



# Logging Truck Noise Near Nesting Northern Goshawks

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**Abstract:** We measured noise levels of four logging trucks as the trucks passed within approximately 500 m of two active northern goshawk (*Accipiter gentilis*) nests on the Kaibab Plateau in northern Arizona in 1997. Neither a brooding adult female nor a lone juvenile exhibited any discernable behavioral response to logging truck noise, which peaked at 53.4 and 50.3 decibels (dBA). Spectral analysis showed most of the truck sound energy was in the vicinity of 80 Hz.

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**Keywords:** northern goshawk, *Accipiter gentilis*, truck noise, sound measurement, disturbance

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Management of potentially disturbing human activities in the vicinity of nesting northern goshawks (*Accipiter gentilis*) is an important issue in the Southwest (Reynolds et al. 1992); however, data on the possible effects of associated noise alone are lacking. To establish initial baseline distances and noise levels for evaluating responses of nesting goshawks, we were able to take advantage of a salvage logging operation on the Kaibab Plateau in northern Arizona, Coconino County, during the summer of 1997. As part of the logging process, loaded trucks used secondary graveled roads close to several nesting goshawks. Based on logging schedules and nesting activity, we chose two active nest sites in ponderosa pine (*Pinus ponderosa*) forest at approximately 2130 m elevation as locations to record noise levels and associated goshawk responses.

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## Methods

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Noise data were obtained by means of a Bruel & Kjaer (B&K) professional microphone system consisting of a type 2804 power supply, type 2639 preamplifier, type 4149 1.3-cm microphone, and 7.5-cm foam windscreen. The system was calibrated by means of a 1-kHz 94 dB signal from a B&K type 4250 calibrator. All data and calibration signals were recorded on a Sony TCD-D7 digital audio tape (DAT) recorder for detailed laboratory analysis. Data analysis was performed with a B&K type 2144 frequency analyzer. We described noise measurements by using maximum one half-second equivalent average sound level (LEQ), referenced to 20 micro-Pascals and A-weighted (dBA, human-based weighting algorithm ubiquitously used and included on most noise meters). Goshawk behavior was monitored from blinds 15-25 m from nest trees.

Our opportunistic pilot test involved recording noise levels of four logging trucks passing within 413 m of an adult female brooding week-old young on 10 June, and two trucks passing within 513 m of another nest containing a lone, 7-week-old juvenile on 27 July. Microphone placement beneath the nest trees was within 3-4 vertical m of the road level at its closest point.

## Results

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Neither the brooding adult female nor the lone juvenile exhibited any discernable behavioral response to logging truck noise at the distances and levels measured. Only two of the six truck passes (53.4 and 50.3 dBA) were louder than ambient noise levels (34.1 dBA); both occurred at the brooding female site. These trucks were audible for 2-3 min, with sound levels increasing to maximum decibel levels when truck-to-nest distance was the least then rapidly decreasing as truck-to-nest distance increased. The other trucks were barely discernable to the human

ear and were easily masked by high altitude jet aircraft passing over, or even light breezes (<16 km/hr) rustling through the canopy. Both nesting pairs were successful in fledging their young.

Spectral analysis of the truck noise showed that most of the sound energy was located in the vicinity of 80 Hz, which is consistent with exhaust noise of large diesel trucks under load. Sound level in the 1/3-octave band centered at 80 Hz was at least 20 dB higher than the sound level in other bands (except for some very low frequency noise due to wind over the microphone) and at least 20 dB higher than ambient noise. Because decibels are measured on a logarithmic scale, every 6 dB difference between ambient and event noise represents a doubling of sound level.

## Discussion

There is little published information regarding the hearing range and sensitivity for birds of prey. Trainer (1946 as cited in Fay 1988) found the American kestrel (*Falco sparverius*) exhibited a typical avian audiogram (graphic relationship between hearing range and sensitivity), albeit somewhat more sensitive in the mid-frequencies. In general, birds hear well in the range from 100 Hz to 8-10 kHz but have a narrower hearing sensitivity range than most mammals including humans, i.e., birds' hearing is less sensitive at both high and low frequencies. Logging truck noise, at 80 Hz, is quite low in frequency and therefore may be less noticeable to birds, or in this case goshawks, than to human observers.

Wind, topography, forest vegetation, and truck and road characteristics can all affect ultimate noise levels at the target species. In our experiment, vegetation, topography, wind, and truck and road characteristics were similar between the two test sites. However, these factors should be addressed in any future studies. Our initial testing indicates that logging trucks passing >400 m away from nest sites in forested habitat result in noise levels <54 dBA, and that such levels are not disturbing to nesting northern goshawks.

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## Literature Cited

- Dooling, R.J. 1982. Behavior and psychophysics of hearing in birds. Pages 261-288 in Popper and Fay, eds., Comparative studies of hearing in vertebrates. Springer-Verlag, New York, NY.
- Fay, R.R. 1988. Hearing in vertebrates: a psychophysics handbook, Hill-Fay Assoc., Winnetka, IL.
- Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, Jr., G. Goodwin, R. Smith, and E.L. Fisher. 1992. Management recommendations for the northern goshawk in the southwestern United States. USDA Forest Service Gen. Tech. Rep. RM-217, Ft. Collins, CO.
- Trainer, J.E. 1946. The auditory acuity of certain birds. Ph.D. thesis. Cornell Univ., Ithaca, NY.