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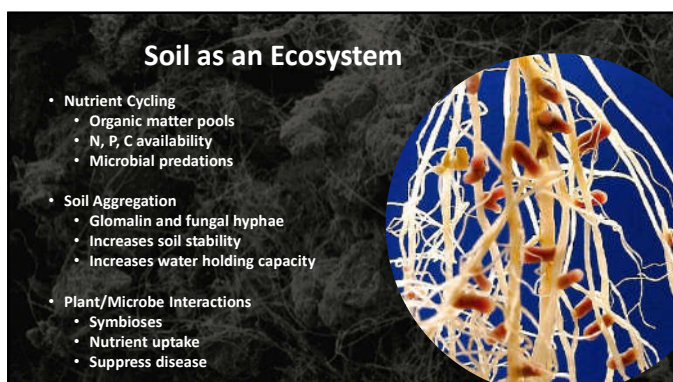
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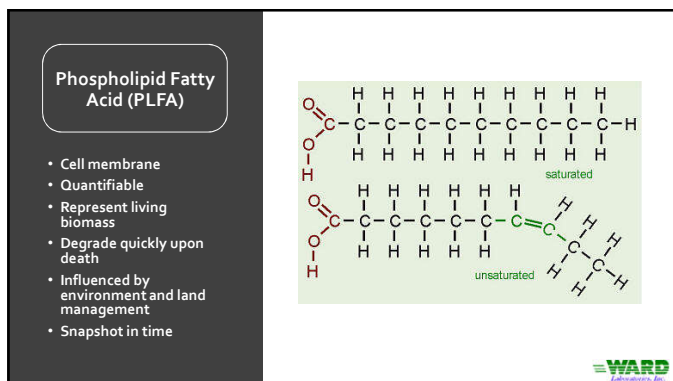
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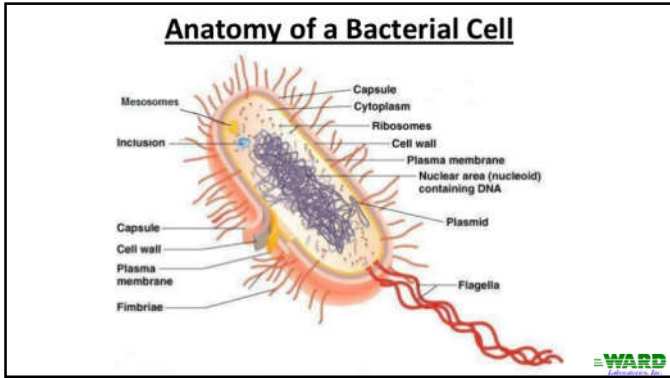
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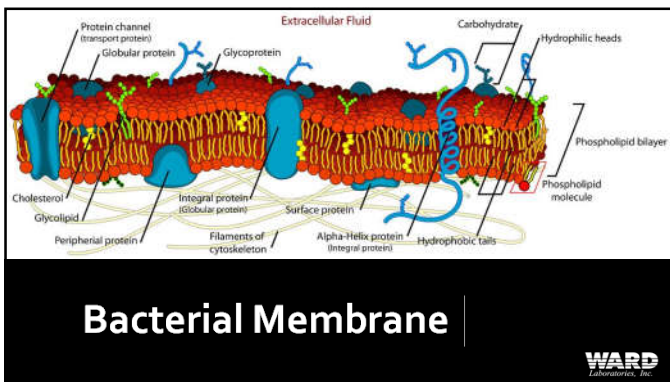
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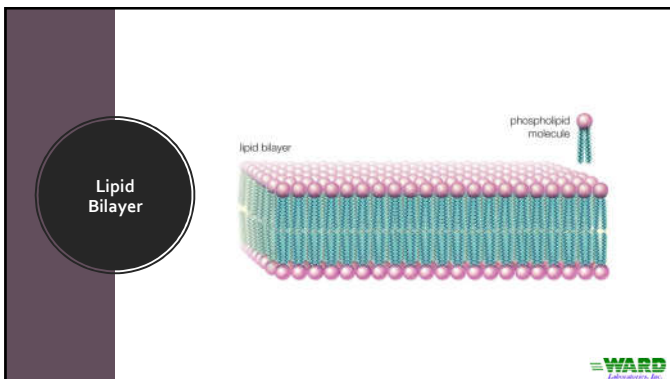
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### Interpreting PLFA

- Higher biomass and diversity are better
- No standard ranking established
- Dependent on soil type, climate, etc.

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



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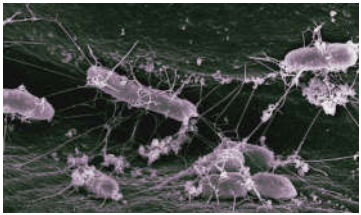

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### PLFA Report Ratios

- Fungi:Bacteria
- Predator:Prey
- Gram(+):Gram(-)
- Sat:Unsat
- Mono:Poly
- Pre 16:1 to cy17:0
- Pre 18:1 to cy19:0

Each of these ratios is provided on the second page of the PLFA report. They are important to better evaluate the microbial community as a whole.

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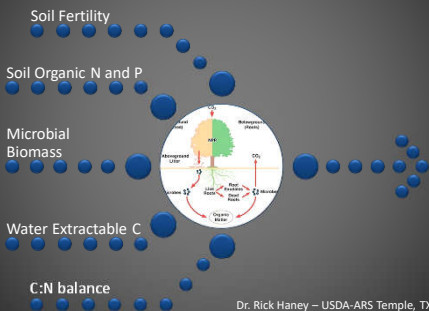
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### Haney Test



Dr. Rick Haney – USDA-ARS Temple, TX



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### Green Chemistry – H3A

A soil extractant that mimics soil solution by using organic acids produced by living plant roots to temporarily change soil pH and increase nutrient availability.

http://www.nature.com/scitable/knowledge/library/the-rhizosphere-roots-soil-and-67500617

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### Microbial Biomass

1-day CO<sub>2</sub> Burst uses drying and rewetting techniques to mimic natural field events and represents the flush of microbial activity, leading to nutrient cycling. The amount of cycling is related to soil habitat including available food (WEOC) and soil fertility.

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### Nature's Solvent – H<sub>2</sub>O

<p><b>Water Extract</b></p> <ul style="list-style-type: none"> <li>Organic C</li> <li>Total N</li> <li>Nitrate</li> <li>Ammonium</li> </ul> <p><b>Calculated</b></p> <ul style="list-style-type: none"> <li>Organic N</li> <li>Organic C:N</li> <li>Organic N Release</li> <li>Soil Health Score</li> </ul>	<p>Microorganisms have the greatest access to nutrients and food that are either suspended, dissolved, or solubilized in soil water.</p> <p>Therefore, the water extract represents what the microbes see in their soil environment.</p>
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### Fertility Recs

Some values from the Haney Test will not be the same as you are used to seeing. This is due to various extract strengths or abilities to pull certain nutrients out of the soil. Therefore, we cannot always use traditional recommendation equations designed for other extracts UNLESS we make an adjustment to certain H3A values.

Example: Bray P-2 vs. Mehlich 3 vs. Bray P-1 vs. H3A vs. Olsen P vs. H2O

Exceptions: Soluble nutrients such as NO3




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### Examples

- |                  |                         |
|------------------|-------------------------|
| • H3A from Haney | • Conventional Extracts |
| • K = 100 ppm    | • K = ~225 ppm (NH4A)   |
| • P = 15 ppm     | • P = ~20 ppm (M3)      |
| • S = 10 ppm     | • S = ~16 ppm (M3)      |
| • Zn = 1 ppm     | • Zn = ~2.5 ppm (DTPA)  |




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### The N-umbers

- |   |   |
|---|---|
| • CONVENTIONAL  | • HANEY   |
| • Corn @ 200 bu/A<br>220 lbs of N req'd   | • Corn @ 200 bu/A<br>220 lbs of N req'd   |
| • N credits<br>10ppm NO3 or 20lbs/A<br>Soybeans past crop – 40lbs<br>??? Or assumed to be 25lbs | • N credits<br>10ppm NO3 or 20lbs/A<br>5ppm NH4 or 10lbs<br>Organic N Release – 30lbs<br>Soybeans past crop – 40lbs<br>??? Or assumed to be 25lbs |




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### The N-umbers

- CONVENTIONAL
  - Corn @ 200 bu/A  
220 lbs of N req'd
  - N credits  
Total Credit = 85 lbs
  - Rec = 135 lbs
- HANEY
  - Corn @ 200 bu/A  
220 lbs of N req'd
  - N credits  
Total Credit = 125 lbs
  - Rec = 95 lbs



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### The Soil Health Effect

- Improving soil health and biological function increases nutrient use efficiency by the crop.
- Using conventional tests and fertilizer requirements can lead to excess fertility being applied.
- Healthier soils require fewer fertility inputs due to the increased ability of plants to acquire necessary nutrients.



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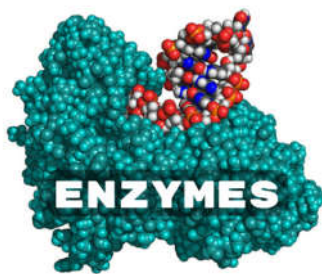
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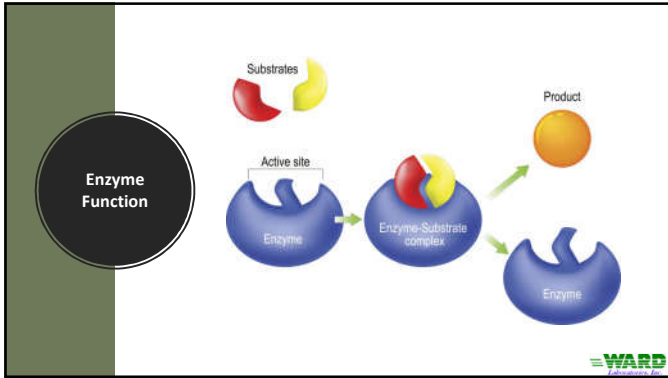
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### Important Functions

Enzyme	Soil Process	Soil Product	Significance	Nutrient Cycle
$\beta$ -glucosidase (BG)	Cellulose Degradation	Glucose	Energy for microbiology	Carbon / OM Decomposition
N-acetyl- $\beta$ -glucosaminidase (NAG)	Chitin Degradation	Amino Acid N	Important source of N	C and N cycling
Phosphodiesterase	Degradation of nucleic acids, phospholipids (Organic P Degradation)	Phosphomonoesters	Intermediate P products	P cycling
Phosphatases (Alkaline, Acid)	Degrade phosphomonoesters	Phosphate	Plant available P	P cycling
Arylsulfatase (ARS)	Degradation of ester sulfates	Sulfates	Plant available S	S cycling

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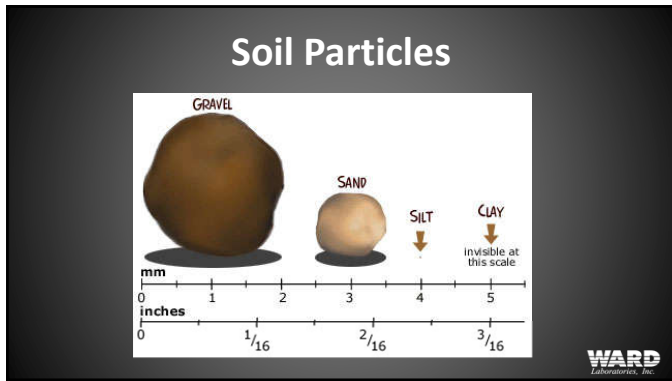
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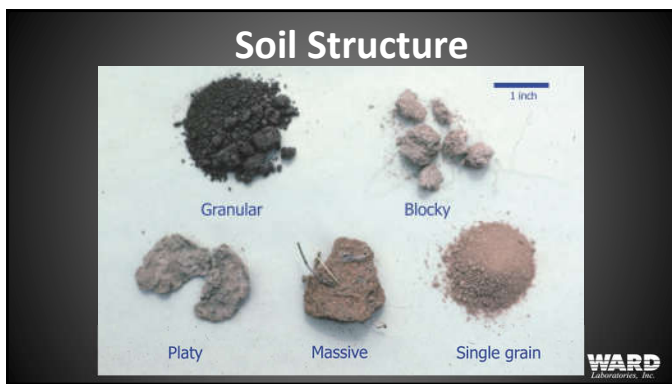
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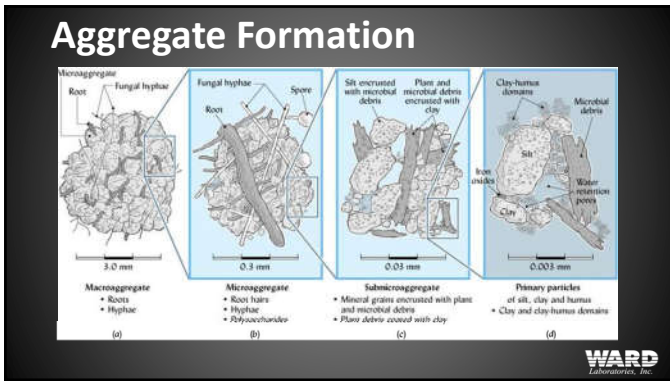
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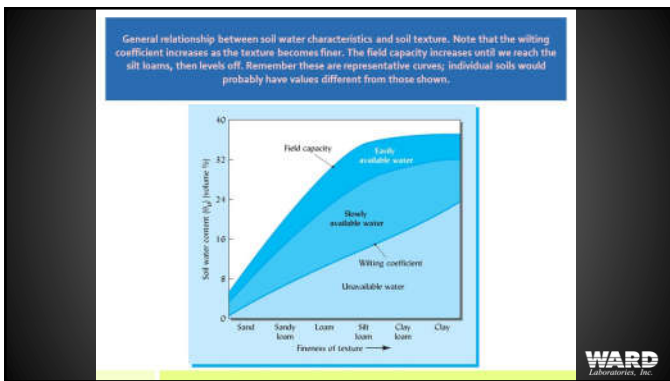
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## When and How to Use Soil Health Tests

- ✓ Comparing two different systems
- ↔ Tracking change over time
- ⚠ Troubleshooting problems
- 🌱 Spring and/or Fall when soil temps >50°



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## Questions?

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www.wardlab.com



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