Overview of invertebrate threats to Canola

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Over forty invertebrate pests species threaten canola (Table 1 proceedings).

Potential losses are > $300 million (Murray et.al. 2013)

TABLE 7.9 Five most important invertebrate pests of canola by potential and present loss

Rank	By Potential Loss	By Present Loss
1	Redlegged earth mite ($96.6 million)	Diamondback moth ($10.3 million)
2	Lucerne flea ($29.7 million)	Redlegged earth mite ($7.8 million)
3	Blue oat mite ($28.8 million)	Canola aphids (various) ($5.1 million)
4	Canola aphids (various) ($24.0 million)	Weevils (various) ($4.3 million)
5	Bryobia (various) / Balaustium mite ($19.3 million)	European earwig ($4.2 million)

Title: The Current and Potential Costs of Invertebrate Pests in Australia

GRDC Project Code: AEP00001

Authors: Dr Dave Murray, Michael Clarke and David Ronning

Pest reports (% of total reports)

Early 1980's	2006/7
Aphids (9%)	Aphids (22%)
RLEM (8%)	RLEM (14%)
Cockchafers (7%)	BOM (9%)
Budworm (7%)	Lucerne flea (9%)
Cutworm (5%)	Budworm (8%)

Hoffmann, et. al. 2008. Aust. J. Exp. Ag. 48: 1481-1493.

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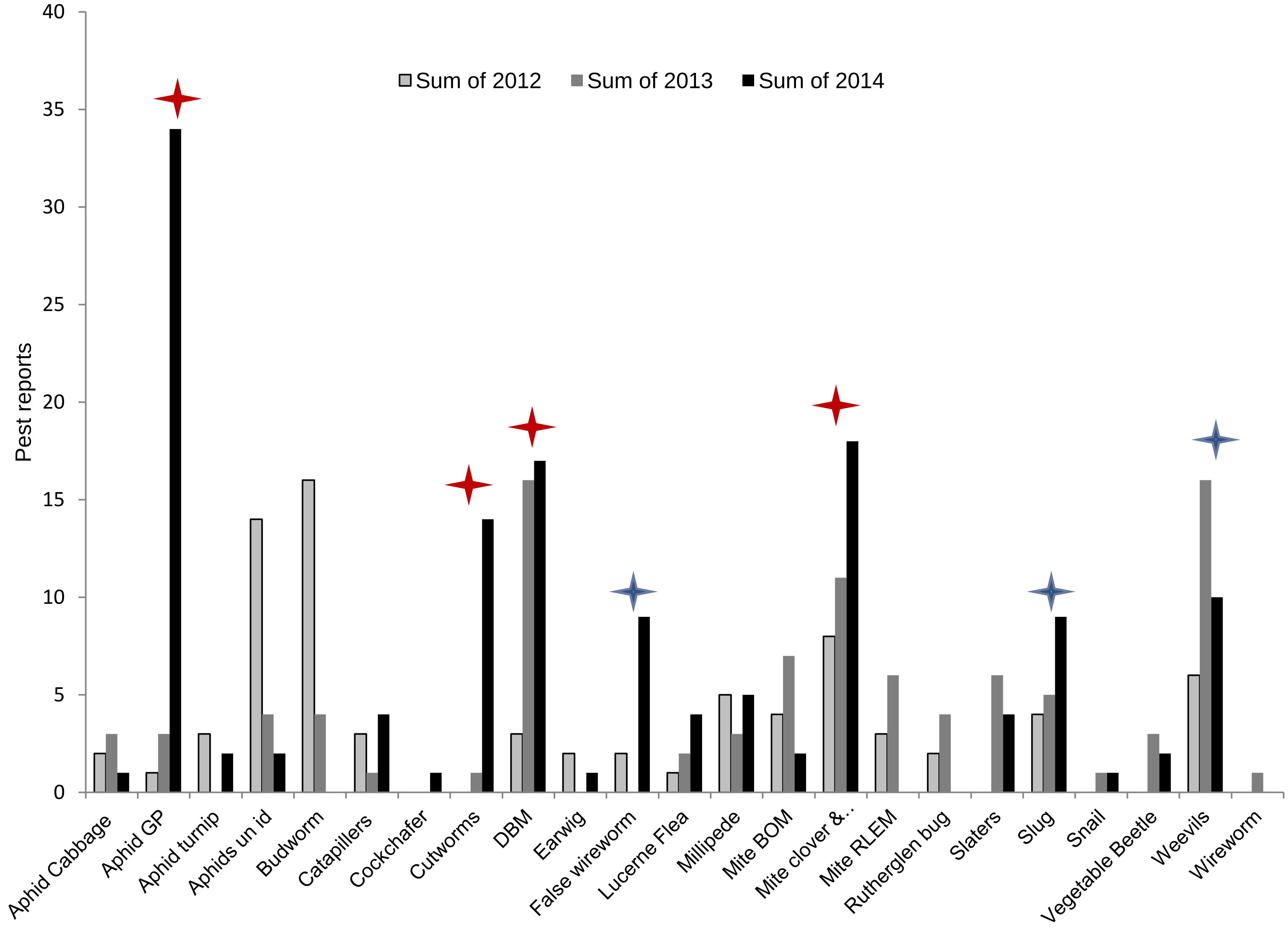

Figure 1 Recent Pest Reports from SE Australia 2012- July 2014

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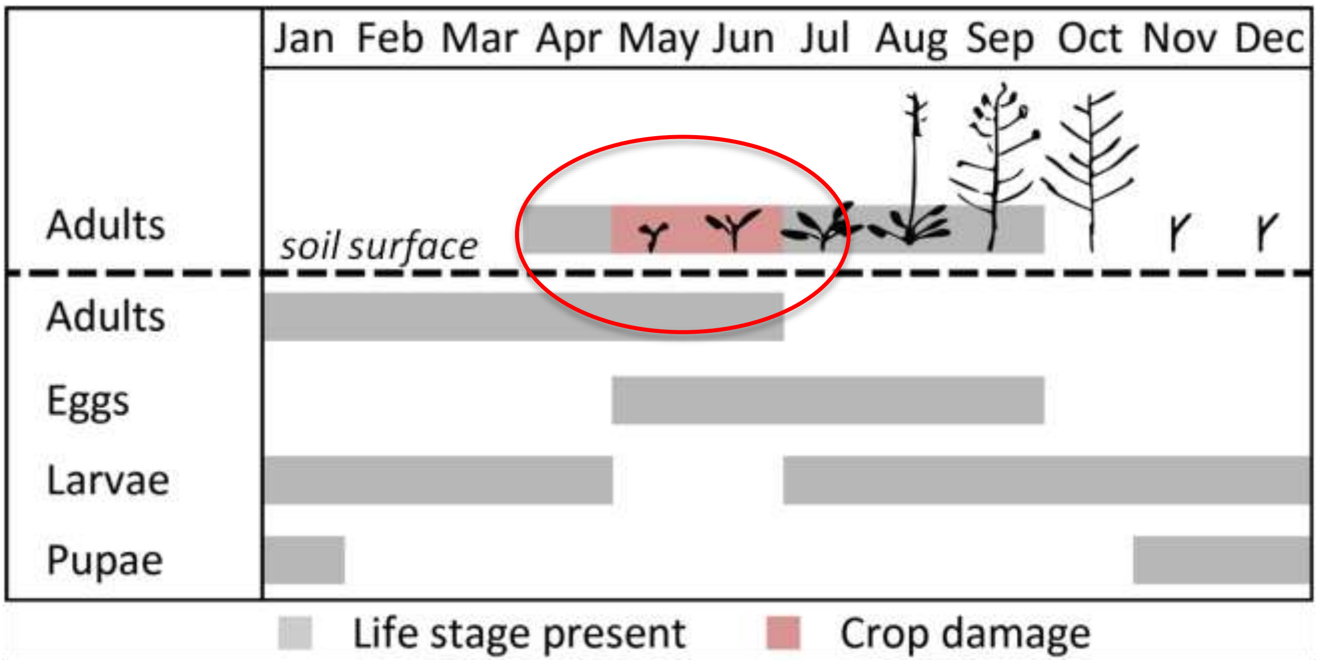
Intangible pests: e.g. Weevils

- Sexual reproduction, one generation per year
- Critical period is May/June (peak adult emergence)



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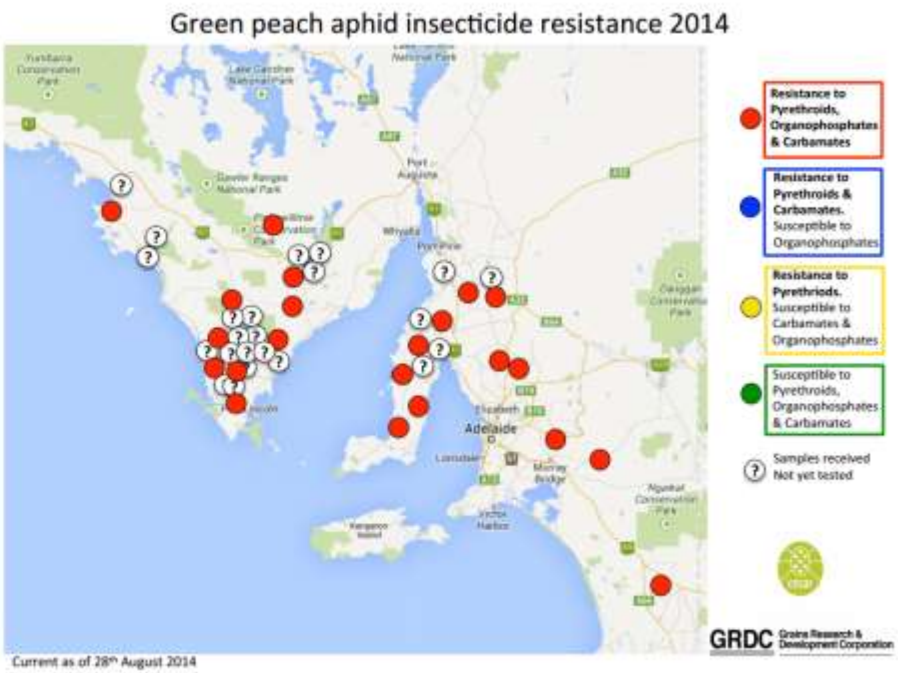
Green Peach Aphid (*Myzus persicae*)

other aphids species can be/ were present

96% infection efficiency of Beet Western Yellow Virus

<u>insecticide resistance</u>



Green peach aphid

Cowpea aphid

Cabbage aphid

Turnip aphid

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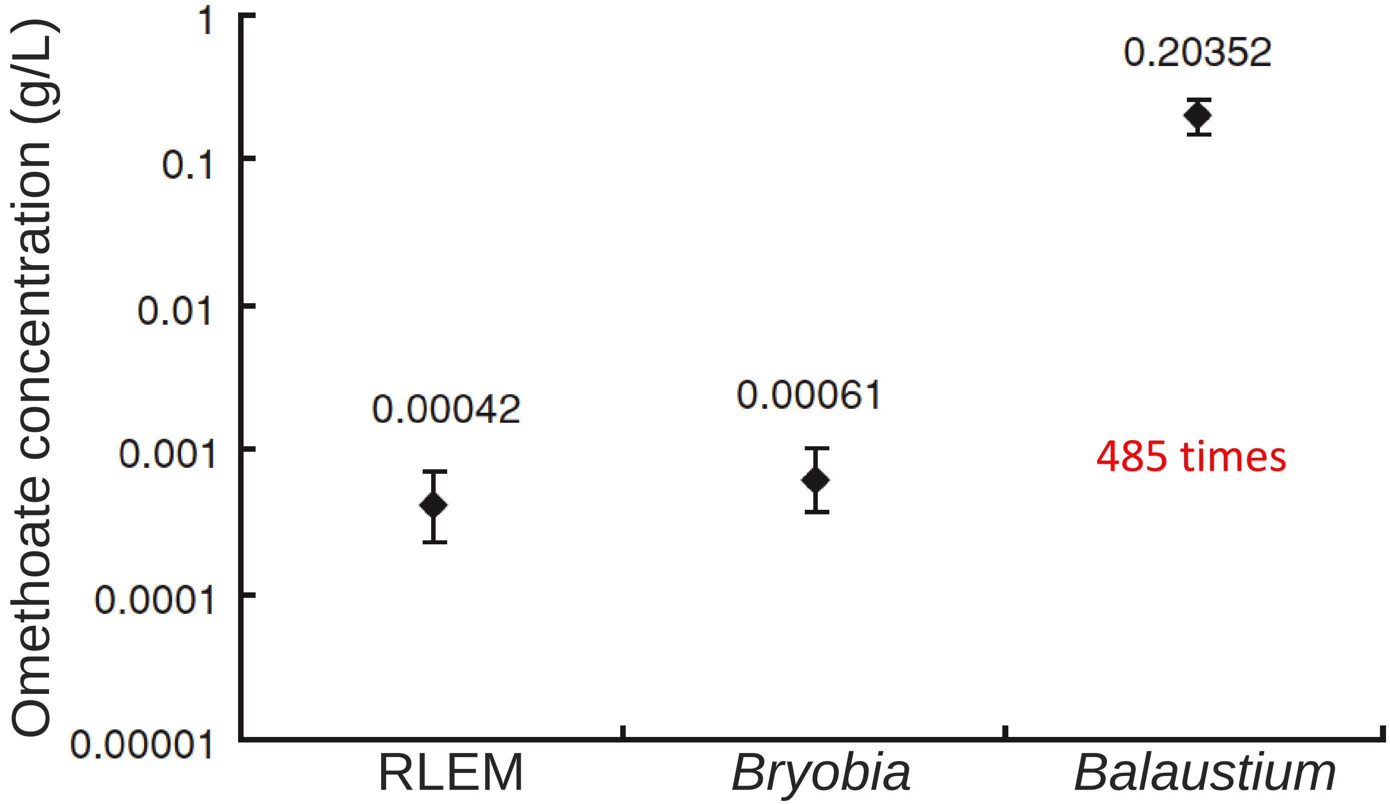
Tolerance to insecticides

Insecticide response curve: comparison of mites



Arthur et al. 2008. *Aust. J Exp. Agric.*

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Cutworms (*Agrotis* spp.)

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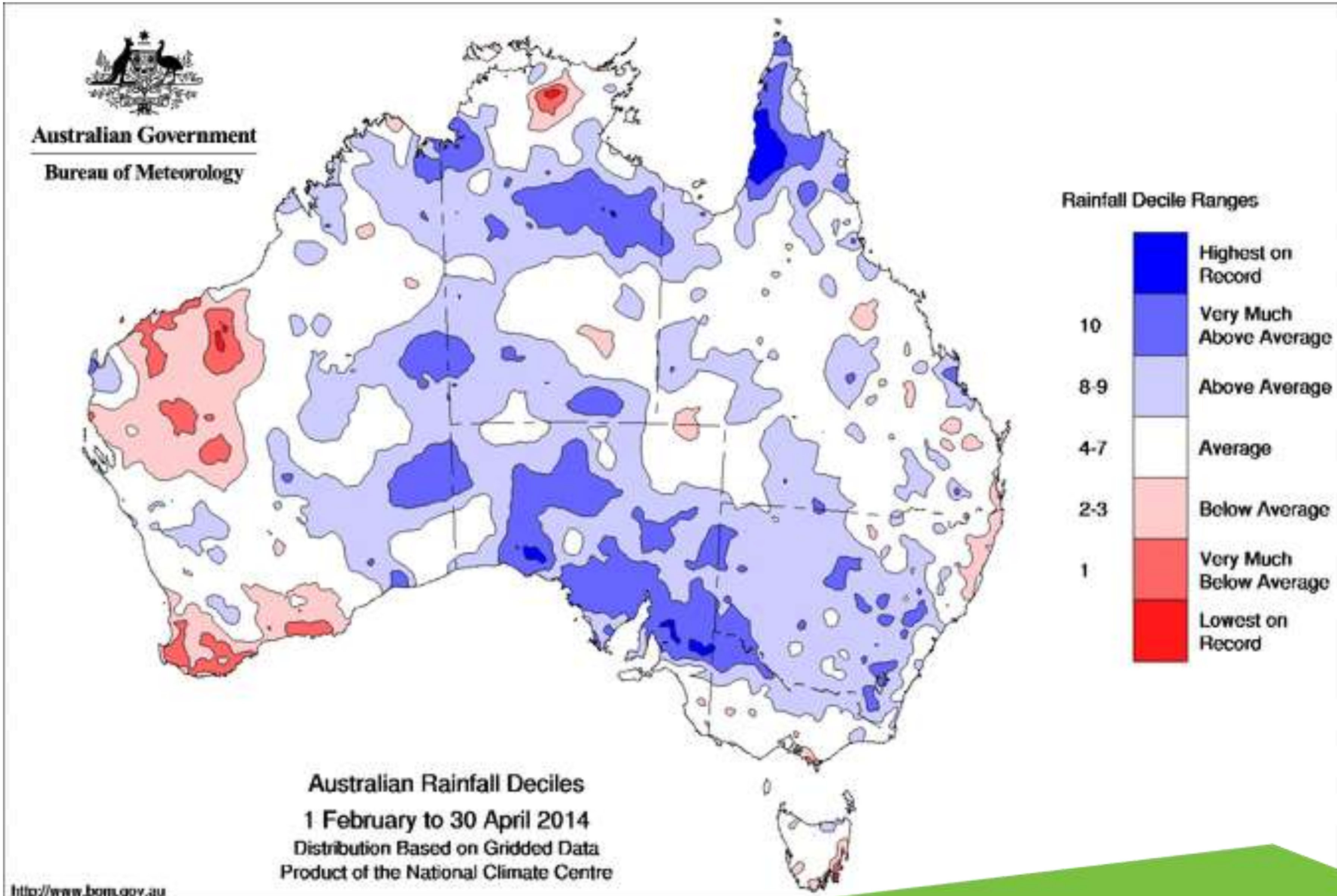

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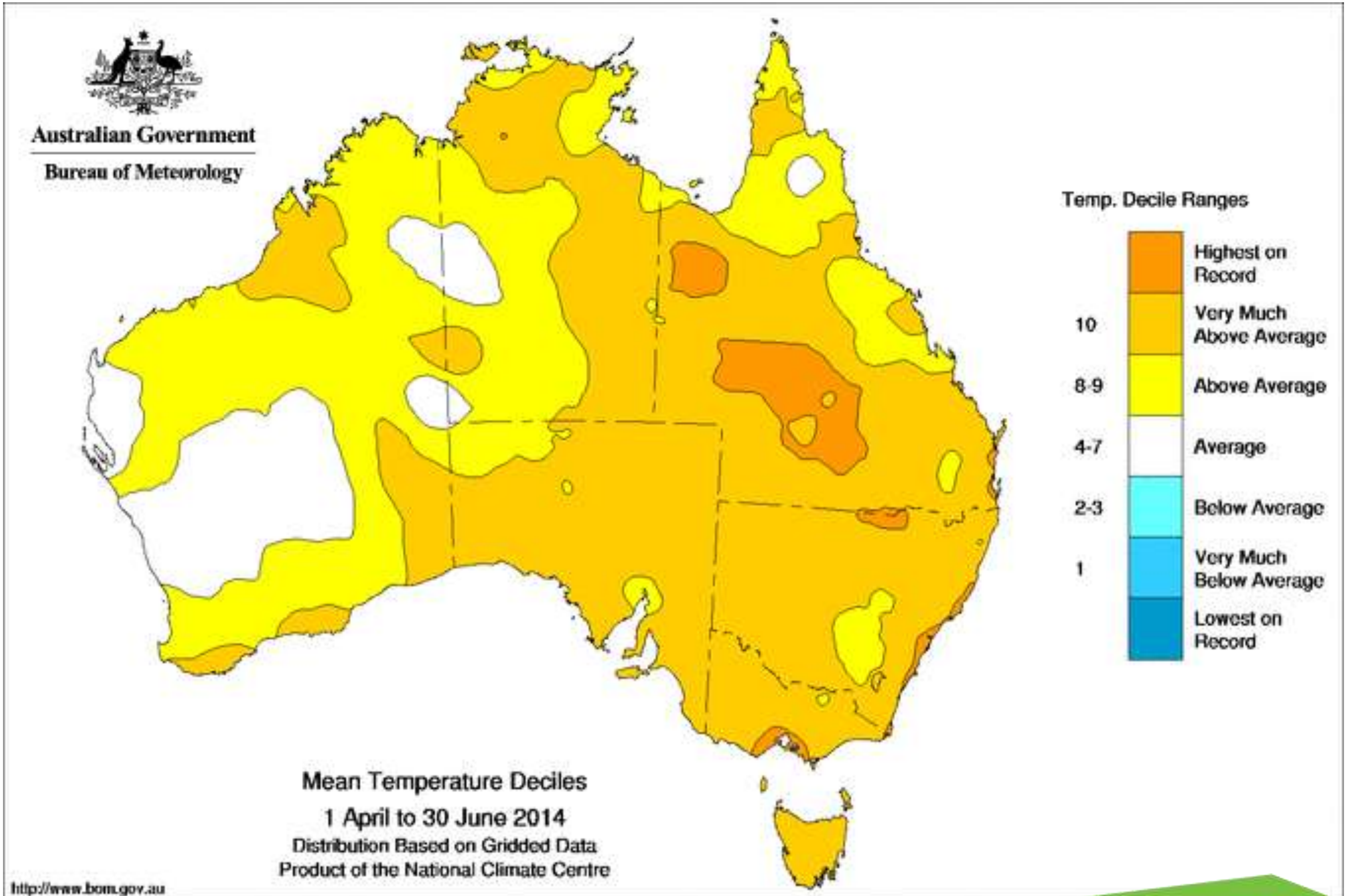
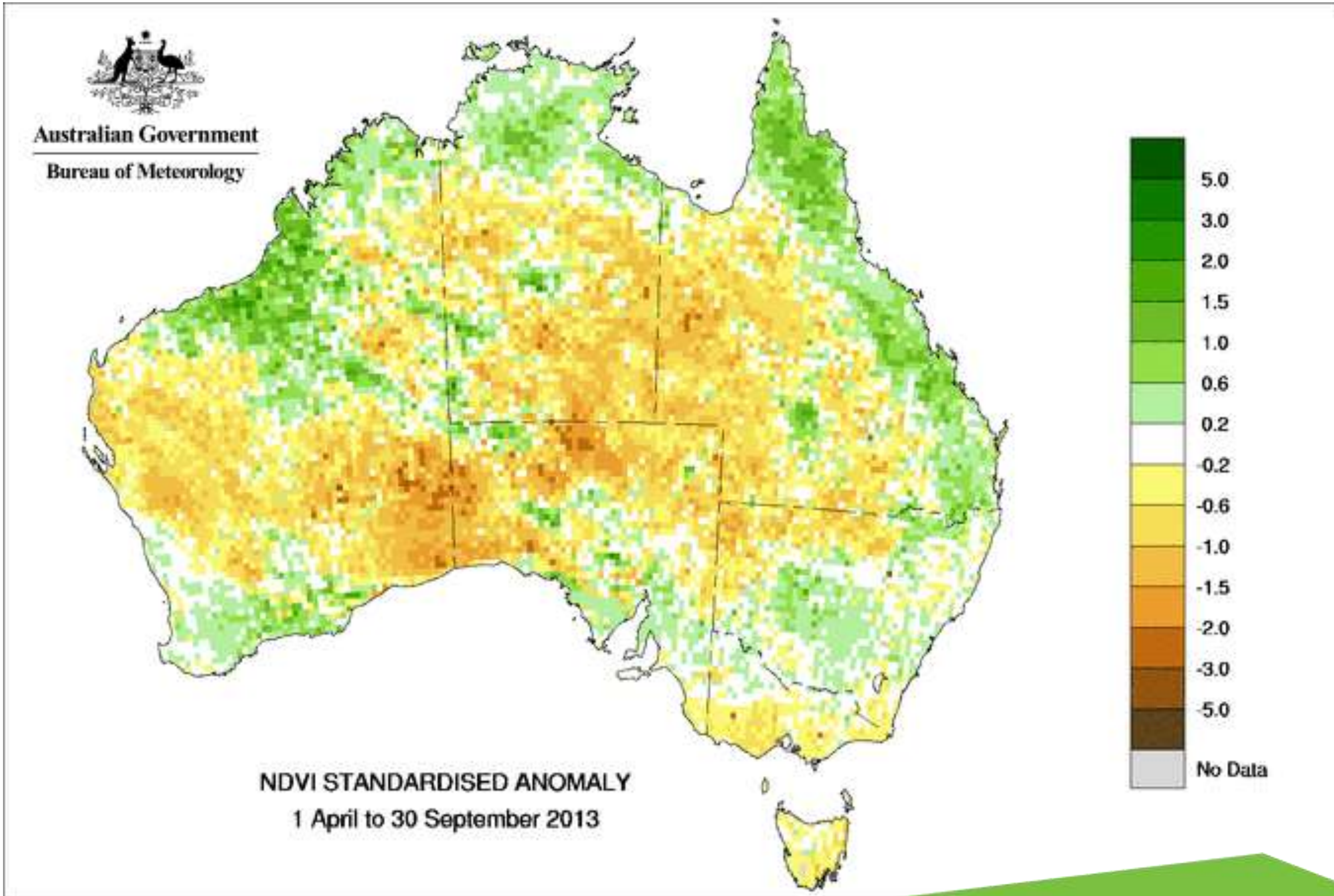

Australian Government
Bureau of Meteorology
Temp. Decile Ranges
Highest on Record
10
Very Much Above Average
8-9
Above Average
4-7
Average
2-3
Below Average
1
Very Much Below Average
Lowest on Record
Mean Temperature Deciles
1 April to 30 June 2014
Distribution Based on Gridded Data
Product of the National Climate Centre
http://www.bom.gov.au


Australian Government
Bureau of Meteorology
5.0
3.0
2.0
1.5
1.0
0.6
0.2
-0.2
-0.6
-1.0
-1.5
-2.0
-3.0
-5.0
No Data
NDVI STANDARDISED ANOMALY
1 April to 30 September 2013

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2014 great year for establishment pests.

- related to climatic conditions?

Pest control is still heavily reliant on broad spectrum pesticides.

Can not always rely on reactive chemical responses.

Lack of implementation of IPM reflects:

- unpredictable nature of pest outbreaks
- pesticides work immediately
- low/unreliable damage thresholds
- tight profit margins

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Understand population increases

Table 1
Examples of reproductive potential of selected invertebrate species occurring in Australia as mentioned in the text. Data includes minimum development temperature (MDT), mature adult life span or length of life cycle if adult life span data is not available, total reproductive output per reproductive individual (fecundity) and intrinsic rate of natural increase (R_m) with relevant temperatures (°C) for data displayed below in brackets.

Pest	Common name	Species	Reproductive strategy	MDT (°C)	Life span (days)	Fecundity	R_m	Source
Gastropoda:								
Agriolimacidae	Slugs	*Deroceras reticulatum* Müller*	simultaneous obligate out-	3.3	318 ± 14 (10:18)	205 eggs (10:18)	0.03	(Carrick, 1938; South, 1982)
Milacidae		*Milax gagates* Draparnaud*	crossing hermaphrodite	–	150–240 (18–25)	100 eggs	–	(Focardi and Quattrini, 1972)
Helicidae	Snails	*Theba pisana* (Müller)*		–	Annual or	3050 eggs/pair	–	(Baker, 1991)
Hygromiidae	Snails	*Cernuella virgata* (Da Costa)*		–	Biannual	3238 eggs/pair	–	
		Cochlicella acuta (Müller)*		–		372.6 eggs/pair	–	(Baker and Hawke, 1991)
		Prietocella barbara (L.)*		–		–	–	
Acari:								
Eriophyidae	WCM	*Aceria tosichella* Keifer*	–	–	8–10	12–20 eggs	–	(Schiffer et al., 2009)
Erythraeidae		*Balaustium medicagoense* Meyer and Ryke*	parthenogenic	–	35–42	–	–	(Arthur et al., 2010)
Penthaleidae	RLEM	*Halotydeus destructor* Tucker*	sexual	5.6	25–56 (11–18)	–	≈0.027	(Ridsdill-Smith, 1997; Weeks et al., 1995)
	BOM	*Penthaleus falcatus* (Dugès)	thelytokous parthenogenic	–	63 (11:18)	–	–	(Umina et al., 2004; Weeks and Hoffmann, 1999)
		Penthaleus major Qin & Halliday		4	49 (11:18)	42.6 eggs (11:18)	≈0.03	(Robinson and Hoffmann, 2001;
		Penthaleus tectus Halliday		–	–	–	–	Weeks and Hoffmann, 2000)
Tetranychidae	Clover mite	*Bryobia* spp.	parthenogenic	–	50–60	–	≈ 0.07	(Arthur et al., 2010)
Collembola:								
Sminthuridae	Lucerne flea	*Sminthurus viridis* (L.)*	sexual	5.5	60 (13)	120 eggs	≈ 0.06	(Davidson, 1934)

Nash, M.A. and A.A. Hoffmann. 2012. Crop Protection 42: 289-304.

Identifying slug threats: indicators

High risk	**Reduced risk**	**Low risk**
Irrigated and/ or > 500mm	500mm -450mm	<450mm
Above average spring – autumn rainfall ??	Dry spring hot finish	Drought
Cold wet establishment conditions	Warm dry conditions	
No till stubble retained	Burnt only	Tillage and Burnt stubbles
Presswheels, raised beds, cloddy seed bed		Full disturbance sowing compacted seedbed
No sheep in enterprise	Sheep on stubbles	
Soil with improved moisture holding capacity; i.e. increased clay content and organic matter		Poor moisture holding capacity; i.e. Sand no OM
Summer volunteers		No volunteers
Slow crop establishment	Quick establishment by earlier sowing of hybrid varieties	
Conventional TT varieties		
Previous paddock history		No slugs
Slug damage	Clean cereal crops	No sclerotinia
Rotation: Beans/ canola		Poor Cereal crop
Sclerotinnia		No weeds

Over forty invertebrate pests, existing as a complex species, often threaten canola crops, but threats vary between seasons.

2014 highlighted the difficulties growers have dealing with extremes, with cutworms and Green Peach Aphids catching many growers unaware.

Discussion points:

More stable crop environments are needed, underpinned by <u>increased crop resilience</u>.

Broad spectrum pesticides are needed, but as the last resort.