
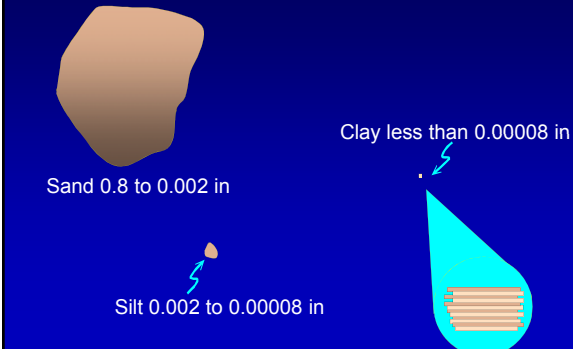


Soil Fertilization for Fruit Production



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Relative Size of Soil Particles



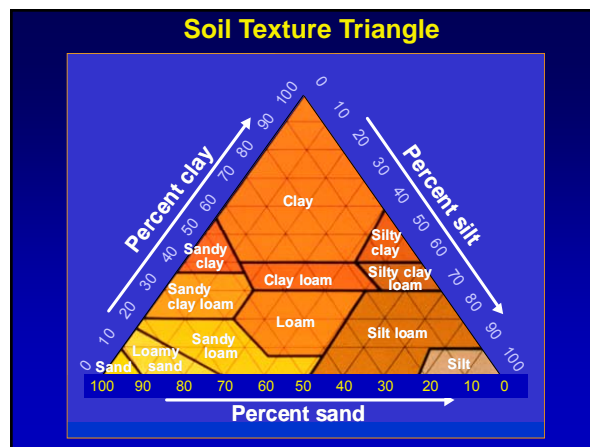
Sand 0.8 to 0.002 in

Silt 0.002 to 0.00008 in

Clay less than 0.00008 in

Today's Presentation

1. Know Your Soils: Texture & Characteristics
2. Know Your Orchard Nutrient Needs
 - a. Essential Plant Nutrients
 - b. Soil Sampling & Testing
 - c. Soil pH & Nutrient Availability
 - d. Yellow Peach Tree Syndrome and Treating Micronutrient Deficiencies
3. Know Your Irrigation Water
 - a. Irrigation Water pH
 - b. Treatment Options
4. Putting it all together

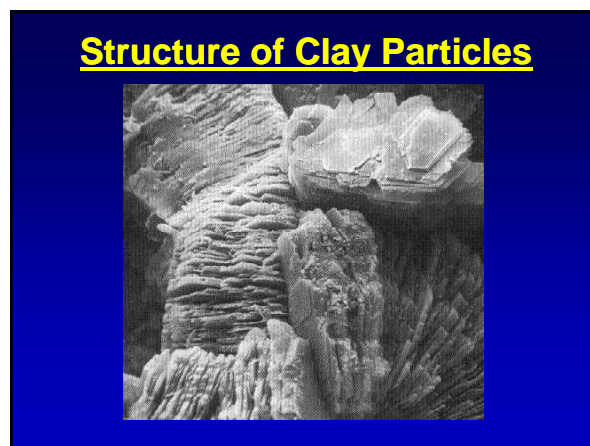


Know Your Soils

Soil Texture and Nutrient Characteristics

%Sand }
%Silt } Soil Texture
%Clay }

- Soil texture is determined solely by the amount of sand, silt, and clay
- Excluded are:
 - organic matter
 - large particles (larger than 2 mm)



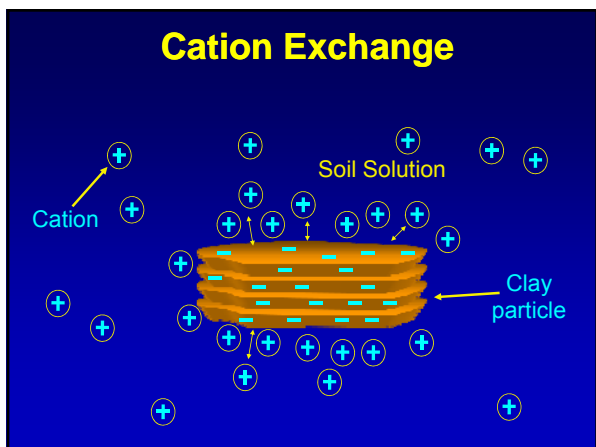
Clay Particles have Electrical Charge

- Clay particles are negatively charged
- Molecules with electrical charge are called ions
 - cations are positively charged ions
 - anions are negatively charged ions
- Cations are attracted to negatively charged clays
 - these cations are loosely held or exchangeable
 - this process is called cation exchange

Essential Plant Nutrients

Essential: Plant can not complete its life cycle without all of these nutrients

C - Carbon	<u>Macro</u>	<u>Micro</u>
H - Hydrogen	N - Nitrogen	Fe - Iron
O - Oxygen	P - Phosphorus	Mn - Manganese
	K - Potassium	Cu - Copper
	S - Sulfur	Zn - Zinc
	Ca - Calcium	B - Boron
	Mg - Magnesium	Cl - Chloride
		Mo - Molybdenum



Soil Sampling & Soil Testing

Soil Sampling:

- Randomly sample 15 - 20 cores from top 1 foot of soil in a PLASTIC bucket
- Mix thoroughly and place 1 qt of soil in paper bag

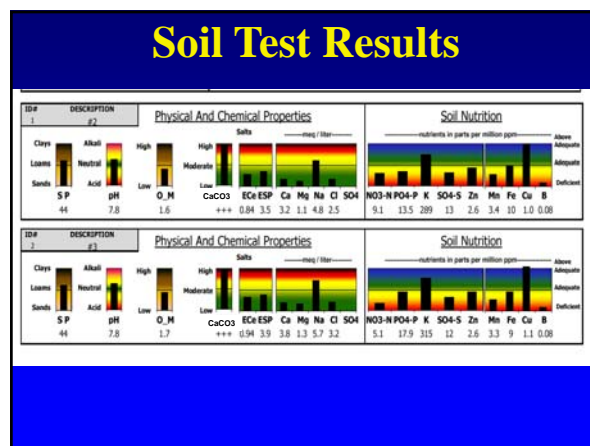
- Sample different orchards/fruits separately
- Sample different topography separately

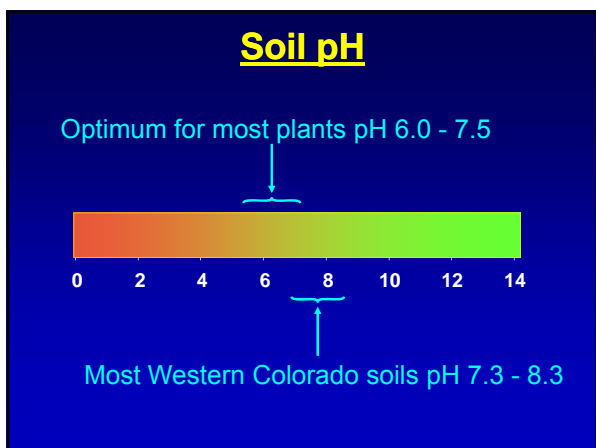
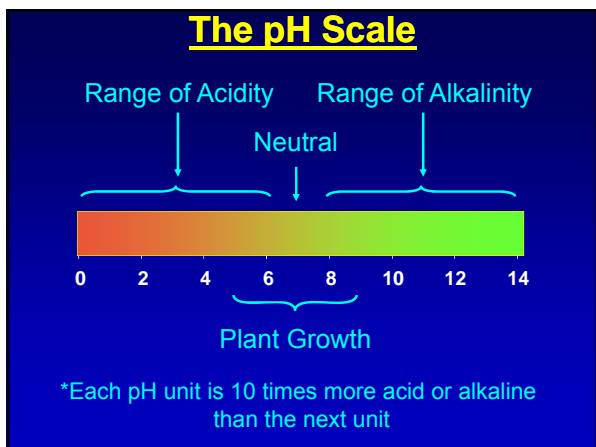
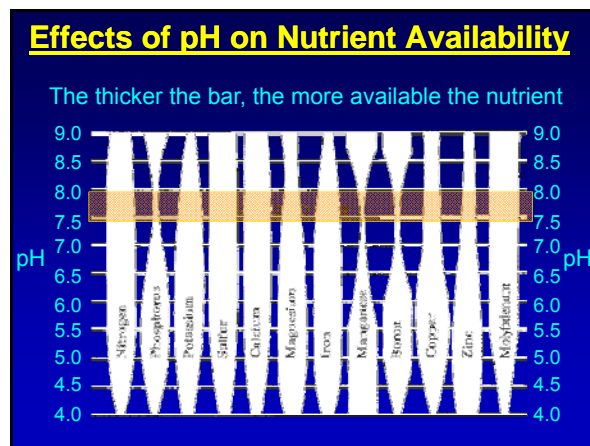
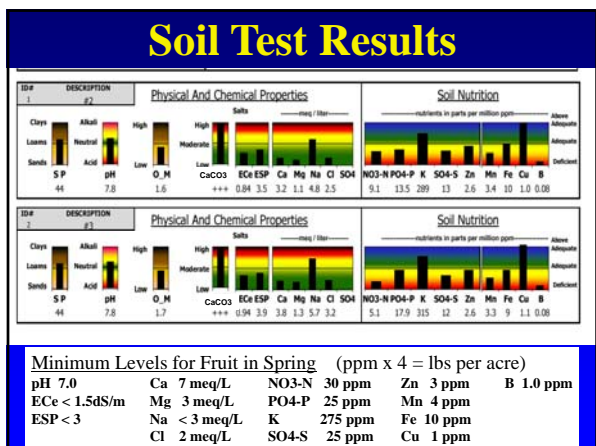
Soil Testing and Analysis

- Send soil samples to lab for analysis
- Approximate cost \$30 for a complete analysis
- Should be done every 2 – 3 years

Know Your Orchard Nutrient Needs

- Essential Plant Nutrients
- Soil Sampling & Testing
- Soil pH & Nutrient Availability
- Yellow Peach Tree Syndrome and Treating micronutrient deficiencies





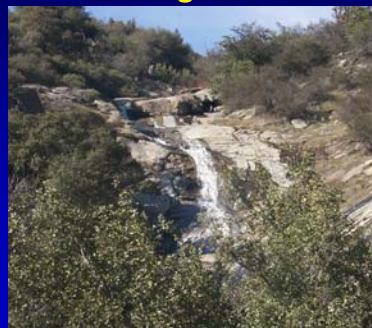
Yellow Peach Tree Syndrome

Chlorosis (yellowing) on youngest leaves



Due to deficiencies in: Iron, Manganese, Zinc, and/or Boron

Micronutrient deficiencies exacerbated by alkaline irrigation water



Yellow Peach Tree Syndrome: Effects

Effects on Trees:

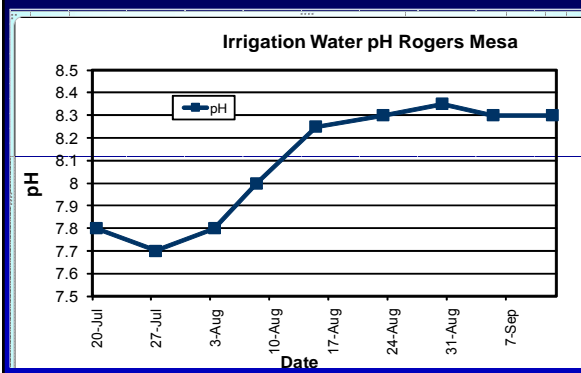
- Yellowing of younger leaves
- Reduces chlorophyll function
- Nutrient stress (reduced health)
- Stunted growth

Effects on Fruit:

- Reduces fruit sugars
- Reduces fruit size
- Reduces fruit QUALITY!!!!

Effect on Yield: - Reduces yield (5 - 15%) depending on severity

Yellow Peach Tree Syndrome

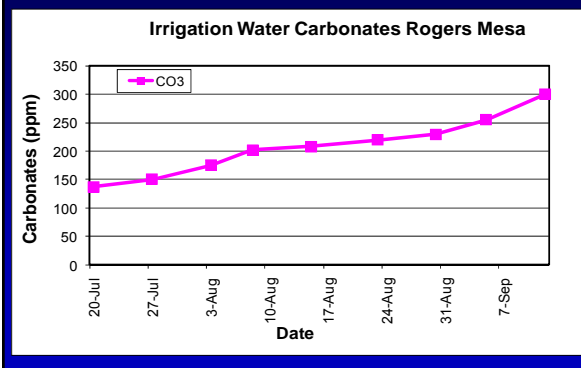


Causes?

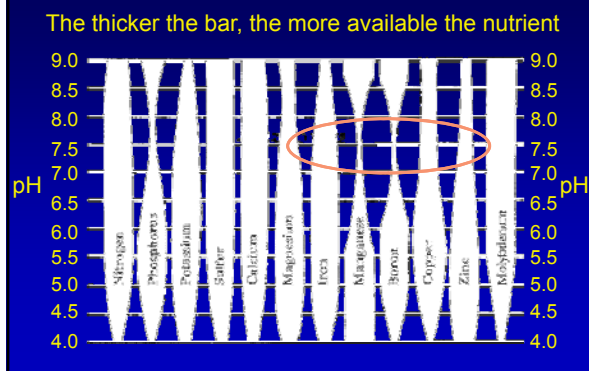
Micronutrient deficiencies caused by alkaline soils (pH 7.5 – 8.2)



Yellow Peach Tree Syndrome



Effects of pH on Nutrient Availability



Micronutrient Chlorosis

On youngest leaves of plants growing in alkaline soils

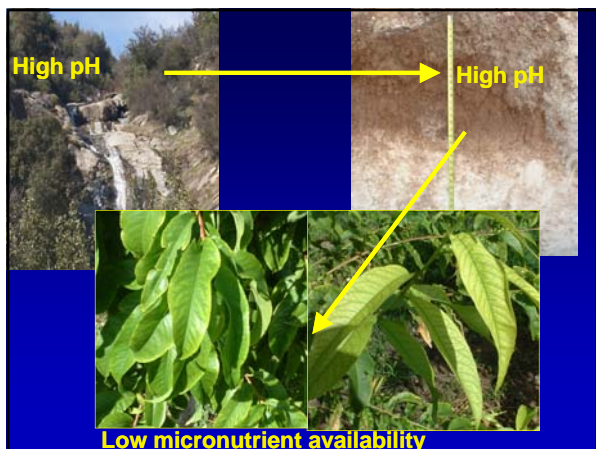


Effects of pH on Micronutrients

Zinc } “Fixed”– made insoluble
 Iron } Carbonates
 Mang. } Hydroxides
 Sulfates

Treatment Options for Micronutrient Management

1. Treating the irrigation water with sulfuric or phosphoric acid or concentrated acetic acid to reduce pH (simple titration can determine amounts (10-15 gal H₂SO₄/ac-ft)
2. Treating the soil with elemental sulfur to reduce pH
 Reversing: 500 – 750 lbs S/ac
 Maintenance: 200 – 300 lbs S/ac
3. Applying chelated micronutrients to soil
4. Applying sulfated micronutrients to foliage (quick fix for a season)
5. Increasing organic matter applications



Treating Alkaline Soils

- Acidifying Soils
 - sulfuric acid: H₂SO₄
 - elemental sulfur: 2S + 3O₂ + 2H₂O ↔ 2H₂SO₄
 - organic matter: contains organic acids
- NOTE: gypsum (CaSO₄) is NOT an effective acidifying compound! It can not be used to lower pH of most soils.

Treating Alkaline Soils

- Apply nutrients that are not readily available in high pH soils
 - zinc, iron, manganese
 - use chelated forms for soil application

Know Your Irrigation Water

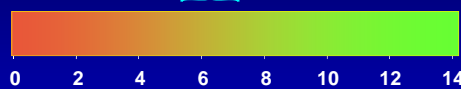
- Irrigation Water pH
- Treating Alkaline Water

Chelated Nutrients

- Metal nutrients tend to be insoluble in alkaline soils
 - iron, manganese, zinc
- Benefits of Chelated forms
 - are more soluble than unchelated forms
 - stay in solution longer
 - are more available for plant uptake

Irrigation Water pH

Optimum for most plants pH 5.5-7.5



Western Colorado Water pH 7.5 - 8.3!

Over time - soil pH will tend towards irrigation water pH

Treating Plants in Alkaline Soils

- Foliar Application:
 - Apply nutrients directly to plant foliage (cautions)
 - Zinc, Iron, Manganese
 - use sulfate salts
 - » zinc sulfate
 - » iron sulfate
 - » manganese sulfate
 - use chelated forms for soil application
 - EDTA
 - DTPA
 - others

Treating Alkaline Water

- Acidify Water: Target pH = 6.5 - 7.0
 - sulfuric acid: H_2SO_4 or phosphoric acid: H_3PO_4
 - Usually done by injection
 - Cautions: acids needs special handling, special fittings, special equipment (non-corrosive), special protection
- Generally: 10 - 15 Gals of acid per acre-foot of water (ac-ft = 325,850 gals) is sufficient to reduce water pH to 6.5 (buy a pH meter to check)

Putting it all together

1. Know Your Soils: Texture & Characteristics
2. Know Your Orchard Nutrient Needs
 - a. Essential Plant Nutrients
 - b. Don't Guess – Soil Test !
 - c. Soil pH & Nutrient Availability
 - d. Yellow Peach Tree Syndrome
 Treating Micronutrient Deficiencies
3. Know Your Irrigation Water
 - a. Irrigation Water pH
 - b. Treatment Options



Questions?

Thank You!



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