

Wildlife in Peril: 6th-12th

- Students learn how the actions of humans can impact wildlife.
- Students will learn how they can take actions to help support wildlife.
- Students learn the importance of biodiversity as a measure of health of the ecosystem.
- Students learn about different issues that may harm wildlife like pesticides, habitat loss, pollution, diseases, climate change, car strikes, invasive species, etc.

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.B: Cycle of Matter and Energy Transfer in Ecosystems - Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in	LS2.A: <i>Students will learn how invasive species, like the Red-Eared Slider, are competing with the native Western Pond Turtle. This is negatively impacting the Western Pond Turtle and is part of what has led to their listing as threatened.</i> LS2.B: <i>Students will learn how any poisons or pollutants released into the environment will enter the lower levels of the food web and will move up the food web to bioaccumulate at higher levels of the food web.</i> LS2.C: <i>Students will learn how disruptions to the ecosystem will impact many of the living organisms within it. For example, over harvesting of Leopard Sharks can disrupt the</i>

aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3) 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) 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.B: Natural Selection - In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5) Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4) 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) 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 new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS1-4) ESS3.A: Natural Resources - Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1) ESS3.C: Human Impacts on Earth Systems - Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction	<i>balance of oceanic ecosystems by removing a key predator from the food web.</i> LS4.B: <i>Students will learn how shifting climatic conditions are putting selection pressure on different organisms globally. For example, hares have adapted to have white fur in the snow to camouflage. As the climate warms, their fur is now white when there is no snow, which can increase predation. This selection pressure may cause that trait to change over time.</i> LS4.D: <i>Students will learn that biodiversity is an important measure of the health of an ecosystem. Human impacts on ecosystems harm the organisms living there and the ecosystem services humans rely on.</i> LS4.C: <i>Students will learn that adaptations are crucial for survival. For example, some species of hares have adapted to get white fur in the winter time for camouflaging in the snow. As climate changes, hares must adapt to warming conditions and less snow.</i> ESS3.A: <i>Students will learn that elements of human resources like old growth forests have been depleted over time and will not be renewed in our lifetimes.</i> ESS3.C: <i>Students will learn how many different species of wildlife are being impacted by human activities that can lead to extinction. As humans have used increasing amounts of resources, more species will be impacted.</i>
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	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)	
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 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.B: Natural Selection - Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3) The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3) 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 HSL2-7) 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	LS2.C: <i>Students will learn many ways that humans have impacted ecosystems, threatening the survival of some species. For example, the introduction of invasive species, like the Red-Eared Slider, has disrupted the ecosystem and contributed to the threatened status of the Western Pond Turtle.</i> LS4.B: <i>Students will learn how shifting climatic conditions are putting selection pressure on different organisms globally. For example, hares have adapted to have white fur in the snow to camouflage. As the climate warms, their fur is now white when there is no snow, which can increase predation. This selection pressure may cause that trait to change over time.</i> LS4.D: <i>Students will learn that many anthropogenic issues like deforestation, pollution, invasive species, and climate change are impacting the biodiversity of California wildlife. By making choices to reduce anthropogenic harm, humans can help sustain biodiversity.</i> LS4.C: <i>Students will learn that adaptations are crucial for survival. For example, some species of hares have adapted to get white fur in the winter time for camouflaging in the snow. As</i>

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) 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.	<i>climate changes, hares must adapt to warming conditions and less snow.</i> ESS3.A: <i>Students will learn that elements of human resources like old growth forests have been depleted over time and will not be renewed in our lifetimes.</i> ESS3.C: <i>Students will learn how many different species of wildlife are being impacted by human activities that can lead to extinction. As humans have used increasing amounts of resources, more species will be impacted.</i>
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