

# 2006 North Carolina Rabies Report

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## Introduction

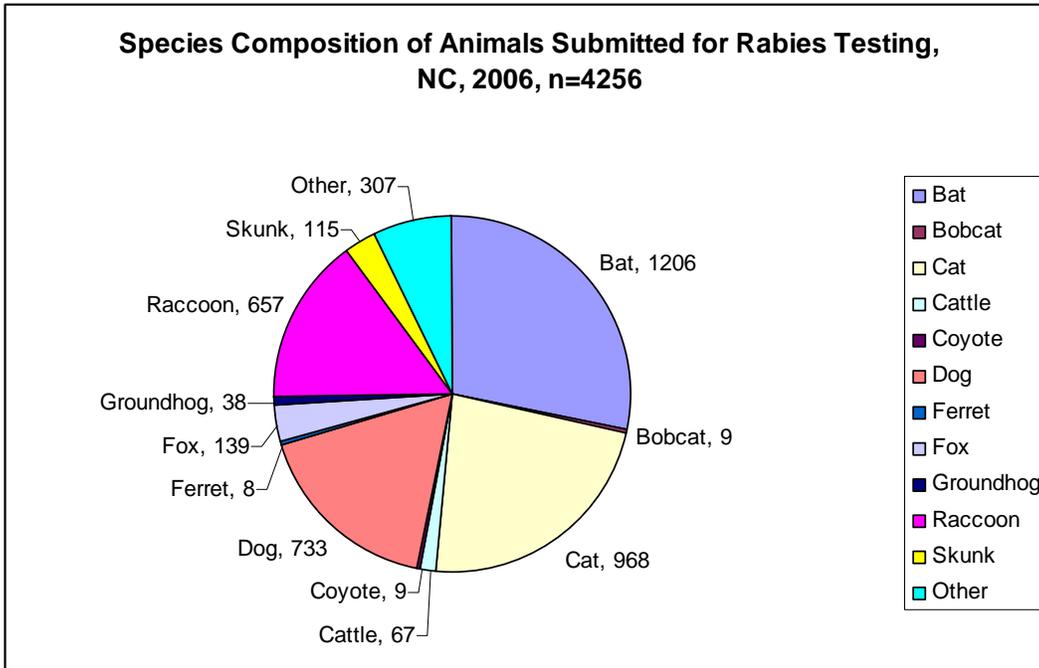
Although rabies information has always been and continues to be available on the state websites (see <http://www.epi.state.nc.us/epi/vet.html> and <http://204.211.171.13/VirologySerology/Rabies/PositiveCountBySourceCounty.asp>) this report will summarize in greater detail information about rabies in NC for the calendar year 2006. It is our hope that this information can be used by anyone in NC to gain more insight into rabies and rabies related issues. For specific concerns regarding human and animal exposures we encourage you to review the 2007 NC Rabies Manual (see <http://www.epi.state.nc.us/epi/vet/pdf/2007NCRabiesManual.pdf>).

## Summary Information.

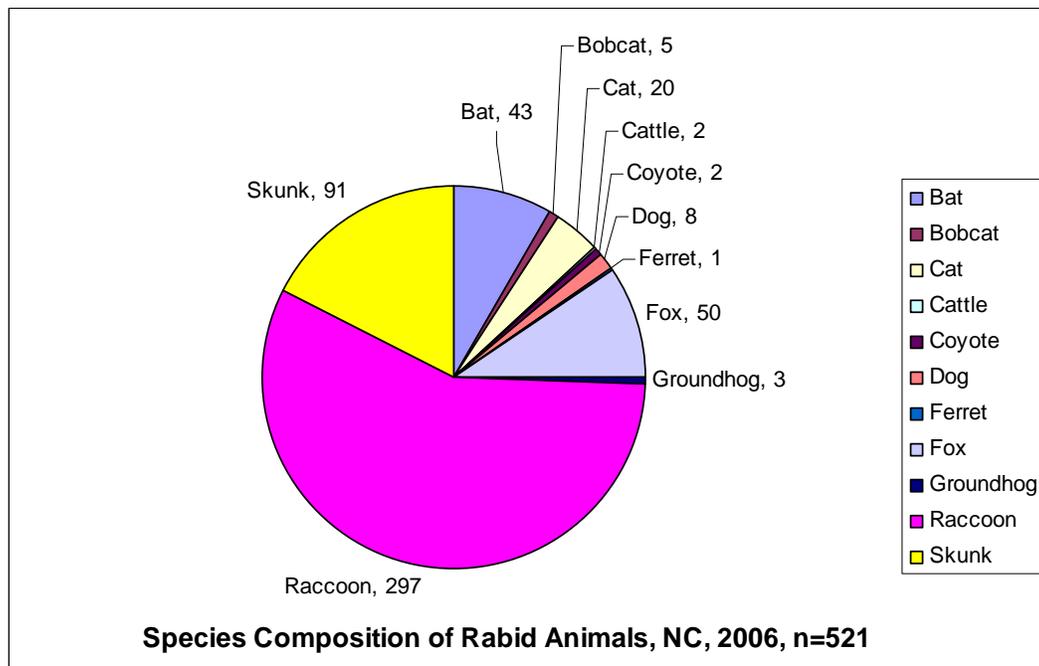
In 2006 ninety-nine (99) NC counties together submitted 4256 animals for rabies diagnostic testing at the NC State Laboratory of Public Health (SLPH). Only Tyrell County did not submit any animals. 521 rabid animals (12%) consisting of five different species of bats and 10 other terrestrial mammal species were identified in 76 of our 100 counties. No human cases of rabies occurred in NC in 2006. The most recent case of human rabies in NC occurred in 1953. Over the years rabies has been identified in every county in NC, but not all counties have positive animals each year and if a county did not have any rabid animals in 2006 it does not mean that the disease is not present in the county. It simply means it was not confirmed in that county.

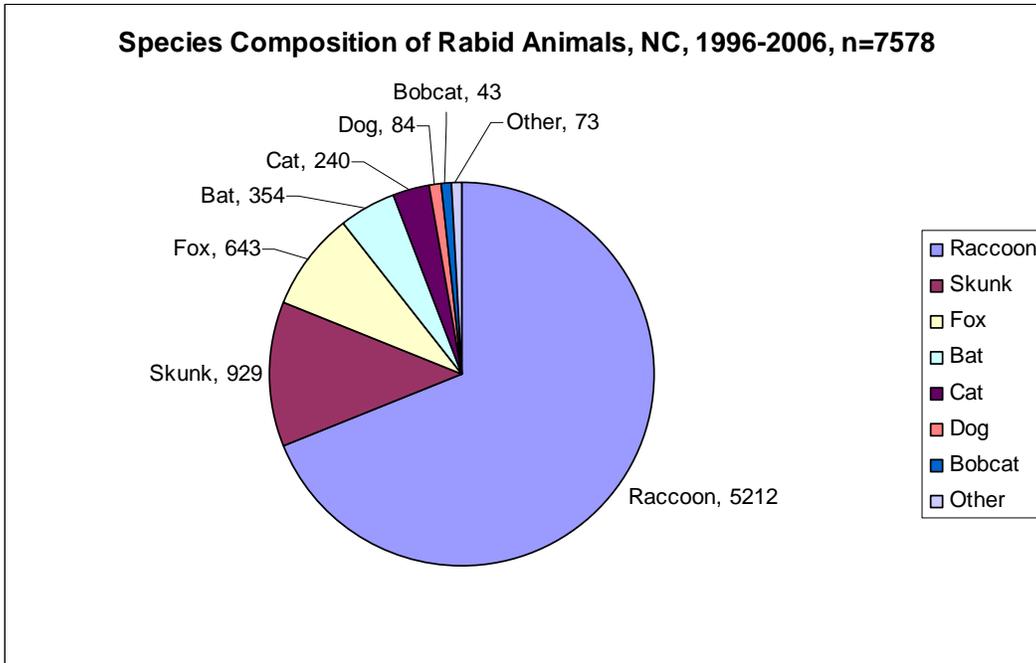
Rabies exists in two reservoir populations in NC. One is the raccoon (*Procyon lotor*), which is the terrestrial reservoir. Raccoon rabies was first identified in Florida in 1947 and continues to be public health threat to this day in Florida. Over the years rabies associated with raccoons spread up the entire east coast and now affects all states from Florida to Maine. The other reservoir population in NC is bats (multiple species), which are non terrestrial. The variant of rabies associated with bats is what causes most human cases of rabies acquired in the US. Although only one human case of rabies has ever been associated with the raccoon variant of rabies virus, the raccoon rabies virus variant is responsible for all other rabies cases in terrestrial mammals in NC in 2006.

Because rabies in raccoons is common in NC it is very important to protect our pets by vaccinating them against rabies. Pets act as a buffer between humans and wildlife and protecting them against this fatal disease will also protect people. Vaccinating pets against rabies is the single most important public health measure to protect against rabies. Nonetheless, if you are ever bitten by a mammal you should seek medical advice as soon as possible so the actual risk of rabies transmission can be determined and other treatment needs can be evaluated. The graph below represents the distribution of animals submitted for testing in 2006.



The graph below represents the distribution of animal types that were identified as positive for rabies in 2006. It is interesting to note that while dogs and cats made up a significant portion of the animals which were submitted, they represent a small percentage of the animals which were found to be rabid. This trend is reversed for the skunk (both striped and spotted) and the fox (both red and grey). All animals listed below, with the exception of bats, were infected with the raccoon strain of rabies virus. The second graph shows summary data for 1996-2006.





In contrast to other vector borne or zoonotic diseases rabies is not seasonal. Rabid animals are identified in every month of the year and thus the risk to humans and pets from rabies is present at all times. The table below shows rabies submissions and percent positive by month for 2006 for all species and counties.

| Submission by Month | # Submitted | # POS | % POS |
|---------------------|-------------|-------|-------|
| JAN                 | 214         | 17    | 8%    |
| FEB                 | 195         | 23    | 12%   |
| MAR                 | 277         | 44    | 16%   |
| APR                 | 257         | 24    | 9%    |
| MAY                 | 358         | 52    | 15%   |
| JUN                 | 588         | 50    | 9%    |
| JUL                 | 568         | 68    | 12%   |
| AUG                 | 597         | 68    | 11%   |
| SEP                 | 345         | 60    | 17%   |
| OCT                 | 301         | 44    | 15%   |
| NOV                 | 297         | 47    | 16%   |
| DEC                 | 259         | 25    | 10%   |

Rabies is uniformly present across NC. In any given year one or several counties may appear to have a greater burden of animal rabies relative to other counties. This could be due to several factors including 1) the number of animals submitted, 2) the selective submission of animals more likely to be infected and 3) the normal cycling of the disease in the wild animal population. At map at the end of the document shows the number of cases by county, for those counties that recorded animal rabies cases. This is a further demonstration of the uniformity of the disease across the state.

The table below shows rabies submissions and percent positive by selected county for 2006 for all species.

| Submission by County*                             | # Submitted | # POS | % POS |
|---|-------------|-------|-------|
| Alamance  | 73          | 5     | 7%    |
| Buncombe  | 105         | 6     | 6%    |
| Cleveland   | 77          | 20    | 26%   |
| Cumberland  | 121         | 2     | 2%    |
| Davidson  | 71          | 11    | 15%   |
| Durham  | 140         | 14    | 10%   |
| Forsyth   | 152         | 11    | 7%    |
| Guilford  | 315         | 37    | 12%   |
| Henderson   | 77          | 11    | 14%   |
| Iredell   | 75          | 9     | 12%   |
| Mecklenburg                                       | 436         | 16    | 4%    |
| Orange  | 168         | 27    | 16%   |
| Rowan   | 83          | 14    | 17%   |
| Wake  | 387         | 22    | 6%    |
| Wilkes  | 86          | 20    | 23%   |
| * For counties that submitted at least 70 animals |             |       |       |

## Rabies in Bats

Although nationwide bats present the greatest threat of rabies to humans (most likely due to unrecognized bites), relatively few of them appear to be infected. 1206 bats were submitted for rabies diagnostic testing in 2006. Only 43 (3.5%) were positive. The table below details which bats were submitted for rabies diagnostic testing and the percentage positive was for each species.

| Submission by Species         | # Submitted | # POS | % POS |
|-------------------------------|-------------|-------|-------|
| <i>Eptesicus fuscus</i>       | 870         | 19    | 2%    |
| <i>Lasiurus borealis</i>      | 78          | 16    | 21%   |
| <i>Nycticeius humeralis</i>   | 45          | 0     | 0%    |
| <i>Lasiurus noctivagans</i>   | 38          | 1     | 3%    |
| <i>Tadarida brasiliensis</i>  | 35          | 2     | 6%    |
| <i>Pipistrellus subflavus</i> | 14          | 3     | 21%   |
| <i>Lasiurus seminolus</i>     | 3           | 0     | 0%    |
| <i>Myotis sp</i>              | 3           | 0     | 0%    |
| Not Speciated                 | 120         | 2     | 2%    |

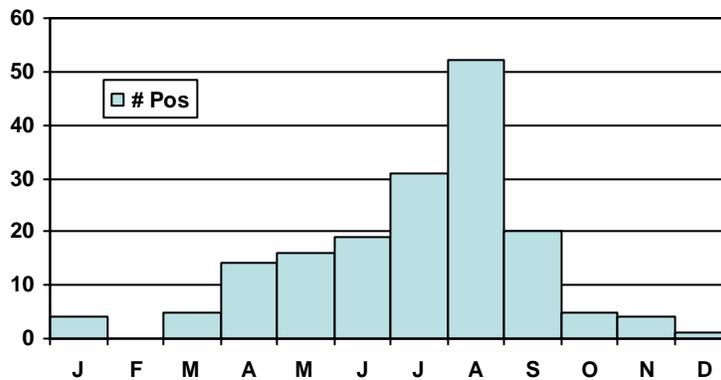
It is important to note that although some species of bat were not identified with rabies in 2006; all species are capable of being infected. Any human exposure to a bat should be regarded as a potential exposure to rabies, regardless of which species of bat is involved. Post-exposure prophylaxis should be considered when direct contact between a human and a bat has occurred, unless the exposed person can be certain a bite, scratch, or mucous membrane exposure did not occur.

When examining rabies in bats alone seasonality is noticed, but this should not be used to determine if rabies post-exposure prophylaxis is warranted in a person exposed to a bat. Although in 2006 no rabid bats were identified in the months of January, February, November and December, rabid bats have been identified in NC in those months in previous years. Bats generally hibernate during the winter months or migrate out of NC, so they are less likely to be encountered during those months, but may still harbor rabies.

Below is a table that shows the number of bat submissions and percent positive by month for 2006 for all bat species.

| Submission by Month | # Submitted | # POS | % POS |
|---------------------|-------------|-------|-------|
| JAN                 | 55          | 0     | 0%    |
| FEB                 | 26          | 0     | 0%    |
| MAR                 | 43          | 1     | 2%    |
| APR                 | 36          | 2     | 6%    |
| MAY                 | 84          | 7     | 8%    |
| JUN                 | 237         | 3     | 1%    |
| JUL                 | 206         | 10    | 5%    |
| AUG                 | 288         | 14    | 5%    |
| SEP                 | 78          | 5     | 6%    |
| OCT                 | 44          | 1     | 2%    |
| NOV                 | 53          | 0     | 0%    |
| DEC                 | 56          | 0     | 0%    |

The chart below examines the number of positive bats by month for the years 2002 – 2006. Identification of rabid bats occurs in virtually every month (n=171).



Rabies in bats is uniformly present across NC. The chart below shows rabies submissions and percent positive by selected county for 2006 for all bat species.

| Submission by County*                          | # Submitted | # POS | % POS |
|--|-------------|-------|-------|
| Alamance                                       | 39          | 2     | 5%    |
| Buncombe                                       | 33          | 0     | 0%    |
| Cumberland                                     | 42          | 1     | 2%    |
| Durham   | 84          | 8     | 10%   |
| Forsyth  | 76          | 1     | 1%    |
| Guilford                                       | 146         | 6     | 4%    |
| Mecklenburg                                    | 149         | 4     | 3%    |
| Orange   | 74          | 5     | 7%    |
| Wake   | 171         | 6     | 4%    |
| * For counties that submitted at least 30 bats |             |       |       |

## Rabies in Raccoons

657 raccoons were submitted for rabies diagnostic testing to the SLPH in 2006. 297 (45%) were identified as positive for rabies. In contrast to bats, when examining rabies in raccoons only, no seasonality is noticed. Rabid raccoons are identified in every month of the year and the risk to humans and pets from rabies is present at all times. The chart below shows raccoon submissions and percent positive by month for 2006 for all counties.

| Submission by Month | # Submitted | # POS | % POS |
|---------------------|-------------|-------|-------|
| JAN                 | 22          | 7     | 32%   |
| FEB                 | 36          | 16    | 44%   |
| MAR                 | 55          | 29    | 53%   |
| APR                 | 51          | 12    | 24%   |
| MAY                 | 61          | 32    | 52%   |
| JUN                 | 92          | 33    | 36%   |
| JUL                 | 68          | 34    | 50%   |
| AUG                 | 63          | 38    | 60%   |
| SEP                 | 71          | 36    | 51%   |
| OCT                 | 58          | 22    | 38%   |
| NOV                 | 52          | 24    | 46%   |
| DEC                 | 28          | 14    | 50%   |

Rabies in raccoons is uniformly present across NC. The chart below shows submissions and percent positive by selected county for 2006 for raccoons.

| Submission by County*                              | # Submitted | # POS | % POS |
|--|-------------|-------|-------|
| Buncombe   | 23          | 4     | 17%   |
| Guilford   | 50          | 20    | 40%   |
| Mecklenburg  | 50          | 11    | 22%   |
| Orange   | 40          | 17    | 43%   |
| Rockingham   | 15          | 9     | 60%   |
| Transylvania                                       | 17          | 12    | 71%   |
| Wake   | 24          | 11    | 46%   |
| Wilkes   | 20          | 9     | 45%   |
| Yancey   | 20          | 11    | 55%   |
| * For counties that submitted at least 15 Raccoons |             |       |       |

Again, in any given year one or several counties may appear to have a greater burden of raccoon rabies relative to other counties. This could be due to several factors including 1) the number of animals submitted, 2) the selective submission of animals more likely to be infected and 3) the normal cycling of the disease in the wild animal population.

## Rabies in Other Carnivores

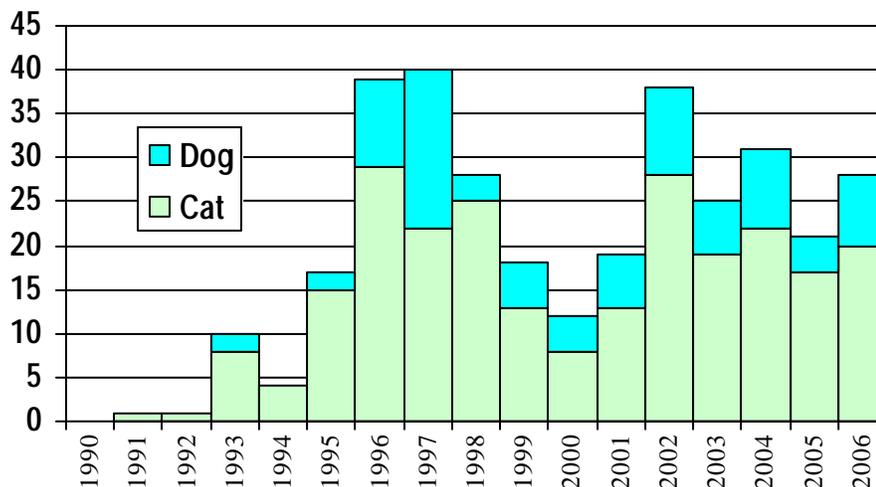
139 fox (red and grey) were submitted for rabies diagnostic testing in 2006. 50 (36%) were identified as positive. 115 skunk (striped and spotted) were submitted for rabies diagnostic testing in 2006. 91 (79%) were identified as positive. 9 bobcat were submitted for rabies diagnostic testing in 2006. 5 (55%) were identified as positive. 9 coyote were submitted for rabies diagnostic testing in 2006. 2 (22%) were identified as positive. These species were all infected with the raccoon strain of rabies virus. Any human or animal exposure to these species should be regarded as potential exposure to rabies, unless the animal can be tested for rabies and is negative.

## Rabies in Livestock

Two of 67 cattle submitted for rabies diagnostic testing in 2006 were identified as positive. No rabies cases were identified among the following animals: alpaca (1 submitted), donkey (3 submitted), horse (59 submitted), goat (33 submitted), llama (6 submitted), swine (3 submitted), sheep (10 submitted). Although licensed rabies vaccines are available for sheep, horses, and cattle, these animals are not required to be vaccinated by law. The decision to vaccinate livestock (for which there exists a licensed rabies vaccine) is up to the producer. In previous years in NC horses have tested positive for rabies. Rabies in livestock is rare; historically they are infected with the raccoon strain of the rabies virus.

## Rabies in Pets

968 cats were submitted for rabies diagnostic testing in 2006. 20 (2%) were identified as positive. 733 dogs were submitted for rabies diagnostic testing in 2006. 8 (1%) were identified as positive. 8 ferrets were submitted for rabies diagnostic testing in 2006. 1 (12%) was identified as positive. In contrast to livestock, dogs and cats are required by law to be vaccinated against rabies. Rabies vaccination of ferrets is not required by law but strongly recommended. Because of the close association between these animals and humans, rabies in a pet typically results in a large number of potentially exposed persons. Therefore it is essential to keep pets vaccinated against rabies at all times, it not only protects them but people as well. The graph below shows the number of rabid dogs and cats recorded in North Carolina since 1990.



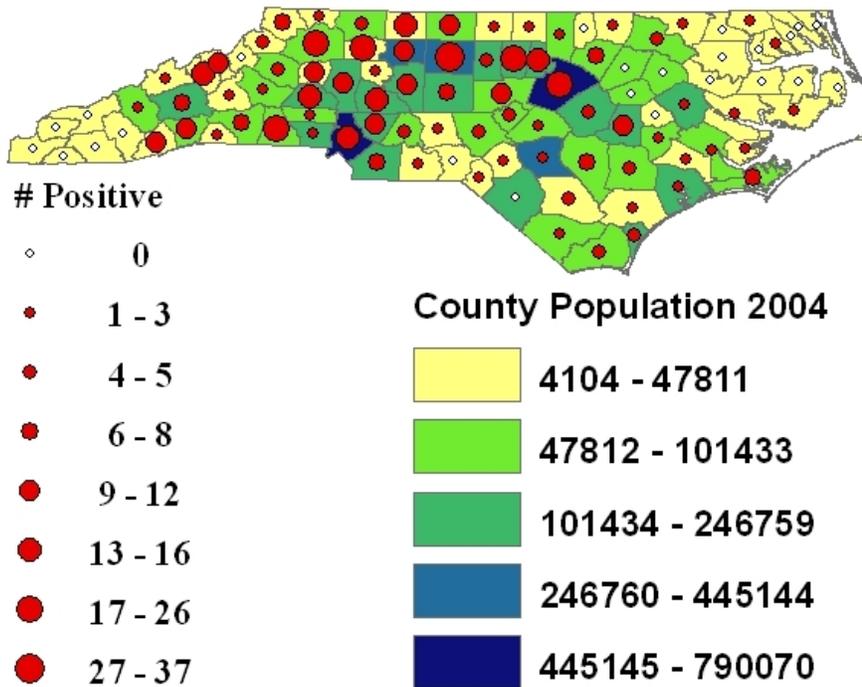
## Rabies in Rodents and Opossums

Small rodents generally do not pose a significant rabies risk. In 2006 the following small rodents were submitted for rabies diagnostic testing, none were positive: gerbil (4 submitted), guinea pig (1 submitted), hamster (3 submitted), mouse (5 submitted), prairie dog (1 submitted), rat (9 submitted), squirrel (41 submitted), vole (4 submitted).

Large rodents do pose a greater risk of rabies transmission. In 2006 five beaver were submitted for rabies diagnostic testing, zero were positive. 38 groundhogs (*Marmota monax*) were submitted for rabies diagnostic testing, 3 (8%) were positive. Four muskrat (*Ondatra zibethicus*) were submitted for rabies diagnostic testing, none were positive. Two nutria (*Myocastor coypus*) were submitted for rabies diagnostic testing, none were positive. In previous years in NC, muskrat and beaver have tested positive for rabies.

The Virginia opossum is the only marsupial to occur in North Carolina or the United States. 94 were submitted for rabies diagnostic testing in 2006, all were negative. Although opossums can be infected with rabies, they appear to be refractory to the disease and are regarded as a species which poses a low risk for rabies transmission.

## 2006 Animal Rabies Cases by County, North Carolina

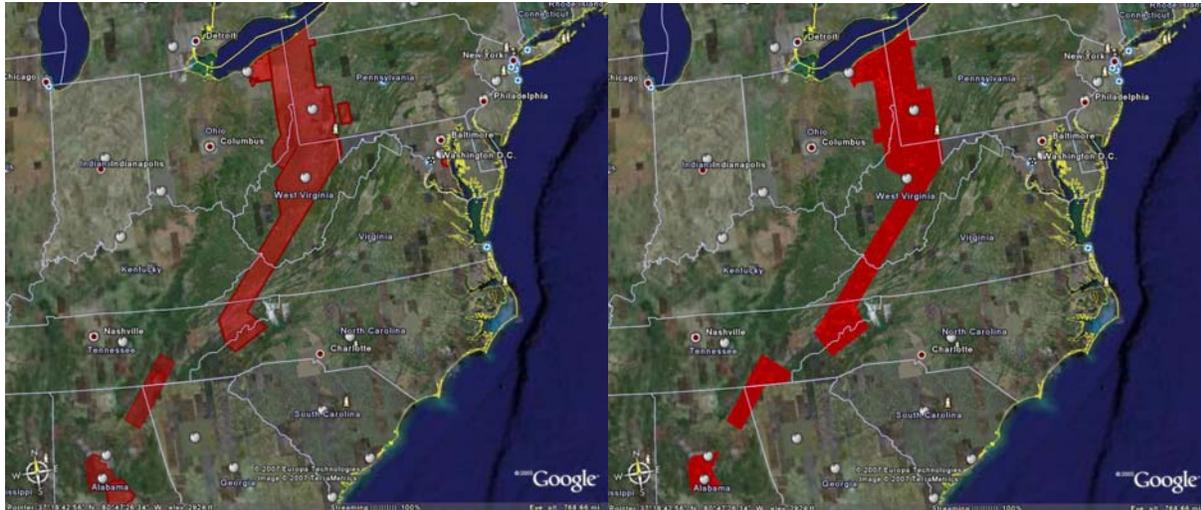


## Oral Rabies Vaccination in North Carolina

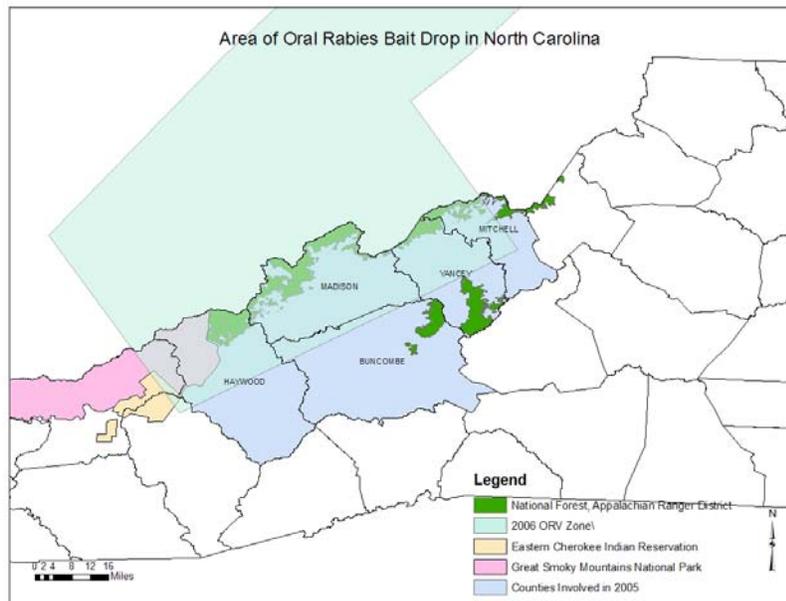
Because raccoon rabies is transmitted very efficiently among raccoons, results in numerous spillover cases into non reservoir animals, and results in a tremendous public health cost, federal support for coordinated ORV in 1998 allowed for creation of cooperative programs in 15 states to *halt western expansion of raccoon rabies*. North Carolina entered into the federal ORV program in 2004, with bait drops occurring in 2005 and 2006. Below are two views of the extent of the federal Appalachian Ridge ORV project.

**2005**

**2006**



Counties in North Carolina are baited for the sole purpose of preventing rabid raccoons from migrating along river basins into Tennessee. With the exception of sporadic cases, Tennessee is free of the raccoon variant of rabies virus and must be kept that way in order to help control the public health cost of rabies, among other things. A detailed map of the 2006 baiting area in NC is shown below.



Bait placement and distribution totals for 2005 are listed here:

| County   | Fixed-wing CS | Ground FMP | Total   |
|----------|---------------|------------|---------|
| Buncombe | 5,634         |            | 5,634   |
| Haywood  | 48,149        |            | 48,149  |
| Madison  | 51,265        | 1,684      | 52,949  |
| Mitchell | 6,551         | 158        | 6,709   |
| Yancey   | 22,099        | 317        | 22,416  |
| Total    | 133,698       | 2,159      | 135,857 |

Bait placement and distribution totals for 2006 are listed here:

| County   | Fixed-Wing CS | Ground FMP | Total   |
|----------|---------------|------------|---------|
| Buncombe | 8,288         |            | 8,288   |
| Haywood  | 47,053        |            | 47,053  |
| Jackson  | 1,470         |            | 1,470   |
| Madison  | 74,516        | 1,690      | 76,206  |
| Mitchell | 13,575        | 150        | 13,725  |
| Swain    | 9,850         |            | 9,850   |
| Yancey   | 28,020        | 320        | 28,340  |
| Total    | 182,772       | 2,160      | 184,932 |

| Count of Result | AnimalType |        |     |     |        |     |        |     |           |         |       | Grand Total |
|-----------------|------------|--------|-----|-----|--------|-----|--------|-----|-----------|---------|-------|-------------|
|                 | Bat        | Bobcat | Cat | Cow | Coyote | Dog | Ferret | Fox | Groundhog | Raccoon | Skunk |             |
| Alamance        | 2          |        |     |     |        |     |        |     |           | 3       |       | 5           |
| Alexander       |            |        |     |     |        |     |        | 3   |           | 2       | 6     | 11          |
| Alleghany       |            |        | 1   |     |        |     |        |     |           |         | 1     | 2           |
| Anson           |            |        |     |     |        |     |        |     |           | 1       |       | 1           |
| Ashe            |            | 1      |     |     |        |     |        |     |           | 5       | 1     | 7           |
| Beaufort        |            |        |     |     |        |     |        |     |           | 1       | 1     | 2           |
| Bladen          |            |        |     |     |        | 1   |        |     |           | 4       |       | 5           |
| Brunswick       |            | 1      |     |     |        |     |        |     |           | 3       |       | 4           |
| Buncombe        |            |        |     |     | 1      |     | 1      |     |           | 4       |       | 6           |
| Burke           |            |        |     |     |        |     |        | 2   |           | 1       |       | 3           |
| Cabarrus        |            |        |     |     |        |     |        | 1   |           | 9       | 1     | 11          |
| Caldwell        |            |        |     |     |        |     |        |     |           | 3       | 2     | 5           |
| Carteret        | 1          |        |     |     |        |     |        | 1   |           | 4       |       | 6           |
| Caswell         |            |        |     |     |        |     |        |     |           | 1       | 1     | 2           |
| Catawba         |            |        |     |     |        |     |        |     |           | 5       | 8     | 13          |
| Chatham         | 1          |        |     |     |        |     |        | 2   |           | 6       | 2     | 11          |
| Cleveland       |            |        | 1   |     |        |     |        |     |           | 3       | 16    | 20          |
| Columbus        |            |        |     |     |        | 1   |        |     |           | 1       |       | 2           |
| Craven          |            |        | 1   |     |        |     |        |     |           |         |       | 1           |
| Cumberland      | 1          |        |     |     |        |     |        |     |           | 1       |       | 2           |
| Davidson        |            |        |     | 1   |        |     |        |     |           | 9       | 1     | 11          |
| Davie           |            |        |     |     |        |     |        | 1   |           |         |       | 1           |
| Duplin          |            |        |     |     |        |     |        |     |           | 4       |       | 4           |
| Durham          | 8          |        |     |     |        |     |        |     |           | 6       |       | 14          |
| Forsyth         | 1          |        |     |     |        |     |        | 2   | 1         | 4       | 3     | 11          |
| Franklin        |            |        |     |     |        |     |        |     |           | 5       | 1     | 6           |
| Gaston          |            |        |     |     |        |     |        |     |           | 1       |       | 1           |
| Gates           |            |        |     |     |        |     |        |     |           | 2       |       | 2           |
| Granville       |            |        | 1   |     |        |     |        |     |           | 1       |       | 2           |
| Guilford        | 6          |        | 1   |     | 1      |     |        | 4   |           | 20      | 5     | 37          |
| Halifax         |            |        |     |     |        | 1   |        |     |           | 4       |       | 5           |
| Harnett         |            |        |     |     |        |     |        |     |           | 3       |       | 3           |
| Haywood         |            |        |     |     |        |     |        |     |           | 1       |       | 1           |
| Henderson       |            |        |     | 1   |        |     |        | 3   |           | 7       |       | 11          |
| Hoke            |            |        |     |     |        |     |        |     |           | 1       |       | 1           |
| Hyde            |            |        |     |     |        |     |        | 1   |           |         |       | 1           |
| Iredell         |            |        | 1   |     |        |     |        |     |           | 5       | 3     | 9           |
| Johnston        |            |        |     |     |        |     |        |     |           | 4       |       | 4           |
| Jones           |            |        |     |     |        |     |        |     |           | 2       |       | 2           |

Animal Rabies Cases

North Carolina

2006

| County       | Bat | Bobcat | Cat | Cow | Coyote | Dog | Ferret | Fox | Groundhog | Raccoon | Skunk | Grand Total |
|--------------|-----|--------|-----|-----|--------|-----|--------|-----|-----------|---------|-------|-------------|
| Lee          |     |        |     |     |        |     |        | 2   |           | 2       | 1     | 5           |
| Lenoir       |     |        |     |     |        |     |        |     |           | 3       |       | 3           |
| Lincoln      |     |        |     |     |        |     |        |     |           |         | 2     | 2           |
| Madison      | 1   |        |     |     |        |     |        |     |           | 1       |       | 2           |
| McDowell     |     |        |     |     |        | 1   |        | 1   |           |         |       | 2           |
| Mecklenburg  | 4   |        |     |     |        |     |        | 1   |           | 11      |       | 16          |
| Mitchell     |     | 1      | 3   |     |        |     |        |     |           | 6       |       | 10          |
| Montgomery   |     |        |     |     |        |     |        | 1   |           |         |       | 1           |
| Moore        |     |        |     |     |        |     |        | 1   |           | 4       |       | 5           |
| New Hanover  |     |        |     |     |        | 1   |        | 3   |           |         |       | 4           |
| Northampton  |     |        |     |     |        |     |        |     |           | 1       | 1     | 2           |
| Onslow       |     |        |     |     |        | 1   |        |     |           |         |       | 1           |
| Orange       | 5   |        |     |     |        |     |        | 1   |           | 17      | 4     | 27          |
| Pamlico      |     |        |     |     |        |     |        |     |           | 1       |       | 1           |
| Pender       |     |        |     |     |        |     |        |     |           | 1       |       | 1           |
| Perquimans   |     |        | 2   |     |        |     |        |     |           | 1       |       | 3           |
| Person       |     |        |     |     |        |     |        |     |           | 1       |       | 1           |
| Pitt         |     |        |     |     |        |     |        |     |           | 2       |       | 2           |
| Polk         | 1   |        |     |     |        |     |        | 1   |           |         |       | 2           |
| Randolph     | 1   |        |     |     |        |     |        |     |           | 5       |       | 6           |
| Rockingham   |     |        |     |     |        |     |        |     |           | 9       | 3     | 12          |
| Rowan        |     |        |     |     |        |     |        | 2   |           | 6       | 6     | 14          |
| Rutherford   |     |        |     |     |        |     |        | 3   |           | 3       | 2     | 8           |
| Sampson      |     |        |     |     |        | 1   |        | 1   |           | 5       |       | 7           |
| Scotland     |     |        | 1   |     |        |     |        |     |           |         |       | 1           |
| Stanly       | 2   |        |     |     |        |     |        |     |           | 3       | 1     | 6           |
| Stokes       |     |        |     |     |        |     |        | 1   |           | 8       | 4     | 13          |
| Surry        |     |        |     |     |        |     |        | 1   |           | 2       | 1     | 4           |
| Transylvania |     |        |     |     |        |     |        |     |           | 12      |       | 12          |
| Union        |     |        |     |     |        |     |        |     |           | 6       |       | 6           |
| Wake         | 6   |        | 2   |     |        |     |        | 3   |           | 11      |       | 22          |
| Warren       |     |        |     |     |        |     |        |     |           |         | 1     | 1           |
| Watauga      |     |        | 2   |     |        |     |        |     |           | 2       |       | 4           |
| Wayne        |     |        | 1   |     |        |     |        | 2   |           | 9       |       | 12          |
| Wilkes       |     | 1      | 1   |     |        |     |        | 4   | 1         | 9       | 4     | 20          |
| Yadkin       | 1   |        | 1   |     |        | 1   |        | 2   |           | 9       | 9     | 23          |
| Yancey       | 2   | 1      |     |     |        |     |        |     | 1         | 11      |       | 15          |
| Grand Total  | 43  | 5      | 19  | 2   | 2      | 8   | 1      | 50  | 3         | 297     | 91    | 521         |