*Extension Note*

**BC Journal of Ecosystems and Management**

*British Columbia's Coastal Forests*

# Paper Birch and Fireweed Stand Establishment Decision Aids

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## Introduction

The Coastal Western Hemlock submaritime biogeoclimatic subzones (CWHds1 and ds2) occur in the inland valleys of coastal British Columbia, where the climate is commonly transitional between the province's coastal and interior regions. Vegetation management issues in these subzones include species such as fireweed (*Epilobium angustifolium*) and paper birch (*Betula papyrifera*). On wetter, rich sites of the CWH zone, management options for other vegetation (e.g., salmonberry, devil's club, and elderberry) are well documented; however, little research has focussed on the competing species found primarily in the submaritime British Columbia subzones.

A field guide for the region (Green and Klinka 1994) lists a number of vegetation concerns for the CWH's submaritime subzones. Practitioners, however, have identified a need for more information about paper birch and fireweed. The vegetation management Stand Establishment Decision Aids (SEDAs) included in this extension note are designed to fill this gap. Although initially developed to address the needs of coastal managers, much of the information presented here can be applied to other areas of the province experiencing similar issues related to successful conifer regeneration. Most of the content was adapted from previously published information on paper birch and fireweed management in the former Cariboo Forest Region (Swift and Turner 2002).

The majority of the information provided for paper birch emanates from research conducted in the province's southern interior (Simard 1996; Simard and Henigman 1996), where birch is well distributed and can affect crop tree regeneration and survival. Earlier legislation required free-growing trees to be 150% of the height of competing vegetation; however, the relatively small canopy of paper birch compared to other hardwood species such as alder makes it a less serious deterrent to conifer development. Therefore, foresters working in the CWH's submaritime subzones must determine the effect that existing levels of birch will have on the short- and long-term growth of crop trees. Additionally, research has shown that birch within a regenerating stand of Douglas-fir are beneficial to ectomycorrhizal development (see Jones *et al.* 1997; Simard *et al.* 1997a and b). Licensees working in submaritime subzones, where a shift from timber-oriented objectives to ecosystem biodiversity and long-term site productivity objectives may occur, could greatly benefit from further research into the effects of paper birch on regeneration.

This extension note provides a general guide for managing paper birch and fireweed in the Coast Forest Region. Peterson *et al.* (1997) provide a more complete discussion of paper birch throughout the majority of its range. Additional information sources for both paper birch and fireweed are listed in the Resource and Reference sections.

### Acknowledgements

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**KEYWORDS:** Betula papyrifera, *Coastal Western Hemlock, competing vegetation,* Epilobium angustifolium, *fireweed, harvesting, non-timber values, paper birch, silviculture.*

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# Paper Birch – British Columbia's Coastal Forests

Paul Wray, Iowa State University, http://www.forestryimages.org

## Site Characteristics

- Paper birch occurs on medium to rich, open sites with well-drained soils.
- Commonly found with cottonwood, maples, salmonberry, thimbleberry, fireweed, willow, and bracken fern.
- The CWHds1 (up to 650 m elevation) and ms1 (650–1200 m elevation) biogeoclimatic variants occur in the upper Fraser River drainages north and east of Chilliwack, and the eastern portion of the Coast Mountains from upper Harrison Lake to the Homathko Valley.
- The CWHds2 occurs mainly at low elevations (valley bottoms to 500 m) north of the head of Knight Inlet in the Klinaklini, Bella Coola, Talchako, and Dean valleys.
- The CWHms2 occurs at low elevations (valley bottoms to 700 m) in the lower Kimsquit River valley, as well as along Southern Dean Channel, Labouchere Channel, and South Bentick Arm, and the major rivers draining into the east end of the Owikeno Lake.
- The CWHws2 (700–1000 m elevation) occurs in the eastern portion of the central coast, north of Knight Inlet. It is found in the upper valleys and inland drainages, including the Kimsquit, Dean, Bella Coola, Klinaklini, and Kingcome river areas, as well as along the main rivers draining into the east end of the Owikeno Lake and South Bentick Arm.
- The IDFww (Interior Douglas-fir) biogeoclimatic variant occurs at lower elevations near the eastern limit to the region, commonly on southwest-facing slopes, and has a discontinuous presence from Lillooet Lake to the Skagit River. In the northern part of the region, it occurs near the Klinaklini and Atnarko river valleys.

## Site Series With Potential For A Paper Birch Component[1]

| BEC Zone[a] | Site Series | | | | | |
|---|---|---|---|---|---|---|
| CWHds[b] | 01? | 02? | 03? | 04? | 05? | 06? |
| CWHms[b] | 01? | 02? | 03? | 04? | 05? | 06? |
| CWHws[c] | 01? | 02? | 03? | 04? | 05? | 06? |
| IDFww[b] | 01 | 03 | 04 | 05 | 06 | |

[a] See Meidinger and Pojar (1991) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.
[b] Ratings adapted from Scagel and Erikkson (2003) for the CWHds1, ms1, and the IDFww. Hazard ratings for CWHds1 and ds2, and for CWHms1 and ms2 are speculated to be similar.
[c] Speculated ratings for paper birch incidence based on Green and Klinka (1994).

### Hazard Rating Key

| Speculated hazard (limited data) | Low hazard | Low–mod hazard | Mod hazard | Mod–high hazard | High hazard |
|---|---|---|---|---|---|
| ? | | | | | |

[1] Ratings are associated with stands that have been harvested through clearcutting. Site series are rated by the overall vegetation hazard rating as it relates to successful conifer establishment.

## Harvesting Considerations

- If paper birch is considered a crop tree, its distribution within the cutblock and over the broader landscape should be supported by stocking standards within a Forest Stewardship Plan. This may affect pre- and post-harvest management decisions. Stocking standards may be supported in higher-level plans that describe biodiversity objectives for the ecosystems under management.
- Birch has potential for commercial utilization (e.g., furniture, decorative veneer, oriented strand board, dimensional lumber, and pulp).
- Assess pre-harvest birch composition. Consider retention of birch patches for biodiversity or birch regeneration. Alternatively, leave cut stems scattered on the forest floor as a coarse woody debris component.
- Retention of mature birch maintains a potential seed source on the block and, combined with suitable seedbed (mineral soil or mixed mineral and organic soil), enhances birch establishment. Most seed is confined to within 100 m of standing trees.

## Silvicultural Considerations

- Birch may influence conifer development less on the coast than in the province's interior owing to the differing crown and leaf characteristics of coastal and interior Douglas-fir.
- Paper birch is less competitive with conifers at lower densities and may benefit conifer growth, site occupancy, and forest health (see discussion of ecological benefits).
- Birch at high densities can reduce conifer growth. Management strategies during the regeneration phase should consider relative growth rates in combination with other management objectives.
- Reducing the birch component of a stand can affect the shrub-herb component, which creates other vegetation management issues (e.g., increase the incidence of fireweed).

### Establishment

SITE PREPARATION

- Site preparation treatments that cause mineral soil exposure or that mix mineral and organic layers may increase birch abundance by creating a preferred seedbed.
- Glyphosate can be highly effective in controlling birch when applied as a late summer broadcast foliar spray (1.5–2.1 kg ai/ha; 3–6 L/ha Vision® in 100–300 L/ha of clean water) with hand-pump backpack sprayers. Avoid early growing season treatments if re-sprouting is a risk.

PLANTING

- Plant stock with large calliper on microsites that benefit the specific conifer species.

### Plantation Maintenance: Brushing

- When determining acceptable levels of paper birch, consider the positive benefits of maintaining the species on-site including maintaining site productivity and meeting higher-level biodiversity objectives. In the Interior Cedar Hemlock zone, modelling suggests that managing for conifer (Douglas-fir)/birch mixtures may provide greater yields than pure conifer stands.

MANUAL

- Selective brushing around competition-stressed conifers is an alternative to broadcast brushing.
- Early post-harvest brushing is recommended on high to very high hazard sites to maintain seedling vigour. Brushing costs will increase rapidly once the vegetation competition is expressed. Longer periods of high competition may reduce crop growth response to release.
- Late-entry brushing should occur when stands are 10–12 years old.
- Delayed brushing may require heavier treatments and perhaps increase costs.
- Manual cutting with power saws or motorized brush saws has had mixed results.
- In the Interior, manual brushing early in stand development targets smaller birch stems to control competition while maintaining dominant birch as crop trees.
- Girdling larger-diameter stems (> 5 cm) with deep notches or double frills has been successful; treat during the summer just following leaf-out. Girdling can be difficult because birch stems are not round.

## Silvicultural Considerations (continued)

### Plantation Maintenance: Brushing

CHEMICAL

- Several different herbicides representing a range of application methods and seasons of application can be used for controlling paper birch.
- Glyphosate applied as a foliar spray (aerial or ground application) is suitable only for young stands.
- Large-diameter trees may require cut-stump glyphosate (i.e., full strength product or dilution of 2:1 water to herbicide). Paint on the stump immediately after cutting to control re-sprouting and (or) use girdling treatments to escape brush competition.
- Glyphosate provides good birch control when applied as a hack and squirt treatment applied at a rate of 1 mL of product for each 5 cm of birch DBH from early spring to late summer; however, trees exceeding 20 cm DBH may not be controlled. Alternatively, stem injection (Ez-ject system ®) with one shell per 5 cm DBH has been effective .
- Triclopyr ester as basal bark application (10–30% product in diesel oil carrier) is effective and has the advantage of a broader season of application.

## Specific Autecological Characteristics

- Paper birch regenerates on recently disturbed areas (e.g., harvesting or wildfire) where it can form pure stands.
- The preferable seedbed for birch regeneration is exposed mineral soil and mixed mineral and organic materials. Conversely, minimizing soil disturbance and maintaining a ground cover of leaf litter discourages its regeneration from seed.
- Paper birch also reproduces vegetatively by sprouting from cut or damaged stems. This increases birch density substantially on sites with a high component of birch in the original stand. The sprouting vigour of felled mature trees is variable; mortality of sprouts is usually high.
- Birch regenerates from seed, or by stem re-sprouting, in 2–3 years after disturbances such as fire or harvesting. Subsequent birch establishment is minimal.
- Paper birch seed germinates best in shade, but long-term growth and survival requires abundant light. It rarely survives under established forests except in openings created by windthrow, insects, or diseases.
- In the absence of further major disturbance, pure birch stands usually last only one generation as conifers dominate in later successional stages. Later, as the forest matures, birch becomes restricted to openings.

## Other Values of the Species

### First Nations' Values

- Birch was used much more commonly by interior First Nations. Birch bark was used to make baskets, cradles, canoes, pit house roofing, and to wrap and store food. The wood was used to make bows and spoons. Birch sap was ingested to treat colds.

### Ecological Benefits

- Birch is an important food and habitat source for many wildlife species.
- Birch can be an important source of carbon for crop trees through mycorrhizal fungi extension. Birch foliage is rich in several nutrients; annual contributions to the forest floor may improve nutrient availability to crop trees.
- Birch can provide frost protection to crop trees, although whipping damage to crop-tree leaders is possible.
- Birch resistance to *Armillaria ostoyae* and immunity to *Phellinus weirii* may reduce the spread of these root diseases to susceptible conifers. As with other deciduous species, weevil attacks may decrease as birch overstorey cover increases; this is because increased shade leads to smaller-diameter spruce terminal leaders.

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# Fireweed – British Columbia's Coastal Forests

Jamie Kantor, International Forest Products Ltd.

## Site Characteristics

- Fireweed occurs throughout the province on moderately dry to fresh sites, and on recently disturbed sites through to mature stands.
- Commonly associated with thimbleberry, red raspberry, grasses, Sitka alder, and willow.
- Prefers sunny or south-facing slopes in northern climates; elsewhere it prefers a wider range of slopes and aspects.
- The CWHds1 (up to 650 m elevation) and ms1 (650–1200 m elevation) biogeoclimatic variants occur in the upper Fraser River drainages north and east of Chilliwack, and the eastern portion of the Coast Mountains from upper Harrison Lake to the Homathko Valley.
- The CWHds2 occurs mainly at low elevations (valley bottoms to 500 m) north of the head of Knight Inlet in the Klinaklini, Bella Coola, Talchako, and Dean valleys.
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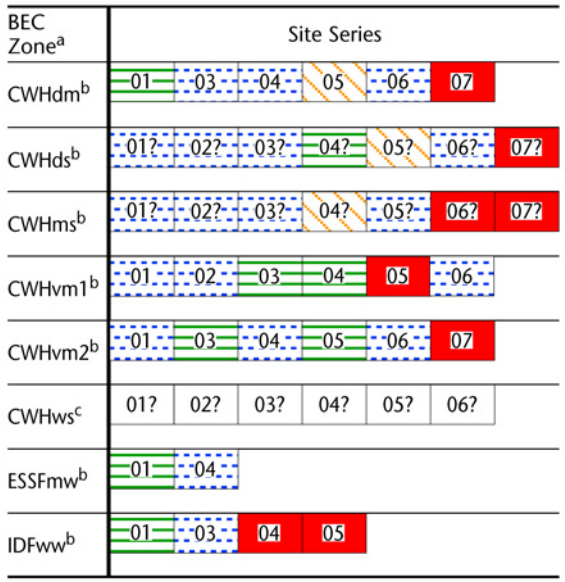
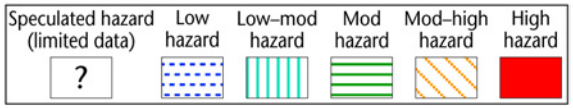
## Site Series With Potential For A Fireweed Component[1]




[a] See Meidinger and Pojar (1991) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.
[b] Ratings adapted from Scagel and Erikkson (2003) for the CWHds1, ms1, and the IDFww. Hazard ratings for CWHds1 and ds2, and for CWHms1 and ms2 are speculated to be similar.
[c] Speculated ratings for fireweed incidence based on Green and Klinka (1994).

### Hazard Rating Key




[1] Ratings are associated with stands that have been harvested through clearcutting. Site series are rated by the overall vegetation hazard rating as it relates to successful conifer establishment.

- The IDFww (Interior Douglas-fir wet warm) biogeoclimatic variant occurs at lower elevations near the eastern limit to the region, commonly on southwest-facing slopes, and has a discontinuous presence from Lillooet Lake to the Skagit River. In the northern part of the region, it occurs near in the Klinaklini and Atnarko river valleys.

## Harvesting Considerations

- Summer harvesting is more likely to benefit subsequent fireweed development than winter harvesting.
- In moist and wet climates, clearcutting encourages fireweed competition by increasing light levels and soil temperatures, whereas partial cutting generally reduces cover. Other site-specific management objectives will determine the selection of cutting pattern.

## Silviculture Considerations

### Establishment

SITE PREPARATION

- Mechanical site preparation or prescribed fire may increase fireweed abundance and competitiveness. Creating mineral mounds, which make a drier, less favourable seedbed for fireweed, may provide crop-tree seedlings with 2–3 years of reduced competition.
- Time site preparation treatments promptly after harvesting and before fireweed seed fall.
- Site preparation with glyphosate in June (1.4–2.1 kg ai/ha) provides medium to good control of fireweed for 2–3 years. Apply immediately after fireweed establishment; treatments conducted after seed release are ineffective.
- Chemical site preparation can be applied over a wider time window during the growing season because crop trees do not require protection from damage.

PLANTING

- Minimize reforestation problems in this complex by planting large, vigorous stock immediately after harvesting (and site preparation).
- Planting on raised sites and next to stumps may benefit subsequent seedling development.

### Plantation Maintenance (Brushing)

- Control of fireweed abundance through manual cutting or chemical treatments may be required if conifer survival and growth is threatened.

MANUAL

- Manual cutting of fireweed provides crop trees with only temporary relief from competition for light as fireweed tends to re-sprout vigorously after cutting.
- Cutting fireweed in early August can enhance crop tree diameter growth while limiting fireweed re-growth during the current growing season and minimizing vegetation press during the fall–winter period. This treatment will provide control only until the following spring.
- Hockey sticks have been used to bend fireweed stems; stems may not require another treatment until the following growing season.

CHEMICAL

- Glyphosate (backpack spray or aerial application; 1.5–2.2 kg ai/ha in 50–100 L of water) applied in August after fireweed establishment and before fireweed seed release can be an effective treatment for 2–3 years. Consider the budset timing of planted seedlings to reduce potential for seedling damage.

## Specific Autecological Characteristics

- Fireweed occurs in mature, usually seral, forest ecosystems and is common in undisturbed alpine and subalpine forest meadows.
- Fireweed favours burned ground over unburned ground and rapidly exploits vacant niches, but is unable to compete where other vegetation is already well established.
- Fireweed spreads via windblown or buried seed, and by the pseudorhizomes of existing plants.
- After colonizing a site, populations expand mainly through perennial rhizome systems that spread horizontally and produce new shoots from buds along their length.
- Fireweed reaches it maximum abundance by the third to fifth growing season and can produce plants up to 3 m tall on rich, moist sites in the CWH. At such heights, it can outcompete crop trees for light, moisture, and nutrients, and can damage young seedlings through vegetation and snow press.
- Although colonies can survive for decades, their longevity depends on the rate of succession. Fireweed abundance declines as shrubs and conifer canopies develop. Other brush species can outgrow fireweed within 1–3 years.
- Fireweed cover of less than 50% will likely not have a negative effect on new plantations stocked with shade-tolerant species.

## Other Values of the Species

### First Nations' Values

- The Haida used the outer stem of fireweed to make cord.
- Fireweed "seed fluff" was used by the Coastal Salish in weaving and padding.
- Some First Nations ate inner tissue of the stem raw, while other groups cooked and boiled the stems. Stem fibres were woven into fishing twine. Fluff was used for bedding.

### Wildlife Food and Habitat Values

- Moose, bear, and Roosevelt elk browse fireweed to some extent in the summer. It is an important food source for all deer species in British Columbia. As shrubs become established, this complex is likely to increase in importance to wildlife.
- Fireweed flowers are used by bees to produce honey.
- Fireweed provides food and habitat cover for many small mammals.

### Other Benefits

- Fireweed stores nutrients and increases organic matter on severely disturbed sites.
- Fireweed acts as a fuel break in fire-prone areas.



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# *Test Your Knowledge . . .*

***British Columbia's coastal forests: Paper birch and fireweed Stand Establishment Decision Aids***

**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. Retaining a component of paper birch may have the following benefits:
   A) Reduce the spread of these root diseases to susceptible conifers
   B) Provide frost protection to crop trees
   C) Decrease weevil attacks on spruce terminal leaders
   D) All the above

2. Retention of mature birch maintains a potential seed source on the block. Most seed is confined to within:
   A) 10 m of standing trees
   B) 50 m of standing trees
   C) 100 m of standing trees
   D) 200 m of standing trees

3. Fireweed cover below which it is unlikely to have a negative effect on new plantations stocked with shade-tolerant species:
   A) 10%
   B) 25%
   C) 50%
   D) 75%

4. Fireweed reaches its maximum abundance by which growing season?
   A) First to second
   B) Third to fifth
   C) Sixth to seventh
   D) Over eight years

*ANSWERS*

1. D 2. C 3. C 4. B