The Rabies Reporter

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The Rabies Reporter, a scientific newsletter about current issues in rabies research and control, is a joint effort of the Rabies Research Unit of the Ontario Ministry of Natural Resources; the Rabies Laboratory at the Animal Diseases Research Institute of the Canadian Food Inspection Agency; the Ontario Ministry of Health; and the Geographic Information Systems Laboratory at Queens University, Kingston. Articles for future issues will be welcomed by the editor. The Rabies Reporter is not refereed, and should not be cited in papers intended for refereed journals. Send contributions, letters and inquiries to:

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Rabies in Ontario During the First Quarter

The number of rabies cases in the first quarter of 2003 was significantly lower than in 2002. There were two main reasons for this. The number of cases in northern Ontario dropped to two from 26 in the previous year. This included a wolf in the Sudbury region and a fox in Thunder Bay. The number of rabid skunks in southwestern Ontario was also greatly reduced (nine in 2003 compared with 18 during the first quarter of 2002). Rabies in raccoons and bats persisted at similar levels as in 2002.

There are several possible factors which could have contributed to the decline in the number of rabies cases. The winter in 2002 produced lots of snow in Huron, Perth, Grey, and Wellington counties in southwestern Ontario which is where most of the rabid skunks are typically located. The Sudbury region in northern Ontario (where all of the rabid fox cases in 2002 were located) also had substantial snow coverage. In addition to the deep snow cover, both areas suffered from extended periods of cold temperatures. The combination of deep snow and cold weather restricted animal movements. Animals tend to stay much closer to their den site if it is too difficult to travel through deep snow or if extremely cold temperatures persist for an extended period. As a result, if an animal was rabid, it would be more apt to die in or near its den without encountering and transmitting rabies to other animals.

Conversely, the Thunder Bay region had very little snow coverage in the winter of 2002. This led to the discovery on January 24th of a dead fox in a Thunder Bay backyard. This animal would not have been discovered until spring thaw if there had been more snow in the region. It was confirmed as having bat strain of rabies. The last rabid animal from Thunder Bay was a horse in November of 2001 which was also infected with bat strain. These are the first two rabies positive animals from the Thunder Bay region in the past several years.

The incidence of rabid bats was slightly increased from this period in 2002. However, these cases were well distributed throughout the province with one case in eastern Ontario, one case in central Ontario, two cases in western Ontario, and one case in southern Ontario.

The first rabid raccoon for 2003 occurred on February 18 near the Spencerville area. This was the start of a cluster of rabid raccoons (five to the end of March) which continued into the second quarter. Two rabid raccoons were also confirmed near the Newbliss area in mid-March. Point infection control programs were implemented in both the Newbliss and Spencerville areas in 2002. The Newbliss area had only trap-vaccinate-release (TVR) during 2002 while the Spencerville area involved depopulation and TVR. Both areas were baited in August of 2002.

The Newbliss and Spencerville areas, as well as other regions of eastern Ontario, will continue to be treated in 2003. This will include expanded TVR zones, aerial baiting, maintenance of the high risk area, and point infection control as required as new cases arise.

Beverly Stevenson
RRDU
Peterborough, ON

Disease Risks of Wildlife Relocation

Historically, it has been common practice to relocate wildlife that has come into conflict with people. Wildlife control agents, the public, wildlife rehabilitators and the Ontario Ministry of Natural Resources (OMNR), have all been involved in the past in moving animals such as raccoons and foxes many kilometres. However, as the negative effects of the relocation of wildlife have become evident, policies and legislation in Ontario have changed to reflect this change in knowledge.

Since the implementation of the Fish and Wildlife Conservation Act in 1999, both 'nuisance' wildlife and rehabilitated wildlife must be returned to within one kilometre of its' point of origin. Furthermore, in a rabies high risk area (HRA), no relocation or rehabilitation of rabies vector species (raccoons, skunks and foxes) is permitted at all. The HRA was implemented to help control the spread of raccoon rabies. From 1999, when the virus was first reported in Ontario, to the end of March 2003, there have been 118 confirmed cases of the raccoon strain of rabies. The designated rabies high risk area is the area within approximately 50 kilometres of recent cases. This is where it is most likely that other raccoons might be infected with the rabies virus but have not yet been detected. The boundaries of the HRA are reviewed with each new case and will be changed if a case if confirmed in a previously uninfected area. See figure 1 for the current boundaries of the HRA.

Not only are there disease risks associated with the translocation of wildlife but there are several other concerns as well. These include: increased physical stress on the wildlife as they must try to find new sources for food and shelter; increased mortality factors as the animals try to find an area where they can establish their own territory; the impact on resident species through the introduction of animals which are competing for the same resources; the potential effect on the genetic structure of the resident population; and the recurrence of problem behaviour in translocated nuisance animals.

Our understanding of wildlife diseases and parasites, and the effects of human-assisted movement of those organisms around the landscape, has increased significantly in recent years. Yet, while constantly improving, our knowledge can never be complete and human influence on ecosystems often has unexpected results. The organisms that infect wildlife adapt and change, and all we can do is try to keep up. We must also recognize that there are pathogens in our environment that have not yet been identified, as well as those that have been imported (i.e. relocated) from elsewhere, examples of which are raccoon rabies and chronic wasting disease. Unfortunately, the field of emerging diseases is not likely to disappear.

When wildlife is moved from one location to another, any parasites or diseases carried by the animal are also relocated. This includes anything from ticks or worms to tularemia, distemper or rabies (as well as any currently unidentified organisms). While diseases such as tularemia and distemper are common, there are still areas where they are not present and relocating an animal always carries the risk of introducing pathogens to a location where they did not previously exist. The organisms that cause the most concern are those that can be transmitted to humans such as tularemia, raccoon roundworm (*Baylisascaris procyonis*) or rabies. However, diseases such as distemper or parvovirus can have a huge impact on an ecosystem through the decimation of local populations of susceptible wildlife. Several of these diseases can also affect your pets if not properly vaccinated. In addition, even though it is not transmissible to people, the fact that distemper can be difficult to distinguish from rabies means it can still have an impact on the public health system.

There have been many reports of raccoon rabies being relocated with raccoons, including the jump of several hundred kilometres from Florida to Virginia in the 1970s. At that time, raccoons were being legally translocated from Florida to be released for raccoon hunting.

Restricting relocation of wildlife to within one kilometre in Ontario ensures that regardless of what an animal is incubating or carrying, nothing is being released with that animal that wasn't there already. Clearly, another requirement to prevent the spread of disease is that all applicable sanitary procedures must be followed in each case to avoid contaminated cages, vehicles or facilities. Furthermore, it is critical that if animals are being kept for rehabilitation, they must not be housed with individuals that were obtained from a different location.

It is important to note that even if an animal is vaccinated for rabies, if they were incubating the virus at the time of inoculation, the vaccination will not be effective. Rabies incubation time in wildlife is highly variable, ranging from less than a week to more than a year.

At OMNR's recent Raccoon Ra-

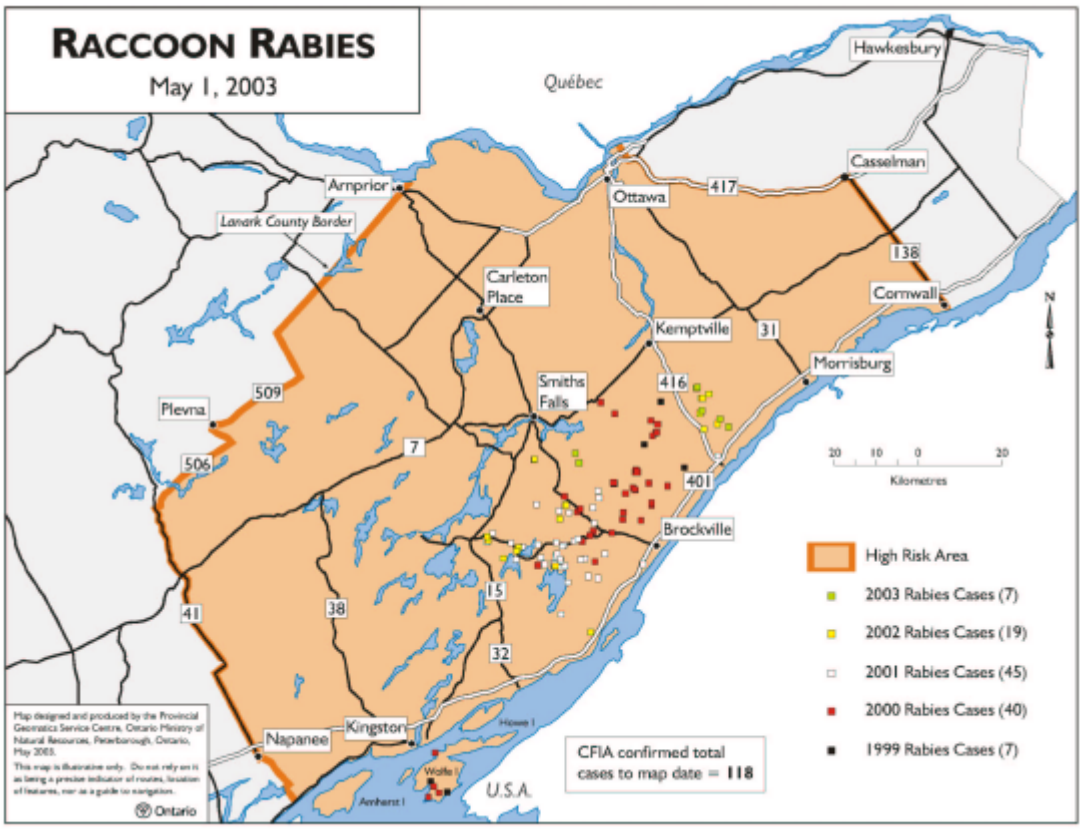

Figure 1. Map of the 2003 high risk area in eastern Ontario. The high risk area boundaries may be changed if cases are discovered in areas that are currently free of the raccoon strain of rabies. Cases of raccoon rabies until May 1, 2003 are also depicted.

bies Colloquium in Peterborough, Dr. Dennis Slate, of the United States Department of Agriculture (USDA), reported that a man's death in March 2003 in Virginia has been confirmed as raccoon strain rabies. This is the first confirmation of a human death from raccoon rabies.

In Ontario, the active areas of raccoon rabies are less than 50 kilometres from the city of Ottawa. It is imperative that all of us do our utmost to prevent the virus from spreading to the dense raccoon (and human) populations of the city. It is difficult to imagine how quickly the virus could spread among wildlife and unvaccinated pets if it were to reach Ottawa or any other major urban centre in Ontario. It is also difficult to imagine the costs (both financial and emotional) of post-exposure treatment that would follow. A single human post-exposure treatment costs in excess of $1,000.00 and the costs of dealing with raccoon rabies in the U.S. and Canada exceed $450M annually. Furthermore, even though it seems unlikely that someone would fail to seek treatment after being exposed to a rabid raccoon, there is always that risk. Once a person shows symptoms of rabies infection, the disease is fatal.

There is no question that translocated wildlife can carry disease. The implementation of the one kilometre restriction on the relocation of wildlife in Ontario in 1999 reduces the risk of human assisted movement of diseases and parasites to new areas of the province.

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Past Issues of the Rabies Reporter are Available Online

Since the implementation of the electronic Rabies Reporter in November 2001, there has been a huge shift in the demand from paper to online availability. Currently, over 85% of the readership to access the Rabies Reporter electronically. As a result of this demand for online availability, all past issues of the Rabies Reporter have been converted to pdf format and are now available online.

Volumes 1 to 10 were scanned from printed copies and are available in pdf format in black and white only. A few of the graphics may have lost some of their resolution during the scanning process but each issue was carefully examined to ensure that an adequate level of clarity was achieved.

Volumes 10 to 12 were converted directly from their original electronic format to pdf format. As a result, some graphics which were originally distributed in black and white may now be available in colour.

Beverly Stevenson
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Rabies Surveillance for 2002-2003

The RRDU's annual surveillance program began on October 15, 2002 and ended February 28, 2003. The area of collection covered the baiting area where ERA and VRG baits were distributed in the summer and fall of 2002.

The main purpose of the surveillance program is to evaluate the success of the aerial baiting programs for both fox and raccoon and also to see the prevalence of rabies in the animal population in southern Ontario.

The collection area focused on collecting raccoon, fox and skunk carcasses from eastern Ontario (EONT), fox carcasses and skunks heads from southwestern Ontario (SWONT) and central Ontario (CONT) and fox carcasses from northern Ontario (NONT). A total of 120 licensed fur harvesters across southern Ontario submitted either fox, raccoon and skunk carcasses or heads depending on their location. Harvesters were compensated for their submissions as long as appropriate information accompanied the animals. A total of 1232 raccoon, 53 skunk and 344 fox carcasses and 208 skunk heads were collected. See Table 1 for the complete breakdown of animals collected.

Species	Submission	Vaccine	Bait Density	Area	No. Samples
Fox	Carcass	ERA	20	CONT	18
Skunk	Head	ERA	20	CONT	27
Fox	Carcass	ERA	20	NONT	121
Fox	Carcass	ERA	20	SWONT	127
Raccoon	Carcass	ERA	20	SWONT	1
Skunk	Head	ERA	20	SWONT	163
Fox	Carcass	VRG	75	EONT	25
Raccoon	Carcass	VRG	75	EONT	536
Skunk	Carcass	VRG	75	EONT	32
Fox	Carcass	VRG	150	EONT	15
Skunk	Carcass	VRG	150	EONT	308
Skunk	Carcass	VRG	150	EONT	8
Raccoon	Carcass	N	0	OUT	386
Fox	Carcass	N	0	OUT	38
Skunk	Carcass	N	0	OUT	13
Skunk	Head	N	0	OUT	18

Table 1. Animals collected during surveillance season 2002-2003. CONT-Central Ontario, NONT– Northern Ontario, SWONT – Southwestern Ontario, EONT – Eastern Ontario, OUT – is outside baited zone, N – no vaccine dropped

Post mortem examinations occurred on a total of 1837 animals. The post mortems consisted of the following procedures: a) using bone cutters to remove the upper canines from all animals. The canines are then sectioned and examined using a ultraviolet microscope to determine the age of the animal and presence of tetracycline, indicating that the animal came in contact with bait. Polarized light is used to age each animal. b) Sampling a portion of the brain stem and/or spinal cord with a modified syringed nicknamed a "brain sucker". These samples were sent to the Canadian Food Inspection Agency (CFIA) and tested to determine if rabies virus was present. If the sample was rabies positive, it was tested further for strain type. c) In fox carcasses only, the submaxillary salivary glands were removed. These glands would be assayed only if the fox tested positive for rabies induced by the ERA vaccine. This is done to see if the animal was excreting the rabies virus. d) On full body specimens, blood samples were taken using a "Monovette" syringe. These samples were then centrifuged to extract the sera. The sera were sent to CFIA to be tested for rabies antibodies due to consumption of a bait. e) Inspection of reproductive tracts on fox and raccoon was preformed. On female samples, the reproductive condition of the placenta was recorded. Recording placental scars may provide a fecundity index in relation to population dynamics. f) An over all examination of the animal was done to examine any uncommon features i. e. mange, parasites.

All 1837 brain samples were tested for rabies. Only one sample tested positive. This was a skunk infected with the Arctic fox strain and was submitted from a fur harvester in Grey township (Huron county) in southwestern Ontario. All teeth will be processed in the MNR rabies lab and hopefully will have the results completed by winter 2003.

Andrew Silver
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Rabies Program Review

In late January 2003, the Rabies Research and Development Unit (RRDU) and the Rabies Advisory Committee (RAC) co-hosted an operational review of the Ontario Rabies Control Program. The intent of this review was to look at what had been accomplished over the past 13 years or so, evaluate the progress and identify key research needs that still need to be addressed. The meeting brought together 40 participants from Ontario (MNR, RAC, Queen's University), the federal government and the northeastern United States.

The meeting started with reviewing the objectives of the Ontario Rabies control program. There was agreement that the overall purpose of the program was to reduce the chance of human contact with rabid animals and to ensure, if there was contact, that appropriate action was taken. The primary approaches used to accomplish these goals is a wildlife vaccination program to reduce the incidence of rabies in wild animals and an education campaign to ensure the public is aware of the disease so that pets are vaccinated and, if exposure occurs, post-exposure treatment is sought.

A brief review of the fox rabies control program showed that, in 13 years, the incidence of fox rabies in southern Ontario has been reduced to 5% or less of the 1980's levels. It continues to persist in southwestern Ontario, primarily in skunks, as the ERA vaccine is not effective at immunizing skunks against rabies. A review of the racoon rabies control program demonstrated that is was controlling the disease and had limited its spread since July 1999 to an area approximately 40 x 60 km with a total of just over 100 cases. Challenges around low anti-body response were identified.

The final session of the Review concentrated on the most pressing needs for rabies control in Ontario. There was consensus from 3 working groups on the most pressing need – a single, cost-effective, bait and vaccine combination that would work on the three common vector species - foxes, skunks and racoons and on all strains of the rabies virus. There are a number of initiatives in both Ontario and the United States working on a solution to this challenge and the workshop recommends close collaboration between these various efforts. Additional high priority areas identified were:

1) the development and implementation of an International Plan for the control of racoon rabies;
2) ecological studies of vector species to better understand the spread of the disease;
3) development of consistent surveillance approaches to allow comparison of surveillance information from different jurisdictions; and
4) testing and development of baiting methods that maximise return on the investment in ORV.

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New Map Format

The maps have a new look for this issue. The intent is to have the maps more accurately reflect the current rabies situation in Ontario.

One map has the combined cases of rabid foxes and skunks. Both species are typically infected with the Arctic fox strain of rabies. By combining the previously individual maps, association between the distribution of rabid foxes and rabid skunks should be more visually apparent. Rabid skunks are indicated by red circles (black circles if you still receive a printed copy) and rabid foxes are indicated by black squares. The total number for each species for the current quarter will appear in the lower right corner of the map.

The second map depicts the rabid raccoons in Ontario. Raccoons are typically infected with the mid-Atlantic raccoon strain of rabies. Occasionally, a raccoon can be infected with the arctic fox strain of rabies but this will be noted on the map and in the tables. Rabid raccoons are represented by black squares. The map will still be enlarged to include only the regions of eastern Ontario where the mid-Atlantic strain of raccoon rabies has been confirmed.

The maps from the previous year will also no longer appear in the current issue. All past maps are available on the Rabies Reporter website (http://www.gis.queensu.ca/rreporter/) if you wish to compare the distribution of cases between years. The data for the number of cases from the previous year will still appear in the tables.

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Animal Rabies Report: January to March 2003

Animal Type	Fox			Raccoon			Skunk			Other Wildlife			Bat			Dog			Cat			Livestock			Totals		
County or Region	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		03	02		03	02		03	02		03	02		03	02		03	02		03	02		03	02		03	02
Eastern																											
Stormont, Dundas & Glengarry																									0	0	0
Prescott																									0	0	0
Russell																									0	0	0
Ottawa-Carleton																									0	0	0
Renfrew															1										0	0	1
Lanark																									0	0	0
Leeds and Grenville				7	7	5																			7	7	5
Frontenac													1	1											1	1	0
Lennox & Addington																									0	0	0
Central																											
Hastings																									0	0	0
Prince Edward																									0	0	0
Northumberland																									0	0	0
Victoria																									0	0	0
Haliburton																									0	0	0
Peterborough													1	1	1										1	1	1
Durham																									0	0	0
York Region																									0	0	0
Toronto																									0	0	0
Simcoe																									0	0	0

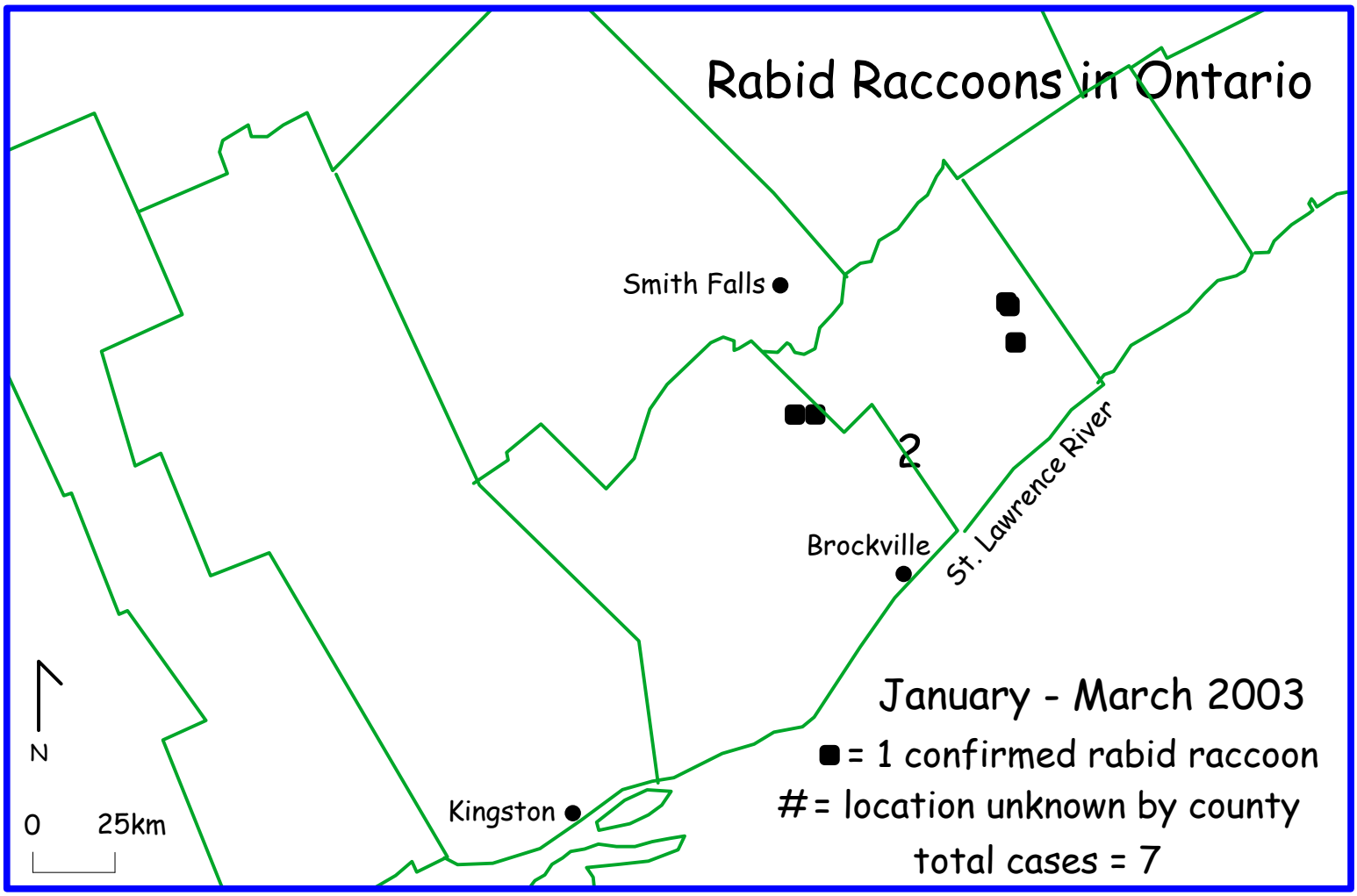
Animal Rabies Report: January to March 2003

Animal Type	Fox			Raccoon			Skunk			Other Wildlife			Bat			Dog			Cat			Livestock			Totals		
County or Region	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		03	02		03	02		03	02		03	02		03	02		03	02		03	02		03	02		03	02
Western																											
Peel									1																0	0	1
Halton																									0	0	0
Dufferin																									0	0	0
Wellington									3				2	2							1	1	1	1	3	3	5
Waterloo									1																0	0	1
Perth																					1				0	0	1
Grey							1	1	2													1	1		2	2	2
Bruce							1	1	5													2	2		3	3	5
Huron							1	1	3																1	1	3
Southern																											
Wentworth																									0	0	0
Haldimand-Norfolk																									0	0	0
Brant																									0	0	0
Niagara																									0	0	0
Elgin																									0	0	0
Oxford																									0	0	0
Middlesex																									0	0	0
Lambton																									0	0	0
Kent													1	1											1	1	0
Essex																									0	0	0

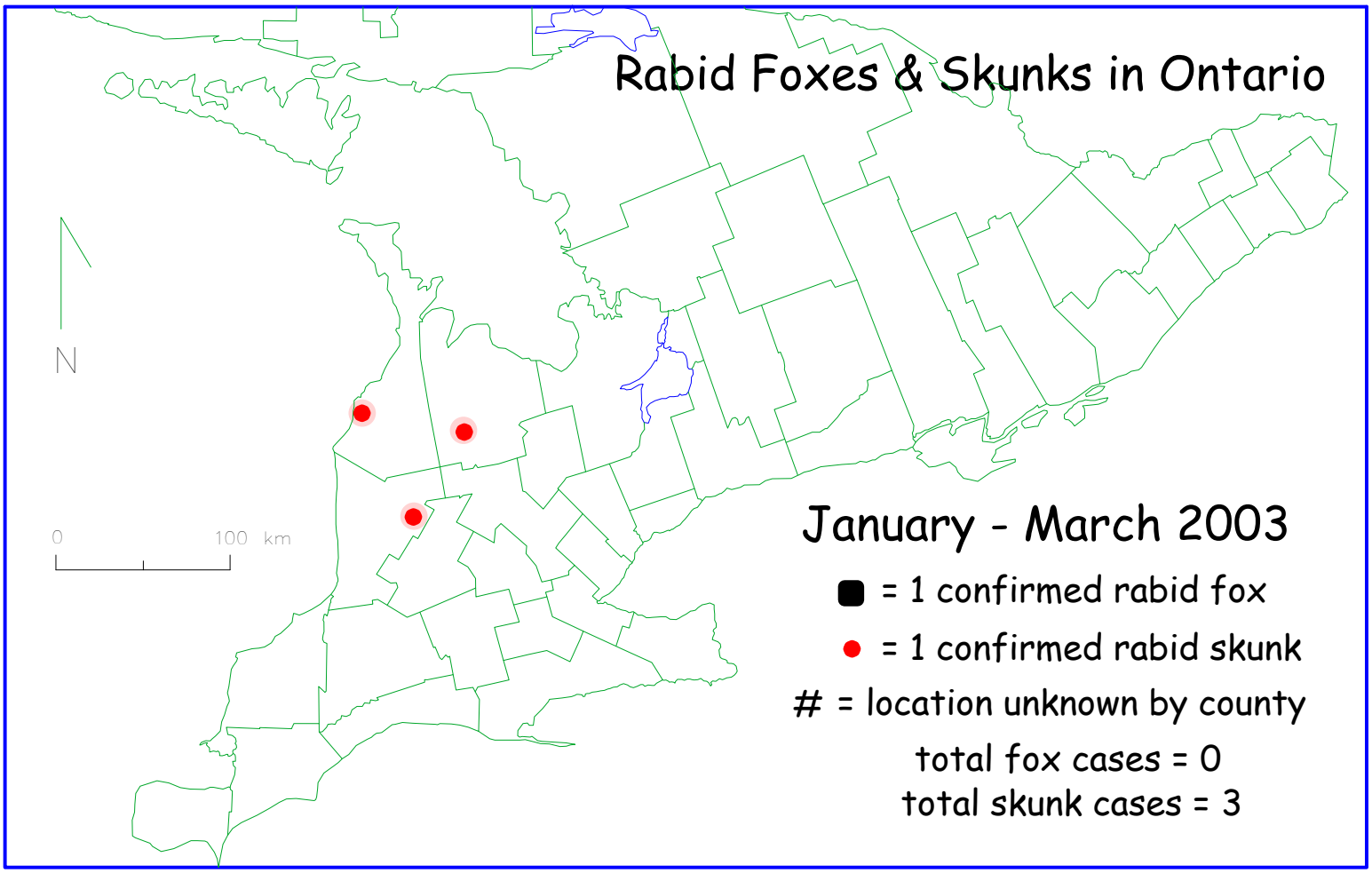
Animal Rabies Report: January to March 2003

Animal Type	Fox			Raccoon			Skunk			Other Wildlife			Bat			Dog			Cat			Livestock			Totals		
County or Region	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		03	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**
Northern																											
Muskoka																									0	0	0
Parry Sound																									0	0	0
Nipissing			1																						0	0	1
Sudbury			20							1	1	1						1						2	1	1	24
Cochrane			1																						0	0	1
Timiskaming																									0	0	0
Algoma																									0	0	0
Thunder Bay	1	1																							1	1	0
Rainy River																									0	0	0
Kenora																									0	0	0
Regional Totals																											
Eastern				7	7	5							1	1	1										**8**	**8**	**6**
Central													1	1	1										**1**	**1**	**1**
Western							3	3	15				2	2							2	4	4	1	**9**	**9**	**18**
Southern													1	1											**1**	**1**	**0**
Northern	1	1	22							1	1	1						1						2	**2**	**2**	**26**
TOTALS	**1**	**1**	**22**	**7**	**7**	**5**	**3**	**3**	**15**	**1**	**1**	**1**	**5**	**5**	**2**	**0**	**0**	**1**	**0**	**0**	**2**	**4**	**4**	**3**	**21**	**21**	**51**

Notes for this quarter: The livestock were three cattle - 2 in Bruce, and 1 in Wellington; and 1 equine in Grey.
The other wildlife was a wolf in Sudbury.
The fox in Thunder Bay was infected with bat strain of rabies.
One bat in Wellington was a little brown bat. The remaining bats were all big brown bats.



GIS Lab, Queen's University
Data Source: Ontario Laboratory - Fallowfield (CFIA)



GIS Lab, Queen's University

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