Area-wide weed management and the distribution of herbicide resistance in the Riverina

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What more can we do to manage and avoid mobile weeds and herbicide resistance?
- Across farms
- Across land uses
- Across industries
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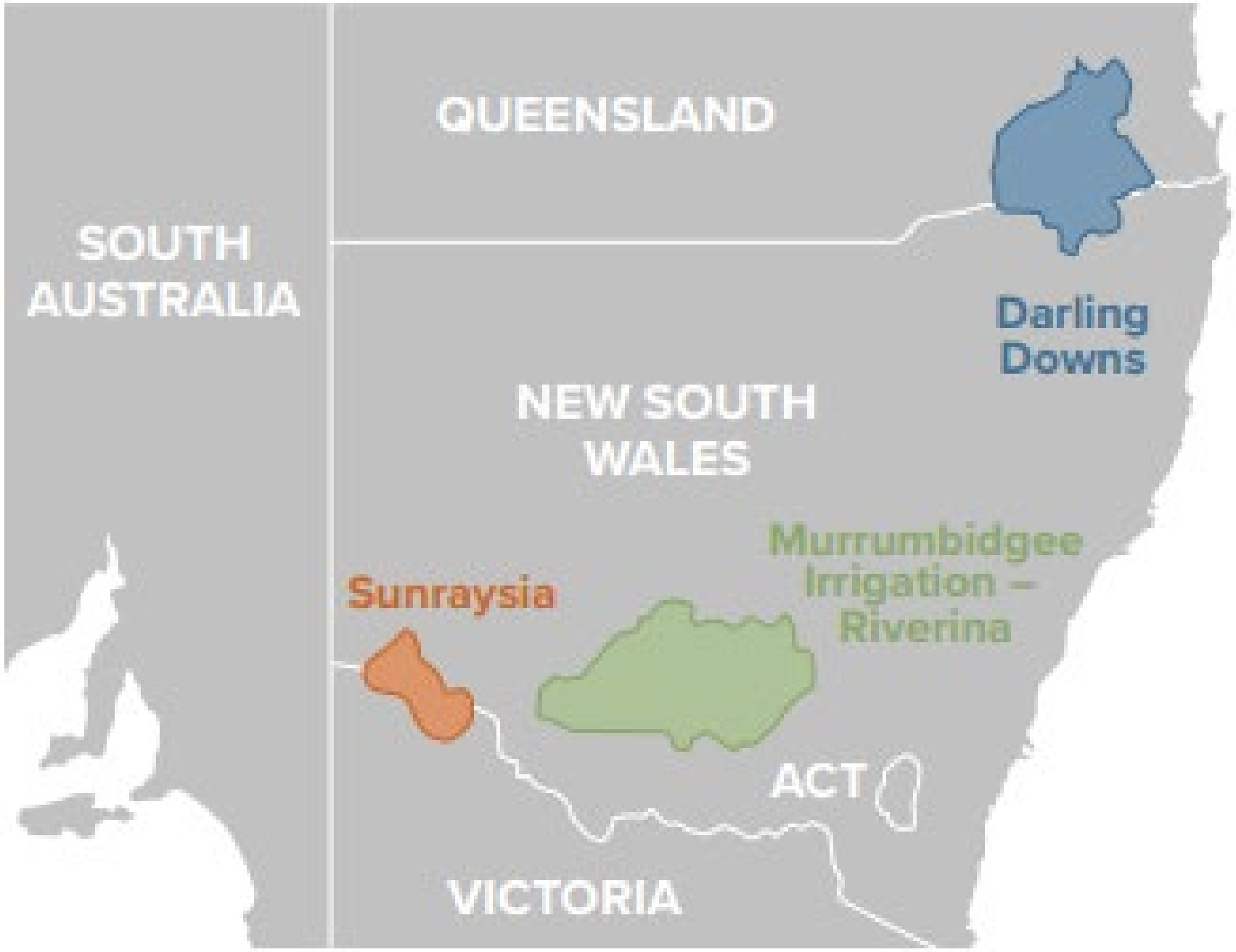

QUEENSLAND
SOUTH AUSTRALIA
Darling Downs
NEW SOUTH WALES
Murrumbidgee Irrigation – Riverina
Sunraysia
ACT
VICTORIA

Priorities for local stakeholders

Consulted to prioritise weed issues & threats (30 interviews Riverina/MIA)

Most commonly mentioned as being of concern were:

- **Ryegrass & Fleabane**
- **Silverleaf nightshade; Feathertop Rhodes grass**

Priorities for local stakeholders

Priority issues affecting weed management:

- **Herbicide resistance (glyphosate)**
- Spray drift risk management
- **Roadsides & waterway – potential spread**

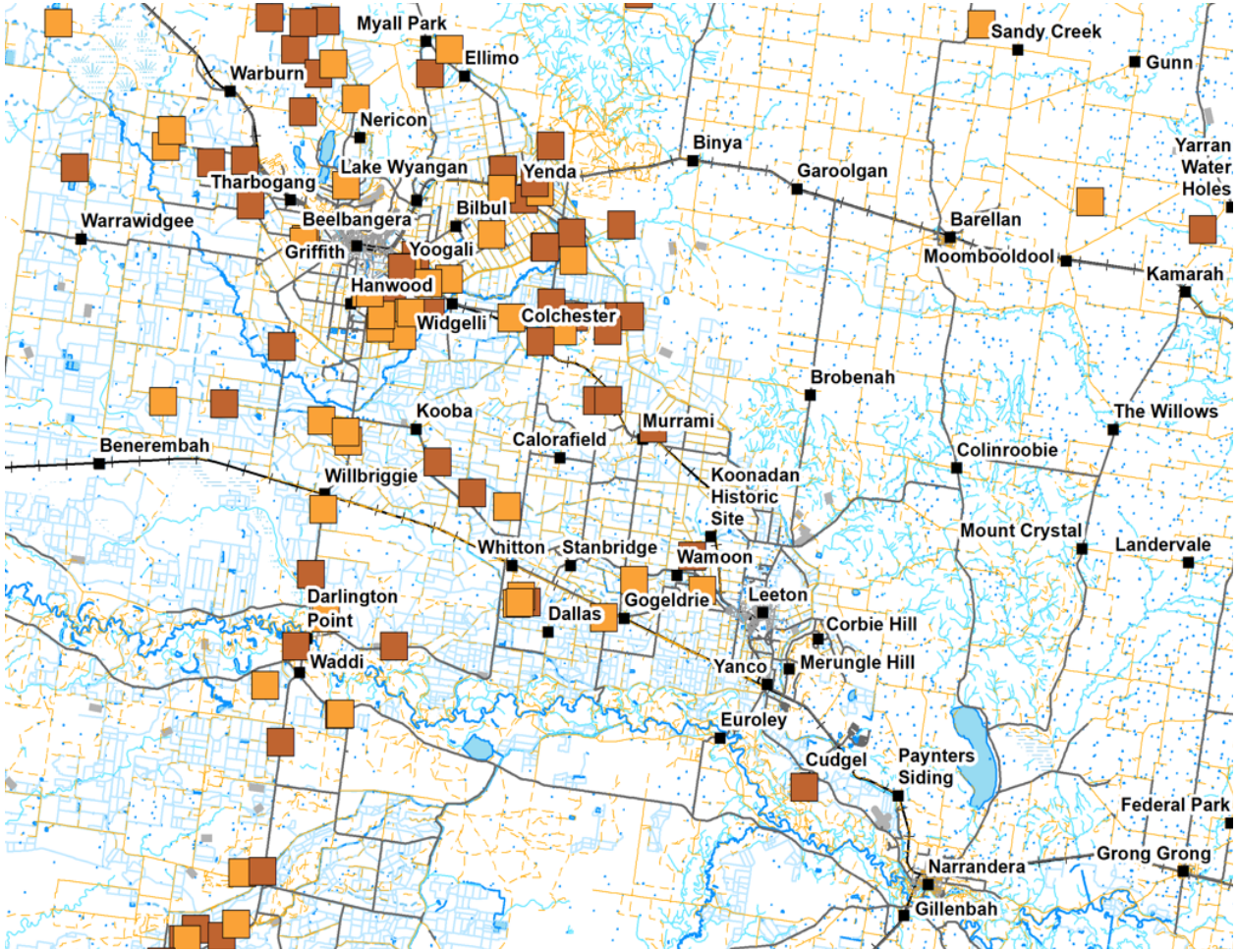
- *Funding (public programs; competition Vs coordination)*

Action

- Determine resistance status of priority weeds
- Test for genetic evidence of ‘spread’

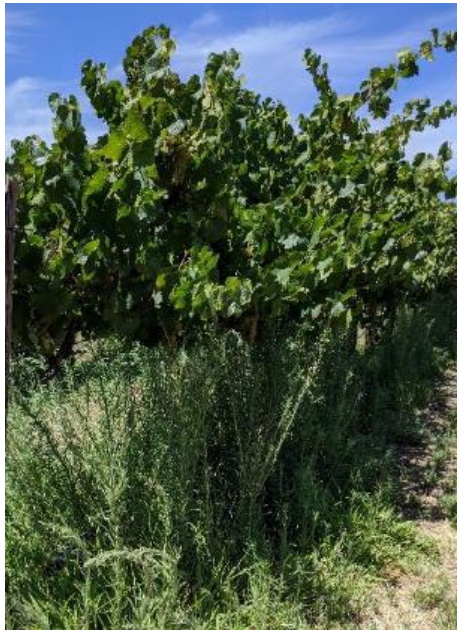
- Identify current actions, attitudes and opportunities
- Conduct range of local trials
- Support local release of a fleabane control agent

- Develop next steps for collaborative area-wide approaches



Riverina Trials

- Weed control in Citrus orchard
- Kikuyu on Channel Bank
- Kikuyu establishment
- Weeds in Vineyards
- Weed control around irrigation infrastructure

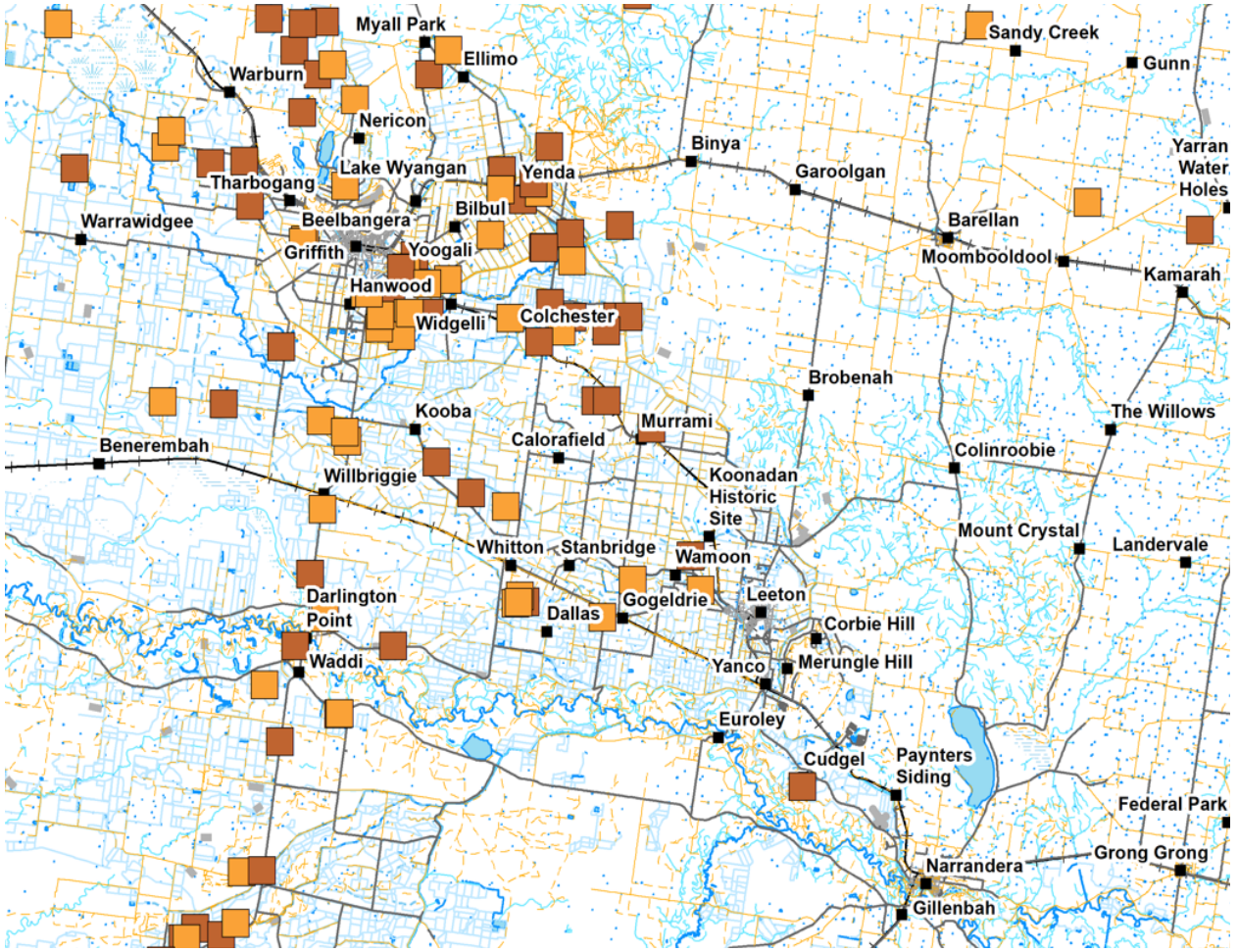


Herbicide resistance status

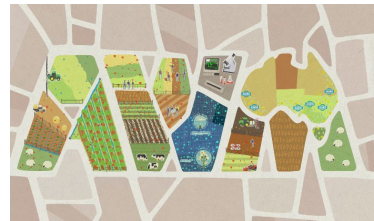
- Fleabane
- Ryegrass
- Silverleaf Nightshade

- Samples collected 2020-21

- In-paddock
- Non-paddock



Fleabane plants were treated with glyphosate (WeedMaster Argo) at 1080 g ha-1 and paraquat + diquat (Spray.Seed) at 324 + 276 g ha^{-1} when at the 6 to 8-leaf rosette stage. Feathertop Rhodes grass was treated with glyphosate at 1080 g ha^{-1} at the 3 to 4-leaf stage. Annual ryegrass was treated with 540 g ha^{-1} glyphosate 7 days after transplanting. Silverleaf nightshade was treated with 540 g ha^{-1} glyphosate at the 4-6 leaf stage.



Results of herbicide resistance testing

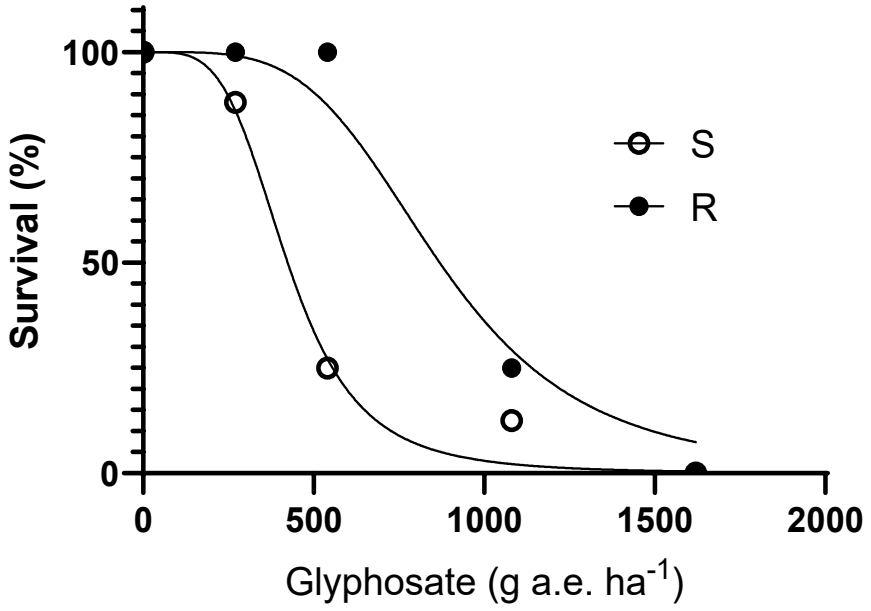
Weed species	Year	Samples tested	Resistant to glyphosate	Resistant to paraquat + diquat
Fleabane	2020	64	41 (64%)	0
	2021	57	21 (37%)	0
Vineyard samples				
Fleabane	2021	22	9 (41%)	0

Results of herbicide resistance testing

Weed species	Year	Samples tested	Resistant to glyphosate	Resistant to paraquat + diquat
Annual ryegrass	2020	20	13 (65%)	-
	2021	16	13 (81%)	-

Results of herbicide resistance testing

Weed species	Year	Samples tested	Resistant to glyphosate *tbc	Resistant to paraquat + diquat
Silverleaf nightshade	2021	11	1*	-



Response of silverleaf nightshade plants grown from root fragments to varying rates of glyphosate. Susceptible (o) and resistant (●) samples of silverleaf nightshade.

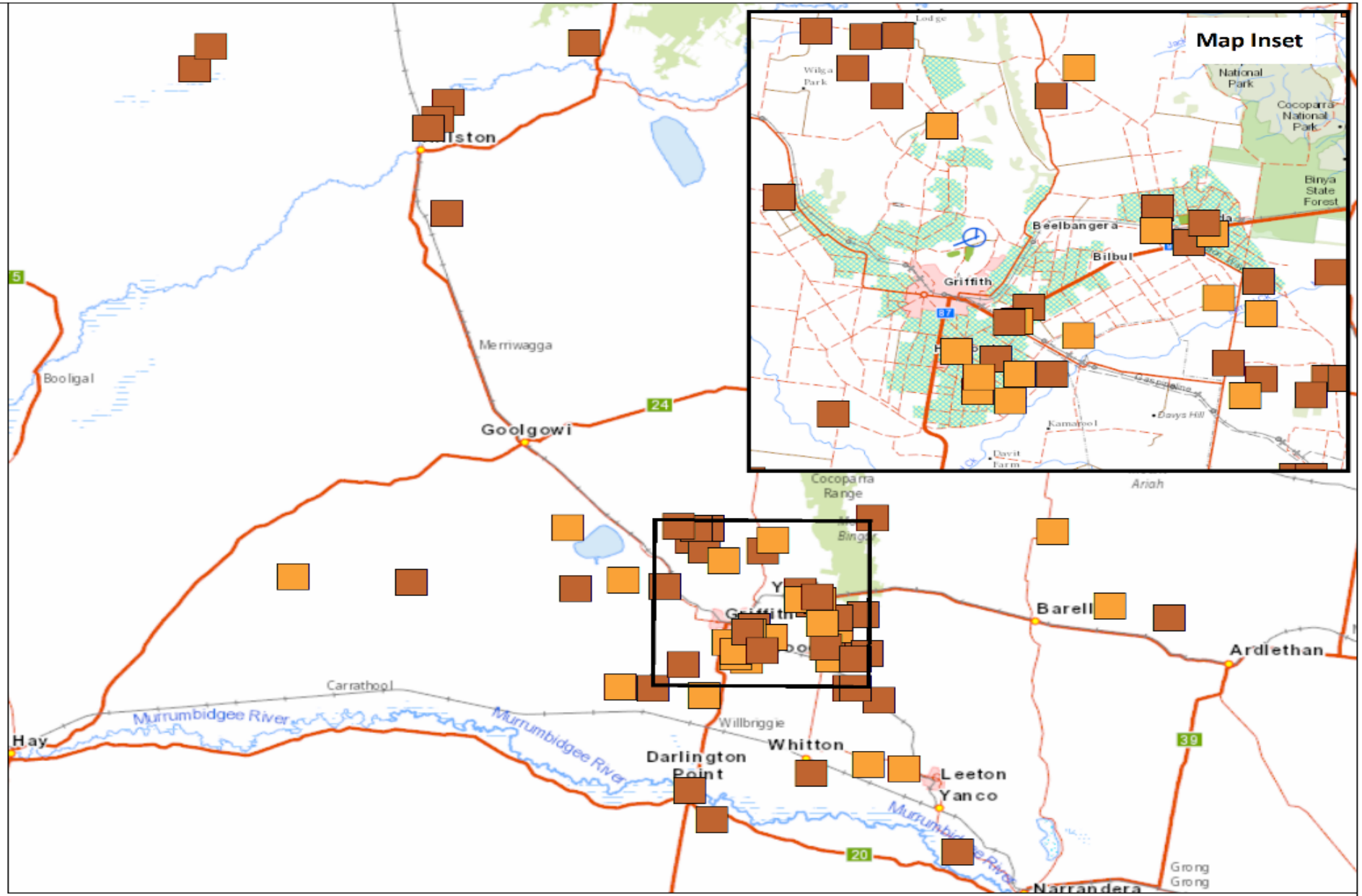
Riverina

Fleabane Resistance to Glyphosate

Glyphosate
using Weedmaster ARGO at 2 L/ha

- Survived Treatment 64%
- All Plants Killed 35%

2020 samples are collected from roadsides and paddocks



Tackling Weeds Together
Area-wide Weed Management
https://research.csiro.au/weed-awm/

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This project is supported through funding from the Australian Government Department of Agriculture, Water and the Environment as part of its Rural R&D for Profit program and the Grains Research and Development Corporation and the Cotton Research and Development Corporation.

Created: 19 November 2021
File:Riverina_Resistance_Fleabane_Oct2020_PB.mxd

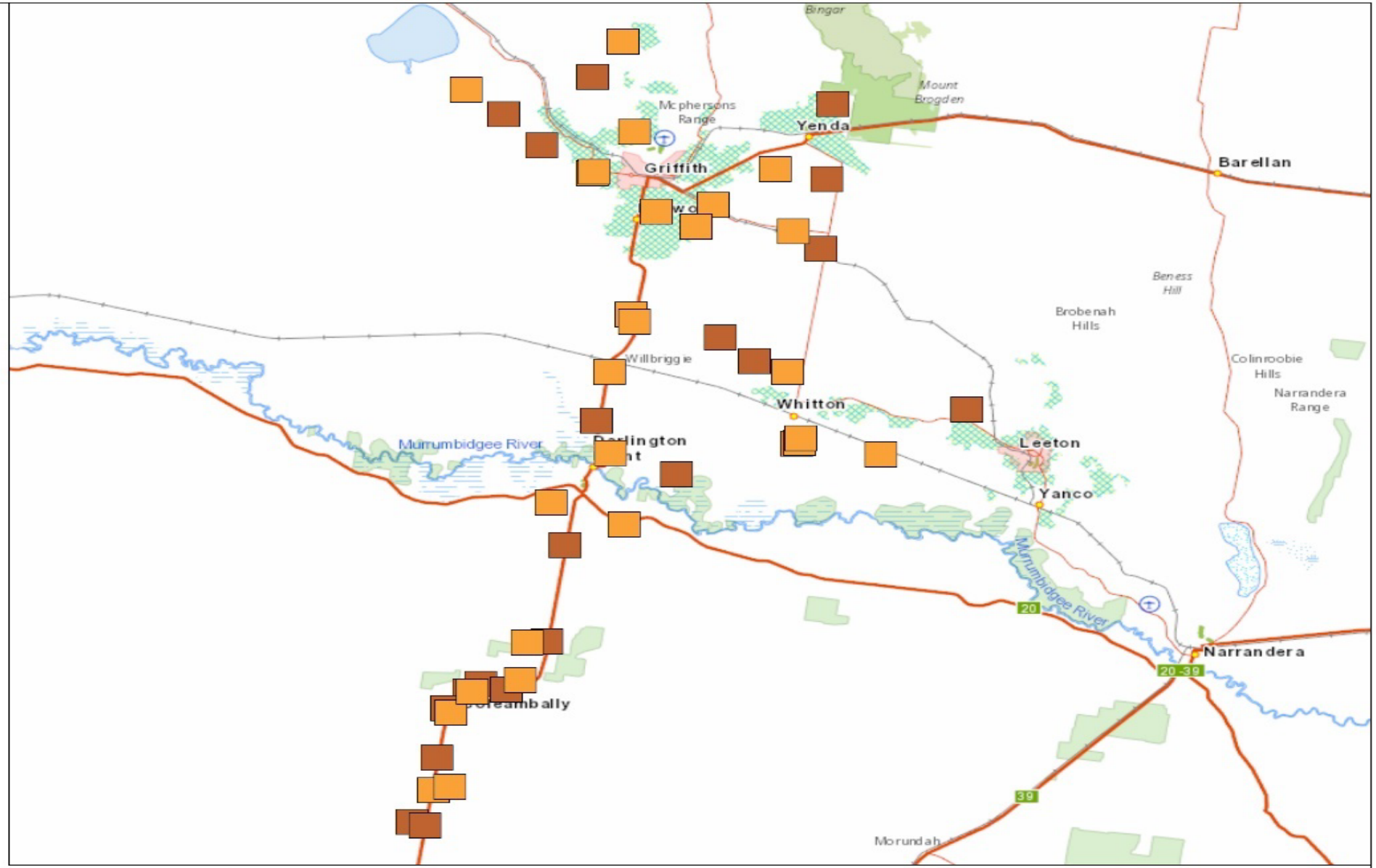
Riverina

Fleabane Resistance to Glyphosate

Glyphosate
using Weedmaster ARGO at 2 L/ha

- Survived Treatment 43%
- All Plants Killed 57%

2021 samples are collected from roadsides and paddocks



N
0 10 20 km

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Area-wide Weed Management
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Riverina

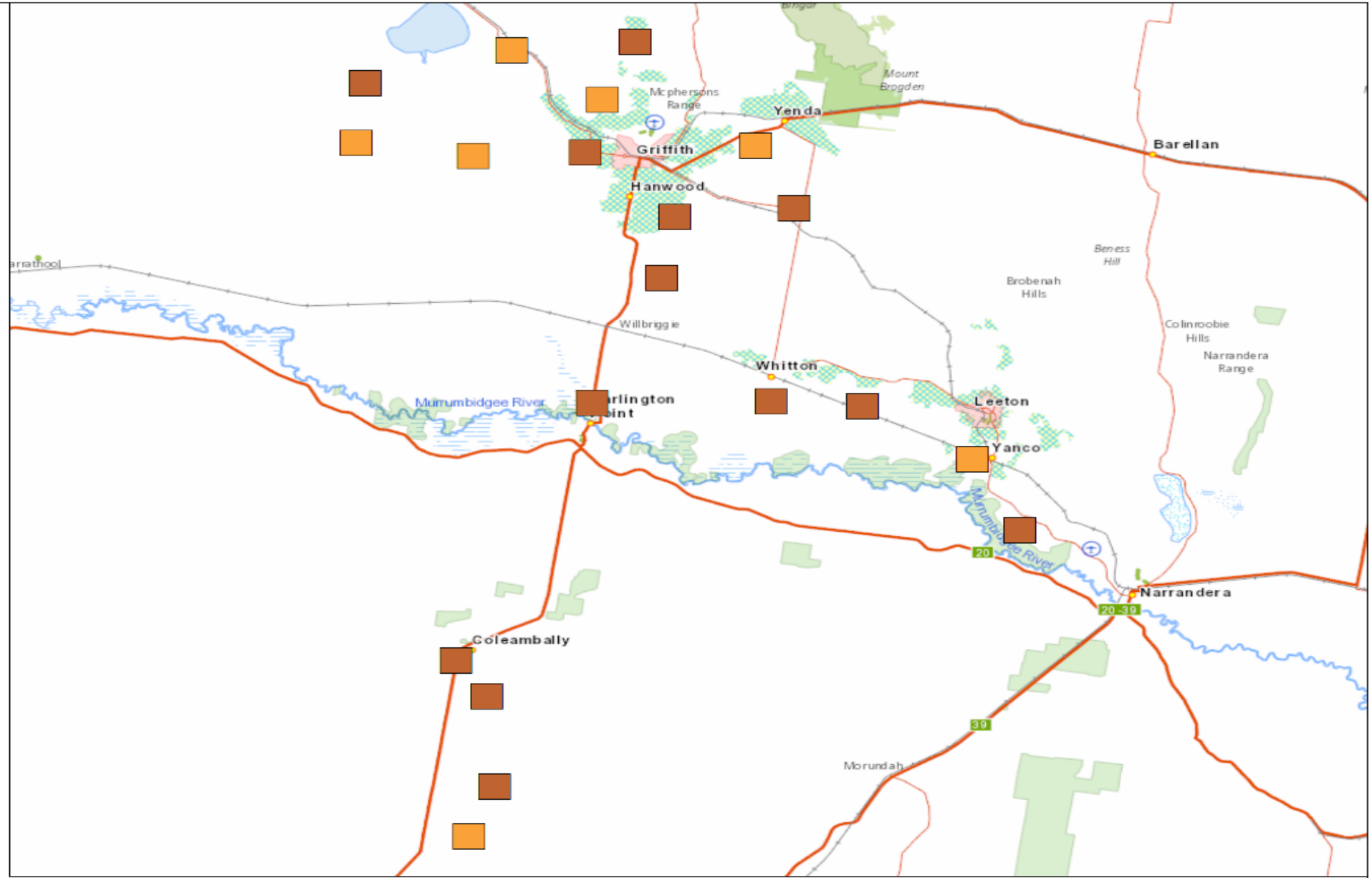
Annual Ryegrass Resistance to Glyphosate

Glyphosate

using Weedmaster ARGO at 1 L/ha

- Survived Treatment 65%
- All Plants Killed 35%

2020 samples are collected from roadsides and paddocks



0 10 20 km

Tackling Weeds Together

Area-wide Weed Management

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Created: 19 November 2021
File:Riverina_Resistance_Ryegrass_Nov2020_PB.mxd
Source(s):© Commonwealth of Australia (Geoscience Australia) 2021.

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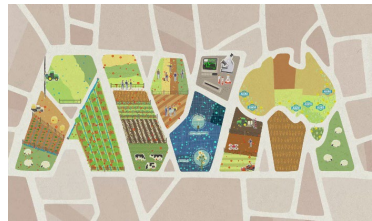
Resistance on or near roadsides

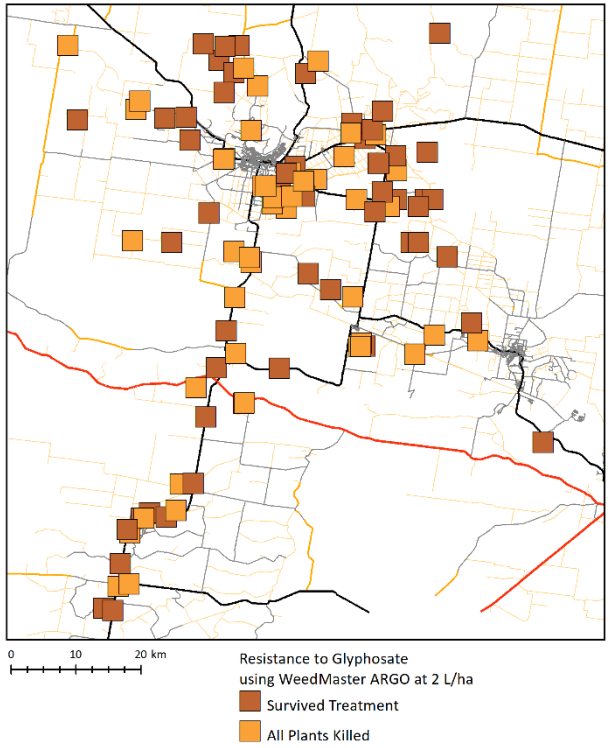
Proportion of populations glyphosate resistant (%) on roadsides and away from roadsides.

			Within 20m of road	Greater than 20m from road	All samples
Riverina	Fleabane	Glyphosate	40%	55%	53%
Riverina	Annual Ryegrass	Glyphosate	-	59%	65%
Darling Downs	Feathertop Rhodes	Glyphosate	53%	67%	60%



Resistance status and distribution - Riverina

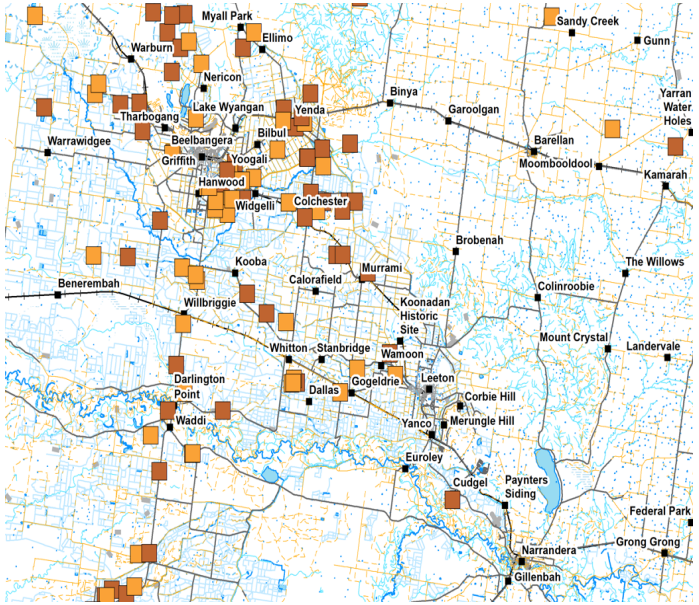
- **The majority of Fleabane was found to be glyphosate resistant**
- **But substantial susceptibility remains**
- **Fleabane has a short seed life so resistance status can shift year to year**



Resistance status and distribution - Riverina

- **A majority of Ryegrass is glyphosate resistant but substantial susceptibility remains**
- **No paraquat/diquat resistance was found**
- **Potential example of silverleaf nightshade resistance to glyphosate**

- **There were no statistically significant patterns to the distribution of glyphosate resistance in any of the weeds**



Resistance status and distribution - Riverina

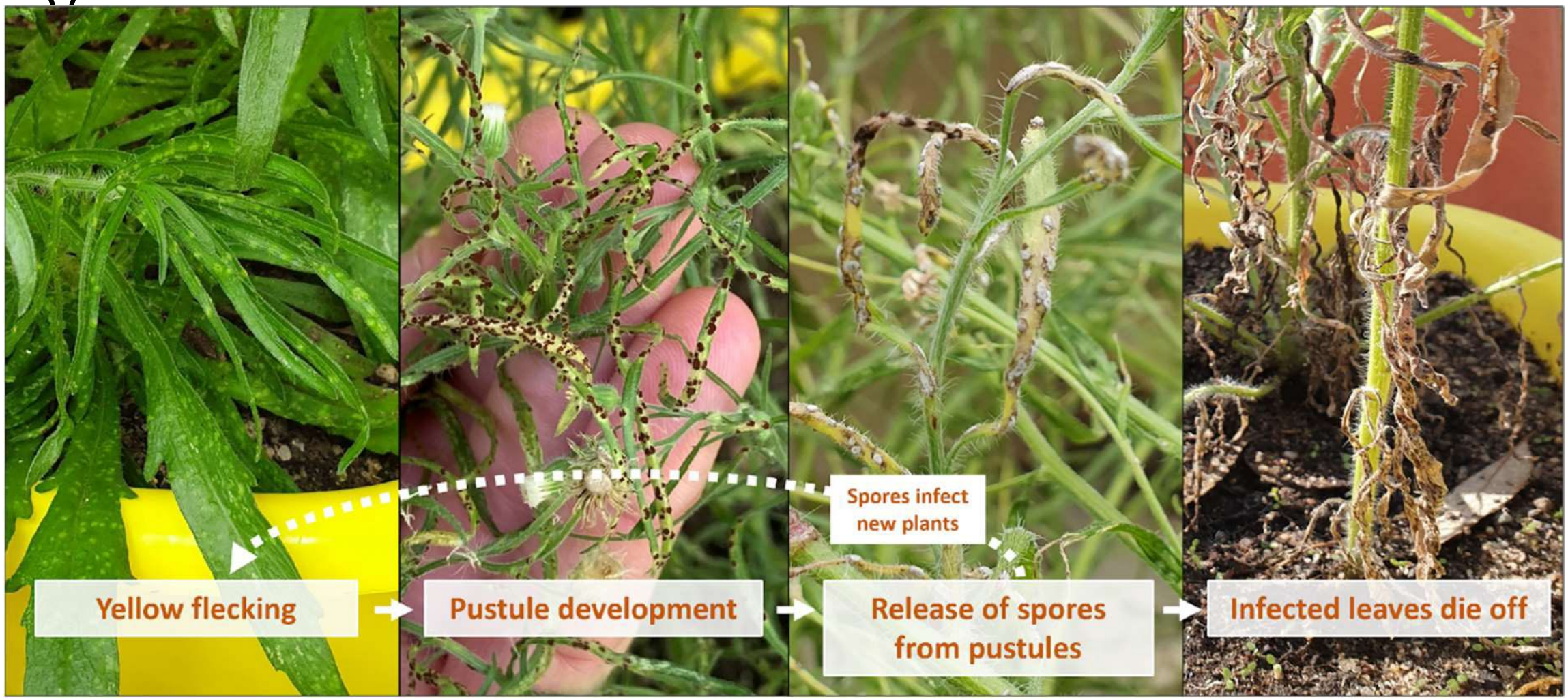
- **Similarly high levels of resistance in-paddock Vs off-paddock**
- **Multiple resistance evolution events and relatively random spread**

- **‘Neighbourly’ strategies rather than sub-regional strategies**

An example of an area-wide weed control tool

- **Biocontrol release for Flaxleaf Fleabane**
- **Rust** –completes development on fleabane only
- **No alternate hosts**

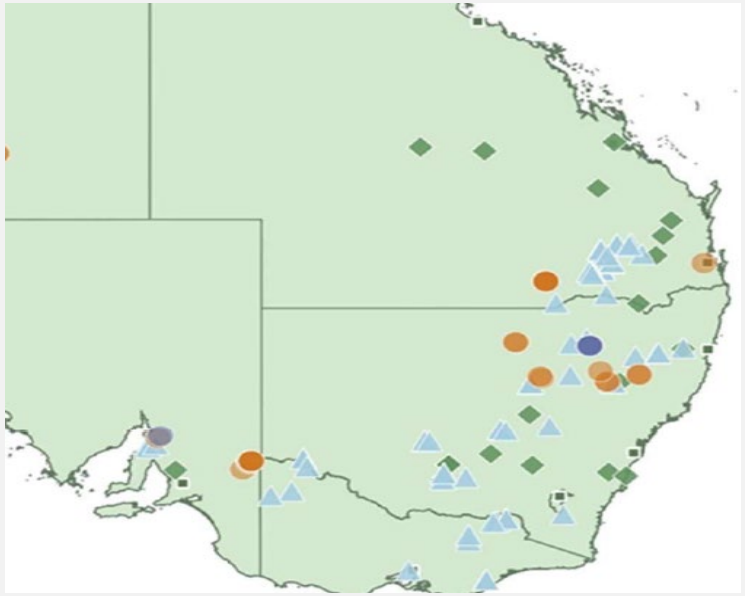
Rust fungus *Puccinia cnici-oleracei* (ex. *Conyza*)

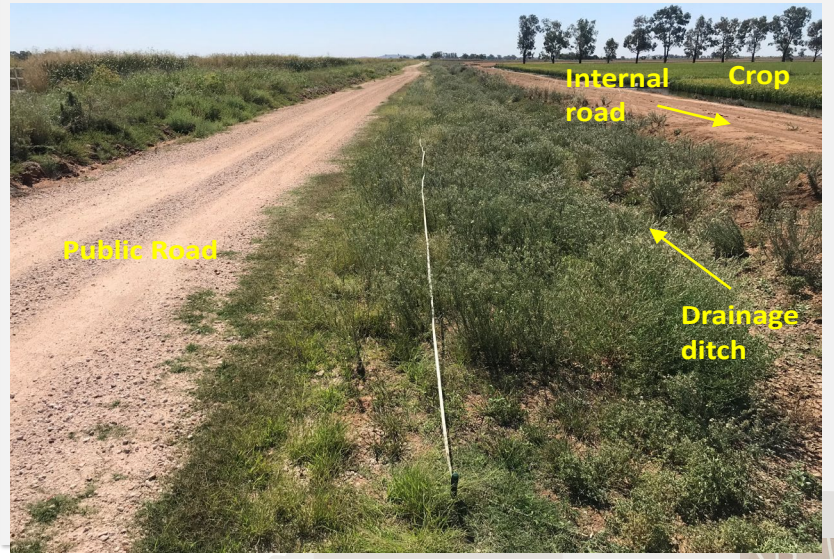


Depiction of disease progression for the fungus on *Conyza bonariensis* under ideal conditions (Ben Gooden)

An example of an area-wide weed control tool

- **The rust fungus is a safe addition to the flaxleaf fleabane control ‘toolbox’**
- **Identifying efficacy of the biocontrol agent in a field setting is in its infancy**
- **Several years likely to be required**

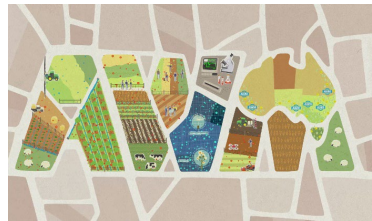




Level of concern (out of 5) for weeds spreading:

… 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

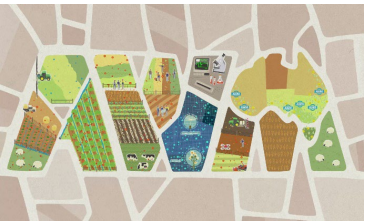
Grain grower survey 2022



Considering roadside management options

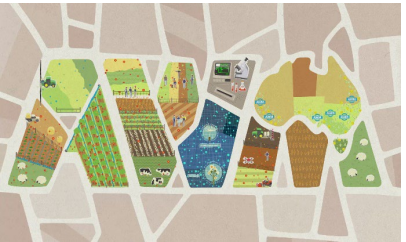
OR

OR



Finally

- **High recognition of important weed mobility issues**
- **High levels of important resistance but the horse hasn't bolted**
- **Finding the benefit:cost opportunities (time)**
- **The untapped potential of collaboration – Industry & RDE & Public**



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