

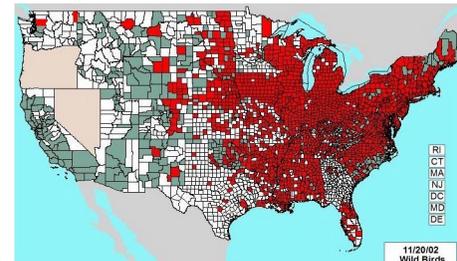
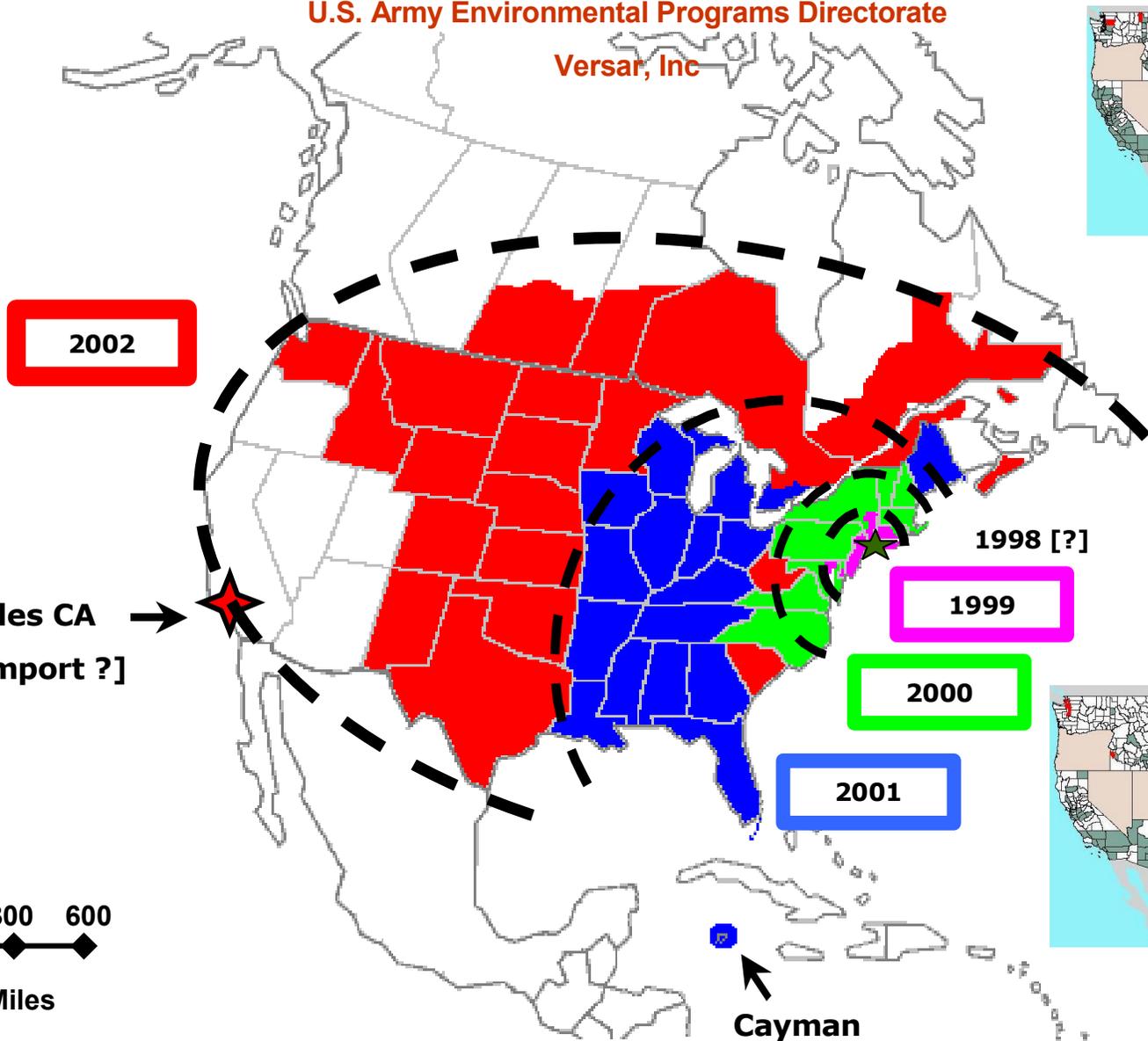
WEST NILE VIRUS IN NORTH AMERICA

[From CDC and Health Canada data as of 26 Nov 2002]

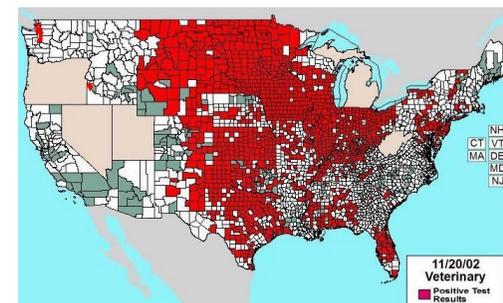
Joseph P. Dudley

U.S. Army Environmental Programs Directorate

Versar, Inc



**BIRDS
2002**



**VETERINARY
2002**

WEST NILE VIRUS OVERVIEW

Joseph P. Dudley, Ph.D.

Headquarters U.S. Army / Office of the Director of Environmental Programs
Versar, Inc.

<joseph.dudley@hqda.army.mil>

West Nile Virus (WNV) is a mosquito-transmitted arbovirus that is closely related to viruses that cause *St. Louis encephalitis* (formerly the most common mosquito-borne encephalitis in the United States) and *Japanese encephalitis*. WNV is a disease of birds that is transmitted to humans and other species of mammals by infected mosquitoes. West Nile Virus was first detected in Uganda in 1937, and has since been reported from various regions of Africa, Asia, Europe, and the Middle East. Prior to its recent appearance in the United States, WNV was known only from Africa and Eurasia (Middle East, southern central Asia, southern and eastern Europe, Russia, India, Indonesia).

Most humans infected with WNV exhibit no symptoms or only mild illness. In some instances, however, human WNV infections result in acute and severe febrile illness, encephalitis (inflammation of the brain), and/or meningitis (inflammation of the membranes and fluid surrounding the brain and spinal cord). Less than 1 percent (perhaps as few as 1/10th of one percent) of people who are infected with the virus appear to develop serious clinical illness, however. Among the confirmed cases of serious clinical illness from WNV reported from the United States during 2002, the death rate has been approximately 6% (254 of 3929 cases reported by CDC as of 15 Jan 03). WNV is potentially fatal for humans although relatively few infected people appear to develop clinical disease (estimated at only about 1 in 1000 people). The average death rate among people documented as suffering clinical illness from WNV in the USA during 2002 was approximately 6% (254 of 3929 cases reported as of 15 Jan 03). The only reported WNV case in a U.S military person (as of January 2003) was from male Army civilian employee and Army Reservist based in Utah who apparently contracted the disease while attending an indoor training course in Petersburg VA during the summer of 2002.

Direct transmission of WNV from birds to humans appears to be rare although not impossible (lab technicians have become infected through scalpel wounds inflicted occurred while processing specimens). The only known human-to-human transmission of WNV has occurred through blood transfusions and organ transplants. While the progress of the WNV epidemic has been well documented, how the virus got to the United States in the first place is still unknown. WNV may have entered North America through infected birds imported to the United States, or through an

infected mosquito that hitchhiked into the U.S. inside an airplane or shipping container from Africa, Europe, or the Middle East.

West Nile virus is relatively new to the United States. WNV first appeared in August 1999 during an outbreak in New York City. The first known indication of the outbreak was the death of a number of birds at the Bronx zoo. Dozens of people in the New York City area became seriously ill during the fall of 1999, and seven people died. Since 1999 the virus has spread widely across most of North America and into the Caribbean. As of 19 Nov 2002, WNV has been detected in 44 states, five Canadian provinces, and the Cayman Islands. The virus has spread in the United States along the migratory patterns of birds. Wild birds are the primary reservoirs for the West Nile virus. Crows and other corvids (magpies, jays, grackles, ravens, blackbirds) appear to be particularly susceptible to WNV and may be the primary reservoirs and vectors for the spread of WNV within continental North America. Once introduced by birds into new areas, mosquitoes spread the virus to humans, horses and other mammals, and other bird species.

West Nile Virus infections in humans and/or animals have now been recorded coast-to-coast in North America between 50°N to 20°N latitudes. West Nile has now been confirmed in autochthonous infections of birds or humans from 44 U.S. states, 5 Canadian provinces, and the Cayman Islands in the central Caribbean. WNV has been confirmed from several counties in Texas adjoining the border with Mexico, and there are [unconfirmed] reports of possible West Nile infected birds from the Yucatan region of Mexico. Further dispersal both northward and southward appears highly probable in light of the migratory patterns of known bird carriers and the distribution of mosquito species known (or assumed to be) potentially viable vectors for this disease.

During 2000, WNV was concentrated in the coastal plain and piedmont areas of eastern New England, Maryland, Pennsylvania, and New York. The second major hotspot was Florida and southeastern Georgia. Incipient hotspots emerged in the Ohio Valley, central Michigan, and around the southern and southwestern corner of Lake Michigan (including the city of Chicago, IL and environs) in 2000. During 2001, WNV became established and proliferated in Florida and southeastern Georgia (<http://www.cdc.gov/ncidod/dvbid/westnile/conf/pdf/p2-conti.pdf>), and greatly increased the density of its known distribution in previously reported areas (this latter phenomenon may be due in part to increased surveillance effort and effectiveness, however).

The known range of WNV has expanded dramatically since 1999, spreading and proliferating from a scattered and fragmented distribution within the middle Atlantic Coastal Plain region in 1999 to a blanket distribution covering most of the midwest and Great Plains regions of the US and southern Canada during 2002 (see attached map). The principal hotspots for human WNV infections during 2002 were in the Midwest (IL = 813, MI = 565, OH = 432, IN = 294; MO = 169) and central Gulf

Coastal Plain (LA = 329, MS = 185, TX = 190) regions (CDC data, 15 Jan 03).
<http://www.cdc.gov/od/oc/media/wncount.htm>

WNV has now been reported from more than 200 species of animals. Many species of migratory birds are known to be susceptible to WNV, and the spread and proliferation of WNV appears to be associated with long-distance dispersal by infected birds. High rates of morbidity and mortality are associated principally with corvids (crows, jays, magpies, ravens, grackles, etc), although high death rates attributed to WNV are being reported among raptors (owls, hawks) in the Ohio Valley region. The available evidence suggests that initial spread of WNV within the middle Atlantic Coastal Plain during 1999 was mediated primarily by American crows (*Corvus brachyrhynchos*). Experimental trials have found WNV mortality may run as high as 80-100% among susceptible bird species (house finch =100%; magpies = 100%; American crows = 92%; blue jays = 83%). There were reports during 2002 of the near-total disappearance of chickadees from suburban areas of Chicago where the species was formerly common, and of alarmingly high levels of suspected WNV mortality among several species of hawks and owls in the Ohio Valley region.

WNV is known to cause high rates of mortality in wild and domesticated mammals (e.g.), with death rates in domesticated horses and mountain goats approaching or exceeding those recorded for human smallpox (30-50% death rate among infected individuals). The total number of WNV illness in horses confirmed at the USDA's National Veterinary Services Laboratories or reported by state officials during 2002 (data as of 12 Nov) was 13 577, with major foci (> 500 cases) in Texas (1269), Nebraska (1099), Illinois (1056), Iowa (1039), Minnesota (964), Missouri (809), Oklahoma (733), Indiana (688), Kansas (673), Ohio (647), North Dakota (569), and Kentucky (507). Many mammal species appear to be susceptible to WNV infections, and there is a growing list of mammals of disparate lineages recorded with fatal WNV encephalitis (humans, horse, domestic dog, domestic cat, domestic sheep, rabbit, raccoon, chipmunk, gray squirrel, striped skunk, bats, llama, alpaca, Rocky Mountain goat, harbor seal, black bear, whitetail deer, reindeer, Barbary macaque).

http://www.nwhc.usgs.gov/research/west_nile/wnvaffected.html Seven of 12 Rocky Mountain goats in a [captive?] herd in Nebraska reportedly died from WNV. WNV has also been identified as a cause of mortality among farm-raised alligators in Florida.

The observed timing and pacing of the spread of WNV appears consistent with initial dispersal into Florida and the Gulf Coast region by southward migrating birds, and subsequent redistribution and proliferation northward and westward by migrants infected on both wintering and summering grounds since that time. On the basis of the available information, it seems probable that large migratory flocks of common grackles (*Quiscalus quiscula*) may be a significant factor in the dispersal and proliferation of WNV within North America. Common grackles are a highly gregarious and mobile migratory species whose migratory range that includes most of North America east of the Rocky Mountains. (see map of grackle migration patterns posted at http://www.birdsource.org/GIS/images/cgrack_as96moani.gif (accessed 25 Nov 2002). WNV-positive grackles have been reported from MA, MD, NY, GA, FL, OK, NE, KS, TX, IL, WV, and KY.

WNV has now been confirmed in Washington State from infected birds in the Idaho/Washington border area and the eastern Puget Sound region. The isolated human case recorded this year in Los Angeles CA is still regarded as a probable

instance of "airport importation" [or perhaps the result of the translocations of infected captive bird(s) from the East Coast through the pet trade or as the result of a household relocation].

OTHER LINKS

<http://www.cfe.cornell.edu/erap/WNV/>

<http://www.mayoclinic.com/invoke.cfm?id=DS00438>