The Influence of Traffic on Edge Use by Boreal Birds

Alaina Mitchell, Lionel Leston, Erin Bayne, Sofia Rivasplata
Department of Biological Sciences, University of Alberta

Introduction

Edges are transition zones between different habitats (e.g., forest and roadside)(Doty, 2022).

Each year roadbuilding creates more edge in boreal forest landscapes(*Boreal Forest*, 2022).

Edge effects are environmental influences spreading from one habitat into another(e.g., noise, light, organisms) that can increase or decrease forest birds along forest edges(Doty, 2022).

Knowing how traffic influences edge effects could aid industry planning and conservation.

Road traffic could affect actual bird abundance or our detection of birds (by affecting song rates or our ability to hear songs).

Question

- Does intensity of traffic influence singing activity, abundance, and detectability of Swainson's Thrush(SWTH), Tennessee Warbler(TEWA), and White-throated Sparrow(WTSP)?

Methods

Autonomous Recording Units(ARUs) are programmable recording devices that record audio data using microphones.

The Bioacoustics Unit has ARUs set up across Alberta. For this project, we looked at ARUs that were set up 0, 50, 100, and 150 meters away from various roads in Alberta.

The website Wildtrax stores ARU recordings and turns them into spectrograms, graphs of time and sound frequency(Fig. 1).

We used Wildtrax to manually tag all the songs of SWTH, TEWA, and WTSP as well as any vehicles that appeared in the recordings.

We tested whether the number of songs and individual birds we heard changed at different distances from the road and whether the amount of traffic detected in that recording affected the birds' edge response.

By comparing how many cars drive past with how close the birds are to the road, we can determine if the level of traffic influences edge use by SWTH, TEWA, and WTSP.

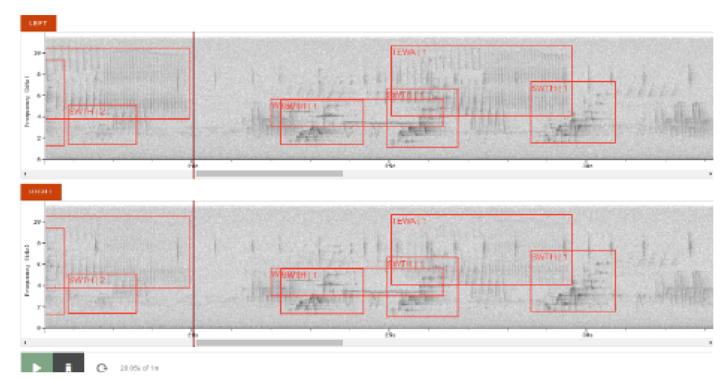


Figure 1: A spectrogram with various birds tagged. This is an example of what the ARU recordings look like as spectograms. Time is on the X axis and sound frequency is on the Y axis. Tagging spectrograms was how we processed the data.

Results

No vehicles observed = 0% of recordings at a specific distance with one or more vehicles present
Average = 6% of recordings at a specific distance with one or more vehicles present
Many = 20% of recodings at a specific distance with one or more vehicles present

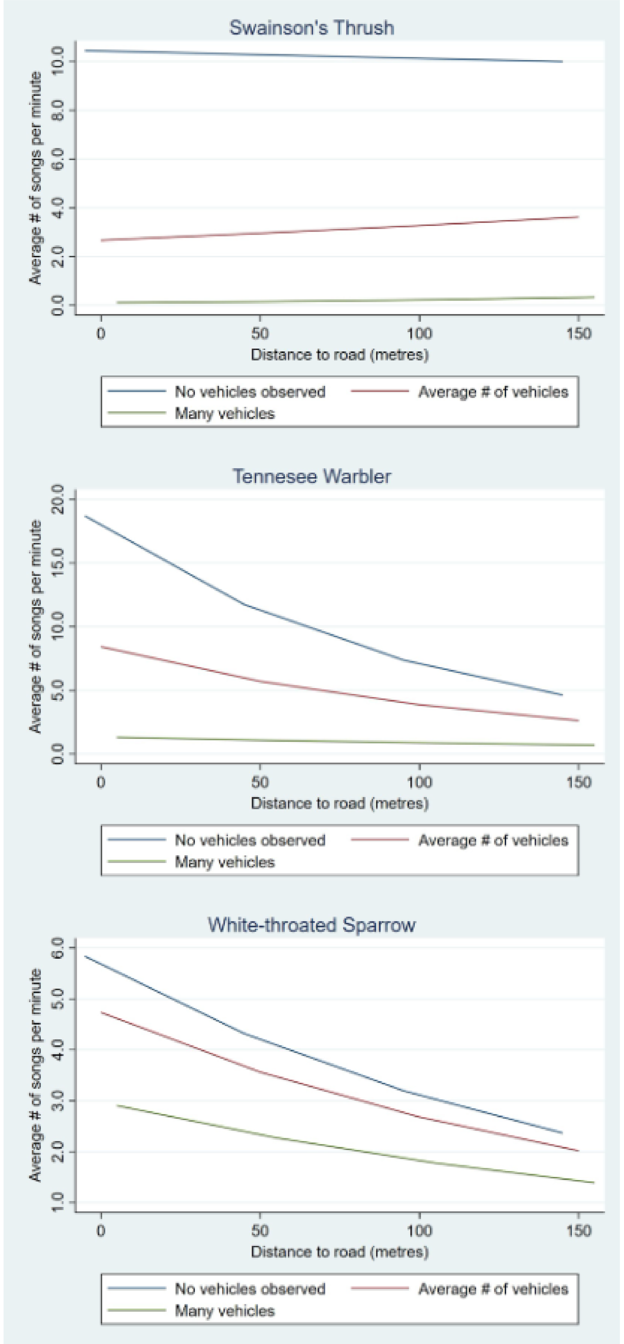


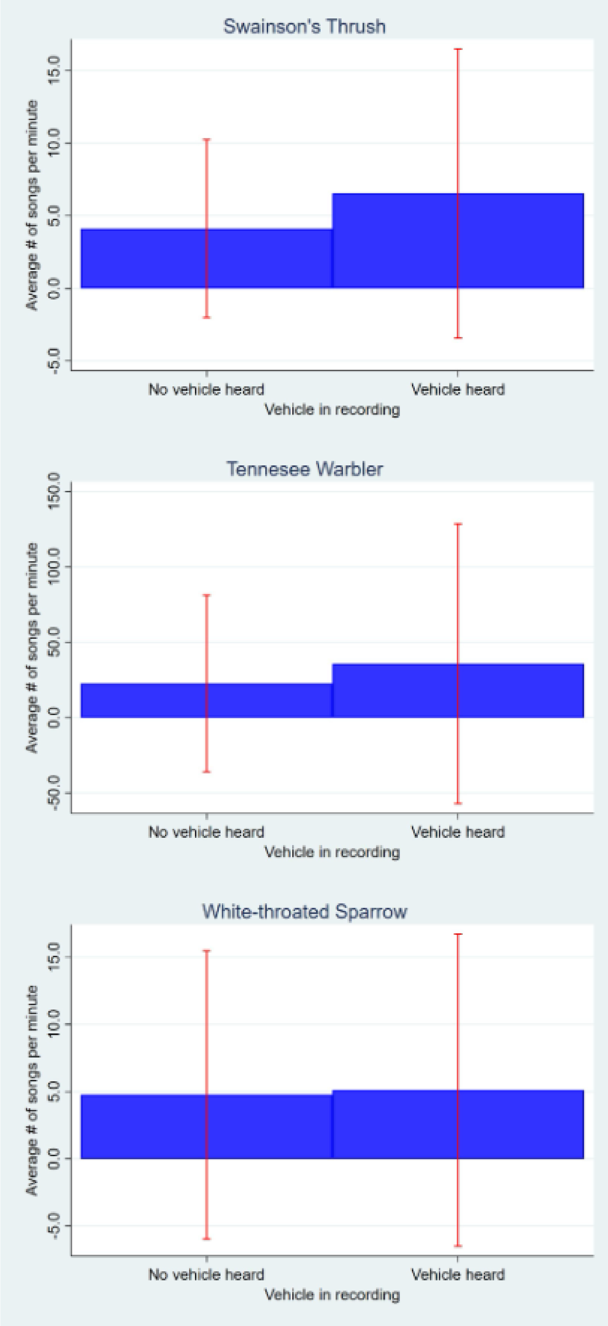
Figure 2

The evidence indicates that a higher traffic intensity is correlated with less bird songs.

This could have two causes:

1. Birds stop singing when vehicles are present and/or are less easy to hear by observer; and
2. Fewer individual birds exist in areas with higher traffic intensity, therefore, there are less bird songs, overall.

Number of songs per minute declines with increasing traffic intensity for all three species(Fig. 2).



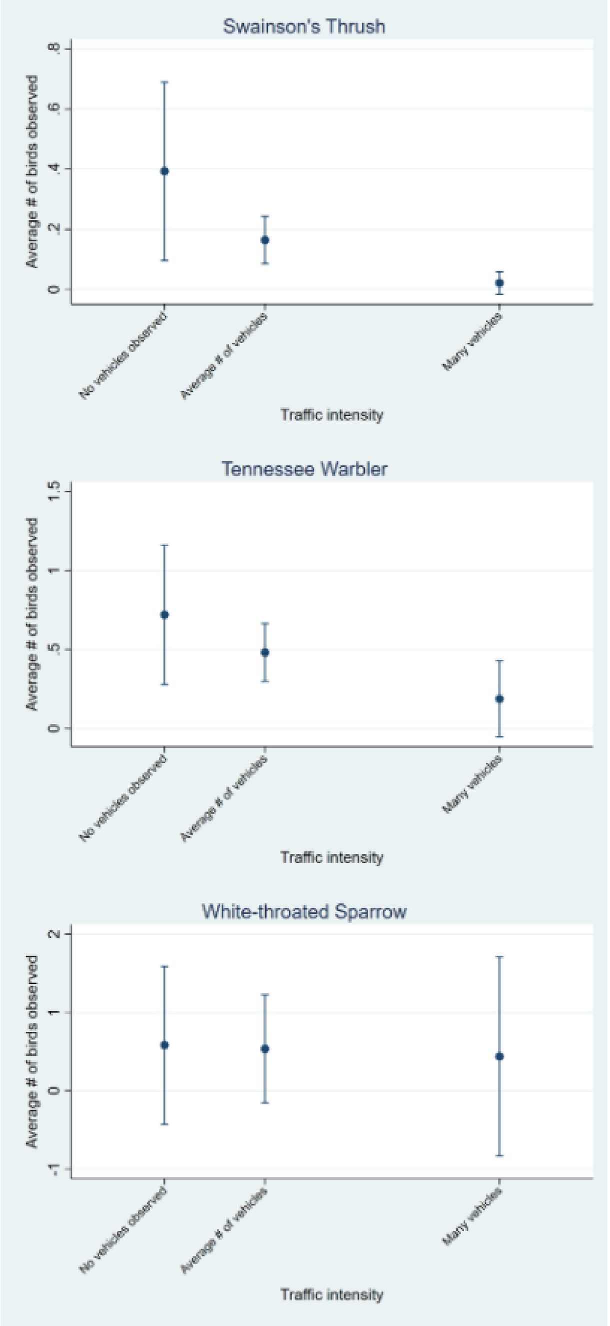


Figure 3: This shows the relationship between how often SWTH, TEWA, and WTSP sing when cars are and are not present in a recording.

There is no significant difference in the average number of songs per minute when there are cars present vs no cars present in the recordings.

Figure 4: This shows how the amount of vehicles observed affected how many birds were observed in each species (SWTH, TEWA, and WTSP).

Where cars are present there are less SWTH and TEWA. WTSP numbers are not affected by the presence of cars. This means that for SWTH and TEWA, higher traffic intensity causes birds to avoid the road.

Figure 5. From left to right: Swainson's Thrush, Tennessee Warbler, White-throated Sparrow((*Search, All About Birds, Cornell Lab of Ornithology*, 2022)

Conclusion

In absence of traffic, TEWA and WTSP (but not SWTH) song rates were higher along road edges. Song rates in all three species and counts of SWTH and TEWA (but not WTSP) declined with increasing traffic volume.

Traffic volume initially apears to affect song activity and counts of birds but not our ability to detect songs in recordings.

Future Directions: A program can be made to automate the process of tagging cars. This will allow us to use more data to study how traffic intensity affects edge use and detection of birds.

References

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