

## **Geospatial Modeling of Forest Road Networks and Their Impacts on Stream Macroinvertebrate Communities**

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Road construction and maintenance throughout the country continues to be one of the largest contributors of sediment pollution to aquatic systems. Road systems also act as a surrogate for a variety of anthropogenic impacts such as mining, timber harvesting and agricultural activities. Though impacts of road networks on aquatic systems can be potentially severe, little work has been performed to evaluate the effect that road spatial location within a watershed has on water quality. To address this issue from a quantitative perspective, a "Road Impact Factor" protocol was designed to identify potential erosion-prone segments of road networks based on road gradient, spatial location based on hydrologic flow length, surface composition, and water control installations. The protocol was developed for two regions in Central Idaho and Eastern Oregon. Ninety-nine areas were determined by deriving the upstream contributing areas using benthic macroinvertebrate sample points as watershed outlet points. We then used the hydrologic travel time procedure, developed for use in the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) runoff and routing model, in order to characterize the spatial distribution of potential road runoff impacts within the study areas. Thirteen macroinvertebrate metrics sensitive to sedimentation (i.e. EPT, Hilsenhoff Biotic Index, etc.) were analyzed to test the significance of the spatial distribution of Road Impact Factors. These 13 metrics were analyzed under the hypothesis that values will be lower for those study areas that have a higher degree of road impact and a lower distance between the road segments and stream reaches.

*Keywords:* Road erosion, benthic macroinvertebrates, Runoff modeling

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