

USGS West Nile Virus Research Strategy

This plan integrates science across multiple USGS disciplines, and provides national and international opportunities for USGS collaboration with state and federal agencies, academic institutions, and non-governmental organizations throughout the Americas.



Photo courtesy of Milton Friend, USGS

Red-shouldered hawk

In 2002, West Nile virus, a mosquito-borne virus in the Flavivirus family, was detected in 44 states, 5 Canadian provinces, the District of Columbia, and Northeastern Mexico. In 2003, the virus was found in at least 44 states and 6 Canadian provinces. Scientists suspect the disease will be detected in every state in the continental U.S., and possibly Alaska and Hawaii by the end of 2003. WNV has also spread into Central America and the Caribbean. The disease was detected in birds and horses in Mexico and horses in El Salvador. In addition, researchers detected antibodies to WNV in non-migratory birds in the Dominican Republic and Jamaica, suggesting local transmission of the virus on these islands.

The increase in the geographic host range of the virus coincides with a dramatic increase in the distribution and number of North American wildlife

species infected. Over 160 bird, 18 mammal and one reptile species are known to be susceptible to WNV.

Wildlife officials are concerned about the effects WNV has on all susceptible wildlife species, especially wild bird populations and threatened and endangered species. A sharp increase in mortality of some bird populations, coinciding with the appearance of WNV, led to several collaborative efforts to investigate the impact of the virus on these bird populations.

Scientists are conducting research on the susceptibility and pathology of WNV in native wildlife species, and are investigating the range and role of wildlife species as disease reservoirs for other wildlife, domestic animals, and humans. While research is beginning to generate results, much about the virus remains unknown.

Current research

Scientists suspect bird migrations in the spring and fall play an important role in the wide dissemination of WNV throughout North America and may eventually play a role in the disease's spread throughout much of the Western Hemisphere. For the third year, U.S. Geological Survey (USGS) scientists are surveying and collecting blood samples

for WNV testing from migrating wild birds along the Atlantic and Mississippi migratory flyways. Over 10,000 birds from 142 different species were caught, sampled, and released at 23 national wildlife sites at U.S. Fish and Wildlife Service refuges, National Parks, and military facilities in 12 states since 2001.

Results are still pending, but initial information indicates 2 percent of gray catbirds, northern cardinals, American robins, blue jays and brown thrashers sampled in 2001 and 2002 were antibody positive for WNV, indicating they had been previously exposed to the virus. USGS is collaborating on this study with the Centers for Disease Control and Prevention (CDC), where scientists are examining the distribution and number of mosquito species in relation to avian mortality, weather, and land cover.

Researchers believe this study will provide basic information on the distribution and spread of the virus. USGS scientists will combine these data with information about avian migratory patterns, landscape characteristics and weather conditions over space and time, providing a foundation for the development of models to forecast the risk of human illness.



Photo courtesy of Robert J. Dusek, USGS

Blue jay sampled for WNV testing

USGS scientists studied the susceptibility of crows, mallards and cranes to WNV infection, and are planning disease susceptibility studies with vector biologists from the University of Wisconsin to experimentally determine the ways virus infects various bird species, particularly waterfowl, raptors, sandhill cranes, and amakihi, a native Hawaiian bird. Investigators in the USGS Biological Safety Level-3 containment laboratory will also study how birds develop resistance to WNV that enables them to successfully fend off the viral attack. In 2003, USGS scientists will also begin

to investigate the effects of WNV on American kestrel populations.

In addition to research and surveillance activities, USGS will continue to investigate avian wildlife mortality events such as those occurring among raptors and American white pelicans. In 2002, USGS wildlife disease specialists at the National Wildlife Health Center determined the virus played a role in avian mortality throughout the U.S. The disease is linked to large-scale raptor mortalities throughout Eastern and Midwestern states, and possibly pelican mortality in the Midwest.

These, and additional field and laboratory studies being planned, will provide a comprehensive and integrated research approach to answer critical questions about West Nile virus that will ultimately benefit wildlife, public health and domestic animal health.

Current USGS/CDC collaborative maps detailing WNV activity can be found at <http://westnilemaps.usgs.gov/>.

Current lists of WNV-positive species can be found at http://www.nwhc.usgs.gov/research/west_nile/wnvaffected.html/



Photos courtesy of Robert J. Dusek, USGS, except crow, courtesy Dan Sudia



A variety of avian and mammalian species are susceptible to West Nile virus



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