



*Cytisus scoparius*

BEST MANAGEMENT PRACTICES FOR  
**Scotch Broom**  
in the Metro Vancouver Region



**metrovancover**  
SERVICES AND SOLUTIONS FOR A LIVABLE REGION



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## Introduction

The impacts of invasive species on ecological, human, and economic health are of concern in the Metro Vancouver region. Successful control of invasive species requires concerted and targeted efforts by many players. This document - **“Best Management Practices for Scotch Broom in the Metro Vancouver Region”** - is one of a series of species-specific guides developed for use by practitioners (e.g., local government staff, crews, project managers, contractors, consultants, developers, stewardship groups, and others who have a role in invasive species management) in the region. Together, these best practices provide a compendium of guidance that has been tested locally by many researchers and operational experts.

Scotch broom is native to Mediterranean Europe and was introduced on Vancouver Island as an ornamental plant in the 1850s (Graham n.d.). It was subsequently intentionally planted along highways to stabilize the soil with its deep roots (King County 2008). In recent years it has been recognized as an invasive species locally. Academic institutions, government, and non-government organizations continue to study this species in British Columbia. As researchers and practitioners learn more about the biology and control of Scotch broom, it is anticipated that the recommended best management practices will change over time and this document will be updated. Please check [metrovancover.org](http://metrovancover.org) regularly to obtain the most recent version of these best management practices.

## REGULATORY STATUS

Section 2 (1) (b) (iii) of the [Community Charter, Spheres of Concurrent Jurisdiction – Environment and Wildlife Regulation](#), states that “municipalities may regulate, prohibit and impose requirements in relation to control and eradication of alien invasive species”, which includes Scotch broom.

Under the [Forest and Range Practices Act, Invasive Plants Regulation](#), a “person carrying out a forest practice or a range practice must carry out measures that are: (a) specified in the applicable operational plan, or (b) authorized by the minister, to prevent the introduction or spread of prescribed species of invasive plants.” Scotch broom is included in the list of invasive plants in the Regulation.

## IMPACTS

Scotch broom is a fast growing shrub that forms dense monocultures (Prasad 2003). It grows in variable ecological niches and spreads rapidly due to its ability to produce large quantities of long-lived seeds, tolerate drought and cold, and its lack of predators. It alters the soil chemistry by releasing chemicals into the soil that adversely impact soil mycorrhizae and the growth of native plants (Grove, Haubensak and Parker 2012). In addition to its leaves, the stems of Scotch broom are photosynthetic, allowing the plant to grow year-round. All of these traits provide competitive advantages over native species that are easily displaced (Evergreen 2015), especially at nutrient poor sites. The impact of Scotch broom is particularly problematic in sensitive and endangered ecosystems such as the Garry Oak grasslands (Prasad 2003), dry moss/lichen plant communities and sandy shoreline ecosystems on the South Coast of British Columbia.

Large patches of Scotch broom provide minimal benefits to wildlife because they offer little cover and impede the movement of large animals (Evergreen 2015). Although Scotch broom is not readily grazed by animals, its seeds and other vegetative parts are toxic to ungulates and humans (King County 2008).

The high oil content of Scotch broom makes it highly flammable (BroomBusters n.d.); dense patches of the plant intensifies fire hazard by increasing fuel loads. Scotch broom obstructs sight lines along roads (Invasive Species Council of British Columbia 2014). Scotch broom can also limit the growth of coniferous seedlings on lands under restoration or reforestation (Prasad 2003).

All levels of government, non-profit organizations and private property owners spend significant resources managing Scotch broom in the Metro Vancouver region every year. In 2016, agencies represented on Metro Vancouver’s Regional Planning Advisory Committee - Invasive Species Subcommittee spent nearly \$44,000 on Scotch broom control efforts. This figure does not include control costs for private landowners across the region, volunteer ‘weed pull’ hours, or costs associated with education and awareness activities.



## REPRODUCTION AND SPREAD

Scotch broom lives 10 to 15 years on average, and up to 20 years (Evergreen 2015), produces deep roots and can re-sprout from its stump after cutting.

The peak flowering period for Scotch broom is from March to June (E-Flora 2017). Each plant can produce up to 10,000 seeds per growing season that can survive in the ground for 30 to 40 years (Prasad 2003) and possibly up to 80 years, creating long-lasting seed banks in infested areas (Evergreen 2015). At maturity, the seedpods split and can eject seeds up to five metres away from the parent plant (Invasive Species Council of British Columbia 2014). Viable seeds are located in the top 6 cm of soil (Prasad 2003).

Seedlings can germinate in extremely high densities; up to 350 seedlings/m<sup>2</sup> (Parker 2017). Scotch broom rapidly colonizes disturbed areas and eventually forms a major component of the areas it occupies (Prasad 2003).

## HABITAT AND DISTRIBUTION

Scotch broom prefers sandy, well-drained soil and full sun exposure. However, it can also tolerate partial shade and moist conditions (Evergreen 2015), as well as low-nutrient soils (King County 2008). In drought conditions or under stress, the plant may drop most of its leaves (King County 2008).

Disturbed soils create ideal conditions for germination (King County 2008). It is commonly found on transportation corridors, utility rights-of-way, gravel pits, degraded pastures, and anywhere with disturbed, bare soil. Scotch broom can be found in most coastal sand ecosystems in the Georgia Basin (Page 2011).

Scotch broom is common throughout the Metro Vancouver region, Sunshine Coast and Vancouver Island. It has also been found at Bella Bella, on Haida Gwaii, the Fraser Valley, North Okanagan, and Central Kootenay regions.



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## CLIMATE ADAPTATION

Climate modellers predict that the Metro Vancouver region will experience warmer temperatures; a decrease in snowpack; longer dry spells in summer months; more precipitation in autumn, winter and spring; more intense extreme events; and an extended growing season. In the past, our region had an average of 252 days in the growing season. In lower elevations 45 days will be added to the growing season by the 2050s, and 56 days by the 2080s, resulting in nearly a year-round growing season of 357 days on average. In higher elevation ecosystems the growing season length will increase by 50% to 325 days by the 2080s (Metro Vancouver, 2016). These changes will stress many sensitive ecosystems, increasing their vulnerability to invasive species.

Chai et al. (2014) evaluated the potential threat to Alberta's biodiversity due to Scotch broom response to climate change. Their findings rated Scotch broom as "highly invasive" with a number of characteristics that may support the expansion of this species into previously unsuitable habitats. Scotch broom may be able to adapt to our future climate in several ways:

- **Longer summer drought periods:** Scotch broom has deep roots, is tolerant to drought and thrives in dry sites (Prasad 2003).
- **Extreme cold temperatures:** Scotch broom is tolerant to cold conditions (Prasad 2003).

- **Increased precipitation and flooding:** Rapid spread of Scotch broom seeds can occur along water courses (Chai et al. 2014) and increased precipitation and flooding events may help to disperse the seeds.

Scotch broom seeds can survive in the soil for decades (Prasad 2003) and can germinate in a wide variety of conditions (Chai et al. 2014). The plants have a long lifespan and are highly competitive with other plants (Prasad 2003), which has allowed this plant to increase its range rapidly. With these kinds of advantages, this species is more adaptable than native species in a variety of ecosystems. Its successful seed production and its ability to spread quickly suggest that it will be able to withstand, and possibly thrive, with changing climate conditions.

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## Identification

The following identification information is a compilation of information from King County (2008) and [E-Flora](#) (2017).

**Lifecycle:** Perennial shrub.

**Stem:** Up to 3 m tall, erect, branched, twigs green and strongly 5-angled, becomes woody and yellow-brown when mature.

**Leaves:** 5 to 20 mm long, oval, alternate, lower/older leaves compound with 3 leaflets, upper/newer leaves simple and unstalked, pointed at the tip.

**Flowers:** Inflorescence of solitary or sometimes 2 or 3 pea-like flowers borne in a leaf axil, 2 cm long; yellow petals, sometimes tinged with red, orange, white or purple.

**Fruits:** Pods, black, flattened, 2.5 to 4 cm long, glabrous except along the long-hairy margins; mature pods split open and spiral as they dry, ejecting 5 to 12 seeds per pod.

The following photos show Scotch broom plant parts.





## SIMILAR SPECIES

Scotch broom resembles other broom species, all of which are non-native, invasive species:

- Spanish broom (*Spartium junceum*) can be differentiated from Scotch broom by its flowers, which grow in loose clusters at the tips of the stems (as opposed to solitary along the entire branch) and stems which are leafless or few-leaved (Swearingen 2016).
- French broom (*Genista monspessulana*) flowers grow in clusters of four to ten (as opposed to solitary) and has round stems covered in silvery, silky hair (California Invasive Plant Council n.d.).
- Portuguese broom (*Cytisus striatus*) is very similar in appearance to Scotch broom except the pods are densely hairy making them appear whitish-grey like pussy willow buds. The stems are more silvery and the flowers paler yellow than Scotch broom (Oregon Department of Agriculture n.d.).
- Gorse (*Ulex europaeus*) can be differentiated by the spines on its stems (Washington State Noxious Weed Control Board n.d.).



Gorse

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## Tracking

The provincial government maintains the [Invasive Alien Plant Program \(IAPP\) application](#) (BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development 2017), which houses information pertaining to invasive plant surveys, treatments, and monitoring. Many agencies, including local governments, have their own internal invasive species inventory and mapping protocols that are used by staff, contractors and, in some cases, the public. For example, the City of North Vancouver has its own system called AlienMap. Agencies in British Columbia that do not enter data into IAPP are encouraged to check it regularly because it contains public reports and data from other agencies and it is important to consider as much data as possible when making management decisions. The Map Display module of IAPP is publicly accessible.

When carrying out a Scotch broom inventory it is useful to record the following information as it will later inform treatment plans:

- Size and density of infestation;
- Location in relation to the high water mark of water courses; and
- Location in relation to other water sources, such as wells.

## Reporting

Since Scotch broom is widespread throughout the Metro Vancouver region and does not pose an imminent health or safety risk, there is generally little value in reporting individual occurrences.

## Prevention and Control Strategies

Effective invasive plant management may include a variety of control techniques ranging from prevention, chemical, manual, mechanical, biological and/or cultural methods. Each method is described below in order of effectiveness.

Scotch broom can be effectively controlled through manual/mechanical and chemical treatment techniques. The technique used is dependent on the age and size of the infestation, and site characteristics. Chemical treatment is most effective and efficient; however, it is not necessarily suited to all sites. Manual/mechanical treatment can also be effective but will generally be more time consuming and may promote seedling germination through soil disturbance. It should be noted that promoting seedling germination can be a positive long term management approach as it may help deplete the seed bank. Follow-up monitoring and treatment will be required for several years regardless of the treatment technique.

### STRATEGY COLOUR LEGEND

**GREEN: RECOMMENDED**

**ORANGE: CAUTION**

**RED: NOT RECOMMENDED OR NOT AVAILABLE**

### PREVENTION: IMPERATIVE

Prevention is the most economical and effective way to reduce the spread of Scotch broom over the long term. Spread of Scotch broom infestations can be minimized by avoiding soil disturbance (Evergreen 2015) as this will promote seed germination. When soil disturbance does occur, monitor the area for germination of Scotch broom and other invasive plants. Remove any germinating Scotch broom and quickly revegetate disturbed sites with fast-growing, competitive native plants (A. Hulting 2008).

Inspect and remove plants, plant parts, and seeds from personal gear, clothing, pets, vehicles, and equipment and ensure soil, gravel, and other fill materials are not contaminated with Scotch broom before leaving an infested area. Bag or tarp plants, plant parts, and seeds before transport to a designated disposal site (see Disposal section).

Do not purchase, trade or grow Scotch broom. Instead, grow regional native plants that are naturally adapted to the local environment and non-invasive. Consult the Invasive Species Council of BC's '[Grow Me Instead](#)' Program or [Metro Vancouver's Grow Green website](#) for non-invasive, drought-tolerant plants, and garden design ideas. Ensure all materials (e.g., topsoil, gravel, mulch, compost) are weed-free. Healthy green spaces are more resistant to invasion by invasive plants, so it is also important to maintain or establish healthy plant communities.

### MANUAL/MECHANICAL: RECOMMENDED

It is important to minimize soil disturbance during all manual or mechanical treatments, since disturbance facilitates germination of the seed bank (Evergreen 2015), unless promoting germination to deplete the seed bank is part of the long term management plan. The Invasive Species Council of BC (2014) suggests that manual treatment will provide an effective control when the entire plant is removed, no seeds are dropped onto the surrounding soil and soil disturbance is minimized. When it is not feasible to remove the entire plant, it is recommended to cut the flower heads off the plant in June or July, before the seeds mature (Evergreen 2015).

The following manual/mechanical methods can be used to control Scotch broom:

- **Pulling**

Pulling is most appropriate to target **young Scotch broom plants**. They can be easily pulled by hand from the soil when the stem is approximately 1.5 cm in diameter or less, or roughly the size of a pencil (Garry Oak Ecosystem Recovery Team 2002). However, they become much more difficult to pull as the plant grows and ages.

Pulling should take place during the wet months of the year and the plant should come out without removing soil. This can be done manually or with a very small weed wrench to avoid disturbing the soil because soil disturbance can facilitate re-establishment (Page 2011). Any soil divots created by pulling should be replaced to diminish soil disturbance (King County 2008).

- **Cutting**

Approximately 50% of smaller (younger) Scotch broom plants have a tendency to re-sprout when cut; therefore, cutting should be avoided (Prasad 2003). Cutting should target **larger plants** with stem diameters of at least 5 cm, and no longer green at the bases (King County 2008). On coastal sites, Evergreen (2015) reports that older broom plants have been found to re-sprout less than 5% of the time after cutting. King County (2008) observed a re-sprout rate of 20% over five years following the cutting. Plants should be cut at or slightly below ground level with loppers or a saw to reduce the likelihood of re-sprouting. Making a flat cut (at 90 degrees from the trunk) versus an angled cut eliminates a hazard for people, dogs and other animals. Plants cut high are more likely to re-sprout (Lucero 2017).

Ideally cutting should occur when broom is in bloom during the spring (BroomBusters n.d.), or after flowering (but before seed maturity) and at the start of the dry season, when its food reserves are at their lowest (Prasad 2003).

Cutting the plant in bloom or shortly after will minimize its ability to successfully re-sprout, as it will die in the summer's heat; this will therefore avoid the need to remove roots.

- **Mowing**

Mowing is not as effective as other control strategies and will either need to be repeated throughout the growing season or combined with other control methods (King County 2008). Parker et al. (2017) found that mechanical control in general promotes germination of the seedbank, particularly in the first few years after treatment.

On coastal sand ecosystems, a recommended removal method for large patches of Scotch broom is to mow the above-ground broom with a tractor-mounted mower or other mechanical means between September 30<sup>th</sup> and April 30<sup>th</sup> (to avoid impacts on nesting birds), and strip 5 cm of soil with a rubber-tired backhoe or bobcat (Page 2011). Soil should be disposed as per the recommendations in the section on disposal. This method ensures the removal of most seeds, therefore preventing re-establishment. The remaining seeds that germinate in the first five years following the stripping generally do not survive the dry summer conditions.

## APPLYING MANUAL/MECHANICAL CONTROL METHODS IN RIPARIAN AREAS

Scotch broom often grows next to water courses. Consider the impact of control techniques and the resulting bare soil on the adjacent aquatic environment. Schedule removal works during a period of least risk to fish species, outside of the [fish window](#). Adhere to Provincial and Federal riparian regulations. It is recommended to consult with a qualified environmental professional when working around water bodies.



## CHEMICAL: RECOMMENDED

When alternative methods to prevent or control invasive plants are unsuccessful, professionals often turn to herbicides. Chemical control may be required to control large Scotch broom infestations, such as transportation corridors or other non-pasture sites (King County 2008).

With the exception of substances listed on Schedule 2 of the [BC Integrated Pest Management Regulation](#), the use of herbicides is highly regulated in British Columbia. Site characteristics must be considered with herbicide prescribed, based on site goals and objectives and in accordance with legal requirements. [This summary of BC's Integrated Pest Management Act](#) provides an overview of the provincial legislation.

## PESTICIDE LICENCE AND CERTIFICATION

A valid pesticide licence is required to:

- offer a service to apply most pesticides;
- apply most pesticides on public land including local government lands<sup>1</sup>; and
- apply pesticides to landscaped areas on private land, including outside office buildings and other facilities.

Pesticides (e.g., herbicides, insecticides, fungicides) are regulated by the federal and provincial government, and municipal governments often have pesticide bylaws.

- Health Canada evaluates and approves chemical pest control products as per the [Pest Control Products Act](#).
- The [BC Integrated Pest Management Act](#) sets out the requirements for the use and sale of pesticides in British Columbia. This Act is administered by the Ministry of Environment and Climate Change Strategy.
- Several municipalities have adopted bylaws which prohibit the use of certain pesticides.

Everyone who uses pesticides must be familiar with all relevant laws.

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<sup>1</sup> on up to 50 ha/year by a single organization. Organizations looking to treat over 50 hectares of land per year are also required to submit a Pest Management Plan and obtain a Pesticide Use Notice confirmation.

ONLY companies or practitioners with a valid Pesticide Licence and staff who are certified applicators (or trained assistant applicators working under a certified applicator) may apply herbicide on invasive plants located on public lands in British Columbia. Applicators must be either the land manager/owner or have permission from the land manager/owner prior to herbicide application.

On private property the owner may obtain a Residential Applicators Certificate (for Domestic class products only) or use a qualified company. Residents do not require a Residential Applicator Certificate for certain uses of domestic class glyphosate including treatment of plants that are poisonous for people to touch, invasive plants and noxious weeds listed in legislation, and weeds growing through cracks in hard surfaces such as asphalt or concrete. Refer to the 'Pesticides & Pest Management' and 'Home Pesticide Use' webpages listed in the Additional Resources Section for more information.

Questions? Contact the BC Integrated Pest Management Program: Telephone: (250) 387-9537

Email: [bc.ipm@gov.bc.ca](mailto:bc.ipm@gov.bc.ca)

Pesticide applicator certificates can be obtained under the category 'Industrial Vegetation Management' to manage weeds on industrial land, roads, power lines, railways, and pipeline rights-of-way for control of noxious weeds on private or public land. Assistant applicator training is also available and the [online course and exam](#) are free.

It is best practice for personnel supervising or monitoring pesticide contracts to also maintain a pesticide applicator licence so they are familiar with certification requirements.

For more information on how to obtain a licence and the requirements when working under the provincial [Integrated Pest Management Act and Regulation](#), please review the Noxious Weed & Vegetation Management section on this webpage: [gov.bc.ca/PestManagement](http://gov.bc.ca/PestManagement).

## HERBICIDE LABELS

Individual herbicide labels must always be reviewed thoroughly prior to use to ensure precautions, application rates, and all use directions, specific site and application directions are strictly followed. Under the federal *Pest Control Products Act* and the BC Integrated Pest Management Regulation, **persons are legally required to use pesticides (including herbicides) only for the use described on the label and in accordance with the instructions on that label.** Failure to follow label directions could cause damage to the environment, poor control results, or danger to health. Contravention of laws and regulations may lead to cancellation or suspension of a licence or certification, requirement to obtain a qualified monitor to assess work, additional reporting requirements, a stop work order, or prohibition from acquiring authorization in the future. A conviction of an offence under legislation may also carry a fine or imprisonment.

Herbicide labels include information on both the front and back. The front typically includes trade or product name, formulation, class, purpose, registration number, and precautionary symbols. Instructions on how to use the pesticide and what to do in order to protect the health and safety of both the applicator and public are provided on the back (BC Ministry of Environment 2011).

Labels are also available from the Pest Management Regulatory Agency's [online pesticide label search](#) or [mobile application](#) as a separate document. These label documents may include booklets or material safety data sheets (MSDS) that provide additional information about a pesticide product. Restrictions on site conditions, soil types, and proximity to water may be listed. If the herbicide label is more restrictive than provincial legislation, the label must be followed.

## HERBICIDE OPTIONS

The following herbicides can be used on Scotch broom; although not specifically listed on these herbicide labels Scotch broom may be treated under the general application provision for broadleaved plants.

ACTIVE INGREDIENT (EXAMPLE BRAND NAMES)+	APPLICATION	PERSISTENCE	GROWTH STAGE++	TYPE+++
Glyphosate (many products) *	foliar application	non-residual	actively growing (preferable spring)	non-selective
Imazapyr (e.g. Arsenal™)	foliar spray	residual	actively growing	non-selective
Triclopyr (e.g. Garlon™)	foliar spray, cut-stump, stem application	residual	actively growing	selective, no effect on grasses
2,4-D ***; alone or mixed with triclopyr or imazapyr	foliar spray	residual	actively growing	selective, no effect on most grasses
Picloram**	foliar spray	residual	actively growing	selective, no effect on grasses

\* Glyphosate should be used with care as it will kill grass and other surrounding vegetation, which may facilitate Scotch broom seedlings germination (Whatcom County n.d.) Glyphosate can impact trees with roots within or adjacent to the treatment area.

\*\* Hard on trees: not good in forested areas (Miller 2017)

\*\*\* 2,4-D products not currently permitted on BC Ministry of Transportation and Infrastructure jurisdiction.

+ The mention of a specific product or brand name of pesticide in this document is not, and should not be construed as, an endorsement or recommendation for the use of that product.

++ For Scotch broom actively growing is defined as spring to late summer (A. Hulting 2008)

+++ Herbicides that control all vegetation are non-selective, while those that control certain types of vegetation (e.g. only grasses or only broadleaf plants) are termed selective.



## APPLYING PESTICIDE IN RIPARIAN AREAS

Provincial legislation prohibits the use of herbicides within 10 metres of natural water courses and 30 metres of domestic or agricultural water sources on public lands. On private lands herbicide labels must be followed (which means for glyphosate products treatment can happen up to the water's edge), and additional restrictions may apply for some private lands (e.g., industrial sites, forestry sites, golf courses, etc.). On public lands, glyphosate is the only active ingredient that can be applied within the 10 metre Pesticide-Free Zone (PFZ)<sup>2</sup> in British Columbia in accordance with the *BC Integrated Pest Management Act* and Regulation and all public land Pesticide Management Plans (PMPs). A plant must be either a listed Noxious Weed (under the *BC Weed Control Act*) or appear in the *Forest and Range Practices Act Invasive Plants Regulation* to be treated within the 10 metre PFZ, but not within 1 meter of the high water mark. Scotch broom is listed in the latter and therefore glyphosate can be applied on Scotch broom up to 1 metre away from the high water mark (HWM)<sup>3</sup>. The 30 metre no-treatment zone around a water supply intake or well used for domestic or agricultural purposes may be reduced if the licensee or PMP holder is "reasonably satisfied" that a smaller no-treatment zone is sufficient to ensure that pesticide from the use will not enter the intake or well

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2 The Pesticide-Free Zone (PFZ) is an area of land that must not be treated with pesticide and must be protected from pesticide moving into it, under the *Integrated Pest Management Act* and Regulation.

3 The High Water Mark (HWM) is defined as the visible high water mark of any lake, stream, wetland or other body of water where the presence and action of the water are so common and usual and so long continued in all ordinary years as to mark upon the soil of the bed of the lake, river stream, or other body of water a character distinct from that of the banks, both in vegetation and in the nature of the soil itself. Typical features may include, a natural line or "mark" impressed on the bank or shore, indicated by erosion, shelving, changes in soil characteristics, destruction of terrestrial vegetation, or other distinctive physical characteristics. The area below the high water mark includes the active floodplain (BC Ministry of Environment and Climate Change Strategy 2018).

When managing Scotch broom with herbicide in riparian areas:

- Observe and mark all PFZs while on site.
- The HWM should be determined by careful evaluation by the applicator.
- Distances in PFZs should be measured as horizontal distance.
- Herbicides restricted in a PFZ must not enter these zones by leaching (lateral mobility) through soil or by drift of spray mist or droplets.
- Treatments should be conducted when water levels are low (e.g. summer months) to reduce risk.
- Note that efficacy may be dependent on site conditions, including moisture in the soil.

## APPLICATION METHODS

The preferred application methods to minimize non-target damage are foliar application, cut surface application, and basal stem application (Invasive Species Council of British Columbia 2014).

- **Foliar application** requires a thorough wetting of the actively growing plant parts with an appropriate herbicide. Herbicides should not be applied when plant is in bloom as blooms will prevent full coverage of spray on the remainder of the plant (A. Hulting 2008).
- **Cut surface application** is labour intensive but is more target specific than foliar spray and reduces the risk of damaging non-target vegetation. The plant should be cut at the base and the stump immediately (within 1 minute) painted with an appropriate herbicide (Huckins and Soll 2004).
- **Basal stem application** involves using a backpack sprayer with a flat fan, solid cone nozzle, or wick attachment, to apply sufficient spray to stems less than 8 cm in basal diameter to form a band 5 cm in width.

## CULTURAL: PARTIALLY RECOMMENDED

- **A closed tree canopy with deep shade** can be used to suppress Scotch broom. The utility of this method is restricted to sites where a tree canopy is desired and/or appropriate. It may be challenging to develop tree cover in an existing infestation because the changes to soil chemistry caused by Scotch broom will suppress and stunt tree growth (Grove, Parker and Haubensak 2017), therefore early intervention is recommended.
- **Targeted grazing** can reduce and suppress Scotch broom infestations; however, grazing alone will not eradicate the infestation, and it may be more effective when used in combination with other treatments as part of a larger site management plan (Miller, Tarasoff & Salmon 2021). Grazing opportunities may be limited in urban areas by municipal bylaws regulating animals, the need for specially trained herds, and the potential damage grazing animals may cause in sensitive ecosystems (e.g. off-target grazing and erosion). Due to these constraints, targeted grazing may not be a practical management option for Scotch broom. Further, targeted grazing is not cost effective compared to other treatment methods for this species (Miller, Tarasoff & Salmon 2021).

## BIOLOGICAL: NOT AVAILABLE

There are currently no approved biocontrol agents for Scotch broom in BC (Invasive Species Council of British Columbia 2014). At least two biocontrol agents have been tested in the Pacific Northwest including the Scotch broom seed beetle (*Bruchidius villosus*) and Scotch broom seed weevil (*Exapion fuscirostre*). Both species attack the developing seeds within the seedpods, ultimately reducing the number of seeds that germinate (Andreas 2016). The adults feed on flowers, foliage and stems. In large populations individual plants can die starting at the tips (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development n.d.). *Aceria genistae* (Scotch broom gall mite) attack newly forming flowers and foliage creating a small gall and reducing the number of seed pods a plant can produce (Landcare Research 2014).

These three Scotch broom biocontrol agents were released in Washington State from the 1990s onwards and have moved north adventitiously (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development n.d.). Populations of all three biocontrol agents are present in the Metro Vancouver region with larger numbers found at Iona Beach Regional Park and smaller populations seen in Pacific Spirit Regional Park (Cousins 2018).

All current adventive Scotch broom biocontrol species are slow to establish (Lucero 2017), and therefore can only be used as a component of a long-term Scotch broom management plan and to minimize the seed bank.



## CONTROL SUMMARY

The following table provides a summary and comparison of control methods for Scotch broom.

CONTROL STRATEGY	TECHNIQUES	APPLICABLE SITE TYPE	PROS	CONS
Manual	<b>Cutting, pulling</b>	Low or medium density sites, small infestations, sensitive sites**	Selective, volunteer friendly, non-chemical	Creates disturbance, may stimulate germination, labour intensive
Chemical	<b>Foliar, cut surface and basal stem applications</b>	High density sites, large or small sites with minimal integration of native trees and shrubs	Selective with appropriate herbicide and application, less labour intensive, can suppress seed bank	Unintended environmental/ health impacts, high public concern, weather dependent, requires trained staff
Mechanical	<b>Mowing</b>	High density sites, large, non-sensitive sites	Less labour intensive, non-chemical	Non-selective, creates disturbance, stimulates germination
Cultural	<b>Closed tree canopy with deep shade</b>	Where forest canopy is acceptable	Natural competition, self-sustaining	Takes many years to effectively shade out broom
	<b>Targeted grazing</b>	Sites accessible to herds, plants aged 1-4 years, re-growth	Non-chemical	Requires specially trained herds and special permits, non-selective, complex logistical considerations, unintended environmental impacts
Biological	<b>No bioagents are currently available for distribution in British Columbia</b>			

### CONTROL SUMMARY COLOUR LEGEND

**GREEN: RECOMMENDED**

**ORANGE: CAUTION**

**RED: NOT RECOMMENDED OR NOT AVAILABLE**

# Disposal

The method of disposal depends on the presence or absence of seeds on the dead plants. Ideally, control activities should be done before plants go to seed (King County 2008).

If seeds are not present:

- For small volumes of Scotch broom, leave on site, scattered or mulched, or deposit in densely shaded areas under conifers where there is no ground vegetation.
- For large volumes, the Pacific Forestry Centre (2003) recommends disposing of the plants by chipping. Perform chipping activities off site or chip into the existing Scotch broom impacted area to minimize spread of undetected seeds. Large unchipped volumes can be disposed at an appropriate disposal or industrial composting facility (see below).

If seeds are present:

- If removal and disposal is not practical, plants with seeds should be left on site, in place, to avoid spread (King County 2008).
- If removal is realistic, plants should be carried on tarps or in a way that prevents seeds from spreading and disposed of at an appropriate facility (see below).

Composting Scotch broom foliage and berries at home or at municipal works yards is **not recommended** as the temperature will not reach high enough to kill the seeds.

Scotch broom patches are a fire hazard. Leaving dead Scotch broom on site increases the risk of fire. Herbicide killed material may need to be cut and either chipped or removed off site due to either fire risk or aesthetic reasons. It is best to wait to cut herbicide-killed material until the high fire hazard season has passed to reduce the risk of equipment or vehicles starting an ignition.

## OFF SITE DISPOSAL

When disposed off site, transport plant parts on tarps or in thick plastic bags to an appropriate disposal or industrial composting facility. In the Metro Vancouver region, several facilities accept Scotch broom plants and/or infested soil. [This list](#) provides addresses and website links for the disposal facilities. This list is updated periodically.

**PLEASE CONTACT ALL FACILITIES BEFOREHAND TO CONFIRM THEY CAN PROPERLY HANDLE THE MATERIAL.**

## CLEANING AND DISINFECTION<sup>4</sup>

Before leaving a site, remove all visible plant parts and soil from vehicles, equipment, and gear, and if possible, rinse these items. When back at a works yard or wash station, vehicles should be cleaned and disinfected using the following steps:

- Wash with 180 °F water at 6 gpm, 2000 psi\*, with a contact time of  $\geq 10$  seconds on all surfaces to remove dirt and organic matter such as vegetation parts or seeds. Pay special attention to undercarriages, chassis, wheel-wells, radiators, grills, tracks, buckets, chip-boxes, blades, and flail-mowing chains.
- Use compressed air to remove vegetation from grills and radiators.
- Sweep/vacuum interior of vehicles paying special attention to floor mats, pedals, and seats.
- Steam clean poor access areas (e.g., inside trailer tubes) – 200 psi @ 300 °F.
- Fully rinse detergent residue from equipment prior to leaving facility.

\* Appropriate self-serve and mobile hot power-wash companies in the Metro Vancouver area include: Zolliker Fleet Cleaning, Omega Power Washing, Eco Klean Truck Wash, RG Truck Wash, Ravens Mobile Pressure Washing, Hydrotech Powerwashing, Platinum Pressure Washing Inc, and Alblaster Pressure Washing. Wash stations should be monitored regularly for Scotch broom growth.



Scotch broom in seed

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<sup>4</sup> Adapted from Metro Vancouver 2018 Water Services Equipment Cleaning Procedures and Inspection Protocols.

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## Follow-up Monitoring

Whatever control method is used, follow-up monitoring and maintenance treatments are components of an integrated management plan or approach.

- For **manually** treated sites, follow-up monitoring should take place for many years following initial treatment, due to the long viability of the seedbank.
- **Chemical treatments** must be repeated over many years also due to the long viability of the seedbank (Invasive Species Council of British Columbia 2014). Seedlings should be treated before they reach 0.5 cm in height (Prasad 2003). The first follow-up treatment may need to take place within the first year after the treatment.

Keeping up-to-date maps of seed bank locations facilitates monitoring sites for regrowth (Pocock 2017).

## Restoration

Restoration is recommended to create competition, control Scotch broom regrowth and replace lost habitat. However, planting should not take place until control of new seedlings has been carried out, so as not to impede treatment (Whatcom County n.d.).

Mulch can be used to avoid leaving bare soil and reduce colonization by other invasive plant species (King County 2008). The International Society of Arboriculture and relevant municipal Parks or arboriculture departments offer guidelines for mulch application. Specific mulch depths can be used to control invasive weeds and encourage plant growth (International Society of Arboriculture 2011).

Replacement species should be chosen based on the ecology of the site by a qualified environmental professional. Local biologists, environmental professionals, agronomists, agrologists, native and domestic forage specialists, seed companies and plant nurseries are all good sources for localized recommendations for regional native species and regionally adapted domestic species, based on site usage. Native grass seed mixes are also available. There are several science-based resources available to guide restoration efforts, such as the South Coast Conservation Program's [Diversity by Design](#) restoration planning toolkit.

Examples of common competitive native species prescribed in Metro Vancouver sites are summarized in the table on the next page based on site moisture. Note that Scotch broom is often found in coastal sands ecosystems; many of the plant species listed below would not be appropriate for that type of ecosystem.



WET SITES	MOIST SITES	DRY SITES
SHRUBS		
Salmonberry	Salmonberry	Thimbleberry
Hardhack	Willow	Nootka rose
Willow	Red osier dogwood	Red flowering currant
Red osier dogwood	Red elderberry	Snowberry
Pacific ninebark	Vine maple	Tall Oregon grape
	Indian plum	Oceanspray
TREES		
Western red cedar	Western red cedar	Douglas-fir
Red alder	Red alder	Red alder

Revegetation of the site to a domestic or cultured non-native plant species composition may be considered in some circumstances. Often domestic species are faster establishing and grow more prolifically which aids in resisting Scotch broom re-invasion.

Scotch broom sites are often found in areas with existing, or potential, wildlife populations (e.g. deer, beaver, muskrat, vole, etc.) that can damage restoration plantings. Therefore, any revegetation plan must consider impacts from wildlife and utilize appropriate mitigation measures to protect the restoration and existing native plantings (tree wrapping, exclusion caging/ fencing, vole guards, etc.).



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## Additional Resources

For more information please refer to the following resources.

- BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Invasive Alien Plant Program (IAPP). [www.gov.bc.ca/invasive-species](http://www.gov.bc.ca/invasive-species)
- E-Flora BC, an Electronic Atlas of the Plants of BC. [www.eflora.bc.ca/](http://www.eflora.bc.ca/)
- Field Guide to Noxious and Other Selected Weeds of British Columbia. 2002. [https://bcinvasives.ca/wp-content/uploads/2021/02/Field\\_guide\\_to\\_Noxious\\_Weeds\\_11th\\_2021.pdf](https://bcinvasives.ca/wp-content/uploads/2021/02/Field_guide_to_Noxious_Weeds_11th_2021.pdf)
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- Grow Me Instead. <https://bcinvasives.ca/play-your-part/plantwise/>
- Invasive Species Council of British Columbia Scotch Broom Fact Sheet. [https://bcinvasives.ca/wp-content/uploads/2021/01/Scotch\\_Broom\\_FINAL\\_10\\_04\\_2019.pdf](https://bcinvasives.ca/wp-content/uploads/2021/01/Scotch_Broom_FINAL_10_04_2019.pdf)

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