WEPP Winter Processes Customization
Reason for Customization

- Different types of frost conditions
  - “concrete” – bare soil
  - “honeycomb” – forest conditions

- Different types of insulating properties
  - Snow type, distribution
  - Residue
  - Soil
Winter Processes Input Parameters

- Lower limits of conductivity for frozen soils:
  - Annual crop/fallow frozen soil (Kfactor[1])
  - Pasture frozen soil (Kfactor[2])
  - Forest frozen soil (Kfactor[3])

- Thermal conductivity adjustment factors:
  - Snow (Ksnowf)
  - Residue (Kresf)
  - Soil (Ksoilf)
Parameter Descriptions

- **Ksnowf** – The first is the factor by which to adjust the default snow thermal conductivity, range 0.1 to 10.0, default 1.

- **Kresf** – The second is the factor by which to adjust the default residue thermal conductivity, range from 0.1 to 10.0, default 1. The factor is multiplied by the baseline thermal conductivity value, which is 0.05 (W/m C) for residue.

- **Ksoilf** – The third factor is to adjust the default soil thermal conductivity, the range is from 0.1 to 10.0, default 1.

- **KFactor** – The next 3 values is control the lower limit of hydraulic conductivity in frozen soils, range >0 to 1.0. The first value is default 0.00001 for cropland and fallow frozen soils, the second value 0.00001 for pasture frozen files and the third 0.5 for forest frozen soils. Depending on the landuse WEPP will use the appropriate KFactor.
Other Winter Specific Parameters

- Freeze/Thaw layers in top soil layers (default 10)
- Freeze/Thaw layers in bottom soil layers (default 10)
- Apply water redistribution during freeze/thaw cycles. (default Yes)

These parameters should be left at their default settings. They can be changed if model run time is a concern.
WEPP Interface Input Window

Winter Processes

- Freeze/Thaw Layers in top soil layers: 10
- Freeze/Thaw Layers in bottom soil: 10
- Apply water redistribution during freeze/thaw cycles: checked
- Thermal conductivity adjustment factor for snow: 1
- Thermal conductivity adjustment factor for residue: 2
- Thermal conductivity adjustment factor for soil: 1
- Lower limit of conductivity for crop/fallow frozen soil: 0.000010
- Lower limit of conductivity for pasture frozen soil: 0.000010
- Lower limit of conductivity for forest frozen soil: 0.500000

OK | Cancel | Reset to Defaults | Help
Effect on WEPP Simulations

Primarily in runoff events on partially frozen soils.

<table>
<thead>
<tr>
<th>Kresf</th>
<th>Runoff (mm/yr)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>105</td>
<td>Default</td>
</tr>
<tr>
<td>0.5</td>
<td>90.5</td>
<td>Lower thermal conductivity=more insulating effect</td>
</tr>
<tr>
<td>0.3</td>
<td>85.4</td>
<td>Still lower thermal conductivity=more insulating effect</td>
</tr>
<tr>
<td>7</td>
<td>125.3</td>
<td>Higher thermal conductivity=less insulating effect=more likely to freeze</td>
</tr>
</tbody>
</table>

20 year run; Des Moines Iowa; corn,soybean–notill
Effect on WEPP Simulations

Type of frost, higher conductivity allows more water to drain when frozen.

<table>
<thead>
<tr>
<th>Kfactor[3] forest</th>
<th>Runoff (mm/yr)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>50.6</td>
<td>Default “honeycomb”</td>
</tr>
<tr>
<td>0.05</td>
<td>64.2</td>
<td></td>
</tr>
<tr>
<td>0.005</td>
<td>77.0</td>
<td></td>
</tr>
<tr>
<td>0.000010</td>
<td>79.7</td>
<td>“concrete”</td>
</tr>
</tbody>
</table>

20 year run; Des Moines Iowa; forest