Using models to explore invasion dynamics and control of St. John's wort (*Hypericum perforatum*)

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Summary Control strategies for invasive weeds can be expensive, environmentally risky and have high failure rates. This necessitates the development of methods for assessing the efficacy and cost effectiveness of potential control strategies before implementation. We use an individual-based model of the population dynamics of the invasive weed *Hypericum perforatum* (St. John's wort), based on data collected in south-eastern Australia, to make predictions about what control strategies will be most effective for populations in open (i.e. pasture) and shaded (i.e. native woodland) sites. We found that populations in shade and open sites have different dynamics and responses to control strategies. Shaded populations take longer to reach infestation densities and are less affected by herbivory and reductions in survival than open populations. Open populations increase faster in response to increases in rainfall, but higher rainfall does not have positive population growth effects on shade populations. We predict that the most successful control strategies will involve a reduction in vegetative (rosette) size in both open and shaded sites. The next most successful control strategy is reduction in flowering stem size in shaded sites and reduction in survival in open sites. Drought in the austral autumn/winter adversely affects populations in both open and shaded sites; control is therefore important after dry winters when populations may not appear to be high but have the potential to rebound.

Keywords Individual-based model, management strategies, invasive plant.