Ecological impacts of different harvesting scenarios for temperate evergreen rain forest in southern Chile - A simulation experiment

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Abstract

Current forestry practices in Chile largely rely on exotic tree plantations, and limited management experiences are available for the species-rich native evergreen rain forests. Yet, conservationists and forest scientists call for sustainable management of native forests as an alternative to plantations so as to maintain important ecosystem services. We parameterised the process-based forest growth model FORMIND for a Valdivian coastal temperate rain forest in Chiloé Island, Chile, to assess the ecological implications of different logging practices including selective logging and strip-cutting. We tested the model by comparing simulation results with field data from the study site and carried out an extensive sensitivity analysis to explore the impacts of parameter values on model results. Simulated logging practices were compared in regard to expected timber harvest and long-term impacts on forest structure and composition.

Results showed that highest harvests could be achieved when strip-cutting was applied, because it promoted the regeneration of the relatively light-demanding and fast-growing *Eucryphia cordifolia*. However, forest structure and composition were severely altered by this practice. In contrast, selective logging, although providing lower harvests, better conserved old-growth forest structure and composition. Canopy gaps created by selective logging were not large enough to ensure regeneration of *E. cordifolia*, but favoured the shade-tolerant *Laureliopsis philippiana*. Overall, the similarity of logged stands to undisturbed forest decreased linearly with increasing harvesting intensity. Management strategies that rely on native species and keep an uneven-aged forest structure ensure the maintenance of native biodiversity, protect ecosystems from exotic species invasions, and promote the conservation of biotic interactions essential for tree reproduction.