

Submitted Abstract

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Abstract

Climate change is modifying forest dynamics, altering the rate and composition of tree regeneration and, eventually, threatening the sustained supply of ecosystem services. In response, managers are developing climate-adapted strategies, mostly focusing on changes in abiotic conditions. Ungulate populations and their direct and indirect impacts on forest composition and productivity are likely to interact with climate change effects. This raises the issue of whether climate-adapted strategies will be compatible with abundant ungulate populations. Here, we (1) review whether climate-adapted strategies currently consider ungulates and (2) highlight how browsing could affect the success of these strategies, using a systematic mapping protocol and available knowledge of ungulate browsing. We identified 57 references discussing climate-adapted forest management that mentioned ungulates, almost exclusively in boreal and temperate forests. The majority (35/57) of these considered browsing a threat to climate adaptation. Specifically, ungulates activity could prevent the achievement of management goals for desired species composition and increased forest resilience. Our review suggests, for example, that browsing impacts will likely limit the success climate adaptive silviculture including nature-based approaches or assisted migration plantings. Potential interactions between large ungulate populations and climate-adapted forest management are sometimes considered but rarely integrated in adaptation strategies. More empirical and modelling data would be beneficial, especially on the interactive effect of climate variables and browsing on tree regeneration. Without this, the climate-adapted strategies implemented today could result in future regeneration failures and exacerbate the pressure on forests.