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UNIT NARRATIVE

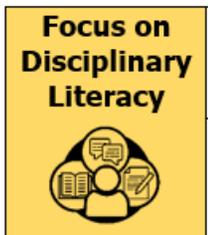
Lesson 1 & 2: 6.12A Abiotic and Biotic Factors These lessons lay the groundwork for understanding ecosystems by distinguishing between abiotic and biotic components. Students explore how these factors interact to shape ecosystems and provide the foundation for subsequent topics, such as energy flow and succession. This foundational knowledge ensures students can analyze the components driving ecological systems effectively.

Lessons 3 – 5: 7.12A Flow of Energy Parts Building on the abiotic and biotic factors, these lessons delve into how energy flows through ecosystems, starting with producers, consumers, and decomposers. Students learn about food chains, webs, and the inefficiency of energy transfer. This sequential deepening ensures students can connect the roles of abiotic and biotic factors to energy dynamics, essential for understanding ecosystem function and resilience.

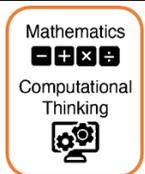
Lessons 6 & 7: 8.12B Primary and Secondary Succession With an understanding of energy flow, students now examine how ecosystems develop and recover over time. Primary succession introduces how life begins in previously uninhabited areas, while secondary succession focuses on regrowth in disturbed ecosystems. These lessons highlight the dynamic nature of ecosystems and the interplay between biotic and abiotic factors over time.

Lesson 8: 8.12A Natural Disasters and Impacts to Transfer of Energy After exploring succession, students analyze how disturbances like natural disasters disrupt energy transfer and ecosystem stability. This lesson emphasizes real-world implications, integrating prior knowledge of energy flow and ecosystem recovery. It encourages critical thinking about human and natural impacts on ecological balance while tying together all content in this unit up until this point.

Lessons 9 & 10: 8.12C Biodiversity Part 1 & 2 The unit concludes by addressing biodiversity, the culmination of abiotic, biotic, and energy dynamics. Students learn how biodiversity supports ecosystem stability and resilience, tying back to concepts like energy flow and succession. These lessons ensure students can synthesize and apply their knowledge to evaluate the health and sustainability of ecosystems.



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.

Readiness Standards
8.12B Describe how primary and secondary ecological succession affect populations and species diversity after ecosystems are disrupted by natural events or human activity.
Supporting Standards
6.8B describe how energy is conserved through transfers and transformations in systems such as electrical circuits , food webs, amusement park rides , or photosynthesis
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;
7.12A diagram the flow of energy within trophic levels and describe how the available energy decreases in successive trophic levels in energy pyramids; and
8.12C Describe how biodiversity contributes to the stability and sustainability of an ecosystem and the health of the organisms within the ecosystem.
Non-Tested Standards
8.12A Explain how disruptions such as population changes, natural disasters, and human intervention impact the transfer of energy in food webs in ecosystems.

UNDERSTANDINGS AND QUESTIONS

Important big ideas and processes for the unit.

Key Understandings
<ul style="list-style-type: none"> • Biotic factors are living, while abiotic factors are not living. Typically, extreme, harsh ecosystems have more abiotic factors than biotic factors, while mild ecosystems have more biotic factors. • The amount of abiotic and biotic factors affect the food webs and food chains in an ecosystem. • Energy is transferred through trophic levels in the environment. This energy transfer is modeled in food chains and food webs. • A diagram called an energy pyramid shows the amount of energy that moves from one trophic level to the next in a food chain/web. The most energy available is at the producer level. As you move up the levels in the energy pyramid, less energy is available than at the level below. • Ecosystems are capable of changing due to both natural and human-induced causes.

- Ecosystems can be completely destroyed necessitating primary succession.
- Ecosystems are able to recover from ecosystems which are either completely destroyed or depleted of certain species.
- Energy is transferred through ecosystems through food webs. When disruptions such as population changes, natural disasters, or human activities happen, they can change how energy flows, affecting the balance and health of the ecosystem.

Key Questions

- How do biotic factors interact with abiotic factors in an ecosystem?
- What is the difference in an abiotic factor and a biotic factor?
- How does energy flow through an ecosystem?
- How can you use models to describe the flow of matter and energy in an ecosystem?
- What is the 10% rule?
- How does an owl pellet provide evidence of the flow of energy through an ecosystem?
- What is primary succession?
- How does primary succession affect populations and the biodiversity of the ecosystem?
- What is secondary succession?
- How does secondary succession affect populations and the biodiversity of the ecosystem?
- How do changes in the population of one species affect the entire food web and the flow of energy in an ecosystem?
- What impact do natural disasters, such as hurricanes or droughts, have on the energy transfer in food webs?
- How do human activities, like pollution or habitat destruction, disrupt food webs and the balance of energy in ecosystems?

Common Misconceptions

- 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
- Thinking that energy is used up or destroyed as it moves through trophic levels
- Thinking that all energy from one trophic level is transferred to the next without any loss
- Thinking that all ecosystems have the same number of trophic levels
- Confusing the roles of producers and consumers
- Thinking that disruptions have immediate and straightforward effects on the food web
- Thinking that ecosystems are fragile and cannot recover from disruptions
- Thinking that ecosystems are simple rather than complex
- Thinking that ecosystems will rapidly return to their original state after disturbances through succession
- Thinking that succession is a one-way path and assuming that once it begins, it always leads to a stable, climax community
- Thinking that primary and secondary succession are unrelated to disturbances

- Thinking that succession always starts with the same species
- Thinking that human activity only leads to negative disruption
- Thinking that succession only occurs in natural environments and not in manmade environments
- A diagram called an energy pyramid shows the amount of energy that moves from one trophic level to the next in a food chain/web. The most energy available is at the producer level. As you move up the levels in the energy pyramid, less energy is available than at the level below
- Thinking that ecosystems can self-regulate and recover without the need for diverse species.
- Thinking that biodiversity is solely about the number of species present in an ecosystem. They may overlook the functional diversity and ecological roles that different species play, which are equally vital for maintaining ecosystem stability.
- Thinking that all species contribute equally to stability and sustainability
- Thinking that a stable ecosystem is one that never changes rather than its ability to resist and recover from disturbances
- Thinking that biodiversity only matters in natural or rural settings rather than understanding that urban biodiversity is crucial for mitigating the environmental impacts of cities
- Confusing stability and sustainability

ROADMAP

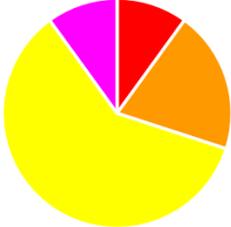
ROADMAP AT A Glance: Unit 10 Investigating Ecosystems				
Day	Date	TEKS	Lesson	Lesson Title
1		6.12A	1	Abiotic and Biotic Factors Part 1
2		6.12A	2	Abiotic and Biotic Factors Part 2
3		7.12A	3	Flow of Energy Part 1
4		7.12A 6.8B	4	Flow of Energy Part 2
5		8.12B	5	Succession Part 1
6		8.12B	6	Succession Part 2
7		8.12A	7	Disruptions to Transfer of Energy
8		8.12C	8	Biodiversity Part 1
9		8.12C	9	Biodiversity Part 2
11				Flex

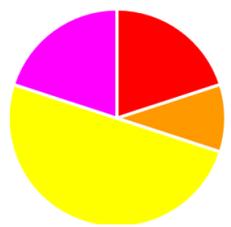
Lesson #01: Abiotic Factors		Date:	
Objective	Instructional Notes	Lesson Look Fors	
SWBAT Investigate the impacts of changing abiotic factors on the health of an aquatic ecosystem using an online simulation.	<ul style="list-style-type: none"> Students investigate the impacts of storms, temperature, and pH on the reef ecosystem. Students investigate the impacts of logging, sewage, and agriculture on the reef ecosystem Students use an online Gizmo simulation to investigate the impact of storms, temperature changes, and pH changes on the local ecosystems. 	Look for teachers to: <ul style="list-style-type: none"> <input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion. Look for students to: <ul style="list-style-type: none"> <input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence. 	
Standards	<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 20px;"> <div style="width: 15px; height: 15px; background-color: red; margin-bottom: 5px;"></div> Thinking Task (5 min) <div style="width: 15px; height: 15px; background-color: orange; margin-bottom: 5px; margin-left: 10px;"></div> Abiotic Factors Gizmo (40 min) <div style="width: 15px; height: 15px; background-color: magenta; margin-bottom: 5px; margin-left: 10px;"></div> Exit Ticket (5 min) </div>  </div>	Students Do and Know	
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;			 <ul style="list-style-type: none"> Students use an online Gizmo simulation to investigate the impact of storms, temperature changes, and pH changes on the local ecosystems.
Vocabulary			 <ul style="list-style-type: none"> Abiotic factors are “non-living” characteristics of the environment that can have an impact on the organisms (biotic) that live there. Biotic factors are living, while abiotic factors are not living. Typically, extreme, harsh ecosystems have more abiotic factors than biotic factors, while mild ecosystems have more biotic factors.
Abiotic factor Nutrients pH			
Science Practices			
2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 7. Engaging in argument from evidence			
Recurring Themes and Concepts			

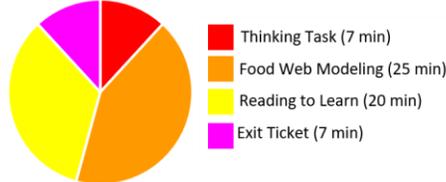
Lesson #02: Biotic Factors		Date:
Objective	Instructional Notes	Lesson Look Fors
<p>SWBAT Investigate the impacts of changing biotic factors on the health of an aquatic ecosystem using an online simulation.</p>	<ul style="list-style-type: none"> Students investigate the impacts of fishing on the reef ecosystem. Students investigate the impacts of disease on the reef ecosystem. Students investigate the impacts of invasive species on the reef ecosystem. Students use an online Gizmo simulation to investigate the impact of changing biotic factors on the local ecosystems. <div style="display: flex; align-items: center; justify-content: center; gap: 20px;"> <div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: center; gap: 5px;"> Thinking Task (5 min)</div> <div style="display: flex; align-items: center; gap: 5px;"> Biotic Factors Gizmo (40 min)</div> <div style="display: flex; align-items: center; gap: 5px;"> Exit Ticket (5 min)</div> </div>  </div>	<p>Look for teachers to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion. <p>Look for students to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
<p>Standards</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>		
<p>Vocabulary</p> <p>Biotic Factor Invasive Species</p>		
<p>Science Practices</p> <ol style="list-style-type: none"> 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 7. Engaging in argument from evidence 		
<p>Recurring Themes and Concepts</p>	<p>Students Do and Know</p> <div style="display: flex; flex-direction: column; gap: 20px;"> <div style="display: flex; align-items: center; gap: 10px;">  <ul style="list-style-type: none"> • Students use an online Gizmo simulation to investigate the impact of changing biotic factors on the local ecosystems. </div> <div style="display: flex; align-items: center; gap: 10px;">  <ul style="list-style-type: none"> • Biotic factors are living, while abiotic factors are not living. Typically, extreme, harsh ecosystems have more abiotic factors than biotic factors, while mild ecosystems have more biotic factors. • The amount of abiotic and biotic factors affect the food webs and food chains in an ecosystem </div> </div>	

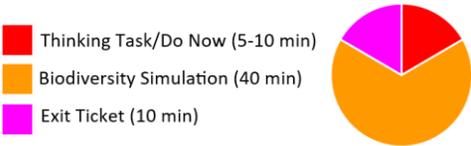
Lesson #03: Flow of Energy Part 1		Date:
Objective	Instructional Notes <ul style="list-style-type: none"> In the activity called A Lower Rio Grande Valley Diet, students will analyze the feeding patterns of various organisms found in the lower Rio Grande Valley. Students will then use this information to make a food web. Students will make food chains from the food web and label the producer and the different levels of consumers in each food web. (This is a review from 6th grade.) In the Energy Efficiency activity, the class will model 8 different food chains (each chain will have a different number of trophic levels.) This modeling activity will provide evidence that available energy decreases in successive trophic levels. Students will analyze a food web and food chain and describe the flow of energy through the trophic levels. <div style="display: flex; align-items: center; margin-top: 20px;"> <div style="margin-right: 20px;"> <p>■ Thinking Task (20 min)</p> <p>■ Energy Efficiency Activity (30 min)</p> <p>■ Exit Ticket (5-10 min)</p> </div>  </div>	Lesson Look Fors
Standards		Look for teachers to:
TEKS 7.12A diagram the flow of energy within trophic levels and describe how the available energy decreases in successive trophic levels in energy pyramids		<input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion.
Vocabulary		Look for students to:
Autotroph Consumer. Heterotroph Producer		<input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
Science Practices		Students Do and Know
2. Developing and using models 4. Analyzing and interpreting data 6. Constructing explanations and designing solutions	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">  <p>Do</p> </div> <ul style="list-style-type: none"> Students will analyze a food web and food chain and describe the flow of energy through the trophic levels. </div> <div style="margin-top: 20px;"> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">  <p>Know</p> </div> <ul style="list-style-type: none"> Energy is transferred through trophic levels in the environment. This energy transfer is modeled in food chains and food webs. </div> </div>	
Recurring Themes and Concepts		

Lesson #04: Flow of Energy Part 2		Date:
Objective	Instructional Notes	Lesson Look Fors
SWBAT use models, such as an energy pyramid, to describe why the available energy decreases in successive trophic levels in a food chain	<ul style="list-style-type: none"> Students will analyze the roles (producer, consumer, heterotroph, herbivore, etc.) organisms play in an ecosystem. Students will participate in a reading to learn about energy pyramids. Students will create energy pyramids from food chains. Students will relate the modeling activity they did yesterday to the 10% rule and energy pyramids. Students will describe why there is a decrease in the amount of energy available in successive trophic levels in a food chain/energy pyramid. 	Look for teachers to: <ul style="list-style-type: none"> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. Promote the use of partners and whole class discussion. Look for students to: <ul style="list-style-type: none"> Engage in discourse and productive struggle Justify their reasoning and support their ideas with evidence.
Standards		
TEKS 7.12A diagram the flow of energy within trophic levels and describe how the available energy decreases in successive trophic levels in energy pyramids		
Vocabulary		
10% Rule Energy Pyramid Trophic Level	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <div style="width: 15px; height: 15px; background-color: red; margin-bottom: 5px;"></div> Thinking Task (20 min) <div style="width: 15px; height: 15px; background-color: orange; margin-bottom: 5px; margin-top: 5px;"></div> The Energy Pyramid (30 min) <div style="width: 15px; height: 15px; background-color: magenta; margin-bottom: 5px; margin-top: 5px;"></div> Exit Ticket (5-10 min) </div>  </div>	
Science Practices		
1. Asking questions and defining problems 2. Developing and using models		
Recurring Themes and Concepts		
		Students Do and Know <ul style="list-style-type: none"> use models, such as an energy pyramid, to describe why the available energy decreases in successive trophic levels in a food chain A diagram called an energy pyramid shows the amount of energy that moves from one trophic level to the next in a food chain/web. The most energy available is at the producer level. As you move up the levels in the energy pyramid, less energy is available than at the level below.

Lesson #05: Succession Part 1		Date:
Objective	Instructional Notes <ul style="list-style-type: none"> • Students participate in a thinking task about ecosystem dynamics. • Students participate in the analysis of either a PowerPoint and/or a video. • Students analyze an article about beavers. • Students display mastery on an exit ticket. • Students are analyzing multiple ways in which ecosystems can be damaged, and then naturally grow back to their normal state. <div style="display: flex; align-items: center; justify-content: center; margin-top: 20px;"> <div style="margin-right: 20px;"> <ul style="list-style-type: none"> Thinking Task (5 min) PPT/Video (10 min) Beaver Article (30 min) Exit Ticket (5 min) </div>  </div>	Lesson Look Fors
SWBAT Investigate the different types of succession and how they are capable of altering ecosystem dynamics.		Look for teachers to:
Standards		<input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion.
TEKS 8.12B: Describe how primary and secondary ecological succession affect populations and species diversity after ecosystems are disrupted by natural events or human activity.		Look for students to:
Vocabulary		<input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
Primary Succession Secondary Succession		Students Do and Know
Science Practices	<p>Investigate the different types of succession and how they are capable of altering ecosystem dynamics.</p> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <p>• Ecosystems are capable of changing due to both natural and human-induced causes.</p> </div> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <p>• Ecosystems can be completely destroyed necessitating primary succession.</p> </div> <p>• Ecosystems are able to recover from ecosystems which are either completely destroyed or depleted of certain species.</p>	
Recurring Themes and Concepts		

Lesson #06: Succession Part 2		Date:	
Objective	Instructional Notes <ul style="list-style-type: none"> Students participate in a thinking task about ecosystem dynamics. Students participate in the analysis of a video. Students analyze an article about beavers. Students display mastery on an exit ticket. Students are analyzing multiple ways in which ecosystems can be damaged, and then naturally grow back to their normal state. <div style="display: flex; align-items: center; margin-top: 20px;"> <div style="margin-right: 20px;"> <p>■ Thinking Task (10 min)</p> <p>■ Disaster Video (5 min)</p> <p>■ Beaver Reading Activity (25 min)</p> <p>■ Exit Ticket (10 min)</p> </div>  </div>	Lesson Look Fors	
SWBAT Investigate a real-world scenario of a population affecting the biodiversity in the ecosystem around them.			Look for teachers to: <ul style="list-style-type: none"> <input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion.
Standards			Look for students to: <ul style="list-style-type: none"> <input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
TEKS 8.12B: Describe how primary and secondary ecological succession affect populations and species diversity after ecosystems are disrupted by natural events or human activity.			
Vocabulary			
No new vocabulary			
Science Practices			
<ul style="list-style-type: none"> Constructing Explanations Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information 			
Recurring Themes and Concepts			
		Students Do and Know <div style="display: flex; align-items: flex-start; margin-top: 10px;"> <div style="margin-right: 20px;">  <p style="margin-top: 10px;">Know</p>  </div> <ul style="list-style-type: none"> Students are analyzing multiple ways in which ecosystems can be damaged, and then naturally grow back to their normal state. Primary succession happens when a new patch of land is created or exposed for the first time. Secondary succession is a natural process that occurs when an ecological community is disrupted, but not destroyed, by a disturbance. </div>	

Lesson #07: Disruptions to Energy Transfer		Date:
Objective	Instructional Notes	Lesson Look Fors
<p>SWBAT to identify and explain at least three types of disruptions (population changes, natural disasters, human intervention) and their effects on energy transfer within food webs in ecosystems by creating models and analyzing real-world examples of disruptions.</p>	<ul style="list-style-type: none"> Students will engage in a modeling activity to provide a concrete example of how disruptions to an ecosystem can alter the transfer of energy in food webs. Students will participate in a reading to learn activity to deepen their understanding of how disruptions to an ecosystem can alter the transfer of energy in food webs. Students will analyze real world examples of disruptions of ecosystems and explain their effects on energy transfer within food webs in ecosystems. 	<p>Look for teachers to:</p> <ul style="list-style-type: none"> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. Promote the use of partners and whole class discussion. <p>Look for students to:</p> <ul style="list-style-type: none"> Engage in discourse and productive struggle Justify their reasoning and support their ideas with evidence.
<p>Standards</p> <p>TEKS 8.12A how disruptions such as population changes, natural disasters, and human intervention impact the transfer of energy in food webs in ecosystems.</p>		
<p>Vocabulary</p> <p>Population Dynamic Equilibrium Energy Pyramid</p>		
<p>Science Practices</p> <p>2. Developing and using models 4. Analyzing and interpreting data 8. Obtaining, evaluating, and communicating information</p>		
<p>Recurring Themes and Concepts</p> <p>B. Cause and Effect G. Stability and Change</p>		
		<p>Students Do and Know</p> <p></p> <ul style="list-style-type: none"> Students will engage in a modeling activity to provide a concrete example of how disruptions to an ecosystem can alter the transfer of energy in food webs. <p></p> <ul style="list-style-type: none"> Energy is transferred through ecosystems through food webs. When disruptions such as population changes, natural disasters, or human activities happen, they can change how energy flows, affecting the balance and health of the ecosystem.

Lesson #08: Biodiversity Part 1		Date:
Objective	Instructional Notes How are scholars building a conceptual understanding of the content during this lesson? <ul style="list-style-type: none"> Scholars are using visual aids to introduce the term biodiversity. Students are conducting a simulation activity to analyze how biodiversity makes an ecosystem healthier. Scholars are watching a video over the content the simulation demonstrated and align to academic vocabulary with a new visual and context. Scholars are sorting scenarios into man-made or natural disturbance, the effect that scenario would have on the ecosystem, and whether that situation would be increasing or decreasing the stability of the ecosystem. How are scholars applying what they learn in this lesson? <ul style="list-style-type: none"> Scholars are using data to draw conclusions on the relationship between biodiversity and ecosystem stability. Scholars are evaluating scenarios as to whether they would increase or decrease ecosystem stability. <div style="text-align: center;">  <p> ■ Thinking Task/Do Now (5-10 min) ■ Biodiversity Simulation (40 min) ■ Exit Ticket (10 min) </p> </div>	Lesson Look Fors
SWBAT explain how biodiversity affects stability of an ecosystem using models and real-world ecological events.		Look for teachers to:
Standards		<input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion.
TEKS 8.12C Describe how biodiversity contributes to the stability and sustainability of an ecosystem and the health of the organisms within the ecosystem.		Look for students to:
Vocabulary		<input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
Biodiversity Disturbance Stability Adaptation Biological Succession Ecosystem Genetic Variation Habitat Interdependence Niche Organism Species		Students Do and Know
Science Practices		<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">  </div> <ul style="list-style-type: none"> Explain how biodiversity affects stability of an ecosystem using models and real-world ecological events. </div> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">  </div> <ul style="list-style-type: none"> Stability is the ability of an ecosystem to remain in a steady state and requires that the system has mechanisms to help it return to its original state after a disturbance. A greater number of species in an environment creates a stable ecosystem that can withstand short-term changes. </div>
Science Practice 2: Developing and Using Models		
Recurring Themes and Concepts		
Stability and change		

Lesson #09: Biodiversity Part 2		Date:	
Objective	Instructional Notes	Lesson Look Fors	
<p>SWBAT differentiate between the stability and sustainability of an ecosystem and explain how biodiversity affects each by evaluating a case study.</p>	<p>How are scholars building a conceptual understanding of the content during this lesson?</p> <ul style="list-style-type: none"> Scholars are sparring with probing questions to create a collaborative thought catcher on their current knowledge of ecological sustainability. Scholars are evaluating scenarios to deepen understanding of biodiversity and stability. Scholars are analyzing a real-world case study of unsustainable ecosystems to define sustainability and differentiate the term from stability. Scholars are comparing the terms sustainability and stability. <p>How are scholars applying what they learn in this lesson?</p> <ul style="list-style-type: none"> Scholars are using scenarios involving cause and effect relationships to draw conclusions on the relationship between biodiversity and ecosystem stability. Scholars are analyzing food webs and informational text to make claims with evidence and reasoning as to the stability and sustainability of the ecosystems presented. <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <ul style="list-style-type: none"> Sustainability Thought Catcher (10 min) Disturbances and Stability Sorting Activity (20 min) Otters Case Study (25 min) Exit Ticket (5 min) </div>  </div>	<p>Look for teachers to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion. <p>Look for students to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence. 	
<p>Standards</p> <p>TEKS 8.12C Describe how biodiversity contributes to the stability and sustainability of an ecosystem and the health of the organisms within the ecosystem.</p>			<p>Students Do and Know</p> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="text-align: center; margin-right: 10px;">  <p>Do</p> </div> <ul style="list-style-type: none"> • Differentiate between the stability and sustainability of an ecosystem and explain how biodiversity affects each by evaluating a case study. </div> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="text-align: center; margin-right: 10px;">  <p>Know</p> </div> <ul style="list-style-type: none"> • Sustainability refers to the ability of the ecosystem to maintain stability over a long period of time based on the predictable flow of energy and cycling of matter without outside input. • A more diverse ecosystem generates a more complex food web, which is more resilient to changes in environmental conditions than a less diverse ecosystem. • Key signs of an unsustainable ecosystem are a significant decline in species diversity, rapid population fluctuations of key species, disruptions to nutrient cycles, reduced stability, increased spread of disease, and visible degradation of habitats. </div>
<p>Vocabulary</p> <p>Biodiversity Disturbance Stability Sustainability Adaptation Biological Succession Ecosystem Genetic Variation Habitat Interdependence Niche Organism Species</p>			
<p>Science Practices</p> <p>Science Practice 4: Analyzing and Interpreting Data</p>			
<p>Recurring Themes and Concepts</p> <p>Stability and change</p>			

UNPACKED STANDARDS

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 	

Possible STAAR Stimuli				<ul style="list-style-type: none"> Overemphasizing predation as the only driver of population interactions Ignoring abiotic factors and focusing solely on biotic interactions
Investigation	Diagram	Informational text/ list	visual/image/ illustration	
Graph	Web/cycle/chain	Chart/table	model	Vocabulary
				abiotic factor
				biotic factor
				competition
				ecosystem
				food
				light
				organism
				population
				soil
				temperature
				water

Standard:	7.12A diagram the flow of energy within trophic levels and describe how the available energy decreases in successive trophic levels in energy pyramids		
Specificity		Content Builder	
<p>Cognition: Diagram</p> <p>Content: the flow of energy within trophic levels</p> <p>Including but not limited to:</p> <ul style="list-style-type: none"> Energy flows through trophic levels. Trophic levels <ul style="list-style-type: none"> Producers / autotrophs – make food using nutrients and energy from the Sun <ul style="list-style-type: none"> Ex: algae, phytoplankton, and plants Consumers / heterotrophs – obtain energy by eating other organisms <ul style="list-style-type: none"> Primary consumers <ul style="list-style-type: none"> ➤ Eat only producers ➤ Ex: grasshoppers and rabbits Secondary consumers <ul style="list-style-type: none"> ➤ Eat primary consumers ➤ Ex: snakes and coyotes Tertiary consumers <ul style="list-style-type: none"> ➤ Eat secondary consumers ➤ Ex: eagles <p>Cognition: Describe</p>		<p>Energy pyramids show how energy moves through trophic levels in an ecosystem. They reveal that energy decreases as it passes from one level to the next. This decrease happens because energy is lost during transfer and because organisms need energy for their own activities. In addition to predation, other ecological interactions such as herbivory, parasitism, and mutualism also involve energy transfer.</p>	
		Instructional Implications	
		<p>When you teach this concept, remember to:</p> <ul style="list-style-type: none"> Use a variety of visuals to model and describe how energy moves through different trophic levels. Explore the importance of producers (e.g., plants and algae) in ecosystems. They provide the main source of energy for all other organisms. Highlight the significance of photosynthesis and the need to protect the ecosystems that support these primary producers. Emphasize that energy is neither created nor destroyed but rather transferred and transformed. Even when an organism dies, while some energy is lost as heat during metabolism, a portion is passed on to decomposers and enters the detritus food chain. 	

<p>Content: how the available energy decreases in successive trophic levels in energy pyramids Including but not limited to:</p> <ul style="list-style-type: none"> • Energy pyramid – a model that demonstrates how energy flows from one trophic level to the next in an ecosystem <ul style="list-style-type: none"> ○ Energy comes from the Sun. ○ Light energy is turned into chemical energy by plants. ○ Energy is transferred between organisms through eating. <ul style="list-style-type: none"> ▪ Most of the energy is used to carry out bodily functions. <ul style="list-style-type: none"> ➢ Chemical energy is transformed into heat energy to maintain body temperature. ➢ Chemical energy is transformed into mechanical energy to allow the movement of organisms. • Only small amounts of energy are stored in the body of organisms to carry out future bodily functions. <ul style="list-style-type: none"> ➢ Most of the stored energy in an ecosystem is stored in producers. ➢ Producers provide food energy for all animals. • 10% Rule <ul style="list-style-type: none"> ○ Each trophic level can only pass on 10% of its energy to the next level. 	<ul style="list-style-type: none"> • Provide hands-on experiences that show how available energy decreases as it moves up trophic levels. Highlight the inefficiency of energy transfer and the loss of energy through waste and metabolic processes. • Have students create energy pyramid diagrams for different ecosystems with varying trophic levels. • Help students see the Recurring Themes and Concepts of <i>flow of energy and cycling of matter and scale, proportion, and quantity in systems</i> in this standard. 											
Vocabulary												
<ul style="list-style-type: none"> 10% rule autotroph biomass consumer 	<ul style="list-style-type: none"> decomposer energy flow energy pyramid* food chain 											
<ul style="list-style-type: none"> heterotroph primary consumer producer secondary consumer tertiary consumer trophic level 												
Student Misconceptions												
<ul style="list-style-type: none"> • Thinking that energy is used up or destroyed as it moves through trophic levels • Thinking that all energy from one trophic level is transferred to the next without any loss • Thinking that all ecosystems have the same number of trophic levels • Confusing the roles of producers and consumers 	<table border="1" style="width: 100%; text-align: center;"> <tr> <td colspan="2" data-bbox="1045 751 2053 792" style="text-align: center;">Possible STAAR Stimuli</td> </tr> <tr> <td data-bbox="1045 792 1381 862">Chart/Table</td> <td data-bbox="1381 792 1717 862">Diagram</td> <td data-bbox="1717 792 2053 862">Visual/Image/ Illustration</td> </tr> <tr> <td data-bbox="1045 862 1381 932">Web/Cycle/Chain</td> <td data-bbox="1381 862 1717 932">Model</td> <td data-bbox="1717 862 2053 932"></td> </tr> <tr> <td data-bbox="1045 932 1381 990"></td> <td data-bbox="1381 932 1717 990"></td> <td data-bbox="1717 932 2053 990"></td> </tr> </table>	Possible STAAR Stimuli		Chart/Table	Diagram	Visual/Image/ Illustration	Web/Cycle/Chain	Model				
Possible STAAR Stimuli												
Chart/Table	Diagram	Visual/Image/ Illustration										
Web/Cycle/Chain	Model											

Standard:	8.12B Describe how primary and secondary ecological succession affect populations and species diversity after ecosystems are disrupted by natural events or human activity		
Specificity		Content Builder	
<p>Cognition: Describe Content: primary and secondary ecological succession affect populations and species diversity Including but not limited to:</p> <ul style="list-style-type: none"> • Ecological succession – the changing sequence of communities that live in an ecosystem during a given time period <ul style="list-style-type: none"> ○ After natural events <ul style="list-style-type: none"> ▪ Ex: wildfires, volcanoes, earthquakes, hurricanes, and floods 		<p>Both primary and secondary ecological succession impact populations and species diversity after disturbances.</p> <ul style="list-style-type: none"> • In primary succession, pioneer species establish on new surfaces, leading to a more diverse ecosystem as populations grow and species increase. • In secondary succession, disrupted areas see the return of original plants and animals, with populations rebounding and species diversity expanding, although the community may change. 	

- After human activity
 - Ex: building of an infrastructure and agricultural activities
- The role of ecological succession
 - Provides diversity of species in a biotic community
 - The variety of species in an ecosystem is called biodiversity.
 - Provides more connections within the food webs in an ecosystem
 - Leads to the attainment of equilibrium
 - Pioneer species – first organisms to immigrate to an area
 - Pioneer species modify the area, which provides conditions that allow complex organisms to immigrate.
- Stages of ecological succession
 - Primary succession – a process that develops a biotic community in a previously uninhabited and barren habitat with little or no soil
 - Process of primary succession (order of establishing initial vegetation)
 - Pioneer species, such as lichens and mosses, break down rocks to form soil.
 - Soil develops.
 - Grasses and small plants begin to grow.
 - Shrubs begin to grow.
 - Trees begin to grow.
 - Secondary succession – a process started by an event that reduces an already established ecosystem to a smaller population of species
 - Environmental disturbances (e.g., fire, drought, etc.) destroy species or cause them to relocate.
 - Some species begin to return to the community and change the environment.
 - More species immigrate as the environment changes.
 - Process of secondary succession (order of re-establishment of vegetation)
 - Weeds
 - Grasses and small plants
 - Shrubs
 - Young forest
 - Mature forest
 - Climax communities – dominant community of plants and animals that come to live in an area
 - Consists of species that are best adapted to conditions in the community
 - Equilibrium attained (stability of abiotic and biotic features over time)
- Limiting factors – a condition or resource that keeps a population at a certain size and slows or stops population growth
 - Climate
 - Elevation
 - Moisture
 - Soil

Both processes can take centuries and are influenced by disturbance severity, available seeds, and environmental conditions. Ultimately, both primary and secondary succession contribute to restoring populations and species diversity in disrupted ecosystems. Students may struggle to differentiate between primary and secondary succession or may not grasp that these processes occur under specific conditions.

Instructional Implications

When you teach this concept, remember to:

- Clearly define primary and secondary succession and highlight their key differences. Use pictures, models, diagrams, or side-by-side comparisons to make each type of succession easier to grasp.
- Show real-life examples of succession in different ecosystems to see how disturbances impact populations and species diversity over time.
- Discuss the gradual nature of succession and the timescales involved to give students a better perspective.
- Include hands-on activities that mimic primary and secondary succession so students can observe how ecosystems recover after disturbances.
- Use flowcharts or concept maps to visually explain the changes in populations and species diversity during both types of succession.

Vocabulary

climax community	ecological succession	ecosystem	natural event
pioneer species	primary succession	secondary succession	Species diversity
Population diversity			

<ul style="list-style-type: none"> ○ Nutrients ○ Availability of food and water ○ Space ○ Shelter ○ Competition for resources ○ Predation 			
Student Misconceptions	Possible STAAR Stimuli		
<ul style="list-style-type: none"> ● Thinking that ecosystems will rapidly return to their original state after disturbances through succession ● Thinking that succession is a one-way path and assuming that once it begins, it always leads to a stable, climax community ● Thinking that primary and secondary succession are unrelated to disturbances ● Thinking that succession always starts with the same species ● Thinking that human activity only leads to negative disruption ● Thinking that succession only occurs in natural environments and not in manmade environments 	Investigation	Chart/Table	Informational Text/List
	Visual/Image/ Illustration	Web/Cycle/Chain	Model

Standard:	8.12C Describe how biodiversity contributes to the stability and sustainability of an ecosystem and the health of the organisms within the ecosystem.		
Specificity	Content Builder		
<p>Cognition: Describe Content: how biodiversity contributes to the stability and sustainability of an ecosystem Including but not limited to:</p> <ul style="list-style-type: none"> ● Ecosystem stability – the ability of an ecosystem to return to a state of equilibrium following a disturbance <ul style="list-style-type: none"> ○ Climax communities – dominant community of plants and animals that come to live in an area <ul style="list-style-type: none"> ▪ Consists of species that are best adapted to conditions in the community ▪ Equilibrium attained (stability of abiotic and biotic features over time) ● Ecosystem sustainability <ul style="list-style-type: none"> ○ Biodiversity – a variety of organisms in an ecosystem or biome ○ Biodiversity increases the chances of survival within an ecosystem. ○ Sustainability – ability to maintain ecological processes over long periods of time; ability of an ecosystem to maintain its structure and function over time ○ Greater biodiversity leads to community stability. ○ Variation within a species leads to community stability. 	<p>Diverse ecosystems can better cope with disturbances as different species respond differently to changes. More diverse ecosystems have stronger food webs, reducing the risk of disruptions from population changes or species loss. Overall, biodiversity maintains ecosystem balance, supports healthy populations, and promotes long-term sustainability. Students may struggle to understand how different species interact and contribute to ecosystem functioning. Connecting the relationship between biodiversity and its impact on ecological processes can also be difficult for them.</p>		
	Instructional Implications		
	<p>When you teach this concept, remember to:</p> <ul style="list-style-type: none"> ● Provide concrete examples of different species and their roles in ecosystem functioning. Use case studies and real-life examples to illustrate the practical implications of biodiversity for ecosystem stability and health. ● Help students realize stability is about an ecosystem staying balanced, while sustainability refers to its ability to keep thriving over time despite changes. ● Use visual aids, models, diagrams, and charts to depict the relationships between species and their contributions to ecosystem processes. ● Facilitate discussions on the importance of preserving biodiversity for the stability and sustainability of ecosystems. 		

<ul style="list-style-type: none"> • Examples of increasing / decreasing biodiversity: <ul style="list-style-type: none"> ○ Introduction of native species ○ Introduction of invasive species ○ Introduction of disease ○ Natural disasters ○ Human impact <p>Cognition: Describe Content: how biodiversity contributes to the health of the organisms within an ecosystem Including but not limited to:</p> <ul style="list-style-type: none"> • Ecosystems with high biodiversity are more likely to maintain healthy organisms. <ul style="list-style-type: none"> ○ Healthy organisms are more resistant to pests, disease, and human interference. ○ Disease – When a disease does affect a population, there is usually an alternate food source for other organisms in the food web to rely on. 	Vocabulary		
	Adaptation	Biodiversity	Biological succession
Variation	Habitat	Interdependence	niche
Species	Stability	Sustainability	
Possible STAAR Stimuli			
<p style="text-align: center;">Student Misconceptions</p> <ul style="list-style-type: none"> • Thinking that ecosystems can self-regulate and recover without the need for diverse species. • Thinking that biodiversity is solely about the number of species present in an ecosystem. They may overlook the functional diversity and ecological roles that different species play, which are equally vital for maintaining ecosystem stability. • Thinking that all species contribute equally to stability and sustainability • Thinking that a stable ecosystem is one that never changes rather than its ability to resist and recover from disturbances • Thinking that biodiversity only matters in natural or rural settings rather than understanding that urban biodiversity is crucial for mitigating the environmental impacts of cities • Confusing stability and sustainability 	Diagram	Visual/Image/ Illustration	Model

Standard:	8.12A Explain how disruptions such as population changes, natural disasters, and human intervention impact the transfer of energy in food webs in ecosystems.
Specificity	
<p>Cognition: Explain Content: how disruptions impact the transfer of energy in food webs in ecosystems. Including but not limited to:</p> <ul style="list-style-type: none"> • Disruptions cause a change in the equilibrium of an ecosystem by changing the availability of food, water, or shelter. <ul style="list-style-type: none"> ○ Population changes – disrupts the available sources of energy in a food web 	
Content Builder	
<p>Disruptions such as population changes, natural disasters, and human intervention can alter the flow of energy in food webs by affecting the abundance and availability of organisms at different levels, leading to imbalances in predator-prey relationships and nutrient cycling within ecosystems. Students may struggle to visualize how disruptions in one part of the ecosystem can have cascading effects on energy flow throughout the entire web.</p>	

<ul style="list-style-type: none"> ○ Possible endangerment and / or extinction of other organisms ○ Possible population growth of other organisms ● Natural disasters – physical geographic events that cause damage to the environment and loss of life <ul style="list-style-type: none"> ○ Earthquakes ○ Volcanoes ○ Hurricanes ○ Drought ○ Wildfire ○ Tornadoes ● Human intervention – physical geographic changes caused by human activity <ul style="list-style-type: none"> ○ Over hunting and population control ○ Overfishing ○ Deforestation ○ Infrastructure <ul style="list-style-type: none"> ▪ Ex: dams, wind turbines, levees, railroads, bridges, and highways ○ Invasive species – non-native species to an ecosystem ○ Positive interventions <ul style="list-style-type: none"> ▪ Ex: artificial reefs, warning systems for natural disasters, responsible agricultural practices, and alternate energy sources 	Instructional Implications		
Student Misconceptions	Vocabulary		
<ul style="list-style-type: none"> ● Thinking that disruptions have immediate and straightforward effects on the food web ● Thinking that ecosystems are fragile and cannot recover from disruptions ● Thinking that ecosystems are simple rather than complex 	When you teach this concept, remember to:		
	<ul style="list-style-type: none"> ● Incorporate real-life examples of disruptions in different ecosystems to illustrate how they affect energy flow. Use case studies of actual events (e.g., the impact of a population decline on predator-prey relationships or the consequences of human intervention on food webs) to help students grasp the practical implications. 		
	<ul style="list-style-type: none"> ● Use visual aids, diagrams, and models to depict food webs and how disruptions can alter the flow of energy. 		
	<ul style="list-style-type: none"> ● Engage students in hands-on activities that simulate disruptions and their effects on energy transfer. 		
<ul style="list-style-type: none"> ● Emphasize the importance of considering both short-term and long-term effects of disruptions. 			
<ul style="list-style-type: none"> ● Help students see the Recurring Themes and Concepts of <i>stability and change</i>; <i>scale, proportion, and quantity in systems</i>; <i>cause and effect</i>; and <i>flow of energy and cycling of matter</i> in this standard. 			

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.

6 th Grade	7 th Grade	8 th Grade
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	7.12A diagram the flow of energy within trophic levels and describe how the available energy decreases in successive trophic levels in energy pyramids	8.12A Explain how disruptions such as population changes, natural disasters, and human intervention impact the transfer of energy in food webs in ecosystems.
		8.12B Describe how primary and secondary ecological succession affect populations and species diversity after ecosystems are disrupted by natural events or human activity
		8.12C Describe how biodiversity contributes to the stability and sustainability of an ecosystem and the health of the organisms within the ecosystem.

VOCABULARY GLOSSARY

Domain-specific words and definitions for this unit.

Key Content Vocabulary
<p>List and define key vocabulary terms</p> <ul style="list-style-type: none"> • 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 • Autotroph: organisms, known as producers in a food chain, capable of synthesizing their own food by a process known as photosynthesis; all plants and some forms of bacteria and other organisms. • Biotic factor – living or once-living part of an ecosystem • Consumer – Organisms that make take in food to obtain their energy. • Dynamic Equilibrium: A state of balance in an ecosystem where things change over time, but the overall system remains stable because gains and losses are balanced. • Energy Pyramid - is a graphical representation, showing the flow of energy at each <i>trophic level</i> in an ecosystem. (sometimes called a trophic pyramid or an ecological pyramid) • Heterotroph: organisms, known as consumers in a food chain, which cannot synthesize their own food; carnivores, herbivores, and omnivores

- **Invasive Species:** A non-native species that is introduced to a new environment, where it spreads quickly and harms the local plants, animals, or ecosystems by competing for resources or disrupting food webs.
- **Natural Disaster:** A sudden and extreme event caused by nature, such as earthquakes, floods, hurricanes, or wildfires, that can cause damage to ecosystems and disrupt life.
- **Nutrients** – substances used by an organism for energy, growth, and/or other processes essential to life
- **pH** – a measure of the acidity of a sample of water (scale of 0-14, 0 is very acidic, 14 is very basic, and 7 is neutral)
- **Population-**: A group of organisms of the same species that live in the same area at the same time and can reproduce.
- **Primary succession** happens when a new patch of land is created or exposed for the first time.
- **Producer** – Organism that makes their own food.
- **Secondary succession** is a natural process that occurs when an ecological community is disrupted, but not destroyed, by a disturbance.
- **Trophic level-** a level or a position in a food chain, a food web, or an ecological pyramid.

Consumable Materials and Lab Supplies for Unit 6 (1 per group of 4 students unless noted)

Lesson	Commercial Vendor	Lab Supplies (Science Vendor)
Lesson 01: Abiotic Factors		Computer with Internet
Lesson 02: Biotic Factors		Computer with Internet
Lesson 03: Flow of Energy Part 1	<p><u>Energy Efficiency Activity</u> <u>Per teacher</u></p> <ul style="list-style-type: none"> • 30 foam cups <p><u>Per group</u></p> <ul style="list-style-type: none"> • 2 large plastic containers or buckets 	<p><u>Energy Efficiency Activity</u> <u>Per teacher</u></p> <ul style="list-style-type: none"> • Timing device • Meter stick • 30 plastic plates or markers (cones from PE?) <p><u>Per group</u></p> <ul style="list-style-type: none"> • Graduated cylinder
Lesson 04: Flow of Energy Part 2	Role and task cards from lesson	
Lesson 05: Succession Part 1	None	
Lesson 06: Succession Part 2	None	
Lesson 07: Disruptions to the Transfer of Energy	<p>Per Group:</p> <ul style="list-style-type: none"> • 50 Green beads (representing grass) • 20 Yellow beads (representing grasshoppers) • 15 Red beads (representing birds) • 10 Blue beads (representing snakes) • 5 White beads (representing hawks) 	

	<ul style="list-style-type: none"> • 5 Orange beads (representing coyotes) • 10 Purple beads (representing rabbits) • 15 Black beads (representing insects) • 8 Brown beads (representing an invasive species, e.g., feral pigs) • Small cups (such as dose cups to hold beads on food web) • Container to put beads in when removed from food web. 	
Lesson 08: Biodiversity Part 1	<p>Per Class:</p> <ul style="list-style-type: none"> <input type="checkbox"/> (2) Anchor Charts <p>Per Group:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Colored Pencils <input type="checkbox"/> Highlighters <p>Per Student:</p> <ul style="list-style-type: none"> <input type="checkbox"/> (4) sticky notes 	<p>Instructional Tools:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Accountable Talk Moves For Students <p>Per Group:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Technology Device
Lesson 09: Biodiversity Part 2	<p>Class Set:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Disturbances and Stability Sorting Activity Cards <p>Per Group:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Anchor Chart <input type="checkbox"/> Chart Markers <input type="checkbox"/> Highlighters 	<p>Instructional Tools:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Accountable Talk Moves For Students