Not just for the birds: Man-made noise has ripple effects on plants, too

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A new study finds that man-made noise has ripple effects on plants such as piñon pine, whose natural seed dispersers tend to avoid noisy areas. Credit: Photo courtesy of Clinton Francis.

A growing body of research shows that birds and other animals change their behavior in response to manmade noise, such as the din of traffic or the hum of machinery. But human clamor doesn't just affect animals. Because many animals also pollinate plants or eat or disperse their seeds, human noise can have ripple effects on plants too, finds a new study.

In cases where noise has ripple effects on long-lived plants like trees, the consequences could last for decades, even after the source of the noise goes away, says lead author Clinton Francis of the National Evolutionary Synthesis Center in Durham, North Carolina.

The study appears in the March 21 issue of Proceedings of the Royal Society B.

In previous studies, Francis and colleagues found that some animals increase in numbers near noisy sites, while others decline. But could animals' different responses to manmade noise have indirect effects on plants, too?

Because they can't move, many plants rely on birds and other animals to deliver pollen from one flower to the next, or to disperse their seeds.

To find out what animal responses to noise might mean for plants, the researchers conducted a series of experiments from 2007 to 2010 in the Bureau of Land Management's Rattlesnake Canyon Wildlife Area in northwestern New Mexico.

The region is home to thousands of natural gas wells, many of which are coupled with noisy compressors for extracting the gas and transporting it through pipelines. The compressors roar and rumble day and night, every day of the year.

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of Land Management's Rattlesnake Canyon Wildlife Area in northwestern New Mexico. The region is home to thousands of natural gas wells, many of which -- such as the one shown here -- are coupled with noisy compressors that run day and night, every day of the year. Credit: Photo courtesy of Clinton Francis.

The advantage of working in natural gas sites is they allow scientists to study noise and its effects on wildlife without many of the confounding factors often associated with noisy areas like roadways or cities, such as pollution from artificial light and chemicals or collisions with cars.

To find out what animal responses to manmade noise might mean for plants, first the researchers did an experiment using patches of artificial plants designed to mimic a common red wildflower in the area called scarlet gilia.

Each patch consisted of five artificial plants with three "flowers" each — microcentrifuge tubes wrapped in red electrical tape — which were filled with a fixed amount of sugar water for nectar. To help in estimating pollen transfer within and between the patches, the researchers also dusted the flowers of one plant per patch with artificial pollen, using a different color for each patch.

Din levels at noisy patches were similar to a highway heard from 500 meters away, Francis explained. When the researchers compared the number of pollinator visits at noisy and quiet sites, they found that one bird species in particular — the black-chinned hummingbird (Archilochus alexandri) — made five times more visits to noisy sites than quiet ones.

"Black-chinned hummingbirds may prefer noisy sites because another bird species that preys on their nestlings, the western scrub jay, tends to

avoid those areas," Francis said.

Pollen transfer was also more common in the noisy sites. If more hummingbird visits and greater pollen transfer translate to higher seed production for the plants, the results suggest that "hummingbird-pollinated plants such as scarlet gilia may indirectly benefit from noise," Francis explained.

Another set of experiments revealed that noise may indirectly benefit some plants, but is bad news for others.

To find out if noise affected the number of piñon pine seeds that animals ate, the researchers scattered piñon pine seeds underneath piñon pine trees in noisy and quiet sites, using a motion-triggered camera to figure out what animals took the seeds. Credit: Photo courtesy of Clinton Francis.

In a second series of experiments at the same study site, the researchers set out to find out what noise might mean for tree seeds and seedlings, using one of the dominant trees in the area — the piñon pine (Pinus edulis).

Piñon pine seeds that aren't plucked from their cones fall to the ground and are eaten by birds and other animals. To find out if noise affected the number of piñon pine seeds that animals ate, the researchers scattered piñon pine seeds underneath 120 piñon pine trees in noisy and

quiet sites, using a motion-triggered camera to figure out what animals took the seeds.

After three days, a number of animals were spotted feeding on the seeds, including mice, chipmunks, squirrels, birds and rabbits. But two animals in particular differed between quiet and noisy sites —mice, which preferred noisy sites, and western scrub jays, which avoided them altogether.

Piñon pine seeds that are eaten by mice don't survive the passage through the animal's gut, Francis explained, so the boost in mouse populations near noisy sites could be bad news for pine seedlings in those areas.

In contrast, a single western scrub jay may take hundreds to thousands of seeds, only to hide them in the soil to eat later in the year. The seeds they fail to relocate will eventually germinate, so the preference of western scrub jays for quiet areas means that piñon pines in those areas are likely to benefit.

In keeping with their seed results, the researchers counted the number of piñon pine seedlings and found that they were four times as abundant in quiet sites compared with noisy ones.

It may take decades for a piñon pine to grow from a seedling into a full-grown tree, Francis said. This means the consequences of noise may last longer than we thought. "Fewer seedlings in noisy areas might eventually mean fewer mature trees, but because piñon pines are so slow-growing the shift could have gone undetected for years, he explained.

"Fewer piñon pine trees would mean less critical habitat for the hundreds of species that depend on them for survival," he added.

More information: Francis, C., N. Kleist, et al. (2012). " Noise

pollution alters ecological services: enhanced pollination and disrupted seed dispersal." *Proceedings of the Royal Society B.*

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