

Focus: GRAIP

Quantifying and Prioritizing Road Impacts



Research

Technology Transfer

Science Application

Key Findings:

- GRAIP predicts site specific fine sediment delivery from roads to streams.
- Predicts risk of road related landslide and gully initiation.
- Ideal for BMP effectiveness monitoring.
- Facilitates prioritization of road restoration projects based on risk.
- GRAIP analyzes many aspects of road risk to watershed health with a single field visit

Challenge

Forest roads are the principle source of anthropogenic fine sediment entering streams on Forest Service lands. How do we efficiently locate, quantify and prioritize these sediment sources for remediation?

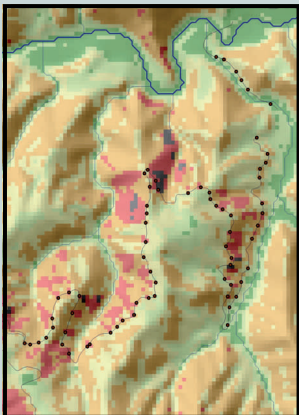
Context

The Geomorphic Road Assessment and Inventory Package (GRAIP) is a process and a set of tools for analyzing the impacts of roads on forested watersheds. GRAIP combines a road inventory with a powerful GIS analysis tool set to predict sediment production and delivery, mass wasting risk from gullies and landslides, stream diversion potential, culvert maintenance and fish passage at stream crossings.

Actions

The road inventory protocol describes how to systematically inventory a road system using GPS and automated data forms. Once downloaded, these data can be immediately run through a data quality checking and correction program. Quality checked inventory data are analyzed by the GRAIP model with the aid of a 10 meter DEM. An inventory crew of two covers an average of 5 miles per day, yielding a cost of about \$50 per mile.

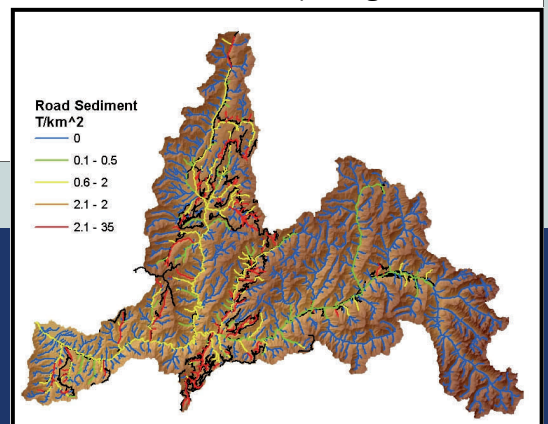
In addition to the National Forests; BLM districts, tribes and state agencies have used GRAIP to complete inventories in areas of critical concern.



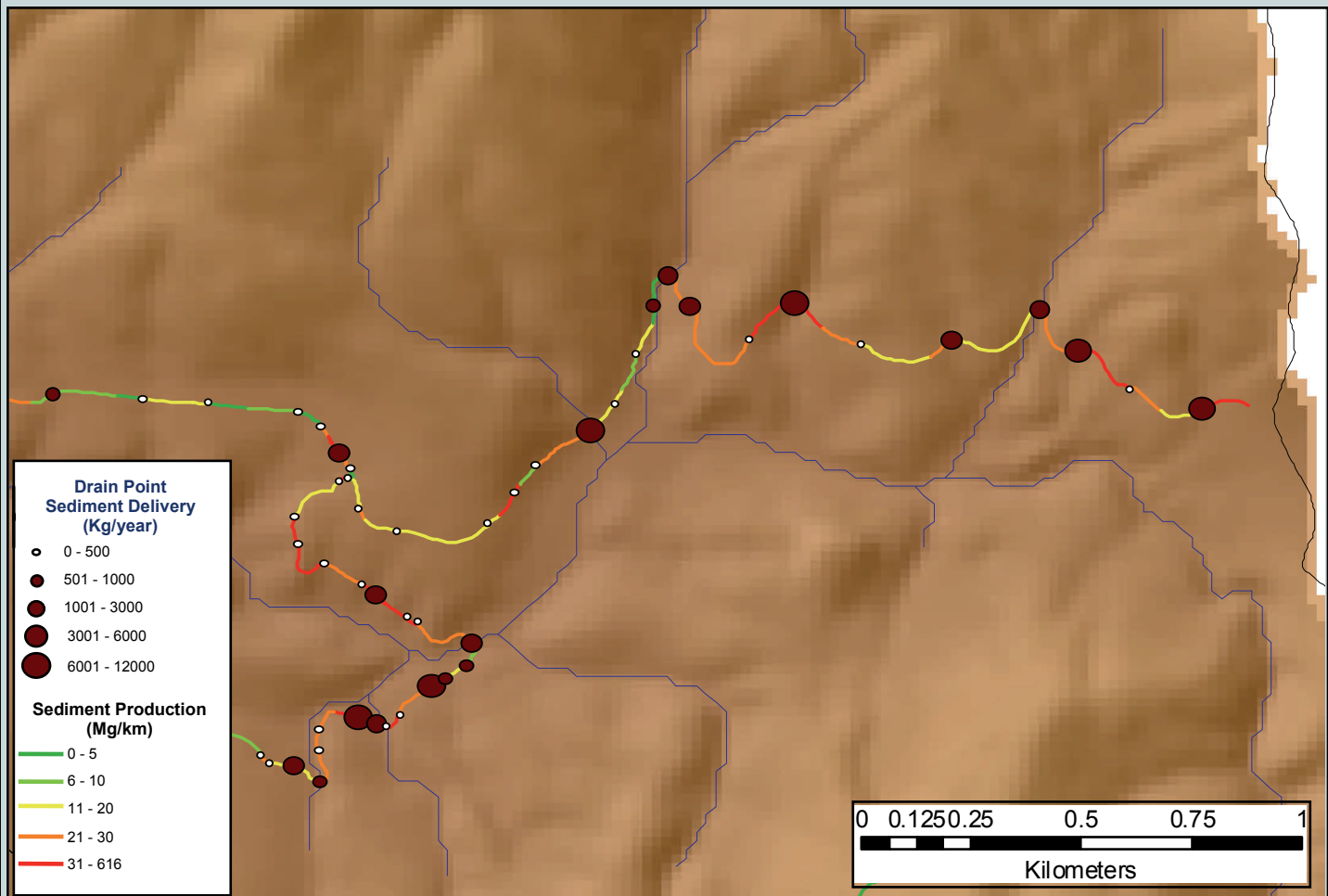
Road slope stability

Results

The program produces maps of surface erosion, accumulated road sediment in streams (bottom right), and as well as maps of slope stability (left) and gullying risks. Other analyses relating to stream diversion potential, culvert maintenance needs, and fish passage are also provided with the program. GRAIP is an ideal tool to monitor BMP effectiveness by quantifying reductions in sediment delivery and risk associated with landslides and gullies



Road Sediment Production and Delivery



Supporting documentation available from www.fs.fed.us/GRAIP/index.shtml

Related Publications

Luce, Charles H.; Black, Thomas A. 1999. Sediment production from forest roads in western Oregon. *Water Resources Research*. 35(8): 2561-2570

Prasad, Ajay; Tarboton, David G.; Luce, Charles H.; Black, Thomas A. 2005. A GIS tool to analyze forest road sediment production and stream impacts. 2005. *ESRI International User Conference Proceedings* : July 25-29, 2005, San Diego, Calif. Redlands, CA: ESRI. 10 p.

Project Science Team



Charlie Luce
Research Hydrologist
Phone: (208) 373-4382
Email: cluce@fs.fed.us



Tom Black
Hydrologist
Phone: (208) 373-4363
Email: tblack@fs.fed.us

