Native landscaping in urban areas can help native birds

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Residential yards mimicking nearby native vegetation and wildlands offer birds Â“mini refuges.Â” Credit: UMass Amherst

A recent study of residential landscape types and native bird communities in Phoenix, Ariz., led by a University of Massachusetts Amherst urban ecologist suggests that yards mimicking native vegetation and wildlands offer birds "mini refuges," helping to offset the loss of biodiversity in cities and supporting birds better than traditional grass lawns and non-native plantings.

The study, led by Susannah Lerman with her advisor Paige Warren at UMass Amherst, and Hilary Gan and Eyal Shochat at Arizona State University, is one of the first to use quantitative measures and a systematic approach, with 24-hour video monitoring, to assess and

compare foraging behavior of common backyard birds in yards in Phoenix, at the northern edge of the Sonoran Desert. It appears in the current issue of *PLOS ONE*.

It is also one of the first to conduct experiments to compare different types of a single urban landscape form (residential yards), Lerman says. Overall, the study found that desert-like, "xeric" yards had a more even bird community and superior habitat compared to moist, or "mesic," grass lawns in the Phoenix area.

She explains, "We already know that bird communities differ and there are more desert birds found in the desert-type yard. With this study, we're starting to look at how different yards function, whether birds behave differently by yard type. We do that using behavioral indicators, specifically foraging, as a way to assess the bird's perception of habitat quality between the two yard designs."

Lerman and colleagues conducted the experiment in 20 residential yards at least 1.8 miles (3 km) apart, making it unlikely that the same birds would visit more than one study yard. Half of the yards were xeric, or desert-like, while the other 10 were mesic, with exotic green lawns. Homeowners removed bird feeders before and during the 24-hour experimental data collection period during February and April 2010.

The researchers set up feeding stations (seed trays) in each yard to simulate resource patches like those used by wild birds. Plastic trays had 0.70 ounce (20 g.) of millet seed mixed into six lbs. (3 kg) of sand, and were left out on a low stool for 24 hours. Later, Lerman and colleagues removed the trays, sifted out and weighed uneaten seed to the nearest 0.01 gram. This represents the giving-up densities (GUD) or amount of seed remaining, which quantifies the foraging decision and quitting point for the last species visiting a seed tray. Trays were videotaped for the entire 24-hour experiment.

This experiment assumes that an animal behaving optimally will quit foraging a seed tray when its energy gains equal the "costs" of foraging, Lerman explains. Costs include predation risk, cost of digestion and missed opportunities to find food elsewhere. As time spent foraging a seed tray increases, so do costs associated with foraging. When a bird first arrives at the tray, seeds are easy to find, but this gets harder as it is depleted. Each bird makes a decision about whether to spend time searching in the tray or to move on to a new patch in the yard. The "giving up" point will be different for different species and in different environmental conditions. Birds visiting seed trays in yards with more natural food available will quit a tray sooner compared to birds in resource-poor yards.

Since the method only measures the foraging decisions for the last species visiting the seed tray, the researchers devised a mathematical model for estimating the foraging decisions for all visiting species. Using the videotapes, they counted every peck by every bird for each tray to calculate the relationship between the number of pecks and grams of seed consumed (the GUD) for each seed tray. This was the GUD-peck ratio for the last species visiting the seed tray.

They then estimated the seed consumption (GUD) for all other species visiting the seed tray based on the number of pecks per tray when each species quit. "We know how many pecks each species had and can put that number into the model and calculate the number of grams at that point," Lerman explains. This greatly enhances the GUD method by expanding the ability to assess foraging decisions for all species visiting trays.

In all, 14 species visited the trays, 11 of which visited both yard types. Abert's towhee, curve-billed thrasher (species unique to the Sonoran desert), house finch and house sparrow were the most widespread tray visitors.

In this study, the researchers found that birds foraging in mesic yards depleted the seed trays to a lower level (had lower GUDs) compared to birds foraging in xeric yards. Further, species that visited trays in both yard designs consumed more seed from trays placed in mesic yards, indicating lower habitat quality compared to the xeric yards. Similarly, foragers in the desert-like yards quit the seed trays earlier due to greater abundance of alternative food resources in those yards, spending more time foraging in the natural yard and less at the seed tray.

Lerman says that by videotaping the trays, counting pecks and measuring giving-up points by species, this work also advanced the GUD method, allowing researchers to disentangle some of the effects of bird community composition and density of competitors, and how these factors affect foraging decisions between two different landscape designs. Results continue to build evidence that native landscaping can help to mitigate the impacts of urbanization on common songbirds, she says.

Provided by University of Massachusetts Amherst