

OVERVIEW OF RUSLE 2

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WHAT IS RUSLE 2

- **“GREAT GRANDSON” OF USLE**
- **MODEL TO PREDICT SOIL LOSS**
 - **WHERE OVERLAND FLOW OCCURS**
 - **COMPUTES ANNUAL SHEET/RILL EROSION**
 - **COMPUTES PARTICLE DISTRIBUTION AND RUNOFF**
- **CROPLAND, FOREST, LANDFILLS, CONSTRUCTION SITES, SURFACE MINES**
- **WINDOWS “PULL DOWN” MENUS**
- **INTERACTIVE**

EROSION EFFECTS PRODUCTIVITY AND ENVIRONMENTAL QUALITY

- **LOSS OF OM, SOIL, ROOTZONE, AND NUTRIENTS REDUCES PRODUCTIVITY**
- **PHYSICAL DAMAGE TO PLANTS**
- **FORMATION OF RILLS AND GULLIES AFFECTS MANAGEMENT**
- **SEDIMENTATION IN WATERWAYS, DIVERSIONS, TERRACES, DITCHES**
- **DELIVERY OF SEDIMENT AND NUTRIENTS TO SURFACE WATER**
- **LOWER LAND VALUE**

EROSION IS A WISCONSIN PROBLEM

- **DEGRADATION OF THE RESOURCE**
 - FERTILITY
 - ORGANIC MATTER
 - TILTH
- **WATER QUALITY**
 - SEDIMENT
 - NUTRIENTS
- **SOCIETAL COST**
 - POLLUTION, DREDGING, SAFETY
 - AESTHETICS

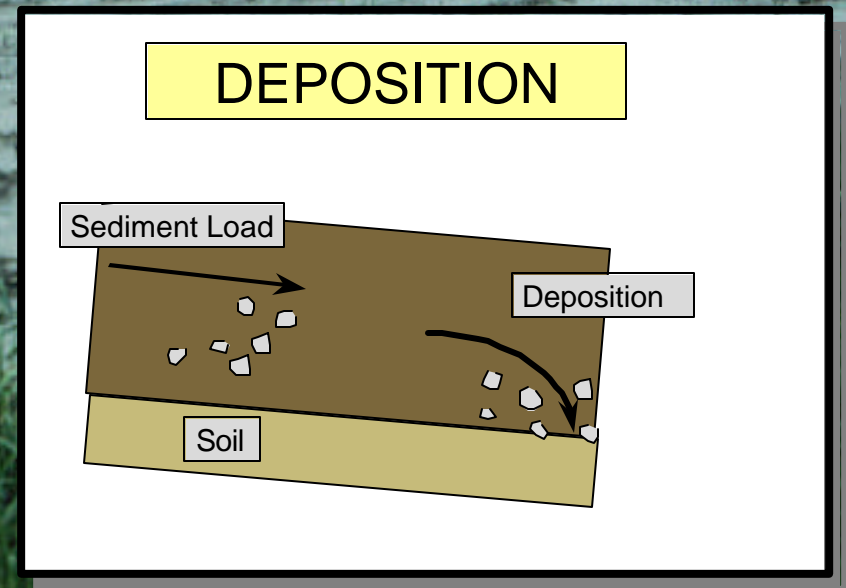
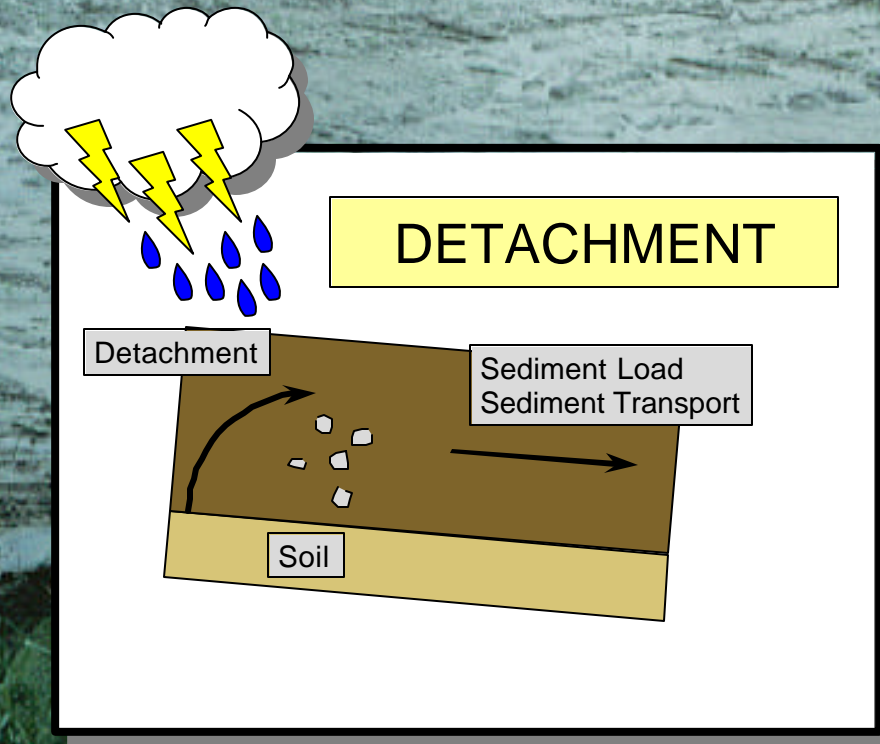
WATER EROSION PROCESS

- **BEGINS WITH RAINDROPS STRIKING BARE SOIL DISLODGING PARTICLES**
- **INTENSE RAINS SEAL SURFACE**
- **WHEN RAINFALL EXCEEDS INFILTRATION WATER IS STORED IN SMALL DEPRESSIONS**
- **ONCE DEPRESSIONS ARE FILLED, RUNOFF BEGINS**

WATER EROSION PROCESS

- **INITIALLY WATER FLOWS IN A DISCONTINUOUS SHEET**
- **EVENTUALLY IT CONCENTRATES INTO SMALL CHANNELS OR RILLS. THE RUNOFF NOW HAS ENERGY TO BREAK OFF PARTICLES AND CUT DEEPER**
- **THE AMOUNT OF EROSION CAUSED BY SHEET AND RILL EROSION INCREASES WITH SLOPE AND DISTANCE**
- **RILLS MAY EVENTUALLY FORM GULLIES**

THE SOIL WATER EROSION PROCESS



PURPOSE OF EROSION AN PREDICTION MODEL

- **DEVELOP A REASONABLE ESTIMATE OF SOIL LOSS BASED ON SCIENTIFIC INFORMATION**
- **GUIDE MANAGEMENT DECISIONS**
- **EVALUATE MANAGEMENT IMPACTS**
- **DETERMINE PRACTICE COST:BENEFIT**
- **ASSESS RESOURCE INVENTORY**

WHO AND WHAT OF RUSLE 2

- USDA-ARS, USDA-NRCS, VARIOUS UNIVERSITIES
- ON-GOING PROCESS OVER 70 YEARS
- THOUSANDS OF RESEARCH DATA
- SET UP WITH VARYING LEVELS OF COMPLEXITY
- COMPUTER REQUIREMENTS
 - WINDOWS 98
 - INTERNET EXPLORER BROWSER
 - 64 MB RAM
- DOWNLOAD
 - [HTTP://BIOENGR.AG.UTK.EDU/RUSLE2/](http://bioengr.ag.utk.edu/rusle2/)

APPLICABILITY OF RUSLE 2

- **ESTIMATES INTER-RILL AND RILL EROSION**
- **ESTIMATES SEDIMENT YIELD FROM OVERLAND FLOW AND TERRACE CHANNELS**
- **DOES NOT ESTIMATE EPHEMERAL OR PERMANENT GULLIES, MASS WASTING, OR STREAM CHANNEL EROSION**
- **BEST SUITED TO CROPLAND, BUT IS USEFUL FOR CONSTRUCTION SITES, LANDFILLS, RECLAMATION PROJECTS, AND DISTURBED FOREST LAND**

APPLICABILITY OF RUSLE 2 (cont.)

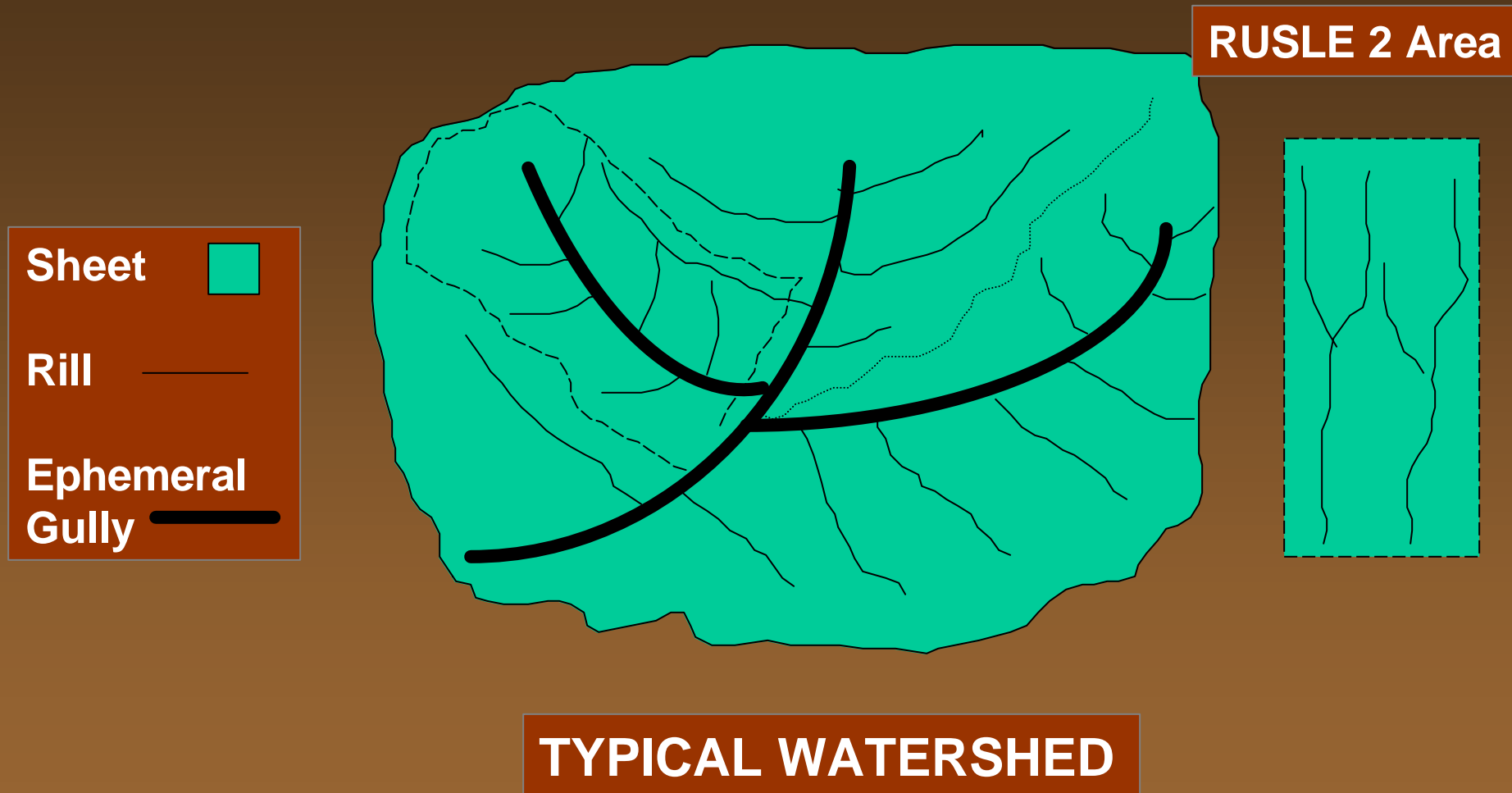
- **BEST WHERE RAINFALL IS REGULAR AND EXCEEDS 20"/YR.**
- **MEDIUM-FINE TEXTURED SOILS**
- **SLOPES 3-20% AND LESS THAN 600 FT.**
- **BEST AT CALCULATING "AVERAGE ANNUAL SOIL LOSS", NOT RECOMMENDED FOR SINGLE STORM EVENTS**

UNIVERSAL SOIL LOSS EQUATION

$$\text{Soil Loss (t/a)} = R \times K \times LS \times C \times P$$

- R = RAINFALL INTENSITY AND AMOUNT
- K = SOIL ERODIBILITY
 - TEXTURE
 - STRUCTURE
- LS = SLOPE LENGTH, GRADE, SHAPE
- C = CULTURAL PRACTICES
 - ROTATION
 - TILLAGE
- P = SUPPORTING PRACTICES
 - TERRACES
 - CONTOURS
 - BUFFERS

PREDICTING EROSION



CROP RESIDUE IS STILL THE BEST EROSION PREVENTION TOOL



- ✓ **REDUCED DETACHMENT**
- ✓ **HINDERS OVERLAND FLOW**
- ✓ **IMPROVED INFILTRATION**

EROSION CONTROL PRACTICES

Structures: diversions, terraces, waterways

- **Reduce slope length**
- **Slow runoff velocity**
- **Divert excess water safely**
- **Avoid runoff over barnyard, feedlots, etc.**

DIVERSION AND SURFACE INLET

*Fond du Lac, Co.
(Note cover crop)*



CONTOUR TERRACES

Grant Co.



WATERWAY MANAGEMENT ?

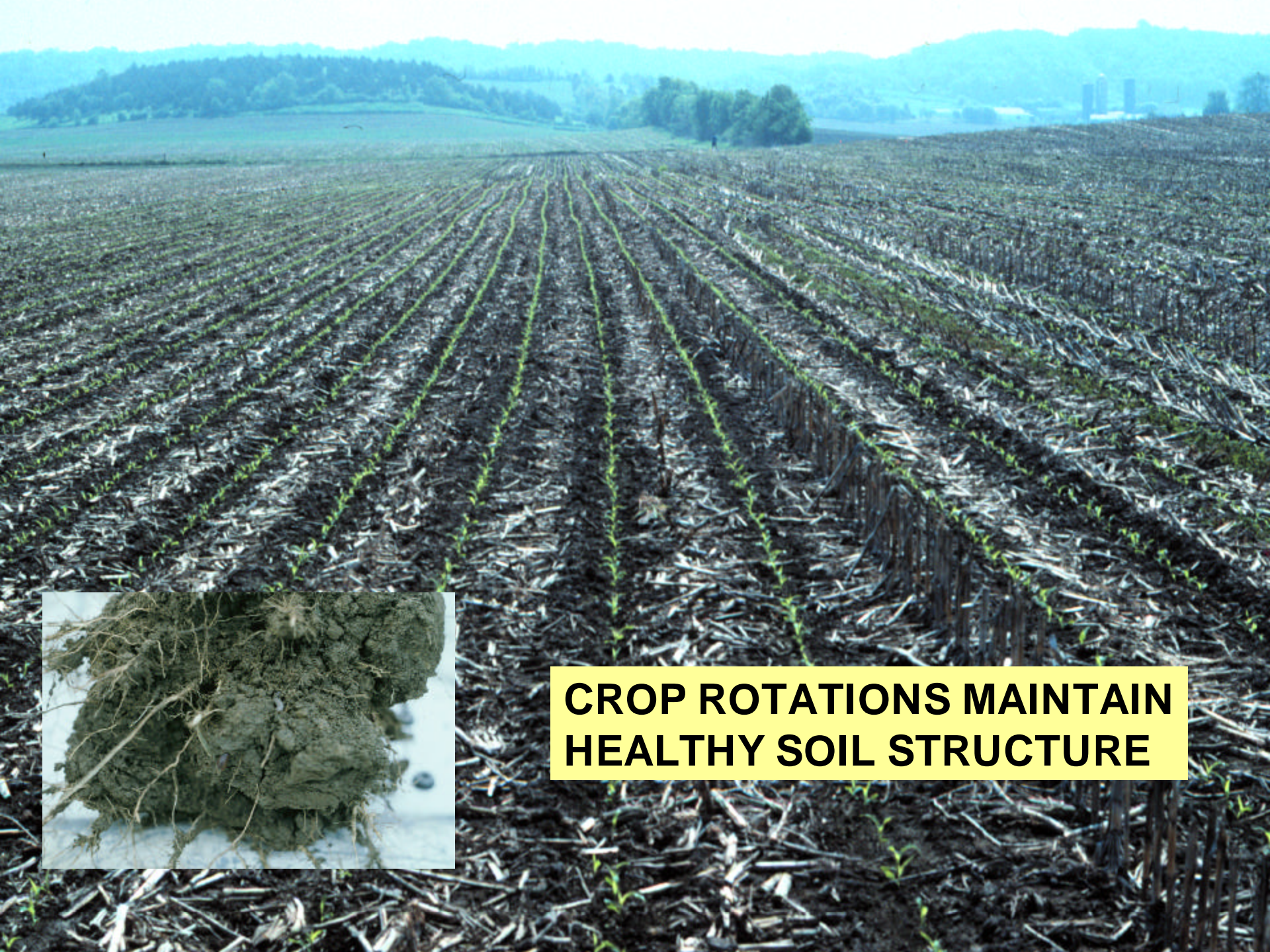
Columbia, Co.



EROSION CONTROL PRACTICES

Management practices

- Cover crops
- Crop residue management
 - 30% residue reduces erosion 50-60%
- Contour tillage
 - Slope $< 8\%$ and 300' long
- Contour strip cropping and buffers
 - Alternating sod strip for steep land



**CROP ROTATIONS MAINTAIN
HEALTHY SOIL STRUCTURE**

CONTOUR STRIP CROPPING

Crawford Co.



CONTOUR BUFFER STRIPS

Chippewa Co.



RUSLE 2 – INITIAL PROFILE

(PROFILE=FIELD)

Profile: start with this profile

STEP 1: Choose location to set climate: Location

STEP 2: Choose soil type: Soil

STEP 3: Set slope topography: Length along slope, ft
Avg. slope steepness, %

STEP 4: Choose management: Base management

STEP 5: Set Supporting practices:

Contouring	<input type="text" value="a up-and-down slope"/>	<input type="text" value="0.0100"/>
Strips/barriers	(none)	
Diversion/terrace, sediment basin	(none)	
Subsurface drainage system	(none)	

Row grade, %

Surf. cov. values

RESULTS

Soil loss erod. portion, t/ac/yr	0.014
Detachment on slope, t/ac/yr	0.014
Soil loss for cons. plan, t/ac/yr	0.014
Sediment delivery, t/ac/yr	0.014

Info

RUSLE 2 – SELECT LOCATION (WILL LIST BY COUNTY)

Profile: start with this profile

STEP 1: Choose location to set climate:

STEP 2: Choose soil type:

STEP 3: Set slope topography:

STEP 4: Choose management:

STEP 5: Set Supporting practices:

Location: could be any place

Washington

West Virginia

Wisconsin

Fond Du Lac

Green Bay

Janesville

La Crosse

Madison

Milwaukee

Wyoming

Base management: (none)

Surf. cov. values: Surf. cover

RESULTS

Soil loss erod. portion, t/ac/yr	0.014
Detachment on slope, t/ac/yr	0.014
Soil loss for cons. plan, t/ac/yr	0.014
Sediment delivery, t/ac/yr	0.014

Info

RUSLE 2 – SELECT SOIL

(WILL LIST SOIL SERIES NAME)

Profile: start with this profile

STEP 1: Choose location to set climate: Location

STEP 2: Choose soil type: Soil

STEP 3: Set slope topography: Length
Avg. slope

STEP 4: Choose management: Base management

STEP 5: Set Supporting practices: Contouring
Strips/barriers
Diversion/terrace, sediment basin
Subsurface drainage system

a up

%

es

RESULTS

Soil loss erod. portion, t/ac/yr	0.014
Detachment on slope, t/ac/yr	0.014
Soil loss for cons. plan, t/ac/yr	0.014
Sediment delivery, t/ac/yr	0.014

Info

RUSLE 2 – SELECT SLOPE AND ROTATION

Profile: start with this profile*

STEP 1: Choose location to set climate: Location

STEP 2: Choose soil type: Soil

STEP 3: Set slope topography: Length along slope, ft
Avg. slope steepness, %

STEP 4: Choose management: Base management

STEP 5: Set Supporting practices: Contouring
Strips/barriers
Diversion/terrace, sediment basin
Subsurface drainage system

RESULTS

Soil loss erod. portion, t/ac/yr	16
Detachment on slope, t/ac/yr	16
Soil loss for cons. plan, t/ac/yr	16
Sediment delivery, t/ac/yr	16

Info

Base management

- Corn grain; chisel sweeps, spring
- Corn grain; chisel tw shov, spring
- Corn grain; chisel twisted shov, fall
- Corn grain; disk 1x, spring
- Corn grain; disk 2x, spring
- Corn grain; manure inj Moldboard plow, spring
- Corn grain; manure, surf Moldboard plow, spring
- Corn grain; Moldboard plow, fall
- Corn grain; Moldboard plow, spring
- Corn grain; no-till

rf. cover

RUSLE 2 – SELECT CONSERVATION PRACTICE(S)

Profile: start with this profile*

STEP 1: Choose location to set climate: Location

STEP 2: Choose soil type: Soil

STEP 3: Set slope topography: Length along slope, ft
Avg. slope steepness, %

STEP 4: Choose management: Base management

STEP 5: Set Supporting practices:

Contouring	<input type="text" value="d standard contouring"/>	Row grade, %	<input type="text" value="0.60"/>
Strips/barriers	<input type="text" value="(none)"/>	Surf. cov. values	<input type="text" value="Surf. cover"/>
Diversion/terrace, sediment basin	<input type="text" value="(none)"/>		
Subsurface drainage system	<input type="text" value="(none)"/>		


RESULTS


Soil loss erod. portion, t/ac/yr	3.6	Info	<input type="text"/>
Detachment on slope, t/ac/yr	3.6		
Soil loss for cons. plan, t/ac/yr	3.6		
Sediment delivery, t/ac/yr	3.6		

RUSLE 2 – “DRILL DOWN” TO FINE-TUNE PRACTICE(S)









Profile: start with this profile*

Management: Continuous\Corn grain; chisel twisted shov, fall*

Graphic  Long-term natural rough., in. 0.24
 Rel. row grade, % Normally used as a rotation? Yes

Rotation builder  open

Operations Info

Management Operations										
Date, m/d/y	Operation	Vegetation	Yield (# harv. units)	Op. depth, in.	Op. speed, mph	External residue	Res. add. / remove, lb/ac	Cover from addition, %	Veg. ret	
+	-									
10/21/1	 no operation									
11/1/1	 chisel, twisted shovel			7.0	5.0					
5/1/2	 Manure spreader			3.0	5.0	 ... bedding	0	0		
5/5/2	 cultivator, field 6-12" sweeps			4.0	6.0					
5/5/2	 planter, double disk opnr	 corn\Corn, grain	112	2.5	5.0					
10/10/2	 harvest killing crop									

Soil loss for cons. plan, t/ac/yr 3.2
 Sediment delivery, t/ac/yr 3.2

manure with bedding

SUMMARY

- **RUSLE 2 OFFERS FLEXIBILITY**
- **RELATIVELY EASY TO USE**
- **AVAILABLE TO THE FARMER, CROP ADVISER, EDUCATOR**
- **NOT QUITE READY FOR USE YET IN WIS.**
 - **NEED CLIMATE, SOIL DATA**
- **HOPE TO BUILD P INDEX INTO RUSLE 2**
- **WILL BE THE PLANNING TOOL FOR THE FUTURE**