Seed banks and fire; A study from heathlands in western Norway

BACKGROUND

Dormant seeds in the soil serve a dual function in plant populations. They are "memories of populations and communities past", and at the same time a potential for future persistence and survival. Hence the longevity of seeds in the soil affects the resilience of plant communities.

Propagule input is an important and integral part of the successional process where the successful recruitment may be limited either by the availability of seeds, or by the availability of safe sites where the seedlings may germinate and establish. Local seed availability may be affected by e.g. seed-source density, dispersal strategy and predation, while microsite availability may be affected by e.g. competition, disturbance, and grazing. In the open heathland landscape seed-sources may be sparse, and while the availability of safe sites may be the major limitation in heavily grazed heathland areas, seed limitation may become the most important limiting factor as grazing pressure decreases.

Heathlands are influenced by many factors leading to vegetational change. Burning and grazing have been the most commonly employed management practices in west Norwegian heathlands.

A proper understanding of how heathlands respond to disturbance must take account of seed production, dispersal, seed bank- and germinability dynamics. In cyclic vegetation types such as heathlands, seed banks are particularly important so that the species can survive locally with time.

Few studies have focused on the temporal changes in seed banks during cyclic heathland succession. Very few studies deal with the role of the seed bank in post-fire recovery, and particularly in heathlands. In this study we investigated the relationship between vegetation composition and seed bank in burnt heath of varying age using a chronosequence. It is part of a larger heathland project focusing on the different effects of management and abandonment on heathland succession.

The island Lyse is situated at 60º 42' N and 5º 5' E, in the Lofotenfjorden fjord basin, approximately 20 km inland from the Norwegian west coast, 40 km north-west of Bergen. The area has a characteristic oceanic climate with relatively small differences between June and January mean temperatures; 2ºC and 12ºC respectively (Aaen 1993), a long growing season of ca. 220 days above 5ºC, abundant precipitation at 1600 mm (Førland 1993) that is relatively evenly distributed throughout the year, and strong winds. The area seldom experiences snow cover or periods of frost.

The size and the quality of the viable seed bank may both be determinants for successful heathland management and restoration. These findings emphasize the need for continued management measures in order to maintain the dynamic heterogeneity characterizing the heathlands of western Norway.

QUESTIONS WE WILL EXPLORE IN THE FUTURE

- What causes the high Calluna germination in the first two years following burning? Does it reflect increased seed input? Or could it be due to changed chemical properties of the soil? Do charcoal particles deposited on the surface absorb germination inhibitors and allelopathic chemicals?
- What is the relationship between seed bank and vegetation along a successional gradient following fire? To what extent does the seed bank contribute to the diversity and composition of the vegetation in the course of succession?
- How important is a buried seed bank of desirable species to heathland management and restoration? What conditions facilitate germination and establishment of these species?
- What is the relative importance of dispersal, in space and in time, for successional dynamics?
- How does the seed bank density and composition change with climate?

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