INTRODUCTION
For deforested catchments prone to landslide erosion, it has been suggested that reforestation of only small parts of the catchment, carefully targeted, could produce a disproportionately large reduction in landslide occurrence and sediment yield (Reid & Page, 2002). The SHETRAN hydrological, sediment transport and landslide model is therefore applied to the 65.8-km² Guabalcón catchment in central Ecuador to demonstrate a technique for identifying the areas of a catchment most susceptible to shallow landsliding and for quantifying the effects of different vegetation covers on landslide incidence. The Guabalcón catchment has an elevation range of 1370-4420 m, an annual rainfall of 700-1000 mm (higher in El Niño years) and a land cover of mainly grassland, pasture or cultivated land, and is subject to landslides and debris flows.

DATA AVAILABILITY
- 10-m resolution Digital Elevation Model
- Soil hydraulic property data for limited sites
- Hourly rainfall for six stations and daily evapotranspiration for three stations
- Daily mean discharge at Saguin (13.3 km²) and Piñancay (57.4 km²)
- Other model parameters were derived from literature sources, past applications or calibration

CALIBRATION
Calibration was carried out for the daily discharge series at the Saguin (13.3 km²) and Piñancay (57.4 km²) gauging stations. Because of data limitations (especially for rainfall and soil properties), the calibration is approximate. (See, for example, the inability to model the major hydrograph in March 2007 because of missing rainfall data.) It therefore provides a sufficient technical basis for landslide modelling but the results should be viewed as illustrative rather than an accurate representation of reality.

LANDSLIDE SIMULATION
For the modelled scenario, landslides were found to be concentrated at a particular region of steeper slopes in the catchment. The spatial patterns of landslides are strongly affected by the root cohesion. A change from grass to young trees (representing a change from grass to young trees) causes a three-fold reduction in the number of landslides.

CONCLUSION
The simulation demonstrates the use of a physically based, spatially distributed landslide model for identifying the areas of a river catchment which are most susceptible to shallow landsliding and for quantifying the effect of different vegetation covers on landslide incidence. Even with imperfect data availability it is still possible to carry out an initial exploration of the problem area. Such models can therefore be proposed as a means of testing and selecting strategies for the targeted reforestation of basins.

References