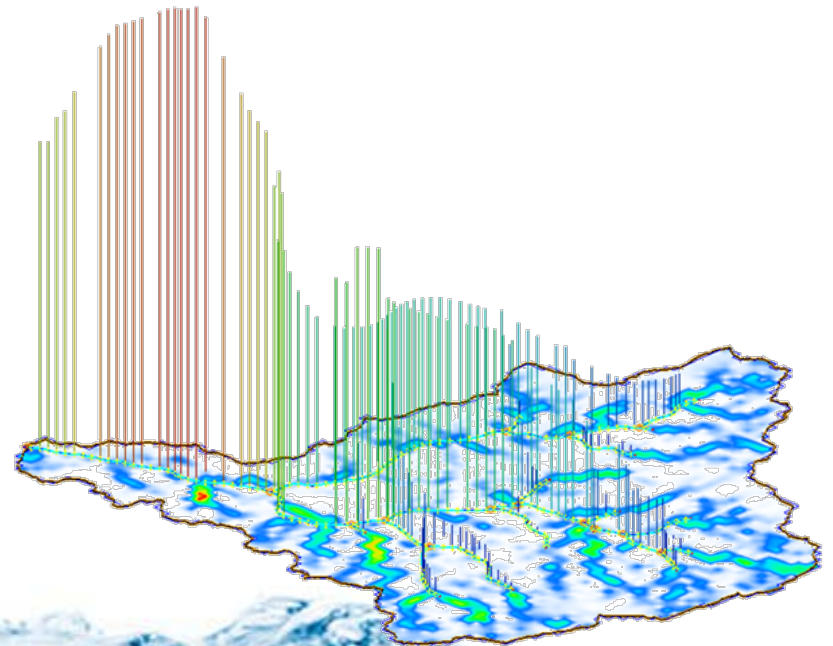




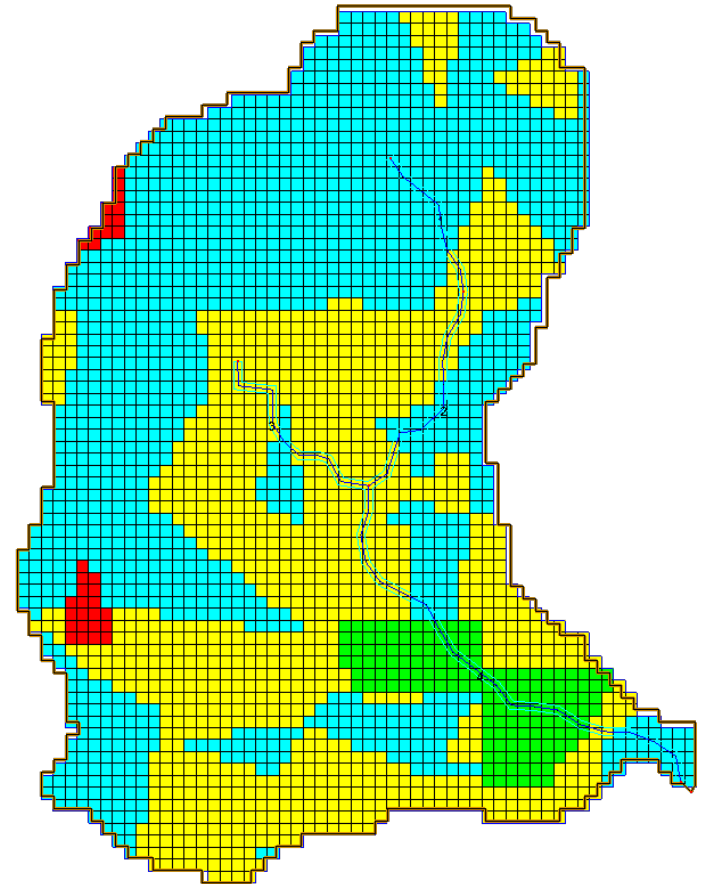
Sediment Transport Modeling





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

GSSHA Job Control Parameters

Computation parameters
Total time (min): 2000
Time step (sec): 60

Outlet information
Column: 56
Row: 66
Slope: 0.01000

Infiltration
☐ No infiltration
☒ Green + Ampt with soil moisture redistribution
Help
Sacramento Model...

Channel routing computation scheme
☐ No routing
☒ Diffusive wave Edit Parameters...
☐ MESH

Overland flow
Computation method: ADE
☒ Interception
☐ Initial depth
☒ Retention depth
☐ Area reduction

Evapotranspiration
☐ No evaporation
☐ Deardorff method
☒ Penman method
☒ Seasonal resist.

Groundwater
☐ Groundwater Edit parameter...
☒ Soil erosion Edit parameter...
☒ Long term simul... Edit parameter...
☐ Contaminant tra... Edit parameter...
☐ Nutrients Edit parameter...
☐ Storm/tile drain Edit parameter...
☐ Stochastic Edit parameter...
☐ Calibrate Edit parameter...
☐ Link CE-QUAL...

Soil depth (m): 0.25
Top layer depth (m): 0.25

Help Output Control... OK Cancel



Adding Sediments

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

Overland soil erosion

Computation methods
Transport capacity: Kilinc-Richardson

Sediments

	Description	Sp. Grv.	Pt. Diam...	Sorb Affinity	Base Output File
1	Sand	2.650	0.25000		Sand
2	Silt	2.650	0.16000		Silt
3	Clay	2.650	0.00100		Clay

Add Delete Use Defaults

Help OK Cancel

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



Soil Erosion Parameters

GSSHA Map Table Editor

X

RoughnessInterceptionRetentionEvapotranspirationInfiltrationInitial MoistureSoil ErosionContaminantsNutrientsContinuous MapsGroundwater

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

GSSHA Output Control

Gridded data sets

Data type: General

☐ Infiltration rate

☐ Surface soil moisture

☐ Groundwater elevations

☐ Incremental groundwater re

☐ Cumulative groundwater re

☒ Volume suspended sediment

☒ Sediment flux

☐ Net sediment transfer

☐ Flood (max) depth

Link / Node data sets

☒ Channel depth

☒ Channel flow

☐ Channel velocity (avg)

☒ Sediment flux

☐ Net sediment transfer

☐ Flood (max) depth

☐ Water surface elev

☐ Pipe flow

☐ Pipe node depths

☐ Pipe node in/out flow

☐ Stream nitrite (NO₂-)

Write frequency

Write frequency: 180 (min)

Gridded data set output format

☐ Binary ☒ ASCII ☐ GRASS ☐ XMDF

Hydrograph

Write frequency: 180 (min)

Output units: ☒ Metric (cms) ☐ English (cfs)

Other

☒ Suppress screen printing

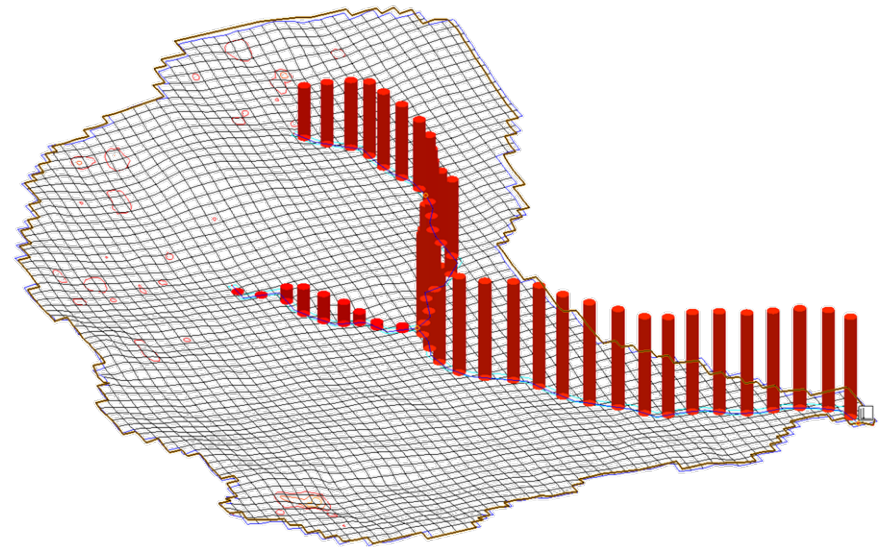
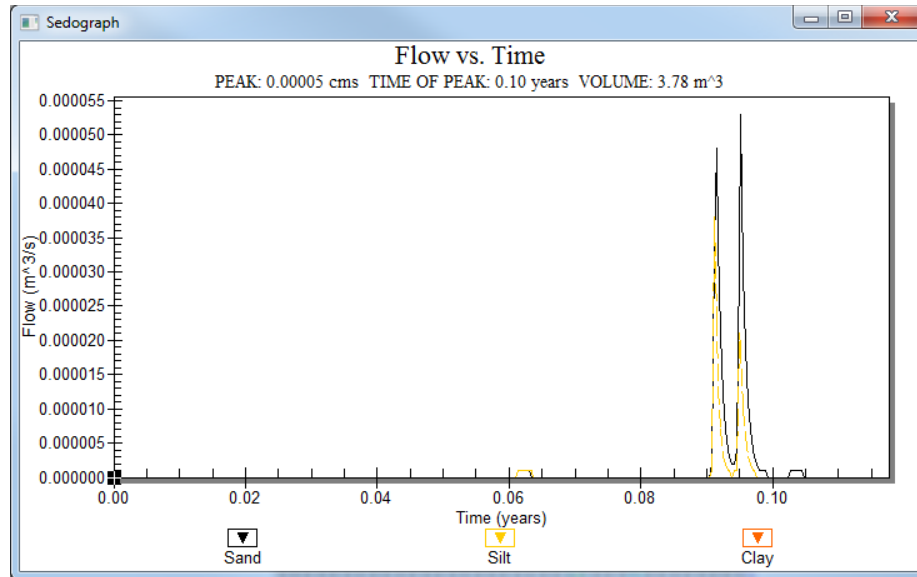
☐ Strict Julian dates

Help OK Cancel



Result Visualization

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

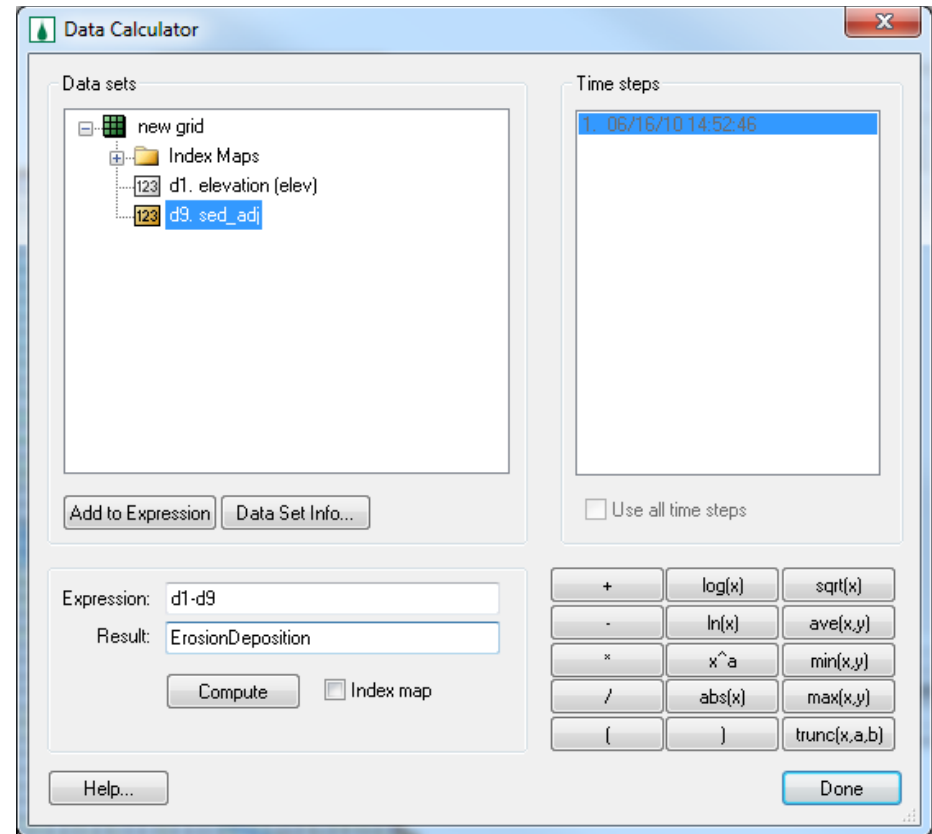




Erosion Deposition Map

Watershed Management and Modeling

- 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
- 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

default (elev) Contour Options

Contour Method
Color Fill

Specify Each Color Color Ramp...

Data Range
Data set: default (elev)
Data set Timestep
Min: 1.0 0.0
Max: 1.0 0.0
☒ Specify a range
Min: -5.0 ☐ Fill below
Max: 10.0 ☐ Fill above

Contour Interval
Specified Values 3
Populate Values... Populate Colors...

	Start Value	End Value	Color
1	-5.0	0.0	Red
2	0.0	0.0	Green
3	0.0	10.0	Blue

☒ Fill continuous color range

Transparency
Transparent %: 0

Legend... Bold Options... Label Options...

Help OK Cancel



Simulating Channel Erodibility

Watershed Management and
Modeling

- 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

Properties

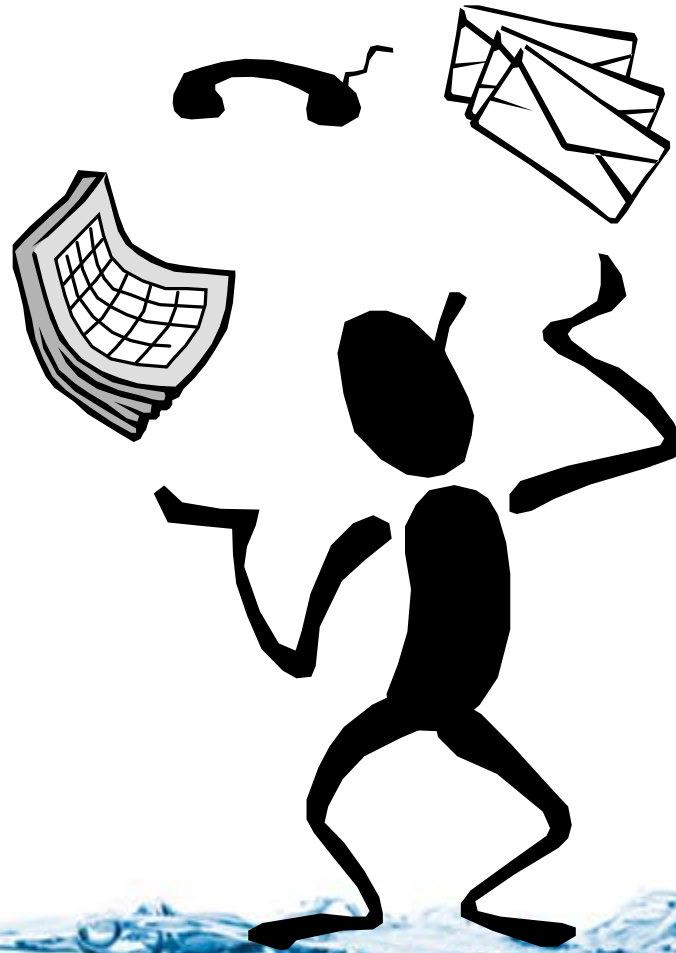
Feature type: Arcs Show: Selected Filter using: Column: None Value:

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

Help... OK Cancel



Demonstration





Workshop

