CSS 260 Soil Science

Course Objectives:

1) To provide a better appreciation of the distribution and variability of soils and their properties across the landscape,

2) a knowledge of how these properties are created and how they effect landscape processes (both at a large and small scale),

3) a preliminary ability to investigate soil characteristics and,

4) an understanding how we manage (or not) soils and their properties for a multitude of objectives.
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There are no scheduled office hours at the moment, but meetings can be made by appointment.
Expectations:

Of you…

**Cornell Code of Conduct / Academic Integrity**

Cheating and Plagiarism are **NOT** acceptable behaviors!
And it will result in a failing grade in this course and other consequences as mandated by the Department and University

Of us…
Commitment to the advancement of your knowledge, skills and ability to excel.
Please make use of our knowledge and talent – it’s why we are here!

Of us all…
While we hope everyone will have a good time, we expect everyone to fully contribute as well as participate in the course and attendance is mandatory!
Text: The Nature and Properties of Soil (14th Ed)  
Brady N. and R. Weil


Week One Reading: Chapters 1, 2 and 4

For Monday and next week’s Lab read:

Laboratory 1 on the web

Chapters 1, 2 and 4 in the text

Labs will be outside so wear appropriate clothing and FOOTWEAR!!!!

Labs will be at least 3 hours long so bring something to drink!!!! (and food)
Grades:

Lecture is 60%
  Two Prelims (15% each)
  Final (20%)
  Attendance and Participation (10%)

Laboratory is 40%
  Quizzes and Reports (30%)
  Participation and Attendance (10%)
Soils: The Foundation of Civilizations

- "For all things come from earth, and all things end by becoming earth."
  - Xenophanes of 580 B.C.

- "While the farmer holds the title to the land, actually it belongs to all the people because civilization itself rests upon the soil."
  - Thomas Jefferson

- "We are part of the earth and it is part of us... What befalls the earth befalls all the sons of the earth"
  - Chief Seattle, 1852

- "The nation that destroys its soil, destroys itself."
  - Franklin Delano Roosevelt
Pedosphere
The Concept of Soil
or what is a soil?

- **Geologic definition:**
  Loose surface of the earth as distinguished from solid bedrock.(support of plant life not required)

- **Traditional definition:**
  Loose, altered surface material of the earth which nourishes and supports growing plants.
  (includes rocks, water, snow, air)
The functions of soil

- Water supply and purification
- Engineering medium
- Medium for plant growth
- Habitat for soil organisms
- Recycling system for nutrients and organic wastes
Soil Components

- Solids
  - Mineral
  - Organic
- Solution
- Air

Biota
- Microorganisms
- Macrofauna
- Plant roots

*Diagram showing the distribution of soil components: Air 25%, Solution 25%, Organic, and Mineral 45%.*
What is A Soil?

- **Soil Taxonomy definition**: Collection of natural bodies of the earth’s surface
  - modified or even made by man or earthy materials,
  - characterized by one or both of the following:
    - horizons, or layers, that are distinguishable from the initial material as a result of additions, losses, transfers, and transformations of energy and matter or the ability to support rooted plants in a natural environment
    - containing living matter and supporting or capable of supporting rooted plants, out of doors, in a natural environment
  - **upper limit**: air, shallow water, live plants or loose plant material that has not begun to decompose
  - **lower limit**: the depth to which soil weathering has been effective
Alteration processes
What is a Soil?

- As a portion of the landscape
  Collection of natural bodies occupying portions of the earth’s surface that
  - support plants
  - have properties due to the integrated effect of climate and living matter, acting upon parent material, as conditioned by relief, over periods of time.
Portion of the landscape

Landscape

A polypedon or soil individual

Solum

A “pedon”

Soil profile
Soil as an Integrator
(soil forming factors)

- Parent material
  - Rock
  - Alluvium
  - Glacial Till
  - Loess
- Climate
  - temperature and humidity

- Biota
  - Animals
  - Microbes
  - Plants
  - Humans
    - management
- Topography
- Time