Assessing the competitive effects of r

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Red alder is a common component of low-elevation Coastal Western Hemlock (CWH) zone forests in southwestern British Columbia and often grows intimately with young conifer stands on highly productive sites. Red alder is valuable as a source of lumber, improves long-term site productivity, may mitigate the effects of root disease on Douglas-fir, and contributes to biodiversity and forest health at both the stand and landscape levels (Hibbs and DeBell 1994). It is also a strong competitor in young conifer stands (Shainsky and Radosevich 1992).

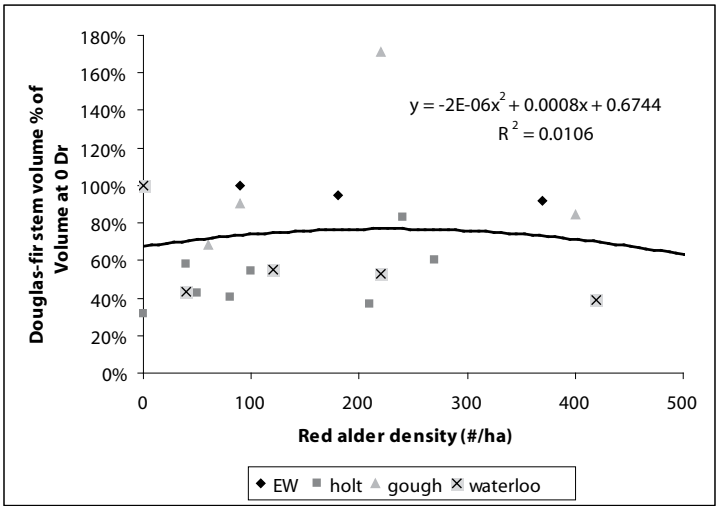

Figure 1. *Effect of red alder density on average volume of individual Douglas-fir at age 10–12 years after planting. Values expressed as a percentage of values at zero red alder density.*

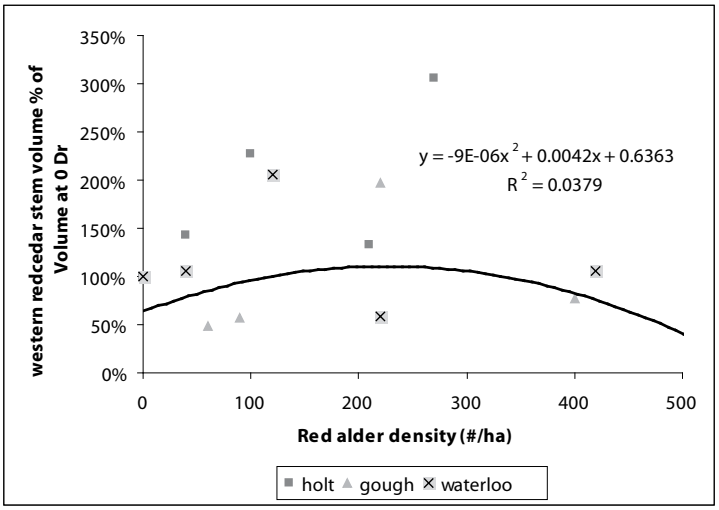

Figure 2. *Effect of red alder density on average volume of individual western redcedar at age 10–12 years after planting. Values expressed as a percentage of values at zero red alder density.*

Young red alder rapidly overtop juvenile conifers, which results in subsequent challenges and costs associated with meeting current free growing obligations.

Because lower levels of light reach the overtopped conifers, Douglas-fir growth in mixtures with red alder is often less than in pure stands. However, the competitive effects of alder on light may be offset by its ability to fix atmospheric nitrogen. Nitrogen fixation rates in alder stands usually range between 20 and 85 kg/ha per year (Binkley *et al.* 1994; Binkley 2003). On at least some sites, low densities of red alder enhance conifer growth. Red alder management in conifer or mixedwood stands requires balancing the detrimental effects of overtopping alder on understorey light with the nutritional and other benefits provided by the alder. To do this successfully, a better understanding of the effects of red alder densities on conifer and mixedwood stand development is required.

In 1992, field studies (Experiment Project 1121.01) were initiated in the South Island and Sunshine Coast forest districts to examine and demonstrate the effects of red alder on stand dynamics and nitrogen availability. This project used mixed red alder and conifer plantings to assess the competitive effects of red alder on Douglas-fir and western redcedar (Table 1). These plantings were established in 1992, 1994, and 1999 as part of a set of replacement series and additive experiments. The two replacement series installations at East Wilson and Holt creeks are also part of a network of five "Type 3" installations established by the Hardwood Silviculture Co-operative (see ***http://www.cof.orst.edu/coops/hsc/geninfo/index.htm#research***; three other installations have been established in Oregon and Washington).

Additional information on this project, including a summary of results from each site and selected references, is provided in a BC Ministry of Forests and Range extension note by Thomas *et al.* (2005).

Analysis of data collected in 2004 from the 1992 and 1994 installations indicates variation in the effects of alder between sites. This data also suggests that alder has little effect on growth of Douglas-fir (Figure 1) or western redcedar (Figure 2) during the first 10–12 years after planting when densities are below 400 trees per hectare. Tree and Stand Simulator (TASS) estimates of potential effects of alder on light at two-thirds the height of Douglas-fir seedlings suggest that greater competition may occur in the near future at densities of 400 trees per hectare or higher (Figure 3). TASS light simulations also indicate that competition for light is of little concern at alder densities of 200 stems per hectare or less.

At the Malcolm Knapp Research Forest, a related ongoing study has shown that red alder densities above 1,000 trees per hectare affected the stem volume growth of eight-year-old Douglas-fir and western redcedar.

When grown at such low densities, alder wood quality is a

ed alder on coastal conifer plantations

concern. Where alder and conifers are grown as crop species on the same block, it may be advantageous to grow them in small discrete patches. Since alder patches can improve nitrogen availability over a distance of 15–20 m into adjacent conifer stands (Lavery *et al.* 2004), one suggested approach is to create 30–40 m wide conifer patches with alder patches established between them. Further study is required to determine the ideal number, size, and arrangement of alder patches required to produce quality alder and to achieve different management objectives.

Ongoing measurement and analysis of the EP1121 installations is planned. As these stands develop, analysis will examine stand as well as individual tree characteristics.

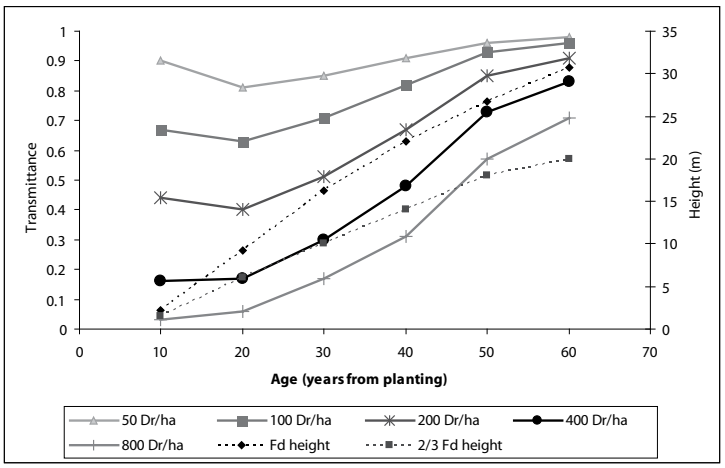

Figure 3. *TASS III model predictions of light (transmittance) levels at two-thirds the height of Douglas-fir (Fd) for five densities of red alder (Dr/ha). Douglas-fir height (dashed lines) was estimated using SiteTools (BC Ministry of Forests 2004) for a site index of 30 m at 50 years.*

References

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More Information

Please visit the following Web sites:

BC Ministry of Forests and Range Research Branch ***http://www.for.gov.bc.ca/hre/standman/trtmixwood.htm***

Center for Enhanced Forest Management ***http://www.cefm.rr.ualberta.ca/Index.asp***

Hardwood Silviculture Cooperative ***http://www.cof.orst.edu/coops/hsc/***

Western Boreal Growth and Yield Association ***http://www.wesbogy.rr.ualberta.ca/***

Table 1. *Field installations established for replacement series and additive experiments*

Study	Installation	District	Subzone[a]	Year established	Conifer species planted
Replacement series	East Wilson Creek	Sunshine Coast	CWHdm	1992	Douglas-fir
	Holt Creek	South Island	CWHxm	1994	Douglas-fir
Additive	Waterloo Creek	South Island	CWHdm	1992	Douglas-fir and western redcedar
	Gough Creek	Sunshine Coast	CWHdm	1992	Douglas-fir and western redcedar
	Holt Creek	South Island	CWHxm	1994	Douglas-fir and western redcedar
	Malcolm Knapp Research Forest	Chilliwack	CWHvm	1999	Douglas-fir and western redcedar

[a] CWHdm=Dry maritime, CWHxm=Very dry maritime, CWHvm=Very wet maritime