

Control of European Water Chestnut in Lake Ontario and the St. Lawrence River

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Ducks Unlimited Canada

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What is Water Chestnut?



Floating leaves (aka Rosette)

- ▶ Green sharply-toothed leaves
- ▶ Appear in May/June
- ▶ Air bladders on leaf stem
- ▶ Up to seven rosettes per plant



Underwater leaves

- ▶ Fine and feather-like



Flowers (timing of flowering)

- ▶ Appear in June
- ▶ Four very small (8mm) white petals



Seeds

- ▶ Dense, hard nut
- ▶ Four barbed spines
- ▶ Produced between July/September



Why is it a Problem?

- Quickly form dense, floating mats that outcompete native plants.
- Dense mats of decaying plants lower dissolved oxygen levels and can cause fish kills.
- Negatively impact habitat for fish, waterfowl and other wildlife.
- Can impact navigation and recreational use of waterways.
- Seeds are very sharp and can be a hazard if washed up on shore.
- **Listed as a “Prohibited Species” under the Invasive Species Act.**



Water chestnut infestation within the western end of the Erie Canal. (Photo Credit: USFWS, 2010)



Current Management Techniques

- **Mechanical**

- Mechanical Harvester – Voyageur Provincial Park.
- Hand Pulling – Wolfe Island Populations/Black Rapids, Ottawa.

- **Chemical**

- U.S. – 2-4 D and Triclopyr
- Canada – REWARD (Active ingredient: Diquat dibromide)

- **Biological**

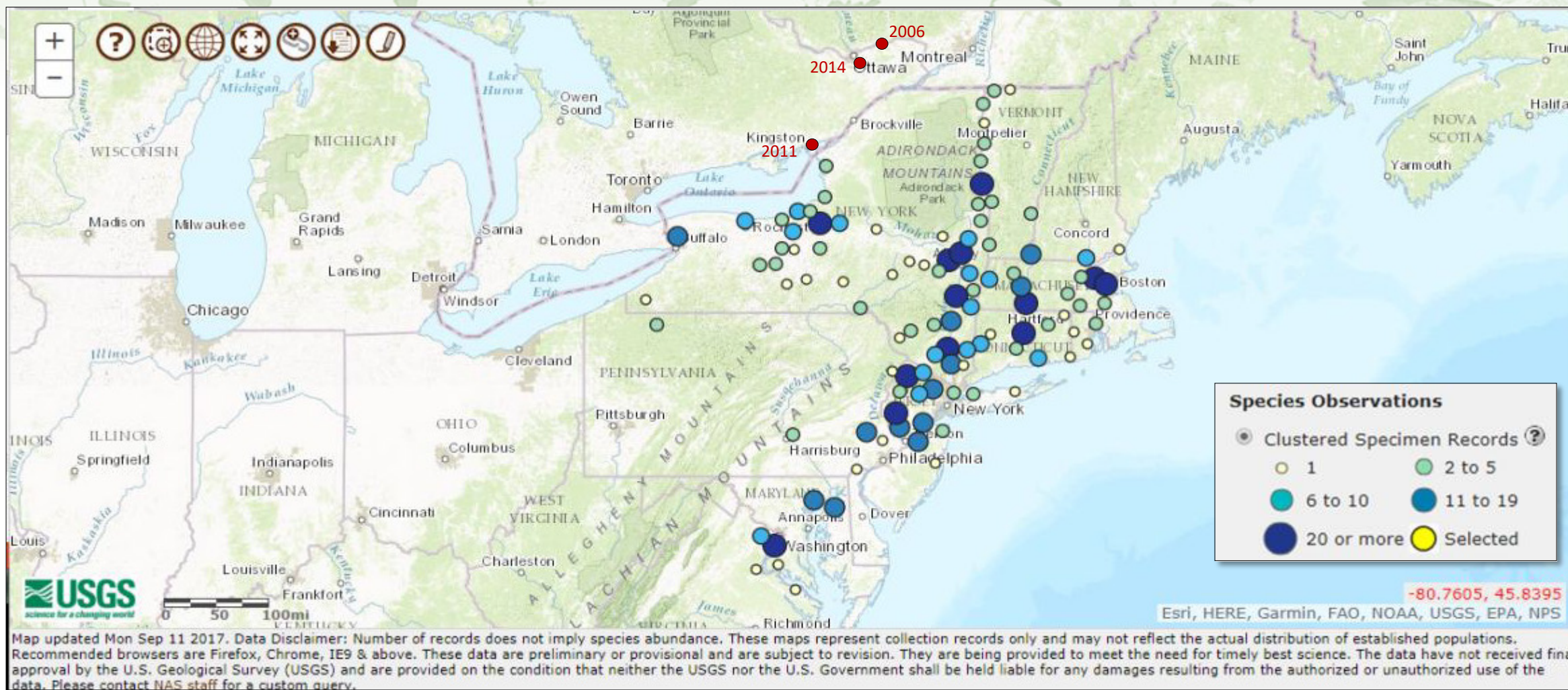
- *Galerucella birmanica* – host specificity testing
- NYS Invasive Species Research Institute – Cornell University.
- Currently unavailable (needs approval from APHIS/USDA in USA).





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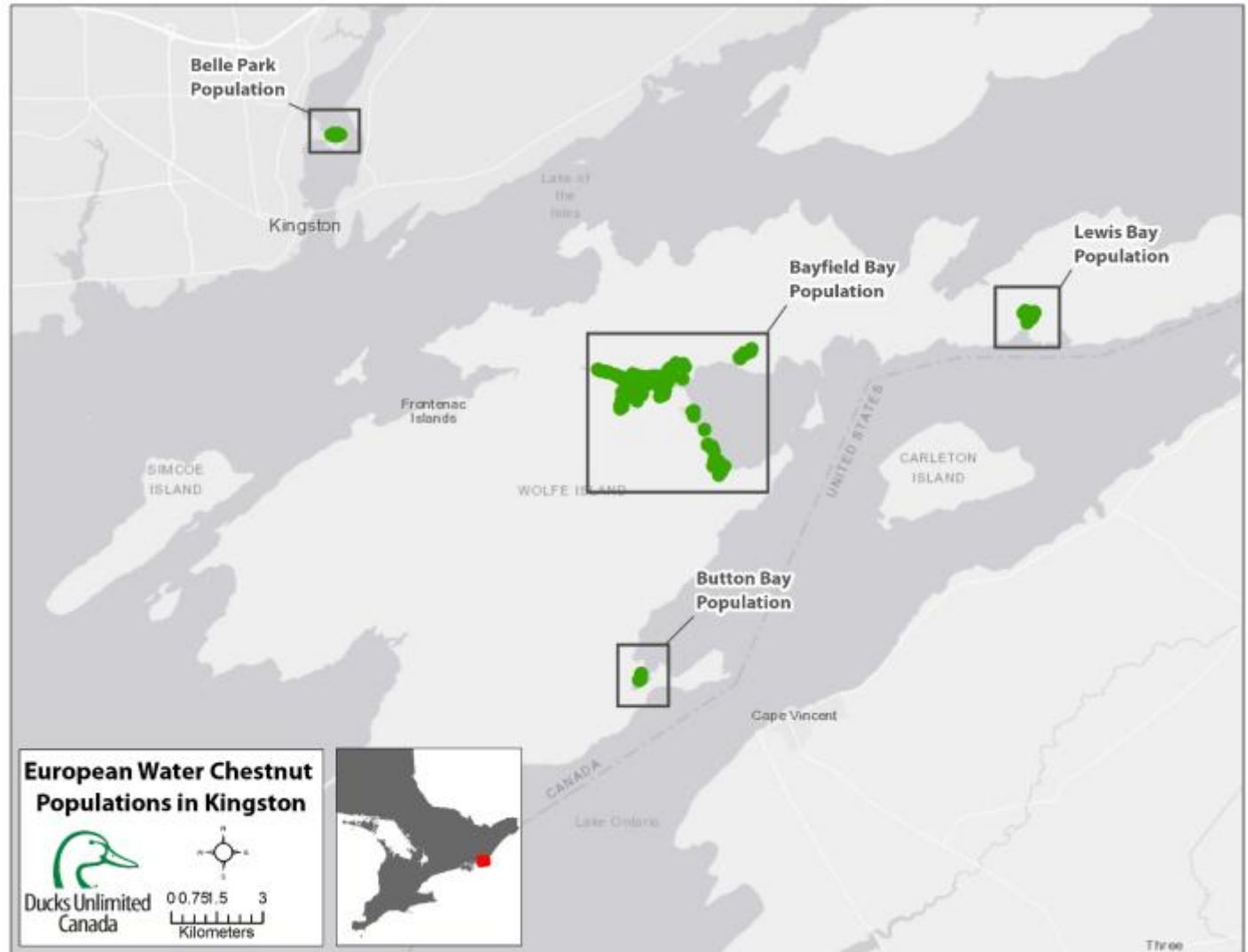
Distribution of Water Chestnut



<https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=263>

Distribution in Kingston/Frontenac Islands

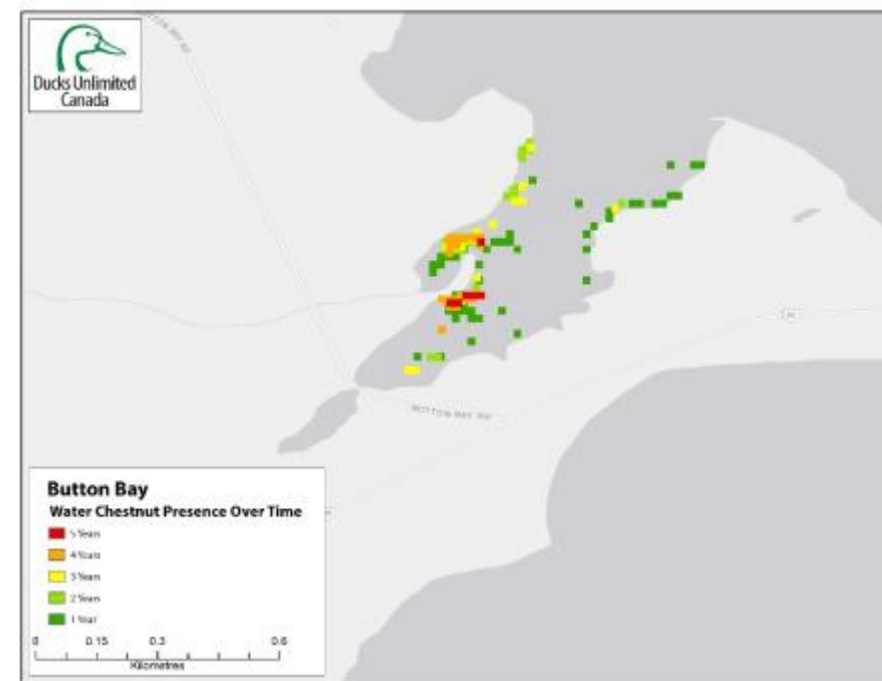
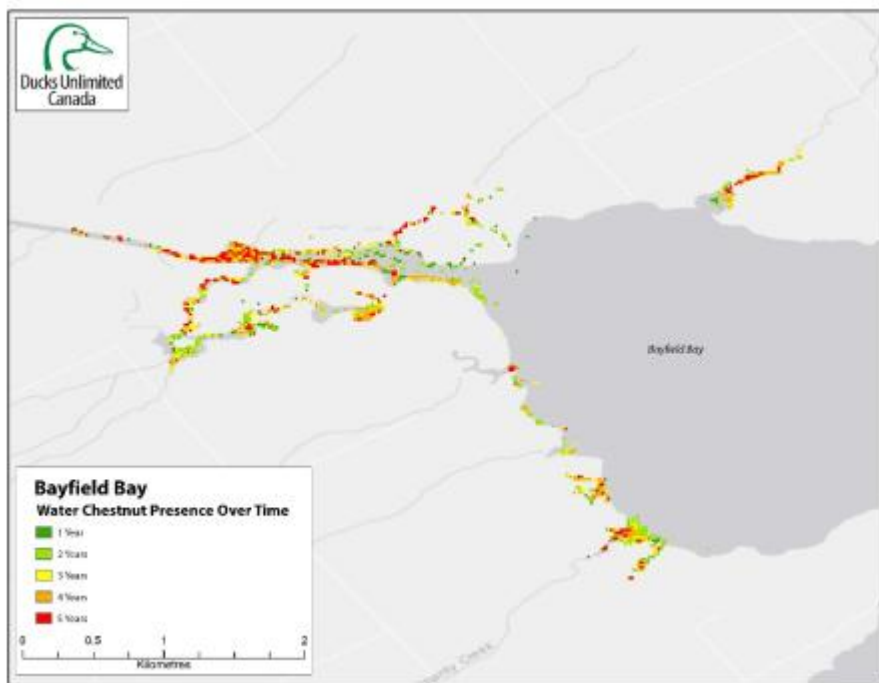
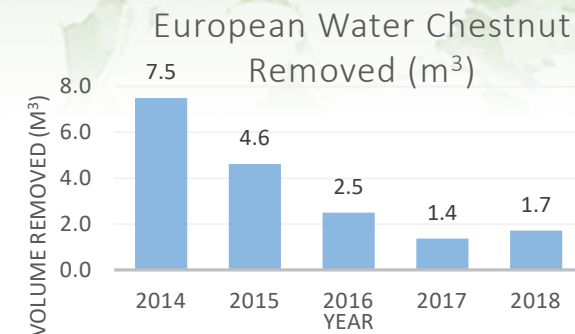
- 2011 – Bayfield Bay, Wolfe Island
- 2014 – Button Bay, Wolfe Island
- 2015 – Belle Park, Kingston
- 2016 – Brown's Bay, Wolfe Island
- 2017 – Lewis Bay, Wolfe Island



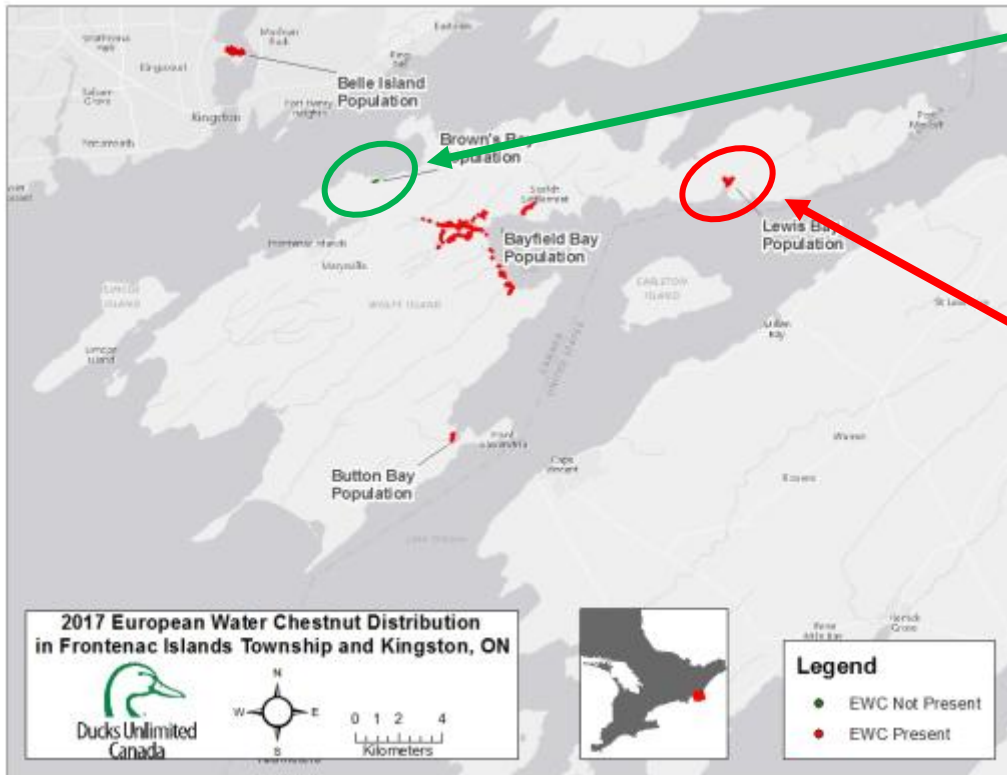
Wolfe Island: Bayfield and Button Bays

Hand Pulling:

- Performed 2014 – Present
- All plants observed are removed.
- Responding effectively to yearly hand pulling.
- Steady decline in water chestnut 2014-2017
- Slight increase in 2018, but still <25% of initial size.



Wolfe Island: Brown's Bay and Lewis Bay Surveillance and Outreach Success!



Brown's Bay

- Discovered by an informed resident
- DUC staff removed all plants in 2016
- Has not been observed in 2017 or 2018

Lewis Bay

2017

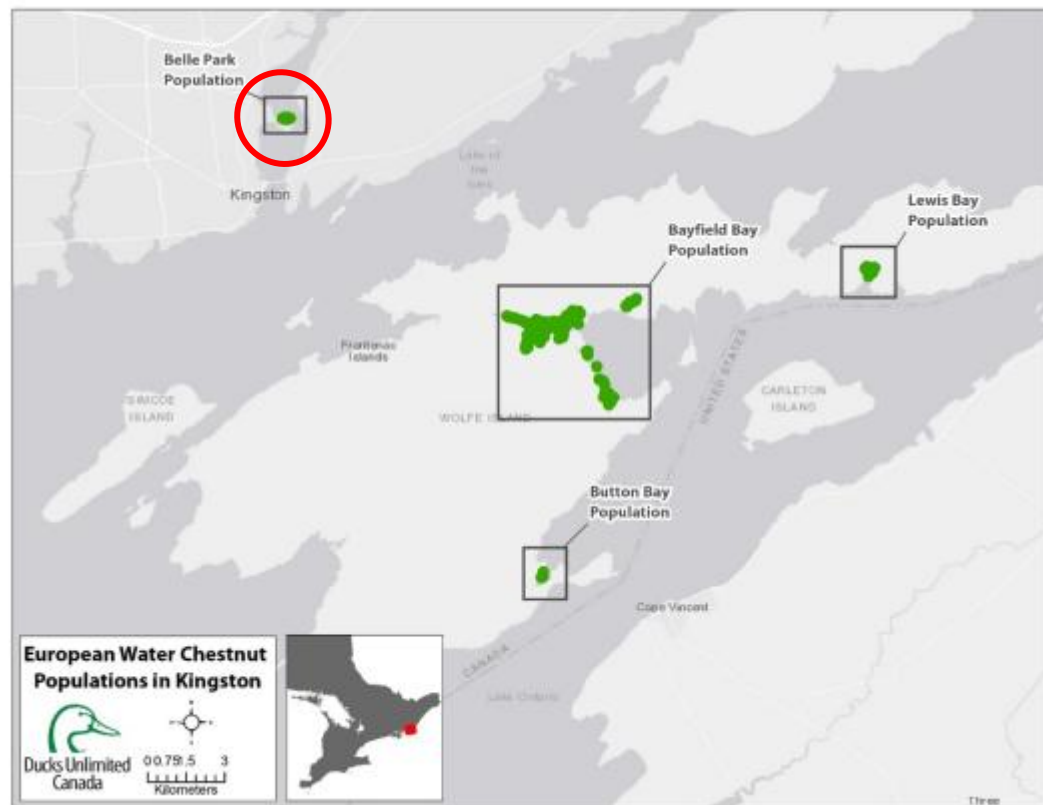
- Discovered in late September
- 16 ½ bins (0.7 m³) of mature plants with seeds removed.

2018

- Removed 9 ¾ bins (0.4 m³) in July/August
- 59% reduction in amount removed.



Chemical Control at Belle Park



- First observed in Fall 2015
- Located within Greater Cataraqui River – Rideau Canal System
- Plans were stalled over concerns of sediment toxicity in the area
- Ideal candidate for chemical control using the aquatic herbicide: REWARD (active ingredient: Diquat dibromide)



Chemical Control at Belle Park

REWARD (Diquat dibromide)

- Contact herbicide
- Currently the only registered aquatic herbicide in Canada
- Water chestnut added to the label but not used in field application
- First use of REWARD to control water chestnut in Canada

Treatment and Timing

- Hand-held wand applicator (under/above water)
- Surfactant (Agral 90) used in treatment
- Ideal treatment timing during flowering event



Site Monitoring and Mapping

- Point Intercept Method of Sampling.
- Set up 10m x 10m Point Intercept Grid overlay.
- Visited each point location by boat/canoe with handheld GPS unit.
- Measured density within 2m x 2m quadrat.
 - Visual estimate of density:
 - Sparse (<20% cover)
 - Moderate (21-60% cover)
 - Dense (61-99% cover)
 - Very Dense (100% cover)
- Collected information on other floating-leaved macrophytes (i.e. white water lily, yellow water lily)



Belle Park - 2017

✓ Develop Surveying/Monitoring Plan

- Determine extent of infestation
- Baseline data
- Determine amount of product needed

✓ Federal, Provincial, Municipal Involvement

- Parks Canada
- MOECC/MNRF
- City of Kingston

✓ Securing Permits

- Parks Canada Research and Collection Permit.
- MOECC Authorization for a Permit to Perform a Water Extermination

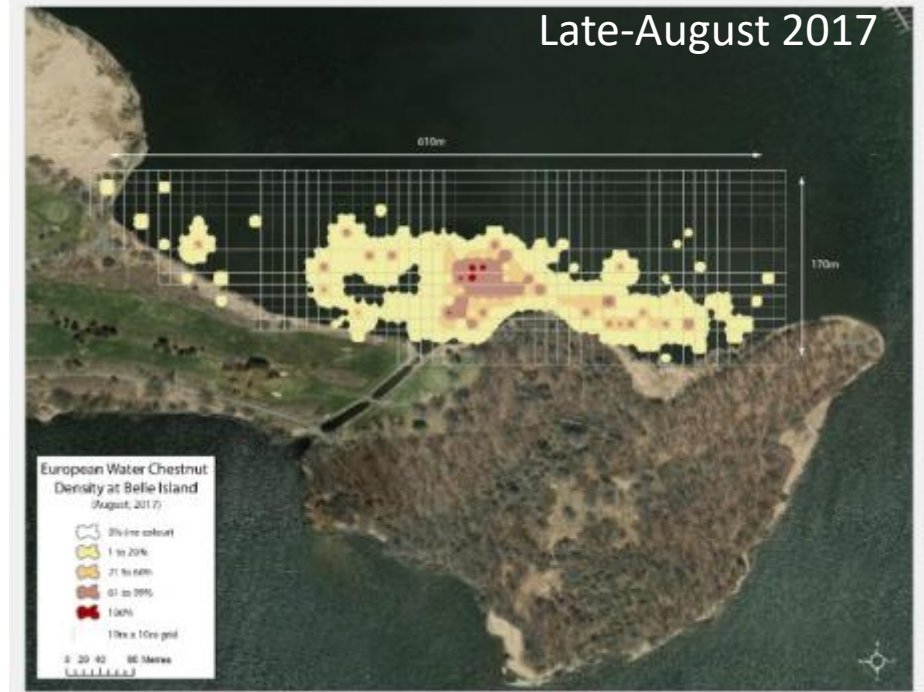
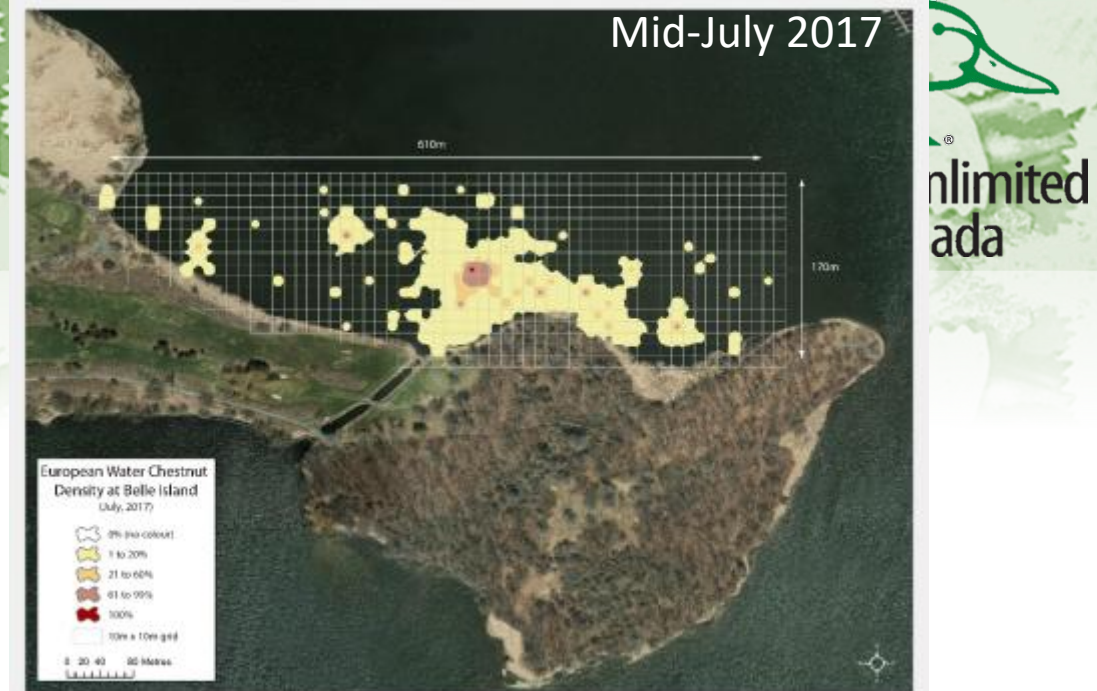
✓ Secure Funding and Product

- Funding made available through partners
- REWARD in short supply in 2017

✓ Hire a Contractor

• Timing and application

- Timing window closed prior to 2017 treatment



Belle Park Timeline - 2018

Pre-Treatment Monitoring - July 9/10, 2018

First Herbicide Treatment – July 17, 2018

- Occurred during flowering event
- Notification of spray 48 hours before
- Treated ~4 ha with 105L of REWARD (w/ Agral 90 surfactant)
- Performed with use of Argo and wand applicator

Post-Treatment Monitoring – July 30/31st, 2018

Second Herbicide Treatment – August 16, 2018

- Follow-up to control regrowth
- Spot application of 68L within treatment area

Post-2nd Treatment Monitoring – September 5, 2018

Fall/Winter 2018/19

- Data Analysis through partnership with Queen's University

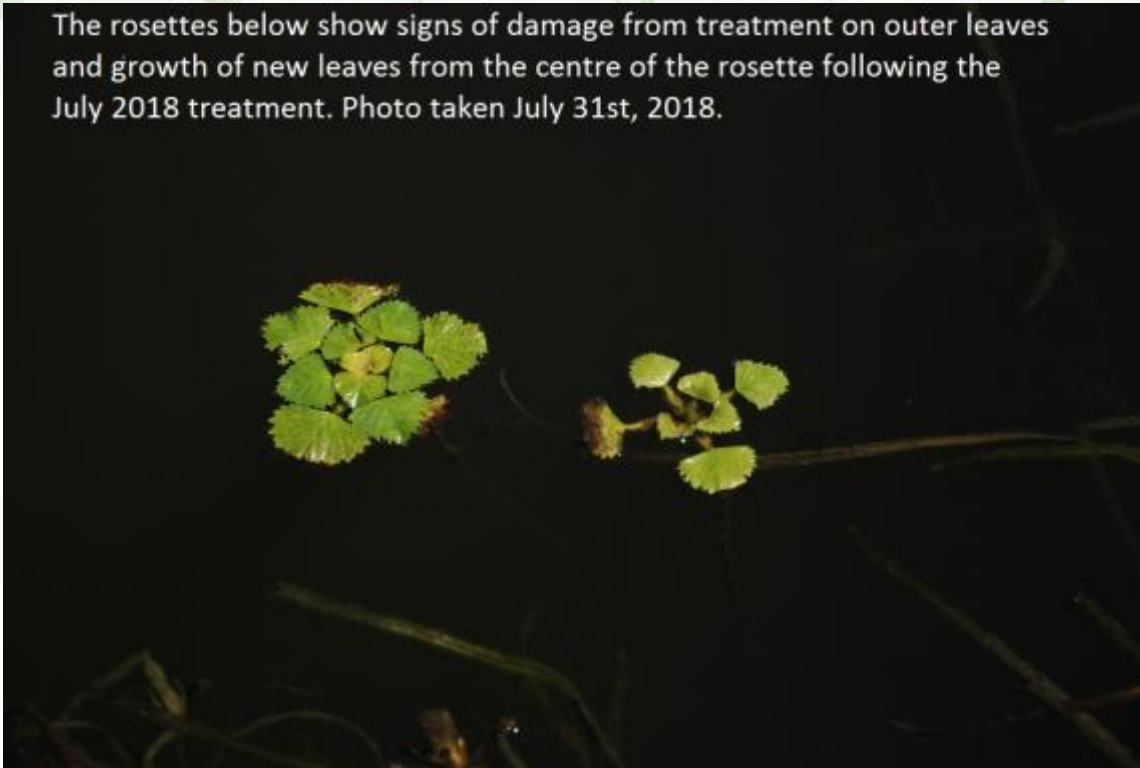


Belle Park – July 20, 2018



Belle Park – July 31, 2018

The rosettes below show signs of damage from treatment on outer leaves and growth of new leaves from the centre of the rosette following the July 2018 treatment. Photo taken July 31st, 2018.



The rosette below shows regrowth of leaves from the centre of the rosette following the July 2018 treatment. Photo taken July 31st, 2018.





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Water Chestnut

No. of Quadrats with Water Chestnut Present

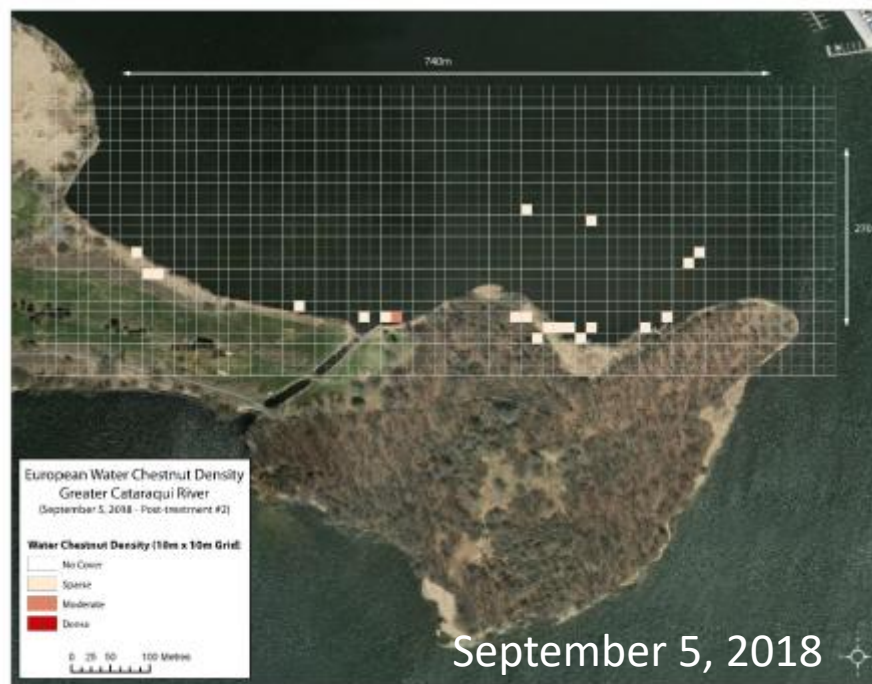
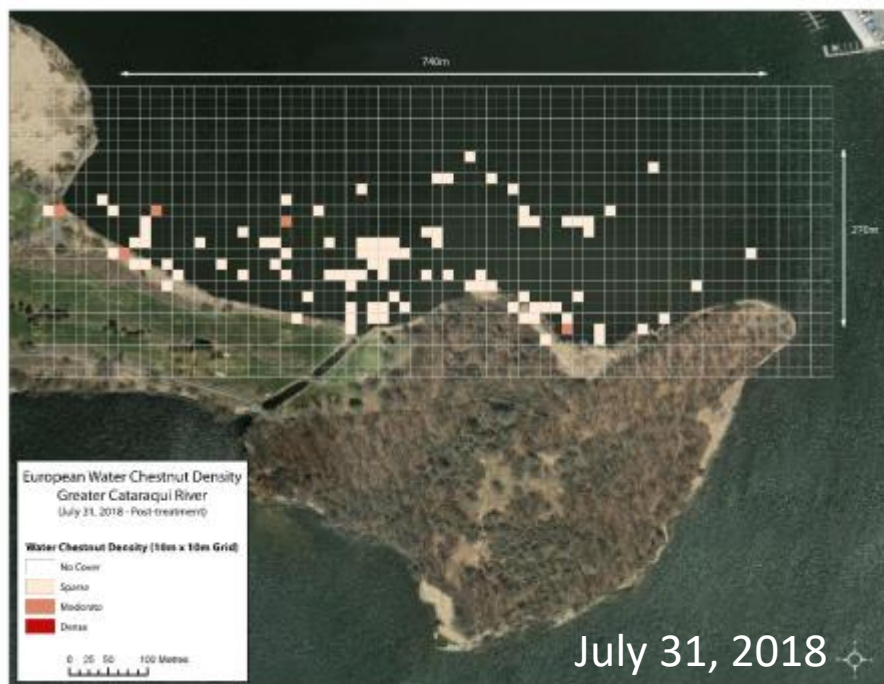
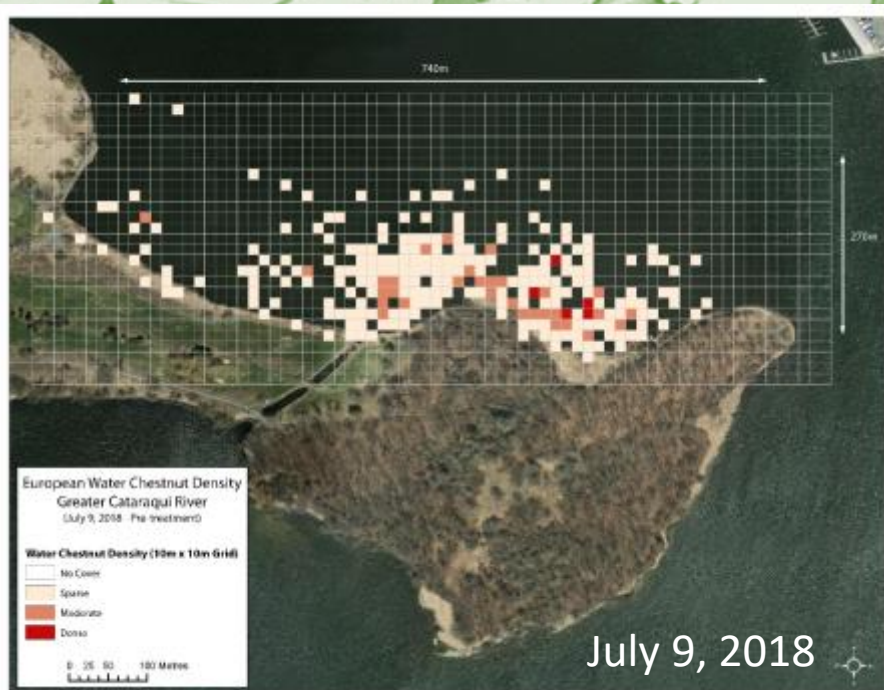
Density	Pre Treatment	After 1st Treatment	After 2nd Treatment
Sparse	214	93	21
Moderate	30	5	0
Dense	5	0	0
Total	249	98	21

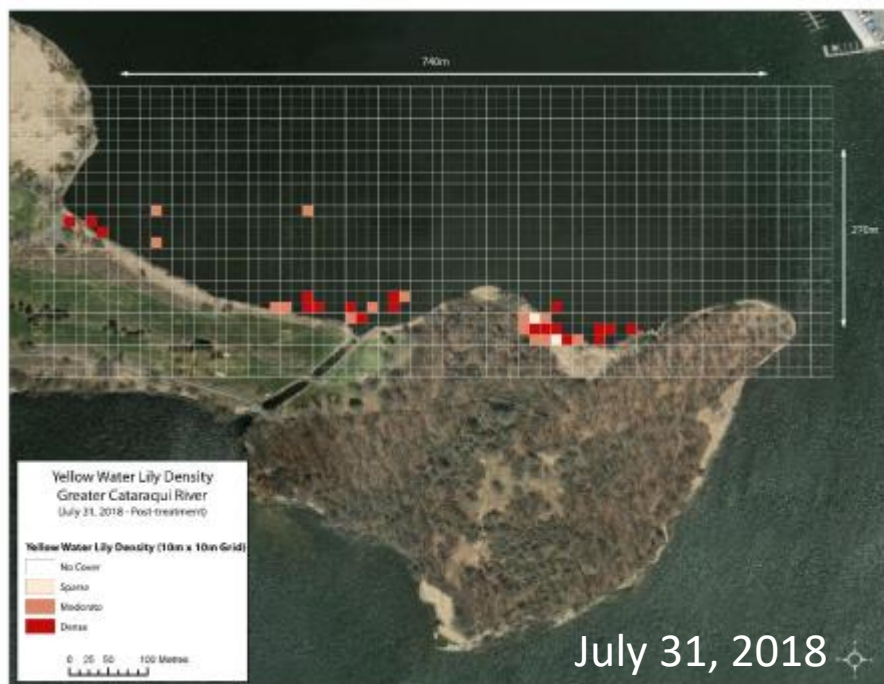
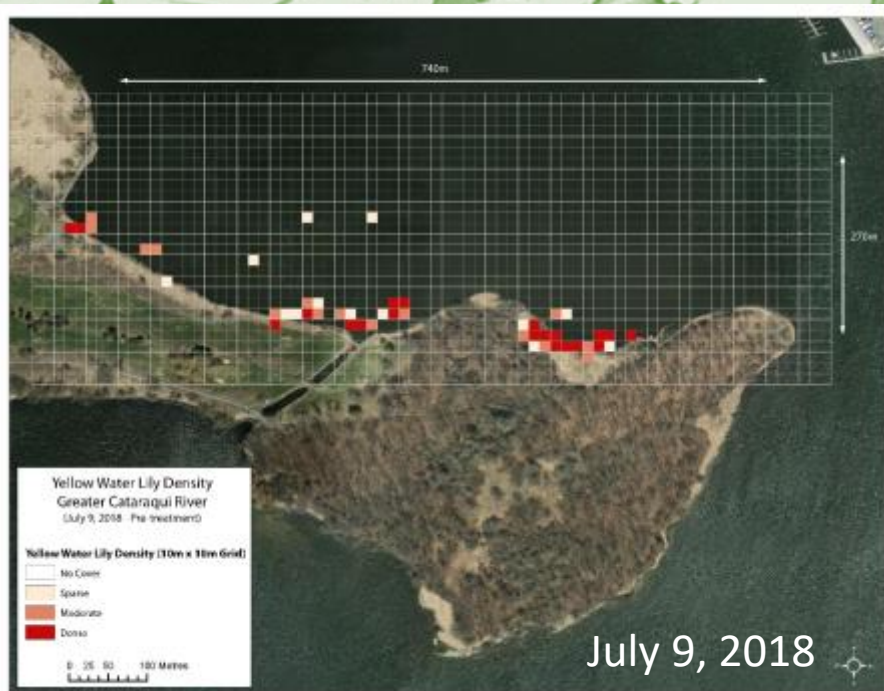
Water Chestnut First Herbicide Treatment

- Plants showing signs of treatment almost immediately
- 61% decline observed

Second Herbicide Treatment

- Only observed sparse populations of water chestnut following second treatment
- 92% decline when compared to pre-treatment
- Sparse populations consisted of 1-3 small rosettes





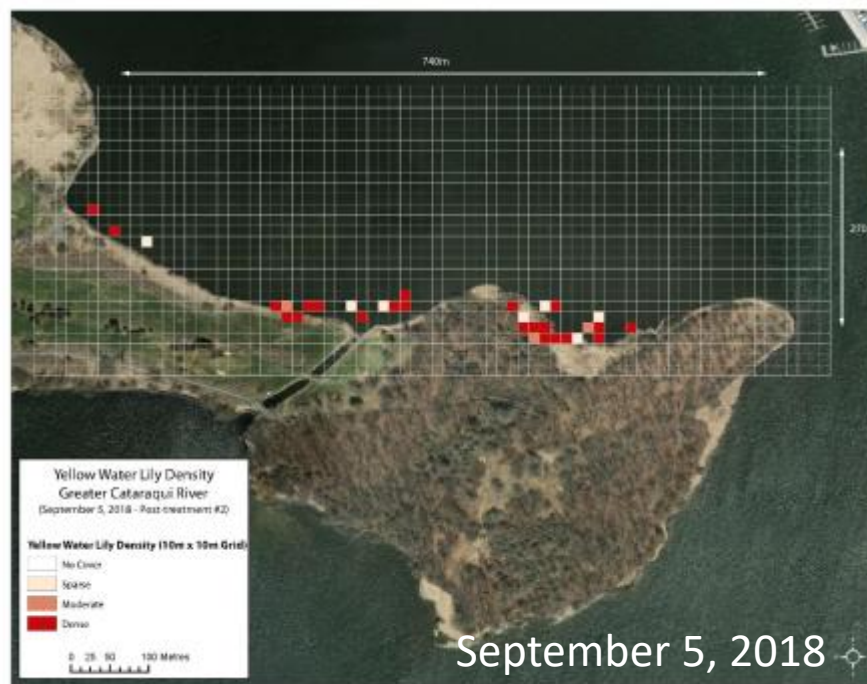
Yellow Water Lily

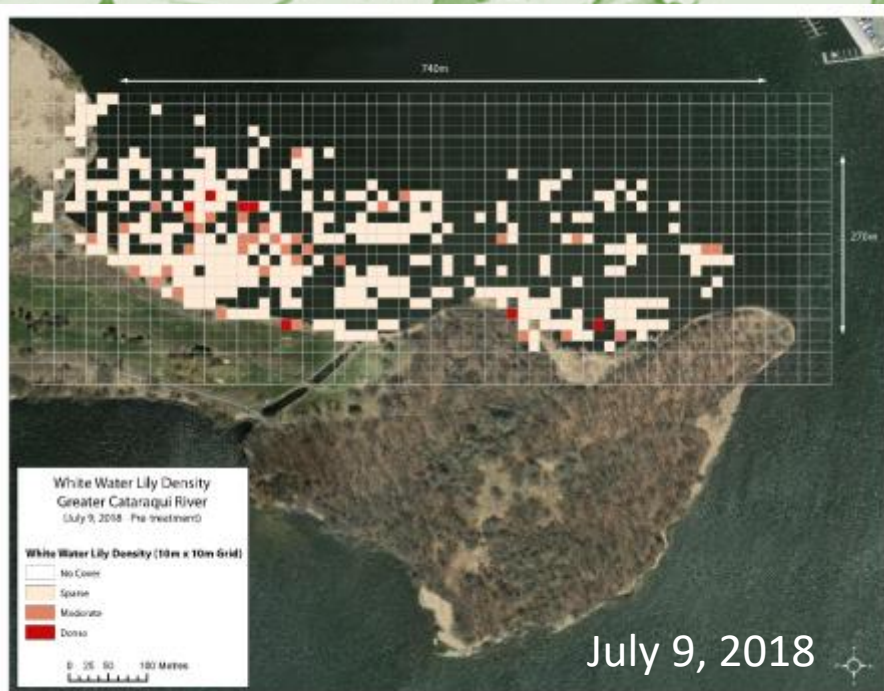
No. of Quadrats with Yellow Water Lily Present

Density	Pre Treatment	After 1st Treatment	After 2nd Treatment
Sparse	13	2	7
Moderate	15	14	3
Dense	20	19	22
Total	48	35	32

Yellow Water Lily

- Generally found in shallow water along shoreline at the site.
- Observed a drop in sparse and moderately dense cover.
- 1/3 drop in cover





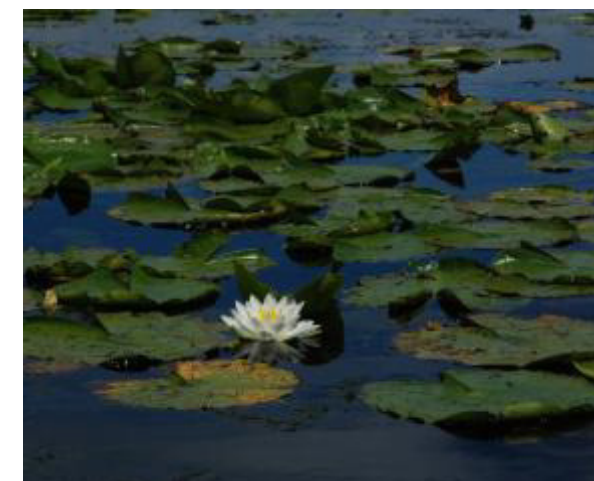
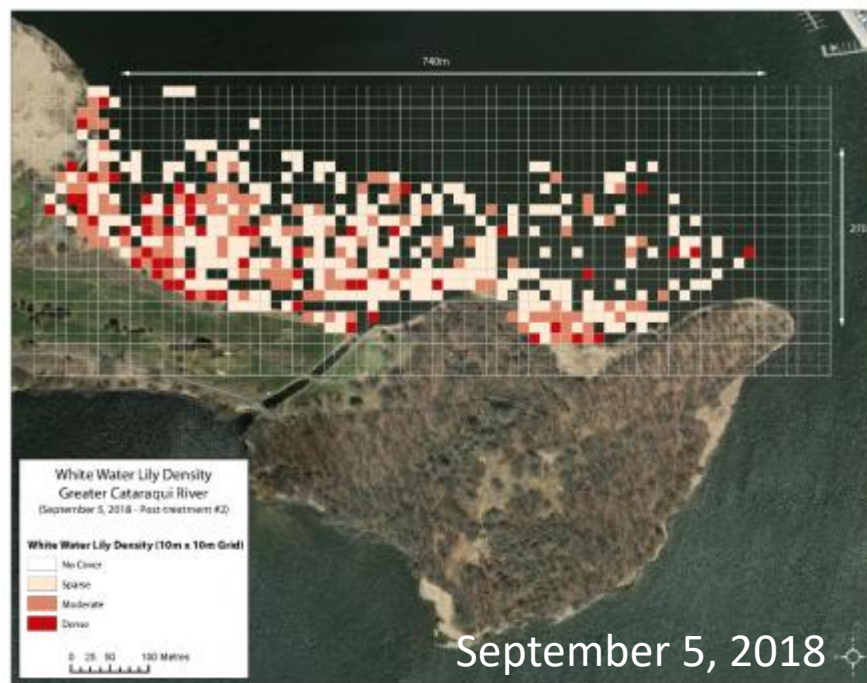
White Water Lily

No. of Quadrats with White Water Lily Present

Density	Pre Treatment	After 1st Treatment	After 2nd Treatment
Sparse	325	299	295
Moderate	35	76	123
Dense	7	16	57
Total	367	391	475

White Water Lily

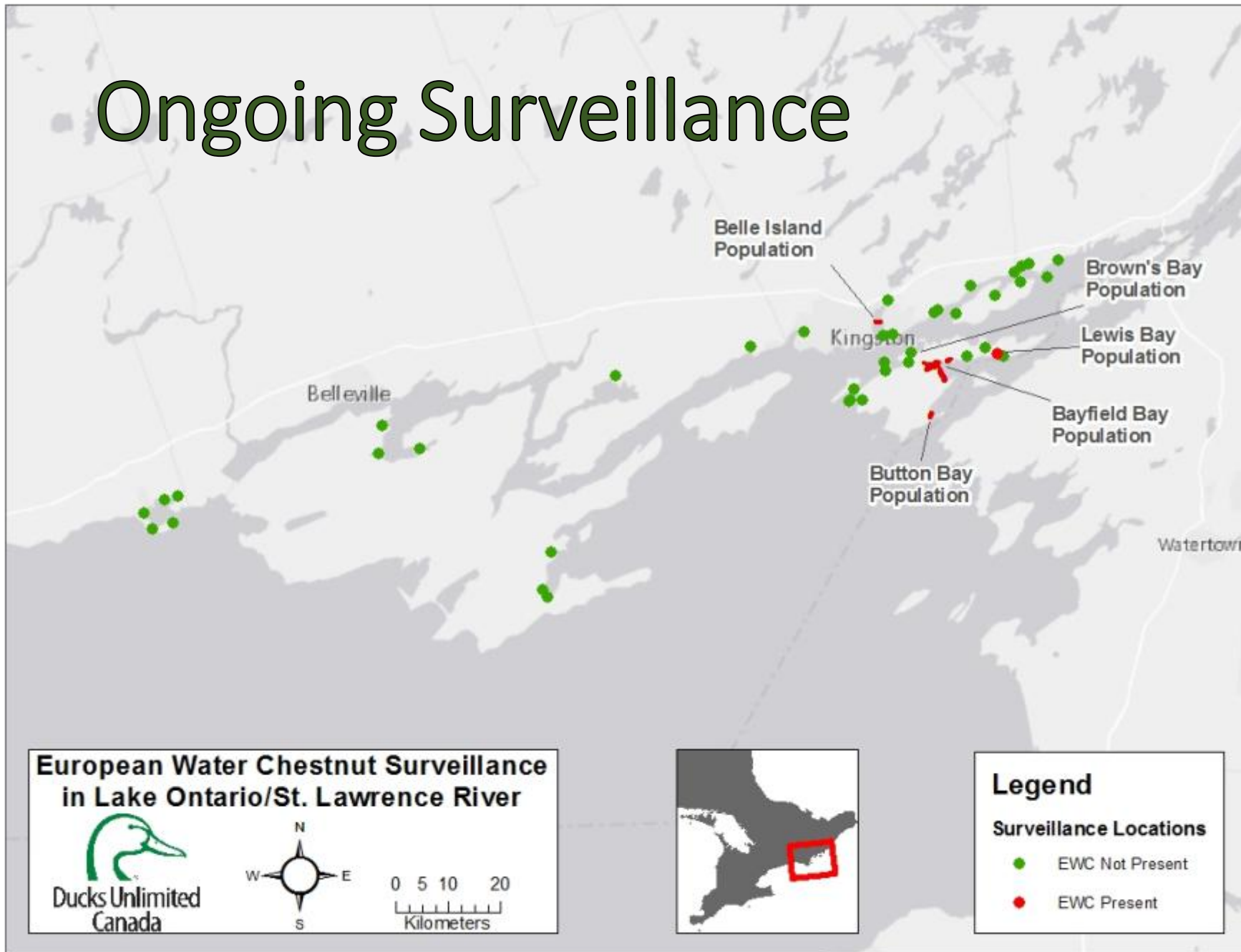
- Dominant floating leaf cover
- Overall increase in cover and density
- 30% increase in cover





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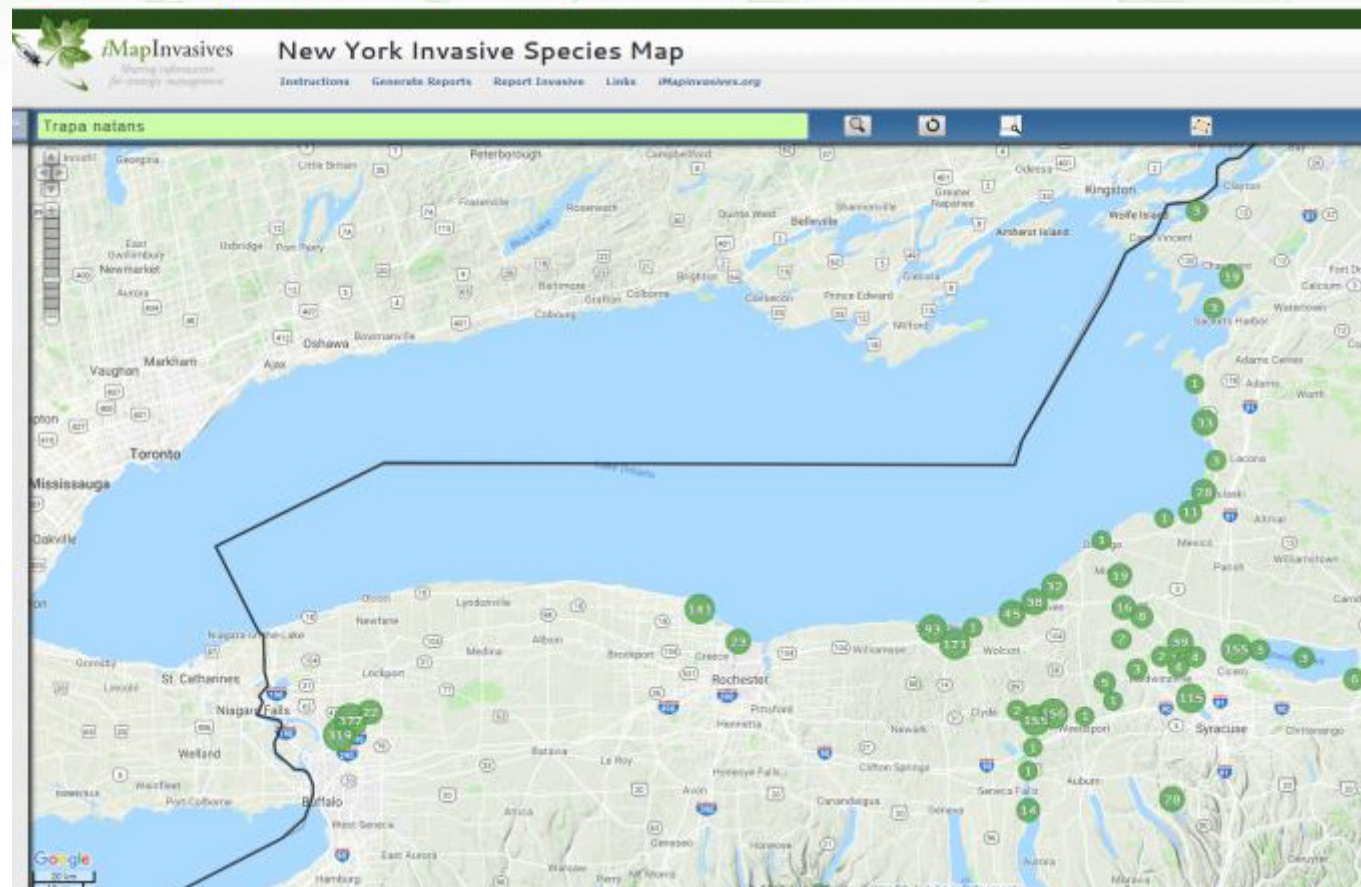
Ongoing Surveillance



- ~40 Locations visited from August to late October
- Range from Brighton, ON to Ganonoque, ON

Continued Surveillance

- Water chestnut present in 44 of 62 counties in New York State.
- Observations in 24 Tributaries and Coastal Embayments connected to Lake Ontario/St. Lawrence River.
- DUC identified highly probably areas where water chestnut could occur
- Surveillance performed in late summer/early fall, following management.



<https://login.imapinvasives.org/nyimi/map/>

Moving Forward in 2019

Wolfe Island

- Continue removal at Bayfield Bay, Button Bay and Lewis Bay
- Revisit Brown's Bay and other potential locations for new infestations

Belle Park

- Data analysis performed by Queen's University student (Undergraduate Research Mentorship) Fall/Winter 2018/19
- Prepare for 2019 season (i.e. secure funding, product and contractor).

Surveillance

- Extend surveillance downstream throughout the 1000 Islands and St. Lawrence River, coastal wetlands of Lake Ontario and Bay of Quinte



Thank You!

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