

# **Archdiocese of Philadelphia Secondary School System Environmental Science Standards**

**The Catholic school community** strives to make its faith commitment a complement to academic excellence by developing a curriculum that leads all students to Christ as it prepares them for a successful life in the twenty-first century. It is a curriculum that recognizes the sanctity of each human life while affirming the dignity of each person as a unique creation of God. It is a curriculum that is intended to offer all students the opportunity to study the world at many levels of complexity, through a variety of courses.

Schools of the Archdiocese of Philadelphia shall teach, challenge, and support every student to realize his/her maximum potential and to acquire the knowledge and skill to achieve the general standards in environmental science.

## **General Standards**

- ◆ History and Structure of the Earth
- ◆ Ecosystems and Energy Flow
- ◆ Water Ecosystems and Pollution
- ◆ Changes in Human Population
- ◆ Air Pollution
- ◆ Soil Studies
- ◆ Land Use and Waste Management
- ◆ Energy Needs

## **Standards Terminology Glossary**

- ◆ General - Goals
- ◆ Content - What a student should know
- ◆ Competency - What a student should be able to do
- ◆ Assessment - How well a student should be able to perform
- ◆ Rubric - Scoring tool to evaluate the level of student performance

# 1. History and Structure of the Earth

## *Content Standard*

### 1.1. Features of the Earth

#### *Competency Standard*

- 1.1.1. Describe the composition of the earth
- 1.1.2. Describe the structure of the earth
- 1.1.3. Construct a geologic time line
- 1.1.4. Defend the story of creation in Genesis with the scientific theory for the beginning of the earth

## *Content Standard*

### 1.2. Geology and Earth Dynamics

#### *Competency Standard*

- 1.2.1. Prove that convection currents play a part in plate tectonics
- 1.2.2. Show how various natural phenomena account for changes on the earth's surface
- 1.2.3. Illustrate the rock cycle
- 1.2.4. Identify the various mineral types
- 1.2.5. Explain the changes caused by weathering, erosion and mass wasting
- 1.2.6. Evaluate the impact of geologic hazards
- 1.2.7. Analyze technology's role in natural resource sustainability

## *Content Standard*

### 1.3. Atmosphere

#### *Competency Standard*

- 1.3.1. Collect and interpret meteorological data
- 1.3.2. Show how weather patterns may affect ecosystems
- 1.3.3. Use computer data to analyze and predict weather changes
- 1.3.4. Evaluate specific adaptations of plants and animals to survive climate changes
- 1.3.5. Identify natural occurrences that have international impact (e.g., El Nino, earthquakes, hurricanes)

## *Content Standard*

### 1.4. Maps / Mapping

#### *Competency Standard*

- 1.4.1. Demonstrate how various maps are used
- 1.4.2. Explain the terms used on various maps
- 1.4.3. Apply current technology to mapping skills

## 2. Ecosystems and Energy Flow

### *Content Standard*

#### 2.1.Land Biomes

##### *Competency Standard*

- 2.1.1. Identify the major biomes of the world
- 2.1.2. Analyze the abiotic factors that affect the biomes
- 2.1.3. Analyze the biotic factors that affect the biomes

### *Content Standard*

#### 2.2.Interrelationships in Ecosystems

##### *Competency Standard*

- 2.2.1. Explain energy flow in an ecosystem
- 2.2.2. Explain carrying capacity
- 2.2.3. Identify the trophic levels of an ecosystem
- 2.2.4. Identify the stages of succession
- 2.2.5. Identify a species and explain how its adaptations are related to its niche
- 2.2.6. Develop food webs from food chains

### *Content Standard*

#### 2.3.Biodiversity

##### *Competency Standard*

- 2.3.1. Explain the importance of biodiversity
- 2.3.2. Analyze the importance of biodiversity in an ecosystem
- 2.3.3. Identify and explain why adaptations can lead to specialization
- 2.3.4. Compare adaptations among species
- 2.3.5. Explain the relationship between species loss and biodiversity
- 2.3.6. Predict how human activities can produce changes to which organisms cannot adapt
- 2.3.7. Describe the problem of an introduced species

### *Content Standard*

#### 2.4.Extinction and Evolution

##### *Competency Standard*

- 2.4.1. Explain the relationship between evolution and extinction
- 2.4.2. Identify criteria for categorizing organisms as threatened, endangered or extinct
- 2.4.3. Explain the impact of the Endangered Species Act
- 2.4.4. Analyze the role of zoos and wildlife preserves
- 2.4.5. Analyze management strategies regarding threatened or endangered species

***Content Standard***

2.5.Natural Cycles

***Competency Standard***

2.5.1. Identify / describe natural cycles in the ecosystem

2.5.2. Explain how cycles affect the balance in an ecosystem

2.5.3. Analyze consequences of interrupting natural cycles

### 3. Water Ecosystems and Pollution

#### *Content Standard*

##### 3.1. Aquatic Environments / Freshwater

#### *Competency Standard*

- 3.1.1. Describe water organisms and their adaptations
- 3.1.2. Describe groundwater and the recharge process
- 3.1.3. Analyze the need to protect the groundwater
- 3.1.4. Evaluate the running water in your community

#### *Content Standard*

##### 3.2. Aquatic Environments / Marine

#### *Competency Standard*

- 3.2.1. Explain the ocean wave action
- 3.2.2. Illustrate the ocean floor topography
- 3.2.3. Evaluate the process of desalinization
- 3.2.4. Identify marine life (plant and animal)

#### *Content Standard*

##### 3.3. Wetlands

#### *Competency Standard*

- 3.3.1. Identify various wetlands
- 3.3.2. Explain the importance / maintenance of wetlands
- 3.3.3. Discuss ways in which students can actively participate in wetland preservation

#### *Content Standard*

##### 3.4. Water Pollution

#### *Competency Standard*

- 3.4.1. Analyze water quality (physical and chemical)
- 3.4.2. Identify toxins and their source
- 3.4.3. Evaluate the effects of pollution on aquatic life
- 3.4.4. Explain the changes that have taken place on the Chesapeake
- 3.4.5. Demonstrate the need to prevent further polluting of oceans, lakes, rivers and streams
- 3.4.6. Discuss ways in which students can play an active role in pollution prevention

## 4. Changes in Human Population

### *Content Standard*

#### 4.1. Demographics.

##### *Competency Standard*

- 4.1.1. Describe population characteristics
- 4.1.2. Explain the relationship between sex ratio and age distribution
- 4.1.3. Relate carrying capacity to limiting factors
- 4.1.4. Describe changes in human populations
- 4.1.5. Analyze reasons for changes in human populations
- 4.1.6. Estimate "doubling time" for various populations

### *Content Standard*

#### 4.2. Cultural and Economic Influences

##### *Competency Standard*

- 4.2.1. Relate population density to GNP
- 4.2.2. Explain the political factors that affect population growth
- 4.2.3. Explain the cultural / social reasons that affect population growth
- 4.2.4. Discuss ethical considerations of population control

### *Content Standard*

#### 4.3. Patterns of Resource Use

##### *Competency Standard*

- 4.3.1. Explain the relationship between population size and energy use
- 4.3.2. Analyze the relationship between population growth, changes in CO<sub>2</sub> production and global warming

### *Content Standard*

#### 4.4. Sustainability

##### *Competency Standard*

- 4.4.1. Predict human population changes in the future
- 4.4.2. Discuss availability of needed resources for increased populations
- 4.4.3. Examine the need for political changes to support increased population

## 5. Air Pollution

### *Content Standard*

#### 5.1. Outdoor Air Pollution

##### *Competency Standard*

- 5.1.1. Describe sources of indoor pollution
- 5.1.2. Compare the results of natural pollution with industrial pollution
- 5.1.3. Identify the effects of air pollution on human health
- 5.1.4. Identify / explain laws that impact the problem of air pollution
- 5.1.5. Identify ways of detecting air pollution by using state of the art technology

### *Content Standard*

#### 5.2. Indoor Air Pollution

##### *Competency Standard*

- 5.2.1. Describe sources of indoor pollution
- 5.2.2. Explain how human health is affected by indoor air pollution
- 5.2.3. Identify household cleaners as air pollutants
- 5.2.4. Explain disposal problems of household cleaners as pollutants

### *Content Standard*

#### 5.3. Global Warming.

##### *Competency Standard*

- 5.3.1. Explain the problem of global warming
- 5.3.2. Explain the causes of global warming
- 5.3.3. Predict the effects of human activities on global warming
- 5.3.4. Develop ways to decrease global warming

### *Content Standard*

#### 5.4. Acid Rainfall

##### *Competency Standard*

- 5.4.1. Explain the term acid rain
- 5.4.2. Explain the occurrence of dry acid deposition
- 5.4.3. Identify causes of acid precipitation
- 5.4.4. Assess the effects of acid precipitation

### *Content Standard*

#### 5.5. Ozone Depletion

##### *Competency Standard*

- 5.5.1. Explain ozone depletion
- 5.5.2. Identify causes of ozone depletion
- 5.5.3. Identify possible hazardous effects of ozone depletion

## 6. Soil Studies

### *Content Standard*

#### 6.1.Changes Through Science / Technology

##### *Competency Standard*

- 6.1.1. Describe how early man obtained food and shelter
- 6.1.2. Explain the role of archeology / radiocarbon dating
- 6.1.3. Construct a technology time line from early man to current developments in agriculture
- 6.1.4. Describe soil texture
- 6.1.5. Describe the formation of soil
- 6.1.6. Identify the physical / chemical types of weathering
- 6.1.7. Identify the types of soil erosion
- 6.1.8. Predict how human activities can slow the rate of erosion

### *Content Standard*

#### 6.2.Fertilizers

##### *Competency Standard*

- 6.2.1. Distinguish between organic and inorganic fertilizers
- 6.2.2. Describe the essential soil nutrients
- 6.2.3. Analyze the quality of the soil
- 6.2.4. Explain the advantages / disadvantages of the different types of fertilizers

### *Content Standard*

#### 6.3.Pests / Pesticides

##### *Competency Standard*

- 6.3.1. Identify the common pest types of American farmers
- 6.3.2. Trace the history of pesticide use
- 6.3.3. Describe the problem of persistent pests
- 6.3.4. Explain *bioaccumulation*
- 6.3.5. Discuss the importance of Rachel Carson and "Silent Spring"
- 6.3.6. Describe the problem of fertilizers and pesticides in regard to air and water pollution

### *Content Standard*

#### 6.4.World Hunger

##### *Competency Standard*

- 6.4.1. Identify the world's tillable lands
- 6.4.2. Assess the ability of technology to solve the problem of food production

## 7. Land Use and Waste Management

### *Content Standard*

#### 7.1. Conservation / Reclamation

##### *Competency Standard*

- 7.1.1. Identify the need for land conservation
- 7.1.2. Describe various reclamation areas

### *Content Standard*

#### 7.2. Waste and Disposal

##### *Competency Standard*

- 7.2.1. Identify types of waste material
- 7.2.2. Discuss landfill use
- 7.2.3. Describe landfill construction

### *Content Standard*

#### 7.3. Toxins in the Water

##### *Competency Standard*

- 7.3.1. Analyze toxins found in the water
- 7.3.2. Explain the impact of Love Canal
- 7.3.3. Examine the responsibilities of chemical companies
- 7.3.4. Analyze how people can actively participate in waste reduction

### *Content Standard*

#### 7.4. Recycling

##### *Competency Standard*

- 7.4.1. Describe the methods of recycling
- 7.4.2. Identify common recycling products
- 7.4.3. Demonstrate how people can actively participate in waste reduction

## 8. Energy Needs

### *Content Standard*

#### 8.1.Fossil Fuels

##### *Competency Standard*

- 8.1.1. Construct a time line of energy sources from 1800 to the present.
- 8.1.2. Describe the importance of fossil fuels
- 8.1.3. Demonstrate the need for crude oil
- 8.1.4. Discuss the process of making fuels
- 8.1.5. Describe the process of making synthetic fuels

### *Content Standard*

#### 8.2.Nuclear energy

##### *Competency Standard*

- 8.2.1. Explain the role and function of nuclear power plants
- 8.2.2. Describe a nuclear power plant
- 8.2.3. Identify the global impact of nuclear power energy
- 8.2.4. Describe the problems and concerns of nuclear power
- 8.2.5. Examine the global problems and concerns of nuclear power
- 8.2.6. Explain the problem and effects of TMI and Chernobyl