

# Building A *Successful* Conservation System To Regenerate Soil Health

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2017

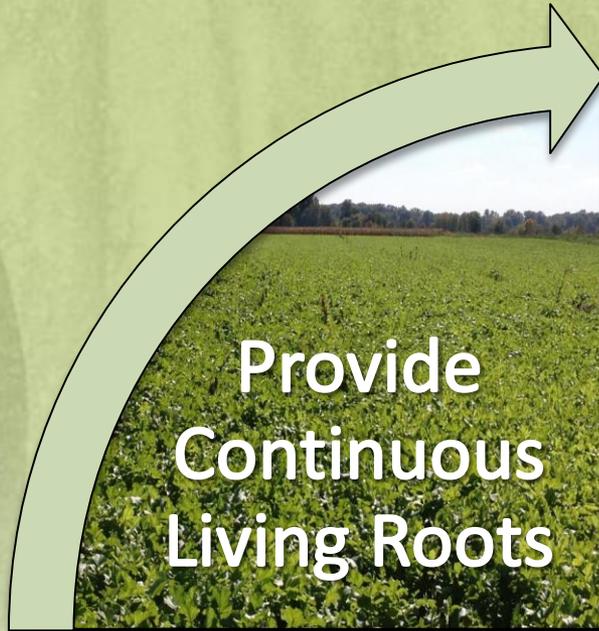


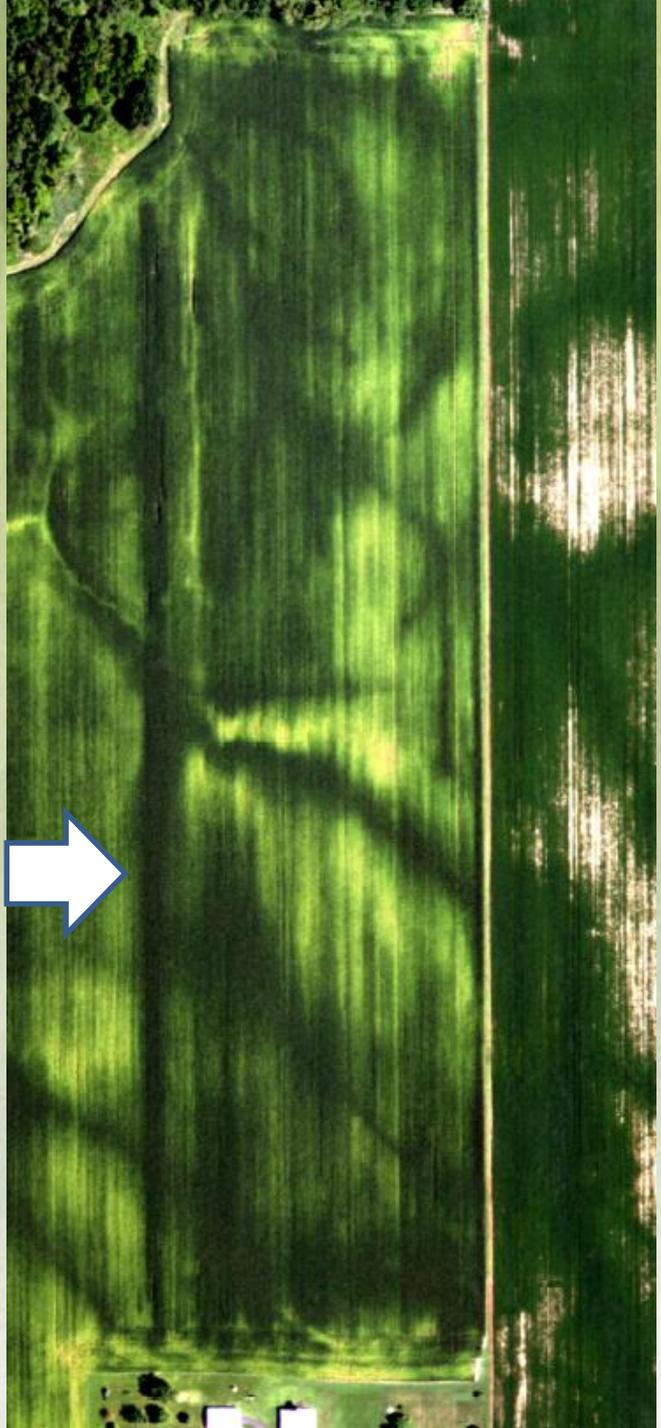


## SOIL HEALTH:

*The continued capacity of a soil to function as a vital, living ecosystem that sustains plants, animals, and humans.*

# Soil Health Principles





The Fence Row Effect



# Principles at work



J. Maloney, Brownsburg, IN 2010

# Soil Health Management System



**Collection of conservation practices that focus on maintaining or enhancing soil health**



**Address all four of the soil health principles**



**Create a “synergistic” effect**

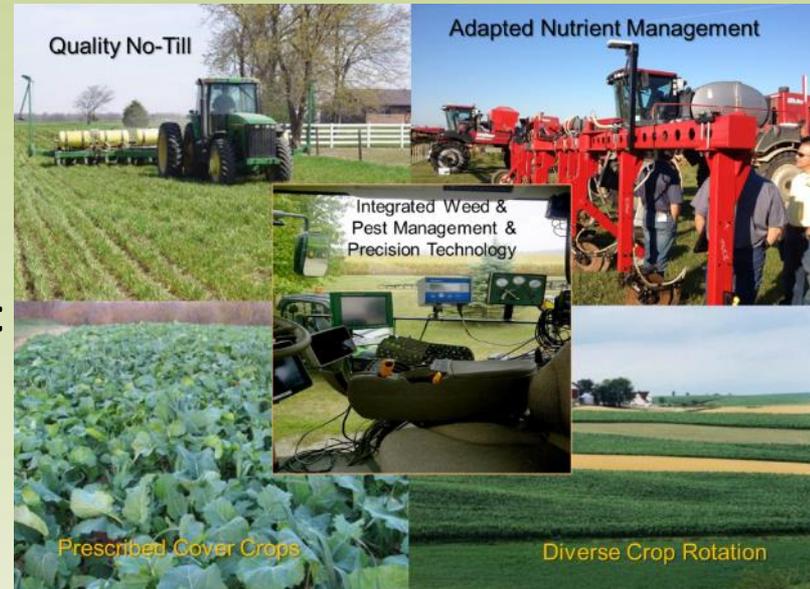


**Cropping system specific**



# Soil Health Management System

- Achieving soil health through:
  - A Quality No-till System
  - Diverse and Strategic Cover Crops
  - Adapted Nutrient Management
  - Integrated Weed & Pest Management
  - Diverse Crop Rotations
  - Precision Farming Technology
  - Prescriptive Buffers and supportive practices



Soil Health is not a destination...it's a Journey



Quality No-Till/Strip-till



Adapted Nutrient Management



Prescribed Cover Crops



New Technology and Integrated Weed & Pest Management



Diverse Crop Rotation



Quality No-Till



Ecological Nutrient Management



Prescribed Cover Crops & Grazing



Integrated Weed & Pest Management and Precision Technology



Diverse Crop Rotation



# Making Soil Health A Priority!

- What does *Soil Health* mean?
- Key Indicators =
  - Improving organic matter
  - Improving aggregate stability
  - Increasing water infiltration
  - Increasing available water
  - Improving nutrient cycling
  - Balancing and diversifying soil biology



Quality No-Till/Strip-till



Nutrient Management



New Technology  
and  
Integrated Weed &  
Pest Management



Prescribed Cover Crops



Diverse Crop Rotation

# No-Till / Strip-Till

Planter set-up and maintenance is critical



Every seed at the exact same depth...



...every seed the exact same environment



# No-Till planters

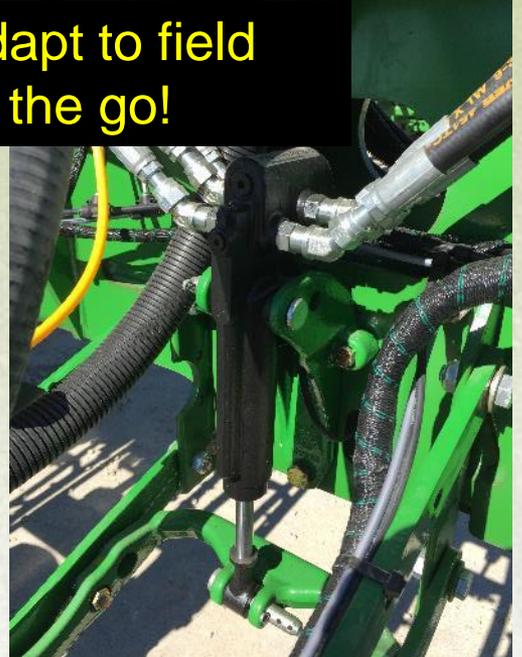


Precision nutrient placement and rate



Sense and adapt to field conditions on the go!

With Space Shuttle Tech





Quality No-Till/Strip-till



Adapted Nutrient Management



Prescribed Cover Crops

Precision Farming  
and  
Integrated Weed &  
Pest Management



Diverse Crop Rotation



# Developing Nutrients Management Strategies for Soil Health Cropping Systems

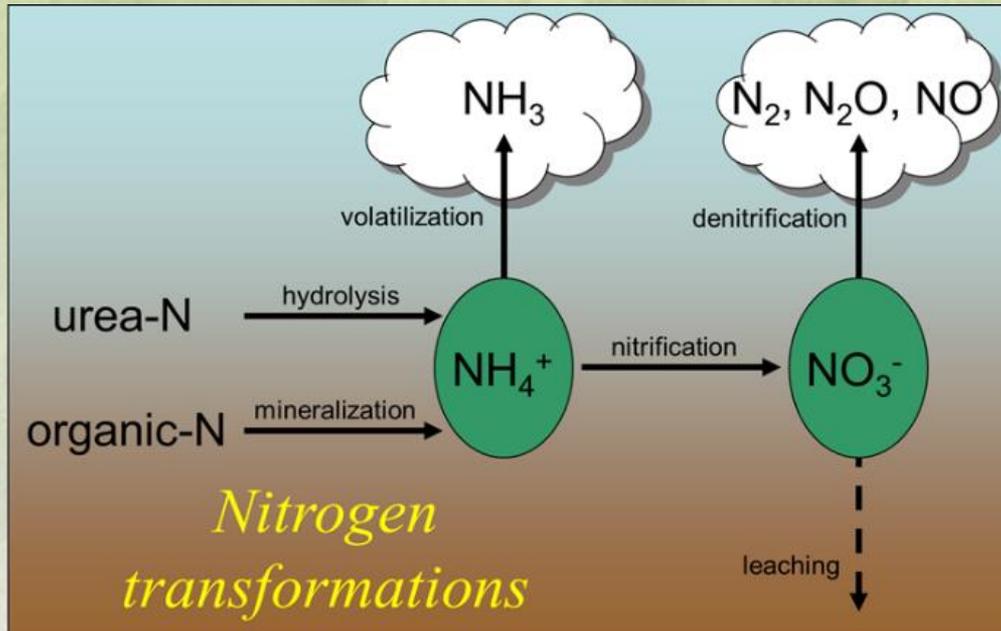


• 4-Rs

Must include SOM and Organic Nutrient Contribution



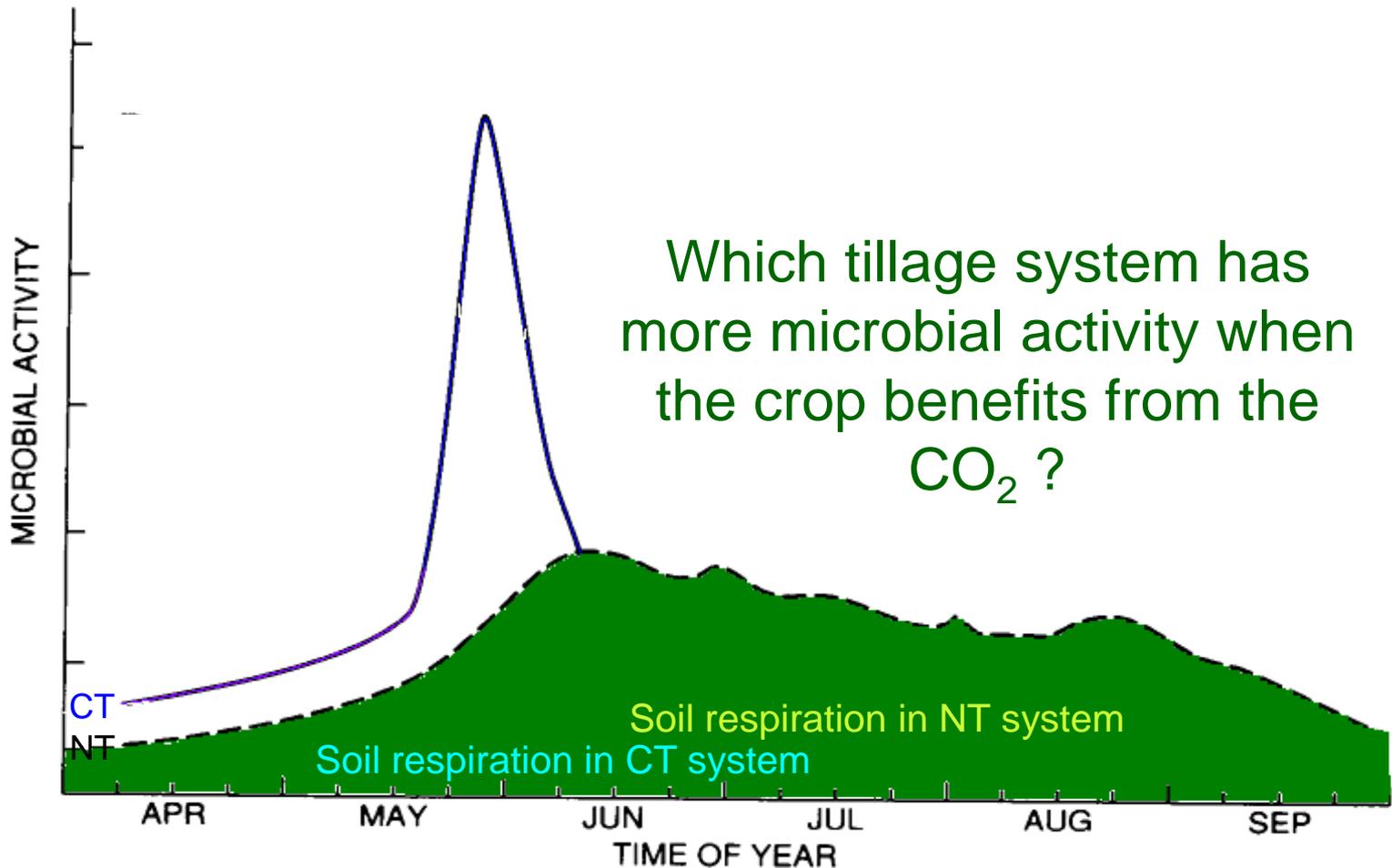
# Nitrogen Mineralization and Immobilization



Biology



# Effect of tillage on microbial activity



# Strategically...

## CC should match desired C:N Ratio



Material	C:N Ratio	
Rye Straw	82:1	} Good for Soybean
Wheat Straw	80:1	
Oat Straw	70:1	
Corn Stover	57:1	
Rye Cover Crop (Anthesis)	37:1	
Rye Cover Crop (Vegetative)	26:1	
Mature Legumes	25:1	} Good for Corn
<b>Balanced Microbial Diet</b>	<b>24:1</b>	
Daikon Radish	19:1	
Crimson Clover	17:1	
Ryegrass (Vegetative)	15:1	
Young Alfalfa	13:1	
Hairy Vetch Cover Crop	11:1	
Soil Microbes (Average)	8:1	





Plant available Nitrogen,  
exactly what we want...right???



# “Catch and Release” Nutrients



# Cover Crop Mgt for N Retention



# Strategically...

## CC should match desired C:N Ratio



Material	C:N Ratio	
Rye Straw	82:1	} Good for Soybean
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# Adapted Nutrient Management



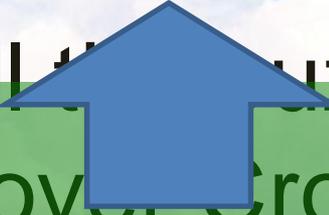
Quality No-Till/Strip-till



Prescribed Cover Crops



Diverse Crop Rotation



Why all the buzz about  
Cover Crops?  
Less Carbon Loss Here

It's all about the Carbon!  
(Organic Matter)

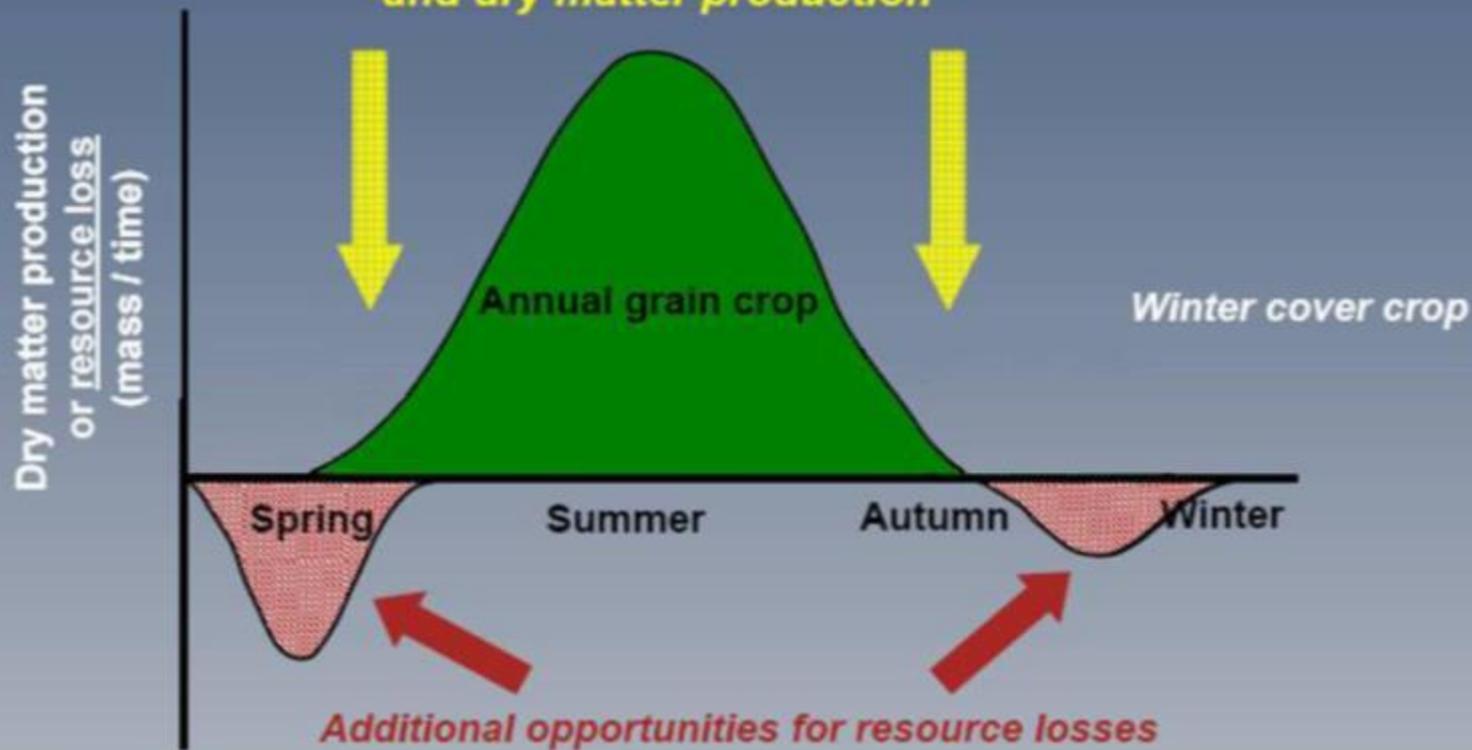
We want more Carbon here



# Biomass Production Annual Cropping Systems



*Missed opportunities for resource assimilation  
and dry matter production*



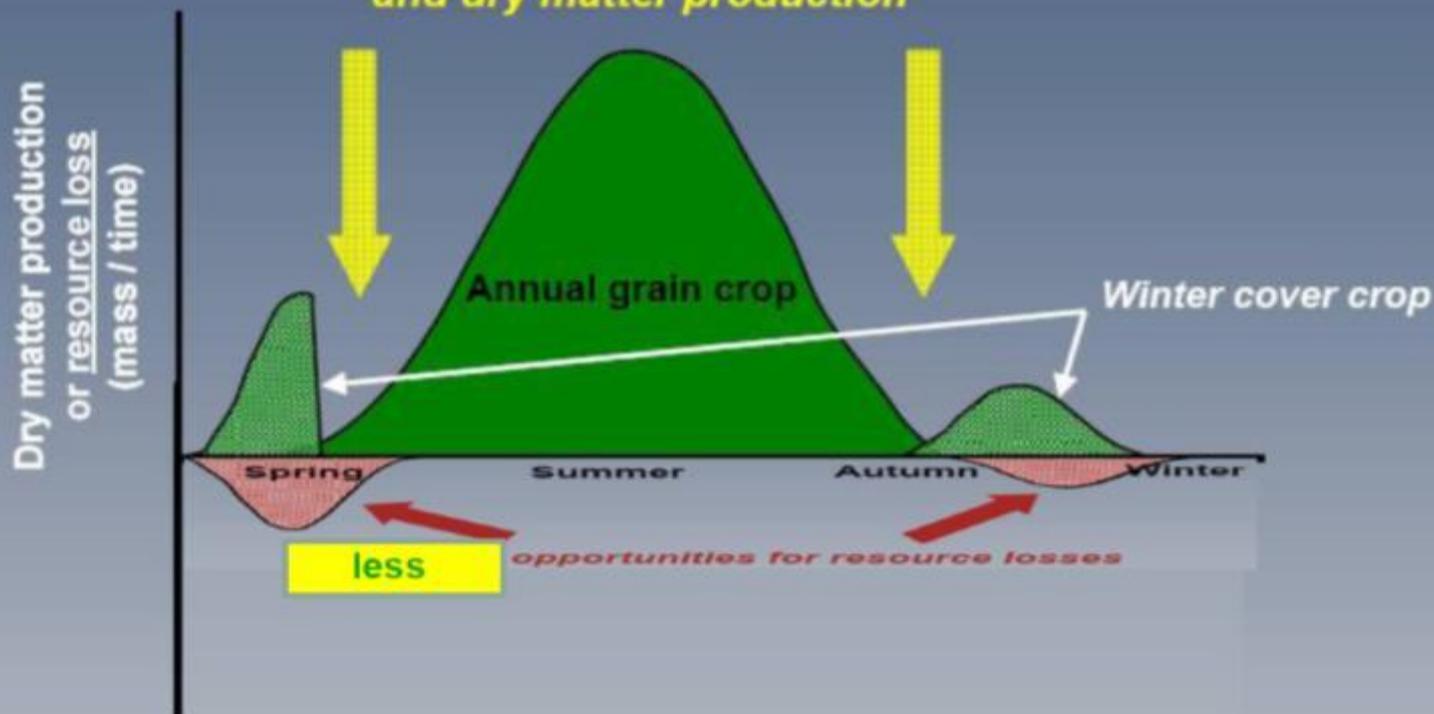
after A.H. Heggenstaller

A. H. Heggenstaller, University of Alberta

# Biomass Production Annual Cropping Systems



**Cover crops** for resource assimilation  
and dry matter production

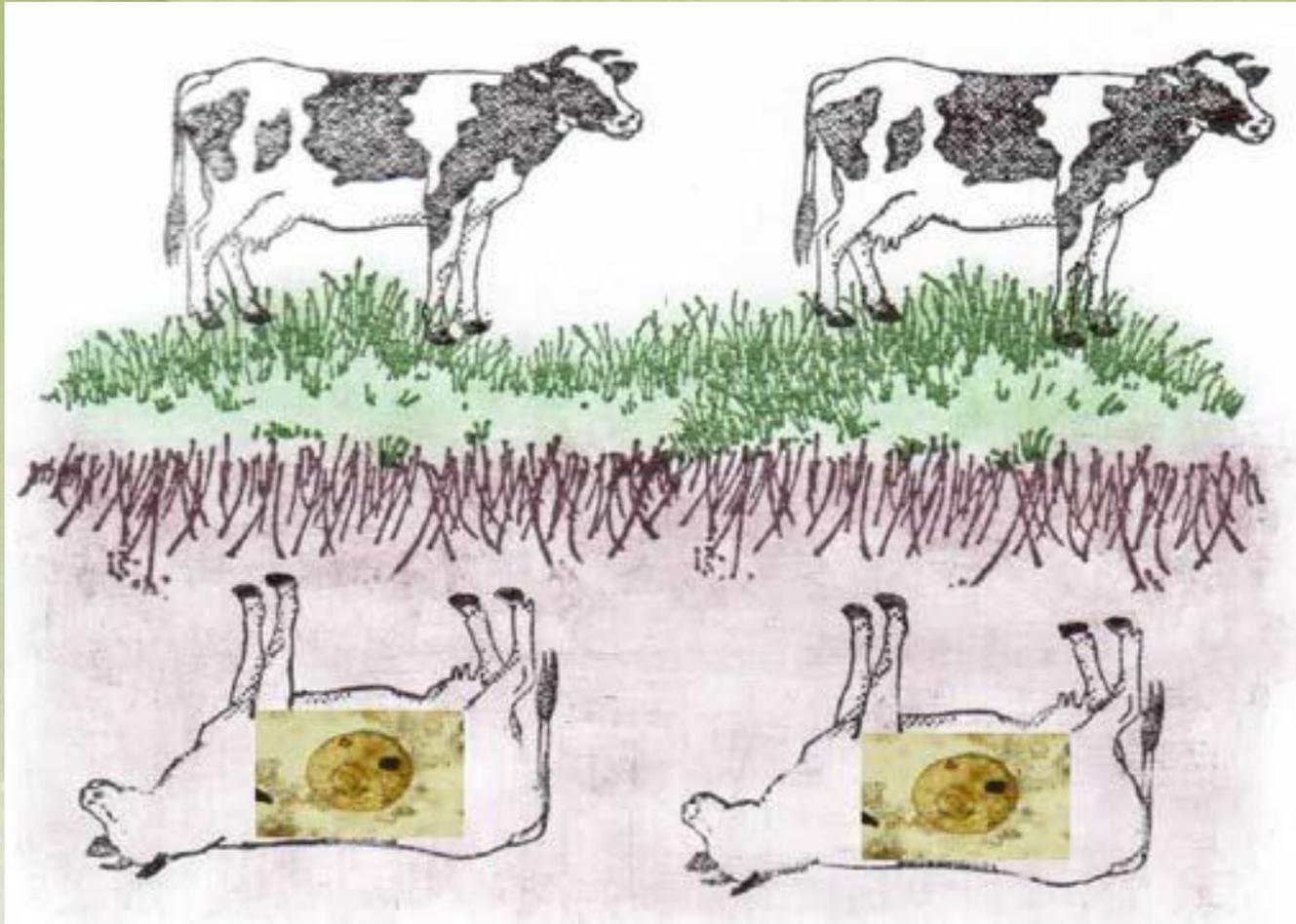


after A.H. Heggenstaller

A. H. Heggenstaller, University of Alberta

# To Build Organic Matter We need to Feed the Herd

unlock the  
**SECRETS**  
IN THE  
**SOIL**



A acre of healthy soil has over 4 cows worth of microorganisms living in it. (Illustration by Eve Stika)



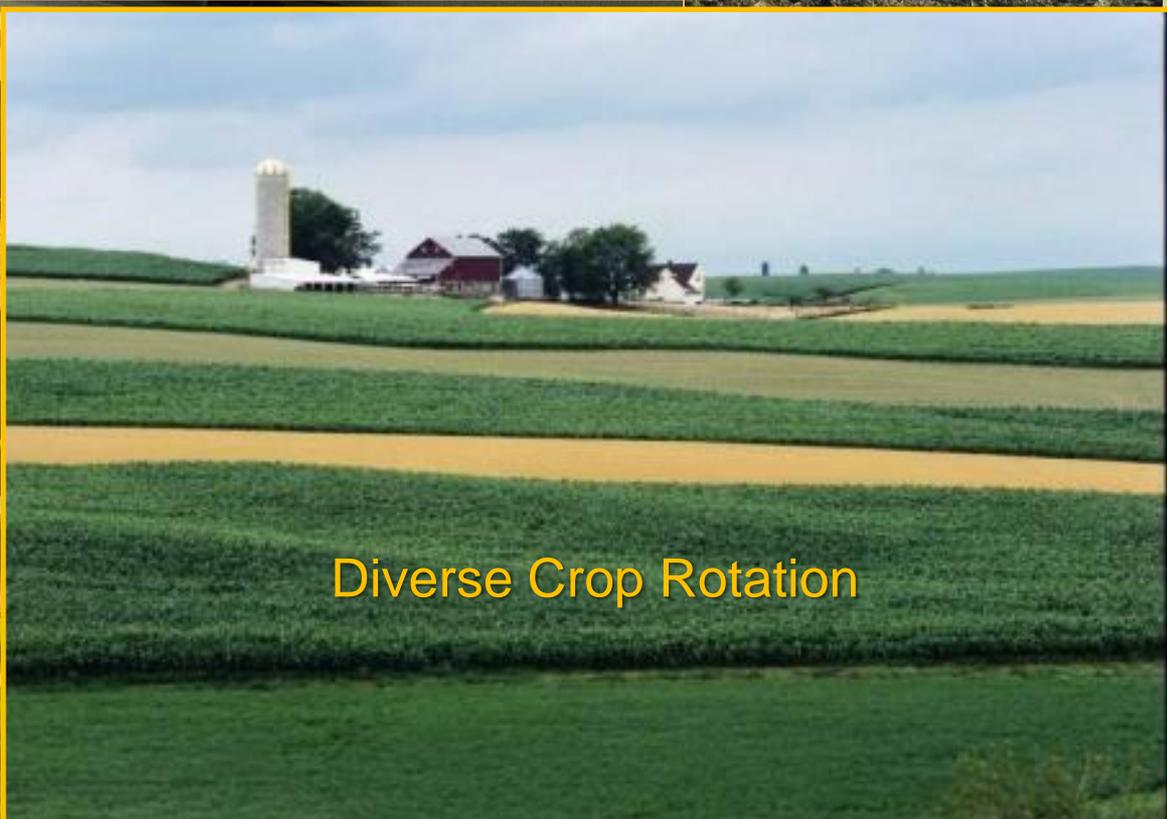
Quality No-Till/Strip-till



Adapted Nutrient Management



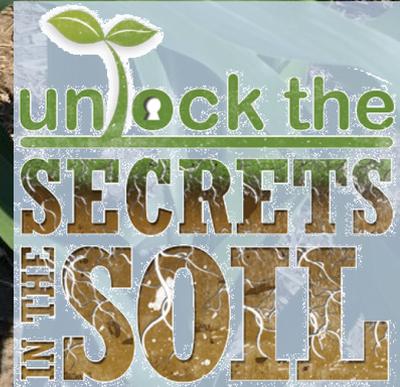
Prescribed Cover Crops



Diverse Crop Rotation

# Soil Health Cropping Systems

**...Strategy Example:  
for a (not so diverse)  
Corn-Soybean Rotation**



Strategically...

CC should complement the following crop

What about Corn?



# Strategically... CC should match desired C:N Ratio

Material	C:N Ratio	
Rye Straw	82:1	} Good for Soybean
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Hairy Vetch Cover Crop	11:1	
Soil Microbes (Average)	8:1	



Strategically...

CC should complement the following crop

...Which is better?

Corn into:

High Carbon  
(Cereals  
Rye/Wheat)

...or

High N (Protein)  
Cover Crop  
(Clover/Peas)



## Strategically...

CC should complement the following crop

Corn into a mix:

**High Carbon (Rye)**

Provides:

- Erosion Control
- Moisture Savings

Uses/ immobilizes:

- Nitrogen/  
nutrients
- Disease?

Starter N a must



## Strategically...

CC should complement the following crop

Corn into:

High N (Protein)

Cover Crop  
(Clover/Peas)

- Contributes high quality N
- Less likely to harbor disease pathogens



## Strategically...

CC should complement the following crop

To Raise N (Protein%)

- Select forage type grasses
- Add Clover/Peas if...
- Terminate Grass when protein is high
- **and consider adding:**
  - Oilseed Radish, Rapeseed if...



Strategically...

CC should complement the following crop

Corn into  
a Balanced Mix  
High C (carbon)  
and  
High N (Protein)



## Strategically...

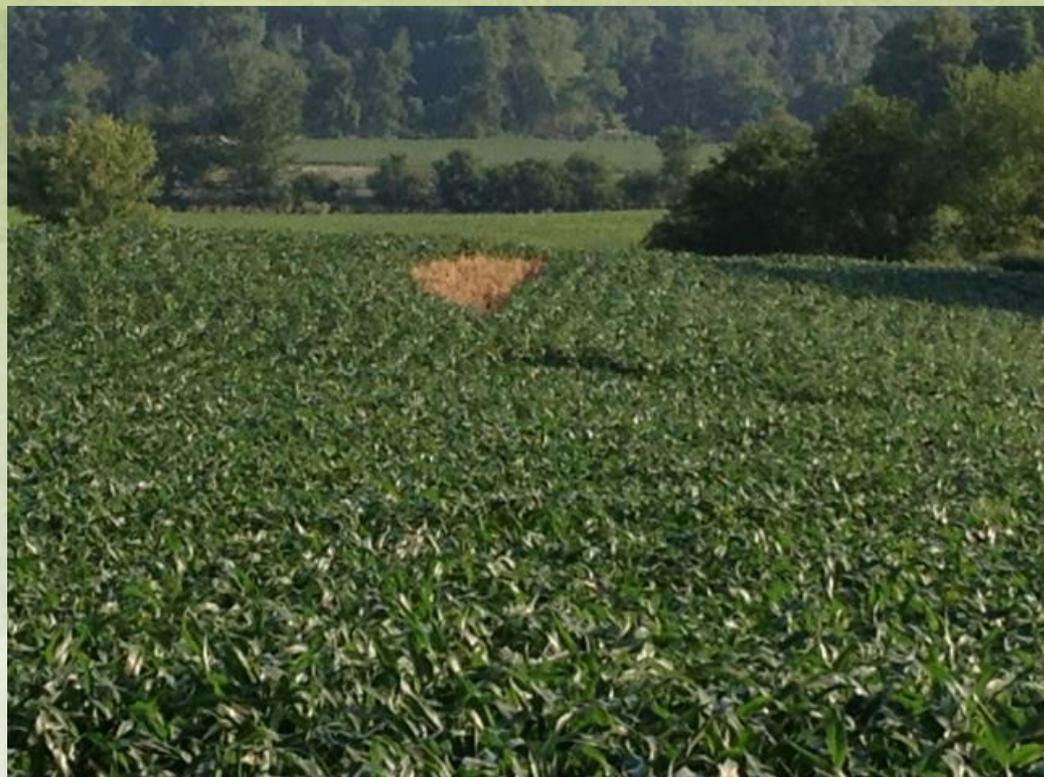
CC should complement the following crop

Corn into a mix:

**High Protein**

Can Provide:

- Optimum Nutrient Release
- Extra water during rapid demand



# Strategically...

## What about Soybeans?

### Choices

Do Soybeans  
need N ?

... Sure, but  
they  
capture  
their own!



## Strategically...

Soybeans do well into a high carbon Cover Crop.

...Why?

Weed Control, Late Season Water and Nutrient Cycling





# Strategically...

## Planning the System Using the Step by Step Approach

1. Drill or Aerial Seed Cereal Rye or Annual Ryegrass into Corn Stalks



Strategically...

## Planning the System Using the Step by Step Approach



2. Terminate the Cereal Rye at 12" ... Or...



# Strategically...

## Planning the System Using the Step by Step Approach

2. Plant a short  
season Soybean  
into the Rye  
(preferably early in  
the season)



# Strategically...

## Planning the System Using the Step by Step Approach

3. Plant a low C:N  
mix into or after  
Soybean



# Strategically...

## Planning the System Using the Step by Step Approach

4. NT Corn into a:  
Biologically  
Active  
High Function  
Soil

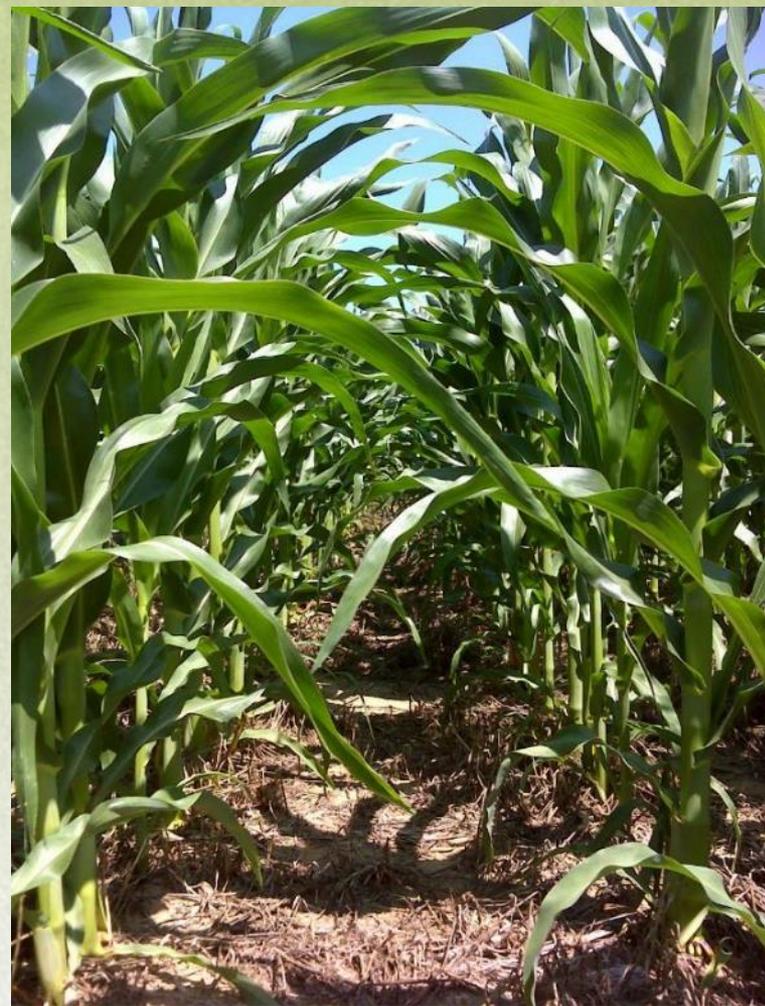




# Strategically...

## Planning the System Using the Step by Step Approach

### 5. Enjoy The Rewards of Soil Health!



# Managing for a Living Ecosystem Requires Dynamic Management

**“We can take production and  
conservation further with  
management systems that  
*continually* build  
Soil Health ”**

USDA is an equal opportunity provider,  
employer, and lender.”





# MORE INFORMATION ABOUT SOIL HEALTH –

Google = “NRCS Soil Health”

**USDA** Natural Resources Conservation Service  
United States Department of Agriculture

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Soils

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Soil Health Theater



Dig A Little, Learn A Lot

## Unlock the Secrets in the Soil

Soil is a living and life-giving substance, without which we would perish.

As world population and food production demands rise, keeping our soil healthy and productive is of paramount importance. So much so that we believe improving the health of our Nation's soil is one of the most important endeavors of our time.

By focusing more attention on soil health and by educating our customers and the public about the positive impact healthy soils can have on productivity and conservation, we can help our Nation's farmers and ranchers feed the world more profitably and sustainably – now and for generations to come.

The resources on this soil health section of our site are designed to help visitors understand the basics and benefits of soil health – and to learn about Soil Health Management Systems from farmers who are using those systems.

So whether you're a farmer, a researcher, a conservationist or an interested citizen, the information on this site will help you "Unlock the Secrets in the Soil."

### Voices of Soil Health

Share  More info



# Soil Health Campaign



**Soil Health Awareness**

**Unlock the Secrets in the Soil**

Sign up for e-mail updates on Soil Health Awareness

Soil is a living and life-giving natural resource. As world population and food production increase, the importance of our Nation's soil is one of the most pressing issues of our time. The resources on this soil health website will help you understand the basics and benefits of soil health and the various soil management systems from farmers who are using them.

**soil health THEATER**

Watch Our Videos

**dig a little LEARN A LOT**

Learning Resources

**GROW! with it!**

Learn From Growers

**MEDIA get the DIRT on it**

News Media Resources

**GROWING & SHARING**

Partner Resources

**BIOLOGY & BEYOND**

Soil Health Science

**Explore the Science of Soil Health**

**Behold Our Living SOIL**

NRCS has got you covered! Behold Our Living Soil is a fun and interactive way to learn about soil health—and one of them will become a full-sized poster! Look here to vote for your favorite soil health print ad today and help us select a winner that will become our national poster in 2015. Once the winner is chosen and printed, you'll be able to order one, free of charge, for your home, office or school. Vote as often as you'd like and please feel free to ask others to vote, too!

After voting, you can view the results to see which ad is currently in the lead. The poll closes November 3, so please vote today!

**Profiles in Soil Health**

**Under Cover Farmers of Stanley County, NE**

Why do you cover your crops? For better soil health and can be seen in NRCS Soil Health Theater

OKLAHOMA

## PROFILES IN soil health

Jimmy Emmons  
Dewey County, Oklahoma  
2,000 acres  
Crops: Wheat, alfalfa, canola, cow/calf operation  
Covers: Multi-species



- Raised awareness
- Expanded demand for system adapted information
- Raising many good questions

MONTANA

## PROFILES IN soil health

Julie Taylor

Changes Soil Health

Julie Taylor, who farms on the Fairfield Bench, has changed her farming practices to include no-till farming methods, planting cover crops, composting to augment soil fertility, and intensively grazing both hay land and rangeland.

Hay: alfalfa, berseem clover, red clover & hairy vetch

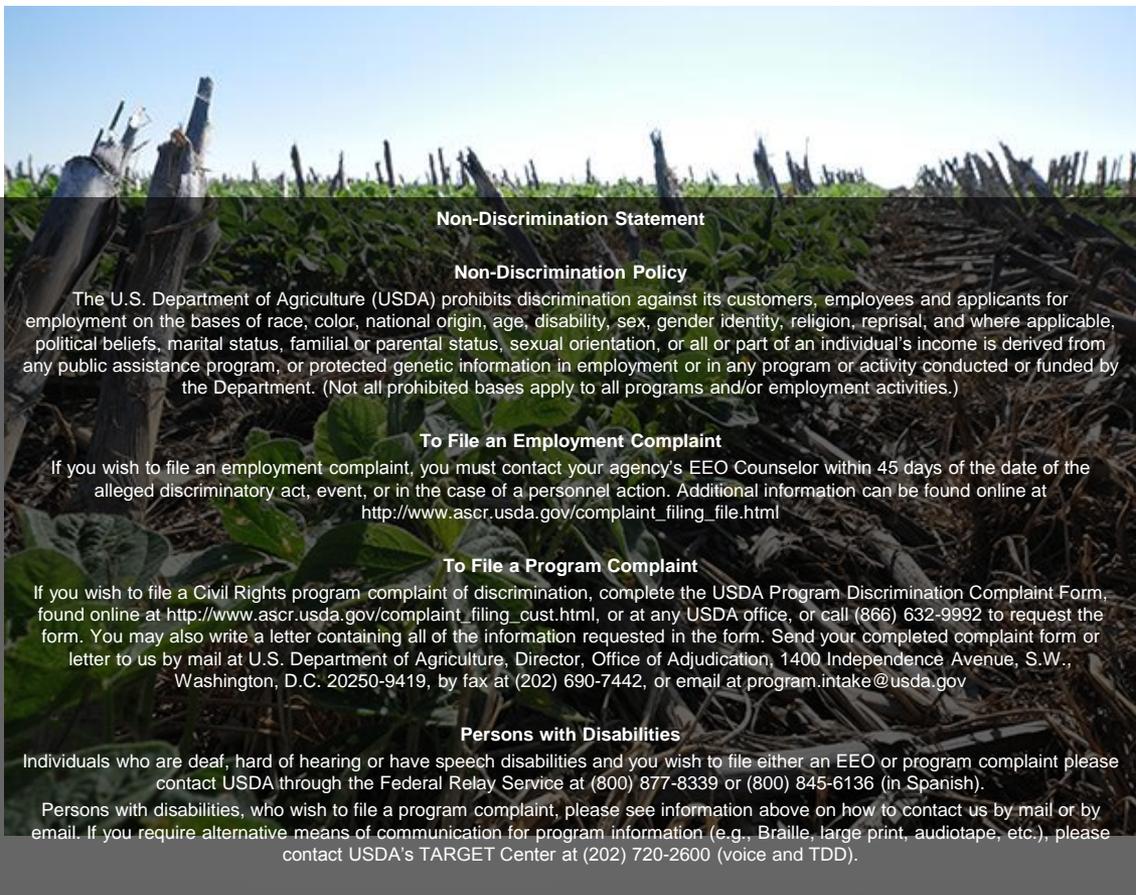



# unlock

## THE SCIENCE OF SOIL HEALTH



United States Department of Agriculture



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Natural  
Resources  
Conservation  
Service



unlock the  
SECRETS  
IN THE  
SOIL

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