European Commission

Science for Environment Policy

Wildfires destroy protective effect of forest roots on soils

07 October 2019
Issue 532
Subscribe to free weekly News Alert

Source: Gehring, E., Conedera, M., Maringer, J., Giadrossich, F., Guastini, E., and Schwarz, M. (2018). Shallow landslide disposition in burnt European beech (*Fagus sylvatica* L.) forests. *Scientific Reports* 9, 8538 (2019).

Contact:
eric.gehring@wsl.ch

Read more about:
Forests, Natural hazards, Risk assessment

Forest root systems increase soil strength and stability, thus protecting mountainous regions against gravitational natural hazards, such as landslides. However, tree roots are affected by factors such as soil properties, climate and disturbances, such as timber-harvesting or wildfire — and, as a result, a forest's stabilising effect can vary greatly. This study of fire-disturbed beech forests explores how this effect changes over time. The results reveal that forests which have suffered moderate and severe wildfires completely lose their protective function within 15 years, placing those regions at high risk of landslide for up to 50 years after the fires.

Root systems help to ensure that mountainous regions stay habitable. Management of these forest ecosystems is an important part of Disaster Risk Reduction (Eco-DRR), something that is covered by the United Nations' Sendai Framework for DRR (2015-2030) — especially global target B, which aims to reduce the number of people affected by global disasters in the coming decade.

With this in mind, silvicultural forest management — the nurture, control, and regeneration of forests in terms of growth, health and quality — should include careful planning and implementation of technical measures in areas where the risk for humans and/or infrastructure is high, suggests this study, which focuses on areas affected by forest fire.

The study explored how the European beech tree (*Fagus sylvatica L.*) responds to fire damage in the medium-term, and how this affects slope stability. Beech is highly susceptible to forest fire due to its thin bark, poor resprouting capacity and a regeneration process that relies upon seed release by adult trees. In addition, after a high-intensity fire, only a few mature beech trees survive, and it is these that are able to release seeds.

The researchers selected 34 fire sites with an average tree-species composition of over 80% beech. Plots within these sites were either classified as burnt (210 plots), low burn or unburnt (34 plots near the burnt areas). Just over a third of the sampled plots were classified as high-severity burns (35%), and the other two-thirds as moderate (33%) or low (unburnt and low: 32%).

The researchers then determined the sites' 'protective capacity' against landslides by modelling and quantifying a range of metrics, including the distribution and characteristics of tree roots, the spatial properties of the tree population over time, the number of tree stems, soil conditions, slope inclination, landslide depth, and burn intensity.

In unburnt and low-burn forests, the protective capacity remained constant over time. Forests hit by moderate burns continued to provide adequate protection for shallow (depths of less than 0.5 m) and cohesive soils only. Cohesive soil can be thought of as 'sticky' soil; it binds together, and comprises types such as clay and silt (as opposed to non-cohesive soils, such as sand and gravel).

Continued on next page.

To cite this article/service: "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

Science for Environment Policy

Wildfires destroy protective effect of forest roots on soils

(continued)

07 October 2019
Issue 532

[Subscribe](#) to free weekly News Alert

Source: Gehring, E., Conedera, M., Maringer, J., Giadrossich, F., Guastini, E., and Schwarz, M. (2018). Shallow landslide disposition in burnt European beech (*Fagus sylvatica* L.) forests. *Scientific Reports* 9, 8538 (2019).

Contact:
eric.gehring@wsl.ch

Read more about:
Forests, Natural hazards, Risk assessment

To cite this article/service: "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

In the case of moderate- to high-severity fires, the forest's protective function decreased by half in just six years post-burn, and vanished completely within 15 years. These areas, therefore, face an increased probability of shallow landslides — this lingers for 40 to 50 years after the initial burn.

This study has relevance for environmental policy in coming years, say the researchers; their holistic modelling approach could be applied to other disturbances, gravitative hazards (such as rock fall), and forest species. This could help policymakers to plan appropriate pre- and post-fire forest management in the face of climate change, and as populations and infrastructure densities increase in mountainous regions across Europe.