

Some Measured Levels of Noise Produced by Logging Equipment in 1998

By

Cornelis F. de Hoop and Neil J. Lalonde
Associate Professor and former Student, respectively
Louisiana Forest Products Development Center
School of Renewable Natural Resources
Louisiana State University Agricultural Center
Baton Rouge, Louisiana 70803

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Corresponding author:
Cornelis F. de Hoop
Renewable Natural Resources Building
LSU
Baton Rouge, LA 70803-6202

Tel: (225) 578-4242

Fax: (225) 578-4251

Email: cdehoop@lsu.edu

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Many studies and investigations have focused on industrial noise, but very few of them focused on the logging industry (SIC 2411). This paper reports the results of some informal sound level readings made of the logging industry. Most of the readings were taken in 1998.

According to an Environmental Protection Agency (EPA) report prepared by an acoustical consulting firm, more than nine million Americans are exposed to daily average occupation noise levels above 85 decibels (dB) (EPA, 1981). A decibel is a standard unit for measuring relative loudness of sound. Decibels increase logarithmically in loudness.

Regulations under the Occupational Safety and Health Act state that 90 dB is the maximum sound level (time-weighted average) to which workers may be exposed in an 8 hour day (permitted exposure level or PEL). Sound levels should never exceed 140 dB. Employees risk developing hearing loss when sound levels reach 85 dB, and employers are required by law to conduct a hearing conservation program if the time-weighted average exposure level exceeds 85dB. Table 1 displays the permissible exposure levels enforced by the U.S. Occupational Safety and Health Administration (OSHA).

Table 1. Maximum permissible exposure levels of sound according to OSHA regulations (29 CFR 1910.95; time-weighted daily average). It is likely that these standards will become more stringent by about 2005, setting the 8 hour limit at 85 dB instead of 90.

Duration of Exposure	Sound level
16 hours	85 decibels
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
30 minutes	110
15 minutes or less	115
No exposure permitted	Over 140

Exposure to loud noise can cause other, more subtle problems, too. A safety engineering textbook states:

“People do not become accustomed to noise. Studies of people who work in noisy environments suggest they have higher incidence of circulatory problems, heart disease, ulcers and medical problems in general... Many of these effects occur at noise levels below those related to hearing loss.” [Brauer 1990]

In Spring 1998, a small investigation was performed on sound levels. A hand-held Extech 407703 Sound Level Meter was used to perform the investigation. The instrument was taken to logging jobs, and sound levels were recorded in dB of different types of equipment for short periods. Readings were taken on board equipment at engine idle and full-throttle speeds. Readings were also taken at idle and full-throttle speeds from 10, 15, and 20 feet away. The results are summarized in Table 2.

Table 2. Selected sound levels of logging machinery (typical). Readings taken at operator's ear unless otherwise specified. Note that most chainsaw readings were taken from 10 feet to the side; sound levels at the operators' ears are much higher.

Machine	Idle (dB)	Full throttle (dB)
Skidder 1997 Franklin Tree Farmer 170 (enclosed cab)	73	100
Skidder 1997 Caterpillar 515 (enclosed cab)	72	84
Skidder 1995 Caterpillar 518C	82	94
Skidder 1964 Franklin Tree Farmer C6	78	102
Skidder 1960 Franklin Tree Farmer C5	82	100
Cutter 1998 Tigercat 845	74	90 (not cutting)
Cutter 1996 Barko 885	76	96 (not cutting)
Loader 1998 Tigercat 860S	68	74
Loader 1998 Tigercat 860S with fan on		82
Loader 1998 Tigercat 860S with fan and radio on		90
Loader 1996 Barko 169B	78	92
Loader 1996 Prentice 210E	80	90
Loader 1960 Barko 160	90	108
Bulldozer 1997 Caterpillar D4H XL	98	102
Bulldozer 1976 John Deere 450 bulldozer	85	98 (¾ throttle)
Bulldozer 1964 Caterpillar D5	84	112
Chainsaw 1998 Stihl 044 (measured 10 feet away)	78	106
Chainsaw 1997 Husqvarna 272 (measured 10 feet away)	76	102
Chainsaw 1995 Husqvarna 268 (measured 10 feet away)	82	104
Chainsaw 1990 Stihl 038 (measured 10 feet away)	80	100
Chainsaw 2002 Stihl 026	80	110
Chainsaw 1994 Shindaiwa 757	85	115 – 120
Chainsaw 1984 Stihl 038	90	112

Operator exposure to sound levels on board five skidders at full throttle were almost all over 85dB. The only one that did not exceed regulations was a 1997 CAT 515 at 84dB. This skidder has an enclosed cab, but this does not protect the operator's ears, nor does it protect the operator from engine noise that can be compounded by a radio. None of the sound levels exceeded 85 dB at idle speeds, but it is rare for a skidder to be driven at an idle speed for 8

hours. The sound levels were still above 85 dB at 10, 15, and 20 feet away at full-throttle speeds (Table 3).

Table 3. Sound levels of selected skidders measured at the operator and to the side of the skidder at distances of 10, 15 and 20 feet. Measurements were taken in May 1998.

Skidders

In cab (at operator's ear)

Name/ Make/ Model	Idle	Full Throttle
CAT 518C 1995	82	94
CAT 515 1997 (Enclosed Cab)	72	84
Franklin Tree Farmer C6 1964	78	102
Franklin Tree Farmer C5 1960	82	100
Franklin Tree Farmer 170 1997 (Enclosed Cab)	82	100

From 10 Feet Distance

	Idle	Full Throttle
CAT 518C 1995	80	92
CAT 515 1997	82	92
Franklin Tree Farmer C6 1964	74	100
Franklin Tree Farmer C5 1960	76	96
Franklin Tree Farmer 170 1997	82	98

From 15 Feet Distance

	Idle	Full Throttle
CAT 518C 1995	78	90
CAT 515 1997	78	90
Franklin Tree Farmer C6 1964	72	98
Franklin Tree Farmer C5 1960	74	92
Franklin Tree Farmer 170 1997	80	88

From 20 Feet Distance

	Idle	Full Throttle
CAT 518C 1995	76	88
CAT 515 1997	76	88
Franklin Tree Farmer C6 1964	71	96
Franklin Tree Farmer C5 1960	72	90
Franklin Tree Farmer 170 1997	78	82

A 1996 Barko 885 and a 1998 Tigercat 845 were the two types of cutters observed. They were observed only while the engine was running, not while cutting was being performed. Exposure to sound levels on board these cutters exceeded 85 dB. The newer Tigercat was quieter at 90 dB, and the Barko registered 96 dB. Neither of the two cutters exceeded regulation level (85) at idle speeds. Regulation sound levels were exceeded from 10, 15, and 20 feet away at full throttle (Table 4).

Table 4. Sound levels of selected feller-bunchers (cutters) measured at the operator and to the side of the machine at distances of 10, 15 and 20 feet. Measurements were taken in May 1998. Full throttle readings were taken with no load; i.e., full engine and saw speed, but not cutting tree.

Cutters Name/ Make/ Model	In cab (at operator's ear)		From 15 Feet Distance	
	Idle	Full Throttle	Idle	Full Throttle
Barko 885 1996	76	96	80	94
TIGERCAT 845 1998	74	90	78	90
	From 10 Feet Distance		From 20 Feet Distance	
Barko 885 1996	82	96	78	90
TIGERCAT 845 1998	80	92	76	88

There was a wide range in dB readings for the four observed loaders. The 1998 Tigercat was the quietest on board at full-throttle, registering 72 dB. However, with a fan on and the radio playing at the operators preferred level, the sound level rose to 90 dB. The 1960 Barko 160 was the loudest at 108 dB. Idle speed sound levels on board these loaders range from 68 dB on the 1998 Tigercat to 90 dB on the 1960 Barko. Regulation sound levels (85) were all exceeded from 10, 15, and 20 feet away at full throttle (Table 5).

Table 5. Sound levels of selected log loaders measured at the operator and to the side of the machine at distances of 10, 15 and 20 feet. Measurements were taken in May 1998.

Loaders Name/ Make/ Model	In cab (at operator's ear)		From 15 Feet Distance	
	Idle	Full Throttle	Idle	Full Throttle
TIGERCAT 860S 1998	68	72	78	90
PRENTICE 210E 1996	80	90	82	88
BARKO 160 1960	90	108	86	100
BARKO 169B 1996	78	92	72	88
	From 10 Feet Distance		From 20 Feet Distance	
TIGERCAT 860S 1998	80	92	76	88
PRENTICE 210E 1996	88	98	78	82
BARKO 160 1960	88	104	80	90
BARKO 160B 1996	74	92	70	86

A 1997 CAT D4H XL and a 1964 CAT D5 were the two types of bulldozers observed. They had dB readings of 102 to 112 on board at full throttle, with the older CAT being louder. However, the older CAT was quieter at idle (84 dB) than the newer CAT (98 dB). Readings taken in 2003 of a 1976 John Deere 450 bulldozer were similar (Table 6).

Table 6. Sound levels of selected bulldozers measured at the operator and to the side of the machine at distances of 10, 15 and 20 feet. Measurements were taken in May 1998, except 1976 Deere, which was taken May 2003.

Bulldozers Name/ Make/ Model	In cab (at operator's ear)		From 15 Feet Distance	
	Idle	Full Throttle	Idle	Full Throttle
CAT D4H XL 1997	98	102	82	90
CAT D5 1964	84	112	80	102
John Deere 450 1976	85	98 (¾ throttle)		

	From 10 Feet Distance		From 20 Feet Distance	
	Idle	Full Throttle	Idle	Full Throttle
CAT D4H XL 1997	84	92	80	88
CAT D5 1964	82	104	78	100

Chainsaws were observed from behind the saws and on the side of the saws from 10, 15, and 20 feet away. The 1997 Husquvana 272 was the quietest of four saws at 78 dB measured 10 feet behind at full throttle. The 1998 Stihl 044 was the quietest at 68 dB, 20 feet behind the saw at full-throttle. All four saws exceeded 85 dB at full throttle when sound measurements were taken from the side of the saws at all three distances (Table 7).

The last three chainsaw readings in Table 2 were taken in May 2003, with the sound meter held at the operator's ear. It appears that the newer saws stay under the 85 dB level at idle speed, but they produce 110 dB or higher at full speed.

Table 7. Sound levels of selected chainsaws. Note that these readings were taken at 10, 15 and 20 feet distances, not at operators' ears. For some selected measurements at the operators' ears, see Table 2.

Chainsaws	BEHIND SAW		TO THE SIDE OF SAW	
	Idle	Full Throttle	Idle	Full Throttle
10 Ft. from Saw				
Husquvarna 268 1995	82	102	82	104
Husquvarna 272 1997	60	78	76	102
STHIL 0 30 H 1990	80	98	80	100
STHIL 044 1998	62	76	78	106
15 Ft. from Saw				
Husquvarna 268 1995	80	100	78	100
Husquvarna 272 1997	58	76	74	98
STHIL 0 30 H 1990	78	96	76	98
STHIL 044 1998	56	72	76	102
20 Ft. from Saw				
Husquvarna 268 1995	78	98	74	98
Husquvarna 272 1997	56	74	72	92
STHIL 0 30 H 1990	76	92	72	94
STHIL 044 1998	52	68	74	98

What can be done? Aside from buying new equipment, there are two practical things that a logger can do: maintain the equipment and wear hearing protection. Mufflers and other acoustical equipment that come with the machinery should be kept on the machinery and replaced as appropriate. Defective or worn equipment is usually louder than it was originally.

The easiest solution to loud noise is also cheap and effective: personal protective equipment (PPE). Hearing protection comes in two major forms: ear muffs and ear plugs. Fortunately, either one is effective if properly worn. Most ear muffs and plugs have a noise reduction rating (NRR) of 17 to 27 dB. The NRR can be subtracted directly from the exposure to estimate the effective exposure if wearing hearing protection. For example, if one operates a bulldozer at 100 dB while wearing earplugs rated at 20 dB NRR, then the operator will hear the noise as if it were 80 dB (provided the plugs are worn properly).

If a machine is particularly loud, both muffs and plugs can be worn for better hearing protection. An additional 5 to 10 dB of protection can be gained this way.

Many safety professionals agree that the best hearing protection is one that is comfortable enough that workers are willing to wear it. Employers and employees should be willing to experiment with different types and brands of muffs and plugs.

Personnel should be reminded to wear hearing protection at home, too. Gunshot noise is especially damaging to the hearing, as are power weed eaters, edgers and leaf blowers. A .22 rifle produces 134 dB; most centrefire rifles, shotguns and pistols produce 150 to 165 dB (Audiology Associates 1997). A home lawn mower of one of the authors produced 84 dB, as measured at the ear, but his weed eater produced 115 dB.

Legal warning to loggers: Employers should be aware that if any of the employees on a job are exposed a time-weighted average noise of 85 dB or higher, OSHA regulations require a comprehensive hearing conservation plan, including regular testing of the employees' hearing. The state OSHA Consultation service can help a small business determine if that is needed (in Louisiana, contact (225) 342-9601).

Bottom line for loggers: Do everything you can to keep your equipment running as quietly as possible, and wear your hearing protection any time you operate a chainsaw or operate machinery that does not have an enclosed (and closed), acoustical cab.

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