

# Impacts of West Nile virus on wildlife

By Emi Kate Saito and Margaret A. Wild

In 1999, investigators discovered dead crows and human cases of encephalitis in New York City to be associated with West Nile virus. This discovery marked the first time that the virus—a mosquito-borne pathogen native to Africa, the Middle East, Asia, and Europe—had been detected in the western hemisphere. How the virus came to the United States remains unknown. Many believe that the virus was introduced through importation of an infected mosquito, bird, human, or other animal; however, others believe introduction occurred when infected birds were blown off course during migration.

From 1999 through 2003, the virus spread along the East Coast and into the Midwest. By the end of 2003 the virus had been detected in 46 states and the District of Columbia, and 7 Canadian provinces (i.e., Manitoba, Nova Scotia, Ontario, Quebec, Alberta, New Brunswick, and Saskatchewan). In addition, evidence of West Nile virus circulation has been detected throughout Mexico and several Caribbean islands. Birds are the natural host for West Nile virus, although humans, horses, and other animals can become ill from the disease. Indeed, West Nile virus has become a serious human health concern with outbreaks in 2003 responsible for the deaths of 262 people in the United States alone, 61 of which occurred in Colorado, the most for any particular state.\* Unlike previous epidemics in other countries where horses and humans primarily were affected, the U.S. epidemic has been associated with high levels of avian mortality, particularly in corvids (e.g., crows, jays, magpies, and ravens). Since 1999, investigators have detected the virus in more than 225 bird and 20 mammal species, and even captive alligators. To date, most surveillance programs have focused primarily on corvids and raptors; therefore, the list of affected species undoubtedly will continue to expand as more species are tested.

\*The Centers for Disease Control and Prevention maintains a Web site at <http://www.cdc.gov/ncidod/dvbid/westnile/index.htm> on West Nile virus that includes information on ways to reduce the human health risks of the disease.

Many surveillance programs also have tested mosquitoes to assess virus activity. Currently, investigators have found the virus in 47 mosquito species. However, at present, scientists still do not know which of these species are the most important in virus transmission or maintenance of the disease in nature. Utilizing the bird and mosquito information of their area in an effort to decrease human risk, many public health agencies have been able to plan prevention and control strategies more efficiently based on local environmental and ecological characteristics.

In units of the National Park System, integrated pest management techniques guide surveillance and mosquito control efforts. Cooperation and coordination between NPS resource managers, public health risk management experts, and local authorities assure that control efforts protect public health, while taking into consideration NPS management policies and impacts on natural resources. Many units in the National Park System have active programs that include surveillance of dead birds, mosquito testing, and education, prevention, and sanitation activities.

A significant question for resource managers regarding the epidemic is: What is the impact of West Nile virus on wildlife populations? Since 2001, more than 325,000 dead birds—with no visible effects attributed to predation or other causes of death—were reported to public health and wildlife agencies. Because a large number of dead birds are never found, these reports represent only a fraction of the number of dead birds in the wild.

Some reports estimate the number of birds that potentially died of West Nile virus to annually exceed 1 million.

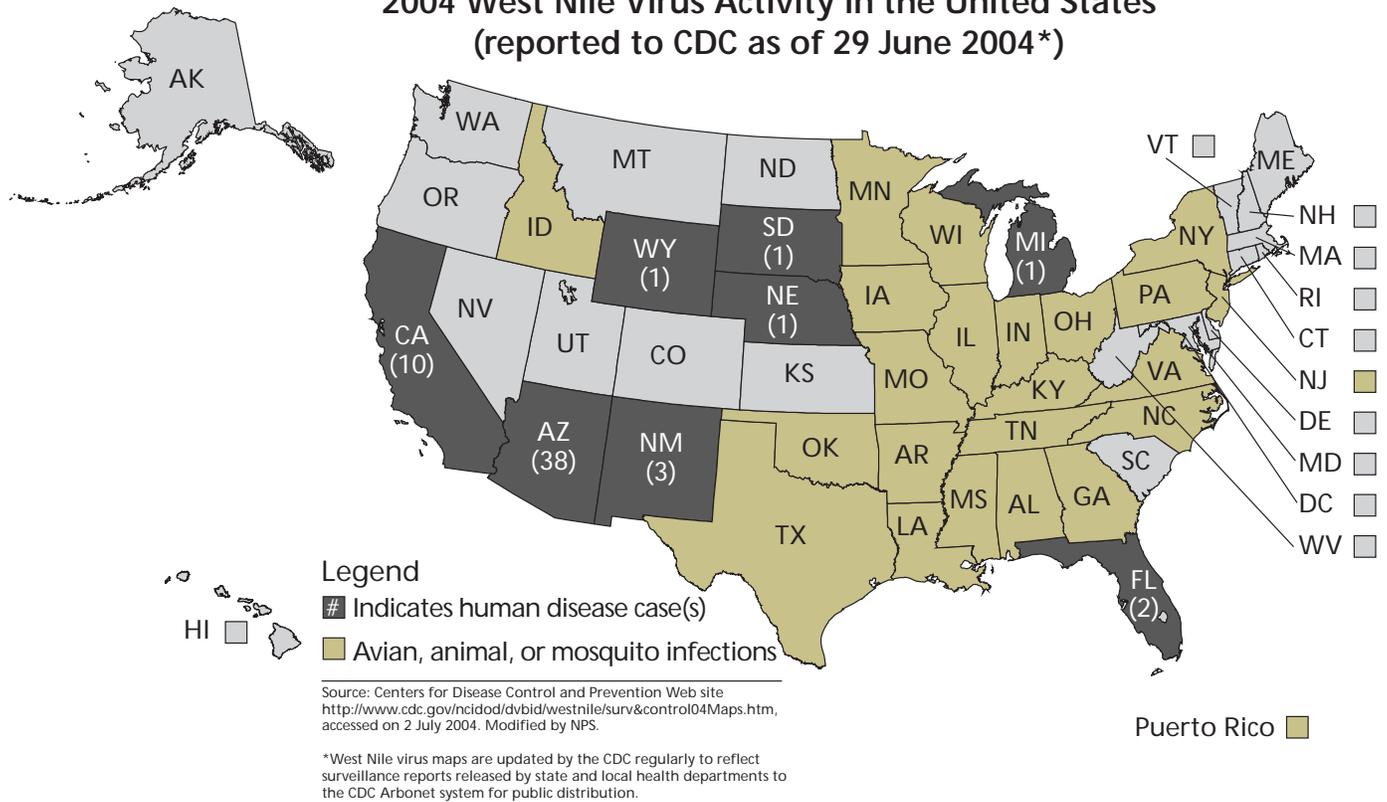
Since 2001, more than 87,000 dead birds were tested for the virus, with at least 36,000 testing positive (CDC ArboNet contributors, unpublished data). However, because birds tested for West Nile virus were not evaluated for other causes of death, the role of the virus as a source of mortality has not been determined.

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## 2004 West Nile Virus Activity in the United States (reported to CDC as of 29 June 2004\*)



The map shows the distribution of avian, animal, or mosquito infection occurring during 2004 with number of human cases, if any, by state. If West Nile virus infection is reported to CDC ArboNet in any area of a state, that entire state is shaded accordingly.

West Nile virus are ongoing. As occurrences of the disease increase in the western United States the number of species, including threatened and endangered species, potentially at risk increases substantially. With limited management options, some zoos have vaccinated rare birds with the licensed equine vaccine (Fort Dodge West Nile Virus Innovator) following the recommended protocols for equine vaccination. However, the efficacy of this vaccine is unknown, and no vaccines have yet been approved for use in birds. New vaccines are under development and some developed for human and equine use have been tested, but none have been reported to be efficacious in bird species.

The recent epidemic of West Nile virus in the United States proved to be unexpectedly active and was the largest epidemic of the virus ever recorded. Much remains to be discovered about the ecology and epidemiology of West Nile virus in the United States, including which species are important in maintaining the virus in nature, why some species are more susceptible to lethal

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infection, and what environmental factors are important in predicting future epidemics. These factors will likely vary regionally, depending on local ecological characteristics. Until scientists better understand the virus and factors influencing its activity, predicting its effects for future seasons is impossible. However, experts are certain about one thing: West Nile virus is here to stay.

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