***Unit 1 AP Environmental Science Learning Targets/Success Criteria***

**The Living World: Ecosystems:**

**6-8% of AP Exam**

**Unit Enduring Understandings:**

1. Ecosystems are the result of biotic and abiotic interactions.

2. Energy can be converted from one form to another.

**EXPECTATIONS:**

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| **Topic** | **Learning Targets (I can …) and** Success Criteria (I am learning how …)  *Learning targets are in bold with their success criteria listed beneath* | **✔** |
| **All** | ***Introduction* to AP Environmental Science: Big Ideas and Course Skills** |  |
| **1.1** | **Explain how the availability of resources influences species interactions.** |  |
|  | In a predator-prey relationship, the predator is an organism that eats another organism (the prey). |  |
|  | Symbiosis is a close and long-term interaction between two species in an ecosystem. Types of symbiosis include mutualism, commensalism, and parasitism. |  |
|  | Competition can occur within or between species in an ecosystem where there are limited resources. Resource partitioning - using the resources in different ways, places, or at different times - can reduce the negative impact of competition on survival. |  |
| **1.2** | **Describe the global distribution and principal environmental aspects of terrestrial biomes.** |  |
|  | A biome contains characteristic communities of plants and animals that result from, and are adapted to, its climate. |  |
|  | Major terrestrial biomes include taiga, temperate rainforests, temperate seasonal forests, tropical rainforests, shrubland, temperate grassland, savanna, desert, and tundra. |  |
| The global distribution of nonmineral terrestrial natural resources, such as water and trees for lumber, varies because of some combination of climate, geography, latitude and altitude, nutrient availability, and soil. |  |
|  | The worldwide distribution of biomes is dynamic; the distribution has changed in the past and may again shift as a result of global climate changes. |  |
| **1.3** | **Describe the global distribution and principal environmental aspects of aquatic biomes.** |  |
|  | Freshwater biomes include streams, rivers, ponds, and lakes. These freshwater biomes are a vital resource for drinking water. |  |
|  | Marine biomes include oceans, coral reefs, marshland, and estuaries. Algae in marine biomes supply a large portion of the Earth’s oxygen, and also take in carbon dioxide from the atmosphere. |  |
|  | The global distribution of nonmineral marine natural resources, such as different types of fish, varies because of some combination of salinity, depth, turbidity, nutrient availability, and temperature. |  |
| **1.4** | **Explain the steps and reservoir interactions in the carbon cycle.** |  |
|  | The carbon cycle is the movement of atoms and molecules containing the element carbon between sources and sinks. |  |
|  | Some of the reservoirs in which carbon compounds occur in the carbon cycle hold those compounds for long periods of time, while some hold them for relatively short periods of time. |  |
|  | Carbon cycles between photosynthesis and cellular respiration in living things. |  |
|  | Plant and animal decomposition have led to the storage of carbon over millions of years. The burning of fossil fuels quickly moves that stored carbon into atmospheric carbon, in the form of carbon dioxide. |  |
| **1.5** | **Explain the steps and reservoir interactions in the nitrogen cycle.** |  |
|  | The nitrogen cycle is the movement of atoms and molecules containing the element carbon between sources and sinks. |  |
| Most of the reservoirs in which nitrogen compounds occur in the nitrogen cycle hold those compounds for relatively short periods of time. |  |
|  | Nitrogen fixation is the process in which atmospheric nitrogen is converted into a form of nitrogen (primarily ammonia) that is available for uptake by plants and that can be synthesized into plant tissue. |  |
|  | The atmosphere is the major reservoir of nitrogen. |  |
| **1.6** | **Explain the steps and reservoir interactions in the phosphorus cycle.** |  |
|  | The phosphorus cycle is the movement of atoms and molecules containing the element phosphorus between sources and sinks. |  |
| The major reservoirs of phosphorus in the phosphorus cycle are rock and sediments that contain phosphorus-bearing minerals. |  |
|  | There is no atmospheric component in the phosphorus cycle, and the limitations this imposes on the return of phosphorus from the ocean to land make phosphorus naturally scarce in aquatic and terrestrial ecosystems. In undisturbed ecosystems, phosphorus is the limiting factor in biological systems. |  |
| **1.7** | **Explain the steps and reservoir interactions in the hydrologic cycle.** |  |
|  | The hydrologic cycle, which is powered by the sun, is the movement of water in its various solid, liquid, and gaseous phases between sources and sinks. |  |
|  | The oceans are the primary reservoir of water at the Earth’s surface, with ice caps and groundwater acting as much smaller reservoirs. |  |
| **1.8** | **Explain how solar energy is acquired and transferred by living organisms.** |  |
|  | Primary productivity is the rate at which solar energy (sunlight) is converted into organic compounds via photosynthesis over a unit of time. |  |
|  | Gross primary productivity is the total rate of photosynthesis in a given area. |  |
|  | Net primary productivity is the rate of energy storage by photosynthesizers in a given area, after subtracting the energy lost to respiration. |  |
|  | Productivity is measured in units of energy per unit area per unit time (e.g., kcal/m2/yr). |  |
|  | Most red light is absorbed in the upper 1m of water, and blue light only penetrated deeper than 100m in the clearest water. This affects photosynthesis in aquatic ecosystems, whose photosynthesizers have adapted mechanisms to address the lack of visible light. |  |
| **1.9** | **Explain how energy flows and matter cycles through trophic levels.** |  |
|  | All ecosystems depend on a continuous inflow of high-quality energy in order to maintain their structure and function of transferring matter between the environment and organisms via biogeochemical cycles. |  |
|  | Biogeochemical cycles are essential for life and each cycle demonstrates the conservation of matter. |  |
|  | In terrestrial and near-surface marine communities, energy flows from the sun to producers in the lowest trophic levels and then upward to higher trophic levels. |  |
| **1.10** | **Determine how the energy decreases as it flows through ecosystems.** |  |
|  | The 10% rule approximates that in the transfer of energy from one trophic level to the next, only about 10% of the energy is passed on. |  |
|  | The loss of energy that occurs when energy moves from lower to higher trophic levels can be explained through the laws of thermodynamics. |  |
| **1.11** | **Describe food chains and food webs, and their constituent members by trophic level.** |  |
|  | A food web is a model of an interlocking pattern of food chains that depicts the flow of energy and nutrients in two or more food chains. |  |
|  | Positive and negative feedback loops can each play a role in food webs. When one species is removed from or added to a specific food web, the rest of the food web can be affected. |  |

**ESSENTIAL VOCABULARY:**

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| 1.1 Intro to Ecosystems | 1.2 Terrestrial Biomes | 1.3 Aquatic Biomes | 1.4 Carbon Cycle | 1.5 Nitrogen Cycle | 1.6 Phosphorous Cycle |
| Symbiosis  Ecosystem  Mutualism  Parasitism  Interspecific competition  Competition  Resource partitioning  Limiting factors  Ecological niches  Adaptive radiation  Fundamental niche  Realized niche  Coevolution  Competitive exclusion | Levels of organization  Biotic/Abotic  Terrestrial  Weather vs. Climate  Temperate  Temperature  Tropical  Tropic of Capricorn Tropic of Cancer  Humus  Forest litter  Leaf litter  Latitude/Longitude  Altitude  Permafrost  Climatograms  Biosphere  All biomes | Aquatic  Biotic  Abiotic  Freshwater biomes  Water column  Stratification  Lake layers  Overturn  Autumnal  Benthos  Bottomlands  Lentic  Marine biomes: oceans, coral reefs, marshlands, estuaries  Algae  Carbon dioxide  Salinity  Wetlands (swamps, marshes)  Turbidity  Mangrove forests/swamps  Top locations of freshwater  Riparian zone | Reservoir  Organic  Inorganic  Carbon cycle  Carbon  Carbon sinks  Photosynthesis  Phytoplankton  Cyanobacteria  Cellular respiration  Decomposition  Decomposer  Leaf litter  Detritivore  Producer (primary, secondary, tertiary) | Nitrogen  Nitrogen cycle  Nitrification  Nitrogen fixation  Ammonium vs. ammonia  Nitrate vs. nitrite  Nitrogen sinks  Uptake  Ammonification  Deposition  Denitrification  Impervious surfaces  Leaching  Assimilation | Phosphorous  Phosphorous cycle  Phosphorus sinks  Limiting factor |
| 1.7 Hydrologic (Water) Cycle | 1.8 Primary Productivity | 1.9 Trophic Levels | 1.10 Energy Flow and 10% Rule | 1.11 Food Chains and Food Webs |  |
| Hydrologic cycle (water cycle)  Uptake  Hydrology  Hydrosphere  Water sinks  Ice caps  Groundwater  Condensation (cloud formation)  Precipitation  Runoff  Evaporation  Infiltration  Transpiration  Percolation  Deposition  Sublimation | Primary productivity  Phytoplankton  GPP  NPP  Photosynthesis  Glucose  Cellular respiration  Depth in water  Eutrophic zone  Zooplankton | Trophic  Trophic levels with photosynthesis  Biogeochemical cycles  Conservation of matter  Omnivore  Carnivore  Herbivore | First, second, and third law of thermodynamics  Energy pyramid  10% rule | Food chain  Food web  Phytoplankton  Primary producers (autotrophs)  Ecological pyramids  Positive feedback loop  Negative feedback loop  Primary, secondary, and tertiary consumers (heterotrophs) |  |