Invasive Plant Survey & Suitability Report For ETL Lands (2024)

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Invasive Species Council of BC

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Project Overview

Envirogreen Technologies Ltd. (ETL) facility is located at 1901 Highway 3 Princeton, B.C. encompassing approximately 22 hectares of land. The site is characterized by a combination of operational facilities and naturalized areas, bordered by Hudbay Copper Mountain Mine, BC Ministry of Highways and Infrastructure Highway #3, and Ingerbelle Composting Facility. The landscape includes transitional zones where the facility's activities meet less disturbed natural habitats, providing diverse environmental conditions.

The primary purpose of this report is to:

1. **Identify the habitat requirements of invasive plants of specific concern to ETL**—particularly Japanese Knotweed, Perennial Pepperweed, Cordgrass, Poison Hemlock, Wild Chervil, Shiny Geranium, and Canada Thistle.
2. **Assess the potential for these invasive plants to establish on the site**—by analyzing whether the site's habitats meet the life history requirements of the targeted invasive plants.
3. **Establish a baseline inventory of invasive plants present on the ETL site**—to identify which invasive plants currently impact the area.

During the initial cursory survey conducted on August 7th and 8th, several invasive species were noted within the property boundaries, especially in areas where operational zones transition into naturalized landscapes. Notably, the focus was on the perimeters of the property, access roads to all areas, 10-20 metres off the roadways, equipment storage, soil material storage pile areas, and the perimeter areas surrounding the facility and the edges of the property where human activity is less frequent.

This report provides ETL with a comprehensive understanding of the current state of invasive plant species on the site and the risks posed by additional species known to be problematic in the region. By identifying habitat requirements and assessing site conditions, this information will inform management strategies to mitigate the spread and impact of high-risk invasive plants.

Site survey goal:

1. **To create a detailed profile of invasive plant habitats**—enabling targeted management interventions.

By proactively addressing any concerns, ETL can enhance the ecological health of the site, comply with environmental regulations, and contribute positively to the surrounding ecosystems.

Site Assessment

CURRENT CONDITIONS:

The current site conditions are a combination of an industrial material processing area, soil storage, equipment storage, gate access area with buildings and scale, road systems for vehicle and truck facility entry, equipment movement, storage area access, and naturalized perimeter areas.

The processing area is concrete and hard gravel-packed surfaces. Staff and equipment buildings surround the processing area entry gate and scale area.

The main processing and entry area is surrounded by stockpiles of processed material which may be transient, permanent fill areas of processed materials, which will be reclamation areas, water facility, and natural areas at the facility perimeter boundary,

Much of the Envirogreen property is influx around the processing area, stockpiling area, and roadway system where soils and surface areas are constantly being disturbed and manipulated.

Significant areas of the roadway edges and adjacent areas are infested with Spotted knapweed and Scentless chamomile which are the dominant invasive plants. Both are listed as provincially noxious.

There is a significant amount of infested reclaimed areas with steep slopes that are vegetated with Russian thistle and Kochia. Although not listed locally as noxious, both are listed in the Peace River region. Despite these two invasive plants helping stabilize sloped soils, these sites should be reclaimed with a non-invasive species.

Other noxious listed species that occur on-site include Diffuse knapweed, Dalmatian toadflax, and Common tansy, but not in significant populations.

Minor occurrences of other invasive and regionally listed noxious plants include Ox-eye daisy, and Burdock. Also present are Himalayan blackberry and cheatgrass which are invasive but not listed as noxious.

Nodding thistle and Bull thistle are invasive, but not noxious, and occur as a few minor infestations with both species being considered under successful biological control in BC. No management of these two species typically occurs. Diffuse knapweed and Dalmatian toadflax occur on site and although listed as noxious they are also under successful biological control in BC with no management of these two species typically occurring.

The species with biological control were sampled for bioagents. Spotted knapweed was sampled and found a root-boring weevil *Cyphocleonus achates* (adult and larvae) and seed head fly *Urophora spp.* (larvae). The Bull thistle that was sampled found a seedhead fly present. No bioagents for Dalmatian toadflax were found

The biennial Mullein is present but not considered invasive, but a non-native occupier.

Annual weeds that are present of note, but not considered invasive, but rather non-native occupiers, are Prickly lettuce, hawksbeard, and groundsel species.

Vetch species occur on the site along with perennial grasses. Vetch species are native, and legumes are nitrogen fixers that benefit desirable plant growth. A more detailed survey would identify more native species present on and adjacent to Envirogreen properties.

Site Survey

METHODOLOGY:

The invasive plant species survey at the Envirogreen Technologies Ltd. (ETL) facility was conducted by a team consisting of Torin Kelly, Special Projects Lead (ISCBC); Dave Ralph, Senior Manager of Operations (ISCBC); and Gisalene Carl, Manager of Regulatory Compliance (ETL). All safety policies, protocols, training, and sign-offs were done with a pre-site visit. Safety equipment hard hat, steel-toed boots, high-vis vest, safety glasses, and gloves were required and worn on site.

The primary objective was to determine the presence and species of invasive and noxious plants in the ETL facility, with a secondary goal of estimating the area of observed invasive plants for mapping purposes. A cursory survey approach was used for the majority of the 22-hectare site due to the need to respect the safety protocols. As ETL's Princeton facility is an active worksite, only areas where heavy machinery was inactive were ground surveyed.

An initial cursory survey of the site from vehicles was conducted to determine invasive & non-native species on site. In locations deemed safe, the team exited the vehicle to perform more detailed inspections, collect species samples, collect photos, and conduct bio-control surveys.

Special attention was given to the edges of the property where operational areas transition into naturalized zones. These transitional zones are less frequented by operational staff, and concerns about invasive species moving from the site to naturalized areas were discussed.

INVASIVE PLANT INVENTORY:

Invasive plant were identified visually using field guides and expert knowledge, and any unidentifiable species on site, either a sample or photo was taken off-site for further analysis and proper disposal. Approximate locations of observed species were noted for mapping purposes, and photographs were taken of certain species to confirm identification and for record-keeping. The team prioritized safety by limiting on-foot surveys to safe access areas, which may have influenced the ability to detect some species.

Invasive Species:

Spotted knapweed (*Centaurea stoebe*)

Diffuse knapweed (*Centaurea diffusa*)*

Dalmatian toadflax (*Linaria dalmatica*)*

Nodding thistle (*Carduus nutans*)*

Bull thistle (*Cirsium vulgare*)*

Himalayan blackberry (*Rubus armeniacus*)

Russian thistle (*Salsola tragus*)

Kochia (*Bassia scoparia*)

Scentless chamomile (*Tripleurospermum inodorum*)

Common tansy (*Tanacetum vulgare*)

Cheatgrass (*Bromus tectorum*)

* considered under biological control in BC

Spotted knapweed and Scentless chamomile are the dominant invasive species on the ETL facility site. They are found along most main and access roads in abundance either together or alone. These species should be a priority for management to reduce or eliminate pathways (roads) through equipment and vehicle movement. Spotted knapweed has several biological control agents available in BC, but is not considered under biological control in the West Similkameen region.

Himalayan blackberry and Common tansy have limited infestations but are very invasive and should be a priority species for management. These 2 species will spread rapidly and dominate.

Diffuse knapweed, Dalmatian toadflax, Nodding thistle, and Bull thistle have limited infestations that should be successfully managed by biological control. A further survey for the presence of biological agents should be conducted. If none are found the introduction of species-specific bioagents should be proposed, in conjunction with the Province of BC.

Russian thistle and Kochia are annuals and very common in the semi-arid region of the southern interior, including the Similkameen, and noxious only in the Peace River. They infest significant areas, but predominately on steep soil piles which offer some soil-holding ability and soil stabilization to slopes. These species are not considered for management outside the Peace River.

Cheatgrass is invasive and listed in the Community Charter Spheres of Concurrent Jurisdiction, Environment, and Wildlife Regulation. It is a priority species in BC that has been known in the southern interior for many decades but currently has no effective option for control other than mechanical and cultural methods. No selective herbicides for control are registered in Canada.

Non-native Species:

Mullein (*Verbascum thapsus*)

Prickly lettuce (*Lactuca serriola*)

Hawksbeard (*Crepis spp,)*

Common groundsel (*Senecio vulgaris)*

These four species are either annuals or biennials and non-native. They are typically considered weeds of agricultural concern or opportunistic weeds that will occupy disturbed soils. These are not considered for management outside of intensive cropping or other specific site use where they may interfere.

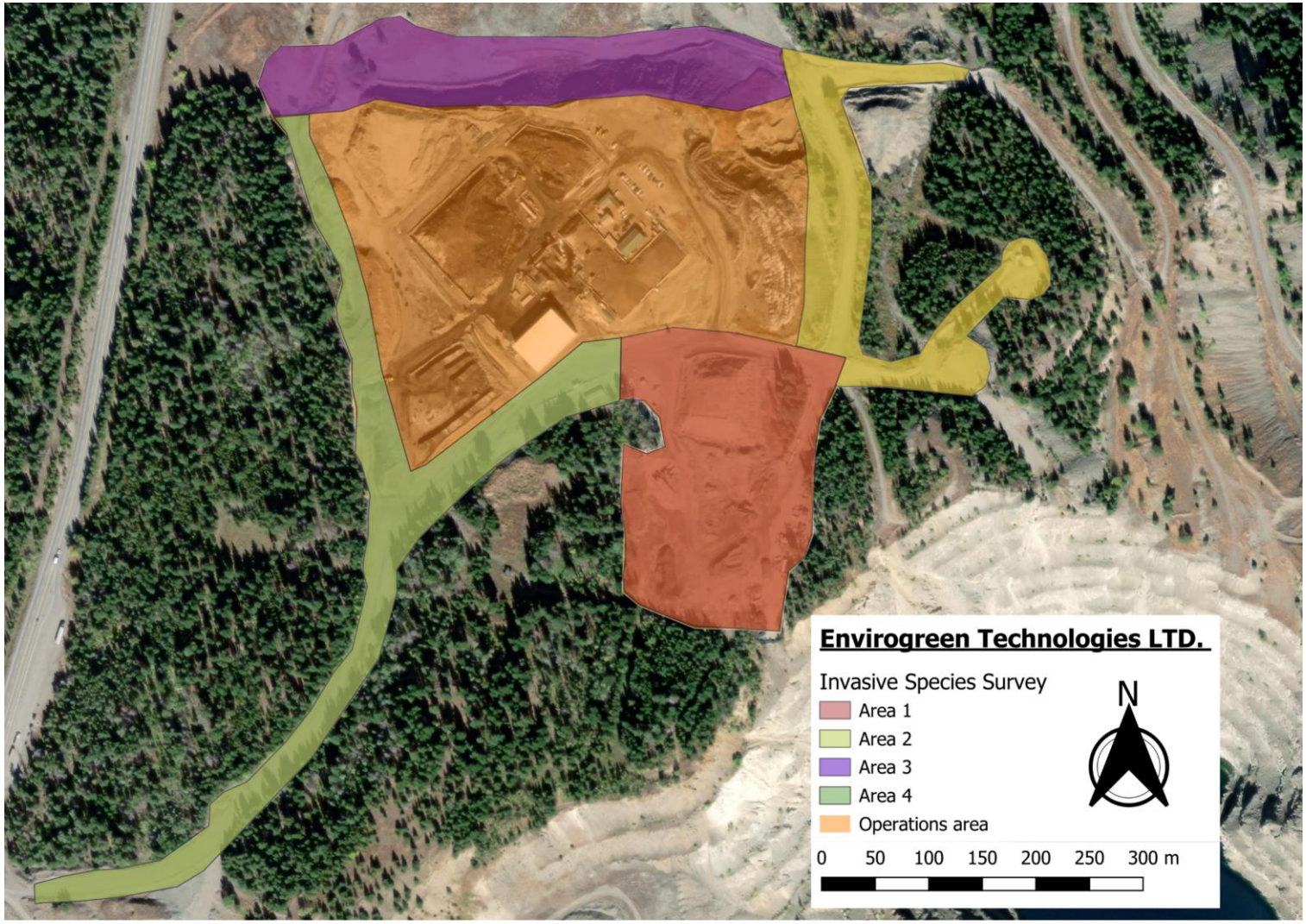

Figure 1: ETL site broken up into survey areas by distinct habitat and invasive plant communities

AREA 1:

Common name	Scientific Name	Percent coverage Estimate
Spotted knapweed	*Centaurea stoebe*	75
Dalmatian toadflax	*Linaria dalmatica*	5
Nodding thistle	*Carduus nutans*	5
Scentless chamomile	*Tripleurospermum inodorum*	10
Common tansy	*Tanacetum vulgare*	5

Figure 2: A) Knapweed root weevil (Cyphocleonus achates). B) Nodding thistle (Carduus nutans)

AREA 2:

Common name	Scientific Name	Percent coverage Estimate
Spotted knapweed	*Centaurea stoebe*	50
Diffuse knapweed	*Centaurea diffusa*	5
Dalmatian toadflax	*Linaria dalmatica*	5
Russian thistle	*Salsola tragus*	5
Kochia	*Bassia scoparia*	20
Scentless chamomile	*Tripleurospermum inodorum*	10
Common tansy	*Tanacetum vulgare*	5

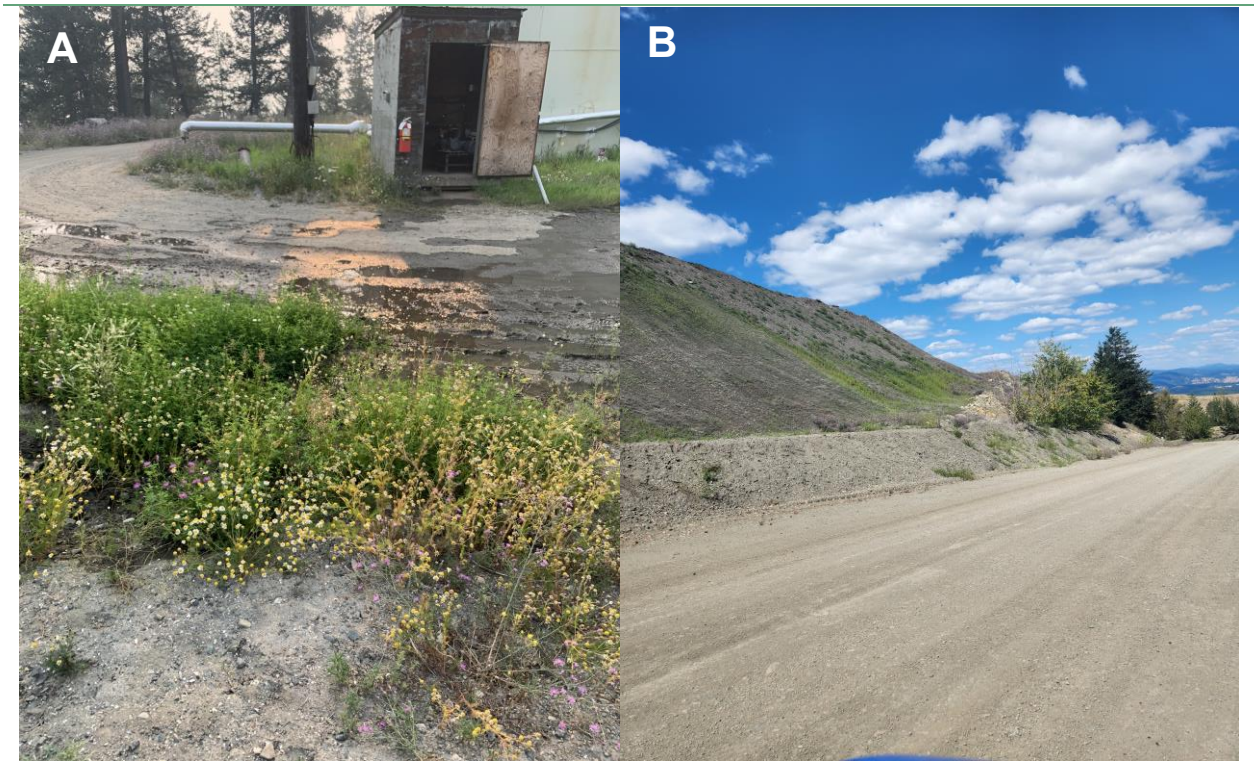

Figure 3: A) Kochia, Spotted knapweed, and Scentless chamomile located near a frequented water filling station. B) Eastern slope of operational area showing signs of Kochia & Russian thistle establishment

Figure 4 4: Staging area with Spotted knapweed and Common tansy. This could increase the spread of invasive species on and off-site

AREA 3:

Common name	Scientific Name	Percent coverage
Spotted knapweed	*Centaurea stoebe*	35
Diffuse knapweed	*Centaurea diffusa*	5
Dalmatian toadflax	*Linaria dalmatica*	5
Himalayan blackberry	*Rubus armeniacus*	5
Russian thistle	*Salsola tragus*	5
Kochia	*Bassia scoparia*	20
Scentless chamomile	*Tripleurospermum inodorum*	10
Common tansy	*Tanacetum vulgare*	10
Cheatgrass	*Bromus tectorum*	5

Figure 5: Hillside covered in a mixture of Dalmatian toadflax, Spotted / Diffuse knapweed, Common tansy, Cheatgrass, and some non-invasive grasses

Figure 6 6: A patch of Himalayan blackberry, a species uncharacteristic of the climate and ecosystem. Likely brought in from topsoil from biowaste facilities

AREA 4:

Common name	Scientific Name	Percent coverage
Bull thistle	*Cirsium vulgare*	5
Spotted knapweed	*Centaurea stoebe*	60
Diffuse knapweed	*Centaurea diffusa*	5
Dalmatian toadflax	*Linaria dalmatica*	5
Kochia	*Bassia scoparia*	5
Scentless chamomile	*Tripleurospermum inodorum*	10
Common tansy	*Tanacetum vulgare*	5
Ox-eye daisy	*Leucanthemum vulgare*	5

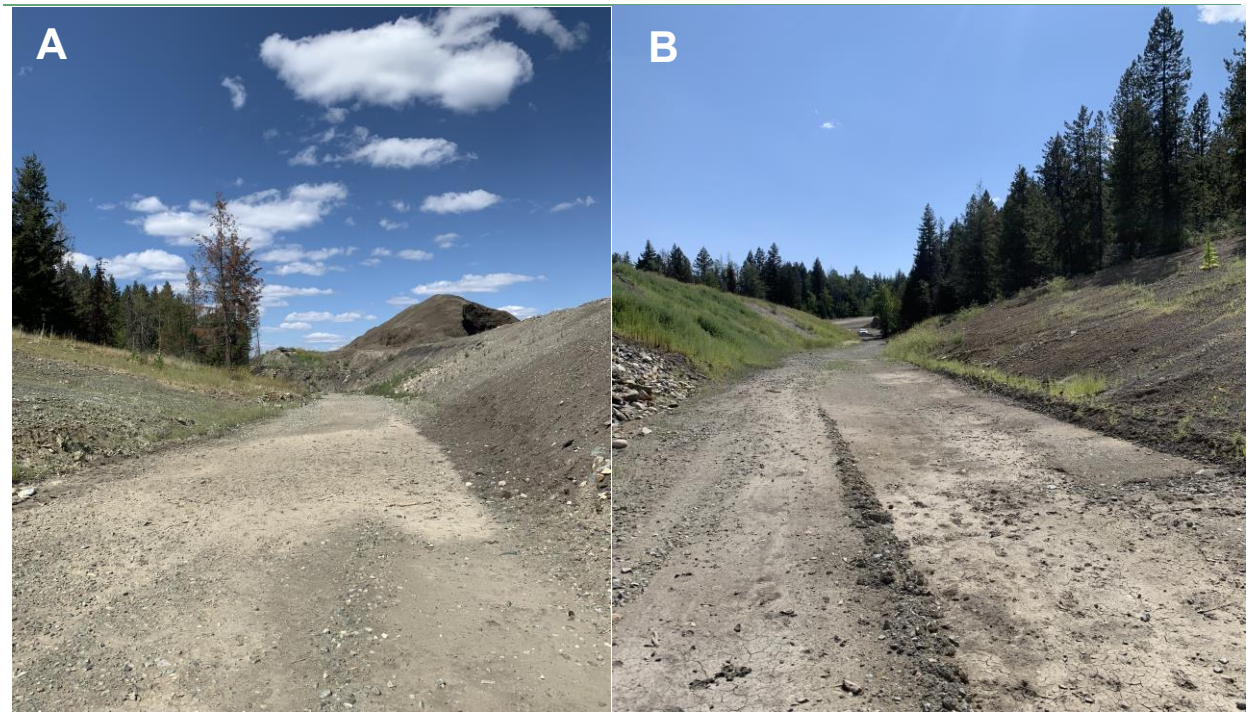

Figure 7 7: A) The western edge of the facility facing north, bare soil from recent rehabilitation efforts shows signs of invasive plant establishment (Dalmatian toadflax, Oxeye daisy, Russian thistle). B) The western edge of the facility faces south, the restoration seeding mix grows in between Kochia, and tree seedlings.

Figure 8 8: Kochia (Bassia scoparia)

OPERATIONS AREA:

A significant portion of the ETL site is designated as the 'operations area', which was not included in the invasive plant survey at the request of ETL. This area is characterized by intensive operational activities involving the frequent movement of heavy machinery, and materials. Additionally, the majority of the ground in this area is not suitable for the growth of plants as it is a concrete pad, developed to prevent any contaminates from leaching into the surrounding soils.

Species Habitat Requirements

Understanding the habitat requirements of invasive plants is crucial for assessing the risk of establishment or spread on ETL property. To determine the risk of invasive plants a list of species of concern was provided by ETL, The species are Japanese knotweed (*Reynoutria japonica*), perennial pepperweed (*Lepidium latifolium L.*), cordgrass (*Spartina angelica, S. patens, S. densiflora*), poison hemlock (*Conium maculatum*), wild chervil (*Anthriscus sylvestris*), shiny geranium (*Geranium lucidum*), and Canada thistle (*Cirsium arvense*). These species were selected as potential risks during the treatment of contaminated soils arriving from outside of the Princeton area.

A detailed analysis of each species' habitat requirements including distribution, habitat conditions, soil preferences, environmental tolerances, and typical habitat types is provided (Appendix 1). Building on the information gathered, the following analysis assesses the likelihood of each species establishing on ETL property and the larger areas around Princeton. By comparing their habitat requirements to those observed at the ETL site, and ecosystems around them, the species are categorized into three risk levels: High Risk, Low Risk, No Risk

Habitat Suitability Analysis.

High risk of establishment

These invasive plants have habitat requirements that closely align with the conditions present at the ETL site, making their establishment highly likely. They are found across a wide range of the southwest coast, Fraser Valley, and the southern interior of BC. This increases the likelihood of species arriving at the ETL site through vectors such as vehicles, soil, and other materials.

Japanese knotweed: This species is highly invasive, it can spread and reproduce through plant fragments, rhizomes, and seeds. It is adapted to grow in a range of moisture and light levels and thrives in disturbed areas. Although not currently present on site, habitat to support the establishment of knotweed can be found throughout the highway 3 corridor. This combined with the potential to cause harm make it a high risk for establishment on the ETL site, especially near wet areas, and stockpiles[1].

Wild chervil: This species prefers moist nutrient-rich soils and disturbed habitats but

[1] Anderson, H. (2012) Invasive Japanese Knotweed (Fallopia japonica (Houtt.)) Best Management Practices in Ontario. Ontario Invasive Plant Council, Peterborough, ON.Retrieved from https://www.invasivespeciescentre.ca/wp-content/uploads/2019/12/OIPC_BMP_JapaneseKnotweed.pdf

can tolerate a range of soil moistures, nutrient, and light levels. It reproduces by plant fragment and seed, between 800-10,000 seeds per mature plant. Besides the Fraser Valley and Lower Mainland, this species is also in isolated areas of the Okanagan and Shuswap regions. The ETL site and surround area have the soil and environmental conditions to sustain wild chervil, making it a high risk. [2]

Canada thistle: This species is found throughout the province including the Princeton and Similkameen regions, increasing its likelihood of reaching the ETL site. The species spreads aggressively via rhizomes, making it difficult to manage once established. Its preference for disturbed areas, which are common at the ETL site, makes it a high-risk species for colonization[3]

Low risk of establishment

These invasive plants have habitat requirements that partially match the ETL site's conditions. Both species are known in the Thompson region and Fraser Valley, which are considerable distances away from ETL, making their establishment possible but less likely under current conditions.

Shiny geranium: This species thrives in a well-shaded areas, but may persists in moderate to full sun, it can tolerate a wide range of soil moisture levels. Shiny geranium reproduces by seed, with a single plant capable of producing thousands of seeds. Its ability to form dense mats that crowd out native vegetation, Although it is tolerant to a variety of mousiture levels, and adaptability to disturbed and semi-natural environments it thrives primarily in full to partial shade, as most of the facility is fully exposed, the risk of establishment would be low, but a higher risk if operations moved closer to shaded areas near naturalized zones.[4]

Perennial pepperweed: This species prefers moist, riparian areas, flood plains, wetlands, and saline environments but is also adaptable to drier conditions. It can reproduce through creeping roots and seeds, with each plant capable of producing hundreds of seeds, and as little as 1cm of plant parts enough to reproduce. While it thrives in coastal regions and moist riparian zones, the limited availability of such habitats at the ETL site and the small amount across BC reduces the likelihood of its establishment[5].

Poison hemlock: Poison hemlock prefers moist, nutrient-rich soils typically found in disturbed areas near waterways, but it can also tolerate drier sites. It reproduces via seeds, with each plant producing thousands of seeds annually. Although its primary habitat is along streambanks and ditches, the disturbed areas at ETL could

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[2] Invasive Species Council of Metro Vancouver (2021). *Wild chervil: Best management practices*. Metro Vancouver, BC. Retrieved from https://metrovancouver.org/services/regional-planning/Documents/wild-chervil-best-management-practices.pdf

[3] A Guide to Weeds in British Columbia. Canada thistle. www.for.gov.bc.ca/hra/plants/weedsbc/canada_thistle.pdf

[4] Government of British Columbia. (2017). *Invasive species alert: Shiny geranium (Geranium lucidum)*. Victoria, BC: Ministry of Environment and Climate Change Strategy. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/alerts/shiny_geranium_weed_alert.pdf

[5] USDA Forest Service. (2017). *Perennial pepperweed: An invasive plant*. Rangeland Management Botany Program, Washington, DC. Retrieved from https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd563037.pdf

potentially support this species. However, the absence of consistently wet habitats makes the risk of establishment low[6].

No risk of establishment

This invasive plant has habitat requirements that are incompatible with the conditions at the ETL site. Although a freshwater plant, in BC it is only known in saltwater tidal mudflats and marshes in the south coastal mainland and Vancouver Island. It is unlikely to establish on the ETL site.

Cordgrass: Primarily found in saltwater marshes and tidal mudflats along coastal regions of British Columbia. The inland location and absence of wetland habitats at the ETL site make it highly unlikely for this species to establish. There is no immediate risk[7].

Recommendations

- Establish and/or strengthen equipment best practices to help prevent the introduction and movement of invasive plants to the site and/or across the site
- Establish and/or ensure soil movement best practices to avoid the movement of infested soils
- Conduct an annual survey to identify any new invasive plants and track the movement of the invasive plants found on the ETL properties
- Provide training for ETL staff and contractors on the identification of invasive plants on site and nearby and best management practices to avoid the spread of these species on ETL properties. Reference to 'ETL Process Improvement Report: To Prevent the Transfer of Invasive Species'
- Monitor and expand best practices from invasive plants to other species due the movement of a variety of soils from various locations, especially the BC south-coast region, where invasive species like the Japanese beetle, Spongy moth, and Chafer beetle are known. Insects could find their way to the site through not only soils but other vectors such as trucks, vehicles, containers, and other materials. Consider the development of a strategic Invasive Species Management Plan (ISMP) o address the management of all invasive species on or that may arrive at the ETL site. This plan should be strategic in scope over at least 5 years and include prevention, identification of key invasive species, appropriate f management techniques, and monitoring plan completed detailed sampling for biological control agents for Spotted and Diffuse knapweed, Dalmatian toadflax, and Bull thistle at specific times during the agents' lifecycle (this will differ between agents') to determine the level of presence and plant attack. If there is low or no presence, work with the Ministry of Forests, Invasive Plant Program to discuss the collection and release or introduction of

[6] University of California Agriculture and Natural Resources, Statewide Integrated Pest Management Program. (2018). *Poison hemlock* (Pest Notes Publication 74162). Davis, CA. Retrieved from https://ipm.ucanr.edu/legacy_assets/PDF/PESTNOTES/pnpoisonhemlock.pdf

[7] Coastal Invasive Species Committee. (2009). *Spartina identification cards*. Retrieved from https://www.coastalisc.com/wp-content/uploads/2011/03/2009spartina-id-cards-2.pdf

biological control agents for these species on ETL properties.

The Invasive Species Council of BC is pleased to discuss these recommendations and opportunities for partnerships in the development of best practices, field inventory, and/or training programs and resources.

Appendix 1: Species Requirements Table

Species	Distribution	BC Distribution	Habitat Conditions	Soil conditions	Environmental Conditions	Habitat Types
Japanese Knotweed[8]	US - Eastern, mid, and western states Canada - Eastern provinces and BC	Southwest coastal areas, Fraser Valley, stream corridors in the southern interior, and east Kootenays.	Open areas to deep shade	Prefers deep soils. Tolerates high salinity, Moist to mesic	Tolerates high heat and drought	Stream and river edges, lowland areas (ditches, disturbed sites), RoW
Perennial Pepperweed[9]	US - eastern seaboard, in several Midwestern states, and throughout western states. Canada - BC, AB, MB, Quebec	East Kootenay (Windermere), Walachin, 83 Mile House, Surrey Mud Bay Park, South Vancouver	Moist or periodically flood, but can adapt to drier upland conditions	Prefers moist soil. Saline tolerant. Salinity does not appear to affect seed germination	Sea level to 3,300 m in elevation. Can also occur in semi-desert sagebrush, grasslands, sand beaches, and along roadsides.	Wet to mesic areas, riparian (stream) areas, coastal wetlands, marshes, roadsides, railways, ditches, hay meadows, pastures, rangelands, semi-

[8] Anderson, Hayley. (2012*). Invasive Japanese Knotweed (Fallopia japonica (Houtt.)) Best Management Practices in Ontario*. Ontario Invasive Plant Council, Peterborough, ON. Retrieved from https://www.invasivespeciescentre.ca/wp-content/uploads/2019/12/OIPC_BMP_JapaneseKnotweed.pdf

[9] Government of British Columbia. (2017). *Invasive species alert: Perennial pepperweed*. Victoria, BC: Ministry of Environment and Climate Change Strategy. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/alerts/perennial_pepperweed_alert.pdf

						desert sagebrush grasslands, cropland, and waste places.
Cordgrass[10] [11] *Spartina angelica, S. patens, S. densiflora*	BC, Washington, California	*S. angelica* - Boundary Bay, Roberts Bank, Vancouver *S. patens, and S. densiflora,* Comox, Denman Island, Courtenay	Salt marshes in the lowland zone	Tidal mudflats	Climate types not evaluated, unknown or variable	Colonizes large areas of tidal mudflats and saltmarsh
Poison hemlock[12]	US -Not found in Mississippi, Florida In Canada – Not found in Manitoba, Newfoundland-Labrador, Territories	Langford, Victoria, Vancouver, Kootenay, Okanagan, Mainland, Vancouver Island, and Cariboo regions	BEC -ICH(1), MS(1)	Wet to mesic sites in the lowland zone. Competitive where moisture is abundant, it can also survive in dry sites	Climate types not evaluated, unknown or variable	Ditches, disturbed sites, roadsides, streams, irrigation ditches, pasture and cropland borders, riparian woodlands, floodplains of natural aquatic systems, and

[10] Coastal Invasive Species Committee. (2009). *Spartina identification cards*. Retrieved from https://www.coastalisc.com/wp-content/uploads/2011/03/2009spartina-id-cards-2.pdf

[11] Washington State Department of Agriculture. (2014). *Spartina field guide*. Olympia, WA: Washington State Department of Agriculture. Retrieved from https://cms.agr.wa.gov/WSDAKentico/Imported/SpartinaFieldGuide.pdf?/SpartinaFieldGuide.pdf

[12] Clark County Public Works. (n.d.). *Poison hemlock control sheet*. Vancouver, WA: Clark County Public Works. Retrieved from https://clark.wa.gov/sites/default/files/dept/files/public-works/Vegetation/Poison%20Hemlock%20Control%20Sheet.pdf

						grazing areas, particularly pastures and meadows.
Wild chervil[13] [14] [15]	US – Pacific Northwest states and northeastern states. Canada – BC, Ontario, Quebec, Newfoundland	Fraser Valley, southern interior (North Okanagan, Shuswap)	Disturbed sites, fields, and margins of woods in the lowland and montane zones.	Wet to moist. Thrives where soils are rich. Will grow in a variety of soils but prefers low to mid-elevation.	Climate types not evaluated, unknown or variable	Prefers wet to moist disturbed sites, and stream corridors. Tolerates part shade. Prefers open sites along ditches, roadsides, rail corridors, fence lines, stream banks, fields, wood margins and RoW
Shiny geranium[16]	BC US – Washington, Oregon, California	Greater Victoria, Sooke, Comox, Salt Spring Island, Fraser Valley	Seeds germinate in favourable conditions in a variety of habitats	Moist soils but tolerates a variety of soil conditions.	Tolerates a variety of light conditions.	Prefers semi-open woodlands, riparian corridors, forest understories, roadsides, and pastures. Thrives

[13] Government of British Columbia. (2017). *Invasive species alert: Shiny geranium*. Victoria, BC: Ministry of Environment and Climate Change Strategy. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/alerts/shiny_geranium_weed_alert.pdf

[14] Government of British Columbia. (2002). *Guide to weeds in British Columbia*. Victoria, BC: Ministry of Agriculture, Food, and Fisheries. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/guidance-resources/guidetoweeds.pdf

[15] In Klinkenberg, Brian. (Editor). (2020). *E-Flora BC: Electronic Atlas of the Plants of British Columbia* [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Colum, Vancouver. Retrieved from E-Flora BC Atlas Page (ubc.ca)

[16] Capital Regional District. (2020). *Invasive species alert: Shiny geranium (Geranium lucidum)*. Victoria, BC: Capital Regional District. Retrieved from https://www.crd.bc.ca/docs/default-source/es-watersheds-pdf/invasive-species/shiny_geranium_weed_alert_mar2020.pdf?sfvrsn=a5674ecc_2#:~:text=What%20to%20do%20if%20you%20spot

						in lawns, gardens, trail edges, forest understorey, sidewalk cracks, and compost piles
Canada thistle[17]	US – not in Texas, Louisiana, Mississippi, Georgia, South Carolina, Oklahoma Canada – not known in Labrador, Inavut	Found in most regions of BC from northern areas to southern areas to the border. Considered naturalized by some.	All BEC zones BG(12), CDF(2), CWH(77), ESSF(18), ICH(36), IDF(75), MS(29), PP(15), SBS(23), SWB(3)	Mesic to dry in the lowland, steppe, and montane zones. Xeric to hydric, does not tolerate very wet locations. Adapted to a wide range of soil types, adapted to rich, heavy loam, clay loam, and sandy loam, tolerates saline soils (up to 2% salt), and a wide range of soil moisture conditions.	0 to 2200 M elevation, occurs where 45–90 cm annual precipitation or where supplemental soil moisture is available. Thrives in direct sunlight. Adapted to a wide range of environmental conditions. Climate types not evaluated, unknown or variable	Roadsides, disturbed areas, pastures, cultivated fields, logged forests, riverbanks

[17] Government of British Columbia. (2002). *Guide to weeds in British Columbia*. Victoria, BC: Ministry of Agriculture and Food. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/guidance-resources/guidetoweeds.pdf