

Acoustic Environment and Soundscape Resource Summary Haleakalā National Park

National Park Service
U.S. Department of the Interior

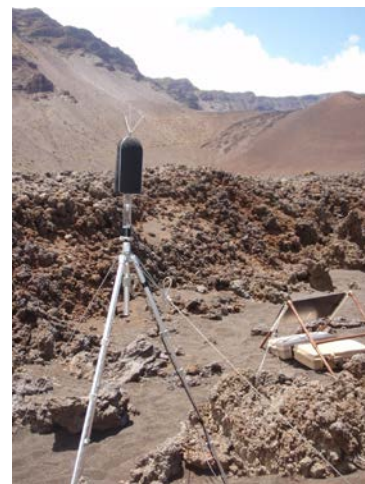
Natural Resource Stewardship and Science
Natural Sounds & Night Skies Division



The acoustic environment is a resource with intrinsic value. It is important as a natural resource, a cultural resource, or both. It is a critical component of wilderness character and plays an important role in wildlife communication, behavior, and other ecological processes. Results from multiple surveys indicate that hearing the sounds of nature is an important reason for visiting national parks. Therefore, the value of acoustic environments and soundscapes is related to an array of park resources and has broad implications for park management.



The quality of the acoustic environment is relevant in nearly every unit in the NPS System. When developing the foundation document, park staff should consider the acoustic environment as a resource with inherent value that may be recognized, when appropriate, in the Fundamental Resource and Value, Other Important Resource and Value, or other section of the document. The topics in Attachment 1 discuss the importance of the soundscape and the acoustic environment in relation to park resources and values. Please see Attachment 2 for an example of how Bryce Canyon National Park incorporated the resource into various sections of the foundation document.



Sound levels in national parks can vary greatly, depending on location, topography, vegetation, biological activity, weather conditions and other factors. For example, the din of a typical suburban area fluctuates between 50 and 60 decibels (dBA), while the crater of Haleakalā National Park is intensely quiet, with levels around 10 dBA. Below are some examples of sound pressure levels measured in national parks.

Decibel level (dBA)	Sound Source	Decibel level (dBA)	Sound Source
10	Volcano crater (Haleakalā NP)	80	Snowcoach at 30 m (Yellowstone NP)
20	Leaves rustling (Canyonlands NP)	100	Thunder (Arches NP)
40	Crickets at 5 m (Zion NP)	120	Military jet, 100m above ground level (Yukon-Charley Rivers NP)
60	Conversational speech at 5 m (Whitman Mission NHS)	126	Cannon fire at 150m (Vicksburg NMP)

Quality of the Resource at Haleakalā National Park

Extensive acoustical monitoring has been conducted for Haleakalā NP. The National Park Service and partners began acoustical monitoring in 1992 after the establishment of the National Parks Overflights Act of 1987. Since then, various studies have been conducted (1993, 1995, 2003, 2007, 2008, 2013) to establish baseline acoustical conditions, to understand human response to aircraft noise and to prepare for a proposed air tour management plan. Overall, these studies show the sound levels in Haleakalā NP to be remarkably low and dominated by natural sounds. They also show that the most common source of noise is from aircraft and that visitors find the aircraft noise annoying. Much of this information is summarized in the 2012 Haleakalā National Park Acoustical Monitoring Report, included as an attachment to this summary (Attachment 3, Lynch, 2012).

The 1992 study established that ambient sounds levels in the park are among the lowest recorded in any national park. Subsequent studies reinforce this reporting. Table 1 includes median existing sound levels (L_{50}) in various sites for the park in 1992, 2003, 2008 and 2013. Notice that the higher median sound levels exist in areas where more sources of natural sounds exist: coastal with sounds of wind and waves and forested with

more a nearby waterfall and presumably more wildlife. The L₅₀ column represents the median daytime existing sound levels (including natural and man-made sound sources), while the L₉₀ column reports the sound level exceeded 90% of the time during the day. This metric is often used as a proxy for natural ambient sound levels.

Table 1. Daytime metrics and site information for acoustic monitoring in HALE

Site ID		Year	Vegetation Type	L ₅₀	L ₉₀
51	Sliding Sands Trail	1992	Alpine, frontcountry	18.9*	13.9*
52	Sliding Sands Trail	1992	Alpine	13.5*	9.8*
P01	Namana o ke Akua	2003	Shrubland	24.5	18.6
P02	Supply Trail	2003	Shrubland	27.2	21.5
P03	Waimoku Falls	2003	Forested Upland	43.5	38.2
HALE001	Sliding Sands	2008	Alpine	18.2	15.1
HALE002	Rain Gauge	2008	Alpine	21.9	15.8
HALE003	Kīpahulu	2008	Coastal	38.9	35.1
HALE004	Nu'u	2013	Grassland	30.5	23.5

*Non-aircraft sound levels reported, averaged from reported intervals

Table 2 demonstrates the percent of time aircraft are audible in the park. The percent ranges from 16% to 68%. The range is dependent on the location in the park and proximity to aircraft routes. The results of all the previous studies demonstrate that the most common noise source is aircraft, with helicopters most common during the daytime and high altitude jets most common during nighttime. The percent time calculations from 1992 are for daytime hours only. For more information on different types of aircraft, refer to the 2012 Acoustical Monitoring Report in Attachment 3 (Lynch, 2012).

Table 2. Mean percent time aircraft is audible in HALE

Site ID		Year	% Time Audible
51	Sliding Sands Trail	1992	37.9*
52	Sliding Sands Trail	1992	44.3*
P01	Namana o ke Akua	2003	30.1
P02	Supply Trail	2003	10.2
P03	Waimoku Falls	2003	16.0
HALE001	Sliding Sands	2008	31.1
HALE002	Rain Gauge	2008	68
HALE003	Kīpahulu	2008	27.7
HALE004	Nu'u	2013	23.9

*daytime calculations

Previous reports:

Anderson, Grant S., Horonjeff, R., Menge, C., Miller, N., Robert, W., Rossano, C., Sanchez, G. 1993. Dose-Response Relationships Derived from Data Collected at Grand Canyon, Haleakala and Hawaii Volcanoes National Parks, HMMH Report No. 290940.14, NPOA Report No. 93-6.

Horonjeff, R. D., Kimura, Y., Miller, N., Robert, W., Rossano, C., Sanchez, G. 1993. Acoustic Data Collected at Grand Canyon, Haleakala and Hawaii Volcanoes National Parks, HMMH Report No. 290940.18.

Lawson, S., Kiser, B., Hockett, K., Reigner, N., Howard, J., Ingram, A., Dymond, S., 2007. Social Science Research to Inform Soundscape Management in Haleakala National Park.

Lee, C. S. Y., Fleming, G. G., Roof, C. J., MacDonald J. M., Scarpone, C. J., Malwitz, A. R., Baker G. 2006. Baseline Ambient Sound Levels in Haleakala National Park, FAA-AWP- 06-xx, DOT-VNTSC-FAA-06-09.

Lynch, E. 2012. Haleakalā National Park: Acoustical monitoring 2008. Natural Resource Technical Report NPS/NRSS/NRTR—2012/549. National Park Service, Fort Collins, Colorado.

McDonald, C.D., Baumgartner, R.M., & Iachan, R. 1995. National Park Service aircraft management studies. USDI Report 94-2. Denver, CO: National Park Service.

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