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Survival and Growth of Planted Yellow-Cedar Seedlings and Rooted Cuttings (Stecklings) near Ketchikan, Alaska

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ABSTRACT

The survival and growth of yellow-cedar (*Chamaecyparis nootkatensis*) seedlings and rooted cuttings (stecklings) were monitored for 6 years after planting at three sites near Ketchikan in southeast Alaska to determine whether stecklings could serve as a suitable planting stock. Survival for both seedlings and stecklings was >85% at the three sites. Survival, final diameter, and final height differed by site but not by the use or absence of Vexar as protection from browsing by Sitka black-tailed deer (*Odocoileus hemionus sitkensis*). Vexar produced a lower rate of browsing but contributed to form problems (especially leaving trees leaning and prostrate on the ground). Seedlings had significantly greater diameters than stecklings even though they experienced a higher rate of browsing at one site. Differences in diameter and height likely were due to genetic variation rather than seedling or steckling stock type. Stecklings appear to be a suitable source of planting stock; when used for large-scale reforestation efforts, genetic considerations are essential. Planting recommendations for maximizing yellow-cedar establishment during regeneration are given.

Keywords: Alaska-cedar, *Chamaecyparis nootkatensis*, artificial regeneration, browsing

Yellow-cedar (*Chamaecyparis nootkatensis* [D. Don] Spach) [1] is culturally, ecologically, and commercially important in southeast Alaska. The maritime climate with year-round precipitation in the region favors abundant natural regeneration of most conifers after timber harvesting. As a result, only a modest tree-planting program exists in the region, with a primary focus of increasing the number of trees of favored species. There is a concern, however, that yellow-cedar does not regenerate in sufficient numbers following natural disturbances or timber harvests in some areas. Reasons for poor or sporadic natural regeneration in these areas are not understood and could relate to the 2-year cone maturation, low seed production, poor germination rates, competition, or heavy browse on seedlings by deer.

A widespread mortality problem, called "yellow-cedar decline," has resulted in about 200,000 ha of concentrated mortality in yellow-cedar throughout southeast Alaska. Recent research on the problem indicates the cause is a form of freezing injury to roots induced by warmer winters, reduced snowpack, and periodic freezing events in early spring (Beier et al. 2008, Hennon et al. 2006, Schaberg et al. 2005, Schaberg et al. 2008). A management strategy is being developed that recommends promoting yellow-cedar regeneration through planting and thinning on sites considered to be free of the decline problem now and into the future (Hennon et al. 2008). The combined losses from the decline problem and continued timber harvest suggest that successful regeneration of yellow-cedar is needed to ensure the sustainability of this valuable species. The management of stock quality; control of competition from herbs, shrubs, and conifers; and protection from browsing will be important components in a successful regeneration program.

Hennon (1992) conducted a small planting of yellow-cedar seedlings on Etolin Island in Alaska and reported good survival (>85%) and growth (heights of approximately 110 cm) after 5 years on productive, well-drained soils. Competing vegetation was noted as limiting survival and growth, particularly where planting was not performed promptly after harvest. There are no other reports in the literature of yellow-cedar planting results in Alaska; however, the Tongass National Forest did have an active yellow-cedar planting program in the 1990s.

Research and operational experience with yellow-cedar artificial regeneration in British Columbia is probably applicable in southeast Alaska. Difficulty in collecting cones and low seed germination rate due to seed-coat–imposed dormancy (Pawuk 1993, Raimondi and Kermode 2004, Bonner and Karrfalt 2008) led to the development of yellow-cedar stecklings—planting stock produced by rooted cuttings rather than from seed (Karlsson 1974, 1981). Interestingly, vegetative reproduction is common for yellow-cedar in unmanaged forests. Parish and Antos (2006) contend that many mature yellow-cedar trees in natural stands originate from layering, the rooting of lower branches. Antos and Zobel (1986) noted the occurrence of layering in natural stands of the Cascade Mountains in Oregon and Washington. Hennon et al. (1990) reported the same phenomenon in Alaska and suggested that vegetative reproduction occurred more

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This article uses metric units; the applicable conversion factors are: millimeter (mm): 1 mm = 0.039 in.; meters (m): 1 m = 3.3 ft.