

Title: Unit I: Ecology

Subject/Course: 9th Grade Science

Topic: Interaction of Biotic/Abiotic Factors, Organization of Ecosystems, Human Impact, Food Chains/Webs

Grade: 9

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Stage 1- Desired Results

Established Goals:

Student knowledge & understanding of...

1. Abiotic and biotic factors in aquatic and terrestrial ecosystems
2. Interactions between organisms in an ecosystem (symbiosis, etc)
3. The levels of ecological organization
4. The conservation, movement and cycling of energy in an ecosystem
5. Ecosystem changes due to human interaction
6. Impact of limiting factors on population dynamics and species extinction/endorsement

Anchor Descriptors:

BIO.B.4.1 Describe ecological levels of organization in the biosphere.

BIO.B.4.2 Describe interactions and relationships in an ecosystem.

Eligible Content:

BIO.B.4.1.1 Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).

BIO.B.4.1.2 Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.

BIO.B.4.2.1 Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids)

BIO.B.4.2.2 Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).

BIO.B.4.2.3 Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).

BIO.B.4.2.4 Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).

BIO.B.4.2.5 Describe the effects of limiting factors on population dynamics and potential species extinction

NGSS:

HS-LS2: Ecosystems: Interactions, Energy, and Dynamics

HS-LS2-1: Use mathematical and/or computational representations to support explanations of 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-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

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 photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

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.

Science and Engineering Practices:

- Developing & using Models (HS-LS2-5)
- Using Mathematical & Computational Thinking (HS-LS2-1, HS-LS2-2, HS-LS2-4)
- Constructing Explanations and Designing Solutions (HS-LS2-3)
- Engaging in Argument from Evidence (HS-LS2-6)

Disciplinary Core Ideas:**LS2.A:** Interdependent Relationships in Ecosystems**LS2.B:** Cycles of Matter and Energy Transfers in Ecosystems**LS2.C:** Ecosystem Dynamics, Functioning and Resilience**Crosscutting Concepts**

- Scale, Proportion, and Quantity (HS-LS2-1)
- Systems & Systems Models (HS-LS2-5)
- Energy & Matter (HS-LS2-3, HS-LS2-4)
- Stability & Change (HS-LS2-6)

Transfer:

Students will be able to independently use their learning to...

1. Describe and differentiate between the levels of ecological organization.
2. Describe characteristic biotic and abiotic components of terrestrial and aquatic ecosystems.
3. Explain how energy flows through an ecosystem.
4. Describe biotic interactions within an ecosystem.
5. Describe the niche of an organism.
6. Explain how matter recycles in an ecosystem.
7. Analyze how ecosystems change in response to natural and human disturbances.
8. Predict the effects of limiting factors on population dynamics and potential species extinction.

Meaning:**Understandings:***Students will understand that...*

- Autotrophs and heterotrophs depend on one another as well as biotic factors in an ecosystem
- Energy and matter cycle through an ecosystem.
- Food chains and food webs demonstrate predatory interactions between living organisms.
- Organisms interact in various ways symbiotically to the benefit and/or detriment of one another (mutualism, commensalism, and parasitism).
- Natural disasters, human impact and limiting factors can have various adverse effects on ecosystems.

Essential Questions:

1. How are ecosystems organized?
2. What factors limit population growth?
3. How does energy flow through an ecosystem?
4. What is the difference between an endangered and a threatened species?
5. How do organisms interact with each other and with abiotic factors in their environments?
6. What are limiting factors and how do they affect an ecosystem and its organisms?
7. How does human activity impact an ecosystem?

Acquisition:

<p><i>Students will know...</i></p> <ul style="list-style-type: none"> • Levels of ecological organization • Different types of organism interaction <ul style="list-style-type: none"> ○ Symbiosis ○ Predation ○ Competition • Classification of organisms based on diet <ul style="list-style-type: none"> ○ Carnivore/Herbivore/Omnivore ○ Decomposer ○ Autotroph/Heterotroph • Abiotic resources upon which organism rely for survival (water, O₂, CO₂, sunlight) • Factors that influence organism diversity/survival 	<p><i>Students will be skilled at ...</i></p> <ol style="list-style-type: none"> 1. Describe and differentiate between the levels of ecological organization. 2. Describe characteristic biotic and abiotic components of terrestrial and aquatic ecosystems. 3. Explain how energy flows through an ecosystem. 4. Describe biotic interactions within an ecosystem. 5. Describe the niche of an organism. 6. Explain how matter recycles in an ecosystem. 7. Analyze how ecosystems change in response to natural and human disturbances. 8. Predict the effects of limiting factors on population dynamics and potential species extinction.
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Stage 2- Assessment Evidence

<p>Unit-Based Project</p> <p>Ecosystems research project</p>	<p>Other Evidence:</p> <p>Chapter quizzes:</p> <ul style="list-style-type: none"> • Ch 2: Principles of Ecology • Ch 3: Communities, Biomes and Ecosystems • Ch 4.1: Population Ecology • Ch 5.1: Biodiversity <p>Unit Test: Ecology</p>
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Stage 3- Learning Plan

Pre-Assessment

<p>Learning Events</p> <p>Vocabulary:</p> <p><u>CH 2</u> <i>Ecology, biosphere, biotic factor, abiotic factor, population, biological community, ecosystem, biome, habitat, niche, predation, symbiosis, mutualism, commensalism, parasitism, autotroph, heterotroph, herbivore, carnivore, omnivore, decomposer (detritivore), trophic level, food chain, food web, biomass, matter, nutrient, biogeochemical cycle, nitrogen fixation, denitrification</i></p> <p><u>CH 3</u> <i>Community, limiting factor, tolerance, ecological succession, primary succession, climax community, secondary succession, terrestrial ecosystem, weather, latitude, climate, tundra, boreal forest, temperate forest, woodland, grassland, desert, tropical savanna, tropical seasonal forest, tropical rain forest, aquatic ecosystem, sediment, littoral zone, limnetic zone, plankton, profundal zone, wetlands, estuary, intertidal zone, photic zone, aphotic zone, benthic zone, abyssal zone</i></p> <p><u>CH 4.1</u> <i>Population density, dispersion, population growth rate, carrying capacity</i></p> <p><u>CH 5.1</u></p>	<p>Progress-Monitoring</p> <ul style="list-style-type: none"> ✓ Do Nows ✓ Vocabulary quizzes ✓ Classwork/homework check ✓ Online activities completion and accuracy check with discussion on results ✓ Accuracy of section and chapter review questions, guided reading handouts, chapter reading synopses ✓ Lab exercises execution & data analyses ✓ Unit project progression monitoring
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<p><i>Extinction, biodiversity, genetic diversity, species diversity, ecosystem diversity</i></p> <p>Vocabulary Lecture presentation/notes/discussion Animations/videos Chapters 2/3/4.1/5.1 Section Assessment Questions Exercises:</p> <ul style="list-style-type: none"> • Review of characteristics of life/biotic vs abiotic • Identifying levels of ecological organization • Ecosystem modeling • Case studies on various types of ecosystems • Organism identification by dietary needs • Food web modeling/diagrams • Food chain modeling/diagrams • Symbiosis recognition exercises • Predicting the effect of various limiting factors • Ecology webquest <p>Laboratory Activities:</p> <ul style="list-style-type: none"> • Population change by predation demonstration activity (beans/colored paper dots) • Deconstructing a food chain <p>Guided reading/Review handouts Chapter 2/3/4.1/5.1 Assessment Questions Chapter 2/3/4.1/5.1 Standardized Test Prep</p>	
<p>Technology</p> <ul style="list-style-type: none"> • Laptops and Internet for online activities and project research • Powerpoint/LCD projector for lecture/discussion • Laboratory equipment & materials for lab exercises • Pearson Biology: eBook, online assignments, quizzes, tests, online activities, questions, presentations, animations • Text companion website: www.pearsonsuccessnet.com • Discovery Streaming, TeacherTube, various online sources for visuals, etc. 	<p>Pacing Guide September/October Chapters 2, 3, 4.1, 5.1 Approx: 4 weeks Review/reteach Unit test / Unit Project due</p>