable by both physical and biological components. This standard allows students to look at various regions on Earth and observe that similar combinations of biotic and abiotic factors persist and that these allow the classification of ecosystems into certain types. Emphasis is the connection between living and non-living factors in ecosystem stability: temperature and pattern of global ocean and wind currents, the temperature of the air that is blown onto land, and then the causation of climate to dictate the type of abiotic factors. For example, the tundra has a lot of ice and permafrost because it is in the northern Hemisphere, does not receive direct sunlight so the water currents and resulting wind currents are cold, which causes a cold climate. Only biotic factors adapted to those abiotic factors can survive in that biome.		• Throughout TE • Lesson Review, SE p. 83 Summative Assessment • Introduction to Ecology Alternative Assessment, TE p. 91 Lesson Quiz **Additional Resources** • Population Growth Patterns cK-12 Resources • Population Growth Limits cK-12 Resources • Mission: Biomes! • Biomes cK-12 Content • To Plant or Not To Plant • Scientists Say: Niche • Exploring the "Systems" in Ecosystems **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will use a sentence frame and pre-taught vocabulary to describe the field of ecology in writing.

Suggested Science and Engineering Practice(s) Obtaining, Evaluating, and Communicating Information 6.LS2.1 (O/E) Students can evaluate text, media, and visual displays of information with the intent of clarifying claims and reconciling explanations. (C) Students can communicate scientific information in writing utilizing embedded tables, charts, figures, graphs. Engaging in Argument from Evidence 6.LS2.4 Students present an argument based on empirical evidence, models, and invoke scientific reasoning. **Suggested Crosscutting Concept(s)** Cause and Effect 6.LS2.1 Students recognize that some cause and effect explanations are merely a correlation of factors. Patterns 6.LS2.4 Students recognize, classify, and record patterns in data, graphs, and charts.		Students will use a T-Chart to compare and contrast sentence frames to distinguish between abiotic and biotic factors by talking with a partner. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) connected, community, resources, organism Ecosystems visuals and simplified language Biomes visuals To support students with the scientific explanation: Model speaking and writing expectations for Entering Level ELs. Consider using the recommended stems to support students in their discussions and writing. Use graphic organizers or concept maps to support students in their comparison of abiotic versus biotic or compare/contrast sources. Provide compare/contrast sentence stems: This is the same as because . This is different than because . All these are because . , and all have/are .

		When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows….? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

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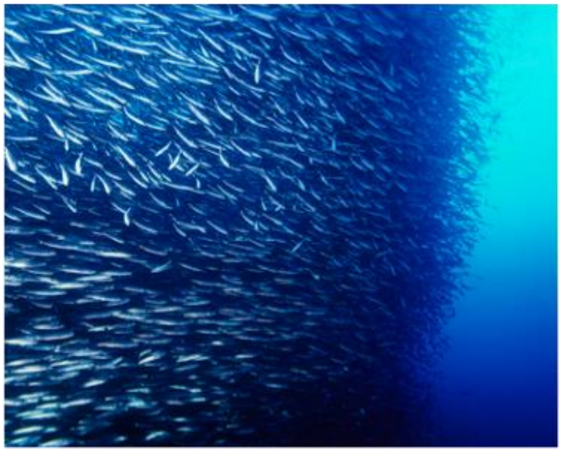
9 weeks	**4 weeks**	5 weeks	3 weeks	2 weeks	1 week	3 weeks	9 weeks

UNIT 2: Relationships Among Organisms (4 weeks)			
Overarching Question(s)			
How and why do organisms interact with their environment and what are the effects of these interactions?			
Unit 2, Lesson 2	**Lesson Length**	**Essential Question**	**Vocabulary**
Roles in Energy Transfer	1 week	How does energy flow through an ecosystem?	omnivore, consumer, herbivore, carnivore, food chain, decomposer, producer, food web, energy pyramid

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 6.LS2.3 Draw conclusions about the transfer of energy through a food web and energy pyramid in an ecosystem. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide**	**Learning Outcomes** • Describe life's energy source. • Explain how producers get energy. • Give examples of producers. • Define photosynthesis. • Explain how decomposers get energy and give examples. • Describe the importance of decomposers in an ecosystem. • Explain how consumers get energy. • Compare and contrast types of consumers, and identify examples of each.	**Curricular Materials** HMH Tennessee Science TE, Unit 2, Lesson 2 pp. 100-115 Engage • Engage Your Brain #s 1 and 2, SE p. • Active Reading #s 3 and 4, SE p. Explore Producers/Decomposers • Energy Role Game Quick Lab, TE p. 103 Food Chains, Food Webs, and Energy Pyramids • Energy Pathways Activity, TE p. 102 Explain

6.LS2.3 Students should be able to consider the transfer of energy between three groups: producers, consumers, and decomposers. Transfer of energy into an ecosystem by consumers is accompanied by transfer of matter. Sources for matter (water, air) include non-living parts of the ecosystem. Energy radiated by the sun is captured by plants and used to combine matter to store chemical energy (food). Inputs of matter into the ecosystem accompany the Sun's energy capture. Consumers combine the food with oxygen, permitting the use of the stored energy and matter for growth. Throughout its lifetime, an organism will use, on average, 90 percent of the energy it consumes. Ultimately, this 90% of energy is released back into the environment as heat. The remaining 10% can be passed along to further consumers or decomposers. The flow of energy and the flow of matter within the ecosystem are entirely connected, yet we see matter cycle between living and non-living components of the ecosystem, while energy flows into, out of, and within ecosystems. (Emphasis for energy flow should be placed on the 10% rule and how energy is transferred to the environment as heat and approximately 10% of potential energy is passed to the next trophic level.) **Suggested Science and Engineering Practice(s)** Developing and Using Models 6.LS2.3	• Differentiate between a food chain, food web, energy pyramid. • Explain energy flow in a web and identify organisms' roles. • Make inferences the regarding removal of a(n) organism(s) from a food web. **Suggested Phenomenon**  Click on the picture to view an oceanic feeding frenzy in which sharks, fish, whales, and birds interact to obtain food (energy). This food web in action displays the many interactions within an ecosystem, including living and nonliving components. Students can complete a See Think Wonder Template while watching the video.	• Think Outside the Book, SE p. 90 Producers/Decomposers • Active Reading #6, SE p. 90 Consumers • Visualize It! #7, SE p. 91 • Infer #8, SE p. 91 Food Chains, Food Webs, and Energy Pyramids • Active Reading #9, SE p. 92 • Visualize It! #s 10-13, SE pp. 92-93 • Active Reading #14, SE p. 94 • Visualize It! #15, SE p. 94 • Visualize It! #16, SE p. 96 • Think Outside the Book #17, SE p. 97 • Visualize It! #s 18 and 19, SE p. 98 Extend Reinforce and Review • Cluster Diagram Graphic Organizer, TE p. 106 • Visual Summary, SE p. 100 Going Further • Earth Science Connection, TE p. 106 • Mathematics Connection, TE p. 106 Why It Matters, SE p. 99 Evaluate Formative Assessment • Throughout TE • Lesson Review, SE p. 101 Summative Assessment • Roles in Energy Transfer Alternative Assessment, TE p. 107

Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. **Suggested Crosscutting Concept(s)** Energy and Matter 6.LS2.3 Students track energy changes through transformations in a system.		• Lesson Quiz **Additional Resources** • Building an Energy Pyramid Lab and Cedar Glade Species List • Popcorn Relay Race • Food Chain Game • Got Energy? Spinning a Food Web • Food Web Crasher • Wolf Quest • Interactive Interdependence • The Earth's Vast Food Chain Under the Seas Newsela Article • Consume or be Consumed: Breaking Down the Structure of a Food Web Newsela Article • Keystone Species Newsela Article **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold):

		Students will talk with a partner to explain how producers get energy using a graphic organizer and word bank. Students will use pictures to identify and give examples of producers. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) flow through, food web, producer, consumer <u>Food chains/ecosystems with visuals and simplified language</u> <u>Food chain diagrams</u> To support students with the scientific explanation: Model speaking and writing expectations for Entering Level ELs. Consider using the recommended stems to support students in their discussions and writing. Sentence Frames: We can classify _____ according to… _____ and ______ are types of … because…. A ___________________________________ is a kind of ____________________________________

		Students should use the following language to describe: for example, for instance, in support of this, in fact, as evidence

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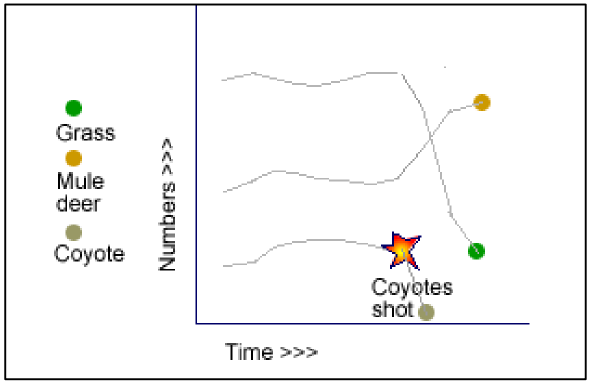
UNIT 1: Energy (9 weeks)

Overarching Question(s)

How and why do organisms interact with their environment and what are the effects of these interactions?

Unit 2, Lesson 3	Lesson Length	Essential Question	Vocabulary
Population Dynamics	1 week	What determines a population's size?	carrying capacity, limiting factor, competition, cooperation

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 6.LS2.1 Evaluate and communicate the impact of environmental variables on population size. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 6.LS2.1 Organisms have needs for similar resources: food, water, and habitat. The abundance of a particular resource can have an impact an individual organism. So, by extension, the abundance of that resource may also impact the population as a whole.	**Learning Outcomes** • Describe factors that increase or decrease population size. • Relate population growth to available resources. • Explain how the carrying capacity can change when the environment changes. • Provide examples of what can cause a population to crash. • Explain the effects of limiting factors on an ecosystem/biome. • Provide examples of biotic and abiotic limiting factors.	**Curricular Materials** HMH Tennessee Science TE, Unit 2, Lesson 3 pp. 116-129 Engage • Engage Your Brain #s 1 and 2, SE p. • Active Reading #s 3 and 4, SE p. Explore Size of Populations • What Factors Influence a Population Change? Quick Lab, TE p. 119 Populations and Limiting Factors • When the Going Gets Tough Daily Demo, TE p. 119

Students should be exposed to multiple sources and types of data on populations (e.g. size, reproductive rates, and growth information over time). Students should use their evaluations of both individual organisms and populations as functions of a particular environmental variable to communicate whether observed patterns indicate causation or merely correlation. Increasing population sizes result in increased competition for these resources. An ecosystem will increase in size until it reaches its carrying capacity. Examples may include a population of antelope decreasing because of a drought and then the lion population decreasing also as a result. Another example could include the relationship between deer and wolf populations: When the deer population increases, the wolf population will increase until it causes the deer population to decrease, which in turn causes the wolf population to decrease, and the cycle continues. Each of these variables dictates the niche of the organism, for example, the wolf is the carnivore and tertiary consumer in its ecosystem. **Suggested Science and Engineering Practice(s)**	• Describe how members of a population may interact with each other. • Explain how social hierarchy can influence a population. **Suggested Phenomenon**  Students can complete a [See Think Wonder Template] after examining the graph. Possible Guiding Question(s): What happened to the populations of coyote over time? Why? What happened to the population of mule deer over time? Why? What happened to the grass over time? Why?	• Investigate an Abiotic Limiting Factor Quick Lab, TE p. 119 Interactions Within Populations • How Do Populations Interact? Exploration Lab, TE p. 119 <u>Explain</u> Size of Populations • Active Reading #5, SE p. 106 • Visualize It! #6, SE p. 106 • Visualize It! #7, SE p. 106 Populations and Limiting Factors • Biotic or Abiotic? Discussion, TE p. 118 • Visualize It! #8, SE p. 108 • Active Reading #9, SE p. 109 • Think Outside the Book #10, SE p. 109 • Apply #11, SE p. 110 • Visualize It! #12, SE p. 110 Interactions Within Populations • Visualize It! #16, SE p. 112 • Active Reading #17, SE p. 113 • Compare #18, SE p. 113 <u>Extend</u> Reinforce and Review • Idea Wheel Graphic Organizer, TE p. 122 • Visual Summary, SE p. 114 Going Further • Real World Connection, TE p. 122 • Fine Arts Connection, TE p. 122 Why It Matters, SE p. 111

Obtaining, Evaluating, and Communicating Information 6.LS2.1 (O/E) Students can evaluate text, media, and visual displays of information with the intent of clarifying claims and reconciling explanations. (C) Students can communicate scientific information in writing utilizing embedded tables, charts, figures, graphs. **Suggested Crosscutting Concept(s)** Cause and Effect 6.LS2.1 Students recognize that some cause and effect explanations are merely a correlation of factors.		Evaluate Formative Assessment • Throughout TE • Lesson Review, SE p. 115 Summative Assessment • Population Dynamics Alternative Assessment, TE p. 123 • Lesson Quiz **Additional Resources** • Deer Me! Predator/Prey Simulation Wolf Quest • Interactive Interdependence • Iguanas Returned to Santiago Island in Hopes of Improving Ecosystem Newsela Article • Wolves of Yellowstone Video • Exploring the "Systems" in Ecosystems Activities **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals

		Sample Language Objectives: (language domain along with a scaffold): Students will talk with a partner to describe factors that increase or decrease population size using a text and graphic organizer. Students will write a sentence that explains the relationship of population growth to available resources. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) determines, capacity, resources To support students with the scientific explanation: Model speaking and writing expectations for Entering Level ELs. Consider using the recommended stems to support students in their discussions and writing. Sentence Frames: The _________ has____, and___________. How does the _________? Why did/didn't the _____________? __________is located _(prep phrase)_the ____. The _________are usually _________ Language to use for describe: for example, for instance, in support of this, in fact, as evidence

		To explain relationships: I think __________ is _______________ because. I like ________ because __________. The _________ had ___________ so _______. Due to the fact that ___________, ________decided to _________.

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UNIT 2: Relationships Among Organisms (4 weeks)

Overarching Question(s)

How and why do organisms interact with their environment and what are the effects of these interactions?

Unit 2, Lesson 4	Lesson Length	Essential Question	Vocabulary
Interactions in Communities	1 week	How do organisms interact?	predator, mutualism, competition, prey, parasitism, symbiosis, commensalism

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 6.LS2.2 Determine the impact of competitive, symbiotic, and predatory interactions in an ecosystem. 6.LS2.7 Compare and contrast auditory and visual methods of communication among organisms in relation to survival strategies of a population. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide**	**Learning Outcomes** • Explain the difference between a predator vs, prey. • Explain how the abundance of a prey species affects the abundance of a predator species, and vice versa. • Identify adaptations that help predators and prey survive. • Explain symbiosis. • Distinguish between the three types of symbiosis. • Explain why communication is important among organisms. • Describe visual communication.	**Curricular Materials** HMH Tennessee Science TE, Unit 2, Lesson 4 pp. 130-143 Engage • Engage Your Brain #s 1 and 2, SE p. • Active Reading #s 3 and 4, SE p. Explore Predation • Prey Coloration Quick Lab, TE p. 133 • Identifying Predators and Prey Quick Lab, TE p. 133 • Modeling the Predator-Prey Cycle Exploration Lab, SE p. 132 Competition

6.LS2.2 Population sizes are influenced by the interactions of organisms within the ecosystem. Predators can decrease population sizes, while mutualistic relationships create a sort of interdependence where the two populations within a community move in tandem. Changes in one population may result in changes to different populations. Students should be familiar with several basic patterns for interactions between organisms: competitive, symbiotic (mutualistic) and predatory. These general patterns for interactions are not limited to specific ecosystems; they are observable in many different ecosystems. Specific examples might be used to support the idea that mutually beneficial relationships between two species might occur when resources are scarce, but be less common when resources are abundant. (The focus should be on relationships within a food web of an ecosystem and the recognition of types of symbiosis, not on specific examples.) 6.LS2.7 Students should ask questions and postulate about the advantages and disadvantages of group sociality in animal populations. Since humans do not have the ability to comprehend the language of other species, we must infer then support the purpose for various forms of communication in other	• Describe auditory communication. • Explain how competition occurs. • Describe resources for which organisms compete. **Suggested Phenomenon**  Shelby Farms Park is home to a thriving herd of buffalo (American bison)! There are usually around 15 buffalo roaming the Park each year. Click on the picture to view the symbiotic relationship among birds and buffalo that roam Shelby Farms. Students can complete a See Think Wonder Template while watching the video.	• What Are You Fighting For? Activity, TE p. 132 • Competing for Resources Virtual Lab, TE p. 133 Explain Predation • Active Reading #5, SE p. 120 • Compare #6, SE p. 120 • Think Outside the Book #7, SE p. 121 • Visualize It! #8, SE p. 121 Symbiosis • Active Reading #9, SE p. 122 • Symbiosis Discussion, TE p. 132 • Compare #10, SE p. 122 • Summarize #11, SE p. 123 • Think Outside the Book #12, SE p. 123 Communication • Visualize It! #13, SE p. 124 Competition • Active Reading #14, SE p. 126 • Predict #15, SE p. 126 • Think Outside the Book #16, SE p. 126 Extend Reinforce and Review • Symbiosis Game Activity, TE p. 136 • Cluster Diagram Graphic Organizer, TE p. 136 • Visual Summary, SE p. 128 Going Further • Social Studies Connection, TE p. 136 • Human Biology Connection, TE p. 136

species. When we observe unique behaviors in animals, we search for an explanation for the purpose of that behavior. Groups of organisms cease to exist if the group no longer provides a benefit to its individuals. Students may begin to draw conclusions about survival and reproduction based on observed communications. Examples include communication in social animals such as meerkats in the presence of different predators and how that can impact individual survival. Other examples include the predatory communication of group hunters such as the spotted hyena, African Hunting Dogs, and Orcas. Plant communication may include pheromones. **Suggested Science and Engineering Practice(s)** Constructing Explanations and Designing Solutions 6.LS2.2 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. Asking Questions (for Science) and Defining Problems (for Engineering) 6.LS2.7		• Why It Matters, SE p. 127 Evaluate Formative Assessment • Throughout TE • Lesson Review, SE p. 129 Summative Assessment • Interactions in Communities Alternative Assessment, TE p. 137 • Lesson Quiz **Additional Resources** • 6.LS2.2 Student Activity, Teacher Guide, Argument Wolf Restoration Article, Argument Simulation Cards 1, and Argument Simulation Cards 2 • Symbiotic Relationships CPALMS Lesson and Activities • Exploring Symbiosis Activity • Visual Communication Examples • Auditory Communication Examples • Wolf Quest • Welcome to the Arctic's All-Night Undersea Party Science News for Students Article • Symbiosis: The Art of Living Together Newsela Article • Wolves of Yellowstone Video **ESL Supports and Scaffolds** WIDA Standard 4- The Language of Science

Questions originate based on experience as well as need to clarify and test other explanations, or determine explicit relationships between variables. **Suggested Crosscutting Concept(s)** Patterns 6.LS2.2 Students recognize, classify, and record patterns in data, graphs, and charts. Systems and System Models 6.LS2.7 Students recognize, classify, and record patterns in data, graphs, and charts		To support students in speaking refer to this resource: WIDA Doing and Talking Science When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold): Students will read a text and use a graphic organizer to explain how the abundance of a prey species affects the abundance of a predator species, and vice versa by working with a partner. Students will use visuals to identify adaptations that help predators and prey survive and write a complete sentence using a word box to describe how adaptations help predators survive. Species interaction visuals Species interaction video

		Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) adapt; adaptation; interact; survival; organism; interdependence; population To support students with the scientific explanation: Model speaking and writing expectations for Entering Level ELs. Consider using the recommended stems to support students in their discussions and writing. Sentence Frames: Identifying: Here we see that_____________________. As evidence, I notice, I think ___________ is ________________ because. I like _________ because ___________. To explain: The _____________ is _______________ because__________________________ This _________is necessary for ____________ because it _________________________. Both _______and ______ could be classified as ______.

		The reason _____ goes with _______ is because __________. <u>Question Starters</u> What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows…? But does your claim account for…(evidence) <u>Response Starters</u> I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

6th Grade Quarter 2 Curriculum Map							
Quarter 1	**Quarter 2**		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	**Unit 3 Earth's Biomes and Ecosystems**	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	**5 weeks**	3 weeks	2 weeks	1 week	3 weeks	9 weeks

UNIT 3: Earth's Biomes and Ecosystems (5 weeks)

Overarching Question(s)

How and why do organisms interact with their environment and what are the effects of these interactions?

Unit 3, Lesson 1	Lesson Length	Essential Question	Vocabulary
Land Biomes	1 week	What are land biomes?	biome, taiga, deciduous tree, grassland, tundra, desert, coniferous tree

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 6.LS2.4 Using evidence from climate data, draw conclusions about the patterns of abiotic and biotic factors in different biomes, specifically the tundra, taiga, deciduous forest, desert, grasslands, rainforest, marine, and freshwater ecosystems. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide**	**Learning Outcomes** • Explain what a biome is and provide examples of biomes. • Describe what differentiates one biome from another. • Describe the relationship between biomes and ecosystems. • Describe the tundra and taiga biomes. • Describe the desert and grassland biomes. • Provide examples of plant and animal adaptations. • Describe the temperate forest and tropical rain forest biomes.	**Curricular Materials** HMH Tennessee Science TE, Unit 2, Lesson 4 pp. 156-169 Engage • Engage Your Brain #s 1 and 2, SE p. • Active Reading #s 3 and 4, SE p. Explore Biomes • Biome Competition Activity, TE p. 158 Explain Biomes • Visualize It! #5, SE p. 142 • Active Reading #6, SE p. 143 • Visualize It! #7, SE p. 143

<u>6.LS2.4</u> Ecosystems can be seen as "organisms" with specific needs for energy similar to individual organisms. Just as organisms have identifiable characteristics, so too do ecosystems. Ecosystems are identifiable by both physical and biological components. This standard allows students to look at various regions on Earth and observe that similar combinations of biotic and abiotic factors persist and that these allow the classification of ecosystems into certain types. Emphasis is the connection between living and non-living factors in ecosystem stability: temperature and pattern of global ocean and wind currents, the temperature of the air that is blown onto land, and then the causation of climate to dictate the type of abiotic factors. For example, the tundra has a lot of ice and permafrost because it is in the northern Hemisphere, does not receive direct sunlight so the water currents and resulting wind currents are cold, which causes a cold climate. Only biotic factors adapted to those abiotic factors can survive in that biome. **Suggested Science and Engineering Practice(s)** <u>Engaging in Argument from Evidence</u> 6.LS2.4 Students present an argument based on empirical evidence, models, and invoke scientific reasoning. **Suggested Crosscutting Concept(s)** <u>Patterns</u> 6.LS2.4	• Provide examples of plant and animal adaptations within each biome. **Suggested Phenomenon** Why might a cactus have an easier time surviving in Las Vegas, NV than in Memphis, TN? Discuss this idea with students, giving them time to generate and record their ideas.	• Visualize It! #8, SE p. 144 Tundra and Taiga • Active Reading #9, SE p. 145 • Visualize It! #10, SE p. 145 Desert and Grasslands • Active Reading #11, SE p. 146 • Visualize It! #12, SE p. 146 • Visualize It! #13, SE p. 147 Temperate Forest and Tropical Rain Forest • Visualize It! #14, SE p. 148 • Think Outside the Book #15, SE p. 148 Visualize It! #16, SE p. 149 <u>Extend</u> Reinforce and Review • Land Biomes in Review Activity, TE p. 162 • Layered Book Graphic Organizer, TE p. 162 • Visual Summary, SE p. 150 Going Further • Social Studies Connection, TE p. 162 <u>Evaluate</u> Formative Assessment • Throughout TE • Lesson Review, SE p. 151 Summative Assessment • Exploring Land Biomes Alternative Assessment, TE p. 163 • Lesson Quiz **Additional Resources**

Students recognize, classify, and record patterns in data, graphs, and charts.		• Mission: Biomes! • Biomes cK-12 Content • To Plant or Not To Plant • Biomes Article **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold): Students will use visuals and a graphic organizer to write 2-3 sentences that describe what differentiates one biome from another. Students will read a passage that describes the relationship between biomes and ecosystems with a partner to identify key vocabulary about biomes and their relationships with the ecosystem.

		Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) Interact, relationship, key, impact To support students with the scientific explanation: Model speaking and writing expectations for Entering Level ELs. Consider using the recommended stems to support students in their discussions and writing. Sentence Frames: Biomes and ecosystems are related to one another by_______________ The relationship between biomes and ecosystems is_______________ A tundra can be described as______________ The features of a tundra are______________ <u>Biome visuals with simplified vocabulary</u> <u>Types of biomes</u>

6th Grade Quarter 2 Curriculum Map							
Quarter 1	**Quarter 2**		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	**Unit 3 Earth's Biomes and Ecosystems**	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	**5 weeks**	3 weeks	2 weeks	1 week	3 weeks	9 weeks

UNIT 1: Energy (9 weeks)			
Overarching Question(s)			
How and why do organisms interact with their environment and what are the effects of these interactions?			
Unit 3, Lesson 2	**Lesson Length**	**Essential Question**	**Vocabulary**
Aquatic Ecosystems	1 week	What are aquatic ecosystems?	wetland, estuary

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 6.LS2.4 Using evidence from climate data, draw conclusions about the patterns of abiotic and biotic factors in different biomes, specifically the tundra, taiga, deciduous forest, desert, grasslands, rainforest, marine, and freshwater ecosystems. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide**	**Learning Outcomes** • Describe the three major types of aquatic ecosystems. • Describe abiotic factors that affect aquatic ecosystems. • Describe freshwater ecosystems. • Describe the characteristics of an estuary. • Describe the marine ecosystems. **Suggested Phenomenon**	**Curricular Materials** HMH Tennessee Science TE, Unit 3, Lesson 2 pp. 170-183 Engage • Engage Your Brain #s 1 and 2, SE p. 155 • Active Reading #s 3 and 4, SE p. 155 Explore Explain Aquatic Ecosystems • Visualize It! #5, SE p. 156 • Compare #6, SE p. 156 • Visit an Aquatic Ecosystem! Activity, TE p. 172 Freshwater Ecosystems • Active Reading #7, SE p. 157 • Visualize It! #8, SE p. 157

6.LS2.4 Ecosystems can be seen as “organisms” with specific needs for energy similar to individual organisms. Just as organisms have identifiable characteristics, so too do ecosystems. Ecosystems are identifiable by both physical and biological components. This standard allows students to look at various regions on Earth and observe that similar combinations of biotic and abiotic factors persist and that these allow the classification of ecosystems into certain types. Emphasis is the connection between living and non-living factors in ecosystem stability: temperature and pattern of global ocean and wind currents, the temperature of the air that is blown onto land, and then the causation of climate to dictate the type of abiotic factors. For example, the tundra has a lot of ice and permafrost because it is in the northern Hemisphere, does not receive direct sunlight so the water currents and resulting wind currents are cold, which causes a cold climate. Only biotic factors adapted to those abiotic factors can survive in that biome. **Suggested Science and Engineering Practice(s)** Engaging in Argument from Evidence 6.LS2.4 Students present an argument based on empirical evidence, models, and invoke scientific reasoning. **Suggested Crosscutting Concept(s)** Patterns 6.LS2.4	 A community of organisms are dependent upon each other and the environment in which they live. Students can complete a See Think Wonder Template after examining the picture. Possible Guiding Question(s): How are the organisms within the pictured ecosystem interacting?	• Visualize It! #10, SE p. 158 • Visualize It! #11, SE p. 159 • Inquiry #12, SE p. 159 Estuaries • Visualize It! #13, SE p. 160 Marine Ecosystems • Visualize It! #17, SE p. 162 • Active Reading #18, SE p. 163 • Marine Adaptation Probing Questions, TE p. 172 Extend Reinforce and Review • Concept Map Graphic Organizer, TE p. 176 • Visual Summary, SE p. 164 Going Further • Chemistry Connection, TE p. 176 • Why It Matters, TE p. 176 Evaluate Formative Assessment • Throughout TE • Lesson Review, SE p. 165 Summative Assessment • Aquatic Ecosystems Alternative Assessment, TE p. 177 • Lesson Quiz **Additional Resources**

Students recognize, classify, and record patterns in data, graphs, and charts.		• Aquatic Ecosystems STUDY JAMS! Video and Quiz • Warming Pushes Lobsters and Other Species to Seek Cooler Homes Science News for Students Article • Saving Wetlands Science News for Students Additional Information **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold): Students will describe the three major types of aquatic ecosystems using a 3-column chart and visuals. To support students with the scientific explanation: Model speaking and writing expectations for Entering Level ELs. Consider

		using the recommended stems to support students in their discussions and writing. Sentence Frames: The ________ has____, and___________. for example, for instance, in support of this, in fact, as evidence I notice that _________.

6th Grade Quarter 2 Curriculum Map							
Quarter 1	**Quarter 2**		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	**Unit 3 Earth's Biomes and Ecosystems**	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	**5 weeks**	3 weeks	2 weeks	1 week	3 weeks	9 weeks

UNIT 3: Earth's Biomes and Ecosystems (5 weeks)

Overarching Question(s)

How and why do organisms interact with their environment and what are the effects of these interactions?
How does biodiversity affect humans?

Unit 3, Lesson 3	Lesson Length	Essential Question	Vocabulary
Changes in Ecosystems	1 week	How do ecosystems change?	eutrophication, biodiversity, succession, pioneer species

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) LS2: Ecosystems: Interactions, Energy, and Dynamics LS4: Biological Change: Unity and Diversity *ESS3: Earth and Human Activity **Standard(s)** 6.LS2.6 Research the ways in which an ecosystem has changed over time in response to changes in physical conditions, population balances, human interactions, and natural catastrophes. 6.LS4.1 Explain how changes in biodiversity would impact ecosystem stability and natural resources.	**Learning Outcomes** • Explain eutrophication. • Describe succession. • Differentiate primary succession from secondary succession. • Explain the role a pioneer species plays in succession. • Explain how mature ecological communities support biodiversity. • Describe how biodiversity contributes to the sustainability of an ecosystem.	**Curricular Materials** HMH Tennessee Science TE, Unit 3, Lesson 3 pp. 186-199 Engage • All Kinds of Changes Activity, TE p. 188 • Engage Your Brain #s 1 and 2, SE p. 171 • Active Reading #s 3 and 4, SE p. 171 • Should Changes Be Prevented? Probing Question, TE p. 188 Explore Succession in Ecosystems • Modeling Succession Activity, TE p. 188 Ecosystems and Diversity

6.ETS1.1 Evaluate design constraints on solutions for maintaining ecosystems and biodiversity. *6.ESS3.3 Assess the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction. **Explanation(s) and Support of Standard(s) [from TN Science Reference Guide]** 6.LS2.6 This standard can be considered a large umbrella. Standard 6.LS2.5 fits under this umbrella, and lists a number of more specific types of impacts on ecosystems. As part of their research, students should look for ecosystems that have undergone changes either environmental (natural hazards, human impacts, precipitation changes) or changes in the organisms found in the ecosystem (species introduction or removal) and the magnitude of these changes. Students should also then research impacts to the populations of organisms in the ecosystem and whether or not changes that can be seen in established populations might be caused by the change to the ecosystem, or if the two events are merely coincidental. External agents will cause changes (even in healthy ecosystems), but a resilient ecosystem will stabilize.	**Suggested Phenomenon**  Although the eruption of Mt. St. Helens destroyed all life near the eruption, the area is now green and full of life. Students can complete a [See Think Wonder Template] after examining the picture.	• Disaster Strikes! Daily Demo, TE p. 189 • Changes in Ecosystems Virtual Lab, TE p. 189 • Predicting How Succession Follows a Human Disturbance, TE p. 189 Explain Changes in Ecosystem • Active Reading #5, SE p. 172 • Visualize It! #6, SE p. 172 Succession in Ecosystems • Visualize It! #10, SE p. 174 • Identify #11, SE p. 175 • Think Outside the Book #12, SE p. 175 Ecosystems and Diversity • Active Reading #13, SE p. 176 • Venn Diagram #14, SE p. 177 • Preserving Biodiversity Discussion, TE p. 188 Extend Reinforce and Review • Process Chart Graphic Organizer, TE p. 192 • Visual Summary, SE p. 178 Going Further • Health Connection, TE p. 192 • Language Arts Connection, TE p. 192 • Why It Matters, SE p. 173 Evaluate Formative Assessment • Throughout TE • Lesson Review, SE p. 179 Summative Assessment

Examples may include the change in the world's oceans, changes in climate over time or an increase in human populations. Students can plan and carry out a research to model this process. 6.LS4.1 Biodiversity can both increase and decrease. Increases in biodiversity occur when new species of organisms emerge, but the loss of a species decreases biodiversity. Healthy ecosystems exist in a state of dynamic equilibrium. In this state, ecosystems are able to recover from disturbances. The level of biodiversity in an ecosystem is an indicator of the health of an ecosystem. Low levels of biodiversity amplify the effects of disturbances, as the effect on a single species may spread across several niches. Biodiversity also includes the observation of a variety of characteristics within a single population or species to promote the survival of that species. To model the effects of biodiversity in an ecosystem, consider two food webs of varying biodiversity, and consider the effects of the removal of one of the species within this food web. Examples may include the loss of potentially medicinal plants in the rainforest, a shortage of potable water, ecosystems with population extinctions, and overfishing causing a decrease in the ability for human consumption of ocean species. **Suggested Science and Engineering Practice(s)**		• Changes in Ecosystems Alternative Assessment, TE p. 193 • Lesson Quiz **Additional Resources** • Wolves of Yellowstone National Park Article • Global Climate Change EPA Article • Biodiversity Video and Activity Collection • Wolf Quest • How Wolves Change Rivers Video • What is Biodiversity? Newsela Article **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold): Students will use contrast sentence frames to write 2-3 sentences about how primary

<u>Obtaining, Evaluating, and Communicating Information</u> 6.LS2.6 (O/E) Students can evaluate text, media, and visual displays of information with the intent of clarifying claims and reconciling explanations. (C) Students can communicate scientific information in writing utilizing embedded tables, charts, figures, graphs. <u>Engaging in Argument from Evidence</u> 6.LS4.1 Students present an argument based on empirical evidence, models, and invoke scientific reasoning. **Suggested Crosscutting Concept(s)** <u>Stability and Change</u> 6.LS2.6, 6.LS4.1 Students explain that systems in motion or dynamic equilibrium can be stable.		succession is different from secondary succession. Sentence Frames: This _____________ is different from that _________ because one has _________ and the other doesn't_________.

6th Grade Quarter 2 Curriculum Map							
Quarter 1	**Quarter 2**		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	**Unit 3 Earth's Biomes and Ecosystems**	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	**5 weeks**	3 weeks	2 weeks	1 week	3 weeks	9 weeks

UNIT 3: Earth's Biomes and Ecosystems (5 weeks)			
Overarching Question(s)			
How and why do organisms interact with their environment and what are the effects of these interactions?			
Unit 3, Lesson 4	**Lesson Length**	**Essential Question**	**Vocabulary**
Human Activity and Ecosystems	2 weeks	How do human activities affect ecosystems?	urbanization, biodiversity, eutrophication, stewardship, conservation

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) LS2: Ecosystems: Interactions, Energy, and Dynamics LS4: Biological Change: Unity and Diversity ETS1: Engineering Design **Standard(s)** 6.LS2.5 Analyze existing evidence about the effect of a specific invasive species on native populations in Tennessee and design a solution to mitigate its impact. 6.LS2.6 Research the ways in which an ecosystem has changed over time in response to changes in	**Learning Outcomes** • Explain how human activities affect ecosystems on land. • Explain how human population growth affects ecosystems. • Define urbanization. • Define exotic species. • Explain how human activities impact water quality and quantity. • Define water population, eutrophication, and acid rain. • Explain how human activities and pollutants affect ocean ecosystems. • Explain conservation.	**Curricular Materials** HMH Tennessee Science TE, Unit 3, Lesson 4 pp. 204-217 Engage • Engage Your Brain #s 1 and 2, SE p. 187 • Active Reading #s 3 and 4, SE p. 187 Explore Human Activities Affect Land Ecosystems • Modeling Pollution Uptake in Plants, TE p. 206 Explain Human Activities Affect Land Ecosystems • Relate #5, SE p. 188 • Active Reading #6, SE p. 189 • Think Outside the Book #7, SE p. 189

physical conditions, population balances, human interactions, and natural catastrophes. 6.LS4.1 Explain how changes in biodiversity would impact ecosystem stability and natural resources. 6.LS4.2 Design a possible solution for maintaining biodiversity of ecosystems while still providing necessary human resources without disrupting environmental equilibrium. 6.ETS1.1 Evaluate design constraints on solutions for maintaining ecosystems and biodiversity. *6.ESS3.3 Assess the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 6.LS2.5 In 6.LS4.1, students discuss biodiversity. Invasive species that take hold in an ecosystem often outcompete native species in an ecosystem. In doing so, this single species may fill the niche of a variety of organisms, thereby decreasing the overall biodiversity of an ecosystem and reducing the availability of natural resources to native species. Student solutions should take into account characteristics of both physical and biological	• Explain how stewardship can help protect Earth's ecosystems. • Describe how maintaining biodiversity enhances a species' chance of survival. • List five strategies that can help protect the environment. **Suggested Phenomenon**  Deer populations are greatly controlled by their natural predators, but with humans hunting their predators or relocating them, the deer populations begin to grow out of check. Add to this the reality that humans are taking more and more of their land, which leads to an unbalance in the ecosystem. This isn't only damaging to the deer population. As deer seek out food in yards and closer to homes and roads, there is an economic toll on home, car, and landowners. Students can complete a See Think Wonder Template after examining the picture.	Human Activities Affect Aquatic Ecosystems • Active Reading #8, SE p. 190 • Visualize It! #9, SE p. 190 • List #10, SE p. 191 • Active Reading #11, SE p. 192 Ecosystem Conservation • Active Reading #15, SE p. 194 • State #16, SE p. 194 • Synthesize #17, SE p. 195 • Reusing Trash Activity, TE p. 206 Extend Reinforce and Review • Description Wheel Graphic Organizer, TE p. 210 • Visual Summary, SE p. 196 Going Further • Art Connection, TE p. 210 Real World Connection, TE p. 210 Evaluate Formative Assessment • Throughout TE • Lesson Review, SE p. 197 Summative Assessment • Human Impact on Ecosystems Alternative Assessment, TE p. 211 • Lesson Quiz • Combating an Invasive Species S.T.E.M., SE pp. 218-222 • Unit 3 Big Idea, SE p. 204

components and the relationships between the components in the Tennessee specific ecosystem. For example, kudzu and native plant species compete for shared habitat resources and may incorporation of matter into the ecosystem if herbivores that feed on kudzu are not present. Tennessee-specific examples may include kudzu, Tree of Heaven, fire ants, Africanized bees, and zebra mussels. Solution may impact both native and invasive species. Firewood transport ban for various counties is a good example. ("Devices" as written in the science and engineering practice refers to a management strategy for the invasive species.) 6.LS2.6 This standard can be considered a large umbrella. Standard 6.LS2.5 fits under this umbrella, and lists a number of more specific types of impacts on ecosystems. As part of their research, students should look for ecosystems that have undergone changes either environmental (natural hazards, human impacts, precipitation changes) or changes in the organisms found in the ecosystem (species introduction or removal) and the magnitude of these changes. Students should also then research impacts to the populations of organisms in the ecosystem and		• Unit 3 Review, SE pp. 205-208 • S.T.E.M. Engineering Design Process: Design an Ecosystem, TE p. 200-202 **Additional Resources** • 6.LS2.5 Student Activity, Teacher Guide, Question Graphic Organizer, and Invasive Mussels in Cherokee Lake • Human Impacts on Biodiversity Video • Saving the World-One Ecosystem at a Time Activity • Wolf Quest • Oceans' Fever Means Fewer Fish Science News for Students Article • Disappearing Sea Ice Could disrupt Arctic's Food Web Science News for Students Article • Is Ocean Acidification Knocking the Scents Out of Salmon? Science News for Students Article • Tilapia and Carp are Threatening the Ecosystem of Xochimilco in Mexico City Newsela Article • Earth's Biodiversity is Disappearing, According to U.N. Reports Newsela Article • Global Warming Changing Timing of Nature's Dinner Bell, New Study Says Newsela Article • Drop in Krill Population Threatens Antarctic Penguins and Seals Newslea Article **ESL Supports and Scaffolds**

whether or not changes that can be seen in established populations might be caused by the change to the ecosystem, or if the two events are merely coincidental. External agents will cause changes (even in healthy ecosystems), but a resilient ecosystem will stabilize. Examples may include the change in the world's oceans, changes in climate over time or an increase in human populations. Students can plan and carry out research to model this process. 6.LS4.1 Biodiversity can both increase and decrease. Increases in biodiversity occur when new species of organisms emerge, but the loss of a species decreases biodiversity. Healthy ecosystems exist in a state of dynamic equilibrium. In this state, ecosystems are able to recover from disturbances. The level of biodiversity in an ecosystem is an indicator of the health of an ecosystem. Low levels of biodiversity amplify the effects of disturbances, as the effect on a single species may spread across several niches. Biodiversity also includes the observation of a variety of characteristics within a single population or species to promote the survival of that species. To model the effects of biodiversity in an ecosystem, consider two food webs of varying biodiversity, and consider the effects of the removal of one of the species within this food web. Examples		WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold): Students will work with a partner to explain how human activities impact water quality and quantity by writing a paragraph using pre-taught vocabulary Students will use a text to identify words that define water population, eutrophication, and acid rain. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) activities, impact, quality, quantity, affect To support students with the scientific explanation: Model speaking and writing expectations for Entering Level ELs. Consider

may include the loss of potentially medicinal plants in the rainforest, a shortage of potable water, ecosystems with population extinctions, and overfishing causing a decrease in the ability for human consumption of ocean species. 6.LS4.2 The living world provides humans with many materials they need, and humans can dramatically reshape the land and interactions between living systems to meet those needs. Patterns in human development have typically been negative with consequences (e.g., overpopulation, over use of resources, destruction of habitat, pollution). Thoughtful consideration is needed if humans are to reduce their impacts. Many of these negative consequences feed into a subsequent loss of biodiversity that can then have negative impacts for humans. Natural resources that can be threatened by disturbing environmental equilibrium include food, energy, and medicines as well as the loss of services provided by ecosystems including water purification and recycling of nutrients by decomposers. Stability 6.ETS1.1 The wording and specificity of an engineering problem is a major factor in the quality of the solutions that may be created for a particular problem. Effective problems should have clear		using the recommended stems to support students in their discussions and writing. Sentence Frames: I think __________ is _______________ because ___________. I like ________ because __________ The _________ had ___________ so _______. Due to the fact that ___________ The ____________ is ______________ because________________________

design constraints that incorporate scientific understanding. Constraints should recognize that humans have needs that are met only through use of natural resources, but balance the importance of those needs with stewardship responsibilities. For example, attempting to eliminate an invasive species may only result in replacing one invasive species with a new invasive species or knowledge of local climate might influence plantings. Examples include comparing recycling programs (deposits, curbside pickup, drop-off centers) and the cost/benefit analysis of recycling solutions. Address engineering design issues centered on water treatment (filtration, chemical treatment, reverse osmosis). Design solutions to minimize soil erosion (forestry practices, farming techniques, construction, and recreation). Examples of design solutions could include scientific, economic, or social considerations. **Suggested Science and Engineering Practice(s)** Constructing Explanations and Designing Solutions 6.LS2.5 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.		

<u>Obtaining, Evaluating, and Communicating Information</u> 6.LS2.6 (O/E) Students can evaluate text, media, and visual displays of information with the intent of clarifying claims and reconciling explanations. (C) Students can communicate scientific information in writing utilizing embedded tables, charts, figures, graphs. <u>Engaging in Argument from Evidence</u> 6.LS4.1 Students present an argument based on empirical evidence, models, and invoke scientific reasoning. <u>Engaging in Argument from Evidence</u> 6.LS4.2 Students present evaluations of a solution or device that include student designed tests and give consideration to constraints and criteria for success <u>Asking Questions (for Science) and Defining Problems (for Engineering)</u> 6.ETS1.1 Students define design problems, invoking scientific background knowledge to define multiple criteria and constraints for solutions. **Suggested Crosscutting Concept(s)** <u>Cause and Effect</u> 6.LS2.5 Students use cause and effect relationships to make predictions.		

Stability and Change 6.LS2.6, 6.LS4.1, 6.LS4.2, 6.ETS1.1 Students explain that systems in motion or dynamic equilibrium can be stable.		