PhD Dissertation
Department of Environmental Science and Policy
George Mason University

Candidate: Katherine Gentry
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Title: The Role Of Anthropogenic Noise On Song Behavior: Implications For Individual Fitness In Territorial Songbirds

Dissertation Director: Dr. David Luther
Committee: Dr. Megan McKenna, Dr. Elizabeth Freeman, and Dr. Thomas Lovejoy.

ABSTRACT

Acoustic communication involves the transmission and reception of signals that carry important messages, such as territory ownership, mate attraction, and predation risk. However, background noise can interfere with acoustic communication and disrupt interspecific and intraspecific interactions, especially in urban landscapes where background noise is elevated by anthropogenic activity. A wide variety of animal taxa alter their behavior in the presence of relatively high levels of anthropogenic noise. It is important to understand how behavior changes in relation to anthropogenic noise because behavioral modification can have larger implications for fitness, reproductive success, and population viability.

In this research, a territorial songbird species, Nuttall's White-Crowned Sparrow *(Zonotrichia leucophrys nuttalli)* (NWCS), is used to investigate how song behavior is modified in relation to background noise in rural and urban landscapes. Birds secure territories and attract mates through song (an acoustic signal), so behavioral changes were studied in terms of song structure integrity, song activity, and antipredator response. Specifically, three studies were conducted to determine (1) if both rural and urban males alter their song in immediate response to fluctuations in background noise, (2) if spatiotemporal patterns of song activity change in relation to anthropogenic noise or natural noise, and (3) if antipredator behavior changes across the urban-rural gradient and in relation to background noise levels.

The results show that urban songs are more plastic than rural songs, there is a spatial relationship between song activity and levels of anthropogenic noise and natural abiotic noise, and the strength of antipredator response to a natural alarm stimuli changes across urban-rural disturbance gradients and in relation to background noise. These findings provide new insight into how the trade-off between signal reception, time-energy expenditure, predation risk and opportunities to attract mates and defend territories changes across disturbance gradients. The NWCS is a model system, so the results can help inform noise management policies and have implications for population management in protected areas, even for disturbance-tolerant species.