# 6. Grade 07: Interdependent Relationships in an Ecosystem

Content Area: **Science**
Course(s):
Time Period: **Generic Time Period**
Length: **23**
Status: **Published**

## Stage 1: Desired Results

## Unit Overview/ Rationale

***What happens to ecosystems when the environment changes?***

Students build on their understandings of the transfer of matter and energy as they study patterns of interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on a population. They construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biodiversity in ecosystems. The crosscutting concept of *stability and change* provide a framework for understanding the disciplinary core ideas.

This unit includes a two-stage engineering design process. Students first evaluate different engineering ideas that have been proposed using a systematic method, such as a tradeoff matrix, to determine which solutions are most promising. They then test different solutions, and combine the best ideas into a new solution that may be better than any of the preliminary ideas. Students demonstrate grade appropriate proficiency in *asking questions*, *designing solutions, engaging in argument from evidence, developing and using models*, and *designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on MS-LS2-4, MS-LS2-5, MS-ETS1-1, and MS-ETS1-3.

All organisms, including the human species, are part of interconnected food webs. The webs rely on a transfer of energy in an ecosystem. Any interruption in the environmental conditions within the ecosystem can effect the survival of individual organisms or entire species.

## Standards & Indicators

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| **Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosy** *[Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in empirical evidence supporting arguments about changes to ecosystems.]* **(MS-LS2-4)** |
| **Evaluate competing design solutions for maintaining biodiversity and ecosystem services. *** *[Clarification Statement: Ex could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints economic, and social considerations.]* **(MS-LS2-5)** |

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| MS-LS2-4 | Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. |
| MS-LS2-5 | Evaluate competing design solutions for maintaining biodiversity and ecosystem services. |

## Big Ideas - Students will understand that…

At the beginning of this unit of study, students will begin to collect empirical evidence that will be used to argue that physical or biological components of an ecosystem affect populations. Students will evaluate existing solutions for maintaining biodiversity and ecosystem services to determine which solutions are most promising. As part of their evaluation, students will develop a probability and use it to determine the probability that designed systems, including those representing inputs and outputs, will maintain biodiversity and ecosystem services. They will develop mathematical model(s) to generate data to test the designed systems and compare probabilities from the models to observe frequencies. If the agreement is not good, they will explain possible sources of the discrepancy.

During this process, students will distinguish among facts reasoned judgment based on research findings, and speculation while reading text about maintaining biodiversity and ecosystem services. Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion.

After determining that ecosystems are dynamic in nature, students may construct an argument to support an explanation for how shifts (large and/or small) in populations are caused by change to physical or biological components in ecosystems (e.g., gas explosions, tornados, mining, oil spills, clear cutting, hurricanes, volcanoes, etc.).

Students will study the variety of species found in terrestrial and oceanic ecosystems and use the data they gather to make decisions about the health of the ecosystem. Students may compare, through observations and data analysis, the biodiversity before and after events affecting a specific area—for examples, the Pinelands, that were lost due to the creation of the reservoir; the underground coal fires in Centralia, PA, that caused people to abandon the town; the volcanic eruption in Mt. St. Helen's, WA; the nuclear reactor meltdown in Chernobyl, Ukraine.

Students should recognize patterns in data about changes to components in ecosystems and make inferences about how these changes contribute to changes in the biodiversity of populations. Students should investigate and design investigations to test their ideas and develop possible solutions to problems caused when changes in the biodiversity of an ecosystem affect resources (food, energy, and medicine) as well as ecosystem services (water purification, nutrient recycling, soil erosion prevention) available to humans. Students can then construct arguments using evidence to support recognized patterns of change in factors such as global temperatures and their effect on populations and the environment. As part of their argument, students need to note how small changes in one part of an ecosystem might cause large changes in another part. While collecting evidence for their arguments about maintaining biodiversity, students will trace and evaluate specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. Students will evaluate the argument and claims in text, assess whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.

As a culmination of this unit of study, students will take the evidence they have collected and their understanding of how changes in the biodiversity of populations can impact ecosystem services and use that evidence and understanding to evaluate competing design solutions. Students will include multimedia components and visual

displays as part of their argument about competing design solutions based on jointly developed and agreed-upon design criteria to clarify evidence used in their arguments. The multimedia component and visual displays should clarify claims and findings and emphasize salient points in their argument.

Students will use a systematic process for evaluating their design solutions with respect to how well they meet the criteria and constraints. Students may determine the systematic process they will use, or the teacher can determine a process for students to use to evaluate ecosystem services. Any process used should include mathematical models that generates data for the iterative testing of competing design solutions involving a proposed object, tool, or process maintaining biodiversity and ecosystem services and quantitative reasoning (with amounts, numbers, sizes) and abstract reasoning (with variables). Ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. For this unit of study, design solution constraints could include scientific, economic, and social considerations. After determining the process for evaluating the design solutions and establishing the criteria and constraints, students will compare competing design solutions to determine the optimal solution.

## Essential Questions - What provocative questions will foster inquiry and transfer of learning

*How can a single change to an ecosystem disrupt the whole system?*

How do living things and nonliving parts of an environment interact?

How does pollution affect air, water and land resourses?

What defines a community?

How are human behaviors impacting the environment and what can be done to conserve the Earth's resources?

## Content - Students will know...

Carbon, nitrogen, water and other types of matter are used by all living things over and over again.

All living things, except producers, get their energy by eating other living things.

The number of individuals in a population varies as the amount of available resources varies.

Natural resources are raw materials and forms of energy that are essential for human life.

People can conserve and protect Earth's resources by reducing, reusing and recycling material.

## Skills - Students will be able to...

compare and contrast predator-prey relationships as well as cooperative relationships

hypothesize the fate of an organism if its environment changes

distinguish between photosynthesis and chemosynthesis

explain how competition can limit the size of a population

design a clothing article out of recycable material

expalin benefits of conserving our natural resources

## Stage 2: Assessment Evidence

## Assessment

**Chapter 20 lesson 3, Chapter 21, Chapter 23 lesson 3 assessments including tests and quizzes**

**Essential question responses**

**lab activity worksheets**

**Science Week Design Challenge rubric**

## Stage 3: Learning Plan

## Learning Activities

Academic vocabulary activities such as journals, E-flashcards, word parts, foldables

Mini-labs

Launch Labs

Interactive technology classroom presentations, science videos, transparencies, interactive white board

Academic Vocabulary Activities: journals, e-flash cards, puzzles, e-games

Mini-Labs (student engagement)

Launch Labs (teacher and/or student led)

Inquiry Labs (use of inquiry skills)

Interactive technology: classroom presentations, science videos, transparencies, interactive whiteboard activities, online assessments

Language arts strategies: make tables, answer guiding questions, organizing ideas, illustrating ideas, outlines, infer meaning, compare and contrast, make connections

**Accommodations for students with IEPs and learning difficulties**:

-visual sentence frames using academic vocabulary for discussion

-graphic organizers and sentence starters for literary analysis writing

-Graphic organizers for comparing and contrasting of characters, plot, and theme in order to create a written narrative.

-Graphic organizers/worksheets for book club roles that explains in detail about what each role entails

-Model how to perform specific roles for book clubs

-Use visuals to show important vocabulary for students to make connections

-Have students share their text to text, text to world, and text to self-connections

-One on one teacher support for comprehension and fluency

- Modeling and scaffolding to highlight specific moments, vocabulary, and figurative language, and using context clues to use inference skills

-Show and discuss exemplar writing pieces before students being their own

-Close reading chapters/chunks

-Re-reading key sections for fluency and comprehension

-Colored overlays and reading windows to reduce visual distractions

-Sentence starters for writing assignments

-Vocabulary word banks and strategies (Say it, Define it, Act it)

-Think aloud and Think-Pair-Share

**For ELL students:**

-visuals for vocabulary

-Word wall

-Additional word work such as illustrating vocabulary and playing vocabulary games

-Partner reading

-Choral reading

-Think-aloud while modeling writing

-Analyze sample summaries before writing

-Color-coded sticky notes for close reading to identify which sticky notes pertain to vocabulary

-Questions about text, etc.

-When students make an error in speaking, answer or restate what they said using the correct form without drawing attention to the mistake.

**For gifted students:**

-Have students complete extended research projects on a related issue of their choice as it pertains to a content area

-Students perform a written/oral debate on topics related to content

## Resources

**Glencoe Life Science Unit 5**

**Chapter 21**

**ConnectEd.Mcgraw-hill.com resources**

**BrainPop videos**

**Various movies and video clips**

**Biome Internet Research and Booklet**

**Launch Lab: What is the Climate of China?**

## Unit Reflections & Teacher Notes