**Management Committee Report** (Draft 2)

Committee members

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## INTRODUCTION:

The MOSES subgroup was formed to address issues related to management "operations" and the development and modification of "management descriptions" within the MOSES interface. The goal is to develop the necessary structure, visual screens, and processes required to allow MOSES to provide the user with a uniform, easy to use, intuitive means of creating and modifying management descriptions for all ARS erosion models (WEPP, WEPS, RUSLE2, and RWEQ).

The MOSES Management Subgroup was charged with dealing with and resolving issues related to physical actions that a land manager can control and schedule. These management actions or MOSES "operations" include, but are not limited to, operations such as: primary and secondary tillage, planting, harvesting, cultivation, burning, grazing, irrigation, application of herbicides, pesticides, and fertilizers, etc.

Each MOSES "operation" is defined as a list of "processes" representing the actual physical action(s) performed by the "operation". A list of MOSES "operations" or management actions applied to a given land unit, including dates and/or rules specifying when they occur, is called a "management description" (management/crop rotation scenario). Most users are expected to select pre-built "description templates" and modify them as necessary to create the "management description" scenario for a particular simulation run. Thus, how easily a user interacts with MOSES to select and view individual operations and groups of operations (full or partial management description scenarios) is important.

The Management web site contains discussions and examples of much that is described below. Individuals interested in the Management material should examine the following web addresses for additional information:

http://www.weru.ksu.edu/moses/moses_man/index.html http://www.weru.ksu.edu/moses

## TERMINOLOGY:

MOSES Process:

An effect which reflects a physical change in some property or group of properties relating to the soil, surface, vegetation, residue, etc. that impacts the soil/surface/vegetation/residue status as represented in the erosion models.

MOSES Operation:

Any event which a land manager can initiate which can effect the soil, surface, vegetation, and/or residue status as represented in the erosion models. Each MOSES "operation" is defined as a list of MOSES "processes" which represent the actual action(s) performed by the "operation".

MOSES Management Description:

Principally, a MOSES management description consists of a date ordered list of MOSES operations. However, there are additional elements required to fully describe a MOSES management description for input to an erosion model for a simulation run. These elements values are often dependent upon factors related to each specific simulation. Examples include: a) length of rotation, b) row/tillage direction, etc. Thus, a “complete” MOSES management description (one ready for input to an erosion model) must also include those additional element values as well.

**OBJECTIVES:**

1. MOSES management descriptions
   a. Define what constitutes a valid MOSES management description.
   b. Describe how user will interact with MOSES to build/modify management descriptions.
   c. Define management description screen layout(s) and functionality.
   d. List actions/tools a user will need to construct/modify management descriptions.
   e. Address any model specific issues related to management descriptions.
   f. Develop some sample management descriptions for MOSES testing.

2. MOSES management operations (user interaction)
   a. Describe how user will interact with MOSES to build/modify management operations.
   b. Define management operation screen layout(s) and functionality.
   c. List actions/tools a user will need to construct/modify management operations.
   d. Address any model specific issues related to management operations.

3. MOSES management related operations
   a. Describe how an "operation" is defined in MOSES.
   b. Provide guidelines that define a valid MOSES operation (rules, restrictions, etc.).
   c. Address issues such as multi-tool and multi-implement tillage operations, schedule-based operations (irrigation), and erosion model specific differences.
   d. Develop a list of core operations for MOSES testing.

4. MOSES management related fundamental physical processes.
   a. Define each fundamental physical process handled in MOSES.
   b. List and define each processes parameters/variables.
   c. Address issues such as "shared" parameters and model specific needs for each process.

**MOSES MANAGEMENT DESCRIPTIONS:**

:A management description is a date ordered list of MOSES operations. Typically they will describe complete rotations suitable for use as input to the erosion models. However, partial rotations can also be described and used as "templates" to aid the user in creating a complete MOSES management description. Thus, the user will have the ability to select complete and/or partial rotation descriptions and manipulate (modify/combine/cut/paste) them as desired to create a complete management description for an erosion model through a MOSES management description editor.

Figure 1 represents a MOSES management description as a date ordered columnar list. The user requires a means of "selecting" operations from a list of pre-defined operations (input), available from a "MOSES operations" database. Also, the user requires a means of "saving" a management description (output) as well as retrieving a previously developed one (input).

The MOSES management description editor must also have the following capabilities:

- Delete (cut) an operation from the current description list.
- Move (cut/paste) an operation in the list relative to others in the list.
- Change the "date" assigned to an operation in the list.
- Insert/Append operations or a list of operations (possibly from other management descriptions) into the current description list being edited.
- Ability to "create" a new operation and insert it into the list.
- Ability to access the underlying elements of an operation in the current list for viewing and potential modification.
- Ability to specify a date, or date range, for an operation.

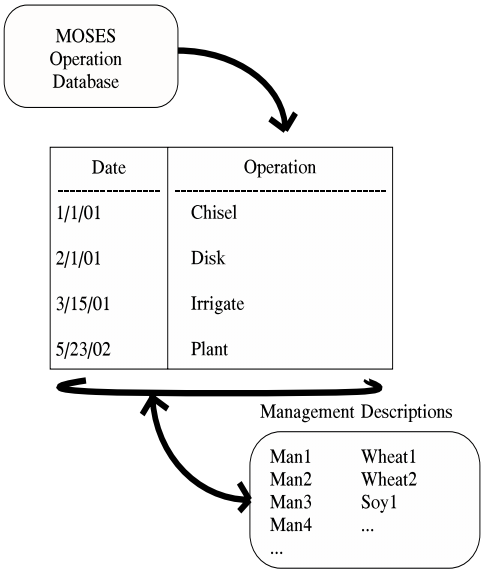


**Figure 1**. MOSES Management Description Editor (Inputs/Outputs)

Figure 2 shows an example view of a MOSES management description editor. It consists of two view components of the current description list: 1) date sorted columnar text list, and 2) date ordered timeline of icons representing the operations. Changes made in either view are reflected immediately in the other. The "list table" view is capable of presenting more information to the user about individual operations (additional user-selectable columns) than the "timeline" view. The "timeline" view, however, should provide a better (faster/easier) method to adjust individual operation dates. It also requires less screen space and is therefore more amenable to being used in editing screens that deal with multiple management descriptions concurrently.

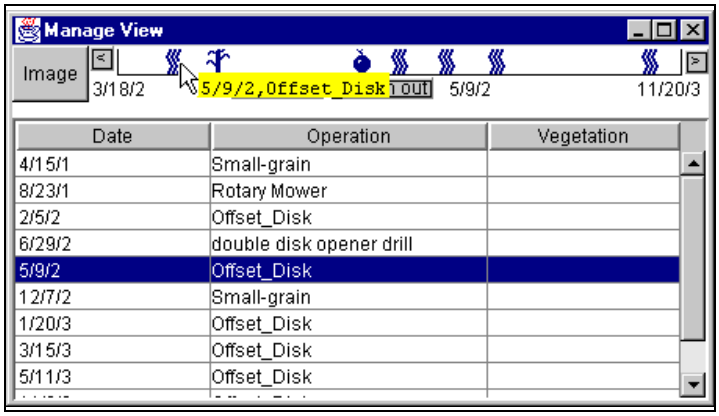


**Figure 2**. Example MOSES management description editor.

Although not shown here, a third view component, a"calendar" view, could also be implemented. It may be easier for users to select groups of operations and "move" them relative to their current dates than in the other

views.. Providing multiple display/edit screen paradigms will allow the user to select the best method for the desired tasks at hand.

Figure 3 shows an example of a drop down tree-view selection list of available MOSES operations. This selection list categorizes the operations based upon their primary function classification. Other classifications schemes are envisioned which the user could select if desired.

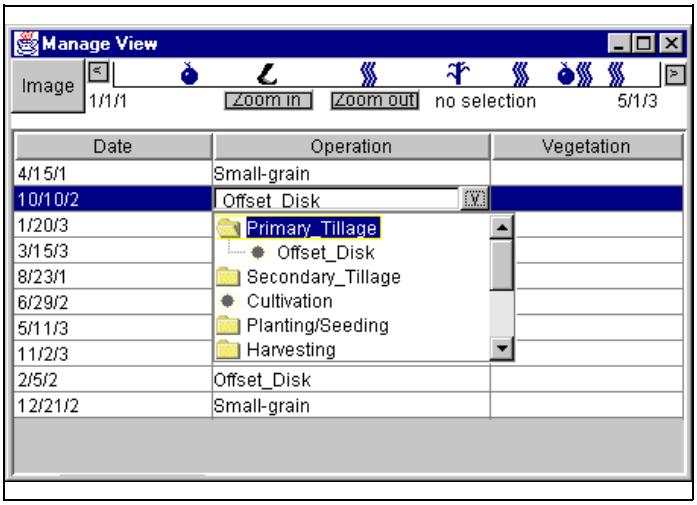


**Figure 3**. Example of operation selection list (tree view)

Similarly, the date format will be a user selectable (eg. mm/dd/yy, dd/mm/yy, etc.) option. Multiple methods for specifying a date entry is envisioned. Besides text editing, the user can "slide" the operation icon in the timeline view, or be able to "popup" a calendar to select the date (no example shown). Automatic re-sorting will occur when working in the timeline view. Manual re-sorting of operations (clicking mouse when pointer is in date field heading) will be provided when changing dates within the table view. This will allow several operation dates to be modified at one time without an annoying re-shuffling of the operation list each time. Besides having the ability to select a group of operations in which the user can cut/paste as a group in these two views (as well as a "calendar" view), he will also have the ability to specify a date offset to move the group. This will be especially useful for modification of management descriptions where planting and/or harvest dates need to be adjusted due to different length growing seasons.

A management description cannot be "complete", ie., ready for input to an erosion model for a simulation run, unless all the additional factors that reflect the specifics of the particular simulation run to the management description's list of operations are included, such as tillage/row direction. Since this type of information is dependent upon the individual field characteristics (size, shape, orientation, topography) of a simulation run, they are not the exclusive domain of the MOSES management description editor. Although the management description editor is expected to be the primary tool through which this information is contained, manipulated and viewed, there will be corresponding views in other screens.

Therefore, additional features required in the MOSES management description editor screen include:

1) A numeric entry field where the user can specify the length of rotation if greater than the number of years operations are specified in the description (no example shown in Figures 1 and 2).
2) A view component to indicate which region of the simulation the current management description applies. A placeholder, labeled "image", is shown in Figures 2 and 3 for this purpose. It is envisioned that the user will also be able to switch to another management region via that component within the management editor. How this is done should be determined by the group that discusses the "management alignment" or "multiple management" screen(s).
3) A means for viewing and changing tillage/row directions directly from the management description editor is required. One approach is to provide an additional column in the table list view in which either individual operations or selected groups of operations can have tillage/row directions modified as required for a specific simulation. Also discussed was the possibility of having an alternate means of specifying/displaying the tillage/row directions for operations on the planview screen.

**MOSES OPERATIONS (screen views):**

No screen(s) for editing/creating individual operations have been discussed by the management group yet. Features that will be required are:

1. The ability to "select" the appropriate MOSES processes and to organize them in an ordered manner (when process order is important).
2. Keeping "operation" level parameters separate from individual "process" parameters. This does not mean that individual processes won't require one or more of the "operation" level parameter values, it means that the "operation" level parameters are likely to be "shared" parameters used by many of the individual processes and that they should not be duplicated in the description of the operation.
3. The ability to "popup" the operation editor screen from within the management description editor when the user selects the "drill down" option to view/edit an operation's parameters.
4. To be able to deal with multi-tool and multi-implement operations, ie. allow multiple instances of specific processes for a single operation and multiple instances of operation level parameters, respectively.

Use of tabbed notebook view components may be one approach used to implement an operation editor. An example of how this could be done is shown in Figure 4. The top tabs would represent various operation parameter groups (multi-tool/multi-implement) and the bottom tabs would represent the processes that pertained to the current view of operation parameters. Reordering the tabs would change the order processes were simulated (necessary for those which order is important).

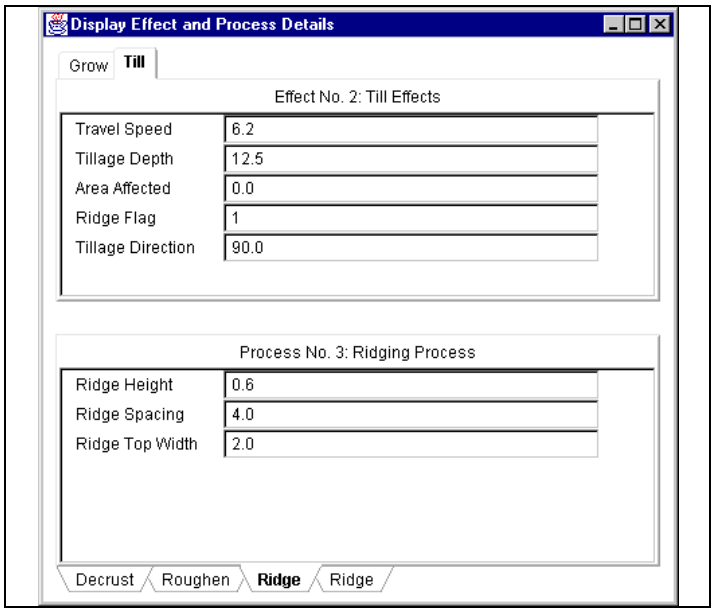


**Figure 4.** Example of tabbed notebook components used to display an operation's parameters and processes.

**MOSES OPERATIONS and PROCESSES:**

Each MOSES "operation" is defined as a list of physical "processes" representing the actual action(s) performed by the "operation". Thus, MOSES should be able to handle any operation, if all the fundamental processes required to represent the operation's actions are available within MOSES. Therefore, the definitions of all necessary fundamental physical processes required by the erosion models are listed.

A MOSES “process” is defined as a process which reflects a physical change in some property or group of properties relating to the soil, surface, vegetation, residue, or any other material that impacts the ARS erosion models' representations of the soil/surface/vegetation/residue states. MOSES processes do one or more of the following:

Soil Surface Modification

The soil surface state is described differently within each of the erosion models. However, each model still represents the surface state condition as a unique set of variables, even though some of those variables may be influenced by other processes and properties.

Soil Mass (layer) Manipulation

The soil mass (represented as a series of stacked, parallel, homogeneous horizontal layers in some of the erosion models) is moved and changed by many management operations. The soil mass (density, aggregate size and stability, etc.) and quantity and location of soil properties (sand, silt, clay, organic matter, etc.) define the state of the soil.

Biomass Manipulation

The biomass manipulation processes describe the effects that management operations have on the growing crop and residue pools in the models. The types of processes here involve the transfer of biomass from standing to flat, live to dead, above ground to buried, buried to surface, etc.

Soil Amendments

The addition of specific materials to the soil and/or surface fall into this category. Typical processes here would include such things as the application of water (irrigation), nutrients (fertilizers), and residues.

**MOSES Management Dictionary**

by Dan Yoder

**Terminology:**

- management area: a contiguous area on the slope/field which the farmer/operator treats as a single unit; the same field operations are performed over the entire area at the same time, and the same vegetation is grown

**Comments:**

- I will not tackle for now how to set initial conditions; those may have to be model-specific
- regardless of how it is done, the goal of the management view is to provide a list of dates and associated operations, and to indicate the effect that those operations have on the soil, growing vegetation, vegetative residues, and other possible objects which might have an impact on erosion (e.g., a rock mulch). In spite of the differences mentioned below, the basic underlying information in the models is not all that different
- WEPP uses a fundamentally different approach to entering this information than do the other three models. WEPS, RWEQ, and RUSLE enter a list of dates and associated field operations, and then specifies what that operation does. WEPP divides the operations by type (affects surface, general residue management, etc.), and then within each type specifies the dates. This basic difference will need to be resolved.
- WEPP also divides things up by calendar year, allowing the user to save yearly "chunks" of the list, and to put those chunks together in different ways. Certain effects are only allowed to be entered in one of these yearly chunks, meaning that they can only be done once in a year. My impressions of this:

  Positives:

  - allows for greater flexibility in putting together and saving "chunks"

  Negatives:

  - seems to assume that chunks are independent, which may or may not be the case. For example, a soybean chunk following soybeans may very well be different from a soybean chunk following corn
  - not sure how easy it is to handle crops that span more than one calendar year

  Ideas:

  - what if we allow the user to save chunks of time associated with specific crops (including "fallow"), rather than with calendar years?? Note that this would be an enhancement, since the goal is still to build the time/operation list, and any agglomeration like this is an optimization rather than a necessity

  Additional comments - LEW

  - The primary concern here that Dan raises is that WEPP requires things to be done in fixed size chunks of yearly multiples. The user can put the "chunks" together to create a complete rotation or management description. Dan would like to see that restriction not exist in MOSES (fixed yearly sized chunks) so that a user could work with any size chunk (groups of operation lists that could range from say a week to several years) when constructing a new management description. The question becomes how does this approach affect WEPP? If MOSES uses a different, less restricted, paradigm towards manipulation/development of management descripitions, will that negatively affect WEPP, ie., require changes in code, compatibility with legacy WEPP management description files, etc? I think that it will be possible to output a MOSES management description into the "format" required by WEPP, eliminating the need for WEPP model code changes, etc. However, would the effort to accomodate the WEPP format in MOSES be greater than the effort required to change WEPP (and the other models) input format(s) to conform to a single MOSES format?

- it has become increasingly clear to me in working with this that the processes are not independent. For example, I see no way that residue can be transferred into or out of the subsurface pools without disturbing the soil, nor do I see any way that the soil can be disturbed without affecting at least the flat and subsurface residue pools. For now I am putting the transfer between subsurface and flat residue pools in the soil disturbance process and cross-referencing it from the residue transferral process.

LEW- One way that a soil could be disturbed without affecting the flat and/or residue pools would be from soil freeze/thaw over-wintering processes (lower bulk density in affected layers). These effects are (will be) simulated within the soil submodel in WEPS. However, other models like RUSLE and RWEQ may want to be able to simulate such a physical process via a "special" operation.

DAN - I would prefer that "natural" processes like freeze-thaw that disturb the soil structure be placed somewhere other than in the operations list (for example, we could include the time of freeze-thaw cycles in the climate description), but can see the need for giving the user flexibility to do that. You're right; you should be able to disturb the soil while burying 0% of the residue, but the approach I'm suggesting allows that by simply entering a 0 value. Can you envision a need for decoupling in the other direction; that you can move residue without disturbing the soil?

- there would be many different ways to organize the operation processes, but I don't feel good about any I can think of now. We could organize by the purpose of the operation, but the same operation can be used for different purposes (e.g., a chisel plow can be used to prepare a seedbed [soil disturbance] or to kill weeds [affect vegetation]). We could organize by mass movement in the way Larry has suggested, but it might be hard to show the interactions I talk about above, and I'm not at all sure that the user can understand all the different ways that we talk about residue transfer. We could emphasize the user describing how the situation after will vary from that before, but maybe this doesn't give a good-enough feel for the mass transfers taking place. This isn't critical for the data dictionary effort, but it will control how we lay out the operations screens

- I envision grazing as an operation which is done every day, with the amount of biomass removed dependent on the number of animals, etc., and perhaps on the amount available. Note that there would also be a continuous residue addition, though it would be of a different type and would not be added uniformly
- I am separating the planting/begin growth process from the amendment process because we may want sometime to have growth begin without introducing seeds (e.g., time-delayed seeding, etc.). In addition, since RUSLE and RWEQ handle crop growth directly rather than through a growth model, they need to be able to change growth patterns directly via an operation

LEW - I assume such an operation would be considered a "null" operation by WEPP and WEPS then. This also means that the user must be aware of RUSLE/RWEQ's requirement in this area if he builds such a rotation and intends it to be "compatible" with all erosion models. This may be a problem for those users having only knowledge of WEPP and/or WEPS and not of RUSLE/RWEQ.

DAN - I'm surprised that neither WEPP nor WEPS has any interest in this; how do you handle interseeding a winter cover crop in soybeans, or modeling winter weed growth which is so important here in the SE? Don't you need some way of telling the crop growth model which new crop to grow? I agree that the regrowth definition after a hay cutting would be internal for WEPP and WEPS and external for RUSLE and RWEQ, but I think that the SDS can handle asking for the right thing depending on the model.

LEW - Right now the WEPS CROP submodel can't handle interseeding. That capability is planned for the future. WEPS does "tell" the CROP growth model which crop to grow.

- Hanging Questions:
  1) do we need to be able to handle something like the root-pruning effects of a cultivation operation, where a portion of the live subsurface biomass is transferred to the subsurface residue pool?
  2) from a more general management consideration, how do WEPP and WEPS handle something like a construction site or landfill that isn't a rotation?

LEW - Not quite sure of what you are asking here. WEPS doesn't have to have a management rotation specified (no growing vegetation).

DAN - The question isn't so much one of whether or not you have vegetation as whether or not the

management pattern is repeated every X years. How does WEPS handle it if I want to clear out brush, do some construction, put down seed and mulch, and never return? What rain and wind patterns are used?

LEW - Still not quite sure what you are asking. Do you mean specifying a management operation that would only be done once during the simulation run? If so, WEPS currently hasn't implemented that capability, but would not be difficult to do by having an "operation level" flag that says to do it only once (kind of like specifying it as an initialization operation). I expect to implement whatever is agreed upon on how MOSES will handle it. I don't follow what is meant by "rain and wind patterns"?

3) RWEQ currently handles barriers as an operation. I would rather handle them as a vegetative strip, and keep within the vegetation description for that strip the barrier properties. Is this what the rest of you envision?

LEW - Yes. However, WEPS has the ability to simulate vegetative barriers like any other "crop". This just means that the changes in a vegetative barrier can be simulated automatically as a separate subregion in WEPS (OLE in WEPP). Typically though, I expect the user to specify such "control practices" via a different mechanism (I.e., the practices/activities section in the Planview screen).

DAN - I would see the "practice" tool for vegetative barriers essentially asking for what management you have in the practice area, including vegetation, cutting, etc. It would really be just another way of specifying a management region.

LEW - Yes. I guess what I am saying is that WEPS can potentially handle barriers in two ways: 1) like any other management region where the vegetation is planted, grown, cut, etc. and 2) as a "special" separate management practice where the user effectively specifies the physical properties pertaining to the location and barrier effects of the vegetative barrier. The first method allows for changes in the barriers properties to be determined automatically based upon the type of vegetation and the growing conditions, etc. The user never actually specifies any of the physical barrier properties in this case as they are determined at run time on a daily basis. The second method allows for both vegetative and non-vegetative barriers to be treated in a similar fashion. The user has control over the barrier properties and specifies how they change over time. This is the method expected to be used in most cases by WEPS users. Even though they can be thought of as an "operation", we haven't included them in the WEPS management description because they can cross subregions.

4) I believe that all models will track flat and subsurface residue pools by type and layer. Do we need for the user to be able to specify how much of each type of residue gets mixed between which layers? For example, do we need to be able to say that a plow will mix the older and very fragile soybean residue from last year into the top 2 inches, while the newer and tougher cornstalks will end up mostly buried at about 6"?

LEW - I can't think of a reason at this time. Future research may provide adequate data/results to allow us to do so in the future (assuming it was a significant enough effect to warrant the effort to add to the model(s).

**Processes and Associated Parameters**

- list of processes
  - entered in order of occurrence

1) affect soil properties
- surface soil properties
  - random roughness after process

- nominal random roughness
- tillage roughness intensity – WEPS, but others will likely adopt?

- oriented roughness
  - ridge height
  - ridge spacing
  - ridge direction – WEPS, RWEQ
  - dike height – WEPS
  - dike spacing – WEPS
- percent of surface disturbed
- crust removal – WEPS
  - areal percentage of crust destroyed (different from % surface disturbed??)

  LEW - I believe that we can consider "percent surface disturbed" to be equal to "areal percentage of crust destroyed".

  LEW - An additional comment. I prefer to use the term "fraction" rather than "percent" or "percentage". This probably stems from the fact that WEPS has defined all such parameters in decimal fractions so that we don't have to do additional computations when using such parameter values in our calculations. I don't have any problems with presenting/asking the user such information in terms of percentages though.

- subsurface soil properties
  - depth of effect
  - shape of subsurface cross-sectional area affected – none yet, but RUSLE would like
  - change in BD by loosening or compaction – WEPS, WEPP?
    - mixing coefficient – WEPS
    - compaction coefficient – WEPS
  - change aggregate sizes in soil layers – WEPS
    - crushing parameters
  - redistribution of soil layer properties by mixing or inversion – WEPS
  - mixing of OM within soil layers
    - applies only to subsurface decomposing residue
  - transfer flat biomass to subsurface
    - for each residue type:
      - mass transferred to subsurface
        - percentage transferred to flat
- transfer subsurface biomass to flat
    - live biomass – is this possible??
      - mass transferred
        - percentage transferred
    - residue
      - for each residue type:
        - mass transferred to flat
          - percentage transferred to flat

2) affect flat and standing biomass => transfer
- kill vegetation (move from live biomass to decomposing biomass)
  - kill percentage
  - vegetation which regrows after kill (esp. if not 100% kill)
    - handled automatically by WEPP and WEPS crop growth models??

      LEW - Yes for WEPS.
    - is needed for RUSLE and RWEQ
- cut standing biomass
  - percentage of standing which is cut
  - cut height

LEW - In WEPS, we can specify a cut height as a value from the surface up or from the top of the crop down. In addition, we provide the option of specifying a fraction of the crop height as well. This allows us to deal better with crops that grow to different heights due to different growing conditions from year to year.

- transfer
  - from live biomass to residue
    - mass transferred to flat
      - percentage transferred to flat
    - evenness of distribution – RUSLE
    - mass removed from field
      - percentage removed
  - from standing residue pool to flat residue pool
    - for each residue type:
      - mass transferred to flat
        - percentage transferred to flat
  - from standing residue pool to removed
    - for each residue type:
      - mass removed
        - percentage removed
- transfer of subsurface biomass (both residues and root crops)
  - transfer to flat => handled in soil disturbance section
  - live biomass removed
    - mass removed
      - percentage removed
  - residue removed
    - for each residue type:
      - mass removed
        - percentage removed
- flat residue transfer
  - transfer to subsurface => handled in soil disturbance section
  - residue removed
    - for each residue type:
      - mass removed
        - percentage removed

3) affect the type of vegetation growing
- regrowth of vegetation – RUSLE, RWEQ

LEW - This would have to be assumed to be a “null” process by WEPS and presumably by WEPP as well. Note previous discussion about potential for users to build erosion model specific management files though.

  - vegetation name
- planting of vegetation
  - vegetation name
  - planting density
  - row spacing (= 0 if broadcast)

4) amendments
- irrigation – RWEQ, WEPS, WEPP
  - scheduled
    - amount
    - how often
    - beginning date

        - end date
    - on demand
        - criterion
- fertilizer
    - for each nutrient type
        - mass
- surface cover material (straw, plastic, rock, ...)

    LEW - I have not given such things much thought before. Would there be a need for a “removal” of surface cover material (or date for such to occur), especially for non-residue materials? For the non-residue situations, WEPS would need to be able to specify that some of these materials are non-erodible and non-abradeable (at least to some degree). Should the “practices/activities” section in the Planview be an alternate method to specify such things (maybe it would bring up the Management editor for the practice to be inserted).

    DAN - I think that in the “residue removal” process we need to be able to specify which residues will be removed. The problem is that we have now made the interface interactive; we need to run through the rotation up to this point to see which residues exist. I think we can handle the “non-erodable” and “non-abradable” aspects of such “residues” (e.g., plastic mulch) by simply setting the decomposition and erosion coefficients high or low enough. I don’t think that there’s a need for a special parameter to indicate this. The more we can handle this like any other residue or practice the more I’ll like it.

    LEW - Dealing with them (non-biological materials) like any other “residue” that have appropriate decomposition properties might be possible in all the models (I believe WEPS would have to know they were non-biological though), but these materials are often physically removed at a future time. There are a few other things we would need to think about with regards to WEPS that have not been discussed before also.

    - name
    - amount
        - mass
        - % cover
    - evenness of distribution – RUSLE

**Specific Parameter Descriptions**

| Parameter | Value Type | Dimension/s | Source | Comments |
|---|---|---|---|---|
| **SOIL DISTURBANCE: surface properties** | | | | |
| random roughness | float | single value | edit | std. dev. in inches; probably nominal value |
| till. rough. intensity | float | single value | edit | modifies nominal for current conditions |
| ridge height | float | single value | edit | |
| ridge spacing | float | single value | edit | |
| ridge direction | float | single value | edit | |
| dike spacing | float | single value | edit | WEPS and RWEQ |
| dike height | float | single value | edit | WEPS and RWEQ |
| % surface disturbed | float | single value | edit | WEPS |
| % crust area lost | float | single value | edit | WEPS |
| **SOIL DISTURBANCE: subsurface properties** | | | | |
| depth | float | single value | edit | |
| shape of disturbance | float | single value | picklist | generalized shapes |
| BD loosening coeff | float | single value | edit | |
| BD compaction coeff | float | single value | edit | WEPP and WEPS |
| aggreg. crush. para. | float | single value | edit | WEPS |
| soil prop. mixing coeff | float | single value | edit | WEPS |
| OM mixing coeff | float | single value | edit | WEPS |
| mass flat res. transferred to sub | float | res types x layers | edit | WEPS, RUSLE |
| mass sub res transferred to flat | float | res types x layers | edit | |
| **TRANSFER FLAT & STANDING BIOMASS** | | | | |
| kill % | float | single value | edit | |
| regrowth veg name | string | single value | picklist | RUSLE, RWEQ |
| % of standing cut | float | single value | edit | |
| cut height | float | single value | edit | |

| | | | | |
|---|---|---|---|---|
| mass live standing transferred to flat res | float | single value | edit | |
| mass live standing removed | float | single value | edit | |
| mass res standing transferred to flat res | float | res type | edit | |
| mass res standing removed | float | res type | edit | |
| mass sub. live removed | float | single | edit | |
| mass sub. res. removed | float | res type x layer | edit | |
| mass flat res removed | float | res type | edit | |
| **AFFECT TYPE OF VEG GROWING** | | | | |
| veg name | string | single value | picklist | |
| planting density | float | single value | edit | |
| row spacing | float | single value | edit | |
| **AMENDMENTS** | | | | |
| demand criterion | float | single value | edit | |
| # irrigation events | int | single value | edit | 0 if scheduled? |
| beginning date | date | single value | edit | |
| frequency | float | single value | edit | |
| irrigation amount | float | # events | edit | |
| # fertilizer nutrient type | int | single value | edit | WEPS, WEPP |
| fertilizer nutrient type | string | # fert. types | picklist | WEPS, WEPP |
| fertilizer nutrient amount | float | # fert. types | edit | WEPS, WEPP |
| # surface cover addition type | int | single value | edit | |
| surface cover addition type | string | # surf. cover types | picklist | |

| | | | | |
|---|---|---|---|---|
| surface cover amount | float | # surf. cover types | edit | need to be able to choose entry by either mass or % cover |