Unit 2 Biodiversity and Ecosystem Populations

Content Area: **Science**
Course(s): **AP Environmental Science**
Time Period: **October**
Length: **5-6 Blocks**
Status: **Published**

Enduring Understandings

ERT-2 Ecosystems have structure and diversity that can change over time

ERT-3 Populations change over time in reaction to a variety of factors

ERT-4 The health of a species is closely tied to its ecosystem, and minor environmental changes can have a large impact

Essential Questions

- What is the importance of biodiversity to human life?
- What are ways to conserve biodiversity on Earth?
- What are the primary causes of biodiversity loss?
- Can an invasive species be considered a native species if it occupies a place for along time?

Lesson Objectives

ERT - 2.A Explain levels of biodiversity and their importance to ecosystems.
ERT - 2.B Describe ecosystem services.
ERT - 2.C Describe the results of human disruptions to ecosystem services.
ERT - 2.D Describe island biogeography.
ERT - 2.E Describe the role of island biogeography in evolution.
ERT - 2.F Describe ecological tolerance.
ERT - 2.G Explain how natural disruptions, both shortand long-term, impact an ecosystem.
ERT - 2.H Describe how organisms adapt to their environment.
ERT - 3.A Identify differences between generalist and specialist species
ERT - 3.B Idenitfy differences between K and r selected species
ERT - 3.C Explain survivorship curves

EIN-4.B Explain how species become endangered and strategies to combat the problem.

EIN-4.C Explain how human activities affect biodiversity and strategies to combat the problem.

Content

Biodiversity

Species Richness

Causes of loss of biodiversity

Ecosystem Services

Island biogeography

Ecological Tolerance

Endangered Species

Environmental Changes on biodiversity

Adaptations

Generalist and Specialist species

K- and r- selected species

Survivorship curves

Standards

Biodiversity Standards:

ERT - 2.A.1 Biodiversity in an ecosystem includes genetic, species, and habitat diversity.
ERT - 2.A.2The more genetically diverse a population is, the better it can respond to environmental stressors. Additionally, a population bottleneck can lead to a loss of genetic diversity.
ERT - 2.A.3 Ecosystems that have a larger number of species are more likely to recover from disruptions.
ERT - 2.A.4 Loss of habitat leads to a loss of specialist species, followed by a loss of generalist species. It also leads to reduced numbers of species that have large territorial requirements.
ERT - 2.A.5 Species richness refers to the number of different species found in an ecosystem.
ERT - 2.B.1 There are four categories of ecosystem services: provisioning, regulating, cultural, and supporting.
ERT - 2.C.1Anthropogenic activities can disrupt ecosystem services, potentially resulting in economic and ecological consequences.
ERT - 2.D.1 Island biogeography is the study of the ecological relationships and distribution of organisms on islands, and of these organisms' community structures.
ERT - 2.D.2 Islands have been colonized in the past by new species arriving from elsewhere.
ERT- 2.E. 1 Many island species have evolved to be specialists versus generalists because of the limited resources, such as food and territory, on most islands. The long-term survival of specialists may be jeopardized if and when invasive species, typically generalists, are introduced and outcompete the specialists.
ERT - 2.F.1Ecological tolerance refers to the range of conditions, such as temperature, salinity, flow rate, and sunlight that an organism can endure before injury or death results.
ERT - 2.F.2 Ecological tolerance can apply to individuals and to species.
ERT- 2.G.1 Natural disruptions to ecosystems have environmental consequences that may, for a given occurrence, be as great as, or greater than, many human-made disruptions.

ERT-2.G.2 Earth system processes operate on a range of scales in terms of time. Processes can be periodic, episodic, or random.
ERT- 2.G.3 Earth's climate has changed over geological time for many reasons.
ERT- 2.G.4 Sea level has varied significantly as a result of changes in the amount of glacial ice on Earth over geological time.
ERT- 2.G.5 Major environmental change or upheaval commonly results in large swathes of habitat changes.
ERT- 2.G.6 Wildlife engages in both short- and long-term migration for a variety of reasons, including natural disruptions.

EIN-4.B.1 A variety of factors can lead to a species becoming threatened with extinction, such as being extensively hunted, having limited diet, being outcompeted by invasive species, or having specific and limited habitat requirements.

EIN-4.B.2 Not all species will be in danger of extinction when exposed to the same changes in their ecosystem. Species that are able to adapt to changes in their environment or that are able to move to a new environment are less likely to face extinction.

EIN-4.B.3 Selective pressures are any factors that change the behaviors and fitness of organisms within an environment.

EIN-4.B.4 Species in a given ecosystem compete for resources like territory, food, mates, and habitat, and this competition may lead to endangerment or extinction.

EIN-4.B.5 Strategies to protect animal populations include criminalizing poaching, protecting animal habitats, and legislation.

EIN-4.C.1 HIPPCO (habitat destruction, invasive species, population growth, pollution, climate change, and over exploitation) describes the main factors leading to a decrease in biodiversity.

EIN-4.C.2 Habitat fragmentation occurs when large habitats are broken into smaller, isolated areas. Causes of habitat fragmentation include the construction of roads and pipelines, clearing for agriculture or development, and logging.

EIN-4.C.3 The scale of habitat fragmentation that has an adverse effect on the inhabitants of a given ecosystem will vary from species to species within that ecosystem.

EIN-4.C.4 Global climate change can cause habitat loss via changes in temperature, precipitation, and sea level rise.

EIN-4.C.5 Some organisms have been somewhat or completely domesticated and are now managed for economic returns, such as honeybee colonies and domestic livestock. This domestication can have a negative impact on the biodiversity of that organism.

EIN-4.C.6 Some ways humans can mitigate the impact of loss of biodiversity include creating protected areas, use of habitat corridors, promoting sustainable land use practices, and restoring lost habitats.

Species' Standards:
ERT - 3.A.1 Specialist species tend to be advantaged in habitats that remain constant, while generalist species tend to be advantaged in habitats that are changing.
ERT - 3.B.1 K-selected species tend to be large, have few offspring per reproduction event, live in stable environments, expend significant energy for each offspring, mature after many years of extended youth and

parental care, have long life spans/life expectancy, and reproduce more than once in their lifetime. Competition for resources in K-selected species' habitats is usually relatively high.
ERT-3.B.2 r-selected species tend to be small, have many offspring, expend or invest minimal energy for each offspring, mature early, have short life spans, and may reproduce only once in their lifetime. Competition for resources in r-selected species' habitats is typically relatively low.
ERT - 3. B.3 Biotic potential refers to the maximum reproductive rate of a population in ideal conditions.
ERT - 3..B.4 Many species have reproductive strategies that are not uniquely r-selected or K-selected, or they change in different conditions at different times.
ERT - 3.B.5 K-selected species are typically more adversely affected by invasive species than r-selected species, which are minimally affected by invasive species. Most invasive species are r-selected species.
ERT - 3.C.1 A survivorship curve is a line that displays the relative survival rates of a cohort—a group of individuals of the same age—in a population, from birth to the maximum age reached by any one cohort member. There are Type I, Type II, and Type III curves.
ERT - 3.C.2 Survivorship curves differ for K-selected and r-selected species, with K-selected species typically following a Type I or Type II curve and r-selected species following a Type III curve.
ERT - 3.D.1When a population exceeds its carrying capacity (carrying capacity can be denoted as K), overshoot occurs. There are environmental impacts of population overshoot, including resource depletion.
ERT- 3. E.1A major ecological effect of population overshoot is dieback of the population (often severe to catastrophic) because the lack of available resources leads to famine, disease, and/or conflict.
ERT - 3. F.1 Population growth is limited by environmental factors, especially by the available resources and space.
ERT-3.F.2 Resource availability and the total resource base are limited and finite over all scales of time.
ERT-3.F.3 When the resources needed by a population for growth are abundant, population growth usually accelerates.
ERT-3.F.5 When the resource base of a population shrinks, the increased potential for unequal distribution of resources will ultimately result in increased mortality, decreased fecundity, or both, resulting in population growth declining to, or below, carrying capacity.

Resources

College Board AP Central : https://apcentral.collegeboard.org/courses/ap-environmental-science/course

College Board AP Environmental Science Course & Exam Description Manual https://apstudents.collegeboard.org/sites/default/files/2019-05/ap-environmental-science-course-and-exam-description.pdf

College Board AP Environmental Science "AP Classroom" https://apcentral.collegeboard.org/about-ap/news-changes/ap-2019?course=ap-environmental-science

AP Environmental Science Classroom Resources https://apcentral.collegeboard.org/courses/ap-environmental-science/classroom-resources

Khan Academy (Please look in AP Biology & Chemistry/Physics for all APES topics) https://www.khanacademy.org/science

Bozeman Science AP Environmental Science videos http://www.bozemanscience.com/ap-environmental-science