European Water Chestnut Eradication Program

2016 / 2017 Year-End Update

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Coordinator of the European Water Chestnut Eradication Program

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A warm thank you to our partners and supporters

EDRR Water Chestnut Program Update

The following is the FY16/17 water chestnut program update. It will discuss program funding, results, conclusions and proposed actions for 2017/2018. The appendix includes the analysis and breakdown2014-2016 data of removed plants from Wolfe Island - Bayfield Bay, Button Bay, Browns Bay, as well as 2014-2016 surveillance locations associated with the DUC Habitat Suitability Model Surveillance Locations for European Water Chestnut in Eastern Lake Ontario and the Upper St. Lawrence River.

Program Funding

For 2016/2017, a Canada-Ontario Agreement (COA) funding request of $48,000.00 was placed by Ministry of Natural Resources and Forestry (MNRF), Kingston Field Office. The funding request was approved and provided the program with a rental truck, program equipment and staffing dollars to operate until March 31, 2016. This application was a multi-year application and therefore requiring confirmation by MNRF Kingston District annually for continued support in seeking COA funding. It should be noted that the COA request of $48,000.00 was subject to HST per MNRF/DUC agreement; therefore DUC was obligated to charge $5522.12 in HST per agreement. The Invasive Species Centre (ISC) provided DUC with $12,500.00 for operational costs while DUC was successful in obtaining a $10,000.00 grant from Ontario Wildlife Fund as well. In total, the Chestnut program operated with $64,977.88 for FY 16/17. It is important to note that in-kind services included: Hit Squad Summer Student, student training, HR management, promotional education materials, boat, trailer, GIS support and many other services totalled nearly $25,000.00 for FY 16/17.

Results:

The 3nd year of field operations enabled DUC, with support from partners, to engage in monitoring, control and surveillance activities from June 10th – November 4th, 2016. DUC returned to controlling

plants in Bayfield Bay (Big Bay) and Button Bay. At the spring open house on Wolfe Island, a concerned citizen asked DUC to investigate a local bay near their cottage noting a suspicious plant. Upon investigation, DUC confirmed Browns Bay (North side of Wolfe Island) to have water chestnut plants present in small quantity (<20 plants). DUC recorded and removed all plants from Browns Bay.

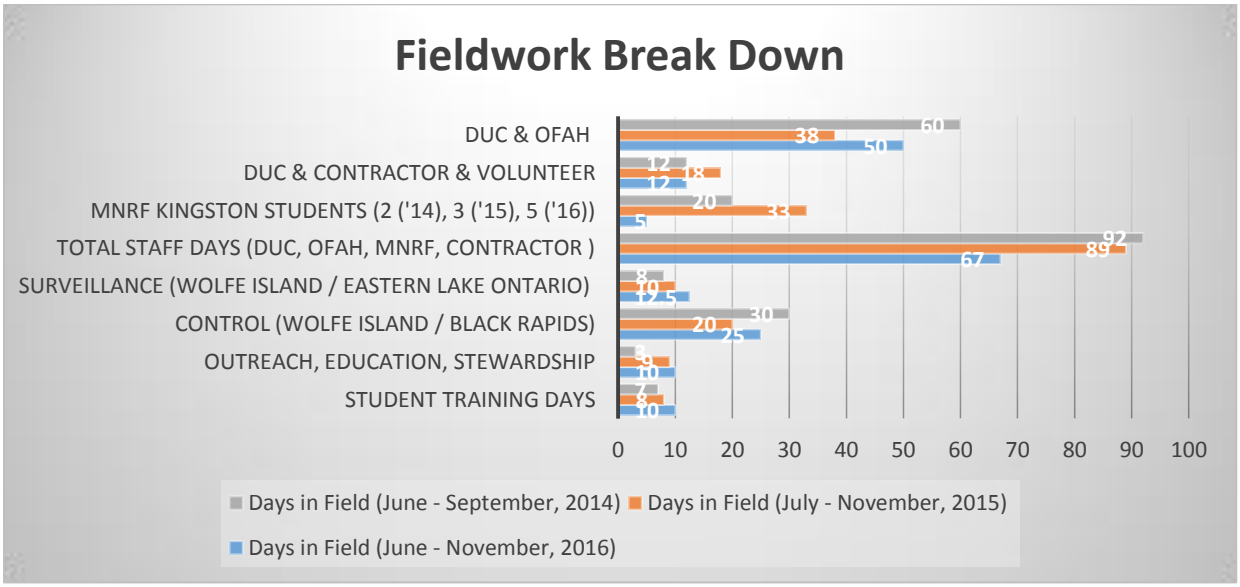


Fig 1. Fieldwork break down identifying total staff days afield.

In 2016, MNRF and Elbow Lake Environmental Education Centre committed 7 days to control efforts and 1 day for surveillance efforts managing water chestnut on Wolfe Island and Belle Island colonies. Approximately 67 total staff days were contributed to the program. This was a marginal drop from 2015 and even 2014 which had greater support from MNRF Kingston Summer Students. DUC with support from partners attended 9 outreach, education, and stewardship events between May and November, 2016. Further details are found in the summary of results.

Control:

Results after 2015 control work in Bayfield Bay and Button Bay have confirmed a decrease in the overall amount of water chestnut plants found. Our calculations estimate approximately 18% reduction in Button

Bay and Bayfield Bay between 2015 and 2016. This result was determined by the number of garbage cans filled manually with harvested plants from Bayfield Bay and Button Bay. The early detection and rapid response initiated for Browns Bay was successful. Approximately 16 plants were removed and no further plants were discovered in the surrounding area upon multiple inspections post-control events.

In 2014, 60 garbage cans were filled, equalling 7500 litres of plants removed. In 2015, 37 garbage cans were filled, equalling 4625 litres. In 2016, 20 garbage cans were filled, equalling 2000 litres of plants removed. The entire difference equals approximately 66% reduction in plants removed since 2014. With a significant increase in staff time and staff efficacy removing plants from Wolfe Island, current results further strengthen our overall efficacy and provided staff with the ability to revisit areas with water chestnut on multiple occasions to provide greater GPS marking of plants to illustrate frequency and distribution of plants.

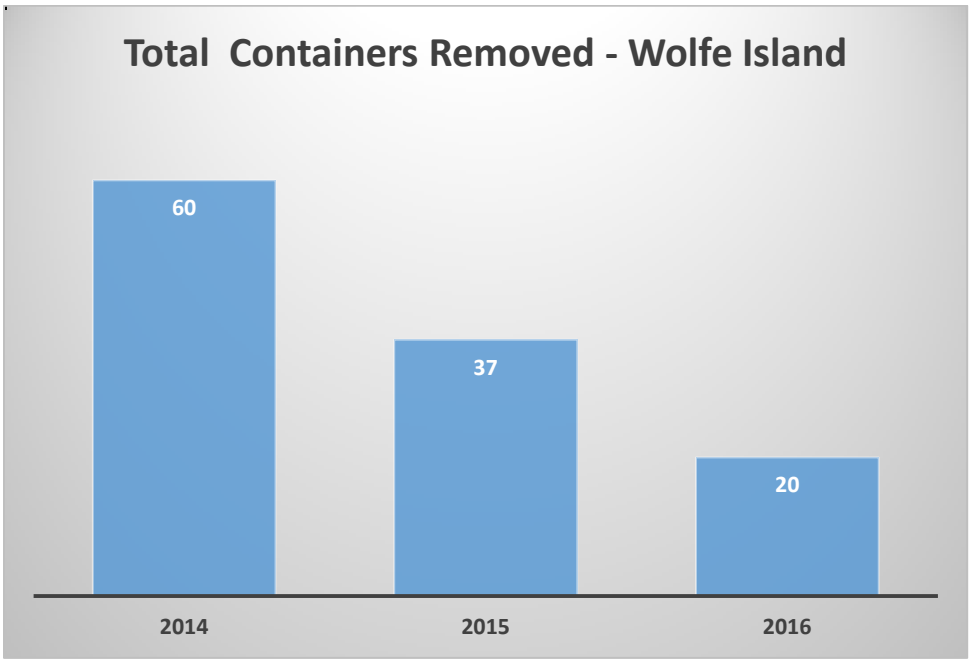


Fig. 2. Total Vegetation Removed: 20, 125 L containers (2016), 66% Reduction from 2014.

In comparison to 2014 and 2015, DUC hired a student for a 12 week contract in 2016 which enabled DUC to visit and monitor Bayfield and Button Bay in June while plant growth was immature and rosettes were just attaining the surface of the water. Each rosette observed indicated one plant, therefore GPS marking ensured accurate representation of frequency and distribution of plants. DUC returned to remove plants in July once plants reached maturity with established roots in the substrate. DUC has proved that waiting for plants to reach maturity facilitated removal with less broken or snapped stems. During second or tertiary visits to remove mature plants, if more plants were present post June monitoring, additional plants were assessed (differentiated and counted) then recorded on GPS to highlight the influx in seed germination throughout the affected area.

Finally, DUC initiated and coordinated partners for the control and removal of water chestnut on the Rideau River at Black Rapids lock station in July 2016. DUC provided education and stewardship for the removal of water chestnut with the Napanee 23rd Geohunters Scout Troop and RVCA volunteers at the July pull event.

Fig. 3. Nepean 23rd Geohunters Scout Troop –Barrhaven, Ontario

DUC and OFAH Hit squad student attended one water chestnut pull event in partnership with City of Ottawa and Rideau Valley Conservation Authority this year. In total, 10 scouts and 2 leaders as well as 6 volunteers spent 100 volunteer hours in canoes and boats pulling invasive water chestnut plants. All plants were removed from the water and placed in to garbage bin at the boat launch. The City of Ottawa

confirmed 2700kg of plant material was removed from 6km of the Rideau River in 2015. In 2016, the group collectively removed approximately 750 lbs.

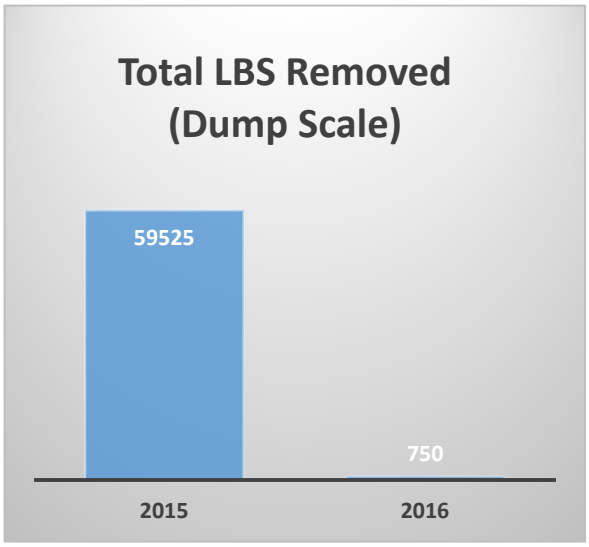


Fig. 4. Total Vegetation Removed – Black Rapids: 750 LBS (2016), 98% Reduction from 2015.

Fig. 5. Total Vegetation Removed – Dumpster Bin

Results and observations from 2016 indicate a **dramatic** reduction in the volume and biomass of plants present in the area. Due to 2015's eradication efforts, more plants were located and growing beyond the main cluster present in the area. Results found in figure 4 appear drastically different between 2015 and 2016. Variables noted between results beyond DUC control are found in table 1.

Table 1. Variables associated to Rideau River Black Rapids water chestnut colony

2015	• 1st control event since discovery • 3 pull events • Plant maturity is greater and magnified within cluster of chestnut plants. The cluster was so thick all other vegetation was choked out and permitted for chestnut plants to take 100% control of cluster area
2016	• 2nd control event since discovery • Main cluster of chestnut is not a big as 2015 – area of plants is less crowded: some means of interspatial spacing • Plants are not as mature (perhaps due to interspatial spacing being significantly greater than 2015) • Lower amount of seed dispersal in affected post-control events due to delayed plant maturity • Greater distribution of plants beyond cluster. 2015 control events may have dislodged and dispersed seeds in immediate area

During the pull event, large vessels worked to remove plants from the main cluster while canoes focused on the shoreline and shallow areas upstream and downstream of the main cluster of plants. On September 2nd, the Scout troop returned to the location and scanned the area for plants. The troop did not discover or record or remove any plants. City of Ottawa, DUC, RVCA, and the Scout troop will revisit the location to perform post effectiveness monitoring in July 2017.

Surveillance:

Fall surveillance work started in late August and continued into early November with the assistance of the OFAH Hitsquad student and external DUC contractor. Funding, time and weather permitted the expansion of surveillance beyond Wolfe Island and the Kingston region. Surveillance efforts in 2016 examined 72 locations between Brighton Ontario and Rockport Ontario. DUC returned to survey Wolfe Island, Howe Island, Amherst Island, and several wetlands in Kingston region including: Parrots Bay, Collins Bay, Deadman's Bay, Kingston Harbour and the Greater Cataraqui Marsh. With the discovery of plants at Belle Island in Kingston Harbour in 2015, DUC examined the Cataraqui Marsh closely and expanded northward in to the Rideau Canal system. DUC was able to survey north of Washburn road without new plants found upstream.

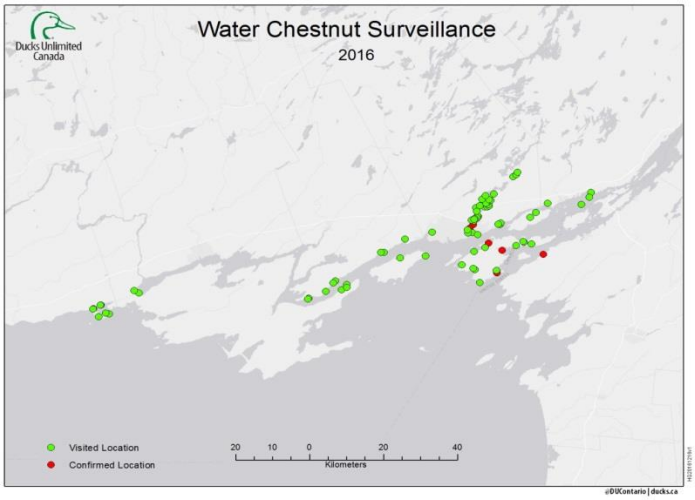


Fig. 6. DUC Habitat Suitability Model Surveillance Locations. Green indicates areas visited. Red indicates areas with established colonies of water chestnut.

Table 2. Surveillance of Highly Probable Areas (HPA) for European Water Chestnut (*Trapa natans*)

Location	# HPA Surveyed	Results
Wolfe Island, Ontario	12	1 new discovery
Amherst Island., Ontario	2	No new discoveries
Howe Island, Ontario	2	No new discoveries
Gananoque, Ontario	4	No new discoveries
Brighton, Ontario	9	No new discoveries
Prince Edward County, ON	3	No new discoveries
Lennox and Addington Township, ON	7	No new discoveries
Kingston, Ontario	6	No new discoveries
Rideau River (Canal), ON	27	No new discoveries
Σ	72	

Outreach, Education & Stewardship

The increase in awareness of European water chestnut continues to grow. This year marked a sharp increase in providing outreach, education and stewardship at 9 events for FY16/17. In total our outreach, education, and stewardship reached 835 members of the public. DUC presented at educational events to children, youth and adults across various delivery platforms. The Elbow Lake Environmental Educational Centre has provided DUC with the ability to reach high school students and provide invasive species awareness for local concerns, such as water chestnut. DUC coordinated partners for addressing the Rideau River (Black Rapids) colony of water chestnut with significant involvement from local volunteers, as well as provided education and stewardship at both control events.

Table 3. Summary of Outreach, Education & Stewardship Events

Event	Attendance
Ducks Unlimited Canada – Kingston Volunteer Appreciation Dinner	100
Ducks Unlimited Canada – Wolfe Island Fundraising Dinner	190
Ducks Unlimited Canada – Wolfe Island Water Chestnut Workshop	10
Ducks Unlimited Canada, City of Ottawa, RVCA – Black Rapids Chestnut Event	75
Elbow Lake Environmental Education Centre – Presentations to HS Students	250
Nepean 23rd Geohunters Scout Troop	22
Lake Ontario Commercial Fishermen AGM – Picton	35
Ontario Invasive Plant Council - Aquatic Invasive Species Webinar Panel Expert	38
Ontario Invasive Plant Council AGM – Toronto	115
Σ	835

Summary of results

With established programming and three years of successful control and surveillance methodology, the current techniques employed by DUC in addressing European Water Chestnut appears to be working. Manually removing plants by hand also appears to be successful. Our immediate results indicate fewer plants are present on Wolfe Island and the Rideau River. That said, some areas or embayment's in the

wetlands had increased numbers of mature plants (MacLaren's Bay, Bayfield Bay) while some embayment's had decreased amounts of mature plants (Button Bay) and in two instances, no plants found (Bayfield Bay channelization areas) remained a factor for 2016.

Mapping for Bayfield Bay and Button Bay has been produced by the DUC GIS Team (Fig 7-8). This year marks 3 years of field work and permitted DUC to generate hotspot mapping of affected areas currently with plants from Bayfield Bay and Button Bay. It is important to note GIS imagery for Bayfield Bay and Button Bay show point data for locations of removed plants. This data has been interpolated to showcase "hot spot" density levels after 3 years of control. In summary, areas in red demonstrate those areas continue to have significant plant growth after 3 years of control.

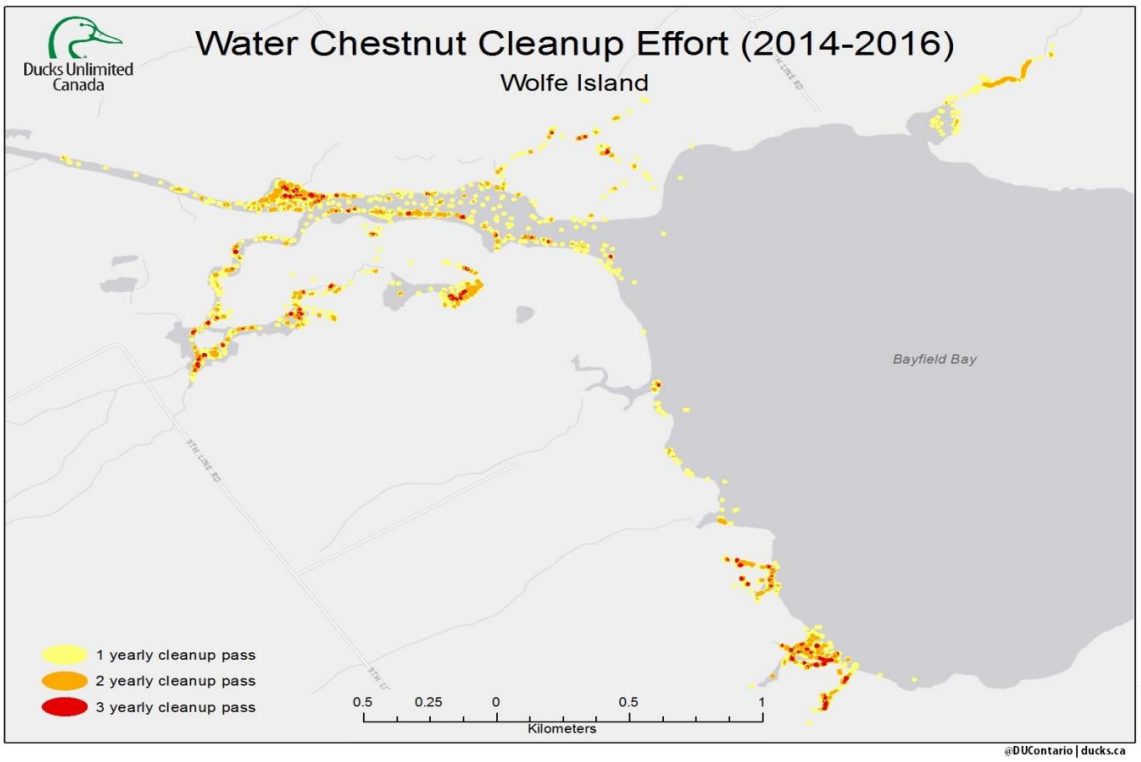


Fig. 7. 3 Year Analysis: Bayfield Bay Hot Spot Density Mapping

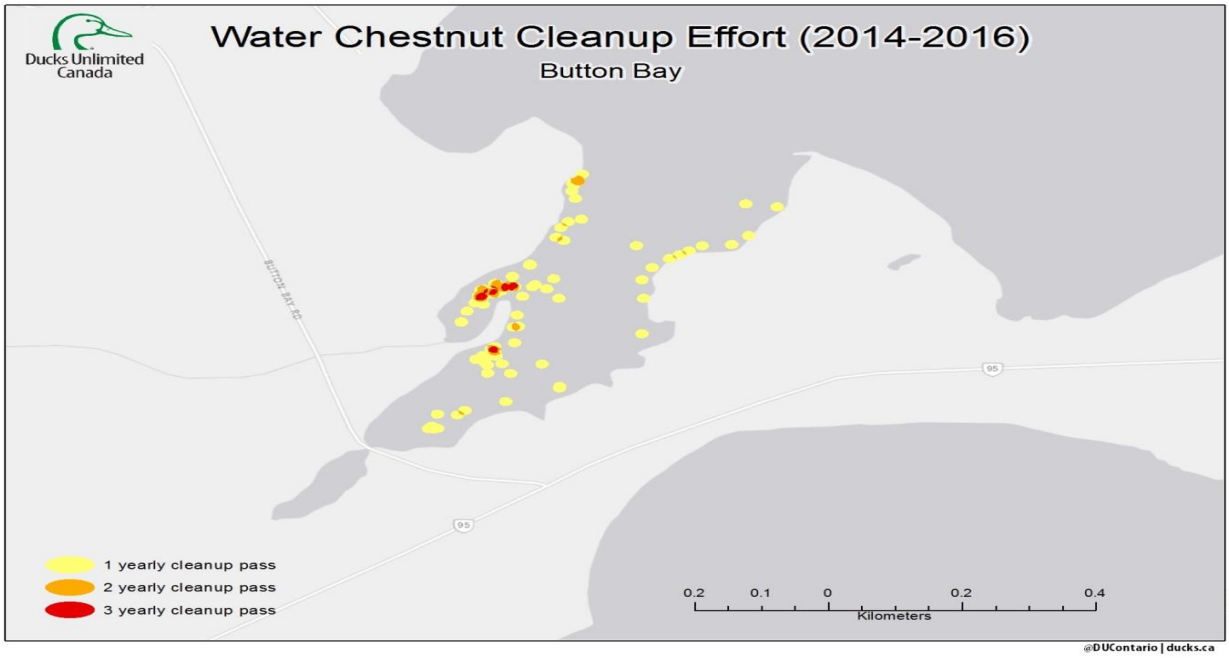


Fig. 8. 3 Year Analysis: Button Bay Hot Spot Density Mapping

This observation indicates these areas are likely to continue to have considerable amounts of seeds which have or continue to be deposited in the substrate and continue to act as a seedbank in those localized areas.

Figure 1 illustrates 2016 operating season was significantly longer than 2015. Better program efficacy and significant student support from the OFAH Hitsquad student provided the opportunity to maintain a strong program and enough staff time to perform monitoring and control events of water chestnut as well as expand the surveillance throughout the local area. For a second year, DUC proceeded with hiring an external contractor to assist the coordinator with surveillance of the local region. This enabled the DUC to continue surveillance in the immediate surrounding area (figure 6). Without the hired contractor, DUC would not have been able to survey the Greater Cataraqui River or northward in to the Rideau River (Canal).

The surveillance protocol and methodology employed by DUC is functioning with the positive discovery of a new colony at Brown's Bay on Wolfe Island. Through public outreach, a report surfaced and DUC examined the area for "a suspicious looking plant". Moving forward, attention should focus on DUC's Habitat Suitability Model (HSM) for Water Chestnut in Eastern Lake Ontario and the surrounding areas. This offers Early Detection and Rapid Response (EDRR) methodology to aid resource managers with the ability to respond to localized threats immediately. With secured funding and a degree of urgency to inspect surrounding HSM sites, 2017 will see an expansion of our surveillance East and West of current surveillance areas as well as northward of Washburn road on the Rideau River. With the detection of a 2nd colony of water chestnut on the Rideau River, the likelihood of additional colonies remains between Burritt's Rapids and Kingston. This is a significant area to cover and multiple partnerships are critical for areas to be examined. Working with partners (City of Ottawa, Rideau Valley Conservation Authority, MNRF), our goal is to increase surveillance on the Rideau River in a strategic manor that optimises resources and eliminates duplicate coverage of surveillance zones. Time and funding permitting, DUC should aim to work with partners and develop a Habitat Suitability Model for the Rideau River.

Proposed Actions for 2017/2018

Control:

For FY17/18, immediate emphasis is to visit all known areas with chestnut plants and assess colony regeneration. This assessment will identify the success rate associated to 2016 efforts.

In June, it is recommended for DUC to revisit areas where plants have been controlled between 2014-2016 to address success and regeneration of water chestnut plants on the surface of the water. Assessing the surrounding areas will also provide the opportunity to identify which areas require the most attention of DUC staff for controlling water chestnut in Bayfield Bay, Button Bay, Brown's Bay and Belle Island on the Greater Cataraqui River. During these monitoring visits in June, it is recommended to record all plants found to accurately assess the volume of plants returning to the surface. This will assist understanding and estimating the volume and biomass of plants remaining to be controlled throughout the

July-Sept months in all affected areas. It is highly recommended that the data be recorded the mimic 2015 and 2016 methodology where 1 rosette on the surface of the water equals one recorded waypoint on the GPS unit the entire a 1:1 ratio GIS representation. After 3 years of control efforts, it is likely that some areas will have lower plant density than in 2016. Staff will have the opportunity to strategically return to areas with increased plant densities to remove regrown plants or offshoots from clusters or other delayed plant growth that may have been overlooked during the first control event. Due to the dormancy of deposited seeds, control events will be need to be continued in the future.

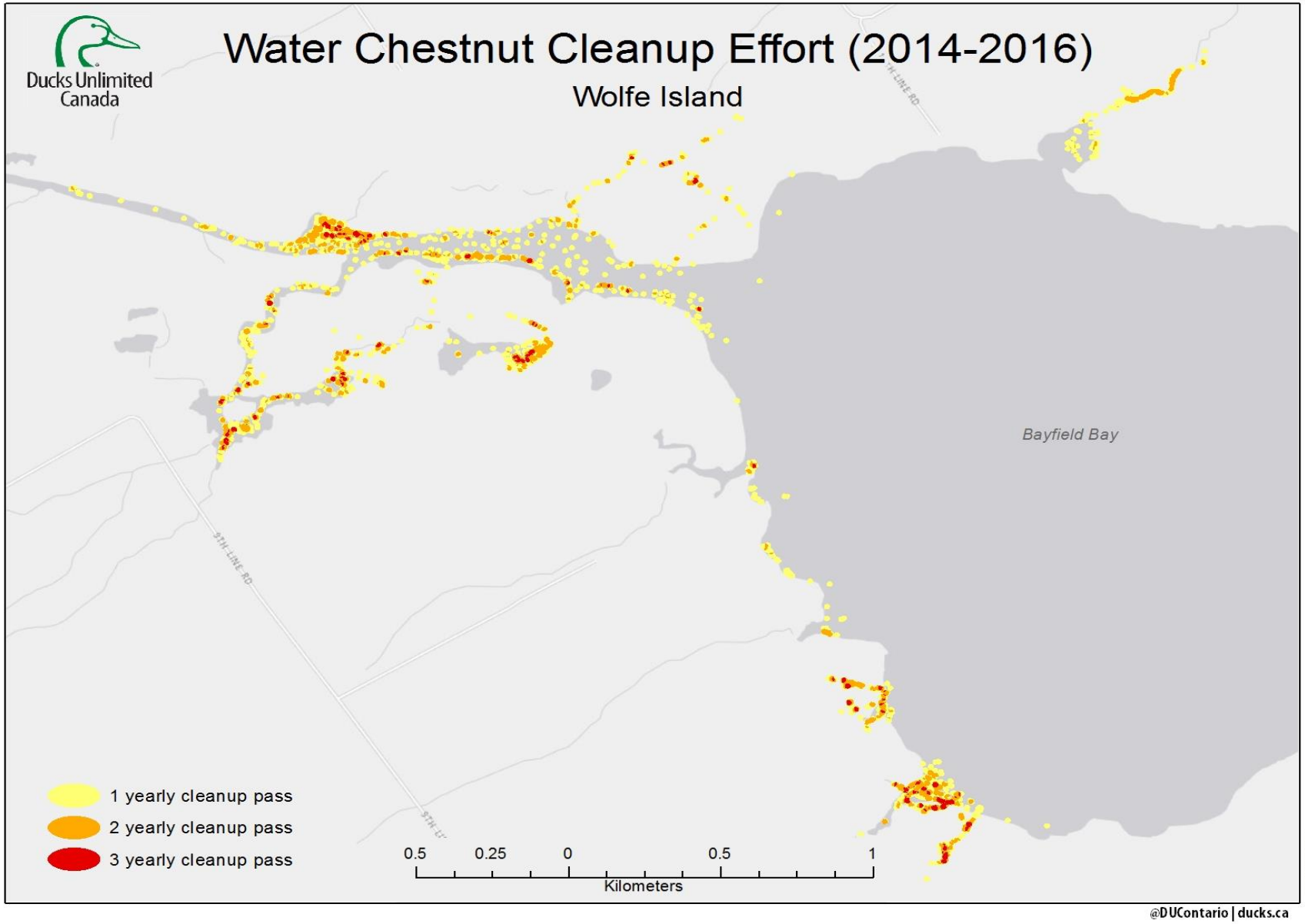
Surveillance:

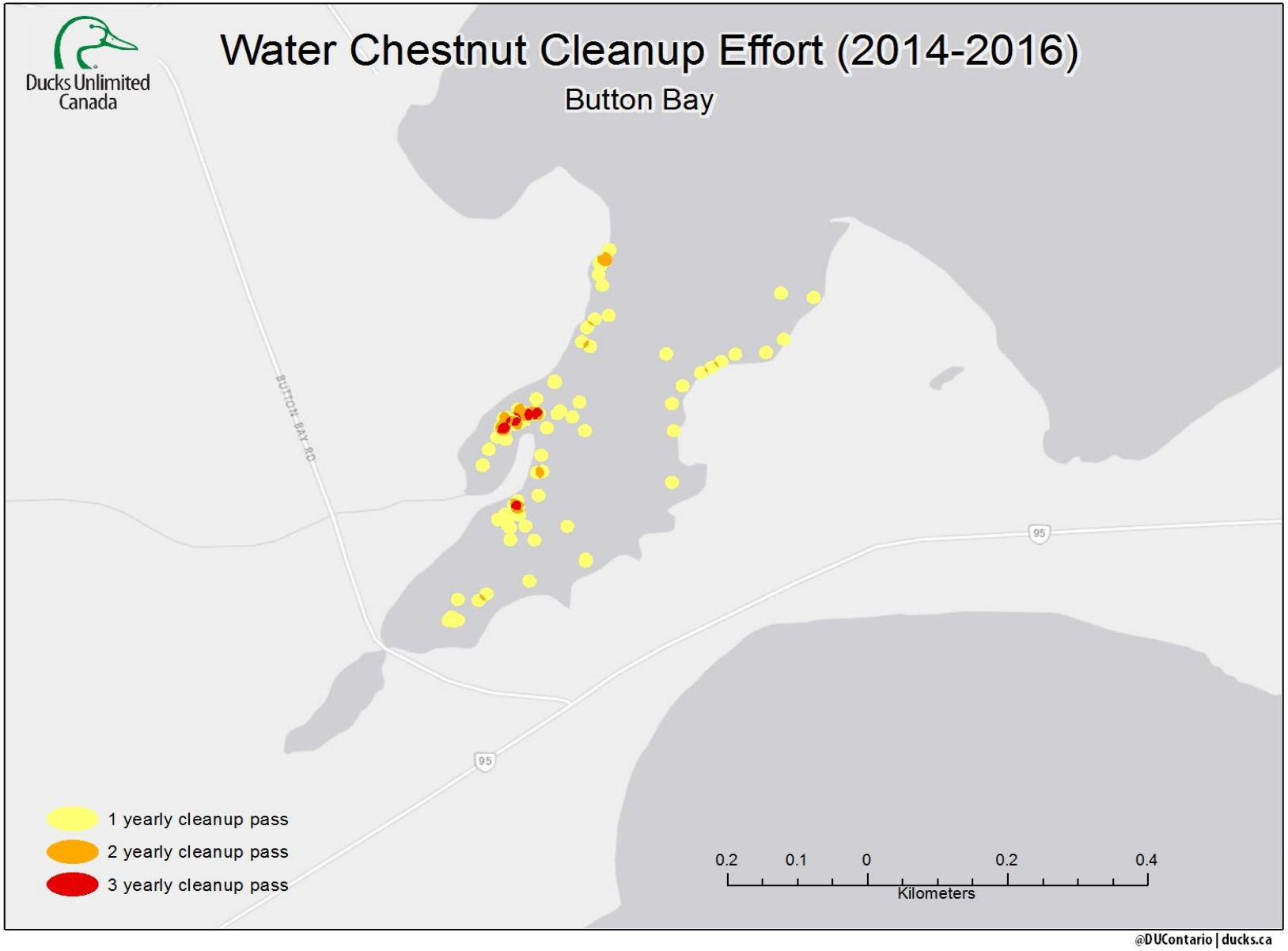
After three years of surveillance efforts, two additional colonies have been discovered on the Rideau River and one on the north side of Wolfe Island. With colonies present at the North and South sectors of the Rideau River, DUC attempted to visit as many sites along the Rideau Canal as possible to offer insight in to the areas as risk. Based on the amount of time required for control measures on Wolfe Island, it is expected that the newest colony at Belle Island is included for DUC management. If additional funding can be secured, further exploration and surveillance in to the Rideau River will aim to assess from Washburn Road to Newboro lock station. The section between Newboro and Burritt's Rapids will need to be addressed after further discussions with the water chestnut working group. The City of Ottawa will maintain surveillance of water chestnut from Burritt's Rapids north to the Ottawa River on a monthly interval coinciding with water quality baseline assessments. Unfortunately, City of Ottawa will be unable to do additional exploratory tasks beyond their scheduled baseline surveys due to budgetary constraints.

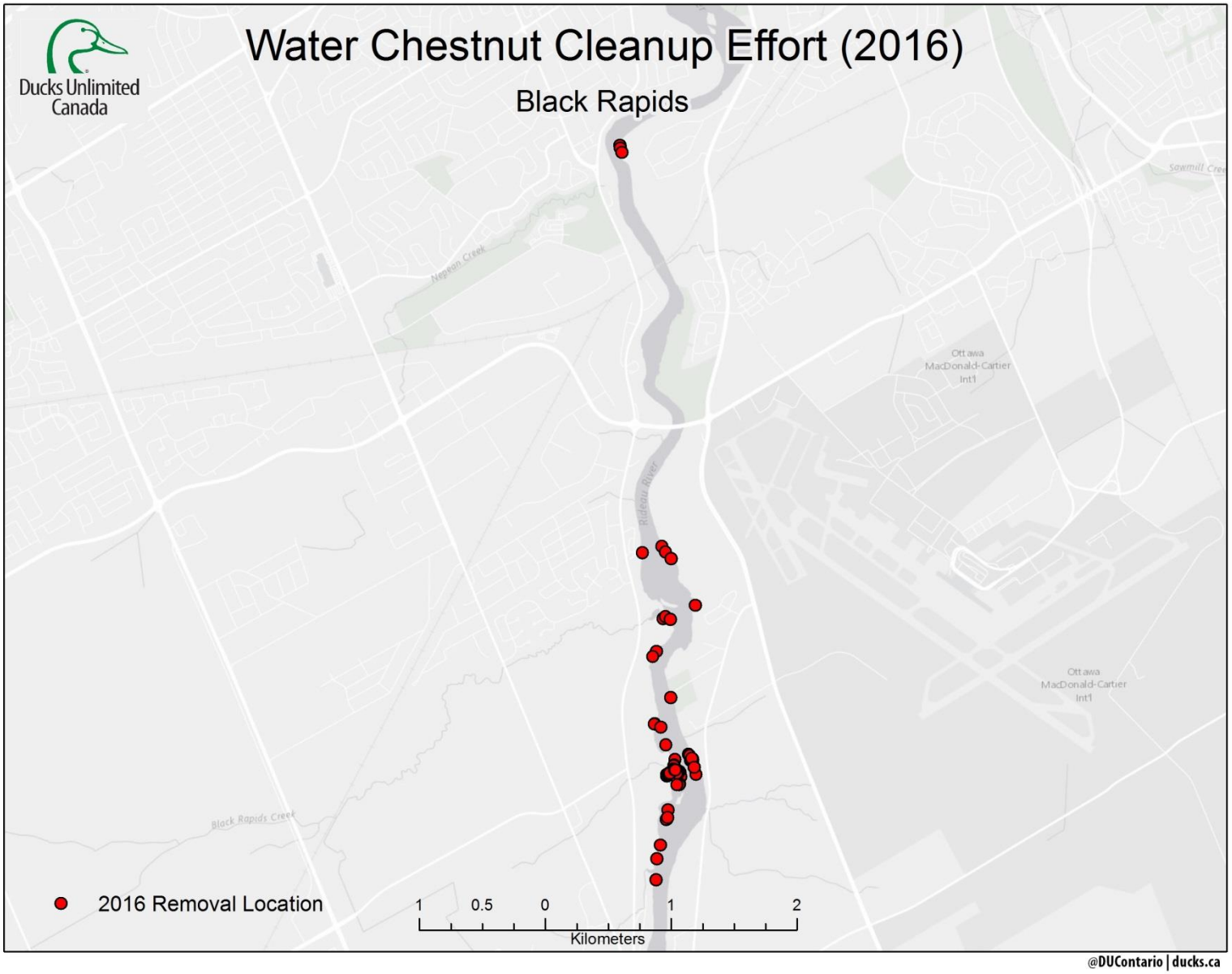
Derived from winter COA meetings, the decision and suggestion was unanimous to include Presqu'ile Bay and surrounding harbour for 2016 surveillance. Due to the low water conditions, DUC was able to visit the area however; several bays were unattainable and will need to be re-visited in the future when water levels permit for entry with canoe. If additional areas are recommended to examine, further financial support will be required to address additional time and work requirements.

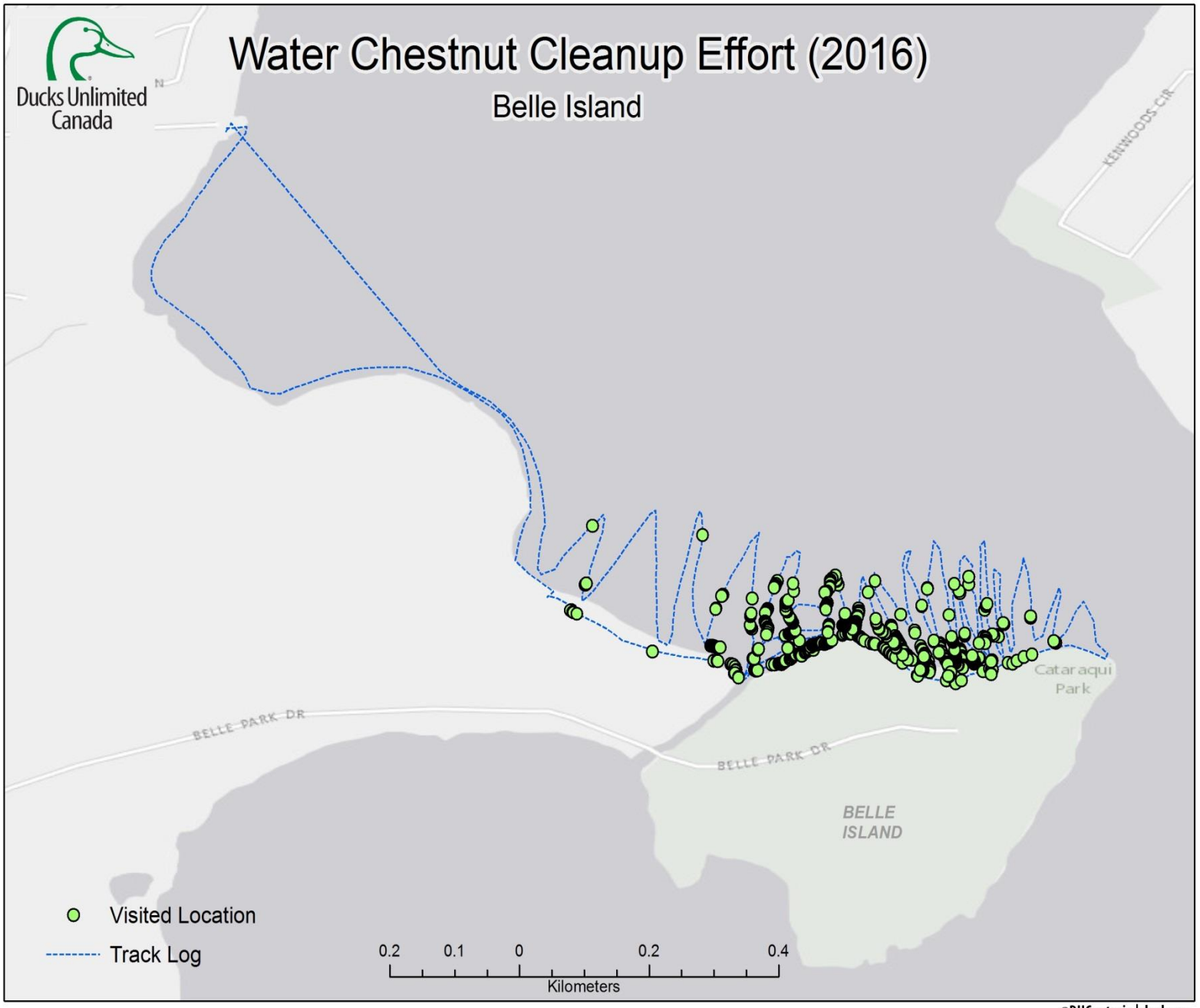
It should be noted that all additional work throughout the area requires attention for a few more years. The seedbank life for water chestnut is approximately 8-10 years; therefore surveillance should be maintained to ensure populations do not return. With the likelihood of additional colonies being present, further surveillance should be sustained and even expanded beyond the immediate area.

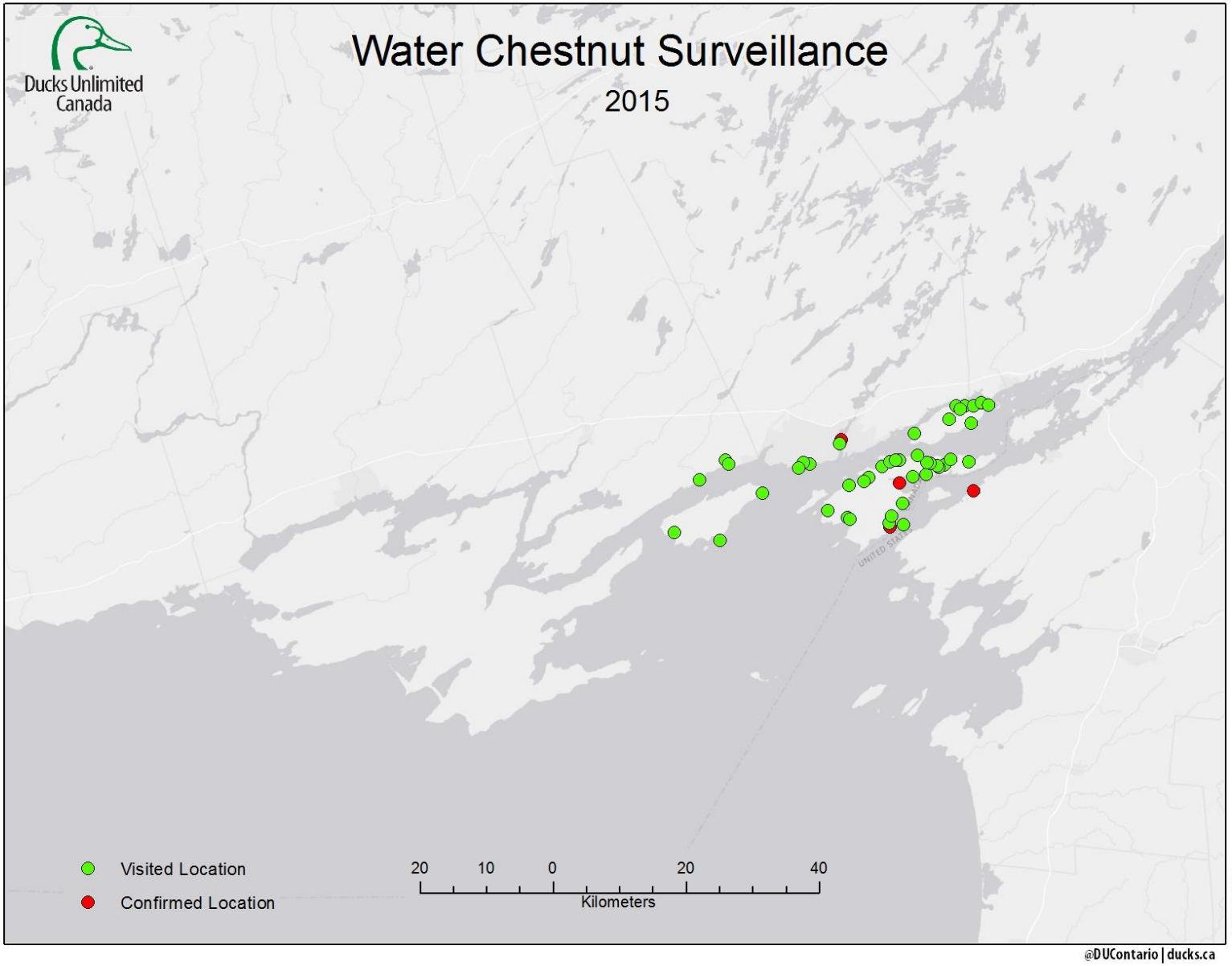
APPENDIX

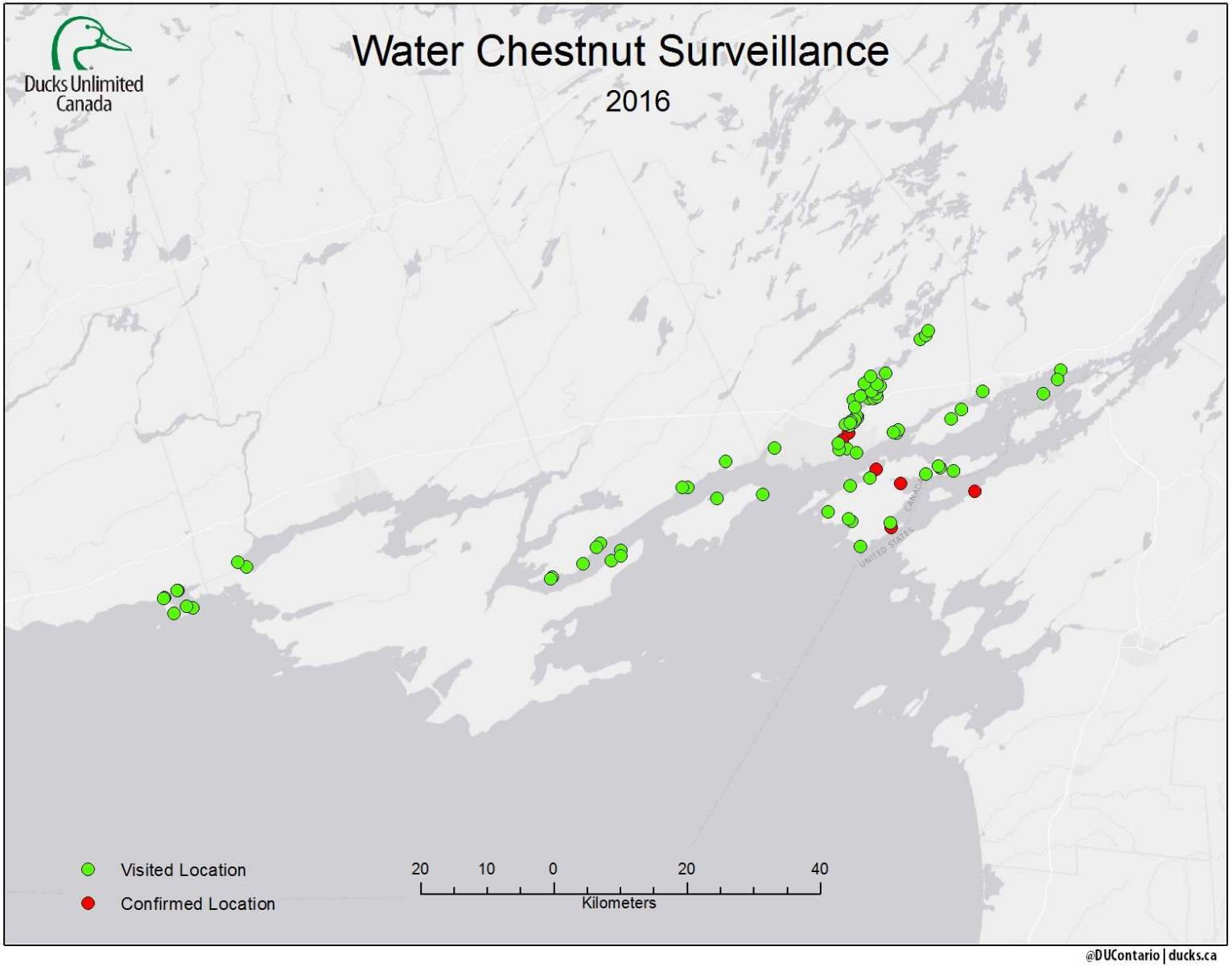

Ducks Unlimited Canada
Water Chestnut Cleanup Effort (2014-2016)
Wolfe Island
Bayfield Bay
1 yearly cleanup pass
2 yearly cleanup pass
3 yearly cleanup pass
0.5
0.25
0
0.5
1
Kilometers
@DUContario | ducks.ca
HG20161208v1


Ducks Unlimited Canada
Water Chestnut Cleanup Effort (2014-2016)
Button Bay
BUTTON BAY RD
95
95
1 yearly cleanup pass
2 yearly cleanup pass
3 yearly cleanup pass
0.2 0.1 0 0.2 0.4
Kilometers
HG20161208v1
@DUContario | ducks.ca


Water Chestnut Cleanup Effort (2016)
Black Rapids
Ducks Unlimited Canada
Nepean Creek
Rideau River
Sawmill Creek
Ottawa MacDonald-Cartier Int'l
Ottawa MacDonald-Cartier Int'l
Black Rapids Creek
2016 Removal Location
1 0.5 0 1 2
Kilometers
LB20170126v2
@DUContario | ducks.ca


Water Chestnut Cleanup Effort (2016)
Belle Island
Ducks Unlimited Canada
KENWOODS CIR
Cataraqui Park
BELLE PARK DR
BELLE PARK DR
BELLE ISLAND
Visited Location
Track Log
0.2 0.1 0 0.2 0.4
Kilometers
@DUContario | ducks.ca
LB20170125v1


Ducks Unlimited Canada
Water Chestnut Surveillance
2015
Visited Location
Confirmed Location
20 10 0 20 40
Kilometers
HG20161216v1
@DUContario | ducks.ca


Ducks Unlimited Canada
Water Chestnut Surveillance
2016
Visited Location
Confirmed Location
20 10 0 20 40
Kilometers
HG20161216v1
@DUContario | ducks.ca