

Does anthropogenic development facilitate West Nile virus amplification in North America?

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Abstract

West Nile virus (WNV) emerged in the western hemisphere during the summer of 1999, reawakening public awareness of the potential severity of vector-borne pathogens. Since its New World introduction, WNV has caused disease in avian, human and other mammalian communities across the continent. However, much of the available data have been collected in response to disease outbreaks and thus, sampling is often focused in areas around human populations with known WNV activity. While a focus on human-dominated landscapes is critical to public health initiatives, a sampling scheme that includes diverse land-use types is essential for understanding the spatial heterogeneity of WNV activity in the primary zoonotic hosts. American crows (*Corvus brachyrhynchos*) are highly sensitive to the disease, with mortality rates approaching 100%. We use dramatic declines in abundance of this susceptible avian host as a proxy for WNV activity to explicitly examine heterogeneity in WNV intensity over a broad spatial range and across multiple land cover types. We document significant declines in crow abundance after WNV emergence at 54 and 360 (15%) Breeding Bird Survey (BBS) sites across the eastern United States. Generally, locations with more area under human development and less forested area were associated with higher odds of WNV impact. Our findings support an urban-pathogen link, but they also

highlight potential non-linearities in this relationship. While human development significantly affected the probability of a WNV-related population decline in crows, our results suggest that lower intensity (suburban) development may be even more important in facilitating WNV dynamics than higher density urban centers.