Joel Rubin

I am one of several Stoughton High School teachers having sections of a required 9th grade Env. Sci. course. This course originated with the Lapinski Env Sci text (2003, currently published by Pearson). I'm gradually working to update my section, for example, by incorporating outside readings, such as the **October 2011 National Geographic article "World Without Ice"**, and, PD I've been taking with the Urban Ecology Institute (**http://www.urbaneco.org/**), co-founded by Eric Strauss (who, coincidentally, authored our textbook's Unit Projects). I also use online video, including clips from NOVA, **Hippocampus.org**, and a number of other sources.

My course website is: **http://sites.google.com/site/envscirubin**.

Below I've highlighted places during the year where we discuss climate change -- though, as you can see, that could be pretty much anywhere -- since fossil fuel formation goes to geological timescle and the rock cycle, changes in the environment, energy transfer via photosynthesis, the effects of changing environmental conditions on biodiversity, evolution, populations and ecosystems. It's a central theme when teaching about the carbon cycle, as well as during our energy and air pollution units. Naturally, we discuss how the extent and condition of Earth's terrestrial and aquatic biomes are involved (tundra, desert, tropical, marine, etc.). Finally, climate change (and our role in provoking it) is central to learning about the evolution of human societies. This is especially true of units on the industrial revolution and the competing ethos' that 'Earth is ours to dispose of' vs. a view aiming towards sustainability -- and, the policies that result from these very different views of our place in the environment. A longstanding issue has been assisting students in differentiating between global warming (the outstanding environmental issue of our time) and ozone depletion (an essentially solved problem and one of several example environmental success stories introduced in hopes of allaying the student tendency to leap from denial to despair then swiftly back to denial).

Please feel free to contact me at **j_rubin@stoughtonschools.org** for further inquiries. I am especially seeking advice on differentiating instruction of a course that, at this point, is vocabulary-intensive and entirely teacher-driven; with very limited opportunities for students to be out of their seats actively 'doing' science and no likelihood of traveling further afield than our schoolyard.

Course Outline: Grade 9 Environmental Science

UNITS	KEY WORDS/CONCEPTS	PACING
1. Principles of Environmental Science	Earth's place in Solar System	

	The "Goldilocks" planet contrasted with Venus and Mars Organism, Ecology Lithosphere Igneous, sedimentary, and metamorphic rock Hydrosphere A quifer Atmosphere Troposphere, Stratosphere Biosphere (Bio = life) Scientific methods Hypothesis, variable, control, values Biotic and abiotic Changes in the Environment Plate tectonics, weathering and erosion Ice Ages, El Nino/Nina (ENSO) Global Warming, Ozone depletion Needs of organisms Nutrients, territory, dormancy, hibernation, species, habitat, geographic range, population and community, ecosystem, biodiversity	Mid-Sept: Chap. 1 Quiz Late Sept: Chap. 2 Quiz October 7: Term 1 Warnings Mid-October: Unit 1 Test
2. Ecology	Trophic levels Producers, consumers, decomposers Transfer of Energy, Food chains/webs, pyramids (biomass, ecological, numbers) biological magnification (bio-accumulation of pollutants)	Term 1 Reports Mid-Oct: Chap. 4.1-3 Quiz

	Chemistry of Life Matter, atom, nucleus, atomic number (element), atomic mass (proton+neutron), electron (-), ion, energy level (orbital, shell), compound and molecule, covalent and ionic bonds	Chem of Life Test by Halloween
	Cycles: Water Evaporation and transpiration, condensation, precipitation Carbon Photosynthesis Nitrogen Legumes and microorganisms	November 10 Term 1 ends Early Nov: Chap. 4.4 Quiz
	Species interactions, adaptations Niche, competitive exclusion, keystone predator Convergent and divergent evolution Symbioses (co-evolution) Predator/prey relations, parasitism, commensalism, mutualism Ecosystem stability and disturbance, natural selection: populations change as changing environmental conditions favor reproduction of some characteristics over others. Succession (primary, secondary)	Mid-Nov: Chap. 5 Quiz Unit 2 Test by Thanksgiving
3. Biomes	Characteristics, formation of: Terrestrial biomes Deserts (hot, cold types) Leaching, pavement, succulents, nocturnal, desertification, tundra (water mostly frozen), permafrost, migration Grasslands (prairie, steppe, savanna - mixed plants, trees in minority), humus, runners, rhizomes, vertical feeding patterns Forests, deciduous (temperate), boreal (coniferous, sub-polar), tropical (rain, dry), deforestation	Dec 13: Term 2 Warnings Chap. 7 Quiz Chap. 8 Quiz Term 2 Reports Chap. 9 Quiz Dec. 24-Jan 2:

		Winter Break
	Aquatic biomes Freshwater (wetlands, ponds, lakes, streams and rivers) Marine (estuaries, ocean: coastal, open, deep)	Unit 3 Test Jan 20-25: Mid-Year Exams Jan 26: Term 2 ends

4. Populations	Human population change/time, historic impacts, trends Gaia hypothesis, hunter-gatherer. agricultural and industrial societies, frontier and sustainable development ethics, renewable and nonrenewable resources, agricultural revolution, germ theory, demography, carbohydrates, proteins, and lipids, essential amino acids, malnutrition, green revolution, cash crop, aquaculture	Chap. 12 Quiz Chap. 13 Quiz Feb. 18-26: Vacation Unit 4 Test
5. Energy	Organic fuels Fossil fuels, biomass fuels, hydrocarbons, stages of coal formation, petroleum, natural gas, bioconversion, ethanol Atomic power Fission and fusion, isotope, half-life, meltdown, high, medium and low level wastes Alternative energy resources and technologies Solar power, passive and active solar heating, photovoltaic cells Hydroelectric power Wind power, aerogenerator (wind turbine) Geothermal energy	March 5: Term 3 Warnings March 7: Science Fair! Chap. 15 Quiz Mid-March: Chap. 16 Quiz Term 3 Reports March 21: 1st day of Spring! Unit 5 Test

6. Air, Land, and Water Resources	Solid waste Sources, disposal methods (historic and present day) sanitary landfill, biodegradable, composting, hazardous waste characteristics/classification (reactive, corrosive, ignitable, toxic, radioactive, medical), reduce, reuse, recycle Soil erosion/conservation Minerals, ores, bedrock, parent rock, soil profile Water Resource issues Irrigation, water table, overdraft, zones of saturation and aeration, water purification, desalination Sewage treatment, pathogens, toxic chemicals, heavy metals, eutrophication, thermal pollution Air pollution Indoor, outdoor issues, particulates, oxides, photochemical smog, ozone depletion and chlorofluorocarbons (CFCs), radon, emphysema, cancer, acid rain, greenhouse effect global warming, ice cores, Noise pollution and decibels	Chap. 18 Quiz April 9: End Term 3 Chap. 19 Quiz April 14-22: Vacation Chap 20 Quiz Chap 21 Quiz Chap 22 Quiz May 14: Term 4 Warnings
7. Human Impact and the Future	Habitat destruction Natural controls and human control efforts, extinction, alien species, wilderness, gene banks Sustainability Resource and energy conservation, recycling, source reduction, Biodiversity preservation, methods and effectiveness Environmental protection Human values and behavior, supply-demand curve, risk assessment, cost-benefit analysis, policy decisions, how made, at global, national and local levels, the individual's importance	June 7: Graduation Final Reports Chap 23 Quiz Chap 24 Quiz Unit 7 Test June 13-18?: Final Exams (Last day June 19 unless snow days push us as far as June 26)