

<b>DEPARTMENT: SCIENCE</b>	<b>COURSE TITLE: ECOLOGY 9 / ENVIRONMENTAL SCIENCE 9</b> <b>COURSE NUMBERS: 208 &amp; 209</b>
<b>GRADE(S): 9</b>	

<b>UNIT</b>	<b>LENGT H</b>	<b>CONTENT</b>	<b>SKILLS</b>	<b>Methods of Assessment</b>	<b>Framework Strand(s) &amp; Standard(s) *</b>
Soils, Climates, and Landscapes	4 weeks	Compartments of the biosphere Scientific methods Bulk density of soil Essential/critical elements for life Atomic structure Dot diagrams Nutrient depletion times Ionic/covalent bonding Nitrogen Cycle	Differentiate among mixtures, solutions, compounds, and elements Compare and contrast the scientific methods of controlled experiments and correlation Use metric units of mass, volume, and length Determine the bulk density of soil samples Perform unit conversions Perform mean/mode/median calculations Memorize the names and symbols of essential plant nutrients Draw dot diagrams of essential plant nutrients Identify ionic and covalently bonded molecules Determine the concentrations of ammonia and nitrate Explain the nitrogen cycle	Lab: Nutrient depletion times for major plant nutrients in ARHS Exp. Forest Lab: Constructed soils as models of organic matter and its effects on water holding capacity and soil air space Quizzes Homework Unit Test	Content:  Biology 1.1, 6.4  Chemistry 1.2, 2.2, 4.1, 4.2, 4.6, 6.3  Earth Science 1.4, 3.1, 3.3,  Inquiry: SIS1, SIS2, SIS3, SIS4  Math. Skills: All 8 core + mean/mode/ median

UNIT	LENGTH	CONTENT	SKILLS	Methods of Assessment	Framework Strand(s) & Standard(s) *
Ecosystems	3 weeks	Biotic and abiotic factors Types of energy Autotrophs and heterotrophs Photosynthesis and cellular respiration Carbon cycle Pyramids of biomass Mass flow through food webs Ecosystem modeling	Differentiate between biotic and abiotic factors Discuss forms of energy and their transformations Perform unit conversions Identify characteristics of autotrophs and heterotrophs Interpret and balance the equations for photosynthesis and cellular respiration Determine total light energy, area, and leaf litter associated with a forest plot Create histograms Perform standard deviation calculations Explain the carbon cycle for a terrestrial ecosystem with an atmospheric, plant, animal, and soil pool Construct pyramids of biomass Model a forest ecosystem	Benchmark Lab: Quantitative model of energy flow through ARHS Exp. Forest Mini-investigations Biomass pyramids Quizzes Homework	Content:  Biology 1.1, 2.4, 6.3, 6.4  Chemistry 4.6, 5.1  Physics 3.1  Earth Science 3.2  Inquiry: SIS1, SIS2, SIS3, SIS4  Math. Skills: All 8 core + sig. figs. histograms, stan. dev.
Communities & Populations	4 weeks	Ecological Niche Inter and intra-specific competition Symbiosis Keystone species Evolution by natural selection Biodiversity Population dynamics Carrying capacity	Differentiate among ecosystems, communities, and populations Define niche and explain factors that determine niche Differentiate between inter and intra-specific competition	Benchmark Lab: Quantitative model of carrying capacity influenced by nutrient levels in algae cultures Lab: Effects of an invasive species on the biodiversity of	Content:  Biology 5.2, 5.3, 6.1, 6.2, 6.3, 6.4  Inquiry: SIS1, SIS2

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			Define symbiosis Evaluate the importance of a keystone species Describe the process of natural selection and its influence on community relationships Discuss the effect of evolution on biodiversity Perform population growth calculations Use a compound microscope properly Use a hemocytometer to determine cell counts Maintain an algae culture Monitor logistic growth and determine a carrying capacity	a New England forest Quizzes Homework Unit test	SIS3, SIS4  Math. Skills: All 8 core + sig. figs., stan. dev.
Agriculture, Water, and Soils	4 Weeks	History of human population growth Difference between industrial and Subsistence agriculture Water use patterns Basic forms of water pollution American “Dust Bowl” African Sahel Pesticides Dose Response Curves Importance of biodiversity Endangered species Factors causing biodiversity decline Global fish stocks Tragedy of the commons	Describe water use patterns in the United States and world Characterize the 5 most common forms of water pollution Compare and contrast events of the “Dust Bowl” and the African Sahel Form an opinion about the costs/benefits of pesticides Determine the dose-response curves of common toxins Discuss the importance of world biodiversity Examine the impact of the major drivers of world biodiversity decline	Benchmark Lab: Nitrogen cycling in Agricultural soils Lab: LD <sub>50</sub> determination for salts in irrigated soils Quizzes Homework Unit Test	Content:  Biology 1.1, 1.2, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4  Inquiry: SIS1, SIS2, SIS3, SIS4  Math. Skills: 1, 3-8 from core + stan. dev., regression

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Energy	4 Weeks	Costs and benefits of fossil fuels Structure of traditional power plants Efficiency/Demand calculations Atomic structure and isotopes Structure of PWR reactor Three Mile Island and Chernobyl Direct solar energy technologies Biomass energy Wind Power Conservation and efficiency	Discuss the costs and benefits of using fossil fuels Diagram a power plant Use kWh and BTU correctly Perform calculations of power plant efficiency and building energy demand Measure the energy demand of Amherst schools Measure the population density of Amherst schools Interpret linear regressions Explain the structure and function of a PWR Assess the damage caused by Three Mile Island and Chernobyl Differentiate between direct and indirect solar technology Build and measure the efficiency of a solar collector Evaluate the limits of biomass energy Discuss the potential of wind and hydro power Evaluate conservation and efficiency technologies	Unit Exam Benchmark Lab: Energy efficiency of three Amherst schools as determined by regressions of their population densities vs their energy demands and the implications for the region's population, economy, and the atmosphere in general Mini-investigations Solar collector construction and efficiency Quizzes Homework	Content: Chemistry 2.2, 2.7, 6.3 Physics 3.1, 3.3, Earth Science 1.1, 2.1, 2.2, Inquiry: SIS1, SIS2, SIS3,SIS4 Math. Skills: All 8 core + sig. figs., kWh, BTU, DD, mrem, S.A., W/sq. m, stan. dev., regression

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Air Pollution & Global Atmospheric Change	4 Weeks	Atmospheric gases Classes of air pollution Clean Air Act Acid Rain vulnerable regions Effects of Acid Rain Carbon dioxide trends Greenhouse Effect Effects of Global Warming Mitigation of Global Warming	List the common gases in the atmosphere Characterize the common air pollutants by formula effects, and concentrations Discuss the effects of the Clean Air Act Measure acid levels in exhaust Evaluate the threat posed to certain regions by acid rain Interpret data sets showing changes in carbon dioxide levels ion Earth's atmosphere Diagram the greenhouse effect Determine the kg of carbon stored in soil samples Determine the kg of carbon stored in a forest plot Determine the kg of carbon emitted by various cars Discuss the ecological implications of global warming Evaluate actions to reduce global warming	Unit Exam Benchmark Lab: Determining the ratio of carbon dioxide emissions from cars in the ARHS parking lot to carbon dioxide absorption by trees and soil in the ARHS Experimental Forest and the implication of the findings for land use and personal transportation habits. Mini-investigations Measuring nitrogen oxides in car exhaust with a field based back titration method Quizzes Homework	Content:  Biology 1.1, 6.4  Chemistry 4.6, 8.2  Physics 3.1, 4.1, 6.2  Earth Science 1.2, 1.3, 2.2,  Inquiry: SIS1, SIS2, SIS3, SIS4  Math. Skills: All 8 core + sig. figs., stan. dev., mg/L, ppm