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Feral host species limiting the reduction of pesticide use for codling moth

*Cydia pomonella* (L.) in the Adelaide Hills

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**Summary** Urbanisation of horticultural areas is occurring throughout Australia. Management techniques for controlling pests and diseases in these areas are limited by the proximity of neighbouring properties and community attitudes to the use of pesticides. The reduction of host species in close proximity to commercial apple and pear orchards would further reduce a producer’s reliance on pesticides to control codling moth, *Cydia pomonella*, and increase the effectiveness of integrated pest management techniques. A project conducted in the Adelaide Hills by Rural Solutions SA Animal and Plant Control team used two properties as case studies to identify the extent of plant species that would host codling moth within one km of the two properties and the social issues influencing options for resolution of the problem.

The study discusses how Global Positioning System (GPS) technology, a laser rangefinder and Geographic Information System (GIS) software was used to accurately map the extent of host species on neighbouring properties. A survey of landholders identified their knowledge, attitude and commitment to the management of host species adjacent to commercial orchards. In total, 93% of neighbours were willing to either remove or manage their trees. The main barriers to tree removal were time, money, and lack of infrastructure. Approximately 10% of landholders may require legislative compulsion to comply with host tree removal or management. Maps generated in the study provide a clearer picture of the resources required and drivers involved for targeting future extension and management plans. Derelict orchards comprised 2% (22 ha) of the total area mapped and over 1168 feral or roadside hosts were recorded.

**Keywords** Biosecurity, apple industry, GIS, pesticide, codling moth.

**INTRODUCTION**

In South Australia, 80% of the approximately 400 pome fruit growers are located in the Lenswood region of the Adelaide Hills due to optimal growing conditions (Paul James pers. comm., Horticultural Consultant, Rural Solutions SA). Peri-urban land use conflict is an increasing issue facing commercial growers in the Adelaide Hills and elsewhere (Aslin and Mazur 2005, Houston 2005). There has been a notable increase in derelict orchards and feral pome trees as larger established orchards were subdivided and sold. The orchard trees remained intact and new owners lack the knowledge, experience, equipment, or desire, to manage them appropriately. As a result, land-use conflicts between horticulturalists and residents have been occurring. These arise through a combination of local government planning issues and a lack of community awareness of commercial horticultural practices.

Codling moth (*Cydia pomonella* L.) is the principal insect pest of the pome industry in South Australia. Costs of codling moth include rejection of produce, exclusion to major markets and increased insecticide applications. Derelict orchards and feral pome trees harbour residual populations of codding moth that may affect adjacent commercial operations. Retention of unnecessary host trees in the area also has biosecurity implications, providing potential reservoirs for fireblight and making a significant impact on obtaining area freedom status for fruit fly. Whilst the produce itself is not infested, the export market views the possible presence in the area as a risk, with the hosts providing potential harbour.

The pome industry has reduced their reliance on chemicals by up to 75% in the last five years, following strategic planning (Paul James pers. comm.). The community and consumer expectation is that this input needs further reduction. However, the presence of derelict orchards and feral host trees is severely undermining the effectiveness of pest and disease control programs by commercial growers, resulting in a community issue over which the orchardist has no control. Consumers and communities in particular have a major role to play in achieving this long-term goal.

**MATERIALS AND METHODS**

Two case studies in the Adelaide Hills were selected for this project. These commercial enterprises were viewed by the Apple and Pear Growers Association South Australia (APGASA) as being representative of pome producers in the Adelaide Hills.
Grower interviews  Prior to on-ground activities, commercial growers provided an overview of their enterprise, including the main production varieties and harvest times, the main pests and diseases and associated control costs, estimates of increased costs associated with derelict orchards, other perceived impacts on their enterprise and historical data on any previous attempts to resolve the issues.

On-ground mapping  Derelict orchards and feral tree host distribution and abundance were mapped using a differentially corrected global positioning system (DGPS) with sub-metre accuracy. An area of 1 km radius surrounding target commercial orchards was mapped. A Trimble® Laser Rangefinder was used in conjunction with the DGPS offset function to facilitate efficient data collection in inaccessible areas such as waterways, hillsides and private property.

Host species for codling moth were the main targets. Host species for black spot and fireblight were also recorded (Figures 1 and 2). Attributes recorded included abundance and type of infestation, such as a derelict orchard, feral tree, garden specimen or roadside infestation. Field data collection was undertaken during pome flowering periods to facilitate species identification.

GIS analysis  The main objective of the project’s mapping component was the production of target maps for extension and codling moth host management in areas adjacent to commercial growers (Figures 1 and 2).

Three levels of buffer zones were identified following production of derelict orchard/feral tree location maps to assist in the prioritisation of hosts according to proximity to the commercial orchard. Buffer distances around the commercial orchards were based on widely recognised flight distances of codling moth dispersal (Paul James pers. comm.), and were placed at 300 m, 600 m and 1 km. It was assumed that these distances would cover the majority of likely codling moth dispersal events under average seasonal conditions.

Landholder interviews  Landholders of ‘target’ properties (with hosts) identified from the GIS analysis (within the buffers) were contacted either by phone, where possible, or by mail. The purpose was to establish their level of awareness of the problems their trees were causing for commercial growers before access to information flyers and to ascertain whether they were agreeable to assist in the resolution of the problem. Justification for keeping the trees was recorded and likely barriers to future removal or management of the derelict orchards or feral trees were identified.

RESULTS

Grower interviews  Case Study 1 was located in the Ashton area. The 5 ha apple orchard experiences impacts from a derelict apple orchard located across the road. Increased codling moth stings and black spot infestations were observable on the nearest adjacent edge of the commercial orchard. The grower estimates that loss of production from these impacts in the exposed 4–5 rows opposite the derelict orchard is 50%, with a further loss of 10–15% production in the next few rows. Increased costs associated with required spraying for these pests and diseases are estimated at 5–10% of the total spraying costs (approximately $5000). The grower did not view roadside infestations and garden host specimens as significant impacts on the commercial enterprise.

Case Study 2 was located in the Inglewood area. Integrated pest management principles are applied where possible on the 31 ha property. The presence of the derelict orchards and feral trees has a significant negative impact on this type of system. The main impacts reported were from codling moth and black spot, with additional spraying costs increasing up to 15% due to the proximity of the derelict orchards. Roadside hosts were perceived to have significantly less impact on the grower than adjacent derelict orchards, but hawthorn and willows were reported by the grower to harbour pest mites. Necessary use of pesticide near adjacent waterways is also an issue of concern to the grower, providing additional incentive to lowering application requirements.

Previous management attempts  Grower 1 has provided pheromone tags free of charge to a couple of nearby orchards for coordinated and effective control of codling moth. The grower has been unsuccessful in contacting owners of the derelict orchard nearest the commercial orchard. Therefore, there have been no attempts at resolving the situation.

Grower 2 has approached adjacent landholders with varying degrees of success. The grower currently supplies free fruit to one landholder who is slowly removing their derelict orchard and has commenced leasing another neighbouring orchard which was previously derelict. This orchard had not been managed for production in seven years and is now in full commercial production. The landholder of the derelict orchard causing the biggest impact has also been approached by the commercial grower and offered several management options at no cost, but has not been agreeable for apparent social reasons. These
options have included removal of trees, management of codling moth and black spot, leasing of the land and provision of free fruit.

**Target maps** The GIS component of the project revealed that derelict orchards comprised 2% (22 ha) of the total area mapped. In both of the case studies, more than one commercial orchard was noted within the one km buffer zone, indicating further resource efficiencies for an industry-wide implementation of the project.

Over 1168 feral or roadside hosts were recorded, which could have more impacts on commercial orchards than perceived by growers.

**Landholder interviews** Approximately half of respondents reported knowledge of all pests and controls. Of the respondents, 70% expressed awareness of the impact of derelict orchards on commercial growers. Almost 90% of respondents wished to see a reduction in pesticide use by commercial growers. This does not indicate knowledge of current or past levels of use and may be based on a general dislike of chemical use. Nearly half of respondents were unwilling to remove some or all of their host trees, almost 80% expressed willingness to actively manage the trees effectively. In total, 93% were willing to either remove or manage their trees. The main barriers identified by participants for not removing the trees were time, money and lack of infrastructure.

Personal fruit production, stock or personal shade and aesthetics were the main reasons cited for keeping the trees. Two respondents expressed reasoning for maintaining the orchard with respect to future property status approvals and upgrades.

**RECOMMENDATIONS**

**Extension program** An effective extension program will assist in raising the current awareness amongst landholders, increasing their capacity to self-manage their host species and associated pests or even willingness to consider tree removal. Such a program may include information leaflets, local advertising campaigns and contacts available for landholders to obtain further information. Only a relatively small number of landholders would be involved within each commercial orchard’s 1 km buffer zone (based on numbers from the two case studies), so this information can be targeted, such as via direct mail. However, general broad-scale community education would be ideal. Whilst minimal resources would be required to develop and implement such a program, definitions of responsibility and contributors need to be clearly outlined.

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**Figure 1.** Map of target landholders and host species within a 1 km buffer zone for Case Study 1.

**Figure 2.** Map of target landholders and host species within a 1 km buffer zone for Case Study 2.
The grower interviews revealed that the producers themselves currently provide a readily available source of technical information and resources on pest management for their neighbours.

**Legislative changes** Approximately 10% of landholders may require legislative compulsion to comply with host tree removal or management, assuming the results obtained from this project reflect wider community attitudes. Considering the abundance of individual host trees recorded in non-derelict orchard situations (i.e. backyards or roadsides), significant incentives may be required for landholders to participate in the management of such hosts. Surveys to determine the extent of the problem should be given a high priority to assist in clarifying legislative changes.

Legislative changes are viewed as longer-term measures and it is recommended that the process be driven strongly by the industry, local government and the appropriate natural resource management bodies. Local government may have a role to play in the shorter term by exercising powers in development application processes and implementing risk assessment processes when considering changes in land use. Local councils need to recognise the benefits of commercial growers to the community (i.e. wealth generation) and provide support.

**Steering committee** It is recommended that a steering committee be formed to progress the implementation of the project. It is anticipated that this committee would comprise representatives from industry (APGASA), key stakeholder groups (e.g. local government, Environment Protection Agency, natural resources management boards) and technical advisory staff. Objectives could include the identification of funding sources and development of delivery mechanisms. It is envisaged that this group would also have responsibility for overseeing the implementation process, and for providing direction and guidance to the implementation team as required.

**Implementation resource requirements** Many resources are required for the successful implementation of the industry-wide program. Mechanisms for implementation of certain phases of the project are required, such as how the on-ground works will be negotiated between domestic landholders and commercial growers, responsibility for monitoring and follow-up maintenance, and requirements for legislative change.

A scoping report conducted in 2003 (Creeper and Nicholson 2003) identified a number of recommendations and strategies for future management of derelict orchards and feral pome trees. These included the development of a code of practice for the industry, an extension and implementation program and changes to legislation (such as animal and plant control and local planning regulations) where appropriate. Local government planners probably have the greatest opportunity to play a part in supporting industry by establishing priority zones around commercial growers.

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**REFERENCES**

