National Park Service
U.S. Department of the Interior

Denali National Park and Preserve

Soundscapes

The sound station on the Ruth Glacier is barely visible above the left plane.

There are many places in the National Park System which look very much like they did 200 years ago, but very few places which sound like they did even twenty years ago.

—Chip Dennerlein

The howl of a wolf—does it not speak of wildness? And how easily the musical chortle of migrating sandhill cranes or the rustle of winds in dry aspen leaves create lasting impressions of a park experience.

Many visitors to Denali and other national parks expect their experiences to include the hearing of sounds associated with a natural landscape.

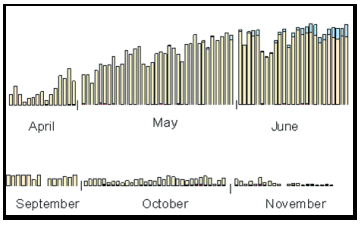
In a park setting, a *natural soundscape* is an area in which the acoustical properties are those of the natural surroundings—without any sounds caused by humans or human technology. The natural soundscape is viewed by the National Park Service as a valuable park resource that is appreciated by and sought after by visitors, and should be managed, as other resources are, to retain natural properties.

Importance of natural soundscapes

Many visitors strongly associate the natural sounds they have heard with the place where they heard them—the parks they hold dear. Natural sounds may be valued by the park visitor, but the importance of natural sound goes beyond the enhancement of a park visit. Natural sound is a matter of life and death to those animals that rely on complex communications. Intrusions of noise can adversely impact wildlife by interfering with the hearing of natural sounds important in foraging or predation, avoiding predators, migration, establishing territory, courtship, rearing young, and migration. Certain types and levels of sound can even cause physiological and/or behavioral responses that can reduce the animal's ability to survive to reproduce.

Protecting soundscapes

Sounds of the wild, as well as sounds meaningful in historic settings, are protected in the National Park System. The Organic Act established parks "to conserve the scenery, the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations..." This mission is interpreted to include protection of soundscapes, so visitors can hear sounds as park founders intended.



Automated sound stations such as the one at Sable Pass (photo at top) "listen in" and record samples of Denali's soundscape.

Songbirds were more vocal in the spring breeding season compared to fall (height of bars in bar graph). Data are from the Stampede Area.

Wind (seen ruffling a raven's feathers in bottom photo) is the most common natural sound in Denali.

Inventorying Denali's soundscape

Many natural sounds can be heard in Denali such as the howls of wolves, thunder of avalanches, roar of rivers, buzzing of mosquitoes, and raven croakings. Sometimes Denali's valued soundscape falls silent.

The Denali soundscape can be categorized into three acoustical zones —scrub/forest, sub-alpine, and alpine. The natural soundscapes in each zone result from the interplay of the production, propagation, and attenuation of sounds. Natural soundscapes in these zones of similar natural sound are influenced by the presence and type of animals, vegetation, seasonal and climatic conditions, topography and altitude, and proximity to water.

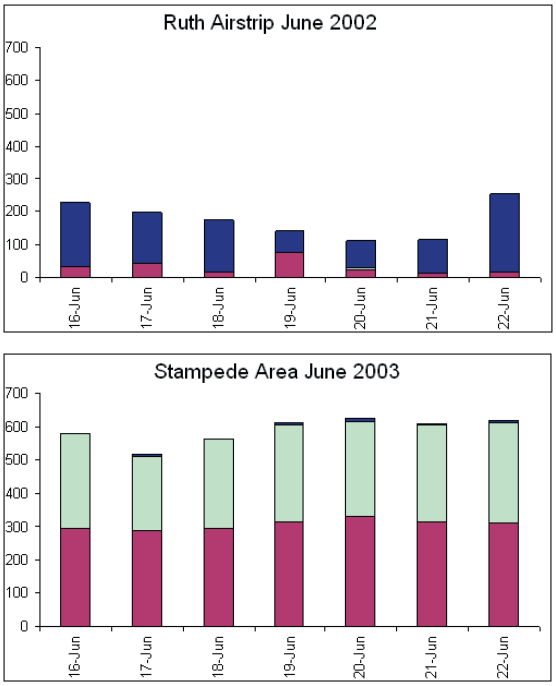
In recent years, park managers have recognized that the soundscape of Denali is becoming increasingly influenced by human-generated sounds. Park management wants to make well-informed decisions to preserve Denali's natural soundscapes and the wilderness values and visitor experiences associated with them. To establish current levels of motorized sound and monitor these sounds over time, a soundscape program was initiated at Denali in 2000. Microphones and data recorders "listen in" and record samples of Denali's soundscapes.

Each summer, automated sound stations are placed at four locations in the park. Locations are selected to represent the park's three acoustical zones, and to include areas with frequent and infrequent motorized use. A few locations are sampled during the winter season. These stations gather digital recordings every five minutes for five seconds over the course of a season. Sound levels (how loud the sounds are) are collected every second.

Results of soundscape analysis

From the audiorecordings for each location, researchers identify sound sources and calculate the number of times per day and the percentage of time each sound is audible. Sound levels of natural ambient sound are compared to those of human-generated sounds.

From the acoustic data, the relative abundance of sounds generated by humans, other living things (e.g., birds, insects), and physical processes (e.g., wind and rain) in each location over time can be summarized. Audio-recordings can also be used to identify bird-song patterns and identify presence of bird species, or to identify seasonal patterns of biological sounds.



Human-generated sounds dominated the Ruth Glacier Airstrip in June (top), whereas natural sounds dominated the Stampede Area (bottom). Bar height indicates the number of recording intervals in which sounds of each category were heard. Physical sounds are shaded in maroon, biological sounds in green, and human-generated sounds in dark blue.

From the data collected to date across all Denali soundscapes, the most common natural sound is wind and the most common human-generated sound is overflights.

For more information

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or check out the National Park Service Natural Sounds Program Center website: www1.nrintra.nps.gov/naturalsounds/index.htm