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Modelling tropical forests response to logging

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Tropical rainforests are among the most threatened ecosystems by large-scale fragmentation due to human activity such as heavy logging and agricultural clearance. Although, they provide crucial ecosystem goods and services, such as sequestering carbon from the atmosphere, protecting watersheds and conserving biodiversity. In several countries forest resource extraction has experienced a shift from clearcutting to selective logging to maintain a significant forest cover and understock of living biomass. However the knowledge on the short and long-term effects of removing selected species in tropical rainforest are scarce and need to be further investigated.
One of the main effects of selective logging on forest dynamics seems to be the local disturbance which involve the invasion of open space by weed, vines and climbers at the expense of the late-successional state cenosis. We present a simple deterministic model that describes the dynamics of tropical rainforest subject to selective logging to understand how and why weeds displace native species. We argue that the selective removal of tallest tropical trees carries out gaps of light that allow weeds, vines and climbers to prevail on native species, inhibiting the possibility of recovery of the original vegetation. Our results show that different regime shifts may occur depending on the type of forest management adopted. This hypothesis is supported by a dataset of trees height and weed/vines cover that we collected from 9 plots located in Central and West Africa both in untouched and managed areas.