



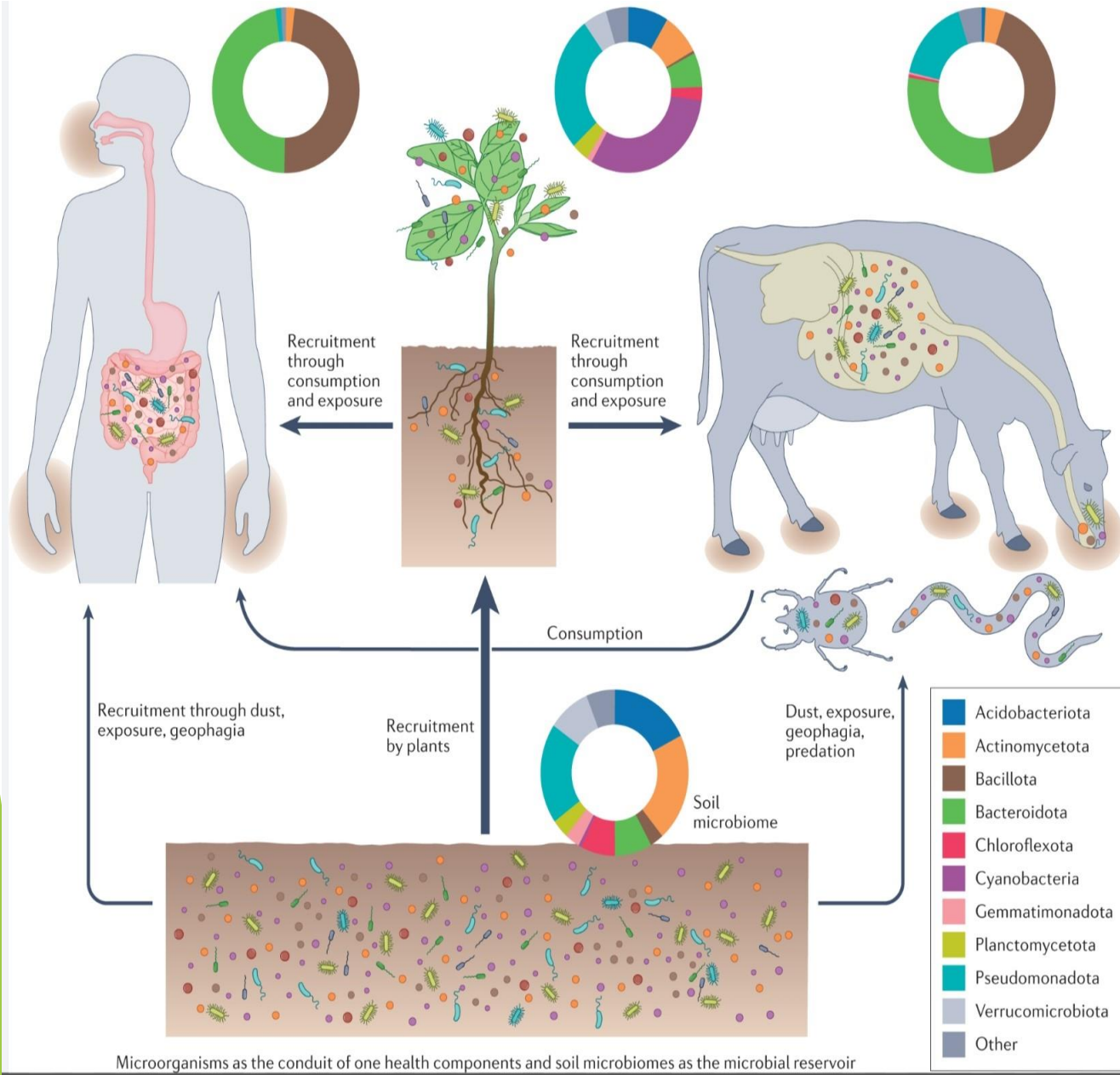
# Organic Gardening 101

# What is Organic Gardening?

The science and art of growing fruits, vegetables, flowers, or ornamental plants by following the essential principles of organic agriculture in **soil building** and conservation, pest management, and heirloom variety preservation.

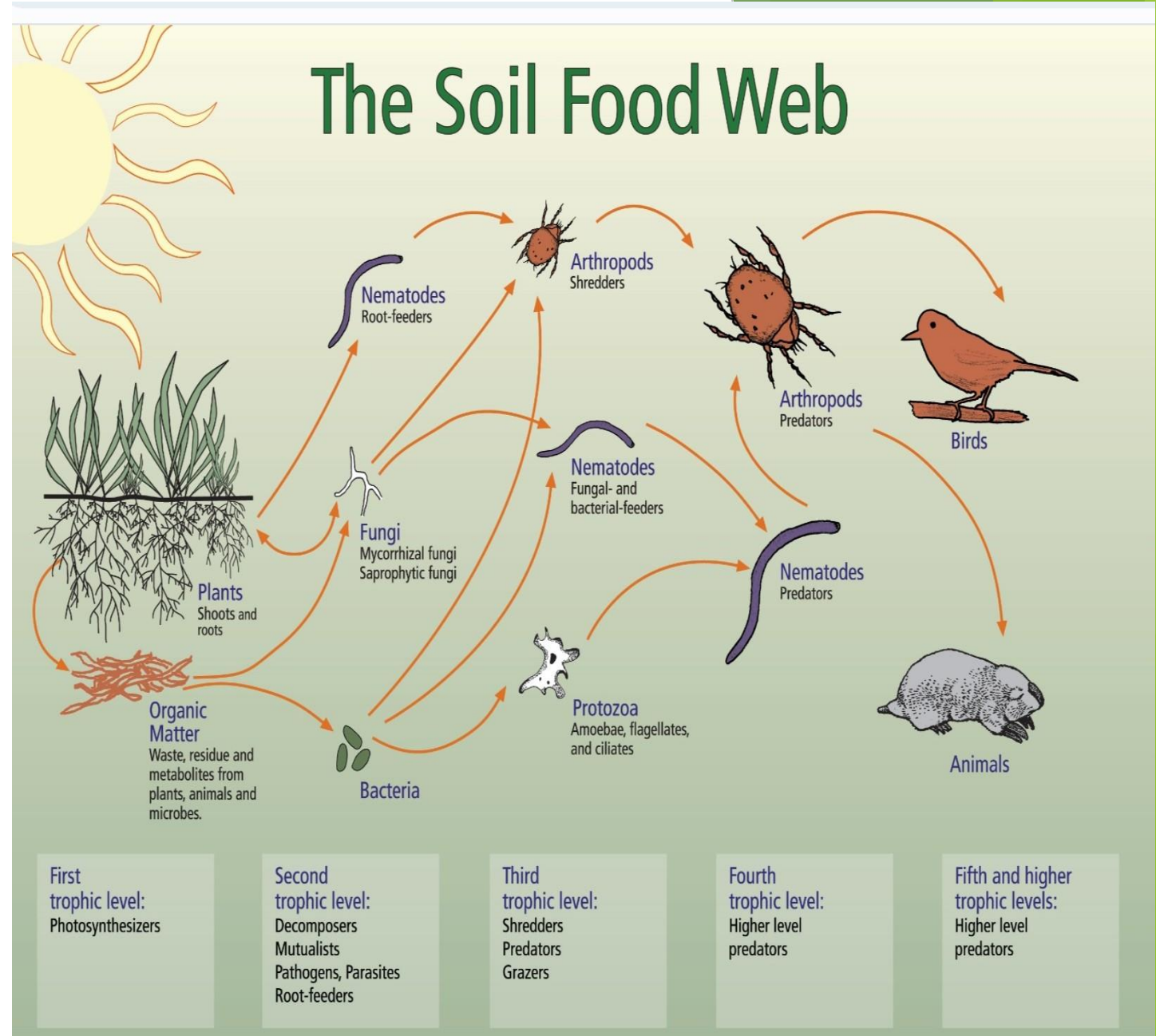
# The Microbiome

The collection of microorganisms in a living system



# The Soil Food Web

The food web refers to the organic matter and the microorganisms that make up the soil



# The Goals Of Organic Gardening

- ▶ **Improve Soil Health And Fertility**
- ▶ **Decrease Erosion**
- ▶ **Reduce Pests And Diseases**
- ▶ **Encourage Plant And Animal Diversity**

# Improve Soil Health And Fertility

Organic farmers nurture the soil ecosystem by adding organic matter which breaks down, making nutrients available to plants.



Elimination of pesticides preserves the ecosystem.

# Decrease Erosion

- ▶ Precious soil is preserved by the presence of plants, ground covers and the use of mulch (which breaks down into organic matter feeding the plants).



# Reduce Pests and Disease

Healthy plants are your best defense against pests and diseases.



Pruning, removing dead parts of plants and using weed fabric can help plants thrive.



# Encourage Plant and Animal Diversity

- ▶ Planting a wide variety of vegetables and flowers encourages beneficial organisms such as pollinators and insects that prey on garden pests.



# Getting to Know Your Garden with Soil Tests



As an Organic Gardener Your **number 1 goal** is to Use Bed Amendments to Improve Soil Health

First assess what type of soil you have (clay, sand, etc.) and what nutrients are there.

The ideal soil has a loose, crumb like structure, which allows water, air and plant roots to penetrate easily. If crushed in your hand it should form a compacted shape, but not be too dense.



# Soil Testing is Cheap and Easy to do

## For \$15 You Can Perform 40 Tests such as pH, N-P-K, etc.

# Beds Should be Amended at Least Once a Year

Amendments should include both organic and inorganic matter.

My amendments for all beds include: compost, perlite, vermiculite, Trifecta +, worm castings, azomite, kelp meal, mycorrhizae and peat moss.

I then amend each bed with additions specific to the plants that will be in that bed (manure, bone meal, blood meal, lime, acidifier, etc.).

# The Benefits of Adding Organic Matter



It feeds microorganisms and other soil life.



'Good' microbes prey on the harmful ones.



It improves soil structure to better hold water and open spaces for drainage, making oxygen available to plant roots for them to grow.

# What Are the Most Commonly Used Forms of Organic Matter

- ▶ **Compost** - by far the most important addition to any garden! At the very least, add a 2-3 inch layer.
- ▶ Aged animal manures (cow, rabbit, chicken)
- ▶ Mulch (shredded wood, straw, pine needles, leaves, etc.). Mulch decays over time, feeding the soil with organic matter. It also retains moisture, helps insulate plant roots, and covers soil borne fungal diseases.

# Composting





# Compost Guidelines

Should be composed of about 4 parts brown matter (carbon sources) to 1 part green matter (nitrogen sources).

The green matter includes materials like grass clippings, food scraps, rotted manure, etc.

The brown matter includes materials like brown leaves, straw, paper, wood chips, etc.

# Compost Guidelines

There are several composting methods, but typically the compost is kept wet, aerated and allowed to generate heat.

It is impossible for me to generate the amount that I need (10 yards a year) so I buy mine from Taylor's.

As summer approaches we bury scraps in the empty beds and 6 months later it is gone.

# Compost Guidelines

## Mushroom Compost

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Mushroom compost is high in salts and alkalinity, which may kill germinating seeds and salt sensitive plants. It has a very low nutrient level and may be contaminated with pesticides and fungicides!

# What are the Best Inorganic Materials to Improve the Soil

- ▶ Perlite (mined organic glass) - opens up the soil for better drainage.
- ▶ Vermiculite (natural mineral) - speeds up germination and rooting, retains moisture and improves aeration.
- ▶ Sand - provides drainage.

# Adding Worms to Improve Soil Health

- ▶ Adding worms each year at the beginning of the season is a great asset (I buy them online from Jim's Worm Farm).
- ▶ Worms provide soil aeration by leaving tunnels behind for roots to grow in and water to drain.
- ▶ Worms also leave behind organic matter making them an important part of the microbiome.

# The Best Way to Control What's in Your Soil is to Start Over With a Raised Bed



# The Advantages of Raised Beds Include

Control of the type of soil.



Elimination of soil compaction from humans and animals walking on the beds.



Faster soil drainage.



More efficient watering and fertilizing.

# Advantages of Raised Beds

Control of  
soil  
erosion

Closer plant  
spacing and  
easier  
weeding

Less  
bending

Less  
weeds



# Advantages of Raised Beds

Better animal/pest control.

Easier to document plant location (plant log).

Attractive organized appearance.

# Organic Fertilizers



# Organic Fertilizers - Advantages Over Chemical Fertilizers



# Organic Fertilizers - Advantages Over Synthetics Fertilizers

- ▶ Synthetics (i.e. 10-10-10) may cause rapid growth, weakening cell walls. The result is plants which are more susceptible to pests, diseases and weather damage.
- ▶ Synthetics may wash away so fast that the plants don't have time to absorb them.
- ▶ Organics release nutrients slowly, resulting in improved absorption.

# Organic Fertilizers - Advantages Over Synthetic Fertilizers

Manufacturers of synthetics only need to guarantee they meet the advertised fertilizer content. Other toxic substances may be present but are not regulated!

**Table 1. Use, Production, Exports, and Imports of Nitrogen Fertilizer by Country in 2019, Million Metric of Actual N.**

	Agricultural Use	Production	Production as % of Use	Exports	Imports	Net Exports <sup>1</sup>
China	26.74	32.40	121%	5.98	0.32	5.66
India	18.86	13.72	73%	0.08	6.53	-6.45
United States	11.67	13.26	114%	1.63	4.09	-2.46
Brazil	4.91	0.36	7%	0.04	4.88	-4.84
Pakistan	3.51	3.21	92%	0.00	0.32	-0.32
Indonesia	2.93	4.14	141%	0.91	0.39	0.52
Canada	2.57	3.93	153%	1.48	1.01	0.48
France	2.13	0.51	24%	0.32	1.94	-1.62
Russia	1.73	10.91	632%	7.19	0.04	7.15
Turkey	1.68	1.14	68%	0.35	1.69	-1.34
Viet Nam	1.49	1.10	74%	0.18	0.57	-0.39
Ukraine	1.47	0.98	67%	0.13	0.70	-0.57
Germany	1.37	1.51	110%	1.14	1.01	0.14
Australia	1.34	0.42	32%	0.08	1.30	-1.22
Mexico	1.33	0.51	39%	0.08	0.77	-0.69
Bangladesh	1.33	0.38	29%	0.00	0.42	-0.42
Argentina	1.28	0.51	40%	0.00	0.83	-0.83
Thailand	1.26	0.14	11%	0.15	1.28	-1.12
Egypt	1.25	4.20	337%	2.12	0.02	2.10
Poland	1.05	2.01	192%	0.84	0.68	0.16
Other countries	17.84	27.63	155%	23.75	17.63	6.12
European Union	8.50	8.57	101%	8.52	10.01	-1.49



# Organic Fertilizers - Advantages Over Synthetic Fertilizers

- ▶ Organic nutrients have complex molecules which don't wash away readily.
- ▶ Synthetics harm sensitive plant roots and kill microbes.
- ▶ Organics work with microbes making nutrients available to plants.



## Organic Fertilizers - Advantages Over Synthetic Fertilizers

- ▶ Synthetics are expensive to make and leave toxic substances, harming the environment.
- ▶ Excess run off from synthetic use harm the environment.
- ▶ Organics improve soil texture for better water retention, increasing bacterial and fungal activity.



# Organic Fertilizers - Nutrients

Nutrients that are essential for plant health consist of **eight macronutrients** (needed by plants in large amounts) and **eleven micronutrients** (needed by plants in small amounts).

# Organic Fertilizers - Macronutrients (N-P-K)

**Nitrogen (N)** which is responsible for growing green leaves, protein and chlorophyll development.

**Phosphorus (P)** aides in fruit, stem and seed development, disease resistance and plant vigor.

**Potassium (K)** provides vigorous growth, disease resistance, flavor, plant development and plant function.

# Organic Fertilizers - Other Macronutrients

Plants also need carbon, oxygen, calcium, hydrogen, magnesium and sulfur.

Plants naturally take in carbon and oxygen in the form of carbon dioxide from the air and hydrogen from water.

Plants also take in inorganic nutrients and water through their roots.



# Organic Fertilizers - Micronutrients

- ▶ The most important micronutrients include iron, manganese, boron, molybdenum, copper, zinc, chlorine, nickel, cobalt, silicon and sodium.
- ▶ Different plants need different micronutrients.

## Deficiency Chart of Micronutrients

**Boron:** Discoloration of leaf buds. Breaking and dropping of buds

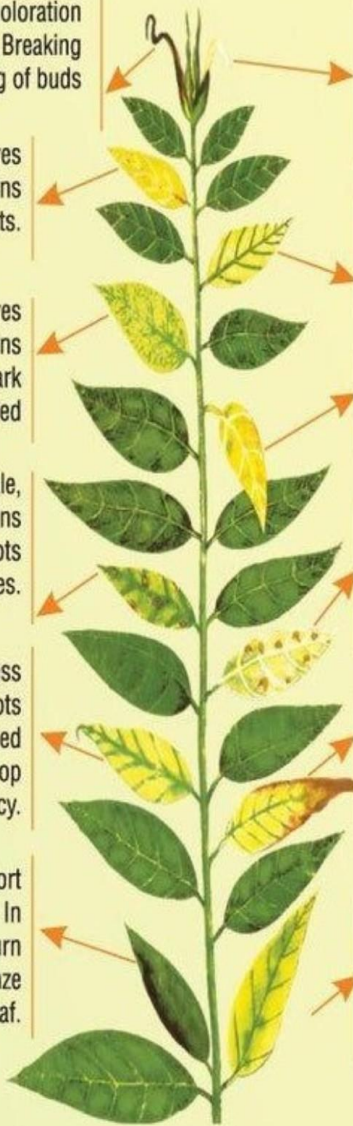
**Sulphur:** Leaves light green. Veins pale green. No spots.

**Manganese:** Leaves pale in color. Veins and venules dark green and reticulated

**Zinc:** Leaves pale, narrow and short. Veins dark green. Dark spots on leaves and edges.

**Magnesium:** Paleness from leaf edges. No spots. Edges have cup shaped folds. Leaves die and drop in extreme deficiency.

**Phosphorus:** Plant short and dark green. In extreme deficiencies turn brown or black. Bronze colour under the leaf.



**Calcium:** Plant dark green. Tender leaves pale. Drying starts from the tips. Eventually leaf buds die.

**Iron:** Leaves pale. No spots. Major veins green.

**Copper:** Pale pink between the veins. Wilt and drop.

**Molybdenum:** Leaves light green/ lemon yellow/orange. Spots on whole leaf except veins. Sticky secretions from under the leaf.

**Potassium:** Small spots on the tips, edges of pale leaves. Spots turn rusty. Folds at tips.

**Nitrogen:** Stunted growth. Extremely pale color. Upright leaves with light green/yellowish. Appear burnt in extreme deficiency.

# Micronutrient Deficiencies

# Organic Fertilizers Come in 4 Forms

- ▶ Plant Based
- ▶ Animal Based
- ▶ Mineral Based
- ▶ Microbial Based



# Organic Fertilizers - Plant Based Fertilizers

Characterized by low to moderate N-P-K values, but their nutrients quickly become available in the soil.

Common forms include alfalfa meal (nitrogen phosphorus, potassium, magnesium and sulfur) compost/compost tea (microbes including bacteria, fungi, protozoa, nematodes and micro arthropods) cottonseed meal (high nitrogen, phosphorus and potassium), kelp/seaweed (many micro and macronutrients including hormones), humus and phytoplankton (Marphyl).

# Organic Fertilizers - Animal Based Fertilizers

Products include manures, bat/bird guano, blood meal (high nitrogen), bone meal (calcium and phosphorus), feather meal (high nitrogen), fish products (fish emulsion, hydrolyzed fish powder and fish meal, high in nitrogen) and **worm castings/worm casting tea** (high in micronutrients, as well as N-P-K as high as 5-5-3).



# Organic Fertilizers - Mineral/Rock Based Fertilizers

Rock based fertilizers dissolve slowly, sometimes over years. They can provide over 100 minerals for plant nutrition. **Azomite** is the most common rock dust, providing calcium, magnesium, potassium, silicon and over 70 more minerals. Other forms include Chilean nitrate of soda, epsom salt, greensand, gypsum, rock phosphate, sulfur, limestone and rock dust.

# Organic Fertilizers - Microbial Based

**Mycorrhizal fungi** allow plants to draw more nutrients and water from the soil by forming a symbiotic relationship with the plant roots. They also increase plant tolerance to different environmental stresses. These fungi play a major role in soil aggregation processes and stimulate microbial activity. The end result is that **mycorrhizae will result in larger and healthier plants!**

# Organic Fertilizers - Methods of Application

- ▶ Side dressing with powders or granules - typically slow-release fertilizers.
- ▶ Plant/root drench - fast acting fertilizer.
- ▶ Foliar spray either with a hand sprayer or a hose end sprayer. Fertilizers are quickly absorbed by the pores in the leaves. Typically used with a surfactant to improve wetting and adhesion to the leaves.

**Foliar Spraying  
is Highly  
Effective at  
Entering Plant  
Pores(Stomata)  
on the Leaf  
Surface.**



# Organic Fertilizers - Soil pH

Soil pH is an indicator of how acidic or basic the soil is. A lower pH number (ie./ below 7) is more acidic while a higher pH (ie./ above 7) is more basic.

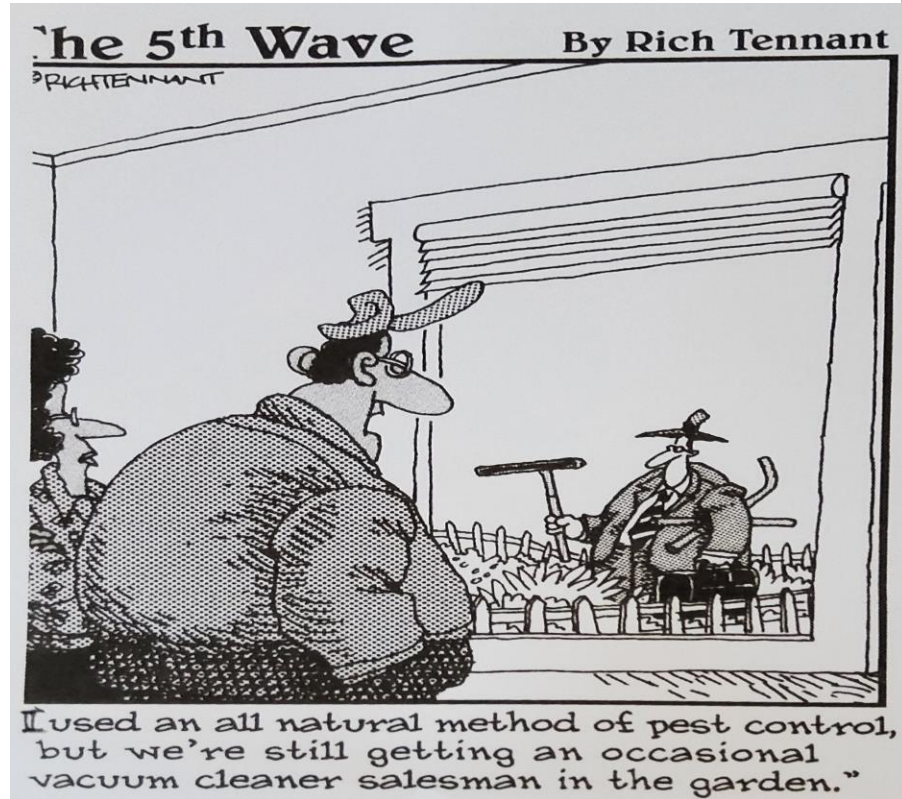
It is important to measure the pH of the soil, in that different plants have different pH requirements. pH can be adjusted to optimize the conditions for growth of the microbes that are compatible with the different plant species.



# Organic Fertilizes Soil pH

- ▶ Fresh compost is the great equalizer for pH. It has a buffering effect resulting in a pH near 7.
- ▶ You can have your soil tested, buy a test kit, or simply buy a pH meter to better match your soil to the plants' needs.

# Organic Pest Control (A Contradiction in Terms)




# Battling Pests

The First Step  
in Battling Pests  
is to Identify  
Them








# General Practices to Control Pests


- ▶ Damaged plant surfaces invite pests.
- ▶ Take precautions to prevent damage from trimmers and rotary tillers by using mulch and/or protective barriers.



# General Practices to Control Pests

## Clean Up Debris

- ▶ Leaves, fallen fruit, etc. can harbor pests and diseases.
- ▶ The act of removing the debris may exposes hiding pests.



# General Practices to Control Pests

## Attract Beneficial Organisms

- ▶ Find ways to invite birds, spiders, toads and beneficial insects.
- ▶ Examples include a bird feeder, bird bath or releasing purchased ladybugs.

# General Practices to Control Pests

Don't Over Fertilize

Excess nutrients are as harmful to plants as a nutrient deficiency.

The best way to avoid over fertilization is to use organic fertilizers, these break down slowly, making it nearly impossible to over fertilize.

# General Practices to Control Pests

Use repellents.

Neem oil - disrupts insect reproduction and deters insects from feeding.

Citrus oils - kills insects on contact.

Hot pepper wax sprays - these repel insects as well as rabbits and squirrels.

Other plant extracts/oils - many herb or spice extracts repel or kill insects.

# General Practices to Control Pests - Bacteria

- ▶ **BT** - a natural bacteria, which when ingested kills many types of bugs. It is very effective against caterpillars and tomato horn worms. Spray proactively if you know when certain bugs will be present.
- ▶ **Spinosad** - a natural bacteria which kills caterpillars, beetles, leaf miners, thrips and fire ants.

# General Practices to Control Pests - Granular and Powder Products

- ▶ **Sevin** kills a wide range of pests. It is not organic, but it can be applied carefully around the perimeter of the entire garden, as a barrier.
- ▶ **Diatomaceous earth** - sharp particles which kill cutworms, beetles and slugs.

# General Practices to Control Pests - Physical Controls

- ▶ Use barriers such as fencing for larger animals and netting when flying bugs are active.
- ▶ Hand pick bugs off the plants.
- ▶ Hose off bugs.
- ▶ Use repellents such as hanging soaps, human hair, etc.



# General Practices to Control Pests - Scare Tactics

Use shiny objects, spinning objects,  
motion activated sprinklers,  
scarecrows, etc.

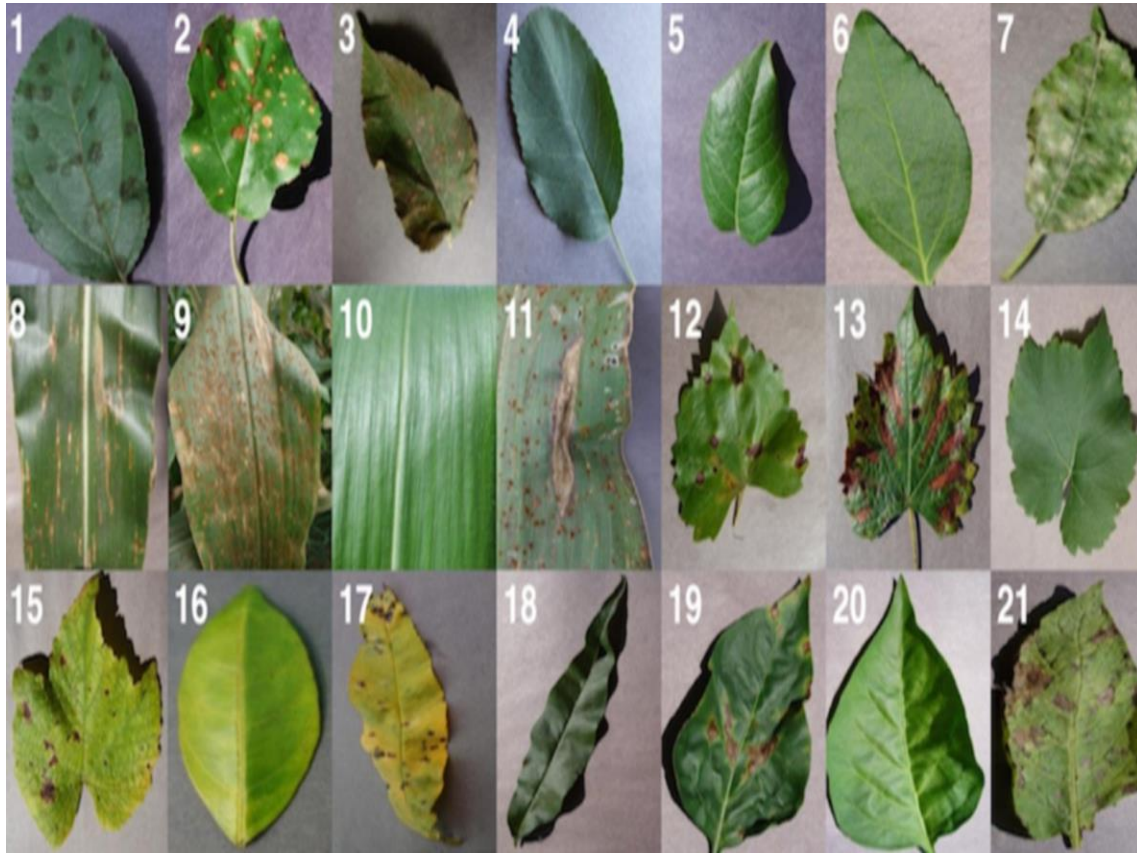
# General Practices to Control Pests - Trapping

Use mouse traps for rodents,  
hanging sticky spheres or hanging  
beetle traps.

# General Practices to Control Pests - Companion Planting

- ▶ Herbs - oregano, sage, thyme, borage and winter savory all deter.
- ▶ Alliums - pests don't like garlic and onions. Try planting scallions from the grocery store. These can grow as large as leeks and can be strategically placed throughout the garden.
- ▶ Flowers - these serve two purposes; they repel pests and attract pollinators. Marigolds and nasturtium in particular are very effective.

# Battling Plant Diseases



The First Step in Battling Diseases is to Identify the Cause (Viral, Fungal, Bacterial)

# Battling Plant Diseases - Preventing Problems

Choose disease resistant plant varieties.

Water the soil, not the plants. Use of drip irrigation will prevent diseases that are exacerbated by moisture.

Prune plants like tomatoes part the way up the stem to minimize soil borne diseases.

Mulching also helps with soil borne diseases.

# Battling Plant Diseases - Other Ideas

Avoid excess nitrogen fertilization.

Keep your shoes, yard and tools clean.

Use crop rotation.

Control insects.

# Battling Plant Diseases - Too Much of a Good Thing

1

Organic Fungicides Must be Used Judiciously

2

Even though Serenade and copper fungicides are very common organic fungicides, overuse can kill fungi in the microbiome.

3

Use of these products can help control blight on tomato plants, but the risk/benefit ratio needs to be considered.



**NO-TILL**

This Sign  
Says it ALL!



# Reasons Not to Till Your Garden

Tilling destroys the soil structure, including tunnels created by worms and plant roots. This leads to increased compaction and a reduction in drainage.

# Reasons Not to Till Your Garden

Tilling buries weed seeds in the fall, protecting them during the winter. Spring tilling brings the seeds back to the surface for them to grow.

# Reasons Not to Till Your Garden

Tilling destroys the soil microbiome, which nourishes the plants. They now become completely dependent on chemical fertilizers to produce vegetables.



Why Would  
You Destroy  
This by  
Tilling!?

A close-up photograph of fresh spinach leaves, heavily coated with water droplets, set against a dark background. The leaves are vibrant green and show clear vein patterns. The image is partially obscured by a white diagonal shape that serves as a background for the text.

# Putting It All Together

By providing a wide range of nutrients to the plants, fresh organic produce tastes far superior to mass produced produce, providing a higher vitamin and mineral content.

# Putting it all Together

While organic gardening may cost more, the yields and quality more than make up for it.



# Putting it all Together

Organic gardening provides a healthy alternative for your family by avoiding pesticides and possible contamination, such as e-coli on lettuce.



# Putting It All Together

- ▶ Organic gardening is dramatically less harmful to the environment and provides a more efficient use of resources.
- ▶ You control eating produce at its highest nutritional state, having just picked it!
- ▶ Buying organic produce is far more expensive than growing it, especially when you grow from seed.



# Committing to Organic Gardening

If you decide to start organic gardening you must commit **100%** to the concept.

There is no such thing as mixing organic and traditional methods, it's one or the other!

It may be scary to let go of the way you have always gardened, but believe me, it's worth it!

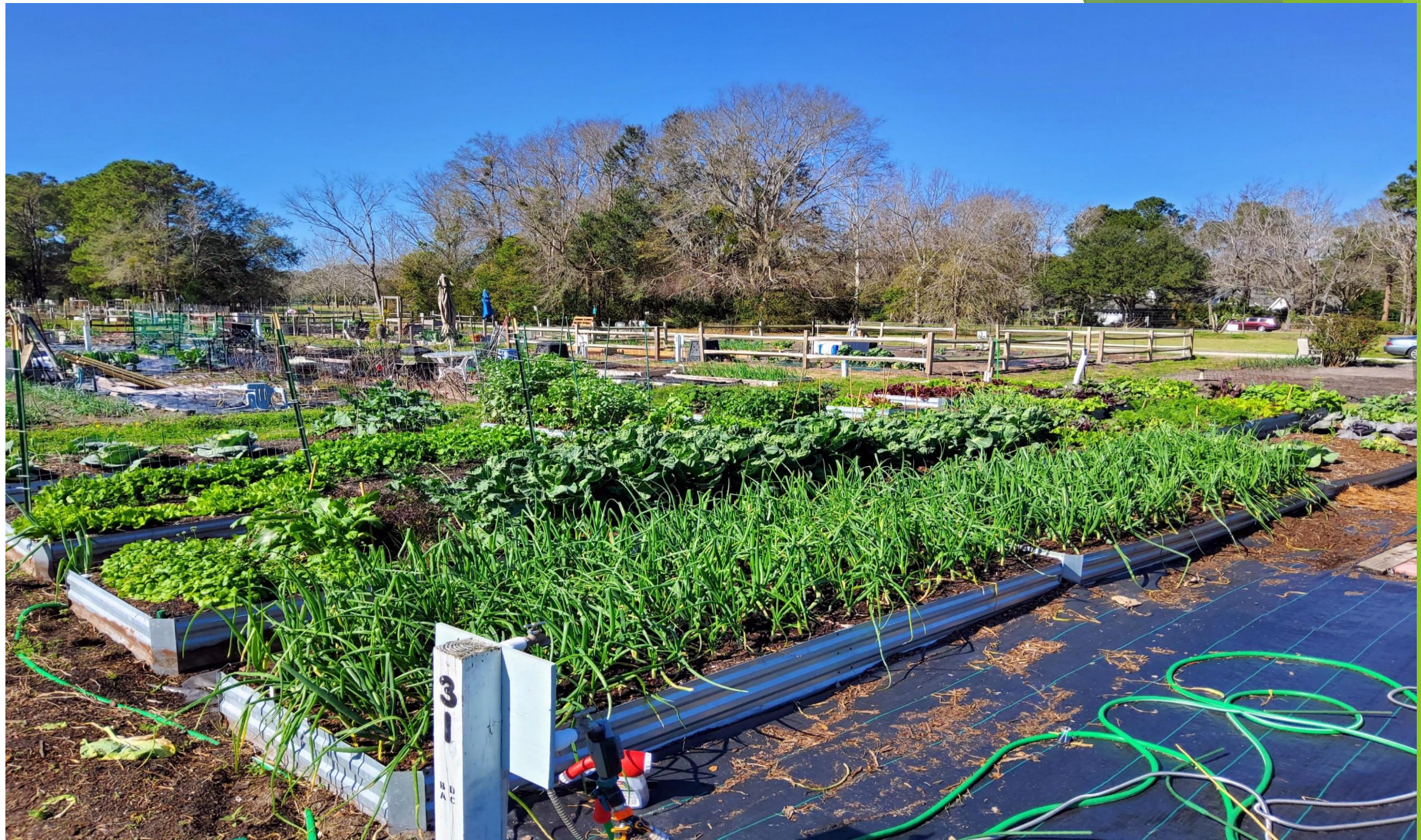


9/25/22



9/1/22







Lettuce



5/10/21

Russet

Red Norland

Kennebec

Yukon Gold

Charlotte

Huckleberry Gold

Adirondack Red





# 182 Vidalia Onions!





# Fertilizers I Use to Start Seedlings

Jobes Fast Start - used to start new seeds and when transplanting.

Espoma Seed Starter - used on top of new seeds (especially small seeds) to cover, promote root growth and retain moisture.

# Fertilizers I Use Every 2 Weeks

## Soil Drench

Marphyl - phytoplankton

Cleankelp - kelp extract

Microboost (Hoss Tools) -  
micronutrients

Alaska fish emulsion (use when  
nitrogen is needed only)

Neptune's Harvest Tomato and  
Veg. - all purpose fertilizer

Bills Perfect Fertilizer - all  
purpose fertilizer

Worm tea concentrate -  
Bloomcity or Killer Tea

Fertilizers I  
Use Every 2  
Weeks

## Foliar Spray

Marphyl -

phytoplankton

Cleankelp - kelp extract

Bloomcity foliar spray -  
all purpose fertilizer

Spray n Grow

Micronutrients

Yucca wet - surfactant


# Fertilizers I Use Once a Year (Slow Release All Purpose Fertilizers)

Chosen Based on Matching N-P-K to Specific  
Plant Needs

- ▶ Trifecta + (5-10-4)
- ▶ Plant-tone (5-3-3)
- ▶ Garden-tone (3-4-4)
- ▶ Jobes All Purpose (4-4-4)

# Fertilizers I Use Occasionally

- ▶ Fulvic acid
- ▶ Humic acid
- ▶ Mycorrhiza
- ▶ Soil balance pro-microbes
- ▶ Pure protein (Boogie Brew)

Three envelopes are arranged in a descending staircase pattern from top-left to bottom-right. The top envelope is white, the middle one is green, and the bottom one is pink. They are set against a background of light blue and orange. The right side of the image features a dark blue and green geometric pattern.

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