Extension Note

BC Journal of Ecosystems and Management

Southern Interior Forest Region (former Cariboo Forest Region): Part 3 of 3

Vegetation Complex Stand Establishment Decision Aids

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Introduction

Over the last six 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*

This is the third of a three-part series for the Southern Interior Forest Region (formerly the Cariboo Forest Region). 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. Copies of reference material that are 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 Southern Interior Forest Region, and is currently under development.

Contact Information

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Aspen Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Ray Coupé, Southern Interior Forest Region

Commonly Occurring Species*

Trees

trembling aspen
black cottonwood
paper birch

Shrubs

black twinberry
thimbleberry
highbush cranberry
snowberry
prickly rose
soopolallie
saskatoon

Herbs and Dwarf Shrubs

pinegrass
American vetch
creamy and purple peavines
other grasses
Lindley's aster
showy aster

* **Note:** Species composition will differ with site and climate. Dominant species appear in **bold type**. Species with generally low cover on all sites are not listed.

General Information

This complex is most productive on nutrient rich, fresh-to-moist, well-drained sites. In areas of the former Cariboo Forest Region with dry climates (Interior Douglas-fir [IDF] biogeoclimatic zone and Sub-Boreal Pine–Spruce very dry [SBPSxc] and dry [SBPSdc] subzones), the *aspen-dry* subcomplex is typically found in moist swales and riparian sites. It is often difficult to regenerate crop trees in these areas because of the dense canopy cover in this subcomplex. Overstorey removal in the dry subcomplex may increase ground frosts. The *aspen–moist shrub* subcomplex is found in areas with moderate precipitation (Sub-Boreal Spruce dry warm [SBSdw] and moist hot [SBSmh] subzones and the SBPS moist cool [SBPSmk] subzone). Crop tree regeneration after harvest in areas previously occupied by this subcomplex is often difficult. The *aspen-wet* subcomplex does not significantly affect regeneration compared to the other two subcomplexes.

Aspen can occupy a wide range of sites (e.g., shallow rocky soils, loamy sands, and wet clays), but is predominantly a species of well-drained soils.

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
ICH	dk	01		05, 06
	mk3	01		04
	wk2	01	04	
	wk4	01		05
IDF	dk3	01		07, 08
	dk4	01		08
	xm			06, 07, 08
	xw			06, 07
SBPS	dc	01	03	04, 05, 06
	mk	01	03, 04, 05	06, 07
	xc	01	03	04, 06
SBS	dw1	01	04, 05	06, 07, 08
	dw2	01	05, 06	07, 08, 09
	mc1		03	
	mh	01	03, 04, 05	06
	mw	01	03, 04	06
	wk1	01	04, 05	

Treatment Necessity Key

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

* See Meidinger and Pojar (1991) for a description of the Biogeoclimatic Ecosystem Classification (BEC) system. Subzones that may be found in the former Cariboo Forest Region (SBSmm, MSxk), but occur primarily in the former Kamloops Forest Region, were not included.

Silvicultural Considerations

Important vegetation management considerations:

- Determine whether vegetation control will significantly improve seedling performance.
- Assess competition and vegetation control requirements for this complex on a site-by-site basis.
- High densities of broadleaf species severely reduce conifer growth resulting in conifer mortality, especially in shade-intolerant species.
- Aspen may also indirectly reduce health of young conifers because it is the primary host of the rust fungus, *Melampsora albertensis*.
- Competition from this complex is minor in the wetter Interior Cedar–Hemlock [ICH] subzones, where birch tends to play a larger role.

Silvicultural Systems

- Aspen cut or damaged during harvesting produce prolific root suckers. Even aspen that remain undamaged will produce suckers as the root system is stimulated by the increased light and heat on the forest floor.
- To control aspen competition for the next generation, girdle mature residual aspen.
- Winter harvesting often results in more aspen suckers than spring harvesting.

Establishment/Regeneration

SITE PREPARATION

- To control aspen, eliminate its root system.
- Site preparation techniques that expose mineral soil (e.g., disc trenching) increase aspen suckering by increasing soil temperatures and light penetration in the rooting zone.
- To decrease aspen growth, scarify after suckers have completed one season of growth.
- Mineral soil exposure provides a favourable seedbed; however, aspen establishment from seeding is uncommon.

CHEMICAL

- Foliar-applied glyphosate typically is highly effective in controlling aspen.

PLANTING

- Plant a sturdy, large-calipered stock type.
- Correct microsite planting is imperative.

Plantation Maintenance

BRUSHING

- Brushing treatment efficacy depends on site productivity and the crop tree species.
- Retaining some aspen can be beneficial to the stand (see Other Values of the Species).
- Hand-breaking in June or July (particularly when competing vegetation is mostly aspen) or cutting high (just below the lowest live branch) are fairly successful control methods.
- In areas of high cattle use, avoid leaving stumps at a height that may damage a cow's udder. Using a serrated sickle cut one-half to two-thirds through the trunk within 10 cm of the ground, push the tree over, and lay all downed aspen in the same direction to allow for cattle movement.

CHEMICAL

- Glyphosate or other herbicides applied to foliage or cut stumps is an effective control method.

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Aspen Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Specific Autecological Characteristics

Pre-disturbance

- As a young tree, aspen grows in pure stands in many areas; however, it is shade intolerant and is usually succeeded by more shade-tolerant conifers.
- Aspen also occurs in mixed stands with a variety of species.

Post-disturbance

- Dense stands of juvenile aspen commonly develop following harvesting on mesic and submesic sites in the IDF, SBS, and ICH zones.
- Regenerating crop trees on dry to moderately dry sites with the aspen complex is often difficult.
- Aspen reproduces primarily by suckering from parent tree roots. Suckers appear soon after disturbance; early growth tends to be rapid.
- Initial sucker densities are usually high, but self-thinning is rapid because of aspen's shade intolerance.
- High light levels and warm soils promote sucker initiation and growth; therefore, treatments that remove the canopy and expose mineral soil promote suckering.
- Treatments that break up the root system or compact the soil reduce suckering; however, in dry ecosystems, soil ripping seems to encourage sprouting.
- Regeneration of aspen from seed most commonly occurs on an exposed mineral soil seedbed.
- Aspen reproduction from seed is uncommon because seed is short-lived and requires constant moisture and low temperatures.
- Occasionally, aspen seedlings can establish in abundance in localized patches; however, little is known about the factors that determine successful establishment.

Other Values of the Species

First Nations' Values

- The Carrier used decayed aspen wood for making diapers and baby cradle linings.
- Dugout canoes were sometimes made of aspen by the Nlaka'pmx.
- The Secwepemc used aspen for tent poles and drying racks.
- First Nations groups may have obtained a quinine-like drug from the inner bark.

Provision of Unique Food/Habitat

- Aspen trees provide food and habitat for many species of wildlife.
- Beavers use aspen to build dams and lodges; they feed on the twigs and bark.
- Many cavity-nesting birds also use aspen trees.
- This complex is commonly utilized for livestock range.
- Aspen suckers are highly nutritious and can contribute substantially to the diet of cattle; however, cattle are often deterred from entering young, dense aspen stands.
- Young aspen sprouts are preferred forage for sheep.

Enhancement of Resource Availability

- Aspen assists in retaining nutrients in the ecosystem.

Protection

- Mature aspen trees reduce frost damage to seedlings in the understorey by restricting radiant heat loss during the night and improving air temperatures at seedling height.
- Because of its sucker-originated communal root system, aspen is mechanically stable, and its presence may increase resistance of neighbouring conifers to windthrow.
- Aspen stands can serve as living firebreaks.

Bioregulation

- Aspen can slow the spread of root diseases in mixed stands because it is immune to *Phellinus weirrii* and more resistant to *Armillaria ostoyae* than most conifers.

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Cottonwood Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Jean Mather, Skyline Forestry Consultants

Commonly Occurring Species*

Trees

black cottonwood

Shrubs

black twinberry
red-osier dogwood
red elderberry
thimbleberry
Sitka alder
mountain alder

Herbs/Dwarf Shrubs

reedgrass
nodding woodreed

* **Note:** Species composition will differ with site and climate. Dominant species appear in **bold type**. Species with generally low cover on all sites are not listed.

General Information

The cottonwood complex is typically found on moist-to-wet sites and in mild-to-warm climates throughout southern and central British Columbia. It is most common at low to mid-elevations. The complex is most commonly found on the floodplains of major rivers and creeks and often exists as nearly pure stands. The complex occurs less frequently on moist seepage sites and depressions. Hybrid white spruce and paper birch often accompany black cottonwood on these sites.

This complex is characteristically associated with riverbanks, gravel bars, or low-lying land, but it also occurs on moist loams, clays, and soils rich in humus on upland sites. Typical soils are young with little soil development. Cottonwood growth rates are best at low elevations on deep alluvial soils; its poorest growth occurs on newly deposited gravel.

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
ICH	dk			06 07 09
	mk3			06 07
	wk2			06 07 08
	wk4			06 07 08
IDF	xm			08
	xw			06 07
SBS	dw1			07 08 09
	dw2			08 09 10
	mc2			08 11
	mh			07 08 09
	mw			05 07 08 09
	wk1			06 07 08 09

Treatment Necessity Key

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

* See Meidinger and Pojar (1991) for a description of the Biogeoclimatic Ecosystem Classification (BEC) system. Subzones that may be found in the former Cariboo Forest Region (SBSmm, MSxk), but occur primarily in the former Kamloops Forest Region, were not included.

Silvicultural Considerations

Important vegetation management considerations:

- Determine whether vegetation control will significantly improve seedling performance.
- Assess the degree of competition from the vegetation complex and vegetation control requirements on a site-by-site basis.
- This complex is found in areas of Tree Farm Licence 5 (Sub-Boreal Spruce moist warm [SBSmw] and moist hot [SBSmh] subzones). Although herbicide applications or manual brushing are effective treatments, this complex is typically left untreated and the area is delineated as a wildlife tree patch or old-growth management area.
- Cottonwood trees compete severely with conifers for the length of the rotation, but to remain competitive they must maintain a dominant crown position.
- Without a dominant crown position, the cottonwood complex may not be of too great a concern.

Silvicultural Systems

- Any system removing the overstorey increases the cover of some species (e.g., thimbleberry).
- Cottonwood seeds-in from residual or nearby trees after harvesting.
- Trees cut during harvesting will sprout profusely from the stump or sucker from the roots.

Establishment/Regeneration

Depending on site, prompt planting following site preparation and follow-up brushing is likely necessary to establish a conifer crop.

SITE PREPARATION

- Any mechanical site preparation that exposes mineral soil creates an ideal seedbed for the complex.
- Stems or root fragments incorporated into moist mineral soil will probably regenerate. Damaged trees will produce new shoots.
- Follow-up treatment is usually required.

CHEMICAL

- Glyphosate application is an effective method of control for all species in this complex.

PLANTING

- Plant a sturdy, large-calipered stock type.
- Correct microsite planting is imperative.

Plantation Maintenance

BRUSHING

- Mechanical brushing does not provide adequate control of cottonwood.

CHEMICAL

- Glyphosate application seems effective.

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Cottonwood Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Specific Autecological Characteristics

Pre-disturbance

- Black cottonwood does not occur as an understorey species beneath mature forest canopies.
- It forms extensive stands on the islands and floodplains of major rivers and is an integral part of such ecosystems.
- Black cottonwood often forms a minor component in moist, low- to mid-elevation conifer forests.

Post-disturbance

- Cottonwood seedling germination likely occurs on areas of exposed mineral soil.
- Some shrub species produce abundant berries that are dispersed by animals (e.g., thimbleberry, red-osier dogwood, and black twinberry). Seeds of these species are often banked in the soil before harvesting, and then germinate when conditions become suitable, such as after canopy removal or ground disturbance.
- Alder has light, short-lived seed that blows in from adjacent areas.
- All of the major species in this complex regenerate vegetatively, but the rate of spread varies among species.
- Thimbleberry has rapidly spreading rhizomes or root suckers.
- Red-osier dogwood and black twinberry spread more slowly by layering or limited rhizomatous growth.
- Alder and red elderberry sprout from the root collar, often creating multi-stemmed bushes.
- Methods of seed dispersal vary among species.
- Overstorey removal increases the cover of many species in this complex (e.g., thimbleberry, red elderberry, alder).
- Light-to-moderate burns encourage vigorous development of species other than cottonwood by stimulating re-growth and providing suitable seedbeds for germination of banked or new seed. Cottonwood is highly susceptible to damage from burning.

Other Values of the Species

First Nations' Values

- Black cottonwood was used extensively for food and to make pillows, soap, medicine, ointments for small cuts, glue, and even dugout canoes (from larger trees).
- Sitka and mountain alder were commonly used by First Nations groups for carving and for smoking salmon and meat; alder was also used to make a reddish dye. Sitka alder was used in basket making and as a source of fuel; mountain alder was used to cure animal hides, make fish nets, and treat certain ailments such as bleeding.
- All Central and Southern Interior groups ate fresh thimbleberries. Shoots were peeled and eaten raw or in a stew. Leaves were used to line baskets or as a surface for drying berries.
- Several First Nations groups used black twinberry for medicinal purposes.
- Red elderberry bark and roots were boiled to make a purgative; the berries were used to make jam; and the stems hollowed out for making whistles, drinking straws, blowguns, and pipestems.
- Red-osier dogwood berries were used to make jam and mouthwash. The inner bark of dogwood had important medicinal values; branches were used to make fish traps, poles, sweathouses, and salmon stretchers.

Provision of Unique Food/Habitat

- Cottonwood provides distinct structure and habitat edge with special value for wildlife. Because it grows to a large diameter relatively quickly, it is well suited for retention as wildlife trees. Because it is prone to heart rot and remains alive even when it is very rotten and damaged, it provides habitat for cavity-nesting birds and mammals.

Enhancement of Resource Availability

- Ecosystems dominated by cottonwood have a more rapid turnover of nutrients than do conifer ecosystems because of the relatively quick decomposition of the deciduous litter fall.

Protection

- Cottonwood reduces frost hazard in conifer plantations.

Bioregulation Benefits

- Cottonwood plays an important role in stabilizing riverbanks and maintaining river islands. It also stabilizes eroding banks and acts as a sediment filter that protects conifer plantations from flooding.
- Cottonwood acts as a nurse crop for protection from spruce weevil attacks.
- Cottonwood is less susceptible to *Phellinus weirii* and *Armillaria ostoyae*; when combined with conifers, it reduces the spread of disease.
- Cottonwood helps to establish conifers on high brush hazard sites and is also a viable crop tree on its own.

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Dry Alder Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Ray Coupé, Southern Interior Forest Region

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

In general, no areas in the former Cariboo Forest Region require treatment of the dry alder complex. However, backlog sites that have not been managed for many years may require some treatment.

Commonly Occurring Species*

Trees

No significant tree layer in this complex.

Shrubs

Sitka alder	kinnikinnick
birch-leaved spirea	dwarf blueberry
black huckleberry	

Herbs

pinegrass	**heart-leaved arnica**
northwestern sedge	**twinflower**

* **Note:** Species composition will differ with site and climate. Dominant species appear in **bold type**. Species with generally low cover on all sites are not listed.

General Information

The dry alder complex is most common in the Sub-Boreal Spruce moist cold subzone, Babine variant [SBSmc2], the Montane Spruce very dry cool [MSxk] subzone, and the Sub-Boreal Pine–Spruce moist cool [SBPSmk] subzone.

This complex occurs on a range of soils and parent materials, but is most common on moderately well to well-drained, coarse-to-loamy textured soils. It develops mainly on submesic to subhygric sites and does not become abundant on either hygric and wetter sites with a high water table, or on subxeric and drier sites that are prone to drought. It is poorly adapted to drought conditions, and occurs predominantly on cool northern and eastern aspects.

Silvicultural Considerations

Important vegetation management considerations:

- Determine whether vegetation control will significantly improve seedling performance.
- Assess the degree of competition from the vegetation complex and vegetation control requirements on a site-by-site basis.
- Most sites can be managed through the timing of planting and choice of stock type, as well as careful retention of alder (i.e., by brushing where it grows in dense patches).
- This complex is generally not a serious detriment to conifer establishment and growth, with or without mechanical site preparation, especially in the drier site series.

Silvicultural Systems

If alder is present before harvesting, it may quickly dominate the site after the removal of the forest canopy.

Establishment/Regeneration

SITE PREPARATION

- When needed, herbicides are highly efficacious, with a low negative effect on forest floor and site productivity; they can also be cheaper and applied selectively.
- Screefs (75 × 75 cm) are effective for increasing lodgepole pine growth and survival in pinegrass.

PLANTING

- If alder is a serious problem, plant promptly after harvest.
- Smaller stock types may be adequate on submesic to xeric sites; however, plant larger stock types on mesic to subhydric sites.
- Planting Douglas-fir and lodgepole pine is preferable; however, lodgepole pine is preferred on drier sites because of its rapid juvenile growth rate. Douglas-fir is not a preferred species in the SBPS.
- Lodgepole pine regeneration seems to benefit from some alder establishment.
- Drag scarify sites with adequate cones to promote natural regeneration (but only if Sitka alder occurs at low densities in the understorey).
- Correct microsite planting is imperative.

Plantation Maintenance

BRUSHING

- The necessity and type of brushing treatment depends on the site.
- To minimize the number of treatments required, consider timing carefully (cutting too early can create more problems). If the crop trees are growing reasonably well, delay treatment as long as possible.
- Apply brushing treatments more frequently on wetter sites. It is important to look at where the alder is growing in relation to the crop tree (i.e., whether the alder is overtopping and will impede the crop tree).
- As alder resprouts prolifically from manual brushing, this treatment is more effective on drier sites where resprouting may be slower.
- If brushing is needed, consider manual cutting around the crop tree.

CHEMICAL

- To retain different amounts of alder, apply different rates of glyphosate to foliage.
- For almost complete control of alder, cut stumps and spray sprouts.

BIOLOGICAL CONTROL

- Two bio-control isolates from *Chrondronstereum purpureum* applied to manually cut stumps as a brush-on solution show promise for controlling Sitka alder.

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Dry Alder Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Specific Autecological Characteristics

Pre-disturbance

- Sitka alder and pinegrass usually occur in the understorey of lodgepole pine forests.
- Being moderately shade tolerant, Sitka alder remains suppressed under a tree canopy. Disturbances that increase light penetration to the shrub layer will increase its incidence.
- Pinegrass cover depends on canopy closure.

Post-disturbance

- This complex reaches its full development 3–20 years after harvest.
- Complete overstorey removal or activities that expose mineral soil and create a suitable seedbed favour the development of this complex.
- Sitka alder colonizes disturbed sites primarily by windborne seed (alder seeds disperse during the late fall and winter and germinate the following spring).
- Sitka alder germinates best on moist, exposed mineral soil and in full sunlight.
- Sitka alder produces good seed crops every year from 6–8 year old plants and bumper crops every 3–5 years.
- Once established, Sitka alder spreads slowly by vegetative reproduction; it also sprouts from damaged stumps.
- Sitka alder develops as clumps of multi-stemmed bushes interspersed with open areas. Excessive areas of continuous Sitka alder are not common. In the Southern Interior, alder typically reaches 2 m in height and 30% cover 10 years after disturbance.

Other Values of the Species

First Nations' Values

- Sitka alder was used for: fuel, making a reddish dye, smoking salmon and meat, carving, and basket making.

Provision of Unique Food/Habitat

- In the relatively uniform lodgepole pine-dominated forests where the dry alder complex occurs, the complex's plant species provide valuable food sources for small mammals (snowshoe hare) and important habitat diversity (showshoe hare, red squirrel, voles).
- Free-range cattle often use Sitka alder communities.

Enhancement of Resource Availability

- Sitka alder is a nitrogen-fixing pioneer species.

Protection

- Sitka alder cover can benefit lodgepole pine regeneration.

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Mixed Shrub Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Ray Coupé, Southern Interior Forest Region

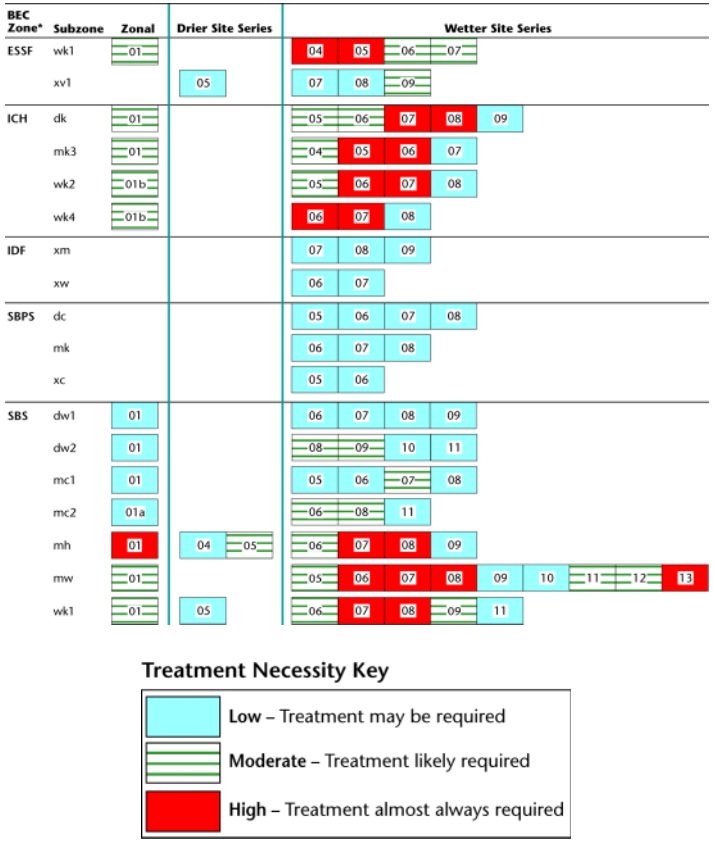
Commonly Occurring Species*

Shrubs

thimbleberry	highbush-cranberry
birch-leaved spirea	red-osier dogwood
saskatoon	pink spirea
falsebox	**common snowberry**
black twinberry	northern black currant
soopolallie	scrub birch
prickly rose	Labrador tea
tall Oregon-grape	red elderberry
black huckleberry	Douglas maple
black gooseberry	mountain alder
oval-leaved blueberry	northern gooseberry

* **Note:** Species composition will differ with site and climate. Dominant species appear in **bold type**. Species with generally low cover on all sites are not listed.

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



* See Meidinger and Pojar (1991) for a description of the Biogeoclimatic Ecosystem Classification (BEC) system. Subzones that may be found in the former Cariboo Forest Region (SBSmm, MSxk), but occur primarily in the former Kamloops Forest Region, were not included.

General Information

The mixed shrub complex is widespread on fresh-to-wet sites in the Sub-Boreal Spruce (SBS) and Interior Cedar–Hemlock (ICH) zones, and in the Engelmann Spruce–Subalpine Fir (ESSF)/ICH transition zone. Fewer examples are found in the Sub-Boreal Pine–Spruce (SBPS), ESSF, and Montane Spruce (MS) zones. It generally occurs on highly productive ecosystems. This complex is broken down into several subcomplexes (refer to Steen and Coupé 1997). It occurs on a variety of soil types on alluvial flats and seepage zones with defined organic layers. It is found on a variety of aspects.

Silvicultural Considerations

Important vegetation management considerations:

- Determine whether vegetation control will significantly improve seedling performance.
- Assess the degree of competition from the vegetation complex and vegetation control requirements on a site-by-site basis.
- Vegetative management of this complex is relatively difficult because of the diversity of species and reproductive strategies.
- Species shifts may occur in this complex following some treatments. For example, soil disturbances associated with harvesting allow many species to regenerate from stem, rhizome, and root fragments. These disturbances create a seedbed for seedling establishment.

Silvicultural Systems

Any system that removes the overstorey increases the cover of some species (e.g., thimbleberry), but has relatively little effect on others (e.g., black twinberry).

Establishment/Regeneration

Depending on the site, prompt planting after site preparation and follow-up brushing is likely necessary to establish a conifer crop. A 1-year delay can cause plantation failure because of competition for light. The vigour and competitive ability of the complex varies with the number and type of brush species present.

SITE PREPARATION

- Medium impact mechanical site preparation (MSP) (e.g., blading or mounding) is useful.
- Prescribed burning is useful; however, a high-impact burn must be site specific to avoid site degradation. Treatment windows are very short.
- Glyphosate is the only registered herbicide with a broad enough efficacy spectrum to control most of the species in this complex.

PLANTING

- Plant a sturdy, large-calipered stock type.
- On sites where low to medium levels of competition are expected, choose a crop species with a rapid early growth rate (e.g., lodgepole pine, where appropriate). On high competition sites, plant more shade-tolerant species (e.g., spruce, subalpine fir).
- Correct microsite planting is imperative.

Plantation Maintenance

BRUSHING

- Brushing may be required on moist, rich sites where vegetation competition may threaten seedling survival. In these cases, use multiple manual cuttings or a single glyphosate application.

LIVESTOCK GRAZING

- Consider browsing treatments on sites dominated by palatable species (e.g., willow and fireweed less than 1 m tall).

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Mixed Shrub Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Specific Autecological Characteristics

Pre-disturbance

- Species diversity and vigour in this complex depends on overstorey stand density (i.e., light intensity) and site productivity.
- If the complex is found in residual stands, consider managing for a variety of attributes before the overstorey is removed.

Post-disturbance

- The complex contains a diversity of plant species that regenerate by various strategies following harvesting.
- Some shrub species (e.g., thimbleberry, red-osier dogwood, and black twinberry) produce abundant berries that are dispersed by animals. Seeds of these species are often banked in the soil after disturbances, and then germinate when conditions are suitable (e.g., after canopy removal or ground disturbance). Other species (e.g., alder) have light, short-lived seed that is blown in from adjacent areas.
- All of the major species in the complex regenerate vegetatively, but their rate of spread varies. Thimbleberry and falsebox spread rapidly by rhizomes or root suckers. Red-osier dogwood and black twinberry spread more slowly by layering or limited rhizomatous growth. Douglas maple, alder, and red elderberry sprout from the root collar, often creating multi-stemmed bushes. Methods of seed dispersal vary among species.
- Overstorey removal increases the cover of many species that make up this complex (e.g., thimbleberry and red elderberry), but has minimal or variable effect on other species (e.g., black twinberry and Douglas maple).
- Light-to-moderate burns tend to encourage vigorous development by stimulating re-growth and providing suitable seedbeds for germination of banked or new seed.
- Low-impact soil disturbance, whether from harvesting or MSP, allows many species to regenerate vegetatively; however, high-impact MSP may hinder development of the complex by destroying roots and rhizomes in the upper soil horizons, and thereby limit vegetative reproduction.

Other Values of the Species

First Nations' Values

- Soopolallie berries can be eaten fresh, or used to make ice cream, syrup, or juice; soopolallie also has important medicinal values.
- Soopolallie berries were the most widely used fruit by First Nations peoples in the Southern Interior. Stems were used for arrow shafts and bows.
- Snowberry twigs were hollowed out for pipestems, and the berries were used to treat sore eyes and diarrhea.
- All Central and Southern Interior groups harvested fresh thimbleberries. The shoots of this plant could be peeled and eaten raw or in a stew. The leaves were used to line baskets or as a surface for drying berries.
- Douglas maple wood was used for snowshoe frames, throwing sticks, bows, rattles, masks, and headdresses. The inner bark was used for twine and rope.
- Several First Nations groups used black twinberry for medicinal purposes.
- Red elderberry bark and roots were boiled to make a purgative; the berries used for jam; and the stems hollowed out for whistles, drinking straws, blowguns, and pipestems.
- Red-osier dogwood berries were used to make jam and mouthwash. The inner bark of the dogwood had important medicinal values; branches were used for fish traps, poles, sweathouses, and salmon stretchers.

Provision of Unique Food/Habitat

- All species in the complex are important to wildlife.
- Many shrubs produce abundant berry crops, eaten by black and grizzly bears, small mammals, and many birds.
- Stems and shoots of several species are important food sources for ungulates (e.g., deer, moose, and caribou). Ungulates and other small mammals browse the leaves of some species.
- The complex provides cover for many small mammals.
- Large shrubs provide nest sites for birds.

Enhancement of Resource Availability

- Highly nutritional Douglas maple litter improves soil productivity. It may beneficially affect Douglas-fir growth on very nitrogen-deficient sites only.
- Mountain alder's nitrogen-fixing ability can be beneficial to crop trees.

Bioregulation

- Several species in this complex can reduce erosion potential on moist, disturbed, or steeply sloped sites.

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Pinegrass Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Ray Coupé, Southern Interior Forest Region

Commonly Occurring Species*

Herbs/Dwarf Shrubs

pinegrass	kinnikinnick
bluebunch wheatgrass	junegrass

* **Note:** Species composition will differ site and climate. Dominant species appear in **bold type**. Species with generally low cover on all sites are not listed.

General Information

This complex occurs on dry-to-fresh sites in the Interior Douglas-fir (IDF), Montane Spruce (MS), Sub-Boreal Pine–Spruce (SBPS), and Sub-Boreal Spruce (SBS) zones. It can be further subdivided into the *pinegrass–kinnikinnick* and *pinegrass–low forb* subcomplexes. The pinegrass–kinnikinnick subcomplex is found on drier sites series and commonly contains high cover of kinnikinnick. The pinegrass–low forb subcomplex has relatively less kinnikinnick and a higher ground cover of low shrubs. In the IDF, SBPS, and MS zones, this complex is widespread and dominates the understorey on a range of sites. Moisture deficits are usually a major concern on sites where this complex is found.

The pinegrass complex occurs on a wide range of soils, but is most commonly found on well-drained, loamy to coarse-textured soils. Soils will vary from poor to very rich and are commonly nitrogen deficient.

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
IDF	dk3	01	05			
	dk4	01				
MS	xk	01	04	05		
	xv	01				
SBPS	dc	01	04			
	mk	01	03	04	05	
SBS	dw1	01	04			
	dw2	01	06			
	mc1		03			

Treatment Necessity Key

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

* See Meidinger and Pojar (1991) for a description of the Biogeoclimatic Ecosystem Classification (BEC) system. Subzones that may be found in the former Cariboo Forest Region (SBSmm, MSxk), but occur primarily in the former Kamloops Forest Region, were not included.

Silvicultural Considerations

Important vegetation management considerations:

- Determine whether vegetation control will significantly improve seedling performance.
- Assess the degree of competition from the vegetation complex and vegetation control requirements on a site-by-site basis.
- This complex affects crop tree survival rather than growth.
- Completely removing pinegrass from around seedlings is the most effective way to improve seedling survival and growth.

Silvicultural Systems

- Be aware of any higher-level management objectives (e.g., management for mule deer winter range in the IDF zone).
- On sites where the priority is conifer production, maintain a high conifer stand density.
- On sites where forage production is a higher priority, maintain a more open stand, which favours pinegrass development.

Establishment/Regeneration

Assess pinegrass cover if natural regeneration is a consideration, as a high cover of pinegrass seriously impedes germination. If natural regeneration is not an option, establish plantations immediately before pinegrass starts to invade the site.

SITE PREPARATION

- For Douglas-fir sites, prepare sites with intensive mechanical disturbance techniques. Patch scarifiers produce noticeable improvements in survival and growth of Douglas-fir.
- If natural regeneration is expected for lodgepole pine, use medium impact site preparation techniques. For sites to be planted with lodgepole pine, use any mechanical site preparation technique that produces a continuous furrow.

CHEMICAL

- Glyphosate effectively controls pinegrass; however, its removal may cause problems on frost-prone sites.

PLANTING

- Correct microsite planting is imperative.
- Plant large, vigorous stock types with well-developed root systems to improve seedling survival.
- Plant near well-distributed slash to increase regeneration success.
- Plant lodgepole pine rather than Douglas-fir on subxeric to xeric sites to enhance seedling survival.

Plantation Maintenance

- Maintain higher crop densities to keep pinegrass in check.

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Pinegrass Complex – Southern Interior Forest Region (Former Cariboo Forest Region)

Specific Autecological Characteristics

Pre-disturbance

- The pinegrass complex generally persists in a forest understorey.
- Treatments that increase light levels or create ground disturbance usually favour the complex.
- If pinegrass is growing in the vicinity, and (or) is well distributed in the understorey before harvesting, its abundance will likely increase after harvest.

Post-disturbance

- Pinegrass regenerates mainly through vegetative reproduction.
- Pinegrass grows quickly in the early spring when water is most available.
- Most of the roots of pinegrass occur in the top 5 cm of the soil.
- Species within this complex spread rapidly after disturbance (e.g., depending on the level of disturbance, dense cover can develop within 2–4 years after clearcutting).
- Low to medium impact ground disturbances and low-intensity fires favour pinegrass development; however, severe disturbances (e.g., high-intensity fires) likely discourage re-invasion of pinegrass.
- Dense pinegrass cover increases the incidence of frost damage to seedlings, particularly in flat areas or depressions where air mixing is limited.
- Pinegrass cover may act as an insulator and prevent soil warming during the day. In addition, cold, stagnant air is often trapped at seedling height during the night.
- When considering treatments, think about the potential effects of pinegrass removal on the nutrient capacity of the site.

Other Values of the Species

First Nations' Values

- First Nations groups often used pinegrass as beaters in the preparation of dried soapberry cakes.
- Pinegrass was used to line cache pits and pit-cooking ovens.
- Socks and insoles for moccasins were often made of pinegrass.

Provision of Unique Food/Habitat

- Except for its new spring growth, pinegrass is not very palatable to grazing animals (e.g., cows, Rocky Mountain elk, and mule deer).
- Pinegrass provides important habitat for a range of small animals, birds, and insects.

Protection

- By excluding more competitive species, pinegrass is beneficial to crop tree establishment and growth in some instances.
- Pinegrass can reduce or prevent overstocking of lodgepole pine where this may be an issue.

Bioregulation

- Pinegrass helps to reduce soil surface erosion.
- Pinegrass contributes organic matter to surface soil layers and recycles nutrients which might otherwise be lost to nutrient leaching.

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