Considerations for Conservation and Restoration of Canada Yew in Protected Areas

Steve K. Windels¹, ³
¹Voyageurs National Park
360 Hwy 11 E.
International Falls, MN 56649

David J. Flaspohler²
²School of Forest Resources and Environmental Science
Michigan Technological University
Houghton, MI 49931

INTRODUCTION

Canada yew (Taxus Canadensis Marsh.), or ground hemlock, is an evergreen shrub native to the mixed conifer-hardwood forests of northeastern North America. Prior to Euro-American settlement, it was likely a major ground cover component in late-successional mesic forests of this region (Martell 1974; Windels and Flaspohler 2011). Canada yew has been extirpated, or its abundance significantly reduced, from most of its range in the United States. Several factors are often implicated in this reduction, including the conversion of forest habitats to agriculture and short-rotation forestry, intense slash fires following the logging of primary forests, and the subsequent increases in white-tailed deer (Odocoileus virginianus Z.) populations following these large-scale disturbances (Stachowicz and Allison 1995; Windels and Flaspohler 2011). Large, but often isolated, populations of yew still remain in the United States and southern Canada, including many protected areas such as U.S. national parks. In particular, many of the highest quality populations of yew persist on Great Lakes islands lacking deer, including most of the islands in Apostle Islands National Lakeshore and South Manitou Island in Sleeping Bear Dunes National Lakeshore.Remnant populations may also persist in areas from which deer typically emigrate in winter due to heavy lake-effect snowfall, such as in Pictured Rocks National Lakeshore (Windels and Flaspohler 2011). Canada yew in many areas remains under threat, however, from local increases in white-tailed deer or moose (Alces alces L.), habitat degradation, or overharvesting of yew for pharmaceutical compounds. Windels and Flaspohler (2011) provide a comprehensive review of the ecology of Canada yew, including its distribution and abundance through history, its interactions with components of forest ecosystems, and the effects of ungulates on its growth, reproduction, and survival. In an effort to improve conservation of extant populations or encourage restoration in areas where yew has been extirpated, we identify additional management and conservation issues aimed at preserving this declining species.

Effects of Forest Management

Canada yew does not persist after deforestation (Glenn 1999) and appears highly sensitive to clearcutting or other intensive timber harvest (Metzger and Schultz 1984; Stachowicz and Allison 1995; Glen 1999; Moola and Vasseur 2008). Overstory removal often reduces soil moisture and understory humidity below the tolerance of Canada yew (Windels and Flaspohler 2011). However, it appears that maritime conditions can moderate these effects. For example, Canada yew remained dominant in primary forests after clearcutting on several of the Apostle Islands, Wisconsin, in the twentieth century (Judziewicz and Koch 1993). Reestablishment or recolonization of Canada yew on land cleared for agriculture or heavily logged has been known to occur naturally, though only after a minimum of 30–100 years. Such natural recolonization appears to depend on local site conditions, including presence of remnant individuals, distance to source populations, and herbivore density (Stachowicz and Allison 1995; Howard and Lee 2002).

Canada yew does appear to tolerate less intensive timber harvest. In a northern hardwood stand in Ontario, selection harvest reduced Canada yew cover by 40% one year after harvest, but yew recovered to near pre-harvest levels after three years (Holmes and Pitt 2007). Similarly, Canada yew was often most abundant and lush in actively managed stands in Upper Michigan (S. Windels, unpub. data). Canada yew experiences optimal growth rates in canopy gaps < 300 m², such as those created in a single-tree selection harvest system (Holmes et al. 2009; Windels and Flaspohler 2011). Creation of larger gaps can decrease Canada yew abundance (De Grandepre and Bergeron 1997). Rooting from equipment often kills Canada yew stems directly (S. Windels, pers. obser.) but it may also cause unsuitable conditions for establishment or survival of new stems by compacting soil and decreasing drainage (Buckley et al. 2003). Patches of Canada yew can often be found cleanly bisected by haul roads and skid trails > 30 years after the last harvest (S. Windels, pers. obser.). Negative effects of timber harvest on Canada yew can be mediated by:

(1) creating canopy gaps < 300 m²
(2) creating buffers around existing patches of Canada yew, particularly with respect to use of heavy equipment that can compact the soil
(3) leaving slash in place to increase moisture conditions and provide protection from browsing mammals; and
(4) harvesting timber in the winter to lessen