Applying contingent valuation estimates to state-wide assessment of a proposal to protect river segments in Victoria

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ABSTRACT

The purpose of the study was to provide a social and economic appraisal of draft recommendations of the Land Conservation Council's "Rivers and Streams Special Investigation", mandated by government. The recommendations aim at protecting the nature conservation, cultural heritage, recreation and scenic values of particular rivers and their corridors in Victoria, and include protection of some 46 essentially natural (referred to as 'high naturalness') catchments of small streams.

Streamside land tenure includes state and national parks, reference areas, wilderness areas, natural feature and scenic reserves, state forests, and public land water frontages. Freehold land was excluded from the study.

The draft recommendations may have implications for: water resource use; timber production; mineral and stone exploration and production; hydro-electricity generation; livestock production; tourism; nature conservation, cultural heritage, recreation and scenic values; and industry.

A focus of the study was the valuation of 'non-market' or 'unpriced' social benefits and costs. Despite the general availability of techniques for valuing unpriced items, their application is expensive, requiring substantial surveys and effort to collect the necessary data. Such surveys were beyond the scope of this study given the range of environmental values to be covered and the time and funds available. Instead, the authors collated estimates from Australian, USA and New Zealand environmental economics research.

In evaluating the environmental and recreational benefits, what we would ideally like to measure in dollar terms is the net change to the welfare of Victorians that is expected to be brought about by the recommendations. Many of the forms of recreation that may be associated with the LCC proposals are readily available elsewhere in the state, or would not be significantly affected on the candidate rivers even if the recommendations were not adopted. To simplify the analysis and reduce the risk of over-stating environmental and recreational values, the forms of recreation for which resource requirements are readily met, such as bushwalking, camping, wildlife hunting and most forms of flat water boating, were excluded. That is, it was assumed that the LCC proposals will generate no net benefits in these areas.

Instead, the authors focussed on valuing the special environmental and recreational characteristics that were used by the LCC as selection criteria for the candidate rivers. It was assumed that the LCC has accurately identified the set of river segments having the highest standards for these characteristics in the state, that the segments are individually unique, and that there are no 'next best' alternatives for providing the values identified on the segments.

Regional visitor data to national and state parks were used as a measure of current demand and the extent to which the candidate rivers and catchments will be valued, either through use values or preservation values. The authors attempted to offset 'additivity' as a potential source of serious over-estimation of environmental values by: collating the values for categories rather than individual species; taking estimates from studies which value wildlife preservation generally rather than value individual species; and by the way in which the valuations are weighted across the state from regional visitor data.

It is difficult to imagine conditions under which market arrangements would offer a similar package of protected rivers and catchments to the public. In addition, because the proposals are confined to public land and also involve the assessment of timber, water and mineral resources which are under public management to varying degrees, the LCC proposals are ideally suited to the application of contingent valuation procedures within a social benefit-co framework.

The overall impression to be gained from the study is that the proposed recommendations for protecting the rivers and streams are likely to lead to net increases in the welfare of Victorians.

INTRODUCTION

The purpose of the study was to provide a social and economic appraisal of the draft recommendations of the Rivers and Streams Special Investigation conducted by the Land Conservation Council of Victoria. The conclusions of the study are a source of information for the Council in making its decisions on proposed recommendations. The draft recommendations aim at protecting the nature conservation, cultural heritage, recreation and scenic values of 23 rivers and their corridors in Victoria, and include protection of some 46 essentially natural (referred to as 'high naturalness') catchments of small streams.

The level of protection is proposed to vary according to the values being protected. In river corridors with sensitive values, a high degree of protection is proposed, similar to that in the most important conservation reserves. This could lead to the restriction of some resource uses. Many potential land uses would modify the essentially natural catchments, so where the catchments are to be protected, these uses would be excluded.

Streamside land tenure includes state and national parks, reference areas, wilderness areas, natural feature and scenic reserves, state forests, and public land water frontages. Freehold land was excluded from the study.

The draft recommendations may have implications for: water resource use; timber production; mineral and stone exploration and production; hydro-electricity generation; livestock production; tourism; nature conservation, cultural heritage, recreation and scenic values; and industry.

An outline of the draft recommendations for each candidate river corridor is included in the summary tables in Appendix S[1]. The draft recommendations for the high naturalness catchments preclude in-stream structures or water diversion, timber production, mining, agriculture and industrial development.

Execution of the study required liaison with staff from the Land Conservation Council, Department of Conservation and Environment, Rural Water

[1] Appendices are available from the authors.

Commission, Board of Works, Department of Industry, Department of Agriculture and Rural Affairs, State Electricity Commission, and the Department of Sport and Recreation.

This paper focuses on the environmental component of the study.

THE EVALUATION OF ENVIRONMENTAL BENEFITS[2]

Substantial methodological development in the valuation of environmental benefits has occurred in recent years, with a range of new and innovative valuation methodologies emerging (Loomis and Walsh 1986). This methodological innovation could provide a balanced policy perspective on the environment, where a lack of information and market prices threatens to undervalue or ignore environmental attributes in relation to development projects where the financial attributes are explicit.

With a range of evaluation techniques emerging in recent years, the need to consider fundamental methodological and comparative issues in the various approaches themselves has become apparent (Adamowicz and Phillips 1983; Bishop and Heberlein 1979; Brookshire et al. 1982; Cummings, Brookshire and Schulze 1986; Rowe and Chestnut 1983; and Schulze, d'Arge and Brookshire 1981). How can some of the methods be improved, extended or supplemented? How useful is the output from these techniques for policy making?

This section firstly considers the range of available valuation methods - their theoretical basis as well as application issues - and concludes with a discussion of the policy relevance of the respective approaches. The material provides the methodological basis for the estimation of environmental benefits in the study.

ENVIRONMENTAL BENEFITS

Species and ecosystems are valued for a variety of uses and reasons (Brown 1985; Randall 1986). The categories of uses include:

[2] The next two sections draw on an earlier paper by Jakobsson and Dragun (1989).

1. USE VALUES

Use values include both consumptive and non-consumptive considerations. For example, environmental resources may be a source of raw materials, pharmaceutical products, recreational use and aesthetic satisfaction. Use values may be differentiated thus:

(i) Direct productive values where certain species are harvested for the sale of their products.

(ii) Direct consumptive values, such as recreational fishing, hunting, plant collecting and so on.

(iii) Indirect productive values where some species provide food for productive species

(iv) Nonconsumptive uses such as bushwalking, camping, viewing or photographing and other categories such as the knowledge obtained to improve agricultural crops.

2. NON-USE OR INTRINSIC VALUES

(i) Option value

Option value can be considered as a risk premium when there is uncertainty about the future demand or supply of environmental services, where consumer surplus would underestimate value. For example, it might be the amount people are willing-to-pay to retain an area as a park, so they might have the option to visit it in the future.

There has been much debate in the literature on the definition and sign of option value - especially whether it is always positive (Freeman 1984; Smith 1983). There is also debate as to whether option value is an adequate way of accounting for uncertainty (Bishop 1978; Kennedy 1987). The uncertainty associated with option value is composed of two parts - the individual's uncertainty about their future demand for use of a resource and uncertainty about whether the resource will still be there to use. For supply uncertainty alone, option value is positive. It seems likely that the overall option value

will be positive when uncertainty on the supply side is large and the resource is unique, as is the case with endangered species (Chisholm 1988).

(ii) Quāsi-option value

Quasi-option value is the value of preserving options, given an expectation of gaining more information with time. Thus, for any species there is a positive probability that a new use with a positive value will be discovered (Randall 1986). With extinction, the probability of discovering a use drops to zero. Quasi-option value is also a means of accounting for uncertainty.

(iii) Existence value

Existence value is the value obtained from knowing something exists, independent of any current or expected future use - for example, knowing that blue whales and giant wetas exist, even if the chance of seeing one is very small or non-existent.

Randall (1986) lists three altruistic motives which might account for existence values:

- *Philanthropic* - the resource is valued because contemporaries may wish to use it.
- *Bequest* - future generations may wish to use it.
- *Intrinsic* - individual humans care about nonhuman components of ecosystem.

Empirical studies on the nonconsumptive uses as well as the option and existence values of wildlife, indicate that these values may be significant - even for relatively unknown species such as the Wisconsin striped shiner (Boyle and Bishop 1987; Cummings, Brookshire and Schulze 1986).

REVIEW OF METHODS USED IN EVALUATING ENVIRONMENTAL COSTS AND BENEFITS

A range of methods are available by which the benefits and costs of environmental amenity may be evaluated. These include:

1. **Indicative values**

These include replacement value/alternative costs and the price of genetic resource intensive products.

2. **Revealed preference methods**

   (a) contributions to private conservation organisations, media coverage of a species, protest action and the like.
   (b) discrete choice procedures
   (c) travel cost methods
   (d) hedonic price analysis/household production function

3. **Contingent/hypothetical valuation techniques**

   (a) surveying
   (b) utility analysis
   (c) priority evaluator technique

The techniques used most widely for evaluation of environmental goods are revealed preference methods such as travel cost and household production functions, and contingent valuation methods.

Revealed preference methods have been used successfully for studies of the recreation and hunting values of wildlife, but they are not generally applicable to wildlife preservation as they fail to capture the non-use values of preservation. Contingent valuation techniques are the only methods which measure non-use values - such as existence and option values which can form a significant component of the total value. For example, Walsh et al. (1985), found that non-use public preservation values accounted for two-thirds of the benefits from preserving endangered species in Colorado -

recreation accounted for the other third. Jakobsson and Dragun (1989), among others, discuss the strengths and weaknesses of the cv approach.

THE ESTIMATION OF ENVIRONMENTAL VALUES FOR CANDIDATE RIVER CORRIDORS AND HIGH NATURALNESS CATCHMENTS

In evaluating the environmental and recreational benefits due to the draft LCC recommendations, what we would ideally like to measure in dollar terms is the net addition to the welfare of Victorians that is expected to be brought about by the recommendations. Many of the forms of recreation that may be associated with the LCC proposals are readily available elsewhere in the state, or would not be significantly affected on the candidate rivers even if the recommendations were not adopted.

A similar situation exists here to that faced by the Centre of Policy Studies (1983) assessment of the recreational value of Victoria's irrigation system. They concluded that the recreational benefits which could be attributed to the system were very small. For similar reasons to those presented at length in the Centre of Policy Studies report; to simplify the analysis; and to reduce the likelihood of over-stating environmental and recreational values, we have attempted to exclude the forms of recreation whose resource requirements are readily met, such as bushwalking, camping, wildlife hunting and most forms of flat water boating. That is, we have assumed that the LCC proposals will generate no net benefits in these areas.

Instead, we have focussed on valuing the special environmental and recreational characteristics that were used by the LCC as selection criteria for the candidate rivers. We have accepted that the LCC has accurately identified the set of river segments having the highest standards for these characteristics in the state, that the segments are individually unique, and that there are no 'next best' alternatives for providing the values identified on the segments.

Where the draft LCC recommendations exclude e.g. timber harvesting, we have assumed that none of the special environmental characteristics will be retained if logging were allowed. As we note in the section on Native forests - economic issues (Appendix T) this is not the case for many recreational activities but as discussed above, most of these were excluded from our analyses.

It is also assumed that the environmental characteristics identified by the LCC will be under immediate threat if the draft recommendations are not followed. In most cases in practice the values would only be threatened over a period of time. It was not possible in the time available to this study to estimate these time-related effects and so this is a source of over-estimation. Off-setting this effect is the fact that we were also not able to estimate the likely effect of income and population changes on the demand for these environmental attributes over time. These effects are normally assumed to be the same across all components of a social benefit-cost analysis. However, consistent with the arguments presented in the Native forest section of Appendix T, we would expect future demand for on-site recreational and off-site values of the candidate river corridors and catchments to increasingly dominate their use for mineral extraction, timber harvesting, and water diversion as the Australian population grows. These effects are therefore a source of under-estimation of environmental values.

While it is an LCC criterion the inclusion of angling over-states the benefits estimated in this study at least it is assumed that the type of angling experience available on the candidate river segments is unique.

The assumption that the segments are unique and that there are no next best alternatives to providing the values to be found on them is strong and leads to over-stating of the environmental benefits. However, the use of 'willingness to pay' rather than 'willingness to accept' measures of value leads to under-estimation of the values. As was noted earlier, the latter criterion commonly gives values that are three to five times those obtained by the former criterion.

We have used regional visitor data to national and state parks as a measure of current demand and the extent to which the candidate rivers and catchments will be valued, either through use values or preservation values. The two main reasons for using these data are that there are few data sets available which specifically record visitors to rivers, and the types of recreational and environmental characteristics found in parks overlap those used by the LCC as criteria for selection of the candidate rivers and catchments.

A consequence of these considerations is that the authors have placed less emphasis on valuing the recreation uses and more emphasis on scenic, cultural heritage and natural values than is implied in the brief. We believe that following this course provides the appropriate measure of the effects of the LCC proposals on the welfare of Victorians.

Numerous non-economic studies have addressed the recreational aspects of environmental resources but have not provided results in a form which can be directly compared with the economic values of alternative uses such as timber or mineral production. This is specially the case for the environmental values addressed in this study.

The authors have developed a methodology which permits these comparisons to be made in an approximate fashion, and at low cost relative to other methods that could be applied. It is probably the first time that such an approach has been attempted on a state-wide basis in Australia.

The methodology relied upon by the authors was described in detail in the preceding pages. It was felt necessary to include this level of detail as the methods and concepts underlying the estimates used by the authors are not widely known or understood.

Collation of information on environmental values

A survey of Australian, New Zealand and USA literature on the estimation of non-market values provided the values that are summarised in Tables 1 to 3, Appendix E.

The criteria used by the LCC to select the candidate rivers were as follows:

Recreation values

National, or state significance for whitewater and touring canoeing and rafting

Angling - introduced fish (trout, redfin)

Angling - native fish (blackfish, Murray cod)

Scenic landscape

River reaches assessed as having high scenic value

Cultural heritage

Sites identified in various studies as being of national or state significance

Natural values

Botanical significance at the national or state levels

Faunal significance at the national or state levels

Presence of rare native fish species (endangered or vulnerable)

Presence of diverse native fish populations

Sites of Geological or Geomorphological significance at the national or state levels.

Because these criteria are relatively narrow they were expanded to the following classes for the purpose of grouping the empirical estimates available from the literature:

Recreation values:

1. Water based recreation - canoeing, rafting, boating - significance at national, state and regional levels.
2. Angling (exotic and native fish).
3. Recreation - camping / backpacking.
4. Wildlife hunting.

Conservation values:

5. Faunal significance - national and state. (wildlife conservation) Includes native fish.
6. Botanical significance - National and State. (vegetation).
7. Wilderness / naturalness (including wetlands) / scenic landscape.
8. Landscape / amenity / scenery.

(including loss from diminished air quality).

8a. Geological / geomorphological significance.

9. - Cultural heritage (National & State).

Miscellaneous:

10. Air quality (health and other effects).

11. Salinity / erosion.

Classes 3,4 and 10,11 are not directly relevant to the approach taken here but are included for comparison. The study team focussed on the values identified by the LCC, as summarised in the tables in Appendix S, and excluded environmental values for which there are ready substitutes at other locations.

In collating the empirical estimates a number of assumptions were made in order to increase the number of relevant data points or to simplify computations:

- to make a crude allowance for the effects of inflation, estimates from the 1960s were tripled and estimates from the 1970s were doubled;
- US, Australian and New Zealand dollars were not converted to a common unit;
- all results expressed in per respondent, per resident or per taxpayer terms were treated as being equivalent to per household;
- a 'trip' was treated as being equivalent to two visitor days;
- regional data were selected in cases where results were expressed in local, regional and national terms.

While these assumptions are sources of over- and under-estimation of environmental benefits they are not likely to significantly bias the results in any direction. The assumption of trips being two days was based on work by

Sinden and by our interpretation of the studies which reported estimates on that basis. A minority of the estimates were expressed in per trip terms and even fewer, if any, have appeared in the modal values used in our analyses.

It was necessary to include estimates from overseas studies. Most of the estimates used in analyses have come from Australian studies and there is no clear evidence that the estimates differ consistently depending on the country of origin. Because US values were treated as being in Australian dollars they were effectively discounted by about 30 per cent.

The two most common units for expressing the results of empirical environmental evaluations are dollars per visitor day or dollars per household and these are the units used in this study.

With few exceptions, the authors were unable to obtain specific visitor data for the candidate rivers or high naturalness catchments. In the latter case there are likely to be few visitors given the nature and selection of the catchments and their inaccessibility. In the case of the rivers monitoring and data collection is inherently difficult due to the large number of entry and exit points along the rivers, although there are exceptions for some rivers where visitor access is confined or restricted in some way.

Environmental values for the candidate rivers

There are 23 rivers proposed in the Schedule of Candidate Rivers in Section 1.

Visitor data are available for the Ovens and King rivers as a result of a current study by Sinden (1990). However, the authors determined that the only measure that was consistently available across the state was the number of visitors to state and national parks. Visitor data collected by DCE staff are shown in the tables headed Visitors to Victorian Parks 1988-89 (Appendix E). A number of qualifications are noted within the tables. The authors view these data as a surrogate measure of the frequency with which people travel to regions to enjoy the types of environmental characteristics offered by rivers.

For most rivers it could be expected that use and preservation values would be present, while for most catchments only the latter would be present.

Where a river crossed more than one DCE region, the proportion of the river falling within each region was estimated. The number of visitor days was assumed to be in the range of 10-30 per cent of the total number of visitor days for the parks in the region. This figure will clearly vary across rivers and may also depend, among other things, on the number of parks in a region. The Ovens and King rivers are in the North East Region where there are few parks relative to other regions. For these rivers the Sinden study yielded a figure close to 30 per cent of the visitor days for the region's parks. It is likely that the Goulburn river would also approximate this figure because of its ready access and the lack of alternative recreational areas, relative to other regions. In the case of the Wimmera river it is likely that the figure would be closer to 10 per cent, or less, because of the influence of the Grampians in the regional total.

The parks for which the river is a major focus for recreational activity were identified. For example, the Lerderderg river is a focus for recreation in the Lerderderg State Park and could be expected to attract a high proportion of the visitors to the park, perhaps higher than 30 per cent of the region's visitors.

Point Nepean National Park was the only park excluded from the regional and state totals because of the surprisingly high number of visitor days (2.1m) and because the number of visitor days for the only candidate river in the region - the Bunyip - would be unlikely to be related to those for this park.

The DCE regions for the high naturalness catchments are shown in Appendix S - Summary Tables.

The data for environmental values that have been collated from published research are shown in the tables at the end of this section. These tables show the category of the environmental value, as described above, and the empirical estimates of use values and preservation values calculated on a $ per household per year basis and on a $ per visitor day basis. The 'raw data' show the individual values reported in the literature, together with their Lower (LWR), Upper (UPR) and Modal (MDL) values. For some categories, viz. angling and wildlife hunting, values are only available on a visitor day basis. For other categories, viz. faunal significance, botanical significance, and wilderness, values were only available on a per household basis.

Data were not available for cultural heritage or geological/ geomorphological significance and the values shown in the tables were assumed from the values for categories of a similar nature such as faunal and botanical significance, and landscape. The wilderness estimates include estimates for wetlands as there were few estimates specifically dealing with wilderness and the wetlands studies were for large areas which appeared to have characteristics similar to those for wilderness areas. The wilderness estimates are consistent with the additional estimates shown in Appendix E that were provided to the authors after the analyses were completed.

The tables to follow, headed 'Environmental Values - River Corridors', show the estimated total environmental values for each candidate river. As explained above, visitors to each river are assumed to be in the range of 10-30 per cent of the visitors to parks in the region.

The environmental values on a visitor day or household basis were estimated as follows. For each river, the environmental values were identified from the Schedule of Candidate Rivers (Appendix S - Summary Tables) and placed in their respective categories. The value for each river is the total of the dollar values for each category. For example, for the Mitta Mitta River the categories 1, 5, 6 and 8 are present, giving visitor day values of $20, $0, $0 and $2, a total of $22; and household values of $97, $37, $55, and $50, a total of $239.

If a category appeared more than once for a given river, only one occurrence was included. This assumption may lead to underestimation of the values for rivers having several occurrences per category, such as the Snowy River, and for these the higher visitor proportion of 30 per cent should probably be used.

The assumption of additivity may be questioned but the authors believe that it is a reasonable assumption for the values considered. It would be less reasonable if the values associated with more widely available activities such as 'flat water' recreation on lakes and reservoirs, bushwalking, or wildlife hunting had been included. The analysis still captures the extent to which these activities might be enhanced by categories of environmental characteristics such as high scenic value. An intuitive view of this approach

is given, for example, by comparing fishing on a farm dam in an area of low scenic value with fishing in a gorge of a wild river having high scenic values.

Another aspect of 'additivity' was discussed in an earlier section, viz. the problem of obtaining willingness to pay estimates, e.g. for the preservation of individual species, then adding the estimates for all preservation and other environmental issues to give unrealistically high values in aggregate. We have attempted to offset this potential source of serious over-estimation of environmental values by: collating the values for categories rather than individual species etc; taking estimates from studies which e.g. value wildlife preservation generally rather than value individual species; and by the way in which the valuations are weighted across the state from regional visitor data. A check on the values estimated for the state revealed a total for all candidate river corridors of about $50-54 per household per annum. For the proposed high naturalness catchments the total was $1.60-3.20 per household per annum. We do not believe that these totals are unrealistically high for the environmental values considered.

The total environmental value per annum for each river on a *visitor day basis* was obtained by multiplying the values in the columns for region visitor use by the values for dollars per visitor day.

The total environmental value per annum for each river on a *household basis* was obtained by taking region visitor use as a proportion of the state total visitors to parks (viz. 6 693 512), multiplying by the values for dollars per household, and by the assumed 1 million households on a state basis (5 million on a national basis). The basis for this approach is that while preservation values are not necessarily directly related to number of visitor days there is probably some relationship between the two and in the absence of better information it is reasonable to assume that the general public will be more concerned about the preservation values for better known locations (that is, those more frequently visited) than those which are less well known and for which there are likely to be fewer visitors.

The figure of 6.7 m total visitor days for the state's parks may be compared with a figure provided by the Victorian Tourist Commission which indicates that 15 m visitor days in 1988-89 were devoted to pleasure trips involving

driving for a round trip of 50 km or more. In other words, visits to parks appear to make up about 50 per cent of rural recreational trips for the state.

The two sets of estimates, viz. visitor day and household basis are not added as they overlap to varying degrees. Instead they are expressed as ranges in the Schedule of Candidate Rivers (Appendix S - Summary Tables). Where the visitor day figures are unavailable (value $0/day) or very low ($2/day) in columns 4 and 5, the range was only presented for the per household figures.

The values shown for each of the rivers are likely to be subject to argument and subsequent modification, particularly given the lack of visitor data on which these methods depend. However, we have retained a consistent set of assumptions across all rivers and have also attempted to keep the methods of valuation consistent with those for water, mineral, timber and agricultural resources. When comparisons are made with these other values in the summary tables it will be seen that the environmental values would often have to change by orders of magnitude before our conclusions would change as to whether or not environmental values are likely to exceed resource values. For these reasons we have not attempted to 'fine tune' the results.

Environmental values were estimated even for the rivers where there were no resource conflicts. These would include river segments which flow wholly through national parks where, with some exceptions, water diversion, timber, mining and agricultural activities are currently prohibited. We are aware that in some cases activities upstream of these segments may impair the values within the segments but have not been able to examine this issue in detail.

Environmental values for the high naturalness catchments

There are 46 high naturalness catchments proposed in Section 1. Of these, 17 have already been included in the Schedule of Candidate Rivers - all are in national parks or wilderness areas where there are no resource conflicts. A further 13 are in national parks or wilderness areas, leaving 16 catchments where there may be a conflict with the potential for timber harvesting.

Of the 16 catchments with potential for timber production, we have calculated that only 5 will have significant production potential, equivalent in value to

greater than 1 month's supply from the Forest Management Area or greater than $6 500 per annum over a forty year period at 5% discount rate. These are Front Creek, South Buller Creek, Cavender Creek, Swamp Creek and Decimal Creek.

We have applied similar methods to the estimation of environmental values for the catchments as were used for the rivers. However, the catchments are a different case for two main reasons. There are more of them, implying that the values are less likely to be individualistic or unique than is the case for the rivers; and they are less likely to capture use values, as was noted above. They should probably be seen in a 'Safe Minimum Standard' context, however, an assessment of whether this number of catchments is needed to meet a safe minimum standard is beyond the scope of this study.

The high naturalness catchments are likely to be viewed as being similar to wilderness reserves or reference areas. It has therefore been assumed that the per household value for catchments should be $25 per year, similar to the modal values listed for preservation of faunal significance ($20 per household per year), preservation of botanical significance ($26 per household per year), and wilderness use and preservation ($ 27 per household per year). It is also assumed that a range in public awareness equivalent to 5-10% of visitors to the parks in each region would be associated with the high naturalness catchments. The results are summarised in the table of Environmental Values - High Naturalness Catchments.

SUMMARY AND CONCLUSIONS

In evaluating the environmental and recreational benefits, what we would ideally like to measure in dollar terms is the net change to the welfare of Victorians that is expected to be brought about by the recommendations. Many of the forms of recreation that may be associated with the LCC proposals are readily available elsewhere in the state, or would not be significantly affected on the candidate rivers even if the recommendations were not adopted. To simplify the analysis and reduce the risk of over-stating environmental and recreational values, we have attempted to exclude the forms of recreation whose resource requirements are readily met, such as bushwalking, camping, wildlife hunting and most forms of flat water boating.

That is, we have assumed that the LCC proposals will generate no net benefits in these areas.

Instead, we have focussed on valuing the special environmental and recreational characteristics that were used by the LCC as selection criteria for the candidate rivers. We have assumed that the LCC has accurately identified the set of river segments having the highest standards for these characteristics in the state, that the segments are individually unique, and that there are no 'next best' alternatives for providing the values identified on the segments.

The assumption that the segments are unique and that there are no next best alternatives to providing the values to be found on them leads to over-stating of the environmental benefits. However, the use of 'willingness to pay' rather than 'willingness to accept' measures of value leads to under-estimation of the values. The latter criterion commonly gives values that are three to five times those obtained by the former criterion.

It is also assumed that the environmental characteristics identified by the LCC will be under immediate threat if the draft recommendations are not followed. In most instances in practice, the values would only be threatened over a period of time, therefore this is another source of over-estimation. Off-setting this effect is the fact that we were also not able to estimate the likely effect of income and population changes on the demand for environmental attributes over time. These effects are normally assumed to be the same across all components of a social benefit-cost analysis. However, we would expect future demand for on-site use values and off-site preservation values of the candidate river corridors and catchments to increasingly dominate their use for mineral extraction, timber harvesting, and water diversion as the Australian population grows. These effects are therefore a source of under-estimation of environmental values.

We have used regional visitor data to national and state parks as a measure of current demand and the extent to which the candidate rivers and catchments will be valued, either through use values or preservation values.

We have attempted to offset 'additivity' as a potential source of serious over-estimation of environmental values by: collating the values for categories rather than individual species etc; taking estimates from studies which e.g.

value wildlife preservation generally rather than value individual species; and by the way in which the valuations are weighted across the state from regional visitor data. A check on the values estimated for the state revealed a total for all candidate river corridors of about $50-54 per household per annum (assuming 1m households). For the proposed high naturalness catchments the total was $1.60-3.20 per household per annum. We do not believe that these totals are unrealistically high for the environmental values considered. The 'public good' nature of environmental goods helps to explain why they appear to attract so much value in proportion to essentially 'private' goods such as timber, water or minerals.

The methodology of contingent valuation relied upon by the authors was described in detail as the methods and concepts underlying the estimates used in this study are not widely known or understood. The development of contingent valuation techniques has enabled the measurement of non-market values such as option and existence values. The addition of these values to the cost-benefit analysis of social programs involving aspects of environmental protection and conservation, will improve the allocation of society's resources as well as accommodate the interests of a broader spectrum of individuals in the community.

Although a number of methodological issues remain to be resolved, contingent valuation is capable of providing policy relevant information in many environmental and conservation circumstances, where only guesses were available before. Further research and application of the technique is necessary to refine the approach and extend its use to other areas.

Contingent valuation procedures are now used extensively in the United States to value environmental goods, both in the area of government regulation of land use and in the litigation of compensation for environmental damage. The Australian Resource Assessment Commission intends applying contingent valuation procedures to measure the difference in the monetary valuation Australians may place on the Kakadu Conservation Zone and Kakadu National Park if the Conservation Zone is mined compared to their valuation if the Conservation Zone is not further mined. We can expect to see the approach applied more extensively in the future as land use conflicts become more widespread.

In the 'first-best' world of some economists it is sometimes argued that where there are no markets there are no prices and that rather than use techniques such as contingent valuation to estimate values of non-market items, we should focus on establishing the institutional arrangements and systems of property rights which permit markets to operate. We do not believe that this 'first-best' situation will ever be achieved for some areas of the economy and that it is therefore impractical for policy makers to wait until the markets are in place.

In the particular case of the LCC proposals, it is difficult to imagine conditions under which any market arrangements would offer a similar package of protected rivers and catchments to the public. In addition, because the proposals are confined to public land and also involve the assessment of timber, water and mineral resources which are under public management to varying degrees, the LCC proposals are ideally suited to the application of contingent valuation procedures within a social benefit-cost framework.

The methods employed in this study involved rapid appraisal over wide areas and the results are not amenable to detailed examination of individual cases. For example, we were not able to study in detail the environmental values of particular species at specific locations, the net returns from timber production for particular catchments, the benefits and costs of specific alternative sites for water proposed water diversions, or the benefits and costs of providing environmental flows in selected rivers. Partly for these reasons, it is difficult to arrive at firm conclusions on the comparisons for the Goulburn, Wimmera or Thomson Rivers, or for Front Creek or South Buller Creek catchments. In these cases, the values for environmental characteristics are close to those for the resource uses with which they are in conflict, or there is too much uncertainty surrounding the estimates.

We have often provided range information for the results of analyses, however, the time available to the project did not permit exhaustive sensitivity analysis of all the assumptions that we have specified. In any case, past experience leads us to believe that analyses of this type can often be difficult to interpret. Instead, we have assumed that some of the sources of over- and under-estimation of values offset each other.

It is our view that for the rivers and catchments for which we have indicated net social benefits arising from adoption of the LCC draft recommendations, there would need to be substantial changes in the values estimated before our conclusions would be altered. In other words, for the large majority of candidate rivers and catchments the proposals should lead to increases in the net welfare (or to the avoidance of decreases in the net welfare) of Victorians, if not other Australians.

POSTSCRIPT

The *Land Conservation Act* 1970 requires the Council to make recommendations for the use of public land 'in order to provide for the balanced use of land in Victoria'. The statutory process (see flow chart) involves 2 periods for public submissions. The available data are never complete, so technically perfect recommendations cannot be made. The public process allows people to provide additional information, and also to put their views. These assist Council in formulating a position of balance.

The social and economic appraisal of the candidate rivers played a major role in the Council's decision-making process. Those Council members arguing for continued access to resources had good economic support for some candidates; those arguing for corridor protection had to moderate any inflated claims.

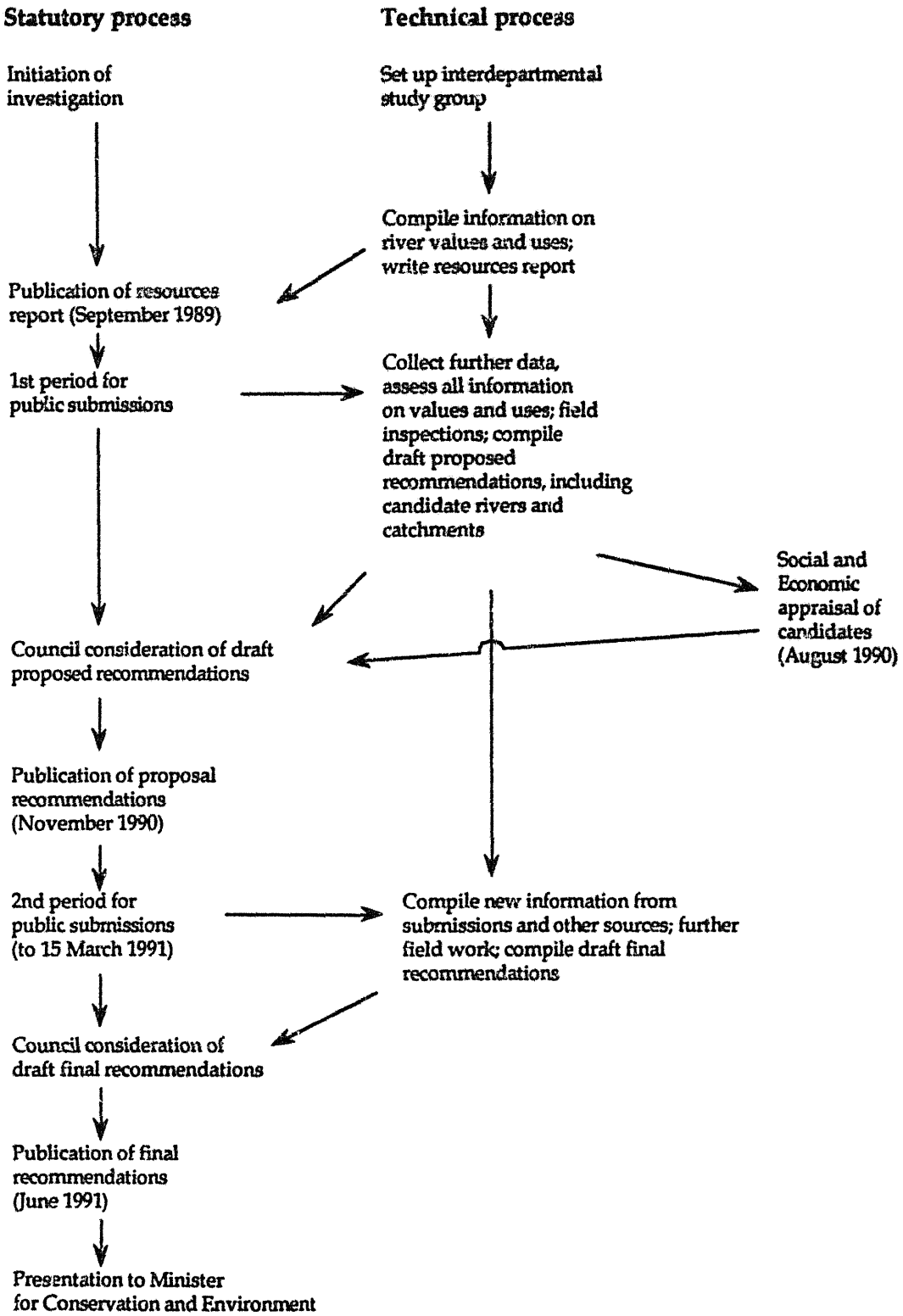
Not every outcome suggested by the economic appraisal was recommended. The position is summarised in the table below. Clearly most recommendations do follow the appraisal; the substantial dollar difference, in favour of corridor protection over resource use, encouraged the Council to recommend 15 heritage rivers.

Other factors were involved in the Big and Bunyip Rivers, and Front Creek catchment decisions, while the King, Loddon and Tyers River candidates were withdrawn because of new information about their environmental values.

Social and economic appraisal versus recommendations

	Environmental value		Resource use value	Recommended for protection
Heritage rivers				
14 rivers	$E	>	$R	Yes
Big River	$E	<	$R	Yes
Bunyip River	$E	>	$R	No
3 rivers (withdrawn)	$E	>	$R	No
Natural catchments				
29 catchments	$E	>	$R	Yes
Decimal Creek	$E	<	$R	No
Front Creek	$E	<	$R	Yes

Land Conservation Council process - flow chart



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SCHEDULE OF CANDIDATE RIVERS

1. MITTA MITTA AND BIG RIVERS (Basin 1)

Reach and description	Environmental values	Land tenure	Potential issues	Recommendation summary
Glen Valley to Lake Dartmouth (National Park and historic area - 200m corridor; State forest - 200m corridor; Water frontage	State significance for canoeing (Glen Valley to Hinnomunjie Bridge) State botanical significance - riparian closed scrub of narrow-leaf peppermint/manna gu· with *Leptospermum brevipes/L. phylicoides* (Livingstone Creek to Lake Dartmouth) presence of and spawning site for the vulnerable Macquarie Perch high scenic landscape value - Eastern Highlands/ farm forest setting (Livingstone Creek to Eight Mile Creek)	Mostly national park; historic area; some State forest and water frontage	Possible site for water resource and hydro development at Glen Valley; retain significance for canoeing State significance	No in-stream barriers to be built; any new diversions are not to impair canoeing or fish values; no timber harvesting in corridor

Environmental values	Water sector comments	Timber resource implications	Mineral and stone	Agriculture	Industry	Economic assessment
Economic valuation $0.3-1.5*m/yr	RWC - No implications; possible hydro-electric development $0m/yr	Very small State forest area; little resource likely to be present $0m/yr	Alluvial and vein gold, tin, lead, copper, silver, antimony $0.13m/yr Rank 4	WFR ~36km Rent $897/yr NFI $3 390/yr Recommendations have no impact	Possible hydro-electric development but not likely to proceed Recommendations have negligible impact	The environmental values are likely to exceed resource values

Notes: WFR = Water Frontage Reserve
Rent = revenue to DCE
NFI = addition to net farm income from grazing WFR, net of Rent

Rank = for category A minerals only, from highest importance (1) to lowest importance (7)
Dollar values for minerals taken as 10% of estimated values

$0m/yr implies expected values less than $10 000 per year

* indicates likely end of range for environmental values
** indicates value may be less than range indicated

3. KING RIVER (Basin 3)

Reach and description	Environmental values	Land tenure	Potential issues	Recommendation summary
Upstream of Lake William Hovell to Hurdle Creek (200m corridor in park; State forest - 200m corridor; water frontage - whole)	State faunal significance - squirrel gliders near Edi State botanical significance - mountain swamp gum riparian forest (Cheshunt to King Valley) high value for Murray cod angling below Whitfield high value for trout fishing (Lake William Hovell to Cheshunt) State significance for canoeing (Lake William Hovell to Cheshunt) presence of the vulnerable Murray cod (below Whitfield); spawning site for Macquarie perch. high scenic landscape value - Eastern highlands semi-natural setting (above Lake William Hovell)	Portions park, State forest; mostly water frontage	Possible enlargement and hydro scheme at Lake William Hovell; implications for canoeing and native fish; water quality issues (nutrient and sediment pollution); bed and bank State significance	Lake enlargement permitted b should not impair canoeing or native fish values; no other in stream barriers to be built; an new diversions are not to impa canoeing or native fish values; priority to be given to improving water quality and b and bank stability in agricultu areas; no timber harvesting in corridor.

Environmental values	Water sector comments	Timber resource implications	Mineral and stone	Agriculture	Industry	Economic assessment
Economic valuation $1.1*-8.1/yr	RWC - No specific implications	Small area of State forest	May have alluvial gold, and coal	WFR ~71km Rent $3 971/yr NFI $13 250/yr	Lake Hovell hydro will not affect environmental values	The environmental values are likely to exceed resource value
	$0m/yr	$0m/yr	$0m/yr	Recommendations have no impact	Recommendations have negligible impact	

3. KING RIVER (Basin 3)

Reach and description	Environmental values	Land tenure	Potential issues	Recommendation summary
Upstream of Lake William Hovell to Hurdle Creek (200m corridor in park; State forest - 200m corridor; water frontage - whole)	State faunal significance - squirrel gliders near Edi State botanical significance - mountain swamp gum riparian forest (Cheshunt to King Valley) high value for Murray cod angling below Whitfield high value for trout fishing (Lake William Hovell to Cheshunt) State significance for canoeing (Lake William Hovell to Cheshunt) presence of the vulnerable Murray cod (below Whitfield); spawning site for Macquarie perch. high scenic landscape value - Eastern highlands semi-natural setting (above Lake William Hovell)	Portions park, State forest; mostly water frontage	Possible enlargement and hydro scheme at Lake William Hovell; implications for canoeing and native fish; water quality issues (nutrient and sediment pollution); bed and bank State significance	Lake enlargement permitted but should not impair canoeing or native fish values; no other in-stream barriers to be built; any new diversions are not to impair canoeing or native fish values; priority to be given to improving water quality and bed and bank stability in agricultural areas; no timber harvesting in corridor.

Environmental values	Water sector comments	Timber resource implications	Mineral and stone	Agriculture	Industry	Economic assessment
Economic valuation $1.1*-8.1/yr	RWC - No specific implications	Small area of State forest	May have alluvial gold, and coal	WFR ~71km Rent $3 971/yr NFI $13 250/yr	Lake Hovell hydro will not affect environmental values	The environmental values are likely to exceed resource values
	$0m/yr	$0m/yr	$0m/yr	Recommendations have no impact	Recommendations have negligible impact	

11. SNOWY AND LOWER LITTLE RIVERS (Basin 22)

Reach and description	Environmental values	Land tenure	Potential issues	Recommendation summary
NSW border to sea; (national park - viewshed; State forest - first ridgeline; water frontage - (whole)	high scenic landscape value - Eastern Highlands/natural and farm forest settings, Foothills/natural settings National significance geological/geomorphological feature - Campbell Knob/Tulloch Ard Gorge National significance geological/geomorphological site - New Guinea karst features National/State significance geological/geomorphological site - Little River Gorge State significance geological/geomorphological feature - floodplain morphology Pleistocene Aboriginal occupation site - New Guinea Cave National significance for canoe and raft touring - border to Buchan confluence State significance historic features on the Orbost floodplain relating to river crossing, flood works and snag removal activities presence of the vulnerable Australian grayling diverse native fish fauna - estuarine reach outstanding botanical values (18 rare species) - Deddick River to Betts Creek State significance faunal values - border to Currie Creek - riparian vegetation important to birds including yellow-tufted honeyeater and rainbow bee-eater	National Park, State forest, Water frontage	Need to increase low flows in Snowy River to protect in-stream values, particularly in estuarine area; timber harvesting on Lower Snowy; future power boating up-stream of Bete Bolong; possible water resource development National significance	No new in-stream barriers to be built; any new diversions are not to impair in-stream values especially in low flow periods; discussions with Snowy Mountains Authority and SEC with view to providing increased flow periods to combat increasing salinity in Snowy Estuary and to improve in-stream values; timber harvesting along Lower Snowy River be conducted in accordance with the Code of Forest Practices and subject to (VMS); no timber harvesting within 200m of river; Note: high wilderness quality

Environmental values	Water sector comments	Timber resource implications	Mineral and stone	Agriculture	Industry	Economic assessment
Economic valuation $0.4-2.6*m/yr (state basis) $1.9-13.1*m/yr (national basis)	RWC - Possible use of high flows for pulpmill proposal; major implications if flows are to be restored below Jindabyne $0m/yr	Above Buchan River confluence - no implications (in national park); between Buchan River confluence and Bete Bolong - no impact as there is an existing natural features zone; operations allowed outside this $0m/yr	Potentially prospective - minor occurrences of zinc, copper, silver, lead, barium in upper and mid reaches In national park $0m/yr	WFR ~44km Rent $1 953 NFI $2 411 Recommendations have no impact	Possibility of Pulp Mill at Orbost - with implications for water flows in Snowy River and tributaries, and prices for residual roundwood Possible intersection with VFT route	The environmental values are likely to exceed resource values Environmental flows may cost ~$6m/yr (not included in above) Implications of E. Gippsland Pulp Mill proposal not evaluated due to lack of economic data

SCHEDULE OF HIGH NATURALNESS CATCHMENTS

Basin	Catchment name	Tributary of	Land tenure	Potential issues	Economic summary
1	Front Creek	Morass Creek	State forest	Timber harvesting Mineral potential - lead, zinc, silver-vein (Category B, $43 000/yr)	16 200 m^3 C+ sawlogs $30 840-40 120/yr direct employment 3.2 persons/yr for 9 yrs Expected realizable mineral value insignificant Environmental value $17 800-35 600/yr Resource values are likely to exceed environmental values
1	Banimboola Creek	Mitta Mitta River	State forest	Timber harvesting	2 400 m^3 C+ sawlogs value < $6 500/yr direct employment effects negligible Environmental value $58 130-116 270/yr The environmental values are likely to exceed resource values
1	Mount Tabor Creek	Mitta Mitta River	State forest	Timber harvesting; existing water supply offtake	1 800 m^3 C+ sawlogs value < $6 500/yr direct employment effects negligible Environmental value $58 130-116 270/yr The environmental values are likely to exceed resource values

15. MITCHELL AND WONNANGATTA RIVERS (Basin 24)

Reach and description	Environmental values	Land tenure	Potential issues	Recommendation summary
From headwaters of Wonnangatta River to Lake King (parks - viewshed from river; State forest - 200m corridor; water frontage - whole)	national, State canoeing significance high scenic landscape value national botanical significance - Mitchell Gorge presence of the vulnerable Australian grayling (Mitchell and Wonnangatta Rivers) diverse native fish fauna (Wonnangatta River, Mitchell River estuary) high value for angling (estuary) and trout angling (Wonnangatta R.) high naturalness main-streams various geological/geomorphological sites - digitate delta (international significance); McLeod Morass, valley at Lindenow, Mitchell River gorge, and sediment exposure at Tabberrabbera (all State significance)	National Parks, State forest, Water frontage	Possible future water resource and hydro development; protection of native fish values; protection of recreation values; protection of main-stream naturalness National significance	No in-stream barriers to be built; any new diversions are not to impair identified values; no timber harvesting in corridor

Environmental values	Water sector comments	Timber resource implications	Mineral and stone	Agriculture	Industry	Economic assessment
Economic valuation $1.5-8.1*m/yr (state basis) $7.5-40.5*m/yr (national)	RWC - Mitchell River Dam - recently under active community consideration but not an economic proposition and not a current proposal for RWC $0m/yr	Small areas of State forest along the Wonnangatta River $0m/yr	Minor alluvial gold down-stream of Dargo River; gravel in lower reaches $0.010m/yr Rank 7	WFR ~243km Rent $7 370/yr NFI $19 816/yr High value market gardening - but not significantly affected by recommendations Recommendations have insignificant impact	Hydro 55 megawatt development not an economic proposition Possible intersection with VFT route Recommendations have insignificant impact	The environmental values are likely to exceed resource values

DATA FOR ENVIRONMENTAL VALUES

VALUE ITEM	USE VALUES				PRESERVATION VALUES				TOTAL VALUE			
	RAW DATA	LWR	UPR	MDL	RAW DATA	LWR	UPR	MDL	RAW DATA	LWR	UPR	MDL
1. WATER BASED												
$/hh/year *	114,7,40,9,7,24	7	114	40	132,57,24, 52-80,66	24	132	57	246,64,64	31	246	97
$/visitor day	10,13,16,20,56,18,12,7,7	7	56	20		0	0	0		7	56	20
2. ANGLING												
$/visitor day	42,38,22,40,26,99,32,65, 14,36,61-296,49,38,98	14	296	65		0	0	0		14	296	65
3. RECREATION												
$/hh/year	6,7,2	2	7	6		0	0	0		2	7	6
$/visitor day	13-74,100,9	9	100	13		0	0	0		9	100	13
4. WILDLIFE HUNTING												
$/visitor day	16-43,16-85,18-132, 36,19-20,26-76,50,20, 20,54	16	132	20		0	0	0		16	132	20
5. FAUNAL SIGNIFICANCE												
$/hh/year	10-17,17,21,23,1	1	23	17	1-9,41,24,7,15-57, 4-19,2-12	1	57	20	58,45,30	2	80	37
6. BOTANICAL SIGNIFICANCE												
$/hh/year	29	29	29	29	7,28,27	7	28	26	58,57	36	57	55

SCHEDULE OF HIGH NATURALNESS CATCHMENTS (contd)

Basin	Catchment name	Tributary of	Land tenure	Potential issues	Economic summary
22	Upper Brodribb River	Brodribb River	Errinundra National Park	-	Environmental value $49 950-99 900/yr The environmental values are likely to exceed resource values
22	Wallaby Creek	Tingaringy Creek	Tingaringy National Park	-	Environmental value $49 950-99 900/yr The environmental values are likely to exceed resource values
22	Musk Creek	Rodger River	Snowy National Park	-	Environmental value $49 950-99 900/yr The environmental values are likely to exceed resource values
22	Mount Gelantipy Creek	Snowy River	Snowy National Park	-	Environmental value $49 950-99 900/yr The environmental values are likely to exceed resource values
23	Stony Creek (Mount Shaw)	Upper Tambo River	State forest	Timber harvesting	800 m^3 C+ sawlogs value < $6 500/yr direct employment effects negligible Environmental value $17 800-35 600/yr The environmental values are likely to exceed resource values
24	Pinnacle Creek (east branch)	Wonnangatta River	Alpine National Park	-	Environmental value $74 890-149 770/yr The environmental values are likely to exceed resource values

ENVIRONMENTAL VALUES - RIVER CORRIDORS

STATE TOTAL VISITOR DAYS: 6693512 (1988/89)

RIVER	TOTAL VISITORS TO REGION	REGION VISITOR USE 10%	REGION VISITOR USE 30%	ENVIRONMENTAL VALUE VISITOR DAY BASIS ($/DAY)	ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($/HH/YR)	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 10%	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 30%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 10%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 30%
Mitta Mitta 20% North East 311300 80% Bairnsdale 95313	138510	13851	41553	22	239	305	914	495	1484
Ovens North East	311300	31130	93390	67	142	2086	6257	660	1981
King North East	311300	31130	93390	87	239	2708	8125	1112	3335
Goulburn 40% Alexandra 318700 60% Benalla 18000	138280	13828	41484	87	289	1203	3609	597	1791
Howqua Alexandra	318700	31870	95610	85	234	2709	8127	1114	3342
Big Alexandra	318700	31870	95610	87	184	2773	8318	876	2628
Loddon Bendigo	85760	8576	25728	67	192	575	1724	246	738
Wimmera 50% Mildura 169700 50% Horsham 1428860	799280	79928	239784	67	242	5355	16066	2890	8669

DATA FOR ENVIRONMENTAL VALUES

VALUE ITEM	USE VALUES				PRESERVATION VALUES				TOTAL VALUE			
	RAW DATA	LWR	UPR	MDL	RAW DATA	LWR	UPR	MDL	RAW DATA	LWR	UPR	MDL
7. WILDERNESS												
$/hh/year	14,14,1,256	1	256	14	14,32,13,6	7	32	13	28,46,13	8	288	27
8. LANDSCAPE												
$/hh/year		0	0	0	6-9,86,50-85,3,58,30	3	86	50		3	86	50
$/visitor day		0	0	0	3,2-3,3	2	3	2		2	3	2
8a. GEOLOGICAL SIGNIFICANCE												
$/hh/year		0	0	0		50	50	50		50	50	50
9. CULTURAL HERITAGE												
$/hh/year		0	0	0		50	50	50		50	50	50
10. AIR QUALITY												
$/hh/year		0	0	0	133,;85,240,709,18,10	10	709	180		10	709	180
11. MISCELLANEOUS												
$/hh/year		0	0	0	564, 444	444	564	500		444	564	500

* hh = household

ENVIRONMENTAL VALUES - HIGH NATURALNESS CATCHMENTS

STATE TOTAL VISITOR DAYS: 6693512 (1988/89)

CATCHMENT	TOTAL VISITORS TO REGION	REGION VISITOR USE 5%	REGION VISITOR USE 10%	ENVIRONMENTAL VALUE VISITOR DAY BASIS ($/DAY)	ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($/HH/YR)	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 5%	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 10%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 5%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 10%
Wongungarra R. hw 50% Cent. Gippsland 401000 50% North East 311300	356150	17807.5	35615	0	25	0	0	66.51	133.02
Decimal Creek North East	311300	15565	31130	0	25	0	0	58.13	116.27
Punchen Creek Bairnsdale	95313	4765.65	9531.3	0	25	0	0	17.80	35.60
Blue Rag Creek Central Gippsland	401000	20050	40100	0	25	0	0	74.89	149.77
Thiele Creek Central Gippsland	401000	20050	40100	0	25	0	0	74.89	149.77
Dolodrook Creek Central Gippsland	401000	20050	40100	0	25	0	0	74.89	149.77
Mount Vereker Creek Yarram	556900	27845	55690	0	25	0	0	104.00	208.00

(Excluding those catchments listed with the river corridors)

ENVIRONMENTAL VALUES - HIGH NATURALNESS CATCHMENTS

STATE TOTAL VISITOR DAYS: 6693512 (1988/89)

CATCHMENT	TOTAL VISITORS TO REGION	REGION VISITOR USE 5%	REGION VISITOR USE 10%	ENVIRONMENTAL VALUE VISITOR DAY BASIS ($/DAY)	ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($/HH/YR)	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 5%	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 10%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 5%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 10%
Double Creek Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
East Errinundra R. Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
Cavender Creek Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
Swamp Creek Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
Gattamurh Creek Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
Upper Brodribb River Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
Wallaby Creek Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
Musk Creek Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
Mount Gelantipy Ck Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
Stony Creek Bairnsdale	95313	4765.65	9531.3	0	25	0	0	17.80	35.60
Pinnacle Creek Central Gippsland	401000	20050	40100	0	25	0	0	74.89	149.77

ENVIRONMENTAL VALUES - HIGH NATURALNESS CATCHMENTS

STATE TOTAL VISITOR DAYS: 6693512 (1988/89)

CATCHMENT	TOTAL VISITORS TO REGION	REGION VISITOR USE 5%	REGION VISITOR USE 10%	ENVIRONMENTAL VALUE VISITOR DAY BASIS ($/DAY)	ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($/HH/YR)	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 5%	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 10%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 5%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 10%
Front Creek Bairnsdale	95313	4765.65	9531.3	0	25	0	0	17.80	35.60
Banimboola Creek North East	311300	15565	31130	0	25	0	0	58.13	116.27
Mt Tabor Creek North East	311300	15565	31130	0	25	0	0	58.13	116.27
Log Bridge Creek North East	311300	15565	31130	0	25	0	0	58.13	116.27
Yarrarabula Creek North East	311300	15565	31130	0	25	0	0	58.13	116.27
Devils Creek North East	311300	15565	31130	0	25	0	0	58.13	116.27
Long Jack Creek North East	311300	15565	31130	0	25	0	0	58.13	116.27
South Buller Creek Alexandra	318700	15935	31870	0	25	0	0	59.52	119.03
Williams Creek Alexandra	318700	15935	31870	0	25	0	0	59.52	119.03
Winnd Creek Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90
Unnamed Tributary Orbost	267479	13373.95	26747.9	0	25	0	0	49.95	99.90

ENVIRONMENTAL VALUES - RIVER CORRIDORS

STATE TOTAL VISITOR DAYS: 6693512 (1988/89)

RIVER	TOTAL VISITORS TO REGION	REGION VISITOR USE 10%	REGION VISITOR USE 30%	ENVIRONMENTAL VALUE VISITOR DAY BASIS ($/DAY)	ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($/HH/YR)	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 10%	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 30%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 10%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 30%
Benm Orbost	267479	26747.9	80243.7	0	192	0	0	767	2302
Red, Benedore, etc Orbost	267479	26747.9	80243.7	0	119	0	0	476	1427
Snowy 45% Orbost 267479 55% Bairnsdale 95313	172788	17278.8	51836.4	22	339	380	1140	875	2625
Rodger River, etc Orbost	267479	26747.9	80243.7	2	132	53	160	527	1582
Upper Suggan Bairnsdale	95313	9531.3	28593.9	2	169	19	57	241	722
Upper Buchan Bairnsdale	95313	9531.3	28593.9	2	219	19	57	312	936
Mitchell 30% Bairnsdale 95313 70% Central Gippsland 401000	309294	30929.4	92788.2	87	316	2691	8073	1460	4381
Avon, Turton, etc Central Gippsland	401000	40100	120300	0	64	0	0	383	1150
Thomson Central Gippsland	401000	40100	120300	87	211	3489	10466	1264	3792

ENVIRONMENTAL VALUES - RIVER CORRIDORS

STATE TOTAL VISITOR DAYS: 6693512 (1988/89)

RIVER	TOTAL VISITORS TO REGION	REGION VISITOR USE 10%	REGION VISITOR USE 30%	ENVIRONMENTAL VALUE VISITOR DAY BASIS ($/DAY)	ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($/HH/YR)	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 10%	TOTAL ENVIRONMENTAL VALUE VISITOR DAY BASIS ($,000/ANNUM) 30%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 10%	TOTAL ENVIRONMENTAL VALUE HOUSEHOLD BASIS ($,000/ANNUM) 30%
Tyers Central Gippsland	401000	40100	120300	2	192	80	241	1150	3451
Bunyip 50% Central Gippsland 401000 50% Dandenong 1294100*	847550	84755	254265	0	169	0	0	2140	6420
Yarra 10% Melbourne 491500 90% Dandenong 1294100*	1213840	121384	364152	87	259	10560	31681	5241	15723
O'Shannassy Dandenong*	1294100	129410	388230	0	119	0	0	2301	6902
Lerderderg Geelong	215100	21510	64530	2	205	43	129	659	1976
Glenelg Portland	221900	22190	66570	87	289	1931	5792	958	2874

* Dandenong figure excludes Pt Nepean National Park