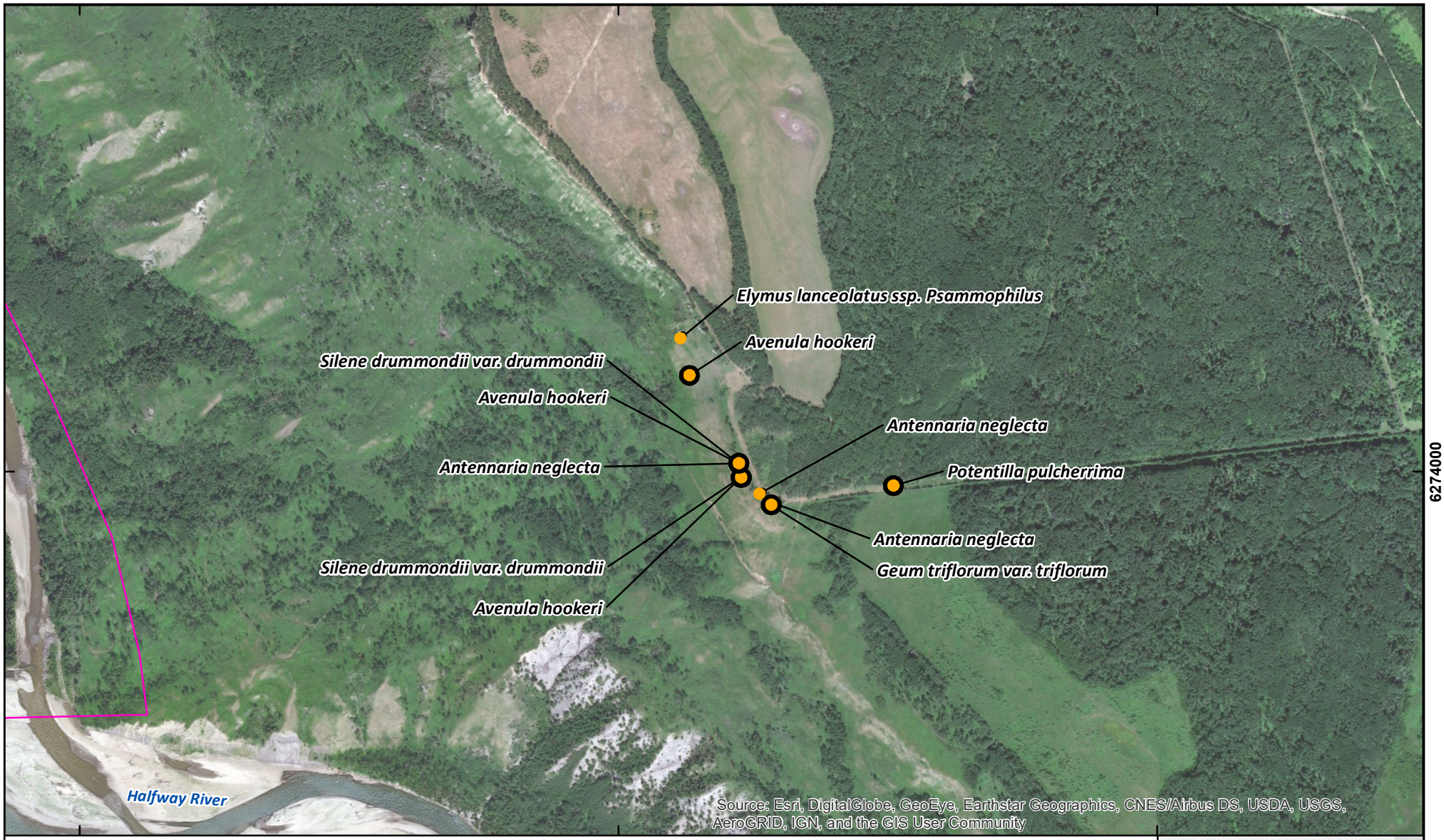
APPENDIX 3. 2016 TARGET AND NON-TARGET RARE PLANT SPECIES LOCATIONS



Site C Project

2016 Target and Non-Target Rare Plant Species Locations

Figure 1

Date: 11/9/2017

Map Number: BCH-019a

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

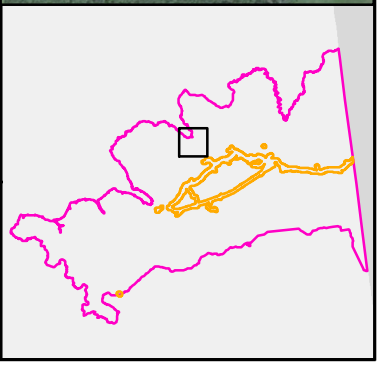
0 250 500 750

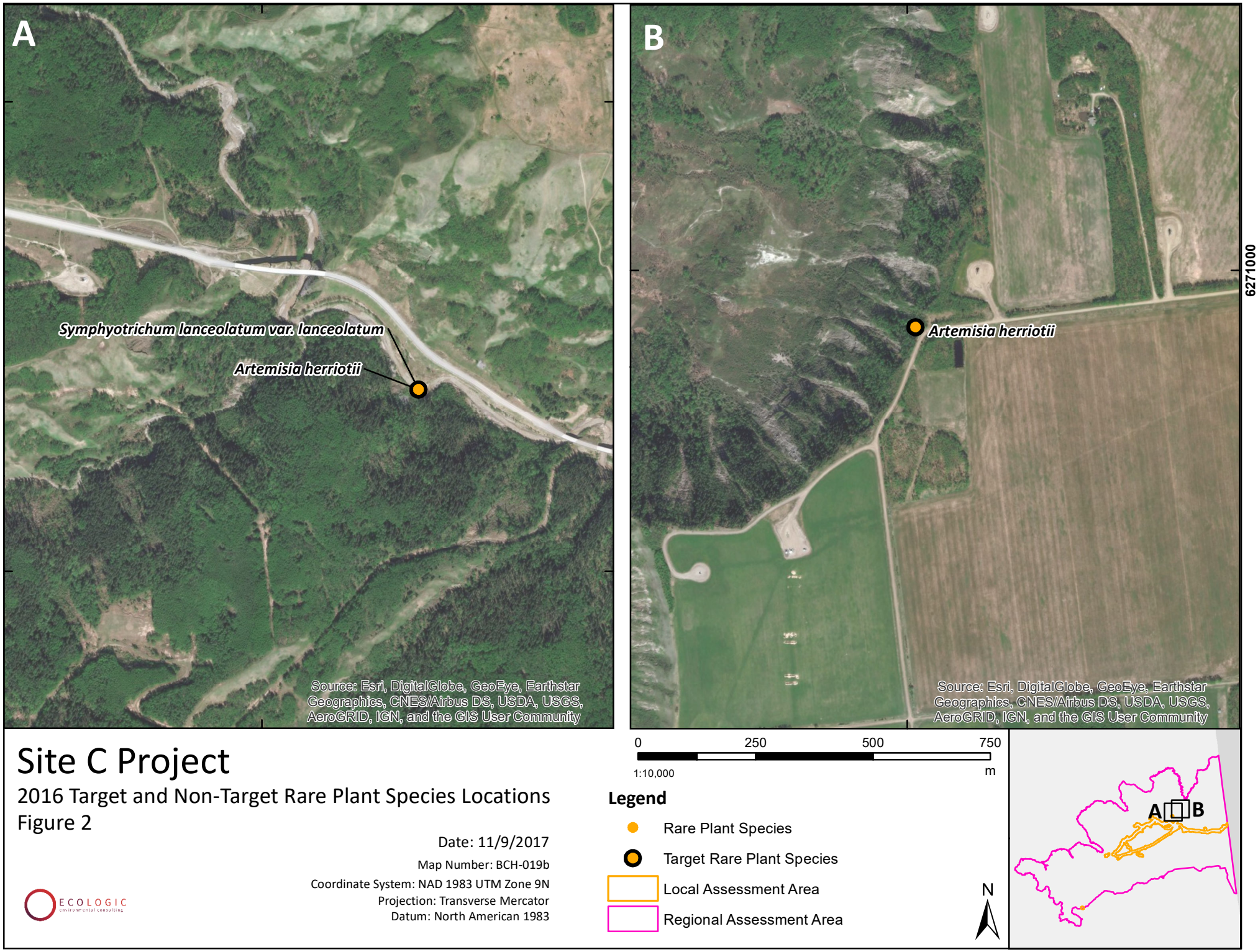
1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Local Assessment Area
- Regional Assessment Area

N





Site C Project

2016 Target and Non-Target Rare Plant Species Locations
Figure 2

Date: 11/9/2017

Map Number: BCH-019b

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

Site C Project

2016 Target and Non-Target Rare Plant Species Locations
Figure 3

Date: 11/9/2017

Map Number: BCH-019c

Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983

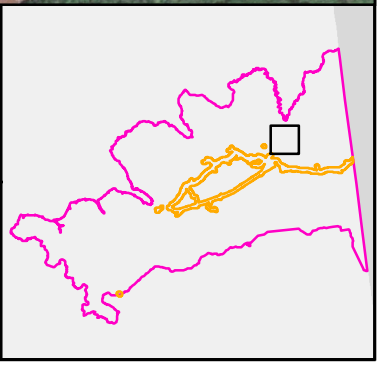
ECOLOGIC environmental consulting

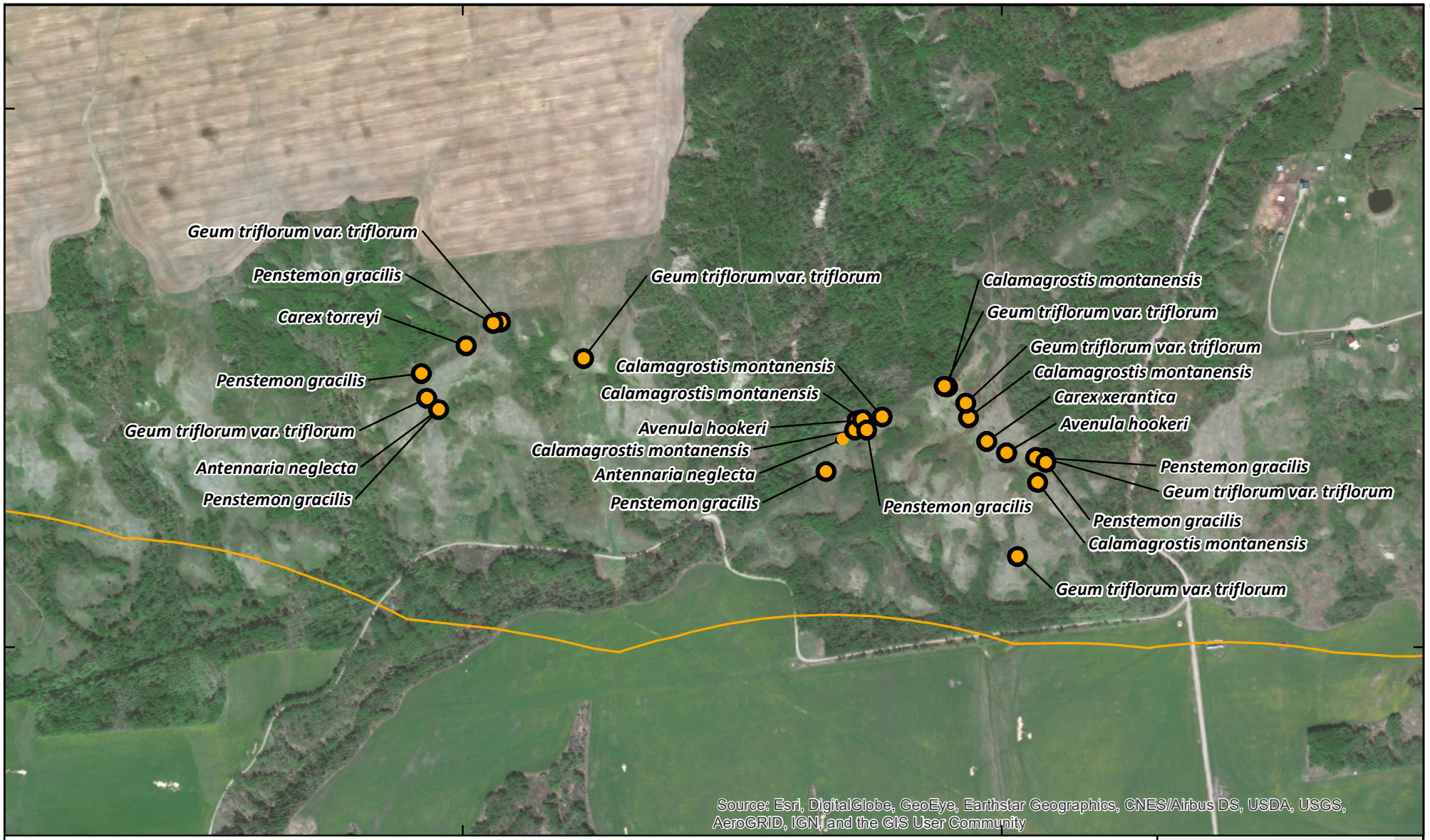
0 250 500 750
1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Local Assessment Area
- Regional Assessment Area

N





Site C Project

2016 Target and Non-Target Rare Plant Species Locations

Figure 4

Date: 11/9/2017

Map Number: BCH-019d

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

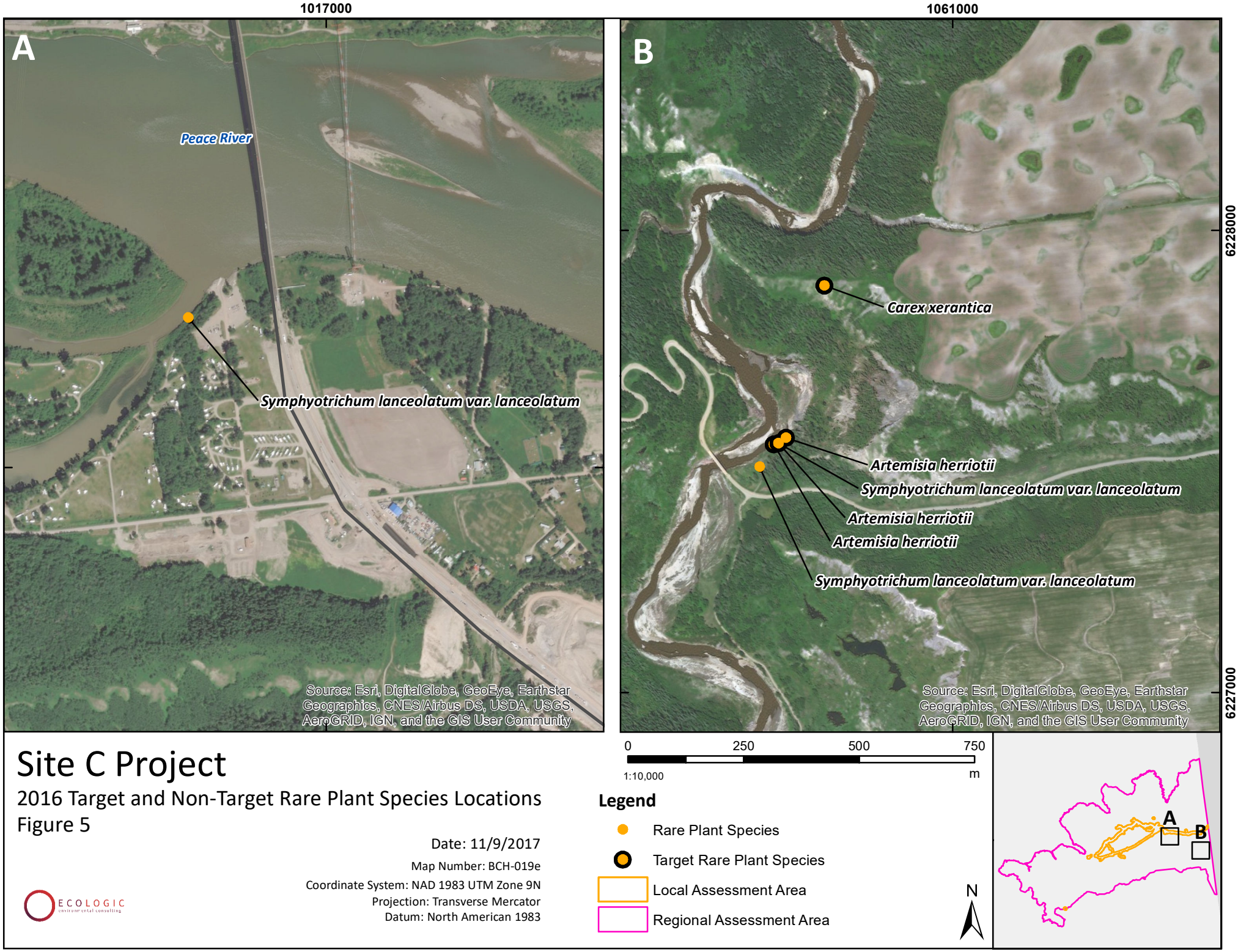
0 250 500 750

1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Local Assessment Area
- Regional Assessment Area

N



Site C Project

2016 Target and Non-Target Rare Plant Species Locations

Figure 5

Date: 11/9/2017

Map Number: BCH-019e

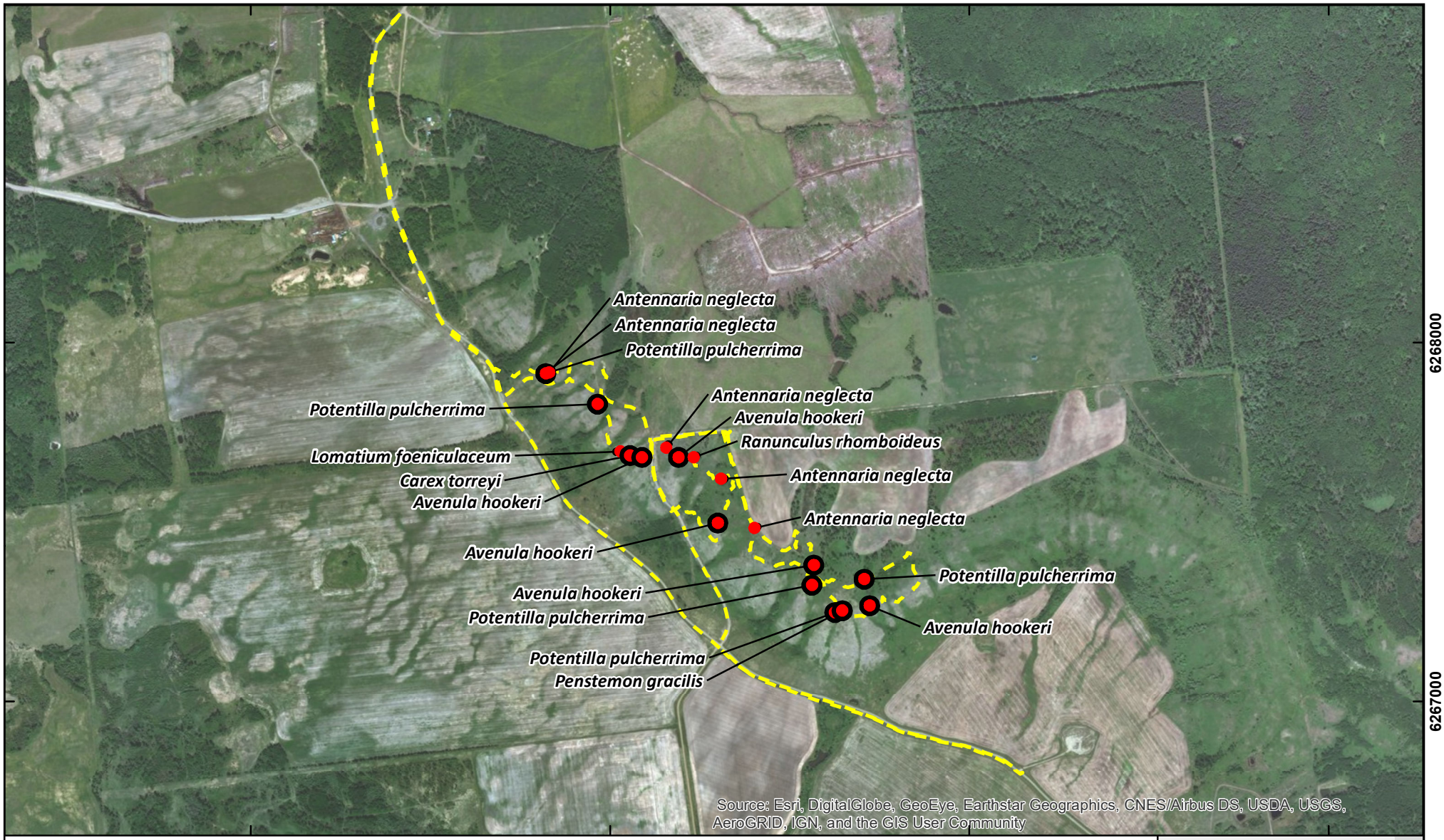
Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

APPENDIX 4. 2017 TARGET AND NON-TARGET RARE PLANT SPECIES LOCATIONS



Site C Project

2017 Target and Non-Target Rare Plant Species Locations

Figure 1

Date: 11/9/2017

Map Number: BCH-016a

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

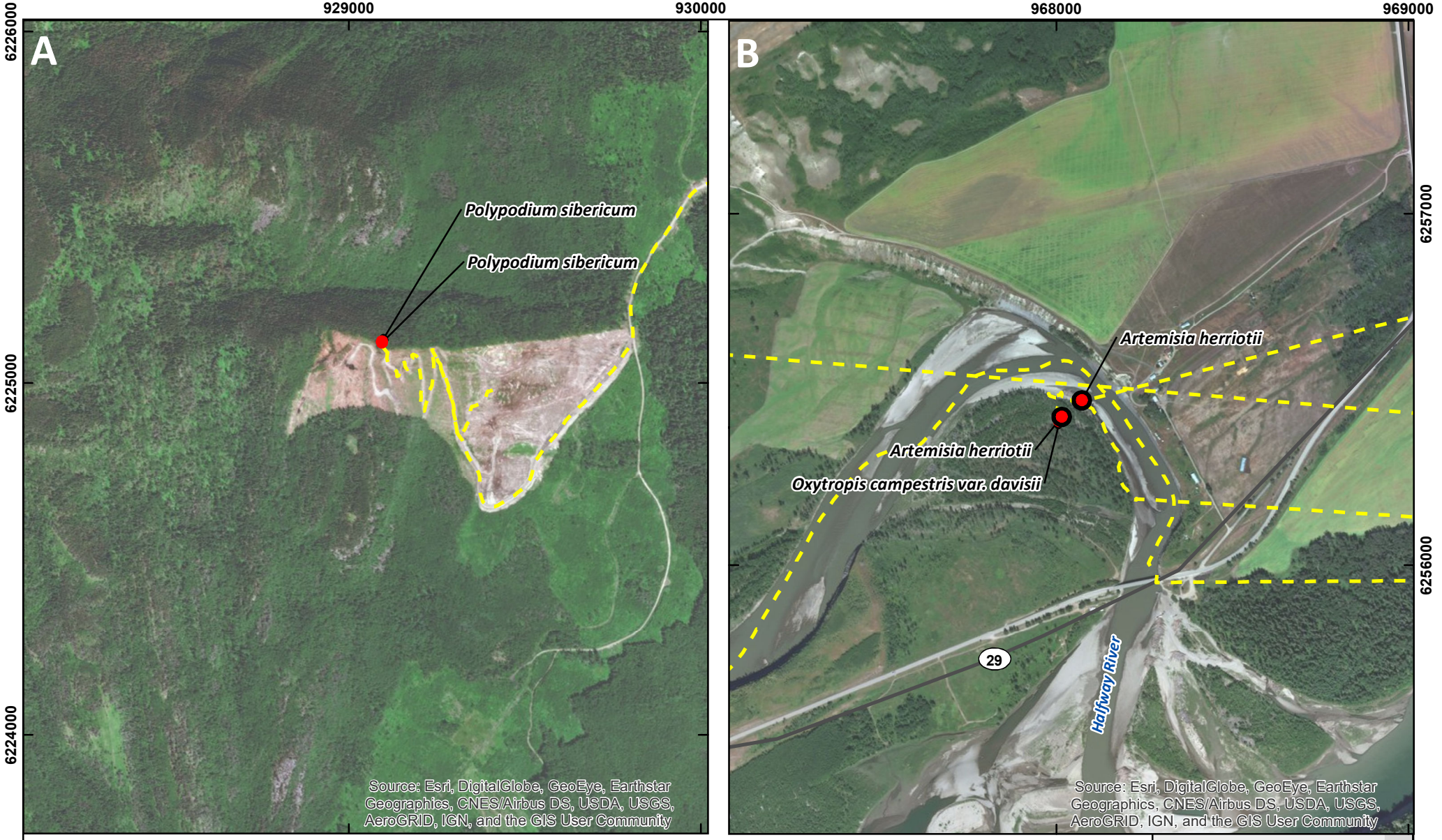
0 250 500 750 m

1:15,000

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N



Site C Project

2017 Target and Non-Target Rare Plant Species Locations

Figure 2

Date: 11/9/2017

Map Number: BCH-016b

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

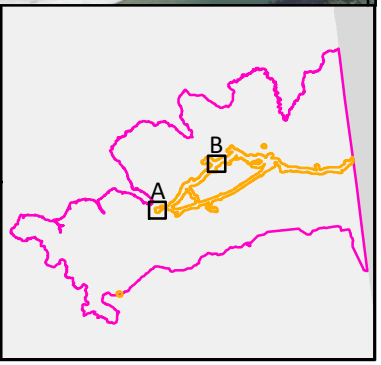
0 250 500 750

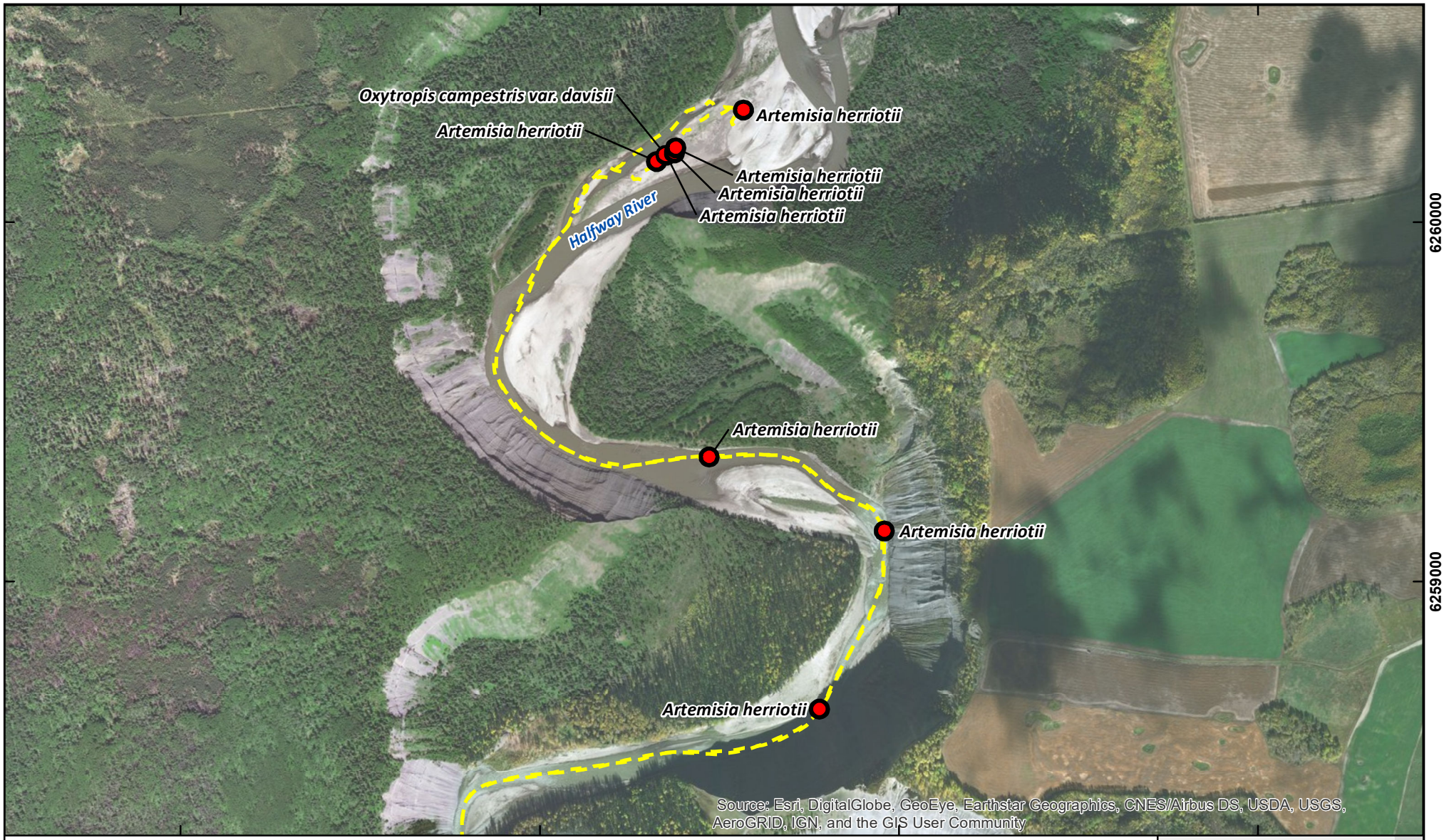
1:15,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N





Site C Project

2017 Target and Non-Target Rare Plant Species Locations

Figure 3

Date: 11/9/2017

Map Number: BCH-016c

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

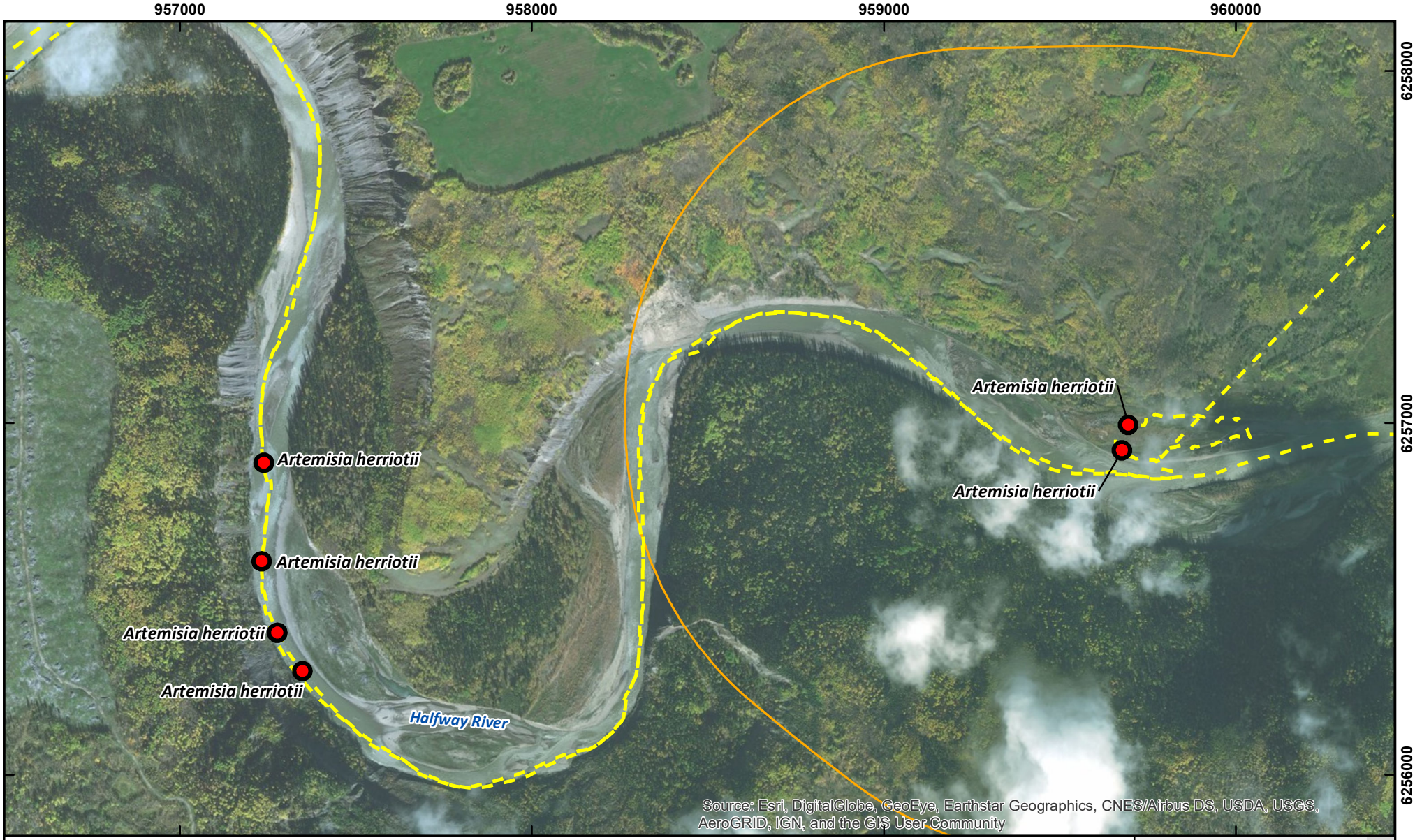
0 250 500 750

1:15,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N



Site C Project

2017 Target and Non-Target Rare Plant Species Locations

Figure 4

Date: 11/9/2017

Map Number: BCH-016d

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

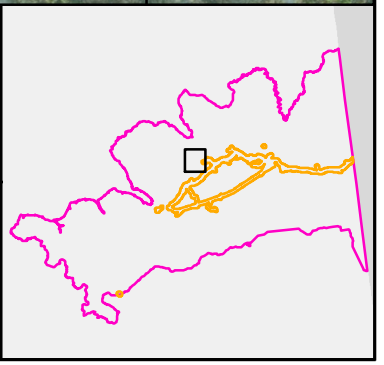
0 250 500 750

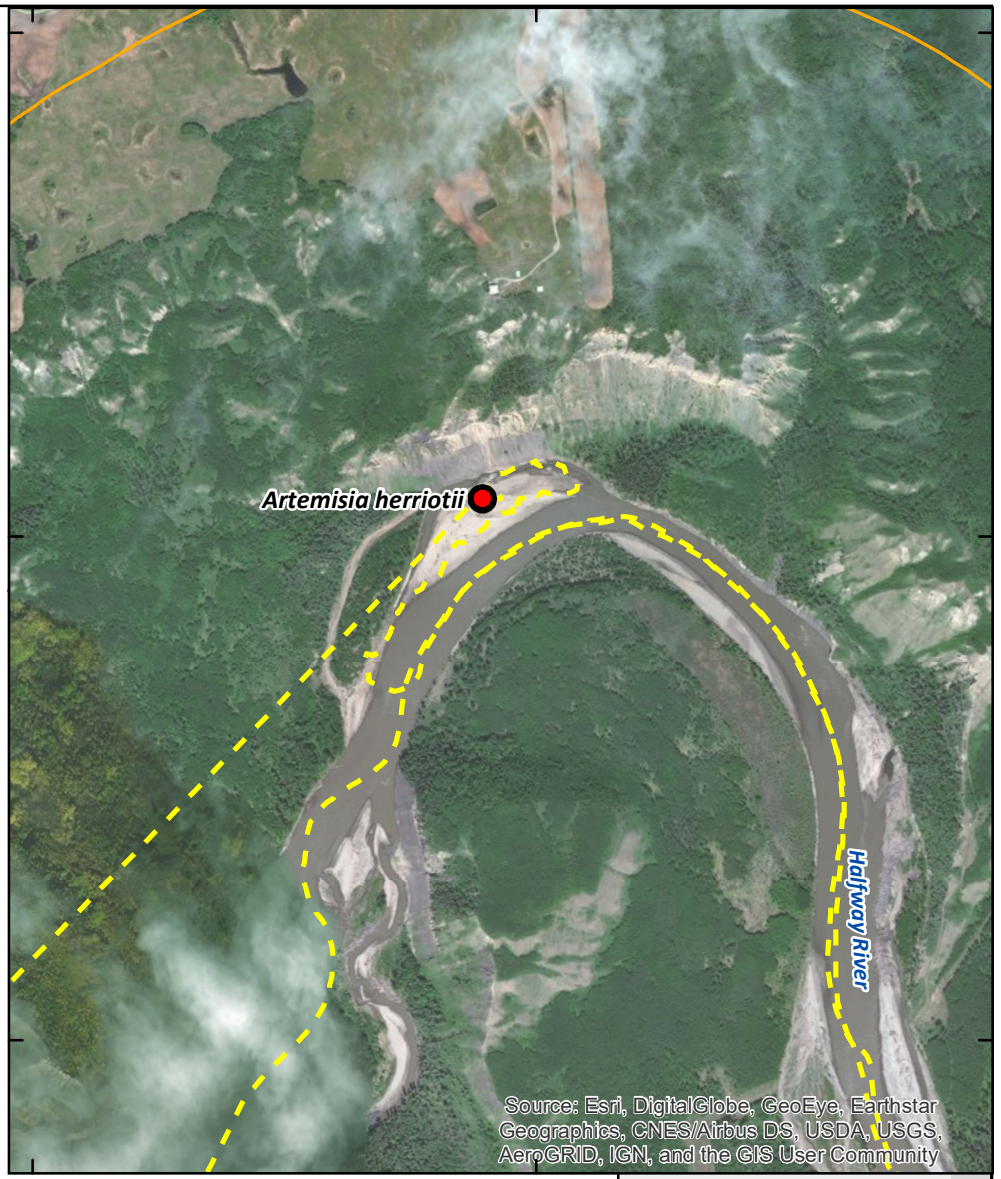
1:15,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N





Site C Project

2017 Target and Non-Target Rare Plant Species Locations

Figure 5

Date: 11/9/2017

Map Number: BCH-016e

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

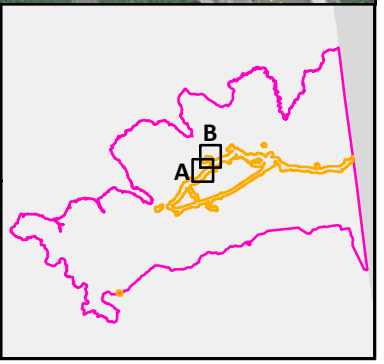
0 250 500 750

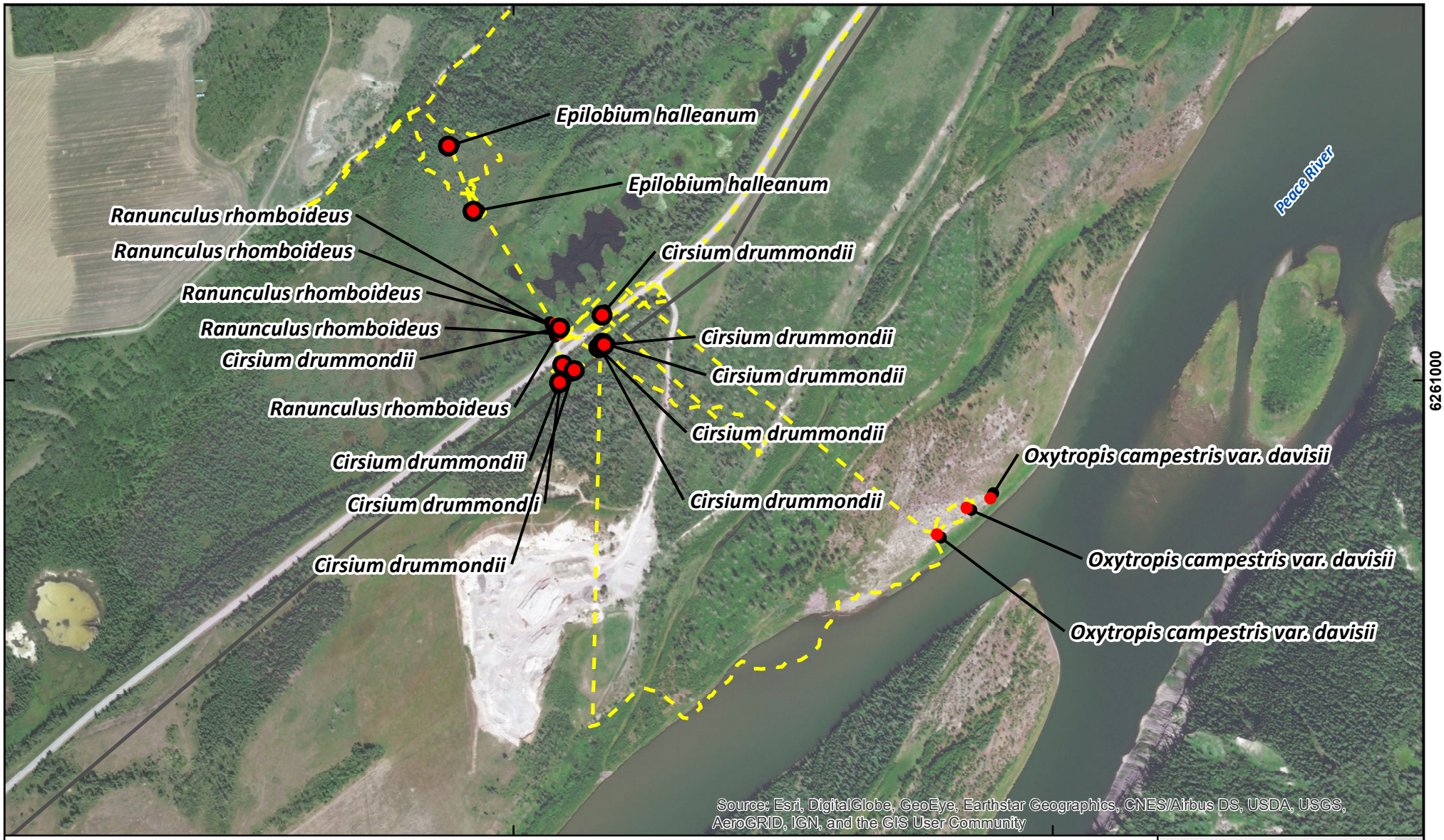
1:15,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N





Site C Project

2017 Target and Non-Target Rare Plant Species Locations
Figure 6

Date: 11/9/2017

Map Number: BCH-016f
Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983

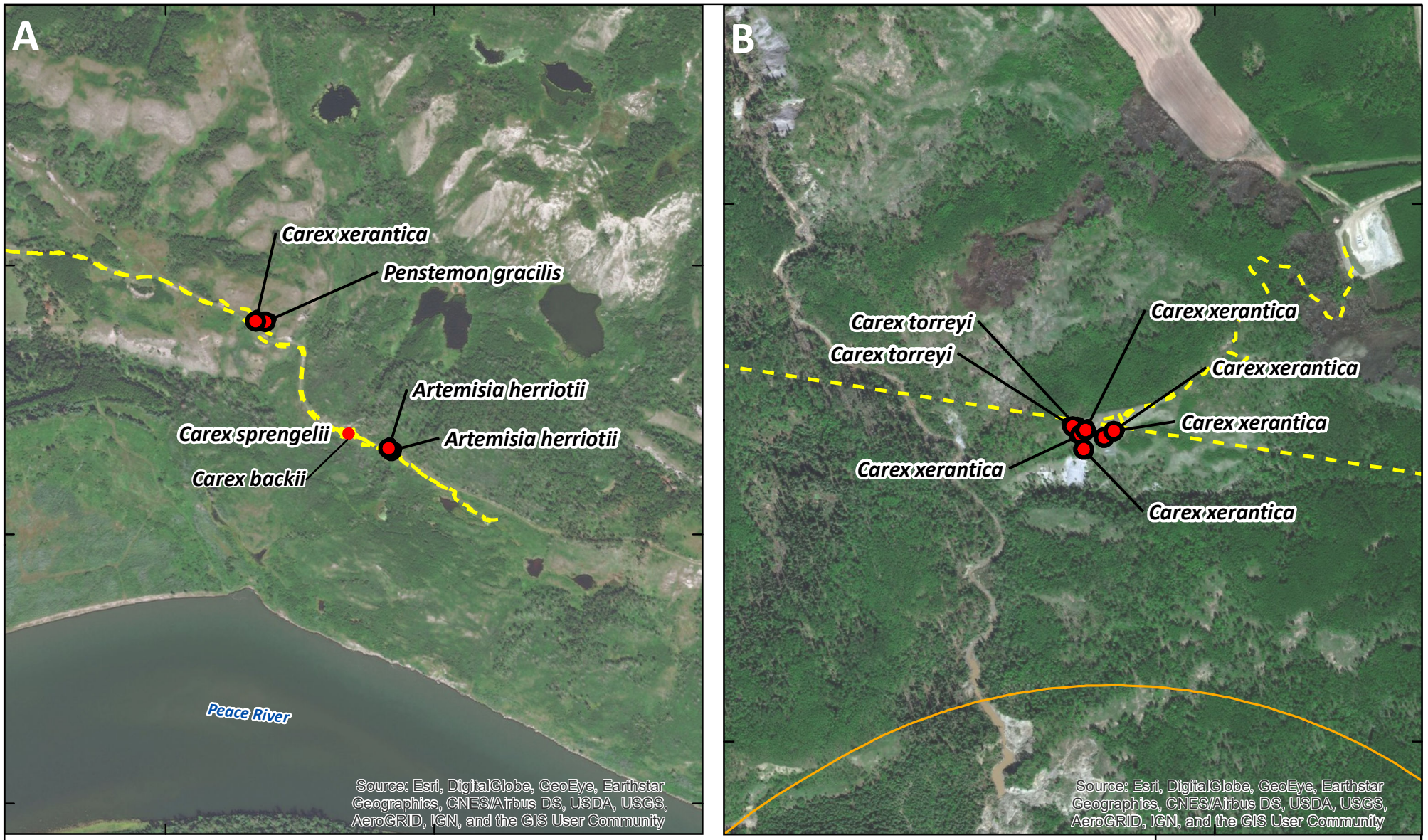
ECOLOGIC environmental consulting

0 150 300 450
1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N



Site C Project

2017 Target and Non-Target Rare Plant Species Locations

Figure 7

Date: 11/10/2017

Map Number: BCH-016g

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

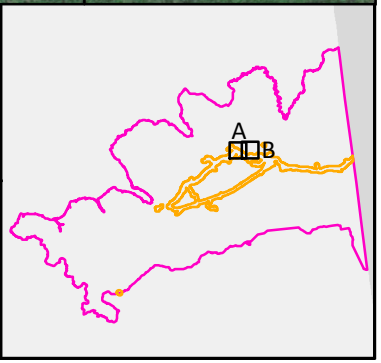
0 150 300 450

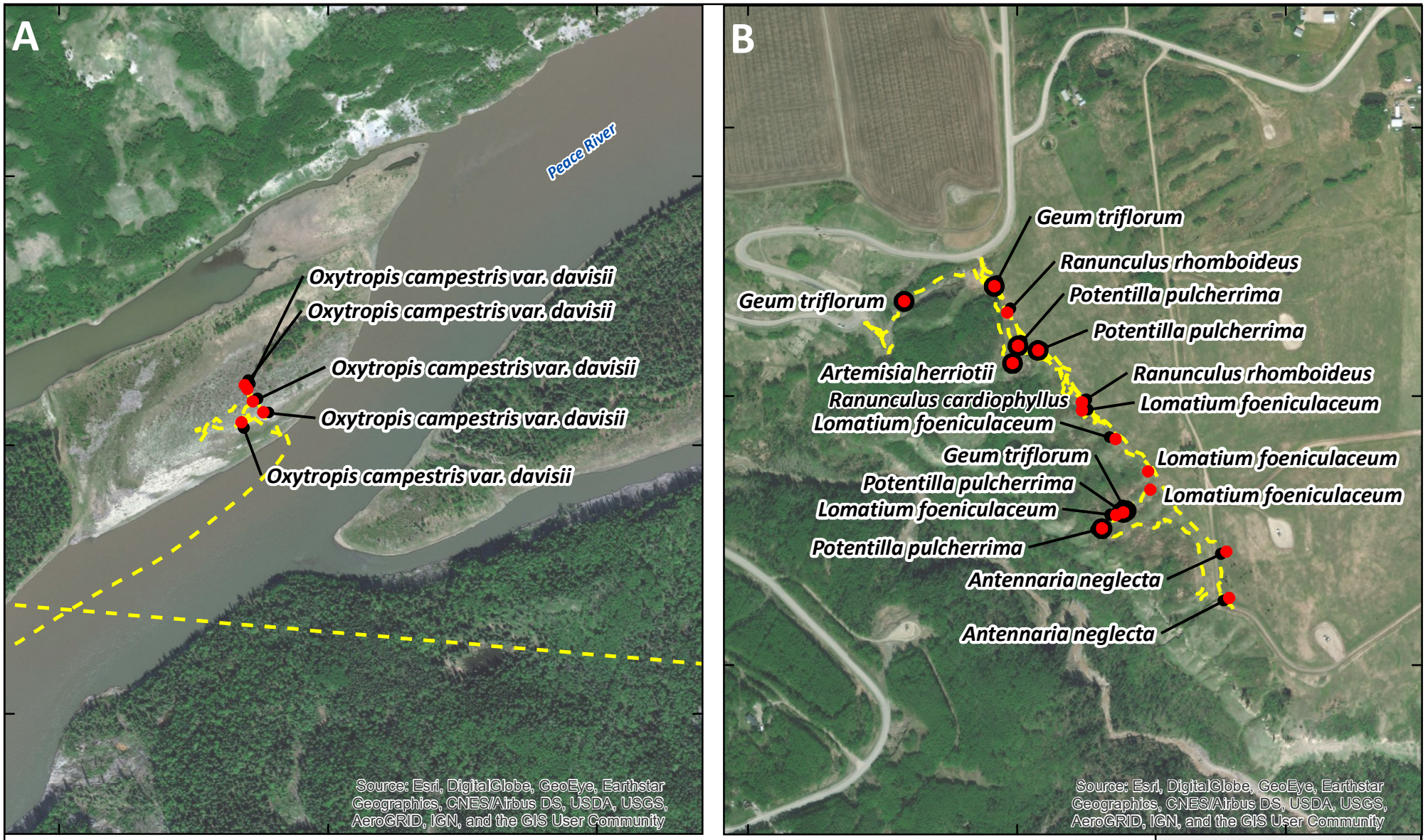
1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N





Site C Project

2017 Target and Non-Target Rare Plant Species Locations

Figure 8

Date: 11/10/2017

Map Number: BCH-016h

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

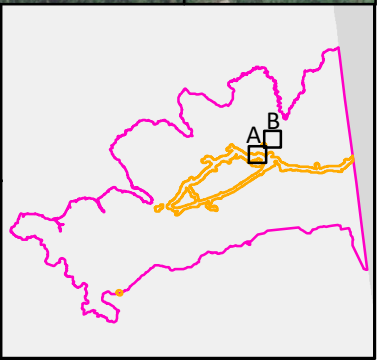
0 150 300 450

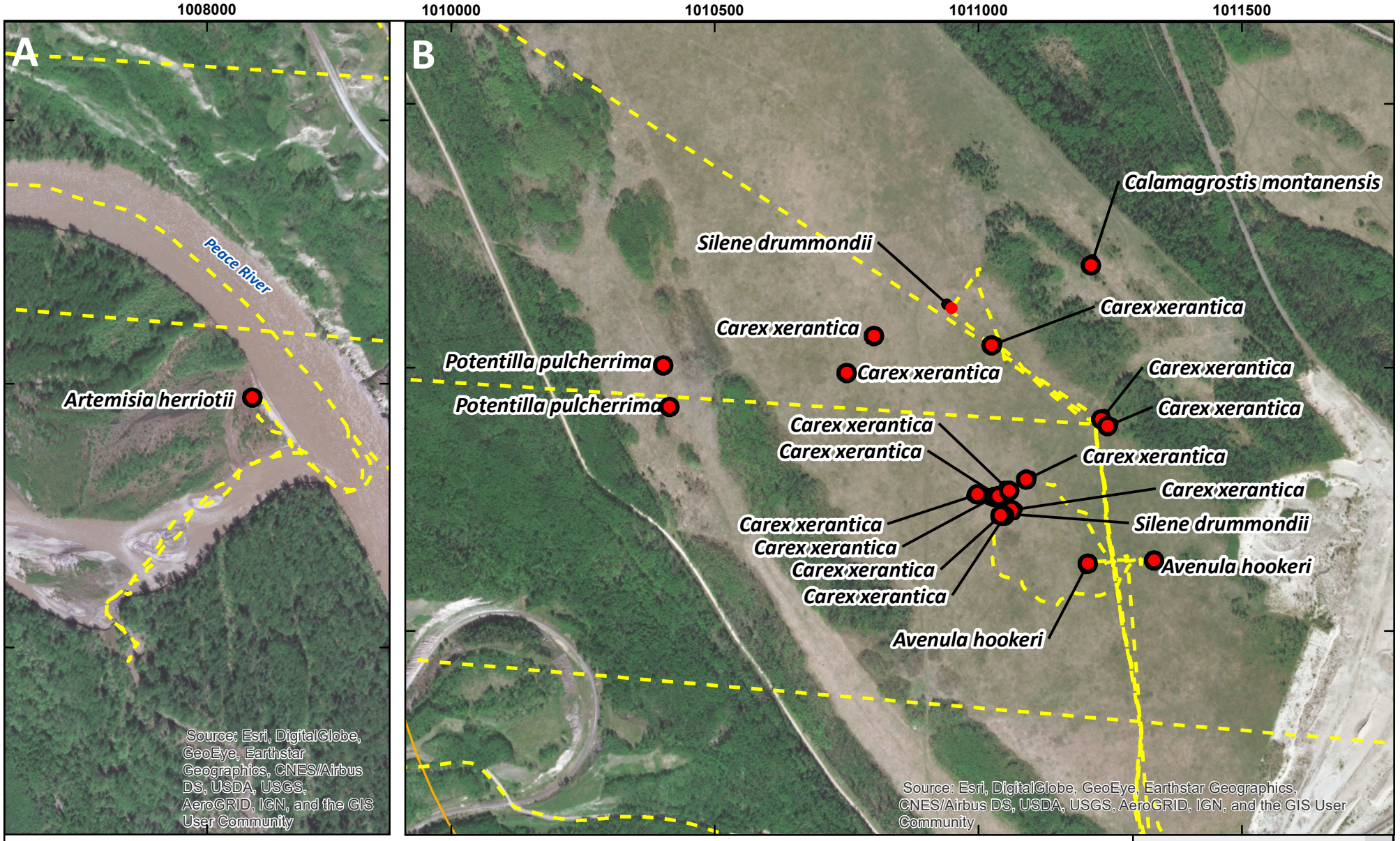
1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N





Site C Project

2017 Target and Non-Target Rare Plant Species Locations

Figure 9

Date: 11/9/2017

Map Number: BCH-016i

Coordinate System: NAD 1983 UTM Zone 9N

Projection: Transverse Mercator

Datum: North American 1983

ECOLOGIC environmental consulting

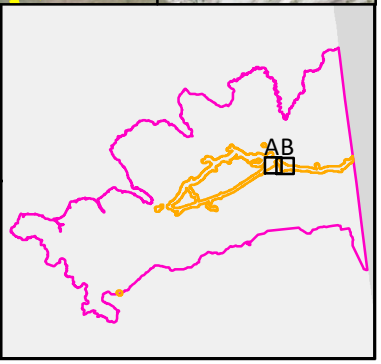
0 150 300 450

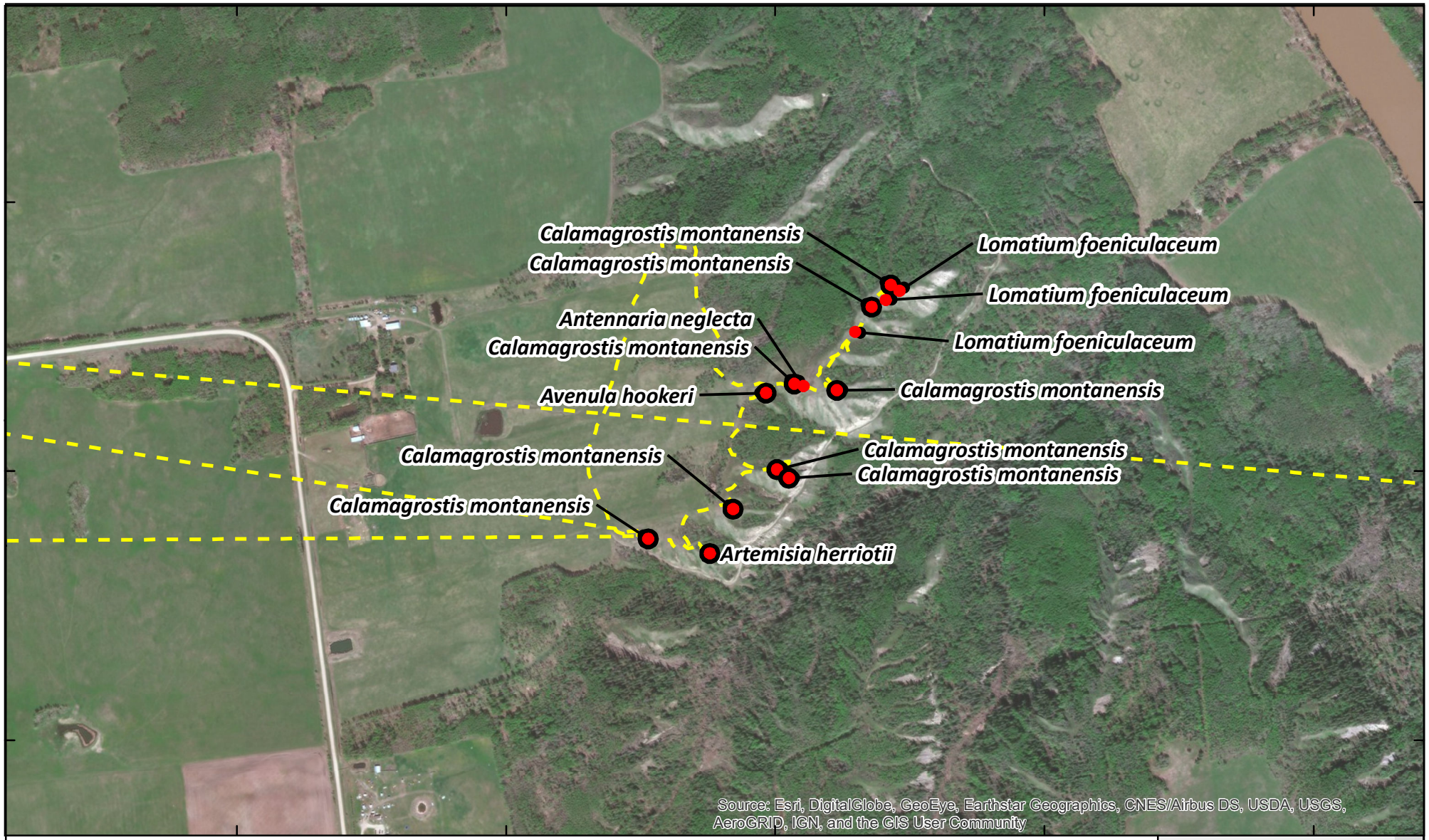
1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N





Site C Project

2017 Target and Non-Target Rare Plant Species Locations
Figure 10

Date: 11/9/2017

Map Number: BCH-016j
Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983

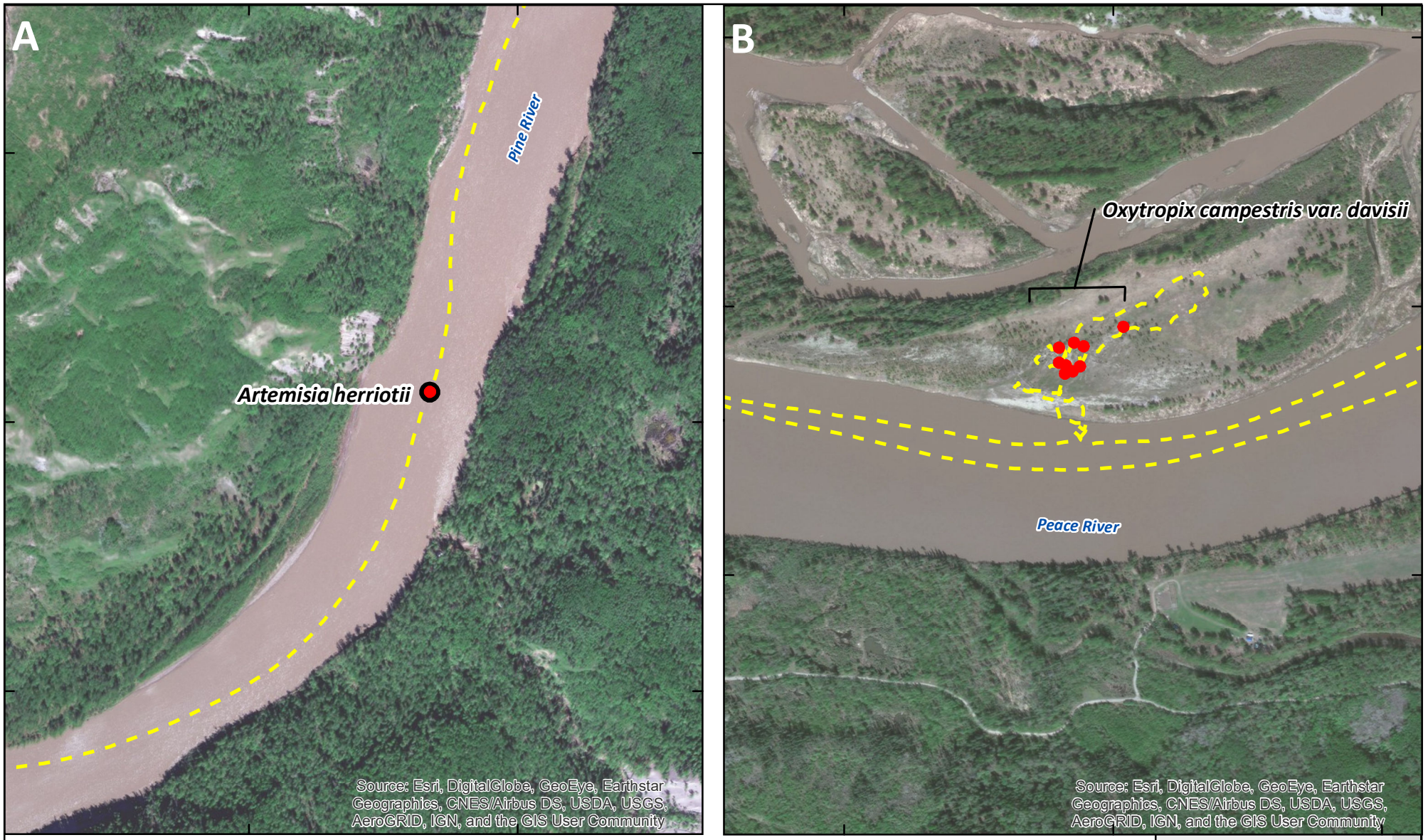
ECOLOGIC environmental consulting

0 150 300 450
1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N



Site C Project

2017 Target and Non-Target Rare Plant Species Locations
Figure 11

Date: 11/9/2017

Map Number: BCH-016k
Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983

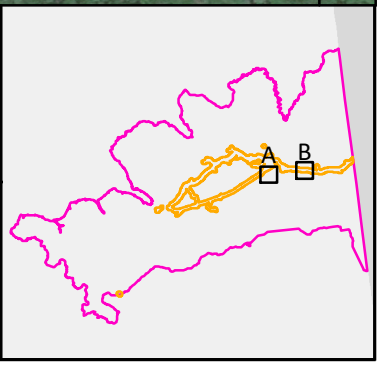
ECOLOGIC
environmental consulting

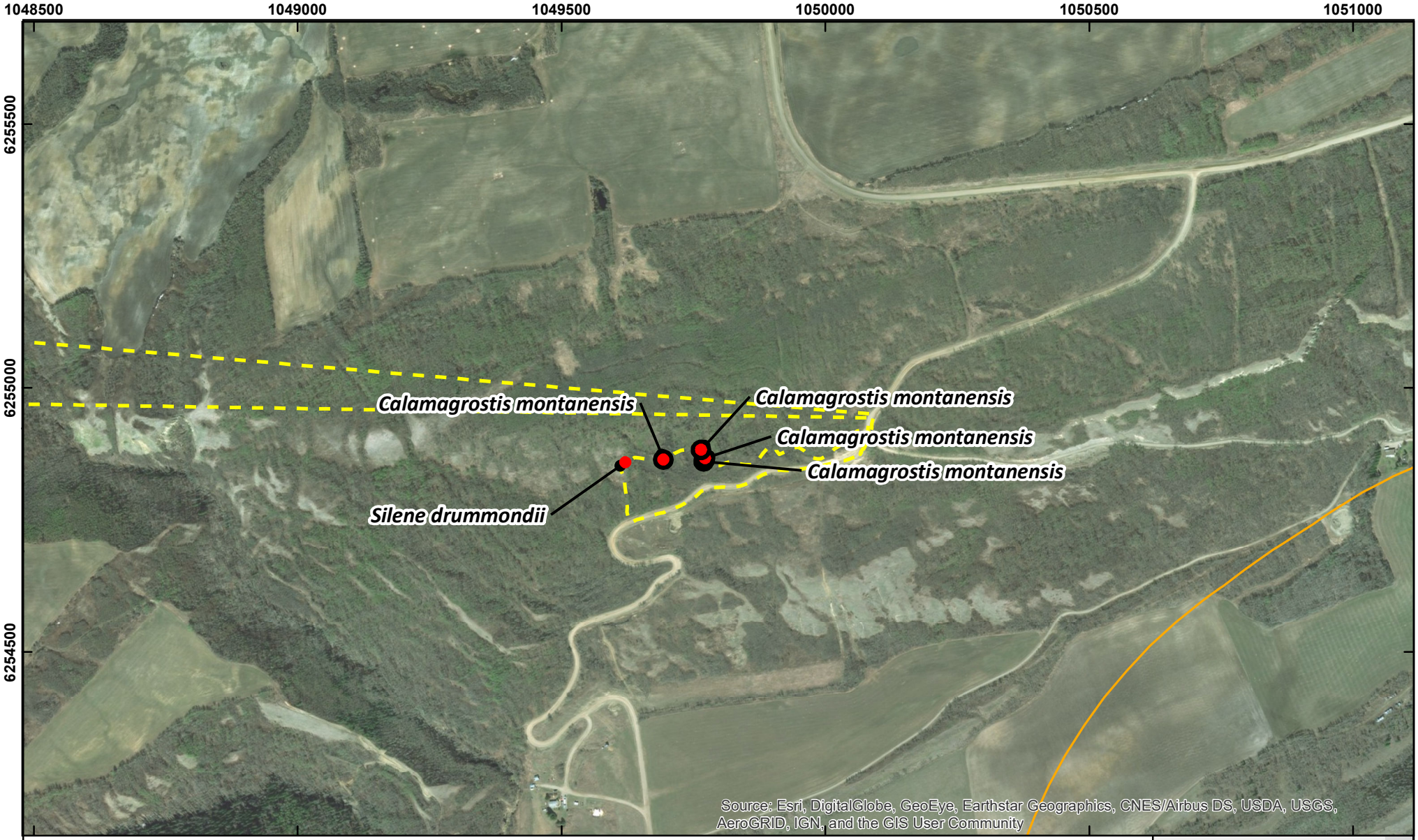
0 150 300 450
1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N





Site C Project

2017 Target and Non-Target Rare Plant Species Locations
Figure 12

Date: 11/9/2017

Map Number: BCH-016l
Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983

ECOLOGIC
environmental consulting

0 150 300 450
1:10,000 m

Legend

- Rare Plant Species
- Target Rare Plant Species
- Tracks
- Local Assessment Area
- Regional Assessment Area

N

Appendix 11. Taxonomy of Ochroleucus bladderwort

BC Hydro
Power smart

Site C Clean Energy Project
Suite 600, Four Bentall Centre
1055 Dunsmuir Street, P.O. Box 49260
Vancouver, BC. V7X 1V5

March 21, 2016

BC Environmental Assessment Office
2nd Floor, 836 Yates Street
P.O. Box 9426 Stn Prov Govt.
Victoria, BC V8W 9V1
Attention: Ms. Monica Perry

Dear Ms. Perry:

Re: Environmental Assessment Certificate #E14-02, Condition 10 of Schedule B
Taxonomic Classification of Orchroleucus bladderwort

The Environmental Assessment Certificate (EAC) for the Site C Clean Energy Project (the Project) was issued to BC Hydro on October 14, 2014. Condition 10 (of Schedule B) of the EAC requires that BC Hydro "fund or undertake directly with the use of a Rare Plant Botanist … a study focused on clarifying the taxonomy of Ochroleucus bladderwort (*Utricularia ochroleuca*), including field, herbaria, and genetic work" in consultation with the Ministry of Forests, Lands and Natural Resource Operations (FLNRO) and the Ministry of Environment (BC Conservation Data Centre). Condition 10 also requires that BC Hydro provide FLNRO and MOE (BC Conservation Data Centre) with the findings and analysis of results from the surveys and taxonomic study. The purpose of this letter is to advise the EAO that the above requirements have been met by both BC Hydro and other sources.

In accordance with the requirements of EAC Condition 10, BC Hydro's program for completing the taxonomic classification of Ochroleucus bladderwort was described in the draft and first revision of the Vegetation and Wildlife Mitigation and Monitoring Plan, submitted to FLNRO and MOE for review and comment on October 17, 2015 and April 7, 2015, respectively. The final program for completing the taxonomic classification is described in Section 8.2.3 of the final Vegetation and Wildlife Mitigation and Monitoring Plan, submitted to FLNRO, MOE and the Environmental Assessment Office on June 5, 2015. This program identifies Ochroleucus bladderwort (*Utricularia ochroleuca*) as a focus of the study, in addition to five other species: Cicuta sp. nov; Elymus sp. nov.; Erigeron pacalis ined.; Erigeron sp. nov. (aff cespitosus); and Platanthera aplectra ined.

Since submission of the final taxonomic classification program, BC Hydro has continued to consult with the BC Conservation Data Center on the taxonomic classification of Ochroleucus bladderwort and the five species identified in the taxonomic classification program. Information received from Jennifer Penny, Program Botanist at the BC Conservation Data Center, between November 2014 and January 2016 indicates that taxonomic classification of the identified species is no longer required, as described below.

- **Ochroleucus bladderwort** - The Conservation Data Center has indicated that Ochroleucus bladderwort is an accepted name for this species on the Flora of North America Update (ITIS

2011)[1] and Annotated Checklist of the Pan Arctic Flora Vascular Plants.[2] Jennifer Penny noted that the species "has consistent morphological characteristics allowing it to be distinguished from other taxa" (Consideration Tracking Table for Vegetation and Wildlife Mitigation and Monitoring Plan, comment from Jennifer Penny dated April 7, 2015).[3]

- **Cicuta sp. nov.** - The Conservation Data Center indicated that a site of Cicuta sp. nov. in the Peace River region was visited by a botanist in June 2014. The species has been revisited, but the species not relocated. No further taxonomic work is possible at this time because observation/collection of this species is required to allow for further taxonomic study (Consideration Tracking Table for Vegetation and Wildlife Mitigation and Monitoring Plan, comment from Jennifer Penny dated November 18, 2014).

- **Elymus sp. nov.** - A paper outlining the taxonomy of Elymus sp. nov. is pending publication. No further taxonomic work is required (Consideration Tracking Table for Vegetation and Wildlife Mitigation and Monitoring Plan, comment from Jennifer Penny dated April 7, 2015).

- **Erigeron pacalis ined** - The taxonomy on this species was published in 2013. Please see: Björk, C. 2013 *Erigeron pacalis* (Asteraceae) a new species from Western Canadian Boreal Grasslands. Novon 22(3):271-275.

- **Erigeron sp. nov. (aff cespitosus)** - A paper outlining the taxonomy of this species is pending publication. Additional taxonomic work is not required (email from Jennifer Penny dated February 9, 2016).

- **Platanthera aplectra ined** - A paper outlining the taxonomy of this species is pending publication. Additional taxonomic work is not required (email from Jennifer Penny, dated January 18, 2016).

In light of this information, please be advised that BC Hydro will no longer undertake taxonomic classification work for the above identified species.

Please don't hesitate to contact me if you have any questions or require additional information.

Sincerely,

Bettina Sander
Regulatory Manager, Site C Clean Energy Project

cc: Chris Parks, Senior Compliance and Enforcement Officer, EAO
Jennifer Penny, Program Botanist, BC Conservation Data Centre
Eric Lofroth, Manager BC Conservation Data Centre

[1] http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=34459
[2] http://nhm2.uio.no/paf/820203
[3] The Consideration Tracking Table for the Vegetation and Wildlife Mitigation and Monitoring Plan was submitted to EAO on June 5, 2015, together with the final Vegetation and Wildlife Mitigation and Monitoring Plan.

Appendix 12. Cavity Nesting Mitigation and Monitoring Program 2017 Annual Report

MEMORANDUM

Date:	November 30, 2017
To:	Brock Simons, Terrestrial Biodiversity Specialist, BC Hydro
From:	Ashleigh Ballevona, R.P.Bio. and Charlie Palmer, P.Biol., R.P.Bio. Hemmera
File:	398-173.08
Re:	Cavity Nesting Mitigation and Monitoring Program – 2017 Field Memo

1.0 INTRODUCTION

The following memo summarizes the 2017 building and installation activities for the Cavity Nesting Mitigation and Monitoring Program.

2.0 BACKGROUND

BC Hydro assessed the potential effects of the Site C Clean Energy Project on Wildlife Resources in the Site C Environmental Impact Assessment using key species groups (BC Hydro 2013). Cavity nesting species were a sub-set of the wildlife resources addressed in the EIS and were assessed as part of the migratory bird (passerines [songbirds], woodpeckers, waterfowl) and raptors (hawks and owls) sections (BC Hydro 2016). In early 2017, a mitigation and monitoring plan for cavity nesting birds was developed with input from the Vegetation and Wildlife Technical Committee (VWTC), which is comprised of representatives of the Canadian Wildlife Service (CWS) and the BC ministries of Environment and Forests, Lands, and Natural Resources.

The purpose of the Cavity Nesting Mitigation and Monitoring Program is to provide a combination of mitigation strategies to benefit cavity nesting bird species. Mitigation is focussed on areas that currently have a lower distribution of suitable cavity nesting trees (structural stage 4 and/or 5 habitats) to enhance the suitability of these areas (i.e., attempting to turn low value habitat into moderate or high value habitat).

Offsetting for cavity nesting birds will be achieved using different measures depending on the time period they are intended to mitigate (i.e., short-, medium-, or long-term). The short-term mitigation component of the plan was initiated in 2017 via the construction and installation of next boxes, and this memo provides a summary of the work conducted in 2017.

3.0 NEST BOX CONSTRUCTION

Cavity nesting birds differ in size, habitat requirements, and tendency to use nest boxes; as such, a combination of nest boxes were constructed to partially offset the loss of cavity nesting habitat associated with project construction. Thirteen different nest box plans were used during nest box construction to

support 26 species of cavity nesting birds and at least 260 nest boxes were constructed in May 2017 (**Table 1**). The number of nest box plans does not directly correspondence to the number of nest box types built as some nest boxes types are of the same style or similar in size, but support different species depending on installation specifications (i.e., habitat, height of installation).

Table 1 Inventory of nest boxes constructed for by species group.

Species group	Box type	Species supported	Number of nest boxes built
Passerines	A / BC / B1	black-capped chickadee boreal chickadee red-breasted nuthatch white-breasted nuthatch house wren brown creeper	41
	A2 / B2	mountain bluebird tree swallow violet-green swallow	61
Woodpeckers (secondary excavators)	C	northern flicker / northern pygmy owl	*
Waterfowl	E1	bufflehead	9
	F	Barrow's goldeneye common goldeneye hooded merganser	49
	D / G	common merganser	18
Raptors and Owls	B3	northern hawk-owl	20
	C	northern pygmy-owl / northern flicker	23
	E2	boreal owl northern saw-whet owl	26
	E3	American kestrel	19
	H	barred owl	3
		Total	269[±]

Notes:
* Box type C supports both northern flicker and northern pygmy-owl. To avoid double counting, the total number constructed of box type C is included in the raptor and owl species group.
[±] Nine nest boxes were constructed as extras.

The exterior of the boxes was painted with non-toxic, dark coloured, exterior grade water-based paint, while the interior was left untreated (**Photo 2** and **3**). Box type E3 (American kestrel) were not stained per the Cornell Nest Watch next box plan (Cornell Lab of Ornithology 2016). All nest boxes were given a unique identification number, painted on the front of the box (**Photo 3**), and large enough to be visible from the ground. As some species of cavity nesting birds excavate their own nests, non-toxic wood shavings were placed in the base of the some of the nest boxes to simulate more natural nesting conditions.

Photo 1 Nest box construction, May 2017.

Photo 2 Constructed nest boxes before painting, May 2017.

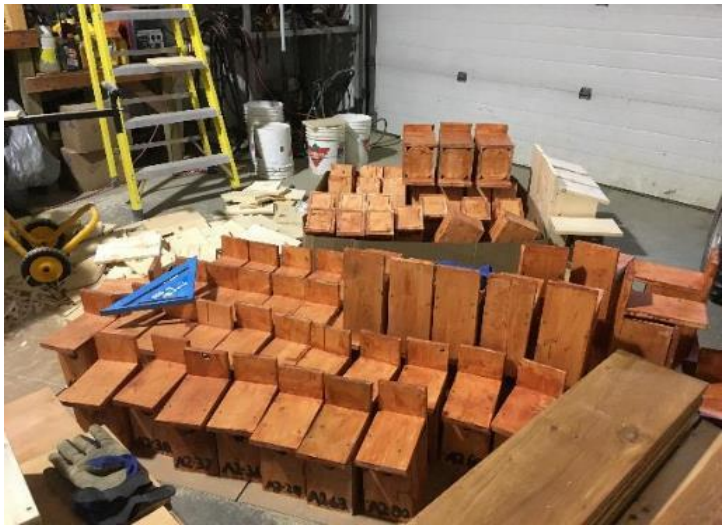


Photo 3 Painted and labelled nest boxes, May 2017.

4.0 NEST BOX INSTALLATION

In late-June and early-July 2017, a field crew composed of one biologist and up to two First Nation field technicians installed a total of 96 nest boxes on the north side of the Peace River (**Figure 1; Table *2***). Trees and structures on BC Hydro owned and managed lands, and private lands where permission was granted, were used to host nest boxes.

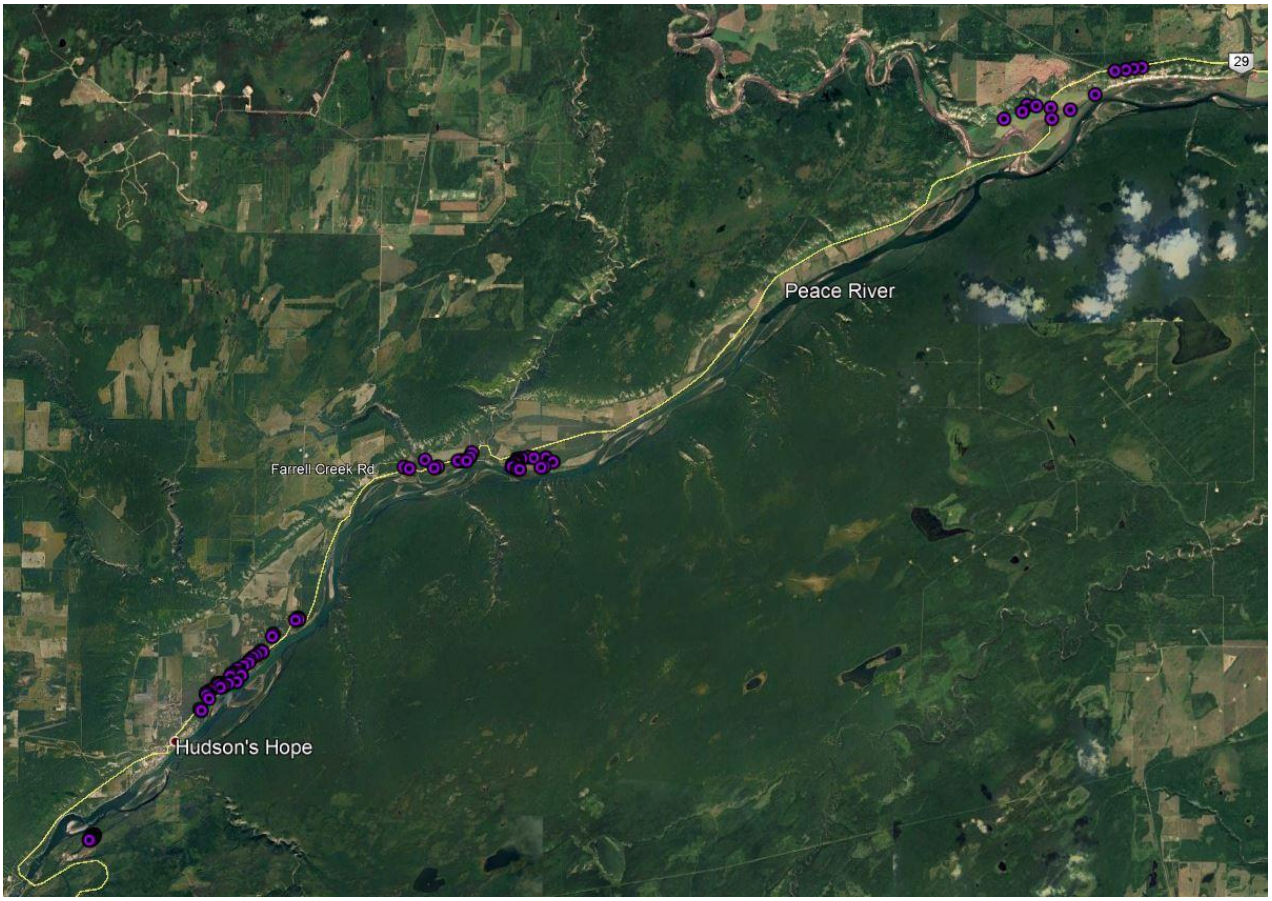


Figure 1. Nest box installation locations (2017).

Table 2 Summary of nest boxes installed in 2017 by species group and nest box type.

Species group	Box type	Number of boxes installed - 2017
Passerine	A / BC / B1	16
	A2 / B2	18
Woodpeckers (secondary excavators)	C	*
Waterfowl	E1	2
	F	10
	G	4
Raptors and Owls	E2	10
	E3	14

Species group	Box type	Number of boxes installed - 2017
	C	9
	B3	13
Total		**96**

Notes: Box type C support both northern flicker and northern pygmy-owl. To avoid double counting, the number installed is included in the raptor and owl species group.

Nest boxes were strategically placed in areas determined to be most beneficial to each species group, and considered availability of land and suitable access for installation and future effectiveness monitoring. **Photos 4 – 6** below show examples of nest box installations for a subset of the nest box types.

Photo 4 Box type A2 (mountain bluebird / swallow) installed on fence post in cultivated field, June 2017.

Photo 5 Box type E2 (boreal / northern saw-whet owls) installed on a trembling aspen, June 2017.

Photo 6 Box type G (merganser) installed on a paper birch near wetland, June 2017

The following data were collected during the installation of each nest box:

- Identification number and nest box type
- Location
- Height, orientation
- Host tree species and diameter at breast height (DBH)
- Photo.

Field data were recorded on electronic data forms on iPads and uploaded to a server upon completion. Field data were later transferred to an Access database for future use in effectiveness monitoring. After installation, the data were provided to BC Hydro in Excel (.csv) format and include applicable comments and coordinates for each nest box.

5.0 FUTURE ACTIVITIES

Nest box effectiveness monitoring will occur two years after initial installation of nest boxes to give the target species groups time to adapt to their presence. However, all field crews will be instructed to record any incidental observations of nest box occupancy; these data will be recorded in the database and used for future effectiveness monitoring.

Additional nest box installation, as well as nest box maintenance and the implementation of medium term mitigation is planned for 2018.

5.1 NEST BOX INSTALLATION

Nest box installation will resume in early spring 2018 and continue through Project construction. The availability of land for installations requires considerations for permission, the proximity of suitable habitat, ease of access and absence of project-related effects.

Field data on all installations will be collected using the same methods as those employed in 2017. All field data will be added to the existing database and will be provided to BC Hydro upon completion of installation.

5.2 NEST BOX MAINTENANCE

With regular maintenance, nest boxes have a 10 to 15 year lifespan (University of the Sunshine Coast 2016), and up to five years without regular maintenance (McBurney 2016). Nest box maintenance for installed boxes will occur once every two years, between November and January (in the late fall/winter outside of the breeding season) and will start in November 2018.

5.3 MEDIUM-TERM MITIGATION

The mitigation and monitoring plan has short, medium and long-term mitigation strategies. Nest box installation is a short-term strategy. Medium-term mitigation includes methods to enhance decay in select trees, speeding up the natural processes that are required for cavity nesting birds to establish nest sites. In 2017 one of these medium-term methods was investigated for application to the study area; inoculation of trees with fungal pathogens to speed decay. The benefits of this technique are now thought to be minimal, and not suitable for the study area. Trembling aspen (*Populus tremuloides*) is the predominant tree species in the study area that is likely to be used by cavity nesting bird species because it is common and prone to heart rot at young ages relative to other tree species in the region (especially relative to longer-lived coniferous softwood trees). This aspen begins to naturally decay at 30 cm dbh (T.Manning *pers. comm*. June 2017), ~50 years of age. Since heart-rot decay fungi are naturally present in aspen at a young age, fungal inoculation for this species is not considered cost-effective for providing benefits to cavity nesting birds. Instead, the mechanical (girdling) technique for stressing aspen to speed the spread of already present heart-rot fungus, as discussed in the mitigation and monitoring plan, will be advanced in 2018.

Hemmera Envirochem Inc.
Ashleigh Ballevona, B.Sc., R.P.Bio.
Environmental Specialist
604.669.0424
aballevona@hemmera.com

Hemmera Envirochem Inc.
Charlie Palmer, M.Sc., P.Biol., R.P.Bio.
Practice Leader
604.669.0424
cpalmer@hemmera.com

6.0 REFERENCES

Cornell Lab of Ornithology. 2016. Nest Box and Nest Structure Plans by species. NestWatch. <http://nestwatch.org/learn/all-about-birdhouses/>.

BC Hydro. 2013. Site C Clean Energy Project Environmental Impact Statement. Prepared for BC Hydro by Keystone Wildlife Research Ltd. <http://a100.gov.bc.ca/appsdata/epic/documents/p371/d35994/1377196616722_0263c53e020fe5f023732f6213a2332790dcad7d2650fa0f8279feaa86fff482.pdf>.

BC Hydro. 2016. Site C Clean Energy Project Vegetation and Wildlife Mitigation and Monitoring Cavity Nesting Species Summary.

McBurney, L. 2016. Are nest boxes an effective management tool for Leadbeater's Possum? longtermecology.com. <http://www.longtermecology.com/blog/2016/5/9/are-nest-boxes-an-effective-management-tool-for-leadbeaters-possum>.

University of the Sunshine Coast. 2016. Campus nesting boxes. Home sweet home. University of the Sunshine Coast, Queensland, Australia. <http://www.usc.edu.au/explore/wildlife/observations/2016/june/campus-nesting-boxes>.