ESS 0010 - CONSERVATION OF NATURAL RESOURCES

Catalog Description

Formerly known as AGRI 190 and NATR 10
Advisory: Eligibility for ENGL 1A
Hours: 54 lecture
Description: Use and protection of natural resources, including soil, water, forest, mineral, plant, and animal life. Ecological principles, history of the conservation movement, modern problems in resource use, and the citizen's role in conservation. (CSU, UC)

Course Student Learning Outcomes

- CSLO #1: Identify and describe natural resources, distinguishing between renewable and non-renewable and between resources of the land, air, water or energy.
- CSLO #2: Explain the conservation of matter using biogeochemical cycles (e.g., carbon, nitrogen, phosphorus).
- CSLO #3: Describe how humans extract, process and utilize natural resources and analyze requirements and impacts of each process.
- CSLO #4: Outline historical environmental ethics and analyze impacts of each ethic on natural resources and sustainability.

Effective Term

Fall 2020

Course Type

Credit - Degree-applicable

Contact Hours

54

Outside of Class Hours

108

Total Student Learning Hours

162

Course Objectives

1. Identify and classify natural resources and ecosystem services.
2. Compare and contrast renewable and nonrenewable energy sources, relating them to natural resource conservation and utilization.
3. Describe and evaluate differing approaches to natural resource exploitation, utilization, conservation and preservation.
4. Apply sustainability principles to natural resource conservation.
5. Assess the human impact on natural resources.
6. Analyze the difference between conservation and preservation of natural resources.
7. Analyze the perception of the environment by different cultures.
8. Analyze and cite examples of how humans shape the environment.
9. Compare natural resources that are endemic to those that are imported.
10. Analyze how people impact their environment through resource use.
11. Describe the cycling of matter and the movement and change of energy through the ecosystem.
12. Illustrate the conservation of matter using biogeochemical cycles (e.g., carbon, nitrogen, phosphorus).
13. Compare and contrast interactions among organisms or populations of organisms.
14. Diagram the specifics of energy flow, describing accurately at least some of the actual species involved in these processes and their roles.
15. Analyze how only a fraction of the available energy is used for growth and incorporated in the plant or animal itself at each trophic level.
16. Analyze the plant and animal use of organic compounds for growth, maintenance, and reproduction (include respiration and photosynthesis) and illustrate how these compounds are broken down (decomposers) and cycled through the living and non-living parts of the environment.
17. Analyze the dynamic equilibrium of ecosystems, including interactions among living and nonliving components (for example, tropical deforestation linked to decreased global precipitation).
18. Inventory possible interactions between two biotic and abiotic factors.
19. Analyze the physiological needs of individual organisms and relate these to the habitat requirements of populations in an ecosystem.
20. Describe how an environment's ability to provide food, water, space, and essential nutrients determines carrying capacity.
21. Explain and relate the roles of mortality, natality, emigration, immigration, intrinsic factors and extrinsic factors in the changes in population sizes over time.
22. Compare and contrast major ecosystems of the world.
23. Analyze and provide examples of species interactions including: competition, predation, parasitism, commensalisms, and mutualism.
24. Predict how specific changes within the environment may increase/decrease a population’s size.
25. Explain how changes in an ecosystem can affect biodiversity and how biodiversity contributes to an ecosystem's stability (organisms can adapt, migrate, or die).
26. Analyze the effects of threatened, endangered or extinct species on human and natural systems and identify and explain how a species' increase, decline, or elimination affects the ecosystem and/or human social, cultural and economic structures.
27. Identify laws, agreements or treaties at national or international levels regarding threatened or endangered species.
28. Distinguish between habitat management and population management and differentiate between managing for a featured species and managing for biodiversity.
29. Evaluate economic, environmental, and other factors that impact resource availability and explain why certain resources are becoming depleted.
30. Assess how human resource use impacts environment (erosion, burning fossil fuels).
31. Differentiate natural soil erosion from soil erosion caused by humans.
32. Analyze the major sources of soil erosion (both agricultural and non-agricultural).
33. Analyze some important techniques used in controlling agricultural and non-agricultural soil erosion.
34. Analyze the distribution and circulation of the world's water through oceans, glaciers, rivers, groundwater, and atmosphere.
35. Analyze how land use variations in a watershed can affect the runoff of water and explain factors that affect water quality and flow through a watershed.
36. Predict how human activities at one location often have adverse affects on other locations.
37. Identify and analyze the costs, benefits, and consequences of using water resources.

38. Analyze the properties of surface water and ground water and how contaminants move and react in water.
39. Analyze soil properties and how they affect water quality.
40. Describe wetlands in terms of their effects (e.g., habitats, floods, buffer zones, prevention areas, nurseries, food production areas).
41. Explain how the speed of water and vegetation cover relates to erosion.
42. Identify the three major water pollution groups.
43. Distinguish between point and non-point source pollution.
44. Explain important biological, chemical, and biogeochemical processes in wastewater treatment.
45. Analyze what is meant by air quality and identify major air pollutants and their sources.
46. Classify types of waste, their sources and methods of waste reduction.
47. Compare practices and alternatives in solid and hazardous waste management and their environmental impacts.
48. Describe situations where prescribed burning would help achieve desired habitat management goals.
49. Given a habitat management goal, suggest appropriate vegetation management techniques that will help achieve that goal or, given a description of an area and landowner goals, suggest appropriate habitat enhancement projects to achieve those goals.
50. Analyze how technology has changed and impacted efficient use of natural resources by business and industry.
51. Identify careers related to natural resources and environmental issues.
52. Analyze how environment and resource availability can affect the economic, political, and social development of a culture, community or region.
53. Compare and contrast the roles of government and non-governmental agencies in natural resource management, sustainability and conservation as well as public policy development.

General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Life Sciences
  - AA/AS - Physical Sciences
- CSU GE Applicability (Recommended-requires CSU approval)
  - CSUGE - B1 Physical Science
  - CSUGE - B2 Life Science
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Classroom Discussions
  - Example: 1. Classroom discussion about impacts of environmental policy on resource extraction. Student will be evaluated based upon ability to synthesize and articulate a wide range of course information, demonstrating understanding of complex topics.
- Essay Examinations
  - Example: 1. (short essay question) Compare and contrast two (given) soils in terms of their drainage capacity and nutrient content. Apply the analysis to shallow groundwater movement, deeper groundwater recharge, ability to support plant growth and movement of dissolved nutrients and pollutants. (Students must analyze soil texture, particle size, pore space, and ratio and type of mineral and organic matter. Student responses will be evaluated based upon accuracy and critical thinking. Points will be provided for completeness, accuracy and synthesis.) 2. (essay question) Explain the effects of creating artificial barriers (i.e.: dams) along water courses. Describe at least three impacts to the local system and one effect on downstream coastal systems. (Students must demonstrate knowledge by listing impacts, but must also go beyond listing by synthesizing course information and demonstrating an understanding of the impacts of dams on hydrology, species migration, upland ecosystem inundation, upstream sediment impediment, downstream loss of nutrient and material input, etc. Points will be provided for completeness, accuracy and synthesis.)1. (short essay question) Compare and contrast two (given) soils in terms of their drainage capacity and nutrient content. Apply the analysis to shallow groundwater movement, deeper groundwater recharge, ability to support plant growth and movement of dissolved nutrients and pollutants. (Students must analyze soil texture, particle size, pore space, and ratio and type of mineral and organic matter. Student responses will be evaluated based upon accuracy and critical thinking. Points will be provided for completeness, accuracy and synthesis.) 2. (essay question) Explain the effects of creating artificial barriers (i.e.: dams) along water courses. Describe at least three impacts to the local system and one effect on downstream coastal systems. (Students must demonstrate knowledge by listing impacts, but must also go beyond listing by synthesizing course information and demonstrating an understanding of the impacts of dams on hydrology, species migration, upland ecosystem inundation, upstream sediment impediment, downstream loss of nutrient and material input, etc. Points will be provided for completeness, accuracy and synthesis.)
- Objective Examinations
  - Example: 1. Multiple choice, true/false, and short-answer examination about a course topic such as land resources. True or False: The United States is currently losing fertile top soil faster than it is renewing.
- Projects
  - Example: 1. Group poster assignment or term paper about a natural resource topic. Student responses will be evaluated based upon accuracy and critical thinking. Points will be provided for completeness, accuracy and synthesis.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. Instructor will first present the construction of a ternary soil diagram for textures, and then discuss several classification examples (e.g., how does the texture of a loam differ from that of a sandy loam). Next, students will be given a handout with the ternary diagram, and asked to work collaboratively in classifying several soils based on percentage values of textural components. The results will be

discussed as a class activity. Last, students will be given parameters to design their own ternary classification system. (Objective 31)

2. Instructor will present information on the Endangered Species Act and threatened and endangered species. Students will choose and analyze a piece of state or national legislation related to an endangered specie(s) and assess its impact (negative or positive).

Distance Learning

1. Following an online instructor lecture on organisms, students will write a report to compare and contrast interactions among organisms or populations of organisms. Reports will be posted on LMS for students to review and provide comment. Students shall comment on a minimum of 5 other students reports.

Typical Out of Class Assignments
Reading Assignments

1. Read (Fisheries Conservation) from Chiras and Reganold "Natural Resource Conservation" textbook and supplemental peer-reviewed metadata article "Fisheries: Hope or despair?" (Pitcher and Cheung; Marine Pollution Bulletin; 2013). Be prepared to discuss in class. 2. Read (Creating a Sustainable System of Energy: Efficiency and Renewable Energy) from Chiras and Reganold "Natural Resource Conservation" textbook and "Climate 2030: a national blueprint for a clean energy economy" (Union of Concerned Scientists, 2019). Be prepared to discuss in class.

Writing, Problem Solving or Performance

Critical Thinking Writing/Discussion Assignment 1: Based on what you have learned in your textbook reading, "The End of the Line" film (Docurama Films 2009), the article "Fisheries: hope or despair" (Pitcher and Cheung 2013), and lecture/discussion, do you have hope or despair for global fisheries? Support your answer using abundant and specific evidence. Critical Thinking Writing/Discussion Assignment 2: Suppose that all commercial synthetic fertilizers were banned for agricultural use, world-wide. Critically analyze the advantages and disadvantages for this development. Include impacts (positive or negative) to not only the agricultural system and food supply, but each of the five interacting subsystems of the earth.

Other (Term projects, research papers, portfolios, etc.)

1. Students will complete a research project on a specific natural resource issue (e.g.: Hydraulic Fracturing for Natural Gas in the San Joaquin Valley of California: uses, impacts and implications). Students will present their findings in a research paper and in a class presentation. 2. Students will work in groups to prepare a joint poster (exhibit) on a natural resource issue to be displayed during appropriate times on campus (Earth Week, People and Culture Days, etc.)

Required Materials

- Natural Resource Conservation
  - Author: Chiras & Reganold
  - Publisher: Benjamin Cummings
  - Publication Date: 2009
  - Text Edition: 10th
  - Classic Textbook?:
  - OER Link:
  - OER:
- Environmental Science: A Global Concern
  - Author: William Cunningham and Mary Cunningham
  - Publisher: McGraw Hill
  - Publication Date: 2017
  - Text Edition: 14th
  - Classic Textbook?:
  - OER Link:
  - OER:
- The Post Carbon Reader
  - Author: Heinberg & Lerch (editors)
  - Publisher: Watershed Media
  - Publication Date: 2010
  - Text Edition:
  - Classic Textbook?:
  - OER Link:
  - OER:
- Protecting Life on Earth
  - Author: Marchetti & Moyle
  - Publisher: University of California
  - Publication Date: 2010
  - Text Edition:
  - Classic Textbook?:
  - OER Link:
  - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.