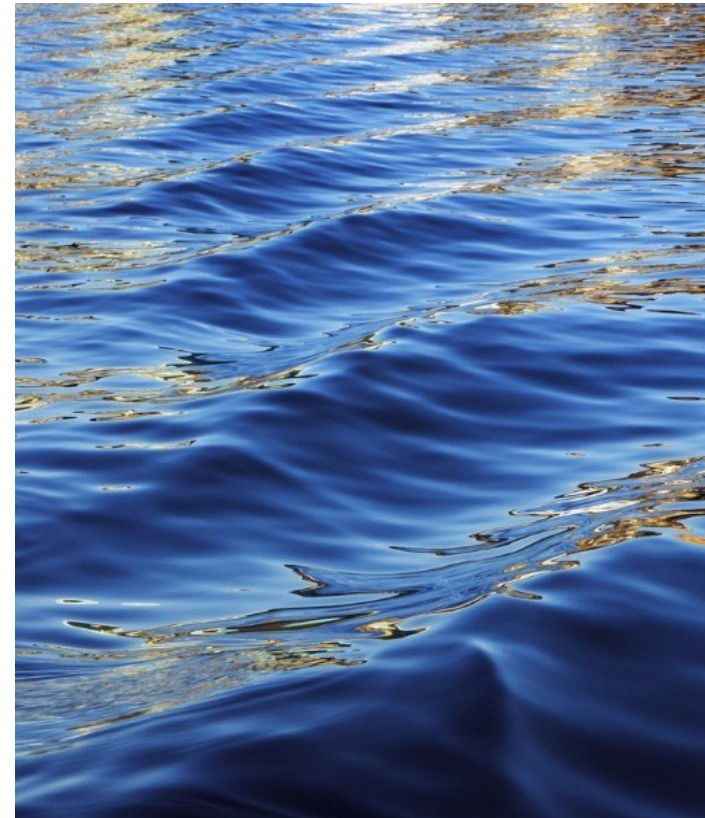


Soil, Microbes, Nutrients and Composting

Kristena LaMar, Master Gardener
and Master Recycler



Perspective



The Truth:

We take the Earth for granted, and we treat the soil like dirt.

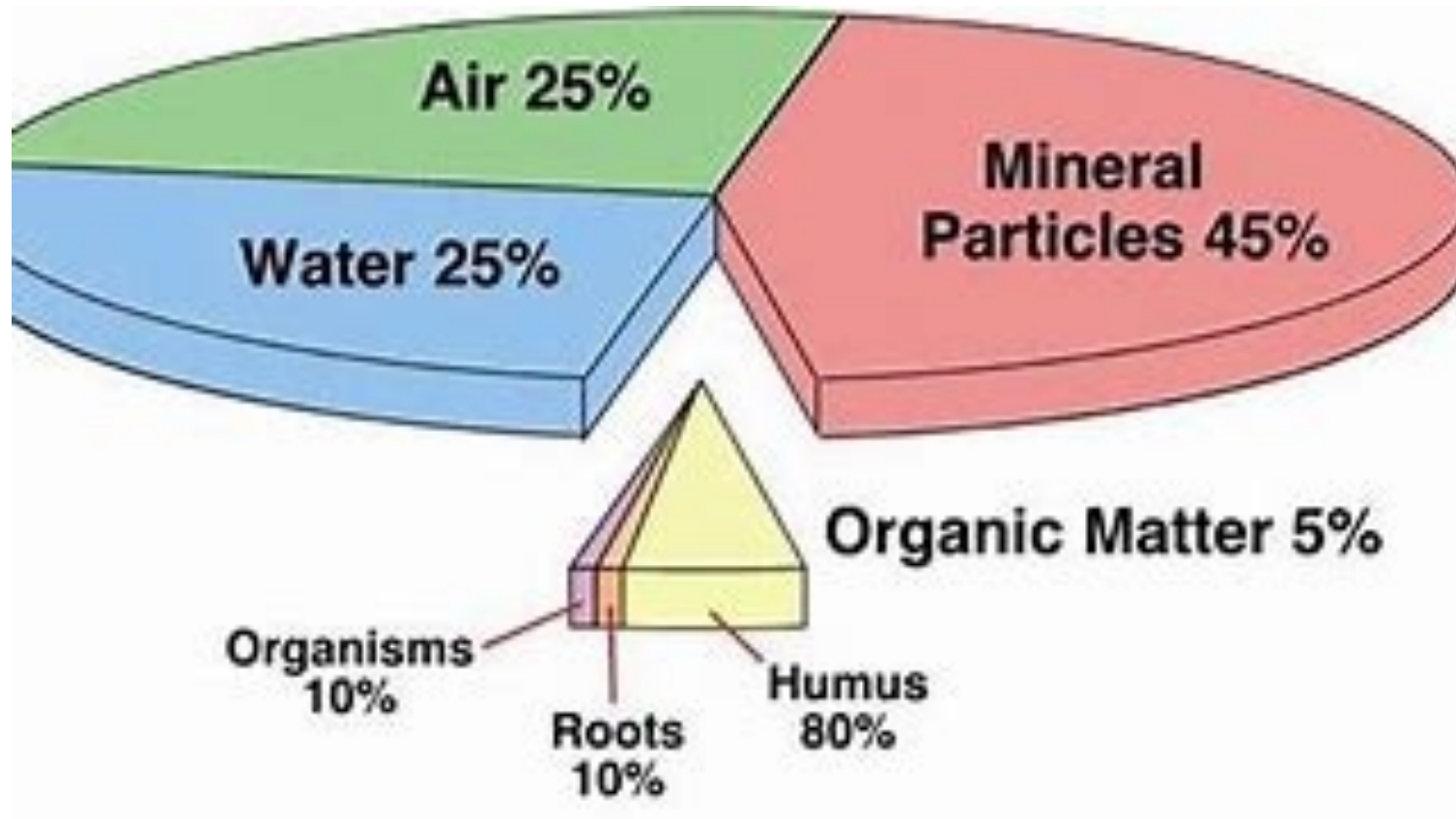


DEFINITIONS FOR THIS TALK

- **NATIVE SOIL:** a collection of natural bodies of the earth's surface, containing living matter and supporting or capable of supporting plants out-of-doors.
- **DIRT:** a substance, such as mud or dust, that soils something.
- **TOPSOIL** is the upper layer of soil, usually the top 5–10 inches. But it may also describe commercially available material for use in growing plants or amending native soil.
- **POTTING SOIL** is a mixture of loam, peat, sand, and nutrients, used as a growing medium for plants in containers. It may also contain perlite, vermiculite, coir and/or pumice (which doesn't "float").



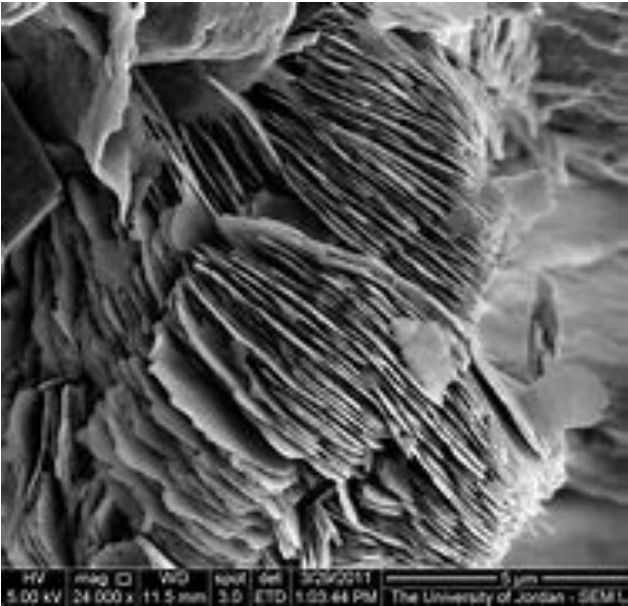
What is “perfect” soil, called loam?



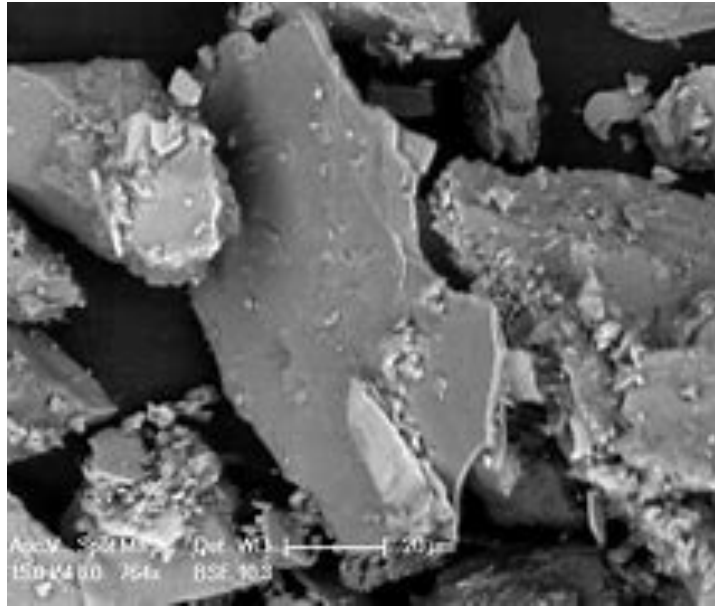
Clay, silt and sand are the three major components of the mineral particles.

Humus is the organic component of soil formed by the decomposition of leaves and other plant material by soil microorganisms. Necessary plant nutrients are held here.

Loam's minerals as seen under a microscope:



Clay



Silt



Sand

Why is soil important?



- Seventy percent (70%) of the Earth's surface is covered by salt water.
- Of the remaining land mass, 20% is desert, and cannot be farmed.
- Another 20% is covered by alpine and arctic tundra, where crops cannot be grown.
- That leaves less than 40% of the land mass to grow food to feed almost 8 billion humans, plus animals grown for food and companionship.

And you think you're complicated and old.

- **Soil forms layers or horizons, roughly parallel to the earth's surface, in response to five soil forming factors: 1) parent material, 2) relief or topography, 3) organisms (including humans), 4) climate, and 5) time.**
- **It takes 500 to thousands of years to create an inch of topsoil.**



Soil Microbes

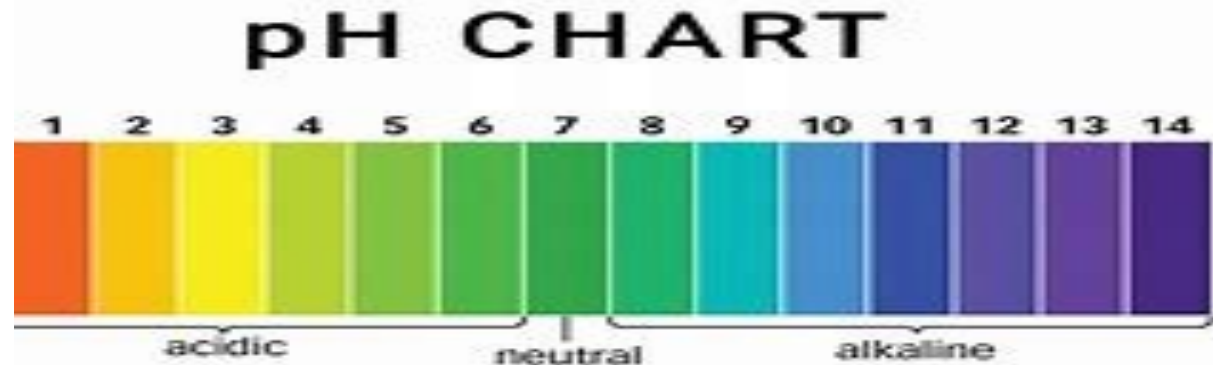
- Bacteria (100,000,000 – 1,000,000,000 per gram)
- Actinomycetes (10,000,000 – 100,000,000 per gram)
- Fungi (100,000 – 1,000,000 per gram)
- Algae (10,000 – 100,000 per gram)
- Protozoa (1,000 – 10,000 per gram)
- Nematodes (100 – 1,000 per gram)



Soil pH and soil testing

- Soil pH is a factor in successful gardening, since it effects which nutrients plants can absorb.
- Most vegetables need a pH between 6.5 and 7.0.
- Most Western Oregon soils are acidic, but some are so acidic they need to be modified for vegetable gardens.
- Consider getting a soil test to see if there are adequate nutrients in the soil, and that the pH is correct for the crop.
- Let the testing lab know what you intend to grow so they can recommend soil amendments to adjust pH or add nutrients in the fall.
- Don't add fertilizer until the spring.

Sulfur makes the soil more acidic.



Lime makes the soil more alkaline

Nutrients

Macro

- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)

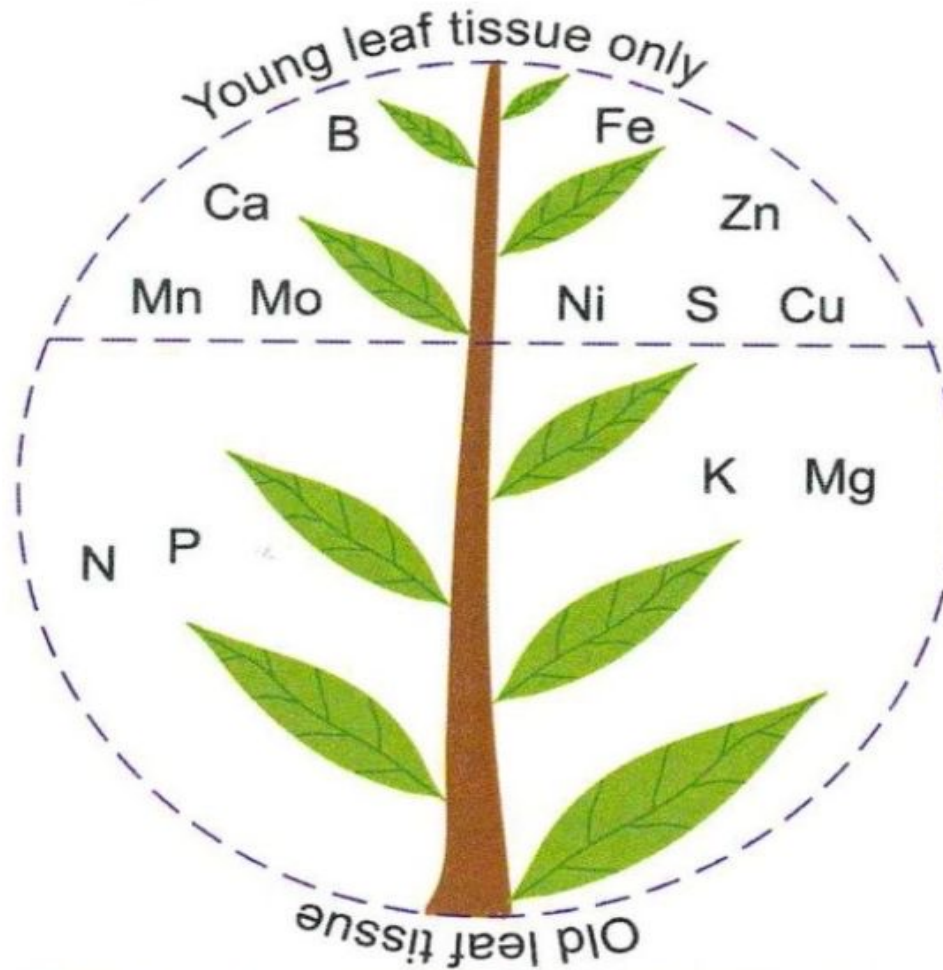
20 lb. Net Weight	
XYZ	5-10-5
Brand	Guaranteed Analysis
Nitrogen.....	5%
Phosphate	10%
Potash	5%
Nutrients derived from ammonium sulfate, triple super phosphate, and potash.	

Micro

- Boron (B)
- Chloride (Cl)
- Copper (Cu)
- Iron (Fe)
- Manganese (Mn)
- Molybdenum (Mo)
- Nickel (Ni)
- Zinc (Zn)

Plant Nutrient Deficiencies

Mobile



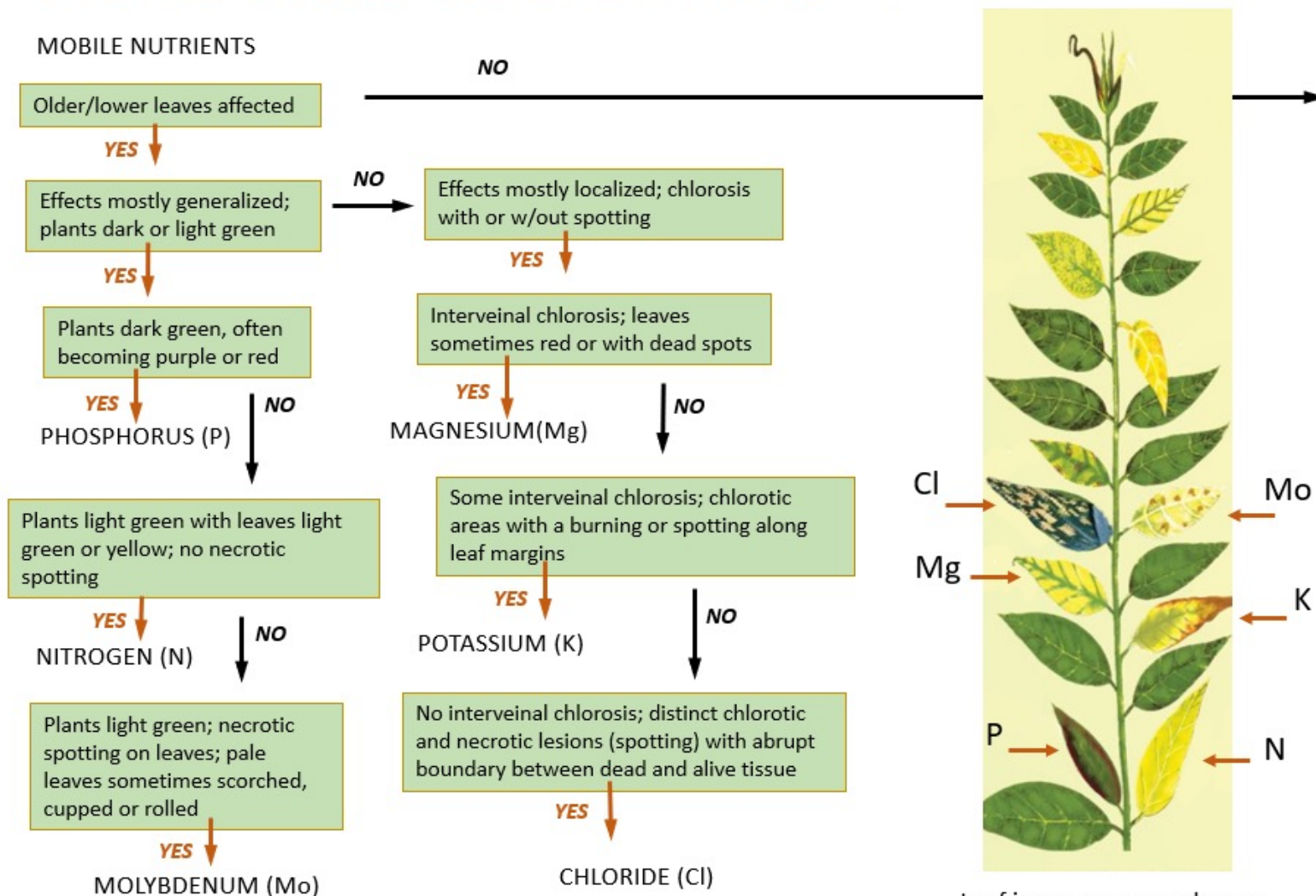
Immobile

Mobile Nutrient Deficiency Symptoms

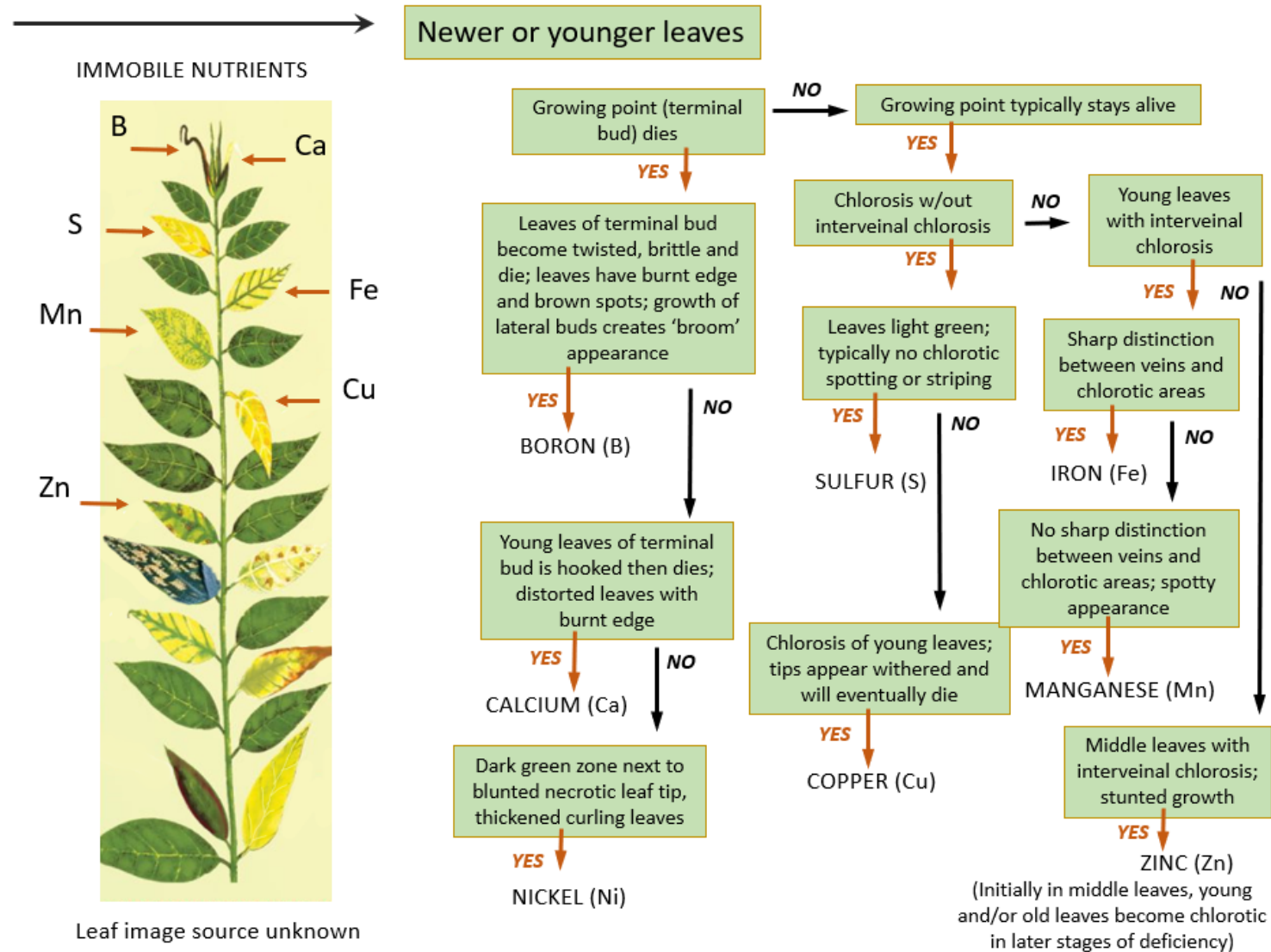
Visual tissue assessment

In Nutrient Management Module 9

<http://landresources.montana.edu/nm>



Immobile Nutrient Deficiency Symptoms



Soil structure and successful vegetable gardening

- The texture of soil, or “tilth,” can make the difference in growing healthy vegetables.
- In order to keep 25% air, compression of the soil must be avoided, whether by walking on it or using equipment, including tilling.
- Adding organic material, such as compost, helps retain the air, holds moisture, and feeds the soil microbes.
- Healthy soil typically has earthworms.



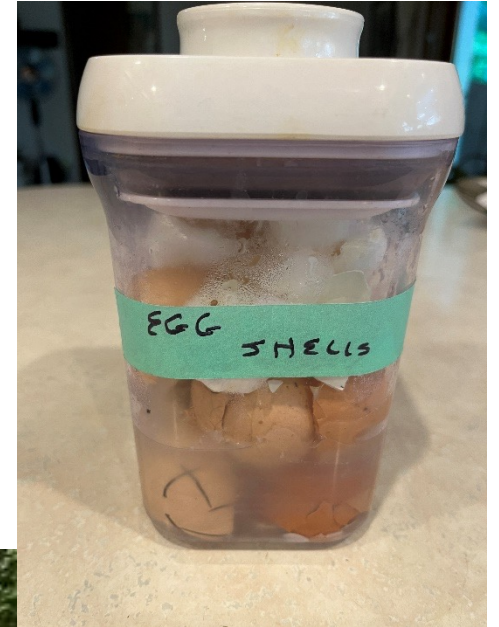
What actions you can take to improve soil

- Add compost.
- Mulch and/or leave the leaves.
- Plant cover crops.



ADD ORGANIC MATTER (COMPOST)

- Composted organic material is just rotting plant tissue.
- Compost should be 1/3 nitrogen ("green" material) and 2/3 carbon ("brown") material, plus air and water. Add soil microbes, your "workers."
- Adding matter in fall makes it available for spring gardens.



HOW ARE RED WIGGLERS HOUSED?

DIY stacking worm bins



Nested plastic storage bins



The bins may be kept indoors, since no odors are emitted. If taken outside, monitor for slugs, and make sure the bin is not exposed to sunlight.

Ingredients for Worm Bins

- Fruit and vegetable scraps.
- Pulverized eggshells, rinsed.
- Coffee grounds and filters, tea bags (without staples or plastic strings).
- Dryer lint from organic sources (cotton, linen, and wool), but not plastics, such as acrylic and polyester.
- Keep cereal, bread and pasta to a minimum, and keep them wet.
- Use cardboard (without plastics), newspaper and “junk mail” as bedding, keeping all moist. Shred papers before adding to any composting system.



What to Leave Out of The Bin



- Meat, poultry, or fish (bones, skin, or drippings), and any animal feces.
- Oils (butter, salad dressing or mayonnaise).
- Dairy products.
- Highly acidic or spicy foods, or allium (including onions, garlicks, leeks, scallions, chives and shallots)
- Citrus—skins and pulp.
- Anything that has been treated with any pesticide.



Watch out for non-compostable materials



Why Should You Compost With Worms?

Worm castings contain more microorganisms, more inorganic minerals, more organic matter, in a form more readily available to plants.....than is contained in soil itself.

“Worm tea” can be used as a liquid fertilizer.

And they’re free!



MULCH AND/OR LEAVE THE LEAVES

- Mulching is adding solid structures to the top of the a. Shred the leaves to let water get to the roots.
- Using organic mulch (bark chips, bark dust or shredded leaves) will provide nutrients to the soil as it decays. Larger chips allow water to get through. Mulch limits weed growth.
- Do not place mulch within 3-4 inches of woody stems, as it will encourage disease growth and insects.



- Be careful not to use mulch treated with pesticides, containing weed seeds or from walnut trees.

PLANT COVER CROPS

- These include grasses, grains and legumes. They keep soil from compacting, and some help soil nutrients.
- Inoculated legumes such as clover and vetch restore nitrogen to the soil.
- Grasses that are deep-rooted help improve tilth, especially over a couple of years. Do NOT use turfgrass!
- Cover crops that produce seeds may produce “weeds” in the vegetable garden if not removed.



- At the end of the winter, cover crops (without seeds) can be tilled in to provide “green manure” to nourish vegetable plants.

Other Resources

- Soil testing labs: <https://catalog.extension.oregonstate.edu/em8677>
- Reading soil tests, and recommended “fixes”: <https://catalog.extension.oregonstate.edu/ec1478>
- Organic vs. inorganic amendments:
<https://depts.washington.edu/dislc/Soil%20Amendments/app.htm>
- And: <https://extension.umd.edu/resource/organic-matter-and-soil-amendments>
- Soil microbes: <https://ohioline.osu.edu/factsheet/SAG-16>
- Using worm castings and worm tea: <https://ucanr.edu/sites/FCManual/files/286155.pdf>
- Cover crops: <https://s3.wp.wsu.edu/uploads/sites/2079/2015/06/Cover-Crops-OSU-Ext.pdf>
- Myths (on a variety of topics): <https://puyallup.wsu.edu/lcs/>

Save the earth. It may be the only one you have.



Kris LaMar, OSU Master Gardener™

