

4.2 HEARING LOSS PREVENTION

National Park Service Hearing Loss Prevention Policy

A Hearing Loss Prevention program shall be implemented to protect NPS employees and volunteer workers from hearing loss when they are exposed to occupational noise at a level at or greater than 85 decibels (A-weighted as an eight-hour, time-weighted average). Precautions will be taken to prevent exposures greater than 90 dbA. Exposures at or above this level are considered hazardous and pose an excessive and unacceptable risk of hearing loss.

Scope: This program applies to all employees and volunteers of the National Park Service who are exposed to hazardous noise in the course of their duties with NPS.

References

NPS Hearing Loss Prevention programs will meet the requirements of 29 CFR 1910.95, Occupational Noise Exposure and 29 CFR 1904.10 Recording Criteria for Cases Involving Occupational Hearing Loss.

Program Elements

1. *Identify Noise Hazards.* Area and personal exposure monitoring shall be conducted to identify noise-hazardous equipment and locations and to characterize worker exposure. Periodic follow-up monitoring will be conducted when there is a change in equipment, work processes or maintenance routines, or if workers are developing significant threshold shifts.
2. *Control Noise Hazards.* To the extent feasible, engineering controls, administrative controls and work practices shall be used to ensure that workers are not exposed to noise at or above 90 dBA as an eight-hour time-weighted average (TWA).
3. *Provide and Use Hearing Protectors.* Hearing protectors shall be provided by the park at no cost to employees. Workers shall be required to wear hearing protectors with adequate noise-reduction capabilities when operating equipment or working in areas that expose them to sound levels that equal or exceed 90 dBA as an eight-hour TWA or whenever exposed to impact noise of 140 dBA or greater. It is strongly recommended that workers wear single hearing protectors whenever exposed to noise levels greater than 85 dBA and double hearing protectors whenever exposed to noise greater than 104 dBA, regardless of duration.
4. *Provide Medical Surveillance.* The park shall provide audiometric testing to determine hearing threshold levels for all workers whose exposures equal or exceed 85 dBA as an eight-hour TWA. A baseline audiogram shall be provided before employment or within 30 days of employment for all workers who will be exposed to noise levels at or above 85 dBA. Audiometric tests shall be conducted annually to determine changes in hearing relative to the baseline audiogram.

5. *Communicate Noise Hazards.* All workers who are exposed to noise at or above 85 dBA as an eight-hour TWA shall be informed of their exposure, the associated risk and protective requirements. Warning signs shall be clearly visible at the entrance to, or at the periphery of, areas where noise exposures routinely equal or exceed 85 dBA.
6. *Train Noise Exposed Workers.* The park shall institute a training program, and ensure worker participation, in occupational hearing loss prevention for all workers who are exposed to noise at or above 85 dBA as an eight-hour TWA. The training program shall be repeated annually to provide reinforcement and updated information.
7. *Keep Records.* The park shall establish and maintain records of area noise monitoring, personal exposure monitoring, personnel notifications, personnel training and audiometric evaluations.

Hearing Loss Prevention Program Implementation Action Items

Step 1 Identify noise-hazardous areas and equipment in your workplace and post warning signs. (This will require a calibrated sound-level meter or noise dosimeter and operator, labels and placards)

Step 2 Monitor to determine worker exposures and inform them of the risk. (Exposures may be calculated or modeled based on data collected in Step 1 or determined through personal dose monitoring. Personal monitoring requires a noise dosimeter.)

Step 3 Take steps to eliminate or control hazards by such measures as isolation, avoidance or changes in work practices noise.

Step 4 Provide workers with appropriate hearing protectors when engineering and administrative control measures (Step 3) fail to reduce noise exposure to a safe level. Ensure that they know how to use them and that they do use them.

Step 5 Conduct baseline audiometric testing of exposed workers. Repeat this testing every year they are exposed to detect changes in hearing.

Step 6 Train exposed workers.

Step 7 Set up a system to maintain records of area noise monitoring, personal exposure monitoring, personnel notification, personnel training and audiometric evaluations.

Technical Appendices

Appendix A: Exposure Criteria

Appendix B: Hearing Protectors

Appendix C: Medical Surveillance

Appendix D: Hazard Communication

Appendix E: Training

Appendix F: Record-Keeping

Appendix A: Exposure Criteria

National Park Service hearing loss prevention programs are based on an occupational exposure limit (OEL) of 90 decibels, A-weighted (dBA), as an eight-hour, time-weighted average (TWA). Exposure to continuous, intermittent or impulse noise shall never exceed 140 dBA. A hearing loss prevention program will be implemented for all employees whose daily exposure is equal to or greater than 85 dBA.

Allowable Exposure

Occupational noise exposure shall be controlled so that worker exposures are less than the combination of exposure level (L) and duration (T). Exposure is calculated by the following formula, where 5 = the exchange rate and 90 = the OEL, or as shown in Table A1.

$$T(\text{min}) = \frac{480}{2^{(L-90)/5}}$$

Table A1. Allowable exposure duration at given noise levels IF THE NOISE LEVEL IS...	...THEN WORKERS MAY BE EXPOSED FOR...		IF THE NOISE LEVEL IS...	...THEN WORKERS MAY BE EXPOSED FOR...	
	HOURS	MINUTES		HOURS	MINUTES
85 dBA	16	0	99	2	18
86	13	10	100	2	0
87	12	6	101	1	42
88	10	36	102	1	30
89	9	12	103	1	18
90	8	0	104	1	6
91	7	0	105	1	0
92	6	6	106	0	54
93	5	18	107	0	48
94	4	36	108	0	42
95	4	0	109	0	36
96	3	30	110-115	0	<18
97	3	0	116-130	0	<2
98	2	36	130-140	0	0

Daily Noise Dose

When the daily noise exposure consists of periods of different noise levels, the daily dose

(D) shall not equal or exceed 100 as calculated according to the following formula:

$$D = [C1/T1 + C2/T2 + \dots + Cn/Tn] \times 100$$

where

Cn = total time of exposure at a specified noise level, and

Tn = exposure duration for which noise at this level becomes hazardous.

The daily dose can be converted into an eight-hour TWA according to the following formula (or as shown in Table 1-2):

$$TWA = 10.0 \times \text{Log}(D/100) + 90$$

Monitoring

Monitoring of the work site or of noisy work tasks shall be conducted to determine the noise exposure levels representative of all workers whose eight-hour TWA noise exposures may equal or exceed 85 dBA. For workers remaining in essentially stationary, continuous noise levels, either a sound-level meter or a dosimeter may be used. However, for workers who move around frequently or who perform different tasks with intermittent or varying noise levels, a task-based exposure monitoring strategy may provide a more accurate assessment of the extent of exposures.

Noise exposure is to be measured without regard to the wearing of hearing protectors. In determining TWA exposures, all continuous, varying, intermittent and impulsive sound levels from 80 to 130 dBA shall be integrated into the noise measurements. An exchange rate of 5 will be used.

Instrumentation

Instruments used to measure workers' noise exposures shall conform to the American National Standard Specification for Sound Level Meters, ANSI S1.4-1983 and S1.4A-1985, Type 2 [ANSI 1983, 1985] or, with the exception of the operating range, to the *American National Standard Specification for Personal Noise Dosimeters*, ANSI S1.25-1991 [ANSI 1991a]. Sound-level meters shall be set at SLOW response. Sound-level meters shall be calibrated to ensure measurement accuracy.

Appendix B: Hearing Protectors

When engineering controls, administrative controls and work practices cannot keep workers' exposures below 90 dBA as an eight-hour TWA, the use of hearing protectors shall be required. Hearing protectors shall attenuate noise sufficiently to keep workers' "realworld" exposure (i.e., the noise exposure at the worker's ear when hearing protectors are worn) below 90 dBA as an eight-hour TWA. Workers whose eight-hour TWA exposures exceed 105 dBA should wear double hearing protection (i.e., they should wear earplugs and earmuffs simultaneously).

In addition, workers shall wear prescribed hearing protection when working with hazardous equipment or in noise-hazardous areas regardless of whether their eight-hour TWA equals or exceeds 90 dBA. It would be prudent for a worker in and out of noise or habitually exposed to loud noise (e.g., 91 dBA for < 2 hours) to wear hearing protection while in noisy environments, even though his or her dose is less than 100%.

Noise Reduction Rating

To compensate for known differences between laboratory-derived attenuation values and the protection obtained by a worker in the real world, the labeled noise-reduction ratings (NRRs) shall be reduced by seven decibels.

For example, if a worker is exposed to 98 dbA (eight-hour TWA) and is supplied hearing protectors with a 20 dB NRR:

Subtract 7 from the manufacturer's NRR,

$$20 - 7 = 13;$$

Subtract the remainder from the employee's exposure level,

$$98 - 13 = 85;$$

Therefore, the hearing protectors are adequate. However, it must be noted that OSHA and NIOSH recommend a further decrease in NRR.

The park shall train workers at least annually to select and fit hearing protectors.

Appendix C: Medical Surveillance

The park shall provide audiometry to determine hearing threshold levels for all workers whose exposures equal or exceed 85 dBA as an eight-hour TWA. Audiometric tests shall be conducted annually to determine changes in hearing relative to the baseline audiogram.

Audiometric Testing

Workers shall not be exposed to noise levels at or above 85 dBA for a minimum of 14 hours before receiving a baseline audiometric test. Hearing protectors shall not be used in lieu of the required quiet period.

Audiometric tests shall be conducted during the worker's normal work shift. Audiometric tests shall be performed by a physician, an audiologist or an occupational hearing conservationist certified by the Council for Accreditation in Occupational Hearing Conservation (CAOHC) or the equivalent, working under the supervision of an audiologist or physician.

Audiometric testing shall consist of air-conduction, pure-tone, hearing threshold measures at no less than 500, 1000, 2000, 3000, 4000 and 6000 Hertz (Hz). Right and left ears shall be individually tested. The 8000-Hz threshold should also be tested as an option and as a useful source of information about the etiology of a hearing loss.

Audiometric tests shall be conducted with audiometers that meet the specifications of, and are maintained and used in accordance with, the American National Standard Specifications for Audiometers, ANSI S3.6-1996 [ANSI 1996b]. Audiometers shall receive a daily functional check, an acoustic calibration check whenever the functional check indicates a threshold difference exceeding 10 dB in either earphone at any frequency, and an exhaustive calibration check annually or whenever an acoustic calibration indicates the need—as outlined in Section 5.5.2. The date of the last annual calibration shall be recorded on each worker's audiogram.

Audiometric tests shall be conducted in a room where ambient noise levels conform to all requirements of the American National Standard Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms, ANSI S3.1-1991 [ANSI 1991b]. Instruments used to measure ambient noise shall conform to the American National Standard Specification for Sound Level Meters, ANSI S1.4-1983 and S1.4A-1985, Type 1 [ANSI 1983, 1985] and the American National Standard Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters, ANSI S1.11-1986 [ANSI 1986]. For permanent on-site testing facilities, ambient noise levels shall be checked at least annually. For mobile testing facilities, ambient noise levels shall be tested daily or each time the facility is moved (whichever is more often). Ambient noise measurements shall be obtained under conditions representing the typical acoustical environment likely to be present when audiometric testing is performed. Ambient noise levels shall be recorded on each audiogram or made otherwise accessible to the professional reviewer of the audiograms.

Baseline Audiogram

The park shall provide audiometric testing to determine hearing threshold levels for all workers whose exposures equal or exceed 85 dBA as an eight-hour TWA. A baseline audiogram shall be obtained for each worker within six months of his/her initial exposure to noise levels at or above 85 dBA as an eight-hour TWA. Audiometric tests shall be conducted annually to determine changes in hearing relative to the baseline audiogram.

Annual Monitoring Audiogram

Audiometric tests shall be conducted annually to determine changes in hearing relative to the baseline audiogram. When the monitoring audiogram detects a change in the hearing threshold level in either ear that equals or exceeds an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear, this is referred to as a significant threshold shift.

An optional retest may be conducted immediately to determine whether the significant threshold shift is persistent. The retest will frequently demonstrate that the worker does not have a persistent threshold shift, thereby eliminating the need for a confirmation audiogram and follow-up action. If a persistent threshold shift has occurred, the worker shall be informed that his or her hearing may have worsened and additional hearing tests will be necessary.

Confirmation Audiogram and Follow-up Action

When a worker's monitoring audiogram detects a significant threshold shift, he or she shall receive a confirmation audiogram within 30 days. This confirmation test shall be conducted under the same conditions as those of a baseline audiometric test. If the confirmation audiogram shows the persistence of a threshold shift, the audiograms and other appropriate records shall be reviewed by an audiologist or physician.

If this review validates the threshold shift, the shift shall be recorded in the worker's medical record and the confirmation audiogram shall serve as the new baseline. This new baseline shall be used to calculate any subsequent significant threshold shift. Whenever possible, the worker should receive immediate feedback on the results of his or her hearing test. However, in no case shall the worker be required to wait more than 30 days.

When a significant threshold shift has been validated, the park shall take appropriate action to protect the worker from additional hearing loss due to occupational noise exposure. Examples of appropriate action include explanation of the effects of hearing loss, re-instruction and refitting of hearing protectors, additional training of the worker in hearing loss prevention and reassignment of the worker to a quieter work area.

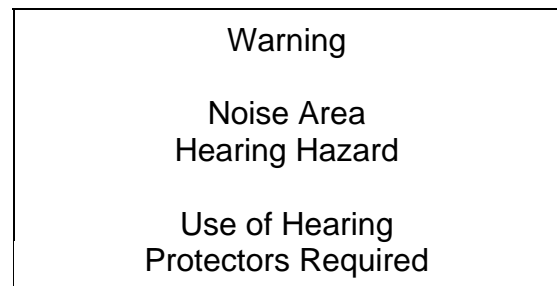
When the reviewing audiologist or physician suspects a hearing change is due to a non-occupational etiology, the worker shall receive appropriate counseling, which may include referral to his or her physician.

Appendix D: Hazard Communication

Warning signs

Warning signs shall be clearly visible at the entrance to, or at the periphery of, areas where noise exposures routinely equal or exceed 85 dBA and on equipment that produces noise equal to or greater than 85 dBA.

All warning signs shall be in English and, where applicable, in the predominant language of workers who do not read English. Workers unable to read the warning signs shall be informed verbally about the instructions printed on signs in hazardous work areas of the facility. The warning sign shall textually or graphically contain the following information:



Example 1. Warning sign with text and graphics **Example 2.** Warning sign with text only

Worker Notification

All workers who are exposed to noise at or above 85 dBA as an eight-hour TWA shall be informed of their exposure, the associated risk and protective requirements. Workers shall be notified within 30 days when initial noise measurements confirm the presence of hazardous noise or when follow-up noise measurements identify additional noise hazards. New workers shall be alerted about the presence of hazardous noise before they are exposed.

Appendix E: Training

The park shall institute a training program in occupational hearing loss prevention for all workers who are exposed to noise at or above 85 dBA as an eight-hour TWA and ensure that these workers participate in the training. The training program shall be repeated annually to provide reinforcement and updated information.

The training addresses, at a minimum, the following topics:

1. The physical and psychological effects of noise and hearing loss;
2. Hearing protector selection, fitting, use and care;
3. Audiometric testing; and
4. The roles and responsibilities of parks and workers in preventing noise-induced hearing loss.

The format for the training program may vary from formal meetings to informal on-the-spot presentations. Allowances shall be made for one-on-one training, which would be particularly suitable for workers who have demonstrated a significant threshold shift. Whenever possible, the training should be timed to coincide with feedback on workers' hearing tests.

The park shall maintain a record of educational and training programs for each worker for the duration of employment plus one year. On termination of employment, the employer should provide a copy of the training record to the worker. The employer may wish to keep the training record with the worker's exposure and medical records for longer durations (see Appendix F, Record-Keeping).

Appendix F: Record-Keeping

The park shall establish and maintain records of area noise monitoring, personal exposure monitoring, personnel training and audiometric evaluations.

Exposure Assessment Records

The park shall establish and maintain an accurate record of all exposure measurements.

Medical Surveillance Records

The park will establish and maintain audiometric test records for each worker subject to the medical surveillance. This should include tester identification, conditions of the test, the etiology of any significant threshold shift and the identification of the reviewer.

Training Records

The park shall maintain a record of educational and training programs for each worker. On termination of employment, the employer should provide a copy of the training record to the worker.

Record Retention

In accordance with the requirements of 29 CFR 1910.95 Hearing Conservation, the park shall retain records for at least the following periods:

- Two years for noise-exposure monitoring records.
- Duration of employment for medical monitoring records.
- Duration of employment plus one year for training records.