Tahoe Basin Sediment Model

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Worksheet Developed for the Lake Tahoe Basin Sediment Model Workshop

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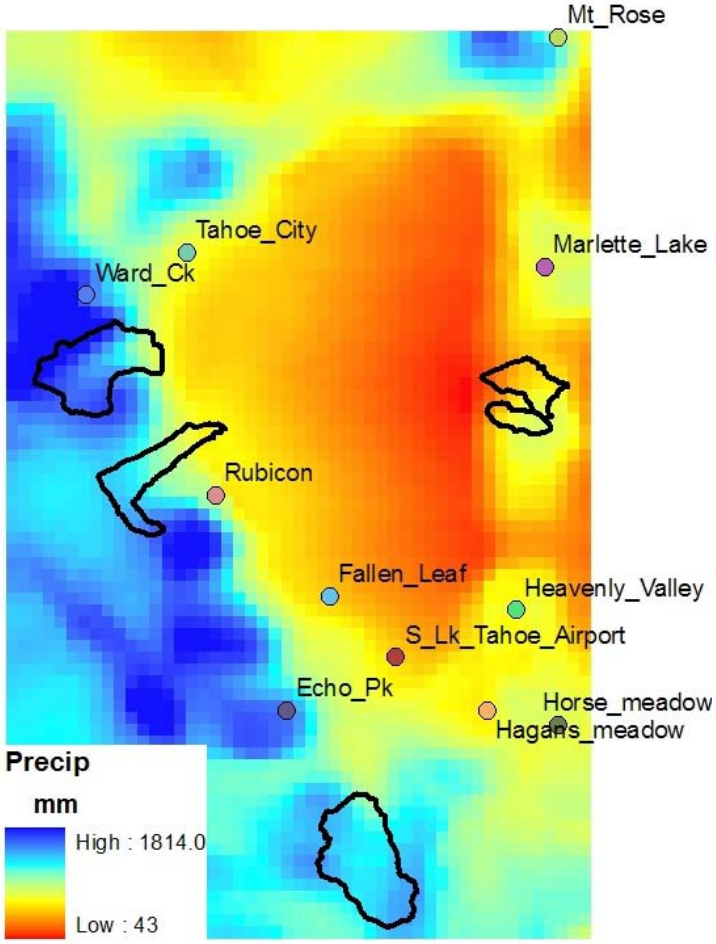

Distribution of Precipitation and location of Snotel and weather station in Tahoe Basin
(Courtesy E. Brooks, Univ. of Idaho, Moscow)

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Online Interface Workshop

I. Find the Web Site: http://forest.moscowfsl.wsu.edu/fswepp/ .

1. Select ○ U.S. Customary units and enter your "personality" code.
2. Select the Tahoe Basin sediment model .
3. Ponder the interface.

II. Select the Desired Climate

1. Click Custom Climate .
2. Scroll to the bottom of the Region, select Tahoe Basin and Click SHOW ME THE CLIMATES .
3. Select RUBICON #2 CA SNOTEL and click MODIFY CLIMATE .
4. Note the Rubicon Climate, and in the upper right corner click the PRISM box.
5. Select the PRISM grid cell 2.5 miles north and click Use PRISM Values .
6. Click "□ Adjust Temperature for Elevation by Lapse Rate".
7. Name the Climate "N of Rubicon CA" and click Use these values .
8. Click Return to input screen .
9. Select N of Rubicon CA from Climate List.
10. Specify years to simulate as 10 (workshop only) and click Run WEPP .
11. At the bottom of the output screen, click Return to Input Screen .

III. Tahoe Interface for Roads

Basic Approach: Model likely current condition and compare to benefits from reducing traffic, outsloping the road, or paving.

A. Most Common surfaces, high traffic and rutted, insloped, or flat.

1. In Soil Texture Box, select granitic .
2. For the upper element, select High traffic road and for the lower element Thin or young forest .
3. Specify the topography:

4% 4%	200 ft
20% 15%	50 ft

4. Click Run WEPP and fill in the first line in Table 1 on the next page.

B. Low Traffic: Change to Low Traffic Road and Run WEPP

C. Outsloped Road: Select High Traffic Road, change upper length to 30 ft, and Run WEPP (total area remains unchanged).

D. Paved Road: Select Rock/Pavement in soil box, Change upper length to 200 ft, High Traffic Road in Treatment and Run WEPP .

E. Add Waterbar: Select [High Traffic Road], [granitic] Soil, Upper length is [100 ft], (Assume area remains unchanged).

Table 1. Results of Road Erosion Runs

Climate Station:_____ Annual Precip:_____ in.

Road Length:_____ ft Road Width: 14 ft Area:_____ Acres

Buffer Length:_____ ft Buffer Width: 14 ft Area:_____ Acres

(43,560 Square feet = 1 Acre)

Road + Buffer Area:_____Acres

	Runoff (inches)			Road Erosion Rate	Road + Buffer Delivery Rate	Delivery from buffer
Road Surface	Rain	Snow	Total	(tons/acre)	(Tons/acre)	Tons

IV. Tahoe Interface for Fuel Management

Basic Approach: Estimate "background" sediment from undisturbed forest and wildfire; compare background to erosion associated with thinning and prescribed fire.

A. Undisturbed Forest Erosion:

1. Select climate [N of Rubicon] and soil [granitic] .
2. Specify upper and lower treatments to be [Mature Forest] .
3. Specify Slope to be:

20% 30%	300 ft
30% 10%	100 ft

4. [Run WEPP] and enter sediment delivery into Table 2 (Columns *(1)* and *(5)*).

B. Wildfire before treatment:

1. Change upper treatment to [High severity fire] [30] percent cover and lower treatment to [Low severity fire] [50] percent cover.
2. [Run WEPP] and enter sediment delivery into Table 2 (column *(1)*).

C. Calculate "background" sediment budget:

1. Divide the erosion in column *(1)* by the return interval in column *(2)* and enter the results in column *(3)*.
2. Sum up the two average annual values in column *(3)* to get the background sediment delivery rate.

D. Estimate the sediment generated by thinning and prescribed fire:
   1. For thinning, Upper treatment: select [Thin or young forest] and set the cover to [85] percent and the Lower treatment to [Mature forest] leaving the default cover at [100] percent.
   2. [Run WEPP] and enter the sediment delivery in Table 2, column 5.
   3. For prescribed fire, Upper treatment: select [Low severity fire] and leave the default cover at [85] percent and the Lower treatment as [Mature forest] with [100] percent cover.
   4. [Run WEPP] and enter the sediment delivery in Table 2, column *(5)*.

E. Estimate the sediment generated by wildfire following fuel treatment:
   1. Set the upper treatment to [High severity fire] , [40] percent cover and the Lower treatment to [Low severity fire] , [70] percent cover.
   2. [Run WEPP] and enter the sediment delivery in Table 2, column *(5)*.

F. Calculate the "Treated" sediment budget:
   1. Divide the erosion in column *(5)* by the return interval in column *(6)* and enter the results in column *(7)*.
   2. Sum up the four average annual values in column *(7)* to get the average annual treated sediment delivery rate.
   3. Discuss the background versus the treated sediment delivery. The extra sediment from roads, if any, may also need to be considered (low traffic roads become high?)

Table 2. Summary of Erosion Analysis for Fuel Management

Column:	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
No Treatment	Sed Delivery (t/a)	Return Interval (years)	Annual Average (t/a/yr)	Treated	Sed Delivery (t/a)	Return Interval (years)	Annual Average (t/a/yr)
Forest		1		Forest		1	
				Thinning		20	
				Rx Fire		20	
Wildfire		40		Wildfire		50	
Background sediment delivery rate:				Treated sediment delivery rate:			

V. Tahoe Interface for Mitigating Bare Areas (Ski Slopes, road cuts, etc.)

Basic Approach: Estimate "untreated" sediment from site with no or low cover. Compare untreated to treatment scenarios (mulching, incorporate residue (tillage), and shortening slope with a water bar). For ski slopes, generally use "sod grass" rather than "bare."

A. Current condition:
   1. Select climate [N of Rubicon] and soil [volcanic] .
   2. Specify upper and lower treatments to be [Bare] , [20] percent rock.
   3. Specify Slope to be

30% 30%	50 ft
30% 20%	50 ft

4. Run WEPP and enter average runoff, erosion and sediment delivery, and 10-year return period sediment delivery into table 3.

B. Mulching treatment:
   1. Change upper and lower treatments to Mulching 85 percent cover.
   2. Run WEPP and enter average runoff, erosion and sediment delivery, and 10-year return period sediment delivery into table 3.

C. Mulch and tillage treatment:
   1. Change upper and lower treatments to Mulch and till 85 percent cover.
   2. Run WEPP and enter average runoff, erosion and sediment delivery, and 10-year return period sediment delivery into table 3.

D. Waterbar only, no mulch:
   1. Change upper treatment to Bare 20 percent rock, and lower treatment to Mature Forest 100 percent cover.
   2. Run WEPP and enter average runoff, erosion and sediment delivery, and 10-year return period sediment delivery into table 3.

E. Discuss results: costs, life of treatment, feasibility of treatment, local considerations…

Table 3. Erosion associated with mitigation bare areas

Treatment	Runoff (in.)	Erosion Rate (t/a)	Sed Delivery (t/a)	10-yr Sediment Deliver	Cost ($) and/or Life of Tmt
Bare					
Surface Mulched					
Incorporate Mulch					
Water Bar					

VI. Estimating the amount of fine sediment delivered from a hillslope

Basic Approach: At the end of the run, look at the end of the annual detailed output file to calculate the amount of clay (or clay plus part of the silt) in the runoff. Clay size particles and aggregates are assumed to be less than 4 microns in diameter. Silt is generally between 4 and 62.5 microns diameter. (1,000 microns = 1 mm)

1. Rerun the previous run of Bare + buffer.
2. Enter the delivered sediment into Table 4, line 9.
3. At the bottom of the output page, click annual detailed .
4. At the bottom of the annual detailed summary file, study the **`Sediment Characteristics and Enrichment`** table.

5. Enter the information requested from the **`Sediment Characteristics and Enrichment`** output into Table 4, columns *(1)* and *(2)*.

Table 4. Fraction of Delivered Sediment that is clay (less than 4 micron dia)

Column:	*(1)*	*(2)*	*(3)*
Class	Percent Clay	Fraction in Flow **Exiting**	Percent Clay in Class
1			
2	0.0		
3			
4			
5	0.0		
Total Clay in delivered sediment:			Percent
Sediment Delivered:			Tons/acre
Total Clay Delivered (Percent Clay x delivered sediment)			Tons/acre Lbs./acre

6. Multiply columns *(1)* and *(2)* to get the total percent of clay in each class.
7. Add up the clay percentage in the 5 classes and enter the total in Table 4.
8. Multiply the percent clay in the delivered sediment by the amount of sediment delivered and enter the value in the last box in both tons/acre and pounds per acre (1 ton has 2000 lbs).
9. The same can be done for the fraction of silt of interest, for example, if interested in silt between 4 microns and 10 microns, this is (10-4)/(62.5-4) or about a tenth of the delivered silt fraction. Additional data about the fraction of silt in this category may be available from previous studies. (Beyond the scope of this project.)