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

Soil Texture by measurement

Texture size comparison

The Soil Triangle

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

See Handout

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

Color Test

How Water Moves

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?

- **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

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
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 H2O 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 due to 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.

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 x 40 x 4” = 10,400/324 = 32 Cubic Yards of Bark
  - 65 x 40 x 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
tclewis@ucdavis.edu
PLANT SALES
APRIL 11th
APRIL 25th
MAY 16th

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 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 ½ 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