# AP Environmental Science 2011-2012
# Course Information and Syllabus

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**Course Overview**

As stated in the *Course Description for AP Environmental Science*, this course is "designed to be the equivalent of a one-semester introductory college course in environmental science" that includes a laboratory and field investigation component. Emphasis is placed on "the scientific principles, concepts, and methodologies required for understanding 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 and/or preventing them."

**Course Goals/Fundamental Ideas** (from the College Board)

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.

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.
   - Science is a method of learning more about the world.
   - Science constantly changes the way we understand the world.
2. Energy conversions underlie all ecological processes.
   - Energy cannot be created; it must come from somewhere.
   - As energy flows through systems, more of it becomes unusable at each step.
3. The Earth itself is one interconnected system.
   - Natural systems change over time and space.
   - Biogeochemical systems vary in ability to recover from disturbances.
4. Humans alter natural systems.
   - Humans have had an impact on the environment for millions of years.
   - 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.
   - 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 suitable combination of conservation and development is required.
   - Management of common resources is essential.

**Course Time Allotment**

This course meets for seven 45-minute periods per week. Three times per week the class is a single 45-minute period, and two times per week the class meets as a two period, 90-minute block. At least one period per week is devoted to laboratory and fieldwork.

**Course Prerequisites**

Students enrolled in AP Environmental Science must complete Algebra I, Physical Science, and Biology prior to enrolling in the course. Grades in each of these classes must be a B- or higher.

**Textbook**
Miller, G. Tyler & Spoolman, Scott E. *Living in the Environment.* 16th ed. Glendale, CA: Brooks/Cole Cengage Learning, 2009.

**Supplemental texts/excerpts** (as applicable)
Other APES texts
Books / periodicals / scientific journals
Selected labs are taken from the following resources:

- Molnar, William. *Laboratory Investigations for AP Environmental Science*. Peoples Education, 2005.
- Wells, Edward. *Lab Manual for Environmental Science*. Brooks/Cole Cengage Learning, 2009.
- Miller, G. Tyler & Spoolman, Scott E. *Instructor's Guide for AP Environmental Science for Miller's "Living in the Environment."* Brooks/Cole Cengage Learning, 2009.
- Environmental Literacy Council. Last Updated June 17, 2008. [http://www.enviroliteracy.org/subcategory.php/243.html]

**Required Materials**

- 3-ring binder (for this class only!)
- dividers
- pencils for graphing and math
- highlighter
- paper – both lined and graphing
- calculator (does not need to be a graphing calculator-cannot be used on AP exam!)
- notecards
- other materials as indicated by instructor

**Class Expectations** (aka the 4 Ps)

- Be prompt
- Be prepared
- Be polite
- Put it back!

(Stricter rules and better behavior are assumed for laboratory/group work and will be discussed as needed)

**Consequences**

Any behavior that disrupts your learning or others will be dealt with in the most appropriate manner. You are young adults and need to take responsibility for your own actions. Possibilities include discussion with teacher, parental contact, detention, office referral, removal from class, and other manners as deemed appropriate.

**Make-Up Work**

- All work needs to be completed promptly (1 day out = 1 day to make up, etc.).
- If an absence is planned, I expect you to see me beforehand to get your work and it will be due on the class due date.
- If you are absent unexpectedly check the course website, ask another student, check the bin of extra papers, then see me with any questions after class. Please do not interrupt me when class has already started.
- Missed tests/labs must be made up within ONE WEEK, OUTSIDE OF CLASS TIME. In some instances an alternate assignment may be given in place of a lab. *It is your responsibility to make arrangements.*
- See grading policy on last page regarding late work.

**Hall Passes**

Hall passes are for emergencies only. Please make sure you have what you need for class.

**Safety First:**

We will be doing a lot of hands-on laboratory exercises throughout the school year. Whenever we are working on labs, I will expect you to act maturely and to follow procedures exactly as they are explained to you. Horseplay and inappropriate behavior of any kind will not be tolerated and will result in disciplinary action, including a loss of points for the lab.

**A Note About Labs and Field Work**

This is a lab-based class with two 90-minute classes per week to help facilitate this – plan on having *at least* one period per week devoted to laboratory/field work. You will be introduced to new lab and sampling techniques, as well as data analysis and calculation techniques. AP Labs are much more extensive and in depth than labs in previous science courses. Labs will be used for two different instructional purposes: first, to discover a new topic and second, to reinforce ideas that have already been learned

Laboratory work is a considerable portion of a college-level class and, in some cases, an entirely separate course. Therefore, some colleges require that a lab notebook be turned in along with the AP scores. Each lab will be graded and kept in a lab file for you. After the AP test, you will make a lab notebook to include all labs that we have completed this year to be turned into a college upon request so that you can obtain full credit for the course. The lab notebook will require CLEAN copies of the labs (not the ones with my markings on them – because, really, do you want to point out your mistakes to a professor?!), so keep a DIGITAL COPY of all reports for the entire year. Editing is a lot easier than retyping. The final lab notebook will be checked and will be for a grade!

Many labs will be performed outdoors or will require you to bring samples from the outdoors into the classroom. I will provide as much notice as possible about outdoor activities and my expectation is that you are dressed appropriately, especially considering the time for our class. Please keep in mind that environmental science can be messy! I suggest leaving an old pair of shoes in your locker (not in my classroom).

**Cheating:**

Cheating is a serious problem. It is important to know that ***BOTH the person who copies work and the person who gives their work to be copied are equally guilty of cheating and will suffer the same consequences***. In my class, any person caught cheating will receive a zero for the assignment as well as an after school detention. In addition, you will be reported to the office per district policy. In science, where a lot of work is done in groups, it will be vital that you participate in the group as a contributing member and that you are able to put your answers in your own words so that you are not guilty of cheating. *Allowing other members of your group to come up with data and answers and then copying the group's work* ***does*** *constitute cheating.* In lab situations, be certain that you have copied down all data for each day BEFORE you leave. A missing group member is not an acceptable reason to not have the lab data on any given day!

**AP Exam: May 2, 2011**

The A.P. Environmental Science Exam, created by the College Board and Educational Testing Service, will be administered on the morning of Monday, May 7th, 2012. This exam is three hours in length and consists of two parts: a multiple-choice section comprised of 100 questions and forming 60% of the grade, and a free response section comprised of four free-response questions and forming 40% of the grade. *All students are expected to take the exam.*

**Grading Policy**

**1.)** ***Summative Quizzes and Tests: 65% of Grade***. As we progress through a unit, students can expect quizzes at the end of each chapter. At the end of each unit, we will have a summative test to demonstrate that you have learned the material, can perform necessary skills, and can apply concepts to solve problems. These quizzes/tests will be the great majority of your grade each quarter. Students can expect about 3-5 summative tests per quarter. Tests will be in the AP format with approximately 30 multiple-choice questions and 1 free response question per test. Tests will include questions from previous units (to help you prepare for the AP Exam!). *There are no test re-takes in this course.*

**2.)** ***Other Assessments: 35% of Grade***

**a)** ***Homework:*** You will be given homework assignments to practice your skills individually on a regular basis. These assignments are crucial for you to expand your understanding. It is very important that you attempt and give serious thought to all problems, as our difficult content is best learned through this individual practice and sometimes struggle. Homework assignments will be checked and discussed on the due date in class. *No homework will be accepted late.* Many homework assignments will be given a completion mark:

2: Student attempted more than 90 % of all problems; work shown where applicable.
1: Student attempted more than 60% of the problems; work shown where applicable.
0: Student completed less than 60% or work not shown.

**b)** ***Lab Reports:*** These are technical papers that will have a specific format to be followed. Lab Report expectations will also be handed out. *Late work will incur a grade penalty and will NOT be accepted after the unit test in which the lab report was assigned.*

**c)** ***Projects/Presentations:*** There will be a few projects and/or presentations throughout the year where you will be asked to apply concepts learned in class to topics of further research. Rubrics or grading policies will be explained and given out with the project/presentation. *Late work will incur a grade penalty and will NOT be accepted after the unit test in which the lab report was assigned.*

**Contacting Me:**

If you need to contact me for any reason, please do not hesitate to do so in person, by phone, or by email. I will set up a time to meet with you so that we can discuss your issue. I am available many days after school until 3:30pm. Please check with me in advance to be assured I will be available to see you.

**Voicemail:** 740-657-4100 ext. 2193
**Email:** kimberly_randall@olentangy.k12.oh.us
**Website:** www.randallscience.com

# AP Environmental Science Schedule 2010-2011

***Assessment Notes:*** A formal test will conclude each unit. Lengthy units that include multiple chapters may also contain quizzes. Lab assessment is based upon performance (including results and/or yield as applicable) and a formal lab report (including calculations as applicable). The dates are included as guidelines and subject to change as needed.

| FIRST QUARTER | | | | |
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| **Text** | **Week(s)** | | **Topics** | **Laboratory Work/Major Activities** |
| **Unit 1: Introduction to Environmental Science** | | | | |
| **Chapter 1** – Environmental Problems, Their Causes, and Sustainability | August 24 – September 2 | 1 Week | *Ecosystem Structure* (Biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes)<br><br>*Global Economics* (Globalization; World Bank; Tragedy of the Commons; relevant laws and treaties)<br><br>*Impacts of population growth* (Hunger; disease; economic effects; resource use; habitat destruction)<br><br>*Economic Impacts* (Cost-benefit analysis; externalities; marginal costs; sustainability) | **Activity-State of the World:** Students will identify major environmental issues using current popular media to develop their notion of what issues the world is currently facing. *1 day*<br><br>**Lab-Tragedy of the commons game**: Wells Lab 2-Students explore the problems associated with resource distribution. *1 day* |
| **Chapter 2** – Science, Matter, Energy, and Systems | | 1 Week | *Energy Flow* (Photosynthesis and cellular respiration; food webs and trophic levels; ecological pyramids) | **Project-Ecological footprint**: Students keep a journal for a week to estimate their ecological footprint using www.footprint.org, an online calculator. *1 day in class, 1 week total* |

| **Unit 2: Ecosystem Structure, Dynamics, and Biodiversity** | | | | |
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| **Chapter 3** – Ecosystems: What are they and How do they work | September 6 – September 30 | 2 Weeks | *Ecosystem Structure* (Biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes)<br><br>*Energy Flow* (Photosynthesis and cellular respiration; food webs and trophic levels; ecological pyramids)<br><br>*Natural Biogeochemical Cycles* (Carbon, nitrogen, phosphorus, sulfur, water, conservation of matter) | **Lab-Understanding the difference between gross primary productivity and net primary productivity**: Miller Lab 3A-Students determine GPP an NPP of microorganisms for two systems. Students will perform data analysis calculations to determine NPP, Respiration, and GPP. *3 days* |
| **Chapter 4** – Biodiversity and Evolution | | 1 Week | *Ecosystem Diversity* (Biodiversity; natural selection; evolution; ecosystem services) | **Lab-Biodiversity In Leaf Litter:** Miller Lab 4-Students sample different ecosystems with Berlese Funnels that they construct and compare populations from different environments. *3 days* |

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| **Chapter 5 Sections 1, 2, and 4**– Biodiversity, Species interactions and Population Control | | 1 Week | *Species interactions* (niche, competition, symbiosis)<br><br>*Ecosystem change* (succession)<br><br>*Population ecology* (carrying capacity, reproductive strategies, survivorship) | **Lab-Evolution and Adaptation:** Miller Lab 5B-Students will become familiar with specific adaptations and the ways some organisms breed more than others and how their genes can eventually dominate the gene pool. Students will use data to calculate and interpret Chi-square values. *2 days* |

| **Unit 3: Populations** | | | | |
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| **Text** | **Week(s)** | | **Topics** | **Laboratory Work/Major Activities** |
| **Chapter 5 Section 3** – What limits the growth of sample populations? | October 3 – October 25 | 1 Week | *Population Biology Concepts* (Population ecology; carrying capacity; reproductive strategies; survivorship) | **Activity-Population Sampling 1:** Students will estimate the population size of trees by Quadrat Sampling. *1 day*<br><br>**Activity-Population Sampling 2**: Students will estimate the population of freshman by "Fishing for Freshman" with the Mark-Recapture Technique. *2 days*<br><br>**Lab-Population Growth with Bread Mold:** Environmental Literacy Council-The students will manipulate variables to determine the effects on the growth of a population. They will collect data to determine colony size and number of colonies, and then calculate the r-value of the population. *2 days plus additional class-time to check/measure colonies* |
| **Chapter 6** – The Human Population and Its Impact | | 2 Weeks | *Population Biology Concepts* (Population ecology; carrying capacity; reproductive strategies; survivorship)<br><br>*Human Populations:*<br>*Human population dynamics* (Historical population sizes; distribution; fertility rates; growth rates and doubling times; demographic transition; age-structure diagrams)<br><br>*Population size* (Strategies for sustainability; case studies; national policies)<br><br>*Impacts of population growth* (Hunger; disease; economic effects; resource use; habitat destruction) | **Lab-World Population Growth**: Molnar Lab 19- Students will graph and mathematically analyze the rates of human population growth. They will project human populations into the future based on generalizations from various data sources for modern times. *2 days*<br><br>**Lab-World Distribution and Survivorship**: Molnar Lab 22-Students will collect data to develop survivorship curves and age-sex population pyramids. They will then use their data to make predictions of future populations based on different factors. *3 days* |

| SECOND QUARTER | | | | |
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| **Text** | **Week(s)** | | **Topics** | **Laboratory Work/Major Activities** |
| **Unit 4 – Climate and Sustaining Biodiversity** | | | | |
| **Chapter 7 Sections 1 and 2** – Climate Terrestrial Biodiversity | October 26 – November 15 | 1 Week | *Ecosystem Structure* (Biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes)<br><br>*Natural Ecosystem Change* (Climate shifts; species movement; ecological succession)<br><br>*Impacts of population growth* (Hunger; disease; economic effects; resource use; habitat destruction)<br><br>*Other Land Use:*<br>*Public and federal lands* (Management; wilderness areas; national parks; wildlife refuges; forests; wetlands)<br><br>*Global Warming* (Greenhouse gases and the greenhouse effect; impacts and consequences of global warming; reducing climate change; relevant laws and treaties) | **Activity-Constructing a Climatogram:** The students will use data to construct a climatogram, and then use the data to determine which biome is represented with the data. *1 day*<br><br>**Lab-Heat Transfer in the Earth:** Miller Lab 7B-The students will determine specific heat of different abiotic materials and determine how that relates to the heating and cooling of the surrounding ecosystems. *1 day* |
| **Chapter 7 Section 3** – How have we affected the world's terrestrial ecosystems **Chapter 8** – Aquatic Biodiversity | | 1 Week | *Ecosystem Structure* (Biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes)<br><br>*Impacts of population growth* (Hunger; disease; economic effects; resource use; habitat destruction) | **Project-Biome Investigation and Presentation**: Students will research a biome and present information about location, climate, biodiversity, positive and negative human impact, invasive species, and endangered species. *1 week* |
| **Chapter 9** – Sustaining Biodiversity: The Species Approach **Chapter 10** – Sustaining Terrestrial Biodiversity: The ecosystem approach **Chapter 11** – Sustaining Aquatic Biodiversity | | 1 Week | *Impacts of population growth* (Hunger; disease; economic effects; resource use; habitat destruction)<br><br>*Loss of Biodiversity* (Habitat loss; overuse; pollution; introduced species; endangered and extinct species*;* maintenance through conservation; relevant laws and treaties)<br><br>*Forestry* (Tree plantations; old growth forests; forest fires; forest management; national forests)<br><br>*Fishing* (Fishing techniques; overfishing; aquaculture; relevant laws and treaties)<br><br>*Ecosystem Structure* (Biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes) | **Activity-Case Studies from Miller Chapters 9, 10, 11:** Students will read and discuss case studies from text and evaluate the approaches taken. *3 days* |

| Text | Week(s) | | Topics | Laboratory Work/Major Activities |
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| **Unit 5: Natural Resources** | | | | |
| **Chapter 13** - Water Resources | November 16 – December 16 | 1 Week | *Feeding a growing population* (Human nutritional requirements; types of agriculture; Green Revolution; genetic engineering and crop production; deforestation; irrigation; sustainable agriculture)<br><br>*Hydroelectric Power* (Dams; flood control; salmon; silting; other impacts)<br><br>*Renewable Energy* (Solar energy; solar electricity; hydrogen fuel cells; biomass; wind energy; small-scale hydroelectric; ocean waves and tidal energy; geothermal; environmental advantages/disadvantages)<br><br>*Water pollution* (Types; sources, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems; Clean Water Act and other relevant laws) | **Project -Water Diversions:** Molnar Investigation 14-Students will research the internet and other sources to analyze the effects of water diversions on surrounding ecosystems and human communities. They will compare and contrast the problems and successes of various water diversions and describe possible remediations. *3 days* |
| **Chapter 14** – Geology and Nonrenewable Minerals | | 2 Weeks | *Earth Science Concepts* (Geologic time scale; plate tectonics, earthquakes, volcanism; seasons; solar intensity and latitude)<br><br>*Soil and Soil Dynamics* (Rock cycle; formation; composition; physical and chemical properties; main soil types; erosion and other soil problems; soil conservation)<br><br>*Mining* (Mineral formation; extraction; global reserves; relevant laws and treaties)<br><br>*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)<br><br>*Noise pollution* (Sources; effects; control measures)<br><br>*Water pollution* (Types; sources, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems; Clean Water Act and other relevant laws) | **Activity-Rock Identification and Classification:** Students will identify and classify rocks from each of the major sub-classifications. *1 day*<br><br>**Lab-Copper Extraction:** Molnar Lab 7-Students will measure the amount of copper metal extracted from an ore and model and environmentally-sound method of extracting copper profitably from tailings. *2 days*<br><br>**Activity-Plate Tectonics:** Molnar Project 2-Students will plot key geologic events and features on a map and correlate them to tectonic plate boundaries. *2 days* |

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| **Chapter 12** – Food, Soil, and Pest Management | | 2 Weeks | *Impacts of population growth* (Hunger; disease; economic effects; resource use; habitat destruction)<br><br>*Feeding a growing population* (Human nutritional requirements; types of agriculture; Green Revolution; genetic engineering and crop production; deforestation; irrigation; sustainable agriculture)<br><br>*Controlling pests* (Types of pesticides; costs and benefits of pesticide use; integrated pest management; relevant laws) | **Video: Food, Inc.**<br><br>**Lab-Soil Analysis:** Molnar Lab 9- Students will collect and analyze the soil quality. Students will analyze biomass production from each of the soil types for different crops. *3 days*<br><br>**Lab-Salinization**: Environmental Literacy Council- Students will analyze the effects of different concentrations of salt water on the germination and biomass production of a crop. *1 day for set-up plus additional class-time to check samples* |
| **Unit 6: Energy Resources** | | | | |
| **Chapter 15** – Nonrenewable Energy | December 19 – January 13 | 1 Week | *Energy Consumption:*<br>*History* (Industrial Revolution; exponential growth; energy crisis)<br><br>*Fossil Fuel Resources and Use* (Formation of coal, oil, and natural gas; extraction/purification methods; world reserves and global demand; synfuels; environmental advantages/disadvantages of sources)<br><br>*Nuclear Energy* (Nuclear fission process; nuclear fuel; electricity production; nuclear reactor types; environmental advantages/disadvantages; safety issues; radiation and human health; radioactive wastes; nuclear fusion) | **Lab-Burning Fuels:** Wells Lab 18-The students will calculate the energy content of various fuels and quantify the amount of energy. They will compare the fuels and analyze the benefits and drawbacks of each of the fuels. *2 days* |

| THIRD QUARTER | | | | |
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| **Text** | **Week(s)** | | **Topics** | **Laboratory Work/Major Activities** |
| **Chapter 16** – Energy Efficiency and Renewable Energy | January 18 – February 3 | 1 Week | *Energy Concepts* (Energy forms; power; units; conversions; Laws of Thermodynamics)<br><br>*Energy Consumption* (Present global energy use*;* Future energy needs)<br><br>*Energy Conservation* (Energy efficiency; CAFE standards; hybrid electric vehicles; mass transit)<br><br>*Renewable Energy* (Solar energy; solar electricity; hydrogen fuel cells; biomass; wind energy; small-scale hydroelectric; ocean waves and tidal energy; geothermal; environmental advantages/disadvantages) | **Lab-Home Energy Audit**: Students conduct a home energy audit and quantify their family's usage. They develop and implement a plan to reduce their family's use and assess the change after one month. Students evaluate one device specifically. *1 day in class plus additional time at home collecting data*<br><br>**Activity-Energy Resource Comparison**: Molnar Investigation 23-Students will research and compare current U.S. electric power production methods and outline each. They will defend a power production policy, including feasible alternative technologies for the upcoming century. *2 days* |
| **Chapter 22 –** Sustainable Cities | | 2 Weeks | *Other Land Use:*<br>*Urban land development* (Planned development; suburban sprawl; urbanization)<br><br>*Transportation infrastructure* (Federal highway system; canals and channels; roadless areas; ecosystem impacts)<br><br>*Land conservation options* (Preservation; remediation; mitigation; restoration)<br><br>*Sustainable land-use strategies* | **Project: Build a Model of a Sustainable City:** Miller Lab 22-Students will build a model of a sustainable city taking into account factors of economics, land/water use, ethics, energy, and sociology. *1 week*<br><br>**Guest Speaker:** Students will listen to a guest lecture from an urban planner and have a discussion about sustainable cities. *2 days* |
| **Unit 7: Environmental Quality - Solids** | | | | |
| **Chapter 17** – Environmental Hazards and Human Health | February 7-22 | 1 Week | *Human population dynamics* (Historical population sizes; distribution; fertility rates; growth rates and doubling times; demographic transition; age-structure diagrams)<br><br>*Impacts on the Environment and Human Health*<br>1. Hazards to human health (Environmental risk analysis; acute and chronic effects; dose response relationships; air pollutants; smoking and other risks)<br>2. Hazardous chemicals in the environment (Types of hazardous waste; treatment/disposal of hazardous waste; cleanup of contaminated sites; biomagnification; relevant laws)<br><br>*Economic Impacts* (Cost-benefit analysis; externalities; marginal costs; sustainability) | **Lab-LD 50 with Daphnia**: Students will collect and graph data to determine the LD50 for *Daphnia* samples. *1 day*<br><br>**Activity-Toxic Sites in your Neighborhood:** Students will research and identify local toxic sites and investigate possible remediation. *1 days*<br><br>**Lab-Effects of Gamma Radiation on Seed Growth:** Molnar Lab 1-11-Students will conduct a controlled experiment on rates of seed germination and plant growth comparing rates for exposure to different levels of gamma radiation. They will apply experimental results to related issues of commercial irradiation of food and seed products. *1 day for set-up plus additional class-time to check samples*<br><br>**Lab-Human Health Risk Assessment**: Wells Lab 16-Students will use data to calculate excess cancer risk due to contaminants in drinking water. *1 day* |

| Text | Week(s) | | Topics | Laboratory Work/Major Activities |
|---|---|---|---|---|
| **Chapter 21 –** Solids and Hazardous Waste | February 7-22 | 1 Week | *Solid waste* (Types; disposal; reduction)<br><br>*Impacts on the Environment and Human Health*<br>1. Hazards to human health (Environmental risk analysis; acute and chronic effects; dose response relationships; air pollutants; smoking and other risks)<br>2. Hazardous chemicals in the environment (Types of hazardous waste; treatment/disposal of hazardous waste; cleanup of contaminated sites; biomagnification; relevant laws)<br><br>*Economic Impacts* (Cost-benefit analysis; externalities; marginal costs; sustainability) | **Activity-Energy and Recycling:** Molnar Investigation 8-Students will compare energy costs of recycling aluminum cans to making cans from raw materials. They will investigate extrinsic benefits and disadvantages of recycling, such as environmental and economic factors. *3 days* |
| **Unit 8: Environmental Quality – Liquids and Air** | | | | |
| **Chapter 18** – Air Pollution | February 23 – March 30 | 1 Week | *The Atmosphere* (Composition; structure; weather and climate; atmospheric circulation and the Coriolis Effect; atmosphere-ocean interactions; ENSO)<br><br>*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) | **Lab-Particulate Air Pollution**: Molnar Lab 27-Students will measure particulate matter locally and evaluate the data by EPA standards. *2 days*<br><br>**Activity-Tailpipe Tally**: Students will collect and quantify particulate matter from student automobiles. *1 day for set-up plus additional time to check filters* |
| **Chapter 19 –** Climate Change and Ozone Depletion | | 1 Week | *Stratospheric Ozone* (Formation of stratospheric ozone; ultraviolet radiation; causes of ozone depletion; effects of ozone depletion; strategies for reducing ozone depletion; relevant laws and treaties)<br><br>*Global Warming* (Greenhouse gases and the greenhouse effect; impacts and consequences of global warming; reducing climate change; relevant laws and treaties)<br><br>*Loss of Biodiversity* (Habitat loss; overuse; pollution; introduced species; endangered and extinct species; Maintenance through conservation; Relevant laws and treaties) | **Lab-$CO_2$ Emissions from Fossil-Fuel Burning**: Molnar Lab 24-Students will track long-term energy production and correlate the data to emissions and atmospheric concentrations of $CO_2$. They will also investigate the effects of $CO_2$ and other greenhouse gases on global temperatures. *2 days* |
| **Chapter 20 –** Water Pollution | | 2 Weeks | *Global Water Resources and Use* (Freshwater/saltwater; ocean circulation; agricultural, industrial, and domestic use; surface and groundwater issues; global problems; conservation)<br><br>*Water pollution* (Types; sources, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems; Clean Water Act and other relevant laws) | **Lab-Water Quality Lab:** Molnar Lab 12-Students will perform tests to determine the WQI of a local body of water. *2days*<br><br>**Project-Wastewater Treatment Challenge:** Miller Lab 20-Students will build a model treatment plant to demonstrate the various processes in wastewater treatment. *1 week* |

| FOURTH QUARTER | | | |
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| **Text** | **Week(s)** | **Topics** | **Laboratory Work/Major Activities** |
| **Unit 9: Environmental Issues and Society** | | | |
| **Chapter 23 –** Economics, Environment and Sustainability | April 2– April 13 (1 Week) | *Global Economics* (Globalization; World Bank; Tragedy of the Commons; relevant laws and treaties) | **Lab-Applying and Analyzing Cost-Benefit Analysis:** Wells Lab 20-Students will apply cost-benefit analysis to a simulated environment. Students will understand the National Environmental Policy Act and Environmental Impact Statements. *2 days* |
| **Chapter 24** – Politics, Environment, and Sustainability | 1 Week | *Global Economics* (Globalization; World Bank; Tragedy of the Commons; relevant laws and treaties)<br><br>*Economic Impacts* (Cost-benefit analysis; externalities; marginal costs; sustainability) | **Lab-Community Planning…Not in My Backyard:** Miller Lab 24-Students will increase their knowledge of planning, regulation, and development. They will explore the positions of various interest groups. *3 days* |
| **Chapter 25** – Environmental Worldviews, Ethics, Sustainability | 1 Week | *Stratospheric Ozone* (Formation of stratospheric ozone; ultraviolet radiation; causes of ozone depletion; effects of ozone depletion; strategies for reducing ozone depletion; relevant laws and treaties)<br><br>*Global Warming* (Greenhouse gases and the greenhouse effect; impacts and consequences of global warming; reducing climate change; relevant laws and treaties)<br><br>*Loss of Biodiversity* (Habitat loss; overuse; pollution; introduced species; endangered and extinct species*;* maintenance through conservation*;* relevant laws and treaties | **Video: The End of Suburbia**<br><br>**Activity-Environmental Worldviews**: Students will represent each of the worldviews and debate a local environmental issue from their assigned worldview. *2 days* |

| Unit 10: AP Review and Testing Strategies | | | |
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| **Text** | **Week(s)** | **Topics** | **Laboratory Work/Major Activities** |
| Miller-All | April 16 – May 4 | **Case Studies in Depth**<br>**AP Test Practice and Review** | Review for AP exam |
| **AP Environmental Science Exam – May 7th** | | | |
| N/A | May 8 – May 29 | **Lab Notebook Compilation** | Students will compile a notebook of the laboratory and fieldwork completed in the course to show to university officials upon request. |
| N/A | | **Independent Research Project** | Students will engage in an independent research project on an environmental topic of their choosing. |
| N/A | | **Passive Solar Heater Construction and Solar Cookoff** | Students will construct a passive solar heater used to heat air. |