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Economic Value of Recreation in Whakarewarewa Forest

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EXECUTIVE SUMMARY

Understanding the economic value of different environmental services provided by planted forests will aid policy makers and land managers in making more informed decisions in the management of land-based resources for multiple benefits to society. Recreation is one important environmental service from planted forests. The value of this service, however, cannot be directly derived from market transactions and is not well known. The objective of this study was to estimate the economic value that mountain bikers and walkers place on recreation in a planted forest on the fringe of Rotorua; Whakarewarewa Forest.

We used travel cost and choice modelling methods to elicit the economic value that users place on different features of Whakarewarewa Forest, such as mix of tree species and tree ages. The data for the study were collected from face-to-face interviews of 709 forest users in Whakarewarewa Forest between November 2008 and February 2009. The survey instrument was developed in consultation with forest users through focus group discussions.

The median economic value of the forest under current management, estimated using the travel cost method, is $15.4 million per year; $5.2 million from walking and $10.2 million from mountain biking. As estimated here, these values are the maximum cost walkers or mountain bikers visiting the forest spend on travel costs, and travel time, when visiting the forest.

The economic value of features of Whakarewarewa Forest for recreation was estimated using choice modelling. The forest features considered were number of species within a forest stand, number of tree age groups within a stand, tree density (stocking) in a typical forest stand, the proportion of the dominant timber species, radiata pine, in the forest landscape, and the average management block/stand size in the forest landscape.

Our results suggest that users would not increase their number of visits or time spent in the forest for changes in the forest features considered in the study. However, a large number of users did show a preference for alternative forest features. Both mountain bikers and walkers preferred more species and tree ages within a stand, and less radiata pine in the landscape. The preference for changes in forest features was stronger for walkers than mountain bikers.

It is important to note that the results of this study do not imply that charging the public for access to Whakarewarewa Forest would yield to the forest owners the economic benefit estimated here. The value does, however, allow a comparison of the value of the forest for recreation in addition to the value of the forest for timber production. The value for mountain biking is five times the annual timber revenue from the forest based on indicative planted forest costs and revenues. The extent to which this value could be realised if appropriate systems were in place to generate revenue from the recreational opportunities that forests provide is a subject of future studies.

INTRODUCTION

Although planted forests account for only 7% of New Zealand's land area[43], they provide important multiple benefits: productive (timber, firewood), supportive (biodiversity conservation, soil stabilization), assimilative (carbon sequestration, waste treatment), meditative (spiritual, serenity) and social (recreational, aesthetic, cultural identity)[3,4,5]. The value of these benefits is increasing with the growing scarcity of natural resources and increasing awareness of global environmental degradation[31,36]. New Zealand still has almost 2 million ha of land that could be planted in forest; further increasing benefits to society. To examine the real value of those benefits, it is important to account for both forests' timber and non-timber value in social, political, and economic decision-making and transactions.

Most non-timber benefits from planted forests are not traded in markets. As such, users demand and realise these benefits at no cost, while forest owners have little economic incentive to include them in management decisions. In addition, policy makers face the problem of allocating scarce resources to promote non-timber benefits without information on the full value of these [22, 31]. It is therefore essential to estimate the economic value of non-timber benefits from planted forests to ensure sound forest management and policy decision-making.

One important non-timber benefit from planted forests is recreation, including mountain biking, camping, walking, picnicking, horse riding, hunting, wilderness exploration, and landscape viewing[3]. The annual recreational benefit from a planted pine forest near Adelaide, Australia, was estimated to be almost 30% of the total standing timber value[58]. In New Zealand, about 26.2 million days were spent on recreation annually, with forest recreation accounting for a significant proportion[3,5]. Demand for forest-based recreation is increasing[56,58], with single-day visits to forests predicted to increase by 1% per year between 2008 and 2014[44].

In New Zealand, a number of studies have estimated the economic value of forest recreation (Table 1)[*]. The majority of these studies used either the travel cost method or contingent valuation to estimate the value of recreation. Reflecting the considerable variability in forest and recreation types studied, the estimated value of recreation ranged from $2.35/visit for Bottle Lake forest near Christchurch to $97/visit for Mt Cook National Park.

Most of New Zealand's national parks are a significant distance from urban areas, making regular visits infeasible. Planted forests located near popular tourist destinations, e.g., Rotorua, Auckland, Christchurch, Hanmer Springs, are alternatives to meet the growing demand for forest recreation. To enhance the recreational opportunities from planted forests it is important for policy makers and forest managers to understand the economic value that recreational users place on forest features (or attributes), such as tree species and age, and size of management blocks.

The purpose of this study was to estimate the economic benefit of mountain biking and walking in a planted forest, Whakarewarewa Forest, and how that benefit might be affected by changes in forest features. Because the economic value of recreation in the forest cannot be directly obtained from market transactions, such as entry fees, we used non-market valuation to estimate these values. The study described here extends previous studies of the economic value of recreation in planted forests in a number of ways. This is the first time the economic value of features of planted forests for recreation, rather than recreation facilities, has been estimated. In addition, our study combines stated and revealed preference methods[1,2], which few studies have previously done[23].

[*] This list was adapted from the New Zealand non-market valuation database (accessed on 30 October 2008 at http://oldlearn.lincoln.ac.nz/markval).

Table 1: Summary of estimates of the economic value of forest-based recreation in New Zealand[a]

Name of site	Reference	Value[a]	Method
Coromandel Peninsula forest recreation	Everitt (1983)	$23.29 ($8)/ visitor group/ year	Travel cost
Kaweka and Kaimanawa Forest Parks	Sandrey and Simmons (1984)	$75.96 ($27) /person/year	Travel cost
Hanmer Forest Park	Sandrey (1986)	$57.10 ($26) /person/visit	Travel cost
Hanmer Forest Park	Sandrey (1986)	$ 5.84-$63.16 ($2.66-$28.76) /person/visit	Contingent valuation
NZ visitors to Mt Cook National Park	Kerr *et al*. (1986)	$96.64 ($44)/person/visit	Travel cost
National park visitor centres	Kerr and Manfredo (1988)	$4.46 ($2.62) /person/visit	Contingent valuation
Road end camping, Tararua Forest Park	Kerr and Manfredo (1988)	$8.74 ($5.13) /person/night	Contingent valuation
Kaitoke Regional Park recreation	Walker (1990)	$9.79 ($6.40)/visit	Travel cost method
Kauaeranga Valley recreation	Riley and Scrimgeour (1991)	$5.86-11.71 ($4-8) /person/year	Contingent valuation
Bottle Lake Forest recreation	Walker (1992)	$2.35 ($1.62)/visit	Travel cost
Bottle Lake Forest recreation	Walker (1992)	$42.12 ($29)/visit	Contingent valuation
Regional Council parks	Kerr (1996)	$14.03 ($10.50) /person/visit	Travel cost
Recreation at Auckland Regional Council parks	Ball *et al*. (1997)	$15.15 ($11.54) /person/visit	Benefit transfer

[a] Reported values are in New Zealand dollars deflated to third quarter 2008. Dollar figures in parentheses are values reported in the publication.

The value of changes in Whakarewarewa Forest for recreation can be extrapolated to estimate the possible value of recreation in other New Zealand planted forests using the benefit transfer technique. This method enables rescaling of values by adjusting for differences in forest conditions that are important for recreation, such as proximity to an urban area, recreational facilities, and forest features.

The rest of this report is organised as follows. The next section reviews the literature on the economic value of recreation in forests. The research methods are then described in terms of how important features for recreation in planted forests were identified, how the survey instrument was developed, and the analytical models used. The results are then presented for the estimated value of recreation in Whakarewarewa Forest and users' preferences for different forest features affecting recreation. The report finishes with the study's conclusions.

Estimating the Economic Value of Recreation

Economic Valuation Methods

There are a number of methods for estimating the economic value of recreation, broadly divided into revealed and stated preference[5,31,65]. The aim of both methods is to determine the value of goods or services that are not directly traded in markets, and therefore do not have an observable price.

Revealed preference methods, such as hedonic pricing and travel cost method, infer economic values from people's actual choices[56,61,63]. For example, the additional value of a house next to Lake Tarawera compared with a similar house in Rotorua provides an indication of the economic value people place on living next to the lake. Stated preference methods, such as contingent valuation and choice modelling, ask people to directly state their values under hypothetical scenarios. For example, individuals could be asked what fee they would pay to use Lake Tarawera, as a measure of the value of the lake. Stated preference values are therefore based on what people say they would do, rather than what people are observed to do[†,10,23,51].

The values estimated under the hypothetical scenarios of stated preference methods may not capture or reflect real life market constraints. For example, individuals may indicate they are willing to pay $50/visit to Lake Tarawera, even though this exceeds their available budget. In contrast, the data from revealed preference methods reflect real life choices and capture the many constraints on individual decisions, such as available budget and time.

Stated preference methods do, however, have an advantage in identifying economic values under different scenarios, while the information collected from revealed preference methods generally reflects a single scenario and cannot predict the impact of alternative management or policy scenarios[1,38]. To overcome the limitations of both revealed and stated preference methods, this study combined these methods, using both travel cost (revealed preference) and choice modelling (stated preference).

The travel cost method implicitly estimates forest recreational value based on the total cost to the user of visiting the forest (e.g., time and petrol used to drive, recreation equipment, entry fees)[12,16]. Essentially the greater the cost of visiting a forest in terms of travel, etc., the greater the implicit value to the individual of recreation in that forest[48]. The travel cost-based value accounts only for use value. Therefore it does not necessarily include other values such as the intrinsic value of the forest[12]. Another limitation of the travel cost method is that it is not possible to estimate how visit cost and frequency might be affected by changes in forest features, such as improvements in walking tracks[2].

Choice modelling focuses on preferences of an individual by examining what levels of forest features would provide them with a greater level of satisfaction. In choice modelling an individual is provided with a set of alternative forest types with different forest attributes, including cost, and asked to choose which they would recreate in. Individuals therefore choose among alternative scenarios based on a trade-off between cost and the forest attributes desirable for recreation[41]. The economic value of individual forest attributes can then be estimated by the extent to which people trade off individual forest features against cost.

Choice modelling may give misleading results when people do not like how cost is represented in the choices they are asked to make – for example, if the value of recreation in a forest with free access is represented by an entry fee. These disadvantages of choice modelling, however, can be overcome by combining the method with the travel cost method[1,29].

† http://www.ecosystemvaluation.org/contingent_valuation.htm

Choice Modelling Estimates of Forest Recreational Value

Few studies have applied choice modelling to estimate the economic value of recreation in forests (Table 1). One study estimated the value of a range of improvements to recreational facilities for cyclists, horse riders, nature watchers, and general forest visitors in Great Britain[16]. Users differed in the value they placed on various improvements, with specialist users placing a higher value on improvements. Enhancements to recreational specific facilities, such as parking, toilets, trails, and wildlife hides were generally valued more highly than the only forest-specific attribute considered; "enhanced surroundings managed for wildlife". However, that attribute was found to significantly enhance the value for some users; £2.39/person/visit (NZ$6.72) for horse riders to £3.62/person/visit (NZ$10.18) for nature watchers.

A study of Spanish planted forests estimated the economic value of carbon sequestration, soil erosion reduction, picnicking, mushroom gathering, and driving[6]. Picnicking was the only recreational activity among the attributes evaluated. Its value ranged from €3.84 to €8.85/person/year (NZ$10.79 to NZ$24.88).

A study of a recreational forest in Finland estimated the economic value of a variety of forest-specific features[30]. Two stand level forest features were considered; species richness, which reflects the number of species and decayed wood at the site, and scenic beauty related to forest management, ranging from no management (natural condition) to intensive timber management. Two forest-wide features were also considered; average species richness across stands and the variance of species richness across stands. The study showed a trade-off between scenery and species richness. The net benefit of the forest could be increased if some stands were unmanaged to create natural habitats, while managing the rest of the forest for recreational purposes.

Determinants of the Economic Value of Planted Forests for Recreation

It is widely recognised that people receive health and psychological benefits from using natural resources for recreation[7,25,32,62]. The level of perceived benefit from a forest, however, depends on the physical features of the forest at the stand and landscape levels[26,28], and the socioeconomic characteristics of the user[15,24,30]. Planted forest management can change these forest features, and hence improve the level of recreational benefit. Important forest features that influence the value of recreation in planted forests include mix of tree species and age, forest landscape, and management block size.

Species Richness

Species richness has been identified as important for forest users in terms of increasing aesthetic values[6,14,45,49]. Estimates of the recreational value of forest species in 27 natural forests in Ireland estimated values of £0.12, £0.10 and £0.05/person/visit (NZ $ 0.27, $0.23 and $ 0.11) for larch, broadleaf and conifer species forests, respectively[55]. A reduction in species richness due to more intensive management was estimated to decrease the value individuals placed on a recreational forest in Finland by €10.36/person/year (NZ$23.10)[30].

Mix of Tree Ages

Users have different preferences for the age of trees in forest stands[23,40]. A mix of age classes provides for people's multiple interests in forests[14,30]. For example, older trees contribute to higher biodiversity[45,50], while variability in age classes increases the aesthetic and biodiversity values of a forest[28,30]. In a study of forests in Sweden[30] the largest annual economic value of natural regeneration was in a mature stand, 5911 SEK per year (NZ$1,321), while the largest value for

natural regeneration under old growth was for middle aged regeneration, 4966 SEK per year (NZ$1,110). The lowest economic value, 984 SEK per year (NZ$220), was for initial stage plantation forest. A mix of species and age classes in the forest is often considered closer to a natural forest condition, with increased recreational value in planted forests with mixed species and tree ages[9,30,40,42].

Forest Landscape Features

Forest visitors' experiences of scenic beauty are positively related to the extent to which the forest landscape can be viewed[52]. Forest landscape features, such as species composition and stand size[40] create a "sense of place" or connection with a forest, particularly where these attributes give the forest a unique character[18,21,57,60] and break up the vista[6,42]. The recreational value of individual species as a proportion of the forest landscape has been found to increase to a maximum and then decline[30]. For example, the highest annual recreational value of pine species of 3500 SEK per year (NZ$782) was at 40% to 50% cover in the forest landscape[30].

METHODS

The steps in the choice modelling process are summarised in Figure 1. The first step was to identify the hypothetical forest types against which the current Whakarewarewa Forest management was compared. This was done based on a literature review, experts' opinions and focus groups with forest users. An experimental design approach was then used to identify the optimal subset of forest types. A survey instrument was finalised in consultation with experts and users. This instrument was administered using face-to-face interviews to examine the economic value placed by users on the hypothetical forests. These interviews were used to elicit users' preferences for the different hypothetical forests, and the cost associated with increasing visits to their preferred forest type.

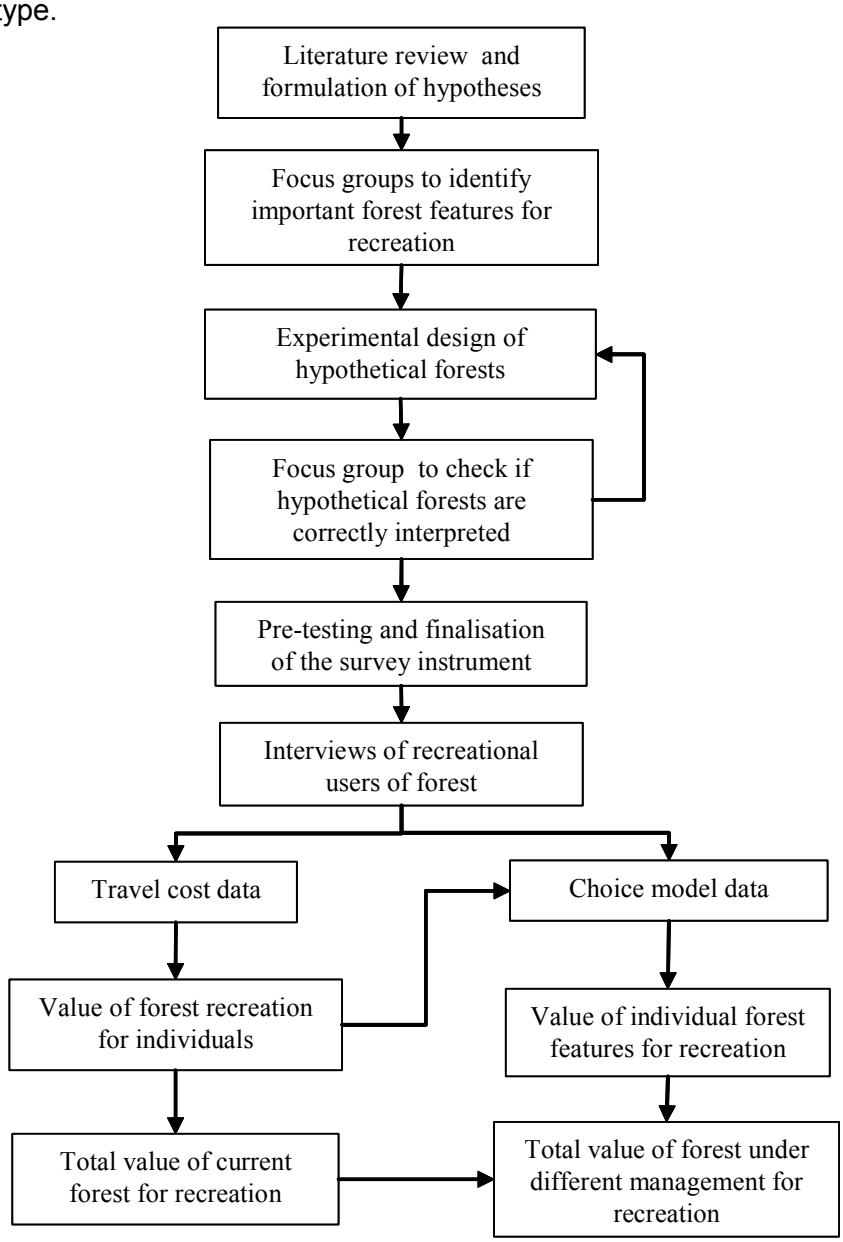


Figure 1: Flow diagram showing the steps in the choice modelling process

The next sections describe the features of the study site, the process for developing choice modelling sets, the survey instrument, the data collection method, and the methods of estimating the economic value of recreation in Whakarewarewa forest.

Study Site

This study estimated the economic value of recreation in the area of Whakarewarewa Forest managed for timber production (Figure 2). Whakarewarewa is a recreational and production forest in New Zealand, famous because of its large area, location in an important tourist town, Rotorua, and its internationally recognised mountain biking tracks[3]. The forest is within six hours drive of three major cities; three hours from Auckland, six from Wellington, and an hour-and-a-half from Hamilton.

Figure 2: Map of Whakarewarewa forest, study site, and location of Rotorua in New Zealand's North Island.

There are three types of management within the 5667 ha of Whakarewarewa Forest; forest park, conservation, and timber production. The Rotorua District Council manages 288 ha of the forest as a forest park. This area is dominated by the iconic redwood and mixed indigenous species[47], and is popular for tourism, walking and running. Another area of Whakarewarewa Forest (289 ha) is under indigenous forest managed for recreation, conservation and historical sites (Waahi Tapu). A timber investment and management organisation, Timberlands Ltd, manages the remaining 2427 ha of the forest for commercial timber production. This area includes commercial timber species,

such as radiata pine (1681 ha), Douglas-fir (521 ha), *Eucalyptus* spp. (40 ha) and other minor species (185 ha). This last area is also used for mountain biking, horse riding, running and walking, and was the focus of this study (Figure 2).

A recent survey of users in Whakarewarewa forest found that of the over 94,000 users/year, three-quarters were from outside of the Rotorua region. Forest users contributed to a total 282,000 recreational visits in 2007[3].

Focus Groups

Forests such as Whakarewarewa, are valued by individuals and communities for many reasons. One of the challenges when using the choice modelling method is to identify the important forest features (or attributes in choice modelling terms), such as those described above, that are valued by user groups, and then to present them in a meaningful way to survey participants as a set of implied modifications to the forest.[41]

We used literature searches and focus groups to select the forest attributes for the choice modelling survey design and implementation. The objectives of the focus group discussions were to:

i) identify the most important forest attributes with the potential to increase recreational benefits;
ii) ensure that respondents distinguish a real difference in selected forest options;
iii) determine the most effective way to visually and objectively depict forest attributes;
iv) refine the wording of choice questions to remove ambiguity and misunderstandings;
v) refine questionnaire design and format; and
vii) determine the appropriate payment vehicle and present it in such a way as to avoid concern over the intentions behind the survey.

Discussion Groups

Two significant forest user groups were selected for this research – mountain bikers and walkers[3].

Two meetings were held with forest users from each user group. Meetings were made up of five individuals, with one female in the mountain biking group and three in the walking group. Participants were selected from within Scion.

The aim of these discussion groups was to gain a snapshot of participant's forest values and to test the method to be used in later focus groups. In the first discussion group, participants were asked individually to draw a picture of Whakarewarewa Forest, identifying significant features and their understanding of the forest area. They were then invited to write down the features they valued the most, and as a group cluster them under common headings.

The method appeared to be effective and participants were happy that their views had been collected and conveyed successfully at the end of the meetings.

Forest Values Focus Groups

Two focus groups were held with forest users from the same user groups. Participants were invited from local clubs; Rotorua Mountain Biking Club and Rotorua Walking Club. The mountain biking group consisted of ten individuals, with one female. Participants were predominantly in their thirties and forties, with one participant in their teens. The walking group was made up of seven

individuals, with two females. Participants were predominantly in their forties and fifties. The same methods were applied in the second focus group meetings as in the first discussion groups.

Mountain bikers and walkers exhibited different preferences for forest features that enhanced their recreation. Enhancements suggested by mountain bikers included improvements in trail quality and addition of recreational facilities in the forest, such as coffee shops, toilets, cleaning facilities for mountain bikes, etc. Walkers suggested more diversity of trees in terms of species and ages, such as more variety in colour, and a combination of big and small trees. Both mountain bikers and walkers stated that accessibility to the forest, in terms of no entry fee and proximity to Rotorua township, is the most important feature of the forest. Both user groups mentioned that if they were asked to pay for their visit, this might decrease the frequency of their visits or stop them from visiting the forest altogether. The separate focus group meetings also indicated that mountain bikers and walkers tend not to like being on the same track at the same time.

Forest Features Focus Groups

In the third focus group meetings, participants were asked about features of the forest itself, such as tree species and ages, and management block size. Both walkers and mountain bikers stated that they wanted more diversity in the forest. Walkers gave high importance to species choice and were more concerned with diversity within forest stands. Mountain bikers placed low importance on species and within-stand diversity, but were more concerned with diversity between stands or diversity at the landscape level. These preferences of both user groups were used to identify a set of attributes grouped into diversity at the stand level and diversity at the landscape level (Figure 3).

Choice Set Design Focus Groups

The fourth focus group meeting was aimed at confirming whether we had clearly represented the identified forest attributes by words and graphics that could be easily understood by respondents. We solicited suggestions from participants composed of both walkers and mountain bikers to whom we each provided a copy of the final draft of the choice sets with the five forest attributes of interest.

Survey Instrument and Experimental Design

Choice Sets and Data

The final set of forest features (attributes) used in the choice modelling choice sets were:

i) number of species within a forest stand;
ii) number of tree age groups within a forest stand;
iii) tree density (stocking) in a typical forest stand;
iv) the proportion of the dominant timber species, radiata pine, in the forest landscape; and
v) average management block/stand size in the forest landscape (Figure 3).

The level of forest features in Whakarewarewa Forest under its current management (status quo) and under two levels of forest modification for recreation are shown in Figure 3. In its current condition Whakarewarewa Forest has a 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, radiata pine covers about 70% of the forest area, and forest management blocks are 30 ha or greater.

Under the changed levels for stand age, the number of age groups of trees within a stand was two age groups and three or more age groups (Figure 3). For species at the stand level, two tree

species and three or more tree species represent the changed levels. The quality of understorey in the forest was related to stand density, with medium and high understorey related to medium and low density, respectively. The proportions of radiata pine in the modified forest landscape were 50% and 30%, with the remaining area in a mix of other species. To represent increased landscape heterogeneity, forest management block sizes of 20 ha and 10 ha were considered.

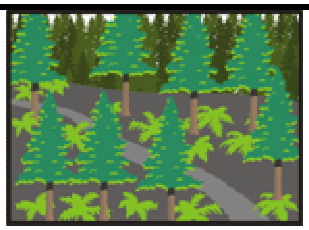
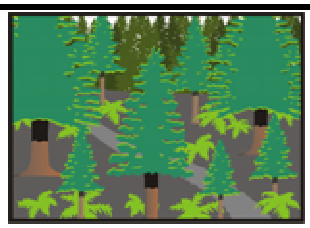
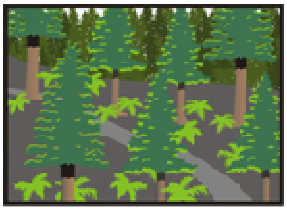
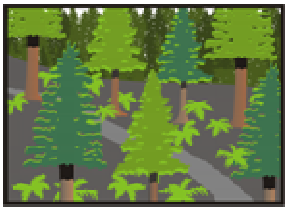
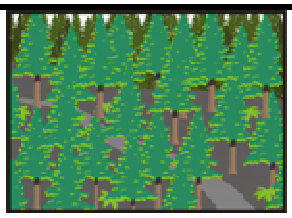
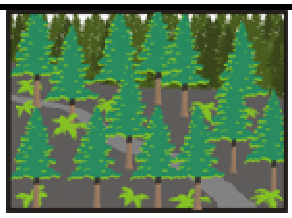
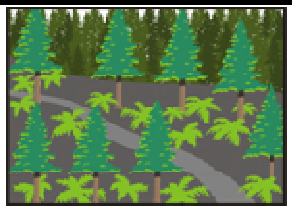
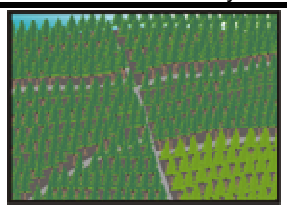
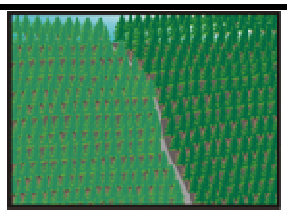
Attribute	Status Quo Level	Changed Level 1	Changed Level 2
Tree ages in the forest	 Same Age Trees	 Two Age Groups	 Three or More Age Groups
Species in the forest	 Same Tree Species	 Two Tree Species	 Three or More Tree Species
Tree density in the forest	 High Density, Poor Understorey	 Medium Density, Medium Understorey	 Low Density, Rich Understorey
Species in the forest landscape	 70% Radiata Pine	 50% Radiata Pine	 30% Radiata
Plot sizes in the forest landscape	 Large Plots (Greater than 30 ha)	 Medium Plots (about 20ha)	 Small Plots (less than 10 ha)

Figure 3: List of forest features (attributes) and levels. The attribute levels in the first column represent the current management of Whakarewarewa Forest.

To elicit the economic value of recreation associated with the five planted forest features, survey respondents were presented with hypothetical options for changes in the forests condition based on combinations of the forest features and levels shown in Figure 3. Each set of options had three alternatives composed of the current forest condition (status quo) and two modified alternatives. This set of three alternatives is called a *choice set* (Figure 4).

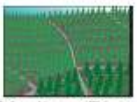
	Type 1 (Status Quo)	Type 2	Type 3
Tree Ages in the Forest	 Same Age Trees	 Two Age Groups	 Three or More Age Groups
No. of Tree Species in the Forest	 Same Species	 Three or More Species	 Same Species
Tree Density in the Forest	 High Density, Poor Understorey	 Low Density, Rich Understorey	 Medium Density, Medium Understorey
Proportion of Radiata in the Forest Landscape	 70 Percent Radiata Pine	 70 Percent Radiata Pine	 30 Percent Radiata Pine, 70 Percent others
Plot Size in the Forest Landscape	 Large Plots (Greater than 30 hectares)	 Large Plots (Greater than 30 hectares)	 Medium Plots (About 20 ha)
Most preferred option	[ ]	[ ]	[ ]
Number of additional visits per year	[x]	[ ]	[ ]
Additional time per visit	[x]	_____ hours	_____ hours

Figure 4: An example of a choice set used in the face-to-face survey

Each respondent was provided with six different choice sets, such as shown Figure 4. For each choice set, respondents were asked to choose a single preferred forest type from the set of three (the first type representing the status quo, while the second and third types represent a changed forest type) (Figure 4). Each alternative forest type is defined by the same five forest attributes, plus two attributes that represent how much the respondent would be willing to pay for each alternative. In this study those attributes were represented by two open-ended questions asking for the number of additional visits and amount of additional time that a respondent would be willing to spend if Whakarewarewa Forest was to be managed under their preferred alternative (Figure 4). This information was used in conjunction with the values from the travel cost method to determine the value users place on the forest under different alternatives.

The travel cost method requires information on as many of the costs associated with recreating as possible. These include travel distance, mode of travel, round trip travel time, number of people travelling, equipment costs for recreation, on site recreation time, annual frequency of visits, and expected additional visits associated with modification of Whakarewarewa Forest for recreation. Based on previous studies[33,48], additional variables influencing time spent recreating in the forest, include time spent on outdoor activities, affiliation to sports clubs, previous experience visiting the forest, and the objective of the recreational activity, e.g., health, fun, etc. Demographic variables included in the travel cost method were gender, ethnicity, family status, education level, employment status, occupation, and income level.

Survey Method

The survey was administered using face-to-face interviews by intercepting users in Whakarewarewa Forest after they had finished their recreational activity. Respondents were intercepted at the main entrance points to the forest between November 2008 and February 2009. Although internet and phone surveys are increasingly being used, face-to-face surveys remain the preferred method [27] of collecting more accurate information and maintain respondent's motivation[12,13]. For example, interviewers were able to confirm if the person intercepted for the interview was qualified for the interview. Prior to the main interview, interviewers initially asked the following questions: "Have you been interviewed as part of this study before?"; "Is this your first visit to the forest?"; and "Is this visit related to your work?".

Prior to production of the final version of the survey, the questionnaire was pre-tested on 13 forest users to check that the questions in the survey made sense. The questionnaire was finalised accounting for the comments and suggestions of the respondents in the pre-test. An example of the questionnaire used in the face-to-face survey is shown in Appendix A. The initial part of the survey includes questions to filter out people who did not meet the criteria of valid respondents. Section A of the survey was structured to collect information about forest users, focusing on recreational use, and expenses and time incurred to visit the forest. This information was used in the travel cost method. Section B described the rationale for proposed forest changes for recreation to motivate respondents to participate in the survey and minimise protest responses. This section also includes a set of warm-up questions (before the relatively more complex choice questions) asking their preference on each forest attribute (see pages 33 and 34).

For each choice set (Figure 4), respondents were asked how many additional visits they would make and extended time of stay, if the forest was modified with their preferred forest features. Each choice set has two changed alternatives (or changed forest types) with different forest attribute levels unique to one another, and an identical status quo alternative. Because this study tested five attributes and three levels of each attribute (Figure 3), there are 243 possible forest types. However, it is not feasible to present all of these forest types for each respondent. To most effectively estimate the economic value of different forest attributes, a subset of forest types was assessed in each questionnaire based on D-optimal experimental design[8,24,54]. This generated 36 hypothetical forest types. Because each choice set has two alternative forest types compared with the status quo, there were a total of 18 choice sets; 36 divided by two. These 18 choice sets were further divided into three blocks, so that each respondent answered one of three possible questionnaires, with each questionnaire having six choice sets.

Immediately after the set of choice questions, respondents who reported that they would not increase their visits or amount of time spent in changed forest types were asked a series of questions to check for protest responses. These questions were used to identify the major constraints to increasing respondents' recreational time in a changed forest. Section C of the survey consisted of standard demographic questions, such as income, ethnicity and gender.

Model Specification

As discussed above, this study utilises data from both travel cost and choice modelling methods. The value of existing forest management was estimated using a travel cost model. The value of improved forest condition was estimated using a choice modelling framework. The total cost of additional visits was used in the choice modelling analysis to estimate the value that a typical respondent placed on forest attributes in a modified forest for recreation.

Sample and Variables

Of the 709 users of Whakarewarewa forest surveyed, 281 (40%) identified their main activity on the current visit as walking, 343 (48%) as mountain biking, and 85 (12%) as other activities (e.g., horse riding, jogging). Based on an APR (2007)[3] estimate of 94,000 users of Whakarewarewa forest per year our sample was approximately 0.8% of forest users.

A large proportion of people surveyed were from Rotorua; 89.3% of walkers and 63.2% of mountain bikers. A small number of visitors travelled over 200 km to get to Whakarewarewa Forest; 3.6% of walkers and 20.7% of mountain bikers. This resulted in a small number of respondents making an unusually high number of visits, while a few others had a high cost of travel associated with visiting the forest. These extreme cases, identified using the *studentized* test for outliers, could over-inflate the mean of the data and bias the results of the analysis[49]. Three walkers and 34 mountain bikers were confirmed as outliers and were removed from the sample. A further four walkers and five mountain bikers were removed as having an unusually high number of visits; over 350 and 360 visits per year, respectively. Including these observations in the analysis would skew the distribution of errors (the difference between observed and model predicted number of visits), which would consequently over-estimate the predicted number of visits[25,46].

As both walkers and mountain bikers were sampled from the same population and site, data from both were combined to get better parameter estimates and reduce biases from excluding non-users in the sample[22]. The final sample size for the analysis was 664.

Our modelling exercise suggested that the number of visits by a user to Whakarewarewa Forest is associated with several factors. Walkers tend to use flatter and wider tracks for exercise while mountain bikers tend to use narrower and steeper tracks for fun. For walkers the variables that were associated with the number of visits they made per year to Whakarewarewa Forest were:

- *Winter High* = 1 if individual visits the forest more frequently in winter, = 0 otherwise;
- *Autumn High* = 1 if individual visits the forest more frequently in autumn, = 0 otherwise;
- *Spring High* = 1 if individual visits the forest more frequently in spring, = 0 otherwise;
- *Whaka Use* = Proportion of individual's time spent walking or mountain biking, that is in Whakarewarewa Forest (%);
- *Exercise* = 1 if the primary reason for the individual's visit to Whakarewarewa Forest was exercise, = 0 otherwise;
- *No Children* = 1 if the individual has no children in their family, = 0 otherwise;
- *Travel Cost* = the cost for the individual of travelling to Whakarewarewa Forest ($/visit) (see below for an explanation of how this variable was calculated); and
- *Constant* = A constant term to capture unexplained factors common to all visitors.

For mountain bikers the variables associated with the number of visits they made per year to Whakarewarewa Forest were:

- *Visit Year* = Number of years an individual has been visiting Whakarewarewa Forest
- *Winter High* = 1 if individual visits the forest more frequently in winter, = 0 otherwise;
- *Spring High* = 1 if individual visits the forest more frequently in spring, = 0 otherwise;
- *Forest Club* = 1 if the individual is a member of any club related to recreation in Whakarewarewa Forest, = 0 otherwise;
- *Whaka Use* = Proportion of individual's time spent walking or mountain biking that is in Whakarewarewa Forest (%);
- *Outdoor Hour* = Hours per week an individual spends on outdoor recreation;
- *Travel Cost* = the cost for the individual of travelling to Whakarewarewa Forest ($/visit) (see below for an explanation of how this variable was calculated);
- *Constant* = A constant term to capture unexplained factors common to all visitors.

Travel Cost

The cost for an individual of visiting Whakarewarewa Forest was estimated as the sum of the return trip vehicle cost (petrol and other running costs) and one-half the cost associated with travel time. The latter is an estimate of the value of the individual's time, assuming that if they were not travelling to the forest they would be doing something else which could be more rewarding[24]. For walkers, the vehicle cost was 0.62c/ km for a private car (IRD rate)[‡], 0.05c/ km for bicycle users[20], and $2.20 for local public bus. For mountain bikers using their own bicycle to get to the forest, the travel cost was estimated from the mountain biking expenses the individual reported in the survey. Where an individual shared a ride, the cost was divided equally among the passengers.

The cost associated with travel time was calculated as 50% of an individual's after tax income for walkers. This proportion was used as, compared with other proportions of income, it gave more precise estimate of the number of visits. For mountain bikers 85% of an individual's after tax income was used[22], as for lower proportions the travel cost variable was not statistically significant in explaining the number of visits to Whakarewarewa Forest.

The opportunity cost of time spent in Whakarewarewa Forest for recreation was considered to be equal for all visitors. Here we assumed each individual would spend as much time in the forest as they would like to, given their time and other constraints. Individuals with a low cost of time per hour would tend to spend more time in the forest than those with a high cost of time per hour[6].

Method for Estimating Number of Visits

The data and variables described above were used to estimate the number of visits per year that mountain bikers and walkers make to Whakarewarewa Forest. The parameters from this model are used to estimate the value an individual places on mountain biking or walking in Whakarewarewa Forest.

Because the variable being predicted is a non-negative integer, i.e. 0, 1, 2, 3, 4, etc. number of visits to Whakarewarewa forest per year, count data models must be used for the analysis. These models (Poisson, binomial and negative binomial) are used to account for the distributions of count data model errors[17,22].

A Truncated Negative Binomial (TNB) model was used to estimate the number of visits to Whakarewarewa Forest made by walkers. This model addresses two problems in the sample data. Firstly, the problem of over-dispersion, i.e. the presence of greater variability in a data set than expected for a standard distribution of data. Over-dispersion was tested for, using a z score test on the over-dispersion coefficient (α). Secondly, the model addressed the problem of an excessive number of observations with zero number of visits. This problem was mainly due to mountain bikers not using the forest for walking, and conversely walkers are unlikely to use the forest for mountain biking.

A Zero Inflated Negative Binomial (ZINB) model was used for mountain bikers. Similar to the TNB model, ZINB also addresses over-dispersion and the excessive number of zero visits. The goodness of model fit tests suggested that the ZINB model better fits the distribution of mountain biker data, while the TNB model is more appropriate for the distribution of walker data.

[‡] In the Employment Court Auckland. *www.justice.govt.nz/employment/judgments/.../ARC_65_07_POSTAL_WORKERS_ASSN_V_NZ_POST_LTD-REAS_JTK_117.pdf -*

Estimation of Preferences and Values for Planted Forest Features for Recreation

The choice modelling data were used to investigate two questions:

1) What is the economic value for recreation that walkers and mountain bikers place on individual features of Whakarewarewa Forest?
2) What preferences do walkers and mountain bikers have for particular levels of forest attributes for recreation?

To estimate the value (willingness to pay) an individual places on a change in a particular forest feature, a conditional logit model was fitted to the likelihood that an individual forest user would choose one among the three alternative forest conditions presented in the six choice sets (e.g. Figure 4) based on the cost of travel and forest features. The estimated willingness to pay is based on the economic concept of *marginal rate of substitution*; the rate at which an individual is willing to give up one good in exchange for another good while maintaining the same level of satisfaction. Here we examine how an individual would trade off a change in, for example, stand tree density against how much extra they would spend visiting the forest. Based on this concept of marginal rate of substitution, the dollar value an individual would be willing to pay for a change in a forest feature is calculated from the model coefficients.

A conditional logit model was used so that an individual's selection of an alternative is conditioned upon features of the forest, but not demographic and other factors. This implies that an individual's decision to visit an alternative hypothetical forest is influenced only by the features of the forest. The model parameters therefore included the five forest features from the choice sets (Figure 3), along with an alternative specific constant that captures those characteristics of the choices not included in the model or excluded from the list of attributes.

The data collected from the choice modelling survey formed a panel data set, i.e., each respondent gave their preferred alternative for forest management from six separate choice sets. As such there were six responses multiplied by 273 walkers and 343 mountain bikers to give 1638 responses from walkers and 2058 responses from mountain bikers. Some observations of the cost of additional visits, derived by multiplying the per visit travel cost by the stated additional numbers of visits, were large. Of these 84 responses from walkers and 42 from mountain bikers were identified as outliers and were removed from the sample.

We then tested whether both walker and mountain biker samples each satisfied the assumption of Independence from Irrelevant Alternatives (IIA); that in a choice set, the relative probabilities of two options being selected are unaffected by the introduction or removal of other alternatives. Results of the statistical tests indicated that both samples satisfy the IIA assumption. This suggests that the simple conditional logit model was appropriate to analyse both samples.

The conditional logit model was also used to analyse walkers and mountain bikers' preferences on different levels of forest attributes. In this model the forest feature levels were coded as dummy variables to examine whether or not an individual preferred a particular level of forest features[51].

RESULTS

Number of Visits to Whakarewarewa Forest

Descriptive Statistics

Table 2 provides descriptive statistics of the variables used in the model to estimate the number of visits per year to Whakarewarewa Forest by walkers. The mean number of visits to the forest made by walkers is high, 62 visits per year, compared with other forest recreation studies[19,37]. One study in the United States reported that the visitors travelled an average 372 km, spent an average 10.2 hours at the recreation site and made an average 3.3 trips per year [25]. Another study reported that the visitors made average 3.1 trips for walking and 2.0 for mountain biking[37]. The high number of visits and short duration of visits to Whakarewarewa Forest reflects the forest's proximity to most users, on average less than 10 km, and its accounting for a large proportion of visitors' time spent walking or mountain biking; 86.6%. The average length of stay in the forest was 1.6 hours, which is lower than other forest recreation studies[19,37], and again reflects the proximity of the forest to Rotorua. The median after tax income of walkers using Whakarewarewa forest was $26,410; 31% higher than the national median income estimated in the 2006 census survey[59].

Table 2: Descriptive statistics for the walker data

Variable	Unit	Mean	Std. dev.	Minimum	Maximum
Number of visits	visits/year	61.9	76.8	1	320
Length of stay	hours	1.6	1.1	0.5	12
Spring high	0 or 1	0.09	0.28	0	1
Autumn high	0 or 1	0.22	0.42	0	1
Winter high	0 or 1	0.50	0.50	0	1
Exercise	0 or 1	0.59	0.34	0	2
Distance travelled	km	10.0	24.2	0.5	250
Driving time	minutes	13.2	18.5	0.5	191
Vehicle cost	$/visit	2.9	0.6	0	5
Travel cost	$/visit	8.7	12.3	0.27	101.41
Whaka use	%	86.6	26.6	1	100
No children	0 or 1	0.33	0.47	0	1
After tax income	$/year	31,175	18,925	0	86390

Table 3 provides descriptive statistics of the variables used in the model to estimate the number of visits per year to Whakarewarewa Forest by mountain bikers. The mean number of visits to the forest made by mountain bikers, like walkers, is high relative to other New Zealand forests; 59 visits per year. Mountain bikers on average travel further than walkers to get to the forest; 27 km, and spend more time in the forest, 2.5 hours. This may reflect the larger number of visitors from outside of Rotorua who go mountain biking. The median after tax income of mountain bikers using Whakarewarewa forest was $38,050; 89% higher than the national median income[59].

Table 3: Descriptive statistics for the mountain biker data

Variable	Unit	Mean	Std. dev.	Minimum	Maximum
Number of visits	visits/year	59.1	71.8	1.0	300.0
Years visiting the forest	years	8.2	7.9	0.3	40.0
Length of stay	hours	2.5	1.1	0.2	8.0
Spring high	0 or 1	0.11	0.32	0.00	1.00
Winter high	0 or 1	0.55	0.50	0.00	1.00
Distance travelled	km	26.7	42.8	0.5	300.0
Driving time	minutes	25.1	28.4	0.5	180.0
Vehicle cost	$/visit	15.6	23.8	0.0	124.0
Travel cost	$/visit	33.0	43.7	1.1	232.2
Whaka use	%	80.2	30.7	0.5	100.0
Forest club	0 or 1	0.14	0.35	0.00	1.00

The estimates, standard errors and statistical significance, of the parameters for the regression models predicting the number of visits to Whakarewarewa Forest by walkers and mountain bikers are presented below. Also presented are statistics for the goodness of fit (restricted log-likelihood and pseudo-R^2) and appropriateness of the model for the data (alpha, Voung and tau test statistics). Finally the estimated willingness to pay by walkers and mountain bikers for visiting Whakarewarewa Forest is presented

Walkers

The parameter estimates for the negative binomial regression model of the number of visits to Whakarewarewa forest by walkers are given in Table 4. The model fit statistics indicate that the negative binomial model is the best fit to the data, with a significant alpha value, and has high predictive power, with a large pseudo-R^2.

The parameters in the model had the expected signs, and were all significant at the 90% level. The positive sign for the *exercise* variable indicates that, controlling for other factors, individuals who visit Whakarewarewa Forest for exercise visit the forest more frequently. The positive sign for the *Whaka use* variable indicates that individuals who use Whakarewarewa Forest for a greater proportion of their outdoor recreation time, not surprisingly visit more times per year. The negative sign for the *no children* variable implies that a typical Whakarewarewa Forest visitor without children visits the forest less frequently, possibly because individuals with children make more use of the forest for family recreation. The negative coefficients on the season variables (*winter high*, *autumn high*, *spring high*) suggest that individuals who visit the forest more often in a particular season, make fewer visits overall. The negative sign for the *travel cost* variable indicates that the more costly it is for an individual to travel to Whakarewarewa Forest, the fewer visits they will make per year.

Results from the negative binomial model (Table 4) suggest that walkers' median willingness to pay (WTP) to visit Whakarewarewa forest was $61/visit. The 95% confidence interval for the estimated WTP was $37 and $187[35]. This estimated WTP is an economic measure of the overall enjoyment a walker gains from a visit to Whakarewarewa Forest. As estimated here, using the travel cost method, WTP is the maximum additional cost a walker visiting Whakarewarewa Forest would be willing to pay for vehicle costs and travel time, before they would decide not to visit the forest.

Table 4: Parameters for the negative binomial model to estimate the number of visits per year to Whakarewarewa Forest by individual walkers

Variable	Coefficient	Standard error
Constant	3.714**	0.314
Exercise	0.265	0.145
Whaka use	0.008**	0.003
No children	-0.320*	0.156
Winter high	-0.357*	0.165
Autumn high	-0.620**	0.225
Spring high	-1.949**	0.316
Travel cost	-0.016**	0.006
Alpha	1.241**	0.142
Restricted log-likelihood	-8,662	
Pseudo R^2	0.85	
WTP per trip ($)	61	
Number of observations	664	

WTP – willingness to pay, * significant at 5% level, ** significant at 1% level

Mountain Bikers

The parameter estimates for the zero-inflated negative binomial (ZINB) model of the number of visits to Whakarewarewa Forest by mountain bikers are given in Table 5. The model fit statistics, Voung, tau and alpha, are highly significant indicating that the ZINB model is the best fit.

The parameters in the model had the expected signs, and were all significant at the 85% level. The positive sign for the *visit year, forest club, Whaka use,* and *outdoor hour* variables indicate that individuals who have been visiting Whakarewarewa Forest for a large number of years, or are members of a club related to recreation in the forest, or use Whakarewarewa Forest for a greater proportion of their outdoor recreation time, or spend a lot of time each week on outdoor activities, not surprisingly visit the forest more times per year. Similar to walkers, the negative coefficients on the season variables (*winter high*, *spring high*) suggest that individuals who visit the forest more often in a particular season, make fewer visits overall. The negative sign for the *travel cost* and *bike cost* variables indicate that the more costly it is for an individual to travel to or ride in Whakarewarewa Forest, the fewer visits they will make per year.

From the ZINB model estimates (Table 5), we calculated the mountain bikers' median WTP to visit Whakarewarewa Forest as $120/visit. The 95% confidence interval for the estimated WTP was $85 and $218[35]. As estimated here, using the travel cost method, this amount is the maximum cost a mountain biker visiting Whakarewarewa Forest would be willing to pay for vehicle and bike costs, and travel time, before they would decide not to visit the forest.

Table 5 Parameters for zero-inflated negative binomial model to estimate the number of visits per year to Whakarewarewa Forest by individual mountain bikers

Variable	Coefficient	Standard error
Constant	2.444**	0.251
Visit year	0.025**	0.008
Forest club	0.380	0.183
Whaka use	0.016**	0.002
Outdoor hour	0.052**	0.010
Winter high	-0.369**	0.106
Spring high	-0.843**	0.161
Travel cost	-0.008**	0.002
Alpha	0.949**	0.113
Tau	0.052**	0.026
Restricted log-likelihood	-1,914	
Vuong Statistics	8.66	
WTP per trip ($)	120	
Number of observations	664	

WTP – willingness to pay, * significant at 5% level, ** significant at 1% level

Comparison with Other Studies of Forest Recreation

This study is the first time the travel cost method has been used to estimate the value of both walking and mountain biking in a planted forest in New Zealand.

Overseas studies of the WTP for mountain biking include two separate studies of recreation at Moab in Utah, which estimated a WTP of $407/mountain biker/visit (all values have been converted to 2008 NZ$)[19], and a consumer surplus of NZ $1,378[11]. Consumer surplus is the difference between the price actually paid for a service, and the maximum amount that an individual is willing to pay for it. If a person is willing to pay up to $3 for visiting a forest, but the entry fee is $1, then the individual's consumer surplus for that item is $2.

Another study estimated a consumer surplus for visiting three United States national forests (the Arapaho-Roosevelt, Gunnison-Uncompaghre, and Pike-San Isabel) of $282/visit for hikers and $327/visit for mountain bikers[37]. An Australian study estimated a consumer surplus of NZ$178/person/visit for hiking in Bellenden Ker National Park[46].

A New Zealand study estimated the WTP for visiting Hanmer forest (a planted forest one-and-three-quarter hours from Christchurch) as $57/person/visit[34,53,] .

While economic values from different studies are not directly comparable, compared with previous studies we estimated a lower WTP per visit but a higher consumer surplus per year. This is probably because unlike other recreational sites studied, Whakarewarewa Forest is very close to an urban centre and users make frequent visits with a short time of travel. Over 27% of mountain bikers and 23% of walkers surveyed made over 100 visits to the forest in the last year.

Preferences and Values for Different Forest Features

Descriptive Statistics

The preferences of walkers and mountain bikers for visiting Whakarewarewa Forest if the forest's features were modified for recreation are shown in Table 6.

Table 6: Percentage of responses by walkers and mountain bikers showing a preference for Whakarewarewa Forest, would make additional visits to the forest, or spend extra time in the forest if it were modified for recreation

User		Current	Alternative 1	Alternative 2	Total
Walkers	Preference	22.3	38.0	39.7	100.0
	Additional visits	0.0	13.6	14.5	28.1
	Extra time	0.0	12.9	14.6	27.5
Mountain bikers	Preference	35.4	34.4	30.3	100.0
	Additional visits	0.0	12.7	10.0	22.7
	Extra time	0.0	11.1	9.3	20.4

Among the alternatives, just above one quarter would make additional visits provided the forest was managed in their preferred option. Only half of the total responses preferred the improved forest conditions, but would not make additional visits. Only one quarter of the forest visitors would extend their time for recreation if Whakarewarewa were modified for recreation.

Surprisingly nearly one quarter of walkers and over a third of mountain bikers said that they preferred the current features of Whakarewarewa Forest. When asked why they would not visit Whakarewarewa Forest more if the forest was managed differently, nearly half replied that the existing forest conditions were adequate for their recreation, and over a third stated that their personal circumstances would not allow them to make additional visits.

Mountain bikers appear to have less of a preference for the alternative forest options than walkers, as well as fewer mountain bikers saying they would make additional visits or spend extra time in the forest if it had different features.

Willingness to Pay for Different Forest Features

Table 7 shows the parameter estimates for the conditional logit model estimated using the responses from walkers. The chi-square statistic for the log-likelihood ratio and goodness of fit statistic (ρ^2) suggest that the model is a good fit[1].

While all of the forest features considered, except forest management block (plot) size, had a positive influence on the value of Whakarewarewa Forest for recreation, only three (tree ages and species in the forest, and species in the landscape) were identified as significantly influencing the value of the forest for recreation.

The significant alternative specific constant term in the model indicates that users' preferences for alternatives to the status quo are influenced by attributes not included in our choice sets. Based on the focus group responses, these could be features such as quality of trails and availability of toilets. The cost variable is non-significant, which suggests that walkers do not place a significant economic value for recreation on the particular forest features studied. This may be due to more than two-thirds of walkers not being willing to make additional visits to the forest were its features modified for recreation. In addition, there was little difference in the additional visits stated for alternative choice sets.

Table 7 Conditional logit model parameter estimates for walkers

Variable	Coefficient	Standard error
Tree ages	0.306*	0.051
Species in the forest	0.208*	0.060
Plot sizes	-0.016	0.051
Tree density	0.015	0.051
Species in the landscape	0.111**	0.052
Travel cost	25.7	120213.3
ASC (Status quo)	0.500*	0.165
Number of observations	1554	
Log-likelihood value	-1264	
Chi-square statistic	812.6	
Adjusted ρ^2	0.24	

* significant at the 1% level, ** significant at the 5% level

Table 8 shows the parameter estimates for the conditional logit model estimated using the responses from mountain bikers. The chi-square statistic for the log-likelihood ratio and goodness of fit statistic (ρ^2) suggest that the model is a good fit to the data[22,64].

Table 8 Conditional logit model parameter estimates for mountain bikers

Variable	Coefficient	Standard error
Tree ages	0.251*	0.048
Species in the forest	0.223*	0.054
Plot sizes	0.056	0.047
Tree density	0.002	0.047
Species in the landscape	0.118*	0.048
Travel cost	15.7	32919.4
ASC	1.233*	0.149
Number of observations	2016	
LL value	1669.81	
Chi-square statistics	1077.960	
Adjusted ρ^2	0.241	

* significant at the 1% level, ** significant at the 5% level

The results of the model estimated for mountain bikers were similar to those for walkers (Table 7).

The above results show that the forest features potentially influencing recreational value are similar between mountain bikers and walkers. In addition, both users have no or negligible willingness to pay for a change in forest features to enhance recreation, particularly tree ages, species in the forest, tree density, species in the landscape, and management block (plot) size. Despite these results, users may be willing to pay for changes in other features of Whakarewarewa Forest that are not related to forest management, such as parking, toilets and trails.

Preferences for Different Levels of Forest Attributes

Table 9 shows the results from the model examining walkers' preferences for different levels in features of Whakarewarewa Forest. The variables in the models are the alternative levels of the forest attributes relative to the current (status quo) levels; one species and tree age planted at a relatively high density within a stand and 70% radiata pine and large management blocks in the

landscape. The fit statistics for the model suggest that given the nature of data and estimated model, the results are robust enough to make conclusions about the walkers' preferences on forest attribute levels.

Table 9: Walkers' preferences for different levels of attributes in Whakarewarewa forest

Variable	Coefficient	Standard error
Constant	-1.25*	0.054
Two age groups in stand	0.21**	0.090
Many age groups in stand	0.69*	0.086
Two species in stand	0.20**	0.087
Many species in stand	0.34*	0.085
Medium tree density in stand	0.49*	0.086
Low tree density in stand	-0.19**	0.087
50% radiata in landscape	0.19**	0.085
Less than 33% radiata in landscape	0.20**	0.085
Medium size plots in landscape	0.14	0.086
Small size plots in landscape	0.02	0.084
Number of observation	4914	
Log-likelihood value	-2984	
Chi-square statistics	289	
Pseudo R -square	0.05	
Predicted percent correct	68.7	

* significant at the 1% level, ** significant at the 5% level

Walkers show a significant preference for a change from the status quo in all of the forest features considered except for the size of management blocks. Only the variable low tree density in the stand has a negative coefficient. This suggests that walkers prefer medium density stands to those more or less stocked. The results suggest that walkers prefer more tree ages and species at the stand level, and less radiata pine in the landscape.

Table 10 shows the results from the model examining mountain bikers' preferences for different levels of features in Whakarewarewa Forest for recreation. The fit statistics for the model suggest that given the nature of the data and estimated model, the results are robust enough to make conclusions about the mountain bikers' preferences on forest feature levels.

Table 10: Mountain bikers' preferences for different levels of attributes in Whakarewarewa forest

Variable	Coefficient	Standard error
Constant	-0.702*	0.044
Two age groups in stand	-0.019	0.083
Many age groups in stand	0.360*	0.079
Two species in stand	0.031	0.079
Many species in stand	0.053	0.078
Medium tree density in stand	0.217*	0.077
Low tree density in stand	-0.473*	0.081
50% radiata in landscape	-0.032	0.078
Less than 33% radiata in landscape	0.053	0.077
Medium size plots in landscape	-0.080	0.076
Small size plots in landscape	-0.163**	0.076
Number of observations	6064	
LL value	-3809.15	
Chi-square statistics	101.6935	
Pseudo R -square	0.01	

Predicted percent correct	66.7

* significant at the 1% level, ** significant at the 5% level

The results in Table 10 suggest that mountain bikers have a weak preference for a change from the current forest management, preferring more tree ages within a stand and medium density stockings. Interestingly mountain bikers showed a preference for the current management in terms of larger management blocks, with a negative preference for smaller management blocks

Preferences for a change in forest features from the current management are not as strong for mountain bikers as those for walkers. The difference between walkers' and mountain bikers' preferences may be due to differences in the way these users interact with the forest. Walkers pass through forest stands and the landscape more slowly, than mountain bikers whose enjoyment of the forest may be more influenced by attributes of forest such as trail difficulty. This suggests that the benefit of alternative features of Whakarewarewa Forest may be higher for walkers than mountain bikers, though our results suggest that neither user group places a significant economic value on these alternatives.

CONCLUSION

The purpose of our study was to estimate the economic value of recreation in Whakarewarewa Forest as a whole, and of particular forest features individually. Using the travel cost method the estimated median per visit willingness to pay was $61 for walkers (with a 95% confidence interval of $37 to $187) and $120 for mountain bikers (with a 95% confidence interval of $85 to $218). These figures provide an economic measure of the overall enjoyment a walker or mountain biker gains from visiting Whakarewarewa Forest. As estimated here, using the travel cost method, these values are the maximum cost a walker or mountain biker visiting the forest would be willing to pay for vehicle and bike costs, and travel time, before they would decide not to visit.

Using these estimates of willingness to pay, the total recreation benefits of Whakarewarewa Forest can be calculated. An APR (2007) survey estimated that there were 85,000 visits by walkers and another 85,000 visits by mountain bikers to Whakarewarewa Forest in 2007[3]. If we multiply the per visit values by the total number of visits each year, the median economic benefit of Whakarewarewa Forest for walking and mountain biking activities could be $15.4 million; $5.2 million from walking and $10.2 million from mountain biking. Recognising that the estimated willingness to pay has an error associated with it, the economic benefit could be between $10.3 million and $34.4 million.

The estimated per trip value is comparatively smaller than estimates from other recreation studies, but total consumer surplus is far greater than previous studies. The result implies that the total value of recreation could be higher in planted forests close to urban areas because of their proximity to users. This suggests urban forests may be important future assets for urban planners to consider, especially if travel becomes more costly. However provision of such forests may require development of means to pay for or minimise the costs of provision.

Our results suggest that both walkers and mountain bikers are not willing to pay for modification of the forest features studied; multiple tree ages and species within a stand and lower stand density, and a lower proportion of radiata pine and smaller management blocks at the landscape level. Our analysis of forest users' preferences, however, shows that users do prefer particular levels of forest features. Walkers have a preference for changes from the current forest features. In particular they prefer more tree ages and species at the stand level, and less radiata pine in the landscape. Mountain bikers appear to be less concerned with a change from the current forest features, preferring more tree ages within a stand and medium density stockings.

As such our results suggest that the current forest features largely fit with mountain bikers' preferences, while walkers have a preference for alternative features. However, neither user group has a significant willingness to pay for the forest attributes.

Whakarewarewa Forest is in a unique location, so its value is unique. However, this study suggests that planted forests have the potential to provide a significant recreational value. In New Zealand a number of planted forests are readily accessible from urban areas (Bottle Lake near Christchurch, Woodhill forest near Auckland, and Wrights Hill Fortress in Wellington) and their inferred recreational and economic value to users may be substantial. Provision of these benefits though is also dependent on the costs associated with changed management to provide them. This is a topic for further research, though this study provides a basis for comparison of those costs against the benefits estimated here.

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APPENDIX: SURVEY INSTRUMENT

Your Views on the Recreational Benefits of Whaka Forest

Interviewer name:	*Name of site:*	*Date:*	*Time (24 hr clock)*

Number of recreation people entering/exiting forest at the time of interview _____

Are there fellow enumerators working on the same site? Yes / No
Hello. My name is <*first name & surname*>, and I am carrying out a survey on behalf of SCION (FRI, the Forest Research Institute). We are conducting a survey of users' preferences and values for recreation in plantation forests, and are here interviewing Whaka forest users who have visited the Whaka forest **before**.

Have you previously been interviewed for this study? Y / N
Is this your first visit to the forest? Y / N
Is this visit related to your work? Y / N

<*If YES either, then thank them for their time and terminate interview*>

This survey typically takes about 10-12 minutes. Would you be willing to be interviewed? Y / N. Your responses will be treated anonymously and absolutely confidentially. We are not asking your name.

A. REGULAR FOREST USE INFORMATION

The first set of questions is about how much time you spend in Whaka Forest and what you use Whaka Forest for.

1. **How long have you been visiting the Whaka Forest**? (*List years*)

_____years

2a. **Which of the following user categories best describes you as a visitor in Whaka Forest**? (*tick one only* ✓)

- O1 Daily visitor
- O2 Weekly visitor
- O3 Fortnightly visitor
- O4 Monthly visitor
- O5 Yearly visitor

2b. **How many times did you visit Whaka Forest in the last 365 days**? (*enter no of times*)

_____times per year

2c. **Thinking about your typical visit, how much time do you spend in the forest on each visit?** (*list number of hours*)

_____hours

3. **In terms of frequency of visits to Whaka Forest, how would you categorise your visits across seasons**? (*tick ✓ in circle*)

	Low frequency	Medium frequency	High frequency
a) Spring	O1	O2	O3
b) Summer	O1	O2	O3
c) Autumn	O1	O2	O3

d) Winter ○1 ○2 ○3

4a. **When you visit this forest what activities do you do?** (*tick as many as apply* ✓)
<Show the respondent Sheet No. 4 and tick on the left boxes corresponding to the selected activities>

○1 Mountain biking
○2 Walking
○3 Running/jogging
○4 Walking the dog
○5 Picnic
○6 Horse riding
○7 Nature watching/sight seeing
○8 Tramping
○9 Ceremony/festival
○10 Other (*please specify*) _____

<Show the respondent Sheet No. 4 and tick on the left boxes corresponding to the selected activities>

4b. **Rank the activities you do in order of frequency of use, with "1" being the most frequent and "2" for the second most frequent and so on?** (*rank in box*)

	1 Mountain biking		6 Horse riding
	2 Walking		7 Nature watching/sight seeing
	3 Running/jogging		8 Tramping
	4 Walking the dog		9 Ceremony/festival
	5 Picnic		10 Other

Now turning to your visit **TODAY**…

5. **What is/was your main activity for today's visit?** (*tick one only* ✓)

○1 Mountain biking ***(go to Q6)***
○2 Walking
○3 Running/jogging
○4 Walking the dog
○5 Picnic
○6 Horse riding
○7 Nature watching/sight seeing
○8 Tramping
○9 Ceremony/festival
○10 Other (*please specify*) _____

6. ***If respondents main reason for visiting was mountain biking, answer Q6, otherwise continue to Q7.***

6a. **How much did your bike cost?** (*note this information is required to help our researchers estimate the value people place on using the forest*).
$_____

6b. **How long have you had your bike**?

_____years

6c. **Approximately how many years longer do you plan to keep it**?

_____years

6d. **What do you estimate the current resale to be**?

$_____

6e. **How much do you spend a year on bike maintenance (including tyres, brakes, etc.)?**
$_____ year

6f. **If you have other expenses related to Mountain Biking, how much would you spend in a year?**
$_____ year

6g. **If you used a rented Mountain Bike, how much rent amount do you pay?**

○ n/a (*tick ✓*)
$_____ year

7a. **Using the following list, what are your <u>recreational objectives</u> for this visit to the forest today**? (*tick as many as apply ✓*) <*Show the respondent Sheet No. 7 and tick on the left boxes corresponding to the selected objectives*>.

○1	Fun	○5	Reflecting/thinking
○2	Physical exercise	○6	Learning
○3	Relaxation	○7	Socialising
○4	Experience nature	○8	Other (*please specify*)

_____

7b. **Please rank these objectives in order of importance with "1" being the most important, "2" the next important etc.** (*rank in box*) <*Show the respondent Sheet No. 7 and tick on the left boxes corresponding to the selected objectives*>.

☐	1 Fun	☐	5 Reflecting/thinking
☐	2 Physical exercise	☐	6 Learning
☐	3 Relaxation	☐	7 Socialising
☐	4 Experience nature	☐	8 Other (*please specify*)

_____

8a. **What is the approximate <u>distance</u> you travelled to visit the forest today?**

_____kilometres

8b. **How long did it take you to get here today?**

_____hours, _____minutes

8c. **How did you get here today?** (*tick one only ✓*)

○1 Walking
○2 Biking
○3 Private motor vehicle
○4 Public transport
○5 Other (*please specify*) _____

8d. **If you travelled by private motor vehicle to visit the forest today how many other people travelled with you?**

_____no of people

9a. **What proportion of your biking/walking/running time is spent in Whaka Forest?**

_____%

9b. **If less than 100% in Question 9a, what is your other most visited site/s for biking/ walking/running?** (*write down location, be as specific as possible*)

_____

B. Whaka Forest Management Options

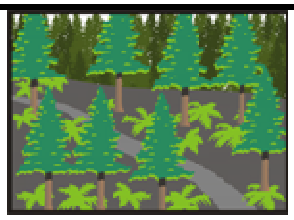
The next questions are aimed at finding out what it is about Whaka Forest that you like for recreation. The focus of the management options is on the area of the forest managed for commercial timber production. This excludes the Tokorangi Triangle which is managed by the Rotorua District Council. This section of the questionnaire focuses on forest improvements using the timber managed forest as the status quo.

Previously Whaka Forest has been managed for research and commercial timber production only. The forest now is increasingly being used for recreation. The recreational appeal of the forest could be increased by changing how it is managed. Based on consultation with forest users and experts, various options for forest management have been identified.

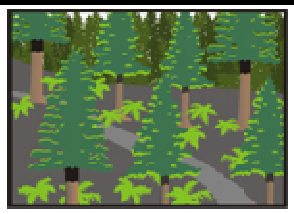
For each of the options the level of free public access and the variety of tracks will **not be reduced from the current status**. Based on your recreational activity today, please state your preferences for the various forest management types.

*Please turn to **sheet number 10.1***

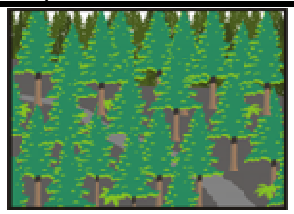
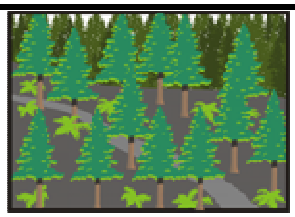
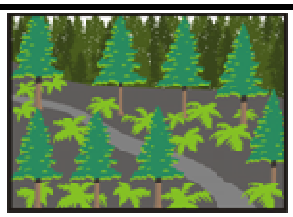
10.1 Thinking about the age of trees in the forest, of the three types described on sheet 10.1, please tell us which you prefer the most "1", which you prefer next "2", and which you prefer least "3".

Tree ages in the forest	 Same Age Trees Preference rank [ ]	 Two Age Groups Preference rank [ ]	 Three or More Age Groups Preference rank [ ]

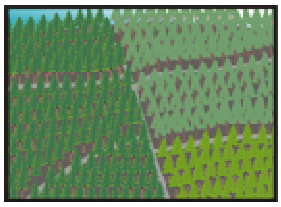
10.2 Thinking about the mix of tree species in the forest, of the three types described on sheet 10.2, please tell us which you prefer the most "1", which you prefer next "2", and which you prefer least "3".

Species in the forest	 Same Tree Species Preference rank [ ]	 Two Tree Species Preference rank [ ]	 Three or More Tree Species Preference rank [ ]

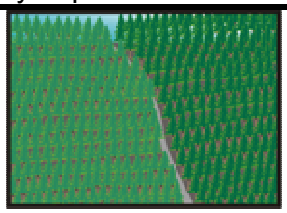
10.3 Thinking about the density of trees in the forest, of the three types described on sheet 10.3, please tell us which you prefer the most “1”, which you prefer next “2”, and which you prefer least “3”.

Tree density in the forest			
			
	High Density, Poor Understorey Preference rank [ ]	Medium Density, Medium Understorey Preference rank [ ]	Low Density, Rich Understorey Preference rank [ ]

10.4 Thinking about the percentage of radiata pine in the forest, of the three types described on sheet 10.4, please tell us which you prefer the most “1”, which you prefer next “2”, and which you prefer least “3”.

Species in the forest landscape			
			
	70% Radiata Pine Preference rank [ ]	50% Radiata Pine Preference rank [ ]	30% Radiata, 70% Other Species Preference rank [ ]

10.5 Thinking about the size of forest plots in the landscape, of the three types illustrated on sheet 10.5, please tell us which you prefer the most “1”, which you prefer next “2”, and which you prefer least “3”.

Plot sizes in the forest landscape			
			
	Large Plots (Greater than 30 ha) Preference rank [ ]	Medium Plots (about 20ha) Preference rank [ ]	Small Plots (less than 10 ha) Preference rank [ ]

11a **Taking into account all of your circumstances (eg, income, work, family and other activities), <u>how many additional visits</u> would you make to Whaka Forest in a <u>year</u> if the forest is managed according to your preferences given above?**

_____**additional** visits a year

11b **If *<u>none/no increase</u>*, why would you not visit more often?**

- ○1 Current conditions of the forest are adequate to achieve my recreational objective(s)
- ○2 The new options make little difference from the current forest condition
- ○3 My personal circumstances do not allow me to increase the number of visits to the forest above the current level even if forest qualities are improved
- ○4 If other please specify

_____

_____

_____

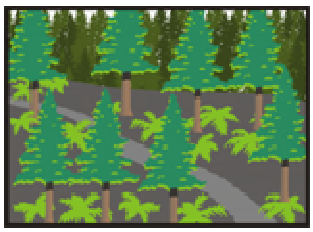
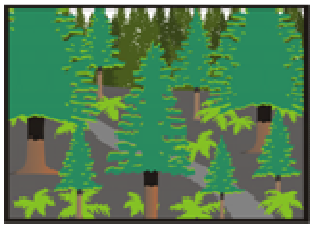
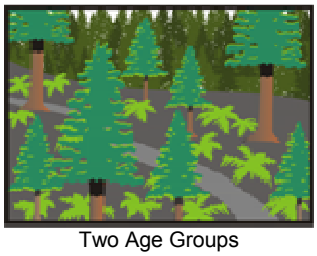
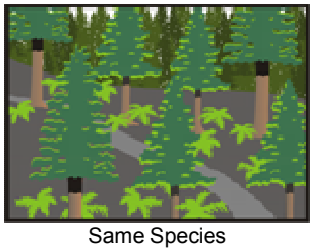
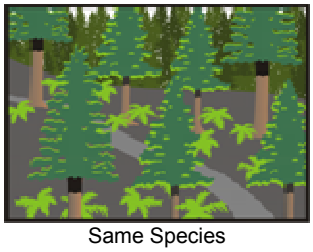
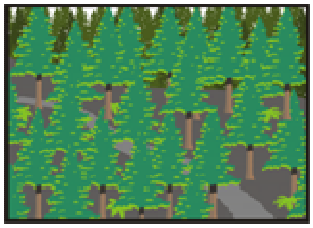
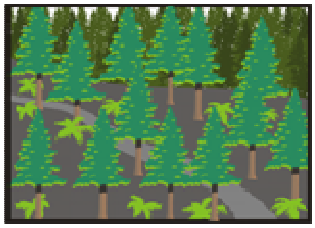
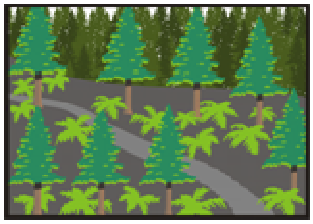
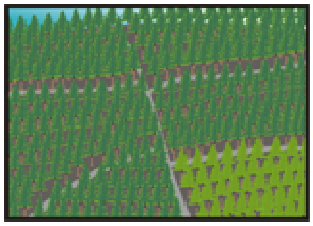
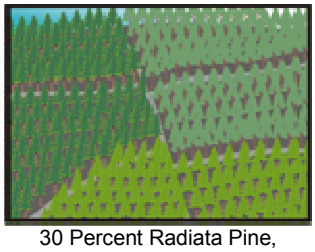
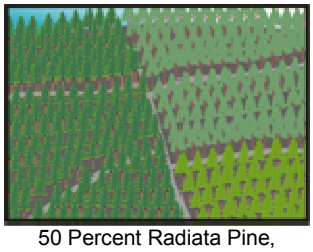
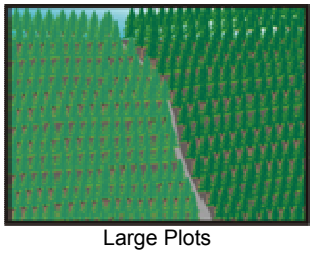
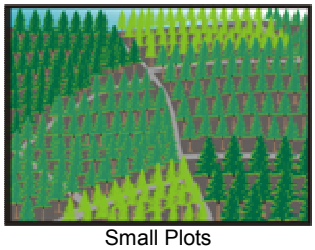
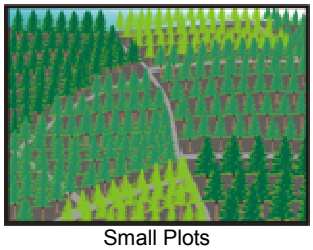
In the next section of the survey (Questions 12a to 12f), you will be answering **questions about your preferred mix of trees and structure of the forest**. For each choice question, there are three different types of forests. The first type or Type 1 is status quo which represents the current condition of the Whaka forest which has low diversity. The other two types represent "improved" or relatively more diverse forests. Please note that in some of the "improved" forest types, there could be only one forest feature (eg, number of species) that is more diverse than the status quo, while in others there could be more than one feature**.** We would like you to now to examine different alternatives with different combinations of forest features that you have seen on Pages 4 and 5. Please turn to the next page for Question 12a.

12a On this sheet there are three combinations of forest features – which we have called forest management types. Look at the three types on this sheet. Note that the three forest types are each made up of a combination of five features, namely: tree ages; number of species; tree density; proportion of radiata pine; and plot sizes.

a) Which one of the three types do you prefer the most as a walker/biker in the forest?

b) If the Whaka Forest was managed according to your most preferred forest type, how many **additional visits** per year do you think you would make?

c) If the Whaka forest was managed according to your most preferred type, would you spend extra time per visit? **Yes / No** If **Yes**, how many extra hours per visit?

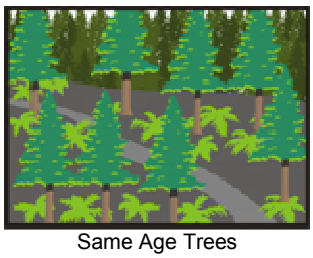
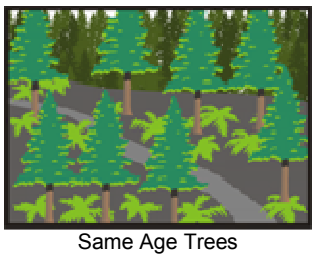
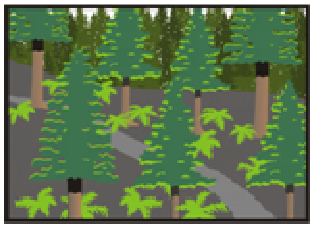
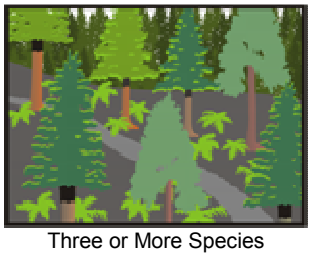
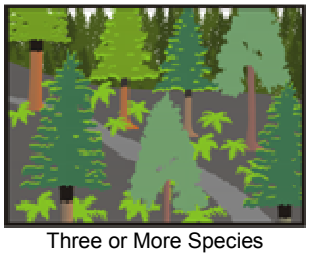
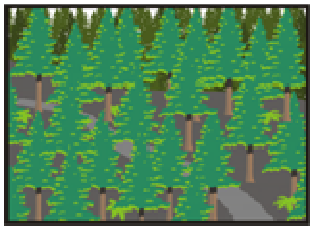
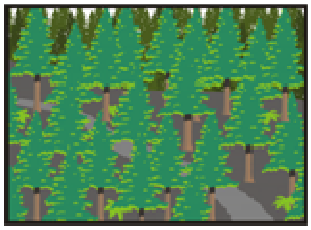
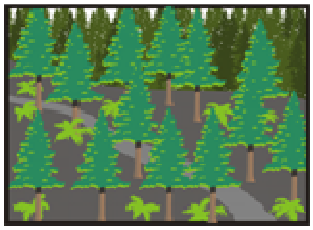
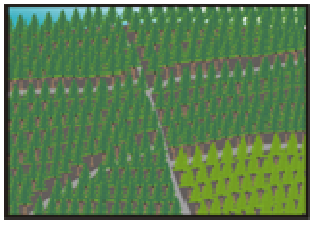
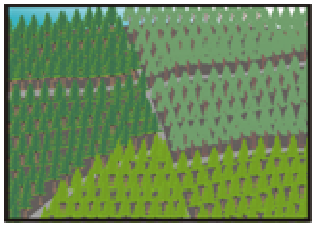
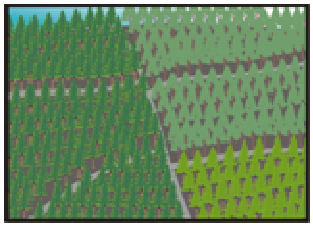
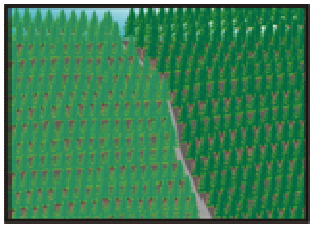
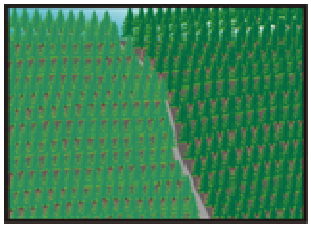
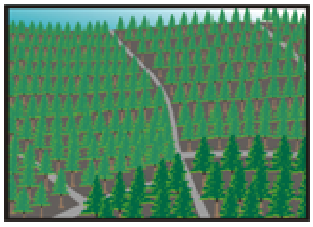
	Type 1 (Status Quo)	Type 2	Type 3
Tree Ages in the Forest	 Same Age Trees	 Three or More Age Groups	 Two Age Groups
No. of Tree Species in the Forest	 Same Species	 Two Species	 Same Species
Tree Density in the Forest	 High Density, Poor Understorey	 Medium Density, Medium Understorey	 Low Density, Rich Understorey
Proportion of Radiata in the Forest Landscape	 70 Percent Radiata Pine	 30 Percent Radiata Pine, 70 Percent others	 50 Percent Radiata Pine, 50 Percent Others
Plot Size in the Forest Landscape	 Large Plots (Greater than 30 hectares)	 Small Plots (Less than 10 ha)	 Small Plots (Less than 10 ha)
a) Most preferred option (Tick only one)	[ ]	[ ]	[ ]
b) No of additional visits per year	[x]	[ ]	[ ]
c) Additional time per visit	[x]	_____ hours	_____ hours

12b The choice questions below are similar to 12a, only that we have varied the levels of different features. Please look at the three forest types.

a) Now, which one of the three types (1, 4 or 5) on this sheet (12b) do you prefer the most as a walker/biker in the forest?

b) If the Whaka Forest was managed according to your most preferred forest type, how many **additional visits** per year do you think you would make?

c) If the Whaka forest was managed according to your most preferred type, would you spend extra time per visit? **Yes / No** If **Yes**, how many extra hours per visit?

	Type 1 (Status Quo)	Type 4	Type 5
Tree Ages in the Forest	 Same Age Trees	 Same Age Trees	 Two Age Groups
No. of Tree Species in the Forest	 Same Species	 Three or More Species	 Three or More Species
Tree Density in the Forest	 High Density, Poor Understorey	 High Density, Poor Understorey	 Medium Density, Medium Understorey
Proportion of Radiata in the Forest Landscape	 70 Percent Radiata Pine	 30 Percent Radiata Pine, 70 Percent others	 50 Percent Radiata Pine, 50 Percent Others
Plot Size in the Forest Landscape	 Large Plots (Greater than 30 hectares)	 Large Plots (Greater than 30 hectares)	 Medium Plots (About 20 ha)
a) Most preferred option (Tick only one)	[ ]	[ ]	[ ]
b) No. of additional visits per year	[x]	[ ]	[ ]
c) Additional time per visit	[x]	_____ hours	_____ hours

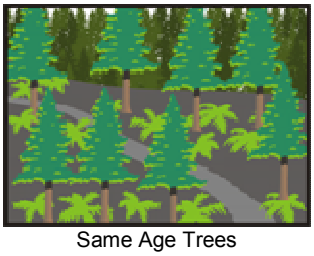
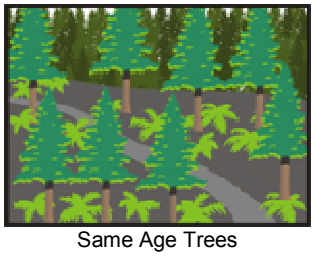
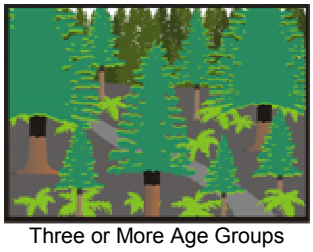
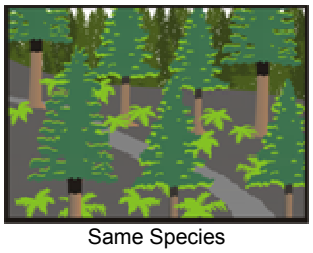
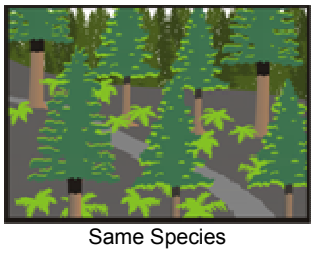
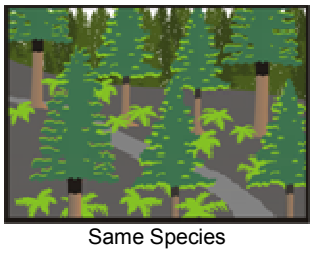
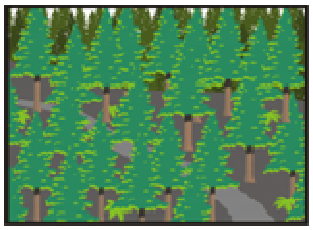
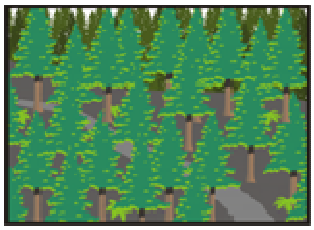
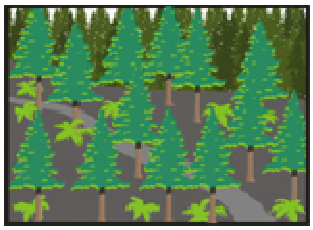
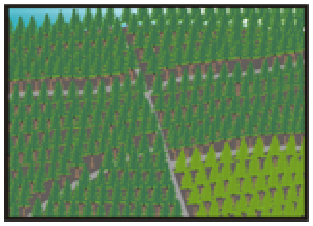
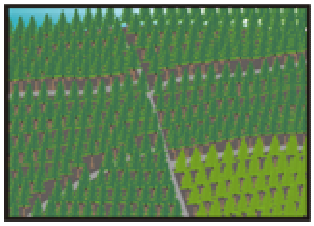
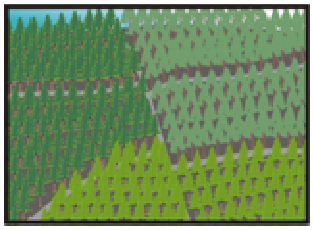
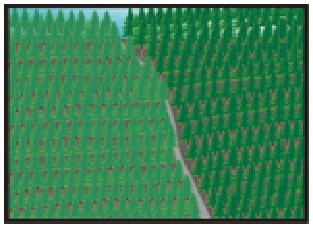
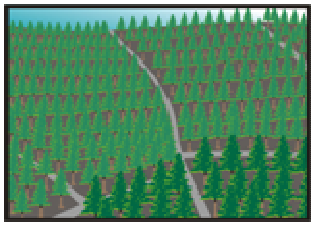
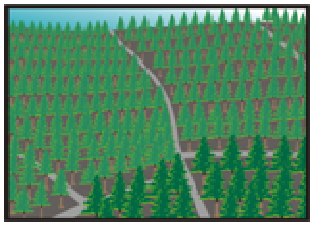
Please now turn to sheet 12c

12c Please look at the three forest types.

a) Which one of the three types (1, 6 or 7) on this sheet (12c) do you prefer the most as a walker/biker in the forest?

b) If the Whaka Forest was managed according to your most preferred forest type, how many **additional visits** per year do you think you would make?

c) If the Whaka Forest was managed according to your most preferred type, would you spend extra time per visit? **Yes / No** If **Yes**, how many extra hours per visit?

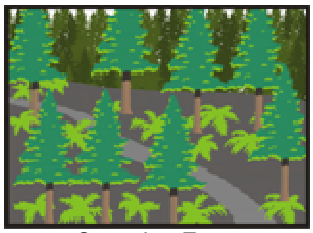
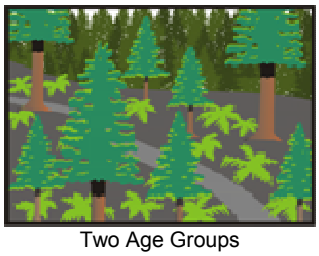
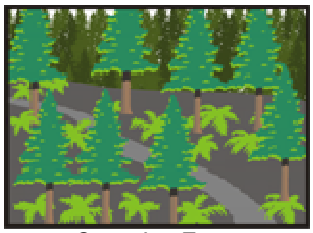
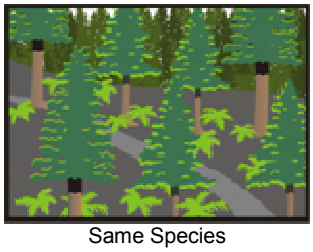
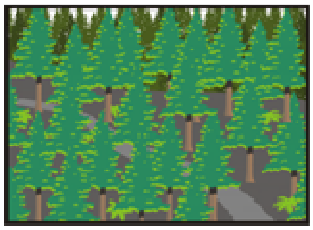
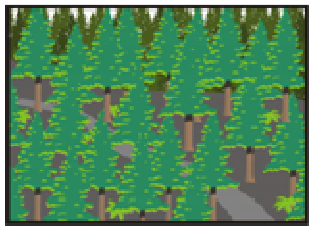
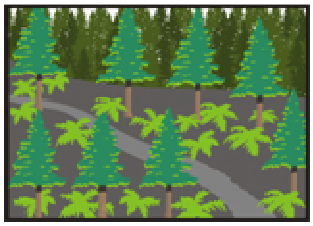
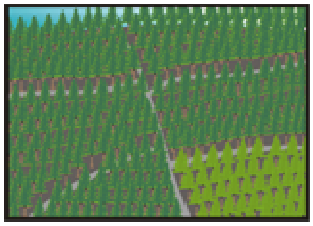
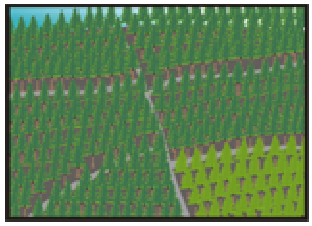
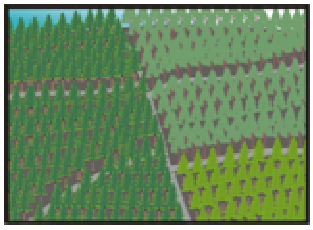
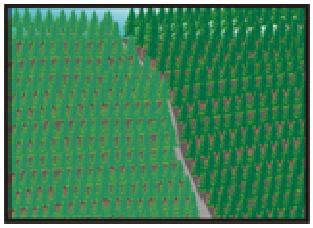
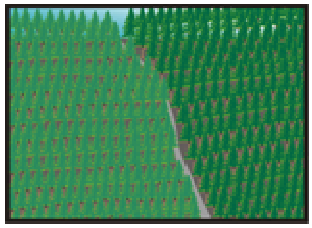
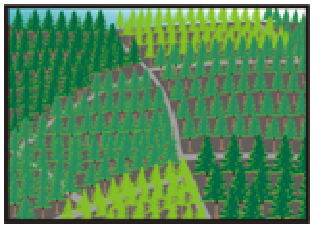
	Type 1 (Status Quo)	Type 6	Type 7
Tree Ages in the Forest	 Same Age Trees	 Same Age Trees	 Three or More Age Groups
No. of Tree Species in the Forest	 Same Species	 Same Species	 Same Species
Tree Density in the Forest	 High Density, Poor Understorey	 High Density, Poor Understorey	 Medium Density, Medium Understorey
Proportion of Radiata in the Forest Landscape	 70 Percent Radiata Pine	 70 Percent Radiata Pine	 30 Percent Radiata Pine, 70 Percent others
Plot Size in the Forest Landscape	 Large Plots (Greater than 30 hectares)	 Medium Plots (About 20 ha)	 Medium Plots (About 20 ha)
a) Most preferred option (Tick only one)	[ ]	[ ]	[ ]
b) Number of additional visits per year	[x]	[ ]	[ ]
c) Additional time per visit	[x]	_____ hours	_____ hours

12d Please look at the three forest types.

a) Which one of the three types (1, 8 or 9) on this sheet (12d) do you prefer the most as a walker/biker in the forest?

b) If the Whaka Forest was managed according to your most preferred forest type, how many **additional visits** per year do you think you would make?

c) If the Whaka Forest was managed according to your most preferred type, would you spend extra time per visit? **Yes / No** If **Yes**, how many extra hours per visit?

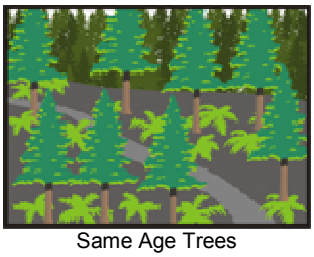
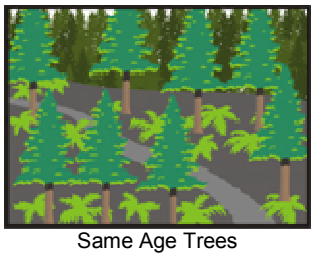
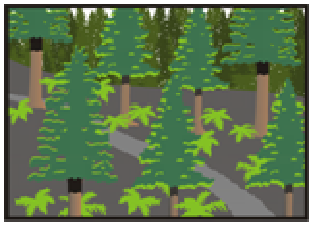
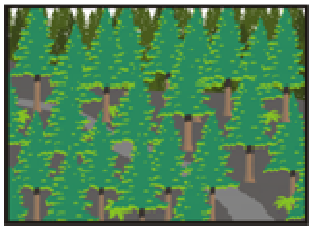
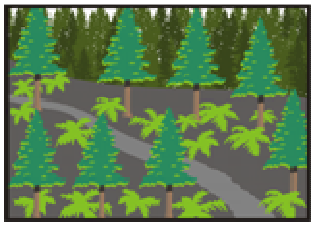
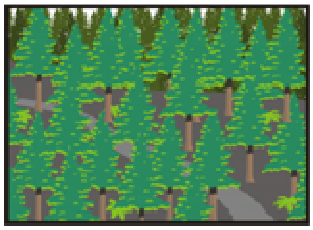
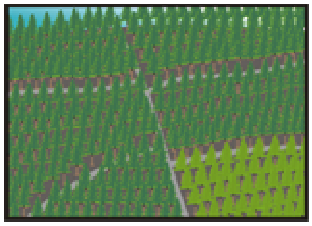
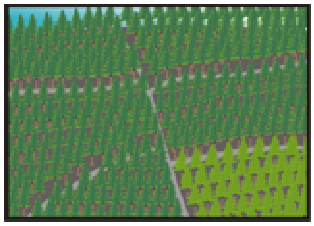
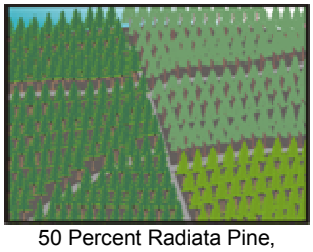
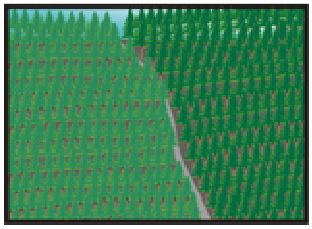
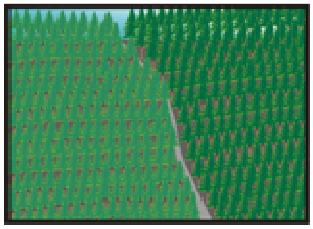
	Type 1 (Status Quo)	Type 8	Type 9
Tree Ages in the Forest	 Same Age Trees	 Two Age Groups	 Same Age Trees
No. of Tree Species in the Forest	 Same Species	 Two Species	 Three or More Species
Tree Density in the Forest	 High Density, Poor Understorey	 High Density, Poor Understorey	 Low Density, Rich Understorey
Proportion of Radiata in the Forest Landscape	 70 Percent Radiata Pine	 70 Percent Radiata Pine	 50 Percent Radiata Pine, 50 Percent Others
Plot Size in the Forest Landscape	 Large Plots (Greater than 30 hectares)	 Large Plots (Greater than 30 hectares)	 Small Plots (Less than 10 ha)
a) Most preferred option (Tick only one)	[ ]	[ ]	[ ]
b) Number of additional visits per year	[x]	[ ]	[ ]
c) Additional time per visit	[x]	_____ hours	_____ hours

12e Please look at the three forest types.

a) Which one of the three types (1, 10 or 11) on this sheet (12e) do you prefer the most as a walker/biker in the forest?

b) If the Whaka Forest was managed according to your most preferred forest type, how many **additional visits** per year do you think you would make?

c) If the Whaka Forest was managed according to your most preferred type, would you spend extra time per visit? **Yes / No** If **Yes**, how many extra hours per visit?

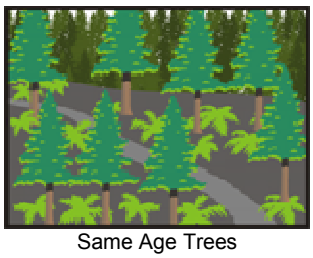
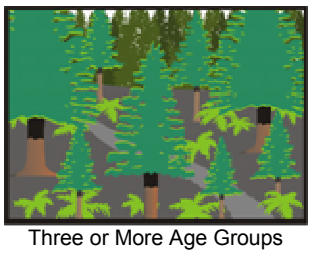
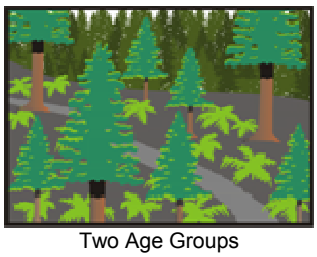
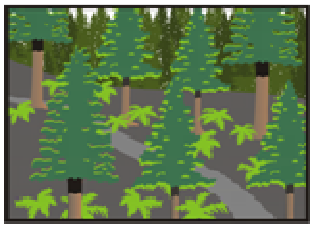
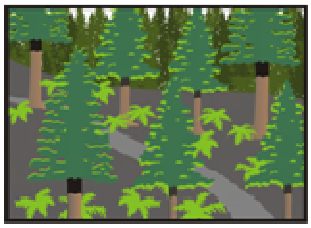
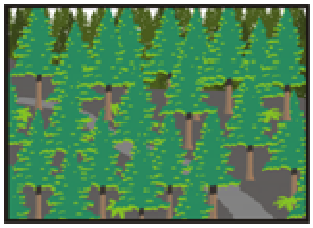
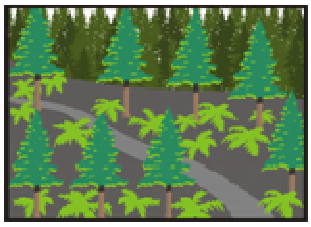
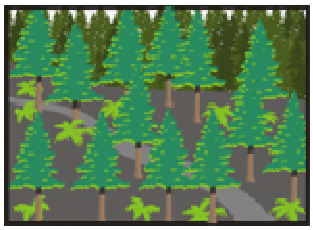
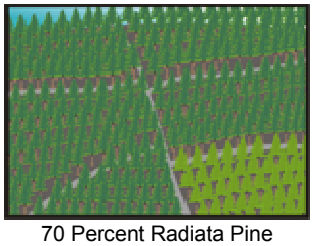
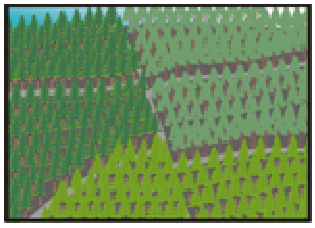
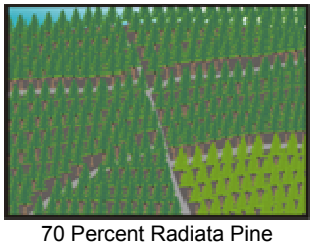
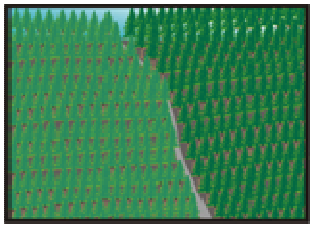
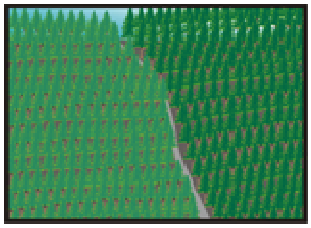
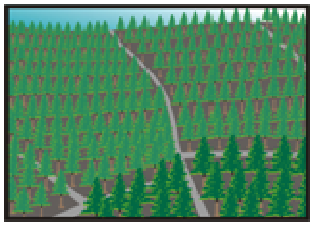
	Type 1 (Status Quo)	Type 10	Type 11
Tree Ages in the Forest	 Same Age Trees	 Same Age Trees	 Three or More Age Groups
No. of Tree Species in the Forest	 Same Species	 Two Species	 Two Species
Tree Density in the Forest	 High Density, Poor Understorey	 Low Density, Rich Understorey	 High Density, Poor Understorey
Proportion of Radiata in the Forest Landscape	 70 Percent Radiata Pine	 70 Percent Radiata Pine	 50 Percent Radiata Pine, 50 Percent Others
Plot Size in the Forest Landscape	 Large Plots (Greater than 30 hectares)	 Small Plots (Less than 10 ha)	 Large Plots (Greater than 30 hectares)
a) Most preferred option (Tick only one)	[ ]	[ ]	[ ]
b) Number of additional visits per year	[x]	[ ]	[ ]
c) Additional time per visit	[x]	_____ hours	_____ hours

12f Please look at the three forest types.

a) Which one of the three types (1, 12 or 13) on this sheet (12f) do you prefer the most as a walker/biker in the forest?

b) If the Whaka Forest was managed according to your most preferred forest type, how many **additional visits** per year do you think you would make?

c) If the Whaka Forest was managed according to your most preferred type, would you spend extra time per visit? **Yes / No** If **Yes**, how many extra hours per visit?

	Type 1 (Status Quo)	Type 12	Type 13
Tree Ages in the Forest	 Same Age Trees	 Three or More Age Groups	 Two Age Groups
No. of Tree Species in the Forest	 Same Species	 Same Species	 Three or More Species
Tree Density in the Forest	 High Density, Poor Understorey	 Low Density, Rich Understorey	 Medium Density, Medium Understorey
Proportion of Radiata in the Forest Landscape	 70 Percent Radiata Pine	 30 Percent Radiata Pine, 70 Percent others	 70 Percent Radiata Pine
Plot Size in the Forest Landscape	 Large Plots (Greater than 30 hectares)	 Large Plots (Greater than 30 hectares	 Medium Plots (About 20 ha)
a) Most preferred option (Tick only one)	[ ]	[ ]	[ ]
b) Number of additional visits per year	[x]	[ ]	[ ]
c) Additional time per visit	[x]	_____ hours	_____ hours

13. In responding to **Questions 12a to 12f**, you might have found one forest feature to be more important than the others. Please rank the five features with "**1**" being the most important and "**5**" as the least important. (*rank in box*)

Rank	
☐	Tree ages
☐	No. of tree species
☐	Tree density
☐	Proportion of Radiata
☐	Plot size
☐	All attributes treated as equally important (Tick)

*Questions **14a** and **14b** below should only be answered if the respondent did not increase their number of visits in Questions **12a** to **12f**. If you have reported **an increase in the number of visits in 12a to 12c**, please go to **Section C**.*

ONLY ANSWER IF YOU DID NOT INCREASE YOU NUMBER OF VISITS IN Q12a TO Q12f

14a If you would not change the number of visits you make to the forest in any of the types presented in 12a to 12f, please explain why? Tick one only

- ○1 Current conditions of the forest are adequate to achieve my recreational objective(s)
- ○2 The new options make little difference from the current forest condition
- ○3 My personal circumstances do not allow me to increase the number of visits to the forest above the current level even if forest qualities are improved
- ○4 If other please specify

_____

_____

_____

14b If you would not increase your time of staying in the forest in any improved option in 12a to 12f, please explain why?

- ○1 Current conditions of the forest are adequate to achieve my recreational objective(s)
- ○2 The new options make little difference from the current forest condition
- ○3 My personal circumstances do not allow me to increase the number of visits to the forest above the current level even if forest qualities are improved
- ○4 If other please specify

_____

_____

_____

Section C. Respondent's details

The final questions are about you, and are standard survey questions to ensure we have surveyed a broad cross section of the population. Your responses will remain anonymous and confidential.

15. **Gender** (*tick one only* ✓)

O1 Male O2 Female

16. **Which ethnic group do you identify with**? (*tick as many as apply* ✓)

O1 New Zealand Maori
O2 New Zealand born European
O3 European immigrant
O4 Pacific Islands
O5 Asian
O6 Middle Eastern/Latin American/African
O7 Other (*specify*) _____

17. **What is your current household type**? (*tick one only* ✓)

O1 Couple With Children
O2 Couple Without Child / Children
O3 One Parent With Child/Children
O5 One Person Household
O6 Flatting/sharing with others
O7 Other (*specify*) _____

18. **What is your age group**? (*tick one only* ✓)

O1	15-19 years	O8	50-54
O2	20-24	O9	55-59
O3	25-29	O10	60-64
O4	30-34	O11	65-69
O5	35-39	O12	70-74
O6	40-44	O13	75-80
O7	45-49	O14	80+

19. **What is the highest qualification you have attained**?
(*tick one only* ✓)

O1 No qualification
O2 NZ school certificate or level 1 NCEA
O3 UE or Bursary, or NCEA level 2 or 3
O4 Overseas high school qualification
O5 Post-school diploma, trades certificate or equivalent
O6 Undergraduate degree (bachelors) or equivalent
O7 Post-graduate degree or equivalent
O8 Other (spec) _____

20. **Are you actively involved in an organisation that uses Whaka forest**?
(*tick one only* ✓)

O1 Yes O2 No

If yes: what organisation/s? ……..

…….

21. **Which one of the following best describes your current employment status**? (*tick one only* ✓)

○1	Employed full time	○4	On ACC or sickness benefit
○2	Employed part time	○5	Not in labour force (retired, student etc)
○3	Not employed, but seeking work	○6	Other (*specify*)----------

22. **What is your current main occupation?** _____

23. **How many hours a week do you spend doing outdoor recreational activities**?

_____ hours

24. **Looking at the categories listed here, what is your own personal annual income before tax**? (*tick one only* ✓)

○1	$ 10,000 and below	○12	$ 60,001 to $ 65,000
○2	$ 10,001 to $15,000	○13	$ 65,001 to $70,000
○3	$ 15,001 to $20,000	○14	$ 70,001 to $ 75,000
○4	$ 20,001 to $25,000	○15	$ 75,001 to $ 80,000
○5	$ 25,001 to $30,000	○16	$ 80,001 to $ 85,000
○6	$ 30,001 to $35,000	○17	$ 85,001 to $ 90,000
○7	$ 35,001 to $40,000	○18	$ 90,001 to $ 95,000
○8	$ 40,001 to $45,000	○19	$ 95,001 to $ 100,000
○9	$ 45,001 to $50,000	○20	$ 100,001 to $ 120,000
○10	$ 50,001 to $55,000	○21	$ 120,001 or more
○11	$ 55,001 to $60,000	○22	Not Applicable

If you do not belong to a one-person household

25. **Using the same scale, what is your total annual household income (before tax)**? *(tick one or leave blank)*

○1	$ 10,000 and below	○12	$ 60,001 to $ 65,000
○2	$ 10,001 to $15,000	○13	$ 65,001 to $70,000
○3	$ 15,001 to $20,000	○14	$ 70,001 to $ 75,000
○4	$ 20,001 to $25,000	○15	$ 75,001 to $ 80,000
○5	$ 25,001 to $30,000	○16	$ 80,001 to $ 85,000
○6	$ 30,001 to $35,000	○17	$ 85,001 to $ 90,000
○7	$ 35,001 to $40,000	○18	$ 90,001 to $ 95,000
○8	$ 40,001 to $45,000	○19	$ 95,001 to $ 100,000
○9	$ 45,001 to $50,000	○20	$ 100,001 to $ 120,000
○10	$ 50,001 to $55,000	○21	$ 120,001 or more
○11	$ 55,001 to $60,000	○22	Not Applicable

26. **Where do you currently live**?

Town..... Suburb……

27. **Do you have any suggestion about how Whaka Forest should be improved for recreation**? *(Please make note of them below)*

_____

_____

_____

_____

Thank you very much for your valuable time and information.