

The interdisciplinary nature of SOIL

Soil science is an incredibly intricate interdisciplinary subject. We will focus on this topic over the next two classes in APES. Please answer the following questions as you read through “The interdisciplinary nature of SOIL” journal article. The answers to many of these questions require a fair amount of independent thought outside of what the journal article provides, so be ready to justify your responses with other information that you may need to research. Each question should be answered fully in complete sentences in order to earn points, but more importantly in order to really explain your thought process. Class time will be given to begin the assignment and late work is accepted for 50% credit this semester, so be sure to use your time wisely. Hopefully you find this article interesting as it makes many connections that you may have never thought of as being related to an everyday item that we take for granted such as soil.

Prior to reading the journal article:

1. Describe how a vast number of careers in biology, chemistry, geology, physics, anthropology, economics, engineering, medicine, sociology, the military and even in the arts relate to the interdisciplinary field of soil science.
2. Describe how the study of soil biodiversity, energy security, climate change, ecosystem services, food security, human health, land degradation and water security all benefit from soil science.

As you read the journal article, explain answers to the following questions.

Introduction

1. Describe how the atmosphere, biosphere, hydrosphere and lithosphere all contribute to soil formation.
2. Pick a field of study outside of the natural sciences and describe how an understanding of soil dynamics can better address some issues faced within your chosen field.

Soils and Biodiversity

3. Explain how soil contributes to ecosystem services.
4. Describe how soil biota determine the biological, chemical and physical properties of soil.
5. Explain what is meant by the quote *“plants are at the center of soil-plant-microbial interactions”* and how this relates to global food security.
6. Compare and contrast the differences in natural vs. mono-cropped vegetation effects on the environment.
7. Explain what is meant by the following quote: *“Due to the reliance of soil biological community structure and activity on the stability of abiotic and biotic soil properties, any change in these conditions may precipitate a shift in biodiversity.”*
8. Describe how agricultural dust can affect marine organisms.
9. Explain the difference between biodiversity and functional diversity of soil microfauna.

Soils and Biogeochemical Cycling

10. Describe how GHGs are linked to soil science.
11. Explain how soil nutrients contribute to eutrophication.
12. Explain one positive feedback mechanism associated with soil nutrient dynamics.
13. Describe how pH and phosphorus contribute to soil challenges.
14. Explain how soil dynamics contributes to the study of climate change.
15. Explain how minimum tillage relates to carbon sequestration.
16. Describe the relationship between soil and the hydrologic cycle.

Soils and Hydrology

17. Explain a link between history and water conservation.
18. Explain how computer science has contributed to our understanding of soil science.
19. Explain how *"preferential water flow"* contributes to an understanding of food and energy security.
20. Describe benefits and costs of SWR.

Soils and Human Health

21. Describe at least three ways in which soil science has contributed to the medical/pharmaceutical industry.
22. Explain some consequences to human health that are from soil.
23. Describe what the *"biggest research need"* is in relation to soil and human health.

Soils and Social Sciences

24. Describe the type of information that soil provides to archaeologists.
25. Explain what is meant by the following quote: *"Environmental conditions influence social, cultural, and economic development, and soils are important in determining which socioeconomic activities are feasible at a given location."*
26. Explain what is meant by *"there is great future potential for soil scientists to work with socioeconomicists to develop and evaluate ecosystem service payment programs and or similar schemes to value non-commodified services and goods, such as soil."*
27. Describe how various types of soil have contributed to wartime outcomes.
28. Explain how a misunderstanding of soil has contributed to degradation.
29. Describe what *"increasing environmental pressures"* soil is under.
30. Explain how soil degradation, protection and restoration are linked to food, energy and water security as well as ecosystem services.
31. Soil is considered to be central to sustainable development, so much so that the UNCCD has been formed. Describe what the UNCCD is and explain some of the basics of the UNCCD.

Interdisciplinary Aspects of Traditional Soil Topics

32. Describe the factors that contribute to soil structure.
33. Explain how better conservation measures can take place by employing an interdisciplinary approach to soil science.