## Living Environment Unit 6 - Ecology

### Unit Overview:
Ecology is the study of life’s interactions with organisms and the non-living environment. Energy flows and matter cycles among organisms and their environments creating dynamic interconnected systems. In this unit, students will learn about the relationships among living things and their non-living surroundings. Students will explore how energy is transferred from one trophic level to the next and how elements necessary for life are cycled. They will also learn about different relationships that certain organisms have that are essential for the success of each organism. Finally, students will study how ecosystems can change over time.

### Essential Questions:
- What type of role does the Sun and the process of photosynthesis have on Earth?
- How do scientists study the interactions between living things, non-living things, and the environment?
- How does energy flow through the ecosystems?
- How do substances essential to life (carbon, nitrogen, oxygen, and water) cycle throughout the environment?
- How does a habitat differ from a niche?
- How do the forms of symbiosis affect the environment?
- How do populations grow in predictable patterns?
- What is succession?

### MST Standard 1 - Science

**Key Idea 1:** The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing and creative process

**MST Standard 4 - Science**

**Key Idea 1:** Living things are both similar to and different from each other and from non-living things.

**Key Idea 5:** Organisms maintain a dynamic equilibrium that sustains life.

**Key Idea 6:** Plants and animals depend on each other and their physical environment.

### New York State P-12 Science Learning Expectations

**New York State Science Learning Standards**

**HS-LS2-1:** Use mathematical and/or computational representations to support explanations of biotic and abiotic factors that affect carrying capacity of ecosystems at different scales.

**HS-LS2-2:** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

**HS-LS2-6:** Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions but changing conditions may result in a new ecosystem.

**HS-LS2-8:** Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce.

**HS-LS2-3:** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in ecosystems.

**HS-LS1-5:** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

**HS-LS2-4:** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

**HS-LS2-5:** Develop a model to illustrate the role of various processes in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

**HS-LS1-6:** Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements such as nitrogen, sulfur, and phosphorus to form amino acids and other carbon-based molecules.
<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Skills, Practices, or Expectations</th>
<th>Specific Standards / Performance Indicators</th>
<th>NYSSLS Disciplinary Core Ideas</th>
<th>Resources</th>
<th>Content Vocabulary</th>
<th>Measurement of Student Learning</th>
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<tbody>
<tr>
<td>04.26.2021 – 05.21.2021</td>
<td><strong>Introduction to Plants</strong></td>
<td>MST Standard 1 Science</td>
<td>• The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.</td>
<td>Castle Learning- Access through Clever</td>
<td>• photosynthesis</td>
<td>• Ticket Out</td>
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<td>Demonstrate an understanding of the function of plants in the environment.</td>
<td>1.1-Elaborate on basic scientific and personal explanations of natural phenomena and develop extended visual models and mathematical formulations to represent one’s thinking.</td>
<td>• As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another.</td>
<td>BPS Science Department Recommended Virtual Labs</td>
<td>• chlorophyll</td>
<td>• Think-Pair – Share</td>
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<td></td>
<td><strong>Levels of Organization:</strong></td>
<td>1.1a – Scientific explanations are built by combining evidence that can be observed with what people already know about the world.</td>
<td>• Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved.</td>
<td>– must be logged into BPS google document account through BPS Gmail account to access</td>
<td>• ecology</td>
<td>• Formative Assessment</td>
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<td>Describe how the environment is organized.</td>
<td>1.2 – Hone ideas through reasoning, library research, and discussion with others, including experts.</td>
<td>• As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another.</td>
<td>McDougal-Littell Biology Living Environment Chapters 4 (4.2), 13, 14, 15, 21</td>
<td>• community</td>
<td>• Weekly Quiz</td>
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<td><strong>Flow of Energy:</strong></td>
<td>1.2a - Inquiry involves asking questions and locating, interpreting, and processing information from a variety of sources.</td>
<td>• Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved.</td>
<td>BPS Science K-12 Schoology Folder 9-12 Resources Living Environment Resources</td>
<td>• nitrogen fixation</td>
<td>• Unit Test</td>
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<td></td>
<td>Trace the flow of energy through ecosystems</td>
<td><strong>Environmental Cycles:</strong></td>
<td></td>
<td>Statedclearly.com Video Series: What is Symbiosis?</td>
<td>• biogeochemical</td>
<td>• Homework</td>
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<td></td>
<td>Interpret diagrams of carbon cycle, nitrogen cycle, oxygen cycle, and water cycle.</td>
<td>1.1 – Explain how diversity of populations within ecosystems relates to the stability of ecosystems.</td>
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<td>Learn.Genetics Extreme Environments: Great Salt Lake – Ecology resource from the Genetic Science Learning Center at the University of Utah. This resource has interactives exploring the living and non-living factors in and around Great Salt Lake</td>
<td>• biomass</td>
<td>• Review Questions</td>
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<td><strong>Niche vs. Habitat:</strong></td>
<td>1.1a – Populations can be categorized by the function they serve. Food webs identify the relationships among producers, consumers, and decomposers carrying out either autotrophic or heterotrophic nutrition.</td>
<td></td>
<td>– must be logged into BPS google document account through BPS Gmail account to access</td>
<td>• nitrogen fixation</td>
<td>• DDI process using data from Edocrinia &amp; Castle learning to generate data</td>
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<td>Differentiate between an organism’s habitat and niche.</td>
<td>1.1b – An ecosystem is shaped by the non-living environment as well as its interacting species. The world contains a wide diversity of physical conditions which creates a variety of environments.</td>
<td></td>
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<td>• energy pyramid</td>
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<td><strong>Symbiotic Relationships:</strong></td>
<td>1.1c – In all environments, organisms compete for vital resources. The linked and changing interactions of populations and the environment compose the total ecosystem.</td>
<td></td>
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<td>• habitat</td>
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<td>Compare and contrast the types of symbiotic relationships.</td>
<td>1.1d – The interdependence of organisms in an established ecosystem often results in approximate stability, over hundreds and thousands of years. For example, as one</td>
<td></td>
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<td>• ecological niche</td>
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<td></td>
<td><strong>Population Patterns:</strong></td>
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<td></td>
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<td>• competition</td>
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<td>Analyze and Interpret population graphs.</td>
<td></td>
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<td>• predation</td>
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<td><strong>Succession:</strong></td>
<td></td>
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<td>• symbiosis</td>
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</table>
When matter is cycled through organisms and ecosystems, some of the matter reacts to release energy for life functions, some is stored in newly made structures, and some is eliminated as waste.

Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, hydrosphere, and geosphere through chemical, physical, geological, and biological processes.

The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis.

Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.

Carrying capacity results from the availability of biotic and abiotic factors and from challenges such as predation, competition, and disease.
This concept may be illustrated with an energy pyramid.

6.1c - The chemical elements, such as carbon, hydrogen, nitrogen, nitrogen, and oxygen, that make up the molecules of living things pass through food webs and are combined and recombined in different ways. At each link in a food web, some energy is stored in newly made structures, but much is dissipated into the environment as heat.

6.1d – The number of organisms any habitat can support (carrying capacity) is limited by the available energy, water, oxygen, and minerals, and by the ability of ecosystems to recycle the residue of dead organisms through the activities of bacteria and fungi.

6.1e - In any particular environment, the growth and survival of organisms depend on the physical conditions including light intensity, temperature, range, mineral availability, soil/rock type, and relative acidity (pH).

6.1f – Living organisms have the capacity to produce populations of unlimited size, but environments and resources are finite. This has profound effects on the interactions among organisms.

6.1g – Relationships between organisms may be negative, neutral, or positive. Some organisms may interact with one another in several ways. They may be in a producer/consumer, predator/prey, or parasite/host relationship; or one organism may cause disease in, scavenge, or decompose another.

6.2 – Explain the importance of preserving diversity of species and habitats.

6.2a – As a result of evolutionary processes, there is a diversity of organisms and roles in ecosystems. The diversity of species increases the chance that at least some will survive in the

• A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.

• Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives.
face of large environmental changes. Biodiversity increases the stability of the ecosystem.

6.3 – Explain how the living and non-living environments change over time and respond to disturbances.

6.3a – The interrelationships and interdependencies of organisms affect the development of stable ecosystems.

6.3b – Through ecological succession, all ecosystems progress through a sequence of changes during which one ecological community modifies the environment, making it more suitable for another community. These long-term gradual changes result in the community reaching a point of stability that can last for hundreds or thousands of years.

6.3c – A stable ecosystem can be altered, either rapidly or slowly, through the activities of organisms (including humans), or through climatic changes or natural disasters. The altered ecosystem can usually recover through gradual changes back to a point of long-term stability.
### BPS Science Department Living Environment – Unit 6

#### Resources
- [http://ngss.nsta.org/Classroom-Resources.aspx](http://ngss.nsta.org/Classroom-Resources.aspx) - Searchable NYSSLS/NGSS aligned resources curated by NSTA
- Buffalo Public Schools Science Department LE Webpage – BPS Living Environment curriculum resource hub
- BPS Science Department Recommended Virtual Labs – Virtual lab resources with embedded links to virtual labs and student sheets. Must be logged into BPS google document account through BPS Gmail account to access.
- NYS Regents Living Environment Exams 2010-2020 – NYSED’s Office of State Assessment webpage for released Regents Living Environment Examinations
- NYSED Bilingual Glossaries – NYSED Statewide Language Regional Bilingual Education Resource for NYSED approved bilingual glossaries.

#### English Language Learners (ELL) Enhancements

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<th>Listening</th>
<th>Speaking</th>
<th>Reading</th>
<th>Writing</th>
<th>Instructional Accommodations (depending on the student’s needs)</th>
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<tr>
<td>- Cross-Linguistic Practices: Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates.)</td>
<td>- <strong>Sentence Frames</strong> - to begin a sentence - such as Evolution is… or I think that evolution is…</td>
<td>- <strong>Supplementary Text</strong> to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension.</td>
<td>- <strong>Sentence Frames</strong> - to begin a sentence - such as Biodiversity is… or An example of competition is…</td>
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<td>- Build background knowledge</td>
<td>- <strong>Academic Conversation Starters:</strong> Have a visual of a list of academic sentence starters that students can refer to in a discussion. Examples include— I expect ___ to happen. My data shows that… This helps students have a more science focused dialogue.</td>
<td>- <strong>Visual Aids</strong> - Pictures or models to support vocabulary words and concepts.</td>
<td>- <strong>Close passages</strong> with word banks</td>
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<tr>
<td>- Activating Prior Knowledge</td>
<td>- <strong>Choral Reading</strong> - To build fluency, self-confidence and motivation with reading/speaking</td>
<td>- Video to review or introduce a topic - use <strong>closed captioning</strong> to help students read along while they listen to the content</td>
<td>- <strong>Word banks</strong></td>
<td>- Extended time for tests in class, projects and assignments</td>
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<tr>
<td>- Visuals - GIFs, pictures- will assist students in understanding what they are listening to. Use <strong>visual thinking strategies</strong> to set the lens for learning.</td>
<td>- Create movement to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning</td>
<td>- <strong>4 Square / Frayer models</strong> to help students gain a deeper understanding of vocabulary.</td>
<td>- <strong>Graphic Organizers</strong> to help break down the writing process and organize thoughts</td>
<td></td>
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<tr>
<td>- Video to review or introduce a topic – use <strong>closed captioning</strong> to help students see the words and pronunciations while they listen to the content.</td>
<td>- <strong>Performance Level Descriptors</strong></td>
<td>- <strong>Highlighting</strong> important text to assist students in answering questions after the reading.</td>
<td>- <strong>Standards-based sentence stems</strong></td>
<td></td>
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<tr>
<td>- <strong>Word stretching / Vowel stretching</strong> when instructing allows student to listen closely to the pronunciation of the word</td>
<td>- <strong>Chunking</strong>- Break reading of text into chunks or paragraphs</td>
<td>- <strong>Choral Reading</strong> - To build</td>
<td>- <strong>Performance Level Descriptors</strong></td>
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<td></td>
<td>- <strong>Performance Level Descriptors</strong> This document provides teachers</td>
<td>fluency, self-confidence and motivation with reading/speaking</td>
<td>this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing. Scroll for grades 9-12.</td>
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</table>

#### Notes
- To access hyperlinked material, you must be logged into your BPS Google Drive.
Performance Level Descriptors
This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening. Scroll for grades 9-12.

Performance Level Descriptors
- levels in the modality of speaking. Scroll for grades 9-12.
- or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary.

### Performance Level Descriptors

<table>
<thead>
<tr>
<th>Levels in the Modality of Listening</th>
<th>Levels in the Modality of Speaking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scroll for grades 9-12</td>
<td>Scroll for grades 9-12</td>
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</tbody>
</table>

### Education Goals

- Interpret information presented in various visual representations such as timelines, graphs, and charts.
- Demonstrate understanding of scientific concepts through practical applications.
- Develop critical thinking skills through problem-solving exercises.

### Special Education Modifications

- **Pre-teach vocabulary**
- **Use picture vocabulary**
- **Scaffold Depth of Knowledge questions**
- **Provide copy of notes/notes in “cloze” form**
- **Use of Think, Pair, and Share strategy to help process information**
- **Scaffold written assignments with the use of graphic organizers**
- **Allow for multiple ways to respond** (verbal, written, response board)
- **Provide model of performance task**
- **Modify informational text to fit the needs of the students**
- **Provide a digital or paper interactive notebook**
- **Present complex tasks in multiple ways**
- **Provide mnemonic strategies for Living Environment concepts**

### Instructional

- **In Class Assessments**
  - Provide review packet or review sheet of concepts covered on the test
  - Practice similar questions prior to the test
  - Provide multiple options for projects
  - Give a timeline of when things are due and remind them of the process often.
  - Use of timer in class
  - Break all complex tasks into chunks

### Technology:

- **Audio reading of text**
- **Text to type functions**
- **Videos to clarify/visualize Living Environment concepts**
- **Record class lecture/discussions and make accessible to student**
- **Nearpod – interactive presentations of notes**
- **Playposit - show a video clip about the topic and add your own questions for them to answer as they watch**
- **Allow students to type answers in chat on Teams**

### Other:

- **Arrange seating for maximum engagement and minimum distraction**
- **Accessible lab space (counter level)**

### SUTW Strategies

- **Informal Outline**
- **Color-Coding – Informative/Explanatory Text**
- **Two-column notes**
- **I-V-F Topic Sentence progressing to Four Step Summary Paragraph**
- **CUPS – Capitalization, Usage, Punctuation, Spelling**
- **Transitions**