“Living Soil” Workshop

(20 Jul 24)

Caveat/Warning

HUGE, BROAD Topic!!!

- We'll just "Scratch the Surface"
- This science is evolving and current "theories" may change

Science & Scientists

- Science: The study of nature through observation and experimentation.

- Farmers were the original scientists "observing" every day.

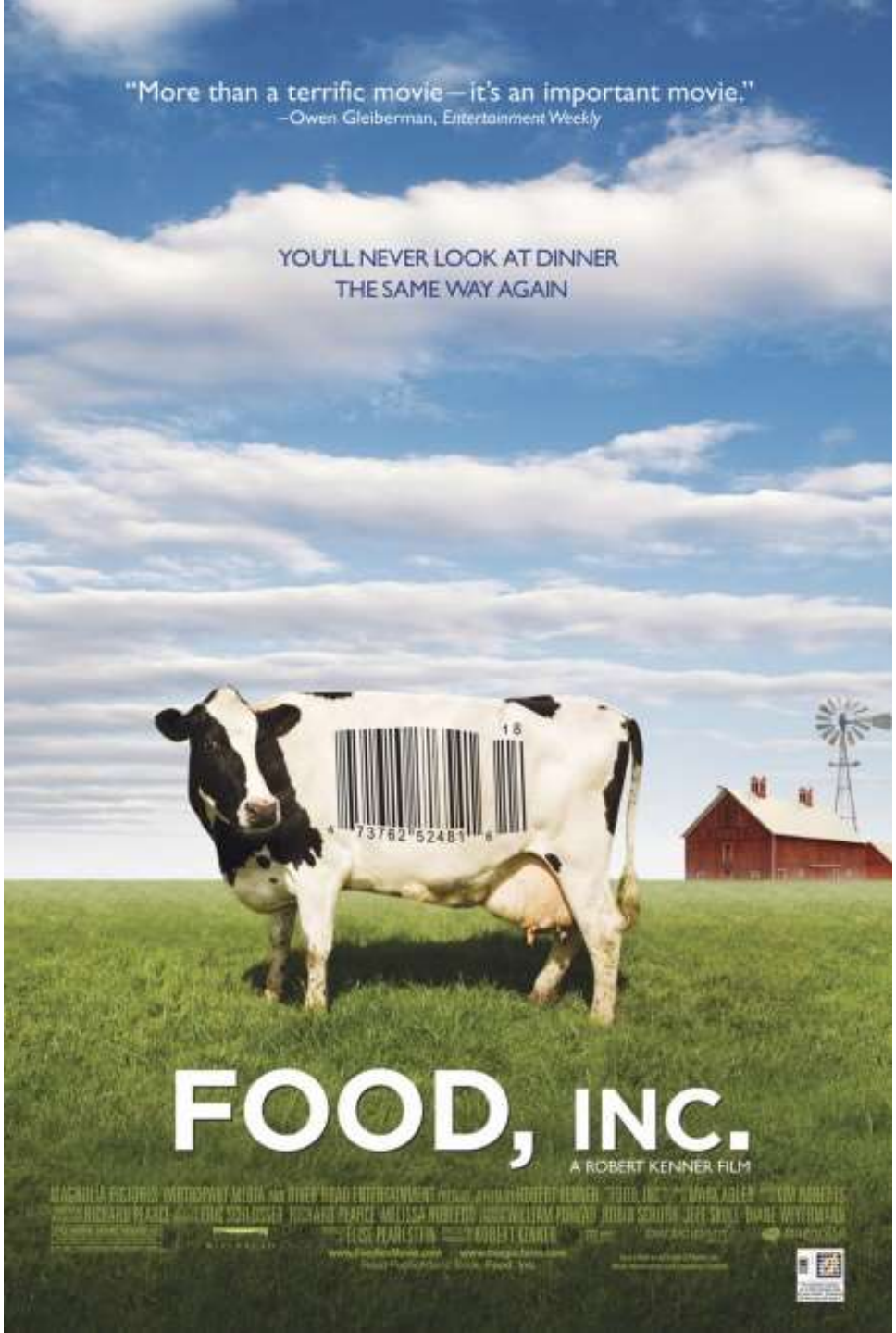
- Let's make you a SOIL SCIENTIST!

Three Objectives Today

1. Understand Soil Microbiome
2. Skills on How to Grow It
3. Skills on How to Reintroduce It

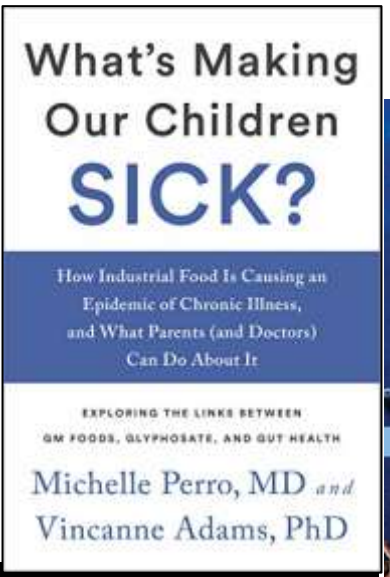
- Extra: Bonus Afternoon

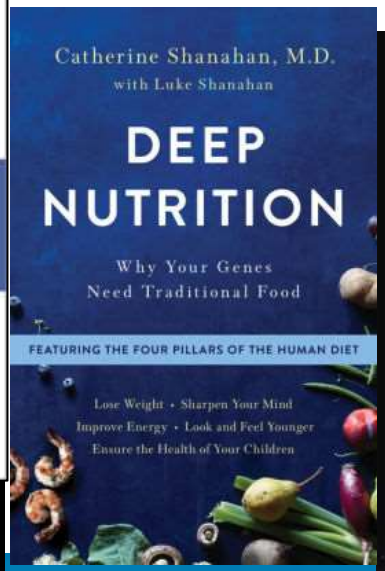
Review from Homestead Festival

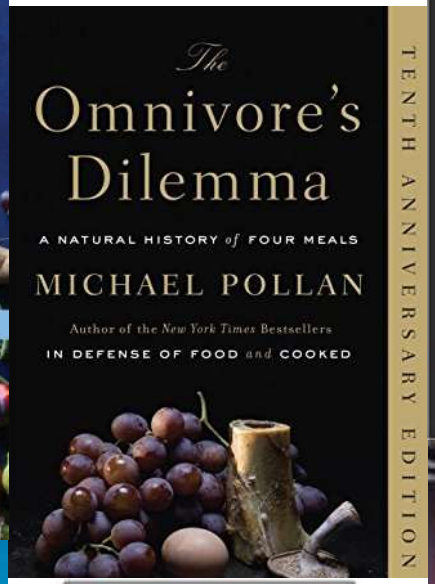

"More than a terrific movie—it's an important movie."
–Owen Gleiberman, Entertainment Weekly
YOU'LL NEVER LOOK AT DINNER
THE SAME WAY AGAIN
FOOD, INC.
A ROBERT KENNER FILM

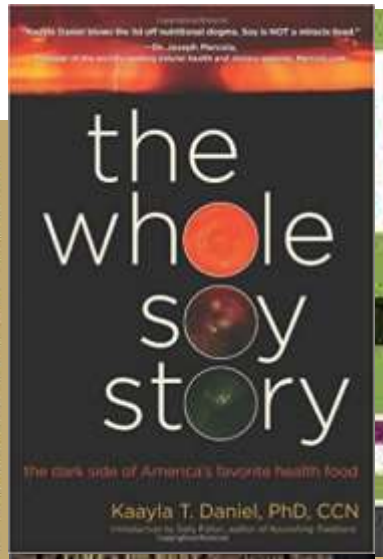
Joel Salatin—Polyface Farm

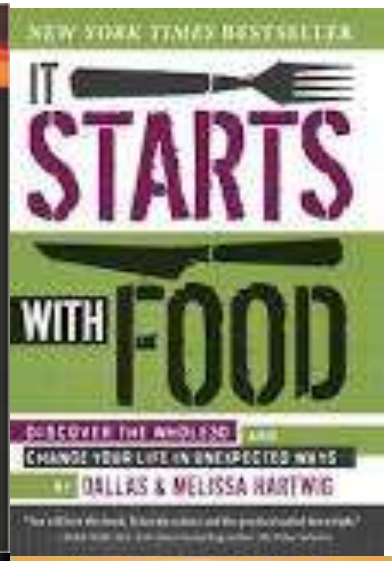
2008 and Every Day Since…

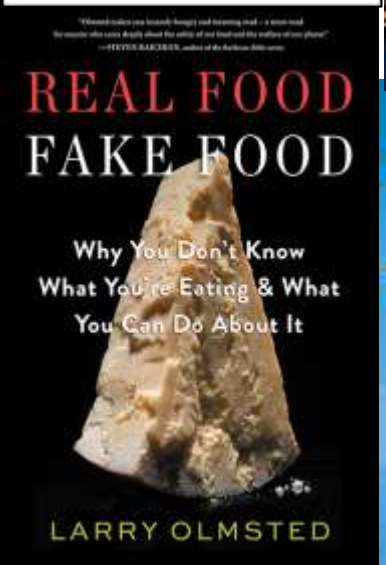


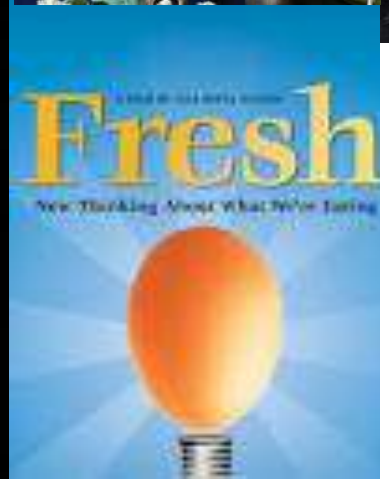


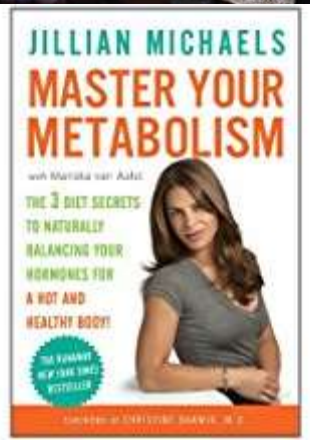


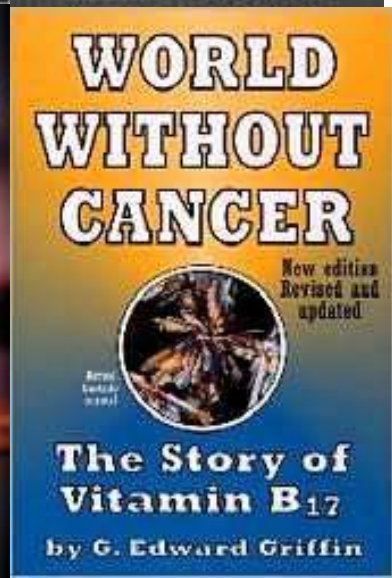




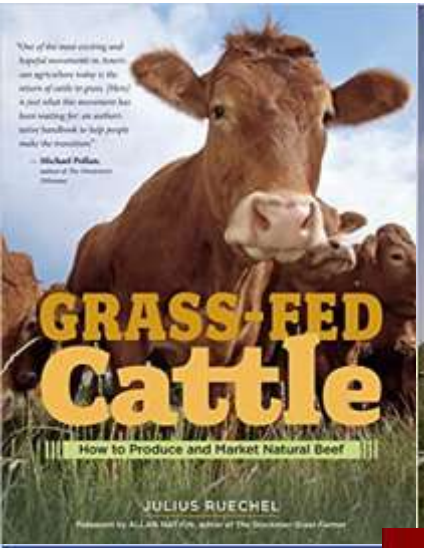


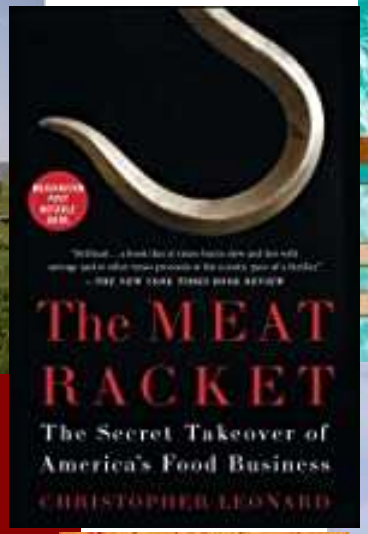


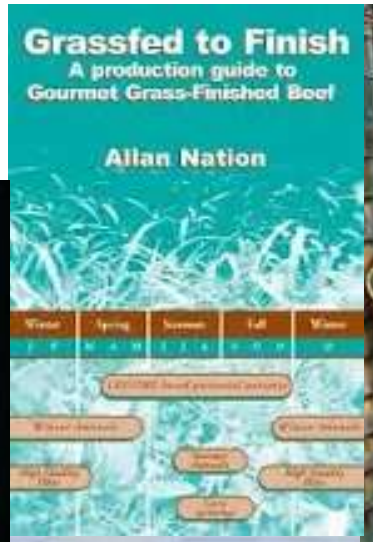


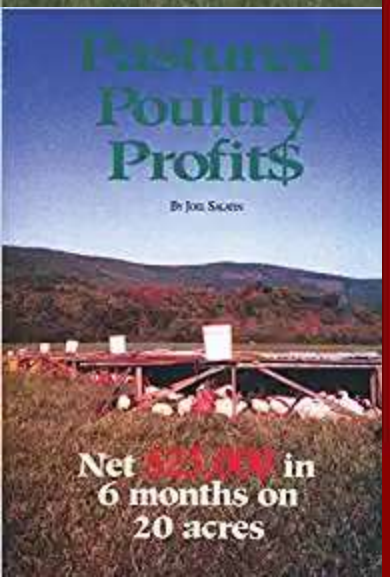


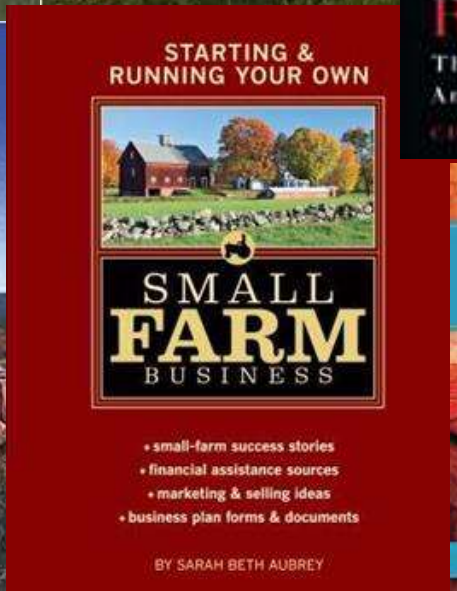
Let's Start a Farm!

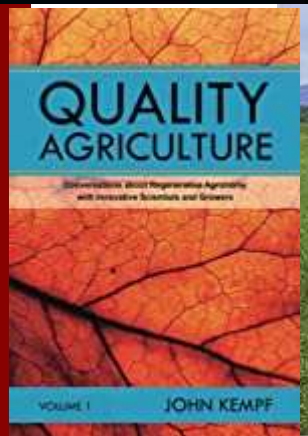


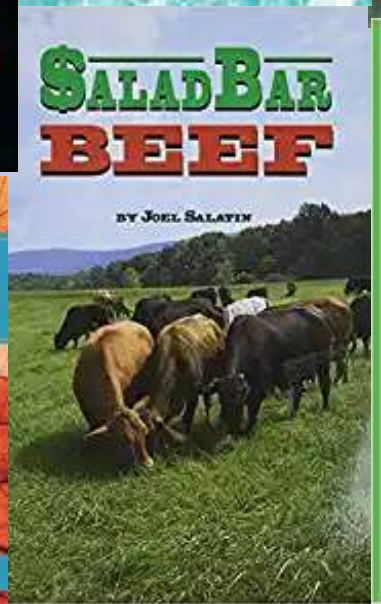


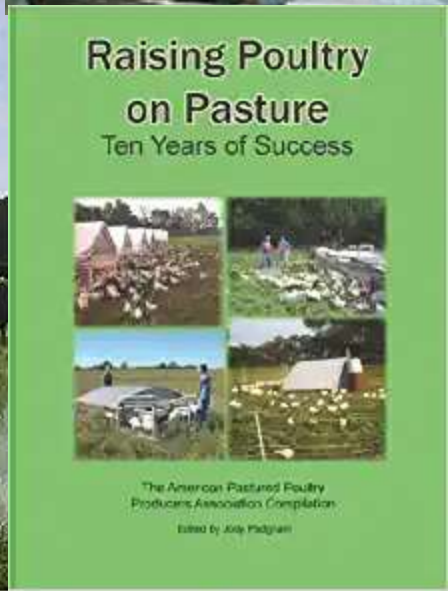




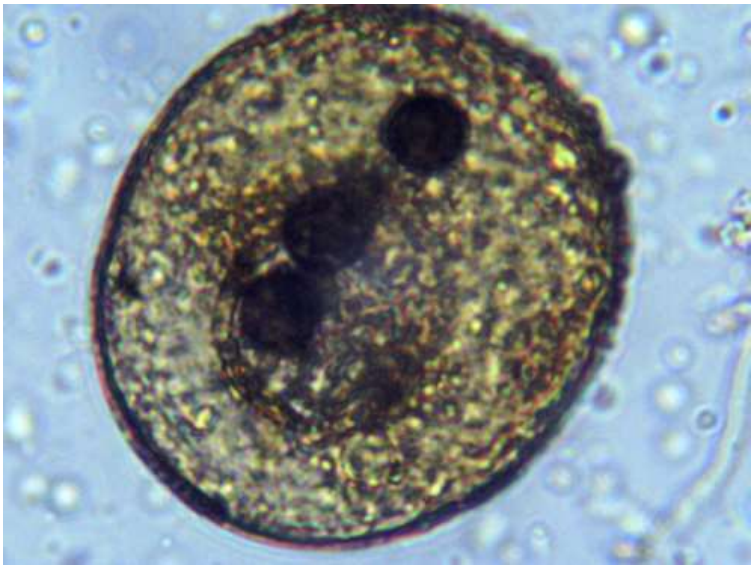








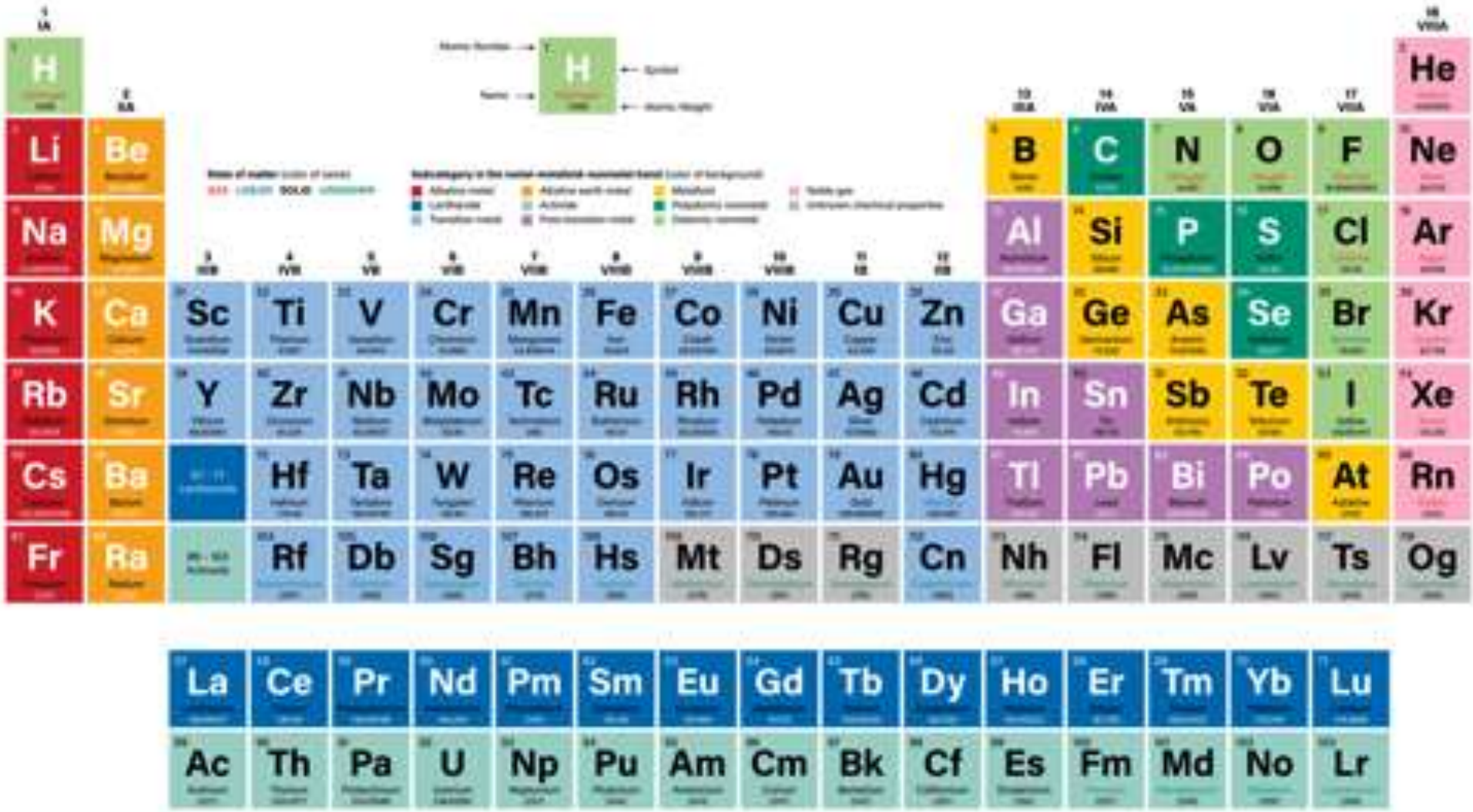
Dr. Elaine Ingham (PhD in 1981)

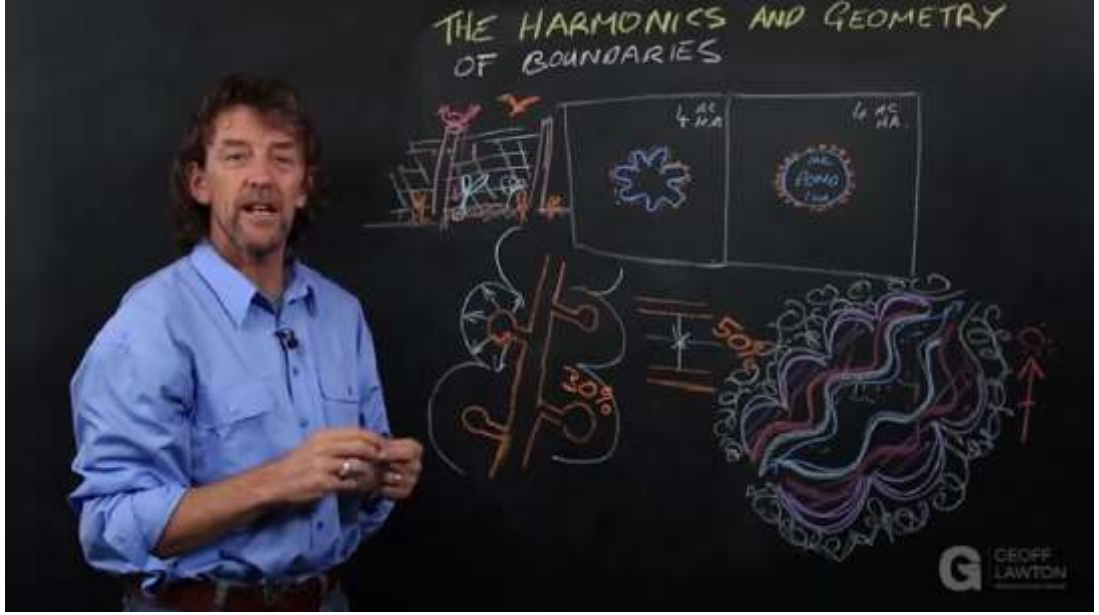


- Soilfoodweb School
  - Fundamental Courses
  - Certified Lab-Tech
  - Consultant Training Program
    - Microbiome
    - Make biological amendments
    - Microscopy
    - Turn dirt to soil

- Korean Natural Farming—Chris Trump
- **Biology is most important ingredient**
  - N, P, K not enough…plants need all nutrients
    - Plant “blood” 1:30 dilution of sea water

Periodic Table of the Elements

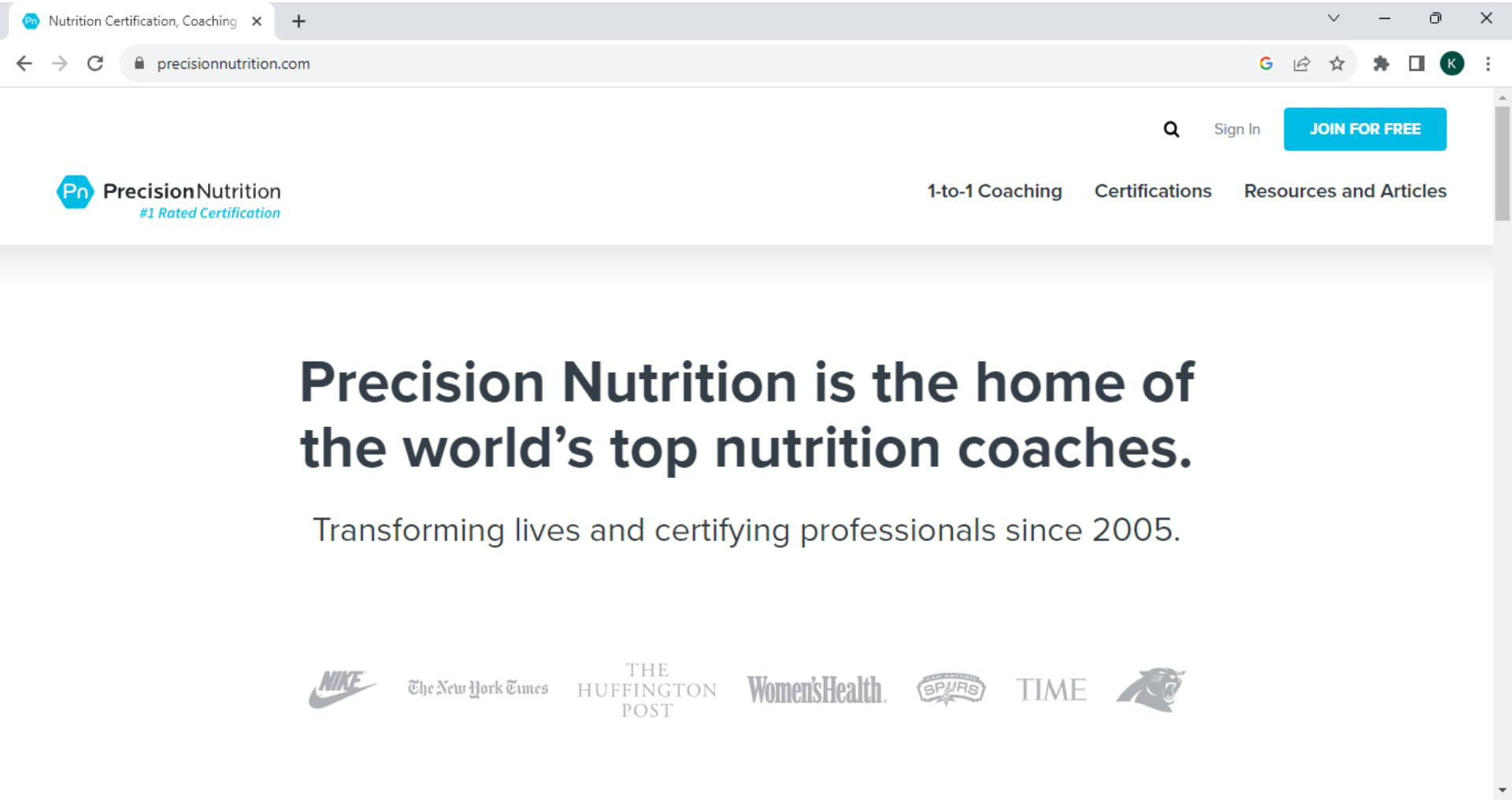




Geoff Lawton's

Permaculture Design Certification

Health/Nutrition Coach



Be Skeptical

"Without data, you're just another person with an opinion"

W. Edward Deming

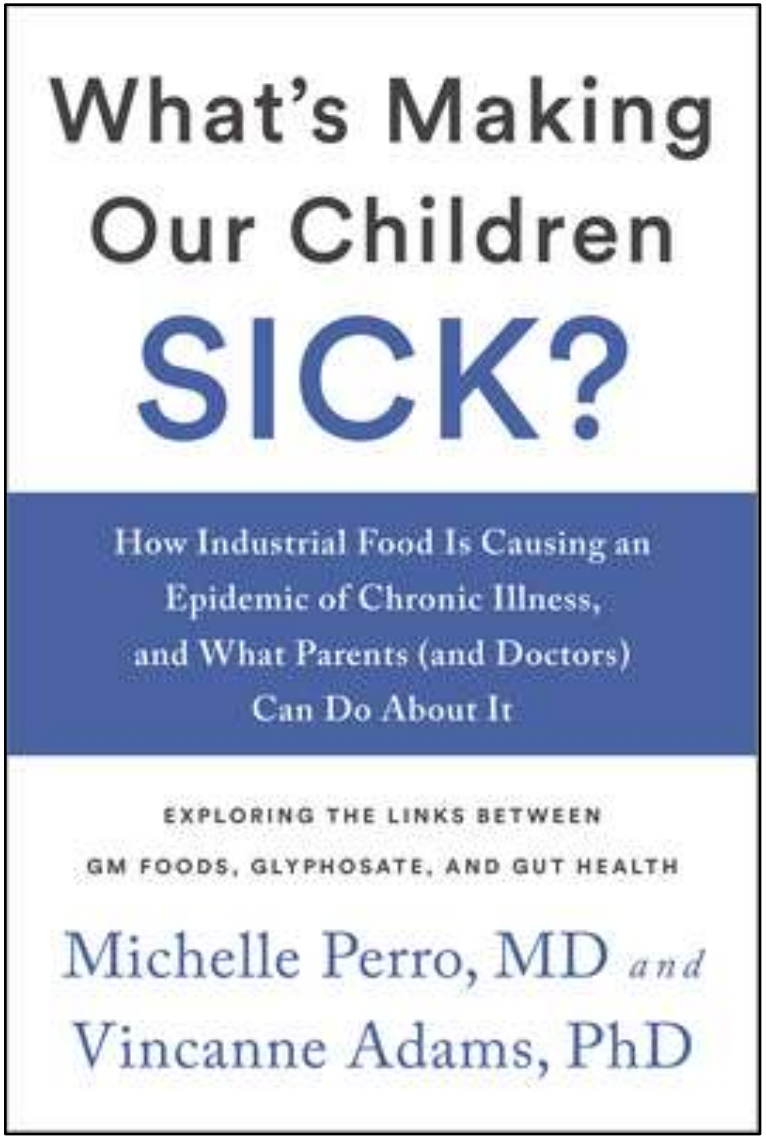
But, be open minded!

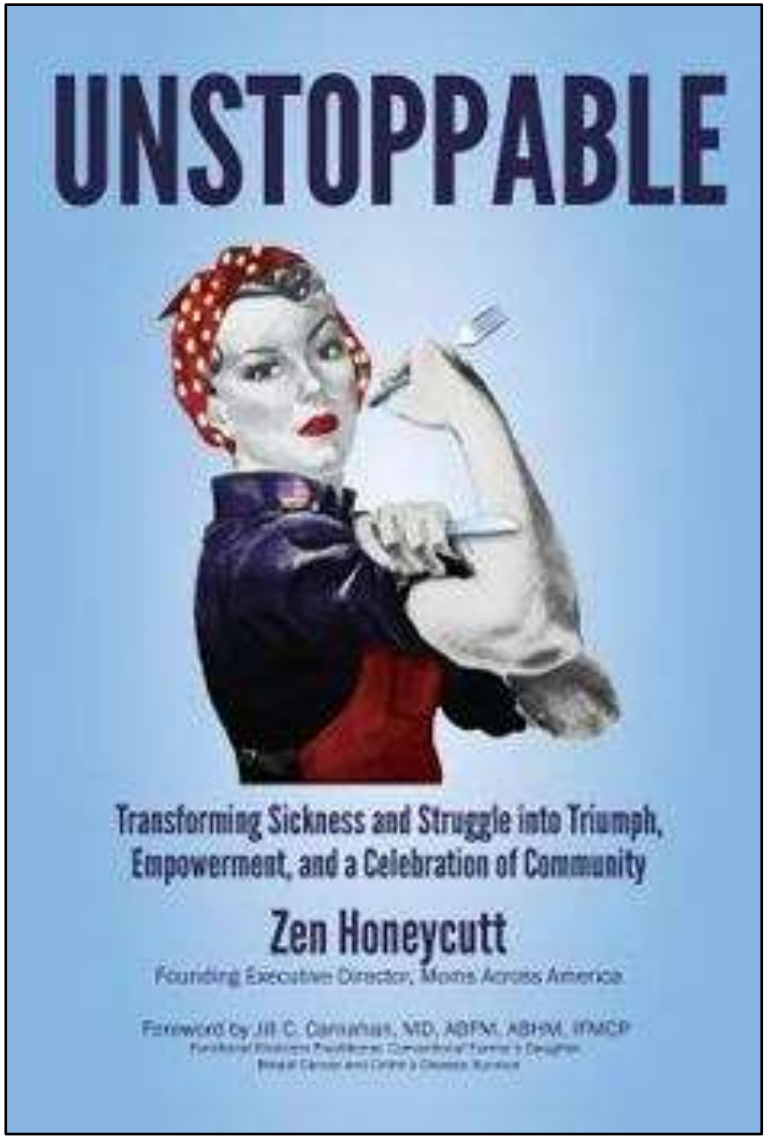
USA Isn't Healthy

- 2017: 75% of our youth 17-24 unqualified to join military
- 1965: 4% of our population had a chronic disease
  - Today 46% of our children have a chronic disease
- 2006: MS only state above 30% obesity--today 41 states
- US spent $4.5 Trillion on healthcare in 2022
  - We spent $4.1 Trillion on WWII (today's dollars)
  - 5+ times Defense Budget ($778 Billion in 2020)

- What's a Trillion??? ($1M/day for how long?)

What's Going On????





MOMS ACROSS AMERICA

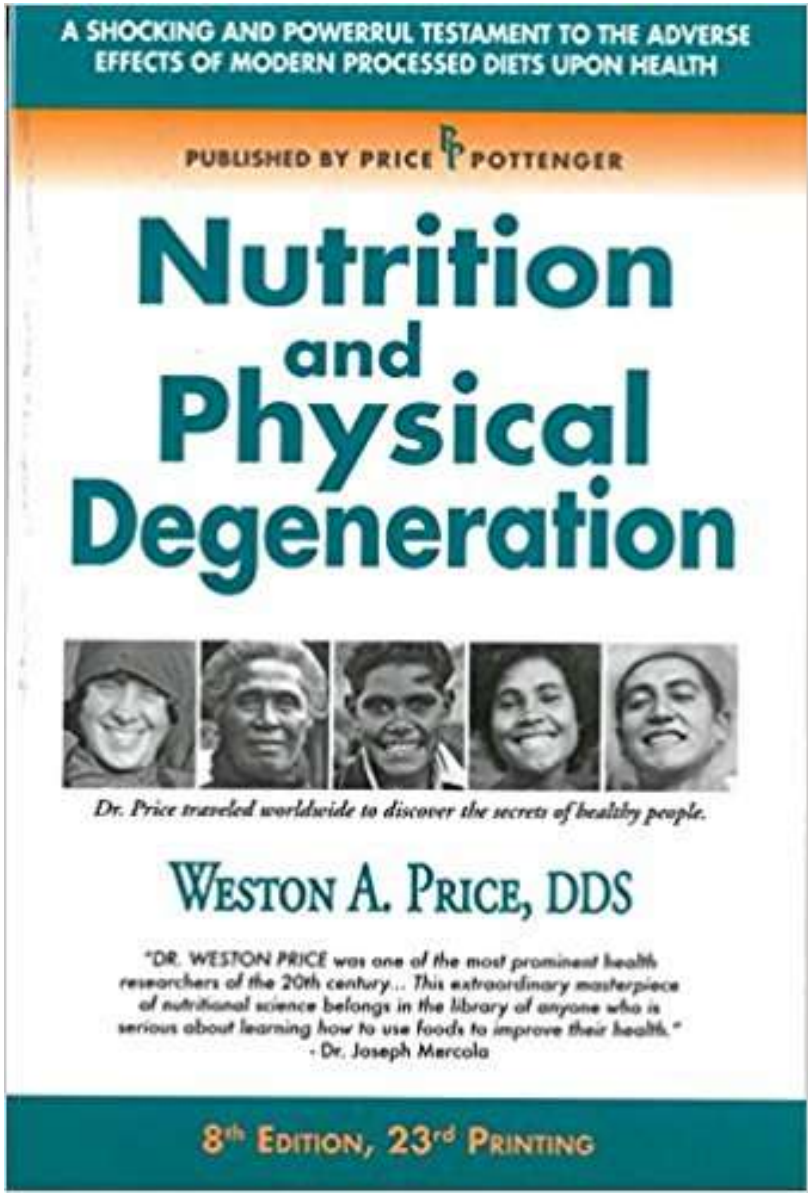
100% of Top Twenty Fast Food Brands Positive for Glyphosate Herbicide 76% Positive for Harmful Pesticides

POSTED BY ZEN HONEYCUTT 4006.40GS ON OCTOBER 11, 2023

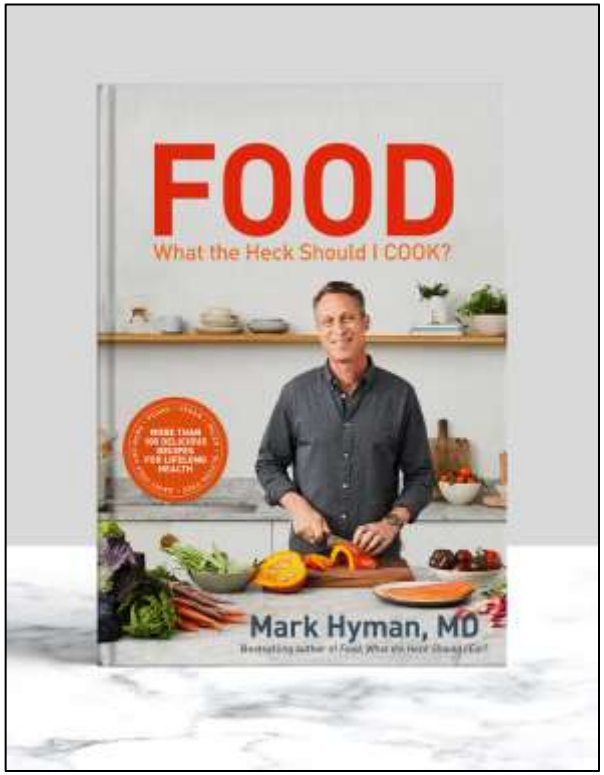
Top Twenty Fast Food Brands Glyphosate and Pesticide Testing Report

Moms Across America, a nationwide non-profit, has initiated an extensive testing program on the top twenty fast food brands in America, plus one restaurant, California's In-N-Out Burger. Forty-two samples of 21 brands were tested for the most widely used herbicide in the world, glyphosate, 236 agrochemicals, 4 heavy metals, PFAS, phthalates, and mineral content. The top ten brands were additionally tested for 104 commonly used veterinary drugs and hormones, B Vitamins and calories.

Dr Weston A. Price

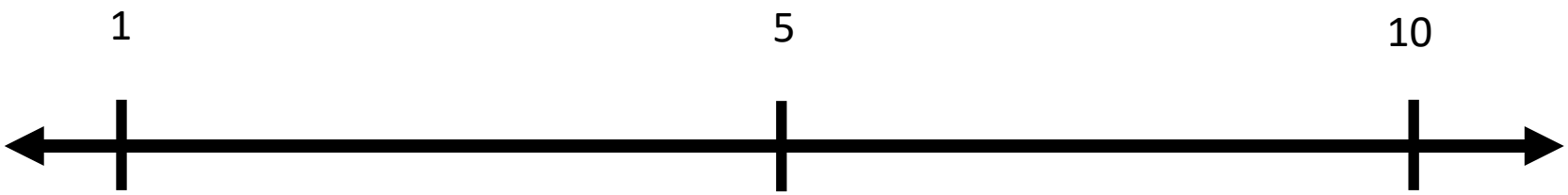


WHAT'S GOING ON?



Dr Mark Hyman "80%+ of all chronic disease is preventable"—through diet!

Health Range (1-10)



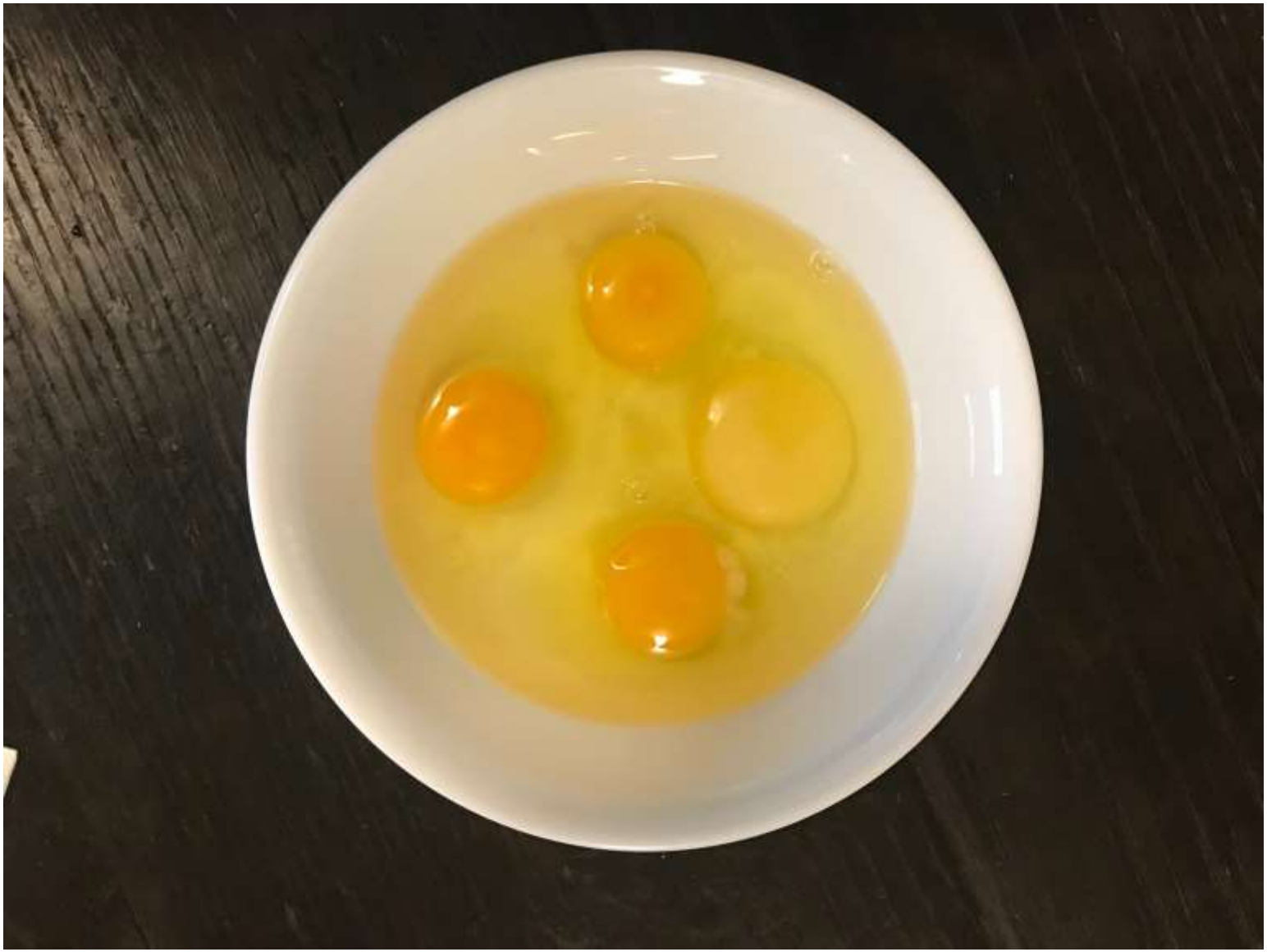
DISEASE

- Chemical Toxins
- Pesticides
- GMOs
- Electromagnetic Radiation
- Stress
- Nutrient Deficiencies

HEALTH

- Nutrient Density
- Vitamins
- Minerals
- Enzymes
- Amino Acids
- Microbiome

You Are What You Eat Eats Too



A or B to Build a New Shed?

A

B

What's "NUTRIENT DENSE" Here?


OVER 35% MORE
Enfamil
NEURO PRO
GENTLEASE ALL IN ONE
Infant formula
Milk-based Powder with Iron
BRAIN BUILDING DHA
designed to help REDUCE CRYING IN 24 HOURS
2'-FL HMO for IMMUNE SUPPORT
0-12


OVER 48% MORE!
NO PALM OLEIN OIL
NO ARTIFICIAL GROWTH HORMONES
Abbott
Similac
PRO-SENSITIVE
For Fussiness & Gas Due to Lactose Sensitivity
IMMUNE SUPPORT
LUTEIN
VITAMIN E
BRAIN & EYE DEVELOPMENT
2'-FL HMO
Human Milk Oligosaccharide
DHA
with Iron
POWDER


VALUE PACK | 1.6 X MORE!
Nutramigen
with Enflora LGG
HYPOALLERGENIC
Infant Formula Powder with Iron
DHA BRAIN BUILDING NUTRITION
FOR FOOD ALLERGIES INCLUDING COW'S MILK ALLERGY
FAST RELIEF FROM SEVERE CRYING DUE TO COLIC
NO ARTIFICIAL GROWTH HORMONES
NET WT 19.8 OZ


42.99
comforts
SOY
INFANT FORMULA
WITH IRON
SOY-BASED POWDER
• Complete Soy Nutrition
• For Fussiness & Gas
• Lactose-Free
• DHA, Lutein & Vitamin E
GROWTH
NET WT 22 OZ
(1.38 LB) 624g


NUTRIENTS
MINERALS
INGREDIENTS: CORN SYRUP SOLIDS, PARTIALLY HYDROGENATED NONFAT MILK AND WHEY PROTEIN CONCENTRATE SOLIDS, SOY, VEGETABLE OIL (PALM OLEIN, COCONUT, SOY AND HIGH OLEIC SUNFLOWER OILS), AND LESS THAN 2% OF
MEAD JOHNSON & COMPANY, LLC
EVANSVILLE, IN 47721 U.S.A.
Mead Johnson Nutrition


No significant difference has been shown between milk derived from rbST-treated and non-rbST-treated cows
Ingredients not genetically engineered
NOT FOR INFANTS OR CHILDREN WITH GALACTOSEMIA
NUTRIENTS per 100 Calories (5 fl oz, prepared as directed)
VITAMINS
MINERALS


INGREDIENTS: CORN SYRUP SOLIDS (47%), VEGETABLE OIL (PALM OLEIN, COCONUT, SOY, AND HIGH OLEIC SUNFLOWER OIL), CASEIN HYDROLYSATE (MILK) (17%), MODIFIED CORN STARCH AND LESS THAN 2%: MORTIERELLA ALPINA OIL*, SCHIZOCHYTRIUM OIL*, LACTOBACILLUS RHAMNOSUS**, CALCIUM CITRATE, CALCIUM PHOSPHATE, POTASSIUM CHLORIDE, POTASSIUM CITRATE, SODIUM CITRATE, CALCIUM HYDROXIDE, MAGNESIUM OXIDE, FERROUS SULFATE, ZINC SULFATE, CUPRIC SULFATE, MANGANESE SULFATE, SODIUM SELENITE, CHOLINE CHLORIDE, ASCORBIC ACID, CALCIUM PANTOTHENATE, VITAMIN A PALMITATE, THIAMIN HYDROCHLORIDE, RIBOFLAVIN, VITAMIN B6 HYDROCHLORIDE, FOLIC ACID, VITAMIN D3, BIOTIN, VITAMIN B12, INOSITOL, VITAMIN A ACETATE, L-CYSTINE, L- TYROSINE, L-TRYPTOPHAN, TAURINE, L-CARNITINE.
MEAD JOHNSON & COMPANY, LLC
EVANSVILLE, IN 47721 U.S.A.
*MODIFIED TO BE BETTER TOLERATED IN MILK-ALLERGIC BABIES
*A SOURCE OF ARACHIDONIC ACID (ARA)
*A SOURCE OF DOCOSAHEXAENOIC ACID (DHA)
**BRANDED AS LGG®, A REGISTERED TRADEMARK OF CHR. HANSEN A/S
Filled by weight, not by volume; some settling may occur.
Mead Johnson Nutrition


USE BEFORE DATE ON BOTTOM OF CAN.
INGREDIENTS: CORN SYRUP, SOY PROTEIN ISOLATE, PALM OLEIN, SOY OIL, COCONUT OIL, HIGH OLEIC SAFFLOWER OR SUNFLOWER OIL, LESS THAN 2%: MORTIERELLA ALPINA OIL*, CRYPTHECODINIUM COHNII OIL**, LUTEIN, FRUCTOOLIGOSACCHARIDES, CALCIUM PHOSPHATE, POTASSIUM CITRATE, POTASSIUM CHLORIDE, MAGNESIUM CHLORIDE, SODIUM CITRATE, ASCORBIC ACID, CHOLINE BITARTRATE, L-METHIONINE, TAURINE, ASCORBYL PALMITATE, FERROUS SULFATE, INOSITOL, MIXED TOCOPHEROLS, ZINC SULFATE, VITAMIN E (DL-ALPHA TOCOPHERYL ACETATE), L-CARNITINE, NICKEL CHLORIDE, CALCIUM PANTOTHENATE, CUPRIC SULFATE, THIAMINE HYDROCHLORIDE, VITAMIN A PALMITATE, RIBOFLAVIN, PYRIDOXINE HYDROCHLORIDE, FOLIC ACID, POTASSIUM IODIDE, POTASSIUM HYDROXIDE, VITAMIN K1 (PHYTONADIONE), BIOTIN, SODIUM SELENITE, BETA-CAROTENE, VITAMIN D3, VITAMIN B12, CHROMIUM CHLORIDE, MONOGLYCERIDES, SOY LECITHIN, TRIBASIC CALCIUM PHOSPHATE, CALCIUM CARBONATE, MANGANESE SULFATE, POTASSIUM BICARBONATE.
CONTAINS: SOY.
PER 100 CALORIES:

Dr Arden Andersen

- Up to 38% decline in nutrients (1950-1999)
  - Protein, Ca, Vit C, P, Fe
  - USDA Data; Davis, Epp & Riordan JACN
- Avg 63% decline (1941-2001)
  - Fe, Zn, Cu, Mn, Se
  - Huling, Dec 2001; Thomas, Analysis of UK, 2003

How Tell if Nutrient Dense?

- Taste
- Brix (Dr Carey Reams)

Refractive Index of Crop Juices -- Calibrated In % Sucrose Or ºBrix

	Poor	Average	Good	Excellent
FRUITS				
Apples	6	10	14	18
Avocados	4	6	8	10
Bananas	8	10	12	14
Blueberries	8	12	14	18
Cantaloupe	8	12	14	16
Casaba	8	10	12	14
Cherries	6	8	14	16
Coconut	8	10	12	14
Grapes	8	12	16	20
Grapefruit	6	10	14	18
Honeydew	8	10	12	14
Kumquat	4	6	8	10
Lemons	4	6	8	12
Limes	4	6	10	12
Mangos	4	6	10	14
Oranges	6	10	16	20
Papayas	6	10	18	22
Peaches	6	10	14	18
Pears	6	10	12	14
Pineapple	12	14	20	22
Raisins	60	70	75	80
Raspberries	6	8	12	14
Strawberries	6	8	12	14
Tomatoes	4	6	8	12
Watermelons	8	12	14	16
GRASSES				
Alfalfa	4	8	16	22
Grains	6	10	14	18
Sorghum	6	10	22	30

	Poor	Average	Good	Excellent
VEGETABLES				
Asparagus	2	4	6	8
Beets	6	8	10	12
Bell Peppers	4	6	8	12
Broccoli	6	8	10	12
Cabbage	6	8	10	12
Carrots	4	6	12	18
Cauliflower	4	6	8	10
Celery	4	6	10	12
Corn Stalks	4	8	14	20
Corn (Young)	6	10	18	24
Cow Peas	4	6	10	12
Cucumbers	2	3	4	5
Endives	4	6	8	10
English Peas	8	10	12	14
Escarole	4	6	8	10
Field Peas	4	6	10	12
Garlic, Cured	28	32	36	40
Green Beans	4	6	8	10
Hot Peppers	4	6	8	10
Kale	8	10	12	16
Kohlrabi	6	8	10	12
Lettuce	4	6	8	10
Onions	4	6	8	10
Parsley	4	6	8	10
Peanuts	4	6	8	10
Potatoes	3	5	7	8
Potatoes, Sweet	6	8	10	14
Romaine	4	6	8	10
Rutabagas	4	6	10	12
Spinach	6	8	10	12
Squash	6	8	12	14
Sweet Corn	6	10	18	24
Turnips	4	6	8	10

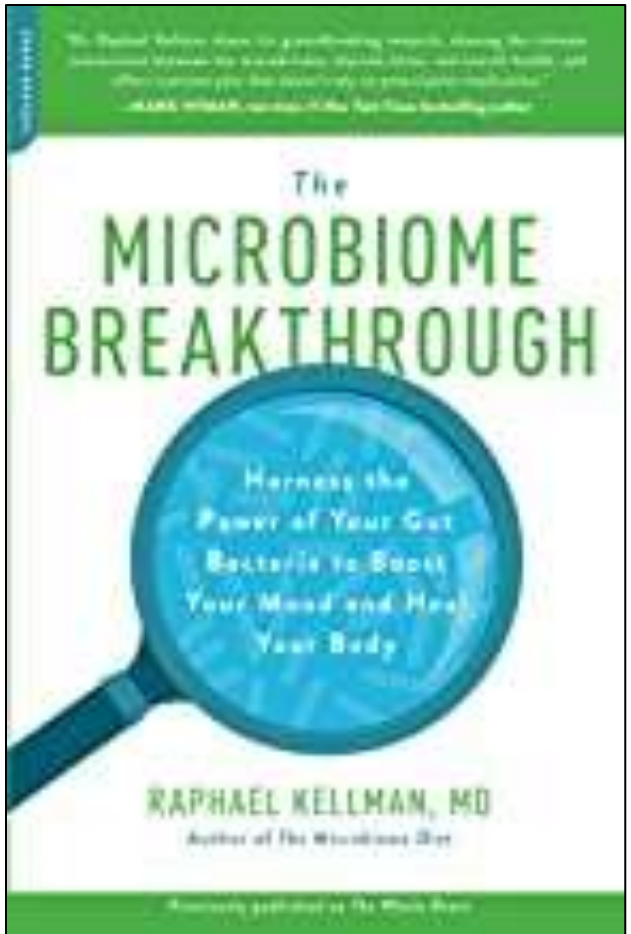
Within a given species of plant, the crop with the higher refractive index will have a higher sugar content, higher mineral content, higher protein content and a greater specific gravity or density. This adds up to a sweeter tasting, more minerally nutritious food with lower nitrate and water content, lower freezing point, and better storage attributes.

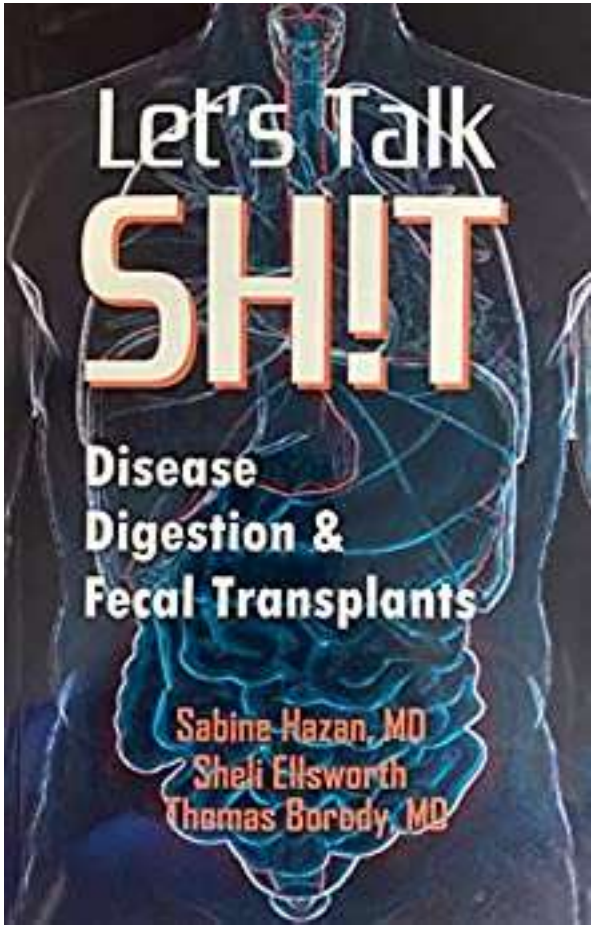
Hands on Brix

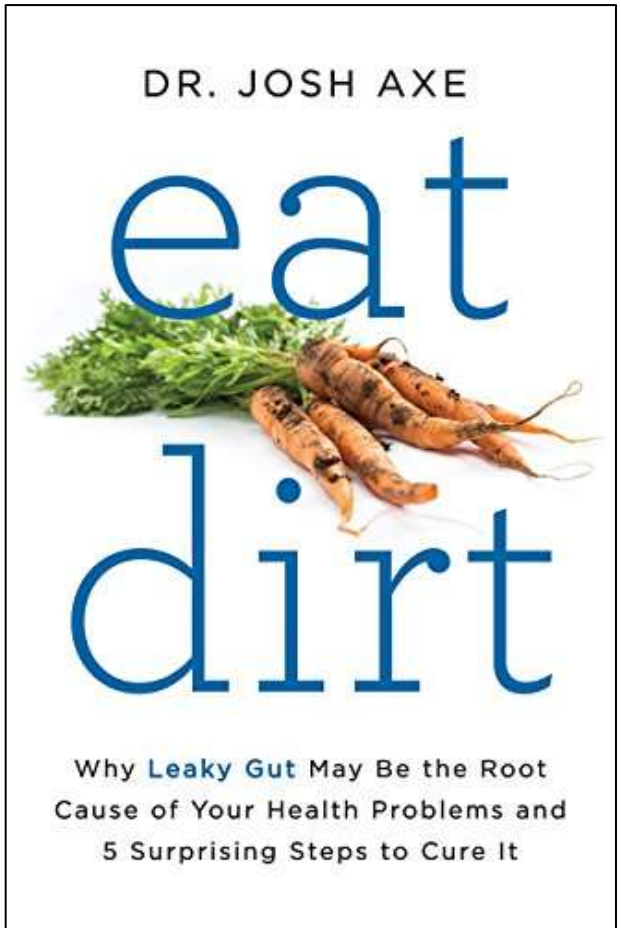
- Measure of Nutrient Density
- Measure of Plant/Soil Health
  - Brix ≥ 12 No Insects

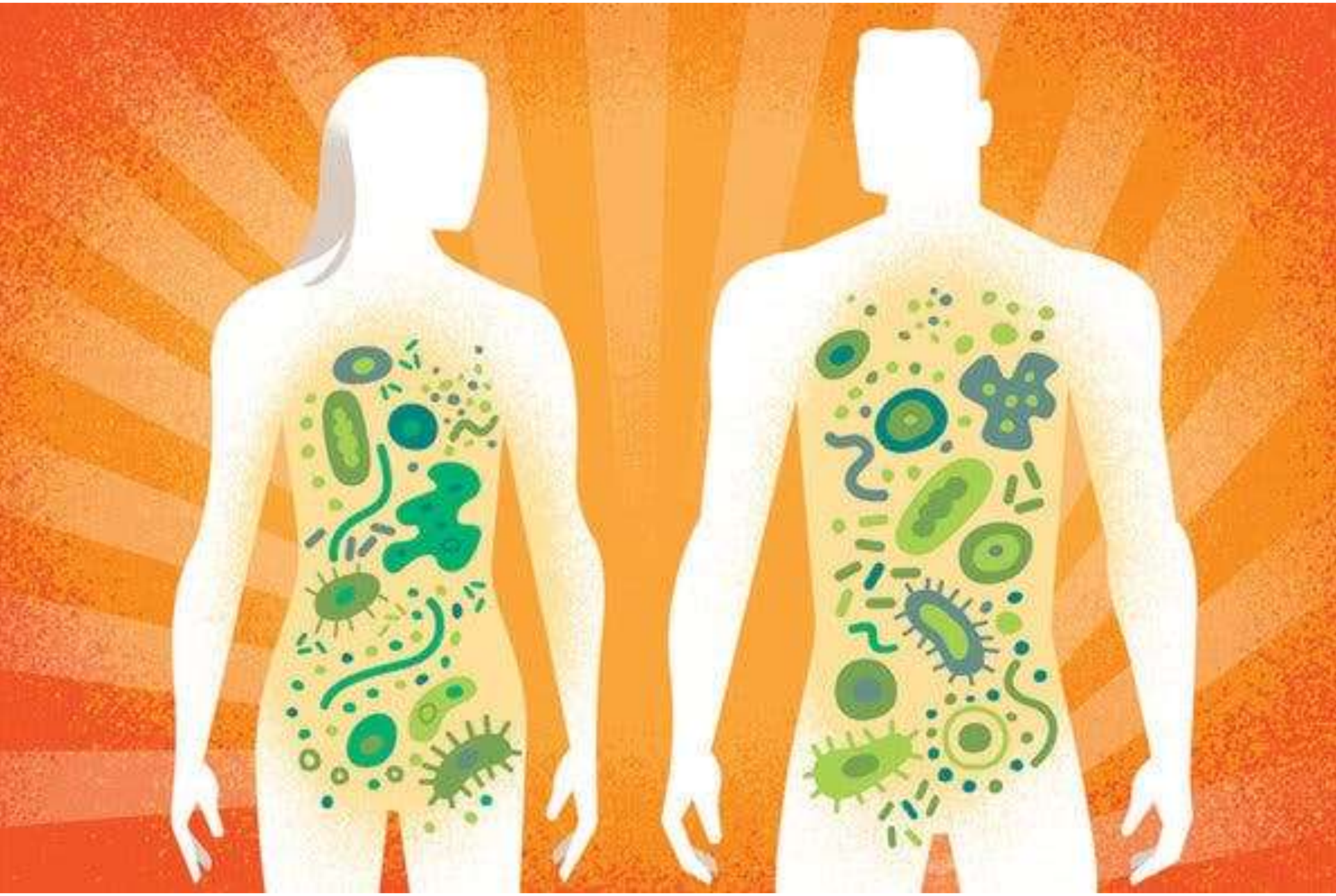
2018 Human Microbiome

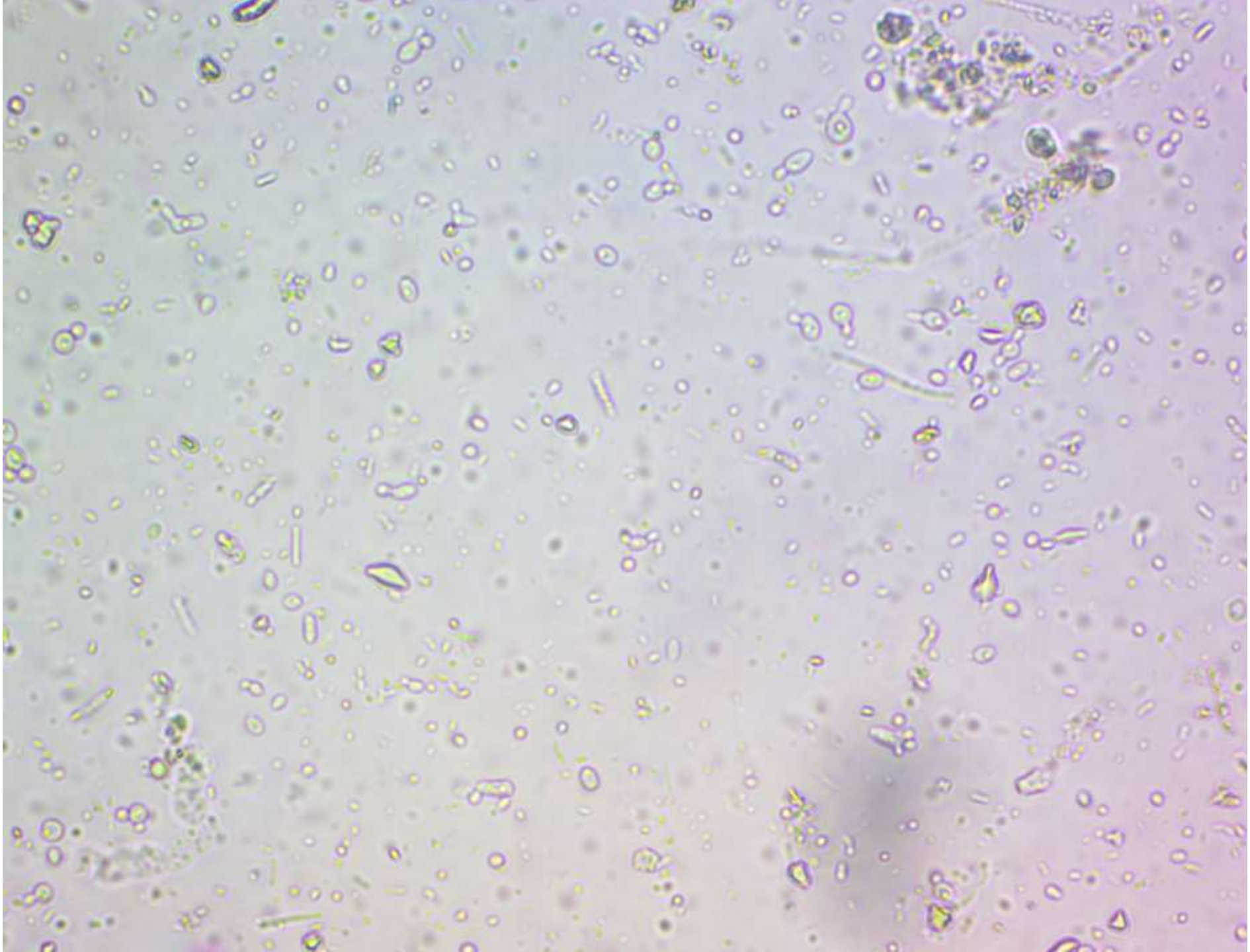
- Very Small Life—can't see with naked eye
- 10X more critters living in/on you than human cells









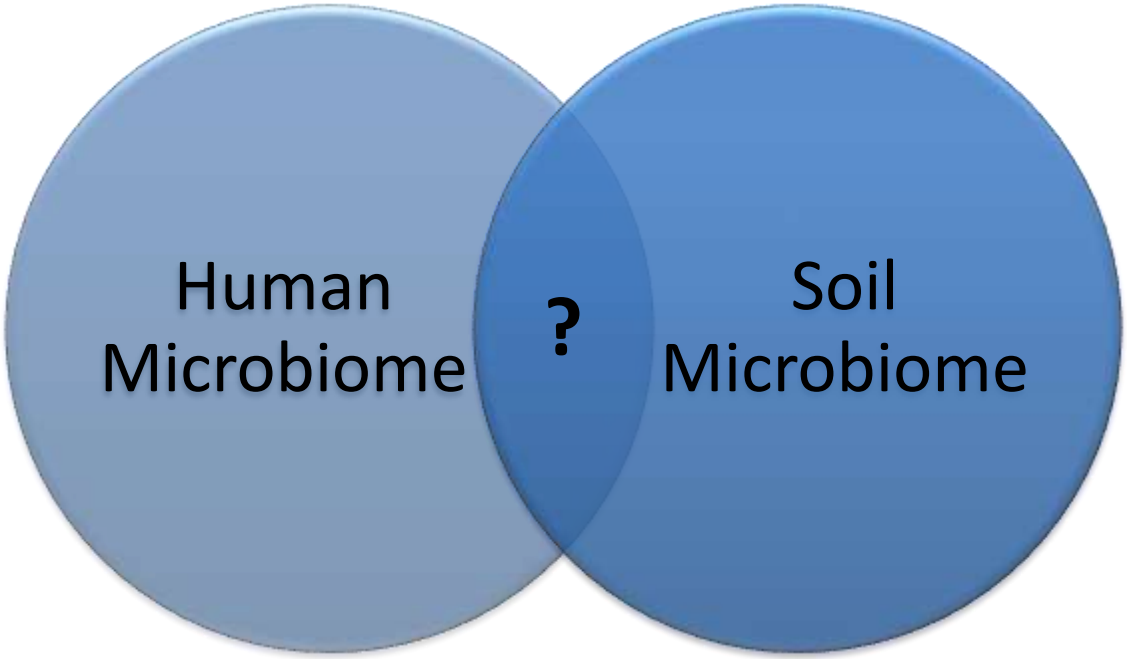


Two Keys to Human Health

- ✓Nutrient Dense Food
- ✓Healthy Microbiome
- So…where do they come from?

The Soil!

- Soil is the foundation for all life on land



87 Years Ago!!

Cosmopolitan—Jun 1936

- Dr Charles Northen, MD

  “Healthy plants mean healthy people. We can’t raise a strong race on weak soil.”

Dirt vs Soil

- Dirt–physical rocks, sand, silt & clay
- Soil—living skin of the planet
  - Handful of healthy soil has more critters in it than people on planet earth
  - Not just there for the “hell of it”

But, Dirt's Taking Over

- Modern agriculture focused on "chemistry"
- What kills biology?
  - Excessive Tillage
  - Chemical Fertilizers (N, P, K)
  - "icides"...Herbicides & Insecticides



Symptoms of “Dirt”

- Sick plants—reduced yield/quality
- Pests (weeds, insects, diseases)
  - Need lots of “inputs” and $$
- Poor water infiltration
- Erosion


REFILL
Roundup


ATRAZINE
St. Augustine Weed Killer
CAUTION

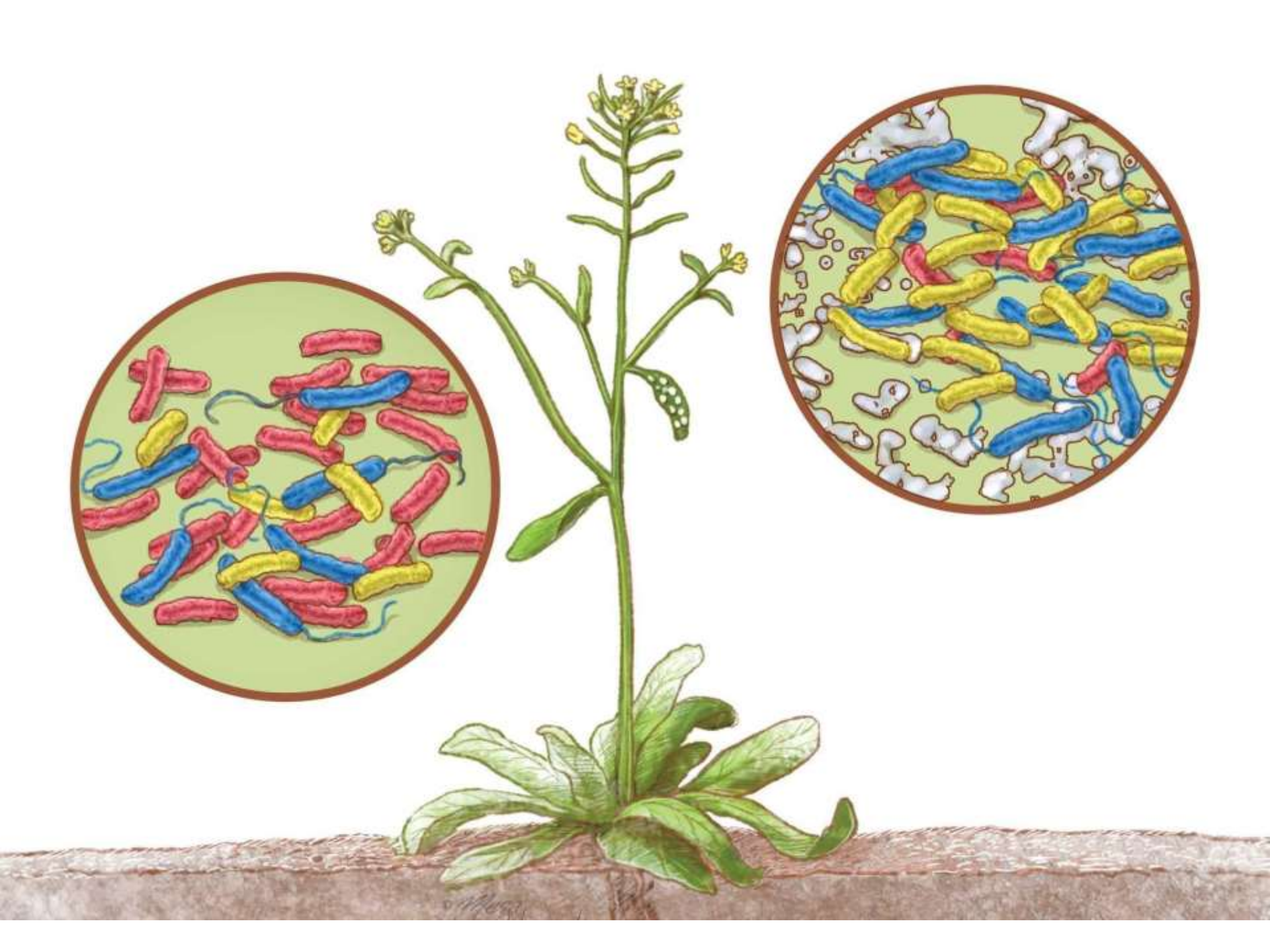
Dr Arden Andersen

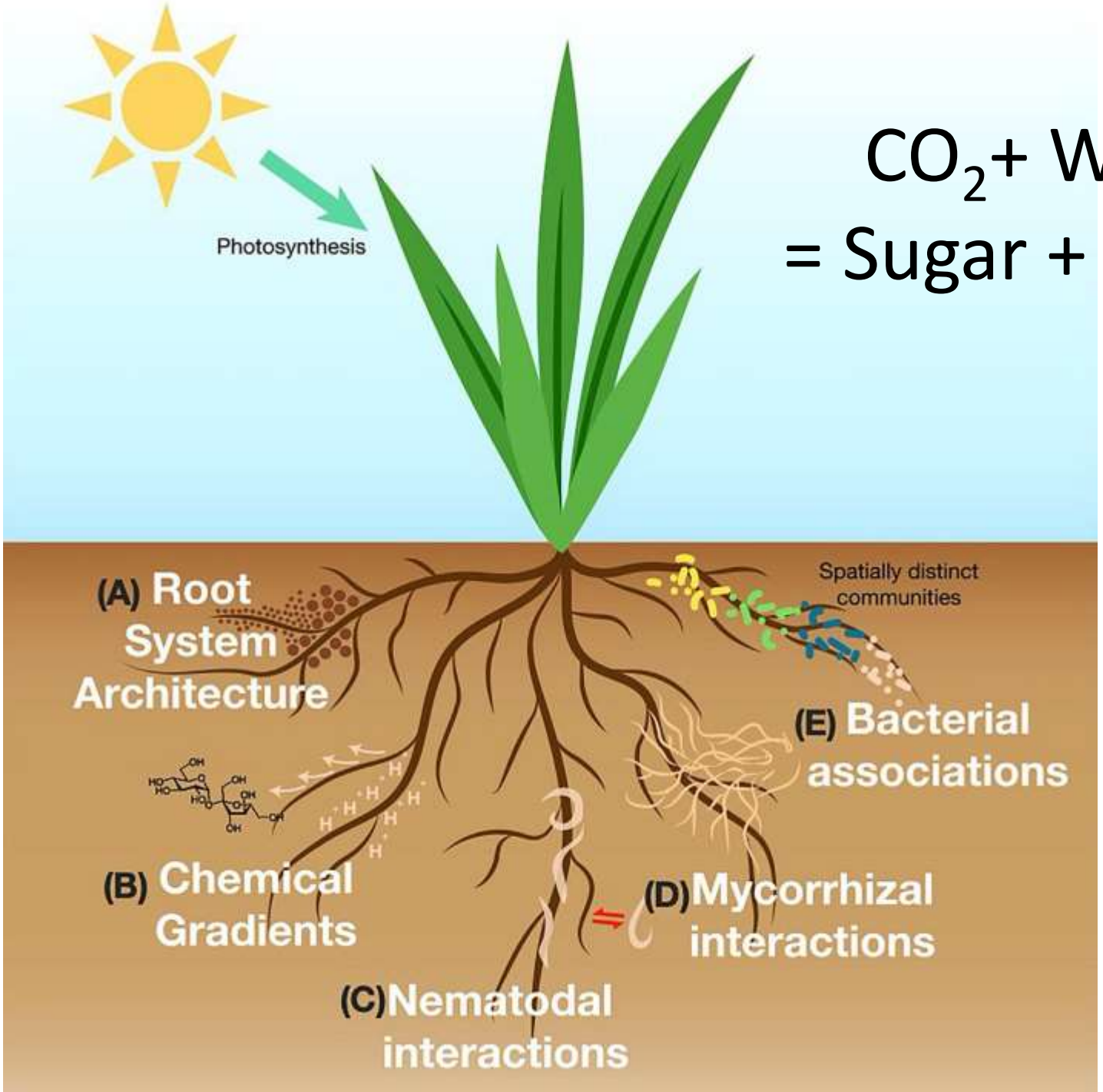
- “When soil degenerates, the growing plants degenerate and the consumers degenerate. This in turn creates a demand for the production and sale of products to combat the symptoms degenerate soil creates. There are products to fumigate the soil for insects and diseases, chemicals for weeds, and finally chemicals for doctors to give sick consumers to cover up the new maladies and diseases.”

Biology
Plants have Microbiome Too!!

- Caretakers of the plants
  - Live on and inside
  - Recycle nutrients (dead plants/animals)
  - Harvest minerals from sand, silt, clay
  - Make Vitamins & Enzymes plant can't
  - Create humus
  - Diversity keeps all "in check"

- Inject Nutrient Density at bottom of food chain





CO_2+ Water
= Sugar + Oxygen

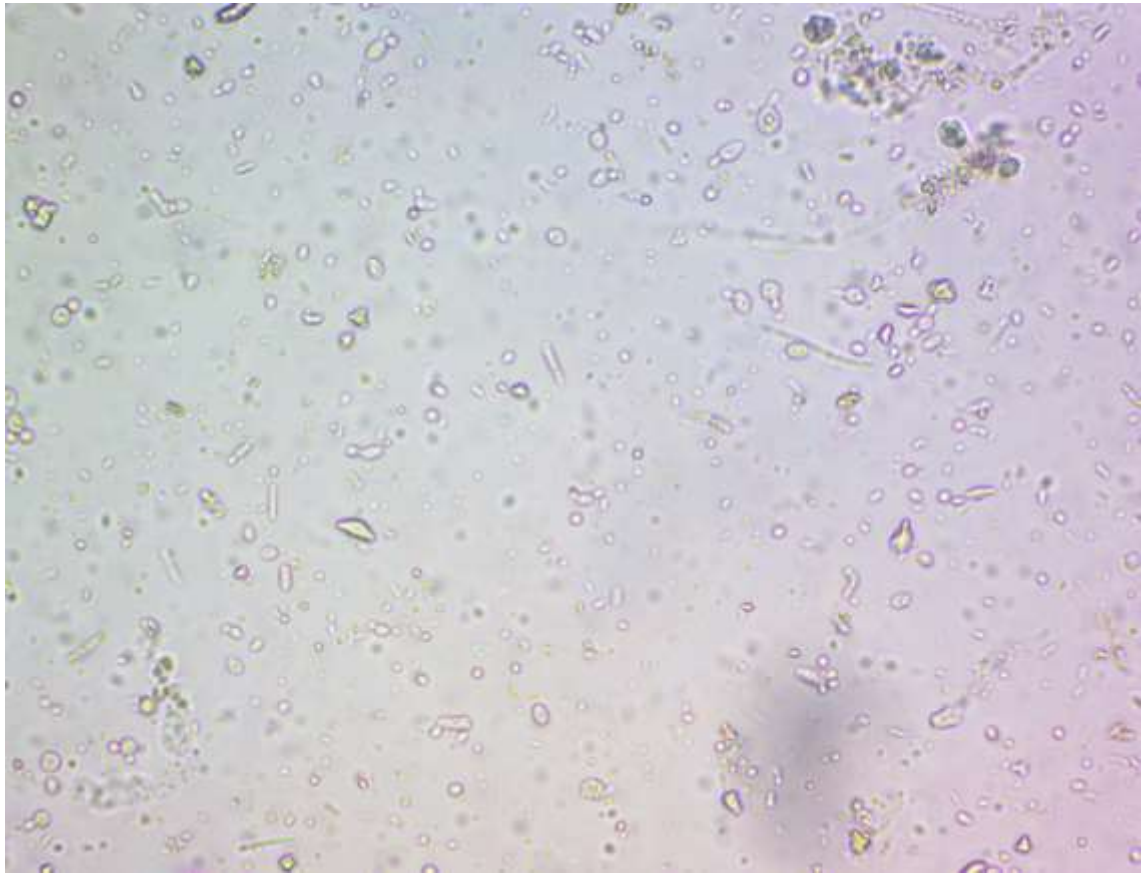
Photo Source: Soil Science Society of America

Nutrient Cycling Video

- How it Works Video

Bacteria

- Recycle simple organic matter
  - Manure, alfalfa, green grass (Green, high nitrogen)
  - Fix nitrogen



Fungi

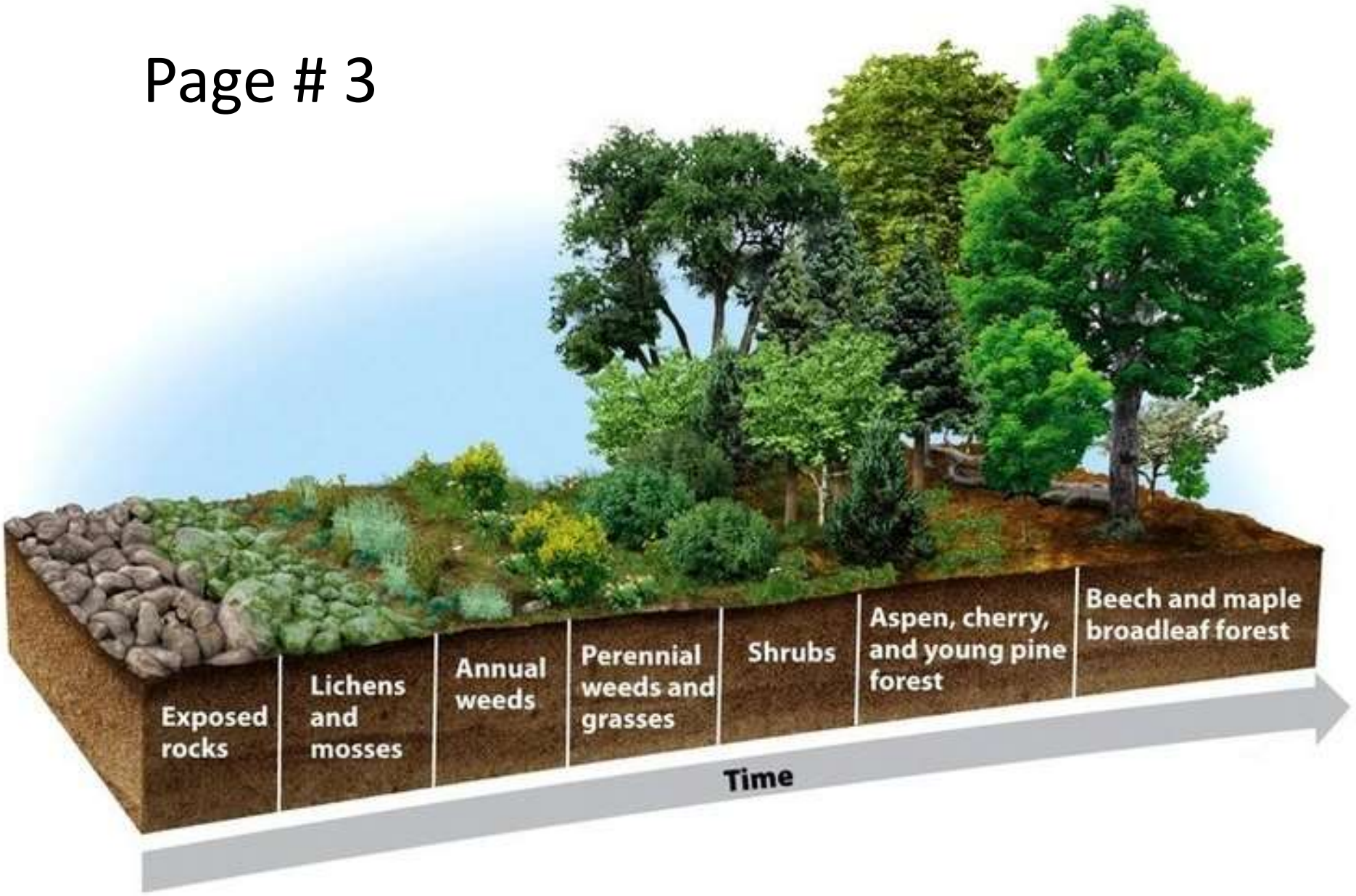
- Recycle more complex organic matter
  - Wood chips, leaves, straw, etc (woody, high Carbon)

Photo Source: Israel Chemicals Limited Growing Solutions

Protozoa--Predator

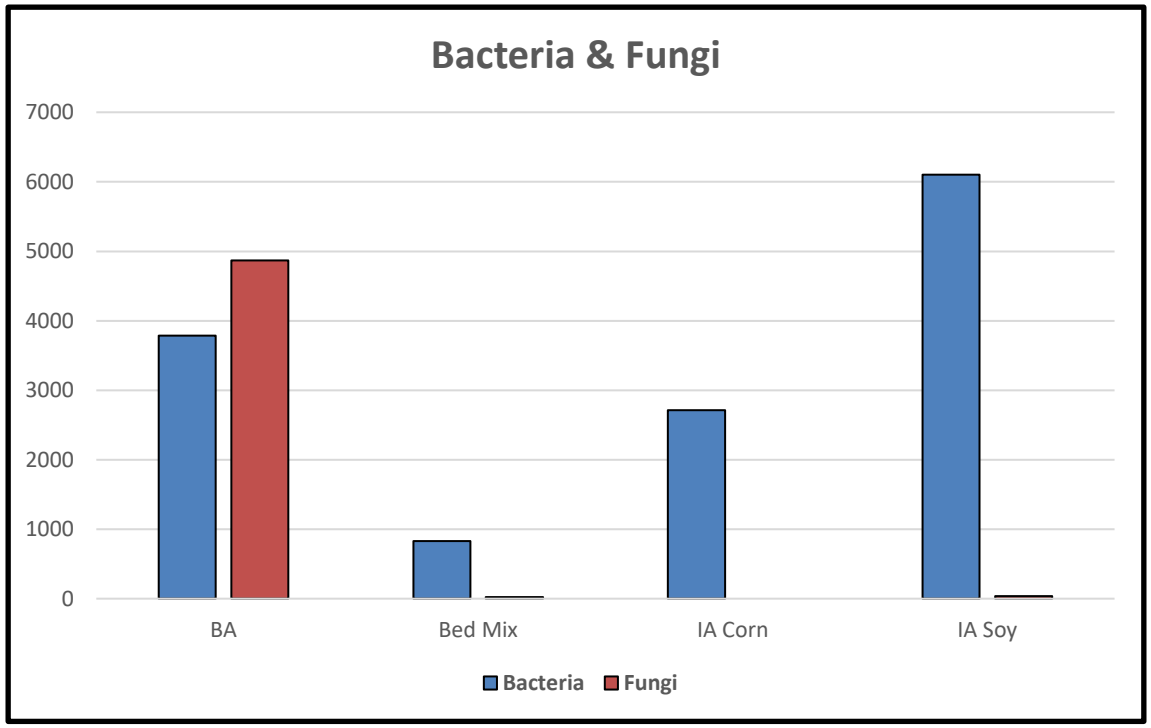
Nematodes--Predator

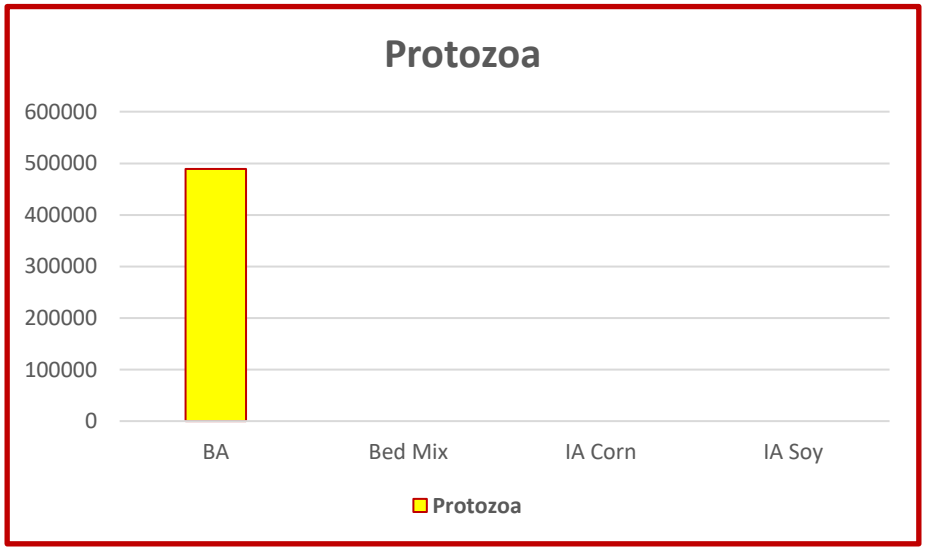
Page # 3

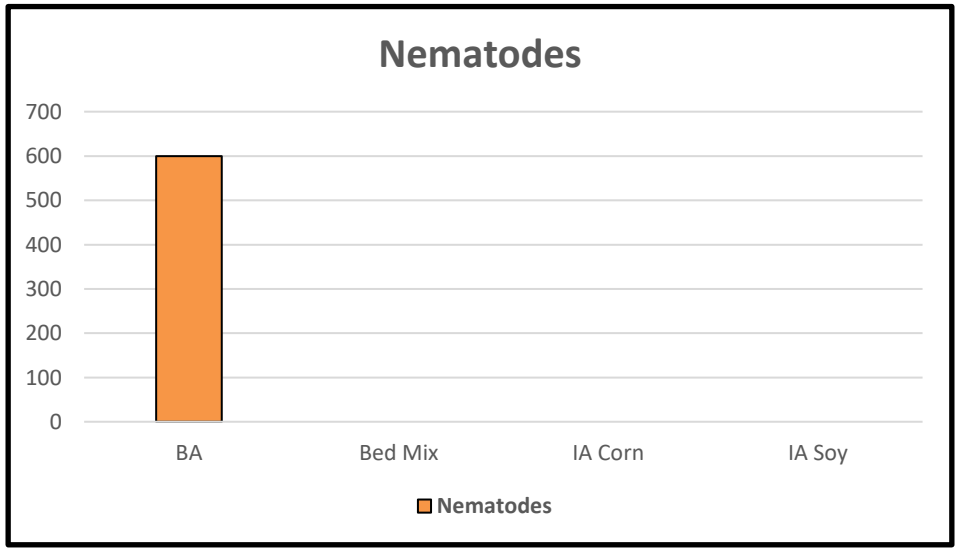

Exposed rocks
Lichens and mosses
Annual weeds
Perennial weeds and grasses
Shrubs
Aspen, cherry, and young pine forest
Beech and maple broadleaf forest
Time

AFExtractDrenchResults_2022-04-11

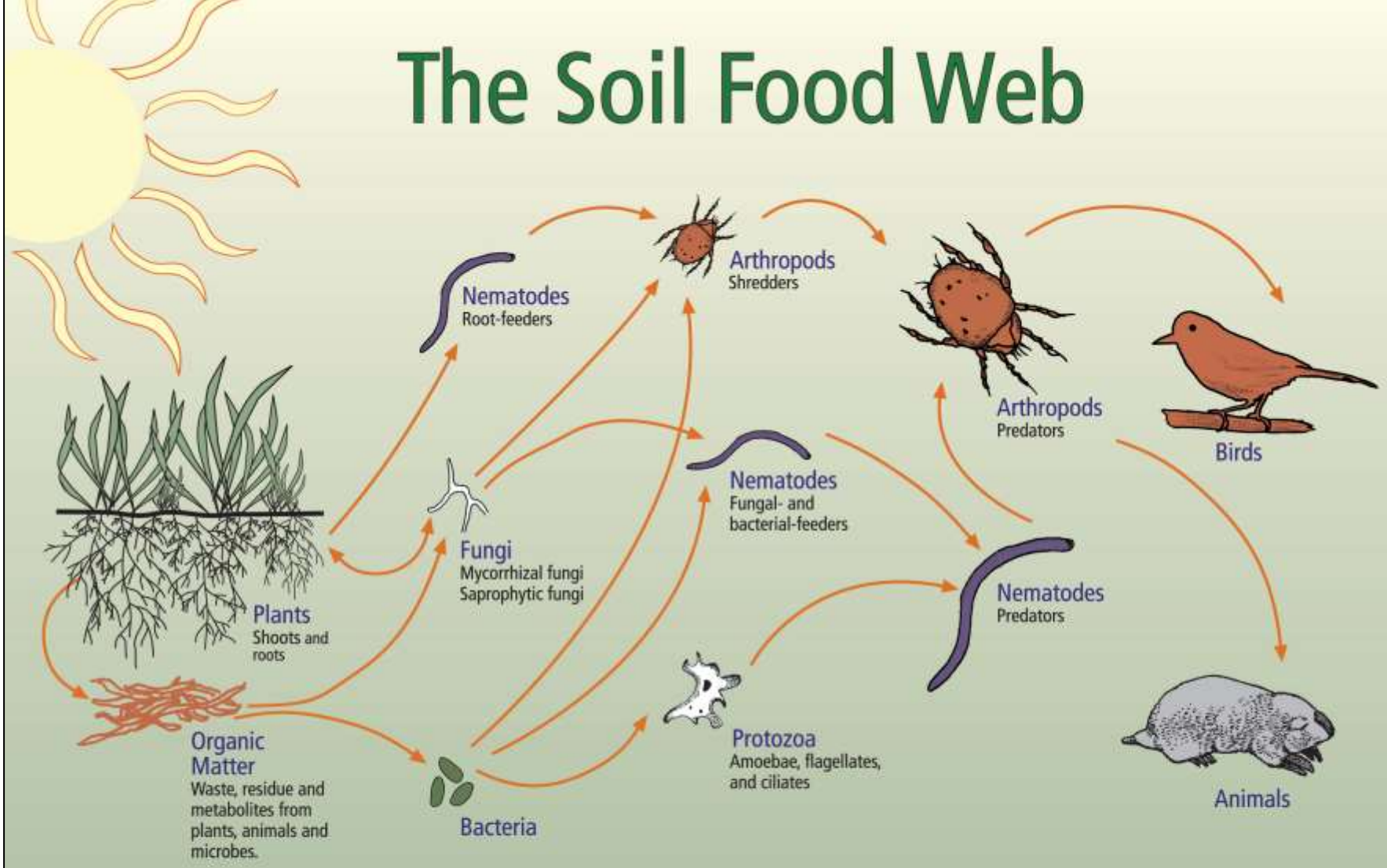
Beneficial Microorganisms	Sample Results
Bacterial Biomass (µg/g)	724.142
Bacterial Standard Deviation Biomass (µg/g)	87.835
Bacterial Standard Deviation as Percentage of Mean	12.10%
Actinobacterial Biomass (µg/g)	0.167
Actinobacterial Standard Deviation Biomass (µg/g)	0.16
Actinobacterial Standard Deviation as Percentage of Mean	95.90%
Fungal Biomass (µg/g)	851.77
Fungal Standard Deviation Biomass (µg/g)	882.451
Fungal Standard Deviation as Percentage of Mean	103.60%
Fungal Average Diameter - Weighted Mean (um)	6.881
F:B Ratio	1.176
Total Beneficial Protozoa (number/g)	136953
Flagellates (number/g)	61629
Flagellates Standard Deviation (number/g)	19519
Flagellates Standard Deviation as Percentage of Mean	31.70%
Amoebae (number/g)	75324
Amoebae Standard Deviation (number/g)	22968
Amoebae Standard Deviation as Percentage of Mean	30.50%
Bacterial-feeding Nematodes (number/g)	21
Fungal-feeding Nematodes (number/g)	0
Predatory Nematodes (number/g)	0
Detrimental Microorganisms	
Oomycetes Biomass (µg/g)	0
Oomycetes Standard Deviation Biomass (µg/g)	0
Oomycete Standard Deviation as Percentage of Mean	0.00%
Oomycetes Average Diameter - Weighted Mean (um)	0
Ciliates (number/g)	3424
Ciliates Standard Deviation (number/g)	4688
Ciliates Standard Deviation as Percentage of Mean	136.90%
Root-feeding Nematodes (number/g)	0
Total Beneficial Protozoa Standard Deviation (number/g)	35807
Total Beneficial Protozoa Standard Deviation as Percentage of Mean	26.10%


Bacteria & Fungi
7000
6000
5000
4000
3000
2000
1000
0
BA
Bed Mix
IA Corn
IA Soy
Bacteria
Fungi


Protozoa
600000
500000
400000
300000
200000
100000
0
BA
Bed Mix
IA Corn
IA Soy
Protozoa


Nematodes
700
600
500
400
300
200
100
0
BA
Bed Mix
IA Corn
IA Soy
Nematodes

The Soil Food Web



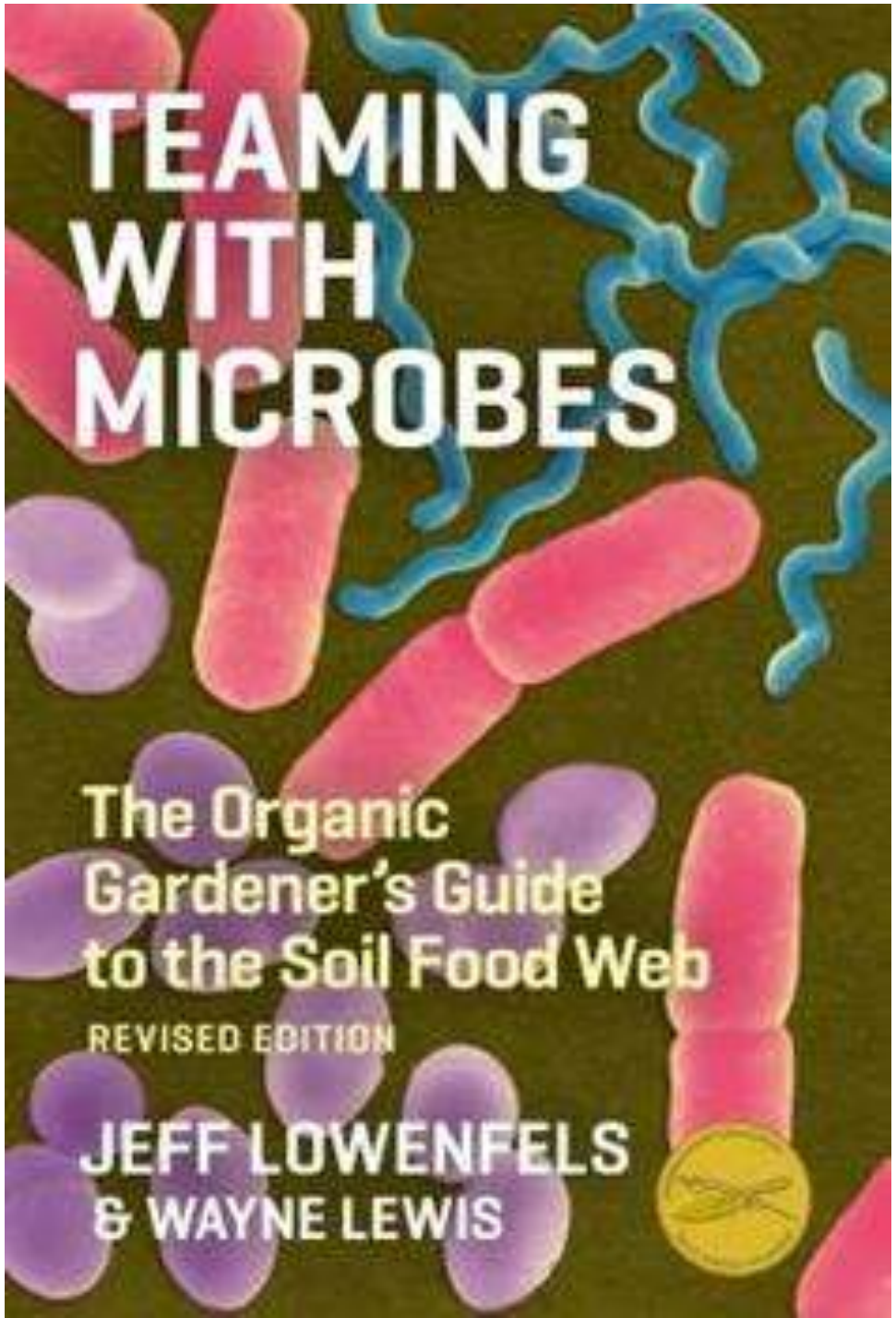
First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators



Websites:

Soilfoodweb.com
Dr Elaine's School

GreenCover.com
NE Company

MicrobeOrganics.com
Tim Wilson

Now What?

- Become a MICROBE FARMER!!
- Microbiome Needs…
  - Air
  - Water
  - Food
  - Comfort (Shelter)

Microbiome is all around us!

- Yeast to bread
- Milk to cheese
- Forest floor—edible mushrooms
- Ferments—Kombucha, sauerkraut
- Rain clouds
- Worms

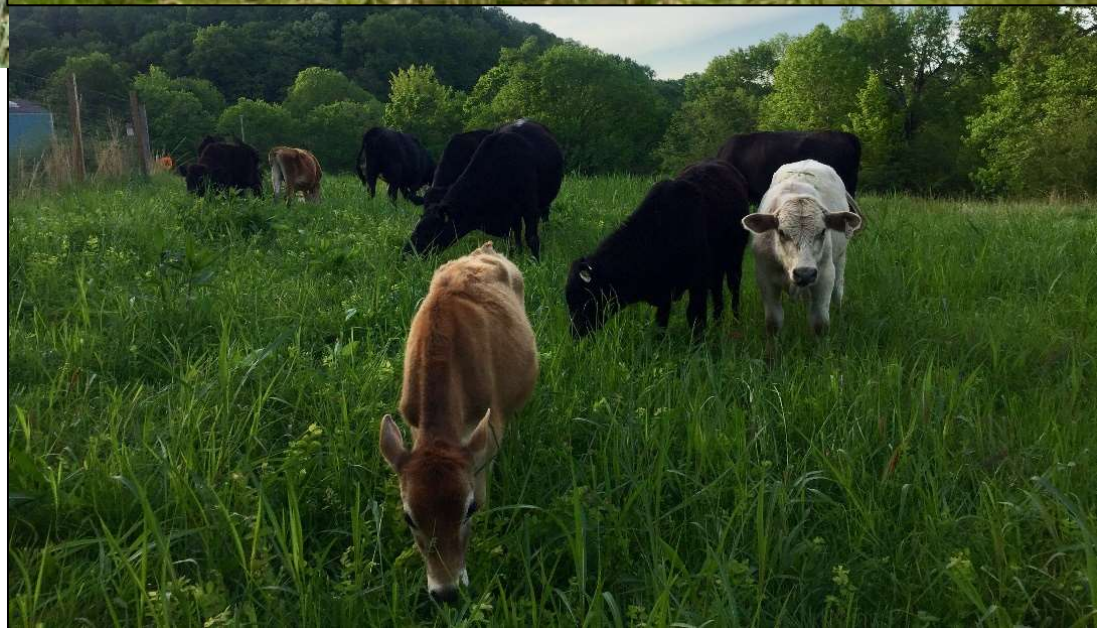
Bread Dough

- You've been a MICROBE FARMER!!

- Microbes +
  - Air
  - Water
  - Food (Sugar & Flour)
  - Comfort (Warm Place to rise)

Sources of Microbes (Soil Yeast)

- Manure
- Worm Castings
- Compost
- Korean Natural Farming
- Raw Milk
- Commercial Products



Worm Castings (Vermicompost)

- Red Wigglers (Eisenia fetida)
- Air & Water
- Comfort--Worm bin & temp 40-120°F (85°F)
- Food scraps, grass clippings, weeds, manure, etc


LINK Heat Mat
10"x20.75"


SEA-90
ERALS AND TRACE ELEMENTS


PERMA-R PRODUCTS, INC.
CAUTION!
RESTROOM
DO IT RIGHT

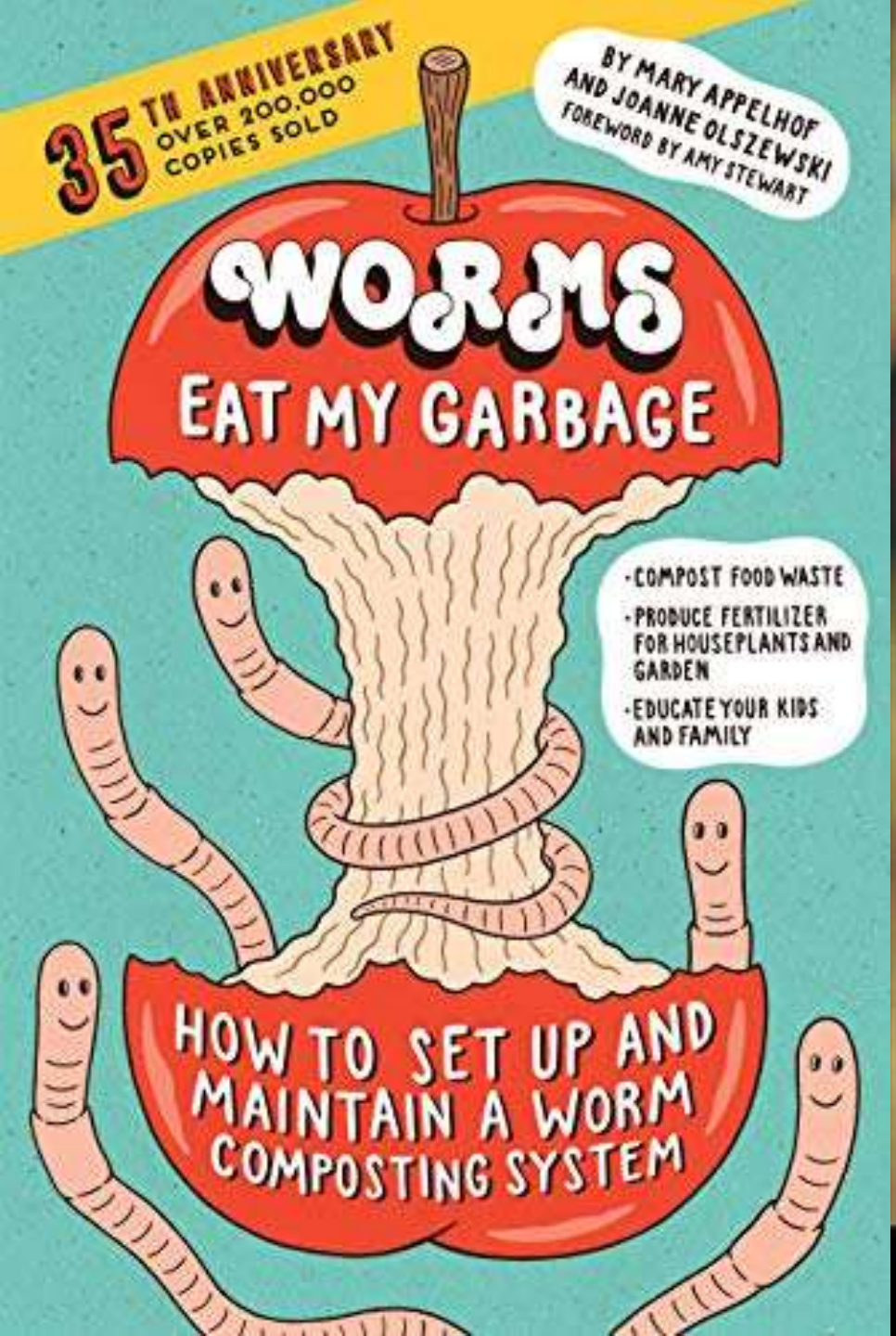
FCMP Essential Living Worm Composter

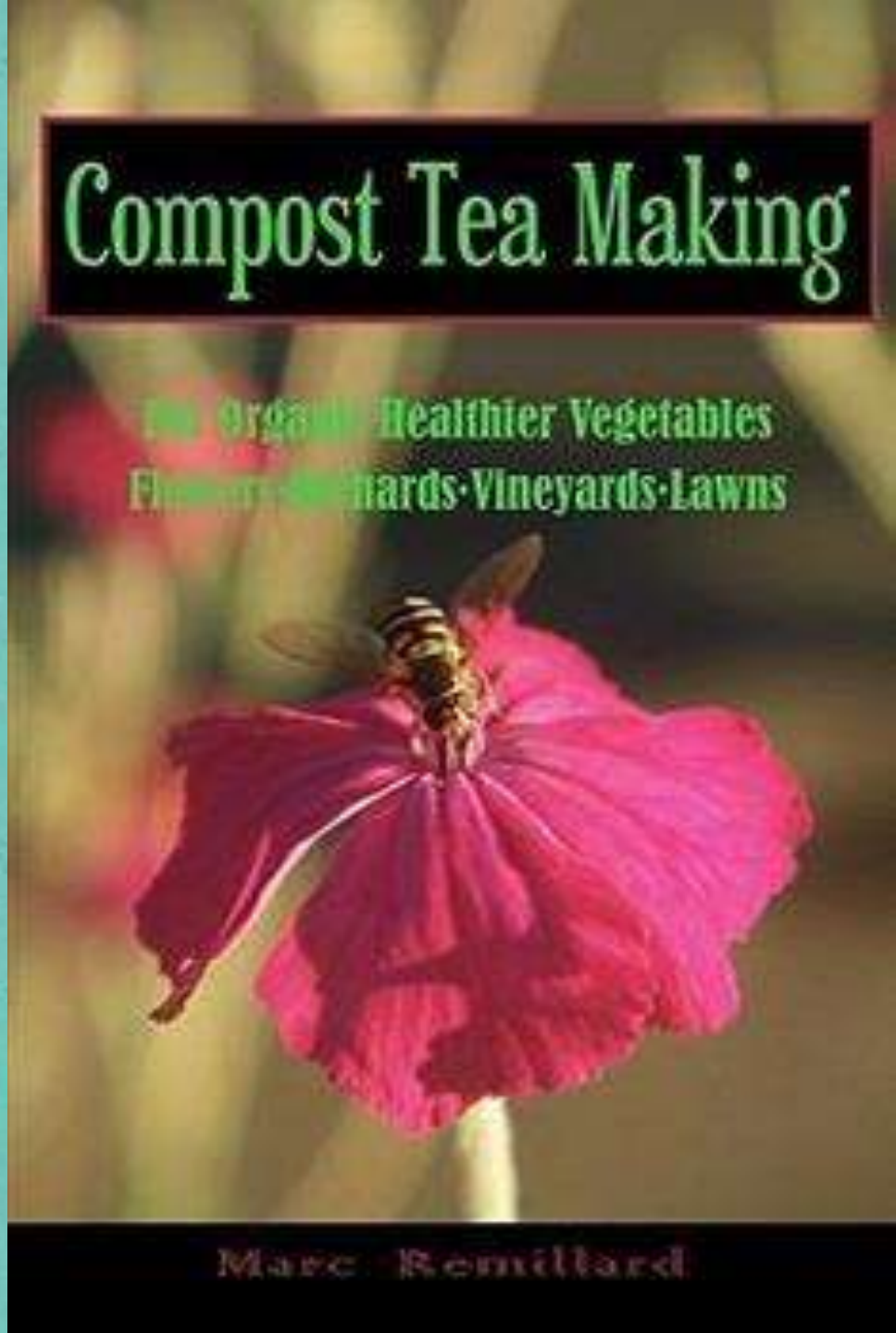
Hiwassee Products

Wormepeople.com

- Capt Matt

- https://unclejimswormfarm.com/
- https://www.memesworms.com/


35 TH ANNIVERSARY
OVER 200,000 COPIES SOLD
BY MARY APPELHOF AND JOANNE OLSZEWSKI
FOREWORD BY AMY STEWART
WORMS EAT MY GARBAGE
• COMPOST FOOD WASTE
• PRODUCE FERTILIZER FOR HOUSEPLANTS AND GARDEN
• EDUCATE YOUR KIDS AND FAMILY
HOW TO SET UP AND MAINTAIN A WORM COMPOSTING SYSTEM


Compost Tea Making
Healthier Vegetables
Vineyards·Lawns
Marc Remillard

Nashville Client--Hydrangeas

What If We Brought Together?

- Bacteria & Fungi
  - Air
  - Water
  - Food
  - Comfort/right temperature
- COMPOST!!!

Different Types of Composting

- **Static**
- **Thermophilic**
- Aerated Static Pile
- Dr David Johnson Bioreactor
- Korean Natural Farming

Static Compost (Not Heated)

Hay (Static Compost & Earthworms)

Different Types of Composting

- Static
- **Thermophilic**
- Dr David Johnson Bioreactor

Time & Temp Goals (Page 5)

- 131-150°F—72 hours
- 150-160°F—48 hours
- 160-165°F—24 hours
- 165-170°F—12 hours
- ≥170°F—Now

What Foods?

- Primary decomposers (Aerobic)
  - Bacteria
    - Less complex materials
    - Simple sugars, green grass, manure
  - Fungi
    - More complex materials
    - Leaves, wood chips, cardboard

Food Categories (Page 4)

1. Hi-Nitrogen “Hi-N” (Manure)
2. Green (Grass Clippings)
3. Woody (Wood Chips)

Basic Compost Principles

- Gather “organic” foods
  - –If it’s lived once, it can live again!
  - –CAUTION—PYRALIDS!!!
- Air, Water & Temp
- Bacteria & Fungi take it from there!

Persistent Herbicides

- Corteva's Grazon® (Aminopyralid)
  - Broadleaf weed control in pasture


TROY-BILT
10HP


TROY-BILT


WARNING: RISK OF FIRE
RISQUE D'INCENDIE

FOOD RATIOS KEY!!!! (Page 5)

1. Ambient Temps: ≥60°F
   - 10% Hi-N, 30-35% G, 55-60% W

2. Ambient Temps: 40-60°F
   - 15% Hi-N, 30-35% G, 50-55% W

3. Ambient Temps: ≤ 40°F
   - 20% Hi-N, 30-35% G, 45-50% W

HIGH NITROGEN					
Ingredient	Details	# Buckets	% of Pile		Comments/Notes
					Weather 10 days: High 83-97; Lows 64-75. Soaked alfalfa pellets overnight. Added 2.5 metal scoops to each quarter, but still had some left…could have gone 3. Added compost inoculant in qtrs 2 & 3.
Compost	Vermi & thermo--2 handfuls as inoculant				
Chicken Manure	Dry from my EM	2	5%		
Cattle Manure	From my pasture	3	8%		
Alfalfa Pellets	From CFS	1	3%		
			0%		
			0%		
			0%		
Total High-N:		**6**	**15%**		
GREEN MATERIALS					
Ingredient	Details	# Buckets	% of Pile		Comments/Notes
					Added 1/2 bucket water to All Overnight.
Square Bale Hay	(Scotty near COOP $5/bale) through wood chipper	7	18%		
Grass Clippings	My yard stored dry	7	18%		
Coffee Chaff	X Coffee Shop	0	0%		
			0%		
			0%		
			0%		
			0%		
Total Green:		**14**	**35%**		
WOODY MATERIALS					
Ingredient	Details	# Buckets	% of Pile		Comments/Notes
					Added 1/2 bucket water to All Overnight.
Wood Chips Small	Last year well decomposed chips misc woods	2	5%		
Leaves	Raked from ridge & chipped this spring/summer	5	13%		
Wood Chips Large	Large 1-2" chunks from Amish sawmill	7	18%		
Paper	Shredded through Chipper	2	5%		
Cardboard	Shredded through Chipper	2	5%		
Brooder Bedding	Bedding/manure from brooder house	2	5%		
			0%		
Total Woody:		**20**	**50%**		
TOTALS FOR ALL INGREDIENTS:		**40**	**100%**		


TRAKKER

Hands on Composting

Lunch

Now See the Concepts

- What if leave sandwich out? Mold
- Air, Water, Food Comfort
  - How preserve? Take away air, water, food, comfort
  - Dehydrate it
  - Refrigerate it
  - Salt it
  - Boil it

Turning Compost

White board 1, 2, 3

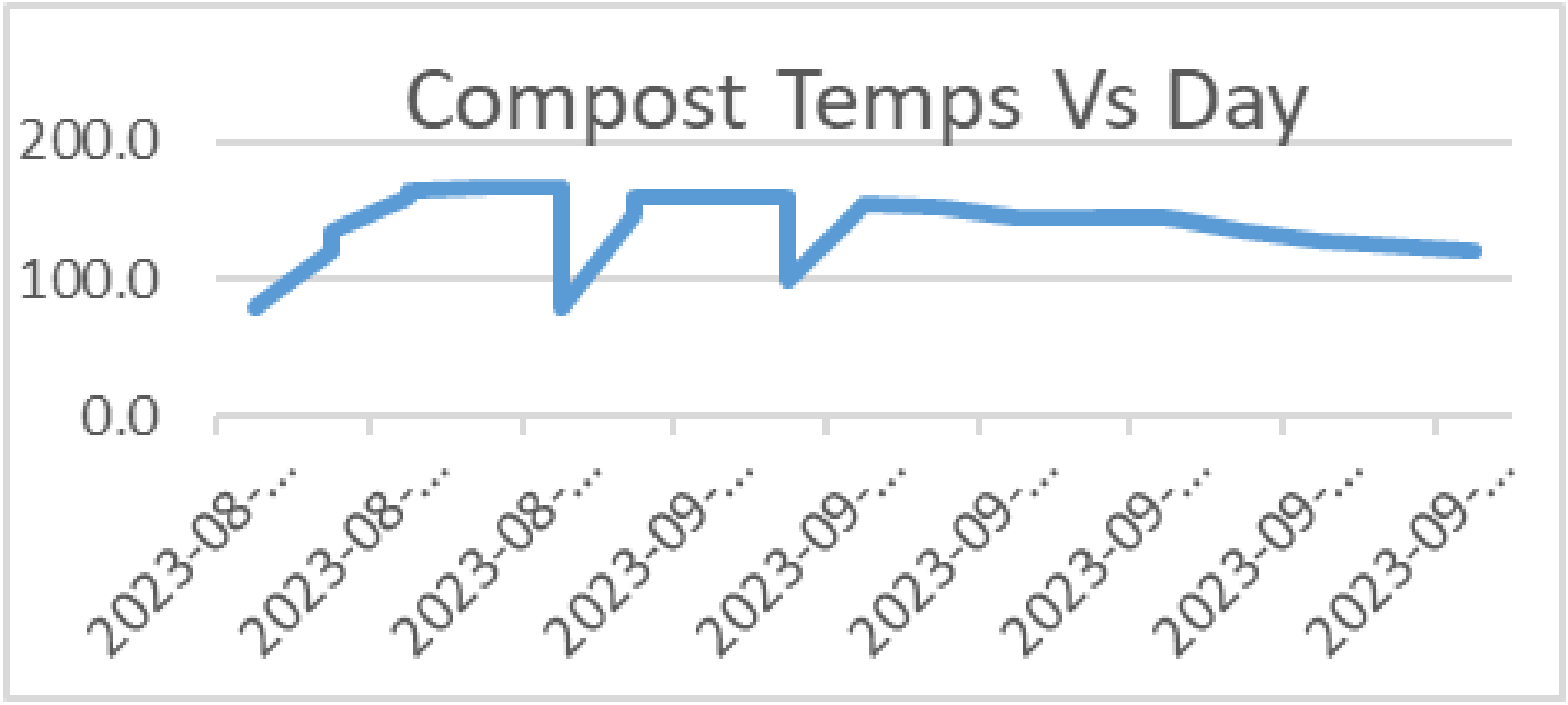
Time & Temp Goals (Page 5)

- 131-150°F—72 hours
- 150-160°F—48 hours
- 160-165°F—24 hours
- 165-170°F—12 hours
- ≥170°F—Now

How heat up?

- Exponential growth of bacteria & fungi
- 1 bacteria to 1 million in 24 hours

Date	Day #	Time	Ambient Temp	Temp 1	Temp 2	Temp 3	Avg Temp	Moisture	Notes/Comments
2023-08-26	1	12:00	80	80			80.0	50	Started during 26 Aug 23 Living Soil Class
2023-08-27	2	6:43	74	120			120.0	50	
2023-08-27	2	14:30		136			136.0	50	≥131; Turn 14:30 on 30 Aug 23
2023-08-28	3	6:00		159			159.0	50	≥150; Turn 06:00 on 30 Aug 23
2023-08-28	3	13:38	74	165			165.0	50	≥160; Turn 13:38 on 29 Aug 23
2023-08-29	4	5:40		166			166.0	50	
2023-08-30	5	13:30	76	166			166.0	50	
2023-08-30	5	14:00	76	80	80		80.0	50	Turned #1; Added 2 scoops prewetted alfalfa pellets to new hot center during turn.
2023-08-31	6	6:00	56	147			147.0		≥131; Turn 06:00 on 3 Sep 23
2023-08-31	6	8:30	70	160			160.0		≥160; Turn 08:30 on 1 Sep 23
2023-09-02	8	6:00	68	160			160.0		
2023-09-02	8	15:00	80	160			160.0		
2023-09-02	8	15:30	80	100			100.0		Turn #2; Added 2 scoops prewetted alfalfa pellets to new hot center during turn.
2023-09-03	9	8:30		160	150		155.0		≥150; Finished 08:30 on 5 Sep 23
2023-09-04	10	6:00	66	155	149		152.0		
2023-09-05	11	6:00	70	140	150		145.0	50	131≤**145**≤150; Finished 08:30 on 6 Sep 23
2023-09-06	12	16:00	83	141	149		145.0		Pile Done!
2023-09-07	13	7:00	65	141	149		145.0		Can continue to monitor until returns to ambient.
2023-09-08	14	6:00	56	134	139		136.5		
2023-09-09	15	6:00	62	124	134		129.0		
2023-09-11	17	6:00	62	120			120.0		Fungi sprouting.
2023-09-13	19	6:00	65	120			120.0		
2023-09-20	25	6:00	52	114			114.0		
2023-09-23	28	13:30							Turn #3 in class to rewet all.


Compost Temps Vs Day
200.0
100.0
0.0
2023-08-…
2023-08-…
2023-08-…
2023-09-…
2023-09-…
2023-09-…
2023-09-…
2023-09-…
2023-09-…

Why Slow Down/Cool Off?

- Air, water, food, or comfort changes
- Food eaten up
- Exponential growth slows

Hands on Turning

Compost Extract

- Compost + Water
- Can add food and/or minerals on way out
- Use within 24 hrs

Extract Demo


MAYTAG


KUBOTA

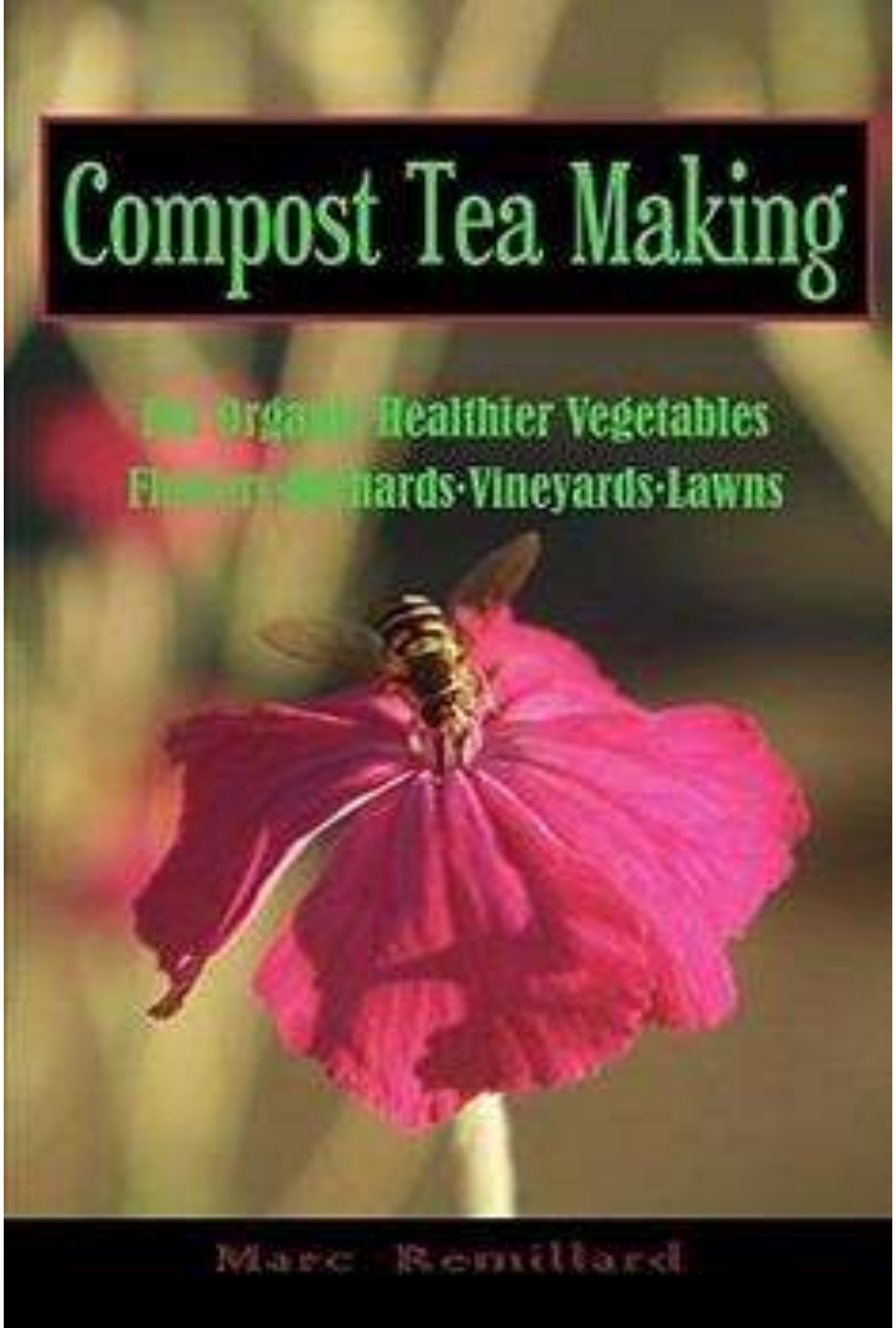
Compost Tea

- Compost + Food + Air + Time
- 24-36 hrs depending upon ambient temps
- Tim Wilson (2.38% compost, 0.5% unsulphured molasses)
- 50 gal (189 liters), 189 g sea salt for 1:30

Compost Tea Making

Healthier Vegetables

Orchards·Vineyards·Lawns



Marc Remillard


50 gal


(888) 686-8265
NSF


SUBS
KOSHER
PICKLE SPEAR


40

Bonus Afternoon

Plants--Energy Accumulators

- Chemistry—minerals & chemical reactions
  - Ca, P, K, NO3, NH4
- Physics—electrical energy
  - Sunlight, moonlight, + ions, - ions
- Biology—microbiome workers
  - Leverage chemistry & physics to care for the plant

“Chemistry” Soil Test

Lab Number: 602069 **Sample Name:** TEST2 **Farm Name:**

Soil Results

pH		Phosphorus	Potassium	Calcium	Magnesium	Zinc	Iron	Manganese	Boron	Sodium
Soil pH	Buffer Value	P	K	Ca	Mg	Zn	Fe	Mn	B	Na
		Pounds per acre - Mehlich 1								
6.65		25 M	84 L	1842 S	140 S	2.3 S	17 S	20 S	0.5	12

Crop/plant Interpretation ranges on last sheet

L = Low, M= Medium, H=High, V= Very High, S = Sufficient

Additional tests, if they were requested											
Sulfur	Nitrogen			Carbon	C/N Ratio	Organic Matter	Soluble Salts	Particle Size Analysis - Hydrometer Method			
LBS/ACRE	NH4-N ppm	NO3-N ppm	Total N %	%	%	%	dS/m	% Sand	% Silt	% Clay	Soil Texture
						3.3	0.03	20	64	16	Silt Loam

INTERNATIONAL AG LABS
A BIOLOGICAL APPROACH TO AGRICULTURE
PHONE 507-235-6909 FAX 507-235-9155 P.O. BOX 788 FAIRMONT, MN 56031

NAME:	Kevin Krause	**DATE:**	02/12/24
		SAMPLE TESTED:	TA1 Bottom
ADDRESS:	4447 Dry Fork Road		Bio/Clean
		Plot Size:	1 Acre **Sq. Ft.**
CITY/STATE:	Hampshire, TN 38461	**2023 CROP GROWN:**	Very Little Bermuda
		2024 CROP:	Mix Clover, Chicory, Brome
		LAB TEST#	**299**

SOIL ANALYSIS REPORT

	UNIT	DESIRED RATIO	DESIRED LEVEL	LAB RESULTS
HUMUS			30-40	3
NITRATES	lbs. / Acre		40	8
AMMONIA	lbs. / Acre		40	6
PHOSPHORUS	lbs. / Acre	1P:1K	174	7
POTASSIUM	lbs. / Acre		167	214
CALCIUM	lbs. / Acre	7 Ca : 1 Mg	3000	1104
MAGNESIUM	lbs. / Acre		429	68
SODIUM	PPM		<35	6
ERGS	µS / Centimeter		200	144
ORP			28	22
pH			6.5	5.7
COPPER	PPM		0.8-2.5	0.5
IRON	PPM		10 50	69.2
ZINC	PPM		1-6	2.1
MANGANESE	PPM		10 50	21.5
BORON	PPM		0.8-1.2	Not Tested
SULFUR	PPM		30	Not Tested
ORGANIC MATTER	%		4%	Not Tested
FORMAZAN	PPM		600	Not Tested

Soil Index

0.03 : 1 P to K Ratio

16.24 : 1 Ca to Mg Ratio

Broadcast:
1 ton Soft Rock Phosphate
1 ton Low Magnesium Limestone
500 lbs. Gypsum
125 lbs. 11-25-0
125 lbs. Ammonium Sulfate
50 lbs. Magnesium Sulfate
40 lbs. Copper Sulfate

When Cattle Are Removed in Fall Apply:
2 qt. Z-Hume
2 lbs. Dextrose
20 gallons water
Note: This will help jump start trash decomposition.

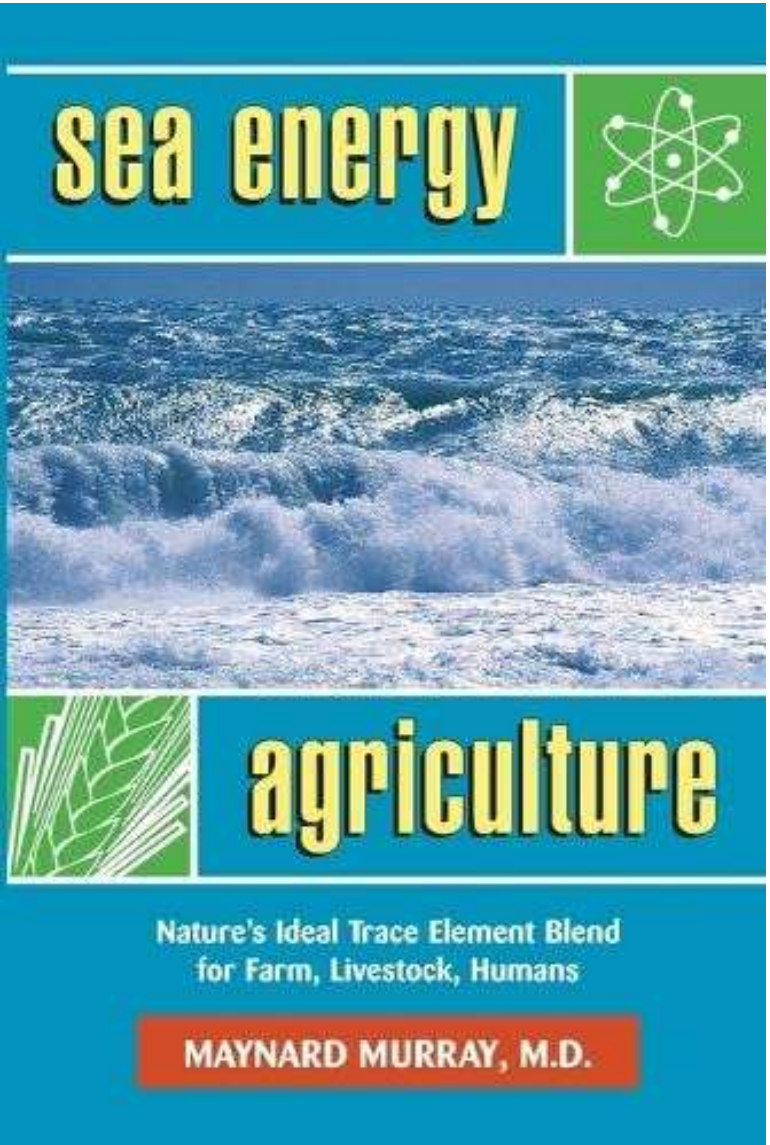
Chemistry--Minerals

- Dr Carey Reams (1903-1985)
  - Calcium: 2000 (lbs/acre)
  - Phosphorus: 400
  - Potassium: 200
  - Sulphur: 200
  - Nitrates: 300
  - Ammonium: 40
  - Iron: 40

Mineral Sources

- Rock--Sand, Silt, Clay
- Rock dust (Soft Rock Phosphate, Basalt, Azomite)
- Blood meal & Bone meal
- Sea salt (90 minerals)
- Organic matter (leaves, wood chips, etc)
- Commercial products—Good & Bad (N, P, K)
  - Potash (Potassium Chloride)
    - 60-125 lbs/acre = 15-31 ppm Chlorine (2-4 ppm pool)

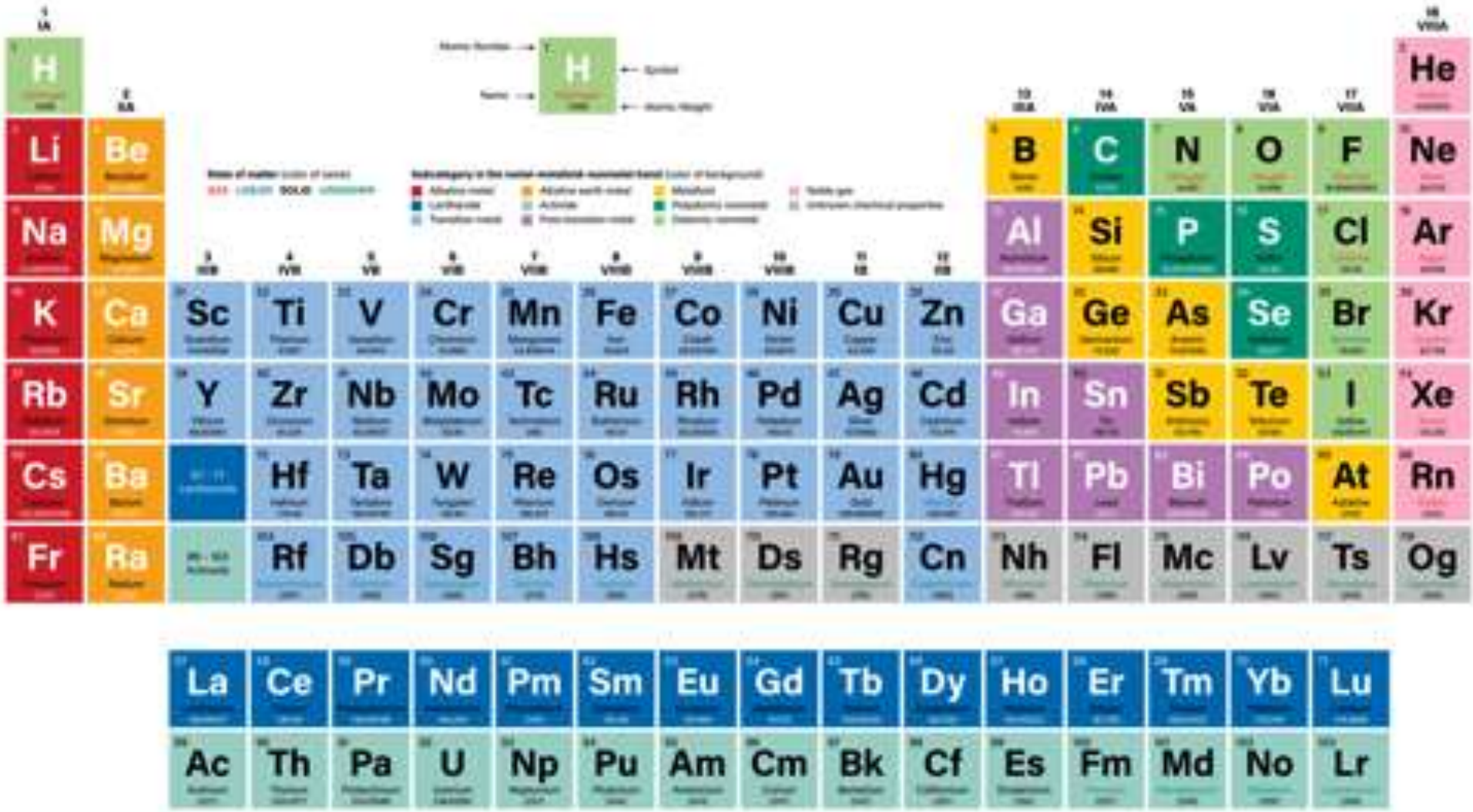
Sea Water Minerals



- Redmond or Sea 90
- 200-2200 lbs/acre

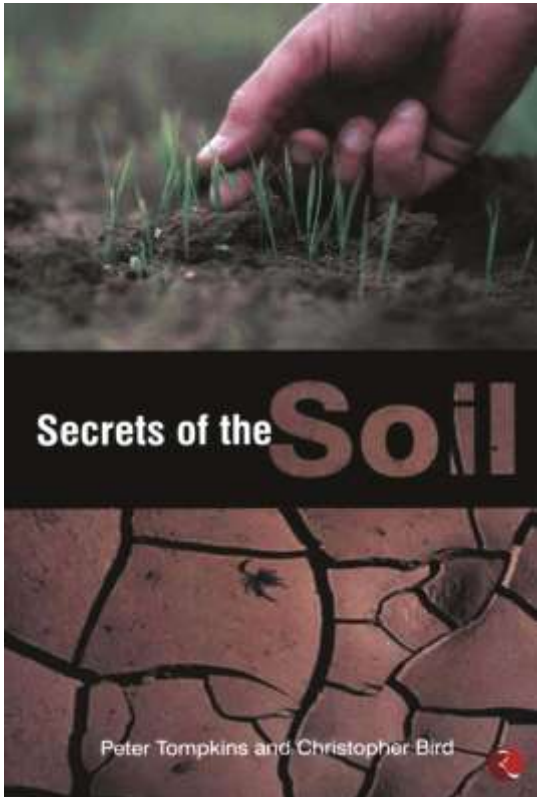
- HighBrixGardens.com
  - 43 lbs/acre
  - 43 oz/acre (water)

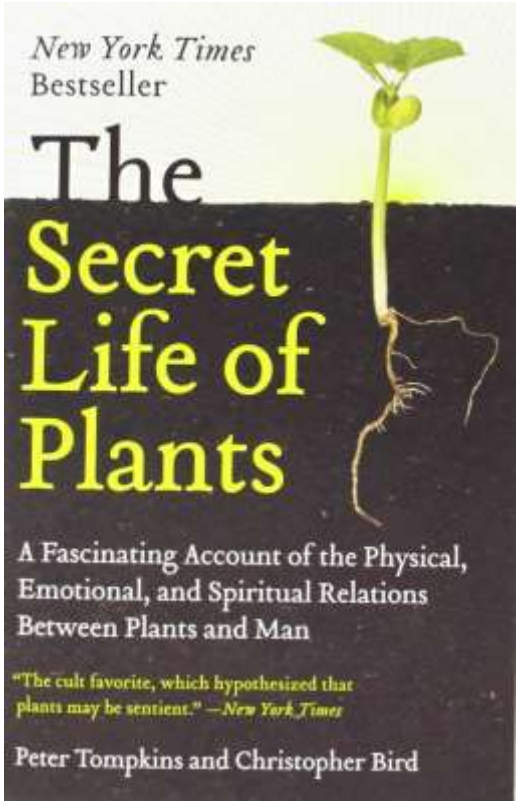
Periodic Table of the Elements



Physics

- Sunlight, Moonlight, Starlight
- Earth's Magnetic Field (Trees N/S)
- Song birds
- Music
- Your energy





Industrial Mindset

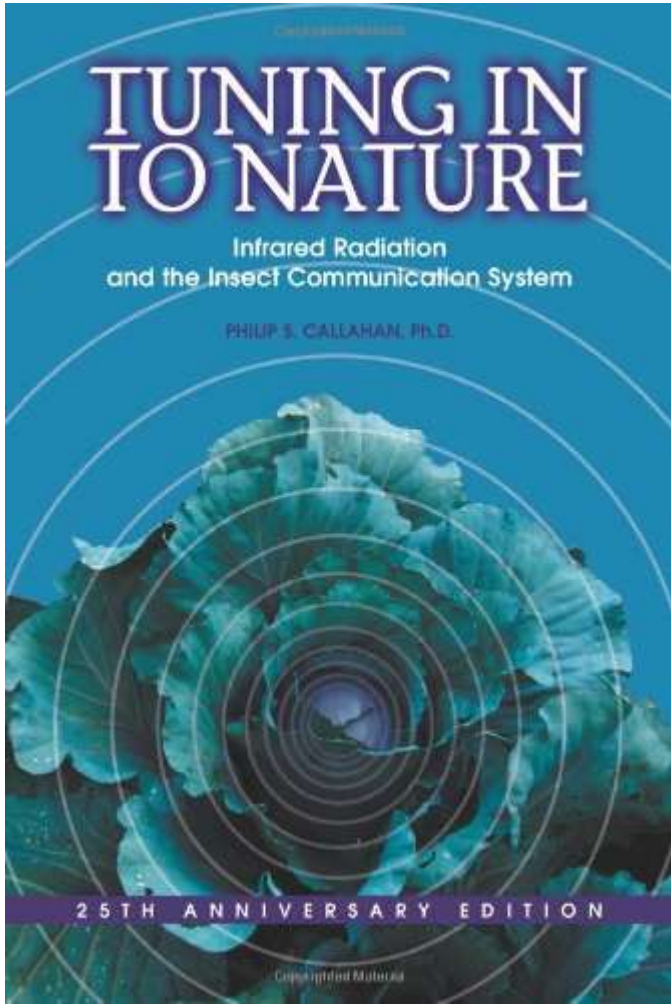
- Plants attract insects and pathogens
  - Root cause—lack of pesticide(s)
- Weeds always grow
  - Root cause—lack of herbicide(s)
- Humans feed plants
  - Root cause—lack of chemical fertilizer (N, P, K)
- Farmer paid for quantity
  - Quality doesn’t really matter!

Your Mindset

- Sick plants attract insects and pathogens
  - Root cause—poor soil health
- Weeds grow best in “poor” soil
  - Root cause—”poor” soil health
- Biology feeds plants
  - Recycled plants & animals
  - All 90 natural minerals—sand, silt, clay
- Quality is all that matters
  - It’s FOOD—your health depends on it!

Insects

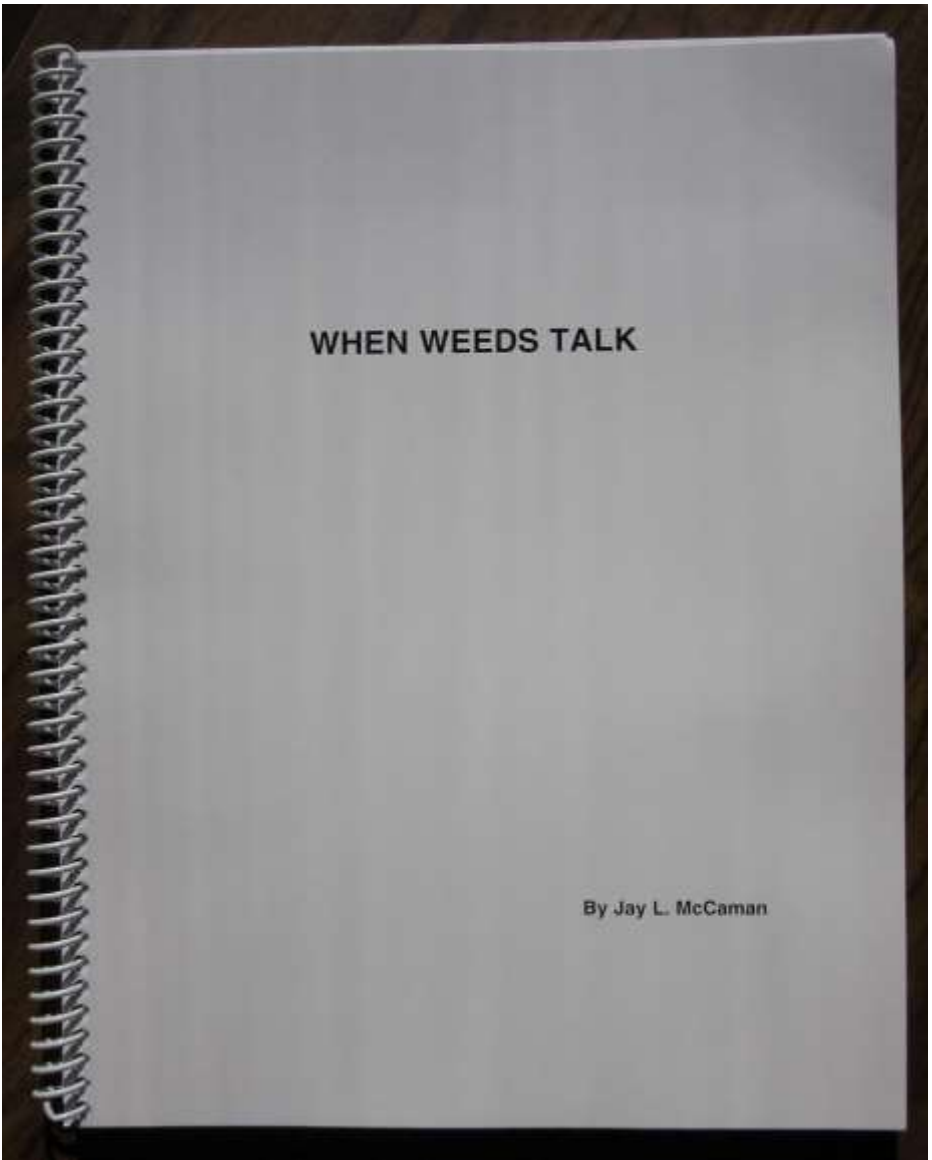
- Nature's garbage collectors
  - Sick plants radiate off-frequency
  - Get Brix ≥ 12

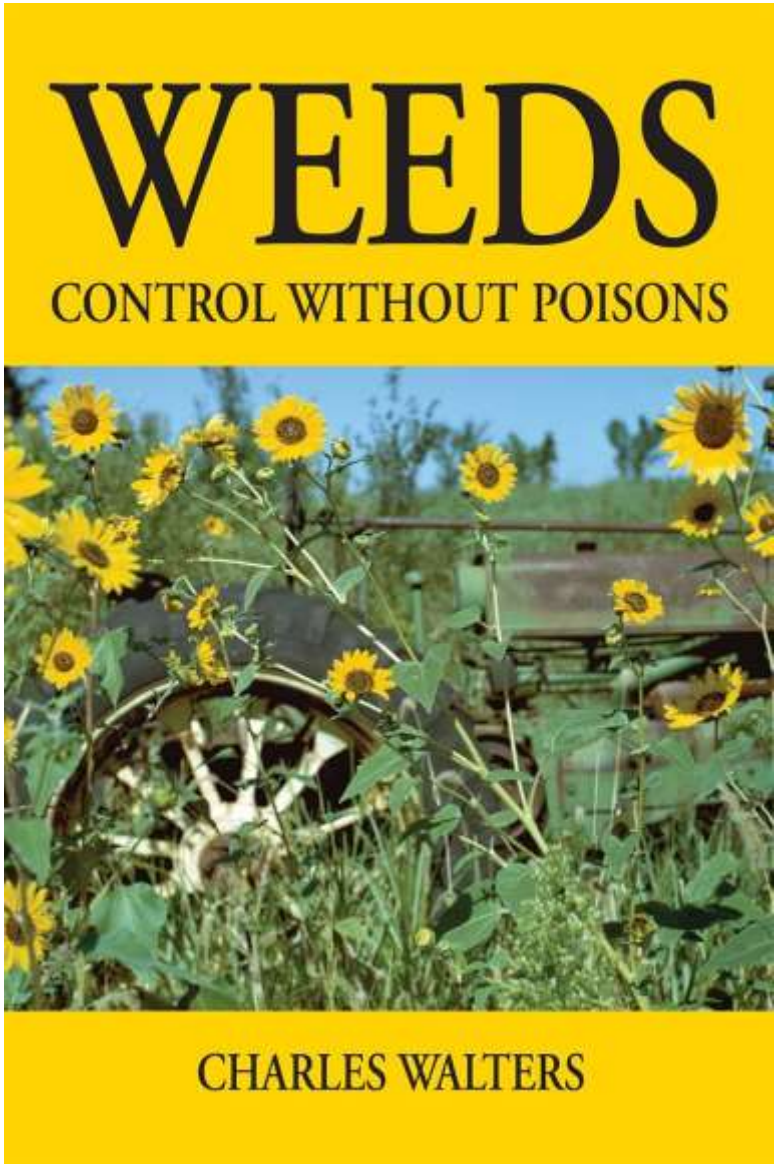


Weeds

- Workers preparing the ground
  - Building up what's missing (ie Ca)
  - Manage for what you want vs what you have

Weeds

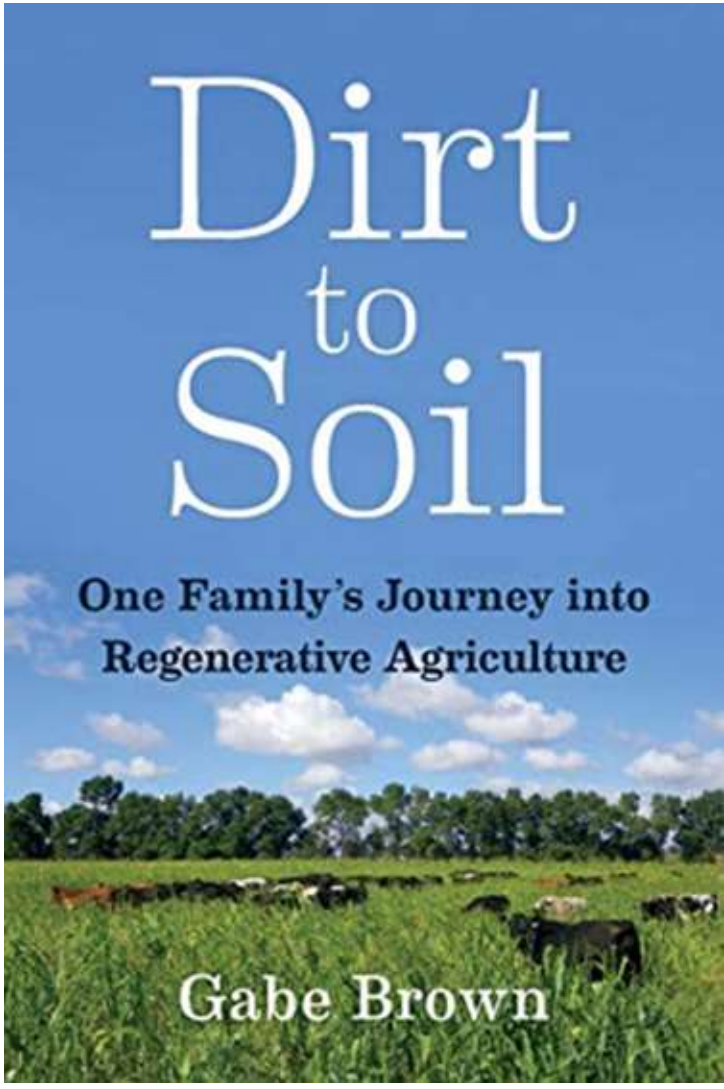

WHEN WEEDS TALK
By Jay L. McCaman


WEEDS
CONTROL WITHOUT POISONS
CHARLES WALTERS

Do This! Regenerative Agriculture

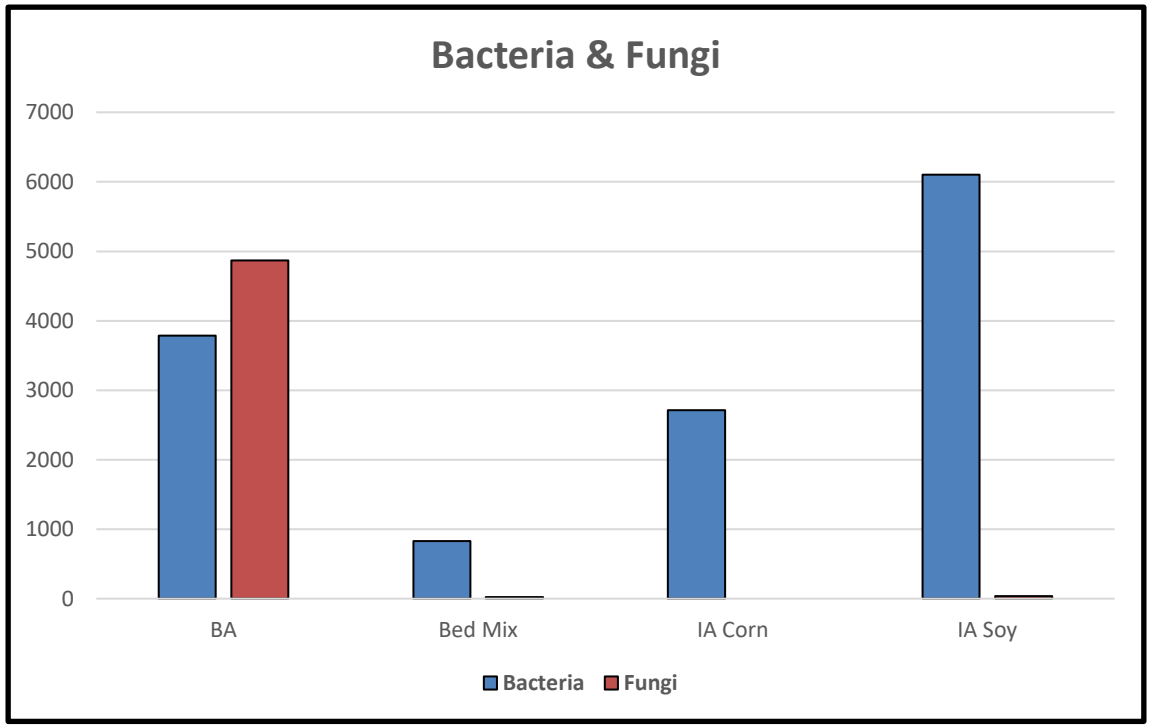
- Farming & grazing principles:
  - Limit Disturbance
  - Armor the Soil Surface
  - Build Diversity
  - Keep Living Roots in Soil
  - Integrate Animals

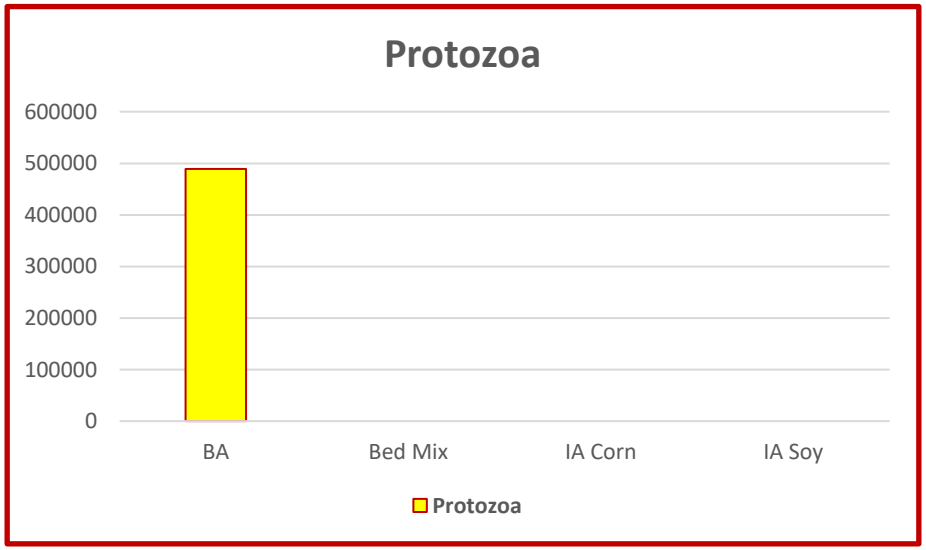
- Urban Landscaping Too!!

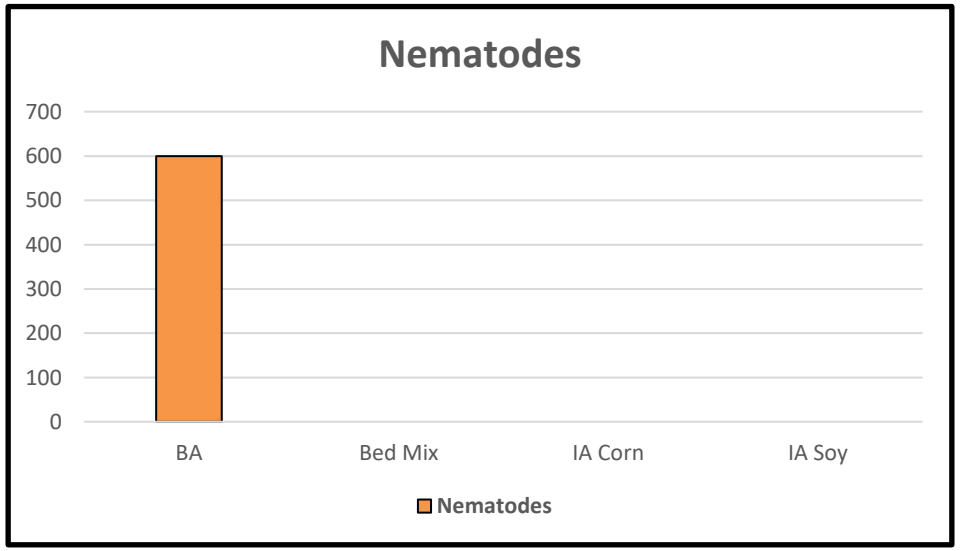


AFExtractDrenchResults_2022-04-11

Beneficial Microorganisms	Sample Results
Bacterial Biomass (µg/g)	724.142
Bacterial Standard Deviation Biomass (µg/g)	87.835
Bacterial Standard Deviation as Percentage of Mean	12.10%
Actinobacterial Biomass (µg/g)	0.167
Actinobacterial Standard Deviation Biomass (µg/g)	0.16
Actinobacterial Standard Deviation as Percentage of Mean	95.90%
Fungal Biomass (µg/g)	851.77
Fungal Standard Deviation Biomass (µg/g)	882.451
Fungal Standard Deviation as Percentage of Mean	103.60%
Fungal Average Diameter - Weighted Mean (um)	6.881
F:B Ratio	1.176
Total Beneficial Protozoa (number/g)	136953
Flagellates (number/g)	61629
Flagellates Standard Deviation (number/g)	19519
Flagellates Standard Deviation as Percentage of Mean	31.70%
Amoebae (number/g)	75324
Amoebae Standard Deviation (number/g)	22968
Amoebae Standard Deviation as Percentage of Mean	30.50%
Bacterial-feeding Nematodes (number/g)	21
Fungal-feeding Nematodes (number/g)	0
Predatory Nematodes (number/g)	0
Detrimental Microorganisms	
Oomycetes Biomass (µg/g)	0
Oomycetes Standard Deviation Biomass (µg/g)	0
Oomycete Standard Deviation as Percentage of Mean	0.00%
Oomycetes Average Diameter - Weighted Mean (um)	0
Ciliates (number/g)	3424
Ciliates Standard Deviation (number/g)	4688
Ciliates Standard Deviation as Percentage of Mean	136.90%
Root-feeding Nematodes (number/g)	0
Total Beneficial Protozoa Standard Deviation (number/g)	35807
Total Beneficial Protozoa Standard Deviation as Percentage of Mean	26.10%


Bacteria & Fungi
7000
6000
5000
4000
3000
2000
1000
0
BA
Bed Mix
IA Corn
IA Soy
Bacteria
Fungi


Protozoa
600000
500000
400000
300000
200000
100000
0
BA
Bed Mix
IA Corn
IA Soy
Protozoa

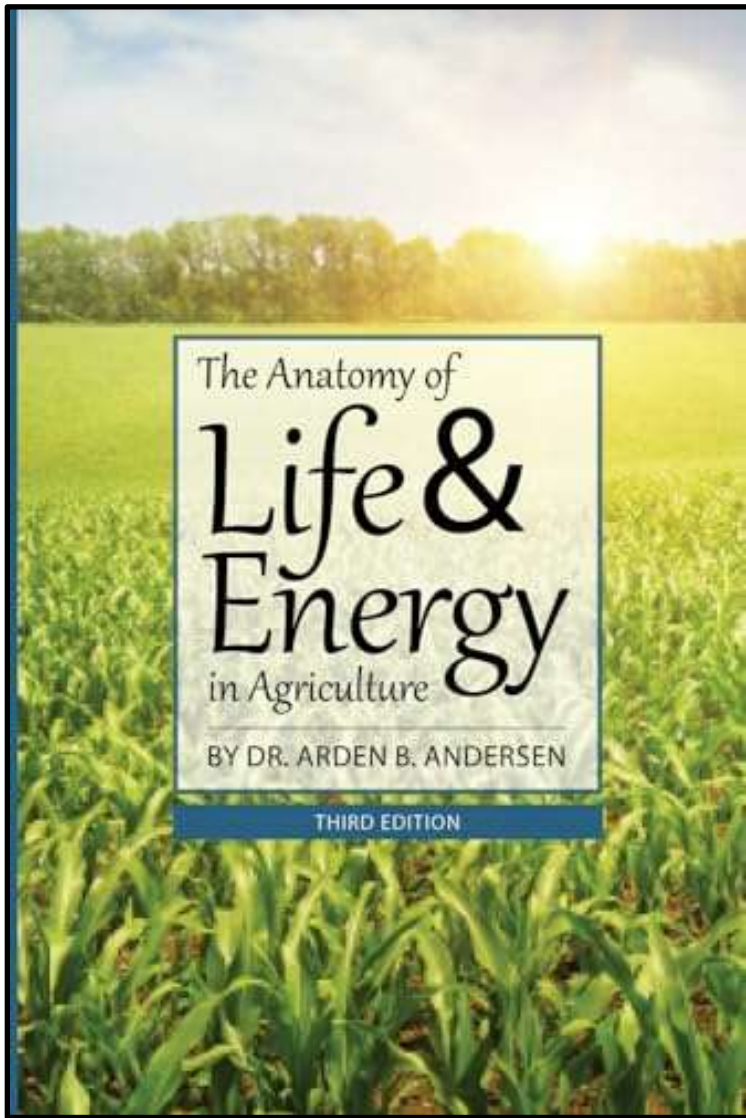

Nematodes
700
600
500
400
300
200
100
0
BA
Bed Mix
IA Corn
IA Soy
Nematodes

Garden Repair

Garden Repair

Dr Arden Andersen

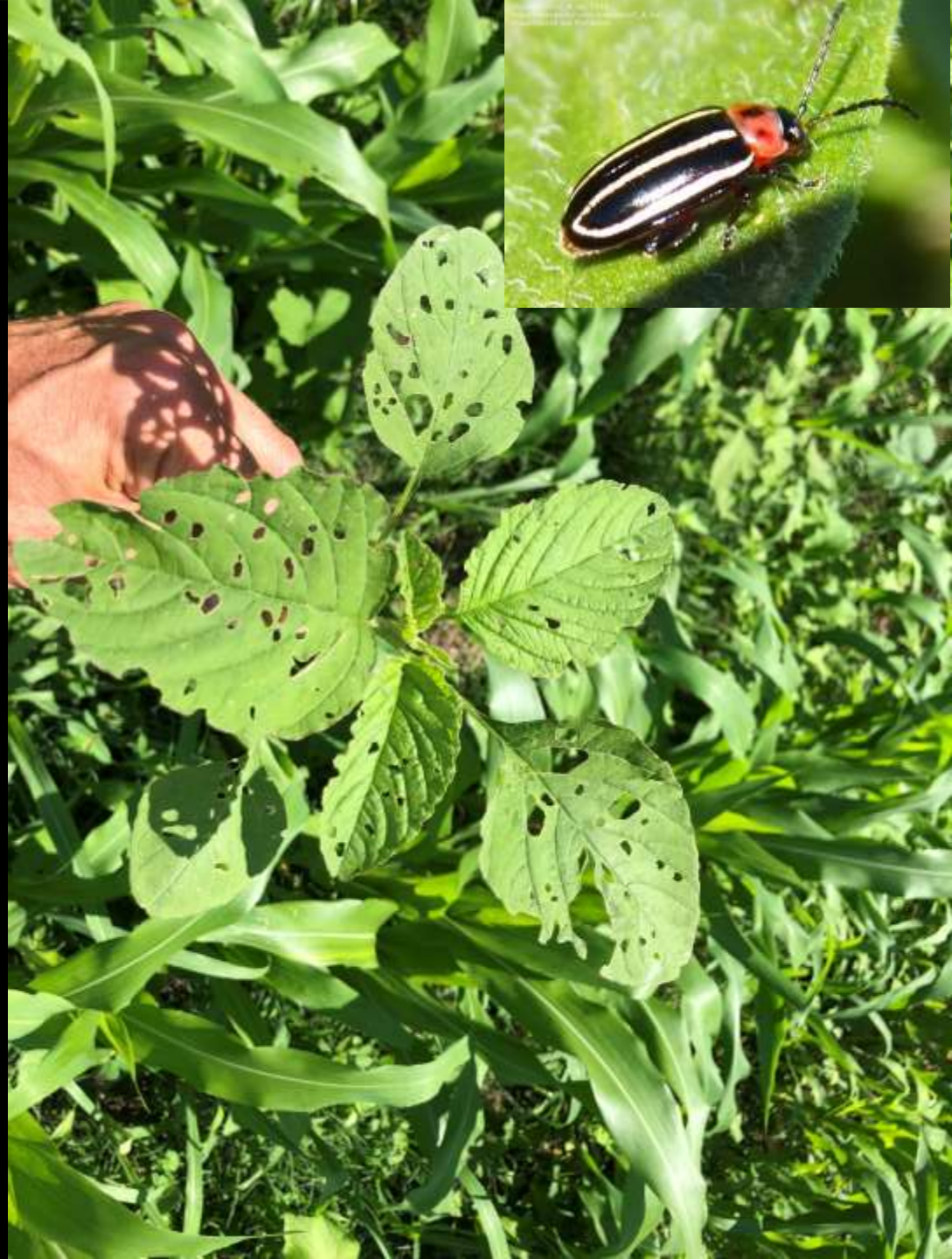
- (All per 1000 $ft^{2)}$
- Soft Rock Phosphate 12 lbs
- High-calcium lime 23-46 lbs
- Ammonium sulphate 2.3 lbs
- Compost 12-184 lbs



Foliar Sprays--KNF

From Scratch

- Build soil from ground up!
- Easy Recipe: Carbon (microbiome food)
  - Wood chips, old hay, straw, bedding, etc
  - Inoculate with biology
  - Cover plants



From Scratch—David Yarrow (Article: Soil Carbon Sink)

- Better Recipe: Lasagna—alternating layers
  1. Rough biomass (wood chips as much as 12”)
  2. Manure
  3. Biochar & Minerals
  4. Soil or dirt
  5. Finer biomass (leaves or hay)
  6. Repeat Layer 2
  7. Repeat Layer 3
  8. Repeater Layer 4
  9. Water and inoculate top layers (Boron, bone & blood meal, volcanic rock dust, Azomite, Sea Salt)

Biochar

- Like charcoal, but pyrolysis process
- Not a fertilizer but a facilitator
  - "Coral Reef" for microbes & minerals
- Terra Preta soils in the Amazon Basin

Cardboard, Log Chunks (Hugelkultur)

Wood Chips, Chicken Manure

Biochar, Compost & Topsoil

Leaves, Manure, Compost & Topsoil, Water

Biology, Compost & Topsoil, Meals/Dust/Salt

Biology, Compost & Topsoil, Meals/Dust/Salt

Richard Cleve’s Pasture Garden

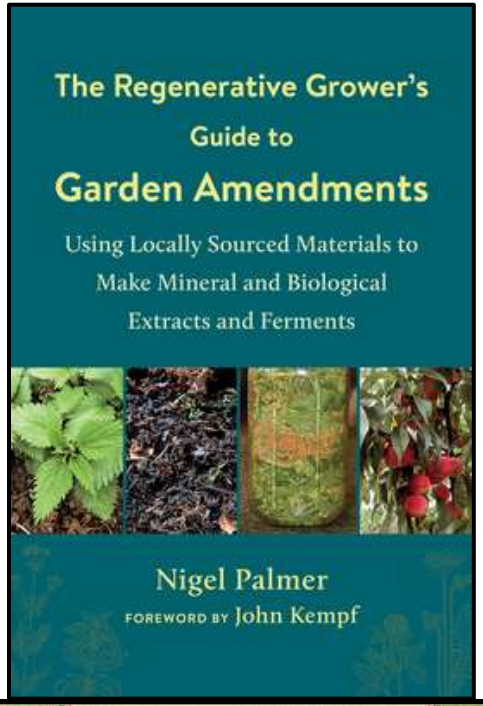
Caution for Materials

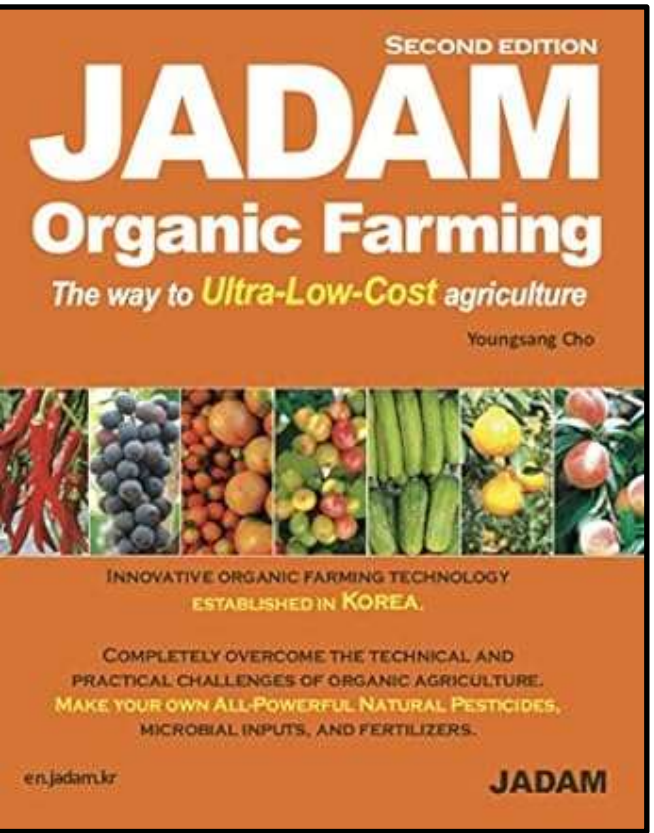
- Gather “organic” foods
  - If it’s lived once, it can live again!
- Bacteria & Fungi take it from there!

- CAUTION—Persistent Herbicides
  - NC State “Herbicide Carryover in Hay, Manure, Compost, & Grass Clippings”

Persistent Herbicides

- Corteva's Grazon® (Aminopyralid)
  - Broadleaf weed control in pasture


The Regenerative Grower's
Guide to
Garden Amendments
Using Locally Sourced Materials to
Make Mineral and Biological
Extracts and Ferments
Nigel Palmer
FOREWORD BY John Kempf


SECOND EDITION
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Organic Farming
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INNOVATIVE ORGANIC FARMING TECHNOLOGY
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COMPLETELY OVERCOME THE TECHNICAL AND
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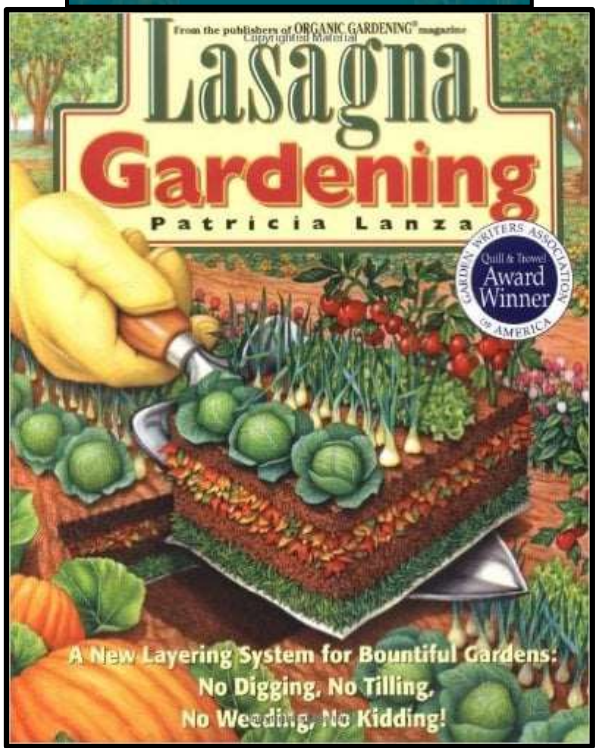
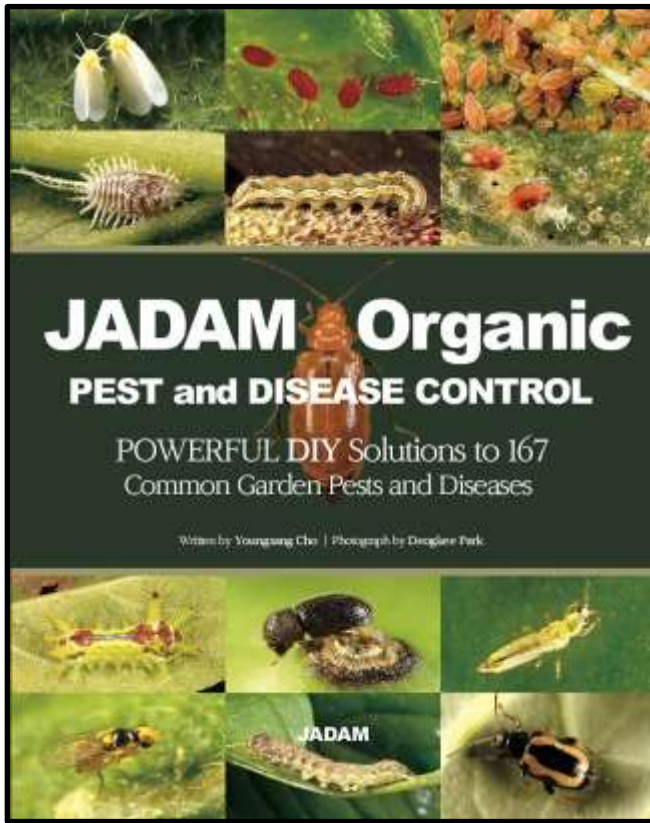

From the publishers of ORGANIC GARDENING® magazine
Lasagna
Gardening
Patricia Lanza
Quill & Trowel
Award
Winner
A New Layering System for Bountiful Gardens:
No Digging, No Tilling,
No Weeding, No Kidding!


JADAM Organic
PEST and DISEASE CONTROL
POWERFUL DIY Solutions to 167
Common Garden Pests and Diseases
Written by Youngsang Cho | Photograph by Deoglare Park
JADAM

Is it Nutrient Dense?

- Taste
- $20 Brix Meter/Refractometer
- Dr Carey Reams (1903-1985)

Refractive Index of Crop Juices -- Calibrated In % Sucrose Or ºBrix

	Poor	Average	Good	Excellent
FRUITS				
Apples	6	10	14	18
Avocados	4	6	8	10
Bananas	8	10	12	14
Blueberries	8	12	14	18
Cantaloupe	8	12	14	16
Casaba	8	10	12	14
Cherries	6	8	14	16
Coconut	8	10	12	14
Grapes	8	12	16	20
Grapefruit	6	10	14	18
Honeydew	8	10	12	14
Kumquat	4	6	8	10
Lemons	4	6	8	12
Limes	4	6	10	12
Mangos	4	6	10	14
Oranges	6	10	16	20
Papayas	6	10	18	22
Peaches	6	10	14	18
Pears	6	10	12	14
Pineapple	12	14	20	22
Raisins	60	70	75	80
Raspberries	6	8	12	14
Strawberries	6	8	12	14
Tomatoes	4	6	8	12
Watermelons	8	12	14	16
GRASSES				
Alfalfa	4	8	16	22
Grains	6	10	14	18
Sorghum	6	10	22	30

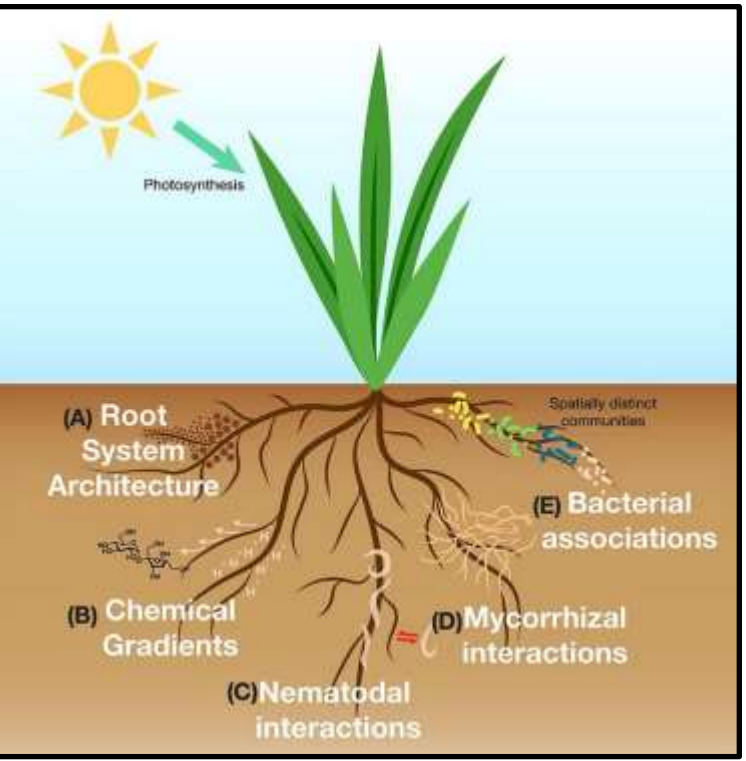
	Poor	Average	Good	Excellent
VEGETABLES				
Asparagus	2	4	6	8
Beets	6	8	10	12
Bell Peppers	4	6	8	12
Broccoli	6	8	10	12
Cabbage	6	8	10	12
Carrots	4	6	12	18
Cauliflower	4	6	8	10
Celery	4	6	10	12
Corn Stalks	4	8	14	20
Corn (Young)	6	10	18	24
Cow Peas	4	6	10	12
Cucumbers	2	3	4	5
Endives	4	6	8	10
English Peas	8	10	12	14
Escarole	4	6	8	10
Field Peas	4	6	10	12
Garlic, Cured	28	32	36	40
Green Beans	4	6	8	10
Hot Peppers	4	6	8	10
Kale	8	10	12	16
Kohlrabi	6	8	10	12
Lettuce	4	6	8	10
Onions	4	6	8	10
Parsley	4	6	8	10
Peanuts	4	6	8	10
Potatoes	3	5	7	8
Potatoes, Sweet	6	8	10	14
Romaine	4	6	8	10
Rutabagas	4	6	10	12
Spinach	6	8	10	12
Squash	6	8	12	14
Sweet Corn	6	10	18	24
Turnips	4	6	8	10

Within a given species of plant, the crop with the higher refractive index will have a higher sugar content, higher mineral content, higher protein content and a greater specific gravity or density. This adds up to a sweeter tasting, more minerally nutritious food with lower nitrate and water content, lower freezing point, and better storage attributes.

Scale Up to Pasture

Dr Ream's 80/20 Rule

- 80% of plant mass comes from the air
- 20% from the soil



Organic Matter:
100 lbs above & 100 lbs below
- 160 lbs air & 40 lbs soil

Cover Plant Diversity

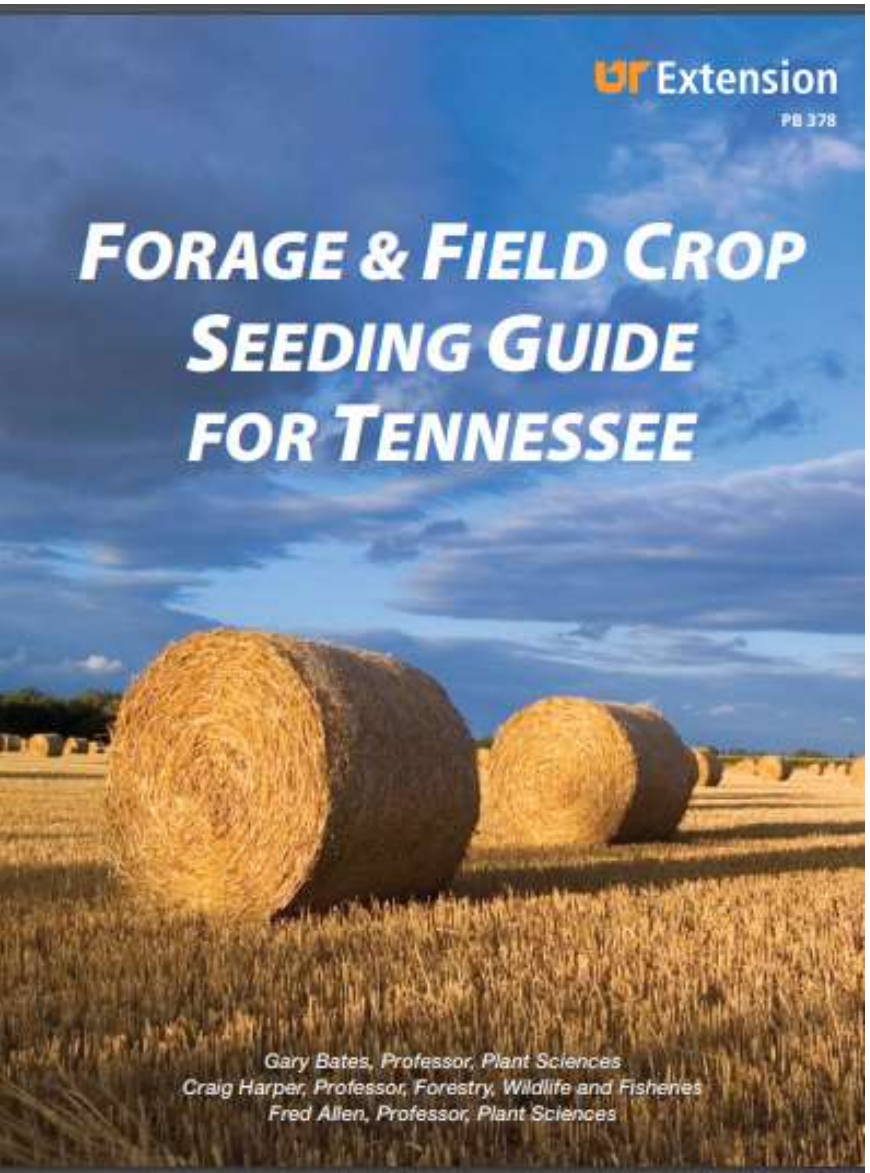


Photo Source: Soil Science Society of America

My Favorites

- Cool Season
  - Hairy Vetch, Austrian Winter Peas
  - Red & White Clover (4 & 2 lbs/acre)
  - Cereal Rye & Wheat
  - Orchardgrass

- Warm Season
  - Sorghum/Sudan
  - Buckwheat

- Green Cover (Greencover.com)

Rotational Grazing

Before: Broomsedge Bumper Crop

Scale Up to Row Crops

- York Family Farms (10,000 acres): York Farms Illinois AgriBio systems Project - YouTube
- Rick Clark in Indiana (7000 acres)

More Info

- www.Libertytracefarm.com
  - Book/Resource Tab
  - Classes on website & Social Media

More Info

- Weston Price Foundation (https://www.westonaprice.org/)

- Childrens Health Defense (https://childrenshealthdefense.org/)
  - Culprits: Nutrition, EMF, Vaccines, Glyphosate & “Icides”, Other Toxins (PFAS, PFOAs, etc)