

MYP/3D Science Unit Planner
Marietta City Schools

Grade & Course: Environmental Science	Topic: Unit 1 - Ecosystems	Duration: 13 Weeks
Teachers: Hunter Fisher, Diana Perez, O'Neal McRunells		
<p>Georgia Standards and Content:</p> <p>Summary: Investigate flow of energy and matter by using models to compare levels of biological organization, adaptations of organisms within different ecosystems, effects and changes of water properties on organisms, how ecosystems change and how humans impact environments.</p> <p>Georgia Standards of Excellence Environmental Science: SEV1.a, d, e, SEV2.c, d, SEV4.a, b, c</p> <p>SEV1. Obtain, evaluate, and communicate information to investigate the flow of energy and cycling of matter within an ecosystem.</p> <p>a. Develop and use a model to compare and analyze the levels of biological organization including organisms, populations, communities, ecosystems, and biosphere.</p> <p>d. Evaluate claims, evidence, and reasoning of the relationship between the physical factors (e.g., insolation, proximity to coastline, topography) and organismal adaptations within terrestrial biomes.</p> <p>e. Plan and carry out an investigation of how chemical and physical properties impact aquatic biomes in Georgia. (Clarification statement: Consider the diverse aquatic ecosystems across the state such as streams, ponds, coastline, estuaries, and lakes.)</p> <p>SEV2. Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems.</p> <p>c. Construct an argument to predict changes in biomass, biodiversity, and complexity within ecosystems, in terms of ecological succession.</p> <p>d. Construct an argument to support a claim about the value of biodiversity in an ecosystem's resilience including keystone, invasive, native, endemic, indicator, and endangered species.</p> <p>SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources. a. Construct and revise a claim based on evidence on the effects of human activities on natural resources. Human Activities Natural Resources Agriculture Forestry Ranching Mining Urbanization Fishing Water use Pollution Desalination Waste water treatment Land Water Air Organisms</p> <p>b. Design, evaluate, and refine solutions to reduce human impact on the environment including, but not limited to, smog, ozone depletion, urbanization, and ocean acidification.</p> <p>c. Construct an argument to evaluate how human population growth affects food demand and food supply (GMOs, monocultures, desertification, Green Revolution).</p> <p>https://www.georgiastandards.org/Georgia-Standards/Documents/Science-Environmental-Science-Georgia-Standards.pdf</p>		

Narrative / Background Information

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Summary: Understand standards from Seventh Grade Life Science analyzing interdependence of organisms with each other and their environments by explaining interactions, cycling of matter and energy, and characteristics of terrestrial biomes and aquatic ecosystems.

Georgia Standards of Excellence Seventh Grade Life Science S7L4 a, b, c, d

S7L4. Obtain, evaluate, and communicate information to examine the interdependence of organisms with one another and their environments. a. Construct an explanation for the patterns of interactions observed in different ecosystems in terms of the relationships among and between organisms and abiotic components of the ecosystem. (Clarification statement: The interactions include, but are not limited to, predator-prey relationships, competition, mutualism, parasitism, and commensalism.) b. Develop a model to describe the cycling of matter and the flow of energy among biotic and abiotic components of an ecosystem. (Clarification statement: Emphasis is on tracing movement of matter and flow of energy, not the biochemical mechanisms of photosynthesis and cellular respiration.) c. Analyze and interpret data to provide evidence for how resource availability, disease, climate, and human activity affect individual organisms, populations, communities, and ecosystems. d. Ask questions to gather and synthesize information from multiple sources to differentiate between Earth's major terrestrial biomes (i.e., tropical rainforest, savanna, temperate forest, desert, grassland, taiga, and tundra) and aquatic ecosystems (i.e., freshwater, estuaries, and marine). (Clarification statement: Emphasis is on the factors that influence patterns across biomes such as the climate, availability of food and water, and location.)

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

Human activities have negatively affected ecosystems, global climate, energy resources, and population.

Unit Phenomena (LEARNING PROCESS)

Scientists in the Gulf of Mexico measured a record-breaking, New Jersey-sized dead zone this week—a sign that water quality in U.S. waterways is worse than expected. What have human activities contributed to this?

MYP Inquiry Statement:

The interactions between organisms and their environments maintain balance between systems and humans influence those relationships.

MYP Global Context:

Systems, models, methods; products, processes and solutions
Sciences: Systems, models, methods

<p>Approaches to Learning Skills (SEPs):</p> <ul style="list-style-type: none"> - Developing and Using Models - Engaging in Argument from evidence - Obtaining, evaluating, and communicating information - Collect and analyze data identify solutions and make informed decisions <p>ATL</p> <ul style="list-style-type: none"> - Research Skills - Thinking Skills - Collaboration Skills - Communication Skills 	<p>Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)</p> <ul style="list-style-type: none"> ● Ecosystem ● Biotic vs. Abiotic Factors ● Ecological Organization ● Biomes ● Adaptations within Biomes ● Ecological Successions ● Biodiversity ● Food Web vs. Food Chains ● Chemical and Physical Characteristics of Water 	<p>Crosscutting Concepts: (KNOWLEDGE & SKILLS)</p> <ul style="list-style-type: none"> ● Stability and Change ● Energy and Matter ● Scale, Proportion, and Quantity ● Structure and Function ● Cause and Effect <p>MYP Key and Related Concepts: Global Interactions and Environmental</p>
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Commented [1]: Added 16:50 on 8/15, to be reviewed by PLC on 8/16 @ 09:30. Will update after PLC member approval

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

When teaching this unit it is important to note that students come in with previous knowledge on ecology and ecosystems. Some misconceptions that they bring include:

- Organisms higher in a food web eat everything that is lower in the food web
- The top of the food chain has the most energy because it accumulates up the chain
- Plants are dependent on humans, not vice versa;
- Carbon dioxide is a source of energy for plants
- Complexity in an organism equals superiority

Key Vocabulary: (KNOWLEDGE & SKILLS)

Ecology, habitat, niche, tolerance, parasitism, symbiosis, herbivore, carnivore, trophic levels, energy, salinity, pH, primary producer, photosynthesis, cellular respiration, decomposer, carnivore, biomass, food chain, food web, biome, keystone species

Inquiry Questions:

- How do changes in population size relate to environmental conditions?
- How do organisms affect another's survival and the environment?
- How does the environment affect where and how an organism lives?
- Why is it important to protect biodiversity?
- How do the nonliving parts of Earth's systems provide the basic materials to support life?

Factual: What types of aquatic biomes exist in Metro Atlanta? Georgia? SE United States? What are the levels of ecological organization? What are the chemical and physical properties of aquatic biomes? What are the major biogeochemical cycles of nature? How do we define the laws of thermodynamics? What is the difference between a food chain and a food web? What is the ultimate source of energy for an ecosystem? How much energy is lost between each trophic level? What are the four trophic levels in an ecosystem?

Conceptual: How do the laws of thermodynamics relate to an ecological pyramid? How do ecosystems restore balance? How do the factors of an organism's environment influence its ability to survive? How do the adaptations aid in the success or decline of an organism or a species? What effects does human activities have on the local environment? How does changing the chemical or physical properties of a biome affect the environment? How does a disruption in a biogeochemical cycle affect the natural balance of an ecosystem? Is it possible that you could drink the same molecule of water that a T Rex did millions of years ago? How does removing one organism affect the entire food web of an ecosystem? How is energy transferred between biotic and abiotic factors? How is matter cycled between biotic and abiotic factors? What happens to a food chain/web when one trophic level is disrupted? How is water purified during the water cycle? In what ways is carbon cycled back into the atmosphere? Why are nitrogen-fixing bacteria so vital to the survival of an ecosystem? Distinguish between food chains and food webs. Why is the cycling of matter necessary to maintain life in an ecosystem? What happens to the energy lost when it is transferred to each trophic level?

Debatable: Are the interactions between an organism and its environment helpful or harmful? In which biogeochemical cycle to humans have the greatest impact on the environment?

MYP Objectives	Summative assessment	
<p>Sciences</p> <p>A. Knowing and Understanding</p> <p>In order to reach the aims of sciences, students should be able to:</p> <p>i. explain scientific knowledge</p> <p>ii. apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations</p> <p>iii. analyze and evaluate information to make scientifically supported judgments</p> <p>B. Inquiring and designing</p> <p>In order to reach the aims of sciences, students should be able to:</p> <p>i. explain a problem or question to be tested by a scientific investigation</p> <p>ii. formulate a testable hypothesis and explain it using scientific reasoning</p> <p>iii. explain how to manipulate the variables, and explain how data will be collected</p> <p>iv. design scientific investigations</p>	<p>Assessment Task:</p> <p>Criterion A:</p> <ul style="list-style-type: none"> - Two Summative Assessments - Create A Animal: Adaptations - Common Formative Assessments <p>Criterion B.</p> <ul style="list-style-type: none"> - Adaptations to a terrestrial biome- Criterion A - Testing the chemical and physical properties of aquatic biomes, predicting the outcomes- Criterion B - Building biomass and ecological pyramids- Criterion C - Biogeochemical cycles, discussing the impacts of excess fertilizer use- Criterion D 	<p>Relationship between summative assessment task(s) and statement of inquiry:</p> <p><i>Science:</i></p> <p>Criterion B & C: What factors affect population growth in yeast?-Design Lab</p> <p>Criterion D: Case Study: Search for the missing Sea Otters-An ecological detective story</p> <p>The Case Study focuses on how a population of sea otters has decreased due to changes in the environment.</p>
<p>Unit Objectives:</p> <ol style="list-style-type: none"> 1. Describe the flow of energy and the cycling of matter within an ecosystem 2. Predict the success of an adaptation by evaluating its surrounding biome 3. Determine the impact humans have on the environment using evidence-based claims 4. Identify the impact ecological succession has on the biodiversity of an ecosystem 		

Learning Activities and Experiences	Inquiry & Obtain: (LEARNING PROCESS)	Evaluate: (LEARNING PROCESS)	Communicate: (LEARNING PROCESS)
Week 1: Scientific Method and Graphing	Scientific Method Lab: Come Fly with Me Lab Inquiry Fortune Fish Lab Making slime Lab Paper Towel Lab Candy Lab Academic Language support: Graphic organizer, academic word wall	Pretest over Unit 1 and Unit 2 - in schoology to assess students' prior knowledge Quiz in schoology over the scientific method.	Discuss results as a class and incorporate the academic vocab Data Nugget: Interpret graph of scientific research - CER activity
Week 2: Biotic/Abiotic and Levels of Organization	<ul style="list-style-type: none"> ● Scientists use models to study the world around them ● Create an ecosystem model (ecocolumns) ● Ecological Organization Stations Support: Graphic organizer (upside down triangle) with written and illustrated definitions of academic vocab. Amoeba Sisters Biological Organization	Quiz in schoology over new academic vocabulary Grade interactive notebook/stations activity.	Students will look at the phenomenon and write a paragraph about how models help us study the world around us.
Week 3 and 4: Biomes and Adaptations	Biomes/Adaptations Stations activity to collect information about biome features and adaptations of plants and animals		
Week 5: Chemical and Physical Properties of water	Notes and vocabulary practice		What's in A River? ProjectWild water pollution activity New York Times Article coal ash ponds breached after hurricane

Week 6: Formative / Remediation	Review Guide and/or practice assessment to evaluate strengths and weaknesses for unit		
Week 7: Summative Assessment: Ecology Part 1		-	Ecology summative assessment: Analyze data to determine strengths and weakness
Week 8: Ecological Succession	Bozeman Science Video - Ecological Succession Ecological Succession Foldable	POGIL Succession Activity	
Week 9: Biodiversity	Christmas Tree Farm Disaster Biodiversity Modeling activity Interactions (symbiosis) Importance of Biodiversity		Keystone Crest - Keystone Species description and explanation of role in ecosystem Invasive species WANTED poster - suggest solutions to remove invasive species from an ecosystem
Week 10 Biogeochemical Cycles	How did the BP Oil spill disrupt the cycling of carbon in the Gulf of Mexico? Students predict how human activity can impact the global carbon cycle.		
Week 11 Food Chains and Food Webs	Invasive Lionfish Phenomena	Create food chain emphasizing energy at each trophic levels	Use a CER Chart to discuss the importance of eating a diet rich in fruits/vegetables

Week 12: Remediation and Review	Culminating Ecology Project	Interactive Schoology Review to include key terms, links to Edpuzzle videos, concept maps and sample constructive responses.	
Week 13: Remediation and Review	Unit 1 Assessment	Unit 1 Assessment Assess students and review data using AMP to provide individual and class data.	Analyze data to determine strengths and weaknesses in student understanding and teaching strategies.

Resources (hyperlink to model lessons and/or resources):
Discovery Education Science Techbook

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit
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