From Forest Nursery Notes, Winter 2008

© 51. Tools for *Carew* revegetation in freshwater wetlands: understanding dormancy loss and germination temperature requirements. Kettenring, K. M. and Galatowitsch, S. M. Plant Ecology 193:157-169. 2007.

Plant Ecol (2007) 193:157–169
DOI 10.1007/s11258-006-9255-8

ORIGINAL PAPER

Tools for *Carex* revegetation in freshwater wetlands: understanding dormancy loss and germination temperature requirements

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Received: 25 May 2006 / Accepted: 5 December 2006 / Published online: 11 January 2007

Abstract *Carex* is a globally distributed genus with more than 2000 species worldwide and *Carex* species are the characteristic vegetation of sedge meadow wetlands. In the mid-continental United States, *Carex* species are dominant in natural freshwater wetlands yet are slow to recolonize hydrologically restored wetlands. To aid in *Carex* revegetation efforts, we determined the dormancy breaking and temperature germination requirements of 12 *Carex* species. Seeds were cold stratified at 5/1°C for 0-6 months and then incubated in light at 5/1°C, 14/1°C, 22/8°C, 27/15°C, or 35/30°C. We found that all *Carex* species produced conditionally dormant seeds. The optimal temperature for germination for all but three species was 27/15°C. As is the case in other species with physiological dormancy, cold stratification increased germination percentages, broadened the temperature range suitable for germination, and increased germination rates for most species, but the magnitude of the effects varied among species. Many species germinated to 80% at 27/15°C without cold stratification and at 22/8°C with ≤1 month of stratification but required much longer stratification (up to 6 months depending on the species) to germinate to 80% at 14/1°C and 35/30°C. Our findings illustrate how a stratification pretreatment can greatly benefit *Carex* seed sowing efforts by triggering rapid germination to higher percentages. We recommend that cold stratification be targeted towards species with strong dormancy or used across a wider range of species when seed supplies for restoration are limiting. For *Carex* revegetation, establishing *Carex* canopies rapidly may help to prevent the invasion of undesirable species such as *Phalaris arundinacea*.

Keywords Cold stratification • Prairie pothole wetlands • Sedge • Seed ecology • Wetland restoration

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Introduction

Restoring native plant diversity to degraded ecosystems is a fundamental goal of many restoration projects. However, the natural recolonization of many plant species in restorations is constrained by seed availability, especially because of seed dispersal limitations in increasingly fragmented landscapes (e.g., Holl et al. 2000; Holmes and