BEST MANAGEMENT PRACTICES FOR

Butterfly Bush

in the Metro Vancouver Region

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INVASIVE SPECIES COUNCIL OF METRO VANCOUVER

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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 targetted efforts by many players. This document — "**Best Management Practices for Butterfly Bush 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.

Butterfly bush[1] is a hardy, fast-growing deciduous shrub that invades both disturbed and natural areas. It exhibits many characteristics that give it a competitive advantage over other plants: rapid germination and growth, short time to flowering, prolific seed production, higher photosynthetic capacity than other woody species, tolerance of a broad range of environmental conditions, and low susceptibility to herbivory and disease (Tallent-Halsell & Watt, 2009). Is it ranked as one of the top 20 weeds in Great Britain and is highly invasive in New Zealand and Australia (Oregon Department of Agriculture, 2016).

Native to China, butterfly bush has been introduced worldwide as an ornamental shrub valued for its attractive and fragrant flowers (Ebeling & Tallent-Halsell, 2009). It was introduced to North America around 1900 (Garry Oak Ecosystems Recovery Team, 2005). Although the plants provide a food source (nectar) for adult butterflies it does not provide crucial habitat or food for butterfly eggs or larvae (Washington State Noxious Weed Control Board, 2006) and may negatively impact plants required for native butterfly reproduction (Evergreen, 2022) (Washington State Noxious Weed Control Board, 2006). Despite its ecological impacts, many online resources from around the world and within British Columbia still promote and maintain the plant as a suitable butterfly and pollinator food source.

When experts began suggesting that butterfly bush was invasive in North America, the nursery industry created sterile cultivars and hybrids that produce very few or no seeds. Oregon State has regulated butterfly bush, only allowing approved cultivars to be propagated and sold (Oregon Department of Agriculture, 2022). Unfortunately, some cultivars have been observed to produce abundant seeds (Tallent-Halsell & Watt, 2009). Butterfly bush is not regulated in British Columbia and many varieties are still widely used. The existence of cultivars further complicates this plant's invasive status in many jurisdictions.

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 butterfly bush, it is anticipated that the recommended best management practices will change. This document will be updated to reflect these changes as the information becomes available. Please check metrovancouver.org regularly to obtain the most recent version of these best management practices.

1 Butterfly bush (*Buddleja davidii* or *Buddleia davidii*) is also known by the common names summer lilac, orange eye and Buddleia bush (Lincoln County Noxious Weed Control Board, 2016). It is referred to as 'butterfly bush' in this document.

REGULATORY STATUS

Although butterfly bush is considered an invasive plant of concern in the Metro Vancouver region, it is not currently regulated anywhere in British Columbia.

IMPACTS

Indigenous Peoples have an intrinsic relationship with the natural world, built on reciprocity and stewardship. Many native plants and animals have cultural and spiritual significance for Indigenous Peoples, in addition to some being important food and medicine sources. Indigenous communities in British Columbia have collectively called for invasive species prevention, management, and control due to their impact on infrastructure, the economy, human health, ecosystems, and cultural practices. Further collaboration with Indigenous Peoples will deepen our understanding about the impacts of invasive species, such as butterfly bush, on Indigenous ways of life and our shared environment.

In North America, butterfly bush is known to form dense thickets that displace native vegetation, especially willows and cottonwoods (Altland & Ream, 2010). The plant may also deplete the soil of nitrogen and phosphorous more readily than other woody plants, further giving it a competitive advantage over native plants (Washington State Noxious Weed Control Board, 2006). Along transportation corridors, butterfly bush can impact safety by obstructing sightlines.

Butterfly bush competes with saplings in reforested areas, impeding tree growth, causing mortality, and increasing the costs of tree establishment (Garry Oak Ecosystems Recovery Team, 2005) (Oregon Department of Agriculture, 2016). In New Zealand, where butterfly bush is also considered invasive, it is estimated that this plant costs the forest industry $0.5 to 2.9 million annually in control and lost production (Ebeling & Tallent-Halsell, 2009).

As the common name implies, adult butterflies of many species are strongly attracted to butterfly bush for its olfactory cues (smell) and secondarily for its visual appeal (Lehner, Schulz, & Dötterl, 2022). Moths, wasps, hornets, lacewings, beetles and hummingbirds have also been observed on butterfly bush flowers (Tallent-Halsell & Watt, 2009). Although advertised as a beneficial plant for pollinators, all varieties of butterfly bush only provide nectar for adult butterflies and do not provide crucial habitat or food for earlier life stages, such as eggs or larvae. No native caterpillars eat butterfly bush leaves (Washington State Noxious Weed Control Board, 2006). Native flowering shrubs provide the best habitat and food for butterfly species. The use of butterfly bush as a food source by butterfly species may impact native plant pollination success (Ebeling & Tallent-Halsell, 2009).

Butterfly bush growing along a roadside

CREDIT: CITY OF SURREY

REPRODUCTION AND SPREAD

Butterfly bush produces many lightweight, winged seeds that disperse far distances by wind, water, animals and human activities (Oregon Department of Agriculture, 2016). A single flower head can produce up to 40,000 seeds per year (Lincoln County Noxious Weed Control Board, 2016), and a single plant can produce millions of seeds per year (Ebeling & Tallent-Halsell, 2009). Plants can produce seeds during the first year and every year afterwards (Evergreen, 2022). Studies have found that 95% of seeds are dispersed 10 metres or more from the parent plant (Tallent-Halsell & Watt, 2009), aiding spread and colonization of new sites. Seeds are retained on the plant throughout the winter and released during optimal, dryer conditions (Tallent-Halsell & Watt, 2009). With the popularity of butterfly bush as an ornamental plant, spread has largely occurred due to seed dispersal from yards and gardens.

Cut stems can regrow and new plants can form from cuttings (Garry Oak Ecosystems Recovery Team, 2005) (Washington State Noxious Weed Control Board, 2006).

Butterfly bush invading a riverbank

CREDIT: L. J. MEHRHOFF, UNIVERSITY OF CONNECTICUT, BUGWOOD.ORG

HABITAT AND DISTRIBUTION

In both its native and introduced ranges, butterfly bush can grow in a wide variety of habitats and it is often a first colonizer (Smale, 1990). It grows well in coarse-textured, nutrient-deficient soil (Smale, 1990) and prefers full sun but is shade tolerant (Lincoln County Noxious Weed Control Board, 2016) (Tallent-Halsell & Watt, 2009).

Butterfly bush often colonizes disturbed and natural areas, such as riparian areas, river gravel bars, rock faces, pastures, abandoned sites, and recently logged or burned forests (Evergreen, 2022) (King County, 2018). It can also grow in challenging conditions such as pavement cracks (King County, 2018). Road and rail rights-of-way are particularly vulnerable to invasion due to the gravelly substrate and reduced grass competition (Oregon Department of Agriculture, 2016).

Butterfly bush is established along the western coastal US states (Washington State Noxious Weed Control Board, 2006) and has been found in all provinces in Canada and the Yukon Territory (North Carolina State University Extension, 2020). It is common in southeastern Vancouver Island, Metro Vancouver, the Fraser Valley, and the Sunshine Coast, but rarely found in eastern British Columbia and not found in northern British Columbia or Haida Gwaii (Government of BC, 2024) (Adams, 2023). It grows throughout Metro Vancouver in gardens and has escaped to parks, streamsides, and transportation corridors. It is often found at dry, sunny sites (Alards-Tomalin, 2023). There are known heavy infestations along Highway 1 on the North Shore.

CLIMATE CHANGE ADAPTATION

Climate models 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. At lower elevations, the growing season is forecast to lengthen by 45 days in the 2050s and 56 days in the 2080s, reaching an average of 357 days per year — essentially creating a year-round growing period. 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 competition from invasive species.

Butterfly bush is well adapted to survive disturbance (Washington State Noxious Weed Control Board, 2006). Its ability to survive in a variety of conditions and habitats across the globe and its prolific seed production will allow it to easily colonize new areas as our climate changes. Under future climates, Kriticos et al. (2011) predict the distribution of butterfly bush to increase in many places around the world, including southern Canada and the northern United States. It is speculated that this plant may benefit from our future climate in several ways:

- **Increased flooding and storm events:** Established butterfly bush plants can withstand repeated flooding and burial by at least 0.5 metres of loose sand/silt during storm events by producing roots and shoots from buried or flattened stems (Smale, 1990). Flooding events can promote seed dispersal (Ebeling & Tallent-Halsell, 2009).
- **Longer summer drought periods:** Plants over 4 weeks of age are drought tolerant (Tallent-Halsell & Watt, 2009).
- **Extreme cold temperatures:** Butterfly bush can tolerate temperatures as low as −28.8°C (Tallent-Halsell & Watt, 2009). Cold hardiness is one of the characteristics that butterfly bush breeding has focused on improving; future cultivars that are developed may be able to better withstand colder temperatures, a current limitation of the plant's distribution especially into other parts of Canada (Ebeling & Tallent-Halsell, 2009).

With these kinds of competitive advantages, this species is more adaptable than native species in a variety of ecosystems. Its ability to reproduce in multiple ways and spread quickly suggest that it will be able to withstand, and possibly thrive, with changing climate conditions.

Identification

Unless otherwise noted, the following identification information was collected from Lincoln County Noxious Weed Control Board (2016) and Klinkenberg (2020).

Lifecycle: Perennial, deciduous shrub with arching branches, 1-5 metres tall. Plants mature quickly, having rapid early growth and producing seeds in the first year, with an average lifespan of about 20 years (Smale, 1990).

Stems: Young stems are green, maturing to thick woody branches with peeling gray-brown bark. Plants may be single- or multi-stemmed (Tallent-Halsell & Watt, 2009).

Leaves: Opposite arrangement, lance-shaped with toothed edges, up to 25 centimetres long and 2.5-8 centimetres wide; the upper surface is dark green to blue-grey and the lower surface appears white or light green due to a dense covering of small, branched hairs.

Flowers: Flowers are in dense, cone-shaped inflorescences 10-25 centimetres long at the ends of branches. Tube-shaped flowers are 9-12 millimetres long and spread into 4 distinct lobes at the opening of the flowers; white or pink to purple with an orange throat, although cultivars come in a variety of colours including red, magenta, purple, blue, orange, and yellow (King County, 2018).

Individual flowers bloom from the base of inflorescences to the top (Ebeling & Tallent-Halsell, 2009) between May to October.

Fruits: Two-sided upright cylindrical capsules, 5-6 millimetres long that split in half when mature to release many lightweight, winged seeds that are viable for 3-5 years.

Roots: Fibrous root system with the main root extending up to 4 metres in the soil (Tallent-Halsell & Watt, 2009).

The following photos show butterfly bush parts.

Young stem
CREDIT: ISCMV

Mature, woody stems
CREDIT: ISCMV

Branch with opposite leaf arrangement
CREDIT: ISCMV

Flowerhead and leaves
CREDIT: ISCMV

Tube-shaped flowers with orange centre
CREDIT: ISCMV

Dried seed capsules
CREDIT: ISCMV

Seeds
CREDIT: ISCMV

SIMILAR SPECIES

The species most commonly mistaken for butterfly bush are listed below.

NATIVE SPECIES

The native species listed below are suitable planting alternatives to butterfly bush and plants/seeds are available from local retailers, especially those that specialize in native plants. Unless otherwise noted, the following identification information was collected from (Klinkenberg, 2020).

Hardhack (*Spiraea douglasii*)[2] shrubs have deciduous, alternate, oval-shaped leaves with toothed margins on the upper half. Like butterfly bush, cylindrical shaped inflorescences are pink and located at the ends of stems, but hardhack flowers are 2 millimetres long with 5 petals.

Red-flowering currant (*Ribes sanguineum*)[2] shrubs have brownish to reddish-brown bark and deciduous, alternate leaves that have 3-5 lobes. Drooping flower clusters form along the length of the stems, each with 5-30 bell-shaped flowers, 2.5-3.5 millimetres long, pink to deep red.

Red elderberry (*Sambucus racemosa*)[2] **and blue elderberry (*Sambucus cerulea*)** have similar growth forms and leaf arrangements as butterfly bush, but have smaller and less compact inflorescences with creamy white flowers. Red elderberry inflorescences are egg- to cone-shaped and blue elderberry inflorescences are flat on the top. The colourful berries of these species are very different from dry butterfly bush capsules.

Fireweed (*Epilobium angustifolium* or *Chamerion angustifolium*)[2] is a herbaceous perennial plant, 1-3 metres tall with single stems. The leaves are alternate and narrow, 10-15 centimetres long. Like butterfly bush, inflorescences are located at the tips of stems, but fireweed flowers are less dense and the fruits are long and thin, with seeds that have hair tufts.

Hardhack
CREDIT: PHIL HAGELBERG, FLICKR

Red-flowering currant
CREDIT: ISCMV

Red elderberry
CREDIT: JON D. ANDERSON

Fireweed
CREDIT: ISCMV

2 Considered pollinator-attractive wild plants of Metro Vancouver (Pollination Ecology Lab at SFU, 2023).

NON NATIVE SPECIES

Except for purple loosestrife, which is invasive, the other non-native species listed here are suitable planting alternatives to butterfly bush.

- **California lilacs (*Ceanothus species*)** and their hybrids are profusely blooming evergreen shrubs (ISCBC, 2023). There are about 50-60 species in this genus, which tend to have smaller, shiny leaves compared to butterfly bush. Flowerheads are rounded, not pointed at the end like butterfly bush. Lilacs bloom in the middle of spring, while butterfly bush blooms later in the season, from June to September.
- **Meyer lilac (*Syringa meyeri*)** leaves are only 2-3 centimetres long with slightly wavy margins. Sweetly scented, lavender-pink flowers bloom in late spring to early summer (ISCBC, 2023).
- **Black chokecherry (*Aronia melanocarpa*)** is deciduous shrub native to Eastern Canada and planted as an ornamental and edible plant. The berries can be used to make jam, juice and wine (University of Saskatchewan, 2022). The plant is smaller than butterfly bush with glossy dark green leaves and small clusters of white flowers all over the plants that mature to dark purple-black berries.
- **Purple loosestrife (*Lythrum salicaria*)** is an invasive herbaceous plant found at wetland sites. Stems are woody and square-shaped. Leaves are 3-10 centimetres long, attached directly to the stem, usually in opposite arrangement. Pinkish-purple flowers grow in dense spikes at the end of each stem and bloom from July to September. More information on this species can be found in the Best Management Practices for Purple Loosestrife in the Metro Vancouver Region.

California lilac
CREDIT: MELYSTU, FLICKR

Meyer lilac
CREDIT: BABIJ, FLICKR

Black chokecherry
CREDIT: F. D. RICHARDS, FLICKR

Purple loosestrife
CREDIT: C. DE LA SALLE

Tracking

The Provincial government maintains InvasivesBC, an invasive species database, map and mobile data collection application available for use by all land managers, contractors, government agencies and non-profit organizations completing surveys and/or management activities on invasive species in British Columbia. InvasivesBC contains invasive species occurrence, treatment, and monitoring records for the entire province. The data can be searched using many criteria, and exported into a variety of summary reports. An active BC Public Service IDIR or Business BCEID is required to request access to the database. 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.

When carrying out a butterfly bush 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 adjacent to water courses;
- Location in relation to other water sources, such as wells;
- Whether it is growing around desired vegetation or structures.

Reporting

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

Many species identification apps are available for mobile devices. Some apps allow users to record observations and participate in community science projects. For example, reports made on the online public platform iNaturalist may be used by government and community groups to track sightings and distributions of high priority invasive species. The Invasive Species Council of Metro Vancouver maintains a list of available apps for identifying native and/or invasive species.

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.

A long timeline may be needed to manage large butterfly bush infestations. In New Zealand, researchers have found that butterfly bush infestations are the densest within the first few years as the plants quickly displace native plants (Smale, 1990). The density diminishes after 10-15 years due to self-thinning and natural plant death, allowing native plants and trees to establish and become dominant again (Smale, 1990). Management of butterfly bush is important to prevent seed dispersal, but this research suggests that when prioritizing sites for large-scale control, focusing on butterfly bush infestations that have been established for less than 10 years is the most effective use of resources.

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 butterfly bush over the long term.

When working in or adjacent to butterfly bush, it is best to 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 butterfly bush before leaving an infested area. Plants, plant parts, and seeds should be tarped or bagged before transport to an appropriate disposal site (see Disposal section).

When selecting plants for a site, do not purchase, trade, or transplant butterfly bush. The Invasive Species Council of BC's 'Grow Me Instead' Program or the Grow Green website provide recommendations for non-invasive, drought-tolerant plants, and garden design ideas. Alternatives are available for butterfly bush that have similar showy, fragrant flowers that are beneficial to butterflies.

All materials (e.g., topsoil, gravel, mulch, compost, wood chips, plant stock) should be weed-free. Butterfly bush can be introduced via these materials and sites where they are used should be monitored carefully for any growth (Crosby, 2023). Healthy green spaces are more resistant to invasion by invasive plants, so it is also important to maintain or establish healthy plant communities.

Butterfly bush with multiple arching stems

CREDIT: J. RUTER, UNIVERSITY OF GEORGIA, BUGWOOD.ORG

MANUAL/MECHANICAL: RECOMMENDED

- **Pulling or digging** is easiest when the soil is moist (Garry Oak Ecosystems Recovery Team, 2005). Young plants may be pulled by hand (Evergreen, 2022). A manually-operated tool designed for this technique (e.g. Weed Wrench©, Extractigator© and others) can be used for larger plants (Alards-Tomalin, 2023). When targetting larger plants, it may be necessary to systematically cut the stems down first to provide easier access to the trunk and roots of the plant. Stems/trunks are brittle and may easily break off, so this method may require persistence or it may not be successful at all sites (King County, 2018). Remove as much of the roots as possible (Alards-Tomalin, 2023). Soil disturbance should be minimized to prevent seed bank germination (Garry Oak Ecosystems Recovery Team, 2005).
- **Cutting** butterfly bush branches, stems and trunks with loppers or a saw is not an effective method alone. Cut stumps left in the ground will regrow quickly (Alards-Tomalin, 2023), so cutting should always be combined with another treatment method, such as:
  - The 'cut cover' method involves cutting the plant close to the base and then covering it with a thick plastic bag or mulch (Garry Oak Ecosystems Recovery Team, 2005) (ISCBC, 2023).
  - The 'cut stump' method involves cutting the stems and trunk then immediately applying herbicide to the freshly cut surface(s). When cutting, leave enough of the trunk to allow access for herbicide application. This is the preferred chemical treatment method for butterfly bush (more details in Chemical Control section below).

  Cutting should be completed before or during flowering to prevent seed production and dispersal (Evergreen, 2022). Cut stems can resprout quickly so they must be removed offsite and not left where they have access to soil (Lincoln County Noxious Weed Control Board, 2016).
- **Flower removal** in June to July before seed maturation can prevent the spread of seeds but will not eradicate the plant (Garry Oak Ecosystems Recovery Team, 2005) (Evergreen, 2022). If flowers have already dried, it is best to put a plastic bag over the flowerheads before cutting, to catch any seeds that may be present (Whatcom County Noxious Weed Board, 2022). This method, also called 'deadheading', can be suggested to gardeners who decline to remove their butterfly bushes but want to minimize the plant's impact.
- **Mowing** is possible for young, green plants, but this is not an effective control method (Evergreen, 2022) and it may stimulate seed bank germination.

Manual removal of butterfly bush at Mackay Creek, City of North Vancouver
CREDIT: JULIA ALARDS-TOMALIN

REMOVAL TIMING

The best time to undertake manual removal is before or at the flowering stage, prior to seed set (Garry Oak Ecosystems Recovery Team, 2005).

APPLYING MANUAL/MECHANICAL CONTROL METHODS IN RIPARIAN AREAS

Butterfly bush often grows in large contiguous patches along streams, watercourses, and natural sources of water supply. Land managers must consider the impact of control techniques and the resulting bare soil on the adjacent aquatic environment. Removal works should be scheduled during a period of least risk to fish species, outside of the fish window. When planning instream activities (in or around water), including removal of invasive vegetation, a water licence or use approval may be required under the BC *Water Sustainability Act* (for pesticide application, see the Applying Pesticide in Riparian Areas section). To access guidance documents or to learn more about water licenses and approvals in British Columbia, visit the Province's Working Around Water webpage. Working around water may also require authorization under other applicable Provincial or Federal legislation, such as the Federal *Fisheries Act*. It is recommended to consult with a Qualified Environmental Professional when working around water.

CHEMICAL: RECOMMENDED

When alternative methods to prevent or control invasive plants are unsuccessful, professionals often turn to herbicides.

This method should be used with caution for the following reasons (Crosby, 2023):

1. Weather conditions greatly influence treatment efficacy;
2. Butterfly bush may be found in riparian areas where pesticide use is restricted; and
3. Since butterfly bush growth is closely associated with other plants, chemical control can easily damage non-target species (Province of BC, 2002).

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[3]; 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 governments, and municipal governments often have pesticide bylaws.

- Health Canada evaluates and approves chemical pest control products if their use will not result in unreasonable adverse impacts as per the *Pest Control Products Act*.
- The *BC Integrated Pest Management Act* sets out additional requirements for the use and sale of pesticides in British Columbia beyond federal requirements. This Act is administered by the Ministry of Environment and Parks.
- Several municipalities have adopted bylaws that prohibit the use of certain pesticides.

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

Butterfly bush along a trail at Mackay Creek, City of North Vancouver
CREDIT: J. ALARDS-TOMALIN

3 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 User 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 residential property the owner may apply pesticides to manage invasive or noxious weeds without a Pesticide User Licence, depending on the product classification or label directions. A private residential property owner may also hire a licensed service company to perform the work. A Residential Applicator Certificate is required to apply domestic class pesticides to landscaped areas including lawns and ornamental garden beds, although there are exceptions. For more information, please visit the Provincial Pesticides and Provincial Pesticides and Pest Management webpage.

Questions? Contact the BC Integrated Pest Management Program:
Telephone: (250) 387-9537
Email: bc.ipm@gov.bc.ca

Before controlling Provincially-regulated invasive plants and noxious weeds with pesticide on private or public industrial land, roads, power lines, railways, and pipeline rights-of-way, an 'Industrial Vegetation and Noxious Weed' Pesticide Applicator Certificate should be obtained. However, since butterfly bush is not a Provincially-regulated invasive plant or noxious weed, the 'Landscape' Pesticide Applicator Certificate category may be more appropriate for herbicide use on public and private lands. While there can be some overlap in categories, applicators should consider the most relevant category for their work depending how much time is spent on invasive plant control versus general plant management. 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 maintain a Pesticide Applicator Certificate or be familiar with all applicable regulations and contractor obligations to limit liability.

For more information on how to obtain a certificate and other requirements when working under the *BC Integrated Pest Management Act and Regulation*, please review the Provincial Noxious Weeds and Vegetation Management webpage.

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, create poor control results, or pose a 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 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

As outlined in DiTomaso, Kyser et al (2013), the herbicides listed in the following table can be used on butterfly bush. Altland and Ream (2010) found that glyphosate provided the best short-term control a few weeks after application, but all the herbicides listed below provided effective control by the following spring.

ACTIVE INGREDIENT (EXAMPLE BRAND NAMES) +	APPLICATION	PERSISTENCE	GROWTH STAGE ++	TYPE +++	COMMENT
Glyphosate§ (many products)	foliar, cut stump application	non-residual*	actively growing	non-selective	foliar application in summer and fall, cut stump application in summer, most effective choice for small plants 1-3 metres tall (Altland & Ream, 2010)
Triclopyr (example: Garlon™)	foliar, cut stump, basal stem application	residual	actively growing	non-selective	foliar application in summer, cut stump application in summer, basal bark application in fall
Imazapyr (example: Arsenal™)	foliar, cut stump application	residual	actively growing	selective, no effect on grasses	foliar application in spring, summer, cut stump application in summer

+ 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.

++ Active growing periods vary from year to year depending on weather and other factors. There may be more than one active growing period for a plant in a year.

+++ 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.

§ Glyphosate can impact trees with roots within or adjacent to the treatment area.

* Non-residual herbicides are active only on growing plant tissue and have little or no persistence in the soil whereas residual herbicides persist in the soil, remaining effective over an extended period.

NOTE: Butterfly bush may not be specifically listed on these herbicide labels. However, it falls under the general application provision for woody plants.

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)[4] 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. **Butterfly bush is not listed and therefore glyphosate and other herbicides can only be applied on butterfly bush up to 10 metres away from the high water mark (HWM)**[5]. The 30 metre no-treatment zone around a water supply intake or well used for domestic or agricultural purposes may be reduced if the licencee or PMP holder is 'reasonably satisfied' that a smaller no-treatment zone is sufficient to ensure that pesticide will not enter the intake or well.

When managing butterfly bush with herbicide in riparian areas:

- Observe and mark all PFZs before treatments.
- 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.

4 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.

5 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, 2011).

APPLICATION METHODS

The following methods can be used to apply herbicide to butterfly bush. Altland and Ream (2010) found that cut-stump application provided slightly better control than foliar spray, regardless of herbicide used.

- **Cut stump application** entails cutting the stems and trunk at the base of the plant and immediately applying the herbicide to the freshly cut surfaces with a paintbrush (Altland & Ream, 2010).
- **Foliar application** can be undertaken by hand or using a backpack sprayer. This method is more efficient and cost effective than cut stump application; however, large plants with dense leaf hairs are less vulnerable to foliar application (Tallent-Halsell & Watt, 2009) and may be difficult to spray due to height application restrictions and risk of drift. Application to large plants and infestations may need to be completed over several years (Altland & Ream, 2010).
- **Basal stem application** involves using a backpack sprayer with a flat fan or solid cone nozzle to apply herbicide around the entire base of the stem and any roots.

TIMING

Timing of application is dependent on the active ingredient used. The table in the Herbicide Options section provides timing information.

CULTURAL: NOT AVAILABLE

- **Grazing** opportunities are limited in urban areas due to municipal bylaws regulating agricultural 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. Although goats have been reported to browse young butterfly bush plants (DiTomaso, Kyser, & et al, 2013), the damage they impose does not kill or eradicate the plants (King County, 2018). Grazing is not recommended as a management option for this species in Metro Vancouver.

BIOLOGICAL: NOT AVAILABLE

There are no biological control agents currently available in British Columbia for butterfly bush. A leaf-feeding weevil and stem-boring beetle are being studied in New Zealand as biocontrol agents for butterfly bush (Lincoln County Noxious Weed Control Board, 2016).

CONTROL SUMMARY

The following table provides a summary and comparison of control methods for butterfly bush.

CONTROL STRATEGY	TECHNIQUES	APPLICABLE SITE TYPE	PROS	CONS
Manual	**Pulling, digging**	Moist soil	Selective, volunteer friendly, non-chemical	Labour-intensive, may create soil disturbance and stimulate seed germination, must remove entire plant, must remove biomass from site
Chemical	**Cut stump application**	All sites	Selective if using appropriate herbicide and application, less disturbance of surrounding environment	Requires manual cutting of stems first, must remove biomass from site, unintended environmental/health impacts, high public concern, weather dependent, requires trained staff
	Foliar application	All sites	More efficient and cost effective than cut stump application, selective if using appropriate herbicide and application, less disturbance of surrounding environment	Less successful on plants with dense leaf hairs, height of plants may restrict treatment area, unintended environmental/health impacts, high public concern, weather dependent, requires trained staff
	Basal stem application	All sites	Same pros as the Foliar application technique	Unintended environmental/health impacts, high public concern, weather dependent, requires trained staff
Manual	**Cutting at the base**	All sites	Non-chemical	Labour-intensive, plants can resprout from stems, to be successful must be used with another method (covering or chemical control), must deal remove biomass from site
	Flower removal	All sites	Selective, volunteer friendly, non-chemical, prevents flower/seed productions if timed appropriately	Labour-intensive, will not kill the plants, may spread seeds
Mechanical	**Mowing**	None		Not effective
Cultural	**Grazing**	None		Not a suitable management option for this species in Metro Vancouver
Biological	**No biological control agents are currently available for distribution in British Columbia**			

CONTROL SUMMARY COLOUR LEGEND

GREEN: RECOMMENDED

ORANGE: CAUTION

RED: NOT RECOMMENDED OR NOT AVAILABLE

Disposal

ON SITE DISPOSAL

Stems, branch and root fragments left on the ground may re-grow and should be removed off site (Garry Oak Ecosystems Recovery Team, 2005) (King County, 2018). Debris piles that are not removed or treated to kill all seeds and plant fragments can become a concentrated source of new germinants the following season (Tallent-Halsell & Watt, 2009).

OFF SITE DISPOSAL

In the Metro Vancouver region, several facilities accept butterfly bush 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 DISINFECTION[6]

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 (82 °C) 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 (149°C).
- Fully rinse detergent residue from equipment before leaving the facility.

* Appropriate self-serve and mobile hot power-wash companies in the Metro Vancouver area include: 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 butterfly bush growth.

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 for several years after treatment. Monitor closely for new seedlings at disturbed sites where a seed bank exists (King County, 2018).

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

Restoration

During the early life stages, growth of butterfly bush is slow, and it is a poor competitor against other vegetation (Oregon Department of Agriculture, 2016). As soon as possible after butterfly bush control, sites should be seeded with a grass or native groundcover or replanted to encourage growth of other vegetation and discourage germination of butterfly bush seeds remaining in the soil (King County, 2018).

Examples of common competitive native species prescribed in Metro Vancouver sites are summarized in the table below based on site moisture.

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
	Osoberry	Oceanspray
TREES		
Western red cedar	Western red cedar	Douglas-fir
Red alder	Red alder	Red alder

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.

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 butterfly bush re-invasion. In a garden setting, there are many non-invasive, showy, fragrant, butterfly-attracting alternatives to butterfly bush. Some are listed in the Similar Species section. Additional alternatives are Chilean potato vine and Lewis's mock orange (Philadelphus lewisii).

Butterfly bush 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 potential impacts from wildlife and utilize appropriate mitigation measures to protect the restoration and existing native plantings (e.g., tree wrapping, exclusion caging/fencing, vole guards, etc.).

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Additional Resources

For more information, please refer to the following resources.

- Garry Oak Ecosystems Recovery Team Annotated Bibliography on the Ecology and Management of Invasive Species: Butterfly bush *(Buddleja davidii Franchet)*.
- Grow Green Guide. www.growgreenguide.ca
- Grow Me Instead. https://bcinvasives.ca/play-your-part/plantwise/
- InvasivesBC is a Provincial invasive species database, map and mobile data collection application available for use by land managers and invasive species practitioners across British Columbia. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/invasivesbc
- Pesticides and Pest Management. Province of British Columbia https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management
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