AP Environmental Science

Curriculum Guide

Scranton School District

Scranton, PA

AP Environmental Science

Prerequisites:

- Successful completion of Algebra and Biology, Honors Biology, or AP Biology
- Be in compliance with the SSD Honors and AP Criteria Policy

AP Environmental Science is an advanced interdisciplinary course that prepares students for the Advanced Placement Exam. The students will understand the interrelationships of the natural world, identify and analyze environmental problems, and evaluate the relative risks of and possible solutions for these problems. It is a full year course designed to fulfill the requirements of a one semester introductory college course in environmental science and frequently draws from a wide variety of fields including geology, biology, environmental studies, chemistry, geography and environmental science. This course is designed to be rigorous and the laboratory/fieldwork is a fundamental part of our studies. The reoccurring themes that we will investigate throughout the course are how science is a process that constantly changes the way we understand the world and that energy conversions are intrinsic to all ecological processes. Students are encouraged throughout the course to consider scientific principles and disciplines when completing activities, and laboratory and/or fieldwork. All laboratory/fieldwork includes an analysis and interpretation component.

The goal of this course is to provide students with the skills needed to methodically identify and analyze environmental issues both natural and anthropogenic, evaluate the risks correlated to these issues, examine alternative solutions to resolve or prevent them, and objectively and adequately evaluate research to develop their own informed views on these issues.

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Year-at-a-glance

Subject: AP Environmental Science	Grade Level: 11th - 12th	Date Completed: 08-12-15

1st Quarter

Topic	Resources*	Academic Standards
Introduction to Environmental Problems and Scientific Solutions	**Approved textbook** **Larry Gonick's *Cartoon Guide to the Environment* or *other preparatory* Summer Reading),** **G. Tyler Miller's *Living in the Environment 17th Edition* Chapters 1 and 2, Tragedy of the Commons Lab and various other resources**	**CC3.5.11-12.B** **CC3.5.11-12.C** **4.1.12.A.**
Economics, Politics, Environmental Worldviews, Ethics, and Sustainability	**Approved textbook** **Miller Chapters 23, 24, and 25** **Various online text and video exercises**	**CC3.6.11-12.A** **4.5.12.A** **4.5.12.F**
The Living World, Ecosystems, Evolution, and Biodiversity	**Approved textbook** **Miller Chapters 3 and 4** **Various online text and video exercises** **Trophic Levels/Food Web Lab** **Shannon-Weiner Biodiversity Lab**	**CC3.5.11-12.B, CC3.5.11-12.C, CC3.5.11-12.D** **4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.F**
Global Change, Terrestrial and Aquatic Biodiversity, and Climate	**Approved textbook** **Miller Chapters 7 and 8** **Various online text and video exercises** **Stream Macroinvertebrate Lab**	**CC3.5.11-12.B, CC3.5.11-12.C, CC3.5.11-12.D** **4.1.12.A, 4.1.12.E, 4.2.12.B** **4.2.12.D**

***These and other labs and activities are subject to time and resource(s) limitations.**

2nd Quarter

Topic	Resources*	Academic Standards
Sustaining Biodiversity	**Approved textbook** **Miller Chapters 9, 10, and 11** **Various online text and video exercises** **Simulated Biodiversity Lab** **Environmental Pollution and Lichens Lab**	**CC3.5.11-12.B, CC3.5.11-12.C, CC3.5.11-12.D, CC3.5.11-12.F** **4.1.12.D, 4.5.12.A**
Food, Soil, Pest Management, Environmental Hazards and Human Health	**Approved textbook** **Miller Chapters 12 and 17** **Various online text and video exercises** **Physical and Chemical Properties of Soil Lab**	**CC3.5.11-12.B, CC3.5.11-12.C, CC3.5.11-12.D, CC3.5.11-12.F** **4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.5.12.E**
Biodiversity, Species Interactions, Population Control, The Human Population and Its Impact	**Approved textbook** **Miller Chapters 5 and 6** **Various online text and video exercises** **Population Growth and Doubling Time Lab** **Duckweed Population Lab**	**CC3.5.11-12.B, CC3.5.11-12.C, CC3.5.11-12.D, CC3.5.11-12.F** **4.1.12.D**

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3rd Quarter

Topic	Resources*	Academic Standards
Land Use, Sustainable Cities, and Waste Management	Approved textbook Miller Chapters 21 and 22 Various online text and video exercises Landfill Decomposition Lab Discover Life in the Soil Lab	CC3.5.11-12.B, CC3.5.11-12.C, CC3.5.11-12.D, CC3.5.11-12.F 4.5.12.A, 4.5.12.D
Geology, Nonrenewable Material Resources, Nonrenewable Energy, Energy Efficiency and Renewable Energy	Approved textbook Miller Chapters 14, 15, and 16 Various online text and video exercises Mapping Earthquakes and Volcanoes Mystery of the Far Flung Fossils Lab Wind Energy Lab Common Uses of Rocks and Minerals Lab	CC3.5.11-12.B, CC3.5.11-12.C, CC3.5.11-12.D, CC3.5.11-12.F 4.3.12.A, 4.3.12.B, 4.3.12.C
Water Resources and Water Pollution	Approved textbook Miller Chapters 13 and 20 Exploring Groundwater Lab Water Pollution Lab	CC3.5.11-12.B, CC3.5.11-12.C, CC3.5.11-12.D, CC3.5.11-12.F 4.2.12.A, 4.2.12.B, 4.2.12.C 4.2.12.D
Air Pollution, Climate Disruption, and Ozone Depletion	Approved textbook Miller Chapters 18 and 19 Air Pollution Lab Greenhouse Effect and Global Warming Lab Specific Heat and Climate Lab	CC3.5.11-12.B, CC3.5.11-12.C, CC3.5.11-12.D, CC3.5.11-12.F 4.3.12.A, 4.5.12.C

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4th Quarter

Topic	Resources*	Academic Standards
AP Environmental Science Exam Review	**Approved textbook** **Miller Text** **Various online text and video exercises** **Various study guides** **College Board - AP Central Site**	**See all standards listed above.**
Final Research Paper	**Approved textbook** **Various search engines, texts, journals**	**Any of the standards listed above.** **Selected course material.**
Green Project	**Approved textbook** **Past examples include:** • **Rain Garden** • **Photovoltaic Array** • **Wind Turbine** **Possible future projects:** • **Green roof** • **Community Vegetable Garden** • **Planting of fruit and/or nut trees** • **Adopt a river clean-up, etc.**	**Any of the standards listed above.**
Final Review/Exam		

***These and other labs and activities are subject to time and resource(s) limitations.**

General Topic	Academic Standard(s)	Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time
Environmental Science Overview **Analyze the differences between natural causes and human causes of extinction.**	**4.1.12.A**	**Analyze the significance of biological diversity in an ecosystem.** • **Analyze the differences between natural causes and human causes of extinction.**	**Approved textbook** **The Cartoon Guide to The Environment by Larry Gonick**	**Teacher prepared test.**	**1 day (after Summer reading assignment)**
Introduction to Environmental Problems and Scientific Solutions	**4.1.12.A**	**Analyze the differences between natural causes and human causes of extinction.** **Vocabulary:** **Sustainable, Human needs, Ecological Footprint, Science, Investigations, subjectivity, interactions, graphing, measuring impact.**	**Approved textbook** **Miller Chapters 1 and 2** **PowerPoint**	**Teacher prepared test.**	**2 days (Summer Pre-read)**

Economics, Politics, Environmental Worldviews, Ethics, and Sustainability	**4.5.12.A** **4.5.12.F**	**Analyze how consumer demands drive the development of technology enabling the sustainable use of natural resources.** **Evaluate experimental information for relevance and adherence to science processes.** **Vocabulary :** **Sustainability, Economics, Supply & Demand, Wealth, Productivity, Kuznets Curve, Natural capital, Agencies, Laws, Regulations, Worldviews, Precautionary Principle, World Agencies, US Agencies, US Policy Process, Deterrents, Incentives, Subsidies, Poverty, Environmental Injustice, cost-benefit analysis (CBA), discount rate, economic development, economic growth, economic system environmentally sustainable economic development, genuine progress indicator (GPI), greenwashing, (GDP)** **manufactured resources, matter recycling and reuse.**	**Approved textbook** **Miller Chapters 23, 24, and 25** **Various online text and video exercises** **The Story of Stuff - Webquest** **Tragedy of the Commons Lab** **PowerPoint** **The Green President Activity**	**Teacher prepared quizzes and test, activity report(s) lab report(s)**	**13 days**

The Living World, Ecosystems, Evolution, and Biodiversity	4.1.12.A 4.1.12.B 4.1.12.C 4.1.12.F	Analyze the significance of biological diversity in an ecosystem. Research solutions to problems caused by interrupting natural cycles. Research how humans affect energy flow within an ecosystem. Evaluate experimental information for relevance and adherence to science processes. Vocabulary : abiotic, aerobic and anaerobic respiration, autotrophs, biogeochemical cycles, biomass, biosphere biotic, chemosynthesis, community, consumers decomposers, detritivores ecology, fermentation, food web, (GPP), herbivores, heterotrophs, hydrologic (water) cycles, hydrosphere, natural greenhouse, (NPP), (biogeochemical) cycles, trophic levels, speciation, mutation, adaptation, extinction, generalist species, specialist species, foundation species, keystone species, ecological niche.	Approved textbook Miller Chapters 3 and 4 Various online text and video exercises Trophic Levels/Food Web Lab Shannon-Weiner Biodiversity Lab PowerPoint	Teacher prepared quizzes and test, activity report(s) lab report(s)	11 days

Global Change, Terrestrial and Aquatic Biodiversity, and Climate	**4.2.12.D** **4.1.12.E** **4.2.12.B**	**Evaluate experimental information for relevance and adherence to science processes.** **Research solutions addressing human impact on ecosystems over time.** **Analyze the effects of policies and regulations at various governmental levels on wetlands and their surrounding environments.** **Vocabulary :** **Climate, Biomes – Climate, Deserts, Grasslands, Forests, Mountains, Human Impact, Aquatic Ecosytems, Saltwater zones, Freshwater zones**	**Approved textbook** **Miller Chapters 7 and 8** **Various online text and video exercises** **Stream Macroinvertebrate Lab** **PowerPoint**	**Teacher prepared quizzes and test** **Biome worksheet activity report(s)** **lab report(s)**	**15 days**

Sustaining Biodiversity	**4.1.12.D** **4.5.12.A**	**Analyze the effects of new and emerging technologies on biodiversity in specific ecosystems.** **Analyze how consumer demands drive the development of technology enabling the sustainable use of natural resources.** **Vocabulary :** **Human Impacts –Biodiversity, Forests, Tropical Rainforest, Grasslands, Ranges, National Parks, Nature Reserves, Ecological Restoration Extinction, Endangered, Threatened, Habitat Loss, Invasive Species, Population, Pollution, Overexploitation, HIPPO, Protection, Sanctuary, Reconciliation, Aquatic Biodiversity, Protection, Sanctuaries, Reserves, Fisheries, Wetlands, Lakes, Rivers**	**Approved textbook** **Miller Chapters 9, 10, and 11** **Various online text and video exercises** **Simulated Biodiversity Lab** **Environmental Pollution and Lichens Lab** **PowerPoint**	**Teacher prepared quizzes and test** **Species activity report** **lab report(s)**	**14 days**

Food, Soil, Pest Management, Environmental Hazards and Human Health	4.4.12.A 4.4.12.B 4.4.12.C 4.4.12.D 4.5.12.E	Research and analyze the social, political, economic, and environmental factors that affect agricultural systems. Research and evaluate laws and policies that affect the food and fiber system. Analyze research and development initiatives as they relate to agriculture. Describe how policies, regulations, and laws affect the technologies adopted in agriculture. Analyze how consumer demands promote the production of pollutants that affect human health. Vocabulary : Hunger, malnutrition, obesity, agriculture, industrial, plantation, nomadic, intensive traditional, livestock, erosion, desertification, salinization, conservation tillage, terracing, strip cropping, windbreaks Green revolution, organic inorganic fertilizer, nitrates, monoculture, GMO, crossbreeding, patenting genes, feedlots, aquaculture, subsidies, IPM, hazards, disease, toxicology, risk analysis, LD 50	Approved textbook Miller Chapters 12 and 17 Various online text and video exercises Physical and Chemical Properties of Soil Lab Bioassay Lab Salinization Lab Disease Activity PowerPoint	Teacher prepared quizzes and test Disease activity report lab report(s)	16 days

Biodiversity, Species Interactions, Population Control, The Human Population and Its Impact	**4.1.12.D**	**Analyze the effects of new and emerging technologies on biodiversity in specific ecosystems.** **Vocabulary :** **age structure, birth rate, crude birth rate, crude death rate cultural carrying capacity, death rate, demographic transition, family planning fertility rate, infant mortality rate, life expectancy, migration population change, replacement- level fertility, total fertility rate (TFR) Dynamics, Carrying Capacity, Age Structure, J-curves, S-Curves, Density, R-selected, K-selected, survivorship, Human Growth, CBR, CDR, Immigration, emigration, LDC, MDC, Population Age Structure, ZPG, Population Dynamics, India, China, Women Rights**	**Approved textbook** **Miller Chapters 5 and 6** **Various online text and video exercises** **Population Growth and** **Doubling Time Lab** **Duckweed Population Lab** **PowerPoint**	**Teacher prepared quizzes and test** **lab report(s)**	**15 days**

Land Use, Sustainable Cities, and Waste Management	**4.5.12.A** **4.5.12.D**	**Research how technology influences the sustainable use of natural resources.** **Evaluate waste management practices.** **Vocabulary :** **Love Canal, Affleunza, solid waste, MSW, hazardous landfills, Integrated Waste, Management, eWaste, Reuse, Reduce, Recycling, Composting, Incineration, bioremediaiton, Low Waste, Phytoremediation, Pb, Hg,** Environmental Justice**, Urbanization, Urban Sprawl, Megalopolis,** **Noise pollution, Inputs vs. Outputs, Urban Poor, Transportation, Land Use Planning, Mass Transit, Smart Growth, Green belt, Ecocity**	**Approved textbook** **Miller Chapters 21 and 22** **Various online text and video exercises** **Landfill Decomposition Lab** **Discover Life in the Soil Lab** **PowerPoint**	**Teacher prepared quizzes and test** **lab report(s)**	**14 days**

Geology, Nonrenewable Material Resources, Nonrenewable Energy, Energy Efficiency and Renewable Energy	4.3.12.A 4.3.12.B 4.3.12.C	Evaluate the advantages and disadvantages of using renewable and nonrenewable resources. Analyze factors that influence the local, regional, national, and global availability of natural resources. Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. Communicate and defend a scientific argument. Vocabulary : nanotechnology, Earth plate tectonics, mineral resources, reserves, surface mining, subsurface mining, smelting, gangue minerals, rock cycle, fossil fuels, oil shales, OPEC, tar sands, natural gas, coal nuclear energy, fission, fusion, breeder reactor, efficiency, hybrid cars, fuel cells, green building hydropower, solar energy, wind-power, biomass, geothermal, hydrogen	Approved textbook Miller Chapters 14, 15, 16 Various online text and video exercises Mapping Earthquakes and Volcanoes Mystery of the Far Flung Fossils Lab Wind Energy Lab Common Uses of Rocks and Minerals Lab PBS Energy Lab Energy Presentations PowerPoint	Teacher prepared quizzes and test lab report(s) presentations	14 days

Water Resources and Water Pollution	**4.2.12.A** **4.2.12.B** **4.2.12.C** **4.2.12.D**	**Examine environmental laws related to land use management and its impact on the water quality and flow within a watershed.** **Analyze the effects of policies and regulations at various governmental levels on wetlands and their surrounding environment.** **Analyze the effects of policies and regulations at various governmental levels on water quality.** **Judge that conclusions are consistent and logical with experimental conditions.** **Vocabulary :** **drought, scarcity, groundwater, dams, reservoirs, aqueducts, desalinization, cloud-seeding, icebergs, efficiency, floods, water pollution, sources, types, effects, streams, lakes, protecting surface water, water treatment, sewage treatment**	**Approved textbook** **Miller Chapters 13 and 20** **Exploring Groundwater Lab** **Water Pollution Lab** **PowerPoint**	**Teacher prepared quizzes and test** **lab report(s)**	**15 days**

Air Pollution, Climate Disruption, and Ozone Depletion	**4.3.12.A** **4.5.12.C**	**Evaluate the advantages and disadvantages of using renewable and nonrenewable resources.** **Analyze the costs and benefits of means to control pollution.** **Vocabulary :** **Clean Air Act, National ambient air quality standards, BIG 6, CO, NOx, PM, SOx, VOC, Ozone, Pb, Hg, cap and trade, electrostatic precipitator, scrubber, ventilation, acid deposition, pH, indoor air pollution, asthma, radon, tobacco smoke, formaldehyde, PM, lung cancer, bronchitis, basal cell skin cancer carbon tetrachloride, chlorofluorocarbon (CFC), halons (HBFCs), hexachlorobutadiene, hydrogen chloride, malignant melanoma, Montreal Protocol, ozone hole, ozone thinning, ozone-depleting compounds, polar vortex squamous cell skin cancer**	**Approved textbook** **Miller Chapters 18 and 19** **Air Pollution Lab** **Greenhouse Effect and Global Warming Lab** **Specific Heat and Climate Lab** **PowerPoint**	**Teacher prepared quizzes and test** **lab report(s)**	**12 days**

AP Environmental Science Exam Review	**All standards listed above.**	**Selected Topics**	**Approved textbook** **Miller Text** **Various online text and video exercises** **Various study guides** **AP Central College Board Site** **http://apcentral.collegeboard.com/home**	**Teacher prepared quizzes**	**12 days**
Final Research Paper	**Selected Standards**	**Selected Topics**	**Approved textbook** **Texts, Periodicals, Journals, Internet Resources, Search Engines**		**12 days**
Green Project	**Selected Standards**	**Project relating to one of the topics studied.**	**Approved textbook** **Materials, grants, fundraising, garnering community support, as appropriate for the task.**		**4 days**
Final Review/Exam					**10 days**