Recreational users' willingness to pay and preferences for changes in planted forest features

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ABSTRACT

This study examines the current and potential economic value of recreation by users of a New Zealand periurban planted forest. The value was derived from a face-to-face survey of 578 users of Whakarewarewa forest in Rotorua. The recreational benefit, estimated by the travel cost method, was NZ$34 per visit for walkers and NZ$48 per visit for mountain bikers. Aggregating these estimated values by the number of forest visits in 2009 suggests that the economic value of recreation in this planted forest was approximately NZ$8 million in that year. Visitors' preferences for alternative features of the planted forest were analysed using a latent class model to account for preference heterogeneity. This analysis indicates that forest users would gain a higher recreational satisfaction from an increase in diversity of forest features. Forest user characteristics that positively influence satisfaction from an increase in diversity were analysed using an ordinary least squares regression model. Important user characteristics include being a New Zealand born European, a local resident of Rotorua, and elderly.

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1. Introduction

The management of planted forests is being modified to accommodate non-timber values. Globally, recreation is one value which is becoming increasingly important as the demand for forest recreational services (health, fitness, serenity and fun) grow and become more diversified (Bartczak et al., 2008; Dignan and Cessford, 2009; Santiago and Loomis, 2009; Scarpa et al., 2010). In the case of New Zealand, this is driven particularly by people living in urban areas who account for 72% of the population (Statistics NZ, 2008; MOT, 2008). Statistics NZ (2008) reports that 26.2 million person days are spent in recreational activity annually, with forest recreation accounting for a significant proportion. Demand for forest-based recreation is increasing, with single-day visits to forests predicted to increase annually by 1% between 2008 and 2014 (MOT, 2008).

People generally prefer to participate in outdoor activities at sites situated close to where they live (Dignan and Cessford, 2009). However, most forest sites in New Zealand are located far from urban centres, or do not provide important recreational activities, such as mountain biking. Only a few recreational forests are accessible to urban residents (e.g. Flagstaff forest in Dunedin; Bottle Lake Forest Park in Christchurch; Whakarewarewa forest in Rotorua, and Woodhill forest near Auckland).

Peri-urban planted forests could help meet the growing demand for recreation, the value of which is potentially significant. For example, the annual recreational benefit from a planted pine forest near Adelaide, Australia, accounted for almost 30% of the standing timber value (Smailes and Smith, 2001).

The recreational value of forests may also be an indicator of sustainable forest management as part of forest certification. This is of importance in New Zealand where over 50% of wood products produced are certified as coming from sustainably managed planted forests (Hock et al., 2009).

Numerous studies have examined the value of forest recreation (Kerr, 2010), though few have estimated these values for planted forests. Sandrey (1986) estimated the value of visits to Hanmer forest park to be $57[2] per visit using the travel cost method. Walker (1992, cited in Kerr, 2010) estimated the value of recreation in Bottle Lake forest to be $42 per visit, using contingent valuation. Those studies, however, did not examine the impact of features of planted forests such as mix of tree ages; mix of tree species and tree density (stocking) at the stand level; and tree species composition and management block size at the landscape level, on recreation value. These features are potentially important influences on the economic value of forests for recreation (Silvennoinen et al., 2001; van Rensburg et al., 2002; Horne et al., 2005) but have not been examined in recreation valuation studies.

This study aimed to estimate the economic value from recreation in Whakarewarewa forest in Rotorua: a New Zealand periurban

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[2] Dollar values throughout the paper are in 2008 New Zealand dollars.

planted forest mainly used for walking and mountain biking. The study addressed three research questions of importance to forest managers and policy makers:

1) What value does a typical forest user place on recreational activity in an urban planted forest?
2) What forest features would forest users prefer to see improved in a planted forest to satisfy their recreational needs?
3) What factors influence the satisfaction (or utility) users derive from changes in forest features?

This paper uses a combination of stated preference and revealed preference methods to examine recreational values and users' preference. We addressed the first question by applying the travel cost method. The second question was answered using stated choice analysis. The third question was addressed using an ordinary least squares regression model.

The next section of the paper describes the study site, method used to construct the survey instrument and the survey instrument itself. We also describe the different econometric models used for analysis. This is followed by results of the analysis; (1) the economic values estimated from the travel cost method; (2) users' preferences for changes in forest features from stated choice analysis using logit models; and (3) individual's characteristics influencing the increase in satisfaction derived from changes in forest features. The paper concludes with a summary of findings, and discusses policy implications and areas for future research.

2. Methods

Both travel cost and choice modelling techniques were employed to explore the benefits from existing and alternative recreational features of Whakarewarewa forest. This section describes the study site, methods and materials used to collect and analyse the data.

2.1. Study location

This study was carried out in Whakarewarewa forest (Fig. 1) located close to the urban centre of Rotorua (population approximately 70,000). This forest is known nationally and internationally as a venue for forest-based recreation, due to its location close to a major tourist centre and high quality mountain bike tracks (APR, 2007). The forest is also relatively accessible from major cities: three hours drive from Auckland (population 1.4 million), 1.5 hours from Hamilton (population 130,000), three hours from Napier-Hastings (population 120,000), and one hour from Tauranga (population 107,000). A recent survey of users in Whakarewarewa forest found that of the over 94,000 users per year (APR, 2009), including overseas tourists, almost three quarters were from outside the Rotorua region. Forest users contributed to a total of 304,040 recreational visits in 2009, a 25% increase from 2005 (APR, 2009).

Public have free access to the forest for recreation. The main recreational activities include mountain biking, walking, running, hiking and horse riding. There are three types of management within the 5667 ha of Whakarewarewa forest. The Rotorua District Council manages 288 ha of the forest (bounded by Nursery, Tarawera and Tokorangi Pa roads; Fig. 1) as a recreational forest park. This area includes the iconic redwoods and a mix of other exotic species, and is popular for tourism, walking and running.[3] A small area of the forest (289 ha) is managed as a natural resource conservation area, including historical and culturally important sites.

A timber investment and management organisation, Timberlands Ltd, manages the remaining 2427 ha of the forest for commercial timber production. Our study focuses on recreational users of this area of

planted forest within Whakarewarewa forest (Fig. 1). This area of the forest includes commercial timber species, such as radiata pine (*Pinus radiata*; 1681 ha; 70% of forest area), Douglas-fir (*Pseudosteuga menzesii*; 521 ha), *Eucalyptus* spp. (40 ha) and other minor species (185 ha). Current timber management is single-species and same-aged trees at the stand level, at an average density (stocking) of approximately 400 stems/ha (depending on stand age), with limited understorey. Forest management blocks are predominantly 30 ha or greater. Recreational activities in this area include mountain biking, horse riding and walking.

2.2. Focus group discussions

Four focus group discussions with walkers and mountain bikers were held separately to address the following objectives of survey design:

1) to identify the most important forest features for mountain biking and walking in Whakarewarewa forest,
2) to ensure that respondents distinguish a real difference in selected forest feature levels for analysis,
3) to determine the most effective way to visually and objectively depict forest features,
4) to refine the wording of choice questions to remove ambiguity and misunderstandings,
5) to refine questionnaire design and format, and
6) to determine the appropriate payment vehicle if charges for recreational access were introduced.

The participants of the focus groups all had some knowledge of the forest and were regular forest visitors, including representatives of local clubs (e.g. walking and mountain biking). The focus groups had between five and nine participants with mixed characteristics in gender, age and recreational experience.

Focus group discussions were semi-structured and conducted in a series of steps in order to elicit information regarding the six objectives. All focus group participants emphasised the importance of ease of access to the forest in terms of proximity to Rotorua and free entry. Participants identified two important features of the forest for recreation; diversity and composition of tree species and ages at the stand and landscape levels. Walkers showed a stronger interest than mountain bikers in forest features. Mountain bikers were more inclined to discuss recreational features such as the quality of mountain biking trails and enhancement of service facilities such as parking and toilets. These differences suggested the need to estimate the walker and mountain biker recreational values separately.

Based on the information collected from literature (Silvennoinen et al., 2001; van Rensburg et al., 2002), expert interviews (Colin Maunder, Timberlands Ltd., pers comm.), and the four focus groups, we identified five features of planted forests with three levels of each that were potentially important for increased recreational value. The features are presented as follows with the initial level as status quo and the second and third levels as changed attributes:

1) species diversity within forest stands: one species, two species, three or more species;
2) composition of tree ages within forest stands: one age group, two age groups, and three or more age groups;
3) tree density (stocking) within stands for enhancing forest understorey: high density (poor understorey), medium density (medium understorey) and low density (rich understorey);
4) species diversity within the landscape, represented by the proportion of radiata pine with the remaining area in a mix of other species: 70% radiata pine, 50% radiata pine and 30% radiata pine; and
5) size of forest management blocks for increasing landscape diversity: greater than 30 ha (large) blocks, 20 ha (medium) blocks and 10 ha (small) blocks.

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[3] http://www.destinationoutdoors.co.nz/themedetail3.asp?itord=&mapid=37.