

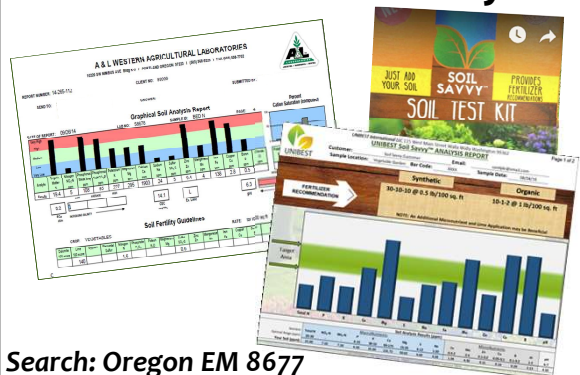
## Improving Soils for Spring Planting

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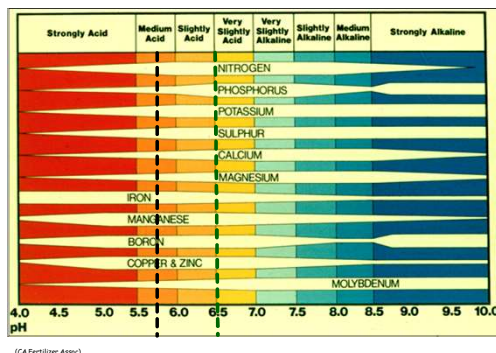
## Know your soil

make it work for  
your garden!

## What's there already?



## pH and Nutrient Availability



## How accurate is that?


Method	Soil 1	Soil 2	Soil 3
Laboratory	7.9	6.3	5.6
Portable pH meter	7.7	6.3	5.5
Color kit	8.0	6.5	5.5
pH probe	6.0	6.0	6.0

## Changing Soil pH

- Raising pH
  - Lime (5 lb. per 100 sq.ft. per year)
  - Wood ashes (1.5 lb. per 100 sq.ft. per year)
- Lowering pH
  - Ammonium sulfate
  - Sulfur-coated urea
  - Aluminum sulfate
  - Sulfur

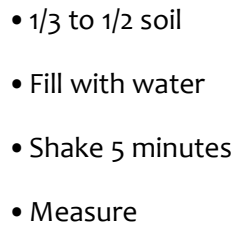


# Texture via “Soil Shake”




A diagram of a glass jar used for soil texture analysis. The jar is filled with soil and water, and the contents have settled into five distinct layers. Labels on the left side of the jar point to these layers from top to bottom: ORGANIC MATTER, WATER, CLAY, SILT, and SAND. The organic matter is at the very top, followed by a layer of water. Below the water is a thin layer of clay, then a thicker layer of silt, and finally a layer of sand at the bottom.

- 1/3 to 1/2 soil
- Fill with water
- Shake 5 minutes
- Measure

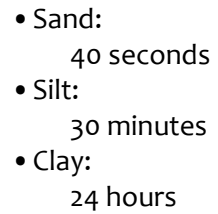


# Mark/Measure Each Depth



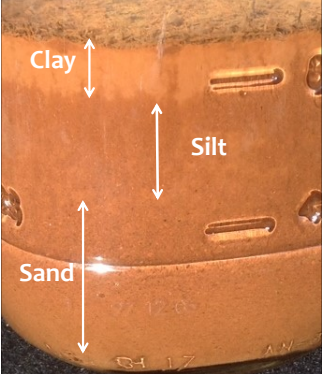
A diagram of a glass jar used for sedimentation. The jar is divided into five horizontal layers, each labeled with a line pointing to it from the left. From top to bottom, the layers are: ORGANIC MATTER (a thin layer at the very top), WATER (the largest layer, below organic matter), CLAY (a thin layer below water), SILT (a thin layer below clay), and SAND (the bottom-most layer). The jar has a screw-on lid.

- Sand:  
40 seconds
- Silt:  
30 minutes
- Clay:  
24 hours



**Search: soil jar test oregon edu**

**Soil Texture Method**



Clay


Silt

Sand

77 120

64 17

# Calculate % of Each Particle

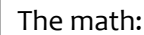


The diagram shows a glass jar containing a sediment sample. The sample is divided into five distinct layers, each with a different texture and a label to its left. From top to bottom, the layers are: ORGANIC MATTER (represented by small circles), WATER (represented by horizontal lines), CLAY (represented by fine dots), SILT (represented by larger dots), and SAND (represented by large, irregular shapes). A small 'e' is written on the side of the jar, indicating the water level.

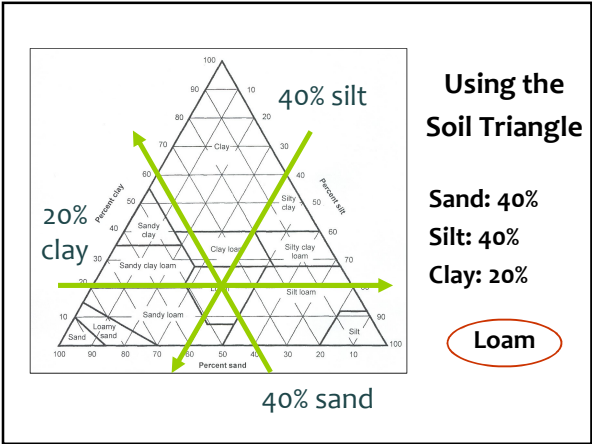
The math:

$$\frac{\text{Height of the layer}}{\text{Height of all layers}} \times 100$$


e.g.:  $(0.5 / 2.00) \times 100 = 25\%$



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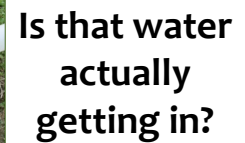


**Sand: 40%**  
**Silt: 40%**  
**Clay: 20%**



**Is that water actually getting in?**

1. Knock in your can or pipe
2. Drape with plastic
3. Fill with one inch of water
4. Remove plastic and start timing



1. Knock in your can or pipe
2. Drape with plastic
3. Fill with one inch of water
4. Remove plastic and start timing



## Just how “well-drained” is that soil?

1. Dig a 12” diameter hole, 10” to 12” deep
2. Fill it with water and let it drain
3. Fill it with water again
4. Wait 1 hour  
≈ 2” per hour seems to be consensus

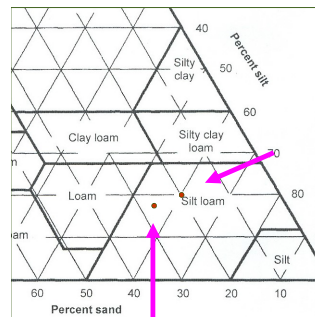
## Just Add Sand??

$$10' \times 10' = 100 \text{ sq ft.}$$

particle	in.	percent
Sand	2.2	20%
Silt	6.6	60%
Clay	2.2	20%
	11.0	

Add 1 in. sand  
(830 lbs.)

particle	in.	percent
Sand	3.2	27%
Silt	6.6	55%
Clay	2.2	18%
	12.0	

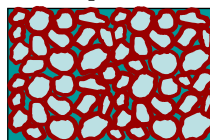


## We Can't Change Soil Texture

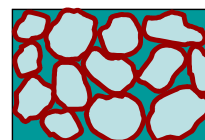


## We Can Change Soil Structure

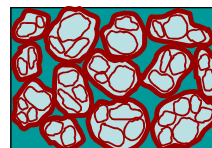
## Improving Soil Structure



Clayey Soil

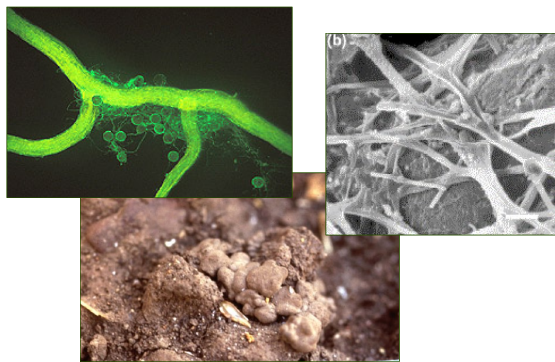


Sandy Soil

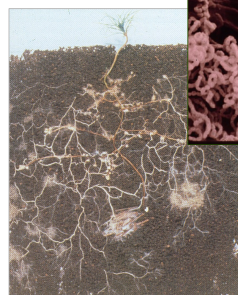


Well-aggregated Soil

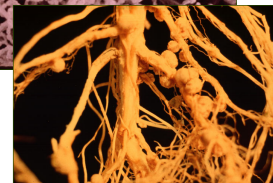
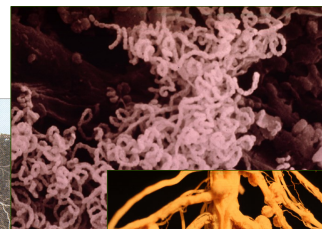
## Biology Helps Create Structure



## Actinobacteria<sup>1</sup>



Mycorrhizae<sup>3</sup>



Rhizobia<sup>2</sup>

<sup>1</sup>No. 14 from Soil Microbiology and Biochemistry Slide Set, 1976, J.P. Martin, et al., eds. SSSA, Madison, WI  
<sup>2</sup>Stephen Temple, New Mexico State University  
<sup>3</sup>Mycorrhizal Applications, Inc., Grants, Oregon

## Organic Matter Feeds the Microbes!

- Increasing the aggregation of particles
- Increasing drainage (clay soils)
- Increasing water-holding (sandy soils)
- Increasing nutrient-holding

## Organic Matter Amendments (soil conditioners)

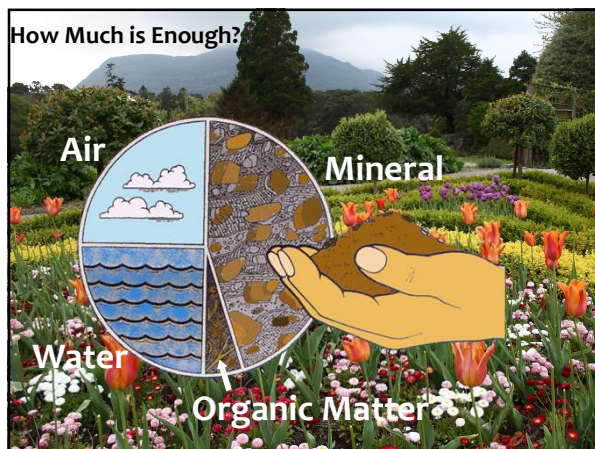
- Food/Yard waste compost
- Composted manures
  - Chicken, rabbit, steer, dairy
- Worm castings
- Grass clippings
- Peat moss/Coir
- Cover crops
- Engineered mixes

## Inorganic Amendments (also soil conditioners)

- Hardened clay or diatomaceous earth
  - Turface/Profile
  - Amturf Ultra Soil Conditioner
  - AXIS
- Gravel
  - Quarter-ten (1/4 -10)
- Volcanic pumice

## Are there “bad” amendments?

- Bark dust/sawdust/wood chips
  - Are you amending or mulching ?
  - Adding nitrogen when amending
- Top soil
  - Source???



## Can You Have Too Much Organic Matter?

- Phosphorus build-up
- Uneven/unpredictable release of nitrogen
- Some lab testing may be unhelpful

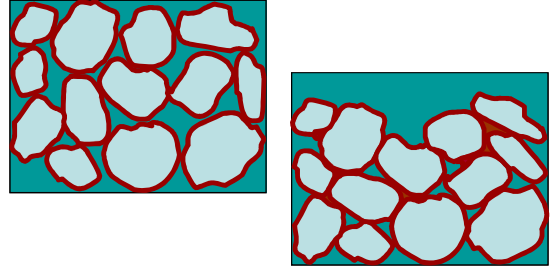


## Organic Mulches

Adding organic matter without digging

- Food for many soil dwellers
- Form aggregates during decomposition
- Plus:
  - Maintain **soil temperature** for microbe activity
  - Aid in **water penetration** (less run-off erosion)
  - **Conserve moisture** by reducing evaporation
  - Help **minimize compaction**

## Compaction Destroys Structure



## Prevent Compaction with Permanent Paths



- Don't dig in soggy soil
- Beware foot and equipment traffic
- Protect surface
- Avoid excessive tilling



## Tilling vs. No-till

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Advantages               <ul style="list-style-type: none"> <li>– Fast mixing</li> <li>– Weed control</li> <li>– Faster decomp</li> <li>– Nutrient mixing</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Advantages               <ul style="list-style-type: none"> <li>– Microbes</li> <li>– Winter crops</li> <li>– Fewer weeds</li> <li>– Slower decomp</li> </ul> </li> </ul> |
|---|--|

## Why Soil Temperature Matters

Low temperatures mean:

- Nutrient availability is slow or stopped
- Roots don't develop - stunted all season
- Slow water uptake → slow nutrient uptake
- Little microbial activity
- Potential tissue damage

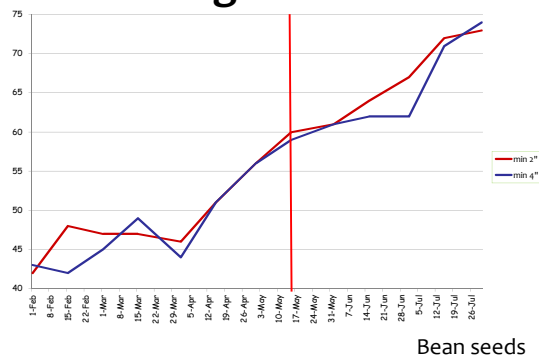
	minimum	optimum
Spinach	35	70
Tomato	50	85
Watermelon	60	95

**Days it took seeds  
to  
come up**

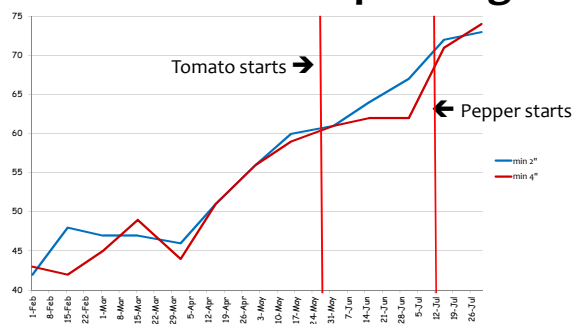
	32°	41°	50°	59°	68°	77°	86°	95°	104°
Spinach	62	22	12	7	6	56	x	x	x
Tomato	x	x	43	14	8	6	6	9	x
Watermelon	...	x	...	...	12	5	4	3	...

x little or no germination  
... not tested

## Planting Those Beans



## How about transplanting?



Your visual assessment of plant growth and fruiting can help you know how much to fertilize. If the plants are growing well, leaves look green, and yield is good, there's no need to worry about whether plants are getting enough nutrients.

*Bernadine Strick*

## Know your soil

make it work for  
your garden!

### Soil resources:

- Oregon State Extension publications:
  - Improving Garden Soils with Organic Matter (EC 1561)
  - Laboratories Serving Oregon (EM 8677)
  - Cover Crops for Home Gardens (FS 304)
  - Mulching Woody Ornamentals with Organic Materials (EC 1629-E)
- Web Soil Survey
  - google: web soil survey
  - App: SoilWeb
- Soil Biology Primer
  - google: soil biology primer
- Natural Resources Conservation Service (NRCS)
  - google: Unlock the Secrets in the Soil or Soil Health NRCS
- Books
  - Elements of the Nature and Properties of Soils -- by Nyle C. Brady and Ray R. Weil