

Managing Your Farm With The Soil Health Principles



**By: Jay Fuhrer | Soil Health Specialist | Bismarck, ND - USA
Natural Resources Conservation Service - USDA**

Landscape Simplification

Agriculture Resource Concerns

Symptoms of Landscape Simplification

- Wind Erosion
- Water Erosion
- Salinity (we need to transpire water in lieu of evaporation)
- Water Quantity
- Water Quality
- Lack of Plant Diversity & Cover (Simplified Crop Rotations)
- Lack of Animal Diversity and Animal Impact
- Season Long Grazing
- Drought/Flood Same Year
- Exporting Carbon (old and new sunshine carbon)
- Carbon Deficient Soils

Factors Affecting the Balance between Gains and Losses of Organic Matter in Soils.

Reference: The Nature and Properties of Soils, Table 12.5

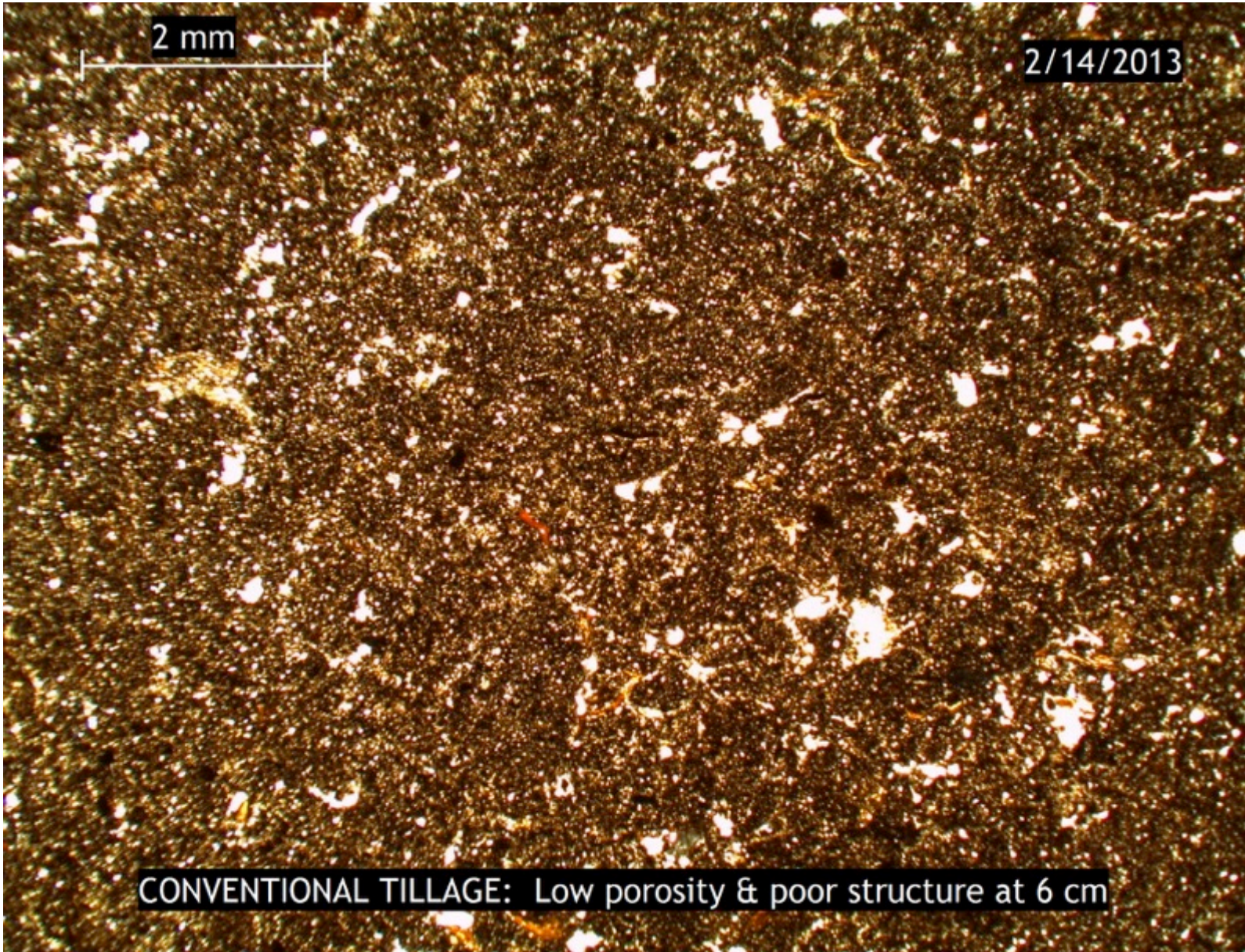
Factors Promoting Gains

- Green manures or cover crops
- Conservation tillage
- Return of plant residues
- Low temperature and shading
- Controlled grazing
- High soil moisture
- Surface mulches
- Application of compost & manure
- Appropriate nitrogen level
- High plant productivity
- High plant root:shoot ratio

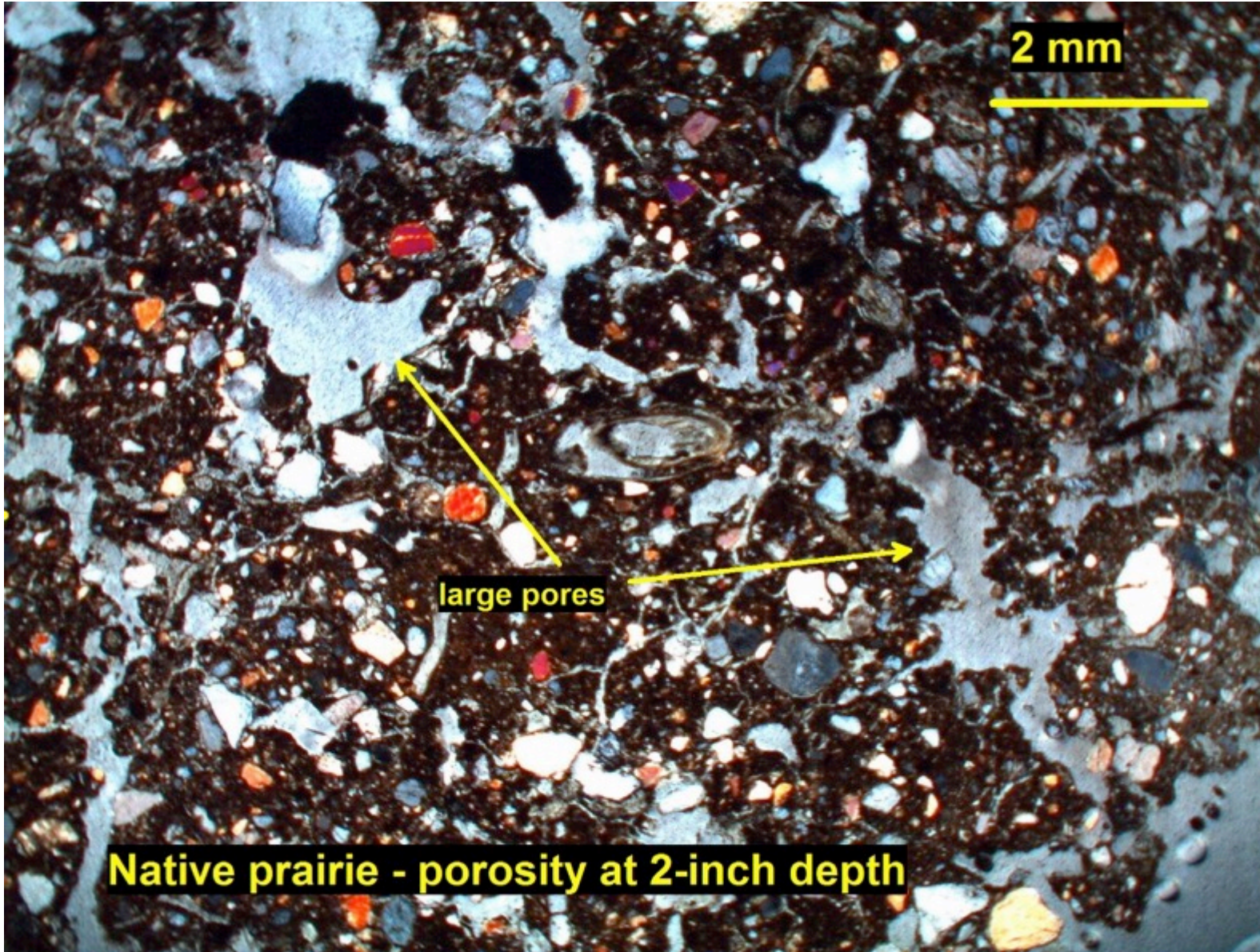
Factors Promoting Losses

- Erosion
- Intensive tillage
- Whole plant removal
- High temperatures & sun exposure
- Overgrazing
- Low soil moisture
- Fire
- Applying only inorganic materials
- Excessive mineral nitrogen
- Low plant productivity
- Low plant root:shoot ratio

Thin Sections Help Us Understand Pore Spaces



CONVENTIONAL TILLAGE: Low porosity & poor structure at 6 cm



Native prairie - porosity at 2-inch depth

**Which Of The Following
Examples Is Your Farm?**



Is Your Farm Too Cold?



Is Your Farm Too Hot and Dry?



Is Your Farm Too Wet?

Let's Rebuild Your Landscape



Soil Health Principles

Systems Approach

Soil Health: the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.



Transpiration Buys You Something

Evaporation
Always Costs
You Something



Usually We Have Transpiration And Evaporation
In The Same Field At The Same Time. There Is
No Armor On The Soil Surface Of This Field.



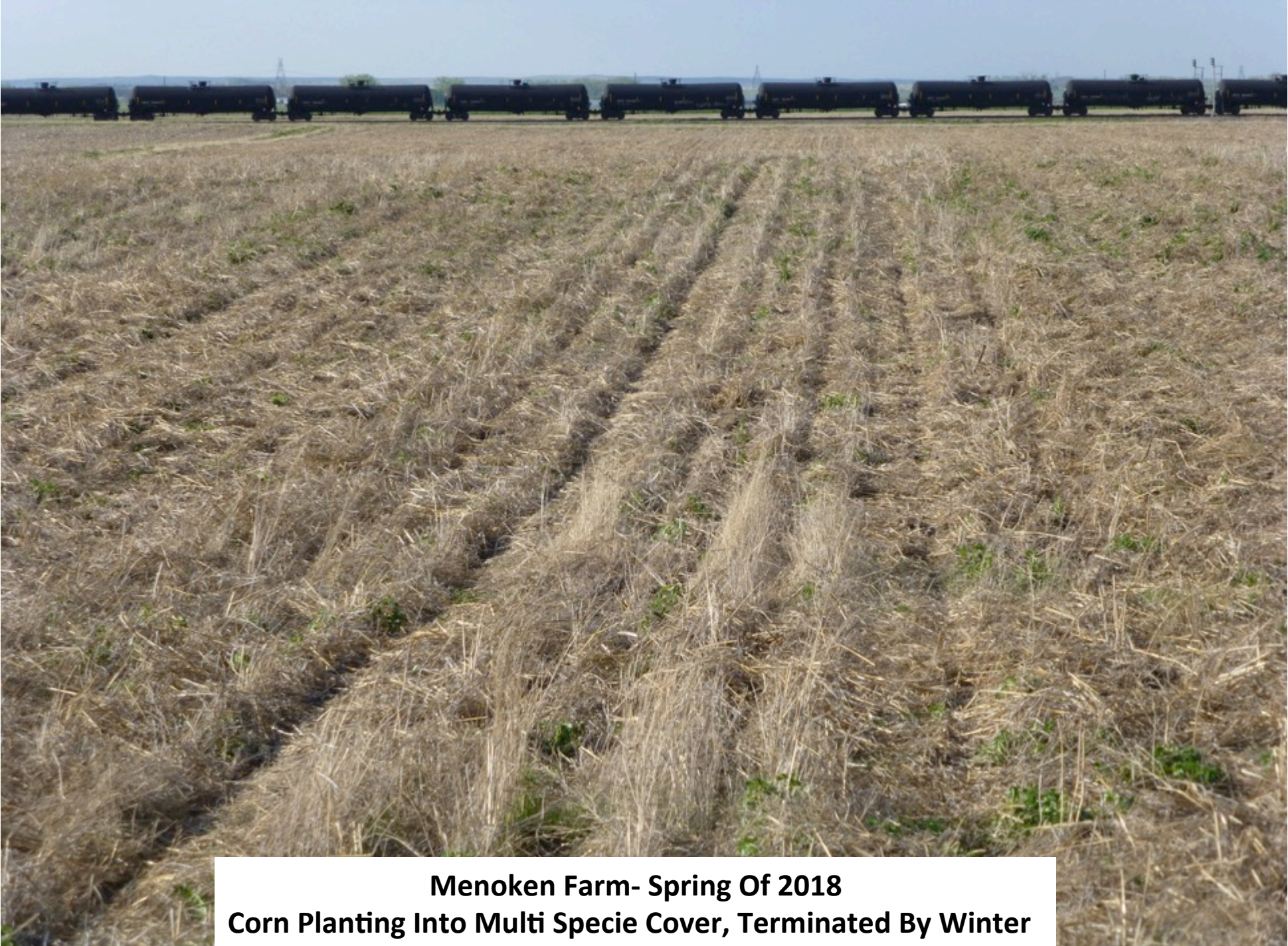
Soil Armor Takes The Energy Out Of A Rain Drop. Preventing Soil Compaction.

Uniform Residue Management
Paul Jasa - 200 Bu Corn.
Only Cobs And Leaves Coming Out Of The Combine.





**Uniform Residue Management
Paul Jasa - No Till Seeding Into 200 bu Corn**



**Menoken Farm- Spring Of 2018
Corn Planting Into Multi Specie Cover, Terminated By Winter**



Menoken Farm – Fall of 2019

Wheat Stubble: Passive Armor, Primarily Returning Carbon Dioxide to the Atmosphere.
Cover Crop Mixture: Active Armor, Every Green Plant Is A Carbon Inlet for the Soil.

“Carbon” coverings for the soil!

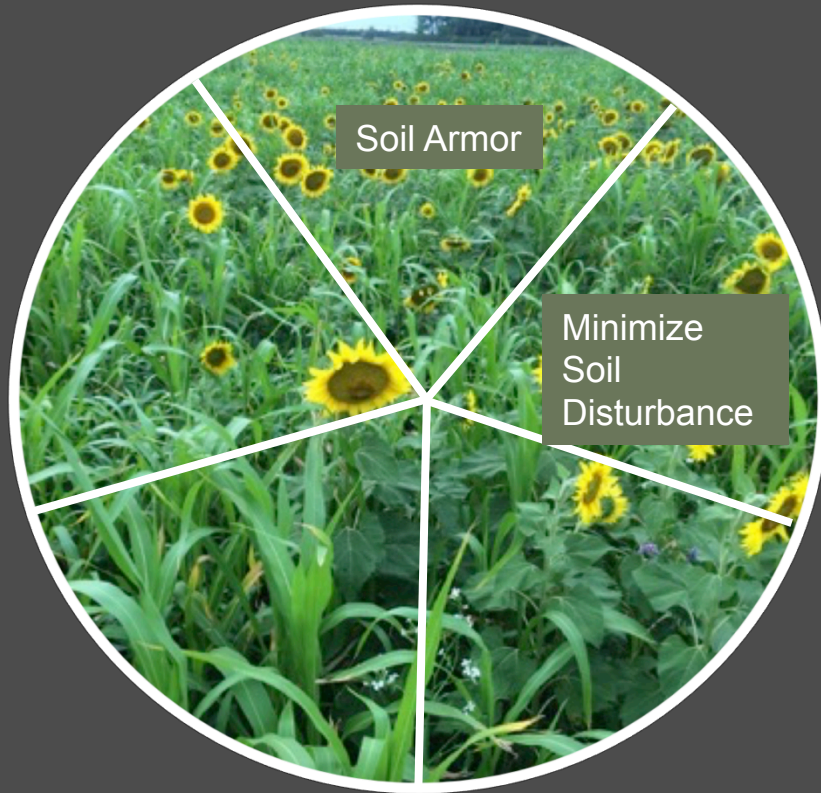
Live crop biomass =
“protective blanket”

*Both are food
sources for the
soil biology!*

Dead crop residue =
“protective blanket”

Dr. Don Reicosky
Retired ARS, Morris, Mn





Soil Health Principles

Systems Approach

Soil Health: the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.



Why Do We Till?
Bakken Oil Field – North Dakota, USA

Fracking An Oil Well Is Like Fracking The Soil

**Horizontal
Compaction
Layers Reduce
Water Infiltration.**

**Resulting
From 120 Years
Of Tillage.**



North Dakota - USA



Menoken Farm
We Need to Constantly Build Soil Aggregates

The Trend In Agricultural Conservation Has Been Toward Less Tillage, But.....



Dust Bowl Era

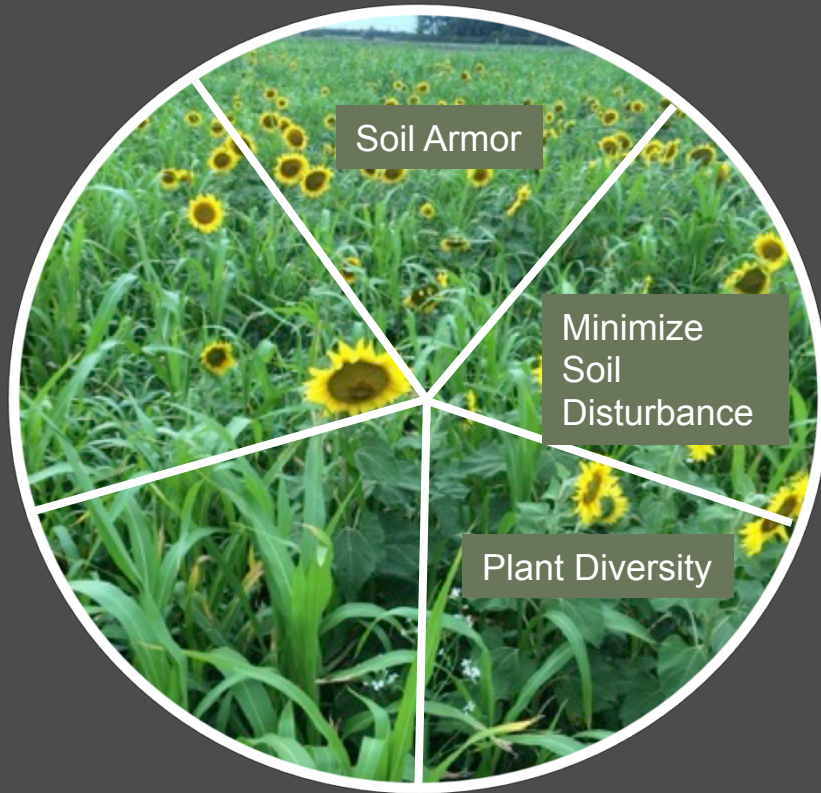


Present

Which Is Better For The Long Term?

“Pulling”
Iron? vs “Pushing”
Carbon!





Soil Health Principles

Systems Approach

Soil Health: the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.

Crop Diversity



“The type and diversity of organic residues added to a soil can influence the type and diversity of organisms that make up the soil community. “ The Nature and Properties of Soils, 14th Edition; Chapter 12.5

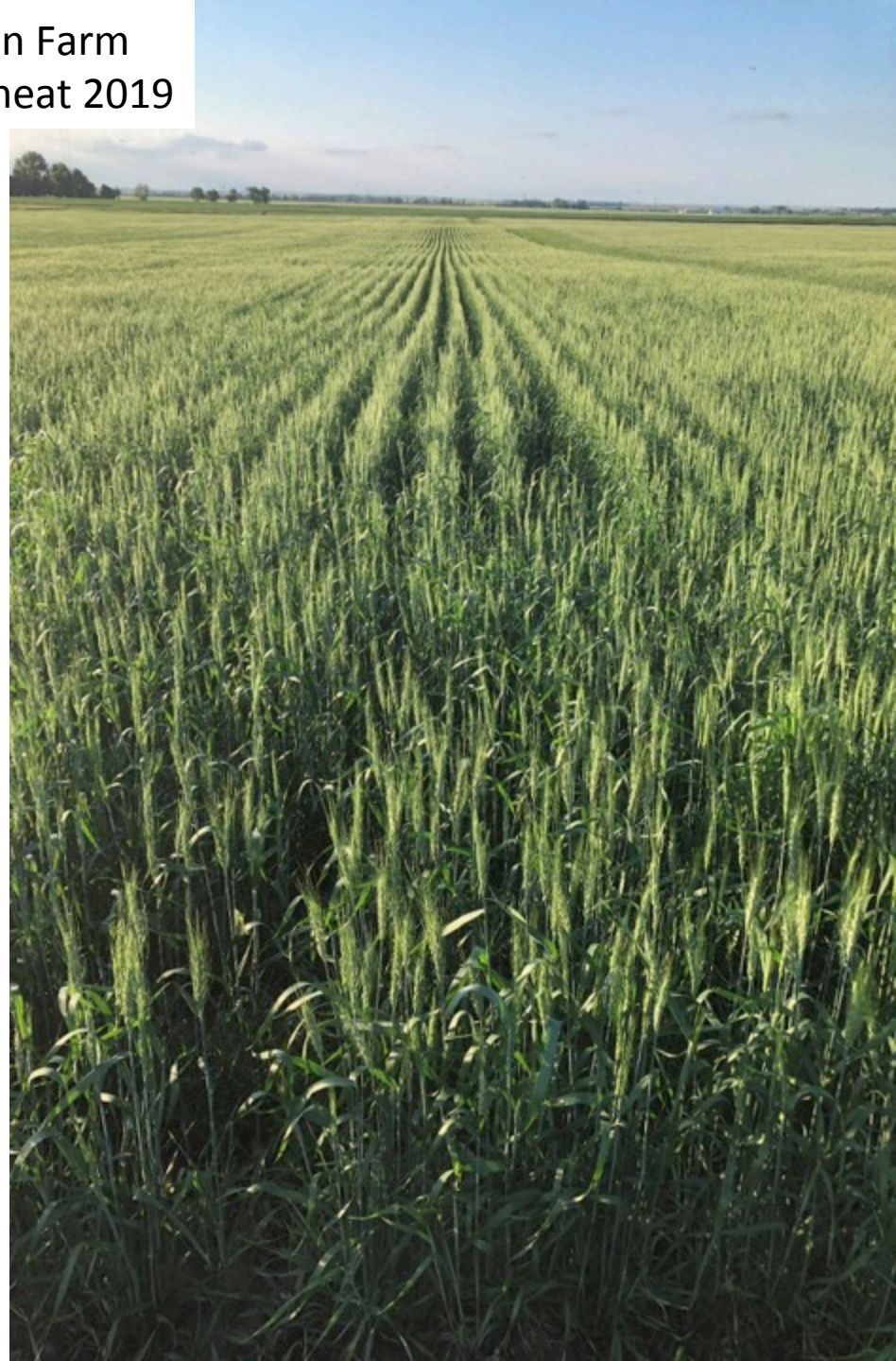
Examples

**Williams Farm
Burleigh County, North Dakota
Soybean and Rye (Or Wheat)**



15 Inch Wheat

Menoken Farm
15 Inch Wheat 2019



Pea/Canola



Menoken Farm – Spring 2019
Planting Pea & Canola In Alternate Rows

60 Inch Corn

Menoken Farm – July 2019
30" Corn With No Cover Crop



Menoken Farm – July 2019
60" Corn & Covers
Perennials and Annuals





Menoken Farm
60 Inch Corn & Covers
Perennials & Annuals



Menoken Farm
60 Inch Corn & Covers
Perennials & Annuals

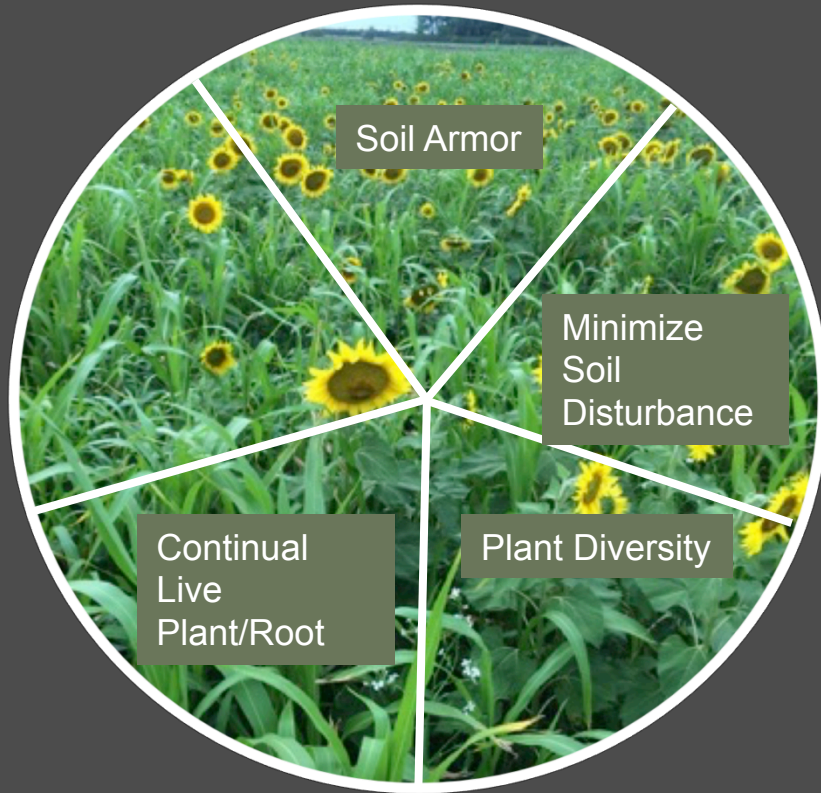


Menoken Farm
60 Inch Corn and Covers
Perennials and Annuals

Flax And Pinto Beans

Menoken Farm – July 2019
Flax And Pinto Beans





Soil Health Principles

Systems Approach

Soil Health: the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.

Covers – Annuals

Planting Green

Why Plant Green?

Erosion Control

Salinity Management

Water Quality

Water Quantity

Transpiration vs
Evaporation

Subsurface Water

Drainage

Wildlife Habitat

Improved Trafficability

Increase Crop Diversity

Less Hairpinning

Livestock Integration

Soil Health Benefits

Weed Suppression:



Biennial Cover Crop Options

Interseeding During The Growing Season (Gaining)
Flying On During The Growing Season (Least Common)
Drilling After Harvest (Most Common)



North Dakota, USA

Precision Planting





Smart Seed Firmer

- **Soil Moisture**
- **Furrow Uniformity**
- **Soil Temperature**
- **Soil Organic Matter**