



Smartphone imagery to analyze animal-induced erosion in riverbanks

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Among the most invasive species, the Coypu (*Myocastor coypus*) best exemplifies the widespread damage caused by alien species to ecosystems, with effects on crops, riverine systems, and hydraulic structures. The extent of the latter impact is still rarely quantified, despite the increasing economic and social importance. In northern Italy, Coypu damages to the drainage network have multiple aspects. One main issue is related to the weakening of earthen structures: burrows significantly reduce the integrity of the banks, and potentially contribute to the bank failure. A second concern is related to the agricultural activities nearby the channels. When burrows are present, soil may collapse when subjected to the weight of heavy objects on the surface (such as vehicles and farm machinery). A third issue is connected on the impact of burrowing activities on riparian buffer zones. Coypu burrows create specific flowing paths for the water, delivering water and sediment from the fields directly to the drainage system, thus possibly reducing the efficiency of these zones, and improving the risk of surface water contamination. The purpose of this research is to provide a new perspective, from a geoscience point of view, on Coypu damages to riverbanks, showing the effectiveness of a low-cost approach to model surface burrowing damages and to quantify the related erosion. The work is based on the Structure-from-Motion (SfM) photogrammetric method. To quantify the damages, high-resolution 3D models of the riverbanks were reconstructed from imagery acquired with a smartphone (Prosdocimi et al. 2015). From these models, it was possible to determine the volume of the animal-induced erosion. Proven its effectiveness, the proposed method could allow the creation of a database of damages. Researchers could test the flexibility of the approach to determine the distribution of erosion along the whole drainage system as an index of damage region wide, and to determine the severity of damage as classified according to Coypu relative abundance ratings when available. This would offer the basis to compare biomes, identifying those suffering the most. The quantification of eroded sediment would also provide a scientific basis to improve the analysis of the impacts of burrowing animals on riparian habitats and native species as well as on the efficiency of buffer zones.

Prosdocimi, M., Sofia, G., Dalla Fontana, G., Tarolli, P. (2015). Bank erosion in agricultural drainage networks: effectiveness of Structure-from-Motion photogrammetry for post-event analysis, *Earth Surface Processes and Landforms*, 40: 1891–1906. doi: 10.1002/esp.3767.