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Functional trait approach for the maintenance of multiple ecosystem functions under silvicultural practices: evaluating management impacts based on macro-scale and local-scale analyses.

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論　文　要　旨

論　文　題　目

Functional trait approach for the maintenance of multiple ecosystem functions under silvicultural practices: evaluating management impacts based on macro-scale and local-scale analyses.

Unravelling the value of biodiversity is a mandatory task for ecology and conservation biology. Functional trait-based ecology plays a key role for translating the value of biodiversity into ecological facet, i.e. linking species diversity with the variety of human benefits. This approach considers the fundamental importance of biodiversity effects in the maintenance of multiple ecosystem functions under a changing environment. Scaling up from species traits to communities or ecosystems allows us to identify the most significant aspects of ecosystem functioning. On the basis of functional trait approach, my thesis proposed a framework of forest ecosystem management based on testing the value of biodiversity mediated through redundancy and sustainability of forest communities. In the analysis, I combined data of species traits (leaf, stem, flower and fruit) related to productivity, nutrient cycling and habitat quality for wildlife, with phytosociological vegetation data from intact forests and secondary-growth forests developed after clearcutting, and then calculated functional structure and functional diversity indices of plant communities. The results suggested that functional redundancy of plant communities differs between traits and between forest vegetation zones. When subject to intensive logging, hemiboreal, cool-temperate and warm-temperate forests were more vulnerable to the loss of ecosystem functions related to leaf and stem traits of tree species, compared with subtropical forests, which appeared relatively resilient. This emphasizes that locally adaptive management promoting the maintenance of multiple ecosystem functions should be developed based on the degree of functional redundancy in forest communities.

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