Enhancing the Resilience of Our Forests

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Forest Fires in Galicia A Recurring Problem

According to statistics, Galicia is, by far, the European region with the largest average burned area. The high rate of vegetation growth along with the climatic conditions in Galicia justify this reality, which is further exacerbated by the presence of irresponsible individuals who intentionally or carelessly cause large forest fires.

FIGURE 1. Vegetation recovery in burned areas previously occupied by pine (areas with bare soil) and chestnut (areas with soil covered by a green mantle of vegetation), one (top) and two (bottom) years after the fire.

Vegetation can burn intensely, causing widespread devastation, or in a controlled manner through prescribed burns. Uncontrolled fires, reaching temperatures of hundreds of degrees, lead to a total destruction of vegetation, preventing its development in subsequent years. In contrast, in controlled burns, vegetation rejuvenates within months. This reality explains the varying degree of resilience of Galician forests to the type of fire, as indicated by the vegetation recovery rate. The USC (University of Santiago de Compostela) conducts research on controlled burning and the recovery of burned areas in projects such as Open2preserve (Interreg-SUDOE), Pyric labs (Ministry of Economic Affairs and Digital Transformation), COMPAS (Biodiversa) and the LIFE VAIA and Silfore projects.

The Case of the Lor Margen Izquierdo Common Woodland Soil and Vegetation Resilience

The Lor Margen Izquierdo Common Woodland burned in September 2021. As seen in the photograph, two years later, most of its surface has still not recovered, appearing almost desert-like. However, within this overall observation of its recovery, areas that are recovering more quickly are visually discernible. Studies conducted within the VAIA project have deepened our understanding of the causes behind this differentiation in burned forest recovery, aiming to increase the resilience of Galician forests to fires and, crucially, their recovery to preserve the soil.

The area showing better year-on-year recovery, as seen in the photograph, is linked to the vegetation history of the burned forest. In the area with greater recovery today, chestnut trees burned, while in the area with poorer recovery, pine trees burned. Chestnut trees, therefore, generate greater soil resilience to the extreme event of fire and consequently a much faster ecosystem recovery.

The reason for this resilience lies in the phenology of the forest species itself. Chestnut trees, being deciduous, annually incorporate their leaves into the soil after falling, whereas evergreen pine trees do not experience this annual leaf fall, so they are not incorporated into the soil with the same regularity. However, when the canopy closes in a pine stand, limiting light entry, the leaves that do not receive light dry out and detach, depositing on top of the duff without being immediately incorporated into the soil. This can be seen in the "cushion" of leaves often found in pine forests. The different composition of pine and broadleaf species' leaves explains the difficulty of incorporating the former, as they contain lignin and polyphenols that limit their decomposition and subsequent incorporation into the soil. This pine needle litter deposited on the soil creates a dry material that favors the rapid spread of fire due to its composition and dryness within the pine stand. Soil studies after the fire used pH as an indicator. pH ranges from 0 to 14, with optimal values around 6.5 where soil biological activity is maximized. The pH of chestnut soil is closer to 6.5 than that of pine before and after burning, which partially explains its recovery.

Prescribed burning, conducted under controlled conditions, is commonly used as a system for controlling plant fuel and improving pastures in shrubland. It offers a differentiated resilient behavior, as although the aerial part of the vegetation also burns, its root system remains in the soil. This allows that, after the pH increase caused by controlled or prescribed burning, the powerful root system favors the rejuvenation of shrubland and the establishment of herbaceous species, which are much more palatable than the existing vegetation before the burn. The use of these re-sprouts through grazing helps to increase plant fuel control over a prolonged period.

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