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Management of invertebrate pests in forests of south-west Western Australia

Ecosystem Science

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Project Team	granted
Program Leader	granted
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Management of invertebrate pests in forests of south-west Western Australia

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Context

Within the history of forest and natural landscape management in Western Australia, many invertebrates are known to utilise forest biomass for their survival and in doing so impart some form of damage to leaves, shoot, roots, stems or branches. There are 10 recognised invertebrate species with demonstrated significant impact on tree health, vitality and timber quality within our natural environment. Currently the most prevalent insect pests of concern in native forests are *Perthida glyphopa* (jarrah leafminer, JLM), *Phoracantha acanthocera* (bullseye borer, formerly known as *Tryphocaria acanthocera* BEB) and *Uraba lugens* (gumleaf skeletoniser, GLS). Both JLM and GLS have documented population outbreak periods, and BEB incidence appears to be responsive to drought stress and is likely to increase. However, Western Australian forests and woodlands also have a history of developing unexpected insect outbreaks with dramatic consequences for the ecosystem health and vitality. The decline in mean annual rainfall in south-west Western Australia since the 1970s and global climate model predictions of a warmer and drier environment mean conditions for invertebrate pests will alter significantly in the next decade as our environment shifts toward a new climatic regime. This project addresses both recognised and emerging/potential invertebrate forest pests, and is designed to augment forest health surveillance and management requirements by providing knowledge on the biological aspects of forest health threats from invertebrates in the south-west of Western Australia.

Aims

- Investigate aspects of pest organism biology, host requirements, pathology and environmental conditions (including climatic conditions) that influence populations.
- Determine distribution of the invertebrate pests, including outbreak boundaries and advancing outbreak fronts, using aerial mapping, remote sensing and road surveys.
- Measure relative abundance of invertebrate pests, including quantitative population surveys and host/environmental impact studies where appropriate and/or possible.
- Utilise appropriate monitoring technologies including GIS and remote sensing.
- Liaise with land managers and the community regarding responses to pest insect outbreaks.

Progress

- Pheromone trapping of GLS was used to quantify the 2014/15 GLS population level.
- More than 250,000 ha of forest was defoliated by GLS in 2010/2011. GLS populations have since decreased from this peak. GLS population changes indicate density dependent mortality is operating in this population decline. The mechanism of density dependent mortality is not yet understood.
- The relationship between November and January populations of GLS larvae was investigated to allow integration of historical and current monitoring data.
- A report summarising results of GLS monitoring 2010-2014 has been prepared and circulated to managers.
- A science information sheet describing the link between GLS outbreak and anomalously low rainfall has been prepared.
- *Cardiaspina fiscella* incidences are increasing in south-west WA and a science information sheet describing the behaviour of this pest insect is being prepared.

Management implications

- Pheromone trapping is effective in monitoring GLS populations and could be used routinely to identify the likelihood of GLS outbreak. Moth populations are a good predictor of subsequent larval populations and may

provide early warning of outbreak events.
- Integration of GLS population and impact data from two major outbreak events will facilitate analysis of links between climatic factors and outbreak development. Preliminary analysis indicates a strong coupling between GLS outbreak and periods of below-normal rainfall at annual or longer timescales.

Future directions

- Refine relationship between moths captures and Normalized Difference Vegetation Index to investigate the spatial structure of the onset and development of GLS outbreaks and the relationship between defoliation rates and leaf area index.
- Finalise and publish findings from investigations of long term population cycles of GLS.