Unit: Ecosystems

Content Area: **Science**
Course(s): **Integrated Science 7**
Time Period: **Week**
Length: **11 weeks**
Status: **Published**

Unit Overview

Students will model interdependency in ecosystems, photosynthesis and cellular respiration, energy flow and cycling of matter, biodiversity, and explore the human impacts on ecosystems and biodiversity.

Transfer

Students will be able to independently use their learning to…

- Develop an interest in structure and function of organisms.
- Develop an interest in and investigate careers in the Life Sciences: zoology, ecology, oceanology, medicine.
- Recognize patterns of interactions among organisms.
- Predict the impact of pollution on the health of water ecosystems.
- Infer the effects of a decrease in biodiversity on Earth as a system.
- Infer how limited resources on Earth affect populations within ecosystems.
- Explain biomass as a renewable resource is a source of energy.
- Recognize successful species have evolutionary adaptations which make them well suited for reproducing in their environments.
- Develop a willingness to think creatively and logically to form scientific explanations.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand ...

- Relationships between living things in ecosystems are interdependent.
- The Biosphere is the part of the Earth where living things are found.
- Changes in biodiversity can influence human survival by altering resources and vice versa.
- How living things get the resources they need to grow and survive
- How ecosystems change over time.
- How producers capture and use energy and matter.
- Energy transfer among living things is a chemical process.
- How energy and matter move through ecosystems.
- Why biodiversity is important in ecosystems.
- How humans rely on healthy ecosystems.
- How humans affect ecosystems.

Essential Questions

Students will keep considering...

- What roles do matter and energy play during photosynthesis?
- How can biomass be used as a renewable energy source on earth?
- How is a habitat related to an organism's behavior and survival?
- How do non-living factors affect liing things?
- How does over-exploitation change ecosystems?
- Why is life so diverse?
- What are the implications of diversity?
- What are some possible consequences resulting from a loss of diversity?
- What is the human role in managing and protecting populations and ecosystems?
- What is the human role in protecting Earth's Oceans.
- What resources could Earth's Oceans provide?
- Could humans live on another planet?

Application of Knowledge and Skill

Students will know...

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- An organism's genetic adaptations determine whether it can survive in its habitat.
- The structure of an organism's parts is related to their function and its survival in the habitat.
- Organisms living in the same ecosystem interact in various ways.
- Cells and organisms require specific resources from their environment to survive.
- There are terrestrial and aquatic ecosystems.
- Matter and energy in ecosystems cycle through living things.
- Matter and energy are used during cellular respiration and photosynthesis.
- Keystone species affect the biodiversity of an entire ecosystem.
- Populations in predator/prey relationships follow cycles in numbers over time.
- Ecosystem changes are related to shifts in populations.

Students will be skilled at...

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- Demonstrating how to safely use tools, instruments, and supplies.
- Predicting the impact that altering biotic and abiotic factors has on an ecosystem.
- Describing how one population of organisms may affect other plants and/or animals in an ecosystem in negative and positive ways.
- Differentiating types of symbiotic relationships in an ecosystem; their advantages and disadvantages.
- Tracking energy flow through an ecosystem via food webs and energy pyramids.
- Analyze data, make predictions, and construct simple models to explain resource needs.
- Interpreting population data represented in graphs and charts.
- Designing and presenting solutions of various formats.
- Present claims and make argument from evidence.

Academic Vocabulary

abiotic

biotic

biodiversity

biofuel

biomass

biome

biosphere

carbohydrate

carbon cycle

carnivore

cellular respiration

cellulose

chlorophyll

chloroplast

climate change

commensalism

competition

constraint

consumer

criteria

decomposer

direct effect

disease resistance

dynamic system

ecological succession

ecosystem

ecosystem service

emerging disease

evidence

extinction

extirpation

fat

food chain

food web

habitat degradation

herbivore

indirect effect

invasive species

keystone species

law of conservation of matter

matter

mitochondria

mutualism

natural resource

niche

nitrogen cycle

omnivore

organism

over-exploitation

parasitism

per capita

photosynthesis

population

predation

producer

proportion

protein

reforestation

resource

scavenger

species trophic pyramid

water cycle

Learning Goal 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-LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Target 1 (Lesson 1-2)

Students can develop an argument to defend the reasons for which living things need other living things and nonlinving elements in order to survive, grow, and reproduce.

Target 2 (Lesson 1-2)

Students can make inferences about how competition over the same limited resources affects population sizes of different species in an ecosystem.

Learning Goal 2

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

SCI.MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Target 1 (Lesson 1-2)

Students can evaluate how predator populations impact their prey populations through a cause and effect relationship.

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Target 2 (Lesson 1-2)

Students can evaluate decisions of conservation scientists and use their understanding of interactions between predator and prey to manage ecosystems.

Target 3 (Lesson 1-2)

Students will explain interactions between species and define those relationships as mutualism, commensalism or parasitism.

Learning Goal 3

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

SCI.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
SCI.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
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.

Target 1 (Lesson 4, 6, 7, 10)

Students will decide the best way to track matter and energy moving through a food web and model energy

transfer through trophic pyramids.

Target 2 (Lesson 4, 6, 7, 10)

Students will distinguish how three types of matter cycle on a global scale: water, carbon, and nitrogen.

Target 3 (Lesson 4, 6, 7, 10)

Students will understand how matter and energy can move between nonliving and living things, including producers, consumers, and decomposers and represent their knowledge in diagrams.

Learning Goal 4

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

SCI.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
SCI.MS-LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Target 1 (Lesson 2,3,9)

Students can explain the impact on populations of biological and physical changes which may occur in some specific natural ecosystems.

Target 2 (Lesson 2,3,9)

Students recognize patterns of limited resources that shape the patterns of biomes on Earth.

Learning Goal 5

Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

SCI.MS-LS2-5	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Target 1 (Lesson 8-10)

Explain how every ecosystem on earth is characterized by a natural level of biodiversity.

Target 2 (Lesson 8-10)

Calculate the biodiversity of different ecosystems and examine the impacts of changes to biodiversity over time.

Learning Goal 6

Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

SCI.MS-LS1-6	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

Target 1 (Lesson 4)

Students can model the interactions of atoms, molecules, and cell structures to craft an explanation of the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

Target 2 (Lesson 4)

Students will compare and contrast how organisms (both plant and animal) use food and oxygen to get energy through cellular respiration.

Learning Goal 7

Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

SCI.MS-LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

Target 1 (Lesson 5)

Students can infer how living cells use molecules from food to carry out the chemical reactions which provide energy.

Learning Goal 8

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

SCI.MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
SCI.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
SCI.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Target 1 (Lesson 2, 6, 8, 9, 10)

Students will design solutions which will help preserve biodiversity by targeting certain species rather than all species.

Target 2 (Lesson 2, 6, 8, 9, 10)

Students use research of current events to understand how human population growth impacts resources for specific species.

Formative Assessment and Performance Opportunities

- Anchoring phenomena checkpoints
- Constructed response
- Exit tickets
- Group work
- Interactive science notebook
- KWL charts
- Misconception check
- Performance assessment
- Quizzes
- Rubrics
- Teacher observation

Summative Assessment

Common assessment in Linkit.

Unit 1 Performance assessment - Determine why a change to a zoo exhibit is causing fish populations to decline. Identify resource needs and interactions of fish and then design a solution to protect them. Present the solution as a talk at a conference.

Unit 2 Performance assessment - Create a sequence of images that shows the path of a carbon atom through the carbon cycle. Compare this to the path of energy.

Unit 3 Performance assessment - Use a news report on abalone populations as a model for your investigation of a local interaction between humans and an ecosystem. After doing research and conducting interviews, you will put together your own news report.

Accommodations/Modifications

- Compare and contrast various animals and their adaptations
- Flexible groupings
- Graphic organizers
- Group investigations
- Guided reading
- Hold class meetings for discussion in small group
- Learning stations
- Provide students with the main ideas of case studies as they work in groups
- Re-word, Re-teach and clarify
- Students design games to study the ecosystems
- Use of collaboration during various activites
- Use of games and tournaments
- Use of models
- Use quizlet for vocabulary review
- Varied supplemental materials

Unit Resources

TCI on-line	Chromebooks	Science World Magazines
TCI kits	Supplemental textbooks	Review Games
Bill Nye Series	Digital Resources	Google Hangouts
Document Camera	Interactive Science Notebook	Blackline Masters

21st Century Life and Careers

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.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.CRP11	Use technology to enhance productivity.

CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Interdisciplinary Connections

LA.RL.7.1	Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
MA.7.RP.A.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
LA.RL.7.4	Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama.
MA.6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
LA.RL.7.7	Compare and contrast a written story, drama, or poem to its audio, filmed, staged, or multimedia version, analyzing the effects of techniques unique to each medium (e.g., lighting, sound, color, or camera focus and angles in a film).
LA.RL.7.8	(Not applicable to literature)
LA.RL.7.9	Compare, contrast and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history.
LA.W.7.1.A	Introduce claim(s), acknowledge alternate or opposing claims, and organize the reasons and evidence logically.
LA.W.7.1.B	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
LA.W.7.1.E	Provide a concluding statement or section that follows from and supports the argument presented.
LA.W.7.2.A	Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia).
LA.W.7.2.B	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
LA.W.7.2.F	Provide a concluding statement or section that follows from and supports the information or explanation presented.
LA.W.7.7	Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.
MA.7.SP.B.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
LA.W.7.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.W.7.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.SL.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and

	reflect on ideas under discussion.
LA.SL.7.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
LA.L.7.4.A	Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
LA.L.7.4.B	Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., belligerent, bellicose, rebel).
LA.L.7.4.C	Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.
LA.L.7.4.D	Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).