

Guidelines for the Excavation, Transport & Disposal of Invasive Knotweeds & Knotweed Infested Soil



B.C. Ministry of Forests
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INTRODUCTION

The following guidelines are intended to support projects involving excavation and soil disturbance within, or in close proximity to invasive knotweed occurrences. Invasive knotweeds reproduce by small stem and root fragments, and sometimes seed (plant propagules). These propagules can be found above and below ground and can form new plants. When invasive knotweed infested soil is disturbed or moved, it becomes a vector that can result in the distribution and spread of these highly invasive plants to new locations.

Generally, the Province recommends avoiding the disturbance of invasive knotweed occurrences and instead treating in situ with a systemic and selectively applied herbicide to control surface and sub-surface growth (see Section 2.4 and [B.C. Knotweed Treatment Guidelines for Provincial Public Lands](#)). However, there are situations where this may not be possible due to project logistics or timing constraints. In these cases, excavation, transport and disposal of knotweed infested material may be required. These guidelines are designed to minimize the risk of invasive knotweed spread that may result from these activities and are part of a [larger initiative](#) to improve invasive plant management protocols related to the movement of soil and related materials.

STEP 1 – IDENTIFYING KNOTWEED

1.1 Identification

Become familiar with the identification and risks of invasive knotweeds, including:

- Bohemian knotweed (*Reynoutria x bohemica*)
- Giant knotweed (*Reynoutria sachalinensis*)
- Japanese knotweed (*Reynoutria japonica*)

1.2 Site History

Reference the provincial invasive plant database, [InvasivesBC](#), to determine known priority invasive plants occurring within 100 meters of the Project Footprint. The Project Footprint is defined as including all areas of potential disturbance (eg. roads, staging areas, parking etc.). Invasive knotweeds are of particular concern and should be identified in the planning stage. Knotweed occurrences should be clearly indicated on all project maps and drawings. If InvasivesBC data indicates knotweed presence within 100 m of the Project Footprint, it is likely that knotweed plants may *also* be located within the Project Footprint.

1.3 Ground Truthing

Prior to any ground disturbance and as early as possible during the project planning and design phase, a Qualified Environmental Professional (QEP) with experience in invasive plant identification should assess the plant communities in the field. The field assessment should:

- Include the area within the Project Footprint, incorporating all potential areas of access, storage, and disturbance.
- Confirm the current location and area of all known knotweed occurrences from the database that may occur within 100 metres of the Project Footprint.

- Survey the area to determine whether there are any additional unmapped knotweed occurrences (or other invasive plants).

How does invasive knotweed affect my project?

- *Activities such as excavating, moving, storing or stockpiling soil and other materials with vehicles, heavy equipment and machinery that are used on, and transported between, various sites should consider the potential presence of invasive plants, particularly on roadsides, parking lots and staging areas. Precautions may be needed to avoid disturbing these plant populations and specific arrangements needed for the excavation, transport, and disposal of knotweed infested soil and related materials.*

1.4 Reporting

Once the QEP has updated the mapping of all invasive knotweed occurrences using [Observation Records](#), all records should be entered in the provincial invasive plant database ([InvasivesBC](#)) to allow for future monitoring and potential management, if required. In addition, the QEP should ensure that any new or updated occurrences are clearly added to all project maps and drawings and communicated to the project management team.

STEP 2 – DEVELOPING A KNOTWEED MANAGEMENT PLAN

Where invasive knotweed presence is confirmed, a Knotweed Management Plan will be an important component of the overall Environmental Management Plan for the project. A QEP, with experience in invasive plant management, should prepare the Knotweed Management Plan and ensure all personnel on the project are familiar with the species and aware of the unique protocols and procedures required.

The intent of a Knotweed Management Plan is to minimize the risk of spreading invasive knotweed and preventing unmanaged introductions to new areas during excavation, transport and disposal activities. The Plan should include protocols for tracking the disposal of knotweed infested soil and, if required, ensuring a plan is in place for future monitoring and management at both the excavation and disposal locations. Having a plan in place will also help to prevent invasive knotweed from negatively impacting the future infrastructure, function, or services of the project.

When invasive knotweed occurs within the Project Footprint it is important to avoid disturbance by establishing a minimum 15 metre “No Entry” buffer zone around the perimeter of each knotweed occurrence. If disturbance is unavoidable within these zones, then specific excavation and disposal protocols will be required as outlined below.

Key components of a Knotweed Management Plan include:

2.1 Buffers and “No Entry” Areas

- Soil within 15 metres* of all knotweed occurrences is considered infested with viable knotweed propagules to a depth of at least 2 metres due to the extensive root system of these plants. Note: The depth of knotweed roots may be affected by soil type and groundwater proximity. Maximum knotweed root depth should be confirmed by an experienced QEP when delineating buffers.

*IMPORTANT: Selling or distributing soil adjacent to knotweed infestations may carry liability if marketed as “clean fill” or “knotweed-free”. In these cases, it is recommended that the buffer

area around all knotweed occurrences be increased to 20 metres to reduce the risk of distributing knotweed infested soil.

- Using the known locations of invasive knotweed sites compiled in Step 1 above, delineate 15-metre buffer areas around all knotweed patches within the Project Footprint, including all potential areas of associated disturbance. Buffers should be measured from the outermost stems and leaves, not the centre of the plant occurrence. Assess these buffer areas with the project management team to determine which areas can remain undisturbed and areas that will require any level of disturbance.
 - IF DISTURBANCE CAN BE AVOIDED: Designate these areas as “No Entry” zones on all project maps and drawings to indicate that entry or disturbance of the vegetation or soil is not permitted. Communicate the location of these “No Entry” zones to all site workers and ensure they are clearly marked in the field using snow fencing or flagging (similar to marking tree root protection zones).
 - IF DISTURBANCE CANNOT BE AVOIDED: If disturbance is required or likely to occur within any portion of the mapped knotweed buffer zones, designate these areas as knotweed infested soil zones and ensure the knotweed excavation, handling, and sanitation protocols are followed and a transport and disposal plan is in place prior to any soil disturbance (see below).
- At all times, avoid parking, driving, or storing vehicles and equipment on known knotweed occurrences and within all knotweed buffer zones.

2.2 *Excavation, Transport & Sanitation*

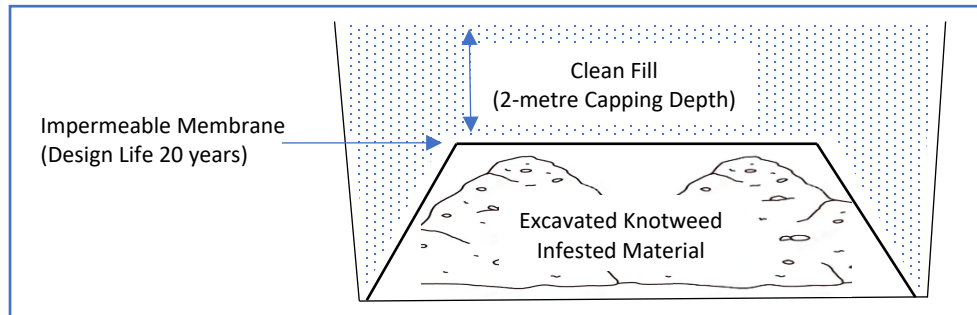
- Where excavation or ground disturbance is unavoidable within any part of the 15-20 metre knotweed buffer zone, transportation to, and disposal at, a suitable location (Section 2.3) is required.
- Prior to excavation, the invasive knotweed should be treated with a non-persistent herbicide and left undisturbed in situ until the herbicide has taken effect and is no longer active in the soil (eg. minimum 7 weeks for glyphosate products).
 - Prior to excavation, complete as many treatments as possible to reduce actively growing plants and viable propagules. To achieve effective control, knotweed occurrences will receive 2-3 herbicide treatments annually for up to 5 years or until there is no detectable surface growth for three consecutive years. Note: Three years of no detectable surface growth does not indicate knotweed eradication but does indicate reduced propagule viability and risk of spread. The length of time required to confirm knotweed eradication is unknown and viable propagules may remain dormant in the soil for many years. See the [B.C. Knotweed Treatment Guidelines for Provincial Public Lands](#).
- During excavation, transportation and disposal, ensure containment of the knotweed infested soil:
 - If excavated knotweed material requires temporary stockpiling prior to permanent disposal, the infested material should be placed on an impermeable barrier to prevent propagule contact with a growing substrate. These knotweed stockpiles should be segregated from regular excavated materials, surrounded with silt fencing, and clearly marked to prevent cross-contamination or accidental movement.
 - All excavated knotweed material and associated infested sediments should be covered prior to and during transport to prevent spread (e.g. line truck box and cover with poly tarps).

- Before leaving the excavation area, project site, and disposal site(s), remove all visible plant parts and soil from vehicles, equipment, tools, and footwear (especially those directly involved in sediment removal). Ideally and as soon as possible, all vehicles, equipment, and tools that encounter knotweed infested soil will be cleaned using a power washer after working with knotweed infested soil and at minimum before working in a new area of the project. (Recommended power wash contact time is ≥ 10 seconds on all surfaces to remove dirt and organic matter, including vegetation or seeds). Special attention should be given to undercarriages, chassis, wheel-wells, radiators, grills, tracks, buckets, chip-boxes, blades, and flail-mowing chains.
- If excavation is used to remove a knotweed occurrence, an InvasivesBC [Mechanical Treatment Record](#) should be completed with the disposal location noted in the comments field.
- Confirm that additive material to be used for construction works is invasive plant free by referencing the provincial invasive plant database for known invasive plant sites near quarries and/or pits and confirming in the field through ground truthing by a QEP. Additive materials include in-fill material, aggregate, rock and rip rap, and organics.

2.3 Disposal

- There are four options for the disposal of knotweed infested soil:
 1. **Deep Burial - Clean Fill Cap** (5-metre capping depth)
 - Deep burial requires hole(s) or trench(es) to be dug large and deep enough to contain the entire volume of excavated knotweed infested soil as well as at least 5m of clean fill on top. Note: Soil bulking or swelling should be considered when determining the volume of material to be buried.
 - Ensure that any fill materials used for covering knotweed infested soil are invasive-plant-free prior to use.
 - Deep burial can result in substantial cost savings if the location occurs within or close to the Project Footprint, as transportation costs will be low and effective deep burial will have limited follow up herbicide treatments needed. Note: The water table and/or sub-surface material may prevent deep burial as an option.
 2. **Deep Burial - Impermeable Membrane Cap** (2-metre capping depth).
 - If it is not possible to meet the depth requirements for the hole(s) or trench(es) outlined in Option 1 above, the depth requirement can be reduced to 2m of clean fill on top of the volume of excavated material by installing an impermeable membrane (with a design life of greater than 20 years) between the clean fill and the knotweed infested fill.
 - Place knotweed infested material into the hole(s) or trench(es), cover with an impermeable membrane that extends over each side to prevent lateral growth (Figure 1), and cap with 2 meters of clean fill material. Note: The membrane should be free of holes or rips, and seams should overlap and be reinforced and sealed.

Figure 1. Diagram of Knotweed Impermeable Membrane Cap.



3. Landfill, Incineration, or Industrial Disposal Facility

- Contact the Regional District or Municipality in the area you are working to determine if a landfill, industrial disposal, or incineration facility accepts knotweed material and knotweed infested soil, as policies vary throughout B.C.
- The Regional District or Municipality may know of other facilities accepting knotweed infested soils. These are rare and may have significant transportation costs and/or disposal fees.

4. Above Ground Disposal Piles

- Ensure piles are covered or seeded to prevent erosion of soil and the spread of plant propagules by wind, wildlife or surface run-off.
 - Annual monitoring and herbicide treatment of the disposal piles will be needed for up to 5 years or until there is no detectable surface growth for three consecutive years. This method of disposal creates a new knotweed occurrence and follow-up treatment plans must be in place as described in Section 2.4 below.
- For all the disposal methods outlined above, confirm suitable knotweed disposal locations in advance of excavating and transporting knotweed infested material.
 - Ensure the landowner or land manager is aware of the potential for invasive knotweed re-growth and the herbicide treatments required for control. Establish all disposal agreements in writing prior to excavation.
 - Where preferred disposal locations occur on the jurisdiction of the Ministries of Forests (FOR) or Transportation and Infrastructure (MOTI), permission must be obtained to deposit material in advance of disposal and a follow up treatment plan may be required.
 - Suitable locations for disposing of knotweed infested soil must be:
 - At least 50 metres away from the High-Water Mark (HWM) of any waterway to reduce the risk of spread; and,
 - At least 30 metres away from any sensitive habitat, water well, or water intake used for agricultural or domestic purposes to allow for follow up chemical treatment of all knotweed infested materials.

- Plus, at least 20 metres away from any critical above or below-ground infrastructure (e.g. bridges, retaining walls, dikes). This buffer is important to prevent knotweed roots from potentially compromising the integrity of the infrastructure.

Why a 50-metre distance from the HWM?

It is extremely difficult to control knotweed in a public waterway, within the High-Water Mark (HWM); and most open waterways in BC are public (jurisdiction of Province). The Province has limited options for controlling knotweed in aquatic environments and management practices in one area should not be creating additional impacts in a new area. Once invasive knotweed establishes in an aquatic environment, erosion and deposition of plant fragments increases the rate of spread substantially. A knotweed root system can radiate out, up to 20 metres belowground, from the actively growing plant parts observed on the surface. In addition, herbicide setbacks from water, under the BC Integrated Pest Management Act and label restrictions, can be up to 30 metres, depending on the herbicide product used and site conditions. The 50-metre distance from HWM is a moderate buffer to reduce risk of spread into public waterways.

- Costs for transportation of infested soil material are significant; therefore, identifying a suitable disposal location close to the project is recommended. This will also reduce the risk of new knotweed introductions and spread in the Province.
- Knotweed disposal areas must be clearly delineated and identified to prevent disturbance and/or future use of the material until such time as the soil is deemed to present an acceptable reduced risk of knotweed spread. See section 2.4 for recommended treatment and monitoring guidelines.
- If a disposal location already has knotweed present, the degree of knotweed both already present and being introduced, may influence disposal and follow up management requirements.
- Once deposited, avoid moving knotweed infested material.

2.4 Monitoring & Management

- Invasive knotweeds have prolific root structures, and the ability to reproduce from stem and root fragments, and sometimes seed. Therefore, systemic herbicide applications are the most effective means of controlling knotweed growth because the plant will translocate the herbicide from the treated foliage (leaves) into the stem and root system. Herbicide foliar applications are preferred over stem injection because they use less concentrated herbicide and are more efficient to execute. See the [B.C. Knotweed Treatment Guidelines for Provincial Public Lands](#) for more information about treatment methods.
- Both the excavation and disposal locations will require post-disturbance monitoring and treatment for up to 5 years or until there is no detectable surface growth for three consecutive years. A typical annual management cycle consists of 2-3 herbicide applications at the following timing:
 - Spring (May) Survey, first chemical treatment before plants mature to full height (target is 1m tall),
 - Summer (July optional) Treatment monitoring, chemical treatment only to newly emerged stems that were not treated in the last pass.
 - Late Summer/Early Fall (Sept) Treatment monitoring, chemical treatment only to newly emerged stems that were not treated in the last pass.

- Note: Three years of no detectable surface growth does not indicate knotweed eradication but does indicate reduced propagule viability and risk of spread. The length of time required to confirm knotweed eradication is unknown and viable propagules may remain dormant in the soil for many years.
- IMPORTANT: Ensure all required permits and authorizations are in place prior to using herbicide on public lands or waters in BC in accordance with the BC *Integrated Pest Management Act*. For Provincial Public Lands, the BC Ministry of Forests must provide written authorization to apply herbicide under the Province's Pest Management Plans to ensure all legal requirements have been met prior to treatments occurring.
- Enter all survey, treatment, and monitoring records into the provincial invasive plant database ([InvasivesBC](#)).
- The Province's standard for monitoring treated knotweed occurrences is 20 years after the first year of 'No Weeds Found' before an occurrence can be confirmed eradicated.

Why the 20-year monitoring standard?

The provincial knotweed monitoring standard is based on the biology, life cycle, and risk of re-emergence of invasive knotweeds. Monitoring frequency decreases from annually in the first five years to every two or three years once the occurrence is considered under control. The length of time required to confirm knotweed eradication is unknown and viable propagules may remain dormant in the soil for many years. Knotweed can cause significant damages to critical ecosystems and infrastructure; it is important to ensure that knotweed infested soil is not disturbed or distributed while propagules remain viable and capable of growing into new plants.

For further information please reference:

- B.C. Knotweed Treatment Guidelines for Provincial Public Lands: https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/pest-management/2019_herbicide_summary_for_control_of_knotweeds_on_crown_land.pdf
- Best Practices for Managing Invasive Plants on B.C. Roadsides: https://bcinvasives.ca/wp-content/uploads/2021/01/Weeds_Roads_BMP_Guide-2019-web.pdf
- Knotweed Best Practices for BC Highway Rights of Ways and Gravel Pits: <https://www2.gov.bc.ca/assets/gov/driving-and-transportation/environment/invasive-species/knotweed-bmp-poster-generic.pdf>
- Soils and Invasive Species B.C. Initiative: <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/imiswg/infested-soil>
- Invasive BC provincial invasive plant database and mapping application: <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/invasivesbc>
- Invasives BC Terrestrial Observation Record: https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/invasivesbc-resources/terrobserv_paper_field_form.pdf
- Invasives BC Terrestrial Mechanical Treatment Record: https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/invasivesbc-resources/terrmechtrmt_paper_field_form.pdf

Or contact the Ministry of Forests Invasive Plant Program: Invasive.Plants@gov.bc.ca

DISCLAIMER: The recommended protocols in this document are a result of many years of experience managing invasive knotweeds and knotweed infested soil by the Province and are supported by best practices in a number of knotweed impacted regions including Europe and the Pacific Northwest. The Province does not take any responsibility or liability for knotweed regrowth when following the guidelines outlined in this document as these are best practices to reduce the risk associated with the spread and establishment of invasive knotweeds but are not a guarantee. Follow up monitoring and timely management is always highly recommended following any disturbance of invasive knotweed.