

ACERA Project: 0706

- 1. Project Title:** Evaluating vegetation condition measures for cost-effective biodiversity investment planning.
- 2. Theme:** Natural resource management
- 3. Rationale:**

In much of rural and periurban Australia there is demand for land use intensification and other changes to landuse systems. Such plans often are constrained by vegetation regulations that reflect concerns about increasing risks to biodiversity. However, there is considerable uncertainty about the condition of existing vegetation and the contribution of protected and rehabilitated patches to the viability of species or other elements of biodiversity. Similarly, the economic and social returns from changing agricultural and urban development practices are uncertain. Government agencies need reliable measures of the returns on public investments. A number of policy mechanisms, vegetation condition metrics and related decision support tools have been developed to address trade-offs and to guide biodiversity investment planning. In particular, vegetation condition measures are being developed by State land management agencies to support significant National Heritage investments are related initiatives.

In this project we will explore the utility and reliability of vegetation condition measures to identify the potential of the landscape to deliver both environmental and production outcomes for given levels of uncertainty. We will take a typical scenario, based on the Cumberland Plain in Sydney, involving tradeoffs between biodiversity and economic objectives and will develop a series of trade off curves for each level of uncertainty. These will be generated from simulations of landscape developments which involve vegetation offsets and direct investment in revegetation and which also involve various levels of priority given to the predicted biodiversity outcomes. Once the details of the study design have been finalized, an appropriate simulation platform will be employed. It is planned that a multi-criteria spatial optimisation tool will be modified to include a set of agreed biodiversity metrics to generate the potential landscapes for the case study region. Options include MOSAIC, a generalisation of the SPEXAN reserve design tool that was developed by Possingham, Ball, Taplin and Lawson, and ZONATION, developed by Moilanen and Kajula at the University of Helsinki. We will then evaluate optimal or near-optimal tradeoffs for their robustness to uncertainty in the assessments.

The study protocol will proceed as follows;

1. Develop plausible land change scenarios involving economic investment and economic and biodiversity returns
2. Compile data from the Cumberland Plain to support implementation of the scenarios (DEMs, vegetation maps, soil maps, species distributions, land values, cadastral layers)
3. Specify landscape-level planning goals.
4. Outline management options to achieve biodiversity goals.
5. Develop models that reflect expected response patterns and uncertainties in vegetation condition and biodiversity values that result from alternative management options.
6. Develop models for uncertainties in measures of vegetation condition
 - a. Models for operator error
 - b. Models for errors in representing specified key biological parameters

7. Map distribution of remnant vegetation patches in the Cumberland Plain (or a section of it).
8. Outline a budget for investment in biodiversity protection and rehabilitation.
9. Rank patches for management and invest in mitigation and rehabilitation strategies.
10. Calculate expected utility of alternative actions, and the robustness to uncertainty in vegetation condition measures, response functions, and economic costs and benefits.

The results will evaluate the efficacy of vegetation condition measures to support strategies to achieve landscape management objectives, and the robustness to uncertainty of planning strategies.

4. Outputs:

- a. Assessments of the robustness of vegetation condition metrics and economic measures to uncertainties in parameter estimates and structural assumptions.
- b. Recommendations for general strategies that will improve the reliability of biodiversity and economic outcomes in vegetation tradeoff and offset schemes.

5. Time frame: Commencing: *January, 2007*; Finishing: *September, 2007*

6. Project Leader(s):

Dr	Kenton Lawson	ABARE
Dr	David Keith	DCE, New South Wales
Dr	Graeme Newell	Arthur Rylah, DSE, Victoria
Dr	Changhao Jin	Arthur Rylah, DSE, Victoria
Ms	Emma Gorrod	UM (PhD student)
Dr	Yakov Ben-Haim	Technion
Prof	Mark Burgman	ACERA

7. Resources

	06/07	07/08
Project Total	58,000	87,000