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MAPS Data Reveal Impacts from West Nile Virus to More Bird Species Than Previously Thought

A new study, published in the prestigious journal *Proceedings of the National Academy of Sciences* and led by researchers from Colorado State University, UCLA, **The Institute for Bird Populations (IBP)**, and Washington University, finds that West Nile virus is killing more birds than previously thought. The findings have implications for the world's ecosystems, human health, and bird populations.

The study grew out of a long partnership between IBP and the UCLA Center for Tropical Research that focused on the effects of introduced infectious diseases on bird populations. All avian data used in the paper were gathered from IBP's Monitoring Avian Productivity and Survivorship (**MAPS) Program**, a continent-wide network of bird banding stations operated by thousands of professional biologists and highly-skilled volunteers. The study analyzed 16 years (1992-2007) of mark-recapture data from over 500 MAPS stations across the United States, in combination with spatial and temporal models of West Nile virus risk to humans developed by researchers at UCLA which provided information on the arrival year of West Nile virus at each MAPS station.

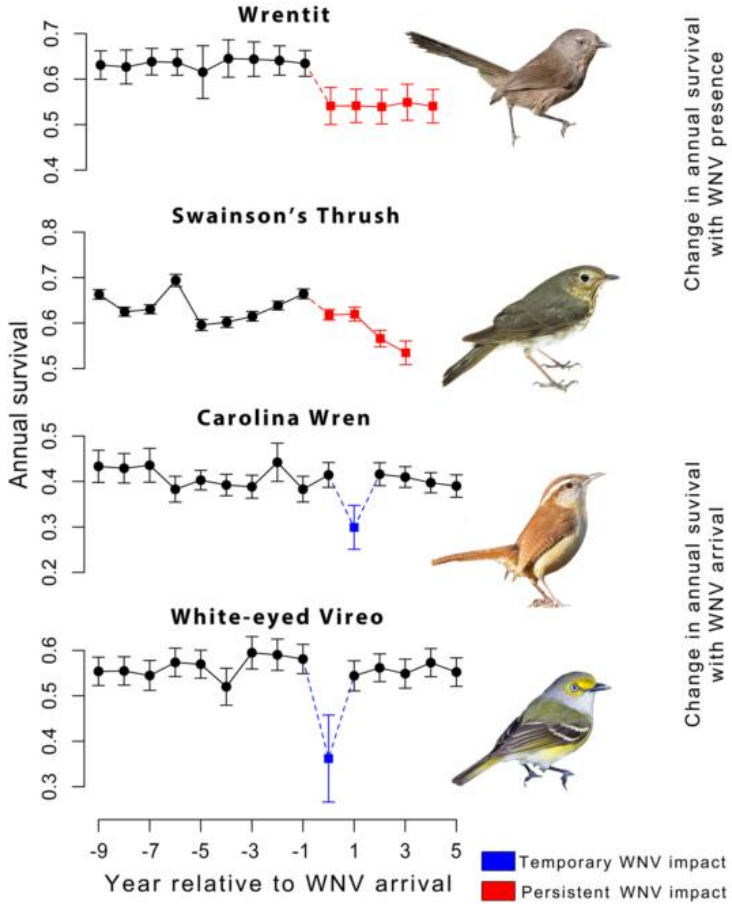
White-crowned Sparrow, one of the species that was shown to have persistent impacts to survival from West Nile virus, according to a new study by IBP and other researchers (Photo: Kelly Colgan Azar).

The authors found that West Nile virus had large impacts on the annual survival rates of landbirds. Overall, nearly half (23 of 49) of the species studied were negatively affected. For some species, the adverse impacts on survival persisted for years after the initial arrival of the virus, an unexpected result. Survival rates for other species seemed to recover more quickly.

T. Luke George, a researcher at Colorado State University and a Research Associate at IBP, was the lead author. He said, "many more species of birds than we thought are susceptible to this virus. We also found long-term effects on survival rates for some species. Prior to this study, we generally thought the West Nile virus had a very short-term effect on bird survival."

Novel Approach Used for Tracking the Virus

The team of scientists used a unique approach to their analysis of West Nile virus which, with mosquitoes as a vector, can move from birds to humans, with potentially fatal results. The researchers pooled bird capture records based on the year of arrival of West Nile virus at MAPS stations, then looked at survival in years before and after the local arrival of West Nile virus.



Examples of temporary and persistent effects of West Nile virus on estimates of annual survival. In some species, such as the Wrentit and Swainson's Thrush, survival decreased (red) after the arrival of West Nile virus, and remained low in subsequent years. In other species, such as the Carolina Wren and White-eyed Vireo, survival was reduced during or immediately after the year of West Nile virus arrival (blue), followed by recovery in subsequent years despite the disease persisting in the community.

They soon saw an impact on a higher percentage of species than had been detected by previous efforts and, for some species, the impact was long-term.

George said that, prior to this study, other researchers looked at West Nile virus in specific locations, but those studies were short-term, and looked at one species and one location. "Some people found effects, and others didn't," he said.

Differences in Survival Rates among Species

The study detected significant differences in impacts among species. Field Sparrow, Downy Woodpecker and Red-eyed Vireo experienced significant declines in survival, followed by recoveries, similar to the results shown for Carolina Wren and White-eyed Vireo in the figure above. For other species, such as Wrentit, Swainson's Thrush, Purple Finch and Tufted Titmouse, survival declined on arrival of West Nile virus and remained consistently lower during the study period.

George said he was surprised by the findings for Swainson's Thrush. "Lab studies found that, while Swainson's Thrushes were susceptible to West Nile infections, they always survived," he said. "Our study suggests that their survival is reduced when they are exposed to West Nile virus in the wild.

"The study suggests that West Nile virus is an additional factor that could reduce the growth rate of bird populations over the long-term. Since there are millions of thrushes, there is not an immediate threat to

that species," George said. "For rare species, we're adding another burden to their population. It may not lead to the extinction of the species, but the presence of West Nile virus will make it harder for populations to recover."

The scientists aren't sure why some species appear to recover quickly and others do not. "That's really the question our study opens," said Ryan Harrington, a co-author and biologist at UCLA. "That would be the next step forward, addressing that question." "The deeper story is that without long-term monitoring and detailed data, we miss patterns like these," said Joseph LaManna, a co-author and researcher at Washington University. "Deaths in one area can easily be masked by immigration from other areas," he added, "and we wouldn't really notice unless we happened to be looking at the right type of data."

Using the MAPS Program in New Ways

The MAPS program was founded in 1989 specifically to study demographic parameters, or vital rates, in bird populations. Over the years, MAPS data have also contributed valuable research to studies on climate change, the effects of weather on bird populations, migratory connectivity, longevity in wild birds, and many other topics. "When I started MAPS in 1989 I had no idea that the data it produced would be used to better understand the effects of West Nile virus on North American landbirds," said David DeSante of IBP, one of the authors on the study. "Heck, West Nile virus had not yet even arrived in North America at that time. But what I did know was that we needed more than just data on population trends of landbirds if we were going to be successful in dealing with the threats that landbirds were facing – threats from habitat loss and from the newly appreciated specter of climate change. I knew we needed data on the birds' vital rates – birth and death rates (productivity and survival) – in order to develop successful land management and conservation strategies to deal with these threats. Now, with 24 years of data, it is clear that MAPS continues to provide a cornerstone of demographic data for landbird conservation. "

To read the paper published in Proceedings of the Natural Academy of Sciences, **click here.**
For more information about this study and the work done by IBP, please contact **David DeSante**.