How forensic science can lead the way in identifying culprit soil fingerprints in European mountains.

Amaury Frankl, O. Evrard, Elle Verleyen, Erik Cammeraat, Alexia Stokes

ENVIRONMENTAL SCIENCES

How forensic science can lead the way in identifying culprit soil fingerprints in European mountains

Author(s):
Amaury Frankl
Organisation:
INRAE
Place of residence:
Montpellier

Mountains in Europe are highly valued as they provide diverse living and recreational opportunities and unique landscapes, are key economic assets, and because they are treasures of unique flora and fauna. Their vulnerable environment is, however, threatened by the frequent occurrence of shallow landslides and water erosion which produce large amounts of sediment during floods. The urgency to mitigate natural hazards calls for an improved understanding of how physical and biological dimensions of soil restoration interact. We address this issue by investigating how environmental DNA (eDNA) or DNA of organisms isolated from environmental samples can be used to trace hotspots of soil erosion in the Bastan catchment in the Pyrenees (France). Based on the persistence eDNA from vascular plant litter in soils and sediments, and the possibilities offered by DNA metabarcoding to characterise whole plant communities to the species level, we argue that eDNA can be used as a high-resolution fingerprinting method for identifying and tracing sediment sources. As such, bridging the gaps between physical and biological connectivity features at the catchment scale will allow us to develop tangible soil restoration scenarios which incorporate hazard protection, landscape and biodiversity restoration.