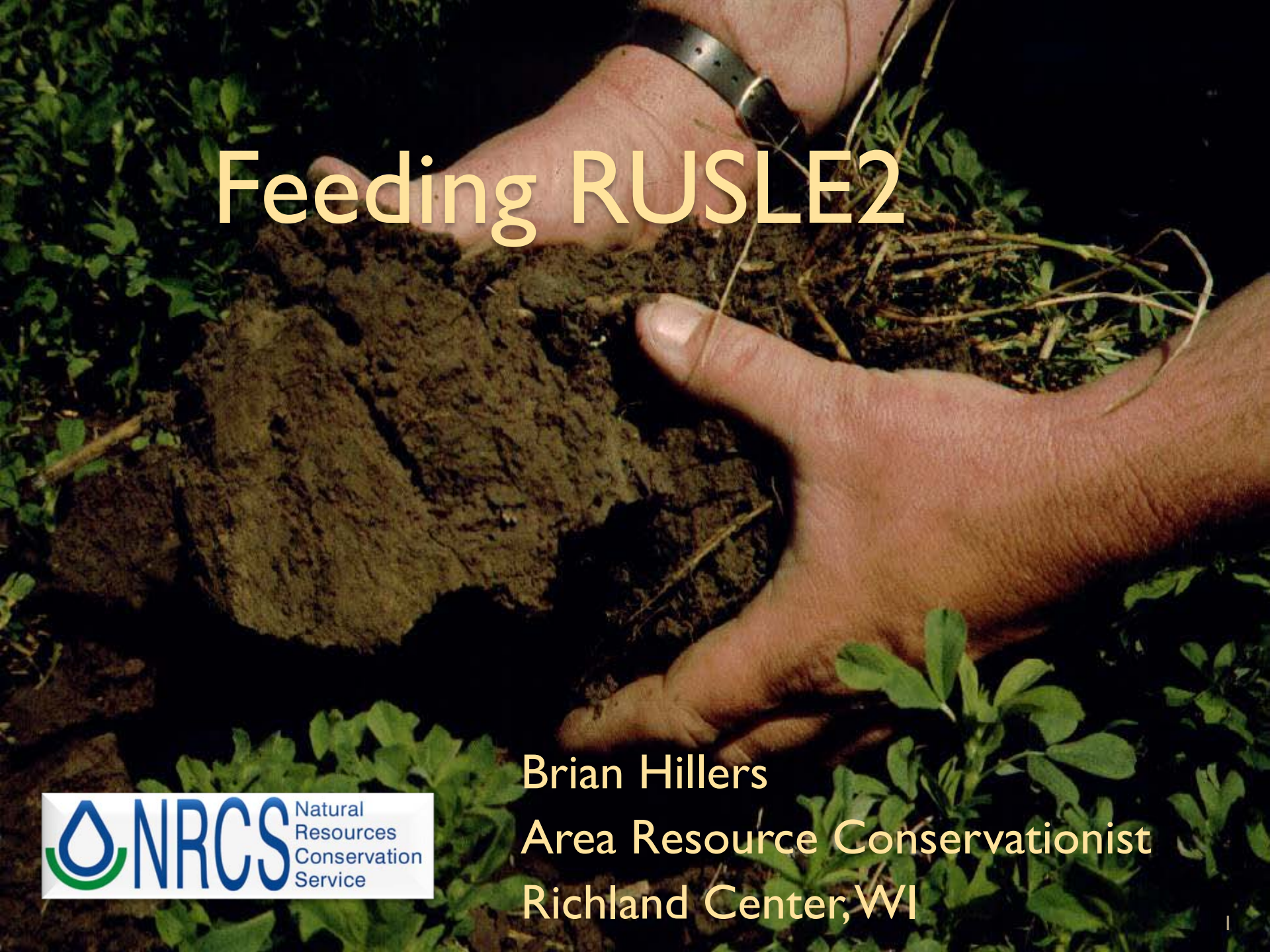
# Feeding RUSLE2



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NRCS Natural Resources Conservation Service

# Tell me how you feel . . .

- "RUSLE2 is Junk"
- "It's not giving me the answer I want"
- "I keep getting a different answer"
- "The residue levels are way off"

# Data Needed

ruslefarmq.doc

- Software/Planner
  - Climate/location
  - Dominant Critical Area for the field or conservation management unit (soil map unit)
  - Length and steepness of slopes
  - Crop yields
  - Supporting practices
- Client
  - Crops grown and sequence of crops
  - Tillage implements used

# Dominant Critical Area

- Defined
  - Soil map unit (SMU) that is >10% of a field (dominant) that will address erosion issues on the remaining portion of the field (critical).
- Must plan for one representative slope in the entire field …
- Slope length and steepness must be an actual value
  - Cannot average
- Why not predominant SMU?
  - Often results in "under-treating" areas

# Dominant Critical Area

| Soil | Acres | Percent |
|---|---|---|
| PoB | 12.2 | 26.3% |
| PoA | 6.0 | 13.0% |
| TrB | 4.5 | 9.6% |
| RnC2 | 11.4 | 24.5% |
| GwD2 | 2.9 | 6.3% |
| PnC2 | 9.4 | 20.3% |
| Total | 46.4 | 100.0% |

# Dominant Critical Area

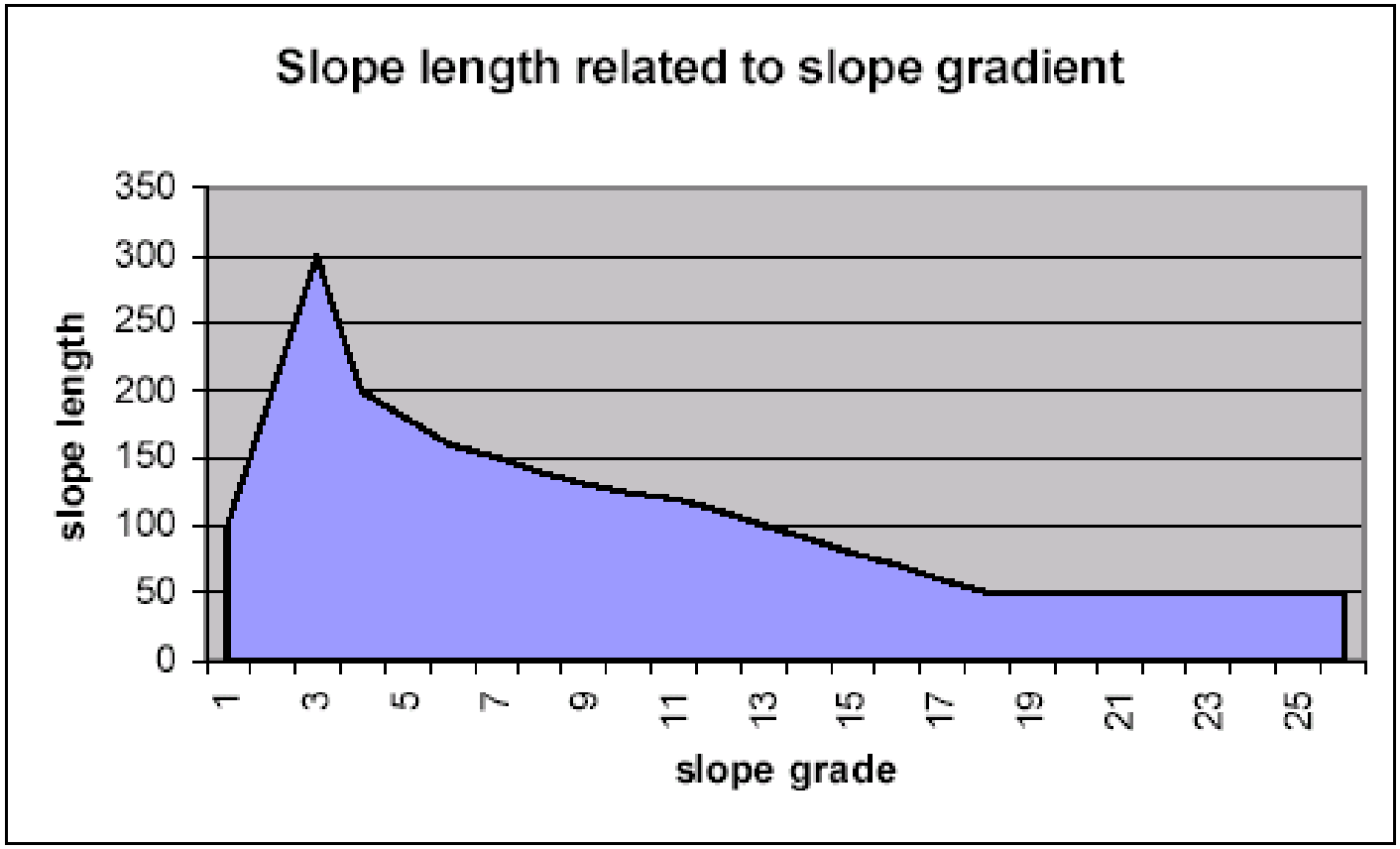
| Soil | Acres | Percent |
|---|---|---|
| PoB | 5.8 | 10.3% |
| PoA | 4.6 | 8.2% |
| TrB | 2.0 | 3.6% |
| KeB | 17.2 | 30.8% |
| GwC | 7.4 | 13.4% |
| BbB | 13.5 | 24.0% |
| DsC2 | 5.3 | 9.4% |
| RaA | 0.2 | 0.3% |
| Total | 56.1 | 100.0% |

# Slope Grade

- Should be representative of the "dominant critical area" (within % of slope of smu)
  - B: 2-6%
  - C: 6-12%
  - D: 12-20%
  - E: 20-30%
- Measure perpendicular to the contour
  - Hand level, clinometer most common
- If you were water, where would you go?

# Slope Length

- Measure in the same location as the % grade
  - Shorter on flat and steep slopes
  - Longer on moderate slopes
- Choose a representative area in the smu
- Measure from area where water concentrates to point of deposition or concentrated flow.
  - Typically 30-45° from concentrated flow channel


Slope length related to slope gradient
slope length
350
300
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
25
slope grade

# Other Info

- Crop yields
  - NRCS uses long-term average yields per soil type
  - Obtain these from Soil Data Mart:
    - http://soildatamart.nrcs.usda.gov/
  - Higher yields generally result in decreased soil loss AND higher amounts of residue after planting
  - SNAP Plus
    - Grain crops: mid-point of the yield goal for nutrients
    - Forage/silage crops: default value in RUSLE2
- Crops
  - Consider "common" rotations
  - Planting dates, methods of planting/harvest, cover crops, species, narrow row/wide row, single-disc vs. double-disc, etc.
- Tillage
  - Details are important
  - Pictures are valuable
  - Brand and model numbers of equipment

# Tillage Implements

"I use a finisher before I plant . . ."

"It's a DC III with the disk in the front . . ."

" It has the spikes in the back with rollers behind it . . ."

↓

RUSLE2: Seedbed finisher, sngl disk, fld cult., coil tine harrow, rolling basket

Twisted


Straight


# Common chisel points

Double-disc


Single-disc


# Disc Openers

Field Cultivator


Seedbed Finisher (combination tool)


# Secondary Tillage

# RUSLE2 IMPLEMENTS

Seedbed conditioner, coulter caddy, rotary harrow, rolling basket


# RUSLE2 IMPLEMENTS

Drill or Air Seeder, double disc w/ fluted coulters


# RUSLE2 IMPLEMENTS

Chisel plow, disk, twst. pts.


# RUSLE2 IMPLEMENTS

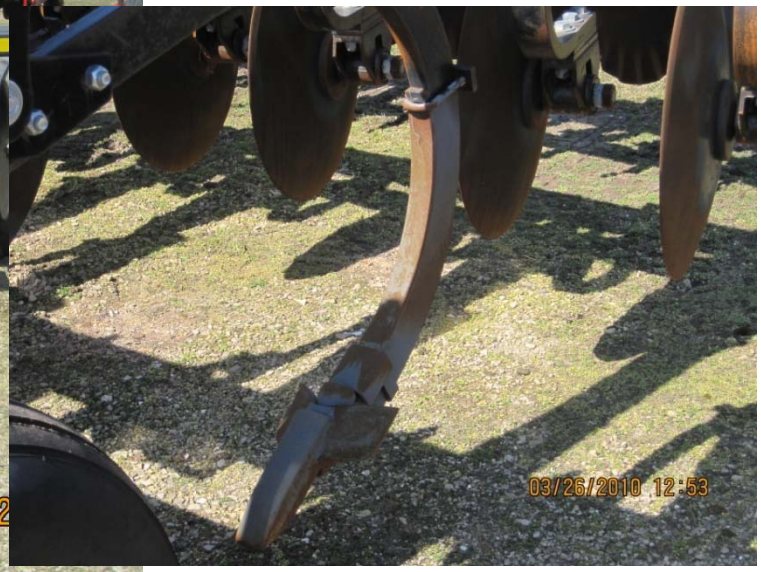
Subsoiler, in-row

# RUSLE2 IMPLEMENTS

Shredder, flail or rotary OR Shred residue, 6” stubble


# RUSLE2 IMPLEMENTS

Subsoiler, disk ripper

# RUSLE2 IMPLEMENTS

Chisel plow, disk, st. pts.

# RUSLE2 IMPLEMENTS

Seedbed finisher, sngl disk, fld cult., coil tine harrow, rolling basket

# RUSLE2 IMPLEMENTS

Roller, corrugated packer

# RUSLE2 IMPLEMENTS

Planter, strip-till


# RUSLE2 IMPLEMENTS

Seeder, corrugated packer

# RUSLE2 IMPLEMENTS

Fert. appl., strip-till 30”

# RUSLE2 IMPLEMENTS

Coulter Tiller, 10° angle, coil tine harrow, rolling basket


# RUSLE2 IMPLEMENTS

Rolling basket incorporator (a.k.a. "crumbler")

# RUSLE2 Products

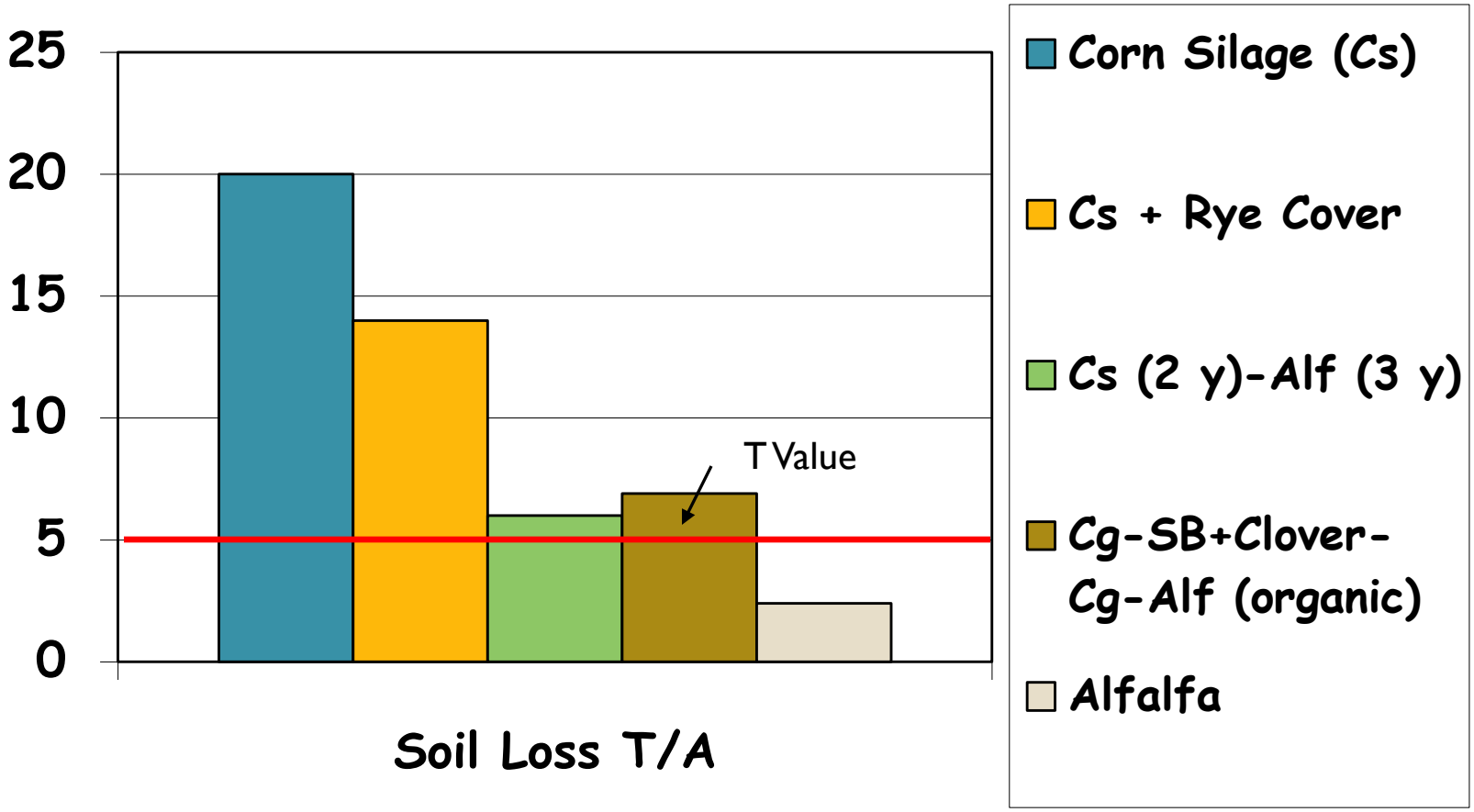
# RUSLE2 Products

- Tolerable soil loss ("T")
- Soil Condition Index (SCI)
- Soil Tillage Intensity Rating (STIR)
- Energy calculator
- Residue values after each operation

# Erosion Factors - The "T" Value

- Different soils have different tolerances to erosion.
- Soil scientists assign a soil loss tolerance "T" value to soil during mapping based on the soil's properties and potential for the soil to lose productivity over time from erosion.
- T values assigned to soils during mapping are 1, 2, 3, 4, or 5 tons per acre per year.
- Soils with lower T values are much more quickly damaged from erosion than soil with higher T values.

# Sample RUSLE2 Rotations

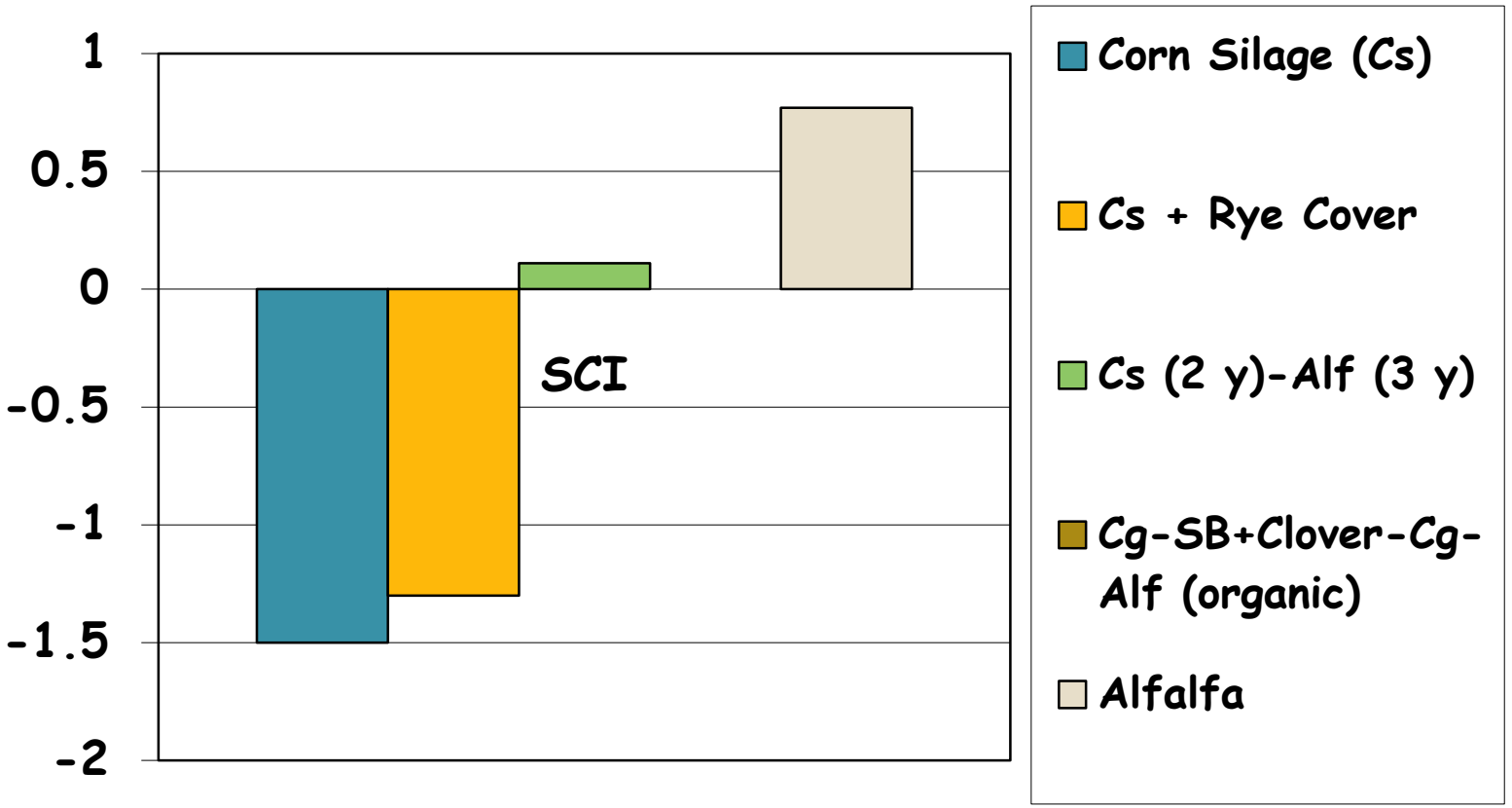



Fayette silt loam, 159 ft 10% slope; Iowa Co, WI; alfalfa-spring seeding w oats
RUSLE2 Calculations by Brian Hillers, NRCS-WI

# Soil Condition Index

- Organic matter returned to the soil
- Field Operations - type, speed & number of passes
- Erosion factors
- THE HIGHER THE NUMBER THE BETTER!!
- “0” Means OM is being maintained(The numbers range from -2..0..+2)

# RUSLE2 Soil Conditioning Index (SCI)




+ Soil OM Increase
- Soil OM Decrease

Fayette silt loam, 150 ft 10% slope; Iowa Co, WI; alfalfa-spring seeding w oats
SCI Calculations by Brian Hillers, NRCS-WI

# HOW CAN I IMPACT SCI??

- High residue crops in rotation
- Cover crops
- Mulch & Manure applications
- Reducing tillage or soil disturbance
- Minimize the erosion from wind & water
- Increase crop production/residue levels
- Move farther north

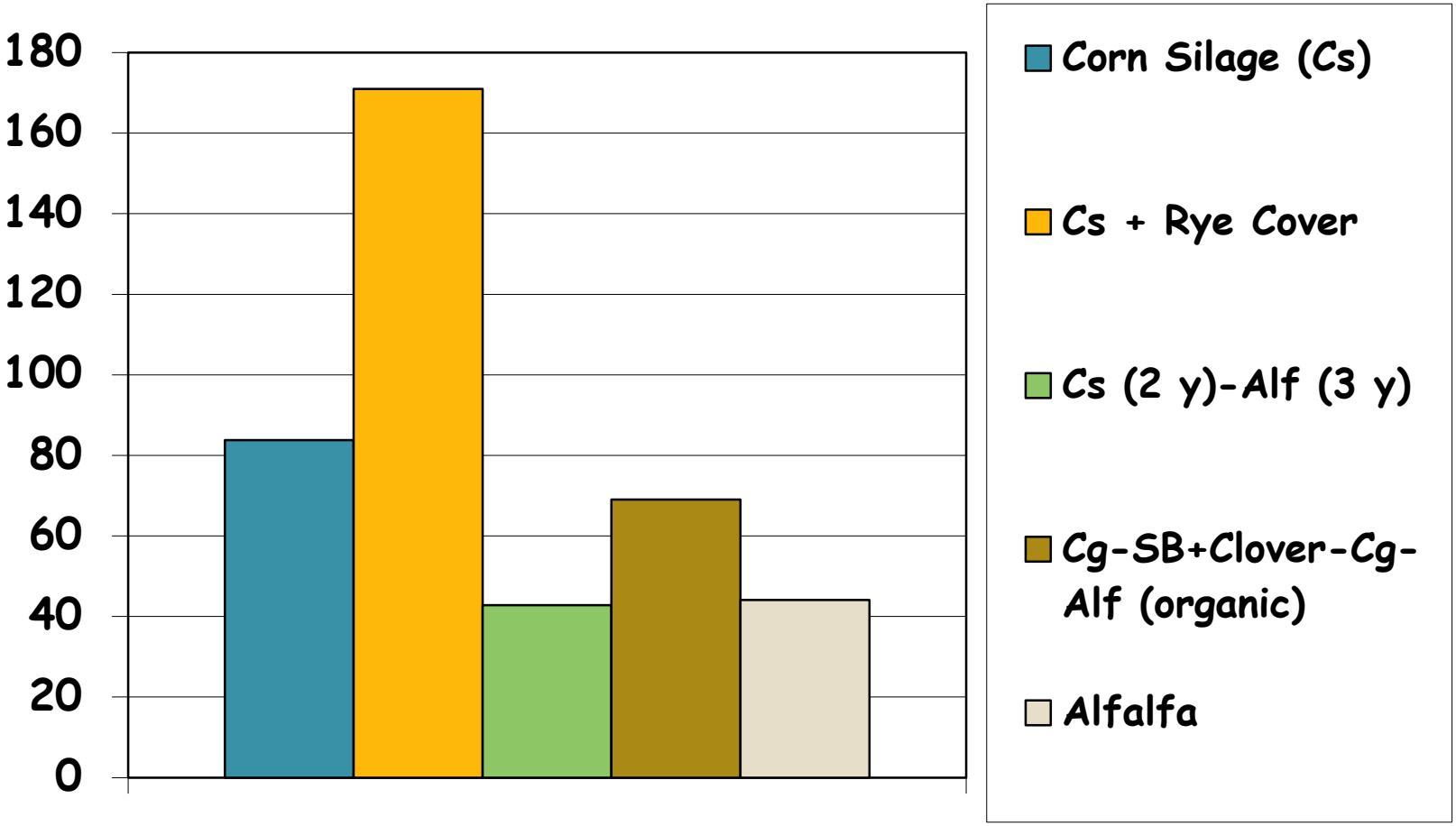
# ROTATION IS CRITICAL

- OM
- Canopy Cover
- Residue composition

# Soil Tillage Intensity Rating (STIR)

- Range: 0 to 200
  - Lower rating results in more organic matter "potential" and reduced erosion
- Impacts SCI value
- Factors
  - Number of tillage passes
  - Depth of tillage
  - Amount of disturbance to soil surface (15" vs. 30", etc)
  - Speed of implements

# RUSLE2 Soil Tillage Intensity Rating (STIR)



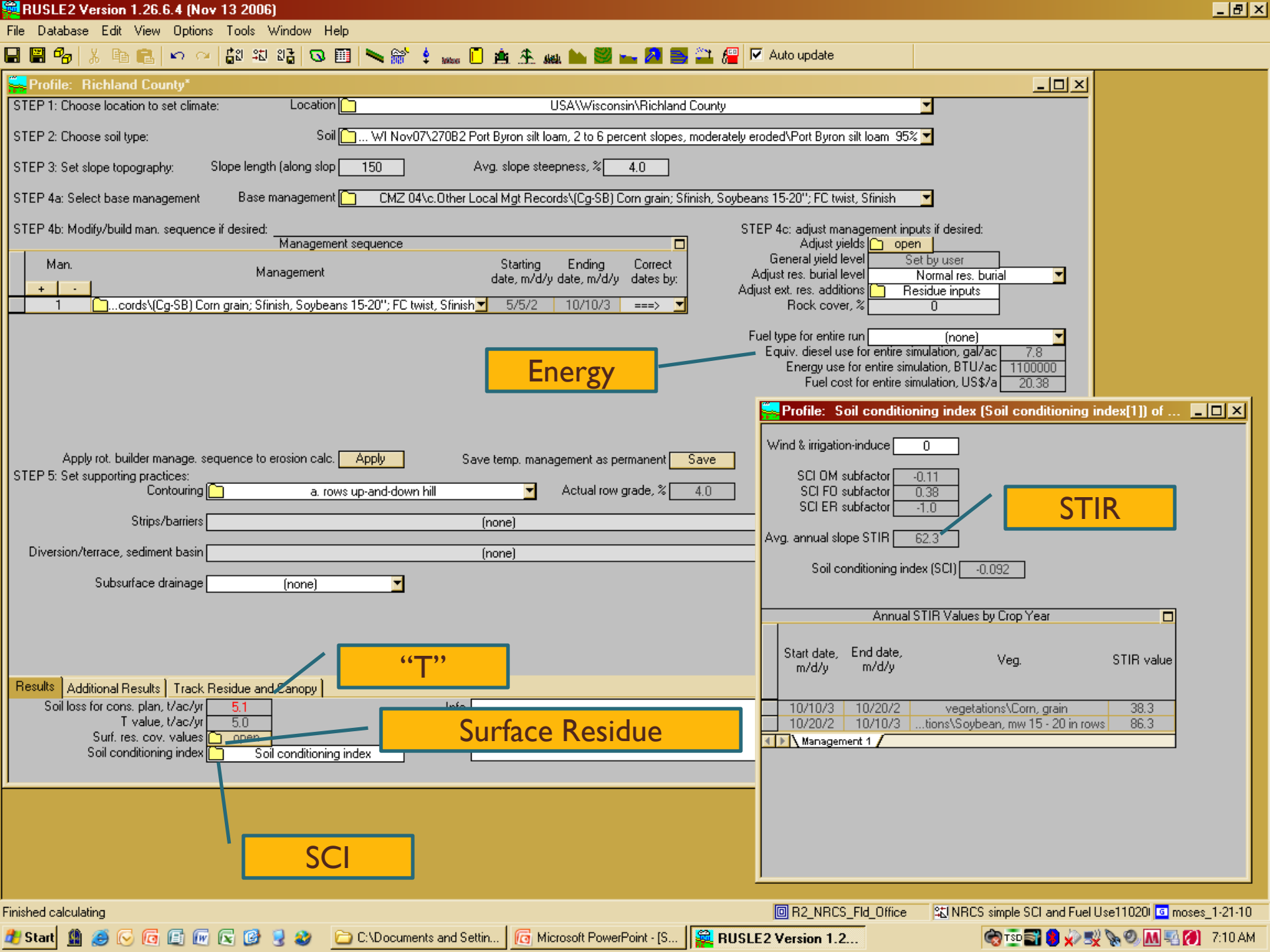

Fayette silt loam, 150 ft 10% slope; Iowa Co, WI; alfalfa-spring seeding w oats
STIR Calculations by Brian Hillers, NRCS-WI

# NRCS Tillage Standards

- No-Till/Strip-Till
  - No-Till
    - STIR value <10
    - No more than 15% of surface area disturbed
  - Strip-Till
    - STIR value 10-15
    - No more than 30% of surface area disturbed
  - If using corn silage – must have positiv SCI
- Mulch-Till
  - STIR value 15-30
  - Full-width tillage

# Other Products

- Energy calculations
  - Primary inputs affecting energy usage
    - Type of fuel
    - Tillage/planting operations
    - Cost of fuel
    - Soil texture
  - Outputs
    - Gallons/acre of fuel used for rotation
    - BTUs/acre
    - Fuel cost ($/acre) for rotation
- Percent residue
  - Gives client a visual "cue" on applying the plan
  - Means of checking feasibility of outputs – are they reasonable?


RUSLE2 Version 1.26.6.4 (Nov 13 2006)
File Database Edit View Options Tools Window Help
Auto update
Profile: Richland County*
STEP 1: Choose location to set climate:
Location
USA\Wisconsin\Richland County
STEP 2: Choose soil type:
Soil
... WI Nov07\270B2 Port Byron silt loam, 2 to 6 percent slopes, moderately eroded\Port Byron silt loam 95%
STEP 3: Set slope topography:
Slope length (along slop
150
Avg. slope steepness, %
4.0
STEP 4a: Select base management
Base management
CMZ 04\c.Other Local Mgt Records\(Cg-SB) Corn grain; Sfinish, Soybeans 15-20"; FC twist, Sfinish
STEP 4b: Modify/build man. sequence if desired:
Management sequence
Man.
Management
Starting date, m/d/y
Ending date, m/d/y
Correct dates by:
1
...cords\(Cg-SB) Corn grain; Sfinish, Soybeans 15-20"; FC twist, Sfinish
5/5/2
10/10/3
===>
STEP 4c: adjust management inputs if desired:
Adjust yields
open
General yield level
Set by user
Adjust res. burial level
Normal res. burial
Adjust ext. res. additions
Residue inputs
Rock cover, %
0
Fuel type for entire run
(none)
Equiv. diesel use for entire simulation, gal/ac
7.8
Energy use for entire simulation, BTU/ac
1100000
Fuel cost for entire simulation, US$/a
20.38
Energy
Apply rot. builder manage. sequence to erosion calc.
Apply
Save temp. management as permanent
Save
STEP 5: Set supporting practices:
Contouring
a. rows up-and-down hill
Actual row grade, %
4.0
Strips/barriers
(none)
Diversion/terrace, sediment basin
(none)
Subsurface drainage
(none)
Profile: Soil conditioning index (Soil conditioning index[1]) of ...
Wind & irrigation-induce
0
SCI OM subfactor
-0.11
SCI FO subfactor
0.38
SCI ER subfactor
-1.0
STIR
Avg. annual slope STIR
62.3
Soil conditioning index (SCI)
-0.092
Annual STIR Values by Crop Year
Start date, m/d/y
End date, m/d/y
Veg.
STIR value
10/10/3
10/20/2
vegetations\Corn, grain
38.3
10/20/2
10/10/3
...tions\Soybean, mw 15 - 20 in rows
86.3
Management 1
"T"
Results
Additional Results
Track Residue and Canopy
Soil loss for cons. plan, t/ac/yr
5.1
T value, t/ac/yr
5.0
Surf. res. cov. values
open
Soil conditioning index
Soil conditioning index
Surface Residue
SCI
Finished calculating
R2_NRCS_Fld_Office
NRCS simple SCI and Fuel Use11020
moses_1-21-10
Start
C:\Documents and Settin...
Microsoft PowerPoint - [S...
RUSLE2 Version 1.2...
7:10 AM

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