

Submitted Abstract

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Abstract

Changes in climate and land-use are two key factors for shrub-encroachment in alpine and arctic tundra ecosystems. In the Alps, the trend of abandoned grassland has continued to grow since the 1950s, yet there is poor knowledge of its consequences, specially under future climate change scenarios. Several studies have already pointed out significant differences in ecosystem functioning with shrub-encroachment in sub-alpine grasslands, such as shifts in biogeochemical cycles, microbial communities, and plant-soil stoichiometry. For instance, the presence of shrubs promotes the accumulation of more recalcitrant compounds with lower decomposition rates, leading to lower N-availability and nutrient-poor soils. The morphology of shrubs, which differ from those of forbs and graminoids, can also have an impact on soil moisture through shading. However, there is still a gap in knowledge regarding how these changes play along the succession. We hypothesize that rather than a continuous change, shrub encroachment results in a tipping point in the functioning of ecosystems. The LUCSES project - forecasting impacts of land-use and climate change on ecosystem services from shrub-encroached mountain grassland- is addressing these questions in the French and Austrian Alps. The Austrian site is located in the Stubai valley (1900-2200 m) near Neustift, where we are studying 10 x 10 m plots with different degrees of shrub encroachment in sub-alpine grassland. Samples were collected between the months of June and September 2021. We collected soil samples for biochemical analysis as well as for profiling fungal communities. Our results show lower pH, higher soil water content (SWC), higher soil organic matter (SOM), and higher leaf and soil C:N ratios in shrub-encroached plots. Our results also suggest that there is a tipping point in these trends along the shrub-encroachment gradient. Our data suggests that the presence of shrubs alters the biogeochemical cycles of grasslands and therefore may result in lower diversity and important changes in ecosystem functioning, which might possibly have spillovers in the delivery of ecosystem services.