

Stand Establishment Decision Aid for nutrient-deficient, salal-dominated sites

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Introduction

This Stand Establishment Decision Aid (SEDA) for the Coastal Western Hemlock (CWH) biogeoclimatic zone is the first SEDA for the coastal region. We have focused on site series that have been studied since the early 1980s as part of the Salal Cedar Hemlock Integrated Research Program (SCHIRP). The objectives of this program are:

- to determine the underlying causes of poor growth of regenerating western redcedar (*Thuja plicata* Donn.), western hemlock (*Tsuga heterophylla* [Raf. Sarg.]), amabilis fir (*Abies amabilis* Dougl.), and Sitka spruce (*Picea sitchensis* [Bong.] Carr.) on cutovers of old-growth cedar-hemlock forests invaded by salal (*Gaultheria shallon* Pursh) on the west coast of North America; and
- to establish the best operational means for improving productivity on these sites.

The first section of this SEDA describes identifying characteristics of sites that will likely develop nutrient deficiencies. This is followed by some general information about harvesting and the goals of silvicultural treatment. The third section identifies site series that are likely to require treatment to improve conifer growth and nutrition. The fourth section outlines some possible silvicultural considerations to attain treatment goals. These include site preparation, planting and fertilization, and stand tending. Sites in the CWH often have important values for First Nations groups and for non-timber forest products. These values are described in the fifth section so that they may be considered in any management plan. Finally, we list some additional sources of information about these sites and their management.

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Coastal Western Hemlock Biogeoclimatic Zone – Nutrient-deficient, Salal-dominated Sites

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Nutrient-deficient western redcedar.

Site Series That May Require Treatment To Improve Conifer Establishment and Growth Following Clearcut Harvesting

BEC Zone*	Subzone	Zonal	Drier Site Series	Wetter Site Series
CWH	vm1	01s	03	06s

Treatment Necessity Key

	Low – Treatment may be required
	Moderate – Treatment likely required
	High – Treatment almost always required

* See Meidinger and Pojar (1991) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

Note: Other subzones (e.g., CWHvh) in the CWH may be susceptible to this problem, but will not be included in the hazard table until such speculation is confirmed by existing or future research studies.

Common Characteristics of Nutrient-deficient Cedar-Hemlock Sites

- Below 600 m elevation.
- High annual rainfall, mild winters, and cool summers.
- Soils are generally imperfectly drained to moderately well-drained Duric Humo–Ferric Podzols.
- Pre-harvest forest consists of fairly open old-growth western redcedar (*Thuja plicata* Donn.) and western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), with a dense salal (*Gaultheria shallon* Pursh.) understorey and a deep mor humus layer.
- Dense salal cover re-establishes within 10 years of harvest.
- Poor tree growth (i.e., less than 10 cm/year for western hemlock, Sitka spruce [*Picea sitchensis* (Bong.) Carr.], and amabilis fir [*Abies amabilis* (Dougl.) Forbes]) and yellowing of foliage. Often these symptoms are coincident with the re-establishment of salal.

General Management and Harvesting Considerations

- Nitrogen and phosphorus deficiencies severely limit the growth of western hemlock, Sitka spruce, and amabilis fir. The primary goal of forest management in these areas is to improve nutrient availability to the trees by fertilizing them and by reducing competing vegetation.
- Accelerating crown closure in stands may eliminate or suppress salal through shading. Reducing salal cover may increase nutrient cycling and improve conifer nutrition and growth.
- Poor conifer nutrition on these sites can be prevented or alleviated through fertilization.

Silvicultural Systems

- Harvesting systems other than clearcutting have not been examined. Salal vigour may be reduced through the sudden increase in sunlight and damage to above-ground structures associated with clearcut harvesting.

Silvicultural Considerations

Establishment/Regeneration

SITE PREPARATION

- Site preparation that reduces salal cover and provides good planting sites improves seedling and sapling responses to fertilization. Scarification treatments that break and pull up salal rhizomes slow re-invasion. Removing salal by hand is also effective, but prohibitively expensive.
- A light burn following harvest decreases salal competition during the first few years after plantation establishment.
- Garlon™ (in a diesel carrier) at 3.5 kg active ingredient per hectare reduces salal cover. In eastern Canada, herbicides (e.g., glyphosate) with an added surfactant (Sylgard®) have successfully controlled similar ericaceous shrubs with waxy cuticles, and may be effective for controlling salal.

PLANTING AND FERTILIZATION

- Plant seedlings immediately after harvest and site preparation to maximize stand establishment and growth before salal re-sprouts or re-invades the site. If possible, plant at higher densities (1400–1800 trees per hectare) to help accelerate the stand to crown closure.
- When fertilizing at time of planting, place fertilizer teabags or tabs which provide N and P near seedlings (no closer than 5 cm) and near soil surface. Note that risk of seedling damage or mortality may increase depending on environmental factors and the closeness of fertilizer placement. Release characteristics of the fertilizer should be tested annually.
- If the site will not be fertilized or if fertilization regime maintenance is uncertain, plant western redcedar, which is less affected by nutrient problems than other conifers. Cedar growth improves with fertilization; however, fertilized trees in some areas may require protection from wildlife browse.
- Planting spruce or amabilis fir is not recommended owing to the poor performance of these species on nutrient-deficient sites. For spruce or amabilis fir already on-site, growth may be improved by fertilizing with N and P. However, fertilization may increase the susceptibility of Sitka spruce to weevil (*Pissodes strobi* Peck.) attack.
- Although western hemlock grows poorly on these sites, it is very responsive to fertilization. If fertilization is planned, then hemlock can be planted, but it may require multiple fertilizations during the rotation.

Plantation Maintenance

- On previously established sites where crown closure has not been achieved and conifers are showing signs of nutrient deficiency, growth can be improved by fertilization, or by fertilization combined with salal control (e.g., brushing or herbicide).
- To maintain good seedling growth to crown closure, re-fertilize conifers once with 225–250 kg N/ha and 75–100 kg P/ha, and then every 5–10 years with 225–250 kg N/ha. One to three additional fertilizations with N, or N + P, may be needed to reach crown closure.
- Broadcast fertilizer applications are not recommended until trees are large enough to capture a significant amount of nutrients. Instead, apply fertilizer within the drip line of individual trees.



Other Values of the Species

First Nations' Values

- Salal berries were an important fruit for coastal Aboriginal people. Today, the berries are used in jams and preserves.
- Western redcedar is of great importance to many coastal First Nations. Traditionally, the wood was used to construct canoes, buildings, totem poles, baskets, and various household items. Cedar bark was used to make clothing and baskets. Standing trees altered by First Nations groups are referred to as “culturally modified trees” and are important archaeological and heritage sites.
- Western hemlock wood was used to make household items. Tannins extracted from hemlock bark were used to tan hides and make dyes.

Non-timber Forest Products

- Picking salal for floral greenery is the second largest non-timber forest product industry in British Columbia.
- Western redcedar boughs are harvested and their essential oils distilled for use in fragrances, cosmetics, and pharmaceuticals. Conifer boughs from fertilized sites are also used for Christmas wreaths and decorations.
- Silvicultural treatments, such as thinning, pruning, and fertilizing (co-management), may increase the amount of commercial-quality salal, as well as other non-timber forest products.

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