

## Standard BIO.8

<p>BIO.8 The student will investigate and understand dynamic equilibria within populations, communities, and ecosystems. Key concepts include</p> <ol style="list-style-type: none"> <li>interactions within and among populations including carrying capacities, limiting factors, and growth curves;</li> <li>nutrient cycling with energy flow through ecosystems;</li> <li>succession patterns in ecosystems;</li> <li>the effects of natural events and human activities on ecosystems; and</li> <li>analysis of the flora, fauna, and microorganisms of Virginia ecosystems.</li> </ol>	
<p style="text-align: center;"><b>Essential Understandings</b></p>	<p style="text-align: center;"><b>Essential Knowledge and Skills</b></p>
<p>The concepts developed in this standard include the following:</p> <ul style="list-style-type: none"> <li>As any population of organisms grows, it is held in check by interactions among a variety of biotic and abiotic factors.</li> <li>Abiotic factors are the nonliving elements in an ecosystem, such as temperature, moisture, air, salinity, and pH. Biotic factors are all the living organisms that inhabit the environment, including predators, food sources, and competitors.</li> <li>Population growth curves exhibit many characteristics, such as initial growth stage, exponential growth, steady state, decline, and extinction. Limiting factors are the components of the environment that restrict the growth of populations. Carrying capacity is the number of organisms that can be supported by the resources in an ecosystem.</li> <li>A community is a collection of interacting populations.</li> <li>Symbiosis is a close and permanent relationship between organisms of two different species. Examples include mutualism, commensalism, and parasitism.</li> <li>Ecosystems demonstrate an exchange of energy and nutrients among inhabiting organisms.</li> <li>An ecosystem consists of all the interacting species and the abiotic environment in a given geographic area. All matter including essential nutrients cycle through an ecosystem. The most common examples of such matter and nutrients include carbon, nitrogen, and water.</li> <li>Energy flows in an ecosystem from producers to various levels of consumers and decomposers. This flow of energy can be diagramed using a food chain or food web. The efficiency of this flow of energy is represented by an energy pyramid.</li> </ul>	<p>In order to meet this standard, it is expected that students will</p> <ul style="list-style-type: none"> <li>graph and interpret a population growth curve and identify the carrying capacity of the populations.</li> <li>make predictions about changes that could occur in population numbers as the result of population interactions.</li> <li>illustrate and/or model the key processes in the water, carbon, and nitrogen cycle and explain the role of living things in each of the cycles.</li> <li>given an illustration of a food chain and a food web, identify each organism as a producer (autotroph), consumer (primary/second order), or decomposer and describe their role in the ecosystem.</li> <li>interpret how the flow of energy occurs between trophic levels in all ecosystems in each of the following:             <ul style="list-style-type: none"> <li>- food chain</li> <li>- food web</li> <li>- pyramid of energy</li> <li>- pyramid of biomass</li> <li>- pyramid of numbers.</li> </ul> </li> <li>identify and describe an ecosystem in terms of the following:             <ul style="list-style-type: none"> <li>- effects of biotic and abiotic components</li> <li>- examples of interdependence</li> <li>- evidence of human influences</li> <li>- energy flow and nutrient cycling</li> <li>- diversity analysis</li> </ul> </li> <li>describe the patterns of succession found in aquatic and terrestrial ecosystems of Virginia.</li> </ul>

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<b>Essential Understandings</b>		<b>Essential Knowledge and Skills</b>
<ul style="list-style-type: none"> <li>Ecological succession is a predictable change in the sequence of species that establish in a particular area over time.</li> <li>A climax community occurs when succession slows down and a stable community is established. The climax community in most of Virginia is a deciduous oak-hickory (hardwood) forest.</li> <li>As the human population increases, so does human impact on the environment. Human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the environment, and intensive farming, have changed Earth's land, oceans, and atmosphere. Some of these changes have decreased the capacity of the environment to support some life forms.</li> </ul>		<ul style="list-style-type: none"> <li>identify the similarities and differences between primary and secondary succession.</li> <li>describe the characteristics of a climax community.</li> <li>use local ecosystems to apply ecological principles in the classroom and in the field where appropriate, using field guides and dichotomous keys for identifying and describing flora and fauna that characterize the local ecosystem.</li> <li>evaluate examples of human activities that have negative and positive impacts on Virginia's ecosystems.</li> <li>recognize that the Chesapeake Bay watershed includes the majority of Virginia and human activities play an important role in its health.</li> </ul>

### Directions

- Read the “Essential Understandings” and “Essential Knowledge and Skills”
- On a separate sheet of paper, write 15 quiz questions based on this information.
- Provide a key for your questions.