

Biodiversity in Danger: 6th-12th

- Students learn the importance of biodiversity to humans and as a measure of ecosystem health.
- Students learn about the different conservation statuses assigned to species of wildlife that are declining.
- Students learn the plight of threatened and endangered species in California.
- Students learn about different problems impacting wildlife like invasive species and habitat loss.

Grade	NGSS Disciplinary Core Idea	Examples
6th-8th	LS2.A: Interdependent Relationships in Ecosystems - Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1) In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1) Growth of organisms and population increases are limited by access to resources. (MS-LS2-1) LS2.C: Ecosystem Dynamics, Functioning, and Resilience - 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. (MS-LS2-4) LS4.C: Adaptation - Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the	LS2.A: <i>Students will learn how the non-native Barred Owl competes with the native Northern Spotted Owl. The Barred Owl is putting pressure on the Northern Spotted Owl population while they are already threatened severely by habitat loss, impacting their ability to survive.</i> LS2.C: <i>Students will learn the importance of biodiversity as a measure of the health of the ecosystem. Students will learn how species like the Desert Tortoise populations are threatened via excessive predation on young tortoises by ravens. Increased human presence brings water and food sources, like trash, ponds, and bird baths, in desert landscapes, allowing ravens to expand their reach into the desert.</i>

	new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS1-4) 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. (MS-LS2-4) 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 to MS-LS2-5) ESS3.C: Human Impacts on Earth Systems - Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3) ESS3.C: Human Impacts on Earth Systems - Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3) Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MSESS3-3),(MS-ESS3-4)	LS4.C: <i>Students will learn the importance of biodiversity as a measure of health for an ecosystem and the importance of ecosystem services, like water purification, soil formation, and food production, to humans. There are many threats to ecosystems that impact the existing ecosystem.</i> LS4.D: <i>Students will learn the importance of biodiversity as a measure of health for an ecosystem and the importance of ecosystem services, like water purification, soil formation, and food production, to humans.</i> ESS3.C: <i>Students will learn how humans endanger species of animals like the Northern Spotted Owl who is endangered due to loss of habitat due to deforestation and invasion by a non-native species.</i> ESS3.C: <i>Students will learn how different issues threaten three different California animals. For example, the introduction of multiple invasive species to California's wetlands has caused the Western Pond Turtle to become threatened.</i>
9th-12th	LS2.C: Ecosystem Dynamics, Functioning, and Resilience - 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	LS2.C: <i>Students will learn how species like the Western Pond Turtle and Northern Spotted Owl have been impacted by invasive species introduced into their respective ecosystems.</i> LS4.D: <i>Students will learn the importance of biodiversity as a measure of health for an ecosystem and the importance of ecosystem</i>

functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6) 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. (HS-LS2-7) LS4.D: Biodiversity and Humans - Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary to HSLS2-7) 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. (secondary to HS-LS2-7) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.) LS4.C: Adaptation - Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3) Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. (HS-LS4-5),(HS-LS4-6)Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5) ESS3.A: Natural Resources - Resource availability has guided the development of human society. (HS-ESS3-1) All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)	<i>services, like water purification, soil formation, and food production, to humans. There are many threats to ecosystems that impact the existing ecosystem.</i> LS4.C: <i>Students will learn the complexities of the relationship between non-native Barred Owls and the Northern Spotted Owl. The Northern Spotted Owl is endangered due to multiple factors, including deforestation, climate change, and the non-native Barred Owl. Despite the owls' competition, interbreeding of the Northern Spotted Owl and the Barred Owl has created owls with characteristics of both species.</i> ESS3.A: <i>Students will learn how the increased amount of human resources, like trash, ponds, and bird baths, in desert landscapes has allowed ravens to expand their reach into the desert, threatening the population of Desert Tortoises via excessive predation on young tortoises.</i> ESS3.C: <i>Students will learn that humans harm biodiversity but are also able to create solutions for the issues they cause via new technologies and engineering with nature in mind.</i>
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	ESS3.C: Human Impacts on Earth Systems - The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3) Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.	
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