KEEYASK TRANSMISSION PROJECT

ENVIRONMENTAL EFFECTS MONITORING

INVASIVE PLANT MONITORING IN 2017

Prepared for

Manitoba Hydro

By

ECOSTEM Ltd.

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SUMMARY

Invasive plants are those non-native plants that can out-compete or even replace native plants. Non-native plants are plant species that are growing outside of their country or region of origin (Manitoba Hydro 2012). Invasive plants are of concern because they can materially affect rare plant species, alter soil conditions and, in extreme cases, change vegetation composition or other ecosystem attributes. Non-native plant species are also of interest because they may become invasive under some local conditions, or may become invasive in the future due to changing climate.

This report provides results for the invasive plant monitoring conducted for the Keeyask Generation Outlet transmission line, Keeyask Generation Unit Line and Keeyask Construction Power ROWs (the Project) during the 2017 growing season.

As of August 2017, four single, non-native plants were observed in the cleared Project ROW. Three of these plants were common dandelion, while the remaining one was common plantain. Neither species is classified as being invasive, or as being an invasive concern.

Three of the four observed locations were close to the south access road ditch, and one was at the eastern end of the ROW near the Radisson Converter Station.

The extremely low cover of non-native plants in the cleared Project ROW was likely due to a combination of factors including the low proportion of the ROW area with exposure mineral substrates, the relatively short time since clearing, limitations on potential seed input, and increasing native vegetation cover.

Invasive plant monitoring will continue in 2018.

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STUDY TEAM

Dr. James Ehnes was the project manager and study designer.

Fieldwork in 2017 was conducted by Brock Epp, Nathan Ricard and Alanna Sutton of ECOSTEM Ltd. and Barry Flett from TCN.

Data analysis and report writing in 2017 were completed by Brock Epp and James Ehnes. GIS analysis and cartography were completed by Nathan Ricard.

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1.0 INTRODUCTION

In 2014, Manitoba Hydro received an Environment Act Licence for the construction, operation and maintenance of the Keeyask Transmission Project (the Project), which includes the Keeyask Generation Outlet transmission line, Keeyask Generation Unit Line and Keeyask Construction Power ROWs (the Project). Licence requirements include monitoring the environmental effects of the Project as outlined in the licence conditions and the Project Environmental Assessment Report. The Keeyask Transmission Project Environmental Effects Monitoring Plan (Manitoba Hydro 2015) defines how this monitoring will be undertaken.

The Keeyask Transmission Project Environmental Effects Monitoring Plan includes monitoring effects on terrestrial ecosystems and vegetation, focusing on intactness, ecosystem diversity, priority plants and invasive plants. Vegetation monitoring in the 2017 growing season focused on invasive plants. This report provides results for the invasive plant monitoring conducted in 2017.

Invasive plants are those non-native plants that can out-compete or even replace native plants. Non-native plants are those plants that are growing outside of their country or region of origin. Invasive plants are of concern because they can materially affect rare plant species, alter soil conditions and, in extreme cases, change vegetation composition or other ecosystem attributes. Non-native plant species are also of interest because they may become invasive under some local conditions, or may become invasive in the future due to changing climate.

The invasive plant monitoring program includes a single study, the Invasive Plant Spread and Control study. The goals of this study are to determine the degree to which the Project contributes to introducing and spreading invasive and other non-native plants, and to evaluate the effectiveness of mitigation measures. The overall objectives of the Invasive Plant Spread and Control study are to:

- Verify the implementation of mitigation measures such as appropriate seed mixes;
- Document the degree of invasive plant introduction and spread; and
- Recommend appropriate control and eradication programs, if there is introduction and/or spread.

Invasive plant monitoring activities in 2017 included field surveys to address the last two study objectives.

2.0 METHODS

Section 4.2.4 of the Keeyask Transmission Project Environmental Effects Monitoring Plan (Manitoba Hydro 2015) outlines the methods for this study. The following summarizes the activities conducted in 2017.

2.1 DATA COLLECTION

Non-native plant data were collected within the cleared portions of the Project rights-of-way (ROW) during the 2017 growing season. Data were collected along transects at pre-determined locations dispersed throughout the ROW. Most of these transects were situated near existing roads or other infrastructure for two reasons. Previous studies had found that non-native plants in the region primarily occur near human features and activity (KHLP 2012). Additionally, previous Project-related plant surveys on more remote sections of the Project construction power ROW did not observe any non-native plants (ECOSTEM 2017b).

Non-native plant surveys were conducted on August 22 and 29, 2017 at the locations shown in Map 2-1. Two people walked along each. One person led the survey by walking the predetermined transect route that had been recorded in a handheld GPS unit (Garmin Map62 or Map78). A botanist followed behind, surveying a band centred on the transect. The width of the surveyed band varied based on what was visible from the transect line (primarily influenced by the terrain and height of vegetation), but was never less than 10 m wide. Additionally, the botanist walked to vegetation patches away from the transect if they looked like they might include non-native plants. These meandering searches were expected to detect any larger, taller patches of invasive plants situated within the entire cleared ROW width due to its openness given the relatively short time since clearing.

Field surveys recorded all non-native plants regardless of whether or not they were also invasive. When a non-native plant location was found, data recorded at each species location included spatial coordinates, spatial extent and abundance. Additional notes were also recorded and photos were taken.

The spatial extent of non-native plants at a location was recorded either as a patch or as a point with an associated number of individuals. The “point with number of individuals” method was typically used in locations where there less than 20 individual plants covering a very small area. In these situations, the number of plants of each species and a GPS waypoint (using a Garmin Map 62 or Map 78) were recorded as close to centre of the patch as possible for the species.

For the remaining non-native plant locations, recorded patch data included estimated vegetation patch boundaries and non-native plant cover by species. Patch boundaries were obtained using a handheld GPS for each vegetation patch that included one or more non-native plant species. The percent cover of each non-native species within the vegetation patch boundaries was then visually estimated.

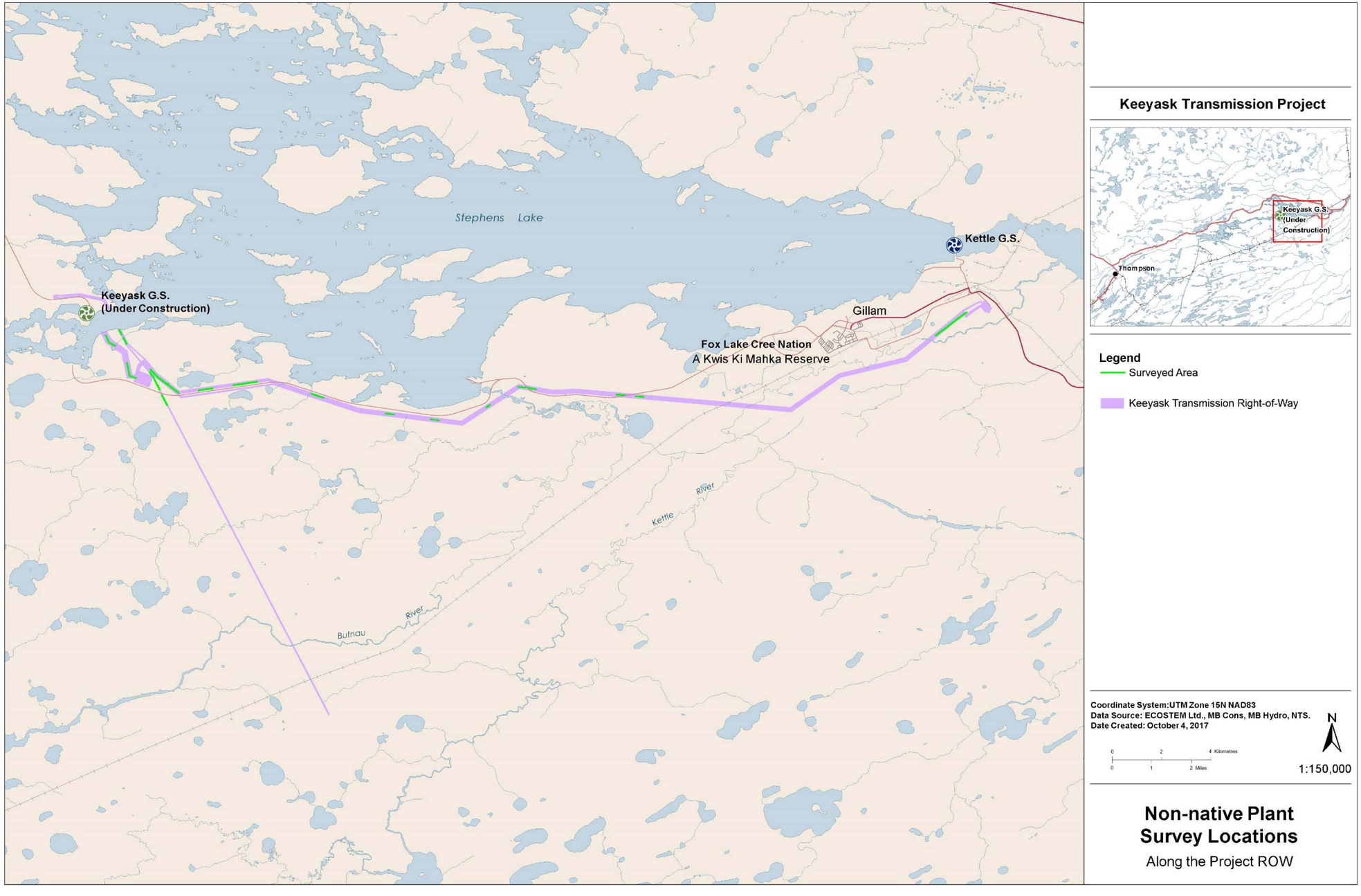
Vegetation patch boundaries were recorded in one of three ways:

1. **Point:** Used for small patches that had a relatively regular shape. Typically applied to small patches in open areas where the boundaries were visible from a single point. In these situations, a GPS waypoint was taken at the patch center whenever possible, with an associated ocular estimate of patch radius (in meters) for circular patches or the dimensional length (e.g. 2m x 4m) for rectangular patches.
2. **Band:** Used for patches too large to be recorded as a point and had a relatively regular band shape. In these situations, the length of the band of the non-native species (e.g. along a ditch) was walked while a GPS recorded a track log for the species. An estimate of the average band width in meters was recorded. For some wider bands, the band width was recorded using distinct features such as a specific impact area (e.g. width of the transmission line right-of-way).
3. **Defined Area:** Used if the patch could not be recorded as a point or a band. In these situations, the surveyor generally walked around the perimeter of a large homogeneous patch with non-native species cover while recording a GPS track log for the patch. Alternately, the surveyor walked through the area in a zig-zag transect so that the points generally corresponded to the boundaries of the patch. The former method was used when the non-native species could be observed throughout the patch from the outer boundaries, which typically occurred in open barren, or low vegetation areas. The latter method was used in heavily vegetated areas where non-native plants were not visible over a long distance. In this method, waypoints were added while recording the species tracklog to indicate if there was a change in cover.

For each non-native species patch, plant cover was estimated and recorded into one of the six classes listed in Table 2-1.

Table 2-1: Cover class and associated percent cover ranges used for non-native plant surveys

Cover Class	Percent Cover Range
Very sparse	>0 - 3%
Sparse	3 - 10%
Low	11 - 25%
Moderate	26 - 50%
High	51 - 75%
Very high	76 - 100%



Map 2-1: Non-native plant survey locations

2.2 MAPPING

Distribution and abundance maps were produced by creating GIS polygons from the spatial extent and cover data obtained during the field surveys. Where the patch extent method (Section 2.1) was used to record non-native species in the field, patch polygons were created from the GPS tracklogs. Polygons for locations where plants were recorded as individuals in the field were created by applying a radius buffer around the location coordinate. The radius applied for each species at each point was a fixed value for the species multiplied by the number of plants recorded. The radius for one plant of a particular species was the estimated typical area covered by an individual plant (Appendix 1).

The non-native plant mapping provided two measures of non-native plant cover. One measure was the overall spatial extent of one or more non-native plant species, which also indicated species distribution. The other measure was the area covered by each species (approximate plant cover), which was used to indicate abundance. Non-native plant cover will almost always be lower than plant extent due to less than complete canopy closure within some of the mapped patches.

Non-native plant cover was derived from the patch cover class (Table 2-1) for locations recorded using the “patch method” or from multiples of individual plant area (Appendix 1) for locations recorded using the “number of individuals” method. The area covered by a species in a mapped patch was calculated by multiplying the patch area by the midpoint of the percent cover class (Table 2-1). For example, a 10 m^2 non-native plant patch with sparse cover for Species A would have a derived area of: 10 m^2 x 6.5% = 0.65 m^2 for Species A.

3.0 RESULTS

In 2017, 17 transects, totalling 11 km in length, were surveyed in the cleared portion of the Project ROW (Map 3-1).

Non-native plants were found at only four locations in the entire surveyed area. All observations consisted of single plants, three of which were common dandelion (*Taraxacum officinale*), and one common plantain (*Plantago major*).

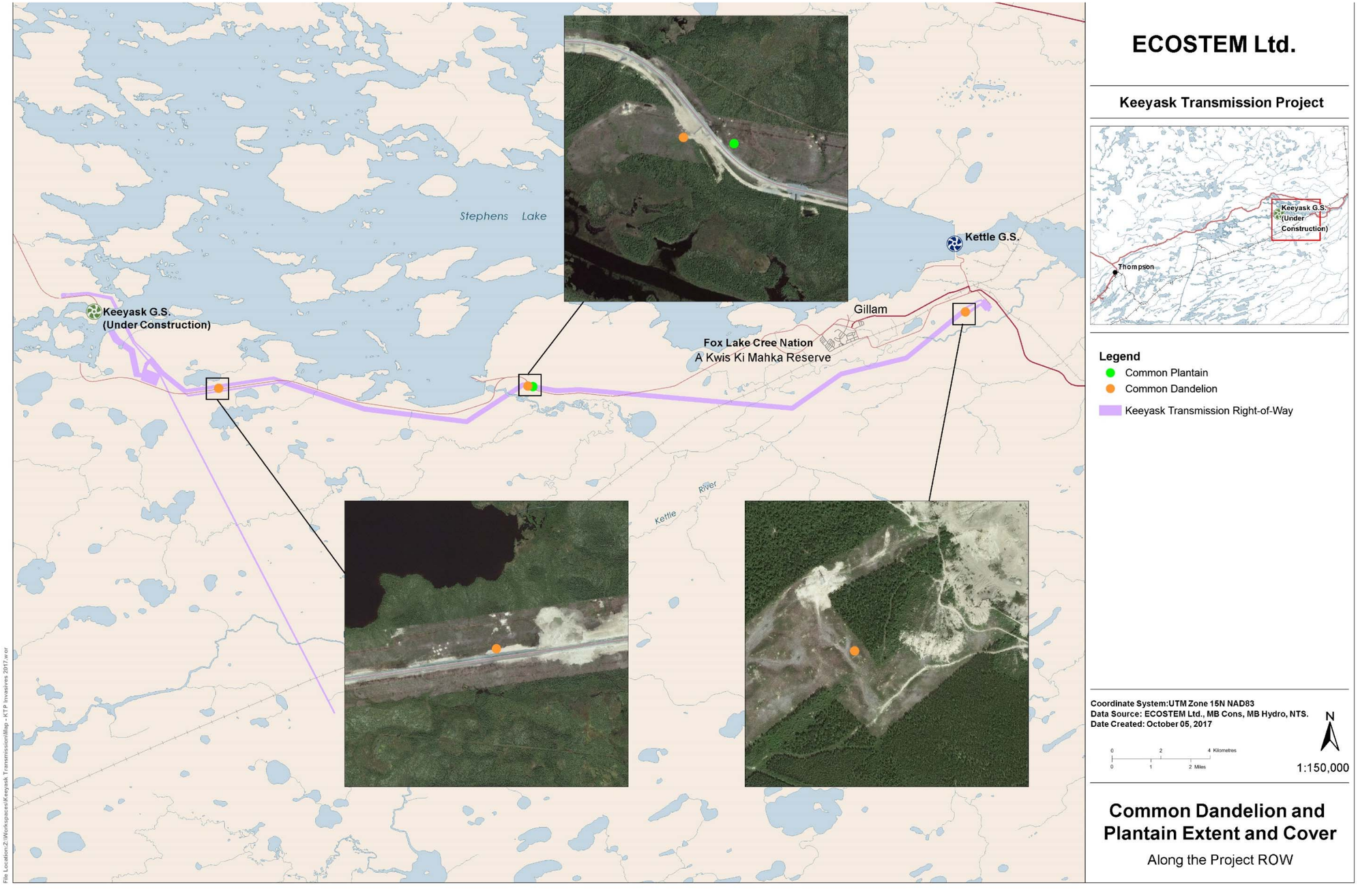
Common dandelion and common plantain are non-native plants, but not listed as an invasive species in Canada (White *et al.* 1993), or a species of concern by the Invasive Species Council of Manitoba (ISCM; 2017). Common dandelion is, however, considered to be a noxious weed in Manitoba (Government of Manitoba 1988).

Two of the common dandelion plants and the single common plantain plant were found in the ROW near the south access road ditch (Map 3-1). It was apparent that the westernmost common dandelion had already seeded (Photo 3-1), but no other plants were found nearby. The third common dandelion was found near the eastern end of the ROW, on a machine trail extending through the clearing.

In 2016, a patch of common dandelion was recorded at another location near the Radisson Converter Station (ECOSTEM 2017a), but these plants were not found there in 2017.

Field personnel conducting this and other monitoring studies anecdotally observed that mineral substrate exposure in the cleared ROW was quite limited. These sites typically occurred where towers had been installed.

Photo 3-1: Common dandelion growing in the transmission ROW.



Map 3-1: Non-native plant distribution and cover

4.0 SUMMARY AND CONCLUSIONS

Invasive plants are those non-native plants that can out-compete or even replace native plants. Non-native plants are those plants that are growing outside of their country or region of origin. Invasive plants are of concern because they can materially affect rare plant species, alter soil conditions and, in extreme cases, change vegetation composition or other ecosystem attributes. Non-native plant species are also of interest because they may become invasive under some local conditions, or may become invasive in the future due to changing climate.

The Project's Environmental Assessment Report predicted that the Project is not expected to substantially increase the rate at which invasive plants are introduced and/or spread in the Project area (Manitoba Hydro 2012). Project environmental protection plans include measures to reduce the risk that equipment transported from outside the region will bring non-native plant seeds into the Project area.

The Invasive Plant Spread and Control study is monitoring the degree to which the Project contributes to introducing and spreading invasive and other non-native plants. This study also recommends control measures where appropriate, and evaluates the effectiveness of mitigation measures.

As of August 2017, non-native plants were observed at only four locations within the cleared Project ROW, and all observations consisted of single plants. These included three common dandelion plants and a single common plantain plant.

Three of the four plants observed during the 2017 surveys were situated close to the south access road, near the ditch. At these three locations, it was quite possible that the plants had established there as a result of south access road construction or traffic. This was particularly likely at the two locations just east of the south access road gate, which were very close to the decommissioned Butnau Road where these species were well established prior to the Project (anecdotal observation by field staff). Other studies (ECOSTEM 2012; KHLP 2012) showed that invasive plants were well established along the public roads in the region.

The fourth plant, which was a common dandelion, was situated near the east end of the ROW beside a trail extending through the clearing. This location was in close proximity to the Radisson Converter Station, where common dandelion was well established (anecdotal observation by field staff).

The likely reasons why non-native plant cover remained very low in the cleared ROW were predominantly the same as stated in ECOSTEM (2017a). These reasons included a combination of the:

- Very low proportion of ROW area having exposed mineral substrates;
- Relatively short time since ROW clearing; and,
- Limitations on potential seed input.

An additional factor for 2017 was that the cover of native plants was increasing.

Other studies in the region have found that non-native plant species are most common on exposed mineral substrates (ECOSTEM 2012; ECOSTEM unpublished data). Only a small proportion of the ROW had exposed mineral substrates, which lowered the availability of higher quality seedbeds for non-native plant species. The paucity of exposed mineral substrates was attributed to two factors. With the exception of transmission tower bases, the clearing was only intended to remove taller vegetation. Also, clearing occurred when the ground was frozen, which minimized unintentional surface organic layer disturbance or removal.

Regarding the relatively short time since clearing, previous extensive studies in the region showed that non-native species were extremely rare in undisturbed native habitat (KHLP 2012). When the vegetation in such habitat is cleared, time is required for non-native plants to colonize from other areas or from seeds buried in the soil.

The amount of time required for colonization from other areas is expected to vary with distance from established non-native plant populations, among other things. Long-existing human infrastructure and activity are typically the primary locations for established non-native populations. Three out of the four new plant locations found in 2017 were in close proximity to well-established seed sources along the decommissioned section of Butnau Road and the Radisson Converter Station.

Relative to its total length, much of the ROW is distant and/or somewhat sheltered from existing human infrastructure and activity. Where the ROW approaches or follows existing infrastructure, it is somewhat sheltered from that infrastructure by a band of native vegetation that ranges from 20 m to more than 800 m in width. Of these vegetated bands, many of the narrowest are along the south access road, which was only recently cleared during Keeyask Generation Project construction.

Factors that appeared to be limiting the potential input of non-native seeds included winter clearing, equipment cleaning and the age of nearby recently cleared areas. Snow cover was expected to reduce the number of seeds picked up by equipment moving through sites. Efforts to clean equipment prior to arriving at the Project should have reduced the amount of non-native seed transported into the ROW. Finally, much of ROW length that is adjacent to existing infrastructure follows the recently constructed Keeyask Generation Project south access road, where non-native plant cover was low in 2016 (ECOSTEM 2017c), and remained low in 2017 (ECOSTEM unpublished data).

In 2017, expanding native plant cover in the ROW (Photo 4-1) was a new possible factor that was limiting the establishment or spreading of non-native plants. Expanding native plant cover should at least somewhat reduce non-native plant cover through shading and competition for resources. Native plant cover should also create a hindrance to the establishment of new non-native plant locations as plant litter gradually covers exposed mineral substrates.

Photo 4-1: Regenerating native vegetation in transmission ROW.

Control recommendations were not developed for the four observed plants for several reasons. While the common dandelion is considered a noxious weed in Manitoba, both that and common plantain are not listed as an invasive species of concern in Canada (White *et al.* 1993) or by the ISCM (2017). These species are not known to crowd out native vegetation. Also, both species are difficult to control since they are ubiquitous in human-disturbed areas. In the case of dandelion, winds readily spread its light airborne seeds. Finally, given the limited amount of vegetation clearing and ground disturbance, it is expected that native plant regeneration will eventually control dandelion and plantain along most of the ROW.

Invasive plant monitoring results to date are consistent with the prediction that the Project is not expected to substantially increase the rate at which invasive plants are introduced or spread in the Project area. Invasive plant monitoring will continue in 2018.

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APPENDIX 1:
DETAILED TABLES

Table 5-1: Estimated radius and derived area for individual plant species

Species	Estimated Radius (cm)	Derived Area (m^2)
Arctium minus	25	0.196
Artemisia absinthium	25	0.196
Avena sativa	4	0.005
Capsella bursa-pastoris	5	0.008
Chenopodium album	10	0.031
Chrysanthemum leucanthemum	10	0.031
Cirsium arvense	10	0.031
Cirsium vulgare	15	0.071
Crepis tectorum	8	0.020
Descurainia sophoides	15	0.071
Helianthus annuus	20	0.126
Hordeum jubatum	4	0.005
Lotus corniculatus	25	0.196
Matricaria discoidea	7.5	0.018
Medicago lupulina	10	0.031
Medicago sativa	25	0.196
Melilotus albus	25	0.196
Melilotus officinalis	25	0.196
Oenothera biennis	20	0.126
Phleum pratense	3	0.003
Plantago major	10	0.031
Secale cereale	4	0.005
Silene csereii	10	0.031
Sonchus arvensis	10	0.031
Taraxacum officinale	10	0.031
Trifolium hybridum	20	0.126
Trifolium pratense	20	0.126
Trifolium repens	20	0.126
Tripleurospermum inodorum	5	0.008
Triticum aestivum	4	0.005
Verbascum thapsus	20	0.126
Vicia cracca	20	0.126

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