BEST MANAGEMENT PRACTICES FOR

Giant Hogweed

in the Metro Vancouver Region

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

ISCMV
INVASIVE SPECIES COUNCIL OF METRO VANCOUVER

Disclaimer

This publication is not intended to endorse or recommend any particular product material or service provider, nor is it intended as a substitute for engineering, legal, or other professional advice. Such advice should be sought from qualified professionals.

While the information in this publication is believed to be accurate, this publication and all of the information contained in it are provided "as is" without warranty of any kind, whether express or implied. All implied warranties, including, without limitation, implied warranties of merchantability and fitness for a particular purpose, are expressly disclaimed by Metro Vancouver. The material provided in this publication is intended for educational and informational purposes only.

Created by: Metro Vancouver and the Invasive Species Council of Metro Vancouver

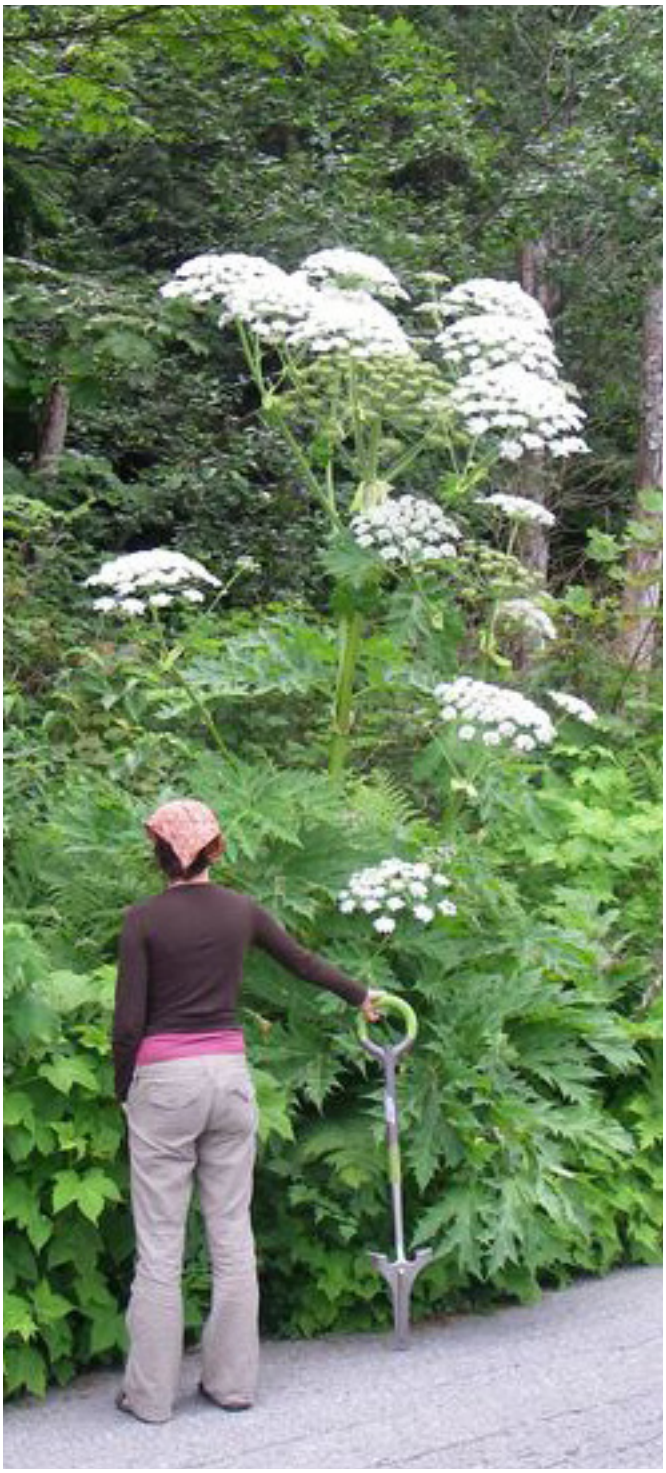
In partnership with: The Invasive Species Council of British Columbia
Diamond Head Consulting

Requested by: Metro Vancouver's Regional Planning Advisory Committee – Invasive Species Subcommittee

4730 Kingsway, Burnaby, BC, V5H 0C6
metrovancouver.org

August 2021

Contents



CREDIT: MINISTRY OF FORESTS, LANDS, NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT

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 Giant Hogweed 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 researchers and operational experts.

Giant hogweed is a target for eradication and education in the region due to the health risk associated with direct contact. The Invasive Species Council of Metro Vancouver (ISCMV) has identified giant hogweed as a top-ten invasive species for management in the region.

Academic institutions, government and non-government organizations continue to prioritize and study this species in British Columbia. As researchers and practitioners learn more about the biology and control of giant hogweed in British Columbia, it is anticipated that the recommended best management practices will change over time and this document will be updated. Please check metrovancouver.org regularly to obtain the most recent version of these best management practices.

REGULATORY STATUS

Giant hogweed is classed as a noxious weed within all regions of the province under the *BC Weed Control Act*, Weed Control Regulation, Schedule A, Part 1 – Provincial Weeds. Under this Act, "an occupier[1] must control noxious weeds growing or located on land and premises, and on any other property located on land and premises, occupied by that person".

Section 2 (1) (b) (iii) of the *Community Charter*, Spheres of Concurrent Jurisdiction, states that "municipalities may regulate, prohibit and impose requirements in relation to control and eradication of alien invasive species" which includes giant hogweed.

IMPACTS

Giant hogweed is a high priority species in the region primarily due to the potential health impacts from direct contact with the plant. The sap in giant hogweed plants contains furanocoumarins, which upon contact with skin, can result in dermatitis. Furanocoumarins react with sunlight and cause severe burns on the affected skin areas when exposed to sunlight, resulting in blistering and recurrent dermatitis (WorkSafe BC 2006). To reduce the public health risk posed by giant hogweed, all levels of government and private land managers incur management costs in the region every year. In 2016, agencies represented on Metro Vancouver's Regional Planning Advisory Committee – Invasive Species Subcommittee spent close to $100,000 on giant hogweed control efforts. This figure does not include control costs for private landowners across the region or costs associated with education and awareness activities.

Giant hogweed tends to form monocultures with large standing biomass and extensive litter production. Its early germination allows it to develop seedlings well ahead of native species (Moravcová 2007). Moravcová also noted that the plant may change the composition and species diversity of native plant communities, and in central Europe, investigations have shown a reduction in species richness and densities by up to 50-60% (Hejda, Pysek and Jarosik 2009). Large infestations of giant hogweed can kill grass and other understory plants by shading. When giant hogweed dies back in the winter, the bare soil in the understory is exposed which may result in soil erosion (Moravcová 2007). Increased soil erosion along stream banks, a favourite location for giant hogweed infestations, is a significant concern.

REPRODUCTION AND SPREAD

Giant hogweed reproduces by seed. An average mature plant can produce between 20,000 and 100,000 seeds each year. Since most seeds fall within a few metres of the parent plant, seedlings develop under very crowded conditions and thus seedling mortality is high. The vast majority of seeds (95%) are found within the top 5 cm of the soil layer and within 9 metres from a plant. Seeds may stay viable in the soil for more than five years (New York State Department of Environmental Conservation 2017). The seeds can be dispersed short distances by wind, but travel dramatically longer distances by water, floating for up to 8 hours (Moravcová 2007). Humans also affect dispersal by transporting plants purposefully or accidentally in urban and rural areas.

1 An occupier is a person who (a) is in physical possession of land, premises or property, or (b) is responsible for, and has control over, the condition of, the activities conducted on and the persons allowed to enter or use, land, premises or property.

HABITAT AND DISTRIBUTION

In the Metro Vancouver region, giant hogweed tends to grow in wet areas along streams and rivers, parks, forest edges, on waste ground, near houses, in gardens, in vacant lots, and along transportation corridors. It prefers moist soil.

Giant hogweed is native to the Caucasus region of Eurasia and was introduced into North America in the early 1900s (Michigan State University Extension 2012). In British Columbia, giant hogweed has been detected in the Southwest coastal and island regions, and recently reported in the Kootenays (BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development 2017). In Metro Vancouver, giant hogweed has been found in 20 municipalities, Electoral Area A, and Tsawwassen First Nation lands (BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development 2017).

CLIMATE ADAPTATION

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

Giant hogweed may be able to adapt to our future climate in several ways:

- **Warmer temperatures:** Although giant hogweed is frost tolerant and adapted to low winter temperatures (Germann, 2018), there is evidence that the plant is adapting to warmer climates, and may need less cold to break seed dormancy during the winter (Centre for Agriculture and Bioscience International, 2019).
- **Longer summer drought periods:** Giant hogweed can tolerate dry summer conditions (Centre for Agriculture and Bioscience International, 2019).
- **Increased precipitation and flooding:** High annual levels of annual precipitation and associated high levels of soil moisture create optimal growing conditions for giant hogweed (Germann, 2018).

Giant hogweed can thrive in a wide variety of habitats and is less restricted by bioclimatological conditions that most other others (Germann, 2018). With these kinds of competitive advantages, this species is more adaptable than native species in a variety of ecosystems and suggest that it will be able to withstand, and possibly thrive, with changing climate conditions.

Identification

Giant hogweed is sometimes referred to as giant cow parsnip or hogweed.

Lifecycle: Biennial (lives for 2 years, flowering in the second) to short-lived perennial (lives for more than 2 years); plant goes dormant in the winter and above-ground leaves and stalks die. Note that identification is easiest when the plant is mature with flowering stalks. However, since the plant only flowers after one or more years, it is important to be able to identify the leaves of young plants.

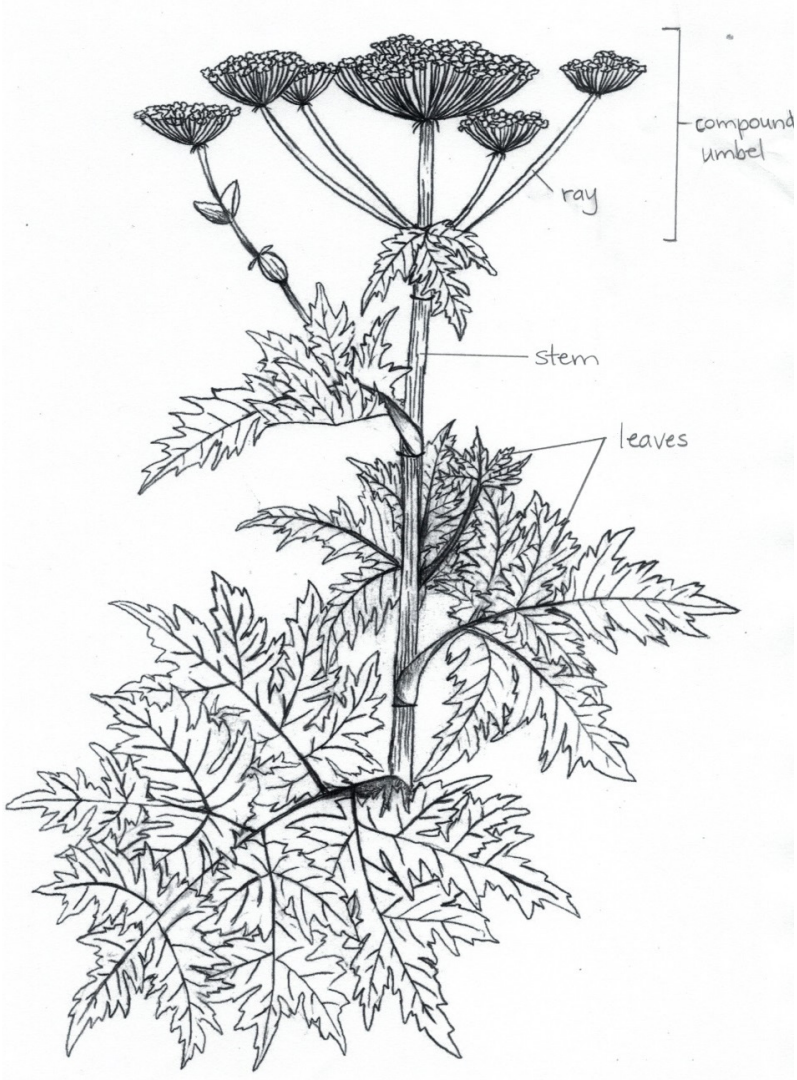
Stem: Flowering stalk 2-5 m tall, up to 10 cm in diameter, usually with purple blotches; often bristly.

Leaves: Dark green, up to 3 metres long and blades to 2.6 cm wide, divided into two or three deeply-lobed leaflets; coarsely toothed leaf margins and stiff underside hairs. Newly emerged leaves and immature plants will have smaller, basal leaves.

Flowers: Clusters of flowers (compound umbels) 20-50 cm in diameter with rays 50-150 cm in length from central stem; white or pinkish petals; plant flowers only after a year or more of growth.

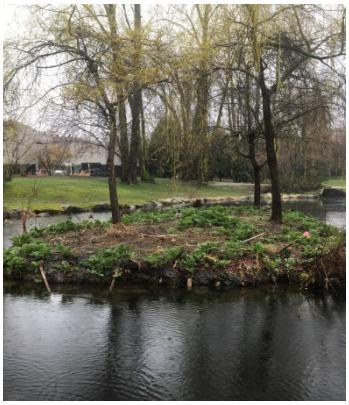
Seeds: Blunt and rounded toward base (E-Flora 2017) green, turning brown and dry when mature, 4-10 mm in diameter (ISCBC 2017); with visible oil tubes that are greater than ¾ the seed length.

Giant hogweed flowering stalk

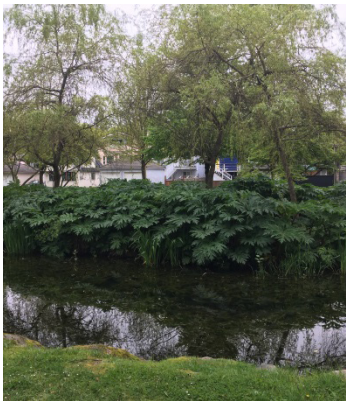


CREDIT: ISCMV

Giant hogweed through the year



Early Spring
CREDIT: ISCMV



Spring
CREDIT: ISCMV

Summer
CREDIT: ISCMV

Winter
CREDIT: ISCMV

SIMILAR SPECIES

Giant hogweed is often confused with wild parsnip (*Pastinaca sativa L.*), Queen Anne's lace (*Daucus carota* L.), and poison hemlock *(Conium maculatum*) which are introduced species, and palmate coltsfoot (*Petasites frigidus*), devil's club (*Oplopanax horridus*), cow parsnip (*H. maximum*), and four Angelica species that are native to British Columbia. All are superficially similar in appearance to giant hogweed (E-Flora 2017).

Young giant hogweed plant emerging from the ground
CREDIT: ISCMV

Cow parsnip is the only member of the genus *Heracleum* that is native to North America. This species is an important nectar source for butterflies, bees, and other beneficial insects. The leaves and stems of cow parsnip also contain toxic sap that can cause hypersensitivity to sunlight resulting in burns, blisters, and scarring (ISCBC 2017), however giant hogweed causes a much more severe reaction than cow parsnip (Canadian Council on Invasive Species n.d.). It is easy to distinguish giant hogweed from cow parsnip when they exist in their typical forms, but it becomes difficult when plants are in the early growing stages or when defining characteristics overlap (e.g., small hogweed individuals versus large cow parsnip individuals). Rarely individual plants can share characteristics of both species, making it difficult to visually confirm identity, even for experts. In these cases, experts consult with others and investigate the history of the presence of both species at the site or surrounding area.

Comparison of giant hogweed and cow parsnip (E-FLORA 2017) (STRATHCONA COUNTRY ALBERTA 2017).

	GIANT HOGWEED	COW PARSNIP
Stem	2 – 5 m tall, rarely taller; up to 10 cm diameter; usually many purple spots, stiff bristles	1-3 m tall, 4.5 to 5 cm diameter, few purple areas, deep ridges, fuzzy hair
Leaves	Up to 1.5 m wide, 3m long, compound, lobed (single leaves with lobes that look like a hand and fingers), deeply incised	0.6 – 0.75 m wide, 10-40 cm long; compound, palmate-shaped (looks similar to a maple leaf, or an open palm with fingers outstretched), divided into 3 segments
Flower	Umbel-shaped, up to 50 cm across	Umbel-shaped up to 10-20 cm across, rarely larger
Seeds	Blunt and rounded toward base; oil tubes >3/4 of seed length	Narrowed toward the base; oil tubes 1/2-3/4 of seed length

Leaves of the mature plant and ripe seeds are reliable features to distinguish giant hogweed from cow parsnip.

Giant hogweed leaf
CREDIT: N. PAGE

Cow parsnip leaf
CREDIT: N. PAGE

Giant hogweed seed: note length of oil tubes (>3/4 of seed length) and shape (rounded toward the base)
CREDIT: N. PAGE

Cow parsnip seed: note length of oil tubes (1/2 to 3/4 of seed length) and shape (narrow)
CREDIT: N. PAGE

Since there are many look-alike plants, it is always advisable to verify identity with an expert, especially prior to any management activity. Due to increased awareness of giant hogweed in the region, there have been many false reports.

Tracking

The provincial government maintains the Invasive Alien Plant Program (IAPP) application (BC Ministry of Forests, Lands, 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 conducting a giant hogweed inventory, the following information should be recorded as it will later inform treatment plans:

- Size and density of infestation;
- Location in relation to the high water mark of watercourses;
- Location in relation to other water sources, such as wells; and
- Public access (whether there is risk of public contact with the plant).

Reporting

Due to the health hazard posed by giant hogweed found in public spaces, it is advisable to report known or suspected giant hogweed infestations as soon as possible. Please report giant hogweed occurrences within Metro Vancouver to:

- The Provincial Report Invasives program (via smart phone app www.gov.bc.ca/invasive-species).
- The Invasive Species Council of Metro Vancouver: 1-604-880-8358 or iscmv.ca.
- The municipality where the giant hogweed was found.
- The landowner directly – Most land managers are keen to be made aware of giant hogweed sites immediately so control can be arranged as soon as possible. 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 authorities. However, some people may be hesitant to report giant hogweed infestations as their presence may affect property values.

Prevention and Control Strategies

Effective invasive plant management programs 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.

HANDLING GIANT HOGWEED SAFELY

Clear, toxic sap is found in all parts of giant hogweed. Contact with sap can occur by brushing against the plant, handling plant material, or even by touching tools or mowing equipment that was used for giant hogweed control (Hallworth 2009). To ensure the necessary precautions are taken, it is best to hire a professional to handle giant hogweed infestations.

Personal protective equipment (PPE) is critical to ensure that sap from plants does not contact workers' skin (see WorkSafeBC video).

WHEN HANDLING GIANT HOGWEED PLANTS, THE FOLLOWING PPE SHOULD BE WORN:

- Goggles or face shield;
- Sunblock;
- Long pants and long-sleeved shirt under waterproof coveralls or rain gear (pants and jacket with hood);
- Heavy rubber gloves or other waterproof gloves that can be discarded after use (e.g. dishwashing gloves);
- Rubber boots; and
- Heavy, waterproof tape can be used to cover seams and gaps between clothing and gear.

Personal Protective Equipment

CREDIT: N. BERGUNDER

BE SURE TO HAVE THE FOLLOWING ON HAND:

- Access to water or portable water source for cleaning gloves and clothes;
- Hand soap;
- A portable eyewash station; and
- A first aid kit.

USE THE FOLLOWING PROTOCOL WHEN HANDLING GIANT HOGWEED:

1. As a preventative measure, apply sunblock to skin, paying special attention to places that have the potential to be exposed to sap like face, neck, hands and wrists.
2. Put on goggles, waterproof coveralls, rubber gloves and boots and ensure no skin areas will be exposed.
3. Cover seams between clothing and gear by tucking items into one another or using heavy, waterproof tape to seal any gaps.
4. Use one of the recommended control methods (e.g., mechanical or chemical control) described below.
5. After control has been completed, wash gloved hands with soap and water.
6. Rinse gloves, coveralls and boots thoroughly with water, paying special attention to gloves and sleeves.
7. Carefully remove gloves, coveralls and boots by turning protective clothing inside out while ensuring any portions of clothing that were exposed to hogweed sap will not accidentally come into contact with skin.
8. Wash hands, equipment, faucet taps and door handles with soap and water.
9. Remove and wash goggles.
10. Dispose of coveralls and gloves after use. Any non-disposable clothing should be washed carefully with soap and water.
11. If skin accidentally comes in contact with sap, wash thoroughly with soap and water and consult a physician. Avoid sunlight and cover the exposed area immediately. Using sunscreen on the affected skin may minimize or help prevent further reactions from occurring when outside. Sunscreen may also be helpful for several months after contact with the plant sap, due to potential continued sun sensitivity.
12. If sap gets into the eyes, flush with copious amounts of water and use sunglasses, then consult a physician (WorkSafe BC 2006).

Adapted from Langley Environmental Partners Society (2017) and New York State Department of Environmental Conservation (2017).

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 giant hogweed over the long term. Be sure to inspect and remove seeds from personal gear, clothing, pets, vehicles, and equipment and ensure soil, gravel, and other fill materials are not contaminated with giant hogweed seeds before leaving an infested area.

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

MANUAL: RECOMMENDED

Manual control, (eg. pulling and digging) can prevent seed production and release of seeds into the soil. To prevent seed production, it is most effective to cut blooms soon after they appear, in May and June. With proper PPE, hand-pulling or digging can be effective on young seedlings, single plants or small infestations of a few individuals (Watson 2017). Safety risks for workers increases when dealing with large plants and large infestations. Manual control may be impractical in these circumstances. Manual removal is the recommended method when plants need to be removed from a site immediately due to the health concern.

The following methods can be used to manually control giant hogweed:

- **Taproot Cutting - for small groups of plants (<100):**

  Giant hogweed has a large, deep taproot like a carrot that stores energy for annual growth and/or flowering and provides a buffer against damage to the above-ground parts of the plant from mowing or browsing. The taproot can be up to 45 cm long and 12 cm thick. Giant hogweed can re-sprout new leaves after taproot cutting so follow-up is essential (Hallworth 2009).

  Using loppers, cut back the upper portions of larger plants for easier access to cut the stem and taproot. During flowering season, be sure to cut and bag flower heads first for secure disposal. Sever the root about 5 to 15 cm below the soil surface (or further if possible) using a sharp, long-handled narrow shovel or spade (Watson 2017).

  Cut the taproots in early spring (April 1 to May 15) and revisit the site in early-summer (June 15 to July 15) to target any plants that were missed or have re-sprouted. Make sure to target all plants. Above-ground plant parts can be left on-site to decompose, unless there is risk that people will come in contact with them. In this case cut the stem into pieces that will fit into sealed plastic bags (see Disposal).

- **Flower removal**

  Removal of the flower head (umbel) can be as effective as cutting the whole mature plant in stopping seed spread. However, the timing of cutting is crucial to prevent additional seeds from being produced. Cutting too early may result in the plant regenerating and producing new flowers with viable seeds. It is best to remove the umbels while in flower (usually May to August in Metro Vancouver although seeds can set as early as July) but before they go to seed. If plants are cut in the flowering stage, the site should be checked again a few weeks later to ensure no new flower heads have formed.

  Removal of flower heads only is a short-term, stop-gap method for preventing further seed dispersal (that is, when it is too late in the season to employ other techniques). It does not kill the plant.

  A long reach pruner or any sharp cutting tool which is long enough to avoid touching the plant can be used to cut and hold the flower heads. With a cutting tool, workers can pull the blade towards themselves to cut the stem. A second person can gently hold the stem and direct the fallen umbel into a sturdy plastic bag. If cut later in the season, avoid scattering seeds on the ground; if seeds are mature and shedding, contain them in a plastic bag or on a tarp, or within as small an area as possible. If seeds have scattered around the plant, scrape/rake the soil surface and collect and dispose of as many of the seeds as possible.

APPLYING MANUAL/MECHANICAL CONTROL METHODS IN RIPARIAN AREAS

Giant hogweed often grows along water courses. Consider the impact of control techniques and the resulting bare soil on the adjacent aquatic environment. Schedule removal works during a period of least risk to fish species, outside of the fish window. Adhere to provincial and federal riparian regulations. It is recommended to consult with a qualified environmental professional when working around water bodies.

CHEMICAL: RECOMMENDED

When alternative methods to prevent or control invasive plants are unsuccessful, professionals often turn to herbicides. 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 each 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[2]; and
- apply pesticides to landscaped areas on private land, including outside office buildings and other facilities.

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.

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

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

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

2 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.

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.

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

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

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

HERBICIDE LABELS

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

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

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

HERBICIDE OPTIONS

The following herbicides can be used on giant hogweed in British Columbia:

ACTIVE INGREDIENT (EXAMPLE BRAND NAMES)+	APPLICATION	PERSISTENCE	GROWTH STAGE++	TYPE+++
Glyphosate (many products)	foliar application stem injection (only Roundup WeatherMAX® With Transorb 2 Technology)	non-residual*	actively growing	non-selective
Chlorsulfuron + aminocyclopyrachlor (e.g. Truvist™)*	foliar application	residual	4 leaf stage	selective, no affect to grasses
Metsulfuron methyl + aminocyclopyrachlor (e.g. Navius™)**	foliar application	residual	4 leaf stage	selective, no affect to grasses
Aminopyralid (e.g. Milestone™)	foliar application	residual	new germinants only	selective, no affect to grasses

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

** Avoid application of this product in areas where the roots of desirable trees and/or shrubs may extend unless injury or loss can be tolerated. Roots of desirable trees or vegetation are affected by local conditions and can extend well beyond the tree canopy.

+ 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.

NOTE: Giant hogweed is not specifically listed on these herbicide labels. However, it falls under the general application provision for broadleaved plants.

APPLYING HERBICIDE 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, only herbicide labels need to be followed (which means for glyphosate products and Milestone™, treatment can happen up to the water's edge). 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 BC *Integrated Pest Management Act* and Regulation and all public land Pesticide Management Plans (PMPs), but not within 1 meter of the high water mark (HWM)[4]. Glyphosate can only be applied up to 1 metre away from the HWM. See the manual/mechanical section above for alternative control techniques that may be used with extreme caution at these sites. 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 from the use will not enter the intake or well.

When managing giant hogweed 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 hi gh water mark includes the active floodplain ((BC Ministry of Environment and Climate Change Strategy 2018).

FOLIAR APPLICATION METHODS

The preferred application methods to minimize non-target damage and applicator exposure are as follows:

- **Spray-on application** uses a backpack or handheld sprayer to completely cover the actively growing plant parts with herbicide, including the underside of the leaves (plants should be 20 to 50 cm in height). Spraying the undersides of the leaves maximizes the herbicide contact and uptake by the stomata. To access tall foliage and minimize the risk of applicator exposure to herbicide, long wands and wand extensions are recommended.
- **Wipe-on application:** This method is only allowed if using products containing glyphosate. Apply herbicide directly onto leaf surfaces using a simple hand held wipe-on applicator (e.g. Red WeederTM). The wipe-on method is only recommended when spraying is not an option. Caution must be taken when using this technique due to the extended time workers would be in close proximity to the plants during application. Wipe-on application is time-consuming and can be messy due to herbicide drips.

Shrouding or shielding the spray nozzle(s) on the spray wand can minimize herbicide drift into pesticide free zones or other sensitive areas during foliar applications. Tarps or garbage bags can be suspended, wrapped or draped as a buffer to adjacent sensitive areas including desirable vegetation, waterbodies or structures.

STEM INJECTION

This technique involves injection of herbicide into single stems using a hand-held tool that delivers a specified amount of product into the hollow stems. Currently in Canada, Roundup WeatherMAX® With Transorb 2 Technology Liquid Herbicide™ (pest control products number 27487) is the only product with stem injection listed the label and therefore the only product that can legally be applied using this method. While it can be used on any sized infestation, this method is useful for patches with few hogweed stems or when stems are growing interspersed between desirable vegetation. This method is more time-consuming and expensive as each stem must be injected and marked (some injection tools come with attachments for marking pens).

TREATMENT TIMING

Herbicide should be applied to actively growing plants. For first treatments in the spring, it is recommended to wait until there is sufficient foliage to ensure adequate surface area for absorption (starting when the hogweed is 20 to 50 cm in height). Early season treatments avoid the need for spraying overhead, reduce the risk of breaking canes, prevent flower/seed set from occurring, and use less herbicide.

In order to minimize impact to insects, if possible, treatment should be avoided during the flowering season. If Himalayan blackberry is also present at the treatment site consider treating before the berries form or cutting any blackberry canes with fruit before treatment to eliminate concerns of berry pickers.

MECHANICAL: NOT RECOMMENDED

Mechanical control using power equipment (e.g., brush saws or weed wackers) is not recommended because removing giant hogweed in this manner can cause sap to splash out of plants onto the face or other exposed skin. Power equipment can also spread seeds and become contaminated with sap.

CULTURAL: NOT RECOMMENDED

Giant hogweed is not effectively controlled by light grazing, but intensive grazing can suppress and eradicate infestations (Miller, Tarasoff & Salmon, 2021). Part of the efficacy is associated with trampling in addition to grazing. Grazing is best conducted using hairy and dark-pigmented animals to reduce inflammation of any mucus-secreting membranes from the furanocoumarins found in the sap. Animals prefer young and fresh giant hogweed plants, and the most efficient control is obtained by beginning the grazing early in the growing season when the plants are small (Nielson, et al. 2005).

Grazing opportunities may be limited in urban areas by municipal bylaws regulating animals, the need for specially trained herds, and the potential damage grazing animals may cause in sensitive ecosystems (e.g. off-target grazing and erosion). Most giant hogweed infestations in the Metro Vancouver region are small in size and, due to access constraints and potential for environmental damage, targeted grazing may not be a practical management option.

BIOLOGICAL: NOT AVAILABLE

There are currently no biological control agents available in British Columbia for giant hogweed. It is likely that biological control is not a high priority for giant hogweed as it is usually desirable to remove/treat it immediately because of the health risks to the public. Due to these constraints, biological control is not recommended as a practical management option in the Metro Vancouver region.

CONTROL SUMMARY

The following table provides a summary and comparison of control methods for giant hogweed.

CONTROL STRATEGY	TECHNIQUES	APPLICABLE SITE TYPE	PROS	CONS
Manual	**Tap root cutting**	Sites with < 100 plants	After treatment if plants are removed offsite the safety hazard is immediately eliminated, selective, non-chemical	Labour intensive
	Flower removal	Plants that cannot be managed in other ways before plants produce flowers	Selective, non-chemical, prevents seed production	Doesn't eliminate the safety hazard, incorrect timing may cause new flower heads may develop, does not kill plants
Chemical	**Spray-on foliar application**	High density sites, large or small sites with minimal integration of native trees and shrubs, sites with high exposure risk for staff	Selective, less labour intensive	After treatment safety hazard still present, unintended environmental/health impacts, high public concern, weather dependent, requires trained staff
	Wipe-on foliar application (glyphosate only), stem injection	Sites with few plants or when stems are growing interspersed between desirable vegetation, sites with high exposure risk for staff	Selective	Labour intensive, increased time workers are in close proximity to the plants, after treatment public safety hazard still present, unintended environmental/ health impacts, high public concern, weather dependent, requires trained staff
Mechanical	**Use of power equipment (e.g., brush saws, weed wackers)**	Sites accessible to machines	Non-chemical	Can increase risk of injury to workers, spreads seeds, contaminates equipment
Cultural	**Grazing**	Sites accessible to grazing herds	Non-chemical, despite toxicity some livestock can be trained to safely browse	Requires specially trained herds and special permits, non-selective, complex logistical considerations, unintended environmental impacts
Biological	**No bioagents 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

Cut or chemically-treated stems and leaves can be left on-site to decompose, unless there is any risk that people will encounter them (Hallworth 2009). Viable seeds and roots should not be left onsite due to the risk of spread or re-growth. Do not compost giant hogweed at home or at municipal works yards due to the risk of exposure to the toxic sap.

OFF SITE DISPOSAL

Giant hogweed umbels, stems and other plant parts must be double-bagged in heavy garbage bags for disposal. Bags should be sealed tightly.

In the Metro Vancouver region, a limited number of facilities accept giant hogweed plants and/or soil infested with giant hogweed seeds, provided they have sufficient capacity. This list provides addresses and website links for the disposal facilities. This list is updated periodically.

GIANT HOGWEED IS NOT ACCEPTED AT METRO VANCOUVER'S TRANSFER STATIONS.

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

CLEANING AND DISINFECTION[5]

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

- Wash with 180 °F water at 6 gpm, 2000 psi*, with a contact time of ≥ 10 seconds on all surfaces to remove dirt and organic matter such as vegetation 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; and
- 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: 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 hogweed 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 important components of an integrated management plan or approach.

- After **umbel removal**, new umbels and flowers will often form on lower branches. If umbels were removed during the flowering stage, check the site again in a few weeks to ensure no new flowers have formed. If so, cut and remove.
- If **taproots** were cut, monitor the site annually in mid to late spring to ensure that new seedlings are identified and removed, including the roots.
- Post-chemical treatment monitoring is required for licencees and PMP holders under the *Integrated Pest Management Act* to ensure that efforts are successful and to allow for adjustments to the management approach as necessary.
- Monitor the site annually in mid to late spring post-treatment. Identify and remove any new seedlings, including the roots. After no new plants are found, the provincial government recommends monitoring the site after 1, 2, 4, and 6 years (Province of BC 2017).
- Sites where **herbicide application** was used must be re-visited to assess efficacy of treatment.
    - After spring glyphosate treatments, a follow-up visit should occur in late spring to early summer, depending on growing conditions. As there is no residual control of new germinants with glyphosate, seeds can germinate at any time after applications and are free to grow. Re-treatment of new plants on the site should occur when the plants are actively growing and there is sufficient foliage for adequate herbicide uptake. Plants should be 20 to 50 cm in height to ensure enough herbicide will be absorbed.
    - For the residual herbicides, monitoring should occur two or more weeks after treatment to evaluate efficacy. If re-growth has occurred, it is best to consult the label before re-treatment to confirm the maximum number of applications per season. In some cases, another product could be considered for use in a second application.

Restoration

Restoration may not be necessary for small giant hogweed infestations. For large infestations, restoration is often necessary to supress colonization by other invasive plant species. Although it is desirable to revegetate with native or non-invasive plant species as soon as possible, restoration activities must be carefully timed. If planting occurs before the giant hogweed is completely eradicated, it will be much harder to manage re-growth without injuring the restored vegetation and putting workers at risk. Planting broadleaved herbaceous or woody plants after application of a residual herbicide should be delayed until herbicide activity is deactivated in the soils. This will depend on soil type, environmental conditions, and herbicide type. Replanting grass species should be delayed for 12 months after application of a residual herbicide (Ralph 2017). If replanting with broadleaved species is planned soon after herbicide treatment, then a non-residual herbicide (e.g., glyphosate) should be used. For glyphosate products, delay preparation of the soils for replanting by at least 7-15 days to ensure complete translocation of herbicide to the root tips (Ralph 2017).

Revegetation of the site to a domestic or non-native, non-invasive plant species composition may be considered in some circumstances. 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
	Indian plum	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.

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

References

BC Ministry of Environment. 2011. ***Canadian Pesticide Education Program: Applicator Core Manual.*** Federal, Provincial, Territorial Working Group on Pesticide Education, Training and Certification.

Canadian Council on Invasive Species. n.d. ***National Factsheet: Giant Hogweed.***

Centre for Agriculture and Bioscience International. (2019). *Heracleum mantegazzianum (giant hogweed) data sheet.* https://www.cabi.org/isc/datasheet/26911

Dreves, Lisa, interview by T. Murray. 2017. ***Langley Stewardship Coordinator, Langley Environmental Partners Society*** (July).

E-Flora. 2017. ***Electronic Atlas of the Flora of British Columbia: Giant hogweed.*** http://linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Heracleum%20mantegazzianum.

Germann, Peter. (2018). *Modeling potential distributions of the invasive species Giant Hogweed under present climate conditions and a future climate scenario.* https://www.researchgate.net/publication/330901565_Modeling_potential_distributions_of_the_invasive_species_Giant_Hogweed_under_present_climate_conditions_and_a_future_climate_scenario

Hallworth, J. 2009. ***Giant Hogweed Control in BC.*** Accessed Oct 2017. https://www.coastalisc.com/wp-content/uploads/2011/01/giant_hogweed_control_in_bc.pdf.

Hejda, M., P. Pysek, and V. Jarosik. 2009. "Impact of invasive plants on the species richness, diversity and composition of invaded communities." ***Journal of Ecology*** 97 (3): 393-403. http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2745.2009.01480.x/full.

ISCBC. 2017. "Giant Hogweed Factsheet."

Metro Vancouver. (2016). *Climate Projections for Metro Vancouver*. Burnaby, BC. Retrieved from http://www.metrovancouver.org/services/air-quality/AirQualityPublications/ClimateProjectionsForMetroVancouver.pdf

Metro Vancouver. 2017. "Water Services Equipment Cleaning Procedures and Inspection Protocols. Notice to Metro Vancouver Contractors, Consultants and Public."

Michigan State University Extension. 2012. ***Extension Bulletin E-2935. Giant Hogweed: An attractive but dangerous federal noxious weed.*** MSU Extension Bulletin E-2935.

Miller, Amanda J., Catherine Tarasoff, Tammy Salmon (2021). *Feasibility of Targeted Invasive Plant Grazing in Metro Vancouver*. Accessed June 2021. http://www.metrovancouver.org/services/regional-planning/PlanningPublications/FeasibilityTargetedInvasivePlantGrazingMV.pdf

Moravcová, L., Pyšek, P., Krinke, L., Pergl, J., Perglová, I., Thompson, K., ed. 2007. ***Ecology and management of giant hogweed (Heracleum mantegazzianum).*** Centre for Agriculture and Biosciences International. http://www.cabi.org/cabebooks/ebook/20073039317.

New York State Department of Environmental Conservation. 2017. ***Giant Hogweed Control Methods Guide.*** http://www.dec.ny.gov/docs/lands_forests_pdf/ghcontrol.pdf.

Nielson, C., H.P. Ravn, W. Nentwig, and M. Wade. 2005. *Practice Manual: Guidelines for the management and control of an invasive weed in Europe.* Forest & Landscape Denmark. http://labgis.ibot.cas.cz/wp-content/uploads/pdf/Booy%20et%20al.%20-%202005%20-%20The%20giant%20hogweed%20best%20practice%20manual%20guidelines%20for%20the%20management%20and%20control%20of%20invasive%20weeds%20in%20Europe.pdf.

Province of BC. 2017. "Crown land post-treatment monitoring frequency."

Province of BC Invasive Alien Plant Program. 2017. *The Invasive Alien Plant Program (IAPP) Application.* https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/iapp.

Ralph, D., interview by T. Murray. 2017. *Extension and Operations Manager, Invasive Species Council of BC* (October).

Strathcona Country Alberta. 2017. *Giant Hogweed or Cow Parsnip?* Oct. Accessed 2017. https://www.strathcona.ca/departments/transportation-and-agriculture-services/plants-crops-and-horticulture/weeds/common-weeds-strathcona-county/giant-hogweed-or-cow-parsnip/.

Watson, G., interview by T. Murray. 2017. *Operations Manager* (October).

WorkSafe BC. 2006. *Toxic Plant Warning: Severe Skin Damage from Giant Hogweed (Heracleum Mantegazzianum).* https://www.worksafebc.com/en/resources/health-safety/information-sheets/toxic-plant-warning/severe-skin-damage-from-giant-hogweed-heracleum-mantegazzianum?lang=en.

Additional Resources

For more information please refer to the following resources.

- Centre for Agriculture and Biosciences International Giant Hogweed Datasheet. http://www.cabi.org/isc/datasheet/26911
- Grow Me Instead. http://bcinvasives.ca/resources/programs/plant-wise/
- Invasive Species Council of British Columbia Giant Hogweed Fact Sheet. https://bcinvasives.ca/wp-content/uploads/2020/12/Giant_Hogweed_TIPS_2017_WEB.pdf
- Pesticides and Pest Management. Province of British Columbia https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management
- WorkSafe BC. Attack of the Giant Hogweed MPEG, 2006. https://www.worksafebc.com/en/resources/health-safety/videos/attack-of-the-giant-hogweed?lang=en

Acknowledgments

The project team would like to thank the following groups for contributions related to the development and review of this document:

Metro Vancouver's Regional Planning Advisory Committee (RPAC) – Invasive Species Subcommittee

Nick Page, Raincoast Applied Ecology

To submit edits or additions to this report, contact Laurie Bates-Frymel, Senior Regional Planner at laurie.bates-frymel@metrovancouver.org.


metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION