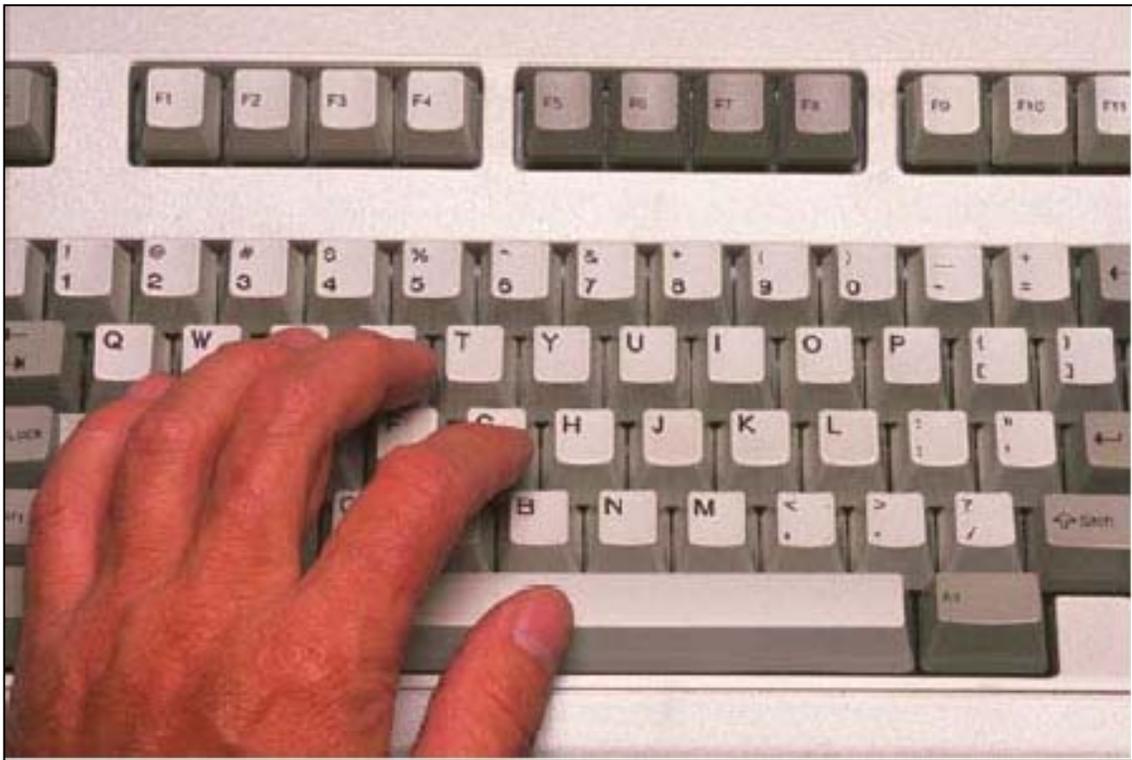


RUSLE2 Users Guide

South Dakota



October 2005

RUSLE2 Users Guide

South Dakota

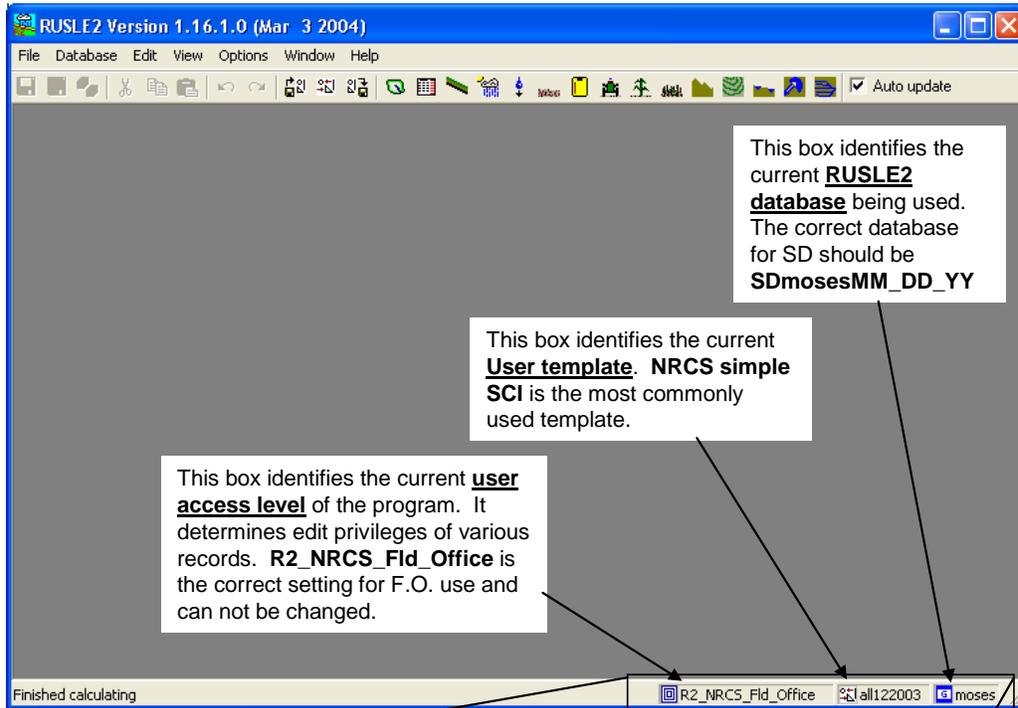
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1. Getting Started

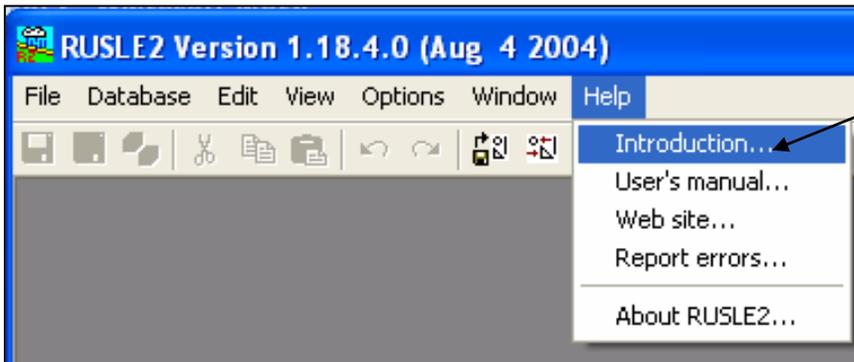
The RUSLE2 program is opened by clicking the icon on your computer desktop.



This is a picture of the screen that RUSLE2 will normally open with. It needs to be configured for South Dakota use.

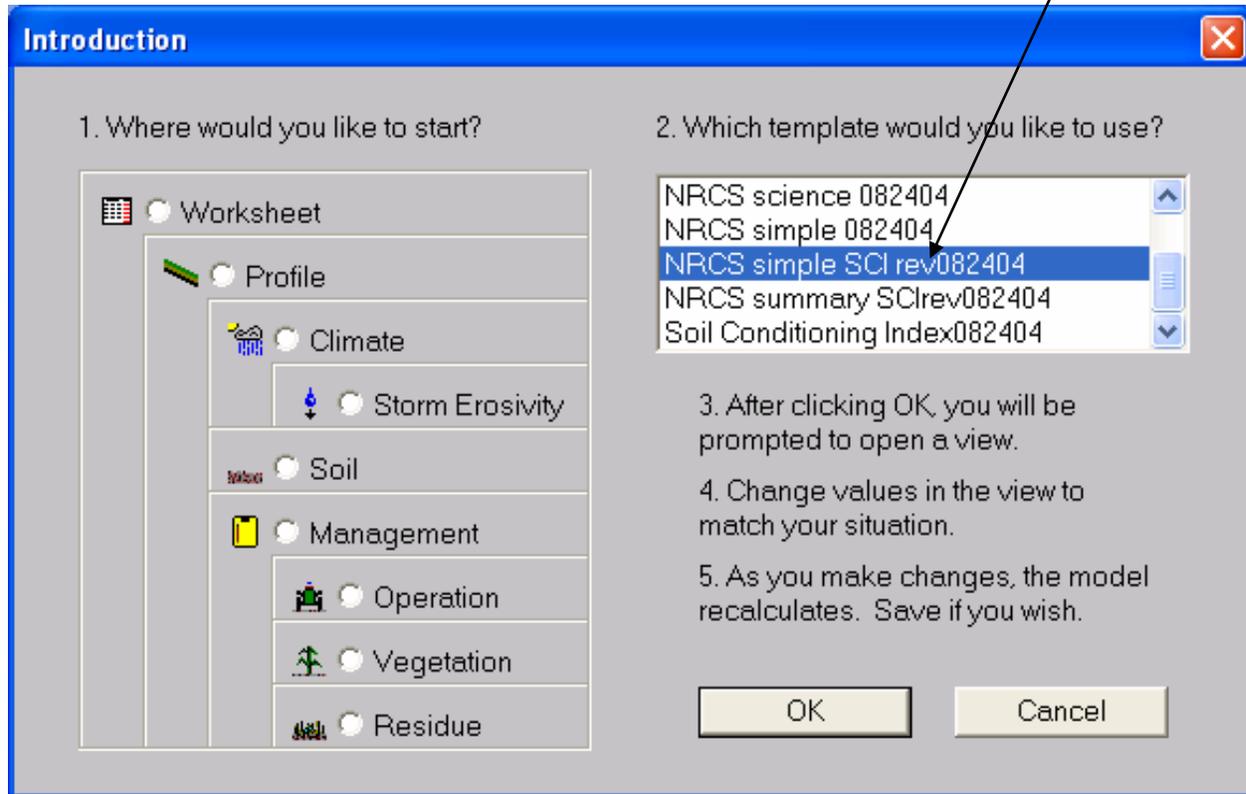


The **status bar** shows that the **wrong User Template** (all122003) and **Database** (moses) are being used

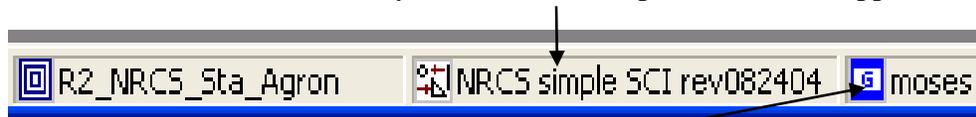


To change to the correct **User Template** select **Introduction** from the **Help** menu.

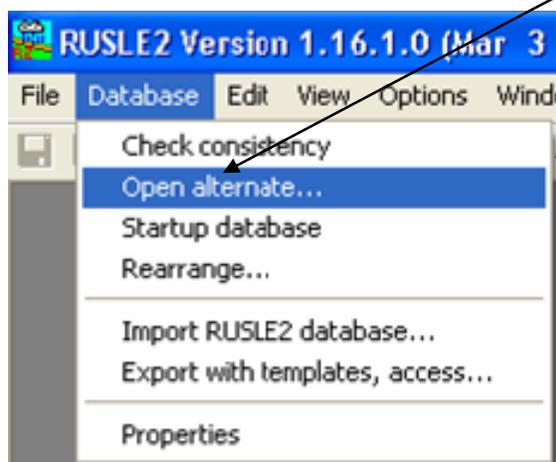
The Introduction Screen opens. (This screen opens automatically the first time RUSLE2 is started after installation.) Scroll down the list of **User Templates** and select **NRCS simple SCI rev082804**. Click OK



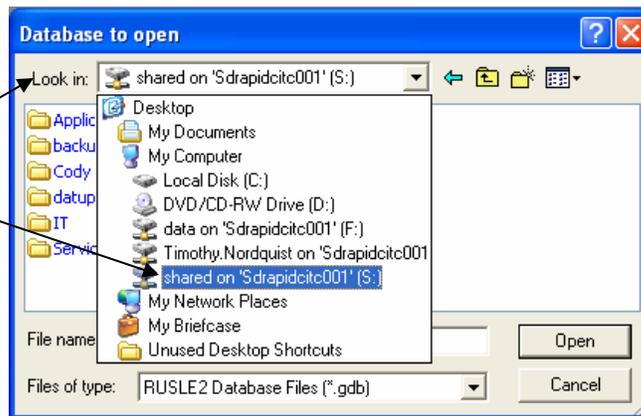
After a few moments the newly selected user template name will appear in the status bar.



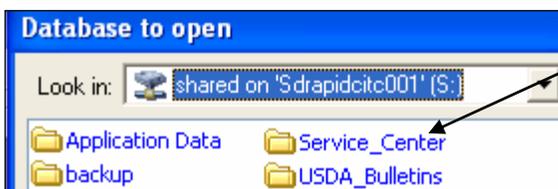
To change to the correct database select **Open alternate** from the **Database** menu.



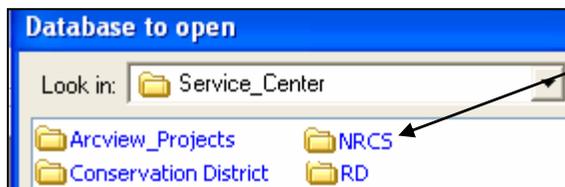
In the Look in: box select **shared on 'Sd.(cityname.)c001'**



Move through the directories:



\ServiceCenter

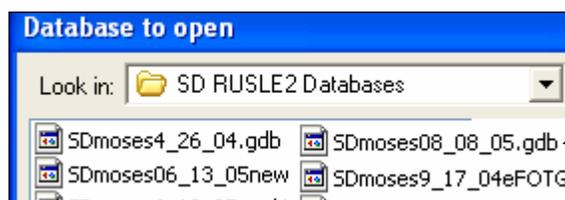


\NRCS



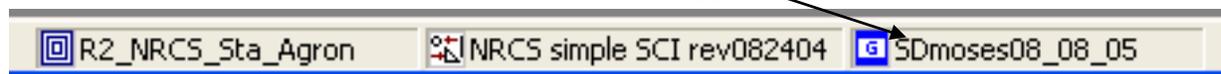
\RUSLE2data

and open

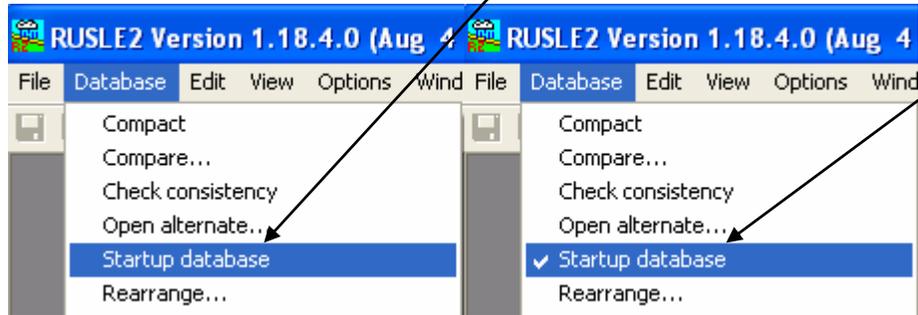


SDmoseseMM_DD_YY.gdb
(most recent date)

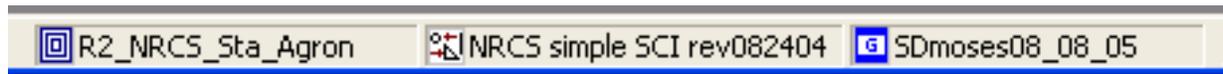
After a pause the newly selected database name will appear.



To make this the default database click **Startup database** from the Database menu. A check mark affirms that Sdmoses08_08_05 is now the default.



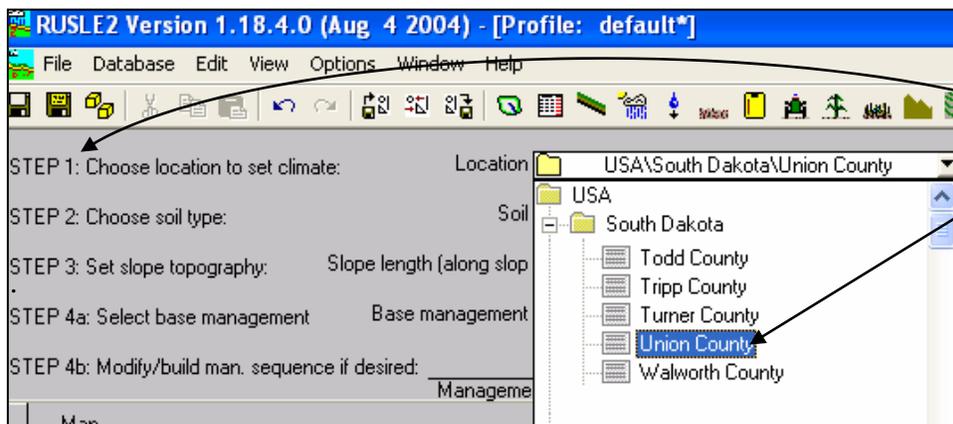
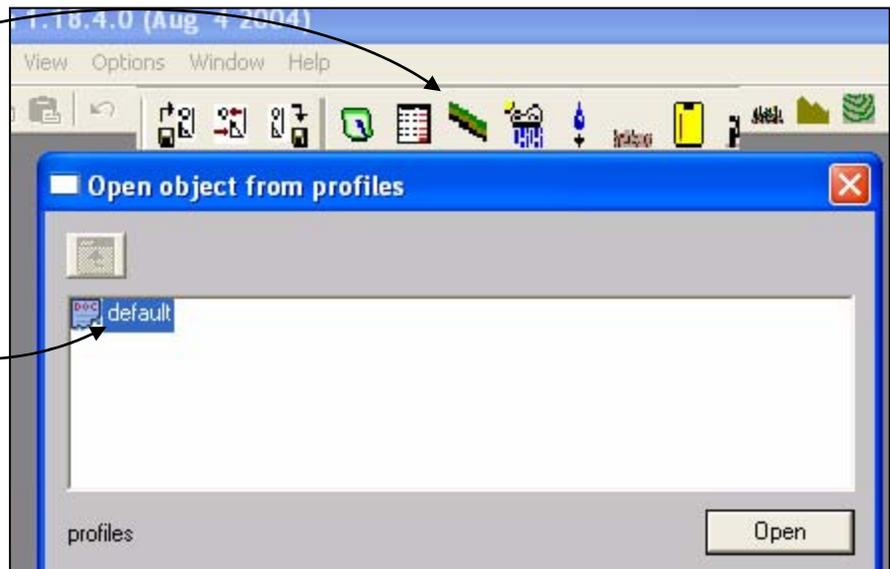
RUSLE2 is now properly configured for use in South Dakota. The next time the program is started it should start with these settings. **Always check to make sure!!**



2. Creating a (Your County) Default Profile

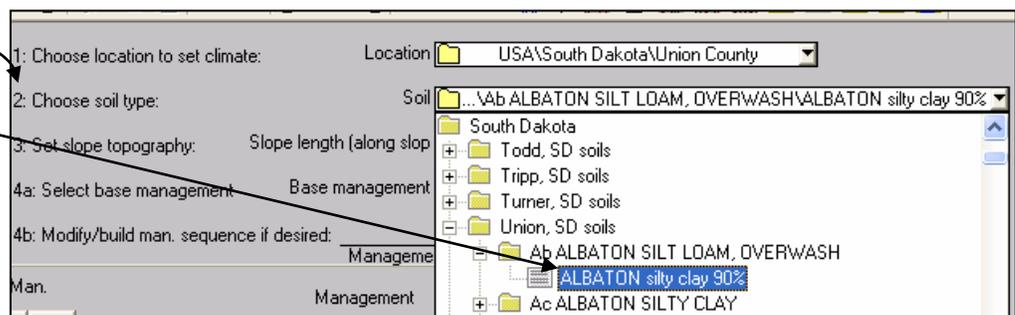
Completing soil erosion estimates using the **profile** screen is probably the most often used function in RUSLE2. By creating a default profile specifically for your county several steps can be eliminated that would otherwise be required with each use.

Click the **Profile** icon and select default from the list.

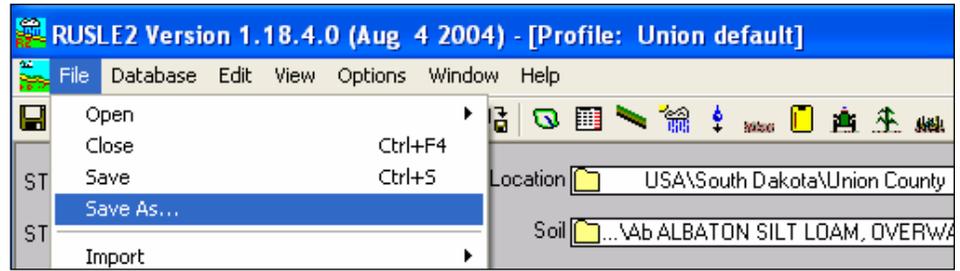


In STEP 1 choose your county from the choice list.

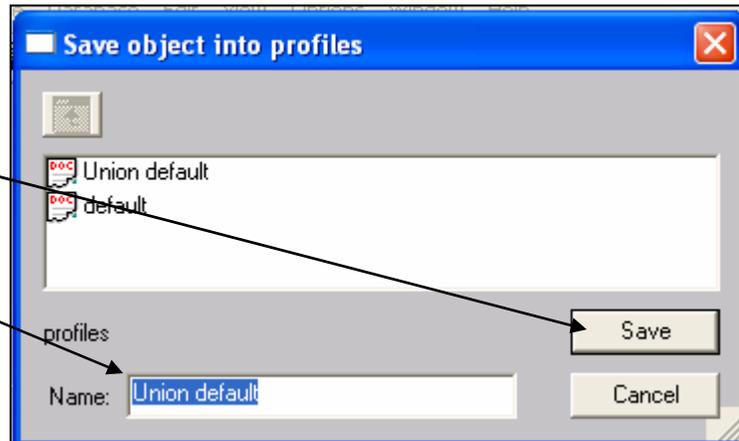
In STEP 2 select the first soil component in your county's soil list as your default soil.



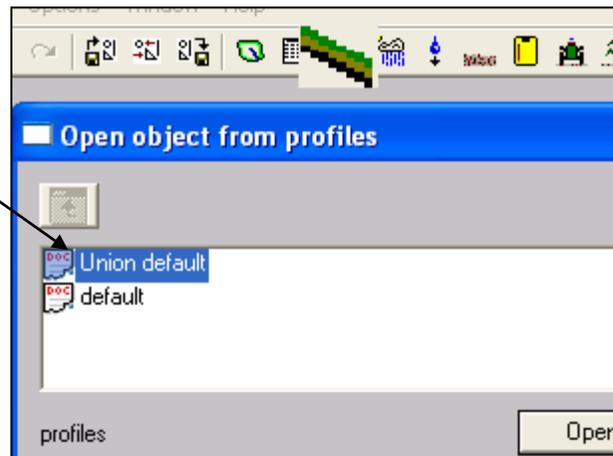
To save the new Profile record select Save As from the File menu



Name the new record and Save

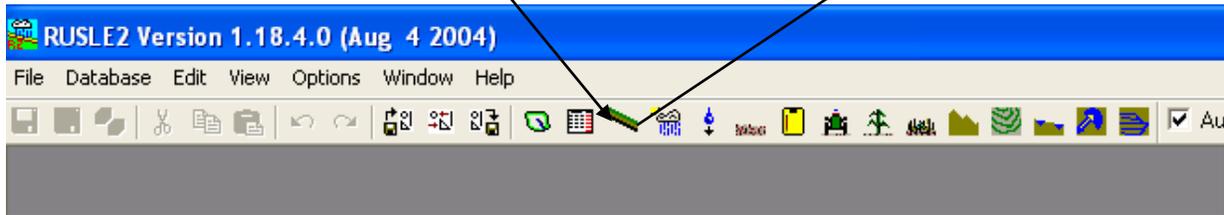


The next time you wish to use the profile screen your County default will be available already set to your climate and soils list.

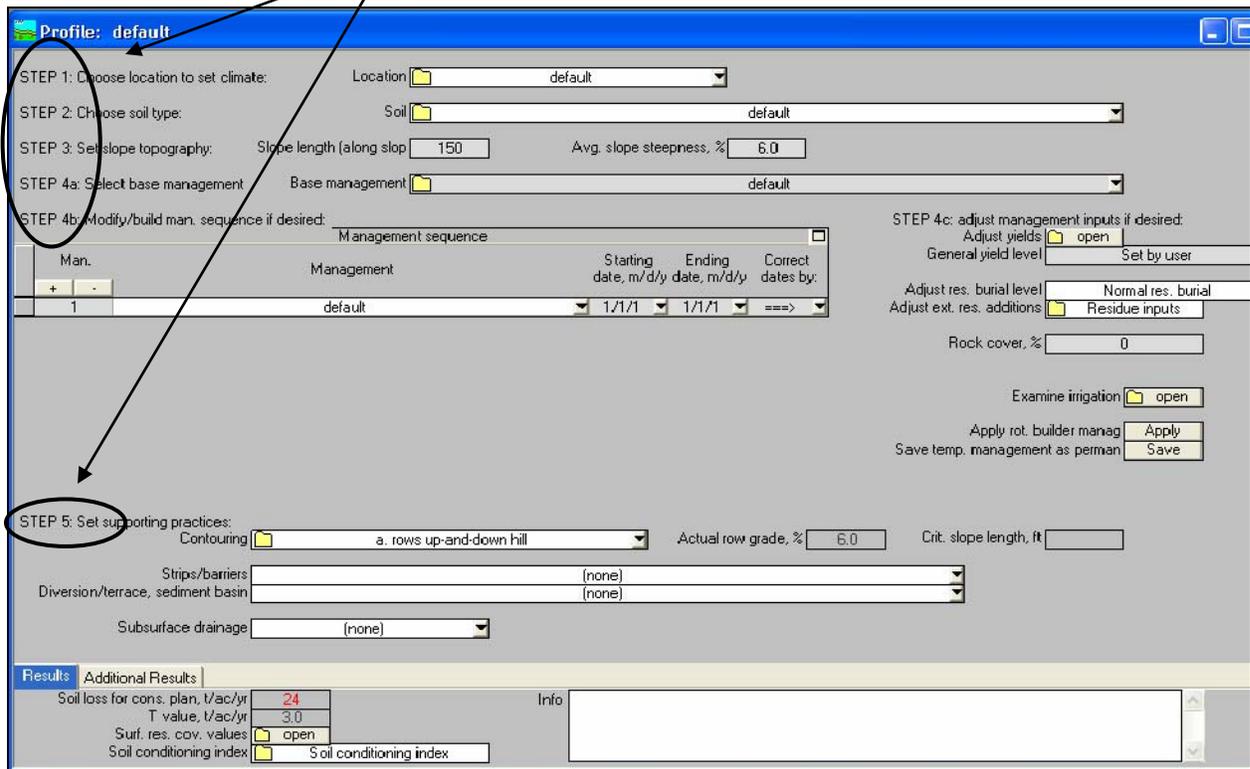


3. RUSLE2 Erosion Estimate – Profile Screen

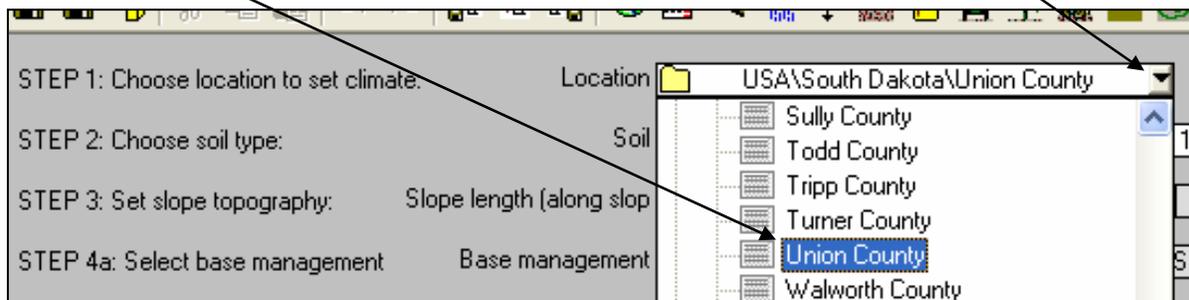
Most erosion calculations are done using the Profile screen.
To open the screen, click the Profile icon.



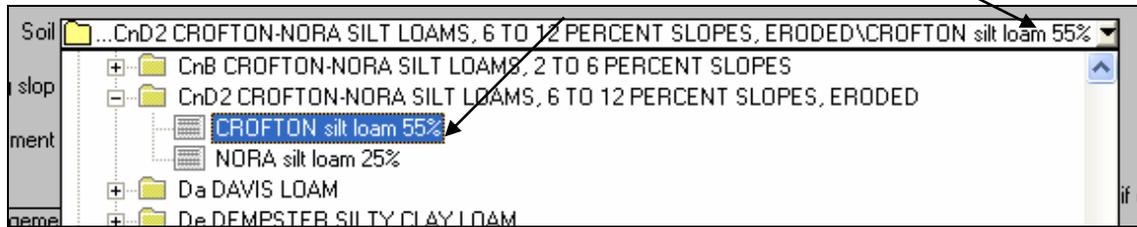
The profile screen lists the **5 steps** for completing an erosion estimate on a single soil, slope, and cropping management system.



Step 1 is to choose the location to set the climate. Open the dropdown choice list, navigate to the correct county, and select it.



Step 2 is to choose the soil that is being planned for. Click the dropdown list and migrate through the soils directory to the desired soil component.

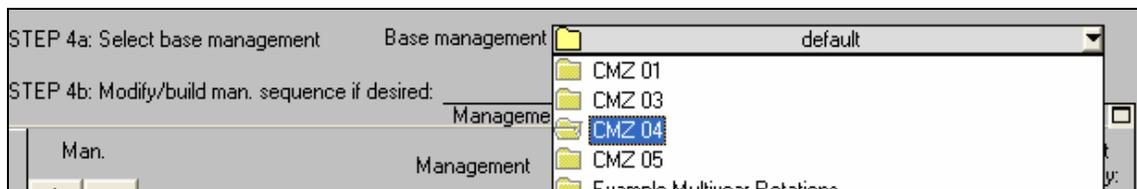


Step 3 is to set the slope topography by overriding the default values and manually entering the slope's length and average steepness.

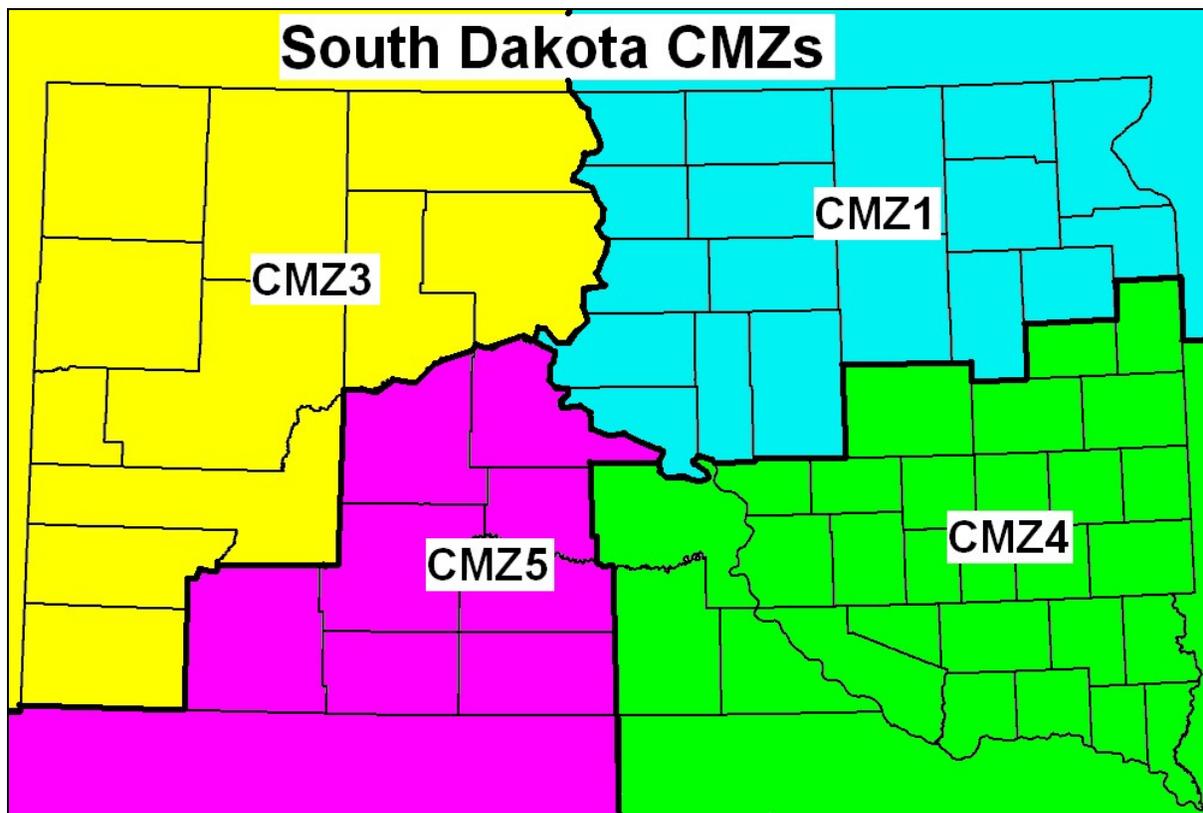
The form contains the following fields:

- Slope length (along slope): 180
- Avg. slope steepness, %: 9.0

Step 4 is to select the base management (cropping system) that will be employed. From the choice list select the Crop Management Zone (CMZ)* that the slope occurs in.



*South Dakota has 4 CMZs that represent regions with similar crops and cropping systems and similar planting and harvest dates. (See Appendix 1)

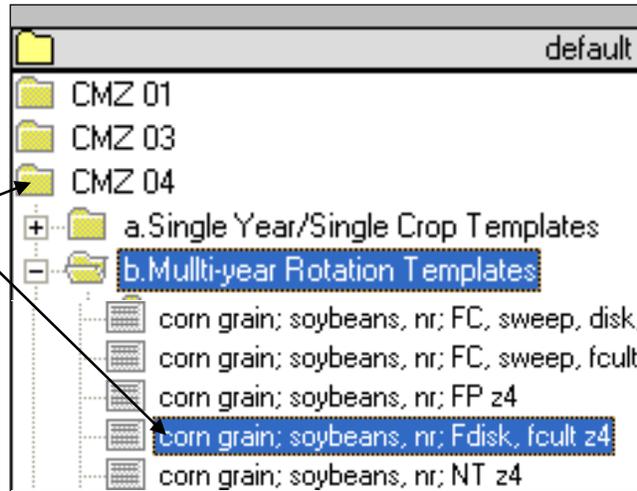


Each CMZ has three subdirectories.

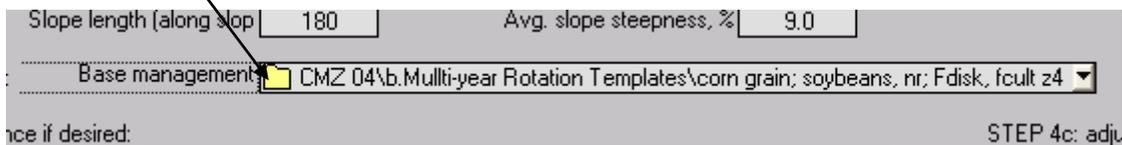
1. This directory has pre-built management templates for a number of single year crops and tillage systems.
2. This directory has pre-built templates for several complete multi-year rotations.
3. This directory has Management templates that were developed by the local Field Office and saved for future use



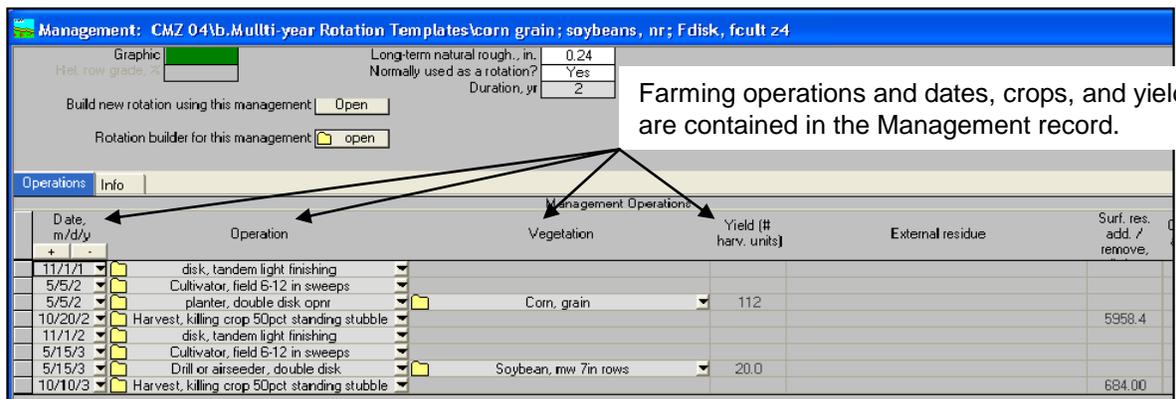
Select a Multi-year rotation from your CMZ.



Click the yellow folder to open the management record.



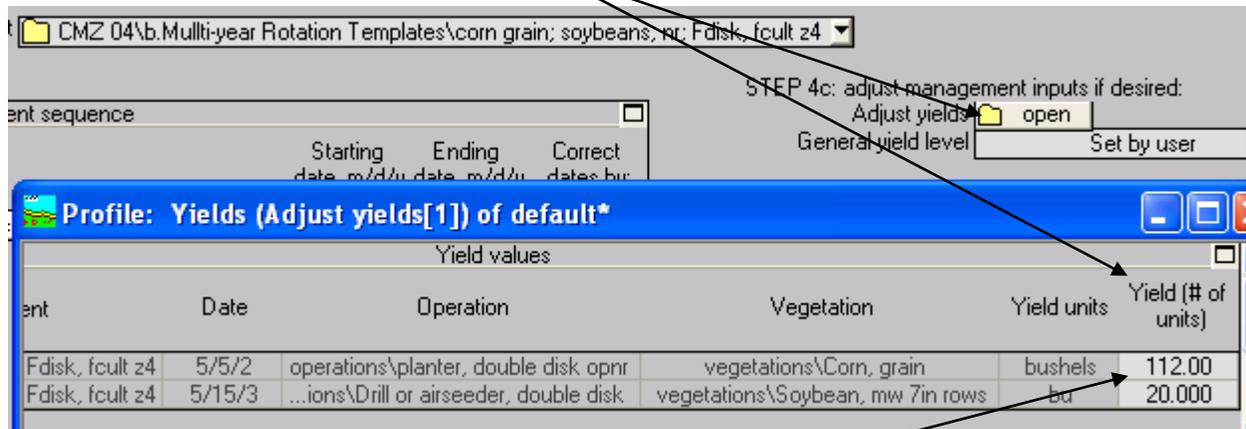
The open Management screen reveals the components that make up the Management record.



Click the X to close the management screen.

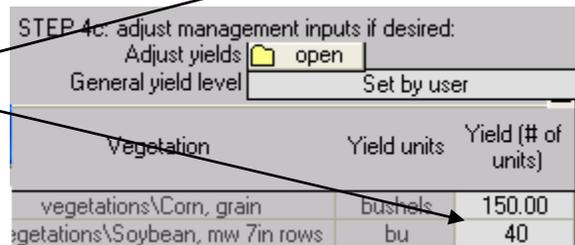


Click the yellow folder to review and adjust yields*.

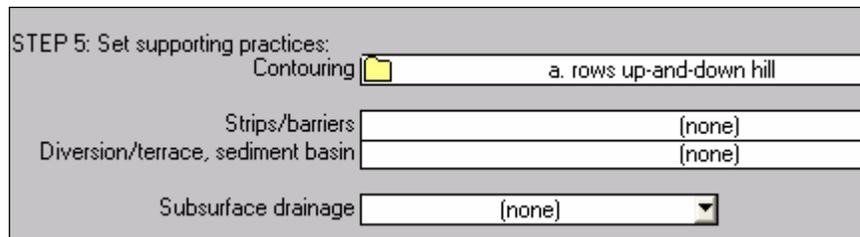


The example shows yields increased from 112 and 20 to 150 and 40 bushels.

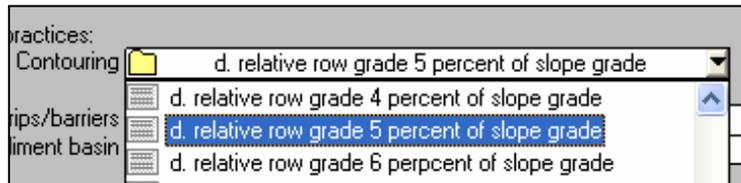
* Use of reasonable crop yields is one of the most important factors determining the accuracy of RUSLE2 calculations.



Step 5 sets the current or planned supporting practices.



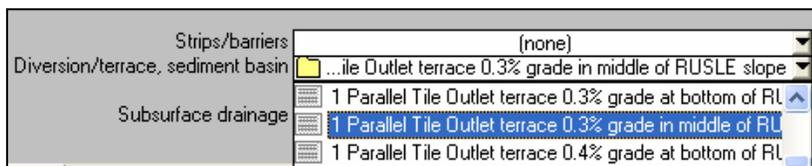
Select the slope grade of the contour from the drop down choice list.



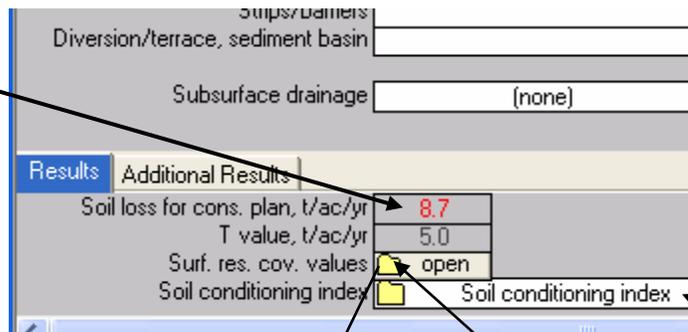
Strips or barriers are selected from the choice list.



Diversions or terraces are selected from the choice list.



With all 5 steps of the Profile screen complete the results of the erosion estimate can be viewed.



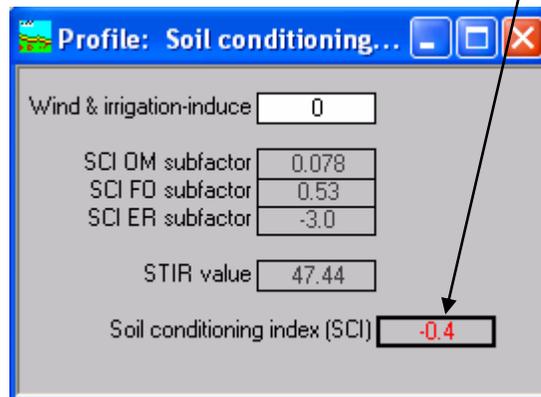
Profile: Surf. cover (Surf. res. cov. values[1]) of default*

Residue by op

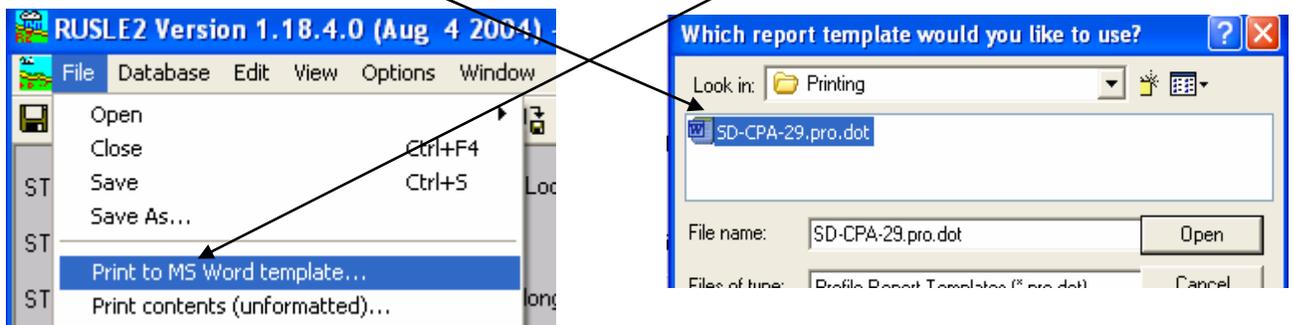
Operation	Vegetation	Surf. res. cov. after op. %
\disk, tandem light finishing		25
\Cultivator, field 6-12 in sweeps		15
perations\planter, double disk opnr	egations\Corn, grain	15
..., killing crop 50pct standing stubble		79
\disk, tandem light finishing		66
\Cultivator, field 6-12 in sweeps		53
...ions\Drill or airseeder, double disk	egations\Soybean, mw 7in rows	53
..., killing crop 50pct standing stubble		59

Opening the Residue screen reveals how much residue cover remains after each operation.

The Soil Conditioning Index addresses the crop management's impacts on several parameters of soil health.



To produce a report of this estimate, from the File menu select "Print to MS Word template" and then select the SD-CPA-29.



The SD-CPA-29 is the official record of rill and inter-rill erosion in SD. It is an MS Word Document that can be printed or saved electronically.

SD-CPA-29

RUSLE2 Profile Erosion Calculation Record

Info:

Inputs:

File: profiles\Union default

Location: South Dakota\Union County

Soil: Union, SD soils\CnD2 CROFTON-NORA SILT LOAMS, 6 TO 12 PERCENT SLOPES, ERODED\CROFTON silt loam 55%

T value: 5.0 t/ac/yr

Slope length (horiz): 180 ft

Avg. slope steepness: 9.0 %

<i>Management</i>	<i>Vegetation</i>	<i>Yield units</i>	<i>Yield (# of units)</i>
CMZ 04\b.Multi-year Rotation Templates\corn grain; soybeans, nr; Fdisk, fcult z4	Corn, grain	bushels	150.00
CMZ 04\b.Multi-year Rotation Templates\corn grain; soybeans, nr; Fdisk, fcult z4	Soybean, mw 7in rows	bu	40.000

Contouring: a. rows up-and-down hill

Strips/barriers: (none)

Diversion/terrace, sediment basin: (none)

Adjust res. burial level: Normal res. burial

Outputs:

Soil loss for cons. plan: 8.7 t/ac/yr Sediment delivery: 8.7 t/ac/yr

Net C factor: 0.13

Net K factor: 0.38

Net LS factor: 1.5

<i>Date</i>	<i>Operation</i>	<i>Vegetation</i>	<i>Surf. res. cov. after op, %</i>
11/1/0	disk, tandem light finishing		32
5/5/1	Cultivator, field 6-12 in sweeps		19
5/5/1	planter, double disk opnr	Corn, grain	19
10/20/1	Harvest, killing crop 50pct standing stubble		79
11/1/1	disk, tandem light finishing		66
5/15/2	Cultivator, field 6-12 in sweeps		53
5/15/2	Drill or airseeder, double disk	Soybean, mw 7in rows	53
10/10/2	Harvest, killing crop 50pct standing stubble		70

Soil conditioning index (SCI): -0.212

Wind & irrigation-induced erosion for SCI: 0 t/ac/yr

SCI OM subfactor: 0.15

SCI FO subfactor: 0.53

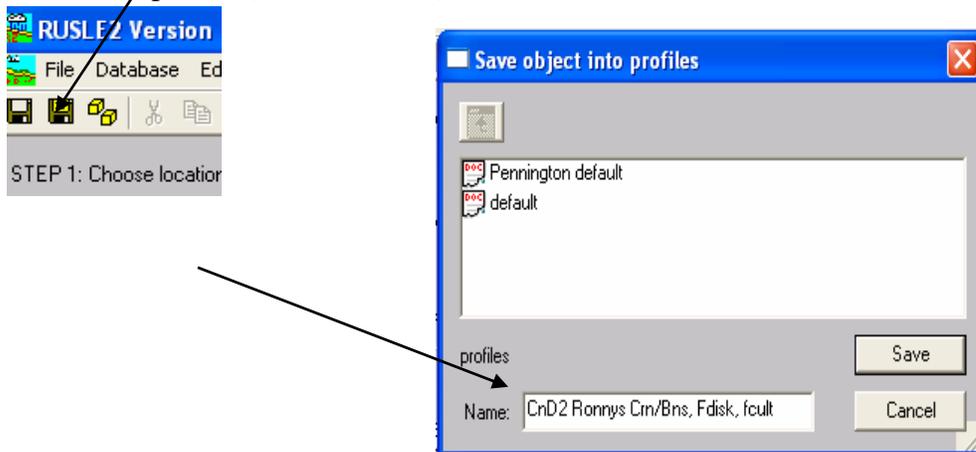
SCI ER subfactor: -2.4

STIR value: 47.44

The RUSLE2 profile can be saved for future reference and use. (However, it is not required because the (SD-CPA29) is the official record.)

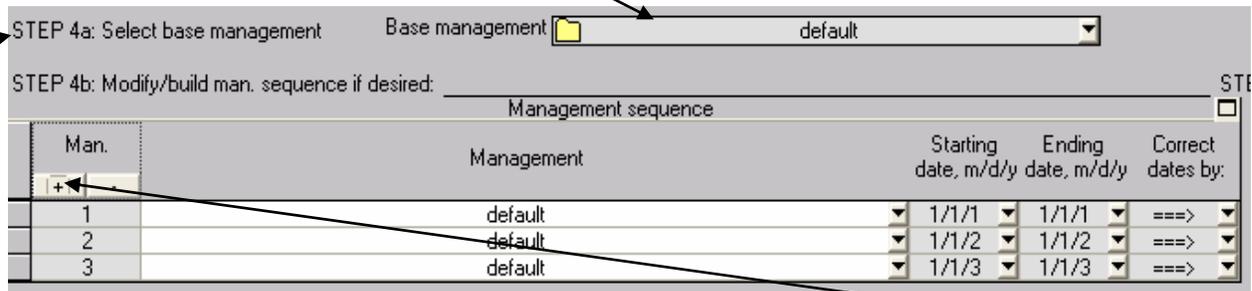
Click the Save As Icon.

Name the new profile (erosion record) and save.



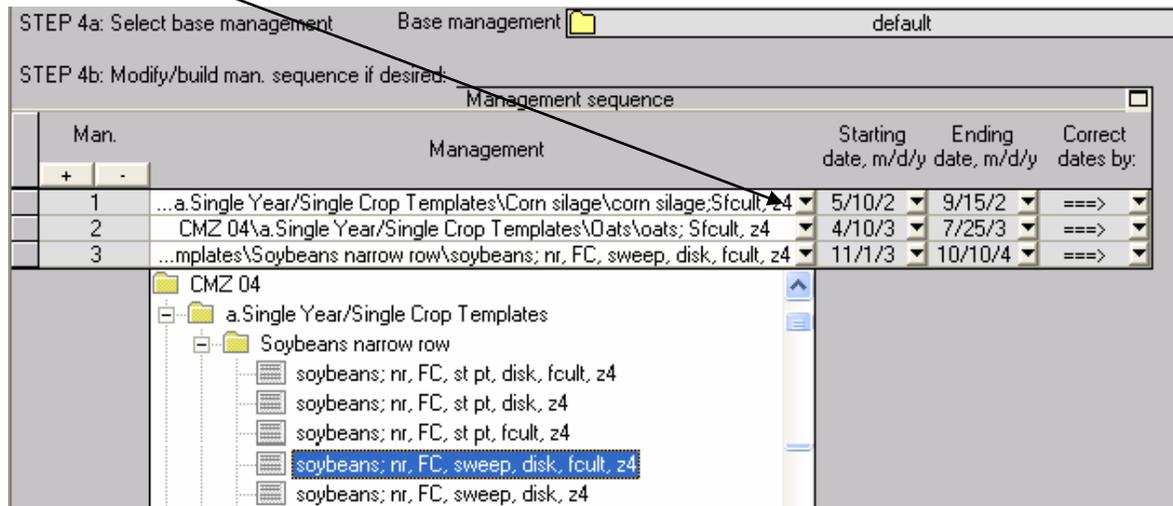
4. Creating a Customized Multi-Year Rotation from Single Year/Single Crop Templates Using the Profile Screen

In STEP 4a: of the Profile screen select default as the Base management

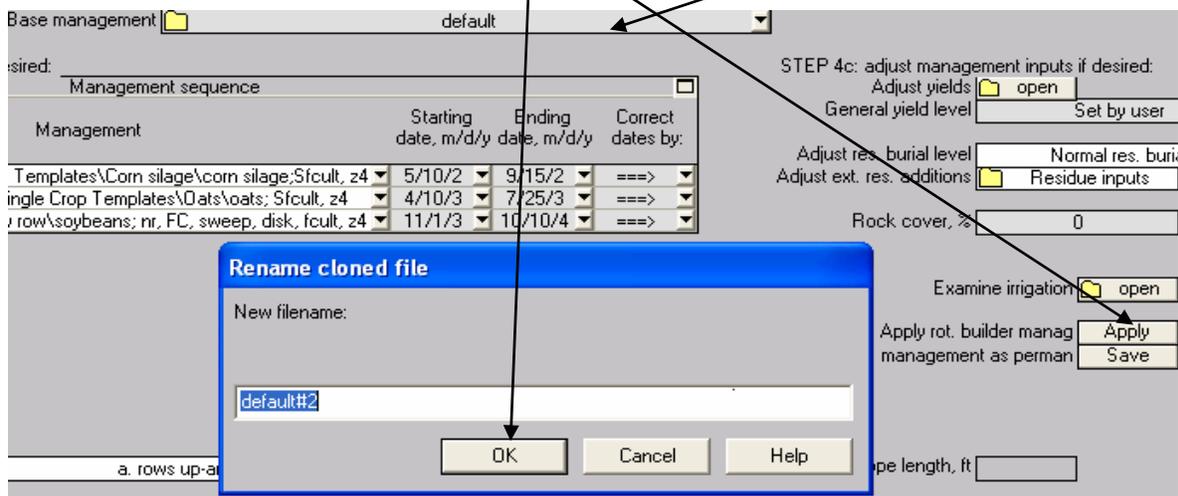


In STEP 4b: add lines 2 and 3 to the Management sequence by clicking the +.

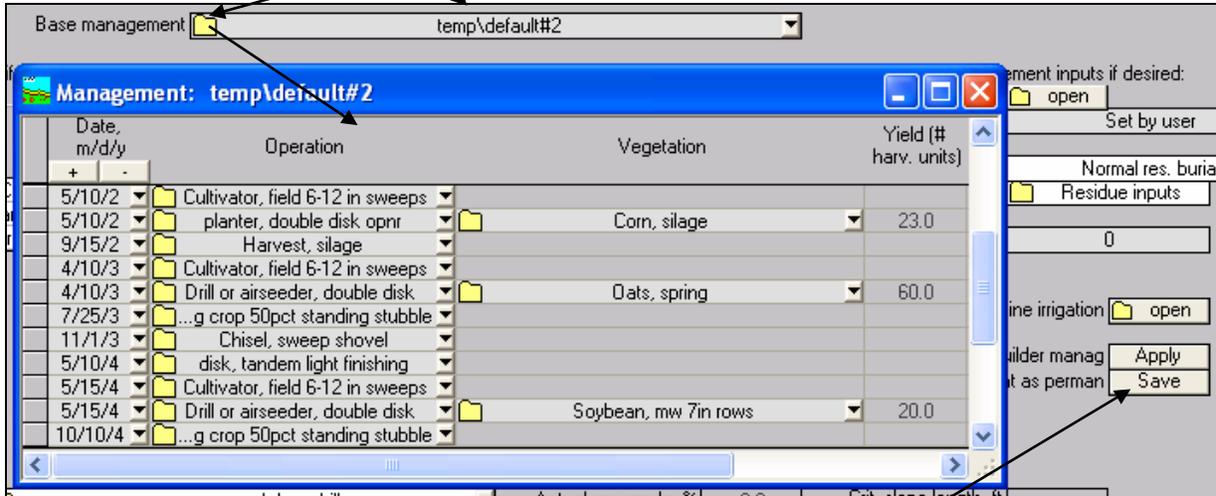
Next, from the drop down choice lists, replace the default managements with Single Year/Single Crop templates for your CMZ in the order they will occur in the rotation.



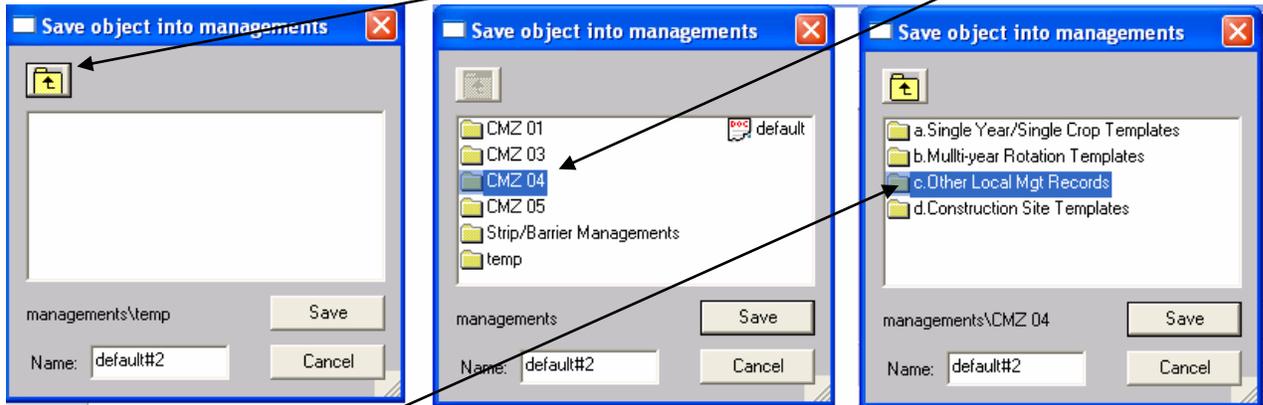
Click the **Apply rot. builder manag button** to replace the current Base management with the newly built multi-year rotation. Click OK.



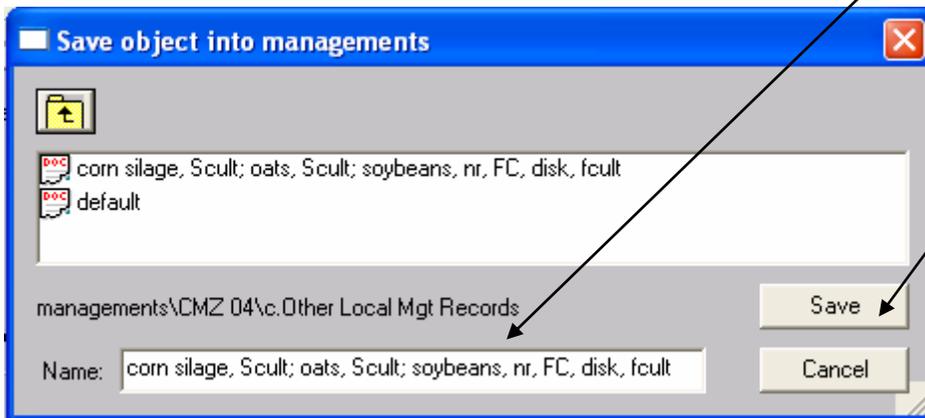
Note the change in the Base management name. Click the yellow folder to reveal the components (Dates, Operations, Vegetations, Yields) of this new multi-year rotation management.



The new temp management may be saved as permanent by clicking *Save. In the “Save object into managements” window, use the up arrow to migrate to managements\CMZ 04



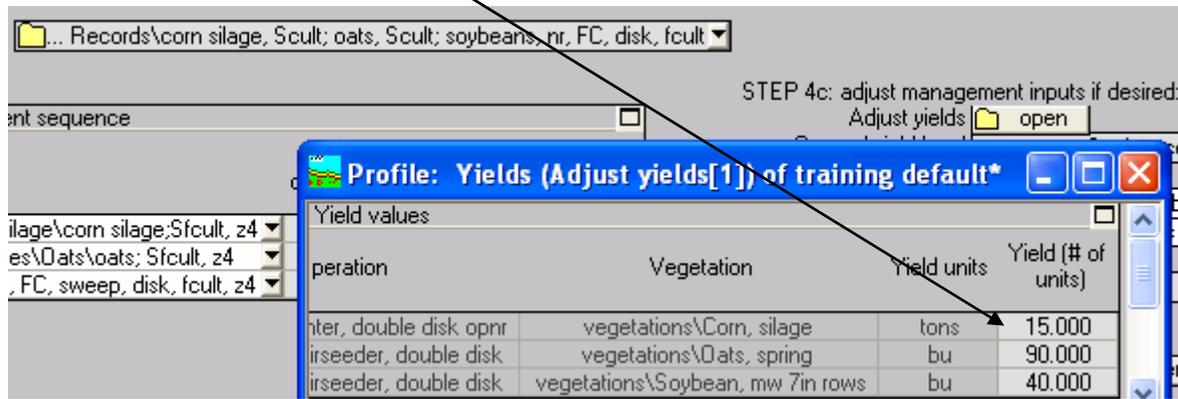
\c.Other Local Mgt Records. **Give the Management record a new name and click Save.



* It is not necessary to save the management. The SD-CPA-29 will print without saving it.

** Other Local Mgt Records is the only managements directory that Field Office personnel have permissions to save to or edit records in.

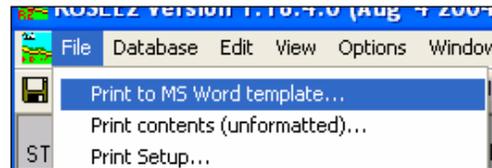
To finish the erosion estimate for this profile using the new multi-year rotation management the default yields need to be changed to the actual expected yields.



Results	Additional Results
Soil loss for cons. plan, t/ac/yr	7.6
T value, t/ac/yr	5.0
Surf. res. cov. values	open
Soil conditioning index	Soil conc

The Results section of the Profile screen now represents the effects of the new rotation on the soil loss.

The Profile (soil loss) calculation can be printed to the SD-CPA-29 for an official record of the soil loss estimate.



If desired the Profile may be saved for future use.

5. Modifying Existing Multi-Year Rotations (Single-Year or Multi-Year) from the Profile Screen Using the Rotation Builder

To add an additional year of crop to an existing rotation, click the yellow folder for the management to be changed.

P 2: Choose soil type: Soil

P 3: Set slope topography: Slope length (along slope) Avg. slope steepness, %

P 4a: Select base management Base management

P 4b: Modify/build man. occurrence if desired:

The Managements screen opens to reveal the components of the management. To add an additional year of crop to the rotation, click Rotation builder for this management.

Build new rotation using this management

Rotation builder for this management

Date, m/d/y	Operation	Vegetation	Yield (# harv. units)
11/1/1	disk, tandem light finishing		
5/2	Cultivator, field 6-12 in sweeps		
5/2	planter, double disk opnr	Corn, grain	112
10/2	...g crop 50pct standing stubble		

The Rotation Builder screen opens and shows the Single year/Single Crop templates that the multi-year rotation was built from.

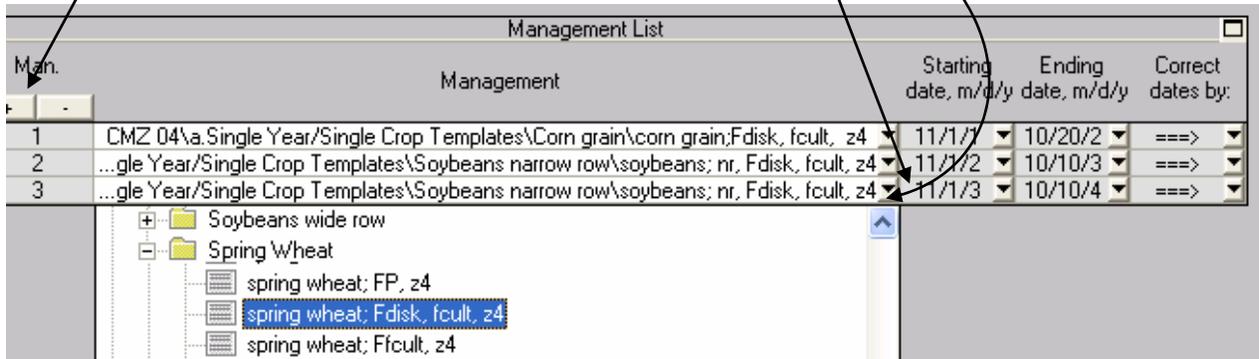
Man.	Management	Starting date, m/d/y	Ending date, m/d/y	Correct dates by:
1	CMZ 04\Single Year/Single Crop Templates\Corn grain\corn grain;Fdisk, fcult, z4	11/1/1	10/20/2	==>
2	...gle Year/Single Crop Templates\Soybeans narrow row\soybeans; nr, Fdisk, fcult, z4	11/1/2	10/10/3	==>

!! WARNING: making any change in the Managements List table will overwrite the Operations List !!

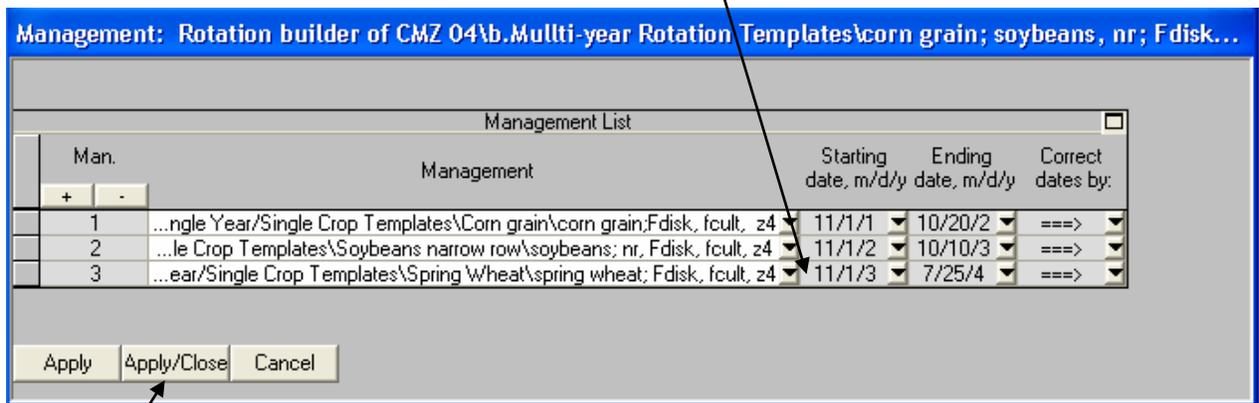
Date, m/d/y	Operation	Vegetation
11/1/1	disk, tandem light finishing	
5/5/2	Cultivator, field 6-12 in sweeps	
5/5/2	planter, double disk opnr	Corn, grain
10/20/2	Harvest, killing crop 50pct standing stubble	
11/1/2	disk, tandem light finishing	
5/15/3	Cultivator, field 6-12 in sweeps	
5/15/3	Drill or airseeder, double disk	Soybean, mw 7in rows
10/10/3	Harvest, killing crop 50pct standing stubble	

Apply Apply/Close Cancel

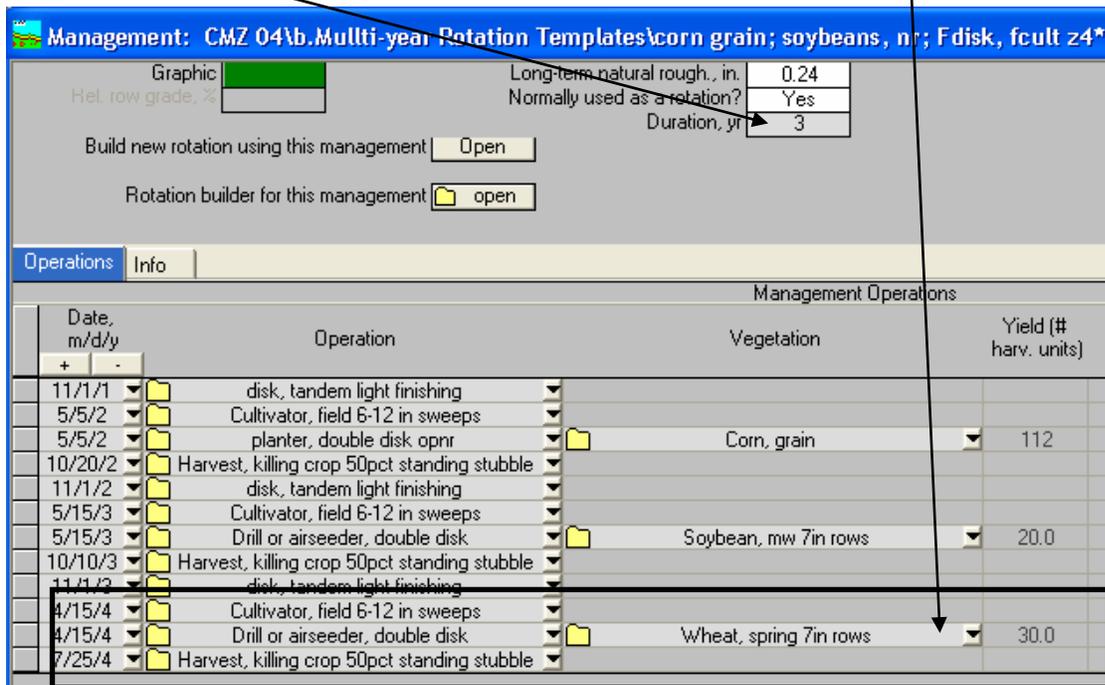
Click + to copy line 2 to line 3. Note that this adds additional time to the rotation equivalent to the copied management. Change management in line 3 to desired single year crop template.



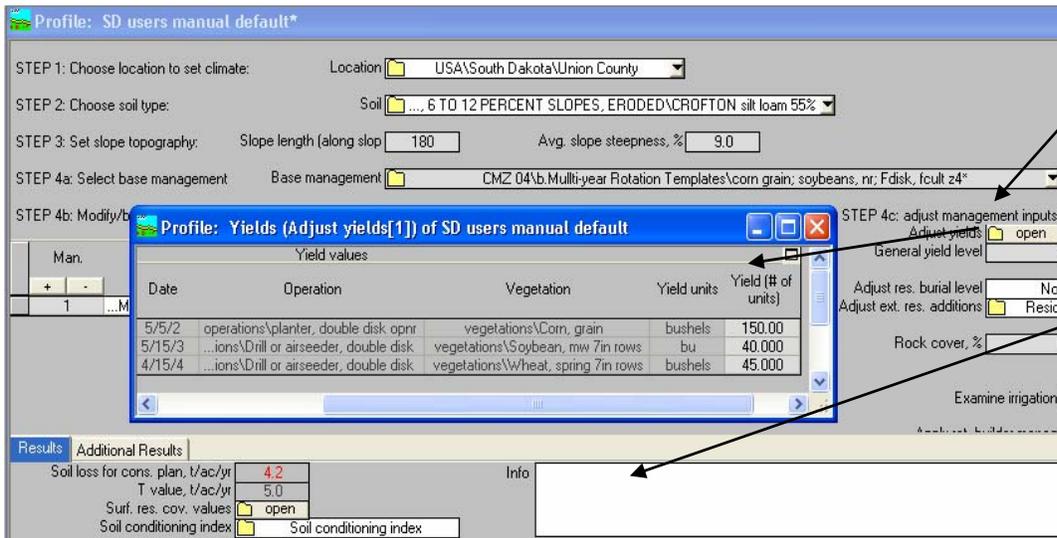
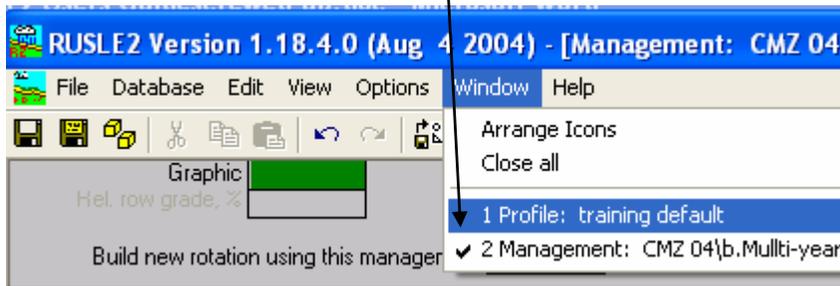
Make sure no years are missing in Starting and Ending Dates.



Click Apply/Close to return to the Management screen. Dates, Operations, Vegetation, and Yield for the new crop year have been added to the original multi-year rotation template to make it a 3 year rotation.



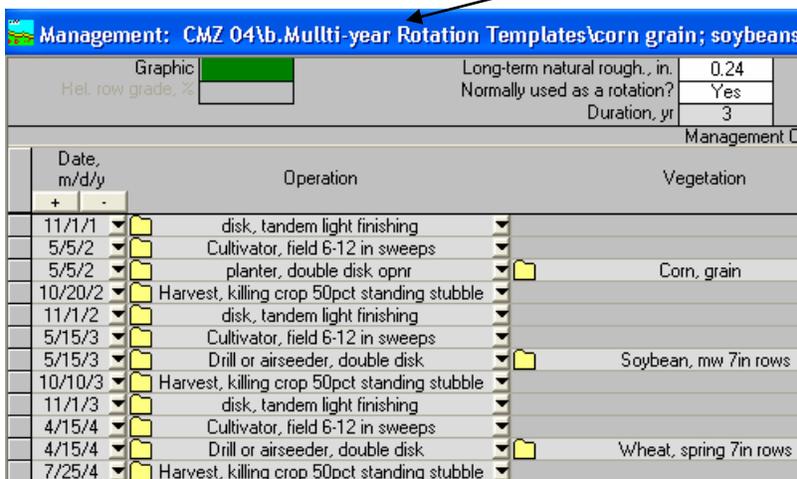
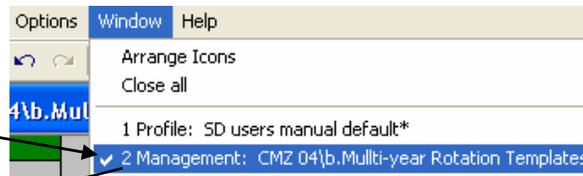
From the Window menu select the Profile screen to review changes to erosion loss.



Crop yields need to be adjusted

Note change in soil loss from original 2-yr to new 3-yr rotation

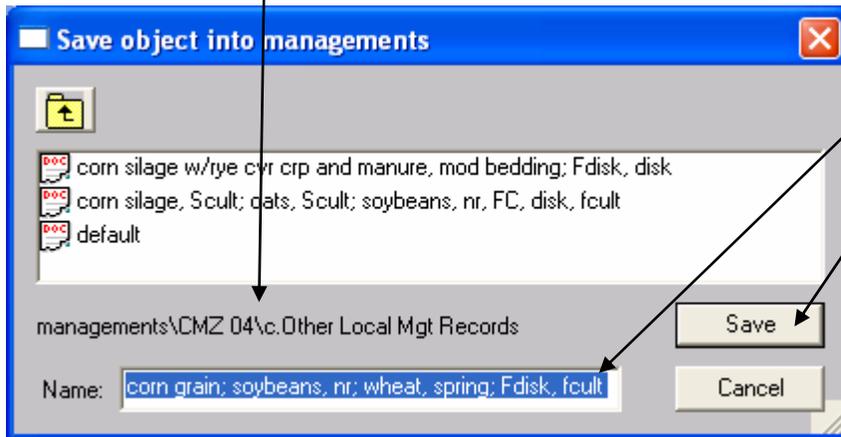
To save the new management as a permanent record, re-open the Management window.



Click the Save As icon



Use up-folder button and migrate to the Other Local Mgt Records directory for your CMZ.



Rename the new 3-year management record and save.

6. Modifying Existing Managements Records from the Management Screen.

(also, Adding Applications of Manure or Other Residues)

This example starts with the corn grain; soybeans, nr; wheat, spring; Fdisk, fcult, z4 record created in chapter 5 and saved in the Other Local Mgt Records directory. The spring wheat will be changed to oats, the planting date of the oats will be changed to 4/20/4, and the tillage operation prior to planting the oats will be changed from a field cultivator with sweeps to one with straight points. Then we will add fall manure application after the corn and oat years.

In the profile screen's Base management box select the starting management (record to be modified). Click the yellow Base management folder to open the Management record.

The screenshot shows the 'Management Operations' table with the following data:

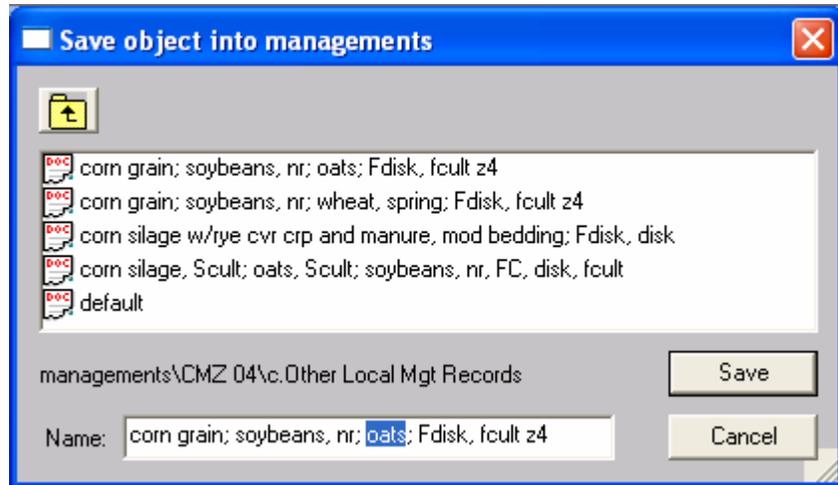
Date, m/d/y	Operation	Vegetation	Yield (# harv. units)	Surf. res. add. / remove,	Cover from addition, %
11/1/1	disk, tandem light finishing				
5/5/2	Cultivator, field 6-12 in sweeps				
5/5/2	planter, double disk opnr	Corn, grain	112		
10/20/2	...g crop 50pct standing stubble			3136.0	70
11/1/2	disk, tandem light finishing				
5/15/3	Cultivator, field 6-12 in sweeps				
5/15/3	Drill or airseeder, double disk	Soybean, mw 7in rows	20.0		
10/10/3	...g crop 50pct standing stubble			370.76	19
11/1/3	disk, tandem light finishing				
4/15/4	Cultivator, field 6-12 in sweeps				
4/15/4	Drill or airseeder, double disk	Wheat, spring 7in rows	30.0		
7/25/4	...g crop 50pct standing stubble			1170.0	50

The 'April, 2004' calendar shows the date 4/20 highlighted. The operation dropdowns show 'Cultivator, field w/ spike points' and 'Oats, spring' selected. The vegetation dropdown shows 'Oats, spring' selected.

Operation Dates, Operations, and Vegetations are changed with the drop down choice lists.

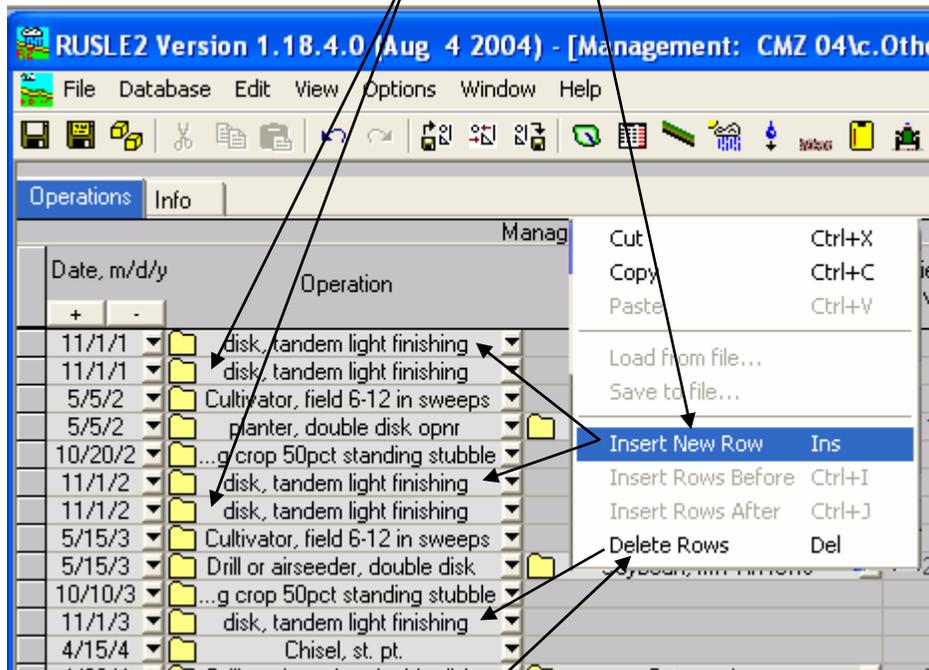
11/1/3	disk, tandem light finishing				
4/15/4	Cultivator, field w/ spike points				
4/20/4	Drill or airseeder, double disk	Oats, spring			
7/25/4	Harvest, killing crop 50pct standing stubble				60.0

If desired for future use this new management can be named and saved in Other Local Mgt Records.



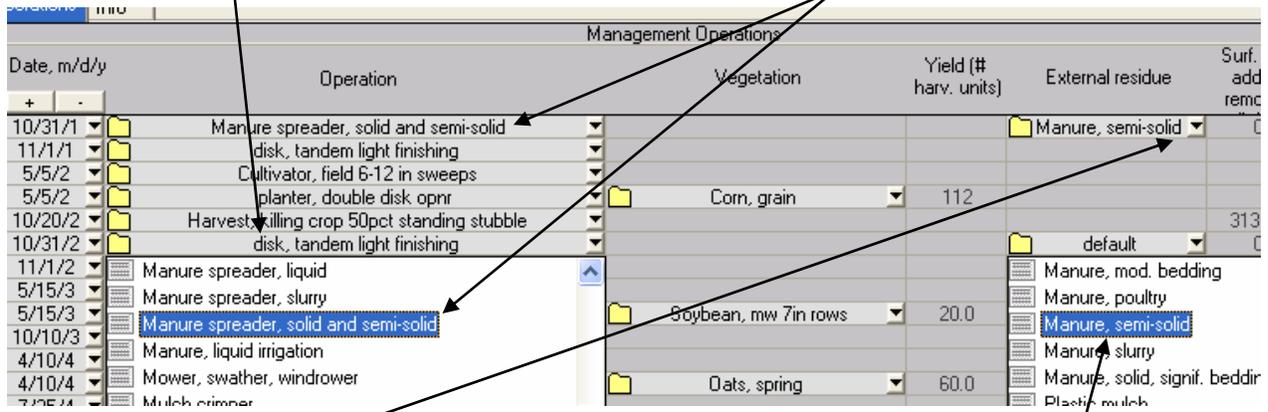
Adding applications of manure or other residues.

In the management window right click on the row that occurs immediately after the manure applications are planned to occur. Select Insert New Row to copy the row.



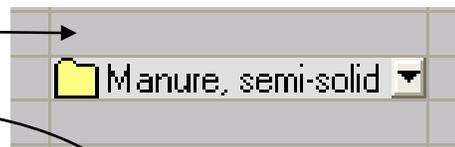
Unwanted operations can also be deleted. In the example it is decided that fall disking the soybean residue was not desired.

Replace the disking operations added in the step above with manure application operations.

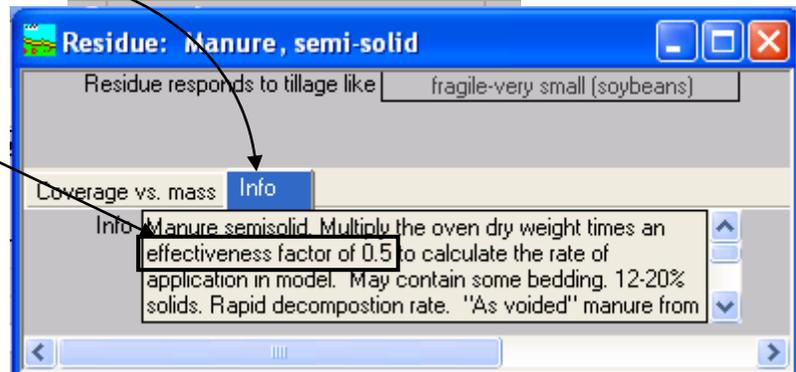


Note that a new choice list becomes available in the External residue column so the type of residue to be applied can be selected.

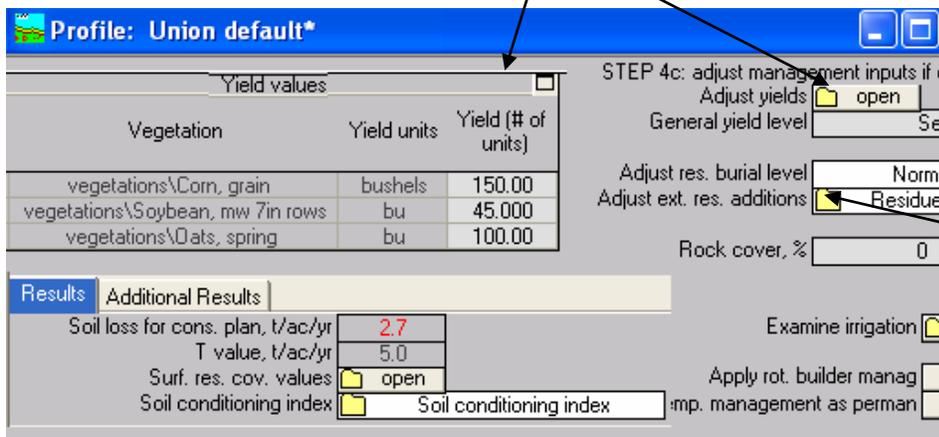
Click the yellow folder to view information about the residue.



Open Info tab. Note "effectiveness factor" for this class of manure. Finer, more easily washed away materials are less effective at reducing erosion than are coarser, more durable manure classes. Other manure classes with similar effectiveness factors include liquid, poultry, and slurry.



Return to the profile screen and adjust yields as needed.



Note 2.7 ton soil loss in Results.

To record manure application rates click Adjust ext.res. additions folder.

Although we specified the type of external residue (manure) to be applied in the Management screen, the amount must be recorded in the Residue inputs screen of the profile.

Date	Operation	Residue type	Residue added, lb/ac	Cover from addition, %
10/31/1	...anure spreader, solid and semi-solid	Manure, semi-solid	3500	95
10/31/2	...anure spreader, solid and semi-solid	Manure, semi-solid	3500	95

In this example the goal is to apply wet manure that is 35% dry matter to the field at the rate of 10 ton/ac. This is equal to 7000 pounds of oven-dry material. Because Manure, semi-solid has an efficiency factor of .5 the amount entered in RUSLE2 is 3500.

The applied external residue (manure) results in a soil loss reduction from 2.7 to 2.5 tons/ac/yr.

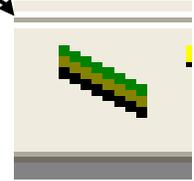
Results	Additional Results
Soil loss for cons. plan, t/ac/yr	2.5
T value, t/ac/yr	5.0
Surf. res. cov. values	open
Soil conditioning index	Soil conditioning index



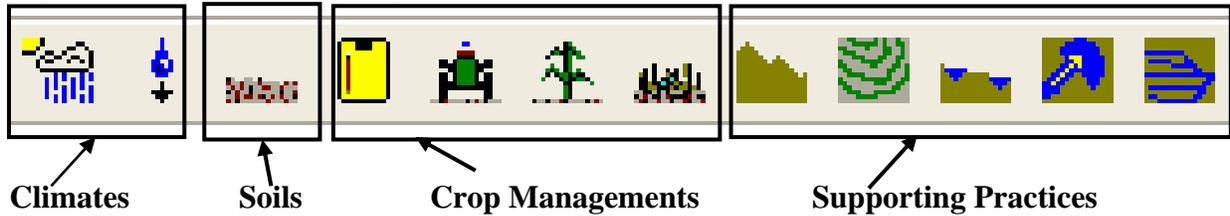
Appendix 1 - Relationship of Profiles and Managements

Confusion often exists between what a **Profile** and what a **Management** actually represents. A Profile should be envisioned as an actual place -- a slope in a field that soil loss from sheet and rill erosion is to be estimated for.

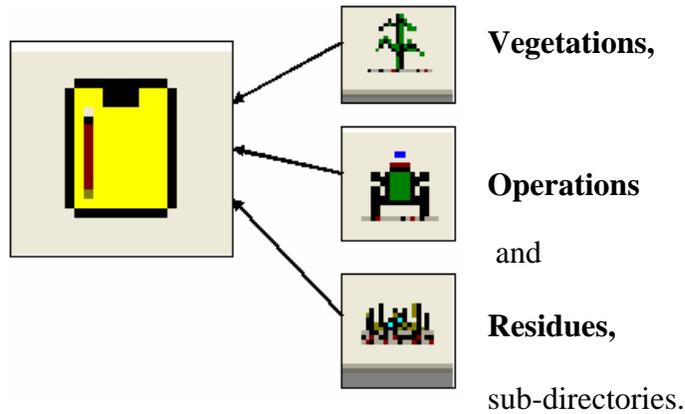
The Profile icon opens an **electronic “fill-in-the-blanks” form** that is used to represent the conditions, or factors, that contribute to soil loss by water on that place in the field (slope). Completing the five steps of the RUSLE2 soil loss in the Profile screen creates an electronic record of those conditions as well as the soil loss resulting from those conditions.



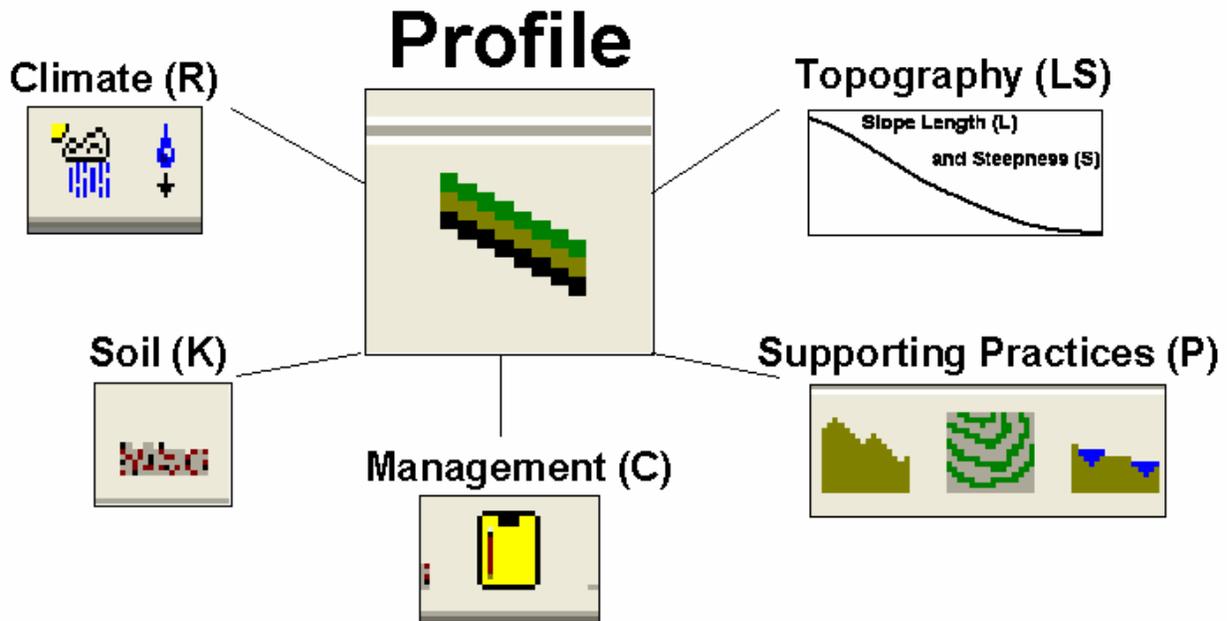
The data drawn on to fill the blanks of the electronic profile form are stored in an **electronic database** with numerous directories and sub-directories. The old paper versions of that data required tremendous cabinet space to contain it all.



Crop **Managements** have been assembled using records from the



Crop **Managements** are just one of data elements that are required to fill the blanks of the electronic Profile form.



The completed electronic **Profile** form can be printed as the SD-CPA-29 (official record of the soil loss calculation). It can also be saved for future use. By changing any one or more of the blanks (erosion factors, such as **managements**) in the form a new erosion estimate may be quickly completed.

Appendix 2 - RUSLE2 Management Abbreviations

A typical Single Year/Single Crop record such as “**corn grain; FC, sweep, disk, fcult, z4**” is named with abbreviations that have consistent meanings . Each part of the name corresponds to data elements in the crop management screen.

corn grain; FC, sweep, disk, fcult, z4

Date, m/d/y		Operation	Vegetation
11/7/1		Chisel, sweep shovel	
5/1/2		disk, tandem light finishing	
5/5/2		Cultivator, field 6-12 in sweeps	
5/5/2		planter, double disk opnr	Corn, grain
10/20/2		Harvest, killing crop 50pct standing stubble	

The typical single year management name has 3 parts:

1. Crop name: **corn grain** -- corn that is harvested for grain
2. Seedbed preparation operations:
 - F** – The first tillage operation occurs in the fall
 - C** – Chisel plow
 - sweep** -- The chisel plow has sweep points
 - disk** – Disking operation, typically in the spring
 - fcult** – Field cultivator operation, typically in the spring
3. Crop Management Zone: **z4** – The management is for Crop Management Zone 4

Other Management Abbreviations

anhyd – anhydrous ammonia applicator

CMZ – Crop Management Zone

eh – early harvest

FM – In z3 it stands for Fall mulch tillage

FP – Fall plow

lh – late harvest

NR, nr – Narrow row spacing

NT – No-till

RT – Ridge-till

SC – Spring chisel plow in zones 1, 4, 5. In z3 it stands for spring conventional tillage

Sdisk – First tillage operation is a disk in the spring

Sfcult – First tillage operation is a field cultivator in the spring

SM – In z3 it stands for Spring mulch tillage

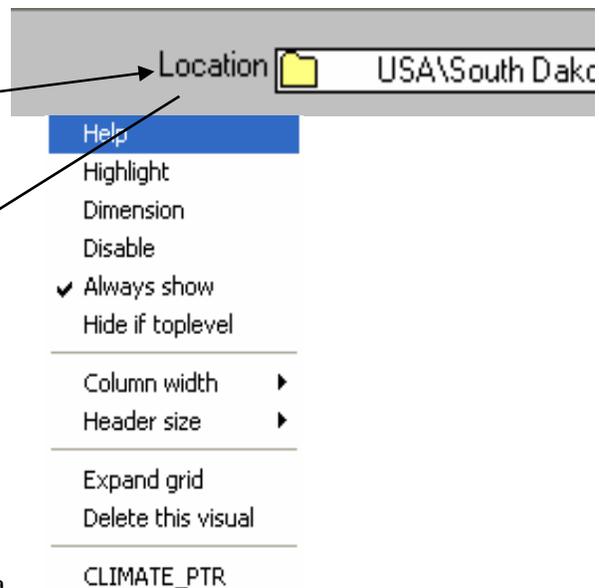
SP – Spring plow

st pt – Straight point shovels on a field cultivator or chisel plow

twist – Twisted point shovels on a field cultivator or chisel plow

wr – Wide row spacing

Other definitions and instructions can be accessed throughout the program by right-clicking on the word in question (Location) and selecting Help from the choice list.



Location:

Select a location that is near your site. Selecting a location chooses input data for monthly precipitation, monthly temperature, R factor, 10-yr EI storm (a storm having an EI with a 10 yr return period), EI distribution, and other weather related values. If a location is not in the list that is sufficiently close to your site, consult your USDA-Natural Resources Conservation Service (NRCS) State Office. Values for the R factor, 10-yr EI storm, and EI distribution can be selected from the RUSLE2 User Guide and monthly precipitation and temperature values can be obtained from the Weather Service. An approximation can be made by choosing a location with precipitation and temperature characteristics close to those at your location and edit the R and 10-yr EI storm values for your location. Adjustments to values may be necessary in regions where weather varies greatly because of elevation and other changes.

A crop year in a RUSLE2 rotation begins with the first operation after harvest of the previous crop and ends with harvest of the current crop. When editing RUSLE2 managements the calendar date of the last operation in a rotation must occur prior to the calendar date of the first operation. (ex: corn harvested 10/15/1. Fall tillage in preparation for the next crop must not occur any earlier than 10/16/1. If not, Rusle2 will add another year to the rotation) To ensure that problems such as harvest operation dates of one crop being overlapped by seeded bed operations of the next crop use the dates from this table.

Appendix 3 - South Dakota RUSLE2 Operation Dates

Crop	First Fall Tillage				First Spring Tillage				Planting Date				Harvest Date			
	Zn 1	Zn 3	Zn 4	Zn 5	Zn 1	Zn 3	Zn 4	Zn 5	Zn 1	Zn 3	Zn 4	Zn 5	Zn 1	Zn 3	Zn 4	Zn 5
Barley	10/20	10/20	11/1	11/1	4/10	4/10	4/5	4/5	4/25	4/25	4/15	4/15	8/5	8/5	7/25	7/25
Bean, field (dry)	10/20	10/20	11/1	11/1	5/5	5/5	5/5	5/5	5/25	5/25	5/25	5/25	10/1	10/1	9/15	9/15
Canola	10/20	10/20	11/1	11/1	4/10	4/10	4/5	4/5	4/25	4/25	4/15	4/15	7/15	7/15	7/15	7/15
Corn, grain	10/20	10/20	11/1	11/1	5/5	5/5	4/20	4/20	5/20	5/20	5/10	5/5	10/15	10/15	10/20	10/20
Corn, silage	10/20	10/20	11/1	11/1	5/5	5/5	4/20	4/20	5/20	5/20	5/10	5/5	9/1	9/1	9/15	9/15
Flax	10/20	10/20	11/1	11/1	4/10	4/10	4/5	4/5	4/25	4/25	4/15	4/15	8/1	8/1	8/1	8/1
Millet, grain	10/20	10/20	11/1	11/1	5/5	5/5	5/5	5/5	6/1	6/1	6/1	6/1	9/1	9/1	9/1	9/1
Millet, hay	10/20	10/20	11/1	11/1	5/5	5/5	5/5	5/5	6/1	6/1	6/1	6/1	8/15	8/15	8/15	8/15
Oats	10/20	10/20	11/1	11/1	4/10	4/10	4/5	4/5	4/25	4/25	4/15	4/15	8/5	8/5	7/25	7/25
Peas, field	10/20	10/20	11/1	11/1	4/10	4/10	4/5	4/5	4/25	4/25	4/15	4/15	8/15	8/15	8/15	8/15
Rye	8/20	8/20	9/15	9/15					9/10	9/10	9/25	9/25	7/20	7/20	7/20	7/20
Safflower	10/20	10/20	11/1	11/1	4/10	4/10	4/5	4/5	4/25	4/25	4/15	4/15	10/15	10/15	10/15	10/15
Sorghum/Sudan	10/20	10/20	11/1	11/1	5/5	5/5	5/5	5/5	5/25	5/25	5/20	5/20	9/1	9/1	9/10	9/10
Sorghum, grain	10/20	10/20	11/1	11/1	5/5	5/5	5/5	5/5	5/25	5/25	5/20	5/20	10/10	10/10	10/10	10/10
Soybeans	10/20	10/20	11/1	11/1	5/5	5/5	5/5	5/5	5/25	5/25	5/15	5/15	10/5	10/5	10/10	10/10
Sunflowers	10/20	10/20	11/1	11/1	5/5	5/5	5/5	5/5	5/25	5/25	5/25	5/25	10/5	10/5	10/20	10/20
Spring wheat	10/20	10/20	11/1	11/1	4/10	4/10	4/5	4/5	4/25	4/25	4/15	4/15	8/5	8/5	7/25	7/25
Winter wheat	9/2	9/2	9/15	9/15					9/10	9/10	9/25	9/25	7/20	7/20	7/20	7/20