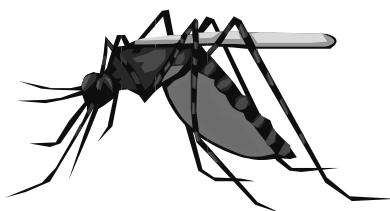


SUMMARY REPORT:

WEST NILE VIRUS IN ALBERTA 2006



Alberta

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I. Introduction

West Nile virus Interdepartmental Committee

Building on the West Nile surveillance programs in 2002-2005, representatives from five provincial departments (Alberta Health and Wellness, Alberta Agriculture and Food, Alberta Environment, Alberta Municipal Affairs, and Alberta Sustainable Resource Development) prepared a provincial response plan for 2006 to address the potential risks posed by West Nile virus (WNV) in Alberta. The interdepartmental committee included the following members:

Dr. Karen Grimsrud	Deputy Provincial Health Officer (Chair) Health and Wellness
Debra Mooney	WNV Provincial Coordinator Health and Wellness
Dr. Margo Pybus Dr. Damien Joly	Provincial Wildlife Disease Specialist, Wildlife Disease Specialist, Fish and Wildlife Division, Sustainable Resource Development
Jock McIntosh	Pesticide Specialist, Alberta Environment
Ronda Morgan	Coordinator, Policy and Grants Municipal Affairs
Marilyn Wakaruk David May Dave Ealey Marie McDonnell	Public Affairs Officers, Communications

Dr. Gerald Ollis and Lisa Morin from the Chief Provincial Veterinarian Office of Alberta Agriculture and Food (AAF) provided information regarding surveillance and communications related to horses. Dr. Peter Tilley of the Provincial Laboratory for Public Health (Microbiology) provided information regarding human surveillance to the WNV committee.

2006 WNV Plan

The 2006 plan contained three primary components: communication, surveillance and targeted mosquito control.

- ✧ Communication occurred through a public awareness campaign which provided messaging through radio, newspaper and magazines, information on the departmental web pages as well as technical updates provided directly to health care, wildlife, municipal officials and veterinary professionals.
- ✧ The surveillance programs focused on monitoring “at risk” populations: physicians monitored human illness, veterinarians monitored horse health, Fish and Wildlife Division tested dead wild corvids submitted by the public and selected municipalities collected and submitted *Culex tarsalis* mosquitoes for testing. The surveillance programs were designed to identify the presence of the virus in natural regions of the province and thereby assist in assessing the health risks to humans and providing appropriate province-wide information to health care professionals and to the public.
- ✧ The targeted mosquito control program provided funds to municipalities in Risk zones 1 and 2 to support surveillance of mosquito breeding sites and chemical control of *Culex tarsalis* mosquito larvae, the mosquito vector for WNV in Alberta.

Summary Report

The purpose of this technical report is to summarize and record surveillance information on WNV in birds, horses, humans and mosquitoes including the geographical location and timing of WNV infection in all species. Details of the targeted larval control program delivered by the municipalities and the 2006 Communication Plan are also addressed.

The report is a compilation of work by members of the Interdepartmental Committee.

Background materials about West Nile virus in Alberta can be found in the following websites:

Alberta Health and Wellness

www.fightthebite.info

Alberta Agriculture and Food

[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex5455?opendocument](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex5455?opendocument)

Fish and Wildlife Division of Alberta Sustainable Resource Development

<http://www.srd.gov.ab.ca/fishwildlife/livingwith/diseases/>

Epizootiology of WNV

WNV occurs in a wide geographic area throughout the world. It was first detected on the North American continent in 1999 in the northeast U.S. To date, it has spread in migrating wild birds, local mosquitoes and humans to encompass all of the lower 48 states of the U.S. and southern Canada east of the Rocky Mountains (see <http://www.cdc.gov/ncidod/dvbid/westnile/>). Virus activity in northern areas is limited to summer months when environmental and biological conditions support amplification of the virus in birds and suitable mosquitoes.

The transmission of all viruses is driven by a complex interaction of biological and non-biological factors. In the case of WNV, this involves birds, mosquitoes, and weather. The species, distribution, migration, immune response, and previous exposure to the virus all affect its success in birds. Similarly, the species distribution and life stage (only adults transmit the virus) affect the success of the virus in mosquitoes. Infected birds and mosquitoes must overlap in time and space in sufficient numbers to establish and maintain a viral population. In 2003, these components all came together in Alberta: the virus was introduced in late spring/early summer by migrating birds and established local viral populations in *Culex tarsalis* mosquitoes. During a relatively hot and dry summer, the virus multiplied and spread in at least three generations of suitable mosquito vectors. Extensive mortality was seen in crows and magpies throughout southern and central Alberta in 2003¹, and the virus also was detected in mosquitoes, horses, and humans in the same wide geographic distribution. By the end of the summer in 2003, there was evidence of extensive viral activity throughout the southern and central areas of Alberta.

Surveillance in United States and Canada

In the United States, while the total number of human cases decreased, the number of cases in California increased as the virus became established along the west coast. No human cases were reported in the state of Washington.

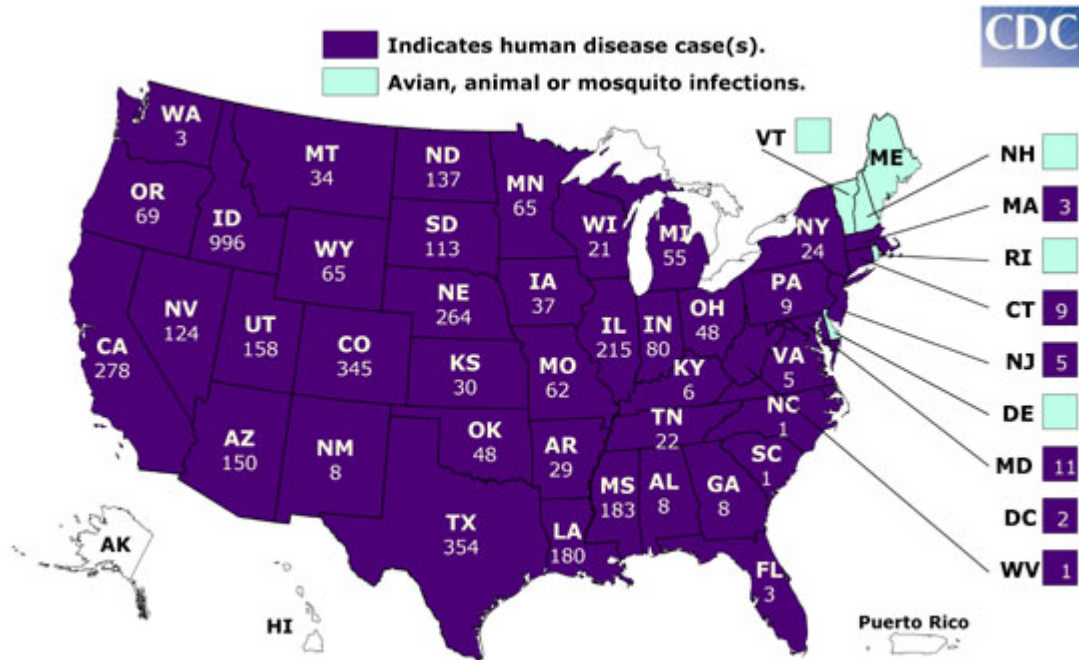
In many areas of the southern United States, *Culex* species do not go dormant during the winter months and thus year-round transmission of WNV now occurs from the Atlantic and Gulf Coast States westward to southern California. In northern areas, West Nile virus can also overwinter in a few dormant individual mosquitoes (Figure 1). The virus is still extending its continental range and establishing populations within Mexico as well as Central and South America.

The 2006 surveillance information on human cases of WNV throughout Canada shows fewer numbers of cases across Canada than in 2005 and considerably lower than 2003. No human cases were reported in the Territories or the Maritimes (Table 1 and 2).

There is little doubt that WNV will establish itself throughout the Western Hemisphere, although the full picture in a North American context is still evolving.

¹Pybus, M.J. 2003. Alberta West Nile virus wild bird surveillance, 2003; www.srd.gov.ab.ca/fw/diseases/WNV/pdf/2005WNVreport.pdf

**Figure 1: Final 2006 West Nile Virus Activity in the United States
January 1- December 31**



Map shows the distribution of avian, animal, or mosquito infection occurring during 2006 with number of human cases if any, by state. If West Nile virus infection is reported to CDC from any area of a state, that entire state is shaded.

Source: Centers for Disease Control and Prevention, 2006

Table 1: Human West Nile Virus Clinical Cases and Asymptomatic Infections in Canada: 2006					
Province/Territory	Neurological Syndrome	Non-Neurological Syndrome	Unclassified/Unspecified	Total²	Asymptomatic Infection⁴
Newfoundland and Labrador	0	0	0	0	0
Prince Edward Island	0	0	0	0	0
Nova Scotia	0	0	0	0	0
New Brunswick	0	0	0	0	0
Quebec	0	1	0	1	0
Ontario ¹	17	25	0	42 ³	0
Manitoba	17	33	0	50	1
Saskatchewan	3	16	0	19 ³	1
Alberta ¹	1	38	0	39 ³	1
British Columbia	0	0	0	0	0
Yukon	0	0	0	0	0
Northwest Territories	0	0	0	0	0
Nunavut	0	0	0	0	0
Total²	38	113	0	151	3

¹ These totals include both probable and confirmed WNV cases.
² Total clinical cases is the sum of WNV Neurological Syndrome + WNV Non-Neurological Syndrome + WNV Unclassified/Unspecified.
³ These totals include some cases related to travel outside the province/ territory.
⁴ Satisfies West Nile virus diagnostic test criteria in the absence of clinical criteria.
Source: Public Health Agency of Canada, 2006

Table 2: Human WNV Cases in Canada 2003-2006				
Province	2006	2005	2004	2003
British Columbia	0	0	0	19 (19)
Alberta	40 (3)	10 (3)	1 (1)	275
Saskatchewan	19 (3)	58	10	848
Manitoba	50	54	3	139
Ontario	42 (3)	95(4)	13	89
Quebec	0	7	1	17
Maritimes	0	3 (3)	0	3 (3)
Territories	0	0	0	1 (1)
Canada	151	227	28	1391

Brackets indicate number of travel-related cases

II. Wild Bird Surveillance

Submitted by Dr. Margo Pybus, *Sustainable Resource Development*

Summary

In 2006, the West Nile virus (WNV) wild bird surveillance program conducted by the Fish and Wildlife Division of Alberta Sustainable Resources Development began on June 1. Members of the public could submit dead corvids (crows, magpies, jays, and ravens) found in the Grassland Natural Region of southeastern Alberta (click [here](#)² for a map of the Natural Regions in Alberta); however, a significant number of birds also were accepted from adjacent areas of the Parkland Natural Region and a small number from the Boreal Natural Region.

Between June 15 and September 8, 114 dead birds were received for WNV testing. Nestlings were not examined and 24 (21%) of the birds received were unsuitable for analysis (dry, rotten, too young, or unsuitable species). Thus testing was limited to 90 corvids (47 crows, 38 magpies, 3 ravens, and 2 blue jays). All usable corvids were tested with the VecTest, an antigen-based screening assay. All but one of the birds were tested within 24 hours of receipt at the laboratory.

In total, we confirmed WNV in 12 corvids: 9 crows, 2 magpies, and 1 blue jay. Infected birds were found dead between July 28 and September 1. All positive birds were found in the Grassland region. The distribution of positive birds spanned southern Alberta from Oyen to Cardston. As recommended by the Provincial WNV Steering Committee, receipt of birds for testing was discontinued when six positive birds were identified in the Grassland Natural Region. However, an additional 6 positive birds were already en route to the laboratory and were tested when received.

Only one greater sage-grouse was received for WNV testing. It was negative.

A predictable pattern of WNV activity in Alberta is apparent. The virus appears each year in July and August, and establishes relatively weak populations in southeastern Alberta. The geographic and numerical extent of the virus each year correlates with local weather and mosquito patterns in the risk areas associated with grassland habitats in southern Alberta.

² URL:

http://www.srd.gov.ab.ca/fishwildlife/livingwith/diseases/images/Alberta_Natural_Regions_large.gif

Epizootiology of WNV in Birds

Birds are the primary habitat for West Nile virus and it occurs in a wide range of bird species, most of which show little or no clinical effect. Now that the virus is well established over much of North America, billions of birds in Canada and the U.S. are potentially infected with WNV. This includes the tiniest hummingbirds; the biggest swans, cranes and eagles; and everything in between. However, members of the corvid family (crows, magpies, ravens, and jays) generally are unable to effectively control the virus with their immune system. As a result, the virus can reproduce quickly in a wide range of tissues, but especially in the brain and spinal cord. Fatal infections occur, particularly in crows and magpies. In contrast, mammals generally are quite resistant to infection but rare fatal cases can occur in horses and some humans.

Bird Surveillance

The Fish and Wildlife Division monitored wild corvids found dead by the public. The surveillance programs were designed to identify the presence of the virus in natural regions of the province (Figure 1) and thereby support the needs of assessing the health risks to humans and assist Alberta Health and Wellness in providing appropriate provincial information to health care professionals and to the public.

In 2006, the program focused on corvids (particularly crows and magpies) as the primary bird species likely to exhibit fatal infections and thus reflect the presence or absence of the virus in Alberta populations. In addition, Fish and Wildlife staff as well as the public were encouraged to report unusual clusters of mortality in any wild bird or mammal species. The surveillance program focused on the Grassland Natural Region (Figure 1) as data from previous years indicated that virus activity was most likely to occur there. Fresh dead corvids collected by the public were dropped off at any Fish and Wildlife office. Following up on the WNV-related mortality detected in greater sage-grouse in southern Alberta in 2003, and in conjunction with the University of Alberta and Alberta Environment, special attention was given to monitoring the sage-grouse population and attempting to limit mosquito populations in prime sage-grouse range in 2005 and 2006.

Fresh or frozen birds were transported or sent to the Fish and Wildlife Division's Wildlife Diseases Laboratory in Edmonton. Birds were thawed and then tested with a VecTest strip, an antigen-based screening assay accepted as the national standard screening test for corvids. Testing occurred as birds arrived at the laboratory; all birds but one were tested the day they arrived at the laboratory.

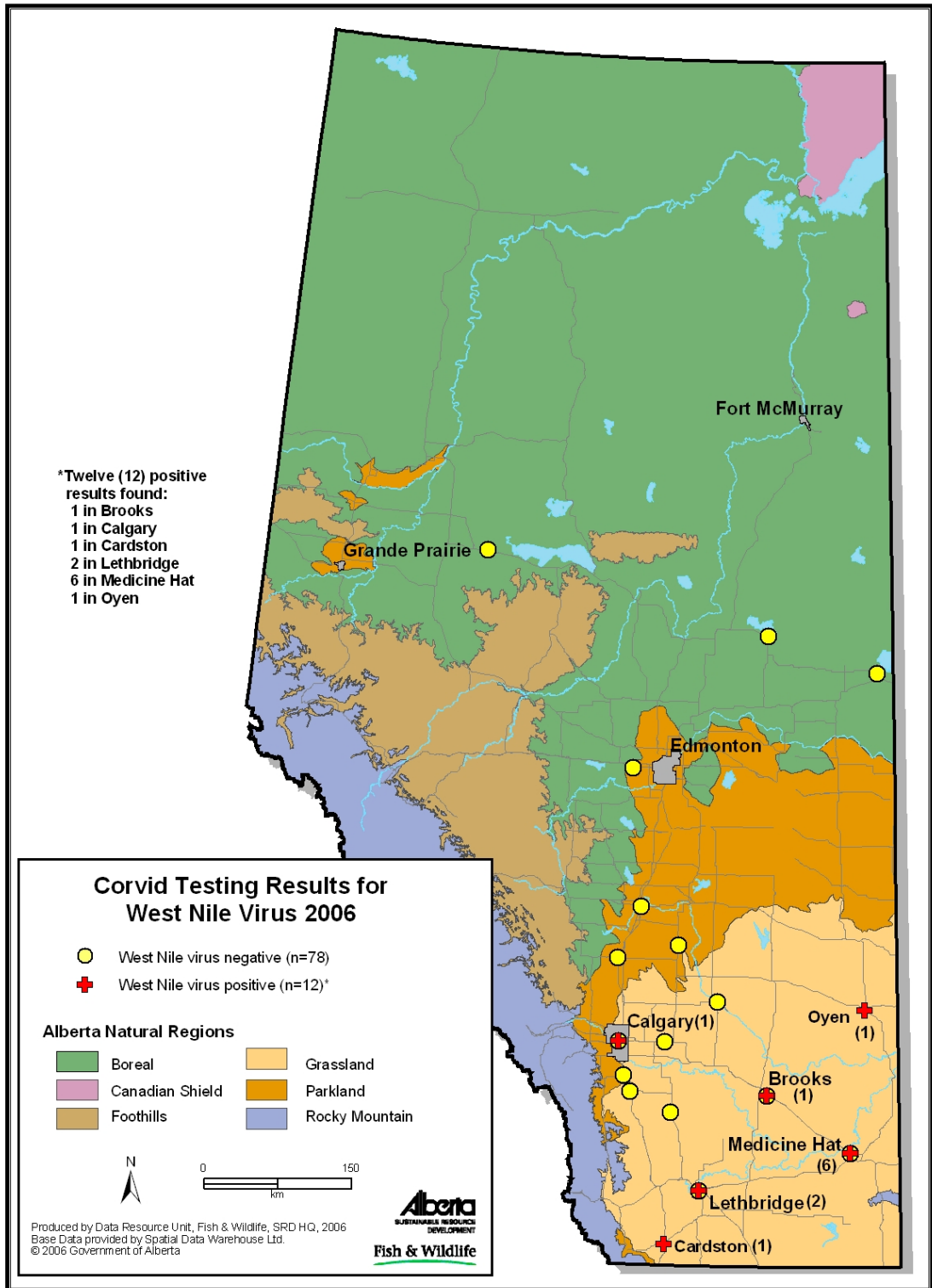


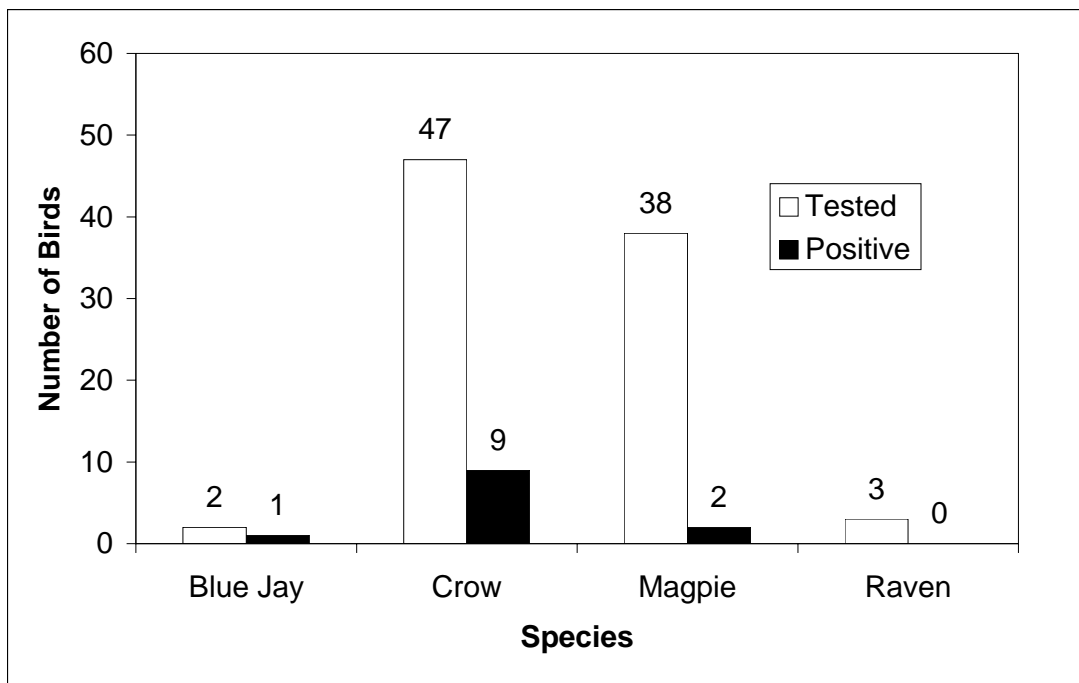
Figure 1. Corvids tested for West Nile virus in natural regions of Alberta in 2006.

Bird Surveillance Data

Submissions

Between June 15 and September 8, 114 dead birds were received for WNV testing. Nestlings were not examined and 24 (21%) of the birds received were unsuitable for analysis (dry, rotten, too young, or unsuitable species). Thus testing was limited to 90 corvids (47 crows, 38 magpies, 3 ravens, and 2 blue jays; Figure 2). In addition, one greater sage-grouse was received for WNV testing.

Figure 2: Species composition of corvids tested for West Nile virus in Alberta in 2006.



The corvids were collected primarily in the Grassland (n = 68, 76%) and adjacent areas of the Parkland (n = 14, 16%) natural regions (Table 1; Figure 1), reflecting the program design of focusing on high risk areas of the province in Grassland Natural Region (Table 2). The few remaining birds came from the Boreal Forest Natural Region (n = 8, 9%), consistent with the low numbers of dead corvids reported from this region.

Table 1: Species composition, geographic distribution, and incidence of West Nile virus in corvids tested in Alberta in 2006.

	Boreal (north)	Grassland (south)	Parkland (central)	Species TOTAL
Blue Jay	0	2(1)*	0	2 (1)
Crow	4	35 (9)	8	47 (9)
Magpie	3	30 (2)	5	38 (2)
Raven	1	2	0	3
All Corvids	8	69 (12)	13	90 (12)

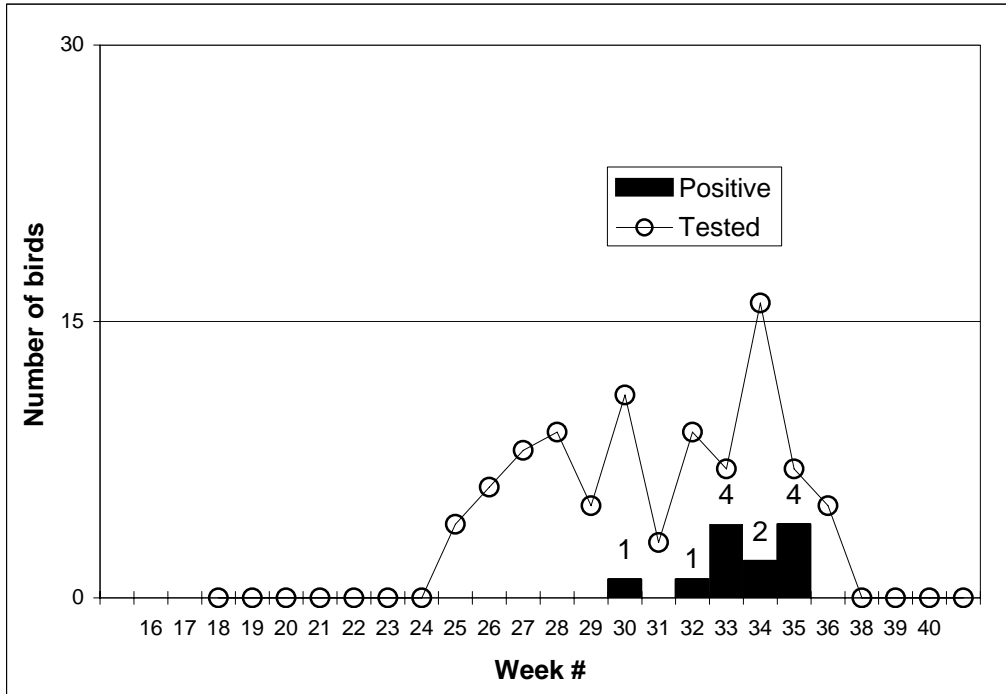
* number tested (number positive)

Table 2: Primary source of corvids tested for WNV in Alberta in 2006 (n = 65).

Urban center	WNV positives and # tested	Proportion of total # tested (%)	Natural Region
<i>Brooks</i>	1 of 7	8%	Grassland
Calgary	1 of 30	33%	Grassland
Lethbridge	2 of 6	7%	Grassland
Medicine Hat	6 of 16	18%	Grassland
Olds	0 of 6	7%	Parkland

Most carcasses were submitted to the lab in July (33%) or August (38%), with the remainder in June (14%) and September (15%; Figure 3).

Figure 3: Corvids tested for West Nile virus in Alberta in 2006. See Table 5 for dates associated with each week. The number above the bar indicates the number of positive birds for that week.



West Nile results

We confirmed WNV in 12 corvids: 9 of 47 crows (19%), 2 of 38 magpies (5%), and 1 of 2 blue jays (Tables 1, 3). All positive birds were collected from the Grassland Natural Region (Table 1, Figure 1) and spanned southern Alberta from Oyen to Cardston. Positive birds were collected in the interval July 28 – September 1. Viral activity was not found in the Parkland, Boreal, Rocky Mountain, Foothills, nor Canadian Shield natural regions, although very few birds were received from these areas.

Table 3: West Nile virus positive birds in Alberta in 2006.

Species	Date Collected	Town	WMU (Wildlife Management Unit)
Crow	July 28	Brooks	108
Crow	Aug 9	Lethbridge	142
Crow	Aug 17	Calgary	212
Crow	Aug 18	Medicine Hat	148
Crow	Aug 18	Medicine Hat	148
Blue Jay	Aug 18	Medicine Hat	148
Crow	Aug 23	Oyen	162
Crow	Aug 25	Lethbridge	142
Magpie	Aug 31	Cardston	300
Magpie	Sept 1	Medicine Hat	148
Crow	Sept 1	Medicine Hat	148
Crow	Sept 1	Medicine Hat	148

The surveillance goal was to identify at least six positive birds in any affected natural region. Once this was achieved, and as recommended by the Provincial West Nile Virus Steering Committee, the program stopped accepting birds from that region. Despite ongoing efforts, the goal of finding six positive birds was not reached until late August. The additional six positive birds from the Grassland region were already en route to the laboratory when public submissions were discontinued.

The sage-grouse submitted for West Nile virus testing was negative.

Discussion

In 2004 and 2005 the virus re-occurred in Alberta but the pattern of occurrence differed significantly from that in 2003³. Although the methods and approach were largely the same, there were fewer dead birds found and fewer positive corvids in 2004 and 2005 (Figures 4, 5). In addition, the proportion of found-dead birds that tested positive for WNV (as an index of viral activity) substantially declined in 2004 and 2005. Infected corvids were detected only in the late summer in 2004 (mid-August to mid-September) and 2005

³ Pybus, M.J. 2005. Alberta West Nile virus wild bird surveillance, 2005; www.srd.gov.ab.ca/fw/diseases/WNV/pdf/2005WNVreport.pdf

(late August), whereas they occurred throughout the summer in 2003 from mid-June to late September. It was suggested that unlike 2003, the virus was unable to establish a summer population and that late summer staging movements of birds brought WNV into Alberta in 2004 and 2005. The majority of infected birds were detected in the Grassland Natural Region in all three years; however, in 2003 a significant number of positive birds also were collected in the Parkland region of central Alberta.

Figure 4: Weekly distribution of corvids tested for West Nile virus in Alberta, 2003- 2006.

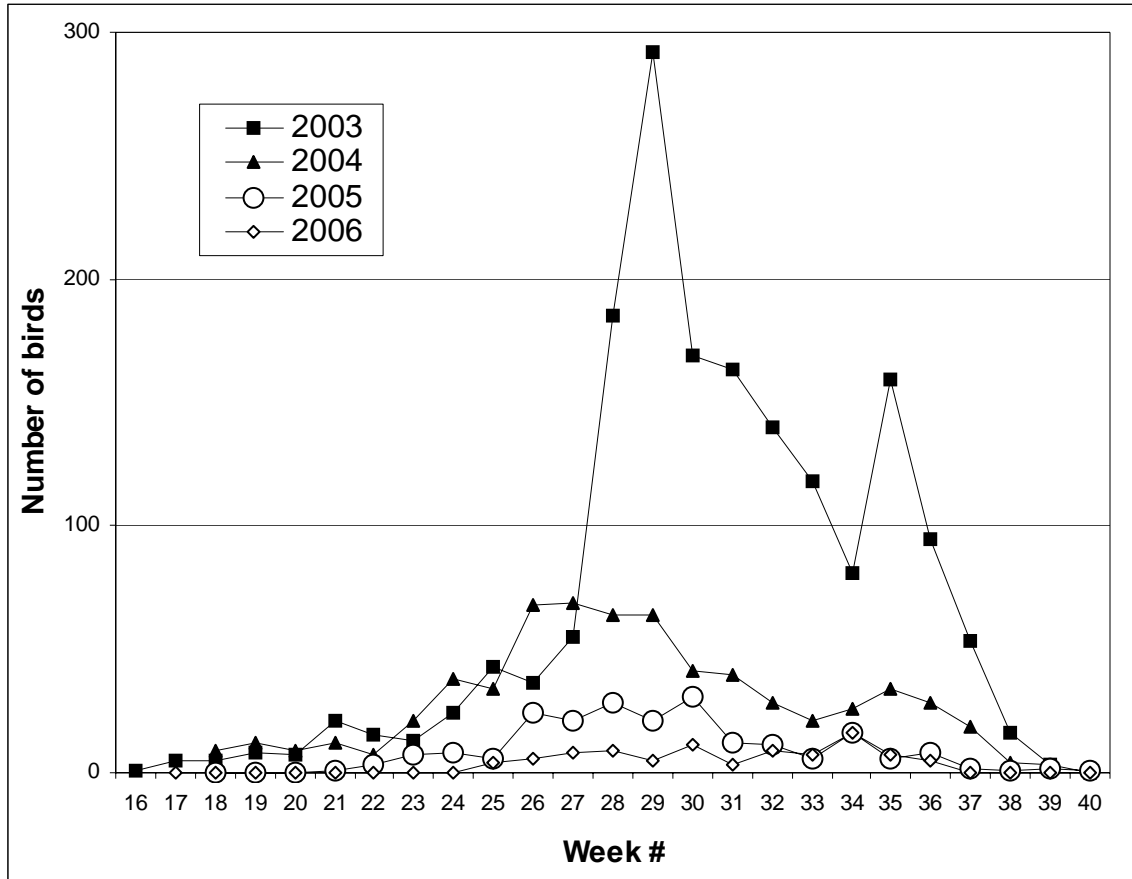
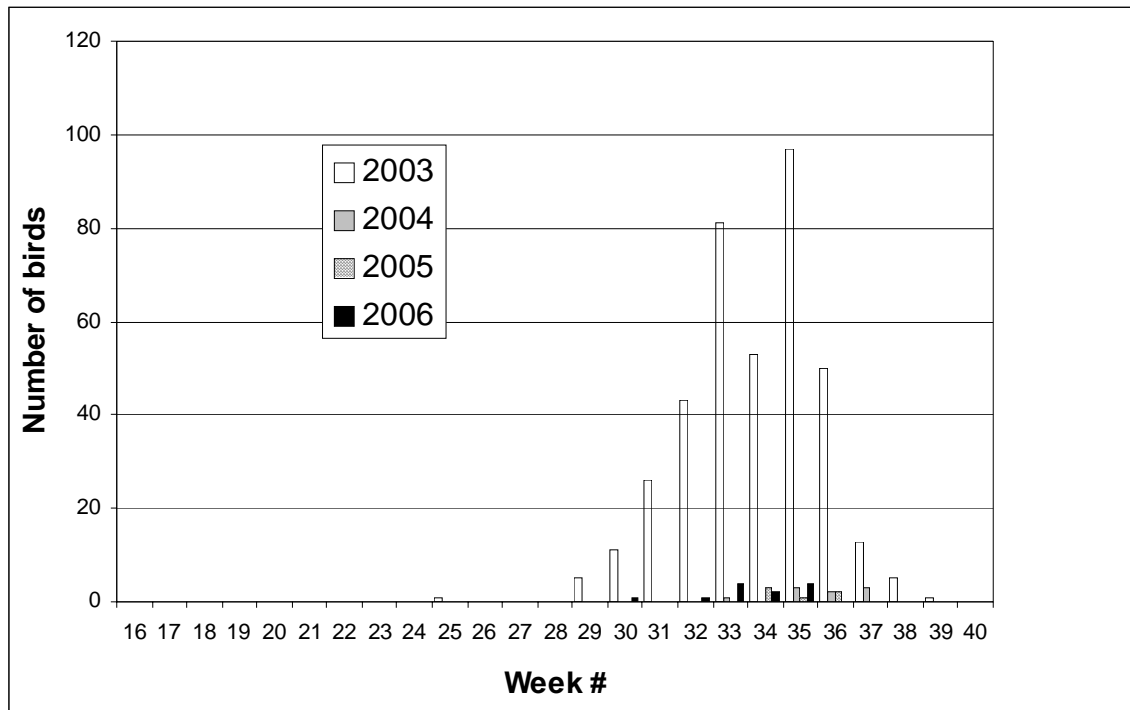


Figure 5: Weekly distribution of West Nile virus-positive corvids in Alberta, 2003-2006.



The pattern of WNV occurrence in corvids in 2006 was intermediate between the major outbreak in 2003 and the reduced viral activity in 2004 and 2005. In 2006 the first WNV-positive bird was found relatively early (Figure 5) and the rate or proportion of birds infected with the virus was higher (Table 4) when compared to the previous two years. This suggests viral activity in birds was higher in 2006 than in 2004 or 2005. This was particularly apparent in crows and less so in magpies. A similar pattern of viral activity was seen in mosquitoes⁴ and reflects the general environmental conditions that promoted faster development and increased abundance of *Culex tarsalis* in 2006 (Alberta Environment, published data). These data further support a generally higher population of WNV circulating in Alberta in 2006. It appears the virus was able to establish a summer population in Alberta, albeit significantly less than that seen in 2003. This is entirely consistent with basic ecological principles of disease occurrence following the introduction of a new virus to a suite of naïve hosts in a new geographic area.

⁴ www.health.gov.ab.ca/public/wnv_evidence2006.htm

Table 4: Proportion of found-dead corvids positive for West Nile virus in Alberta, 2003-2006.

Species	2003	2004	2005	2006
Crow	22.6 (899)*	2.1 (355)	5.8 (102)	19.1 (47)
Magpie	27.7 (835)	0.4 (264)	0 (95)	5.2 (38)
Blue Jay	10.2 (49)	3.8 (26)	0 (6)	1 of 2
Raven	0 (60)	0 (40)	0 (12)	0 of 3
All Corvids	23.8 (1843)	1.4 (685)	2.8 (215)	13.3 (90)

* % positive (# tested)

Table 5. Standardized 2006 Table of Weeks.

Week #	Month	Days	Week #	Month	Days
17	April	24-30	29		17-23
18	May	1-7	30		24-30
19		8-14	31	July/Aug	31-6
20		15-21	32	Aug	7-13
21		22-28	33		14-20
22	May/June	29-4	34		21-27
23	June	5-11	35	Aug/Sept	28-3
24		12-18	36	Sept	4-10
25		19-25	37		11-17
26	June/July	26-2	38		18-24
27	July	3-9	39	Sept/Oct	25-1
28		10-16			

Differences in methodology among years weaken other comparisons (for example, the number of found-dead corvids submitted for WNV testing in 2006 was the lowest since the epizootic began but the 2006 program focused on the Grassland Natural Region and discontinued testing once the program goal of finding 6 positive birds was achieved). However, the proportion of infected birds was highest in the Grasslands region each year since 2003 and it is readily apparent that this region is the primary risk area for WNV in Alberta. Although the overall number of birds tested was lowest in 2006, the proportion of infected birds was higher than in 2004 and 2005. This counter-intuitive result (fewer dead birds, more of them infected) could result from several overlapping hypotheses: 1) increased public familiarity with WNV could lead to less incentive to report mortalities, 2) reduced media attention on WNV relative to previous years could result in generally less public profile and concern, 3) reduced corvid populations relative to previous years could result in fewer birds to be found dead, and/or 4) reduced corvid mortality rates could result from potential increased immunity and survival of crows and magpies.

While the first two hypotheses cannot be quantified, a review of the last 10 years of Christmas Bird Count data (<http://audubon2.org/birds/cbc>) does not indicate any significant effect of WNV on the trends in abundance of crows or magpies overall in Alberta nor in Lethbridge, Medicine Hat, or Dinosaur Provincial Park, all within the Grassland region. There may be intense natural selection pressure to reduce the effects of the virus in conjunction with increased resistance in non-corvid birds and, perhaps, mosquitoes. The mechanism for the selection pressure could involve death and removal of highly susceptible individual birds; thus leaving resistant individuals to produce the future generations and pass on any acquired or inherent immunity. Given the evidence of reduced viral activity and lack of significant bird mortality, it appears that local ecosystems have adapted to the seasonal presence of WNV with limited effects on wild populations of birds in Alberta. Similarly, patterns of reduced bird mortality and viral occurrence across Canada and the U.S. indicate that integration of WNV virus into North American ecosystems is well underway.

Looking at the patterns across all four years, it seems there are two primary requirements for WNV populations to build in Alberta: the virus must be present in birds by mid summer and environmental conditions in southeastern Alberta must favour increased *Culex* population growth. The absence of either component stifles transmission. Early occurrence of virus allows for uptake and amplification by the second generation of *Culex* mosquitoes. Occurrence of the third and fourth generations of *Culex* drives the relative abundance of the virus. Without sufficient populations of mosquitoes, there is not enough transmission among birds to amplify the viral population. Further, with the decline of *C. tarsalis* populations in late August, the virus population quickly declines and disappears. Thus, the WNV risk period in Alberta occurs in July and August, with maximum risk in late July to mid-August.

Future Outlook

West Nile virus was an exotic disease prior to its first appearance in Alberta. Its occurrence in 2003 resulted in a classic epizootic (=outbreak) of significant proportions among naïve corvid populations within the province. Alberta ecosystems had no previous experience with the virus and no inherent means to limit viral activity. In addition, the outbreak was supported by favourable weather conditions, particularly in spring and early summer that supported high *Culex tarsalis* populations in 2003. Now that the primary epizootic wave has passed through the Alberta ecosystems, using dead corvids as a sentinel system to detect the presence of the virus has become less effective. There appear to be significant biases associated with monitoring dead corvids, wherein mortality may be reduced and public reporting may be less sensitive to the mortality that does occur. Thus this method of detecting WNV is unreliable as an early warning system. In addition, as in other locations⁵, dead bird reporting tends to be biased towards large urban centres (like Calgary), which are not the primary areas where *Culex tarsalis* populations accumulate and thus are outside the primary risk area for WNV in Alberta. Furthermore, the general patterns of WNV temporal occurrence and geographic distribution within the province were consistent across all four years from 2003 to 2006 and can now be predicted without additional dead bird data. We can assume that the virus is present in Alberta each summer, particularly in August and in

⁵ Ward, M.R. et al. 2006. Wild bird mortality and West Nile virus surveillance: biases associated with detection, reporting, and carcass persistence. *Journal Wildlife Diseases* 42:91-106

the southeast, and management actions to protect human and equine health can be based on that assumption.

The recommendation from the Provincial WNV steering committee is that the WNV bird surveillance program in Alberta be modified in 2007 to focus on clusters of unusual mortality of wild birds or mammals. Routine testing of public submitted birds should be discontinued. The WNV surveillance programs from 2003-2006 significantly broadened our understanding of the epizootiology of WNV in Alberta. Based on presence of suitable biological and environmental factors that lay the foundation for WNV transmission, there is little doubt that the virus will return to southeastern Alberta each year, and if environmental conditions are sufficient, may extend into the adjacent areas of central Alberta. Routine testing of found-dead corvids will not significantly add to our understanding of the virus, nor will it change our management actions. The public and veterinary risk can be generalized across these regions and information directed accordingly.

The lack of detectable mortality in greater sage-grouse is encouraging. This species is endangered in Alberta and has low populations across its current range in northern prairie provinces and states. Initial concerns regarding excessive mortality as West Nile virus spread into sage-grouse range in 2003 were well founded. However, it appears the long term effect will not be devastating to the residual populations.

III. Horse Surveillance

Submitted by Dr. Gerald Ollis and Lisa Morin, *Alberta Agriculture and Food*

Introduction

Horses become infected with West Nile virus (WNV) when they are bitten by mosquitoes that carry the virus. Research suggests that most horses bitten by infected mosquitoes will not develop clinical disease, but instead will eliminate the virus uneventfully. Symptoms of WNV can include weakness, depression, muscle tremors, and an inability to rise. There is no specific treatment for horses affected with WNV. Up to 35 percent of horses that develop clinical signs may die or have to be euthanized due to complications from the illness.

WNV in horses became a provincially reportable disease in Alberta in 2003, meaning all suspected or confirmed cases are required to be reported to the Office of the Chief Provincial Veterinarian (OCPV). From 2003 to 2005, Alberta Agriculture and Food, asked Alberta veterinary practitioners to complete surveys on each horse suspected of having the virus. In 2003 and 2004, the surveys focused on horse location, clinical signs and vaccination information. Potential environmental and age/sex/breed risk factors were also queried, in order to gain some insight into what factors may contribute to a horse becoming infected. Surveys in 2005 were shortened to only include location, clinical signs and vaccination information. In 2006, veterinarians were only asked to provide additional information on horses that tested positive for the virus, not suspects. This information included, vaccination information and whether or not the horse had recently traveled.

WNV in all species of animals is Immediately Notifiable under Canada's *Health of Animals Act*, meaning that veterinary laboratories are required to contact the Canadian Food Inspection Agency (CFIA) regarding the suspicion or diagnosis of the virus.

Table 1 summarizes the occurrence of WNV in Alberta horses in 2003, 2004, 2005 and 2006.

Table 1. Summary of West Nile virus (WNV) in Horses in Alberta in 2003, 2004, 2005 and 2006

Year	Positives	Deaths per Positive Case
2003	170	59 (34.7%)
2004	4	1 (25.0%)
2005	3	1 (33.3%)
2006	9	unknown

Objectives

The objectives of the 2006 WNV surveillance program and survey of WNV suspect horses in Alberta were to:

- Determine the number of horses affected with WNV in Alberta in 2006,
- Determine the location of infected horses in the province, and
- Determine vaccine usage of positive cases-

Methods

WNV in horses is a reportable disease in Alberta, therefore, all veterinary practitioners who examined a horse with suspicious clinical symptoms were required to report this fact to the OCPV. Veterinarians and private diagnostic laboratories notified the OCPV of suspected cases and the results of laboratory tests (IgM Elisa serology), which confirmed the disease.

Results

The first case of WNV in horses was reported at the end of August 2006, with reporting continuing until mid-September. Nine horses confirmed positive for WNV. None had been vaccinated for the virus. Four horses were euthanized due to complications from the virus, one died and four were alive as of our last contact with the veterinarian.

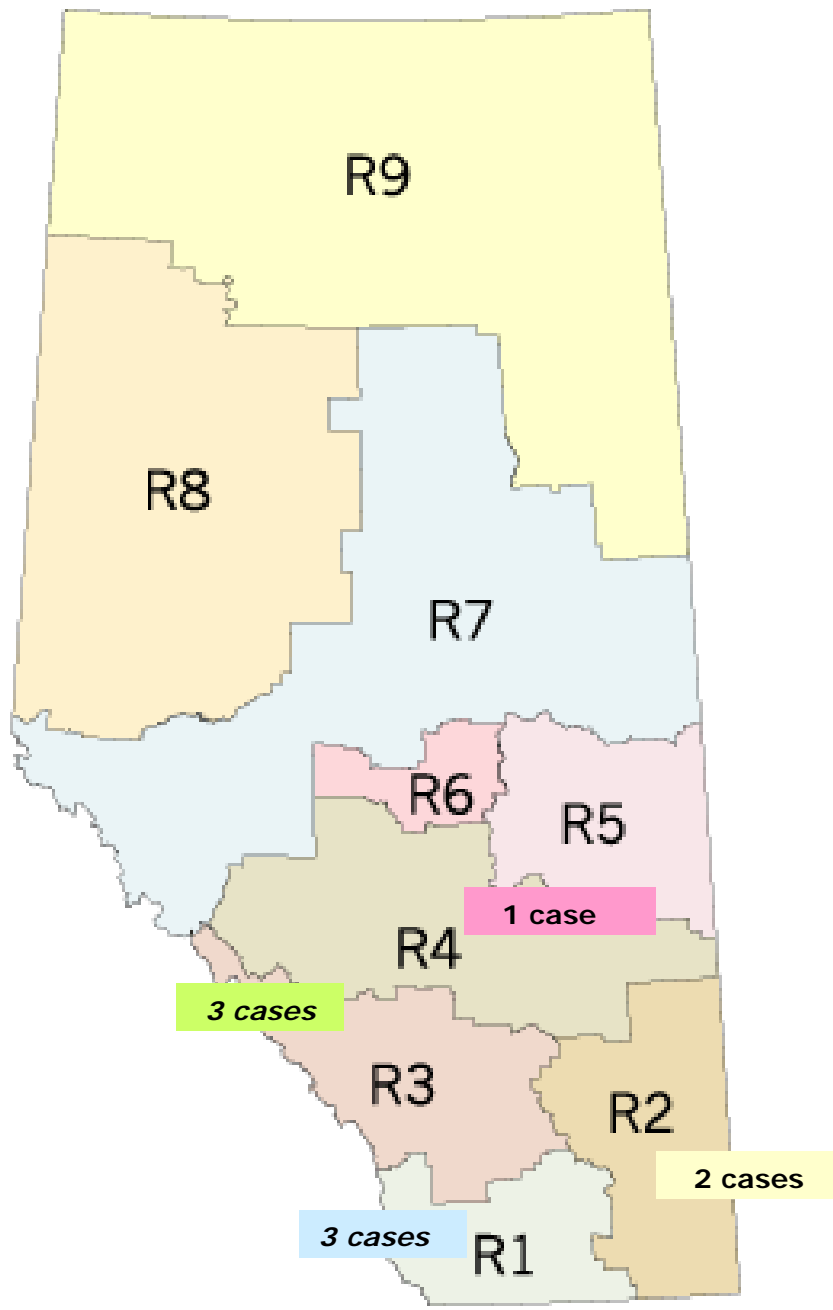
Geographic Distribution

The geographic distribution of confirmed WNV cases according to health authority region is illustrated in Figure 1. Three horses confirmed positive for WNV were from Chinook health region, two were from Palliser health region, three were from Calgary health region and one was from David Thompson regional health authority.

Conclusion

In 2006, there were nine horses that were laboratory confirmed positive for WNV in Alberta.

Figure 1. Geographic Distribution of Equine Laboratory Confirmed Positive Cases of West Nile virus (WNV) by Regional Health Authorities in Alberta (2006) (n= 9)



IV. Human Surveillance

Submitted by: Kimberley Simmonds, *Alberta Health and Wellness*

Introduction

In 2006 there continued to be three categories of West Nile virus (WNV) infection reported, West Nile Neurological Syndrome (WNNS), West Nile Non-Neurological Syndrome (WNNon-NS), and West Nile virus Asymptomatic Infection (WNAI). Previously West Nile Non-Neurological Syndrome (WNNon-NS) was called West Nile virus Fever (WNVF).

Methods

The method of reporting WNV cases to Alberta Health and Wellness varies by the category of WNV infection. Both confirmed and probable cases of WNNS are reportable by fastest means possible in addition to the standard reporting requirements for notifiable diseases in Alberta. Both WNNon-NS and WNAI require only the standard reporting requirements for notifiable diseases in Alberta. All three categories of WNV infection require the completion of the Alberta Enhanced Surveillance Report for West Nile Infection.

Results

Number of Cases

There were 40 cases of WNV reported in Alberta in 2006. There was one case of West Nile Neurological Syndrome and thirty eight cases of West Nile Non-Neurological Syndrome. There was one asymptomatic case.

Gender

Twenty three of the cases of WNV infection were males and the remaining seventeen cases were females. None of the cases were pregnant.

Age Distribution

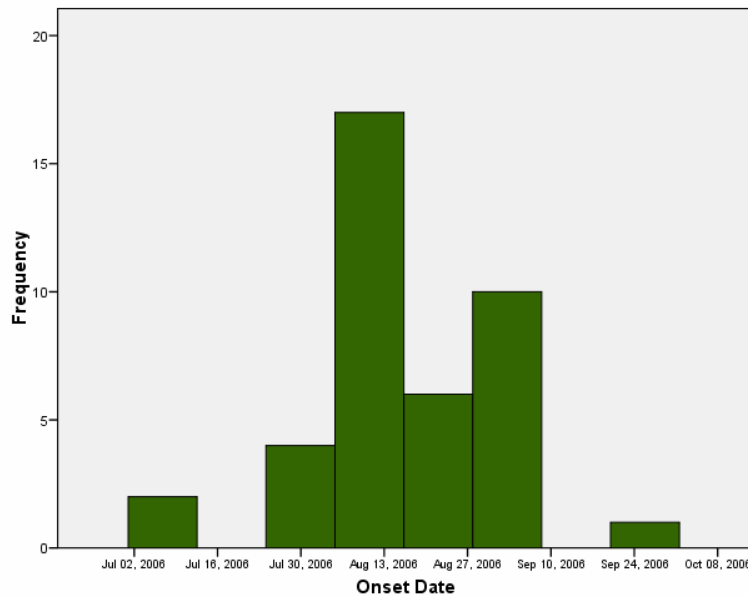
Mean age at symptom onset is 42.1 years, with an age range of 8 to 69 years. The age specific rates remain very low.

Age Group	Number of Cases	2006 Population	Rate (per 100,000)
<1	0	43018	0.0
1-4	0	165297	0.0
5-9	1	206910	0.5
10-14	0	226372	0.0
15-19	1	239058	0.4
20-24	3	245053	1.2
25-29	4	240415	1.7
30-39	4	475640	0.8
40-59	23	969432	2.4
60+	4	486833	0.8

Epi Curve

The 40 cases of West Nile virus infection have symptom onset between July 1 and September 25, 2006. The incubation period for WNV infection is variable, between 2 and 15 days after exposure. In 2006 the majority of cases were exposed to the virus between late July and early August. The first cases had symptom onset earlier than previous years.

Human West Nile virus Cases in Alberta, by Symptom onset date, 2006
(n=40)



Geographical Distribution

There were thirty eight cases of WNV infection that were not associated to travel outside of the regional health authority of residence to areas with West Nile virus activity. All of the locally acquired cases remain in the three southern most health regions.

Hospitalization/Deaths

No deaths as a result of West Nile virus infection were reported in 2006. Four of the 40 cases were hospitalized as result of their infection, including the one West Nile virus Neurological Syndrome case.

Summary

Despite the substantial number of cases of WNV infection in Alberta in 2003 (275 cases), there were no locally acquired cases in 2004 and only seven in 2005. In 2006, there was an increase to 40 cases. This is likely due to the warm summer. The geographic distribution of cases indicates that residents of the south eastern most region of the province are most at risk for WNV infection, either due to the higher concentration of *Culex* mosquito population in the area.

V. Mosquito Surveillance Program

Submitted by: Jock McIntosh, *Alberta Environment*

Summary

Alberta Environment implemented the 2006 mosquito surveillance component of the West Nile virus Alberta Response Plan in cooperation with 18 Alberta municipalities and the Canadian Forces Base Suffield. A total of 642 trapping nights occurred over the span of 13 weeks from June 13 until September 6, 2006. There were a maximum of fifty-nine carbon dioxide baited CDC (Centre for Disease Control) traps that operated within the boundaries of six southern regional health authorities. Traps operated at least one night per week and captured 396,470 adult female mosquitoes that were sorted and processed for the surveillance program. A total of 22,449 mosquitoes were separated from this collection and submitted in a total of 861-pooled samples of the mosquito species *Culex tarsalis*. These were forwarded from points throughout the southern half of the province on a weekly basis to the Provincial Laboratory for Public Health (Microbiology), Calgary where they were analyzed for the presence of West Nile virus (WNV).

In 2006, the first two pools of *Culex tarsalis* mosquito adult specimens were confirmed for the presence of WNV in Alberta from traps operating on July 18. Subsequent to that there were an additional 115 pools detected until September 6, 2006 for a total of 117 WNV positive pools over the entire program. The first detections were found in the Palliser Health Region, followed by the Chinook, Calgary, David Thompson and East Central Health Regions.

Weather conditions through the 2006 season were ideal for operating mosquito surveillance traps. Consistent heat through the southern part of the province provided ideal conditions for *Culex tarsalis* development and their populations thrived, as well as increasing their geographical area of activity, which had been suppressed the previous two years by cooler temperatures. Coinciding with warm temperatures and the subsequent increased reproductive and biting activity of this mosquito species, an increase in the detection of West Nile virus was observed in the mosquito samples collected. This was first observed in the southeast corner of the province and moved east as far as the Lethbridge area and north as far as Hanna. Similar to previous years of the program, a pattern of virus activity was noted that coincided with the population peak activity of *Culex tarsalis*. This occurred from mid-July until mid-August, after which there was a significant drop in mosquito-virus activity. This appears related to the onset of diapause in this mosquito species when, triggered by shorter day length, they suspend reproductive and biting activity in anticipation of freezing temperatures. In addition, during the course of the 2006 season when virus activity was at its peak, there were no positive detections of virus in other samples of Alberta mosquito species.

Across North America mosquito surveillance continues to be an effective tool in observing population increases in vector species and confirming the activity of the virus, which allows for meaningful alerts to the public. Surveillance of this nature has provided the observation of a continued pattern of activity in the southeast quarter of the province, where consistent summer heat predominates. In this area of the province there appears to be a typical seasonal and regional pattern of virus activity that coincides with the

success of *Culex tarsalis* development, however consistent warm weather may well expand this activity more west and north into the Parkland natural region in any year when all contributing factors are in place. This would include presence of the virus, the presence in significant numbers of a competent mosquito vector (i.e. in Alberta it only appears to be *Culex tarsalis*), and a pattern of consistent warm weather with average daily temperatures that remain above 16 to 20°C during July and August.

Introduction

A variety of mosquito species are able to draw virus from the blood of infected birds and pass the virus on to others; however, in *Culex* spp. the virus appears to replicate (reproduce) more extensively within each mosquito. Thus, *Culex* mosquitoes are the most efficient transmitters of WNV and directly contribute to increasing the amount of virus circulating in the environment. In Alberta, *Culex tarsalis* is the primary vector of WNV. This species prefers shallow, non-moving water bodies and thrives in the hot dry conditions present in southern Alberta. Pools of standing water that accumulate in mid-to late summer at the edges of drying ponds, in old tires and rain gutters, or on irrigated lands are perfect for the development of this species. Adult females attempt to overwinter and become active in late May to lay the first generation of eggs. Two, three, and sometimes four generations occur each summer, depending on suitable environmental conditions. As day-length shortens in the fall, metabolic changes direct the last generation of females to abstain from taking blood. Instead, they seek a warm, dry place to spend the winter in a state of suspended animation.

The surveillance of mosquitoes assists in understanding the relationship between the success of WNV as a vector-borne disease and how it is influenced by mosquito species and numbers, and how they are both influenced by climatic conditions.

The mosquito surveillance program component of the “*West Nile Virus: Alberta Response Plan 2006*” was again established throughout the six southern most regional health authorities in Alberta.

Objectives of Surveillance

The overall objectives of the 2006 Mosquito Surveillance Program were to:

- alert the public when the virus had built up to the point of detection in mosquitoes.
- to perform WNV testing of *Culex* mosquito pools in different geographical areas of the province. An additional intent was to monitor for the virus in other species should it become active in *Culex* populations.
- to study how climate and environmental factors in Alberta influence mosquito survival and virus activity.

Data and information collected from Alberta’s surveillance program is intended to be combined with that collected in other provinces to: provide a better understanding of the role of the mosquito in WNV transmission in Alberta, determine how the virus is

developing across Canada, to assist in identifying factors that determine the success of the virus, and to help guide decisions regarding mosquito control strategies.

Methods of Mosquito Surveillance

Surveillance Centres

Municipalities participating in the 2006 surveillance program included those listed in the following table.

Regional Health Authority	Participating Municipalities
Capital	City of Edmonton
East Central	MD of Wainwright, MD of Provost
David Thompson	Town of Drumheller, Special Areas 2 & 4
Calgary	City of Calgary, Wheatland County, Vulcan County, MD of Willow Creek
Palliser	City of Brooks, City of Medicine Hat, County of Newell, Special Area 3, County of Forty Mile
Chinook	City of Lethbridge, County of Warner

The University of Alberta operated one trap centre (of four trapping points) in Manyberries as a part of their monitoring project involving the endangered Sage grouse. In addition, there was also a trap centre (of two traps) that operated from the Canadian Forces Base Suffield.

Operational Procedure and Testing

At the onset of the program, mosquito identification training and Alberta specific taxonomic keys were provided to municipal staff to ensure they were capable of at least separating *Culex* species from the other mosquito species typically captured in the traps.

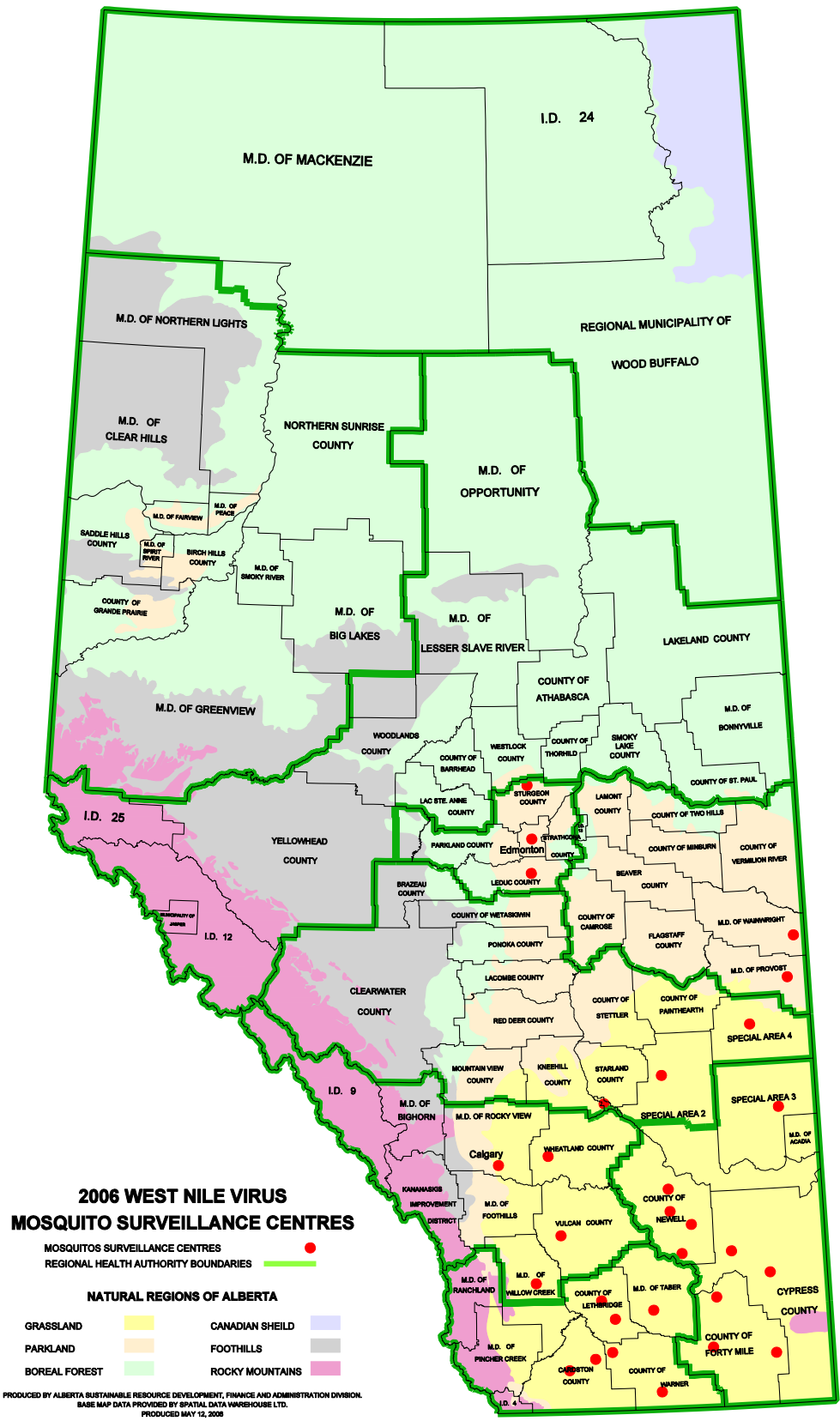
Traps used to capture mosquitoes were the standard CDC (Centre for Disease Control) model⁶ used for monitoring diseases in insects. At least two traps were issued to all surveillance centres. Traps were operated in accordance with the West Nile virus National Steering Committee Guidelines (i.e. they were baited with carbon dioxide, in the form of dry ice or pressurized tanks, and operated without lights).

Municipalities commenced operation of the traps on June 13, and all were finished on September 6. A maximum of fifty-nine CDC traps were operated one night per week (usually Tuesday evenings) over the 13-week surveillance period for a total of 642 trapping nights. Live adult female mosquitoes were collected, killed by freezing,

⁶ Model 1012-CO₂, available from J.W. Hock Company, California

identified to species, and sorted into pools of no more than 50 adults per pool (usually each Wednesday). The pooled mosquitoes were placed in vials and shipped to the Provincial Laboratory for Public Health (Microbiology) in Calgary (on Thursdays and Fridays).

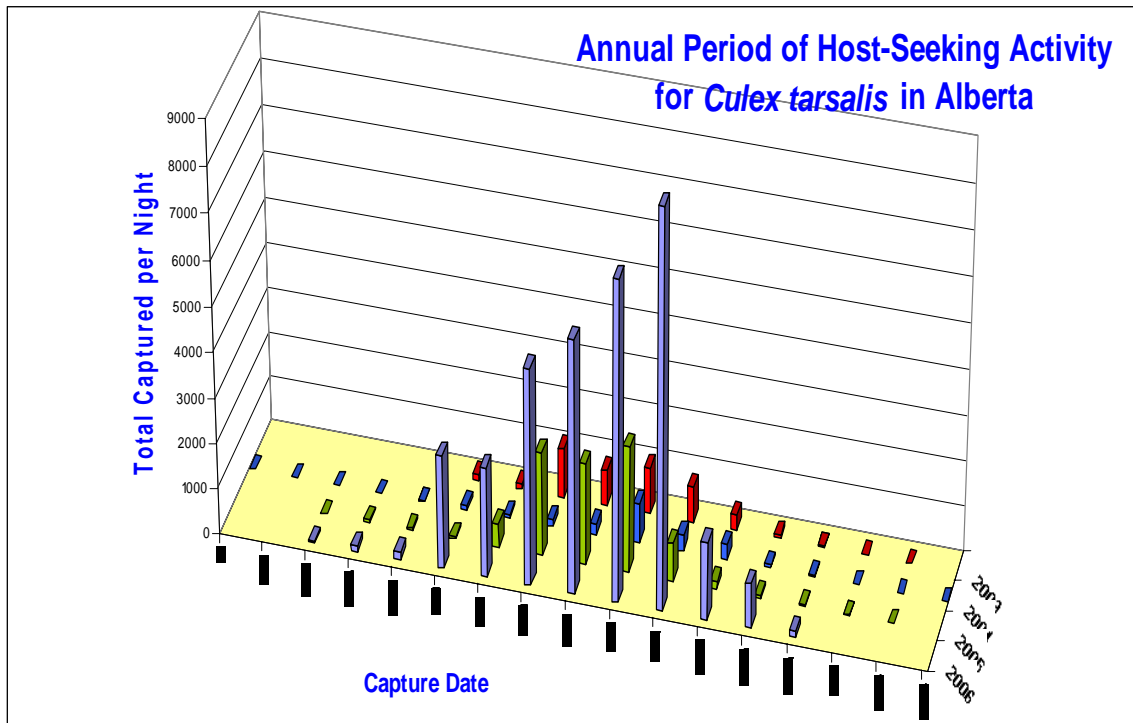
The Provincial Laboratory analyzed the mosquito pools for presence of WNV using both Nucleic Acid Sequence Based Amplification (NASBA) and Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) methods. Results of analysis were provided to Alberta Environment on a maximum 4-day turnaround basis and, in turn, Alberta Environment provided the results to participating surveillance centres and health regions the Monday following the trapping event. Weekly summaries were also posted on the Alberta Health and Wellness website.



Results

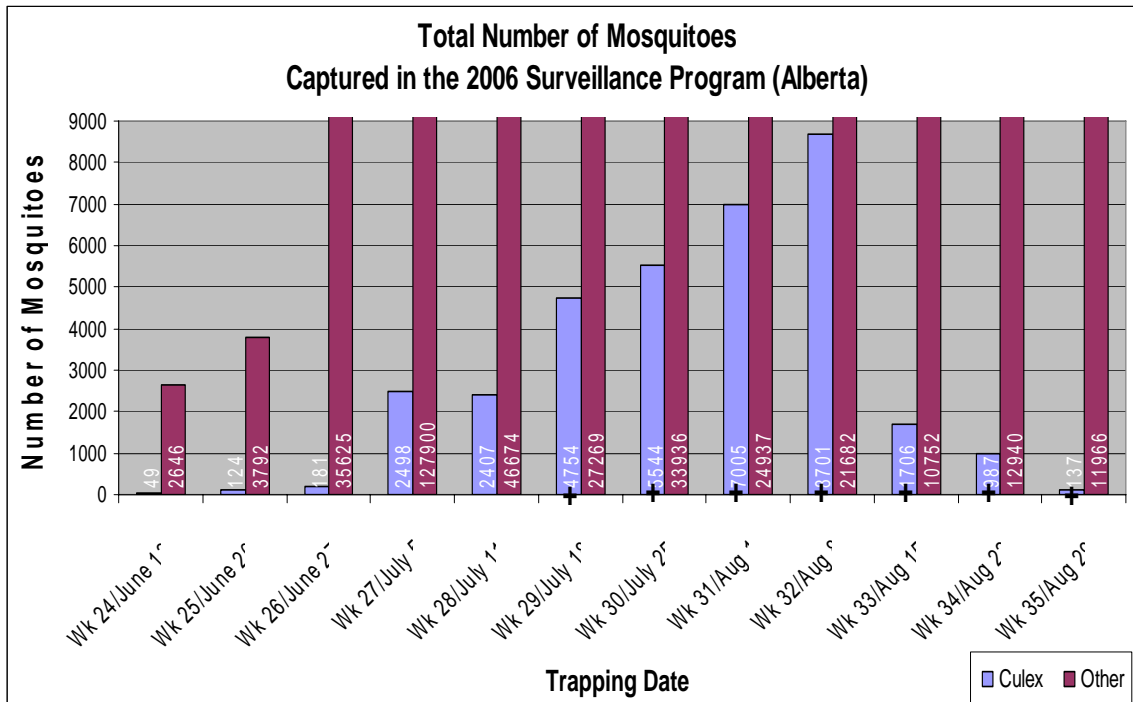
At commencement of the 2006 Mosquito Surveillance Program overall weather conditions in southern Alberta began to be conducive to *Culex tarsalis* development and remained consistently warm until mid-August. As a result, all trapping events in all municipalities operated efficiently and were not impacted by inclement weather. Traps produced good catches and the numbers of *Culex tarsalis* attracted to the traps were higher this year than any other operational year of the program (Figure 1). Sample collection, sorting and identification by the participating municipalities, and virus analysis conducted by the Provincial Laboratory in Calgary resulted in timely weekly reports on mosquito-virus activity being delivered to provincial health officials, regional Medical Officers of Health, health inspectors, municipal participants and officials, Agricultural Fieldmen, and other interested parties.

Figure 1. Comparison of the Annual Period of Host-Seeking Activity for *Culex tarsalis* in Alberta determined through Carbon Dioxide Baited CDC Trap Surveillance from 2003 to 2006



Culex tarsalis, were initially found to be active in the southeast quarter of the province in early June through sampling water standing from snow melt and in irrigated fields. Trap operation did not produce significant numbers until the first week in July, at which time population numbers increased each week, peaking the second week in August (Week 32). In mid-August a drastic decline in numbers being attracted to the traps was observed and this was not influenced by inclement weather (Figure 2). At this time shorter day length triggers the state of diapause, where this species suspends reproductive and biting activity in anticipation of freezing temperatures.

Figure 2. 2006 population trends of all mosquitoes captured in surveillance traps in comparison to *Culex tarsalis* mosquitoes captured.



Over the 13 week surveillance period there were over a total counted of 396,470 adult female mosquitoes captured, of which 22,449 *Culex tarsalis* adult females were separated, identified, and sorted into 861 pools of mosquitoes that were submitted for WNV testing. In addition, there were an extra 72 pools of other mosquito species tested for virus. One hundred and seventeen West Nile virus positive pools of *Culex tarsalis* were confirmed commencing July 18 until September 5 (Table I). There was no virus confirmed in any of the other species that were separated from the trap catches and analyzed.

Table I. Weekly Summary of when and where West Nile virus positive mosquito (*Culex tarsalis*) pools were confirmed over the 2006 Mosquito Surveillance Program.

WEEK #	CAPTURE DATE	NUMBER OF WNV POSITIVE POOLS	CUMULATIVE NUMBER OF WNV POSITIVE POOLS	AREA OF TRAP LOCATIONS WHERE POSITIVE POOL CONFIRMED
24	Jun 13	0	0	
25	Jun 20	0	0	
26	Jun 27	0	0	
27	Jul 5	0	0	
28	Jul 11	0	0	
29	Jul 18	2	2	Tilley, Medicine Hat
30	Jul 25	10	12	Rolling Hills, Medicine Hat, Burdett
31	Aug 1	12	24	Brooks, Rolling Hills, Medicine Hat, Foremost, Coaldale, Magrath
32	Aug 8	44	68	Hanna, Claresholm, Strathmore, Vulcan, Bow Island, Brooks, Tilley, Rolling Hills, Medicine Hat, Oyen, Foremost, Milk River
33	Aug 15	25	93	Vulcan, Bow Island, Tilley, Rolling Hills, Medicine Hat, Foremost, Empress
34	Aug 22	19	112	Provost, Hanna, Bow Island, Tilley, Rolling Hills, Medicine Hat, Oyen, Foremost, Milk River, St. Mary's, Picture Butte
35	Aug 29	4	116	Brooks, Medicine Hat, Coaldale, Magrath
36	Sep 5	1	117	Brooks

Data provided by Environment Canada (Figures 3, 4, 5 and 6), shows the accumulated degree-days⁷ above 16°C, which is the optimal developmental temperature for *Culex tarsalis*. Since the onset of WNV in Canada, the potential correlation between weather, mosquito activity and risk of human infection has been examined. The following figures from the end of August summarize the areas with over 200 to 300 accumulated degree-days above 16°C (in yellow), and are where *Culex* populations were captured in the traps. The area where accumulated degree-days exceeded 400 (in orange and red) was where *Culex* activity and virus activity are more predominant and where infective mosquitoes were consistently captured until the end of August, even with declining population numbers.

Figure 3. 2003

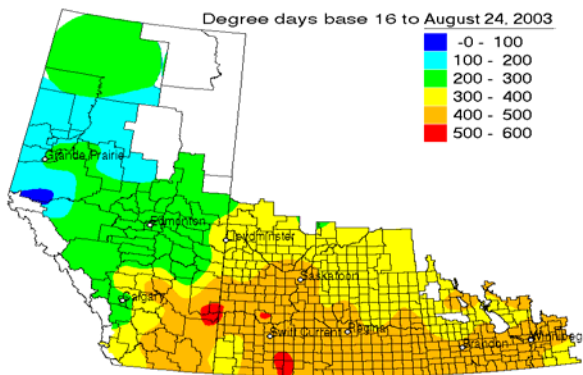


Figure 4. 2004

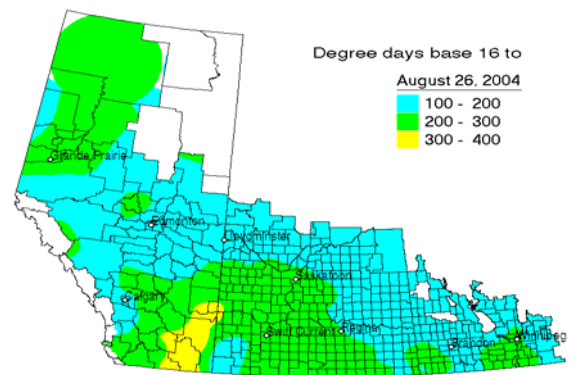


Figure 5. 2005

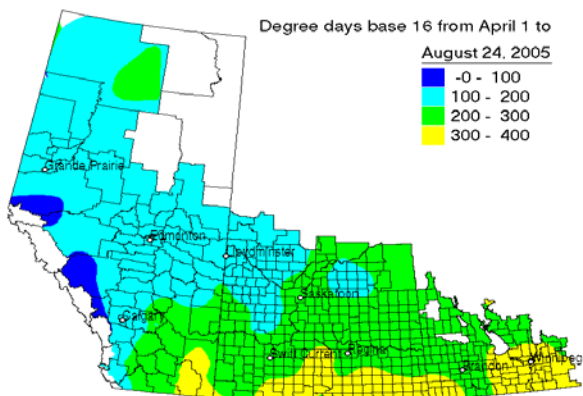
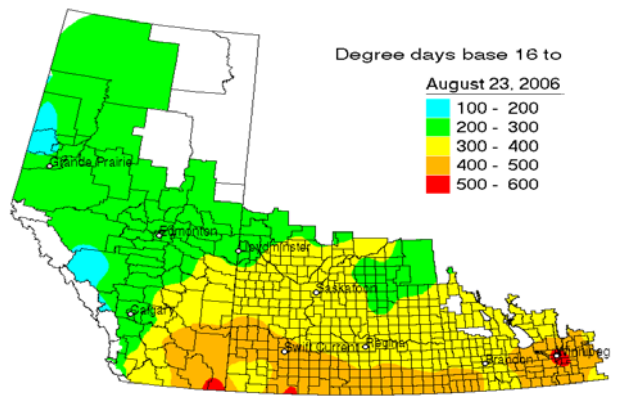


Figure 6. 2006



⁷ Accumulated degree days are a seasonal accumulated number of mean daily degrees above a base temperature determined for insect development.

Conclusion

The 2006 West Nile virus Mosquito Surveillance Program was again effective in demonstrating how the regular operation of carbon dioxide baited traps situated in various municipalities can show the presence and movement of WNV. Ideal weather conditions were experienced for the development of the species of mosquito, *Culex tarsalis*, which is known to transmit the virus to humans in Alberta. Coinciding with the activity of that species and cumulative heat, the virus was shown to amplify and spread with the typical seasonal peak of activity of this mosquito species. The last four seasons of surveillance clearly demonstrates the relationship of West Nile virus activity coinciding with the peak reproductive and biting activity of *Culex tarsalis* populations.

Although there was little activity in the Parkland natural region again in 2006, with the consistent heat experienced in the Grassland and Parkland region *Culex tarsalis* is re-establishing a population presence north of Hanna since being suppressed in their activity by cooler summer weather in 2004 and 2005. As a result, with a repetition of similar weather conditions experienced in 2006, there would be an expectation of virus activity extending north into the Parkland natural region in 2007.

The mosquito surveillance program continues to serve an important purpose in monitoring *Culex tarsalis* populations and their relationship with the amplification and transmission of West Nile virus. Weekly reports served to inform regional health authorities and municipal mosquito control program personnel. The program provides confirmation of primary vector activity in an area, and that the virus is at a level where the public can be alerted to take increased personal protective measures

Recommendations

As a result of the repeating trend of mosquito-virus activity associated with the annual weather dependent success of *Culex tarsalis* populations, the window of virus transmission to humans appears greatest from mid-July to mid-August. As long as the primary response to this activity will be enhanced personal protective measures, then consideration can be given to reduced mosquito surveillance in an annual program. A few traps could be strategically located and operated annually within this time period in the six southern health regions to confirm presence and movement of the virus in Alberta. This could either be operated by a municipality that has expertise associated with the annual operation of a nuisance mosquito control program or a health authority.

VI. Targeted Mosquito Larval Control Program

Submitted by Jock McIntosh, *Alberta Environment*

Summary

In 2006, Alberta Health and Wellness again provided funding to municipalities to control targeted mosquito species to assist in reduction for the amplification and spread of West Nile virus (WNV) in the higher risk areas of the province. The program authorized and guided municipalities through their implementation of control strategies specifically targeting the *Culex tarsalis* mosquito in the aquatic larval stage of their life cycle. The adult female of this species is known in the Prairie Provinces to be primarily responsible for the transmission of the disease to humans.

Of 104 municipalities eligible to participate in the 2006 *West Nile virus Targeted Mosquito Larval Control Program*, 79 (76%) applied for grant funding. Alberta Environment trained municipal staff and issued pesticide applicator certificates restricted to the use of specific larvicides for the 2006 season. The Department issued certificates to 90 municipal employees and ensured authorizations were in place to conduct spraying within 80 municipalities.

Municipal mosquito program personnel received training in late May and early June, commencing programs June 1 and concluding September 15, 2006. As in previous years, *Culex tarsalis* larvae were first noticed in small numbers in mid-June and became more noticeable by mid-July. In late July and early August, population numbers again reached peak level for the year. The first WNV positive mosquito samples were detected July 18, 2006.

In 2006, participating municipalities provided recommendations in their year-end summaries indicating continued support for the program to assist in awareness and address public concern. Recommendations included more advance notice of the program by Alberta Health and Wellness in order to budget and hire qualified staff, continuation of mosquito-virus surveillance (to provide an alert system and to gauge the extent of threat to Albertans), continued training and updates in dealing with health issues and staff turnover, and supporting a continued partnership to further understand and develop expertise in addressing WNV.

Objectives

The primary vector of West Nile virus in the Prairie Provinces is the *Culex* species of mosquitoes, the most prevalent species in southern Alberta being *Culex tarsalis*. The *West Nile Virus Targeted Mosquito Larval Control Program* served to:

- distinguish this species from other species that have been documented in Alberta and focus on strategies targeted at its control.
- administer, fund and implement targeted mosquito control programs that encompassed a defined area around populated communities/municipalities, in particular those in higher risk zones.
- identify larval development sites and to take appropriate and responsible control measures, which would include the application of approved mosquito larvicides.

Guidelines for Mosquito Control

On April 25, 2006, the Ministers of Health and Wellness and Municipal Affairs jointly announced the renewal of the *West Nile virus Targeted Mosquito Larval Control Program*. In the third year of this program the government committed \$752,000 to support the control of mosquito larvae in areas of the province where the risk of West Nile virus (WNV) infection is considered to be the highest. Conditional funding was made available to municipalities in the southeast portion of the province where there has been the highest rate of WNV infection to date in birds, horses, mosquitoes and humans. Grant guidelines and application forms were developed and sent to eligible municipalities on May 12, 2006.

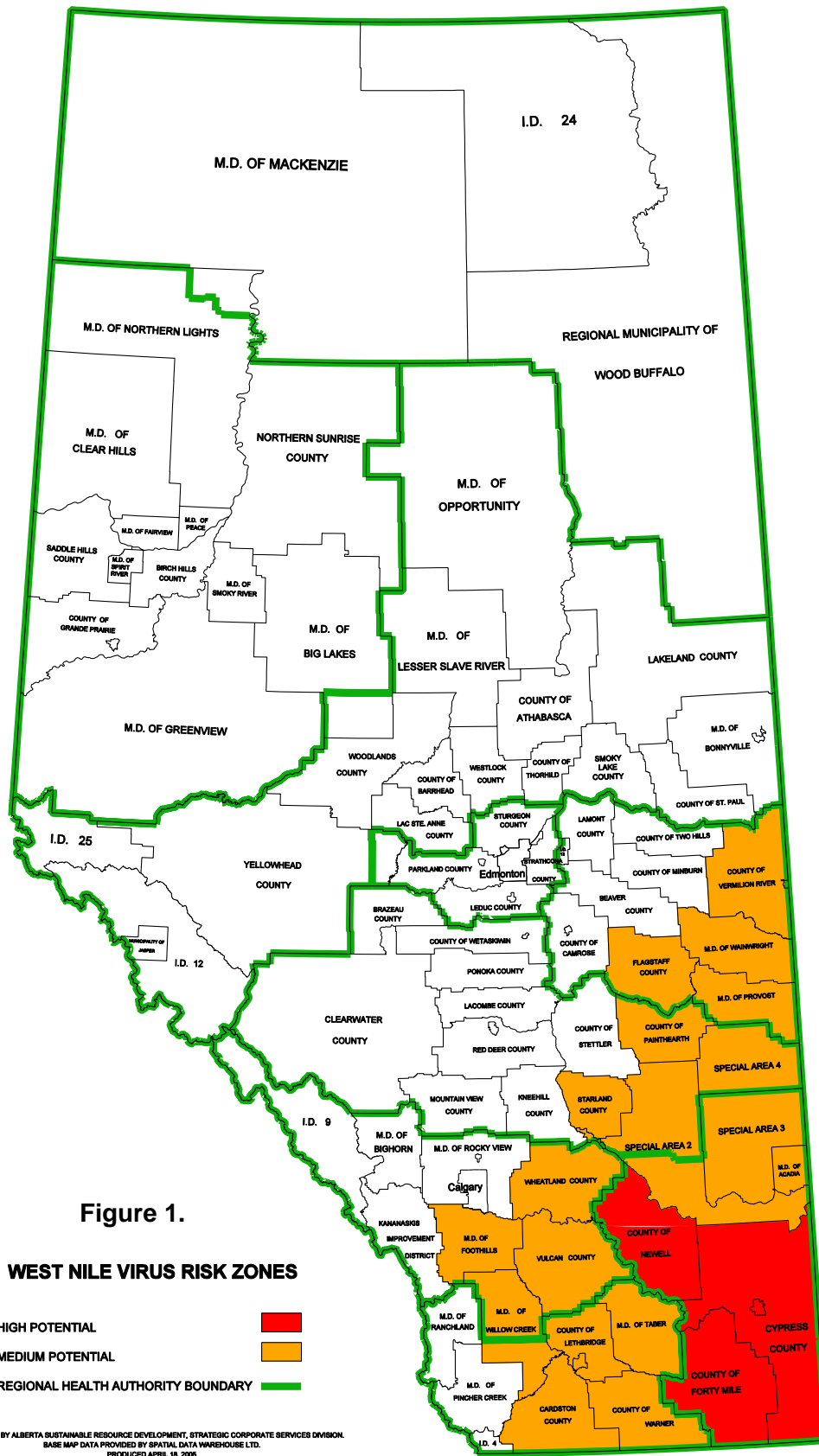
The 2006 program guidelines were similar to the previous year but with the following key change:

- the program continued to target municipalities in high and medium risk areas. However, the overall program budget was scaled back by \$1.00 per capita and limited to a maximum grant of \$85,000 to more accurately reflect the actual grant usage in previous years.

Funding Formula

Municipalities located within the high and medium risk zones (Figure 1) were eligible for a minimum funding level of \$1,500. Municipalities with higher populations were eligible for additional funding based on population and location in risk zones as follows:

- RISK ZONE 1 (Highest Potential - RED) funded up to \$3 per capita to a maximum of \$85,000; and
- RISK ZONE 2 (Medium Potential - ORANGE) funded up to \$2 per capita to a maximum of \$85,000.



Funding was based on the 2005 Alberta Municipal Affairs' Official Population List.

Five special grants totaling \$45,978 were approved to accommodate municipalities dedicated to reducing the risk of the WNV for area residents where the lower grant amount entitlements were not sufficient to adequately deliver an effective larval control program.

Again, municipalities in risk zones 3, 4, and 5 were not eligible for funding in this program year.

Funding Guidelines

Payment of funds was contingent on municipalities submitting a complete and signed application package with a proposed program description that included:

- a) the identification of a person responsible for implementation of the mosquito control program and his or her current pesticide certification (individuals who were not certified had the opportunity to obtain "restricted" certification);
- b) a mapping system (8.5 by 11 inch) that simply identified the mosquito program control area, showing the jurisdictional boundaries of the municipality and a surrounding buffer area (recommended 2 to 5 km);
- c) the completed application form for a Pesticide Service Registration for the municipality to conduct pesticide applications for mosquito control;
- d) complete responses to the current/planned resources check list;
- e) signed council resolutions to support applications involving a partnership that designated the managing partner to submit the application and conduct all the communication with the Alberta Government on behalf of the partnership; and
- f) projected total expenses and revenues for the proposed control program.

Program Timelines

The timeframe for implementing targeted control mosquito larval control was as early as April 1, 2006, and continued on to September 15, 2006. Municipalities were expected to provide a year-end summary report that included expenses, chemical application records and other program evaluation information by October 31, 2006. Any unused funds related to the grant were to be refunded to Alberta Municipal Affairs.

Summary of Municipality Participation

The following table provides an overall grant allocation summary for participating municipalities:

TABLE I.

**2006 WNv Program
Summary of Municipality Participation**

RISK ZONE	TOTAL NUMBER IN RISK ZONE	TOTAL NUMBER IN RISK ZONE THAT PARTICIPATED	% OF MUNICIPALITIES PARTICIPATING IN RISK ZONE	NUMBER IN PARTNERSHIPS	TOTAL NUMBER NOT IN PARTNERSHIP	TOTAL NUMBER IN RISK ZONE THAT DID NOT PARTICIPATE	MAXIMUM ENTITLEMENT FOR THOSE WHO DID NOT PARTICIPATE	GRANT ALLOCATION	GRANT AMOUNT PAID
1	12	12	100	9	3	0	\$0	\$199,150	\$211,930
2	92	67	73	42	25	25	\$62,374	\$560,194	\$490,074
3	0	0	0	0	0	0	\$0	\$0	\$0
4	0	0	0	0	0	0	\$0	\$0	\$0
5	0	0	0	0	0	0	\$0	\$0	\$0
TOTAL	104	79	76	51	28	25	\$62,374	\$759,344	\$702,004

Season Synopsis

Information/training sessions were held from May 26 to June 5, 2006 and were open to interested municipal officials, health inspectors, administrators and the staff that would be directly involved in control program implementation. Sessions were held in Provost, Hanna, Brooks, Medicine Hat, Lethbridge, and Vulcan. The training component of these sessions qualified some participants for pesticide applicator certification that were issued by Alberta Environment on a restricted basis. The restriction was for the 2006 season (June 1 to September 30) and only authorized the use of biorational larvicides. These chemicals are comprised of active ingredients that are microbial, such as those containing *Bacillus* species, or an insect growth regulator such as those containing Methoprene.

Municipalities commenced their programs in May by having staff (existing and/or hired specific to the program) determine the boundaries of their control programs, obtain landowner authorizations, and identify and map the locations of mosquito larval habitat. To assist municipal staff to focus on identification of *Culex* species in the larval stage of development (and adults for those municipal employees participating in the provincial mosquito surveillance program), Alberta Environment provided taxonomic identification keys specific for Alberta mosquitoes and provided training on their use.

Southern Alberta received sufficient rains during the fall of 2005 and enough snow over the winter that created standing water in areas that had not been observed for years. The spring of 2006 resulted in high spring populations of mosquitoes that resulted in

annoyance levels that created public concern in June. In the mid part of June weather warmed and remained above average daily temperatures of 16°C through to mid-August. This first resulted in an overall decline of nuisance mosquito populations, and as water levels declined and weather remained consistently warm, populations of *Culex tarsalis* mosquitoes continuously increased. The surveillance program found the highest populations of this species developing overall in the Grassland natural region since monitoring began in 2003. Since early July, municipalities in the program conducted larvicide applications, however the need diminished into August as water bodies dried up that supported developing mosquito larvae.

Chemical Selections

Mosquito larvicides registered for use in Canada fall within 5 insecticide groups: microbials; insect growth regulators; organophosphates; carbamates and pyrethroids. Municipalities entering this initiative for the first time were restricted to the use of microbial and insect growth regulator formulations because of:

- the lower toxicity associated with these pesticide products,
- the number of inexperienced applicators involved in this new initiative that would be potentially exposing themselves and the environment through application of these pesticides,
- federal law limiting the use of higher risk products only to certified applicators,
- the targeted nature of *Culex* mosquito control, and
- the simpler type of equipment used for lower risk granular applications.

Mosquito larvicides were to be applied only by certified applicators and only to water found to support mosquito larva populations. The preferred formulation was the active ingredients impregnated on either corncob granules or charcoal pellets/granules. These were applied to the margins of larval habitat through the use of fertilizer/seed manually operated spreaders or motorized backpack units calibrated as best as possible to federal label rates of application.

Municipal Program Assessment

Staff and Training

The six training sessions held between May 26 and June 5, 2006 provided restricted certification to apply mosquito larvicides to 90 municipal employees. The timing of these sessions was to accommodate municipalities who relied on hiring and positioning summer wage individuals specifically for surveillance and control operations. Municipal employees were also provided with specific taxonomic identification keys, associated equipment, and any extra guidance and assistance on request to aid in the identification of *Culex tarsalis* larvae.

Mapping and Surveillance

The majority of participating municipalities in 2006 had operated programs the previous year and had established mapping systems in place. These systems saved time at the start of the control season by allowing them to direct control measures to priority *Culex tarsalis* development sites.

In 2006 the majority of southern municipalities first found the presence of *Culex tarsalis* larvae in late June and observed them increase in significant numbers by mid-July. This continued through to late August where standing water was found. Larval development sites typically were found to be in roadside ditches, irrigated fields, sloughs, and particularly in sheltered standing water problem areas near highly organic sources (sewage lagoons, livestock operations, etc.).

Chemical Selection and Application

Overall, a relatively small amount of larvicide is used each year for targeted control of *Culex tarsalis* mosquito species. The 61 kilograms of active ingredient of all mosquito products used this program year relates to the small percentage of active ingredient required for controlling larvae and the period of time where this species becomes a problem. During warm weather conditions found favorable to *Culex tarsalis* development, one of the most natural control measures that occurs is that sloughs and ditches are drying up. However, this drives this species to seek any standing water that many municipal employees cannot access or have difficulty accessing (i.e. stagnant water on private properties).

A common observation noted by municipalities, that have developed a degree of expertise in operating their programs over the past three years, is that they have been able to noticeably reduce numbers of larvae in the standing water to which they repetitively been apply larvicides, and in some locations to the point where an application may not be necessary.

TABLE II. Summary of Pesticide Used in the 2006 West Nile Virus Targeted Mosquito Larval Control Program (within the High and Medium Risk Zones identified in Figure 1)

Jurisdictions	<i>Number Reporting</i>		38	
	<i>Number Reporting Use of Chemical</i>		34	
	<i>Percentage Reporting Use of Chemical</i>		90%	
Larvicide Active Ingredient	Larvicide Product	Total Amount of Larvicide Product Used	Amount of Active Ingredient in Product	Total Amount of Active Ingredient Used (kg)
Chlorpyrifos	<i>Dursban 2.5G</i>	224.52 kg	2.5 %	5.61 kg
<i>Bacillus thuringiensis var. israelensis</i>	<i>Vectobac 200G</i>	55.00 kg	0.2 %	0.11 kg
	<i>Aquabac 200G</i>	50.00 kg	0.2 %	0.1 kg
	<i>Aquabac II XT</i>	94.59 L	1.2 %	1.14 kg
<i>Bacillus sphaericus</i>	<i>Vectolex CG</i>	700.29 kg	7.5 %	52.52 kg
Methoprene	<i>Altosid Granules</i>	108.00 kg	1.5 %	1.62 kg
			TOTAL	61.1 kg AI

In 2006 there was more interest in the purchase and use of the more residual biorational product *Vectolex CG*. This product is manufactured to provide control for in the order of three weeks. It was found to work well in more permanent water bodies in the southern areas of the province where temperatures were consistently warmer for the three weeks following application. Six of the reporting 38 municipalities reported using this product, the two primary users being the City of Brooks and the County of Newell.

Many programs continue to use the short-term *BTI* containing products (*Vectobac* or *Aquabac*), finding that it is less costly and that many of the water bodies to which it is applied usually dried up within three weeks. *Culex tarsalis* can be potentially hatching and developing as larvae continuously in standing water bodies. *BTI* applications are found to be effective for around three days but through by careful monitoring of the mosquito's life cycle, program operators have been able to time re-applications every week to two weeks.

Although the use of Dursban was not approved for use by "restricted" certificate holders in this program, there are a number of municipalities who operate control programs under the supervision of "Biting Fly" Class Pesticide Applicator Certificate holders authorized to use this product. It cannot be used within residential areas and is typically applied to roadside ditches and sloughs within the established buffer zones around the jurisdictional limits of cities, towns and villages.

Source Reduction Initiatives

Projects were undertaken to remove some specific long-standing mosquito larval development sites that included the presence of *Culex tarsalis*. These problem areas were attributed to poor drainage and a total of four specific sites were modified in the Town of Drumheller, the Municipal District of Taber, and Cardston County.

General Comments from Municipalities regarding 2006 Control Program

- rate payers really support the program and benefits to outdoor activities, and the increased awareness about where mosquitoes are developing and the presence of the disease;
- the funding program allows access to expertise and resources beyond their reach;
- repeated monitoring and larvicide applications to problem *Culex tarsalis* development sites have resulted in a significant reduction of the population surviving at these sites each year;
- control programs are primarily labour intensive and once mapping is established can take less time and resources to check and apply larvicides, particularly when warm weather favors *Culex tarsalis* development and evaporates this mosquito's environment;
- mapping and monitoring has reduced the amount of time and effort and allows them to target priority larval development sites within their jurisdictional areas; and
- control personnel rely on the mosquito surveillance initiatives operating in conjunction with their programs to have a better idea of what is occurring with the mosquitoes and virus in their area.

Conclusion

Control programs targeting a specific species of mosquito must be commenced in the early spring to obtain authorizations and landowner permissions, equipment purchase and calibration, and chemical supplies. Again this year, the critical period for targeted larval control was demonstrated to be from late June to mid-August, requiring a focus of effort in mid to late July. The mosquito species, *Culex tarsalis*, found responsible for transmitting WNV in Alberta, continues to show maximum reproductive and biting activity from mid-July to mid-August. Coupled with consistent warm weather patterns in 2006, it was successful in reaching significant numbers to result in WNV amplification and detection during this period. The area of positive detection of virus carrying mosquitoes was found to expand north and west in the province as average daily temperatures above 16°C accumulated in these areas.

VII. Provincial Laboratory for Public Health (Microbiology) Submitted by: Dr. Peter Tilley, Provincial Laboratory for Public Health (Microbiology)

Diagnostic Testing

A combined serology/molecular approach was again used in 2006. Nucleic acid amplification testing (NAAT) of plasma or serum was very successful in acute cases, identifying 24 of 41 cases on the first sample. WNV IgM was the main serological test, and identified 17 cases on the first sample. IgM results were confirmed by background subtraction to rule out non-specific binding. IgG testing was also performed to document rising antibody levels and to show low-avidity (recently formed) antibody. Fourteen convalescent sera were received and all showed either significant rises in IgG and/or low avidity IgG. These additions to the test algorithm helped in the interpretation of IgM-positive patients, as IgM has been shown to persist for over a year.

Transplantation

NAAT testing on plasma specimens continued for 2006 on organ donors and recipients, as requested by the individual transplant programs. Testing was performed from June 1st to Dec 1st, and on request for travelers. All transplant screens were negative in 2006.

Mosquito Testing

In collaboration with Alberta Environment, NAAT testing was continued for mosquito pools in 2006. We had a bumper crop this year with 118 positive pools from the SE corner of the province.

WNV Testing Summary

Jan 1st – Dec 31st, 2006

Test	Population	Specimens tested	Positive patients
Serology	human diagnostic	1218	23
CSF NAAT	human diagnostic	204	0
Plasma NAAT	human diagnostic	1192	24
Plasma NAAT	transplant screen	650	0
Mosquito pool NAAT	mosquito pools	928 pools	118 pools

NAAT: Nucleic Acid Amplification Test (= PCR or NASBA)

VIII. Communications

Submitted by Edi Skoropad, *Alberta Health and Wellness*

Alberta's communication plan in 2006 focused on increasing the public awareness of the potential risks associated with West Nile virus (WNV) and reminding the public of choices about personal protection measures.

The goals for the communication plan were to:

- Inform the public about WNV, especially Albertans in the medium and high-risk zones of the province.
- Provide access to reliable information and resources to guide the public, (particularly active seniors aged 50+) and health professionals in reducing the risk of infection with WNV.
- Inform agencies and stakeholders about specific strategies and responses
- Provide up-to-date information on WNV surveillance in Alberta.

Communication Plan

A number of specific resources and communication strategies were identified and developed for 2006. The strategy aimed to make information widely available but targeted to active seniors. The strategy included:

- News releases
 - May 29 - *Alberta Preparing for Another Season of West Nile virus* was distributed to all Albertans. The release covered information in Alberta's provincial plan for 2006 on behalf of four Alberta ministries including Environment, Sustainable Resource and Development, Agriculture and Food, and Health and Wellness. *Taking Precautions to Avoid Mosquito Bites Reducing the Risk of Infection* was distributed and posted to the Alberta government website www.health.gov.ab.ca.
 - July 25 – *West Nile Virus confirmed in Alberta mosquitoes – in southeastern Alberta.*
 - August 14 – *First 2006 human cases of WNV found in Alberta – two Albertans reported; one in Palliser and the other in Chinook.*
- The Health and Wellness website – www.fightthebite.info - continued as Alberta government's homepage for information on WNV, including links to resources available on other provincial department websites, Health Canada, U.S. Communicable Disease Control and other reputable sources. The website also provided responses to commonly asked questions and printable materials like posters and brochures used in the public awareness campaign.
- A public awareness campaign, which included radio, daily and weekly newspapers and print materials, began in June to again inform Albertans of the low risk but high consequences of WNV infection and how to protect themselves. The campaign was targeted to travellers within the province and active seniors who are known to be at a higher risk of more severe consequences. Testimonials from two Albertans who had experienced more serious effects of the diseases in 2003 were included to provide a more local perspective. The survivors town locations of Medicine Hat and Bow Island were added to advertising. The campaign included:
 - ❖ Print advertising: placements in province-wide, dailies and weeklies and magazines like *Western Grandparent* and *Our World*.

- ❖ Radio spots ran throughout the province with a greater frequency of play in the southern at risk portions of the province.
 - ❖ Distribution of a brochure holder and small foldout brochures went to regional health authorities, municipalities, senior's organizations, parks, campgrounds and golf courses.
 - ❖ Factsheets were available at www.fightthebite.info
- News releases were issued with the first evidence of West Nile virus in humans, birds and mosquitoes in the province for 2006.
 - Cumulative numbers of cases of WNV in birds and humans and number of positive mosquito pools were posted on the Alberta Health and Wellness Web site every Friday.
 - Service Alberta (310-4455 throughout Alberta) and Health Link Alberta (408-5465 in Edmonton, 943-5465 in Calgary and 1-866-408-5465 elsewhere in Alberta) operators provided general WNV information as well as information on personal protective measures.

Media Relations

Evidence of disease appearing in Alberta was promptly released to ensure that Albertans knew when their risk of infection had increased. Evidence of disease was also stored on the department's web site and updated regularly.

Key Messages

- The risk of infection is low but consequences can be high.
- There are simple steps that Albertans can take to protect themselves.
- The government has a response plan in place to monitor evidence of the virus in the province, provide information to the public regarding personal protection and to provide funding to municipalities in the high risk areas to control mosquito larvae.

Audiences

- All Albertans and travelers to the province; especially outdoor enthusiasts like golfers, gardeners, hunters etc.in the
- Active seniors who are at risk for more serious consequences.
- Stakeholders working directly with the public such as health care workers, Fish and Wildlife officers and municipal staff.

Evaluation

A variety of measures were used to evaluate the public awareness campaign for 2006. The following were monitored:

- Web site visits between June 1 to October 7-2006:
 - The top three most popular web pages were:
 - 1) the AHW 2005 WNV Response Plan with 6,568 visits,
 - 2) the Common Questions section with 3,044 visits, and
 - 3) the WNV Evidence in Alberta page with 2,798 visits.
- Results from focus groups conducted in March, 2006 to measure the public's response to the 2005 campaign and provide recommendations for the 2006 campaign
 - focus groups suggested adjusting print materials to localize information about WNV evidence in Alberta and,
 - keeping a serious approach rather than a humorous approach to the print materials.
 - television ads were not recommended as it is a high cost medium that doesn't "fit" with Alberta's provincial campaign.
- Evaluation of print materials at the end of the 2006 WNV season:
 - brochures and posters should be sent earlier in the season (e.g., May-June)
 - magazine, radio and newspaper ads should stay the same
 - the website should be reviewed for making information easy to find and easy to understand.
 - some of the information can be expanded to include pet care and local information.

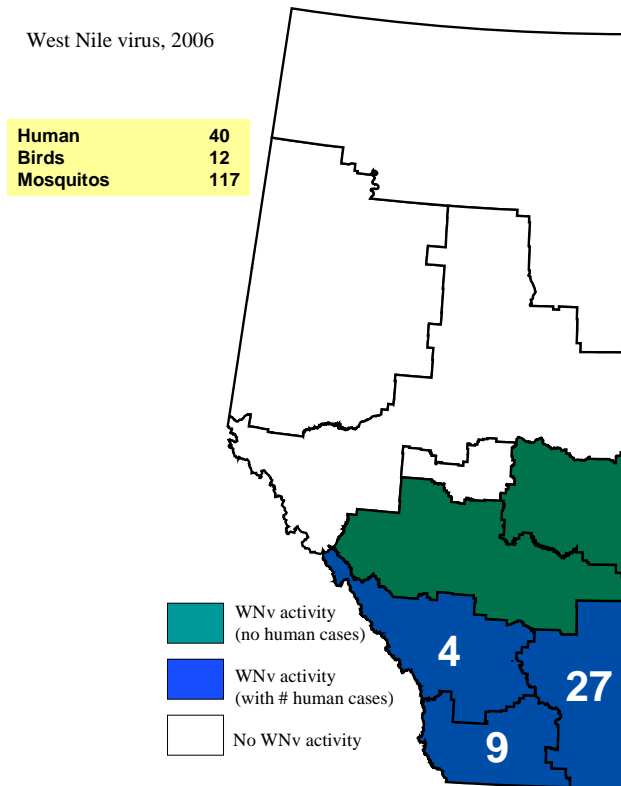
IX. Summary of Surveillance Across Species

Submitted by Kimberley Simmonds, *Alberta Health and Wellness*

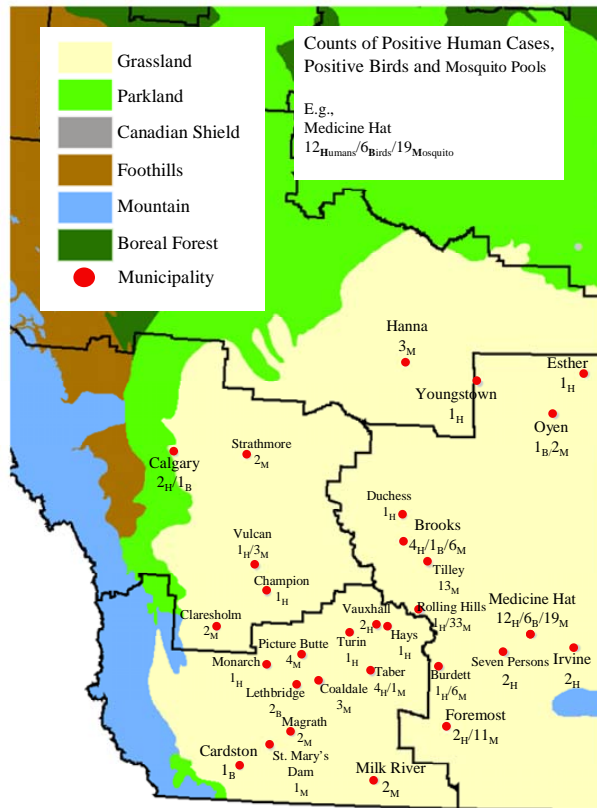
In the third year of West Nile virus in Alberta, the rate of infection was very low in all species. Evidence of the virus was limited to the southeast corner of the province where temperatures tend to be higher and precipitation lower – a climate which supports the vector *Culex tarsalis*.

The results of surveillance in all species are provided below.

Summary of Positives in 2006 by Regional Health Authority

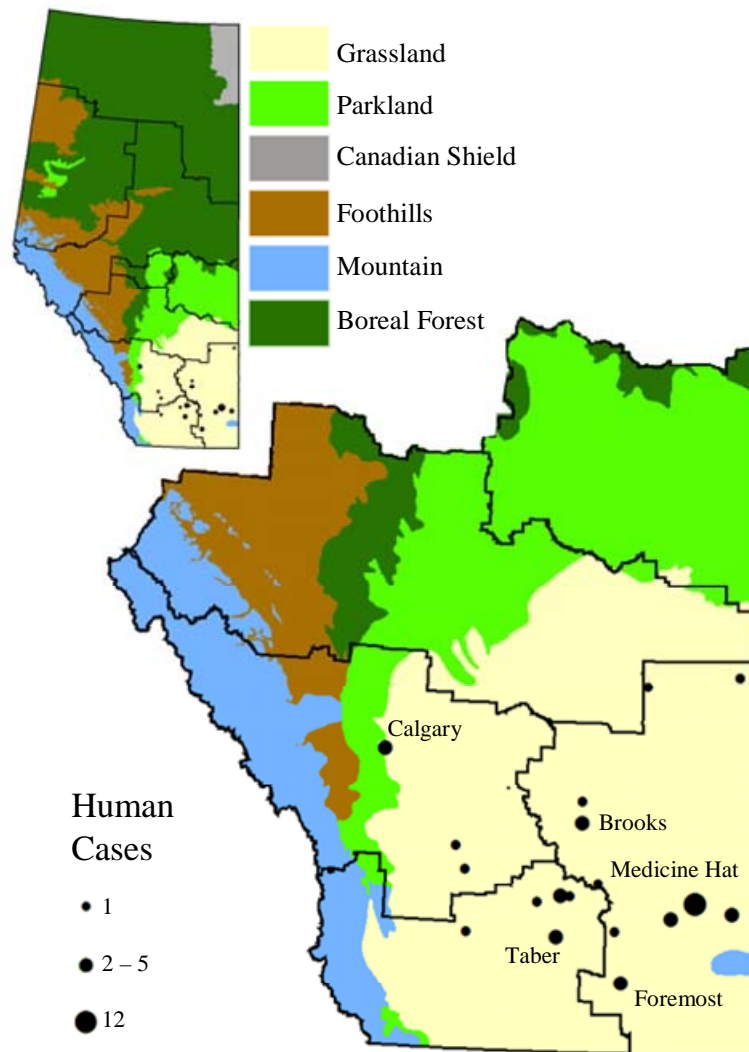


Summary of All Positives in 2006 by Natural Region

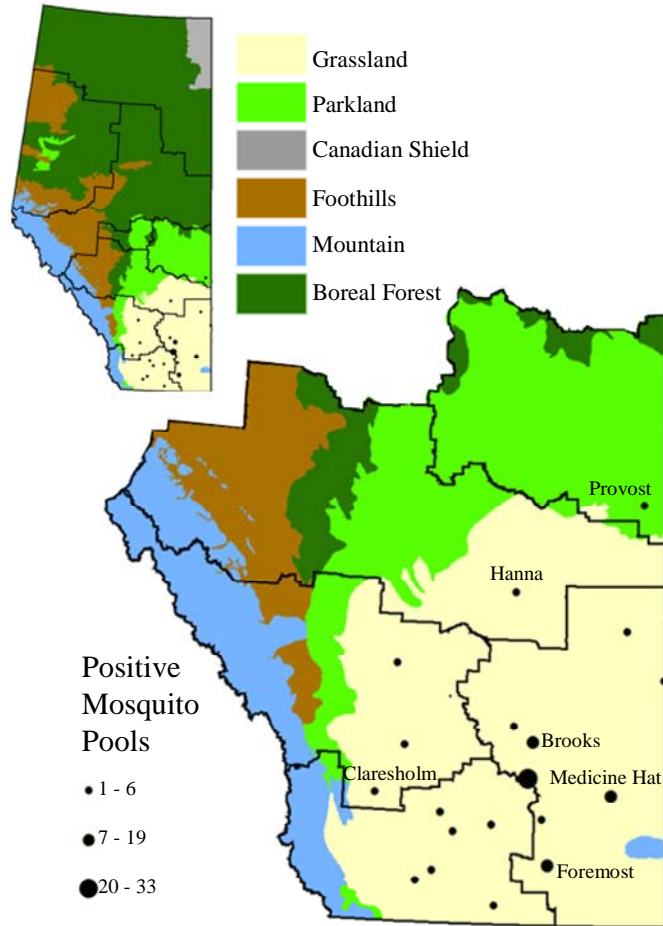


Summary for Each Species by Natural Region

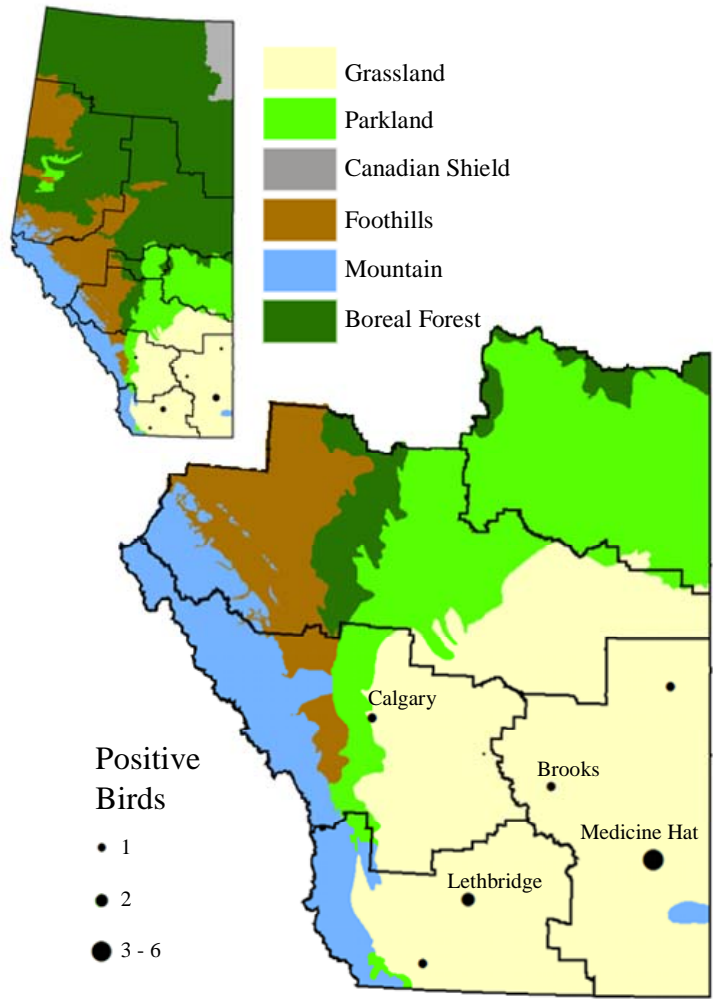
Humans:



Mosquitoes:



Birds:



Conclusions:

- WNV continues to persist in established regions of the province.
- Positive human cases and birds have been detected in the Grassland area of the province.
- Positive mosquito pools have been detected in the Grassland and Parkland areas of the province.
- Bird surveillance has been useful in early detection of the virus in previously uninfected areas but it is less useful in areas known to support WNV.
- Endemic transmission will continue for the foreseeable future.

X. Acknowledgements

We would like to thank the following members of the Interdepartmental Working Committee who provided leadership in the response to WNV in 2006.

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Lisa Morin and Dr. Gerald Ollis – Alberta Agriculture and Food

Jock McIntosh and David May – Alberta Environment

Ronda Morgan and the grant approval staff - Alberta Municipal Affairs

Dr. Karen Grimsrud, Debra Mooney and Marilyn Wakaruk - Alberta Health and Wellness

We would also like to thank all the staff listed below from municipalities, regional health authorities, government agencies and departments who provided their support and expertise in monitoring and responding to West Nile virus in Alberta in 2006.

Bird Surveillance

This program could not have been completed without the significant efforts of many many Fish and Wildlife staff, particularly the district officers, wildlife biologists, and administration staff who fielded phone calls by the public and took direct action as appropriate and as possible. In addition, Stephanie Bugden documented and tested dead birds throughout the summer and she and Damien Joly analyzed the results. The Provincial West Nile Virus Steering Committee provided ongoing input and review of the program and the Fish and Wildlife Division managers were supportive at all times.

The program also began in most cases with a member of the public providing us with a dead corvid. Without this input, the WNV bird surveillance programs could not have happened. Their efforts, and often their patience and understanding, are gratefully acknowledged.

Horse Surveillance

The Office of the Chief Provincial Veterinarian would like to thank the veterinary practitioners in Alberta and horse owners for their cooperation. Thanks are also extended to the Alberta Veterinary Medical Association (AVMA) for publicizing WNV information.

Human Surveillance

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- Larry Svenson and Michael Sanderson from Health Surveillance and Environmental Health
- Medical Officers of Health and communicable disease staff
- Dr. Judy Hannon, Dr. Dale Towns and staff from the Canadian Blood Services

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- Andrew Fox and staff, City of Calgary
- Russ Muenchrath and staff, Wheatland County
- Kelly Malmberg, Vulcan County
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- Jenny Wheeler, Rebecca Montoya and staff, City of Medicine Hat
- Terry Walsh, Matt Solberg and staff, Town of Brooks
- Steve Wylie, Mark Scholz and staff, County of Newell
- Dean Flamminio and Melissa Penno, Canadian Forces Base Suffield
- Jennifer Carpenter and staff, University of Alberta
- Kevin Jensen, Ron Esau and staff, City of Lethbridge
- Dave Matz, County of Forty Mile
- Jamie Meeks, Cathy Preston and Megan Turner, County of Warner