ACERA Project 0806

1. **Project Title**: Application of search theory to invasive-species control programs

2. **Theme**: Surveillance and monitoring

3. **Rationale**:

The management of biological invasions poses many difficulties because the particular course of action taken depends on the expected costs of control relative to the available budget, and it must consider the net benefits of managing the spread of infestations. The costs of controlling an invasion are influenced by factors such as ease of detection, topography, and remoteness of the infested site, as these determine the resources required to search for and control target organisms. The benefits of controlling an invasion depend on the type of landscape under threat. We have developed a model for evaluating the feasibility of eradicating weed invasions in natural environments (Cacho et al., 2006). The model integrates population dynamics, search theory and economics. Search theory was originally developed by the US military to locate enemy submarines and more recently has been applied to search and rescue problems. Search theory offers a convenient method of relating search effort to the probability of locating a target; it also introduces a useful measure of detectability. We have also extended this analysis by incorporating labour and herbicide input equations, undertaking cost analysis and identifying important features of weed control in natural environments (Cacho, Hester and Spring, 2007). Our search and control model provides a quick and rigorous way of obtaining information on the resources required to achieve eradication. We will develop the model to answer a series of questions relevant to biosecurity such as: what is the probability of eradicating an invasion in x years given a budget of y dollars? What is the level of search effort that minimises the cost of eradicating an invasion? How much would it cost to increase the probability of eradication or decrease the time to eradication by a given amount?

4. **Outputs**

The project will produce useful decision-analysis tools for managing invasions and so will result in more efficient use of funds for weed-control programs. A major report will be produced at the end of the project and conference papers will be presented. At least 2 journal papers will be submitted to relevant international journals and a model written in Matlab to replicate the analyses contained in reports will be made available.

5. **Time frame:** Commencing date: 01 January 2008; finishing date: 30 June 2009

6. **Project leader(s)**

Title	First name	Surname	Location	Organisation	% Time per year
Dr	Oscar	Cacho	Armidale, NSW	UNE	15

7. **Resources**

Financial years of requested funding	06/07	07/08	08/09
Salaries and stipends: Susie Hester (0.8 FTE Postdoctoral fellow)		41,211	86,460
Travel: Airfares for participants in Melbourne workshop; Accomodation and other workshop costs; 2009 Australian Agricultural and Resource Economics conference, Perth, 2 participants; Other travel		5,300 4,500 1000	 4,500 2600
Operating and capital: Dual processor computer Matlab mapping toolbox, 2 copies; Matlab statistical toolbox, 1 copy; Maintenance fee for Matlab software;		4,000 700 350	 1,000
Project Total			**151,621**

B. Funds obtained from other sources for this project
(Participant, Industry or Third Party support (cash or in-kind)

Financial years of requested funding	**06/07**	**07/08**	**08/09**
Salaries:			
inkind for Cacho, Spring, Pheloung & Panetta		21,720	43,440
Travel			
Operating			
Total		21,720	43,440

8. **End Users:** DAFF and state biosecurity agencies.