Standard 6.4.5

<table>
<tr><td>Strand 6.4: STABILITY AND CHANGE IN ECOSYSTEMS</td><td colspan="2">The study of ecosystems includes the interaction of organisms with each other and with the physical environment. Consistent interactions occur within and between species in various ecosystems as organisms obtain resources, change the environment, and are affected by the environment. This influences the flow of energy through an ecosystem, resulting in system variations. Additionally, ecosystems benefit humans through processes and resources, such as the production of food, water and air purification, and recreation opportunities. Scientists and engineers investigate interactions among organisms and evaluate design solutions to preserve biodiversity and ecosystem resources.</td></tr>
<tr><td>Standard 6.4.5

MS-LS2-5</td><td colspan="2">Evaluate competing design solutions for preserving ecosystem services that protect resources and biodiversity based on how well the solutions maintain stability within the ecosystem. Emphasize obtaining, evaluating, and communicating information of differing design solutions. Examples could include policies affecting ecosystems, responding to invasive species or solutions for the preservation of ecosystem resources specific to Utah, such as air and water quality and prevention of soil erosion.</td></tr>
<tr><td></td><td>Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.
Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.</td><td>Stability and Change
Small changes in one part of a system might cause large changes in another part.</td></tr>
<tr><td>DCI</td><td colspan="2">LS2.C: Ecosystem Dynamics, Functioning, and Resilience
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.
LS4.D: Biodiversity and Humans
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.(secondary)
ETS1.B: Developing Possible Solutions
There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary)</td></tr>
<tr><td>Student Friendly Objectives</td><td colspan="2">I can obtain, evaluate, and communicate information about different design solutions for preserving ecosystems and maintaining stability.</td></tr>
<tr><td>Anchor Phenomena</td><td colspan="2">Humans can provide solutions for preserving ecosystems.</td></tr>
<tr><td>Possible Scenarios</td><td colspan="2">Policies to prevent the spread of invasive mussel species in Utah’s waterways
Policies to promote biodiversity</td></tr>
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Vertical Learning Progression Alignment	Previous Science Content (Discussed in K-5 Standards)	Future Science Content (Discussed in 9-12 Standards)
	● When the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. ● A range of different organisms lives in different places. ● Particular organisms can only survive in particular environments ● Populations of organisms live in a variety of habitats. Change in those habitats affects the organisms living there.	● If a biological or physical disturbance to an ecosystem occurs, including one induced by human activity, the ecosystem may return to its more or less original state or become a very different ecosystem, depending on the complex set of interactions within the ecosystem ● Biodiversity is increased by formation of new species and reduced by extinction. Humans depend on biodiversity but also have adverse impacts on it. Sustaining biodiversity is essential to supporting life on Earth.

What students should be doing:

1. Identifying the given design solution and supporting evidence
    a. Students identify and describe:
        i. The given competing design solutions for maintaining biodiversity and ecosystem services.
        ii. The given problem involving biodiversity and/or ecosystem services that is being solved by the given design solutions, including information about why biodiversity and/or ecosystem services are necessary to maintaining a healthy ecosystem.
        iii. The given evidence about performance of the given design solutions.
2. Identifying any potential additional evidence that is relevant to the evaluation
    a. Students identify and describe the additional evidence (in the form of data, information, or other appropriate forms) that is relevant to the problem, design solutions, and evaluation of the solutions, including:
        i. The variety of species (biodiviven ecosystem.
        ii. Factors that affect the stability of the biodiversity of the given ecosystem.
        iii. Ecosystem services (e.g., water purification, nutrient recycling, Students collaboratively define and describe criteria and constraints for the evaluation of the design solution.
3. Evaluating and critiquing the design solution
    a. In their evaluations, students use scientific evidence to:
        i. Compare the ability of each of the competing design solutions to maintain ecosystem stability and biodiversity.
        ii. Clarify the strengths and weaknesses of the competing designs with respect to each criterion and constraint (e.g., scientific, social, and economic considerations).
        iii. Assess possible side effects of the given design solutions on other aspects of the ecosystem, including the possibility that a small change in one component of an ecosystem can produce a large change in another component of the ecosystem.