Object-based image analysis technique for gully mapping using topographic data at very high resolution (VHR)

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An accurate mapping of gullies is important since they are still major contributors of sediment to streams. Mapping gullies can be difficult because of the presence of dense canopy, which precludes the identification through aerial photogrammetry and other traditional remote sensing methods. Moreover, the wide spatial extent of some gullies makes their identification and characterization through field surveys a very large and expensive proposition. One cheaper and more expeditious way to detect gullies can be achieved in terms of morphological characteristics by the Digital Elevation Models (DEMs). The recent widespread availability of very high resolution (VHR) imagery, such as LIDAR data, has led to a remarkable growth in the availability of terrain information providing a basis for the development of new methodologies for analyzing Earth surfaces. So far, different procedures have been developed to operate on these high resolution DEM data. They can be roughly classified as pixel- and object-based, which analyzes spatial data using the concept of the image object

This work aims to develop an object-based image analysis (OBIA) to detect and map gullies based on a set of rules and morphological characteristics retrieved by very high resolution (VHR) imagery. A one-meter resolution LiDAR Digital Elevation Model (DEM) is used to derive different morphometric indexes, which are combined, by using different segmentation and classification rules, to identify gullies. The tool has been calibrated using, as reference, the perimeters of two relatively large gullies that have been measured during a field survey in the Calhoun Critical Zone Observatory (CCZO) area in the Southeastern United States.