  

Plant traits driving the recolonization patterns after a high-intensity forest fires in dry inner-alpine valleys

In 2003, an extensive forest fire consumed over 300 hectares of woodland on a mountain slope near Leuk, Switzerland. This event stands as one of the most significant fire incidents of the past century in Switzerland, resulting in the near-complete elimination of all aboveground plant life across various forest ecosystems within the elevation range of 900 to 2100 meters above sea level. In response to this ecological disruption, a systematic grid of 150 research plots was established. Over subsequent intervals of one, two, three, four, ten, and twenty years following the fire, these plots became the focal point for an in-depth investigation into the process of natural recolonization.

The primary objective of this master's project is to identify the traits of plant species that have successfully recolonized the burned area. This analysis will be refined by taking into account three key factors:

Successional Stage: This dimension explores the time that has passed since the fire and the subsequent stages of ecological succession. It seeks to understand how these factors influence the traits of the plant species pioneering the regrowth.

Elevation: Elevation serves as a surrogate for a complex interplay of temperature and precipitation patterns. It provides insights into the environmental challenges plants face during the recovery process and how these challenges shape their traits.

Distance to the Edge: The proximity of the burned area to existing forests plays a pivotal role in the availability of seed sources. Investigating this spatial factor enables us to unravel how seed dispersal and colonization traits are affected by the presence of nearby unburned vegetation.

This research is structured in a sequence of steps:

Trait Definition: Initially, we will establish a set of traits that are likely critical to understanding the post-fire recovery process. These traits encompass various characteristics, such as seed dispersal distances and the ability to resprout, among others. These traits play a vital role in how plant species respond and adapt to the changed ecological dynamics.

Data Collection: We will collect data on these selected traits for all plant species. This data collection will involve mining existing trait databases and scientific literature. It is possible to plan trait measurement in the field. The goal is to create a comprehensive repository of plant traits in the study area for further analysis.

Trait Distribution Analysis: The focus of this research project lies in analyzing how these traits are distributed across space and time. We will employ a range of spatio-temporal statistical techniques to unveil patterns and relationships that emerge as plant communities recolonize the burned landscape. This analytical approach will illuminate how traits change across the study area and over the 20-year timeline. Ultimately, it promises to provide fresh insights into the primary drivers behind recolonization in the wake of a high-intensity forest fire, particularly in landscapes not historically prone to such events.

In summary, this master's thesis project offers a nuanced understanding of the traits that give certain plant species a competitive edge in post-fire recolonization and illuminates the intricate interplay between time since the fire, elevation, and proximity to unburned forests, shedding light on their roles in shaping the recovery of the plant community. This can make substantive contributions to the broader understanding of post-fire ecosystem resilience in landscapes not accustomed to frequent fire events.

Collaboration:

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