

Development of biological control options for invasive *Salix* in Australia

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Research scope

Riparian and waterway managers in southern Australia invest heavily in the physical control of invasive willows, particularly in Victoria where large-scale invasions have significant degrading impacts on waterway assets. Eradication of invasive willow taxa in Australia is highly unlikely because most species have extensive distributions, seed dispersal occurs over long distances, asexual reproduction is frequent and infestations often occur in remote and difficult to access locations.

Biological control of key willow taxa is necessary to achieve sustainable long-term suppression of infestations and to protect the investment in control works undertaken by waterway managers. Biological control of invasive willows will need to address the complex of species present in Australia, hybridisation between species, the reproductive strategies utilised by willows, the biological attributes of target species, and potential conflicts of interest.

A range of biological control strategies can be designed to address many of the constraints associated with the biological suppression of willows. Strategies can include the targeting of specific organs e.g. seed producing organs, to more aggressive targeting of all main structural components of the host.

Several sequential phases are identified in the construction of a biological control program for willows:

- ◆ Phase 1 - nomination of willows as targets for biological control, modelling the efficacy of bio-control approaches, particularly use of seed-reducing organisms and source population matching of Australian willows to populations within their natural distributions;
- ◆ Phase 2 – Identification of key agents and development of a strategic sequence of evaluation, and host specificity testing;
- ◆ Phase 3 – Application for release of priority agents;
- ◆ Phase 4 – Mass-rearing and redistribution of approved agents.

Results to date

A feasibility study (Sagliocco & Bruzzese 2002) identified a rich herbivorous biota associated with willows in their countries of origin, with many species having considerable potential for biological control of willows in Australia.

A strategic approach to biological control of willows has been documented and specific organism nominated for further consideration and development (Adair et al. 2006).

A biological control program can be undertaken in a series of progressive stages, but for advances to be achieved an operational time frame of around 15 years would be required to address the willow complex in Australia. Operations narrowed to target fewer willow taxa or specific organs of willows could be achieved within a shorter time frame.

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Implications for management

- ◆ Biological control offers to suppress targeted willows on landscape-scale
- ◆ Long-term benefits would accrue following an initial investment outlay
- ◆ The cost:benefit ratio of Australian biological control programs are mostly highly favourable and with high investment in physical control methods, this is likely to be the case for a number of willow species in Australia
- ◆ Biological control offers to protect the huge investment already made for willow suppression in Australia
- ◆ Weakening the fitness of willows rather than attempting to kill plants would allow a gradual successional change in riparian vegetation processes
- ◆ Biological control could be integrated with physical control methods.

Further work needed / gaps

- ◆ Development of Phase 1 of a biological control program
- ◆ Run a two day workshop to develop biological control plans using international and national expertise
- ◆ Construct a model to examine the potential impacts of seed-reducing organisms on selected willow taxa
- ◆ Continue to collate information on agent distributions, taxonomy and specificity from published literature to refine a biological control program

Related publications

Sagliocco, J-L and Bruzzese, E. (2002). Biological control of willows in Australia – A feasibility study. Department of Primary Industries, Frankston, Victoria, Australia.

Adair, R.J, Sagliocco, J-L, Bruzzese, E. (2006). Strategies for the biological control of invasive willows in Australia. *Australian Journal of Entomology* **45**, 259-267.