



Non linear ecological processes, fires, environmental heterogeneity and shrub invasion in NW Patagonia, Argentina

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The behaviour of emergent nature is not only the sum of interactions among ecosystem parts but it depends also on the organization of these interactions. Fire behaviour, climate and vegetation patterns produce non linear fire propagation across landscape. Fires can increase the abundance of determined species modifying the fire regime and increasing the invasion of the same species (*Fabiana imbricata* and *Senecio bracteolatus* shrubs in NW Patagonia). Environmental heterogeneity, like the presence of outcrop, favours landscape patchiness with different fire frequencies and generates occupation of fire refuges by species that can survive there (*Autrocedrus chilensis* tree). We monitored shrub cover and recruitment during 8 postfire years in NW Patagonia grasslands. We described shrub population dynamics with matrix models projecting the population in hypothetical scenarios of different fires and ENSO (El Niño Southern Oscillation) frequencies. Fire promote shrub invasion in NW Patagonia. Global climate change suggests the increase of frequency and amplitude of ENSO phenomena, which in NW Patagonia implies more coupled fires and rainy springs, and consequently more shrub windows of recruitment. The matrix models indicate that this scenario promotes shrub invasion. Future satellite images and aerial photographs analysis will provide information about long term changes in vegetation and fire regime. Our results improve the knowledge of ecosystem properties and processes providing useful information for grassland sustainable use.