

Setting up the GSSHA Green & Ampt Infiltration Model



Green and Ampt Parameters

- Derived from soil texture index map or combination soil texture land use index map
- Assigned with mapping table
- Initial values can be taken as average values from Rawls et al. 1983
- Calibrated values are constrained within limits from Rawls et al. 1983

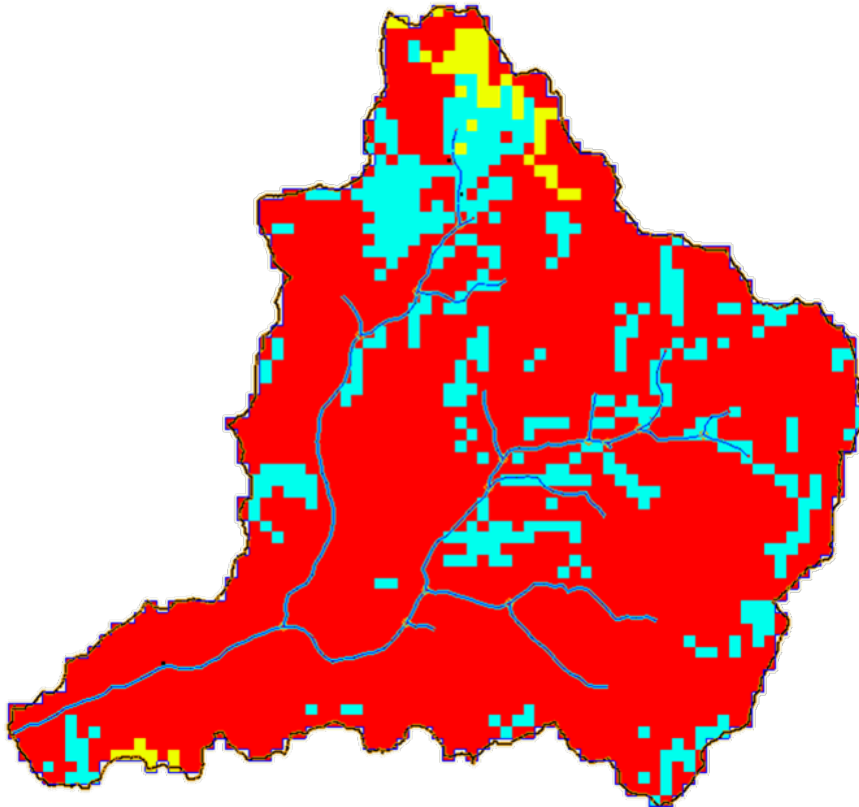


GSSHA Infiltration Setup

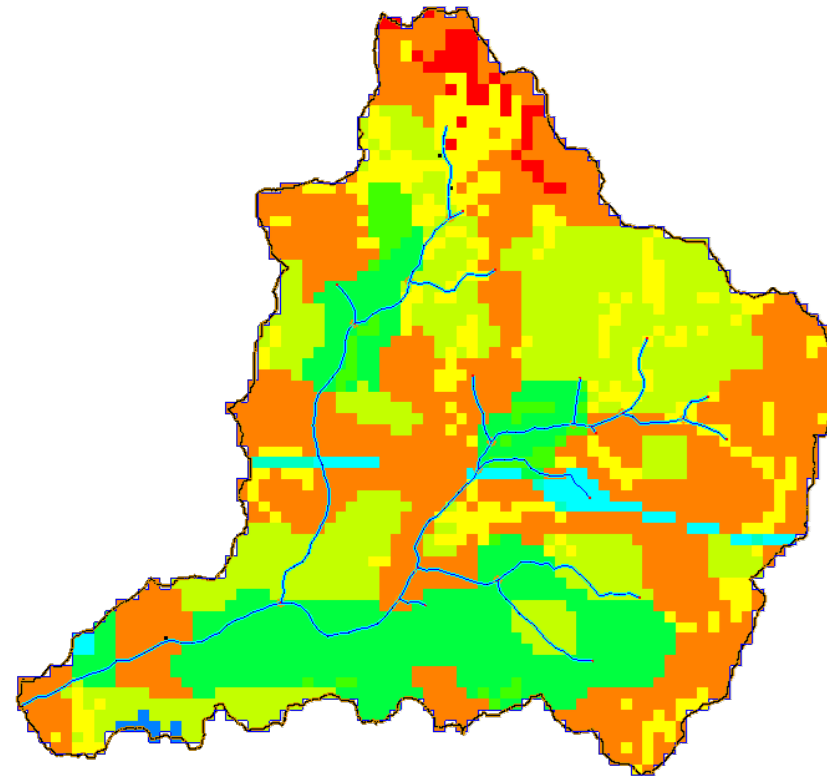
- Generate Index Maps
 - Soil or
 - Soil and Land Use Combination
- Define mapping table properties
- Establish initial conditions
- Turn on Green & Ampt simulation
- Save and run
- Visualize the results



Generate Index Maps



Soils



Land Use



Define Mapping Table Properties

GSSHA Map Table Editor

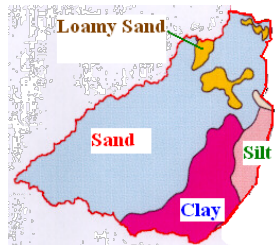
Roughness | Interception | Retention | Evapotranspiration | **Infiltration** | Initial Moisture | Soil Erosion | Contaminants | Nutrients | Continuous Maps

Using index map: NewCombined

Infiltration	1	2	3	4	5	6	7	8	9	10	11
ID	1	2	3	4	5	6	7	8	9	10	11
Description1	coarse sand...	sand ...	fine sand ...	very fine sa...	loamy coars...	loamy sand ...	loamy fine s...	loamy very fi...	sandy loams...	coarse sand...	sandy loam ...
Description2	Cropland an...	Cropland an...	Cropland an...	Residential ...	Residential ...	Deciduous ...	Deciduous ...	Transportati...	Transportati...	Mixed Urba...	...
Hydraulic conductivity (cm/hr)	23.560000	23.560000	23.560000	2.000000	2.000000	23.560000	5.980000	0.500000	0.500000	0.500000	2.180000
Capillary head (cm)	4.950000	4.950000	4.950000	4.950000	6.130000	6.130000	6.130000	6.130000	11.010000	11.010000	11.010000
Porosity (m ³ /m ³)	0.437000	0.437000	0.437000	0.100000	0.100000	0.437000	0.437000	0.100000	0.100000	0.100000	0.453000
Pore distribution index (cm/cm)	0.694000	0.694000	0.694000	0.694000	0.553000	0.553000	0.553000	0.553000	0.378000	0.378000	0.378000
Residual saturation (m ³ /m ³)	0.020000	0.020000	0.020000	0.020000	0.035000	0.035000	0.035000	0.035000	0.041000	0.041000	0.041000
Field capacity (m ³ /m ³)	0.091000	0.091000	0.091000	0.091000	0.125000	0.125000	0.125000	0.125000	0.207000	0.207000	0.207000

Table of Green and Ampt Values (Rawls et al, 1983)

Water-Retention properties classified by soil texture									
USDA Textural Classification	Total Porosity cm3/cm3 (θ_s)	Residual water content cm3/cm3 (θ_r)	Effective Porosity cm3/cm3 (θ_e)	Bubbling Pressure Geometric mean,cm (ψ_b)	Pore size distribution Arithmetic Mean (λ)	Field Capacity (Water Retained at -33kPa) cm3/cm3	Wilting Point (Water Retained at - 1500 kPa) cm3/cm3	Hydraulic Conductivity, cmh ⁻¹ (K_s)	ψ_r (cm)
Sand	0.437	0.02	0.417	7.26	0.694	0.091	0.033	4.95	4.95
	(0.374 - 0.500)	(0.001 - 0.039)	(0.354 - 0.480)	(136 - 38.74)	(0.298 - 1.090)	(0.018 - 0.164)	(0.007 - 0.059)		
Loamy sand	0.437	0.035	0.401	8.69	0.553	0.125	0.055	6.13	6.13
	(0.368 - 0.506)	(0.003 - 0.067)	(0.329 - 0.473)	(1.80 - 41.85)	(0.234 - 0.872)	(0.060 - 0.190)	(0.019 - 0.091)		
Sandy loam	0.453	0.041	0.412	14.66	0.378	0.207	0.095	11.01	11.01
	(0.351 - 0.555)	- 0.024 - 0.106	(0.283 - 0.541)	(3.45 - 62.24)	(0.140 - 0.616)	(0.126 - 0.288)	(0.031 - 0.159)		
Loam	0.463	0.027	0.434	11.15	0.252	0.27	0.117	8.89	8.89
	(0.375 - 0.551)	- 0.020 - 0.074	(0.334 - 0.534)	(1.63 - 76.40)	(0.086 - 0.418)	(0.195 - 0.345)	(0.069 - 0.165)		
Silt loam	0.501	0.015	0.486	20.76	0.234	0.33	0.133	16.68	16.68
	(0.420 - 0.582)	- 0.028 - 0.056	(0.394-0.578)	(3.58 - 120.4)	(0.105 - 0.363)	(0.258 - 0.402)	(0.078 - 0.188)		
Sandy clay loam	0.398	0.068	0.33	28.08	0.319	0.255	0.148	21.85	21.85
	(0.332 - 0.464)	- 0.001 - 0.137	(0.235 - 0.425)	(5.57 - 141.5)	(0.079 - 0.559)	(0.186 - 0.324)	(0.085 - 0.211)		
Clay loam	0.464	0.075	0.39	25.89	0.242	0.318	0.197	20.88	20.88
	(0.409 - 0.519)	- 0.024 - 0.174	(0.279 - 0.501)	(5.80 - 115.7)	(0.070 - 0.414)	(0.250 - 0.386)	(0.115 - 0.279)		
Silty clay loam	0.471	0.04	0.432	32.56	0.177	0.366	0.208	27.30	27.30
	(0.418 - 0.524)	- 0.038 - 0.116	(0.347 - 0.517)	(6.68-158.7)	(0.039 - 0.315)	(0.304 - 0.428)	(0.138 - 0.278)		
Sandy clay	0.43	0.109	0.321	29.17	0.223	0.339	0.239	23.90	23.90
	(0.370 - 0.490)	(0.013 - 0.205)	(0.207 - 0.435)	(4.96 - 171.6)	(0.048 - 0.398)	(0.245 - 0.433)	(0.162 - 0.316)		
Silty clay	0.479	0.056	0.423	34.19	0.15	0.387	0.25	29.22	29.22
	(0.425 - 0.533)	- 0.024 - 0.136	(0.334 - 0.512)	(7.04 - 166.2)	(0.040 - 0.260)	(0.332 - 0.442)	(0.193 - 0.307)		
Clay	0.475	0.09	0.385	37.3	0.165	0.396	0.272	31.63	31.63
	(0.427 - 0.523)	- 0.015 - 0.195	(0.269 - 0.501)	(7.43 - 187.2)	(0.037 - 0.293)	(0.326 - 0.466)	(0.208 - 0.336)		
	First Line is the mean value, second line is \pm one standard deviation about the mean								



Establish Initial Conditions

GSSHA Map Table Editor

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

Using index map: Soil

Generate IDs Add ID Delete ID

Initial Moisture			
ID	1	2	3
Description1	Soil moisture...	Soil moisture...	Soil moisture...
Description2	
Initial moisture	0.150000	0.150000	0.150000

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

Turn on Green & Ampt Simulation

GSSHA Job Control Parameters

Computation parameters

Total time (min): 2000

Time step (sec): 10

Overland flow

Computation method: Explicit

☐ Interception

☐ Initial depth

☐ Retention depth

☐ Area reduction depth

Initialize GSSHA

Outlet information

Column: 1

Row: 64

Slope: 0.00100

Evapotranspiration

☒ No evaporation

☐ Deardorff method

☐ Penman method

☐ Seasonal resist.

Infiltration

☐ No infiltration

☐ Green + Ampt

☒ Green + Ampt with soil moisture redistribution

Sacramento Model...

Richard's infiltration

Edit Parameters...

Channel routing computation scheme

☐ No routing

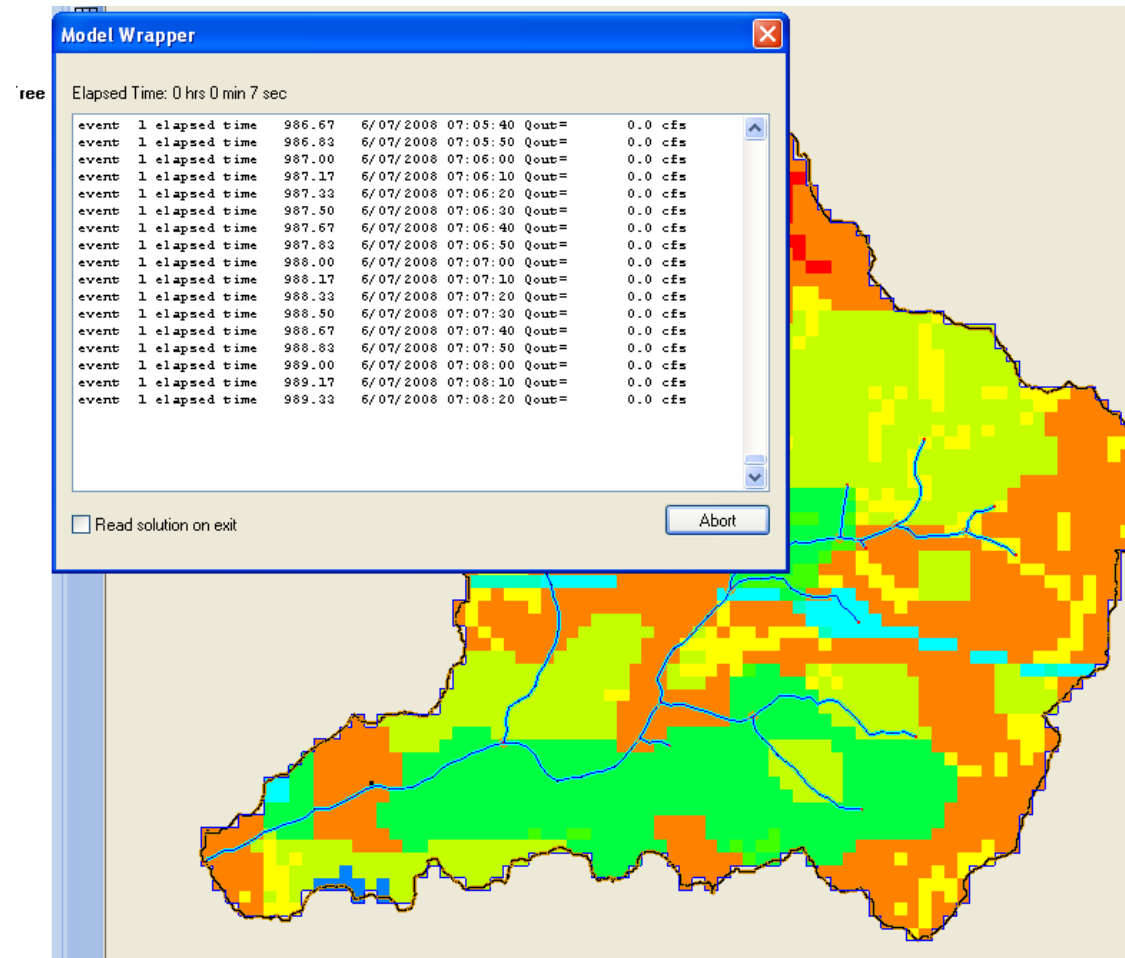
☒ Diffusive wave

☐ MESH

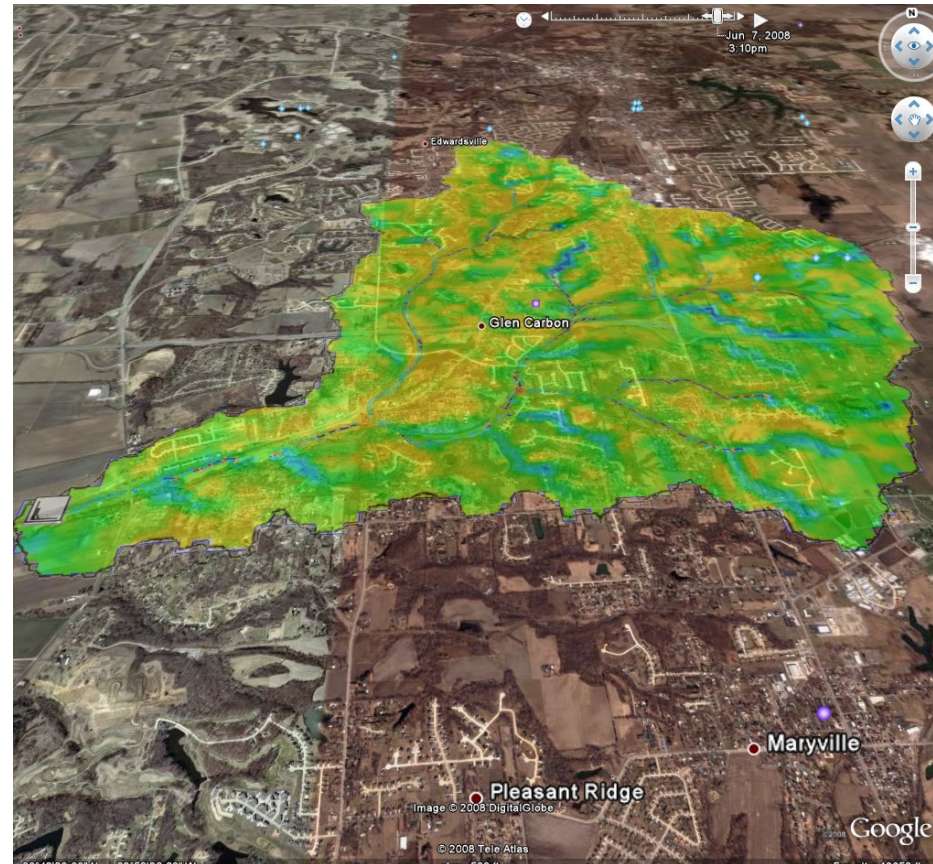
Edit Parameters...

<input type="checkbox"/> Groundwater	Edit parameter...
<input type="checkbox"/> Soil erosion	Edit parameter...
<input type="checkbox"/> Long term simulation	Edit parameter...
<input type="checkbox"/> Contaminant transport	Edit parameter...
<input type="checkbox"/> Nutrients	Edit parameter...
<input type="checkbox"/> Storm/tile drain	Edit parameter...
<input type="checkbox"/> Stochastic	Edit parameter...
<input type="checkbox"/> Link CE-QUAL-W2 ...	Edit parameter...
<input type="checkbox"/> Manage files	Edit parameter...

Help **Output Control...** **OK** **Cancel**



Visualize the Infiltration Results



Workshop

