GRAIP_Lite: A New GIS Method For Prioritizing Road Sediment Impacts

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GRAIP_Lite is a field-calibrated GIS method that predicts sediment production on forest roads, delivery of that sediment to streams, and accumulation of that sediment within the stream network; it is intended to act as a prioritization tool to determine areas of higher road sediment impact where more detailed inventory work is needed. While based on the GRAIP model's architecture, GRAIP_Lite uses GIS methods to approximate road segments and drain points and a local polynomial regression model (LPRM) to predict fractional sediment delivery. A field-collected data set provides calibration data for the LPRM and vegetation factors. GRAIP_Lite uses GIS methods to break road lines into segments at catchment boundaries and stream intersections. Sediment production is calculated for each road segment and routed to the drain point at the downhill endpoint. The fraction of sediment reaching the stream from each drain point is estimated using the local polynomial regression model that describes the probability of each drain point being connected to the stream in terms of a predictive landscape variable, most commonly the flow distance to the stream. This sediment is then routed to the stream and accumulated down the stream network. GRAIP_Lite was validated against the GRAIP model, which is based on field observations, in the North Fork Siuslaw River (NFSR) watershed. Validation was done by analyzing differences in predicted sediment accumulation in the stream network at increasing drainage areas. Sediment accumulation predictions were within one order of magnitude of the GRAIP model predictions once the drainage area was greater than 13 km^2 and was within a factor of three at contributing areas greater than 21 km^2.

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