

Glacial outwash plain as an experimental setting for understanding proximate causes of vegetation patchiness.

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Vegetation succession is a directional change in structure and species composition of plant communities. It is ultimately determined by the available species pool (i.e. influx of seeds), and beyond that by safe sites for plant establishment and growth. The aim of this study is to understand how factors related to seed dispersal and environmental heterogeneity limit plant colonization and influence small scale vegetation patterns in early primary succession.

Our setting is the homogeneous and flat outwash plain of Skeiðarársandur, S. Iceland, where the limited environmental variability is likely to be controlled by a few factors that may influence i) patterns of seed input (e.g. if depressions “catch” seeds) and ii) seedling establishment through variation in microclimate (e.g. humidity, wind) and soil factors. We selected variation at two different scales. The undulating topography with shallow depressions and ridges at a scale of ca 100 m² (vertical difference ca 0.5 m) may influence seed distribution and environmental factors. On a microscale (0.1 m²), the lee side of stones and already established plants, particularly cushion and caespitose plants, may catch seeds, and provide both shelter and a more favorable environment.

In spring of 2005 two sites with a vegetation cover of <5% but signs of rapid succession, were selected. The study was divided into four parts: i) Estimates of seed bank size and species composition, ii) Natural seedling emergence and establishment, iii) The survivorship of transplanted seedlings and iv) Measurement of environmental variation i.e. pH, grain size distribution and water retentiveness.

i) Mean soil seed bank was 798 germinable seeds/m². Differences among depressions and ridges were not significant (df=1, p>0.5). Significant small-scale variation was found: the number of germinable seeds was significantly higher on the lee side of stones and established plants than on level ground (df=2, p=0,001). ii) During the 2005 growing season, only 5% of the seed bank emerged on the sandur (36.5 seedlings/m²) and survivorship from beginning of July to end of August was about 52%. Monitoring will continue in 2006. iii) In spring 2005, 792 seedlings of six native species were planted on the sandur. Five of the species were grown from seeds collected on the sandur. Survival at the end of the growing season was 45%. Next summer monitoring of the plants will continue and more species will be planted. iv) Measurements of environmental factors will be done in the autumn of 2006.

First results indicate that even though the seed pool is small, both in size and species diversity, unfavourable environmental conditions and lack of suitable habitats for emergence and survival of seedlings are likely to be more limiting to plant establishment and vegetation succession.