

Restoration of species-rich grasslands: nutrient availability and species establishment

Olivier Huguenin-Elie, Cornel J. Stutz, Rafael Gago and Andreas Lüscher; olivier.huguenin@art.admin.ch
Agroscope Reckenholz-Tänikon Research Station ART, CH-8046 Zurich; www.agroscope.ch

Background

Persisting high nutrient availability in the soil and/or seed limitation probably impede the restoration of species-rich grasslands.

Objective

Assess the influence of nutrient availability on the establishment of forb species in existing swards.

Materials and Methods

- 17 different NPK levels (0 to 60 kg N, 0 to 23 kg P and 0 to 111 kg K per year) were applied over 14 years to a meadow of the *Arrhenatherion* alliance.
- Seeds of 27 forb species were oversown (broadcaster with roller). The presence of each species of vascular plants was recorded 3 years after oversowing.
- Before oversowing, treatments differed in nutrient availability and yield but not in the number of forb species.

Results

- The largest number of forb species was found in the unfertilized treatment and the lowest in the treatments with high NPK application, with a difference of up to 5 species per 10 m².
- The number of forb species in the swards showed a linear relationship with above-ground productivity (Fig. 1).
- Twelve species of the oversown seed mixture were newly found in the field (Fig. 2).
- The number of new forb species showed a negative linear relationship with above-ground productivity ($P < 0.001$, $b = -1.2$).

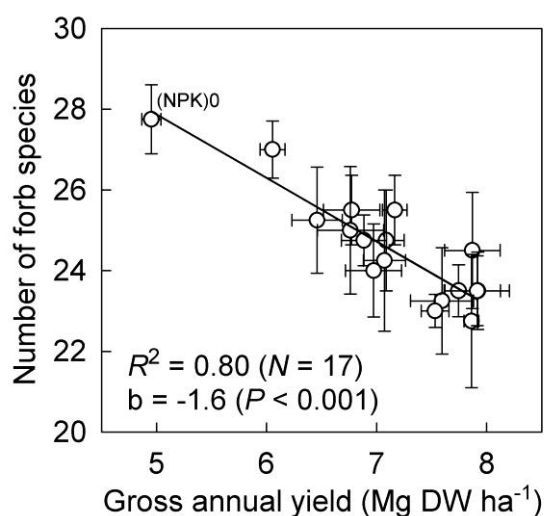


Fig. 1. Relationship between above-ground productivity and number of forb species in the swards three year after oversowing. Shown are treatment means ($N = 4$) \pm SEM

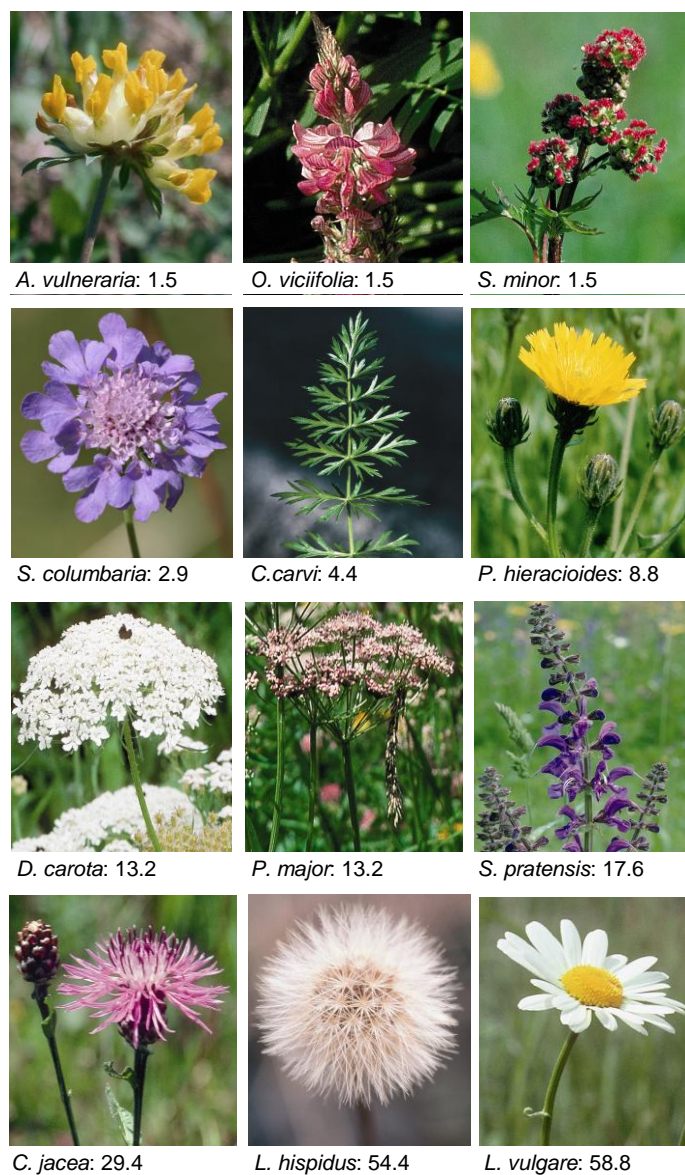


Fig. 2. Frequency (%) of the forb species that had established in the experimental field three years after being oversown. Frequency = Number of plots with presence/Total number of plots

Conclusions

- Colonization of forb species in existing swards is more likely to occur when biomass production is limited by low nutrient availability.
- Under low nutrient availability, oversowing seeds in an existing swards can lead to the establishment of a few new species.
- The differences in the number of newly established species were small, indicating that restoration of diversity in existing swards remains difficult even at low nutrient availability.

