WESTERN LABORATORIES

UNDERSTANDING SOILS FOR YARDS AND GARDENS

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Introduction 1
- Producing 2000 pound Atlantic Giant Pumpkins
- Soil has three Distinct Properties
- Physical Properties of Soil
- Chemical Properties of Soil
  - 118 elements on the periodic table
  - 18 essential elements for plants
  - What is an ion
  - Essentiality of a nutrient

Introduction 2
- Three ways nutrients transport to roots
- What is the rhizosphere
- Mobility of nutrients in soils and in the plant
- Active and passive nutrient transport
- Xylem and Phloem transport of nutrients and water within the plant
- Four ways water moves into and through the plant

Lecture 1: Soil pH
- What is soil pH
- Acid soils: pH < 7.0
  - How they form
  - How to raise pH on acid soils
- Alkaline soils: pH > 7.0
  - How to lower the pH of alkaline soils
- What is hydrogen and hydroxide ion activity

- Lecture 2: Soil Texture
  - Soil texture is % sand, % silt, and % clay that adds to 100%
  - Particle sizes for sand, silt and clay
  - Soil Triangle
  - Types and behavior of clays
- Lecture 3: Ec - Electrical Conductivity or Soluble Salts
  - Potential young seedling mortality
  - Fertilizers are salts
  - Manures contain salts
  - Sprinkler and drip irrigation for managing excess salts
- Lecture 4: CEC - Cation Exchange Capacity
  - Clays and Humus
  - Sands and Silts
  - Phosphorus fixation
  - Influence of organic matter on the CEC
- Lecture 5: % Lime
  - Measuring of calcium and magnesium carbonates in the soil
  - How lime forms in alkaline soils through root respiration
  - Pounds elemental sulfur required to reduce soil pH
  - Pounds elemental sulfur to neutralize the % Lime
  - Rules for using elemental sulfur

- Lecture 6: % Organic Matter
  - Differences in the types of organic matter
  - Factors affecting organic matter decay
  - Types of micro-organisms living in lawns and gardens
  - Biological oxygen requirements
  - Mineralization and immobilization of organic matter nutrients
  - The Soil Food Web
  - Pounds organic matter to apply for 1 pound on NPK
- Lecture 7: Ammonium and nitrate-nitrogen
  - 4 ways nitrogen is added to soils
  - Nitrogen forms assimilated by roots
  - Bacteria producing nitrate-nitrogen
  - Role of nitrogen in plants
  - Legumes and rhizobium bacteria
  - Nitrogen fixation by legumes
- Lecture 8: Phosphorus
  - Complexity of phosphorus in acid and alkaline soils
  - Phosphorus covalent bonding with clays and humus
  - Why phosphorus is difficult to leach
  - Role of phosphorus in plants
  - Things to know about phosphorus
- Lecture 9: Calcium
  - Why calcium doesn't translocate downward in the xylem
  - Role of calcium in plants
  - Calcium physiological problems. Example: blossom end rot in tomatoes
  - Things to know about calcium in yards and gardens
- Lecture 10: Potassium
  - Winter kill in lawns and perennials
  - Solids in fruits and vegetables
  - How much potassium is in banana's and potatoes
  - Things to know about potassium
- Lecture 11: Magnesium
  - Grass tetany
  - Chlorophyll and photosynthesis
  - Role of magnesium in plants
  - Things to know about magnesium
- Lecture 12: Sodium
  - The trouble maker
  - Crop tolerance to sodium
  - Water, water everywhere, nor any drop to drink
- Lecture 13: Soil micro-nutrients: Zn, Fe, Mn, & Cu
  - Role of micro-nutrients
  - How to fertilize using micro-nutrients
  - Products to use for best results
  - How long does fertilizing with micro's last
- Lecture 14: Sulfate
  - Sulfates vs sulfur
  - Thiobacillus bacteria
  - Things to know about sulfates and sulfur

- Lecture 15: Boron
  - The narrow range between deficiency and toxicity
  - Calcium to boron ratio
  - Pollen grain viability and why sweet corn ears don't fill
  - Translocation of sugars in the phloem
- Lecture 16: % Base Saturation
  - Can you balance the nutrients in the soil
  - Sum of the cations vs measured CEC
  - How critical is the % sodium of CEC
  - Things to know about base saturation that can help
- Lecture 17: Measuring area to fertilize
- Lecture 18: How to soil sample
  - Sampling tools and sampling techniques
  - Soil depth to collect
  - Number of cores to collect
  - Mixing the samples properly for best results
  - Bias sampling and how long is a soil test good
- Lecture 19: Fertilizers and soil amendment recommendations
  - How to interpret the numbers on the fertilizer bag
  - When to apply
  - How often to apply
  - How long do fertilizers last and how much is too much
  - Can I be a 100% organic grower
- Lecture 20: Green manure plants for disease suppression
  - What is bio-fumigation
  - Best plants to grow for bio-fumigation
  - How long after bio-fumigation can the ground be seeded or transplanted
- Lecture 21: Irrigation scheduling
  - How to water - When to water - How much to water
  - Using a cheap balance and oven for irrigation scheduling
  - Why is watering 70% of having a beautiful garden
  - Drip and sprinkler irrigation methods
- Lecture 22: Plant Pathology
  - Seedling, tree and lawn diseases
  - Composting and composting diseased plants
  - Crop rotation and not planting plants with similar diseases in the same locations
  - Things to know about yard and garden diseases