Science for Saving Species

Research findings factsheet

Project 6.1

Threatened Species Recovery Hub

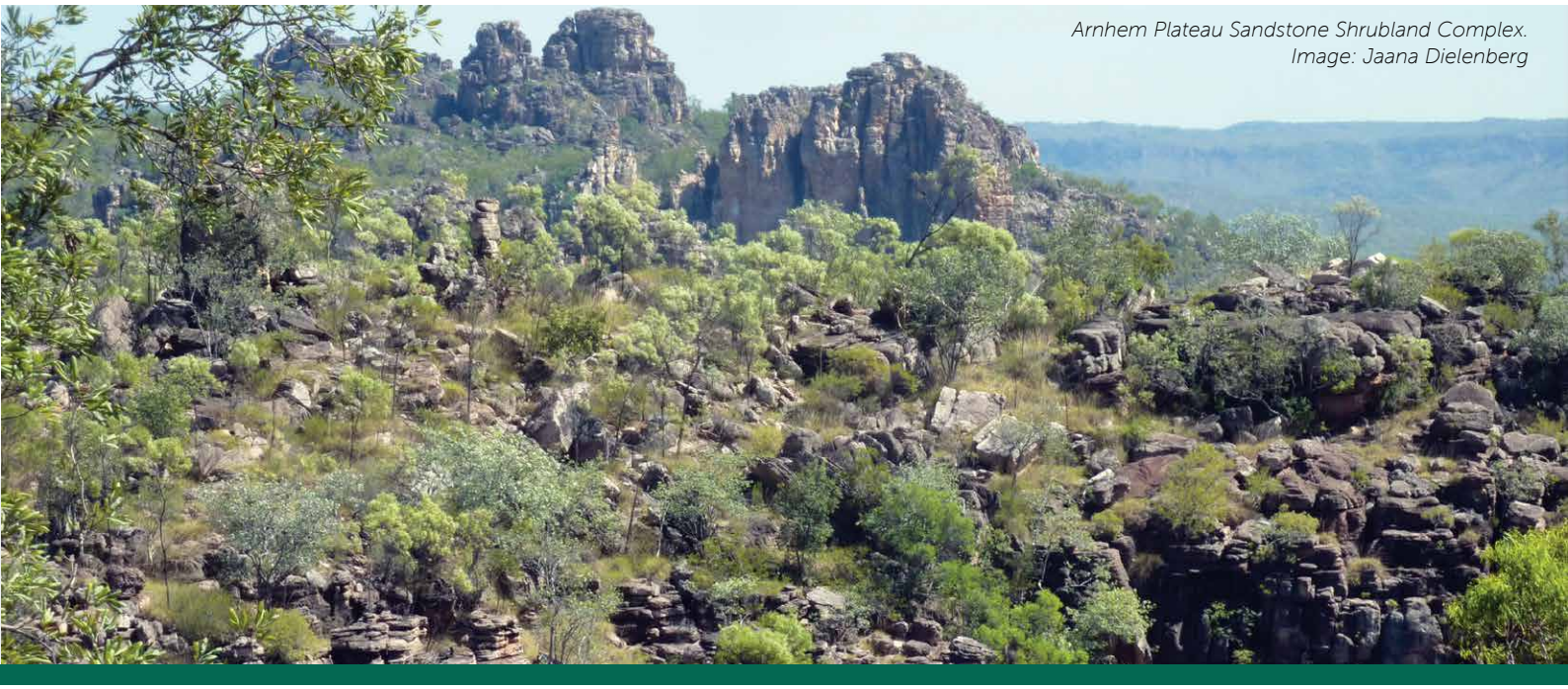
National Environmental Science Programme

Economic valuation of multiple threatened species and ecological communities in Australia based on community willingness to pay

In brief

Australia has numerous threatened species that need protection, and limited funding for conservation actions. Understanding the monetary values that Australians place on threatened species can help inform conservation investments and policy. We investigated the preferences of the Australian public for improving the levels of extinction risk for 14 threatened species and two ecological communities. We used an economic technique called discrete choice experiment. We conducted three online surveys to collect the data. We then calculated willingness-to-pay benefit estimates for each species and community.

Our results indicated that people are willing to pay to protect native species and communities. Survey respondents differentiated between species in terms of how much they would value improved protection, and the degree to which the risk of extinction was reduced. The most valued threatened species was the great desert skink (*Egernia kintorei*), with a willingness-to-pay of $1.87 per year per household for 20 years for a one percentage point improvement in its status. The least valued was the threated ecological community Clay Pan of the Swan Coastal Plain, at $0.12 per year per household for the same period and level of improvement in status. These valuation estimations and our benefit transfer approach improve the information available to decision–makers so that better investments in conservation actions can be made in the future. The approaches used in this study have significant potential to contribute to assessments of the 'total economic value' of ecosystems by complementing information on the benefits that people receive through ecosystem services, applied through frameworks such as ecosystem accounting under the United Nations System of Environmental-Economic Accounting.



Arnhem Plateau Sandstone Shrubland Complex. Image: Jaana Dielenberg

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Background

Australia has more than 1700 species and ecological communities that are known to be threatened with extinction. Given the large number of species to protect and limited funding, understanding the values Australians place on threatened species will help decision-makers to invest appropriately in conservation actions. Apart from threat status, the costs and benefits of an investment could play a part in assessing conservation actions.

Benefit estimates in monetary form may be valuable for setting management priorities and assessing proposed investments for conservation projects. However, using economic theory in developing decision frameworks for conservation has not yet been done in Australia.

Benefit estimates are available for improving the status of only a few of the Australian threatened species listed in the Threatened Species Strategy. This lack of data could lead to poor investment choices in conservation. To address this, we have developed a benefit transfer tool and guidelines to enable benefit estimates to be determined for the non-valued species listed on the Threatened Species Strategy. This current research builds on this work and focuses on estimating valuations for multiple threatened species.

Main aims of the research

We first aimed to investigate preferences of the Australian public for improving the levels of extinction risk for 14 species and two ecological communities. Second, we aimed to determine a willingness-to-pay benefit estimate for these species and communities.

Banksia vincentia. *Image: Tony Auld*

Great desert skink. Image: Martin Whiting

What we did

We prepared an initial list of threatened species and ecological communities based on listing in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Threatened Species Strategy. In consultation with government stakeholders and project partners from the Threatened Species Recovery Hub, we narrowed the list to 14 animal and plant species and two ecological communities.

The 12 animals included in the surveys and benefit estimates were:

- eastern bristlebird
- orange-bellied parrot
- Murray cod
- numbat
- Boggomoss snail
- great desert skink
- Australasian bittern
- far eastern curlew
- shaw galaxias
- brush-tailed rabbit-rat
- giant freshwater crayfish
- Gulbaru gecko.

The two plants included were *Acacia equisetifolia* and *Banksia vincentia*, and the two ecological communities were the Arnhem Plateau Sandstone Shrubland complex and the Clay Pans of the Swan Coastal Plain. We translated terms used to classify the threat status of a species into an extinction risk category: extinct, very high, high, moderate and low extinction risk.

To investigate the Australian public's preferences for species conservation, we applied an economic technique called discrete choice experiment. We used a partial profile design with each survey sample containing seven plant and animal species and one ecological community from the 16 possible species and communities. With the partial profile survey design, the respondents could only give improved protection to a subset of the eight possible species, with the other species remaining at the same protection level they are currently.

We implemented three nationwide online surveys with around 900 valid respondents completing each one of the three surveys. We offered a choice of five levels of extra protection that a species could be given, and an estimate of the cost to each household was provided for each protection plan (See Figure 1).

The survey designs were:

1. Select a subset of three species to increase their level of protection from eight possible species
2. Select a subset of five species to increase their level of protection from eight possible species
3. Select an increase in the level of protection for all eight species provided.

Acacia equisetifolia.
Image: Kym Brennan

Using a statistical model, we obtained willingness-to-pay estimates over a 20-year period for two metrics: first, for reducing a species' extinction risk by 1%; and second, for improving a species from their current extinction risk to the lowest extinction risk. We analysed the survey responses and checked them for consistency, and determined a mid-point dollar value for each species. We then conducted two benefit transfer case studies to illustrate how the estimated species values can be used in other contexts.

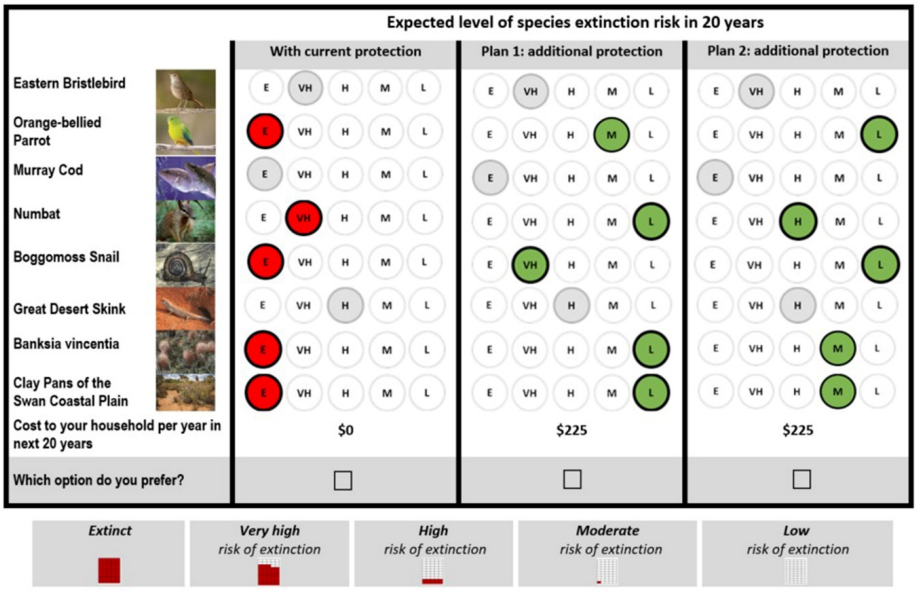

Figure 1: *An example of the design used in the second survey. This survey asked a person to choose one of five additional levels of protection for five of the eight species and communities under two different management plans.*

Key findings

Our results indicated that people are willing to pay to protect threatened native species and communities. Further, we found differences in the level of willingness-to-pay across species. The respondents differentiated between species in terms of the amount that they value improved protection, and the degree to which the risk of extinction is reduced.

In the first survey, the most highly valued species/community was the great desert skink (*Egernia kintorei*), with a willingness-to-pay of $1.87 per year per household for 20 years for a one percentage point improvement in its status. The least valued was the community Clay Pan of the Swan Coastal Plain at $0.12.

In the second survey, the most highly valued species was the brush-tailed rabbit-rat (*Conilurus penicillatus*), with an estimate of $3.54 per year per household for 20 years for a one percentage point improvement in its status. The least valued were the Gulbaru gecko (*Phyllurus gulbaru*) and *Acacia equisetifolia* at only $0.46. Our analysis showed that respondents were able to express differential dollar values for a set of species, and that these values could be estimated with high statistical precision.

We also calculated the willingness-to-pay values for moving each species from its expected outcome in 20 years if there is no further protection up to the lowest level of risk (Tables 1 and 2). It should be noted that differences in these values across species are a combination of the differences in values per percentage point improvement for each species plus the differences in their initial risk status.

Table 1: *Value estimate for each species in species set 1. Willingness to pay (WTP) over 20 years for either a 1% improvement in risk level, or for improving species from their current level to the lowest extinction risk level.*

Species name (*species risk status in 20 years with no additional protection*)		**Value range ($) (low–high)**	**WTP ($) 1% improvement**	**WTP ($) Low extinction risk**
Great desert skink *(High)*		1.16–4.28	2.72	54
Murray cod *(Extinct)*		0.32–0.93	0.63	63
Numbat *(Very high)*		0.25–0.97	0.61	46
Banksia vincentia *(Extinct)*		0.20–0.73	0.47	47
Orange-bellied parrot *(Extinct)*		0.15–0.68	0.42	42
Eastern bristlebird *(Very high)*		0.06–0.63	0.35	26
Boggomoss snail *(Extinct)*		0.01–0.48	0.29	29
Clay Pans of the Swan Coastal Plain *(Extinct)*		0.02–0.37	0.20	20

Shaw Galaxis. *Image: Tarmo A. Raadik*

Key findings (continued)

Table 2. Value estimate for species set 2. Willingness to pay (WTP) for 20 years for either a 1% improvement in risk level, or for improving species from their status quo level to the lowest extinction risk level.

Species name (*species risk status in 20 years with no additional protection*)		Value range ($) (low–high)	WTP ($) 1% improvement	WTP ($) Lowest extinction risk
Brush-tailed rabbit-rat *(High)*		2.62–7.43	5.03	101
Giant freshwater crayfish *(High)*		1.65–5.38	3.52	70
Australasian bittern *(Very high)*		0.57–1.67	1.12	84
Arnhem Plateau Sandstone Shrubland Complex *(Very high)*		0.36–1.28	0.82	62
Far eastern curlew *(Extinct)*		0.37–1.07	0.72	72
Shaw galaxias *(Extinct)*		0.35–0.98	0.67	67
Gulbaru gecko *(Extinct)*		0.34–0.97	0.65	65
Acacia equisetifolia *(Extinct)*		0.33–0.98	0.66	66

We found that the estimates from the third survey, where all eight species needed to be assigned a level of protection, were less consistent. This was so to such an extent that some species had insignificant value estimates in our statistical model. The values were more reliable from the first and second surveys, where a subset of three or five species had to be chosen for added protection.

A comparison of the results between surveys one and two revealed that willingness-to-pay values differed based on the number of species planned to be saved.

When respondents were asked to select three species to save, they were willing to pay more money per species than when they were asked to choose five species to save.

We explored two case studies on how to use the willingness-to-pay values in a benefit transfer. A benefit transfer is required when values from one species or context are transferred to another, such as where values are needed for a species that has not yet been valued in a primary study. We choose two bird species not included in the three surveys.

The results estimated the aggregate value of benefits for conserving the superb parrot (Polytelis swainsonii), moving from the current risk level to the lowest extinction risk level, was AU$ 8.8 million per year for 20 years. The aggregate value of benefits for conservation of the painted honeyeater (Grantiella picta) was AU$ 5.8 million per year for 20 years.

These aggregated national values were derived through a process where we made four adjustments for the benefit transfer purpose. Firstly, we adjusted for the policy and biological context for benefit transfer (e.g. orange-bellied parrots for superb parrot and from national level to Murray Darling Basin). Secondly, we adjusted for inflation using the consumer price index and real income using weekly earnings per person for 2020 using index and weekly earnings of 2019 and 2020. Thirdly we adjusted for improving the extinction risk level of the species from the current level to the desired level. Finally, we aggregated the adjusted willingness-to-pay value to the total number of households in Australia.

Murray cod.
Image: Jabin Watson

Implications

This study focused on a set of specific species and ecological communities. If management actions can be interpreted for changes in extinction risk to these species and communities, then the willingness-to-pay estimates reported here can be used to value those improvements.

Resources to conserve threatened species are always limited, and a sound approach is therefore needed to make investment decisions. A benefit–cost analysis can be used to assess alternative options that arise when planning a project or management action to conserve a threatened species in a given context.

The estimated values of species and ecological communities that we calculated could be applied to a range of decision-making contexts. Even without using these values in a formal accounting framework or a decision support tool, quantitative estimates of non-market values for threatened species can help decision-making. These values can influence the subjective judgements that people make about the relative importance of different interventions, and thereby influence the decision-making process. For example, these estimates can help decide whether a conservation project should target a single species or multiple species, or whether a management action should be implemented over five or 10 years to maximise outcomes for investment.

Decision makers now have access to a more widespread set of values that underpin the value of investment in conservation actions to save threatened species. The database of estimated values we calculated can be used in setting management priorities, assessing proposed investments on species conservation projects, informing environmental accounting and conducting benefit–cost analysis and benefit transfer for conservation projects.

Cited material

Asha Gunawardena, Michael Burton, Ram Pandit, Stephen T. Garnett, Zander, and David Pannell (2020). *Valuing multiple threatened species and ecological communities in Australia*. NESP Threatened Species Recovery Hub Project 6.1 Final report, Brisbane.

Australasian Bittern. Image: Graeme Lembcke

Further Information

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