

# **ENVIRONMENTAL SCIENCE**

**Performance Indicators  
Essential Questions  
Suggested Activities  
Suggested Resources**

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# **ENVIRONMENTAL SCIENCE UNIT CONCEPTS**

## **UNIT I.1 ECOLOGICAL PRINCIPLES**

Desert, rainforest, deciduous forest, coniferous forest, grasslands, savannas, tundra, species, population, community, ecosystem, biome, biosphere, abiotic, biotic, habitat, niche, range, adaptation, coevolution, competition, predator, prey, carnivore, herbivore, omnivore, pioneer species, primary succession, secondary succession, keystone predator, water cycle, nitrogen cycle, carbon cycle, photosynthesis, cellular respiration, carbohydrate, precipitation, evaporation, transpiration, run-off, seepage/filtration, condensation, surface water, groundwater, aquifer, artesian well, water table, nitrogen fixation, nitrification, denitrification, food web, food chain, producer, consumer, decomposer, scavenger, trophic pyramid, energy pyramid, 10% energy law, commensalism, host, mutualism, natural selection, parasitism, climax community

## **UNIT I.2 BIODIVERSITY**

Extinct, endangered, and threatened species; endangered species act; exotic/introduced species; keystone species; habitat destruction; captive breeding

## **UNIT II HUMAN POPULATION DYNAMICS**

Birth rate, death rate, immigration, emigration, developed country, developing country, histogram, limiting factor, exponential growth, carrying capacity, biotic potential, population, demographic transition, overpopulation, J-curve, S-curve, agricultural revolution, industrialization, hunter-gatherer

## **UNIT III NATURAL RESOURCES AND POLLUTION**

Renewable vs. non-renewable; conservation; point vs. non-point; air, water, and land pollution; thermal inversion, primary and secondary pollutants, acid rain, ozone depletion, sick building syndrome, greenhouse effect, global warming, bioaccumulation/biomagnification

# **ENVIRONMENTAL SCIENCE UNIT CONCEPTS**

## **UNIT IV ENERGY**

Renewable vs. non-renewable, fossil fuels, nuclear energy, conservation, solar energy (passive vs. active), wind energy, hydroelectricity, geothermal energy, biomass, alternative energy sources

# ENVIRONMENTAL SCIENCE

## UNIT I.1 ECOLOGICAL PRINCIPLES (29%)

### Performance Indicators

1. Biomes and Ecosystems:
  - (E) (1.2) a. The student will be able to distinguish among the major biomes of the world by identifying the abiotic and biotic factors within each.
  - (E) (1.1) b. Given an organism's niche and habitat, the student will be able to describe the organism's interactions within its environment.
  - (E) (1.1,4) c. The student will be able to trace the flow of energy and the cycling of matter between living systems and the physical environment.
  - (E) (1.1) d. The student will be able to contrast primary and secondary succession and their representative plant and animal communities.
  - (E) (1.6) e. The student will be able to explain how variations within a species affect the likelihood of survival.
  - (E) (1.3)f. The student will be able to identify the type of growth rate represented by a graph and the effect limiting factors have on the growth rates of a population.

### Essential Questions

1. Given a description or diagram, in which biome would the abiotic or biotic factor be found?
2. What is the role of this organism in its environment?
3. How is a population limited by the available energy and nutrients in an ecosystem?

4. What are the characteristic organisms found in the various stages of primary and secondary succession?
5. How do variations in a species affect its survival?

# **ENVIRONMENTAL SCIENCE**

## **UNIT I.2 ECOLOGICAL PRINCIPLES (20%)**

### **Performance Indicators**

2. Biodiversity:
- (E) (1.1) a. The student will be able to define and identify benefits of biodiversity.
  - (I) (1.6) b. The student will be able to compare and contrast endangered, extinct, and threatened species and the leading causes of each.
  - (I) (1.6) c. The student will be able to describe laws protecting biodiversity.
  - (E) (1.5) d. The student will be able to predict the effects of introduction, removal, or disruption of both keystone and exotic species in an ecosystem.

### **Essential Questions**

1. What are the benefits of having an ecosystem high in biodiversity?
2. What are the differences among endangered, extinct, and threatened species, and what is an example of each?
3. What laws protect biodiversity?
4. Given an example of a keystone or exotic species, what effect would that species have on the ecosystem?

# **ENVIRONMENTAL SCIENCE**

## **UNIT II HUMAN POPULATION DYNAMICS AND HUMAN INTERACTIONS WITH THE ENVIRONMENT**

(17%)

### **Performance Indicators**

The Nature of Human Population Dynamics:

- (E) (2.1) a. The student will be able to predict the effect that various factors (immigration, death, cultural changes, etc.) have on a population's size.
- (E) (2.1) b. The student will be able to distinguish between developed and developing countries using an age distribution histogram.
- (E) (2.2) c. The student will be able to list major causes of a population explosion and the issues (socioeconomic and environmental) stemming from overpopulation as well as stable and declining populations.
- (E) (2.3) d. The student will be able to describe how health care, education, and socioeconomic barriers can affect the birth rate.

### **Essential Questions**

1. Describe the factors that led human populations to change from hunter-gatherer to agricultural and industrial cultures and the effects of these changes on population growth.
2. Given a histogram of a developed and developing country, predict the effects of population growth on the environment.
3. Given population growth graphs, identify the type of growth depicted and potential limiting factors.

4. What types of social and environmental problems stem from an increasing, a stable, and a declining population?
5. What can be done to alleviate the problems of overpopulation and over-consumption?

# ENVIRONMENTAL SCIENCE

## UNIT III NATURAL RESOURCES AND POLLUTION (23%)

### Performance Indicators

#### Natural Resources and Pollution:

- (E) (3.1) a. The student will be able to identify renewable vs. non-renewable natural resources citing benefits and consequences of use.
- (E) (3.2,3) b. Recognizing that there are limits to the use of natural resources, the student will be able to identify ways society conserves and wastes resources.
- (E) (5.1) c. The student will be able to identify the legislative acts and conservation methods that serve to control water, air, and land quality, and give examples of the resulting actions of each. (6.2)
- (E) (5.1,3) d. The student will be able to understand causes of, environmental effects of, and methods for controlling pollution.
- (E) (1.5) e. The student will be able to determine the impact of waste production and management on the environment.
- (E) (1.2) f. The student will be able to trace the effects of bioaccumulation within a specific ecosystem. (5.2)

### Essential Questions

1. Given the concepts of point/non-point pollution, answer the following: What is the nature of this pollution? Could it be better controlled? What can you do personally to reduce non-point pollution?
2. Would bioremediation be helpful in cleaning up heavy-metal pollutants as it is cleaning up organic pollutants? Why or why not?
3. Given a point/nonpoint scenario, what would be the effects of bioaccumulation/biomagnification within an ecosystem?

4. When considering use, misuse, and conservation of natural resources, are we as a society working towards maintaining a sustainable future? Explain your answer.
5. List specific effects of air pollution caused by the burning of coal.
6. What differentiates renewable resources from non-renewable resources?

**ENVIRONMENTAL SCIENCE**  
**UNIT IV**  
**ENERGY SOURCES AND THEIR USE**  
(11%)

**Performance Indicators**

Energy:

- (E) (4.1) a. The student will be able to define and describe energy sources including alternative energy sources. (1.4)
- (E) (4.1,2) b. The student will be able to identify advantages and disadvantages of all energy sources.
- (E) (4.3) c. The student will be able to compare various methods of energy conservation.

**Essential Questions**

1. Why might it be dangerous for people to assume that the number and size of recoverable fossil-fuel deposits have been underestimated?
2. Looking at the choices for alternative energy production, which ones would be feasible in our area and what would be your prediction for success?
3. Given that we are a global society looking to provide energy services, are the trade-offs of energy consumption and energy related pollution worth the outcome of any particular good or product?