BRITISH COLUMBIA | Ministry of Forests

Nimpkish River – Invasive Knotweed Treatment Frequently Asked Questions

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's 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 reduce 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. Bohemian knotweed reproduces and spreads by seed, and stem and root fragments, allowing it to rapidly establish in an area.

The extent of knotweed in and adjacent to the Nimpkish River system is currently limited to a total area of 0.48 ha (70 kilometres), occurring sporadically along the Upper Nimpkish River.

In the absence of treatment, knotweed has the potential to dominate gravel bars and riverbanks along the Nimpkish River to its estuary.

Where is it located in BC?

Knotweeds occur throughout the coastal area (Vancouver Island, the Gulf Islands, and the Lower Mainland), the Shuswap, Kitimat, Stikine, Skeena, Columbia, Okanagan, and Kootenay areas, as well as Haida Gwaii. 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 also occur in private gardens.

Along the Nimpkish River system, knotweed is currently limited to a total area of 0.48 ha, a 70 kilometre length of the Upper Nimpkish near Woss. It has not yet spread to Nimpkish Lake or the lower section of the river.

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 suite the specific characteristics of each infestation site. As mentioned above, mechanical methods such as digging, mowing, and cutting control 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. Mechanical treatments for knotweed implemented on the Cowichan River have not been successful and have led to increased spread of the plant.

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 invasive knotweed on the Nimpkish River due to the size of infestation and risk of spread. Mechanical treatment can break up plants, leaving fragments to escape downriver and regrow, as well as increasing sedimentation in the river. Small fragments left in the ground will vigorously regrow in response to disturbance, re-establishing and possibly spreading infestations.

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 and within the river.

If left unchecked, invasive knotweed will continue to spread along the Nimpkish River as fragments are moved by erosion and flooding to overtake new banks and gravel bars.
Currently, invasive knotweed is only located upstream from Nimpkish Lake; however, there is risk of it spreading along Nimpkish Lake and the Lower Nimpkish section if nothing is done.

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 Provincial Public 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 majority of knotweed infestations on the Nimpkish River occur within the pesticide-free zone and below the high water mark on exposed gravel bars, a PUP is required to authorize treatment of these areas. An issued PUP is valid for 3 years.
The extent of knotweed adjacent to Nimpkish River is currently limited to a total area of 0.48 ha. The total area proposed for inclusion in the PUP is significantly larger at 7000 ha, including both Upper and Lower Nimpkish Rivers as well as Vernon and Nimpkish Lakes. The large PUP boundary will allow for the treatment of newly detected knotweed clones that may be introduced to Vernon and Nimpkish lakes or the Lower Nimpkish River as a result of high-water events or disturbance. The limit to total treatment area each year will not exceed 5 ha, however it is anticipated that the actual annual treatment area will be significantly less based on currently known knotweed locations

The 2022 to 2025 PUP will use both Roundup WeatherPro (a.i. glyphosate) and the aquatic herbicide Habitat Aqua (a.i. imazapyr). This PUP proposes to treat all knotweed clones detected growing in or adjacent to Upper and Lower Nimpkish Rivers, as well as Vernon and Nimpkish Lake to protect the Nimpkish River system. Wherever feasible, foliar application methods will be used to limit the volume of herbicide entering the environment. Stem injection using Roundup WeatherPro may be required in some instances if the knotweed foliage cannot be effectively accessed using foliar application. Habitat Aqua is specifically formulated for use in and adjacent to aquatic environments and will be the preferred product for knotweed treatments during the 2022 to 2025 treatment period. These treatments will occur as foliar applications. The addition of Habitat Aqua to the PUP will also limit the risk of knotweed developing herbicide resistance, as Habitat Aqua chemistry and modes of action are different from that of the glyphosate products. In addition, Habitat Aqua is well-suited for knotweed treatments not only to water's edge but also emergent, wetted plant applications. All foliar treatment applications will be made as targeted spot treatments with the intention of limiting drift and non-target vegetative damage.

When will treatment occur?

Treatments are scheduled to occur 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 fall spawning of fish. There is also less recreational use of the river during these months.

Who can I contact regarding this project?

For more information contact –
BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development
Invasive.plants@gov.bc.ca

REFERENCES

Wilson, L. M. 2007. Key to identification of invasive knotweeds in British Columbia. British Columbia Ministry of Forests and Range, Forest Practices Branch, Kamloops, B.C.

* Morgan, M. J., and Kiceniuk, J. W. 1992. Response of Rainbow Trout to a two month exposure to Vision, a glyphosate herbicide. Bulletin of Environmental Contamination and Toxicology. 48(5):722-80.

Rudenko, M., and Hulting, A. G. 2010. Integration of chemical control with restoration techniques for management of *Fallopia japonica* populations. Management of Biological Invasions. 1:37-49.

Durkin, P. R. 2003. Glyphosate – Human health and ecological risk assessment final report. Syracuse Environmental Research Associates Inc., Fayetteville, N.Y.

Wojtaszek, B. F.; Staznik, B.; Chartrand, D. T.; Stephenson, G. R.; and Thompson, D.G. 2004. Effects of Vision® herbicide on mortality, avoidance response, and growth of amphibian larvae in two forest wetlands. Environmental Toxicology and Chemistry. 23(4):832-42.

Edge, C.; Thompson, D.; Hao, C.; Houlahan, J. 2014. The response of amphibian larvae to exposure to a glyphosate-based herbicide (Roundup WeatherMax) and nutrient enrichment in an ecosystem experiment. Ecotoxicology and Environmental Safety. 109:124-132.

Thompson, D. G.; Pitt, D. G.; Buscarini, T. M.; Staznik, B.; and Thomas, D.R. 2000. Comparative fate of glyphosate and triclopyr herbicides in the forest floor and mineral soil of an Acadian Forest regeneration site. Canadian Journal of Forest Research. 30:1808-16.