

# Who turned on the light?!

## Light pollution causes some birds to get up early

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Street lamps are convenient to us for many reasons. When it is dark outside, they help us get to our urban destinations safely. In fact, they increase our comfort so much that we have littered our paths with artificial light sources, even far beyond the boundaries of our cities. However, have you ever considered the impact street lamps may have on your natural surroundings?

Many plants and animals have evolved sophisticated adaptations to use natural light-dark patterns for timing many of their daily and yearly activities. To them, this timing is so important that the entire success of their breeding season depends on it. For example, many temperate-zone birds time their breeding when their food source (caterpillars) is most abundant so they can feed their young with it. In order to time this well, they mainly depend on the changing light-dark cycles. Their main food source however (caterpillars) times its hatching mainly based on temperature conditions. Their food source in turn (young broad leaved tree shoots) also mainly depends on temperature for its budburst development. Light pollution may be harmful by changing these naturally evolved patterns and causing birds to mistime their seasonal activities.

To study the impact of light on bird's timing, I wanted to know if their most light sensitive activity, dawn song, was affected by light pollution. To this end, bird song was recorded in sites with artificial night lighting and without artificial night lighting from January through May 2012. Recordings started automatically before the first birds started singing and continued for three hours. For each day, six common European bird species were scored for the onset of their dawn song: Blue Tit, Great Tit, Chaffinch, Blackbird, Robin, and Song Thrush. Moreover, to find out how trees may respond to light condition changes, I investigated whether light pollution affects leaf development in four tree species: Sycamore Maple, Norway Maple, Small-leaved Lime, and Hornbeam.

The results suggest that five out of the six bird species (all except Chaffinch) begin their dawn song earlier in light polluted plots. It was found that this could be anywhere between 17 minutes earlier and 41 minutes earlier. Moreover, it was found that two tit species changed their dawn chorus onset more and more as they got closer to their peak egg laying date. This means there may have been a shift in the timing of their breeding. Leaf development was hardly affected, although a small effect was found in one of the four tree species (Sycamore Maple).

In summary, artificial light sources cause five out of six birds studied to sing earlier. This effect is somewhat local, because artificial light sources often do not penetrate foresty areas. However, with cities growing and artificial light sources expanding by up to twenty percent per year, it would be beneficial to look into lighting that minimizes ecological impact. Other solutions could be to consider more focused light sources or to not put light sources where they are not absolutely needed.

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