



Dynamics between functional groups in alpine grasslands: How will the balance between functional groups change if climate warming leads to a decline of bryophytes?

By: Mads Markussen, Mari Thorsen, Frida Wickmann, Akuonani
Zakeyo and Tomas Zapasnikas.



Introduction

The climate is predicted to become warmer and wetter in Norway with climate change ⁽¹⁾. How will this affect the flora? FunCaB ⁽²⁾ is a dataset from a plant removal experiment in the western fjords of Norway, carried out on a gradient of elevation and precipitation. Can we use this data to see how the balance will shift between the functional groups if one functional group faces decline?

We take a closer look at bryophytes, as they are expected to decline in a warmer climate ^(3, 4). How will the remaining groups of graminoids and forbs react? Will there be a trend in who ends up dominating in different altitudes and precipitation zones?

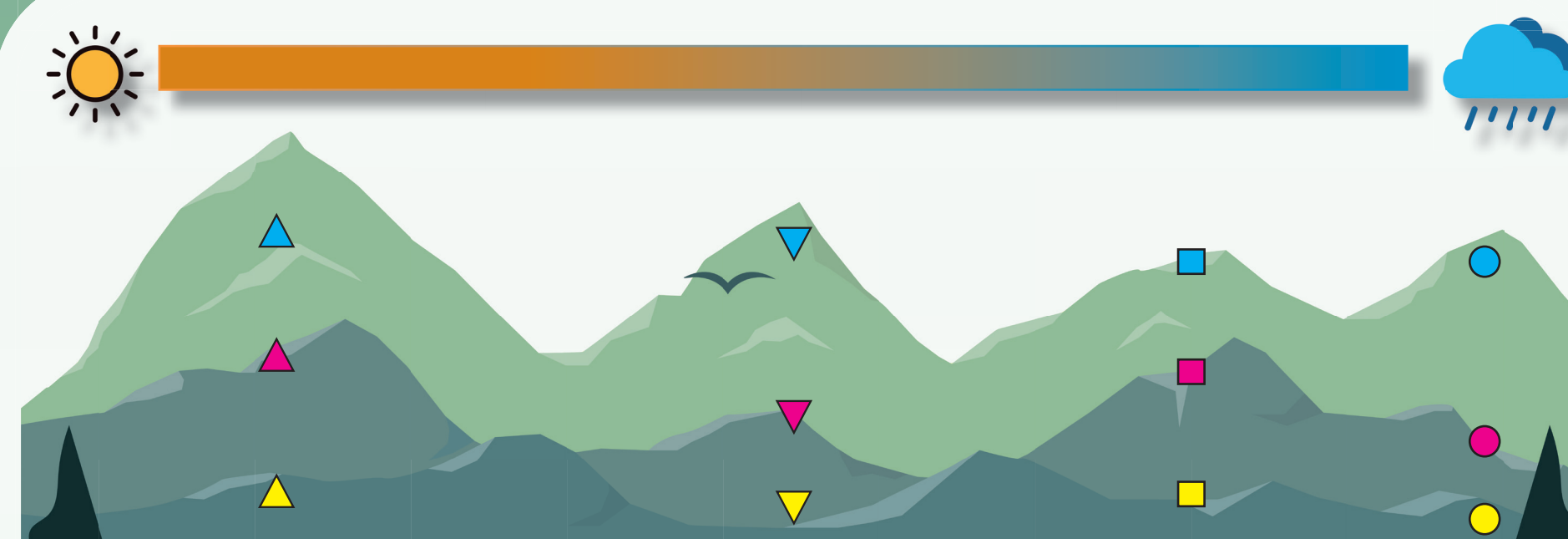


Figure 1:
Overview of the sites that were used in the FunCab experiment in western Norway, they vary in elevation (▲, ▲, ▲) and precipitation level (▲, ▼, ■, ●).

Materials and Methods

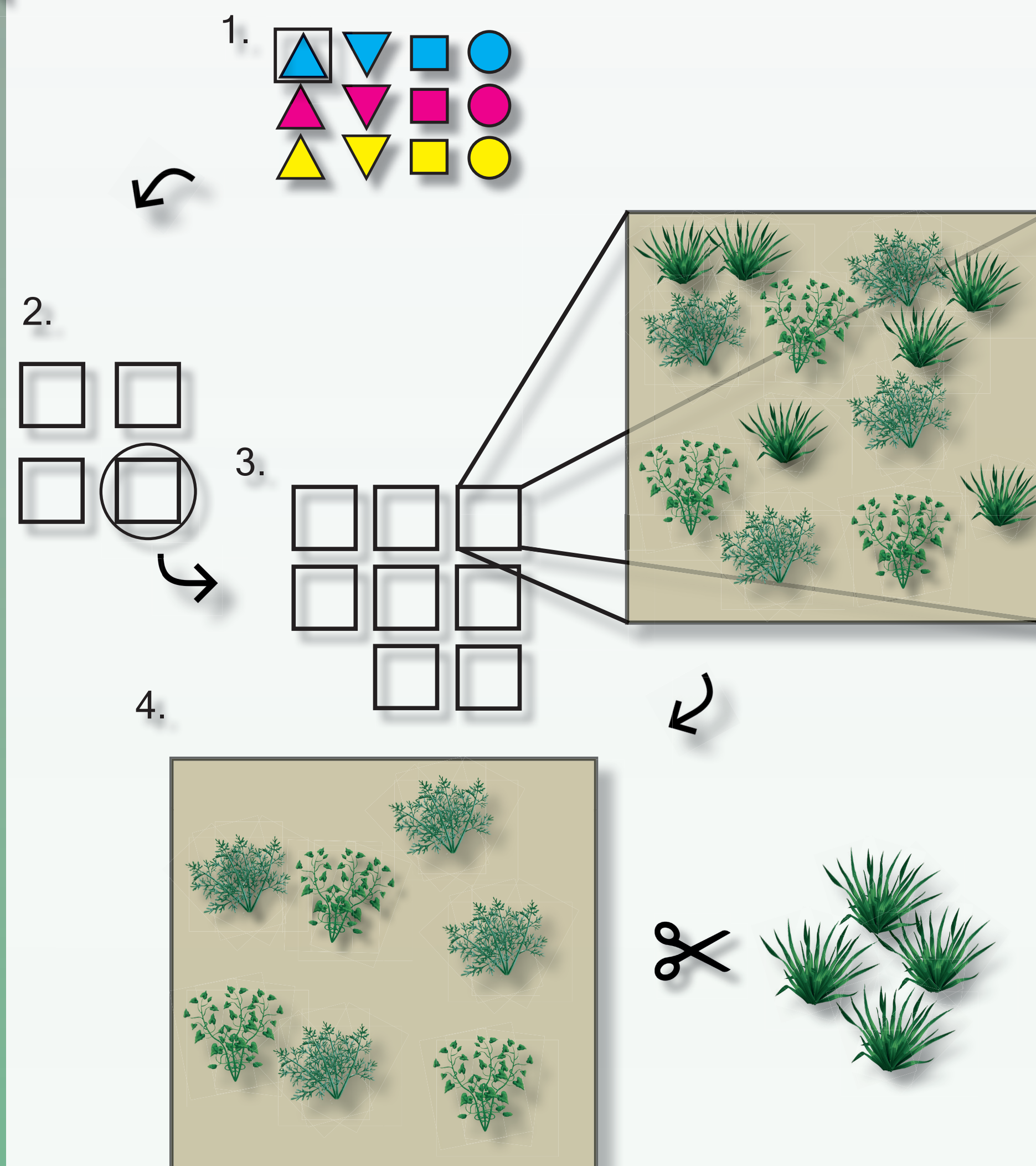


Figure 2:
12 observation sites in the Norwegian fjords, distributed on 3 temperature zones and 4 precipitation zones (1). At each of the 12 sites, four blocks were marked (2), and within each of these 8 25cm x 25cm plots were selected, each containing different treatments (3). We focused on the treatment where forbs, graminoids and bryophytes were present, and the bryophytes were removed (4). The remaining functional groups were observed, and their cover percentage noted. We used RStudio to analyse the data.

Results

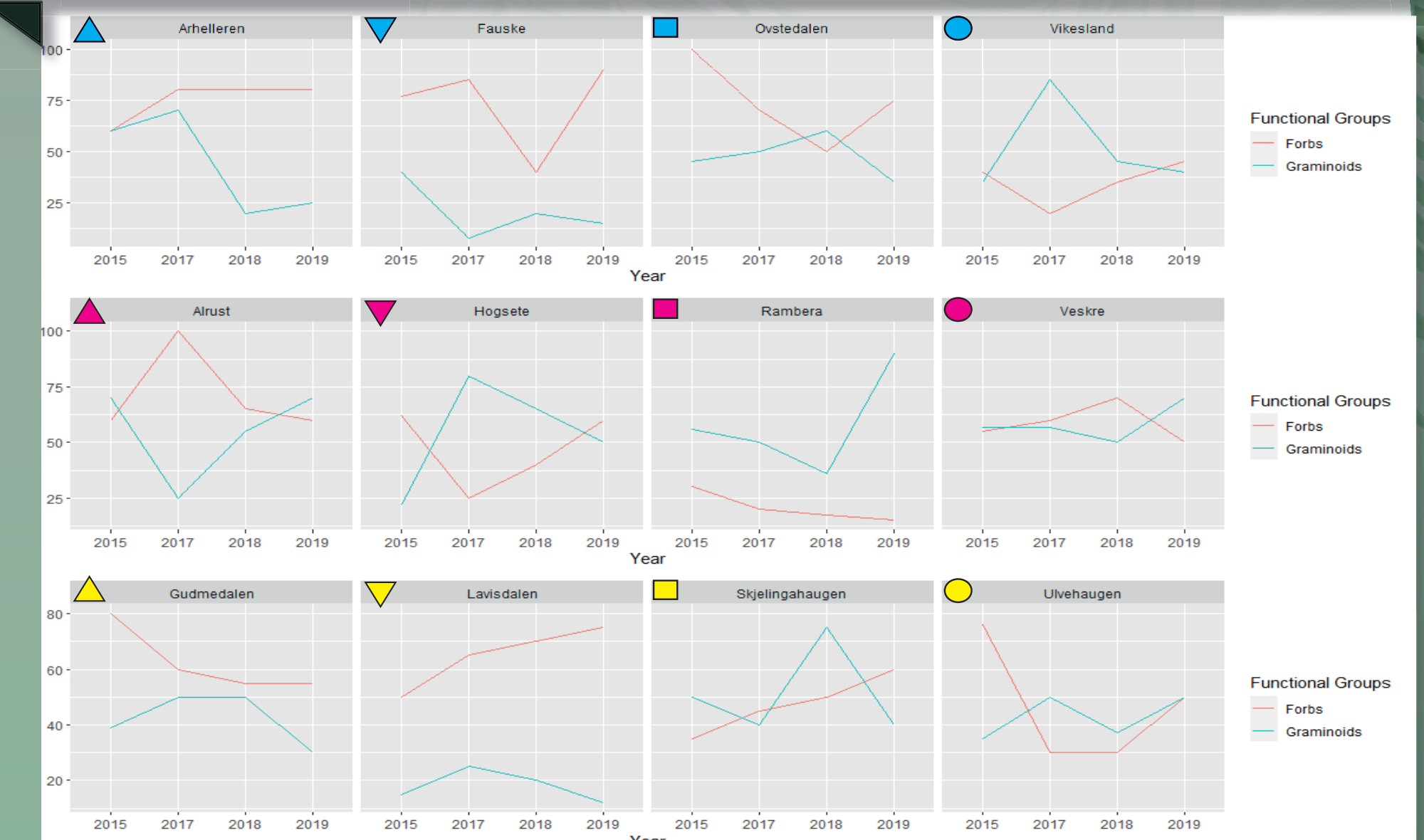


Figure 3:
Change in cover percentage of graminoids and forbs in plots with bryophyte removal treatment, from 2015 to 2019.

Discussion

No major trends were observed on the dynamics of the remaining functional groups after removing the bryophytes, but a pattern of graminoid domination with increased precipitation was visible. There is a pattern along the precipitation gradient: forbs dominate in the two driest precipitation zones, except for Hogsete. Graminoids dominate in the wettest precipitation zones, except for Veskre, and Ovstedalen. Earlier research ⁽⁵⁾ states graminoids increase with precipitation and supports our finding.

The data from each site is only represented by four plots, this creates great uncertainty in the results. It is not enough data to confirm any trends, and further observations are needed to evaluate the dynamics between them, also after stabilization.

In addition, none of the plots had the same community composition at start, this makes it challenging to compare data between the sites. The surveillance of control plots should have been included in our analysis, to see if the fluctuation happens without removal, and a standardized group-composition could help us determine if the establishment is due to lottery competition ⁽⁶⁾.

References

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