2021 - 2022, HS, Ecology, Quarter 1

Big Ideas/Key Concepts:

- **Matter is neither created nor destroyed as it flows through biogeochemical cycles.**
- **Adaptations in one biome are predictably similar to adaptations in a similar biome.**
- **The flow of energy in an ecosystem dictates interrelationships between organisms.**
- **Competition for resources drives evolutionary adaptation.**

Quick Links within this Document

Quarter 2 Quarter 3 Quarter 4
WCS Ecology OER

Standards	Student Friendly "I Can" Statements
Matter and Energy in Ecosystems	**Matter and Energy in Ecosystems**
ECO.LS2.5 Using the laws of conservation of energy, create a model of energy flow through the biosphere. Use the model to explain limitations in energy transfer and the need for ongoing energy input.	I can model energy flow through the biosphere using the law of conservation of energy. I can model limitations in energy transfer and the need for ongoing energy input.
ECO.LS2.7 Use models to explain relationships among biogeochemical cycles (water, carbon, nitrogen, phosphorus).	I can research and model cycling of matter in our biosphere to explain relationships between biogeochemical cycles. I can predict how changes in a biogeochemical cycle can affect an ecosystem.
ECO.LS2.8 Create a diagram tracing carbon through the processes of photosynthesis and respiration. Use the diagram to construct an	I can create a diagram and model the flow of carbon and energy between photosynthesis and cellular respiration.

explanation for the importance of photosynthesis and respiration in the carbon cycle.	I can use a diagram to explain the importance of photosynthesis and respiration in the carbon cycle.
ECO.LS2.9 Construct an argument from evidence regarding the importance of the microbial community in nutrient cycling.	I can construct an argument from evidence regarding the importance of the microbial community in nutrient cycling.
ECO.LS2.6 Compare pyramids of energy, numbers, and biomass to calculate rates of productivity within food chains and food webs among various biomes. Using mathematics, explain the relationship between biomass and trophic levels.	I can use energy pyramids, numbers, and biomass to calculate rates of productivity among various biomes. I can mathematically explain how a pyramid model illustrates the relationship between biomass and trophic levels.
Biomes & Ecosystems	**Biomes & Ecosystems**
ECO.LS2.1 Construct explanations for patterns relating to climate, flora, and fauna found in major terrestrial biomes (deserts, temperate grasslands, temperate forests, tropical grasslands, tropical forests, taiga, and tundra).	I can recognize patterns relating to climate, flora, and fauna found in major terrestrial biomes. I can analyze data and construct explanations for why specific biomes are associated with certain climate conditions. I can relate the climate conditions of a biome to the flora and fauna found in that biome.
ECO.LS2.2 Research examples of adaptations of organisms in major marine and freshwater ecosystems. Develop an explanation for the formation of these adaptations and predict how the organisms would be affected by environmental disturbances or long-term ecological changes.	I can distinguish the differences between major marine and freshwater ecosystems. I can develop an explanation, based on research, of adaptations in major marine and freshwater ecosystem. I can predict, based on my explanation, how organisms would be affected by environmental disturbances or long-term ecological

	changes. I can design a solution, based on my explanation, to solve an environmental disturbance in a specific ecosystem.
<u>Ecosystem Interactions</u> **ECO.LS2.4** Compare patterns of stratification and zonation in various terrestrial and aquatic ecosystems. Construct an argument regarding the importance of these patterns in ecosystem diversity.	**<u>Ecosystem Interactions</u>** I can compare patterns of stratification in various terrestrial ecosystems. I can compare patterns of zonation in various aquatic ecosystems. I can construct and engage in an argument, from evidence, regarding the importance of these patterns in ecosystem diversity.

2021 - 2022, HS, Ecology, Quarter 2

Big Ideas/Key Concepts:

- **There are dynamic interactions both within and between populations.**
- **Adaptations in behavior and physiology increase the fitness of a species.**
- **Population size can be limited by biotic and abiotic factors.**

Quick Links within this Document

Quarter 1 Quarter 3 Quarter 4
WCS Ecology OER

Standards	Student Friendly "I Can" Statements
Ecosystem Interactions	**Ecosystem Interactions**
ECO.LS2.3 Create a model of an ecosystem depicting the interrelationships among organisms with a variety of niches. Use the model to explain resource needs of these organisms.	I can create a model of an ecosystem that depicts the interrelationships among organisms found in varying niches within that ecosystem. I can use the model to explain biotic and abiotic resource needs of organisms in a variety of niches.
ECO.LS4.5 Construct an explanation for the importance of keystone species in ecosystem stability.	I can identify a keystone species in an ecosystem and identify its role. I can construct an explanation for the importance of keystone species in ecosystem stability.
ECO.LS4.6 Compare resource needs of specialists versus generalists. Construct an explanation regarding the vulnerability of specialists when faced with ecosystem disturbances.	I can research resource needs of specialist vs. generalist species and explain the vulnerability of specialists when faced with ecosystem disturbances.

Behavior Within Ecosystems	**Behavior Within Ecosystems**
ECO.LS2.18 Use models to explain the impacts of types of symbiosis on the species involved in the relationship.	I can model the impacts of types of symbiosis on the species involved in the relationship.
ECO.LS4.4 Engage in argument from evidence regarding the importance of coevolution in species interactions (competition, predation, symbiosis).	I can engage in argument with evidence, regarding the importance of coevolution in species interactions, such as competition, predation and symbiosis.
ECO.LS2.17 Based on information obtained from research, construct explanations regarding mechanisms by which prey protect themselves from predation (including herbivory).	I can research and communicate information by which prey protect themselves from predation.
ECO.LS2.15 Compare types of competition and construct an explanation for the importance of niche differentiation in response to competition.	I can identify and describe different types of competition within a niche. I can compare types of competition and construct an explanation for the importance of niche differentiation in response to competition.
ECO.LS2.16 Use a mathematical model to examine predator-prey interactions. Based on the model, construct an argument regarding the importance of predators in maintaining stability of prey populations.	I can use a mathematical model to examine predator/prey interactions. (Through data collection and analysis of a table/chart showing key role of predator in maintaining stability of the prey population.)
Interactions between Populations	**Interactions between Populations**
ECO.LS2.12 Use mathematical models to construct an explanation for population growth patterns and rates observed in ecosystems. Account for both density-dependent and density-independent factors in your explanation.	I can use mathematical models to construct an explanation for population growth patterns and rates observed in ecosystems, including both density-dependent and density-independent factors in your explanation. I can analyze and categorize limiting factors as density dependent or

	density independent, human influenced or non-human influenced, and biotic or abiotic when given scenarios.
ECO.LS2.13 Analyze data regarding exponential and logistic population growth patterns. Use the data to create mathematical models to make predictions regarding carrying capacity.	I can analyze quantitative data regarding exponential and logistic population growth patterns.
ECO.LS2.14 Obtain information regarding survivorship curves and reproductive strategies of various species. Choose one of these strategies and construct an argument regarding its effectiveness.	I can illustrate and interpret the type of survivorship curves created by r-strategists and K-strategists. I can create and analyze population growth curves relating to carrying capacity. I can choose one of these reproductive strategies and construct an argument regarding its effectiveness in regard to survivorship curves.

2021 - 2022, HS, Ecology, Quarter 3

Big Ideas/Key Concepts:

- **Ecosystems are complex dynamic systems.**
- **Disturbances in an ecosystem have far reaching effects.**
- **Diversity in an ecosystem results in stability.**

Quick Links within this Document

Quarter 1 Quarter 2 Quarter 4
WCS Ecology OER

Standards	Student Friendly "I Can" Statements
Interactions Between Populations & Ecosystems **ECO.LS2.11** Obtain information regarding distribution patterns (clumped, uniform, and random) and make predictions regarding types of organisms that will exhibit each type. **ECO.LS2.10** Plan and carry out an investigation measuring species diversity (richness and evenness) and density in a local ecosystem. **ECO.LS2.19** Carry out an investigation of stability and change within a local ecosystem. Identify signs of succession (primary or secondary). Based on investigation findings, make predictions regarding future changes in this ecosystem.	**Interactions Between Populations & Ecosystems** I can investigate distribution patterns (clumped, uniform, and random) to make and defend predictions regarding types of organisms that exhibit each type of pattern. I can plan and carry out an investigation measuring species diversity (richness and evenness) and density in a local ecosystem. I can explain the relationship between species richness and species evenness. I can explain the differences between primary and secondary ecological succession. I can summarize how a disturbance impacts succession and ecosystem stability. I can carry out an investigation that explores the stability and change

	of a local ecosystem, identifying signs of primary or secondary succession, and make predictions regarding future changes within this ecosystem.
ECO.LS4.2 Construct an argument, citing evidence, supporting the influence of natural selection on changes in populations over time.	I can construct an argument about how natural selection influences changes in populations based on the availability of resources after reading case studies and looking at pictures of divergent evolution (i.e.: Galapagos finches).
Classification	**Classification**
ECO.LS4.1 Develop and revise a system for classifying organisms. Justify choice of information (morphology, molecular data, energy acquisition, habitat, niche, trophic level, reproduction, etc.) used in developing your system.	I can develop, evaluate, and revise a system for classifying organisms. I can justify choice of information (morphology, molecular data, energy acquisition, habitat, niche, trophic level, reproduction, etc.) used in developing my system of classification.
Interactions Between Organisms	**Interactions Between Organisms**
ECO.LS4.3 Design and carry out an investigation examining the importance of animal behaviors and plant tropisms for survival.	I can design and carry out an investigation examining the importance of plant tropisms for survival.
ECO.LS2.21 Gather information regarding types of learned behaviors (fixed action patterns, imprinting, imitation, habituation, trial-and-error, associative learning – classical conditioning, operant conditioning). Ask questions regarding the importance of these behaviors in species survival.	I can design and carry out an investigation examining the importance of animal behaviors for survival. I can ask questions regarding the importance of these behaviors in species survival. I can research learned behaviors.
ECO.LS2.22 Construct an explanation for the relationship between sexual selection and sexual dimorphism.	I can research and construct an explanation for the relationship between sexual selection and sexual dimorphism.

ECO.LS2.23 Obtain and evaluate information regarding the relationship between altruistic behavior and kin selection. **ECO.LS2.20** Plan and carry out an investigation examining kinesis and taxis in a simple organism. Construct and share explanations regarding observations.	I can research and evaluate information regarding the relationship between altruistic behavior and kin selection. I can research, plan and carry out an investigation examining kinesis and taxis in a simple organism. I can construct and share explanations regarding observations.

2021 - 2022, HS, Ecology, Quarter 4

Big Ideas/Key Concepts:

- **Humans have a disproportionately large impact on Earth's climate.**
- **Fossil fuel consumption drives human-caused climate change.**
- **Pollution can have acute, devastating effects on local and global climate.**
- **Biodiversity must be maintained and recovered through the work of human initiatives.**
- **Engineering and technology have an impact on biodiversity.**

Quick Links within this Document
Quarter 1 Quarter 2 Quarter 3
WCS Ecology OER

Standards	Student Friendly "I Can" Statements
Human Impact **ECO.ESS3.2** Construct an argument in support of protection of native species. Develop responses to anticipated counterarguments. **ECO.LS4.7** Research and evaluate the effectiveness of strategies for maintenance of biodiversity.	**Human Impact** I can research Southeastern examples of endangered native species, non-native species, invasive species, indicator species, and introduced species. I can construct an argument in support of protection of native species and defend my findings. I can prepare an evidence-based rebuttal for counter arguments against the protection of native species. I can research and evaluate the importance and strategies of maintaining biodiversity within an ecosystem. (I.e.: captive breeding, hot spots, reintroduction of species, and biosphere reserves). I can describe, evaluate, and communicate the role of government

ECO.ESS3.1 Research and evaluate the effectiveness of public lands (state parks, national parks, wildlife refuges, wilderness areas) in sustaining biodiversity.	agencies in maintaining biodiversity for future generations. I can plan and model a properly designed wildlife refuge. I can gather evidence to argue the effectiveness of public lands (state parks, national parks, wildlife refuges, wilderness areas) in sustaining biodiversity. I can research how human activities have affected ecosystems.
ECO.ETS2.1 Engage in argument from evidence regarding the impact engineering and technology have on biodiversity.	I can engage in argument from evidence regarding the impact engineering and technology have on biodiversity. I can analyze and evaluate environmental impacts of different energy sources (renewable vs. nonrenewable).
ECO.ESS3.3 Engage in argument from evidence regarding the impacts of human activity on climate change. Design solutions to address these impacts.	I can engage in evidence-based arguments regarding the impacts of human activity on climate change. I can design a solution that addresses a human impact on climate change.
Careers in Ecology **ECO.ETS2.2** Research and communicate information on a career in ecology. Analyze the role of engineering, technology, and science in that career.	**Careers in Ecology** I can research and communicate information on a career in ecology. I can analyze the role of engineering, technology, and science in a career by interviewing an environmental scientist or an environmental engineer.