Improving Soils for Spring Planting

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Know your soil
make it work for your garden!

What’s there already?

Search: Oregon EM 8677

pH and Nutrient Availability

How accurate is that?

<table>
<thead>
<tr>
<th>Method</th>
<th>Soil 1</th>
<th>Soil 2</th>
<th>Soil 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td>7.9</td>
<td>6.3</td>
<td>5.6</td>
</tr>
<tr>
<td>Portable pH meter</td>
<td>7.7</td>
<td>6.3</td>
<td>5.5</td>
</tr>
<tr>
<td>Color kit</td>
<td><strong>8.0</strong></td>
<td><strong>6.5</strong></td>
<td><strong>5.5</strong></td>
</tr>
<tr>
<td>pH probe</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

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”

- $\frac{1}{3}$ to $\frac{1}{2}$ soil
- Fill with water
- Shake 5 minutes
- Measure

Mark/Measure Each Depth

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

Search: soil jar test oregon edu

Soil Texture Method

Calculate % of Each Particle

The math:

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

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

Using the Soil Triangle

- 40% silt
- 20% clay
- 40% sand

Using the Soil Triangle

- Sand: 40%
- Silt: 40%
- Clay: 20%

Loam

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
**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
   \(\approx 2”\) per hour seems to be consensus

**Just Add Sand??**

10’ x 10’ = 100 sq ft.

<table>
<thead>
<tr>
<th>particle</th>
<th>in.</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>2.2</td>
<td>20%</td>
</tr>
<tr>
<td>Silt</td>
<td>6.6</td>
<td>60%</td>
</tr>
<tr>
<td>Clay</td>
<td>2.2</td>
<td>20%</td>
</tr>
</tbody>
</table>

Add 1 in. sand (830 lbs.)

<table>
<thead>
<tr>
<th>particle</th>
<th>in.</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>2.2</td>
<td>27%</td>
</tr>
<tr>
<td>Silt</td>
<td>6.6</td>
<td>55%</td>
</tr>
<tr>
<td>Clay</td>
<td>2.2</td>
<td>18%</td>
</tr>
</tbody>
</table>

**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**

**Rhizobia**

**Mycorrhizae**

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2018 Soil School

No. 14 from Soil Microbiology and Biochemistry Slide Set. 1976. J.P. Martin, et al., eds. SSSA, Madison, WI

Stephen Temple, New Mexico State University

Mycorrhizal Applications, Inc., Grants Pass, 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???

**How Much is Enough?**

**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**

- Advantages
  - Fast mixing
  - Weed control
  - Faster decomp
  - Nutrient mixing
- Advantages
  - Microbes
  - Winter crops
  - Fewer weeds
  - Slower decomp

- 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

**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
Know your soil
make it work for your garden!

Rainfall

Days it took seeds to come up

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>optimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinach</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>Tomato</td>
<td>50</td>
<td>85</td>
</tr>
<tr>
<td>Watermelon</td>
<td>60</td>
<td>95</td>
</tr>
</tbody>
</table>

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

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

Planting Those Beans

Spinach

<table>
<thead>
<tr>
<th></th>
<th>32°</th>
<th>41°</th>
<th>50°</th>
<th>59°</th>
<th>68°</th>
<th>77°</th>
<th>86°</th>
<th>95°</th>
<th>104°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinach</td>
<td>62</td>
<td>22</td>
<td>12</td>
<td>7</td>
<td>6</td>
<td>50</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Tomato</td>
<td>x</td>
<td>x</td>
<td>43</td>
<td>14</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>x</td>
</tr>
<tr>
<td>Watermelon</td>
<td>x</td>
<td>x</td>
<td>...</td>
<td>12</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

How about transplanting?

Tomato starts  Pepper starts