# AP Environmental Science Syllabus Spring Semester 2019

**Course Overview**

This course is designed to cover a variety of topics within the sciences. The goal is to provide you 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 risk factors of these problems, and to examine alternative solutions for resolving or preventing them. Emphasis in this class is placed on science as a process, energy conversions underlying all ecological processes, the Earth as an interconnected system, how humans alter the environment, environmental problems and their social context and developing sustainable practices. This course adheres to the objectives instituted by the College Board for all AP Environmental Science.

This is a laboratory course in which you are expected to follow scientific methodologies, collect data and make accurate hypotheses.

The objectives of this course are that each student shall:

* Demonstrate skills using various types of instrumentation and scientific methodologies
* Learn how to read and critique scientific research articles in the field of Environmental Science
* Practice using data collected to solve scientific problems
* Apply their knowledge and critical thinking to current social concerns

# **Reading Materials**

This course will utilize the following textbook:

 *Living in the Environment* by Miller & Spoolman, 17th Edition, Belmont, CA: Brooks/Cole, 2012

Additional Reading comes from the following books:

*The Ethics of What We Eat: Why Our Food Choices Matter* by Peter Singer and Jim Mason

*Cradle to Cradle: Remaking the Way We Make Things* by Michael Braungart and William McDonough

*Tomatoland, Third Edition: From Harvest of Shame to Harvest of Hope* by Barry Estabrook

*The Sixth Extinction: An Unnatural History,* by Elizabeth Kolbert

*Garbology: Our Dirty Love Affair with Trash* by Edward Humes

*The Big Thirst: The Secret Life and Turbulent Future of Water* by Charles Fishman

Various Articles and Case Studies will also be utilized for students to become aware of current issues.

**Recommended Student Materials**

The key to success in an advanced placement course is organization. For you to be organized it is recommended that you have the following:

* **Lined composition book** for chapter notes.
* **Binder** with the following sections
	+ Powerpoint notes
	+ Laboratory
	+ Practice Questions
	+ Additional Readings
	+ Homework and various class work
* In general you will not be permitted to use a Calculator. However, in some cases I may permit you to use it for data collection.
* 3 x 5 index cards
* Pens and pencils for writing
* UCPS Chromebook or other laptop computer

# **Methodologies**

# **Lab Component**

Laboratory investigations are a very important component of this course. Through lab work you are required to use higher thinking skills, apply concepts in real situations and perform science skills such as data collection, analysis and communicating results. Laboratory exercises utilize the inquiry method. Students will participate in many hands on activities and AP style labs. Labs will be run approximately once per week. You will keep lab journals for all laboratory investigations, and will need to present complete lab write ups including background information, data collection, data analysis, conclusions and further inquiries.

**Lectures**

Because this course parallels an introductory college course I will lecture several times per unit. In lecture I will present topics in relation to the current data available. I will utilize pictures, graphs, and other various visual aids. Lectures will consist of note-taking as well as discussion.

**Field Trips**

A field trip to the Monroe, NC wastewater treatment plant will be scheduled. 100 % Attendance is expected.

One additional field trip may be scheduled for after the AP exam.

**Classroom Policies**

1. Late work will not be accepted. However, I understand that life happens and sometimes you need a little more time to do your best**.** You may turn in an assignment late up to the date of the unit exam for **half credit.**
2. The key to your success in Environmental Science is attending class each day. If you experience absences you will fall behind and need to spend time after school to catch up. You will be permitted time equal to the length of your absence to make up any assignments that were missed. **After 3 absences (excused and unexcused) you may be dropped from the class.**
3. In order to learn you need to be present in class. You may leave for the restroom only in the case of emergency.
4. If a student would like extra help on an assignment or is having difficulty with the current topic, s/he may come in for tutoring before school, after school, or during Cougar Time. You must check with me to make an appointment after school.
5. Students are expected to behave as adults. Behavior that is disruptive to the learning environment will not be tolerated.
6. Absolutely no food or drink (except water).

**Student Assessment**

Tests and Quizzes 45%

 Lab Reports 35%

 Other 20% (Homework and class assignments)

**Course Outline**

**Please note, these are the minimum labs that will be conducted. Labs may be added throughout the course of the semester.**

**Unit 1: Introduction to Environmental Science – 4 classes**

* Chapter 1:
	+ Environmental Problems and Causes
	+ Tragedy of Commons
	+ Ecological Footprints
* Chapter 25:
	+ Environmental Ethics
	+ Sustainability
* Supplement 3:
	+ History of Environmental Science (S6- S10)
* Labs and Activities:
	+ Environmental History Timeline
	+ The Lorax and Sustainable Development
	+ Tragedy of Commons Lab Activity
	+ The Material World
	+ Ecological Footprint Calculator

**Unit 2: Science, Matter and Energy – 4 classes**

* Chapter 2:
	+ Scientific Inquiry
	+ Basic chemistry Review
	+ Conservation of Matter
	+ Energy
	+ Conservation of Energy
	+ Systems
* Supplement 1:
	+ Measurement Units (S2)
* Supplement 3:
	+ Reading Graphs and Maps (S3- S5)
* Supplement 4:
	+ Some Basic Chemistry (S11-S17)
* Labs and Activities:
	+ Energy in Food – Experimental Inquiry Lab
	+ Basic Chemistry Review Packet
	+ Unit Conversion Problems
	+ Conservation of Energy Collage

**Unit 3: Population Dynamics – 6 classes**

* Chapter 5:
	+ Limits
		- Age Structure, Range of Tolerance, Limiting Factors
		- Carrying Capacity and Population Crash
		- Exponential and Logistic Growth (J/S Curves)
		- Reproductive Strategies (r-selected/k-selected species)
		- Population Density
		- Natural Ecological Change: Climate shift, Succession, Species Movement
* Chapter 6:
	+ Historical Population Size
	+ World Population Distribution
	+ Future Population Predictions
	+ Rate of Growth (r=BIDE)
		- Birth/Fertility Rates, Immigration/Emigration Rates, Death/Mortality Rates
	+ Doubling Times
	+ Life Expectancy and Age Structure Diagrams
	+ Human Population Sustainability
		- Demographic Transition, Family Planning
	+ National Policies
		- Focus of China, India, and United States
	+ Impacts
		- Hunger, Disease, Economic Effects, Resource Use, Habitat Destruction
* Labs and Activities:
	+ Population Estimation and Simulation Lab
	+ Reading: UN’s *The World at Six Billion* Introduction and Analysis Questions
	+ Video: The World In Balance and Questions
	+ The Human Population – Too Many People? Graphing Activity
	+ Power of the Pyramids
	+ Research: Population Issues in China and India

**Unit 4: Ecosystems and Biodiversity- 10 Classes**

* Chapter 3:
* Components of an Ecosystem
* Energy Flow- Food chains/webs, trophic levels, ecological pyramids
* Photosynthesis and Respiration
* Biogeochemical Cycles- carbon, nitrogen, phosphorous, sulfur
* Chapter 4:
* Biodiversity
* Evolution and natural selection
* Geologic time scale
* Speciation
* Species diversity and edge effects
* Ecological niches
* Ecological roles- native, nonnative, indicator, keystone, foundation species
* Chapter 5:
* Species interactions- competition, predation, symbiotic relationships
* Chapter 9:
* Extinction: causes, rates
* Endangered/threatened species
* International Treaties and Laws
	+ - Convention on International Trade in Endangered Species
		- Convention on biological diversity
		- Endangered Species Act of 1973
* Protecting Species
	+ - Wildlife Refuges, Gene Banks, Botanical Gardens, Wildlife Farms, Zoo and Aquariums
* Supplement 5:
	+ Classifying and Naming Species (S18-S19)
* Supplement 6:
	+ Components and Interactions in Major Biomes (S20-S25)
* Labs and Activities:
	+ Food Chain and Web Activity
	+ Biogeochemical Cycles Packet
	+ Carbon Budget
	+ Biodiversity in Ecosystems Field Investigation
	+ Eco column (Extended Lab Investigation)
	+ Reading: Examining Stages of Ecological Succession and Questions
	+ Research: Endangered/ Extinct Species
	+ Video: The Cove and Questions

**Unit 5: Terrestrial Biodiversity – 4 classes**

* Chapter 7:
	+ Weather v. Climate
	+ Factors Influencing Climate
		- Solar intensity and Latitude, Seasons, Ocean currents, Trade Winds, Greenhouse Gases, Atmosphere-Ocean Interactions, ENSO
		- Coriolis Effect
		- Local climate
	+ Major Terrestrial Biomes
	+ Human Impacts on Terrestrial Ecosystems
* Chapter 10:
	+ Sustaining Forests, Deforestation
	+ Sustaining rangelands, Overgrazing
	+ Desertification
	+ Parks and Nature Reserves
	+ Ecological Restoration
* Supplement 6:
	+ Components and Interactions in Major Biomes (S20-S25)
* Labs and Activities:
	+ A Local Weather Study Field Study
	+ Webquest: Virtual Meteorology 101
	+ Research: Major Terrestrial Biomes
	+ Continue Eco column

**Unit 6: Aquatic Biodiversity – 4 classes**

* Chapter 8:
	+ Organization of Aquatic Systems
		- Freshwater and Marine
	+ Aquatic Biomes
		- Freshwater and Marine
	+ Human Impacts on Aquatic Ecosystems
* Chapter 11:
	+ Threats to Aquatic Biodiversity
		- Invasive Species, Population Growth, Climate Change, Overfishing
	+ Sustaining Aquatic Biodiversity
		- Laws and Treaties, Economic Incentives, Marine Sanctuaries, Marine Reserves
	+ Fisheries
	+ Sustaining Wetlands
* Labs and Activities:
	+ Continue Eco column
	+ Video: Empty Oceans, Empty Nets and Questions
	+ Group Presentations on *And the Waters Turned to Blood* by Rodney Barker

**Unit 7: Food, Soil and Pests – 6 classes**

* Chapter 12:
	+ Food Security
		- Malnutrition, Hunger, Famine, Over Nutrition, Government Involvement
	+ Agriculture
		- Industrialized Agriculture, Hydroponics, Traditional Agriculture, Genetic Engineering, Green Revolution
	+ Meat, Fish, and Shellfish Production
	+ Environmental Impacts
		- Soil Types and Soil Erosion
		- Drought
		- Irrigation Techniques and Problems
		- Air Pollution and Climate Change
		- Loss of Biodiversity
		- Genetic Engineering
		- Aquaculture
	+ Pests and Pesticides
		- Advantages and Disadvantages
		- Laws and Treaties
			* Federal Insecticide, Fungicide, and Rodenticide Act
		- Alternatives
		- Pest Management
	+ Sustainability
		- Reducing Soil Erosion, Soil Fertility, Soil Salinity, Desertification, Sustainable Aquaculture, Efficient Meat Production, Organic Agriculture
* Labs and Activities:
	+ Soil Texture Lab
	+ Soil Quality Testing (temperature, salinity, pH, Moisture)
	+ Research: Pesticides
	+ Pesticide Label Lab
	+ Toxicity of Pesticides Lab
	+ Group Presentations on *The Omnivore’s Dilemma: A Natural History of Four Meals* by Michael Pollan
	+ Video: Food Inc. and Questions

**Unit 8: Earth Systems and Resources – 6 classes**

* Chapter 14:
	+ Geologic Processes
		- Plate Tectonics, Rock Cycle and Types, Weathering and Erosion, Earthquakes and Volcanoes
	+ Resources
		- Nonrenewable and renewable
		- Mineral Formation and Global Reserves
	+ Environmental Impacts
		- Mining
		- Depletion
	+ Sustaining Minerals
		- Recycling, Substitutes
	+ Laws and Regulations
* Chapter 15:
	+ History, Current, and Future Predictions of Energy Use
	+ Nonrenewable Energy Resources
	+ Oil
		- Formation, Availability of Supplies, Extraction Methods, Advantages and Disadvantages
	+ Coal
		- Formation, Availability of Supplies, Extraction Methods, Advantages and Disadvantages
	+ Nuclear Energy
		- How Reactors Work, Nuclear Fuel Cycle, Advantages and Disadvantages, Safety, Radioactive Waste, Radiation and Heath Effects
* Chapter 16:
	+ Energy Efficiency
	+ Reducing Energy Waste
	+ Solar Energy
		- Solar Heating, Solar Electricity, Advantages and Disadvantages
	+ Hydropower
		- Dams, Tidal Energy, Advantages and Disadvantages
	+ Wind Power
		- Wind Farms and Turbines, Advantages and Disadvantages
	+ Biomass
		- Advantages and Disadvantages, Biodiesel, Ethanol
	+ Geothermal Energy
		- Geothermal Heat Pump, Advantages and Disadvantages
	+ Hydrogen
		- Hydrogen Fuel Cells, Advantages and Disadvantages
	+ Sustainable Energy Transition
		- Economics, Politics, and Education
* Labs and Activities:
	+ Cookie Mining Lab
	+ Research: Alternative Energy Sources and Presentations
	+ Energy Audit
	+ Videos: Chernobyl and Fukushima Daiichi

**Unit 9: Water and Pollution – 5 classes**

* Chapter 13:
	+ Global Distribution of Water
	+ Groundwater, Aquifers, surface Water, Watersheds
	+ Human usage, Water Footprint
	+ Shortages, Drought and Hunger
	+ Dams, Aqueducts
		- Advantages and Disadvantages
	+ Desalination
	+ Water Sustainability
		- Water Waste, Irrigation, Conservation Techniques
	+ Flooding
* Chapter 20:
	+ Sources of Water Pollution
	+ Major Pollutants and Their Effects
	+ Pollution of Streams and Lakes
		- Eutrophication
	+ Pollution of Groundwater and Drinking Resources
		- Purifying Drinking Water, Us Safe Drinking Water Act, Bottled Water
	+ Maintaining Water Quality
	+ Pollution of Oceans
		- Oxygen Depletion, Oil, Other Sources
	+ Reducing and Preventing Water Pollution
		- Clean Water Act of 1972, Sewage Treatment
* Labs and Activities:
	+ Water Quality Testing
	+ Home Water Use Survey
	+ Eutrophication Lab
	+ Thermal Pollution and Dissolved Oxygen Lab
	+ Biodegradable Materials and Dissolved Oxygen Lab
	+ Group Presentations: *When the Rivers Run Dry: Water- The Defining Crisis of the Twenty-First Century* by Fred Pearce
	+ Video: Water Wars

**Unit 10: Air & Pollution – 5 Classes**

* Chapter 18:
* Layers of the atmosphere
* Composition of the air
* Sources of Air Pollution
* Primary and secondary
* Carbon oxides, sulfur dioxide, sulfuric acid, particulates, ozone, volatile organic compounds
* Industrial smog, Photochemical smog
* Heat Islands, temperature inversions
* Acid deposition
* Indoor air pollution
* Health affects
* Reducing & preventing air pollution
* Laws & regulations, economics, education
* Chapter 19:
* History of climate change
* Natural Greenhouse Effect
* Human impact
* Release of Greenhouse Gases
* Cause & effects
* CO2 emissions, waste heat, solar radiation, oceans, cloud cover, air pollution
* Drought, melting of snow, ice, & permafrost, raising sea levels, extreme weather, loss of biodiversity, agriculture, human health
* Prevention & reduction
* Government involvement, economics, education
* Ozone depletion
* Causes & effects
* Reversing ozone depletion
* Labs and Activities
* Air pollutant posters
* Air particulates lab
* Volcanoes & Ozone Deletion Activity
* Greenhouse Effect Lab
* Webquest: Stratospheric Ozone Depletion
* Video: An Inconvenient Truth & Questions
* Sunscreen Comparison Lab
* Acid Deposition Lab
* Investigating Indoor CO2 Concentrations Lab
* Car Emissions Lab using Gastex equipment

**Unit 11: Environmental Hazards and Waste Management – 5 Classes**

* Chapter 17:
* Risk assessment & Management
* Biological hazards
* Chemical hazards
* Chapter 21:
* Solid & toxic wastes
* Waste management
* Reduce, reuse, recycle
* Burning & burying waste
* Storing hazardous waste
* Laws & regulations
* Labs & Activities
* What’s in our Trash? Audit
* Research: Landfills & Recycling Centers
* Group Presentations: *Raising Elijah: Protecting Our Children in an Age of Environmental Crisis* by [Sandra Steingraber](http://www.goodreads.com/author/show/79156.Sandra_Steingraber)

Field Trip: Monroe Waste Water Treatment Plant

**Unit 12: Sustainability, Economics and Politics – 5 Classes**

* Chapter 22:
* Urbanization & Urban planning
* Environmental impacts
* Ecological Footprints, llack of vegetation, water problems, sanitation, noise pollution, light pollution
* Effects of Transportation & Transportation Infrastructure
* Chapter 23:
* World Bank
* Supply and Demand
* Economic Growth
* Economic Costs & Benefit Analysis
* Taxes & Fees
* Poverty and the Environment
* Sustainable Economics
* Chapter 24:
* Politics & the Environment
* Environmental Policies
* Major Environmental Groups
* Environmentally Sustainable Societies
* Labs and Activities
* Sustainability Projects
* Group Presentations on Hot*,*Flat, and Crowded*:* *Why We Need a Green Revolution--and How It Can Renew America* by Thomas L. Friedman

**AP Exam on May 6, 2019**

The AP Environmental Science examination consists of two sections: Section I has 100 multiple choice questions; Section II has four free-response questions. You will have 90 minutes for each section.

AP Environmental Science

2019

***Return this paper with signatures!***

**Syllabus Acknowledgement**

I acknowledge that I have read and understand the class syllabus for APES.

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Student Printed Name Student Signed Name Period

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Parent Printed Name Parent Signed Name

**Photo Release**

Throughout the course of the year your student will participate in activities such as field trips, science research presentations, and laboratory activities that I would like to document and share with you via the class website. Thank you for your continued support.

\_\_\_\_\_\_Permission authorized Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_I do not authorize permission Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_

**Parent/ Guardian Contact Information and Preferences (please print clearly)**

Parent/Guardian Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Daytime Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Home Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Email Address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Parent/Guardian Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Daytime Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Home Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Email Address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

My preferred method of contact is through email for communication with parents/guardians.

\_\_\_ Yes, the teacher MAY contact me via email regarding my son or daughter’s.

\_\_\_ No, contact me via phone. Best hours to reach: \_\_\_\_\_\_\_\_\_\_\_

 **SCHOOL**

 **LABORATORY SAFETY CONTRACT**

Science is a hands on laboratory class. Safety in the science classroom is the number one priority for students, teachers, and parents. To ensure a safe science classroom, a list of rules have been developed and provided to you in this student safety contract. These rules must be followed at all times.. Students and parents must sign off with their individual science instructor acknowledging these rules before participating in any science laboratories.

General Guidelines

1. Conduct yourself in a responsible manner at all times in the laboratory. Never fool around; do not wander around the room, distract other students, or interfere with the lab experiments of other students.
2. No student may work in the lab without an instructor present.
3. Never touch any equipment, chemicals, or other materials until you are instructed to do so.
4. You may not eat or drink in the lab.
5. Carefully follow all teacher-given and written instructions. Unauthorized experiments are prohibited.
6. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory.
7. Work areas should be kept clean and neat at all times. Bring only your lab instructions, worksheets, and/or reports to the work area. Other materials (books, purses, back pacts, etc.) must be stored away from the work area.
8. Know the locations and operating procedures of all safety equipment including the first aid kid, eyewash stations, safety shower, fire extinguisher and fire blanket. Know where the fire alarm and exits are located.
9. Dispose of all chemical waste properly. Never mix chemicals in sink drains. Sinks are to be used only for water and those solutions that may be disposed of properly in the sink (as instructed by teacher). Solid chemicals, metal, matches, filter paper and all other insoluble materials are to be disposed of in the proper waste containers.
10. Keep hands away from face, eyes, mouth and body while using chemical or preserved specimens. Wash your hands with soap and water after performing all experiments. Clean and wipe all work surfaces and apparatus at the end of the experiment. Throw away all trash and waste into appropriate containers.
11. You will be assigned a lab station at which to work. You may not wander around the lab.
12. If there is a fire drill during your lab period, turn off gas values, fume hoods and electrical equipment before leaving. Bring your back pack/purse with you outside.
13. Handle all living organisms used in a laboratory activity in a humane manner. Preserved biological materials are to be treated with respect and disposed of property.
14. When using knives and other sharp instruments, always carry with tips and points pointing down and away. Always cut away from your body. Never try to catch falling sharp instruments. Grasp sharp instruments only by the handles.

Clothing

15. Laboratory goggles MUST be worn any time chemicals, heat or glassware are used.
16. Contact lenses may be worn with the use of unvented goggles,
17. Dress for safety when working in the lab. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured. Shoes must completely cover the foot. Sandals are NOT permitted.

Accidents and Injuries

18. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the instructor immediately for clean up procedures.
19. If a chemical should splash in your eye(s) or on your skin, immediately flush with running water from the eyewash station or safety shower for at least 20 minutes. Notify your teacher immediately.

Handling Chemicals

20. All chemicals in the laboratory are to be considered dangerous. Do not touch or smell any chemicals unless specifically instructed to do so. The proper techniques for smelling chemical fumes will be demonstrated to you. NEVER taste any chemicals.
21. Acids must be handled with extreme care. Always add acid to water slowly and carefully swirl or stir the solution.
22. Never remove chemicals or other materials from the laboratory area.

Handling Glassware and Equipment

23. Examine glassware before each use. Never use chipped, cracked or dirty glassware.

24. Report damaged electrical equipment immediately. Look for things such as frayed cords, exposed wires, and loose connections. Do not use damaged electrical equipment.
25. If you do not understand how to use a piece of equipment, as the instructor for help.
26. Do not immerse hot glassware in cold water, it may shatter.

Heating Substances

27. Use extreme caution when using a gas burner. Keep hair, clothing and hands are a safe distance from the flame at all times. Do not put any substance into the flame unless specifically instructed to do so. Never reach over an exposed flame. Light gas burners only as instructed by the teacher.
28. Never leave a lit burner or anything that is being heated unattended for any amount of time. Never leave anything that is being heated unattended. Always turn the burner or hot plate off when not in use.
29. You will be instructed in the proper method of heating and boiling liquids in test tubes. Never point the open end of a test tube being heated at yourself or anyone else.
30. Heated metal and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs if necessary.
31. Never look into a container that is being heated