

The Rabies Reporter

The Ministry of Natural Resources

MNR Publication 51709, Volume 34

January — December 2023



The Rabies Reporter is a scientific newsletter about current issues in rabies research and control. It is a joint effort of the Wildlife Research and Monitoring Section of the Ontario Ministry of Natural Resources; the Rabies Laboratory at the Ottawa Laboratory (Fallowfield) of the Canadian Food Inspection Agency; and the Ontario Ministry of Health. Articles for future issues will be welcomed by the editor. The Rabies Reporter is not peer reviewed and should be cited as a newsletter. Send contributions, letters and inquiries to: rabies@ontario.ca.

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ISSN (print): 1186-8961
ISSN (pdf): 1705-2106

[Ontario.ca/rabies](https://ontario.ca/rabies)

Continued decline of raccoon rabies in Ontario

Anne McCarthy, Ministry of Natural Resources

We are happy to report that for the second year in a row all six cases of raccoon rabies detected in 2023 were from a single city (St. Catharines). Controlling the spread of the disease is an important step towards reaching our goal of eliminating terrestrial rabies in Ontario.

In 2023, we tested 2,974 samples from sick, strange acting, found dead, or roadkill wildlife (Figure 1). Since December 2015, we have tested over 30,500 wild animals and identified 523 raccoon strain and 21 fox strain cases in Ontario (Figure 2).

Raccoon strain: In 2023, only 6 raccoon strain rabies cases were detected — all were detected in the City of St. Catharines (6 skunks – Figure 1).

Fox strain: For the fifth year in a row, no fox strain cases were detected. Testing of dead, sick or strange acting animals continues within the surveillance area.

Bat strains: In 2023, 49 cases of bat rabies were detected across the province. All cases were detected in bats (45 big brown bats, three little brown bat and one hoary bat). Find additional case details at [Ontario.ca/rabies-cases](https://ontario.ca/rabies-cases)

In 2023, a cat found in St. Catharines tested positive for rabies, however strain typing was not possible. Given the area is currently within the control zone, no additional management action was taken.

2023 saw a 98% decline in cases of raccoon strain rabies since the peak of the outbreak in 2016 and cases continue to be contained to a small geographic area. We will continue enhanced surveillance and terrestrial rabies control efforts throughout 2024.

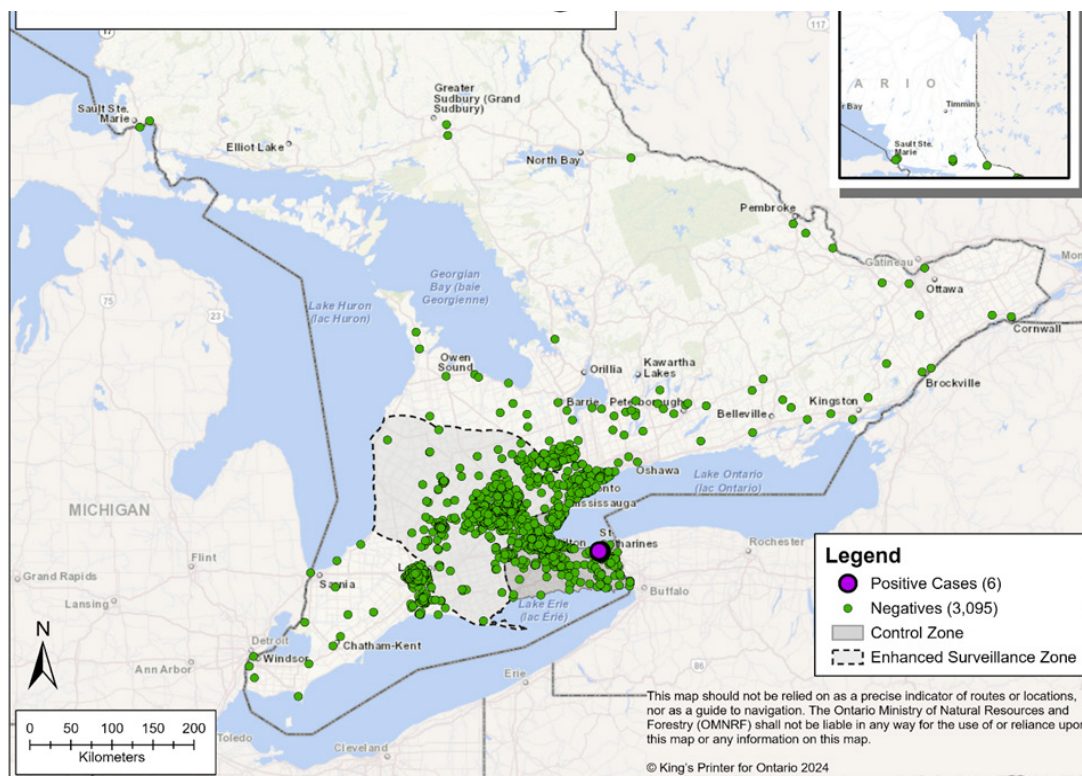


Figure 1. Terrestrial rabies cases (N=6) detected and negative samples collected in southern Ontario in 2023.

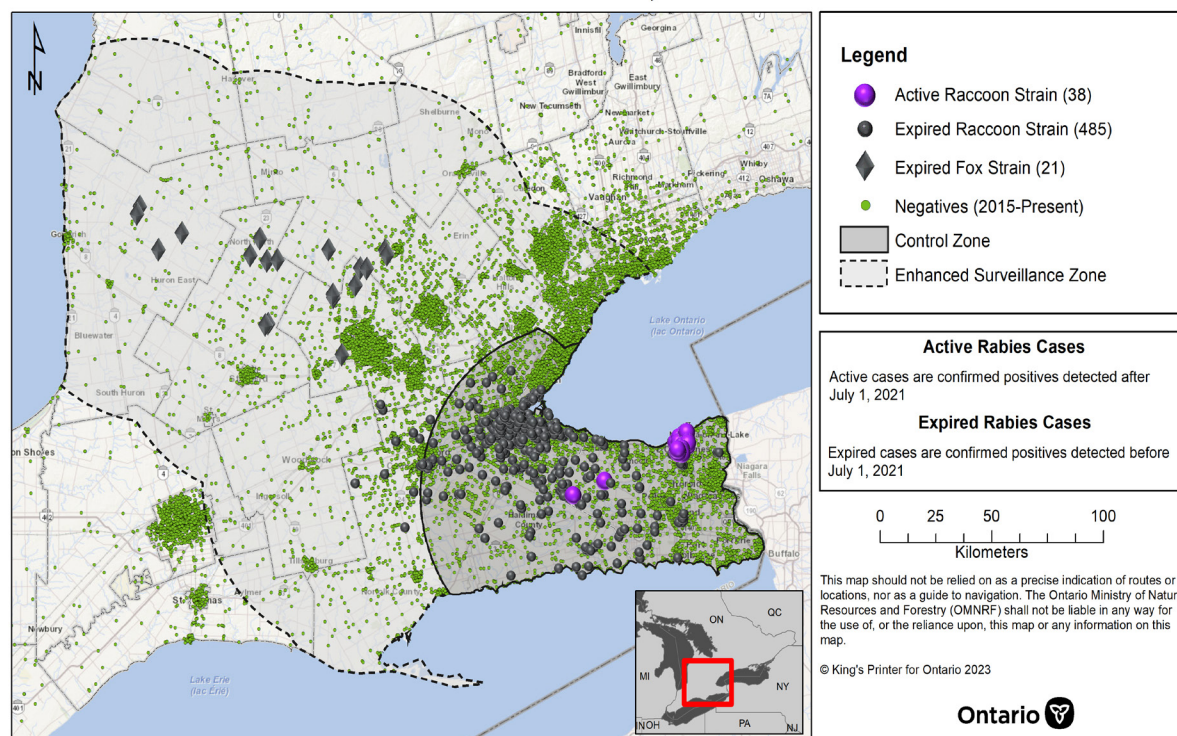


Figure 2. All terrestrial rabies cases active (<2 years since detection) and expired (>2 years since detection) detected in southern Ontario from December 2015–December 2023 along with the current enhanced surveillance and control zone.

Rabies surveillance and control program – 2023

Ministry of Natural Resources

In 2023, we continued our efforts to control, contain, and eliminate terrestrial rabies in southern Ontario. The rabies control zone was reduced by 21% (almost 1,400 km²) because 485 of the 523 cases detected since December 2015 were more than 2 years old (expired) and no recent cases have been detected in the northern part of the zone.

We continued to focus on oral rabies vaccine distribution using the ONRAB bait, Trap-Vaccinate-Release (TVR) and enhanced surveillance within 50 km of any positive cases (Figure 3). In 2023, over 671,000 baits were distributed in southern Ontario by hand, air and bait station. Enhanced surveillance focuses on the collection of sick, strange acting, or found-dead wildlife for rabies testing.

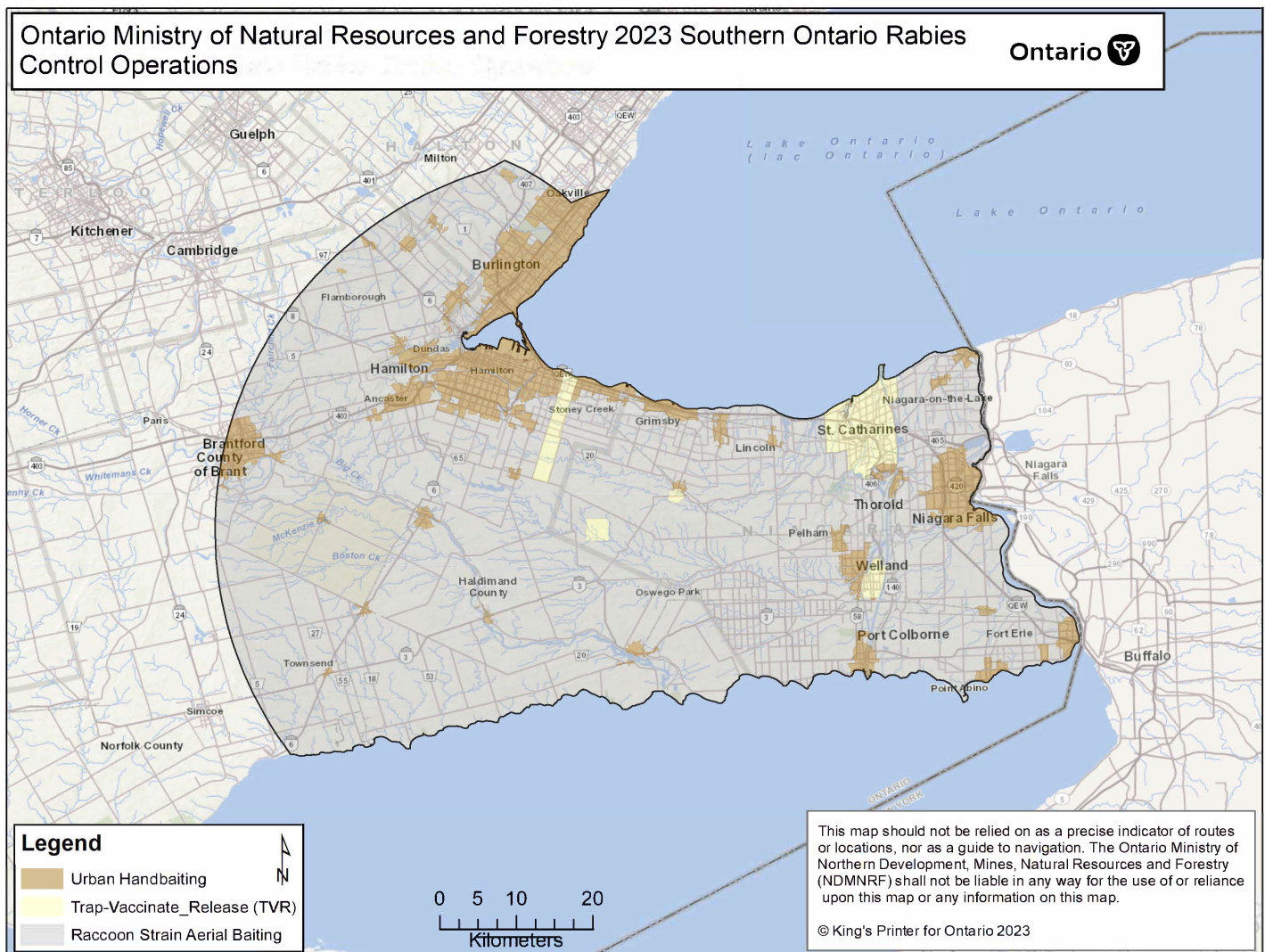


Figure 3. Southern Ontario aerial baiting, hand-baiting and Trap-Vaccinate-Release was conducted from May to October; almost 671,000 baits were distributed in 2023.

Aerial baiting

Baiting flights in southern Ontario were conducted from August 22-28. A total of 486,075 baits were distributed by fixed-wing aircraft at densities of 75, 150 and 300 baits/km² over an area of 4,300km² (Figure 3).

An additional 50,025 baits were distributed by helicopter from August 28-29 at a density of 150 baits/km². Of these, 36,900 were distributed in the Niagara region, east of St. Catharines to the Ontario/US border and 13,125 were distributed throughout the Golden Horseshoe.

Hand-baiting

Hand-baiting is carried out in urban areas, focusing on raccoon and skunk habitat (bushes, parks, ravines, etc.) where animals may forage, or along travel corridors such as fence lines, hedges, and large culverts. Green spaces such as forested parks, along railways and small hydro cuts were also targeted by crews on foot using trails and pathways.

Hand-baiting took place throughout the summer in the Golden Horseshoe area from June 19 to August 24. Crews distributed 95,963 baits at 150 baits/km² covering an area of 689 km² (Figure 3).

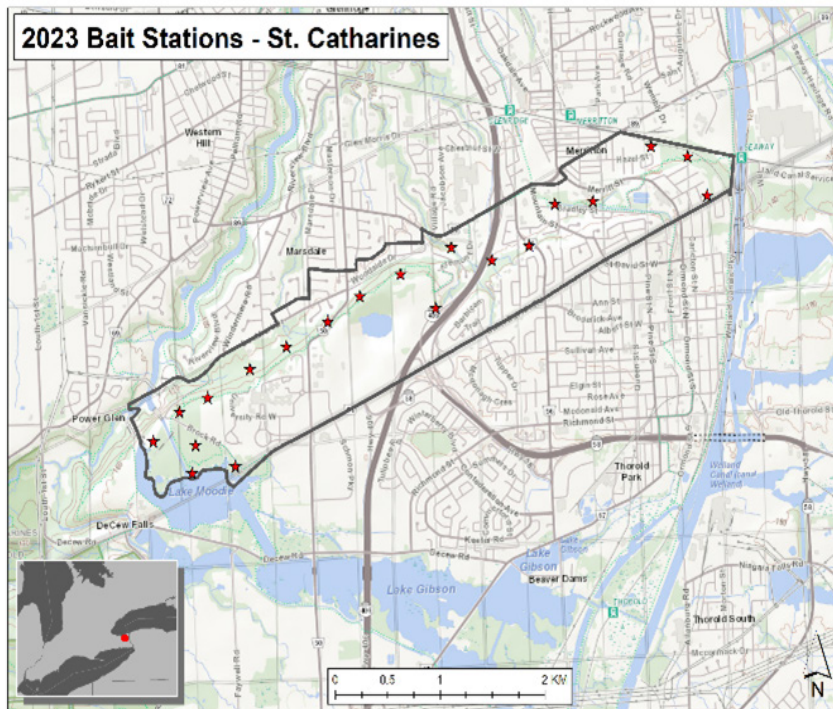
Trap-Vaccinate-Release (TVR)

Ontario's 2023 TVR program ran for twenty-one non-consecutive weeks between May 1 and October 13. Thirty-three cells (trapping areas) covering approximately 141 km² were trapped in St. Catharines, Thorold, Hamilton, Stoney Creek, Caistor Centre, Smithville and Welland. Staff targeted high risk areas where positive cases were recently detected, and strategic areas to help create a barrier of vaccinated animals to prevent the spread of rabies. With cooperation from the public, municipalities, and various organizations, permission was obtained to set humane live-traps on private and public land. Animals were captured and vaccinated with an intramuscular injection of IMRAB 3 rabies vaccine. Ear tags with unique identification numbers were applied so that mark-recapture data could be used to estimate raccoon and skunk population density and to determine the percentage of animals vaccinated. After vaccination, animals were released at the site of capture. In 2023, 1,613 raccoons, 217 striped skunks, 19 red foxes and 1 coyote were vaccinated during TVR.

In 2023, we began using the application ArcGIS Survey123 (www.esri.com) to collect TVR data digitally instead of using paper data forms (Figure 4). The move to digital data collection allowed for improved data collection, management, and summarization. See article on page 8 for additional details.



Figure 4. TVR staff learn to use new digital data tools during training.



Bait stations

In 2023, we installed temporary bait stations along the Niagara escarpment in the St. Catharines and Grimsby areas to target wildlife corridors in urban and semi-urban areas. Bait stations are Polyvinyl chloride (PVC) tubes that are filled with oral rabies vaccine baits once a week. Wildlife that encounter the stations can take a bait, get vaccinated and keep moving.

Twenty stations were set up in St. Catharines, and 47 stations in Grimsby (Figure 5). Stations were re-baited with 75 baits per station once per week. MNRF dispensed 8,248 baits using bait stations in 2023.

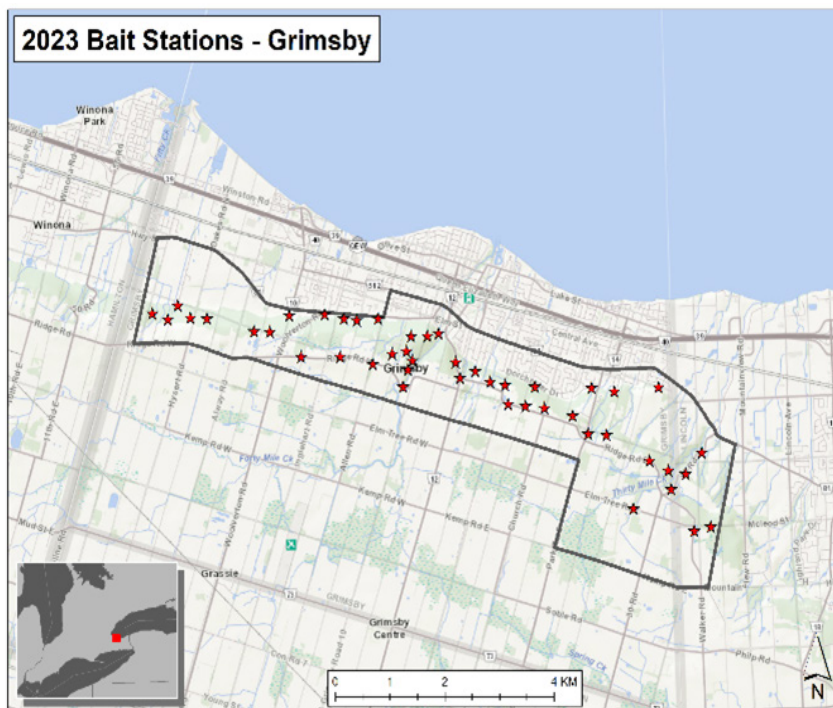


Figure 5. 2023 locations of Grimsby and St. Catharines bait stations.

Eastern Ontario preventative baiting

To prevent another re-incursion of raccoon strain rabies from northeastern New York (NY) State, MNRF distributed 24,600 ONRAB baits by fixed wing aircraft over a 431 km² area along the St Lawrence River (Figure 6) on August 10. This area on the mainland borders the St. Lawrence River near Kingston and Wolfe Island. Baits were dropped along flight lines spaced 750m apart and at a density of 75 baits/km² over agricultural and forested habitats. From August 8-12, hand-baiting crews distributed 5,462 baits in the city of Cornwall (Figure 5). Additionally, MNRF partnered with the Mohawks of Akwesasne First Nation to provide 1,560 baits for distribution on Cornwall Island (Akwesasne). Eastern Ontario has not had a case of terrestrial rabies since 2005. In 2023, there were 2 cases detected in the Cape Vincent area of NY, approximately 8 km from the Ontario border along the St. Lawrence River.

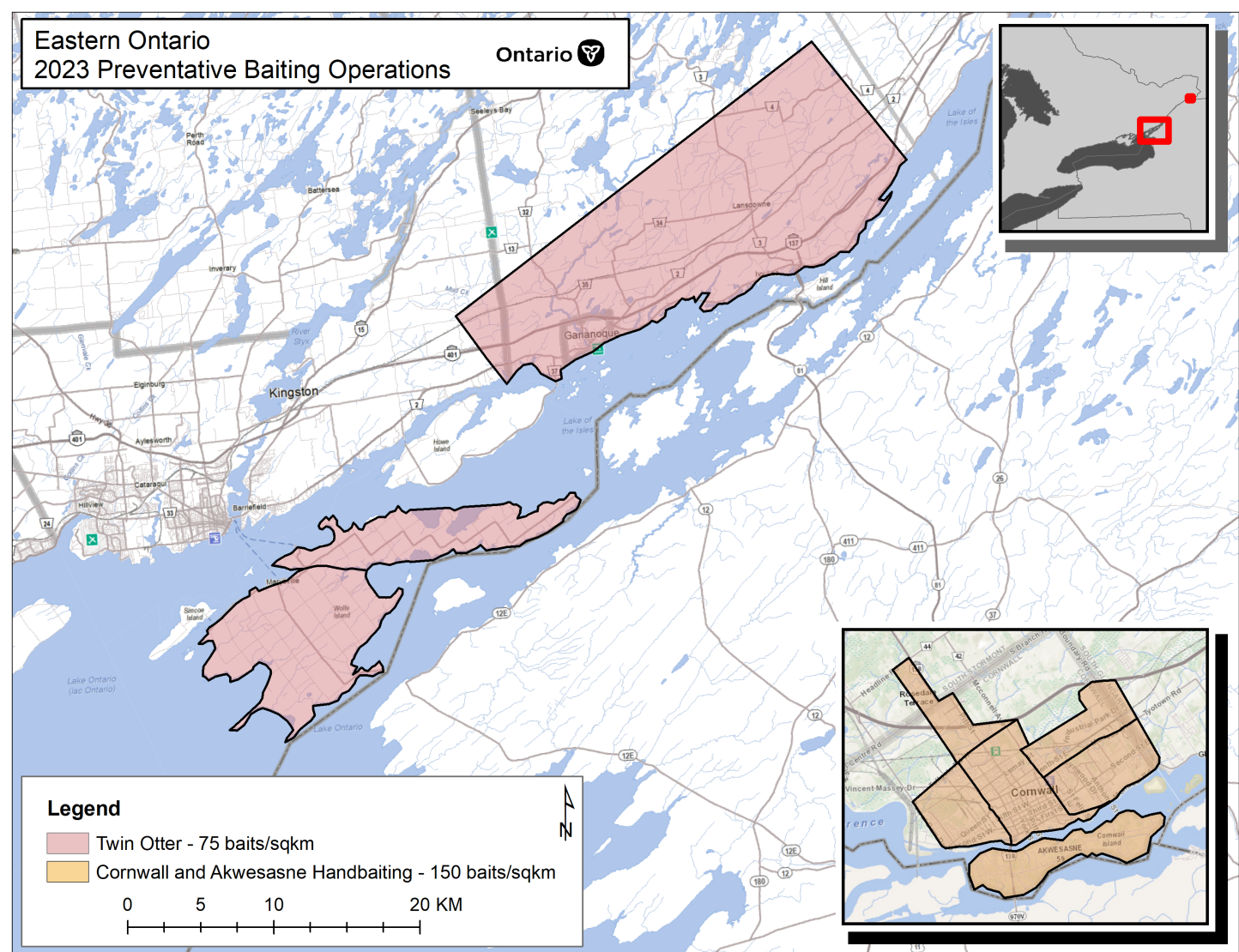


Figure 6. 2023 preventative baiting operations in eastern Ontario.

MNR 2023 communications

Anne McCarthy, Ministry of Natural Resources

Public education and outreach are an important part of the rabies program. We work closely with municipal and ministry partners to inform and engage the public and key audiences about rabies in wildlife. Tools used to communicate about the program include rabies information brochures, posters, media bulletin, social media, webpages, engagement events and presentations to partners and stakeholder groups.

The 2023 social media posts on Facebook, Instagram, Twitter and LinkedIn were successful, reaching (the number of people who saw the post) over 130,000 people. The average engagement rate for organic posts averaged 2.8% (typically 1–5% is considered 'good'). All together the posts generated 477 link clicks directing people to Ontario.ca.

Visits to the "Rabies in Ontario" webpages increased overall in 2023. The largest increases in visitation were seen for the "Rabies in humans" and "Rabies in Pets" pages. The other pages had less fluctuations in visitation. (Table 1). In 2021, the content of the rabies in wildlife page was split into the "Rabies in wildlife" and "Wildlife rabies outbreaks and control operations" pages. Since the split, the operations page has averaged about 6,000 visits per year, and the wildlife page has averaged almost 8,500 views which together show an increase in people seeking that content.

Table 1. Number of site visits to Rabies in Ontario web pages from 2015–2023.

Webpages	2015	2016	2017	2018	2019	2020	2021	2022	2023
Rabies (landing)	5,733	23,956	9,071	8,929	19,397	7,844	5,368	4,543	4,111
Rabies cases		4,530	8,058	6,764	4,585	3,922	4,988	6,508	6,958
Rabies in humans		1,790	8,057	10,688	13,402	8,379	9,082	13,500	25,590
Rabies in livestock		73	853	1,285	970	466	417	506	1,476
Rabies in pets		1,132	9,444	11,837	16,939	13,906	15,433	19,566	26,609
Rabies in wildlife		2,813	10,138	9,538	18,251	11,765	10,581	7,441	9,477
Rabies operations*							524*	6,386	5,696
Total	2,800	18,481	34,903	43,027	72,563	46,282	46,393	63,112	79,917

* new webpage posted October 14, 2021 separated *operations* section from *rabies in wildlife* page

In 2023, we received and responded to almost 280 calls to the wildlife health information line. This is slightly more calls than received in 2022, however similar to the average number of calls annually, except during the start of the recent outbreak. Of the calls:

- Almost 30% requested pickup of dead, sick or strange-acting wildlife for rabies testing
- Almost 30% were for advice regarding sick or strange acting animals
- Over 10% were related to general rabies questions
- Over 10% were about possible human or pet exposure
- Less than 10% were about ONRAB oral rabies vaccine baits. Calls about baits included queries about the baiting schedule, baits found by dogs and bait safety

Call volume was relatively consistent (24-36 calls per month) between April and October, when wildlife are active and baiting operations are underway. The decrease in bait related calls is likely related to the legacy of rabies control operations and communications in the control zones, as well as the reduced control zone area. As in previous years, most calls originated in or near the control zone and enhanced surveillance zone (Figure 7).

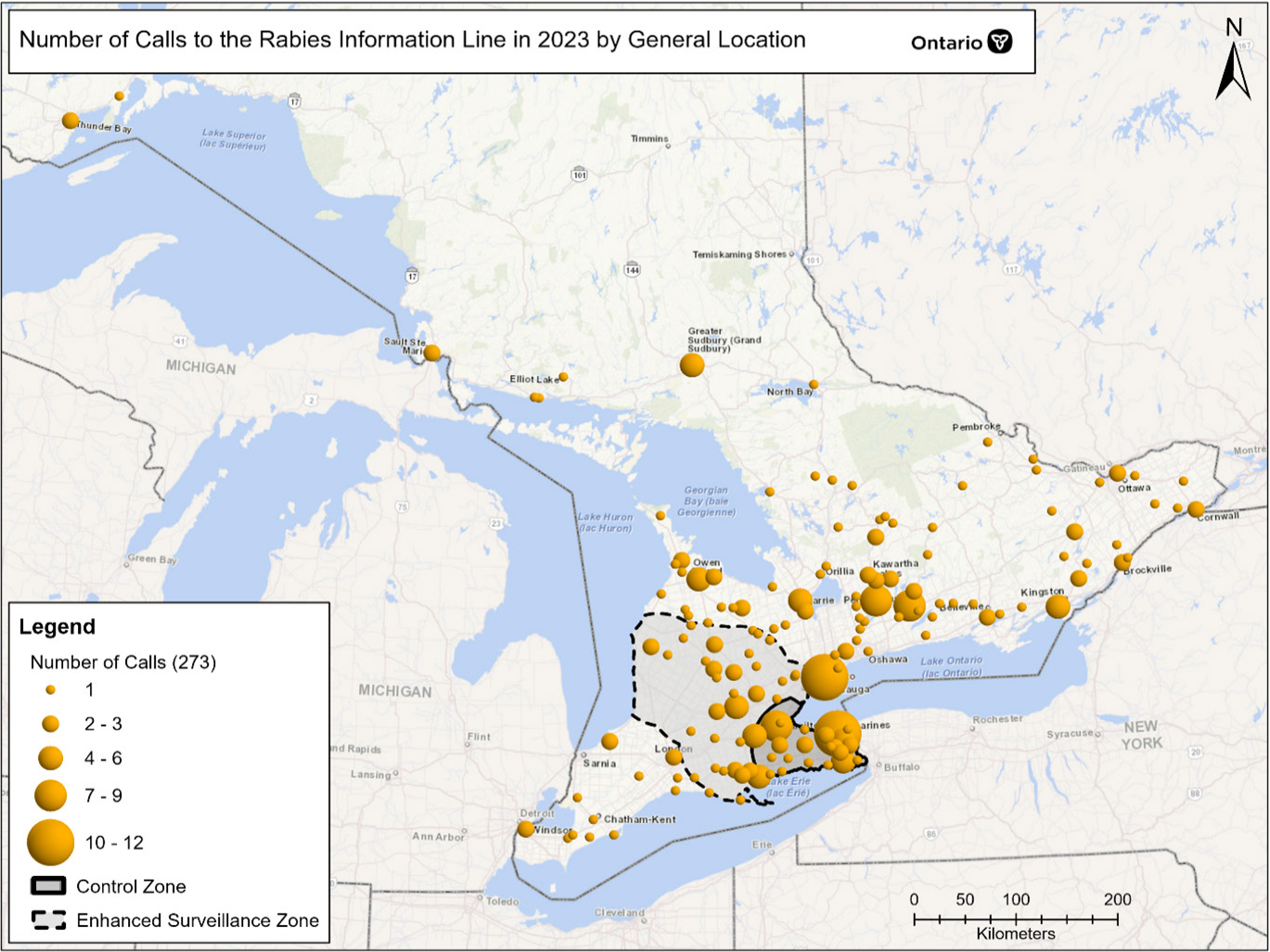


Figure 7: General locations and number of calls to the rabies information line in Ontario in 2023. Calls lacking geographic information are not shown.

Improved rabies data capabilities with ArcGIS Survey123.

Lisa Pollock, Ministry of Natural Resources

In 2023, we transitioned to using Survey123 to collect Trap-Vaccinate-Release (TVR) program data to improve data entry, management and summary. This tool allowed us to

- combine data collection and data entry into one step
- customize the data entry fields and mapping to fulfill program-specific needs, and add restrictions on some data fields to improve data quality and standardization

Trap location and animal capture data are now entered using our digital form and submitted after each trap check. Once data are submitted, it is uploaded automatically through Survey123 to an ArcGIS online database where data can be exported in various file types (e.g., excel, csv, shapefile, etc.). We also developed an ArcGIS dashboard to track and summarize trap location and capture data (Figure 8). This dashboard automatically updates as data are submitted, providing live vaccination totals throughout the field season. These totals can be filtered on the dashboard to obtain capture numbers for each trapping cell.

Using this new tool, we were able to complete data cleaning throughout the field season and needed fewer staff hours for data entry after the field season. Embracing this technology has resulted in faster and more accurate data analysis capabilities, and improved data quality and summarization for the rabies program. It has also been valuable for tracking field operations in real time, for example as a double-check to ensure all traps have been checked each day.

We plan expand our use of Survey123 into our rabies baiting operations in the 2024 field season.

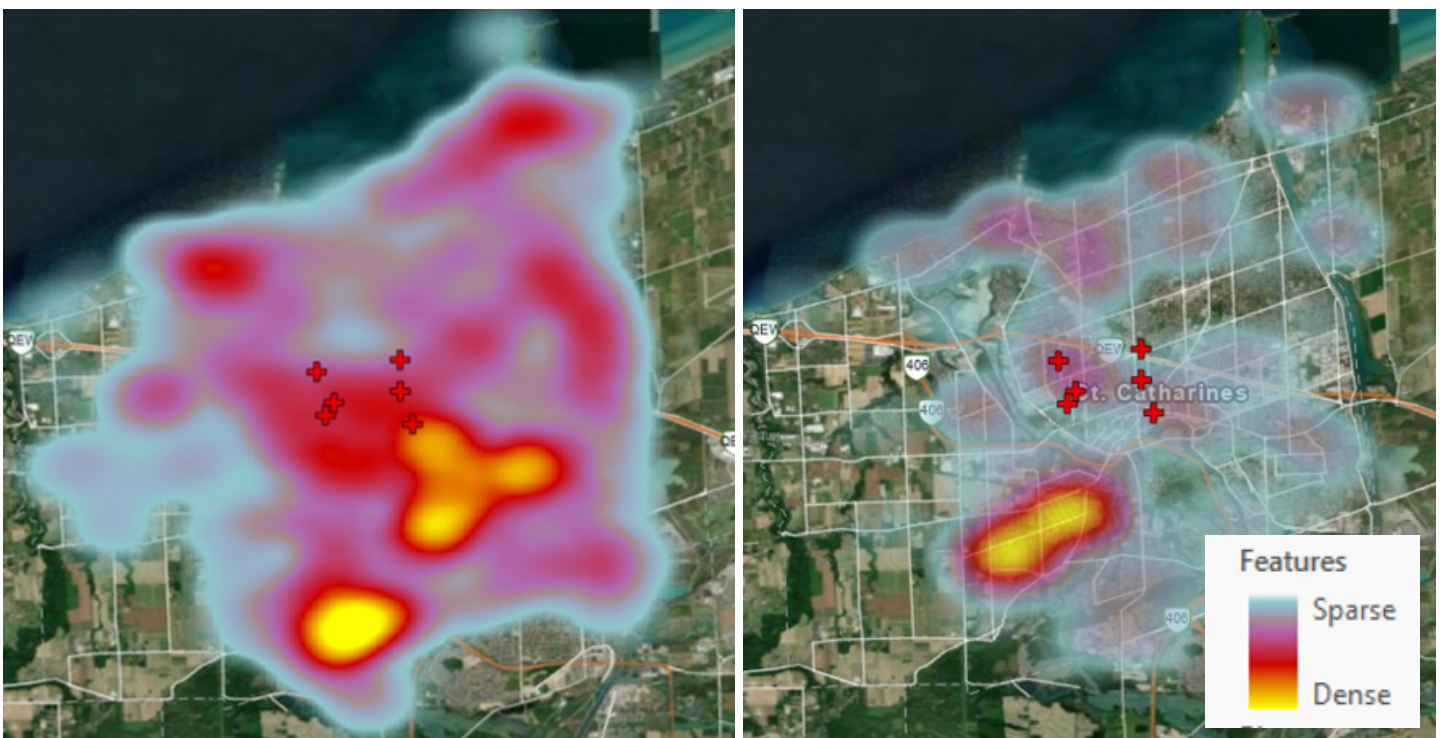


Figure 8: Heat map showing vaccination coverage in St. Catharines for raccoons (left) and skunks (right) in 2023, around 2023 positive cases marked in red crosses.

Example outcome - natural movements and translocations in St. Catharines

Using the Survey123 dashboard, we were able to explore how animal movements may influence the spread of rabies. We examined distances between recaptured raccoons and striped skunks in St. Catharines (where the most recent rabies cases have occurred) during the 2023 TVR season. The average distance between the first and last capture location of raccoons was $509\text{m} \pm 47\text{m}$, with most individuals traveling less than 1km from their initial capture site. However, some individuals moved more than 2km between trapping locations. Most striped skunks moved less than 500m, with an average of $278\text{m} \pm 54\text{m}$ between first and last capture location. Adults of both species tended to be re-captured further away than juveniles. This movement data helps us better understand the potential for rabies spread across the landscape.

Examining movements of recaptures also highlighted potential translocation issues (Figure 9). We identified possible instances of animals being moved up to 13km away from their initial site of capture and being released into green spaces in and outside of the city. These large movements, particularly from an area with active rabies cases, can facilitate the geographic spread of rabies and introduce rabies into new areas. Translocations can also help the disease move beyond natural barriers such as rivers and large highways.

In 2024, we will look at historic TVR data to examine movements in relation to rabies cases to see if there are any patterns that will help us better understand the potential impacts of wildlife translocation on the current and potential future rabies outbreaks.



Figure 9: Examples of raccoon movements identified in 2023, showing what is likely natural movement (left; 2.7 km area in almost 2 weeks) and a possible translocated individual (right; 5.9 km in 6 days).

Animal type Year	Fox 2022	Fox 2023	RAC 2022	RAC 2023	SSK 2022	SSK 2023	Other 2022	Other 2023	Bat 2022	Bat 2023	Dog 2022	Dog 2023	Cat 2022	Cat 2023	LVSTK 2022	LVSTK 2023	Total 2022	Total 2023
Southern Ontario																		
Brant									1								1	0
Elgin										1							0	1
Essex																	0	0
Haldimand									1								1	0
Hamilton					1				7	8							8	8
Kent																	0	0
Lambton																	0	0
Middlesex										4							0	4
Niagara			5		18	6			1	1				1			24	8
Norfolk									2								2	0
Oxford										1							0	1
Northern Ontario																		
Algoma																	0	0
Cochrane																	0	0
Kenora																	0	0
Muskoka																	0	0
Nipissing										1							0	1
Parry Sound																	0	0
Rainy River																	0	0
Sudbury																	0	0
Thunder Bay																	0	0
Timiskaming																	0	0
Regional Totals																		
Eastern	0	0	0	0	0	0	0	0	3	5	0	0	0	0	0	0	3	5
Central	0	0	0	0	0	0	0	0	11	19	1	0	0	0	0	0	12	19
Western	0	0	0	0	1	0	0	0	9	9	0	0	0	0	0	0	10	9
Southern	0	0	5	0	19	6	0	0	12	15	0	0	0	1	0	0	36	22
Northern	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Totals	0	0	5	0	20	6	0	0	35	49	1	0	0	1	0	0	61	56

Acronym Legend

RAC: raccoon

SSK: striped skunk

Other: other wildlife

LVSTK: livestock

