FSWEPP

Soil and Water Engineering Research
Rocky Mountain Research Station
Moscow, Idaho

http://forest.moscowfsl.wsu.edu/fswepp/

Forest Wildfire Erosion Analysis with ERMiT and Peak Flow Calculator

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The Erosion Risk Management Tool (ERMiT) was developed to aid in analysis of erosion risk after wildfire, and to evaluate effectiveness of common treatments.

The ERMiT interface is for single storm analysis. The Disturbed WEPP interface can be used to estimate average annual runoff and erosion rates.

As each step is completed, fill in the blanks to save the information for the summary.

1. From the **ERMiT** Interface select conditions for a typical hillslope in the burned area.

   a. **Select** Climate: **Climate Selected:_____**

   b. **Select** soil and Rock Content: **Soil Selected:_____**
   Rock Content:_____%

   c. Select vegetation type: _____

   d. **Select** hillslope steepness and length

   Hillslope Steepness:_____% Top, _____% Average and _____% Toe

   Hillslope Length:_____ft

   e. Specify ○ **Unburned**

   f. **Run** ERMiT, and wait approximately 1 minute.

2. On ERMiT output page, confirm inputs were correct in first box.
   Confirm mean annual precipitation is typical of climate
   Mean Annual Precipitation _____ in.
   There is a 20 percent chance that erosion will exceed _____ tons/acre

3. Specify **Soil Burn Severity Class (Low, Moderate or High)** _____
   Run ERMiT, and wait approximately 1 minute.

4. Note return period analysis of single storms. These events are **ranked by runoff**, and not by precipitation. The dates associated with each event determine whether they are rainfall events, snowmelt events, or rain-on-snow events. Determine the return period of interest (BAER or other guidelines may specify return period).

Return Period _____-year; Runoff amount ____ in.;

Storm amount _____ in.; Date of storm _____
You may wish to pick more than one return period for your final report.

5. On the graph of exceedance probability verses sediment yield, there are five curves, one curve for each year of the first five years following the wildfire. You may wish to report on all five curves.
    a. Look at where the top curve intersects the probability axis; what is the probability that there will be erosion in the first year?
    Probability of erosion in the year following the wildfire _____ %
    b. If the probability of erosion the year following wildfire is greater than 50%, then the amount of erosion associated with the 50% probability is the median erosion.
    Median erosion amount _____ t/ac
    The Median value can also be found in the final table by entering 50% in the target chance box and clicking **go**.

6. In the table following the graph, ERMiT shows the probability that erosion will exceed a target amount for a given event, for each of the first five years, in the first line. The second line shows how seeding after fire may alter that amount. Note that seeding is not effective in reducing erosion until the second year following a fire. The next four lines in the table show the effect of adding different levels of mulch on reducing the probability that a given amount of erosion will occur.
    a. To use this first table, determine the probability you want to consider, enter it in the box at the upper left corner of the table, and click the **go** button.
    Exceedance Probability _____ %
    b. From the first column, line 1, note the erosion rate associated with your exceedance probability. **Erosion Rate _____t/ac**
    "There is a _____ % chance that sediment delivery from this hill will exceed _____ t/ac."
    c. If the erosion rate is too high, will treatment reduce it to an acceptable level for your exceedance probability?
    Mulch required to reduce probability to satisfactory level of ____ t/ac
    There is a _____ % probability that sediment delivery will exceed _____ t/ac if _____ t/ac mulch are applied on this hill.

7. Several analyses may be carried out to give a number of levels of sediment yield and associated costs of mitigation. Additional runs of ERMiT can also be carried out for a range of topographic conditions within the burn area, and for a range of severities. Tables, graphs and discussion can then be prepared to summarize the results.

Estimate the Peak Flow with the Peak Flow Calculator

1. Open the Peak Flow Calculator from the FSWEPP Web site
   http://forest.moscowfsl.wsu.edu/fswepp/

2. Enter the storm and runoff from ERMiT

   Runoff amount, Q _____ in.

   Storm amount, P _____ in.

3. Enter the watershed details

   Watershed Area, A ____ac

   Watershed Flow Length, L _____ ft

   Average Watershed Gradient, S_g _____ ft/ft

4. Decide on a Curve Number

   CN _____

For high severity, use the ERMiT value
Other severities, use a lower severity curve number from the Peak Flow Calculator

5. Decide on a time of concentration

   Time of Concentration, T_c _____ hrs

High severity fire and rangeland, use calculated value
Moderate severity; use your judgment, leaning toward a longer time
Low severity and forest, use 10 hours

6. Note the Peak Flow Rate

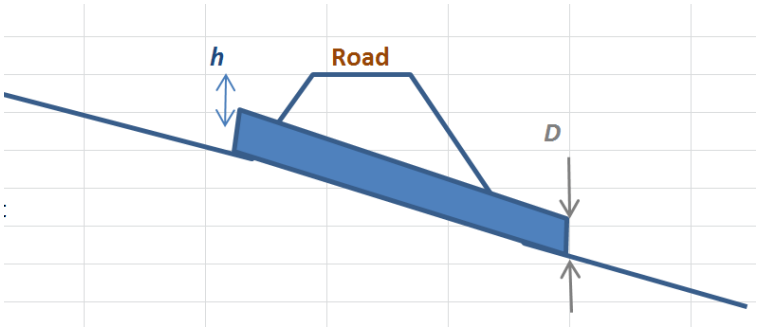
   Estimated Peak Flow Rate, q _____ ft^3/s

7. Check the culvert size, for a culvert with a gradient greater than about 5 percent:

$$D = \sqrt{\frac{8q}{\pi\sqrt{2gh}}} \times 12$$

Using, **h _____ ft**, culvert diameter is **D_____ in**.

Where *D* is the minimum culvert diameter (in.), *q* is the peak flow rate ($ft^3\ s^{-1}$), *g* is acceleration due to gravity (32.2 ft sec^{-2}), and *h* is the distance (ft) from the center of the culvert to about 1 ft below the road surface. *h* can vary from 1 to 60 ft depending on the depth of the road fill above the culvert.



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