



**2021 Invasive Species Monitoring
Report - Antrim Wind Project**

Year 2

Hillsborough County, New Hampshire

November 11, 2021

Prepared for:

Antrim Wind Energy, LLC

Prepared by:

Stantec Consulting Services Inc.
30 Park Drive
Topsham, ME 04086

November 11, 2021

Table of Contents

1.0	PROJECT BACKGROUND	1
2.0	INVASIVE SPECIES MONITORING GOALS.....	1
3.0	INVASIVE SPECIES MONITORING AND CONTROL METHODS.....	3
3.1	SURVEY APPROACH.....	3
3.2	CONTROL TECHNIQUES.....	4
4.0	MONITORING RESULTS.....	4
4.1	CURRENT SITE CONDITIONS.....	4
4.2	INVASIVE SPECIES MONITORING RESULTS	4
5.0	SUMMARY AND RECOMMENDATIONS	5
5.1	SUMMARY.....	5
5.2	RECOMMENDATIONS	5

LIST OF TABLES

Table 1. New Hampshire Prohibited Invasive Species List.....	2
Table 2. Summary of Invasive Plant Occurrences, Antrim Wind Project, 2021.....	5

LIST OF APPENDICES

APPENDIX A **FIGURES**

APPENDIX B **REPRESENTATIVE SITE PHOTOGRAPHS**



2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Project Background
November 11, 2021

1.0 PROJECT BACKGROUND

Construction of the 28.8-megawatt Antrim Wind Project (Project) located in Antrim, New Hampshire (Appendix A, Figure 1) was completed in 2019 and the Project's Commercial Operations Date was December 24, 2019. The Project is owned and operated by TransAlta Corporation, through its subsidiary Antrim Wind Energy, LLC (AWE). The Project includes a total of nine wind turbines along with above ground and underground electrical collector lines, a substation (a collection yard and an interconnection yard), an operations and maintenance (O&M) building, one permanent meteorological tower, and new Project access roads. Collectively, the Project occupies approximately 11.3 acres of privately owned land, with an initial clearing area of approximately 57 acres for construction. During construction, a laydown area was used, but it is no longer part of the Project. This laydown area, located approximately 0.5 miles west of the Project's access road off State Route 9, was included in the current scope.

An Invasive Species Management Plan (ISMP) was developed by AWE for the Project in response to comments from the New Hampshire Fish and Game Department on managing invasive plants during the post-construction operations period of the Project. The ISMP was included in the Project's New Hampshire Site Evaluation Committee (SEC) application and adherence to this ISMP was referenced as a condition of the Project's Order and Site Certification from the SEC. The ISMP was developed to be consistent with the goals and objectives of the United States Army Corps of Engineers (USACE)'s invasive species policy.¹ The ISMP involves invasive species monitoring and control along the Project's turbine areas, access roads, and collector line during the first three growing seasons following the completion of construction.

Stantec Consulting Services Inc. (Stantec) was contracted to conduct the first two years of invasive species monitoring and management for the Project during August 2020 (Year 1) and July 2021 (Year 2). This report summarizes the invasive plant species monitoring and as required, the control methods applied during Year 2 of invasive species management. A comparison with the results of the Year 1 monitoring is also provided.

2.0 INVASIVE SPECIES MONITORING GOALS

Invasive monitoring at the Project has been conducted to meet the rules of the New Hampshire Department of Agriculture's Chapter Agr 3800 - Invasive Species, namely to prevent and control the spread of invasive plant species, minimize the adverse environmental and economic effects of invasive species, and protect the public from potential health problems attributed to invasive species.² Invasive plants are non-native species whose introduction causes, or is likely to cause, environmental or economic

¹ Department of the Army. U.S. Army Corps of Engineers. USACE Invasive Species Policy. June 2, 2009. Available at: <http://www.nae.usace.army.mil/Missions/Regulatory/Invasive-Species/>

² New Hampshire Department of Agriculture. Chapter Agr 3800 Invasive Species. Available at: http://www.gencourt.state.nh.us/rules/state_agencies/agr3800.html



2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Invasive Species Monitoring Goals
November 11, 2021

harm. Invasive plants often lack natural predators, have aggressive reproduction strategies, efficient dispersal methods, can successfully colonize and thrive beyond their natural ranges, and often out-compete native plants. The ISMP identified 36 invasive plant species listed as prohibited by the New Hampshire Department of Environmental Services (Table 1). The goal of the Project's 2021 invasive species monitoring effort was to assess the presence/absence of these invasive species in the searched areas and to implement the appropriate control measures, if warranted.

Table 1. New Hampshire Prohibited Invasive Species List³

Scientific Name	Common Name
<i>Acer platanoides</i>	Norway maple
<i>Ailanthus altissima</i>	Tree of heaven
<i>Alliaria petiolata</i>	Garlic mustard
<i>Alnus glutinosa</i>	European black alder
<i>Berberis thunbergii</i>	Japanese barberry
<i>Berberis vulgaris</i>	European barberry
<i>Celastrus orbiculatus</i>	Oriental bittersweet
<i>Centaurea stoebe</i>	Spotted knapweed
<i>Cynanchum louiseae</i>	Black swallow-wort
<i>Cynanchum rossicum</i>	Pale swallow-wort
<i>Elaeagnus umbellata</i>	Autumn olive
<i>Euonymus alatus</i>	Burning bush
<i>Frangula alnus</i>	Glossy buckthorn
<i>Glyceria maxima</i>	Reed sweet grass
<i>Heracleum mantegazzianum</i>	Giant hogweed
<i>Hesperis matronalis</i>	Dame's rocket
<i>Impatiens glandulifera</i>	Ornamental jewelweed
<i>Iris pseudacorus</i>	Water-flag iris
<i>Lepidium latifolium</i>	Perennial pepperweed
<i>Ligustrum obtusifolium</i>	Blunt-leaved privet
<i>Ligustrum vulgare</i>	Common privet
<i>Lonicera x bella</i>	Showy bush honeysuckle
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Lonicera maackii</i>	Amur honeysuckle
<i>Lonicera morrowii</i>	Morrow's honeysuckle
<i>Lonicera tatarica</i>	Tatarian honeysuckle
<i>Lonicera xbella</i>	Bella honeysuckle

³ ¹New Hampshire Department of Agriculture, Markets & Food. *Fact Sheet: Prohibited Invasive Plant Species Rules, Agr 3800.* January 31, 2017.



2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Invasive Species Monitoring and Control Methods
November 11, 2021

Scientific Name	Common Name
<i>Lysimachia nummularia</i>	Moneywort
<i>Microstegium vimineum</i>	Japanese stilt grass
<i>Persicaria perfoliata</i>	Mile-a-minute weed
<i>Pueraria montana</i>	Kudzu
<i>Reynoutria × bohemica</i>	Bohemia knotweed
<i>Reynoutria japonica</i>	Japanese knotweed
<i>Reynoutria sachalinensis</i>	Giant knotweed
<i>Rhamnus cathartica</i>	Common buckthorn
<i>Rosa multiflora</i>	Multiflora rose

3.0 INVASIVE SPECIES MONITORING AND CONTROL METHODS

3.1 SURVEY APPROACH

On July 26, 2021, Stantec conducted invasive species monitoring and control within the turbine pads, collector line right-of-way (ROW), laydown area, and turbine area access roads (Project Area; Figure 1). These surveys were conducted during an appropriate time of year to allow accurate identification of invasive plants. In late summer, most perennial invasive species have reached a size where they can be easily identified yet have not begun to produce seeds.

Invasive species monitoring and control was conducted within the following specific boundaries of the Project Area:

- Turbine Pads and Roads – Monitoring and control were conducted within the nine turbine pads and the approximately 3.6 miles of roads associated with the Project within approximately 50 feet of clearing on either side.
- Area Adjacent to the O&M Building and Substation – Monitoring and control were conducted within the cleared portions adjacent to the O&M Building and Project Substation. Stantec scientists did not enter the Project substation.
- Laydown Area – Monitoring and control were conducted within the cleared portions of the approximately 3 acres of laydown area located approximately 0.5 miles west of the Project access road on State Route 9 in Antrim, New Hampshire.

Stantec scientists conducted meander surveys for invasive species within the three areas described above. If an invasive species occurrence was encountered, a Global Positioning System (GPS) point was



2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Monitoring Results
November 11, 2021

taken near the center of a population or at an individual plant, and the size of the affected area and abundance of plants were estimated. If larger populations were encountered, the boundaries of the population were located with the GPS. For each GPS point or polygon collected, habitat data, population information, and site condition notes were recorded.

3.2 CONTROL TECHNIQUES

Since control at the earliest detection is most effective at reducing the spread of invasive species, Stantec performed invasive species control concurrently with the detection of an invasive species occurrence. Mechanical or chemical controls are typically utilized depending on the size, density, and location of the invasive plant or population. Typical mechanical removal would include pulling plants up by hand with as much soil as possible removed from the root ball. Plants are then typically left on a rock or stump, or hung in adjacent shrubs, to let the roots dry out and to keep the plant from re-generating. If plants with fruit are encountered, the fruiting stems would be cut and collected in trash bags for proper off-site disposal. In situations where there are too many fruiting plants to reasonably remove, mechanical or herbicide treatment would be used. Stantec has a supervisory-level commercial herbicide operator licensed by the New Hampshire Division of Pesticide Control on staff. Typical herbicide treatment consists of a 50 percent solution of Rodeo® (active ingredient: glyphosate) and water, using the “clip-and-drip” application method. In this method, stems of individual plants were cut and the herbicide solution was applied to the cut stem using a hand-carried squirt bottle.

4.0 MONITORING RESULTS

4.1 CURRENT SITE CONDITIONS

Much of the Project is located in previously forested uplands and wetlands that were cleared of trees and permanently converted to areas dominated by shrubs and herbaceous vegetation. Upland areas in the Project Area that have been cleared along the summit and access road/collector ROW are regenerating with common red raspberry (*Rubus idaeus*), quaking aspen (*Populus tremuloides*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), and grasses from the seed mix used for re-vegetation and site stabilization, such as common timothy (*Phelum pratense*), redtop (*Agrostis gigantea*), and perennial rye grass (*Lolium perenne*). Wetland vegetation in the Project Area is dominated with speckled alder (*Alnus incana*) and red maple that are re-sprouting from stumps cut during construction. Cottongrass bulrush (*Scirpus cyperinus*), fowl mannagrass (*Glyceria striata*), and broad-leaf cat-tail (*Typha latifolia*) are common herbaceous plant species found in wetlands along the ROW. Appendix B contains representative site photographs of upland and wetland areas within the Project Area.

4.2 INVASIVE SPECIES MONITORING RESULTS

A total of three invasive plant occurrences were identified within the Project Area during the 2021 surveys. The three occurrences were located adjacent to the Project’s access road within the existing transmission line corridor south of the Project substation. The two invasive plant species identified were



2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Summary and Recommendations

November 11, 2021

purple loosestrife (*Lythrum salicaria*) and oriental bittersweet (*Celastruc orbiculatus*). Details on the occurrences are summarized in Table 2 and depicted on Figure 1. Each invasive plant occurrence was removed and controlled utilizing the “clip-and-drip” control method previously described in Section 3.2.

Table 2. Summary of Invasive Plant Occurrences, Antrim Wind Project, 2021.

Occurrence ID	Scientific Name	Common Name	Population Abundance	Control Method
Lyt_sal_001_EDB	<i>Lythrum salicaria</i>	Purple loosestrife	< 10	Herbicide
Lyt_sal_002_EDB	<i>Lythrum salicaria</i>	Purple loosestrife	< 10	Herbicide
Cel_orb_001_EDB	<i>Celastrus orbiculatus</i>	Oriental bittersweet	Single Plant	Herbicide

5.0 SUMMARY AND RECOMMENDATIONS

5.1 SUMMARY

Stantec did not identify any occurrences of invasive plant species within the Project Area during the 2020 surveys. The three occurrences documented in 2021 consist of small populations that coincide with the existing transmission line ROW. Treatment of these invasive plant occurrences by a New Hampshire licensed herbicide applicator was conducted concurrently with the monitoring effort.

5.2 RECOMMENDATIONS

In compliance with the ISMP, Stantec recommends that invasive species monitoring and control for the Project be performed using similar methods in 2022. Treating any new invasive occurrences as soon as identified (i.e., concurrently with the monitoring) will help to limit establishment and spread of invasive species within the Project Area.

The three occurrences of invasive species found during year two surveys may be the result of natural seed dispersal by animals, wind, or from maintenance activities on the existing transmission line corridor, and not a result of previous Project construction. If practicable, Stantec recommends that any vegetation maintenance in areas of observed invasive species be performed after invasive species monitoring and control or outside of the growing season to reduce the risk of spreading of invasive species. In addition, vegetation maintenance personnel should be provided with the locations of previously mapped invasive species locations and use of off-road vehicles or equipment should be avoided, to the extent practicable, in these areas to reduce the risk of spreading invasive species.

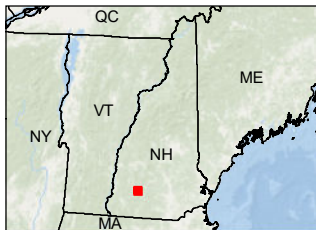
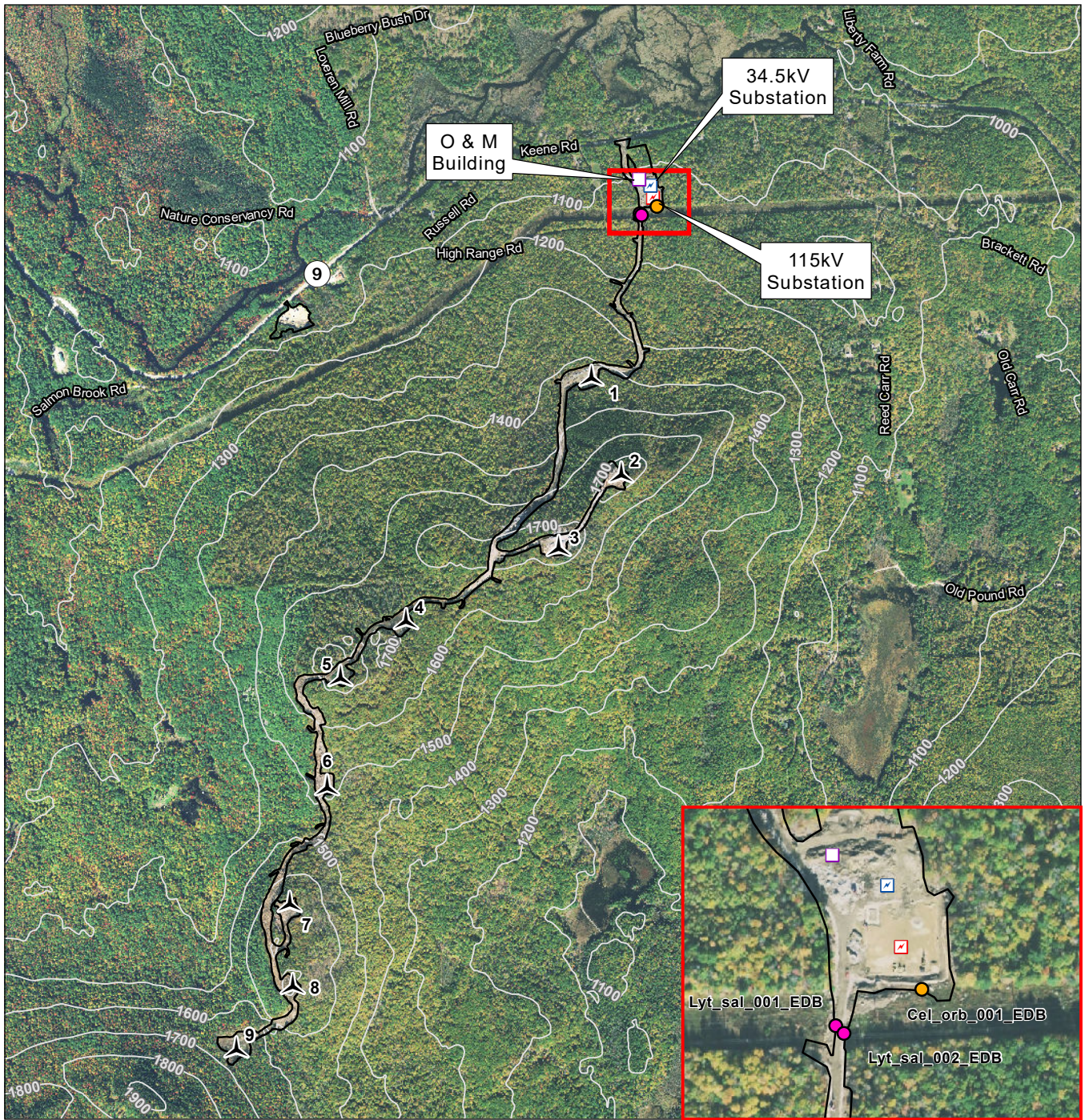


Appendix A Figures
November 11, 2021

APPENDIX A

Figures

V:\1956\active\195601919\03_data\gis_cad\GIS\mxd\Antrim\invasive2021\01919_01_invSpecies2021.mxd Revised: 2021-08-03 By: pbarbera

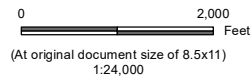


Legend

- Turbine Location
- O&M Building (Approximate)
- 115kV Substation (Approximate)
- 34.5kV Substation (Approximate)
- Limit of Disturbance
- 100-ft Contours

Invasive Plant Species

- Oriental Bittersweet (*Celastrus orbiculatus*)
- Purple Loosestrife (*Lythrum salicaria*)



Project Location: Antrim, New Hampshire
 Prepared by PWB on 2021-08-02
 TR Review by KWH on 2021-08-02
 IR Review by EB on 2021-08-03

Client/Project: TransAlta Corporation
 2021 Invasive Species Monitoring
 Antrim Wind Project

Figure No. 1

Invasive Species Locations

Notes
 1. Coordinate System: NAD 1983 UTM Zone 19N
 2. Data Sources: Stantec, Antrim, USGS
 3. Background: Aerial imagery provided by National Agriculture Imagery Program (NAIP), New Hampshire, 2018.

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Appendix B Representative Site Photos
November 11, 2021

APPENDIX B
Representative Site Photos

2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Appendix B Representative Site Photos



Photo 1. Typical revegetating access road corridor north of turbine T6. July 26, 2021, Stantec.



2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Appendix B Representative Site Photos



Photo 2. Stabilized and revegetated bank at turbine T8. July 26, 2021, Stantec.



2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Appendix B Representative Site Photos



Photo 3. Typical stormwater retention basin north of turbine T1. July 26, 2021, Stantec.



2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Appendix B Representative Site Photos



Photo 4. Revegetating laydown area south of State Route 9. July 26, 2021, Stantec.



2021 INVASIVE SPECIES MONITORING REPORT - ANTRIM WIND PROJECT

Appendix B Representative Site Photos



Photo 5. Typical purple loosestrife occurrence, Lyt_sal_001_EDB, adjacent to the Project access road and south of the substation. July 26, 2021, Stantec.





Photo 6. Typical oriental bittersweet occurrence, Cel_orb_001_EDB, south of the Project substation and within the transmission line corridor. July 26, 2021, Stantec.

