



United States
Department
of Agriculture
Forest Service
Rocky Mountain
Research Station
Research Note
RMRS-RN-23-12-WWW
March 2005

Fuels Planning: Science Synthesis and Integration

Environmental Consequences Fact Sheet: 12

Water Erosion Prediction Project (WEPP) Fuel Management (FuMe) Tool



*Synthesizing
Scientific Information
for Fire and Fuels
Project Managers*

**William Elliot
David Hall**

USDA Forest Service
Rocky Mountain Research Station
Moscow, ID

Environmental Consequences
Team Leader

Elaine Kennedy Sutherland
USDA Forest Service
Rocky Mountain Research Station
Missoula, MT

Fuels planning: Science synthesis and integration, an interagency research/management partnership to support the Ten-Year Fire Plan, led by Russell T. Graham, RMRS, and Sarah M. McCaffrey, NCRS.

What is WEPP FuMe?

The Water Erosion Prediction Project (WEPP) Fuel Management (FuMe) tool was developed to estimate sediment generated by fuel management activities. WEPP FuMe estimates sediment generated for 12 fuel-related conditions from a single input. The conditions are an undisturbed forest, three severities of wild-fire, three severities of prescribed fire, two severities of thinning, and three levels of road traffic.

Intended Users

The tool is designed to be used by erosion specialists for detailed analysis of impacts of proposed fuel treatments, or by fuel management specialists for a quick estimate of potential sedimentation impacts from a given stand treatment.

Intended Uses

WEPP FuMe is intended to be used as a planning tool for:

- Categorical Exclusion justification
- NEPA analysis

Required Inputs

The user must select or specify the attributes of the treated area(s) as listed in table 1.

Table 1—Required inputs. The user can click the “question”  buttons on the WEPP FuMe input screen to obtain additional information for each input.

Attribute	Description
Climate	Select nearest weather station from a list, and further specify the latitude and longitude of the site.
Soil texture	Select from a list of four choices.
Road density	Divide the number of miles of road in the watershed where the treatments are located by the area of the watershed.
Length(s) of treated hillslope(s)	The user may wish to analyze several hillslopes that make up the treated area.
Length(s) of untreated buffer(s)	The buffer is that area at the bottom of a hill that is not thinned or burned during a prescribed fire.
Hillslope gradient(s)	Steepness at the top, middle, and bottom of the hillslope; may be obtained with the aid of a GIS.
Time between disturbances	Wildfire return interval, and proposed time between thinning and/or prescribed fire activities.

What the Model Does

WEPP FuMe uses the inputs to carry out the 12 WEPP runs. The results are converted to common units, and long-term annual averages are determined based on the time between disturbances. The results for an initial analysis from the first four hillslope runs and the three road runs are presented in an output table like table 2.

Table 2—Output table presenting predicted sediment yield rates.

Line	Source of sediment	Erosion in year of disturbance (ton mi ⁻²)	Return period of disturbance (y)	"Average" annual sedimentation (ton mi ⁻² y ⁻¹)
1	Undisturbed forest	0	1	0
2	Wildfire	2534.4	40	63.4
3	Prescribed fire	6.4	20	0.3
4	Thinning	0	20	0.0
5	Low access roads	0.2 to 2.7	1	0.2 to 2.7
6	High access roads	1.1 to 2.8	1	1.1 to 2.8

A narrative is then presented that aids the user in interpreting and reporting on the results. If the user is carrying out a NEPA or similar analysis requiring several options, the tables summarizing all of the runs following the narrative can be used. The **Disturbed WEPP** table (see table 3) contains the results from the first four hillslope runs summarized in the first output table, plus five additional runs to aid in preparing management alternatives. The final column of the **Disturbed WEPP** table describes the inputs for each run. The runs are intended to describe the conditions shown in the table. In all cases, cover means soil cover due to surface vegetative residue and rock.

Figure 1 shows how some of the results may be summarized, in this example comparing a no-action alternative (low traffic roads and high severity wildfire) to a fuel-treatment alternative (high traffic roads, but anticipated moderate severity wildfire). In this example, as shown from table 1, there was no sediment generated by the thinning operation, and little by the prescribed fire.

Table 3—Example of a disturbed WEPP table.

Run	Cover	Buffer	Condition
Undisturbed	<i>percent</i> 100	—	Conditions typically found 5 years after a human disturbance, or 10 years after a wildfire
Thinned forest	85–100	yes	Forest following a tractor thinning operation
Prescribed fire	85–100	yes	
High severity	30–45	no	Only condition with water wildfire repellent soils
Lower impact	95–100	yes	For a helicopter or other thinning low impact thinning operation
Higher severity prescribed fire	75–85	no	A dry fall burn
Lower severity	90–100	yes	A damp spring burn prescribed fire
Moderate severity wildfire	50–60	no	
Low severity wildfire	70–80	no	

Figure 1 clearly shows that if fuel treatment reduces the risk of high severity fire, there is a considerable drop in long-term sediment generation. The user may wish to copy and paste the results from each run directly into an analysis document, or the document's appendix.

WEPP FuMe only models hillslope surface erosion processes. It does not model channel processes such as sediment transport and gullying. The interface does not model landslides on disturbed hillslopes or on road networks.

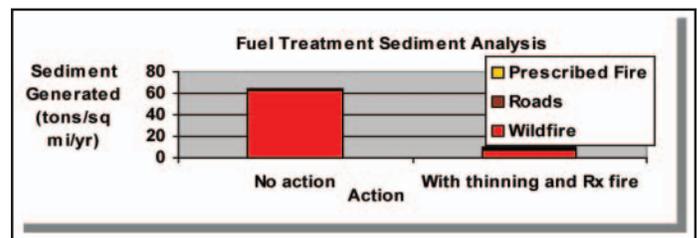


Figure 1—Graphic summary of results.

How to Obtain the Model

WEPP FuMe is an online interface that can be run with any recent Web browser. It can be found at: <http://forest.moscowfsl.wsu.edu/fuels/>

Environmental Consequences Fact Sheets

Look for fact sheet topics from the Environmental Consequences Team including information about the effects of fire behavior and alternative treatment strategies, Wildlife Response Model, weed responses, riparian systems, soil erosion, restoration objectives, treated spaces, the Fire Effects Information System (FEIS), and the First Order Fire Effects Model (FOFEM).

Fuels Planning: Synthesis and Integration

This fact sheet is one in a series being produced as part of a larger project supported by the USDA Forest Service to synthesize new knowledge and information relevant to fire and fuels management. Fact sheets address topics related to stand structure, environmental impacts, economics, and human responses to these factors. Information in the fact sheets is targeted for the dry forests of the Inland West, but is often applicable across broad regions of the country. For more information, please visit our Web site at: www.fs.fed.us/fire/tech_transfer/synthesis/synthesis_index

The Fuels Planning fact sheets are based on preliminary findings. Information from fact sheets will be synthesized in an upcoming publication.