SUMMARY OF WEST NILE VIRUS SURVEILLANCE IN ALBERTA 2005

ALBERTA AGRICULTURE FOOD AND RURAL DEVELOPMENT
ALBERTA ENVIRONMENT
ALBERTA HEALTH AND WELLNESS
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ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT
PROVINCIAL LABORATORY OF PUBLIC HEALTH

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I. Introduction

Building on the West Nile surveillance programs in 2002, 2003 and 2004, representatives from five provincial departments (Alberta Health and Wellness, Alberta Agriculture, Food and Rural Development, Alberta Environment, Alberta Municipal Affairs, and Alberta Sustainable Resource Development) prepared a provincial response plan for 2005 to address the potential risks posed by West Nile virus in Alberta. The interdepartmental committee including the following members:

Dr. Karen Grimsrud	Deputy Provincial Health Officer (Chair) Health and Wellness
Debra Mooney	West Nile virus Coordinator Health and Wellness
Kimberley Taylor	Public Health Information Officer Health and Wellness
Jock McIntosh	Pesticide Specialist Environment
Dr. Gerald Ollis and Lisa Morin	Chief Provincial Veterinarian Office Agriculture, Food and Rural Development
Dr. Margo Pybus	Wildlife Disease Specialist, Fish and Wildlife Division, Sustainable Resource Development
Ronda Morgan	Coordinator, Policy and Grants Municipal Affairs
Marilyn Wakaruk David May Dave Ealey Marie McDonnell	Public Affairs Officers Communications

Regional medical officers of health, communications staff, the Provincial Laboratory for Public Health (Microbiology) and Canadian Blood Services also provided support to the committee and the WNv program.

The 2005 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 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 C*ulex tarsalis* mosquito larvae, the mosquito vector for WNv in Alberta.

The purpose of this technical summary 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 2005 Communication Plan.

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

Alberta Health and Wellness
http://www.health.gov.ab.ca/public/WNv/Index.html

Alberta Agriculture, Food and Rural Development
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex5455?opendocument

Fish and Wildlife Division of Alberta Sustainable Resource Development
http://www3.gov.ab.ca/srd/fw/diseases/WNv/index.html

Surveillance in Canada and United States

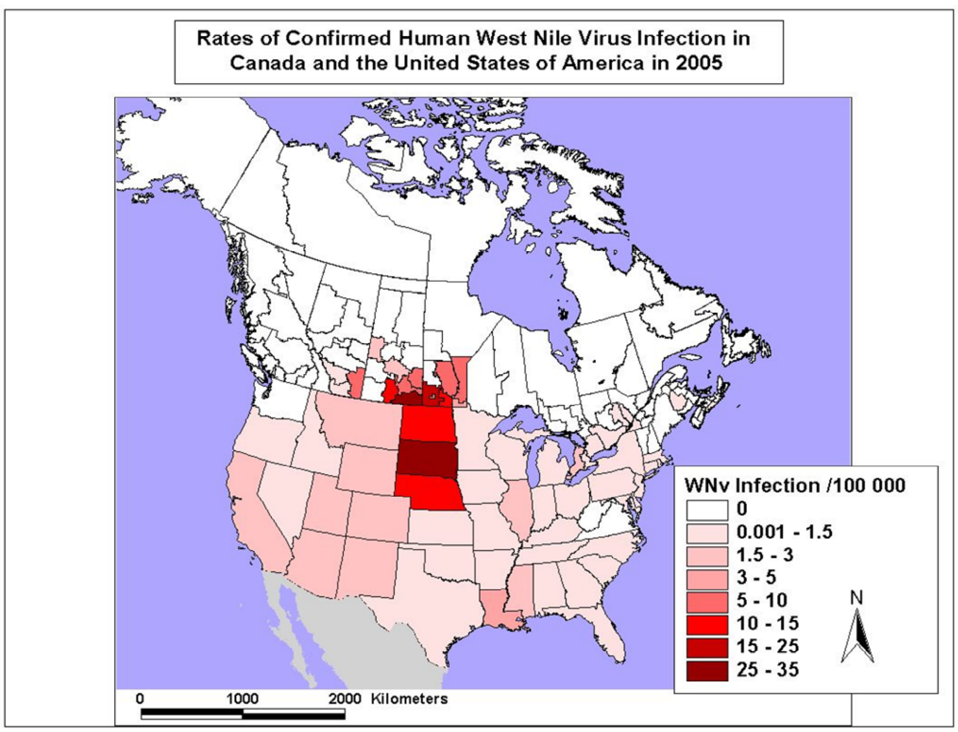
The surveillance information on human cases of WNv throughout Canada shows higher numbers of cases across Canada than in 2004 but considerably lower than 2003. No human cases were reported in the Territories or the Maritimes.

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. The virus is still extending its continental range and establishing populations within Mexico as well as Central and South America.

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

Intensity of Human Cases of WNv in 2005 throughout Canada and United States



(from 2006 U.S. National WNv Conference)

Human WNv Cases in Canada 2003-2005

Province	2005	2004	2003
British Columbia	0	0	19 (19)
Alberta	10 (3)	1 (1)	275
Saskatchewan	58	10	848
Manitoba	54	3	139
Ontario	95(4)	13	89
Quebec	7	1	17
Maritimes	3 (3)	0	3 (3)
Territories	0	0	1 (1)
Canada	227	28	1391

Brackets indicate number of travel-related cases.

Evidence of WNv in Canada, 2005

Province	No. of confirmed human cases	No. of confirmed positive dead birds	No. of presumptive or confirmed positive horses	Number of confirmed positive mosquito pools
Newfoundland and Labrador	0	0	0	0
Prince Edward Island	1(1)	0	0	0
Nova Scotia	1 (1)	0	0	0
New Brunswick	1(1)	0	0	0
Quebec	6 (1)	115	0	100
Ontario	101 (4)	300	5	291
Manitoba	58	12	4	193
Sask.	58 (2)	14	10	110
Alberta	10 (3)	6	3	1
British Columbia	0	0	0	0
Yukon	0	0	0	0
Northwest Territories	0	0	0	0
Nunavut	0	0	0	0
CANADA	**236**	**447**	**22**	**695**

Brackets indicate number of travel-related cases.

WNv Cases in the United States

State	2005	2004	2003	2002
Alabama	10	13	37	49
Arizona	111	378	13	0
Arkansas	26	22	25	43
California	873	687	3	1
Colorado	101	276	2947	14
Connecticut	6	1	17	17
Delaware	2	0	17	1
District of Columbia	0	1	3	34
Florida	21	35	94	28
Georgia	20	16	50	44
Idaho	13	2	1	0
Illinois	252	56	54	884
Indiana	23	7	47	293
Iowa	37	19	147	54
Kansas	19	44	91	22
Kentucky	5	6	14	75
Louisiana	170	70	124	329
Maryland	5	12	73	36
Massachusetts	6	0	17	23
Michigan	62	9	19	614
Minnesota	45	33	148	48
Mississippi	70	29	87	192
Missouri	31	32	64	168
Montana	25	5	222	2
Nebraska	173	22	1942	152
Nevada	31	44	2	0
New Hampshire	0	0	3	0
New Jersey	6	1	34	24
New Mexico	33	79	209	0
New York	38	5	71	82
North Carolina	4	3	24	2
North Dakota	86	20	617	17
Ohio	61	8	108	441
Oklahoma	31	15	79	21
Oregon	7	1	0	0
Pennsylvania	25	11	237	62

Rhode Island	1	0	7	1
South Carolina	5	1	6	1
South Dakota	229	49	1039	37
Tennessee	17	10	26	56
Texas	188	95	720	202
Utah	52	10	1	0
Vermont	0	0	3	1
Virginia	0	5	26	29
West Virginia	0	0	2	3
Wisconsin	17	10	17	52
Wyoming	12	9	375	2
Total	**2949**	**2151**	**9862**	**4156**

II. Wild Bird Surveillance

Summary:

Approximately 240 dead birds were received during the West Nile Virus (WNv) surveillance program implemented by the Fish and Wildlife Division of Alberta Sustainable Resource Development in 2005. Nestlings were not examined and approximately 25 (10.4%) of the birds received were unsuitable for analysis (dry, rotten, too young, or unsuitable species). Thus testing was limited to 215 corvids (102 crows, 95 magpies, 12 ravens, and 6 blue jays). All usable corvids were tested with the VecTest, an antigen-based screening assay. In addition, 5 greater sage-grouse were assessed for WNv using a PCR molecular test.

Starting in mid-June and continuing until the end of September, corvids were received from throughout the province for testing. Most birds (88.3%) came from the Grassland region (n=118, 54.9%) and the Parkland region (n=74, 34.4%) of central and southern Alberta. The first positive crow was found dead on August 15, 2005 in Lethbridge and the last on August 30, 2005 in Brooks. We confirmed WNv in 6 of the 102 crows (5.9%) and one sage-grouse, and all positive birds were found in the Grassland region. No evidence of the virus was found in the Parkland, Boreal, Rocky Mountain, Foothills, or Canadian Shield natural regions.

Birds were tested in batches once a week during June, whereas testing was conducted daily in July and August, and as they arrived in September. The average time between collection by the public and testing in our lab in 2005 was 18.4 ± 15.0 days (n=215). The average time between when a bird arrived at the lab and when it was tested was 3.6 ± 2.3 days (n=209).

Epizootiology of West Nile virus:

West Nile virus (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 and local mosquitoes to encompass most 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.

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) are unable to effectively control the virus with their immune system. As a result, the virus reproduces quickly in a wide range of tissues, but especially in the brain and spinal cord. Fatal infections often occur in corvids, 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.

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.

In broad areas across the southern U.S., *Culex* species do not go dormant and thus year-round transmission of WNv now occurs from the Atlantic and Gulf coast states westward to southern California. The virus is still extending its continental range and establishing populations within Mexico as well as Central and South America. There is little doubt that West Nile virus will establish itself throughout the Western Hemisphere, although the full picture in a North American context is still evolving.

Additional background material about West Nile virus in Alberta can be found on the websites of

Alberta Health and Wellness http://www.health.gov.ab.ca/public/WNv/Index.html
Alberta Agriculture, Food and Rural Development
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/fw/diseases/WNv/index.html

Alberta's WNv Program:

Building on the successful West Nile surveillance programs since 2002, representatives from five provincial departments (Alberta Health and Wellness; Alberta Agriculture, Food and Rural Development; Alberta Environment; Alberta Municipal Affairs; and Alberta Sustainable Resource Development) prepared a provincial response plan for 2005 to address the potential risks posed by West Nile virus in Alberta. The plan contained two primary components: communication and surveillance. Communication occurred largely through the ***Fight the Bite*** public awareness campaign and information provided in departmental web pages and fact sheets (see above) as well as technical information provided directly to health care, wildlife, and veterinary professionals. The surveillance programs focused on monitoring "at risk" populations: physicians monitored human illness, veterinarians monitored horse health, and the Fish and Wildlife Division monitored mortality of 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 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.

The current report provides data only from the wild bird component of the provincial West Nile virus surveillance program. In 2005, 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. A few birds of other species were received. 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.

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. Dead bird testing occurred weekly in June, daily in July and August, and as birds arrived at the laboratory in September. Non-corvid birds to be tested for West Nile virus were sent to the diagnostic laboratory of the Canadian Cooperative Wildlife Health Center, Saskatoon, SK for testing with a DNA-based polymerase chain reaction test (PCR).

Bird Surveillance Data:

Submissions

Two hundred and forty birds were received for West Nile testing from June to September 2005. Of these, 215 corvids (ravens, crows, magpies, and blue jays) were tested for WNv using VecTest (Table 1; Figure 1). The remaining 25 birds (10.4%) were unsuitable for testing (dry, rotten, too young, or non-corvid).

Most of the tested corvids were crows (n = 102, 47.4%) and magpies (n = 95, 44.2%; Figure 2). Twelve ravens and 6 blue jays also were tested. In addition, 5 greater sage-grouse were assessed for WNv using a PCR molecular test. The corvids largely were collected in the Grassland (n = 118, 54.8%) and Parkland (n = 74, 34.4%) natural regions (Table 1; Figure 1), reflecting the presence of urban centers such as Edmonton and Calgary (Table 2). The remaining birds came from the Boreal Forest (n = 20, 9.3%), Foothills (n = 2, 1%), and Mountain (n = 1, 0.5%) natural regions. No birds were received from the small portion of Canadian Shield in the far northeastern corner of the province.

Most samples were submitted in July (50.2%) or August (26.3%), with the remainder from June (8.1%) and September (15.3%) (Figure 3; see Table 5).

West Nile results

The average time between collection by the public and testing in our lab in 2005 was 18.4 ± 15.0 days (n=215 corvids). The average time between when a bird arrived at the lab and when it was tested was 3.6 ± 2.3 days (n=209). Time intervals included the extended holding period associated with weekly testing in June.

West Nile virus was found in 6 of 215 (2.8%) corvids tested (Table 1; Figure 2). The virus was found in 6 of 102 (5.9%) crows, but none of the 95 magpies, 12 ravens and 6 blue jays tested. One of the 5 sage-grouse tested positive for WNv.

The positive crows were collected from the Grassland (6 of 118, 5.1%) regions of southern Alberta (Table 1, Figure 1). Viral activity was not found in the Parkland, Boreal, Rocky Mountain, Foothills, nor Canadian Shield natural regions. All six positive crows were collected in the first two weeks of August (Table 3). The positive sage-grouse was collected in southeastern Alberta in the first week of August.

Discussion

West Nile virus apparently arrived in North America in 1999 [1]. Since then it moved systematically across the continent with subsequent summer and winter distributions reflecting the major bird migration corridors. The virus was documented on the Atlantic Flyway in 2000, the Mississippi Flyway in 2001, the Central Flyway in 2002 and 2003, and the southern portion of the Pacific Flyway in 2004 (patterns derived from Centers for Disease Control http://www.cdc.gov/ncidod/dvbid/westnile/). This movement resulted in a steady geographic expansion of infections in birds, horses, mosquitoes, and humans from the northeastern U.S. in 1999/2000, to the area east of the Mississippi River (including southern Ontario) in 2001, the area east of the Rockies (including southern Saskatchewan, Manitoba, Ontario, Quebec as well as Nova Scotia) in 2002. In 2003, the greatest viral activity was up against the east side of the Rocky Mountains, including its first appearance in Alberta. Extensive mortality was seen in crows and magpies throughout southern and central Alberta in 2003, and the virus also was detected in mosquitoes, horses, and humans in the same wide geographic distribution[2] Mortality in birds was considerably reduced in 2004[3]

The transmission of all viruses is driven by a complex interaction of biological and non-biological factors. In the case of West Nile virus, 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 dry summer, the virus multiplied and spread in at least three generations of suitable mosquito vectors. By the end of the summer in 2003, there was evidence of extensive viral activity throughout the southern and central areas of the province.

In 2004 and 2005 the virus re-occurred in Alberta but the pattern of occurrence differed significantly from that in 2003: there were fewer dead birds found and fewer positive corvids (Figures 4, 5). The prevalence of WNv in corvids was similar in 2005 to that in 2004 but significantly lower than in 2003 (Table 4). Infected corvids were detected only in the late summer in 2004 (mid-August to mid-September) and 2005 (late August), whereas they occurred throughout the summer in 2003 from mid-June to late September. The majority of infected birds were detected in the Grassland natural region in all three year; however, in 2003 a significant number of positive birds also were collected in the Parkland region of central Alberta. Similar patterns were seen in mosquitoes, horses, and humans over the three years. Although the underlying causes cannot be definitively identified, there are contributing factors that are readily apparent.

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[1] Centers for Disease Control and Prevention. Outbreak of West Nile-like viral encephalitis—New York, 1999. 1999. MMWR Morbidity and Mortality Weekly Report 48:845-9.
[2] Pybus, M.J. 2003. Alberta West Nile virus wild bird surveillance, 2003; http://www.srd.gov.ab.ca/fw/diseases/WNv/pdf/WNvSurveillance2003.pdf
[3] Pybus, M.J. 2004. Alberta West Nile virus wild bird surveillance, 2004; http://www.srd.gov.ab.ca/fw/diseases/WNv/pdf/2004WNVreport.pdf

There may be two driving factors that affect the extent to which WNv can establish a significant summer population in northern regions: weather and avian immunity. Only adult mosquitoes can transmit West Nile virus, and the development of *Culex tarsalis* from larval to adult stages is temperature-dependent. Spring and early summer in 2004 and 2005 were relatively cool and evidence from mosquito surveillance conducted by Alberta Environment indicates that *Culex tarsalis* development was significantly delayed by weather conditions in 2004 and 2005 in comparison to 2003. It may be that when infected migrating birds arrived in the spring and early summer, there were inadequate numbers of *Culex tarsalis* adults available to transmit the virus and establish a new viral population in Alberta.

The late summer evidence of West Nile virus activity in 2004 and 2005 may be associated with movements of birds gathering at staging/moulting lakes during the period between fledging (when the young are able to fly) and migration. Previous banding results show that birds from areas such as Saskatchewan and Montana move into Alberta during August, and there was evidence of WNv activity in these regions during July and August in 2004 and 2005. The occurrence of a few positive birds in late summer suggests there were sufficient *Culex tarsalis* mosquitoes to transfer the virus to other birds and establish a relatively small viral population in the Grassland natural region of southeastern Alberta.

Birds exposed to WNv can develop immunity to further infection. During the summer of 2003, birds throughout the Grassland and Parkland regions of Alberta were exposed to a massive population of the virus. A significant number of birds that survived the infection may have developed immunity to WNv. Similarly, young birds likely were exposed to the virus while they were still in Alberta or in the wintering areas in the U.S. and Central America. These factors may have affected the amount of virus that was present in migratory birds that returned to Alberta in 2004 and 2005. A similar immunity may have developed in birds that are year-round residents of the southern and central areas of the province, such as magpies. Immune birds do not have virus circulating in their blood and thus cannot pass WNv to biting mosquitoes. The combined effects of the slow development of *Culex* mosquitoes and the presence of immunity in many individual birds may be reflected in the lack of viral activity in the summer in 2004 and 2005.

The provincial West Nile virus Response Plan is based on passive surveillance of birds found dead by the public. In particular, people are encouraged to submit fresh-dead crows and magpies to any office of the Fish and Wildlife Division. Information is provided regarding appropriate precautions when handling any wild animal found dead of unknown causes. These are general precautions and do not reflect a specific concern from handling birds that died of West Nile virus. Although no surveillance program can ever be 100% effective, the combined tools of passive public submission of found dead corvids and the unique susceptibility of crows and magpies to fatal infections of West Nile virus provide appropriate means to detect the presence and activity of the virus, even at low levels of viral activity. Dead corvids positive for West Nile virus were found temporally and geographically near the mosquito, human, and equine cases, and reflected the distribution of *Culex tarsalis* mosquitoes in Alberta.

Following the WNv-related mortality in 2003, the small sage-grouse population in southern Alberta was closely monitored in 2004 and 2005. A cooperative program among the Fish and Wildlife Division, the University of Alberta, Alberta Environment, and the City of Medicine Hat was implemented in both years. The study design included a comparison of mortality in two areas treated repeatedly with a standard biological control for mosquito larvae [*Bti*] and a control area that received no treatments. While no WNv sage-grouse mortalities were detected in 2004 and only one in 2005; the general evidence of low viral activity in southern Alberta in these years prevented any further assessment of the change in potential risk to sage-grouse. However, there was a significant decrease in the number of *C. tarsalis* in treated areas (J. Carpenter, U. of Alberta, unpublished results) and selected treatment can potentially mitigate the risk to sage-grouse in limited areas.

Future Outlook

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. However, the potential effects of changing resistance and immunity in wild birds remain unknown, and environmental conditions vary greatly from year to year. As such, the overall extent to which the viral population will build in Alberta in July and August in any one year is difficult to predict.

The WNv bird surveillance program will be implemented in 2006 to identify when the virus returns and to track its behaviour; however, the program will be limited to the Grasslands natural region where the risk factors indicate there is potential for infections to occur. A maximum of six positive birds is considered sufficient evidence of viral activity and no further surveillance will be conducted in the region if that threshold is reached. In addition, clusters of unusual mortality of wild birds or mammals will continue to be investigated to see if WNv is involved.

It appears that local ecosystems have adapted to the seasonal presence of WNv with limited effects on wild populations of birds in Alberta. Although local and perhaps overall crow populations in eastern provinces and states appear to have declined in some areas, there are ample populations still present in Alberta and western jurisdictions. 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 crows or magpies overall in Alberta nor on Lethbridge, Medicine Hat, or Dinosaur Provincial Park counts, 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. Highly susceptible individual birds die and are removed from the population; resistant individuals remain to produce the future generations. Similarly, reduced patterns of bird mortality and viral occurrence indicate integration of WNv virus into North American ecosystems is well underway.

It is readily apparent that West Nile virus will establish populations across the continent wherever suitable bird and mosquito species exist. There is a high probability that West Nile virus eventually will occur in all states and provinces from the Atlantic to the Pacific, although perhaps at differing local levels. With its ability to circulate year-round in southern states and occasionally overwinter in some individual mosquitoes, in addition to continental transmission across a broad range of bird and mosquito species, West Nile virus is unlikely to be controlled or eradicated. Fortunately, it is a relatively benign virus with limited direct effect on wild populations. Sporadic cases in horses and humans are likely to continue. All species will have to learn to live with West Nile virus as an integral part of the seasonal biodiversity of Alberta.

Table 1: Species composition, and geographic distribution of corvids tested for West Nile virus and incidence of WNv positive corvids in Alberta in 2005.

	Boreal (north)	Foothills (west)	Grassland (south)	Mountain (far west)	Parkland (central)	Species TOTAL
Blue Jay	0	0	1	0	5	6
Crow	7	1	55 (6)*	1	38	102 (6)
Magpie	6	1	61	0	27	95
Raven	7	0	1	0	4	12
All Corvids	20	2	118	1	74	215 (6)

* number tested (number positive)

Table 2: Primary source of corvids tested for WNv in Alberta in 2004

Urban center	WNv positives and # tested	Proportion of total # tested (%)	Natural Region
Edmonton	0 of 50	23.3	Parkland
Lethbridge	1 of 16	7.4	Grassland
Medicine Hat	1 of 21	9.8	Grassland
Calgary	0 of 51	23.7	Grassland

Table 3: West Nile virus positive birds in Alberta in 2005 (by date found).

Species	Date Collected	Town / District	WMU (Wildlife Management Unit)
Crow	15-Aug-05	Lethbridge	108
Crow	17-Aug-05	Brooks	142
Crow	21-Aug-05	Medicine Hat	148
Crow	24-Aug-05	Brooks	142
Crow	30-Aug-05	Brooks	142
Crow	30-Aug-05	Brooks	142

Table 4: Prevalence of West Nile virus among corvids tested in Alberta, 2003-2005.

Species	2003	2004	2005
crow	22.6 (899)*	2.1 (355)	5.8 (102)
magpie	27.7 (835)	0.4 (264)	0 (95)
corvids	23.8 (1843)	1.4 (666)	2.8 (215)

*** % positive (# tested)**

Table 5. Standardized 2005 Table of Weeks**.**

Week #	Month	Days	Week #	Month	Days
18	April/May	25-1	30		18-24
19	May	2-8	31		25-31
20		9-15	32	Aug	1-7
21		16-22	33		8-14
22		23-29	34		15-21
23	May/June	30-5	35		22-28
24	June	6-12	36	Aug/Sept	29-4
25		13-19	37	Sept	5-11
26		20-26	38		12-18
27	June/July	27-3	39		19-25
28	July	4-10	40	Sept/Oct	26-2
29		11-17			

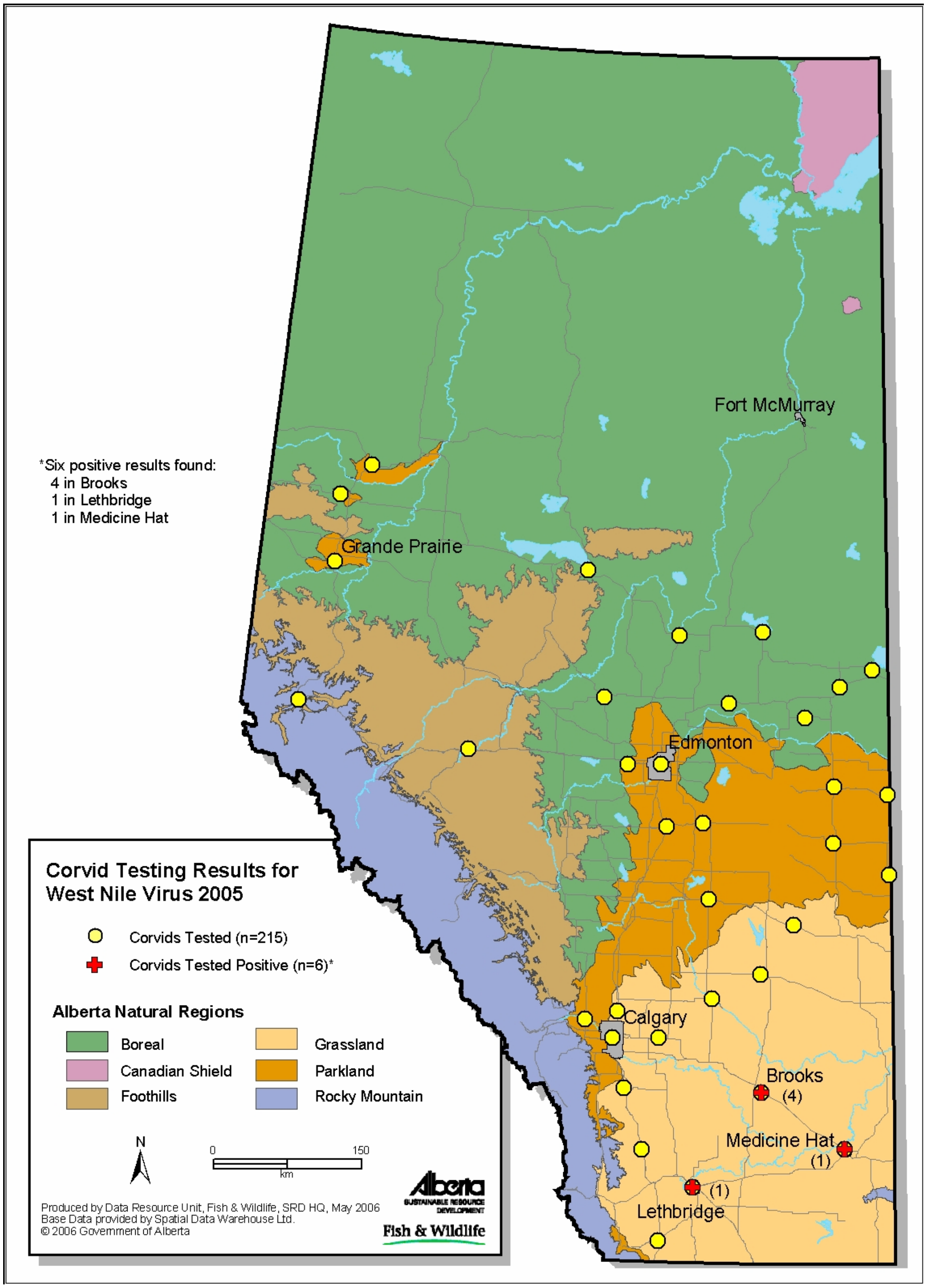


Figure 1. Distribution of corvids tested for West Nile virus in natural regions of Alberta in 2005.

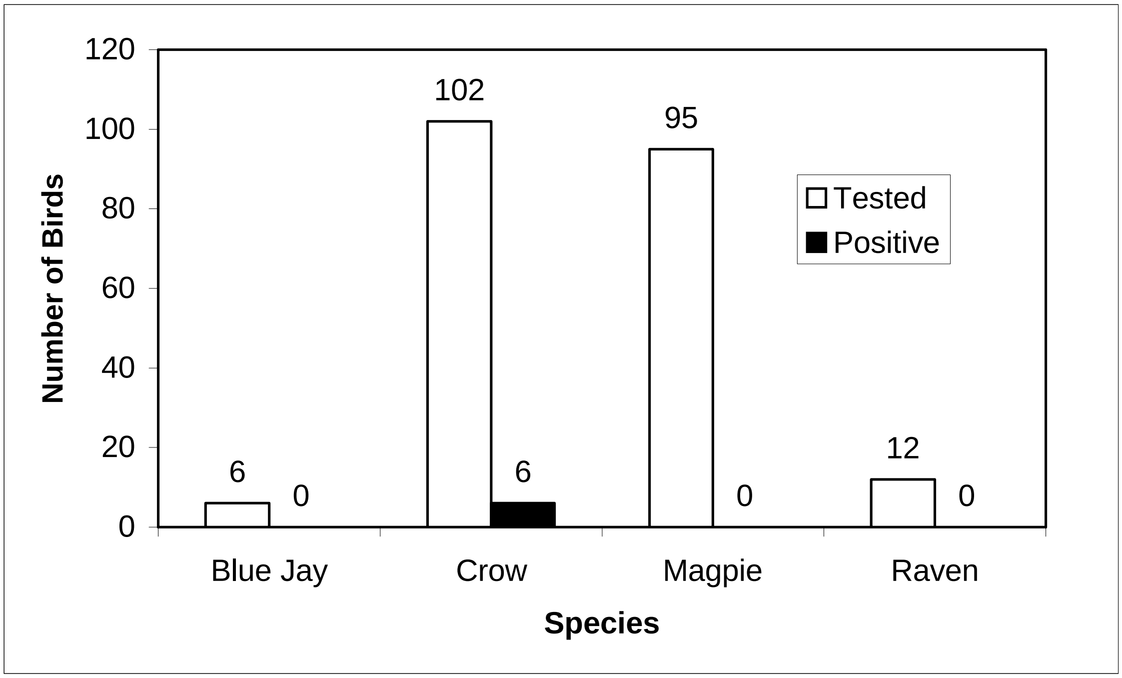


Figure 2: Corvids tested for West Nile virus in Alberta in 2005.

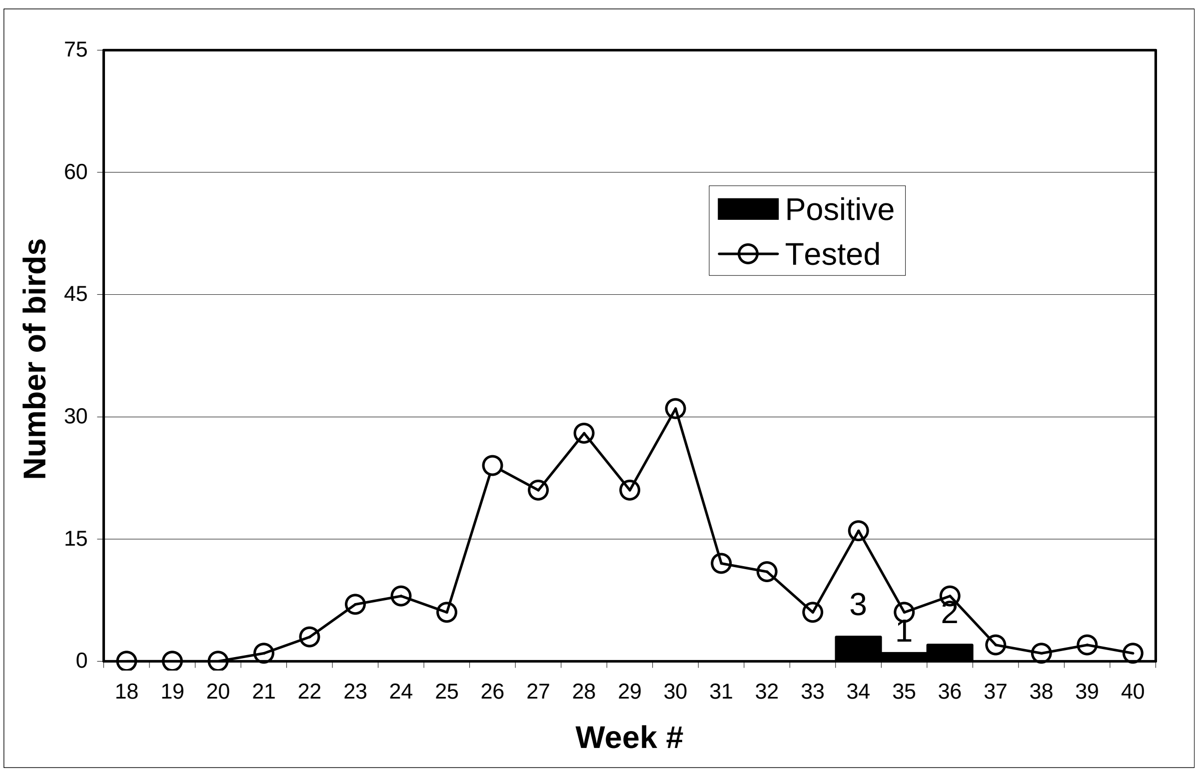


Figure 3: Weekly collection of corvids tested for West Nile virus in Alberta in 2005. See Table 5 for dates associated with each week.

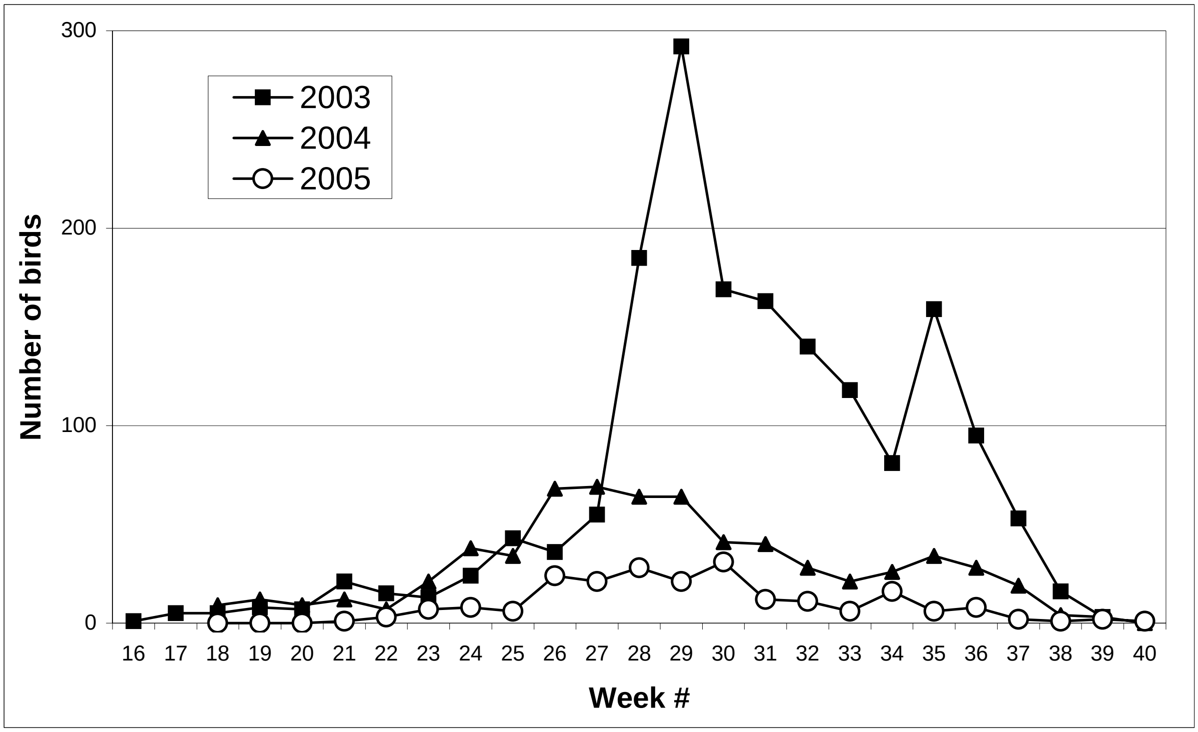


Figure 4: Weekly collection of corvids tested for West Nile virus in Alberta, 2003-2005.

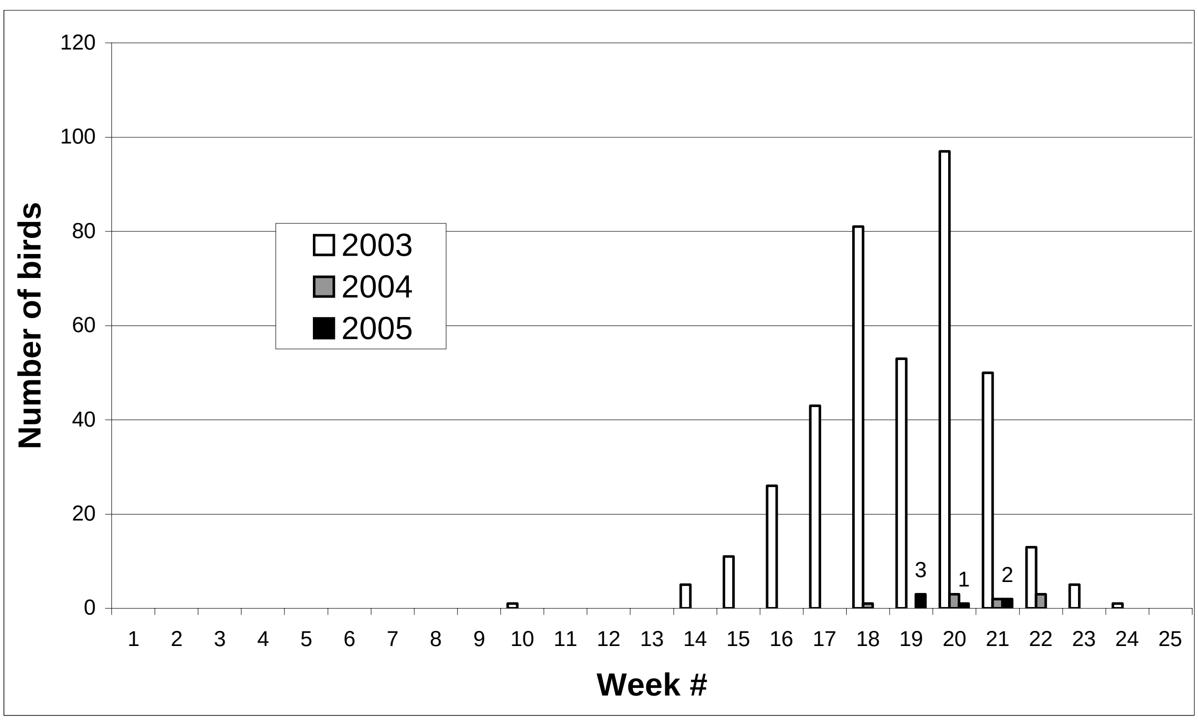


Figure 5: Number of corvids that tested positive for West Nile virus in Alberta, 2003-2005.

III. Horse Surveillance

Introduction

Horses become infected with 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). For the past three years, Alberta Agriculture, Food and Rural Development (AAFRD) has 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.

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 and 2005.

Objectives

The objectives of the 2005 WNv surveillance program and survey of WNv suspect horses in Alberta were to:

- Determine the number of horses affected with WNv in Alberta in 2005,
- Determine the location of infected horses in the province, and
- Determine the clinical signs present in infected horses, as well as vaccine usage.

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 were asked to complete a survey for each horse they suspected of having the virus and private diagnostic laboratories notified the OCPV of the results of laboratory tests (IgM Elisa serology), which confirmed the disease.

Results

The first suspected case of WNv in horses was reported at the end of June 2005, with reporting continuing until late October 2005. During 2005, private veterinary practitioners reported 20 suspect cases of WNv in horses. Of these, 3 were laboratory confirmed positive and 17 were negative. Of the 3 horses confirmed positive, 2 recovered and 1 (33.3 percent) was euthanized due to complications associated with the virus. Of the 20 horses suspected of possible WNv infection, 7 had been vaccinated, either for the first time or with a follow-up booster. None of the horses confirmed positive for the virus had been vaccinated.

Although veterinarians completed a survey for each "suspect" case of WNv, not every case could truly be defined as suspect. Veterinarians who submitted a blood sample to the laboratory, may have only been doing so to rule-out WNv as a potential diagnosis. Consequently, data collected from suspect cases that were confirmed negative will not be summarized in this report.

Clinical Findings

To investigate the presence of clinical signs of WNv infection in horses, veterinarians were asked to report if the horse demonstrated specific clinical signs. Survey results for the three horses that were laboratory positive indicated that one experienced depression, two demonstrated muscle tremors and one displayed signs of weakness.

Geographic Distribution

The geographic distribution of confirmed WNv cases according to health authority region is illustrated in Figure 1. Two horses confirmed positive for WNv were from Chinook health region, and one was from Palliser health region.

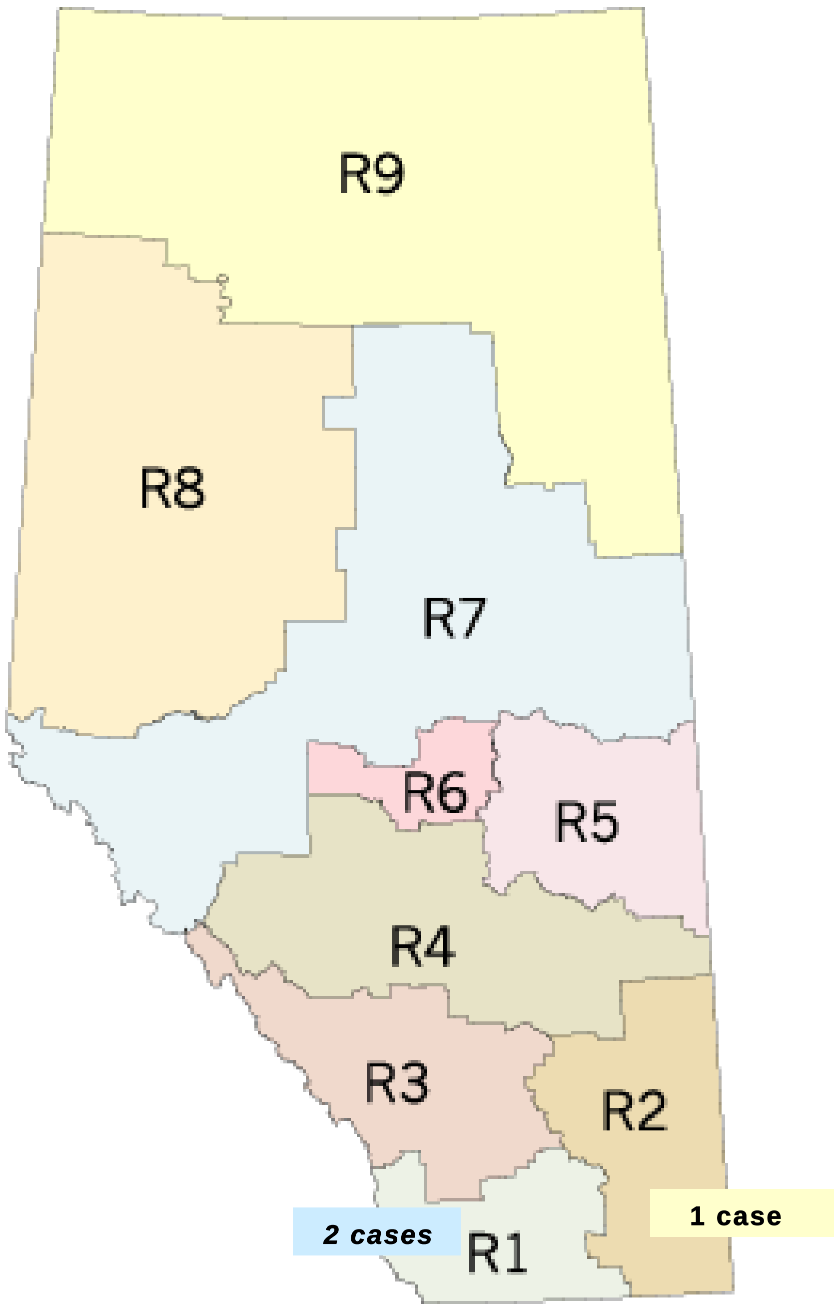
Conclusion

In 2005, there were three horses that were laboratory confirmed positive for WNv in Alberta.

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

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

Figure 1. Geographic Distribution of Equine Laboratory Confirmed Positive Cases of West Nile virus (WNv) by Regional Health Authorities in Alberta (2005) (n = 3)



IV. Human Surveillance

Introduction
In 2005 there continued to be three categories of WNV infection, West Nile Neurological Syndrome (WNNS), West Nile virus Fever (WNF) and West Nile virus Asymptomatic Infection (WNAI). Nationally the category WNF was replaced by West Nile Non-Neurological Syndrome (WNNon-NS), although the case definition remained the same.

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 WNF 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 10 cases of WNv reported in Alberta in 2005. This includes six confirmed cases and four probable cases. There were two cases of West Nile Neurological Syndrome (one probable) and eight cases of West Nile virus Fever (3 probable). There were no asymptomatic cases.

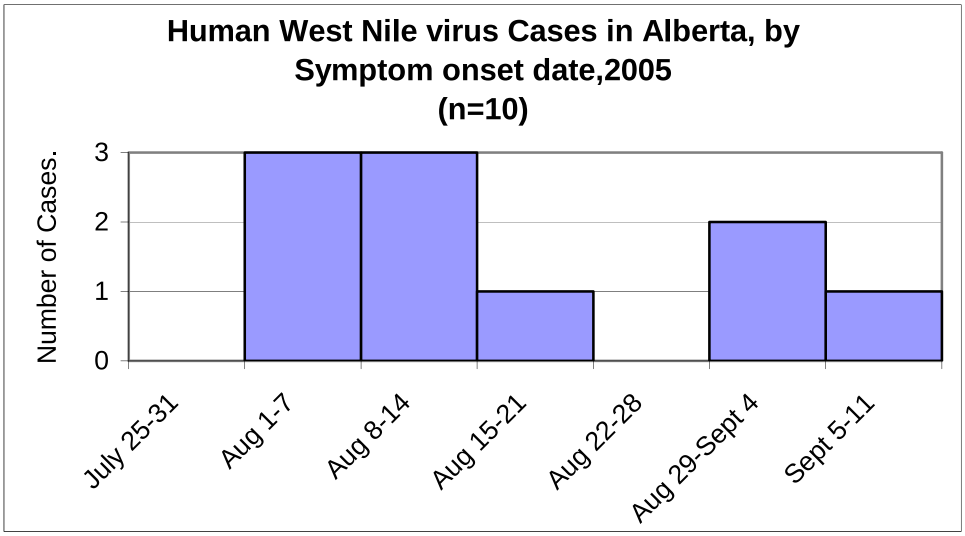
Gender
Three of the cases of West Nile virus infection were females and the remaining seven cases were males. None of the cases were pregnant.

Age Distribution
Mean age at symptom onset is 40.6 years, with and age range of 6 to 68 years. The age specific rates remain very low.

Age Group	Number of Cases	2004 Population	Rate (per 100,000)
<1	0	40396	0.00
1-4	0	156338	0.00
5-9	1	208009	0.48
10-14	0	229035	0.00
15-19	1	234277	0.43
20-24	0	235008	0.00
25-29	1	228698	0.44
30-39	1	467993	0.21
40-59	4	923998	0.43
60+	2	455284	0.44

Epi Curve

The 10 cases of West Nile virus infection have symptom onset between August 5 and September 6th, 2005. The incubation period for WNv infection is variable, between 2 and 15 days after exposure. In 2005 the majority of cases were exposed to the virus between late July and early August. This is consistent with the results in 2003, when the majority of cases (77%) had symptoms in the last three weeks in August.



Geographical Distribution

There were seven cases of West Nile virus infection that were not associated to travel outside of the regional health authority of residence. Six of these cases were in the Palliser Health Region and the other case was in the Chinook Regional Health Authority. The remaining three cases were associated with travel outside the RHA of residence to areas with West Nile virus activity.

Hospitalization/Deaths

No deaths as a result of West Nile virus infection were reported in 2005. Both of the West Nile virus Neurological Syndrome cases were hospitalized as result of their infection. None of the cases of West Nile virus Fever were hospitalized.

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. 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 human behaviour or the density of the *Culex* mosquito population in the area.

V. Mosquito Surveillance Program

Summary

Alberta Environment implemented the 2005 mosquito surveillance component of the West Nile virus Alberta Response Plan in cooperation with 30 Alberta municipalities and the Canadian Forces Base Suffield. A total of 814 trapping nights occurred over the span of 14 weeks from June 14 until September 13, 2005. There were a maximum of seventy-two carbon dioxide baited CDC (Centre for Disease Control) traps that operated within the boundaries of the six southern regional health authorities. Traps operated at least one night per week and captured 408,339 adult female mosquitoes that were sorted and processed for the surveillance program. A total of 14,454 mosquitoes were separated from this collection and submitted in a total of 636 pooled samples (455 of these were pooled specimens 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 2005, one pool of *Culex tarsalis* mosquito adult specimens confirmed the initial presence of WNv in Alberta. This occurred on August 3, 2005 from the Provost area located near the Saskatchewan border on the southern edge of the Parkland natural region. There were no other pools of mosquitoes (of the total 636) that tested positive for WNv during the 2005 surveillance period.

The weather resulted in a significant influence on the surveillance program again in 2005. In 2004 cooler temperatures throughout the mosquito season consistently suppressed mosquito development and potential virus transmission activity. In 2005, warm temperatures through the month of July and substantial rainfall / flooding in southern Alberta resulted in overall high numbers of mosquitoes, including *Culex tarsalis* (the primary vector of WNv on the prairies). As *Culex tarsalis* biting and reproductive activity were peaking in early August with detection of the first virus-positive pool of samples, average daily temperatures dropped the week of August 7 and remained cool over the following weeks. The marked drop in captured *Culex tarsalis* numbers in this time period may again reflect suppression of WNv amplification and transmission. This was at a time when it was expected to be on the rise with increased biting pressure of this species. In the southern-most region of the province where *Culex tarsalis* population numbers were higher than in the past two years, there were no further detections of virus-positive mosquito pools in this dramatic decrease in number of pooled specimens.

Across North America mosquito surveillance is being found as 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. It is recommended that mosquito surveillance continue with a greater focus on the higher risk areas in the Grassland natural region for 2006. In the event of increased virus activity, consideration can again be given to expanding the trapping sites across a broader range. In conjunction with the Provinces of Saskatchewan and Manitoba, the 2006 program should begin in mid-June and primarily *Culex tarsalis* adult females be submitted for viral analysis. Extending

analysis of other mosquito species would also be considered in the event of high virus activity.

Introduction

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

Due to the unpredictability of the weather and its potential impact on mosquito and virus activity the mosquito surveillance program component of the "*West Nile Virus: Alberta Response Plan 2005*" was again established throughout the six southern most regional health authorities in Alberta.

Objectives of Surveillance

The overall objectives of the 2005 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.
- use information for a better understanding of the role of the mosquito in WNv transmission in Alberta.

The success of the 2005 adult mosquito surveillance program was dependent on the continued cooperative working relationship with those municipalities that participated in the 2004 Programs and that were located throughout all the southern regional health authorities.

Methods of Mosquito Surveillance

Surveillance Centres

Municipalities participating in the 2005 surveillance program included those listed in the following table.

Regional Health Authority	*Participating Municipalities*
Capital	City of Edmonton
East Central	County of Camrose, County of Vermilion River, MD of Wainwright, Flagstaff County, MD of Provost
David Thompson	City of Red Deer, Kneehill County, Town of Drumheller, County of Stettler, Special Areas 2 & 4
Calgary	City of Calgary, Wheatland County, Vulcan County, MD of Willow Creek, MD of Foothills
Palliser	Town of Brooks, City of Medicine Hat, County of Newell, Special Area 3
Chinook	City of Lethbridge, Cardston County, County of Warner

The University of Alberta operated one centre in Manyberries as a part of their monitoring project involving the endangered Sage grouse, and one centre operated from the Canadian Forces Base Suffield.

Other municipalities in the northern part of the province, including the City of Grande Prairie, the County of Athabasca, the MD of Peace and the Regional Municipality of Wood Buffalo were also prepared to participate if the need was identified (see Map).

Operational Procedure and Testing

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

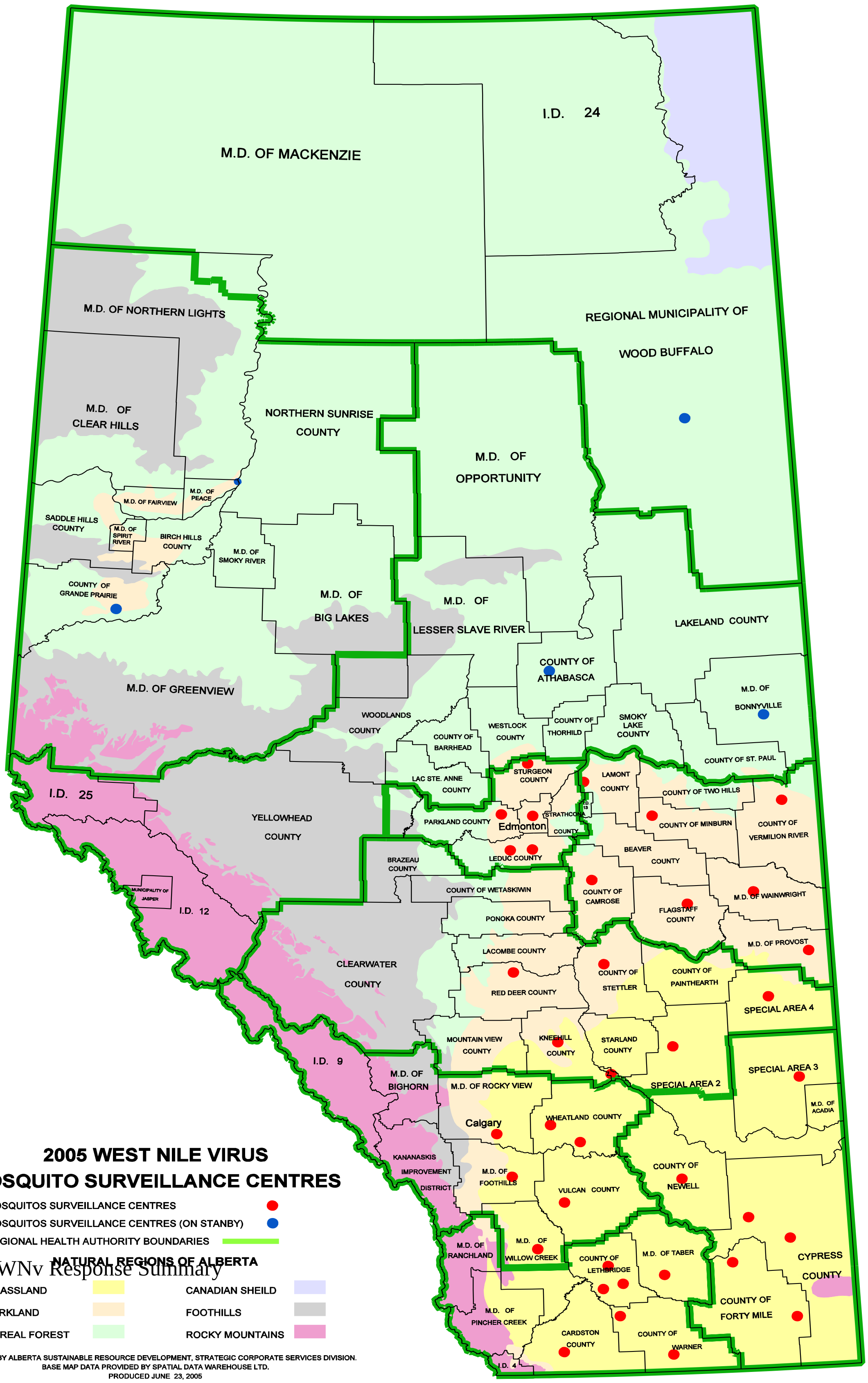
Traps used to capture mosquitoes were the standard CDC (Centre for Disease Control) model[4] used for monitoring diseases in insects. At least two traps were issued to all surveillance centres. Traps were operated in accordance with the West Nile virus National Steering Committee Guidelines (i.e. they were baited with carbon dioxide, in the form of dry ice or pressurized tanks, and operated without lights).

Municipalities phased in the operation of the traps between June 14 and 28, and began winding down in late August with all traps stopping on September 14. A maximum of seventy-two CDC traps were operated one night per week (usually Tuesday evenings) over the 14-week surveillance period for a total of 814 trapping nights. Live adult female mosquitoes were collected, killed by freezing, 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

[4] BioQuip Products, Inc., California

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

A warmer winter was experienced in the southern part of the province, and south of the Trans Canada Highway conditions were fairly dry with little to no snowmelt and spring rain events. Significant numbers of standing water bodies were observed in the area west of Brooks to Hanna and northeast that had not been there for a number of years. Around the third week in May, flood irrigation commenced in the irrigation districts and the resulting standing water from Medicine Hat to the Lethbridge area produced high populations of mosquito larvae, and of particular note were the numbers of the species *Culiseta inornata*. As this species survives the winter in the adult stage like *Culex tarsalis*, these numbers were indicative of a high winter survival rate. Throughout southern Alberta between mid June and early August, average daily temperatures remained in the range of 15 to 20°C in most areas and the populations of the above two species continued to climb. Larvae of each were found in most standing water, however the *Culiseta inornata* were in much higher numbers. Higher than average populations of all mosquito species thrived through July as the result of extensive rainfall and flooding that occurred in areas from Calgary to the eastern border of the province. In the second week of August average daily temperatures declined with cooler evenings predominating for the next two to three weeks. The impact of this was a reduction in mosquito nuisance levels throughout southern Alberta.

In 2005, populations of *Culex tarsalis* (the primary vector for West Nile virus) steadily increased through July reaching a peak in early August. This followed the same trend that the surveillance program has shown each year since 2003 (and is consistent with trends recorded by Alberta Environment in the 1980's). On August 3, 2005, the first virus-positive mosquito pool was detected in the Provost area, near the Saskatchewan border. The next day the Saskatchewan mosquito surveillance program detected the virus in mosquitoes near Lloydminster, and both detections were in the species *Culex tarsalis*. It was anticipated that *Culex tarsalis* populations would continue to increase with more virus activity but the average daily temperatures declined in the second week of August. As in 2004, the lower temperatures resulted in a decrease in biting activity, which may have also reduced virus transmission. Human cases followed detection of the virus-positive mosquito sample on August 3, 2005, and the cases that followed were suspected to relate to the peak infectivity period of the mosquitoes during the first two weeks in August.

Over the 14 week surveillance period in 2005 there were a total of 408,339 adult female mosquitoes captured, of which 14,454 of these were separated, identified, and sorted into 636 pools of mosquitoes (455 *Culex tarsalis*) that were submitted for WNv testing. During the peak activity period of *Culex tarsalis*, some municipal surveillance personnel emptied traps on an hourly basis. It was observed that this species was drawn to the traps between the hours of 2100 hours and 0700 hours, with the majority between 2100 and 0100 hours.

In addition, the surveillance programs in the Prairie Provinces, with data provided by Environment Canada, have conducted monitoring of the daily temperatures over the past three seasons (Figures 3, 4 and 5) and have tracked the number of accumulated degree days[5] above 16°C, which is the optimal development temperature for *Culex tarsalis.* This is being examined for a correlation between weather, mosquito activity and risk of human infection. The figures from the end of August summarizing areas with over 200 accumulated degree days above 16°C are also where *Culex* activity recorded by participating municipalities in the province has been more predominant.

Conclusion

In the 2005 mosquito season, *Culex tarsalis*, the species that West Nile virus is detected in almost exclusively in Alberta, became noticeably active in early June. The second generation of adults that followed the over-wintering (adult) generation, increased in numbers through July to early August. Based on observations in past years, and other provinces where the virus has been more active, this is the period where the repetitive feeding by adult female mosquitoes transmits and amplifies the virus, if it is present. In seasons where weather remains consistently warm increased reproductive activity of these mosquitoes will lead to a third generation of mosquito adults that will develop in mid August, some of which will actively host seek and blood feed before they enter diapause (suspending activity) in preparation for cold weather / winter. Municipal surveillance personnel in Alberta observed noticeable numbers of *Culex tarsalis* larvae in late June to mid July and the increase in adult populations later in July. It is believed that a third generation was starting at this time, when the decrease in average daily temperatures (second week in August) suppressed continued reproductive and biting activity. If the virus was present (which we can conclude it was to some extent by the activity experienced in Saskatchewan and Manitoba), amplification and transmission was also suppressed.

Monitoring mosquito populations over the past three seasons has demonstrated a trend from which we can expect West Nile virus activity to coincide with the peak reproductive and biting activity of *Culex tarsalis* populations. The magnitude of the activity will be dependent on:

a) the presence of the virus, and
b) the influence of weather on mosquito development.

The range of activity of *Culex tarsalis* has been demonstrated throughout the southern half of the province, particularly when weather was consistently warm in 2003. When weather conditions are not consistent, as in 2004 and 2005, *Culex tarsalis* appears to be limited to the more southern and eastern parts of the province. In observing the accumulated degree maps for the Prairie Provinces over the past three years, the documented areas of activity of *Culex* appear to match the areas where the numbers of warmer days are greatest.

In 2005, precipitation events resulted in heavy flooding in the Grassland natural regions that produced standing water not observed for several years. This created great numbers of all mosquito species in July and the *Culex tarsalis* populations, although low, were found widespread throughout these areas. This was not observed to the north in the Parkland natural region where very few numbers of *Culex tarsalis* were captured in the surveillance program throughout the season.

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

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

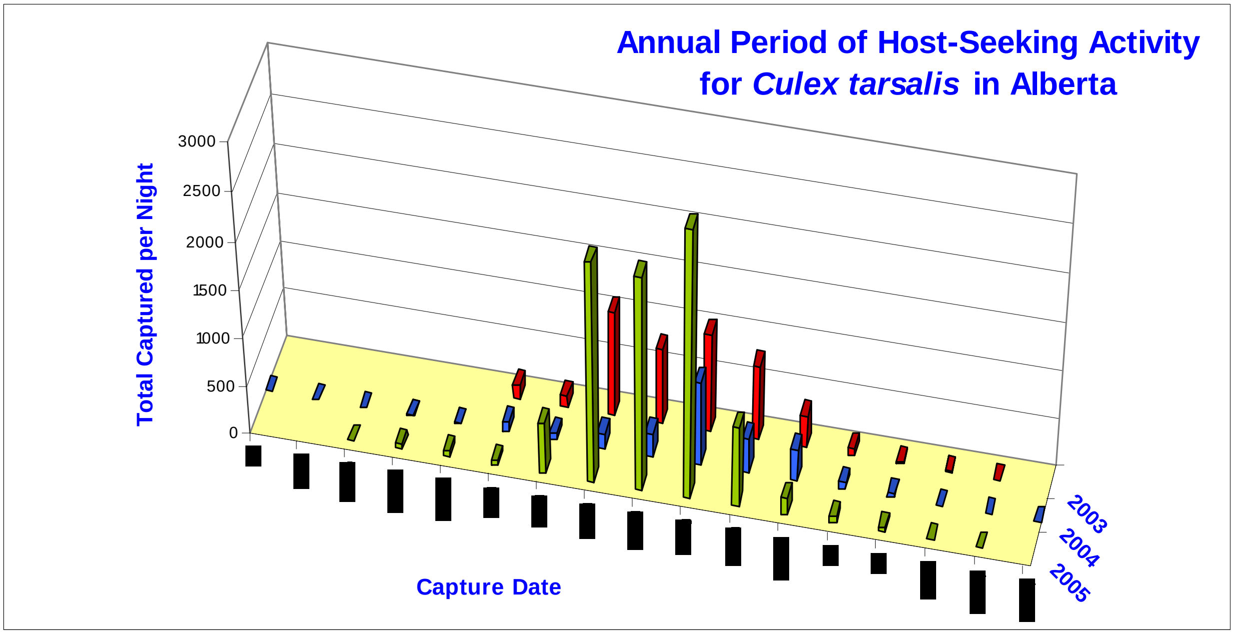


Figure 2. Population Trends of All Mosquitoes Captured in Surveillance Traps in Comparison to *Culex tarsalis* mosquitoes Captured.

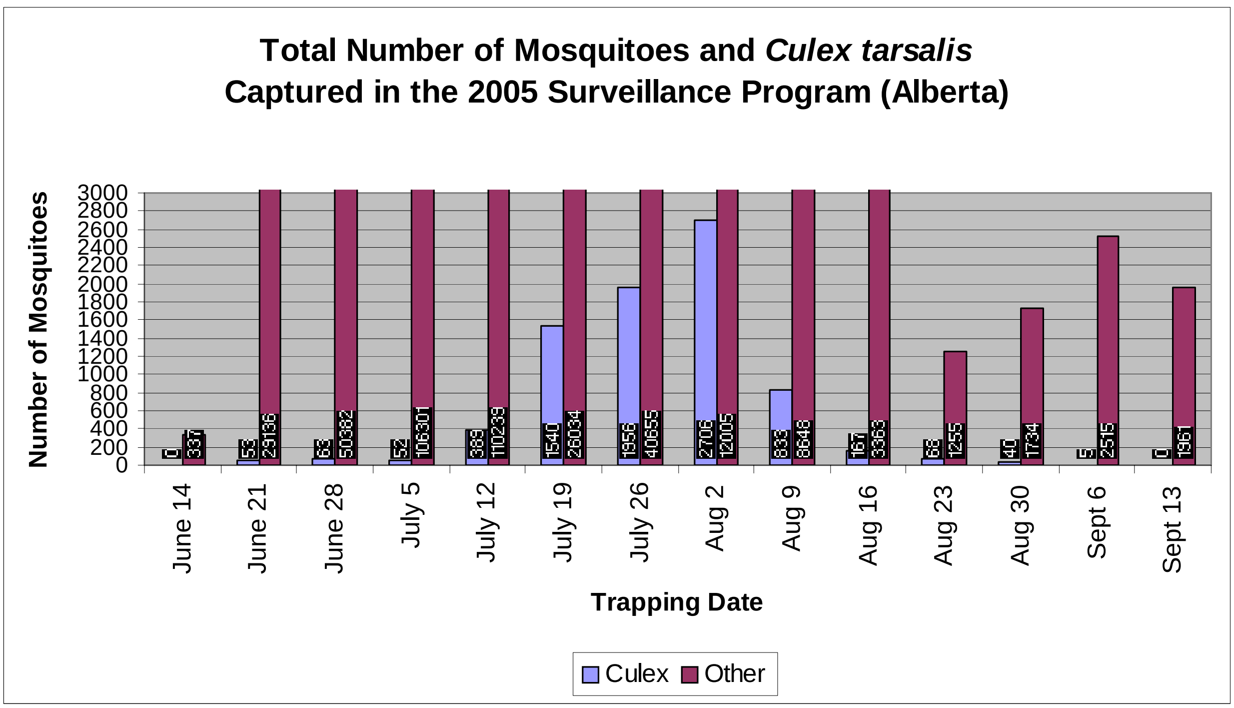


Figure 3.

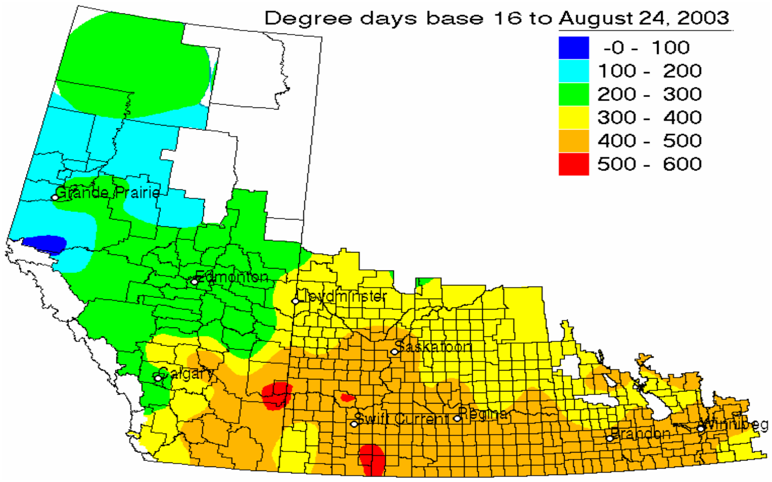


Figure 4.

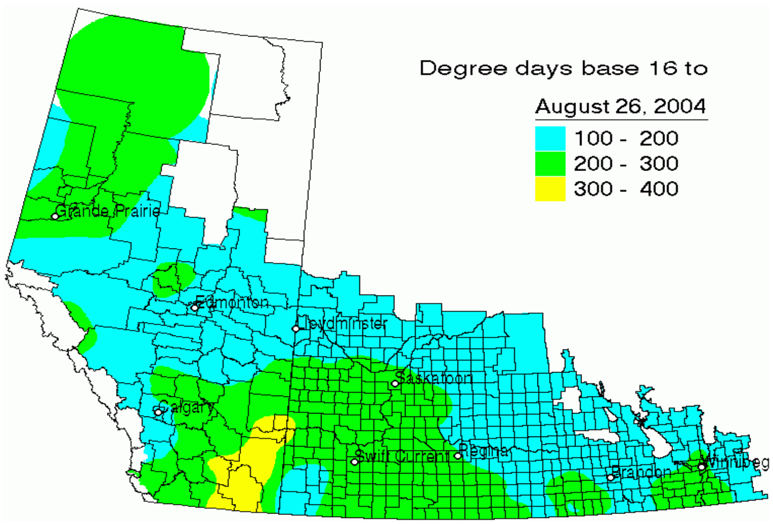
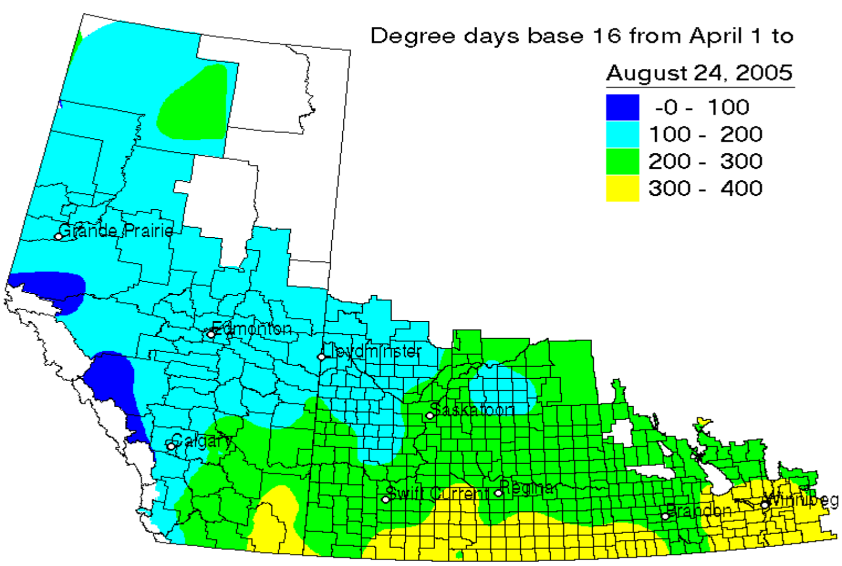


Figure 5.



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. It may also be providing municipalities that are conducting mosquito control measures a means of gauging the success of their control efforts.

Recommendations

The spatial distribution of traps in 2005 again appeared to provide good coverage for virus analysis and an early detection system to alert the public to take greater personal protective measures. Although there was little activity in the Parkland natural region, continued surveillance of mosquitoes in 2006, particularly in the Grassland natural region, has been requested by municipalities to alert and educate their public.

It is recommended, should the program be approved for 2006, that surveillance continue to commence in mid-June and that only *Culex tarsalis* adult females be submitted for viral analysis. Trapping locations are proposed to be reduced in number within the Parkland natural region, and continue to be evenly distributed throughout the Grassland natural region, similar to the past two years. Some focused testing is also proposed in some areas that would involve an increase in trap numbers and/or nights of operation. Should the virus become active and widespread, consideration would then be given to intensifying trapping in other areas and extending analysis to other mosquito species. Existing data does not support monitoring beyond the second week in September.

Jock McIntosh
Pesticide Specialist
Environmental Policy Branch
Environmental Assurance
Alberta Environment

For further information re WNv mosquito surveillance email Jock McIntosh at jock.mcintosh@gov.ab.ca

VI. Targeted Mosquito Larval Control Program

Summary

In 2005, 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 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 developing as larvae. 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 partake in the funding offered for mosquito control, 84 (87%) of these municipalities participated. Alberta Environment trained municipal staff and issued pesticide applicator certificates restricted to the use of specific larvicides for the 2005 season. The Department issued certificates to 90 municipal employees and extended authorizations from the 2004 season to conduct spraying within their municipalities.

Municipal mosquito program personnel received training during the month of May and commenced their operations June 1, concluding September 30, 2005. As in 2004, *Culex tarsalis* larvae were first noticed in small numbers in mid-June and became more noticeable from late June to mid-July. In late July and early August, population numbers again reached peak level for the year. The first and only West Nile virus positive mosquito sample was detected near Provost on August 3, 2005.

In 2005, the warmer weather during July and the resulting flooding across the southern-most part of the province resulted in more widespread development of *Culex tarsalis* larvae, which were found in small numbers in most standing water bodies. Average daily temperatures declined the second week in August and remained cooler for the next three weeks. *Culex tarsalis* biting and reproductive activity at this time was suppressed as it was in 2004, again making it difficult to assess the effectiveness of the municipal control programs. All participating municipalities provided feedback in their year-end summaries indicating continued support for the program. Recommendations included more advance notice of the program by Alberta Health and Wellness, continuation of mosquito-virus surveillance (to provide an alert system), and more training with respect to mosquito species identification.

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

The "*West Nile virus Targeted Mosquito Larval Control Program – 2005 Grant Program Guidelines*" were developed and announced to Alberta municipalities in April 2005. Grants, administered by Alberta Municipal Affairs, were allocated to approved municipalities and were based on a graded scale of risk established by scientific information obtained through the 2003 surveillance program.

Funding Formula

Municipalities located within each risk zone (Figure 1) were eligible for a minimum amount of funding of $1,500 and as follows:

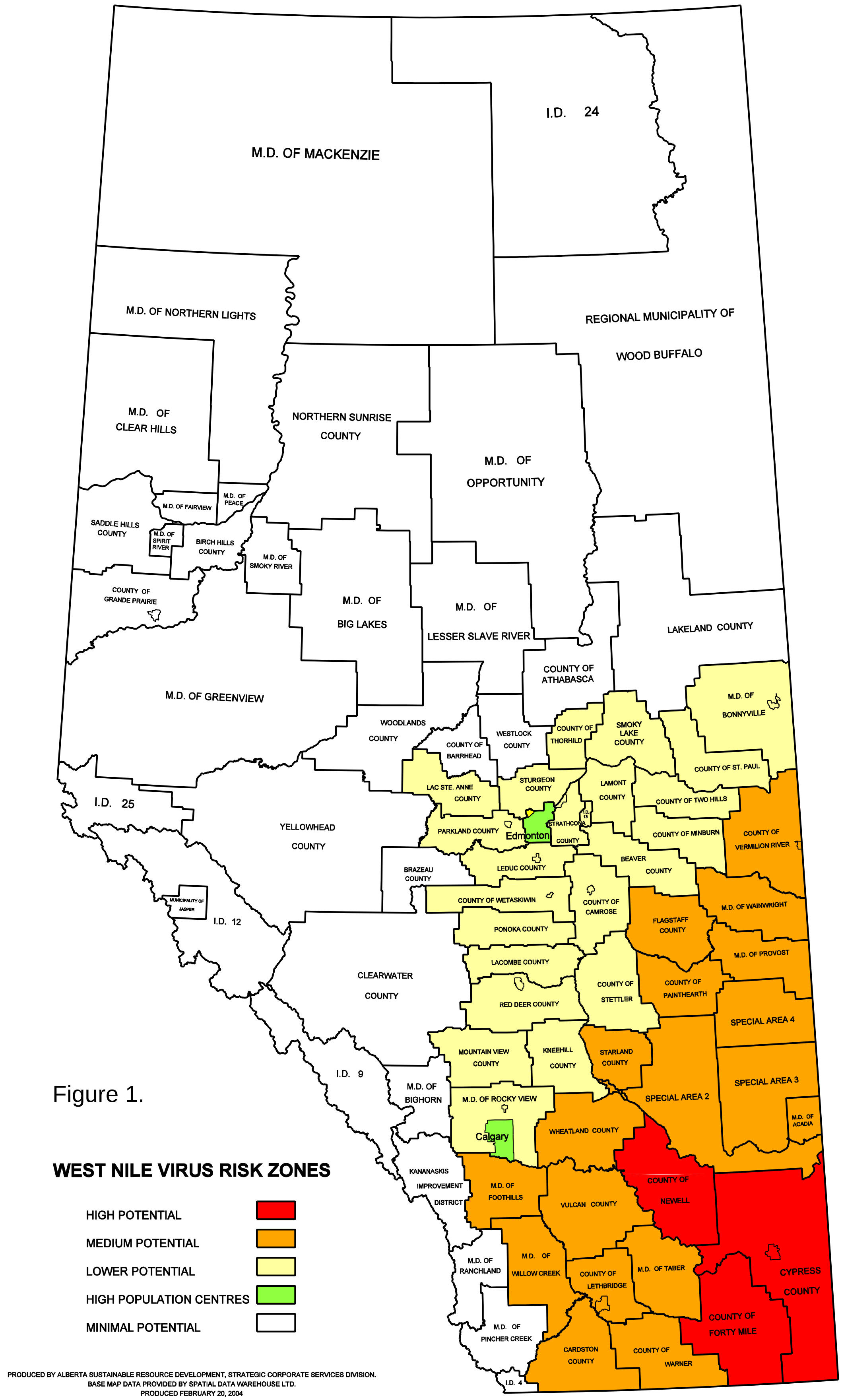
- RISK ZONE 1 (Highest Potential - RED) funded up to $4 per capita.
- RISK ZONE 2 (Medium Potential - ORANGE) funded up to $3 per capita.

The 2003 Alberta Municipal Affairs' Official Population List served as the population index for each municipality on which funding was calculated.

Funding Guidelines

Participating municipalities in this 2005 program were expected to:

1) identify an individual responsible for the program that would have or obtain certification to conduct or supervise all mosquito larvicide applications when and where required,
2) develop a mapping system to record all mosquito larval development sites within their established control zones (area within jurisdictional limits and including a 2 to 5 km surrounding buffer area),
3) obtain a Pesticide Service Registration, required to conduct mosquito larvicide applications within their jurisdiction,



M.D. OF MACKENZIE
I.D. 24
REGIONAL MUNICIPALITY OF WOOD BUFFALO
M.D. OF NORTHERN LIGHTS
M.D. OF CLEAR HILLS
NORTHERN SUNRISE COUNTY
M.D. OF OPPORTUNITY
M.D. OF FAIRVIEW
M.D. OF PEACE
SADDLE HILLS COUNTY
M.D. OF SPIRIT RIVER
BIRCH HILLS COUNTY
M.D. OF SMOKY RIVER
COUNTY OF GRANDE PRAIRIE
M.D. OF BIG LAKES
M.D. OF LESSER SLAVE RIVER
LAKELAND COUNTY
COUNTY OF ATHABASCA
M.D. OF GREENVIEW
WOODLANDS COUNTY
COUNTY OF BARRHEAD
WESTLOCK COUNTY
COUNTY OF THORHILD
SMOKY LAKE COUNTY
M.D. OF BONNYVILLE
COUNTY OF ST. PAUL
LAC STE. ANNE COUNTY
STURGEON COUNTY
LAMONT COUNTY
COUNTY OF TWO HILLS
I.D. 25
YELLOWHEAD COUNTY
PARKLAND COUNTY
Edmonton
STRATHCONA COUNTY
I.D. 13
COUNTY OF MINBURN
COUNTY OF VERMILION RIVER
BRAZEAU COUNTY
LEDUC COUNTY
BEAVER COUNTY
MUNICIPALITY OF JASPER
I.D. 12
COUNTY OF WETASKIWIN
COUNTY OF CAMROSE
FLAGSTAFF COUNTY
M.D. OF WAINWRIGHT
PONOKA COUNTY
M.D. OF PROVOST
LACOMBE COUNTY
CLEARWATER COUNTY
COUNTY OF STETTLER
COUNTY OF PAINTEARTH
RED DEER COUNTY
SPECIAL AREA 4
MOUNTAIN VIEW COUNTY
KNEEHILL COUNTY
STARLAND COUNTY
SPECIAL AREA 3
I.D. 9
M.D. OF BIGHORN
M.D. OF ROCKY VIEW
SPECIAL AREA 2
M.D. OF ACADIA
Calgary
WHEATLAND COUNTY
KANANASKIS IMPROVEMENT DISTRICT
M.D. OF FOOTHILLS
COUNTY OF NEWELL
VULCAN COUNTY
M.D. OF RANCHLAND
M.D. OF WILLOW CREEK
COUNTY OF LETHBRIDGE
M.D. OF TABER
CYPRESS COUNTY
M.D. OF PINCHER CREEK
CARDSTON COUNTY
COUNTY OF WARNER
COUNTY OF FORTY MILE
I.D. 4
WEST NILE VIRUS RISK ZONES
HIGH POTENTIAL
MEDIUM POTENTIAL
LOWER POTENTIAL
HIGH POPULATION CENTRES
MINIMAL POTENTIAL
PRODUCED BY ALBERTA SUSTAINABLE RESOURCE DEVELOPMENT, STRATEGIC CORPORATE SERVICES DIVISION.
BASE MAP DATA PROVIDED BY SPATIAL DATA WAREHOUSE LTD.
PRODUCED FEBRUARY 20, 2004

Figure 1.

4) operate their control program between June 1 and September 15, 2005,
5) attend government sponsored training sessions/clinics for larvicide applicator certification and mosquito identification,
6) provide community notification regarding intent to conduct mosquito control and obtain authorizations from residents residing in the buffer areas established around their jurisdictional limits,
7) provide a year end summary report that included expenses, chemical application records, and an evaluation of their program, and
8) return all unexpended funds related to the grant issued to them by Alberta Health and Wellness.

Funding Process

In April 2005, each municipality received a grant application along with the Grant Guidelines. Alberta Municipal Affairs processed grant applications received from May through July. The Assistant Deputy Minister of Alberta Municipal Affairs and the municipal representative signed each grant agreement. The funds were dispersed and any unused portion was returned at the end of the season.

Season Synopsis

Information/training sessions were held from May 25 to June 7, 2005 and were open to municipal officials, health inspectors, administrators and staff that would be directly involved in control program implementation. Sessions were held in Medicine Hat, Lethbridge, High River, Hanna, Airdrie, and Wainwright. 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 2005 season (June 1 to September 30) and only authorized the use of biorational larvicides. These are comprised of active ingredients that are microbial, such as those containing *Bacillus* species, or an insect growth regulator, such as Methoprene.

There were 84 municipalities that commenced their programs in early 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 developed taxonomic identification keys specific for Alberta mosquitoes and provided training on their use.

Weather trends through June and July were warm enough to result in good development of *Culex* populations, but again numbers were low enough that municipal staff did not observe these particular mosquito larvae appearing in significant numbers until mid-July. Larvicide applications were necessary from mid-July to late August. Average weather conditions turned cooler through the latter part of August, which again this year suppressed continued larval development of *Culex tarsalis* and biting/reproductive activity of the adults. It was further noted that low population numbers of this species were found later in the season throughout southern Alberta in much of the standing water left in areas that received above average rainfall and flooding through early July.

Summary of Municipality Participation

The following Table summarizes the participating municipalities in each of the risk zones and the funding that was utilized to establish targeted mosquito control programs during 2005:

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	GRANT ALLOCATION	GRANT SPENT*
1	12	12	100	9	3	$356,384	$177,707
2	92	72	78	48	44	$887,838	$485,601
TOTAL	104	84	87	57	47	$1,244,222	$663,368

* Based on municipal reports.

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

All participating municipalities were requested to respond to a series of questions that would assist in an assessment of the operation of the 2005 targeted mosquito control initiatives. An overview of responses is provided below.

Staff and Training

1. Were staff specifically hired to conduct the control program?

   Responses were variable and reflected the ability and commitment of municipalities to the program. Large towns and cities typically hire seasonal staff dedicated to conduct the program. Following major rain events some were able to draw extra support from other staff. The responsibilities associated with the program were directed to the Agricultural Fieldmen of the Counties and Municipal Districts and again, some attempted to conduct the program by themselves while some hired temporary staff. Those in larger areas recognized the need to have dedicated staff, particularly if they had an increase in their standing water during peak Culex tarsalis development from mid-July to mid-August.

   If yes, how many other people were available to assist them (full-time or as required)?

   Responses did not indicate exact numbers. The preference of most municipalities (with exception of the cities) is to leave the program to one dedicated person. These people have commented that they can usually maintain the area with pesticides of a more residual nature (Dursban, Altosid and Vectolex). Larger counties and cities require more resources and the program will be beyond their capability if there is a significant amount of standing water that supports mosquito larvae development. Large cities have typically provided technical assistance to outlying centres over the past three years of WNv surveillance and control.

   If no, and the program was implemented as a supplement to regular position responsibilities, was the staff member able to adequately implement the mapping, monitoring and larviciding requirements for this program?

   The majority in this situation were the Agricultural Fieldmen in the Special Areas and southern Alberta. They indicate they cannot maintain the monitoring that is required on their own.

   Would the same approach be considered in a future program (please explain)?

   This is totally dependent on what happens with respect to the amount of standing water that is created from snowmelt and rainfalls prior to and during the peak period of Culex tarsalis activity in the overall mosquito season.

2. Did program staff receive training and certification prior to commencing the program or were they supervised by someone that had been?

   All program staff received training required for pesticide applicator certification in the sessions that were held by Alberta Environment. The timing of these sessions allowed for municipalities to hire seasonal staff to partake in the training.

3. Did program staff feel the training was timely and adequate?

   All responses were unanimous in that training was timely.

   Please indicate what changes or improvements would be recommended.

   - *would like more detailed training with respect to mosquito identification.*

- *would like more "hands-on" / on-the-job training.*
- *more courses should be offered to address shortage of applicators and to train support staff required for vacation coverage.*

4. Did program staff conduct mosquito larva and/or adult identification?

   All program staff in attendance at the training sessions received training and taxonomic keys for the identification of <u>Culex</u> larvae. Their ability to identify larvae was dependent on their commitment, their access to a microscope, and the presence of larvae in their area. All staff dedicated to the <u>Culex</u> control program found the identification keys useful and it assisted them in successfully targeting control of these larvae.

   Only those municipalities involved in the adult mosquito surveillance program received training, taxonomic keys, and assistance in adult identification (taxonomic keys were also provided by Alberta Environment). The major centres, that typically conduct mosquito nuisance control programs with more experience staff did the majority of the adult sorting and identification (Edmonton, Red Deer, Calgary, Lethbridge, Medicine Hat, Brooks, and CFB Suffield).

   Did the mosquito identification information received this year from Alberta Environment assist in this position responsibility?

   The taxonomic keys for identification of mosquito larvae and adults were well received.

   In particular, did the program staff member develop confidence in the identification of the West Nile virus primary mosquito vector species (*Culex tarsalis*)?

   Most municipal staff that have their first experience with the program are not certain about what to look for until they actually see <u>Culex tarsalis</u> larvae. The likelihood of this is typically around mid-July. A significant number of program personnel returned from the 2004 season and have developed a higher confidence level for identification.

   Do they have any suggestions as to how the mosquito identification component could be improved to further benefit the program?

   The most consistent comment was that they would like more "hands-on" training.

5. Were program staff able to access the supplies, materials and other resources to assist in mosquito identification?

   All those municipalities that responded to this question indicated that Alberta Environment had provided them with all the necessary materials (forceps, vials, pipettes, preservative, taxonomic keys, and written instructions). At the start of the season it was suggested that they access microscopes for the summer from local high schools and it appears that many were successful in that regard.

   Please provide any comments as to what worked well and any suggestions that might benefit other municipalities.

- *would like more advance notice of the program to assist them in their efforts to obtain qualified staff, budget forecasting, and management of time and resources.*
- *some retail centres sell magnification devices that provide a viable option to microscopes (these are better for the more experienced user).*

MAPPING and SURVEILLANCE

1. Please provide a description of the mapping system this municipality has developed for mosquito larval development sites within its established control program area?

   A considerable number of municipalities have established and/or supplemented an existing GPS system for recording mosquito larval development sites within their established control zones. Many of the systems that were observed by Alberta Environment and examples submitted in year-end reports were exemplary and will allow them to retain and build on for as long as they choose to operate control programs.

   Some of the smaller communities have also kept hand made mapping systems that are retained in their offices in loose-leaf binders.

2. Has the mapping system been developed in a way that it can be available and used for future programs?

   It was noted that only one municipality did not.

   Please indicate whether partnering municipalities could have future access to the maps/mapping system if required.

   Yes, if hand made. Yes, if GPS technology is similar. Mapping is generally believed to be an invaluable tool to have in place for future years.

3. Through mapping and monitoring for the presence of the target mosquito vector species *Culex tarsalis* please provide opinions/observations regarding:

   How easily were they found?
   - *because of the time they take to build up in numbers, it is not often they become noticeable in the water until early to mid-July.*
   - *their development/activity is not easily detectable in cooler temperatures.*
   - *the warm days throughout July noted Culex tarsalis building in numbers throughout Alberta south of Hanna and east of Lethbridge/Calgary – with densities increasing towards the east.*
   - *the drop in daily temperatures throughout this region that occurred during the second week of August resulted in a noticeable decline in development/activity (i.e. the cooler evenings).*
   - *larvae were observed developing in the water as late as the second week in October, however were in very low numbers.*

   When were they first found in the water in this program's control area?
   - *the first records of Culex tarsalis larval detection occurred in the second week of June (Drumheller).*

- *the latest first record of detection was reported in mid-August (High River).*
- *most first detections occurred early to mid-July.*

What kinds of numbers were found throughout the season?

- *although larvae of all other mosquito species were found in large numbers from mid-June to late July, the Culex tarsalis population numbers of larvae were increasing steadily through the summer and were comprising as much as 95% of the total mosquito population in the remaining standing water around late August.*

What kind of habitat/water were they found in?

- *typically in roadside ditches, irrigated fields, sloughs.*

What kind of habitat/water were they found in higher numbers?

- *reservoirs, parks, lagoons / waste transfer stations.*
- *highly organic water.*
- *edges of irrigation reservoirs.*

4. Based on this program's experiences this year, do you feel that *Culex tarsalis* can be effectively targeted?

Examples of direct comments are as follows:

- *targeting all mosquito larvae ensures maximum results in Culex larvae population reductions.*
- *it is not difficult to target larvae in general, but more so for one species.*
- *best approach is to treat sites routinely.*
- *overall success hard to evaluate as one of the wettest summers in recent history was experienced.*
- *pesticide application crews can effectively target Culex populations, however they find this species indiscriminate in habitat preference and tend to find them in most of their standing water.*

Is this limited to a certain percentage of mosquito development habitats (that you have been successfully able to determine through your mapping)

Particularly in southern Alberta the general consensus is that Culex has the potential to develop in any standing water, and becomes more prolific in protected waters and those that become more stagnant or rich in organic matter.

OR are mosquito vector control strategies required to be more broad spectrum within a certain time period when *Culex tarsalis* is most active?

Responses as in (4) above indicate that control strategies should be more broad spectrum.

CHEMICAL SELECTION and APPLICATION

1) Did this program use pesticides (larvicide) to control mosquito larvae in 2005?

The majority of the participating municipalities engaged in the use of larvicides during the 2005 season.

2) What larvicide(s) were used?

LARVICIDE PRODUCT NAME	**Active Ingredient**
AQUABAC 200G	*Bacillus thuringiensis* var. *israelensis*
AQUABAC IIXT	*Bacillus thuringiensis* var. *israelensis*
AQUABAC SHAKER CANS	*Bacillus thuringiensis* var. *israelensis*
VECTOBAC 200G	*Bacillus thuringiensis* var. *israelensis*
VECTOLEX CG	*Bacillus sphaericus*
ALTOSID	Methoprene
DURSBAN 2½ G	Chlorpyrifos

3) Following a treatment of any *Bacillus thuringiensis*-based product (such as Vectobac or Aquabac granules) in any one larval development site:

What was the period of time before re-treatment of the same site was required (i.e. how long did the BTI appear to be effective before larval recolonization of the site was noted)?

	DAYS
RANGE	3 to 14

All programs found BTI applications to be effective for a minimum of 3 days. Longer periods of recolonization appeared to be related to weather conditions and the time it took for the majority of the larval population to reach the appropriate life stage for another pesticide application.

Were there larval development sites where the pesticide appeared to be ineffective?

No reports of ineffective product.

4) Following a treatment of any Methoprene-based product (such as Altosid granules) in any one larval development site:

What was the period of time before re-treatment of the same site was required (i.e. how long did the Methoprene appear to be effective before larval recolonization of the site was noted)?

There were very few municipalities that used Altosid granule formulations and they commented that it appeared to provide around 30 days of control. They were not explicit as to how they monitored product efficacy.

Were there larval development sites where the pesticide appeared to be ineffective?

There was one report where the application of Altosid did not appear to be effective and may be related to actual product integrity (past expiry date).

5) Did this program use *VECTOLEX CG Biological Larvicide* this year?

Seven of 38 programs reported using this product in 2005.

If so, please provide an assessment of the efficacy of this product and how it was assessed.

Through routine checking at the site of application, most communities found that this product appeared to be effective for 3 weeks. The product did not receive federal approval for use until early June 2005 and was not available until early July. Most municipalities were not geared to use it this season. One municipality did not start using it until mid-August.

6) Was the program under the supervision of a certified applicator that could use pesticides other than those (larvicides) authorized to be used by the holder of a "restricted" certificate?

YES	4 programs
NO	34 programs
TOTAL	38 programs

If so, please provide the choice of products used and include these in the application records.

Dursban 2½G Insecticide Granules (active ingredient is Chlorpyrifos)

7) Did this program use pesticides (adulticide) to control mosquito adults in 2005?

YES	1 program
NO	37 programs
TOTAL	38 programs

If so, what adulticides were used?

A malathion-based product**.**

8) Describe the pesticide application equipment used for this program.

Ultra Low Volume truck-mounted application equipment.

Summary of Pesticide Used in the 2005 West Nile Virus Targeted Mosquito Larval Control Program (within the High and Medium Risk Zones identified in Figure 1)

Jurisdictions	*Number Reporting*		38	
	Number Reporting Use of Chemical		34	
	Percentage Reporting Use of Chemical		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	*Dursban 2.5G*	741.30 kg	2.5 %	18.53
Bacillus thuringiensis* var. *israelensis	*Vectobac 200G*	2098.41 kg	0.2 %	4.20
	Aquabac Shaker Cans (Domestic)	13.00 kg	0.2 %	0.026
	Aquabac 200G	1206.71 kg	0.2 %	2.41
	Aquabac II XT	114.60 L	1.2 %	1.38
Bacillus sphaericus	*Vectolex CG*	1515.12 kg	7.5 %	113.63
Methoprene	*Altosid Granules*	576.00 kg	1.5 %	8.64
			TOTAL	148.82 kg AI

GENERAL COMMENTS FROM MUNICIPALITIES REGARDING OVERALL PROGRAM

- to justify to rural residents that their health and well-being is less important than those located in built up areas simply due to the fact it is impossible to protect all due to manpower and time limitations was for some, a disappointment (MD of Taber).
- the control efforts they are taking contribute to public awareness regarding standing water on personal property – some extent of control is better than none at all (Town of Coalhurst)
- local taxpayers really support program and benefits to outdoor activities, and the increased awareness about the disease (County of Forty Mile)
- larviciding is much more receptive to the public than adulticiding (Town of Strathmore).
- control area (the County) is too large to implement from a major centre (City of Medicine Hat).
- County residents are appreciative that something is being done to reduce risk of WNV in their community – they phone and stop staff on the roads t personally thank them (Cardston County).
- trapping and identification is beneficial for control personnel to have a better idea of what is happening in their area.

Conclusion

Municipalities continue to identify their willingness to continue implementing surveillance and control activities while information is still being obtained about the activity of the virus in this province. Mosquito control programs can fit within their summer projects and are best conducted with dedicated staff that can, if necessary, be utilized to assist in other project areas. The month of May and June involves training and program preparation (i.e. mapping, obtaining authorizations and landowner permissions, equipment purchase and calibration). The critical period for targeted larval control appears to be from late June to mid-August, with an emphasis on locating and targeting the first seasonal generation of larvae through June and July. The success of each municipal program is dependent on their commitment to determining larval development sites and being able to apply the pesticides in the time required. The time is dependent on the amount of standing water that support *Culex tarsalis* larvae and consistent warm weather that will speed up mosquito reproductive activity and development. Municipalities in the higher risk area of the province have developed an appreciation for the significant numbers of mosquitoes they can reduce in their control areas, at the same time recognizing the influences that can occur from outside their control areas created by weather conditions and irrigation practices. In addition, they continue to support Government funding for surveillance and related activities to determine whether targeted mosquito control strategies can impede the build up and spread of the virus.

For further information re WNv mosquito control, email Jock McIntosh at jock.mcintosh@gov.ab.ca

VII. Provincial Laboratory for Public Health (Microbiology)

Diagnostic Testing

<u>Serology</u>
In 2005, West Nile virus IgM again served as the primary diagnostic test. Positive specimens were retested by a background subtraction IgM method, which removed false positives due to non-specific binding. IgG testing was performed on IgM-positive samples, and on previous samples, where available, to show diagnostic rises in antibody level. IgG avidity testing was also validated and introduced into the test algorithm. Sera from probable cases were forwarded to the National Microbiology Lab for hemagglutination and neutralization titres, for confirmation.

<u>Nucleic Acid Amplification Tests (NAAT)</u>
NAAT testing was again employed for WNV diagnosis in CSF and plasma. NAAT was also introduced for serum from cases where plasma was not available. As before, WNV NAAT was linked to enterovirus NAAT as the latter is common in the summer months.

Ten patients were diagnosed with WNV infection in 2005. In 5 cases, the patient was viremic, and confirmed positive by NAAT testing on the first blood sample. Three patients were IgM-positive, IgG-positive on the first sample, and had low-avidity IgG, indicating acute infection. Two patients were IgM-positive, IgG-negative, and converted in a convalescent sample.

Transplantation

NAAT testing on plasma specimens was continued for 2005 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 2005.

Mosquito Testing

In collaboration with Alberta Environment, NAAT testing was continued for mosquito pools in 2005. Only one pool was positive this year, (*Culex tarsalis* , Provost).

WNV Testing Summary

Jan 1st – Dec 31st, 2005

Test	Population	Specimens tested	Positive patients
Serology	human diagnostic	1449	9
CSF NAAT	human diagnostic	218	0
Plasma NAAT	human diagnostic	1325	5
Plasma NAAT	transplant screen	536	0
Mosquito pool NAAT	mosquito pools	647 pools	1 pool

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

VIII. Communications

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

The goals for the communication plan were to:

- Inform the public about WNv
- Provide access to reliable information and resources to guide the public, (particularly active seniors) 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 2005. The strategy aimed to make information widely available but targeted to active seniors. The strategy included:

- A news release to provide members of the media with information on Alberta's provincial plan for 2005. *West Nile virus: Alberta's Response Plan (2005)* was distributed at that time, and posted to the Alberta Government website.

- The Health and Wellness website – www.fightthebite.info continued as the Alberta Government's homepage for information on West Nile virus, including links to resources available on other provincial department websites, as well as Health Canada, U.S. CDC and other reputable sources. The website also provided responses to commonly asked questions and copies of the materials used in the public awareness campaign.

- Focus testing was conducted to explore the level of concern regarding WNv, the awareness of WNv and the response to the 2004 'Wheel of Misfortune' campaign. The results of the testing were used to guide the content and approach of the 2005 public awareness campaign.

- A public awareness campaign which included radio, daily and weekly newspapers and print materials were created to again inform Albertans of the low risk but high consequences of WNv infection and how to protect themselves. The campaign was targeted to 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 campaign included:
    - ❖ Print advertising: placements in province-wide, dailies and weeklies and magazines (for example, Grandparent Magazine and Our World)
    - ❖ Radio spots 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 to Regional Health Authorities, municipalities, senior's organizations, parks, campgrounds, golf courses
- Factsheets available at www.fightthebite.info

- News releases were issued with the first evidence of West Nile virus in humans, birds, mosquitoes and horses in the province for 2005,
- Cumulative numbers of cases of WNv in birds, horses 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
- 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, veterinarians, and municipal staff.

Evaluation

A variety of measures were used to evaluate the public awareness campaign for 2005. The following were monitored:

- Media coverage
- Web site visits
- Phone calls to the provincial Health Link information line
- Public inquires to AHW – letters, emails, phone calls, requests for materials

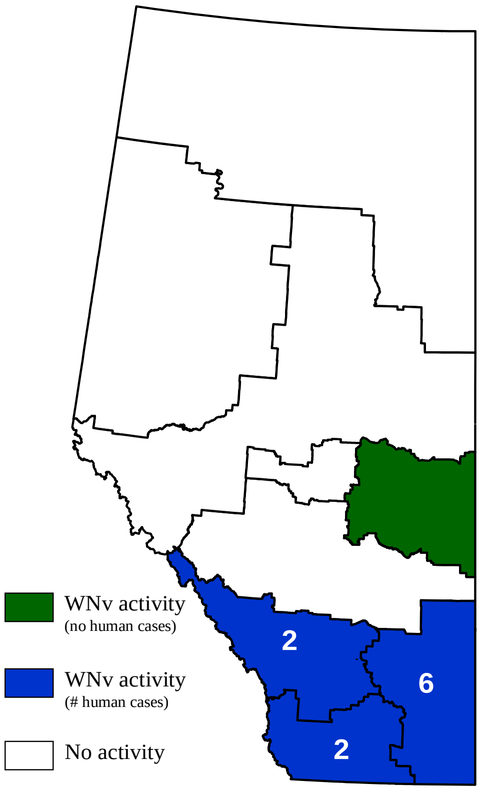
- Results from questions in the 2004 serosurvey related to knowledge, attitudes and behaviours around personal protection measures
- Results from focus testing conducted in June 2006 to measure the public's response to the 2005 campaign.

IX. Summary of Surveillance Across Species

In the third year of WNv 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.

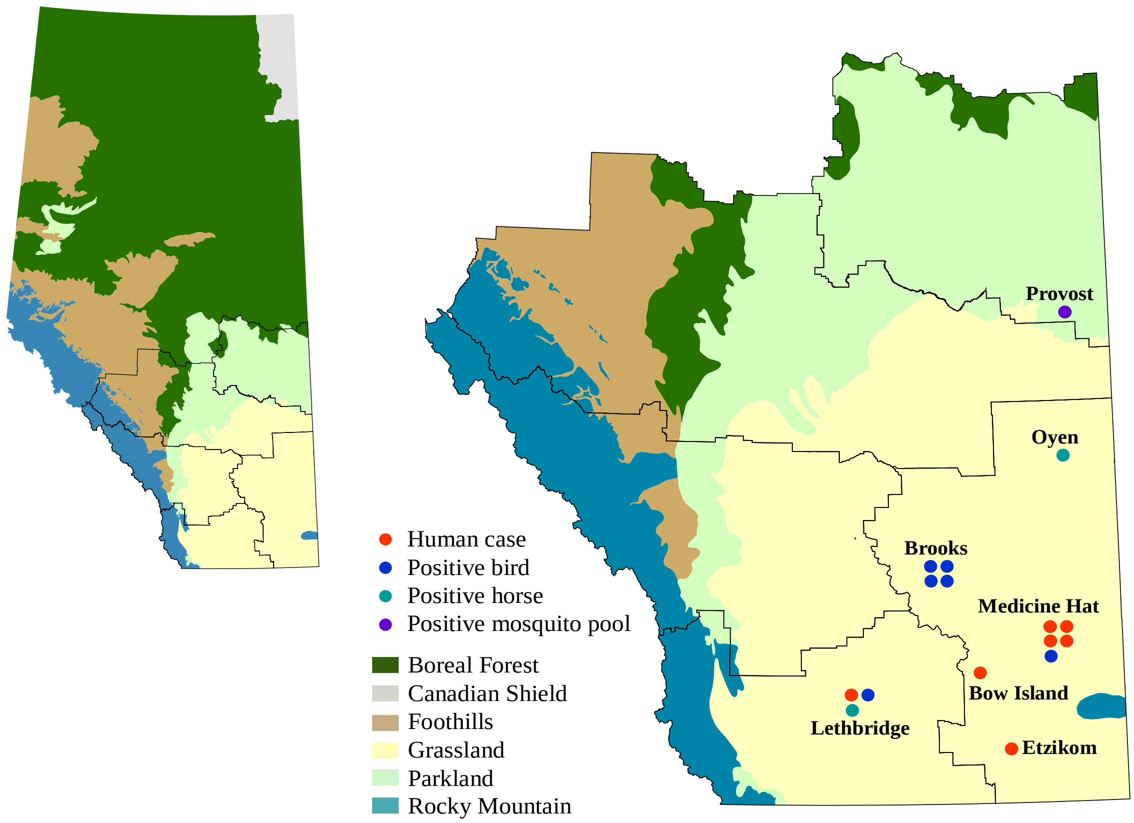
Summary of Positives in 2005 by Regional Health Authority



2005

Humans	**10**
Horses	**3**
Birds	**6**
Mosquito pools	**1**

Summary of All Positives in 2005 by Natural Region



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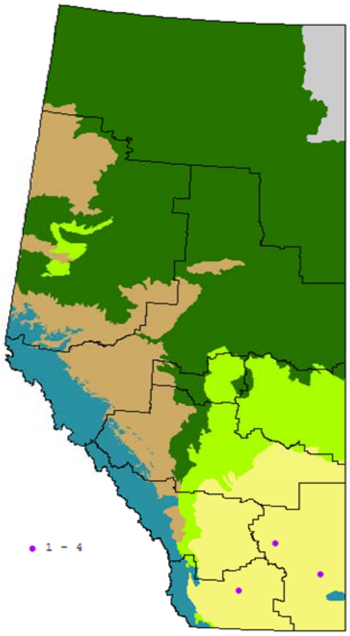
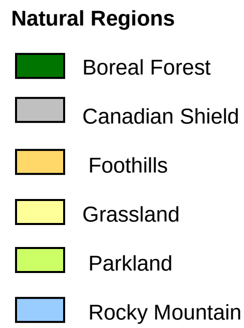
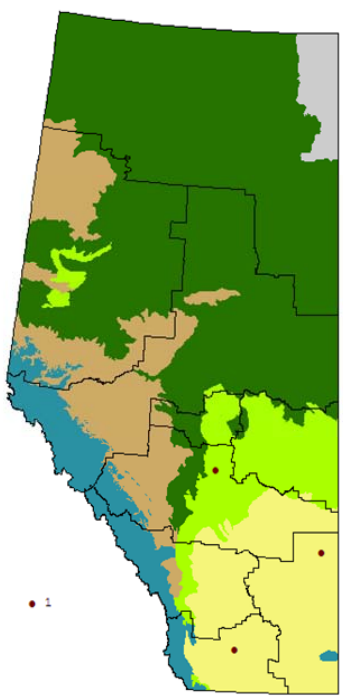
Summary for Each Species by Natural Region

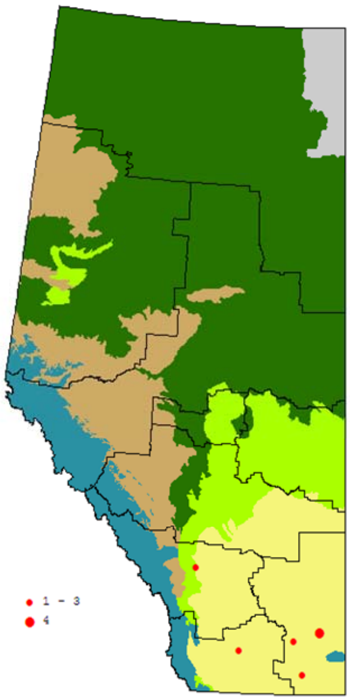


Birds 2005
N=6





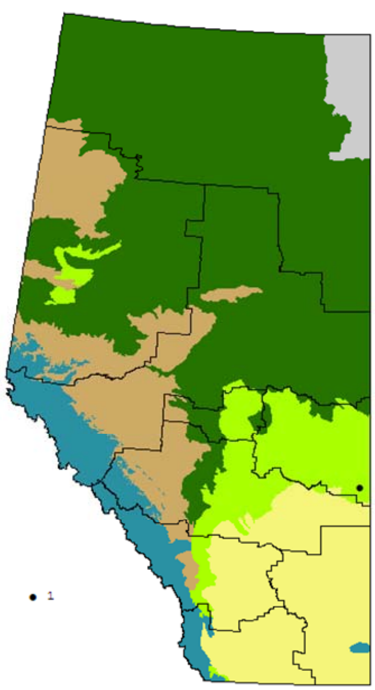
Horses 2005
N=3



Humans 2005
N=10

Natural Regions

- Boreal Forest
- Canadian Shield
- Foothills
- Grassland
- Parkland
- Rocky Mountain



Mosquitoes 2005
N=1

Conclusions:

- WNv continues to persist in established regions of the province.
- Endemic transmission will continue for the foreseeable future.
- The level of immunity in birds, the weather patterns and personal protective behaviours are difficult to predict and therefore, it is still difficult to forecast the viral activity for the upcoming season. It is unlikely that there will be a repeat of the 2003 season.
- Bird surveillance is useful in early detection of the virus in previously uninfected areas but its long term usefulness is uncertain in areas known to support WNv. .
- Horse surveillance has limited benefit in predicting human risk.

X. Acknowledgements

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Ronda Morgan and the grant approval staff - Alberta Municipal Affairs
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Horse Surveillance

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- Cal McLean, Michelle Gosselin and staff, County of Vermilion River
- Darwin Ullery, County of Minburn
- James Schwindt, Darcie Long and staff, MD of Wainwright
- Burt Forbes, MD of Provost
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- Grant Moir, Margaret Stevenson and staff, City of Red Deer
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- Bill Kolkman, Special Areas 3
- Jordon Christianson, Special Areas 4
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- Kelly Malmberg, Vulcan County
- Ron MacKay, MD of Willow Creek
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- Jennifer Carpenter and staff, University of Alberta
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- Jamie Meeks, Cathy Preston and Megan Turner, County of Warner
- Rod Foggin, Kip Barnes and staff, Cardston County

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, Junyoung Jeon spent long hours in the lab documenting and testing dead birds throughout the summer and analyzing the results. The Interdepartmental 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.

Jennifer Carpenter, with assistance from Maria Olsen and Mike Swystun, largely designed and carried out the sage grouse program, in consultation with Jock McIntosh (Alberta Environment), Mark Boyce (University of Alberta), and Steve Brecthel, Joel Nicholson, Dale Eslinger, and Margo Pybus from the Fish and Wildlife Division.

Human Surveillance

The Provincial Health Office would like to thank the following people for their tremendous assistance in conducting surveillance of WNv infection in humans this year:

- Dr. Peter Tilley, Dr. Julie Fox and staff at the Provincial Laboratory of Public Health
- Dawn Krahn, Kimberley Simmonds, Agnes Honish and staff from Disease Control and Prevention
- Larry Svenson and Niko Yiannakoulias from Public Health Surveillance
- Medical Officers of Health and communicable disease staff, particularly in Chinook and Palliser Regional Health Authority
- Dr. Judy Hannon and staff from the Canadian Blood Services