Silverleaf nightshade management

Phil Bowden
Karen Herbert
Murrumbidgee Landcare

Do you have this weed?

WoNS

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A summer crop?

SLN at the Acropolis
in Greece……
an ornamental plant?

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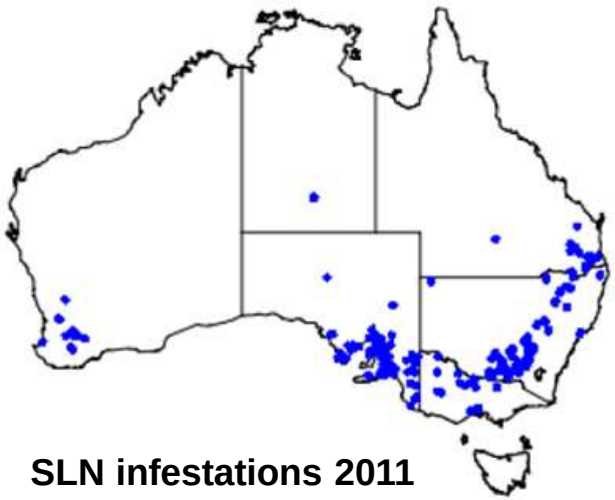
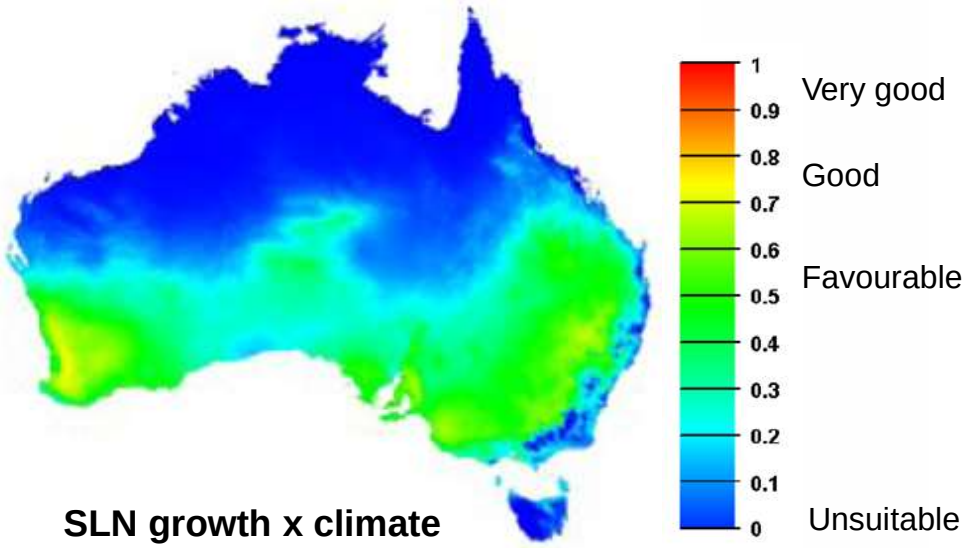
How much do we know about SLN?

- Summer active perennial in 300~560mm rainfall areas
- Introduced circa 1900’s, a problem since 1960’s
- Plants to 80cm tall with extensive root systems
- Spread by seed and root sections

SLN continues to spread



SLN infestations 2011



SLN growth x climate

Map data from: Wilson, P.D., Downey, P.O., Gallagher, R.V., O'Donnell, J., Leishman, M.R. and Hughes, L. (2011)

Impact

- Compete for soil water and nutrition
- Direct control costs & lost production
- Up to 100% yield loss of pasture and cereal crops
- Host of pests, virus and nematodes
- Potentially toxic to livestock
- Lower property value & marketability of produce
- Frustration…hard to control!!

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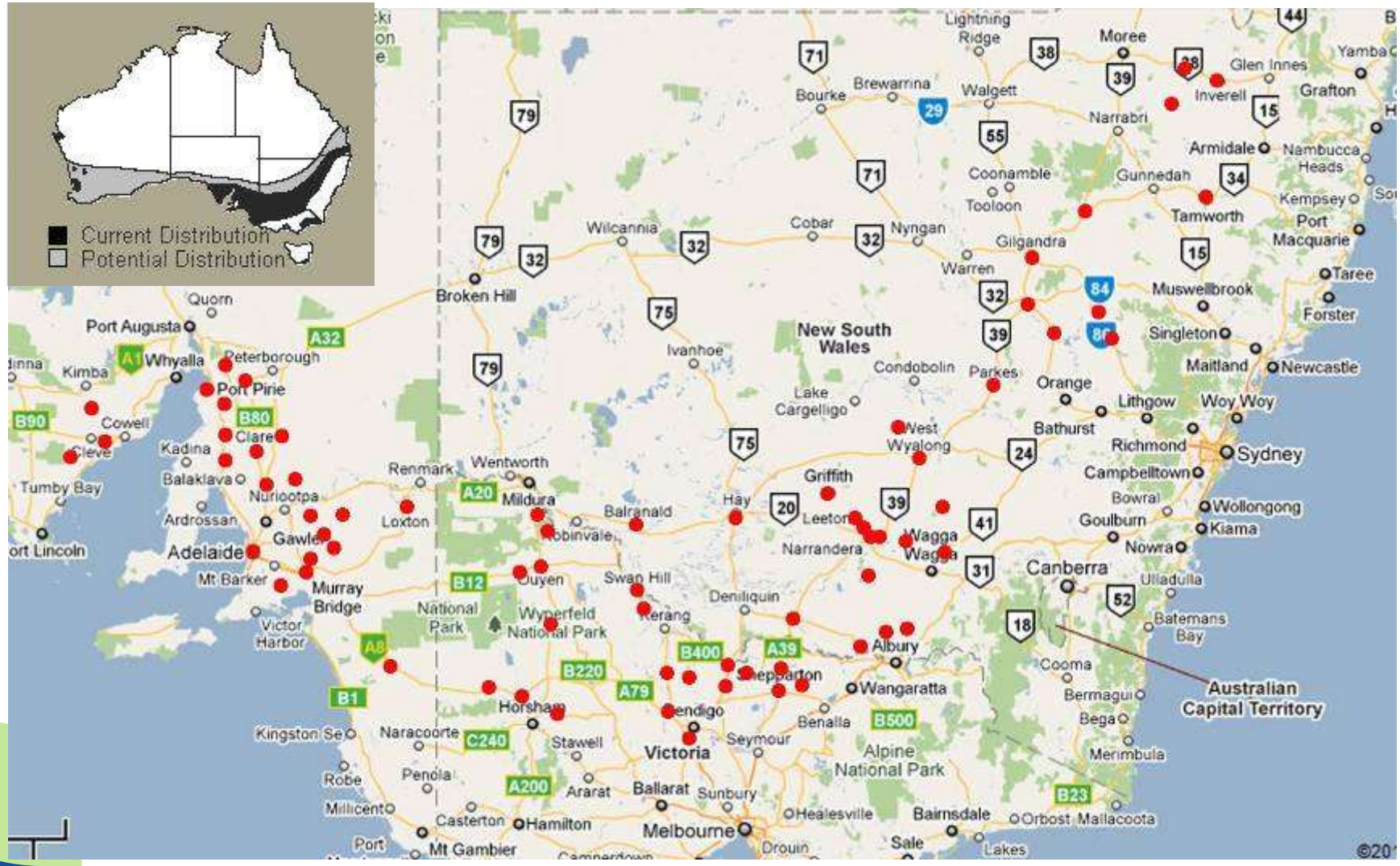
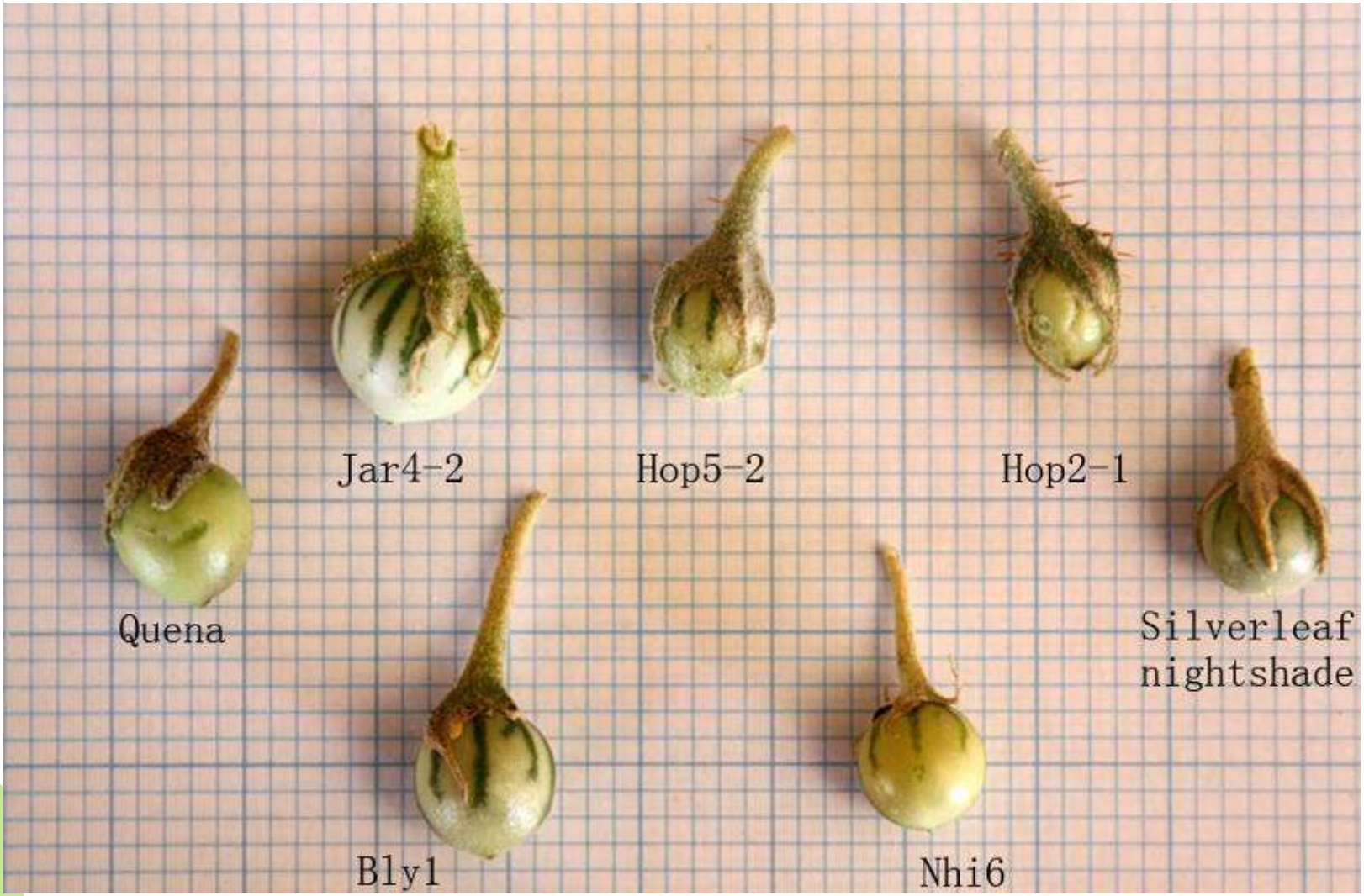
Sample collection across Australia

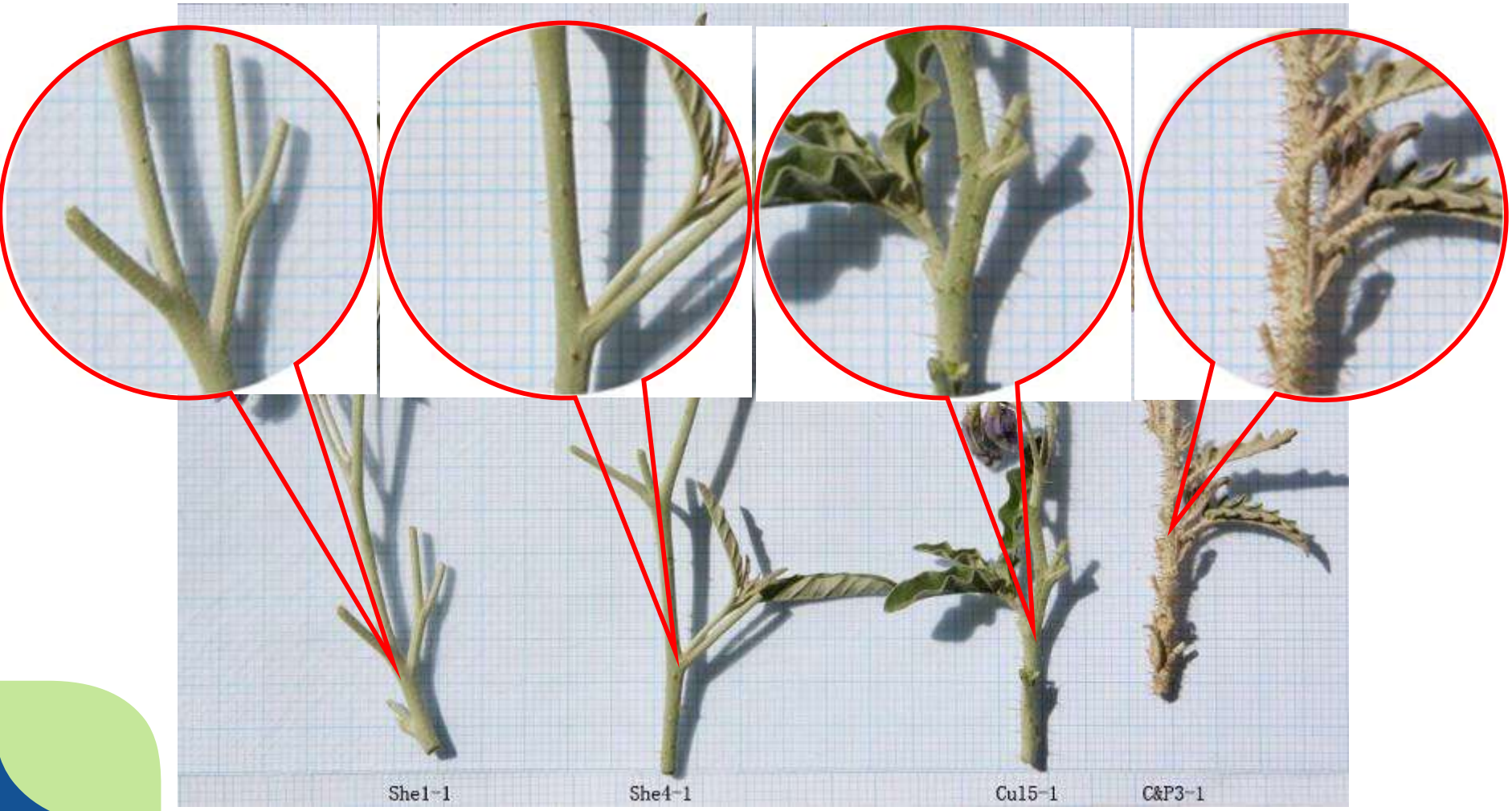


Petal number and colour

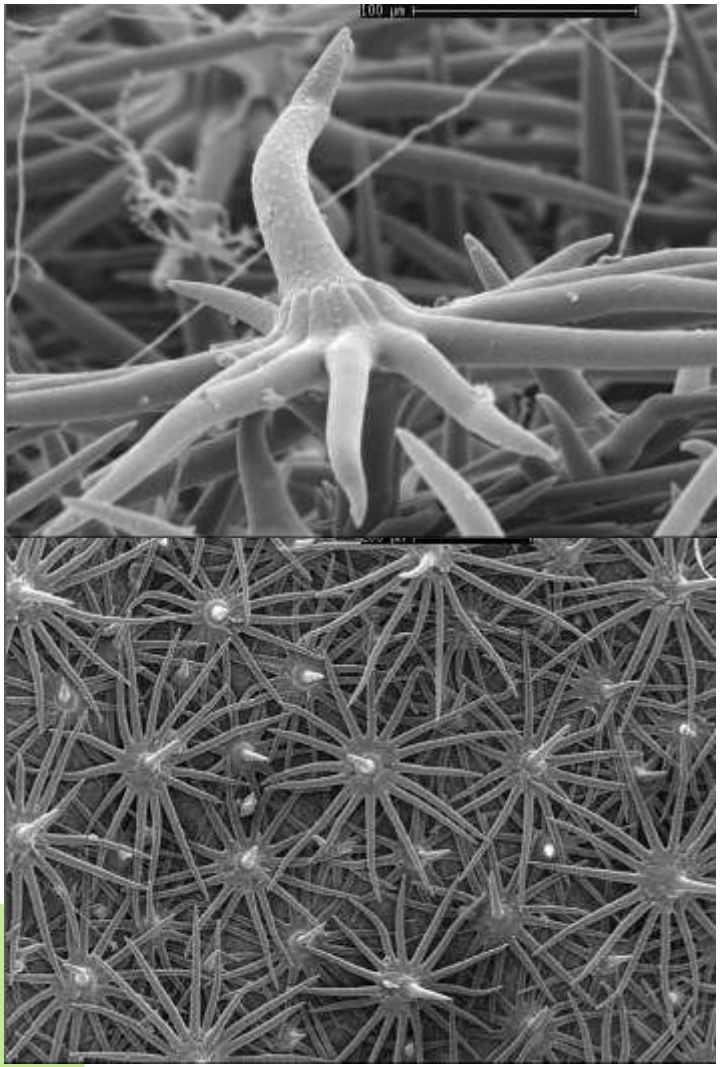
Fruits

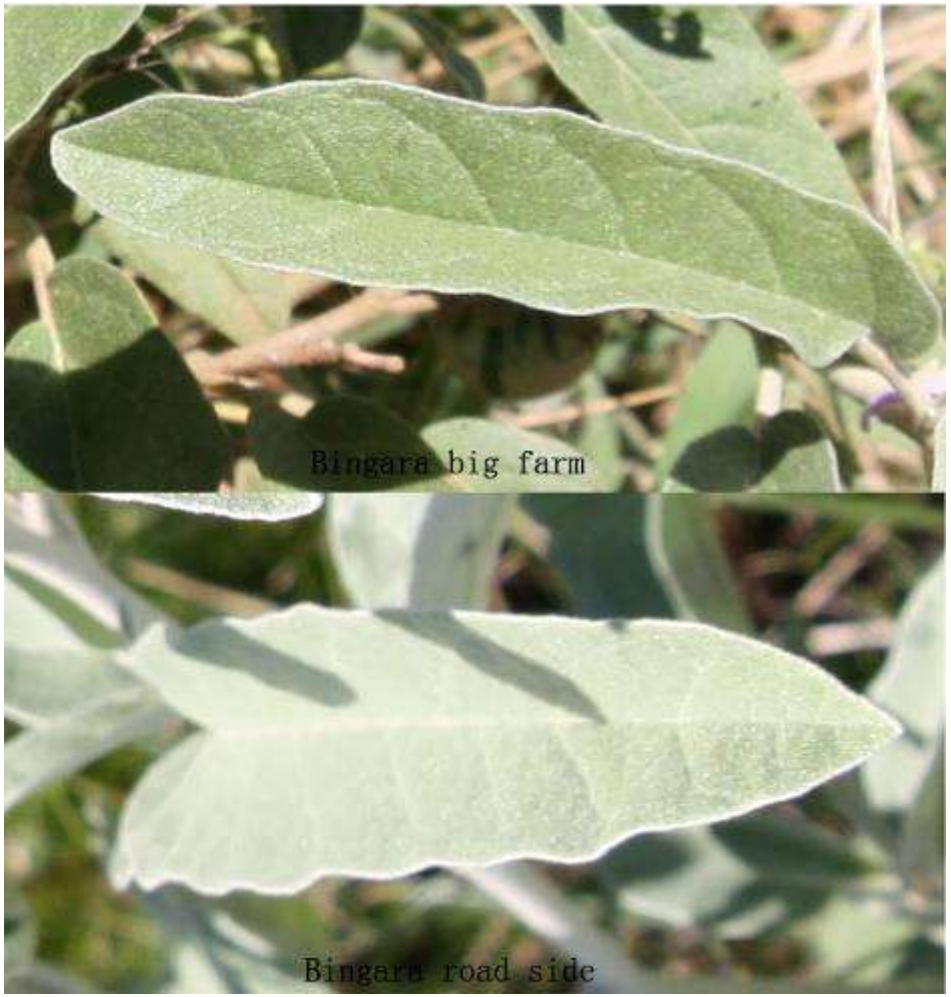


Spine on stem



Trichome density

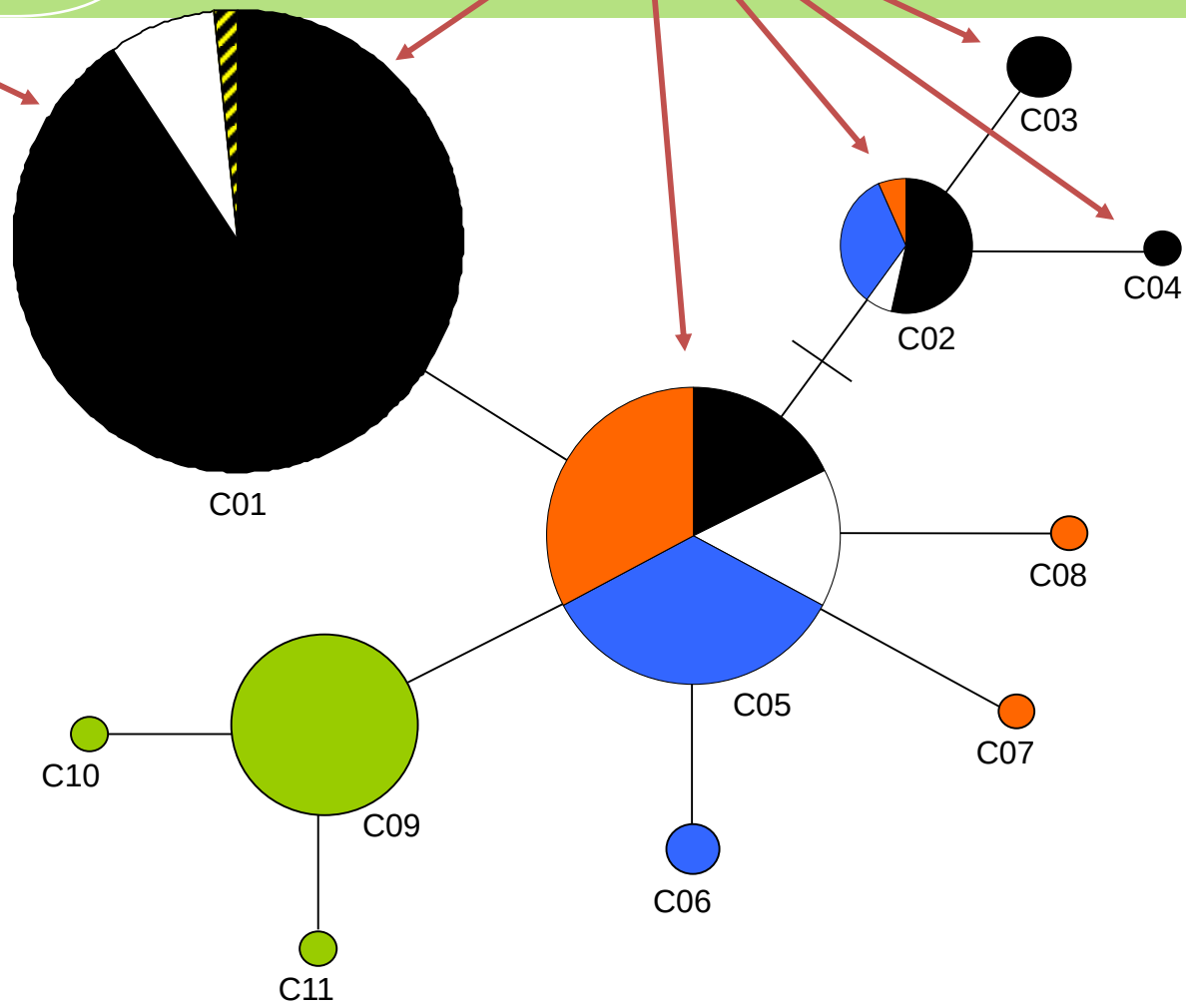




(Photo by Dr Geoff Burrows)

five haplotypes in Australia

76 % Australian sample



Australia
South Africa
USA
Mexico
Argentina
Paraguay

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DNA barcoding results

- Australian SLN contains a diverse assemblage
- a frequent South African and South American component
- a lesser North American component
- response to potential biocontrols likely to be varied according to genotypic source

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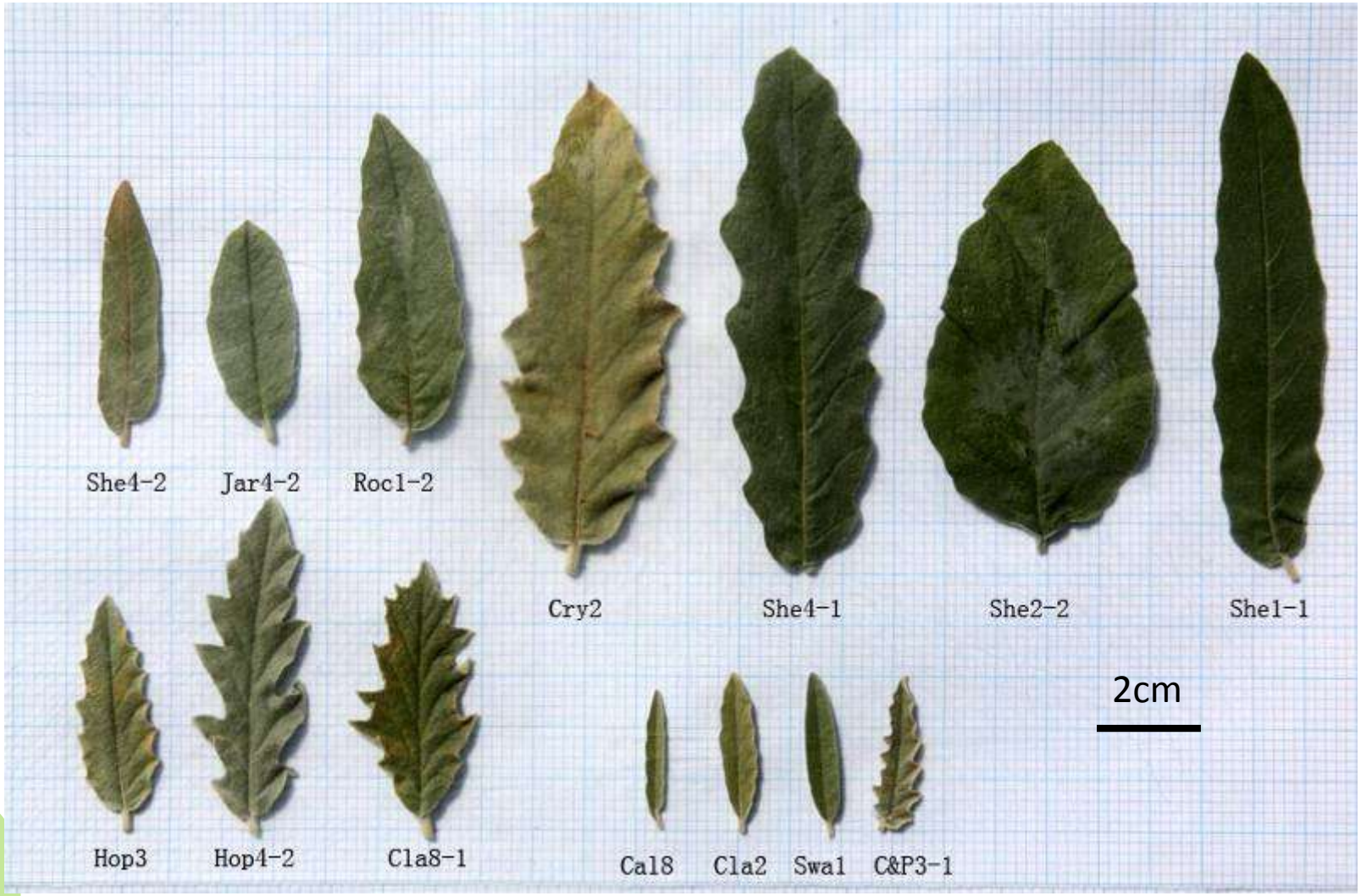
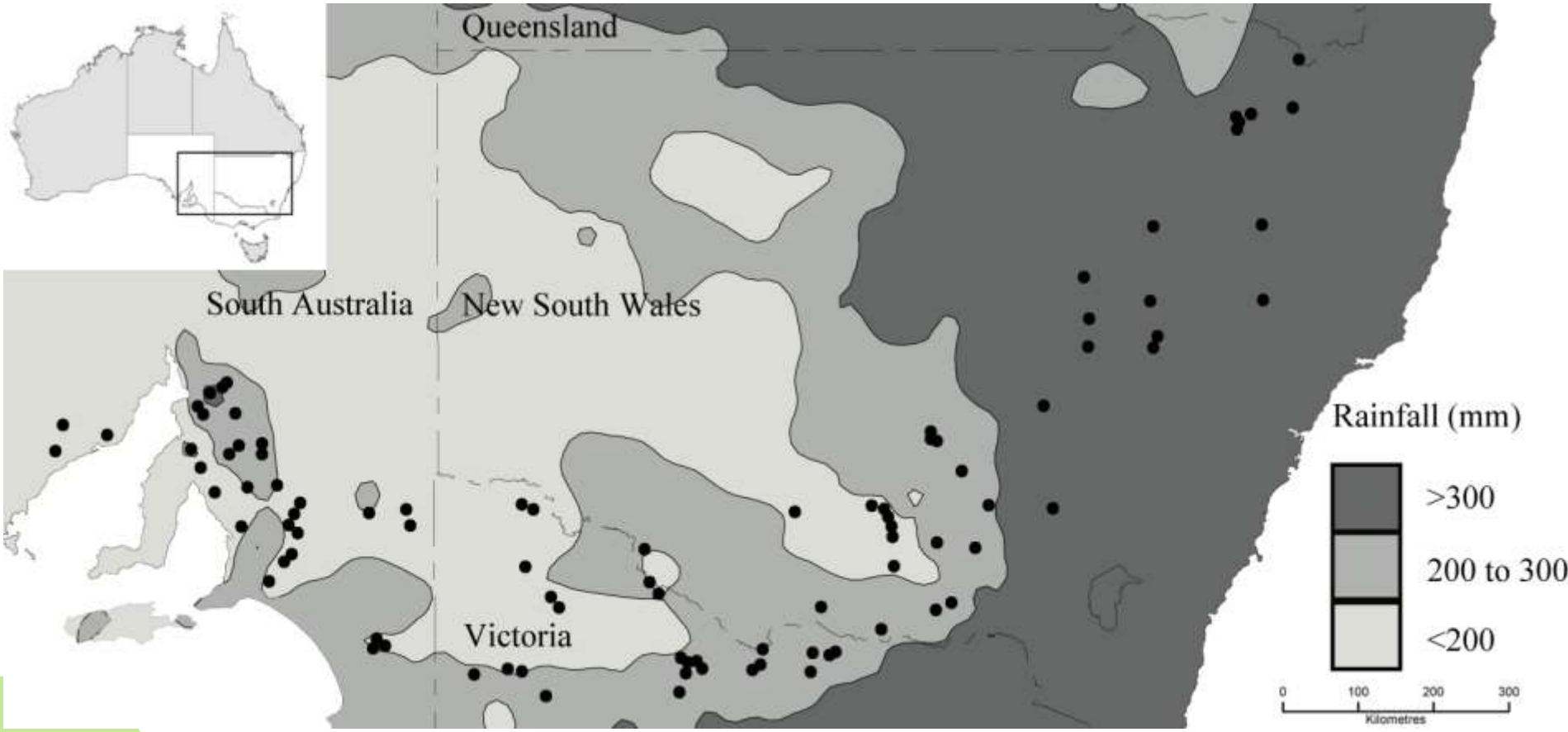
Leaf size and shape



Botanical variation Vs Summer Rainfall (2009-10)

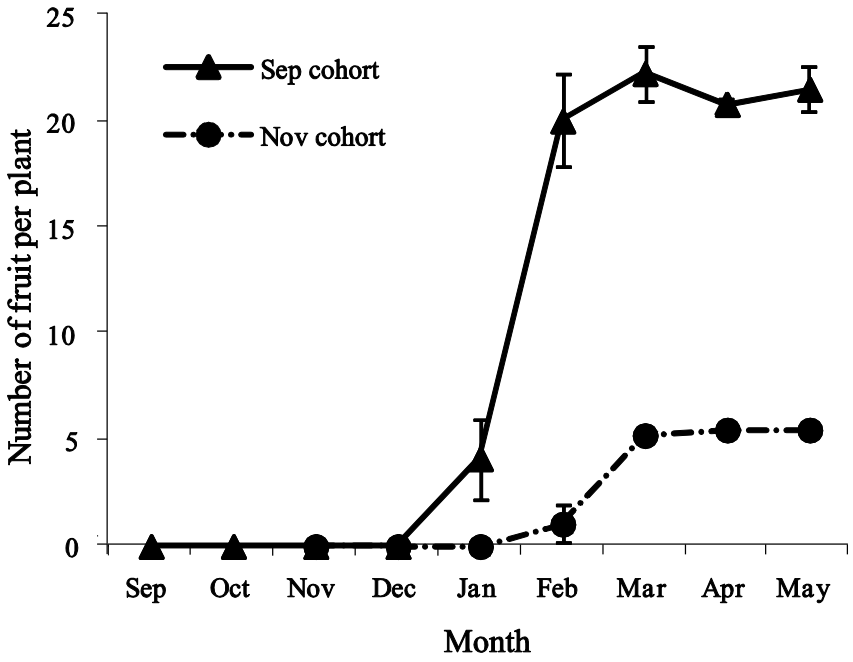


Rainfall and Morphology

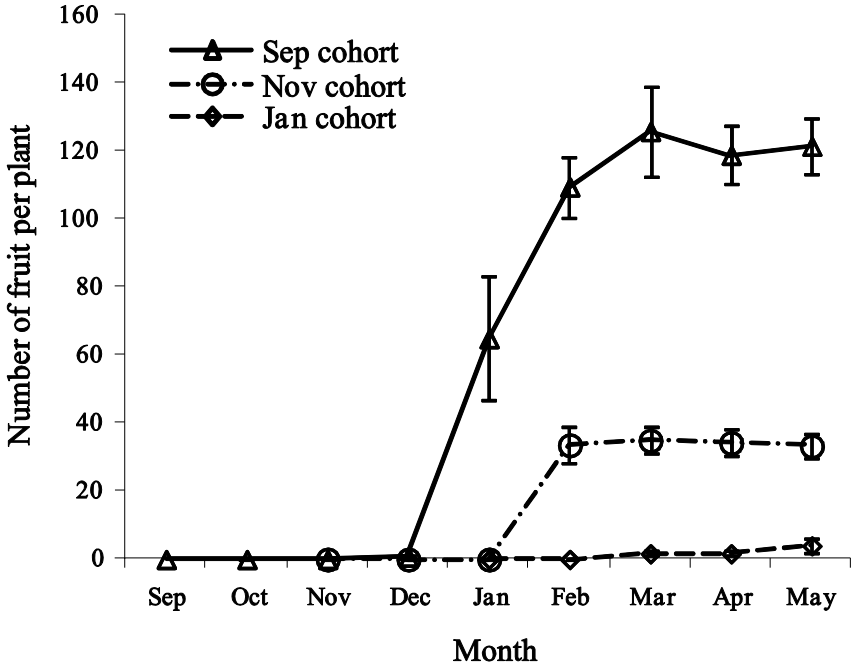
Traits	Rainfall September 2009 – February 2010 (mm)					
	< 200		200 - 300		> 300	
	Mean	SE	Mean	SE	Mean	SE
Leaf length (cm)	4.55[a]	0.098	4.68[a]	0.092	5.81[b]	0.120
Leaf width (cm)	1.34[a]	0.032	1.38[a]	0.035	1.58[b]	0.043
Leaf area (cm^2)	4.71[a]	0.247	5.05[a]	0.229	6.88[b]	0.321
Plant height (cm)	29.3[a]	0.734	34.2[b]	0.708	39.0[c]	0.871

Fruit production of different cohorts

Seedlings



Stems



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Seed production

	SLN
Berries per stem	59.4 (± 13.4)
Berry diameter (mm)	10.0 (± 0.5)
Berry weight (g)	0.4 (± 0.1)
Seeds per berry	**40.1** (± 8.1)
Average seeds per stem	2,381

Spread

- Cultivation
- Grazing animals
- Vehicles and machinery
- Infested fodder and seed
- Water, birds and other native animals
- Dry berries - spread over long distances

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Spread of SLN

Seeds in sheep dung – MAJOR!

Creeping roots: 2 m per year

Dragged fragments

Also consider:

Water (creeks/channels)
Mud on machinery/cars
Seed/hay
Blowing through fences

Government of South Australia
Biosecurity SA

Photos: Rex Stanton, John Heap, archaeobotany.dept.shef.ac.uk, griffith.edu.au


740

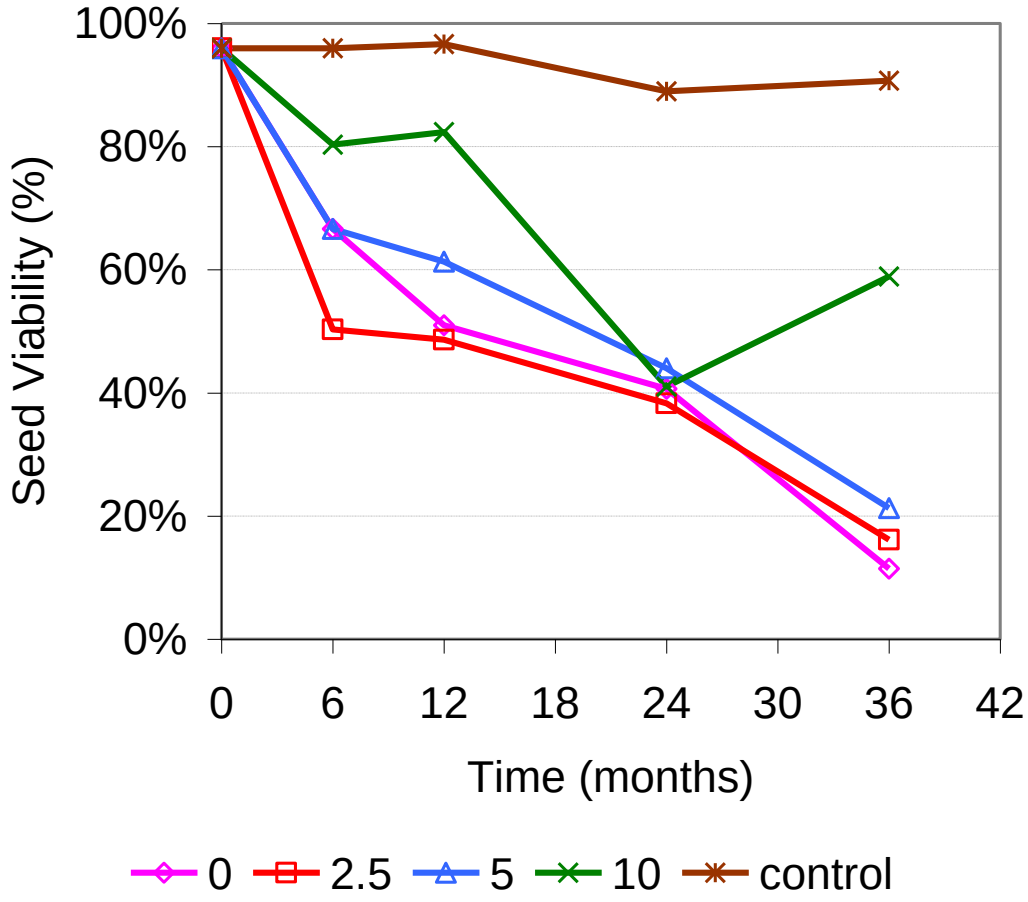
- Seedbank
- Rootbank

SLN Seedlings in the field

SLN seedlings

How long does seed survive?

Bare SLN seeds



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Emergence from stem cuttings

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Key findings in biology & ecology

- Bare seed survives for up to 4 years. Seedbank can persist longer if intact berry is present
- SLN prefers alternative daily temperature for seed germination (15/30 ° C)
- SLN requires good moisture availability for germination. Limited emergence opportunities in the field
- Root fragment optimum emergence from 5 cm. Emergence from fragments as short as 1 cm

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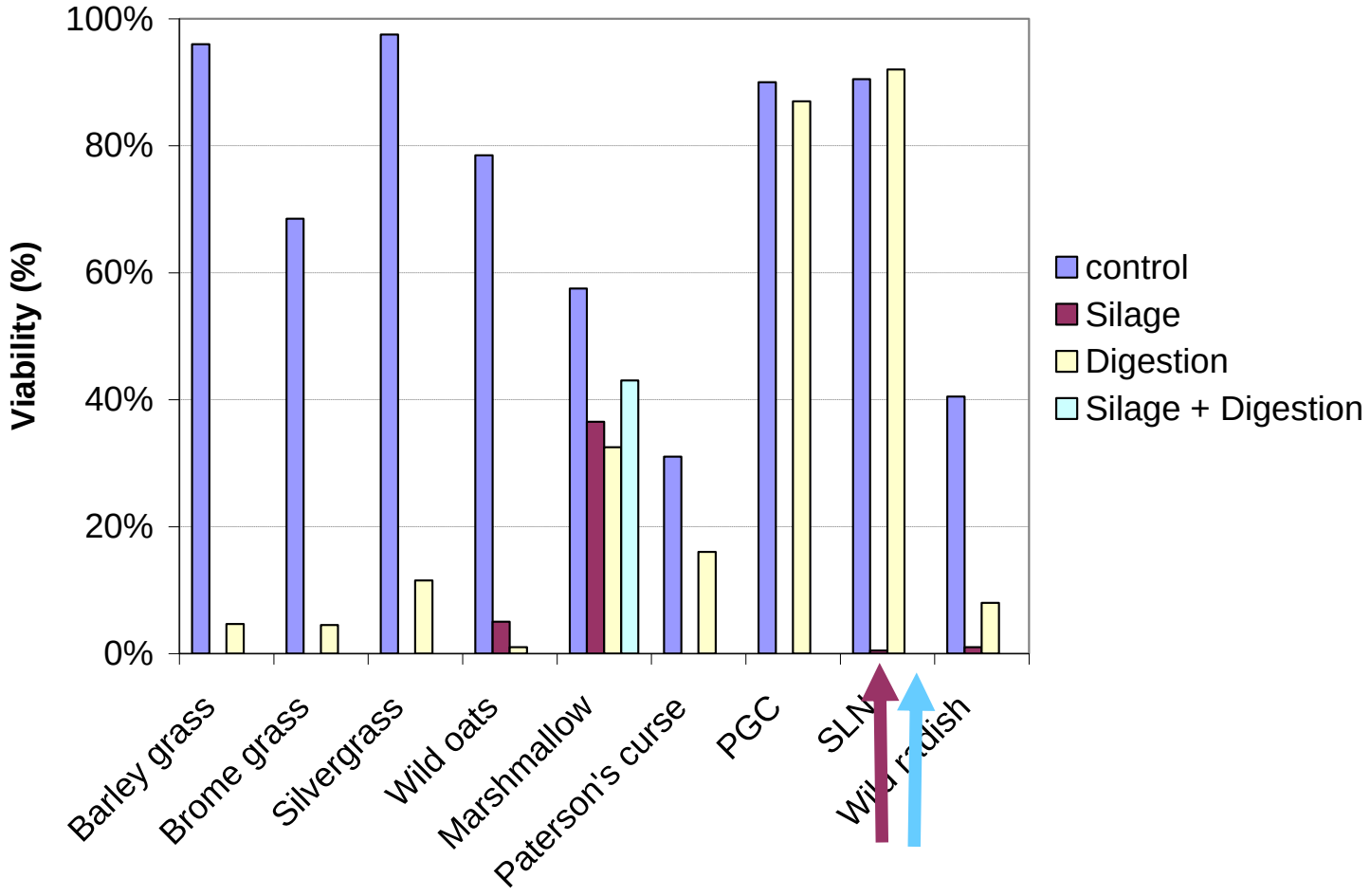
Pasture competition - glasshouse

Pasture	Pasture production (t/ha)	SLN Weed Biomass (t/ha)
Control	0.00	2.73
Bambatsi panic	11.50	0.16
Biserrula (cv. Kasbah)	6.77	0.14
Chicory (cv. Puna)	3.41	0.19
Currie cocksfoot	4.34	0.13
Digit grass	10.65	0.05
Lucerne (cv. Aurora)	7.14	0.17
Katambora Rhodes grass	19.72	0.04
Phalaris (cv. Sirolan)	5.75	0.09
Strickland finger grass	20.59	0.05
l.s.d.	*4.03*	*0.43*

Competitive crop/Stubble effects

Crop	Crop biomass (t/ha)	SLN stem density December	SLN stem density April	SLN berries/stem
Control		4.6	5.8	2.7
Annual ryegrass	0.3	1.2	4.4	1.6
Wheat (cv. Diamondbird)	1.6	0.7	5.6	0.3
Cereal rye	2.0	0.2	5.9	0.3
Oats (cv. Saia)	1.4	0.2	7.7	0.1
LSD (0.05)		*1.8*	*n.s.*	*1.3*

Impact of Silage & Digestion



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SLN chemical seed set control

Flowering	Seeds	Viability (%)	Viable Seeds
control	57.2	77.3	44.3
2,4-D amine	9.3	5.0	0.5
glyphosate	16.3	15.7	2.6
fluroxypyr	2.3	16.7	0.4
picloram + 2,4-D amine	0.0	0.0	0.0
triclopyr + picloram + aminopyralid	0.0	0.0	0.0

Early Berry	Seeds	Viability (%)	Viable Seeds
control	84.2	99.0	83.4
2,4-D amine	55.1	75.6	41.7
glyphosate	63.8	66.0	42.1
fluroxypyr	73.5	65.7	48.3
picloram + 2,4-D amine	64.5	33.7	21.7
triclopyr + picloram + aminopyralid	34.0	36.0	12.2

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Herbicide timing

Flowering application

Autumn application

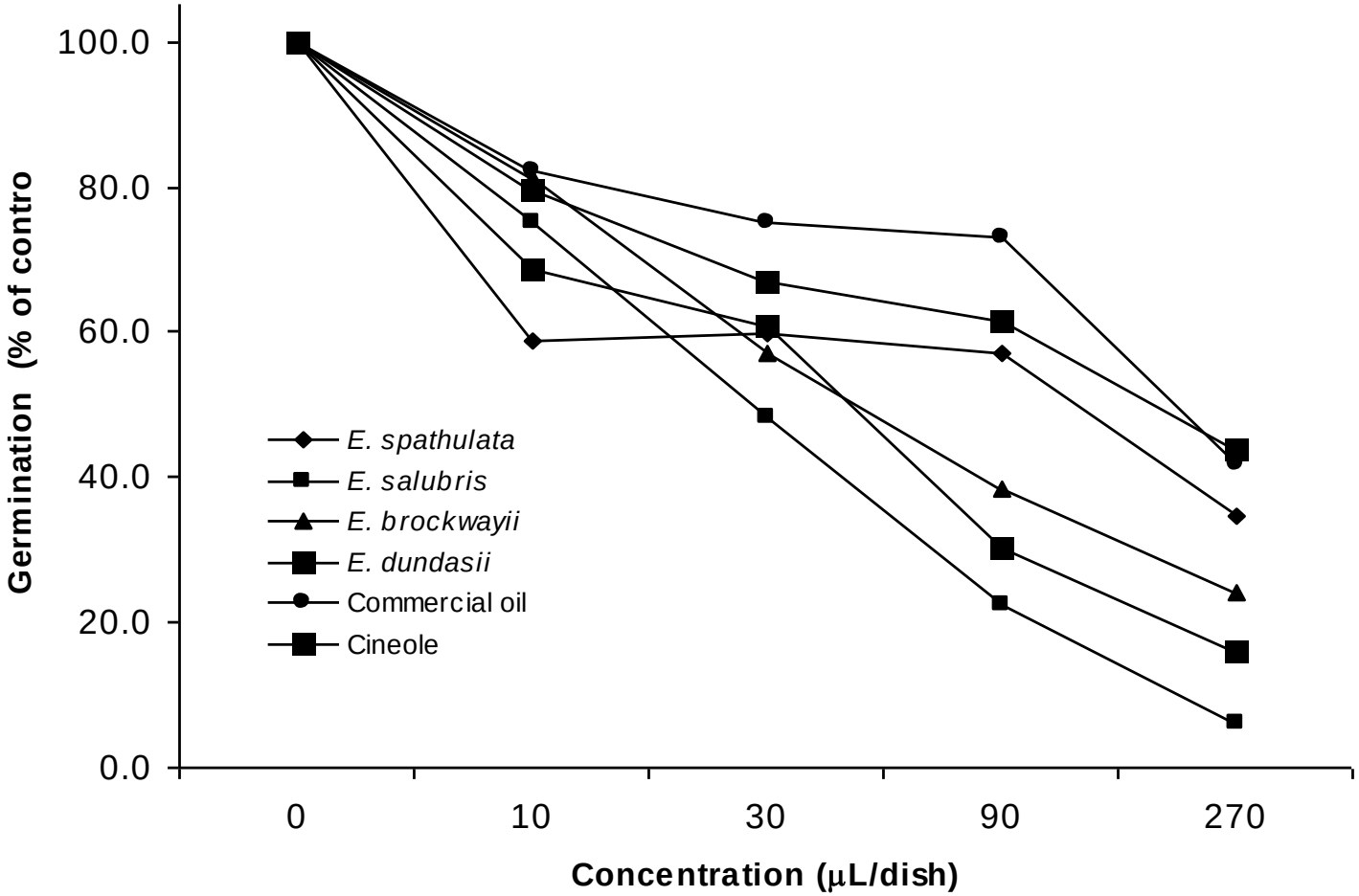
Targeted herbicide application

Field observation

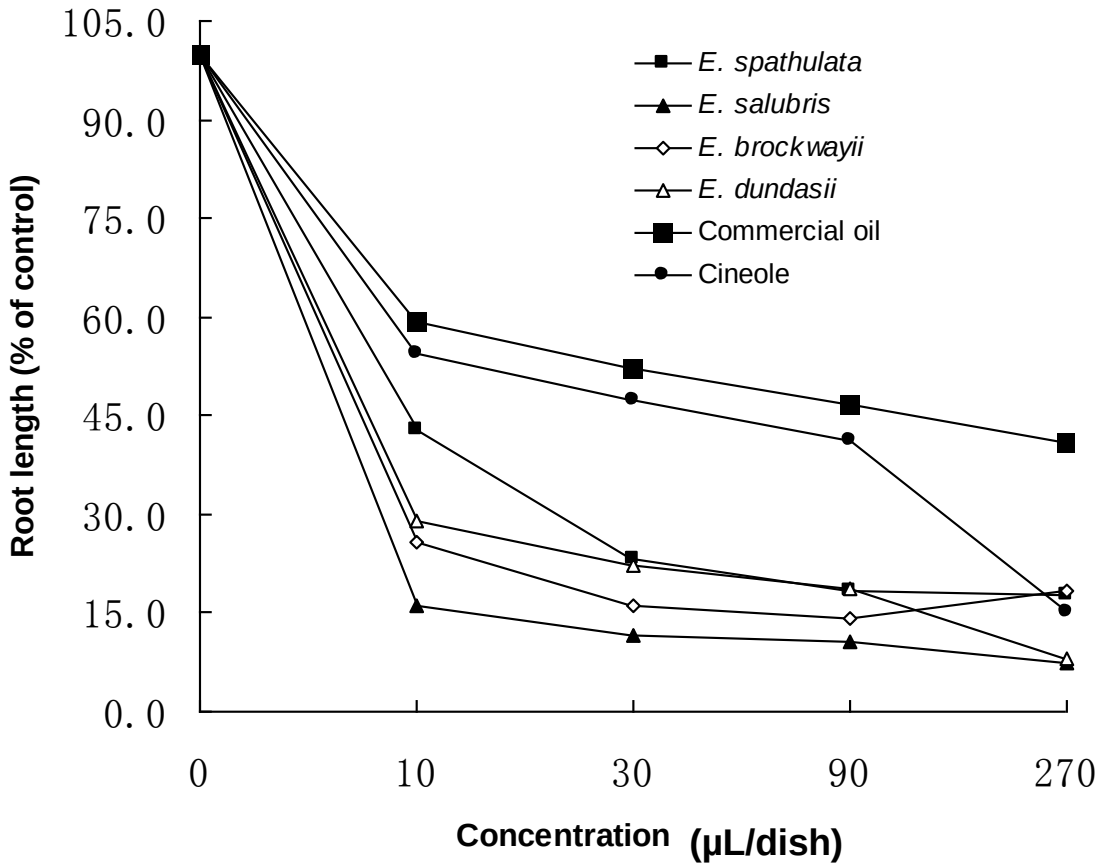
Competition?

Weeds between Eucalyptus

Essential oils on SLN germination



Essential oils on SLN root growth



Biological control

http://www.invasive.org

http://www.invasive.org

***Leptinotarsa texana* beetle – successful in South Africa**

Government of South Australia

Biosecurity SA

Biological control

Gelichiid moth larvae in WA

Government of South Australia

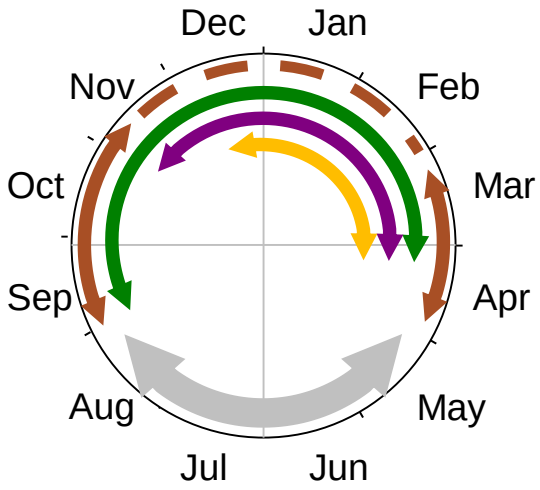
Biosecurity SA

Apply multiple strategies

DELIBERATION | **DIVERSITY** | **DILIGENCE**

Control seedset

Control early emergence



Control rootbank

Monitor for new emergence

Mininise movement

A good strategy involves doing something **all year round**

Seedling emergence
Stem emergence
Flowering
Berry set
Dormant

Typical silverleaf nightshade growth cycle

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Key BMP summary - Dual Actions

Early action

Growth stage: Prior/at flowering

Month: Dec-Jan

Grazing
Slashing
Burning or
Knockdown herbicides

↓

- Seedbank
- Stop provision of food
- Exhaust the food reserve
- Control seedlings

Late action

Regrowth (Veg.)

Mar-Apr

Picloram-based residue herbicides

↓

- Rootbank

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Critical stage for control: early flowering

Critical stage for control: too late

Control options

- ✗ Cultivation?
- ? Grazing
- ? Slashing
- ✓ Summer active pastures or crops
- ✓ Competitive winter crops
- ✓ Stubble retention, no-till
- ✓ **Dual actions** - early for seedbank
  - late for rootbank

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Key messages

- Perennial weed so needs attention every year
- Farm hygiene important so that seeds or roots not transferred from paddock to paddock
- Timing control measures is important for seedbank and root control
- Dual actions: Single action is not enough
- Care with glyphosate use as it can remove the competition…Don't leave the ground "bare"
- Combine with crop or pasture competition
- Design a practical management program depending on levels of infestation – Heavy or scattered
- Keep at it!!

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On farm demo (Glovebox)

- Select 1-3 treatments you can apply
- Compare current practice
- Using commercial sprayer
- No need for replications within paddocks
- Include an untreated area comparison (benefit/cost)
- The treated paddock should be sown to crops or pastures according to growers' normal rotation plan.

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Assessments

Using the Glovebox Recording Sheet

- 1st year pre-treatment count: SLN counts in 5 x 0.5m^2, GPS (? Phone app)
- 2nd and 3rd year pre-treatment count: same area
- Take photos
- Yield mapping data comparing the treated and untreated strips

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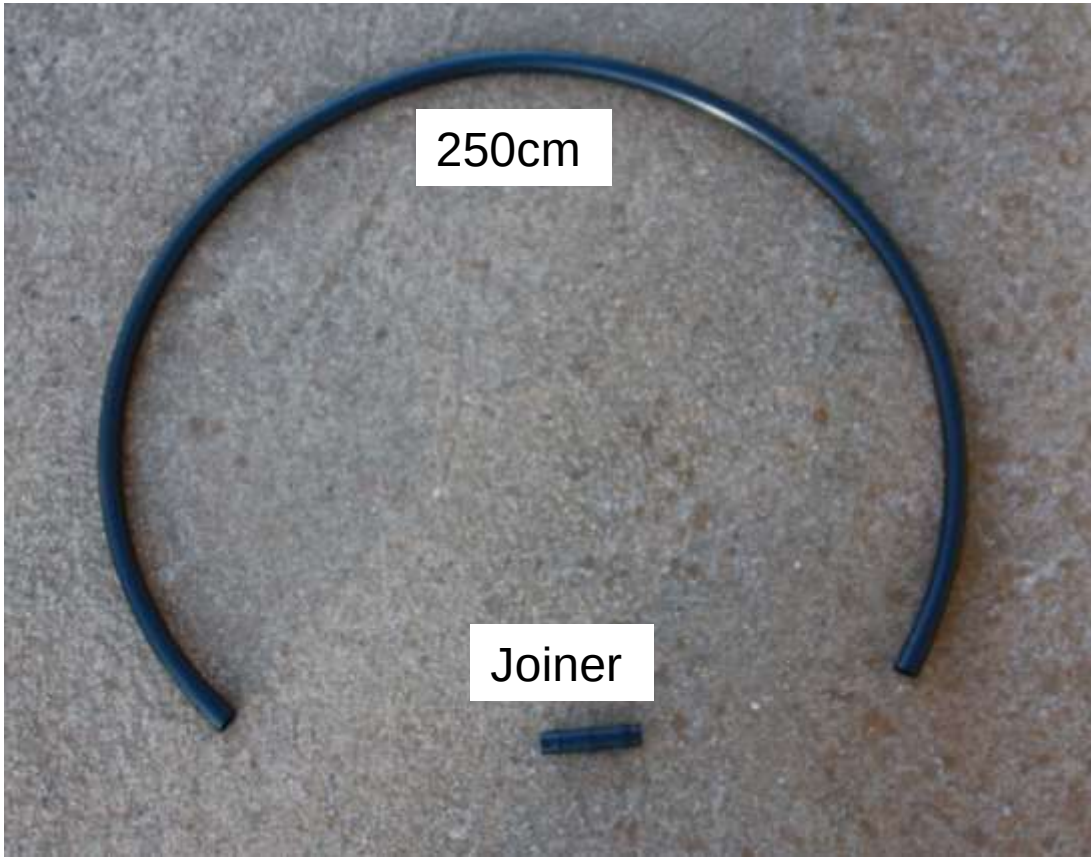
Standard 0.5 m2 Circle for assessment

- Cut 13-mm polypipe 250 cm in length
- Connect the ends with a joiner
- Circle area: 0.5 m^2



Data recording (5 stem counts/strip) 2014, 2015, 2016..

Land use for this year (Please ✓):
□Crop type_____ □Pasture type_____ □Fallow

	5 stem counts/treatment					Note
T'ment	1	2	3	4	5	
1 (Your current practice)						
2 (Untreated control)						
3 (BMP1)						
4 (BMP2)						
5 (BMP3)						
6 (BMP4)						

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Land use for this year (Please ✓):

☐ Crop type_____

☐ Pasture type_____

☐ Fallow

Treatment or application details:

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Feedback/further contact

- Dr Karen Herbert, Mobile 0438 297 319
  Email: kherbert@mli.org.au

- Phil Bowden, Mobile 0427 201 946
  Email: weeds@mli.org.au

- Dr Hanwen Wu, NSW DPI, Phone: 02 69381602
  Email: hanwen.wu@dpi.nsw.gov.au

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