Voichita Bucur Urban Forest Acoustics

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With 109 Figures and 33 Tables



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Preface

In general, trees are viewed as admired symbolic individuals, producing recreational, spiritual and emotional rejuvenation. Their lifespan can far exceed that of humans. Planting a tree is a singular act of faith in the future, creating a legacy for the community members who will follow. The presence of trees in an urban area has been a reality for several centuries. Beautiful trees in urban plazas are synonymous with a high sense of community and civic pride. Trees significantly enhance the landscaping and appearance of the built environment.

City trees improve several architectural and engineering functions, providing a green infrastructure for communities. Trees create a friendlier environment for walking, riding bikes and working, by reducing glare and softening harsh traffic sounds and concrete views. Trees enhance the viewing in urban areas of a variety of birds and small animals, such as squirrels. They are of extreme importance to the functioning of many different ecosystems. Trees planted in the right place around buildings can improve air conditioning and heating costs by providing shade or by affecting wind speed or direction. Evergreen trees with dense, persistent needles can be used to provide a windbreak, while deciduous trees allow the sun to warm a house in winter. The more compact the branches and foliage of a group of trees, the greater their influence as a windbreak. It has been shown that trees are able to remove pollutants from the air; and they are seen as an important potential resource for removing greenhouse gasses from the atmosphere. Trees contribute to the protection of the environment and public health, providing economic and social benefits, encouraging positive social interaction.

In a modern concept, urban forest refers to all trees and vegetation in urban and suburban areas.

My motivation for writing this book comes from the frequently asked questions about urban environmental integrity, related namely to noise, climate, air and water quality.

This book is structured in nine chapters. As usual the first chapter "Introduction" relates the concept of the urban tree in contrast to the forest tree and gives a short description of the dendrological characteristics of different trees in the urban environment. The second chapter is "Noise in Forest" and refers to sound propagation in forest and the factors affecting this propagation. The

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equipment for in situ noise measurement is presented. The third chapter introduces acoustical sensors for the measurement of tree characteristics (diameter, height, mechanical and genetic characteristics). Chapter 4 is devoted to noise attenuation with plants, setting aside ground attenuation, scattering by trees, foliage, trunks and branches. The last section of this chapter refers to reverberation and attenuation in a forest stand. Chapter 5 depicts a very current subject, namely, protection against traffic noise from highways, railways and aircraft. Chapter 6 - noise abatement and dwellings in urban and suburban areas - underlines the necessity to take into consideration the meanings of the soundscape, which are environmental, historical or cultural. The practical application of this concept produces sound maps for urban planning. A positive impression on the urban soundscape is produced by large vegetation areas, belts of trees, public gardens and parks. Chapter 7 offers a brief discussion on the relationships between noise, animals, insects and trees and, of course, the acoustic methods for the detection of the presence of these biological agents in different stages of development. Chapter 8 - fire control with acoustical methods - briefly describes the potential of acoustics in forest fire detection and control. Finally, it seems appropriate to end this book (Chap. 9) with some considerations about economic aspects related to the value of urban trees.

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