

Linear Grassland Reserves Program Weed Control Monitoring Program

Who wins the battle for space after weed control in critically endangered grassland remnants?



Key Points

- Weed control is effective at reducing weed cover, only as long as it is maintained.
- Within the first year after weed control finished, weeds recovered.
- Weed control did not result in an increase of native species diversity or cover.
- Native species recovery in grasslands requires multiple recovery actions, weed control alone is inadequate.
- We need to experiment with a range of weed control and recovery actions, paired with long-term monitoring, to identify effective approaches to grassland restoration.

Weed Control



Many **weeds pose a significant threat to high-quality native grasslands**. Weeds can reduce native plant diversity, threaten rare and endangered species, modify ground cover, and alter disturbance regimes (for example weeds can increase the risk and intensity of fire).

Native and weedy grassland plants are often densely mixed together. Therefore, **weed control is difficult** as some natives are killed to ensure most weeds are eradicated, or some weeds will be missed to avoid killing natives.

While control of high-threat weeds, using herbicides, is a commonly used grassland management activity, there is only **limited quantitative (i.e. measured) evidence** to demonstrate the positive effects of weed control for native grasslands.

Natural Temperate Grasslands

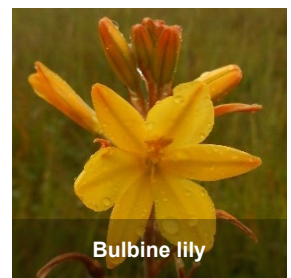


Here we describe a monitoring program that is generating **new knowledge about the effectiveness of weed control** across 40 high-quality grassland remnants on Victorian Volcanic Plain (VVP) roadsides and rail lines in western Victoria.

Natural temperate grassland is a **critically endangered** ecological community



Blue pincushion



Bulbine lily

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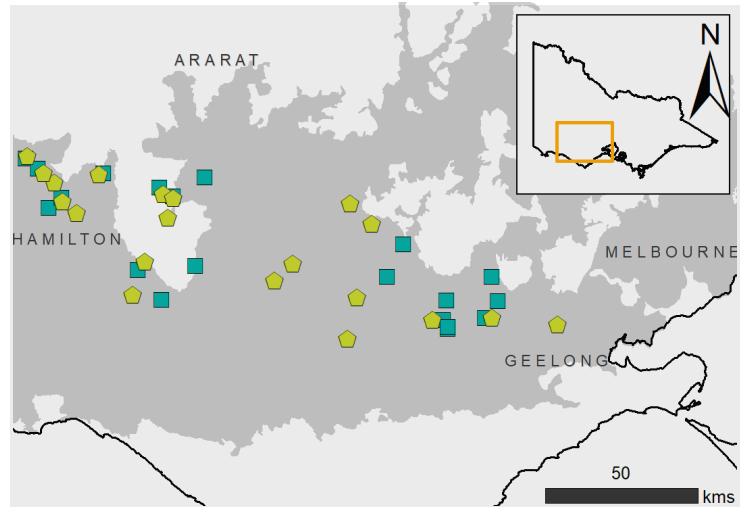
Weed Control Monitoring Program



This research is part of the **Linear Grassland Reserves Program** and was developed to examine the effectiveness of weed control actions on grassland biodiversity. The knowledge generated from the program will be used to improve grassland management and conservation outcomes.

Native grasslands need to be monitored to determine if management improves grassland values (for example wildflowers, species diversity, cultural values)

It was anticipated that weed control would reduce weed cover and that native species would be able to occupy the space vacated by weeds.

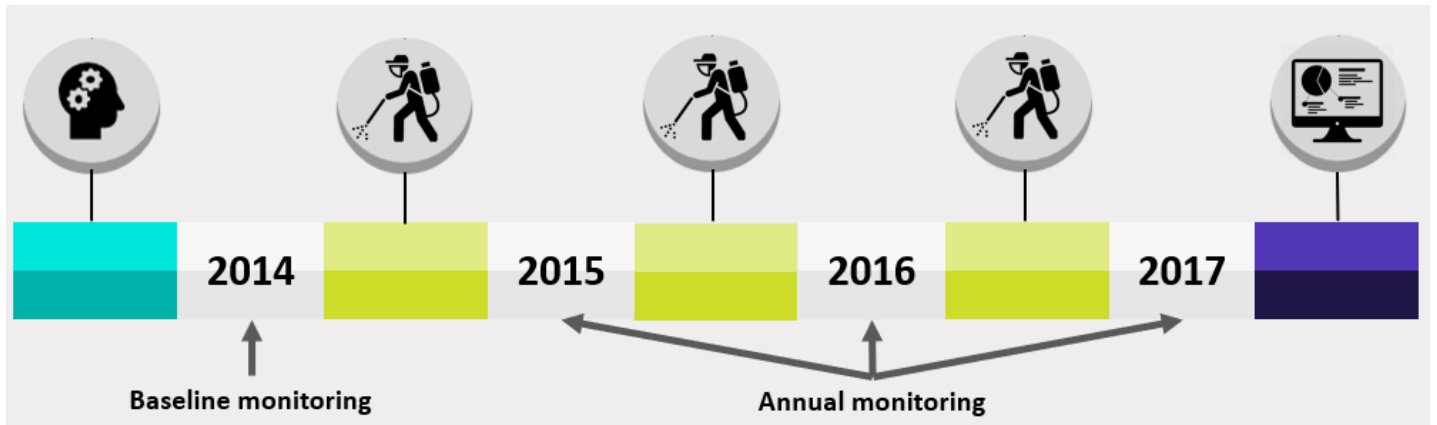


Location of monitoring sites within the VVP (squares – no weed control; pentagons – weed control)

Project Timeline



Project planning (**teal**) took place prior to monitoring. Baseline monitoring was established prior to weed control in spring 2014, followed by recurring weed control in autumn (**yellow**) and annual monitoring in spring. Final analysis and reporting (**purple**) occurred after three consecutive years of monitoring.



Methods



Detailed surveys of all plants were undertaken at the same locations each year (2014-2017).

Plant responses to weed control were examined by comparing the abundance and richness of plants in grassland sites with weed control against untreated control sites.



Blue devil



Hoary Sunray



ARI staff member conducting monitoring

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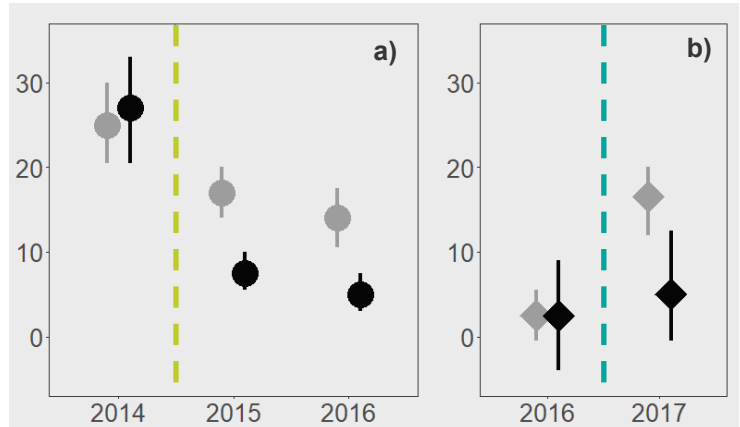
Plant Cover



Weed cover in sites with weed control decreased by 37%, relative to untreated controls sites, in 2015. Subsequent weed control in 2016 maintained the difference in weed cover (Figure a).

Weed cover in sites where weed control ended increased by 34%, relative to sites where weed control continued. This indicates that **weed cover can quickly return when weed control ends** (Figure b).

Native species (abundance or the number of species) did not change after two consecutive years of weed control, or in the year after weed control ended.



Change in target weed abundance (cover %)

(a) During weed control: Two years of weed control (2015 and 2016). Weed control (black circles) vs. Untreated control (grey circles)

(b) Once weed control ended: First year after weed control ended (2017). Weed control (black diamonds; continuous weed control) vs. Weed control ended (grey diamonds; two years of weed control stopped after 2016)



Knowledge Gap:

Why don't native plants respond to the reduction in weed cover during, or after, two years of weed control?

Ground Cover



Litter and bare ground cover increased after weed control. It appears that dead weeds turn into litter in the first year, and the following year that litter either blows away or breaks down, creating bare ground the following year.

Biological soil crust cover declined after weed control. While the driver of this pattern is unclear, it is a concern as biological soil crust (i.e. **moss, algae, lichen, bacteria, fungi**) is crucial for soil health. A disruption to soil health could lead to altered survival and recruitment of native species.

None of the ground covers (i.e. litter, bare ground or biological soil crust) changed in the first year after weed control ended.

Change in ground cover

In the first year after the weed control program began (i.e. 2015) litter cover increased in weed control sites. This was followed by an increase in bare ground and a decrease in biological soil crust cover in the weed control sites the following year (i.e. 2016).

Dash symbols indicate no change. All comparisons are made to the pre-weed control state in 2014.

Cover Type	2014	2015	2016
Litter		▲	-
Bare Ground		-	▲
Bio. Soil Crust		-	▼



A patch of target weeds sprayed with herbicide

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Conclusions



Weed control reduced weed cover by 37% in the first year, which was maintained with continued weed control.

Weeds began to return within the first year after weed control stopped.

Native grassland plants did not respond to weed control during application, or in the year after weed control ended. However, two years may not be long enough for native plants to respond. Therefore, long-term monitoring is required to identify these patterns.

Ground cover (litter, bare ground and biological soil crust) were all modified by weed control and could have implications for native plant species recruitment.

Lessons for Decision Makers



- Weed control can substantially reduce weed cover, but weeds can return if weed control ends.
- Native species showed no immediate response to weed control in grasslands.
- Additional management actions (e.g. fire) may be effective in facilitating a native species response.
- Longer-term monitoring is required to determine the effectiveness of weed control in VVP grasslands.

These lessons would not have been possible without investment in ecological monitoring.

Further information

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