

Dispersal dynamics of willows (*Salix cinerea*) in southeastern Australia – implications for catchment-scale control

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The Problem

Willows are aggressive exotic components of many river systems in southeastern Australia and they have the potential to expand their range. Current control efforts for the most highly invasive species, *Salix cinerea*, are extensive, costly and not always successful due to rapid post removal reinfestation. Improving knowledge of dispersal dynamics of this species will help minimise future expansion and make current control efforts more effective.

Materials and Methods

CSIRO in collaboration with Victorian Catchment Management Authorities is undertaking a multiyear study of the reproductive biology and dispersal of *Salix cinerea*. Here we report results from a single population of this study located on the Ovens River in northeast Victoria.

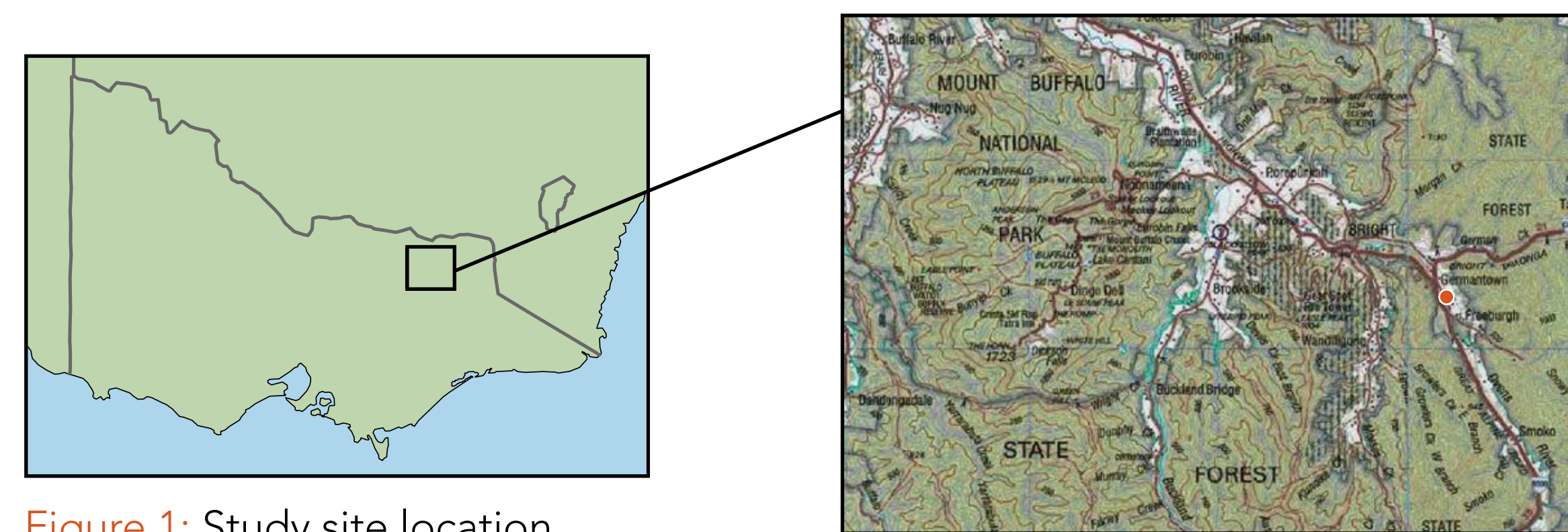


Figure 1: Study site location

Pollination Vector

The relative importance of wind pollination was measured using a pollinator exclusion experiment detecting reduction in seed set when insects were excluded.



Figure 2: Treatments used in pollinator exclusion experiment.

Paternity analysis

To examine the spatial scale of pollen dispersal every adult male (61) and female (50) in the population were sampled and genotyped using 7 microsatellite markers. 20 seeds from each of 15 mothers were collected, grown and genotyped for paternity assignment which was undertaken using genetic exclusion analysis.



Results

Pollination Vector

Our initial aim was to determine the efficiency of insect versus wind pollination.

Levels of wind pollination are variable between trees (0-38%) with the average across the site being 23%.

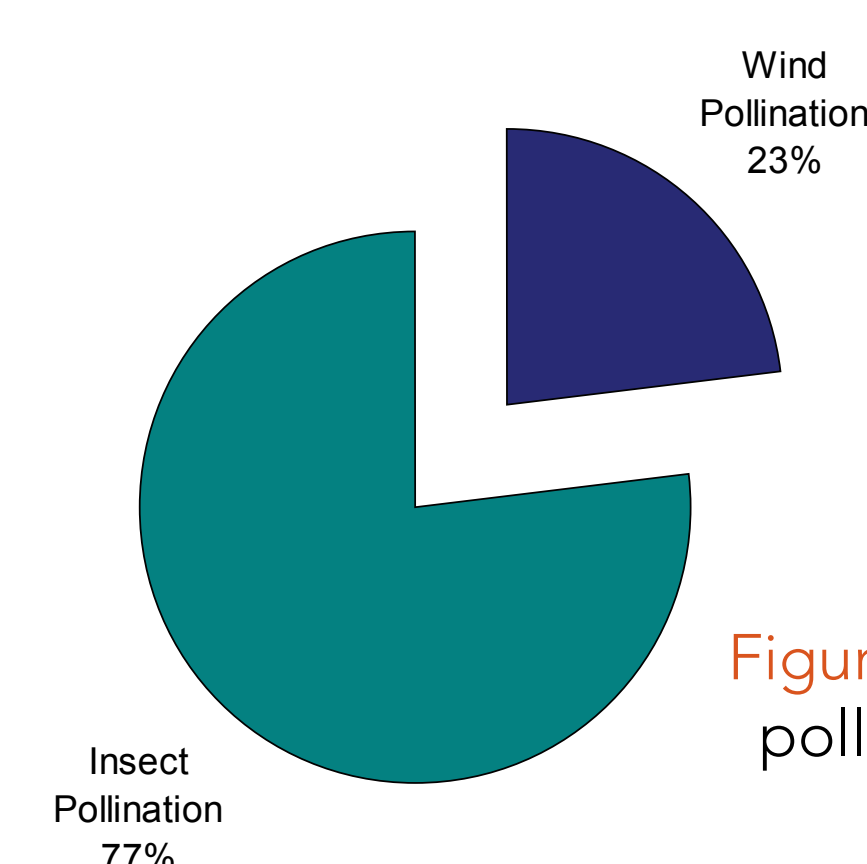


Figure 3: Percentage of pollinations that occur via insect or wind.

Local or foreign paternity

The number of seedlings per mother that could not be accounted for by males within the population (foreign outcrosses) varies from 20 to 80% per mother. However every mother has some foreign pollen contributing to her seedlings. Overall an average of 50% of seedlings are sired by males outside the population.

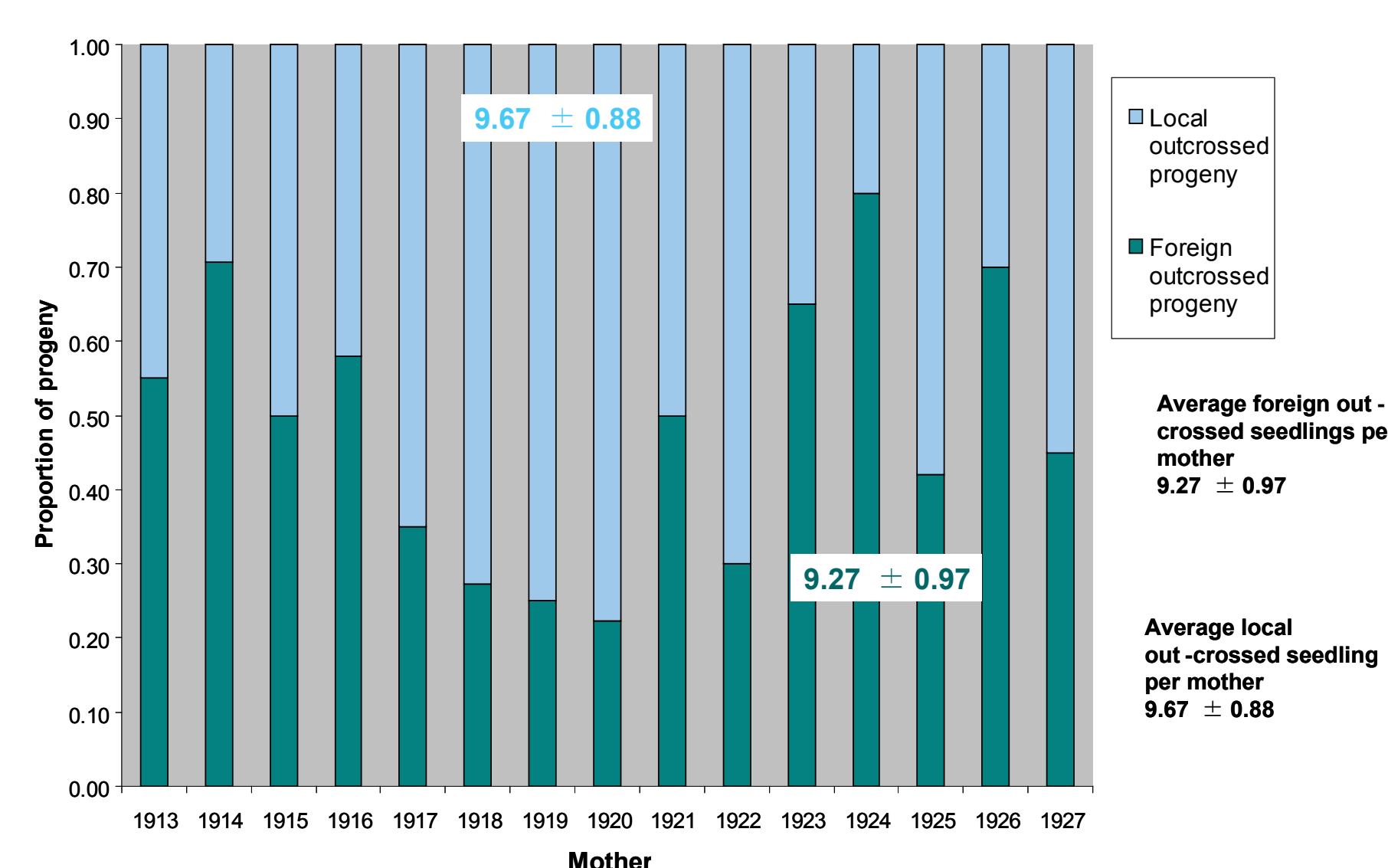


Figure 4: Proportion of seedlings resulting from local and foreign outcross events.

Mating patterns

Local outcrossed seedlings from a mother were generally sired by multiple males. However, male fitness is highly skewed; of the 61 males just 5 were responsible for 41% of pollinations.

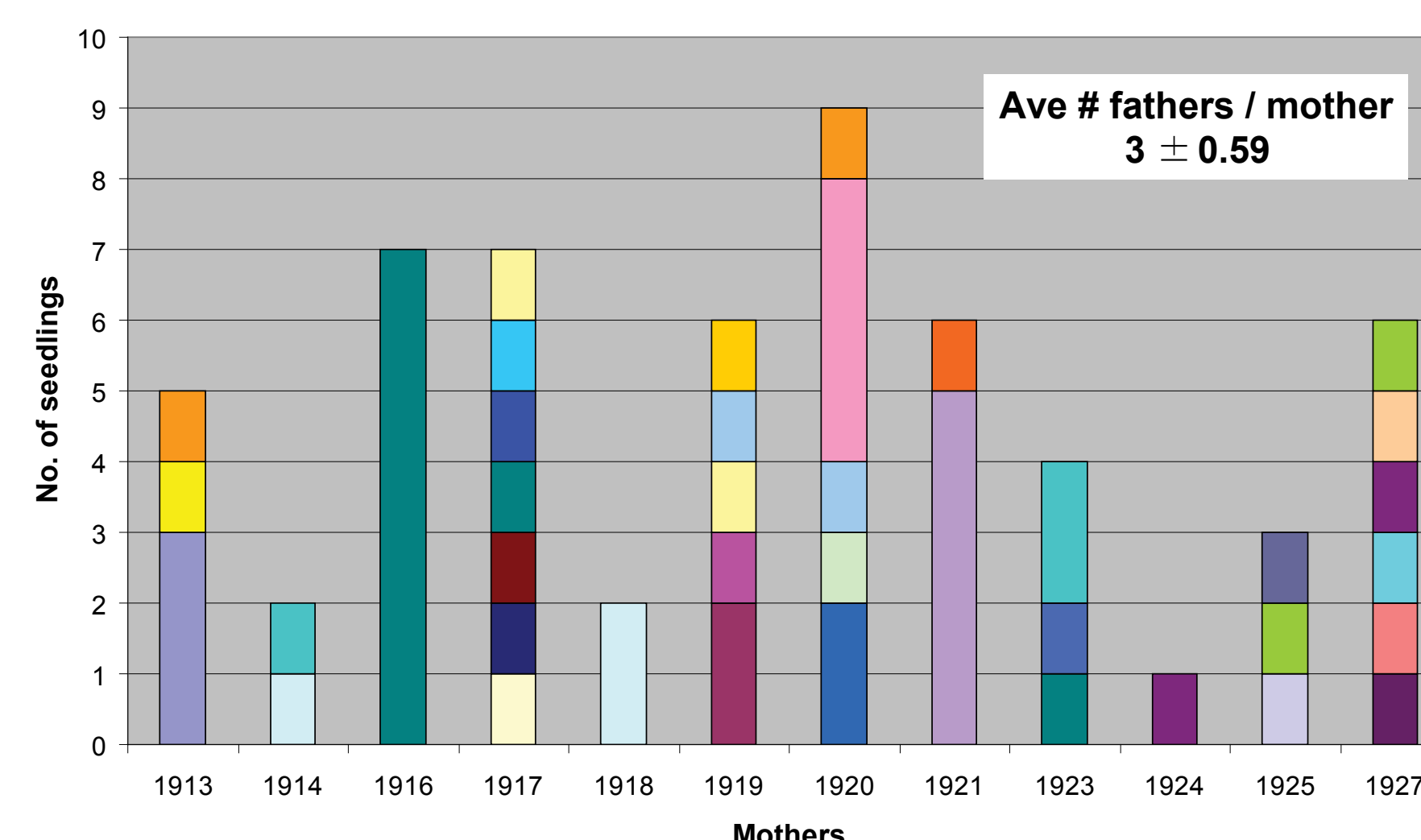


Figure 5: Number of seedlings per mother assigned to local fathers. Different colours represent different fathers.

Conclusions

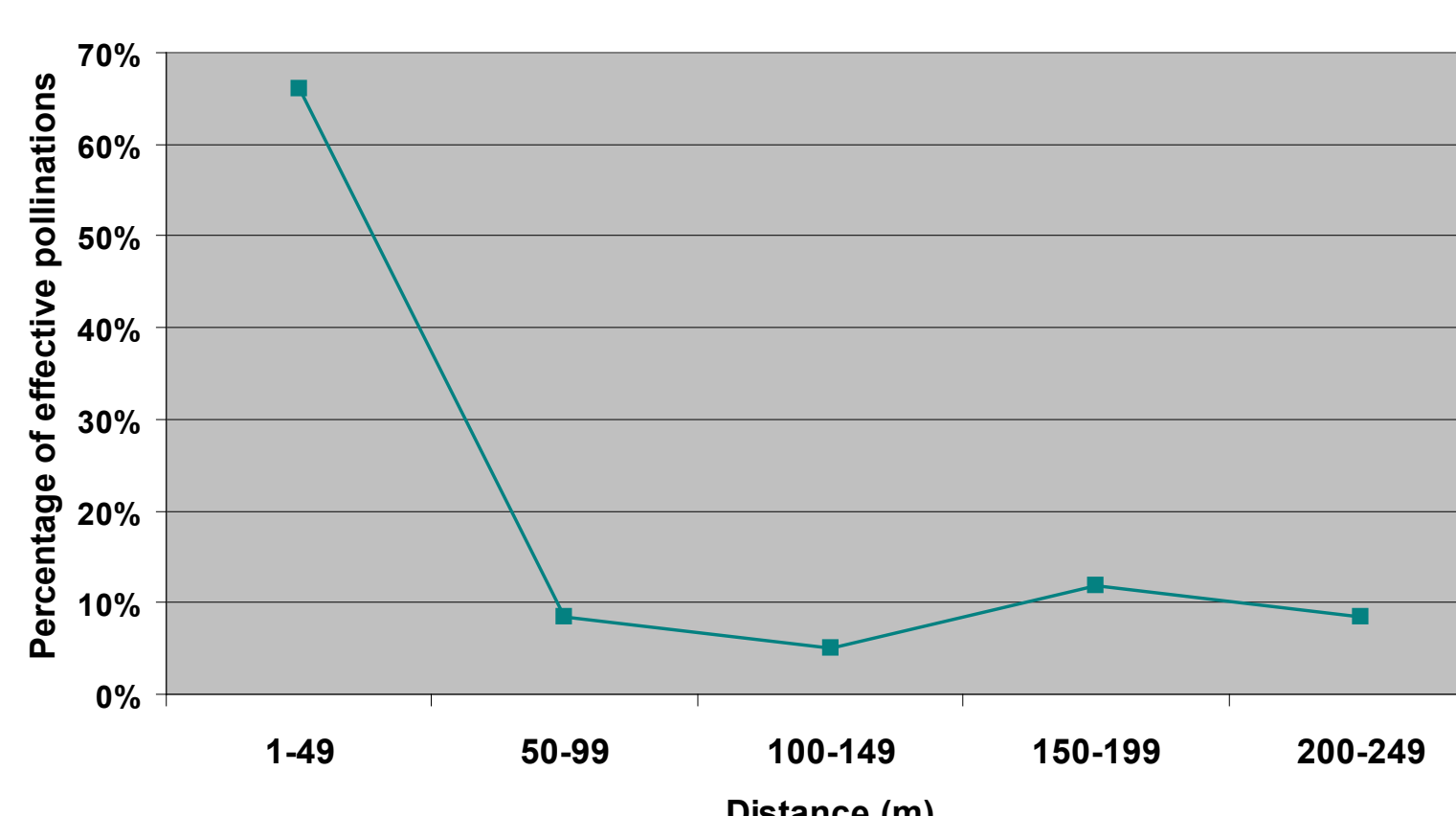
Biology

- Wind pollination accounts for 23% of pollinations
- 50% of seedlings are sired by males outside the population
- Significant variation in male fitness within populations
- 2/3 of local pollination events occur at less than 50 metres

Management

- High proportion of wind pollination has the potential for long distance dispersal
- Within populations, removal of key male pollen contributors could significantly reduce seed set
- Importance of foreign pollen (50% of pollination events) means that scale of control must be bigger than a single population

Pollination distances



Of the local pollinations, 66% occur at less than 50 metres, though pollinations were observed occurring at over 200 metres.

Figure 6: Local pollination distance curve.