Disentangling landscape and vegetation drivers of soundscape quality in urban forest remnants

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Abstract

Natural landscapes are increasingly subjected to anthropogenic pressure and fragmentation resulting in biodiversity loss and reduced ecological condition. Previous studies in eastern Australia have revealed a strong relationship between soundscape patterns, ecological condition and the extent of landscape fragmentation. However the effect that vegetation structure and species richness has on soundscape patterns remains little studied. Our goal in the current study was to examine the vegetation/soundscape relationship in urban forest remnants characterized by two different vegetation communities, spotted gum open forest and scribbly gum woodland.

Our results indicate that landscape attributes, particularly patch size and extent of road fragmentation, are the primary drivers of soundscape patterns in both vegetation communities. Large, remnant forest patches close to conservation areas exhibit higher soundscape quality (normalized difference soundscape index; NDSI) than small urban fragments. However, soundscape quality was also related to a number of different vegetation structural attributes in spotted gum and scribbly gum forests. For example, native shrub cover was negatively correlated with soundscape quality in spotted gum forests, but positively correlated in scribbly gum woodland. Neither vegetation type displayed any significant correlation between NDSI and native vegetation species richness. We did not identify any one vegetation attribute that could be positively correlated with soundscape patterns in both vegetation communities.

Comparison to a benchmark (or 'natural') site revealed that different patterns were related to disturbance and reduced vegetation quality; spotted gum forests in an undisturbed state have sparse shrub cover, while scribbly gum woodlands are characterized by a shrubby heath layer when in pristine condition. We conclude that soundscape patterns in urban forest remnants are strongly influenced by landscape fragmentation, disturbance and resultant changes in vegetation quality.

Keywords: landscape fragmentation, disturbance, vegetation, soundscape

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