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Techniques to Promote Garry Oak Seedling Growth and Survival in Areas with High Levels of Herbivory and Competition

Abstract

Though regeneration of Garry oak (*Quercus garryana*) seedlings within Garry oak ecosystems is important to maintain this threatened habitat, seedling regeneration is often poor. Two independent studies were initiated in the early 2000s to examine questions surrounding Garry oak recruitment: one at the Crow's Nest Ecological Research Area (CNERA) on Salt Spring Island, BC, and another at the Pacific Rim Institute for Environmental Stewardship (PRI) on Whidbey Island, WA. In both areas, Garry oak seedlings were caged and monitored for growth and relative health. Over 8 years at CNERA, growth of caged plants outpaced growth of controls, which was indicative of high browsing pressure and relatively high palatability of Garry oak seedlings to black-tailed deer and feral sheep. The PRI oaks grew more slowly and at four PRI sites survival was 30-50% over 5-6 years as compared to 90% survival at CNERA over 8 years. The mortality at PRI was likely due to a combination of dry summer conditions and large numbers of voles, which took advantage of the cages for protection from predators; furthermore, lack of mycorrhizal hosts could have inhibited seedling establishment. Weed block inside enclosure cages provided ideal nesting conditions for voles. This study demonstrated that the caging of Garry oak seedlings, although labor-intensive and requiring frequent maintenance, provides valuable protection from large ungulate browsers and can be maintained as a relatively long-term measure, but vigilance is required to protect young seedlings from other threats such as voles or competing vegetation.

Introduction

In the Pacific Northwest, Garry oak (*Quercus garryana*), also known as Oregon white oak, represents a foundation species in various savanna and woodland community types that occur from northern California to southern British Columbia, wherever rainfall is relatively low, and often in areas with a strong rain shadow effect (Stein 1990, Gonzales and Clements 2010). In British Columbia annual precipitation in Garry oak habitats ranges from ca. 60–120 cm (Roemer 1993). The existence of relatively high populations of Garry oaks in some areas is attributed to anthropogenic influences. Large areas of the relatively open, savanna and prairie-like ecosystems where Garry oak trees thrive are thought to have been maintained since the last glacial period

by aboriginal peoples, who used fire to enhance the habitat and productivity of plants with edible bulbs such as common camas (*Camassia quamash*), particularly in the northern range of *Q. garryana* (Turner 1999).

Euro-American settlement in the Pacific Northwest impacted Garry oak populations and associated ecosystems through a reduction in fire frequency, invasion by non-native vascular plants, and increased deer populations (Pellatt et al. 2001, MacDougall et al. 2004, Lea 2006, Gonzales and Clements 2010). Evidence suggests that in many areas, a new cohort of Garry oak trees was recruited around the time of Euro-American settlement, with very little subsequent recruitment (Thilenius 1968, Dunwiddie et al. 2011, Gilligan and Muir 2011).

In light of the vulnerability of Garry oak ecosystems in the Pacific Northwest, recruitment of new oak trees is a significant issue. Challenges to regeneration may be

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