Extension Note

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British Columbia's Coastal Forests

Red Alder Stand Establishment Decision Aid

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Introduction

Red alder (*Alnus rubra*) is a common component of low-elevation Coastal Western Hemlock (CWH) biogeoclimatic zone forests in southwestern British Columbia, and is the most abundant broad-leaved species in coastal British Columbia. It can influence nutrient cycling in the forest and contribute to site nitrogen capital and long-term productivity through the process of symbiotic nitrogen fixation. Red alder is resistant to laminated root rot (*Phellinus weirii*), and its presence may reduce or ameliorate the disease's effect on Douglas-fir. It contributes to biodiversity at both the stand and landscape levels. In addition, there are presently strong markets for red alder and it is harvested to produce lumber for remanufacturing into mouldings, furniture, and pallets, as well as chips for pulping. Red alder's value is in its clear wood, which means management regimes that improve wood quality and shorten rotation age over natural stands will be more profitable.

This Stand Establishment Decision Aid (SEDA) is intended as a general aid for managing red alder in British Columbia's coastal forests. A more complete discussion of red alder management can be found in Peterson *et al.* (1996). Additional information sources are found in the Resource and Reference list at the end of this document.

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KEYWORDS: Alnus rubra (*red alder), red alder plantation management, British Columbia's coastal forests.*

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Red Alder – British Columbia's Coastal Forests

BC Ministry of Forests and Range, Research Branch

A two-year-old red alder/conifer mixture near Duncan, BC.

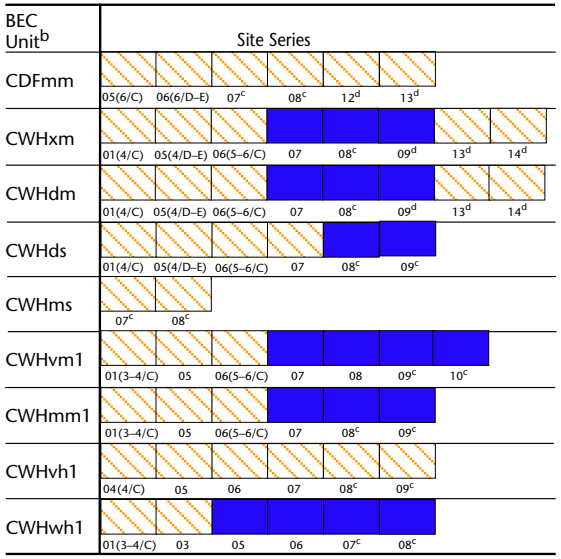
Characteristics of Sites with Red Alder

- Minimum moisture regime of fresh and a nutrient regime of medium
- Aerated root zone ≥ 30 cm
- Abundant winter precipitation or root contact with seepage moisture or groundwater
- Well-drained upland or alluvium sites
- Common on recently disturbed sites (e.g., floodplains, logging roads, landslides, burns, and clearcuts)

Red Alder Management Considerations

- Site-specific evaluation is the most important step when planning for red alder regeneration and management.
- Identify and avoid frost pockets prior to planting.
- Intensive management is required when managing red alder for sawlogs in the short term (e.g., 20–30 years).
- Manage for wood quality (clear boles).
- Red alder growth is rapid during the juvenile stage and declines after 50 years.

Site Series (Edatopic Classes) where Optimal Red Alder Growth Occurs[a]



[a]Courtin *et al.* (2002).
[b]See Meidinger and Pojar (1991) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.
[c]= alluvial floodplain site
[d]=fluctuating water sites

Potential Red Alder Growth Key

- Medium–Good
- Optimal

- The demand for alder wood products is high when compared to other coastal British Columbia broadleaves.
- Intensive, short-rotation management of alder should be limited to more productive sites (Site Index ≥ 27 m).
- Mixed-species forests that include alder can increase forest productivity and provide a variety of other ecosystem management values.

Silvicultural Considerations: Plantation Establishment

Site Preparation

- To reduce natural regeneration of alder, minimize soil disturbance and exposure of mineral soil.
- To reduce vegetation competition and to maximize survival and growth, pre-planting vegetation control measures may be required.
- Growth is impacted when vegetation cover is > 50% and survival of alder is reduced if vegetation cover exceeds 90%.
- Second-year vegetation can have a negative impact on growth and vegetation control measures may be required.
- Planting is the preferred regeneration method for the production of high-quality sawlogs. Vegetation management may be required if alder site dominance is not achieved in the first three years.

Planting

- 1100–1700 stems per hectare (sph) are recommended. At this density alder will rapidly occupy the site, so control understorey vegetation and promote early self-pruning. Thinning may be required to promote early diameter growth.
- Bareroot seedlings are the preferred stock type.
- Desirable seedling characteristics: caliper of > 4 mm, a height 20–40 cm, disease-free, fibrous root system, no damage, localized seed source, presence of nitrogen (N)-fixing nodules, and healthy buds along the entire length of the stem.
- Red alder should be planted after the risk of frost is over (mid-March to mid-April), but before summer drought stress.
- Seedlings should be planted deep into the mineral soil with minimal scalping to avoid heat stress. Avoid wood in the planting hole. Root collar should be at least 2.5 cm below the soil.
- Stems are brittle; handle with care.
- Use crews experienced or trained in alder planting.
- Common damaging agents include, but are not limited to: deer/elk browse, antler rubbing, sunscald, alder flea beetle, alder bark beetle, and sapsuckers.

Thinning

- The best time to thin is measured by "stage of development" instead of age. Alder progresses through stand development stages faster than conifers, creating a narrow management window.
- Thinning in both planted and natural stands should be conducted before crown recession exceeds 40–50% (approximately 8–10 m). In managed stands, crown recession takes approximately 10 years and in natural stands, it takes approximately 10–15 years.
- Never remove more than 60–70% of stems.
- Variables such as site quality, planting density, available markets, rotation age, timber supply, etc. will affect the decision to thin.
- To keep brush down and to reduce sunscald, avoid opening the stand excessively.
- Maintain uniform spatial arrangements or alder will lean into openings, reducing wood quality.
- Felling is effective at reducing intra-specific competition and helps prune residual stems.
- Thinning should consider local potential of weather damage (snow, wind) that can snap stems after opening the stand.

Pruning

- Pruning improves wood quality.
- Prune after thinning as falling of thinned trees will effectively remove most dead branches on the leave trees, significantly reducing pruning costs.
- When pruning, do not remove more than 60% live crown. Healing rates are similar between live and dead branch pruning.
- Timing of pruning (summer versus winter), or branch type (live versus dead) does not affect healing rates and thus wood quality.

Specific Autecological Characteristics

- The indeterminate growth pattern of red alder allows it to grow in height at any time when growing conditions are favourable. This trait makes red alder susceptible to early- and late-season frosts.
- Alder is a relatively short-lived tree, reaching maturity and maximum stand volume between 50–70 years.
- Alder trees can produce seed as early as 5 years of age, but dominant trees in a stand usually produce seed at 6–8 years of age. Some seed is produced every year, and large numbers of alder seed may be expected in most years.
- Seed collection is best done prior to the end of January (Hibbs and Ager 1989). Collection can be done by felling or climbing.
- Red alder seed is very light and susceptible to desiccation. Germination primarily occurs on moist mineral soil.
- Red alder seedlings need full sun for normal development. However, they can tolerate partial shade for a number of years.
- Free-growing saplings can be produced from seed in about 2–4 years on suitable sites.
- Alder is a drought-intolerant species. As well, young alder can be very susceptible to frost damage. Good alder sites ensure adequate growing season moisture; avoid frost prone areas.
- Although young alders sprout vigorously after cutting, their capacity for vegetative reproduction is greatly reduced after 10–15 years and managing sprouts is not a recommended practice.
- Other than black cottonwood, red alder requires more light than any of its associated tree species (shade intolerant).

Other Values/Considerations for Red Alder

Wildlife Food and Habitat

- Red alder contributes to biodiversity both at the stand and landscape level through its effect on tree species and structures, wildlife, and the understorey.
- Red alder is resistant to laminated root rot (*Phellinus weirii*) and only mildly susceptible to armillaria (*Armillaria ostoyae*).
- Living and dead alder provide foraging and nesting habitat for birds and mammals.

First Nations' Values

- Red alder wood is used to make eating implements, to smoke meats, and to build fires. The outer bark provides an orange-red dye and the inner bark is edible.
- The wood is also used for making feast bowls, masks, and rattles.
- Alder bark is valued for a variety of medicinal purposes.

Other Benefits and Considerations

- Red alder can improve soil productivity through fixation of atmospheric nitrogen (approximately 100–300 kg/ha/yr), and through nutrient input from litterfall. Red alder litterfall increases organic matter content in the soil, leading to improved soil aeration and lower soil bulk density. The leaves are a preferred food source for earthworms, which help to incorporate organic matter into the soil.
- Although the exact nutritional requirements are not known, phosphorus appears to be important in alder growth and development.
- Red alder growth and yield estimates are available using the software programs TASS (Tree and Stand Simulator) and TIPSY (Table Interpolation Program for Stand Yield) developed by the BC Ministry of Forests and Range. These programs are used for timber supply review and silviculture planning, and for predicting project stand characteristics over time (i.e., density, volume, lumber, and economics). URL: *http://www.for.gov.bc.ca/hre/gymodels/*

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Test Your Knowledge . . .

British Columbia's Coastal Forests: Red Alder Stand Establishment Decision Aid

How well can you recall some of the main messages in the preceding extension note? Test your knowledge by answering the following questions. Answers are at the bottom of the page.

1. Red alder is managed for:
   - A) pulp wood
   - B) clear boles
   - C) biodiversity

2. The recommended density range for planting red alder is:
   - A) 1400–1600 stems per ha
   - B) 2200–2400 stems per ha
   - C) 1700–2200 stems per ha

3. Red alder should capture and dominate the plantation site:
   - A) within 2 years after planting
   - B) within 1 year after planting
   - C) within 3 years after planting
   - D) between 3 and 5 years after planting

Answers

1. B
2. C
3. C