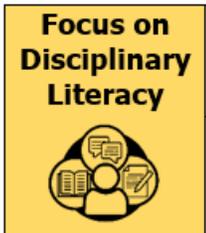


TABLE OF CONTENTS

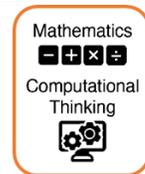
UNIT NARRATIVE	1
UNDERSTANDINGS AND QUESTIONS	2
ROADMAP	3
UNPACKED STANDARDS	13
VERTICAL STANDARDS	18
VOCABULARY GLOSSARY	19
UNIT SUPPLY LIST	

UNIT NARRATIVE

This unit once again focuses on Lake Mendota in Wisconsin. During this unit students will explore the hierarchical organization in ecosystem. They will then learn about the biotic and abiotic factors in an ecosystem, by exploring the dependence of organisms on these factors. Next, students will explore the relationships among organisms and how energy is transferred through ecosystems. Students will analyze variations in populations and explore how these variations can be an advantage or disadvantage when the environment changes.



In science, disciplinary literacy is synonymous with the science and engineering practices. The SEPs are the context through which all science concepts should be taught. In the lessons, you will find the Science and Engineering practices icons when the SEPs are being explicitly used by students.



CONTENT STANDARDS

Below are the standards **taught** and **assessed** in this unit.

TEKS in bold are assessed on 8th grade STAAR exam

Readiness Standards

- 6.12A** investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition
- 6.8B** describe how energy is conserved through transfers and transformations in systems such as ~~electrical circuits, food webs, amusement park rides, and photosynthesis.~~

Supporting Standards

- 6.12B describe and give examples of predatory, competitive, and symbiotic relationships between organisms including mutualism, parasitism, and commensalism.
- 6.12C describe the hierarchical organization of organism, population, and community within an ecosystem.
- 6.13C describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change

UNDERSTANDINGS AND QUESTIONS

Important big ideas and processes for the unit.

Key Understandings

- Organisms depend upon biotic and abiotic factors for survival and may compete with other organisms for these resources.
- Relationships exist among organisms. These relationships can be predatory, competitive, or symbiotic.
- Variation exists among populations of organisms. In a changing environment, these variations can lead to survival or decline of the population.
- Energy in an ecosystem is transferred through trophic levels. Only 10% of the energy is transferred level to level. The remaining 90% is transformed to thermal energy and released as heat. The total amount of energy remains constant.

Key Questions

- In what ways do organisms depend on biotic and abiotic factors in an ecosystem?
- What happens when there are not enough available resources in an ecosystem?
- What are advantages and disadvantages of variation within populations?
- In what ways is energy transformed within living systems?
- Is energy transfer through an ecosystem an efficient process?

ROADMAP

ROADMAP AT A Glance: Unit #03 Organisms and Environments				
Day	Date	TEKS	Lesson	Lesson Title
There are two flex days built into this unit to use as needed. Flex days can be used for lessons that take longer than one day or for reteaching material the students may not have gotten during tier 1 instruction.				
1		6.12C	1	Hierarchical Organization of Ecosystems
2		6.12A	2	Abiotic and Biotic Factors
3		6.12A	3	Limiting Factors and Carrying Capacity
4		6.12B	4	Relationships Among Organisms Part 1
5		6.12B	5	Relationships Among Organisms Part 2
6		6.12B	6	Predator Prey Relationships
7		6.8B	7	Food Chains, Webs, and Energy Pyramids Day 1
8		6.8B	8	Food Chains, Webs, and Energy Pyramids Day 2
9		6.8B	9	Food Webs in Lake Mendota
10		6.12A-C; 6.8B	10	Bio-manipulation of Lake Mendota Part 1
11		6.12A-C; 6.8B	11	Bio-manipulation of Lake Mendota Part 2
12		6.13C	12	Variation within Populations Day 1
13		6.13C	13	Variation within Populations Day 2
14			Unit Exam	TX_SCI_6thScience_F24_UE2 Scanning Deadline:

Lesson	Objective(s) and Standard(s)	Instructional Notes	Resources
Lesson 01: Hierarchical Organization of Ecosystems	<p>SWBAT Identify and illustrate the hierarchical organization within an ecosystem</p> <p>TEKS 6.12C describe the hierarchical organization of organism, population, and community within an ecosystem</p>	<ul style="list-style-type: none"> • Students will conduct an inquiry lab in which the attempt to design a balanced ecosystem for the space and resources of a 29-gallon aquarium. Student will then analyze the components of their ecosystem to determine it is balanced. • Students will participate in a reading to learn to learn formal definitions of the levels of organization in an ecosystem. • Students will complete a three-way card sort matching name, description, and picture of the levels of organization. • Student will illustrate the levels of organization in an ecosystem by completing a model. <p><u>Vocabulary</u> Organism Population Community Ecosystem</p>	Lesson 01: Hierarchical Organization of Ecosystems
Lesson 02: Abiotic and Biotic Factors	<p>SWBAT distinguish between biotic factors (organisms and populations) in an ecosystem and abiotic factors</p> <p>TEKS 6.12A investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition</p>	<ul style="list-style-type: none"> • Students will complete an exploration lab in which they will classify and compare abiotic and biotic factors from two different biomes: the hot desert of Death Valley National Park and the deciduous temperate forest of Harpers Ferry, WV. • Students will also identify differences in the balance of abiotic-to-biotic factors between extreme and non-extreme environments. • Students will distinguish between biotic and abiotic factors in the Lake Mendota Ecosystem. • Students will write a scientific explanation, in CER format, to respond to the questions: What is the difference between abiotic and biotic factors? How is the balance of those factors affected by different ecosystems? <p><u>Vocabulary</u> Abiotic factor Biotic factor</p>	Lesson 02: Abiotic and Biotic Factors

Lesson	Objective(s) and Standard(s)	Instructional Notes	Resources
Lesson 03: Limiting Factors and Carrying Capacity	<p>SWBAT describe how biotic factors (organisms and populations) in an ecosystem depend on and may compete for abiotic factors</p> <p>TEKS 6.12A investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition</p>	<ul style="list-style-type: none"> • In the Oh Deer game students will experience how both abiotic and biotic factors are things organisms compete for, and the availability of each determines the carrying capacity. • Students will then graph the population size of the deer from the activity. • In the Carrying Capacity and Limiting Factors activity, students will learn more about limiting factors and carrying capacity. • Students will read case studies and answer questions. Students will also learn the differences between density-dependent and density-independent limiting factors. Finally, this activity also teaches students about overshoot and introduces them to population graphs. • Finally, students will analyze 2 population graphs and answer questions about carrying capacity and limiting factors. <p><u>Vocabulary</u> Carrying Capacity Competition Limiting Factor</p>	Lesson 03: Limiting Factors and Carrying Capacity
Lesson 04: Relationships Among Organisms Part 1	<p>SWBAT predict and describe ways organisms interact in ecosystems</p> <p>TEKS 6.12B describe and give examples of predatory, competitive, and symbiotic relationships between organisms including mutualism, parasitism, and commensalism;</p>	<ul style="list-style-type: none"> • Student will read an article which reviews limiting factors from the previous lesson and introduces interactions among organisms. • Students will investigate and compare interactions of organisms by researching a northern forest ecosystem. They will then compare the roles of that ecosystem to the roles of another to predict relationships. • Students will write a scientific explanation, in CER format, to respond to the questions: <ul style="list-style-type: none"> ○ How can we predict the ways organisms will interact with each other in different ecosystems? <p><u>Vocabulary</u> Competition Commensalism Mutualism Parasitism Symbiosis</p>	Lesson 04: Relationships Among Organisms Part 1

Lesson	Objective(s) and Standard(s)	Instructional Notes	Resources
Lesson 05: Relationships Among Organisms Part 2	<p>SWBAT analyze scenarios and graphs and identify the symbiotic relationship present.</p> <p>TEKS 6.12B describe and give examples of predatory, competitive, and symbiotic relationships between organisms including mutualism, parasitism, and commensalism.</p>	<ul style="list-style-type: none"> • Students will engage in a class reading to learn activity which provides a more in depth understanding of symbiotic relationships than was provided in lesson 4. • Students will participate in a Symbiosis game. Students will be given a card and asked to find their matching symbiont. The pair will then identify the symbiotic relationship the organisms have. • Students will analyze scenarios and graphs and identify the symbiotic relationship. <p><u>Vocabulary</u> Symbiosis Mutualism Parasitism Commensalism</p>	Lesson 05: Relationships Among Organisms Part 2
Lesson 06: Predator Prey Relationships	<p>SWBAT Analyze and explain population sizes in predator and prey relationships.</p> <p>TEKS 6.12B describe and give examples of predatory, competitive, and symbiotic relationships between organisms including mutualism, parasitism, and commensalism;</p>	<ul style="list-style-type: none"> • In thinking task, students will complete a graph of population data and analyze the graph. This activity reviews the concepts of carrying capacity and the relationships of biotic factors. • During the activity Pop Goes the Weasel, students will model and illustrate a predator-prey relationship and analyze the effect this relationship has on the dynamics of a population. • Finally, students will analyze data tables and graphs and explain population sizes in predator and prey relationships. <p><u>Vocabulary</u> Predation Predator Prey</p>	Lesson 06: Predator Prey Relationships

Lesson	Objective(s) and Standard(s)	Instructional Notes	Resources
<p style="text-align: center;">Lesson 07: Food Chains, Webs, and Energy Pyramids Day 1</p>	<p>SWBAT analyze food chains and food webs and identify relationships that exist among organisms and how energy is transferred from one organism to another.</p> <p>TEKS 6.8B describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, and photosynthesis.</p>	<ul style="list-style-type: none"> • Students will start with an activity where they will draw upon their prior knowledge (from 5th grade) of different types of feeding patterns of organisms. • Students will use the Prairie Ecosystem Gizmo to explore and observe the populations of grass, prairie dogs, ferrets, and foxes in a prairie ecosystem. Investigate feeding relationships and determine the food chain in the ecosystem. • Students will analyze the more complex relationships of how matter and energy is transferred in ecosystems by looking at a prairie food web. Students will identify predator-prey relationships, competitive relationships and classify organisms and herbivores, omnivores, or carnivores. Students will also predict how removing one population from the ecosystem will affect another ecosystem. <p><u>Vocabulary</u> Carnivore Consumer Herbivore Omnivore Producer</p>	<p>Lesson 07: Food Chains, Webs, and Energy Pyramids Day 1</p>

Lesson	Objective(s) and Standard(s)	Instructional Notes	Resources
<p style="text-align: center;">Lesson 08: Food Chains, Webs, and Energy Pyramids Day 2</p>	<p>SWBAT analyze food webs, chains, and pyramids to describe the transfer of energy through trophic levels and describe how energy is conserved.</p> <p>TEKS 6.8B describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, and photosynthesis.</p>	<ul style="list-style-type: none"> • Students will use a food web to identify all the food chains found within the food web. • Students will analyze a data table below that describes the energy flow/eating pattern found in a northern marine ecosystem. Students will then create a food web using cut-outs and string. Students will then identify the organisms' roles in the ecosystems. Students will make a connection between the trophic levels and food webs and organisms' roles in the ecosystem. • Students will then be introduced to energy pyramids. Students will identify 2 food chains from the food webs they created in parts 1-2. Students will then transfer the food chain to an energy pyramid. • Students will conduct an investigation to model the conservation of energy in food webs. • Students will analyze a food chain and create an energy pyramid from the food chain. They will label the organisms and their roles in the food chain as well as the amount of energy available to organisms on the different levels on the energy pyramid. Students will describe how even though energy transfer is an inefficient process it still follows the law of conservation of energy. <p><u>Vocabulary</u> Law of Conservation of Energy Energy Pyramid Trophic level 10% rule</p>	<p>Lesson 08: Food Chains, Webs, and Energy Pyramids Day 2</p>

Lesson	Objective(s) and Standard(s)	Instructional Notes	Resources
Lesson 09: Food Webs in Lake Mendota	<p>SWBAT create and analyze food webs, chains, and pyramids in lake Mendota and determine the ecological impact of removing organisms.</p> <p>TEKS 6.8B describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, and photosynthesis.</p>	<ul style="list-style-type: none"> • Students will model and explain how many food chains make up a food web. • In the Weaving the Web Activity students will model a food web and be able to describe the balance that exists in an ecosystem. Students will be able to describe the ecological impacts of the alternation of a food web by removing an organism from the food web. • Students will analyze feeding relationships of organisms in Lake Mendota and then build a food web. Students will identify the roles of the organisms in the food web. • Students will describe the ecological impacts of removing an organism from an environment. <p><u>Vocabulary</u> ecological impact</p>	Lesson 09: Food Webs in Lake Mendota
Lesson 10: Biomaniipulation of Lake Mendota Part 1	<p>SWBAT analyze data/graphs to develop a scientific explanation on how biomanipulation can affect ecosystems.</p> <p>TEKS 6.12A investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition 6.12B describe and give examples of predatory, competitive, and symbiotic relationships between organisms including mutualism, parasitism, and commensalism; 6.12C describe the hierarchical organization of organism, population, and community within an ecosystem. 6.8B describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, and photosynthesis.</p>	<ul style="list-style-type: none"> • Students will be introduced to what a eutrophic lake is and what causes eutrophication. • Students will participate in a reading to learn and analyze a biomanipulation research study that was conducting in Lake Mendota to determine what impacts the addition of top predators had on the lower trophic levels in the food web. • Students will spiral back to the Lake Mendota food web they learned about in Lesson 9 to analyze what aspects of the food web the biomanipulation project was altering. • Students will write a scientific explanation, in CER format, to answer the guiding question, “Was the biomanipulation study a success, why or why not?” <p><u>Vocabulary</u> Biomaniipulation Biomass Eutrophication Phytoplankton piscivorous fish planktivorous fish water hypoxia zooplankton</p>	Lesson 10: Biomaniipulation of Lake Mendota Part 1

Lesson	Objective(s) and Standard(s)	Instructional Notes	Resources
<p style="text-align: center;">Lesson 11: Biomaniipulation of Lake Mendota Part 2</p>	<p>SWBAT analyze data/graphs to develop a scientific explanation on how biomanipulation can affect ecosystems.</p> <p>TEKS</p> <p>6.12A investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition</p> <p>6.12B describe and give examples of predatory, competitive, and symbiotic relationships between organisms including mutualism, parasitism, and commensalism;</p> <p>6.12C describe the hierarchical organization of organism, population, and community within an ecosystem.</p> <p>6.8B describe how energy is conserved through transfers and transformations in systems such as electrical circuits, amusement park rides, and photosynthesis. food webs,</p>	<ul style="list-style-type: none"> • Students will be introduced to what a eutrophic lake is and what causes eutrophication. • Students will participate in a reading to learn and analyze a biomanipulation research study that was conducted in Lake Mendota to determine what impacts the addition of top predators had on the lower trophic levels in the food web. • Students will spiral back to the Lake Mendota food web they learned about in Lesson 9 to analyze what aspects of the food web the biomanipulation project was altering. • Students will write a scientific explanation, in CER format, to answer the guiding question, “Was the biomanipulation study a success, or why not?” <p><u>Vocabulary</u></p> <p>Biomaniipulation Biomass Eutrophication Phytoplankton piscivorous fish planktivorous fish water hypoxia zooplankton</p>	<p>Lesson 11: Biomaniipulation of Lake Mendota part 2</p>

Lesson	Objective(s) and Standard(s)	Instructional Notes	Resources
Lesson 12: Variations within Populations Day 1	<p>SWBAT explain how, because of variation, some organisms are better suited for survival when there is an environmental change.</p> <p>TEKS 6.13C describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change</p>	<ul style="list-style-type: none"> • Students will engage in a model of natural selection and variation in candy. Students will analyze the characteristics that made some of the candy more desirable than others. • Students will engage in a card sort in which they try to group animals in the way they respond to the changes in the environment. • Students will conduct a reading to learn to determine the differences in hibernation, torpor, and migration. • Students will read information about the little brown bat and the Mexican free-tailed bat and compare the differences that allow each type of bat to survive. Students will write a short-constructed response explaining the variations and how they respond to changes in the environment. <p><u>Vocabulary</u> Hibernation Migration Torpor Variation</p>	Lesson 12: Variation within Populations Day 1

Lesson	Objective(s) and Standard(s)	Instructional Notes	Resources
Lesson 13: Variations within Populations Day 2	<p>SWBAT explain how, because of variation, some organisms are better suited for survival when there is an environmental change.</p> <p>TEKS 6.13C describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change</p>	<ul style="list-style-type: none"> • In the Bird Buffett lab, students will investigate beak variation in a species of birds. They will understand that populations naturally contain variations of traits and that some variations can either be beneficial or detrimental to the survival of organisms within the population. • In the Peppered Moth Study, students will use the Explore Learning Natural Selection Gizmo to explore the variation of moths. Students will play the role of a bird feeding on peppered moths on both light and dark trees. Students will analyze the percentage of the populations that light-colored moths and dark-colored moths after 5 years when the trees were light in color. They will repeat with dark-colored trees. They will understand that populations naturally contain variations of traits and that some variations can either be beneficial or detrimental to the survival of organisms within the population. • Students will write a scientific explanation that explains why variation of traits (such as different sized bird beaks or color of moths) is important to the survival of a population of organisms. Students should use evidence for Bird Buffett or the Peppered Moth Simulation) <p><u>Vocabulary</u> Variation</p>	Lesson 13: Variation within Populations Day 2
Unit Exam		Test Name: SCI_6thScience_S26_UE3	

UNPACKED STANDARDS Focus standards for this unit.

Standard:		6.12A investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition	
Specificity		Content Builder	
<p>Cognition: Investigate Content: how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors Including but not limited to:</p> <ul style="list-style-type: none"> • Dependence • Biotic – living factors in the environment; related to, produced by, or caused by living organisms <ul style="list-style-type: none"> ○ Availability of biotic factors <ul style="list-style-type: none"> ▪ How do individual organisms and populations depend on other organisms (biotic factors)? <ul style="list-style-type: none"> ➤ Food • Abiotic – nonliving factors in the environment; physical rather than biological; do not come from living organisms <ul style="list-style-type: none"> ○ Availability of abiotic factors <ul style="list-style-type: none"> ▪ How do individual organisms and populations depend on nonliving resources (abiotic factors)? <ul style="list-style-type: none"> ➤ Light ➤ Water ➤ Range of temperatures ➤ Soil composition • Competition – when two organisms need the same resource that is available in limited quantities <ul style="list-style-type: none"> ○ Availability of biotic factors <ul style="list-style-type: none"> ▪ What happens when organisms and populations compete for limited food resources? ○ Availability of abiotic factors <ul style="list-style-type: none"> ▪ What happens when organisms and populations compete for limited nonliving resources (abiotic factors)? <ul style="list-style-type: none"> ➤ Light ➤ Water ➤ Range of temperatures ➤ Soil composition 		<p>Organisms and populations in an ecosystem depend on biotic factors, such as food, as a source of energy and nutrients for survival and reproduction. They also rely on abiotic factors, such as the availability of light and water, the range of temperatures, and soil composition, to create suitable living conditions. Competition arises when different organisms and populations vie for limited resources, including food, shelter, and other essential factors. Students may struggle if they lack a solid foundation in basic ecological concepts, making it difficult to comprehend the dependencies and competitions within ecosystems.</p>	
		Instructional Implications	
		<p>When you teach this concept, remember to:</p> <ul style="list-style-type: none"> • Use real-world examples and case studies to demonstrate how different species interact and compete for resources in specific ecosystems. • Provide opportunities for students to explore a variety of ecosystems and describe the biotic and abiotic factors they observe. • Explore biotic factors (e.g., plants, animals, protists, fungi, bacteria, animal waste, and decomposing biomass). • Explore abiotic factors (e.g., sunlight, rocks, soil, water, and air). • Provide a variety of charts, tables, and graphs for students to analyze the needs of organisms and to predict the impact of limiting those resources. • Provide opportunities to predict changes due to competition in a variety of organisms and populations. 	
		Misconceptions	
		<ul style="list-style-type: none"> • Thinking that organisms or populations are not competing for the same biotic or abiotic factors in an ecosystem • Thinking that adaptations do not enable an organism or population to have an advantage over competitors for obtaining resources • Incorrectly predicting the changes in a population that result from competition • Overemphasizing predation as the only driver of population interactions • Ignoring abiotic factors and focusing solely on biotic interactions 	
		Vocabulary	
		abiotic factor	biotic factor
		food	light
		soil	temperature
		competition	ecosystem
		organism	population
		water	
Possible STAAR Stimuli			
Investigation	Diagram	Informational text/ list	visual/image/ illustration
Graph	Web/cycle/chain	Chart/table	model

Standard:			6.8B describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, or photosynthesis
Specificity			Content Builder
Cognition: Describe Content: How energy is conserved through transfer and transformations in systems such as electrical circuits, food webs, amusement park rides, and photosynthesis Including, but not limited to: <ul style="list-style-type: none"> • The law of conservation of energy states that energy can neither be created nor be destroyed. Total energy in the entire universe is constant. • Energy is conserved during transfers since the amount of energy transferred stays the same. • Energy transfers occur in: <ul style="list-style-type: none"> ○ Food webs – Radiant energy (light energy) is used by green plants for photosynthesis. ○ Chemical energy from plants is transferred to animals. ○ Other examples: <ul style="list-style-type: none"> ▪ Sound energy is transferred from one place to another via particles in matter. ▪ Thermal energy is transferred by conduction, convection, and radiation. ▪ Kinetic energy of air particles in wind is transferred to movement of leaves. • Energy is conserved during energy transformations since energy is not lost in the entire system. <ul style="list-style-type: none"> ○ Food webs – Green plants convert radiant (light) energy from the Sun into chemical energy (glucose), and decomposers convert chemical potential energy into heat energy. 			Energy is conserved in various systems through transfers and transformations. In food webs, energy moves through the ecosystem as organisms consume and are consumed, maintaining the overall energy balance. Students may struggle to grasp the concept of energy conservation and how it applies to different systems. Instructional Implications When you teach this concept, remember to: <ul style="list-style-type: none"> • Allow students to explore different energy transformations and begin to describe where the energy goes. • Demonstrate energy transformations involving different forms of energy. Show examples where energy is transformed from one type to another, including chemical, thermal, light, mechanical, and electrical energy. • Provide opportunities for students to apply the law of conservation of energy in various scenarios, including analyzing energy flow in food webs or ecosystems, • Have students create flow charts or diagrams representing energy transfers and changes in everyday situations to help them develop a deeper understanding of energy pathways and transformations. Provide opportunities for students to describe their understanding both verbally and in writing.
Possible STAAR Stimuli			Student Misconceptions
Investigation	Demonstration	Diagram	Students may make the following mistakes: <ul style="list-style-type: none"> • Thinking that energy cannot be transformed into more than one type of energy • Thinking that energy can be created or destroyed • Thinking that the same type of energy cannot transfer to another object without transforming into another type of energy • Assuming all energy transformations are perfectly efficient, leading to the misconception that there are no losses during energy conversions • Neglecting energy flow in ecosystems
Visual/Image/ Illustration	Web/Cycle/Chain	Model	
Informational Text/List			

Standard:	6.12B describe and give examples of predatory, competitive, and symbiotic relationships between organisms including mutualism, parasitism, and commensalism;															
Specificity		Content Builder														
<p>Cognition: Describe, Give Content: examples of predatory, competitive, and symbiotic relationships between organisms including mutualism, parasitism, and commensalism Including but not limited to:</p> <ul style="list-style-type: none"> • Identify if a given scenario is an example of predation, competition, or symbiosis. <ul style="list-style-type: none"> ○ Predatory relationships <ul style="list-style-type: none"> ▪ Describe a predator and prey relationship. <ul style="list-style-type: none"> ➢ Predator (hunter) and prey (hunted) relationship ▪ Provide examples of predator / prey relationships. <ul style="list-style-type: none"> ➢ Example: Fox is a predator; hare is prey. ▪ Note – Plants can also be prey (like bears eating berries) or predators (like Venus fly traps). ▪ Note – Scavengers are a type of predator. ○ Competitive relationships <ul style="list-style-type: none"> ▪ Describe competitive relationships. <ul style="list-style-type: none"> ➢ Two organisms compete for the same biotic and abiotic resources, such as water, sunlight, shelter, mate, etc. ▪ Identify examples of inter- and intra-species competition. <ul style="list-style-type: none"> ➢ Two hares competing for the same grazing area ➢ A hare and a turtle competing for a grazing area ▪ Note – Both plants and animals compete in symbiotic relationships. ○ Mutualism <ul style="list-style-type: none"> ▪ Describe mutualism. <ul style="list-style-type: none"> ➢ Both organisms benefit from the relationship. ▪ Identify examples. <ul style="list-style-type: none"> ➢ Insects pollinating flowers ○ Parasitism <ul style="list-style-type: none"> ▪ Describe parasitism. <ul style="list-style-type: none"> ➢ One organism benefits while the other is harmed from the relationship. ▪ Identify examples. <ul style="list-style-type: none"> ➢ Fleas or ticks on dogs ○ Commensalism <ul style="list-style-type: none"> ▪ Describe commensalism. <ul style="list-style-type: none"> ➢ One organism benefits while the other is neither harmed or benefiting from the relationship. ▪ Identify examples of commensalism. <ul style="list-style-type: none"> ➢ Barnacles on whales 		<p>Predatory, competitive, and symbiotic relationships are common interactions among organisms in an ecosystem. Predatory relationships involve one organism hunting and consuming another as prey (e.g., a lion and a zebra). Competitive relationships arise when organisms vie for limited resources (e.g., two bird species competing for nesting sites). Symbiotic relationships entail close interactions between different species, with mutualism benefiting both, parasitism benefiting one at the other’s expense (e.g., ticks on mammals), and commensalism benefiting one without harming the other (e.g., barnacles on turtles). These relationships shape ecosystem dynamics, highlighting the intricate interactions in nature. Students may struggle with this concept due to the numerous types of relationships involved.</p>														
		Instructional Implications														
		<p>When you teach this concept, remember to:</p> <ul style="list-style-type: none"> • Provide examples for each type of organism relationship in a variety of ecosystems. • Clearly distinguish between competitive relationships, where organisms compete for the same resources, and predatory relationships, where one organism hunts and consumes another. • Emphasize the specific characteristics of the three types of symbiotic relationships. • Provide opportunities for students to describe and give examples of organism relationships, both verbally and in writing. • Help students see the Recurring Theme and Concept of <i>modeling the parts of a system and their interdependence</i> in this standard. 														
		Misconceptions														
		<ul style="list-style-type: none"> • Thinking that all organism relationships harm one of the organisms involved • Confusing mutualism, parasitism, and commensalism • Thinking that competition for resources only happens between organisms of the same species • Thinking that parasitism always leads to the death of the host organism 														
		Vocabulary														
		<table border="1"> <tr> <td>commensalism</td> <td>Competitive</td> <td>ecological relationship</td> <td>Parasite/ parasitism</td> </tr> <tr> <td>mutualism</td> <td>Niche</td> <td>organism</td> <td>host</td> </tr> <tr> <td>Predator/predatory</td> <td>Prey</td> <td>Symbiotic</td> <td></td> </tr> </table>			commensalism	Competitive	ecological relationship	Parasite/ parasitism	mutualism	Niche	organism	host	Predator/predatory	Prey	Symbiotic	
commensalism	Competitive	ecological relationship	Parasite/ parasitism													
mutualism	Niche	organism	host													
Predator/predatory	Prey	Symbiotic														
		Possible STAAR Stimuli														
		<table border="1"> <tr> <td>Investigation</td> <td>visual/image/ illustration</td> <td>model</td> <td>Informational Text/List</td> </tr> </table>			Investigation	visual/image/ illustration	model	Informational Text/List								
Investigation	visual/image/ illustration	model	Informational Text/List													

Standard:		6.12C describe the hierarchical organization of organism, population, and community within an ecosystem			
Specificity		Content Builder			
Cognition: Describe Content: the hierarchical organization of organism, population, and community within an ecosystem Including, but not limited to: <ul style="list-style-type: none"> • Organisms – a single living thing that can function on its own <ul style="list-style-type: none"> ○ Example: rabbit • Population – all organisms of a certain species in a certain area <ul style="list-style-type: none"> ○ Example: group of rabbits • Community – all populations sharing a certain area <ul style="list-style-type: none"> ○ Example: population of rabbits, population of deer, population of bears, population of ants • Ecosystem – all living and non-living parts of the environment 		The hierarchical organization of an ecosystem includes three levels: organism, population, and community. <ul style="list-style-type: none"> • Organism refers to individual living entities (plants, animals, or microorganisms). Organisms can interact with multiple ecosystems in their lifetime. For example, a bird may inhabit a forest during nesting season and a wetland during migration. • A population is a group of individuals of the same species interacting in a specific area. Population sizes can fluctuate, are dynamic, and can change over time. Changes in population size can have significant effects on the community. For example, an increase in prey population can lead to an increase in predator population, which can then lead to a decrease in prey population. • A community comprises all populations of different species coexisting and interacting within a defined geographical area. This organization helps us understand how individual organisms form populations, and populations collectively shape communities, contributing to ecosystem complexity and stability. Students may struggle to differentiate between individual organisms, populations, and communities and understand their relative scales.			
Vocabulary		Instructional Implications			
Community	Ecosystem	Habitat	Hierarchy		
Niche	Organism	Population	species		
Possible STAAR Stimuli		When you teach this concept, remember to:			
Demonstration	Chart/Table	Diagram	Visual/Image/Illustration		
Web/Cycle/Chain	Informational Text/List				
Possible STAAR Stimuli		Students may make the following mistakes: <ul style="list-style-type: none"> • Confusing community and population • Thinking that a community is made up of only the biotic factors in an ecosystem • Thinking that organisms only belong to one ecosystem • Assuming populations always have fixed and stable numbers of individuals • Thinking that all organisms in a community have direct interactions with each other 			
		<ul style="list-style-type: none"> • Provide opportunities for students to diagram the levels of organization within an ecosystem (organism, population, community, and ecosystem) using varied biomes and organisms. • Investigate scenarios and data that require students to infer and diagram the levels of organization within a described ecosystem. • Vary the visuals and species used when recognizing levels of organization. • Create visual representations and models of the levels of organization within multiple ecosystems. • Provide opportunities for students to describe hierarchical organization, both verbally and in writing. 			

Standard: 6.13C describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change									
Specificity	Content Builder								
<p>Cognition: Describe Content: how variations within a population can be an advantage or disadvantage to the survival of a population as environments change</p> <p>Including but not limited to:</p> <ul style="list-style-type: none"> • Variations in populations can be advantageous when environments change. • Changes can be short- or long-term environmental changes. • Short term change – over a very short time period, mostly reversible, so organisms do not need to adapt or migrate; however, most organisms can die since they don't get a chance to adapt (e.g., a flood) • Long term change – over a long period of time, mostly irreversible so organisms adapt, migrate, or die (e.g., the industrial revolution) • Variation in species can lead to better adapting to new environments. • Need to identify which changes are short term or long term (Provide a lot of examples.) • Need to identify if organisms will adapt, migrate, or die • Advantages: <ul style="list-style-type: none"> ○ Variations allow for organisms to adapt to new food resources. ○ Variations allow for organisms to adapt to short-term environmental changes, such as drought. • Disadvantages: <ul style="list-style-type: none"> ○ Variations can limit finding mates. ○ Variations can limit adaptability in short-term environmental changes, such as flooding. 	<p>Variations within a population can be both advantageous and disadvantageous as environments change. Advantageous variations help some individuals adapt and thrive, passing on beneficial traits. However, disadvantageous variations may lead to struggles in survival and reproduction. Over time, nature selects the best traits for the environment. Students may struggle to grasp the concept that long-term variations must benefit the population as a whole rather than just benefiting individual organisms within the species.</p>								
	Instructional Implications								
	<p>When you teach this concept, remember to:</p> <ul style="list-style-type: none"> • Provide real-life examples of variation in populations and how it can lead to advantages or disadvantages in specific environments. Use case studies of organisms adapting to different habitats or changing conditions. • Engage students in interactive activities where they simulate natural selection in changing environments. Use games or virtual labs to demonstrate how advantageous traits increase in frequency over time. • Use graphs or charts to illustrate changes in trait frequencies over generations due to natural selection. • Emphasize the role of environmental changes as the driving force for natural selection. Explain how certain traits become advantageous in new environments and others may become disadvantageous. • Help students see the Recurring Theme and Concept of <i>stability and change</i> in this standard. 								
	Vocabulary								
	<table border="1"> <tr> <td>Environmental change</td> <td>Genetic variation</td> <td>Natural selection</td> <td>Population</td> </tr> <tr> <td>Stability</td> <td>Survival</td> <td>Variation</td> <td></td> </tr> </table>	Environmental change	Genetic variation	Natural selection	Population	Stability	Survival	Variation	
Environmental change	Genetic variation	Natural selection	Population						
Stability	Survival	Variation							
	Misconceptions								
<ul style="list-style-type: none"> • Thinking that all individuals within a population have identical traits and characteristics • Thinking that populations can immediately adapt to environmental changes simply by acquiring new traits • Thinking variations within a population have a predetermined purpose or goal rather than recognizing that natural selection acts on existing traits • Overemphasizing individual adaptation rather than recognizing that the population as a whole evolves over time • Overlooking the role of environmental factors (e.g., changes in temperature or availability of resources) in influencing the survival and reproduction of different traits • Assuming every variation within a population provides a survival advantage • Ignoring the long timescales involved in the process of natural selection 									
	Possible STAAR Stimuli								
	<table border="1"> <tr> <td>Investigation</td> <td>visual/image/illustration</td> <td>model</td> <td>Informational Text/List</td> </tr> </table>	Investigation	visual/image/illustration	model	Informational Text/List				
Investigation	visual/image/illustration	model	Informational Text/List						

VERTICAL STANDARDS

This section details the **progression** of key student expectations/standards** in the courses **before** and **after** this course. This will help you understand what **prior knowledge skills to build upon** and guide you in knowing what **skills you are preparing your students** for in the subsequent course.

Course/Grade	Course/Grade	Course/Grade
5.12A observe and describe how a variety of organisms survive by interacting with biotic and abiotic factors in a healthy ecosystem;	6.12A investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition	7.12B describe how ecosystems are sustained by the continuous flow of energy, and the recycling of matter and nutrients within the biosphere; and
5.12B predict how changes in the ecosystem affect the cycling of matter and flow of energy in a food web; and	6.12B describe and give examples of predatory, competitive, and symbiotic relationships between organisms including mutualism, parasitism, and commensalism;	7.12A diagram the flow of energy within trophic levels and describe how the available energy decreases in successive trophic levels in energy pyramids;
	6.8B describe how energy is conserved through transfers and transformations in systems such as electrical circuits, food webs, amusement park rides, and photosynthesis.	
5.12C describe a healthy ecosystem and how human activities can be beneficial or harmful to it.	6.12C describe the hierarchical organization of organism, population, and community within an ecosystem	7.13B describe the hierarchical organization of cells, tissues, organs, and organ systems within plants and animals;
No TEKS in 5 th or 4 th grade aligned 3.13A explore and explain how external structures and functions of animals enable them to survive in their environment such as the neck of a giraffe or webbed feet on a duck	6.13C describe how variations within a population can be an advantage or disadvantage to the survival of a population as environments change	7.13.D describe and give examples of how natural and artificial selection change the occurrence of traits in a population over generations.

VOCABULARY GLOSSARY

Domain-specific words and definitions for this unit.

Key Content Vocabulary

10 % rule -when energy is passed in an ecosystem from one trophic level to the next, only ten percent of the energy will be passed on

Abiotic factor – A non-living chemical or physical factor in the environment

Biotic factor – living parts of an ecosystem

Biomanipulation - the deliberate alteration of an ecosystem by adding or removing species, especially predators.

Biomass - the total mass of organisms in a given area or volume

Carnivore – Organisms that consumes only meat (other animals)

Carrying Capacity – a species' average population size in a particular habitat

Commensalism - a relationship between two living organisms in which one organism benefits from the other without harming it

Community – all of the populations sharing a specific area or region

Competition – relationship that occurs when two organisms need the same resource

Conservation of energy- a scientific law that states that energy can neither be created nor destroyed - only converted from one form of energy to another

Consumer – Organisms that make take in food to obtain their energy

Ecological Impact - the effect of human activities and natural events on living organisms and their nonliving environment.

Ecosystem – the living and nonliving components of an environment

Energy Pyramid - is a graphical representation, showing the flow of energy at each *trophic level* in an ecosystem. (sometimes called a trophic pyramid or an ecological pyramid)

Eutrophication - excessive plant and algal growth due to the increased availability of one or more limiting growth factors needed for photosynthesis, such as sunlight, carbon dioxide, and nutrient fertilizers

Herbivore – Organisms that consumes only plants

Hibernation – *a state of minimal activity and metabolic depression undergone by some animal species*

Limiting Factor – anything that constrains a population's size and slows or stops it from growing.

Migration - *The seasonal movement of a complete population of animals from one area to another. Animals migrate for three main reasons finding food, avoiding cold temperatures, and for reproductive reasons*

Mutualism - association between organisms of two different species in which each benefits.

Omnivore – Organisms that consumes both plants and meat (other animals)

Organism – a living thing that can function on its own

Parasitism - A relationship between two organisms in which one organism (the parasite) benefits and the other (the host) is harmed.

Phytoplankton - *the autotrophic components of the plankton community and a key part of ocean and freshwater ecosystems*

Piscivorous fish - carnivorous fish that consume primarily other smaller fish as prey

Planktivorous fish - fish that feeds on planktonic food, including zooplankton and phytoplankton

Population – all of the members of a species living in a particular area at a particular time

Predation - a feeding behavior of natural animals, plants, and microorganisms where one species feeds on another for its survival

Producer – Organism that makes their own food

Predator - animals that live by preying on other organisms for food. Many predators hunt and eventually kill their prey

Prey- the animal being hunted by a predator

Symbiosis - a close and prolonged interaction between organisms of different species

Torpor - *the state of reduced activity that some animals experience during the winter.* The main difference between hibernation and torpor is during torpor, the animal is able to wake up quickly to avoid danger, or if the opportunity exists exit the den to feed.

Trophic level- a level or a position in a food chain, a food web, or an ecological pyramid.

Water hypoxia - low oxygen and is primarily a problem for estuaries and coastal waters. Hypoxic waters have dissolved oxygen concentrations of less than 2-3 mg/L.

Variation- any difference between cells, individual organisms, or populations caused either by genetic differences (genotypic variation) or by the effect of environmental factors on gene expression (phenotypic variation).

Zooplankton – the heterotrophic components of the plankton community; zooplankton are herbaceous

Unit Supply List

Consumable Materials and Lab Supplies for Unit #03 (1 per group of 4 students unless noted)

Lesson	Commercial Vendor	Lab Supplies Science Vendor
Lesson 1: Hierarchical Organization of Ecosystems	None	None
Lesson 2: Abiotic and Biotic Factors	None	Hand Lens Ruler or 12" of string
Lesson 3: Limiting Factors and Carrying Capacity	None	None
Lesson 4: Relationships Among Organisms Part 1	None	Computer with internet access
Lesson 5: Relationships Among Organisms Part 2	None	None
Lesson 6: Lesson 06: Predator-Prey Relationships	Small plastic bowl 100 popcorn kernels plastic spoon	calculator
Lesson 7: Food Chains, Food Webs, and Ecological Pyramids Part 1	None	None
Lesson 8: Food Chains, Food Webs, and Ecological Pyramids Part 2	String or yarn 4 Styrofoam cups 1 plastic tub (shoe box) or bowl	None
Lesson 9: Food Webs in Lake Mendota	Ball of string or yarn	Beaker Timer
Lesson 10: Biomanipulation of Lake Mendota Day 1	None	None
Lesson 11: Biomanipulation of Lake Mendota Day 2	None	None

Lesson 12: Variations within Populations Day 1	<ul style="list-style-type: none"> • Variety of candies—must include popular ones and unpopular ones (try black licorice). You should have at least two candies per person plus plenty of unpopular ones. Possibly include candies with different colors, sizes, brand names, etc. (avoid candies with nuts for kids who are allergic) 	None
Lesson 13: Variations within Populations Day 2	<p><u>Bird Buffett</u></p> <ul style="list-style-type: none"> • Paper plate (or similar tray/ container for feeding grounds) • 4 plastic cups • Resealable bag • Plastic spoon • Large amounts of: (you can use other similar items but make sure and change the student sheet.) <ul style="list-style-type: none"> ○ Dried beans ○ Toothpicks ○ Dried macaroni ○ Marbles 	<p><u>Bird Buffett</u></p> <ul style="list-style-type: none"> • Pair of tweezers • Large binder clip • Scissors