
Tom Bartels
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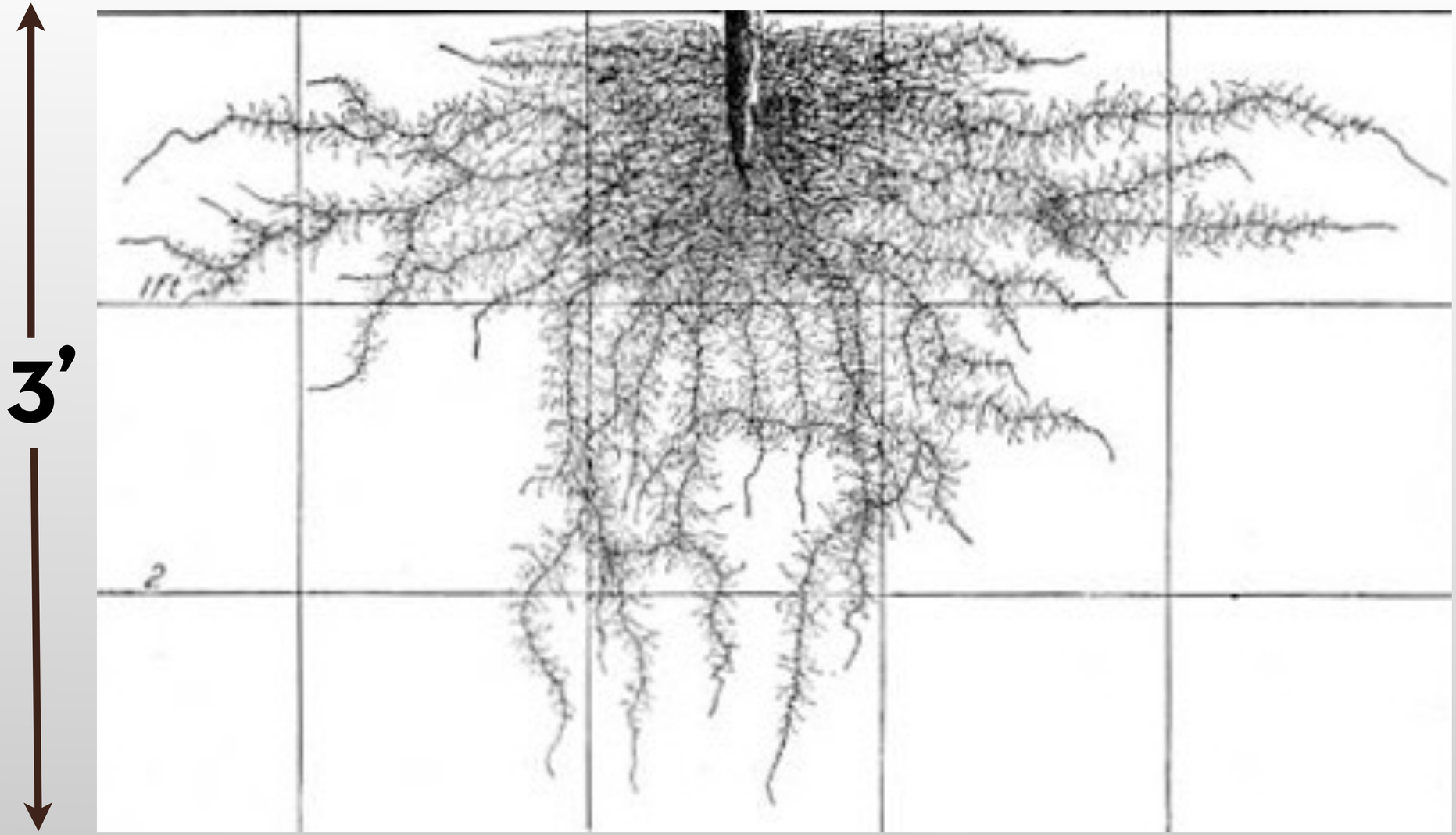
Soil Microorganisms:

Help prevent disease
Attract beneficial insects
Feed the plants
Extend water to plants
Break down organic matter
Strengthen plant growth
Provide resilience



Cabbage Root Profile

Roots...

have relationships with:

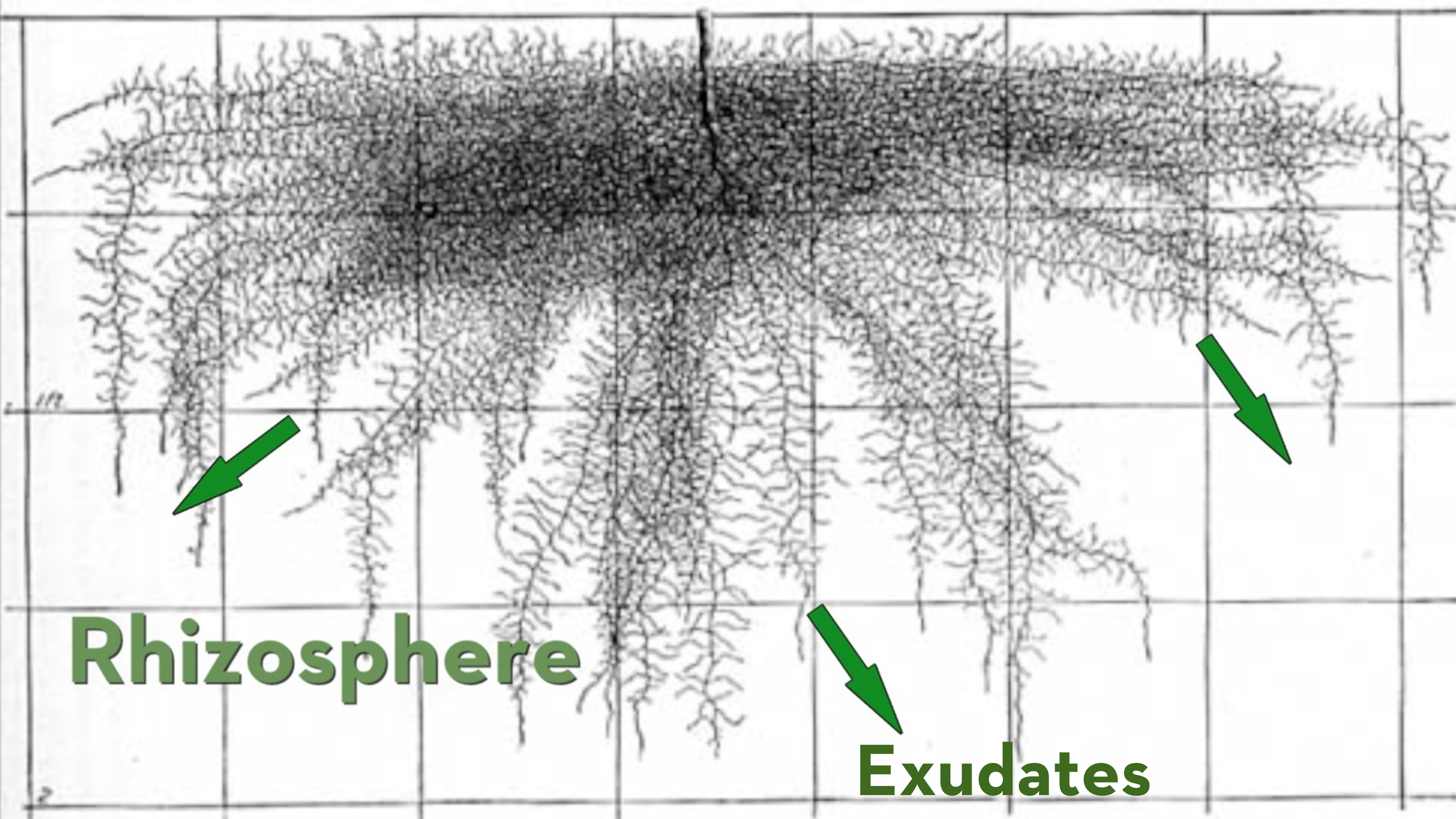
Bacteria
Fungi
Protozoa
Nematodes
Micro-arthropods

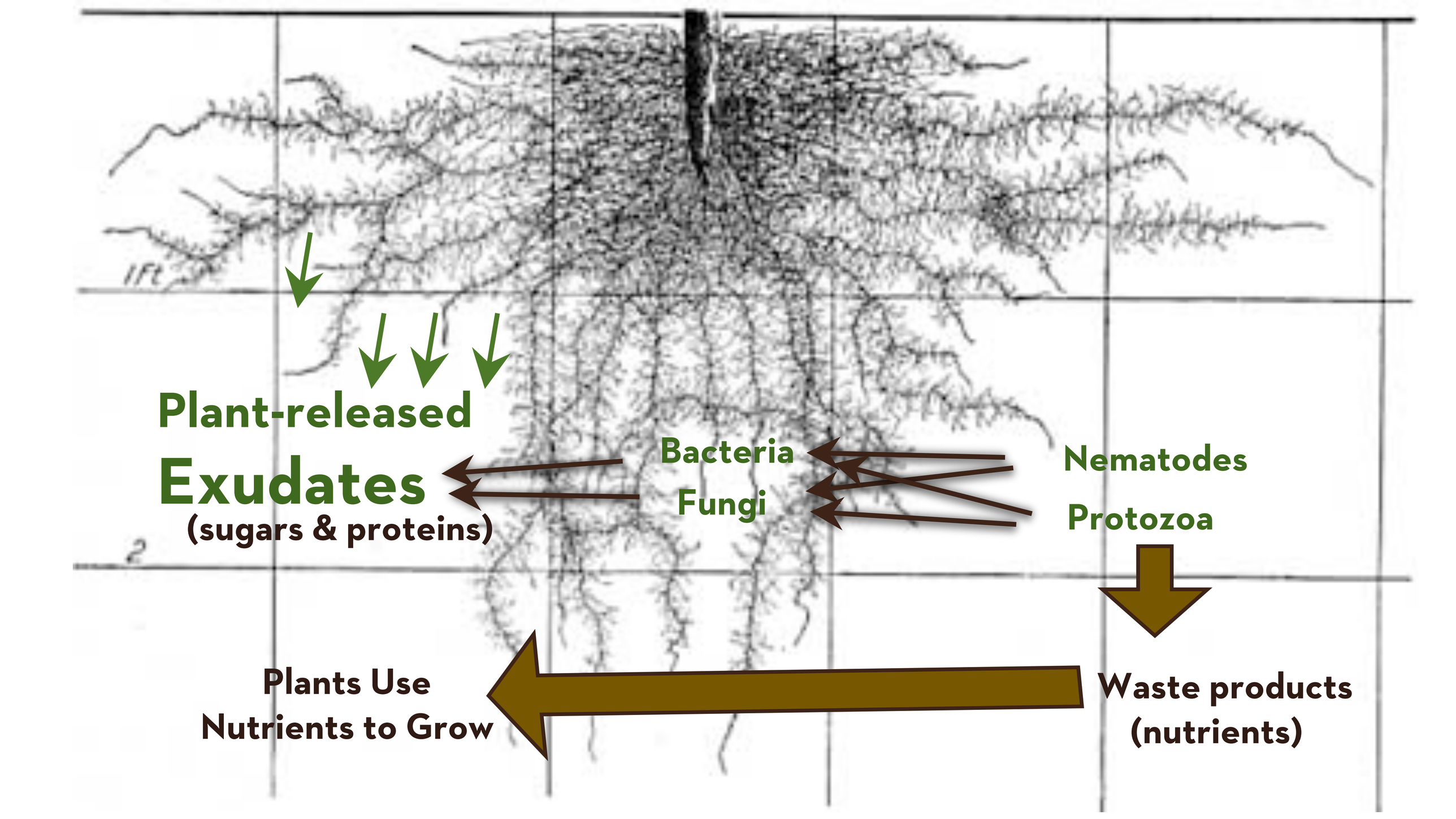
Magic happens down there.

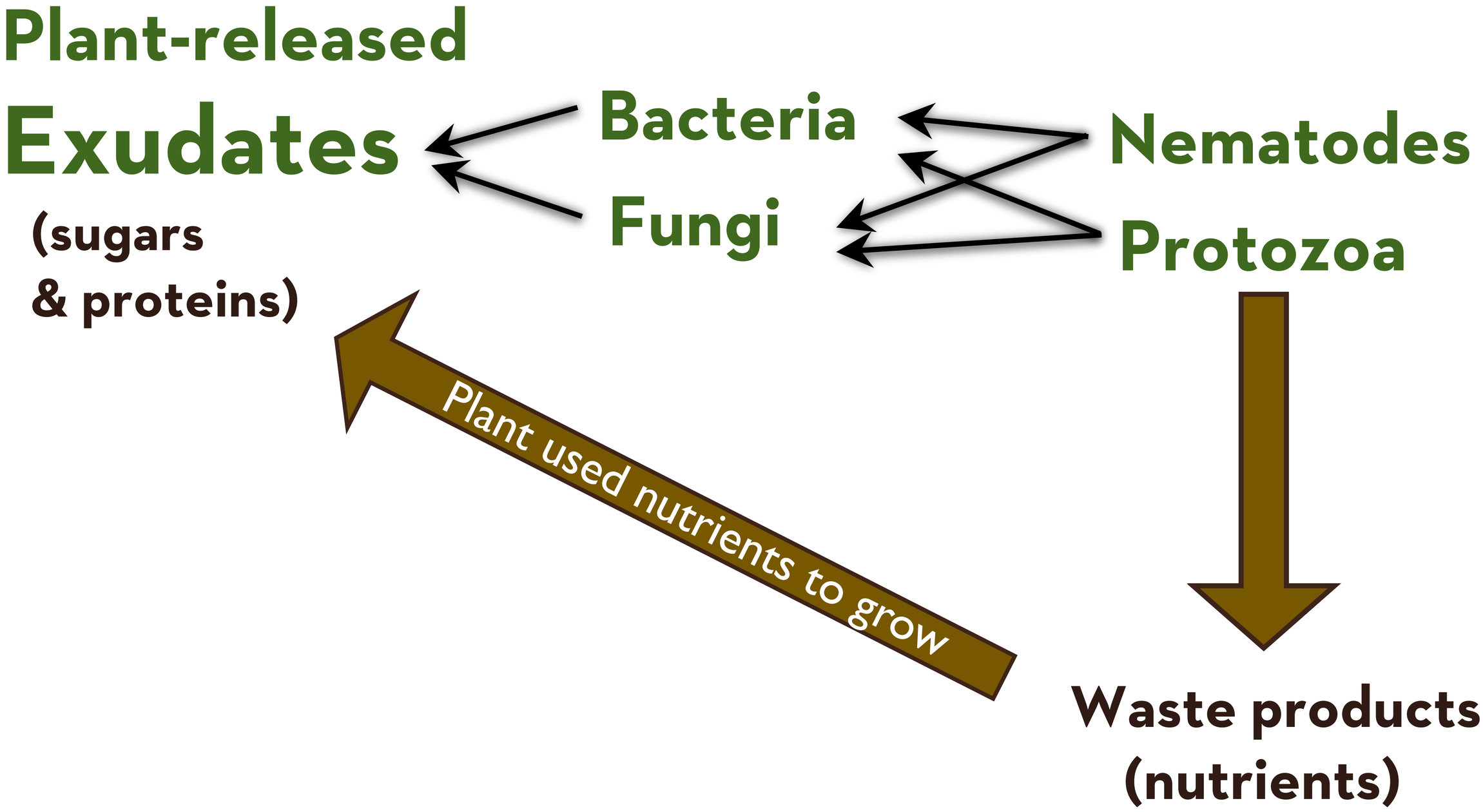
Notice the “Root Hairs.” This is key to healthy plants.

<u>Roots need:</u>

Loose, living soil
Minerals and Nutrients
Water
Oxygen


Rhizosphere
Exudates


1ft
2
Plant-released
Exudates
(sugars & proteins)
Bacteria
Fungi
Nematodes
Protozoa
Plants Use
Nutrients to Grow
Waste products
(nutrients)


Plant-released
Exudates
(sugars
& proteins)
Bacteria
Fungi
Nematodes
Protozoa
Plant used nutrients to grow
Waste products
(nutrients)

A Healthy Soil Food Web can:

Prevent disease
Attract Beneficial insects
Feed the plants
Extend water to plants
Break down organic matter
Strengthen plant growth
Provide resilience

The microorganisms surround (and protect) the roots of their plant host from pathogens.

The original “pesticide”

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Chemical additives disrupt the balance.


Your main role:
Increase diversity
of organisms
in the soil.

Organic Compost :

Improves soil texture.
Regulates moisture.
Feeds the Soil Food Web
Creates aggregate soils
Reduces temperature swings
Reduces Plant Stress
Sequesters carbon in the soil

(Liquid Fertilizers do none of that)

Synthetic Fertilizer:

N-P-K

vs

Compost:

Nitrogen
Phosphorus
Potassium
Sulfur
Carbon
Magnesium
Calcium
Copper
Iron
Iodine
Zinc
Manganese
Boron

Categories of Bacteria based on Temps.

Psychrophilic : 28F-55F

Mesophilic : 50F-115F

Thermophilic :115F-160F


150f
130f
120f
3 wks
3 wks
3 wks
60f
60f
60f
60f


In 3-4 weeks it will drop to 50-80 F
100
120
140
Steady
Hot
80
60
40
160
180
200
0
°F
REOTEMP
Compost


Carbon
Materials
&
Nitrogen
Materials

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Optimal C/N ratio
is 30 to 1 (by weight)

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The 'easy' way:
layer 2x as much
of the brown material
as green material.

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50 lbs cut grass

+

25 lbs of dried leaves

=

c/n ratio of 35-1 when mixed

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High carbon= low heat
Low bacterial activity.
Takes forever to break down.

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Low carbon= high heat

But less nitrogen in final pile.

Carbon to Nitrogen ratios of common composting materials.

Material	C/N
Grass Clippings	17/1
Chicken Manure	7/1
Food scraps	17/1
Vegetable scraps	12/1
Cow manure	20/1
Fruit waste	32/1
Fresh weeds	20/1
Seaweed	19/1
Garden soil	10/1
Hay	90/1
Leaves	70/1
Sawdust	325/1
Wood chips	400/1
Peat moss	58/1
Corn stalks	60/1
Shredded Newsprint	175/1
Shrub trimmings	53/1

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Repair an Anaerobic compost pile by adding more Oxygen and Carbon.

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Carbon Materials

Straw (avoid pesticides)
Hay (weed seed, straw is better)
Woodchips (high in carbon)
Sawdust (matting and high carbon)
Shredded Newspaper
Garden Chaff
LEAVES!

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Nitrogen Materials

Lawn Clippings (avoid chemicals)
Plant Trimmings
Kitchen Scraps
Seaweed
Manure (no chems, add in Autumn)
Egg Shells
Cover Crops, flowers, weeds, pulp

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Compost Materials from other places...

Leaves from Landscapers

Veggie Trimmings
(From Organic Food Stores)

Coffee Grounds from shops

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Materials to Avoid:

Weeds (with seeds or disease)

Plants (with disease or infestation)

Poisonous Plants

(Hemlock, Castor Beans)

Meat & Dairy

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Materials to Avoid:

Pet Manure

Pine Needles

Toxic Tree Leaves

(Eucalyptus, Bay Laurel,
Walnut, Juniper, Cyprus)

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Materials to Avoid:

Pet Manure

Pine Needles

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They Need:

Oxygen

Food

Water

Shelter


Bottom brush
4-5 inch layer brown
inoculate with soil
water
1-2 inch layer of green
inoculate with soil
water
Repeat.
*Use full perimeter
After 4 ft. Cover


150f
130f
120f
3 wks
3 wks
3 wks
60f
60f
60f
60f


'Hybrid' Compost
Add composting Worms
to process the piles Without turning.

Add 2 pounds of worms per pile

Eisenia fetida

Buying Compost (until you can make your own)

Commercially available compost is an unregulated product. Read the labels.

Here are some of the things to look for:

-Buy organic compost in bulk for quantity discount
-On bags, look for “OMRI” seal for organic ingredients

Appearance:
The compost you are buying in bulk
or bags shouldn’t look like its source materials.
If it looks like wood chips, it probably is wood chips.
Good compost will be dark in color and crumbly
like chocolate cake.

Aroma:
It should smell “earthy” but not distasteful.
Like a forest soil in spring, not a barnyard in July.

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Compost Ingredients:

Good compost is made up of a number of organic source materials.
The more diversity, the better the diversity of soil microbes,
which makes for stronger compost.

Questionable Ingredients

Sludge: a byproduct of municipal sewage plants. I would steer away from the bilge.

Pesticides: Some compost that is derived from grass clippings, straw, and hay can have herbicide residue that can be very persistent and can negatively affect plant growth in your garden.

Priority One is to **START MAKING YOUR OWN COMPOST** as you get into gardening.

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Questionable Ingredients...

Pesticides & Herbicides

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Questionable Ingredients...

Sludge

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More diversity in source materials

=

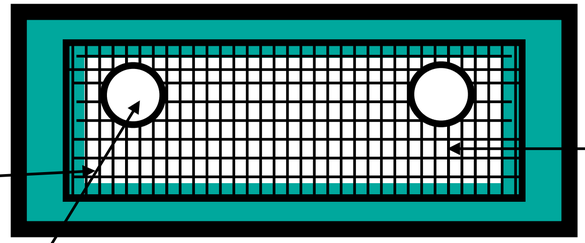
More diversity in microbes


Worm Bins are
also GREAT!

Eisenia fetida: (Compost worms)

bird's eye view: worm bin,
(not showing hinged top)

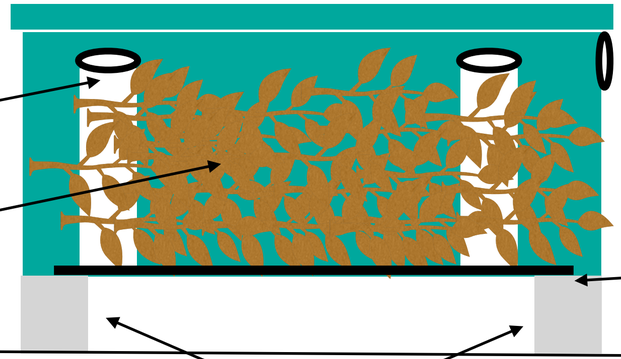
Perimeter of freezer box



Metal screen resting on
remaining rim of
bottom of bin.
open space below.

bottom cut out with smaller
dimensions than box, leaving
perimeter shelf rim to rest
structural screen on.

optional
side vent



4" diam. PVC vent pipes

Front view

Organic material

bottom screen

ground level

10" risers, cinder block etc
to allow airflow from beneath.

Coffee Bio-Furnace for Worm Bins

You can keep a worm bin active all winter long in cold climates by using discarded coffee grounds from your local coffee shop mixed with a bit of soil and fresh compost scraps. This system can keep worms active all winter busily making you nutrient-rich worm castings for your spring garden.

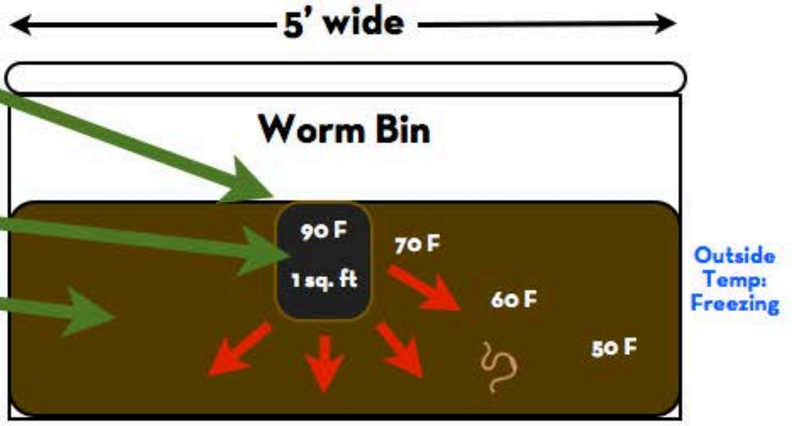
Start by creating a space about the size of 1 sq. foot in center top of bin material. Then add the new coffee ground mixture directly to that space.

Approx. size of your monthly addition of fresh coffee grounds mixed with new food scraps and some soil and old compost material from bin.

General Organic material in bin

How it works:

Hot composting "Coffee Furnace" radiates heat to rest of the bin. This creates a heat gradient throughout the bin so worms migrate to their comfort zone and stay active. The center of the 'furnace' can get over 90 degrees which is too hot for worm activity at center, but worms have plenty of room to stay away from it and will eventually move to center in a few weeks as the furnace cools down. This process can keep a bin warm for three weeks at a time in cold climates. So every three weeks or so you check the compost thermometer in the bin and change out with new coffee material etc.



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Benefits:

18 months of hot water
BTU equiv. 7 cords wood
Reduce waste stream
30 cu. yards of free compost
Sequestered most of the carbon into soil =
Grow more food!

Soil Food Web