Red Alder–salmonberry Complex

This operational summary provides information about vegetation management in the red alder–salmonberry complex. The dominant species in this complex are red alder (*Alnus rubra*) and salmonberry (*Rubus spectabilis*). Other shrubby species that may occur with varying abundance are red elderberry (*Sambucus racemosa*), devil's club (*Oplopanax horridus*), red-osier dogwood (*Cornus stolonifera*), and stink currant (*Ribes bracteosum*). Vine maple (*Acer circinatum*), thimbleberry (*Rubus parviflorus*), sword fern (*Polystichum munitum*), and bracken fern (*Pteridium aquilinum*) can be minor components.

Topics covered in this summary include development of the complex and its interaction with crop trees; non-timber values and pre-harvest considerations; and management strategies for current and backlog sites.

Other Titles in this Series

Operational Summary for Vegetation Management:

- Bigleaf Maple Complex
- Cottonwood Complex
- Dry Alder Complex
- Ericaceous Shrub Complex
- Fern Complex
- Fireweed Complex
- Mixed-shrub Complex
- Pinegrass Complex
- Reedgrass Complex
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Operational Summary for Vegetation Management

Red Alder–Salmonberry Complex

British Columbia

Forest Practices Branch
Ministry of Forests

Forest Renewal BC

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Operational Summary for Vegetation Complexes
Red Alder–Salmonberry Complex

Foreword

Managing competing vegetation during reforestation can be challenging. Combinations of plants that thrive in seral ecosystems often dominate sites following harvesting or natural disturbance. While many treatment methods for limiting the growth and spread of these vegetation complexes have been explored, the effectiveness of these methods varies widely. This is due to a varying mix of factors, including the number, health, and structure of the competing plants on site, site conditions, treatment timing, and impact of forestry activities. In addition, while some treatments may provide suitable control, the cost in terms of site degradation, hazard to surrounding habitat or crop trees, or the cost of the treatment itself may be prohibitive.

Much work has been undertaken in recent years by ecologists, silviculturalists, and vegetation management specialists in identifying the characteristics of, and the range of treatment options for, major competing vegetation complexes. Until recently, however, knowledge about managing particularly challenging vegetation complexes was scattered. This series summarizes the key information needed to identify and manage important vegetation complexes in British Columbia.

Introduction

Each complex includes several plant species and may be found over a wide range of ecosystems. As a result, response to treatments will vary within complexes, and prescriptions should be developed on a site-specific basis. This operational summary provides information about vegetation management issues in the red alder–salmonberry complex. Topics include: complex development and interaction with crop trees; treatments that affect development of the complex; non-timber and pre-harvest considerations; and management strategies for current and backlog sites.

1. Description

Species Composition

The dominant species in this complex are red alder (*Alnus rubra*) and salmonberry (*Rubus spectabilis*). Other shrubby species that may occur with varying abundance are red elderberry (*Sambucus racemosa*), devil’s club (*Oplopanax horridus*), red-osier dogwood (*Cornus stolonifera*), and stink currant (*Ribes bracteosum*). Vine maple (*Acer circinatum*), thimbleberry (*Rubus parviflorus*), sword fern (*Polystichum munitum*), and bracken fern (*Pteridium aquilinum*) can be minor components.

Occurrence

While the red alder–salmonberry complex occurs on a wide range of sites, with both mineral and organic soils, it is predominantly found on nutrient rich, moist, well-drained loams or sandy loams of alluvial origin in the Coastal Douglas-fir (CDF) and Coastal Western Hemlock (CWH) biogeoclimatic zones. The high soil nutrient capital of these sites may be attributed partly to nitrogen fixation by red alder.

2. Complex Development

Reproduction

The red alder–salmonberry complex contains a variety of species with differing reproductive strategies.

Starting at the age of 6 to 8 years, red alder annually produces abundant wind-borne seed that may remain viable in the soil for up to one year. Very large quantities of seed are produced every 3 to 5 years. The viability of red alder seed decreases after trees reach about 40 years of age.

While red alder seed will germinate on moist organic material, the primary mode of regeneration is germination on moist mineral soil in full light conditions and moderate temperatures. Germination is poor under low light conditions or when seed are buried.

Red alder does not produce root suckers but it can vigorously sprout from the root collar or stump when young. However, starting between the ages of 5 and 10 years, its ability to successfully re-sprout decreases dramatically and while some very old trees will develop stump sprouts, few trees beyond this age will produce sprouts that live for more than 2 years. The number and vigour of sprouts decrease when stump height is less than 10 cm. For red alder, vegetative reproduction is a means for damaged individuals to recover and is not a means of population expansion.

Salmonberry produces large quantities of hard-coated seed every year. Most seed are deposited immediately below the parent plant with wider dispersal being achieved through the consumption of the fruit by birds and mammals. The seed can remain viable in the forest floor for very long periods of time. Soil disturbance and increased sunlight apparently stimulate germination, but light may not be necessary for germination. The resultant seedlings, however, will not survive under low light conditions. Seedlings will germinate on a variety of substrates but mineral soil appears to be required for successful establishment. Seedling production is not significant in perpetuating established colonies.

Vegetative reproduction is the primary means of expansion and perpetuation of established salmonberry colonies. The spread of new shoots is achieved through the lateral extension of rhizomes. However, adventitious shoots will form on existing stems if damaged or disturbed and the rooting of buried shoot tips has been reported. Rhizome and root fragments can be expected to re-establish new shoots following soil disturbance.

Both red elderberry and red osier dogwood have similar reproductive strategies to that of salmonberry, although red osier-dogwood produces stolons instead of rhizomes. Stink currant appears to reproduce mainly from seed but has the ability to vigorously sprout from the root crown or stem if damaged.

Rate of Development

Red alder seedlings require full sun for normal development but can tolerate partial shade for several years. Red alder can grow well in moderate-sized canopy gaps that have a diameter equalling the height of the surrounding trees. When grown under the low light conditions found beneath continuous canopies, red alder has reduced growth and may eventually die. Under full light and adequate moisture, the indeterminate red alder seedling can grow to 1 m or more in the first year and annual height growth can exceed 3 m on some sites during the first 5 years. This rate of growth slows after the juvenile stage. In most stands, red alder trees reach half of their mature height by 15 years of age, and after the age of 50 years, height growth stops.

Young alder trees generally produce conical shaped crowns since they are strongly apical dominant. The breadth and width of the alder crown is strongly influenced by the light conditions under which it grows. Under reduced light levels, red alder produces a narrow crown; however, under full light conditions, branches spread out from the base to produce a broad, rounded crown. With advanced age, apical dominance decreases, resulting in a more rounded crown that becomes flat-topped with time. The characteristics of mature red alder are determined primarily by early stand conditions (< 20 years of age) and management beyond this point can do little to improve future size or quality of the stems.

Salmonberry has been described as shade semi-tolerant. It is able to inhabit sites too shady for other species, but it cannot survive under the very low light conditions of a dense coniferous canopy. Salmonberry, however, achieves its best growth on well-aerated moist soils under full sunlight.

Salmonberry is a perennial shrub that can produce healthy canes that have been reported to last for 10 to 15 years. Under full light conditions, it can grow as much as 1–2 m in a single season, but is normally 1–3 m tall.

Within the red alder–salmonberry complex, dense young red alder stands have sparse, low-vigour, salmonberry-dominated understories. As the red alder component ages and canopy gaps begin to appear, understorey shrub cover increases and, in the absence of conifers, salmonberry and other shrubs may completely dominate the site after red alder begins to die (after 80 to 100 years). Salmonberry that is able to overtop red alder in the first 3 years can cause significant red alder mortality.

Factors that Affect Development

Development of the red alder–salmonberry complex is promoted by treatments that increase light levels and create ground disturbance. The red alder–salmonberry complex is relatively long-lived and few other plant species can readily colonize and out-compete it, once established. Therefore, establishment of the red alder–salmonberry complex should be inhibited or delayed, and desired crop trees should be established prior to full complex development.

Treatments or factors that favour the development of the red alder–salmonberry complex include:

- natural disturbances, harvesting and other activities that result in increased light levels
- ground disturbances that expose mineral soil
- light to moderate burning
- removal of other non-crop vegetation (i.e., non-crop trees and shrubs)
- low- to moderate-impact mechanical site preparation (MSP).

Treatments or factors that can impede or delay red alder–salmonberry complex development include:

- complete or partial shading (may prevent or inhibit red alder growth)
- very intense burns (removes salmonberry)
- dry site or soil conditions
- thick organic layers
- vegetation control using herbicides:
  - glyphosate applied as a foliar spray in late summer
  - triclopyr ester in water applied as a foliar spray in spring or late summer
  - basal application (red alder) of triclopyr ester
  - cut stump application (red alder) of glyphosate, triclopyr ester, or 2,4-D.

Interactions with Crop Trees

Shade-intolerant species, such as Douglas-fir, cannot survive for long periods under moderately dense to dense red alder and salmonberry canopies. Red alder itself is an early successional species that does not replace itself without a major disturbance; thus, it cannot replace itself under an established salmonberry canopy. Dense canopies of salmonberry can reduce volume growth of red alder and conifers during initial growth periods. The growth of moderately shade-tolerant species, such as western redcedar, Sitka spruce, and western hemlock, can be suppressed by the presence of red alder and salmonberry canopies. Mats of salmonberry and red alder leaf litter may also prevent germination or smother small seedlings of shade-tolerant crop trees.

Red alder competes with conifers for light and water. Light levels below 5% can be found under well-established 15-year-old red alder canopies, creating conditions unfavourable for the survival of conifer seedlings. Any conifer that grows up through the red alder canopy can suffer physical damage such as leader breakage or the loss of buds and needles.

A primary beneficial effect of red alder on the growth of crop trees is its ability to increase soil nitrogen supply, decrease soil bulk density, and increase organic matter content of forest soils. On nitrogen-poor or -medium sites, a component of red alder can increase the growth of conifers if red alder densities are kept sufficiently low. Ecosystem modelling suggests that between 50 to 200 uniformly distributed red alder/ha, in a coniferous stand, are sufficient to improve soil nitrogen capital and

conifer growth. Densities above 200 red alder/ha are likely to result in reductions of conifer yield. However, when red alder is grown at densities below 300 stems/ha (sph), red alder will retain lower branches for a long period of time, resulting in poor wood quality. Growing red alder in strips or patches (cluster planting), with densities above 600 sph, may allow for the production of both red alder and conifers on the same site. Studies indicate that on nutrient-poor sites, red alder patches can improve soil nitrogen availability and growth of Douglas-fir for distances up to 15 m from the patch edge. Side shade from red alder influences only a narrow region along the edge of the patch, extending less than 7 m on the north side, less than 4 m on the east and west side, and 0 m on the south side.

A canopy of red alder, like that of cottonwood, also appears to reduce the frequency of spruce leader weevil (*Pissodes strobi*) attack on Sitka spruce saplings. Side shade from adjacent patches or strips of red alder appears to reduce leader weevil damage for a distance of 5–10 m. Red alder is also resistant to laminated root rot (*Phellinus weirii*), thus, a rotation of red alder on laminated root rot infected sites can help sanitize the stand.

Beneficial effects of salmonberry may be the control or reduction of soil surface erosion, the contribution of large amounts of soil organic matter to the site, and the exclusion of other competitive species.

3. Management Consideration For Other Resource Values

Red alder is believed to support greater invertebrate biomass than other associated tree species. With advanced age, it also provides short duration cavity nesting and feeding sites and, in younger stages, can provide nesting and breeding habitat for a variety of species. Deer, elk, mountain beaver, and beaver will forage on red alder leaves or twigs. However, red alder grows so rapidly that it is within the range of browsing animals only for a short period after the beginning of its second year. Red squirrels will feed on the catkins and deer mice, shrews, and red-backed voles will feed on the seed.

Salmonberry is an important forage species for many coastal animals: elk, deer, moose, and mountain goats browse foliage; birds and bears consume berries; nectar in the early-appearing flowers is a critical initial food source for hummingbirds.

Soil surface erosion may also be reduced with a cover of red alder and salmonberry. The thick mats of litter intercept and dissipate raindrop impacts and reduce rill formation.

The rapid aboveground and belowground growth of both of these species can provide stream bank stability when disturbance has caused a loss of bank integrity. The litter of both species contributes detritus to streams.

4. Pre-harvest Considerations

Silvicultural System

The photosynthetic system of salmonberry and red alder is most efficient under higher light levels such as those of forest clearings. In open canopy forests with moderate understorey light levels, salmonberry has moderate aboveground growth and may have a significant amount of rhizome production. Red alder growth rates are significantly reduced or it is eliminated from the site under these conditions. When large openings are created in these stand types the resulting full light conditions can lead to rapid site occupancy by salmonberry and red alder. If shade-tolerant species are suitable crop trees for these sites, the silvicultural system options under these conditions should ensure that some form of shading occurs on the site. The post-harvest understorey light levels should be low enough to restrict aboveground biomass production of salmonberry and the germination of red alder, but are high enough not to significantly reduce the growth of the desired crop tree seedlings. Also, the harvesting technique used should avoid excessive soil disturbance to minimize the potential for red alder ingress.

The reduced light levels under a closed forest canopy can eliminate red alder and severely reduce salmonberry biomass production. Under these conditions, salmonberry presence is minimal since the number of plants surviving harvest may not lead to rapid full site occupancy through rhizome extension. However, since the amount of salmonberry seed stored in the soil could be potentially high, any excessive soil disturbance and mineral soil exposure following the harvest of a closed canopy forest may promote the development of the red alder–salmonberry complex through: (i) the colonization of the site through rhizome fragments, (ii) the germination of salmonberry seed stored in the soil, and/or (iii) through the germination of wind-deposited red alder seed. If mineral soil exposure is minimized during harvesting, development of the red alder–salmonberry complex may be avoided.

The silvicultural system chosen must therefore take into consideration the shade tolerance of the desired crop species, understorey light level, and the pre-harvest site occupancy levels of salmonberry and red alder. When an open canopy structure exists and shade-tolerant crop species are preferred, systems that promote some shading (i.e., shelterwood or selection) may reduce the amount of red alder and salmonberry competition with the desired crop trees. When shade-intolerant crop species are preferred or where low pre-harvest understorey light levels and low numbers of salmonberry plants exist prior to harvest, large openings may be created through clearcutting, retention, patch clearcutting, or seed tree systems. In all cases, the exposure of mineral soil should be kept to a minimum.

Seed Tree Control

Removal of red alder seed trees in adjacent stands is not generally considered viable since red alder seed can travel substantial distances.

Advanced Regeneration

The retention of advanced regeneration may reduce some of the competitive impacts of red alder and salmonberry. Advanced regeneration of sufficient size will not be subjected to early light competition and taller advanced regeneration may be able to withstand, or prolong, the duration before the light competition from red alder becomes significant. High

levels of advanced regeneration may also provide some shading of the site, thus reducing the competitive effects of both salmonberry and red alder.

Method of Reforestation

Natural regeneration of conifers should not be considered an option due to the associated delays in seedling establishment that will allow for the full development of the red alder–salmonberry complex before the majority of crop tree seedlings are large enough to withstand its competitive impacts. Crop tree seed falling beneath the salmonberry and red alder canopies may not have enough light to germinate, and any seedling that does germinate may be smothered by leaf litter.

Since the competition-free window is relatively short, planting is generally the most effective means for rapidly establishing a crop of desired tree species. Plantations should be established prior to site domination by either salmonberry or red alder. Even if the desired crop tree is red alder, planting may still be undertaken to ensure full site occupancy by the trees prior to establishment of the salmonberry component of this complex.

5. Vegetation Management for Current Sites

Site Preparation

General

Soil disturbance that causes exposure of mineral soil provides a favourable seedbed for both salmonberry and red alder. It may also stimulate the germination of buried salmonberry seed. If existing salmonberry plants are damaged, re-sprouting and the spread of rhizome fragments can occur. Since the constituent species of the red alder–salmonberry complex have diverse means of reproduction, vegetation management of the complex is relatively difficult.

Mechanical

Light- to medium-impact MSP treatments can create conditions that favour the spread and colonization of both red alder and salmonberry. Treatments that expose and mix the upper mineral horizons will sever and spread salmonberry rhizomes and buried seed throughout the treatment area. These rhizomes and seed can quickly establish new plants, thus compounding the competitive impacts of salmonberry. Rhizome elongation from existing plants has been found to be greatest through soils with low bulk density. The exposed mineral soil can also create conditions that may allow for the germination of red alder seed and the establishment of new plants. Thus, these treatments may effectively increase the rate of development of the red alder–salmonberry complex.

Mechanical site preparation techniques that have high to very high impact on the site can set back the establishment of salmonberry if the roots, rhizomes and buried seed are removed from the soil. However, in most cases, as with low- to medium-impact site preparation, freshly exposed and mixed mineral soil creates seedbed conditions that favour the establishment of both red alder and salmonberry. Both salmonberry and red alder densities can be higher on scarified sites than those on unscarified sites.

Retention of the organic layer may minimize the colonization and site occupancy by red alder and salmonberry.

Manual Scalping (Screefing)

Planter patch (30 cm × 30 cm) scarification does not usually provide enough of a competition-free window to allow sufficient establishment of desired crop trees. Like some forms of mechanical site preparation, manual scalping or screefing may promote the spread and establishment of both red alder and salmonberry by creating favourable growing microsites that promote the spread of these species through severed rhizomes and exposed seed. The size of the patch may be ineffective in compensating for the rapid height growth, and associated light competition, of both red alder and salmonberry.

Prescribed Fire

Once the red–alder salmonberry complex is established, burning may be very difficult due to the very low flammability of red alder. Burnings that are light to moderate have been found to have little damaging impact on existing salmonberry plants. The fire may remove the aboveground portion of the salmonberry but has little impact on the belowground rhizomes or buried seed. The re-sprouting of the rhizomes and establishment of new plants may increase the coverage of salmonberry over that which was present prior to treatment. With very intense burns the majority of the organic layer including the rhizomes and seed bank are consumed, leading to control of salmonberry. However, regardless of the intensity of the burn, red alder is generally one of the first trees to become established on burned-over areas. Thus, burning may provide only a very short competition-free window in which to establish desired crop trees.

Chemical

Chemical treatments have successfully been used to control both salmonberry and red alder. A foliar application of glyphosate or triclopyr ester can control both salmonberry and red alder stems. For site preparation treatments, these herbicides can be applied any time during the growing season.

Basal application and stem injection of triclopyr ester or stem injection with glyphosate or 2,4-D cause severe damage to treated red alder stems. Due to the selective nature of these treatments, they can be used to thin red alder to desired densities. Caution must be exercised because controlling only the red alder component of this complex may release the salmonberry portion, thus resulting in an increase in its density and canopy closure on the site.

Seeding of Cover Crops

Where the site has been mechanically cleared or prescribed burned (e.g., continuous MSP and broadcast burning) and existing salmonberry plants are not present, seeding with agronomic grasses or legumes may prevent or reduce the establishment of both red alder and salmonberry. Excessive grass cover, however, may result in increased competition and rodent populations that can subsequently damage conifer seedlings. If salmonberry rhizomes or established plants are already present on-site, the seeding of agronomic species may be ineffective. In these situations,

salmonberry may be able to out-compete the agronomic species and dominate the site.

Biological Control

Livestock Grazing

Early season brush control can be achieved using sheep because they find salmonberry moderately palatable in the early foliar stage. Sheep will also browse on the leaves of red alder and can provide control to a height of 1.5 m. Due to the risk of foot rot, however, sheep grazing is not feasible on the very wet sites of the complex.

Both red alder and salmonberry have low palatability to cattle, and hence are not favoured. Trampling damage by cattle may provide some control of both species by preventing significant height growth. Browsing activities may cause species shifts towards other less competitive species.

Other

Though not yet registered, research results have confirmed that the fungus *Chondrostereum purpureum*, when inoculated into frills of young alder, can be more effective in controlling red alder than frilling alone. Development and temporary registration of commercial formulation of this fungus is now complete.

Planting

Timing

In order to take full advantage of the competition-free window, crop tree planting should occur immediately after harvest or site preparation. The longer the red alder–salmonberry complex can develop prior to crop tree establishment, the lower the success rate of reforestation efforts.

Stock Type

The use of large (415D or greater) and vigorous planting stock with well-developed root systems can improve seedling survival on red alder–salmonberry sites. Stock types establish and begin to grow quickly following planting will maximize post-planting height and diameter growth, allowing the exploitation of the competition-free window and aiding in the successful establishment of desired crop trees. Larger caliper seedlings may also be better able to withstand any potential mechanical damage.

Species Selection

Sitka spruce, western redcedar, Douglas-fir, amabilis fir, grand fir, black cottonwood, or red alder are the preferable crop species on moist CWH sites. Douglas-fir, grand fir, western redcedar, black cottonwood, bigleaf maple, or red alder may be more suitable in the CDF.

If a silvicultural system that provides less than 60% light levels in the understorey is employed, or the red alder–salmonberry complex is well developed, western red cedar, western hemlock, or Sitka spruce may be the more suitable choices. Douglas-fir, black cottonwood, bigleaf maple, or red alder should be used only where there is full sunlight and the microsite of seedling establishment is relatively free of competition. Red alder and black cottonwood seedlings have a very low tolerance to the competitive impacts of salmonberry.

Sitka spruce should be used only in areas with low spruce leader weevil hazard and, if possible, spruce leader weevil resistant genotypes should be employed.

Cluster Planting

A cluster planting system can reduce the cost of post-planting vegetation management activity. The system can provide an option for growing mixtures of conifers and broadleaved species and can also integrate the needs of silviculture with those of wildlife habitat management.

If a cluster planting system is chosen, the recommended range for inter-tree distance within clusters is 1–2 m. Closer spacing is recommended for small clusters, where competition is lower, and wider spacing is recommended for larger clusters, providing more growing space. The number of trees per cluster required to meet recommended density should be determined according to the conditions of the site and the associated stocking standards. Factors to consider include the size of the available microsites and their distribution, species selection, anticipated post free growing mortality, and the ability of the trees to self-prune within the cluster. The target number of trees per cluster should be in the range of 10 to 30 seedlings. To maximize red alder contributions to soil nitrogen within the conifer cluster, clusters should be less than 30 m in diameter but large enough to minimize the impacts of red alder side shade into the conifer cluster, and alder canopy expansion overtop the conifer cluster. A minimum recommended cluster size is 20 m × 20 m.

Brushing

General

The need for brushing treatments will depend largely on the success and timing of the initial planting. Since salmonberry is able to rapidly re-occupy a site from underground rhizomes, stem base re-sprouting, and buried seed, few brushing techniques will provide anything but short-term competition relief. Red alder, on the other hand, is susceptible to long-term control through brushing. It is important to remember that controlling only the red alder component of this complex may cause the release and growth of salmonberry, which can result in an increase in salmonberry density and canopy closure on the site.

Manual

Manual cutting of salmonberry stimulates rapid re-sprouting from stem bases and rhizomes and can result in an increase in salmonberry coverage on the treated site. Salmonberry plants cut in spring have been reported to re-sprout to a height of over 1 m by late summer. Since it is difficult to control salmonberry by manual cutting, any manual treatment should aim at maximizing light availability to the target crop tree during the bud elongation and bud setting phase of determinate conifer seasonal growth (mid-May to end of June).

Manual cutting is effective in controlling red alder trees older than 15 years. Sprouts of the cut stumps rarely live longer than 2 years. Trees younger than this can sprout vigorously with the greatest amount arising on cut stems between 1 to 3 years old. The effectiveness of cutting

increases when treatment occurs in mid-summer or when the cut stump is within partial or full shade. Stump heights below 10 cm have been shown to have fewer, less vigorous sprouts.

Girdling has been shown to be completely effective in controlling red alder greater than 3 cm DBH. Death of girdled red alder, depending on size, can take two to three growing seasons. The treatment involves removing a band (at least 1.5 cm wide) of the bark and cambium as low as possible on the stem.

Chemical

As described under "Site Preparation (Chemical)," herbicide treatments can control both red alder and salmonberry. Foliar applications of glyphosate (2.0 kg ae/ha) or triclopyr ester (1.4–5 kg ae/ha) may provide sufficient competition-free windows to ensure crop tree establishment and survival. Care must be taken to ensure that damage to the desired crop trees does not occur during application. Broadcast foliar glyphosate application over plantations of Douglas-fir or Sitka spruce must be conducted in late summer or fall to minimize crop tree damage. Glyphosate application can severely damage western redcedar, yellow-cedar, and western hemlock. Triclopyr ester applied in an oil carrier will severely damage oversprayed conifers. Foliar application of triclopyr ester in water during dormant periods (late summer and very early spring) at rates below 2 kg ae/ha can be used for release of Douglas-fir, grand fir, and western hemlock.

Basal bark application of triclopyr ester (in oil carrier) to target red alder stems will provide effective control, as will stem injection of red alder with triclopyr ester, glyphosate, or 2,4-D. Cut stump application of glyphosate, triclopyr ester, or 2,4-D will effectively control treated red alder.

Physical Barriers (Mulches)

Large (2 m × 2 m) plastic mulches, when firmly anchored to the ground, can provide a competition-free microsite for up to 2 years if placed promptly after disturbance. Plastic mulches that are small do not yield good results.

Livestock Grazing

As described under "Site Preparation (Biological Control)," sheep and cattle can be used for some control of both salmonberry and red alder. The use of livestock, however, must be timed appropriately to ensure the greatest amount of salmonberry and red alder is either consumed or trampled with the minimum amount of damage to the desired crop trees. To avoid browsing damage, livestock grazing should not occur during active crop tree growth.

6. Vegetation Management Strategies for Backlog Sites

General

There is little change to the red alder–salmonberry complex over time, and once it is established there is little difference between the complex on current and backlog sites. The vegetation management strategies employed on current sites can be applied to backlog sites.

7. Summary

The most effective methods for the control of the red alder–salmonberry complex appear to be treatments that inhibit or reduce the ability of salmonberry and red alder to colonize the site. Reduction of the competitive impacts of this complex must begin with the silvicultural and harvest systems employed, and all subsequent treatments must consider the potential growth response of the complex under the resulting microsite environment. While one treatment alone may provide some control, the most effective control of the red alder–salmonberry complex should be viewed as a system or series of treatments.

When the red alder–salmonberry complex is established on-site long before crop tree establishment, the effectiveness of all potential control methods is greatly reduced. Successful plantation establishment in this plant community is associated with prompt initiation of reforestation activities after disturbance.

An effective non-chemical strategy for managing the red alder–salmonberry complex appears to include the following four-step strategy:

1. minimizing the exposure of mineral soil and the retention of the organic layer during harvest
2. immediate planting of large vigorous stock types of a fast-growing species
3. 2 to 3 years after harvest, manually brushing a 1–1.5 m radius around each crop tree in the mid-May to end of June period for 2 consecutive years
4. girdling the alder trees once they achieve a DBH of at least 3 cm.

Among chemical treatments, a foliar application of glyphosate or triclopyr ester, a basal bark application of triclopyr ester, or a stem injection with glyphosate, triclopyr ester, or 2,4-D are effective for controlling red alder in this complex. Foliar application of glyphosate (1.5–2.1 kg ae/ha) or triclopyr ester (1–2 kg ae/ha in water) will provide effective control of salmonberry for several years.

The most effective way of managing sites that currently have, or have the potential to develop, the red alder–salmonberry complex is the use of a combination of both chemical and non-chemical treatments. This may involve a series of treatments starting with the minimization of mineral soil exposure during harvest, followed by prompt planting of a fast-growing crop species. Planting should be followed, approximately 2 to 3 years, by a foliar application of glyphosate, if necessary. If the red–alder salmonberry complex is already well established, a chemical site preparation with glyphosate would be required prior to planting.

Maintaining a component of red alder within conifer stands will contribute to species and structural diversity and can, if maintained at appropriate densities, provide increased conifer yield. In order to enhance conifer yield, densities of red alder should be kept below 200 uniformly spaced stems/ha when grown in intimate mixture with conifers in stands over age 10 years. To enhance conifer yield on medium and poor sites, it is generally desirable to maintain between 50 and 100 well-distributed red alder to provide the necessary nutrient inputs. As an alternative to maintaining low densities of uniformly distributed red alder through conifer plantations, red alder can also be grown in patches at least 20 m wide. Distances between patches should be kept below 40 m. This patchy arrangement may produce a component of sawlog quality red alder along with the coniferous yield. The potential use of red alder as the main crop species on these sites should also be given serious consideration, particularly on sites with laminated root rot or on backlog sites currently dominated by red alder.

Any treatment of these sites should be assessed for its impacts on all competitive species in this complex. Control of only one competing species in the complex can potentially lead to site domination by one or all of the other species. This can in turn result in higher competition for resources with the desired crop species than existed prior to treatment. In all cases, monitoring the non-crop species growth on these sites is essential in effective management.

For More Information

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