09_Human Impact on the Environment

Content Area: **Science**
Course(s):
Time Period: **Full Year**
Length: **3-4 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

Biology focuses on the diversity, complexity, and interdependence of life on Earth. Students will develop an understanding of how organisms evolve, reproduce, and adapt to their environments. This will include an exploration of how to relate the structure and function of molecules to their role in cell biology and metabolism. Further understanding of evolution and reproduction will be explored through the science of genetics. Knowledge of biodiversity and adaptation will be illustrated through the science of ecology.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.
- 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.
- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction).

CONTENT AREA STANDARDS

SCI.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
SCI.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
SCI.HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
SCI.HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

MA.S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
LA.W.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, trying a new approach, or consulting a style manual (such as MLA or APA Style), focusing on addressing what is most significant for a specific purpose and audience.
SCI.HS-ESS2-6	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
SCI.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
SCI.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- The interdependence of factors (both living and nonliving) and resulting effect on carrying capacity and identify the factors that have the largest effect on the carrying capacity of an ecosystem for a given population.
- The populations and number of organisms in ecosystems vary as a function of the physical and biological dynamics of the ecosystem.
- The response of an ecosystem to a small change might not significantly affect populations, whereas the response to a large change can have a large effect on populations that then feeds back to the ecosystem at a range of scales

Procedural Knowledge

Students will be able to:

- Students identify the given explanation(s) to be supported, which include the following ideas:
  - Factors (including boundaries, resources, climate, and competition) affect carrying capacity of an ecosystem.
  - Some factors have larger effects than do other factors. ii. Factors are interrelated.

- The significance of a factor is dependent on the scale (e.g., a pond vs. an ocean) at which it occurs.
- Students identify and describe* the components in the given mathematical representations (which include trends, averages, and graphs of the number of organisms per unit of area in a stable system) that are relevant to supporting and revising the given explanations about factors affecting biodiversity and ecosystems, including:
  - Data on numbers and types of organisms are represented.

EVIDENCE OF LEARNING

Formative Assessments
- Checks for understanding during lesson..
- Do Now activities.
- Student-centered questioning and discussion that is facilitated by instructor.
- Exit Tickets.

Summative Assessments
- Exams/Unit Exams.
- Quizzes.
- Laboratory Activities.

RESOURCES (Instructional, Supplemental, Intervention Materials)

[Miller & Levine Biology Textbook](#)

- Unit 2 - Ecology
  - Chapter 3 - Darwin's Theory of Evolution
    - Animation: *The Greenhouse Effect*
    - Analyzing Data: *Which Biome?*
  - Chapter 4 - Ecosystems
    - Case Study: *What's to blame for the bloom?*

POGIL Biology

- Ecological Relationships

[Brainpop](#)

[NSTA](#)

[Data Nuggets](#)

INTERDISCIPLINARY CONNECTIONS

ELA/Literacy

Mathematics

Technology

Earth Science

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.