

2020 Chelsea Hill Solar Rare Plant Monitoring Report

I. Introduction

As part of the environmental assessment for the proposed Chelsea Solar Project, Arrowwood Environmental (AE) assessed the proposed impacts on rare, threatened and endangered (RTE) plant species. An RTE plant inventory of the Project site was conducted on August 14th, 2014 and subsequently updated on October 11-12, 2017. During these inventories, a population of arrow-leaved aster (*Symphotrichum urophyllum*) was discovered in the Project area. This plant is not listed as Threatened or Endangered in Vermont, but it is ranked as S1-very rare. Transplantation of the arrow-leaved aster into an established Conservation Area occurred in 2014 and 2017. The purpose of this report is to document the monitoring efforts that were undertaken in 2020 to assess those transplantation efforts.

II. Monitoring

A map of the Project site with the Conservation Area, plant locations and transplant plot locations is shown in Figure 1.

Monitoring of the transplant plots has occurred yearly since transplanting occurred in 2014. The monitoring in 2020 occurred on October 1. During each monitoring period, the number of basal rosettes and flowering stems in each plot was documented. The plots were weeded starting in 2017 and will continue to be weeded during each monitoring event. The focus of the weeding is to decrease competition on the arrow-leaved aster plants. While most species other than the aster were removed, in order to minimize disturbance to the aster plants some weeds were left untouched. Table 1 lists total number of plants in each plot in each year of monitoring.

Germination of the aster seeds appears to be good within the transplant plots. There is often a flush of recently germinated plants which survive for a single season and then die. Since these recently germinated basal rosettes look very different from the mature plants, this was not recognized until 2019.

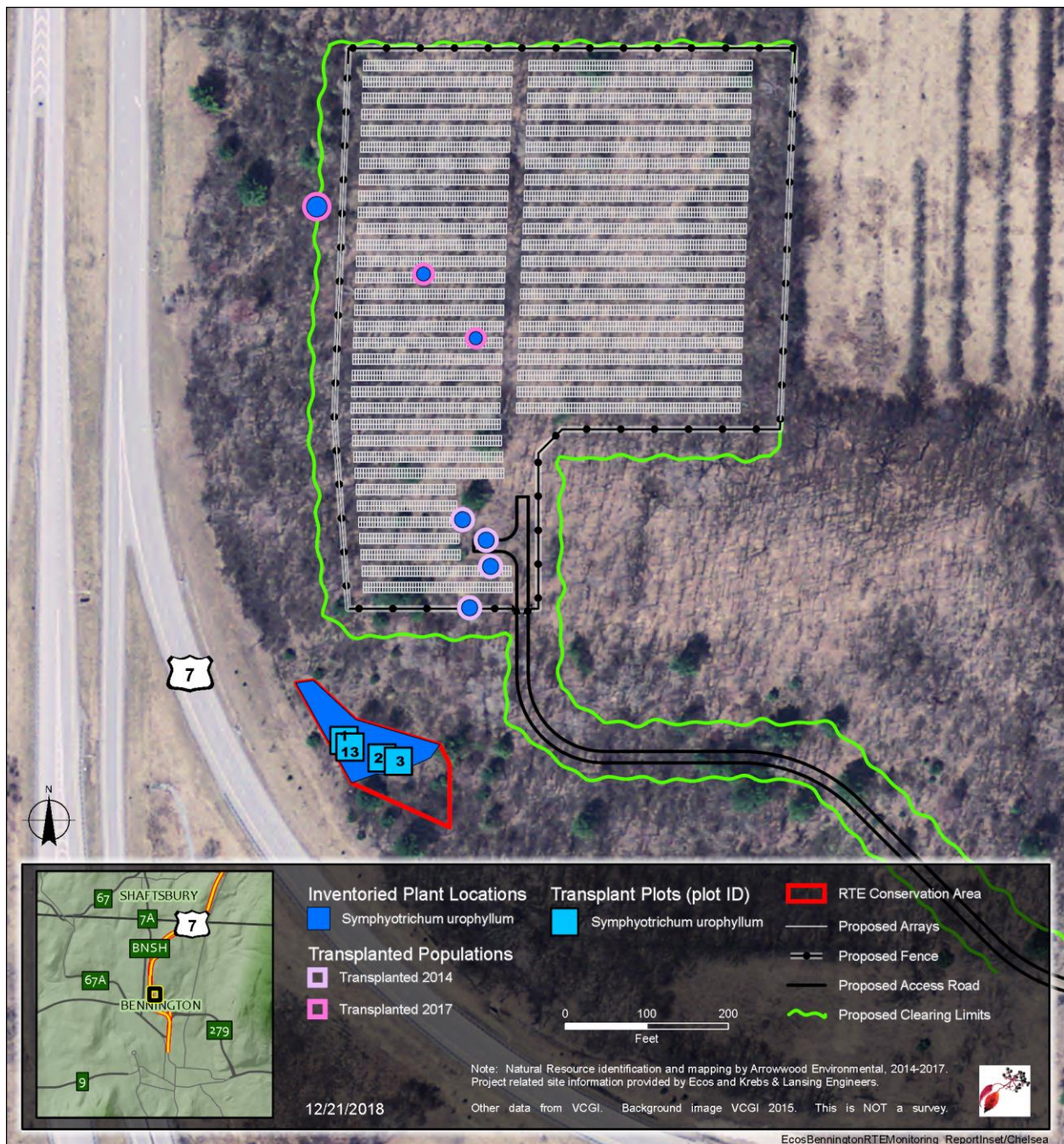


Figure 1. Map of rare plant populations and transplant plots

In 2019 and 2020 the number of these basal rosettes was counted and are shown in parenthesis. Since the majority of these plants will die, it is unlikely that these numbers will represent a spike in the population. However, this information may be useful in understanding the local population dynamics in future years.

Table 1. Vegetation data of *Symphyotrichum urophyllum* transplant plots

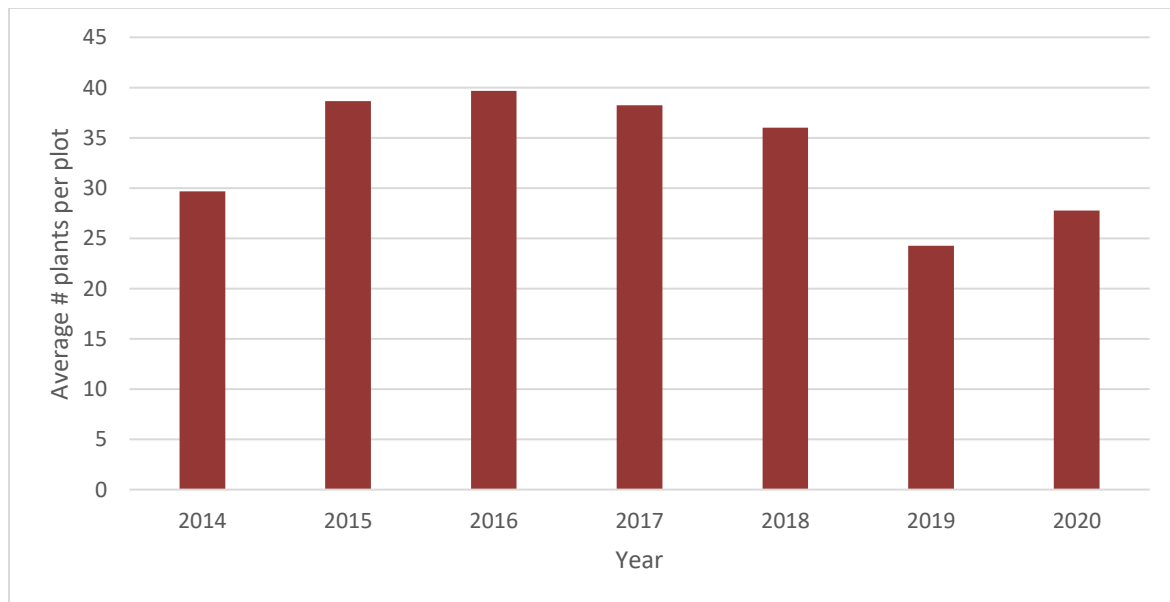
	# Plants 2014	# Plants 2015	# Plants 2016	# Plants 2017	# Plants 2018	# Plants 2019 ²	# Plants 2020 ²
Plot 1	22	30	33	51	43	22 (54)	22 (112)
Plot 2	36	42	43	45	42	26 (4)	34 (9)
Plot 3	31	44	43	48	38	33 (24)	31 (54)
Plot 13¹	NA	NA	NA	9	21	16 (10)	24 (35)
TOTAL	89	116	119	153	144	97 (92)	111 (210)
Change since transplantation³		+27	+30	+55	+46	-1	-5

¹ Plot 13 was established in 2017.

² Number of 1st year basal rosettes shown in parenthesis

³ Data calculated without Plot 13

Figure 2. Average number of *Symphyotrichum urophyllum* plants per plot per year



As can be seen from this data, the overall success rate since transplantation is fairly good. While there is fluctuation throughout the years, six years after transplantation (3 years for plot 13), there is only five fewer plants than was transplanted. Statistically, there is no difference in number of plants per plot between 2014 and 2020 (paired Student's T-test $p=0.2113$).

This overall trend is shown in Figure 2, which displays the average number of plants per plot for each year of monitoring. This data shows that *S. urophyllum* did not exhibit transplant shock immediately after the transplantation event in 2014. There appears to be a peak in average number of plants in 2016 followed by a decline to 2019. Average number of plants per plot, however, increased from 2019 to 2020, though this increase was not statistically significant (paired Student's T-test $p=0.1376$). It is unknown if this increase is an anomaly or the start of an upward trend.

A photographic record of each plot during each monitoring event is presented in Appendix 1. To comply with the Memorandum of Understanding established with the Vermont Agency of Natural Resources, monitoring will continue for three years post-construction.

Appendix 1:

Photo Documentation of *Symphyotrichum urophyllum* transplant plots

Plot 1



Plot 1 10/12/2014



Plot 1 10/7/2015



Plot 1 9/13/2016



Plot 1 10/12/2017

Plot 1 (con't)



Plot 1 10/17/2018



Plot 1 9/27/2019



Plot 1 10/1/2020

Plot 2



Plot 2 10/12/2014



Plot 2 10/7/2015



Plot 2 9/13/2016



Plot 2 10/12/2017

Plot 2 (con't)



Plot 2 10/17/2018



Plot 2 9/27/2019



Plot 2 10/1/2020

Plot 3

	
Plot 3 10/12/2014	Plot 3 10/7/2015
	
Plot 3 9/13/2016	Plot 3 10/12/2017

Plot 3 (con't)



Plot 3 10/17/2018



Plot 3 9/27/19



Plot 3 10/1/2020

Plot 13



Plot 13 11/28/2017



Plot 13 10/17/2018



Plot 13 9/27/2019



Plot 13 10/1/2020