Forest Soils -- the least renewable physical resource

Key Concepts:
1. There are 5 soil forming factors – time, biota, topography, climate, parent material.
2. Soil texture affects tree growth, water & nutrient availability, soil aeration.
3. CEC (cation exchange capacity) is a measure of plant nutrient availability.
4. Clear cutting can cause nutrient losses by leaching, especially NO₃⁻ and SO₄²⁻.
5. The type of forest tree species strongly influences soil properties.
6. Many forest soils are acidic (especially confer forests), and soil pH affects many soil and plant processes.

Study Questions:
1. When trees are harvested, which 2 nutrients are removed in greatest amounts? How are they replenished?
2. Which soil layer (or horizon) contains the most nutrients?
3. Why is CEC important? What are cations and anions? Examples?
4. Does surface soil erosion matter since there is still a deep layer of parent material?
5. Why are soil aggregates important? How do they form?

1. Introduction: “We cannot manage forest ecosystems sustainably unless we maintain those soil conditions and processes that help to determine forest ecosystem function and ability to recover from disturbance. Much of the negative environmental impact of forestry in the past has been related to effects on soils.” (Kimmins’ 1997 Forest Ecology, pp. 268-269).

A. Why are soils the ‘least’ renewable resource? How does timber harvesting remove nutrients? How are nutrients replenished? # 1 (Fig. 5.14 Kimmins).
B. Five soil forming factors – – time, biota, topography, climate, parent material.
C. Soil formation - Glacier Bay Alaska. #2 (Fig. 5.15, Kimmins)

2. Soil Properties
A. Appearance: Soil horizons. #3 (Fig. 11.2)
B. Physical: 1. Texture #4 (Fig. 11.3) 2. Structure & aggregates 3. Color 4.Water content #5 (Fig 11.5)
C. Chemical: 1. Nutrients 2. Cation exchange capacity[CEC] #6 3. Soil pH #7 (Fig.11.7) 4.Soil Organic Matter
D. Biological:1. The Rhizosphere 2. Soil microbes - bacteria, fungi, amoebae, actinomycetes, algae,
3. Soil animals microfauna (protozoa, nematodes, mites, ..), mesofauna (ants, springtails, larger mites, ..), macrofauna (earthworms, millipedes, spiders, termites, gophers, shrews, mice, ..)

3. Forest Vegetation & Topography affect soils - e.g. Michigan’s Upper Peninsula #8 (Fig. 11.8)

To learn more about Forest Soils.........................
CLASSES: SSC10 (Concepts-Soil Science); SSC100 (Principles-Soil Science); SSC111 (Soil Microbio.); SSC112 (Soil Ecology); SSC 118 (Soils/Land Use/Environment).