2003 Surveillance Program Report

West Nile Virus Nonhuman Surveillance in Washington State

September 2004

Environmental Health Division
Office of Environmental Health and Safety

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The *2003 Surveillance Program Report - West Nile Virus Nonhuman Surveillance in Washington State* is available in electronic format on the Internet at: www.doh.wa.gov/wnv.

Mary C. Selecky
Secretary of Health

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2003 Program Highlights

- Mosquito surveillance resulted in the identification of mosquito species never before reported in 21 counties. Multiple mosquito species were newly detected in several of these counties.

- Mosquito species considered potential West Nile virus vectors were newly detected in 14 counties.

- Washington State Department of Health provided extended coverage of their general permit for aquatic mosquito control to aid partners. Results from mosquito larval surveillance efforts are used to target mosquito control by local and state agencies, as well as private entities.

- Dead bird surveillance was expanded to achieve statewide coverage.

- Over 500,000 *West Nile Virus—Do You Know What's Biting You?* brochures were distributed to agencies, organizations, and other interested parties.

- Bi-weekly newsletter was published to help inform agencies of the latest local, regional, and national perspectives on West Nile virus.

- During the 2003 season, the *West Nile Virus in Washington* Web site was one of Washington State Department of Health's most popular, with the portal page receiving over 34,200 hits.

West Nile Virus Nonhuman Surveillance Program

Introduction

The Washington State Department of Health established the West Nile Virus Surveillance Program in 2000 under a grant sponsored by the U. S. Centers for Disease Control and Prevention. The program coordinates surveillance and response activities to reduce the risk of Washington's citizens from West Nile virus.

The program detects early signs of West Nile virus activity in the state. It also provides detection capability for other arboviruses, such as western equine encephalitis and St. Louis encephalitis viruses.

The program is a cooperative effort of numerous partners including local health jurisdictions, mosquito control districts, local and state agencies, health care providers, veterinarians, and other interested parties. The program also collaborates with state and federal agencies including the Washington State Department of Agriculture, Washington State Department of Ecology, Washington State Department of Transportation, Washington State Department of Fish and Wildlife, Washington State Parks and Recreation Commission, Washington Animal Disease Diagnostic Laboratory, Washington State University Extension, U.S.G.S. National Wildlife Health Center, U.S. Army Center for Health Promotion and Preventive Medicine-West, and U.S. Centers for Disease Control and Prevention.

In 2003, the program coordinated the following activities:

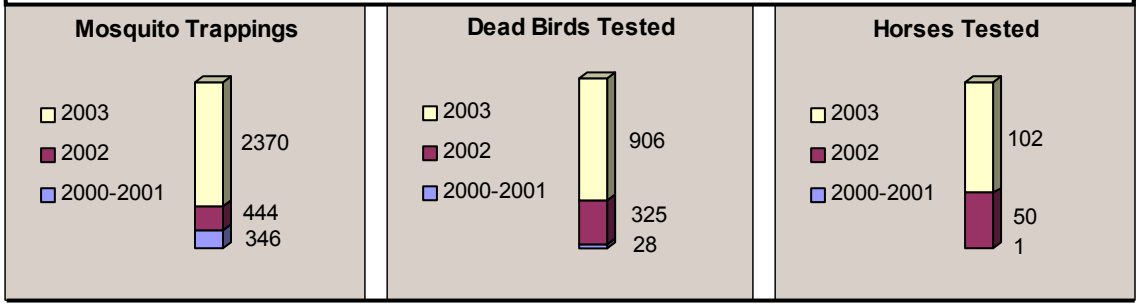
1) Monitoring mosquito populations to identify potential West Nile virus vector species.
2) Testing mosquito pools for the presence of West Nile, western equine encephalitis, and St. Louis encephalitis viruses.
3) Providing extended coverage of the aquatic mosquito control National Pollutant Discharge Elimination System general permit to agencies and private entities.
4) Testing and reporting of dead birds, particularly corvids, for West Nile virus.
5) Testing of horses that exhibit clinical signs consistent with West Nile virus infection.
6) Distributing West Nile virus health education materials to state and local agencies and the public.
7) Providing information on West Nile virus through the Internet.

These activities support the program's primary goal of providing prevention through surveillance, control, and education.

The program has significantly broadened its surveillance and control efforts since 2000. As results of training, technical assistance, and public outreach activities in previous years, awareness of public health implications of West Nile virus has increased among local and state agencies, and other surveillance partners.

Surveillance numbers have more than tripled during this time period as illustrated in Figure 1.

Figure 1. West Nile Virus Surveillance



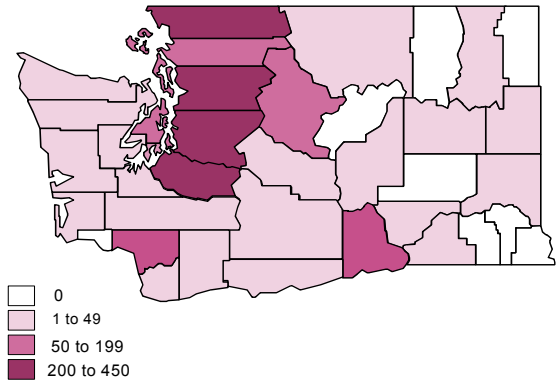
Mosquito Surveillance

Surveillance Activities

Between April and October, 35 local agencies from 31 counties collected adult mosquitoes primarily using carbon dioxide traps. Some mosquitoes were also collected as larvae and reared to adults. Mosquitoes were submitted for the identification of potential West Nile vectors and to monitor population densities of those vectors within a particular area.

A total of 1,533 trapping events collected 41,554 mosquitoes for identification by Washington State Department of Health. The U.S. Army Center for Health Promotion and Preventive Medicine-West conducted 538 trapping events, which collected 13,270 mosquitoes for identification. Benton, Clark, and Cowlitz County Mosquito Control Districts performed an additional 299 trapping events, which collected 34,750 mosquitoes for identification.

Figure 2. Mosquito Trapping Events 2003



Expanded mosquito surveillance efforts resulted in a combined total of 2,370 trapping events. Trapping events occurred throughout the state with the majority occurring in the heavily populated counties, as shown in Figure 2.

Mosquito Species Findings

Mosquito surveillance activities resulted in the identification of species never before reported in 21 counties. Potential West Nile virus vectors were newly detected in 14 of these counties.

Mosquito surveillance during 2003 resulted in an increased understanding of the distribution of potential West Nile vector species and populations in particular areas of the state. This information is useful in identifying geographic areas of high risk and implementing prevention and control measures to reduce the risk of human disease.

2003 Findings by County

Franklin	Two species: *Anopheles freeborni* and *Ochlerotatus sierrensis.*
Grays Harbor	Five species: *Coquilletidia perturbans* (potential vector), *Culiseta morsitans, Culiseta particeps*, *Ochlerotatus fitchii,* and *Ochlerotatus increpitus.*
Island	Five species: *Aedes vexans* (potential vector), *Culex restuans, Culiseta minnesotae Ochlerotatus melanimon,* and *Ochlerotatus sierrensis*.
Kitsap	Three species: *Aedes vexans* (potential vector), *Culex tarsalis* (potential vector), and *Culiseta inornata* (potential vector).
Klickitat	Five species: *Culex pipiens* (potential vector), *Culiseta incidens, Culiseta inornata* (potential vector), *Ochlerotatus increpitus,* and *Ochlerotatus sierrensis.*
Lewis	One species: *Ochlerotatus hexodontus.*
Lincoln	Three species: *Culex pipiens* (potential vector), *Culiseta inornata* (potential vector), and *Ochlerotatus sierrensis.*
Mason	One species: *Coquilletidia perturbans* (potential vector).
Okanogan	One species: *Coquilletidia perturbans* (potential vector).
Pacific	Two species: *Culiseta minnesotae and Culiseta morsitans.*
Pierce	Two species: Culiseta morsitans and Ochlerotatus japonicus japonicus (potential vector).
San Juan	Eight species: *Anopheles punctipennis* (potential vector), *Coquilletidia perturbans* (potential vector), *Culex pipiens* (potential vector), *Culex tarsalis* (potential vector), *Culex territans, Culiseta inornata* (potential vector), *Culiseta particeps*, and *Ochlerotatus togoi*.
Skagit	One species: *Coquilletidia perturbans* (potential vector).
Skamania	Three species: *Coquilletidia perturbans* (potential vector), *Culex boharti,* and *Culex territans*.

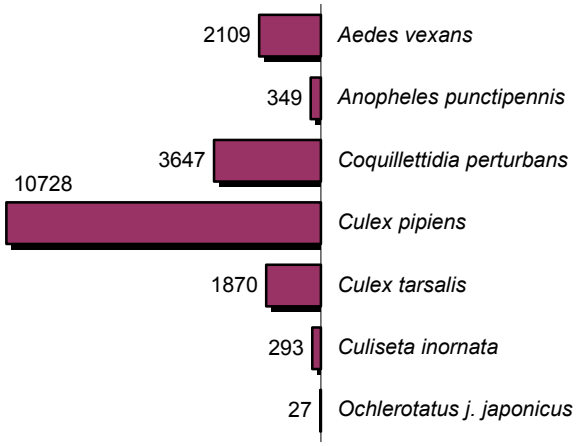
Snohomish	Three species: *Anopheles occidentalis, Culiseta particeps*, and *Ochlerotatus japonicus* (potential vector).
Spokane	Two species: *Anopheles earlei* and *Ochlerotatus melanimon.*
Stevens	One species: *Ochlerotatus sierrensis*.
Thurston	One species: *Ochlerotatus sticticus.*
Walla Walla	Two species: *Coquilletidia perturbans* (potential vector) and *Ochlerotatus sierrensis.*
Whatcom	Four species: *Coquilletidia perturbans* (potential vector), *Culiseta minnesotae, Culiseta morsitans,* and *Ochlerotatus sierrensis.*
Whitman	Two species: *Ochlerotatus aboriginis* and *Ochlerotatus fitchii.*

Potential West Nile Virus Vectors

There are nine mosquito species considered potential vectors of West Nile virus found in Washington. As climate and habitat differ throughout the state, so do mosquito species. A general comparison of potential West Nile vectors between Western and Eastern Washington reveals a difference in the occurrence and distribution of mosquito species. The following figures illustrate this comparison for one year of surveillance data.

The prevalence of the potential West Nile vector, *Culex pipiens*, appeared strong in western counties during 2003 (Figure 3). Though to a lesser extent, *Aedes vexans*, *Coquillettidia perturbans*, and *Culex tarsalis* also appeared strong in western counties. In general, *Culex pipiens*, commonly referred to as the "northern house mosquito," can be found in rural environments, but reach their greatest numbers in urban and suburban areas.

Figure 3. Potential WNV Vectors
Western Washington
Number of Mosquitoes Identified in 2003

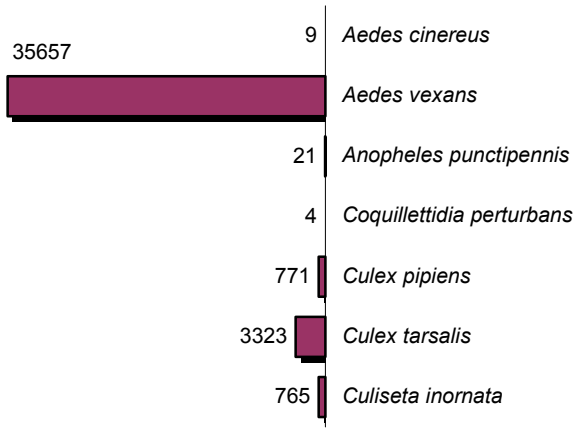


An important finding from 2003 surveillance activities is the emergence of a new mosquito species, *Ochlerotatus japonicus japonicus*. This mosquito species had not

been identified in the western United States prior to 2001. In 2001, this potential West Nile vector was found in King County. Limited monitoring conducted in 2003 indicates that *Ochlerotatus japonicus japonicus* is established and spreading. This species can now be found in neighboring Pierce and Snohomish counties.

In eastern counties, *Aedes vexans* and *Culex tarsalis* appeared to be the predominant potential West Nile vectors during 2003 (Figure 4). C*ulex pipiens*, though not as strongly represented, is considered a concern particularly in populated areas. Both *Aedes vexans* and *Culex tarsalis* are mosquitoes found in large numbers in floodwater and irrigated habitats.

Figure 4. Potential WNV Vectors
Eastern Washington
Number of Mosquitoes Identified in 2003



In 2003, *Culex tarsalis* was associated with the serious outbreaks of West Nile virus in Colorado and Nebraska. This highly competent vector is found primarily in irrigated agricultural areas along major rivers in these states. With similar agricultural settings in Eastern Washington, it is anticipated that *Culex tarsalis* may play a major role in the transmission of West Nile virus in Washington. *Culex tarsalis* is also known as an important vector of western equine encephalitis and St. Louis encephalitis. Because *Culex tarsalis* is one of the most widespread species in the state, the activity of this vector should be closely monitored. For more information on mosquito habitat, refer to Appendix A of the *Washington State Mosquito-borne Disease Response Plan*.

Summary of Findings 2001-2003. See Appendices 1 and 2 for a summary of mosquito species distribution in the state and new findings for 2001 through 2003.

Mosquito Pool Testing

A total of 582 mosquito pools from 11 counties were tested for West Nile virus by the U.S. Army Center for Health Promotion and Preventive Medicine-West, Benton County Mosquito Control District, Clark County Mosquito Control District, and Cowlitz County Mosquito Control District. Pools submitted by Benton and Cowlitz County Mosquito Control Districts were also tested for western equine encephalitis and St. Louis encephalitis viruses, and pools from Clark County Mosquito Control District were tested for St. Louis encephalitis virus. All mosquito pools tested negative for these arboviruses. See Appendix 3 for a summary of the number of mosquito pools tested for West Nile virus by county.

Mosquito Control

To reduce the risk from West Nile virus and other arboviral diseases, the Washington State Department of Health obtained a National Pollutant Discharge Elimination System general permit for aquatic mosquito control through the Washington State Department of Ecology. An extension of the department's permit coverage was available to all entities in the state qualified to follow the conditions of the permit and best management practices for mosquito control. The Washington State Department of Health completed the State Environmental Policy Act checklist on behalf of entities and permit fees were not required of entities.

In 2003, the Washington State Department of Health extended permit coverage to 76 entities in the state. Twenty-four cities, 10 counties, 10 mosquito control districts, 3 school districts, 2 state agencies, 3 other government agencies, and 24 private entities including businesses, land owners, and home owner associations have permit coverage to control mosquito larvae within their jurisdictional water bodies. Forty-seven of the 76 entities covered under the general permit applied aquatic larvicides for mosquito control. Results from mosquito larval surveillance efforts are used to target mosquito control by local and state agencies, as well as private entities.

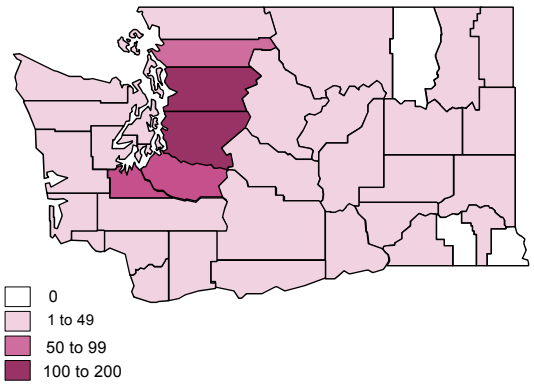
Bird Surveillance

Surveillance Activities

Dead bird surveillance acts as an early detection system for West Nile virus. The West Nile Virus Surveillance Program encourages the public to report dead birds to their local health jurisdiction. Local Health Jurisdictions maintain records of dead bird reports and submit specimens to the program for West Nile virus testing. During 2003, surveillance focused primarily on collecting corvids (crows, jays, magpies, and ravens) and raptors.

From January through November, 906 dead birds collected from 36 counties were submitted for West Nile virus testing. All specimens tested negative for the virus. Dead bird surveillance efforts were expanded in 2003 to achieve statewide coverage, with the majority of dead bird collection occurring in the more populated counties, as indicated in Figure 5.

Figure 5. Dead Birds Tested 2003



Although corvids were the principal bird species tested for West Nile virus, a variety of other species were tested as well. Table 1 summarizes the number and species of dead birds submitted for testing during 2003.

Table 1. Bird Species Tested for WNV			
Species	Number	Species	Number
American Crow	746	Hermit Thrush	1
American Kestrel	1	House Sparrow	4
American Robin	2	Mourning Dove	1
Barn Owl	3	Northern Flicker	2
Barred Owl	1	Peregrine Falcon	2
Black-Billed Magpie	35	Red-headed Woodpecker	1
Blue Jay	4	Red-tailed Hawk	2
Cedar Waxwing	3	Ruffed Grouse	1
Common Raven	15	Sharp-shinned Hawk	1
Cooper's Hawk	2	Spruce Grouse	1
Downy Woodpecker	1	Steller's Jay	54
Fish Crow	2	Swainson's Thrush	1
Great Horned Owl	2	Other Species	18

See Appendix 3 for a summary of the number of dead birds submitted for West Nile virus testing by county.

Dead bird surveillance revealed an unusually high number of deaths among American Crows in Snohomish County. These deaths were determined by U.S.G.S. National Wildlife Health Center to be unrelated to West Nile virus. Many of the American crows submitted from Snohomish, King, Pierce, and Thurston counties were infected by a reovirus-like organism.

In recent years, U.S.G.S. National Wildlife Health Center investigated crow mortality events in the eastern United State that were caused by a previously unidentified reovirus-like organism. The 2003 crow mortality event in Washington represents the first known reports of the virus affecting crow populations in the western United States. The virus causes enteritis and mortality in crow populations. Little is known about the organism or its genetic relationship to the virus in eastern United States. There is currently no evidence to suggest that this virus is a public health risk. The findings of the U.S.G.S. National Wildlife Health Center's investigation suggest that another virus may be affecting crow population as well as West Nile virus.

Chicken Serosurveillance

The Benton County Mosquito Control District maintained five sentinel chicken flocks, ten birds each, from which blood specimens were collected throughout the summer. A total of 435 chicken sera were tested for West Nile virus and for western equine encephalitis and St. Louis encephalitis. Test results were negative for these three arboviruses. See Appendix 3 for a summary of the number chicken sera tested by county.

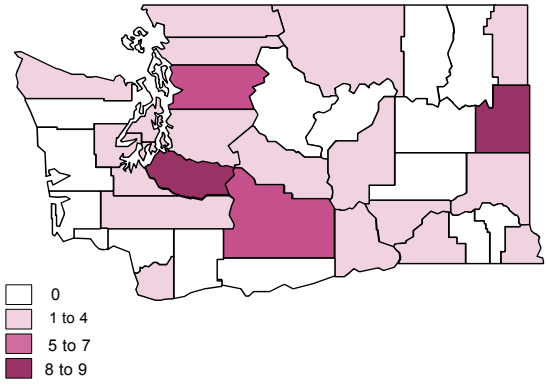
Veterinary Surveillance

Surveillance Activities

The West Nile Virus Surveillance Program and Washington State Department of Agriculture encourage veterinarians to report suspect cases of West Nile virus in horses and other animals to the Washington State Department of Health. This surveillance provides early detection of West Nile virus activity, particularly in rural areas.

Between February and December, specimens from 102 horse cases were submitted for West Nile virus testing. See Appendix 3 for a summary of horse cases by county. All specimens tested negative. County information was only available for 74 of the total horse cases. These particular cases came from 22 counties across the state, as shown in Figure 6.

Figure 6. Horses Tested 2003



In 2002, a horse vaccine to prevent West Nile virus infection became available. As local horse populations are vaccinated, the use of horses as indicators for West Nile virus may become less effective. Other animals tested for West Nile virus in Washington during 2003 included three canines, one deer, and one llama. All test results were negative.

Zoo Surveillance

The Seattle Woodland Park Zoo participated in the National Surveillance System for West Nile Virus in Zoo Institutions. The zoo collected 132 zoo and feral animal specimens for West Nile virus testing, including 118 birds and 14 mammal specimens. All specimens tested negative for West Nile virus.

Outreach Activities

Publications

During 2003, new publications included two brochures and a bi-weekly newsletter. The *West Nile Virus—Do You Know What's Biting You?* brochure target public concerns about West Nile virus, while its companion piece, *Mosquito Repellent—How to Use It Safely*, addresses concerns regarding the use of repellents containing DEET.

- *West Nile Virus—Do You Know What's Biting You?* available in English and Spanish: 528,250 brochures were distributed.

- *Mosquito Repellent—How to Use It Safely*: 50,000 brochures were distributed.

- The West Nile Virus newsletter was published bi-weekly to provide agencies with the latest local, regional and national perspectives on West Nile virus.

Existing publications were distributed as well. These publications focus on mosquito habitat reduction around the home. All health education materials related to West Nile virus are available for print or order on the Washington State Department of Health, Health Education Resource Exchange Web site (www.doh.wa.gov/here).

- *Mosquito Problems Start At Home* flyers, bookmarks, and posters.

- *Mosquitoes – Take the Bite Out of the Bug!* brochures.

Other Outreach Activities

- During the season, nine news releases communicating the program's prevention message on West Nile virus were released to the media. Two public service announcements were distributed to over 100 radio stations. Public service announcements in Spanish went out to Hispanic radio stations in the state.

- A toll-free information line, 1.866.78VIRUS, was created for the public. Callers can learn the latest status on West Nile virus activity in Washington, have their common questions answered, and be directed to additional resources.

- Web site development included improved site navigation and expanded information for health care providers. Information available on the Web site includes: news releases, response plan, resource guide, West Nile virus bi-weekly newsletter, information on the aquatic mosquito control general permit, answers to the common questions on West Nile virus, educational materials, and other related resources.

- During 2003, the West Nile virus site was one of the most popular Washington State Department of Health Web sites. Between April and October, the West Nile virus portal Web page received 34,299 hits, peaking at 9,065 during the month of May. The high number of hits in May correlates with news releases, especially those related to the announcement of the investigation of the first suspected human case of West Nile infection in Washington.

Appendices

Appendix 1: Mosquito Species by County, Western Washington

Appendix 2: Mosquito Species by County, Eastern Washington

Appendix 3: 2003 West Nile Virus Surveillance, Testing Summary

Appendix 1

Mosquito Species by County, Western Washington

County	***Aedes cinereus****	*Aedes trichurus*	***Aedes vexans****	*Anopheles earlei*	*Anopheles freebomi*	*Anopheles occidentalis*	***Anopheles punctipennis****	***Coquilletidia perturbans****	*Culex apicalis*	*Culex boharti*	***Culex pipiens****	*Culex restuans*	*Culex salinarius*	*Culex stigmatasoma*	***Culex tarsalis****	*Culex territans*	*Culiseta impatiens*	*Culiseta incidens*	***Culiseta inornata****	*Culiseta minnesotae*	*Culiseta morsitans*	*Culiseta particeps*	*Ochlerotatus aboriginis*	*Ochlerotatus aloponotum*	*Ochlerotatus campestris*	***Ochlerotatus canadensis****	*Ochlerotatus cataphylla*	*Ochlerotatus communis*	*Ochlerotatus dorsalis*	*Ochlerotatus excrucians*	*Ochlerotatus fitchii*	*Ochlerotatus flavescens*	*Ochlerotatus hexodontus*	*Ochlerotatus impiger*	*Ochlerotatus implicatus*	*Ochlerotatus increpitus*	*Ochlerotatus intrudens*	***Ochlerotatus japonicus japonicus****	*Ochlerotatus melanimon*	*Ochlerotatus nigromaculis*	*Ochlerotatus pionips*	*Ochlerotatus pullatus*	*Ochlerotatus punctor*	*Ochlerotatus sierrensis*	*Ochlerotatus spencerii idahoensis*	*Ochlerotatus sticticus*	*Ochlerotatus togoi*	*Ochlerotatus ventrovittis*
Western Washington																																															
Clallam			X		X		X	2			X				X	X	X	X	X					X					X		X						2			X		X		2		
Clark	X		X		X		X	X			X				X	X	2	X	X	X		2								2						2						X	X	X		
Cowlitz	X		X		X		X	2	2	2	X			X	X	X	X	X	X			2			X				X							X	X						2	X	X		
Grays Harbor			X				X	3	X		X				X	X		X			3	3	X		X				X		3				3										
Island	X		3		X		X	2			X	3			2	X		X	X	3	2	2	X	2					X	X	X				X			3				3		X	2	
Jefferson	X		X					3			X				X	X	X	X				X						X	X	X	X	X			X				X			X				
King	X				1		X	X	X		X			X	X	X	X	X	X		2	X	X					X	X	X			X		2		1				X		X			
Kitsap			3				2	2			X				3	X	X	X	3	X	X		X	X					X		X		X								X					
Lewis	X						X				X			X	X	X	X	X	X				X					X			X		3	X							X					
Mason	X						X	3								X	X	X					X	X	X				X	X	X					X			2			X			1	
Pacific			X					X			X				X	X	2	X		3	3	2	X						X		X					X		2				X		X		
Pierce	X		X		1		X	2			X		2		X	1	X	X	X		3	2	X	X	X			X	X	X	X	X	X	X	X	X	X	3				X		X	X		X
San Juan							3	3			3				3	3		X	3			3	X				X		X		X					X						X			3	
Skagit			X					3							X	X	X	X					X	X					2	X	X					X						X		X	2	
Skamania	X	X	X		X		X	3		3	X				X	3	X	X	X				X	X				X		X	X		X	X	X	X				X		X			
Snohomish	X		X			3	X	2	X		X				X	X	X	X	X	X		3	X							X	X					X		3				2		X			
Thurston	X						X	X			X				X	X		X	X		1	X	X						X	X	X					X	X					X		3			
Wahkiakum															X			X																													
Whatcom	X		X		X	X	X	3	X		X				X	X	X	X	X	3	3		X	X				X	X	X	X					X	X					3		X	2	

***Potential West Nile virus vector species.**

Last Revised 07/27/04

New Findings for: **1 - 2001** **2 - 2002** **3 - 2003** **Previous Findings: X**

The matrix shows the known distribution of mosquito species by county for western Washington through the year 2003. Previous findings are based on mosquito surveillance conducted by Washington State Department of Health in the 1960s and 1970s. New mosquito species findings which had not been identified during earlier surveillace efforts are presented by the surveillance year 2001 through 2003 when the species was first detected.

Appendix 2

Mosquito Species by County, Eastern Washington

County	***Aedes cinereus****	*Aedes trichurus*	***Aedes vexans****	*Anopheles earlei*	*Anopheles freeborni*	*Anopheles occidentalis*	***Anopheles punctipennis****	***Coquillettidia perturbans****	*Culex apicalis*	*Culex boharti*	***Culex pipiens****	*Culex restuans*	*Culex salinarius*	*Culex stigmatasoma*	***Culex tarsalis****	*Culex territans*	*Culiseta impatiens*	*Culiseta incidens*	***Culiseta inornata****	*Culiseta minnesotae*	*Culiseta morsitans*	*Culiseta particeps*	*Ochlerotatus aboriginis*	*Ochlerotatus aloponotum*	*Ochlerotatus campestris*	***Ochlerotatus canadensis****	*Ochlerotatus cataphylla*	*Ochlerotatus communis*	*Ochlerotatus dorsalis*	*Ochlerotatus excrucians*	*Ochlerotatus fitchii*	*Ochlerotatus flavescens*	*Ochlerotatus hexodontus*	*Ochlerotatus impiger*	*Ochlerotatus implicatus*	*Ochlerotatus increpitus*	*Ochlerotatus intrudens*	***Ochlerotatus japonicus japonicus****	*Ochlerotatus melanimon*	*Ochlerotatus nigromaculis*	*Ochlerotatus pionips*	*Ochlerotatus pullatus*	*Ochlerotatus punctor*	*Ochlerotatus sierrensis*	*Ochlerotatus spencerii idahoensis*	*Ochlerotatus sticticus*	*Ochlerotatus togoi*	*Ochlerotatus ventrovittis*
Eastern Washington																																															
Adams											X				X				X										X									X								
Asotin					X										X																																
Benton			X		X	X	X				X			X	X	X		X	X	X					X				X		X				X			X	X			X			
Chelan	X		X		X		X				X				X	X	X	X	X	X	1		X				X	X	X	X	X	X	X	X	X	X				X	X	X	X	X		X
Columbia			X		X		X								X																					X										
Douglas			X												X				X										X									X								
Ferry	X		X		X			X			2				X	X		2					X			X		X			X		X	X	X	X	X				X			2		
Franklin					3	X					X				X			X	X										X							1			X				3		X		
Garfield							X								X			X																					X							
Grant	X		1		X			X			X				X			X	X						X	X			X	X	X	X				X			X	X			X	2			
Kittitas	X		X		X		X				X				X	X	X	X	X	X	X		X				X	X	X	X	X		X			X			X				X	X		X
Klickitat			X								3			X	X			3	3				X										X			3							3				
Lincoln			X		X					X	3				X			X	3									X			X	X				3							3				
Okanogan	X		X	X	X	X	X	3			X				X	X		X	X						X	X		X	X		X	X	X		X			X		X	X	X				
Pend Oreille	X	X	X	X	X		X				X				X	X				X				X		X		X		X	X		X	X	X	X	X				X	X	X	X		
Spokane	X		X	3	X		X	2			X				X			1	X				X		X					X	X	X				X			3			X					
Stevens	X		X	X	X		X				X				X		X	X	X							X	X	X	X		X				X							3				
Walla Walla	X		X		X		X	3			X			X	X	1	1	X	X				X						X						X			2	X			3		2		
Whitman			X		X		X				X				X			X	X				3		X						3				X											
Yakima	X		X		X		X	X	X		X			X	X	X	X	X	X	X					X			X	X	X	X	X		X		X			X	X			X	X	X		

***Potential West Nile virus vector species.**

New Findings for: 1 - 2001 | 2 - 2002 | 3 - 2003

Previous Findings: X

Last Revised 07/27/04

The matrix shows the known distribution of mosquito species by county for eastern Washington through the year 2003. Previous findings are based on mosquito surveillance conducted by Washington State Department of Health in the 1960s and 1970s. New mosquito species findings which had not been identified during earlier surveillace efforts are presented by the surveillance year 2001 through 2003 when the species was first detected.

Appendix 3

2003 West Nile Virus Surveillance Testing Summary

	Horses		Birds		Sentinel Flocks		Mosquito Pools	
County	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive
Adams	0	0	2	0	0	0	0	0
Asotin	1	0	0	0	0	0	0	0
Benton	3	0	21	0	435	0	260	0
Chelan	0	0	8	0	0	0	0	0
Clallam	2	0	11	0	0	0	0	0
Clark	3	0	5	0	0	0	11	0
Columbia	0	0	1	0	0	0	0	0
Cowlitz	0	0	11	0	0	0	32	0
Douglas	0	0	2	0	0	0	0	0
Ferry	0	0	0	0	0	0	0	0
Franklin	3	0	9	0	0	0	0	0
Garfield	0	0	0	0	0	0	0	0
Grant	1	0	4	0	0	0	0	0
Grays Harbor	0	0	6	0	0	0	0	0
Island	0	0	48	0	0	0	5	0
Jefferson	0	0	19	0	0	0	3	0
King	4	0	146	0	0	0	0	0
Kitsap	3	0	30	0	0	0	24	0
Kittitas	4	0	2	0	0	0	2	0
Klickitat	0	0	2	0	0	0	0	0
Lewis	1	0	22	0	0	0	0	0
Lincoln	0	0	1	0	0	0	0	0
Mason	1	0	21	0	0	0	0	0
Okanogan	1	0	2	0	0	0	0	0
Pacific	0	0	7	0	0	0	0	0
Pend Oreille	1	0	6	0	0	0	0	0
Pierce	9	0	98	0	0	0	227	0
San Juan	0	0	15	0	0	0	0	0
Skagit	1	0	40	0	0	0	0	0
Skamania	0	0	1	0	0	0	0	0
Snohomish	7	0	194	0	0	0	14	0
Spokane	9	0	16	0	0	0	3	0
Stevens	0	0	11	0	0	0	0	0
Thurston	2	0	70	0	0	0	0	0
Wahkiakum	0	0	1	0	0	0	0	0
Walla Walla	4	0	8	0	0	0	1	0
Whatcom	4	0	48	0	0	0	0	0
Whitman	3	0	12	0	0	0	0	0
Yakima	7	0	6	0	0	0	0	0
Totals	**74**	**0**	**906**	**0**	**435**	**0**	**582**	**0**