

Basin Biodiversity

Grades: 6-12

Time: 45 minutes

Rationale and Context:

Biodiversity supports ecosystem health by providing important ecosystem services. It also boosts ecosystem resiliency through the redundancy of species' roles in the system. Students will consider the value of a biodiversity, what constitutes biodiversity at a global and local scale, and the issues negatively impacting biodiversity in the Basin.

Teacher Background Information:

Biodiversity is the variety of life on Earth, from genes to species to ecosystems. Ecosystems provide important services that support human life, including pollination of plants, climate regulation, water purification, nutrient cycling, and medicine. Biodiverse ecosystems are more resilient than ecosystems in which diversity has been degraded. This is due to the existence of functional redundancy (performance of similar services by species) in biodiverse systems. Researchers have estimated that there are between 3 - 30 million species on Earth. Currently, we have described 1.7 million species globally. In the Basin, there are approximately 500 described vertebrates (and many more invertebrates, plants, fungi, and microorganisms) and approximately 10% of these vertebrates are considered endangered or threatened. The most pressing threats to biodiversity in the Basin include habitat loss/fragmentation, competition from invasive species, and climate change.

Vermont Standard(s): Next Generation Science Standards

Disciplinary Core Idea	6-8	9-12
ESS3.A	Humans depend on Earth's land, ocean, atmosphere, and biosphere for different resources, many of which are limited or not renewable. Resources are distributed unevenly around the planet as a result of past geologic processes.	Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.
ESS3.C	Human activities have altered the biosphere, sometimes damaging it, although changes in the environment can have different impacts for different living things. Activities and technologies can be engineered to reduce people's impact on earth.	Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources, including the development of technologies.
ESS3.D	Human activities affect global warming. Decisions to reduce the impact of global warming depend on understanding climate science, engineering capabilities, and	Global climate models used to predict changes continue to be improved, although discoveries about the global climate system are ongoing and continually

	social dynamics.	needed.
LS1.B	Animals engage in behaviors that increase the odds of reproduction. An organism's growth is affected by both genetic and environmental factors.	
LS2.A	Organisms and populations are dependent on their environmental interactions both with other living things and with nonliving factors, any of which can limit their growth. Competitive, predatory, and mutually beneficial interactions vary across ecosystems but the patterns are shared.	Ecosystems have carrying capacities resulting from biotic and abiotic factors. The fundamental tension between resource availability and organism populations affects the abundance of species in any given ecosystem.
LS2.C	Ecosystem characteristics vary over time. Disruptions to any part of an ecosystem can lead to shifts in all of its populations. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.	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.
LS4.C	Species can change over time in response to changes in environmental conditions through adaptation by natural selection acting over generations. Traits that support successful survival and reproduction in the new environment become more common.	Evolution results primarily from genetic variation of individual species, competition for resources, and proliferation of organisms better able to survive and reproduce. Adaptation means that the distribution of traits in a population, as well as species expansion, emergence or extinction, can change when conditions change.
LS4.D	Change in biodiversity can influence humans' resources and ecosystem services they rely on.	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.
Cross Cutting Concepts	Systems and system models Stability and change	Systems and system models Stability and change

Learning/Behavioral Objective(s):

- Discuss the importance of biodiversity, its different definitions, and current global/local status.
- Explore how functional redundancy makes ecosystems more resilient by role playing a food web cascade.
- Explore the impacts of habitat fragmentation through a population extinction game.

- Become familiar with high-impact invasive species in the Basin and their life strategies.
- Experience how invasive species get transported among watersheds through a vector and pathway simulation.

Vocabulary:

Biodiversity

Resiliency

Functional Redundancy

Invasive Species

Nuisance Species

Native Species

Ecosystem

Species

Wildlife Corridor

Habitat Fragmentation

Vector

Trophic Cascade

Focusing Question(s):

1. What is biodiversity and why is it important?
2. How does biodiversity make ecosystems more resilient?
3. What are the most pressing threats to biodiversity in the Basin?
4. How does habitat fragmentation contribute to species becoming threatened or endangered?
5. What are invasive species and how do they impact native species?
6. How do invasive species get introduced to the Basin?