

Plant Nutrition

- All plants are autotrophs
- make their own carbohydrates but still require other nutrients

Macronutrients

- **Carbon**
 - from CO_2
- **Oxygen**
 - from H_2O , O_2
- **Hydrogen**
 - from H_2O
- **Nitrogen**
- **Potassium, Calcium, Magnesium, Phosphorous, Sulfur**

Mineral Deficiencies in Plants (1)



Healthy



Chlorine-deficient

Mineral Deficiencies in Plants (2)



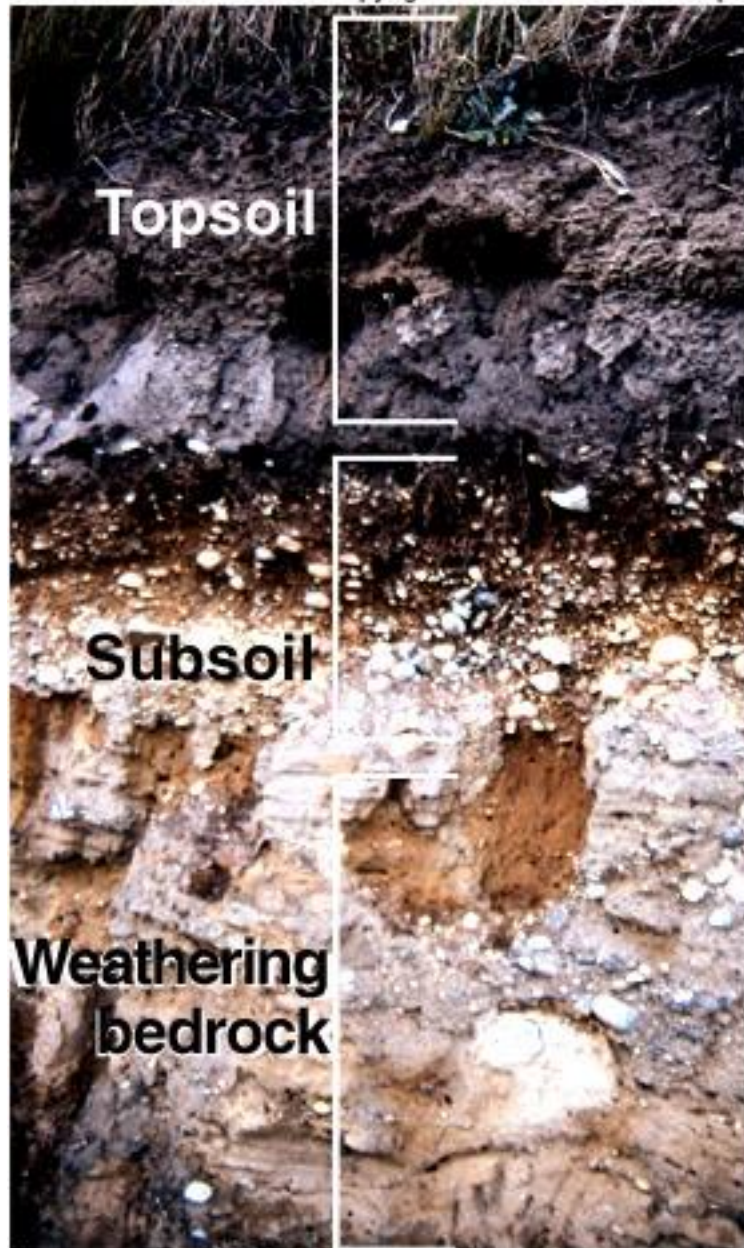
Copper-deficient



Zinc-deficient

Importance of Soil

- **Soil** = the highly weathered upper layer of the earth's crust
- **Topsoil** - where roots occur
 - uppermost layer of soil
 - mixture of mineral particles of various sizes (from coarse sand to silt to fine clay), living organisms and humus (partly decayed organic matter)



Topsoil

Importance of Soil

- Plant growth is significantly influenced by the nature of the soil

Water Holding Capacity

- Clays may hold water so tightly it is unavailable to plants
- Sands allow water to drain very rapidly
 - most water is removed by gravity to lower levels
- Ideal soil is a mixture of coarse and fine particles

Soil Fertility

- Its ability to support plant growth
- nutrients must be replenished in soil
 - decomposition & nitrogen fixation
 - fertilization
 - Chemically or organically (manure, dead animals)
adding nutrients to the soil
 - crop rotation

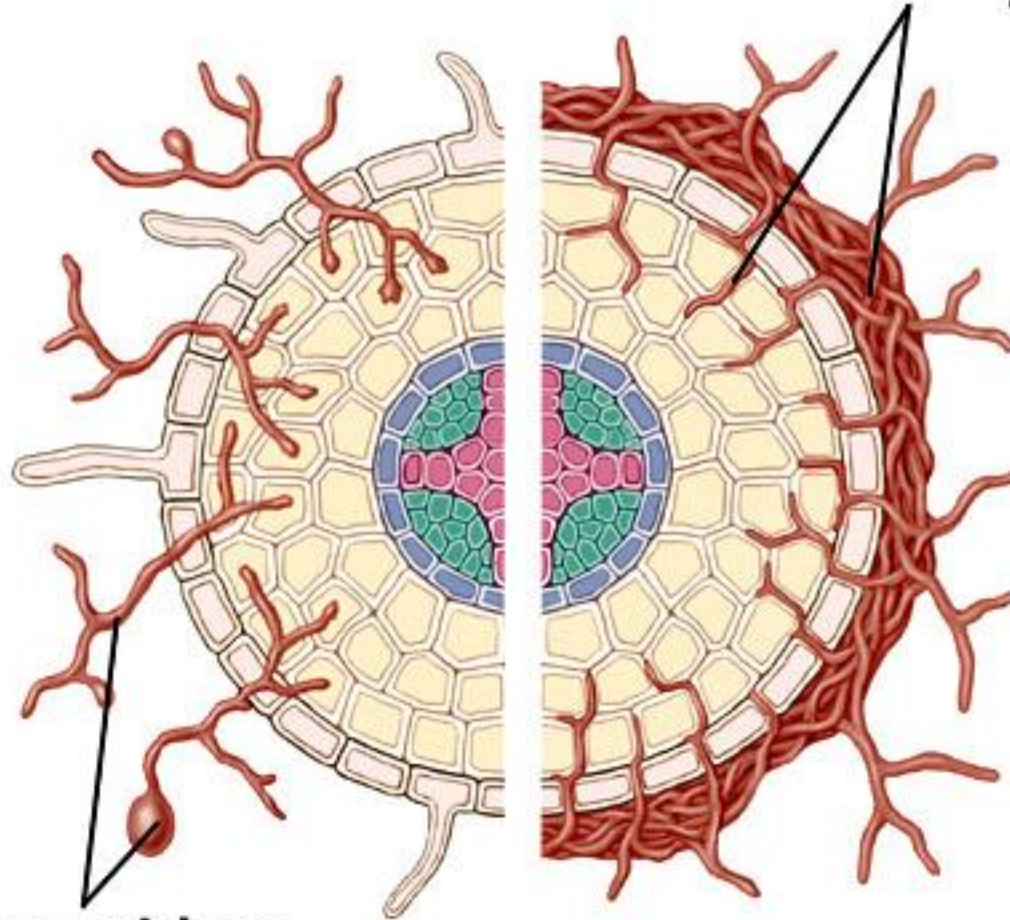
Plant Symbioses

- Plants have evolved symbioses with other organisms that increase their efficiency at removing nutrients from soil

Found in 90% of
vascular plants

Mycorrhizae

Ectomycorrhizae



Endomycorrhizae

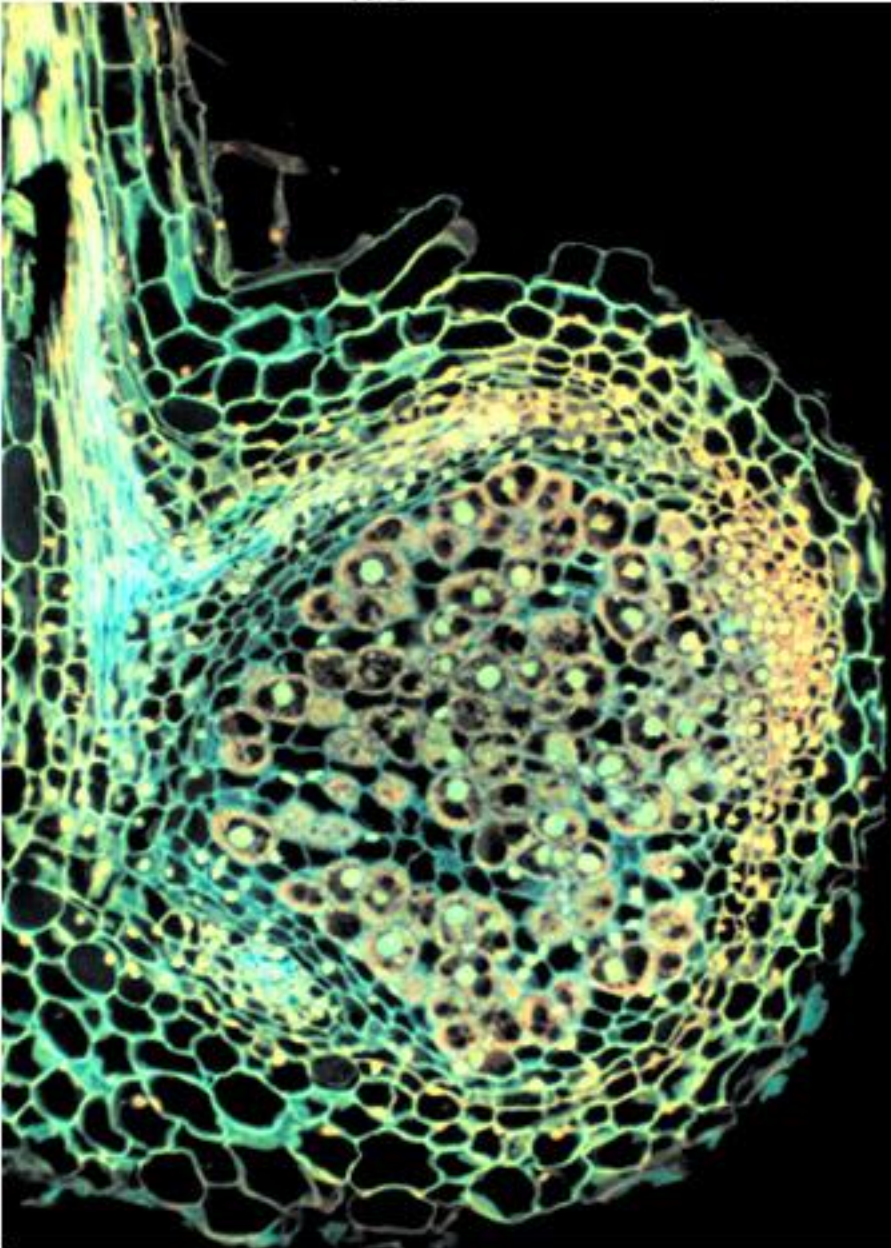
-more common

Ectomycorrhizae on Pine Roots



Nitrogen-Fixing Nodule

Found in legumes



Carnivorous plants

- Some plants obtain nitrogen directly from other organisms, just as animals do.
- Usually grow in bogs with acidic soil that is not favorable to the growth of nitrifying bacteria
 - venus fly trap, pitcher plants, bladderworts and sundews



(a)



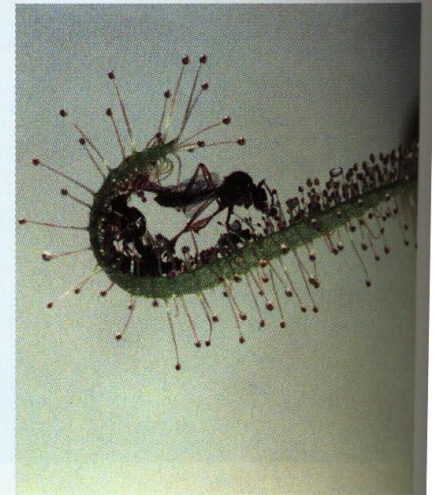
(b)



(c)



(d)



(e)

FIGURE 36.8

Carnivorous plants. (a) The Venus flytrap (*Dionaea muscipula*) inhabits low, boggy ground in North and South Carolina. (b) A Venus flytrap has snapped together, imprisoning a fly. (c) A tropical Asian pitcher plant, *Nepenthes*. Insects enter the pitchers and are trapped and digested. Complex communities of invertebrate animals and protists inhabit the pitchers. (d) The yellow pitcher plant (*Sarracenia flava*) grows in bogs in the southeastern United States. Its pitchers, with their yellow borders, resemble flowers and secrete a sweet-smelling nectar that aids the plants in trapping insects. The flowers of this species, with their hanging petals, are also evident in this photograph. (e) Sundew (*Drosera*). A small fly has been trapped by the glandular hairs.