Indian Hills Golf Course Fen

A. Project Location

Figure 1. Location map for the fen on the Indian Hills Golf Course, Stillwater, MN.

Project Location	Immediate Waterbodies Impacted	BMP Performance
Fen is located on a sloping, east-facing hillside on the Indian Hills Golf Course in the southwestern portion of Section 26 of Township 30, Range 21.	Seepage Fen	The Fen is a rare and unique groundwater dependent resource. This project is restoring and protecting this resource and the 50+ native plant species it contains.

Figure 2. Maintenance and inspection area.

B. Description of Facility

I. General Site Description

In 2009 the BCWD completed a groundwater dependent natural resources management plan for the fen located on the Indian Hills Golf Course. The goal for the BCWD's groundwater dependent natural resources is to ensure that they function at or near maximum potential and that they are not significantly compromised due to man-made factors. As a result, the BCWD has taken an active role in managing the fen to restore this high quality resource and developed a management plan to protect the resource from future land use changes that may occur in its contributing drainage area.

Partners	Project Purpose	Drainage Size	Project Size	Project Completed	Maintenance Requirement
BCWD, Mike Regan, owner of the Indian Hills Golf Course	Restore and protect a rare and unique groundwater dependent natural resource that supports over 50 native plant species.	39.9 acres	10 acres	Management activities began in 2010	On-going on a voluntary basis

II. Parts Inventory

Not Applicable for this project

III.Stormwater Management Facilities

Not Applicable for this project

IV. Accessibility

To maintain the Fen restoration area there is one main access road on the south side of 75th avenue north that permits access to the site. Equipment is limited to light weight vehicles unless approval is given by the BCWD Administrator. Flooding of the access road has occurred in the past, making access to the fen difficult during wet conditions.

Before accessing the Fen restoration area, contact Mike Regan, owner of Indian Hills Golf Course, and provide advanced notice of an upcoming inspection and/or maintenance.

Contact Personnel	Contact Number	Organization	Advanced Notice
Mike Regan, Owner	651-770-2301 x24	Indian Hills Golf Course	48 hours

V. Start-Up and Operating Procedures

a. Process Description

Not Applicable for this project

b. Controls

Not Applicable for this project

c. Start – up Procedures

Not Applicable for this project

d. Normal Operating Procedures

The following personnel can be contacted for questions related to the maintenance of this resource.

Contact Personnel		Contact Number	Organization
Primary	Karen Kill, Administrator	651-330-8220 x26	BCWD
Secondary	Camilla Correll, District Engineer	651-770-8448	Emmons & Olivier Resources, Inc.

e. Common Operating Problems

Not Applicable for this project

C. Maintenance and Inspection Requirements

I. Planning Maintenance and Inspections

a. Inspection Procedures

Inspections should be made at least once per year between the months of April and November, and will be completed by the contractor concurrently with the maintenance activities. Inspections should include documentation (*Outlined in Section E, Record of Annual Inspection and Maintenance Program*) and measurements of the following components:

1. Document the presence, quantity, and location of any invasive vegetation.
2. Document the presence, quantity, and location of high quality vegetation.
3. Rate the overall condition of the Fens vegetation community.
4. Note any additional areas of concern.

b. Maintenance procedures

Item	Corrective Action	Maintained by	Maintenance Frequency	Estimated Annual Cost *(Based on 2026 Estimate)*
Remove invasive vegetation	Mow, hand pull and spray as needed	BCWD/Contracted Party	As determined by inspections	$4,200*
			Anticipated Total Yearly Cost:	**$4,200**

* Includes the cost of EOR site visit to confirm work being completed and gather information to provide recommendations for future maintenance.

Maintenance activities will include mowing, pulling and spot-spraying invasive species. The maintenance should be performed by a contractor experienced in native plant community restoration with a licensed herbicide applicator and will include three visits to the site throughout the growing season.

II. Corrective Actions and Modifications

Ongoing maintenance of the site is necessary to ensure that invasive species from the surrounding areas do no re-encroach into areas previously addressed through restoration efforts.

III. In-house Verses Contracted Labor

Since 2010, the BCWD has been contracting this work to Natural Shore Technologies.

D. Maintenance Responsibilities and Agreements

The BCWD has voluntarily been performing maintenance of the fen at the Indian Hills Golf Course since 2010. This work is coordinated with the property owner, Mike Regan.

I. Manufacturer's Recommendations

Not Applicable for this project

II. Safety

A contractor experienced in native plant community restoration with a licensed herbicide applicator should perform maintenance.

E. Records and Reporting

Records and reporting should be submitted to and maintained by BCWD. The most current summary of maintenance activities can be found in the appendices.

Record of Annual Inspection and Maintenance Program:

Inspector Information				
Visit Number:				
Name				
Date:				
Identifier Number	**Structure Description**	**Presence**	**Quantity**	**Notes**
1.	Invasive Vegetation	Y / N		
	High Quality Native Vegetation	Y / N		
	Fen Condition	NA	NA	
	Condition of contributing drainage area	NA	NA	
Maintenance Description:				
Contractor / Maintenance Crew Information				
Date:				
Name:				
Phone:				
Address:				
Maintenance Description:				

I. Sampling and Performance Monitoring

a. Sampling and Analysis

Not Applicable for this project

b. Performance monitoring

Not Applicable for this project

F. Emergency Plan and Operating Procedures

I. Emergency Plan

Always call 911 in a situation that presents a risk of immediate bodily harm to yourself or the surrounding community.

II. Emergency Operating Procedures

In the event on an operational emergency, please contact the following personnel for further assistance.

Contact Personnel		Contact Number	Organization
Primary	Karen Kill, Administrator	651-330-8220 x26	BCWD
Primary	Mark Guenther, President	651-425-0469	Fenway Land Company
Secondary	Camilla Correll, District Engineer	651-770-8448	Emmons & Olivier Resources, Inc.

G. Appendices

I. Grant Fen Maintenance Summary Report (March, 2018)

March 1st, 2018

Grant Fen Maintenance Summary Report

Site Description: Grant Fen is located in Washington County. The fen is characterized by its saturated soils and diverse native sedge and forb species. It is a mix of highly diverse native species as well as several species of non-native invasive plants. The fen is subject to nutrients entering from neighboring agriculture and golf course landscapes. A large amount of bird, mammal, and insect species have been observed on the site, making this fen high value for wildlife. Several interesting native species have been observed on this site including bottle gentian (*Gentiana andrewsii*), sensitive fern (*Onoclea sensibilis*), the native broad leaf cattail (*Typha latifolia*), swamp saxifrage (*Micranthes pensylvanica*), and others. These species are not common for the area and are found in these rare fen ecosystems.

Site Assessment: The fen has been managed for several years for aggressive or invasive species such as buckthorn, reed canary grass, Canada thistle, and Canada goldenrod. These species have been in dramatic decline due to our timely herbicide applications, and are replaced with native plants. However re-infestation is likely due to neighboring seed sources. There has been recent agricultural activity in the fen where native plants have been tilled and replaced with plants used to attract deer. Due to the sensitive nature of the native plants, any disturbances like this open the area up for recolonization of invasive species like reed canary grass.

612.703.7581 | naturalshore.com | Office & Nursery 1480 County Rd 90 Independence, MN 55359

Long-term goals: Continue timely ongoing maintenance including herbicide treatments and mowings to protect this valuable native plant ecosystem from neighboring weed sources. Work with land owner to improve wetland buffer and reduce edge effect due to surrounding land use. Promote the propagation of native species in areas where we removed non-natives, to help foster wildlife habitat, biodiversity, and aesthetics.

Maintenance History:

- **Site Maintenance began in 2010**
  - Mowed site and did herbicide treatment to control buckthorn, Canada thistle, and reed canary grass.
- **Site was reassessed in 2012**
  - Mowing and herbicide treatment were considered a success as there was an increased abundance of native species like Joe pye weed and sensitive fern where previously just had reed canary grass.
  - Spring herbicide treatment targeted reed canary grass and Canada thistle.
  - Continued maintenance with a fall herbicide treatment of the reed canary grass, Canada thistle, and stinging nettle.
- **Further improvements in 2013**
  - Due to the observed positive response to previous management strategies, a more intensive approach to manage more reed canary grass on the site was employed and other invasive species were targeted (Canada goldenrod).
  - A spring herbicide treatment was conducted on reed canary grass, Canada thistle, and Canada goldenrod.
  - A mid and late summer weed whipping and herbicide treatment also controlled the spread of invasive species by preventing seed maturation.
  - Invasive tree species were cut and treated with herbicide (common buckthorn, glossy buckthorn, and Amur maple).
  - Further decrease of reed canary grass was observed.
- **2014 Maintenance**
  - Perennial and annual invasive weeds were mowed in the spring and fall to ensure their seeds did not mature.
  - A spring and late summer herbicide treatment were used to control reed canary grass and invasive broadleaf species.
  - Decrease in reed canary grass and Canada thistle by an estimated 33%.
  - Decrease in invasive woodies by an estimated 40%.

- **2015 Maintenance**
  - Dramatic decrease in presence of invasive species during spring assessment.
  - Spring mowing of reed canary grass and an herbicide treatment of broadleaf invasive species.
  - Late summer and fall herbicide treatments to further decrease the most prominent stands of invasive species.
  - Increased presence of sensitive fern, tussock sedge, and other native plants are observed in areas where invasives species were removed.
- **2016 Maintenance**
  - Raspberry bushes moved into areas previously vacated of reed canary grass and Canada thistle. Raspberry was controlled to prevent ongoing spread.
  - Herbicide treatments and spring mowing of reed canary grass and broadleaf species, as well as small invasive woodies.
  - Dramatic decrease in presence of reed canary grass, where management is becoming more time consuming to work around native plants. Herbicide treatments include more hand-wicking in addition to spot treatments with a backpack sprayer to prevent drift to native plants.
  - Another fall invasive tree removal was conducted to target common buckthorn, glossy buckthorn, Amur maple, and honeysuckle.
- **2017 Maintenance**
  - Reed canary grass was mowed and broadleaves were sprayed early spring.
  - Area in fen which contained rare native plants was tilled and planted with a deer forage seed mix.
  - Decrease in raspberry bushes encroaching on areas previously reed canary grass.
  - Decrease in Canada goldenrod (estimated 33%) and Canada thistle (estimated 40%).
  - Fall woody cut and stump treatment on buckthorn and Amur maple.

Grant Fen General Maintenance Summary:
Reed canary grass observed on site has decreased by an estimated 60% since maintenance efforts began. Canada thistle observed on site has decreased by an estimated 75% since maintenance efforts began. Non-native woody species such as buckthorn, Amur maple, and others by an estimated 60%. Native species such as joe pye weed, swamp milkweed, bottle gentian, sensitive fern, and many other native species as increased by an estimated 60% since maintenance efforts began and invasive species were removed. Some of these

native species are rare for the area and the conditions. The ongoing maintenance of this site is necessary to ensure that invasive species from the surrounding areas do not re-encroach into areas previously made to vacate.

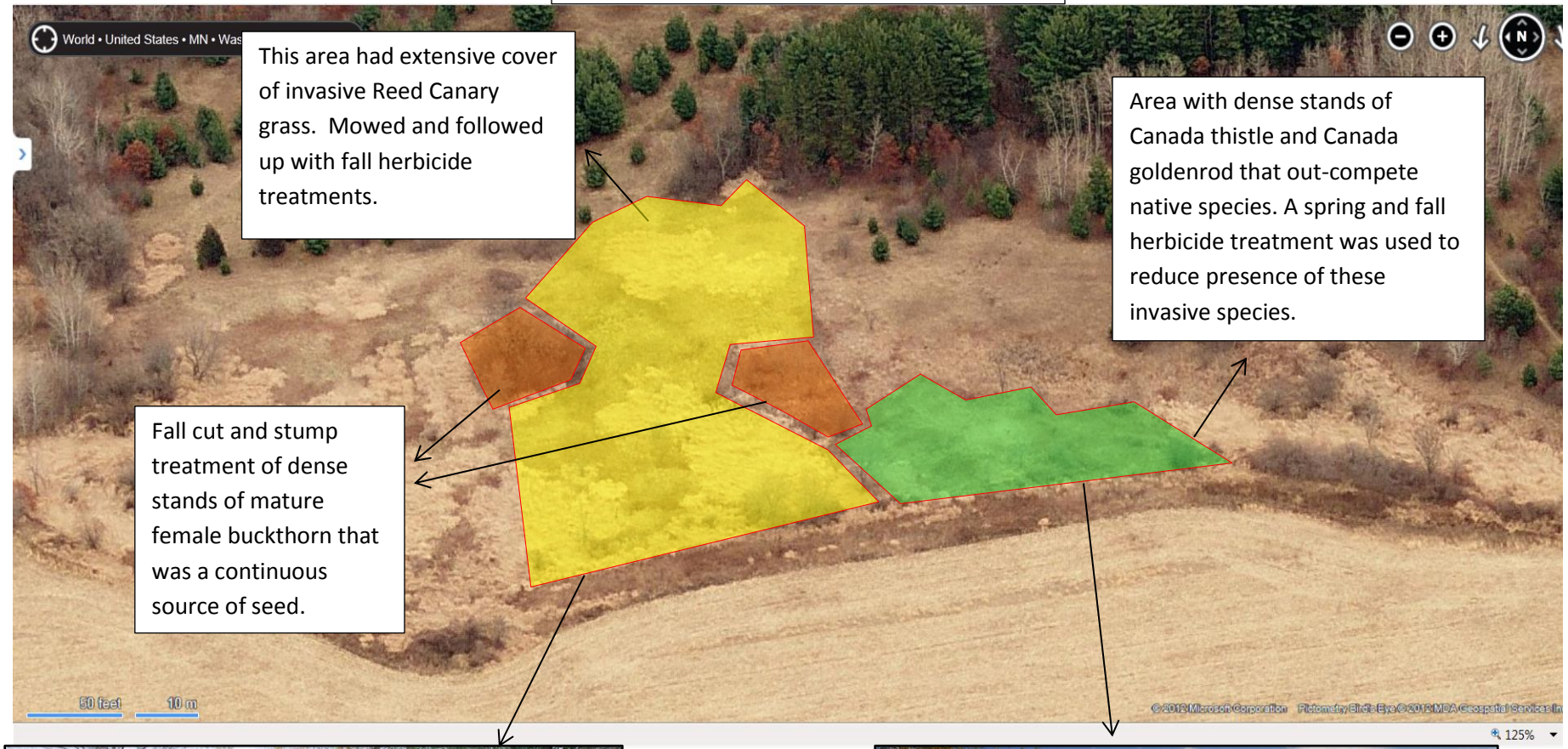
Grant Fen Maintenance Summary Report

3/1/18

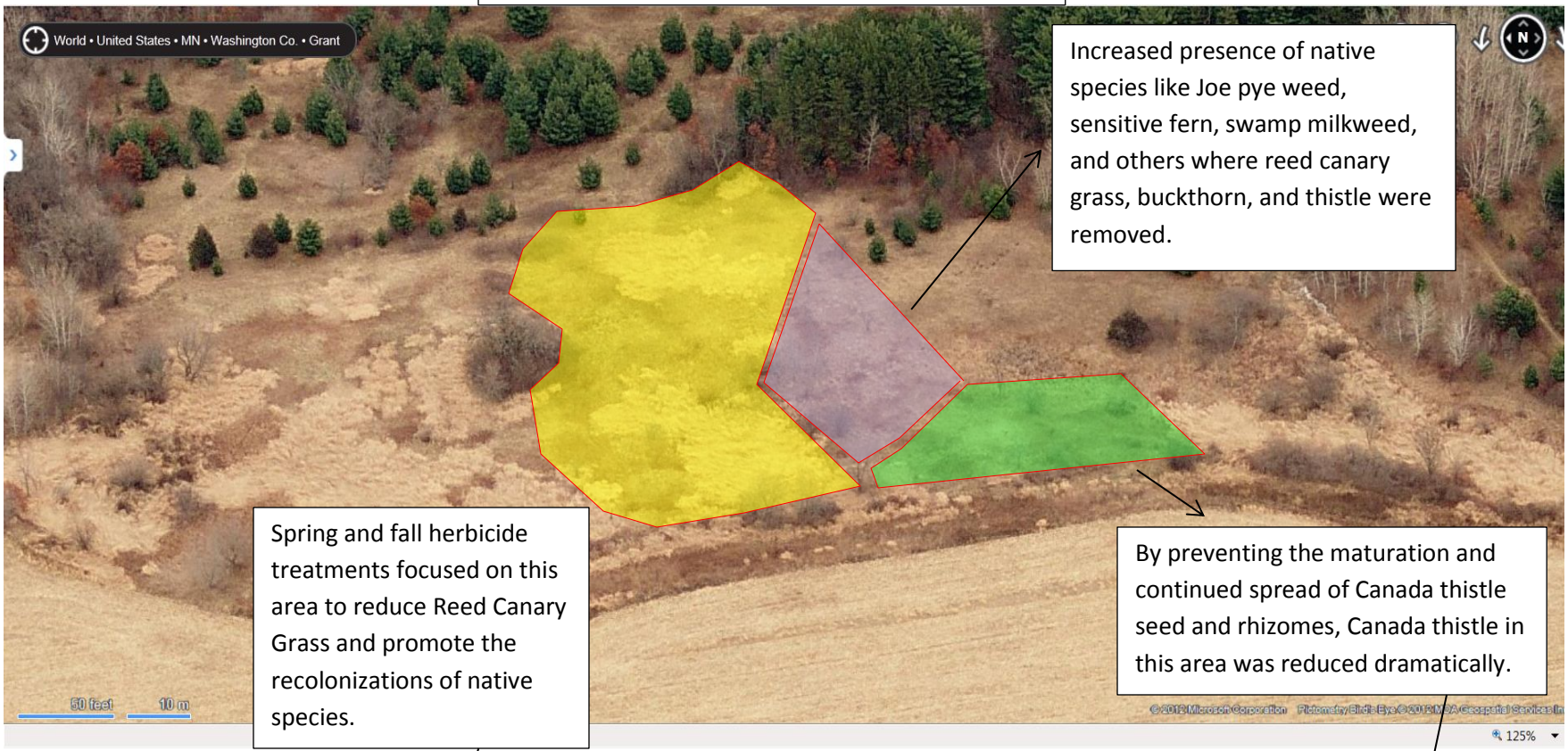
Maintenance Issues:

- **Invasive species (Reed Canary Grass, Canada thistle, buckthorn, Amur Maple, etc.)**
- **Surrounded by neighboring areas infested with invasives species (consistent seed source)**
- **Water levels can fluctuate depending on the season**
- **Good diversity of native plants mixed in with invasive species**

2010-2011 Vegetation Management



2012 Vegetation Management

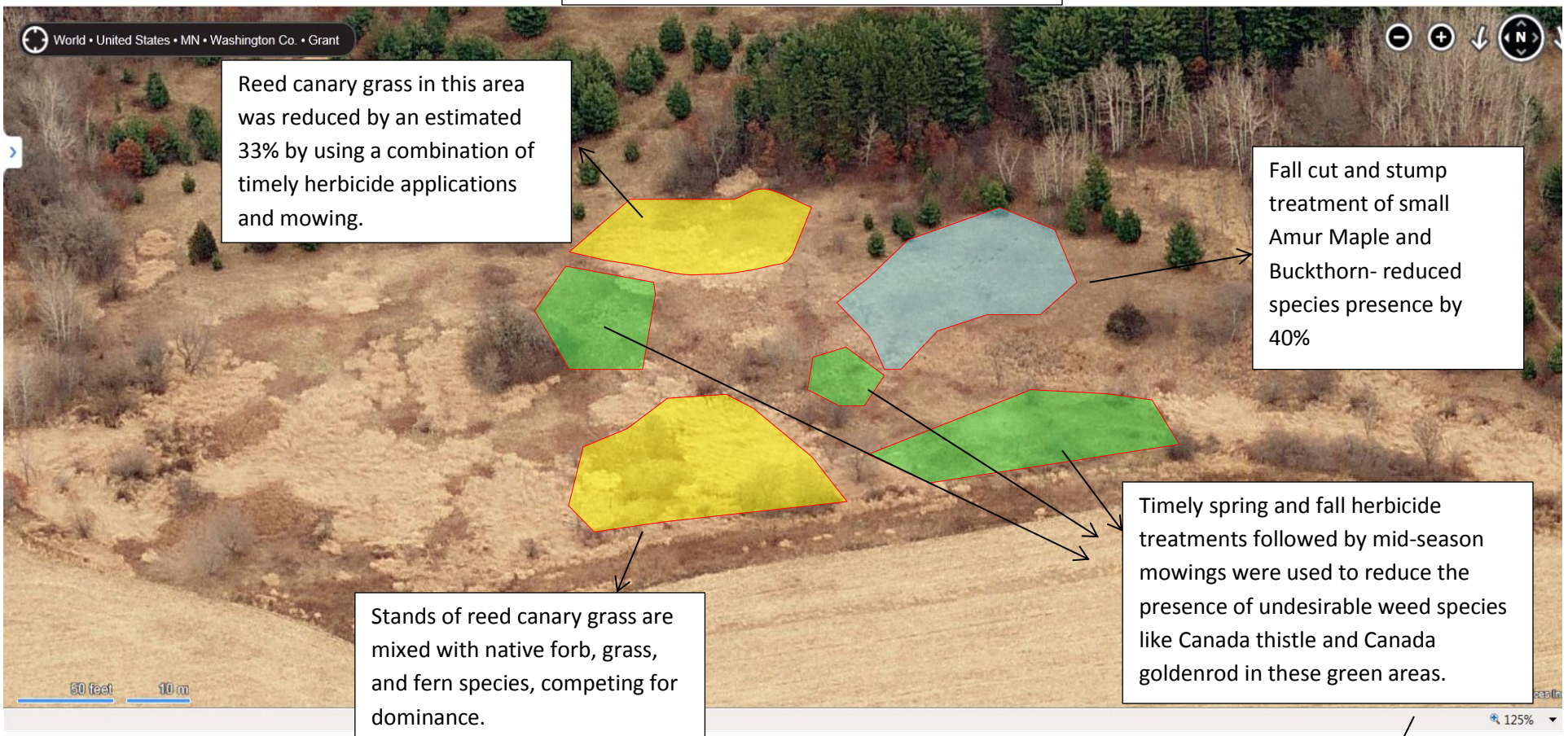


Increased presence of native species like Joe pye weed, sensitive fern, swamp milkweed, and others where reed canary grass, buckthorn, and thistle were removed.

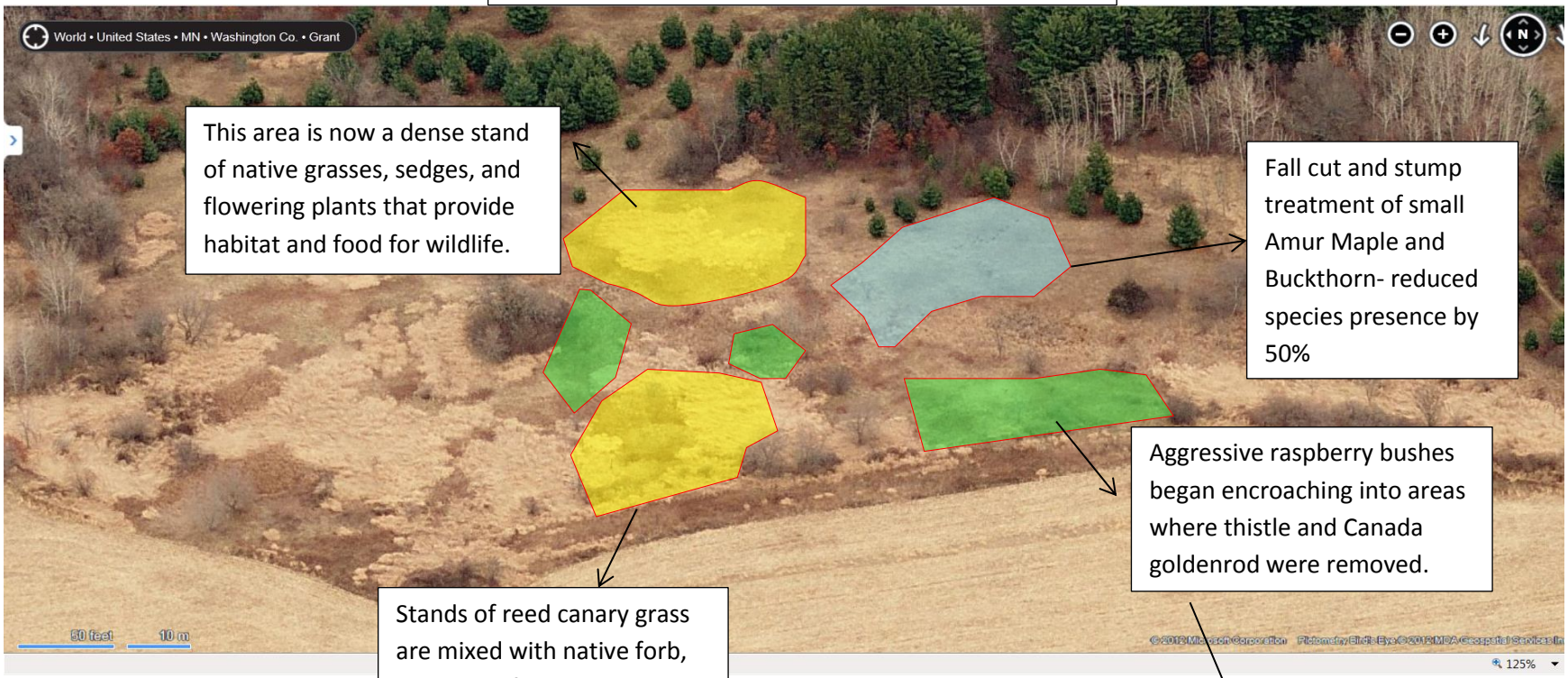
Spring and fall herbicide treatments focused on this area to reduce Reed Canary Grass and promote the recolonizations of native species.

By preventing the maturation and continued spread of Canada thistle seed and rhizomes, Canada thistle in this area was reduced dramatically.

2014 Vegetation Management



2016 Vegetation Management



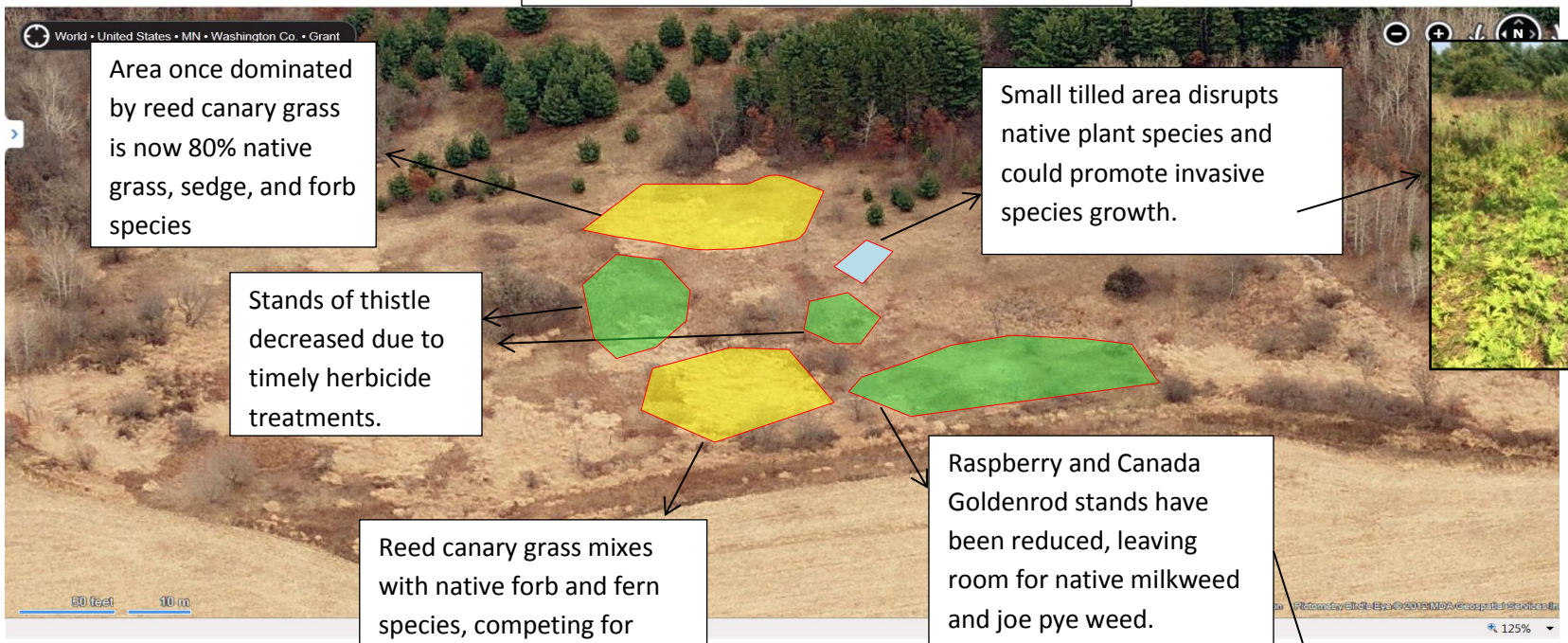
This area is now a dense stand of native grasses, sedges, and flowering plants that provide habitat and food for wildlife.

Fall cut and stump treatment of small Amur Maple and Buckthorn- reduced species presence by 50%

Aggressive raspberry bushes began encroaching into areas where thistle and Canada goldenrod were removed.

Stands of reed canary grass are mixed with native forb, grass, and fern species, competing for dominance.

2017 Vegetation Management



Area once dominated by reed canary grass is now 80% native grass, sedge, and forb species

Small tilled area disrupts native plant species and could promote invasive species growth.

Stands of thistle decreased due to timely herbicide treatments.

Reed canary grass mixes with native forb and fern species, competing for dominance.

Raspberry and Canada Goldenrod stands have been reduced, leaving room for native milkweed and joe pye weed.