

## LESSON 5: APPALACHIAN STREAM CONSERVATION

### MIDDLE SCHOOL STANDARDS ADDRESSED:

<p>NGSS (Kentucky, Maryland)</p>	<p><b>MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.</b> <i>Clarification Statement:</i> Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems. <i>Disciplinary Core Ideas:</i></p> <ul style="list-style-type: none"><li>• Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.</li></ul> <p><b>MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.</b> <i>Clarification Statement:</i> Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations. <i>Disciplinary Core Ideas:</i></p> <ul style="list-style-type: none"><li>• Biodiversity describes the variety of species found in Earth’s terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health.</li><li>• Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. <i>(secondary)</i></li><li>• (ETS1.B) There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. <i>(secondary)</i></li></ul>
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### HIGH SCHOOL STANDARDS ADDRESSED:

<p>NGSS (Kentucky, Maryland)</p>	<p><b>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.</b> <i>Clarification Statement:</i> Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. <i>Disciplinary Core Ideas:</i></p> <ul style="list-style-type: none"><li>• Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and</li></ul>
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nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.

**HS-LS2-6: Evaluate 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.**

**Clarification Statement:** Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.

**Disciplinary Core Ideas:**

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.

**HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.**

**Clarification Statement:** Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.

**Disciplinary Core Ideas:**

- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.
- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (*secondary*)

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|  | <ul style="list-style-type: none"><li>• Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. <i>(secondary)</i></li><li>• (ETS1.B) When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. <i>(secondary)</i></li></ul> |
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