Soils

INTRODUCTION:

There can be many uses of the word "soil", depending upon the context. For example, soil can be thought of as an engineering material for road construction, as dirt on clothing, as a mixture of ingredients for growing potted plants, or what the farmers plow every spring. For the purposes of the Regional Envirothon, "Soil is the collection of natural bodies on the earth's surface, in places modified or even made by man of earthy materials, containing living matter and supporting or capable of supporting plants out-of-doors." Soil is thus considered both a product of nature and a critical part of natural systems. This definition also allows soils to be collectively grouped into a classification system, as used in making soil surveys. Soils "begin" as parent material, then the process of weathering occurs. Weathering eventually causes a differentiation into distinct horizons. A soil and its profile show the effects of five soilforming factors: Climate, Living Organisms, Topographic Relief, Parent material and Time (it may help to remember the word "CLORPT"). Soils can be considered as "young", "mature" or "old", depending upon their extent of weathering and horizon development. Soils in NY State are relatively young or mature, but not old -- their parent material was exposed or deposited during the relatively recent retreat of glaciers, some 10 to 15 thousand years ago. There are a number of soil properties and limitations including: composition, texture, structure, slope, color, chemistry, profile, permeability and drainage. In addition to defining and applying these soil properties for background, a practical knowledge of the soils can be attained by using the Soil Survey, which classifies soils into series for identification, provides reference maps and interpretative tables. Most of the soils in the U.S. are aerobic. But soils can often become saturated with water due to rainfall and flooding. When this anaerobic (no oxygen) environment continues for long periods during the growing season, different biological and chemical reactions begin to dominate. In soils where saturation with water is prolonged and is repeated for many years, unique soil properties usually develop. Soils with these unique properties are called hydric soils. These soils are important favor the formation of many types of wetlands. In fact, hydric soils were defined so that they help identify wetlands. Soil erosion and sedimentation are separate processes, but think of them as occurring together, since once soil is eroded, it will eventually become sediment impacting water quality somewhere else. [3]Normally it takes an average of 500 years for nature to build up 1 inch of topsoil. To grow good crops agriculturally, 6 inches of topsoil are required. Since only 1/500th of an inch of topsoil is being built up naturally on the average annually in the U.S.,soil is being depleted on the average each yearapproximately 18 times faster than it is being built up in nature.[2] (Ecology Action, 5798 Ridgewood Road, Willits, CA 95490)

Source: New York State Envirothon Web Site

OBJECTIVES:

• Recognize soil as an important and dynamic resource.
• Recognize and understand the features of a soil profile.
• Describe basic soil properties and soil formation factors.
• Explain the origin of soil parent materials.
• Identify and list soil characteristics (e.g. , texture, structure, etc.) and their relation to soil properties.
• Determine basic soil properties and limitations (e.g., mottling and permeability) by

observing a
soil pit or a soil profile.
• Recognize the characteristics of wetland (hydric) soils.
• Explain soil drainage classes and understand how wetlands are defined.
• Describe soil water, its movement, storage and uptake by plants.
• Cite the effects of land use on soils.
• In land use planning decisions, discuss how soil is a factor in or is impacted by non-point source pollution.
• Identify types of soil erosion and discuss methods for reducing erosion.
• Utilize soil information, including a soil survey.
Source: Canon Envirothon Objectives Soils

OUTLINE:

I. Soils and Ecosystems
- A. Soil an Important Natural Resource
- B. Basic Interrelationships between Soil and the other Components of an Ecosystem
  1. involved in major nutrient cycles
  2. Involved in successional stages
  3. soil-plant interactions: nutrient transfer, decomposition/organic matter, erosion prevention, fertility/productivity, soil a matrix/mechanical support
  4. soil-water interactions: filtration, eluviation/illuviation, holding capacity, erosion effects, wetlands including definition of hydric soils, water table, aquifer recharge

II. Soil Forming Factors: Parent Material, Climate, Plant/Animal Life, Topography, Time

III. Soil Drainage Classes
- A. Definition and Delineation of Wetlands
- B. Hydric Soils: Physical/Chemical Characteristics
  1. testing for hydric soils

IV. Soil Properties: By Observing a Soil Pit or Soil Profile
- A. Define and Provide Application for Major Soil Properties and Limitations such as: texture, structure, color, chemical content, slope, water content, permeability, mottling, permeability, consistence, aggregation, cation exchange capacity, pH

V. Soil Composition
- A. Major Components of Soil: air, water, minerals, organic matter
- B. Major Soil Types: sand, clay, loam
- C. Soil Particles: sand, silt, clay
- D. Use of Soil Triangle

VI. Soil Profile: Differentiation of Soil Horizons

VII. Soil Survey Document
- A. History, Status and Current Applications of the Survey

B. Knowledge and Use of Soil Series, Soil Interpretations
C. Basic Working Knowledge of Survey Format and Information
D. Ability to Use Aerial Photomaps
E. Land Use Capability Classification System: Operation and Application
F. Geographical Database: Usage/Application

VIII. Soil Quality Indicators: Aggregate Stability, Organic Matter, Crusts, and Infiltration

IX. Soil Resource Concerns
A. Examples: compaction, erosion (types), sediment deposition
B. Identification of Concerns
C. Identification of Specific Best Management Practices
D. Soil: a Factor in, or Impacted by Nonpoint Source Pollution

SKILLS:

1. Use of clinometers, augers, color charts, test kits, and meters
2. Familiarity with soil pits
3. Determination of soil type by ribboning or use of particle screens
4. Basic ability to determine land use class
5. Identification of wetland indicators
6. Identify landform at site
7. Determine permeability of soil
8. Identify drainage class, depth to bedrock, depth of rooting
9. Measure thickness of topsoil, subsoil
10. Analyze soil structure and texture
11. Ability to quickly and effectively locate needed information in a soil survey
12. Using soil survey: identify hydrologic soil group; analyze chemical properties of soil; estimate erosion potential; Identify soil-mapping unit; evaluate soil type for its suitability for crops and pasture, woodland productivity, wildlife habitat, recreation, building site development and sanitary facilities.