

Soil and Water



June 27, 2020

Presented by Laura Dickinson

Master Rosarian

A Presentation from the American Rose Society

Thanks and Tips

- Thank you to John and Mitchie Moe for the original bones of this presentation
- Plain and simple slides
- Reduce control panel to maximize the slide view
- CR school candidates – keep an eye out for the v



Who am I?

- Consulting Rosarian 2008—Master CR 2018
- Central Dist. CR Chair—KS, MO, IA, NE
- Board member Kansas City Rose Society
 - Rose Show Chair, CR Chair, ARS liaison, Ask a Rosarian program
kcrosehelp@gmail.com
- Extension Master Gardener 2001-2017
- Career in science education and volunteer management
 - Naturalist, science librarian, science fair director, science teacher training
 - Volunteer coordinator county EMG program 10 years
- My rose interest is in easy care landscape roses and encouraging everyone to grow roses in their own gardens.

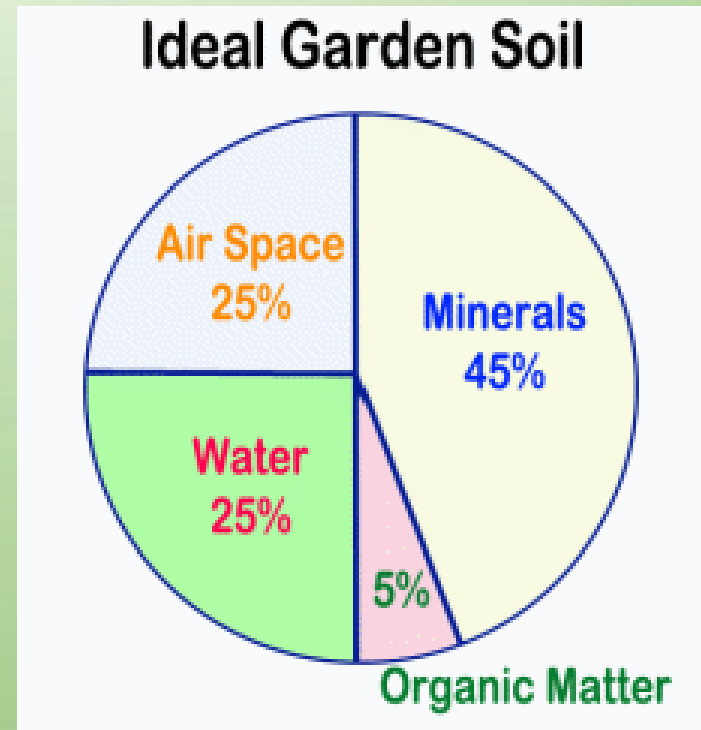
Roses are easier than tomatoes!

The Purpose of Soil

- Anchors the plant in the ground
- Holds nutrients for plant uptake
- Holds water and air for metabolic processes
- Provides habitat for living organisms
- Environmental protection
 - Filters impurities
 - Reduces water runoff

Components of Healthy Soil

- Minerals from bedrock 45%
- Organic matter 5%
- Water 25%
- Air 25%

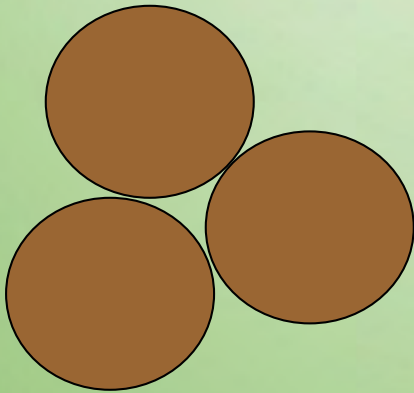


Minerals come from parent bedrock

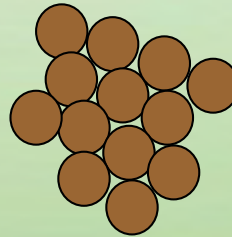
- Granite and other igneous/metamorphic rock
 - Decomposes into mixtures of gravel, sand, silt and clay
- Limestone
 - Decomposes into fine clay particles
- Sandstone
 - Decomposes into sand

What is the parent rock
underlying your soil??

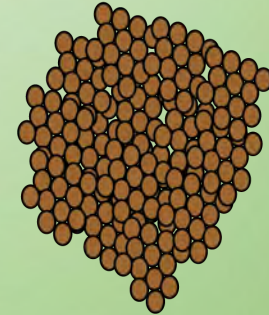
Soil Texture is determined by the mixture of particle sizes



Sand
.05-2 mm



Silt .002-.05
mm



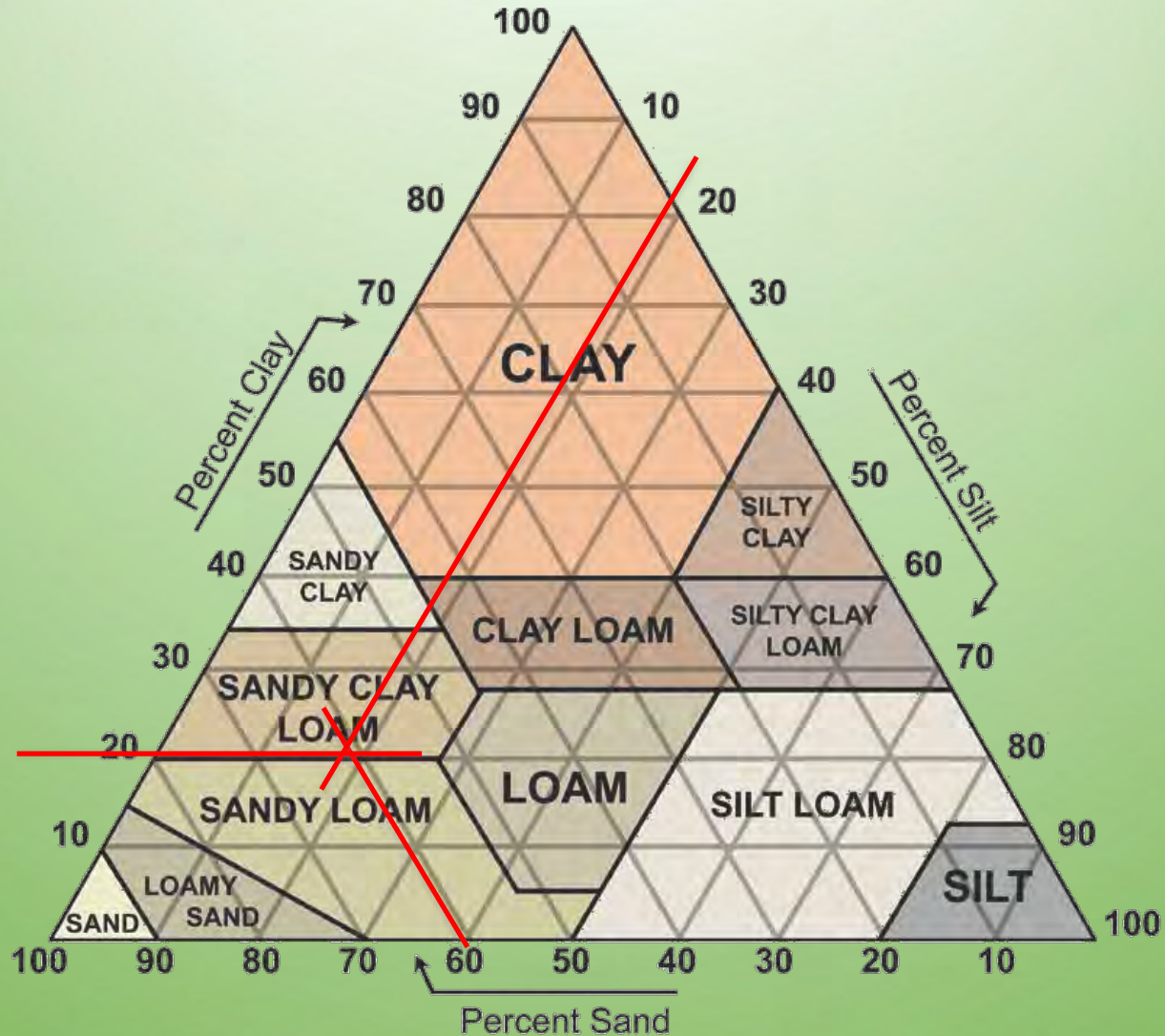
Clay <.002
mm

How to determine your soil texture



1. Get a cup of soil. Remove stones and organic material
2. Put soil in a quart jar. Fill with water. Add a few drops of dish soap
3. Shake well. Let sit until contents settle and water is clear. May take awhile!
4. Sand will settle on the bottom, then silt, then clay
5. Measure each layer and figure % of each

The Soil Triangle



√ Sandy loam is the perfect soil for roses!

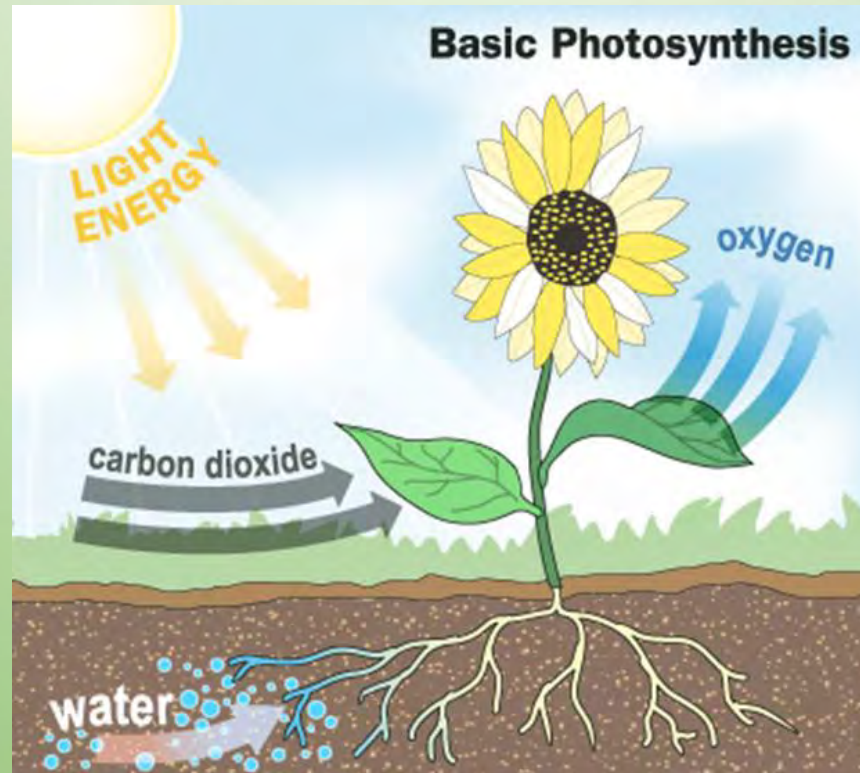


Why soil texture matters

- Water Drainage
 - How fast the water flows through the soil
- Water Holding Capacity
 - How much water stays in the soil to be available to the plant
- Air Space
 - How much air is available for plant growth and metabolism

Roses don't like wet feet!

Botany Review -- Photosynthesis



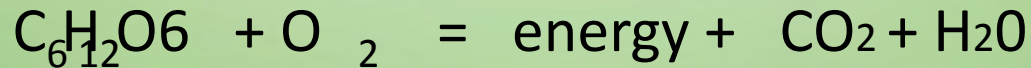
Carbon dioxide + water + sunlight = carbohydrates + oxygen



Botany Review -- Respiration

Chemical process by which carbohydrates produced during photosynthesis are converted into energy to support plant growth.

Carbohydrates + oxygen = energy + carbon dioxide + water

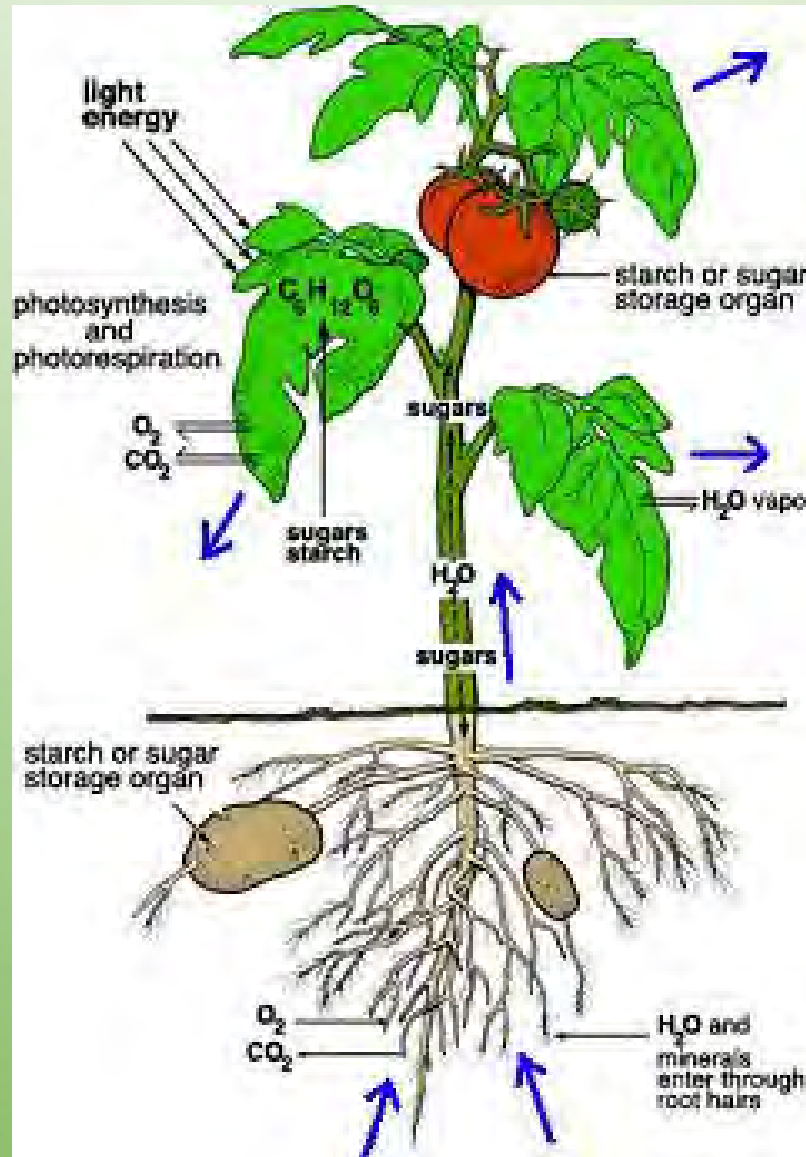


Roots need air for respiration

✓ Water in the Soil

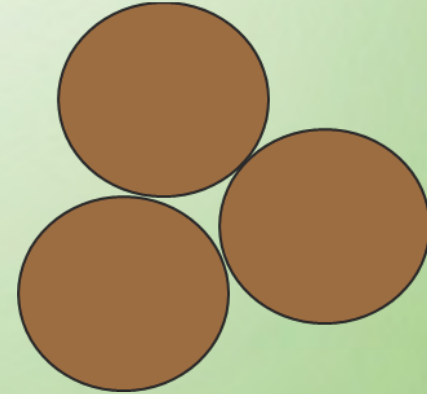
- Water is a major component of photosynthesis and respiration
- Water dissolves nutrients so plant roots can take them up
- Water carries nutrients through the plant
- Water makes the cells stiff (turgid) to hold the plant up strongly
- Water cools the plant through evaporation from its leaves

Botany Review--Evapo-Transpiration

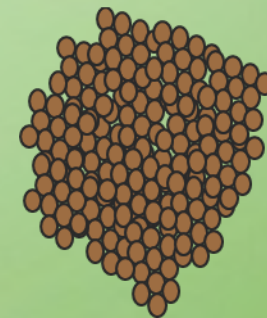


Soil Water/Air Balance

- Water is held in the pore spaces between particles
- Some water molecules stick to the particles
- Rest of the water drains out leaving room for air
- Water flows fast through sandy soil leaving lots of air
- Water flows slowly in clay soil leaving little air



Sand—big pore space



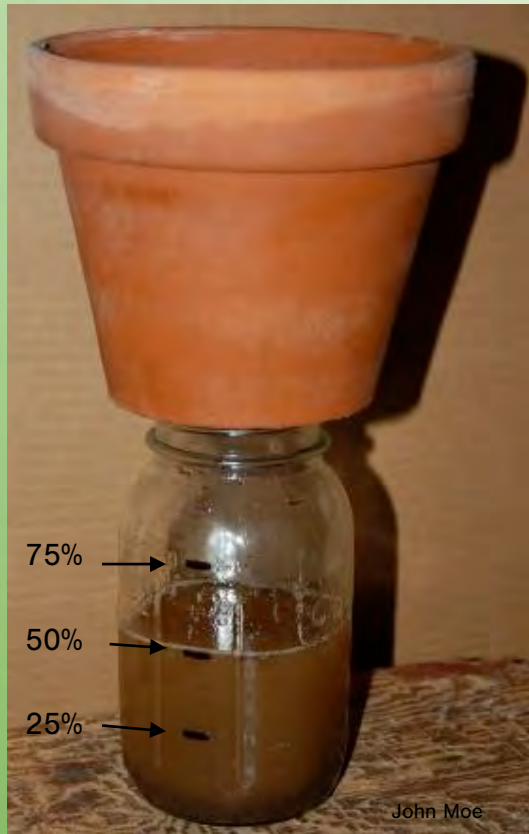
Clay—small pore space

Test for Water Drainage



1. Cut both ends off coffee can
2. Push down 1 inch in moderately moist soil
3. Fill with water
4. Should take about an hour to drain

Test for Water Retention



1. Get two quart containers
2. Mark one at 25, 50, 75% levels
3. Fill flower pot with 1 gallon soil, leave room for 1 qt. water
4. Pour water slowly over the soil and catch in the jar below
5. Read % collected in 1 hr.
6. Retention should be around 50%

Watering tips

- 1 in/week. More in mid-summer
- Local water restrictions will guide you on best practices
- Watering at the base of the plant is better than overhead
- Water deeply and infrequently to encourage deep root growth and minimize leaf wetness
- Water in the morning so sun will quickly dry the leaves



Organic matter

- Crucial to healthy soil—it's the glue that gives the soil life!
- ✓ Decomposing organic material creates humus
 - Breaks down inorganic minerals and chemicals into available nutrients
 - Creates soil aggregates called **peds** that give soil its structure
 - Increases water holding capacity in sandy soil
 - Can lower soil pH
- Living organisms—worms, insects, microbes
 - Till the soil as they move through it, creating air spaces
 - Increase humus through their activities of living



Mycorrhizal fungus

- Naturally occurring in healthy soil—looks like white threads
- Increases plants ability to take up nutrients
- Fungal hyphae attach to plant roots and grow out into the surrounding soil
- Absorb water and nutrients and carry them to the plant
- Caution! Applying fungicides to the soil will kill the mycorrhizal fungus



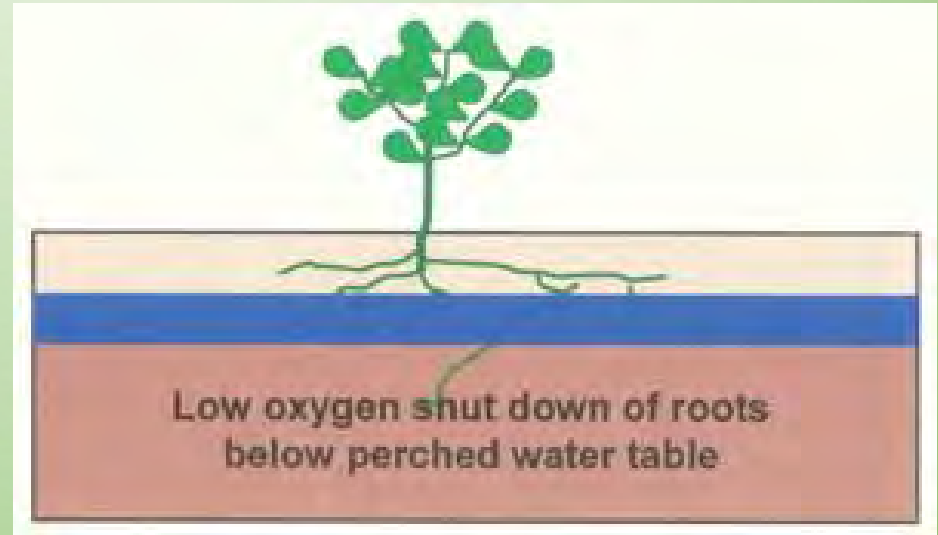
Changing Soil Texture

- Very difficult to change proportions of sand/silt/clay
- Mixing new soil into old destroys the existing soil structure and aggregation
- Getting correct proportions is hard
- Sand + clay = concrete!
- Can't just amend the planting hole



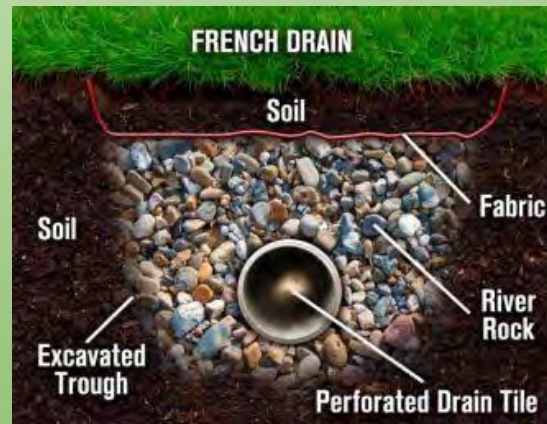
The Bathtub Effect

- Water can't move between two different soil textures.
- Creates **perched water table**



Ideas to Improve Drainage

- Raise planting bed above surface level
- Make a slope or drainage channel downhill from plants
- Dig a deeper and wider hole than usual
- Add graduated amendments
- Create a transition zone between native soil and amended soil
- Install French drain



Compost to the Rescue!

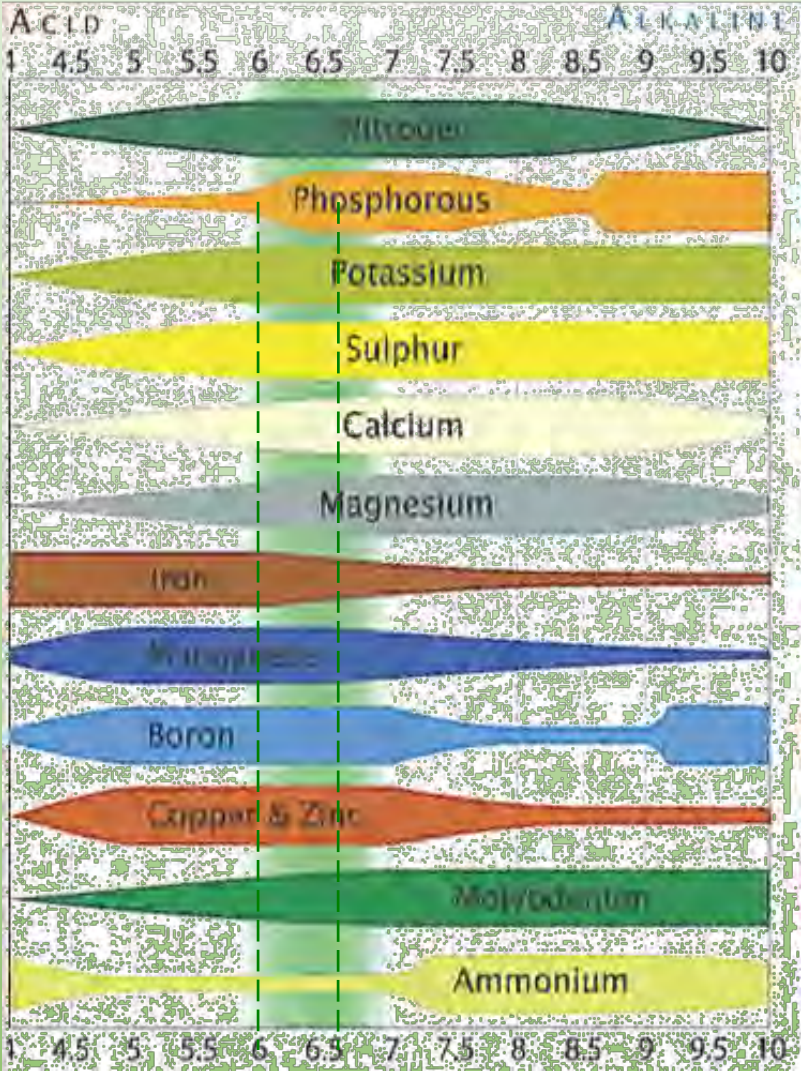
- Compost improves both clay and sandy soil
 - Loosens and aerates clay soil
 - Improves water and nutrient holding capacity of sandy soil
- Lowers pH of alkaline soil
- Feeds microorganisms to facilitate nutrient availability
- Releases nutrients slowly over time
- Best used as an annual top dressing
- Can be mixed into planting hole—but not too much!



Soil pH

- pH measures the Hydrogen ion concentration (H^+)
- Determines nutrient availability
- pH 7 = neutral (pure water)
- pH below 7 = acidic (aka sweet)
- pH above 7 = alkaline (aka basic)
- √Each number is 10x more acid or basic than the one before it
- √Roses do best in slightly acidic soil– pH 6.0-6.5

Soil pH affects Nutrient Availability



pH is Influenced by

- Native bedrock
- Annual rainfall • High rainfall = acidic soil • Low rainfall = alkaline soil
- The history of your property
 - Native vs developed
 - Agriculture or pasture
 - Age of your house/settlement of your land



The Importance of a Soil Test

“No CR should recommend a soil change without first recommending a soil test. Soil chemistry is very complex, and thus it is very easy to come to an improper diagnosis of the problem. The proposed solution based on an improper diagnosis may well amplify the problem or create other problems rather than fix it.”

Testing your Soil

- Extension service or private lab
- pH Reading
 - Whether it is appropriate for your crop
 - Directions for adding lime or sulfur to adjust if needed
- Phosphorus/Potassium (P/K) Reading
 - Whether it is appropriate for your crop
 - P/K reading will determine N/P/K fertilizer balance choice
 - How much and how often to treat
- Other optional tests
 - Nitrogen—usually assume it will be needed
 - Organic matter %
 - Micronutrients
 - Pollutants/toxic contaminants

√What Can Change pH?

- Raise pH of acidic soil
 - Add limestone
 - Some chemical fertilizers containing calcium
- Lower pH of alkaline soil
 - Add sulfur
 - Add compost
 - Many chemical fertilizers
- Water
 - Rainwater is neutral or slightly acidic
 - Tap water can be acid or alkaline—ask your water provider

Review

- Components of soil
 - Minerals 45%
 - Organic matter 5%
 - Water 25%
 - Air 25%
- Botany review
 - Photosynthesis
 - Respiration
 - Evapo-transpiration
- Testing
 - Texture
 - Water holding and draining capacity
 - Soil tests for pH and soil chemistry
- Methods to improve soil texture, water/air balance and chemistry



Take care of the soil and the
plant will take care of itself



Questions???