Non-use Values of Victorian Public Land:
Case Studies of River Red Gum and East Gippsland Forests

URS Australia Pty Ltd, June 2007

Executive Summary

The Victorian River Red Gum (RRG) forests, wetlands and floodplains of the Murray Valley, and the forests of East Gippsland (EGF), are valuable environmental resources with many, sometimes competing, land uses giving rise to benefits for a wide range of people. Determining the appropriate balance of these uses from a society-wide perspective requires information about the relative economic values generated from those uses.

Information about the commercial value of timber production, mining and grazing in the River Red Gum and East Gippsland forests is readily available from the markets in which the products are exchanged and are not the focus of this study. More problematic is the estimation of values associated with forest benefits that are not marketed. These benefits arise from recreation and tourism activities, ecosystem conservation and protection of cultural heritage.

Choice modelling

Considerable effort has been applied to the development of non-market valuation techniques over the past 30 years, particularly in the US, UK and Australia. One of these techniques, Choice Modelling (CM), was applied in this study of the River Red Gum and East Gippsland Forests.

Choice modelling is a *stated preference* non-market valuation technique. The key advantage of using the technique is that it is capable of assessing non-use values – the values that people in the community might hold for environmental assets, irrespective of whether they have direct or indirect contact with them. Non-use values are a key subset of non-market values and reflect the value that people obtain, for example from knowing that ecosystems will be protected for future generations.

The CM technique involves a sample of people being asked to make a sequence of choices between outcomes of various resource management strategies. The outcomes are described by a set of attributes that take on different levels.

Designing the application of the choice modelling methodology involves several tasks:

- defining the set of attributes used to describe the non-market benefits derived from forests. This requires that the views of forest managers and scientists and the views of the communities be considered;
- setting the ranges over which the attributes are varied for each forest area;
- developing questionnaires to assess the values attaching to the attributes in each relevant community; and
- designing and printing questionnaires and information posters.

Questionnaire development

The selection of attributes and their levels was made in consultation with appropriate experts and the community. Community focus groups were held in Melbourne, Echuca and Bairnsdale.

For each of the forest areas, the appropriate ranges over which the attribute levels may vary over 20 years under current management strategies (with no new initiatives), and with options for enhanced management, were determined by Victorian Environmental Assessment Council (VEAC) staff and experts in the relevant fields. The following two tables summarise the results of that process, and the options for annual payments included in the questionnaires.

Attributes and their levels for River Red Gum forests

Attribute	Description	Levels
Cost	Compulsory annual payment ($)	0; 20; 50; 100
Healthy RRGs	Area in hectares	54,000; 67,000; 74,000; 80,000
Threatened Parrots	Number of breeding pairs	900; 1,200; 1,500; 1,800
Murray Cod and other threatened native fish	Percentage of pre-European numbers	10; 20; 40; 60
Recreation Facilities	Number of campsites with facilities	6; 9; 12; 18

Attributes and their levels for East Gippsland forests

Attribute	Description	Levels
Cost	Compulsory annual payment ($)	0; 20; 50; 100
Threatened Owl Species	Number of breeding pairs	400; 440; 460; 500
Threatened Long-footed Potoroos	Number of individuals	2,000; 2,500; 3,000; 4,000
Significant Rainforest Sites	Number of hectares protected	3,350; 4,000; 4,500; 5,000
Old Growth Forest	Number of hectares protected	172,000; 190,000; 215,000; 240,000

The survey materials contained the following main elements:

- background information about the forest areas in the form of full colour information posters which also contained maps of VEAC's study areas;
- questions relating to respondents' attitudes towards, and uses of, these forests;
- explanations of the issues and trade-offs in use of the forests, ways in which management might be improved, why people should have to pay for improving forest health, how they might do this, and what could be achieved;
- the choices between alternative forest management strategies;
- debriefing questions; and
- questions to establish the socio-economic characteristics of respondents.

Survey logistics

Previous research has found it appropriate to involve both the community within each study region and the general community outside the region – due to the possibility of people in different regions holding different values for the forest attributes. The following table summarises the sampling design that was used to take these effects into account.

The 'drop off/pick up' (DOPU) method was selected as the survey method. This method involves survey personnel visiting randomly selected households, providing a brief explanation of the survey, requesting the household's participation, then leaving a hard copy of the questionnaire and making arrangements to pick up the completed questionnaire at a convenient time.

Selection of Samples

	REGION				
	Melbourne (out of region)	**Murray Region**		**Gippsland Region**	
STUDY AREA					
River Red Gum forests (RRG)	1. Metro	2. Echuca 3. Mildura 4. Wodonga	5. Rural	6. Bairnsdale (out of region)	
East Gippsland forests (EGF)	7. Metro	8. Rural (out of region)		9. Bairnsdale	10. Rural

The consultants contracted the Lions Clubs in each of the urban survey regions and the response rates were comparatively high for these regions. Surveys in rural areas outside cities were undertaken by Catchment Management Authorities (CMAs) and Landcare Groups, but collection rates in these areas were lower, except in East Gippsland, with collectors suggesting that the drought had a major impact on response rates.

The surveys were conducted in November 2006.

Results for River Red Gum forests

A total of 1,045 questionnaires were collected for the River Red Gum (RRG) survey, with 487 respondents from the in-region urban sub samples of Echuca, Mildura and Wodonga. A total of 257 questionnaires were collected in the outside-region urban sub sample (Melbourne) and 239 questionnaires in the rural outside-region sub sample (Bairnsdale). There were 62 respondents from the in-region rural sub sample.

Comparisons with ABS data showed that the RRG sample characteristics were broadly representative of their respective populations.

The variables used in the RRG models to explain respondents' choices across the various outcomes and the technical details of the models are provided in the main report.

The 'Cost', 'Parrots' and 'Cod' attributes are highly significant factors in explaining respondent choice in all sub samples with the expected signs. 'Healthy RRGs' is significant and positive in the Melbourne and Bairnsdale sub samples. Reducing the costs, increasing the area of healthy RRG forests, increasing the number of threatened parrot pairs or increasing the percentage of pre-European populations of Murray Cod and other threatened native fish will increase the probability of people selecting a specific choice alternative. Hence higher levels of these environmental attributes are associated with higher levels of respondent well-being.

Most of the significant socio-economic variables have the expected signs. 'Income', 'visitation' and 'education' are predominantly positive, as is understanding of the information provided on the survey poster. Accordingly, higher levels of these variables are associated with respondents choosing alternatives that involve environmental improvements.

A consistent result across the River Red Gum sub samples is that respondents who did not reveal their income were less likely to support changes in forest management. As expected, respondents who are members of an environmental organization were likely to support changing forest management, and respondents who are associated with agricultural industry in the 'within region' sample preferred the current situation. Respondents' association with the timber industry did not have a statistically significant effect in the models.

Different outdoor activities in the Murray River Red Gum forests are significant between sub samples. While bushwalking is positive and significant in the Melbourne and 'within region' sub samples, bird-watching is positive only in the 'within region' sub sample. The fishing

variable is negative and significant in the Melbourne and Bairnsdale sub samples, indicating recreational fishers would prefer no change, contrasting with the significant overall support for increasing populations of threatened native fish from those sub-samples.

The full models described in the main report have been used to estimate the marginal values of the Healthy RRGs, Parrots, Cod and Recreation attributes. These values are expressed in terms of *implicit prices*: the marginal willingness to pay of the average respondent household over a 20 year period for a unit increase in the attribute.

The results in the table below show that respondents in the Bairnsdale and Melbourne sub samples are willing to pay $3.29 and $1.45 respectively for a 1,000 hectare increase in the area of healthy River Red Gum forest (per annum per household for 20 years). Within region respondents recorded an implicit price for increasing the area of healthy forest that is not significantly different from zero. Respondents were found to attach a positive value to increasing the numbers of breeding pairs of threatened parrots, ranging from around $4 to $8.40 per 100 pairs. The implicit price for a one-percent increase in the populations of Murray Cod and other threatened native fish species varies across the sub samples from about $1 to $1.40. Implicit prices for the recreation attribute are not significant for any of the sub samples.

Implicit Price Estimates for River Red Gums

Sub sample →	Melbourne ($/yr/hh)	Bairnsdale ($/yr/hh)	Within region ($/yr/hh)
Attribute ↓			
Healthy RRGs /1,000 ha	1.45***	3.29**	0.0677
Parrots /100 pairs	4.39***	8.39***	3.96***
Cod /1% increase	1.02***	1.37***	1.09***
Recreation /campsite	-0.11	-0.85	-0.24

Significance levels indicated by: * 0.1, ** 0.05, *** 0.01.

The non-significance of the recreation/campsite attribute may be due to a conflict of preferences between those seeing positive outcomes (eg. more facilities providing a better camping experience) and those seeing negative outcomes (eg. more facilities leading to more congestion). Managers should weigh these tradeoffs when considering the development of public land.

Results for East Gippsland forests

A total of 723 questionnaires were collected, with 269 questionnaires from the outside-region urban (Melbourne) sub sample, 316 questionnaires from the in-region urban sub sample (Bairnsdale) and 112 questionnaires from the in-region rural sub sample. There were insufficient respondents (26) in the outside-region rural (Murray) sub sample to warrant model estimation.

The socio-economic characteristics of the EGF sample data are broadly similar to those for ABS data for the parent populations.

The variables used in the EGF Choice Models and the technical details of the models are provided in the main report.

Other than Rainforest sites in the Bairnsdale sub sample, all choice attributes are significant across the three samples and have the expected signs. Increasing the numbers of Owls or Potoroos and increasing the area of protected Rainforest sites or Old growth forest will increase the well-being of respondents.

The effects of socio-economic characteristics on East Gippsland forest management alternatives differ across sub samples. Age is positive in the Melbourne sub sample – older respondents are more likely to favour improved environmental management – but it is

negative in the Bairnsdale sub sample. Education and (outside Melbourne) income are both positive, indicating that higher income or more years of education increase the probability of supporting changed management. Women are more likely to support changed forest management, contrasting with the River Red Gum area where there was no consistent gender trend.

For Melbourne and East Gippsland Rural sub samples, as expected, respondents who are members of an environmental organization were likely to support changing forest management, and respondents who are associated with agricultural industry preferred the current situation. Of the activity variables, Melbourne respondents who have swum or fished in East Gippsland support change, as do bird-watchers from the Bairnsdale and East Gippsland Rural sub samples, while hunters amongst Bairnsdale respondents and recreational fishers in the East Gippsland Rural sub sample prefer the status quo.

The implicit prices for East Gippsland are shown in the table below.

The marginal willingness to pay (per annum for 20 years per respondent household) for increasing the number of breeding pairs of threatened owl species is significant for all sub samples, ranging from 18 to 83 cents per breeding pair. The annual implicit price for increasing the number of threatened Long-footed Potoroos by 100 individuals varies between $1.20 for Bairnsdale respondents to $4.50 for East Gippsland Rural respondents. Respondents in the Bairnsdale and Melbourne sub samples are willing to pay, on average per annum, 33 and 65 cents for a 1,000 ha increase in the area of protected old growth forest. Rural East Gippsland respondents were found to be willing to pay $2.05 for the same increase.

The implicit prices for a 1,000 ha increase in identified rainforest site protection are significant in the Melbourne and East Gippsland Rural sub samples, and are in the order of $11 and $53 respectively. In contrast with the River Red Gum area, East Gippsland Rural respondents – those closest to and most familiar with the region – were willing to pay the highest amounts for all attributes.

Implicit Price Estimates for East Gippsland Forests

Sub sample →	Melbourne ($/yr/hh)	Bairnsdale ($/yr/hh)	East Gippsland Rural ($/yr/hh)
Attribute ↓			
Owls/pair	0.18**	0.24**	0.83*
Potoroos/100 individuals	1.50***	1.23***	4.50**
Rainforest/1,000 ha	11.16**	8.10	53.08*
Old growth forest /1,000 ha	0.65***	0.33**	2.05**

Note: Significance levels indicated by: * 0.1, ** 0.05, *** 0.01

Application to Benefit Cost Analysis

The implicit prices estimated from the choice data are directly applicable to the consideration of alternative forest management options. Specifically, they are compatible with the principles of Benefit Cost Analysis (BCA). The process of employing implicit prices in BCAs involves four basic stages.

1) Predicting the impact of a management change on the attributes used in the choice modelling exercise relative to the predicted continuation of the 'status quo'.

2) Multiplying the implicit prices by the respective predicted attribute change to estimate the per respondent household willingness to pay for each attribute change.

3) Aggregating the per respondent household willingness to pay across all attribute changes.

4) Extrapolating across the relevant population, using the survey response rate, to estimate the societal willingness to pay for the management change.

A hypothetical example is used in the main report to illustrate these key stages, involving the setting aside of part of a River Red Gum forest as a nature conservation reserve rather than production forest. Consultation with bio-physical scientists and forest managers yield predictions that the change in land use will cause (over the next 20 years) approximately:

- 500 more hectares of healthy River Red Gum forests
- 10 additional breeding pairs of parrots
- 5 per cent more of pre European numbers of Cod
- 2 more camping sites with facilities

The example shows that the gross benefits of the proposed change amount to a total for Victoria of $6.5m per annum over 20 years.

With this estimate of the environmental benefits arising from the change in forest management, it is possible to assess the net impact on community well-being that results from the change. This would require estimation of the opportunity costs imposed by restricting other uses of the land area, such as timber harvesting or grazing. In this way, the implicit prices determined in the choice modelling exercise are a key component of the information required by decision makers to assess the economics of alternative future management options.

Conclusions

A key aim of this report has been to demonstrate the use of choice modelling as a practical tool to assist natural resource managers in deciding between alternative future management options. For many years, the use of BCA as a decision making tool was limited in contexts where non-marketed environmental benefits and costs were important, because of the difficulties associated with generating robust and accurate estimates of value. The development of non-market valuation techniques over the past 30 years has resulted in the ability to estimate these values more accurately, which has increased the usefulness of BCA to decision makers.

In particular, Choice Modelling has been shown to have particularly attractive features as a non-market valuation technique. Its capacity to generate implicit prices for environmental attributes that can then be used to estimate values arising from multiple scenarios of resource management is useful when specific alternatives have not been predetermined in the policy process. In the VEAC application outlined in this paper, the flexibility this characteristic of choice modelling affords makes it especially suited. Choice modelling results of the type presented here allow decision makers to explore the benefits of multiple alternatives through a single study.

There have been few original Victorian surveys of the type reported here. In the past, many evaluations of environmental benefits have relied on extrapolating results from interstate or overseas. Hence there are few estimates available for the values of environmental benefits and costs arising from changes in resource management in Victoria. The results reported here provide a contribution to a growing database of environmental values that will prove useful to wider policy formulation. With a strong database in place, value estimates may be ‘transferred’ from already completed studies to new contexts where policies are being formulated. This is the essence of the process referred to as ‘benefit transfer’.

In the absence of estimated environmental values, economic assessment of policies, programs and projects will often be seriously deficient.