

# Science

## B R I E F I N G

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# TOOLS TO MODEL ROAD IMPACTS

## BACKGROUND

The Rocky Mountain Research Station has a long history of developing tools that meet the needs of National Forest Systems for managing the environmental impacts of road systems on watersheds. Existing tools have been optimized to answer particular management questions at specific spatial scales.



*Forest roads are a major source of sediment delivery to streams.*

## RESEARCH

**WEPP Road** and **WEPP Road Batch** are modeling tools optimized to rapidly predict sediment production and delivery of road segments and groups of road segments with limited field data. These online tools are simple to use and well suited to illustrate management alternatives such as improved road surfacing or drainage for a road segment.

**GRAIP** is designed to predict the sediment and geomorphic impacts of road systems as they interact with the channel network at a

sub-watershed to watershed scale using a GPS road inventory. GRAIP is designed for locations that have a need for the higher confidence in sediment delivery and risk metrics that comes with local observations. GRAIP can be used to address TMDL issues and to inform restoration priorities in areas with critical habitat for rare and endangered fish species.

**GRAIP-Lite** is a GIS based tool that uses existing spatial data and a capacity for local calibration to predict the relative intensity of road sediment impacts on streams across larger spatial scales. This tool is conceived to replace road density as a metric for predicting road sediment impacts at the scale of forest planning. This tool is well suited for selecting high priority road restoration work.

## MANAGEMENT IMPLICATIONS

All models have tradeoffs between accuracy and cost. It is important to apply the right tool that captures the locally important processes with the desired degree of confidence at the spatial scale of the analysis unit.

## KEY POINTS

- Forest roads are the principle source of anthropogenic fine sediment entering streams on Forest Service lands.
- Determining how to efficiently quantify these sediment sources is of major concern for managers.
- RMRS researchers have developed a suite of powerful tools to model the impacts of roads at a range of spatial scales, from road segments to individual forests.
- These tools are now widely used to predict the road sediment production and delivery to streams, as well as mass wasting risk to roads from gullies and landslides, gullies, and stream crossing failures.

Spatial Scale (km <sup>2</sup> )	WEPP Road	WEPP Road Batch	GRAIP	GRAIP-Lite
Road segment (1)	■	■		
Subwatershed (100)		■	■	
Project (250)			■	■
Watershed (500)				■
Forest (5,000)				■

## MORE INFORMATION

Freeware GIS tools, statistical software, tutorials, and example datasets for running the road network models are available through the linked website for each individual tool. For additional information, please contact **William Elliot**, USFS Research Engineer, (208) 883-2338 or [welliott@fs.fed.us](mailto:welliott@fs.fed.us).