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# Monitoring and modeling sound levels at landscape scales in U. S. National Parks

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## Abstract

NPS has pursued a program of acoustical monitoring to inventory existing conditions in parks throughout the NPS system to estimate natural sound levels and evaluate the costs of noise to both wildlife and visitor experience. Acoustic data have been collected at over 300 sites within 73 parks. The NPS recently created a predictive map of sound levels throughout the contiguous U. S. by fitting geospatial data related to sound sources and propagation to the acoustic monitoring data. These maps include predictions of existing and natural sound levels for A-weighted summaries and one-third octave spectra. The acoustic data were also analysed for broad patterns in bioacoustic activity that relate to ecological and seasonal variables, and visitor use.

To evaluate the human costs of noise, the NPS pursued measurement and modeling of the duration of audible noise using one-third octave spectrum levels. The median hourly percentage of noise audibility across all sites within park units is about 25%. Audibility analysis is complemented by evaluating the masking effects of noise, seeking to preserve opportunities for visitors to appreciate the rich auditory experience that is vital to many wildlife species, and to establish a framework for evaluating costs of noise that generalize across species.

Through partnerships, NPS has produced a standard for sound level measurement in parks and quiet rural areas, and sponsored studies of noise impacts to wildlife and visitor experience. Collectively, these efforts inform park managers and the public about the value of natural acoustic environments and the costs of noise.

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