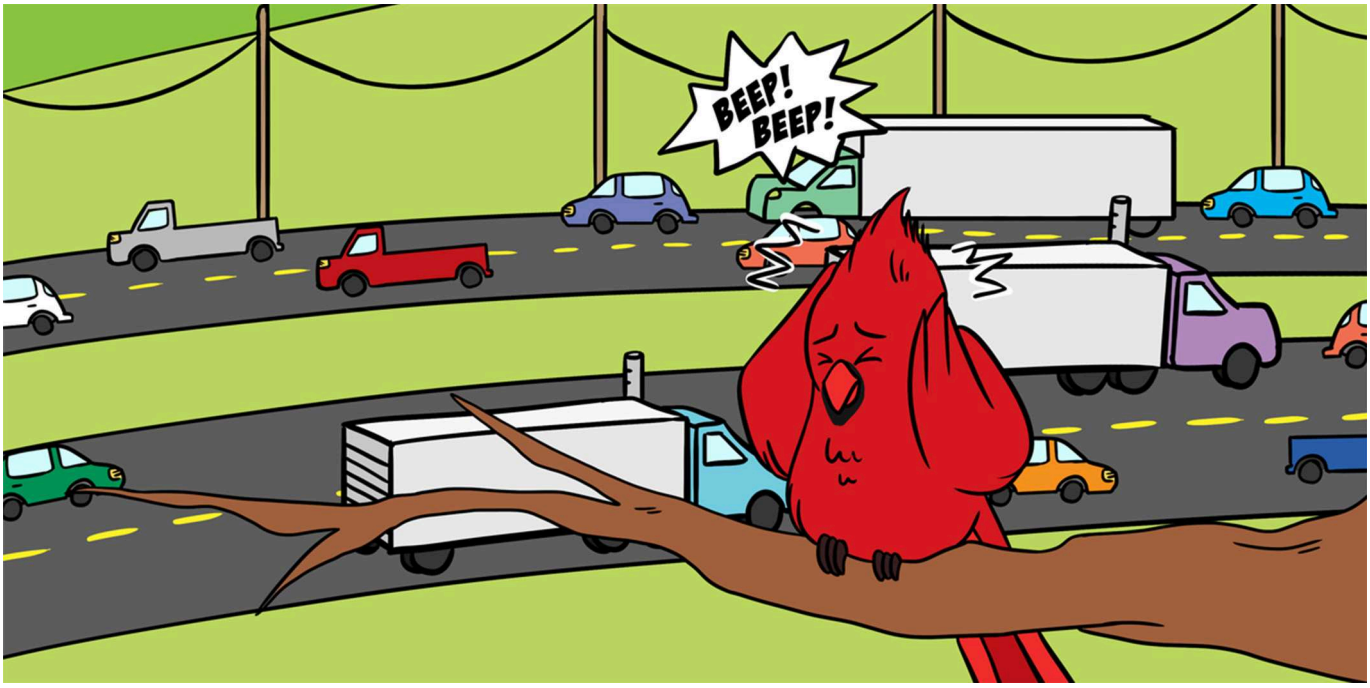
frontiers FOR YOUNG MINDS

BIODIVERSITY
Published: 13 September 2019
doi: 10.3389/frym.2019.00109



WHY DIDN'T THE BIRD CROSS THE ROAD?

Christopher D. Johnson**, Daryl Evans and Darryl Jones

Environmental Futures Centre, Griffith University, Nathan, QLD, Australia

YOUNG REVIEWERS:

SYRACUSE ARTS ACADEMY

AGES: 12–14

TALI

AGE: 13

Roads are very useful: we build them so we can travel to the grocery store, see our friends, and take day trips to the beach. However, when we clear land to build our roads, we destroy the homes of other animals. If your home was destroyed, what would you do? Find a new home of course! But roads make this very difficult for other animals, at least for larger animals. Not many studies have looked into the impacts of roads on smaller animals, such as birds. So, we decided to investigate this ourselves. Why birds? They have wings and can fly, right? Surprisingly, we found fewer birds crossed as roads became wider. We also found that the small birds that need forests to survive were the ones most impacted by roads. These findings show us that, despite appearances, birds are as vulnerable as other animals to human activities.

HOW DO ROADS AFFECT BIRDS?

What is it that is so awesome about birds? If you ask people that question, chances are they will likely respond with "they can fly!" Birds can fly away when chased by a dog, they can catch food in the air

(some are even quite acrobatic), and they can even fly above and around obstacles, such as buildings and trees. It appears that there is not much a bird cannot do (other than use a computer). Unfortunately, because many people have thought this in the past, very few studies have looked at birds in situations where they must move between **habitat** patches. However, recent studies have shown that birds may find it very difficult to cross even small open spaces like roads when moving between forest patches [1].

HABITAT

The natural home or environment of an animal, plant, or other organism.

HABITAT FRAGMENTATION

The breakdown of a large, continuous habitat into several smaller, separate habitats.

Scientists have suggested several reasons to explain why building roads may be bad for some birds. One theory is that, by building a road, we separate forests and reduce the area of habitat available for animals to live in, a process that we call **habitat fragmentation**. Habitat fragmentation is a big problem for many species, because conditions may change very quickly within the remaining habitat fragments and become unsuitable for the species, particularly around the edges (in this case, the areas nearby the road). Try to imagine waking up one morning to find that the roof of your house is gone, and for some reason you are unable to replace it. Let us say you decide to stick around for a bit. You will soon notice that nothing stays dry when it rains, it gets too hot in summer and too cold in winter (and you have no air conditioning), you have to share your house with some of the other local creatures (and you may not always get along), there never seems to be enough food in the pantry, and your friends would not come around because the place is a mess. You may be able to continue living in your old home for a while, but sooner or later you will want to move elsewhere! This is what it might be like to be a bird living in an area through which a road is built.

Other studies have found that when roads are heavy with traffic and noise, birds in the surrounding habitats are more likely to experience stress [2]. Exposure to loud noises is also known to mask the calls and songs of some birds [2]. For example, imagine you are trying to have a conversation with your friend out in front of your school and you are interrupted by a loud passing truck. This is very problematic for birds, because they use their songs to communicate with other birds and to defend their territories. So, if a bird species is unable to change the sound of its calls, then that species will be more likely to move to a quieter area where it can be heard [2]. The end result will be that the area near road will be left with only a few species—those that are noise tolerant.

However, all of this information comes from only a few studies. In fact, most studies have focused on the effects of roads on larger animals, such as bears, moose, and elephants. Of the few instances in which birds were studied, most were performed in the northern hemisphere, where both the forests and the birds are very different to those found in Australia. In Australia, for example (where our study was performed), many of the birds can fly great distances, sometimes across the whole of Australia, often because of unpredictable weather.

Birds in other parts of the world where the weather is more predictable, such as England and America, do not have to fly such long distances. No previous studies of the effects of roads on birds had been performed in Australia, and so this got us thinking, "maybe our birds are different from those in the other studies." With this in mind, we asked three questions:

1. Do different road sizes change the number of bird species found in the forests nearby?
2. Do different road sizes change to the number of bird species crossing the roads?
3. Are the types of birds crossing the roads different from the types found in the forest nearby?

DESIGNING THE EXPERIMENT

We used a simple study design: good old-fashioned bird watching and carefully recording what we saw. To be a little more specific, we:

1. Found 12 roads that were suitable for our study: four small, four medium, and four large;
2. Sat at each road for 20 min, counting the numbers and types of birds crossing from one side of the road to the other;
3. Walked 100 m off the road from both sides at each site and counted the types of birds living there, for 20 min; and
4. Revisited each site and repeated the counts eight times, between August 2015 and February 2016.

What made our study different from other related studies was that we decided to try something new: we looked at roads of different sizes (two, four, and six lanes) and analyzed the road-crossing abilities for species of different body sizes ($<$19, 20–29, $>$30 cm) and life-history traits (small forest-dependent, large forest-dependent, honeyeater, and urban-tolerant bird species). We also used some assessment tools and mathematical methods to ensure that we had similar forests and birds at each of our study sites.

FEWER BIRDS CROSSED WIDER ROADS

Would you be willing to cross a small street to get to your friend's house? Now, what if we replaced that street with a busy highway, would you still be willing to cross that road to get to your friend? It turns out that birds also do not like to cross wider, busier roads. Fewer species of bird were able to cross wider roads in our study (see Figure 1). What was even more surprising was that we also saw this pattern in the forests nearby these roads—fewer birds were present in the forests near large roads than in the forests near small roads. Astoundingly, it

Figure 1

Shows the total number of bird species to cross over small, medium, and large road types. Fewer species of bird crossed over large roads compared to small and medium roads.

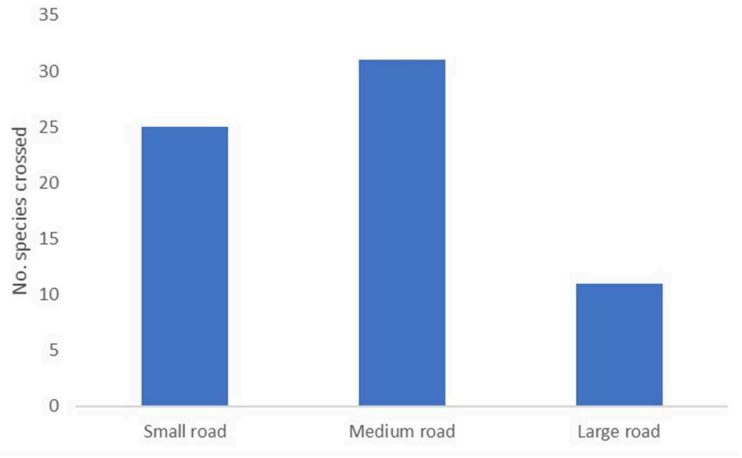


Figure 1

Figure 2

Shows the total number of bird species of different body types to cross over small (blue), medium (orange), and large (gray) road types. The number of small bird species that were seen to cross declined more rapidly as road type increased compared to medium and large birds. No small birds were seen to cross large roads.

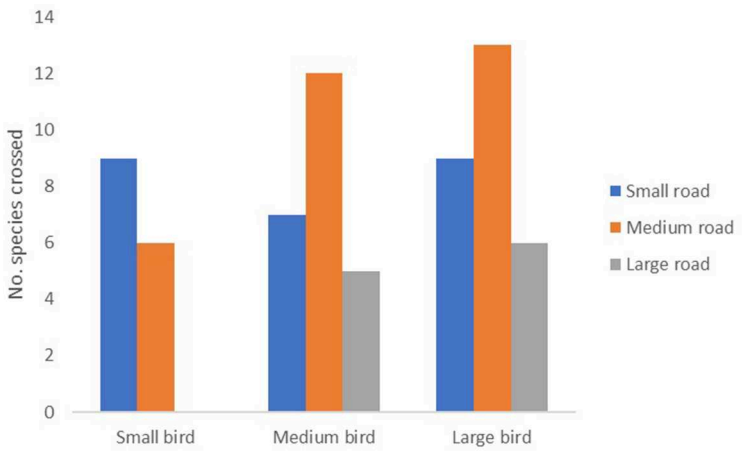


Figure 2

turns out that different types of birds are differently affected. We found that the birds most unlikely to cross roads (of any size) were birds that were small and loved to live in forests, whereas large birds did not seem to mind crossing roads all that much (see Figure 2). Importantly, the results we found in this experiment are similar to those found in other studies [1].

OKAY, SO FEWER BIRDS CROSSED ROADS. BUT WHY?

Why do you think the small forest birds were the most affected by roads? For starters, this group of birds really likes to live in areas with dense plant cover, where there is plenty of food and space available for their families (and enough for other birds, too), and shelter to hide from hungry predators [3]. Road construction often results in changes to the surrounding environment. For example, the dense forest next to the road may become a more open forest (something that we saw a lot of near our roads), and food and space that was previously there

becomes harder to find, so many different animals may be fighting over it. Traffic noise may also make life more difficult. Some of the birds may have trouble calling to and being heard by others and the traffic noise also helps the hungry predators that do not want to be heard when hunting [2]. To make matters worse, the new lights, powerlines, and gardens that often come along with new roads are perfect for some of the bigger and meaner birds, such as the noisy miner and magpie, and these large birds will happily kick the small birds out, to keep these areas for themselves [3].

These are some of the things that the small birds must deal with in the forest near the road. Even if these small birds do manage to survive these challenges, they still need to cross the road. Similar to the results of many previous studies, we counted many more large birds crossing roads than small birds, especially the larger roads. The wings of small forest birds are generally suited for short flights in dense tree cover, so a wide treeless gap, such as a road may be impossible for them to cross in a single flight, and therefore they avoid crossing roads [4]. Predator activity also makes crossing more perilous for small forest birds, because they are very easy for predators to catch when they are outside of tree cover [5].

WHY ARE OUR FINDINGS IMPORTANT?

ECOSYSTEM SERVICES

The direct and indirect contributions of ecosystems to human well-being.

ECOSYSTEM

A biological community of interacting organisms and their physical environment.

KEYSTONE SPECIES

A species that plays a unique and critical role in maintaining the health and function of an ecosystem; without this species, the ecosystem would be very different.

Habitat fragmentation is currently recognized as one of the greatest threats to the survival of many of Earth's species, birds included. What is even more worrying is that humans benefit from the many vital services, called **ecosystem services** that birds provide. For example, many birds are important predators of "pest" species, such as mosquitos and rodents, and birds can also be pollinators of many plant species [6]. In fact, one study found 33% of birds to be involved in spreading the seeds of plants that are medically and economically importance to humans [6]. There are even some birds that are so critical to the functioning of the **ecosystems** they live in that, without them, these ecosystems fall apart. We call these critical species that hold ecosystems together **keystone species**.

Unfortunately, as the human population continues to grow, so too does our demand for more houses and better roads. This has resulted in the widespread destruction and fragmentation of forests, which in turn threatens the survival of birds and the ecosystem services the birds provide us. It is therefore important to better understand how birds behave when they encounter man-made changes to the environment, such as roads.

We hope that our findings will help bring birds into the focus of future research. For example, it will be interesting to compare the way birds react to more natural openings in forest cover, such as clearings in the forest, or rivers. Our work, along with these future

studies, will hopefully give us a better chance at protecting our wildlife while we still meet our need to move from one place to another using roads.

ACKNOWLEDGMENTS

The authors would like to thank the students of the Syracuse Arts Academy, and Tali for their review and invaluable contribution towards this article.

ORIGINAL SOURCE ARTICLE

Johnson, C. D., Evans, D., and Jones, D. 2017. Birds and roads: reduced transit for smaller species over roads within an urban environment. *Front. Ecol. Evol.* 5:36. doi: 10.3389/fevo.2017.00036

REFERENCES

1. Lees, A., and Peres, C. 2009. Gap-crossing movements predict species occupancy in Amazonian forest fragments. *Oikos* 118:280–90. doi: 10.1111/j.1600-0706.2008.16842.x
2. Reijnen, R., and Foppen, R. 2006. Impact of road traffic on breeding bird populations. *Ecol. Transp.* 12:255–74. doi: 10.1007/1-4020-4504-2_12
3. Kutt, A. S., and Martin, T. G. 2010. Bird foraging height predicts bird species response to woody vegetation change. *Biodivers. Conserv.* 19:2247–62. doi: 10.1007/s10531-010-9840-y
4. Keast, A. 1996. Wing shape in insectivorous passerines inhabiting New Guinea and Australian rainforests and eucalypt forest/eucalypt woodland. *Auk* 113:94–104.
5. Desrochers, A., and Hannon, S. 1997. Gap crossing decisions by forest songbirds during the post-fledging period. *Conserv. Biol.* 11:1204–10. doi: 10.1046/j.1523-1739.1997.96187.x
6. Wenny, D., Devault, T., Johnson, M., Kelly, D., Sekercioglu, C., Tomback, D., et al. 2011. Perspectives in ornithology: the need to quantify ecosystem services provided by birds. *Auk* 128:1–14. doi: 10.1525/auk.2011.10248

SUBMITTED: 18 December 2018; **ACCEPTED:** 13 August 2019;
PUBLISHED ONLINE: 13 September 2019.

EDITED BY: Becky Louize Thomas, School of Biological Sciences, Royal Holloway, University of London, United Kingdom

CITATION: Johnson CD, Evans D and Jones D (2019) Why Didn't the Bird Cross the Road? Front. Young Minds 7:109. doi: 10.3389/frym.2019.00109

CONFLICT OF INTEREST STATEMENT: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

SYRACUSE ARTS ACADEMY, AGES: 12–14

Syracuse Arts Academy is a public charter school near Salt Lake City in Syracuse, Utah. Students at SAA have a wide variety of interests and enrich their interests with an equally robust variety of arts and electives. These young reviewers are part of the eighth grade integrated science class.

TALI, AGE: 13

I am a 13 years old girl who loves drawing and reading. I am in the eighth grade and I like all of my classes. I also spend a lot of time training in competitive gymnastics.

AUTHORS

CHRISTOPHER D. JOHNSON

Christopher Johnson is a restoration ecologist in the early stage of his career, and recent Griffith University alumni. His passion for the environment comes from his long-standing interest in birds, in particular how their activities and behaviors may be influenced by people within the urban setting. Chris specializes in integrated ecosystem restoration, and over the past decade has worked in close unison with several entities, including government bodies, not-for-profit community groups, and private businesses, across several projects to promote ecological sustainability and achieve balanced outcomes. *christopher.johnson2@uqconnect.edu.au

DARYL EVANS

Daryl is an Ecologist with over 17 years' experience working across government, commercial, and not-for-profit sectors. He specializes in holistic approaches to land and river-scape scale restoration and management. Daryl has successfully integrated community, government and commercial interests to achieve ecologically sustainable outcomes across multiple projects. Daryl is experienced with community-based engagement programs working from the grass roots level through management committee positions. His work has been recognized via government, industry, and academic awards.

DARRYL JONES

Darryl Jones is an urban ecologist based at Griffith University in Brisbane Australia. He is particularly interested in how some species adapt to urban landscapes and why lots of others do not. His work tries to understand the many and complex ways that humans and nature interact, sometimes as conflict and sometimes as coexistence. Over the past decade his work has focused on the ecological impact of traffic and roads and on ways that allow animals to cross roads safely.