



Impatiens glandulifera

BEST MANAGEMENT PRACTICES FOR
Himalayan Balsam
in the Metro Vancouver 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 Himalayan Balsam 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.

Himalayan balsam¹ is native to the Western Himalayas, most likely brought to Canada in the early 1900s as an ornamental plant. Its high reproductive output, early germination, rich nectar production, hardiness, rapid growth and habitat preference have allowed the species to spread rapidly, dominate landscapes, and compete with and displace

native plant species (Global Invasive Species Database, 2018). Management of this species in Canada seems to be following the invasion trends observed in Europe over the last two decades where it has rapidly become established along waterways (Clements, Feenstra, Jones, & Staniforth, 2008). Himalayan balsam has been predicted to become more widespread in British Columbia (Clements, Feenstra, Jones, & Staniforth, 2008).

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 Himalayan balsam, it is anticipated that the recommended best management practices will change overtime and this document will be updated. Please check metrovancover.org regularly to obtain the most recent version of these best management practices.

¹ Himalayan balsam (*Impatiens glandulifera*) is also known by the common names policeman's helmet, ornamental jewelweed and poor man's orchid. It is referred to as Himalayan balsam in this document.

REGULATORY STATUS

Section 2 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 Himalayan balsam under Terrestrial Vascular Plants of Schedule 1. Although this species is not currently classified as a noxious weed in British Columbia, it is designated as an “invasive plant of concern” in the Province’s [Field Guide to Noxious Weeds and Other Selected Invasive Plants of British Columbia](#).

IMPACTS

Himalayan balsam is a summer blooming annual plant that produces abundant seeds in capsules. These capsules explode when ripe, enabling dispersal and thick growth (Klinkenberg, 2018). Himalayan balsam quickly dominates a variety of areas, forming homogeneous stands in moist shady sites and along creeks, riverbanks, sloughs and open ditches, grassy clearings with full sun, and trail edges. It outcompetes native vegetation, decreasing plant diversity. The plant’s minimal root system does not provide soil stabilization or protect against high water flows. When the plants completely die off in the winter, the ground is left exposed and bare, further promoting erosion. Compared to many native plants, Himalayan balsam offers a sweet, abundant supply of nectar to pollinators, attracting them away from native or other beneficial plants thus adding to its invasiveness (Clements, Feenstra, Jones, & Staniforth, 2008).

All levels of government, non-profit organizations and private property owners spend significant resources managing Himalayan balsam in the Metro Vancouver region every year. In recent years, agencies represented on Metro Vancouver’s Regional Planning Advisory Committee – Invasive Species Subcommittee together have spent over \$55,000 on Himalayan balsam control and volunteer stewardship annually. This figure does not include control costs for private landowners across the region or costs associated with education and awareness activities.

REPRODUCTION AND SPREAD

Like all members of the *Impatiens* genus, Himalayan balsam produces seeds that explode out of mature capsules when disturbed (e.g., when touched or moved by a strong wind). Pods catapult up to 2,500 seeds per plant per growing season, spreading up to 32,000 seeds per square metre in a dense infestation (Invasive Species Council of British Columbia, 2017). Seeds can be ejected up to 7 metres from the plant (Invasive Species Council of British Columbia, 2017).

The buoyant seeds are dispersed by humans and animals, and can be transported long distances via watercourses (Clements, Feenstra, Jones, & Staniforth, 2008). They can travel up to 10 km without loss of viability and can germinate under water (Whatcom County Noxious Weed Board, 2018). This species is thought to have one of the highest rates of



Adventitious roots growing from lower stem nodes

CREDIT: ISCMV

seed spread of all invasive species worldwide (Clements, Feenstra, Jones, & Staniforth, 2008).

Although considered an annual species, hollow woody stems from large Himalayan balsam plants can persist through the winter and may prevent other plant species from growing at the site (Clements, Feenstra, Jones, & Staniforth, 2008).

Another adaptive strategy of this species is the simultaneous germination of seeds that form dense stands of plants of the same age, which may further discourage growth of other plant species (Clements, Feenstra, Jones, & Staniforth, 2008).

Himalayan balsam can produce adventitious roots from lower nodes of the stem, especially when the plants are blown over or growing on a slope (Beerling & Perrins, 1993).

Though not commercially available, people contribute to its spread by collecting and spreading seed, trading it, or maintaining it on properties.

HABITAT AND DISTRIBUTION

Himalayan balsam is partially shade tolerant and requires wet soil. It prefers disturbed, lowland, riparian areas including stream sides, ditches, sloughs, wet meadows, woodlands and wetlands throughout the region. It can also be found in private gardens, along utility rights-of-way, at waste sites and encroaching on moist fields (Crampton, 2018). It forms thick monocultures at moist sites. Himalayan balsam plants are able to retain a lot of moisture to withstand summer drought conditions, but they are sensitive to frost (Saskatchewan Invasive Species Council, 2013).

Native to the Himalaya region of Asia, Himalayan balsam was introduced to North America in the early 1800s as an ornamental plant and in ship ballast water (Saskatchewan Invasive Species Council, 2013). It is predominantly found in the Southern part of the British Columbia, including southern Vancouver Island, Metro Vancouver, Fraser Valley and southeastern British Columbia. It is spreading rapidly through the Metro Vancouver area (Clements, Feenstra, Jones, & Staniforth, 2008). It can also be found in isolated patches in the Northwest of British Columbia (Wichrowski, 2010).

Research suggests that Himalayan balsam is far from reaching its “potential climatic range in Canada” (Clements, Feenstra, Jones, & Staniforth, 2008). Its ability to thrive in cool climates and variable precipitation levels and soil moisture regimes will likely allow its population to expand in British Columbia.

Identification

The following identification information was collected from Clements, Feenstra, Jones, & Staniforth (2008) and the Invasive Species Council of British Columbia (2017).

Lifecycle: Annual, succulent herb; stems erect, often branched; 0.6 - 3 metres tall; roots are red-pink and very superficial, extending only 10 - 15 centimetres into the soil. Germinates starting in February/March.

Stem: Brittle, succulent, hexagonal, glabrous (smooth and hairless), hollow and jointed, sometimes branched, sappy, green to pink-red; leaves and branches arise from stem joints.

Leaves: Opposite to whorled (usually in threes), stalked, egg-shaped to elliptic, sharply and closely saw-toothed, prominent reddish mid vein, 5–20 centimetres long, shiny and dark green.

Flowers: One to several in leaf axils, borne on long stalks, pink to fuchsia (rarely white), usually spotted inside; sepals pouched, with a short-recurved spur. The common name ‘Himalayan balsam’ comes from the flower’s resemblance of an old-fashioned English police ‘Bobby’ helmets; flowers also resemble a slipper or orchid flowers. Flowers bloom from June to November and have a fragrance. Mostly insect-pollinated but rarely self-pollinated.

Fruits: Capsules, elastically dehiscent (burst when ripe, triggered by touch), 1.5 – 3 centimetres long, up to 16 seeds in five chambers. Seeds are mature starting mid-July, and mature later at shady sites. The fascination with the explosive seed capsules when touched gives rise to the common name

'touch-me-not' given to various species in the Impatiens genus. The seeds can be thrown up to 7 metres from the plant. The seeds are cream-coloured to dark brown/black at maturity and viable for 18 months in the soil.

Other characteristics: Plants have a distinctive smell that is described as musty or like sweet gasoline.

The following photos show Himalayan balsam plant parts.



Leaves

CREDIT: ISCMV



Stem with node and branched leaves

CREDIT: SSISC



Roots

CREDIT: SSISC



Flower

CREDIT: ISCMV



Mature, unopened seed pods

CREDIT: ISCMV



Dehiscent capsule and immature seeds

CREDIT: ISCMV

SIMILAR SPECIES

There are a number of other *Impatiens* species in British Columbia that Himalayan balsam could be confused with, especially in the absence of flowers. All *Impatiens* species have similar looking flowers and explosive seed capsules (Clements, Feenstra, Jones, & Staniforth, 2008). Himalayan

balsam can be distinguished by its relatively tall height, opposite or whorled leaves, and the pink-purple flowers. The table below describes the most common *Impatiens* species (unless otherwise noted, sourced from (Klinkenberg, 2018)).

SPECIES	STATUS IN BRITISH COLUMBIA	STEM	LEAVES	FLOWERS
<i>Impatiens noli-tangere</i> (common touch-me-not)	Native to North America	Hairy, 20–60 centimetres tall	Alternate, coarsely saw-toothed, stalked, 3-12 centimetres	Yellow sparingly flecked with dark red to orange spots, gradual taper to the spur
<i>Impatiens glandulifera</i> (Himalayan balsam, Himalayan balsam)	Invasive	Often branched, purple-tinged, 0.6–2.0 metres	Opposite to whorled, stalked, sharply and closely saw-toothed, 6-15 centimetres	White to pink to purple, usually purplish-spotted, with a short recurved spur
<i>Impatiens capensis</i> (spotted touch-me-not, orange balsam, orange jewelweed)	Non-native (Zika, 2006)	20–80 centimetres	Alternate, stalked, shallowly and remotely saw-toothed, 3–12 centimetres	Orange, brown-spotted or mottled, spur curved or hooked
<i>Impatiens parviflora</i> (small-flowered touch-me-not, small touch-me-not)	Invasive	20–80 centimetres	Alternate, stalked, finely and sharply saw-toothed, 3–12 centimetres	Small, pale yellow to orange, spurs straight and directed backward



Impatiens noli-tangere (native)
CREDIT: BARBARA TOKARSKA-GUZI, UNIVERSITY OF SILESIA, BUGWOOD.ORG



Impatiens capensis flower
CREDIT: ISCMV



Impatiens parviflora (invasive)
CREDIT: ARTMECHANIC VIA FLICKR

Impatiens parviflora (Small-flowered touch-me-not or small touch-me-not)

Small-flowered touch-me-not is also an invasive plant of concern in the Metro Vancouver region. It is found in similar habitats and often at the same sites as Himalayan balsam. Sometimes small-flowered touch-me-not is the dominant invader. For example, in the City of Surrey, *I. parviflora* is more widespread than *I. glandulifera*. The flowers are small and yellow; capsules are light green and slender. Its form and leaf look similar to Himalayan balsam, but it is much smaller and lacks the purple-tinge. It is also commonly mistaken for the native *Impatiens noli-tangere* (common touch-me-not). The table above distinguishes the *Impatiens* species. Verifying identification is crucial prior to any management activities.

Small-flowered touch-me-not tends to emerge and flower slightly earlier than Himalayan balsam (Crampton, 2018). It is fairly common in the region, and due to its smaller and more inconspicuous form, is probably more widespread than thought. A high level of effort is required for removal of small-flowered touch-me-not compared to Himalayan balsam due to its smaller size (Crampton, 2018).

Like Himalayan balsam, if left unmanaged, it can spread very quickly, and cover forest floors and other sites it has invaded (see photo).



Impatiens parviflora

CREDIT: JAN SAMANEK, PHYTOSANITARY ADMINISTRATION, BUGWOOD.ORG

Some jurisdictions undertake control of small-flowered touch-me-not concurrent with Himalayan balsam, although Himalayan balsam is usually higher priority. There is value in conducting management at the same time if they are growing together (Crampton, 2018). The management strategies outlined in this document also hold true for small-flowered touch-me-not (Dreves, 2018).

Tracking

The Provincial government maintains the [Invasive Alien Plant Program \(IAPP\) application](#) (British Columbia 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 Himalayan balsam 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 10 metre Pesticide-Free Zone (PFZ) adjacent water courses, and
- Location in relation to other water sources, such as wells.

Reporting

Please report Himalayan balsam occurrences to:

- The Provincial Report-A-Weed program (via smart phone app www.reportaweedbc.ca)
- The Invasive Species Council of Metro Vancouver: 1-604-880-8358 or www.iscmv.ca
- The municipality where the Himalayan balsam was found
- The landowner directly – If the landowner is unknown, the [Invasive Species Council of Metro Vancouver](#) can provide support to identify the appropriate authority

Reports submitted through these channels are reviewed by invasive species specialists who coordinate follow-up activities when necessary with the appropriate local authorities. However, some people may be hesitant to report infestations as their presence may affect property values.

Prevention and Control Strategies

Effective invasive plant management techniques 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.

Due to the explosive nature of the fruits, be cautious when working around infestations, especially after the seed capsules have matured. Since Himalayan balsam is found and spread primarily by water, management plans should consider targeting upstream infestations first to limit dispersal downstream (Clements, Feenstra, Jones, & Staniforth, 2008).

Whatever control method is undertaken, it is best to aim for complete management at the site. Due to seed production and spread, missing even one flowering plant during control activities can be detrimental to the management effort.

For this species, 99% control efficiency has been shown to be almost as ineffective as no management at all (Wadsworth, Collingham, Willis, Huntley, & Hulme, 2002).

Follow-up monitoring and treatment will be required during the same growing season and for several years regardless of the treatment technique.

PREVENTION: IMPERATIVE

Prevention is the most economical and effective way to reduce the spread of Himalayan balsam over the long term.

When working in or adjacent to Himalayan balsam, 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 Himalayan balsam before leaving an infested area. Bag or tarp plants, plant parts, and seeds before transport to an appropriate disposal site (see Disposal section).

Do not purchase, trade or grow Himalayan balsam. Instead, grow regional native plants that are naturally adapted to the local environment and non-invasive. Consult the Invasive Species Council of British Columbia'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.

STRATEGY COLOUR LEGEND

GREEN: RECOMMENDED

ORANGE: CAUTION

RED: NOT RECOMMENDED OR NOT AVAILABLE

MANUAL/MECHANICAL: RECOMMENDED

The following manual/mechanical methods can be used to control Himalayan balsam. **Due to the explosive nature of seed dispersion, none of these techniques should be used when the seed capsules are mature.** It is recommended to leave the plant in place until the following season if the seed capsules have matured (City of Port Moody, n.d.).

- **Pulling** the plant by hand is simple and easy, as the roots are very shallow and weak and the plants easily come out of the ground with little effort. Digging or use of special tools are not usually necessary unless in dry compacted soil. Using hands, the base of the plant can be carefully pulled from the ground, removing as much of the root as possible (Langley Environmental Partners Society, 2014). Every plant should be removed from the site. Any divots created after pulling should be replaced to minimize soil disturbance (King County Noxious Weed Control Program, 2010). After pulling, the plants wither quickly.

The ideal time to conduct the first pull is prior to and up until the plants flower (usually late May to early June), but certainly before ripened seeds are present to avoid the spread of seeds (Crampton, 2018). Monthly pulls should be conducted until the seed forms, with a minimum of 2 hand pulls each season, the second pull taking place later in summer (Leblanc & Lavoie, 2017). Follow-up is essential as new or missed plants will emerge.

Hand pulling can be used at sites of any size. It is the most desirable form of control when there are native or desirable plants also present (Dreves, 2018). In this situation, care must be taken to inspect under vegetation for juvenile plants. When using this form of control along a waterbody, caution should be used, or consider using a barrier to avoid releasing vegetation or sediment into the water (Washington State University, 2011).

- **Cutting** may be used to remove the top of the plant to prevent fruit formation if it is growing at a sensitive site or on a steep slope or ditch where the bottom of the plant is inaccessible (City of Port Moody, n.d.). If maintenance in the area is required or disturbance is likely after the plant has already flowered or set seed, cutting may also be used (City of Port Moody, n.d.) A bag should be placed around the entire cluster of capsules to prevent them from exploding or escaping and then the flower/seed head should be cut (King County Noxious Weed Control Program, 2010). The rest of the plant can be pulled as per recommendations above. Himalayan balsam can grow new flowering stems after cutting, so monitoring and follow-up with this method is crucial.

- **Mowing or brush cutting** can be effective and may be best suited for large, non-riparian sites. This method can be conducted in June and July, immediately following the appearance of flowers and before the seed capsules form (Clements, Feenstra, Jones, & Staniforth, 2008). Plants should be cut as close to the ground as possible (King County Noxious Weed Control Program, 2010).

The site should be monitored in case plants re-sprout (Whatcom County Noxious Weed Board, 2018). Follow-up may include either pulling or additional mechanical treatments.

- **Knocking** involves the use of a hockey stick or similar instrument to hit the plants, thereby severing or damaging them. This method is possible because the plants are hollow and easily broken. Although this method is less time-consuming and many plants can be targeted within a short period of time, it will not kill all the plants. Some will be knocked down, but will continue to grow or re-root, allowing opportunity for blooming and seed maturation. Pulling or brush cutting are more effective and take the same amount of time.
- **Burning/flaming** is not recommended as the plants contain high water content and the tissue will not burn

well. This technique was tested in the Fraser Valley using a small portable propane flamer prior to flowering with little success as some of the plants either recovered or escaped control (Clements, Feenstra, Jones, & Staniforth, 2008).

APPLYING MANUAL/MECHANICAL CONTROL METHODS IN RIPARIAN AREAS

Himalayan balsam often grows in large contiguous patches right up to the edge of water courses. Consider the impact of control techniques and the resulting bare soil on adjacent water courses. Time removal works during a period that minimizes risk to fish species, outside of the [fish window](#). Adhere to Provincial and Federal instream and riparian regulations. It is recommended to consult with a qualified environmental professional when working around water bodies.

CHEMICAL: CAUTION

When alternative methods to prevent or control invasive plants are unsuccessful, professionals often turn to herbicides. Use of herbicides may be an option for large infestations of Himalayan balsam (King County Noxious Weed Control Program, 2010), but this method should be used with caution for a number of reasons (Crosby, 2018):

1. Weather conditions greatly influence treatment efficacy;
2. Himalayan balsam may grow in riparian areas where pesticide use is restricted;
3. There is a greater chance of missing plants with herbicide treatment compared to manual/mechanical control; and

4. Native vegetation is often integrated with Himalayan balsam infestations. Mortality of non-target plants should be expected. Sites with well established native shrubs layers are not suitable for chemical treatment.

With the exception of substances listed on Schedule 2 of the [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 British Columbia'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 lands²; and
- apply pesticides to landscaped areas on private land, including outside office buildings and other facilities.

² on up to 50 hectares/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.

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 [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.
- Several municipalities have adopted bylaws that prohibit the use of certain pesticides.

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

ONLY companies or practitioners with a valid Pesticide Licence and staff who are certified applicators (or 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 Integrated Pest Management Program: Telephone: (250) 387-9537
Email: 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.

Although an annual fee and annual reporting are required, 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.

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 Provincial 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 (British Columbia Ministry of Environment and Climate Change Strategy, 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 Himalayan balsam. For best results, herbicide application should occur before the plants begin to flower to minimize seed production (Invasive Species Council of British Columbia, 2017).

ACTIVE INGREDIENT (EXAMPLE BRAND NAMES)+	APPLICATION	PERSISTENCE	GROWTH STAGE	TYPE++
Glyphosate (many products)*	foliar application	non-residual	actively growing	non-selective
2, 4-D	foliar application	residual	actively growing	selective, no effect on most grasses**
Triclopyr (example: Garlon™)	foliar application	residual	actively growing	selective, no effect on most grasses**

+ 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.

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

* Treatment with glyphosate should be combined with re-vegetation of the site (see Restoration section below) to prevent seedlings from re-infesting the area (King County Noxious Weed Control Program, 2010).

** Selective herbicides are "most effective when Himalayan balsam is growing in a grassy area or with other monocots. Re-treatment the following year is necessary to control late-germinating plants. Continue to monitor for new plants for several years after the initial treatment and following any disturbance to the soil such as tilling or construction" (King County Noxious Weed Control Program, 2010).



Stand of Himalayan Balsam

CREDIT: CITY OF PORT MOODY

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 need to be followed (which means for glyphosate products treatment can happen up to the water's edge) and other restrictions may apply (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)³ in British Columbia in accordance with the *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 [Weed Control Act](#)) or appear in the *Forest and Range Practices Act Invasive Plants Regulation* to be treated within the 10 metre PFZ. **Himalayan balsam is not listed in either and therefore glyphosate and other herbicides can only be applied on Himalayan balsam up to 10 metres away from the high water mark (HWM)**⁴. 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.

When managing Himalayan balsam 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.

3 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.

4 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 (British Columbia Ministry of Environment and Climate Change Strategy, 2011).

APPLICATION METHODS

“Both selective and non-selective herbicides should be applied before flower but late enough that seedlings have grown to a stage where they can be covered by the herbicide application” (King County Noxious Weed Control Program, 2010) as sprayed flowers can still set seed (Whatcom County Noxious Weed Board, 2018).

The preferred application methods to minimize non-target damage are outlined below.

- **Foliar application** involves using a backpack or handheld sprayer to completely cover the actively growing plant parts with herbicide. Low pressure and larger droplet size should be used (King County Noxious Weed Control Program, 2010). A second pass of spraying will ensure that smaller individuals protected by larger ones the first time around will get treated (Beerling & Perrins, 1993). Earlier application of herbicides achieves much better control in the majority of products (Beerling & Perrins, 1993).
- **Wick application** involves the use of specialized hand-held wands to apply or wipe herbicide directly on the leaf surfaces (King County Noxious Weed Control Program, 2010). The herbicide solution should not be allowed to drip from the wick and the wick should not contact the foliage of non-target species.

Chemically treated plants can be left onsite to die. If mowing will be conducted at the site, this should not occur until after herbicide has had a chance to work (King County Noxious Weed Control Program, 2010). Manual treatments can be combined with chemical control in riparian areas where regulations prohibit chemical control of an entire infestation (that is, plants within the PFZ should be manually removed where adjacent chemical treatment occurred).

CULTURAL: NOT RECOMMENDED

In the United Kingdom, efficient control has been achieved using cattle and sheep to graze on Himalayan balsam leaves, stems and flowers from early spring and throughout the growing season (Clements, Feenstra, Jones, & Staniforth, 2008). However, grazing opportunities are limited in urban areas due to municipal bylaws regulating agriculture animals, the high probability of interface with the public, and the damage animals could cause to riparian areas and other sensitive sites with multiple land uses.

BIOLOGICAL: NOT AVAILABLE

The Provincial government is working with United Kingdom researchers who are testing host specificity with the *P. komarovii* rust and comparing the efficacy of the rust strains from Pakistan and India on Himalayan balsam from Canada. (British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development, 2018). However, there are currently no approved biological control measures for Himalayan balsam in British Columbia.

CONTROL SUMMARY

The following table provides a summary and comparison of control methods for Himalayan balsam.

CONTROL STRATEGY	TECHNIQUES	APPLICABLE SITE TYPE	PROS	CONS
Manual	Pulling or cutting	Individual plants, sites of all sizes	Selective, can be done by volunteers, inexpensive, non-chemical	Creates disturbance, labour intensive, flowering can still occur on regrowth
Mechanical	Mowing or brush cutting	Possible at all sites, but best suited for large non-riparian infestations	Less labour intensive, non-chemical, reduces risk of disturbance and erosion	Requires trained staff, speciality equipment, flowering can still occur on regrowth
Chemical	Foliar application, wick application	Large infestations, non-aquatic environments	Treatment method for plants that cannot be managed other ways, less labour intensive, treat large areas, less disturbance of surrounding environment	Unintended environmental/health impacts, high public concern, requires trained staff, speciality equipment and herbicide products, manual control may be necessary for plants within the PFZ adjacent to chemical treatments
Cultural	Not recommended			
Biological	No bioagents are currently available for distribution in British Columbia			

Disposal

ON SITE DISPOSAL

The vegetative and pre-flowering parts of Himalayan balsam plants can be dried out and composted on site, usually desiccating within 6-7 days (King County Noxious Weed Control Program, 2010). Large piles of Himalayan balsam may take up to two weeks before desiccation. The piles can either be exposed to air or covered (King County Noxious Weed Control Program, 2010). Himalayan balsam can re-root from nodes (Dreves, 2018) and therefore tarps should be used underneath compost piles or piles should be elevated above ground and dried thoroughly (King County Noxious Weed Control Program, 2010).

For best results, crush stems before placing on compost pile. Re-rooting is more likely to occur in cool or wet weather. Composting onsite during hot weather will promote faster desiccation (Dreves, 2018). Himalayan balsam plants should not be composted if seeds are present.

OFF SITE DISPOSAL

When disposing off site, transport plant parts on tarps or in thick plastic bags to an appropriate disposal or compost facility. In the Metro Vancouver region, the several facilities accept Himalayan balsam plants and/or infested soil. Please consult [this disposal facility list](#) for current details.

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

CLEANING AND DISINFECTION⁵

Before leaving a site, all visible plant parts and soil from vehicles, equipment, and gear should be removed and rinsed if possible. 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 ≥ 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 region include: Mary Hill Truck Wash, 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 Himalayan balsam growth.

⁵ Adapted from Metro Vancouver 2017 Water Services Equipment Cleaning Procedures and Inspection Protocols.

Follow-up Monitoring

Whatever control method is used, follow-up monitoring and maintenance treatments are components of an integrated management plan or approach. Monitor sites throughout the growing season and remove any new plants (King County Noxious Weed Control Program, 2010). Management should continue until plants are no longer sprouting at the site (Langley Environmental Partners Society, 2014). Seeds can be viable for 18 months (King County Noxious Weed Control Program, 2010). Most sources agree that monitoring of all managed sites should occur annually for several (> 2) seasons following eradication (Clements, Feenstra, Jones, & Staniforth, 2008).

After chemical treatment, sites should be monitored for re-growth from the seed bank for several years (King County Noxious Weed Control Program, 2010).

Restoration

Restoration is recommended to create competition, control Himalayan balsam regrowth and replace lost habitat. Numerous studies have shown that removal of this invasive plant increased the number of non-native plants in the area (Clements, Feenstra, Jones, & Staniforth, 2008). As the plant often grows in wet and sensitive sites, control activities can further damage sites as people access them, making restoration of sites especially important.

The City of Port Moody has noticed that Himalayan balsam often takes over at knotweed species management sites, especially in moist sites (Crampton, 2018). Due to its ability to grow quickly from seed and take advantage of disturbed sites, watch for Himalayan balsam at sites being managed for other invasive species.

If a non-selective herbicide is used in areas with grass or other desirable monocots, the area should be re-vegetated to prevent re-invasion (King County Noxious Weed Control Program, 2010). If a non-selective herbicide is used for treatment along road rights-of-way, re-seeding should occur (King County Noxious Weed Control Program, 2010).

Mulch or a non-invasive grass seed can be used to avoid leaving bare soil and reduce colonization by other invasive plant species. 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, 2018).

Native plant re-growth may occur naturally at management sites. The Township of Langley has observed Himalayan balsam stands reducing in size after native red alder, hardhack, and willow naturally regenerated following control of the invasive (St. Andrassy, n.d.). Further, in areas where healthy native vegetation existed adjacent to Himalayan balsam infestations the native vegetation eventually regrew to the edge areas where the invasive had been dominant (St. Andrassy, n.d.).

Examples of common competitive native species prescribed for sites within the Metro Vancouver region are summarized in the table below based on site moisture. Replacement species should be chosen based on the ecology of the site by a qualified environmental professional. Local biologists, environmental professionals, agronomists, arborists, 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. Several science-based resources are available to guide restoration efforts, such as the South Coast Conservation Program’s [Diversity by Design](#) restoration planning toolkit.

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

If it can be sourced, the native *Impatiens noli-tangere* (common touch-me-not) would also be a suitable restoration species for Himalayan balsam management sites.

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

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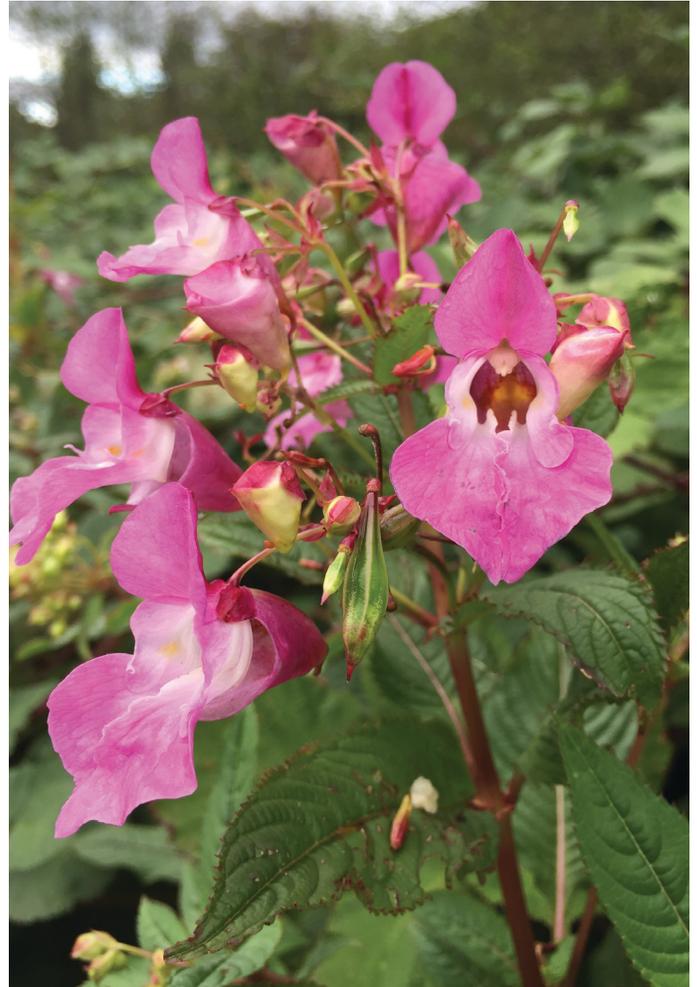
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Additional Resources

For more information please refer to the following resources.

- British Columbia Ministry of Forests, Lands, and Natural Resource Operations, Invasive Alien Plant Program (IAPP). <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/reporting-invasive-species>
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- E-Flora BC, an Electronic Atlas of the Plants of British Columbia. www.eflora.bc.ca/
- Field Guide to Noxious and Other Selected Invasive Plants of British Columbia. 2014. https://bcinvasives.ca/documents/Field_Guide_to_Noxious_Weeds_Final_WEB_09-25-2014.pdf
- Grow Me Instead. <http://bcinvasives.ca/resources/programs/plant-wise/>
- GrowGreen Guide. www.growgreenguide.ca
- Invasive Species Council of British Columbia Himalayan balsam Factsheet. https://bcinvasives.ca/documents/Himalayan_Balsam_TIPS_2017_WEB.pdf
- Pesticides and Pest Management. Province of British Columbia <https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management>

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