

Contents

1	Introduction	1
2	Noise in Urban Forest	7
2.1	Sound Propagation.....	8
2.1.1	Definitions and Theoretical Considerations.....	8
2.1.2	Factors Affecting Sound Propagation.....	14
2.2	Equipment for Noise Measurement.....	15
2.2.1	Instrumentation and Noise Sources.....	15
2.2.2	Measurement In Situ.....	18
2.3	Summary.....	24
3	Tree Characteristics and Acoustic Sensors	27
3.1	Morphological Characteristics.....	27
3.2	Mechanical Characteristics.....	29
3.2.1	Devices and Instrumentation.....	30
3.2.2	Mechanical Characteristics of Standing Trees.....	32
3.2.3	Detection of Internal Defects in Standing Trees.....	32
3.3	Genotypic Characteristics.....	38
3.4	Sylvicultural Practices.....	39
3.5	Summary.....	42
4	Noise Attenuation with Plant Material	43
4.1	Physical Aspects of Noise Attenuation by Vegetation.....	43
4.2	Ground Attenuation.....	45
4.3	Scattering by Trees.....	52
4.3.1	Scattering by Stems.....	55
4.3.2	Scattering by Canopy and Foliage.....	64
4.3.3	Reverberation in a Forest Stand.....	92
4.3.4	Atmospheric Conditions.....	97
4.4	Sound Scattering by Barriers.....	101
4.4.1	Psychological Effect.....	101
4.4.2	Solid Barriers Without Vegetation.....	102
4.4.3	Solid Barriers with Vegetation.....	105
4.5	Summary.....	109

5	Traffic Noise Abatement	111
5.1	Road Traffic Noise	114
5.2	Rail Transportation Noise.....	121
5.3	Aircraft Noise	125
5.4	Summary	127
6	Noise Abatement and Dwellings	129
6.1	Urban Area	129
6.2	Suburban Area.....	132
6.3	Summary	138
7	Noise, Birds and Insects in Urban Forest Environment	139
7.1	Bird Acoustic Communication in Forest Environment	141
7.2	Detection of Termite Infestation in Urban Trees.....	143
7.3	Summary	145
8	Acoustics for Fire Control in Forest	147
9	Economic Aspects	151
	Annex 1 – Symbols	155
	Annex 2 – Some Theoretical Considerations	159
	Annex 3 – Frequency Weighting	161
	Annex 4 – Standards	163
	Annex 5 – Units	165
	References	167
	Subject Index	177