

DISTRICT OF COLUMBIA
DEPARTMENT OF HEALTH
OFFICE OF ENVIRONMENTAL HEALTH SCIENCE
AND REGULATION

ARBOVIRUS
SURVEILLANCE AND RESPONSE PLAN
2003

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James A. Buford, Director



Theodore J. Gordon
Senior Deputy Director for
Environmental Health Science and Regulation



Table of Contents

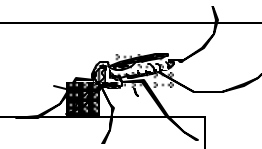
Executive Summary	
Introduction	1
Human Surveillance	6
Mosquito Surveillance	9
Avian Surveillance	11
Equine and other Mammal Surveillance	12
Mosquito Management	14
Public Information, Outreach & Education Campaign	16
Public Health Laboratory	18
Information Technology	19
Data Analysis and Reporting	21
Acknowledgements & Contact Information	22
Appendix:	
A. Arbovirus Epizootic/Epidemic Management Plan	B-1
B. MOU DC DOH/ US Army Mosquito Arboviral Testing	B-3
C. Human Surveillance Forms	B-6
D. Mammal Surveillance Forms	B-8
E. Model WNV Nuisance Legislation	B-10
F. Tire Roundup Campaign	B-13
G. Outreach and Education Information	B-14
H. Arbovirus Collaborative Work Plan	B-15
I. WNV 2002 End of Year Report	B-25

Executive Summary

Under the strong leadership of Mayor Anthony A. Williams, the West Nile Virus Program has been a great public health success story in the District of Columbia. The Department of Health (DOH) has operated a West Nile Virus (WNV) program since WNV was first reported in the United States in 1999. The three foundations of this program are surveillance, mosquito control and outreach and education. Surveillance: since 1999, DOH has conducted human, avian, or bird, mammal and mosquito surveillance. DOH maintains an extensive database that tracks the presence and spread of the virus. In calendar year 2002, avian surveillance determined that WNV was endemic in District birds and avian testing was discontinued in August 2002. While avian testing has been discontinued, DOH intends to continue to track dead bird reports in 2003. In 2003, working with the CDC and other federal and regional partners, DOH will install stationary mosquito traps based upon a grid system that covers all neighborhoods, federal enclaves, military installations and parks in the District of Columbia. Furthermore, DOH will expand its surveillance to include testing for malaria, Dengue Fever and other mosquito-borne pathogens. Mosquito Control: CDC has stated that larvicidal applications in catch basins and standing water is an essential component to a successful mosquito management program and is the most successful method to eliminate mosquitoes over time. In 2002, DOH staff larvicided in response to positive birds, mosquitoes and humans and community concerns. The larvicide, a biologic product that kills mosquitoes in the larval stage, is placed in catch basins and in standing or stagnant water. In 2003, DOH will continue the extensive larviciding program. Outreach and Education: DOH'S outreach and education program reached millions of people in 2002. The District's message to residents is to take personal responsibility to prevent conditions for mosquito harborage and to prevent mosquito bites. In 2002, DOH used a number of media channels to get out the message: the DOH website; bulk distribution of informational brochures (in five languages); public presentations; and, door-to-door visits. In 2002, DOH staff visited over 46,000 residences and distributed over 200,000 brochures to the public. In 2003, DOH will continue these outreach efforts. In addition, DOH will create a video public service announcement (PSA) with tips to eliminate mosquito harborage and prevent mosquito bites. Furthermore, DOH intends to sponsor a Tire Round-Up campaign for residents who wish to discard old tires – a potential breeding site for mosquitoes. The PSA and Tire Round-Up are subject to availability of funds. Enforcement and Compliance: Recognizing the potential threat to public health created by conditions that support the harborage and breeding of mosquitoes, DOH intends to publish regulations that impose civil fines and penalties on individuals and businesses who do not abate these conditions.

Due in large part to DOH's aggressive surveillance, mosquito control, outreach and education program, through 2002, there have been only thirty-one positive cases of West Nile virus and two deaths in the District of Columbia.

In 2003, DOH will continue to fight the spread of West Nile Virus and other mosquito-transmitted illnesses.



Introduction

This plan outlines the activities for implementing a response to West Nile virus or other arbovirus outbreaks in the District of Columbia. An arthropod-borne virus (arbovirus) is one that is transmitted to vertebrates by biting insects and acarines (ticks). These viruses multiply in both their vertebrate and invertebrate hosts.

This plan is a working document that identifies various specific programs of surveillance, mosquito control and public outreach and education. The *District of Columbia Arbovirus Surveillance and Response Plan 2003* is the District's plan for the organized monitoring of arbovirus activity, vector populations, arbovirus infections in vertebrate hosts and humans and other factors to detect or predict changes in the transmission dynamics of these arboviruses. The surveillance task force includes staff from the District of Columbia's Department of Health, Environmental Health Administration, Preventive Health Administration, Public Health Laboratory and Emergency Management. These offices work collaboratively to develop and implement strategies to decrease the transmission of arboviruses to human and other vertebrate hosts.

West Nile virus (WNV), though known since 1937, had never been detected in the United States until late August and September 1999, when 62 people in New York City and the surrounding areas became sick. Seven people died. From 1999 through 2001, there were 149 cases of confirmed West Nile virus human illness in the United States reported to CDC, including 18 human deaths.

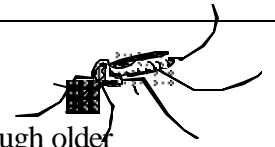
National Perspective

The 2002 WNV epidemic in the United States was the largest arboviral meningoencephalitis epidemic documented in the western hemisphere and the largest reported West Nile Meningoencephalitis (WNME) epidemic. Epizootic and epidemic activity was most intense in the central United States, especially the Great Lakes region, and extended to the west coast. One human case reported in a Los Angeles County, California, a resident with no known travel history (and with no other WNV activity found statewide) and a report of a WNV-infected horse in Island County, Washington, indicate the complete transcontinental movement of WNV within 3 years. In 2002, Canadian health authorities also documented WNV activity in 5 provinces. The 2002 WNV epidemic included the first documented cases of person-to-person WNV transmission through organ transplantation, blood and blood product transfusion, and possibly breast-feeding. Also in 2002, intrauterine infection was reported, and a poliomyelitis-like syndrome was first recognized in the United States among some WNME patients with acute flaccid paralysis (AFP).

Nationally, the epidemic peak of human WNV-associated illness during 2002 occurred in late August; human cases in southern states preceded those in northern states by approximately 1 month. In 2002, human cases also were reported from the New York City metropolitan area for the fourth consecutive year. This prolonged and continued widespread transmission to humans, including in areas of previous epidemic activity, underscores the importance of maintaining human surveillance programs from early June through November. IN addition, there is a need to consider WNV disease in the differential diagnosis of encephalitis, meningitis, acute flaccid paralysis (AFP), and nonspecific febrile illness before and after the late summer months in which arboviral outbreaks traditionally occur.

In 2002, the proportion of human cases reported with West Nile Fever (WNF) was greater than in previous years. This phenomenon reflects increased testing and diagnosis of WNV infection in persons with milder illness. WNF patients tend to be younger than patients with WNME. The somewhat lower median age among persons with WNME reported in 2002 compared with those reported during 1999 to 2001 (59 years versus 66 years) could reflect the incorrect classification of some WNF cases as WNME cases. The median age





among persons with fatal WNME reported in 2002 was similar to that in previous years. Although older persons are at higher risk for WNME and death, persons of any age may develop severe neurologic disease.

Bird- and horse-based surveillance are important tools for monitoring the geographic spread of WNV and for signaling WNV activity in an area before the recognition of human illnesses. The number of counties reporting WNV-infected dead birds in 2002 was 5 times greater than that in 2001, and the number of reported WNV-infected dead birds doubled.

From 2001 to 2002, equine cases reported to ArboNET increased 12-fold, and equine transmission occurred over a longer season and in 9 new states. In 2002, the geographic and temporal distribution of equine cases closely paralleled the human epidemic in the midwestern and north-central states, suggesting that horses, although unlikely to contribute to the transmission cycle for WNV, might be useful indicators of increased human risk in those areas.

The three *Culex* species that produced the most WNV-positive pools during 2002, *C. pipiens*, *C. quinquefasciatus*, and *C. restuans*, are among the most important WNV epizootic or epidemic vectors in the United States. **Control of *Culex* mosquitoes continues to be the most important strategy to reduce the risk for WNV transmission to humans.**

The epidemic of 2002 underscores the continued need for intensive ecologic surveillance to detect early-season WNV activity. To decrease the risk for human WNV infection, the coordinated and phased public health response to detection of WNV activity in an area should include intensified mosquito-control activities that reduce the avian-mosquito amplification cycle. Prevention activities should continue to include 1) public education programs urging residential source reduction and personal protective measures to reduce mosquito exposure; 2) development of long-term, community-level, integrated mosquito surveillance and control programs, and 3) high-priority emphasis on the control of *Culex* mosquitoes, especially in urban and suburban areas.

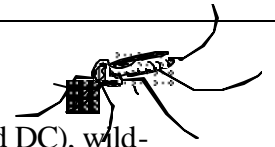
In 2002, the reported numbers of human and animal infections increased, and the geographic range of WNV activity expanded substantially. This data underscores the need for intensive surveillance to detect and quantify WNV activity in areas where humans are at risk, public education to teach persons how to prevent mosquito bites, and sustained and integrated mosquito-control activities.

In 2002, through November 20, WNV activity through out the United States was reported from 2,289 counties in 44 states and the District of Columbia (DC) compared with 359 counties in 27 states and DC in 2001 (1), and WNV virus was detected for the first time in 1929 U.S. counties and 16 states. A total of 3,389 human cases of WNV disease were reported, compared with 149 during 1999 to 2001, and large numbers of WNV-infected birds, equines, and mosquitoes also were reported. (For additional detail see the year-end narrative report in Appendix H).

In 2002, through November 20, of the 3389 reported cases of human WNV-associated illness, 2,354 (69 percent) persons were diagnosed had West Nile meningoencephalitis (WNME), 704 (21 percent) had West Nile fever (WNF), and 331 (10 percent) had an unspecified illness. Of 2,289 counties reporting WNV activity, 1,719 (75 percent) counties in 42 states and DC reported 14,122 dead WNV-infected birds (7,719 crows, 4,948 blue jays, and 1455 birds of 92 other species). Of 10,036 tested dead crows, 7,719 (77 percent) were WNV-positive compared with 6403 (40 percent) of 16,132 birds from other species.

A total of 9,144 (99.9 percent) of 9,157 reported nonhuman mammal cases occurred in equines, and 13 occurred in other species (dogs [3], squirrels [8], and unspecified species [2]). Cases were reported from 1,374 counties in 38 states, with illness onset dates ranging from 3 Jan to 8 Nov





2002. A limited number of counties and states tested mosquitoes (639 counties in 37 states and DC), wild-caught birds (65 counties in 8 states), and sentinel chickens (92 counties in 8 states) as part of WNV surveillance. In 2002, approximately 1.3 million mosquitoes of 88 species were tested. WNV was detected in 4,943 pools (representing 26 species). Since 1999, a total of 36 WNV-infected mosquito species have been reported to ArboNET. In 2002, a total of 144 seropositive wild-caught birds were reported from 25 counties in 4 states (Indiana, Kansas, Louisiana, and Ohio), and 366 seroconverting captive sentinel birds were reported from 47 counties in 7 states (Florida, Iowa, Nebraska, New York, North Carolina, Pennsylvania, and Texas).

The total number of equine cases of illness caused by West Nile virus (WNV) confirmed at the USDA's National Veterinary Services Laboratories (NVSL) or reported by state officials from January 1 through December 12, 2002 is 14,515.

Routes of Transmission

West Nile virus (WNV), a mosquito-borne flavivirus introduced recently to North America, is a human, equine, and avian neuropathogen. The majority of human infections with WNV are mosquito-borne; however, laboratory-acquired infections with WNV and other arboviruses also occur. There were two recent cases of WNV infection in laboratory workers, without other known risk factors, who acquired infection through percutaneous inoculation. Laboratory workers handling fluids or tissues known or suspected to be WNV-infected should minimize their risk for exposure.

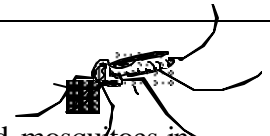
In 2002, newly recognized mechanisms of person-to-person WNV transmission were described by health officials including transmission from mother to infant through breast milk. Health officials believe that WNV can be transmitted via organ transplant and blood transfusion. However, the risks of contracting WNV by these routes are very small as compared with other risks associated with these treatments. Evidence is also mounting that WNV may be transmitted to babies in breast milk. WNV genetic material was transiently present in the breast milk of a woman with WNV infection and measurable WNV-specific IgM was detected in her baby. Despite this finding, the risk of WNV illness in young children is very low. Only 4 infants in the US are known to have become infected with WNV during the 4 years that the virus has been reported in the US. There is also increasing evidence of intrauterine West Nile virus infection. WNV has not been previously associated with intrauterine infection or adverse birth outcomes. There was a case of transplacental WNV transmission. Pregnant women should take precautions to reduce their risk for WNV or other arboviral infection and should undergo diagnostic testing when clinically appropriate.

District of Columbia Perspective

Evidence of West Nile virus first appeared in the District in 2000 as detected through avian surveillance. Thirteen birds were tested for West Nile virus in 1999. All tested negative. In 2000, five birds tested positive for West Nile virus with the first collection date of September 26. There was no other positive West Nile activity in the District. In 2001, nine hundred fourteen (914) birds were collected and four hundred forty-four (444) birds were processed for testing. Three hundred sixty birds (360) tested positive, with a rate of positivity of 81.08%. Eighty-four (84) birds tested negative. Eight hundred forty-one (841) mosquito pools and four thousand three hundred sixty-eight (4,368) individual female mosquitoes were submitted for testing. Three pools of *Culex* mosquitoes tested positive. In 2001, there was no human or mammal positive West Nile activity in the District.

In 2002, The District continued to conduct human, avian, mosquito and mammal surveillance. Nine hundred five (905) birds were collected and three hundred forty (340) birds were processed for testing. One hundred thirty-four (134) birds were disposed of, one hundred seventy-five (175) birds tested positive and thirty-one





birds (31) tested negative with a rate of positivity of 84.95%. DOH collected and tested mosquitoes in cooperation with the US Army, The National Zoo and the National Park Service. One thousand three hundred fifteen (1315) mosquito pools and ten thousand seven hundred fifty-five (10,355) individual female mosquitoes were collected and submitted for testing. Eighty-four (84) mosquito pools tested positive for West Nile virus.

Data indicates that the District's WNV program is a great public health success. In response to WNV-positive mosquito pools, the Department of Health staff larvicides the area and distributes information door to door to District residents in the neighborhoods. The health information material has been translated into Spanish, Korean, Vietnamese, and Chinese and emphasizes prevention and protection. Staff also speak at neighborhood meetings and work with residents to evaluate their property to eliminate potential mosquito breeding sites. The number of mosquitoes collected is significantly reduced in the areas that are larvicided extensively.

The *District of Columbia Arbovirus Surveillance and Response Plan, 2003*, will follow the Centers for Disease Control and Prevention's (CDC) *Guidelines for Arbovirus Surveillance in the United States* and *Epidemic/Epizootic West Nile Virus in the United States: Revised Guidelines for Surveillance, Prevention and Control*. Both documents emphasize surveillance methods to assess risk levels and protection and prevention strategies. In addition, the District is a member of the Metropolitan Washington Council of Governments (COG) regional Emerging Pathogens West Nile virus Planning Committee. The focus of the District's arbovirus surveillance program is the detection, reporting, and management of WNV and other arboviruses to prevent human epidemics and animal epizootics. The laboratory will test for additional arboviruses when performing tests on humans, equines, mosquitoes, and birds, as requested.

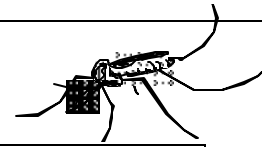
This plan focuses on the surveillance of human, insect, avian, and mammalian populations as indicators of the presence of the WNV. As the primary vector, the mosquito is the key element in the development of this response plan. The identification of mosquito species, their location, and population numbers help to assess the current risk to the community and the necessary response steps based upon that perceived risk.

Generally, WNV does not cause symptoms in most people who have been exposed to it. However, in some individuals, WNV can cause a very mild infection including fever, muscle aches, rash, swollen lymph nodes, and a "sick" feeling. This illness starts about 3-15 days after the mosquito bite, lasts a few days, and then subsides.

A very small percentage (<1%) of people exposed to WNV or other arboviruses can experience an inflammation of the brain (encephalitis) or of the tissues that surround the brain (meningitis). Encephalitis and meningitis due to arboviruses can cause death. Data from 1999 through 2002 indicate that deaths from WNV infection occur mostly among persons greater than 65 years of age.

The following pages describe the District's 2003 plan to respond to West Nile and other arboviruses through surveillance, control, analysis, and education activities.





Human Surveillance

Purpose:

The District of Columbia will continue to conduct active human surveillance in cooperation with key area hospitals and the local medical communities. Increased monitoring for encephalitic disease is a necessary tool for public risk assessment.

Encephalitis, an inflammation of the brain, is the most serious form of WNV infection. However, many other diseases can cause encephalitis. In 2000, there were 16 reported cases of encephalitis documented from May - November in neighboring Maryland; WNV was not attributed to any of those cases. In 2001, the first cases of WNV in neighboring Maryland were identified through enhanced surveillance (3 WN encephalitis cases, 3 WN aseptic meningitis cases). Two of these six patients died. This illustrates the importance of a strong surveillance program. There were no reported cases of human WNV infection in the District in 2000 or in 2001.

In 2002, there were 80 (80) human specimens tested for West Nile virus. Thirty-one (31) samples tested positive, twenty-eight (28) samples tested negative. Three (3) samples are probable and eighteen (18) samples are still considered pending because there is some information that is unavailable.

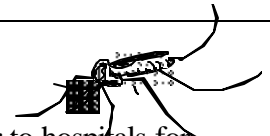
Strategy:

Any reported case of human encephalitis or hospitalized adult aseptic meningitis in the District during the WNV surveillance period will be investigated to ensure detection of WNV or other arboviral disease or bioagent. These studies may include blood tests or other tests to detect WNV in the brain or the spinal fluid. The human surveillance effort will inform public health officials and District agencies about this disease and decrease the transmission of the virus.

Actions:

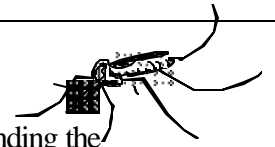
1. DC Department of Health will inform physicians and other health professionals about WNV disease through a Physician's Alert- See Appendix C. The Alert contains reporting criteria and protocol and was forwarded to physicians and hospitals on Monday, April 14. The Alert will remind doctors and hospital infection control personnel (ICPs) that encephalitis and meningitis can be indicators of arboviral infection; therefore, any case of encephalitis or meningitis must be reported to DOH no later than the next working day.
2. A fact sheet containing the case definition and reporting codes from CDC will be included in the information to be forwarded to the physicians. The letters were sent out April 15 and again on approximately July 15 as a reminder.
3. The Physician's Alert will be blast faxed to over 900 hospital ICPs, family practitioners and pediatricians. In addition, the Alert will be placed on the web site and forwarded to the Medical Society of DC (MSDC) and the Medical Honor Society, MEDCHI.
4. DC Department of Health Bureau of Communicable Disease will prepare a letter to all hospital ICPs indicating requirements for submitting samples and promptly sending clinical, laboratory, risk factor and case information on appropriate cases to the DOH for collection, data tracking and analysis.





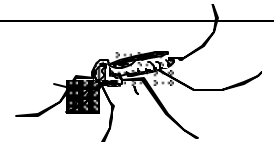
5. DC Department of Health Bureau of Communicable Disease will prepare a standard letter to hospitals for reporting results and requesting additional samples, if necessary.
6. The Chief Medical Officer will prepare a letter to all Chief Medical Officers of the hospitals indicating specimen testing requirements and protocol. The letter will ask that all specimens from patients in the hospitals be sent directly to the Public Health Lab (PHL) and not to a commercial lab and that all labs call the Public Health Lab with any positive results immediately. (Please refer to the algorithm in Appendix C.)
7. CDC has notified all commercial lab directors to indicate specimen testing requirements and protocol. Commercial labs must notify the PHL immediately of any positive result. The commercial lab must then send a sample to the PHL for testing. The Director of the Public Health Lab will establish protocols for accepting samples from commercial labs for testing at the PHL.
8. DOH will prepare a WNV and Malaria Human Specimen Laboratory Testing Algorithm for distribution and placement on the web site.
9. The DC Public Health Laboratory will conduct all human specimen testing and inform all pertinent parties by email and phone of positives results.
10. DOH will provide professional education to hospitals and interested medical and nursing groups.
11. All DOH pertinent parties from the Animal Disease Prevention Division, Public Health Laboratory and Bureau of Health Risk Assessment will contact each other by phone at the end of the day to confirm that all parties have exchanged all necessary information. In addition, a staff person from the West Nile virus program in the Animal Disease Prevention Division will prepare and circulate a spreadsheet daily to keep all parties informed of all cases.
12. DOH will consider the following actions in the event of a positive human case and/or death:
 - a. Notify email distribution list, per HIPAA regulations.
 - b. Notify the Director of Communication and Director of DOH determine whether to issue a press release emphasizing protection and prevention.
 - c. Contact Mayor's office.
 - d. Call CDC to report the case verbally and discuss recommendations.
 - e. Inform COG Health Officers and other pertinent and regional partners.
 - f. Conduct a conference call with CDC or COG Health Officers.
 - g. Discuss the case with hospital staff and caretakers.
 - h. Evaluate the situation and educate caretakers and other residents of the home regarding prevention and protection.
 - i. Evaluate the necessity to conduct a serological survey in the area.
 - j. Send a DOH team to the neighborhood to identify and reduce potential mosquito breeding sites.





- k. Distribute outreach and education information in an eight square block area surrounding the location of the positive human case.
 - l. Larvicide in the same eight square block area.
 - m. Schedule additional community speaking engagements as necessary.
 - n. Complete the appropriate DOH reporting forms.
13. Information on reportable cases of encephalitis and aseptic meningitis will be shared between the West Nile virus program, the PHL and the Bureau of Communicable Diseases.
14. Results of human testing for WNV and other arboviruses (EEE, SLE, WEE & LAC) will be collected and analyzed by DOH on a weekly basis, and the results forwarded to CDC.





Mosquito Surveillance

Purpose:

Mosquito populations are required vectors for the transmission of certain diseases to humans and animals. Therefore, it is important to monitor various mosquito species throughout the District, especially those species known to transmit arboviruses. It is equally important to analyze the mosquitoes to determine if they are carrying West Nile virus, Malaria, Dengue fever or any other arbovirus.

The risk of disease transmission correlates directly to the presence of identified mosquito carriers and their densities. Mosquito surveillance enables staff to conduct risk assessment, systematic planning, and a structured response. Activities involve trapping, speciating, determining population densities, and arboviral testing of resident mosquitoes.

Identifying mosquito-breeding sites for elimination or treatment, particularly those located near susceptible human populations, is a continuous and critical activity to support a formulation of an effective mosquito management program. These efforts inform DOH staff of the potential for disease in local animal or human populations.

Strategy:

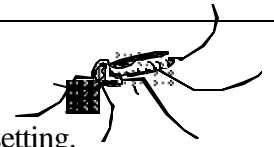
Multiple mosquito genera have been identified in the District as carriers of West Nile virus and malaria. The Department of Health has made a commitment to identify and test mosquitoes for diseases that may threaten the public health and safety of the residents and visitors in the District. *Culex pipiens* is the predominant carrier of the West Nile virus in the Washington, D.C. area. The focus of mosquito surveillance is to trap and test primarily *Culex* species to determine infection rates. The CDC gravid trap, designed specifically to trap this species, will be the main tool for this surveillance system. Previous experience has shown that the gravid traps work extremely well in the District. In addition, all collected *Anopheles* genera will be tested for malaria. Other collected mosquitoes may be tested for yellow fever, Dengue fever and other arboviruses.

DOH and its federal and local partners have established stationary mosquito trap locations based on a grid system to cover the city with an even distribution of traps. In addition, staff will determine locations of other mosquito traps that will be moved in response to events, such as, increased mosquito activity or increased numbers of specimens testing positive. DOH will work cooperatively with the US Army, National Park Service and National Arboretum to set traps and collect mosquitoes from trap locations that are owned by the federal partners to ensure complete coverage per the grid configuration. Also, several light traps containing CO₂ and mosquito magnets will be added to the surveillance system for capture of various mosquito species.

Actions:

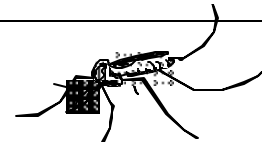
1. During the active mosquito season (typically April through October), the District of Columbia Department of Health will use special equipment to trap mosquitoes throughout the District.
2. Through a partnership between the DC Department of Health, National Park Services (Central, East and C&O Canal), and the Department of Defense, trap locations will be determined in a grid system throughout the District, with a maximum of 1.5 miles between any two traps.





3. The staff will set approximately 50 traps twice per week with two trap nights per trap per setting.
4. The National Park Service and the National Arboretum will purchase traps and the DC Department of Health staff will assist the National Park Services and the National Arboretum in mosquito trap setting, collection, speciation and testing.
5. Staff from the US Army mosquito-testing lab will assist in training DOH staff in mosquito identification, collection, specimen preparation, and transportation.
6. DOH staff has established stationary trap locations following a grid and several mobile traps, with location dependent upon various factors, such as, positive test results from other surveillance systems.
7. Frequency of trap setting may change based on mosquito density or minimum infection rates. Other traps, such as CDC light traps and mosquito magnets will be set in the District as determined by staff based on the species of mosquito that will be targeted and numbers of mosquitoes collected.
8. Mosquitoes will be transported to the US Army Public Health Lab in Fort Meade, MD for arboviral testing. Laboratory scientists will speciate and analyze the mosquitoes for the presence of West Nile and other mosquito-borne diseases. When testing is complete, results will be sent to the Department of Health. DOH staff will enter test results into a special database, called Arbo-NET[®] and upload the information to CDC in Atlanta, Georgia. Information collected on mosquito population numbers and distribution will be collected during field studies and will be analyzed simultaneously with the mosquito virus test results. These results will help to identify possible areas of risk for WNV transmission by mosquitoes in the District.
9. DOH staff will procure sampling equipment for larval investigations. Equipment includes; dip sticks, felt sampling strips, and containers. Investigations will be on an as needed basis to determine which species are utilizing breeding sites.
10. When a positive mosquito pool is identified, DOH will consider the following actions:
 - a. Forward the information to the DOH Director of Communications to determine whether a press release will be issued.
 - b. Distribute outreach and education information in an eight square block area surrounding the location of each positive mosquito pool.
 - c. Larvicide in the same eight square block area.
 - d. Work with residents to identify and eliminate potential mosquito breeding sites.
 - e. Upload information to CDC.





Avian Surveillance

Purpose:

The District of Columbia has collected and tested dead birds for the past two years as an early indicator of the presence of West Nile virus. West Nile virus is now endemic in the District. Dead bird collection is no longer a primary tool to monitor disease in the District of Columbia. The District will institute a live wild bird surveillance program to determine if asymptomatic birds are hosts of the virus.

Several states, including the state of Maryland, have discontinued an active dead bird collection and testing program.

Strategy:

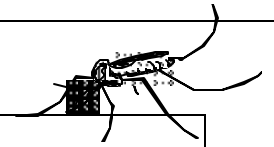
The Department of Health, in consultation with CDC, now considers West Nile virus endemic and enzootic in the District of Columbia. The value of collecting and testing dead birds as a predictor of virus activity is significantly diminished and may be considered unnecessary. Resources are better spent through outreach and education to educate and inform the population about prevention and protection measures. The District may test certain avian species, such as raptors or birds from endangered populations or exotic bird collections.

Actions:

1. The Department of Health will monitor CDC updates regarding avian surveillance.
2. Various sites throughout MD and DC will be selected for mist netting in an attempt to detect the species of birds that may be reservoirs of WNV. Wild avian species will be humanely captured in accordance with USFWS guideline in areas with an ongoing or previous history of WNV activity; serum (and/ or swab, tissue) samples will be obtained. The bird will be aged, sexed, banded, recorded and released. Where possible, serology results will be matched with swab or tissue sample results. Data on banded birds will be submitted to the National Bird Banding Lab at the Patuxent Wildlife Research Center, Laurel, MD. U.S. FWS permits have been obtained for this purpose.
3. The Department of Health will assist the National Zoo to monitor the wild bird collection.



Equine and other Mammal Surveillance



Purpose:

The District of Columbia will conduct passive mammal surveillance in cooperation with area veterinarians, wildlife rehabilitators, local animal shelters and barn staff. Increased monitoring for encephalitic disease is a necessary tool for public risk assessment. West Nile virus can infect other mammals and is particularly virulent in horses and causes a nearly 50% mortality rate. Mammals are considered dead end hosts, although some experiments under extreme scientific conditions have produced some level of transmission from animal to animal in cats. There is not enough scientific evidence to deem other mammals a suitable indicator at this time.

It is important to alert veterinarians about this disease, provide equine testing information if WNV or other arboviral infections are suspected, and encourage equine vaccination against WNV. DOH recommends vaccination of all equines residing or working in the District.

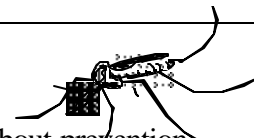
Strategy:

It is essential to monitor equine and other mammal West Nile virus activity. Veterinarians will be encouraged and instructed to inform DOH of any possible West Nile virus infection, particularly those animals that present with a neurological component. DOH will investigate and take measures as necessary.

Actions:

1. DOH will notify veterinarians about the WNV surveillance plan for horses and other mammals. The notification letter will inform veterinarians about the clinical signs of WNV, how to obtain testing for horses, information on the WNV equine vaccine and reporting protocol for equines and other mammals.
2. If a horse is suspected of having WNV infection, veterinarians will be asked to collect appropriate specimens (i.e. CSF, blood, necropsy samples) for testing or analysis. The DC Public Health Laboratory will perform virus isolation and polymerase chain reaction (PCR) on brain tissue and IgM capture ELISA on serum samples. Cerebrospinal fluid (CSF) has not been a useful diagnostic specimen to detect WNV in horses; therefore, its submission for arboviral testing will be discouraged. Confirmatory testing of sera will occur at NVSL in Ames, Iowa pending approval of the USDA/APHIS Area Veterinarian in Charge (AVIC).
3. Necropsies (thorough examinations of the bodies of dead horses to detect cause of death) will be performed, for a fee, on horses at any of the five Maryland Animal Health Diagnostic Laboratories, if the cause of death suggests WNV or other arboviral diseases causing encephalitis. Equine testing may take several weeks to complete.
4. Small mammal traps will be set at the location of mist nets to detect the virus activity in various wild mammals. Serum (and /or swab, tissue) samples will be collected from wild mammals and submitted for WNV detection.
5. Once an equine or other mammal has been WNV-confirmed, DOH will consider the following actions:
 - a. Inform COG Health Officers, District veterinarians and other partners.
 - b. Submit data results to the Director of Communications to determine if a press release is in order.

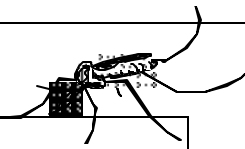




- c. Contact animal owner and stable manager to discuss situation and educate them about prevention and protection.
 - d. Evaluate necessity for serological survey to be conducted at the location of the positive equine or other mammal.
 - e. Distribute outreach and education information in an eight square block area surrounding the location of the positive equine or other mammal.
 - f. Larvicide in the same eight square block area.
 - g. Schedule additional community speaking engagements as necessary.
 - h. Complete DOH reporting forms.
 - i. Upload data to CDC.
6. Results of horse blood testing and of horse necropsies will be collected, analyzed, and reported to CDC on a weekly basis.

Note: Protection of horses involves vaccination and keeping horses stabled inside during high mosquito feeding times, i.e., dusk and dawn. Insect-proofing stables and use of repellents are strongly recommended. USDA approved an equine WNV vaccine in 2002 that has proved to be effective and safe.





Mosquito Management

Purpose:

The safest and most successful technique in controlling mosquito populations is to identify and eliminate potential mosquito breeding sites and mosquito harborage by removing standing pools of water (e.g. waste tires, yard clutter, and neglected swimming pools). Introduction of natural predators, such as goldfish, or larvicidal applications to pools of water can also be effective in reducing larval hatching in those sites. To minimize the public health risk of WNV, other arboviruses and other diseases, it is important to reduce the sources of standing water and supplement by larviciding as a mosquito management tool to reduce the mosquito population.

CDC has stated that larvicidal applications in catch basins and standing water is an essential component to a mosquito management program and is the most successful method to eliminate mosquitoes over time. In addition, the CDC recommends larvicidal applications rather than spraying for both efficacy in reducing mosquito populations, environmental factors and cost effectiveness. Best practices also indicate that preparation and enforcement of nuisance legislation contributes to mosquito elimination. DOH staff will apply larvicide to catch basins and standing water. Adulthood only kills mosquitoes that are flying and remains effective for only a few hours. The efficacy of adulticide is open for debate and is not considered an effective tool for mosquito management or control through only one application, or, over time, as shown through scientific research. Reapplications of adulticide may compound negative health effects of pesticide useage.

Strategy:

The DOH, following CDC recommendations, will apply larvicidal treatment to mosquito breeding sites beginning early and lasting late into the season. Sites receiving larvicidal treatments, as outlined in other sections of this document, will be in response to both positive mosquito pool collections and positive human sites. These treatments will be in an eight square block area from the determined site of the virus. Staff collected significantly smaller numbers of mosquitoes in mosquito traps set in areas where larviciding was applied. Larviciding appears to be an inexpensive and effective method for mosquito control and reduction and significantly aided in the protection of humans in the District against West Nile virus.

The District does not expect to spray for adult mosquito control for many reasons.

?? **Washington, DC has the highest asthma rate in the country (2.5 times the national average).**

Aerosolized pesticides can trigger asthma and aggravate respiratory conditions. To lessen the negative effects of spraying, it would be necessary to have every person remain indoors for several hours after spraying. Broadcast aerosol applications of pesticides, even at night, will elicit a negative public response.

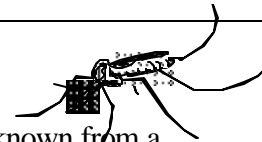
?? **Forty percent (40%) of the land in Washington, DC is federally owned. Embassies are located on foreign soil.**

The District does not have authority to apply larvicide or adulticide products at embassies. Multiple jurisdictions within the confines of the District creates difficulty in developing and implementing policy. Pesticides from aerial or ground ULV applications can drift and potentially cause liability issues.

?? **Washington, DC is home to an endangered species (Hays Spring Amphipod) and a rare invertebrate (Kenk's Amphipod)**

As aquatic arthropods, these shrimp-like organisms are extremely sensitive to pesticide residues. These species are found nowhere else in the world. Hays Spring Amphipod is known only from a





spring on the grounds of the National Zoo and the Kenks Amphipod is presently only known from a site in Rock Creek Park.

?? **The Asian Tiger Mosquito (*Aedes albopictus*), a West Nile Virus vector, is a day flying mosquito.**

Application of pesticide sprays during the evening would have limited effect on this species.

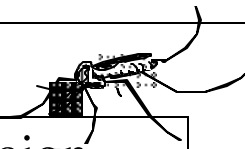
?? **Non-target organisms would be affected.**

Broad-spectrum insecticides such as Malathion and Sumithrin will kill many insects that are unintended targets.

Actions:

1. DC Department of Health will begin larvicidal applications as weather conditions become conducive to mosquito breeding activity.
2. Larvicidal application sites are initially determined based on a grid-system throughout each ward in the District.
3. Larvicide will be applied in an eight square block zone surrounding the location of positive mosquito pools from surveillance year 2002. DOH staff will larvicide each grid location at least 3 times per year.
4. As positive WNV sites become known through surveillance measures, larvicide will be applied in eight square block zones surrounding each positive location and repeated every four to six weeks.
5. Staff will enforce local ordinances prohibiting the breeding and harborage of disease-causing insects.
6. DOH will notify in writing to the D.C. Water and Sewer Authority (DCWASA) of the need for DCWASA to monitor, assess, clean and maintain the catch basins located throughout the District.
7. DOH will contract with a sewer-baiting vendor to aspirate for adult mosquitoes, package and deliver to DOH for speciating and testing. DOH expects approximately 2,000 sewers to be sampled.





Public Information, Outreach & Education Campaign

Purpose:

The DOH will inform District citizens of the risk from arboviruses and inform them of current DOH surveillance, prevention and management strategies. Public cooperation is essential to help reduce the risk of WNV infection by identifying and eliminating mosquito-breeding sites and taking personal protective measures.

For successful implementation, DOH will provide information to the public, healthcare communities, and government agencies. Flyers, web sites, news briefs, bulletins, and physician alerts exist for distribution to targeted populations. Press releases will be issued as required.

The DOH will target educational campaigns seasonally based upon the mosquito life cycle and current threats to citizen health. Information will be developed accentuating targeted messages for specific time periods. There will be early year, mid year and late year messages.

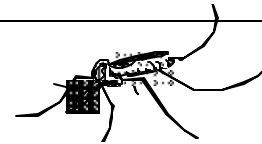
Strategy:

The development of multiple targeted messages distributed throughout the surveillance year is a strategy that was used successfully in New York in 2002. Outreach and education information was considered an essential component in protecting the public health and safety of the District residents and visitors.

Actions:

1. The Mayor will conduct a press conference to announce the publication and implementation of this Plan.
2. DOH will set up the West Nile Virus Call Center on or about April 10 or earlier as indicated by environmental and meteorological conditions.
3. DOH will use the Council of Governments (COG) Regional Press Release to inform the public of West Nile virus, the District plan for arboviral surveillance and management, and information on how to contact the District's West Nile virus Call Center and DOH Internet site.
4. DOH will update the public with informational materials concerning West Nile virus infections and ways to minimize mosquito exposure. These documents will be made available by request through the Call Center and on the DOH website.
5. DOH will create a video public service announcement (PSA) on the topics of personal protection, use of repellants, identification and elimination of environmental conditions that may be conducive for the breeding and growth of mosquitoes.
6. DOH in partnership with the Department of Public Works and other agencies will conduct a Tire Round-Up in late-Spring. This program will decrease the number of old tires in the community provide habitat for the breeding and growth of mosquitoes by providing a location where residents may bring old tires for recycling – See Appendix [F].
7. Representatives from DOH will be available to answer questions from the public and media. DOH Office of Communication will handle the coordination of media requests.





8. The public education campaign will emphasize the following– See Appendix [G]:

~~///~~ Personal protection and prevention methods (use of repellents, wearing clothing on extremities, staying indoors at dusk and dawn).

~~///~~ The elevated risk to immunocompromised and elderly citizens of developing serious symptoms from WNV infection.

~~///~~ How to eliminate sites around residential areas, commercial establishments, and recreational areas where mosquitoes can breed and develop.

~~///~~ Where and whom to call for further information about mosquito control.

~~///~~ Landscaping tips to discourage mosquitoes from breeding on properties.

~~///~~ Identification and elimination of environmental conditions in cemeteries (i.e. standing water in decorative urns) and open spaces that may be conducive to the breeding and growth of mosquitoes.

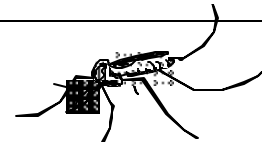
9. DOH shall distribute information to healthcare providers, residential facilities, churches, recreation centers, Office of Maternal and Child Health (OMCH), Addiction Prevention and Recovery Administration, public schools and other government agencies.

10. If mosquitoes in a given area are determined to have WNV, a public education campaign will focus directly on that area.

11. Other field personnel in DOH, such as food safety inspectors, will distribute brochures and other information.

12. All pertinent information, such as weekly reports, mapping and brochures will be provided to the Mayor and will be available on the web. The web site will be updated every two weeks or less.





Public Health Laboratory

Purpose:

The DC Public Health Laboratory has expanded capabilities to begin arboviral testing

All arboviral suspect human specimens will be tested in the DC Public Health Laboratory (DC PHL). The lab has increased capacity to run both PCR and PRNT on all specimens. The PHL will conduct screening and confirmatory testing on in-patient submissions from District hospitals and confirmatory testing on specimens initially determined positive by commercial labs.

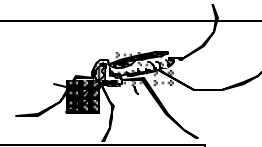
Strategy:

The District of Columbia will expand laboratory capacity to permit all human arboviral testing to be completed in house and to protect the public health and safety of the residents and visitors in the District. Increased monitoring for encephalitic disease is a necessary tool for public risk assessment.

Actions:

1. Develop infrastructure of West Nile virus lab component at the PHL. The necessary equipment and CDC recommended protocols for human specimen testing are ready for use. Human specimens will be PCR tested for WNV, SLE, and EEE and other arboviruses where necessary.
2. Staff training is complete.
3. Conduct West Nile virus validation study.
4. Conduct parallel study.
5. The US Army lab will test mosquito specimens throughout the season as outlined in an MOU (see Appendix B). All mosquito specimens will be fully speciated. A split sample of all positive pools (both DOH and other agency submissions) will be sent to the DC PHL for confirmatory testing.
6. The DOH follows all HIPPA regulations. Patient information will be kept confidential; test results will be forwarded to appropriate parties by secure means only.





Information Technology

Purpose:

Monitoring infectious and communicable disease cases within and around the District Metropolitan Area is based on compulsory reporting requirements for emergency and infection control departments, clinical laboratories, physicians, and both District and Federal legislative mandates. Presently, there is no overall integrated IT application architecture at DOH. The current National Electronic Telecommunications System of Surveillance (NETSS) does not provide for the electronic transmission of information from healthcare providers and the Department of Health. Information is conveyed by fax, telephone or mail.

The Department of Health is now developing a new automated surveillance system based on the CDC's National Electronic Disease Surveillance System (NEDSS). The purpose of this system is to take advantage of contemporary technology to make reporting between health providers, state/local public health agencies, and CDC both more rapid and timely, and consistent. It will also allow for the integration of the Syndromic Surveillance System for Bioterrorism with other infectious disease databases. The NEDSS system will render obsolete any paper-based reporting by health care providers, state/local public health agencies.

Currently, the West Nile Virus Database is an Access Database and data received by phone or fax are entered into the database by a program staff. The NEDSS system that is expected to be fully functional by July 2003 will allow for the electronic receipt of information, and with its geographic information system (GIS) capability, will improve data analysis by mapping the distribution of cases in the District. It will also ensure the integration of West Nile Virus Surveillance with the District's Syndromic Surveillance System for bioterrorism.

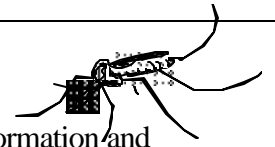
With the introduction of Geographic Information Systems (GIS) into the science field, tracking the spread of disease has become easier. Benefits of a GIS-based system include the early warning of WNV activity, targeted remediation, and effectiveness in planning and controlling costs of remediation efforts, ability to readily map "hot spots". This system will also decrease administrative costs and increase program management efficiency.

Through handheld computers using GIS technology, surveillance technicians can catalogue their actions. Route creation can be designed for larvicidal applications with near-real time collection of data for effective route management and reporting.

Actions

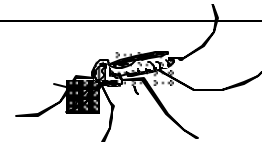
1. Continue to include West Nile Virus staff in the NEDSS and Bioterrorism Surveillance Committee.
2. Improve coordination and integration of data collection through NEDSS. Sierra Systems (Contractor with BEHRA) will ensure the coordination and timely transfer of data into the Washington DC automated Disease Surveillance System.
3. Secure transmission of data via a web-based system. A web-based system is being developed for the NEDSS and users will be provided with passwords to access the system
4. Conduct and support web browser-based data entry and management





5. Accept, route and process electronic HL7 messages containing laboratory, clinical, information and integrate with mosquito and avian databases
6. Develop an active data translation and exchange (integration broker) functionality
7. Develop data reporting and visualization capability
8. Implement a security system and appropriate security policies.
9. Train staff on efficient use of Arc Pad.
10. Complete installation of GIS equipment and programs.





Data Analysis and Reporting

Purpose:

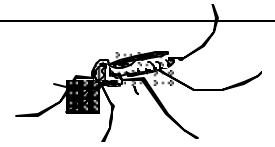
Decision making process under uncertainty is largely based on application of statistical data analysis. Information from the West Nile Virus Surveillance System can be used to compile and produce graphical displays and animations showing the pattern and spread of the virus. Other analyses can be done to detect clusters of infections and to determine the geographic origin of the outbreak.

The surveillance system will provide basic information on the spatial distribution of WNV. The combination of this data with information about weather conditions, over space and time, will provide the foundation for developing spatial analytical and forecasting models. It is imperative that data are compiled accurately and forwarded to various partners in a timely manner.

Actions:

1. Improve coordination and integration of data collection through NEDSS. Sierra Systems (Contractor with BEHRA) will ensure the coordination and timely transfer of data into the Washington DC automated Disease Surveillance System.
2. Develop a comprehensive set of basic data elements as indicated in the NEDSS standards.
3. Continue to include West Nile Virus staff in the NEDSS and Bioterrorism Surveillance Committee
4. Compile ground meteorological and remotely sensed data for the District of Colombia for an assessment of seasonal climatic and environmental change
5. Merge of enviro-climatic profiling with avian and mosquito collection data for use in delineating the seasonal changes in population densities. The merger of this data will be produced within a Geographic Information System (GIS) framework
6. Provide simple descriptive analyses of data and show trends
7. Use aberration detection methods to show unusual patterns of occurrences
8. Disseminate information by the following media: routine surveillance reports, such as MMWR of CDC, monographs, and state annual reports, peer review journal publications, DOH website and presentation at conferences and other national meetings





Acknowledgements & Contact Information

ACKNOWLEDGEMENTS

The Department of Health would like to acknowledge the following distinguished organizations and individuals for their strong support, contribution and participation in the development of this Plan:

- Centers for Disease Control and Prevention
- The Metropolitan Washington Council of Governments
- The National Park Service
- The National Zoo
- The United States Army Center for Health Promotion and Preventive Medicine
- The United States Department of Agriculture/ Wildlife Services

The Department of Health’s West Nile Virus/Arbovirus Surveillance Program Working Group:

- Robert B. Vowels, MD, MPH *Chairperson & Supervisory Medical Officer, EHSR*
- Karyn Berry, MD, MPH *Chief, Bureau of Communicable Diseases*
- Kenneth Campbell *DOH Agency General Counsel*
- John Davies-Cole, PhD, MPH *Chief, Bureau of Epidemiology & Health Risk Assessment*
- Mark Greenleaf *Chief, Bureau of Community Hygiene*
- Robert Hamilton, PhD *Program Manager, Pesticide Control Program*
- Jamie Hinson *West Nile Virus Coordinator*
- Cecilia Keller, MPH *Chief, Animal Disease Prevention & Program Manager, West Nile Virus Program*
- Maurice Knuckles, PhD, MSPH *Director, Public Health Laboratory*

Other Distinguished Contributors:

- Brenda Kelly *Chief, Policy, Planning, and Program Evaluation, EHSR*
- Michael Richardson, MD *Senior Deputy Director for Primary Care and Prevention*
- Vincent Nathan, PhD, MPH *Assistant Deputy Director, Environmental Health Administration*

CONTACT INFORMATION

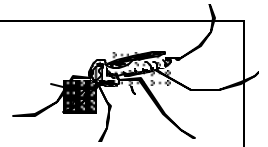
For further information, visit the Department of Health website at <http://www.dchealth.dc.gov> and click on the West Nile Virus button, or contact:

Cecilia Keller
 Program Manager, West Nile Virus Program
 51 N Street, N.E., 6th Floor
 Washington, DC 20002
 Phone: (202) 535-2323
 Email: peggy.keller@dc.gov

For Customer Service Requests,

Call the West Nile Virus Call Center at (202) 535-2323 or (202) 727-1000





APPENDIX A

ARBOVIRUS EPIZOOTIC/EPIDEMIC MANAGEMENT PLAN TO GUIDE MOSQUITO CONTROL OPERATIONS DURING 2003

September. In neighboring Maryland, the arbovirus LaCrosse encephalitis (LCE) and West Nile encephalitis virus (WNV) were found in 2002. Maryland has also documented evidence of St. Louis encephalitis (SLE) and Eastern Equine encephalitis (EEE) in 2001. EEE is known to be endemic Arthropod-borne viruses (arboviruses) are pathogens affecting human and animal health throughout much of the world. All arboviruses are maintained in nature in a complex cycle involving nonhuman vertebrate hosts (birds and small mammals primarily) and arthropod vectors (mosquitoes, other flies and ticks).

West Nile virus is of the greatest current concern to public health authorities in the District. WNV is a newly introduced pathogen in North America to which native wildlife, domestic animals, and humans have no previous exposure, therefore a high susceptibility. The distribution of human cases of West Nile encephalitis in the northeastern U.S. during the period 1999-2001 has been in urban/suburban areas with an introduction to rural areas in 2002.

Mosquito control has been of slight interest in the U.S. over the past 50 years since the near elimination of yellow fever and malaria, both mosquito-borne diseases. Due to the introduction of WNV in 1999, there is a renewed interest in mosquito surveillance and control.

WNV was first detected locally in the District in 2000. Five wild birds found dead in the District were confirmed positive for WNV in late in Maryland effecting primarily equines, but occurring sporadically in people.

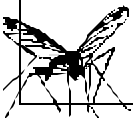
The District began WNV surveillance of mosquito pools and dead birds in 2000. There was no WNV human activity documented. In 2001, through similar yet elevated surveillance methods, WNV activity was detected in 360 of a total 444 dead birds tested and 3 of 870 pools of mosquito collected and tested. A full report of 2002 arbovirus activity in the District was prepared by the Department of Health. This section is concerned principally with WNV management through mosquito control and the challenges of mosquito control in the District.

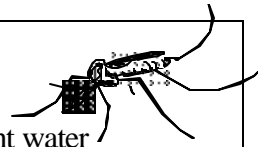
MOSQUITO CONTROL MANAGEMENT OF WNV DISEASE

The District did not participate in adult mosquito control programs due to many factors. 43% of the public space in the District is owned by the federal government and in many cases, no adulticide can be used. Numerous residents have complained very vocally about the effects of pesticide use in the District.

Mosquitoes are increasing in rural and suburban areas in and adjacent to the District due to the introduction of the exotic "tiger" mosquito (*Aedes albopictus*), which proliferates in the urban environment, and construction of storm water ponds, which are providing new breeding habitat for native mosquito species. The distribution of West Nile virus in the District from 1999 - 2001 indicates that the urban/suburban corridor between Baltimore and Washington is at risk for reoccurrence of the disease.

West Nile Virus Response Mosquito Control Options:





1. Community Outreach and Public Education - Educate and inform the public to remove stagnant water mosquito breeding sites in backyards. This is the best method of mosquito control in the urban/suburban environment.

Advise the public to avoid mosquito bites by use of personal protection measures (screening, proper use of repellents, protective clothing) and behavior modification (avoid mosquito infested areas, limit outdoor activities at peak times of mosquito biting).

DOH will provide brochures on these topics in targeted response and upon request. DOH press releases will also emphasize the importance of these measures.

2. Conduct Mosquito Surveillance - Collect adult mosquitoes to determine species, population level and West Nile virus infection rate.

DOH staff will trap adult mosquitoes during the period June 1 to October 15, 2002 at specific sites known to be endemic for WNV. Additional sites may be sampled in response to epizootic/epidemic activity.

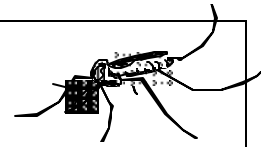
The US Army will provide training to DOH staff for mosquito surveillance and identification, if such training is requested.

3. Larval Mosquito Control - Apply bacterial (*Bti* or *Bacillus sphaericus*) or insect growth regulator (methoprene) insecticides to mosquito breeding sites in and near communities. Consider stocking storm water ponds with fish (*Gambusia holbrooki*).

DOH staff will conduct a larval mosquito surveillance and control program throughout the District.

4. Adult Mosquito Control - Consider adulticiding only after extensive discussion with cooperating federal and local agencies.





APPENDIX B

MEMORANDUM OF UNDERSTANDING

I. INTRODUCTION

This Memorandum of Understanding (MOU) is entered into between the District of Columbia Department of Health (DOH) and the United States Army Center for Health Promotion and Preventive Medicine-North (USACHPPM-North).

II. OVERVIEW

The CDC/USACHPPM-North IAA recognized the potential requirements for WNV mosquito laboratory support for the District of Columbia in FY 2003 on a reimbursable basis. In order to foster and continue the close cooperation of DOD installations in and around the District of Columbia, USACHPPM-North will provide WNV mosquito laboratory support to the District of Columbia through the District of Columbia Department of Health (DOH) in accordance with this Memorandum of Understanding (MOU).

III. SCOPE OF SERVICES

A. USACHPPM shall provide the following:

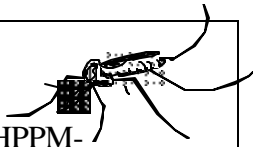
1. Mosquito surveillance training
2. Identification of submitted mosquitoes to species level
3. Testing of all appropriate pools of mosquitoes submitted for WNV analysis using real-time PCR and guidance provided by CDC
4. Timely reporting of testing results (i.e. within an agreed turnaround time)
5. Split samples for all positive samples obtained in the District are to be sent to DC Public Health Laboratory for archiving.
6. Test appropriate mosquito pools for Malaria and, if applicable, other pathogens, including Eastern Equine Encephalitis (EEE) virus, Saint Louis Encephalitis (SLE) virus, La Crosse Encephalitis (LAC) virus and others. Testing will be conducted using approved established protocols.
7. Data generated from the testing of mosquitoes collected by the District of Columbia Department of Health shall only be shared after expressed written permission from the DC Dept of Health.

B. DOH shall:

1. Be responsible for mosquito surveillance via the location of traps in a pre-determined grid pattern in cooperation with the National Park Service and other surveillance partners.
2. DOH shall be responsible for the collection and transport of the mosquito pools from the surveillance traps to the USACHPPM-North Laboratory.
3. Coordinate mosquito control procedures as dictated by the surveillance efforts.

IV. IMPLEMENTATION PLAN





Implementation of this MOU shall commence on the date of execution by USACHPPM-North and DOH as signified by the signatures of the authorized representatives below. Any modifications to this MOU shall have no force or effect unless and until said modifications are reduced to writing and signed by all parties herein.

V. DURATION OF AGREEMENT

The period of this MOU shall be May 1, 2003 to November 30, 2003.

VI. TERMINATION OF AGREEMENT

This MOU may be terminated by any party upon sixty days written notice to the other party without cause. This MOU may be terminated at anytime for cause upon occurrence of any of the following:

- a. Lack of local funding,
- b. Lack of Congressionally approved budget,
- c. Changes in applicable law,
- d. Changes in District or Federal policy affecting these services,
- e. Changes in the structure or nature of this program, or
- f. Elimination of this program or services.

VII. EFFECTIVE DATE

This Memorandum of Understanding shall be effective as May 1, 2003. Any special procedures not included in this memorandum of understanding must be cleared between USACHPPM-North and DOH.

VIII. FUNDING PROVISIONS

A. Cost of Services

The cost to provide services under this agreement shall not exceed twenty thousand dollars (\$20,000).

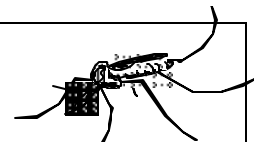
B. Payment

- 1. DOH shall transfer funds stipulated above to USACHPPM-North upon receipt of and certification of an invoice..
- 2. DOH reserves the right to deny payment for services not provided pursuant to the terms of this agreement.

IX. CONTACTS

The contacts of each party to this agreement are:





For DOH:

Mr. Theodore J. Gordon
Sr. Deputy for Environmental Health Sciences & Regulation Department of Health
825 North Capitol Street, N.E.
Washington, D.C. 20002

For USACHPPM-North:

Lt Col Charles E. Canon
Chief, Entomological Sciences Division
U.S. Army Center for Health Promotion and Preventive Medicine-North
4411 Llewellyn Avenue
Fort George G. Meade, Maryland 20755

IN WITNESS WHEREOF, the Parties hereto have executed this MOU as of the day and year written below.

For the Department of Health:

James A. Buford
Director, Department of Health

Date

For USACHPPM-North:

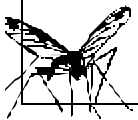
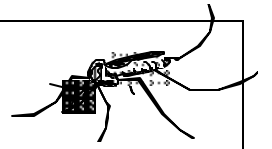
Charles E. Cannon
Lieutenant Colonel, Medical Services Corp
Chief, Entomological Sciences Division

Date

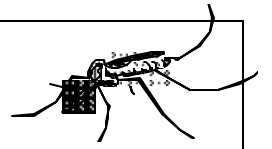
APPENDIX C

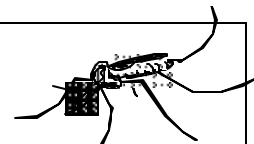
HUMAN SURVEILLANCE FORMS WNV HUMAN TESTING ALGORITHM





WNV PHYSICIAN'S ALERT





APPENDIX D

MAMMAL SURVEILLANCE FORM

GOVERNMENT OF THE DISTRICT OF COLUMBIA

Department of Health

Bureau of Community Hygiene
Animal Disease Prevention Division



April 23, 2003

TO: District of Columbia Practicing Veterinarians

SUBJECT: West Nile Virus (WNV) Update

In anticipation of the upcoming West Nile Virus (WNV) season in our area, we are providing the following information to assist you in identifying, testing and reporting West Nile virus cases.

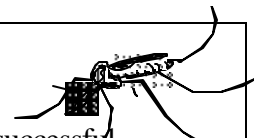
Surveillance and control plans: The District of Columbia Department of Health has developed an Arbovirus Surveillance and Response Plan for the year 2003. This plan outlines WNV surveillance for humans, birds and mammals, and mosquitoes. The plan also provides a prevention, control, and response program for WNV for the District of Columbia. The plan as well as prevention and control measures, periodic health alerts and weekly surveillance reports are available on the Department of Health website at www.dchealth.dc.gov. Clients should be advised to apply the same general guidelines proposed for people to their pets to reduce the chance of their pet's exposure to West Nile virus.

Reporting and testing of ill animals: In animals ill with encephalitis that you may encounter in your practice, rabies is still a more likely diagnosis than WNV, and is a more critical diagnosis in regards to rapid provision of preventive treatment to persons exposed. If rabies is suspected and exposures have occurred, such as a bite or other human contact with the animal's saliva, the animal must be euthanized and submitted for rabies testing. That submission should be coordinated with the Department of Health. For horses from a WNV affected area that test negative for rabies, the Laboratory will subsequently test the brain specimens for WNV. Routine WNV testing of the brains of additional rabies-negative animals may be arranged depending on resources and priorities.

Clinical disease and transmission caused by WNV infection in dogs and cats was documented in 2002. Clinical case criteria that have been helpful in narrowing down human encephalitis cases for WNV testing include fever, altered mental status, muscle weakness by neurologic exam or EMG, and abnormal CSF with increased protein, pleiocytosis, and lymphocytosis. Animals ill with encephalitis that do not require euthanasia and rabies testing and are from WNV affected areas may be tested for WNV. The District of Columbia Public Health Laboratory will conduct serologic and virus isolation testing for WNV. Because rabies is a more likely diagnosis in small companion animals, and pets are unlikely to become clinically ill with WNV, please consult with Department of Health Animal Disease Control Division if you have questions regarding sample submission criteria.

For encephalitis cases in domestic animals/livestock, Department of Health, Animal Disease Prevention Division must be consulted before submitting samples. Samples collected for antibody detection should be





collected in red top (clot) tubes and should be paired samples. Virus isolation has, to date, been successful with brain, spinal cord, and kidney.

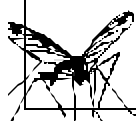
Prevention: Efforts should be directed to minimize exposure to mosquitoes. The single most important control effort should be to eliminate or minimize mosquito breeding habitat near dwellings or stable areas. Clients should be directed to police their areas for cans, tires, clogged gutters or other items which hold standing water that can be used as breeding sites for mosquitoes. This includes swimming pools that are not opened and not maintained in good condition. Water troughs and water dishes should be kept in good condition, water changed every three days, and maintained such that they do not become breeding sites for mosquitoes. By minimizing breeding sites of the WNV carrier mosquito, the number of adult mosquitoes and potentially virus positive mosquitoes that interact with mammalian hosts can be decreased.

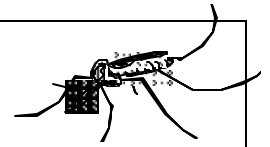
In addition to decreasing the number of breeding sites for the vector, keeping animals in during dawn and dusk when *Culex spp.* is most active may decrease exposure to this mosquito species that prefers to feed in twilight. Insect spray may be effective for short periods of time, but will not have a lasting effect.

Summary:

The risk of acquiring WNV infection from horses or other mammals as a clinician examining these animals is un documented. WNV is vector-borne, however it is prudent to practice universal precautions when handling animals with neurologic signs, especially since rabies, a differential rule-out, can be transmitted directly from an infected animal.

For further questions and submission criteria, please call the District of Columbia Department of Health, Animal Disease Prevention Division, 202-535-2323.





APPENDIX E

MODEL WNV NUISANCE LEGISLATION

A BILL

IN THE COUNCIL OF THE DISTRICT OF COLUMBIA

Chairman Linda W. Cropp, at the request of the Mayor, introduced the following bill, which was referred to the Committee on _____.

To establish, on an emergency basis, procedures for the control of vector-borne infectious diseases.

BE IT ENACTED BY THE COUNCIL OF THE DISTRICT OF COLUMBIA, That this act may be cited as the "Vector-Borne Infectious Diseases Control Emergency Act of 2003".

Sec. 2. Definitions.

For the purposes of this act, the term:

(1) "Abate" means to put an end to a public nuisance, or to reduce the degree or intensity of a public nuisance.

(2) "Person" means any individual; partnership; corporation, including a government corporation; trust association; firm; joint stock company; organization; commission; the District or federal government; or any other entity.

(3) "Property" means land and improvements including any water thereon.

(4) "Public health nuisance" means the following:

(A) Any property, including water, that supports the development, attraction, or harborage of vectors.

The presence of vectors in their developmental stages on a property shall be prima facie evidence of a public nuisance;

(B) Any property that has a vessel, container, or other structure holding water that provides a breeding place for vectors. The presence of vectors in their developmental stages in a vessel, container, or other structure on a property shall be prima facie evidence of a public nuisance; or

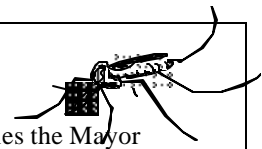
(C) Any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors.

(5) "Vector" means any animal capable of transmitting the causative agent of human or animal disease or capable of producing human discomfort or injury, including mosquitoes, flies, mites, ticks, or other arthropods.

Sec. 3. Inspection.

The Mayor may inspect occupied or vacant property to investigate an allegation of a public health nuisance. The Mayor may act on the Mayor's own information or observation or on the information or observation of another person. The Mayor shall, upon the presentation of appropriate credentials to the owner or occupant of the property, conduct the





inspection during reasonable times and in a reasonable manner. If the owner or occupant of the property denies the Mayor access for the purposes of this section, the Mayor may apply to a court of competent jurisdiction for a search warrant. If, as a result of an inspection, the Mayor determines that a public health nuisance exists he or she may order the owner or occupant to take appropriate action to abate the public health nuisance.

Sec. 4. Prohibited activities.

(a) No person shall:

- (1) Cause or allow the open dumping of any used or waste tire;
- (2) Cause or allow the open burning of any used or waste tire;
- (3) Cause or allow the storage of any new or used tire unless the owner or operator of the property where the tire is stored takes measures to prevent the tire from accumulating water by covering or altering the tire; or
- (4) Cause or allow a tire to be used in playground equipment unless the tire is altered to prevent the accumulation of water.

(b) No person shall cause or allow standing water on property unless the person takes measures to prevent the breeding or harborage of vectors including the following:

- (1) Draining or replacing water frequently enough to prevent vector breeding;
- (2) Keeping swimming pools and other open waters used for bathing or swimming sufficiently chlorinated to prevent vector larva from hatching;
- (3) Covering water-bearing containers with fine netting to prevent access by vectors; or
- (4) Applying larvacides to the standing water.

Sec. 5. Abatement.

(a) When the Mayor determines that a public health nuisance exists on a property, the Mayor shall issue a notice of violation to the person alleged to have created the public health nuisance or the owner or occupant of the property. The Mayor may serve the notice of violation on the owner or any other responsible person at the premises, deliver the notice of violation by prepaid mail return receipt requested, or by posting the notice in a conspicuous place on the property in violation. The notice of violation shall include the following:

- (1) The location, date, and time that the public health nuisance took place or that the Mayor investigated the public health nuisance;
- (2) The nature of public health nuisance;
- (3) The time, not later than 10 days, within which the public health nuisance shall be abated;
- (4) The specific corrective actions the owner or occupant shall take to abate the public health nuisance; and





(5) A statement that failure to abate the public health nuisance shall constitute a violation of this act, with each day of violation consisting of a separate offense.

(b) Upon receipt of a notice of violation, the person responsible for the property shall abate the public health nuisance within the time specified in the notice of violation. The Mayor may grant additional time to abate the public health nuisance upon a request from the responsible person and a good faith showing that the person has made an effort to abate the public health nuisance and that a longer time for abatement is necessary.

Sec. 6. Penalty.

A violation of this act or the rules issued under authority of this act shall be a civil infraction for the purposes of the Department of Consumer and Regulatory Affairs Civil Infractions Act of 1985, effective October 5, 1985 (D.C. Law 6-42; D.C. Official Code § 2-1801.01 *et seq.*) ("Civil Infractions Act"). Civil fines, penalties, and fees may be imposed as sanctions for any infraction of the provisions of this act, or the rules issued under authority of this act, pursuant to Titles I-III of the Civil Infractions Act. Adjudication of any infraction shall be pursuant to Titles I-III of the Civil Infractions Act.

Sec. 7. Rules.

The Mayor, pursuant to Title I of the District of Columbia Administrative Procedure Act, approved October 21, 1968 (82 Stat. 1204; D.C. Official Code § 2-501 *et seq.*), shall issue rules to implement the provisions of this act.

Sec. 8. Fiscal impact.

The Council adopts the fiscal impact statement of the Chief Financial Officer as the fiscal impact statement required by section 602(c)(3) of the District of Columbia Home Rule Act, approved December 24, 1973 (87 Stat. 813; D.C. Official Code § 1-206.02(c)(3)).

Sec. 9. Effective date.

This act shall take effect following approval by the Mayor, (or in the event of veto by the Mayor, action by the Council of the District of Columbia to override the veto), and shall remain in effect for no longer than 90 days, as provided for emergency acts of the Council of the District of Columbia in section 412(a) of the District of Columbia Home Rule Act, approved December 24, 1973 (87 Stat. 788; D.C. Official Code § 1-204.12(a)).

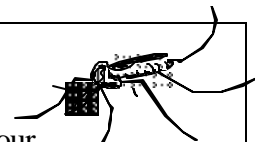
APPENDIX F

TIRE ROUNDUP CAMPAIGN

Purpose:

To eliminate potential mosquito-breeding sites by removing discarded tires that serve as reservoirs for water and to develop a program to recycle collected tires.



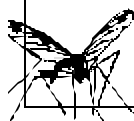


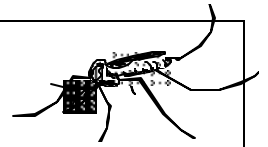
The District of Columbia invests considerable resources to support recycling as a way to protect our environment. By bringing products manufactured from scrap tires "full-circle" back to the community, people can see the results of everyone's recycling efforts.

This pilot project will highlight ways in which recycled scrap tire products can be used in the improvement of community facilities such as playgrounds, parks, buildings, walkways, arenas, etc. There are increasing opportunities for communities to use and benefit from the growing range of tire-recycling products. The project will provide an opportunity for community groups to observe and assess the value of using recycled scrap tire products.

Actions:

1. Develop and finalize plan to collect tires from residents at one location, such as, RFK Stadium, for recycling. Through educational outreach efforts, residents will be requested to bring their old tires to the collection site.
2. Coordinate with Department of Public Works, DPW, to remove tires from resident homes and transport to collection site.
3. Prepare Statement of Work for Office of Contracting and Procurement, OCP, to seek a qualified vendor to develop a tire-recycling program at one location.
4. Develop Public-Private partnerships with stakeholders to collect and recycle tires.
3. Coordinate with other agencies, such as DCRA, for a multi-agency plan.



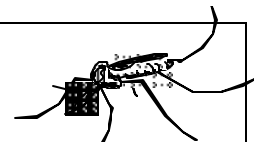


APPENDIX G

OUTREACH AND EDUCATION SEASONAL MESSAGE

Pre-Season (April-May)	Mid-Season (June- July)	Late Season (Aug-Sept)
<p>Messages</p> <ul style="list-style-type: none"> ✍️ The DC DOH is Prepared ✍️ Mosquitoes can carry disease ✍️ Clean up standing water around your home ✍️ Persons over age 50 are at higher risk for serious illness from WNV ✍️ DC DOH will not be collecting birds this season <p>EMPHASIS: Eliminate standing water and potential mosquito breeding sites ✍️</p>	<p>Messages</p> <ul style="list-style-type: none"> ✍️ Continue Pre-Season messages ✍️ The DC DOH is working to Protect YOU ✍️ Wear personal protection, bug spray with DEET when outdoors ✍️ Risk from WNV is increasing as mosquitoes start to appear ✍️ Dead birds need to be disposed of in double plastic bags <p>EMPHASIS: Eliminate standing water and potential mosquito breeding sites ✍️</p>	<p>Messages</p> <ul style="list-style-type: none"> ✍️ Continue Pre and Mid Season messages ✍️ Mild, flu-like symptoms are not dangerous, if you have headache with high fever, disorientation and muscle pain with weakness, seek medical attention ✍️ Other animals can become infected, contact your veterinarian if you have particular concern about a domestic or farm animal <p>EMPHASIS: Eliminate standing water and potential mosquito breeding sites ✍️</p>





APPENDIX H

WORK PLAN FOR MOSQUITO ARBOVIRUS DISTRICT OF COLUMBIA COLLABORATIVE SURVEILLANCE PROGRAM April 2003

I. Purpose

To assess the threat of West Nile virus (WNV), malaria and other arboviruses in the District of Columbia by determining the presence, distribution, and relative abundance of potential vector mosquito species and to test collected material to determine the presence of arborviral pathogens. This information will be used to guide public health protection activities.

II. Participants

Principal agencies include: the DC Department of Health (DCDOH); National Park Service (NPS), National Zoological Park, Smithsonian Institution (NZP,SI); US Army Center for Health Promotion and Preventive Medicine-North (USACHPPM-North); and DoD facilities in Washington DC. Selected points of contacts (POCs) are provided in enclosure 1.

III. Schedule

Period	Activity
April 7 – 11	Inventorv and Test all Trapping Equipment and Order Supplies (including pesticides)
April 7 - June 5	Initial Larval Survey and Control
May 7-8	Training in Mosquito ID and Trapping Methods
May 19 – Oct 30 (or first killing frost)	Adult Mosquito Trapping and Data Submission
July 7 – Aug 23	Follow-up Larval Surveillance and Control
April 10 – Oct 30 (or first killing frost)	Compile and Catalog all Field Data in GIS

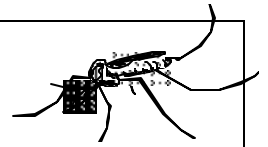
Table 1.

IV. Mosquito Collection

A. Larval Surveillance

1. Background – Larval surveillance shall be conducted by visual examination through the use of a dipper and/or the use of improvised suction devices (e.g., modified hand powered bilge pump) in small water-holding cavities. Presence or absence of larvae shall be determined. Field notes shall include: surveyor, date, location, larval presence/absence, and treatment (if done). Relative abundance of larvae can be recorded by standardizing the number of dips (e.g., 5 per site). If larval identification is not possible then this should be noted. Emphasis will be placed on immediate treatment if possible and if appropriate. Treatment may consist of removing debris from a culvert, turning over a wheelbarrow, or straightening a wrinkled tarp. In certain circumstances larvae can be collected and returned to laboratory for rearing and identification.





2. Techniques - There are several recommendations for successful dipping. Larvae are sensitive to water movement and change in light intensity (e.g., your shadow) and will quickly hide if so disturbed. The dipper should be directed at making a quick but gentle sweep at the water surface. Place the dipper at an angle as it enters the water so that surface water enters the cup. Continue sweeping across the water surface until the cup is one-half to three-quarters full. Avoid filling the cup all the way because larvae could escape before the dipper is righted and removed from the water. Larvae that are disturbed from the water surface will escape to deeper water, resurfacing only when air is needed. Pausing between dips or changing dipping locations will encourage larvae to resurface. If there is vegetation in the water, try dipping where the water meets the leaves or stems. In this case, do not sweep the dipper. Slowly enter it into the water so that water is sucked out of the vegetation into the dipper.

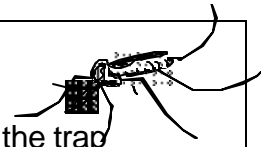
B. Adult Surveillance – Adult surveillance shall be conducted through the use of gravid traps, CDC Light Traps augmented by dry ice, and Co₂ generating Propane Traps (Mosquito Magnet™). Additionally Ovitrap shall be used to determine the presence of container breeding potential vectors, but reared adults from these cups will not be routinely tested for pathogen presence. Trap descriptions, advantages and disadvantages are presented in Enclosure 2.

1. CDC Gravid Traps – The gravid mosquito trap is single most important tool to assess WNV in the mosquito population. The gravid trap traps and collects female mosquitoes that have recently taken a blood meal and are ready to lay eggs, which in turn greatly increases the probability of detecting the virus, if it is present.

a. Placement. Locate the trap in or near residential areas in order to collect container-breeding *Culex spp.*. Traps should be located in areas protected from extreme environmental conditions (e.g., wind and direct sun) and in secure areas (not conspicuous) where they are not disturbed or vandalized. Appropriate trap sites include: utility yards, window wells, stairwells, storm drains, boatyards, animal stables, transformer pits, cluttered backyards, tire storage yards, sewage treatment plants, near garden plots, and cemeteries. It is desirable to have some type of overhead cover (e.g., shrubs or overhangs) so that the tub is not easily flooded in the event of rain. Locate traps where they can be visited daily. If after several visits the trap does not appear productive, move it to an alternate location. The primary goal is to collect blood-fed female mosquitoes. Greater yield per trap is a greater priority than consistent sites that may have poor yields. Traps should be spaced more than 150 feet apart. If trapping at least two consecutive nights, set traps in the morning and, at the same time the next morning, collect the mosquitoes from the trap and switch the battery as preparation for the next trap night. This saves one trip back to the trap but may expose some early –trapped mosquitoes to the mid-day sun. If trapping only one night, set trap out in mid to late afternoon and pick up early the next morning. This avoids trapped material from being exposed to high-noon temperatures.

b. Setup. If using the trap for the first time, season the plastic tubs to rid them of insect repellent properties associated with chemical components found in some plastics, and can be accomplished by immersing the tubs in a muddy pond for several days. At least 2 days before trapping, mix, in a gallon jug or jerry can, at least 1 cup of rabbit pellet food or horse feed alfalfa cubes (available from pet or feed stores) per 1 gallon of aged water. Let the concentrate incubate in a protected (inaccessible to mosquitoes) location. At the trapping site put approximately 1/4 gallon of the premixed rabbit food concentrate to the tub and add aged water collected from a nearby natural source (e.g., pond or stream) or brought along with you, to bring the water level up to within 2 inches of the bottom edge of the fan housing tube. Position the trap





bracket securely over the center of the tub and slide the collection bag over the top of the trap tube. Be sure the bag is not askew and that it remains properly positioned, even if breezes pick up. Attach the battery to the terminal wires and make sure it is securely positioned, and test the trap making sure the fan turns freely and draws the air from below. Note: the fan will spin in the wrong direction if polarity is reversed. Assign the trap a number and note its location on a map or GPS mapping system.

c. Servicing. Visit the trap in the early AM so caught specimens do not cook. Carefully remove the trap bag containing mosquitoes and replace with an empty one. Tie off the open end, and if the bag is not easily hung in the servicing vehicle, place net props (e.g., tongue depressors) around the bag so that it does not collapse and the mosquitoes are not crushed. Note in a field notebook the general number of mosquitoes taken from each particular trap (to be verified later in the laboratory) and any other relevant information. The water can be used for multiple trap nights within a week (top it off with aged water to make up for evaporation), but dump the water, where it will evaporate, at the conclusion of one week of trapping and repeat procedure. If this is not done, eggs potentially laid could hatch thereby contributing to mosquito breeding in the vicinity. (Note: prior to emptying water, water surface can be examined for the presence of eggs and, if present, collected in specimen jars for rearing and species confirmation.

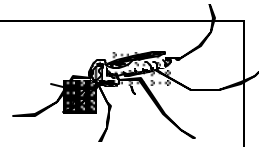
2. CDC Light Traps. The miniature light trap collects primarily host-seeking female mosquitoes. The addition of a carbon dioxide (CO₂) attractant (e.g. dry ice) substantially increases the number and species diversity of collected mosquitoes and is, therefore, essential.

a. Placement. Locate the trap in generally moist areas (near ponds, swamps, cattail marshes, creeks, wet fields, storm drains, culverts, or flooded woods), protected from the wind. Generally wood margins are good because of the diversity of habitat. In urban environments, place the traps near shrubs, refuse areas, cluttered back yards, cemeteries, and woods. Place in secure areas (not conspicuous) and where they will not be disturbed or vandalized and **make sure there are not competing light sources**. This can best be verified by visiting potential sites at night. Locate traps where they can be visited daily. If after several visits, the trap does not appear productive, move it to an alternate location. Traps should be spaced more than 150 feet apart. If trapping at least two consecutive nights, set the trap out in the morning, and, at the same time the next morning, pick-up trap material and switch battery in preparation for the next trap night. This saves one trip back to the trap but may expose some early-trapped mosquitoes to the mid-day sun. If trapping only one night, place trap out in mid to late afternoon and pick up early the next morning. This avoids trapped material from being exposed to high-noon temperatures.

b. Setup. Hang trap approximately 7 feet off the ground. Using a bent wire coat hanger between a tree limb and trap speeds up the set up and marks a consistent attachment point. Attach the battery to the terminal wires and make sure it is securely positioned, and test the trap making sure the fan turns freely and draws the air from below. If there are dipswitches controlling bulb and fan activation, make sure it is set to run during light and dark periods so that daytime biters (e.g., *Aedes albopictus*) will be captured. Note: the fan will spin in the wrong direction if polarity is reversed. Fill an insulated container holding 2-3 lbs. of commercial chunk dry ice and hang it directly above or right next to the trap. Assign the trap a number and note its location on a map or GPS mapping system.

c. Servicing. Visit the trap in the early morning so collected specimens do not cook.





Carefully remove the trap bag containing mosquitoes and replace with an empty one. Tie off the open end, and if the bag is not easily hung in the servicing vehicle, place net props (e.g., tongue depressors) around the bag so that it does not collapse and the mosquitoes are not crushed. Note in a field notebook the general number of mosquitoes taken from each particular trap (to be verified later in the laboratory) and any other relevant information.

3. Propane-Generated CO₂ Traps (e.g., Mosquito Magnet™) can collect large numbers of day or nighttime biting mosquitoes. Uses CO₂, heat, and a chemical lure (octonol) to capture a variety of mosquito species.

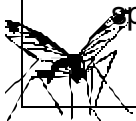
a. Placement. Locate the trap in a secure area where theft is not possible (these traps are expensive). Generally place in the same location as CDC light traps. Competing light sources are not a problem. Locate traps where they can be visited daily. Even though these traps run continuously, trap bags should be removed frequently because specimens dry out. If after several visits the trap does not appear productive, move it to an alternate location. Traps should be spaced more than 150 feet apart (refer to manufacturer's instructions).

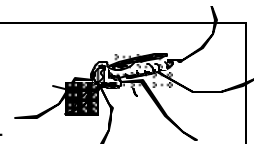
b. Setup. Indicate in field records if octonol (synthesized ox breath) lure is being used. Refer to trap directions for starting catalytic converter and safely running trap. Assign the trap a number and note its location on a map or GPS mapping system.

c. Servicing. Even though these traps run continuously, trap bags should be removed frequently (several times per week) because specimens will dry out and turn brittle. Carefully remove the trap bag containing mosquitoes and replace with an empty one. Tie off the open end, and if the bag and hang or prop up the bag in the servicing vehicle so that it does not collapse and the mosquitoes are not crushed. Note in a field notebook the general number of mosquitoes taken from each particular trap (to be verified later in the laboratory) and any other relevant information.

V. Specimen Processing

Do not expose mosquitoes to direct sunlight or extreme temperatures (e.g., enclosed vehicle). The mosquitoes must be fresh for viral testing. Captured mosquitoes can be transferred from the net bag to a more compact handling container (e.g., paper ice cream container with a rubberized aperture) using a battery-powered aspirator or HEPA-protected oral aspirator. Upon return to your processing facility, place the handling container or entire bag containing mosquitoes in a normal freezer (< 32 degrees F) for at least 30 minutes [ultra low freezer (-60 degrees F) – at least 15 minutes). Empty frozen mosquitoes on a chilled surface (chill table or enamel pan nested in an ice bath) examine with a hand lens or dissecting microscope. Mosquitoes should be handled carefully and promptly. As mosquitoes dry they become brittle and legs/body parts break off. It is advisable to have a fresh, clean sheet of paper underneath the contents of each trap. Also, forceps should be wiped clean between each filling each pooling tube. First remove all non-mosquitoes. Next separate all male mosquitoes and note the number in the data sheet remarks section (but do not pool). Either discard or save the males for your own reference purposes. After all non-mosquito and male specimens are removed, females are then placed in vials as a group (pool) of 1 to 25 specimens of the same genus or species, which were collected from the same trap. If expertise is available, sort to species. For West Nile virus, members of the genus *Culex* will be given priority for pooling. In particular the *Culex* species listed in Table 2 (below) that occur in the DC area. The urban container breeding and/or





non-native species *Aedes aegypti*, *Ae. albopictus* and *Ochlerotatus japonicus* merit examination as well and should be pooled if collected. For malaria, the *Anopheles* mosquitoes are the vectors and will be tested for this pathogen. If expertise in species identification is not available, sort to the best of your ability. Package and ship specimens IAW viral assay protocol.

Record all required data and make sure pool vials are clearly labeled. A list of mosquito species that have tested positive in the field is provided in Table 2. Species with an asterisk (*) do not normally occur in the District of Columbia.

**WNV-Positive Mosquito Species Reported,
United States, 1999-2002***

<i>Culex</i>	<i>Aedes</i>	<i>Ochlerotatus</i>	<i>Anopheles</i>	Other
<i>pipiens</i>	<i>albopictus</i>	<i>atlanticus</i>	<i>atropos*</i>	<i>Cs. melanura</i>
<i>quinq.</i>	<i>aegypti</i>	<i>atropalpus</i>	<i>barberi*</i>	<i>Cs. inornata</i>
<i>tarsalis</i>	<i>cinereus</i>	<i>canadensis</i>	<i>crucians</i>	<i>Cq. perturbans</i>
<i>restuans</i>	<i>vexans</i>	<i>cantator</i>	<i>puncitennis</i>	<i>Deinocerites cancer*</i>
<i>salinarius</i>		<i>japonicus</i>	<i>quadrimac.</i>	<i>Ps. columbiae</i>
<i>nigripalp.*</i>		<i>sollicitans</i>	<i>walkeri*</i>	<i>Ps. ciliata</i>
<i>erraticus</i>		<i>taeniorhynchus</i>		<i>Ps. ferox</i>
<i>territans</i>		<i>triseriatus</i>		<i>Orthopodomyia signifera</i>
		<i>trivittatus</i>		<i>Uranotaenia sapphirina</i>

* Reported as of 01/21/2003 – 36 species

Table 2.

VI. Trapping Frequency/Weekly Schedule/Timing

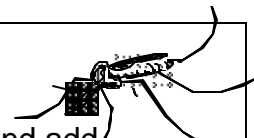
Ideally the traps at any trap site should be run **two nights per week**. It is best to trap at the beginning of the week; Monday, Tuesday (and/or Wednesday), to allow time for sorting and express mailing specimens before the weekend. This also allows for adjustments if there is some reason you can't trap on a given night (e.g., storms, holidays). Remember, the attractant concentrate needs to incubate for at least 2 days, so it should be prepared NLT **THURSDAY** of the prior week. If trapping at least two consecutive nights, set the trap in the morning, and then, at the same time the next morning, pick-up trap material and switch battery in preparation for the next trap night. This saves one trip back to the trap but may expose some early-trapped mosquitoes to the noon-day sun. If trapping only one night, set trap in mid to late afternoon and pick up early the next morning. This avoids trapped material from being exposed to high-noon temperatures.

1.

VII. Trapping Scheme

There will be approximately 40 sites being sampled throughout the season. A **site** can contain one or more traps (several of the military properties have more than 6 traps at a site). The traps at a particular site can be of different types. Individual trap locations should remain relatively constant. If a trap is unproductive after a few weeks, it should be moved to another location. If





this is done, **give the newly located trap a new identification code or number** (and add coordinates to your GPS mapping system). Ideally the trap sites near wooded wet areas (e.g., C&O Canal, Potomac River, Anacostia River, woodland ponds/streams) should have at least one gravid and one CDC light trap or a Mosquito Magnet. This is because the gravid trap will not normally catch *Anopheles* spp mosquitoes (Malaria vector) but the others will. Although not distributed on a strict grid pattern, the trap sites are spaced with care to provide uniform coverage. Considering the total number of traps used (remember, more than one trap can be at a site) there will be at least one trap per square mile within the District.

VIII. Sample Transport to Lab for Testing

Collected specimens shall be overnight shipped to the USACHPPM-North laboratory at Fort Meade, MD, or delivered to the lab, by arrangement, on a weekly basis. If samples are to be hand-delivered, please call the lab in advance (301 677-3932/3806/2607/or 3466) to get information on security requirements to enter Fort Meade. Samples should be in an insulated box or cooler with several chill packs (not dry ice).

IX. Data Reporting

Mosquito collectors should enter pooling data on a standard data sheet provided by the USACHPPM-North Laboratory. A data sheet must accompany all submitted specimens. Once specimens arrive in the USACHPPM-North Lab, they will be logged in, reviewed, and tested. A weekly report will be transmitted by e-mail to all collaborators.

X. Information Technology (IT)

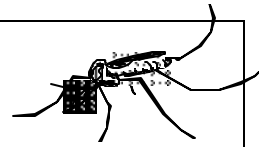
Data generated from this project will be used, by agreement, for geoinformation purposes including Remotely Sensed Epidemic Surveillance (RSEPS), and Epidemic Surveillance Database (ESDB) projects. This is research headed by Dr. James Wilson, Georgetown University Medical College.

XI. Personal Safety

Personal safety should be a priority throughout the project duration. It is best to travel in teams of 2 to trap sites. A mobile phone for field personnel is recommended. Do not transport dry ice in a closed vehicle. Do not handle dry ice without gloves. Do not break dry ice blocks without wearing safety glasses. Wearing light colored, long sleeve shirts and long pants is advisable to reduce the potential of being bitten by daytime mosquito biters and to detect and remove ticks on clothing. The use of skin repellent containing at least 30% concentration of DEET and a clothing repellent containing permethrin is encouraged if trapping in an area where daytime biting mosquito species (e.g., *Aedes albopictus*) and/or ticks occur. However measures should be taken to not contaminate traps and equipment with repellent. This is best done by applying repellent while still at the office, and then thoroughly washing hands with soap and water prior to handling traps. Field staff should have personal protective equipment, gloves and a N-95 dust mask at a minimum.



Enclosure 1



CONTACTS

National Park Service

Jil M. Swearingen
Center for Urban Ecology
4598 MacArthur Blvd, NW
Washington DC 20007
202-342-1443 x218
jil_swearingen@nps.gov

Rock Creek Park
Ken Ferebee
3545 Williamsburg Ln, NW
Washington, DC 20008
202-895-6221

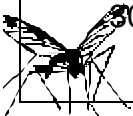
East
Jamese Hemsley
1900 Anacostia Drive, SE
Washington DC 20020
202-690-5164
Jamese_Hemsley@nps.gov

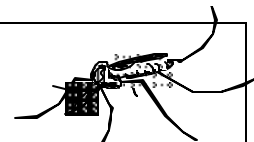
Li Wong
NACE
Li_Wong@nps.gov

Central
Gopaul Noojibail
900 Ohio Drive, SW
Washington, DC 20024
202-485-9685
gopaul_noojibail@nps.gov

Ravi Kumar
NACC
202-485-9698
ravi_kumar@nps.gov

US Army Center for Health Promotion and Preventive Medicine-North, ESD
Ben Pagac
Building 44411 Llewellyn Ave
Fort Meade, MD 20755-5225
301-677-3932





ben.pagac@na.amedd.army.mil

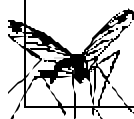
District of Columbia Department of Health

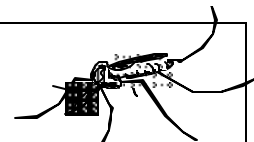
Jamie Hinson
51 N Street, NE
Washington, DC 20002
202-535-2325
jhinson@dchealth.com

Peggy Keller
51 N Street, NE
Washington, DC 20002
202-535-2322
peggy.keller@dc.gov

Alpha A. Diallo
DC Public Health Lab
300 Indiana Ave, NW
Washington, DC 20001
202-727-8956
adiallo@dchealth.com




Hong-Yuan Kan
DC Public Health Lab
300 Indiana Ave, NW
Washington, DC 20001
202-997-3109
hkan@dchealth.com





Enclosure 2

SELECTED, COMMERCIALY-AVAILABLE MOSQUITO SURVEILLANCE TRAPS*

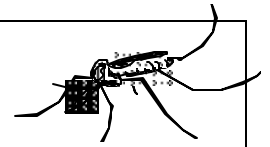
TRAP & DESCRIPTION	PHOTO	ADVANTAGES	DISADVANTAGES
<p>GRAVID TRAP</p> <p>(AKA CDC Gravid trap, Reiter Trap) Plastic basin (14"x10"x7") holding synthetic sewage (e.g., fermented rabbit/horse chow in water), updraft fan in cross-bracketed 3.25"D PVC pipe, net collection bag at top, powered by 6VDC sealed rechargeable battery. Variation includes a tool-box fan/collection canister housing.</p>		<p>Best use: <i>Culex</i> collection for pathogen testing, population density, breeding source determination</p> <p>Selective for large numbers of Gravid (and likely fed) <i>Culex</i> spp, esp. <i>pipiens</i>.</p> <p>Will catch smaller numbers of <i>Ae. albopictus</i> and <i>Och. japonicus</i></p> <p>Low cost, low tech</p> <p>Few non-targets</p>	<p>Limited species caught</p> <p>Specimens go through fan (not so in the tool box model)</p> <p>If neglected can be breeding source</p> <p>Need advance preparation of synthetic sewage attractant</p> <p>Stinks</p>
<p>CDC LIGHT TRAP W/CO₂</p> <p>(AKA SSAM Trap, CDC Miniature Light Trap, ABC Trap, New Standard Miniature Light Trap)</p> <p>Tubular acrylic or PVC trap body approx. 3.5"DX5" tall, approx. 14"D removable lid, down-draft fan below screen and 4W minibulb, net bag or vented collection canister hangs below, powered by 6VDC sealed rechargeable or 4 D-cell batteries, needs insulated canister for dry ice.</p>		<p>Best use: species composition, population density, pathogen testing, breeding source determination</p> <p>Good for <i>Culex</i>, <i>Culisita</i>, <i>Coquillettidia</i>, <i>Uranotaenia</i>, <i>Anopheles</i></p> <p>Diverse mosquito trap catch</p> <p>Compact, light-weight</p> <p>Spare parts readily available</p>	<p>Specimens go through fan</p> <p>Collects non-targets</p> <p>Need CO₂ source (dry ice)</p> <p>Specimens may not have fed (limits value for pathogen testing)</p>
<p>CO₂ GENERATING PROPANE TRAP</p> <p>(AKA Mosquito Magnet, others)</p> <p>Uses counterflow geometry (CFG) collection principle, CO₂ produced catalytically by 20 lb propane tank (some models need 110AC current), maximum dimensions 28"X20"X27.5," collection bag in internal housing, units movable on wheels.</p>		<p>Best use: species composition, pathogen testing, population density</p> <p>Diverse mosquito trap catch, esp. with Octenol lure</p> <p>Specimens don't go through fan</p> <p>Large number of certain species can be caught</p> <p>Can run long time without tending</p> <p>Few non-targets (mainly spiders)</p> <p>No need for dry ice</p>	<p>Relatively pricey, bulky</p> <p>Requires compressed gas</p> <p>Some require AC outlet</p> <p>Some alternate manufacturer's trap versions perform poorly</p> <p>Specimens can dry-out if not removed promptly</p> <p>Specimens may not have fed (limits value for pathogen testing)</p>

* The first two traps listed, Gravid Trap and CDC Trap w/CO₂, are time-tested and proven to have the most value in WNV mosquito and viral surveillance, to date. Other traps exist (e.g., CFG Trap, Wilton Trap) but are either not commercially available or little is known about their performance. Specific products or brands mentioned do not imply endorsement by the US Government.

Prepared by B. Pagac, USACHPPM-North, Apr 1 2003 (ben.pagac@na.amedd.army.mil)

APPENDIX I





WEST NILE VIRUS & MALARIA UPDATE YEAR END REPORT December 31, 2002

WEST NILE VIRUS

West Nile virus is a new disease, labeled as an emerging infectious disease, and only appeared in the eastern United States in 1999. As part of the West Nile virus tracking system, the Department of Health (DOH) conducts human, avian, or bird, mammal and mosquito surveillance and keeps extensive database and spreadsheet records detailing the surveillance. In the last year, there have been only thirty-one positive¹ cases of West Nile virus in a large part due to the comprehensive outreach and education program and targeted larvaciding.

West Nile virus (WNV), a mosquito-borne flavivirus introduced recently to North America, is a human, equine, and avian neuropathogen (1). The majority of human infections with WNV are mosquito-borne; however, laboratory-acquired infections with WNV and other arboviruses also occur. There were two recent cases of WNV infection in laboratory workers without other known risk factors who acquired infection through percutaneous inoculation. Laboratory workers handling fluids or tissues known or suspected to be WNV-infected should minimize their risk for exposure and should report injuries and illnesses of suspected occupational origin to their supervisor.

In 2002, the reported numbers of human and animal infections increased, and the geographic range of WNV activity expanded substantially. These data underscore the need for intensive surveillance to detect and quantify WNV activity in areas where humans are at risk, public education to teach persons how to prevent mosquito bites, and sustained and integrated mosquito-control activities.

In 2002, newly recognized mechanisms of person-to-person WNV transmission were described by health officials including transmission from mother to infant through breast milk. Health officials believe that WNV can be transmitted via organ transplant and blood transfusion. However, the risks of contracting WNV by these routes are very small as compared with other risks associated with these treatments. Evidence is also mounting that WNV may be transmitted to babies in breast milk. WNV genetic material was transiently present in the breast milk of a woman with WNV infection and measurable WNV-specific IgM was detected in her baby. Despite this finding, the risk of WNV illness in young children is very low. Only 4 infants in the US are known to have become infected with WNV during the 4 years that the virus has been reported in the US. There is also increasing evidence of intrauterine West Nile virus infection. WNV has not been previously associated with intrauterine infection or adverse birth outcomes. There was a case of transplacental WNV transmission. Pregnant women should take precautions to reduce their risk for WNV or other arboviral infection and should undergo diagnostic testing when clinically appropriate.

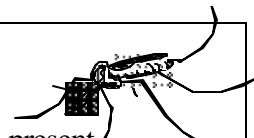
DOH established a West Nile virus Call Center number at 202-535-2323 a health care and question line at 202-442-9196 and extensive web site information at <http://www.dchealth.dc.gov>. In addition, DOH added Health Alerts to the web site, as needed, such as the alert regarding the discovery of West Nile Virus in four organ transplant recipients who had received infected blood in Florida.

The chances of actually developing the symptoms of West Nile virus from the bite of a mosquito is very

¹ CDC changed definition of “positive” case. Cases may be reported “positive” without confirmatory tests such as neutralization or PCR. Case categories: “positive”; “probable” “pending” and “negative”.

CDC combines the results of positive and probable into one category





remote. Less than one percent of mosquitoes test positive for the virus in areas where the virus is present. And, if bitten by that mosquito, a person has less than a one percent chance that he or she will develop symptoms. Generally, the symptoms are very mild and may not even be noticed. Only in very rare cases will the symptoms be severe. Immune compromised individuals are the population most at risk. Anyone who suspects that they have the virus should contact their doctor immediately.

DOH has trained staff to assist residents with identifying and eliminating potential mosquito breeding sites and to speak at neighborhood meetings and health fairs. The fundamental components of the West Nile virus plan are prevention and protection.

The West Nile virus program is a fluid program that is continually evaluated and altered to protect the public. DOH ceased dead bird surveillance in August and increased mosquito surveillance to increase assessment of human risk in the District. It is paramount to track positive mosquito pools and species of mosquitoes testing positive. As a result of this increased mosquito surveillance, new species of mosquitoes have been identified as positive in the District. Two pools of *Aedes albapictus* from Fort McNair and two pools of *Aedes albapictus* and one pool of *Aedes aegypti* tested positive at US Soldier's Home tested positive for West Nile virus. These species are closely associated with humans, are day-time human biters, breed in tires, flower pots and bird baths and cause increased concern. The *Aedes albapictus* is very aggressive and can be hidden in shady, grassy or wooded areas. In addition, *Aedes aegypti* is considered a tropical mosquito species and not thought to inhabit this region. Previously only *Culex pipiens* have tested positive in the District. *Culex pipiens* are primarily avian biters and bite at dusk and dawn. As a result of the new species testing positive, DOH has added precautions of protecting residents against mosquito bites at all times during the day and not just dusk and dawn. CDC has reiterated that larval control is the most effective control, per Harry Savage on August 3. DOH has ceased mosquito trapping and collection with the onset of cooler nights. At temperatures below 50 degrees, mosquitoes can become dormant or die. To become active again, the temperatures must increase to approximately 60 degrees. The numbers of mosquitoes collected have significantly diminished.

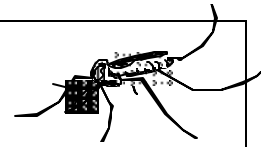
A meeting was held with the US Army to coordinate larval control and mosquito surveillance at Fort McNair and the US Soldier's Home. Numerous mosquito pools were found at the Rock Creek Church Cemetery. DOH is working closely with the staff at the cemetery to reduce the mosquito breeding sites, eliminate the mosquito larva, inform nearby residents of precautions and distribute information. DOH staff will continue to assist the cemetery staff with larval control. In addition, DOH staff has identified all the cemeteries in the District and is inspecting for potential mosquito breeding sites and discussing methods of prevention. DOH will prepare an abstract and paper documenting the investigation and findings.

Ecological Impact of West Nile Virus from PRO-MED

 First there was the silence of the crows. Then the horses fell ill – more than 14 000 this past summer [2002] alone -- along with squirrels, chipmunks, and mountain goats. Even mighty raptors -- eagles, hawks, and great horned owls -- dropped from the sky. Now scientists are beginning to take stock of West Nile virus's North American invasion, and they are taken aback by the scale and sweep of its ecological impact. While the Human toll dominated the nation's attention this year [2002] -- the virus killed at least 241 people and infected thousands more -- the effects on wildlife were far worse.

The virus swept westward with alarming rapidity, appearing in almost every state in the nation -- an astonishing expansion for a [virus] that had never been seen in the Western Hemisphere until 3 years ago. Equally unexpected, nearly 200 species of birds, reptiles and mammals fell ill as a result of West Nile virus infection this year [2002], including rabbits and reindeer, pelicans and bats, even a few dogs and cats. The virus also slammed dozens of exotic species in about 100 U.S. zoos, killing cockatiels, emus,





seals, flamingos, and penguins. Florida alligator farms lost more than 200 of the reptiles.

The epidemic has so resembled a bioterrorism attack that the nation's zoos -- which spearheaded an effort to track the spread of West Nile virus and mount emergency vaccinations -- could end up with potentially important roles in the emerging arena of homeland security. Just last month, in a hastily organized effort reminiscent of President Bush's smallpox plan, officials at 2 California zoos inoculated their endangered California condors with an experimental vaccine that may be the animals' only hope for survival.

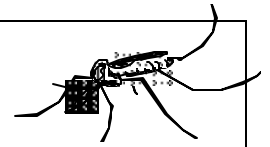
West Nile virus infection is not fatal in all animals, and over time some species are expected to adapt. But even partial [declines] in key populations could have serious consequences. Rodent populations could blossom in areas where raptors are dying, and pest birds such as house sparrows may be increasing where crows are absent. The worst is still ahead, scientists say. Come spring, West Nile virus is expected to complete its push to the West Coast, home to endangered whooping cranes and economically important flocks of domestic geese. The virus is also poised to leap to the subtropics, where rare birds and other vulnerable creatures already face formidable threats to their survival. "Once it gets to the tropics, where you've got species already stressed by habitat destruction and you have the potential for year-round mosquito transmission, some of those populations are not going to make it," said Peter Marra, an animal ecologist and West Nile specialist at the Smithsonian Environmental Research Center in Edgewater, Maryland. "I'm concerned about parrots and hummingbird populations. There's not that many of them left."

West Nile made its North American debut in the fall of 1999, discovered in a dead New York crow. Scientists don't know how the virus reached U.S. shores -- perhaps it hid inside a single infected bird imported from the Middle East. But one thing is certain, said Stephen Ostroff of the Centers for Disease Control and Prevention (CDC) in Atlanta: "There's no way that West Nile virus is going to go away." The virus does not appear to be any more virulent in Americans than in other people around the world, and scientists suspect that the US population will gradually gain immunity through low-level exposures. That is the situation today in countries where the virus has been active for many years. Most people in those countries have antibodies to the virus from early childhood, and serious complications or death from West Nile virus infection are rare.

But in North American wildlife, the virus has proven to be unusually aggressive and capable of infecting a surprisingly diverse array of animals. "Most viruses tend to be rather host-specific, but that's not the case with what we were seeing," said Tracey McNamara, chief of pathology for the Wildlife Conservation Society, which has its headquarters at the Bronx Zoo [NY], where the first infected crow was found. It is still unclear how many of the 200 or so species struck by West Nile virus infection have suffered significant population declines. But a consensus is emerging that among birds, in particular, far more species are being hurt than scientists had predicted -- not just the crows, ravens, and jays that were known to be especially vulnerable. "There's been a huge die-off of raptors," said Robert G. McLean of the Agriculture Department's National Wildlife Research Center in Fort Collins, Colorado.

The experience of the University of Minnesota's Raptor Center, which rehabilitates sick and injured raptors, was typical. "In mid-August [2002], we had our first case: a great horned owl," said spokeswoman Sue Kirchoff. "In September and October, we were just inundated." The center took in 70 ailing birds of prey, including great horned owls, eagles, and red-tailed hawks. Officials there presume that if that many were found and brought to the center, countless others died in the wild, with potentially far-ranging repercussions. "From a biological standpoint, raptors take longer to mature and have fewer offspring" than smaller birds, said Patti Bright of the American Bird Conservancy. "Whether they'll be able to rebound, well, we just don't know." It will take a while longer, Bright and others said, before it is known whether rodent populations are taking





advantage of West Nile virus's impact on birds of prey.

The evidence for declines in songbirds and other small avian species is less direct, in part because they are so much less visible. "We're simply not going to know for a while [about] the smaller birds, because we're not going to find the bodies," said David S. Wilcove, a professor of ecology at Princeton University who has been studying West Nile virus disease. Still, researchers this year have found more than 140 bird species sickened or dead [as a result of West Nile virus infection], including chickadees, doves, grackles, gulls, herons, kingfishers, pelicans, sparrows, swans, turkeys, warblers, woodpeckers, and wrens. And while most of those species will probably pull through as resistant individuals mate and pass their antiviral vigor to their offspring, ornithologists expect that others will not be so lucky.

They point to the experience of Hawaii, where the arrival of an avian poxvirus in the 1890s and avian malaria in the 1930s drove dozens of species to extinction or close to it. "Those [microbes] just hammered Hawaiian forest birds," Wilcove said. "That illustrates the potential for harm when a disease organism encounters a naive population."

Several unexpected aspects of the epidemic have fed Wilcove's and others' pessimism. One surprise is that the virus can be transmitted directly from bird to bird, not only via mosquitoes. Raptors can acquire the virus by eating infected prey, and some birds can apparently spread the virus in their droppings. There's also evidence that some birds can pass the virus directly to their chicks while they're still inside the egg.

Another surprise is that West Nile virus can be transmitted directly from adult mosquitoes to their eggs, so that newly hatched aquatic larvae are born infected. That could make insecticides, which typically kill only adults, less effective.

Scientists have also been surprised to learn that the virus can persevere through the winter, even in many Northern states. Researchers are not sure which animals are serving as the virus's winter host, but the phenomenon is allowing the disease to spread year round and is giving the summer viral eruption an earlier start each year.

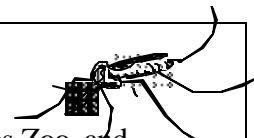
Yet another surprise is the number of mosquito species -- 36 at last count -- that carry the virus. "This is a virus that's never seen a mosquito it doesn't like," said Ostroff of the CDC. "That's not typical for most pathogenic viruses."

If that weren't enough, some researchers suspect that West Nile virus might be capable of mixing its genetic material with that of a closely related virus, such as the one that causes St. Louis encephalitis, if both viruses were to infect a single animal. Other viruses have periodically produced such hybrids, creating in the process an entirely new and dangerous virus.

"This virus is going to spread to the West Coast big time by next year, no question," USDA's McLean said. "Each habitat is different, but California seems to be an area that has all the factors you need for a major spread. I think they're going to be facing major problems in humans, horses, birds, and other animals. I just don't see any barriers."

Such predictions have a particularly ominous ring for researchers on the California Condor Recovery Team, who have been struggling to bring the ungainly bird back from the brink of extinction. They knew that this summer's experimental inoculations of zoo birds with the horse vaccine -- the only West Nile vaccine approved for marketing in this country -- had been disappointing, with many birds failing to develop protective antibodies. So in November 2002, veterinarians at the Los Angeles and San Diego zoos injected into the thighs of their condors an experimental vaccine to try to confer immunity before the spring egg-laying season.





"We had absolutely zero negative effects," said Cynthia Stringfield, veterinarian of the Los Angeles Zoo, and preliminary blood tests suggested that the birds "had a fantastic immune response." If further tests show that the vaccine works, the team will try to vaccinate all 128 captive California condors and the approximately 70 birds now living in the wild.

Zoos may take the lead in the fight against West Nile virus in more ways than that. More than 100 U.S. zoos and wildlife parks have joined a newly created information-sharing network, which has its headquarters at Chicago's Lincoln Park Zoo, to track West Nile virus infection and other emerging infections in exotic animals. Some scientists suspect the network may even prove useful in the cause of homeland security, by providing a sensitive nationwide "sentinel system" for detecting the first hints of a bioterrorism attack. After all, zoo officials noted, New York crows were dying in droves in the fall of 1999, but no one figured out that West Nile virus was the culprit, or that the deaths were related to a spate of unusual human illnesses, until a crow died on the grounds of the Bronx Zoo. Zoos, it turns out, take every death seriously -- even those of non-zoo animals on zoo grounds -- because any death can mark the start of a devastating epidemic. "Every dead animal is picked up and immediately necropsied," said McNamara, the Bronx Zoo pathologist. "That's not true in Central Park." When the Bronx crow was found to be teeming with West Nile virus, it was the first evidence that the Old World virus had leaped the Atlantic -- and the beginning of the recognition that an epidemic was already under way in humans. McNamara said a zoo vet could be the first to know whether terrorists have released a human or animal pathogen. The consortium is seeking federal funding.

Still, some scientists fear that the nation may soon become less able to prevent outbreaks such as that of West Nile virus -- whether accidental or intentional. They said the U.S. system for screening incoming animal, plant and microbial life -- a patchwork of more than 20 agencies -- has long been undervalued and underfunded. Now the largest component, the Agriculture Department's Animal and Plant Health Inspection Service, is to become part of the new Homeland Security Department. That's leading many ecologists to fear that it will narrow its focus to classical bioterrorism pathogens such as anthrax, leaving the nation more vulnerable to [agents] such as West Nile virus. "I have a feeling that beetles in imported wood packaging are not going to be at the top of the list," said Faith T. Campbell, director of the invasive species program at the American Lands Alliance in Washington. Yet the recent U.S. invasion by Asian longhorned beetles, which arrived in wood packaging from China, is expected to cost the nation as much as \$669 billion in insect-destroyed trees in urban areas alone in coming decades, Campbell said.

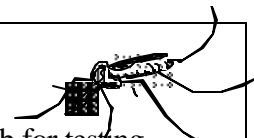
Whether West Nile virus ends up decimating many animal populations or settling in as a mere high-grade ecological disturbance, the epidemic should be a wake-up call to beef up the nation's surveillance and quarantine network, said Princeton's Wilcove.

[Byline: Rick Weiss]

AVIAN SURVEILLANCE

- ?? DOH established a West Nile virus Call Center at 202-535-2323 that received approximately 10-120 calls per day from the public requesting advice and assistance.
- ?? Effective August 9, DOH ceased dead bird collection because the rate of positivity was exceptionally high and West Nile virus in birds should be considered endemic in the District. Residents were encouraged to dispose of the birds themselves or call DPW at 202-727-1000 for removal. Specific details instructions for disposal were available on the Department of Health's website http://www.dchealth.dc.gov/information/fact_sheets/westnilevirus.shtm and the Call Center at (202) 535-2323.





- ?? Crows, blue jays and hawks that are viable specimens were sent to the Maryland State lab for testing.
- ?? In 2000, the first positive bird was collected on September 28, with a total of 5 positive birds for the year. In 2001, the first positive bird was collected on July 10, with a total of 360 positive birds for the year. In 2001, 914 birds were collected, 444 were tested and 360 tested positive, with a percent of positivity of 81.08%.
- ?? In 2002 year to date, 905 birds have been collected, 340 have been processed for testing, 31 tested negative, 134 disposed of and 175 birds have tested positive, with a rate of positivity of 84.95%.
- ?? In 2001, the vast majority of positive birds were located in the Ward 5 Brookland area.
- ?? In 2002, the epicenter has changed and is located along the Connecticut Ave corridor located near the 3000 block. The concentration of positive dead birds falls primarily in a circle emanating from that central point.
- ?? The positive bird breakdown by ward is Ward 1-9, Ward 2- 8, Ward 3- 123, Ward 4-12, Ward 5- 2, Ward 6- 7, Ward 7- 13, and Ward 8-1.

HUMAN SURVEILLANCE

- ?? DOH staff distributed West Nile virus Physician Alerts by blast fax to health care providers and hospitals detailing the West Nile virus reporting and specimen submission criteria.
- ?? DOH staff contacted hospital infectious disease practitioners weekly to determine if any patients meet the testing and reporting criteria.
- ?? DOH staff prepared, processed, transported and submitted human specimens for testing.
- ?? Thirty-one cases of human infection have been reported positive¹ in the District. There have been two human deaths associated with WNV. The first human death in D.C. associated with WNV occurred on September 9, 2002 in a man receiving treatment for leukemia. The second human death associated with WNV occurred on October 1, 2002 in a woman in a high risk category with a compromised immune system.
- ?? There were over 20 samples submitted in 2001 and all samples tested negative.
- ?? In 2002, 80 samples from District residents have been submitted for testing: thirty-one samples were positive, three samples were probable, 28 samples are negative, and 18 samples are pending.

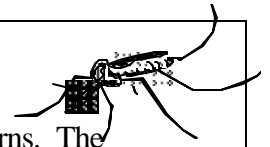
MOSQUITO SURVEILLANCE

- ?? DOH staff set gravid traps, targeting pregnant mosquitoes, throughout the District in all wards in response to reports of positive birds and mosquitoes.
- ?? DOH staff set traps on Mondays and Wednesdays and collected, sorted, prepared for testing and transport on Tuesdays and Thursdays.
- ?? The US Army tested the mosquitoes and assisted the District with trap setting in 2001.
- ?? In 2001, DOH and the Army partners such as, Bolling, Fort McNair, Walter Reed submitted 870 pools for testing. Three pools tested positive.
- ?? In 2002, DOH Fort McNair, Walter Reed, Soldier's Home, Bolling, Rock Creek Park and the National Zoo submitted pools of mosquitoes. There are 84 positive pools, 43 from Fort McNair, 17 from Rock Creek Park, 23 from Soldier's Home and one from the 3100 block of Connecticut Ave, NW.

MOSQUITO CONTROL

¹ CDC changed definition of "positive" case. Cases may be reported "positive" without confirmatory tests such as neutralization or PCR. Case categories: "positive"; "probable" "pending" and "negative".





- ?? DOH staff larvacided in response to positive birds and mosquitoes and community concerns. The larvacide, a biological product that kills mosquitoes in the larval stage, is placed in catch basins and in areas of standing or stagnant water.
- ?? In April of 2002, DOH staff began larvaciding in the District at locations of positive birds and mosquitoes from 2001 in an eight square block area at each address.
- ?? The larvacide application was repeated approximately every 5-6 weeks.
- ?? Larvaciding has been determined to be more effective over a period of time than adultaciding. Mosquito catches were significantly reduced in areas where larvaciding efforts were conducted.
- ?? In 2001, DOH staff larvacided 3496 catch basins. In 2002, DOH staff larvacided over 10,835 catch basins to date.
- ?? The District does not expect to spray for mosquitoes because of low efficacy; kills off non-target species and potential health risks to a high population of persons affected with respiratory problems and compromised immune systems.
- ?? Killing mosquito larva and eliminating mosquito-breeding sites appear to be the most effective measure in reducing the numbers of mosquitoes.
- ?? Research shows that larvaciding is far more effective in reducing mosquitoes than spraying over time.

MAMMAL SURVEILLANCE

- ?? DOH staff has distributed information to vets, pet shops, and horse stable managers detailing reporting and specimen submission criteria and protocol.
- ?? No mammals have tested positive in the last three years.

OUTREACH AND EDUCATION

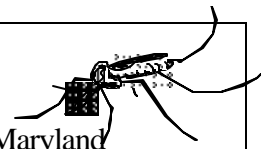
- ?? DOH has prepared an informational brochure emphasizing prevention and protection. The brochure has been translated into Spanish, Chinese, Korean and Vietnamese.
- ?? DOH provided information on the DOH website to provide residents with information regarding West Nile virus including Controlling Mosquitoes, CDC questions and answers, recent press releases and the brochures in multiple languages.
- ?? DOH developed an informational script for use in community presentations.
- ?? DOH staff distributed brochures door- to- door to 46,987 residences, and spoken to residents about prevention and protection techniques.
- ?? Brochures were distributed in response to requests by private citizens, day care centers, senior citizen homes, residential housing, hospitals, libraries, schools, parks and recreation centers, churches, other District agencies, NSC Coordinators and all ANC Commissioners. To date, DOH distributed approximately 201,250 brochures in bulk this year.
- ?? DOH staff attended approximately 68 community and core team meetings.
- ?? DOH spokespersons have completed approximately 48 interviews with local and national media to discuss West Nile virus, explained health precautions and promoted prevention and protection techniques. Spokespersons also conducted seven live interviews on national radio, answering listener's call-in questions.

MALARIA

MALARIA SURVEILLANCE

Two people have tested positive for malaria in Loudoun County in the Commonwealth of Virginia in September 2002. In response, neighboring jurisdictions tested mosquitoes and reported that 2 mosquito pools in Loudon County, Virginia; one pool in Arlington County, Virginia; two pools on Seldin Island in





Montgomery County, Maryland; and one pool on Van Deventer Island in Montgomery County, Maryland have tested positive for malaria. Only the *Anopheles quadrimaculatus* mosquito carries malaria in the metropolitan Washington area. The DOH mosquito surveillance team has been setting traps to collect and test mosquitoes for malaria in addition to the West Nile virus testing. To date, DOH and US Army staffs have collected only 6 *Anopheles* mosquitoes (5 pools) out of over 9,300 mosquitoes. As of this date, all the collected *Anopheles* mosquitoes have tested negative for malaria.

CDC MMWR Editorial Notes:

The 2002 WNV epidemic in the United States was the largest arboviral meningoencephalitis epidemic documented in the western hemisphere and the largest reported WNME epidemic. Epizootic and epidemic activity was most intense in the central United States, especially the Great Lakes region, and extended to the west coast. One human case reported in a Los Angeles County, California, resident with no known travel history and with no other WNV activity found statewide) and a report of a WNV-infected horse in Island County, Washington, indicate the complete transcontinental movement of WNV within 3 years. In 2002, Canadian health authorities also documented WNV activity in 5 provinces (Manitoba, Nova Scotia, Ontario, Quebec, and Saskatchewan). The 2002 WNV epidemic included the first documented cases of person-to-person WNV transmission through organ transplantation, blood and blood product transfusion, and possibly breast-feeding. Also in 2002, intrauterine infection was reported, and a poliomyelitis-like syndrome was first recognized in the United States among some WNME patients with acute flaccid paralysis (AFP).

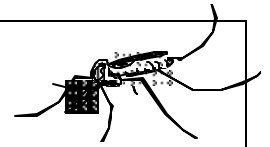
Nationally, the epidemic peak of human WNV-associated illness during 2002 occurred in late August; human cases in southern states preceded those in northern states by approximately 1 month. In 2002, human cases also were reported from the New York City metropolitan area for the fourth consecutive year. This prolonged and continued widespread transmission to humans, including in areas of previous epidemic activity, underscores the importance of maintaining human surveillance programs from early June through November and the need to consider WNV disease in the differential diagnosis of encephalitis, meningitis, AFP, and nonspecific febrile illness before and after the late summer months in which arboviral outbreaks traditionally occur.

The 2002 WNV epidemic is similar to the 1975 St. Louis encephalitis (SLE) epidemic, which produced approximately 2100 reported human illnesses and 170 fatalities (case-fatality ratio: 8 percent), primarily in the Mississippi and Ohio River basins. WNV and SLE virus are closely related; both are transmitted primarily by Culex mosquitoes and amplified in birds. However, SLE virus is not an avian or equine pathogen.

In 2002, the proportion of human cases reported with WNF was greater than in previous years. This change probably reflects increased testing and diagnosis of WNV infection in persons with milder illness. WNF patients tend to be younger than patients with WNME. The somewhat lower median age among persons with WNME reported in 2002 compared with those reported during 1999 to 2001 (59 years versus 66 years) could reflect the incorrect classification of some WNF cases as WNME cases. The median age among persons with fatal WNME reported in 2002 was similar to that in previous years. Although older persons are at higher risk for WNME and death, persons of any age might develop severe neurologic disease.

Bird- and horse-based surveillance are important tools for monitoring the geographic spread of WNV and for signaling WNV activity in an area before the recognition of human illnesses. The number of counties reporting WNV-infected dead birds in 2002 was 5 times greater than that in 2001, and the number of reported WNV-infected dead birds doubled. In 2002, crows, blue jays, and other members of the family Corvidae accounted for 90 percent of WNV-infected birds, and crows had the highest rate of





WNV infection. State and local health department surveillance programs should continue to emphasize the collection and testing of dead corvids. Because non-corvid bird species were the first indicator of WNV activity in 144 (6 percent) counties, surveillance programs should include these species when possible.

From 2001 to 2002, equine cases reported to ArboNET increased 12-fold, and equine transmission occurred over a longer season and in 9 new states (1). In 2002, the geographic and temporal distribution of equine cases closely paralleled the human epidemic in the midwestern and north-central states, suggesting that horses, although unlikely to contribute to the transmission cycle for WNV, might be useful indicators of increased human risk in those areas.

The 3 *Culex* species that produced the most WNV-positive pools during 2002, *Cx. pipiens*, *Cx. quinquefasciatus*, and *Cx. restuans*, are among the most important WNV epizootic or epidemic vectors in the United States. During 1999 to 2002, an additional 33 mosquito species also were found infected with WNV. These include *Cx. nigripalpus*, the principal epidemic vector of SLE in Florida, and *Cx. tarsalis*, an important vector of SLE and western equine encephalitis in the western states. Although other species (e.g., *Ochlerotatus triseriatus*, *Ae. albopictus*, *Ae. aegypti*) might contribute to human WNV transmission, control of *Culex* mosquitoes continues to be the most important strategy to reduce the risk for WNV transmission to humans.

The ArboNET data summarized in this report probably underestimate the actual geographic distribution and intensity of WNV virus transmission in the United States for at least 3 reasons. First, although dead bird surveillance is important in monitoring WNV activity, only 27 percent of reported dead birds in 2002 were submitted for testing, compared with 50 percent in 2001. Many state and local health departments were overwhelmed by the large numbers of samples submitted for WNV testing and discontinued dead bird testing during the transmission season. Second, because data provided by the 54 ArboNET coordinators are derived primarily from local health unit surveillance efforts, which vary according to local capacity and priorities, some animal and human surveillance data might not yet be reported and confirmed. Finally, states might vary in their interpretation of and adherence to the national surveillance case definition of arboviral encephalitis/meningitis, and no standard national case definition for WNF exists.

The epidemic of 2002 underscores the continued need for intensive ecologic surveillance to detect early-season WNV activity. To decrease the risk for human WNV infection, the coordinated and phased public health response to detection of WNV activity in an area should include intensified mosquito-control activities that reduce the avian-mosquito amplification cycle. Prevention activities should continue to include 1) public education programs urging residential source reduction and personal protective measures to reduce mosquito exposure; 2) development of long-term, community-level, integrated mosquito surveillance and control programs; and 3) high-priority emphasis on the control of *Culex* mosquitoes, especially in urban and suburban areas.

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