The Forest as a Soil and Water Manager

J.C. Bathurst

Newcastle University, School of Civil Engineering & Geosciences, Newcastle Upon Tyne, United Kingdom
(james.bathurst@newcastle.ac.uk)

Forests provide a vital service in regulating stream flow and protecting soil from erosion. Loss of forest cover increases erosion (by raindrop impact, surface runoff, gullies, landslides and river bank failure) and the transfer of eroded soil or sediment to the river network. It also increases annual runoff and the peak discharges of at least small to moderate flood events, and thus the sediment transporting capability of streams. Adverse impacts include reservoir sedimentation, aquatic habitat degradation and river channel instability. Sediment also greatly increases the destructive effects of floods. The forest/erosion interface takes many forms, e.g. forest fire impact, forest/landslide interaction and impact of pre-plantation activities such as ditching. However, despite decades of study, data on forests and erosion remain relatively fragmented and there is no integrated overview at regional to continental scales, e.g. at the European scale. Further, quantitative understanding does not yet match qualitative understanding and lags behind our ability to make quantitative generalizations on, for example, the impact of forest cover on water yields and flood frequencies. This presentation therefore discusses our current understanding of the effect of forest cover on water runoff and soil erosion, highlighting in particular the type of quantitative data available and the quantitative methods which are available to predict the impact of changes in forest cover, including their limitations. It also considers the type of models needed to predict the impacts of land use and climate change on soil erosion and proposes a next step in improving our predictive capability for the forest/erosion interface through an integration of existing research to provide generalizations and an overview at regional to subcontinental scales.