

# PFW&CBC

Combined Data of Project FeederWatch and the Christmas Bird Count Indicate

## Declines of Chickadees and Corvids: Possible Impacts of West Nile Virus

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**Black-capped Chickadee (*Poecile atricapilla*)  
at suet feeder. Photo/Michael Bochnik**

In 2002 West Nile virus, a mosquito-borne pathogen, was more widespread than ever in the United States and Canada. Historically, the virus has been widespread in Africa, the Middle East, and southern Eurasia. It first gained a foothold in the Western Hemisphere in 1999, when it caused an outbreak among birds and humans in and around New York City. By the end of 2002, West Nile virus had been detected in 44 states and five Canadian provinces. As the virus spreads across North America, so does concern over its impact on wild bird populations. Limited testing has found thousands of birds infected by the virus, with many having died as a result of these infections. But has West Nile virus-related mortality had a significant impact on bird populations? Surveys of American Crows and Black-capped Chickadees by Audubon-Chicago Region and the Bird Conservation Network found striking declines of both species in the Chicago region following an outbreak of the virus there in 2002 (Bonter and Hochachka 2003). Starting with these local observations, we have attempted to both quantify the magnitudes of population declines, as well as assess the area over which these declines occurred. Our preliminary analyses confirm notable drops in counts of several bird species in the upper Midwest compared with the previous winter, as well as a wider-ranging decrease in sightings of Black-capped Chickadees and Carolina Chickadees. In contrast, counts of several other species have held steady or increased since last winter.

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To conduct our analyses, we made use of two separate winter bird monitoring schemes: Project FeederWatch (PFW; Wells et al. 1998, LePage and Francis 2002) and the Christmas Bird Count (CBC). We needed to use data from both of these projects, because each has particular strengths of which we took advantage. PFW data are collected at thousands of individual feeders, which allowed us to determine whether declines were seen everywhere, or whether declines were local and interspersed with areas showing no declines in bird abundances. This latter pattern was observed around Chicago (Bonter and Hochachka 2003), and a confirmation over a larger region would be of interest. Another strength of the PFW data is that FeederWatch sites are much more densely distributed than CBC count circles in most areas, giving us insights into population changes in a less patchy fashion than could be gained with CBC data alone. The main weakness of PFW data is that the project has only been running continent-wide since 1988, and most individual sites have been monitored for far fewer years than that. Thus, we used CBC data from 28 sites in the upper Midwestern United States and southern Ontario to place the observed declines within a broader historical context of the last four decades.

We analyzed PFW data from six species: American Crow, Blue Jay, Black-capped/Carolina Chickadee (data from the species were combined), Tufted Titmouse, Northern Cardinal, and House Sparrow. We chose the first three because the corvids are known to be highly sensitive to West Nile virus, and the chickadees were anecdotally a species that showed substantial declines in abundance. The other three species were chosen because they were also residents and widely observed. We maximized the number of locations from which data were used by testing for the presence of declines only between the winter of 2001-2002 and the winter of 2002-2003; a PFW site would only have to be active for two years in order for the data

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to be used. Data from between 800 and 1400 sites across the United States and Canada were available for each species. FeederWatchers count their birds every one to two weeks starting in mid-November, and we used the data from the start of the season until mid-February in each winter. Data from this last winter were available in a timely fashion because more than half of PFW participants entered their data over the Internet. We used the week-to-week changes in reported numbers of birds in PFW to quantify expected variation in numbers of birds at each site. Changes in the average number seen between years

that exceeded this within-year variation were classified as being unusual increases or declines (i.e. between-year changes exceeded 95 percent confidence limits for variation around annual averages).

The CBC data were chosen from 28 count circles (Figure 1), all more than 30 years old. The earliest data came from the 1964-65 winter. The region was arbitrarily chosen based on the locations of declines in chickadee abundance seen in the PFW data. We corrected for variation in observer effort following Link and Sauer's (1999) method, and calculated year-to-year changes in departures from the long-term, effort-corrected averages. This was done separately for each of the count circles. These year-to-year deviations were used to contrast the declines of the last winter with other large changes in population size observed over roughly the last three to four decades.

Our first observation from the analyses of PFW data is that there have indeed been widespread declines in at least some species. FeederWatchers witnessed notable declines in the number of Black-capped and Carolina chickadees visiting their feeders. Chickadees declined at 74 percent of the 203 FeederWatch sites with greater than expected changes in



Figure 1. Locations of the 28 Christmas Bird Count circles from which data on Blue Jay, American Crow, and Black-capped Chickadee were analyzed in comparison with data from Project FeederWatch.

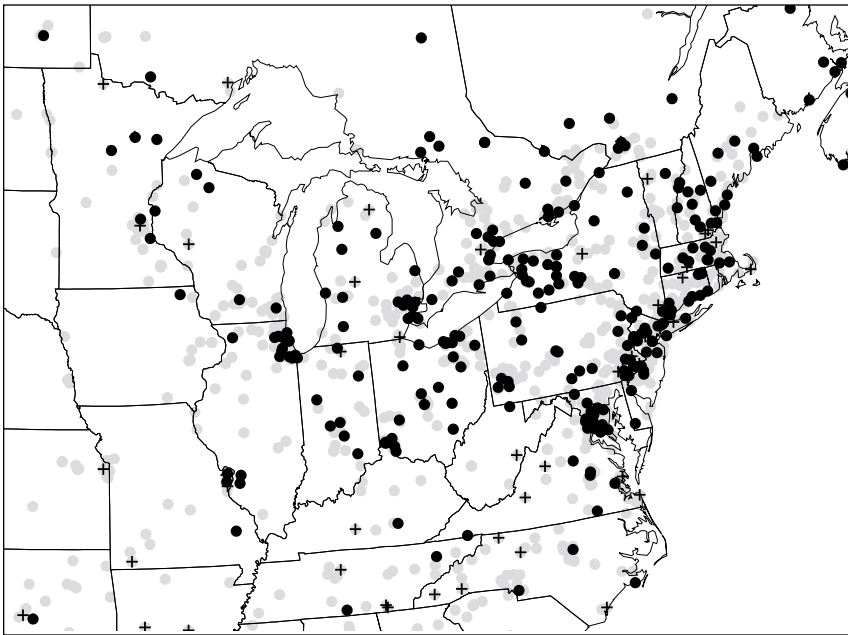
counts (Figure 2). A high proportion of sites with declines was notable in the upper Midwest (Ohio, Illinois, Indiana, Michigan, and Wisconsin). The average number of chickadees counted was down

by 26 percent in Illinois, 19 percent in the upper Midwest as a whole, and 10 percent elsewhere. Declines were also detected in the number of Tufted Titmice visiting feeders (63 percent of 234 sites

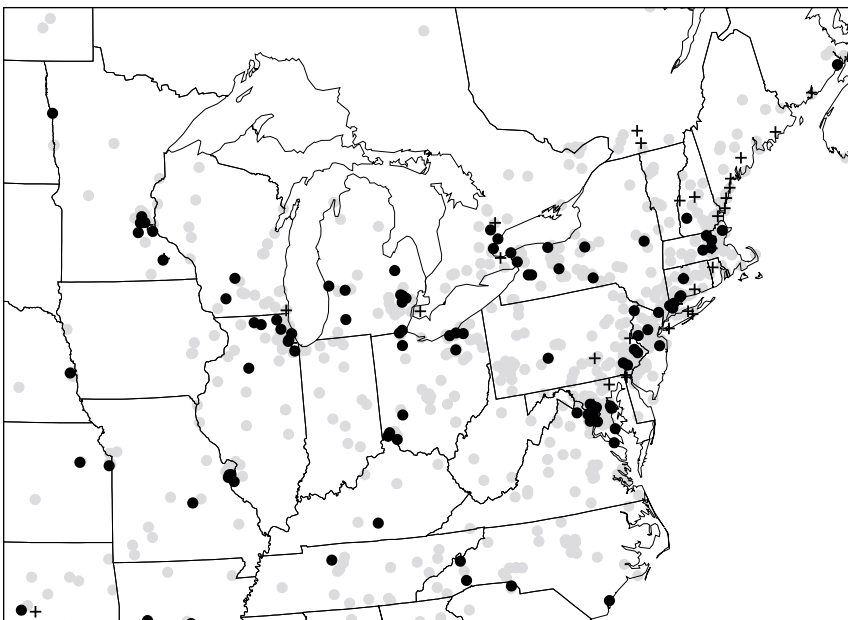
with unusually large changes). The average number of titmice counted was down by 29 percent in the upper Midwest, but increased by 4 percent across the rest of their range. Similarly, American Crow counts declined at 70 percent of 173 FeederWatch sites where changes were identified between winters. Declines were recorded in most regions, although there were some increases concentrated along the coast of New England (Figure 3). Crow counts decreased by 61 percent in the upper Midwest compared with last winter, and Illinois reported a staggering 91 percent decrease. Across the rest of the continent, crow counts were up by 6 percent.

Our second observation from the PFW data is that only some species of birds showed these sharp declines. FeederWatchers continued to see Blue Jays, House Sparrows, and Northern Cardinals in numbers comparable with those of the previous winter. Although the number of sites with declines in Blue Jay counts far exceeded those with increases in parts of the Midwest, counts of jays remained stable or increased across much of the species' range (Figure 4). Overall, reports of Blue Jays increased at 52 percent of 301 sites where changes were detected between winters. The average number of jays counted declined by 26 percent in Illinois and 6 percent in the upper Midwest, but increased by 15 percent across the remainder of their range. More FeederWatchers reported increases than declines in the number of House Sparrows at their feeders this winter (56 percent of 253 sites with changes). Similarly, 64 percent of 327 FeederWatchers reported increases in the number of Northern Cardinals.

Our third conclusion from the analyses of PFW data is that declines were patchy. Even in areas of substantial declines, there were still FeederWatchers for whom we could detect no unusual changes in abundance of chickadees or crows. Admittedly, some of these "no change" sites may have experienced more subtle declines in abundance of birds that could not be detected in our analyses. Thus, we cannot say that some local areas experienced absolutely no



**Figure 2.** Changes in population size of Black-capped/Carolina Chickadees between the winters of 2001-2002 and 2002-2003. Black circles indicate FeederWatch locations at which numbers declined more than expected by chance between these winters. Black plus signs indicate locations at which unexpectedly large increases in abundance occurred. Gray dots indicate FeederWatch sites at which abundance did not undergo unexpectedly large changes.



**Figure 3.** Changes in population size of American Crows between the winters of 2001-2002 and 2002-2003. Black circles indicate FeederWatch locations at which numbers of American Crows declined more than expected by chance between these winters. Black plus signs indicate locations (mostly clustered along the coast of Maine) at which unexpectedly large increases in abundance occurred. Gray dots indicate FeederWatch sites at which crow abundance did not undergo unexpectedly large changes.

declines over the last winter. We can conclude that the large declines, in which the majority of birds appear to have disappeared, were not repeated everywhere even within the upper Midwest. This is in keeping with the more detailed data available from around Chicago (Bonter and Hochachka 2003).

The PFW data indicate that something did happen to bird populations over much of the northeastern United States and adjacent Canada after the summer of 2002. The CBC data confirmed the FeederWatch-observed widespread declines. Twenty-six of 28 CBC circles showed declines in Blue Jay and Black-capped Chickadee numbers, and 22 of 28 circles also showed declines in abundance of American Crows. So, we have a clear case that winter bird populations did decline markedly from the winter of 2001-2002 in the upper Midwest. But were these declines unheard of in magnitude, or have populations of crows and chickadees undergone fluctuations of similar magnitudes in the past? We examined the CBC data in more detail to answer this question.

Surprisingly, the declines detected were often well within the range of fluctuations that have been observed in the

past. The current decline of Black-capped Chickadees was at most only the third largest fluctuation in chickadee abundance observed in a count circle over the course of several decades. In half the circles, larger fluctuations in chickadee abundance were observed in at least ten other years over the past three decades or more. This same story was found for both Blue Jays (at least 7 greater fluctuations over the past decades in over half the count circles), and American Crows (at least 10 larger fluctuations in over half the count circles). One unusual aspect of these declines is that all three species (Blue Jay, American Crow, Black-capped Chickadee) declined in the upper Midwest at the same time. Typically, Blue Jays have tended to fluctuate in opposite directions to the other two species ( $r = -0.6$  in correlations of inter-annual fluctuations across species). Another unusual aspect of the declines was the proportion of count circles that showed declines in the same year. For all three species, the winter of 2002-2003 showed the greatest proportion of simultaneous declines

across the 28 circles that was ever recorded (92 percent of circles showed declines from the previous winter for jays and chickadees, and 79 percent for crows).

What can and cannot be concluded from these patterns? The presence of declines doesn't confirm that West Nile virus was the cause. The virus has not yet been directly linked to high mortality rates of many species, including chickadees and titmice. Small birds are difficult to find after they die, and even when found, most are not tested for West Nile virus. Nevertheless it is a logical suspect. If the virus is the cause, then it is capable of causing large declines in populations of birds over a substantial part of the continent in a single year. However, the impact of West Nile virus (or whatever else caused these declines) was not unusually great, as local populations within CBC circles have almost always experienced greater declines in the past. So, the most unusual aspect of these declines was the synchrony, both across species and across locations, with which large declines occurred. Even though the sizes of declines were not unusual, this synchrony may impede rapid recovery of nesting populations because the pool of potential immigrants has been depleted over a large area.

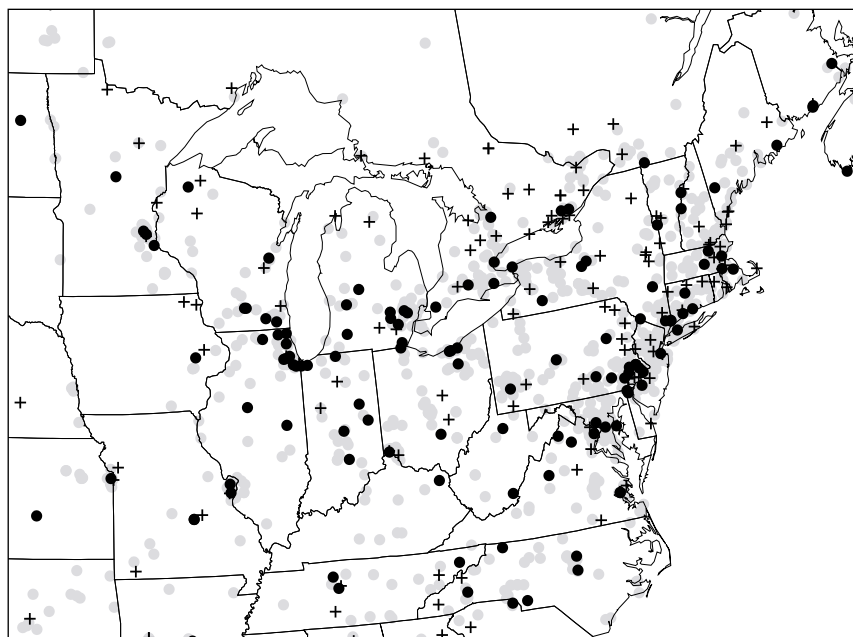


Figure 4. Changes in population size of Blue Jays between winters of 2001-2002 and 2002-2003. Black circles indicate FeederWatch locations at which numbers of Blue Jays declined more than expected by chance between these winters. Black plus signs indicate locations at which unexpectedly large increases in abundance occurred. Gray dots indicate FeederWatch sites at which jay abundance did not undergo unexpectedly large changes.

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