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Editorial

Biodiversity Conservation in Managed Forests

Todd S. Fredericksen

Ferrum College, Ferrum, VA 24088, USA; tfredericksen@ferrum.edu

In addition to management for forest products, an increasing priority in the management of forests is the provision and maintenance of ecosystem services. A key component of these ecosystem services is the conservation of forest biodiversity, including genetic, species, habitat and landscape components. Among terrestrial habitats, forests are the most biodiverse because of their structural heterogeneity and variety of available niches.

Management strategies often produce very different types of forests, including protected areas for recreation and/or conservation of biodiversity, naturally regenerated native forests for wood production, monoculture plantations of native or exotic species for pulp or paper and short-rotation biomass plantations. Regardless of objectives, forest managers are confronted by challenges ranging from increasing demand for forest products, shifting land-use policies, invasive pests and pathogens and climate change.

This Special Issue of *Forests* focuses on strategies to understand and mitigate human pressures on managed forests with respect to maintenance of biological diversity. Eight papers comprise this Special Issue and span a wide range of topics including ecological indicators of biodiversity and naturalness in forests; assessment of understudied taxa in forests such as nematodes, microbial communities and lichens; and ecosystems under decline, such as mangrove forests.

Zheng and Ouyang [1] use a variety of modelling approaches to assess the usefulness of key indicators of biodiversity in forests for conservation planning. A key part of their analysis is an evaluation of the relationships between key indicators and biodiversity at different spatial scales. They found that biophysical and climatic factors had the strongest effects on biodiversity distribution at fine scales, but net primary productivity and the type of ecoregion worked best at coarser scales.

Côté et al. [2] provide a conceptual model to assess the naturalness of forests in boreal forests of Quebec, Canada. Many consumers of wood products are interested in obtaining products that come from forests that are managed to maintain natural attributes and functions. The authors use five characteristics of naturalness including landscape context, forest composition, structure, dead wood and regeneration process to provide an index of naturalness in managed forests. They highlight the importance of protected areas in managed forests.

Species-area relationships are often used to determine how species diversity changes at different spatial scales. In a study in natural forests of northeastern China, Chen et al. [3] compared different models to determine which of them best explained species-area relationships in mixed pine-broadleaved forests.

Shen et al. [4] examined the distribution of a Tertiary period relict tree species (*Liriodendron chinense*) in subtropical China and showed the importance of mountain corridors and mountain refuges in maintaining genetic diversity of the species and migration of its subspecies.

Papers by Reňco et al. [5] and Lõhmus and Lõhmus [6] document species diversity of species-rich, but understudied species in Eastern European forests. Reňco et al. studied the response of soil nematodes and microbial communities to windstorms in beech and spruce forests. They found that nematodes reacted quickly to wind damage in forests with a loss of community structure and diversity in beech forests, but not in spruce forests. It took much longer for microbial communities to respond in both beech and spruce forests. Lõhmus and

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Lõhmus studied the response of lichen species in forests with four different management stages: old growth, mature preharvest forests, clear-cut sites with retention trees and clear-cut sites without retention trees. Although a large number of lichen species were maintained in production forests, the lichen communities appeared to be very sensitive to more intensive management, suggesting the need for landscape reserves to serve as buffers to protect lichen diversity.

Xu et al. [7] compared approaches involving measures of functional diversity and phylogenetic diversity in forests of the Qinling Mountains in China. They found that phylogenetic diversity was a useful metric because of its linkages to ecological processes such as niche differentiation and resource partitioning. Functional diversity could also be effective if it included several different functional traits.

Finally, another study from China by Wang et al. [8] documented the continuing degradation of mangrove forests despite strict protection. The major cause of the degradation was attributed to seawall construction. The authors recommend reconsidering wetland reclamation on mudflats using fast-growing exotic species which is detrimental to biodiversity and other ecosystem services.

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