Healthy Soil: Structure

• Good tilth
Healthy Soil: Structure

- Good tilth
- Network of small and large pores
- Absorbs & retains moisture
Healthy Soil: Structure

• Good tilth
• Network of small and large pores
• Absorbs & retains moisture
• Fosters root development
• Resists compaction
Accounts for only 1 - 6% of the soil

“*The living, the dead, and the very dead.*”

Vermont Agric. Exp. Sta. Bulletin 135, 1908
How Healthy Soil Improves Soil Water Dynamics

Healthy Soil

Dr. Mark Schonbeck
How Healthy Soil Improves Soil Water Dynamics

Healthy Soil

Compacted Soil

Dr. Mark Schonbeck
Bare Soil Is at Risk!
NRCS Principles of Soil Health

- Keep soil covered
- Diversify crops
- Maintain living roots
- Minimize soil disturbance
NRCS Principles of Soil Health

- Keep soil covered
- Diversify crops
- Maintain living roots
- Minimize soil disturbance
Cover Crops Enhance Water Availability and Quality

Legumes

Grasses

Brassicas

Basche et al., 2016;
Basche & DeLonge 2019
Radishes: Master Subsoilers and Nutrient Scavengers
NRCS Principles of Soil Health

- Keep soil covered
- Diversify crops
- Maintain living roots
- Minimize soil disturbance
Each species offers a different growth habitat, root depth and architecture, and suite of microbes.
Diversified Rotations

• Build soil organic matter
• Increase soil functional biodiversity
• Reduce pests
• Provide market opportunities
NRCS Principles of Soil Health

Keep soil covered

Diversify crops

Maintain living roots

Minimize soil disturbance
Reducing Tillage to Conserve Soil Water-holding Capacity

- Mulch-tilling leaves residue cover.
- Strip tilling leaves alleys undisturbed.
- Rotary spaders reduce compaction.
- Rototillers can be geared down to conserve aggregates.
- Sweep plow undercutters leave residues and conserve moisture.
Fallow vs. Cover Crop

Fallow

Cover Crop
Fallow
Fallow

Young Cover Crop
Bare Soil vs. Ground Cover

Poor Soil Structure & Soil Health

Dr. Zahangir Kabir
Bare Soil vs. Ground Cover

Poor Soil Structure & Soil Health

Healthy Soil with Good Structure

Dr. Zahangir Kabir
Cover crop

Fallow

Closer look—cover crop field

Closer look—fallow field
Cover Crop Confers Flood Resilience
Cover Crop Confers Flood Resilience
Cover Crop Confers Flood Resilience
Step 1: Assess Your Soil Resources

- Soil texture
- Soil depth and profile
- Drainage, permeability
- Depth to restrictive layer
- NRCS Web Soil Survey: 
  
  https://websoilsurvey.nrcs.usda.gov/
Step 2: Review Your Practices

Crop rotations

Cover cropping

Fertilizers and amendments

Tillage
Understand the Benefits...

- SOM, soil life, soil health
- N fixation, nutrient cycling
- Drainage, water capacity
- Weed and pest control
And the Potential Costs and Risks

- SOM, soil life, soil health
- N fixation, nutrient cycling
- Drainage, water capacity
- Weed and pest control
- Seed and planting costs
- Cover crop failure
- Cash crop planting delay
- Water use in dry years
Reducing Risk through Best Soil Health Practices

Download for free at ofrf.org
Step 3: Make Small, Measurable Changes

Add crops

Add practices

Adjust inputs
Step 3: Make Small, Measurable Changes

Add crops

Add practices

- Add one new practice at a time:
  - Small scale trial
  - Comparison trial
  - Enterprise budget

Adjust inputs

- Scale up promising crops or practices.
Step 4: Identify Soil Health Resources
Step 4: Identify Soil Health Resources

- USDA NRCS, Soil Health
- Midwest Cover Crop Council (cover crop tool)
- Soil and Water Conservation Society
- Sustainable Agriculture Research & Education (SARE)
- Practical Farmers of Iowa
- eOrganic
- ofrf.org
Thank You to Our Funding Source
Questions?

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• What kind of weather-related challenges/resiliency have you been dealing with on your farm?
• What soil health building practices have you implemented to deal with these climate challenges? Were they successful or not?
• Have you grown cover crops? If so, which cover crops worked well? Did you experience challenges establishing winter cover crops in time? When did you terminate your winter cover crops? Have you tried summer cover crops interseeded with cash crops?
• Have you had any luck with conservation tillage or no-till?
• What other practices have you implemented to build soil health and improve soil water dynamics?