

Driving *Phragmites* to Eradication:

Five Years of Management at the Royal Botanical Gardens

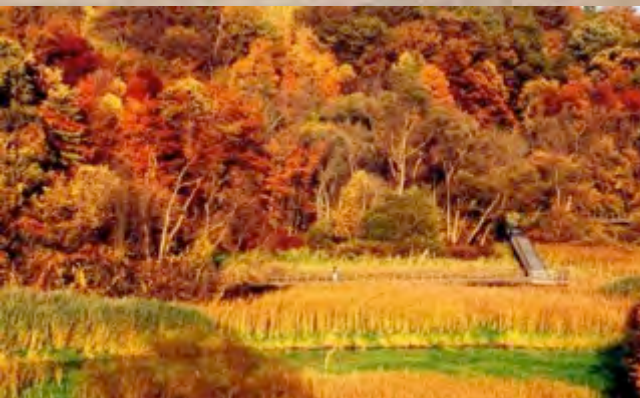


**ROYAL
BOTANICAL
GARDENS**
www.rbg.ca

Jennifer Bowman
Aquatic Ecologist

Sophia Munoz
Botany Intern

**Creek Side Trail
Hendrie Valley
September 4th, 2013**



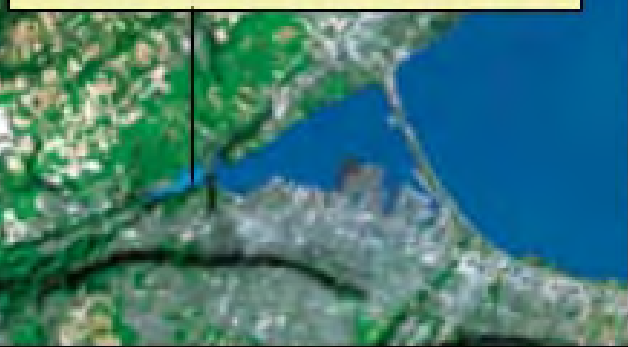
What is Royal Botanical Gardens?

- Canada's largest botanical garden on the basis of the size of lands: 1,100 hectares or 11 square km
- Dedicated to connecting people and nature
- Using expertise in horticulture, conservation, science and education, and unique gardens, facilities and natural lands, to inspire and nurture peoples' commitment to the environment.
- A self-governing charity that owns its own lands and buildings

Protecting Nature Right in the City

- Almost 1,000 hectares of protected nature sanctuaries: Canada's richest place for biodiversity
- Nationally recognized habitat for birds, turtles, and endangered plants
- Ecological restoration projects since the 1940s protecting Cootes Paradise Marsh, prairie habitats, savannahs and forests
- Research and educational programs on ecosystem management, fighting invasive species, protecting endangered species

Cootes Paradise





Canada's Biodiversity Hotspot

RBG has 38% of Ontario's and 23% of Canada's native flora living in environmentally sensitive ecosystems

- UNESCO World Biosphere Reserve
- Important Bird Area (IBA)
- Important Area for Reptiles and Amphibians (IMPARA)
- Provincial Area of Natural and Scientific Interest (ANSI)
- Environmentally Sensitive Area
- Provincially Significant Wetlands
- National Historic Site

Phragmites australis subsp *americanus*



RBG Herbarium records

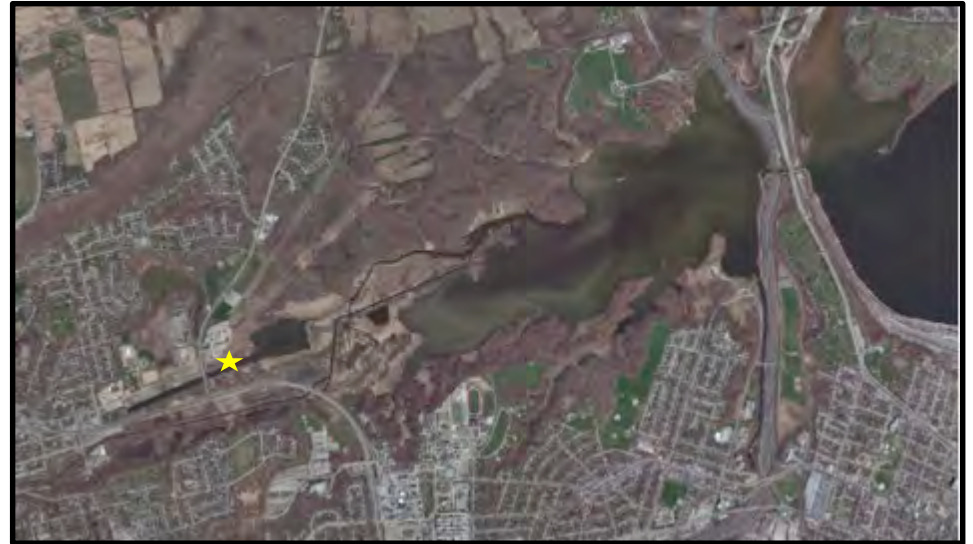
- 1892 - W. Chapman, collected from marsh near Desjardin Canal
- 1955 - A. Tamsalu, collected from reed swamp (N9)
- 1955 - A. Tamsalu, collected from nurse field (N13)



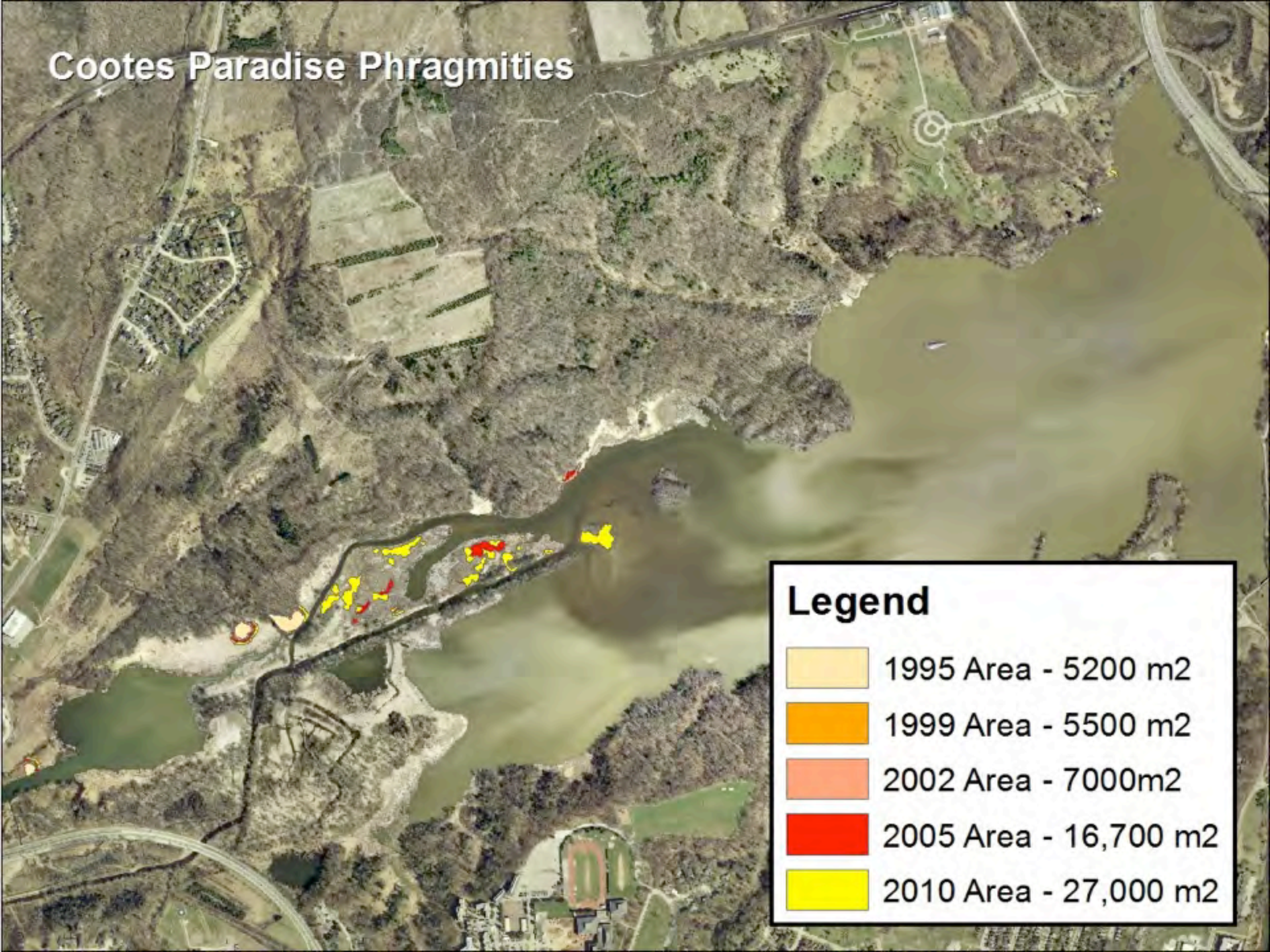
Phragmites australis subsp *australis*



- Earliest records in North America show *Phragmites* in Annapolis Royal, N.S., in 1910
- Earliest records at RBG from 1946 along the banks of the canal.



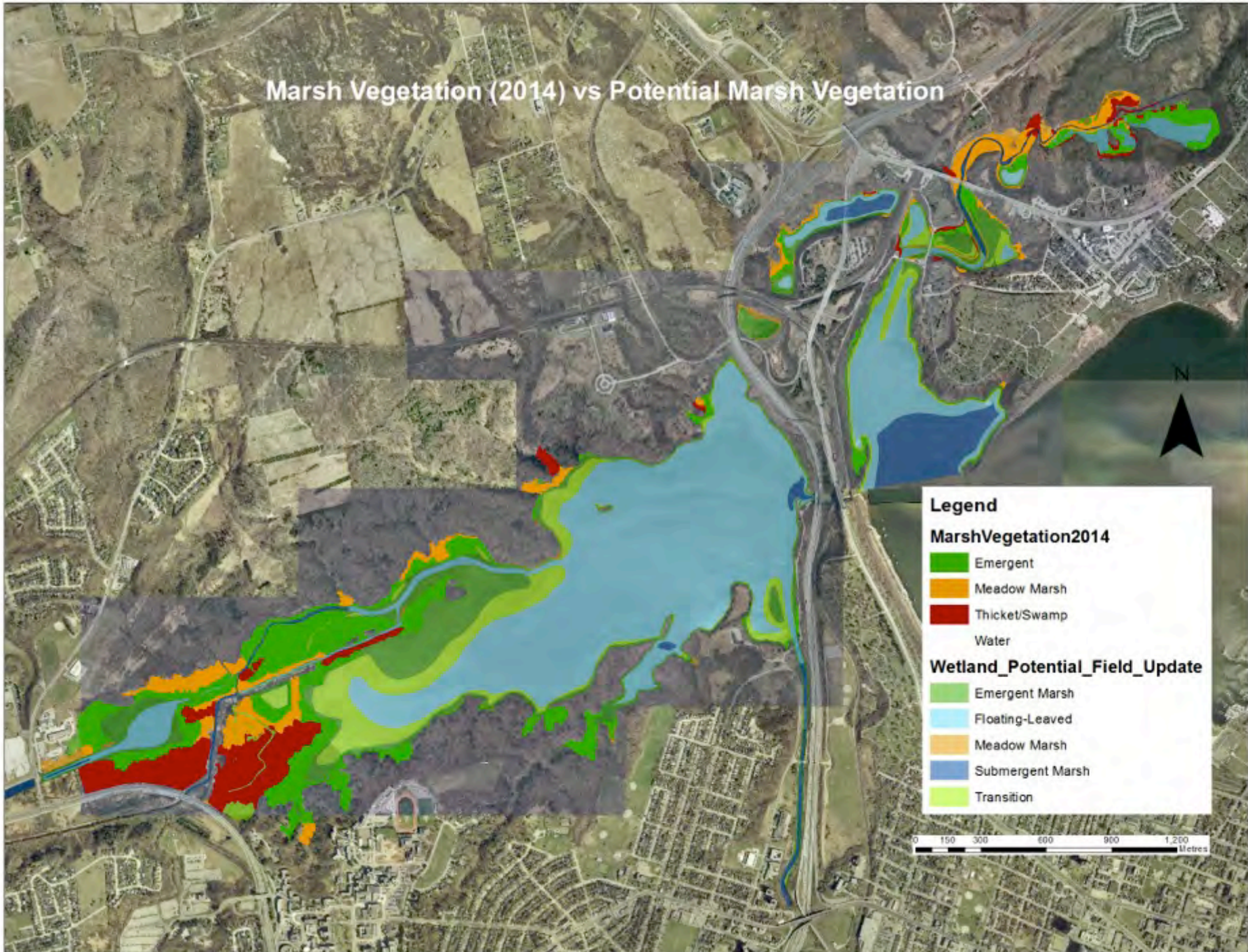
Cootes Paradise Phragmites



Legend

	1995 Area - 5200 m2
	1999 Area - 5500 m2
	2002 Area - 7000m2
	2005 Area - 16,700 m2
	2010 Area - 27,000 m2

Marsh Vegetation (2014) vs Potential Marsh Vegetation

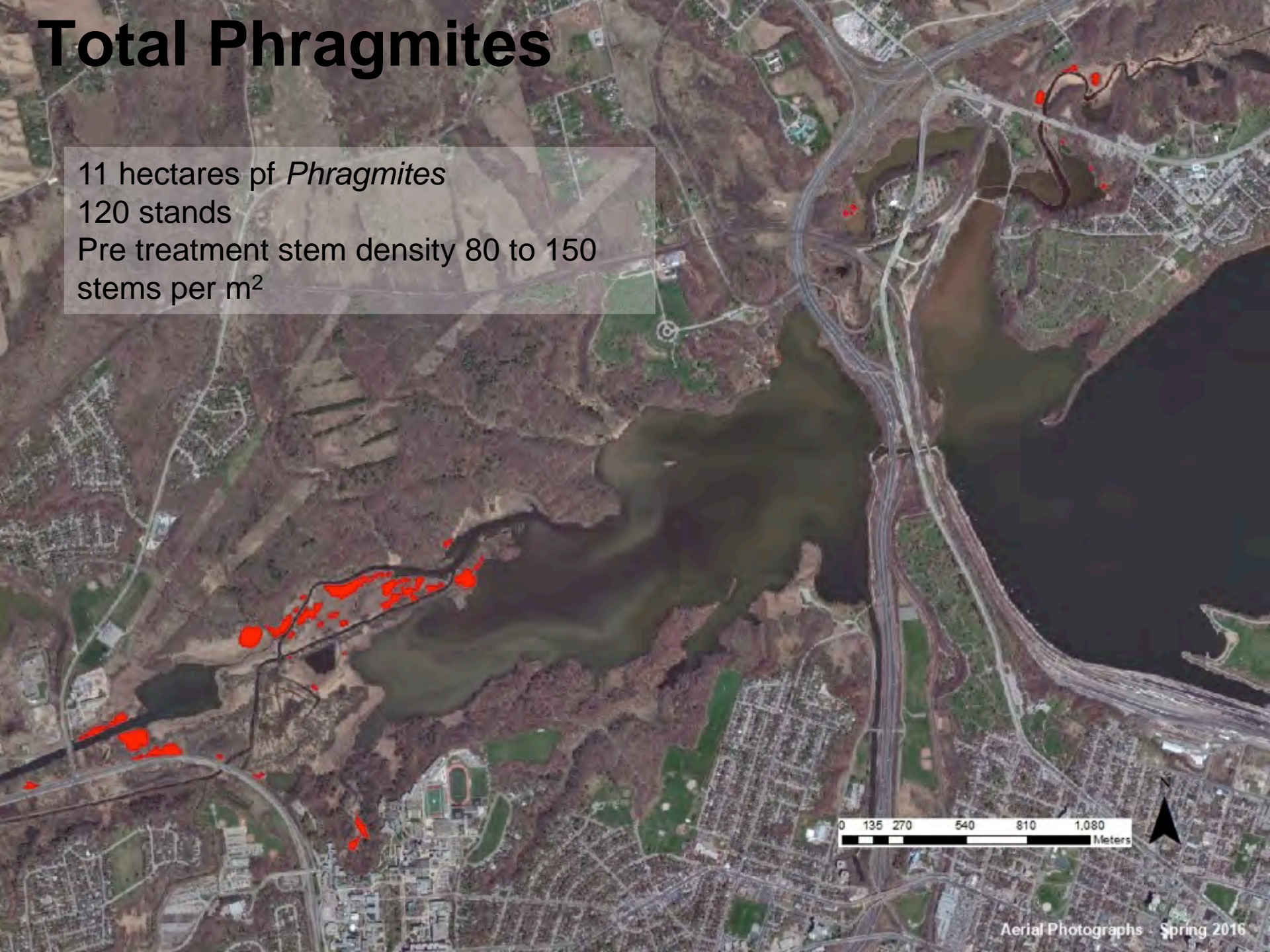


Total Phragmites

11 hectares pf *Phragmites*

120 stands

Pre treatment stem density 80 to 150
stems per m²



0 135 270 540 810 1,080
Meters

Management

- Started Management in 2013

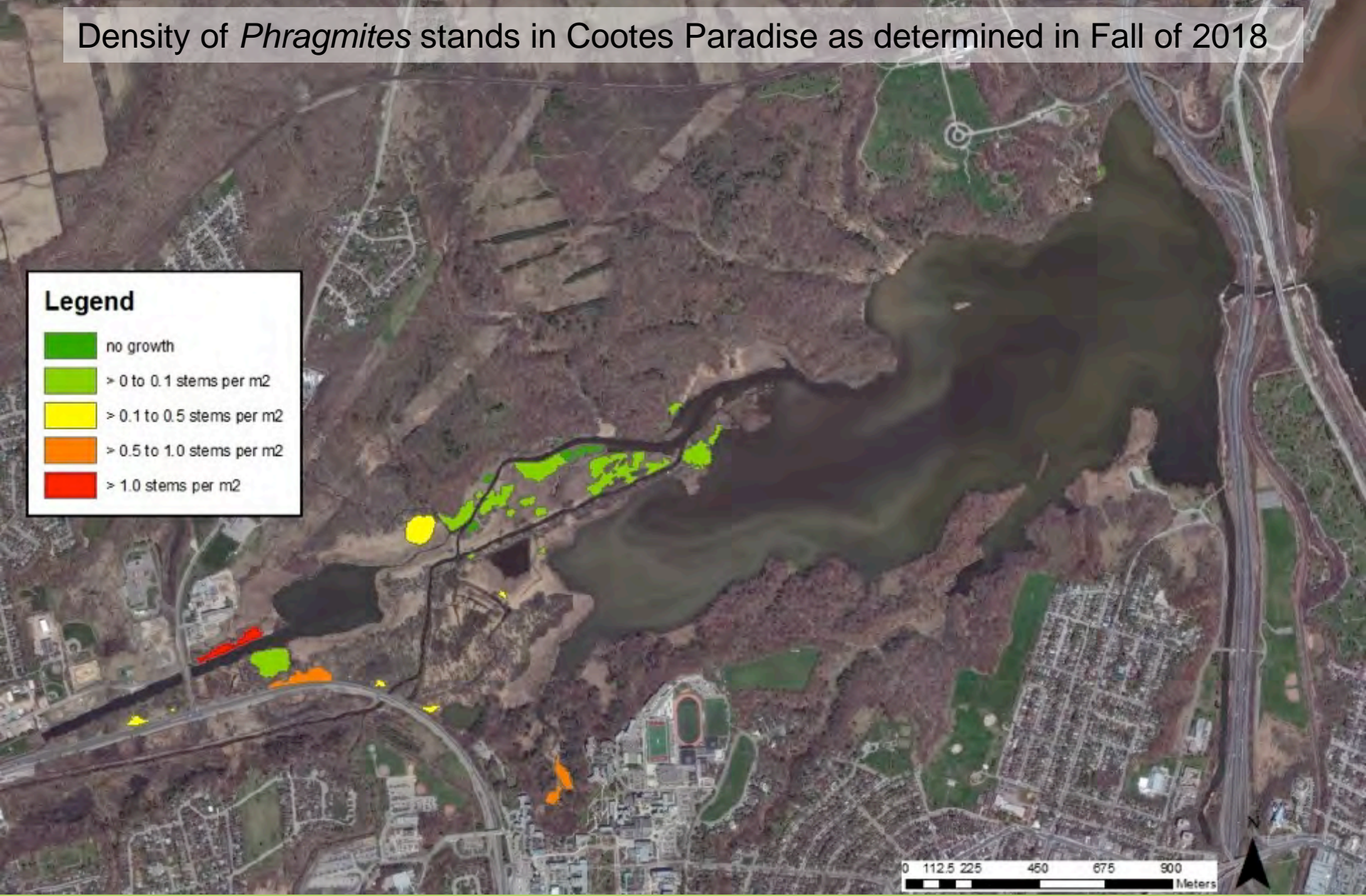
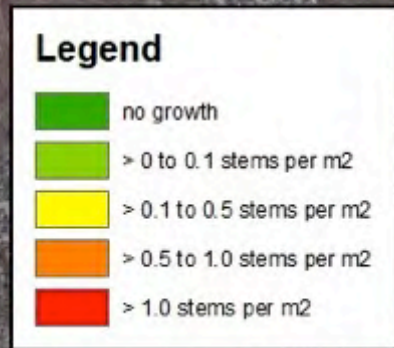
September – Herbicide application

Winter – smash or roll dead stalks

Monitoring takes place just before spraying.



Density of *Phragmites* stands in Cootes Paradise as determined in Fall of 2018



Aerial photos from Spring 2016

Pre-management *Phragmites* stands had 80 to 150 stems per m²



Aerial photos from Spring 2016

Pre-management *Phragmites* stands had 80 to 150 stems per m²



**Pre-herbicide treatment
2014**



Post- herbicide (primary) treatment 2015



Post- herbicide (tertiary) treatment 2016



Planting 2016



2017



2018

Least Bittern Stats @ RBG

O. Reg. 167/17 sch.3 #50

L: 13" WS: 17" WT: 2.8 oz

Least Bittern

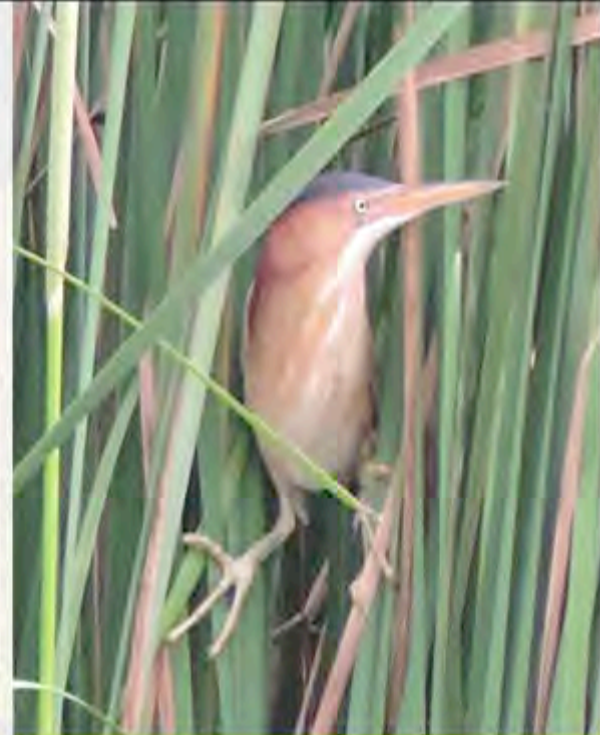
Ixobrychus exilis

Year	# Stns Surveyed	Observed At
2007	78	0
2010	7	1
2014	17	3
2017	24	11

Status: Threatened

Hemi-marsh nesting obligate

**Just finished its 4th round of
formal surveys at RBG**

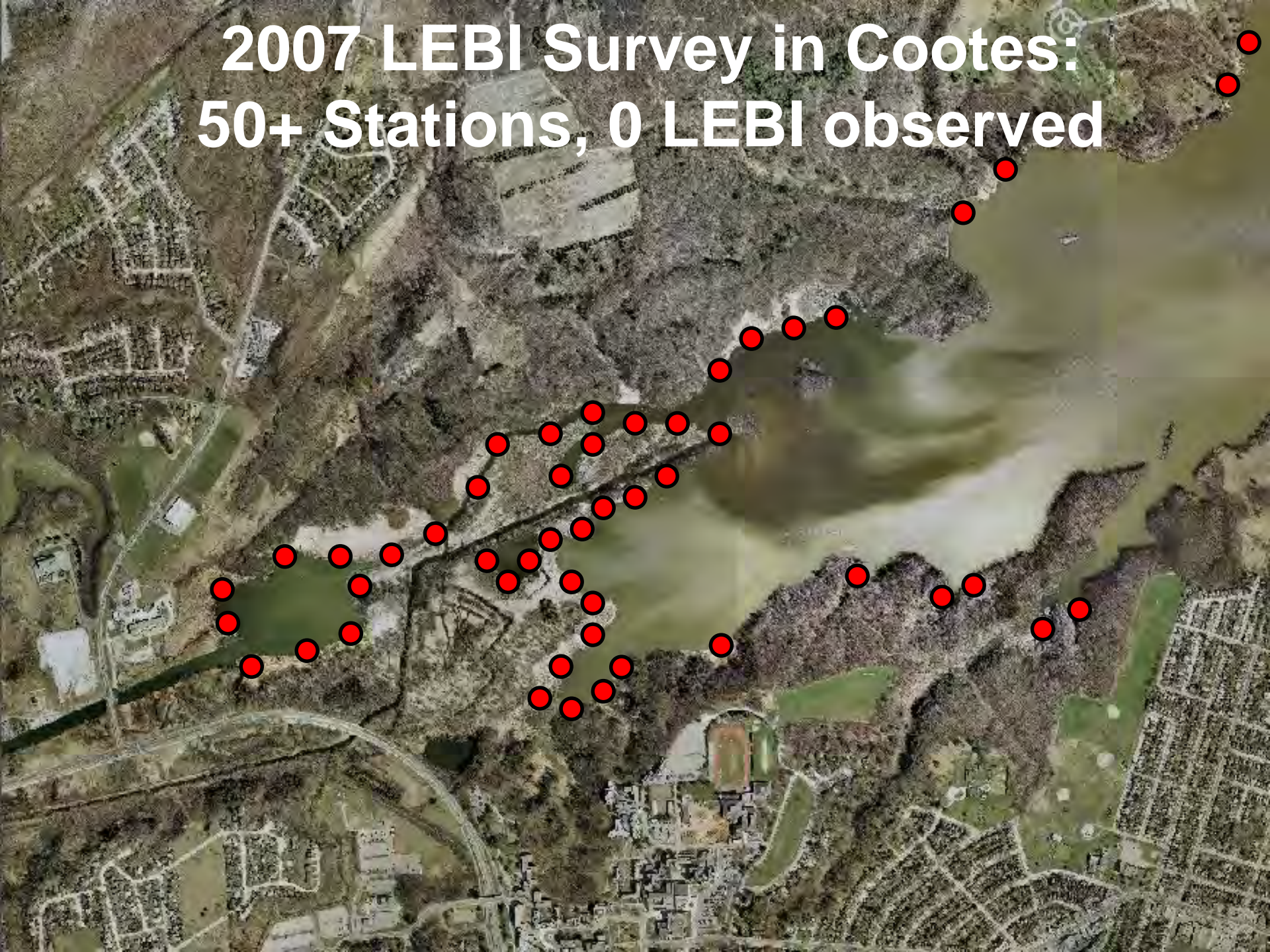


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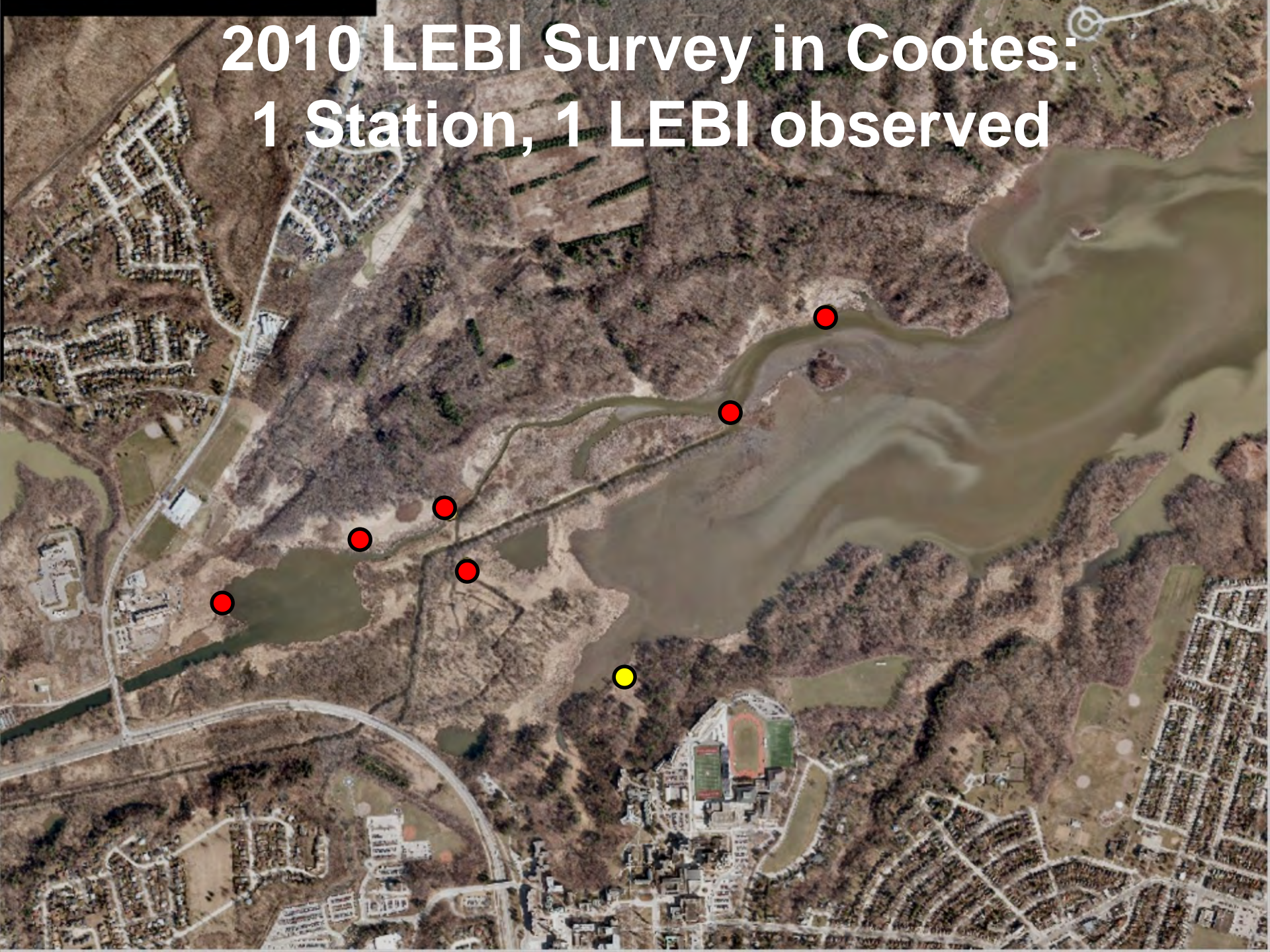


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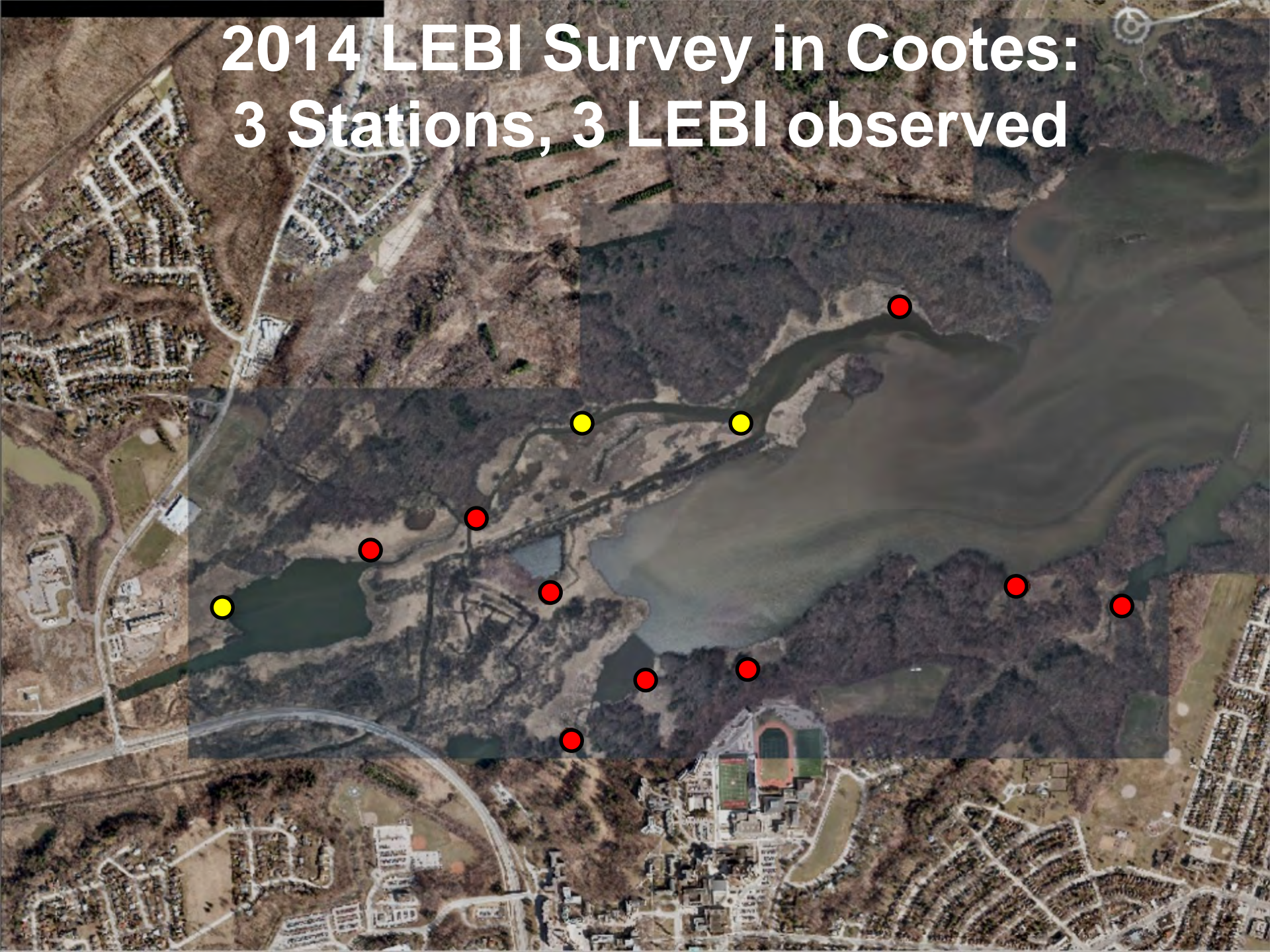
**2007 LEBI Survey in Cootes:
50+ Stations, 0 LEBI observed**



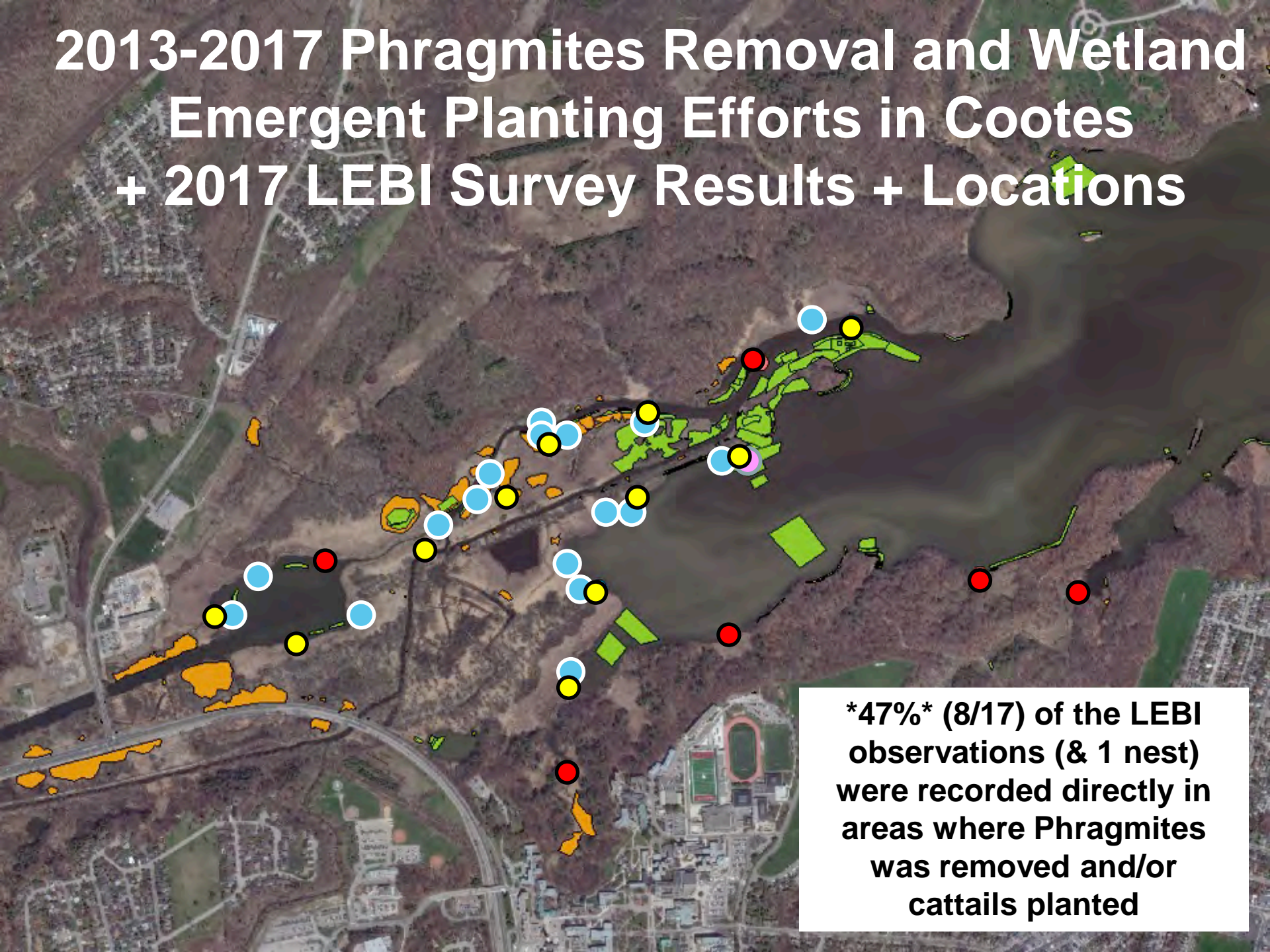
2010 LEBI Survey in Cootes: 1 Station, 1 LEBI observed



2014 LEBI Survey in Cootes: 3 Stations, 3 LEBI observed



2013-2017 Phragmites Removal and Wetland Emergent Planting Efforts in Cootes + 2017 LEBI Survey Results + Locations



***47%* (8/17) of the LEBI
observations (& 1 nest)
were recorded directly in
areas where Phragmites
was removed and/or
cattails planted**



What plant species are regenerating in the managed *Phragmites* sites?

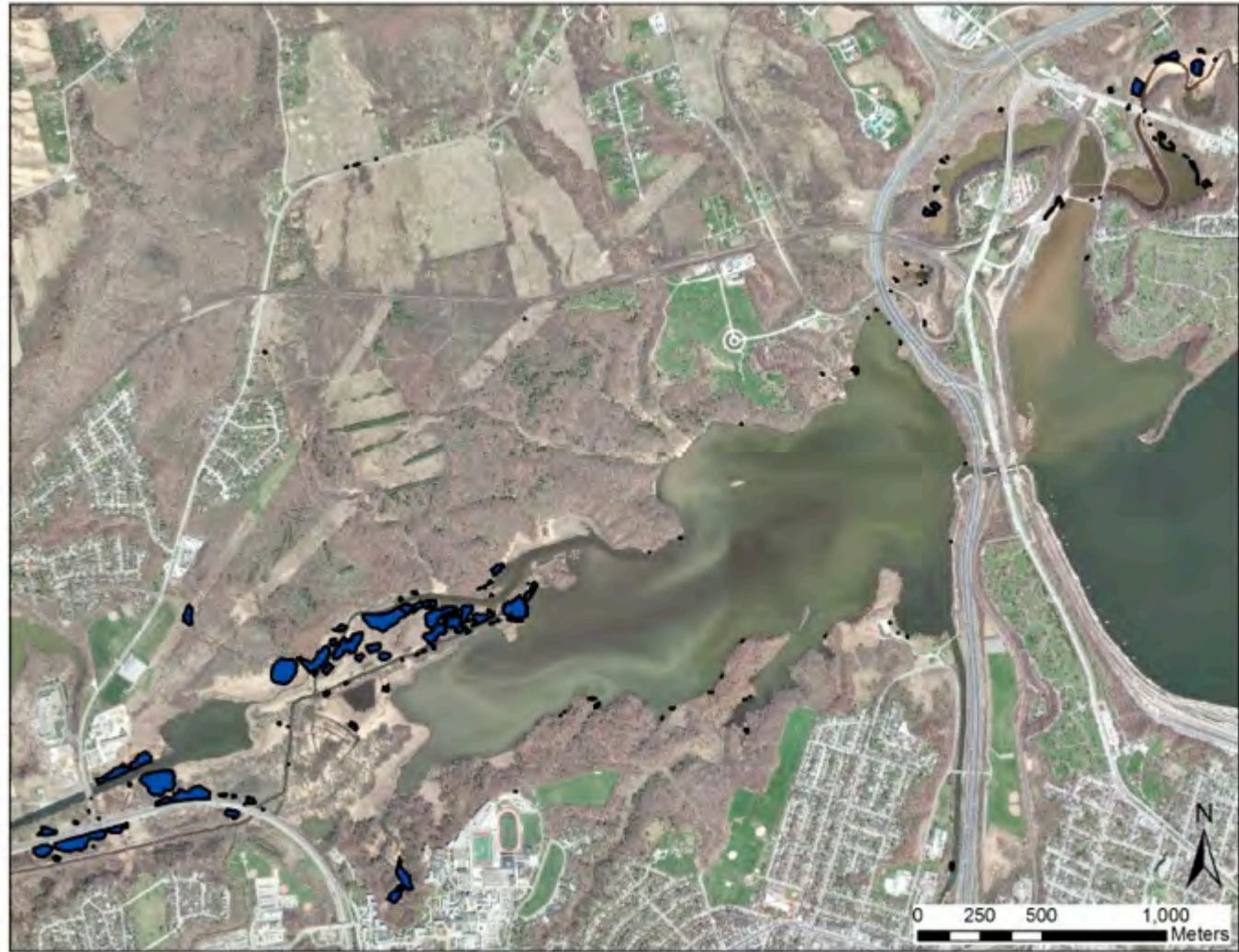


Total number of
Phragmites
stands at RBG:

120

Occupying a
total area of:

10.8 ha



Total number of
Phragmites
stands surveyed
in 2018:

11

Occupying a
total area of:
3.4 ha



Vegetation survey of treated *Phragmites* sites using Ecological Land Classification (ELC)

- Examine entire site to build a complete species list
- Score abundance for each species:

Rare

< 3-5 individuals or small clumps

Occasional

scattered individuals or 1+ large clumps

Abundant

large number of individuals; forming >10% ground cover

Dominant

visually more abundant than other species; forming >35% layer cover



Work in progress

- Surveying took place from June 2018 – last week
- Collected voucher specimens for all species
- Species identification ongoing





What is regenerating? Just more invasives?

- *Phragmites*
 - Shown regrowth at most of our sites
- Other invasive plants
 - Purple loosestrife (*Lythrum salicaria*) at 8 of 11 sites
 - Rough mannagrass (*Glyceria maxima*) at 5 of 11 sites
 - Flowering rush (*Butomus umbellatus*)¹ at 1 of 11 site

Regeneration survey results:

Species diversity

- 198 species across 11 surveyed sites
- 64% of all identified species were native
 - 58% native when excluding 'rare' species with < 5 individuals or clumps



Regeneration survey results: Dominant species

- Cattails (*Typha* spp.)¹
- Devil's beggertick (*Bidens frondosa*)²
- Common reed (*Phragmites australis* subsp. *australis*)
- Rough mannagrass (*Glyceria maxima*)
- No dominant species at 3 of 11 sites



Regeneration survey results:

Desirable species

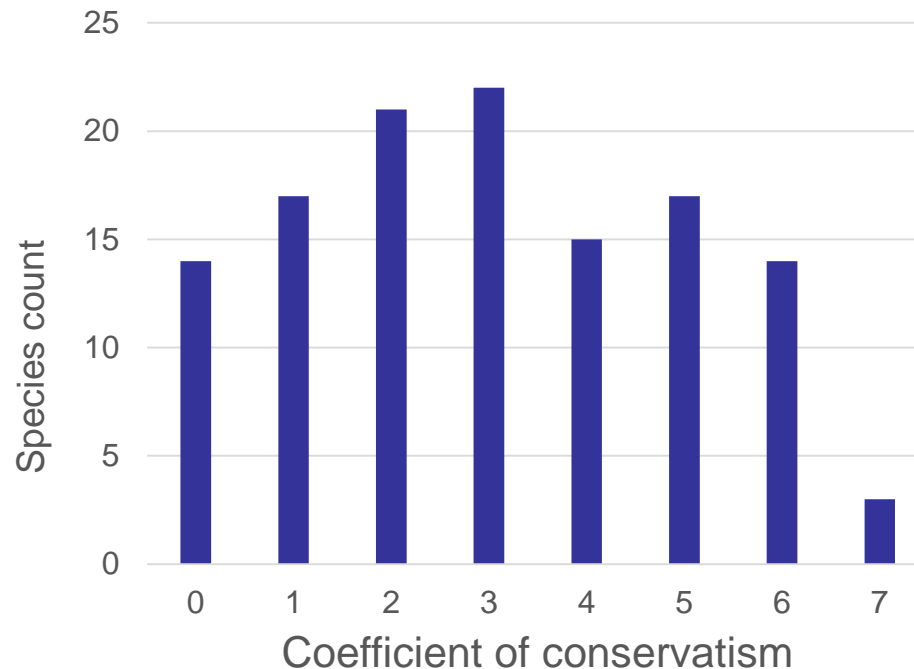
- Sedges (*Carex* spp.)
- Softstem bulrush (*Schoenoplectus tabernaemontani*)¹
- Spotted Joe-Pye weed (*Eutrochium maculatum*)
- Swamp milkweed (*Asclepias incarnata*)
- Square-stemmed monkeyflower (*Mimulus ringens*)²
- Broad-leaved arrowhead (*Sagittaria latifolia*)
- Blue vervain (*Verbena hastata*)³
- Large-fruited burreed (*Sparganium eurycarpum*)⁴



Coefficient of Conservatism

value applied to native plant species that ranks them (0 to 10) by their sensitivity to anthropogenic disturbance

Oldham, M.J. (1995). Natural Heritage Information Centre.

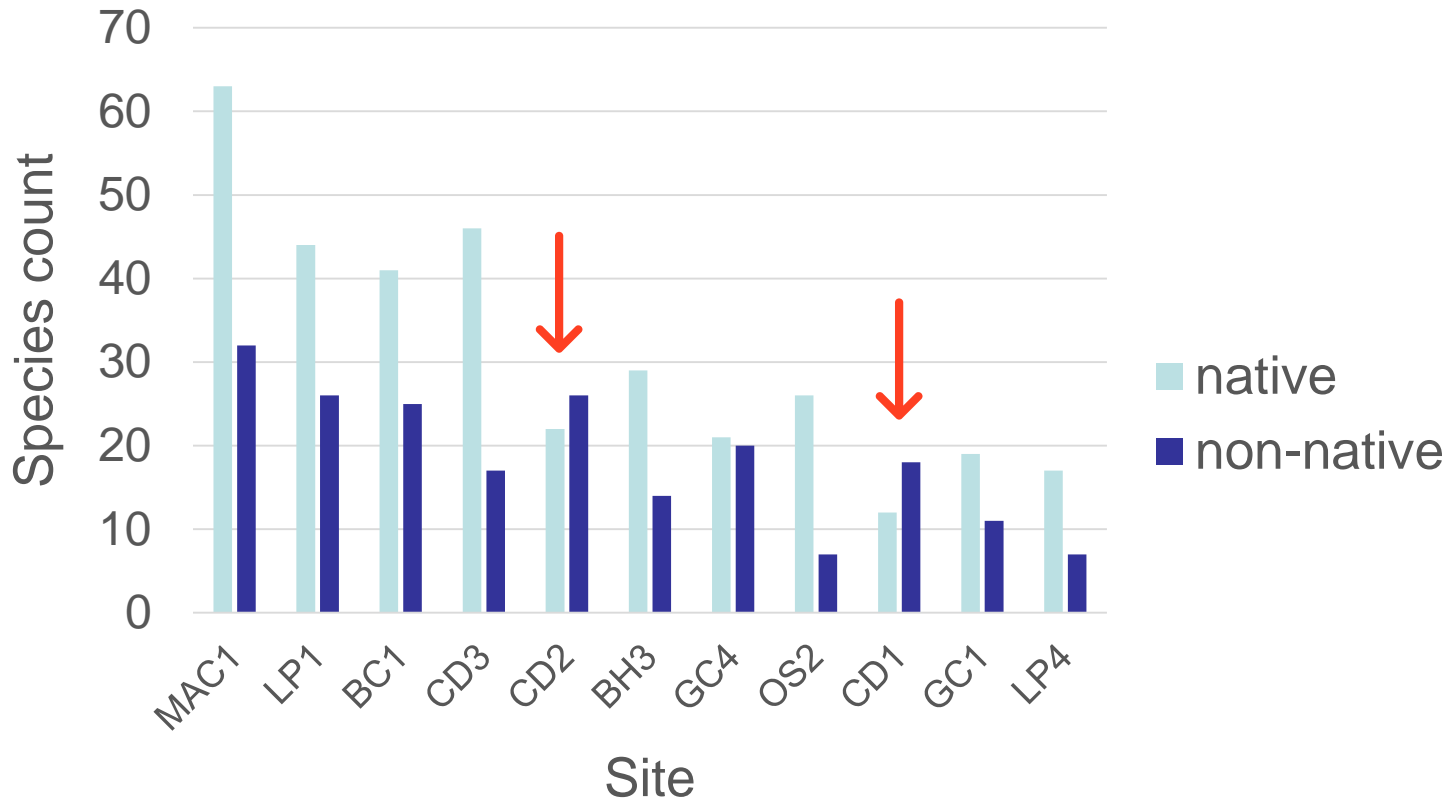


Regeneration differences between sites

- Age of *Phragmites* stand
- Examine historical specimens from 1950's in our herbarium collection



Two sites have more non-native than native species



The sites with the greatest presence of non-natives are adjacent to road and edge of RBG property

CD1

CD3

CD2

2016 aerial photograph



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2018

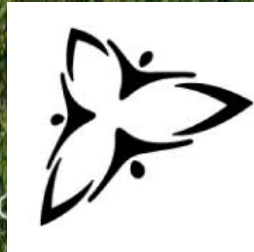
Has our *Phragmites* management been successful?

- In 2018: *Phragmites* showed no regrowth in 53% of sites while only 1% of sites had > 1 stem / m²
- Most (64%) regenerating species are native
- Increased wildlife use (least bittern, insects, amphibians) of managed areas

Lesson learned

- Biomass removal and burning are unnecessary if using rolling or smashing
- Don't plant in first few years of treatment to allow ease of touch-up treatments, and for the site to respond naturally
- Try seeding, then planting if nothing native is regenerating
- Eradication is not a realistic goal with the management tools we currently have





Thank you!