

# Unit 03: Ecosystems - Organisms and the Environment (Week 11 - Week 18)

Content Area: **Template**

Course(s):

Time Period: **Full Year**

Length: **FY**

Status: **Published**

## Standards Alignment

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- **MS-LS2-1:**

*Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.*

**Focus:** Population dynamics, competition, availability of food, water, and shelter.

- **MS-LS2-2:**

*Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.*

**Focus:** Predator-prey relationships, symbiosis (mutualism, parasitism, commensalism), and competition.

- **MS-LS2-3:**

*Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.*

**Focus:** Food webs, energy transfer (producers, consumers, decomposers), and matter cycling (carbon, water, and nitrogen cycles).

- **MS-LS2-4:**

*Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.*

**Focus:** Natural disasters, human impact, and habitat changes.

- **MS-LS2-5:**

*Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*

**Focus:** Conservation efforts, sustainable practices, and human impact on biodiversity.

## New Jersey Student Learning Standards

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**LS1: From Molecules to Organisms: Structures and Processes**

**LS1.B: Growth and Development of Organisms**

Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)

Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)

**LS2: Ecosystems: Interactions, Energy, and Dynamics**

**LS2.A: Interdependent Relationships in Ecosystems**

Organisms, and populations of organisms, are dependent on their environmental interactions both with other living

things and with nonliving factors. (MS-LS2-1)

In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1)

Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)

Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)

## **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems**

Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)

## **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**

Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)

Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5)

## **LS2.D: Social Interactions and Group Behavior**

Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5)

## **ESS3: Earth and Human Activity**

### **ESS3.C: Human Impacts on Earth Systems**

Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MSESS3-3)

Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MSESS3-3),(MS-ESS3-4)

## **LS2: Ecosystems: Interactions, Energy, and Dynamics**

### **LS2.A: Interdependent Relationships in Ecosystems**

Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and non-living resources and from such challenges such as predation, competition, and disease. 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. (HS-LS2-1),(HLS2-2)

## **LS4: Biological Evolution: Unity and Diversity**

### **LS4.D: Biodiversity and Humans**

Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids

humanity by preserving landscapes of recreational or inspirational value. (secondary to HS-LS2-7)(HS-LS4-6)

SCI.1-LS1	From Molecules to Organisms: Structure and Processes
SCI.2-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.2.LS2.A	Interdependent Relationships in Ecosystems
SCI.2.LS2.A	Interdependent Relationships in Ecosystems
SCI.1.LS1.B	Growth and Development of Organisms
SCI.3.LS2.D	Social Interactions and Group Behavior
SCI.2.LS4.D	Biodiversity and Humans
SCI.5.LS2.B	Cycles of Matter and Energy Transfer in Ecosystems
SCI.3.LS2.C	Ecosystem Dynamics, Functioning, and Resilience
SCI.5-ESS3	Earth and Human Activity
SCI.5.ESS3.C	Human Impacts on Earth Systems
SCI.MS-LS1	From Molecules to Organisms: Structures and Processes
SCI.MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
SCI.MS-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.MS-LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
SCI.MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
SCI.MS-LS2-3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
SCI.MS-LS2-5	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
SCI.HS-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
SCI.MS-ESS3	Earth and Human Activity
SCI.MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
SCI.MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
9.3.12.AG	Agriculture, Food & Natural Resources
9.3.12.AG-ANI	Animal Systems
9.3.12.AG-ANI.2	Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.
2-LS4	Biological Evolution: Unity and Diversity

## **Integration of Career Readiness, Life Literacies and Key Skills**

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CRP.K-12.CRP1

Act as a responsible and contributing citizen and employee.

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

## **Technology / Integration of Computer Science and Design Thinking**

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TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.1.8.F.1	Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.
TECH.8.2.8	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.8.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.8.C.7	Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.

## **Interdisciplinary Connections: NJSLs for ELA, Social Studies, Science and/or Math Section**

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LA.RL.8	Reading Literature Key Ideas and Details Key Ideas and Details
LA.K-12.NJLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.RL.8.1	Cite the textual evidence and make relevant connections that most strongly supports an

	analysis of what the text says explicitly as well as inferences drawn from the text.
LA.K-12.NJSLSA.R2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
LA.RI.8	Reading Informational Text
LA.RI.8.2	Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
LA.K-12.NJSLSA.W	Writing
LA.K-12.NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.W.8.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.

## **Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media Literacy**

see Crosswalks

## **21st Century Life and Careers**

### **Stage I: Desired Results**

### **Transfer/Overview/Rationale**

#### **Transfer / Overview / Rationale**

##### Unit Rationale

The purpose of this unit...

1. The behaviors, adaptations and relationships organisms have in their environment (biotic & abiotic) enable them to reproduce and survive as a species. Abiotic factors determine what types of biotic factors will thrive in an area. Humans rely on their environment and the natural resources it provides for survival. Living sustainably is an attainable goal and students should understand that it is their responsibility to minimize natural resource use.

### **Meaning**

## Essential Questions

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### Essential Questions

1. How is energy and matter being cycled through ecosystems and what is their importance?
2. How do living things within the biosphere interact with each other and the non-living things they rely on for survival?
3. How do animal behaviors and structural adaptations help organisms survive in various ecosystems?
4. What impact can living things have on their own environment (Focus-humans)?
5. Should we/Can we work towards a more sustainable future?

## Enduring Understanding/Indicators of Understanding

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### Enduring Understanding/Indicators of Understanding

1. Energy and Matter are constantly cycling through ecosystems and get re-used in the environment.
2. Living things (including people) depend upon one another and their environment to survive.
3. Behavioral and Physical adaptations of organisms are a direct result of limiting factors present in the environment.
4. People benefit directly and indirectly from energy, materials, and natural resources offered by biodiverse ecosystems
5. Humans have the power to change the environment more than any other living thing

## Acquisition (Student Learning Objectives)

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### Knowledge

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#### Knowledge

Students will know...

1. **Ecology** is the study of interactions that take place in the biosphere.
2. The relationship between populations, communities, and ecosystems.
3. Living and nonliving factors affect an organism's ability to survive.
4. Population size can be estimated.
5. competition for limiting factors can restrict the size of a population.
6. All life requires energy (Discuss Photosynthesis)
7. The difference between producers and consumers.
8. The types of symbiotic relationships.
9. What a niche is
10. Important abiotic factors and their major characteristics
11. The path that water, carbon, and nitrogen take in their perspective cycles and the role they play in the environment.
12. How energy flows through ecosystems and how it can be modeled.

13. Ecological succession a gradual change from one community to another.
14. A climax community has reached a stable stage of succession.
15. The difference between primary and secondary succession.
16. How the climate of a region is determined.
17. The different land and aquatic biomes and their major characteristics.
18. Human activities can change the dynamics of an ecosystem.
19. Human impact should be minimized and we should work towards a more sustainable future.

## **Skills**

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### Skills

Student will be skilled at ...

1. Identify places where life is found on earth.
2. Define **ecology**.
3. Observe how the environment influences life.
4. Identify methods for estimating population sizes.
5. Explain how competition limits population growth.
6. List factors that influence changes in population size.
7. Describe how organisms obtain energy for life and how they interact.
8. Recognize that every organism has a niche.
9. Identify common abiotic factors in most ecosystems and their characteristics.
10. Explain how climate influences life in an ecosystem.
11. Explain the importance of the carbon cycle, water cycle, and nitrogen cycle.
12. Explain how energy flows through an ecosystem.
13. Recognize how much energy is available at different levels in a food chain.
14. Explain how ecosystems change over time.
15. Describe how new communities begin in areas without life.
16. compare pioneer communities and climax communities.
17. Explain how climate influences different environments.
18. Identify seven biomes of earth and describe them (same with aquatic biomes).
19. Describe the adaptations of organisms found in each biome.
20. Identify human activities that can be changed/altered in order to minimize our impact on ecosystems.

## **Stage 3: Learning Plan**

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### **Resource and Mentor Texts**

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#### Resources and Mentor Texts

1. Projector

2. Lab Materials (see learning activities for more detail)

3. Elmo

4. Interactive notebooks

5. Interactive notebook materials

6. Student copies (see learning activities for more detail)

## **Formative Assessment Strategies**

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Formative Assessment Strategies

1. Quizzes (Wrap-ups)

2. Virtual labs

3. Interactive notebook activities/assignments

4. Labs (based on lab availability/scheduling conflicts).

5. Informal questioning

## **Learning Activities/Unit of Study**

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Learning Activities/Unit of Study

1. Virtual Lab: Energy Flow through ecosystems
2. Virtual Lab: Ecosystems, organisms, and trophic levels
3. Virtual Lab Biotic/Abiotic Factor
4. Presenter: Marine mammal stranding center
5. Presenter: Macro-invertebrate/NJ Watershed ambassadors
6. Design a zoo Enclosure for an animal based on adaptations/behaviors (include biotic/abiotic)
7. Project: Prepared and Afraid
8. Lab: Trophic Level modeling lab
9. Invasive Species Wanted Poster Activity
10. Weeples estimating populations lab
11. Cycle Games (carbon, water, nitrogen)

[Virtual Lab: Energy Flow through ecosystems](#)

[Virtual Lab: Ecosystems, organisms, and trophic levels](#)

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## **Modifications and/or Accommodations**

**Suggested Modifications (ELL, Sp. Ed, Gifted, At-risk of Failure)**

## English Language Learners

**Native language support:** The teacher provides auditory or written content to students in their native language.

**Adjusted Speech:** The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

**Visuals:** The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

**Front-Loading Vocabulary:** The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

## Special Education Students

**Chunking:** The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

**Checking for Understanding:** It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

**Extra time:** The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

**Oral Reading:** The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

**Timers:** The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

## Students with 504 Plans

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## **Gifted & Talented Strategies**

**Extensions/Enrichments:** Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

**Modify/Change Activities:** Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

## **Students at Risk of School Failure**

**Directions or Instructions:** Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

**Peer Support:** Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

**Alternate or Modified Assignments:** Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

**Increase One to One Time:** When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

**Contracts:** It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

**Hands On:** As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read

instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.