Mapping ecosystem services of mountain forests in Europe

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Introduction

The European Union (EU) hosts more than 400,000 km^2 of mountain forests, delivering such benefits as wood, soil stabilization, climate regulation and recreation opportunities to millions of people.

The protection and sustainable management of these forests should rest on an in-depth knowledge of where forest ecosystem services (FES) are supplied: something that can be achieved through mapping (Burkhard et al., 2012).

In particular, we need to identify areas that supply large amounts of FES (Garcia-Nieto et al., 2013), as these may be given a conservation status, and to verify whether different FES systematically occur together, as these ensembles may reflect important socio-ecological systems (Raudsepp-Hearne et al., 2010).

This study aims to support the sustainable management of EU mountain forests by:

- mapping the supply of FES;
- delineating FES hotspots;
- identifying spatial bundles of FES.

EU mountain forests

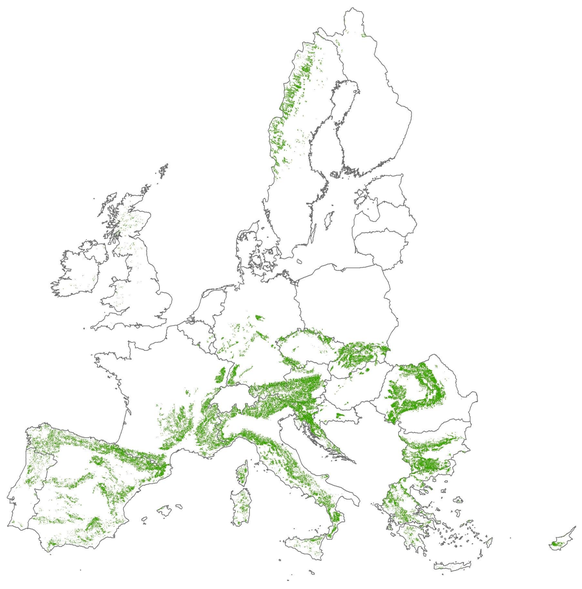

Figure 1. Mountain forests of the EU, as identified combining the CORINE land cover (classes 311, 312, 313) and the World Conservation Monitoring Center (WCMC) map of mountain areas.

FES supply

A total of eight services strongly linked to forest ecosystems were mapped using Tier 1 mapping methods (Figure 2).

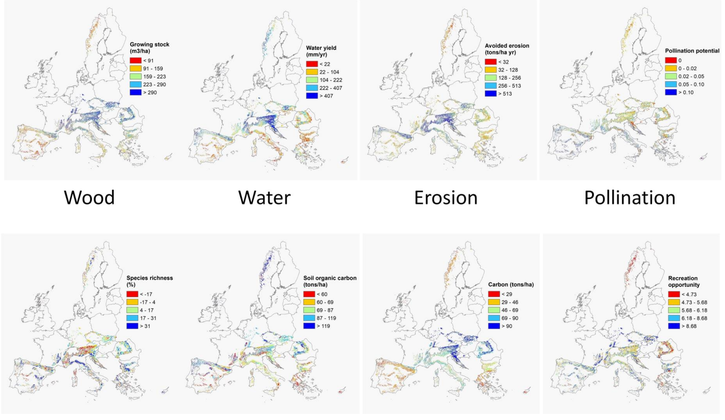

Figure 2. Supply of the selected FES across the EU.

FES hotspots

Hotspots were initially mapped for all EU forests (i.e. mountainous and non-mountainous) as the 20% of forest pixels ensuring the highest supply per unit area. Figure 3 shows the spatial patterns of hotspots and indicates how much of each FES's hotspot is found in mountain forests.

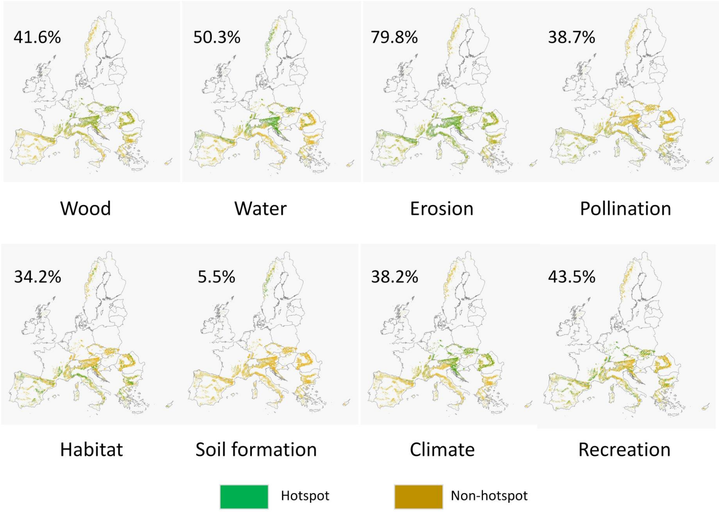

Figure 3. Spatial patterns of FES hotspots and fraction of FES hotspots that is found in mountain forests (%).

FES bundles

Four main bundles were identified by performing a cluster analysis on principal components of FES indicators (Figure 4).

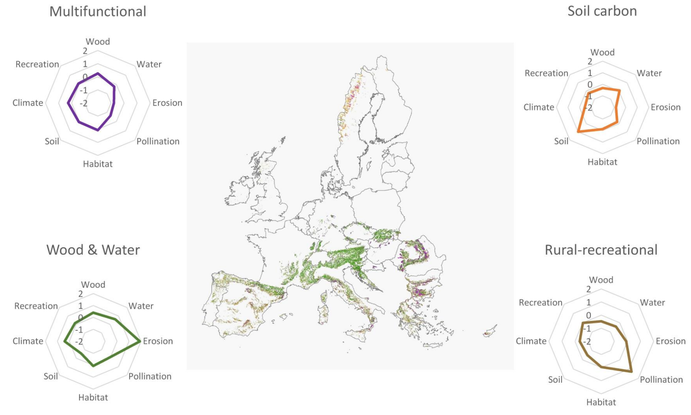

Figure 4. Spatial bundles of FES in EU mountain forests.

Key findings

- FES supply varies dramatically across EU forests
- EU mountains are a major hotspot of wood, water, erosion control and recreation
- Most of the carbon is in mountain forests, not mountain soils
- The "multifunctional" bundle is mainly present in the Carpathians
- The Alps are the epicenter of the "wood & water" bundle
- Mediterranean forests offer significant rural-recreational opportunities

Acknowledgements

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