

Science Background: Forest Ecosystems and Carbon Storage

Forest Ecosystem Carbon Pools

- **Living Biomass:** Leaves, twigs, stems, coarse roots and fine roots of trees, shrubs and herbaceous plants
- **Dead Biomass:** Standing dead trees, downed trees, leaf litter (forest floor), dead roots
- **Soil Carbon or Soil Organic Matter (SOM):** Humus, microbial biomass



Forest Types

1. **Boreal:** large accumulations of moss and undecomposed organic matter on the forest floor that are characteristic of these ecosystems
2. **Tropical:** multiple layers of vertical structure in aboveground biomass
3. **Temperate:** biomass pools associated with standing living trees, dead trees, and downed woody debris
4. **Savannah:** some aboveground carbon storage with a larger accumulation of belowground carbon storage



Image: <http://www.forestryimages.org/>

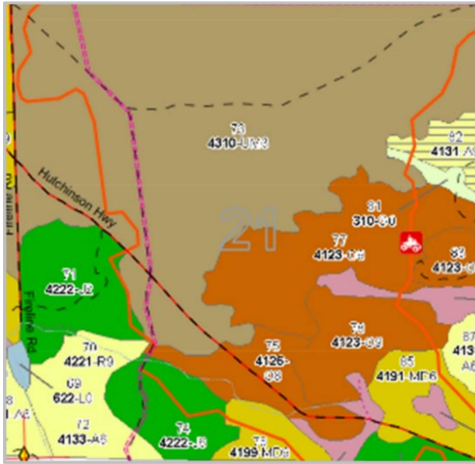
Residence Times of Organic Matter

Plant Residues	Residence Time
Leaf litter	Months to years
Root litter	Years
Bark	Decades to centuries
Wood	Decades to centuries
Soil organic matter (SOM)	Years to millennia

Source: Lorenz, K., & Lal, R. (2009). Carbon sequestration in forest ecosystems. Springer Science & Business Media

Images: <http://www.forestryimages.org/>

Forest Stands - Composition and Structure



Images: Michigan DNR

- **Composition**
 - Cover type: Classified by the dominant tree species present in a stand
 - Species richness: number of species present in a given area
 - Relative abundance of different species
 - Genetic diversity

- **Structure**
 - Vertical structure: size of trees, canopy layers
 - Horizontal structure: tree spacing, clumping
 - Amount and distribution of dead wood
 - Amount and distribution of leaf litter
 - Root amounts and distribution

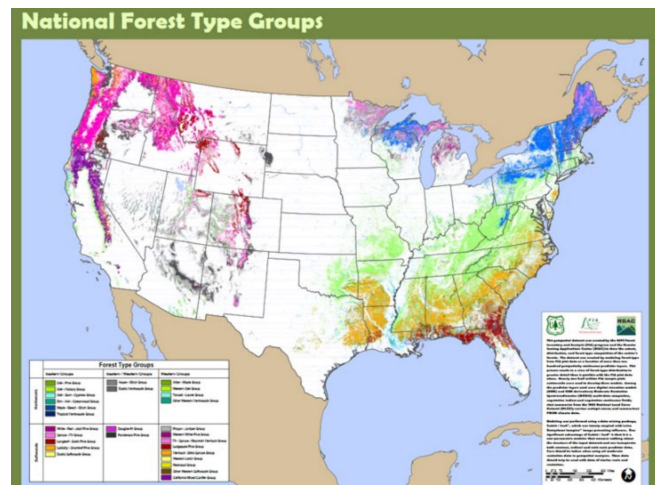
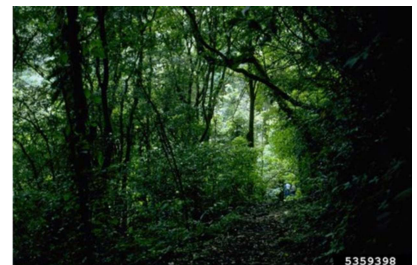
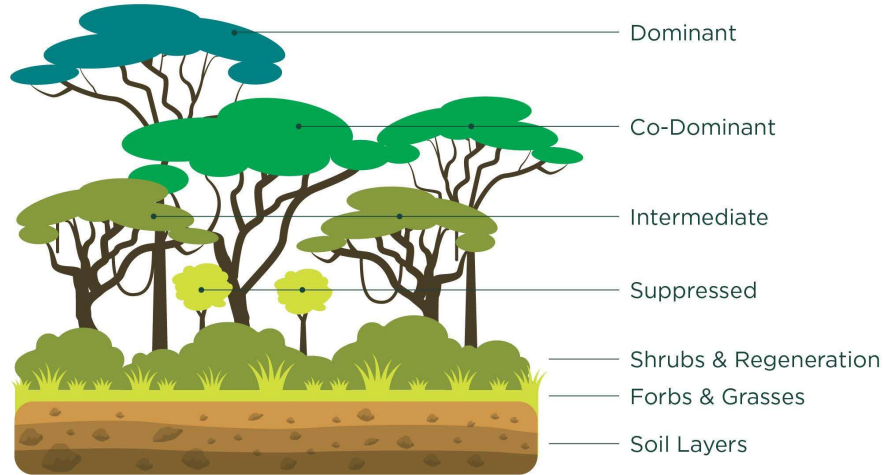


Image: https://data.fs.usda.gov/geodata/rastergateway/forest_type/

Vertical Structure of a Forest



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Images: <http://mfj.dsisd.net/Environment/PICS/Tertical/>
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