Biosphere 2

* Totally self contained
* Grew their own food
  + Mostly vegetables, a few animals
* Irrational Antagonism
  + 2 groups of 4
* Lasted 2 years, but had to add oxygen
* Concrete absorbed oxygen

Basics of Soil

* We are interested in the O, A, and B horizons
  + O: Humus/decaying organic matter
  + A: mineral layer
  + B: Water layer

Humus

* Living microorganisms
* Stuff that just died and is beginning to decompose
* Humus
  + Well-decomposed dead stuff
  + Stable - won’t break down any further; would stay just the way it is for centuries if not disturbed

SOM

* Improves soil structure
* Improves drainage
* Enhances water and nutrient holding capacity
* Reduces damage to plants from drought, flood, and disease
* Enhances productivity
* Sequesters carbon -> can help reduce CO2 in atmosphere
* Increased / sustained yields
* Reduced risk of flooding, standing water
* Healthier crops and livestock

Good Tilth

* A way of describing soil that:
  + Has good aggregation
  + Is well aerated
  + Infiltrates water well
  + Drains well
  + Holds a desirable amount of moisture

Horizon Development

* O Horizon: Organic matter
* A Horizon: Topsoil, a mixture of organic matter and mineral soil
* B Horizon: Mineral soil and clays

Chemical Properties of Soil

* pH
  + A way of expressing the acid status
  + Affects nutrient availability
* Cation exchange capacity (CEC)
  + Elements having an electrical charge are called ions
    - Positively charged ions are cations
      * Include many important plant nutrients
* Salinity
  + Too much salt will kill crops
  + Salts can come from irrigation water, fertilizers, composts, and manure
  + Salts can be leached slowly applying excess water
  + Measured in conductivity meters (mmho / cm)
* C:N Ratio
  + Carbon to nitrogen ratio is a ratio of the mass of carbon to the mass of nitrogen in a substance
  + Within the organic component of soil

Rhizosphere

* Root exudates
  + Hydrogen+ exchange for nutrient cations

Mycorrhizae

* In forest systems, mycorrhizae actually connect even across species
  + Chemical alarm signals
  + Nutrients
  + Older trees feed young ones - increase survivorship
  + Tree near death will transfer nutrients and sugar to nearby trees
* Suzanne Simard
  + Other foresters were very skeptical and dismissive at the start

NPK

* Macronutrients
* Ammonium: NH4+
* Nitrate: NO3-
* Potassium: K