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Reproductive challenges of a rare grass, *Calamagrostis porteri* subsp. *insperata* (Swallen) C. Greene: implications for habitat restoration

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Abstract

Background: Habitat management for reproductively challenged rare species is a problem when there is insufficient knowledge of their autecology. This study investigated reproductive failure in the rare grass *Calamagrostis porteri* ssp. *insperata* (Swallen) C. Greene (Reed bentgrass). Does the management recommendation of high light stimulate clonal growth, flowering, and seed production?

Location: Shawnee National Forest, IL, USA, and in a greenhouse and an experimental garden at Southern Illinois University, Carbondale, IL, USA.

Methods: Clones obtained from the three known Illinois populations were grown in a glasshouse under experimental light and soil moisture treatments. After 3 years, plants from the high light treatment were planted outside in an experimental garden where the light treatments were maintained for two more years. In the field, vegetative and flowering tiller density, canopy cover, and associated biotic and abiotic variables including abundance of co-occurring plant species were monitored for 5 years. The overhead tree canopy was cleared over a portion of one population.

Results: In the glasshouse, plants increased in size under high light and moist soil, and there were size differences among populations. Sixty-six per cent (20 of 30) of the genets flowered when planted outdoors under full sunlight but did not produce seed. In the field, flowering only occurred in *Calamagrostis* growing in the cleared area, but no seed were produced. The plants in the flowering population were smaller than plants in the other two populations. The herbaceous community associated with *Calamagrostis* in the open diverged from the communities remaining under the shade.

Conclusions: This study highlights the difficulty of managing reproductively challenged rare species. *Calamagrostis* populations can be managed to enhance clonal growth, but establishment of new populations would require translocation of vegetative material as it is highly unlikely that seed can be obtained.

Keywords: Autecology; *Calamagrostis porteri* ssp. *insperata*; Clonal growth; Habitat restoration; Rare plant conservation; Reproduction.

Nomenclature: Mohlenbrock (2002).

Introduction

The need to restore habitats of rare and endangered species is a central tenet of restoration ecology (Montalvo et al. 1997). To develop appropriate habitat restoration plans require detailed information on the population biology of the rare species concerned, especially their breeding system (Schemske et al. 1994; Weller 1994), and how ecological and genetic influences may affect population demography, especially as they affect reproduction and fitness (Sipes & Wolf 1997).

It is also important to determine the balance or emphasis to place on restoration whether it is for a single species of concern, the community as a whole or some other anthropogenic management goal (Brown 1994). Management to increase the population of a rare species may compromise other members of the community, while whole-habitat restoration or whole-ecosystem management may disadvantage certain desired species and be wholly unsuitable for a rare species (Simberloff 1998). Moreover, restoration for a single species is difficult when the species has precise habitat requirements that may be incompletely known. Some rare species