

Noise and light alter bird nesting habits and success

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The northern cardinal has a relatively low frequency song and delayed breeding in response to noise pollution. Credit: David Keeling

Looking for a bird's-eye view of human impact? A new study published in the journal *Nature* provides the most comprehensive picture yet of how human noise and light pollution affect birds throughout North

America, including how these factors may interact with or mask the impacts of climate change.

Recent troubling findings suggest [bird populations](#) have declined by more than 30% in the last few decades. To develop effective strategies to reverse this trend, scientists and land managers need to understand what caused the decline.

The effects of noise and [light pollution](#) on the health of bird populations had been largely overlooked until some recent studies suggested that these stressors can harm [individual species](#). With this new study, a continent-wide picture has emerged.

"Our study provides the most comprehensive evidence that noise and light can profoundly alter reproduction of [birds](#), even when accounting for other aspects of human activities," said Clint Francis, a biologist at California Polytechnic State University and one of the lead study authors.

Researchers looked at a huge collection of data sets—including those collected by citizen scientists through the NestWatch Program—to assess how light and noise affected the reproductive success of 58,506 nests from 142 species across North America. The team considered several factors for each nest, including the time of year breeding occurred and whether at least one chick fledged from the nest.

Birds time their reproduction to coincide with peak food availability to feed their young, using daylight cues to breed about the same time each year. The researchers found that light pollution causes birds to begin nesting up to a month earlier than normal in such open environments as grasslands or wetlands and 18 days earlier in forested environments. The consequence could be a mismatch in timing—hungry chicks may hatch before their food is readily available. If that happens, these early season

nests may be less successful at fledging at least one chick, but the situation is complicated by climate change.

As the planet warms, birds' food is available earlier due to warmer weather. Birds that maintain their historical breeding times because their internal clocks are set to changes in day length may have fewer chicks survive because the food source they rely on already came and went.



The white-breasted nuthatch has good dim light vision and advanced the timing of its nesting with light exposure. Credit: David Keeling

"We discovered that the birds that advanced the timing of their reproduction in response to increased light pollution actually have better reproductive success," Francis said. "A likely interpretation of this response is that light pollution actually allows these birds to 'catch up' to the shift towards earlier availability of food due to climate change."

These findings suggest two conclusions about how birds respond to climate change. First, at least temporarily, birds in areas impacted by light pollution may track climate change better than those in natural habitats that are darker. Second, when scientists thought birds were adjusting their reproductive timing to climate change, birds actually may have been responding instead to the light cues because many studies were done in areas exposed to some light pollution.

When considering noise pollution, results showed that birds living in forested environments tend to be more sensitive to noise than birds in open environments.

Researchers delved into greater detail for 27 species looking for physical traits that could explain the variations in species' responses to light and noise. A bird's ability to see in low light and the pitch of its call were related to species' responses to light and noise pollution, respectively.

The more light a bird's eye is capable of taking in, the more that species moved its breeding time earlier in the year in response to light pollution and the more that species experienced improved nest success as a result of light pollution. Noise pollution delayed nesting for birds' whose songs

are at a lower frequency and thus more difficult to hear through low-frequency [human noise](#). Mating decisions are made based on the male's song, and in some cases, females need to hear the male's song to become physically ready to breed.

These trait and environment-specific results have strong implications for managing wildlands.

"We show convincingly across a lot of species that noise and light pollution are having strong effects on wild populations," Francis said. "If there's a proposed development and land managers are worried about a bird that they have no information on, they can use this study to see whether the development is likely to affect the bird. Is it a forest bird? If so, it is likely that it is more sensitive to light and noise."

The study is the first step toward a larger goal of developing a sensitivity index for all North American birds. The index would allow managers and conservationists to cross-reference multiple physical traits for a species to assess how factors such as [light](#) and [noise](#) pollution would affect it and each species.

More information: Sensory pollutants alter bird phenology and fitness across a continent, *Nature* (2020). [DOI: 10.1038/s41586-020-2903-7](https://doi.org/10.1038/s41586-020-2903-7) , www.nature.com/articles/s41586-020-2903-7

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