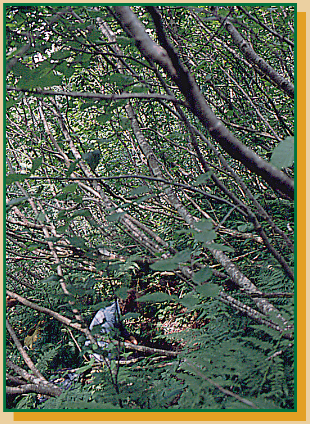
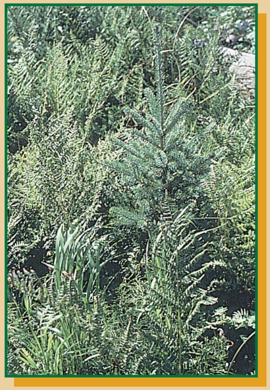
Wet Alder Complex





Wet Alder Complex

This operational summary provides information about vegetation management in the wet alder complex. This complex is dominated by Sitka alder (*Alnus viridus* spp. *sinuata*), which grows in dense, nearly pure stands. Mountain alder (*Alnus incana* spp. *tenuifolia*), thimbleberry (*Rubus parviflorus*), and black twinberry (*Lonicer involucrata*) are the other significant shrubs. The most common herbs in the complex are lady fern, bluejoint, bracken fern, and fireweed. In the north, spiny wood fern, devil's club, red elderberry, and twistedstalk may also occur with this complex.

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:

- Dry Alder Complex
- Ericaceous Shrub Complex
- Fireweed Complex
- Mixed-shrub Complex
- Pinegrass Complex
- Willow Complex

British Columbia

Forest Practices Branch
Ministry of Forests

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Operational Summary for Vegetation Management
Wet Alder Complex

FOREWORD

Managing competing vegetation during reforestation can be challenging. Combinations of plants that thrive in seral ecosystems are often well suited to dominating sites following harvesting or wildfire. While many treatment methods for limiting the growth and spread of these vegetation complexes have been explored, efficacy has varied widely. This is due in part to the widely varying mix of parameters from site to site, including the number, health and structure of the competing plants on site, site conditions and timing 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 during the past decade by ecologists, silviculturists, and vegetation management specialists on 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

This operational summary provides information about vegetation management issues in the wet alder 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. 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.

1. DESCRIPTION

Species Composition

The major shrub species in the wet alder complex:

- Sitka alder (*Alnus viridis* ssp. *sinuata*)
- mountain alder (*Alnus incana* ssp. *tenuifolia*)
- thimbleberry (*Rubus parviflorus*)
- black twinberry (*Lonicera involucrata*).

The dominant shrub, Sitka alder, grows in dense, almost pure thickets. Mountain alder is usually restricted to alluvial, swamp, or streambank habitats.

The most common herbs are:

- lady fern (*Athyrium filix-femina*)
- bluejoint (*Calamagrostis canadensis*)
- bracken fern (*Pteridium aquilinum*)
- fireweed (*Epilobium angustifolium*).

Typical species in northern B.C. include:

- spiny wood fern (*Dryopteris expansa*)
- devil's club (*Oplopanax horridus*)
- red elderberry (*Sambucus racemosa*)
- twistedstalk (*Streptopus* spp.).

Occurrence

The complex occurs on rich, wet sites in the ICH, MS, SBS, BWBS, and ESSF zones. It is most extensive in the transition between the ICH and ESSF zones and between the SBS and ESSF zones.

The complex typically occurs on moderately well-drained Sombric Brunisols and Podzols derived from morainal parent materials. The thick Ah horizons are loam to silt-loam and enriched with humus derived from herbaceous and alder litter. Nitrogen fixation by the alders may also contribute to the high soil nutrient capital. The subsurface horizons are loam to sandy loam. Mottling may occur indicating imperfect drainage.

2. Development

Reproduction

The wet alder complex contains numerous competing species with a variety of reproductive strategies. This diversity makes vegetation management relatively difficult.

Alder invades new sites primarily by wind- and water-borne seed. Seed disperse in the fall and germinate the following spring on moist, exposed soil. As alder can 'fix' nitrogen, it colonizes severely disturbed sites such as roadcuts, skidtrails, and landslide scars.

Vegetative reproduction is important for the persistence and expansion of established alder colonies, but is generally insignificant as a means of producing new plants and invading new areas. Alder sprouts from damaged or cut stumps. It can also reproduce by layering.

Thimbleberry, black twinberry, and red elderberry produce abundant seed that are stored in the soil until conditions are favourable for germination. Once established, thimbleberry expands through rhizomatous growth.

Ferns are generally on site prior to disturbance and regenerate vegetatively by rhizomes. They also produce numerous spores that germinate on wet sites in the spring.

Fireweed and bluejoint aggressively invade disturbed sites. Both species have light, wind-borne seed that are dispersed in late summer-fall and germinate on open, moist mineral soil. Also, fireweed is often present in the understory to form the nucleus of the new colony.

Rate of Development

Prior to harvest, the wet alder complex occurs as a climax community in gaps or along borders of open spruce forests. As there is little merchantable timber in alder thickets and most harvesting is done in the winter, little damage to the thickets occurs during logging operations. If the complex is not treated, it encroaches onto surrounding not satisfactorily restocked (NSR) areas.

The alder complex rapidly occupies a site following harvest. Plants already on site are released, growing to capture newly available growing space. As well, Sitka alder and invading forbs and grasses encroach on surrounding cut-over areas. The complex develops rapidly due to the high productivity of the ecosystems.

Existing alder clumps gradually coalesce and may develop into continuous thickets within 3–10 years following harvest. Alders occurring in this complex are considerably larger than those in the dry alder complex. The springy branches layer downslope in the direction of snowcreep. Although the length of the branches can reach 10 m, the average height rarely exceeds 5 m. Stems can grow to 20 cm in diameter.

Fireweed, bluejoint, and ferns attain heights of up to 3 m and can cause considerable damage to conifer seedlings through vegetation press and snowpress.

Treatments that Affect Development

Treatments that favour the development of the wet alder complex include:

- overstory removal that increases resource availability and causes ground disturbance. Following harvesting, residual alder thickets on site can spread through vegetative growth and seed. Also, increased soil temperatures resulting from the removal of the overstory can stimulate seedbankers such as thimbleberry and black twinberry to germinate.
- ground skidding or low-impact mechanical site preparation (MSP) treatments that expose mineral soil. Such treatments favour invasion by alder, fireweed, ferns, and grasses. Nearby seed sources and timing of MSP immediately prior to seed dispersal may also favour establishment.
- low- to medium-impact fire stimulating sprouting of alder stumps and banked seed, and spreading of rhizomes.
- high-impact burns that may destroy banked seed and rhizomes, but may expose mineral seedbeds to favour other species.

Treatments that can reduce the development of the wet alder complex include:

- severe MSP treatments that destroy alder roots and thimbleberry, fireweed, fern, and grass rhizomes
- seeding domestic grasses onto areas of exposed mineral soil to reduce invasion of native vegetation
- minimizing soil disturbance (e.g., through winter logging on deep snow or through cable logging systems).

Some treatments may reduce the spread of some species (e.g., alder) while favouring the growth of others (e.g., herbs and grasses). This shift in species composition may not reduce their overall competitive effect on crop species.

Interaction with Crop Trees

On the coast, Sitka alder is a minor competitor relative to other vegetation complexes. However, on moist sites in the interior, Sitka alder can be well established in the understory before harvesting, form a dense canopy after clearcutting, and shade out conifer seedlings such as Douglas-fir.

Sitka alder can benefit crop trees by increasing the nitrogen content of forest soils. Alder acts as a nurse crop to Sitka spruce on poor sites by improving soil conditions and adding organic matter and nitrogen. On nitrogen-deficient sites, conifers may benefit from the presence of Sitka alder. Alder can also control erosion and stabilize steep slopes.

3. Non-timber Values

Sitka and mountain alder have relatively low browse value for ungulates. However, both alder species are important food sources for snowshoe hares and rodents. Also, birds use the alders as a food source (seeds, buds, and catkins) and as nesting sites.

In northern B.C., the alder clumps are often intermixed with productive shrub and herb understories. These sites, rich in berries, are important forage sites for bears and other animals. Clumps of alder also provide cover for animals that like to forage in open, logged areas.

Leaving wet alder thickets within conifer stands may be considered. They can provide diversity, wildlife forage, cover, and nesting sites throughout the rotation.

4. Pre-harvest Considerations

Silvicultural System

Overstory removal such as clearcutting increases light levels and, where the site is disturbed, it may stimulate alder growth and competition. Following clearcutting, Sitka alder grows slowly while mountain alder increases in abundance on wet sites.

Advance Regeneration

Advance regeneration should be retained where possible within and around alder thickets because seedlings are difficult to establish where this complex exists.

Method of Reforestation

Dense thickets of the wet alder complex, well established prior to harvest, make natural regeneration unsuccessful. Consequently, successful reforestation includes site preparation, planting, and usually brushing treatments.

Timing

Many species in the complex can rapidly invade disturbed areas following logging. To avoid or minimize the need for brushing treatments, conifer seedlings must be planted immediately following site preparation.

5. Vegetation Management Strategies for Current Sites

Site Preparation

General
The wet alder complex generally requires some form of vegetation management to achieve a free growing crop. The complex is best controlled using a site preparation treatment.

Mechanical
On sites that are saturated most of the growing season, creating raised microsites by excavator mounding is the treatment of choice.

Low-impact MSP treatments do not successfully control alder species because they cause minimal damage to root systems and promote rapid regrowth. Follow-up treatments are nearly always required.

Medium-impact blading is recommended. The MSP should be done from early to mid-summer **before** alder seed dispersal. Following this treatment, a vigorous herb complex may replace the alder. This herb complex may need to be controlled with a chemical brushing treatment within 1–2 years.

High-impact MSP (e.g., blading), which removes root and rhizome systems, has successfully been used to remove alder thickets. However, Sitka alder remaining on site may slowly increase in cover and dominate the site within 10 years. For the best results, high impact MSP treatments must be combined with planting of large stock to increase the chances of successful regeneration. Although examples of good growth can be found among planted spruce in the ICH/ESSF transition zone following high impact MSP treatment, few soils are resilient enough to withstand this treatment.

The medium- and high-impact treatments may, while removing the alder, also eradicate the raised microsites where advance regeneration has established. Removing the alder may also raise the water table, making expensive mounding treatments necessary.

Screefing
The effectiveness of this treatment depends on the size and depth of the screef. Also, screefing is unsuitable where alder is dense and side growth will quickly overtop the screef. Root crowns and stem bases damaged during the treatment will sprout and alder will re-invade the treated sites.

Prescribed Fire
Low-impact burns usually do not carry through moist alder thickets and usually provide only one year of vegetation control on the surrounding area. They stimulate alder sprouting, seed germination, and regrowth of

rhizomatous shrubs, grasses, and forbs. Fireweed and bluejoint reappear on the moist, burned duff in the spring. Follow-up brushing is necessary after most burns.

High-impact burns destroy the alder thickets and provide up to 10 years of control. They remove organic horizons and destroy alder stumps, banked seed, and rhizomes. Fireweed, and to a lesser extent bluejoint, seed onto the site and spread rapidly. High-impact burns can rarely be carried out, however, due to narrow burning windows, the extreme drought code required, low fuel loads, and the risk of site degradation.

Chemical

Glyphosate is the most common herbicide used in controlling vegetation in the wet alder complex due to its broad efficacy spectrum. Broadcast application of glyphosate at high rates provides the best chemical control of alder. Glyphosate can be used for site preparation by applying it in mid-summer. Hexazinone and 2,4-D ester applications have resulted in variable control in the wet alder complex. Triclopyr ester is effective for alder control.

Seeding

Seeding may be used with an MSP or burn treatment. A grass/legume mix will reduce cover and diversity of native species. It may also partially offset nitrogen losses from alder removal, and site degradation from high-impact site preparation. However, tree survival and growth may be no better than under untreated conditions due to intense competition for soil nutrients and mechanical damage from snowpress.

Livestock Grazing

Use of sheep or cattle may not be successful because most of the major competing species in this complex — alder, thimbleberry, bracken — are not palatable to sheep or cattle.

Planting

Timing

Plant immediately after site preparation. A one-season delay will reduce plantation success due to re-invasion of non-crop vegetation.

Stock Type

Plant large, sturdy stock (PSB 313 or 415) with large caliper to reduce the damage from vegetation press and snowpress.

Species Selection

Spruce is the most common crop tree planted on wet alder sites. Although susceptible to snowpress, lodgepole pine should also be considered on dry or frost-prone sites. Subalpine fir may be the most suitable species in heavy snow areas (e.g., wet ESSF, ICHvc).

Brushing

General
A brushing treatment is generally required following site preparation. Sitka alder sprouts more vigorously on richer, wetter sites than on poorer, drier sites.

Manual
Manual cutting results in prolific and rapid (up to 2 m/yr) sprouting of alder and has little effect on forbs and grasses. Sprouting vigour of alder does not appear to be related to season of cutting. Cut alder stems typically produce 3 to 20 sprouts per stump which grow 0.2 to 1.5 m/year.

At least two cuttings are required to release seedlings from alder. Crop trees may sustain damage, particularly if brushsaws are used. Using large planting stock will reduce damage as tree seedlings are more visible.

Manual brushing operations combined with juvenile spacing are successful if crop trees are similar in height (2–4 m) to the surrounding alder. Otherwise, overtopping of crop trees can occur within one year.

Chemical
See *also Site Preparation, Chemical*.

Glyphosate is most effective and causes the least amount of damage to seedlings when applied as a broadcast spray in late summer to early fall. Efficacy is reduced when plants are under drought stress or are partially sprayed. Glyphosate has also been used successfully to control alder when applied to freshly cut stumps or sprouts. Glyphosate treatments will shift the species composition to grasses, fireweed, and nettles.

Triclopyr ester can be applied as a basal bark or cut stump treatment but care must be exercised to avoid spraying conifers.

Hexazinone has provided variable control of Sitka alder and can damage conifer seedlings, particularly pine. Foliar application of 2,4-D ester controls Sitka and mountain alder.

Hack-and-squirt and girdling treatments are inappropriate due to the multi-stemmed growth form and stringy bark of alder. Cut-stem treatments (glyphosate or triclopyr ester applied to stumps and sprouts following manual cutting) provide good control of alder but are expensive and do not control other species in the complex. Triclopyr ester may also be applied as a basal bark treatment.

Livestock Grazing
While sheep browsing provides good control of fireweed and thimbleberry, it does little to control alder, a relatively unpalatable species. Other factors, such as height of target browse species, on-site species mix, and time of year, also affect the success of browsing treatments. Browsing may be used following site preparation. Site preparation treatments can reduce alder cover to acceptable levels and increase the herb component.

6. Vegetation Management Strategies for Backlog Sites

General

The wet alder complex can form extensive thickets in backlog brushfields. Treatment of backlog sites depends on the existing regeneration. If stocking is poor, the MSP or prescribed fire treatments described in Section 5, *Vegetation Management Strategies for Current Sites*, are appropriate. If the conifers are worth saving, herbicide or mechanical spot treatments and fill-planting are required.

When a backlog area of this complex is site-prepared for regeneration, the remaining root/rhizome systems can sprout quickly to re-occupy the site. Consequently, sites must be planted immediately with large stock and monitored to assess the need for follow-up brushing treatments.

Mechanical

When stocking is low and not worth preserving, medium-impact MSP can successfully control the complex. Since mineral soil is exposed, this treatment should be applied before alder seed maturation (early to mid-summer), followed immediately with planting.

Prescribed Fire

Burning, if successful, results in relatively slow recovery of established Sitka alder plants. Medium- to high-impact burns may successfully control established alder for up to 10 years. Ideally, burning should be carried out in the fall after the leaves have turned brown. However, low fuel loading and a narrow treatment window may restrict the use of prescribed fire; it is virtually impossible to find suitable conditions in the fall.

Chemical

Broadcast herbicide spray treatments are usually difficult to apply to wet alder complexes on backlog sites due to the numerous dissecting water courses that restrict herbicide applications. Treatments are most effective when applied aerially in mid-summer. However, efficacy can be variable due to the high density of the alder canopy. Understory vegetation may not release because the chemical may not penetrate the understory.

Refer to Section 5, *Site Preparation, Chemical*.

"Brown-and-Burn"

For sites that are too moist, or do not have enough fuel loading to burn effectively, glyphosate application can brown the foliage and facilitate burning. The herbicide should be applied in June–July and vegetation allowed to cure for 6–10 weeks. Burning should be carried out in the fall or by the next spring.

Disadvantages of "brown-and-burn" include the timing (it must be carried out during a period of high escape hazard) and the unpredictable efficacy of the herbicide. If the burn is unsuccessful, a mechanical treatment may be required to create plantable spots.

7. Summary of Treatment Efficacy

Among the non-chemical treatments, the best option for recently harvested sites is medium-impact MSP (cat and brush blade) or broadcast burning right after harvest, followed immediately by planting a fast-growing crop species of a large stock. Native herbs and grasses will often invade the treated site requiring a brushing treatment within 2–3 years of planting. Manual brushing requires at least two entries to control alder, has little effect on herbs, and may damage crop trees. Seeding the site to a grass/legume mix may reduce invasion by native vegetation and eliminate the need for follow-up brushing treatments.

Among the chemical treatments, glyphosate is recommended because it has a broad efficacy spectrum, provides four or more years of alder control if coverage is good, and does not damage conifers when applied in the late summer to fall. The optimum timing for glyphosate or triclopyr ester application is mid-summer for site preparation and backlog treatments, and late summer to fall for brushing to release conifers. Basal bark and foliar application of triclopyr ester are also effective. Glyphosate applied to stumps and sprouts following manual cutting provides good control of alder. However, this treatment is labour intensive and has no effect on the other species of the complex.

For More Information

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Appendix – Key to Biogeoclimatic Zones of B.C.

AT	Alpine Tundra	IDF	Interior Douglas-fir
BG	Bunchgrass	MH	Mountain Hemlock
BWBS	Boreal White and Black Spruce	MS	Montane Spruce
CDF	Coastal Douglas-fir	PP	Ponderosa Pine
CWH	Coastal Western Hemlock	SBPS	Sub-Boreal Pine–Spruce
ESSF	Engelmann Spruce–Subalpine Fir	SBS	Sub-Boreal Spruce
ICH	Interior Cedar–Hemlock	SWB	Spruce–Willow–Birch