

# A One-day Visit to Soils

## *Ubiquitous yet Invisible to Most Americans -- The Core of Human Sustenance*

March 25, 2006    Central Rockies Chapter of the Society for Ecological Restoration    D. Buckner, M. Paschke

*Spend a day with Drs. Buckner and Paschke as we delve into the fascinating world of soils. Topics include soil's chemical and physical properties, soil classification, analysis of soils in the field, and interactions with animals.*

**When:** March 25, 2006, 9:00am to 3:00pm

**Where:** Denver Botanic Gardens, Morrison Center  
909 York Street, Denver, CO 80206

**Cost:** CeRSER or DBG Members \$25, Non-members \$35 (includes lunch)

**Registration:** Shirley Hanson, 720 865-3580, hanson@botanicgardens.org

### Draft Agenda

- I.     **Soil In Brief: the Dirt, the Sweat and the Peculiarity of Water**
  
- II.    The Dirt : Bits of Grit
  - A. Particle sizes in Perspective
  - B. Less than 2 mm (2000 microns)
  - C. Sand (50 – 2000 microns)
  - D. Silt (2 – 50 microns)
  - E. Clay (<2 microns)
  - F. Surface Area Ratios : SAND : SILT : CLAY = 1: 100: 1000
  - G. The Veneer of Bits of Grit on the Rocky Planet
    - i.     Where do the bits of grit come from?
      - a. Physical weathering
      - b. Abrasion
      - c. Chemical weathering
      - d. Secondary weathering
    - ii.    Stability of the veneer – once it is there, what happens?
    - iii.   Erosion – grain by grain, cubic meter by cubic meter
    - iv.    Deposition – look out, here it comes
    - v.     Relation of geomorphology to human agriculture.
  
- III.   The Sweat
  - A. Terrestrial Organisms -- Leaking Bags of Water
  - B. Why must Terrestrial Plants leak?
    - i.     To breathe is to leak
    - ii.    Adaptations to reduce / control leakage
  
- IV.    The Peculiarity of Water
  - A. Polarity -- What if water were not a polar molecule?
  - B. Surface tension
  - C. Capillary rise
  
- V.     Soil Water – The faux Ocean
  - A. Saturated soils
  - B. Soil Field Capacity
  - C. Permanent Wilting Point
  
- VI.    Soil versus just Dirt – What makes soil out of dirt??
  - A. Organic Additions

- i. Development of organic-rich surface layers --- humus
  - ii. Cation and Anion Exchange
  - iii. Soil Structure
- B. Translocation Phenomena
  - i. Clays
  - ii. Salts
  - iii. Metals
- VII. Climate and Soil -- An environmental veneer
  - A. Warmth – Rates of chemical reaction
  - B. Precipitation – Rates of moisture addition and leaching
- VIII. Organisms and Soil
  - A. Burrowing Invertebrates and Vertebrates
  - B. Detritivores
  - C. Role of Organics in Soil Structure and Chemistry
- IX. The Support of Human Kind -- The Role of Soil and the Perils of Soil Under Human Management
  - A. Soil Erosion – Role in Vegetation Ecology; Role in Human History – past and future
  - B. Fertilizers
  - C. Herbicides
  - D. Nitrogen Pollution
  - E. Smoke and Mirrors -- the fossil fuel-supported green revolution – beware the cliff ahead
- X. Kinds of Soil - Classification --
  - A. Orders, Suborders, Families, Series
  - B. The Ten Soil Orders
- XI. Soil Chemical Properties
  - A. pH
  - B. Salts
  - C. Metals
- XII. Soil Physical (and Circumstantial) Properties
  - A. Texture
  - B. Depth
  - C. Slope
  - D. Geomorphic Position
- XIII. How do you know something about soils in the field?
  - A. Texture – Grit/ SMOOOOTH / Sliiiiime
  - B. Depth
  - C. Geomorphic Position
  - D. US Natural Resource Conservation Service (NRCS or SCS) Soil Surveys
  - E. Horizons
- XIV. Plants and Soil – Why do Plants’ and Soils’ Distributions Correlate (when they do)?
  - A. Preference vs. Left-overs
  - B. Deep / Shallow
  - C. Suck-it-up or Spit-it-out
  - D. The Root Zone -- the ecological frontier
- XV. Summary