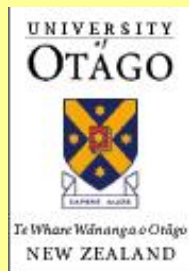


Beyond sanctuaries: do corridors help insects move away from sanctuaries onto farms?

Yuki Fukuda (University of Otago)

Bruce Burns (University of Auckland)

Henrik Moller (University of Otago)



Background

- Sanctuaries on main lands – surrounded by farms

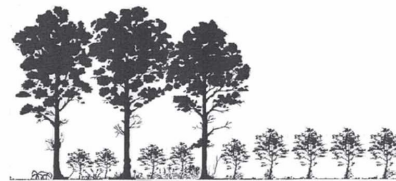


Background

Increasing restoration efforts on farms adjoining sanctuaries

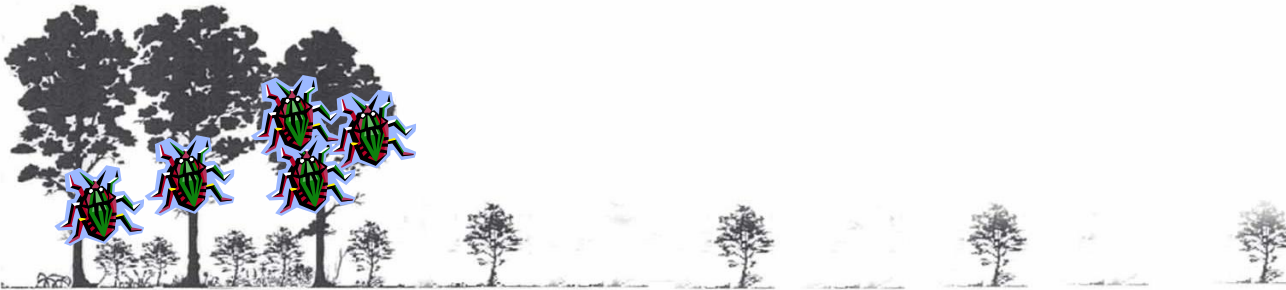


*Should I plant native trees **close**
to remnant bush or **space them out** ???*



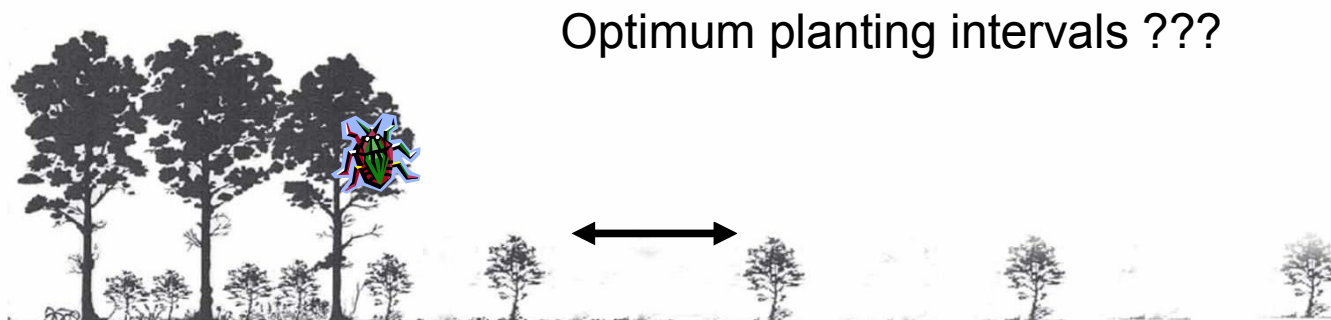
Background

- If trees are planted with large intervals, fewer insects can successfully move onto the trees (island biogeography)
 - Insects from native forests can move more easily to trees closer to native forests
 - Wetland in NZ (Watts and Didham, 2006)



Background

- Creating corridors/ stepping stones to facilitate dispersal
 - Distance depends on how far insects can travel
 - few beetles moved into pastures (<50 m) from remnant bush on NZ dairy farms (Harris & Burns 2000)
- But no one had planted native trees on farms



Aim

- To see if/how
 - 1) three planting intervals &
 - 2) closeness to source bushinfluenced insects moving onto native plants on farms
- We expected
 - ↑ planting intervals, ↓ fewer insects
 - ↑ distance from source, ↓ fewer insects
 - Fewer spiders may move onto trees than insects that feed on plants

Methods: study plant 'mahoe'

Melicytus ramiflorus



Herbivores associated with mahoe

53 known species

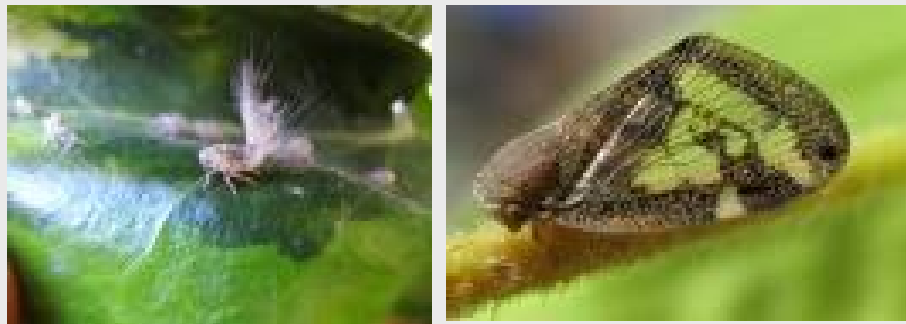
Martin, N. Crop & Food database



Mahoe stripper
(*Feredayia graminosa*; Native)



(*Koroana rufifrons*; Native)



Passion vine hopper
(*Scolypopa australis*; introduced)

Predators found on mahoe

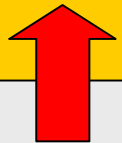
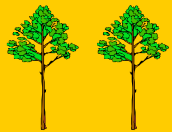
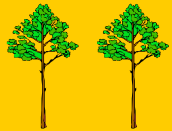
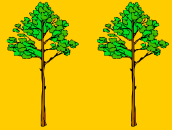


Study sites



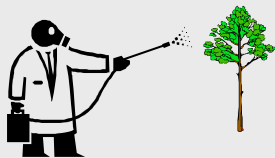
Experimental design

Native bush



Control
0 & - 5 m

Pastures



Three mahoe plants as a group

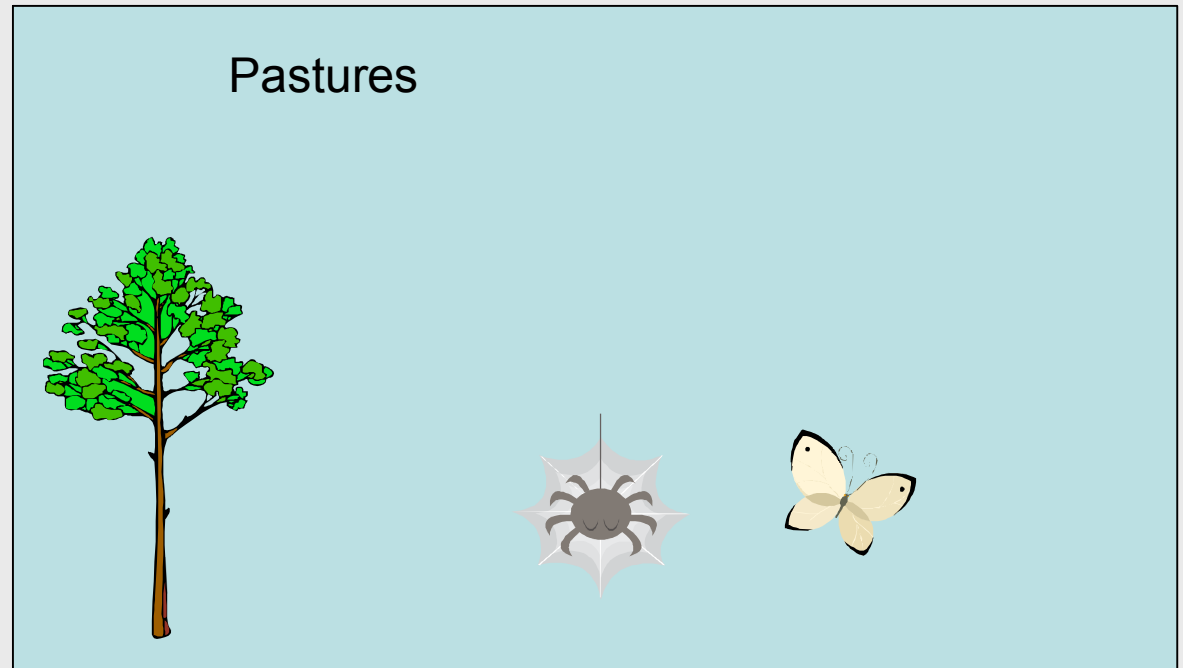
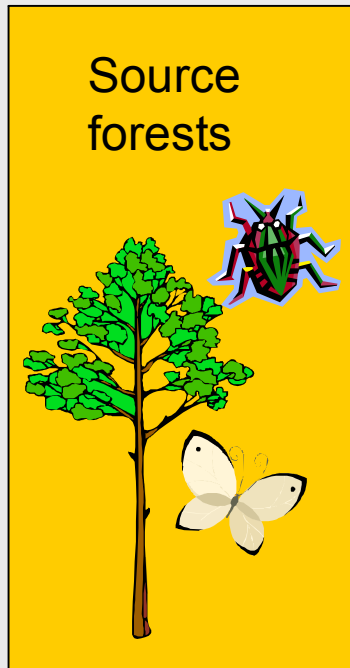


Control plants in bush

20 m planting intervals

Methods 1) identifying species from forests

- 1) Bugs from forests
- 2) Bugs from pastures
- 3) Bugs that use **both** habitats



Methods 1) identifying species from forests

- Insects & spiders on mahoe from source bushes collected via 5 min hand-search
- Insects & spiders from pastures -vacuum suction
- Dec 2007 & 08
- Species identified by experts
- Focal species - 25 prey & 12 predator species
- Field guide with photos



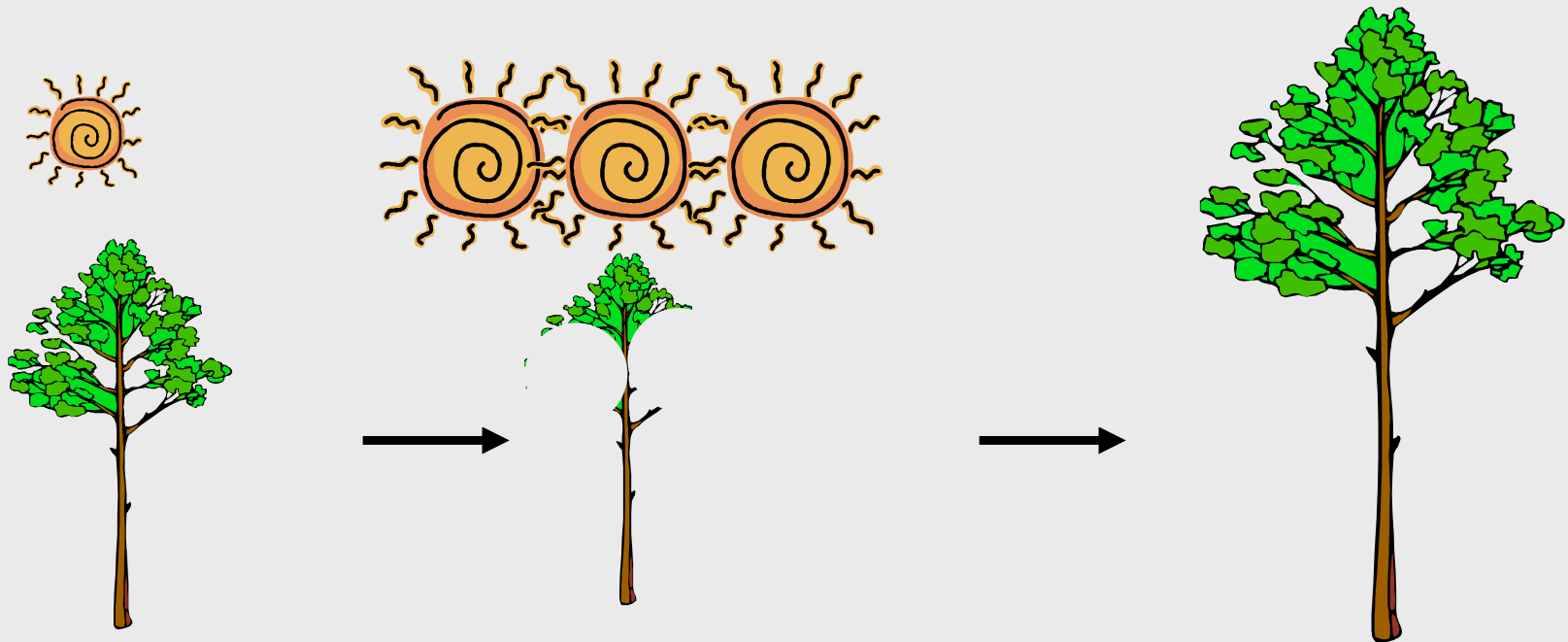
Methods 2) counting species

- # of each focal sp recorded
- 2.5 min / plant
- Leaf numbers counted
- 7, 14, 21 weeks (Jan- Apr 08, 4 farms)
- 42,49,56,63,70 weeks (Sep 08- Apr 09, 3 farms)








Results: plant size

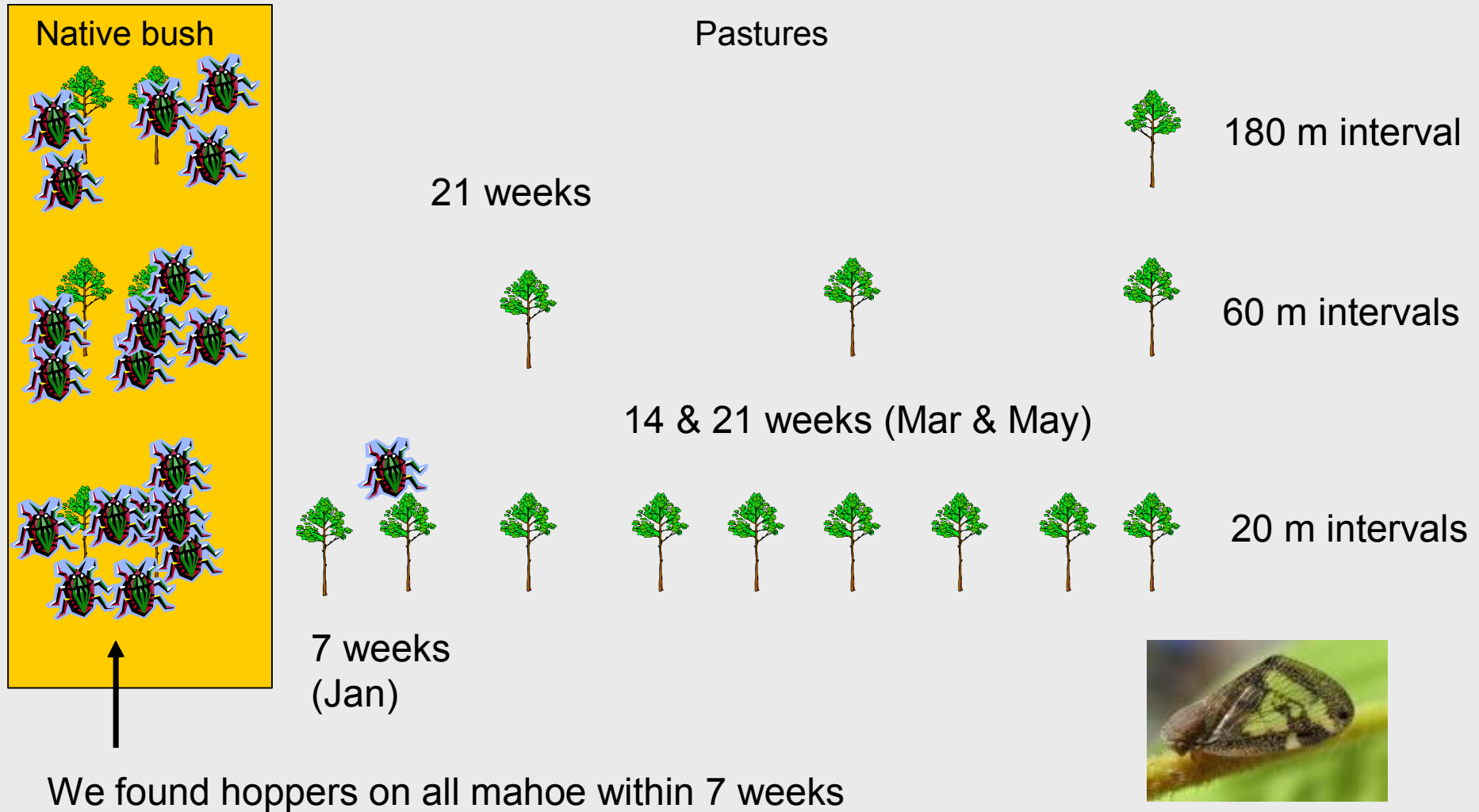
- No difference at 0 week
- Summer 2008: plants became smaller over time...but not over distance
- Spring 2008-Summer 2009: plants grew a lot bigger



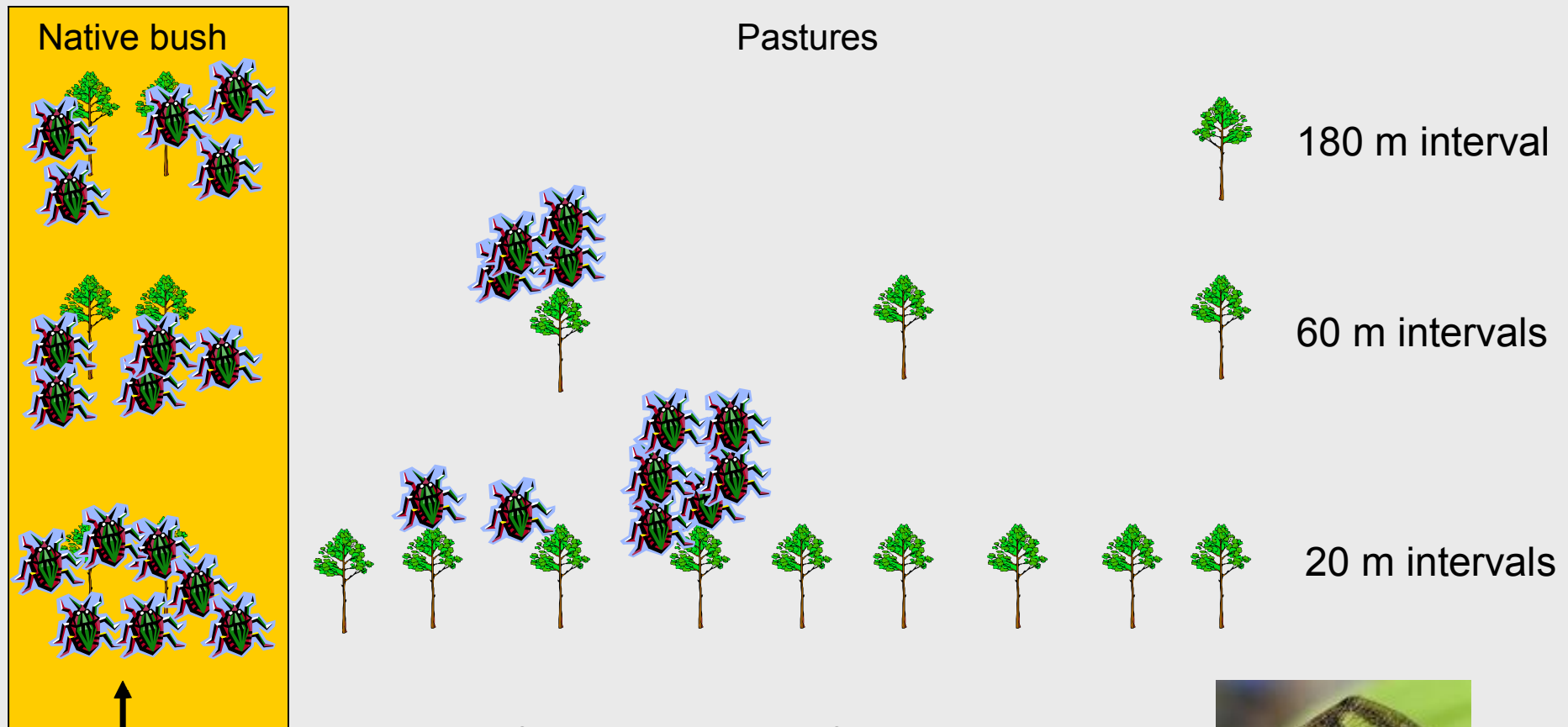
Results: Insects on mahoe we planted

Native bush		Pastures	
		Mahoe in Forests	Mahoe in Pastures
	# of insects that feed on mahoe	 2725 (2555)	 424 (359)
	# species	19	4
	# of spiders that eat insects	66	5
Co 0 &	# species	6	3

Results: passion vine hoppers in summer 2008



Results: passion vine hoppers in summer 2009

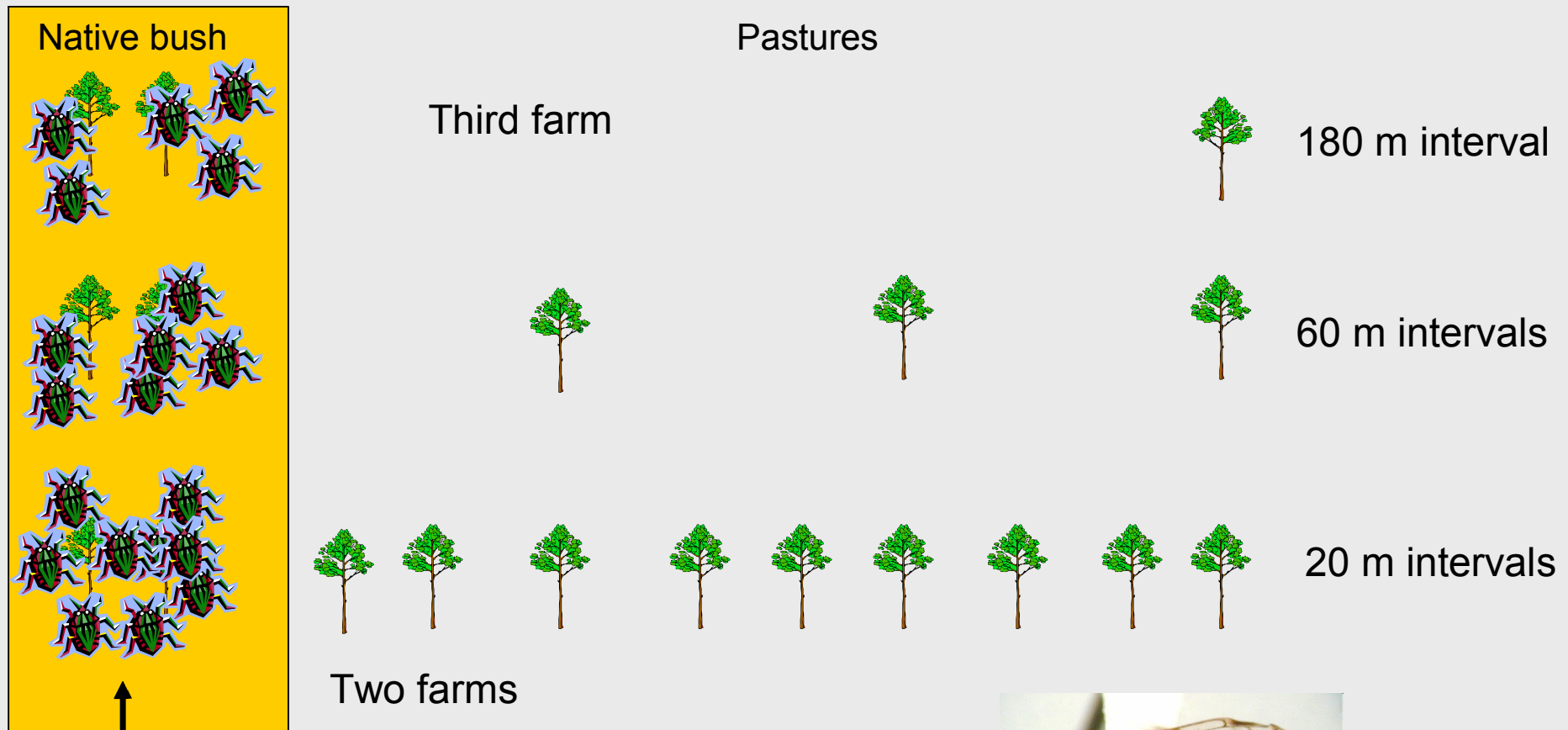


63 & 70 weeks (Feb & April)

49-56 weeks (Oct & Dec) youngsters start developing
A lot more of them compared to 2008



Native plant hopper on 56 weeks (Dec 2008)



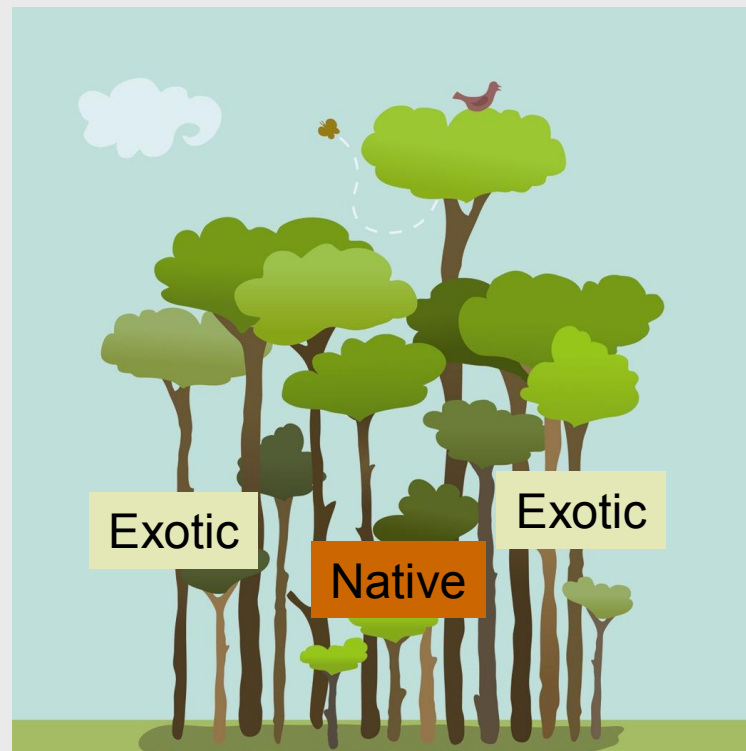
Koroana ruffifrons

Discussion

- How far insects reached depended on how far they could travel
 - Exotic passion vine hoppers relied on corridors
 - Native plant hopper may or may have not needed corridors
 - Most native insects could not reach mahoe in pastures
 - Few insects move away from forests and wetland (dairy farms, Harris and Burns, 2000; wetland, Watts and Didham, 2006)
- Mahoe in pastures: very few number of species reached them within 70 weeks compared to mahoe in forests
 - For whole suite of native insects to come back to restoration sites may take 10-20 yrs
 - 7-9 years (Watts et al., 2008)

What does this mean for restoration ?

- Why did exotic species quickly reached mahoe in pastures?
 - Forest fragments = high edge to area ratio
 - Pastures not suitable for insects that like living inside forests

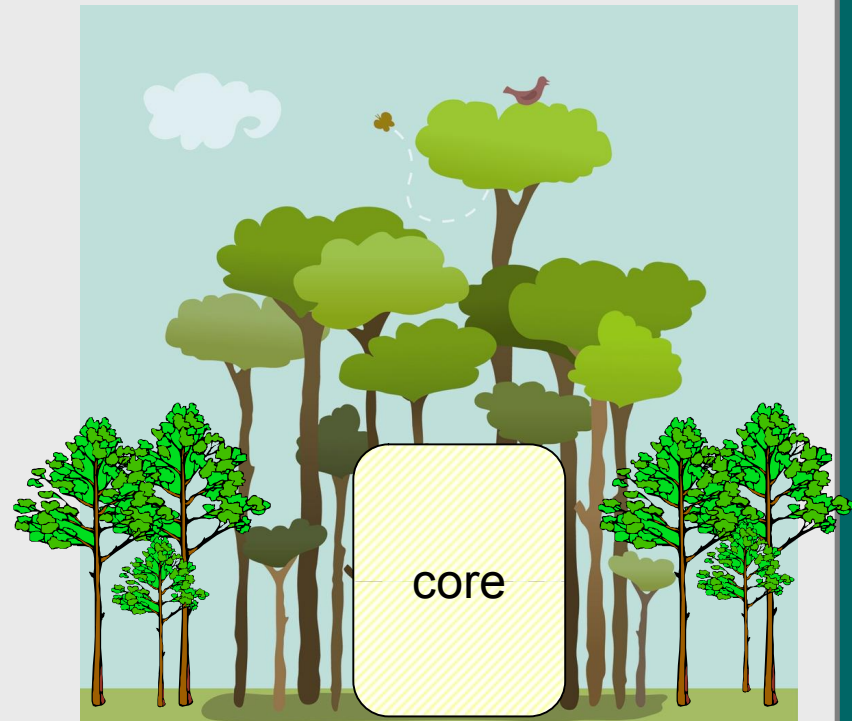
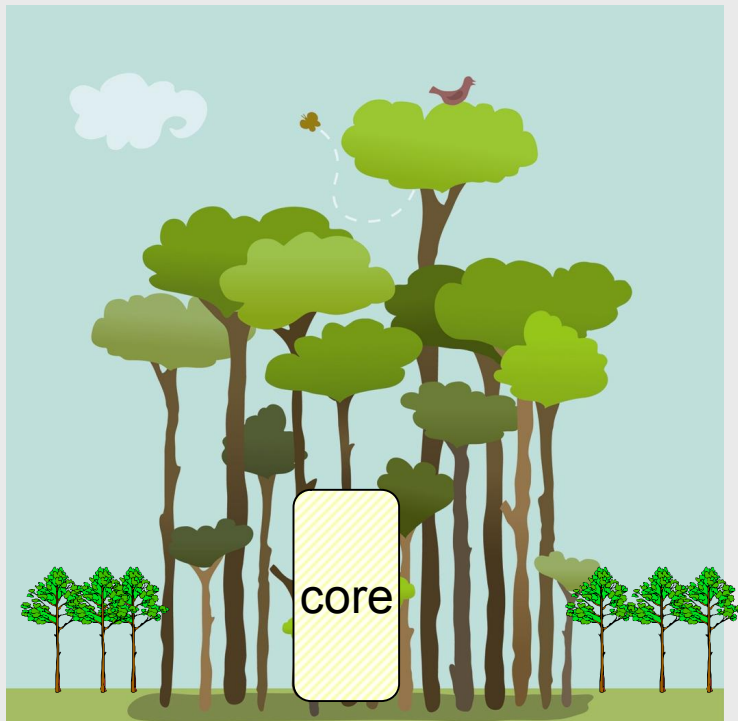


Limitations of our study

- Only four farms
- No replication within farm
- Drought limited sampling methods
 - Insects that live inside plants & wasps that lay eggs into other insects not recorded
 - ⇒ Use emergence traps for more complete recording
- Mark insects and see how they reach plants

Take home messages ✓

1. Fewer insects reached plants as distance from bush increased
2. Where to plant – it depends on the landscape
 - 2a. If one forest remains on/near a farm, plant trees to increase forest size



Take home messages ✓

2b. If > 1 patch of native vegetation present, plant trees to **create corridors**
< 20 m intervals



Acknowledgements

- Foundations of Research Science & Technology for funding
- Farmers (G&R Garrett, I&T Brennan, B&P Wise and G&E Gatsby) for providing study sites
- Drs. C. Watts and R. Didham for their advice on experimental design
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- P & R Williams, B Jenkins & J. Johnson, L. Bridgman, N. Fitzgerald, S. Bartlam, C. Floyd, J. Edgar for constructing tree shelters and planting trees



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