

# Down and Dirty With your soil

## What I'll cover tonight

- ☞ Soil Texture
- ☞ How to test it and what the results mean
- ☞ Water and how it moves
- ☞ Hard to manage soils: High Salts, High pH, Heavy Clay
- ☞ How to prepare your soil for planting
- ☞ Plants for different soil types
- ☞ Any other issues you might have.

## Soil Basics

- ☞ **Texture:** This refers to the size of the particles that make up your soil
- ☞ **Sand-** Gritty and large
- ☞ **Silt-** Smooth and medium
- ☞ **Clay-** Slick/Sticky and medium

## Other Basics

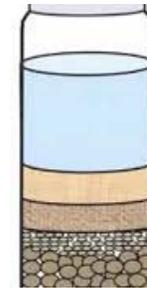
- ☞ **Mulch=Bark:** made from various tree materials. Left on top to retain moisture and reduce evaporation and inhibit weed growth
- ☞ **Compost:** Decomposed organic material: great conditioner. How do you know when it's ready?
- ☞ **Manure:** Best if composted, Great conditioner
- ☞ **Soil Conditioner:** Pre-Made products to improve soil structure.

## Soil Test



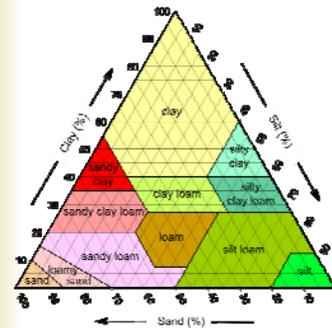
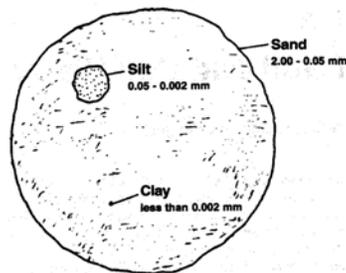
- ☞ Is it necessary?
- ☞ Texture by measurement  
See Handout
- ☞ Texture by feel  
See Handout
- ☞ Drainage Test
- ☞ Color Test
- ☞ UC Davis Analytical Lab  
Davis, California 95616-5270  
Phone: (530) 752-0147  
Email: [anlab@ucdavis.edu](mailto:anlab@ucdavis.edu)

## Soil Texture by measurement



Clay layer – water clears  
Silt layer – 2 hours  
Sand layers – 1 minute

## Texture size comparison



## The Soil Triangle

And you thought this was going to be easy??  
See Handout

## Drainage Test

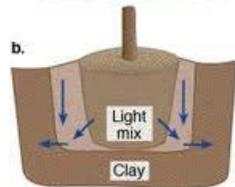
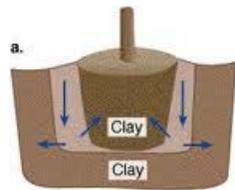
See Handout



## Color Test



- ☞ Dark Soil: In general, the darker the soil the more organic material it has
- ☞ Brown-red: This is usually a sign that the soil drains well and breathes well
- ☞ Blue-Green or Gray: Continuously wet, not good
- ☞ Yellow: A sign that the soil is imperfectly drained
- ☞ Mottling or Streaking: seasonal or periodic drainage problems



## How Water Moves

High  
to Low  
Literal Height  
Potential  
Wet to Dry

Big to small

## Your Soil



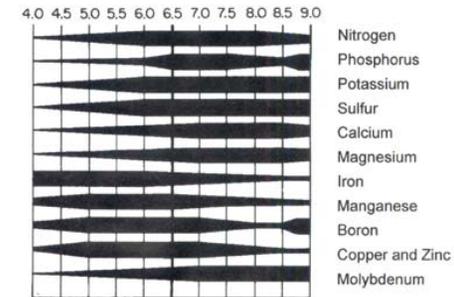
Let's talk about the soil map  
What it means  
How to use it

## Salty/Alkaline Soils



- ❧ **Lots of Salty Cations:** Potassium-K, Sodium-Na, Magnesium-Mg, Calcium-Ca
- ❧ Test multiple areas of your yard to get a better idea of what the pH of your soil actually is
- ❧ pH > 8.5
- ❧ Poor Structure
- ❧ Low infiltration
- ❧ Dominant presence of Sodium carbonate. They cause the soil to swell and make it difficult to settle
- ❧ **This may not be an issue now, but drought changes things**

## Why does the pH of my soil really matter?



## Methods of lowering pH



- ❧ Iron Sulfate- To lower: from Ph8 to Ph 6.5, about 30 lbs per 100 sq feet \*1
- ❧ Soil Sulfur- To lower: from Ph8 to Ph 6.5, about 3.5 lbs per 100 sq feet \*1
- ❧ Gypsum & Aluminum Sulfate-wouldn't use
- ❧ Leach the salts from your soil
- ❧ Compost, Compost, Compost
- ❧ Any Organic Matter addition helps
- ❧ Leaching: Salts rise to the top over time, Water deeply
- ❧ Plant Salt sequestering material, Halophytes: Pickle weed, Abronia, Atriplex, Distichlis, etc

## Gypsum



- ❧ Gypsum removes Sodium from the soil complex and replaces it with Calcium. This is ok if your soils are sodic
- ❧ Both Sodium and Calcium are salts
- ❧ Gypsum can help to loosen clay soil
- ❧ Does not change acidity
- ❧ Can increase leaching of Aluminum
- ❧ Short lived effects, months

## Leaching Salts



- ☞ Only Practical way of removing excess salts
- ☞ The amount of salts removed depends on quantity and quality of water during one irrigation period
- ☞ Must not run off surface, Needs to drain down
- ☞ Apply slowly

## Soil Amendments



- ☞ Soil amendments: Any material added to soil to improve its physical properties
  - ☞ Manure
  - ☞ Fertilizers
  - ☞ Compost, Compost, Compost

## Amendment- General Rules



- ☞ Mix thoroughly
- ☞ Plant based amendments are low in salts.
- ☞ In Clayey soils amendments will:
  - ☞ Improve aggregation, porosity, permeability, aeration, drainage, and rooting depth
- ☞ Humus-What's left of OM after decomposition
- ☞ Hummus-Dip for Pita Chips

## Manure



### Benefits

- ☞ Usually free, except for transportation
- ☞ Organic matter addition to the soil
- ☞ Increase H<sub>2</sub>O holding capacity of the soil
- ☞ Reduce erosion.
- ☞ Contains both slow-release and quick-release/available nutrients

### Disadvantages

- ☞ You don't know what is in it
- ☞ Potential E.coli
- ☞ If not incorporated into soil, the nutrients can be volatilized into the air
- ☞ Presence of weedy seeds
- ☞ Horse manure: Many weed seeds, High in salts

## Fertilizers



- ☞ Known amounts of: N, P, K
- ☞ Buy specifically for particular crops
- ☞ Known properties of the materials used: bone meal, feather meal, kelp etc
- ☞ Easily available
- ☞ Use organics to avoid salt input and runoff to due quick soluble rates
- ☞ Organics come with Dormant beneficials:
  - ☞ Archea, Mycorrhizae, Bacteria,

## Compost



### Benefits

- ☞ Concentrated nutrients
- ☞ Beneficial microbes
- ☞ Slow release nutrients
- ☞ High Organic matter content
- ☞ Few viable weed seeds.
- ☞ Drier than manures and easier to work with.
- ☞ Do it

### Disadvantages

- ☞ Not free;
- ☞ Takes time to produce
- ☞ Compost tea
- ☞ Needs to be managed:
  - ☞ Air
  - ☞ Water

## Soil Preparation



- ☞ Plan ahead
- ☞ Dig or Roto-till the planting area
- ☞ Work soil amendment into the top 6-12" of soil
- ☞ Work with easy rectangles:
  - ☞ Easier to irrigate
  - ☞ Easier to calculate

## Cubic Yard formula



- ☞ You want 4" of bark and 3" of compost?
- ☞ You know how big your planting area is.
- ☞ Length(65') x Width (40') x Depth (#of inches)/324
- ☞  $65 \times 40 \times 4 = 10,400 / 324 = 32$  Cubic Yards of Bark
- ☞  $65 \times 40 \times 3 = 7800 / 324 = 24$  Cubic Yards of Compost
- ☞ There are calculators online if math scares you.

## Amending Clay Soils



- ☞ Clay is NOT A BAD THING
- ☞ Remember how small clay is? The total surface area of a high clay substrate is HUGE. This is good
  - ☞ High water holding capacity
    - ☞ But you need to manage it correctly
    - ☞ Excellent nutrient holding capacity
- ☞ The Bad part is the Hard Pan
- ☞ You want to add Sand?? Let's look again. How do you make Adobe bricks?
- ☞ COMPOST, COMPOST, COMPOST

## Clay Breakdown



- ☞ Heavy Clay Soils need Organic Matter additions
- ☞ The top 8-10" of soil is where plants need to breathe
- ☞ Don't try and work it when it's wet
- ☞ This is not a one time venture, Yearly additions to improve the clay.
- ☞ Between 25%-50% Amendment
- ☞ Don't use Peat Moss, Sand or gravel
- ☞ Plants for Heavy Soil: See Handout

## Common Problems



- ☞ Plant Death: One plant or the entire landscape?
- ☞ Right Plant: Right Place
- ☞ Check your Irrigation
- ☞ Mulch bare spots, but leave some open for native pollinators
- ☞ Did I mention Compost
- ☞ Fertilize occasionally, new plants not established

## Plants tolerant of heavy soils



See Handout

## QUESTIONS??



- ☞ Taylor Lewis
- ☞ [tlewis@ucdavis.edu](mailto:tlewis@ucdavis.edu)
- ☞ PLANT SALES
  - ☞ APRIL 11<sup>th</sup>
  - ☞ APRIL 25<sup>th</sup>
  - ☞ MAY 16<sup>th</sup>

☞ YOU MADE IT!!!  
THANK YOU FOR  
COMING

## Gypsum



- ☞ Gypsum does not usually change soil acidity, Though occasional reports of both increasing and decreasing pH exist;
- ☞ Gypsum can increase leaching of aluminum, which can detoxify soils but also contaminates nearby watersheds;
- ☞ Gypsum can increase leaching of iron and manganese, leading to deficiencies of these nutrients; •
- ☞ Gypsum applied to acid soils can induce magnesium deficiency in plants on site;
- ☞ Gypsum can have negative effects on mycorrhizal inoculation of roots, several reports of negative effects of gypsum on tree seedling establishment and survival;
- ☞ Gypsum is variable in its effects on mature trees;
- ☞ Gypsum will not improve fertility of acid or sandy soils;
- ☞ Gypsum will not improve water holding capacity of sandy soils; and
- ☞ Gypsum's effects are short-lived (often a matter of months)

## Leaching Salts



- ☞ 6" of water will leach about 1/2 the salt
- ☞ 12" of water will leach about 4/5 of the salt
- ☞ 24" of water will leach about 9/10 of the salt
- ☞ IF: you have heavy clay soils, compact soil or hardpan!!
  - ☞ You will not be able to leach salts from your soil

## Free Lime/Calcium Carbonates



- ☞ It is very difficult if not impossible to lower the pH of your soil using Sulfur and others if there is 'Free Lime' present.
- ☞ To test for 'Free Lime':
  - ☞ -put a large Tablespoon of crumbled dry soil in a cup.
  - ☞ -moisten with vinegar
  - ☞ -if the soil-vinegar mixture bubbles, there is 'Free Lime' present.

## Salt Tolerant Plants



- ☞ Achillea millefolium
- ☞ Atriplex spp
- ☞ Baccharis
- ☞ Bouteloua
- ☞ Chrysothamnus
- ☞ Distichlis
- ☞ Frankenia
- ☞ Grendilia
- ☞ Isomeris arborea
- ☞ Lasthenia
- ☞ Penstemon (some) c,p
- ☞ Prosopis (Mesquite)
- ☞ Salicornia
- ☞ Sporobolus