

Relating wildlife behavioral responses to noise to ecological consequences

By Jesse R. Barber and Kurt M. Fristrup



THE EFFECTS OF NOISE ON WILDLIFE

are most commonly documented by observations of behavioral responses, because experimental trials are brief and readily replicated. Studies that document changes in population density or spatial distribution are more difficult and less common, but they address ecological issues that relate directly to resource conservation. Can focal, behavioral studies provide reliable indications of ecological consequences of noise? Yes, if the immediate response measure relates directly to demographic and ecological processes.

For example, recent data collected on the effects of noise on breeding boreal songbirds showed that pairing success was significantly reduced in noisy environments around natural gas compressor stations (Habib et al. 2007). Noisy areas were disproportionately populated by younger males, and they were less successful at attracting mates than were young males

in quiet areas. Subsequent survey work by the same laboratory confirmed the expected ecological consequences: passerine birds had a density 1.5 times higher in quiet control sites than they did near loud compressor stations (Bayne et al. 2008).

Two sets of studies on the responses of ungulates to anthropogenic disturbance events associated with high levels of noise (roads, oil/gas extraction, and military training) illustrate misleading inferences from small spatial-scale, focal studies. Decades of research have been devoted to the responses of caribou (*Rangifer tarandus*) to human activities; 85 of these studies were reviewed by Vistnes and Nellemann (2007). They found that only 13% of focal, behavioral studies document significant responses. This suggests low-frequency impacts, and the evidence could be dismissed as equivocal. However, 83% of the studies conducted over large spatial scales document substantial negative ef-

Caribou roam the Arctic tundra of Alaska's North Slope along the 414-mile Dalton Highway, also known as the Haul Road. Research suggests caribou reduce their activity 50–95% within 3 miles of human infrastructure and activities.

fects. Within 5 kilometers (3 mi) of human infrastructure or activities, caribou reduce habitat utilization by 50–95% (see photo). Studies of endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*) yielded a similar pattern: minimal behavioral responses to noise (Krausman et al. 2004), but landscape-scale analysis revealed significant preference for quiet and avoidance of noise (Krausman et al. 2004).

Failure to observe behavioral responses to noise during focal experiments does not provide a strong basis for dismissing ecological impacts. These studies indicate the importance of selecting behavioral response metrics that are intimately related

Demographically important behaviors that occur during limited times of the year—breeding, provisioning offspring, defending offspring against predation—are likely to provide persuasive positive evidence of noise impacts.

to population consequences. However, negative evidence of behavioral responses to noise, even with the best metrics, cannot be as decisively interpreted. The prevalence of documented noise impacts suggests the need for adaptive management at the appropriate spatial scale even when initial studies indicate no significant problems.

What about behavioral responses that are not accompanied by population consequences? Fishery or game resource managers would dismiss these impacts, but the National Park Service is required to preserve for future generations the opportunity to experience unimpaired wildlife resources. Shifts in habitat use and activity schedules may render wildlife less accessible to visitors, and behavioral adaptations to noise constitute degradation of the authentic ecological conditions that parks were created to preserve.

References

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About the authors

Jesse R. Barber is a postdoctoral research fellow in the Department of Fish, Wildlife, and Conservation Biology at Colorado State University, Fort Collins, Colorado. He can be reached at 970-491-0672 and by e-mail at jesse.barber@colostate.edu. **Kurt M. Fristrup** is an acoustic scientist with the NPS Natural Sounds Program, part of the Natural Resource Program Center, also in Fort Collins. He can be reached at kurt_fristrup@nps.gov.