Victoria Lake – Invasive Knotweed Treatment FAQ

What is knotweed?
Considered one of the world’s worst invasive plants, knotweed consists of four perennial species – Japanese, Giant, Bohemian, and Himalayan – that originate from eastern and southern Asia. All species, except Himalayan, have hollow stems that rapidly grow 1 to 6 meters tall and form dense clusters similar to bamboo. Young shoots appear similar to red asparagus.

Knotweeds have smooth-edged leaves that vary in size and shape depending on the species. Giant knotweed leaves are distinctly heart-shaped and can reach lengths of up to 40 cm, while Japanese knotweed leaves are truncate (straight across the base of the leaf), grow to 10 cm long, and taper sharply at the tip. Bohemian knotweed, being a hybrid of these two, can have leaves that mimic the shape and size of both. Himalayan knotweed has leaves that are lance-shaped, thin, and up to 20 cm long. Knotweeds develop small greenish-white or pinkish-white flowers in July to August. The plants die back at the first hard frost, turning to bare brown stalks while roots overwinter underground. An extensive network of rhizomes (sprouting roots) can extend up to 7 meters horizontally from a parent plant and reach depths of 3 meters.

More information on how to identify knotweed can be viewed here: https://www.for.gov.bc.ca/hra/Publications/invasive_plants/Knotweed_key_BC_2007.pdf

Why is it a problem?
Knotweed readily establishes on stream banks, gravel bars, and other open areas displacing native vegetation, degrading water quality and fish habitat by eroding stream banks, and reducing access to water for wildlife and recreation. Knotweed has numerous impacts on riparian and aquatic ecosystems such as reducing nutrient cycling by locking nutrients in its root system, increasing sedimentation into streams and rivers via bank erosion, and outcompeting riparian vegetation which reduces plant diversity and alters the input of detritus (food for invertebrates) into water systems. Knotweed spreads vegetatively and sexually through rhizomes, fragmentation, and seed production allowing it to rapidly establish in an area.

Knotweed has already infested a 1 km contiguous stretch of lakeshore on the west side of Victoria Lake as well as a smaller area of the lake near its outlet into the Link River. In the absence of treatment, knotweed has the potential to infest and dominate the remaining lakeshore and spread throughout the Marble watershed.

Where is it located?
Knotweeds occur throughout the coastal area (Vancouver Island, the Gulf Islands, the Lower Mainland, and Haida Gwaii), the Shuswap, Kitimat, Stikine, Skeena, Columbia, Okanagan, and Kootenay areas. Knotweeds thrive in roadside ditches, low-lying areas, irrigation canals, and other water drainage systems. They are also found in riparian areas, along stream banks, and in other areas with high soil moisture. Plants may exist in many gardens in communities across BC.

Knotweed is currently limited to a 1 km stretch of lakeshore on the western shoreline of Victoria Lake and a small site near the lake’s outlet into the Link River. In proximity to Victoria Lake, a large infestation occurs at the Neucel Pulp Mill located just south of Port Alice and along an access road that connects the pulp mill and Victoria Lake.
How does knotweed spread?
Knotweed can spread rapidly due to its ability to reproduce from fragments. Root and stem fragments as small as 1 cm can form new plant colonies. Human dumping of garden waste is one of the biggest factors of spread for knotweed via fragmentation. Bohemian knotweed is the only species that also reproduces by seed, although this is a less viable reproduction method for the plant. Knotweed regrows vigorously following cutting, mowing, and digging, especially early in the growing season. Such treatments stimulate the production of new shoots from the root system.

Seasonal high water events and floods sweep knotweed plants into rivers and creeks, which then break up and disperse plant parts. The fast growing knotweed then takes advantage of the freshly disturbed soil to become established on banks and gravel bars elsewhere on the water bodies. Because it grows faster than most other plant species, including native species as well as other weeds, it quickly outgrows and suppresses or kills them.

What are the treatment options?
Mechanical Control:
Cutting, mowing, digging or grazing may be effective for new, isolated, and very small infestations if continually repeated and properly monitored. In general, mechanical control on its own is not an effective management tool for knotweed species due to their massive root structure and ability to reproduce from small root and stem fragments. Manual control is only recommended under specific circumstances, for small, newly established sites and should be carried out with extreme caution due to the likelihood of spread. Material must be properly disposed of to prevent regrowth and spread.

Biocontrol:
Biological control, or biocontrol, is the use of an invasive plant’s natural enemies - chiefly insects, parasites and pathogens - to reduce the plant population below a desired level. It is the long-term, self-sustaining treatment method for managing invasive plants. A sap sucker psyllid, *Aphalara itadori*, has been studied as a potential biological control in British Columbia and is currently in development.

Chemical Control:
Chemical treatment is a management strategy that requires monitoring and follow-up treatments as long as there is re-growth. Chemical treatment is most effective between bud formation and when the plant begins to die back after the first frost. Generally, knotweed sites can be controlled with herbicide within 3-5 years. Herbicides must be absorbed by the plant into its root system in order to control knotweed; they may be applied using a variety of application methods depending on the site and product being used. Herbicide use must be considered on a site specific basis and labels must be followed at all times. All applicators must follow the requirements found in the BC Integrated Pest Management Act (IPMA), federal regulations, and any relevant local bylaws.

What is the most effective way of controlling knotweed?
Control methods need to suit the specific characteristics of each infestation site. As mentioned above, mechanical methods such as digging, mowing, and cutting may be suitable only for very small, new, isolated patches if continually treated and properly monitored and disposed of. They are not, however, very feasible for larger infestations because they are labour intensive and may only encourage denser
growth. Other mechanical treatments such as excavation are increasingly costly with larger sites, do not guarantee eradication, and create a new challenge regarding disposal of excavated material.

Chemical treatment of knotweed has demonstrated the most targeted, effective means of control. With a high efficacy rate, herbicide provides a treatment method that targets the roots of the plant where its energy is stored. A 2010 Oregon State University study demonstrated 80% control of Japanese Knotweed after 1 year of herbicide treatment (Rudenko and Hulting). Continued monitoring and treatment of new growth is required to prevent re-establishment of chemically treated infestations.

**Why have you chosen herbicide treatment?**
Mechanical treatment is not a viable option to eradicate knotweed from Victoria Lake due to the size of the infestation and risk of spread. Mechanical treatment can break up plants, leaving fragments to escape to other areas of the lakeshore and to the Marble River system at large.

Herbicide has been demonstrated to provide the most effective control of knotweed infestations. A number of herbicides including imazapyr, glyphosate, triclopyr, and aminopyralid have proven efficacy in treating knotweed. However, glyphosate is the only herbicide active ingredient allowed for stem injection in B.C. Plant specific treatments can be applied through a variety of application methods such as foliar spray, stem injection, and wipe-on application. Herbicide treatments are less labour intensive and cause less site disturbance as they only require one or two site visits per year, whereas mechanical treatments often require many treatments per season for several years at each site. Herbicide is absorbed through foliage or the stem where it is translocated throughout the plant, specifically to the roots. By working on the root system of knotweed, herbicides are able to target the growth-centre for the plant in order to provide effective long-term control.

**What is the cost of doing nothing?**
Invasive knotweed displaces natural vegetation, reduces water access and forage for wildlife species, limits nutrient cycling in aquatic ecosystems, degrades fish habitat, contributes to increased erosion, and can lead to infrastructure damage for roads and bridges. These impacts also affect recreational activities through reduced environmental quality and access to the lake.

If left unchecked, invasive knotweed will continue to spread along the Victoria Lake shoreline and throughout the Marble River system, moved by fragmentation, high water levels, and recreational activity.

**What is the purpose and scope of the Pesticide Use Permit?**
A Pesticide Use Permit (PUP) provides support for the use of integrated pest management principles for the purpose of controlling invasive knotweed under the Integrated Pest Management Act and Regulation (IPMA). Under the IPMA, a minimum 10 meter pesticide-free zone must be maintained around and along bodies of water, dry streams, and classified wetlands on Crown land. If using glyphosate for the management of invasive plants or noxious weeds, this pesticide-free zone may be reduced to 1 meter above the high water mark.

As the Victoria Lake infestation occurs below the pesticide-free zone on the exposed shoreline, a PUP is required to authorize treatment of knotweed in this area. An issued PUP is valid for 3 years.
Under a PUP, treatment of invasive knotweed on Victoria Lake would be applied to several sites existing along a 1km stretch of shoreline and near the outlet of the lake totalling 4.5 hectares.

**Why use glyphosate?**

Due to the size of the knotweed infestation on the Victoria Lake, chemical treatment has been deemed the most appropriate control measure due to its effectiveness. All other options considered do not lead to the desired outcome of eradication. The herbicide’s active ingredient, glyphosate, has a proven efficacy in treating invasive knotweeds and is the only herbicide active ingredient allowed for stem injection in B.C. and can also be applied using foliar spray techniques.

With stem injection, the herbicide is injected directly into the hollow stem of the knotweed where it is translocated to the roots. This method allows for a direct and contained application of the herbicide, reducing the risk of treatment on non-target plants and environmental contamination. This option is not available for other herbicides and provides the desired application method for treatments occurring near water.

Glyphosate is considered non-persistent in soil and water, as it is highly susceptible to degradation by microbial organisms (bacteria and fungi) found in these environments. The half-life for glyphosate ranges from a few days to weeks dependent on environmental conditions. Warmer climates such as those found on the coast improve the degradation half-life timeframe.

**Is glyphosate a carcinogen?**

Any application of glyphosate must follow herbicide label specifications. When used in accordance with label directions, glyphosate does not pose a risk as a carcinogen.

The World Health Organization (WHO) recently clarified the carcinogenic risk of glyphosate in response to an International Agency for Research on Cancer (IARC) study listing glyphosate as a probable carcinogen. The WHO stated this study was based only on the level of dosage, not the amount of exposure to the chemical. The level of glyphosate was found to be a probable carcinogen in the original study because exposure was unaccounted and exceeded the labelled use of this product. When label specifications are followed, it does not meet carcinogenic levels.

Also included in the IARC’s list of probable carcinogens were red meat, coffee, cell phones, and shift work.

**Does glyphosate persist in soil and water?**

Glyphosate is non-persistent in soil and water. It binds to soil particles where it is readily degraded by microbial organisms (bacteria and fungi), preventing excessive leaching and uptake from non-target plants. The half-life for glyphosate (the time it takes for 50% dissipation) is variable depending on environmental conditions influencing microbial activity.

In soils, glyphosate’s half-life ranges from a week to two months. In general, soils that are warm, moist and rich in organic matter show the most rapid degradation.

In aquatic systems, glyphosate is degraded by microorganisms and removed from the water column by binding to bottom sediments. Half-life in water ranges from a few days to four weeks, typically reaching non-detectable levels in moving water within 1-4 days. Environmental conditions effecting glyphosate’s half-life include temperature, water depth, presence of macrophytes, and water:sediment ratios.
**What are the environmental impacts?**
Glyphosate is a non-selective herbicide, meaning it will have the same control effects on all plants it is applied to. Through the use of shielding and stem injection tools, however, non-target plant exposure can be significantly reduced or eliminated.

Glyphosate has been demonstrated to have a low toxicity in fish and wildlife, and has shown no significant potential to accumulate in animal tissue. Although laboratory studies have demonstrated that fish and amphibian larvae are sensitive to formulated glyphosate products, several field studies show no significant effects. Glyphosate has also been shown to have minimal effects on beneficial insects and pollinators.

Because most of the knotweed on Victoria Lake is growing on exposed lakeshore at a fair distance from the water, the majority of treatments will occur through foliar spray. This is a more time-effective treatment and ensures less herbicide product is put into the environment. For this technique, shielding will be used where necessary to eliminate any risk of environmental contamination through spray drift away from plant parts. In areas where exposure to water is likely, or where non-target vegetation is likely to be adversely affected, stem injection techniques will be used.

**When will treatment occur?**
Treatments are scheduled to occur yearly in July, August, and possibly September during seasonal low water levels. This provides best access to sites and reduces the risk of contact with water as water levels are below site treatments areas, as well as occurring outside of spring hatching and autumn spawning of fish.

**Who can I contact regarding this project?**
For more information contact –
BC Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
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