



AP Environmental Science Syllabus

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Textbook: *Living in the Environment* by G. Tyler Miller Jr. and Scott E. Spoolman, 17th edition, 2012, Brooks/Cole Cengage Learning.

Other Resources: In addition to the textbook, we will draw information from supplemental environmental science textbooks, lab manuals, periodicals, readings/case studies, and the Internet.

Course Description: The AP Environmental Science course is a full-year course designed to be the equivalent of a one-semester, introductory college course in environmental science. The AP Environmental Science course has been developed to be like a rigorous science course that stresses scientific principles and analysis and includes a laboratory component: as such, it is intended to enable students to undertake, as first-year college students, a more advanced study of topics in environmental science. In both breadth and level of detail, the content of the course reflects what is found in many introductory college courses in environmental science.

The goal of the course is to 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 human-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving or preventing them.

Environmental science is interdisciplinary; it embraces a wide variety of topics from different areas of study. Yet there are several major unifying constructs, or themes, that cut across the many topics included in the study of environmental science. The following themes provide a foundation for the structure of the AP Environmental Science course:

1. Science is a process
 - a. Science is a method of learning more about the world.
 - b. Science constantly changes the way we understand the world.
2. Energy conversions underlie all ecological processes.
 - a. Energy cannot be created; it must come from somewhere.
 - b. As energy flows through systems, at each step more of it becomes unusable.
3. The Earth itself is one interconnected system.
 - a. Natural systems change over time and space.
 - b. Biogeochemical systems vary in ability to recover from disturbances.
4. Humans alter natural systems.
 - a. Humans have had an impact on the environment for millions of year.
 - b. Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment.
5. Environmental problems have a cultural and social context.
 - a. Understanding the role of cultural, social, and economic factors is vital to the development of solutions.
6. Human survival depends on developing practices that will achieve sustainable systems.
 - a. A suitable combination of conservation and development is required.
 - b. Management of common resources is essential.

Course Prerequisites: AP Environmental Science is offered to students in grades 11-12 who have successfully completed biology, chemistry and Algebra I and have received a teacher recommendation to take the course.

Class Duration:

- 87 minute block/every other day
- Includes lecture, class discussion, demonstrations, research, current event analysis
- On average, a minimum of one hour per week is devoted to laboratory/field work. Laboratory/field work will require written analysis.

Homework: Homework may include, but is not limited to:

- Reading the current unit content and answering textbook questions
- Reviewing lecture notes(from PowerPoints, classroom generated notes, AND student generated notes)
- Reading and case studies
- Lab reports/write-ups
- Essays/Short answer responses based upon textbook and/or supplemental readings
- Collaborative and individual projects
- Supplemental Work Packets

Tests: Tests will be given as indicated in class and on Power School and will vary in questioning methods that will focus on AP Environmental Science rigor. Quizzes can be expected at any time (both announced and unannounced). The format of both tests and quizzes will mirror the AP Environmental Science exam in both content and duration.

AP Environmental Science EXAM: Thursday, May 10, 2018 – 12pm START time

The AP Environmental Science exam is 3 hours long and is divided equally in time between a multiple-choice section and a free-response section. The multiple-choice section, which constitutes 60% of the final grade, consists of 100 multiple-choice questions that are designed to cover the breadth of the students' knowledge and understanding of environmental science. The free-response section emphasizes the application of principles in greater depth. In this section, students must organize answers to broad questions, thereby demonstrating reasoning and analytical skills, as well as the ability to synthesize material from several sources into cogent and coherent essays. Four free-response questions are included in this section, which constitutes 40% of the final grade.

Grading Policy: Every quiz, homework, test, lab, project and activity that is graded will be worth a certain amount of points (i.e. tests are usually worth 100 points, quizzes can range from 20-50points). Quarter grades are simply the average of points earned divided by the amount of assigned, or possible points. For example, if I assign 1000 possible points in a marking period and you earn 752 of those points, your average for the marking period is a 75.2, or a 75/C.

- **Final Class Grade** is determined by marking period averages (20% each), mid-term exam (10% of final grade), and a final exam and/or project (10% of final grade).
- **Attendance Policy.** Please note the attendance policy in your student handbook. Frequent **tardiness AND absenteeism** can result in the loss of credit DESPITE a passing grade.
- **Late assignments** are **NOT** accepted
- **Grades** will be posted bi-weekly on Ed-line. Please e-mail me with any questions.
- **Make-up work:** For any EXCUSED ABSENCE, the following will apply:
 - If the student is absent on the due date, BUT was present when it was assigned, the assignment is due when the student returns to class. Students are also required to take a test despite being absent from the class prior to the test.
 - If student is absent on the due date AND when work was assigned, the student will have three days from their return to submit work.
 - If student is absent on the date the work was assigned, but present the date it is due, no extension will offered unless arrangements are made *in advance*. Please visit the AP Environmental Science Ed-line calendar to determine any missed work.
- **Academic Honesty** is expected at all times and on ALL assignments. Please refer to the handbook for the details of consequences for academic dishonesty.

Course Outline*

Unit 1: Introduction to Environmental Science

- **Chapter 1: Environmental Problems and Sustainability**
 - An overview of population growth, biodiversity, resources, and pollution
 - The principles of sustainability
- **Chapter 2: Science, Matter, Energy, and Systems**
 - Energy concepts – energy forms; power; units; conversions; Law of Thermodynamics
 - An introduction to models and systems
- Supplement 1: Measurement Units
- Supplement 3: History of Environmental Science
- Labs and Activities:
 - The Lorax
 - *Tragedy of the Commons* Article/Questions and Lab Activity
 - Internet Activity: Ecological Footprint Analysis
 - Lab Activity: Introduction to Experimental Design
 - Quizzes, Class/Supplemental Work Packets
 - Exam(s)

Unit 2: The Living World: Ecosystems & Biodiversity

- **Chapter 3: Ecosystems: What Are They and How Do They Work?**
 - Earth's Life Support System: Atmosphere, Hydrosphere, Geosphere, and Biosphere
 - Components of an Ecosystem:
 - Energy Flow – Food chains/webs, trophic levels, ecological pyramids, photosynthesis and cellular respiration
 - Natural Biogeochemical Cycles: Water, carbon, nitrogen, phosphorus, sulfur, and conservation of matter
- **Chapter 4: Biodiversity and Evolution**
 - Ecosystem Diversity: Biodiversity, Natural Selection and Evolution, Speciation and Extinction
 - Species Diversity, Ecological Niches and Roles, Keystone Species
- **Chapter 5: Biodiversity and Species Interactions**
 - Interactions among species
- Supplement 5: Classifying and Naming Species
- Supplement 6: Components and Interactions in Major Biomes
- Labs and Activities:
 - Case studies
 - Biogeochemical Cycles Packet
 - Lab Activity: Owl Pellet Lab
 - Lab Activity: Biomagnification Through a Food Chain
 - Lab Activity: Food Webs
 - Lab Activity: Predator-Prey species Interaction simulation
 - Quizzes, Class/Supplemental Work Packets
 - Exam(s)

Unit 3: Population Dynamics

- **Chapter 5: Species Interactions and Population Control**
 - Population ecology, carrying capacity, reproductive strategies, ecological succession

*Labs, Activities, Sequence are subject to change depending on availability of materials or pace of the class.

▪ **Chapter 6: Human Population and Its Impact**

- Human population dynamics, distribution, Rate of Growth (Fertility rates, Immigration/Emigration Rates, Death/Mortality Rates)
- Population Size – Strategies for sustainability, case studies, national policies
- Impacts of population growth – hunger; disease; economic effects; resource use; habitat destruction

▪ Labs and Activities:

- Case studies
- Human Population Activity
- Lab Activity: Population Ecology Exercise
- Quizzes, Class/Supplemental Work Packets
- Exam(s)

Unit 4: Climate and Terrestrial Biodiversity

▪ **Chapter 7: Climate and Biodiversity**

- The Atmosphere – composition; weather and climate; Atmospheric circulation; solar intensity and latitude; seasons; atmosphere-ocean interactions; ENSO; coriolis effect
- How Climates affect Nature and Location of Biomes
- Major Terrestrial Biomes
- Human Impacts on Terrestrial Ecosystems

▪ Supplement 7: Weather Basics

▪ **Chapter 10: Sustaining Terrestrial Biodiversity: The Ecosystem Approach**

- Sustaining Forests/Forestry – tree plantations; old growth forests; forest fires; forest management; deforestation
- Sustaining Rangelands – overgrazing; deforestation; desertification
- Public and Federal lands - management; wilderness areas; national parks; wildlife refuges; forests and wetlands
- Land conservation options/Ecological Restoration

▪ Labs and Activities:

- Case studies
- Quizzes, Class/Supplemental Work Packets
- Lab Activity: Community Ecology: Forest Plot Analysis
- Lab Activity/Research: Butcher the Biomes – activity will guide students to an understanding of the location of climates, and biomes
- Exam(s)

Unit 5: Aquatic Biodiversity

▪ **Chapter 8: Aquatic Biodiversity**

- General nature of aquatic systems – freshwater/saltwater
- Services (economic/ecological) provided by aquatic systems
- Human impacts on Aquatic Ecosystems

▪ **Chapter 11: Sustaining Aquatic Biodiversity**

- Major threats to aquatic biodiversity – invasive species, population growth, climate change, overfishing
- Protecting marine biodiversity – relevant laws and treaties, marine sanctuaries, marine reserves
- Fisheries
- Sustaining wetlands

▪ Labs and Activities

- Field trip: Norwalk Maritime Aquarium

- Lab Activity: Life in a Watershed and/or Know Your Neighborhood
- Lab Activity: Oil Spill Bioremediation
- Lab Activity: Stream Ecology Kit
- Case studies
- Quizzes, Class/Supplemental Work Packets
- Exam

Unit 6: Food, Soil, and Pest Management

- **Chapter 12: Food, Soil, and Pest Management**
 - Agriculture – feeding a growing population (human nutritional requirements; types of agriculture; Green Revolution; genetic engineering and crop production; deforestation; irrigation; sustainable agriculture)
 - Soil composition and conservation
 - Environmental Impacts of Industrialized food production – soil erosion; drought; irrigation techniques and problems; air pollution and climate change; loss of biodiversity; aquaculture; biomagnification
 - Pests and Pesticides – laws and treaties; alternatives; integrated pest management
 - Sustainability
- **Labs and Activities**
 - *Silent Spring* – revisit sections of text and questions
 - Lab Activity: Biology and Chemistry of Soil Experiment
 - Case studies
 - Quizzes, Class/Supplemental Work Packets
 - Exam

Unit 7: Earth Systems and Resources

- **Chapter 13: Water Resources**
 - Global Water Resources and Use – freshwater/saltwater; water availability; agricultural, industrial, and domestic use; surface and groundwater issues; global problems; conservation
 - Using water more sustainably
- **Chapter 14: Geology and Nonrenewable Mineral Resources**
 - Earth's Major Geological Processes and Hazards – plate tectonics, earthquakes, volcanisms, weathering and erosion
 - Rock cycle and types
 - Mineral Resources and Environmental impacts of using them/Mining – mineral formation; extraction; global reserves; relevant laws and treaties
 - Using mineral resources more sustainably – recycling/reusing materials
- **Labs and Activities**
 - Lab Activity: Cookie Mining Lab
 - Case studies
 - Quizzes, Class/Supplemental Work Packets
 - Exam

Unit 8: Energy Resources and Consumption

- **Chapter 15: Nonrenewable Energy**
 - Energy Concepts
 - History, Current, and Future Predictions of Energy Use

*Labs, Activities, Sequence are subject to change depending on availability of materials or pace of the class.

- Fossil Fuel Resources and Use – formation of coal, oil, and natural gas; extraction/purification methods; world reserves and global demands; environmental advantages and disadvantages of sources
- Nuclear Energy – nuclear fission process; nuclear fuel; nuclear reactor; environmental advantages and disadvantages; safety issues; radiation and human health; radioactive wastes; nuclear fusion
- **Chapter 16: Energy Efficiency and Renewable Energy**
 - Energy Concepts
 - Energy Conservation – energy efficiency; reducing energy waste; energy efficient vehicles; mass transit
 - Solar Energy – solar heating; solar electricity; environmental advantages/disadvantages
 - Hydropower – dams; tidal energy; environmental advantages/disadvantages
 - Wind Power – wind farms and turbines; environmental advantages/disadvantages
 - Biomass – Biodiesel; ethanol; environmental advantages/disadvantages
 - Geothermal Energy – Geothermal heat pump; environmental advantages/disadvantages
 - Hydrogen – hydrogen fuel cells; environmental advantages/disadvantages
 - Sustainable energy transition – economics, politics, and education
- Labs and Activities
 - Research: Energy Sources/Presentations
 - Energy Audit
 - Lab activity: Alternative Energy Project (if time allows)
 - Case studies
 - Quizzes, Class/Supplemental Work Packets
 - Exam(s)

Unit 9: Pollution

- **Chapter 18: Air Pollution**
 - Layers of the Atmosphere
 - Composition of Air
 - Air Pollution – sources – primary and secondary; major air pollutants; measurement units; smog; acid deposition – causes and effects; heat islands and temperature inversions; indoor air pollution; remediation and reduction strategies; Clean Air Act and other relevant laws
- **Chapter 19: Climate Disruption and Ozone Depletion**
 - History of Climate Change – global warming; greenhouse gases and the greenhouse effect; impacts and consequences of climate change; reducing climate change; relevant laws and treaties
 - Stratospheric Ozone – formation of stratospheric ozone; UV radiation; cause of ozone depletion; effects of ozone depletion; strategies for reducing ozone depletion; relevant laws and treaties
- **Chapter 20: Water Pollution**
 - Causes and Effects of Water Pollution
 - Pollution of streams and lakes, groundwater, and oceans
 - Maintaining water quality; water purification; sewage treatment
 - Clean Water Act and other relevant laws
- Labs and Activities
 - Lab Activity: Water Quality Testing
 - Lab Activity: How Clean is Your Air?
 - Field Trip: Local wastewater treatment plant
 - Video: *An Inconvenient Truth* & Questions

- Case studies
- Quizzes, Class/Supplemental Work Packets
- Exam(s)

Unit 10: Environmental Hazards and Waste Management

- **Chapter 17: Environmental Hazards and Human Health**
 - Major human health hazards – biological, chemical, physical, and cultural factors
 - Risk assessment and management
- **Chapter 21: Solid and Hazardous Waste**
 - Types of Solid and Hazardous wastes
 - Waste Management – treatment/disposal of hazardous waste; reusing and recycling; storing hazardous waste
- **Chapter 9: Sustaining Biodiversity: The Species Approach**
 - Loss of biodiversity
 - Habitat loss; overuse; pollution; endangered and extinct species
 - Maintenance through conservation; relevant laws and treaties
- **Labs and Activities**
 - Lab Activity: Biodegradation and Landfills
 - Case studies
 - Quizzes, Class/Supplemental Work Packets
 - Exam(s)

Unit 11: Sustainability, Economics, and Politics

- **Chapter 22: Cities and Sustainability**
 - Population Trends in Urban Areas
 - Urban Land Development – planned development; suburban sprawl; urbanization
 - Effects of Transportation and Transportation Infrastructure
- **Chapter 23: Economics, Environment, and Sustainability**
 - World Bank
 - Supply and Demand
 - Economic Growth
- **Chapter 24: Politics, Environment, and Sustainability**
 - Environmental Policies
 - Major Environmental Groups
 - Environmentally sustainable societies
- **Chapter 25: Environmental Ethics, Worldviews, and Sustainability**
- **Supplement 9: Environmental Data and Data Analysis**
- **Labs and Activities:**
 - End-of-Year Projects (including Post-APES exam project – substantial part of 4th marking period grade – details TBA)
 - Case studies
 - Quizzes, Class/Supplemental Work Packets
 - Exam(s)

Unit 12: APES EXAM REVIEW

- Study Guide
- Mock Exam(s)

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Additional NOTES: