

AP Environmental Science Syllabus

COURSE SIZE AND SCHEDULING

AP Environmental Science is limited to 24 students due to restricted laboratory workspace. The class will meet for four 46-minute periods and one double lab period of 96 minutes per week for the duration of the school year.

COURSE OBJECTIVE

The goal of the AP Environmental Science 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.

TEXTBOOK

Environmental Science for AP, 2nd Edition by Friedland and Relyea. W. H. Freeman and Company, 2015.

ADDITIONAL MATERIALS

- *Living in the Environment, 18th Edition* by G, Tyler Miller, Jr. and Scott Spoolman. National Geographic Learning, 2012.
- National Geographic Magazine
- The New York Times Newspaper
- The Washington Post Newspaper
- Previously released AP Exams

COURSE OVERVIEW

The AP Environmental Science Course is equivalent to a college-level introductory environmental science course. Students will use hands-on laboratory experiments, class discussions, group research projects, traditional class and homework assignments, and tests and quizzes to evaluate environmental issues and content and relate these experiences to their everyday lives. Students will analyze the impact of human activity on the environment as well as the impact of environmental issues and conditions on everyday human life and health. Students will use inquiry to create experimentation procedures to evaluate natural phenomena. They will analyze data collected via field and laboratory experiments, ecological surveys, and internet-based research to determine the state of resources within their local environments and to develop solutions to current environmental issues.

Students will be quizzed on each topic within all units and will be tested upon completion of each unit. Throughout each unit, students will read current articles pertaining to

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both the local and nonlocal environment and examine the effect and interdependence of small ecosystems on the global environment. Homework will consist of studying these articles in preparation for class discussions as well as completion of mathematical-based problems pertaining to the current class topic. The articles will be discussed in detail and the problems will be reviewed at the beginning of the class during which the assignment is due.

Students will be responsible for maintaining an orderly laboratory notebook that will be graded at the end of each marking period. In addition to maintaining a laboratory notebook, students will be required to complete a formal, detailed laboratory report for each investigation throughout the school year. These reports will be graded based upon the Science Department's laboratory report rubric.

LABORATORY ACTIVITIES AND PROJECTS

Environmental Issues Portfolio – Students will be responsible for starting an environmental portfolio at the beginning of the school year and add to the portfolio throughout the year. Students will be required to find and add one article per week that focuses on a current environmental issue around the world. Students will write a brief response to each article, including the article's source, bias, personal opinion, and importance in the scientific community as well as include a copy of the full article in their portfolios. Portfolios will be presented to the class at the end of the school year.

Who's Got the Power? – Students will explore the relationship between work and power. They will first learn to differentiate between the two, and then will calculate how much work is required to use up the energy in a snack.

Ecosystem Field Walk – Students will observe an ecosystem in nature using the high school's forest trails.

How Much Paper Do You Use? – Students will evaluate how much paper they use and calculate the impact of this use on the environment.

Weather Report Lab – Students will record daily weather data including temperature, wind speeds, barometric pressure, humidity, and precipitation. The data will be plotted on graphs and used to compare yearly patterns and averages. Students will predict future local weather events by examining current global weather systems.

Hurricane Tracking Lab – Students will track the path of an Atlantic or Pacific hurricane or tropical system. They will examine and record data on storm direction, wind speed, pressure, and precipitation. The data will be used to predict longevity, path of travel, and path as it relates to human populations. Students will also analyze the severity of hurricane landfall at

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specific locations. All data compiled will be added to a class database to be used in future investigations.

Biome Presentations – Students will select a unique biome and create a brief PowerPoint or Prezi presentation including climatic characteristics and species diversity.

Calculating the Diversity of Trail Mix Using Shannon’s Index – Students will use the Shannon-Weaver Index to compare diversity of ecosystems and to quantify species evenness and species richness in communities of trail mix.

Endangered Species Project – Students will select an endangered species from around the world and develop a presentation outlining location, habitat, niche requirements, and issues leading to the listing of the species on the Endangered Species List.

How Large is your Home? – Students will consider how logging affects habitat loss by calculating how much lumber is used for an average house in the United States.

Climate Change – Students observe the greenhouse effect and analyze its impact on Earth using models with bottles, light, and paper.

Measuring Your Impact: GDP & Footprints – Students will calculate and determine the relationship between ecological footprint and the GDP for China, India, Japan, and the United States. Students will then discuss environmental equity between a developed nation and a less-developed nation and identify two goals of the United Nations Millennium Declaration that would assist a less-developed nation in environmental equity.

Coal Cookie Lab – Students will model a coal mining organization. The goal of the project is to properly balance land and equipment acquisition with profit margins. Students will relate the activity to a real coal mining operation examining potential assets and liabilities.

News Report Assignment – Students will conduct research on a particular tectonic event in history and develop a newscast explaining where the event took place, why it took place, how it affected manmade and natural environments, and how the event played a role in shaping our history.

Soil Quality Lab – Students will collect experimental data on soil samples taken from on-campus test sites. The data will include soil type, color, percent moisture, percolation rate, organic matter content, temperature, and chemistry. Students will compare samples from various test sites and analyze soil composition in relation to surrounding environment. Data will be compiled in google classroom drive to be used for yearly analysis.

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Salinization Study – Students will design an experiment to test the effects salinization of soil has on germination of crop seeds. Through their investigation, students will determine salinization thresholds for specific crop seeds/plants relating their findings to soil salinity and water resource use in agricultural states.

Water Loss: Drop by Drop – Students will estimate household water loss from common leaks and extrapolate water loss to the surrounding community to demonstrate how minor events, when occurring often, may result in large effects.

EcoBottle – Students will build and observe a land and water ecosystem. They will observe abiotic and biotic interactions between the two systems as well as observe and review carbon, nitrogen, and water cycles.

Saving Water – Students will calculate the impact of installing low-flow shower heads and toilets that use less water to consider the amount of water conserved and the economic benefits of conserving water.

Waste and Its Effects on Atmospheric Carbon Dioxide – Students will evaluate the effect of the presence of pollutants such as sewage and agricultural runoff on atmospheric carbon dioxide.

Testing for Tropospheric Ozone Pollution – Students will prepare and carry out tests for tropospheric ozone pollution by making test strips. They will then analyze the ozone pollution test results for local variation and possible impact on human health.

Ozone Sampling – Students will determine the amount of ozone present in different areas.

What's In Our Trash? – Students will examine the types and amounts of waste they generate in a day.

Solid Waste Composting – Students will research the rate of decomposition of commonly used waste items. Students will collect data on percent decomposition at specific intervals throughout the year and plot the decomposition curve for each item. Students will use their data to interpret the affect product use has on the waste flow in the United States and analyze issues surrounding waste disposal and recycling as well as raw material usage.

Brownfield Remediation – Students will develop a detailed remediation plan for a Brownfield site in their community from the perspective of an environmental technician. The plan will outline dangers of contaminates in the area, potential impacts on the public, scope and sequence of testing, and future goals for the site. Students will ultimately compare their unique plans to actual ongoing remediation of the site.

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Tracking Diseases Activity – Students will analyze the spread of diseases born from environmental contamination by plotting confirmed cases on a map and examining the global impacts of the disease.

How Does Risk Affect Life Expectancy? – Students will examine risky behaviors by determining how they can affect life expectancy.

Determining Population Size – Students will use the quadrant method to study communities and to calculate the density and frequency of species in a particular community.

Global Population Trend Statistics Lab – Students will compare population statistics among developed and non-developed countries around the world. Students correlate population trends to resource availability and resource use.

Virtual Cemetery – Students will visit several “virtual cemeteries” to collect data on human life span demographics from various generations. Students will plot data and examine life expectancy values from the gathered information.

The Costs of Commuting – Students will use online calculators to determine the monetary and environmental impact of commuting to-and-from work, school, and recreational activities by foot, car, and public transportation methods.

Forest Management Plan – Students will conduct a detailed analysis on a parcel of forest. Included in the analysis will be species composition and abundances, average tree age, harvestable timber, firewood timber, wildlife value, historic land use, and current land use. Students will prepare a report to a homeowner recommending a management plan for the forest that includes harvesting timber, increasing wildlife diversity, and maintaining aesthetical value. All data collected will be included in the report as well as included in a class database for future use.

Plan a City – Students will use their knowledge of urban sprawl and smart-growth development to design a city that fosters environmental awareness, community togetherness, and limits urban sprawl.

Ecological Footprint of Food Consumption – Students will examine data on the amount of different foods consumed by a typical person in the United States and the ecological footprint of producing these items. Students will then calculate the ecological footprint for the total amount of each food item consumed in the United States and compare this footprint to that of others in the world.

Home Energy Audit – Students will analyze the ways electricity is used in their household and determine the amount of energy used by their families. They will be responsible for describing

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ways to reduce their energy use and conservation strategies. Students will collect data on amount of appliances and lights, hours used by electrical appliances, and electrical energy used to operate the individual appliances.

Coal Investigations – Students will measure and calculate the percentage of water found in the four different types of coal.

Choosing a Car: Conventional or Hybrid? – Students will determine the pros and cons of choosing a hybrid or a conventional vehicle.

Solar Energy – Students will experiment with solar cells and compare energy output with different variables in order to learn how passive solar systems work.

Solar Oven – Students will research, design, and build working solar ovens made from recyclable materials.

Indoor Air Quality Survey/Lab – Students will conduct a school wide survey on Indoor Air Quality. They will survey faculty and students, compile data, and create a PowerPoint presentation to be presented to the school administration. Including in their research will be information on indoor air samples collected throughout the school.

Litter Lab/Campus Survey – Students will develop a survey that will examine the composition and amount of litter found on their school's campus. Students will analyze percentages of litter type and abundance and offer explanations of their findings. Following the survey, students will develop a plan to implement a Recycling Program in their school and further enhance recycling awareness in their community.

Campus Cleanup – Students will organize a campus cleanup and school wide Environmental Awareness Day.

COURSE/TOPIC OUTLINE

UNIT 1: Introduction to Environmental Science

<i>Chapter</i>	<i>Mod</i>	<i>Topic</i>	<i>Week</i>	<i>Labs</i>
1-Studying the State of Our Earth	1 2	Environmental Science Indicators and Sustainability	1	
2-Environmental Systems	4 5	Systems and Matter Energy, Flows, and Feedbacks	2	<i>*Who's Got the Power?</i>

Unit 1 Test – Chapters 1 & 2

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UNIT 2: The Living World

<i>Chapter</i>	<i>Mod</i>	<i>Topic</i>	<i>Week</i>	<i>Labs</i>
3-Ecosystem Ecology	6	Movement of Energy	3-4	*Ecosystem Field Walk *How Much Paper Do You Use?
	7	Movement of Matter		
	8	Responses to Disturbances		
4-Global Climates and Biomes	9	Unequal Heating of Earth	5-6	*Weather Report Lab *Hurricane Tracking Lab *Biome Presentations
	10	Air Currents		
	11	Ocean Currents		
	12	Terrestrial Biomes		
	13	Aquatic Biomes		
5-Evolution of Biodiversity	14	Biodiversity of Earth	7-8	*Calculating the Diversity of Trail Mix Using Shannon's Index *Endangered Species Project
	15	How Evolution Creates Biodiversity		
	16	Speciation and the Pace of Evolution		
	17	Evolution of Niches and Species Distributions		

Unit 2 Test – Chapters 3, 4, & 5

UNIT 3: Global Change and a Sustainable Society

<i>Chapter</i>	<i>Mod</i>	<i>Topic</i>	<i>Week</i>	<i>Labs</i>
18-Conservation of Biodiversity	59	Sixth Mass Extinction	9-10	*How Large is your Home?
	60	Causes of Declining Biodiversity		
	61	Conservation of Biodiversity		
19-Global Change	62	Global Climate Change and the Greenhouse Effect	11-12	*Climate Change
	63	Evidence for Global Warming		
	64	Consequences of Global Climate Change		
20-Sustainability, Economics, and Equity	65	Sustainability and Economics	13-14	*Measuring Your Impact: GDP & Footprints
	66	Regulations and Equity		

Unit 3 Test – Chapters 18, 19, & 20

UNIT 4: Earth Systems and Resources and Water Use

<i>Chapter</i>	<i>Mod</i>	<i>Topic</i>	<i>Week</i>	<i>Labs</i>
8-EarthSystems	24	Mineral Resources and Geology Plate Tectonics, Rock Cycle	15-16	*Coal Cookie Lab *News Report Assignment *Soil Quality Lab *Salinization Study *Geological Timescale
	25	Weathering and Soil Science		
9-Water Resources	26	The Availability of Water	17-18	*Water Loss: Drop by Drop Investigation *Eco Bottle *Saving Water
	27	Human Alteration of Water Availability		
	28	Human Water Use Now & in the Future		

Unit 4 Test – Chapters 8 & 9

MID – TERM EXAM / AP EXAM SIMULATION

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UNIT 5: Pollution

<i>Chapter</i>	<i>Mod</i>	<i>Topic</i>	<i>Week</i>	<i>Labs</i>
14-Water Pollution	41	Wastewater from Humans & Livestock	19-20	<i>*Waste & Its Effects on Atmospheric Carbon Dioxide</i>
	42	Heavy Metals and Other Chemicals		
	43	Oil Pollution		
	44	Nonchemical Water Pollution		
	45	Water Pollution Laws		
15-Air Pollution and Stratospheric Ozone Depletion	46	Major Air Pollutants and Their Sources	21-22	<i>*Testing for Tropospheric Ozone Pollution</i> <i>*Ozone Sampling</i>
	47	Photochemical Smog and Acid Rain		
	48	Pollution Control Measures		
	49	Stratospheric Ozone Depletion		
	50	Indoor Air Pollution		
16-Waste Generation and Waste Disposal	51	Only Humans Generate Waste	23-24	<i>*What's In Our Trash?</i> <i>*Solid Waste Composting Lab</i> <i>*Brownfield Remediation</i>
	52	The Three R's and Composting		
	53	Landfills and Incineration		
	54	Hazardous Waste		
	55	New Ways to Think About Solid Waste		
17-Human Health and Environmental Risks	56	Human Disease	25-26	<i>*Tracking Diseases Activity</i> <i>*How Does Risk Affect Life Expectancy?</i>
	57	Toxicology and Chemical Risks		
	58	Risk Analysis		

Unit 5 Test – Chapters 14 – 17

UNIT 6: Biological and Human Populations

<i>Chapter</i>	<i>Mod</i>	<i>Topic</i>	<i>Week</i>	<i>Labs</i>
6-Population and Community Ecology	18	Abundance & Distribution of Populations	27	<i>*Determining Population Size</i>
	19	Population Growth Models		
	20	Community Ecology		
	21	Community Succession		
7-The Human Population	22	Human Population Numbers	28	<i>*Global Population Trend Statistics Lab</i> <i>*Virtual Cemetery Lab</i>
	23	Economic Development, Consumption, & Sustainability		

Unit 6 Test – Chapters 6 & 7

UNIT 7: Land Use

<i>Chapter</i>	<i>Mod</i>	<i>Topic</i>	<i>Week</i>	<i>Labs</i>
10-Land, Public, & Private	29	Land Use Concepts & Classification	29-30	<i>*The Costs of Commuting</i> <i>*Forest Management Plan</i> <i>*Plan A City Project</i>
	30	Land Management Practices Rangelands, Forestry, Fire Management Wildlife Refuge and Wilderness Federal Regulations Residential Use and Urban Sprawl		

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11-Feeding the World	31	Human Nutritional Needs	31-32	<i>*Ecological Footprint of Food Consumption</i>
	32	Modern Large-Scale Farming Methods		
	33	Alternatives to Industrial Farming Methods		

Unit 7 Test – Chapters 10 & 11

UNIT 8: Energy Resources and Consumption

<i>Chapter</i>	<i>Mod</i>	<i>Topic</i>	<i>Week</i>	<i>Labs</i>
12-Nonrenewable Energy Resources	34	Patterns of Energy Use	33-34	<i>*Home Energy Audit Lab *Coal Investigations *Choosing a Car: Conventional or Hybrid?</i>
	35	Fossil Fuel Resources		
	36	Nuclear Energy Resources		
13-Achieving Energy Sustainability	37	Conservation, Efficiency, & Renewable Energy	35-36	<i>*Solar Energy *Solar Oven</i>
	38	Biomass and Water		
	39	Solar, Wind, Geothermal, & Hydrogen		
	40	Planning Our Energy Future		

AP Exam Review

AP EXAM

Indoor Air Quality Survey/Lab	Remainder of the School year
Litter Lab/Campus Survey and Campus Clean Up	