Characterisation of salvage logging as a concatenation of interacting ecological/anthropogenic disturbances

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Abstract

Large disturbances increasingly affect forests around the world. As a result, increasing amounts of forest are subject to salvage logging –an intervention aimed at salvaging economic value of the forest and sometimes considered a means of ecological restoration. Understanding and managing the world's forests thus increasingly hinges upon understanding the combined and interactive effects of natural disturbance and logging disturbance, including interactions so far unnoticed. Here, I disentangle and describe the mechanisms through which natural disturbance (e.g. wildfire, insect outbreak or windstorm) can interact with anthropogenic disturbance (logging) to produce unanticipated effects. For this, I apply recent advances in disturbance-interaction theory. First, many ecological responses to salvage logging likely result from interaction modifications–i.e., from non-additive effects between natural disturbance and logging. However, a systematic review encompassing 209 relevant papers showed that interaction modifications have not been the focus of empirical research to date. Second, salvage logging constitutes an interaction chain because natural disturbances increase the likelihood, intensity and extent of subsequent logging disturbance resulting from complex socio-ecological interactions. The existence of such an interaction contrasts with the typical plot-level research. Both interaction modifications and interaction chains can be driven by nonlinear responses to the severity of each disturbance. Sampling at different natural disturbance and/or logging intensity levels is necessary to understand such nonlinearities. Whereas many of the effects of salvage logging likely arise from the multiple kinds of disturbance interactions between natural disturbance and logging, they have mostly been overlooked in research to date. Interactions between natural disturbance and logging imply that increasing disturbances will produce even more disturbance, and with unknown characteristics and consequences. Disentangling the pathways producing disturbance interactions is thus crucial to guide management and policy regarding naturally disturbed forests.

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