

Conservation

Science

Grade(s) 11th - 12th, Duration 1 Semester, .5
Credits
Elective Course

Course Overview

GENERAL DESCRIPTION: Students will complete unit objectives on biomes, soils, aquatics, forestry, climate, and populations. The class will consist of many field trips and field research practice.

HOMEWORK OR READING NECESSARY: Individual completion of unit objectives. All students are required to read A Sand County Almanac by Aldo Leopold.

FORMAT: Individualized activities and research projects.

TESTS: Accompany each unit.

Scope And Sequence

Timeframe	Unit	Instructional Topics
5 Day(s)	Soils	
2 Week(s)	Biomes	
1 Week(s)	Energy	
1 Week(s)	Forestry	
1 Week(s)	Populations	
2 Week(s)	Aquatics	
18 Week(s)	Sand County Almanac	

Materials and Resources

Outdoor, working clothes.

Prerequisites

PREREQUISITE: Biology or with instructor's permission.

Course Details

Unit: Soils

Duration: 5 Day(s)

Materials and Resources

Soil Exam
Conservation

This is an essay exam. You will be graded on the completeness of you answers as well as correctness. Assume I know nothing (not a big stretch) and use your answers to teach me.

Terms to define 1 point @:

horizon humus topsoil subsoil leaching erosion
deposition soil profile weathering agriculture cropland parent material
rangeland loess desertification salinization overgrazing momoculture
fertilizer nutrient

1. Relate land use by humans to effects upon the soil. Include all the listed key words and underline those terms as they are used. [30]
compaction erosion slope pore space
vegetative cover root action
2. Fully describe 6 forms of erosion control and how each is done. Additional techniques described will be awarded 2 points gravy. [18]
3. Describe the effects of climate, weathering (physical & chemical), and biological factors in the formation of soils. [30]
4. Explain why the preponderance of agricultural production on our planet occurs in temperate regions. [15]
5. Use a full paragraph to compare and contrast soil fertility vs. productivity. How are they the same and how are they different? [25]
6. Explain the importance of limiting factors, three examples of what they might be, and how those factors affect soil fertility. [15]
7. Describe how our bedrock of limestone results in soils different from areas with granite bedrock. Include the concepts of pH, buffer, runoff and acid rain. [20]
8. Bring about 1 gallon of topsoil from home and complete both the soil column and the mud ball soil texture tests.
9. Submit your field journal to Mr. Haggard with your exam so he can grade your soil profile illustration (from the field trip) and the results from your soil texture tests.

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Unit: Biomes

Duration: 2 Week(s)

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Biome Objectives Due 10/11/13

Read ch. 6 of the Enger & Smith Environmental Science text.

Terms to define:

BOD (biochemical oxygen demand) benthic boreal emergent plants

eutrophic oligotrophic limnetic zone littoral zone pelagic

nekton salinity limnology fauna abyss

periphyton permafrost phytoplankton sere submerged plants

succession zooplankton boreal pioneer species

1. Biomes/ecosystems [105]

Use all your references to make a table showing each of these applicable components for each of the Biomes/Ecosystems listed below (some may not apply).

(x axis)

average temperature predominant vegetation

average precipitation predominant animal life

slope latitude and global position

elevation topography

depth solar exposure

(bold terms may not apply to all of those below)

(y axis)

Temperate forest Tropical desert

Temperate woodland Tropical rainforest

Temperate shrubland Tropical savanna

Temperate rainforest Tropical woodland

Temperate desert Estuaries (several types)

Grassland Coastal ecosystems (several types)

Tiga Shallow ocean (shore)

Tundra Open ocean (neritic)

Arctic polar Deep ocean (benthic)

Antarctic polar Intertidal zone

Islands

2. List two human activity impacts upon each of the listed biomes/ecosystems. [42]

3. Make a global map on poster board showing general biome regions. [100]

4. Draw and label the Carbon, Nitrogen, and Water cycles. [30]

5. Draw & labels the parts of the marine water column including the abyssal, benthic, neritic, limnetic, and intertidal zones. [25]

Topic:

Duration:

Unit: Energy

Duration: 1 Week(s)

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Resource Conservation Due Monday December 1.

(It is very helpful when you underline or embolden the key terms and phrases in your responses)

Terms

fuel cell fossil fuel photovoltaic biomass (energy source)
geothermal hydroelectric electrolysis cogeneration conservation
hybrid vehicle organic waste compost recycle incineration
landfill deep well injection net metering

Complete these objectives:

1. Read chapters 13 & 14 from your text.
2. Contrast renewable energy and non-renewable energy sources and list several examples of each. [20]
3. Recognize that energy and matter are forever in a constant cycle (second law of thermodynamics) and that our energy and materials are no different. Knowing that, answer the following two questions:
 - o What and when were the origins of most fossil fuels? [10]
 - o What is methane [5] and how is it collected from landfills [15] and why are landfills a source of this methane? [10]
4. Research your trash habits by listing your trash collector [5]. Call them and find out where they deposit their collected trash [10]. Call this repository and ask for a source for the process they use to sequester trash (how is it stored)[15]. What is the fate of that trash [5]? What about the groundwater that percolates through that trash [5]?
5. Contrast active vs. passive solar power. [5] (pg 352 may be helpful)
6. Describe the potential in Kansas for energy production from wind, hydroelectric, solar, geothermal, and biomass? [10]
7. Refer to question #3. Understanding that all things are cyclical, both matter & energy, apply the same concept to your waste production. Choose three waste items that you discard to the trash in a given day and explain for me in writing if and what any alternative fate for those items might be. [12] Then read the article "Anything Into Oil".
8. Explain what a waste-to-energy facility is and then explain why we do not have more of them around (remember the "golden rule"). [10]
9. Write a synopsis of the insert article pg 356 & 357 of your text "Digging garbage: The Archaeology of Solid Waste". [10]
10. Graph the electrical usage of your household in kilowatt hours per month for the past year. Which months have the highest usage? Which are the lowest? What is the rate per KWHr? [30]
11. Calculate the annual cost of fueling your car at \$2.00/ gallon, \$3.00/ gallon, and \$4.00/ gallon. You will need to estimate miles driven per week and divide by miles per gallon [30]

Topic:

Duration:

Unit: Forestry

Duration: 1 Week(s)

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Forestry Conservation Mr. Haggard

Complete each section as part of the take home exam. I recommend doing essay problems on computer so that you can amend them before the due date.

Terms

Define each of the following:

deciduous coniferous board feet angiosperm
gymnosperm cambium pith heartwood
sapwood ray extractives transverse plane
radial plane tangential plane bole crown
apical meristem lateral meristem transpiration cellulose
lignin grain tracheid vessel elements
clear cutting reforestation monoculture exotic species
slash & burn selective harvest sustained yield Chestnut blight

1. Describe each of the three harvest techniques covered in your text. Be sure to contrast each form. [9]
2. Use ~ 200 words to describe the effects of clear-cutting in high slope (mountain) areas on soil erosion, water quality, and fish production. [24]
3. Explain the relationship between virgin timber and timber production in a monoculture timber stand in terms of biodiversity. [4]
4. Explain why a reseeded timber stand will never attain the same quality as the original stand (biodiversity, shade, age diversity, and density are your key points) [9]
5. List the four objectives for the fertilization of a forest site. [4]
6. List 5 multiple use forest management techniques. [5]
7. Describe the American chestnut tree, its former range and its current demise. [9]
8. Are pine trees native to Kansas? [2]
9. Describe the pine wilt nematode and its effect upon pine trees in Kansas. [6]
10. Describe the Emerald Ash borer and its effect upon the lumber industry. [6]
11. Differentiate between the three classes of forest fire. [9]
12. What 5 factors must be considered in managing a controlled burn? [5]
13. List 9 advantages to controlled burning in slash pine stands. [9]
14. About how much U.S. timber lies in small woodlots? [2]
15. List the amount of lumber (with correct units) found in a log with a 21" small end, inside bark diameter and 12 feet long. [4]
16. Identify selected wood samples in class.
17. Identify selected leaf samples in class.
18. Observe the fine vascular systems of selected tree species.
19. Conduct an exercise in use of the Biltmore stick.
20. Complete a leaf sample collection of at least 20 mounted specimens with common name and binomial listed.

Topic:

Duration:

Unit: Populations

Duration: 1 Week(s)

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Population Concepts [due 2/8/10]

Terms to know: (definitions due) 1 point @ [58]
population habitat niche immigration
emigration community carrying capacity succession
climax community producer consumer herbivore
carnivore decomposer detritus biosphere
macroclimate microclimate biodiversity endemic
species richness extinction restricted range reproductive potential
home range biotic potential cyclic population stable population
exotic species predator control territory evolution
natural selection adaptation tolerance interdependence
dormancy acclimation biotic abiotic
biomass migration immigration emigration
density-dependence density independence inbreeding succession
species speciation coevolution symbiosis
intraspecific competition interspecific competition competitive exclusion
natality mortality population density

The student will complete and submit the following:

1. Read and know chapters 5 & 7 of your Environmental Science text.
2. Fully describe the range of tolerance of an organism relative to some limiting factor. [8]
3. Describe habitat fragmentation and list 4 examples. [8]
4. List the habitat requirements for animal populations. [4]
5. Compare & contrast the organism interactions of predator/prey, parasite/host, commensalisms, and mutualism. Be sure to include the benefit or harm of each member. [12]
6. Sketch the carbon, nitrogen, and phosphorus cycles. [12]
7. Describe four types of migration in animals. [8]
8. Research and explain the Pittman-Robertson Act. Who, what, when, where, why, & how. [40]
9. Explain Gaia theory. What is it? Are there similar philosophies? Name and explain them. [25]
10. Complete the accompanying Population Exam. [79]
11. Read the Discover article on exploding deer populations. Use at least six of the above terms to know as paragraph topics in a 200+ word response to the article. Be sure to underline or circle each of the key concepts. [25]
12. Read the ABC news article on the effects of wolf reintroduction in Yellowstone. Use at least six of the above terms to know as paragraph topics in a 200+ word response to the article. Be sure to underline or circle each of the key concepts. [25]
13. Calculate species richness, relative abundance, and construct a frequency distribution of a sample population problem in class. [25]

Topic:

Duration:

Unit: Aquatics

Duration: 2 Week(s)

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Aquatics (Limnology) This is due 4/5/10

Conservation Read Ch. 16

Terms to Know:

freshwater aquifer floodplain desalination hardness turbidity

eutrophic oligotrophic upwelling intertidal zone hydrothermal vents

estuary red tide by-catch non-point source pollution

slough fen bog swamp carr marsh

lake pond playa riparian herbivore predator

prey consumer carnivore heterotrophic autotrophic producer omnivore symbiosis mutualism commensalism parasitism predator/prey

competition saprophyte biomass precipitation aeration transpiration

percolation habitat trophic level population community ecosystem biome optimum condition range of tolerance detritus

biotic abiotic niche pH poikilothermic

decomposer scavenger macronutrient benthos micronutrient

potable artesian water table porosity salinization irrigation

evapotranspiration

1. What percentage of all water is freshwater? What is the biggest reservoir of freshwater? [4]
 2. Sketch & label the hydrologic cycle. [20]
 3. Sketch & label the features of aquifers and groundwater. [20]
 4. What is the average age estimate of groundwater (pg. 221 of green book)? [2]
 5. Why is it important to line the bottom of a landfill? [5]
 6. Contrast consumptive use of water to non-consumptive use. [8]
 7. Explain how irrigation increases soil salinity. [8]
 8. List 4 types of water pollution and one example of each type. [8]
 9. List seven positive reasons for maintaining and restoring wetlands. [14]
 10. Write and present a 500 word report on grey water recycling. Contrast grey water and black water. Include the usual path of grey water and alternatives uses by recycling. What is required to set-up such a system? [50]
 11. Write a 250 word paragraph comparing water price and usage trends in regions of the USA as compared to the rest of the world. (Are we 'haves' or 'have nots'?) [25]
 12. Use the table 16.1 pg 365 as a guide and describe which of those pollution sources are controlled at the water plant we visited and which are not controlled there. [35]
 13. Explain the significance of Biological Oxygen Demand (BOD) and the effects of higher BOD levels. [10]
 14. How is land use related to water quality? List and explain two local examples. [12]
- Find the following for your home AND the school (you will have to check your bill and call the service):
1. Source of the water supply – which water district and the original source (well, river, lake – which & where?). [15]
 2. Sewer/septic method. Do you have sewer, septic tank, lagoon, etc.? Describe the drainage basin that system empties into (home & school). [15]

Topic:

Duration:

Unit: Sand County Almanac

Duration: 18 Week(s)

Unit Overview

Students peripherally read "A Sand County Almanac" by Aldo Leopold during the semester. They are to complete summative worksheets along with their reading.

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