

Textbook: Miller Environmental Science 10th Ed., 2004

Course Description

AP Environmental Science is designed to be the equivalent of a one semester, introductory college course in environmental science and specifically intended for those students who intend to take the College Board AP Environmental Exam in May. This course will provide students with the scientific principles, concepts and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems both natural and man human made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. Laboratory investigations are an essential component of the course.

Unit	Topics	Text Chapters	Approximate Number of Days
1)	Climate/Air/Global Warming	6, 12, 13	18
2)	Populations	8, 11	15
3)	Biodiversity	5, 6, 17, 18	26
4)	Soils/Food	9, 16	15
5)	Toxicology, Hazardous/Solid Waste, Pesticides	10, 15	15

Partial Listing of AV Materials

- “Race to Save the Planet” Series, PBS
- “The Medicine Man”, Hollywood Pictures
- “World Population”, ZPG
- “An Inconvenient Truth”, Al Gore

Synopsis of Units

Unit One – “Climate/Air/Global Climate Change

- Weather and Climate Introduction
- The Atmosphere
- Outdoor Air Pollution
- Photochemical & Industrial Smog
- Regional Outdoor Air Pollution From Acid Deposition
- Indoor Air Pollution
- Effects of Air Pollution on Organisms and Materials
- Preventing and Reducing Air Pollution
- Past Climate Change and Natural Greenhouse Effect

C1-Earth Systems and Resources

C6-Pollution

C7-Global Change

- Climate Change and Human Activities
- Projecting Future Changes in Earth’s Climate
- Factors Affecting Changes in Earth’s Average Temperature
- Some Possible Effects of a Warmer World
- Dealing With the Threat of Climate Change (Energy Efficiency)
- Reducing Greenhouse Gas Emissions
- Ozone Depletion in the Stratosphere
- Protecting the Ozone Layer

LAB Example – “Detection of CO₂”

Students compare levels of CO₂ from different sources (i.e. room air to auto exhaust).

Unit Two – Populations

- Population Dynamics and Carrying Capacity
- Predators Role in Controlling Population Size
- Reproductive Patterns and Survival
- Conservation Biology
- Human Impacts on Ecosystems
- Factors Affecting Human Population Size
- Population Age Structure
- Influencing Population Size
- Slowing Population Growth in India & China
- Cutting Global Population Growth
- Population Distribution – Urbanization
- Urban Resources & Environmental Problems
- Transportation and Urban Development
- Making Urban Areas More Livable & Sustainable

C3-
Population

C2-The
Living World

C9- Analyze
and Interpret
Information
& Data...

LAB Example – “Yeast Population Study”

Yeast are grown over time and counted using a colorimeter to study a bell-shaped curve of population growth.

Unit Three – Biodiversity

- Origins of Life
- Evolution & Adaptation
- Ecological Niches and Adaptations
- Speciation, Extinction, & Biodiversity
- Biomes
- Deserts & Grasslands
- Forests & Mountains
- Aquatic Environments
- Saltwater Life Zones
- Freshwater Life Zones

C2-The
Living World

C4-Land and
Water Use

- Sustainability of Aquatic Life Zones
- Human Impacts on Biodiversity
- Land Use in the World & USA
- Managing & Sustaining Forests
- Management of US Forest Resources
- Tropical Deforestation
- Managing and Sustaining National Parks
- Establishing, Designing & Managing National Parks
- Protecting & Sustaining Aquatic Systems
- Ecological Restoration
- Species Extinction
- Extinction Threats From Habitat Loss & Degradation
- Extinction Threats From Nonnative Species
- Extinction Threats From Hunting & Poaching
- Other Extinction Threats
- Protecting Wild Species From Depletion & Extinction
- Wildlife Management

LAB – “Biodiversity of Tropical Insects”

The diversity of insects is compared using specimens of tropical and local insects.

Unit 4 – Soils/Food

- Geological Processes
- Internal & External Earth Processes
- Rocks, Minerals & the Rock Cycle
- Finding, Removing & Processing Nonrenewable Mineral Resources
- Supplies of Mineral Resources
- Earthquakes & Volcanic Eruptions
- Soil Resources, Formations & Types
- Soil Erosion
- Soil Conservation
- Food Production
- The Green Revolution vs Traditional Techniques
- Food Production, Nutrition, & Environmental Effects
- Increasing World Crop Production
- Producing More Meat
- Catching & Raising Fish & Shellfish
- Government Agricultural Policy
- Protecting Food, Conventional Chemical Pesticides
- Alternatives to Chemical Pesticides
- Sustainable Agriculture

<p>C1- Earth Systems and Resources</p>

<p>C4-Land and Water Use</p>

LAB Example – “Physical & Chemical Factors of Soil Types”

A variety of physical and chemical tests are conducted on several soil types.

Unit 5 – Toxicology, Hazardous/Solid Waste, Pesticides

- Risk, Probability, & Hazards
- Toxicology
- Chemical Hazards
- Biological Hazards: Disease in Developed/Developing Countries
- Risk Analysis
- Wasting resources
- Producing Less Waste & Pollution
- Cleaner Production & Selling Services Instead of Things
- Reuse
- Detoxifying, Burning, Burying & Exporting Wastes
- Chlorine, Dioxins, Lead & Mercury
- Hazardous Waste Regulation in the US
- Achieving a Low-Waste Society

C6-Pollution

C10-Identify and Analyze Environmental Problems...

LAB Example – “Acute Toxicity Bioassay”

Water fleas are exposed to different levels of toxic materials determining lethal levels.

Field Trips

Midwest Renewable Energy Association
County Sanitary Landfill
Dairy Farm that produces electricity from biogas
Organic/Sustainable Food Cooperative
Local University – College of Natural Resources
Lake Study – Assisting 6th grade students
Restaurant that serves organic/locally produces food

(Prerequisite Course for AP Environmental Science)

Principles of the Environment

The Prerequisite Course for APES is: *Principles for the Environment*, one semester course. Topics of study include ecosystem structure and function encompassing concepts such as communities and biomes, energy flow and matter cycling; environmental issues such as natural resources, land use and pollution. A water study unit on a local creek is a major focus of this course. The topic of energy will also be explored in detail. Lab investigations make up a large percentage of the course especially in units two, three & four.

Textbooks:

Miller, Environmental Science, 8th Ed., 2001.
Science & Sustainability, SEPUP, 2001.

Material World, Sierra Club Books, 1994.

Field Manual for Water Quality Monitoring, GREEN, 11th Ed. Mitchell/Stapp, 1997.

Partial Listing of AV Materials

The Lorax, Dr. Suess

Never Cry Wolf, Farley Mowatt

Unit	Topics	Text Chapters
1	Sustainability	1, 2
2	Water Study	14
3	Ecology	3, 4, 7
4	Energy	19, 20

Synopsis of Units

Unit 1 - Humans & Sustainability

- Living Sustainably
- Population Growth
- Economics, Poverty & Globalization
- Resources
- Pollution
- Environmental & Resource Problems
- Cultural Changes & Sustainability
- Are We Living Sustainably?
- Economy & the Environment
- Progress
- Economics & Environmental Quality
- Poverty & Environmental Quality
- Environmental Sustainable Economies

C3-
Population

C6-Pollution

LAB Example – “Ecological Footprint”

Students calculate their ecological footprints concerning energy & resource use to determine how many planets would be needed if everyone lived at their level.

Unit 2 – Water Resources

- Importance of Water
- Water Supply, Renewal & Reuse
- Water Shortages
- Water Conservation
- Water Abundance
- Water Pollution
- Freshwater Streams, Lakes & Groundwater
- Oceans

C4-Land and
Water
Resources

C8-Scientific
Principles,
Concepts and
Methodologies

- Preventing & Reducing Surface Water Pollution
- Water Sustainability
- Water Quality Index (GREEN)
- Macroinvertebrates
- Physical Features of Streams

C11-
Laboratory
& Field
Investigation

LAB Examples – “One Mile Creek Field Study”

A lengthy study of a local creek’s chemical & physical features is conducted over several weeks.

Unit 3 – Ecology

- Nature of Science
- System Models
- Matter
- Energy
- Physical & Chemical Changes
- Nuclear Changes
- Energy Laws
- Matter/Energy Change Laws & Environmental Problems
- Ecology
- Earth’s Life Support Systems
- Ecosystems
- Food Webs/Energy Flow
- Primary Productivity
- Matter Cycling
- Studying Ecosystems
- Ecosystems & Sustainability
- Communities & Diversity
- Species Types
- Symbiosis
- Ecological Succession
- Ecological Stability & Sustainability

C1-Earth
Systems &
Resources

LAB Example – “Relationships Between Plants & Animals”

Snails & Elodea are grown in test tubes. Light is the main variable studied.

Unit 4 – Energy

- Energy Resources
- Oil, Natural Gas, Coal
- Nuclear Energy
- Energy Efficiency
- Solar Heat & PV
- Hydroelectric & Heat Pumps
- Wind Power

C5-Energy
Resources &
Consumption

C10-Analysis of
Environmental
Problems...

- Biomass
- Solar-Hydrogen
- Geothermal
- Decentralized Micropower
- Sustainable Energy Strategy

LAB Example – “Insulation & Heat Energy”

Various types of building insulation are tested for their R-values and an estimate for insulating a building with these insulations is calculated

Field Trips:

Field Study at Local Steam

Water Treatment Facility

Local Nature Preserve