

Playing it by ear: Understanding the costs of noise pollution in protected areas

INVISIBLE, PERVASIVE, THREATENING, AND NOT YET FULLY understood: chronic noise is the other air pollution. Despite a growing foundational literature on noise in natural settings, the unanswered questions and unknown consequences of being noisy neighbors are piling up in ecologists' in-boxes. In a "state-of-knowledge" address to the scientific community, Barber et al. (2009) emphasize that the vast and interconnected nature of the aural landscape of a terrestrial ecosystem, while not yet fully understood, is being substantially altered by anthropogenic noise. When predator footfalls are masked by the ubiquitous dull whoosh of traffic, when shipping noise interrupts a male songbird's aria, when owls and bats cannot efficiently localize prey because of sounds in a specific spectrum, and when that prey cannot perceive the incoming wing beats, animal behavior and possibly populations are altered. In this comprehensive review of the research concerning anthropogenic noise exposure on protected lands, the authors conclude that immediate action is needed to manage America's din, for even in the most remote wilderness, animal habitats can be notably affected by the sounds emanating from adjacent urban development and motorized vehicles on or near the site.

One problem with most studies to date, however, is that they have not separated human activity generally from the effects of noise specifically. Barber et al. (2009) call for greater scrutiny: Is animal vigilance dulled by background noise? Does low-frequency anthropogenic noise inhibit perception of higher-frequency signals? Are sounds made by predators being masked, and is their cognition affected by the masking? Do animals directly perceive human sound as such and associate it with the threat of predation? As humans struggle to converse in a noisy restaurant, so too does chronic noise interfere with the abilities of wildlife to perform efficiently over time. And just as people will adapt by speaking more loudly or smiling in uncertain agreement, some, but not all, animals can adapt.

Chronic noise masks not only deliberate call-and-response soundings that help to maintain community structure but also

acoustical eavesdropping of one species on the location and activities of another—a crucial tool in assessing risk for many terrestrial animals. “The acoustical environment is not a collection of private conversations between signaler and receiver but an interconnected landscape of information networks and adventitious sounds,” write Barber et al. (2009).

With each investigation, researchers are learning that the soundscape of the natural world is more connected, and the masking effects of anthropogenic noise more destructive, than they may have realized. Among terrestrial animals, clear and substantial changes in reproductive success, density and community structure, and foraging and antipredator behavior have all been observed in response to noise—though birds, primates, and crustaceans have been observed to alter their vocalizations to reduce the effects of masking in an attempt to maintain group cohesion.

“Taken collectively, the preponderance of evidence argues for immediate action to manage noise in protected natural areas,” write Barber et al. (2009). Resource managers can begin by targeting highly fragmented and heavily visited locations as the priority for their own experiments in adaptive management. For instance, quieting efforts could begin with the main noise management solution at a resource manager’s disposal: increased use of shuttle buses and mass transit into and around the protected area.

With almost 5 trillion vehicle-kilometers (3.1 trillion miles) now traveled on U.S. roads each year, transportation networks are the worst aural offender. As the U.S. population increased by approximately one-third between 1970 and 2007, traffic on U.S. roads nearly tripled. Additionally, aircraft traffic at least tripled between 1981 and 2007. Thus, noise management is now an “emergent” issue for protected lands. Reverberations from the explosive growth of the U.S. transportation network are heard by most, if not all, of its neighbors—especially the ones who cannot call in a noise complaint. To mitigate the effects of chronic noise in protected areas, quieting methods must factor in ecology, wildlife biology, mathematics, and physics. Though noise monitoring and management are a priority of the National Park Service, as the authors attest, great strides still need to be taken to understand the consequences of noise and how to manage fairly for its reduction.

Reference

Barber, J. R., K. R. Crooks, and K. M. Fristrup. 2009. The costs of chronic noise exposure for terrestrial organisms. *Trends in Ecology and Evolution* 24(3):180–188.

—Jonathan Nawn, Amy Stevenson, and Jeff Selleck