The Rabies Reporter

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RABIES IN ONTARIO REVIEW OF 1997

I hope I am not hexing future numbers of rabies cases by saying that 1997 will probably be remembered as the year that fox rabies collapsed in southern Ontario. Rabid fox numbers (southern Ontario only) declined from 24 in 1996 to 6 in 1997. Because there was rabies activity in northern Ontario (but over 800 km from the nearest case in southern Ontario), and because the very low overall numbers of rabies cases make bats a higher percentage of our total rabies, I want to examine the situation rather carefully. Figure 1 shows the total annual rabies case numbers for all of Ontario, plus the total rabid foxes and rabid skunks for each year. While this graph shows clearly that rabies has declined dramatically, the numbers if cases are now so low that the right end of the graph is hard to evaluate. Therefore, Fig. 2 shows the totals for each quarter (3 months) since 1994, when the bait program was expanded to cover most of southern Ontario. You can see on this graph that peaks in rabid skunks occurred after peaks in rabid foxes, usually trailing by 3 - 12 months. However, that does not show up well in fig. 1. The explanation is that as long as there was a lot of rabies across all of southern Ontario, different regions went up and down at different times. If you could view the graphs for each region, yes, skunk rabies peaks normally trailed fox peaks by a few months. In fig. 2, there are only two regions reporting significant rabies cases, so the individual peaks do not obscure each other.

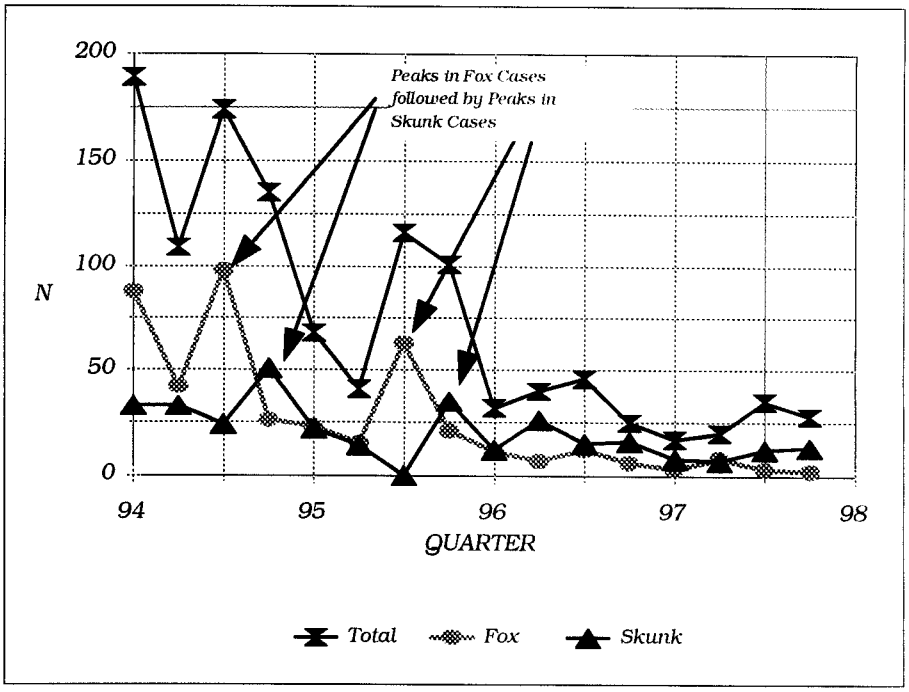

Figure 2. Quarterly totals of rabies cases in Ontario.

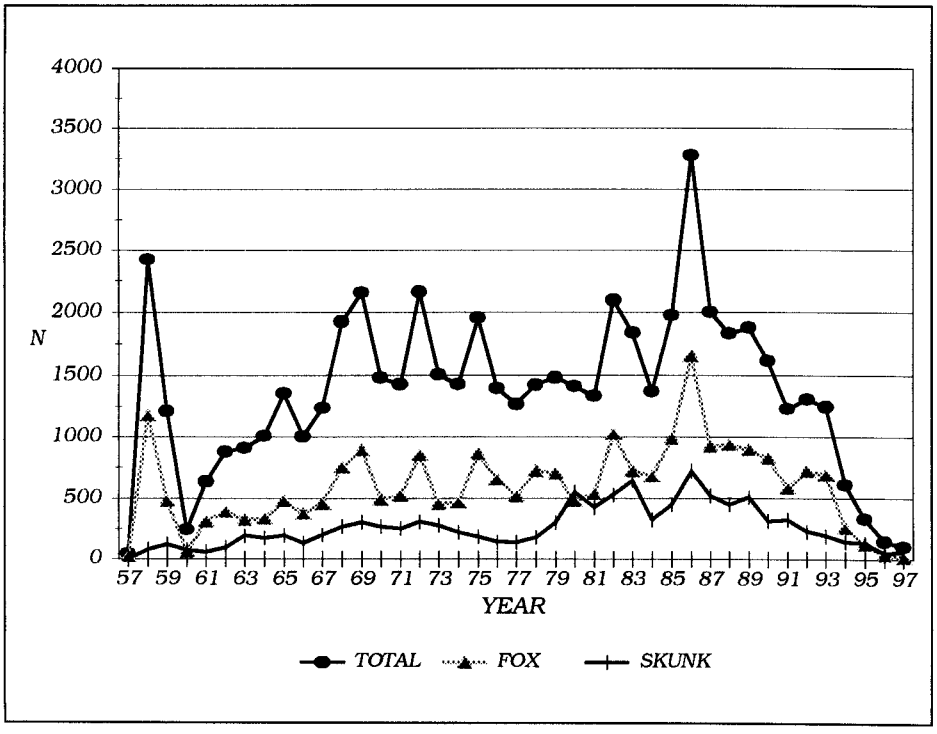

Figure 1. Summary of annual rabies case totals in Ontario.

Figure 3 shows another level of detail, and, for the first time, bats are separated out from other species. Here we see some interesting trends. First,

the number of rabid dogs and cats fell off quickly after the aerial baiting began. Second, rabid livestock persisted as long as there were rabid skunks. Third, and most important, the number of rabid bats has fluctuated in a narrow range, with the minimum and maximum in the past 18 years being 16 and 47 cases per year. When we had almost 2000 rabies cases a year, bats made up less than 2% of the total, but in 1997, because there were so few fox rabies cases, bats made up 29% of all the rabid animals in Ontario, and 30% of the cases in southern Ontario.

If we remove the bats, and the 10 foxes in northern Ontario, there were 60 cases of Arctic fox strain rabies in southern Ontario during 1997. That is just less than half the 1996 total (122), and more than a 97% reduction from the average case levels of the 1980's.

There were two hotbeds of skunk rabies activity during the year, one in Waterloo-Wellington-Dufferin, and the other in Perth and Grey Counties. There was diffuse rabies activity in Durham Region-Victoria-Peterborough Counties, and minor events in St. Catherines, and in Scarborough. In the last two cases there had not been any rabid foxes during the previous year. It does seem strange, after the experience of the 1980's, to call 14 or 11 cases in a year "a hotbed".

There were 1029 humans given post-exposure treatment during 1997, compared to 934 in 1996, and 1241 in 1995. One might hope that the number of treatments would drop in proportion to the falling levels of animal rabies. However, again we must look at details. An analysis by Dr. Charles LeBer of the Ministry of Health of the sources of rabies exposure for which people received post-exposure treatment during the 1980's indicated that in 23% of cases, the offending animal could not be found or caught for testing. In such cases, treatment is given just in case the animal really was rabid. The average number of humans treated annually during the 1980's was 2150, so we may expect that when

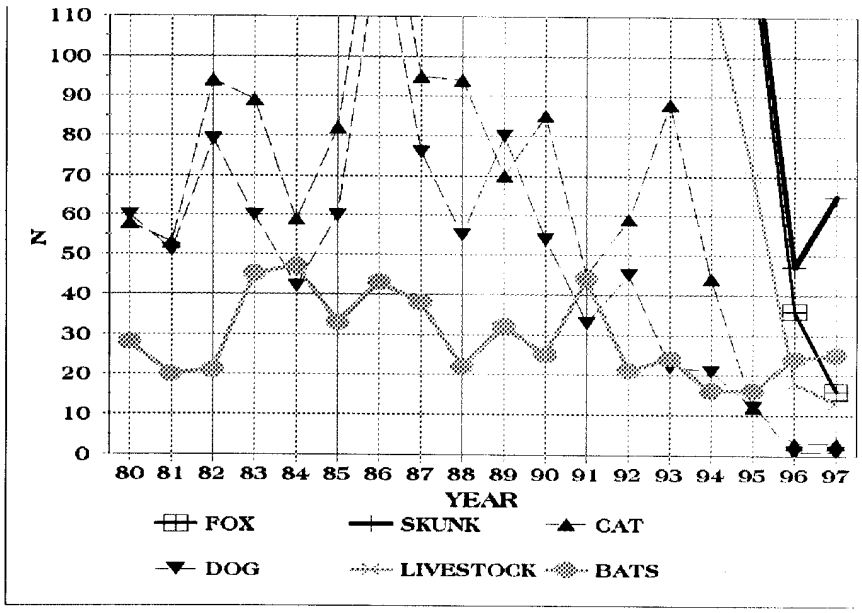

Figure 3. Details of rabies cases in southern Ontario.

there is no terrestrial rabies left, about 500 people a year will receive post exposure treatment. In recent years, there has been increasing concern about non-bite exposure to bats. We do not have a list of the sources of exposure for people receiving post-exposure treatment in 1997. There will always be the possibility that a terrestrial animal might be infected with a bat variant of rabies, as well. Therefore, there will always be some need for post-exposure treatment in Ontario.

Another very positive feature of the Ontario rabies scene in 1997 is that we did not record our first case of raccoon strain rabies. There were cases right along the St. Lawrence river near the Ivy Lea bridge, but nothing in Canada. By the end of the year four raccoons tagged during TVR projects in Ontario had been recovered in New York. Two had crossed the Niagara River, and two the St. Lawrence. Since there was no program to look for tagged animals on the New York side, these four came to our attention by accident, but through the cooperation of people who know we are interested. Therefore, one must suspect that many more tagged raccoons crossed into New York than were detected. These indicate that raccoons do cross the rivers, and so our TVR programs on the Canadian side are worth-while insurance against the arrival of raccoon rabies. The Niagara TVR zone is also producing data on raccoon movements which should be very useful for planning the width of future barriers.

Planning is already underway to continue baiting for foxes next year. However, we are now facing an interesting problem. How should we make the decision to stop baiting? We do not know exactly how much role skunks may play in maintaining the Arctic fox strain of rabies in the wild. We do know that probably only 1 - 10% of rabid wild animals ever reach the ADRI laboaratory for diagnosis, and that may drop as CFIA capabilities are reduced as a result of federal program reductions. Currently we believe we should continue to put out baits for two years after the last rabid skunk is reported. If experience in eastern Ontario is an indicator, the last rabid skunk should occur about a year after the last rabid fox, but it may take longer in the relatively milder and more skunk-friendly climate of southwestern Ontario.

Charlie MacInnes
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RABIES IN NEW YORK STATE 1997 ANNUAL SUMMARY

The distribution of animal rabies in New York State during 1997 can best be described as diverse. The range in species affected by rabies is evidenced by the confirmation of cases in twenty different species during the year: 7 terrestrial wildlife species, 7 domestic species and 6 species of bats. Geographically, the raccoon rabies outbreak that spread into the state in 1990 continued to spread into the few remaining unaffected areas, so that by year's end it had been confirmed in 58 of the state's 62 counties. Rabies in bats during 1997 was reported from 64 different towns in 34 counties. Seasonal distribution of cases was also widespread: more than fifty confirmed terrestrial rabies cases occurred in each month of the year; bat rabies was confirmed in every month except January. The peaks of rabies cases in raccoons, bats, and skunks occurred in spring, summer and fall respectively.

There were 10,369 animals examined in New York State during the year for evidence of rabies infection: 9,449 at the Wadsworth Center Rabies laboratory, and 920 at the New York City Department of Health. Sixty-four different species of mammals were received for rabies diagnosis in 1997. Domestic cats were most frequently tested, accounting for 2,569 or 25% of all specimens received, followed by bats (2,368, 23%), raccoons (2, 019, 19%), and skunks (642, 6%). Overall 22 % of all animals received had reportedly bitten a person, 25% were involved in a non-bite human contact, % a domestic animal exposure, and 22% were non-contact surveillance specimens.

Rabies infection was confirmed in 1,266 animals in the state during the year, for overall positivity rate of 12% among all animals tested. Rabid raccoons accounted for 836 of the cases, or 66% of the total, followed by 236 skunks (19%), 79 bats (6%), and 43 gray foxes (3%). The total cases in skunks and gray foxes for the year were the greatest annual counts recorded for those species in New York. Rabies was also confirmed in 10 red foxes, 10 woodchucks, 2 bobcats, and 2 opossum.

In domestic animals, rabies infection was identified in 21 cats, 15 cattle, 5 dogs, 2 goats, 2 horses, 2 sheep and 1 rabbit. Rabies was far more common in cats than dogs, as it has been each year and cumulatively (207 rabid cats, 45 rabid dogs) since 1990. Wild species accounted for 96% of rabid animals, but only 63% of all animals tested, while domestic animals accounted for only 4% of rabies cases, but 37% of all examinations. Among rabid animals 6% of those received had reportedly bitten a person, 25% were involved in a non-bite human contact, 65% a domestic animal exposure, and 22% were non-contact surveillance specimens.

The raccoon rabies outbreak spread into new areas of Lewis, Jefferson, Essex and Clinton counties during the year, and entered St. Lawrence County for the first time. The outbreak has now affected 871 different towns or cities in the 58 counties involved thus far, with only Franklin County in northern New York, Kings County (Brooklyn) in New York City, and Nassau and Suffolk counties of Long Island as yet unaffected. For the first time since 1991 there were no terrestrial rabies cases reported from the five boroughs of New York City. Overall the number of rabid raccoons increased 22% from the 1996 total (668), and the rabies positivity rate among all raccoons examined was 41%, up significantly from 33% in 1996. The percent rabid among those raccoons with reported human contact (40%) was similar to the overall rate in raccoons, but 66% (454 of 687) of raccoons that fought with a domestic dog were rabid. The cyclical nature of the raccoon rabies epizootic was made apparent by the observation that among 56 New York counties previously affected by the outbreak, 24 experienced more cases in 1997 than in 1996, 20 had fewer cases than in the previous year, and 12 were unchanged.

Rabies in bats was again the preeminent rabies-related public health issue of 1997 nationally, as all of the four human radius deaths during the year were the result of infection with bat rabies variants (3 with the variant associated with silver-haired and pipistrelle bats, one with the variant associated with the common big brown bat). In none of the cases, which occurred one each in Montana, Washington, Texas and New Jersey, was there a history of a bat bite or other animal bite, but in three of the cases there had been an indoor encounter with a live bat in the months preceding onset of rabies.

The 79 rabid bats in New York in 1997 were widespread geographically and by species, with cases in 34 of the state's 62 counties and in 6 of the 9 indigenous bats species. Overall, 3.3% of the 2,368 bats examined were rabid. The big brown bat accounted for 1,510 (64%) of the bats examined and 472 (91%) of the rabid bats. Other rabid bats included 2 little brown bats, 2 Keen's bats, 1 hoary bat, 1 red bat and 1 silver-haired bat. The rabies positivity rate among big brown bats was 4.6%, for little brown bats 0.3%. Cumulatively since 1981, rabies positivity rates among all submitted bats has been 4.0% (n= 23,148), among big brown bats 5.7% (n=13,970), and little brown bats 1.0% (n=7,050). Among the 2,337 bats received at the Wadsworth Center during 1997, 527 (23%) had a reported contact with a human, 719 (31%) had cat contact, and 189 (8%) contact with a dog. Among the 77 rabid bats examined at Wadsworth, 25 (32%) had human contact, 25 (32%) cat contact, and 11 (14%) had dog contact.

There was a dramatic increase in the number of samples received at the Wadsworth Center Rabies Laboratory for serologic testing of human serum

to determine the need for rabies vaccination booster injections. The 2,516 tests on human serum was 55% greater than the 1996 total, and 85% greater than the average for the previous five year period. The laboratory also tested 588 animal sera, largely in support of trials of the efficacy of oral rabies wildlife vaccination conducted by the College of Veterinary Medicine at Cornell University and the New York State Department of Health. The Wadsworth Center Rabies Laboratory performed 188 monoclonal antibody panel analyses for the antigenic characterization of the rabies virus variant associated with cases. These tests were performed on cases in unusual species or locations, domestic animal rabies cases and all rabid bats. All wild and domestic terrestrial mammals analyzed were found to be infected with the raccoon rabies variant of rabies virus, and all rabid bats were infected with one of the four bat rabies periods commonly identified in northeastern insectivorous bats.

There were 43 rabid gray foxes in the state during 1997, from 27 different counties. A surprising proportion (58%) of these were involved in actual attacks on humans, that resulted in 19 bites and 6 non-bite human exposures (in contrast to a 23% human exposure rate among rabid raccoons during the year. The gray fox rabies cases are not the result on independent cycle of rabies in that species, but spillover of the raccoon rabies into the foxes. This is evidenced by the widespread geographic distribution of the cases, as well as the antigenic identification of the rabies variant in each fox case examined as the raccoon rabies virus.

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New York City Health Department Laboratory data supplied by Dr. Igbal Poshni

RABIES IN THE AMERICAS 1997 CONFERENCE

The 1997 Rabies in the Americas Conference took place in Kingston from 2-6 of November 1997. Dr. Rowland Tinline of Queens University, and Chris Nunan of the Ministry of Natural Resources were the convenors. Events at the conference rolled very smoothly, evidence of the long hours and hard work that Peg Hauschildt, Dave Ball and others of the Queens GIS lab put in behind the scenes.

These conferences cover a wide variety of topics. One could almost say that there are several conferences in one location. The organizers of this year's conference tried to extend the scope beyond classical rabies to the many practical aspects of getting rabies under control. The session titles indicate this: Mobilizing Public Support; Rabies Control and Methodologies; Rabies Diagnosis and Laboratory Science; Legal, Political and Economic Aspects of Rabies Control Programs; Latin America; Bats: Rabies Control and Conservation: Finding Compatibility; Vaccines; Rabies Pathobiology; Emerging Issues.

Delegates were welcomed to the conference bright and early Monday morning by Dr. John Dixon of Queen's University and Dr. David Balsillie of the Ministry of Natural Resources. From there we plunged into plenary addresses. These were wide-ranging reviews of major topics. I was, in fact, the first speaker. I spoke about eliminating rabies from wildlife populations, covering a wide variety of topics from science to logistics business and law. I tried to point out how much of what we do in wildlife rabies control is based on "I thinks", rather than real knowledge of what is going on in the field. There are number of debates about when to put out baits that cannot be resolved without much additional information. For example, should we bait once, twice, or more than twice a year? Can we save baits, and therefore money, by targeting baits to specific habitats? If we are dropping baits from the air, must we follow the what biologists believe are the best places to put baits, or can we take a more businesslike approach and space flight lines to make optimum use of air time? Only our target animals can answer that question, by finding baits after they are dropped. Carefully designed experiments can indicate how far we can change our approach away from "I think" to "this is what our results indicated". The next speaker in the session was Dr. Charles Trimarchi from the Wadsworth laboratory in Albany. He gave a very thorough review of current laboratory procedures, in a well-organized presentation. The next paper was a review of progress in Latin America towards eliminating dog-transmitted rabies, given by Dr. Alfonso Ruiz of PAHO. This made very clear the real progress that has been made throughout the region by aggressive, government-sponsored campaigns to make sure that dogs are vaccinated. The next plenary paper was given by Dr. Steve Franz of New York State, and was on the comprehensive management of commensal bats. The last paper was by Dr. Charles Rupprecht, under the intriguing title of "Has Rabies Become Passe?". Dr. Rupprecht drew attention to the number of surprises that we have encountered in rabies biology during the 1990's. Considering that rabies has been under active study for a century, one might have thought that there was not much left to learn. However, Dr. Rupprecht indicated first, that there are still a lot of unknowns, and second that we continue to make important discoveries.

Once the conference got down to business, information flowed in so thick and fast that it would be impossible to summarize everything here. The book of abstracts is more than a centimeter thick!

In the hands-on wildlife rabies control sessions, there were summaries of

results from the coyote and gray fox programs in Texas, the raccoon rabies barrier in Massachusetts, and efforts against in raccoon rabies in Pinellas County, Florida, and in New York and surrounding areas. Sam Linhart of the University of Georgia reported on a new bait, which may have a lot of potential. He took a plastic sachet full of vaccine and dipped it in a bait mixture, so the resulting bait weighed only 5 - 6 grams, compared to 15 to 17 grams for the Ontario bait. This bait will be tested in Texas and New York, but it will raise a whole new class of problems in handling and distribution. Rick Rosatte's report on dispersal of raccoons in Ontario, already discussed in the Rabies Reporter, surprised quite a few participants, and indicated that vaccination barriers to impede the spread of raccoon rabies will have to be a lot wider than currently thought. The results of bait density trials in Ontario indicated that acceptance of baitys by adult male raccoons is always higher than that of other age-sex classes, a fact which will cause complications in analyzing results of field experiments. Although acceptance was no higher at 100 baits/km^2 than at 80, the overall acceptence was roughly 50%, which was disappointing.

There was a very interesting paper on the impacts of the wildlife rabies epizootic on public health in New York State. This indicated costs in excess of 10 million dollars per year and net benefits, viewed on the long-term, if we can successfully control this rabies outbreak.

Bobby Accord, head of the Wildlife Services (formerly Animal Damage Control) agency in USDA-APHIS outlined the actual and potential roles of his agency in rabies control. The agency certainly has the mandate to work towards control of diseases spread by wildlife, and rabies is mentioned specifically in legislation which established the agency. I view the involvement of Wildlife Services in oral vaccination as a very positive step, because it will provide a vehicle for interstate communication, coordination and cooperation. Exactly how they will be involved is still being planned.

Modern laboratory techniques are being instituted throughout Latin America, and there were several papers reporting on the variants of rabies found in various countries. There were two outstanding papers on the role of bats in rabies in Chile.

There was a whole session on rabies in bats and its relation to conservation. I found this a very useful summary, especially as the most ardent bat conservationists, and the public health authorities, seemed to be in agreement. Although rabies from bats is causing human mortality, the great majority of bats are not rabid. There are many ways to reduce contact between humans and bats, and these approaches seemed the most practical way to protect humans from rabies carried by bats. One fortunate coincidence is that the bats most frequently found in and near houses in Ontario either are very rarely found with rabies (little brown bats), or harbour forms of rabies rarely associated with human infections (big brown bats). This rule is not universal: for example, the recent death of a young girl in the northwestern U.S. was due to a rabies variant carried by a close relative of the little brown bat. However, that specifife form of rabies has not been identified in Ontario.

The up-to-date numbers related to human deaths in the USA highlight the problems associated with bats. In the U.S.A. since 1990, there have been 19 human deaths due to domestically acquired rabies infection. Seventeen of those 19 were infected with virus of bat origin. Most bat exposures occur without known bites, and "contacts" may involve no more than being in the same room as a bat.

For me, one of the most interesting papers in this conference in was on a topic that I would normally not understand. This described work at the Institut Pasteur in Paris on the effect of rabies on the blood-brain barrier in mice. One of the puzzles about rabies is that at the level of cellular pathology, rabies does not cause great damage. How then does it have such a dramatic effect on the brain? We have known for several years that the brain is more isolated from the fluids circulating in the bloodstream than are most other organs of the body. This barrier is the result of special cells lining the blood vessels of the brain. The cells are very selective in what they allow to pass from the blood into the brain. That is a necessity, because the brain's internal communication is mostly chemical, employing relatively small molecules in very specific quantities. Similar chemical substances from the rest of the body can seriously interfere with the delicate balance within the brain. Experimental studies in mice indicated that rabies interferes with the function of the blood-brain barrier, so that chemicals from the rest of the body can pass into the brain and cause very dramatic effects. Hence we can begin to understand how rabies can have such devastating effects in the brain, without causing major cellular damage.

There were several papers on fine details of the workings of vaccines against rabies for humans and for animals. There were also a few papers on the molecular structure of rabies, and the variations which have taught us to recognize different forms of rabies.

There was also a poster session, accompanied by a luxurious wine and cheese buffet, sponsored by Chiron Behring, to launch a new human rabies vaccine in North America. The posters covered as wide a selection of topics as the conference.

During another evening there was dinner and a tour of Fort Henry, including all the pageantry of an early 19th-century fort. Staff of the fort were completely baffled when a big brown bat flew around the heads of conference delegates while touring the armoury, and the response of our conference people was gales of laughter. MNR had a Twin Otter at Kingston

airport giving demonstration flights, to complement a display about the bait machinery, which was in the poster session. One of the few glitches of the conference happened when group were at a workshop on modelling at the Queen's GIS lab, and their activities were interrupted by a campus-wide power failure.

This was an informative conference. The next one will be in Mexico, in Puerto Vallarta, in early December 1998.

Charlie MacInnes
Rabies Unit
Peterborough

DAVID BALSILLIE HAS RETIRED

Dr. David Balsillie, Assistant Deputy Minister in charge of the Science and Information Resources Division of MNR for several years, retired at the end of 1997. David was a true friend of the Rabies Program. He understood what we were trying to do, and supported us throughout his tenure in MNR. During the budget turmoil of the early 1990's, it was David's support which kept the fox baiting program alive. We thnak him for his help, without which the program could not have survived.

Charlie MacInnes
Rabies Unit
Peterborough

THE RABIES UNIT HAS PERMANENT QUARTERS, AT LAST!

The Rabies Unit has finally moved into its final offices and laboaratories at Trent University in Peterborough. The mailing address is:

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HAVE FOXES INCREASED AS A RESULT OF THE RABIES CONTROL PROGRAM??

There can be no doubt that a lot of foxes died of rabies in Ontario during the past 40 years, nor is there any question that fox numbers were down at the end of each local rabies outbreak. It is also obvious to almost everyone that foxes have more visible, and probably, therefore, more numerous for the last decade or so. Also, the oral vaccination program has enabled a lot of foxes to survive. What is not at all clear, however, is whether the gretaer fox numbers we have seen in recent years are a direct result of controlling rabies.

The rabies unit studied fox biology in detail during the late 1970's. When Dennis Voigt told me that, next to trapping, being killed by a vehicle was a major cause of death, I was surprised, because, despite the fact that I drove a lot of miles on rural roads, and saw a lot of dead animals, road-killed foxes were a rare sight, back then. Now, I see lots of them.

Foxes have become much more obvious in urban Ontario in the past 15 years or so, even thought they were always there.

I believe that fox numbers actually built up before the rabis control program began. When Dr. Steve Smith and I visited County Councils and Health Units in eastern Ontario during the summer of 1989, a unversal comment was that people were seeing more foxes than ever before. When Mike Pedde was collecting fox carcassses from trappers in eastern Ontario, I asked him to get impressionms of fox numbers from the trappers he dealt with. No clear picture emerged. Trapper A would report more foxes in a particular year, then, 40 km away, trapper B would say there were fewer that year.

Southern Ontario has experienced almost universally mild winters since the winter of 1979-80. That has allowed deer numbers to rebound from the lows which followed the harsh winters of the 1970's. Maybe foxes have been similarly affected. Katryn MacDonald, who is our current carcass collector, gave me the following "While attending numerous trapper meetings, workshops and courses over the past year, I have been questioned about the population declines in groundhogs, cottontail and grouse. Some blame the reduction in rabies and higher fox numbers. However, other factors, such as urban sprawl, pesticides, disease etc. may also be culprits. Coyote numbers are high. I am asking all Rabies Reporter readers to contribute their thoughts on what I can tell farners, trappers and others about what has really happened." We will have more on this point (out of space and time for this issue). Please let us hear from you.

Charlie MacInnes and Katryn MacDonald.

The Rabies Reporter, a scientific newsletter about current issues in rabies research and control, is a joint effort of the Rabies Research Unit, Ontario Ministry of Natural Resources; the Food Production and Inspection Branch of Agriculture Canada; The Ontario Ministry of Health and the Department of Geography, Queens University, Kingston.. Articles for future issues will be welcomed by the editor. Comments, letters, submissions and enquiries should be sent to:
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http://www.gis.queensu.ca/RReporter/mm.html

Animal Rabies Report: October to December 1997

Animal Type	Fox			Skunk			Other Wildlife			Dog			Cat			Livestock			Total		
County or Area	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		97	96		97	96		97	96		97	96		97	96		97	96		97	96
Western																					
Peel									1										0	0	1
Halton						2													0	0	2
Dufferin					3	2									1		1	1	0	4	4
Wellington		1	3	7	8	7	1	2			1					1	2	1	9	14	11
Waterloo			2	1	3	3											1	2	1	4	7
Perth		2	1	3	6	3			1					1				3	3	9	8
Grey			2		5	9										1	1	5	1	6	16
Bruce			5			6									1	2	2	2	2	2	14
Huron			1	1	1	4	1	3							1				2	4	6
Southern																					
Wentworth									1										0	0	1
Haldimand - Norfolk	1	1	1			1													1	1	2
Brant			1																0	0	1
Niagara					3	2													0	3	2
Elgin								4					1	1		1	1	3	2	6	3
Oxford			1			3		1				1	1	1				5	1	2	10
Middlesex	1	1	1			5		2	2										1	3	8
Lambton								1	1							2	2		2	3	1
Kent								1	2										0	1	2
Essex																			0	0	0
Northern																					
Muskoka																			0	0	0
Parry Sound																			0	0	0
Nippissing																			0	0	0
Sudbury																			0	0	0
Cochrane		10	10																0	10	10
Timiskiming																			0	0	0
Algoma																			0	0	0

Animal Rabies Report: October to December 1997

Animal Type	Fox			Skunk			Other Wildlife			Dog			Cat			Livestock			Total		
County or Area	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		97	96		97	96		97	96		97	96		97	96		97	96		97	96
Eastern																					
Stormont																			0	0	0
Dundas																			0	0	0
Glengarry																			0	0	0
Prescott																			0	0	0
Russell								1	1										0	1	1
Carleton							2	6	7										2	6	7
Renfrew						1													0	0	1
Lanark																			0	0	0
Grenville								1											0	1	0
Leeds																			0	0	0
Frontenac								2	3										0	2	3
Lennox-Addington																			0	0	0
Central																					
Hastings						3		1											0	1	3
Prince Edward																			0	0	0
Northumberland																			0	0	0
Victoria		1	1		1	1													0	2	2
Haliburton																			0	0	0
Peterborough			2			17		1											0	1	19
Durham			1		3														0	3	1
York Region					3														0	3	0
Scarborough				1	3	1									1				1	3	2
East York																			0	0	0
City of Toronto			1																0	0	1
City of York																			0	0	0
NorthYork																			0	0	0
Etobicoke																			0	0	0
Simcoe									1										0	0	1

Animal Rabies Report: October to December 1997

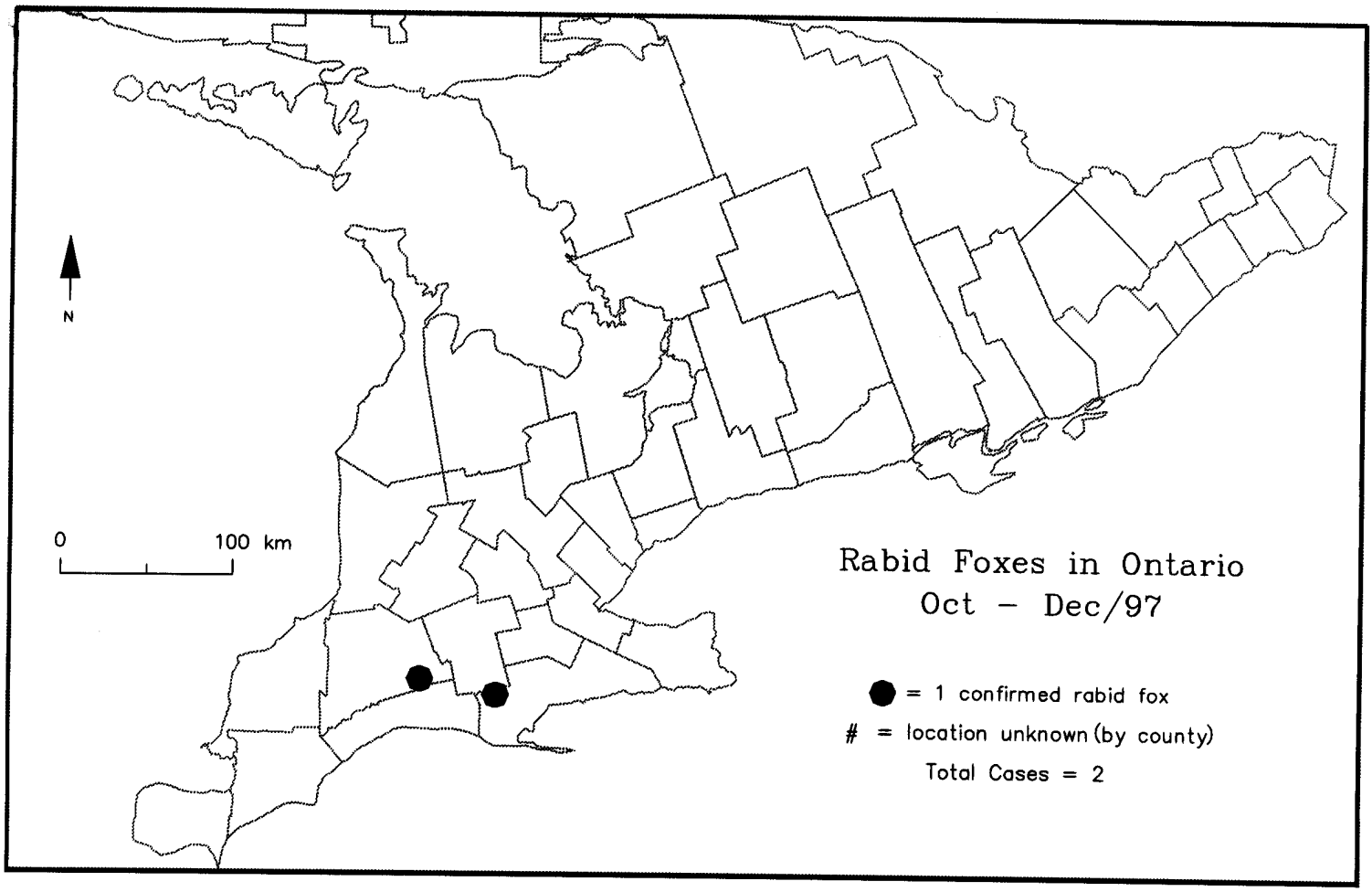
Animal Type	Fox			Skunk			Other Wildlife			Dog			Cat			Livestock			Total		
County or Area	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		97	96		97	96		97	96		97	96		97	96		97	96		97	96
Northern (continued)																					
Thunder Bay																			0	0	0
Rainy River																			0	0	0
Kenora							2	2											2	2	0
Subtotals																					
Eastern						1	2	10	11										2	10	12
Central		1	5	1	10	22		2	1						1				1	13	29
Western		3	14	12	26	39	2	5	2		1			1	3	4	7	14	18	43	72
Southern	2	2	4		3	11		9	6			1	2	2		3	3	8	7	19	30
Northern		10	10				2	2											2	12	10
Totals	2	16	33	13	39	73	6	28	20	0	1	1	2	3	4	7	10	22	**30**	**97**	**153**

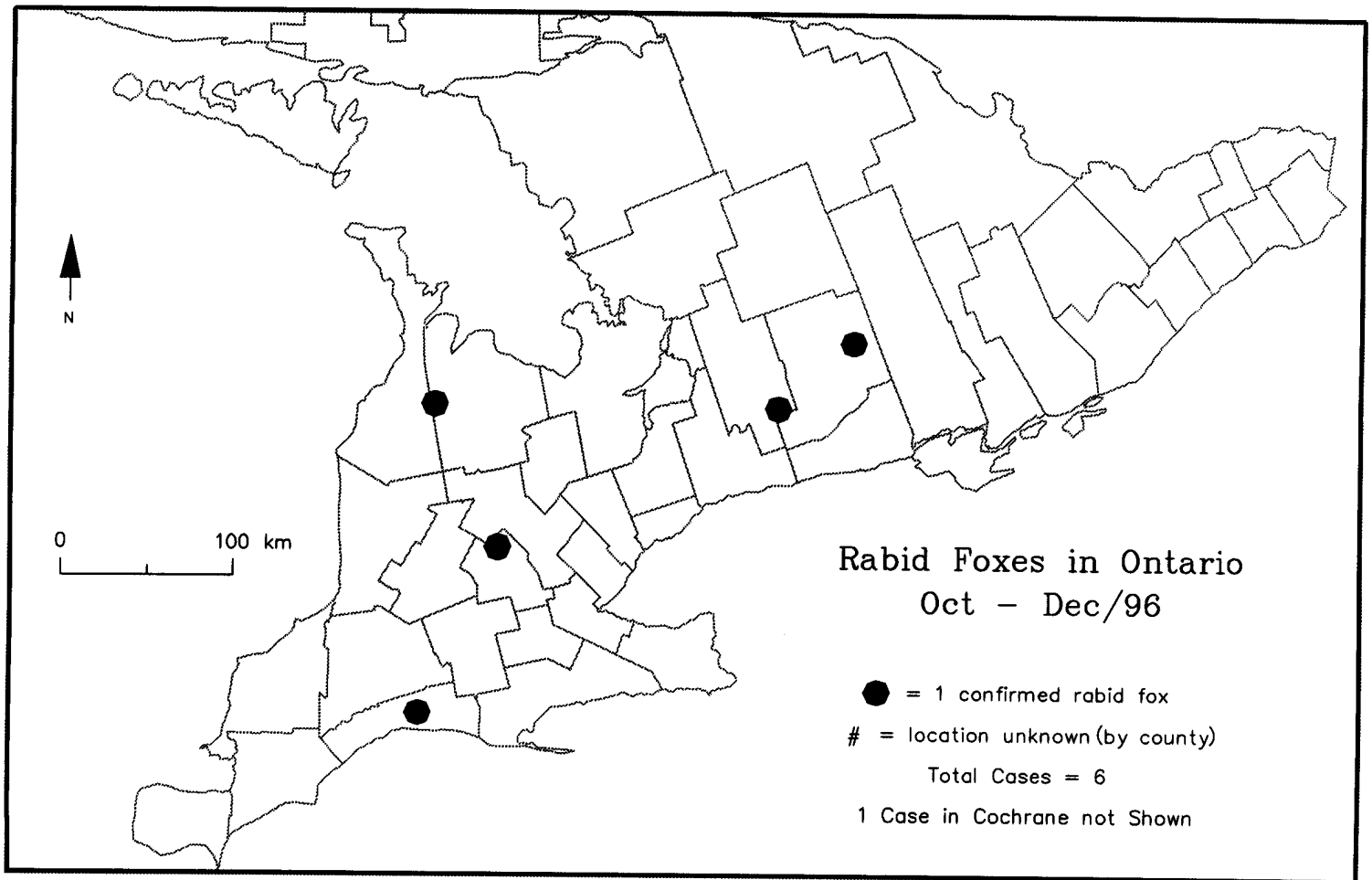
Livestock this quarter: 7 cattle

Livestock for all 1997: 10 cattle

Other wildlife this quarter: 1 big brown bat; 1 little brown bat

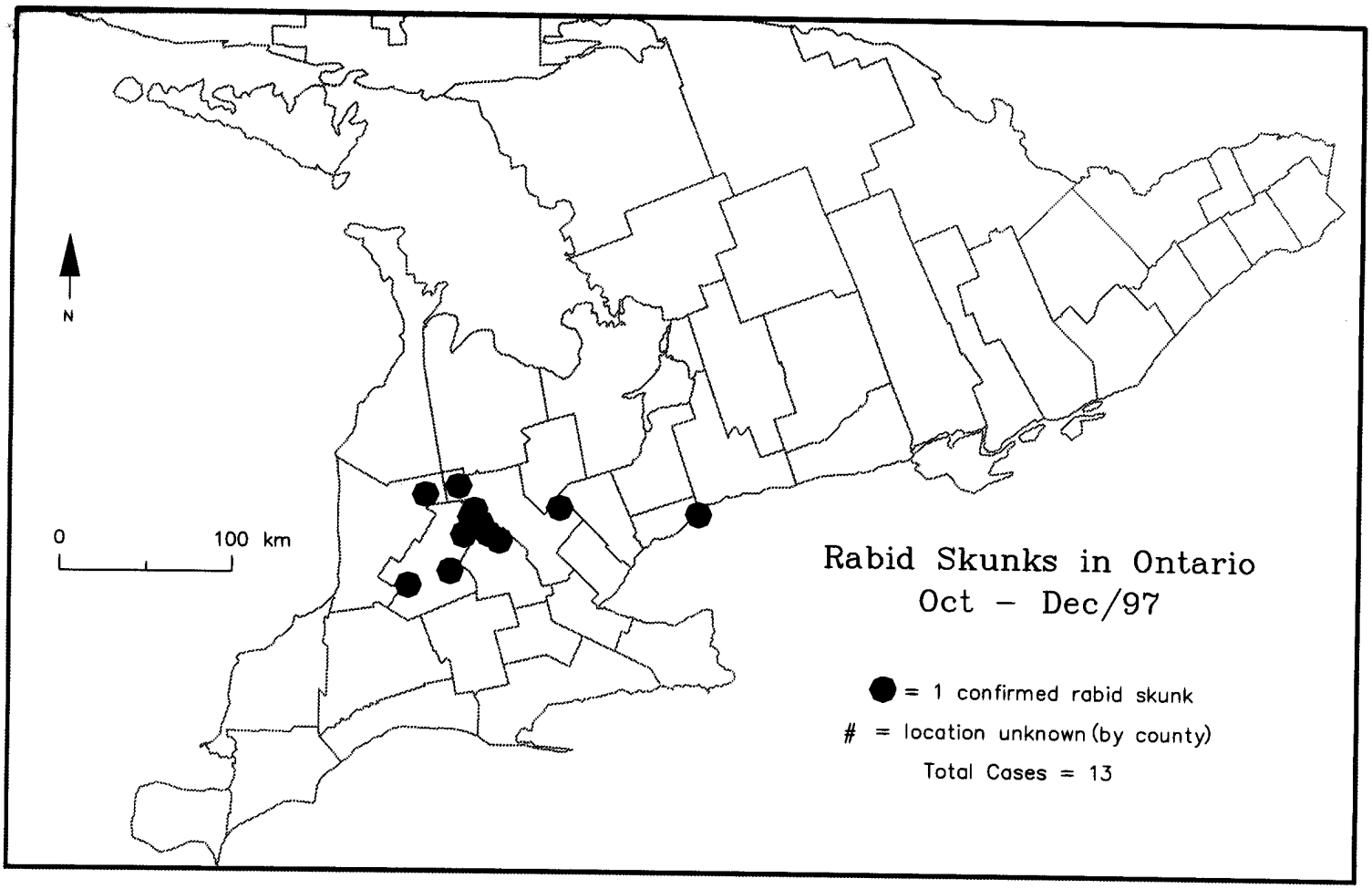
Other wildlife for all of 1997: 21 big brown bats; 3 little brown bats; 1 silver-haired bat

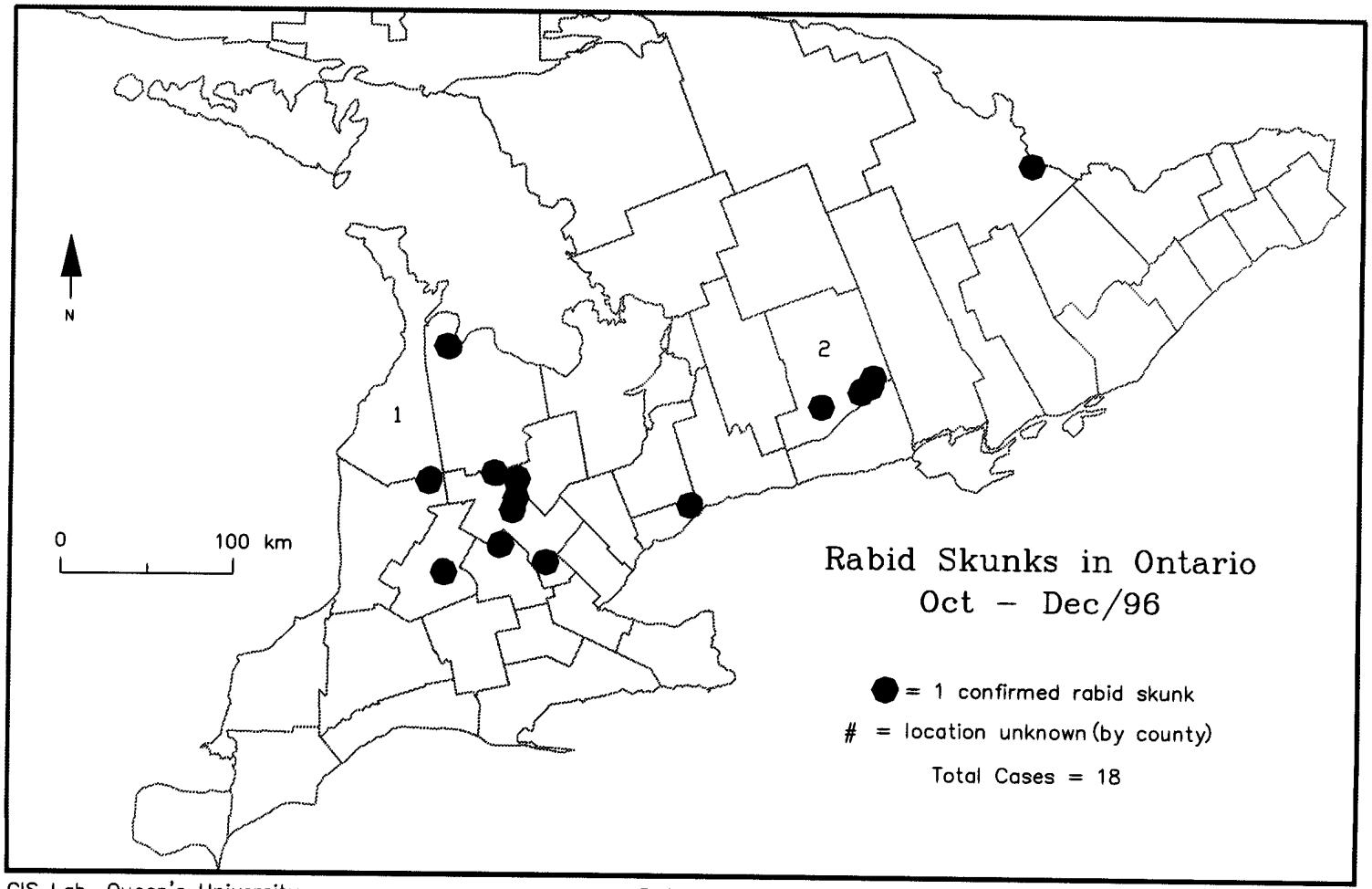




GIS Lab, Queen's University

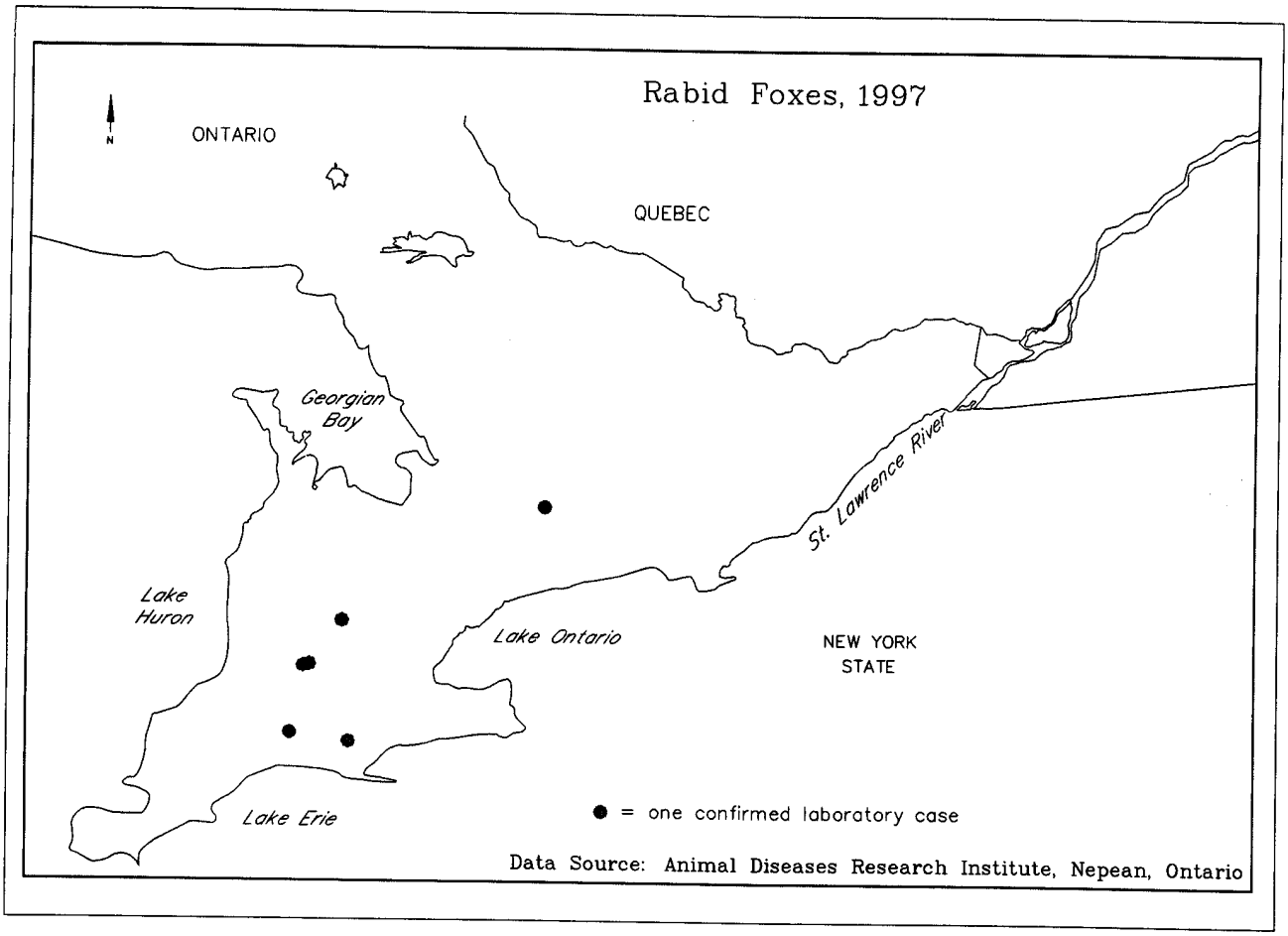
Data Source: Animal Diseases Research Institute, Nepean, Ontario

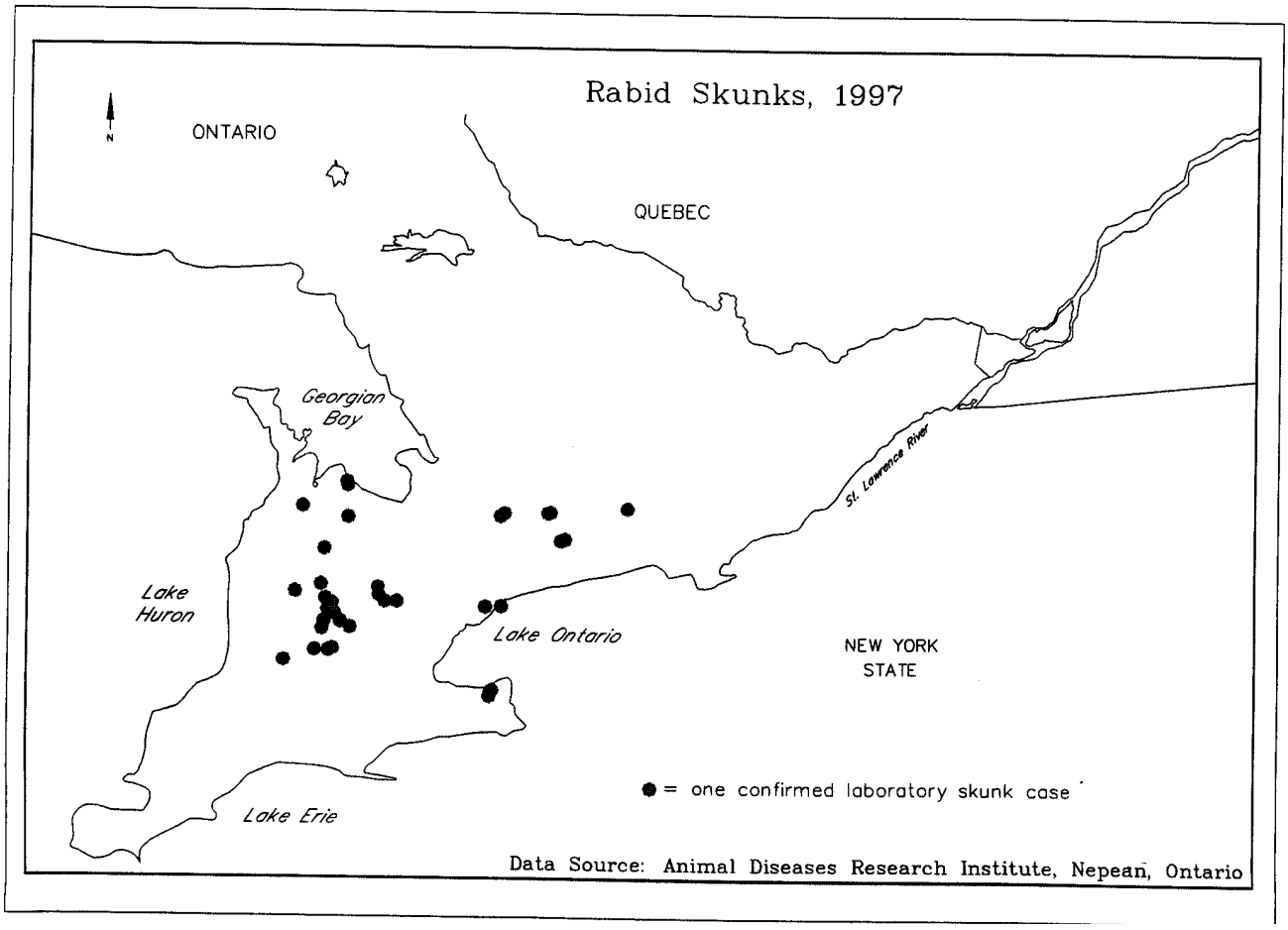




GIS Lab, Queen's University

Data Source: Animal Diseases Research Institute, Nepean, Ontario


Rabid Foxes, 1997
N
ONTARIO
QUEBEC
Georgian Bay
St. Lawrence River
Lake Huron
Lake Ontario
NEW YORK STATE
Lake Erie
● = one confirmed laboratory case
Data Source: Animal Diseases Research Institute, Nepean, Ontario


Rabid Skunks, 1997
N
ONTARIO
QUEBEC
Georgian Bay
St. Lawrence River
Lake Huron
Lake Ontario
NEW YORK STATE
Lake Erie
● = one confirmed laboratory skunk case
Data Source: Animal Diseases Research Institute, Nepean, Ontario