



Evidence of weed spread across the MIA (AWM)

James Hereward, UQ





Area-wide Weed Management

Social science

Genetics

Herbicide resistance testing

Regional trials

Economics





More mobile weeds are generally better
candidates for AWM



Article

Opportunities to Manage Herbicide Resistance through Area-Wide Management: Lessons from Australian Cropping Regions

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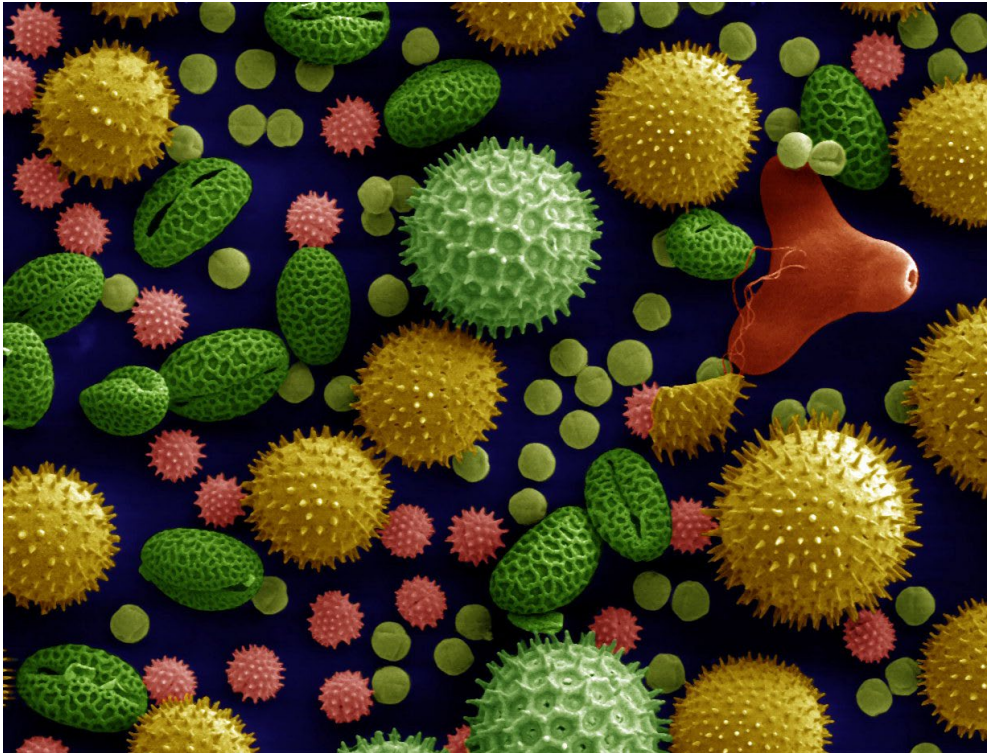
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Spread of resistance is a major concern and potential driver of AWM

Growers worried about resistance spreading to neighbours property



At what scale do weed individuals and
herbicide resistance genes move?



pollen



seeds



Feathertop Rhodes Grass



Chloris virgata

Fleabane



Conyza bonariensis

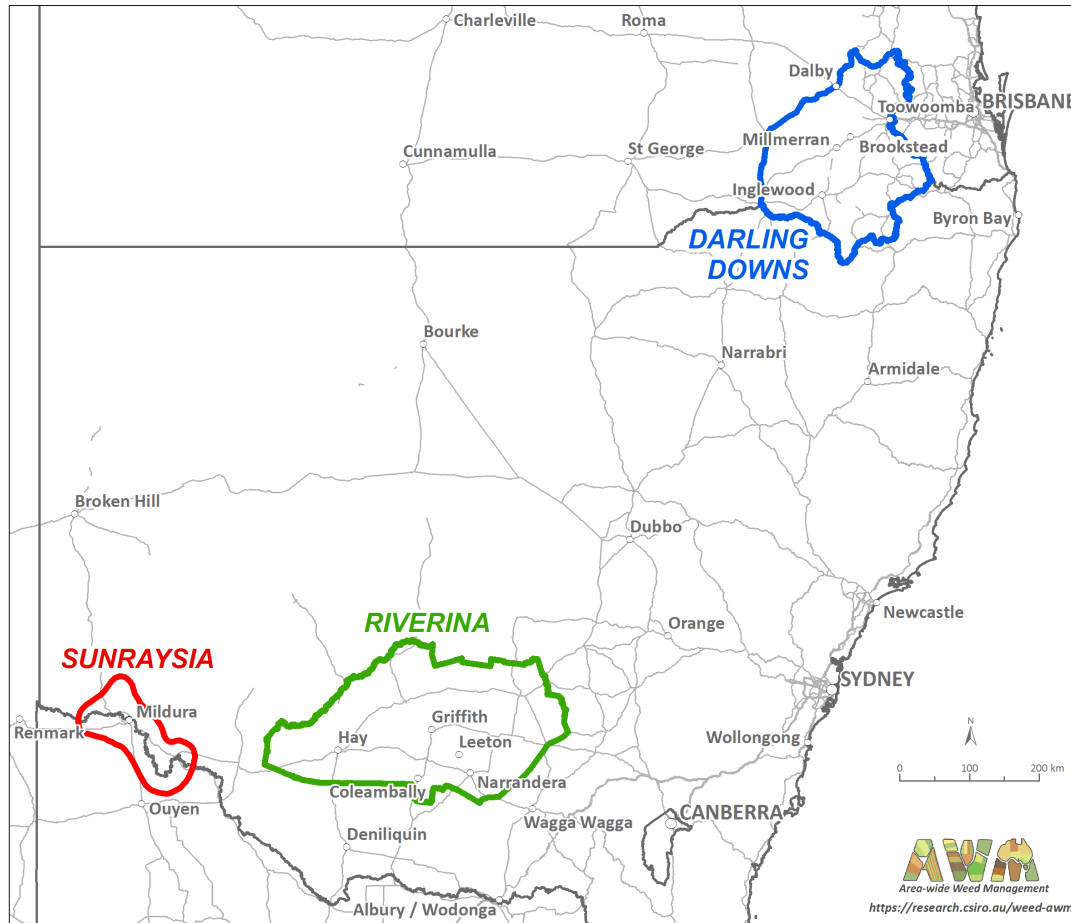
Annual Ryegrass



Lolium rigidum



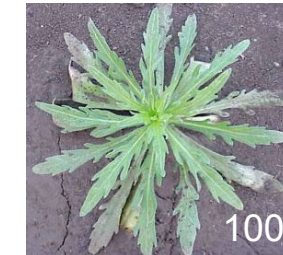
2020 sampling



Darling Downs



Sunraysia

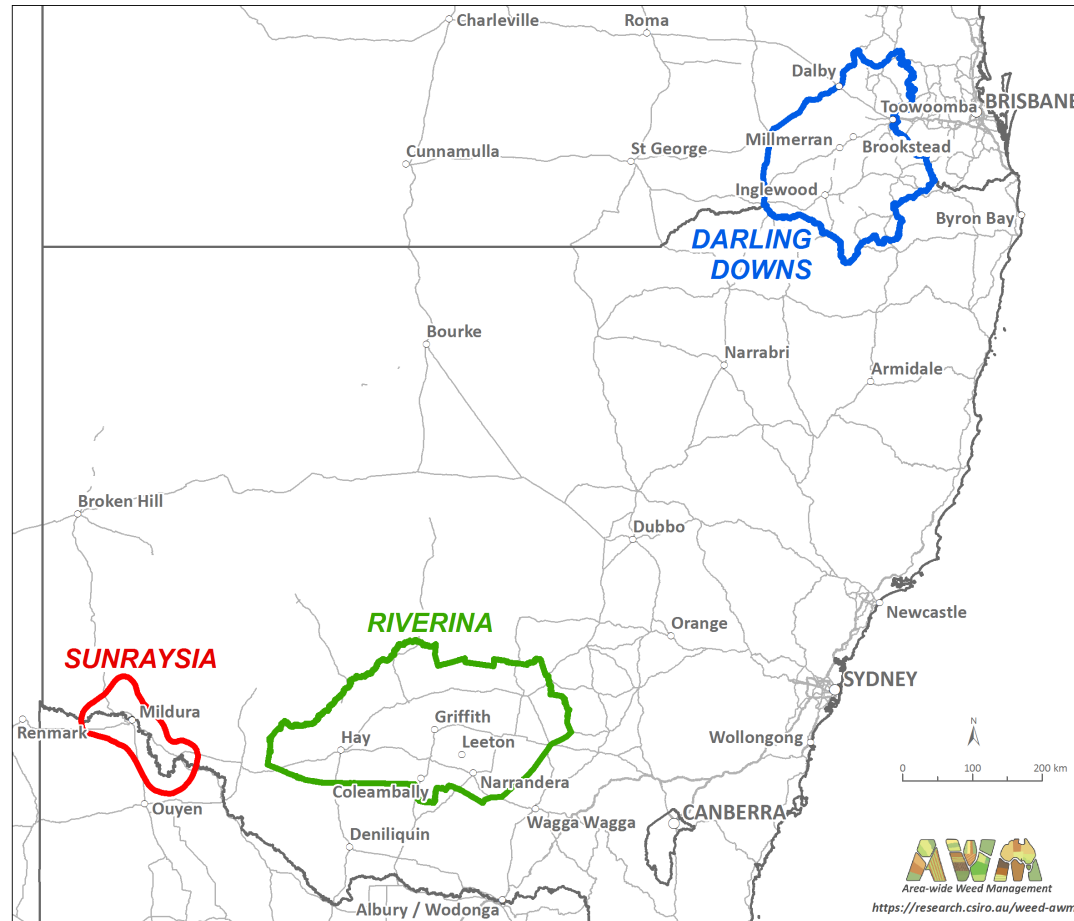


Riverina





2021 sampling



Darling Downs



Sunraysia



Riverina







THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

CREATE CHANGE





AWM 1

AWM 2

AWM 3

AWM 4

AWM 5

AWM 6

AWM 7

AWM 8

AWM 9

AWM 10

AWM 11

AWM 12

AWM 13

AWM 14

AWM 15

AWM 16

AWM 17

AWM 18

AWM 19

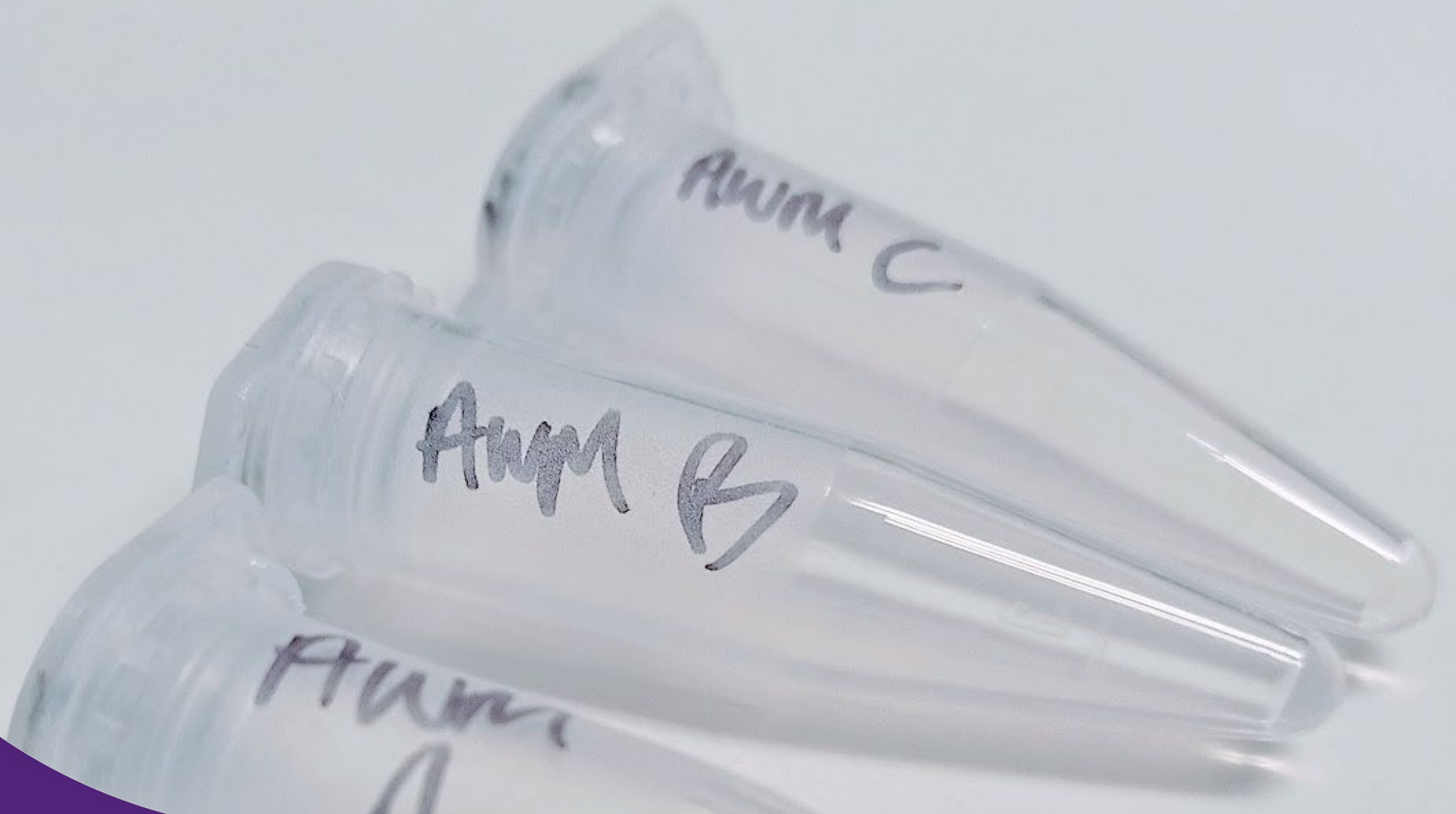
AWM 20

AWM 21

AWM 22

AWM 23

AWM 24





$$F_{ST} = 0.0059 \quad F_{IS} = 0.1314$$

outcrossing



$$F_{ST} = 0.0075 \quad F_{IS} = 0.0024$$

outcrossing



$$F_{ST} = 0.2670 \quad F_{IS} = 0.7289$$

selfing

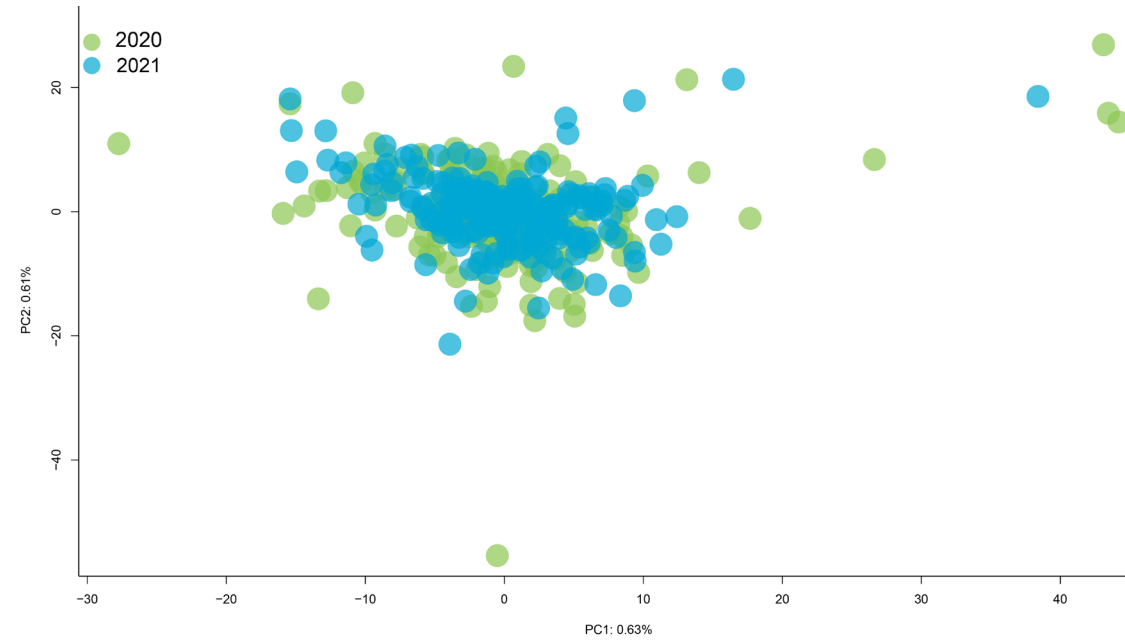


FTR and Ryegrass can move resistance genes by pollen as well as seed

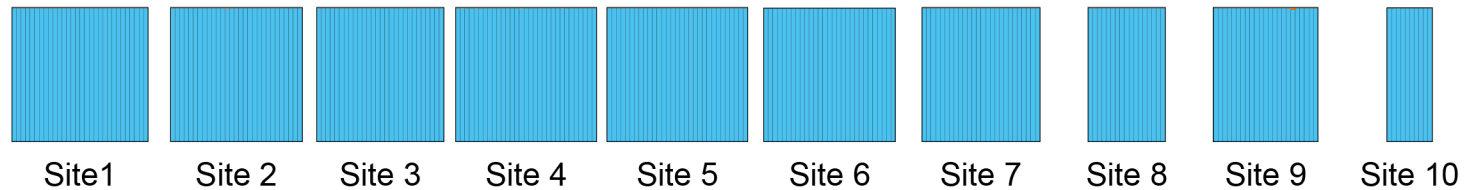
Outcrossing also enables weeds to stack resistance to different modes of action more effectively



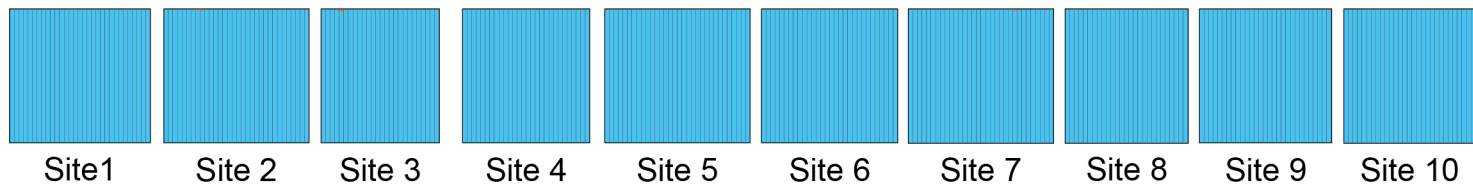
Ryegrass Riverina 2020 and 2021



2020 season

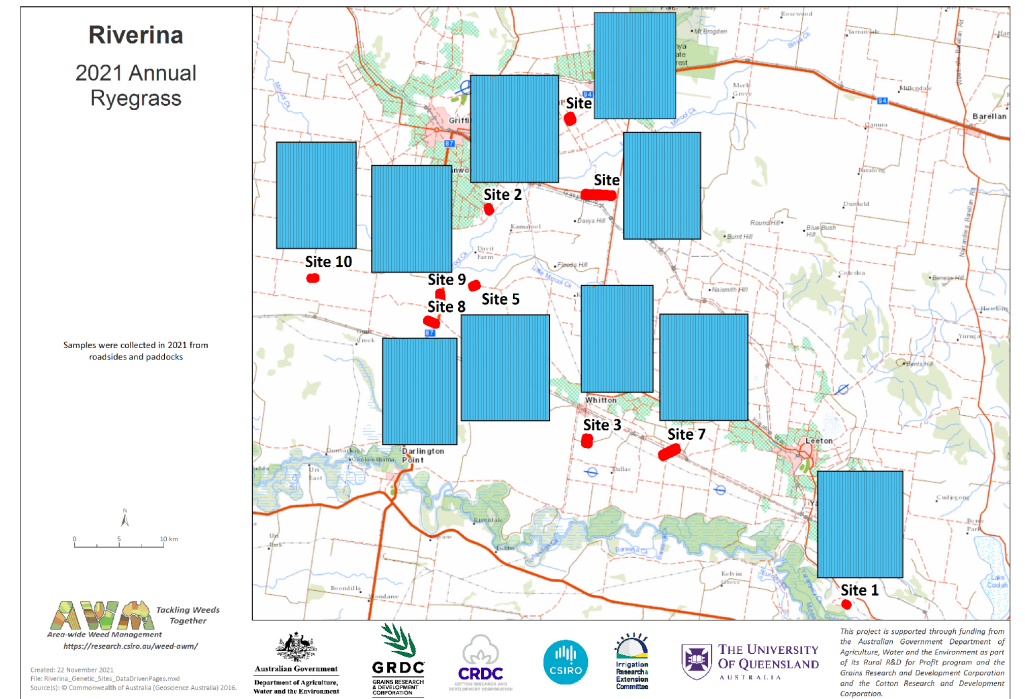
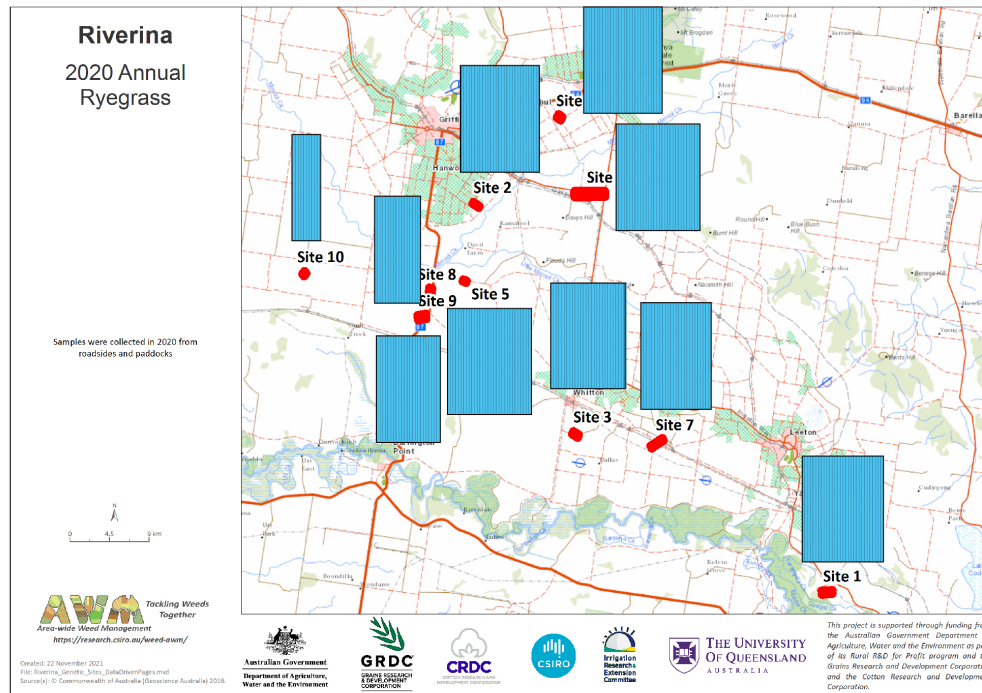


2021 season





Ryegrass Riverina 2020





Ryegrass
Riverina
2020

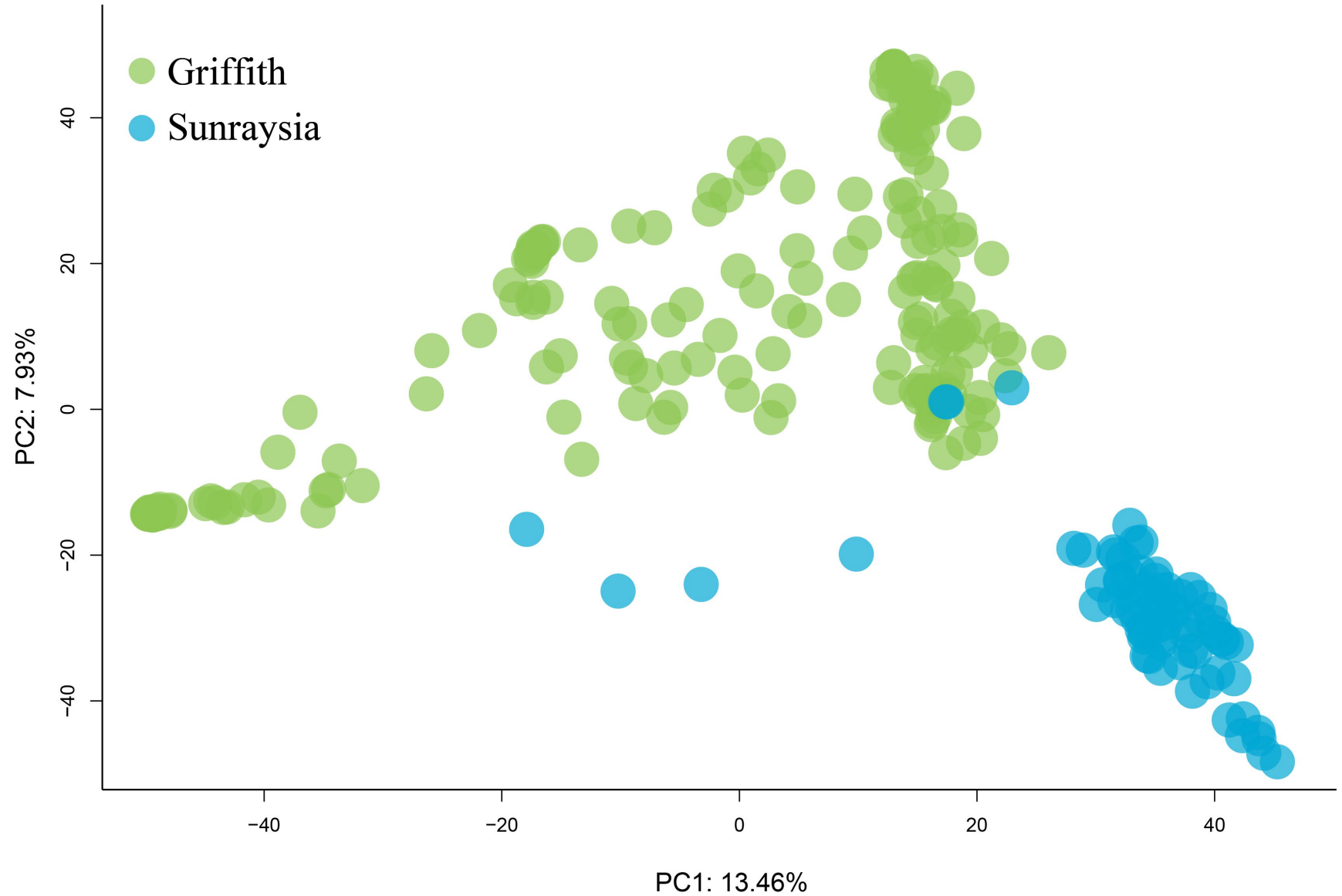
High gene flow across the Riverina region

Geneflow spreads resistance across region

~35% susceptible in 2020

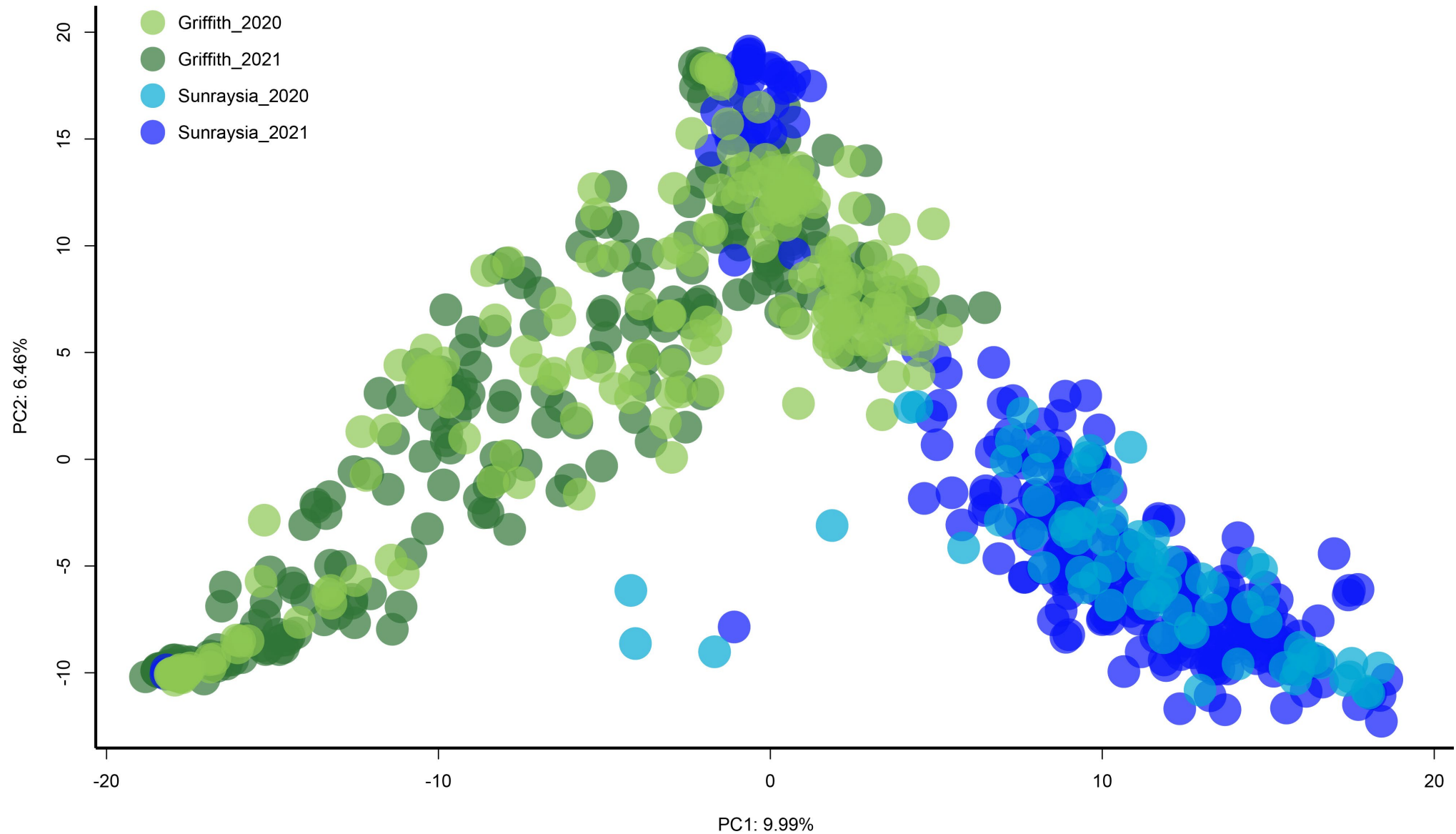


Fleabane
2020



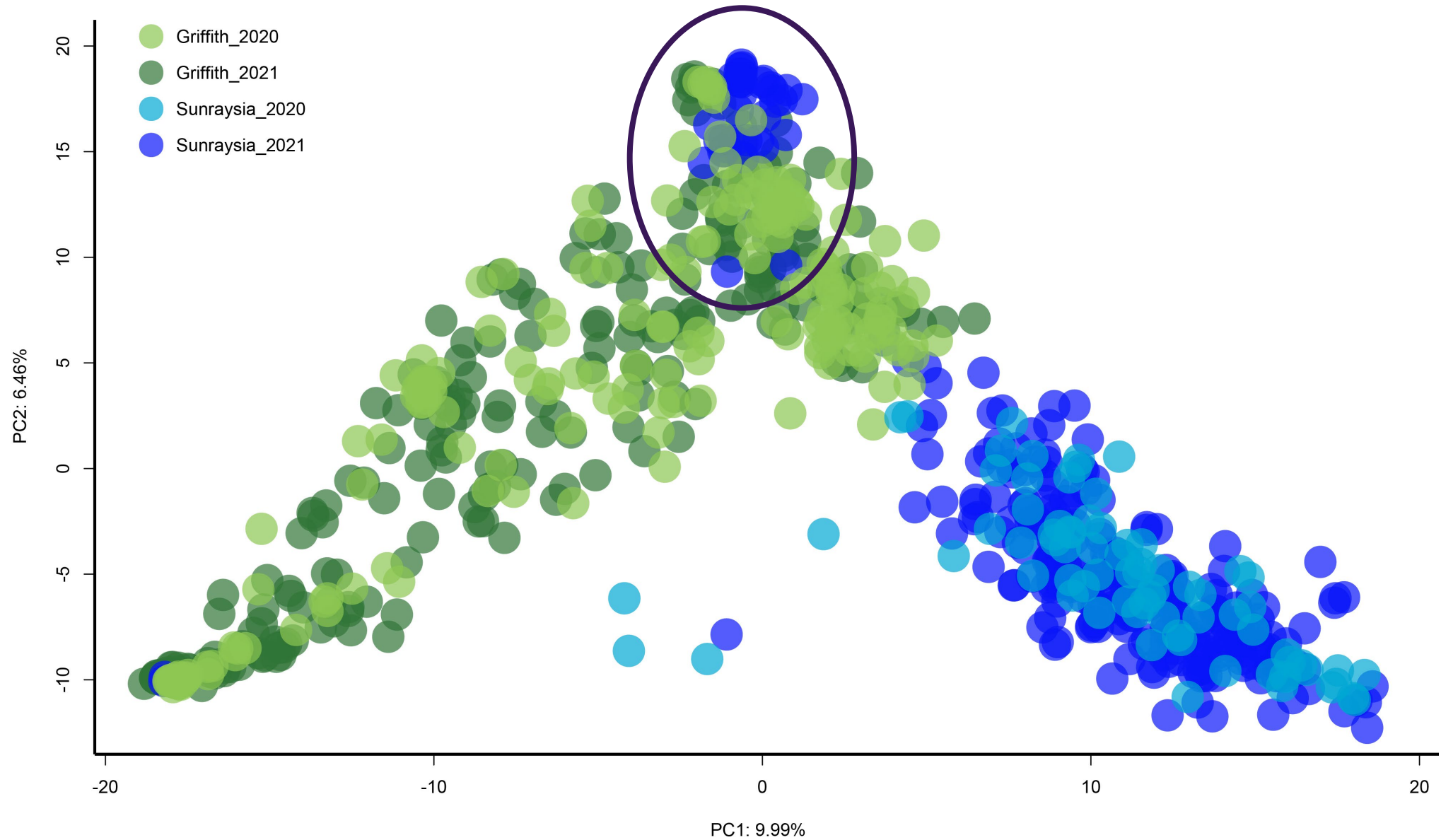


Fleabane
2020 and 2021





Fleabane
2020 and 2021

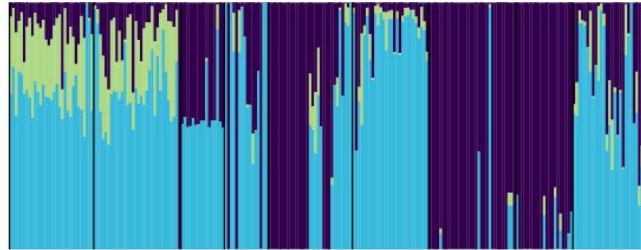




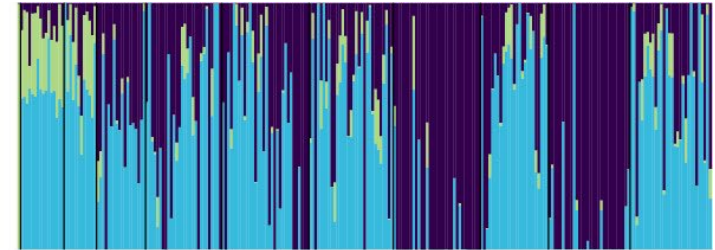
Fleabane
2020 and 2021

Riverina

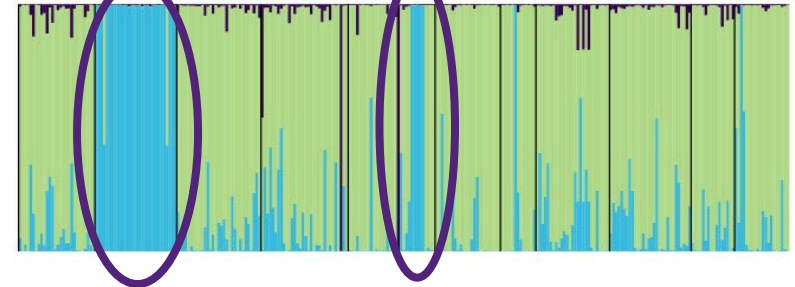
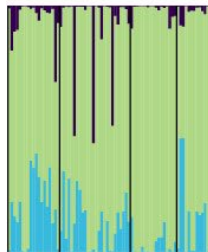
2020



2021



Sunraysia





Fleabane
2020 and 2021

Evidence of long distance dispersal of Fleabane
between regions



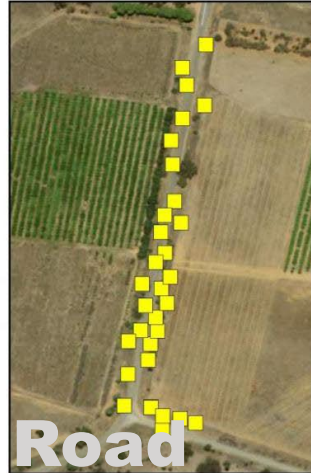
Fleabane
Griffith
2020

Riverina Fleabane Sites

■ Sample Location

INTERNAL USE ONLY
not for general distribution

Site 1



Road

Site 2



Road

Site 3



Farm

Site 4



Road

Site 5



Farm



Road

Site 6



Farm

Site 7



Farm

Site 8



Farm

Site 9

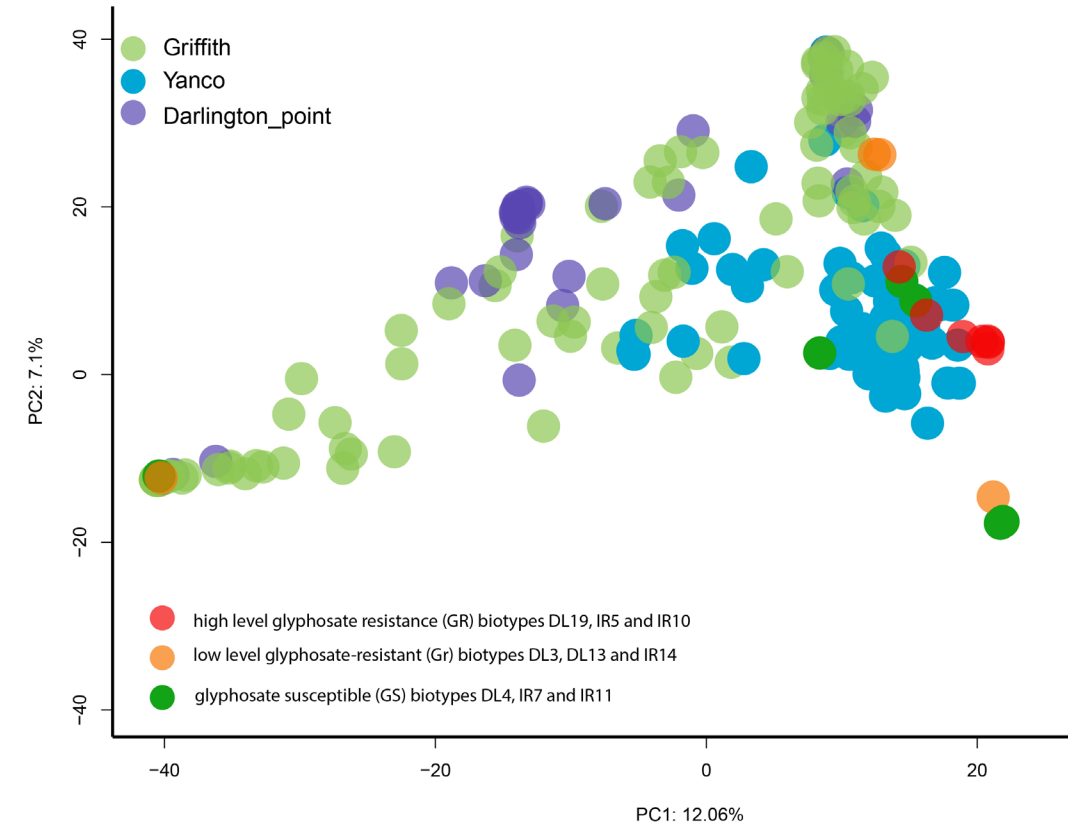
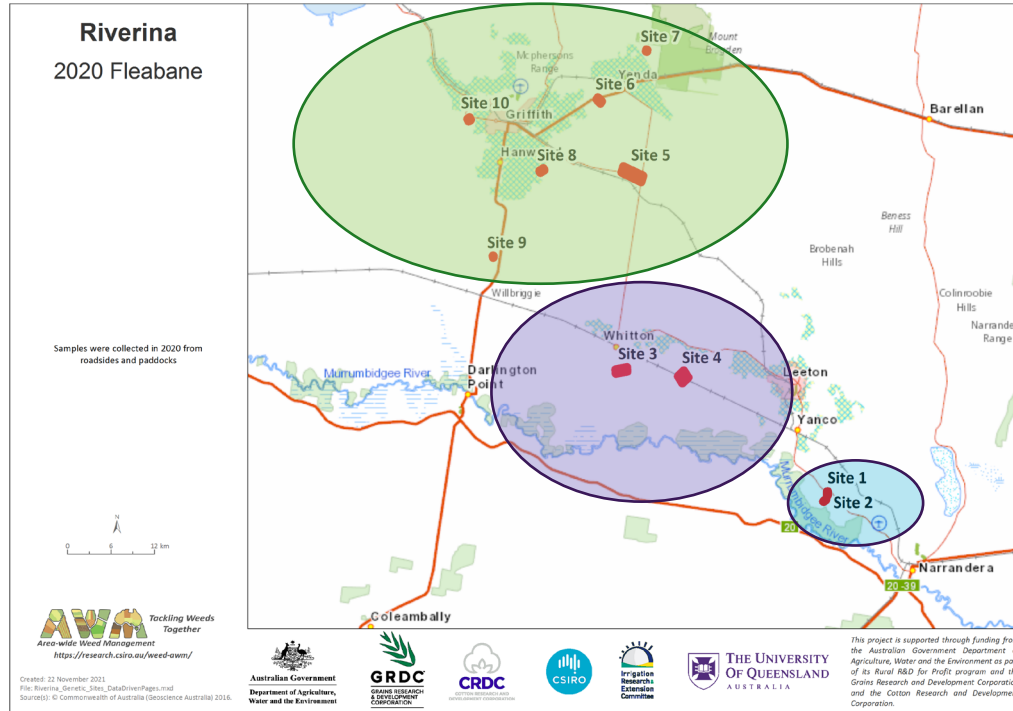


Farm

Site 10



Fleabane Griffith 2020

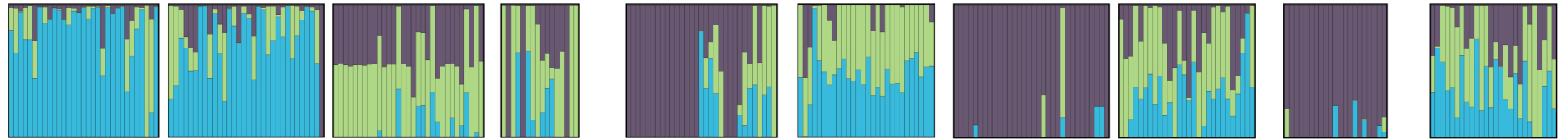




Fleabane
Griffith
2020 and 2021

2020

Riverina 2020



Site1

Site 2

Site 3

Site 4

Site 5

Site 6

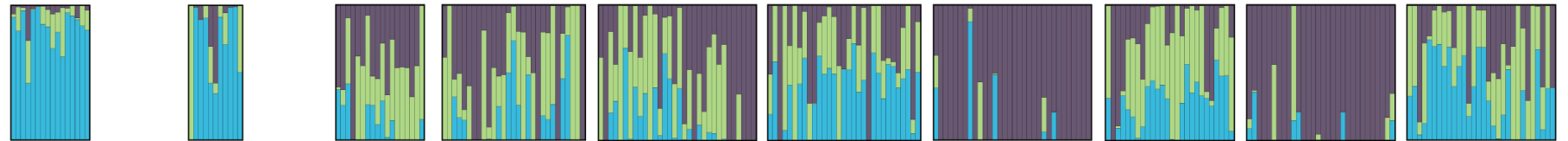
Site 7

Site 8

Site 9

Site 10

Riverina 2021



Site1

Site 2

Site 3

Site 4

Site 5

Site 6

Site 7

Site 8

Site 9

Site 10

Road

road

farm

road

farm

road

farm

farm

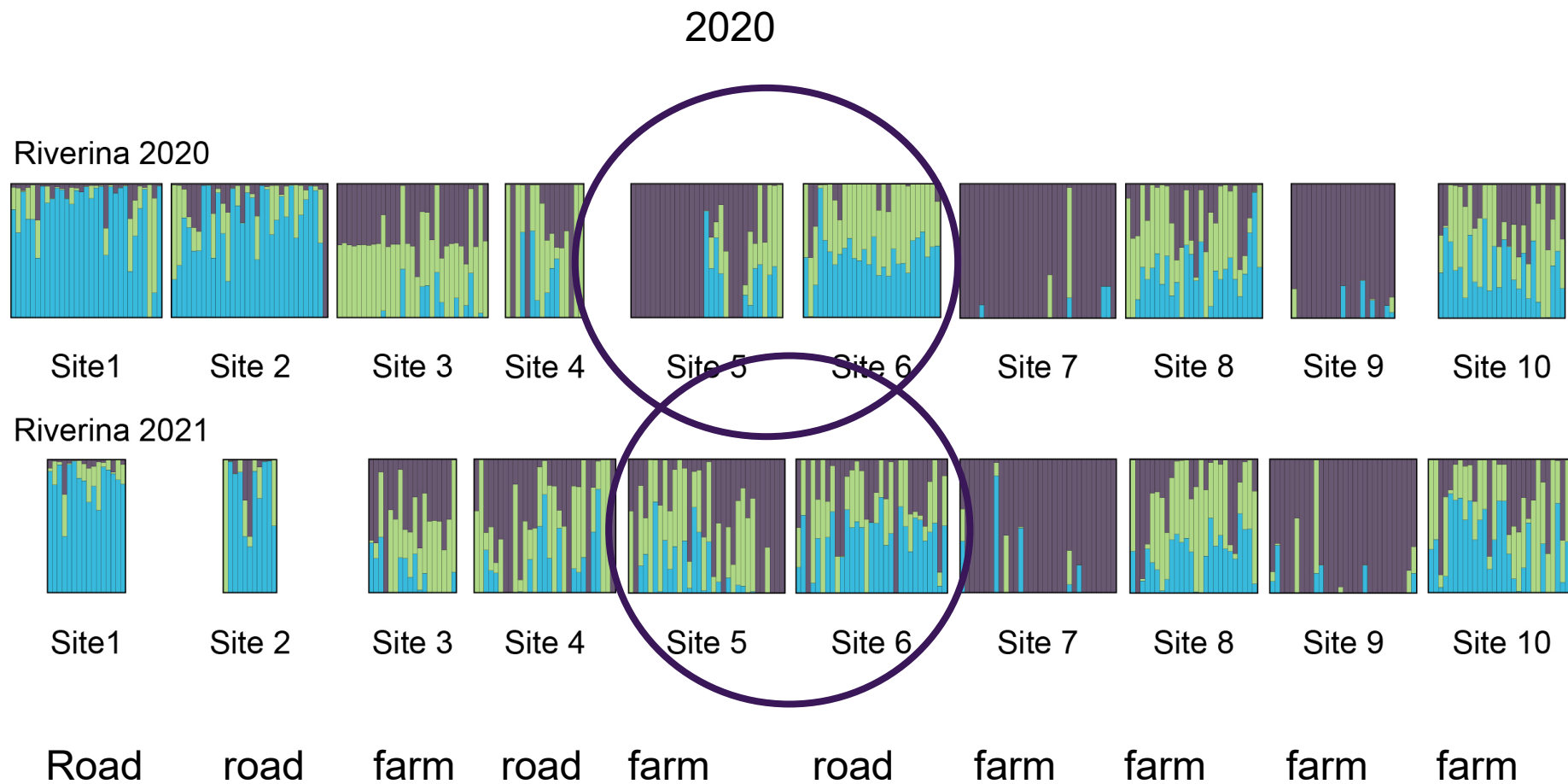
farm

farm

2021

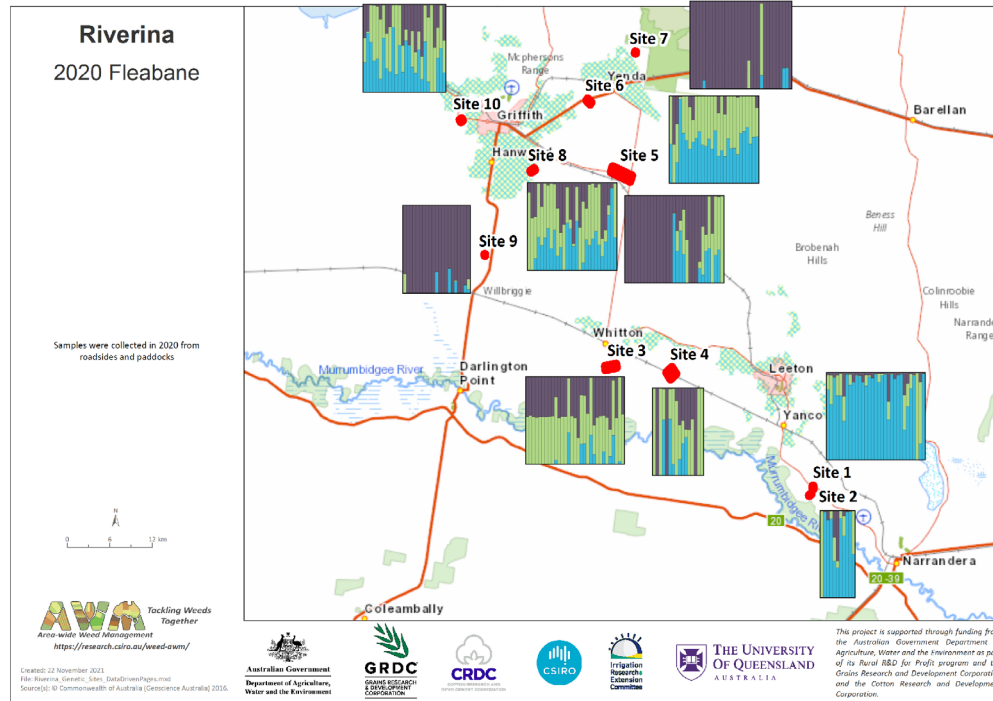


Fleabane
Griffith
2020 and 2021

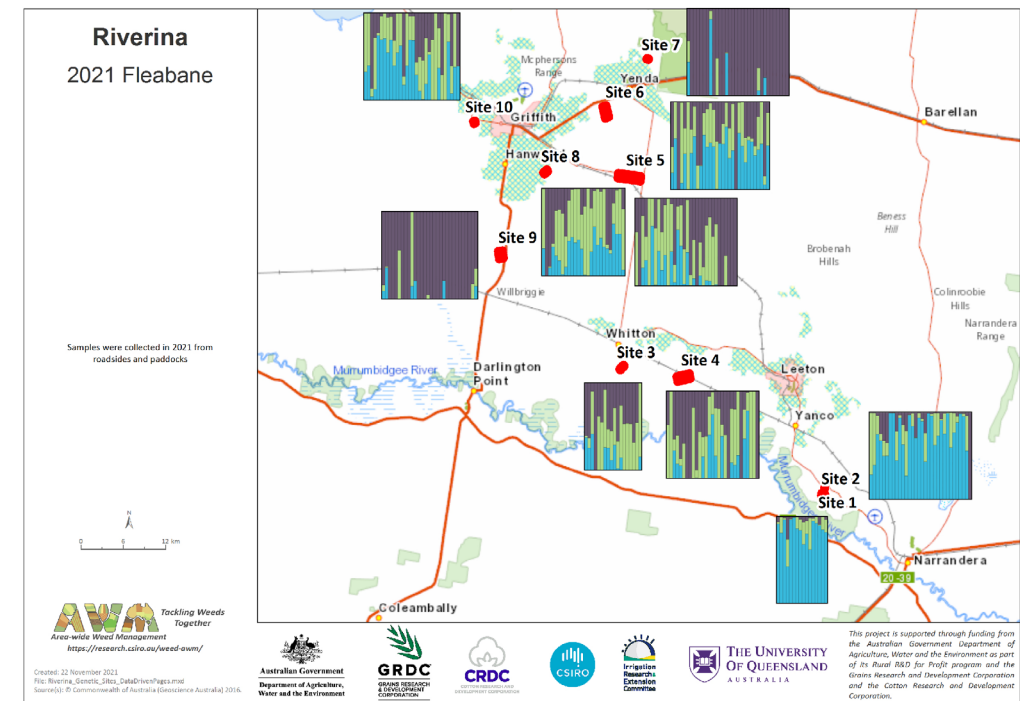




Fleabane Griffith 2020 and 2021



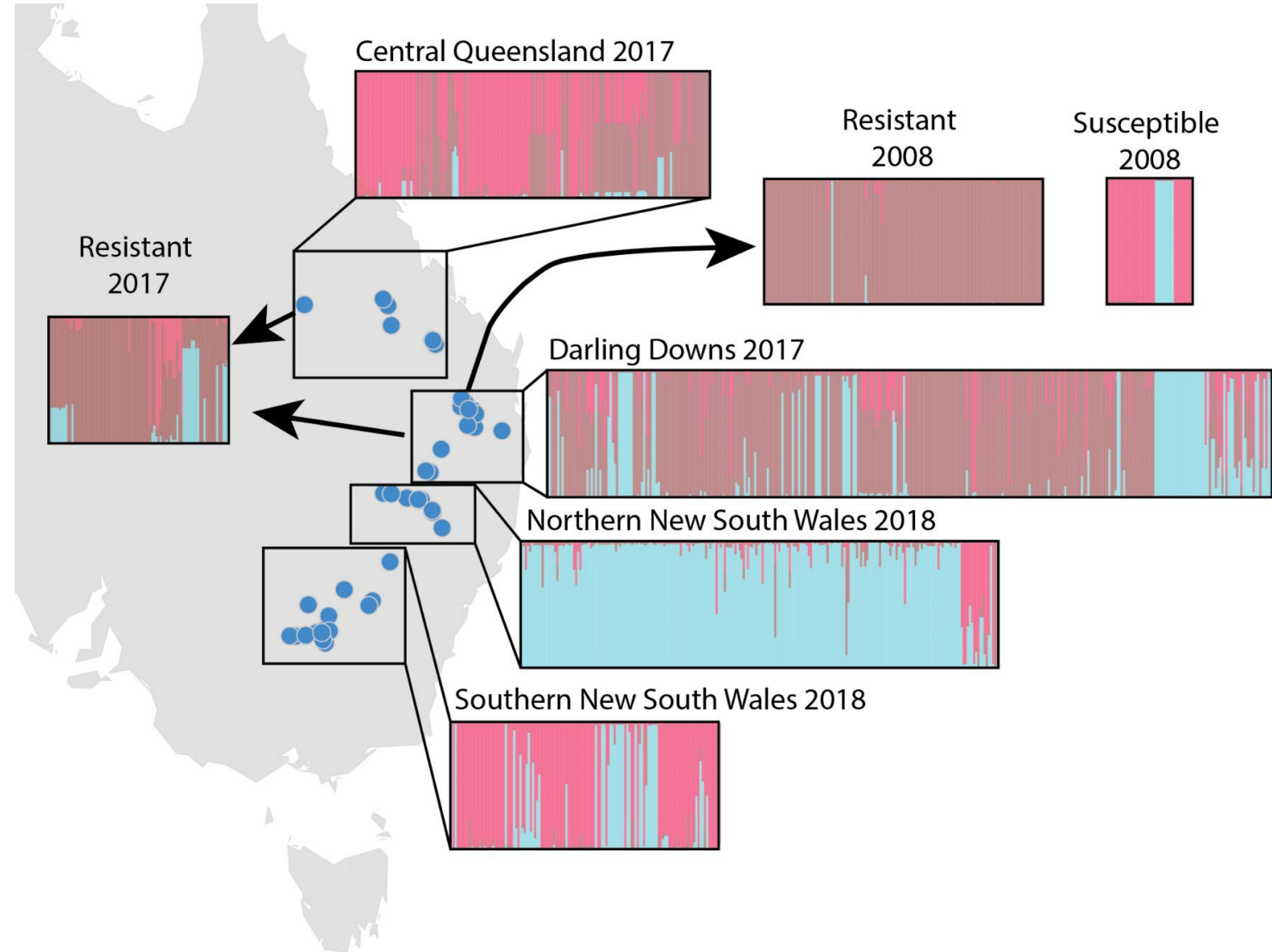
2020



2021



Fleabane
CRDC
Project
UQ1501





Fleabane
Griffith
2020 and 2021

More genetic structure within the region than expected

Population structure was similar in 2020 and 2021 – seed set from previous year

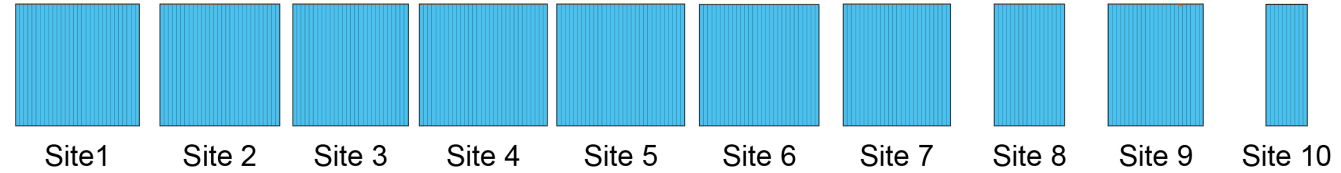
Mobile weed but less geneflow than Ryegrass at a regional scale – low pollen flow?



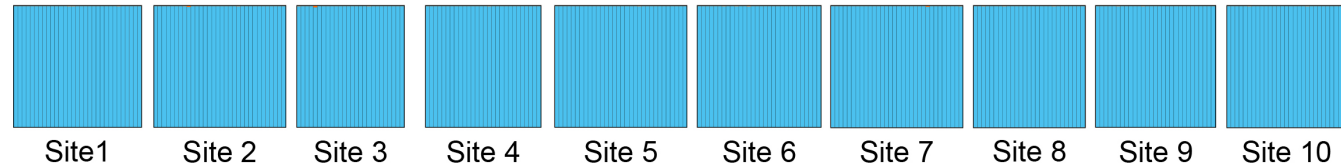
Ryegrass



2020 season



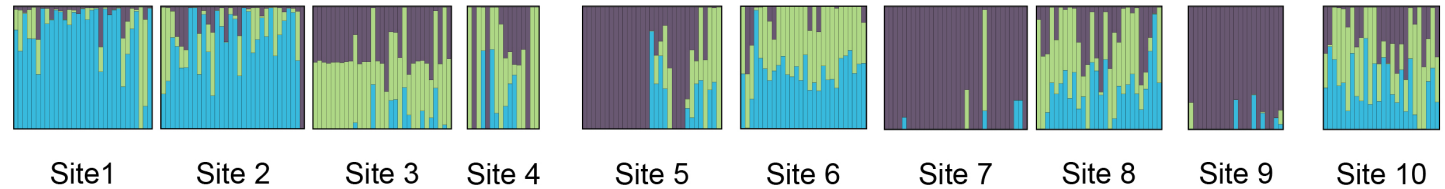
2021 season



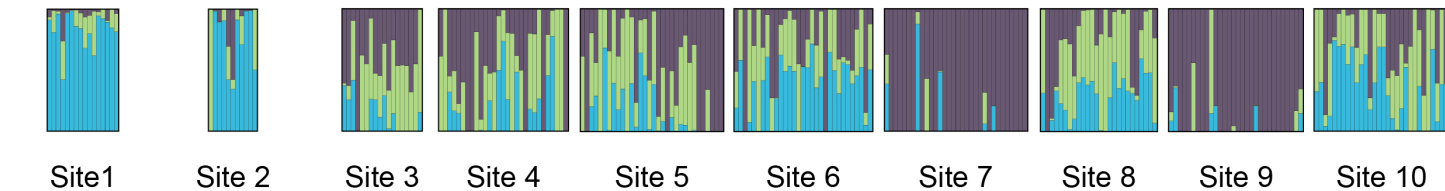
Fleabane



Riverina 2020



Riverina 2021





Coordinated control of highly mobile weeds likely to reduce spread of herbicide resistance and regional resistance levels



Thank You!

