Soil Management Practices to Reduce Erosion and Improve Soil Quality

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Managing Agricultural Landscapes for Environmental Quality Conference
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Principles and Goals for Environmental Quality

- Keep every soil particle in place
- Keep every rain drop and snowflake where it lands
- Remove highly erodible land from crop production
- Maximize water use efficiency
- Build soil quality, not just maintain it

Goals of a Soil Management Program

Environmental Quality: to meet or exceed environmental standards for improving soil, water and air quality

Agronomic Production: to maintain or increase crop yields and total crop production

Best Soil Management Practices Recommendations

- Continuous no-till cropping systems
- Use cover crops following low-residue crops (cotton, soybeans, corn silage)
- Use 'precision tillage' as needed

  (strip-till, variable depth subsoiling)
- Use vegetative buffers as protection against extreme erosion events

If ALL our cropland was NO-TILLED…

If **ALL** our cropland was **NO-TILLED…**

Wind Erosion?
Water Erosion?
Runoff?
Water quality?
Soil Carbon?

Nutrient loss?
Buffer strips?
Terraces?
Grass Waterways?

Crop yields?

Key Questions

- If research shows excellent results for no-till (and other conservation practices) why don't farmers adopt them?
- If good practices are successful and profitable on individual farms, why doesn't everyone in the area adopt them?
- Why do good people use bad practices?

U.S. Tillage Practices

- In 1990

  73 million (26%) acres Conservation Tillage

  17 million (6%) acres No-till

- In 2004

  112 million (40%) acres Conservation Tillage

  62 million (23%) acres No-till

(CTIC, 2004)

Residue &Tillage Mgt Conservation Practices

Conservation Tillage Benefits (Residue Management)

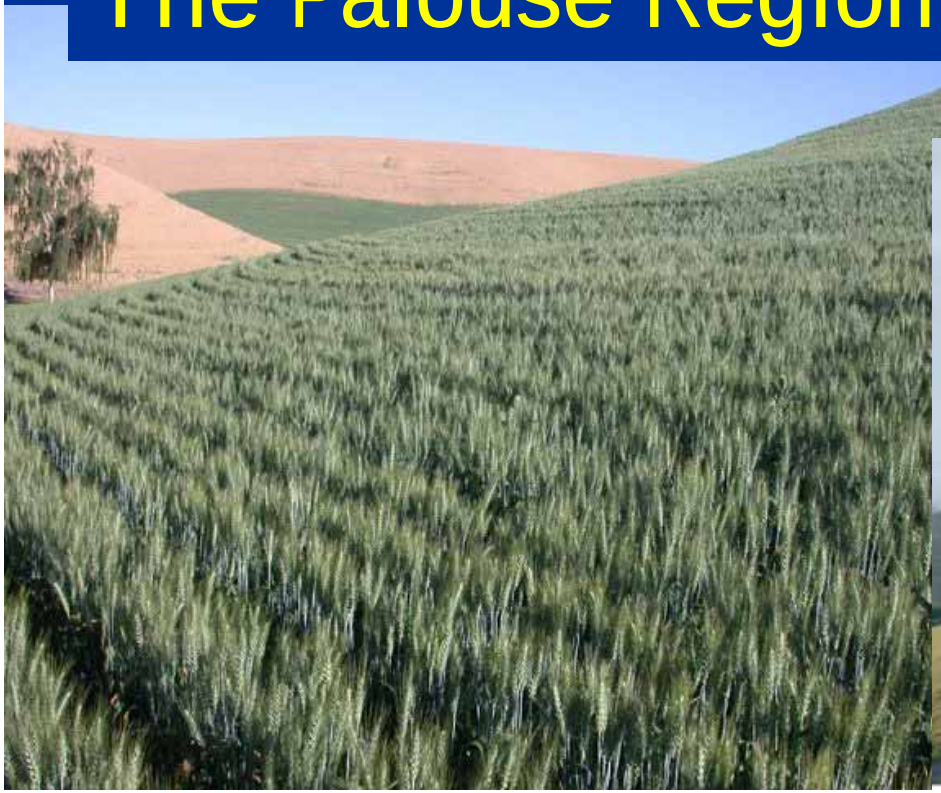
- Increases crop residues to protect soil surface
- Reduced soil erosion has positive impact on soil and water quality
- Increases soil carbon content
- Reduces potential wind erosion
- Increases water infiltration and storage

No Tillage means…

Cleaner Streams


No-till in the Midwest

The Palouse Region



In the Palouse…
No-till ~ 10%
Why not 90%?

Continuing Machinery Innovation

Grass waterways and buffers

Grass waterways and buffers

Tillage overwhelms other conservation practices

Water Erosion Control Practices

Contour Farming

Field borders

Vegetative barrier


Trees, grass buffer
Additional grass buffer
(CREP, 200 feet wide)
Corn

Cover Crop
(& Other Conservation Practices)

Facilitates sustainability of production systems

- Providing protective soil cover
- Enhancing soil physical and chemical properties
- Improving soil fertility and plant nutrition
- Facilitating pest management
- Reducing soil water evaporation
- Competing with weeds


Cover Crop:
Austrian Pea

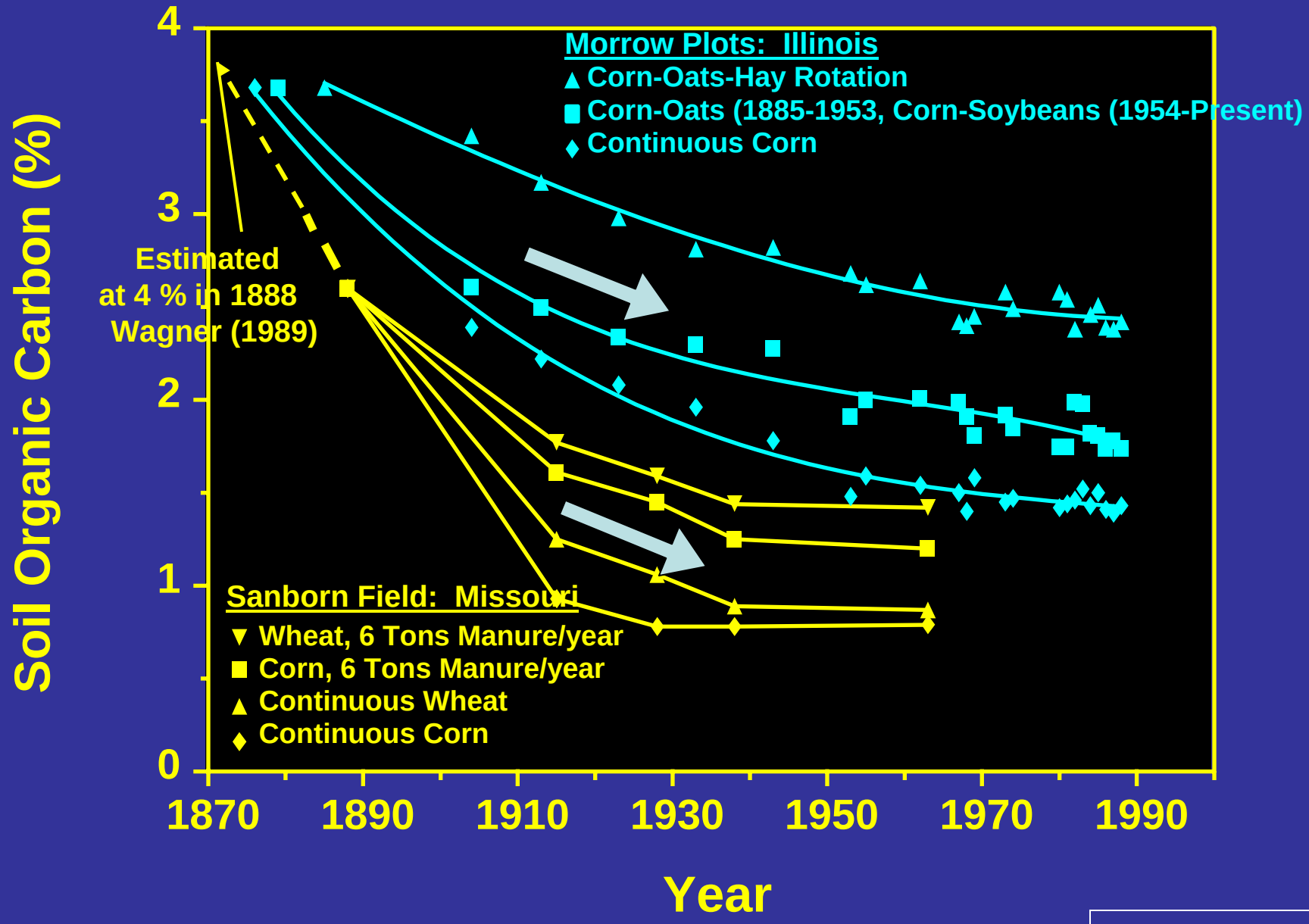
Cover Crop Issues

- Extra costs
- Lack of time for establishment
- Lack of adequate equipment
- Synchrony of N release
- Management required
- Suitable plant species

Cover Crop Research Needs (to encourage widespread use)

- Adaptation to semi-arid and arid climates
- Adaptation to colder climates
- Quantifying nutrient cycling
- Quantifying effects on diseases, pests and other soil microorganisms
- Quantifying benefits for soil carbon

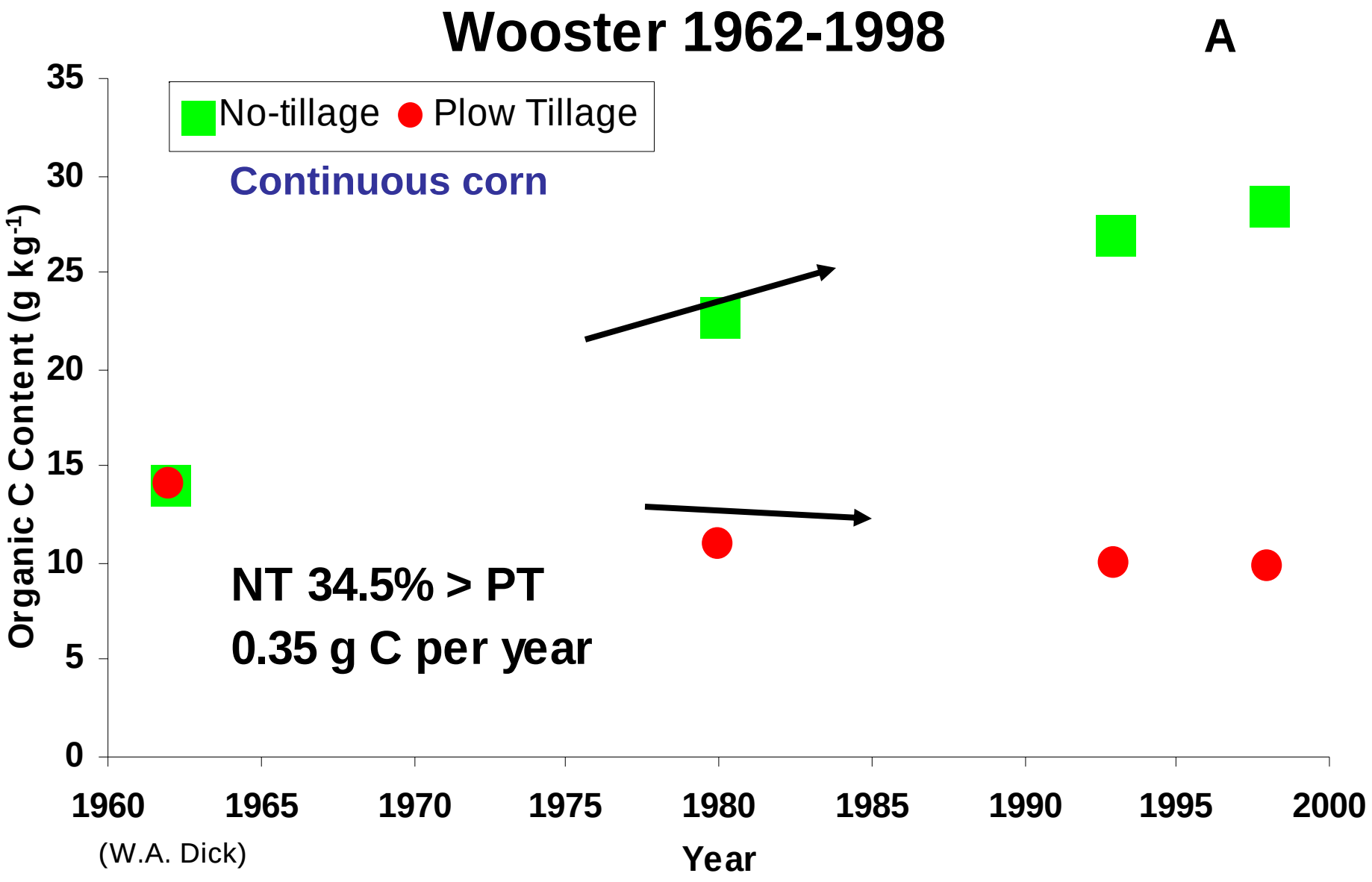
Tillage over time reduces soil carbon



Long Term Effects of Various Crop Rotations

D.C. Reicosky

Wooster, Ohio: Carbon (0-2 inches)



RTK Networks and widespread use of Conservation Practices

Auto-steering systems

(precise, consistent tracking)

Strip-till (for corn)

Controlled traffic

(minimizes soil compaction)

No need to till

Continuous No-Till

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Other Issues…

- Targeting watersheds with most erodible land?
- Equal payments per acre, or trying to provide equal “payments” per ton of prevented erosion?
- Commodity payments or Conservation payments

Summary
Principles and Goals

- Keep every soil particle in place
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Conclusions/Recommendations

- Continuous no-till cropping systems
- Use cover crops after low-residue crops
- Use ‘precision tillage’ as needed
- Use ‘vegetative buffers’ as protection against extreme erosion events
- Use irrigation practices that minimize erosion and maximize water conservation

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Water Erosion Conservation Practices – Key Factors

- Ease of establishment & management
- Effectiveness (sediment vs. soluble)
- Impact on other farm operations
- Economics
- Aesthetics

Summary
Soil Management - Key Points

- Practices on-field most effective
- Long term commitment; consistency
- Optimum system for each environment (geographic region, soil, slope, crop, climate)
- Target areas for protection
- Short term vs. long term goals
- Commodity vs. conservation goals
- Society benefits