DEVELOPING NON-PESTICIDE ERADICATION STRATEGIES

Hester Williams (Auckland University)
Darren Ward (Landcare Research) -Supervisor
Ecki Brockerhoff (Scion) -Co supervisor
Mandy Barron (Landcare Research) -Advisor
Sandy Liebhold (USDA) -Advisor

Project background

- PhD project part of MBIE program:
  "A Toolkit for the Urban Battlefield" led by Scion
- Theme: Developing non-pesticide eradication strategies

Overall Project Objectives

- Identify key factors influencing the establishment and eradication of insect pests using a biocontrol agent as a model
- Understand the role of Allee effects in small populations and how these could be used to facilitate eradication

Why use a Weed Biocontrol Agent?

- Simulation of new incursion
- Wanted organism – safe to release
- Not widespread – no experimental interference with 'ferals'

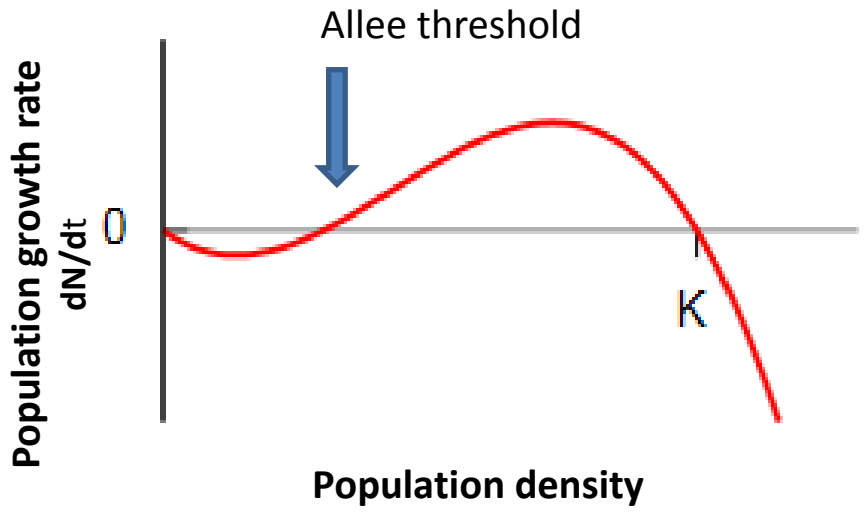
Our model system –

- **Invasive weed: *Tradescantia fluminensis***
- **Biocontrol agent: *Neolema ogloblini***

Small Populations & Allee Effects

What is an Allee effect?

"Decrease in per capita growth rate caused by decrease in population density"



OBJECTIVE 1: Characteristics relating to Allee effects

"Know your enemy!"

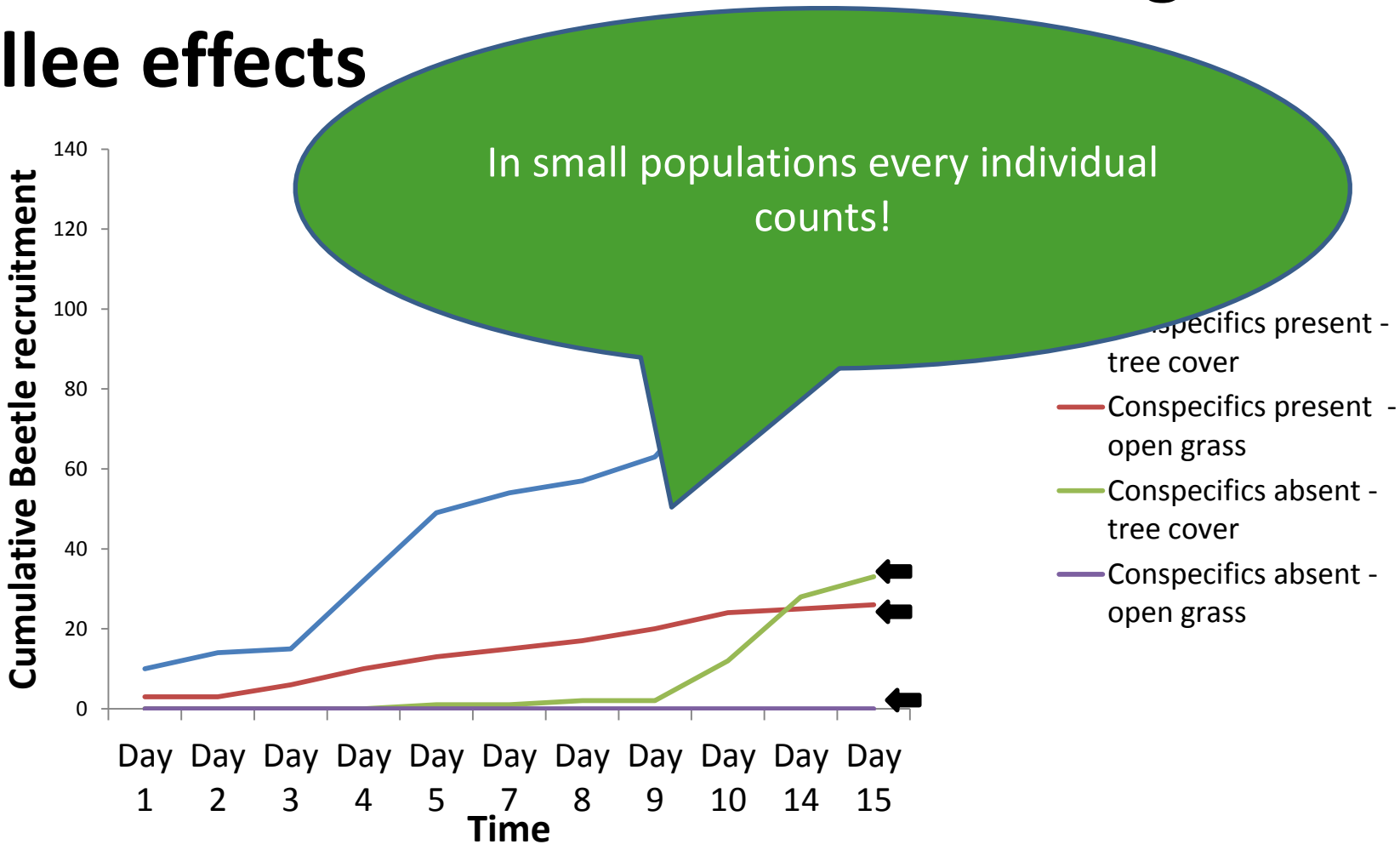
- Biological features
- Dispersal behaviour
  - Newly eclosed adult behaviour?
  - How far?
  - Forced dispersal?

OBJECTIVE 1: Characteristics relating to Allee effects

RESULTS

- Prefer to colonize plants under tree cover
- Adults preferentially disperse to plants already colonized by conspecifics
- Adults strongly rely on conspecific feeding to find host plants

OBJECTIVE 1: Characteristics relating to Allee effects



Influence of conspecifics presence on patch finding success and recruitment time

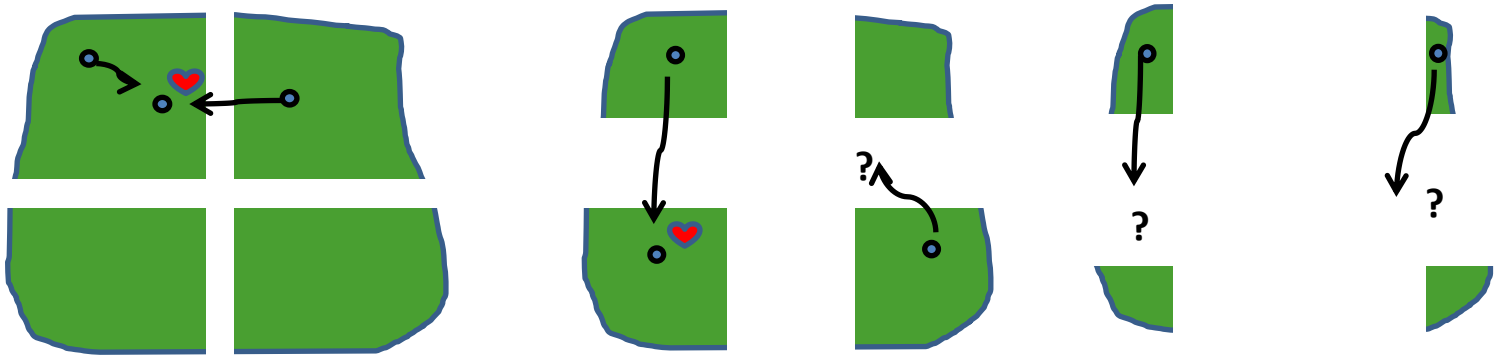
OBJECTIVE 2: Propagule size and establishment success

- Experimental releases and establishment of isolated founder populations
  - in the field,
  - in tents, etc. (‘mesocosms’)
- Verification of establishment

OBJECTIVE 3: Eradication

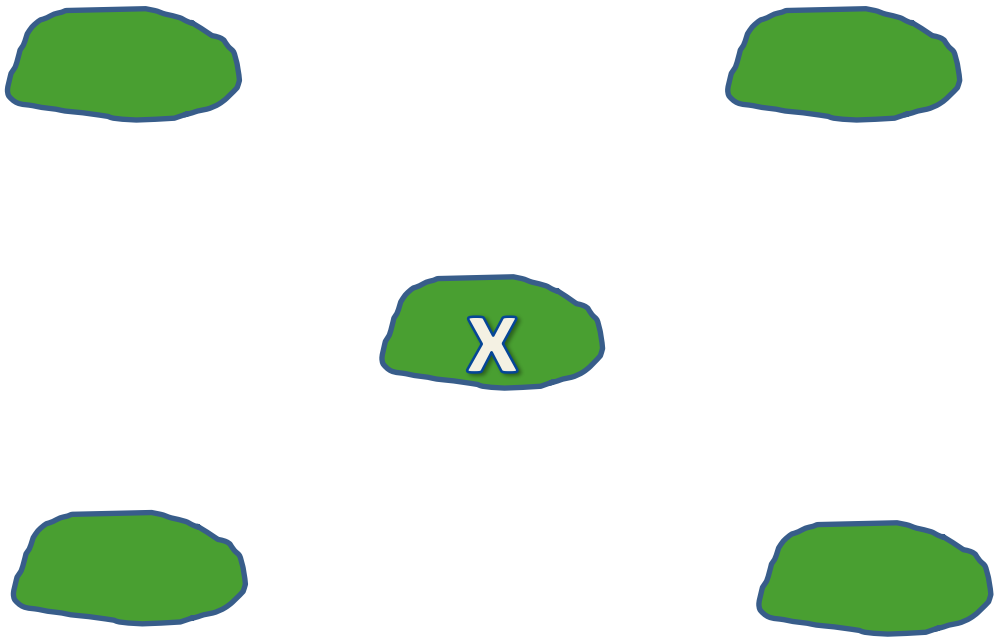
Study relationship between host removal, host patch connectivity and probability of eradication

- Reduce pest population
- Reduce host patch size
- Reduce connectivity between host patches



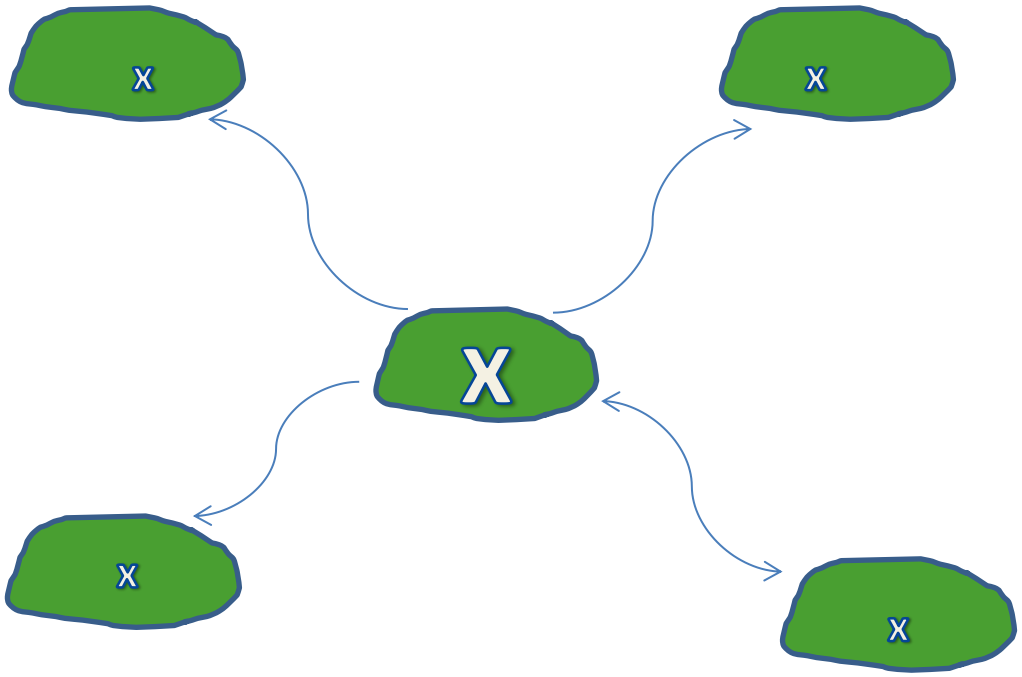
High connectivity | Medium connectivity | Low connectivity

OBJECTIVE 3: Eradication through host removal

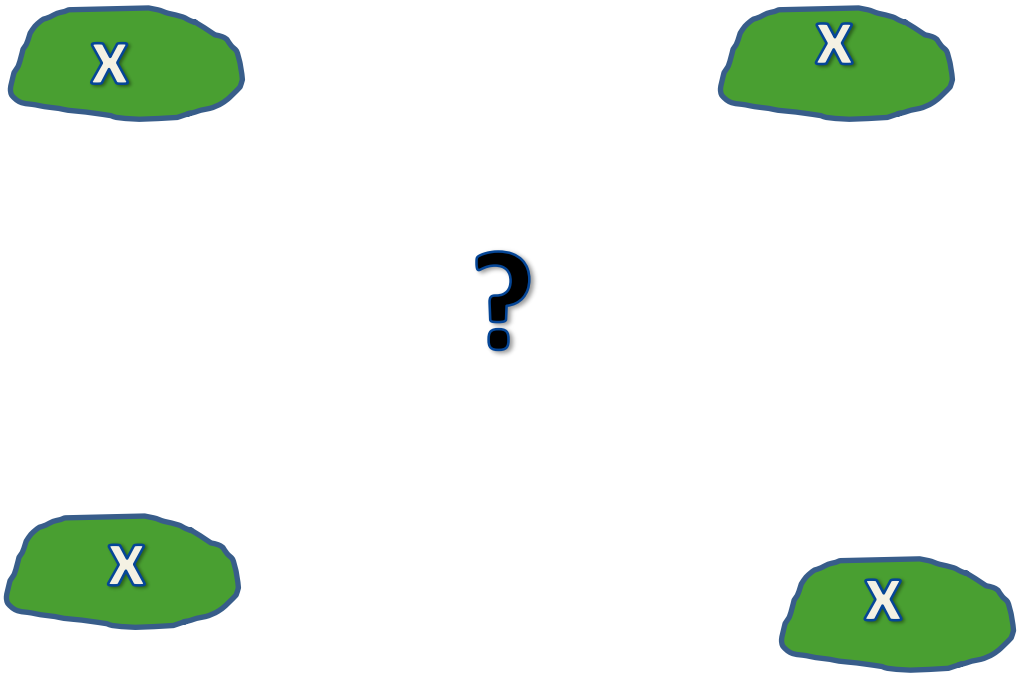


Experimental layout

OBJECTIVE 3: Eradication through host removal



OBJECTIVE 3: Eradication through host removal



Conclusions

- Aggregative behaviour a good indication that small populations will be governed by Allee effects.
- Aggregation:
  - Positive – hotspots can be easily identified and facilitate eradication; trap plants for surveillance at low pop levels
  - Negative – very good at finding their host plant
- Eradication does not mean every last pest individual needs to be killed.
- Habitat removal can contribute to insect eradication at early stage of invasion.