

Vegetation Complex Stand Establishment Decision Aids

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Introduction

Over the last four years, the Early Stand Dynamics program of FORREX—Forest Research Extension Partnership has assessed the information needs of the operational silvicultural community. This process has identified a number of issues relating to management of competing vegetation, forest health, silvicultural systems, and best practices. Besides information needs, members of the silvicultural community also expressed concern about the loss of their experiential knowledge.

These operational concerns prompted the initiation of an extension project to fill in the identified information gaps and document local knowledge. Competing vegetation and forest health were selected as the first subject areas on which to focus effort. Information relating to these two subject areas was collected, synthesized, and presented in an easy-to-use format. The resulting product was then presented to both the operational and scientific communities for their review and input.

The extension product generated by this process was called a “Stand Establishment Decision Aid” (SEDA). SEDAs are designed to provide information on the biological features that new and inexperienced practitioners need to consider when making silvicultural decisions about site limiting factors, such as competing vegetation or forest health. These decision aids are not intended to make the decisions for the practitioners. We currently base these decision aids on the Biogeoclimatic Ecosystem Classification (BEC) system. A description of this system is available on-line at: www.for.gov.bc.ca/hfd/pubs/Docs/Srs/SRseries.htm

The SEDAs for the Cariboo Forest Region will be published as a three-part series. The first two sections of the vegetation complex SEDAs identify specific species of concern that are found within the particular vegetation complex, and the geographic location of the complex in the forest region. The third section provides a treatment necessity rating system that identifies the specific biogeoclimatic zone, subzone, and site series where the vegetation complex can potentially be considered a problem. The fourth section outlines some possible silvicultural considerations that affect the species growing within this complex. These considerations could be used to develop a vegetation management strategy, if one is required. The fifth section provides information on some of the important autecological characteristics of the species occurring within this complex, followed by information on what roles and functions these species play in the ecosystem. We recognize vegetation community response is a function of many factors (e.g., type and intensity of disturbance); therefore, the vegetation complex SEDAs conclude with a resource section outlining where more information can be located. Reference material that is not available on-line can be ordered through the Queen's Printer at: www.qp.gov.bc.ca

Although these decision aids currently identify the problem first, rather than the particular ecosystem in which the problem occurs, we intend to develop a product that focuses on the ecosystem (subzone and site series) and ecosystem-specific problems. This extension product will be presented as part of a compendium of limiting factors in the Cariboo Forest Region, and is currently under development.

Contact Information

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Ericaceous Shrub Complex – Cariboo Forest Region

B.C. Ministry of Forests, Cariboo Forest Region



Commonly Occurring Species*

Low Shrubs

black huckleberry
oval-leaved blueberry
velvet-leaved blueberry
white-flowered rhododendron

Sitka mountain ash
falsebox
birch-leaved spirea

Herbs

fireweed
bluejoint

Indian hellbore
Sitka valerian

* **Note:** Species composition will differ between subcomplexes (see General Information for description of ericaceous subcomplexes). Only species that can affect crop tree establishment are listed. For a particular subcomplex, species names appearing in **bold type** have moderate to high ground cover.

General Information

The ericaceous shrub complex in the Cariboo Forest Region occurs primarily in the Engelmann Spruce–Subalpine Fir (ESSF) zone. The complex most frequently occurs on mid- to upper slope positions in wetter ESSF subzones. While found on various aspects, it is most common on cool, steep, northern and eastern aspects. The ericaceous shrub and subalpine herb complexes often develop in a mosaic of patches, with the ericaceous complex occupying slightly drier (better drained) and poorer sites. For example, in an area of rolling topography, the ericaceous complex occurs on the

Site Series That May Require Vegetation Complex Treatment For Successful Conifer Establishment Following Clearcut Harvesting

BEC Zone*	Subzone	Zonal	Drier Site Series	Wetter Site Series
ESSF	wc3		02	03
	wk1		03	
	xv1		06	
	xv2		06	
ICH	wk2	01	04	
	wk4	01	04 05	

Treatment Necessity Key

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

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

drier ridges, while the subalpine herb complex occupies the swales where soils remain wetter from more persistent seepage. These two complexes share many species in common and their classification is largely determined by the relative abundance of ericaceous shrubs versus tall herbaceous vegetation. Several factors, such as harvesting method, silvicultural treatments, and site characteristics, play roles in determining whether a shrub- or herb-dominated community develops.

The ericaceous complex has been further divided into two subcomplexes. The *ericaceous shrub–rhododendron* subcomplex consists of larger shrubs, such as white-flowered rhododendron, black huckleberry, oval-leaved blueberry, and Sitka mountain ash. This subcomplex commonly occupies mid- to upper slope positions in ESSFwc3 (Wet Cold subzone, Cariboo variant) 01 and 02 site series. However, it also occurs on mid- to upper slope positions with poor to medium nutrient regimes in ESSFxv1 (Very Dry, Very Cold subzone, West Chilcotin variant) 06 site series, where competing vegetation often limits crop tree survival and the growth and establishment of natural regeneration. The principal competing species of the *ericaceous shrub–low shrub* subcomplex are black huckleberry, velvet-leaved blueberry, falsebox, and birch-leaved spirea. This subcomplex occurs more frequently on ridge crests with shallow soil over bedrock in SBSmc1 (Sub-Boreal Spruce Moist Cold subzone, Babine variant) 02 site series.

Silvicultural Considerations

Important vegetation management considerations:

- Determine whether vegetation competition is the most limiting factor on the site.
- Assess competition and control requirements on a site-by-site basis.
- This vegetation complex affects crop tree survival more than growth.

Silvicultural Systems

- Ericaceous shrubs are negatively affected by disturbance to the forest floor; therefore, the complex tends to develop on winter-logged sites where stems have been protected by the snow pack.
- Overstorey removal has relatively little effect on shrub competition, but herbs such as Sitka valerian will greatly increase in vigour. Group selection, or similar silvicultural systems, may improve reforestation success and non-timber values, particularly at higher elevations.

Establishment/Regeneration

SITE PREPARATION

- Mechanical site preparation is the most effective site preparation method to control this complex in the ESSF.
- Late season application of glyphosate may control the shrub component, but can shift species composition to herbs.
- Medium- to high-impact burns have led to successful regeneration in the ESSF zone (wetter subzones), but can shift sites from shrub- to herb-dominated communities.

PLANTING

- Plant sites immediately after site preparation to take advantage of warmer soil temperatures.
- Larger stock sizes may provide a gain in growth, but frost is a concern.
- Correct microsite planning is imperative to successful regeneration.

Plantation Maintenance

BRUSHING

- If sites are prepared and planted promptly following harvest, brushing may not be required.



Ericaceous Shrub Complex – Cariboo Forest Region

Specific Autecological Characteristics

Pre-disturbance

- This complex is typically found in the openings of mature forest stands.
- It is often present under ESSF forest canopy. Although it does not develop or spread quickly in this zone, it may eventually become the dominant plant community following logging. This is particularly true on sites where, before harvest, the complex is well developed under the forest canopy or in openings. These conditions typically occur in very cold, high-elevation ESSF forests where the canopy tends to be open or with gaps.

Post-disturbance

- Undisturbed shrubs increase slowly in height after canopy removal.
- In the ESSF, canopy removal does not cause white-flowered rhododendron cover to change substantially.
- In ESSFwc3 01 site series, a reduction in shrub cover generally results in a substantial increase in the cover of the herb layer.
- In the SBS, shrub and herb cover in the ericaceous shrub–low shrub subcomplex increases little after harvest.
- Vegetation complex shrubs initially become established following seed dispersal by animals (black huckleberry and oval-leaved blueberry) or wind (rhododendron and false azalea), and subsequently spread mainly by vegetative means.
- All *Vaccinium* species reproduce vegetatively via rhizomes; in the case of black huckleberry, rhizomes are 8–30 cm below the soil surface.
- White-flowered rhododendron spreads via rhizomes, by sprouting from the root crown and adventitious buds, and by layering.
- Shrubs infrequently establish by seed; growth is slow on undisturbed sites.
- Sitka valerian increases rapidly in size following overstorey removal; vegetative growth can initiate in the spring when the snow is still 15–25 cm deep.

Resource and Reference List

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Other Values of the Species

First Nations' Values

- The scent of the white-flowered rhododendron was valued by the Nlaka'pmx.
- Several Southern Interior natives ate the berries of velvet-leaved blueberry, oval-leaved blueberry, and Sitka mountain ash.
- Sitka mountain ash bark was used to cure coughs, flu, and fever, while the wood was sometimes used by the Carrier to make sidesticks for snowshoes.

Provision of Unique Food/Habitat

- This complex provides valuable habitat for animals using the ESSF year-round or during the snow-free season.
- Although poisonous to most domestic and wild animals, rhododendron has forage value to grouse.
- The fruits of oval-leaved blueberry and black huckleberry are a valued food source for bears, humans, small mammals, and several bird species. Foliage and twigs of these shrubs are also important for winter browsing by deer and mountain goat.
- Wildlife species graze the subalpine herbs of this complex.

Protection

- The susceptibility of falsebox to Armillaria root disease makes it a useful site indicator of the pathogen's incidence.

Bioregulation

- White-flowered rhododendron may impede conifer performance through allelopathy.

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Fern Complex – Cariboo Forest Region

B.C. Ministry of Forests, Cariboo Forest Region



Commonly Occurring Species*

Shrubs

red elderberry	red-osier dogwood
mountain alder	thimbleberry
skunk current	

Herbs

lady fern	western medowrue
ostrich fern	spiny wood fern
stinging nettle	devil's club

* **Note:** Only species that can affect crop tree establishment are listed. Species names appearing in **bold type** have moderate or high ground cover.

General Information

The fern complex and the mixed shrub complex tend to occupy similar sites and include similar species, although the fern complex is less common in the Cariboo Forest Region. It is found on moist to wet sites in wetter subzones of the Interior Cedar–Hemlock (ICH) and Sub-Boreal Spruce (SBS) biogeoclimatic zones. It most commonly develops on moist, previously burned sites, or where the complex was present before logging. Areas with a high density of devil's club can also develop into the fern or mixed shrub complex after harvesting. The fern complex is of particular concern in the wetter ecosystems and on steeper slopes in the Cariboo Forest Region.

Site Series That May Require Vegetation Complex Treatment For Successful Conifer Establishment Following Clearcut Harvesting

BEC Zone*	Subzone	Zonal	Drier Site Series	Wetter Site Series
ESSF	wk1	01		04 05 07
ICH	dk			06 07 08
	mk3			05 06 07
	wk2			05 06 07 08
	wk4			06 07 08
SBS	mh			07 08
	mw			08 13
	wk1			07 08

Treatment Necessity Key

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

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

Silvicultural Considerations

Important vegetation management considerations:

- Determine whether vegetation competition is the most limiting factor on the site.
- Assess competition and control requirements for this complex on a site-by-site basis.
- Lady fern competes for light with young seedlings and causes mechanical damage via smothering.

Silvicultural Systems

- This complex should be considered a serious competitor if it is well established (with or without a high density of devil's club) before canopy removal. It will probably diminish in cover on those sites where previously moist soils become prone to drying out following logging.

Establishment/Regeneration

- Seedlings likely experience minimal competition for moisture and nutrients from this complex. It is possible, however, that excess moisture and high humidity under extremely dense vegetation of this nature can cause seedlings to rot.
- High seedling mortality is common immediately following planting in fern-dominated openings; this can sometimes lead to stocking problems.
- Multiple treatment entries may be necessary to ensure seedling survival, especially in wetter ecosystems and on steeper slopes where snowpress is a concern.

SITE PREPARATION

- Lady fern colonies tend to be favoured by light to moderate burns, but are retarded by mechanical site preparation (MSP).
- This complex usually forms a mat of roots; this can lead to more soil disturbance than desired during MSP. As a result, spot MSP and good operators are essential.

CHEMICAL

- Glyphosate may be applied once, as either a broadcast or spot application.

PLANTING

- Mortality and loss of vigour tends to occur if delays occur between harvesting, planting, and early brushing. Plant seedlings within 1–2 years of harvest or site preparation.
- Plant a large stock type with a large calliper on best microsites for crop establishment on sites with a substantial cover of the fern complex.

Plantation Maintenance

BRUSHING

- Single or repeated manual cutting treatments may be required.

CHEMICAL

- Glyphosate may be applied once, as either a broadcast or spot application.



Specific Autecological Characteristics

Pre-disturbance

- Lady fern (on sites where it is dominant) will commonly persist under a mature overstorey.
- A few sites in the SBSmh can have dense ostrich fern cover.
- Spiny wood fern is a more common complex species than bracken fern in the Cariboo Forest Region.

Post-disturbance

- Lady fern usually becomes a dominant species on logged sites only if it was well established (or is established with a significant cover of Devil's club) in the previous stand.
- Lady fern, if present before logging, reproduces through rhizome division, but it does not form an extensive underground network.
- Ferns reproduce through spores.
- Lady fern often forms large uniform stands.
- Thimbleberry patches are common in this complex. Canopy removal, burning, and mechanical site preparation all stimulate sprouting from rhizomes of thimbleberry plants that were present before logging; burning and MSP creates suitable conditions for germination of new or banked seeds. Once established, thimbleberry plants quickly expand into colonies through vegetative reproduction of the rhizomes.

Resource and Reference List

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Other Values of the Species

First Nations' Values

- The Nlaka'mx used lady fern as a medicine, and ate the fiddleheads in early spring.
- Starch provided by spiny wood fern stems was very important to several First Nations groups.
- All central and southern Interior groups ate fresh thimbleberries. The shoots of this plant could be peeled and eaten raw or in a stew.

Provision of Unique Food/Habitat

- Lady fern is moderately important winter food for deer, elk, moose, bighorn sheep, and caribou.
- Black bear and deer readily eat fiddleheads and mature fronds during spring and summer.
- Many birds and mammals favour thimbleberry fruit. Twigs and leaves have limited value as a food source, but tend to be used more for cover.

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Reedgrass Complex – Cariboo Forest Region

B.C. Ministry of Forests, Cariboo Forest Region



Commonly Occurring Species*

Reedgrass sp.

General Information

The reedgrass complex is found in the Engelmann Spruce–Subalpine Fir (ESSF), the Interior Cedar–Hemlock (ICH), and Sub-Boreal Spruce (SBS) biogeoclimatic zones. The complex is common and often locally abundant at low to high elevations in moist to wet forests, wetlands, and clearings.

Throughout much of southern British Columbia, bluejoint is primarily a wetland species, occurring in swamps, marshes, wet meadows, and floodplains. In the Cariboo Forest Region, it is commonly found north of Likely (on mesic and wetter sites series of the ESSFwk1 [Wet Cool subzone, Cariboo variant]), particularly near Wolverine Lake, Kangaroo Creek, and Keithley Creek.

The reedgrass complex grows best on nutrient-medium to rich sites.

Site Series That May Require Vegetation Complex Treatment For Successful Conifer Establishment Following Clearcut Harvesting

BEC Zone*	Subzone	Zonal	Drier Site Series	Wetter Site Series		
ESSF	wk1	01		04	05	07
ICH	wk2			05	06	07
	wk4			06	07	08
SBS	wk1			09		

Treatment Necessity Key

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

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

Silvicultural Considerations

Important vegetation management considerations:

- Determine whether vegetation competition is the most limiting factor on the site.
- Assess competition and control requirements for this complex on a site-by-site basis.
- This complex is generally not a major issue in the Southern Interior.
- If considered a problem, apply vegetation control treatments soon after disturbance to control the vegetation before it becomes well established.

Silvicultural Systems

- Use of partial cutting rather than clearcutting could reduce invasion or serious infestation.

Establishment/Regeneration

- *Snow press and smothering of young seedlings can occur.*

SITE PREPARATION

- Any site preparation that mixes the soil will likely encourage rhizome sprouting and germination of buried seed, as will light prescribed burning. Avoid such practices where grass invasion is a possibility.
- Inverted mounds can increase the chance of seedling survival.

CHEMICAL

- Glyphosate provides good to excellent control.

PLANTING

- Plant the site (on the best microsites) immediately following disturbance.
- Use large-caliper stock and higher than minimum stocking levels to increase the chance of seedling survival and reforestation success.
- Check 1- to 3-year survival and determine whether replanting or fill planting is required.

Plantation Maintenance

GRAZING

- Sheep grazing has successfully controlled this complex in the Cariboo Forest Region.

CHEMICAL

- Glyphosate provides good to excellent control.

BIOLOGICAL CONTROL

- The development of an integrated strategy that combines biological control with low impact silvicultural techniques is currently under way.



Specific Autecological Characteristics

Pre-disturbance

- If this complex is already growing in the vicinity, or if grass is well distributed in the forest understorey before harvesting, then the probability of invasion is high (depending on site and location).

Post-disturbance

- Reedgrass can occupy a site quickly because of its ability to produce creeping rhizomes.
- It is an aggressive colonizer after disturbance.

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Other Values of the Species

Enhancement of Resource Availability

- It can increase soil organic matter.

Protection

- Light growth of bluejoint on scalped areas of soil may be beneficial in reducing frost heaving of seedling conifers.

Bioregulation

- Provides good control against surface erosion.
- Bluejoint cover can also limit invasion from larger brush species which may have a longer lasting and more serious impact.

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Subalpine Herb Complex – Cariboo Forest Region

B.C. Ministry of Forests, Cariboo Forest Region



Commonly Occurring Species*

Herbs

lady fern
Sitka valerian
arrow-leaved groundsel

cow-parsnip
Indian hellebore

Low Shrubs

black gooseberry
white-flowered rhododendron

black twinberry
black huckleberry

* **Note:** Only species that can affect crop tree establishment are listed. Species names appearing in **bold type** have moderate to high ground cover.

General Information

The subalpine herb complex in the Cariboo Forest Region occurs primarily in the Engelmann Spruce–Subalpine Fir (ESSF) zone. It is best developed on lower and toe slopes and small depressions in the wetter subzones of the ESSF, where abundant precipitation and deep snow packs maintain moist to wet soils throughout the growing season. Although occurring on all aspects, it is most common on cool northern and eastern aspects where soils remain wetter from more persistent seepage during the growing season. This complex often develops a mosaic of patches in combination with the ericaceous shrub complex, with the ericaceous complex occupying slightly drier and

Site Series That May Require Vegetation Complex Treatment For Successful Conifer Establishment Following Clearcut Harvesting

BEC Zone*	Subzone	Zonal	Drier Site Series	Wetter Site Series
ESSF	wc3	01		
	wk1			04 05 07

Treatment Necessity Key

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

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

poorer sites. These two complexes share many species in common and their classification is largely determined by the relative abundance of ericaceous shrubs versus tall herbaceous vegetation.

The subalpine herb complex is dominated by a dense and rich variety of relatively tall forbs. These include Sitka valerian, fireweed, Indian hellebore, lady fern, arrow-leaved groundsel, foamflower, and cow parsnip. Shrubs, if present, occur with low cover. These often include white-flowered rhododendron, black huckleberry, oval-leaved blueberry, and black twinberry.

Silvicultural Considerations

Important vegetation management considerations:

- Determine whether vegetation competition is the most limiting factor on the site.
- Assess competition and control requirements on a site-by-site basis.
- Recognized as a competitor to conifer crop seedlings.
- This complex can create dense shade, which maintains soil temperatures below critical thresholds for water and nutrient uptake and reduces the availability of light for conifer seedlings.

Silvicultural Systems

- This complex usually develops following disturbance to the forest floor (e.g., disturbance as a result of summer logging).

Establishment/Regeneration

SITE PREPARATION

- Mechanical site preparation (MSP) encourages growth of this complex because of the rhizomatous nature of the species. However, in combination with immediate planting of high-quality stock, MSP can be an effective treatment, reducing or eliminating the need for further control measures such as brushing.

CHEMICAL

- Herbicide treatment may not be the best option: some herbs within this complex appear to tolerate glyphosate.

PLANTING

- Plant sites immediately after site preparation to take advantage of warmer soil temperatures.
- Larger stock size may provide a gain in growth, but frost is a concern.
- Correct microsite planting is imperative to crop tree survival.

Plantation Maintenance

BRUSHING

- The need for brushing is unlikely.

LIVESTOCK GRAZING

- Grazing may be the best option for plantation maintenance. Herbs associated with this complex have variable palatability to livestock. Sitka valerian and fireweed are preferred forage species for sheep, and are also grazed to some extent by cattle. However, Indian hellebore is very toxic to these animals.

CHEMICAL

- Herbicide treatment may not be the best option on sites dominated by Sitka valerian, which appears to tolerate glyphosate.



Subalpine Herb Complex – Cariboo Forest Region

Specific Autecological Characteristics

Pre-disturbance

- This complex is generally poorly developed under a forest canopy, but the presence of the ericaceous shrub complex can indicate its potential occurrence.

Post-disturbance

- All species within this complex have the ability to increase in vigour following canopy removal and disturbance to the forest floor (e.g., that which occurs during summer logging, mechanical site preparation, or medium- to high-impact broadcast burning).
- This complex may be enhanced by the treatment of the ericaceous shrub complex.
- Less is known about individual species in the subalpine herb complex than the ericaceous shrub complex, but most species are rhizomatous and presumably spread rapidly by vegetative means.

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Other Values of the Species

First Nations' Values

- Several groups used Sitka valerian as a medicine and disinfectant.
- Racehorses were bathed with Sitka valerian; powder from the dried root was mixed with tobacco to add flavour.
- Rhizomes of Indian hellebore were burned and the fumigant used to drive away evil spirits.
- Indian hellebore was also used as a treatment of skin and scalp conditions.
- Nlaka'pmx used lady fern as a medicine and ate the fiddleheads in early spring.

Provision of Unique Food/Habitat

- Lady fern is moderately important winter food for deer, moose, bighorn sheep, and caribou.
- Black bear and deer readily eat fiddleheads and mature fronds during spring and summer.
- Several herbs associated with this complex are used by wildlife during the summer and fall; moderate use for summer forage by bears, mule deer, caribou, bighorn sheep, mountain goat, marmots, foxes, rabbits, and pikas.
- Herbs associated with this complex have variable palatability to livestock. Sitka valerian is a preferred forage species for sheep, and is also grazed to some extent by cattle; Indian hellebore is toxic to livestock.

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