Stream network detection using remotely sensed data and an artificial neural network

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Given that streams are an integral part of the landscape and its processes, it is a conceivable postulation that landscape factors have a decisive function in stream network initiation and development. Past research studies have acknowledged certain general relationships between drainage density and other environmental factors. Nevertheless, a definite model for stream delineation has not yet materialized. The use of digital terrain models alone for this purpose turns out to be often problematic, rendering erroneous results. To explore which factors are most indicative for stream network delineation, an artificial neural network along with data derived from Landsat 7 ETM+ images were employed in this study. The extracted data included a number of available soil, topographic and lithologic factors. For this purpose two hydrologically and geographically diverse study areas in Apulia/Italy and Pennsylvania/USA were examined. Various spectral band ratios were identified as being commonly significant in both case studies. Furthermore, the neural network identified a number of factors from more general parameter groups (e.g. soil and topographic) and hence this suggests that future stream network derivation methodologies should probably consider that certain groups of environmental factors are more key for certain geographic regions than for others.