FOREST: A spatially explicit sediment model for forested watersheds

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Abstract. Increases in sediment from wild fires, forest harvest, and unpaved roads are a primary concern of land managers. The cumulative effects of increased sediment in the stream network can degrade water quality and aquatic habitat. The predictive models currently used by agencies such as the US Forest Service are lumped, spreadsheet models, but there is an urgent need to calculate accurately sedimentation with spatially explicit models that account for local mitigation practices and natural variability. FOREST (FORest Erosion Simulation Tools) is a spatially explicit set of models designed to calculate the amount of sediment produced, delivered, and transported through streams in forested watersheds. The goal is to produce a model that is scientifically based, easy to use by resource managers with little GIS experience, spatially explicit, easily modified, and transparent to users.

The hillslope sediment production model assumes a linear recovery from user-specified initial sediment production rates. Road sediment production models use either empirical equations or a look-up table approach. Hillslope sediment delivery is calculated using look-up tables of sediment delivery rates that were derived from WEPP simulations. The road sediment delivery model uses an empirical relationship between mean annual precipitation and the percent of roads connected to streams.

The sediment transport model is now being formulated. Given the variability and complexity of sediment routing, we propose to incorporate both empirical transport distances and a simplified stream power approach. Once FOREST is completed it will be tested against field data from experimental watersheds.

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