The Effect of Disturbance on the Seedling Recruitment and Persistence of *Braya longii* and *Braya fernaldii*

by
Laura Noel

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Department of Biology
Memorial University of Newfoundland.

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Abstract

Braya longii and *B. fernaldii* (Brassicaceae) are endemic to limestone barrens on the Great Northern Peninsula, Newfoundland. In 1997, COSEWIC (Committee on the Status of Endangered Wildlife in Canada) designated them as endangered and threatened respectively. These arctic-alpine plants cannot persist without disturbance, which causes gaps in the vegetation. As these gaps allow colonization, they are crucial habitat for stress tolerating ruderals such as braya. Understanding the effects of disturbance on seedling recruitment and persistence of *B. longii* and *B. fernaldii* is imperative when defining critical habitat for the Braya Recovery Plan. With increasing rates of anthropogenic disturbances on limestone barrens, it is becoming critical to understand the effects of disturbance on seedling recruitment and long term persistence, when attempting to conserve appropriate habitat for recovery. Five sites (2 *B. longii*, 3 *B. fernaldii*) were chosen to compare recruitment and persistence patterns between anthropogenic and natural disturbance regimes. In each site distribution of substrate type, level of disturbance, and size classes of braya were mapped. The density of each size class was then calculated for each substrate type. This study compares the seedling recruitment and persistence (flowering individuals with one or more rosettes) between the two braya species, as well as between various disturbance regimes and substrate types. There was no significant difference between the numbers of *B. longii* and *B. fernaldii* for all size classes on naturally disturbed substrate such as gravel and mud, and areas surrounding frost boils. Seedling density is higher in anthropogenically disturbed sites but, persistence is higher in naturally disturbed sites for both species. At naturally disturbed sites, braya densities were highest on substrates experiencing intermediate levels of disturbance. The edges of frost boils contained the highest densities of braya. Areas of higher disturbance such as the centers of frost boils or areas of very low disturbance, such as vegetation mats had significantly lower densities of braya. Substrates of intermediate disturbance such as the edges of frost boils and other elevated mud extrusions encompass a high density of braya, yet are only found in small scattered patches on the landscape and make up a only a small percentage of the available habitat. Other substrates, such as limestone gravel and boulder gravel, have lower densities of braya, but are more prevalent on the landscape, so they contain a higher mean number of individuals. Braya in anthropogenically disturbed habitats were observed to have higher levels of lepidoptera larvae predation than in naturally disturbed habitat in both species. Larvae may reduce plant fitness by decreasing seed productivity and increasing mortality, as holes in the silique suggest that they are consuming the seeds as well as the leaves and flowers. Both species of braya in anthropogenically disturbed habitat also bloom and disperse seeds approximately 2-3 weeks earlier than braya in natural sites. Non-overlapping blooming times is a very powerful isolating mechanism which can limit gene flow between the natural and anthropogenic populations of braya. Limestone barrens are a unique habitat and need protection. However, protection of crucial habitat to ensure long-term persistence of both braya species must include areas intermediate disturbance surrounding frost boils.