

Trees and the Earth

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Objectives

- What is PINEMAP?
- What a tree needs to grow
- Properties of soil
- What are Micro- and Macronutrients?
- What happens when a tree doesn't have enough of a nutrient?
- What are soil horizons and subsoil layers?

What is PINEMAP?



- Pine Integrated Network: Education, Mitigation, and Adaptation Project
- PINEMAP is an organization that studies pine plantations in the southeastern U.S. and works with southern pine land owners to help them with forest management
- It was formed from a large USDA grant, comprised of 11 southeastern universities, 8 regional university-corporate-governmental research cooperatives, the US Forest Service, and several others

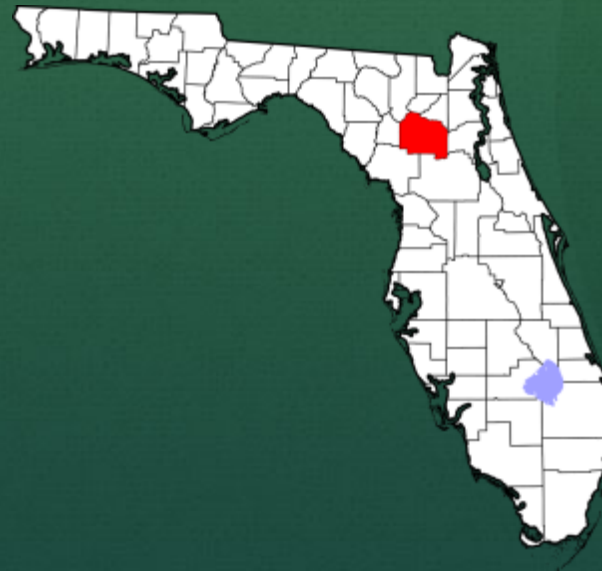
PINEMAP

- Some projects PINEMAP is involved in are:
 - Growing trees using less water and nutrients (Nitrogen)
 - Create more adaptable Pine trees



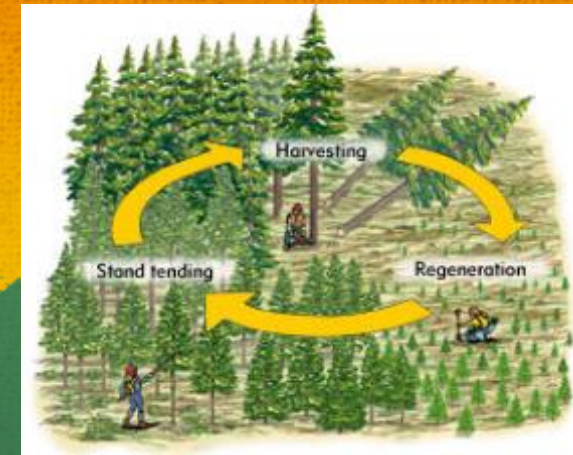
My PINEMAP Experience

- Over the summer I worked for PINEMAP at the University of Florida
- While there I learned about **silviculture**
- I was collecting samples in Alachua county Florida and Hortense Georgia



Silviculture

- Dictionary Definition: “A branch of forestry dealing with the development and care of forests.” – Merriam-Webster
- Herbicide
- Bedding
- Genetics
- Tree position density
- Fertilizer
- Only ~30% of fertilizer on average actually gets in the trees (N + P, B)



Fertilizer bag:
10-10-10
N-P-K

My PINEMAP Experience

- I was also able to conduct analysis on those samples to research needle and shoot dieback and soil organic matter content.



2 year old
Loblolly pines



What does a tree need to grow?



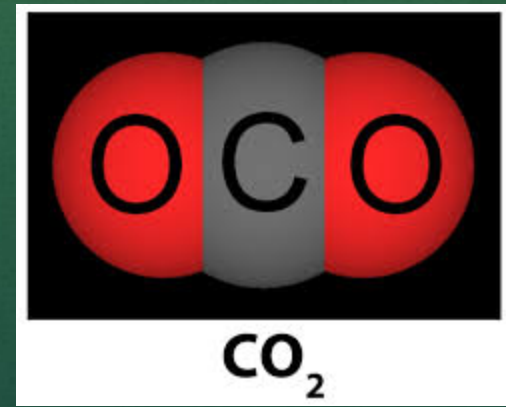
Water



Sunlight



Nutrients



Carbon Dioxide

Soil

What is it?

- Soil is the upper layer of the earth made up of organic matter and eroded rock particles.

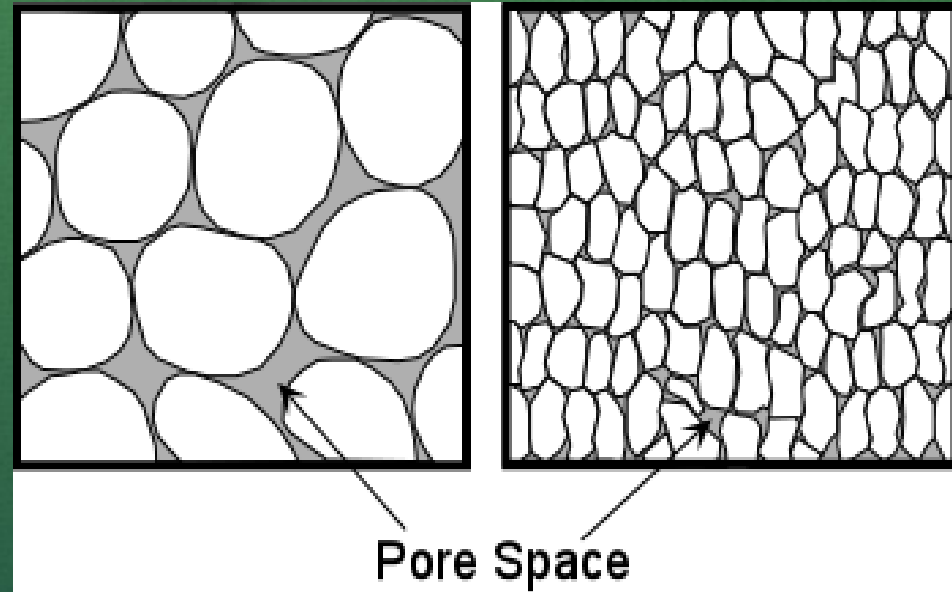


Soil

- Different soils have different capacities to hold water.
- Part of what dictates if a soil holds water is the soil texture.

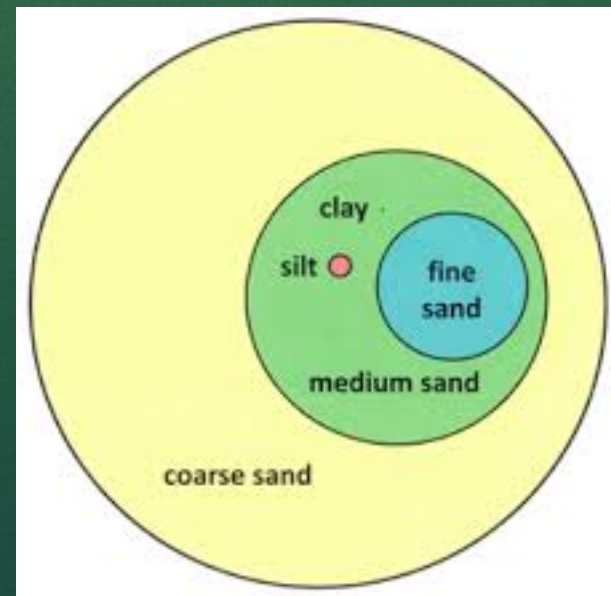
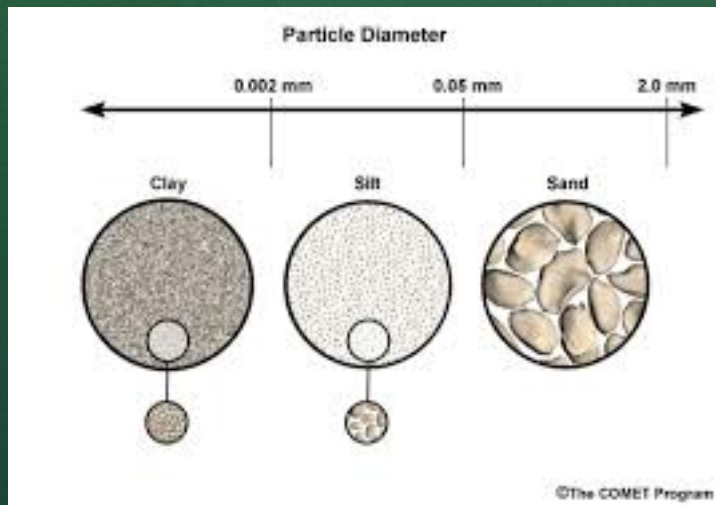
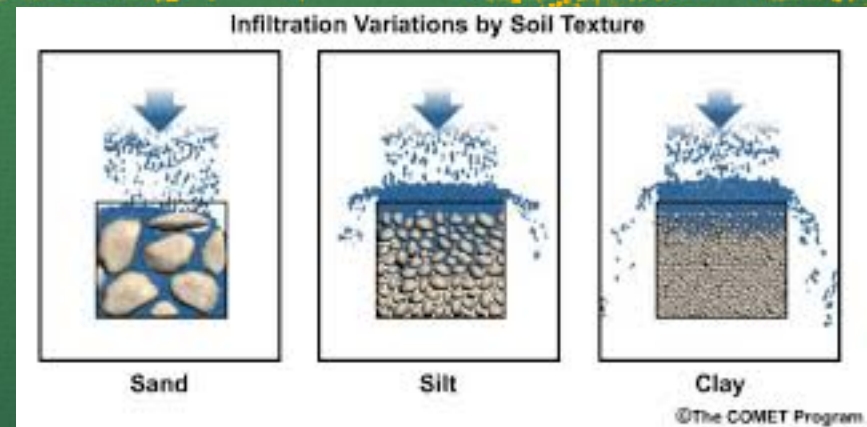
Soil

- Soil Texture
- Coarse grained
- Fine grained
- Which is better for holding water? Why?



Types of soil

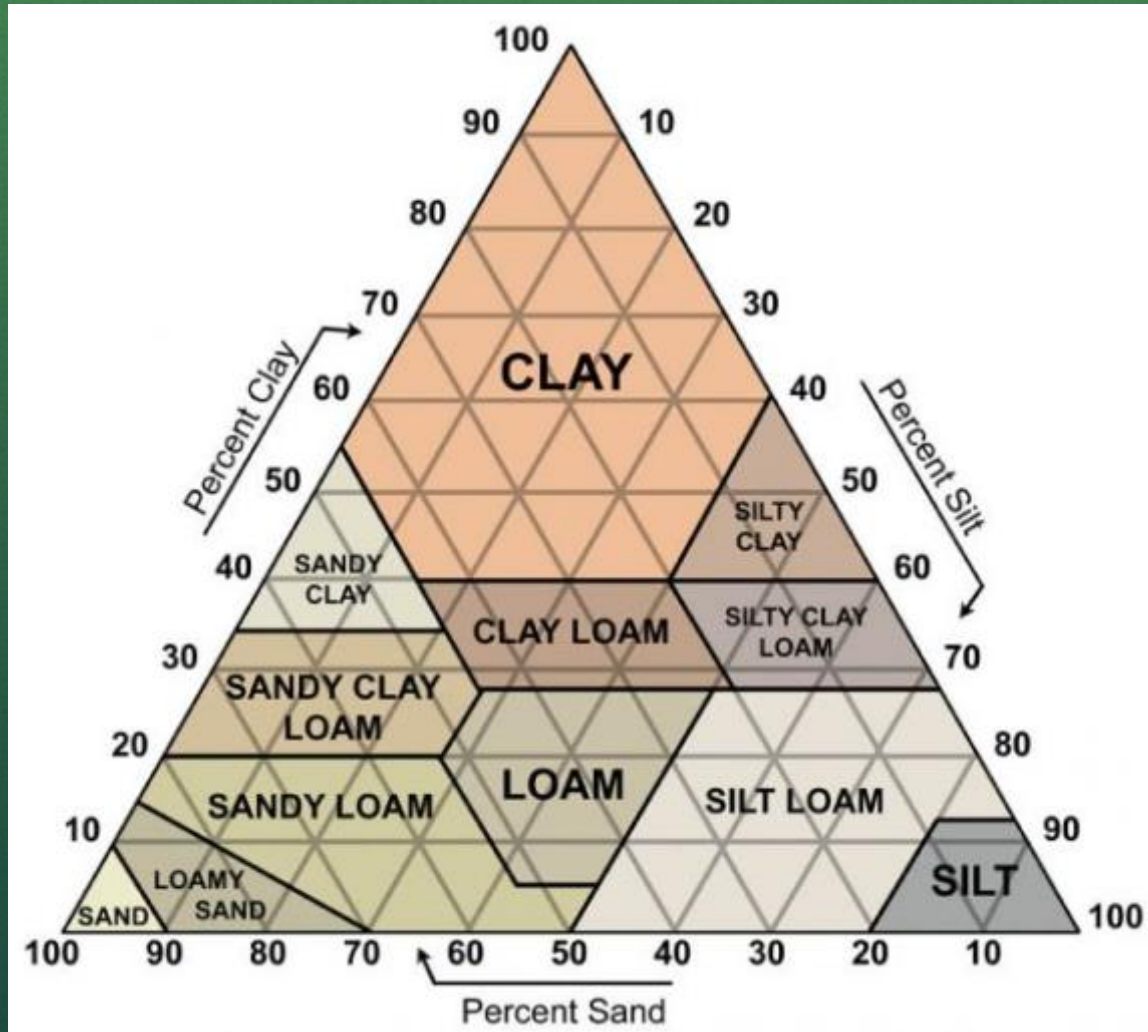
- Clay: $< 0.002\text{mm}$
- Silt: $0.002\text{mm}-0.05\text{mm}$
- Sand: $0.05\text{mm}-2.0\text{mm}$



Soil

(particle size triangle)

Sand vs. Silt
vs. Clay



Loam:
A mixture of
sand and silt
and clay

What does a tree need to grow?



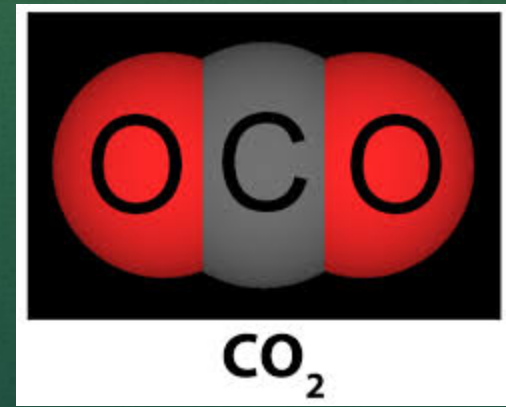
Water



Sunlight



Nutrients



Carbon Dioxide

Nutrients

- Carbon, Hydrogen, Oxygen, Phosphorus, Potassium, Nitrogen, Sulfur, Calcium, Iron Magnesium, Boron, Chlorine, Molybdenum, manganese, Copper, Zinc.
- C HOPKNS CaFe Mg B Cl Mo Mn Cu Zn
- C. Hopkin's café mighty good but closed Monday morning see you soon

Nutrients

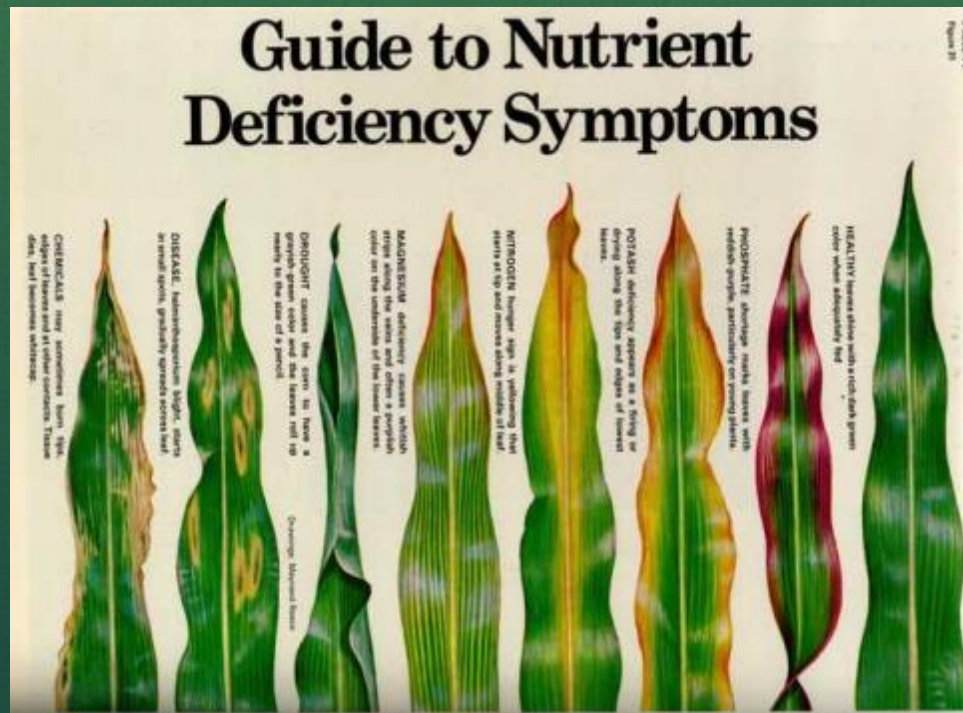
Macronutrients	Micronutrients
Carbon	Iron
Oxygen	Manganese
Hydrogen	Copper
Nitrogen	Zinc
Phosphorus	Boron
Potassium	Chloride
Sulfur	Molybdenum
Calcium	
Magnesium	

Micro vs. Macro nutrients

- Macronutrients are nutrients a plant needs in a large amount such as nitrogen and phosphorus.
- Micronutrients are nutrients a plant needs in a small amount such as copper and zinc.

Nutrient Deficiencies

- Nitrogen- Leaves are lighter and smaller and may fall earlier in the fall. Stems and shoots are smaller and fewer.
- Phosphorus- Leaves will become brown or purple on the lower surface of the leaf and leaves will be smaller. Shoots will be thinner.

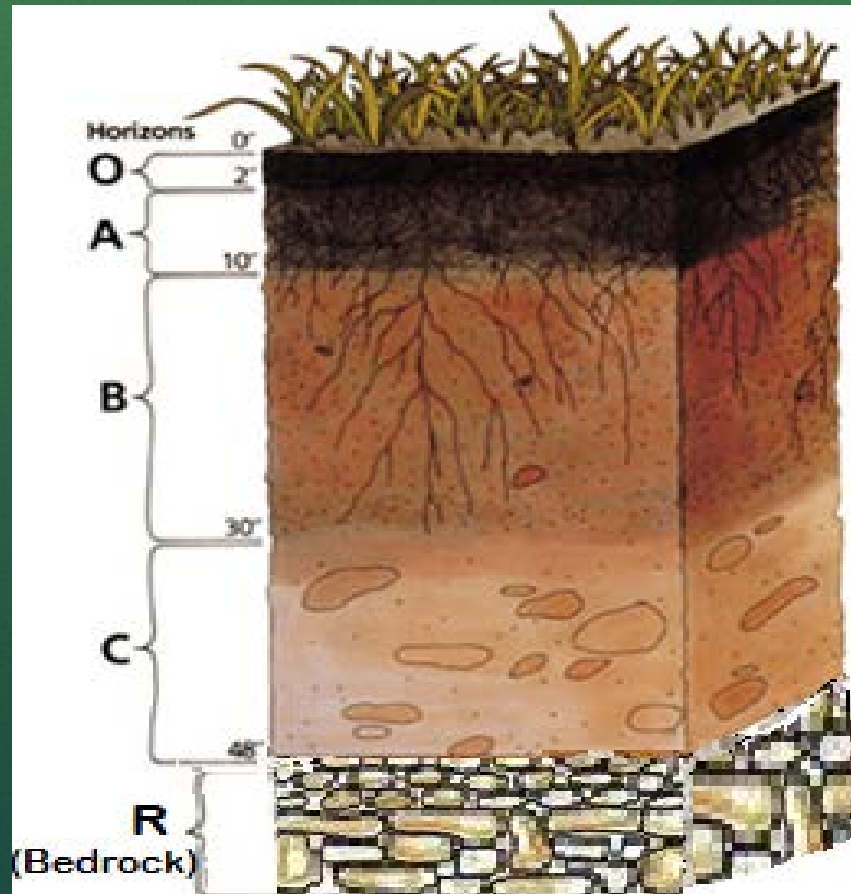


What does soil look like under the surface?



Subsoil layers

Which layer is best for Growing?



Organic matter in the A gives it color

Not all horizons are perfect



Some causes:
root canals, animals, water

Conclusion

What soil horizon has the most tree roots?

The A Horizon

What do trees need to grow?

Trees need sunlight, water, CO² and nutrients to grow

What is soil texture?

Soil can be coarse grained or fine grained. (fine grained holds water better)

What are the three recognized soil particle sizes?

Silt, Clay, Sand

Conclusion

What is a mixture of two or all three of those classifications?

soil texture(eg. Loam, clay loam, sandy loam)

What is the difference between Micro and Macro nutrients?

Macronutrients are nutrients a plant needs in a large amount while micronutrients are nutrients a plant needs in a small amount.

What are the boundaries separating subsoil layers?

Soil Horizons



PINEMAP



Citations

- <https://extension.umd.edu/hgic/nutrient-deficiency-trees-and-shrubs>
- <http://www.merriam-webster.com/dictionary/silviculture>