riskmapr: a web tool for mapping weed risk to support operational decisions

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Summary New alien plant species are constantly introduced across borders or landscapes, and some are likely to become problematic invasive weeds from experiences elsewhere. Initially, weed population growth and spread is typically slow. This 'invasion lag' often presents the only window of opportunity where containment and eradication can be achieved, and long-term negative impacts avoided. We developed a weed risk mapping tool that allows land managers to identify priority areas for monitoring and management relatively quickly and with limited data. The tool considers both habitat suitability (where weeds are likely to grow well and reproduce) and susceptibility (where weed propagules are likely to arrive from known source plants). 'Risk factors' that reflect the environmental conditions a weed needs to grow, reproduce and spread (like rainfall, land use, soil type or road networks) are identified and linked to spatial data. A collection of open-source web apps called 'riskmapr' allow land managers and researchers to plug in their own spatial data and generate weed risk maps. These maps may be used to direct on-ground resources, along with other operational considerations. Risk models can also help structure our understanding of the factors and processes driving weed invasions.

Here, we showcase an application of riskmapr to support surveillance planning for *Miconia calvescens* in the National Tropical Weeds Eradication Program. Previously, surveillance effort was evenly allocated to forested areas within concentric buffer zones surrounding known mature infestations. Using riskmapr and spatial analysis to gain a more nuanced understanding of invasion risk allowed the operations team to focus on-ground effort. At one site, high risk areas subject to frequent surveillance were reduced by 24% (from 613ha within buffer zones to 467ha using riskmapr outputs); medium risk areas were reduced by 27% from 833ha to 612ha; but less frequently surveyed low risk areas increased from 236ha to 672ha.

Keywords Invasion lag, risk model, risk map, risk factors, suitability, susceptibility, monitoring, surveillance