# Soil Biology to Grow Garden Abundance

Presentation by Michael Wedgley

# About Me

Permaculture Designer

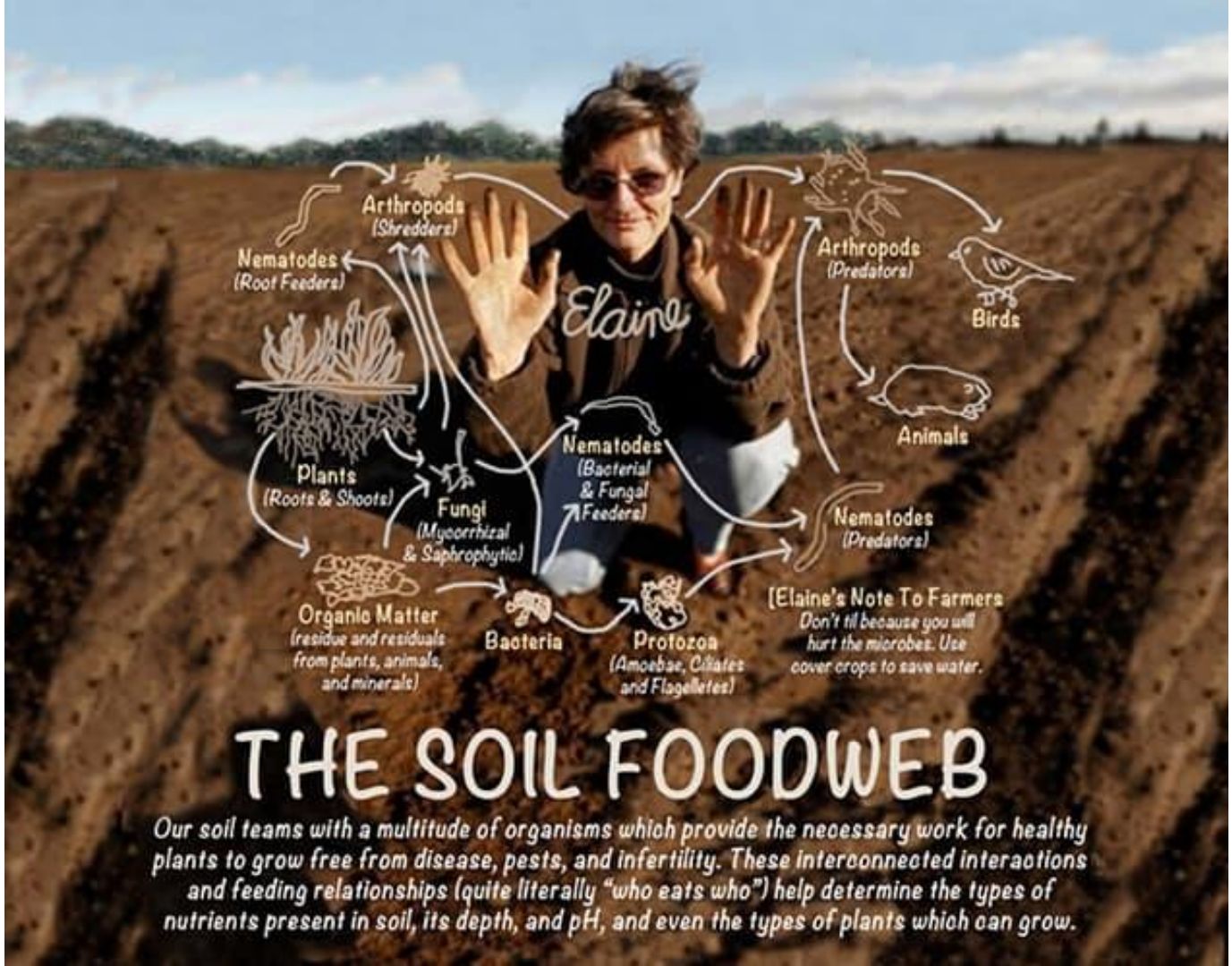
Water Harvesting Designer

Founder of Transformative Soil and Landscapes

Soil Food Web Lab Technician

Program Manager at Sustainable Solano

How I became interested in this work


Arthropods
(Shredders)
Nematodes
(Root Feeders)
Elaine
Arthropods
(Predators)
Birds
Animals
Plants
(Roots & Shoots)
Fungi
(Mycorrhizal
& Saprophytic)
Nematodes
(Bacterial
& Fungal
Feeders)
Nematodes
(Predators)
Organic Matter
(residue and residuals
from plants, animals,
and minerals)
Bacteria
Protozoa
(Amoebae, Ciliates
and Flagellates)
[Elaine's Note To Farmers
Don't til because you will
hurt the microbes. Use
cover crops to save water.
THE SOIL FOODWEB
Our soil teams with a multitude of organisms which provide the necessary work for healthy
plants to grow free from disease, pests, and infertility. These interconnected interactions
and feeding relationships (quite literally "who eats who") help determine the types of
nutrients present in soil, its depth, and pH, and even the types of plants which can grow.







## Renald Flores

### Market Garden Makeover (Sweden)

Soil Food Web Consultant. Renald Flores reported an average **increase in yields of 72% across 8 different types of crops**, on this market garden near Stockholm, Sweden.


**York Farms, Illinois**
Corn & Soy: 10,000 Acres
by Todd Harrington


**International Case Studies: Ecuador, India, Peru, USA**
Grapes, Cannabis, Turmeric and more
by Miles Sorel


**Alfalfa, Potatoes, & Beans – 25,000 Acres**
Alfalfa, Potatoes, & Beans
by Todd Harrington


**Organic Banana Farm South Africa**
5,000 Acre Organic Banana and more
by Shane Plath


**Governors Island NYC**
172 Acre Public Park Restoration
by Todd Harrington

# 1. Plant Basics

**All plants need nutrients and all plants photosynthesize**

- **Primary Nutrients**
  NPK (Nitrogen, Phosphorus, Potassium), etc.
- **Secondary Nutrients**
  Calcium, Magnesium, Sulphur, etc.
- **Trace Minerals or Micro Nutrients**
  Boron, Chlorine, Copper, Iron, Manganese, Molybdenum, and Zinc

Where do these nutrients come from?

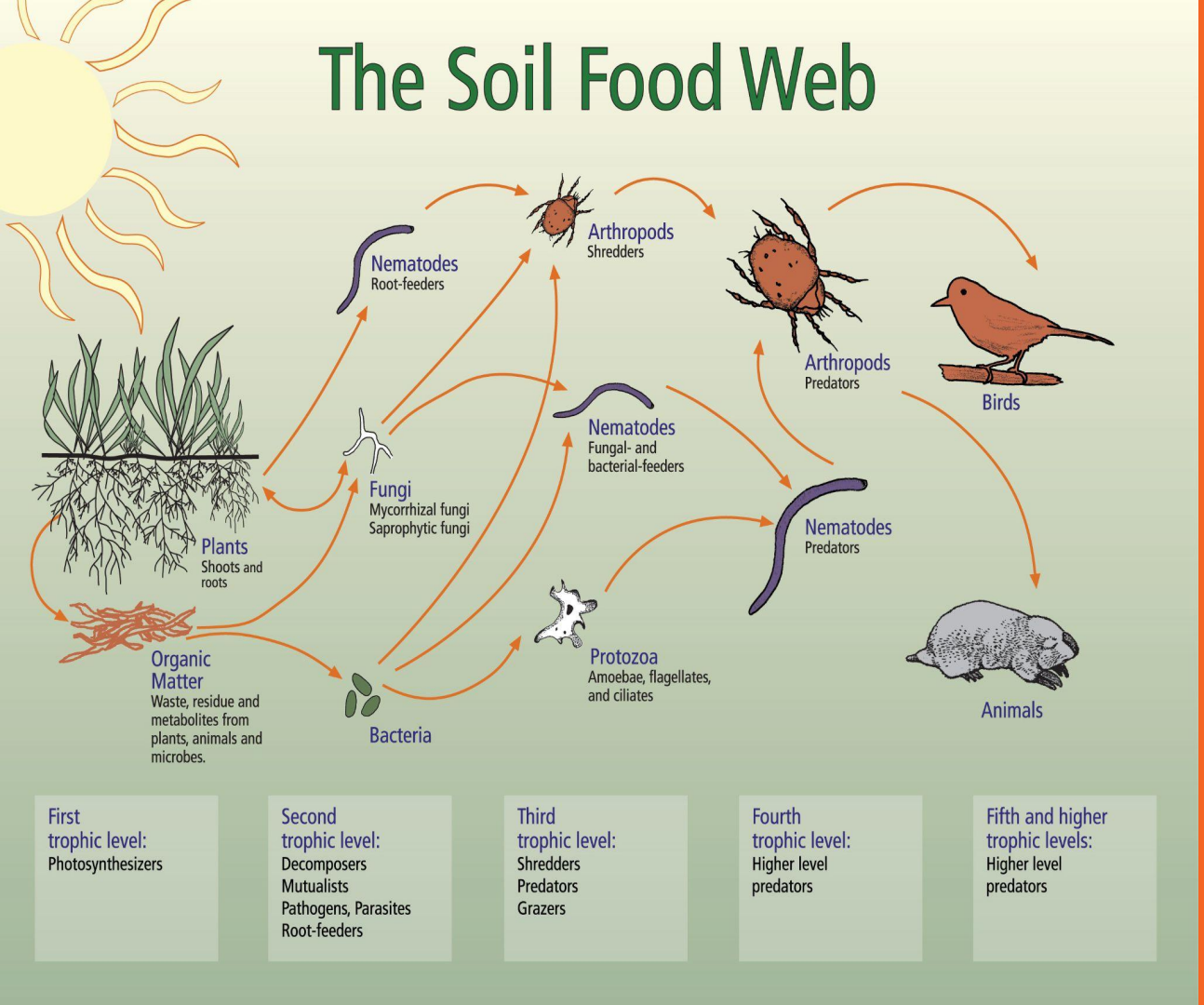
# What percentage of nutrients needed to grow most plants resides in most soils?

# What percentage do we need to add in?

**100% of nutrients needed to grow most plants are in most soils.**

We do not need to add any nutrients. We just need to unlock them.


Nobody ever fertilized an old growth forest




# Enter **The Soil Food Web**

## Credit the work of Dr. Elaine Ingham

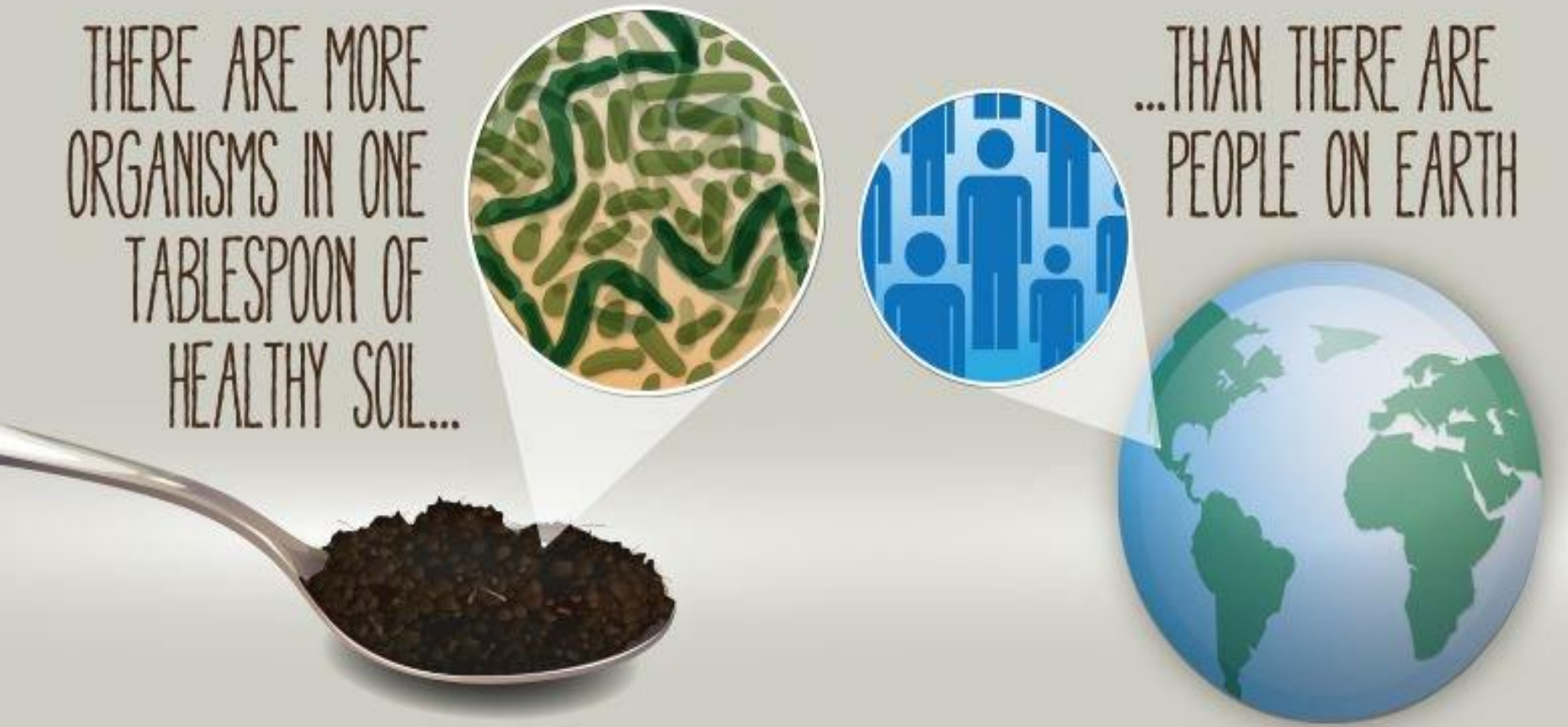
The Soil Food Web includes microbes that are in the soil and cycle nutrients

**Photosynthesis - the process by which green plants and some other organisms use sunlight to synthesize foods from carbon dioxide and water**

# 2. Functions of Soil Food Web

Some of the most important functions of a healthy Soil Food Web are:

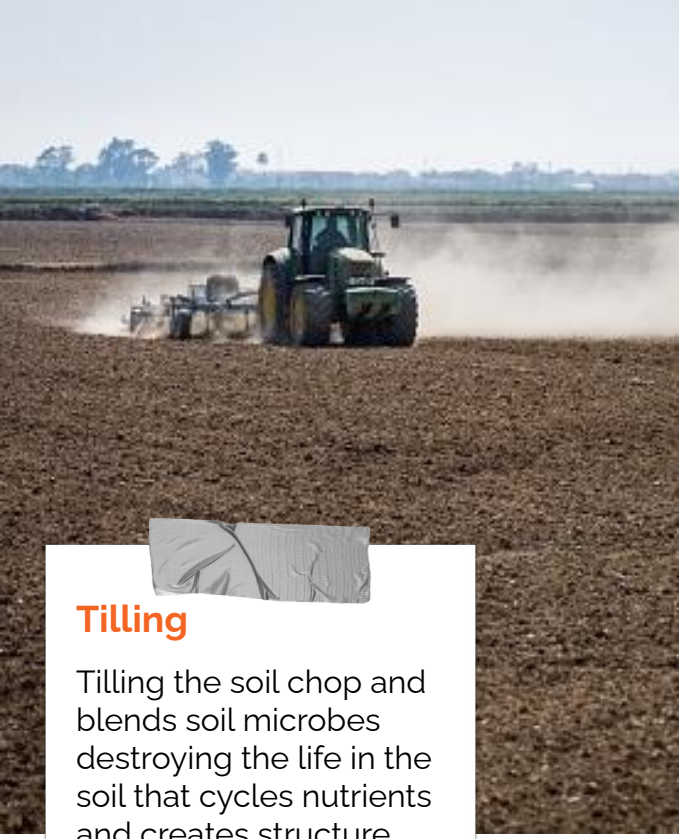
- **Nutrient Cycling**
  Starting from bacteria up to microarthropods predation cycles nutrients
- **Disease and Pest Resistance**
  Diversified organisms compete for resources
- **Soil Structure**
  Soil Food Web improves soil structure and makes soil spongy trapping moisture and nutrients


THERE ARE MORE ORGANISMS IN ONE TABLESPOON OF HEALTHY SOIL...
...THAN THERE ARE PEOPLE ON EARTH

## Typical Numbers of Soil Organisms in Healthy Ecosystems

| | | Agricultural Soils | Prairie Soils | Forest Soils |
|---|---|---|---|---|
| Bacteria | Per teaspoon of soil (one gram dry) | 100 million to 1 billion. | 100 million to 1 billion. | 100 million to 1 billion. |
| Fungi | | Several yards. (Dominated by vesicular-arbuscular mycorrhizal (VAM) fungi). | Tens to hundreds of yards. (Dominated by vesicular-arbuscular mycorrhizal (VAM) fungi). | Several hundred yards in deciduous forests. One to forty miles in coniferous forests (dominated by ectomycorrhizal fungi). |
| Protozoa | | Several thousand flagellates and amoebae, one hundred to several hundred ciliates. | Several thousand flagellates and amoebae, one hundred to several hundred ciliates. | Several hundred thousand amoebae, fewer flagellates. |
| Nematodes | | Ten to twenty bacterial-feeders. A few fungal-feeders. Few predatory nematodes. | Tens to several hundred. | Several hundred bacterial- and fungal-feeders. Many predatory nematodes. |
| Arthropods | Per square foot | Up to one hundred. | Five hundred to two thousand. | Ten to twenty-five thousand. Many more species than in agricultural soils. |
| Earthworms | | Five to thirty. More in soils with high organic matter. | Ten to fifty. Arid or semi-arid areas may have none. | Ten to fifty in deciduous woodlands. Very few in coniferous forests. |

Good Soil Structure and water retention



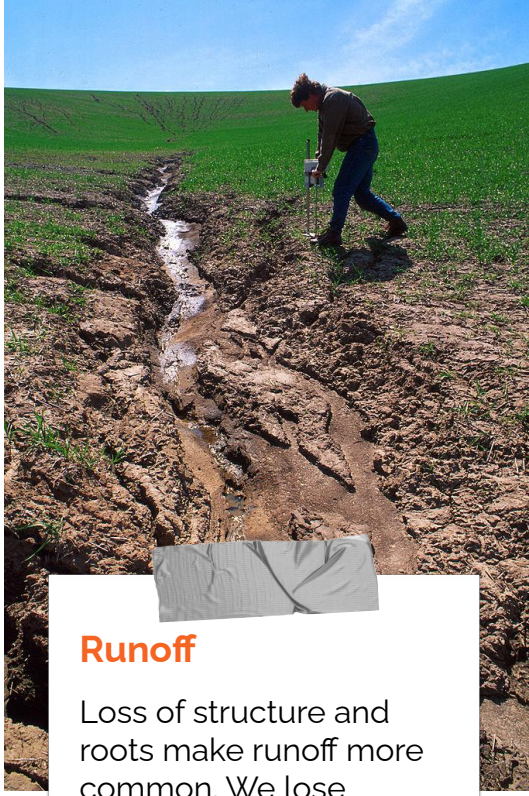
### Tilling

Tilling the soil chop and blends soil microbes destroying the life in the soil that cycles nutrients and creates structure

# What Went Wrong?

## In the 1800s during the agricultural revolution we began tilling

The estimate is that we are now losing **about 1 percent of** our topsoil every year to erosion, most of this caused by agriculture. The United States is losing soil at a rate 10 times faster than the soil replenishment rate



### Runoff

Loss of structure and roots make runoff more common. We lose nutrients and top soil in the process.

# Toxic Chemicals

Pesticides, Herbicides, and Fungicides that are applied do not just kill the targeted organisms. They also kill beneficial microbes.

## Foliar Microbes

Microbes on the leaves help prevent disease and can help increase photosynthesis.

# But there is a more peaceful and healthy way

## Biological Techniques

There are a handful of techniques and things you can do to start working with biology and not against.

# Stop Disrupting Microbes and Destroying Soil Structure

No tilling, no pulling plants out with the roots, no walking on and compacting soil

Soil is an ecosystem - we need to think of cultivating that ecosystem not just plants

# Cover Soil

## NATURE ABHORS BARE SOIL

- **Woodchips**
  Can source from arborists for free (chipdrop.com)

- **Ground Cover**
  Low growing ground cover like creeping thyme, roman chamomile, microclover, dichondra, etc.


Nobody ever fertilized an old growth forest


**Tip**

BoogieBlue inline filters from Boogiebrew.com are effective in eliminating harmful chemicals

# Filter Chlorine and Chloramine

Chemicals like Chlorine and Chloramine are added to municipal water to kill biology.

Inline or whole house water filter systems filter water so that the soil microbes can thrive!

# Introduce Biology

We can inoculate the soil and foliage of plants with a diverse set of microbes to colonize the root zones of the plants

**Tip**

Biology will more readily take hold in a hospitable environment with food sources and protection

# How to Introduce Biology

Much of the dirt cannot be considered healthy soil and so we must introduce healthy bacteria, fungi, protozoa, and nematodes.

To do this we employ:

- **Compost**
  Decomposed organic matter
- **Compost Extracts and Teas**
  Extracts and teas are produced using high quality compost.
- The 2 are very different and have different uses.

Many people are familiar with compost but...

# NOT ALL Compost is created equally.

**Tip**

Good compost suppliers should be able to provide you with test records which indicate the numbers of Nematodes, the F:B ratio, the number of bacteria, and the number of protozoa.

Compost resource: https://www.catalystbioamendments.com/


Catalyst BioAmendments
REGENERATING SOIL
Craft Compost
Catalyst BioAmendments LLC Craft Compost is used to: create a desirable soil structure for plants, add organic matter to soil, improve water retention, and promote an environment for the entire Soil Food Web to thrive.
Directions For Use: Use as a soil amendment: Field or Crop: incorporate 1-5 yards per acre of compost into the soil before planting. When using around established perennials apply a layer 1-2" deep to the surface of the soil, rake in and cover with mulch. In raised beds apply up to 25% of total growing media. All application rates may vary depending on growing conditions and medium. Catalyst BioAmendments LLC Craft Compost can also be used as a base to any compost tea recipe or tea starter for at home composting systems.
We do not sift our material; the woody chunks are left with purpose to provide structure and air spaces.
Ingredients: Compost
Volume: 0.5 Cubic Foot
Catalyst BioAmendments LLC

# Application Methods

Direct Applications

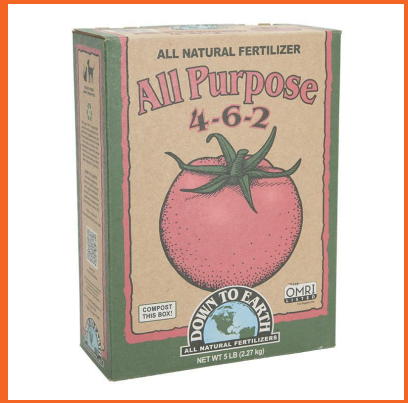
Compost Teas

Compost Extracts

Don't fall for marketing ploys

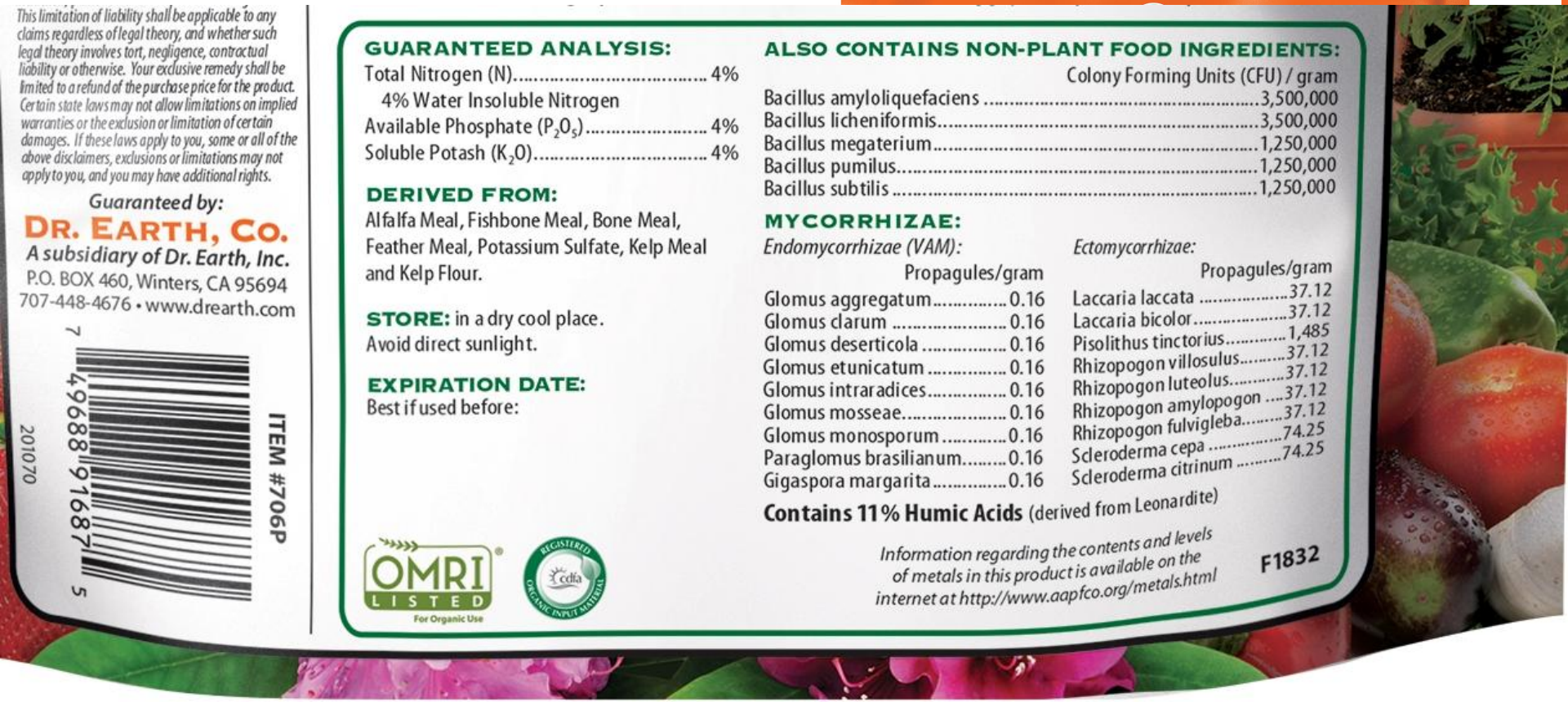
# ABSOLUTELY NO FERTILIZERS OR PESTICIDES





# Pop Quiz

What about Organic like Dr. Earth?



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ITEM #706P

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## GUARANTEED ANALYSIS:

| | |
|---|---|
| Total Nitrogen (N) | 4% |
| 4% Water Insoluble Nitrogen | |
| Available Phosphate ($P_2O_5$) | 4% |
| Soluble Potash ($K_2O$) | 4% |

## DERIVED FROM:

Alfalfa Meal, Fishbone Meal, Bone Meal, Feather Meal, Potassium Sulfate, Kelp Meal and Kelp Flour.

**STORE:** in a dry cool place. Avoid direct sunlight.

## EXPIRATION DATE:

Best if used before:

OMRI LISTED For Organic Use

REGISTERED cdfa ORGANIC INPUT MATERIAL

## ALSO CONTAINS NON-PLANT FOOD INGREDIENTS:

| | Colony Forming Units (CFU) / gram |
|---|---|
| Bacillus amyloliquefaciens | 3,500,000 |
| Bacillus licheniformis | 3,500,000 |
| Bacillus megaterium | 1,250,000 |
| Bacillus pumilus | 1,250,000 |
| Bacillus subtilis | 1,250,000 |

## MYCORRHIZAE:

*Endomycorrhizae (VAM):*

| | Propagules/gram |
|---|---|
| Glomus aggregatum | 0.16 |
| Glomus clarum | 0.16 |
| Glomus deserticola | 0.16 |
| Glomus etunicatum | 0.16 |
| Glomus intraradices | 0.16 |
| Glomus mosseae | 0.16 |
| Glomus monosporum | 0.16 |
| Paraglomus brasilianum | 0.16 |
| Gigaspora margarita | 0.16 |

*Ectomycorrhizae:*

| | Propagules/gram |
|---|---|
| Laccaria laccata | 37.12 |
| Laccaria bicolor | 37.12 |
| Pisolithus tinctorius | 1,485 |
| Rhizopogon villosulus | 37.12 |
| Rhizopogon luteolus | 37.12 |
| Rhizopogon amylopogon | 37.12 |
| Rhizopogon fulvigleba | 74.25 |
| Scleroderma cepa | 74.25 |
| Scleroderma citrinum | 74.25 |

**Contains 11% Humic Acids** (derived from Leonardite)

*Information regarding the contents and levels of metals in this product is available on the internet at http://www.aapfco.org/metals.html*

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# 4. Summary

Garden Abundance Checklist

- ➔ **Filter your water**
- ➔ **Disturb your soil as little as possible**
- ➔ **Cover and protect your soil**
- ➔ **Get roots in the ground**
- ➔ **Use high quality compost, extracts and teas to inoculate and feed the soil microbiome**

# Additional Resources

Dr. Elaine Ingham's Soil Food Web School
https://www.soilfoodweb.com/

BoogieBlue Filters
https://www.boogiebrew.net/water-filter

Pelican Whole House Filters
https://www.pentair.com/en-us/water-softening-filtration/products/whole-house-water-filtration.html?categories.lvl0.hierarchical=Residential

Catalyst BioAmendments
https://www.catalystbioamendments.com/

## Happy Gardening!

# How to Reach Me

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