

A spatial and temporal explicit model to compare the effectiveness and cost of serrated tussock (*Nassella trichotoma*) management on public land

Ratnapriya Gajaweera¹, Jackie Steel¹, Franz Mahr¹, Rodney Jones¹, Charles Grech¹ and Jean-Phillippe Aurambout²

¹ Biosciences Research Division, Department of Primary Industries, Agribio, Bundoora VIC 3083

² Spatial Information Sciences, Department of Primary Industries, Parkville VIC 3052
(Ratnapriya.Gajaweera@dpi.vic.gov.au)

Serrated tussock is an invasive wind dispersed grass species which has established in Port Phillip and Corangamite Catchment Management Authorities (CMAs) of Victoria. Of the 26 240 km² of land under these two CMAs, 70% of land is suitable for serrated tussock establishment of which 3% and 97% is on public and private tenure respectively. Under the Victorian government initiatives, the current serrated tussock control program in these CMAs, is aimed at preventing value deterioration of public assets. This strategy is based on the assumption that the private property owners/ managers have enough awareness, capacity and access to the latest information on serrated tussock control and will perform serrated tussock management to prevent further spread. Different methods of control are being used by land owners/managers depending on the land use where the serrated tussock is infested.

To estimate the effectiveness and cost of management options of serrated tussock on public land a spatial and temporal simulation framework was developed. The framework consisted of a non-spatial unit cellular model constructed on the STELLA platform that was applied within a Spatial Modelling Environment (SME) associated with current GIS information. The unit model consists of four modules:

1. the lifecycle of serrated tussock (STELLA),
2. the mechanism of wind dispersal (scripted in PYTHON),
3. management strategy (STELLA) and
4. the cost of management (STELLA).

The integration of the modules enabled the simulation of serrated tussock spread to interact spatially with the prescribed management scenarios. The simulation outputs included maps of the spread and density of serrated tussock across the two CMAs and the cost of management associated with this spread over a 20 year period.

Two management scenarios were compared, based on the extent of best practise management on public land: no management on public land *versus* 100% best practice management on public land, whilst all private land was under standard management in both scenarios.

The simulation found that serrated tussock will reach its maximum dispersal distance in the two CMAs within the next 20 years under either management scenario. Whilst the final difference in the area of spread on either public or private land between the two scenarios was only 0.5%, serrated tussock density was kept below 10% on public land under best practice management. The small amount of public land available for possible incursions (3%) compared to surrounding private land (97%) and ease of invasion from neighbouring private lands were identified as possible causes that diminish the effectiveness of the public land management. The model estimated a cumulative cost of \$3.6 m at its present value (not including cost for surveillance) to manage public land infested areas over the next 20 years.