

ACERA Project 0902

1. **Project Title:** Strategies for managing invasive species in space: deciding whether to eradicate, contain or control

2. **Theme:** Biosecurity framework and development; Risk analysis methods

3. **Rationale:**

The question we raise in this project is where managers should invest their time and money within a region in order to eradicate, contain or control an invasive species? Research which considers both spatial interactions and incomplete observability when managing invasive species is lacking and this work will produce timely and valuable advice to invasive species managers who need to make decisions not only at a local level but for a whole region.

Using a partially observable Markov decision process (POMDP) model and graph theory we will develop new theory and general rules of thumb for optimal decision making for invasive species that accounts for both imperfect detectability and spatial dynamics. We will model dispersal over time and space using graph representation and appropriate decomposition methods, simplifying the spatial problem into tractable management units. Using spatial POMDP would provide a fast and exact solution to this optimization problem but unfortunately solving a spatial POMDP is computationally intractable. To overcome this difficulty minimum cut algorithms can be used to divide an area into tractable sub-areas. The decomposition process will highlight areas with limited connectivity which may require more localized management versus areas that are strongly connected requiring a more regional management approach. This project is unique because it combines spatial dynamics and graph theory with decision theory.

4. **Outputs**

The project will develop a spatially explicit optimization method that addresses management of cryptic invasive species. It will produce a decision support tool for displaying graphs, representing study areas, and recommending management actions over time. It will provide a scientifically defensible basis for decisions to eradicate, contain or otherwise manage invasive species.

The principal scientific outputs will be reports that will form the basis of refereed journal articles. The decision support tool will be available in the public domain. In addition, we will make presentations at scientific conferences and workshops.

- Stage 1. Review and limits of relevant methods for solving spatial POMDP (Report Dec 30th 2008).
- Stage 2. Develop a new optimization method to solve the problem of spatial management of cryptic invasive species (Report Jun 30th 2009).
- Stage 3. Provide and test general rules of thumbs (Report Jun 30th 2009).

5. **Time frame:** Commencing: July 2008; finishing: June 2009

6. Project leader(s)

Title	First name	Surname	Location	Organisation	% Time per year
Prof	Phil	Pollett	Brisbane	University of Queensland	5
Prof	Hugh	Possingham	Brisbane	University of Queensland	5

7. Resources

A. Funds

Financial years of requested funding	06/07	07/08	08/09
Project Total			71,345.72

B. Funds obtained from other sources for this project

(Participant, Industry or Third Party support (cash or in-kind))

Financial years of requested funding	07/08	08/09
Total		40,000

8. End Users