

# Busting Bins: Tips and Tactics for Strip-Tilling High-Yielding Corn

Jeff Herrold  
Wanatah IN



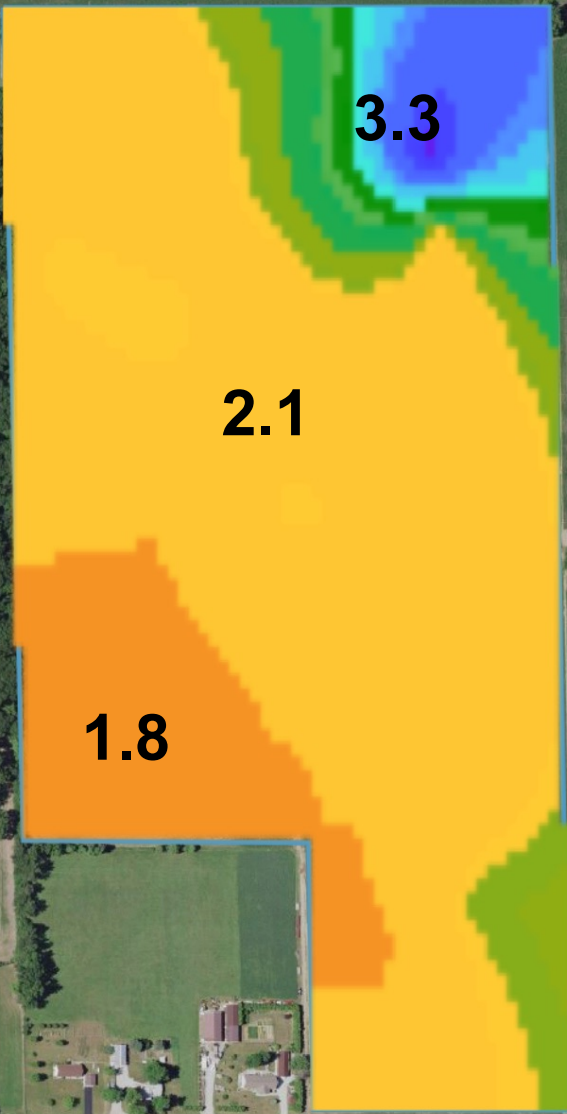


# BIN BUSTING YIELDS



The 70  
2017  
Soil Test - 11/15/2015 - OM Map

# THE 70



S County Highway 800 W

W900 S

W900 S

W900 S

# COVER CROPS







The 70  
2017  
Yield Map

Planted: 5-13-17  
Population: 35,000-38,500  
Hybrid: Wyckoff 2665 VT2P  
RIB



	> 300 bu/ac
	294 - 300 bu/ac
	289 - 294 bu/ac
	283 - 289 bu/ac
	278 - 283 bu/ac
	272 - 278 bu/ac
	267 - 272 bu/ac
	261 - 267 bu/ac

Legal

W900S

W900S

W900E





**FERTILITY:**  
**253-73-83-56 S**

# Nitrogen Timing

- Pre-plant -60 units
- At Planting – 35 units
- Sidedress – 100 units
- Irrigation/Y-drops – 55 units

## Foliar

- W/rdup- micro mix 1qt
- W/fungicide – micros 1/2#

## Fungicide

- 2 Applications

## Potassium

- 50 units thru pivot



# Even Emergence





<b>Date</b>	<b>GDU's</b>	
4/27/2017	5	
4/28/2017	5	
4/29/2017	0	
4/30/2017	7.5	
5/1/2017	6.5	
5/2/2017	0	
5/3/2017	3	
5/4/2017	0	
5/5/2017	0	
5/6/2017	1	
5/7/2017	2.5	
5/8/2017	4.5	
5/9/2017	3.5	
5/10/2017	13	
5/11/2017	5.5	
5/12/2017	9.5	
5/13/2017	14	
	<b>80.5</b>	



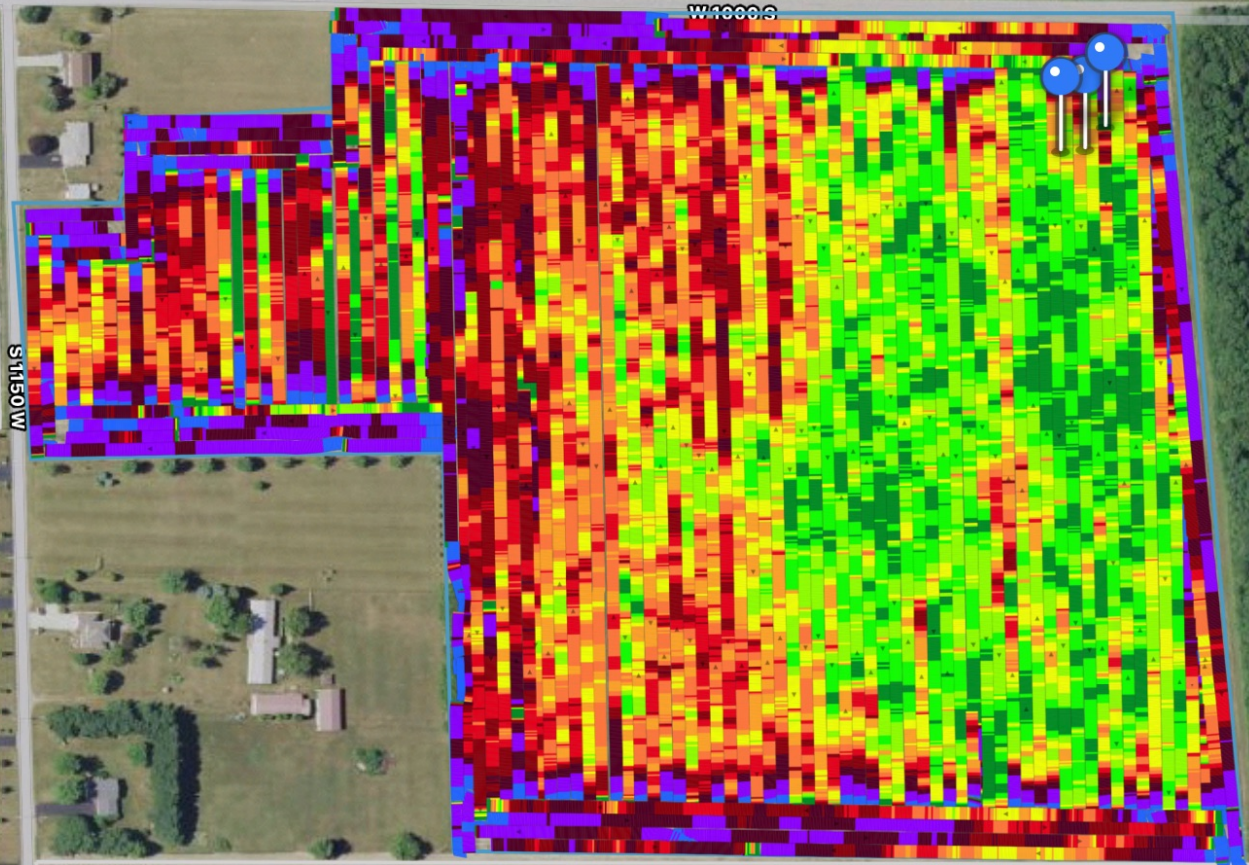


1000S

W1900S

S1150W

S1150W



**West side: 200bu-220bu**  
**East side: 255bu-275bu**

> 275 bu/ac
264 - 275 bu/ac
253 - 264 bu/ac
244 - 253 bu/ac
237 - 244 bu/ac
229 - 237 bu/ac
220 - 229 bu/ac
206 - 220 bu/ac

W1000S

W1800S

W1000S






S1150W

S1150W

2.8

3.2



	4.5
	3
	2



Report Number  
F17178-5060  
Account Number  
37670



a&lgreatlakes  
LABORATORIES  
Scientists who don't mind getting dirty.™

3505 Conestoga Dr.  
Fort Wayne, IN 46808  
260.483.4759  
algreatlakes.com

To: HERROLD FARMS  
7707 S US HWY 421  
WESTVILLE, IN 46391

# TISSUE

Sample ID: 2665  
Plant Type: CORN  
Growth Stage: PRIOR TO TASSELING  
Plant Part: LEAF

Attn: PAUL HERROLD

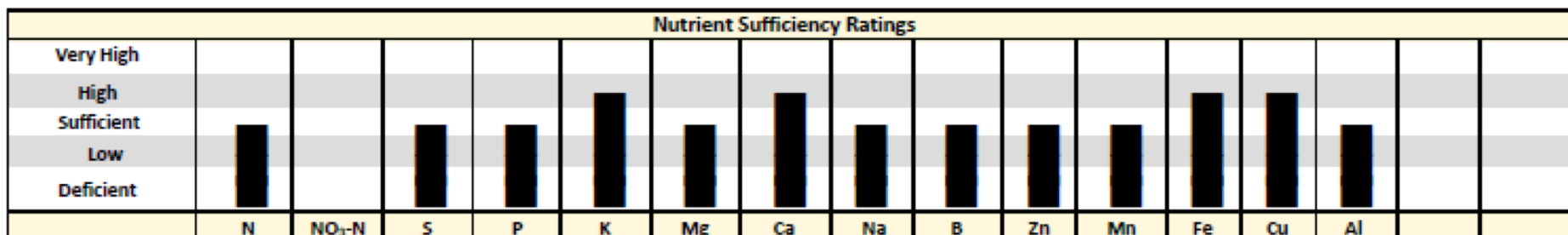
## ANNUAL ANALYSIS REPORT

Date Received: 6/27/2017  
Date Reported: 6/28/2017

Page: 1 of 9

Date Sampled	Lab Number	Nitrogen (%)	Nitrate Nitrogen (%)	Sulfur (%)	Phosphorus (%)	Potassium (%)	Magnesium (%)	Calcium (%)	Sodium (%)	Boron (ppm)	Zinc (ppm)	Manganese (ppm)	Iron (ppm)	Copper (ppm)	Aluminum (ppm)		
06/26	823322	3.29		0.43	0.36	3.15	0.14	0.67	0.01	14	28	51	242	16	68		
Normal Range		3.00 3.50		0.15 0.50	0.25 0.45	2.00 2.50	0.13 0.30	0.25 0.50	0.03	4 25	15 60	15 300	10 200	3 15	1 300		

	N/S	N/K	P/S	P/Zn	K/Mg	K/Mn	Fe/Mn	Ca/B								
Actual Ratio	7.7	1.0	0.8	128	22.1	617	4.7	487								
Expected Ratio	10.0	1.4	1.1	93	10.5	143	0.9	259								



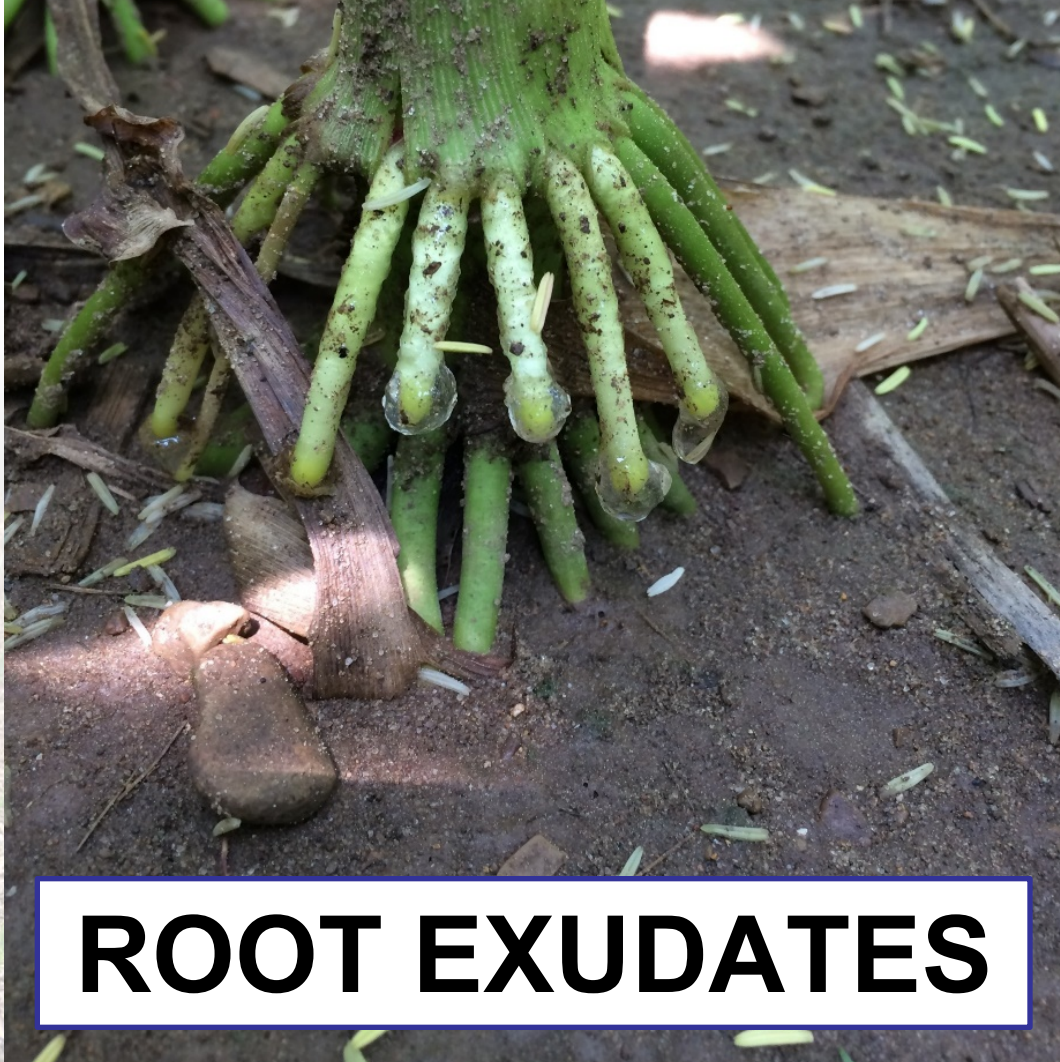
# Tissue Sample Levels

- Nitrogen - above 4 – Split apply
- Phosphorous- above .35 -
- Potassium- above 2.5 – split apply
- Sulfur- 8:1-10:1 ratio N:S – always put w/ N
- Magnesium – above .25 – less gypsum, k-mag
- Zinc – above 40 – split apply
- Boron- above 10 - Put on soil, 4 times



# SOIL HEALTH





# ROOT EXUDATES



# 2005

## How to achieve the highest yield?

- Eliminate Compaction
- Balance of Nutrients
- Good seedbed
- Water management











# WATER INFILTRATION



**I CHECKED THE CROPS,  
THEY LOOK GREAT!!!**





# SHOP FIELD

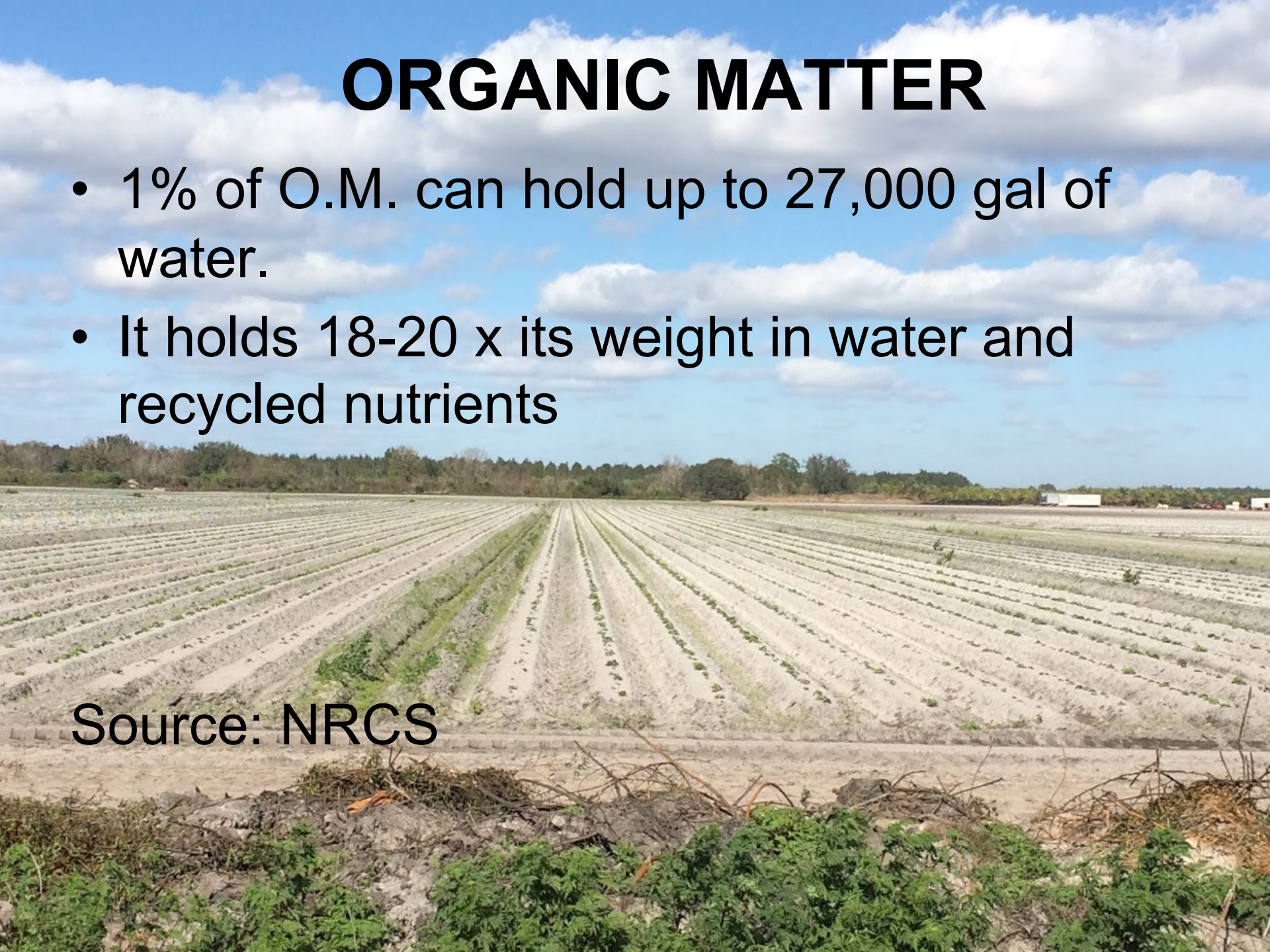
YEAR	O.M.
2007	3.05
2011	2.94
2014	2.69
2015	2.57



# ORGANIC MATTER

- 1% of O.M. can hold up to 27,000 gal of water.
- It holds 18-20 x its weight in water and recycled nutrients

Source: NRCS



The question is not can we grow something, we can grow things on mars. It's how many resources is it going to take and from where?



# SOIL TEST SUMMARY

Sample ID	PH	O.M.	Nitrate	CEC	P	K	SU	ZN
COVER CROP #1	6.6	2.6	1.3	8.8	98	255	9.2	3.75
CONVENTIONAL #2	6.8	2.3	2.1	8.1	36	277	6.7	2.24
NO-TILL #3	7	2.3	1.8	9.6	35	176	8.1	2.74
FENCE ROW #4	5.8	8.8	7.9	20.6	147	548	14.6	10.08



# 2018

## How to achieve the highest PROFIT long term?

- High Yield
- Eliminate Compaction
- Balance of Nutrients
- Good seedbed
- Water management
- Regenerate our soil
- Good stewards
- Increase Soil Health







**“While the farmer holds the title to the land, actually it belongs to all the people because civilization itself rests upon the soil.”– Thomas Jefferson**

**“The nation that destroys soil, destroys itself.” Franklin D. Roosevelt**



# Soil Health

- **Soil health**, also referred to as **soil quality**, is **defined** as the continued capacity of **soil** to function as a vital living ecosystem that sustains plants, animals, and humans.

Source: NRCS



# SOIL HEALTH

Pore spaces are  
Essential for Biology  
And Water Infiltration



# Poor soil aggregation:

- Clogs the pores
- Crusting
- Poor water infiltration



**1 inch rain event**  
**A.K.A = FLOOD**



**We do not have a rainfall problem,  
But a water infiltration problem.**



# The Importance of Soil Biology for Soil Health

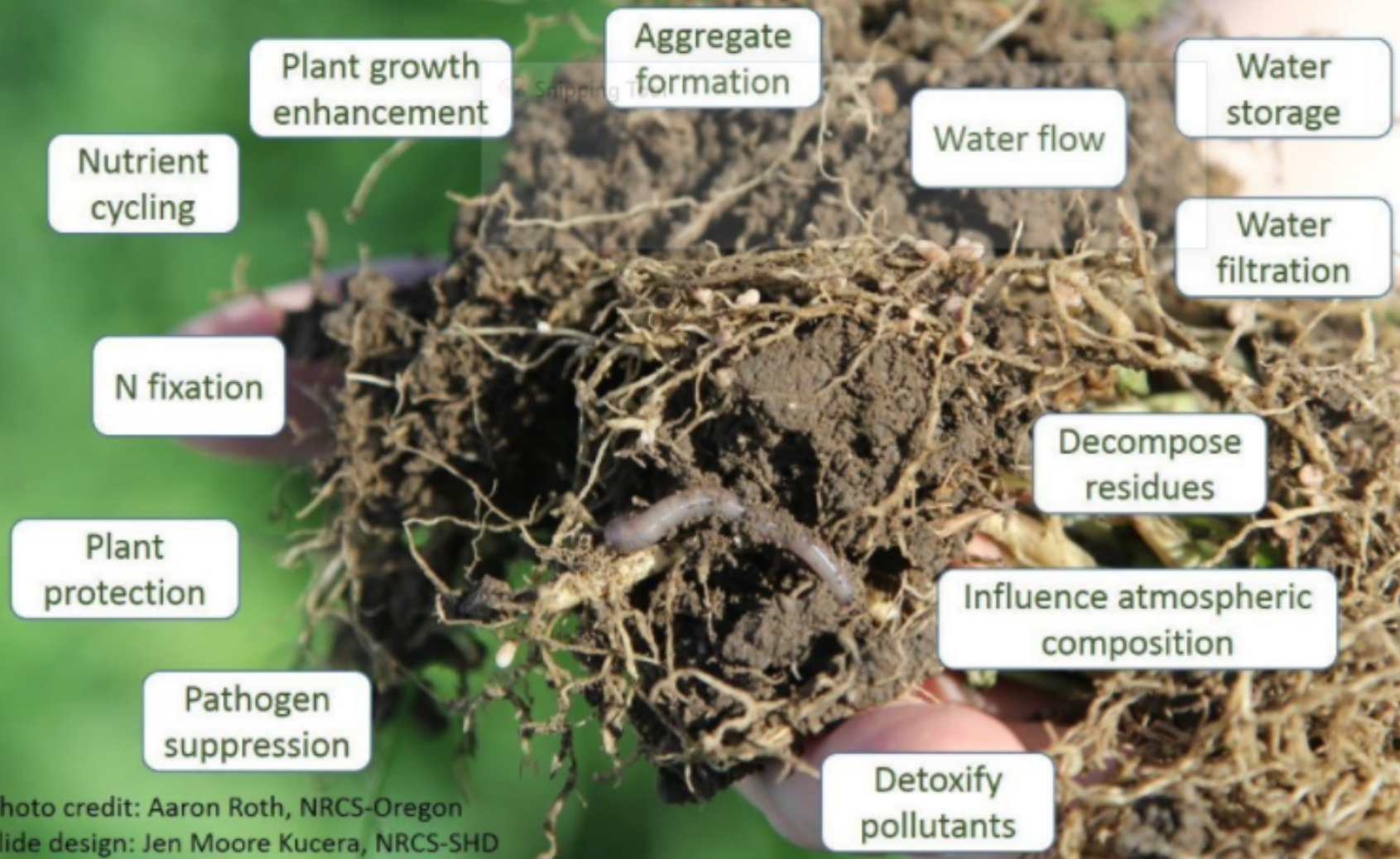


Photo credit: Aaron Roth, NRCS-Oregon  
Slide design: Jen Moore Kucera, NRCS-SHD

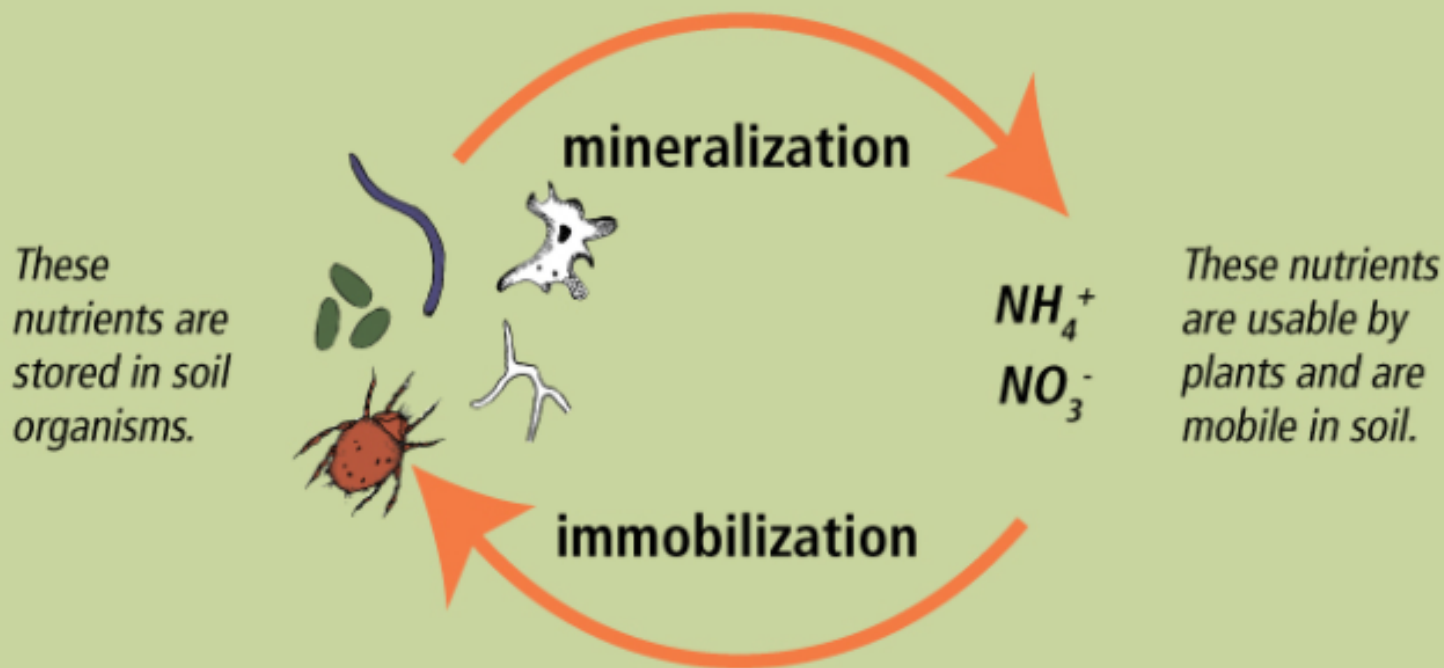




## Save Are Mineralization and Immobilization?

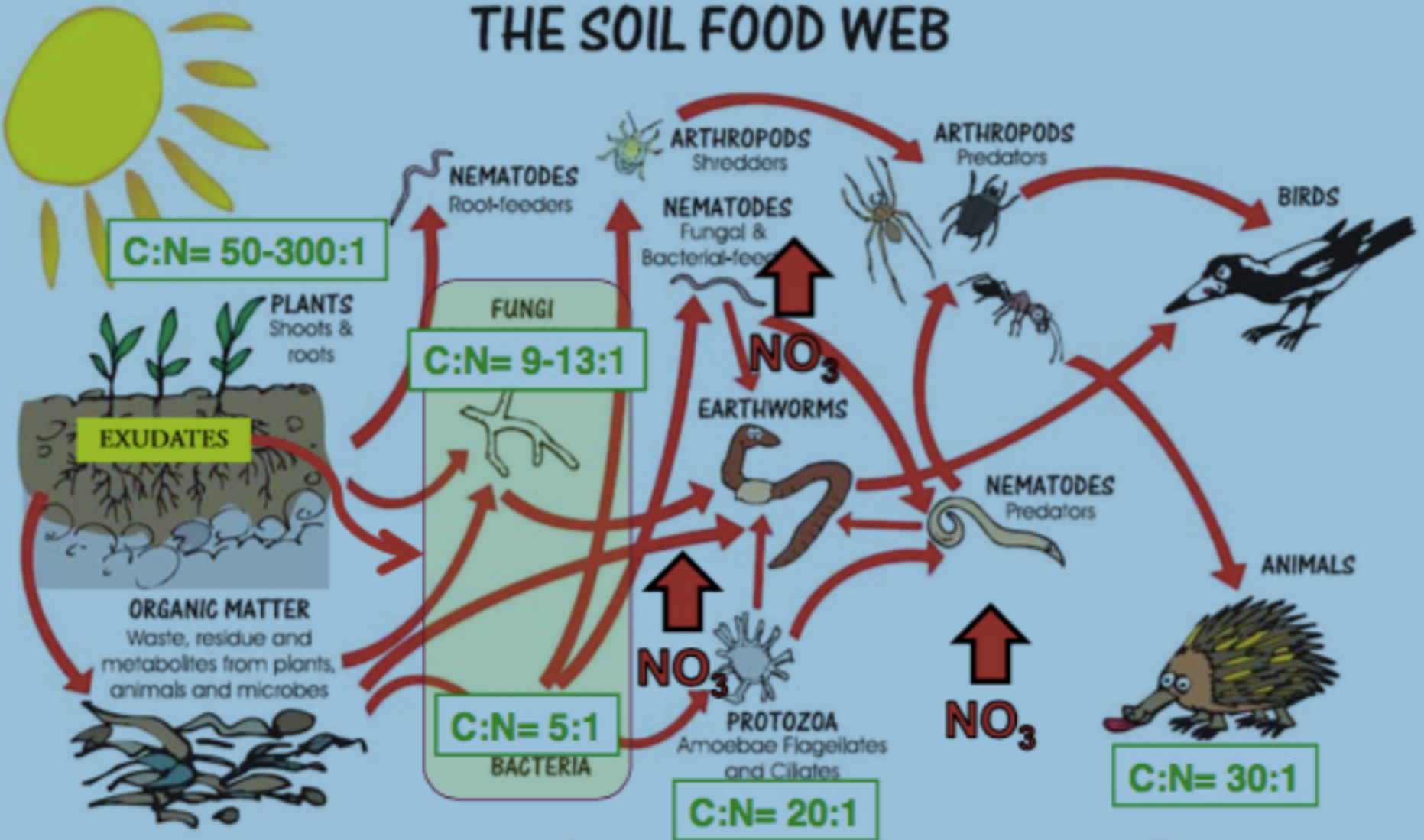
Soil nutrients generally occur in two forms: inorganic compounds dissolved in water or attached to minerals, and organic compounds part of living organisms and dead organic matter. Bacteria, fungi, nematodes, protozoa, and arthropods are always transforming nutrients between these two forms. When they consume inorganic compounds to construct cells, enzymes, and other organic compounds needed to grow, they are said to be "immobilizing" nutrients. When organisms excrete inorganic waste compounds, they are said to be "mineralizing" nutrients.

Organisms consume other organisms and excrete inorganic wastes.



Organisms retain nutrients as they grow.

# THE SOIL FOOD WEB

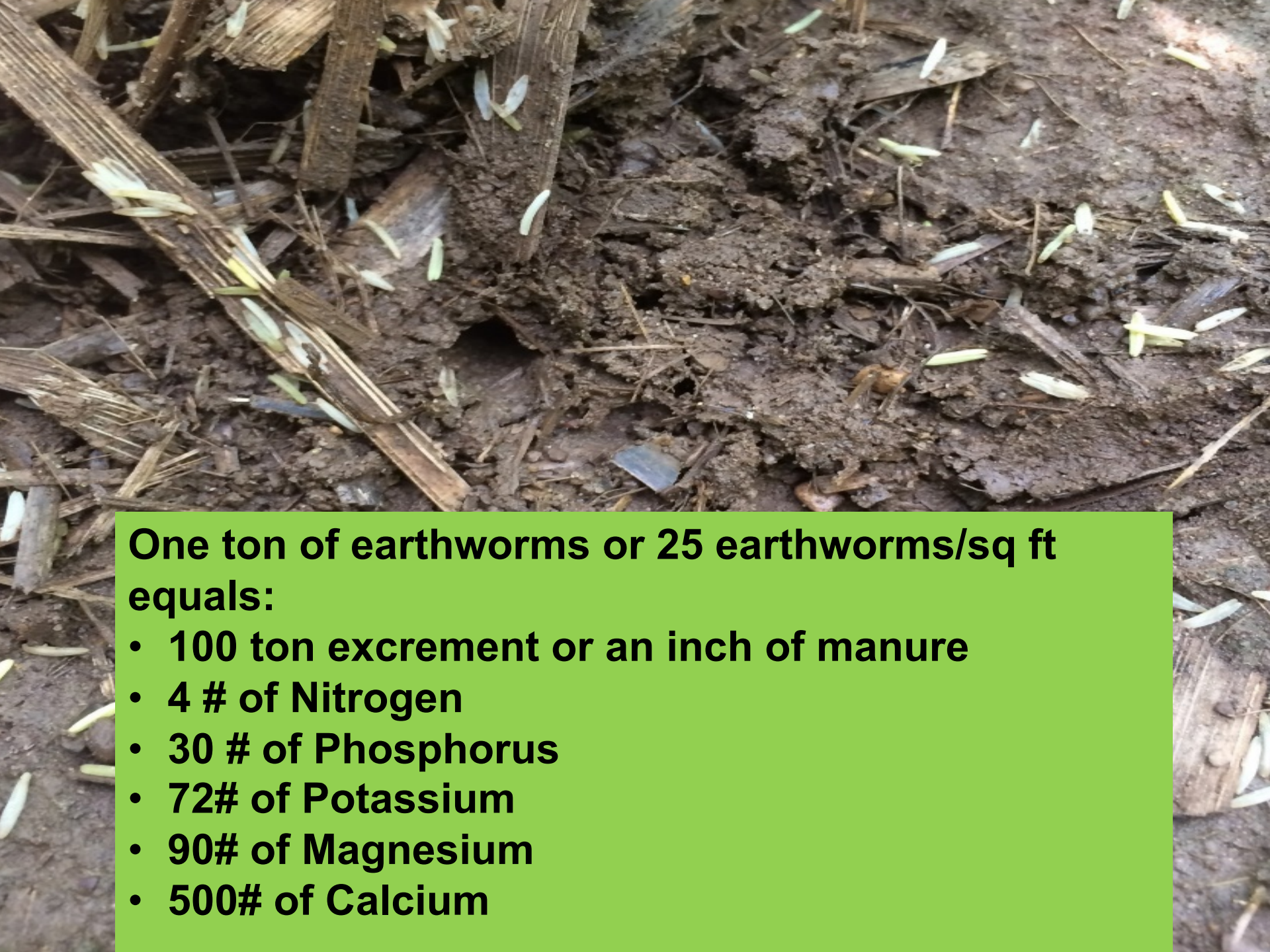


<http://www.sltec.com.au/sltec/images/cartoons/SLTEC-166-SOIL-FOOD-WEB.jpg>



# WE HAVE OUTSOURCED THE JOB OF THE MICROBES!!





**One ton of earthworms or 25 earthworms/sq ft equals:**

- **100 ton excrement or an inch of manure**
- **4 # of Nitrogen**
- **30 # of Phosphorus**
- **72# of Potassium**
- **90# of Magnesium**
- **500# of Calcium**



# BABY ARMYWORMS

EST. 2013

**MonTag**

**INGERSOLL**

**TOPCON**  
Agriculture

**SCHLAGEL**

**VULCAN**  
EQUIPMENT

**Yetter**  
FARM EQUIPMENT

# BENEFICIAL NEMATODES



Results For : HERROLD FARMS

Sample ID 1 : SHOP

Sample ID 2 : COVER CROP #1

## PLFA Soil Microbial Community Analysis

### Functional Group Biomass & Diversity

Total Living Microbial Biomass, Phospholipid Fatty Acid (PLFA) ng/g

3244.89

Functional Group Diversity Index

1.545

Total Biomass	Diversity	Rating
< 500	< 1.0	Very Poor
500+ - 1000	1.0+ - 1.1	Poor
1000+ - 1500	1.1+ - 1.2	Slightly Below Average
1500+ - 2500	1.2+ - 1.3	Average
2500+ - 3000	1.3+ - 1.4	Slightly Above Average
3000+ - 3500	1.4+ - 1.5	Good
3500+ - 4000	1.5+ - 1.6	Very Good
> 4000	> 1.6	Excellent

Functional Group	Biomass, PLFA ng/g	% of Total Biomass
Total Bacteria	1635.40	50.40
Gram (+)	1023.03	31.53
Actinomyces	334.31	10.30
Gram (-)	612.37	18.87
Rhizobia	31.01	0.96
Total Fungi	323.66	9.97
Arbuscular Mycorrhizal	92.92	2.86
Saprophytes	230.74	7.11
Protozoa	28.07	0.86
Undifferentiated	1257.77	38.76

## Community Composition Ratios

**Fungi:Bacteria** 0.1979

Bacteria tend to dominate in systems with fewer organic inputs or residues possibly leading to a lower C:N ratio. In addition, bacteria can be more prominent in the early spring or late fall as soil temperatures are usually cooler and vegetation is less active or absent. Dry conditions, slightly alkaline to alkaline pH values, or increased land disturbance through prolonged and extensive tillage, grazing, or compaction may also favor bacteria. While bacteria are important and needed in the soil ecosystem, fungi are desired and more often considered indicators of good soil health. Increased use of cover crops and/or other organic inputs and less soil disturbance should help the soil support more fungi. Adjustments to pH may also be recommended in some more extreme circumstances.

Scale	Rating
< 0.05	Very Poor
0.05+ - 0.1	Poor
0.1+ - 0.15	Slightly Below Average
0.15+ - 0.2	Average
0.2+ - 0.25	Slightly Above Average
0.25+ - 0.3	Good
0.3+ - 0.35	Very Good
> 0.35	Excellent

**Predator:Prey** 0.0172

This ratio is also expressed as protozoa to bacteria. Protozoa feed on bacteria which helps release nutrients, especially nitrogen. A higher ratio indicates an active community where base level nutrients are sufficient to support higher trophic levels or predators. However, this ratio will always be a relatively low number because the prey will greatly outnumber the predators.

Scale	Rating
< 0.002	Very Poor
0.002+ - 0.005	Poor
0.005+ - 0.008	Slightly Below Average
0.008+ - 0.01	Average
0.01+ - 0.013	Slightly Above Average
0.013+ - 0.016	Good
0.016+ - 0.02	Very Good
> 0.02	Excellent

**Gram (+):Gram (-)** 1.6706

Gram (+) bacteria typically dominate early in the growing season and/or following a fallow period. They also survive better under certain environmental conditions or stressors such as drought or extreme temperatures due to their ability to form spores. Therefore, it is common to see higher values when the community is coming out of dormancy or is stressed. These values will typically begin to approach those of a more balanced bacterial community as the soil conditions become more favorable throughout the growing season. A gram (-) dominated soil may be due to anaerobic conditions or other stressors such as pesticide application or heavy metal contamination.

Scale	Rating
< 0.5	Gram (-) Dominated
0.5+ - 1.0	Slightly Gram (-) Dominated
1.0+ - 2.0	Balanced Bacterial Community
2.0+ - 3.0	Slightly Gram(+) Dominated
3.0+ - 4.0	Gram(+) Dominated
> 4.0	Very Gram(+) Dominated



**“When we stand on the soil, we stand on the rooftop of another world.”  
Dr. Jill Clapperton**



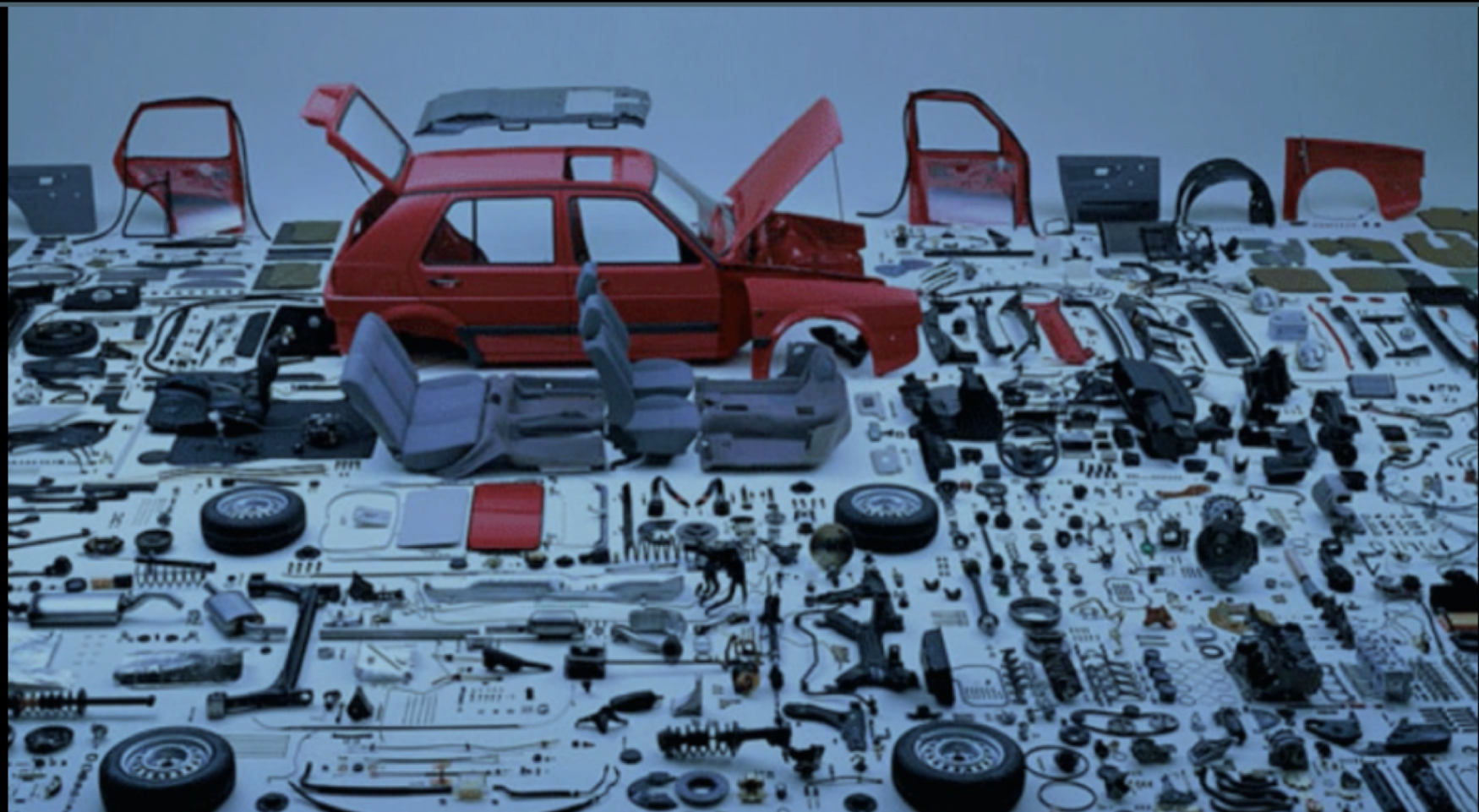
# How to get healthy soil. . .

The systems approach . . .

1. Till the soil as little as possible
2. Grow as many different species of plants
3. Keep living plants in the soil as long as possible
4. Keep the soil surface covered with residue









**A good man leaves an inheritance to his children's children, but the sinners wealth is laid up for the righteous.  
Proverbs 13:22**



# Questions?



# Some of the benefits:

Less soil erosion

Less Tillage

Increase residue cover

Better water infiltration

Scavenge Nutrients

Sequester Carbon

Increase O.M.

Better weed suppression

Feed Biology in soil

Better soil health



# PFLA BIOLOGICAL SOIL ANALYSIS REPORT

Sample ID	Total Living Biomass	Diversity Index	Average
COVER CROP #1	3244	1.545	
CONVENTIONAL #2	2105	1.185	1.2-1.3



# PFLA BIOLOGICAL SOIL ANALYSIS REPORT

Sample ID	Bacteria	% of Biomass	Rhizobia
COVER CROP #1	1635	50.4%	31
CONVENTIONAL #2	2105	53.1%	0



# PFLA BIOLOGICAL SOIL ANALYSIS REPORT

Sample ID	Fungi	Mycorrhizal Fungi	Saprophytes Fungi
COVER CROP #1	323.66	92.92	230.74
CONVENTIONAL #2	59.82	5.69	54.13



# PFLA BIOLOGICAL SOIL ANALYSIS REPORT

Sample ID	Fungi:Bacteria	Rating
COVER CROP #1	0.1979	.15-.20 AVG
CONVENTIONAL #2	0.0535	



# PFLA BIOLOGICAL SOIL ANALYSIS REPORT

Sample ID	Protozoa	Predator:Prey
COVER CROP #1	28.07	0.017
CONVENTIONAL #2	0	ALL PREY

**Very Good**  
**.016-.020**



Sample ID 1 :

Sample ID 2 : CONVENTIONAL #2

## PLFA Soil Microbial Community Analysis

### Functional Group Biomass & Diversity

Total Living Microbial Biomass, Phospholipid Fatty Acid (PLFA) ng/g

2105.54

Functional Group Diversity Index

1.185

Total Biomass	Diversity	Rating
< 500	< 1.0	Very Poor
500+ - 1000	1.0+ - 1.1	Poor
1000+ - 1500	1.1+ - 1.2	Slightly Below Average
1500+ - 2500	1.2+ - 1.3	Average
2500+ - 3000	1.3+ - 1.4	Slightly Above Average
3000+ - 3500	1.4+ - 1.5	Good
3500+ - 4000	1.5+ - 1.6	Very Good
> 4000	> 1.6	Excellent

#### Functional Group

#### Biomass, PLFA ng/g

#### % of Total Biomass

Total Bacteria	1118.93	53.14
Gram (+)	805.57	38.26
Actinomycetes	225.85	10.73
Gram (-)	313.36	14.88
Rhizobia	0.00	0.00
Total Fungi	59.82	2.84
Arbuscular Mycorrhizal	5.69	0.27
Saprophytes	54.13	2.57
Protozoa	0.00	0.00
Undifferentiated	926.79	44.02

## Community Composition Ratios

**Fungi:Bacteria** 0.0535

Bacteria tend to dominate in systems with fewer organic inputs or residues possibly leading to a lower C:N ratio. In addition, bacteria can be more prominent in the early spring or late fall as soil temperatures are usually cooler and vegetation is less active or absent. Dry conditions, slightly alkaline to alkaline pH values, or increased land disturbance through prolonged and extensive tillage, grazing, or compaction may also favor bacteria. While bacteria are important and needed in the soil ecosystem, fungi are desired and more often considered indicators of good soil health. Increased use of cover crops and/or other organic inputs and less soil disturbance should help the soil support more fungi. Adjustments to pH may also be recommended in some more extreme circumstances.

Scale	Rating
< 0.05	Very Poor
0.05+ - 0.1	Poor
0.1+ - 0.15	Slightly Below Average
0.15+ - 0.2	Average
0.2+ - 0.25	Slightly Above Average
0.25+ - 0.3	Good
0.3+ - 0.35	Very Good
> 0.35	Excellent

**Predator:Prey** ALL PREY

This ratio is also expressed as protozoa to bacteria. Protozoa feed on bacteria which helps release nutrients, especially nitrogen. A higher ratio indicates an active community where base level nutrients are sufficient to support higher trophic levels or predators. However, this ratio will always be a relatively low number because the prey will greatly outnumber the predators.

Scale	Rating
< 0.002	Very Poor
0.002+ - 0.005	Poor
0.005+ - 0.008	Slightly Below Average
0.008+ - 0.01	Average
0.01+ - 0.013	Slightly Above Average
0.013+ - 0.016	Good
0.016+ - 0.02	Very Good
> 0.02	Excellent

**Gram (+):Gram (-)** 2.5707

Gram (+) bacteria typically dominate early in the growing season and/or following a fallow period. They also survive better under certain environmental conditions or stressors such as drought or extreme temperatures due to their ability to form spores. Therefore, it is common to see higher values when the community is coming out of dormancy or is stressed. These values will typically begin to approach those of a more balanced bacterial community as the soil conditions become more favorable throughout the growing season. A gram (-) dominated soil may be due to anaerobic conditions or other stressors such as pesticide application or heavy metal contamination.

Scale	Rating
< 0.5	Gram (-) Dominated
0.5+ - 1.0	Slightly Gram (-) Dominated
1.0+ - 2.0	Balanced Bacterial Community
2.0+ - 3.0	Slightly Gram(+) Dominated
3.0+ - 4.0	Gram(+) Dominated
> 4.0	Very Gram(+) Dominated





















## F:B Ratio

David C. Johnson- NMSU Institute for Sustainable Agricultural Research (ISAR)  
davidcjohnson@nmsu.edu

New Mexico State University



**MAYER**  
Farm Equipment