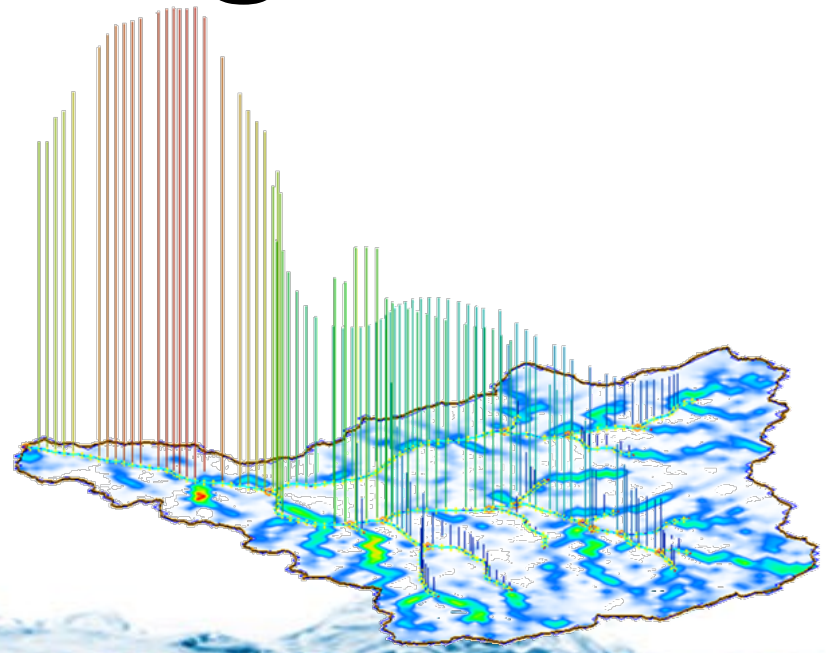
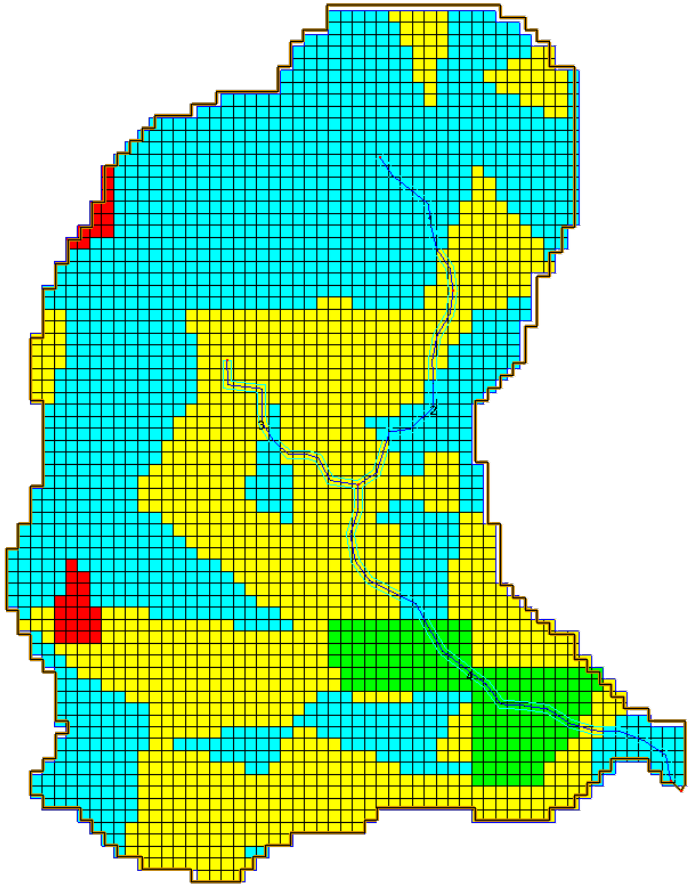
Sediment Transport Modeling



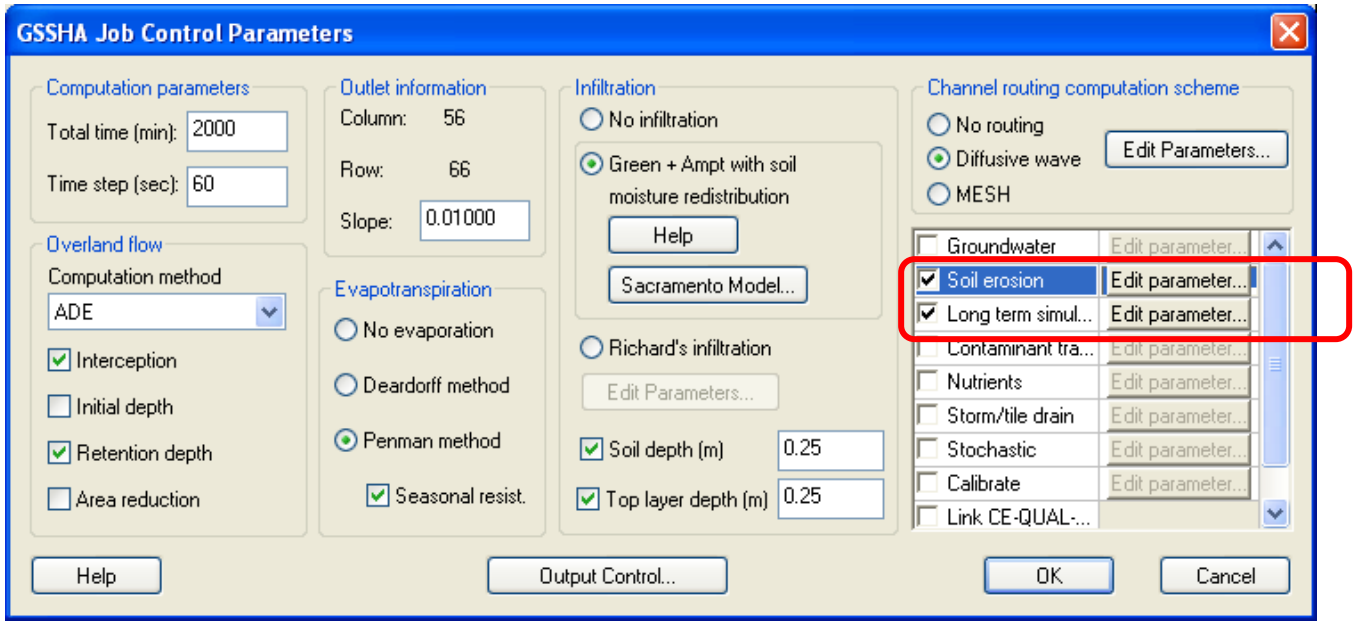
Base Model

- We will continue working with the Eight Mile Creek Watershed
- The base model that you will open has the following processes defined:
  - Long Term Simulation
  - Distributed Infiltration
  - Distributed overland flow roughness
- You will add Sediment Transport parameters and run the model
- You will also add stream erosion and re-run the model
- As an output, we will create an erosion–deposition map for the watershed



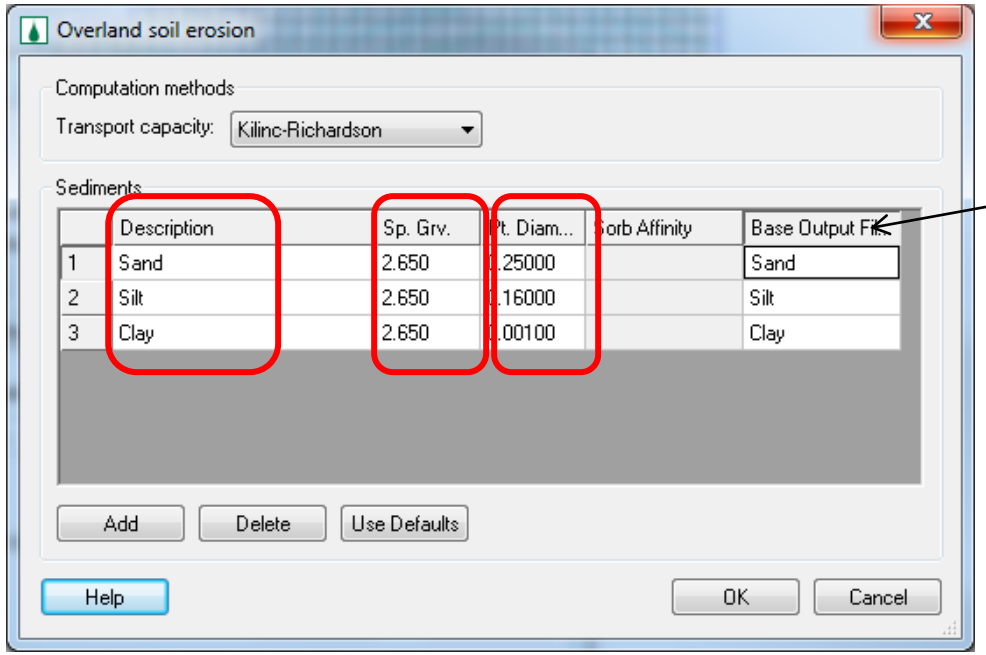
Soil Erosion

- To start soil erosion and sediment transport process, you need to turn it on from the job control
- Turn on Soil Erosion



Adding Sediments

- Typically three sediment sizes are used to describe the soils
  - Sand
  - Silt
  - Clay



specifies the location of the output files that will be generated for each sediment class.

Soil Erosion Parameters

GSSHA Map Table Editor

Roughness | Interception | Retention | Evapotranspiration | Infiltration | Initial Moisture | Soil Erosion | Contaminants | Nutrients | Continuous Maps | Groundwater

Using index map: Combined

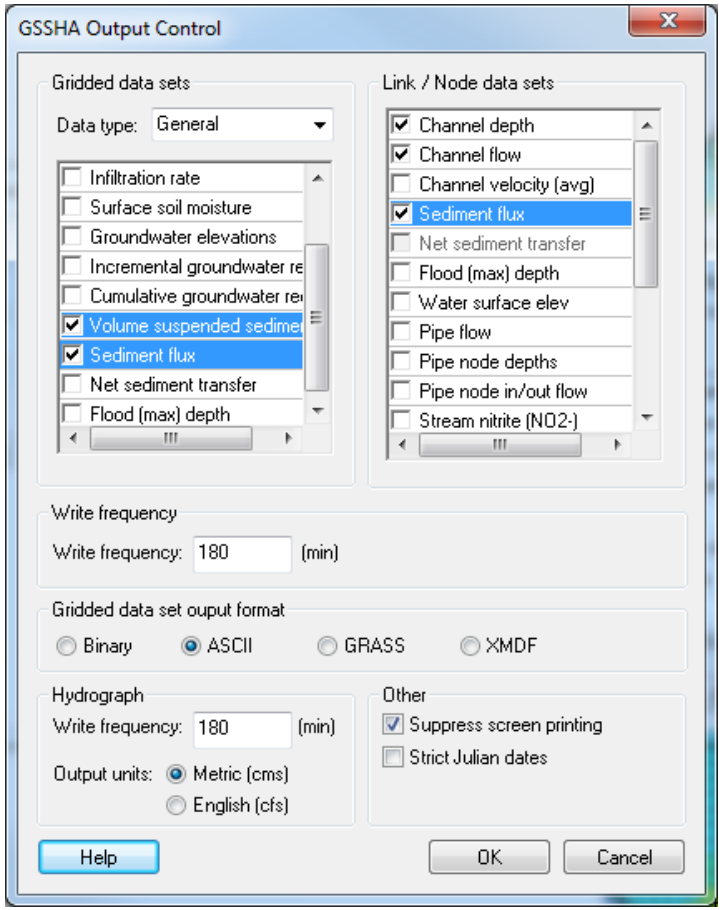
Generate IDs | Add ID | Delete ID

Soil Erosion									
ID	1	2	3	4	5	6	7	8	9
Description1	Silt loam	Loam	Loam	Silt loam	Loamy sand	Silt loam	Sandy loam	Loam	Sandy loam
Description2									
Transport coefficient	0.285000	0.285000	0.285000	0.285000	0.285000	0.285000	0.285000	0.285000	0.285000
Transport index	1.300000	1.300000	1.300000	1.300000	1.300000	1.300000	1.300000	1.300000	1.300000
Crit. transport capacity	0.000200	0.000200	0.000200	0.000200	0.000200	0.000200	0.000200	0.000200	0.000200
Rain splash coeff	1200.000000	1200.000000	1200.000000	1200.000000	1200.000000	1200.000000	1200.000000	1200.000000	1200.000000
Runoff detachment coeff	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100	0.000100
Runoff detachment index	0.400000	0.400000	0.400000	0.400000	0.400000	0.400000	0.400000	0.400000	0.400000
Runoff detachment crit. shear	0.005000	0.005000	0.005000	0.005000	0.005000	0.005000	0.005000	0.005000	0.005000
Erodibility coeff	0.650000	0.650000	0.650000	0.650000	0.650000	0.650000	0.650000	0.650000	0.650000

Help | Import Table... | Export Table... | Job Control | Done

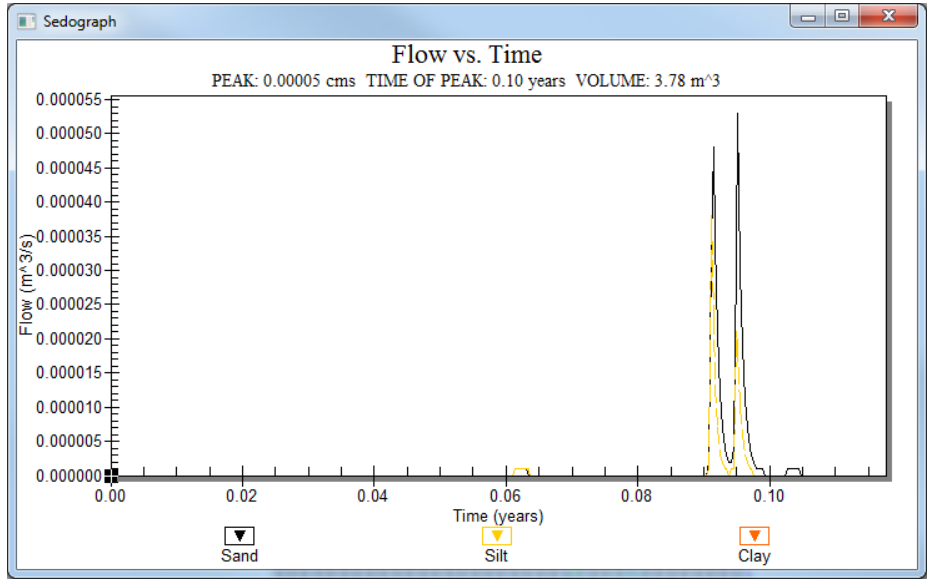
Output parameters

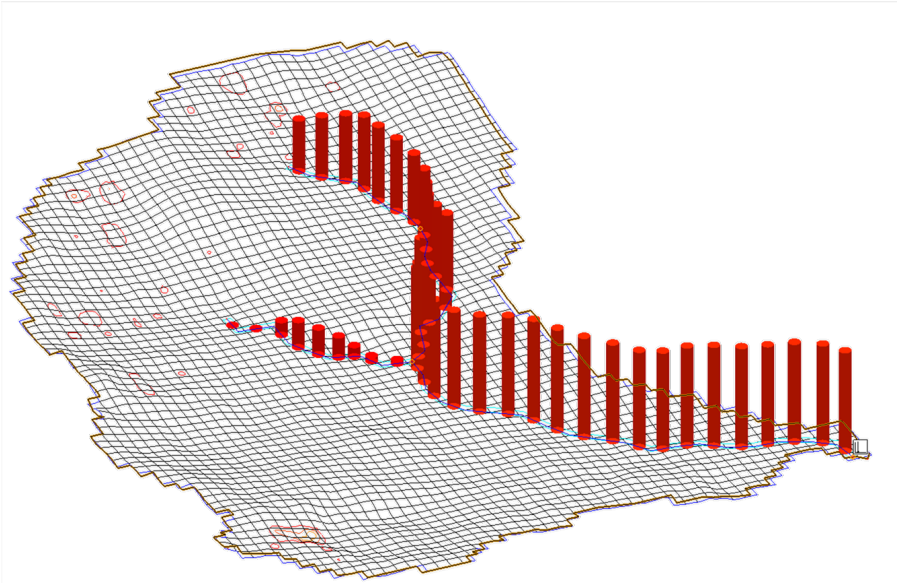
- There are different output options available for sediment transport
- Select the ones that you are more interested in
- Select the net sediment transfer to see areas of erosion and deposition
- Loading all output parameters creates several datasets making the solution results big and WMS will take time to load the solution



Result Visualization

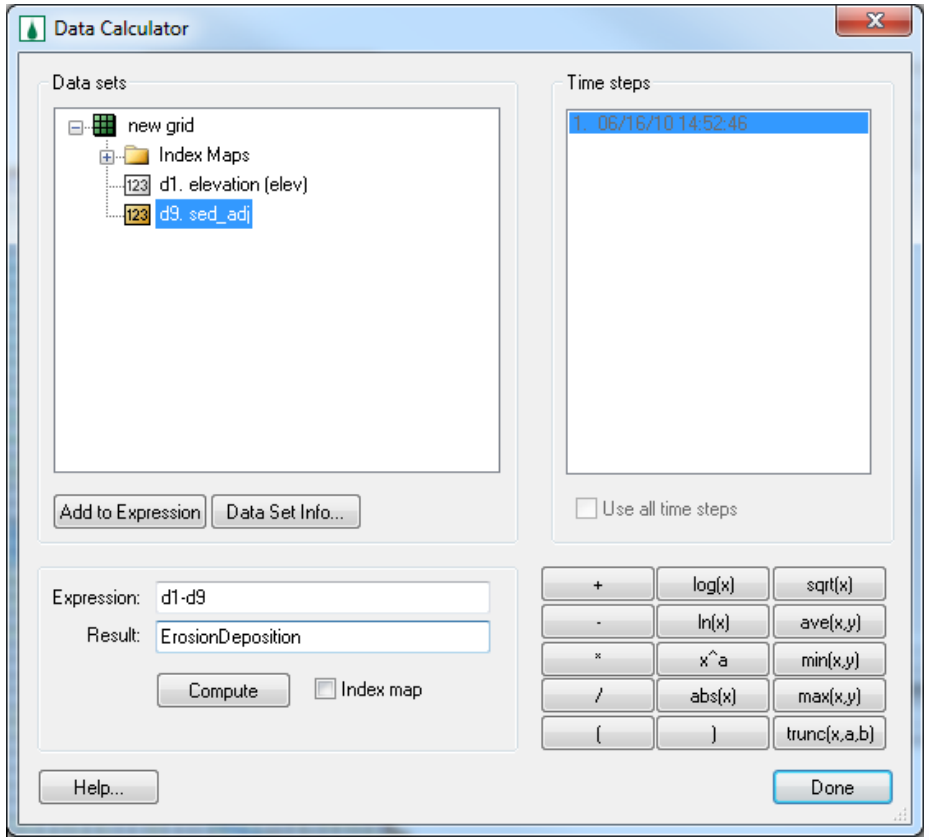
- Outlet Sedimentgraph
- Stream Sediment Flux
- Animations / Google Earth





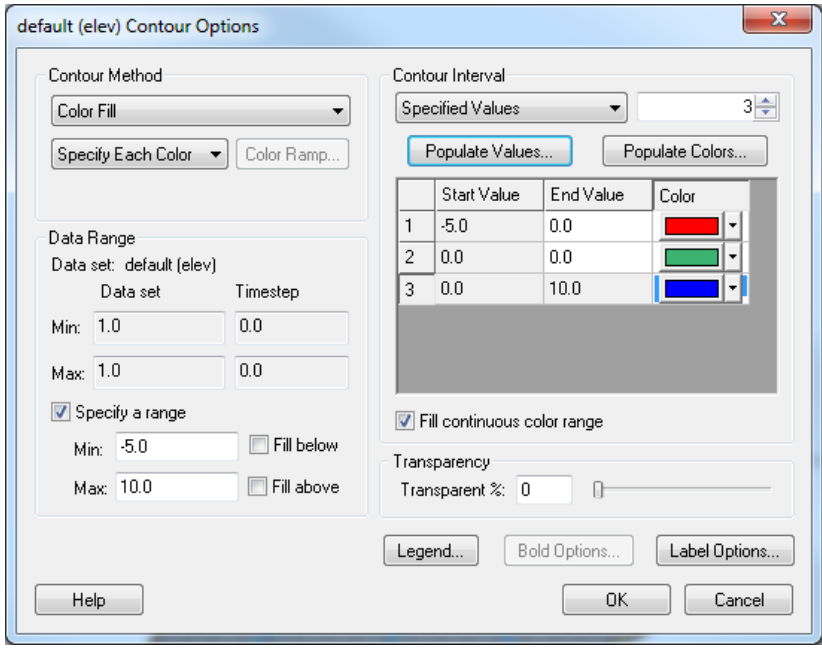
Erosion Deposition Map

- GSSHA produces adjusted grid elevation data set based on erosion or deposition that occurred during the Erosion and transport process
- You can then subtract this adj_elev map from original elev map and get an erosion/deposition map
- You can also get this information by selecting the "net sediment transfer" output in the output control.
- The erosion/deposition map is created as a new dataset in the 2D grid data
- If the difference is negative, there is deposition, if it is zero there not change and if it is positive, it the erosion.
- You can also look at the net sediment erosion maps



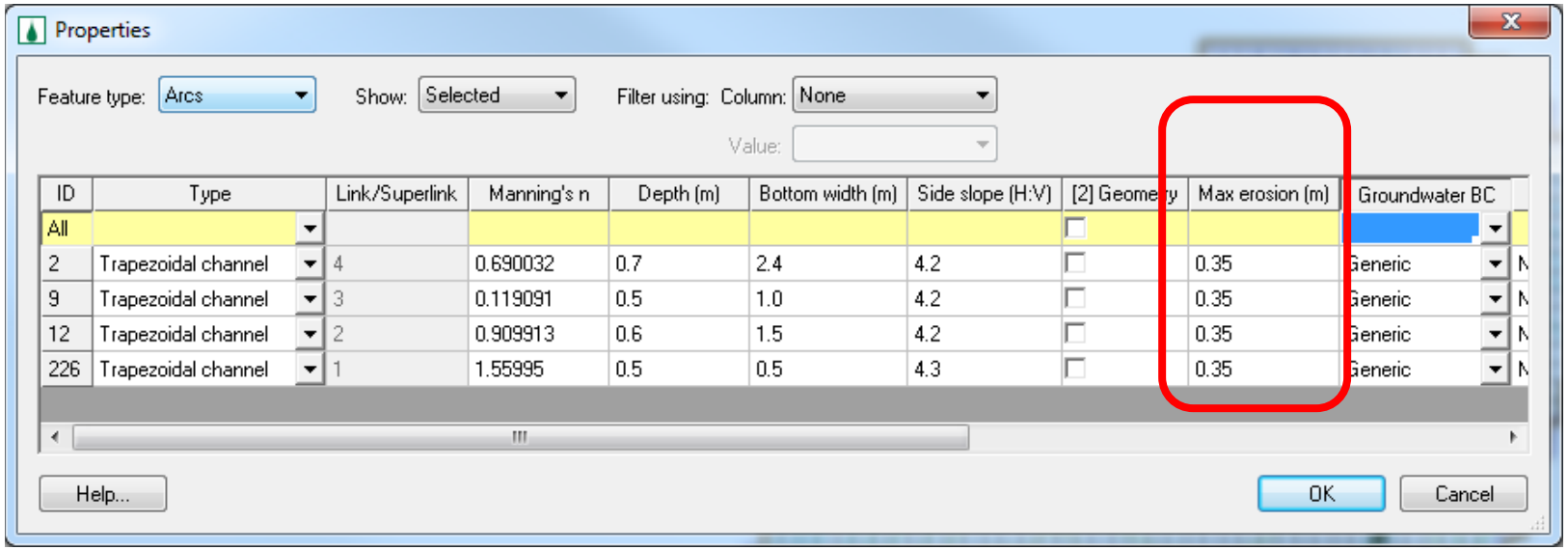
Changing contour options

- You can modify the contour display option for the erosion/ deposition map
- Right click the new dataset and go to contour options
- Select *Color Fill*
- Select *Specify Each Color*
- Select *Specify a range* and check off *Fill below* and *fill above* options
- Under contour interval, change the drop down to *Specified values*
- Change number of contours to 3
- Edit the values in the list so that you have three range min to zero, zero and zero to max
- Change the color as red for negative, green for zero and blue for positive.
- Click OK



Simulating Channel Erodibility

- GSSHA can simulate both overland and Stream erosion
- You can define erodible depth for the channels
- Select all the streams and edit properties
- Enter *Max erosion* to define the erodibility of the streams



ID	Type	Link/Superlink	Manning's n	Depth (m)	Bottom width (m)	Side slope (H:V)	[2] Geometry	Max erosion (m)	Groundwater BC
All									
2	Trapezoidal channel	4	0.690032	0.7	2.4	4.2		0.35	Generic
9	Trapezoidal channel	3	0.119091	0.5	1.0	4.2		0.35	Generic
12	Trapezoidal channel	2	0.909913	0.6	1.5	4.2		0.35	Generic
226	Trapezoidal channel	1	1.55995	0.5	0.5	4.3		0.35	Generic

Workshop