



Growing Mixtures of

WE NEED TO ACCEPT A COMPONENT OF ALDER IN REGENERATING conifer plantations due to the important ecological role of red alder and its potential contributions to site productivity.

There are many benefits to red alder:

- It can increase soil nitrogen and lead to long-term improvements in nitrogen availability and site productivity.
- It is resistant to laminated root rot and it can reduce or ameliorate its effects on Douglas-fir.
- It is useful for reducing weevil injury to Sitka spruce.
- It is an important component of riparian zone ecosystems.

However, there are also problems. Several studies indicated that red alder can be a strong competitor with Douglas-fir, western redcedar and other species, due to its much more rapid initial height growth and dense canopies that intercept light. These studies suggest that the nutritional benefits alder can provide to Douglas-fir on sites that are nitrogen deficient may not occur where nitrogen supplies are adequate (Miller and Murray 1978, Binkley 1983, Cole and Newton 1986). As a result, red alder can seriously reduce the growth of conifers on moist sites that are not nitrogen deficient (Cole and Newton 1986).

Recent work indicates a substantial variability in the effects of alder in relation to climate, site and soil factors (Comeau et al 2007) on the growth of associated conifers. These studies indicate little effect of alder at densities up to 400 stems per hectare on growth of Douglas-fir or western redcedar to ages 10 to 12, suggesting that alder might be less competitive in BC than has been observed in Oregon. On some sites the presence of between 100 and 300 alder per hectare may be beneficial to Douglas-fir.

However, competition for light may be problematic in the future when alder densities exceed 400 sph (stems per hectare) on fresh and moist sites. Measurements at age eight from an experiment near Maple Ridge (CWHvm1, moist site) have shown increases in soil nitrogen availability and Douglas-fir foliar nitrogen concentrations with increasing alder density (Cortini and Comeau 2008). At this site, growth of both Douglas-fir and western redcedar declined with increasing densities of red alder, and growth reductions exceeded 30% when red alder densities exceeded 500 sph. In contrast, growth of western hemlock was unaffected by red alder at densities of up to 1,100 sph. Nevertheless, field observations and other studies indicate that when western hemlock is overtopped by high densities of alder, its growth can be reduced on many sites.

Figure 1.

This photograph illustrates both the strong competitive effects of red alder when established at 400 stems ha⁻¹ on a moist site and the problem with retention of lower branches and resulting potential wood quality problems when alder are grown at such low densities.



Red Alder and Douglas-Fir



Continued research is needed to help in determining the site specific influences of red alder but interim results suggest that red alder densities should be kept below 100 sph (uniformly spaced trees) when it is being grown with Douglas-fir on moist sites, with higher densities of alder being acceptable on drier sites (ie. 200 or 300 sph or higher on fresh or drier sites or perhaps higher densities on sites where alder are overtopped by the conifers within the first 10 years).

However, when alder is grown at these low densities, it will retain lower branches for many years, leading to branchy trees of poor form with a wide knotty core that will have low or no commercial value (except for firewood). Conifers will likely only serve as trainer trees if they maintain heights of at least 60% of the height of the alder from early ages.

One option for growing higher quality alder is to establish it in patches of adequate density. While alder patches may be any desired size (but large enough so that sufficient interior trees exist to provide quality logs), it might be ideal for conifer patches to be less than 40 m wide so that most trees benefit from nitrogen input that can occur up 20 m from standing alder (Lavery et al. 2004, Comeau et al. 2007). When growing Sitka spruce, conifer strips may need to be narrower and oriented with the long axis going east-west to reduce weevil impacts.

Crop rotations of red alder with conifers are another possibility and may be particularly useful on sites with laminated root disease. Crop rotations could also avoid problems with yield declines observed with multiple rotations of alder on some sites.

In summary, we should not try to extirpate every alder from plantations and results suggest that we can accept 100 stems per hectare or more alder (depending on site) in conifer plantations with little risk of loss in conifer yield and perhaps with yield improvements. The potential to establish and manage patchy (or aggregated) mixtures needs to be explored further. Continuing research is needed to help determine appropriate densities and to provide us with a better understanding of the long-term influences of red alder on stand dynamics and site productivity. 🌲

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Additional resources are listed on our website

Figure 2.

On fresh or drier sites, Douglas-fir can often keep up with red alder in terms of height growth. Alder will likely have little competitive effect and may be beneficial if present at reasonable densities on these sites.