

Tolerating noise and the ecological costs of “habituation”

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ANIMALS ARE SAID TO BE HABITUATED

when their response to a novel stimulus diminishes over time. Habituation can be viewed as adaptive when the stimulus is irrelevant to the animals. Animals that exhibit tolerance of noise are often cited as evidence that noise impacts to wildlife are transient and of neutral ecological consequence. Both theory and observations refute the equation of noise tolerance with absence of impact.

At the Monkey Mia resort in Australia, a population of bottlenose dolphins (*Tursiops* spp.) has been exposed to tourism for more than 40 years. Experimental studies of dolphin reactions to boats documented much stronger responses by dolphins outside of tourist areas than inside tourist areas (Bejder et al. 2006). Two decades of surveys at these sites documented a decrease in the dolphin population inside tourist areas coinciding with an increase outside these areas. Dolphins have long generation intervals, so these studies implicate displacement of sensitive individuals, not habituation.

An apparent increase in noise tolerance may actually indicate more severe constraints on animal behavior (Gill et al. 2001). Declining foraging success and body condition can cause animals to diminish their responses to disturbance stimuli because they cannot afford decreased feeding rates (Stillman and Goss-Custard 2002). Recent work with turnstones (*Are-naria interpres*, see photo) has shown that birds whose food resources were experimentally supplemented flushed earlier and flew farther when approached (Beale and Monaghan 2004).

If animals demonstrate behavioral or distributional changes to acoustical disturbance, management action can be taken. However, in the absence of clear impacts, we suggest managers strive to ensure that (1) sensitive individuals have not already been displaced; (2) decreased body condition, critical habitat needs, social forces, lack of habitat experience, and/or expensive investment in territory formation are not preventing animals from reacting to the disturbance (Bejder et al. 2009); and (3) alternative explanations are not available. For example, in Grand Teton National Park, mother moose (*Alces alces*) have been giving birth closer to the road over the last 10 years. In the absence of data indicating that this shift protects moose calves from recolonizing, road-averse grizzly bears (*Ursus arctos*) exhibiting this behavioral pattern may have been interpreted as evidence for habituation to the roadway (Berger 2007).

Managers should minimize wildlife exposure to noise and avoid habituation to noise wherever possible. However, in situations where acoustical disturbances to wildlife cannot be avoided, park managers should consider structuring human activities to foster habituation. A predictable timetable enhances opportunities for learning. Animals can distinguish between routine and anomalous occurrences of human noise; they might productively utilize habitats that they would otherwise avoid, or perform critical activities during times of reduced human presence. Scheduling can provide more control over interactions between visitors and wildlife, and offer more reliable opportunities to view

wildlife under less perturbed conditions. Given increasing evidence of animals avoiding traffic on roads (e.g., Gagnon et al. 2005; Waller and Servheen 2005; Kerth and Melber 2009), scheduling of visitor access to protected lands will likely increase habitat connectivity, reduce wildlife collisions (thus increasing visitor safety), and increase overall habitat quality in the last of our wild places.

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Ruddy turnstones forage by probing and flipping over stones along rocky shores in search of insects and other invertebrate prey. Animals that depend on specialized habitats may become tolerant of disturbance owing to lack of readily available, alternative habitats. In contrast to habituation, tolerance may carry ecological costs.

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