



HAL
open science

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

► To cite this version:

Amaury Frankl, O. Evrard, Elle Verleyen, Erik Cammeraat, Alexia Stokes. How forensic science can lead the way in identifying culprit soil fingerprints in European mountains.. MCAA Annual Conference, Mar 2021, Bruxelles, Belgium. pp.38, 2021. hal-03200478

HAL Id: hal-03200478

<https://hal.inrae.fr/hal-03200478>

Submitted on 16 Apr 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

ENVIRONMENTAL SCIENCES

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

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.

Author(s):

Amaury Frankl

Organisation:

INRAE

Place of residence:

Montpellier

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

Amaury Frankl^{1,3*}, Olivier Evrard², Elie Verleyen³, Erik Cammeraat⁴, Alexia Stokes¹

¹ INRAE, AMAP, IRD, CIRAD, CNRS, Montpellier University, France; ² LSCE/PSL, CEA, CNRS, UVSQ, Paris Saclay University, France; ³ Ghent University, Belgium; ⁴ Amsterdam University, the Netherlands; * Corresponding author: e-mail: amaury.frankl@cirad.fr

Context
Mountains in Europe are very valuable:
© Amaury Frankl
WATER, ENERGY
AGRICULTURE SKI VILLAGE
FAUNA AND FLORA
HIKING, CLIMBING, GLIDING, CYCLING, ...
Pressure on mountains is high, accelerating land degradation:
© Jean Guyo

- Landslides
- Water erosion
- Avalanches
- Gullying
- Flash floods
- River bank erosion

These processes are exacerbated by extreme weather events and require actions to strengthen sustainable mountain development

Research objective
Investigate how environmental DNA (eDNA) or DNA of organisms isolated from environmental samples can be used to trace hotspots of soil erosion. We focus on a case study area in the Bastan catchment in the Pyrenees (France).

eDNA fingerprinting

- eDNA is assumed to be highly persistent in soils and sediments
- Allows to identify plant species and thus hotspots of soil erosion at an unprecedented resolution
- Allows to bridge the gaps between biological and physical catchment connectivity aspects

Development goal
Through our interaction with stakeholders and communities develop tangible soil restoration scenarios which incorporate hazard protection, landscape and biodiversity restoration.

MCAA GENERAL ASSEMBLY AND ANNUAL CONFERENCE
12 March 2021