Winter Ambient Sound Levels in Grand Canyon National Park

NPS Report No. GRCA-07-02

7 March 2007

Laura Levy[1] and Sarah Falzarano[2]
Overflights and Natural Soundscape Program
Grand Canyon National Park
823 N. San Francisco St, Ste C
Flagstaff, AZ 86001
[1]Laura_B_Levy@nps.gov, (928) 774-0387
[2]Sarah_Falzarano@nps.gov, (928) 226-1566

Abstract
Winter acoustic natural ambient conditions in Grand Canyon National Park were determined by analyzing sound data from February 2006 at four sites based on vegetation and comparing them to summer natural ambient conditions described by Ambrose (2006). The percent time audible of natural sounds decreased in winter to 83% of the time, allowing non-natural sounds to be heard on average about 39% of the time, 5.4% more than in the summer. Summer and winter sound pressure levels (SPL) for all sites except the ponderosa pine site were very low, and within ±1 dBA of each other. Daytime winter natural ambient levels range from 17.4 dBA for warm desert scrub to 33.1 dBA for ponderosa pine. The SPL values at the ponderosa pine site were 4-5 dBA higher in winter than in summer. The high number of wind induced events at this site in February 2006 suggests that the higher SPL values are most likely due to wind. The L_{min} values at all sites occurred at or near the noise floor of the instruments (about 15 dBA) indicating that a low noise microphone should be used in future studies.

Introduction
This study is complementary to "Sound Levels in the Primary Vegetation Types in Grand Canyon National Park, July 2005" (Ambrose 2006) which described the sound levels within the Park during the summer months. This study describes the same acoustic zones, but during the winter month of February. The natural ambient data from these studies provides a baseline of acoustic conditions within selected acoustic zones of Grand Canyon National Park.

Study Area
The field sites used in this study represent the four acoustic zones defined by the major vegetation types in Grand Canyon National Park. These acoustic zones were developed for aircraft noise modeling at the Park. Together, these sites represent more than 83 percent of the Park's area (Falzarano 2006). The four field sites in this report are the same sites used to determine summer ambient values from July 2005 (Ambrose 2006; Figure 1 and Table 1). According to Grand Canyon National Park's General Management Plan zones (NPS 1995) GRCA008 and GRCA011 are located in corridor areas and GRCA009 and GRCA010 are located in proposed wilderness.

Table 1. Locations of summer 2005 and winter 2006 field sites.

Site	Location	Elevation	Vegetation Type
GRCA008	Pasture Wash	1929 m	Pinyon-Juniper Woodland
GRCA009	Tuweep Area	1273 m	Warm Desert Scrub
GRCA010	Tuweep Area	1400 m	Cold Desert Scrub
GRCA011	South Rim	2151 m	Ponderosa Pine Forest

Methods
Definitions (Courtesy of the Natural Sounds Program)
Audibility: The ability of animals with normal hearing, including humans, to hear a given sound. Audibility is affected by the hearing ability of the animal, other simultaneous interfering sounds or stimuli, and by the frequency content and amplitude of the sound.
Decibel (dB): A logarithmic measure of sound. The decibel provides the possibility of representing a large span of signal levels in a simple manner as opposed to using the basic unit Pascal. The difference between the sound pressure for silence versus a loud sound is a factor of

1,000,000:1 or more, therefore it is less cumbersome to use a small range of equivalent values: 0 to 130 decibels.
A-Weighted Decibel (dBA)*:* A-weighting de-emphasizes the high (6.3 kHz and above) and low (below 1 kHz) frequencies, and emphasizes the frequencies between 1 kHz and 6.3 kHz, in an effort to simulate the relative response of human hearing.
Frequency: The number of times per second that the sine wave of sound repeats itself. It can be expressed in cycles per second, or Hertz (Hz). Frequency equals speed of sound/wavelength.
L_{max} and L_{min}: The maximum and minimum sound pressure level for a given period.
L_x (Exceedence Percentile): The sound pressure level, in decibels, exceeded x percent of the time.
L_{50}: The sound pressure level, in decibels, exceeded 50 percent of the time (the median).
L_{90}: The sound pressure level, in decibels, exceeded 90 percent of the time. This approximates the decibel level of the natural sounds in a non-natural environment.
Natural Ambient Sound Level (L_{nat}): The sound level of all natural sounds in a given area, excluding all mechanical, electrical and other human-caused sounds. The L_{nat} is the sound level associated with an exceedence value calculated by removing the percent time human-caused sounds are audible.
Noise Free Interval (NFI)*:* The length of the continuous period of time during which there is silence or only natural sounds are audible.
Octave: The interval between two frequencies having a ratio of 2:1.
One-third octave band: A frequency band whose cutoff frequencies have a ratio of 2 to one-third (approximately 1.26). Humans have the ability to differentiate one-third octaves.
Sound Pressure: Fluctuations in air pressure caused by the presences of sound waves. Sound pressure is the instantaneous difference between the actual pressure produced by a sound wave and the average barometric pressure at a given point in space.
Sound Pressure Level (SPL): The logarithmic form of sound pressure. In air, 20 times the logarithm of the ratio of the actual sound pressure to a reference sound (20 micropascals, the assumed threshold of human hearing).

Sound Equipment
The sound system at each of the four sites consisted of a Panasonic CF-18 Toughbook laptop, an ANSI Type 1 Larson-Davis sound level meter (model 824), microphone (GRAS 40AE; protected by a Larson-Davis Environmental Shroud, including a foam windscreen and bird spike) and preamplifier (Larson-Davis 902; Figure 2). This system is known to be accurate within 1 dBA. An array of solar panels was used to recharge the 12-volt batteries which powered the system. SoundMonitor software SM030301 and SM051210 (© Far North Aquatics, Fairbanks, AK) were both used.

Sound Recordings
Digital sound recordings were collected at each of the four sites. Ten second recordings were collected every 2 minutes (720 recordings/24 hours = 2 hours of recordings) and sounds louder than 55 dBA occurring for at least 10 seconds or 75 dBA occurring for at least 1 second, termed *events*, were also recorded. In the office, the 720 daily recordings were logged for sound sources through listening. One week's worth (2 hours per day or 14 hours total; February 1-7, 2006) of sound recordings were logged from each of the four sites. Events from each of the sites were also logged and sound sources identified. Percent time audible of non-natural sources was calculated

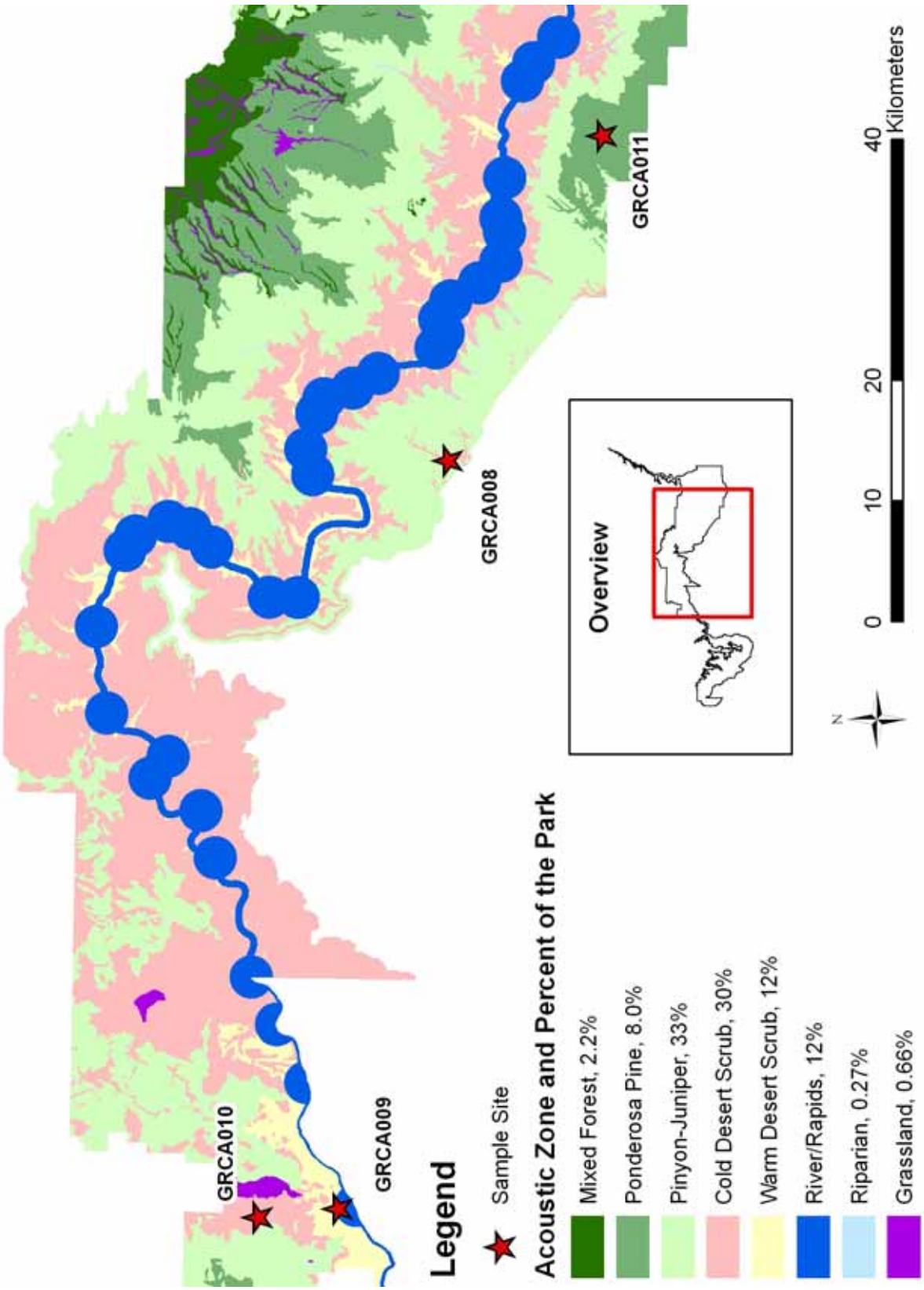

Figure 1. Locations of summer 2005 and winter 2006 field sites.

from the office logging data. Comparison of sound source identification and computation of percent time audible using the 10-second/2-minute sample scheme and continuous logging in the field yields a good correlation (r^2 = 0.936, S. Ambrose, S. Burson, and S. Falzarano, unpublished data).

Observer Logging

Multiple times at each site, observers listened and logged what they heard for an hour in the field. Sounds were recorded on standardized logging sheets in 10 second intervals (not necessarily in order of loudness). Observers logged more than 25 m from the sound systems to avoid influencing the sound data, but close enough to hear the same sounds that the systems were recording. Among the four sites, 17 hours of daytime observer logging was conducted in January and February. The mean and maximum noise free intervals were calculated using these data.

Figure 2. Sound system consisting of microphone with windscreen, array of solar panels (shown), laptop, sound level meter and 12V batteries are in pelican cases underneath solar panels.

Sound Pressure Levels
Sound pressure level (SPL) data over each of the one-third octave bands between 12.5 and 20,000 Hz were collected every second at each of the sites. All four systems ran continuously for the month of February, with the exception of a couple of hours biweekly when data was being downloaded and general maintenance was being performed. In order to meet the minimum requirement of 25 days of data analyzed (NPS 2005), February 1-28, 2006, were analyzed at all four sites.

Results
Percent Time Audible and Sound Source Identification
The percent time audible of non-natural sounds during daytime hours (0700-1900) ranged from 31.0% to 46.6%, with an average of 38.9% (Table 2). GRCA011 had the highest percent time audible of non-natural sounds and GRCA009 the lowest. On average, non-natural sounds were heard 5.4% more of the time during winter (February) 2006 than summer (July) 2005.

Similar to summertime, the majority (and at GRCA009, all) of the non-natural sounds were caused by aircraft in the wintertime. The majority of aircraft noise was from jets (mean percent time audible of 27.2%). Propeller aircraft or helicopters were audible 6.0% of the time.

Table 2. Percent time audible for non-natural and natural sounds, daytime hours (0700 to 1900), for winter 2006 and summer 2005 (in parentheses)

Site	% Time non-natural sounds audible	% Time all aircraft audible	% Time jets audible	% Time propeller and/or helicopter audible	% Time natural sounds audible
GRCA008	43.8 (44.8)	42.4 (40.5)	35.2 (36.0)	3.4 (4.5)	87.0 (94.5)
GRCA009	31.0 (22.8)	31.0 (22.2)	24.0 (9.4)	5.6 (12.9)	79.1 (96.3)
GRCA010	34.1 (28.9)	32.3 (27.2)	28.0 (22.6)	3.1 (4.6)	71.3 (99.2)
GRCA011	46.6 (37.7)	36.3 (21.5)	21.7 (14.4)	11.9 (7.1)	95.7 (99.6)
Mean	38.9 (33.5)	35.5 (27.8)	27.2 (20.6)	6.0 (7.3)	83.3 (97.4)

The highest percentage of naturally caused sounds occurred at GRCA011 and the lowest at GRCA010 with an average of all sites of 83.3% compared to 97.3% of the time during summer months. Wind and birds accounted for the majority of the natural sounds at all four sites and insects were also heard at the warmer sites, GRCA009 and GRCA010 (Table 3). Percent time audible for all sound sources for all sites are presented in the Appendix.

The highest percentage of naturally caused sounds occurred at GRCA011 and the lowest at GRCA010 with an average of all sites of 83.3% compared to 97.3% of the time during summer months. Wind and birds accounted for the majority of the natural sounds at all four sites and insects were also heard at the warmer sites, GRCA009 and GRCA010 (Table 3). Percent time audible for all sound sources for all sites are presented in the Appendix.

Jets, propeller planes, wind, mammals, birds, and insects were heard at all four sites during February 1-7, 2006, during daytime hours (0700 to 1900; Table 3). Periods of complete quiet, when no sound was audible, also occurred at all four sites. Helicopters were only heard at GRCA008 and GRCA011, and GRCA009 was the only site where vehicles were not heard.

Train sounds were heard from GRCA011, the site closest to train crossings in Grand Canyon Village. The unidentified motor sounds heard at GRCA010 were most likely either from a distant vehicle or aircraft. People were only heard at GRCA008 at the nearby Pasture Wash Ranger Station.

Table 3. Average percent time audible of sound sources, daytime hours (0700 to 1900), February 1-7, 2006.

Sound Source	**GRCA008**	**GRCA009**	**GRCA010**	**GRCA011**
No Sound Audible	4.8	7.3	13.1	0.8
Aircraft, Unknown	4.3	1.3	1.5	3.5
Aircraft, Jet	35.1	24.6	27.7	21.6
Aircraft, Propeller	1.9	5.0	3.2	1.2
Aircraft, Helicopter	1.4	0	0	10.5
Vehicle	0.4	0	1.6	8.4
Train	0	0	0	0.2
Motor Sounds	0	0	0.2	0
People	0.2	0	0	0
Non-natural Unknown	0.9	0	0	2.3
Wind	68.6	65.2	47.3	77.3
Mammal	0.7	0.3	0.6	0.3
Bird	36.0	10.2	29.5	75.4
Insect	4.7	19.6	7.5	0.2
Animal	0.1	1.9	0.9	0
Natural Other	3.6	0.1	0.1	0.1
Natural Unknown	2.6	0.5	0.6	2.1
Artifact	1.1	16.2	4.4	1.8
Unknown	0.7	0.1	0	0

Events

During the month of February 2006, the vast majority of the events occurred at GRCA011 (n = 1367; Table 4). GRCA009 and GRCA010 were relatively quiet sites. Only one event occurred at GRCA009, none occurred at GRCA010, and 60 events occurred at GRCA008. Wind induced events were responsible for the majority of the events at GRCA008 and GRCA011. Jets, propeller and helicopter aircraft were responsible for the remainder of the events.

Table 4. Sources of loud events at each site.

Site	**Vegetation**	**Total # of Events**	**% Wind**	**% Jet**	**% Propeller**	**% Helicopter**
GRCA008	Pinyon-Juniper	60	88.3	10	1.7	0
GRCA009	Warm Desert Scrub	1	100	0	0	0
GRCA010	Cold Desert Scrub	0	0	0	0	0
GRCA011	Ponderosa Pine	1367	97.7	1.8	0.4	0.1

Noise Free Interval

The mean and maximum noise free intervals (NFI) were based on 17 one-hour field observer logs from January and February 2006 (Figure 3). The highest mean and maximum NFIs occurred at GRCA010. The maximum NFI ranged from 11.4 minutes at GRCA010 to 2.5 minutes at GRCA011. The mean NFI had a much smaller range from 0.5 minutes at GRCA011 to 2.8 minutes at GRCA010 with an average of 1.9 minutes. The shorter maximum NFI in both winter and summer occur at GRCA008 and GRCA011, the sites located in the corridor management zones. GRCA009 and GRCA010, located in proposed wilderness, have considerably longer maximum NFIs. The mean NFI was shorter at all four sites during the winter as opposed to the summer. The greatest difference in mean NFI occurred at GRCA008 where there was a 135% increase in the NFI in summer over winter. GRCA009 had the most similar summer and winter mean NFIs with only a 24% increase in the summer.

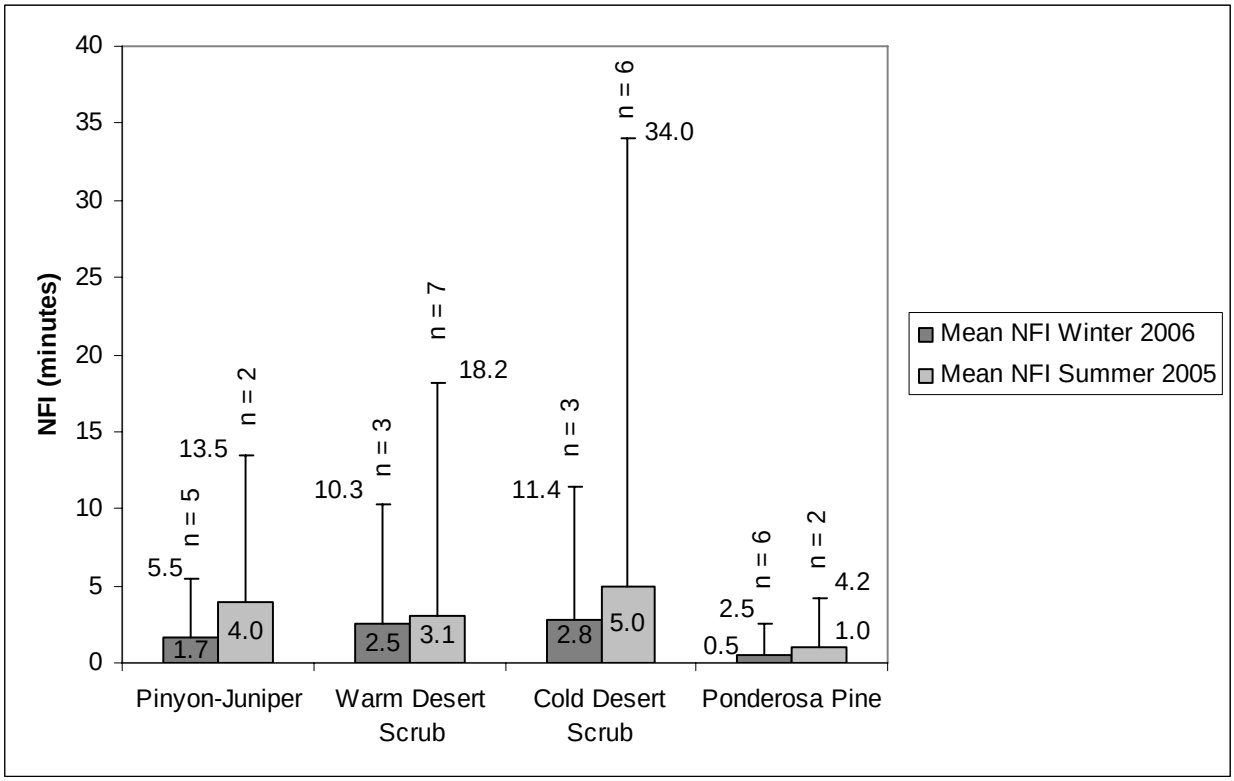

Figure 3. Mean and maximum Noise Free Interval (NFI) for winter 2006 and summer 2005. Mean NFI values are shown on columns, maximum NFI values are shown next to top of bars and number of samples (n) are indicated at the top of each data column.

Sound Pressure Levels

Using the percent time audible for non-natural sounds, the percent exceedence (L_x) level as described by Ambrose (2006) was computed for daytime and nighttime hours (Table 5). This value for *x* is used to determine L_{nat}. Sound pressure levels were calculated for daytime hours (0700-1900), nighttime hours (1900-0700) and for all hours (0000-2400) for each of the four sites (Tables 6-8). L_{50} and L_{90} were calculated for each of these timeframes. GRCA011 had significantly higher SPL values than the other sites (Table 6). The median (L_{50}) SPL values for daytime hours ranged from 18.5 dBA to 35.4 dBA. Nighttime hours were 2 to 4 dBA lower

(Table 7). The daytime L_{nat} values range from 17.4 dBA to 33.1 dBA with GRCA009 and GRCA010 being within 0.8 dBA of each other indicating that the two desert scrub types have similar acoustic levels. Similar to summertime, GRCA011 has the loudest SPL data. Because most of the loud events at GRCA011 were from wind, the louder SPL data is likely due to the long needles of ponderosa pine blowing in the wind. Daytime, nighttime, and 24 hour sound pressure levels for all sites for all frequencies are presented in the Appendix.

The noise floor of the acoustic systems used in this study was ~15 dBA. The L_{min} values at all four sites, as well as several of the exceedence metrics (L_{nat}, L_{90}, and L_{50}) were very close to the noise floors of the systems (Appendix). Any SPL value within 10 dB of the noise floor is being influenced by the noise floor of the system, indicating that actual sound levels may be quieter than we can accurately measure with this equipment.

Table 5. Exceedence values (the *x* in L_x) for daytime (0700-1900) and nighttime hours (1900-0700).

Site	Daytime	Nighttime
GRCA008	72	60
GRCA009	65	59
GRCA010	67	59
GRCA011	73	65

Table 6. SPL data for daytime hours (0700-1900) winter 2006 and summer 2005 (in parentheses).

Site	**Vegetation**	**L_{50} dBA**	**L_{90} dBA**	**L_{nat} dBA**
GRCA008	Pinyon-Juniper	23.7 (23.2)	18.5 (19.2)	20.6 (20.7)
GRCA009	Warm Desert Scrub	18.5 (19.2)	16.1 (17.0)	17.4 (18.4)
GRCA010	Cold Desert Scrub	19.2 (20.3)	17.6 (16.7)	18.2 (18.5)
GRCA011	Ponderosa Pine	35.4 (31.5)	30.4 (25.5)	33.1 (29.1)

Table 7. SPL data for nighttime hours (1900-0700) winter 2006 and summer 2005 (in parentheses).

Site	**Vegetation**	**L_{50} dBA**	**L_{90} dBA**	**L_{nat} dBA**
GRCA008	Pinyon-Juniper	15.6 (17.1)	15.2 (17.0)	15.4 (17.4)
GRCA009	Warm Desert Scrub	19.3 (20.7)	16.3 (17.8)	18.0 (20.3)
GRCA010	Cold Desert Scrub	17.1 (21.2)	16.9 (17.2)	17.0 (20.6)
GRCA011	Ponderosa Pine	21.0 (19.2)	18.5 (17.3)	19.9 (17.8)

Table 8. SPL data for all hours (0000-2400) winter 2006 and summer 2005 (in parentheses).

Site	**Vegetation**	**L_{50} dBA**	**L_{90} dBA**
GRCA008	Pinyon-Juniper	17.7 (20.5)	15.7 (18.0)
GRCA009	Warm Desert Scrub	18.9 (19.7)	16.2 (17.2)
GRCA010	Cold Desert Scrub	17.8 (20.4)	17.2 (16.8)
GRCA011	Ponderosa Pine	29.4 (24.7)	25.0 (20.6)

Discussion

The reduced percent time audible for natural sounds in winter (83.3%) from summer (97.3%) likely allows more non-natural sounds to be heard (38.9% for winter vs. 33.5% for summer). Similarly, the shorter mean NFI in winter than in summer is likely due to the same cause.

For all sites except GRCA011, the daytime SPL data for winter and summer are within ±1 dBA of each other, indicating there is no significant difference in exceedence metrics from summer to winter. Overall, sound pressure levels are extremely low in the backcountry, below recording studio levels (30 dBA) and significantly below conversational speech (60 dBA).

The daytime SPL data for GRCA011 (located in a ponderosa pine forest) is 4 to 5 dBA louder in the winter than in the summer. The events recorded at GRCA011 suggest that wind sounds are responsible for the increase. Although the percent time audible of wind (determined by listening to one week of recordings) is similar from winter to summer (mean percent time audible of wind in winter 65%; summer 64%), the sheer number of wind-induced loud events from the month of February demonstrate that wind may be responsible for the increase in sound pressure levels from summer to winter.

Sound data spanning winter and summer months has also been collected and analyzed from other National Park units including Bryce, Arches and Yellowstone. Winter and summer data were analyzed from two sites each from Bryce and Arches National Parks (H. Iyer, unpublished data, 2002). Like Grand Canyon, the sites at Bryce and Arches had sound levels within 5 dBA for winter and summer. However, winter was consistently quieter in Arches and Bryce as opposed to Grand Canyon. Summer and winter data from a site near the Nez Perce Creek in Yellowstone National Park demonstrate similar tendencies with summer sound levels slightly louder (0.7 to 3.0 dBA) than winter levels (S. Burson, unpublished data, 2007).

Winter (2006) and summer (2005) sound levels may be similar in Grand Canyon National Park because of the low precipitation and warm temperatures experienced in February 2006. According to the National Oceanic and Atmospheric Administration (NOAA), February 2006 was the second driest and the thirtieth warmest February in 112 years of recorded data. In order to determine if these similar sound levels are an anomaly due to the warm, dry winter of 2006, more sound data will need to be collected in Grand Canyon National Park during both winter and summer months. In addition, low-noise equipment should be used because of the extremely low noise levels.

Acknowledgments

Maria Wessel maintained the acoustic field systems and conducted observer logging. Skip Ambrose of the Sandhill Company analyzed the summer 2005 natural ambient data and offered many helpful suggestions to the winter data analysis. Overflights and Natural Soundscape program direction was provided by Ken McMullen. Data was analyzed using software developed by Ric Hupalo, National Park Service, Natural Sounds Program. Cover photo courtesy of National Park Service.

References

Ambrose, Skip. 2006. Sound Levels in the Primary Vegetation Types in Grand Canyon National Park, July 2005. NPS Report No. GRCA-05-02. 42 pp.

Falzarano, Sarah. 2006. Characterizing Grand Canyon Sounds. *Geospatial Solutions,* 16 (1): 46.

National Park Service, 1995. General Management Plan, Grand Canyon National Park, Arizona. U.S. Department of the Interior, Denver Service Center, Denver, CO. 67 pp.

National Park Service, 2005. Acoustics and Soundscape Studies in National Parks. Draft report (August 20, 2005), Natural Sounds Program, Fort Collins, CO. 47 pp.

Appendix.

GRCA008, February 1-7, 2006, 0700-1900, percent time all sounds audible.

	Date							
Sound Source	**2/1**	**2/2**	**2/3**	**2/4**	**2/5**	**2/6**	**2/7**	**Mean**
No Sound Audible	6	5	6	11		4	1	5
Aircraft, Unknown Type	12	1	3	5	6	3	1	4
Aircraft, Jet	42	50	43	27	39	23	22	35
Aircraft, Propeller	2	1	2	4	3	1	1	2
Aircraft, Helicopter	4	0	2	2	1	0	1	1
Vehicle	0	0	1	1	0	0	1	0
Train	0	0	0	0	0	0	0	0
Motor Sounds	0	0	0	0	0	0	0	0
People	0	2	0	0	0	0	0	0
Non-natural Other	0	0	0	0	0	0	0	0
Non-natural Unknown	0	2	1	3	1	0	0	1
Wind	34	72	33	68	98	79	96	69
Mammal	0	0	0	0	0	4	0	1
Bird	51	31	52	30	22	38	29	36
Insect	10	5	11	6	1	0	0	5
Animal	0	0	0	0	0	1	0	0
Natural Other	0	2	0	0	1	2	20	4
Natural Unknown	5	2	3	2	1	4	1	3
Artifact	0	0	0	0	0	0	8	1
Unknown	0	1	3	0	0	0	0	1

GRCA009, February 1-7, 2006, 0700-1900, percent time all sounds audible.

	Date							
Sound Source	**2/1**	**2/2**	**2/3**	**2/4**	**2/5**	**2/6**	**2/7**	**Mean**
No Sound Audible	13	6	14	17	1	0	1	7
Aircraft, Unknown Type	0	0	3	3	1	1	1	1
Aircraft, Jet	45	37	30	15	29	11	6	25
Aircraft, Propeller	5	4	6	11	3	4	2	5
Aircraft, Helicopter	0	0	0	0	0	0	0	0
Vehicle	0	0	0	0	0	0	0	0
Train	0	0	0	0	0	0	0	0
Motor Sounds	0	0	0	0	0	0	0	0
People	0	0	0	0	0	0	0	0
Non-natural Other	0	0	0	0	0	0	0	0
Non-natural Unknown	0	0	0	0	0	0	0	0
Wind	35	57	31	54	80	99	99	65
Mammal	0	0	0	1	1	0	0	0
Bird	12	15	11	8	10	7	9	10
Insect	17	26	30	18	22	9	15	20
Animal	0	2	6	2	1	1	1	2
Natural Other	0	1	0	0	0	0	0	0
Natural Unknown	1	0	1	1	0	0	0	0
Artifact	4	15	2	4	42	22	24	16
Unknown	0	0	0	0	0	0	0	0

GRCA010, February 1-7, 2006, 0700-1900, percent time all sounds audible.

	Date							
Sound Source	**2/1**	**2/2**	**2/3**	**2/4**	**2/5**	**2/6**	**2/7**	**Mean**
No Sound Audible	4	11	28	13	6	19	11	13
Aircraft, Unknown Type	2	1	2	2	1	1	1	2
Aircraft, Jet	43	36	28	14	33	22	20	28
Aircraft, Propeller	4	2	6	5	3	1	1	3
Aircraft, Helicopter	0	0	0	0	0	0	0	0
Vehicle	0	0	3	4	2	3	0	2
Train	0	0	0	0	0	0	0	0
Motor Sounds	0	0	0	1	1	0	0	0
People	0	0	0	0	0	0	0	0
Non-natural Other	0	0	0	0	0	0	0	0
Non-natural Unknown	0	0	0	0	0	0	0	0
Wind	47	55	19	52	76	30	51	47
Mammal	0	1	1	0	0	0	2	1
Bird	13	33	31	37	24	37	31	30
Insect	19	3	7	4	2	8	9	8
Animal	1	2	1	1	0	1	1	1
Natural Other	0	0	1	0	0	0	0	
Natural Unknown	0	0	0	0	1	0	3	1
Artifact	4	11	0	3	12	1	1	4
Unknown	0	0	0	0	0	0	0	0

GRCA011, February 1-7, 2006, 0700-1900, percent time all sounds audible.

	Date							
Sound Source	**2/1**	**2/2**	**2/3**	**2/4**	**2/5**	**2/6**	**2/7**	**Mean**
No Sound Audible	0	0	1	0	2	0	2	1
Aircraft, Unknown Type	5	2	4	3	6	4	1	3
Aircraft, Jet	37	20	32	9	29	11	14	22
Aircraft, Propeller	3	2	2	0	0	1	1	1
Aircraft, Helicopter	27	2	11	16	10	8	0	11
Vehicle	18	5	13	13	2	3	6	8
Train	1	0	1	0	0	0	0	0
Motor Sounds	0	0	0	0	0	0	0	0
People	0	0	0	0	0	0	0	0
Non-natural Other	0	0	0	0	0	0	0	0
Non-natural Unknown	1	3	1	3	3	2	3	2
Wind	60	100	46	75	70	100	91	77
Mammal	0	0	0	1	0	0	1	0
Bird	89	66	88	56	79	75	76	75
Insect	0	0	1	0	1	0	0	0
Animal	0	0	0	0	0	0	0	0
Natural Other	0	1	0	0	0	0	0	0
Natural Unknown	0	2	2	2	1	1	6	2
Artifact	1	5	0	2	1	1	2	2
Unknown	0	0	0	0	0	0	0	0

GRCA008, February 1-28, 2006, 0700-1900, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 333 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}	L_{Nat72}
dBA	14.8	72.6	39.9	32.2	23.7	18.5	20.6
12.5	13.3	84.0	52.3	43.7	36.1	31.6	33.9
16	16.5	82.5	50.3	41.3	35.1	31.2	33.1
20	16.4	81.4	48.0	40.1	34.7	31.0	32.7
25	13.4	80.5	45.5	39.4	33.8	29.8	31.8
31.5	11.3	78.6	42.7	37.6	31.1	26.9	28.8
40	7.7	77.3	40.2	36.7	29.8	25.1	27.2
50	4.6	74.4	38.2	35.5	28.3	23.1	25.4
63	2.5	76.7	36.7	33.4	25.7	19.9	22.6
80	0.4	81.0	36.4	31.6	23.8	17.7	20.4
100	-3.1	83.9	35.5	31.2	21.8	15.6	18.5
125	-4.5	80.1	35.8	32.2	19.8	13.6	16.6
160	-4.7	76.8	35.1	32.3	17.7	11.3	14.0
200	-4.5	72.5	33.1	29.8	16.8	10.1	12.9
250	-4.2	73.0	32.9	28.8	17.4	10.2	13.5
315	-3.9	73.0	32.3	27.3	17.7	10.6	14.0
400	-3.5	69.8	32.2	26.5	17.8	11.0	14.3
500	-2.8	67.4	31.6	25.7	17.3	10.1	13.7
630	-2.3	64.4	31.3	24.3	15.5	8.7	12.0
800	-1.5	60.2	31.2	21.3	13.0	6.2	9.3
1000	-0.6	59.2	30.9	18.1	10.0	4.3	6.6
1250	0.3	58.8	30.4	14.7	7.2	3.1	4.8
1600	1.0	58.6	29.3	11.6	5.5	3.0	3.9
2000	1.7	57.2	27.2	9.2	4.4	3.3	3.7
2500	2.5	55.4	24.3	8.0	4.4	3.8	4.0
3150	3.3	54.2	22.1	7.2	4.7	4.3	4.5
4000	3.9	58.6	19.9	6.5	5.0	4.7	4.8
5000	4.3	58.1	17.4	6.2	5.2	5.0	5.1
6300	4.9	54.1	15.6	7.1	5.9	5.6	5.7
8000	4.8	49.0	12.4	6.4	5.6	5.3	5.4
10000	4.5	45.8	10.0	5.7	5.2	5.1	5.1
12500	4.4	44.1	8.4	5.5	5.2	5.0	5.1
16000	3.8	42.2	6.9	5.0	4.7	4.5	4.6
20000	2.7	43.5	4.9	4.0	3.7	3.6	3.7

GRCA009, February 1-28, 2006, 0700-1900, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 333 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}	L_{Nat65}
dBA	14.6	74.7	35.0	25.7	18.5	16.1	17.4
12.5	19.5	86.8	59.6	54.4	42.6	35.9	39.8
16	19.8	85.2	57.8	51.1	40.7	35.4	38.6
20	20.9	85.1	55.9	48.2	40.4	35.7	38.6
25	18.8	84.4	53.8	45.6	38.8	34.1	37.1
31.5	18.1	85.0	51.2	42.5	35.3	31.0	33.8
40	16.3	81.7	48.5	40.6	33.3	29.1	31.9
50	13.3	80.8	45.8	38.0	30.4	25.9	28.8
63	10.5	80.0	43.4	35.7	26.6	22.0	24.8
80	7.1	84.8	41.7	33.5	23.3	18.1	21.2
100	4.7	76.1	38.9	31.5	20.8	14.8	18.3
125	0.7	72.3	36.5	28.3	18.2	12.0	15.8
160	-2.8	71.5	34.8	24.8	15.6	9.0	13.2
200	-4.8	70.3	33.1	22.9	14.3	7.0	11.6
250	-5.0	67.7	31.0	21.6	12.4	5.8	10.1
315	-4.8	65.5	29.2	20.9	11.1	4.2	8.7
400	-4.7	65.4	27.7	18.9	9.6	3.5	7.2
500	-4.3	62.7	25.1	16.2	7.4	2.1	5.3
630	-3.6	61.3	23.3	14.0	4.8	0.6	2.9
800	-2.8	60.3	21.9	11.4	3.4	0.1	1.9
1000	-2.0	59.5	20.7	9.5	2.4	0.1	1.2
1250	-1.1	58.9	19.2	7.1	1.8	0.5	1.2
1600	-0.2	58.5	17.7	4.9	1.7	1.0	1.4
2000	0.6	57.6	16.1	3.9	2.2	1.7	2.0
2500	1.5	55.7	14.1	3.9	2.8	2.5	2.7
3150	2.4	53.8	12.9	4.6	3.5	3.3	3.5
4000	2.9	51.3	13.2	5.3	4.3	4.0	4.2
5000	3.4	51.3	12.2	5.9	4.9	4.7	4.8
6300	3.8	50.2	9.5	6.4	5.6	5.4	5.5
8000	4.9	50.3	9.8	7.4	6.5	6.2	6.4
10000	5.4	49.4	10.1	7.8	6.7	6.4	6.6
12500	5.3	48.2	9.7	7.5	6.7	6.5	6.6
16000	3.4	44.2	7.5	5.9	5.4	5.2	5.3
20000	1.0	44.7	4.5	3.7	3.3	3.1	3.3

GRCA010, February 1-28, 2006, 0700-1900, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 333 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}	L_{Nat67}
dBA	16.4	70.0	33.8	27.6	19.2	17.6	18.2
12.5	14.6	86.8	59.7	53.2	39.6	33.6	37.2
16	17.1	85.5	57.6	49.4	38.2	33.2	36.2
20	15.6	84.8	55.4	46.0	37.6	33.0	35.7
25	14.3	83.2	52.9	43.3	36.5	31.5	34.4
31.5	14.7	81.6	50.0	41.0	33.6	28.6	31.5
40	12.6	81.0	47.0	39.8	31.7	26.6	29.3
50	8.3	79.7	43.9	38.7	29.4	23.8	26.8
63	2.2	79.8	41.3	37.0	26.4	20.0	23.1
80	0.2	82.6	39.2	34.5	23.4	16.6	20.1
100	-2.9	76.3	36.4	31.0	20.4	12.4	16.8
125	-4.6	70.2	33.2	28.1	17.7	9.5	13.8
160	-4.7	76.4	32.8	27.3	14.3	6.4	11.1
200	-5.2	73.8	31.4	27.3	12.6	4.2	8.9
250	-4.3	66.8	30.9	25.9	10.2	2.2	6.3
315	-3.8	64.5	30.6	23.2	7.8	1.3	4.1
400	-3.1	65.0	28.6	19.9	5.9	1.1	3.4
500	-2.4	63.7	25.6	16.4	4.5	1.1	2.6
630	-1.5	52.7	21.8	13.3	3.7	1.5	2.5
800	-0.4	53.8	20.7	11.2	3.5	2.0	2.6
1000	0.6	54.5	20.5	9.1	3.5	2.6	3.1
1250	1.4	53.4	20.2	6.4	3.9	3.4	3.7
1600	2.5	52.5	19.3	5.7	4.5	4.1	4.4
2000	3.4	51.4	18.1	6.2	5.2	4.9	5.1
2500	4.1	54.8	16.5	6.7	5.8	5.5	5.7
3150	5.0	56.2	15.0	7.1	6.4	6.2	6.3
4000	5.6	53.2	12.9	7.3	6.8	6.6	6.8
5000	5.1	56.7	12.3	7.4	7.1	6.9	7.1
6300	4.9	54.8	10.2	7.5	7.3	7.1	7.2
8000	4.9	51.6	9.2	7.5	7.4	7.2	7.3
10000	4.2	45.5	8.3	7.5	7.4	7.2	7.3
12500	3.3	42.3	7.9	7.4	7.2	7.1	7.2
16000	2.7	39.2	7.7	7.3	7.1	7.0	7.1
20000	1.4	49.8	7.1	6.7	6.6	6.4	6.5

GRCA011, February 1-28, 2006, 0700-1900, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 329 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}	L_{Nat73}
dBA	16.6	76.4	48.6	40.7	35.4	30.4	33.1
12.5	17.1	88.2	60.5	51.5	41.3	35.1	38.3
15.8	19.3	85.9	59.1	48.6	39.1	34.0	36.5
20	18.2	87.2	57.7	45.8	37.8	33.5	35.7
25	16.5	85.2	55.9	44.2	37.3	32.7	35.0
31.5	15.1	85.0	53.9	43.0	36.0	31.2	33.5
40	14.1	84.2	51.5	42.0	35.5	30.6	33.0
50	13.3	81.0	49.1	40.9	34.1	29.1	31.7
63	9.5	82.6	46.9	39.7	33.3	28.7	31.1
80	9.5	80.8	44.9	38.5	32.7	28.2	30.5
100	4.0	76.3	43.2	37.4	29.9	25.0	27.6
125	1.4	75.3	42.2	37.6	27.7	22.7	25.0
160	0.1	80.6	40.9	36.7	25.8	20.7	23.0
200	-0.7	78.4	39.2	33.1	24.6	20.1	22.4
250	-0.5	75.8	39.3	32.8	26.2	22.1	24.2
315	-1.1	71.6	38.7	32.8	27.9	23.8	26.2
400	-1.4	69.2	38.8	34.3	30.0	25.8	28.0
500	-0.8	73.4	39.0	35.3	30.9	26.6	28.7
630	-0.5	72.6	39.5	35.3	30.3	25.3	28.0
800	0.0	66.3	40.1	34.2	28.5	22.5	25.8
1000	1.0	61.5	40.3	31.8	25.3	18.5	22.5
1250	1.8	62.7	39.9	28.9	21.4	14.2	18.2
1600	2.6	62.4	38.5	24.7	16.8	10.3	13.8
2000	3.4	61.7	35.9	20.2	12.4	7.6	9.8
2500	3.9	61.0	32.8	16.4	10.0	6.6	7.7
3150	4.9	59.7	30.3	16.3	9.9	7.0	8.0
4000	5.4	58.5	27.1	20.0	11.8	7.7	9.1
5000	5.9	57.3	24.3	17.8	10.3	7.5	8.4
6300	6.1	55.8	21.3	12.9	8.6	7.3	7.8
8000	6.2	56.5	18.9	11.8	8.2	7.2	7.6
10000	6.2	58.2	17.1	10.8	7.8	7.0	7.3
12500	5.9	58.0	15.2	9.8	7.2	6.7	6.9
16000	5.2	57.5	13.2	8.6	6.6	6.2	6.3
20000	2.9	57.2	10.2	6.8	5.5	5.2	5.3

GRCA008, February 1-28, 2006, 1900-0700, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 335 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}	L_{Nat60}
dBA	14.8	63.5	28.6	19.8	15.6	15.2	15.4
12.5	12.3	81.3	40.5	34.3	30.4	26.7	29.8
16	12.8	79.0	38.4	33.3	29.5	26.2	28.9
20	11.7	78.1	36.3	32.8	28.6	25.3	28.0
25	8.8	76.0	33.8	31.7	26.5	23.2	25.7
31.5	5.8	73.4	31.6	30.5	23.5	20.2	22.8
40	2.7	69.8	29.8	30.1	20.9	17.4	20.2
50	0.8	67.7	28.1	29.2	18.0	14.0	17.1
63	-1.0	61.9	25.6	26.3	14.5	10.3	13.1
80	-1.8	59.7	23.4	23.1	11.3	7.3	10.0
100	-4.3	64.5	24.9	20.2	7.9	3.3	6.1
125	-5.1	66.9	27.1	18.0	5.3	1.2	4.0
160	-5.4	68.0	26.3	18.0	3.7	-0.2	2.3
200	-5.1	60.2	23.8	18.3	3.3	-0.5	1.9
250	-4.4	64.3	24.8	15.7	3.8	-0.4	2.3
315	-4.1	65.6	23.5	13.7	3.7	-0.2	2.2
400	-3.5	63.8	23.5	11.4	2.4	-0.5	1.5
500	-3.0	60.1	21.8	8.8	1.4	-0.6	0.8
630	-2.5	53.5	20.3	5.6	0.6	-0.5	0.2
800	-1.5	53.6	19.4	2.7	0.5	-0.2	0.3
1000	-0.8	53.8	18.7	1.9	0.9	0.5	0.8
1250	-0.1	54.5	17.9	1.9	1.5	1.1	1.4
1600	0.9	54.2	16.5	2.5	2.1	1.8	2.1
2000	1.6	53.5	14.2	3.1	2.8	2.5	2.7
2500	2.5	52.2	11.5	3.7	3.5	3.2	3.4
3150	3.2	51.0	9.7	4.2	4.1	3.8	4.0
4000	3.7	48.7	8.0	4.7	4.6	4.4	4.5
5000	4.2	46.3	6.9	5.1	4.9	4.7	4.9
6300	4.8	44.5	6.6	5.5	5.4	5.2	5.3
8000	4.7	42.1	6.0	5.3	5.2	5.1	5.2
10000	4.5	39.6	5.4	5.1	5.0	4.9	5.0
12500	4.4	36.5	5.1	5.0	4.9	4.8	4.9
16000	3.8	33.1	4.5	4.4	4.3	4.2	4.3
20000	2.7	37.6	3.4	3.4	3.3	3.2	3.2

GRCA009, February 1-28, 2006, 1900-0700, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 336 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}	L_{Nat59}
dBA	14.6	67.3	29.2	26.4	19.3	16.3	18.6
12.5	18.7	85.2	58.5	58.0	46.2	36.6	44.1
16	18.0	84.3	56.3	54.7	42.7	34.9	41.1
20	17.9	81.9	53.7	50.8	40.1	33.8	38.9
25	17.9	81.4	50.7	46.9	37.5	31.9	36.2
31.5	15.8	78.5	47.3	43.8	34.7	29.6	33.5
40	13.2	80.1	44.0	41.0	32.3	27.5	31.2
50	13.2	78.3	41.0	38.6	29.4	24.5	28.3
63	10.7	73.1	38.4	36.3	26.2	21.4	25.1
80	7.9	70.3	36.3	34.0	23.3	18.3	21.9
100	5.5	68.3	34.4	31.2	20.9	15.9	19.6
125	2.1	67.3	32.6	28.0	18.8	13.7	17.6
160	-0.6	66.0	30.4	25.4	17.0	11.4	16.0
200	-2.5	66.9	28.3	24.0	16.4	9.8	15.1
250	-4.1	66.1	26.6	23.7	15.6	9.2	14.2
315	-4.1	64.2	25.6	23.7	14.6	8.0	13.1
400	-4.2	60.9	24.7	22.0	12.8	7.1	11.6
500	-4.1	57.8	21.6	18.3	10.2	4.9	9.2
630	-3.6	51.7	19.2	15.7	8.7	3.5	7.8
800	-2.9	51.1	17.2	13.5	7.1	2.3	6.2
1000	-2.0	52.0	15.5	11.5	5.1	1.0	4.1
1250	-1.2	51.6	13.7	9.0	3.0	0.7	2.4
1600	-0.3	49.4	11.7	6.2	2.0	0.9	1.6
2000	0.6	46.5	9.6	4.6	2.1	1.5	1.9
2500	1.4	45.5	7.6	4.1	2.6	2.3	2.5
3150	2.3	43.5	6.3	4.3	3.4	3.1	3.3
4000	3.2	42.7	6.0	4.9	4.1	3.8	4.1
5000	3.9	40.6	6.5	5.7	4.8	4.5	4.8
6300	4.7	40.5	7.3	6.6	5.5	5.2	5.4
8000	5.4	45.4	8.6	7.6	6.4	6.0	6.3
10000	5.9	50.1	9.1	8.1	6.8	6.4	6.7
12500	5.8	49.2	8.9	7.8	6.6	6.3	6.6
16000	4.0	42.1	6.5	5.8	5.0	4.7	4.9
20000	1.0	61.6	10.7	3.3	2.9	2.7	2.9

GRCA010, February 1-28, 2006, 1900-0700, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 336 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}	L_{Nat59}
dBA	16.4	65.3	28.3	19.8	17.1	16.9	17.0
12.5	13.7	85.4	53.4	38.2	33.6	29.5	32.7
16	14.5	83.9	51.4	37.1	32.7	29.1	32.1
20	14.9	81.2	49.2	36.1	31.3	27.8	30.7
25	11.8	80.9	46.8	35.3	29.8	26.0	28.9
31.5	10.8	80.0	43.9	34.3	27.3	23.7	26.5
40	8.1	78.2	40.7	33.4	24.5	20.8	23.7
50	5.1	75.0	37.4	31.7	21.2	17.4	20.3
63	1.4	74.0	34.2	29.6	17.2	13.1	16.2
80	-1.5	69.0	31.0	26.8	13.5	8.7	11.9
100	-4.0	64.3	27.6	23.2	9.9	4.2	7.7
125	-5.2	64.2	25.1	19.3	6.7	1.8	4.7
160	-5.3	64.3	24.7	16.7	3.4	-0.2	2.0
200	-5.0	65.1	25.8	15.6	0.9	-1.5	-0.1
250	-4.8	66.8	26.9	13.7	-0.3	-1.8	-0.9
315	-4.1	66.9	26.9	9.6	-0.2	-1.5	-0.6
400	-3.5	68.0	25.6	7.0	0.1	-0.8	-0.1
500	-2.3	63.0	22.8	4.7	0.4	-0.3	0.2
630	-1.7	52.3	17.3	2.6	0.7	0.2	0.6
800	-0.7	47.7	14.7	2.0	1.3	0.9	1.2
1000	0.4	44.8	13.5	2.5	2.1	1.7	2.0
1250	1.4	44.6	12.8	3.3	2.9	2.6	2.8
1600	2.4	44.5	11.7	4.1	3.7	3.4	3.7
2000	3.3	44.0	10.4	4.8	4.5	4.3	4.5
2500	3.6	43.0	9.0	5.5	5.2	5.0	5.2
3150	4.4	41.3	8.0	6.2	5.9	5.7	5.9
4000	4.8	39.7	7.5	6.7	6.5	6.3	6.4
5000	4.7	37.9	7.4	7.0	6.8	6.7	6.8
6300	5.4	35.8	7.4	7.2	7.1	6.9	7.0
8000	5.2	33.4	7.4	7.3	7.2	7.1	7.1
10000	5.6	30.5	7.4	7.4	7.2	7.1	7.2
12500	4.4	32.4	7.3	7.2	7.1	7.0	7.1
16000	3.8	35.0	7.1	7.0	6.9	6.8	6.9
20000	2.6	55.8	8.7	6.3	6.2	6.1	6.2

GRCA011, February 1-28, 2006, 1900-0700, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 336 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}	L_{Nat65}
dBA	16.3	70.6	37.3	28.8	21.0	18.5	19.9
12.5	9.3	84.1	49.6	36.7	32.6	28.8	31.3
16	13.3	84.1	47.9	35.8	31.6	28.1	30.5
20	12.5	83.5	45.8	35.6	30.7	27.2	29.4
25	10.3	80.1	43.4	35.2	29.4	25.8	28.1
31.5	8.2	79.2	40.9	35.0	27.9	24.0	26.3
40	6.3	75.1	38.2	34.7	27.0	21.9	24.5
50	2.9	75.2	35.9	33.2	25.2	20.1	22.9
63	2.0	74.4	33.7	31.2	24.0	18.4	21.4
80	1.3	72.9	32.0	30.5	24.1	18.8	22.0
100	-2.2	69.7	31.0	27.5	18.8	13.3	16.3
125	-2.7	68.8	31.4	27.3	16.3	11.2	13.6
160	-4.0	64.2	30.2	27.9	15.6	9.8	12.7
200	-3.8	61.6	27.9	25.4	13.9	9.0	11.2
250	-2.9	61.3	28.6	24.8	16.0	11.4	13.8
315	-2.7	67.7	28.9	24.4	16.5	11.9	14.2
400	-2.1	70.9	30.6	24.2	16.3	11.6	14.2
500	-1.7	71.9	31.0	22.1	14.4	9.8	12.5
630	-1.0	60.3	30.7	18.7	10.5	6.6	8.8
800	-0.2	55.3	30.4	14.3	7.3	4.0	6.0
1000	0.6	56.7	29.5	10.8	4.9	3.0	4.0
1250	1.5	57.0	27.8	7.1	3.7	2.9	3.4
1600	2.4	57.1	25.2	5.3	3.9	3.5	3.7
2000	3.2	54.9	21.5	4.9	4.5	4.2	4.4
2500	4.1	52.8	17.8	5.4	5.1	4.8	5.0
3150	4.7	49.8	15.2	6.0	5.7	5.5	5.6
4000	5.4	46.1	12.4	6.4	6.2	6.0	6.1
5000	5.7	43.0	10.8	6.8	6.6	6.4	6.5
6300	6.1	42.3	9.5	7.0	6.8	6.6	6.7
8000	6.2	42.1	8.9	7.0	6.8	6.7	6.8
10000	6.2	39.9	8.4	7.0	6.8	6.7	6.8
12500	5.8	40.2	7.7	6.5	6.4	6.3	6.4
16000	5.2	36.8	6.8	5.9	5.8	5.7	5.7
20000	4.2	36.6	5.5	5.0	4.8	4.7	4.8

GRCA008, February 1-28, 2006, 0000-2400, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 668 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}
dBA	14.8	72.6	37.1	27.6	17.7	15.7
12.5	12.3	84.0	49.6	37.8	33.0	29.1
16	12.8	82.5	47.5	36.7	32.2	28.6
20	11.7	81.4	45.3	36.3	31.6	27.9
25	8.8	80.5	42.8	35.6	30.2	26.5
31.5	5.8	78.6	40.0	34.7	28.0	23.7
40	2.7	77.3	37.5	33.9	26.4	21.4
50	0.8	74.4	35.6	33.1	24.7	18.7
63	-1.0	76.7	34.0	30.7	21.9	14.9
80	-1.8	81.0	33.6	28.1	19.0	12.0
100	-4.3	83.9	32.8	27.1	16.5	8.2
125	-5.1	80.1	33.3	28.0	13.8	5.5
160	-5.4	76.8	32.6	29.1	10.7	3.2
200	-5.1	72.5	30.6	26.4	9.9	2.2
250	-4.4	73.0	30.5	24.3	9.9	2.7
315	-4.1	73.0	29.8	22.4	9.8	2.7
400	-3.5	69.8	29.7	20.9	8.8	2.1
500	-3.0	67.4	29.0	18.5	7.1	1.3
630	-2.5	64.4	28.6	15.2	4.7	0.7
800	-1.5	60.2	28.4	11.5	2.7	0.5
1000	-0.8	59.2	28.1	8.2	2.0	0.9
1250	-0.1	58.8	27.6	5.9	2.1	1.4
1600	0.9	58.6	26.5	4.6	2.5	2.1
2000	1.6	57.2	24.4	4.2	3.1	2.8
2500	2.5	55.4	21.5	4.2	3.7	3.4
3150	3.2	54.2	19.3	4.6	4.2	4.0
4000	3.7	58.6	17.1	4.9	4.6	4.5
5000	4.2	58.1	14.7	5.2	5.0	4.8
6300	4.8	54.1	13.1	5.7	5.5	5.3
8000	4.7	49.0	10.3	5.5	5.3	5.1
10000	4.5	45.8	8.3	5.2	5.1	4.9
12500	4.4	44.1	7.0	5.1	5.0	4.9
16000	3.8	42.2	5.8	4.6	4.4	4.3
20000	2.7	43.5	4.2	3.6	3.5	3.3

GRCA009, February 1-28, 2006, 0000-2400, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 669 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}
dBA	14.6	74.7	33.0	25.9	18.9	16.2
12.5	18.7	86.8	59.1	56.4	43.8	36.0
16	18.0	85.2	57.1	53.1	41.4	35.3
20	17.9	85.1	54.9	49.4	40.2	35.1
25	17.9	84.4	52.5	46.2	38.2	33.1
31.5	15.8	85.0	49.7	43.0	35.0	30.3
40	13.2	81.7	46.8	40.6	33.0	28.3
50	13.2	80.8	44.0	38.2	29.9	25.3
63	10.5	80.0	41.5	36.0	26.6	21.7
80	7.1	84.8	39.8	33.6	23.3	18.3
100	4.7	76.1	37.2	31.4	20.8	15.4
125	0.7	72.3	34.9	28.3	18.5	12.9
160	-2.8	71.5	33.1	25.1	16.4	10.2
200	-4.8	70.3	31.4	23.5	15.2	8.5
250	-5.0	67.7	29.3	22.8	14.3	7.2
315	-4.8	65.5	27.8	22.3	12.9	6.4
400	-4.7	65.4	26.5	20.5	11.6	5.6
500	-4.3	62.7	23.7	17.5	9.2	3.5
630	-3.6	61.3	21.7	14.7	7.2	2.2
800	-2.9	60.3	20.1	12.5	5.6	1.2
1000	-2.0	59.5	18.8	10.2	3.7	0.5
1250	-1.2	58.9	17.3	7.6	2.3	0.5
1600	-0.3	58.5	15.7	5.3	1.8	0.9
2000	0.6	57.6	14.0	4.2	2.1	1.6
2500	1.4	55.7	11.9	4.0	2.8	2.4
3150	2.3	53.8	10.7	4.4	3.5	3.2
4000	2.9	51.3	11.0	5.1	4.2	3.9
5000	3.4	51.3	10.2	5.8	4.9	4.6
6300	3.8	50.2	8.5	6.5	5.6	5.3
8000	4.9	50.3	9.2	7.5	6.4	6.1
10000	5.4	50.1	9.6	8.0	6.7	6.4
12500	5.3	49.2	9.3	7.6	6.7	6.4
16000	3.4	44.2	7.0	5.8	5.2	4.9
20000	1.0	61.6	8.6	3.6	3.1	2.9

GRCA010, February 1-28, 2006, 0000-2400, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 669 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}
dBA	16.4	70.0	31.9	24.4	17.8	17.2
12.5	13.7	86.8	57.6	43.8	36.1	31.5
16	14.5	85.5	55.5	41.5	35.1	31.1
20	14.9	84.8	53.3	40.1	34.2	30.1
25	11.8	83.2	50.8	39.1	32.9	28.6
31.5	10.8	81.6	48.0	37.7	30.8	26.3
40	8.1	81.0	44.9	37.1	28.7	23.8
50	5.1	79.7	41.8	36.2	26.0	20.5
63	1.4	79.8	39.1	34.3	22.5	16.3
80	-1.5	82.6	36.8	31.9	19.4	12.2
100	-4.0	76.3	33.9	28.2	16.3	8.5
125	-5.2	70.2	30.8	25.1	12.7	5.2
160	-5.3	76.4	30.4	23.9	9.3	2.5
200	-5.2	73.8	29.5	23.2	6.2	0.7
250	-4.8	66.8	29.3	21.9	3.8	-0.4
315	-4.1	66.9	29.1	18.0	2.9	-0.5
400	-3.5	68.0	27.4	14.3	2.4	-0.1
500	-2.4	63.7	24.4	11.7	1.9	0.3
630	-1.7	52.7	20.1	7.7	1.8	0.7
800	-0.7	53.8	18.6	5.2	2.0	1.3
1000	0.4	54.5	18.3	4.0	2.5	2.1
1250	1.4	53.4	17.9	3.9	3.2	2.8
1600	2.4	52.5	16.9	4.5	4.0	3.7
2000	3.3	51.4	15.7	5.2	4.8	4.5
2500	3.6	54.8	14.2	5.9	5.5	5.2
3150	4.4	56.2	12.8	6.5	6.1	5.9
4000	4.8	53.2	11.0	6.9	6.6	6.4
5000	4.7	56.7	10.5	7.2	7.0	6.8
6300	4.9	54.8	9.1	7.3	7.2	7.0
8000	4.9	51.6	8.4	7.4	7.2	7.1
10000	4.2	45.5	7.9	7.4	7.3	7.2
12500	3.3	42.3	7.6	7.3	7.2	7.1
16000	2.7	39.2	7.4	7.1	7.0	6.9
20000	1.4	55.8	8.0	6.5	6.4	6.3

GRCA011, February 1-28, 2006, 0000-2400, median hourly dBA and one-third octave band dB (12.5-20,000 Hz; n = 665 hours).

Frequency	L_{min}	L_{max}	L_{eq}	L_{10}	L_{50}	L_{90}
dBA	16.3	76.4	45.9	35.5	29.4	25.0
12.5	9.3	88.2	57.8	43.9	36.3	31.8
16	13.3	85.9	56.4	41.6	35.3	31.3
20	12.5	87.2	54.9	39.9	34.3	30.4
25	10.3	85.2	53.1	39.2	33.6	29.6
31.5	8.2	85.0	51.0	38.5	32.6	28.2
40	6.3	84.2	48.6	38.1	32.1	27.1
50	2.9	81.0	46.3	36.9	30.3	25.3
63	2.0	82.6	44.1	35.5	29.4	24.2
80	1.3	80.8	42.1	34.4	28.6	23.6
100	-2.2	76.3	40.4	33.5	24.7	19.9
125	-2.7	75.3	39.5	34.5	22.5	17.6
160	-4.0	80.6	38.2	33.6	21.3	16.2
200	-3.8	78.4	36.5	29.8	20.5	16.0
250	-2.9	75.8	36.6	29.3	22.6	18.2
315	-2.7	71.6	36.1	29.9	24.0	19.5
400	-2.1	70.9	36.4	30.5	25.1	20.4
500	-1.7	73.4	36.6	30.3	24.8	19.6
630	-1.0	72.6	37.0	29.1	22.9	17.0
800	-0.2	66.3	37.5	26.8	20.1	13.6
1000	0.6	61.5	37.6	23.3	16.0	9.6
1250	1.5	62.7	37.1	19.3	11.8	6.7
1600	2.4	62.4	35.6	15.0	8.5	5.3
2000	3.2	61.7	33.0	12.7	7.1	5.2
2500	3.9	61.0	29.9	10.8	6.6	5.5
3150	4.7	59.7	27.4	11.2	7.2	6.1
4000	5.4	58.5	24.2	13.5	8.0	6.6
5000	5.7	57.3	21.5	11.8	7.8	6.8
6300	6.1	55.8	18.5	9.3	7.3	6.9
8000	6.2	56.5	16.3	8.5	7.2	6.9
10000	6.2	58.2	14.6	7.9	7.0	6.8
12500	5.8	58.0	12.9	7.3	6.6	6.4
16000	5.2	57.5	11.0	6.6	6.0	5.8
20000	2.9	57.2	8.4	5.4	5.1	4.9