



Australia's National Science Agency



Good neighbour: Opportunities for improved management of mobile cropping weeds

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Area Wide Management for cropping systems weeds: investigating the weed management, social and economic opportunity; Locally important weeds; Better summer weed management decisions in southern and western Australia

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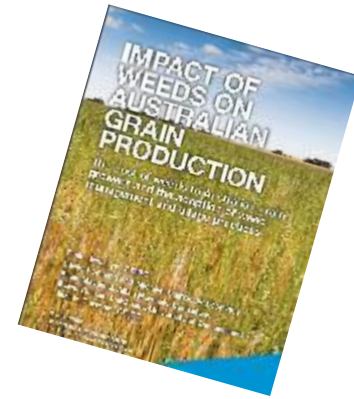
Sonia Graham, Gina Hawkes, Silja Schrader, Kaitlyn Height, University of Wollongong

Alex Douglas, DPIRD WA | Jason Emms



Background

- Weeds now cost the Australian grains industry over \$4B p.a. (over \$200/ha).
- The most costly weed is annual ryegrass – outcrossing with mobile pollen
- Fallow weeds are just as costly to yield loss as in-crop weeds
- The most costly summer weeds are all highly mobile: sow thistle; fleabane; feathertop Rhodes grass





Background

70% of growers believed that they had already gained a herbicide-resistance problem on their farm due to the movement of seed or pollen

Llewellyn & Allen 2006

What more can we do to manage and avoid mobile weeds?

- Across farms
- Across land uses
- Across industries



nature
plants

PERSPECTIVE

<https://doi.org/10.1038/s41477-019-0395-y>

Considering weed management as a social dilemma bridges individual and collective interests

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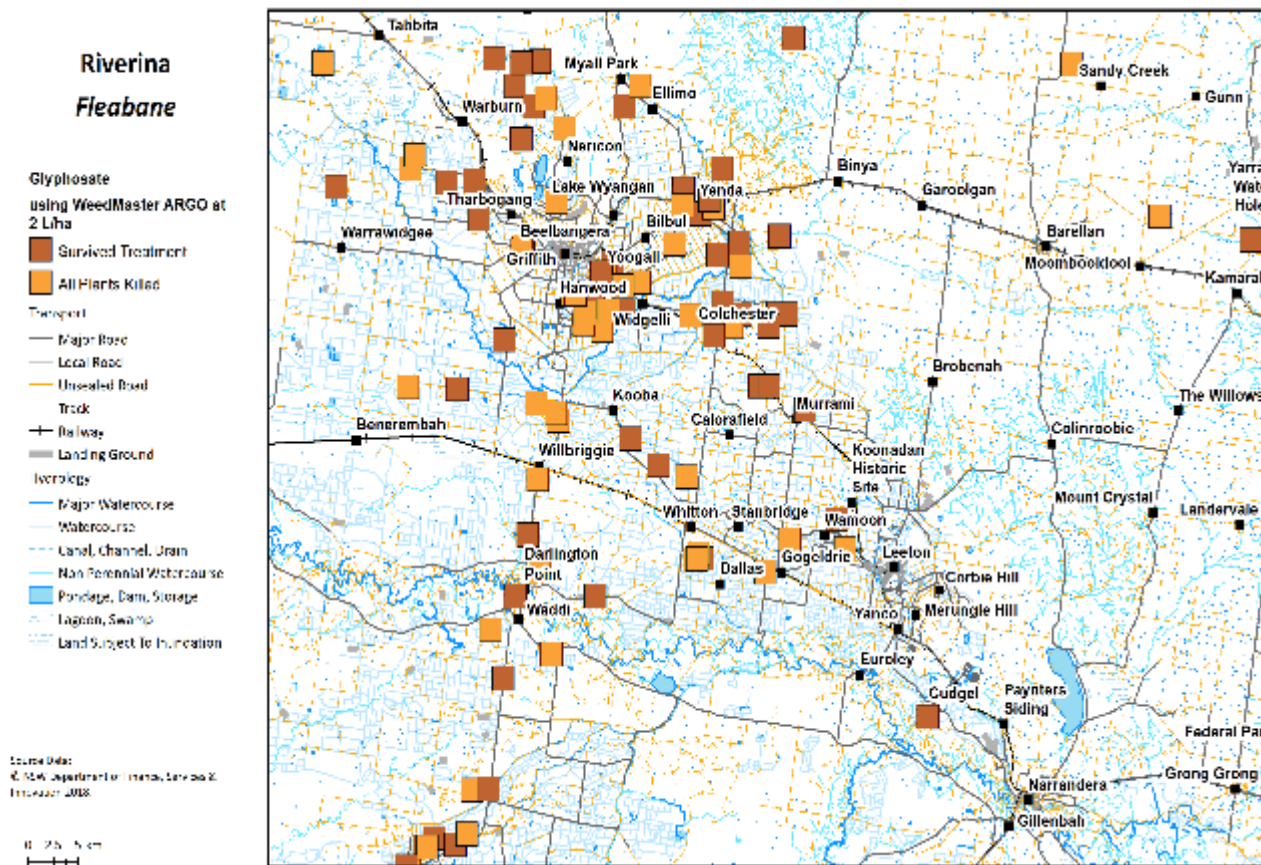
Spread of herbicide resistant weeds was identified as the most common major concern

Fleabane, ryegrass and feathertop Rhodes the most commonly cited mobile weeds of concern

Reducing the spread of major weeds with high levels of resistance into crop-land was identified as the most likely benefit of an AWM approach

Economic criteria for Area Wide Management interventions for mobile weeds of cropping

Are there still substantial areas and numbers of growers yet to gain the weed problem?



Glyphosate resistant (dark); susceptible (light)

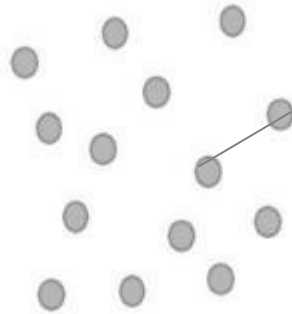
Economic criteria for Area Wide Management interventions for mobile weeds of cropping

Do the weeds have potential for mobility?

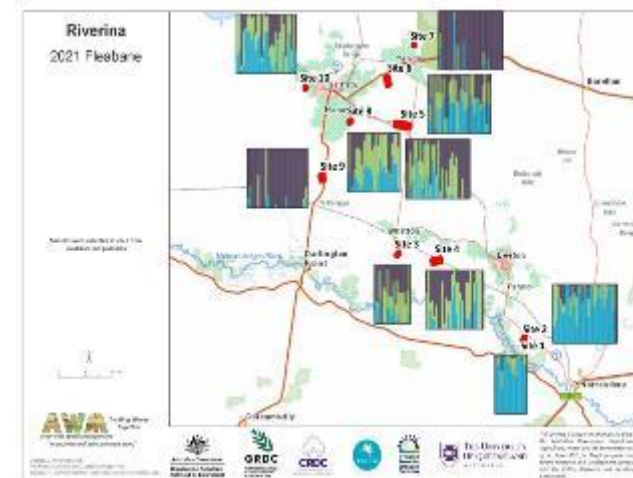
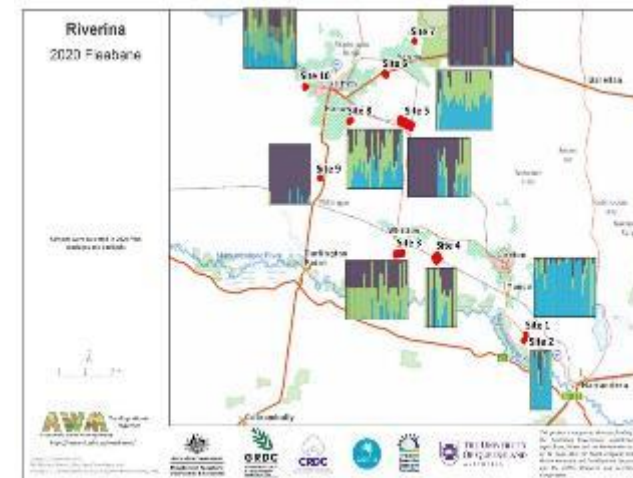


Economic criteria for AWM interventions for mobile weeds of cropping

If mobility is limited and the neighbours avoid substantial incursion costs by adopting cost-effective practices then: little need for intervention

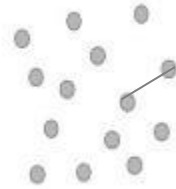


Fleabane—still local differences

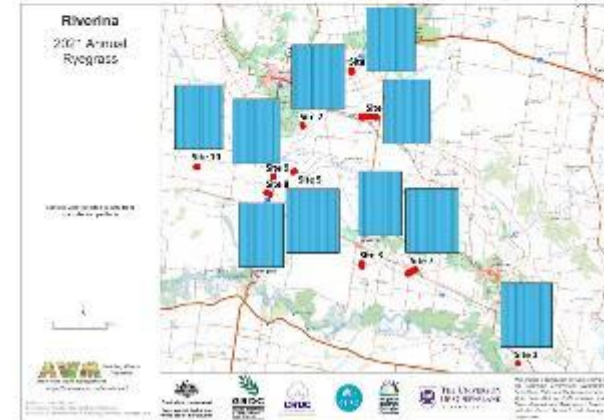
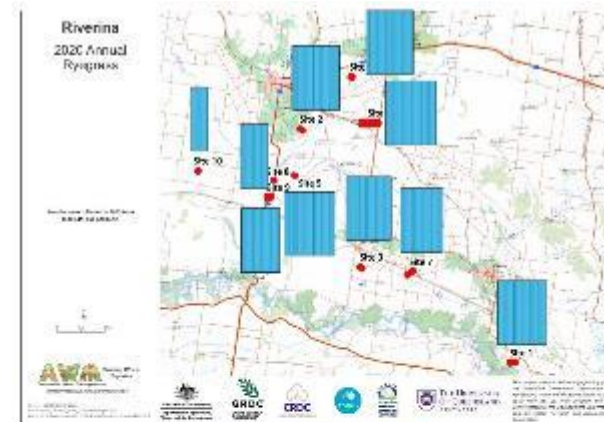


Economic criteria for AWM interventions for mobile weeds of cropping

If mobility is moderate, then: it will depend on the spatial distribution and magnitude of incursion costs

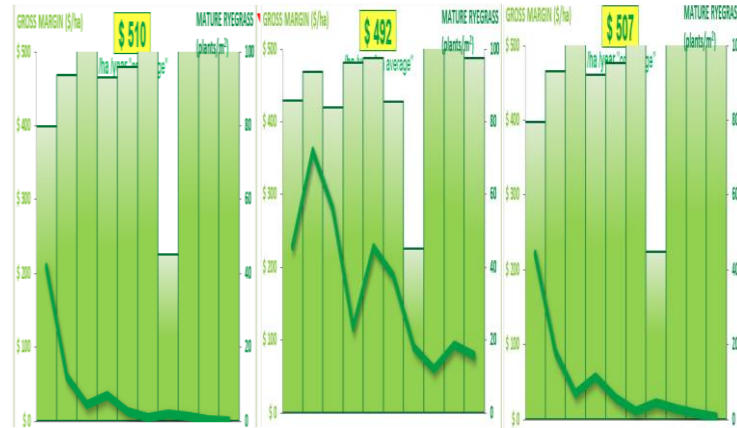


Annual ryegrass –genetic similarity



Economic criteria for AWM interventions for mobile weeds of cropping

If mobility and incursion costs are high then area-wide intervention may be justified:



Often moderate marginal costs of additional weed gains

\$WT



Economic criteria for AWM interventions for mobile weeds of cropping

If mobility and incursion costs are high then area-wide intervention may be justified:



Level of concern (out of 5) for weeds spreading:

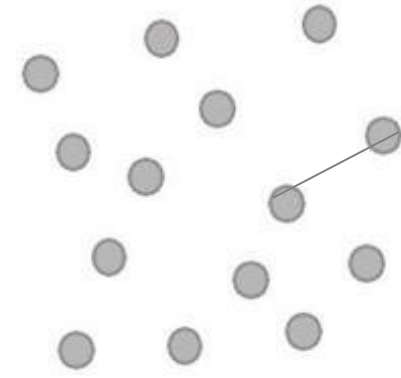
... from public land (e.g., roadside) to your land	3.8
... from neighbouring farmland to your land	3.5
... from your land to neighbouring farmland	3.1
... from your land to public land (e.g., roadside)	2.6

Willingness to Pay to reduce glyphosate resistant summer weed spread risk from a 75% chance down to 10% ranged from \$1,500 to \$15,000.

If the risk of spread was only reduced from 90% to 50% there was no willingness to pay for any category of farmers



Good neighbour approaches



Grower:Grower (low cost)

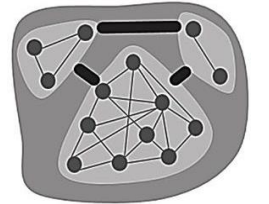
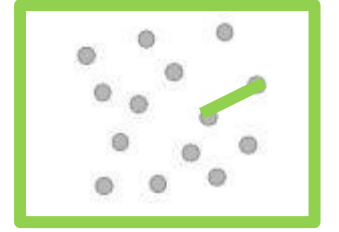


Council roadside:Grower (high & increasing cost for councils)



Conclusions

- High potential mobility but criteria was only met for minor AWM ‘intervention’
- Increasing time costs of ‘coordinated area-wide participation and collaboration’ on increasingly large intensive cropping farms is a major factor
- Good evidence and potential for low-cost ‘good-neighbour’ weed mobility management considerations were found when mobility risk can be demonstrated
- But co-ordinated area-wide/ cross-sector opportunities at industry sector level e.g. joint weed management R, D & E effort for mixed industry regions
- Other weed incursion scenarios will exist when more AWM criteria are met e.g. high cost market-threatening new weed incursions and/or potential for local exclusion/eradication





THANK YOU



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