



Soil Science in Horticulture

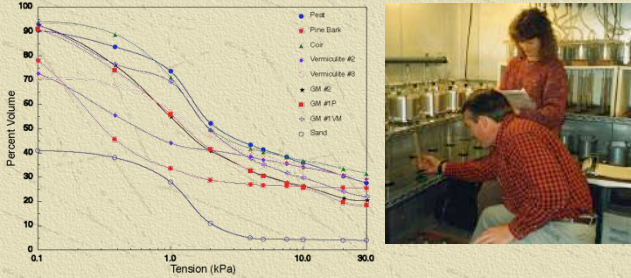
Dr. Bill Fonteno
NC State University



Physical Properties

$$\Theta = \Theta_r + (\Theta_s - \Theta_r) / [1 + (\alpha h)^n]^m$$

Moisture Retention Curves



Standards & Certification Program

- ✦ To develop standards for mulches, potting soils and soil amendments
- ✦ To certify the quality and authenticity of mulches, soil amendments, and potting soils




Repurposed Materials

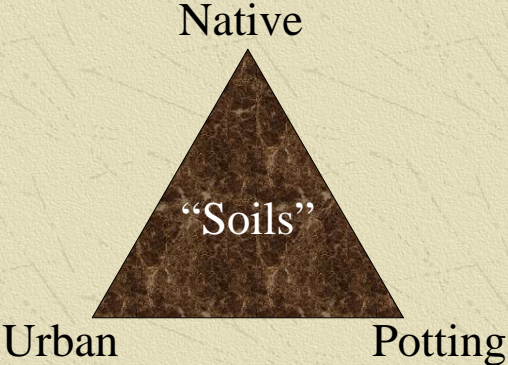
- ✦ Wood processing
- ✦ Dairy fiber
- ✦ Biochar
- ✦ Rain Gardens





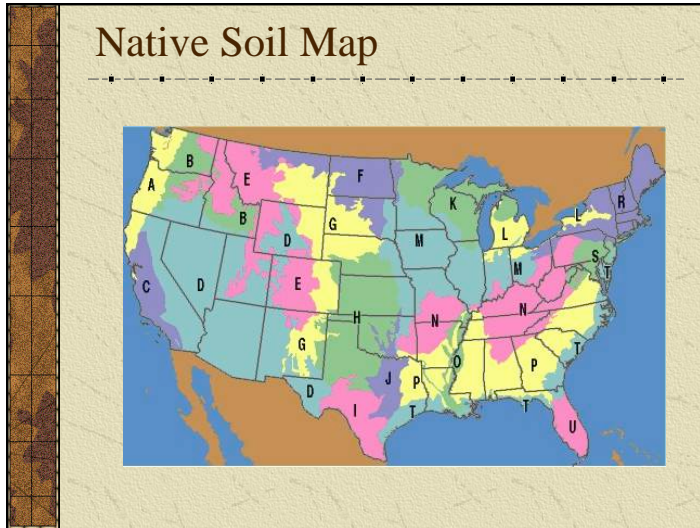


Horticultural Soils



Soil Science in Horticulture

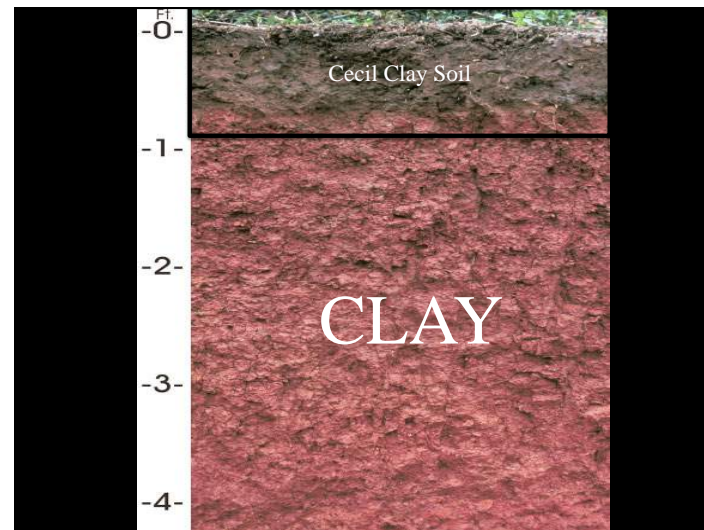
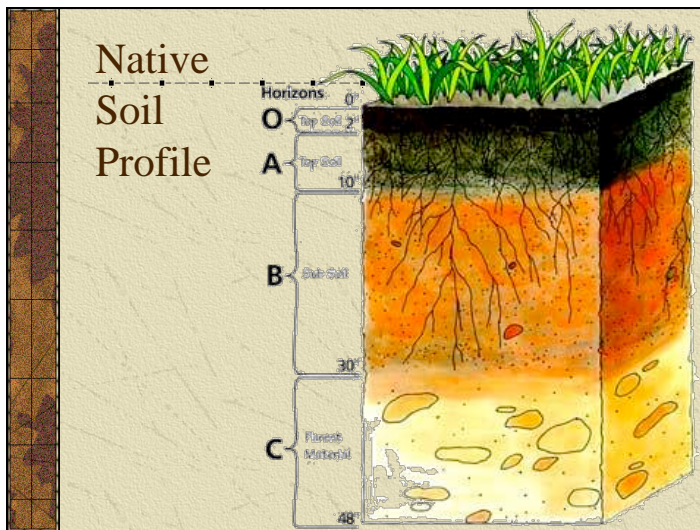
- ✦ Exactly the same but entirely different!
- ✦ Same rules- different playing field.
- ✦ Fruits and vegetables in the field
 - ◆ Same rules; same playing field
- ✦ Soils in urban areas
 - ◆ Altered playing field
- ✦ Potting Soils
 - ◆ Completely different playing field

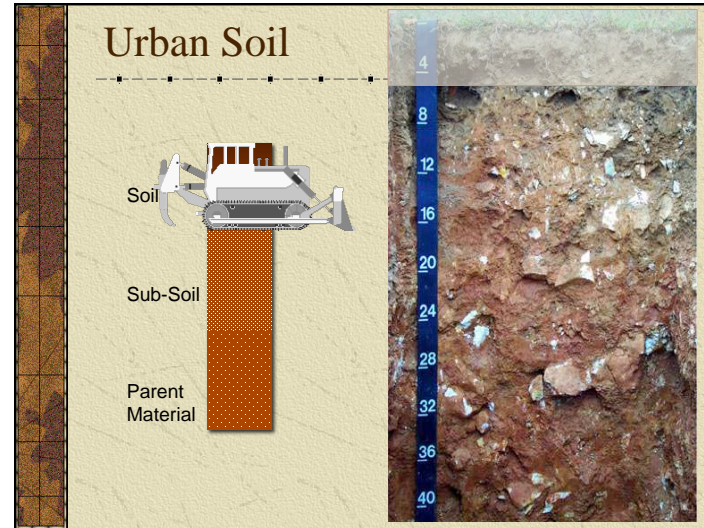


Soil Issues in Urban Areas

Biggest problem...

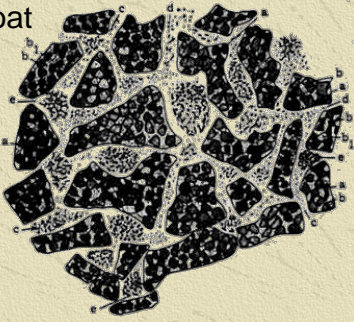
- ✦ We think we have something that we do not!
- ✦ We think we have good, native soils
- ✦ We do not!!





Organic Matter Builds Soils

- ✦ Breakdown releases (liquid) humates that coat soil particles
- ✦ Physically separates particles & aggregates
- ✦ Provides food



Improving the Soil Biology

If you build it- they will come!





Top Soil: Ag vs Retail

- ✦ Agriculture: O & A horizon
- ✦ Retail: almost all organic matter
- ✦ Retail top soil: 12 lb/cu ft
- ✦ Native top soil: 70-100 lb/cu ft
- ✦ 3 cu ft bag of top soil?

Potting Soils

Worst thing to put in a pot?

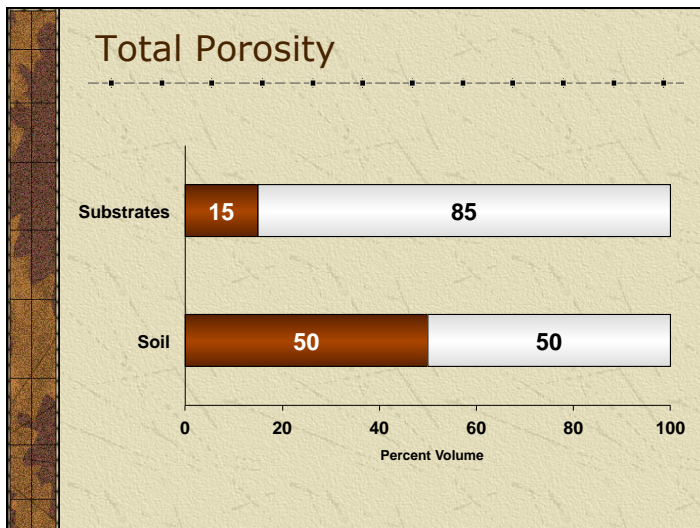
Native Soils!!



The illustration shows a potted plant with vibrant red flowers and green leaves. The root system is depicted in blue, showing a main taproot and several lateral roots. The roots are shown extending downwards into the potting soil, with one root specifically pointing towards the text 'Native Soils!!' to indicate that native soil is not suitable for potting.

Fundamental Differences

- ✦ Mineral vs Organic Material
- ✦ Total Porosity
- ✦ Particle Size
- ✦ Soil Column Height

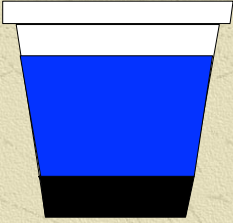


Particle Size

- ✦ Mineral soils: $\leq 2.0\text{mm}$
- ✦ Substrates: $\leq 25.0\text{mm}$
- ✦ Example: Sand
 - ◆ Add to clay soil to increase drainage
 - ◆ Add to substrates to reduce drainage
 - ◆ Biggest particle in soils
 - ◆ Smallest particle in substrates

Soil Column Height


- * Soil column height affects drainage
- * The shorter the column, the less it drains...



Container vs Field Capacity

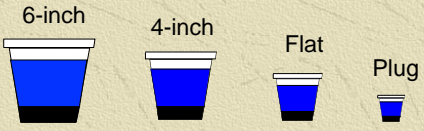
How tall would the column need to be for the drainage in the native soil to equal the potting soil?

Potting Soil 6 inches Field Soil 0.1 – 0.3 atm.
3 - 10 ft



Container Size

Potting Soil



	6-inch	4-inch	Flat	Plug
Air	20	13	8	3
Water	67	74	79	84
Solid	13	13	13	13

Horticultural Soils

Native

