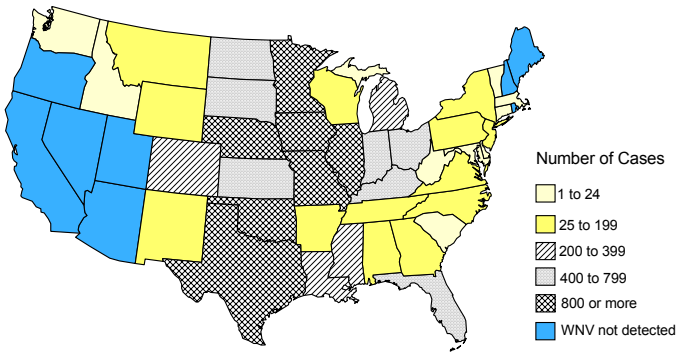
2003 Equine WNV Outlook for the United States

Since its introduction to the Eastern United States in 1999, West Nile Virus (WNV) has spread across the country. In 2002 there were more than 15,257 laboratory-confirmed WNV equine cases reported in 43 States (see map). Spread by mosquitoes, WNV can cause disease mainly in birds, equine animals, and humans. This report evaluates the factors that establish and/or maintain WNV infection in equids (horses, donkeys, mules, and ponies), and attempts to predict the prevalence of U.S. equine WNV cases in 2003.

Before making any estimates about equine WNV cases in 2003, it is important to understand all the factors that may influence both the viral threat presented to equids and the resistance of the equids to the disease. Two main factors influence the occurrence of WNV in a given population of equids: the existence of mosquitoes carrying the virus; and the presence of susceptible equids in geographic proximity to mosquitoes.

Number of Laboratory Confirmed WNV Equine Cases by State in 2002, as Reported USDA:APHIS:VS



Mosquito/Bird Cycle

Birds are the primary reservoir for WNV and mosquitoes the primary carrier. Thus a mosquito/bird cycle is required to maintain WNV in a particular location. WNV has been detected in 138 bird species, yet some species have been identified as more efficient reservoirs than others.

One study looked at various bird species to ascertain the number of days different species maintained WNV in their blood in levels adequate to infect mosquitoes. Passerines were found to be the most proficient hosts, including members of the Corvidae family (crows, jays, and magpies) as well as other species such as the house finch, house sparrow, and ring-billed gull. Evaluation of previous WNV outbreaks in the United States found that Corvidae species also were the most susceptible to disease once infected with WNV.

It is believed that a bird species' immunity to WNV also plays a role in the transmission of the virus. However, the importance of immunity is hard to predict due to several factors. For example, many of the bird species most commonly infected with WNV have short life spans with high population turnover; therefore new susceptible individuals are added to the local population each year. On the other hand, high susceptibility to WNV and accompanying high fatality rates may result in a decrease in the local populations of these birds. Despite important research in this area, there remains a lack of information about which bird species are most important in the local increase, maintenance, and distribution of WNV, including a lack of information about attack rates and mortality rates.

Mosquito Abundance

The abundance of mosquitoes depends on environmental factors such as temperature and moisture. Although the correlation between warm temperatures and rapid multiplication of mosquitoes is well known, the correlation between moisture and mosquito abundance is the subject of ongoing research projects. Correlations between moisture and mosquito abundance and/or disease prevalence may vary from one location to another.

Studies have shown a positive correlation between winter precipitation and summer abundance of mosquitoes in the western half of the United States. However, there is speculation that summer drought in the Western United States may create more breeding sites for mosquitoes as more water sites become stagnant.

WNV Vaccine

Equids acquire immunity to WNV via natural exposure and/or vaccination. A WNV vaccine became commercially available in August 2001. As of February 6, 2003, the vaccine was fully licensed by the USDA. In laboratory trials, the vaccine was 95 percent effective in preventing measurable viremia in horses. The recommended initial vaccination series for adult equids is two vaccinations 3 to 6 weeks apart. Foals require an initial series of three vaccinations. Annual boosters are recommended prior to mosquito season, and there may be a need for a second annual booster if the local season exceeds 4 months. Equine owners should consult with their veterinarian to develop a vaccination program.

At this time, the duration of immunity from vaccination is not known. WNV vaccine remains relatively expensive, costing about $40 to $50 for the two doses (when the cost of a veterinary fee for administration is included). Currently the manufacturer supplies the vaccine exclusively to licensed veterinarians.

Equids that survive WNV infection are likely immune to reinfection, although the duration of immunity is unknown. The general health status of the equid may influence an individual animal's likelihood of showing signs of disease if exposed to WNV, since young, healthy animals appear less likely to die from WNV infection than older equids.

***Regions**

Western: Arizona**,** California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming
Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont
Southern: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia
Central: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin

Mosquito Mitigation

For equids to become infected with WNV, they must be in contact with an adequate number of infected mosquitoes, so implementing mosquito-control measures is an important factor to consider when predicting future WNV cases. At the farm level, mosquito mitigation may include: minimizing standing water sites; regular treating/cleaning of water troughs; keeping equids indoors at dusk and dawn; using fans in stable areas to reduce mosquito feeding; and applying insect repellants, especially during high mosquito feeding times. Unfortunately, it is difficult to measure what level of mitigation, if any, a particular farm should use. As far as mitigation at the community level, such as spraying to control adult mosquitoes, these measures depend on county and State policies, etc. Furthermore, most equids are not in city or suburban areas where this mitigation is typically focused.

Outlook for 2003 by Region*

WNV first appeared in the northeast region, and there have been cases each year in this area since 1999. However, since 1999 most States in the northeast region each had fewer than 100 cases (with inventories in this region ranging from approximately 2,000 to 170,000 equids per State). Based on statistics from 1999 through 2002, it appears that the number of WNV cases peaked in the second year the virus appeared and has since declined. Because the northeast region has had WNV for 2 to 4 years, it is likely many equids and birds have developed natural immunity to WNV. Furthermore, a large percentage of equids are likely to have been vaccinated against WNV, so overall the population is likely to be more immune than in other regions. All these factors, along with increased mosquito mitigation in this area, will likely result in relatively fewer WNV equine cases in the northeast region during 2003 than occurred in 2002.

The southern region averaged 100 to 500 WNV equine cases per State in 2002. These numbers may decrease in 2003, although the region as a whole will still have a significant number of cases in 2003. The southern region's climate permits year-round mosquito activity and, therefore, viral activity. While it is probable that some equids in this region also have acquired WNV immunity either naturally or via vaccination, the virus has not circulated here as long as it has in the northeast region so a smaller percentage of animals will be immune. The

percentage of equids vaccinated against WNV in the southern region is unknown, but since the virus has been recognized in this region since 2001, equine owners have had a heightened awareness of the need to vaccinate.

In the central region, the numbers of WNV equine cases in 2003 will probably be similar to those in 2002. For example, Missouri, Minnesota, North Dakota ,South Dakota, and Wisconsin saw approximately 150 to 1,000 cases per State in 2002, with an estimated attack rate ranging from 13 to 142.3 cases per 10,000 horses. The region's highest numbers of WNV equine cases were found in Illinois, Indiana, Iowa, Kansas, Missouri and Nebraska, where 700 to 1,100 cases per State were reported, for an estimated attack rate ranging from 50.2 to 146.7 cases per 10,000 horses.

The western region, where the bird and equine populations are still relatively unexposed, may experience a high viral load in mosquitoes and therefore significant numbers of WNV cases. In 2002, Colorado, Montana, and New Mexico had between 60 to 400 cases per State and an estimated attack rate ranging from 9.4 to 26.2 cases per 10,000 horses. Although WNV was not detected in 2002 in Arizona, California, Nevada, Oregon, and Utah, these States can expect to see numbers similar to those found in Colorado in 2002 (200 to 400 cases). Although some equids in the western region have been vaccinated against WNV, 2002 was the first year some States vaccinated.

In anticipation of the arrival of WNV, many States in the western region already have been educating the public about WNV and implementing control measures that may include vaccination of equids. California State agencies are providing information to the public, especially equine owners, including recommendations for vaccination and mosquito control. Based on various public health Web sites, Nevada, Utah, and Arizona also are attempting to educate the public about WNV.

Because this is the first year WNV will likely appear in many areas of the western region, birds and unvaccinated equids in this area will be highly susceptible, although bird/mosquito cycles may not yet be well established. There also are climatic, geographic, and demographic factors to consider when using data from the central part of the western region for estimates about the spread of WNV along the West Coast. Geographic factors such as elevation may have an impact. In fact, most WNV cases in Colorado and in the northeastern U. S. were not located at higher elevations. It is not entirely clear what effect the drought in the West will have, although it may mean more mosquito breeding sites due to stagnation of normally fast moving waterways. Mosquito abatement is already being considered in many States, including California where mosquito mitigation is an important control measure to prevent reemergence of malaria and reduce occurrence of other vector borne diseases such as St. Louis encephalitis and western equine encephalitis.

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