



## Supporting Threatened Species in Exotic Planted Forests: Would New Zealanders be willing to pay?

### Summary

“Is habitat for threatened native species in planted forests valued by New Zealanders?” To answer this question we conducted an economic valuation survey of 209 New Zealanders. A typical respondent agreed that planted forests provide a variety of environmental services including; carbon sequestration, recreation and also provides habitat for threatened native species. Using ‘willingness to pay’ questions, we determined the value placed by individuals on biodiversity in planted forests. A typical respondent would be willing to pay additional income tax (to be provided to the Department of Conservation) of \$41 per year for five years to increase the population numbers for five selected threatened species in New Zealand’s planted forests. Among the five species studied, the most valued were the bush falcon (\$19/year) and the brown kiwi (\$17/year). The national value of improving indigenous biodiversity in planted forests through a feasible increase in the population of the five threatened species is approximately \$26.3 million per year for five years.

**Authors: R.T. Yao , J.A. Turner, R. Scarpa, C. Maunder and T. Barnard**

### Introduction

New Zealand’s 1.8 million ha of planted forests account for approximately 7% of the country’s land area. These forests consist mainly of exotic trees such as radiata pine, Douglas-fir and eucalyptus. They provide habitat for at least 118 threatened native animals and plants <sup>[1-3]</sup>. Studies also suggest that habitat for threatened species can be enhanced through forest management <sup>[4-6]</sup>.

To estimate the economic value that New Zealanders place on increasing population numbers for threatened species in planted forests we first undertook a scoping exercise. Based on a literature review and interviews with key stakeholders on biodiversity in planted forests, although planted forests provide habitat for threatened native species, some people still regard these forests as biological deserts. While there was evidence that New Zealanders place a dollar value on enhancing biodiversity on private land by planting more native trees <sup>[7]</sup>, it is unknown if this also holds for biodiversity in privately owned exotic planted forests.

We addressed these issues in the question ‘would a typical New Zealander be willing to

support an increase in threatened native species in planted forests and if so, in what ways?’

In the next stage of the scoping exercise we conducted focus groups to identify the five main threatened species, in planted forests, that people would be willing to financially support. We conducted focus groups in Rotorua, Whakatane and Taupo with potential survey respondents. At the same time, we worked with ecologists and forest managers to determine the current population of threatened species. We also approximated feasible ranges for increasing population numbers of those species that can be achieved through forest management.

A range of native species were suggested by focus group participants, namely; brown kiwi, kereru, frog, worm, mistletoe, snail, eels, bat, pohutukawa, wood rose, falcon, gecko, weta, giant kokopu, inanga, morepork, kokako, fernbird, kakabeak, and spotless crane. This list was discussed with ecologists and refined based on the species conservation status and if the species’ visibility could be enhanced through forest management. Table 1 shows the eight species ranked from most valued to least.



# ENVIRONMENT & SOCIAL TECHNICAL NOTE

Number: ESTN-016  
Date: June 2011

Species	Points
Brown kiwi	19
Native bat	11
Hochstetter's frog	9
Bush falcon	8
Giant kokopu	7
Green gecko	5
Kakabeak plant	1
Weta	1

**Table 1.** List of most valued threatened species from focus group meetings.

Consultations with ecologists helped us identify the feasible set of five threatened species composed of the New Zealand bush falcon, Auckland green tree gecko, the giant kokopu fish, the kakabeak plant and the brown kiwi. The frog and bat were excluded because of their low visibility in planted forests.

Figure 1 shows the five identified species with corresponding description of different levels of presence in planted forests. The column labelled as "current condition" represents the existing level of abundance in specific planted forests. From the current condition, we explored the feasible ranges of increase for Level 1 (intermediate level improvement) and Level 2 (highest level of improvement) in consultation with forest ecologists and forest managers. The range of payment values (i.e., dollar bid values \$30, \$60 and \$90) to increase the number of species were identified in focus group meetings.






In Figure 1, the description of levels was framed using words such as "sighted", "heard" and "occurring" in order to collect a combination of *use*, *option*, *existence* and *bequest* values from respondents.

Use values include *direct* use such as the value a recreationist derives from bird watching and *indirect* use such as the value derived from knowing a forest provides habitat for wildlife.

*Option value* includes knowing that one would hear a kiwi in a forest in the future. *Existence value* comes from knowing threatened birds exist in a forest. *Bequest value* comes from

ensuring that a threatened bird will be conserved for future generations.

The abovementioned values represent the different components of economic value. In this case, economic value refers to the degree to which biodiversity enhancement in planted forests satisfies individual preferences. Therefore, economic value can be measured by the amount of money that the individual is willing to pay for supporting biodiversity services in planted forests.

Threatened Animal/Plant	Current Condition	Level 1	Level 2
<u>Brown Kiwi</u>	 Kiwi calls heard in 1 out of 200 planted forests	Kiwi calls heard in 10 out of 200 planted forests	Kiwi calls heard in 20 out of 200 planted forests
<u>Giant Kokopu</u>	 Kokopu seen in 1 out of 10 suitable streams	Kokopu seen in 3 out of 10 suitable streams	Kokopu seen in 5 out of 10 suitable streams
<u>Kakabeak</u>	 At least 3 naturally occurring Kakabeak shrubs	At least 10 actively managed Kakabeak shrubs	At least 20 actively managed Kakabeak shrubs
<u>Auckland Green Gecko</u>	 Gecko sighted in 1 out of 50 walks	Gecko sighted in 3 out of 50 walks	Gecko sighted in 5 out of 50 walks
<u>NZ Bush Falcon</u>	 Bush falcon sighted in 1 out of 8 drives	Bush falcon sighted in 3 out of 8 drives	Bush falcon sighted in 5 out of 8 drives






**Figure 1.** The five native species, their current condition and two feasible levels of enhanced conditions.

The results from the scoping exercise were used to finalise the economic valuation questions. These questions aim to elicit the willingness to pay (WTP) values of respondents. Specifically, we used the choice experiment economic valuation technique, where each respondent was provided with nine choice situations. Each choice situation includes three options, the first is the current condition with the value of zero while each of the other two options include a combination of the current level, and levels 1 and 2, along with an estimated cost of achieving the level of improvement; either \$30, \$60 and \$90 per year for five years. Figure 2 shows an example of a choice situation.



# ENVIRONMENT & SOCIAL TECHNICAL NOTE

Number: ESTN-016  
Date: June 2011

Threatened Animal/Plant	Current Condition	Option A	Option B
<b>Brown Kiwi</b> 	Kiwi calls heard in 1 out of 200 planted forests	Kiwi calls heard in 10 out of 200 planted forests	Kiwi calls heard in 20 out of 200 planted forests
<b>Giant Kokopu</b> 	Kokopu seen in 1 out of 10 suitable streams	Kokopu seen in 5 out of 10 suitable streams	Kokopu seen in 3 out of 10 suitable streams
<b>Kakabeak</b> 	At least 3 naturally occurring Kakabeak shrubs	At least 20 actively managed Kakabeak shrubs	At least 3 naturally occurring Kakabeak shrubs
<b>Auckland Green Gecko</b> 	Gecko sighted in 1 out of 50 walks	Gecko sighted in 5 out of 50 walks	Gecko sighted in 3 out of 50 walks
<b>NZ Bush Falcon</b> 	Bush falcon sighted in 1 out of 8 drives	Bush falcon sighted in 3 out of 8 drives	Bush falcon sighted in 5 out of 8 drives
Amount to be paid annually for five years	\$0	\$60	\$90
I would choose (tick)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Figure 2.** An example of a choice situation.

## What is Willingness To Pay (WTP)?

WTP is the amount of money an individual would be prepared to forego in exchange for some benefit from specific actions. In this case, we are eliciting the WTP of an individual to support an increase in the number of threatened species in planted forests by undertaking a five-year programme.

WTP also refers to the amount of money that would make an individual indifferent between paying for the improvement and foregoing the improvement so they can spend that money on other things that they enjoy. WTP is constrained by an individual's income. In estimating the WTP of a person, it is assumed that WTP cannot exceed his/her income.

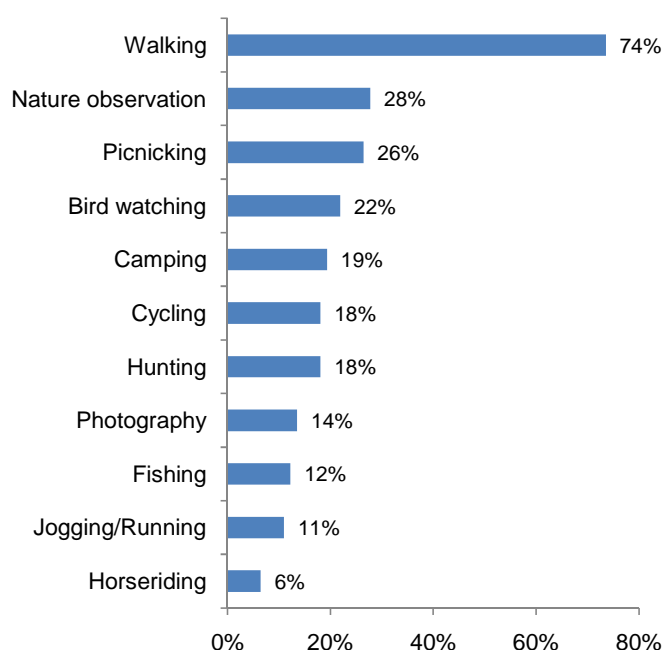
The process of estimating WTP requires care so as to account for potential sources of bias. To address potential biases in the valuation process, before asking respondents about their WTP value, we first reminded them that their money could also be spent on other things that they enjoy (e.g., watching movies). We also emphasised that it is important to provide the

value that they truly feel like giving to the programme. This technique of reminding respondents of the alternative use of money is called "cheap talk" [8]. As a result, several respondents wrote that although they would like to financially contribute to the programme, their existing financial condition prevents them from doing so.

## Survey Respondent Characteristics

We received 250 completed surveys; a 41% response rate. Of these respondents 61% were from an urban area and a third were less than 10 km from a large planted forest. At least 81% of respondents were aware that planted forests provided habitat for threatened native species, this possibly reflected the proportion of respondents that lived close to planted forests and the fact that 67% of respondents had visited a planted forest.

Figure 3 shows the activities participated in during forest visits, with walking, nature observation and picnicking being the main activities.



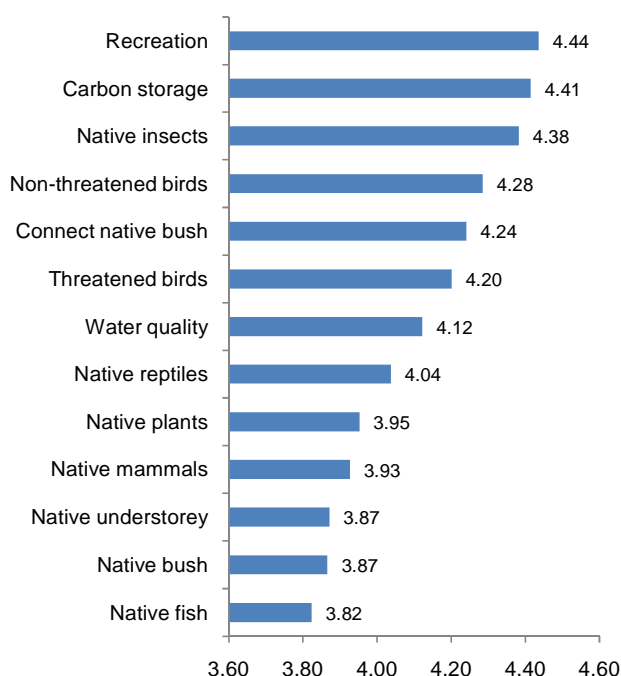
**Figure 3.** Activities participated in during a visit to a planted forest.



# ENVIRONMENT & SOCIAL TECHNICAL NOTE

Number: ESTN-016  
Date: June 2011

On average, respondents agreed that planted forests provide the environmental services that we have listed on the survey. The top environmental services that they agreed on were recreation, carbon sequestration, and habitat for native insects (Figure 4).



**Figure 4.** Extent to which respondents agree that planted forests provide different environmental services. 5 represents strongly agree, 3 is neutral, and 1 is strongly disagree

## The Value of Biodiversity Enhancement

In answer to the question from the title of this Technical Note; “Would New Zealanders be willing to pay to support threatened species in planted forests?” - the answer is clearly **YES**.

Table 2 presents a summary of WTP estimates that range from \$0 for a Level 1 increase in green gecko sighted to \$19 for a Level 2 increase in falcon sighted in planted forests.

These estimates represent the average amount that a typical respondent would be willing to pay on an annual basis for five years to the Department of Conservation to increase threatened species population levels.

WTP estimates on Table 2 indicate a pattern of higher financial support for native bird species, brown kiwi (\$17) and bush falcon (\$19). These birds represent the iconic and ‘charismatic’ species. The lower WTP values for kokopu, kakabeak and gecko, may be due to a couple of factors. These species are less charismatic and are less likely to be seen when visiting planted forests. WTP values on Table 2 are slightly higher for Level 2 than Level 1 with the exception of kakabeak.

Threatened Species	Status Quo	Level 1	Level 2
Brown kiwi		14.26	16.64
Giant kokopu		4.87	--
Kakabeak		5.45	5.22
Green gecko		--	--
Bush falcon		14.43	18.86
Status Quo	25.32		
<b>TOTAL</b>	<b>\$25.32</b>	<b>\$39.01</b>	<b>\$40.72</b>

**Table 2.** Mean WTP of respondents for an increase in the population native species in planted forests

In total, the value of a Level 2 increase in the population of threatened species had an average value of \$41 per year per year for five years. The WTP estimates were adjusted for two potential sources of biases; aggregation and hypothetical biases.

Aggregation bias in our WTP estimates was accounted for using the method of Morrison (2000) <sup>[9]</sup>. As 43% of the people contacted participated in the survey, we assumed that 57% of New Zealand’s taxpaying population of 3 million <sup>[10]</sup> has a WTP of zero.

Hypothetical WTP estimates are approximately two to three times greater than actual values <sup>[11, 12]</sup>. However, as we employed “cheap talk”, reminding respondents of the opportunity cost of money, we assume that the hypothetical WTP is closer to twice the actual.

Accounting for aggregation and hypothetical biases, respectively, we assume that 43% of taxpayers hold 50% of the total WTP values in Table 2. Taking these into account, a Level 1 increase in species in planted forests of \$39/taxpayer corresponds to an aggregate value





# ENVIRONMENT & SOCIAL TECHNICAL NOTE

Number: ESTN-016  
Date: June 2011

of \$25.2 million per year for five years. The Level 2 increase provides a value of \$41/taxpayer or an aggregate value of \$26.3 million per year for five years. Maintaining the current population of threatened species in planted forests was also valued as indicated by a WTP of \$25/taxpayer or an aggregate value of \$16.3 million per year for five years.

We also asked respondents if they would be willing to provide in-kind support to help increase native species in planted forests. About one out of five respondents would be willing to provide approximately nine volunteer days per year to support threatened species. However, our sample of respondents might be biased because for every three persons that were invited on the phone to join the survey, only one agreed to join the survey. We could therefore say that for every fifteen New Zealand taxpayers, one would be willing to volunteer his/her time to increase the number of threatened species in planted forests corresponding to about 7% of the taxpayers.

## Conclusion

This study is consistent with previous studies that suggest that planted forests provide non-timber forest values such as recreation and environmental services <sup>[13, 14]</sup>. Respondents would be willing to financially support improving the habitat for threatened species in these forests with an estimated national value of \$26 million per year for five years. In addition to financial support, about seven percent of taxpayers would be willing to volunteer approximately nine days per year to help support threatened species. The above suggests that the enhancement of habitat for indigenous animals and plants in exotic planted forests is highly valued by New Zealanders and should be accounted for in future policy decision making.

## References

1. Brockerhoff, E.G., Jactel, H., Parrotta, J.A., Quine, C.P., and Sayer, J., *Plantation forests and biodiversity: Oxymoron or opportunity?* Biodiversity and Conservation, **17** (5), pp. 925-951. (2008).
2. Brockerhoff, E.G., Shaw, W.B., Hock, B., Kimberley, M., Paul, T., Quinn, J., and Pawson, S., *Re-examination of recent loss of indigenous cover in New Zealand and the relative contributions of different land uses.* New Zealand Journal of Ecology, **32** (1), pp. 115-126. (2008).
3. Pawson, S.M., Ecroyd, C.E., Seaton, R., Shaw, W.B., and Brockerhoff, E.G., *New Zealand's exotic plantation forests as habitats for threatened indigenous species.* New Zealand Journal of Ecology, **34** (3), pp. 342-355. (2010).
4. Carnus, J.M., Parrotta, J., Brockerhoff, E., Arbez, M., Jactel, H., Kremer, A., Lamb, D., O'Hara, K., and Walters, B., *Planted forests and biodiversity.* Journal of Forestry, **104** (2), pp. 65-77. (2006).
5. Maunder, C., Shaw, W., and Pierce, R., *Indigenous biodiversity and land use - What do exotic plantation forests contribute?* New Zealand Journal of Forestry, **49** (4), pp. 20-26. (2005).
6. Seaton, R., Holland, J.D., Minot, E.O., and Springett, B.P., *Breeding success of New Zealand falcons (Falco novaeseelandiae) in a pine plantation.* New Zealand Journal of Ecology, **33** (1), pp. 32-39. (2009).
7. Yao, R., and Kaval, P., *Valuing biodiversity enhancement in New Zealand.* International Journal of Ecological Economics and Statistics **16** (10), pp. 26-42. (2010).
8. Cummings, R.G., and Taylor, L.O., *Unbiased value estimates for environmental goods: A cheap talk design for the contingent valuation method.* American Economic Review, **89** (3), pp. 649-665. (1999).
9. Morrison, M., *Aggregation biases in stated preference studies.* Australian Economic Papers, **39** (2), pp. 215-230. (2000).
10. Treasury, N.Z., *Key facts for taxpayers: Who pays tax and how much?* 10 November]; Available from: <http://www.treasury.govt.nz/budget/2007/taxpayers/01.htm>. (2010)
11. Christie, M., *An examination of the disparity between hypothetical and actual willingness*



# ENVIRONMENT & SOCIAL TECHNICAL NOTE

Number: ESTN-016  
Date: June 2011

- to pay using the contingent valuation method: The case of red kite conservation in the United Kingdom.* Canadian Journal of Agricultural Economics, **55** (2), pp. 159-169. (2007).
12. List, J.A., and Gallet, C.A., *What experimental protocol influence disparities between actual and hypothetical stated values?* Environmental and Resource Economics, **20** (3), pp. 241-254. (2001).
  13. Rivas Palma, R.M., *Environmental and social values from plantation forests: A study in New Zealand with focus on the Hawke's Bay region.* Department of Forestry, Unpublished PhD Thesis, University of Canterbury. (2008).
  14. Scarpa, R., Chilton, S.M., and Hutchinson, W.G., *Benefit estimates from forest recreation: Flexible functional forms for WTP distributions.* Journal of Forest Economics, **6** (1), pp. 41-54. (2000).