Spring is advancing unevenly across North America

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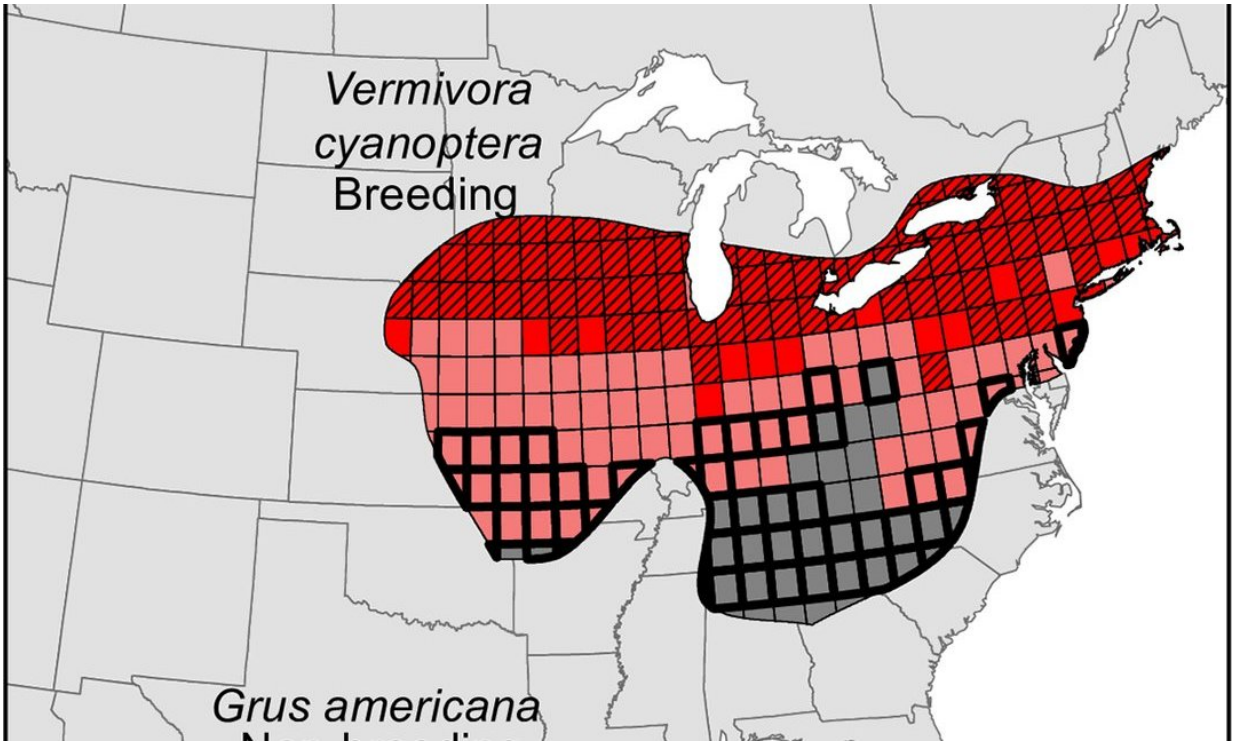

Migratory birds face a variety of changing spring conditions, as demonstrated by spatial trends in the first leaf index within breeding and wintering ('non-breeding') areas for the whooping crane (Grus americana) and the blue-winged warbler (Vermivora cyanoptera). Credit: Waller et al. 2018

Spring is arriving earlier in many parts of North America, but this advance is not happening uniformly across the migration routes of many

birds, according to a study by Eric Waller at the US Geological Survey in California and colleagues, publishing September 12 in the open-access journal *PLOS ONE*.

Climate change has been linked to earlier springs, but not all species respond equally, threatening to put many species out-of-sync with their habitats. To understand how mismatches in the timing of spring events could impact migratory birds, researchers compared published data on the first appearance of leaves and flowers on deciduous trees for 496 US National Wildlife Refuges and four major North American bird migratory routes between 1901 and 2012.

They found that spring is now arriving early in 76% of wildlife refuges across the USA, and extremely early in 49% of refuges, compared to the early 20th Century. For three of the four migration flyways, spring advanced more rapidly at higher latitudes than lower latitudes, but there was no latitudinal pattern across the Pacific flyway, which covers the west coast of North America from Baja California to Alaska.

The team also estimated the rate of spring advance for the breeding and over-wintering grounds of two bird species—the Blue-winged Warbler (*Vermivora cyanoptera*) and Whooping Crane (*Grus americana*), and found that while the species' breeding sites have shown significant advances in the arrival of spring, wintering sites have not.

Mismatches in the timing of events across a birds' migration route could mean they struggle to stay in-sync with food availability and other seasonal changes. Taking these differences into account when planning conservation strategies and defining refuges could help protect vulnerable migratory birds from extinction due to climate change.

Waller notes: "We found differential rates of advance in the onset of spring within North American migratory flyways over the past century,

with spring generally advancing more quickly at higher latitudes than at lower latitudes. When considering breeding and non-breeding habitats of migratory birds—such as the whooping crane and the blue-winged warbler—continental-scale shifts in the onset of spring have species- and flyway-specific ramifications."

More information: Waller EK, Crimmins TM, Walker JJ, Posthumus EE, Weltzin JF (2018) Differential changes in the onset of spring across US National Wildlife Refuges and North American migratory bird flyways. *PLoS ONE* 13(9): e0202495. doi.org/10.1371/journal.pone.0202495

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