

Sediment removal is an important part of flood mitigation but may cause significant disturbance. These guidelines are designed to minimize this disturbance, to prevent the introduction and spread of invasive plants to new and existing sites. Identifying where sediment removal activities interface with invasive plant locations is also important for ensuring worker safety when operating near toxic plants.

Identifying these interface areas early will allow time for adequate planning, which will benefit the overall project. Failure to identify priority invasive plants within a work area could compromise the project goals (e.g. flood mitigation, infrastructure protection) and/or result in worker injury (e.g. skin burns or rashes, respiratory illness, poisoning). The following invasive plant guidelines will support the flood mitigation works.

Step 1 – Identifying Invasive Plants

1. Reference the provincial invasive plants database, [InvasivesBC](#), to determine known priority invasive plants occurring within 50 to 200 metres of the construction footprint. Invasive plants of particular concern include the knotweed complex and species that may pose safety risks to workers (e.g. Giant hogweed, Daphne, poison hemlock).
2. Become familiar with the identification and risks of priority invasive plants including:
 - Invasive knotweed complex
 - Bohemian knotweed (*Reynoutria x bohemica*)
 - Giant knotweed (*Reynoutria sachalinensis*)
 - Japanese knotweed (*Reynoutria japonica*)
 - Himalayan knotweed (*Persicaria wallichii*)
 - Invasive plants – Worker Safety Concerns
 - Giant hogweed (*Heracleum mantegazzianum*)
 - Poison hemlock (*Conium maculatum*)
 - Spurge laurel (*Daphne laureola*)
3. Ground truth all occurrences from the database within a 50 to 200 metre range of planned works.

Why these distance ranges?

- (50 m) Invasive plants occurring within 50m of a construction footprint are likely to be disturbed and spread during ground moving activities. Specific arrangements will be needed for the disposal of knotweed contaminated sediments (see below) and to ensure workers do not come into physical contact with toxic plants.
- (51-200 m) Invasive plants occurring within 51-150m of a construction footprint are likely to be disturbed and spread due to staging areas and stockpiles where equipment, machinery, and vehicles may disturb plant populations and/or workers may come into physical contact with toxic plants. Precautions will be needed to avoid disturbing the plant populations and to prevent worker injury.

4. A Qualified Environmental Professional (QEP) will identify and map the presence of priority invasive plants, especially knotweed, detected during ground truthing and prior to sediment removal. Enter invasive plant occurrences in the provincial invasive plant database ([InvasivesBC](#)) using an [Observation Record](#) to allow for future management.

Step 2 – Developing an Invasive Plant Management Plan

An invasive plant management plan is an important component of the overall environmental management plan for any flood mitigation project. Key components to the plan will include:

- Minimizing disturbance
 - Sanitation
 - Potential treatment
 - Disposal
 - Monitoring
1. Where invasive plant presence is confirmed, measures will be implemented to minimize the risk of spread and introductions to new locations and ensure worker safety.
 - General invasive plants: [Best Practices for Managing Invasive Plants on B.C. Roadsides](#)
 - Knotweeds: [Knotweed Best Practices for BC Highway Rights of Ways and Gravel Pits](#)
 - Giant hogweed (*Heracleum mantegazzianum*): [WorkSafeBC Bulletin](#)
 - Poison hemlock (*Conium maculatum*): [BC Invasive Species Alert](#)
 - Spurge laurel (*Daphne laureola*): [WorkSafeBC Bulletin](#)
 2. Where knotweed presence is confirmed, measures will be implemented to minimize the risk of spread and introductions to new sites, track sediment disposal, use designated knotweed contaminated disposal sites, and enter disposal sites into the provincial invasive plant database ([InvasivesBC](#)) using an [Observation Record](#) to allow for future management. See Appendix I - Guidelines for the Removal of Knotweed Contaminated Sediments.
 3. Minimizing Disturbance: Avoid parking or driving vehicles/machinery on known invasive plant sites.
 4. Sanitation:
 - Vehicles/machinery conducting sediment removal within 150 metres of known invasive plant occurrences, should be cleaned before leaving the infested area to prevent spread to new locations.
 - Confirm that additive material to be used for flood prevention works is invasive plant free by referencing the provincial invasive plant database for known invasive plant sites in close proximity to quarries and/or pits. Additive materials include in-fill material, aggregate, rock and rip rap, and organics.
 5. Potential Treatment:
 - Identify the schedule for planned sediment removal to occur within 200 metres of invasive plant sites, and where the sediment will be deposited or disposed. Where possible, avoid or treat invasive plant sites prior to disturbance and select management practices appropriate for transient materials. See Appendix I -Guidelines for the Removal of Knotweed Contaminated Sediments.
 6. Disposal:
 - Confirm suitable knotweed disposal locations in advance of transporting knotweed contaminated material. See Appendix I -Guidelines for the Removal of Knotweed Contaminated Sediments
 - Avoid placement of new material on top of known invasive plant occurrences at disposal sites.

- Avoid moving material, including sediment, once deposited at disposal sites.
 - Record and report the deposition location of sediments known to be infested with invasive plants
 - Prevent the movement of invasive plant contaminated material, including sediment, from deposition sites to other locations
7. Monitoring:
- Plan to monitor both the excavation and disposal sites for invasive plants the year following excavation. Manage invasive plants if present. See the [B.C. Knotweed Treatment Guidelines for Provincial Public Lands](#) (under revision).

For more information, contact the Ministry of Forests, Invasive Plant Program:
invasive.plants@gov.bc.ca

APPENDIX I - Guidelines for the Removal of Knotweed Contaminated Sediments

Generally, the Province recommends treating knotweed in situ and chemical treatments are the most effective means of controlling surface and sub-surface growth. However, given the short timeframe and difficulty in establishing a Pesticide Use Permit to treat knotweed effectively in and adjacent to water, excavation may be the most reasonable approach for large scale sediment removal. The Ministry of Forests, Invasive Plant Program has developed these knotweed guidelines for the purpose of supporting flood mitigation works.

1. Buffers & Excavation Guidance by Clone Class

- **Class A** – Single stem, new plant (distribution: individual stem <30 cm height, density: 1 stem/5 m², area: <2 cm²)
Guidance: Carefully excavate a 30-centimetre circumference around the single stem using a hand shovel. Locate the entire root system. Bag and stockpile excavated material in a dryland location on top of a sediment barrier until a long term, suitable knotweed disposal location is determined. If roots are intercepted during excavation, expand the excavation circumference by an additional 30 centimetres. Care should be taken to prevent fragmenting the stem and roots, as less than 2 centimetres of rhizome or stem fragment is capable of regenerating into a new plant (regeneration from stem fragment requires node presence). Ideally, the excavated sediment will be disposed of with the plant material.
- **Class B** – All other knotweed size classes occurring within a planned sediment removal area.
Guidance: Soil occurring within a 20-metre circumference and 2-metre depth of surface knotweed clones, is considered contaminated with viable knotweed propagules and requires excavation and deep burial at a suitable location.
- **Class C** – Knotweed clones occurring above the High Water Mark (HWM) with the root crown at an elevation 2m higher than the elevation of a planned sediment removal area, with no visible surface or subsurface knotweed growth on the river bank between.
Guidance: The sediment may be excavated up to, but not including the toe of the riverbank slope without disturbing the bank and will be considered free of knotweed propagules (reproductive plant parts).
- **Class D** – Knotweed clones occurring on large woody debris with roots clearly isolated to that debris.
Guidance: Remove the knotweed and large woody debris in its entirety and stockpile in dryland location on top of sediment barrier until long term suitable knotweed disposal location is determined. Where clones are growing on large woody debris with roots clearly penetrating adjacent sediment, the 20-metre buffer will apply.

2. Sanitation & Transport

- Avoid vehicles and equipment driving on known knotweed occurrences where works are conducted.
- Where chemical treatment is not feasible and knotweed disturbance is unavoidable, knotweed contaminated sediments will require excavation and deep burial at a suitable location.

- If excavated knotweed material requires temporary stockpiling prior to permanent disposal, the contaminated material should be placed on a barrier to prevent propagule contact with a growing substrate. These knotweed stockpiles should be segregated from regular excavated materials to prevent cross-contamination.
- All excavated knotweed material and associated contaminated sediments should be covered prior to and during transport to prevent spread.
- Before leaving a site, remove all visible plant parts and soil from vehicles, equipment, tools, and footwear (especially those involved in sediment removal). All vehicles, equipment, and tools that have come in contact with knotweed should be cleaned using a power washer (recommended contact time of ≥ 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. Equipment and vehicle cleaning should be repeated prior to leaving the permanent disposal location.

3. Disposal

- Confirm suitable knotweed disposal locations in advance of transporting knotweed contaminated material. 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. MOTI permission can be obtained from Satish Prasad, Provincial Aggregate Resource Manager (notification to Grahame Gielens, Environmental Roadside Manager). FOR permission can be obtained from the District Area Manager (notification to Becky Brown, Invasive Plant Specialist).
- Knotweed contaminated soil will require deep burial in a designated location more than 50 metre horizontal distance from any High Water Mark (HWM) of an open public waterway, including wetlands. Enter knotweed disposal sites into the provincial invasive plant database ([InvasivesBC](#)) using an [Observation Record](#) to allow for future management. The disposal location will require monitoring and treatment for up to 5 years minimum. See the [B.C. Knotweed Treatment Guidelines for Provincial Public Lands](#) (under revision).
- 50 meters away from a waterway is the minimum buffer to reduce the risk of spread. Any movement of viable knotweed propagules to a new location will establish a new knotweed occurrence. This new occurrence will require monitoring and treatment to prevent spread.

Why a 50-metre buffer?

It is extremely difficult to control knotweed in a waterway, within the HWM, and most open waterways in BC are public (jurisdiction of Province). The Province has very limited options for controlling knotweed in an aquatic environment and management practices in one area should not be creating additional impacts in a new area. A knotweed root system will radiate out from the surface plant material for at least 20 metres. The 50-metre distance from HWM is a moderate buffer to reduce risk of spread to public waterways.

- Deep burial will require a pit of at least 5 metres minimum; place knotweed in the pit to a depth of 3 metres minimum, and then cover with a permeable membrane and 2 metres (or remaining depth) of capping material.
- If a depth of 5 metres is not possible, a 3-metre pit is acceptable if it is completely lined with a membrane.

- Apply a foliar application of glyphosate (or similar) to the knotweed material prior to capping, to reduce the growth of any viable plant material.
- Membranes should have a design life of greater than 20 years.
- Avoid disturbing or moving deposited material once capped.
- 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.

What are these burial guidelines based on?

Knotweed deep burial disposal guidelines are modified from the B.C. Ministry of Transportation and Infrastructure best practices for knotweed deep burial.

4. Monitoring & Management

- The disposal location, once capped, will require monitoring and treatment for up to 5 years minimum. A typical annual management cycle is: (May) survey, first chemical treatment before plants mature to full height, (July) treatment monitoring, second chemical treatment only to newly emerged stems that were not treated in the first pass, (Sept)) treatment monitoring, third chemical treatment only to newly emerged stems that were not treated in the first or second pass.
- All survey, treatment, and monitoring records should be entered 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 Weed Found before an occurrence can be confirmed eradicated.

What is the rationale for this monitoring standard?

This 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.

- Given the prolific root structures and ability to reproduce from stem/root fragments, and sometimes seed, systemic herbicide applications are the most effective means of controlling knotweed growth because the plant will translocate the herbicide from the treated foliage into the stem and root system. Foliar applications are preferred because they result in use of the lowest concentration of herbicide. Stem injection is an alternate option that is needed in some circumstances, but more time consuming and uses a much higher volume of concentrated herbicide. See the [B.C. Knotweed Treatment Guidelines for Provincial Public Lands](#) (under revision).

For further information please reference:

- [B.C. Knotweed Treatment Guidelines for Provincial Public Lands](#) (under revision).
- [Best Practices for Managing Invasive Plants on B.C. Roadsides](#)
- [Knotweed Best Practices for BC Highway Rights of Ways and Gravel Pits](#)