

**From [www.collegeboard.com](http://www.collegeboard.com):  
On AP exam—Soil and Soil Dynamics  
(Rock Cycle; Formation; Composition; Physical and Chemical Properties; Main Soil Types;  
Erosion and Other Soil Problems; Soil Conservation)**

**CHAPTER 8 NOTES**

**8.1**

I. Plants and Soil

A. Soil characteristics

1) Soil profiles

photos: <http://tpwww.gsfc.nasa.gov/globe/soilgall/images/images.htm>

- a) horizons—horizontal soil layers
- b) soil profile—vertical “slices” through soil layers
  - O horizon = surface; humus
  - A horizon = topsoil
  - [E horizon = zone of leaching/eluviation]
  - B horizon = subsoil
  - C horizon = parent material; weathered

*Pneumonic: “Only Ants Excite Bored Children.”*

**detailed soil horizons** from <http://www.seafriends.org.nz/enviro/soil/geosoil.htm>

2) Soil texture—classification based on particle size

- a) Soil separates—rock fragments of varying size
  - Sand
  - Silt
  - Clay
- b) loam—common soil type with 40% sand, 40% silt, and 20% clay
- c) soil triangle—diagram used to classify soil type
- d) soil attributes
  - infiltration
  - nutrient-holding capacity & water-holding capacity
  - aeration
  - workability—how easy soil is cultivated

3) Soil classes

- a) mollisols—large A horizon, dark, rich; temperate grassland
- b) oxisols—small O horizon; not rich; rain forest
- c) alfisols—well-developed horizons; can be good growing soil with supplements; temperate forest
- d) aridisols—dryland/desert; not a well-developed profile

B. Soils and plants

1) Mineral nutrients and nutrient-holding capacity

- a) weathering—the wearing down of rock (liberating minerals)
- b) leaching—water washing away soluble materials from the soil
- c) nutrient-holding capacity (ion-holding capacity)—how the soil can “hold on” to important ions (calcium, potassium, phosphate)
- d) fertilizer
  - organic fertilizer—from plant/animal waste
  - inorganic fertilizer—chemicals only

- 2) Water and water-holding capacity
    - a) transpiration—plants emitting water through their stomata
    - b) irrigation—controlled introduction of water to an area
    - c) relevant soil attributes
      - infiltration—water seeping into an area
      - water-holding capacity—the ability of soil to retain infiltrated water
      - evaporative water loss—controlled by the O-horizon
  - 3) Aeration
    - a) soil aeration—allowing gases to diffuse in and out of the soil
    - b) compaction—pressing down; decreases pore space
  - 4) Relative acidity (pH)
    - a)  $\text{pH} = -\log[\text{H}^+]$
    - b) 0-14 scale
    - c) soil pH close to neutral is optimal for most plants and animals
  - 5) Salt and water uptake—water can be drawn out of plant roots if the soil is too salty
- C. Soil as an ecosystem
- 1) Detritus, soil organisms, humus, and topsoil
    - a) bacteria—base of the soil food web
    - b) humus—decomposed organic material; dark and rich
    - c) composting—producing humus in controlled conditions
    - d) castings—soil clumps
    - e) soil structure—particle arrangement
    - f) symbiosis
  - 2) Soil enrichment or mineralization
    - a) action of green plants
      - protection against erosion
      - reduction of evaporation
    - b) mineralization—loss of humus and breakdown of topsoil

## 8.2

### II. Soil Degradation—begins with depletion of topsoil

- A. Erosion and desertification
  - 1) erosion—movement of weathered particles (usually by wind and running water) <http://soilerosion.net/>
    - a) splash erosion (raindrops)
    - b) sheet erosion (more water flow)
    - c) gully erosion (stream flow)
  - 2) desertification—the process of converting areas to deserts (drylands) by soil degradation
- B. Drylands
  - 1) ~10-30 in. rainfall per yr.
  - 2) UNCCD—United Nations Coalition to Combat Desertification, 1996 <http://www.unccd.int/> COP (Conference of the Parties) meetings
- C. Causing and correcting erosion
 

U.S. National Resource Conservation Service <http://www.nrcs.usda.gov>

  - 1) overcultivation—frequent plowing
    - a) crop rotation—alternating the type of crops grown

b) no-till agriculture—weed control, planting, and covering up all at once

c) contour-strip cropping—cultivation along sloping ground

d) shelter belts—“belts” of trees planted around farmland to reduce wind erosion

2) overgrazing

BLM, Bureau of Land Management <http://www.blm.gov>

BLM leases grazing land

3) deforestation

U.N. Food & Agriculture Organization (FAO) <http://www.fao.org>

a) causes increased leaching and erosion

b) worst-case scenario—layers above the subsoil are gone

4) the other end of the erosion problem

displaced sediments can wash into rivers and streams

#### D. Irrigation and Salinization

1) irrigation—controlled introduction of water to an area

a) flood irrigation—diverted canals

b) central-pivot irrigation—water pumped from a central area

2) salinization—salts accumulating in and on the soil, hindering plant growth

### 8.3

#### III. Addressing Soil Degradation

##### A. public policy and soils

1) money and profit are usually the priorities

2) sustainable agriculture – an alternative

<http://www.sare.org> <http://www.sustainableagriculture.net>

a) topsoil integrity

b) food quality

c) chemical pesticide reduction

d) farming’s financial feasibility

3) LISA program (Low Input Sustainable Agriculture), 1988

<http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-07/>

4) CRP (Conservation Reserve Program), 1985

<http://www.fsa.usda.gov/dafp/cepd/crp.htm>

5) Food Security Act of 1985

[http://www.thecre.com/fedlaw/legal14coast/food\\_security\\_act\\_of\\_1985\\_legal\\_matters.htm](http://www.thecre.com/fedlaw/legal14coast/food_security_act_of_1985_legal_matters.htm)

6) FAIR (Federal Agricultural Improvement and Reform Act), 1996

<http://www.agriculturelaw.com/legis/farmbill.htm>

##### B. helping individual landholders

FARM (Farmer-centered Agriculture Resource Management)

<http://dbtindia.nic.in/farm/>