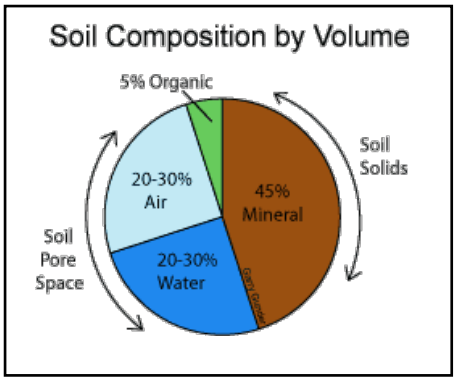
# Soil Enrichment: An Overview

Healthy soil is the key to a productive garden. While there are a wide variety of good organic fertilizers on the market to feed your plants over the growing season, by focusing your efforts on enriching the soil itself, you will not only increase productivity, but improve the earth for more sustainable growing over the long term.

## What is in my soil?




Soil is made up of four basic ingredients: *mineral matter* from the natural breakdown of rock over time (45%); *organic matter* from decaying organisms (5%); *air* (20-30%), which includes stored $CO_2$; and *water* (20-30%). The mineral and organic matter make up the solid part of the soil, while air and water inhabit the pore spaces between these solid particles. An important fifth component includes the living organisms (plants, bacteria, fungi, nematodes, and arthropods) that contribute to overall soil health.

## Steps to better soil: Evaluation & Adjustment

Building healthy soil takes time. Adjusting pH, for example, can take almost 3 months. Fall is the perfect time to focus on improving your soil. Although ideally you should fortify your soil all year round, the break between growing seasons allows gardeners to dedicate the time and garden space necessary for intensive soil-building treatments.

Before making any changes, it is important to fully evaluate the soil that you already have. Is it compacted? Nutrient deficient? Acidic? A simple physical evaluation can tell you a lot, but you should also opt to perform a mail-in laboratory analysis to obtain more detailed information. Here are 3 steps to a complete soil analysis:

### Evaluation

1. Conduct a Survey: Use the chart on the reverse side to check several key soil health indicators yourself. Keeping notes in a garden journal will help you to monitor changes in your soil after adding new materials, as well as from season to season and year to year.
2. Test your pH: A simple pH test kit can be purchased from a garden supply center for around $2.00. The pH scale ranges from 0 – 14, with 0 being the most acidic and 14 being the most alkaline. A pH of approximately 6.5 is ideal for vegetable gardening.
3. Laboratory Soil Analysis: Several labs offer services where you collect a soil sample and send it to them for evaluation. A standard soil analysis will examine pH, percentage of organic matter, soil's ability to retain nutrients, and individual nutrient levels (nitrogen, phosphorous,

potassium, calcium, magnesium, etc.). Contact Cornell Cooperative Extension (http://cnal.cals.cornell.edu) or the University of Massachusetts at Amherst (http://www.umass.edu/plsoils/soiltest) for more information. Both labs offer recommendations for soil treatment along with their standard soil analysis results. Cost $12-15.

**Soil Health Survey**

| Indicator | Definition | Test |
|---|---|---|
| **Texture** | Soil particle size | Look at a dry handful of your soil. Are the particles large (sand)? Medium (loam)? Or small (clay)? Loam is ideal for most vegetables, but particle size alone does not determine success. |
| **Tilth** | Soil aggregation, or the ability of the soil to hold together | Pick up a handful of soil and make a fist. Healthy soils will hold together, but still be pliable and break apart easily |
| **Compaction** | How tightly compressed the soil is | Check the soil surface for signs of crusting (indicating compaction). Insert a probe such as a skewer or pipe into the soil. It should enter without serious resistance through the first 12". |
| **Water Infiltration & Drainage** | How quickly does the soil absorb water? Does it drain well? | Remove both ends of a coffee can and press it halfway into the soil. Pour water into the can until the soil absorbs it at a constant rate. Add an additional cup of water and time its absorption. Healthy soils should be able to absorb it in under 30 min. |
| **Erosion** | Occurs when water is not absorbed and runs off the surface, carrying away soil particles & nutrients | Check for visible signs of runoff, such as rivulets or gullies |
| **Plant Growth** | Number, variety, and health of plants growing on soil | Examine the plants growing on the soil. If the soil has adequate nutrients and water management properties, the plants should be of uniform size, healthy color, and stress-resistant. |
| **Soil Life** | Worms, arthropods, and other organisms inhabiting soil | Dig a small hole and look for evidence of earthworm and arthropod activity (organisms, holes, castings, etc). |

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|---|---|---|
| **Surface Cover** | Organic or artificial covering on the surface of soil | Observe whether the soil is covered year round, and with living (plants), non-living organic (e.g. straw mulch), or artificial (e.g. black plastic) materials. All will retain soil moisture, but the organic options have additional beneficial properties. |

## Adjusting and Improving your Soil

| If you want to… | Use… | The details… |
|---|---|---|
| Raise the pH (soil pH is currently too low / acidic ) | Lime | Safely raises soil pH over 2 – 3 months. Best applied to bare soil. Follow directions on packaging for recommended treatment amounts. |
| | Wood Ash | Very inexpensive, but apply cautiously because it can raise pH rapidly |
| Lower the pH (soil pH is currently too high / alkaline) | Leaves | Organic, free, and readily available in the fall. They will not lower pH as significantly as sulfur, but have additional benefits, such as adding organic matter. Apply a 3" layer of shredded leaves in the fall and turn into soil in the spring. |
| | Sulfur | A quick, easy way to lower pH; can damage the soil's food web. Follow directions on packaging for recommended treatment amounts. |
| Increase Organic Matter | Compost | Compost consists of decomposed plant matter and will add nutrients while increasing organic matter. |
| | Cover Crops | Cover crops add organic matter when turned into the soil, but have additional benefits such as reducing compaction, improving water filtration, and breaking pest cycles. |
| | Leaves | Again, a natural and inexpensive source of organic matter. Leaves will also act as a mulch over the winter. |
| | Manure | Like compost, manure adds nutrients while increasing the percentage of organic matter. Be sure that manure has been aged 6 months to 1 year before application, or it could burn your plants and pose a threat of bacterial contamination. |
| Add Nutrients | Compost | See above |
| | Cover Crops | Legumes will fix atmospheric nitrogen, adding it to the soil |
| | Organic Fertilizer | Very useful when plants are already growing and you need to quickly boost the availability of specific nutrients. |
| Reduce Compaction | Cover Crops | Root will break up compacted soils and improve tilth |

There are many types of soil throughout the Capital Region and many options for improving them. Keep these simple rules in mind:

1. Always keep the soil covered with a diverse array of organic matter. This means plants, as well as compost and organic mulches. Keeping the soil covered will reduce water evaporation, compaction, and erosion.
2. Plant a diversity of organisms. Different plants will use different nutrients, and biodiversity always decreases the risk of pests and disease.

3. Add natural sources of nutrients regularly. Spaces like community gardens that have been under constant cultivation for years have often been drained of nutrients and need work to rebuild their soil.

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