



Conium maculatum

BEST MANAGEMENT PRACTICES FOR
Poison Hemlock
in the Metro Vancouver Region



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Introduction

The impacts of invasive species on ecological, human, and economic health are of concern in the Metro Vancouver region. Successful control of invasive species requires concerted and targeted efforts by many players. This document - “**Best Management Practices for Poison Hemlock 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.

It is widely agreed that poison hemlock¹ is one of the world's deadliest plants (Pitcher, 1989). Native to Europe and North Africa, it is thought to be the plant that killed Socrates in Athens in 399 B.C. (Province of BC, 2002). This invasive biennial herbaceous plant is found in isolated populations in Metro Vancouver and is spreading in coastal BC (Pitcher, 1989).

Although not as widespread or aggressive as other high priority invasive plants in the region, its presence is concerning due to the potential health impacts and its prolific seed production. Identification of poison hemlock can be challenging as it is easily mistaken for many other plants, including edible plants in the same family. Management and research on this species thus far have largely focused on controlling it on rangelands, not in natural or urban areas.

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 poison hemlock, 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 metrovancover.org regularly to obtain the most recent version of these best management practices.

¹ Poison hemlock (*Conium maculatum*) is also known by the common names poison-hemlock, hemlock, wild hemlock, spotted hemlock, deadly hemlock, poison parsley and fool's-parsley. It is referred to as 'poison hemlock' in this document. Note that despite the name, poison hemlock is unrelated to the native evergreen hemlock trees (*Tsuga* species).

REGULATORY STATUS

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

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 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 spurge laurel, on Indigenous ways of life and our shared environment.

As the name suggests, poison hemlock plants are poisonous. Although poisoning by ingestion is most common, toxicity can also result from inhalation and skin contact. All parts of the plant are poisonous and contain a number of different toxic plant chemicals such as coniine (Wexler, 2005). Symptoms of human poisoning include a burning sensation in the mouth, salivation, nausea, diarrhoea, vomiting, confusion, depression, muscle paralysis, coma and ultimately rapid death by respiratory failure (Clark County Washington, 2021) (Wexler, 2005). Even dried and dead plants can remain toxic for up to three years (Province of BC, 2002). Unfortunately, identification can be difficult as poison hemlock is easily mistaken for many other edible and/or ornamental plants in the carrot plant family (Apiaceae), which is a common cause of human poisoning.

Poisonings of pigs, cows, goats, horses and sheep have been documented (DiTomaso, Kyser, & et al, 2013). Livestock poisonings are more common than human poisonings (Lincoln County Noxious Weed Control Board, 2021). Livestock exhibits similar poisoning symptoms to humans. Although livestock tends to avoid poison hemlock, poisoning risk is elevated in the early spring when young plants can be confused with other edible plants and when there is little else to eat (Municipality of North Cowichan, 2021) (Lincoln County Noxious Weed Control Board, 2021). Exposure of pregnant livestock to poison hemlock can also cause birth defects (Clark County Washington, 2021).

In agricultural settings, poison hemlock can crowd out desirable forage species (Province of BC, 2002). Crops can become worthless due to the plant's toxicity (District of Saanich, 2021). If left unmanaged, poison hemlock can dominate sites (Pitcher, 1989).

REPRODUCTION AND SPREAD

Poison hemlock only reproduces by seeds, which can easily spread by soil movement, vehicles, farm machinery, clothing, water and wind (Province of BC, 2002). One plant can produce over 1,000 seeds (Capital Regional District, 2021). Flowering and seed dispersal is prolonged, starting in the summer and continuing through the winter. Most seeds germinate quickly if conditions are favourable, but some remain dormant and will germinate up to three years later (DiTomaso, Kyser, & et al, 2013). Flowers can form viable seeds even after being cut (Capital Regional District, 2021).

HABITAT AND DISTRIBUTION

Poison hemlock can survive in a wide variety of habitats, including areas with dry to moist soils and variable sunlight conditions. It commonly grows along streams, ditches, roadsides, trails, forest edges, pastures, and vacant lots (Province of BC, 2002) (King Country Noxious Weed Control Program, 2019). It prefers disturbed areas and is frequently found at sites where soil has been introduced (Capital Regional District, 2021).

Poison hemlock is common in the region and has been spreading throughout coastal areas in southwestern British Columbia, particularly around Vancouver and Victoria. It is also present in the Fraser Valley, Cariboo, Okanagan and Kootenay regions (Province of BC, 2002). It is found throughout the United States and is categorized as noxious in many states.

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, 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 competition from invasive species.

Poison hemlock's ability to survive in a variety of conditions and thrive with disturbance will likely influence its ability to adapt to future climate changes. No specific information on how poison hemlock will adapt to climate change was found in the literature, but it is speculated that this plant may benefit from our future climate in several ways:



Young poison hemlock rosettes invading the edge of a field

CREDIT: K. LI, CITY OF DELTA

- **Extended growing season:** With a wide seasonal window of survival and the ability to germinate throughout the year (Province of BC, 2002), poison hemlock may be able to take advantage of an extended growing season.
- **Increased precipitation and flooding:** Poison hemlock seeds easily disperse in water and wind. Seeds can spread rapidly after autumn rains and wind storms, especially at disturbed sites or sites with little existing vegetation (Pitcher, 1989).
- **Drought tolerance:** Although it thrives in moist soils, poison hemlock can adapt to drier soils (King Country Noxious Weed Control Program, 2019).

With these kinds of competitive advantages, this species is more adaptable than native species in a variety of ecosystems, suggesting 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 the Province of BC (2002) and the Capital Regional District (2021).

Lifecycle: Biennial, sometimes perennial in favourable conditions (Pitcher, 1989); clusters of leaves (rosettes) form in the first spring (although germination can happen any time of year), and flowering stems appear in the second year; plants grow rapidly from March to May (King Country Noxious Weed Control Program, 2019).

Rosettes may stay green during the winter, or in colder winters, go dormant with the aboveground leaves and stems dying (but remaining toxic). Note that identification is easiest when the plant is mature with flowering stems. However, since the plant only flowers in the second year, it is important to be able to identify the leaves.

Stem: Hollow, thick, hairless with distinct purple blotches or streaks (especially on the lower portions); extensively branched; flowering stem 0.5-3 metres tall; stems are erect but may appear slightly wavy in profile.

Leaves: Compound, shiny, hairless, bright green, triangular and finely divided, appearing fern-like; alternate arrangement, but may be opposite at the top of the stem; leaves have a strong musty odour, described as the smell of mouse urine (DiTomaso, Kyser, & et al, 2013). Leaf veins end at the tips of teeth along the leaf margin (U.S. Department of Agriculture, 2015).

Flowers: Clusters of tiny white flowers (compound umbels) up to 0.5 metres in diameter grow at the ends of stems; typically blooms from April to July; individual flowers have 5 petals.

Fruits: Ridged capsules with two seeds form in July through the winter; green turning to light brown with maturity; 2-3 millimetres long (U.S. Department of Agriculture, 2015); one plant can produce over 1,000 seeds/year; most seeds mature before dispersal and can germinate immediately in favourable conditions; seeds are viable for 3 years (DiTomaso, Kyser, & et al, 2013), although some sources suggest up to 6 years.

Roots: Long, fleshy, pale-yellow taproot with many lateral roots (DiTomaso, Kyser, & et al, 2013).

The following photos show poison hemlock plant parts.



Stem with purple spots

CREDIT: CITY OF SURREY



Leaves

CREDIT: CITY OF SURREY



Young, first-year rosette

CREDIT: CITY OF SURREY



Taproot

CREDIT: ANSEL OOMMEN,
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Flowers

CREDIT: CITY OF SURREY



Immature fruits

CREDIT: K. LI, CITY OF DELTA



Mature fruits

CREDIT: JAN SAMANEK,
PHYTOSANITARY
ADMINISTRATION,
BUGWOOD.ORG

SIMILAR SPECIES

There are many members of the *Apiaceae* (carrot) plant family in BC, native and many non-native, including other high priority invasive species. Like poison hemlock, some other members of this plant family are also acutely poisonous. The most common look-alike plants are described below, with the features that distinguish them from poison hemlock underscored. **Purple spots all over hairless stems can be diagnostic of poison hemlock** (Province of BC, 2002).

- **Cow parsnip** (*Heracleum maximum*) is 1-3 metres tall with green fuzzy stems with ribs and few purple spots; leaves are compound, palmate-shaped, with 3 segments (Klinkenberg, 2021). This plant has toxic sap.
- **Water parsley** (*Oenanthe sarmentosa*) is less upright with basal and stem leaves pinnately divided 2-3 times (Klinkenberg, 2021).



Water hemlock (left), poison hemlock (right)

CREDIT: STEVE DEWEY, UTAH STATE UNIVERSITY, BUGWOOD.ORG

- **Water hemlock/Douglas' water hemlock/Western waterhemlock** (*Cicuta douglasii*) lacks spots on the stems and has larger leaves (leaflets are 3-4 times as long as broad); if the stems and roots are cut, a yellow liquid is released (Lincoln County Noxious Weed Control Board, 2021). Water hemlock leaf veins end in notches along the leaf margin whereas poison hemlock has leaf veins that end at the tips of teeth (U.S. Department of Agriculture, 2015). This plant is also extremely toxic.



Cow parsnip

CREDIT: ISCMV



Water parsley

CREDIT: GERTJANVANNOORD VIA FLICKR



Water hemlock

CREDIT: MARY ELLEN (MEL) HARTE, BUGWOOD.ORG

NON NATIVE SPECIES

- **Queen Anne's lace/wild carrot** (*Daucus carota*) has larger flowers that are densely arranged in flat umbels often with a central red/pink flower (King County Noxious Weed Control Program, 2018); grows to 1 metre tall and has plain green stems with hairs (King County Noxious Weed Control Program, 2019). Toxic if large quantities are eaten, also causes skin irritation. It is a common weed in Metro Vancouver, flowering in late spring and summer.
- **Wild chervil** (*Anthriscus sylvestris*) has an entirely green stem, which is hollow, ridged, and branching, and 0.3-1.2 metres tall. A fringe of hairs is visible at stem nodes (Province of BC, 2002). More information on this species can be found in the [Best Management Practices for Wild Chervil in the Metro Vancouver Region](#).
- **Bur chervil** (*Anthriscus caucalis*) is an annual herb with hairy leaves and seeds covered in short, hooked burs (Province of BC, 2002). Bur chervil is classed as a noxious weed within all regions of the province under the BC Weed Control Act, Weed Control Regulation, Schedule A, Part I.
- **Giant hogweed** (*Heracleum mantegazzianum*) is a high priority invasive species in Metro Vancouver due to its toxicity. It is the largest member of the Apiaceae family reaching heights of 2-5 metres (Klinkenberg, 2021); stems are hairy and usually have many purple spots. If this plant is observed anywhere in BC, it should be reported. More information on this species can be found in the [Best Management Practices for Giant Hogweed in the Metro Vancouver Region](#).
- **Wild parsnip/common parsnip** (*Pastinaca sativa* L.) has yellow flowers and pinnately compound leaves that are not fern-like (Klinkenberg, 2021). It is rare in southwest BC. If this plant is observed anywhere in BC, it should be reported.
- **Wild caraway/common caraway** (*Carum carvi*) has a single stem that branches at the top, up to 1 metre tall; leaves are alternate, thin and finely divided (dill- or carrot-like) (Thompson Nicola Regional District, 2021).



Queen Anne's lace/wild carrot

CREDIT: CHRIS EVANS, UNIVERSITY OF ILLINOIS, BUGWOOD.ORG



Wild chervil

CREDIT: ISCMV



Bur chervil

CREDIT: JOSEPH M. DITOMASO, UNIVERSITY OF CALIFORNIA - DAVIS, BUGWOOD.ORG



Giant hogweed

CREDIT: ISCMV



Wild parsnip

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



Wild caraway

CREDIT: FRANK:OLIVIER VIA FLICKR

Tracking

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

When carrying out a poison hemlock 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;
- Public or animal access (whether there is risk of contact with the plant).

Reporting

Due to the health hazard posed by poison hemlock found in public spaces, it is advisable to report known or suspected infestations as soon as possible. Please report poison hemlock occurrences to:

- The Provincial Report Invasive Species program (via smart phone app www.gov.bc.ca/invasive-species).
- The Invasive Species Council of Metro Vancouver: 604-880-8358 or www.iscmv.ca.
- The municipality where the poison hemlock was found.
- The landowner directly – If the landowner is unknown, the Invasive Species Council of Metro Vancouver can provide support to identify the appropriate authority.

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



Poison hemlock under management in the Township of Langley

CREDIT: J. ST. ANDRASSY

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. Poison hemlock sites where livestock, humans or pets are present, or where food is grown/harvested should be a top priority for management (Clark County Washington, 2021). Small, isolated sites and perimeters of infestations should also be prioritized (U.S. Department of Agriculture, 2015). Since poison hemlock spreads by seed, effective management must focus on preventing seed production and spread, and exhausting the existing seeds in the soil.

HANDLING POISON HEMLOCK SAFELY

All parts of the plant are poisonous (Wexler, 2005). Contact can occur by brushing against living or dead plants, handling plant material, or even by touching tools or equipment that were used for poison hemlock control. Personal protective equipment (PPE) is critical to ensure that plants do not contact workers' skin. To ensure the necessary precautions are taken and to minimize risk to staff, consider hiring a professional to handle poison hemlock infestations. This plant is not a suitable candidate for community weed pulls.

WHEN HANDLING POISON HEMLOCK PLANTS, THE FOLLOWING PPE SHOULD BE WORN:

- Goggles or face shield;
- Long pants and long-sleeved shirt under waterproof coveralls or rain gear (pants and jacket with hood);

- Heavy rubber gloves or other waterproof gloves (not leather) that can be washed or discarded after use (e.g., dishwashing gloves);
- Rubber boots;
- Heavy, waterproof tape can be used to cover seams and gaps between clothing and gear; and
- Consider wearing a respirator when manually controlling plants for extended periods or when using mechanical control (Municipality of North Cowichan, 2021).

BE SURE TO HAVE THE FOLLOWING ON HAND:

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

USE THE FOLLOWING PROTOCOL WHEN HANDLING POISON HEMLOCK:

Adapted from Langley Environmental Partners Society (Dreves, 2021) and New York State Department of Environmental Conservation (Kraus, 2021).

1. Put on goggles, waterproof coveralls, rubber gloves and boots and ensure no skin areas will be exposed. Cut back any surrounding plants with thorns, as these can pierce PPE.
2. Cover seams between clothing and gear by tucking items into one another or using heavy, waterproof tape to seal any gaps.
3. Use one of the recommended control methods (e.g., manual or chemical control) described below.
4. After control has been completed, wash gloved hands with soap and water. Rinse gloves, coveralls and boots thoroughly with water, paying special attention to gloves and sleeves.
5. Carefully remove gloves, coveralls and boots by turning protective clothing inside out while ensuring any portions of clothing that were exposed to the plant will not accidentally come into contact with skin.
6. Wash hands, equipment, faucet taps and door handles with soap and water.
7. Remove and wash goggles.
8. Dispose of coveralls and gloves after use. Any non-disposable clothing should be washed carefully with soap and water.
9. If skin accidentally comes in contact with plants, wash thoroughly with soap and water and consult a physician.
10. If any portion of the plant is ingested, seek medical attention immediately (Capital Regional District, 2021).



Personal protective equipment should be used to manage poison hemlock

CREDIT: N. BERGUNDER

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 poison hemlock over the long term.

Prior to any work around poison hemlock, follow the protocols for PPE outlined above. When working in or adjacent to poison hemlock, 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 poison hemlock 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).

The Invasive Species Council of BC's [‘Grow Me Instead’ Program](#) or [Metro Vancouver’s Grow Green website](#) provide recommendations for non-invasive, drought-tolerant plants, and garden design ideas. All materials (e.g., topsoil, gravel, mulch, compost, wood chips, plant stock) should be weed-free. Poison hemlock can be introduced via these materials, and sites where they are used should be monitored carefully for any growth (Crosby, 2018). Healthy green spaces are more resistant to invasive plants, so it is also important to maintain or establish healthy plant communities.

MANUAL/MECHANICAL: RECOMMENDED

Safety risks for workers increase when dealing with flowering 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 safety concerns.

While wearing appropriate PPE, the following methods can be used to manually control poison hemlock:

- **Pull** young plants when the soil is moist (District of Saanich, 2021). Pull up as much root as possible, easing the plant out of the ground (Dreves, 2021).
- **Dig the taproot** of mature plants that are difficult to pull (District of Saanich, 2021). Use a shovel or digging fork to keep the root intact. If needed, use loppers to cut back the upper portions of larger plants for easier stem and taproot access. Be sure to remove the entire taproot and as much of the root system as possible. Minimize soil disturbance as much as possible.
- **Cut** plants that cannot be dug or pulled. Sever the root 3 centimetres below the ground (Capital Regional District, 2021) using a sharp, long-handled narrow shovel or spade. If needed, use loppers to cut back the upper portions of larger plants for easier access to the stem and taproot. Dig up as much of the remaining root as possible left in the soil (Dreves, 2021). Re-growth can occur from the base of the plant, so monitoring within the same season is required (Pitcher, 1989).
- **Flower removal** can be effective to prevent seed production if other methods cannot be used (Province of BC, 2002). Since flowers can form viable seeds even after being cut (Capital Regional District, 2021), they should be bagged. Remove the flowerheads before they go to seed, from April to July. This is only a short-term solution for preventing further seed dispersal (e.g., when it is too late in the season to employ other techniques) and it will not kill the plant. Multiple treatments may be required through the growing season.
- **Repeated mowing or grading** before seed set can limit plant growth and seed production (ISCBC & Ministry of Transportation & Infrastructure, 2019). Since this method increases the risk of workers coming in contact with plants or breathing in the toxic vapours (King Country Noxious Weed Control Program, 2019), it is only recommended when managing poison hemlock along roadsides where workers are enclosed in maintenance vehicles. This method should not be used for large infestations or where there is a high likelihood of people or animals accessing the site (Municipality of North Cowichan, 2021).

Plants can easily regrow after mowing and this method will take 3-5 years of consistent mowing to be successful (U.S. Department of Agriculture, 2015). A deep mulch application after mowing can help deter regrowth but is not an effective method on its own (Clark County Washington, 2021).

This method may cause the plant toxins to more easily volatilize, which poses a greater risk to workers. If this method is used, respiratory protection should be worn (Municipality of North Cowichan, 2021).

- **Burning** is not a safe method for management as this releases toxic substances (DiTomaso, Kyser, & et al, 2013).

REMOVAL TIMING

Conduct manual control activities before flowering (Capital Regional District, 2021). If management occurs after flowering, use the flower removal method above first.

APPLYING MANUAL/MECHANICAL CONTROL METHODS IN RIPARIAN AREAS

Poison hemlock often grows in large contiguous patches right up to the edge of water courses. Consider the impact of control techniques and the resulting bare soil on 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. This method may be used for large infestations that cannot be managed with other methods or when the risk to workers with manual control is too great. Since this method requires the plants to stay on site, is not suitable for use at sites where elimination of the safety hazard is desired.

This method should be used with caution for the following reasons (Crosby, 2018):

1. Weather conditions greatly influence treatment efficacy;
2. Poison hemlock often grows in riparian areas where pesticide use is restricted; and
3. Native vegetation is often integrated with poison hemlock.

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 lands²; 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 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.

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

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

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

Email: bc.ipm@gov.bc.ca

Pesticide applicator certificates can be obtained under the category 'Industrial Vegetation Management' to manage weeds on industrial land, roads, power lines, railways, and pipeline rights-of-way for control of noxious weeds on private or public land. However, since poison hemlock is not a regulated noxious weed in the Metro Vancouver region, the 'Landscape' certification category is needed for herbicide use on public and private lands. Assistant applicator training is also available and the [online course and exam](#) are free.

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.

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).



Small poison hemlock infestation under management, Township of Langley

CREDIT: J. ST. ANDRASSY

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 poison hemlock. Information is from the Province of BC (2002) and DiTomaso, Kyser, et al. (2013). Other herbicides may be effective, including herbicide mixes. For a more extensive list of herbicide combinations that have been used for poison hemlock, refer to DiTomaso, Kyser, et al. (2013) and U.S. Department of Agriculture (2015).

ACTIVE INGREDIENT (EXAMPLE BRAND NAMES)+	APPLICATION	PERSISTENCE	GROWTH STAGE++	TYPE+++
Glyphosate (many products)§	foliar application	non-residual*	actively growing, before flowering; higher rates may control plants during bloom stage	non-selective
2,4-D**	foliar application	short residual	actively growing, seedlings to rosette stage	selective, no effect on most grasses
Triclopyr (e.g., Garlon™)	foliar application	residual	actively growing, seedlings to rosette stage	selective, no effect on grasses
Imazapyr (e.g., Arsenal™)	foliar application	residual	preemergence to rosette stage (U.S. Department of Agriculture, 2015)	non-selective
Dicamba (e.g., Banvel™)	foliar application	short residual	actively growing	selective
Aminocyclopyrachlor + Chlorsulfuron (e.g., Truvist™)*	foliar application	residual	actively growing, seedlings to rosette stage	selective
Metsulfuron (e.g., Escort™)	foliar application	residual	actively growing plants only on pastures, rangeland and non-crop sites	selective, no effect on grasses

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

++ 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 have little or no persistence in the soil whereas residual herbicides persist in the soil, remaining effective over an extended period.

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

NOTE: Poison hemlock may not be specifically listed on these herbicide labels. However, it falls under the general application provision for broadleaved plants.

Picloram can also be used to control poison hemlock (Province of BC, 2002), but it is not recommended for use in coastal areas or the Lower Fraser Valley west of Hope because it is very persistent (4 to 7 years) and mobile in high water tables or regions with high rainfall.

APPLYING PESTICIDE IN RIPARIAN AREAS

Provincial legislation prohibits the use of herbicides within 10 metres of natural water courses and 30 metres of domestic or agricultural water sources on public lands. On private lands, herbicide labels need to be followed (which means for glyphosate products treatment can happen up to the water's edge) and other restrictions may apply (e.g., industrial sites, forestry sites, golf courses, etc.). On public lands, glyphosate is the only active ingredient that can be applied within the 10 metre Pesticide-Free Zone (PFZ)³ in British Columbia in accordance with the Integrated Pest Management Act and Regulation and all public land Pesticide Management Plans (PMPs). A plant must be either a listed Noxious Weed (under the [Weed Control Act](#)) or appear in the Forest and Range Practices Act [Invasive Plants Regulation](#) to be treated within the 10 metre PFZ. **Poison hemlock is not listed and therefore glyphosate and other herbicides can only be applied on poison hemlock up to 10 metres away from the high water mark (HWM)**⁴. The 30 metre no-treatment zone around a water supply intake or well used for domestic or agricultural purposes may be reduced if the licensee or PMP holder is "reasonably satisfied" that a smaller no-treatment zone is sufficient to ensure that pesticide will not enter the intake or well.

When managing poison hemlock with herbicide in riparian areas:

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

³ The Pesticide-Free Zone (PFZ) is an area of land that must not be treated with pesticide and must be protected from pesticide moving into it, under the *Integrated Pest Management Act* and Regulation.

⁴ The High Water Mark (HWM) is defined as the visible high water mark of any lake, stream, wetland or other body of water where the presence and action of the water are so common and usual and so long continued in all ordinary years as to mark upon the soil of the bed of the lake, river stream, or other body of water a character distinct from that of the banks, both in vegetation and in the nature of the soil itself. Typical features may include, a natural line or "mark" impressed on the bank or shore, indicated by erosion, shelving, changes in soil characteristics, destruction of terrestrial vegetation, or other distinctive physical characteristics. The area below the high water mark includes the active floodplain (BC Ministry of Environment, 2011).

APPLICATION METHODS

Foliar application by hand sprayer or backpack sprayer should occur during the rosette stage in the spring, before flowering (Province of BC, 2002) or as directed in the herbicide table above. Spray the leaves and stems (King Country Noxious Weed Control Program, 2019). Apply herbicide again in the summer or fall to new rosettes that may have formed (King Country Noxious Weed Control Program, 2019). Any stems that re-grow after treatment can be re-treated or cut following the guidelines above (Province of BC, 2002). Even plants that have been treated are toxic, so appropriate PPE is required at all times and during all stages of control.

CULTURAL: NOT AVAILABLE

There are no documented cultural control methods for poison hemlock. Due to the toxicity of poison hemlock, targeted grazing is not a suitable management option for this species.

BIOLOGICAL: NOT AVAILABLE

There are no biological control agents currently available in BC for poison hemlock. A moth (*Agonopterix alstroemeriana*) accidentally introduced into the United States apparently feeds exclusively on poison hemlock (Province of BC, 2002). The moth is currently approved and provides effective biocontrol in many states in the United States (U.S. Department of Agriculture, 2015), but has not been found in British Columbia (Province of BC, 2002).

CONTROL SUMMARY

The following table provides a summary and comparison of control methods for poison hemlock. The use of personal protective gear is advised.

CONTROL STRATEGY	TECHNIQUES	APPLICABLE SITE TYPE	PROS	CONS
Manual	Pull	Young plants	If plants are removed offsite the safety hazard is immediately eliminated, selective, non-chemical	Labour intensive, may create soil disturbance
	Dig the taproot	Mature plants		
	Cut	Plants that cannot be dug or pulled		
	Flower removal	Sites that cannot be managed in other ways before plants produce flowers	Selective, non-chemical, prevents seed production	Doesn't eliminate the safety hazard, does not kill plants, flowers can produce viable seeds event after cutting
Chemical	Foliar application	Sites that cannot be managed in other ways, large or small sites with minimal integration of native plants, sites with high exposure risk for staff	Selective with appropriate herbicide and application, less labour intensive	After treatment safety hazard is still present, unintended environmental/health impacts, high public concern, weather dependent, requires trained staff, does not address seed bank
Mechanical	Repeated mowing or grading	Prior to seed set along roadsides where workers are enclosed in maintenance vehicles, do not use for large infestations or sites with a high likelihood of use by people or animals	Less labour intensive than manual methods, non-chemical	Can increase risk of injury to workers, spreads seeds, contaminates equipment, risk of non-target damage
Manual	Burning	None		Not effective, not safe
Cultural	Grazing	None		Not a suitable management option for this species, potential toxicity
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

After manual control, since dead plants can remain toxic for up to three years (Province of BC, 2002), they should be removed offsite. Do not compost poison hemlock at home or at municipal works yards due to the risk of exposure.

OFF SITE DISPOSAL

When disposed off site, all plant parts should be tarped or placed in thick plastic bags before transporting to an appropriate disposal or compost facility. Do not re-use the bags for other purposes. In the Metro Vancouver region, several facilities accept poison hemlock plants and/or infested soil. Please consult this [disposal facility list](#) for current details.

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

CLEANING AND DISINFECTION⁵

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

- 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 poison hemlock growth.
- 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.

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

Follow-up Monitoring

Whatever control method is used, follow-up monitoring and maintenance treatments are components of an integrated management plan or approach. Introducing a layer of mulch to the site after manual or mechanical control will reduce the germination of seeds (King Country Noxious Weed Control Program, 2019). Following chemical control, the site should be monitored and re-treated for several years as new plants will emerge from the seed bank (U.S. Department of Agriculture, 2015).

Since poison hemlock seeds can germinate at any time during the year (although most often in the spring), monitoring should be conducted regularly to detect and control missed plants or newly emerged seedlings (U.S. Department of Agriculture, 2015). A few remaining plants can result in re-infestation of the site (Crosby, 2018). Eradication, no matter what methods are used, will likely require 3-6 years of repeated treatments (U.S. Department of Agriculture, 2015).



Poison hemlock

CREDIT: ISCMV

Restoration

Although very little research has been conducted on the restoration of natural areas after the management of poison hemlock (Pitcher, 1989), restoration is recommended to create competition, deter poison hemlock regrowth, and replace lost habitat. 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.

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 poison hemlock re-invasion.

Poison hemlock 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 (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.

- BC Ministry of Forests, Lands, and Natural Resource Operations, Invasive Alien Plant Program (IAPP). www.gov.bc.ca/invasive-species
- Grow Green Guide. www.growgreenguide.ca
- Grow Me Instead. <http://bcinvasives.ca/resources/programs/plant-wise/>
- Pesticides and Pest Management. Province of British Columbia <https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management>
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