Manure and Cover Crops… Improving Soil Functions

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Helping People Help the Land.

TOPICS:

- What is *Soil Health?*
- Importance of healthy soil
- The principles of *Soil Health*
- Improving nutrient use efficiency
- Manure and cover crops in soil health management system.

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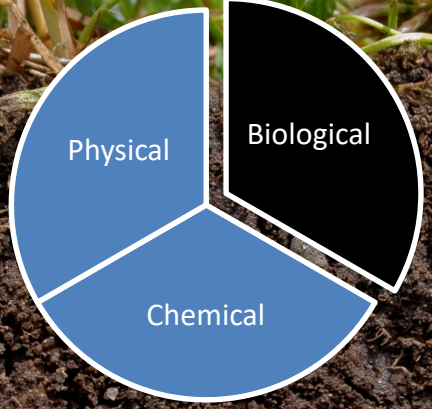

SOIL HEALTH:

The capacity of a soil to <u>function</u> as a vital, <u>living ecosystem</u> that <u>sustains</u> plants, animals, and humans.

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What is *Soil Health*?

- **Key Indicators / Functions =**
  - Improv**ing** aggregate stability
  - Improv**ing** organic matter
  - Increas**ing** water infiltration
  - Increas**ing** water-holding capacity
  - Improv**ing** nutrient cycling
  - Enhanc**ing** and diversify**ing** soil biology

Healthy soil is not a destination...it's a journey!

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Why is *Soil Health* Important?

Soil Erosion and Runoff

Western Lake Erie Basin
Steve Davis, NRCS

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Why is *Soil Health* Important?

Incomplete System = sediment and nutrient loss

October, 2011

Lake Erie = sediment and algae plumes

SOLUTION = Conservation Cropping Systems

Water Quality

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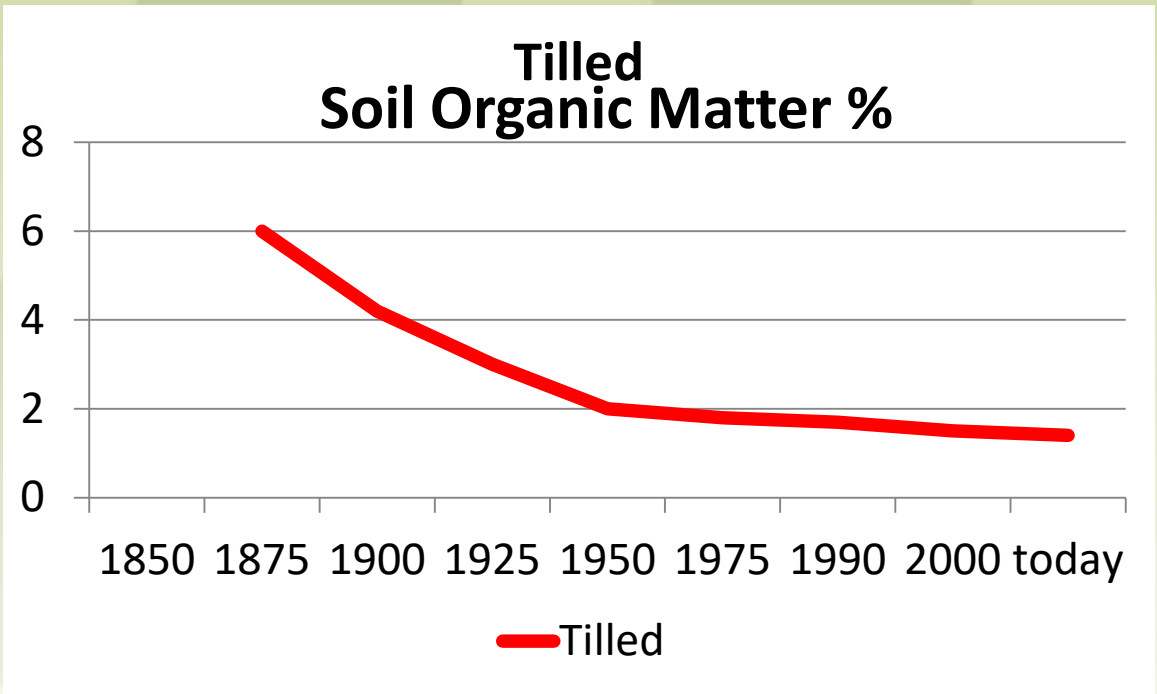
Why is *Soil Health* Important?

(Mining Organic Matter… Is Not an Option!)



Morrow plots, Champaign, IL

Each 1% of O.M. contains:

10,000 lbs. of C

1000 lbs. of N

100 lbs. of P

100 lbs. of S

14,000 gallons of H_2O

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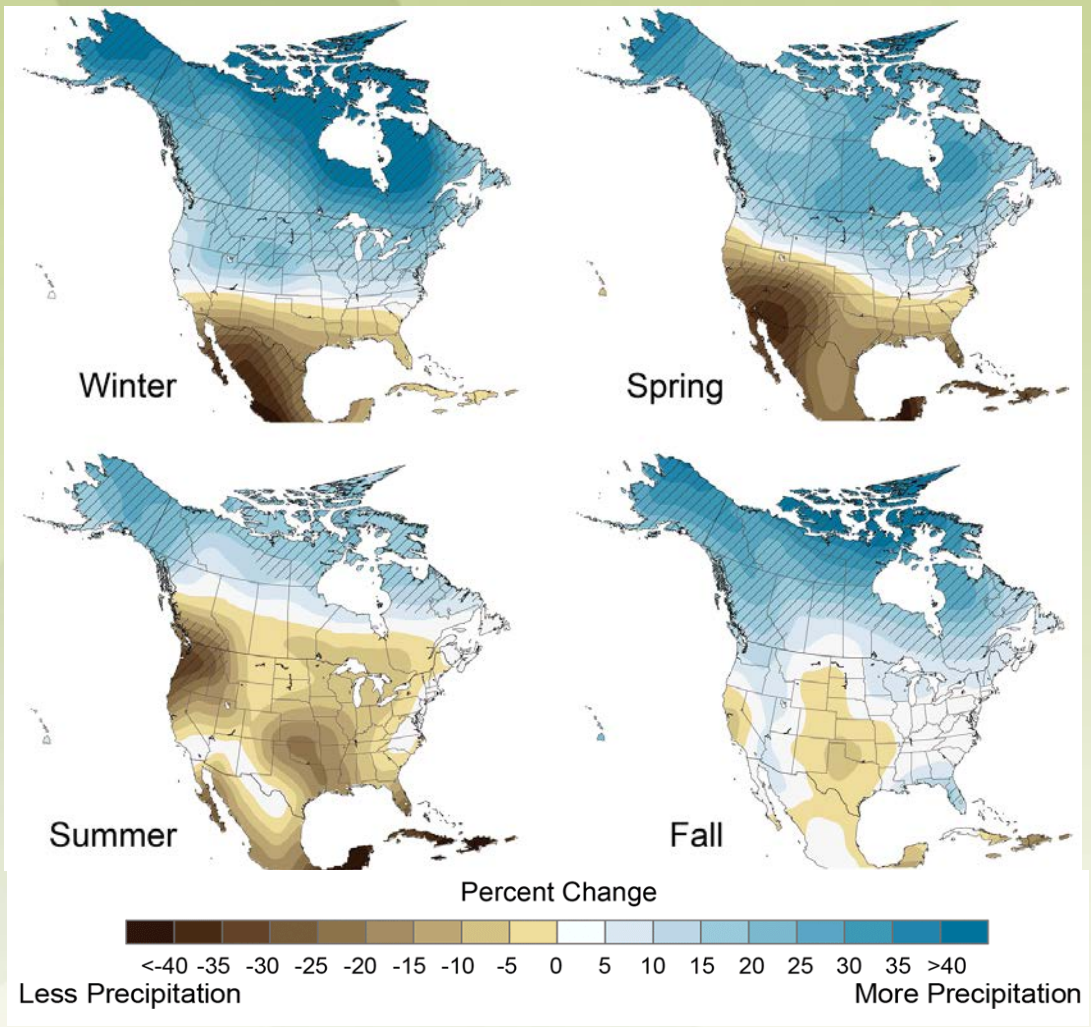
Why is *Soil Health* Important? (Resilience)



Jerry Hatfield, ARS

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We need to start building soil life….ASAP!

Soil response… aggregation after <u>ONE</u> season

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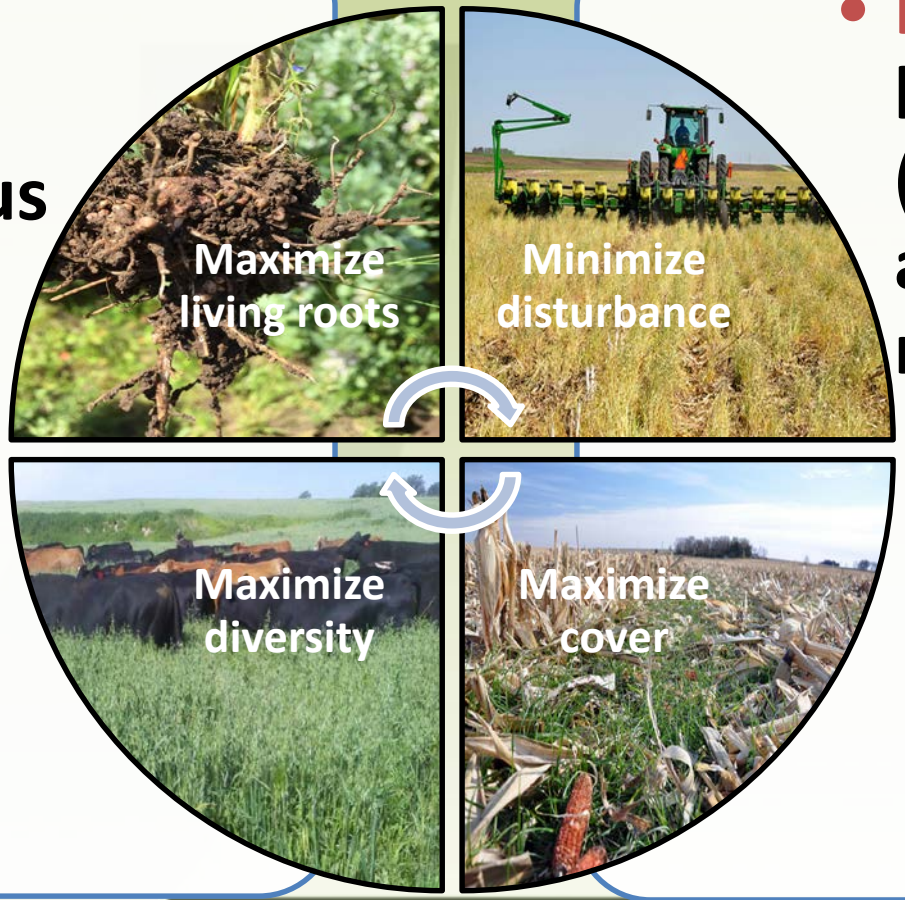
4 Soil Health Principles to Support High Functioning Soils

- **Feed** diverse, continuous inputs (C sources, energy)



- **Protect** habitat (aggregates and organic matter)

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Achieving Soil Health Takes a *SYSTEMS* Approach

- A Quality No-till (Never-Till) System
- Diverse and Strategic Cover Crops
- Adapted Nutrient Management
- Integrated Weed & Pest Management
- Diverse Crop Rotations
- Precision Farming Technology
- Prescriptive Buffers and other edge of field practices

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Nutrient Management Planning (FOTG 590)

- Improving nutrient use efficiency!
- Single application of manure often meets multi-year P needs. (allowance/challenge)
- Do not exceed planned crop N needs.
- Do not overapply N based on losses due to method and timing of application(s).
- Phosphorus Index (PI) = evaluate and address environmental risk(s).

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Adaptive Nitrogen Management

- Tools = improving manure N use
  - Tissue Testing
  - Pre-sidedress Soil Nitrate Test (PSNT)
  - Chlorophyll Meter
  - End-of-Season Stalk Nitrate Test
  - Replicated Plots
  - (State) N Model

Strategically…

Planning the system

First and Foremost - P applications should **ONLY** take place if a soil test supports the need for more P.

Only if Soil Test P is <40 ppm.

Tri-State Fertilizer Recommendations

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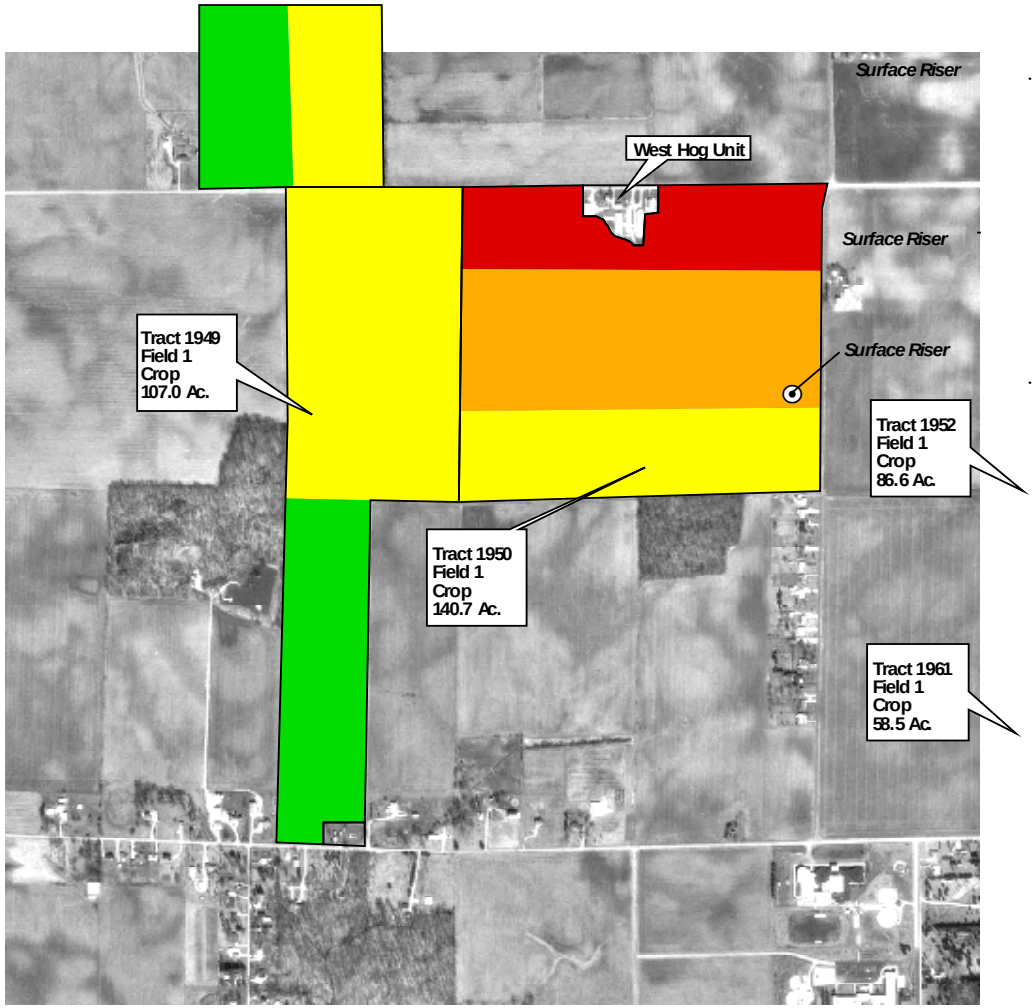
Phosphorus Test

Green = <100 lb

Yellow = 100-199 lb

Orange = 200-399 lb

Red = 400 lb +



Strategically…

Planning the system…which is first?

1. Manure application
   - Avoid compaction.
   - Wet vs. dry?
   - Injection vs. incorporation = reduce disturbance!
2. Cover crops
   - Establish cover crop prior to, during ("slurry seeding") or immediately after a summer / fall application of manure.
   - Previous & next crop?
   - Species (rates & planting dates)?

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Strategically…

Planning the system

1. **If** application is planned…inject or spread **manure** into corn stalks.

2. **Coulter harrow** incorporation <u>while</u> seeding a cover crop with a mounted air delivery seeder.

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Strategically…
Planning the system

OR…

1. **If** application is planned…inject or spread **manure** into corn stalks.

2. **Rotary harrow** incorporation <u>while</u> seeding a cover crop with a mounted air delivery seeder.

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Strategically…

Planning the system

OR…

1. **CC** can also be aerially applied and then…

2. **Nutrients** can be injected/spread into growing cover crop + corn stalks.

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Strategically…
Planning the system

OR…

1. **Liquid no-till / strip-till injection** with a coulter knife injector tool bar and a drag line.

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Strategically…

Planning the system

OR…

1. **Liquid no-till / strip-till injection** with a coulter knife injector and closing wheels attached to a flotation nurse truck.

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Strategically…
Planning the system

OR…

1. **Liquid no-till / strip – till and modified no-till injection** with aerator directed placement.

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Soil Health Is Understanding How the Soil is Designed to Function and Managing it Accordingly

Thank you!

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