ANNEXE F

Environnement sonore – Méthodologies

Référence: Sound and Vibration, Design and Analysis, National Environmental Balancing Bureau, 1994

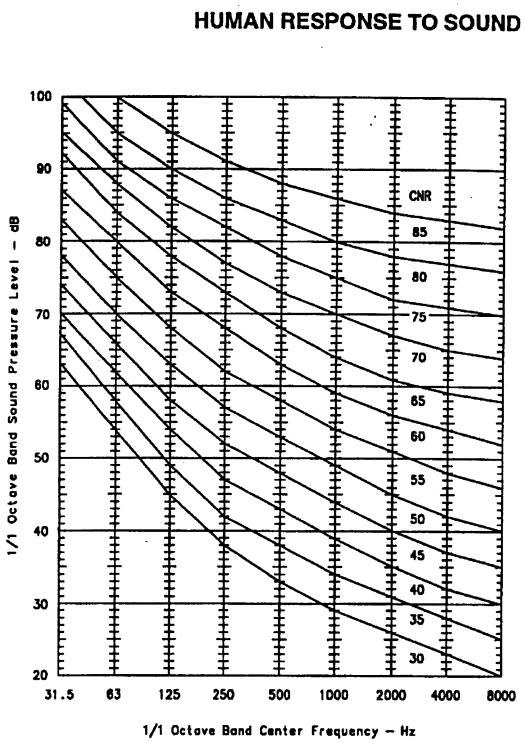


Figure 2.9 Non-Normalized Composite Noise Rating Curves

2.4 OUTDOOR NOISE CRITERIA

Often it is necessary to determine the acceptability of the intrusion of HVAC and other types of mechanical and electrical equipment noise into a community. Several factors influence community reaction to intruding noise. They are: the loudness or level of the noise, the background or ambient sound level in the absence of the noise, the duration and intermittency of the noise, the frequency content of the noise, and previous exposure to other similar noises. People tend to compare an intruding noise with the background or ambient noise that was present before the intruding noise came into existence. If an intruding noise has distinctive sounds that make it readily identifiable or if its sound levels are considerably higher than the background levels in the absence of the noise, it will be noticeable, and it may be judged to be objectionable. On the other hand, if the intruding noise has a rather unidentifiable, unobtrusive character and if it blends into the background noise, it will hardly be noticed. When an intruding noise occurs during the daytime, there are usually other noise sources present,

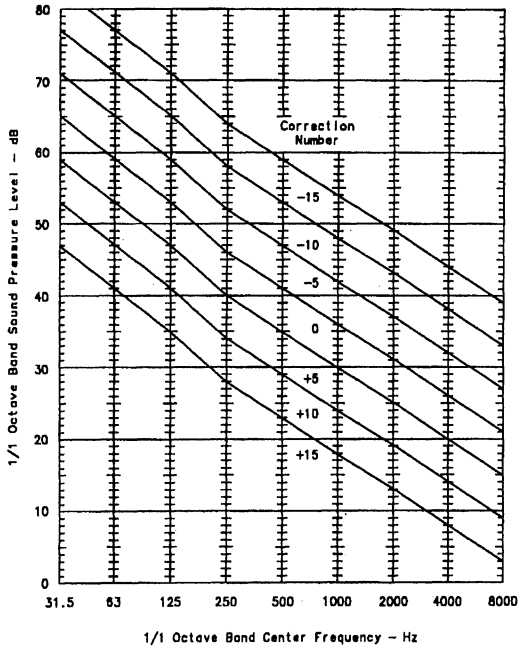


Figure 2.10 Correction for Composite Noise Rating Associated with Ambient Noise

Table 2.6 Background Noise Correction Numbers

Condition	Background Correction Number
Nighttime, rural; no nearby traffic of concern	+15
Daytime,rural; no nearby traffic of concern	+10
Nighttime, suburban; no nearby traffic of concern	+10
Daytime, suburban; no nearby traffic of concern	+5
Nighttime, urban; no nearby traffic of concern	+5
Daytime, urban; no nearby traffic of concern	0
Nighttime, business or commercial area	0
Daytime, business or commercial area	-5
Nighttime, industrial or manufacturing area	-5
Daytime, industrial or manufacturing area	-10
Within 300 ft of intermittent light traffic	0
Within 300 ft of continuous light traffic	-5
Within 300 ft of continuous medium-density traffic	-10
Within 300 ft of continuous heavy-density traffic	-15
300 to 1,000 ft from intermittent light traffic	+5
300 to 1,000 ft from continuous light traffic	0
300 to 1,000 ft from continuous medium-density traffic	-5
300 to 1,000 ft from continuous heavy-density traffic	-10
1,000 to 2,000 ft from intermittent light traffic	+10
1,000 to 2,000 ft from continuous light traffic	+5
1,000 to 2,000 ft from continuous heavy-density traffic	-5
2,000 to 4,000 ft from intermittent light traffic	+15
2,000 to 4,000 ft from continuous light traffic	+10
2,000 to 4,000 ft from continuous medium-density traffic	+5
2,000 to 4,000 ft from continuous heavy-density traffic	0

and community residents are usually not as critical of the noise because they are often engaged in activities that generate noise. However, at nighttime, the ambient sound levels are usually significantly lower. Thus, intruding noise is often judged more severely, especially if it interferes with relaxation or sleep.

Composite noise rating (CNR) procedures can be used to evaluate the acceptability of HVAC and other types of mechanical and electrical equipment noise that intrude into communities. The basic procedures have been around since 1955 [39]. The procedures that are presented here have been slightly modified to make the results obtained by the procedures more consistent with the results of procedures used to determine the acceptability of transportation-related noise sources. Figure 2.9 shows the set of non-normalized composite noise rating (CNR) curves. The non-normalized composite noise rating is determined by plotting the octave band sound pressure levels associated with an intruding noise on Figure 2.9. The octave band sound pressure levels should be measured at several representative times at each location of interest in the community. The measurements should span a time period long enough to give confidence that the average octave band sound pressure levels of the noise are truly representative. If the daytime and nighttime noise signals are different in contents and levels, separate sound measurements should be taken for the two periods.

The non-normalized composite noise rating associated with a noise equals the highest penetration of any of the octave band sound pressure levels into the curves. If the highest penetration falls between two curves, the non-normalized CNR is the interpolated value between the CNR values associated with the two curves. The non-normalized CNR must then be normalized or corrected for the background noise conditions that exist in the absence of the intruding noise and for time-of-day, seasonal, noise intermittency, noise characteristics, and previous community exposure to similar noise factors. The correction for background noise that exists in the absence of the intruding noise can be accomplished in one of two ways. If it is possible to measure the octave band sound pressure levels associated with the ambient or background noise in the absence of any intruding noise source, the levels should be measured and plotted on Figure 2.10. The zone into which the major portion of the octave band spectrum falls designates the correction to be applied for the background noise. The correction that should be used is associated with the curve that has a point of tangency that is closest

Table 2.7 Correction Numbers for Time-of-Day, Seasonal, Noise Intermittency, Noise Characteristics, and Previous Community Exposure to Similar Noise Factors

Correction for time-of-day and seasonal factors (For full time operation, the total correction is 0)	Correction Number
Daytime only	-5
Nighttime (2200 to 0700 hrs)	0
Winter only	-5
Winter and summer	0
Correction for intermittency: ratio of source "on" time to reference time period	
1.00 to 0.57	0
0.56 to 0.18	-5
0.17 to 0.06	-10
0.05 to 0.018	-15
0.017 to 0.0057	-20
0.0057 to 0.0018	-25
Correction for character of noise	
Noise is very low frequency (peak level at 1/1 octave center frequency of 125 Hz or lower)	+5
Noise contains tonal components	+5
Impulsive sound	+5
Correction for previous exposure and community attitude	
No prior exposure	+5
Some previous exposure but poor community relations	+5
Some previous exposure and good community relations	0
Considerable previous exposure and good community relations	-5

to the octave band ambient sound pressure level curve. It is not necessary to interpolate between curves. Daytime ambient noise levels should be recorded for daytime intruding noise, and nighttime ambient levels should be used for nighttime intruding noise. If it is not possible to measure the octave band ambient sound pressure levels, the background sound level corrections given in Table 2.6 can be used to estimate the correction for background or ambient sound levels. The corrections in Table 2.6 are based on the general type of community area and nearby traffic activity. The normalized CNR, corrected for background noise level, is obtained by adding the number (must keep track of the sign in front of number) obtained from either Figure 2.10 or Table 2.6 to the non-normalized composite noise rating obtained from Figure 2.9.

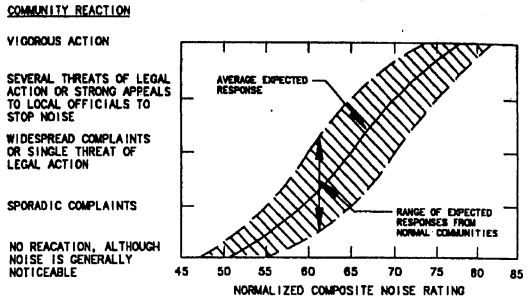


Figure 2.11 Estimated Community Reaction to Intruding Noise vs. Normalized Composite Noise Rating

The final correction is associated with time-of-day, seasonal, noise intermittency, noise characteristics, and previous community exposure to similar noise factors. These correction factors are obtained from Table 2.7. The total correction for these factors is the sum of the corrections associated with each individual factor.

The normalized CNR is calculated by taking the non-normalized CNR obtained from Figure 2.9 and adding to it the correction number for the background noise obtained from either Figure 2.10 or Table 2.6 and the total correction number associated with the time-of-day, seasonal, noise intermittency, noise characteristics, and previous-community-exposure-to-similar-noise factors. Once the normalized composite CNR has been calculated, the anticipated community reaction to the intruding noise is obtained from Figure 2.11.

The composite noise rating procedure is generally a reliable method of determining community reaction to outdoor noise from mechanical and electrical equipment. However, it may not be reliable when dealing with certain types of equipment that generate strong pure tones (e.g. high pressure blowers, diesel generators, gas turbines, etc.). It is strongly advised that an acoustical expert be consulted when dealing with these types of sound sources.

EXAMPLE 2.3

The octave band sound pressure levels associated with a cooling tower are listed below:

	Octave Band Center Freq. - Hz							
	63	125	250	500	1000	2000	4000	8000
L_p, dB	64	64	62	60	56	53	51	43

The cooling tower runs 24 hours a day. The location at which the sound pressure levels were measured is a business area. Assume there is previous exposure to

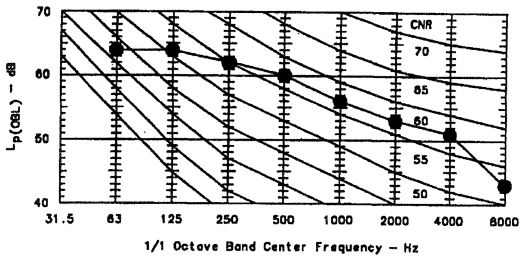


Figure 2.12 CNR_{nn} Value for Example 2.3

similar noise and that there are good community relations. Determine the composite noise rating associated with the cooling tower noise, and make some statement relative to the anticipated community reaction to the noise.

SOLUTION

The non-normalized composite noise rating (CNR_{nn}) is obtained by plotting the above octave band sound pressure levels on Figure 2.9. The resulting plot is shown in Figure 2.12. An examination of the plot indicates that the CNR_{nn} is CNR_{nn}-58.

Since the cooling tower runs 24 hours a day, it is necessary to determine the normalized composite noise rating (CNR_n) for both daytime and nighttime use. The background noise correction numbers are obtained from Table 2.6. The numbers for a business area are:

daytime: -5
nighttime: 0

The correction numbers from Table 2.7 are:

time-of-day: 0
intermittency: 0
character of noise: +5
previous exposure: 0

Thus, the normalized CNR_n values are:

Daytime:
$CNR_n = 58 - 5 + 0 + 5 + 0$ or $CNR_n = 58$

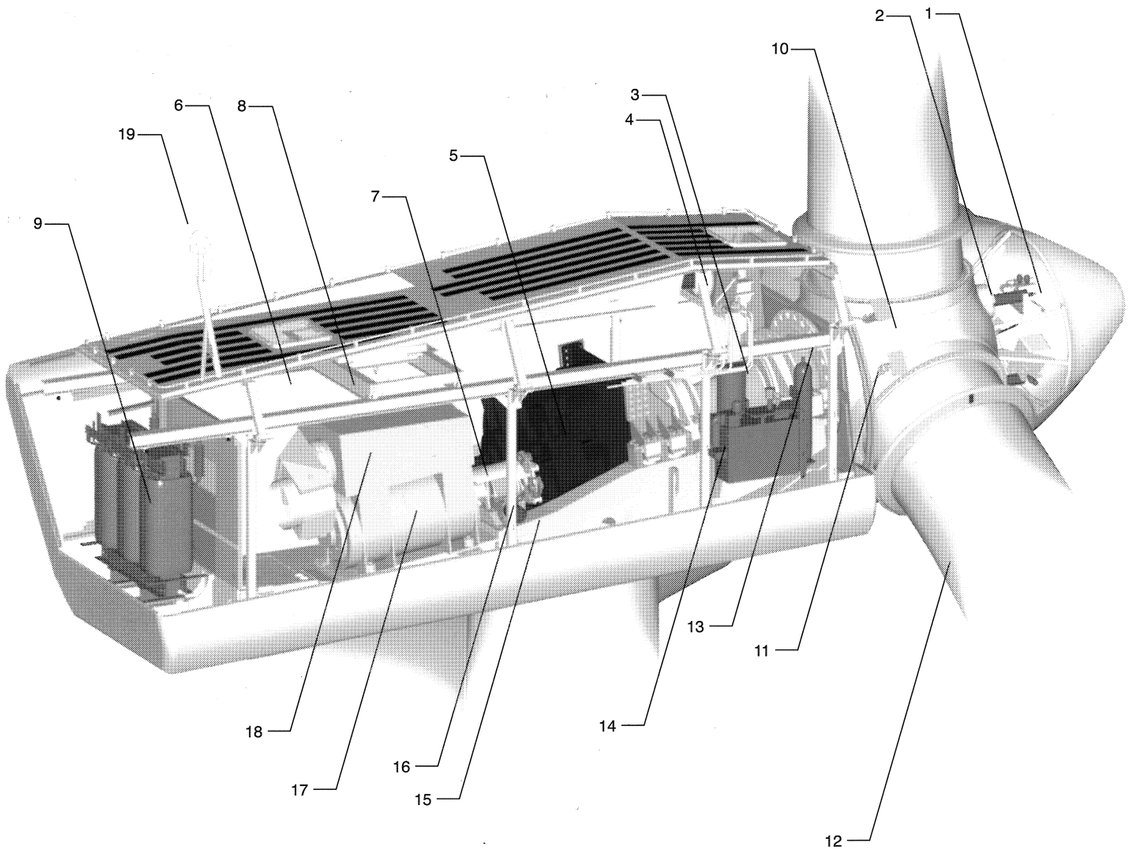
Nighttime:
$CNR_n = 58 + 0 + 0 + 5 + 0$ or $CNR_n = 63$.

An examination of Figure 2.11 indicates there will be no complaints during the daytime hours; and there will be some sporadic complaints during the nighttime hours.

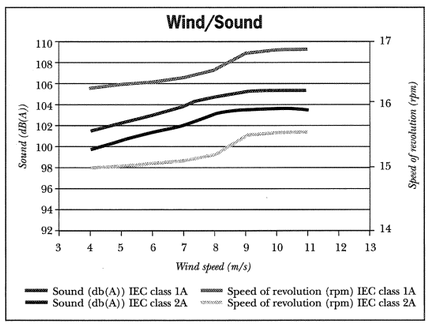
La réaction de la communauté est associée à l'intensité de l'impact sonore comme suit :

Community Reaction Figure 2.11	**Intensité de l'impact sonore**
Vigorous action	Très forte
Several threats of legal action or strong appeals to local officials to stop noise	Forte
Widespread complaints or single threat of legal action	Moyenne
Sporadic complaints	Faible
No reaction, although noise is generally noticeable	Faible *

*: Il faut noter que l'intensité de l'impact aurait pu être qualifiée de très faible pour respecter la logique de la grille. S'il n'en est pas ainsi, c'est pour limiter le nombre de combinaisons possibles aux étapes ultérieures de l'évaluation. Le biais ainsi introduit est faible et va dans le sens d'une surestimation de l'importance des impacts pour les composantes appartenant à cette catégorie.



1. *Hub controller*
2. *Pitch cylinder*
3. *Main shaft*
4. *Oil cooler*
5. *Gearbox*
6. *VMP-Top controller with converter*
7. *Parking brake*
8. *Service crane*
9. *Low loss transformer*
10. *Blade hub*
11. *Blade bearing*
12. *Blade*
13. *Rotor lock system*
14. *Hydraulic unit*
15. *Machine foundation*
16. *Yaw gears*
17. *OptiSlip®-generator*
18. *Generator cooler*
19. *Ultra-sonic sensor*



The chart to the left illustrates the relationship between wind and sound levels as well as the speed of revolution (rpm) of the two models of the V80-1.8 MW turbine. As the chart indicates, the lower rotor speed model (IEC-61400 class 2A) has a lower sound level than the higher rotor speed model. The chart also shows that sound levels vary significantly with wind speeds. In this connection, it should be noted that a 3 dB(A) reduction is perceived as a 50% reduction of the sound level.

Rotor

Diameter:	80 m
Swept area:	5,027 m²
Speed of revolution:	15.5 rpm/16.8 rpm
Number of blades:	3
Power regulation:	Pitch + OptiSlip®
Air brake:	3 separate pitch settings

Tower

Hub height (approx.):	60 - 67 - 78 m

Operational data

Cut-in wind speed:	4 m/s
Nominal wind speed:	16 m/s
Stop wind speed:	25 m/s

Generator

Type:	Asynchronous with OptiSlip®
Nominal output:	1.8 MW
Operational data:	60 Hz 690V 1,800 - 1,980 rpm

Gearbox

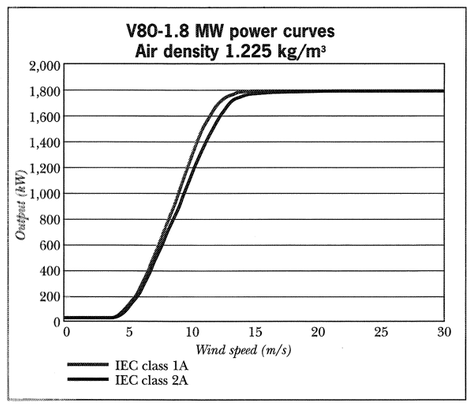
Type:	Planet/parallel gear

Control

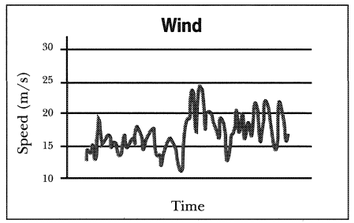
Type:	Microprocessor-based control of all turbine functions with the option of remote monitoring. OptiSlip® output regulation and OptiTip® pitch regulation of the blades.

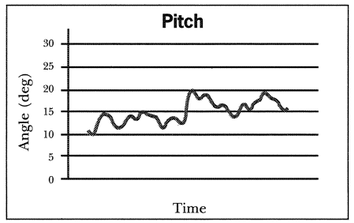
Weight (approx.)

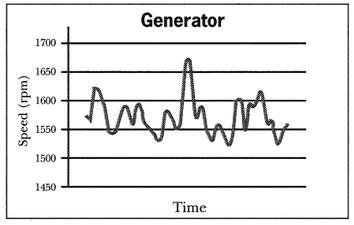
Hub height:	60 m	67 m	78 m
Nacelle:	138,915 lbs.	138,915 lbs.	138,915 lbs.
Rotor:	77,175 lbs.	77,175 lbs.	77,175 lbs.

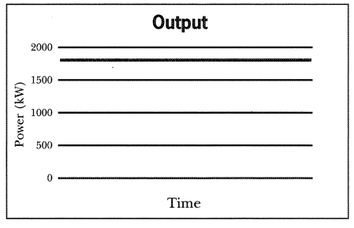


Vestas V80-1.8 MW with OptiSlip®









OptiSlip® allows the speed of revolution of both the rotor and the generator to vary by approximately 10%. This reduces both unwanted fluctuations in the grid supply and the load on the vital parts of the construction.

Proven Performance

At Vestas, extensive testing is performed over long periods to document the performance of all Vestas turbines. When finally satisfied, Vestas commissions an independent testing organization to verify the results. This is standard operating procedure at Vestas, a practice referred to as "Proven Performance". It is our guarantee that your Vestas turbine meets the highest quality standards for energy production, availability, power quality and sound levels.

PP PROVEN PERFORMANCE THE VESTAS STANDARD

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Vestas

03/04

Tableau 3 Dénombrement des oiseaux migrateurs par famille ou sous-famille à Murdochville en printemps 2004*

Date	Secteur	Virée	Longueur Virée	Anatinae		Accipitrinae		Falconidae		Scolopacinae		Larinae		Picinae		Tyrannidae		Tetraoninae		Corvidae		Paridae		Sittinae		Troglodytidae		Sylvinae		Turdinae		Bombycillidae		Vireoninae		Parulinae		Emberizinae		Carduelinae		Total / virée	Totale / km	% de l'avifaune virée	% de l'avifaune km
21 mai	1	1	600	0	0	0	0	0	0	0	0	2	3.3	0	0	0	0	0	0	0	0	2	3.3	0	0	1	1.7	1	1.7	1	1.7	0	0	0	0	0	0	8	13.3	1	1.7	16.0	26.7	1.9%	1.8%
21 mai	1	2	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.7	4	6.7	0	0	2	3.3	0	0	1	1.7	3	5.0	2	3.3	13.0	21.7	1.6%	1.4%
21 mai	1	3	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6.7	0	0	0	0	5	16.7	2	6.7	0	0	0	0	3	10	6	20	1	3.3	19.0	63.3	2.3%	4.2%
22 mai	2	4	800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2.5	0	0	1	1.3	0	0	0	0	2	2.5	6	7.5	0	0	0	0	1	1.3	7	8.8	0	0	19.0	23.8	2.3%	1.6%
22 mai	2	5	600	1	1.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.7	0	0	0	0	0	0	0	0	1	1.7	7	11.7	0	0	10.0	16.7	1.2%	1.1%
22 mai	2	6	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.0	0	0	0	0	0	0	0	0	0	0	9	9.0	0	0	10.0	10.0	1.2%	0.7%
22 mai	2	7	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.4	0	0	1	1.4	0	0	0	0	1	1.4	0	0	0	0	0	0	0	0	6	8.6	0	0	9.0	12.9	1.1%	0.9%
23 mai	3	8	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5.71	0	0	3	4.3	1	1.4	1	1.4	4	5.7	3	4.3	0	0	0	0	0	0	10	14.3	1	1.4	27.0	38.6	3.3%	2.6%
23 mai	3	9	400	0	0	0	0	0	0	0	0	0	0	2	5.0	0	0	1	2.5	0	0	2	5.0	0	0	1	2.5	3	7.5	1	2.5	0	0	0	0	1	2.5	9	22.5	0	0	20.0	50.0	2.4%	3.3%
23 mai	3	10	500	0	0	0	0	0	0	0	0	0	0	1	2.0	0	0	1	2.0	1	2.0	3	6.0	1	2.0	1	2.0	3	6.0	1	2.0	15	30.0	0	0	4	8.0	10	20.0	0	0	41.0	82.0	5.0%	5.4%
23 mai	3	11	400	0	0	0	0	0	0	0	0	0	0	3	7.5	0	0	0	0	0	0	3	7.5	0	0	0	0	8	20.0	1	2.5	0	0	0	0	1	2.5	6	15.0	0	0	22.0	55.0	2.7%	3.7%
24 mai	3	12	900	0	0	0	0	0	0	0	0	0.0	0	2	2.2	0	0	2	2.2	0	0	3	3.3	1	1.1	2	2.2	9	10.0	2	2.2	0	0	0	0	1	1.1	10	11.1	0	0	32.0	35.6	3.9%	2.4%
24 mai	3	13	500	0	0	0	0	0	0	0	0	0	0	2	4.0	0	0	0	0	0	0	3	6.0	0	0	3	6.0	3	6.0	1	2.0	0	0	0	0	0	0	6	12.0	0	0	18.0	36.0	2.2%	2.4%
24 mai	3	14	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.0	0	0	0	0	3	6.0	1	2.0	0	0	0	0	0	0	2	4.0	0	0	7.0	14.0	0.8%	0.9%
25 mai	4	15	1000	0	0	0	0	0	0	0	0	1	1.0	0	0	1	1.0	0	0	2	2.0	0	0	0	0	0	0	4	4.0	6	6.0	0	0	0	0	5	5.0	10	10.0	1	1.0	30.0	30.0	3.6%	2.0%
25 mai	4	16	500	0	0	0	0	0	0	0	0	2	4.0	0	0	0	0	0	0	2	4.0	1	2.0	4	8.0	4	8.0	1	2.0	0	0	0	0	0	0	15	30.0	0	0	29.0	58.0	3.5%	3.8%
25 mai	4	17	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10.0	0	0	0	0	0	0	0	0	1	5.0	9	45.0	0	0	12.0	60.0	1.5%	4.0%
25 mai	4	18	500	3	6.0	0	0	0	0	0	0	2	4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	4	8.0	0	0	0	0	0	0	0	0	5	10.0	0	0	14.0	28.0	1.7%	1.9%
25 mai	4	19	500	0	0	0	0	1	2	0	0	0	0	1	2	0	0	0	0	0	0	3	6	2	4	2	4	2	4	3	6	0	0	0	0	4	8	9	18	0	0	27.0	54.0	3.3%	3.6%
26 mai	1	1	600	0	0	0	0	0	0	1	1.7	0	0	1	1.7	0	0	1	1.7	0	0	2	3.3	2	3.3	2	3.3	6	10.0	7	11.7	0	0	0	0	2	3.3	9	15.0	2	3.3	35.0	58.3	4.2%	3.9%
25 mai	1	2	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5.0	0	0	1	1.7	0	0	0	0	7	11.7	5	8.3	0	0	0	0	3	5.0	7	11.7	1	1.7	27.0	45.0	3.3%	3.0%
26 mai	1	3	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6.67	0	0	0	0	0	0	0	0	2	6.7	1	3.3	0	0	0	0	0	0	6	20	2	6.7	13.0	43.3	1.6%	2.9%
27 mai	2	4	800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.3	1	1.3	0	0	0	0	0	0	3	3.8	7	8.8	0	0	0	0	0	0	11	13.8	0	0	23.0	28.8	2.8%	1.9%
27 mai	2	5	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3.3	2	3.3	0	0	0	0	0	0	10	16.7	1	1.7	15.0	25.0	1.8%	1.7%
27 mai	2	6	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9.0	0	0	9.0	9.0	1.1%	0.6%
27 mai	2	7	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2.9	0	0	2.0	2.9	0.2%	0.2%
28 mai	3	8	700	0	0	1	1.43	0	0	0	0	0	0	1	1.43	0	0	2	2.86	0	0	12	17	2	2.9	2	2.9	7	10	9	13	0	0	0	0	0	0	27	38.6	0	0	63.0	90.0	7.6%	6.0%
28 mai	3	9	400	0	0	0	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0	1	2.5	2	5.0	2	5.0	3	7.5	5	12.5	0	0	1	2.5	1	2.5	12	30.0	0	0	29.0	72.5	3.5%	4.8%
28 mai	3	10	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.0	0	0	1	2.0	3	6.0	1	2.0	0	0	0	0	1	2.0	12	24.0	1	2.0	20.0	40.0	2.4%	2.7%
28 mai	3	11	400	0	0	0	0	0	0	0	0	0	0	3	7.5	1	2.5	0	0	0	0	1	2.5	1	2.5	2	5.0	5	12.5	0	0	0	0	0	0	1	2.5	9	22.5	0	0	23.0	57.5	2.8%	3.8%
29 mai	3	12	900	0	0	0	0	0	0	0	0	0	0	2	2.2	0	0	1	1.1	2	2.2	6	6.7	1	1.1	3	3.3	13	14.4	8	8.9	0	0	0	0	5	5.6	16	17.8	1	1.1	58.0	64.4	7.0%	4.3%
29 mai	3	13	500	0	0	0	0	0	0	0	0	0	0	4	8.0	1	2.0	0	0	2	4.0	1	2.0	0	0	2	4.0	6	12.0	1	2.0	0	0	0	0	0	0	8	16.0	0	0	25.0	50.0	3.0%	3.3%
29 mai	3	14	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	12.0	0	0	3	6.0	4	8.0	1	2.0	0	0	0	0	3	6.0	12	24.0	0	0	29.0	58.0	3.5%	3.8%
30 mai	4	15	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2.0	3	3.0	7	7.0	0	0	0	0	1	1.0	7	7.0	0	0	20.0	20.0	2.4%	1.3%
30 mai	4	16	500	0	0	0	0	0	0	0	0	1	2.0	1	2.0	0	0	0	0	0	0	0	0	0	0	3	6.0	2	4.0	0	0	0	0	0	0	2	4.0	8	16.0	0	0	17.0	34.0	2.1%	2.3%
30 mai	4	17	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5.0	1	5.0	2.0	10.0	0.2%	0.7%
30 mai	4	18	500	4	8.0	0	0	0	0	1	2.0	0	0	0	0	0	0	1	2.0	0	0	2	4.0	0	0	0	0	3	6.0	2	4.0	0	0	0	0	2	4.0	1	2.0	1	2.0	17.0	34.0	2.1%	2.3%
30 mai	4	19	500	0	0	0	0	0	0	0	0	0	0	3	6	0	0	0	0	0	0	0	0	1	2	2	4	4	8	3	6	0	0	0	0	0	0	10	20	1	2	24.0	48.0	2.9%	3.2%
		total		8		1		1		2		4		31		3		23		6		64		15		44		133		88		17		1		44		324		17		826.0		100.0%	
		Composition de l'avifaune (%)		1.0		0.1		0.1		0.2		0.5		3.8		0.4		2.8		0.7		7.7		1.8		5.3		16.1		10.7		2.1		0.1		5.3		39.2		2.1					

* Le nombre d'observations par virées est noté dans la colonne blanche, alors que le nombre d'observations par kilomètre de virées est indiqué dans la colonne grise.

Tableau 4 Dénombrement des oiseaux migrateurs par famille ou sous-famille à Murdochville en automne 2004*

Date	Secteur	Virée	Longueur Virée	Anatinae		Accipitrinae		Falconidae		Picinae		Tyrannidae		Tetraoninae		Corvidae		Paridae		Sittinae		Troglodytidae		Sylvinae		Turdinae		Bombycillidae		Parulinae		Emberizinae		Icterinae		Carduelinae		Passeriformes nd		Total / virée	Totale / km	% de l'avifaune virée	% de l'avifaune km
040911	1	1	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	11.7	0	0	0	0	0	0	0	0	0	0	5	8.33	9	15.0	0	0	4	6.7	5.0	8.3	30.0	50.0	3.9%	3.7%
040911	1	2	600	0	0	0	0	0	0	1	1.67	1	1.67	0	0	1	1.67	5	8.33	0	0	0	0	4	6.7	1	1.7	0	0	0	0	9	15.0	0	0	3	5.0	2.0	3.3	27.0	45.0	3.5%	3.3%
040911	1	3	300	0	0	0	0	0	0	1	3.33	2	6.67	0	0	0	0	6	20	0	0	0	0	1	3	1	3	0	0	3	10	3	10	0	0	2	6.67	2.0	6.7	21.0	70.0	2.7%	5.1%
040912	2	4	800	0	0	0	0	0	0	0	0	2	2.5	0	0	1	1.25	1	1.3	0	0	0	0	0	0	1	1.3	0	0	0	0	5	6.3	0	0	0	0	1	1.25	11.0	13.8	1.4%	1.0%
040912	2	5	600	0	0	0	0	1	1.67	0	0	2	3.33	0	0	0	0	2	3.33	0	0	0	0	0	0	0	0	0	0	5	8.3	3	5.0	0	0	1	1.67	0	0	14.0	23.3	1.8%	1.7%
040912	2	6	1000	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	6	6.0	0	0	1	1	2	2	20.0	20.0	2.6%	1.5%
040912	2	7	700	0	0	0	0	0	0	0	0	2	2.86	0	0	1	1.43	0	0	0	0	0	0	1	1.4	0	0	0	0	7	10	1	1.4	0	0	2	2.86	1	1.4	15.0	21.4	2.0%	1.6%
040913	3	8	700	0	0	0	0	0	0	0	0	0	0	0	0	1	1.43	0	0	0	0	0	0	2	3	0	0	0	0	7	10	6	9	0	0	0	0	3.0	4.3	19.0	27.1	2.5%	2.0%
040913	3	9	400	0	0	1	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5.0	0	0	0	0	4	10.0	2	5.0	0	0	0	0	1	2.5	10.0	25.0	1.3%	1.8%
040913	3	10	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.0	0	0	0	0	0	0	2	4.0	0	0	0	0	3	6	6.0	12.0	0.8%	0.9%
040913	3	11	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5.0	0	0	0	0	2	5.0	0	0	0	0	0	0	2	5	6.0	15.0	0.8%	1.1%
040914	3	12	900	0	0	0	0	0	0	2	2.2	0	0	1	1.1	1	1.11	8	8.9	2	2.2	2	2.2	5	5.6	2	2.2	0	0	11	12.2	6	6.7	0	0	0	0	2	2.2	42.0	46.7	5.5%	3.4%
040914	3	13	500	0	0	0	0	0	0	1	2.0	0	0	0	0	0	0	1	2.0	0	0	0	0	1	2.0	0	0	0	0	5	10	0	0	0	0	1	2	0	0	9.0	18.0	1.2%	1.3%
040914	3	14	500	0	0	0	0	0	0	0	0	0	0	0	0	2	4	2	4.0	1	2	0	0	1	2.0	0	0	0	0	5	10	2	4.0	0	0	0	0	0	0	13.0	26.0	1.7%	1.9%
040915	4	16	500	0	0	0	0	0	0	1	2	1	2	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	2	4	8	0	0	0	1	2	4.0	8	18.0	20.0	2.4%	1.5%
040915	4	18	500	2	4	0	0	0	0	0	0	0	0	0	0	0	0	5	10.0	1	2.0	0	0	0	0	0	0	0	0	0	0	1	2.0	0	0	0	0	2	4	11.0	22.0	1.4%	1.6%
040915	4	19	500	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3	6	0	0	0	0	0	0	0	0	0	0	3	6	12	24	0	0	0	0	3	6	22.0	44.0	2.9%	3.2%
040915	5	20	500	0	0	0	0	0	0	1	2	0	0	0	0	1	2	5	10	1	2	1	2.0	1	2.0	0	0	0	0	8	16	27	54.0	0	0	3	6	0	0	48.0	96.0	6.3%	7.0%
040915	5	21	300	0	0	0	0	0	0	1	3.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3.33	4	13.33	0	0	0	0	0	0	6.0	20.0	0.8%	1.5%
040917	1	1	600	0	0	0	0	0	0	1	1.7	0	0	0	0	0	0	5	8.3	0	0	0	0	0	0	0	0	0	0	6	10.0	18	30.0	0	0	0	0	4.0	6.7	34.0	56.7	4.4%	4.1%
040917	1	2	600	0	0	0	0	0	0	1	1.67	0	0	1	1.7	0	0	5	8.3	1	1.67	0	0	5	8.3	1	1.7	0	0	28	46.7	7	11.7	0	0	2	3.3	4.0	6.7	55.0	91.7	7.2%	6.7%
040917	1	3	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6.67	0	0	0	0	0	0	1	3	0	0	3	10	6	20	0	0	0	0	0	0	12.0	40.0	1.6%	2.9%
040918	2	4	800	0	0	0	0	0	0	0	0	0	0	0	0	1	1.3	3	3.75	1	1.25	0	0	5	6.3	0	0	0	0	8	10	0	0	0	0	0	0	0	0	18.0	22.5	2.4%	1.6%
040918	2	5	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	6.7	0	0	0	0	8	13.3	3	5.0	0	0	1	1.7	0	0	16.0	26.7	2.1%	2.0%
040918	2	6	1000	0	0	1	1	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	6	6	0	0	1.0	1.7	0	0	0	0	12.0	12.7	1.6%	0.9%
040918	2	7	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	20	0	0	0	0	0	0	0	0	14.0	20.0	1.8%	1.5%
040919	3	8	700	0	0	0	0	0	0	0	0	0	0	3	4.29	2	2.86	4	5.71	0	0	0	0	0	0	1	1	0	0	0	0	9	12.86	0	0	10	14.3	0	0	29.0	41.4	3.8%	3.0%
040919	3	9	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.5	0	0	0	0	3	7.5	0	0	0	0	1	2.5	4	10.0	0	0	0	0	0	0	9.0	22.5	1.2%	1.6%
040919	3	10	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6.0	0	0	0	0	0	0	0	0	0	0	1	2.0	2	4.0	0	0	0	0	3.0	6.0	9.0	18.0	1.2%	1.3%
040919	3	11	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	12.5	3	7.5	0	0	0	0	1	2.5	0	0	0	0	7	17.5	16.0	40.0	2.1%	2.9%
040920	3	12	900	17	18.9	0	0	0	0	0	0	0	0	0	0	1	1.1	6	6.7	1	1.1	0	0	0	0	1	1.1	0	0	10	11.1	8	8.9	0	0	7	7.8	1.0	1.1	52.0	57.8	6.8%	4.2%
040920	3	13	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4	8.0	0	0	0	0	1	2	6.0	12.0	0.8%	0.9%
040920	3	14	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.0	10	20.0	0	0	0	0	0	0	11.0	22.0	1.4%	1.6%
040921	4	16	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	16	32	0	0	0	0	1.0	2	20.0	40.0	2.6%	2.9%
040921	4	18	500	3	6	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.0	0	0	0	0	5	10	1	2.0	0	0	0	0	5	10	17.0	34.0	2.2%	2.5%
040921	4	19	500	0	0	0	0	1	2	0	0	0	0	0	0	1	2	0	0	0	0	0	0	4	8	13	26	12	24	8	16	11	22	0	0	0	0	2	4	52.0	104.0	6.8%	7.6%
040921	5	20	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0.0	0	0	0	0	1	2	17	34.0	0	0	0	0	0	0	20.0	40.0	2.6%	2.9%
040921	5	21	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3.3	0	0	3	10	9	30	0	0	1	3.33	1	3.3	15.0	50.0	2.0%	3.7%
			total	22		3		4		11		11		5		15		76		8		3		50		26		12		185		232		1		39		62		765.0		100.0%	
			Composition de l'avifaune (%)	2.9		0.4		0.5		1.4		1.4		0.7		2.0		9.9		1.0		0.4		6.5		3.4		1.6		24.2		30.3		0.1		5.1		8.1					

* Le nombre d'observations par virées est noté dans la colonne blanche, alors que le nombre d'observations par kilomètre de virées est indiqué dans la colonne grise.