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Evaluating the (non-market) impacts of wilding conifers on cultural values

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Objectives

- To improve understanding of (non-market) impacts of wilding conifers under two future management scenarios on sites of cultural value in three study areas.

- To develop capabilities across research and policy organisations in the Natural Resources Sector to work more effectively with cultural values.

Background

- A large area of New Zealand is affected by the spread of introduced conifer trees. This report provides the Department of Conservation with examples of how cultural values are associated with the areas surrounding lakes Tarawera, Pukaki, and Wakatipu, as well as how these cultural values might be considered in future plans for managing wilding conifers. The Department of Conservation is charged with promoting conservation of the natural and historic heritage of New Zealand on behalf of, and for the benefits of, present and future New Zealanders. To achieve this, a thorough understanding is required of cultural values, how and where these values are established and enacted, and their associated ecosystem benefits and disservices.

Methodology

- Sites of cultural value around Lakes Tarawera, Pukaki and Wakatipu are presented and examined with regard to potential spread or removal of wilding conifers.
- Cultural values can be understood as the underlying values that shape judgements and expectations about the world. Working with cultural values provides an entry point to the ways culture resonates through material objects, including conifers and their ecosystems.
- An online survey, key informant interviews, literature review, and a deliberative and collaborative analysis process were used to identify cultural values. These values are evaluated through a focus on 'cultural practices', 'environmental spaces', and 'cultural ecosystem benefits' associated with wilding conifers. In order to understand potential impacts of wilding conifer spread on these cultural values two management scenarios were explored for the future of wilding conifers in the three study sites by 2035 (i.e. the next 20 years): one scenario projected a 5-6% per annum spread; the second considered the complete removal of wilding conifers. This report makes extensive use of quotes from interviews to document views shared about these scenarios, potential impacts on cultural values, and implications for the management of wilding conifers.

Findings and Synthesis

- Respondents to the online survey showed knowledge of conifers. But opinions about the presence of these trees in the study sites were varied. Most typically, people see the presence of trees as good, but natives are preferred. There is an indication that people do not distinguish between plantation conifers and wilding conifers.

- For some respondents, wilding conifers represent the demise of healthy mountains, rivers, and land. The potential spread of wilding conifers creates a sense of loss of well-being and inability to provide for future generations. People also recognised that conifers had provided benefits for people, including prevention of erosion and the provision of shelter from the wind. People were most concerned about the spread of wilding conifers in awe-inspiring vistas. These vistas and associated experiences are considered unique to New Zealand.
- However, in some places where wildings flourish, the lush, forested alpine vistas and deciduous autumnal colours (for instance, of the larches) are also appealing. Wilding conifers also impact on farming lifestyles and many concerns about the impacts of wilding conifers were enclosed in broader concerns about changing farming cultures. In some places, productive land use is being balanced with removal of wilding conifers and restoration of more indigenous landscapes. This concept of taking a balanced approach to stewardship of the land was frequently expressed as key to the control of wilding conifers.
- Difference was noted in the level of concern about the spread of wilding conifers between the responses gathered through an online survey and the perspectives expressed through interviews by people actively managing wilding conifers: there is a high level of concern from people actively managing both the natural and historic heritage in the study sites about the potential negative impacts of wilding conifers. This indicates that the control of wilding conifers is an issue at the threshold of becoming a topic of national conversation.

Discussion and conclusions

- The sites of cultural value presented in this report became significant through a variety of cultural practices including tourism, adventure, storytelling, natural history, weddings, picnics, land restoration, farming, filming and many more. These places shape people's sense of self, sense of place, and sense of New Zealand. Numerous cultural ecosystem benefits have been derived from learning new skills such as water skiing, to creating a heritage legacy and developing capabilities for land restoration.
- Specific sites of cultural value e.g. Aoraki/Mt Cook, Glenorchy, Mt Tarawera, need immediate attention to help landowners and curators of the heritage of these places identify management priorities. At a more regional scale, stories of the hardship and limited successes of managing wilding conifers will support more widespread engagement with the risks of wilding conifer spread. A national conversation (e.g. through a social marketing campaign) about land management would emphasise the cultural values associated with establishing a legacy of proactive environmental care from which future generations could benefit.

Keywords

- Cultural values; wilding conifers; heritage; history; landscapes; Queenstown; Lake Wakatipu; Twizel; Lake Pukaki; Tarawera, Lake Tarawera; ecosystem services, natural capital.

1 Introduction

This research is part of current considerations about natural capital and cultural values in New Zealand's natural resources sector. Ways of thinking about cultural values in relation to landscapes and ecosystems are presented, the terms used are explained and a working definition of cultural values is provided. To evaluate the (non-market) impacts of wilding conifers on cultural values in three study sites in New Zealand, this report presents sites of cultural value identified through a survey, interviews and geo-datasets. The potential implications of wilding conifer spread under two future management scenarios are discussed in relation to the range of cultural values identified. Debates about evaluation approaches for impacts of invasive species on cultural values in international and New Zealand literature are considered. Key to the challenge of evaluating impacts is recognizing that cultural values are best understood as dynamic, evolving through their specific relationships and contexts. Following on from the background to this research, the multi-method, participatory approach is explained. In section 4 the three study sites are presented, providing background to the introduction of conifers in these sites as well as current management practices.

Eighteen sites of cultural value that survey respondents identified around lakes Tarawera, Pukaki, and Wakatipu[1] are presented in tables in section 4. For each site the types of environmental spaces (e.g. walking track or camping ground) are presented, as well as the reasons why the site was deemed significant by the survey and interview respondents. Quotes from interviews explain some of the perceived potential implications of wilding conifer spread in these sites. A synthesis is provided of perceived impacts across the sites, followed by discussion of the potential implications for wilding conifer management.

A growing sense of urgency is developing through this and related wilding conifer projects: there are challenges of prioritising investment, limited visibility of the issue, as well as how capabilities might be supported through networks across research, Māori organisations, volunteers, and landowners. To conclude, the spread of wilding conifers is not a localised problem, rather wilding conifer management needs to be addressed as a national issue. Such attention, would take into consideration impacts on specific cultural values, and also actively shape New Zealand's natural and cultural heritage.

[1] From the original Māori name - Whakatipu wai-Māori

2 Background

New Zealand faces the challenge of responding to the spread of wilding conifers. Approximately 1.7 million hectares, almost 6% of New Zealand, have already been affected to some extent by these trees. Wilding conifers are continuing to increase in area at an average compounding rate of approximately 5–6% per year. At current incursion levels this equates to approximately an increased spread across 90 000 hectares each year.

The risk of not looking holistically (e.g. across biophysical, social, and financial dimensions) at this spread of wilding conifers is that cultural values may be overlooked when decisions are made that focus only on tangible evidence expressed in monetary (e.g. cost-benefit analysis) or biophysical terms (e g. water-quality measurements). If cultural values are overlooked, contestation may occur, or future generations may be left with a landscape or natural heritage legacy that reduces their well-being.

Natural capital is a term used to refer to the land, air, water, living organisms, and all formations of the Earth's biosphere that provide society with ecosystem goods and services imperative for human survival and well-being. Natural Capital approaches argue that traditional measures to gauge economic performance, such as produced and human capitals, predominantly neglect natural capital. Typically, this omission has led to a depletion of biophysical stocks and the loss of valuable ecosystem services (Costanza & Daly 1992).

The term wilding conifers (also known as wilding pines) incorporates trees that go by a range of names including lodgepole (*Pinus contorta Loud.*), Corsican pine (*P. nigra Arn. Subsp. Laricio (Poir.) Maire*), Ponderosa (*P. ponderosa C. L. Laws.*), European Larch (*Larix decidua Mill*), Radiata pine (*P. Radiata D Don*), and Douglas fir (*Pseudotsuga menziesii (Mirb.) Franco*). Planted conifers provide significant benefits to New Zealanders, but wilding conifers present a significant and increasing problem.

> *In the right place introduced conifers can provide economic, environmental, social and cultural benefits: such as timber resource, increased carbon sequestration, decreased erosion, nutrient filtration, improved water quality and shelter and shade for stock. In the wrong place wilding conifers compete with native vegetation, change existing ecosystems, reduce available grazing land, limit future land use options, visually change landscapes, can affect surface flows and aquifer recharge in water sensitive catchments, and can result in damaging wild fires impacting on the ecosystem services that would have traditionally been provided by these sites. A large area of New Zealand is affected by the spread of introduced conifer trees. In 2007 the area affected by wilding conifers, at various densities, was estimated at approximately 805,000 ha in the South Island and approximately 300,000 ha in the North Island* (New Zealand Wilding Conifer Management Group, 2014, p. 7).

The Department of Conservation is charged with promoting conservation of the natural and historic heritage of New Zealand on behalf of, and for the benefits of, present and future New Zealanders. The Department's primary purpose is to provide conservation leadership for our nature. This role includes managing natural and historic heritage on roughly one third of New Zealand's land area, as well as in marine environments.

Accordingly in 2015 New Zealand's Natural Resources Sector agencies[2] investigated what value can be gained by applying a natural capital approach to natural resource decision making. The broad purpose of its work was to better position the Sector to assess and decide on the value of a more comprehensive and structured approach to incorporate natural capital values into decision-making. To support the work of the Natural Resources Sector, the Department of Conservation funded this study on wilding conifers and cultural values in relation to natural and historic heritage. This study compliments an economic analysis of wilding conifer impacts undertaken by Scion on behalf of the Ministry for Primary Industries.

2.1 Ways of thinking about cultural values

Value is increasingly being considered in policy and environmental management settings as a social construct arising from the cultural contexts and practices of a time and place (Stephenson 2008). The constraints of narrowly approaching value as intrinsic (belonging to a thing by its very nature) and universal (applicable in all cases) are being rejected, especially with regard to understanding the cultural values associated with landscapes and ecosystems. Understanding how specific landscapes or ecosystems are valued involves understanding both the characteristics of the valued 'object' (e.g. wilding conifers), and how expressions of value and values for that object are formalised (regulated, funded, researched).

Many environmental researchers and policy analysts find it challenging to incorporate cultural values into decision making. These values often appear inaccessible or difficult to express – they can be relegated to an afterthought (Pizzirani et al. 2014). However, more attempts are now being made to consider cultural values when planning environmental programmes. A number of concepts are associated with the idea of cultural value including cultural ecosystems, cultural ecosystem benefits, and cultural landscapes (see Table 1). For the purposes of this study we work with the idea of cultural values of ecosystem services as:

> *the collective norms and expectations that influence how ecosystems accrue meaning and significance to people* (Church et al. 2014, p. 16).

Working with cultural values as collective norms and expectations provides a start to investigate how culture both resonates through and is associated with things (material objects), which includes wilding conifers and landscapes.

Recent attempts to ground work on ecosystem services in strong social theory has drawn attention to how cultural values influence, and are influenced by three dimensions: 1) cultural practices are being presented as the actions people take; 2) environmental spaces are defined as the settings in which these happen; and 3) cultural ecosystem benefits is the term used to show how meanings or significance develop from specific practices in specific spaces (Church et al. 2014). In turn, these facets of cultural values enable and shape each other. These dimensions can be identified by answering the following questions:

[2] Department of Conservation (DOC); Department of Internal Affairs (DIA); Land Information New Zealand (LINZ); Ministry for the Environment (MFE); Ministry for Primary Industries (MPI); Ministry of Business, Innovation and Employment (MBIE); Te Pun Kōkiri (TPK).

- Cultural practices: what do people do to interact with each other and with the environment?

- Environmental spaces: where do people interact with each other and with the environment?

- Cultural ecosystem benefits: why people do what they do, what do they feel, and what benefits do they derive from these interactions?

For example, Māori have *whakatauki* (proverbs) about their links to their ancestors. In turn, *whakatauki* are linked to a physical location (environmental space) that provides spiritual or ancestral meaning. The retelling of the *whakatauki* is a cultural practice which conveys *tūrangawaewae* (which can be interpreted as a cultural ecosystem benefit) (Carr 2008).

Similarly, modified landscapes provide a sense of place to 'locals' as they are "social constructs that mirror societal world view and ideologies" (Cosgrove 1984). These reflect people's relationship to their local landscape; where there has been inter-generational living in a locality, this provides a similar sense of history and purpose over time (a cultural ecosystem benefit). Egoz et al. (2001) state that "Farmed landscapes are, therefore, cultural signatures, embodying the values and motives of the people involved in shaping the landscape" (p. 180). The Church et al. (2014) classification is used to explore different dimensions of cultural values, specifically because this conceptualisation does not detach the values from the setting in which they become significant or are enacted.

The list in Table 1 sets the scope of the study by identifying the cultural values that could be impacted by wilding conifers. Throughout the report we distinguish between the sites of cultural value people identified on maps and the broader cultural values expressed when discussing the significance of these sites and potential impacts of wilding conifers.

Māori cultural and spiritual values are considered in this report with regard to both natural and historic heritage for example: Spiritual (*wairua*); sacred (*tapu*); metaphysical (e.g. mythology, beliefs, superstition); intrinsic; customary (e.g. protocols, *tikanga*); ethics – integrity; education – knowledge; amenity; heritage; well-being; recreation; prestige; and authority (*mana*).

> *These values underpin (and transfer into planning) policy and action that can be expressed as protection and management of traditional cultural sites, resources, and ecosystems* (Harmsworth, et al. 2013, pp. 281, 284).

A number of terms are used in conjunction with the notion of cultural values when examining ecosystem services.

Natural heritage: includes cultural values that span four types of ecosystem services (i.e. provisioning, regulating, supporting, and cultural services). This study therefore considers cultural values in the context of these ecosystem services, including a comprehensive range of cultural ecosystem services such as spiritual/religious/symbolic values, aesthetic values, identity values, sense of place, bequest values, existence values, option values, inspiration, learning/education, entertainment, scientific research, discovery/innovation, recreation, and branding and trade implications (de Groot et al. 2010, p. 262).

Historic heritage: distinct from natural heritage, consideration is given to New Zealand's histories and cultures, and the systems or practices passing on cultural identity. Such historic heritage includes archaeological sites and artefacts, buildings, bridges, structures, tracks, roads, memorials, pā, mining sites, whaling stations, shipwrecks, historic areas (e.g. cultural landscapes, groups of related historic places), and Māori sites. Historic heritage also incorporates stories, meanings, identities, shared memories and connections people pass on. Historic heritage is integral to cultural practices such as recreation, education, and bequeathing and shapes people's sense of place and identity.

Cultural heritage: used in the Millennium Ecosystem Assessment (MA) and more recently by the Intergovernmental Platform for Biodiversity and Ecosystem Services (MA 2005; Hernández-Morcillo et al. 2013) to refer to historically important landscapes or species. Once cultural heritage is degraded, cultural services are unlikely to be replaced by technical or other means. This concept appears to be associated with the measurement of the immaterial process alone (the benefit), and the relationship with the biophysical domain is unclear (Church et al. 2014).

Cultural landscapes: referred to by numerous authors as 'Human constructions resulting from people's relationships to the natural areas within which they live or move' (Carr 2008, p. 36). They can also be thought of as 'Cultural signatures, embodying the values and motives of the people involved in shaping the landscape' (Egoz et al. 2001). These concepts help clarify the benefits from: appreciation; aesthetic; production; relationship to land; sense of place; and reflected social meaning. 'Such landscapes may have significant symbolic meaning for a particular cultural group, or groups, of people' (Bourasa 1991, cited in Carr 2008, p. 36). Notably, landscapes are modified to reflect current social constructs – a reflection of cultural values (Carr 2008; Egoz et al. 2001).

Cultural ecosystem services/benefits: a term used to emphasise the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences.

Cultural ecosystem disservices: refer, on the other hand, to the negative side of those services, for example, scariness (e.g. perceived fear of wolves), noisiness, or unpleasantness. Noise and waste in the landscape is a consequence of human use of ecosystems, not a disservice from the ecosystem itself. Some disservices may indicate an overuse of parts of the ecosystem (Plieninger et al. 2013, p. 125).

To summarise, when considered in the context of ecosystems, the notion of cultural values can be understood as incorporating three dimensions:

- *cultural practices* (the things people do)
- undertaken in specific *environmental spaces* (landscapes, ecosystems or places)
- that generate *cultural ecosystem benefits* (and disservices)

These cultural ecosystem benefits can be understood as the ways identities are shaped through ecosystems or landscapes, the experiences people have in specific settings, and the capabilities or new skills and relationships that form through engagement with the ecosystem. This approach to understanding the use of the term cultural values with regard to ecosystem

services is expressed in the Table 1 and is used in subsequent tables detailing the sites of cultural value identified through the surveys. Examples are provided from a review of international literature on this topic. This conceptual framework informed design of the survey and interview questions.

Table 1 Examples of cultural values derived through literature review

Environmental spaces	**Cultural practices**	**Cultural ecosystem benefits**		
		Identities	**Experiences**	**Capabilities**
Wahi tapu Spiritual places Burial sites *Maunga* Mountains Lakes Rivers Streams Gardens Parks Farmland Forests Beaches Seascapes	*Mahinga kai* Storytelling *Tikanga* *Manaakitanga* Creating Exercising Visiting Playing Gathering and consuming Producing and caring	Sense of place *Tūrangawaewae* *Whakapapa* Genealogy Belonging Attachment Rootedness Spirituality Sense of self Sense of society	Mauri Vitality Safety Tranquillity Inspiration Aesthetics Escape Discovery Memories	Spiritual *Wairua* Prestige Authority *Mana* Ethics Integrity Education Amenity Heritage Well-being Recreation Knowledge Health Dexterity

2.2 Evaluating (non-market) impacts of an invasive species on cultural values

Cultural values are often identified as a 'must-be-investigated' issue in relation to invasive species (FAO 2005). However, impacts of weeds and pests on cultural values have received little attention, both internationally and in New Zealand. Working with cultural values requires attention to how, when, and where values are articulated, as well as to what this articulation responds to. Consideration of both specific and broad processes can help environmental managers and policy officials engage with seemingly intangible and contradictory social dimensions.

2.2.1 Previous research on the impacts of wilding conifers on cultural values

To the best of our knowledge, only a handful of studies have dealt with the impacts of wilding conifers on cultural values, and these focused mainly on aesthetic and landscape values (Fairweather et al. 1994; Höck et al. 2001; Swaffield et al. 1996). These studies show that in New Zealand over 20 years ago people were already calling for robust management of the spread of wilding conifers from plantations. Although some of the insights from this earlier research have informed wilding conifer management in New Zealand, the knowledge informing current strategies is still fairly narrow, is focused primarily on biophysical considerations, and has very limited engagement with social knowledge. The New Zealand wilding conifer strategy (2014) mentions but does not expand on Māori cultural values that could be potentially impacted by wildings, and only briefly mentions that landscape values would be affected (NZ Wilding Conifer Management Group 2014).

2.2.2 Perceived risks

Perceived risks of invasive species have been considered for both weeds and mammalian pests, internationally (Warren 2001) and in New Zealand. People's perceptions of risk extend beyond concern about the potential for invasions, e.g. possums, to perceptions about the risks of specific impacts of invasions, e.g. bovine tuberculosis, as well as the risks of specific management approaches, e.g. the use of aerially applied chemical controls or genetically modified organisms (Green & Rohan 2011; Greenaway et al. 2014; Munshi 2014). Authors consistently call for attention to the specificity (temporal, spatial, and cultural) of actual and perceived potential impacts as well as more generalised public awareness campaigns about the invasive species (Garica-Llorente et al. 2008. p. 2980).

2.2.3 Impacts on recreation and aesthetics

Insights can be gleaned from examples in aquaculture. Typically, these studies have focused on a narrow view of cultural values, i.e. only aesthetics (Hewitt et al. 2006). The effects of invasive trees on recreation and aesthetics has also been addressed, for example, woody weeds may hinder access to tracks and watercourses in protected areas, as is the case with the invasion of Barrington Tops National Park in New South Wales (Australia), by Scotch Broom *Cytisus scoparius* (L.) Link subsp. scoparius (Odom et al. 2005). Conflict, it is argued, should be seen as part of the issue of invasive tree removal (Dickie et al. 2014).

2.2.4 Conflicting viewpoints

International literature suggests that conflicting cultural values about invasive species and their impacts must be recognised. For example, while a group of citizens may regard invasive trees as 'attractive and ecologically beneficial', with high recreation and aesthetic value, control programmes have in various locations been put in place through political advocacy and a narrow science focus. One example of this is the Table Mountain National Park, a World Heritage Site in South Africa (van Wilgen 2012). Broad scientific approaches spanning multiple disciplines and stakeholder engagements are being advocated as a way to navigate conflicts and support robust understanding of ecosystem values (de Groot et al. 2010). A cautionary note is also raised in international debates about collaborative approaches to managing invasive species. Risks have been identified with collaborative initiatives which attempt to create or find a unified position. Rather recent work on collaborative management suggests that diversity needs to be recognised through management approaches allowing for a plurality of responses (Juntti et al. 2009, p. 209).

2.2.5 A diversity of values

A distinction can be made between the "scientifically identified" and "culturally identified" risks of invasive species (Andow 2005). While "scientifically identified" risks refer to those risks that can be measured quantitatively (e.g. biophysical), "culturally identified" risks refer to the social values that influence these risks. Andow (2005) argues for an integrated risk assessment that incorporates a diversity of values rather than classifying them as one type of value. At the same time, to increase public confidence in the process of integrating social and cultural values into environmental decisions, it is argued that these processes need to be supported with basic ecological studies (Ishii et al. 2010).

2.2.6 Multi-method participatory deliberation

It is apparent that innovative ways of working with and identifying cultural values still need to be explored. Consultative and deliberative approaches to valuation are increasingly used as people seek to address cultural values related to ecosystems (de Groot et al. 2010, p. 264). Mapping and spatial representation of cultural values is advocated; however, much work is still to be done to identify how to work best with the range of scales associated with cultural values and how to show these in relation to the ecosystems or landscapes under examination (Plieninger et al. 2013). Chan et al. (2012), noting that extending beyond economic presentations of cultural value to include anthropological and sociological approaches can make analysis of cultural value 'messier' and less generalizable, argue that it is a "necessary route to a decision-making framework comprehensive in values" (Chan et al. 2012, p. 13).

Three methodological considerations answer these challenges: 1) inclusion of people who are not resident in the three study sites but to whom the sites are significant; 2) survey respondents were able to represent environmental spaces as areas (a polygon on a map), a trajectory (a line on a map), or a specific site (a dot on the map); 3) a workshop provided for cross-network discussion of the interests engaged with this research.

> *When transformative values of a site call for stories to be told in the decision making process, how can these critically important narratives and value expressions be brought forth, and for whom?* (Chan et al. 2012, p. 16).

The workshop, this report, and subsequent seminars are part of a range of responses to current debates about how best to work with oral history, cultural heritage, and narratives in decision-making processes. The specific steps taken are described below.

3 Methodology

An online survey, participatory mapping, semi-structured interviews, and the co-analysis workshop outlined below were used first to identify and explore cultural values for three study sites, and then to assess possible implications of wilding conifer incursion and management for these sites. Case study locations (Fig. 1) were selected on the basis of 1) presence of wilding conifers; 2) access to data about wilding conifer incursion plus natural and heritage values; and 3) access to key informants. The area included in each study site was determined by current presence of wilding conifers plus each study area encompasses a 6% per annum spread. For Tarawera, the mountain was used as a centre point, for the Lake Pukaki and Twizel study area, the Twizel town was the centre point and for the Lake Wakatipu and Queenstown study area, the township. The radius encompasses major features associated with the study area; in the case of the Lake Wakatipu study area, this included the whole of Lake Wakatipu, as well as the surrounding high country. For Tarawera, the study site was restricted to keep the focus on the mountain, and not to encroach into the Rotorua Township.

The limitations of this are that a bias was created towards study areas where there will be wilding conifer spread and the study areas are not equivalent in size. This approach does not detract from the findings about potential impacts on cultural values in these study areas. However we recommend similar future studies develop more robust criteria for delineation of the study area which would prioritise heritage and socio-cultural characteristics along with the presence of wilding conifers.

The research focused on cultural values relating to natural and historic heritage and considered the current rate of incursion and two future management scenarios. The first future scenario projected incursion in 20 years assuming current management levels continued (business as usual). The second future scenario projected to 2035 (20 years), during which wilding conifers were completely removed from the study site. Data points were collated from the Ministry for Primary Industries study, and geospatial polygon areas, indicating where wilding conifers are currently, or have been, under managed control, were collated from the Department of Conservation and Local Territorial Authorities.

The business-as-usual scenario assumes a growth of 6% per annum over 20 years (based on a generalised estimation across New Zealand). Due to factors such as wind speeds, soils, and seed sources, it is not possible to be certain about where the wildings 6% increased spread will occur in the 3 study sites. Accordingly, these are hypothetical projections only, for discussion in the interview and analysis process. A fringe spread method was used to extend the polygons showing the current state to a 200 metre buffer, 5 yearly for 20 years, as this is the ‘rule of thumb’ spread rate. The complete eradication scenario only required a map devoid of conifer data.

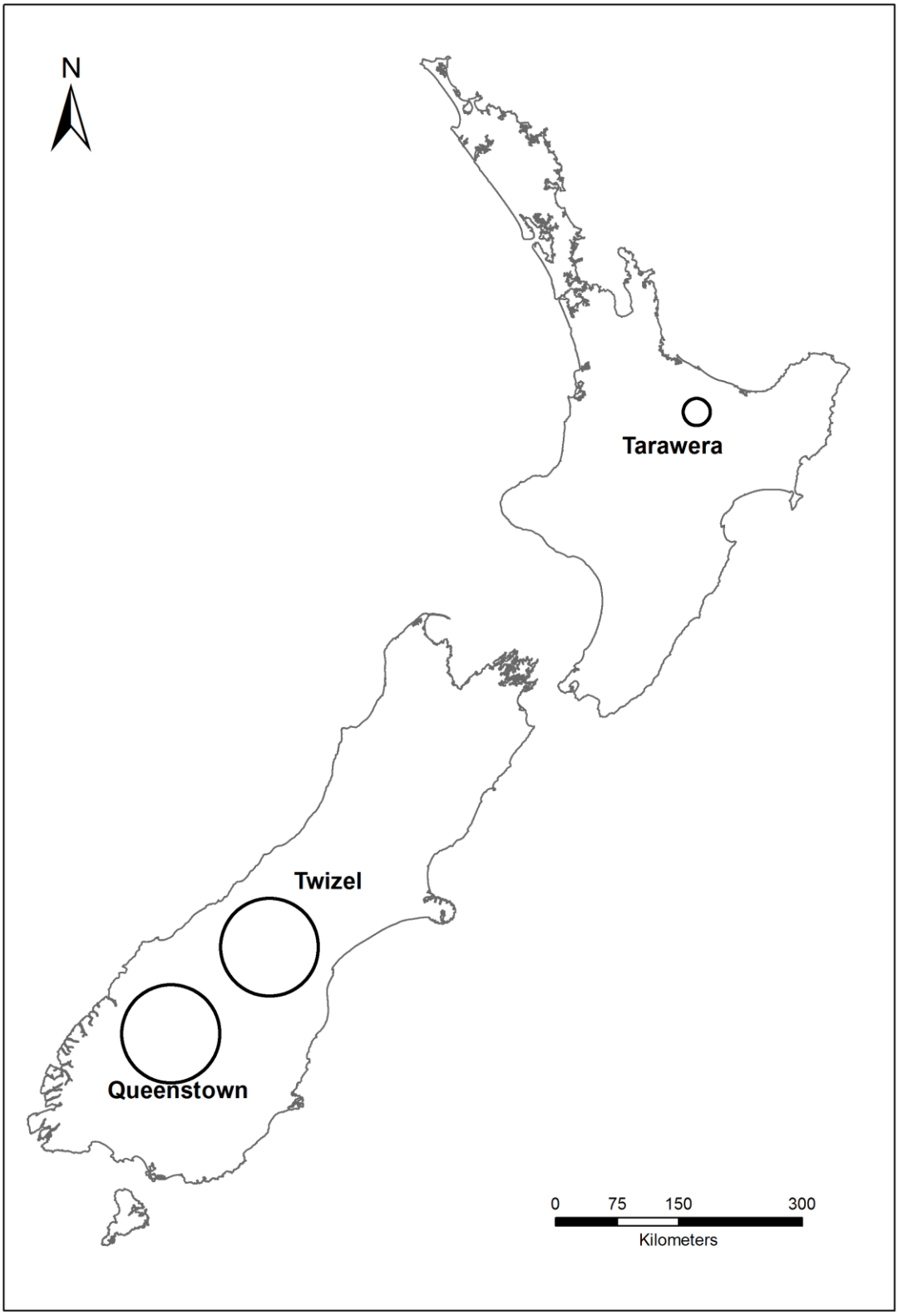

Figure 1 Three study sites: Mt Tarawera, Lake Tarawera and surrounds; Twizel, Lake Pukaki and surrounds; Queenstown, Lake Wakatipu and surrounds.

3.1 Literature review

Discussion of New Zealand's cultural values, especially natural and historical heritage, in media articles (circulated in the last 5 years) and journal papers and reports (released in the last 25 years) was synthesised identifying the specific impacts wilding conifers and other invasive weeds might have on cultural values. This was supported by a review of research exploring cultural values in relation to ecosystems and landscapes and the issues in defining, researching, and interpreting these values. National and international literature about the social dimensions of invasive species was sourced through Scopus and Google Scholar. Grey literature informs much of the background discussion for each study site. Included were Council and NGO reports, newspaper articles, local tourism brochures, YouTube videos, and websites.

3.2 Online survey mapping sites of cultural value and associated environmental spaces

An online survey (see Fig. 17 in the Appendix) asked people to identify sites of significance (environmental spaces) and encouraged people to express cultural benefits (making of identities, experiences and capabilities) to ascertain sites of cultural value for the 3 study sites. The survey was in two parts:

- The first part required respondents to identify, name, and explain sites of significance on Google Maps by placing pins, or drawing lines or polygons. They then ranked these in order of significance and were prompted to identify, name, explain, and rank sites (for the study site) they thought were of importance to all New Zealanders.

- The second part of the survey elicited respondents' awareness of the wilding conifers issue. Respondents were asked to choose between two images of a landscape, one with wilding conifers and one without. For the survey, the figure of 5% per annum rate of spread was used. Note due to new evidence arising during the research period this figure was revised to 6% for the maps showing potential future incursion scenarios presented during interviews (see section 3.3 for further explanation). The photos were of the same site taken 20 years apart[3] (with encroaching wilding conifers in the later image).

3.2.1 Recruitment

Facebook-paid advertising was used to recruit for the survey between the 11th and 22nd May 2015. The ads targeted respondents within New Zealand (restricted by Facebook to those respondents who specified they live in NZ) and aged 18+. In addition, to ensure higher relevance to the potential target audience, placement was further limited to respondents who specified they were interested in fishing, outdoor recreation, hunting, boating, camping, hiking or sports and outdoors, with a potential reach of 2 000 000 people (as estimated by

[3] The same image was used in part 2 of the survey for each study site due to the lack of 'before and after' pictures for each site. The approach provides consistency in terms of visual appearance on how wildings would look in a landscape.

Facebook) (see Fig. 17 in the appendix for examples of the advertisements). Participation in the survey was encouraged by a chance to win a $500 Prezzy Card. To improve the quality of responses, five $100 Prezzy Cards were given to those respondents whose answers were deemed of highest quality/depth (determined in part by time on survey, number of sites identified, and number of words written). Respondents were encouraged to share the survey on social media to improve their chances of winning the main prize. Landcare Research and Aardwolf Research Consulting posted the links to the surveys on their respective Facebook pages, and approximately 15 responses were due to this method of recruitment. Advertisements for the survey ran for 1 week for the Twizel and Queenstown sites, while advertising for the Tarawera study site ran for 2 weeks. An additional 50 respondents was gained for the Tarawera site by targeting Facebook users with areas of interest described as Māori language, Māori music, and Mai FM and Māori television. The recruitment strategy was not entirely successful, one respondent identified they were from Australia and two were under the age of 18.

3.2.2 Survey respondents

A total of 232 completed surveys were collected, with 985 places of significance identified across the three sites. There were 55 respondents for the Queenstown and Lake Wakatipu survey, 106 for the Mt Tarawera survey, and 66 for the Twizel and Lake Pukaki survey. Respondents' home locations were plotted and respondents' home regions are shown in Table 2, arranged by study site. Prime home regions for each study site are highlighted below.

Table 2 Home regions for respondents by study site

Queenstown & Lake Wakatipu			Twizel & Lake Pukaki			Mt Tarawera & Lake Tarawera		
Home Region	**Number**	**Percentage**	**Home Region**	**Number**	**Percentage**	**Home Region**	**Number**	**Percentage**
Australia	1	2%	Canterbury	25	38%	Bay Of Plenty	46	43%
Bay Of Plenty	1	2%	Hawke's Bay	1	2%	Canterbury	4	4%
Canterbury	12	22%	Manawatu-Wanganui	3	5%	Hawke's Bay	1	1%
Tasman District	1	2%	Tasman District	1	2%	Manawatu-Wanganui	3	3%
Waikato	2	4%	Waikato	4	6%	Waikato	13	12%
Otago	19	35%	Otago	11	17%	Otago	4	4%
Auckland	11	20%	Auckland	5	8%	Auckland	14	13%
Wellington	2	4%	Nelson	1	2%	Wellington	8	8%
Southland	2	4%	Wellington	2	3%	Northland	3	3%
Taranaki	1	2%	Southland	4	6%	Gisborne	1	1%
Region not stated	3	5%	Northland	1	2%	West Coast	1	1%
			Gisborne	1	2%	Taranaki	1	1%
			West Coast	1	2%	Region not stated	7	7%
			Region not stated	6	9%			
Total	**55**	**100%**	**Total**	**66**	**100%**	**Total**	**106**	**100%**

Web surveys generally underrepresent males (Gosling et al. 2004), and this was also the case in this study. Overall, 98 males responded, 132 females, 2 preferred not to indicate gender. In the Tarawera area, however, males (56) outnumbered females (48). A total of 13.7% of respondents identified themselves as Māori. Most respondents identifying as Māori (25) completed the Tarawera survey, 3 completed the survey for Queenstown, and 4 completed the Twizel survey. A general a priori expectation for recruitment over Facebook and other social media is an over-representation of younger people and under representation of older.

As the online survey was targeted to New Zealand residents only, the conclusions drawn from the survey cannot be extrapolated to international visitors. International visitors' preferences and levels of awareness about wilding conifers could play an important role in tourist development in the case study areas as found during the interviews.

3.3 Maps of current and potential incursion on sites of cultural value

Data about the current status of wilding conifers and a projected incursion of 6% increase per annum were collated into a database and mapped for each study site. Evidence from a related modelling project became available after the online survey was completed. This new evidence suggests the original rate of 5% per annum spread was too conservative. Throughout this report we refer to the 5% per annum spread when discussing findings from the online survey and to the 6% per annum spread is discussed in relation to impacts and implications identified through the interviews and workshop.

A 6% spread was used when building the maps for each study site. The 5% spread rate was obtained from the text of the Wilding Conifer Strategy (Wilding Conifer Group, 2014). The 6% increase per annum was obtained from the spread graph presented in the Wilding Conifer Strategy based on unpublished data by Clayson Howell (Department of Conservation) and from a wilding conifer model (Scion, Ministry for Primary Industries, Contract No. 17234). These maps were available after the online survey was completed and used during the face to face interviews and final synthesis workshop.

Maps for each study area were also created showing sites of cultural value identified from data sets from the Department of Conservation and local authorities. These maps show heritage, archaeological, and recreational sites, e.g. historic trees, walking paths, huts, archaeological sites, and iconic locations from the filming of the Lord Of The Rings movies in the South Island (these have now become popular tourist destinations). Cultural sensitivity was required to determine what Māori values could be shared through this report (and at what resolution) to help cross-cultural understanding and management of public land. It was agreed that only data gathered through the survey and interviews would be used, this project has not incorporated iwi datasets showing sites of cultural value.

3.4 Interviews exploring impacts on cultural values and management implications

Twenty three semi-structured interviews were undertaken in early June, 2015. A snowball sampling technique identified people with an interest in natural and historic heritage values for the sites. Six interviews were conducted in the Wakatipu area, 5 in Twizel/Pukaki, and 5 in Tarawera with people from the organisations below.

Queenstown & Lake Wakatipu

- Wakatipu Heritage Society Queenstown and District Historical Society
- Ngāi Tahu Tourism
- Destination Queenstown
- Lakes District Museum
- SOHO Properties
- Glen Nevis Station

Twizel & Lake Pukaki

- Ben Ohau station
- Twizel Promotion and Development Assn
- Ferintosh station
- Peppers Bluewater Resort
- Fishing guides

Mt Tarawera & Lake Tarawera

- Māori Investments Ltd.
- Ruawahia 2B Trust and Tuhourangi Tribal Authority
- Lake Tarawera rate payers' association
- Landcare Okareka & Lake Okareka Community Association
- DOC ranger

The interviews ranged from 40 minutes to 2.5 hours. One Twizel & Lake Pukaki interview was conducted over the phone, the rest were face to face. While this telephone interview did not allow for dialogue of core cultural values associated with the region around a map, the informant was sent the images of areas under both future wilding management scenarios, and dialogue was able to be held virtually by reference to these maps.

Interview procedures were aligned with the Landcare Research Social Ethics approval process. All interviewees were given the opportunity to discuss information about the research before the interview and signed a consent form. All except one were audio-recorded and transcribed, notes were taken during the unrecorded interview. These notes and the transcripts were coded using qualitative data analysis software (QSR International Pty Ltd, Version 10, 2012).

The interviews began by prompting people to identify their connections to the study site. Using a map of the study site, informants identified those sites of cultural value related to their fields of interest. The map of sites of cultural value generated from the online survey was then presented and discussed. Towards the later part of the interview the map showing the current state of wilding conifer incursion was presented, and informants were then asked to consider how complete eradication of wildings would affect the places they had discussed. They were then presented with a map showing a 6% rate of incursion and asked to consider what this would mean for the places of cultural value being discussed. Implications for their areas of interest were discussed and perspectives were gauged on management strategies and responsibilities. All interviewees were invited to attend the analysis workshop. Four accepted this invitation, but, due to weather restrictions, only two were able to attend.

3.5 Analysis workshop to determine implications for wilding conifer management

On 19 June 2015, the project team (including 2 interviewees) from across the Department of Conservation, Scion, and Landcare Research analysed the implications for wilding conifer management, identifying the strengths and limits of the findings. The workshop was designed to support analytical and creative thinking to inform the research project. Using a style similar to Chatham House rules[4] participants agreed to use the information received without attributing it to specific individuals or organisations.

[4] a system for holding debates and discussion panels on controversial issues, named after the headquarters of the Royal Institute of International Affairs (situated in St James's Square, London), also known as Chatham House, where the rule originated in June 1927.

4 Findings: non-market impacts of wilding conifers on cultural values in three study sites

This section presents the three study areas, moving south to north from Lake Wakatipu to Tarawera. Drawing from published and non-published literature an historical and cultural context is described for each area. Sites of cultural value for each area commonly named through the survey are presented in the tables. The reader is encouraged to explore how the significance of each environmental space was expressed by survey respondents. For each of the study sites the table is followed by more in-depth discussion of the implications of wilding conifer spread on cultural values. Extensive use of quotes from interviews helps to create a sense of the diversity of perspectives, as well as the potential affects (emotional and sensory impacts) of wilding conifer on cultural values. In addition to the sites of cultural value, current cultural resources e.g. cartoon in Fig. 2, maps, photos, stories, expressions of identity (individual and societal) are also presented. These provide a resource for planning local and regional wilding conifer management approaches[5].

Figure 2 Cartoon lamenting the growth of wilding conifers (Scott 9 March 2001).

[5] Maps produced through the online survey can be examined by following this link http://aardwolfresearch.com/Account/DOC_Conifers/Map.aspx and selecting the study site from the drop down box on the left. A login is required to access this website; email requests to Alison Greenaway (greenawaya@landcareresearch.co.nz).

4.1 Queenstown, Lake Wakatipu and surrounds

The Queenstown Lakes District is self-proclaimed as the 'Adventure Capital of the World' (Cloke et al. 2002; Woods 2011). Located in the South Island, this region's environment has been much modified; a process started in the 1300s by the *Waitaha* people and continued by European colonists who arrived in the 1850s. A short gold rush between 1862 and 1870 brought 8,000 miners from Europe, Australia, and China. After the rush was over, sheep farming was the main activity. From the early 1900s, tourists recognised the area's amenity value, and took excursions to appreciate the mountain scenery and the lakes (Woods 2011). Tourism has grown since the first air connection between Queenstown and Rotorua (another major New Zealand tourist attraction) in 1970. Place, spectacle, embodied experience, and memory are some characteristics of adventure tourism that have been commoditised for tourists (Cloke et al. 2002).

Beyond tourism, the area deeply affects the psyche of New Zealanders. It reflects the multifunctional nature of New Zealand countryside, combining as it does "an international film set, farmed and idyllic landscape, and accessible global tourism destination" (Mackay et al. 2014, p. 41). The influence of the film trilogy 'Lord of the Rings', much of which was filmed in the Queenstown Lakes District (and the South Island as a whole), is said to have had an effect on New Zealand's national identity and emerging visions of nationhood (Jones et al. 2005). The Queenstown Lakes District is also a contested environment for land use planning, where amenity values and investment interests among other factors, have put pressure on the development of rural land in the area (Woods 2011).

Te Runanga o Ngāi Tahu cultural, spiritual, historic, and traditional association to Whakatipu-waimaori (Lake Wakatipu) and the Mataura River is acknowledged by the Crown under section 206 (Te Ao Marama Inc. 2007). An often repeated story connecting Ngāi Tahu to Lake Wakatipu refers to a giant tipua (ogre), Matau, who had captured the chief's daughter, Manata. Manata's father offered her in marriage to whoever rescued her. Matakauri, who had been in love with Manata, rescued her while Matau was sleeping. Matakauri then set Matau alight. The fire was so fierce that it burned a deep hole that was filled by the melted snow on the hills, and formed today's Lake Wakatipu. Stories like this reinforce tribal identity and continuity between generations (Te Ao Marama Inc. 2007).

Cultural values for Queenstown, Lake Wakatipu and surrounds

Sites of cultural value most commonly noted via the online survey for the Lake Wakatipu area are presented in Table 3. This table reflects the idea that cultural values can be understood by looking at the 'environmental spaces' with which these cultural values are associated, what people were doing (cultural practices) in relation to the environmental spaces, and the 'cultural ecosystem benefits' they express from these experiences or connections with the environmental space. The sites of significance most commonly noted by respondents to the online survey are shown as 'environmental spaces', the other two boxes were created based on the reasons given for selecting the sites of significance. Coming through strongly in this table are the cultural practices of appreciating the vista, walking, holidaying, and remembering special times with friends and family. Some of the practices mentioned could be considered in an analysis of market values; however, they are included here because they are couched in sentiments about broader cultural practices of holidaying, remembering or doing fun leisure activities.

Table 3 Sites of cultural value survey respondents associated with Lake Wakatipu

Environmental spaces	Cultural practices	Cultural ecosystem benefits: reasons given for selecting the site
Arrowtown Township Glacier River Golf course The church	Walking Visiting Holidaying Marriage proposal Driving Appreciating vista	*Certainly the most impressive glacier you can see around New Zealand from a short walk and the road to reach it is breath-taking.* *It is very historical lots of lovely walks, the old Chinese settlement, the museum, the river the shops so many features that make it a special place.* *I love visiting this beautiful little town. Especially in Autumn the colours are magnificent.* *It is where my uncle-in-law proposed to my aunty.* *Had a wonderful and very challenging golf course my dad and I played on holiday.* *Charming gold town in near original condition.*
Ben Lomond Mountain	Walking Biking Tramping Appreciating vista	*An easy access area for walking and biking. It provides a great natural resource which should be preserved for access by all.* *I like to hike up this peak.* *The first tramping place with my partner in 2010.* *Great walk with friends.* *Wonderful scenery and unspoilt native bush.* *Valuable walking and MTB tracks.*
Coronet Peak Mountain Ski field	Holidaying Paragliding Skiing Appreciating vista	*This is part of the golden goose.* *So many family holidays.* *Paragliding area.* *Winter fun.* *My partner is an avid skier and would love to ski Coronet Peak.* *I learned to ski there as a child.*
Fergburger Restaurant	Eating burgers	*Need I say more? I think everyone from Queenstown takes a little pride in the Amazing Fergburger.* *Who can forget the classic Fergburger and long queues in this street?* *The best burger joint in the entire world. Whether it be after a night out, a hangover meal or just the first meal you want to eat, each time you visit Queenstown.*
Glenorchy Road Hills Village	Movies Walking Driving Photography Remembering family history Appreciating vista	*Hobbit land!!* *A magical place and the farm station and hospitality there is wonderful.* *Glenorchy is a beautiful place to visit.* *Great memories of holidays there and 'Top of the Lake'.* *Enjoyed a spring drive to the end of the road. Snow on the mountains.* *Amazing beautiful town with spectacular views.* *Glenorchy was a trip or two because we had extended family who did the shelite mining there and were close to my dad. It was always a lovely remote area.* *The whitetail herd – have hunted there, they are a taonga that needs better management.*
Kingston Train stop	Riding the train Races Holidaying	*Fond memories of travelling on the Kingston Flyer with my brother and parents when I was a child. I can still smell the mix of steam and coal smoke from the engine.* *Hack races – families from the surrounding area would compete in annual race.* *Where I spent my Xmas holidays growing up, installing my love of Lake Wakatipu and its surroundings.* *So many great memories of trips on the Kingston Flyer.*
Queenstown Lake Township Gardens	Appreciating the vista Making memories Being hosts Biking Tourism Watch the sun set Watch other people Appreciating vista Walking Ice skating	*The MOST scenic, and stunning place I have ever visited. With the lake, and the Remarkables in the background.* *So much to see and enjoy here. The Gondola to the top for a marvellous view of the Remarkables and then walking back down to town.* *Showing tourists the best of New Zealand.* *Great mountain bike trail network all within a short distance from Queenstown.* *To watch a sunset here is quite spectacular. While you can't see the sun itself, you can see the shadow it casts upon the mountains.* *A very pleasant walk. Lovely views.* *Especially loved the walkway right around it, the memorial garden, the duck pond and bridge, the view of Remarkables from there, etc., etc., an oasis in the heart of the town.* *I remember when we use to skate on the outside ice skating ring.*

Landscape, history and tourism were noted in the survey and interviews as key to the cultural values of the Queenstown study site. These cultural values have a long heritage as Fig. 3 and the following quotes help to portray.

> *There was one [Māori encampment] on Camp Hill. Camp Hill's about there [points to map]. That was even thought to be lightly fortified. There was an encampment, and there are a lot of artefacts that have been found in that area. There was some greenstone in the Dart, and they used to go up to work the greenstone. And that's [points to map] where they could get their waka up…There's old umu sites that are quite obvious if you know where to look for them, at the Dart Bridge. And there's information on them, there's been two archaeological digs on them* (Land Manager, pers. comm., June 2015).

The Lakes district museum and gallery in Arrowtown curates both natural and historic heritage, providing a resource of cultural value for both residents and visitors to the area.

> *Our emphasis, of course, is on the gold, but I think we punch above our weight in terms of what we* [the museum] *try to do. Special exhibitions – every one or two years we do a major exhibition focused on some sort of local topic, quite often tied into oral history interviews that we've done. We've got about 600 hours, I think, now of oral history interviews. We've done one on the history of women and the Wakatipu history of tourism, all the tourism pioneers. The history of wine and food. Māori, Chinese, Cribbies, why people built holiday houses. We've just done a World War one* (Heritage Manager, pers. comm., June 2015).

Figure 3 Lake Wakatipu 1912 with conifers in the background.

Tourism is not something that's new. By the 1900s it was starting to focus more on Queenstown. You had all these boarding houses, and the steamers would arrive, and the people would be out on the wharf calling for "Come to Hamilton House" or Palmyra House, and then you would stay. But the big adventure thing to do would be to climb Ben Lomond – and see the sunrise. People still climb Ben Lomond, but now there's more exciting things to do like throw yourself off bridges and stuff like that. Then the other thing would be to get a wagon and do a circuit trip to Arrowtown, or go into Skippers in a wagon and stop at the Welcome Home Hotel, which is halfway into Skippers, and then carry on. Have lunch there, carry on. So it was a day trip into Skippers, which they still do in four-wheel drive vehicles obviously (Heritage Manager, pers. comm., June 2015).

4.1.1 Current and potential incursion of wilding conifers around Lake Wakatipu

From 1860, European settlers burned much of the native beech forest and shrub lands to open them up for grazing. Trees such as Douglas fir, larch, sycamore, willow and poplar evident in Fig. 3 & 4 were planted later with the idea that they would enhance the barren landscape.

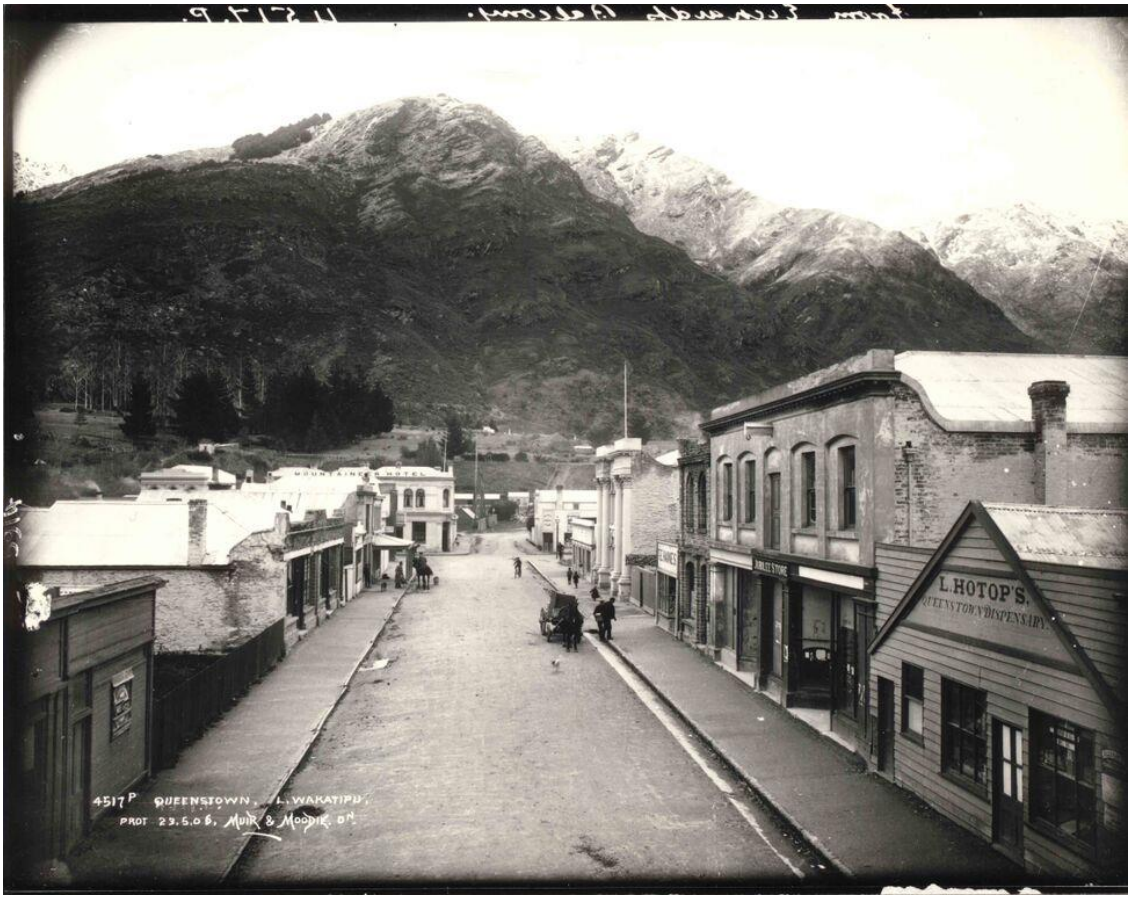

Figure 4 Queenstown 1906, a small stand of conifers at the base of Ben Lomond.

Wildings originated from these trees and have become a significant environmental issue. Seeds from Douglas fir have also spread from a 180 ha commercial forest plantation on slopes between Coronet Peak and Arrowtown (Pringle et al. 2013):

> *We're very fortunate in that we've got a very active wilding pine group in the area. And we're all working in, and if it wasn't that way, there's absolutely no hope* (Land Manager, pers. comm., June 2015).

The community founded the Wakatipu Wilding Conifer Control Group in 2009 to control wilding spread. The Wakatipu Wilding Conifer Strategy 2013–2017 builds on the 2004 and 2008 strategies adopted by the Queenstown Lakes District Council. The strategy was designed on the premise that the adverse effects of wilding conifers on biodiversity and landscape values are greater than the benefits. Therefore, wilding conifer control and containment are the preferred approaches. At the same time, there is a risk that recreational and landscape amenity values could be affected by felling or spraying programmes (Pringle et al. 2013).

One of the often mentioned areas of wilding conifer spread was Queenstown Hill, which is also one of the first places where wilding control was carried out in the early 1990s (Pringle et al. 2013). The Queenstown Lakes District has 1136 ha of wilding forests not currently managed (Millar et al. 2013). The wilding problem is seen by some as an alternative income generation activity, for example, a company that produces Pine Essential Oil was established in 2013 (Chandler 2014; Reynolds 2014); another company has explored the use of wilding conifers as a bioenergy source (Millar et al. 2013).

> *What would happen if the Remarkables were covered in wilding pines? They wouldn't be very remarkable anymore* [laughter]. *They'd have to call it something else* (Heritage Manager, pers. comm., June 2015).

Impacts on tourism (which emphasises cultural values to sell tourist products and shapes culture by providing tourist experiences) were of major importance. This is an area where people are highly invested in and practised at telling and showing heritage, both natural and historic:

> *....If Walter Peak or Cecil Peak were covered in wilding pines – that's a very different vista as opposed to that quite stark landscape that you see now. Which people love – the blue lake and the yellow tussock lands…The landscape will look different, but I think most of the heritage sites will be obliterated too. Part of the joy of going to Macetown is you're in this tussock land, and then all of a sudden you come across this oasis of English trees in the middle of it. Because, like Arrowtown, it was settled by the same sort of people, so there's Lombardy poplars, and oaks, and stuff like that there. But if it's just pine all the way, there's no reason to even go there, really, other than it's a trip up the river in the gloom of the pine forests. I think gold mining history certainly would be obliterated. And then you wouldn't get the vistas if you were in amongst the trees either (*Heritage Manager, pers. comm., June 2015).
>
> *A lot of our tourists, depending on where they come from, they don't actually see the conifers and the exotics as a problem, because they're used to seeing them. It's only when you realise that this is not the way – and they are exotic – that they become a problem. But if we want to have any point of difference, if we don't want to be another*

> *little Canada or something, we've got to* [eradicate them] (Land Manager, pers. comm., June 2015).

The majesty and legibility of the landscape surrounding Lake Wakatipu are key to people's interests in wilding conifers. However, it was recognised that the tourist experience of awe and wonder might not be diminished if wilding conifers spread further:

> *Will it stop people coming here? No. So, they'll still come. It's not going to have such an impact in a negative sense that it would stop our visitors coming. Okay, so purely from a visitor experience perspective, I think it's likely to probably enhance the visual landscape. And again, I do use reference points of places like Canada where they're very much a part of the landscape. And I can't say that I would ever see them as anything other than a very positive part of their mountain landscape. So, that's not got anything to do with the other impacts, which people have a view on and I have no real understanding of, technically. I don't see a downside, in other words, from a visual perspective* (Tourism Manager, pers. comm., June 2015).

For some, the impacts would be an addition to the current decline of the mustering culture. As land use changes from sheep and beef to dairying a loss is being felt for the free-ranging, storytelling teams who roamed the wilderness:

> *It would ruin us. Yeah, you're going to ruin that beautiful farmland, but also it's your landscape for everybody, we see it as farmland. And I think to ruin land that's already pristine without wilding pine, it's not an option. Yeah, it would be totally different, and if they went to try and find some of those water races and old huts and stuff, they'd just be all buried in trees, and you'd never be able to find them would you. It would wreck the whole culture, the farming culture. It would change it. It would change all the properties right around Lake Wakatipu… The whole open feel of the countryside that you've got now, you wouldn't have that* (Land Manager, pers. comm., June 2015).

The climate effects of the wildings were also raised:

> *The trees supposedly draw in the moisture, don't they? They can bring in fronts, don't they? So, from that perspective it could turn into the West Coast* (Land Manager, pers. comm., June 2015).

It was explained how tourist operators already tell stories about the history of land use and land modification. Possum control is easier to explain to tourists than the idea of trees as weeds. But it is part of the history that adds another layer to the story of the land, of extraction and use (e.g. gold mining) as well as of restoration and care. Either way – eradication or rampant incursion – the wilding conifer story will become part of the story told to tourists; a story that needs to be told with care.

> *We'd probably be horrified to hear what international visitors take out of their experience. "You've all ruined it and thanks for explaining that to me."* [chuckles] *"And ripping me off because I should have gone somewhere else. Not to this 100% pure New Zealand lie." (*Tourism Manager, pers. comm., June 2015).

As this cultural values study did not include international visitors in the survey, conclusions are not drawn about what their perceptions of wildings, or the NZ 100% Pure tourism marketing brand, might be.

Wilding conifers will encroach on protected historic heritage sites. Fig. 5 shows this is most likely to occur around Glenorchy, Skippers, and Arrowtown. Vegetation is managed on walking tracks. Incursions may increase track maintenance costs for the Department of Conservation and Queenstown Lakes and District Council. Vistas and overall ease of access will most likely be adversely affected by the spread of wilding conifers in these areas. These sites were all mentioned as sites of significance in the online survey and by key informants.

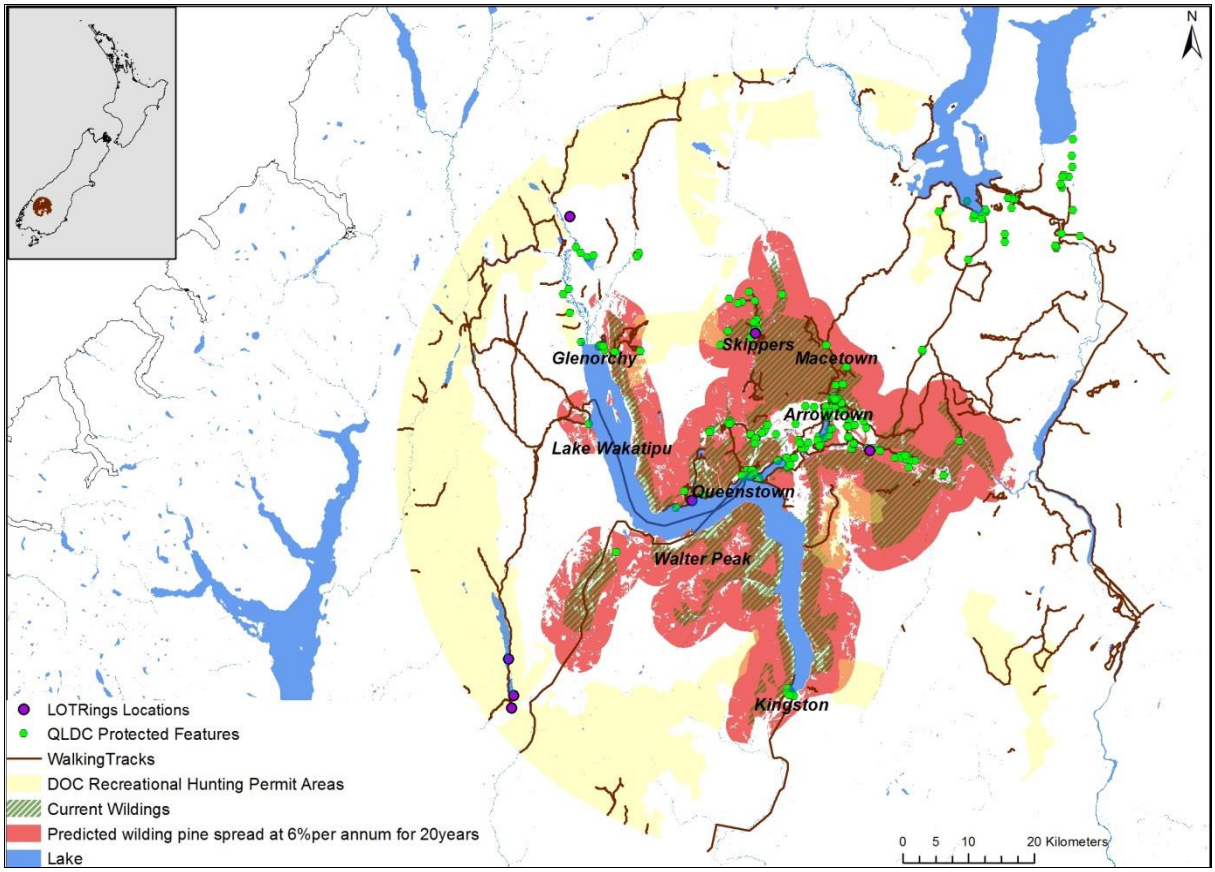

Figure 5 Sites of cultural value around Lake Wakatipu overlaid with wilding conifer incursion.

Of the 55 people who responded to the Queenstown survey, 35 said they knew what the tree was and the majority of these named it as some sort of conifer. When asked about preference between the image with wilding conifers and another with fewer conifers (see Fig. 17) 8 people had no preference, 25 preferred the scene with wilding conifers and 22 preferred the scene with fewer trees. Concern was expressed when respondents were asked if they would mind if conifers were to grow in or near to the sites they had plotted earlier in the survey as being of significance to them (Fig.6). Ten people would be pleased or very pleased to have conifers growing around the places they plotted.

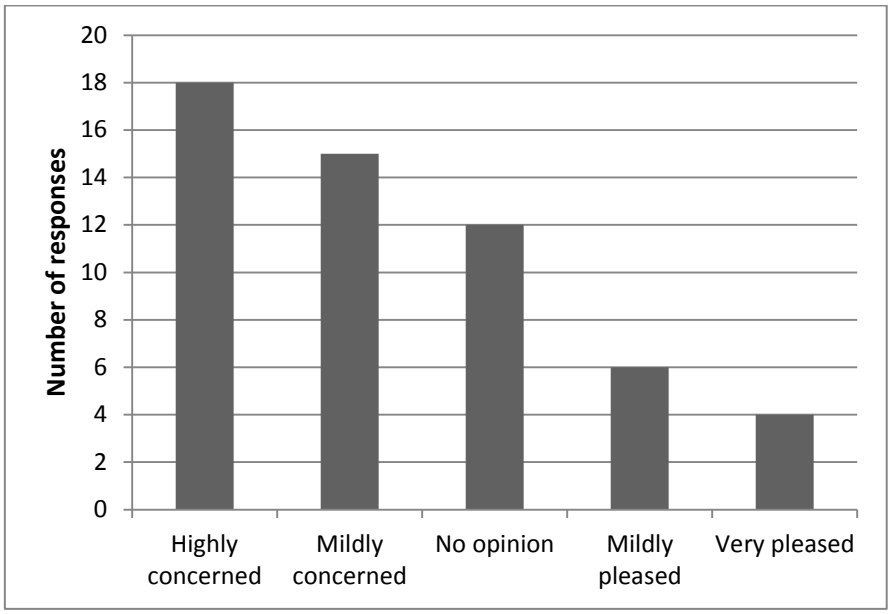

Figure 6 Concern about potential impacts of tree spread on sites of significance around Lake Wakatipu.

When informed that the land area wilding conifers cover is increasing by 5% each year (using the conservative projection) respondents to this question showed an increase in concern; almost 90% of this question's respondents expressed concern (Fig.7).

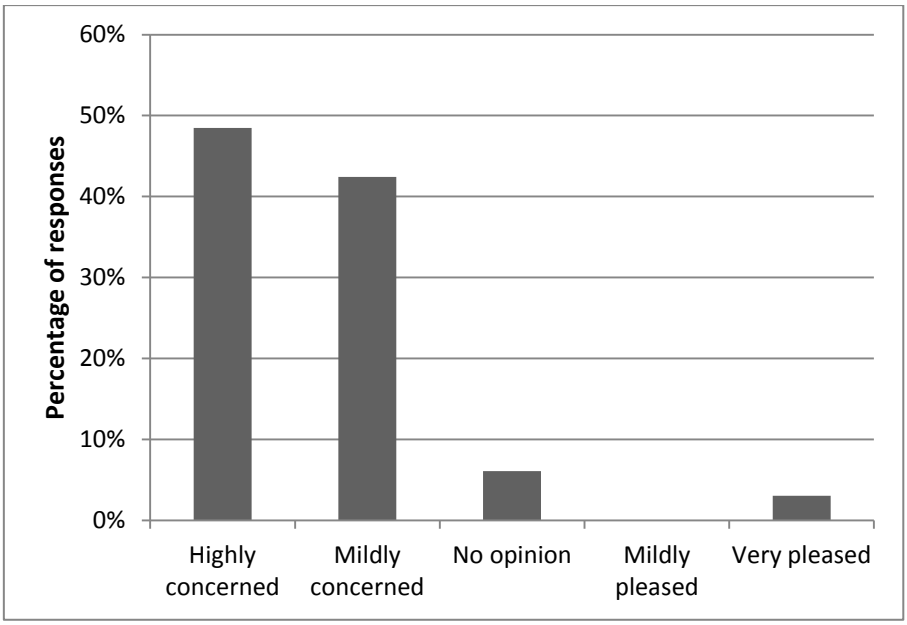

Figure 7 Concern about 5% annual increase in tree cover for the area around Lake Wakatipu.

While there were strong expressions of concern, one person would be very pleased about wilding conifers spreading to the places of significance they identified (Fig. 7). One of the interviewees explained that his low level of concern about the spread of wilding conifers and the impact on tourism was because heritage is not lost when it is no longer visible:

You'd still protect the bits that are still physically there that people can relatively readily access. I mean, the [Chinese] *Village and Skippers are examples of that. There will be some other more remote places that might ultimately become pretty hard to access. But there'd be probably intrepid people who'd think that's probably a good thing, because they'd now have to bush-bash a bit to get there. So look, I'm sure it's a different view from some people, but I don't think you'd lose your heritage and all of the history and learning you'd have from that, by it being covered by trees, you know. Yeah, I have that perspective that history will evolve and change and make places physically different than they were once, and that's okay* (Tourism Manager, pers. comm., June 2015).

4.1.2 Views about the management of wilding conifers around Lake Wakatipu

The investment in wilding conifer control on privately owned land was frequently noted and appreciated by key informants:

There'll be a huge benefit to the nation in that the soil and water have far more value than any amount of wool or meat that you can take off this country. Long term, our benefits will be the soil and water values (Land Manager, pers. comm., June 2015).

There was a high level of awareness among key informants of past and current wilding conifers operations:

I think they've done an amazing job, what they're doing with the wilding pine and, you know, I think they've made such a big indent into it that it would be a shame to see them stop now, because they've spent all that money. You don't want to waste what they've done so far because it will end up looking how it did. So, it's one of things that it's like a beast, really. You've got to keep going (Land Manager, pers. comm., June 2015).

When asked to rank responsibility for the management of wilding conifers (1 being the most responsible and 7 the least responsible) most respondents thought the Department of Conservation and the Regional Council should take responsibility. The landowner and Central Government were also seen to have a role (Fig. 8). Note that a few people ranked the landowner highly, but most respondents did not place such an emphasis on the landowner. It would be worthwhile following up this distinction in perspective. Some interviewees expressed strong concern about properties which acted as a seed source for wildings. In some cases the landowner is also the Regional Council.

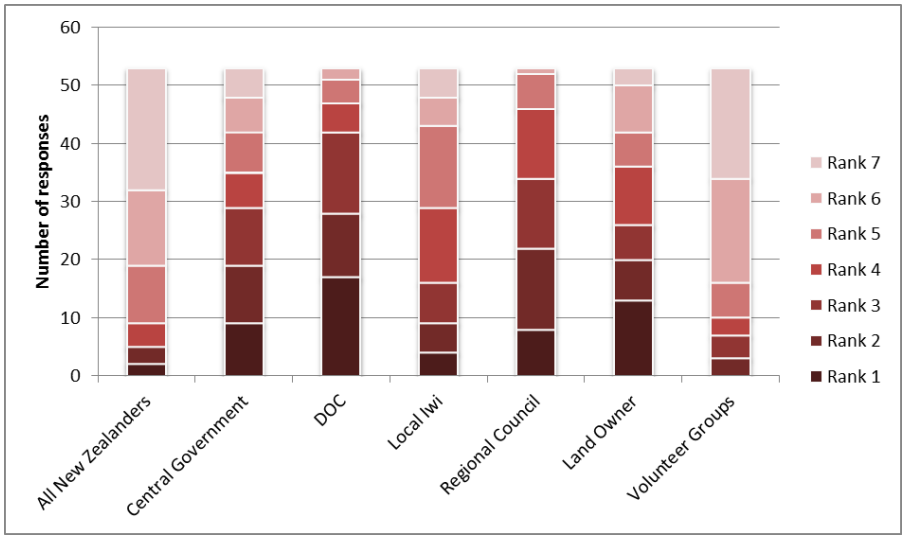

Figure 8 Who should have responsibility for reducing the spread of wilding conifers around Lake Wakatipu? (1 = most responsibility, 7= least responsibility).

Communication was expressed as a key concern to be addressed by agencies managing wilding conifers. One informant thought the name "wilding conifer" was confusing and there was a need to generate more of a sense of threat:

> *So I think rebranding the name of the pine could help, make it sound really nasty. Then people are like, "What? We've got those sort of pines in our backyard?" (*Tourism Manager, pers. comm., June 2015).

Communicating the threat of wilding conifers to tourists and explaining a vista of chopped or dying trees may be an issue. Tourism guides can relate this to their clients, but information will need to be prepared for independent travellers:

> *If you're in a small group, you can kind of explain* [about wilding conifers], *and actually that is part of the story. So, it's a little different for the independent traveller – the self-drive people and the people who are just spending time downtown, and aren't having the benefit of those very specific experiences. You can't explain to them, and they won't understand what's going on if they saw a patch* [of dying conifer] (Tourism Manager, pers. comm., June 2015).

How wildings are controlled was of more concern than the question of whether they should be controlled:

> *If we just mass-sprayed, I'd be very concerned, because that would create negative sentiment, I'm absolutely sure. As you will well know, even in our local community, there's very different views on this, and so there's no way you're going to be able to have a visitor explanation that's satisfactory* (Tourism Manager, pers. comm., June 2015).

> *I think that it's always very dangerous in a community for something like this* [a potential controversy], *particularly in terms of the environment. To have visitors interacting with people that are countering each other and having different views, it becomes –... it degrades the experience. So, it's a little bit like jumping in a taxi and having the taxi driver moan the whole time about traffic on the road and stuff like*

> *that. Especially when your economy is based around visitor business, you want every element of that and every touch point for a visitor to be a positive experience. And so, I guess I'll go back to where I'll say, "Will it stop people coming?" No, but over time, you're going to actually degrade the experience, both visually and in terms of that interaction with the community* (Tourism Manager, pers. comm., June 2015).

This concern was about how the landscape would look after the trees had been killed and the effects of the chemicals used for killing the trees. This concern was also raised by current control operations and will need to be addressed, if a more extensive programme were to be undertaken:

> *Yes, people who drove through there thought, "Oh my goodness. Look, they've killed all those trees. What's going on here?" And then there were all these patient letters and articles in the paper to explain what it was all about. They cleared the ones nearest the road – because they didn't want them falling down on the road, obviously – but as time has gone on and the trees have died, and they're bleaching lighter and lighter, and the undergrowth, the plants and so on are coming up from underneath, it's being transformed, and now it's not an issue at all. The same thing happens wherever you spray. So there was the same problem along Queenstown Hill for a little while, and now they're all bleached grey. At above Fern Hill along the Ben Lomond slope here, they're just trying to spray to keep it getting over the ridge or to stop it getting into the beech forest. There were people in Fern Hill who were worried about spray drift and the effects of it, but these new sprays that stick properly – just wonderful* (Heritage Manager, pers. comm., June 2015).

Informants noted that sites for eradication around Queenstown need prioritising, and that tackling seed sources will be key:

> *Well, we've been working from the outsides in. The main seed sources are in the populated areas. And I mean ultimately they're going to – somebody's going to have to grasp the nettle and say, "They have to get rid of the seed source." And ultimately when that happens, yes, we can control it. But unless they do, we've got no chance… and the same applies to the council stand – they've got to go. You can't ignore it* (Land Manager, pers. comm. June 2015).

4.2 Twizel, Lake Pukaki and surrounds

This study site includes Twizel Township, parts of Aoraki/Mt. Cook, Lakes Tekapo, Pukaki, Ohau, Benmore, Aviemore and Waitaki, and the Fairlie area within the Mackenzie Country. The area provides important cultural values to visitors and residents, for example: recreation, landscape/scenic values, and Māori cultural values.

The Mackenzie Country has more than 150 years heritage of pastoralism, characterised by dry grasslands and large "sheep stations". It features iconic tussock grassland landscapes, lakes and biodiversity, is host to the largest hydroelectricity generation dam in New Zealand, and is one of the country's most visited destinations (Upper Waitaki Shared Vision Forum 2013). The Māori name for the region is Te Manahuna (Gibson 2014). A number of plaques and monuments in the area commemorate the high country heritage (e.g. the collie dog monument and Church of the Good Shepherd, Tekapo; and Mackenzie's statue, Fairlie), along with a plaque commemorating the hydroelectric scheme, and the planting of wilding conifer species around Twizel in 1968. Lake Pukaki, on the eastern side of the study site, has significant value to *tāngata whenua*, as well as landscape values. According to their oral traditions, pre-European Māori visitors to the area sought *mahinga kai*, mainly waterfowl and freshwater eels (Carr 2008). They hunted moa during the summer months, as evidenced by moa bones found in archaeological sites along Lake Pukaki (Environment Canterbury 2009; Gibson 2014). A *nohoanga* (campsite) has been mapped for members of Ngāi Tahu iwi on the eastern shores of Lake Pukaki, which has resulted in controversy with people who would like to have public access to the area (Carr 2008). The *nohoanga* is for exclusive use by the iwi members, particularly for gathering *mahinga kai*. Evidence for *whakapapa* (genealogy), *Te Taiao* (earth, natural world, environment, nature, country), *rangatiratanga* (chieftainship, right to exercise authority), and *mahinga kai* (resource base) has been gathered to support natural resource management in the Waitaki basin (Tipa 2013).

Lake Tekapo and Lake Pukaki provide around 65% of New Zealand's hydroelectricity storage capacity (Department of Conservation 2010). Lake Pukaki's water level was first raised 9 metres in 1952, then 37 metres in 1976, in order to flood the hydroelectric dams, submerging Te Kohai Island ('Five Pound Note Island'),[6] and early homesteads,[7] and considerably altering the landscape (Carr 2006). The homestead plot was submerged at Lake Tekapo in 1951 but the house was relocated (Environment Canterbury 2009). Māori rock art is submerged under Lake Benmore (Gibson 2014).

Aoraki/Mt Cook is important to Ngāi Tahu as the great mountains and valleys of Te Wāhipounamu are the places of *Atua* (gods).[8] Aoraki/Mt Cook is part of the Te Wāhipounamu UNESCO World Heritage Area – South West New Zealand. It is a significant tourism destination for both New Zealanders and overseas visitors, with more than 330 000 visitors recorded at the Aoraki /Mt Cook National Park Visitor centre in 2014. New visitors

[6] http://www.rootsweb.ancestry.com/~nzlscant/pukaki.htm

[7] http://www.ruraldelivery.net.nz/2011/10/wilding-pine-control/

[8] http://www.doc.govt.nz/about-us/international-agreements/world-heritage/te-wahipounamu/

have been brought into the region through recent development of the 'Alps 2 Ocean' bicycle trail,[9] which winds around the lakes in the region. Uniquely, the area is also a destination for stargazing[10]. The Aoraki Mackenzie Dark Sky Reserve at Mount John and Mount Cook is recognised as a 'starlight reserve' (Loveridge et al. 2014).

Twizel is the largest town in the Mackenzie District with a population over 1000 people. Known as the 'town of trees', Twizel was founded in 1968 as a temporary campsite for workers who built the Upper Waitaki Hydroelectric Scheme.[11] This town is said to represent a 'unique achievement in transforming New Zealand's pastoral culture' because of its (current) orientation towards commercial forestry instead of sheep farming, as is the norm in the high country (Tane n/d).

Cultural values for Lake Pukaki and surrounds

The most commonly noted sites of significance for the Lake Pukaki area are presented in Table 4. Respondents were asked to name the site they marked on the online map. Sites with similar names were clustered to create the list of environmental spaces. The reasons respondents gave for choosing these sites are shown in the third column as cultural ecosystem benefits. These have been summarised to create the list of key cultural practices for each environmental space. Similar to responses for the Lake Wakatipu area, appreciation of the vista is a key cultural value, along with weddings and holidays. The magnificence of Aoraki/Mt Cook, the long history of settler movement, trade, and sightseeing through this area mean that the spaces noted are strongly associated with people's sense of New Zealand, with stories of journeys and family heritage.

[9] http://www.alps2ocean.com/about

[10] http://www.mtcooknz.com/

[11] http://www.twizel.info/history.html

Table 4 Sites of cultural value survey respondents associated with Lake Pukaki

Environmental spaces	Cultural practices	Cultural ecosystem benefits: reasons sites were selected
Church of the Good Shepherd The church	Appreciating vista Family trips Shaping sense of New Zealand Wedding	*Beautiful views, beautiful church in a beautiful location.* *A view known through the world as New Zealand.* *This is where I was bridesmaid for my best friend.* *My wife's favourite Church. This was the place where we fell in love.* *Beautiful, old, a piece of history and fantastic to look past the altar onto the lake.* *The church has always had a special place in my heart – the beauties surrounding it, etc., a spiritual soft spot for me.*
Lake Ruataniwha Lagoon Lake Playground Picnic are Swimming area	Rowing Expressing of genealogy – family heritage Boating Swimming Picnicking Holidaying	*This is where I spent many years rowing with my school friends and where I met my husband,* *Daughter is a rower.* *It speaks to me of the endeavours of our fathers to leave an area better than it was before they were there – I was a Dam Dwellers kid and this shows me that we improve the environment.* *Great safe place to go swimming, picnicking, chilling by the lake – any season is beautiful.*
Lake Tekapo Lake Ski field Mt John Springs Park The school	Expressing genealogy – family heritage Making memories Shaping sense of New Zealand Boating and fishing Appreciating vista Holidaying	*It is such a beautiful place, not yet commercialised as other areas in the south. Peaceful and a place to relax enjoy the nature walks and near skiing in winter time. Most of all, peaceful and awesome place.* *Always a beautiful place to stop when travelling.* *This is the first time I ever visited the South Island. To see a girl friend who worked on a high country station with her husband.* *Great lake for a boat and fish with the family.* *Had my first day at school at Tekapo; lived there with my family.* *As it is a gorgeous site to wake up to every morning, directly in front of the lake. It makes me let go of my worries and I get to spend time with family that live there.*
Aoraki/Mt Cook The Mountain National Park DOC campsite Hermitage Hotel Village	Appreciating vista Walking Shaping sense of New Zealand Curating history Heli- skiing Holidaying Making a home Photography Feeding salmon Wedding	*As it is where people adventure too, and a family member helps people out when in trouble on the mountain.* *Very special place, magnificent views, great walks, can really connect to nature.* *Favourite scenic views in the world. Beautiful area. Good walks, information area and Sir Ed Hillary museum.* *Our mountain; It's an important NZ landmark.* *The home of Mt Cook Airlines. As a child in the 70s I used to fly into Mt Cook on route to my family in Queenstown for school holidays. Landings at Mt Cook were always incredible… As a child I'd get invited into the cock pit to witness the amazing scenery.* *This is my home, which my husband and I built together. It is relaxing and set in a peaceful and beautiful location.* *It gives me a sense of pride in being Kiwi, as it is an area I associate with Sir Ed. I enjoy the scenery and going on walks up the Hooker Valley.* *Fun place to feed salmon, great photo opportunity.* *Got married here, and have spent some other good times there.*
Twizel Cycle trail Holiday accommodation Township Canals	Holidaying Making a home Creating a family Driving Visiting friends and family Fishing Biking Fishing Learning new skills Biking	*Have been holidaying there my whole life; We have a bach in Twizel. I love going there as it is truly a place where I can relax and unwind.* *Grew up there – it's still home; Son born here.* *Love staying in Twizel and going out for dinner and good to relax.* *I love the drive from Christchurch to Twizel. It leads me through some stunning countryside. Twizel is surrounded by great walks, all at my friends' doorstep. The community is small and people know each other and do fun activities, just like in the olden days. The weather is dramatic and can be very harsh, but that in itself is beautiful. I love the changing colour of the lakes.* *Twizel is beautiful horse riding country.* *Lived at Twizel after Lake Pukaki was raised with my family one of the first pupils of the school. Also we were some of the first to live at Twizel.* *This is the prime salmon fishing spot on the canals around Twizel. You can literally see the fish jumping out of the water.* *My friend's father really enjoys his time down there as when they were building the canals he was doing his apprenticeship down there.* *Where I caught my first fish!*

The vast vista was the focus of conversation in the interviews about the cultural values around Lake Pukaki. This was expressed in terms of both the lack of infrastructure on the upper slopes, the sense of isolation and the barrenness of the browned terraces:

> *There's a huge amount of talk about the night sky. There are definitely those types of icons that are really special. But the other one that is special to the area, is man-made, it is our hydro scheme that actually goes through the canals. It's a pity you can't actually drive along the canal now that runs from Tekapo to Pukaki. The drive that you used to be able to go through there, and the views and all that sort of stuff, we've got something pretty special… So now you drive from Twizel to Tekapo, from Mohau – you come up over Burkes Pass and have a look at the Southern Alps – you can see most of them… I think that is it – it's big country, when you drive through – there's probably not many places where you can see most of the South Island Mountains, and the divide* (Community Board member, pers. comm., June 2015).

> *I love the harshness. I love the grasses. Just the whole – because it's a desert, and it's just that harshness of that desert is absolutely beautiful. I think some people don't see it...Whereas it's actually got so much beauty within itself. I struggle with the dairy farms* (Fishing Guide, pers. comm., June 2015).

> *There are certain areas around here where tourism hasn't really caught on yet, and I think some of the scenic values of those areas are still paramount. Tekapo is starting to get crowded out with people around the lake, but you're looking up at Lake Ohau, and anything up through the valleys up above Lake Ohau, are just world class, basically, in terms of what you see up there. Even going for a drive up the Haka – up the Ahuriri Valley where there's a dirt track and a couple of farms, and that's it. The intensification of farming in those areas hasn't increased as it has down through the flatter country down here as well. So I think tenure reviews changed how people develop what they're doing there, hasn't it? In terms of the types of farming that's going on and the intensification of it, and the development in those areas, which for 100 years hasn't changed a lot. The fences are sort of falling over. But now, they're all new fences, and deer fencing, and carefully manicured circle crops and so on … The upper stuff isn't necessarily suited to that but it will change in time. But there are still certainly a lot of areas through here that maintain that [sense of] 'it's just me out here and there's no one else around', which is fantastic (*Fishing Guide, pers. comm., June 2015)

The barren landscape was contrasted sharply by a very modified and man-made landscape in the Mackenzie basin itself, largely from the industrial hydro-electric schemes, but also more recently due to dairying and cropping infrastructure, e.g. irrigation races. There is also a strong recognition of the loss in cultural value from these changes to the landscape:

> *They used a huge amount of gravel out of Lake Puaka. That's where they got most of the gravel from to build* [the dam]. *And then the clay lining, they took where those hills were. It was on the Clay Cliffs. You can see there's a line that goes down in the angle of the fault line. So they just dug all that out, then they were left with a hole. A whole lot of springs were there so they ended up being Loch Cameron* [chuckles]. *That's basically what happened. And then they pushed the soil up at the end on the sides. Pretty amazing. I mean, '67 and '83, it's a long time isn't it, building something?...You can see the different building stages. But when we're talking Pukaki,*

probably from a heritage point of view, a lot of things were lost. Because at Pukaki School where I went to school, below the school just up to where the old camp ground was, there was all rock drawings in the rocks there…Again, that photograph of boating down the Waitaki. A couple of years prior to that, I went ...into the huge caverns? That were where Benmore Dam is now. Through the gorge there, there was these amazing caverns with all these rock drawings...where those might have been. They'll be underwater most likely (Land Manager, pers. comm., June 2015).

Informants also expressed a strong sense of a settler heritage, the culture of mustering and a land that has been crossed by people moving from the west to the east coast since the arrival of the first Māori waka:

They found up through here just recently, some sort of remnants of a stone. The same goes for this wee place up here [pointing to map]. *There's remnants of a wee stone building…I was reading one of Mum's diaries – Mum's got a whole lot of stuff. So yeah,* [the diaries show] *they were campsites for surveying* (Land Manager, pers. comm., June 2015).

There is a sense that this place has had things done to it by central government (e.g. the dams and tenure review).

So it was probably a fiord I should think. Now they let it dry, of course. And there were some rock drawings in the original lake (Land Manager, pers. comm., June 2015).

The puddle was out here. And the place has lost 4000 acres of flats entirely with the two lake raisings (Land Manager, pers. comm., June 2015).

That's the valley. It's interesting because I've got a schoolteacher friend and we see things quite differently. He always used to go up there riding. He loves his riding and he's great. He's a good friend of ours. And take his kids, brought them all up there. They used to ride up to Canyon Creek and go beyond. He made the point, last time he came back, he was really sad. I said, "What's wrong with up there?" He said, "… when I used to go up there I used to take the kids. We'd get up there, and we'd drive into the homestead. The dogs were all barking. And there's about four or five horses all there swishing their tails. And there's normally a shepherd's son there roaring around in a four-wheel drive or a four-wheeler or something. And then you'd see somebody." He normally took the papers up or something. And he'd say, "Oh we just wanted to take the kids up Canyon Creek." And they'd say, "Well actually, there's a guy up there shooting. But if you went up the other arm," and that such and such a hut's got a couple of perched sharpshooters in it. "But if you go up the next hut, there's a good spot where you can camp in." So that's basically what used to happen. They'd go right up there. It was an active high country run. He went up there the other day, and of course they've pulled the woolshed down. They've pulled all the fences out. And it's all the grasses lignified and died. As you get up and you go to the next creek, because they were getting people going up there in their four-wheel drives and doing wheelies and things, they've locked it. So you can't even get up there now...so if you're an elderly fisherman who's fished there all your life, you can't (Land Manager, pers. comm., June 2015).

4.2.1 Current and potential incursion of wilding conifers around Lake Pukaki

Similar to the Queenstown, Lake Wakatipu study area, the magnificence of the vista was again a prime cultural value raised in interviews for the Twizel, Lake Pukaki study site.

> *I think in heritage terms you'd lose what the Mackenzie means to New Zealanders who know this special area, which is your strata: your golden tussock; and then your sort of indigo mountains; clouds; blue blue skies* (Land Manager, pers. comm., June 2015).

In the Twizel area some landowners already feel under siege by wilding conifers, and believe they are not able to maintain the lifestyle they value:

> *We would carry on farming here because we're managing our patch, if you know what I mean. So we don't want any trees up. I've actually got a guy full-time just going around* [removing trees]. *I'm employing him to walk around the blocks and it's a constant. It's absolutely constant. And 6%, that's why I asked whether it was 6%. Could be more than that… It's a full-time job for somebody. He's not keeping up with it. One guy on this property isn't keeping up with it at the moment. He's a fit guy and he wanders around and he's doing a really good job but… But it's going to include so much of our visual vistas that, let's face it, it's going to destroy that isn't it, with that many trees around? We've already seen that* (Land Manager, pers. comm., June 2015).

> *With the lake raising, Ministry planted on the bottom side of the new highway, from about six kilometres from the turnoff up the road to Boundary Creek. Because that was all right. They had a nursery at Twizel. So a lot of tree planting going on. So all these trees they planted along the bottom side of the lake came from the nursery at Twizel, and it makes them Contorta and a few other varieties. So it was the late '70s. By 1984, when I took over Dusky on the top side of the highway, that country had been cleared of all trees. The Land Survey Department did that before I took over. Well, it was only eight years after the trees were planted on the bottom side of the highway, I was getting seedlings coming up, and there were these Contorta. From then on, I've been battling with those* (Land Manager, pers. comm., June 2015).

The hard, physical work required to remove wilding conifers was impacting on some informants' capacity to contribute to society in other ways (e.g. as volunteers or tourists). Wilding conifers are being blamed for disputes with neighbours and discord in communities. For example, in the late 1990s a few land owners around Lake Pukaki registered their conifers in order to receive carbon credits. These conifers are potentially seed sources for wilding conifers. These landowners continue to receive revenue from these trees while creating ongoing costs for their neighbours. One way to remove these stands of conifers may well be to pay the cost of control as well as the carbon value of the trees. Informants noted the potential for people to leave their land if they could not control wildings while continuing to draw an income from the land.

Tackling seed sources was also the priority for informants from this site:

> *…if we don't take the seed source out, the impact on conservation's going to be massive. I could take you out around there now. All that hill is just*

> *absolutely…They've taken [the wilding conifers] out, they've done a great job. But it's just a sea of seed coming away again* (Land Manager, pers. comm., June 2015).

Land owners with wildings on their land appear to have their own long-term management strategies for wilding management. Understanding the intentions of each land manager for wildings and coordination of these management strategies will be key to any regional wilding management effort.

The map showing a 6% per annum spread of wilding confers for 20 years was generally thought to be an unrealistic scenario. Most informants thought this level of spread had already occurred in many places within the region, particularly around the lower Lake Pukaki. This could indicate either that the high level of awareness of the problem in this area has generated an over-estimation of the problem, or that more detailed assessments of wilding spread are required for this site.[12] Either way, the knowledge held by land users and community groups is important for the comprehensive monitoring of this site.

Some informants thought wilding conifers would impact on how people experienced the town of Twizel as well as Aoraki/Mt Cook:

> *The people that come here, they have holiday homes to do their recreation, and if those recreation areas are degraded for some reason, then it will have an impact. But also most of the houses here are also lent out to visitors, so it would have an impact on the economy of the town. If people are not staying here because they don't see the value in it – I think the view is there because there's no trees in the way. And there is that cartoon* [Fig. 2] *I think of the Mount Cook road isn't there, about the bus going up, great view or whatever, but there's trees on both sides. They can't see anything. I think that sort of says it, really* (Land Manager, pers. comm., June 2015).

A number of data sets showing sites of natural and historic heritage and recreational values were available for the Lake Pukaki study site these are shown in the index of Fig. 9. This map indicates that walking tracks and heritage trees could be impacted by wilding conifer incursion around Lake Pukaki. Many of the heritage objects and heritage sites are outside the predicted incursion area. However, the incursion area shows significant spread into areas currently not in wildings, particularly in the upper Hakataramea, or "valley of the dancing speargrass". The areas within the valley provide unique viewing corridors towards Mount Cook not seen from the main highway.

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[12] Because of the number of seed sources most land in this area is prone to incursion, and high wind regularly distributes seeds widely.

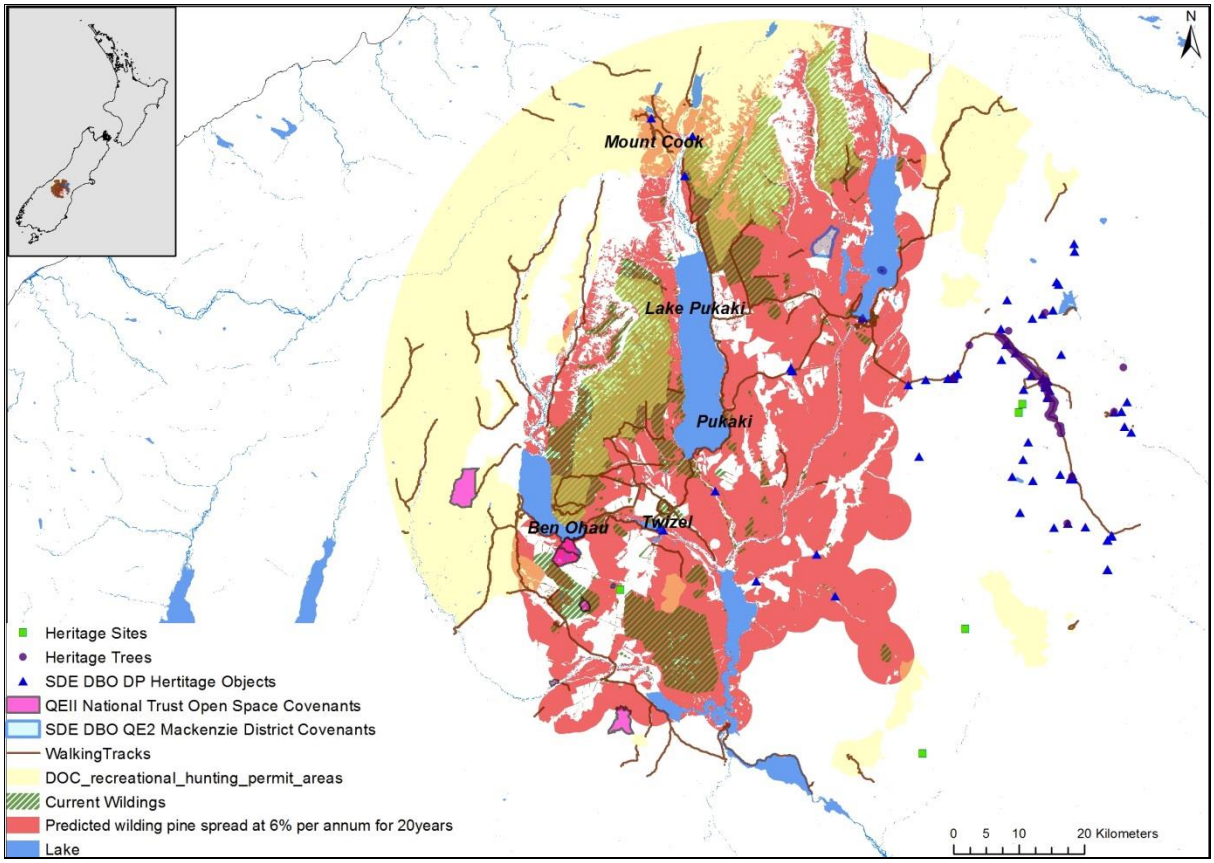

Figure 9 Sites of cultural value around Lake Pukaki overlaid with wilding conifer incursion.

For the Twizel study site, 47 out of the total 66 respondents were familiar with the conifer. Slightly more respondents (*n*=31) showed a preference for the scene with fewer conifers on the landscape (27 people preferred the other scene). Views on the presence of wilding conifers in the sites of significance were also fairly mixed: 33 respondents (50%) expressed concern about potential tree cover spread (Fig. 10). There were a significant number with no opinion (*n*=15) and 18 respondents would be mildly pleased or very pleased if the trees spread at the rate of 5% per annum (Fig. 11).

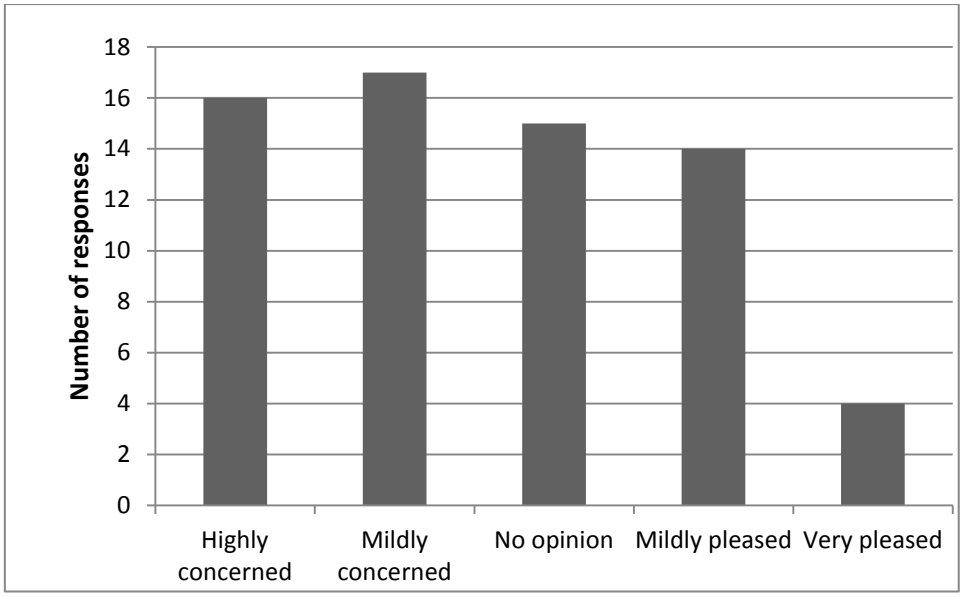

Figure 10 Concern about potential impacts of tree spread on sites of significance around Lake Pukaki.

In response to the prompt about a 5% annual increase in tree cover, a higher level of concern was expressed and there was a marked decrease in the number of people who would be at all pleased by this scenario. Those with no opinion about the presence of conifers seemed to form an opinion with the added information of the rate of spread. However, only 33 people answered this question compared with the 66 who answered the question above.

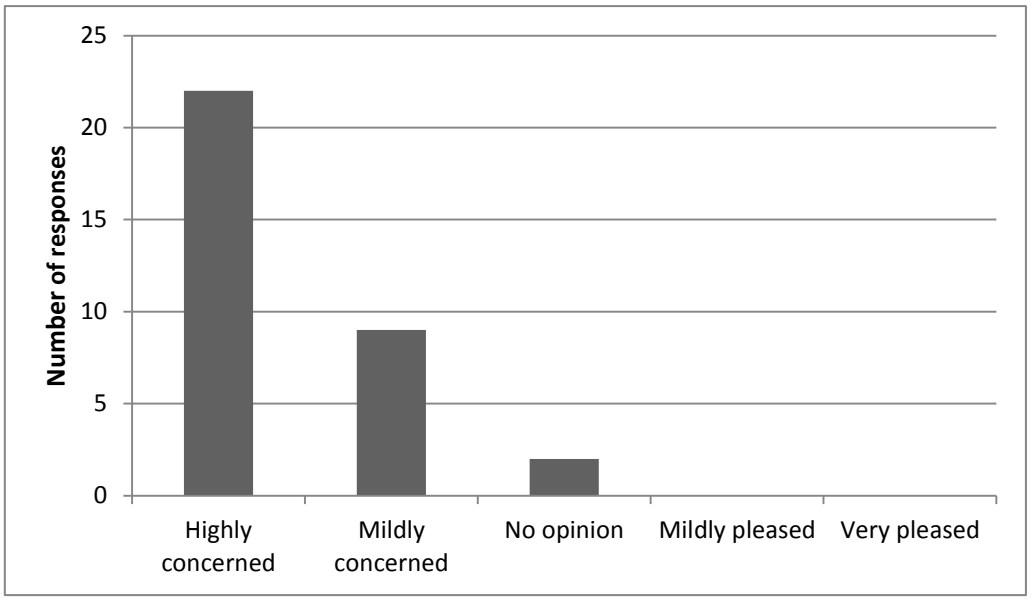

Figure 11 Concern about 5% annual increase in tree cover for the area around Lake Pukaki .

4.2.2 Views about the management of wilding conifers around Lake Pukaki

Consistent with findings for the Lake Wakatipu study site, respondents also suggested that the Department of Conservation and the Regional Council should take responsibility for managing wilding conifers (Fig. 12). Volunteer groups and local iwi were again ranked as least responsible.

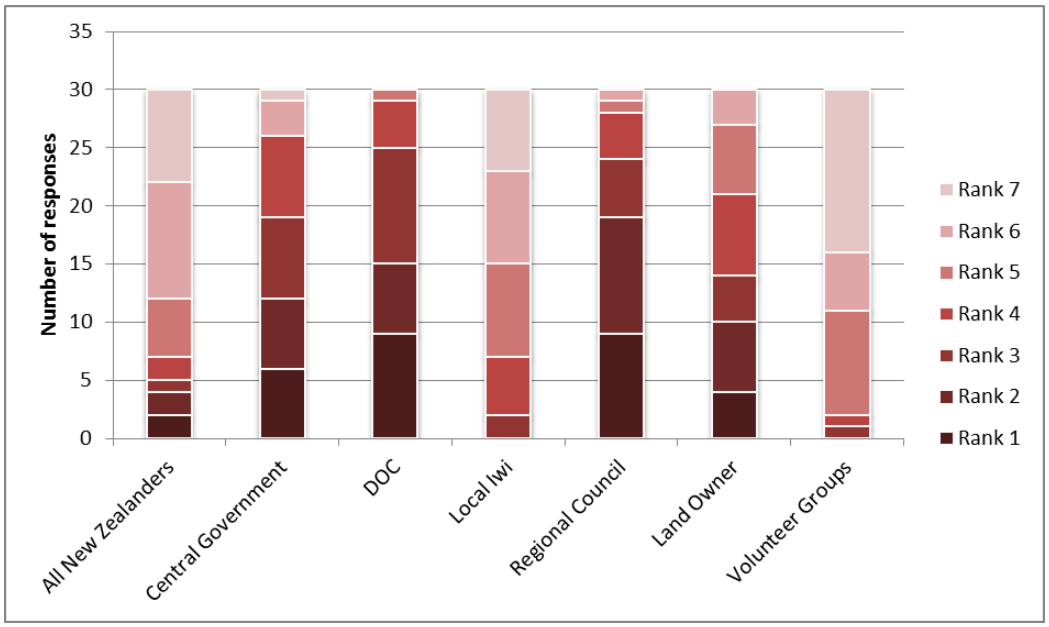

Figure 12 Who should have responsibility for reducing the spread of wilding conifers around Lake Pukaki? (1 = most responsibility, 7 = least responsibility).

Historically, erosion control, shelter plantings, and 'enhancing' the landscape were the main reasons government agencies and residents planted conifers and other trees in the Mackenzie basin and upper Waitaki valley and around the lakes (e.g. Pukaki and Benmore) (Department of Conservation 2012a). These plantings (which occurred from the 1950s to 1980s) were the origin of the wilding conifer spread around the Pukaki/Twizel area, invading grasslands, shrublands, riverbeds, wetlands, and alpine communities (Froude 2011). The species planted around Lake Tekapo were lodgepole (*Pinus contorta*), Corsican pine (*P. nigra*), Ponderosa (*P. ponderosa*), and European Larch (*Larix decidua*) (Environment Canterbury 2009).

The Canterbury Regional Pest Management Strategy (Maw 2011) dedicates a specific section to wilding conifers. The responsibility of control on public conservation land falls to Department of Conservation, and other areas in the Mackenzie basin area managed by Environment Canterbury (ECan) and Land Information New Zealand (LINZ) (Department of Conservation 2012b). Crown agencies are not bound to the rules in the existing Regional Pest Management Strategy (2011-2015) and are constrained by funding[13]. The Ohau Conservation Trust is working to keep the Lake Ohau landscape in its natural state:

[13] However, the crown will be bound to any "good neighbour" rules when strategies are reviewed.

> *You're trying to keep the landscape and things, and the water, right for people to be able to use, but if the people are not productive, or can't make a living, and stay in these areas, then what happens is that people would move from the area and then no one is left to look after it. Because there's no doubt that the – the Department of Conservation might have a different view, but there's no doubt with the land that the best way to preserve the land is have farmers look after it. I think that's your thing with wildings, if you remove the farmer out of the picture, and said, "We'll leave the land to regenerate," it won't regenerate, it'll grow wildings, gorse, and rabbits and what have you* (Land Manager, pers. comm., June 2015).

A comprehensive wilding conifer control project was suggested as the most cost-effective way of dealing with wilding conifers in this area (Stephens 2004). One key informant emphasised the importance of linking initiatives and finding a way to create a balance between productive land use and conservation:

> *The other big one we're dealing with is SNA, which is Significant Natural Areas under the Resource Management Act. There are difficulties with that at the moment in relation to how that's interpreted, how the biodiversity part of that is interpreted, and how that would apply to the farmers. So, there is a daily battle going on between trying to get that balance between productive farming and leaving the landscape as it is. And we've obviously seen that between Twizel – it's out of our area – but between Twizel and Omarama, where you've got dairy farms and over-sowing now, so it's that greening of the basin and that's sort of a battle at the moment* (Land Manager, pers. comm., June 2015).

Another informant thought concerns that dairy farms were unnaturally greening the McKenzie were laughable:

> *They want a dryland national park up here. But they don't see the wood for the trees – have to excuse my pun – because they don't want the greening of the Mackenzie. They don't want* [dairy] *intensification of the Mackenzie. But they're going to have green anyway; they're going to have dark green* (Land Manager, pers. comm., June 2015).

The key informants noted that in the last 10 years wilding conifers have become associated with the landscape of the world famous 'Lord of the Rings' trilogy: "As we fly over the land close to Lake Pukaki, the wheaten-coloured landscape studded with wilding pines is instantly recognisable".[14] Some of the land shown in the films did not have wildings at the time of filming, but wilding conifers are now visibly present. The later Hobbit films used the presence of new wilding conifers as scenery, and advertised scenes from the films depicting dwarves walking among the dotted wildings landscape.[15] One landowner interviewed is surrounded by wilding conifers, and managing spread is an integral part of his business

[14] http://www.dailymail.co.uk/travel/article-2305447/The-Hobbit-tour-Follow-hairy-footsteps-awe-inspiring-journey-New-Zealand.html#ixzz3cnKqNnuw

[15] http://www.imdb.com/media/rm2000727808/tt0903624?ref_=ttmi_mi_all_sf_36

strategy. Recently the area has also been sought after as a filming location for Northern Hemisphere productions such as 'Slow West' a film directed by John Maclean.[16]

[16]http://www.imdb.com/title/tt3205376/

4.3 Mount Tarawera, Lake Tarawera, and surrounds

The Tarawera site is a culturally rich area and is a past and present tourist attraction. The Te Arawa iwi have received cultural redress[17] over 14 lakes including Lakes Tarawera, Rotoehu, Rotomahana, and Okareka (Office of Treaty Settlements 2004), all of which are located within the case study area. A key site is the birthplace of Tuhourangi, the ancestor of the Te Arawa people, son of Rangitihi-Whakahirahira, and father of 'Nga Pumanawa e Waru o Te Arawa'. This place is *uruuru whenua* or a place of offerings (Bay of Plenty Regional Council 2015). The Tarawera River is recognised as an integral part of the overall life force that sustained the people of Tuhourangi, providing social, spiritual, and physical lifestyle. The Tarawera River also served as a passage for the people to access a number of *wāhi tapu*[18] sites along the river and as the main route between coastal areas and Tarawera/Taupo.

Mount Tarawera is located on the east side of Lake Tarawera. On 10 June 1886, the lives of those living in its vicinity were transformed when Mount Tarawera erupted, killing more than 150 people and burying the village of Te Wairoa in metres of ash. Before the eruption, the area was popular with tourists visiting the Pink and White Terraces,[19] which were known as one of the natural wonders of the world (Ryan et al. 2006). These terraces were submerged in the eruption.[20] The buried village has been a tourist attraction since 1931 (Ryan et al. 2006) and is currently publicised as New Zealand's most visited archaeological site.[21] The event has been incorporated into the lineage of tribes and individuals and is one link between modern Māori and their ancestors (Cashman et al. 2008). Mount Tarawera is a *maunga tapu* (sacred mountain) for the Ngāti Rangitihi sub-tribe of Te Arawa (Department of Conservation 2012a). The mountain has *urupā* sites (burial ground) on its slopes (Olsen 2015). The Te Arawa ancestral connections to Mount Tarawera, Mount Whakāri, and Mount Putauaki are explained through Māori legends (Peters n/d.; Te Ao Hou – The New World 1955).

The Lake Tarawera Scenic Reserve[22] area is used for tourism and recreation activities, in particular walking and tramping, fishing and boating.[23] Hunting is permitted in the Tarawera Forest, but is restricted to the trustees of the Whānau Trust and their immediate whānau who are members of the Nga Kaitiaki O Pokohu Hunting Club (Māori Investments 2015). Part of

[17] Recognition of the traditional, historical, cultural and spiritual association of the Affiliate Iwi/Hapu with places and sites owned by the Crown within their area of interest

[18] Sacred place, sacred shrines
http://www.maoridictionary.co.nz/search?idiom=&phrase=&proverb=&loan=&keywords=tapu

[19] http://www.nzhistory.net.nz/eruption-of-mt-tarawera

[20] http://www.teara.govt.nz/en/1966/disasters-and-mishaps-eruptions

[21] http://www.buriedvillage.co.nz/

[22] http://www.doc.govt.nz/parks-and-recreation/places-to-go/bay-of-plenty/places/lake-tarawera-scenic-reserve/

[23] http://www.tourism.net.nz/region/rotorua/rotorua---lake-tarawera/attractions-and-activities

the Lake Tarawera Scenic Reserve is *whenua rāhui*,[24] as recognised in the Te Arawa Lakes Settlement (Office of Treaty Settlements 2004).

Māori values of *mauri* and respect for the land (Bathurst et al. 2011) are arguably in conflict with economic opportunities provided by the Tasman pulp and paper mill, one of the largest employers in the Eastern Bay of Plenty (Bloxam Burnett & Oliver Ltd 2012). Built in 1955, in the town of Kawerau, below Putauaki (Mt Edgecumbe),[25] the mill was granted 25-year resource consent to discharge effluent into the Tarawera River in 2009.[26] Opinions within Ngāti Rangitihi were divided: while a group signed a memorandum of understanding in 2010 with the owners of the paper mill to clean up the river,[27] members of Te Rangatiratanga o Ngāti Rangitihi appealed the consent. Māori cultural values such as *mauri*, *kaitiakitanga*, *mahinga kai* (food gathering), and the *wairua* (spirit) of the rivers were mentioned in the appeal (Environment Court of New Zealand 2010). In 2010, the consent took effect, but it was noted by the Environment Court that the discharges did not comply with the Act because of the significant changes to the colour and clarity of the river.[28] The Tarawera falls and river outlet were frequently identified by survey respondents and key informants as sites of cultural value.

[24] reserve, reserve land – land set aside for a special purpose
http://www.maoridictionary.co.nz/search?idiom=&phrase=&proverb=&loan=&keywords=whenua+rahui&search=

[25] http://teaohou.natlib.govt.nz/journals/teaohou/issue/Mao10TeA/full.html

[26] http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10603488

[27] http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10629900

[28] http://www.parliament.nz/resource/mi-nz/50SCLGE_ADV_00DBHOH_BILL11527_1_A318852/9e99534f2749ea7e185eaaafcb1b4c53c2cdc1ab

4.3.1 Cultural values for Mount Tarawera, Lake Tarawera and surrounds

The sites of cultural value identified in the online survey for Lake Tarawera and surrounding area (Table 5) show appreciation for the natural and historic heritage of this area as well as strong spiritual and recreational values.

Table 5 Sites of cultural value survey respondents associated with Lake Tarawera

Environmental spaces	Cultural practices	Cultural ecosystem benefits: reasons given for selecting the site
Buried village of Te Wairoa Historic Village	Heritage	*Family history.* *Historic, educational, picturesque and serene.* *This whole area around the lake is of great significance to many Māori.* *Buried village. A site of national significance.* *Full of history about the eruption, beautiful walk, a must see!* *Fabulous site of heritage value to all New Zealanders. Great place for educating our upcoming generations on NZ history.*
Department of conservation camp grounds Campground	Camping	*Camped…this was awesome. Stars were out in force and we later discovered that this area was a "dark sky zone".* *Provides opportunity for recreation and tourism.* *A cheap and cool getaway...tradition for family.* *Summer holidays with friends as I have gotten older. Tranquillity.* *Was magical.* *It's our family's place to admire our heritage and beauty of New Zealand's natural outdoors.*
Hot water beach Lake beach	Swimming Picnicking Camping	*Awesome times spent soaking on lake edge in lovely warm water.* *Hot springs, nice bush walks, where my wife camped as a kid.* *Very popular with friends who want to camp, and get away from it all. Be with Nature.* *Site of hot sand where you can cook trout and where the natural hot pools are to soak in.* *A special place where the whanau go to picnic – to have fun and to enjoy – to 'live' and create their own history in the place where their tipuna also had 'lives' and had fun and enjoyed life for so many generations.*
Lakes Rerewhakāitu, Rotomahana, Tarawera, Okataina Lakes Lake edges	Fishing Water skiing Wedding Camping Waka ama Respite Wakeboarding Swimming	*Cultural history, unspoiled, untouched. Spiritual significance.* *We live here and love our lake and work hard to keep it clean. The lake is the reason we bought a home here. It is part of me. Keep it clean.* *Site of the Pink & White terraces lost in the 1886 eruption of Mt Tarawera.* *This waterway is the lifeblood of the area, sick of seeing people destroying it.* *Grew up spending family holidays water-skiing here, renting houses all over the lake and enjoying exploring the different parts of the lake.* *It is an awesome area that needs to be protected.* *Competed in my 3rd Rotohoe with Te Arawa Paddlers.* *Caught my first trout here.* *Took a sick relative for the day there, to relive past memories was just so moving, loved that.*
Mt Tarawera Mountain Crater Bottom of crater Summit	Heritage Appreciating vista Tūrangawaewae	*History of the Mountain and hidden pink terraces.* *Important to local iwi and hapu, also important in terms of historical significance and scientific significance.* *Spectacular, beautiful…also one of the first places I came into contact with Māori culture.* *It overlooks Rotorua city, I can see it from my back door.* *Important land mark to the area. Has great cultural significance, and one epic view!! Plus it's a volcano!!* *A site of national significance –- it shaped our country, a place that attracted early tourists.* *It is the maunga of my people of Ngāti Rangitihi.*
Waimangu Geothermal area	Hunting Walking Swimming	*Important for its thermal activity. Very interesting geologically.* *A fantastic place to see fauna and landscape.* *Lots of hot water swimming spots. Awesome place to relax.*

Assertions were made in some of the interviews that specific sites of cultural value could not, or even should not, be discussed in isolation from the whole area. This sentiment came through in the Tarawera survey, with the whole area being named 3 times as a site of significance:

> *"I am the river and the river is me". They* [people of the Whanganui River] *have grown up with that flowing through their veins. There's that deep sense of I am the river and the river is me, and vice versa. It flows from the mountain to the sea and the sea back to the mountain, there's that whole connection …That's what we say about the mountain. We are the mountain, and the mountain is us. That sense of belonging is deep rooted, it's in your DNA. It has to be, it's there. And it gets reinforced, reinforced by catching a fish, by chasing a pig, by seeing a deer. I can't explain it really* (Land Manager, pers. comm., June 2015).
>
> *This place holds all of our stories, our history, our knowledge* (Land Manager, pers. comm., June 2015).
>
> *I've always said it was paradise. We've got the best of everything, we've got the bush, we've got the lakes, and we're an hour from the sea. I think that's pretty hard to beat. And we're central, in terms of Auckland, dare I say. Even Wellington, pretty handy to Wellington, so I think we're quite fortunate. Although this has changed from when I grew up, this was all nursery through here, and although it was a dusty road, we'd pick blackberries along. And the hunting and fishing was phenomenal. It'll never be like that again* (Land Manager, pers. comm., June 2015).
>
> *What I found fascinating yesterday was after having lunch with my son, we went down and did a few things in the boatshed and then we went for a walk along the bay and he said, "Oh mum, I just love being here." He said, "I wish I didn't have to go back tonight." But he said, "The fact that the cell phone doesn't work, and I can ignore the phone and dah, dah, dah, dah, dah." But he said, "This place does something to your soul." He said, "I had a huge amount of stress over this meeting." And he said, "I've got up here. Now I can almost feel it going whoosh." I think there is a huge amount of that here* (Tarawera resident, pers. comm., June 2015).
>
> *This is the mountain over here. Well, you see, I'm here, and that's Kariri Point. That's another very special place for me because that's where the first missionaries were and they've got the little mausoleum up there for them. It's just such a lovely place to be. There's no houses, no buildings. There's a few little boatsheds along here and you can walk all through the bush and it's absolutely gorgeous* (Tarawera resident, pers. comm., June 2015).

4.3.2 Current and potential incursion of wilding conifers around Lake Tarawera

Planting of exotic trees on the Volcanic Plateau of the Bay of Plenty started in the Rotorua area. Pine trees began to be planted in the 1920s and 1930s in anticipation of the supply of native logs. This dwindled in the coming decades. Commercial plantations have been one of the major seed sources for the spread of wilding conifers around Mt Tarawera (Ledgard 2006).

It was clearly articulated to the research team that addressing wilding conifer incursion is considered a necessary part of ensuring future generations are provided for. Informants from around Tarawera maintained a connection between the health and well-being of people to their surroundings: if the mountain and river are not in a good state, this reflects the state of the people. The risk of not looking at the wilding issue holistically is that cultural values may be overlooked when decisions are made that only focus on tangible evidence expressed in monetary (e.g. cost-benefit analysis) or biophysical terms (e g. water-quality measurements):

> *As residents at Tarawera, we get very distressed when you see an algal bloom like we had in January and we were on the other side of the lake and my grand-daughter said to me, "Oh, granny, what's wrong with the lake? It's gone brown." And it was. Those things I find really quite distressing.* (Resident, pers. comm., June 2015).

> *I know that there's a really deep spiritual connection that certain people feel to the mountain, so it's more than, "Oh, it's so pretty. I go up there and have a picnic." It's* [that] *people's ancestors were buried there. People fought over it. People died over it. People look to it and go, "That's our mountain. That's our river." It's all connected. It's kind of like if you have a mountain and a river that's flourishing, it means that people will flourish. There's a connection between the health and well-being and the people to their surroundings. So, if they're not in a good state, it's* [a] *reflection of how the people are. You know what I mean?* (Land investor, pers. comm., June 2015).

There is great potential for the incursion of wilding conifers to impact on the cultural values of the Lake Tarawera study site (Fig. 13).

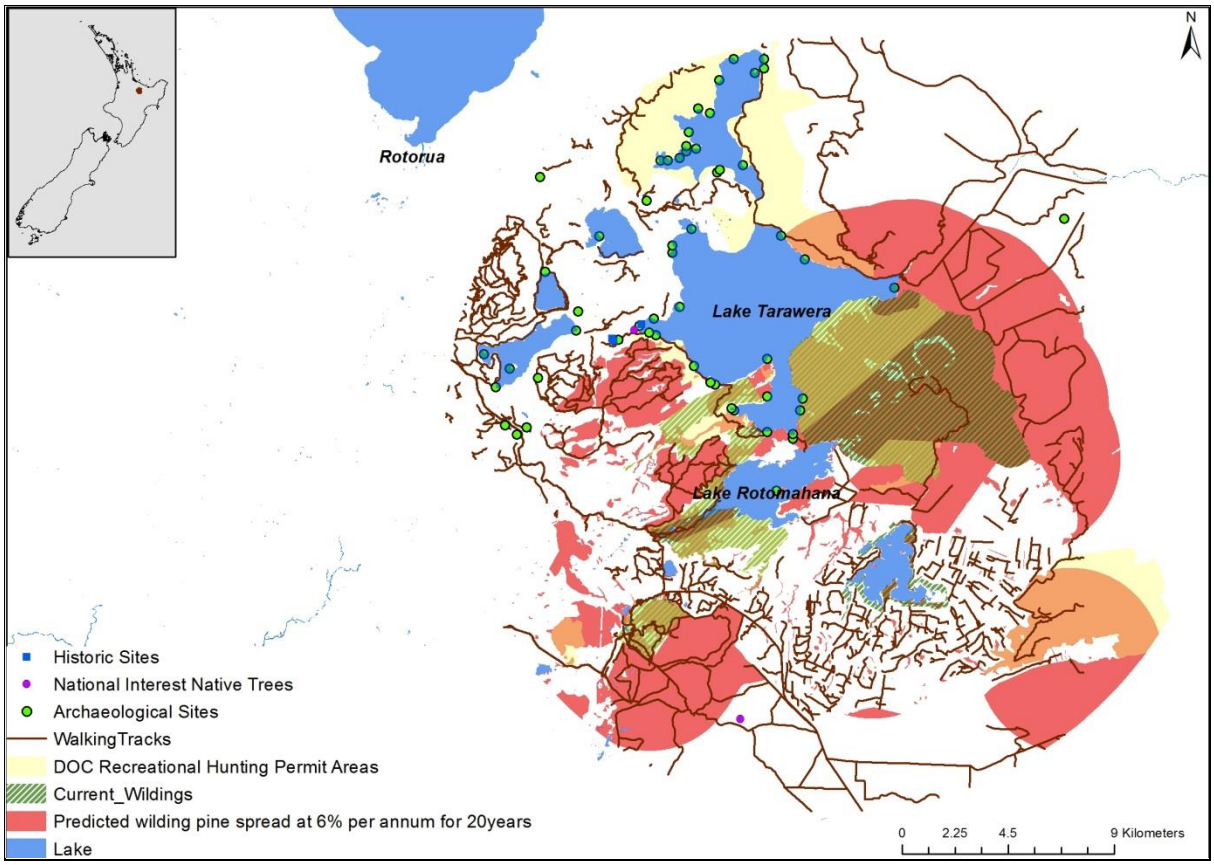

Figure 13 Sites of cultural value around Lake Tarawera overlaid with wilding conifer incursion.

Opinions about the impacts of conifers on sites of significance around Lake Tarawera were however quite mixed (Fig. 14). Almost as many people had no opinion (n=30 or 28%) as were highly concerned (n=31) about the presence of conifers in their sites of significance; 19 respondents would be mildly pleased or very pleased should the conifers spread to their sites of significance.

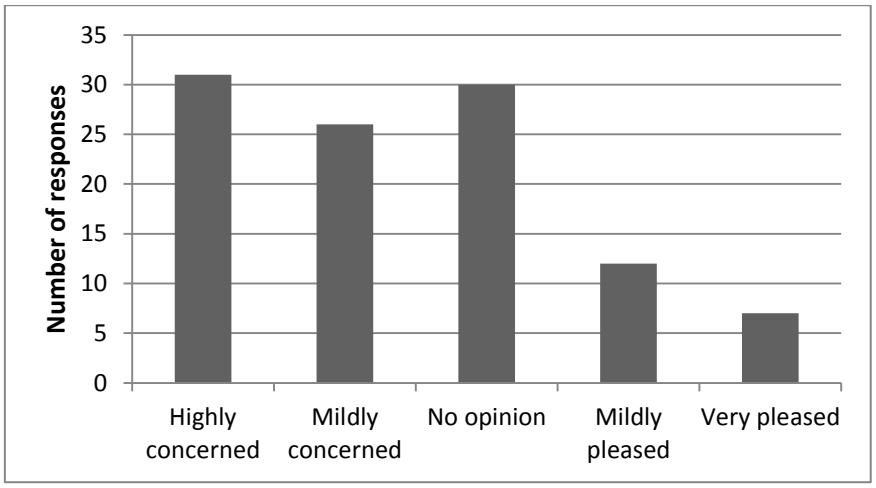

Figure 14 Concern about potential impacts of tree spread on sites of significance around Lake Tarawera.

The interviewees were all concerned about the future impacts of wilding conifers. However, in marked contrast to the interview responses, half (n=53) out of a total of 106 survey respondents showed a preference for the scene with more conifers, 14 showed no opinion, and 39 people preferred the scene with fewer conifers. When asked about the potential expansion of tree cover by 5% for 20 years (Fig. 15), the majority of respondents (*n*=56) were concerned but 2 responded 'very pleased'.

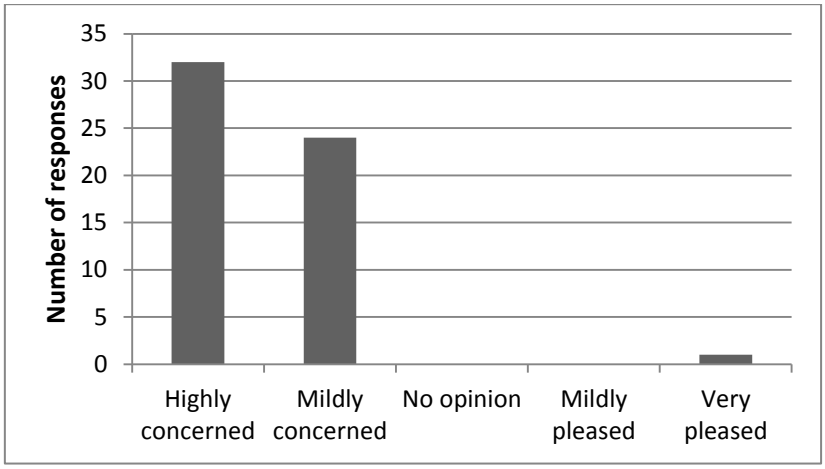

Figure 15 Concern about 5% annual increase in tree cover for area around Lake Tarawera.

4.3.3 Views about the management of wilding conifers around Lake Tarawera

Twenty percent of respondents ranked Landowners as the most or the second most responsible for management of wilding conifers (Fig. 16). This response, which contrasts with the other study sites, may be because Mt Tarawera is owned by Ngāti Rangitihi. However, local iwi were not ranked as high as the Department of Conservation, regional councils or central government, so the significance is unclear.

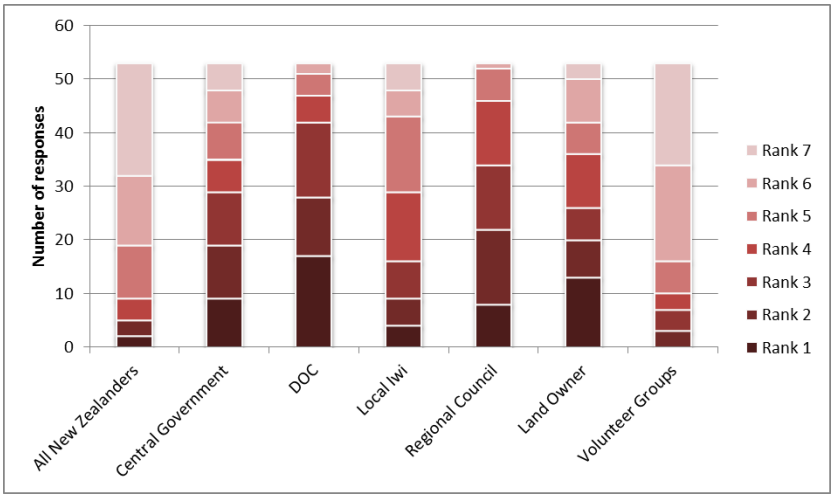

Figure 16 Who should have responsibility for reducing spread of wilding conifers around Lake Tarawera? (1 = most responsibility, 7= least responsibility).

Wilding conifers (lodgepole pine (*Pinus contorta*), radiata pine (*P. radiata*), and Douglas fir (*Pseudotsuga menziesii*) have been actively managed on part of the Tarawera Mountain since 2009, through the Ruawahia Wilding Conifer Control Programme. This programme is a partnership between the Ruawahia 2B Trust that administers Mt Tarawera on behalf of Ngāti Rangitihi, the Department of Conservation, and the Bay of Plenty Regional Council.

> *I don't know what it is, but what I find intriguing is that people look at the mountain and they can see what's being done* [removing wilding conifers], *and they say, "But it's not moving fast enough." When you've only got a few people up there four days a week, and it's horrendously difficult – it's hard, hard work. I think the ones that are so critical, they should actually be sent up there to have a look and then they might be a little more sympathetic* (Tarawera resident, pers. comm., June 2015).

The project has also received financial support from the Biodiversity Condition Fund (Department of Conservation 2013) and funding is matched by landowners and other organisations.[29] The aim of the removal programme is to "protect the high ecological, landscape and cultural values on the mountain" (Department of Conservation 2013). Among the cultural values addressed by the wilding removal is the wellness and mana of iwi through the better health and wellness of the Mountain (Department of Conservation 2012a). "Because we're the *maunga kaitiaki* (mountain guardians) we have a *whakaaro* (thought) – healthy mountain, healthy people" (New Zealand Herald, 7 April 2014):[30]

> *It's an interesting scenario, because it's a place where you just can't rock up to. And yet, you've got all these groups of people who are keen to go up and help, knowing full well that it's not a public place, so what's driving them? They are looking out and thinking, "This is obviously a unique ecosystem and biodiversity, we need to keep it like that". I guess stuff like this, we watch history and nature channels and stuff, and you see the same sorts of things all around the world where something's been introduced and it's now changed the whole landscape. We are only a young country* (Land Manager, pers. comm., June 2015).

[29] http://www.nzherald.co.nz/rotorua-daily-post/news/article.cfm?c_id=1503438&objectid=11075617 Retrieved 14/9/15

[30] http://www.nzherald.co.nz/rotorua-daily-post/news/news/article.cfm?c_id=1503437&objectid=11233695 Retrieved 14/9/15

5 Synthesis: non-market impacts of wilding conifers on cultural values

Changing the aesthetic of the landscape or the vista was the primary impact reported by survey respondents and interviewees with regard to wilding conifer spread on all the study sites. This research shows wilding conifers will reduce the sense of uniqueness of the landscapes (even if they are already modified). People frequently stated that these views and experiences are found nowhere else in the world. However, some of the landscapes are barren and for some respondents there is an appeal in the lush, forested alpine vista (and deciduous autumnal colour scapes) that wilding pine incursion could provide.

It was also noted that the new cycling tracks are being built in the Lake Pukaki and Lake Wakatipu study areas; both the 'Alps to Ocean' and the 'Around the Mountains' cycle tracks, may alter the main viewing corridors of key sites away from those typically seen from the highway. This could mean that iconic views seen today as significant might change; where people look and what they value on the landscape might also change. Support for the spread of wilding conifer was articulated through the online survey. However, as the previous discussion of study areas in section 4 has shown, there is a high level of concern about the incursion amongst people directly affected by wilding conifers.

Common themes emerged from the online survey about perceived potential impacts of wilding conifers on sites of cultural value: conifers were seen as exotic rather than native species (if trees are to spread, respondents would prefer these to be native trees), and their negative impact on vista and the reduced accessibility to areas of personal attachment were also seen as important. There were different responses, however, to the impact of wilding conifers on the sites of significance depending on which case study site the respondents spoke of. A range of quotes from the survey are presented here to show some of the viewpoints with which wilding conifer management needs to engage. Ideas for how to engage are discussed in the following sections.

For the Lake Wakatipu study site, respondents saw some positive impacts of wildings on the beauty of the area: the ecosystem services the trees provide; and the environmental benefits from tree cover. However, wildings were also seen to reduce the significance of the area as they were inappropriate for the area; they competed with native vegetation; restricted access to sites of significance; reduced wildlife, particularly birdlife; and reduced the heritage value of the sites of significance. The impact of wildings on recreation and the vista were seen to hold both positive and negative impacts:

> *Better to have a living forest than a dead one that is a fire hazard, unsightly and rules out any recreation in the area for 100years plus due to fall danger*
>
> *Loss of natural appearance. Poor habitat for native and game animals. Cost of control. Limit access*
>
> *They are part of what has shaped mountain biking in Queenstown. Queenstown Hill/Skyline and 7 Mile. But they are also killing the view and native plant species can't compete. NZ Natives should take precedence.*
>
> *A good deal of the significance of the area is the relationship to early settlers and adventurers. The autumn splendour of L. Hayes and Arrowtown is because of*

European trees, not natives. Grapes and apricots are significant crops in the area - not native. Lupins along the coast of Wakatipu – not native.

These trees already exist in the areas that I have outlined. At present we are able to coexist with these invasive species but I believe the current strategy to manage the spread of these trees is a good one and will help in not reducing the significance of the places described.

It would enhance these areas. This area is a place of such beauty. People come from all over the world for the beauty of this area, and the attractions come second to that. You will find that most of people's holiday photos show scenery. This truly is one of the most beautiful parts of New Zealand, and a very natural looking landscape. To grow more trees, would never be a nuisance but will enhance the lake and mountainside beauty.

For the Lake Pukaki site, the trees were seen to enhance the sites of significance by adding colour; reducing erosion; and providing environmental benefits. Impacts from the presence of wilding conifer presence that reduced the significance of the areas included the potential to block views of the mountain; removing the ruggedness and barrenness of the landscape; and taking over the landscape and completely altering it.

These are not natives and hence interfere with the natural beauty of the South Island.

It would increase the aesthetic view of most places I have nominated.

McKenzie country to me is a land of barren and beauty in the mountains and the lake. I would prefer the trees not to be there. It would probably reduce the significance as the terrain would have changed.

To me, pine trees are part of the essence of the Mackenzie District. It wouldn't be Twizel without pine trees!

It would completely alter the landscape and existing vegetation. It would take away the view, it would change the soils and make everything even drier than it already is. The pines would smother everything else that grows there.

For the Lake Tarawera site, there was less awareness of what the trees were, with some respondents thinking they were native, or that they had been commercially planted. This influenced the perceptions of potential impacts:

Depends if they are growing to make income for an iwi or just spread by seed

If we're going to plant trees in this region let's plant natives

I don't know if these are native trees or not – if they are native – then no – If they are introduced 'pests' then yes

It would be disrespectful of the significance of these places. It should be New Zealand natives only.

It depends what these trees are? If they are not providing any good to the area then why plant them? If they are harmful to people, animals, birds, insects and other flora and fauna then NO they shouldn't be planted, but if they are safe and are to provide positivity to the environment then I would be OK with it I guess

Positive impacts seen from wilding conifer presence at the sites of significance included iwi revenue from timber; limiting erosion on the mountain; increasing hunting zones; the new forest as an 'exciting' place to be; and the aesthetic contrast to the native forest vista. Survey respondents also believed that ecosystem benefits were derived from the presence of these trees. Conversely people mentioned a number of impacts from wilding conifers that would reduce their chosen site's significance, including reducing the significance and *mana* of the mountain (disrespectful); reducing scenic value; changing the climate of Tarawera; and limiting access to sites due to increased logging activities. There were differing views on the impact as a result of the change to the natural landscape of Tarawera. There appeared more acceptance for the presence of these trees, given the nearby forestry infrastructure and the opportunities such environments provide for hunting and recreation.

Wilding pines and Douglas fir are a gift and a curse. It is great to have more forest (running and riding is generally better in forest) and it can make for great orienteering maps. So in that regard I do prefer them to bare land. They are also preferable to gorse/broom/blackberry. They would need to be kept in check in order to not out-compete native forest environments.

It would enhance and will make hunting more fun and later will be timber for milling

It would be fine as long as they didn't over take the native trees. I think it would enhance the places.

It would take away from the beautiful view of the lake. For hunting, I don't imagine it would make any difference.

5.1 Impacts on environmental spaces

The spread of wilding conifers was perceived as having potentially negative and positive impacts on many of the sites of cultural value identified for the three study sites. In contrast to some of the sentiments from the survey responses expressed above, the majority of the interviewees preferred the scenario of complete removal of wilding conifers from most of the environmental spaces for access, visual, aesthetic, cultural and natural heritage reasons. The alternative perspective expressed in interviews was largely to do with visual impacts of removal and loss of the seemingly European or Canadian alpine aesthetic. Perceived negative impacts of wilding conifer incursion in environmental spaces such as camping grounds, picnic spots, roads, walking tracks and lake access points could all be managed. These spaces were commonly noted as significant in the survey. It will be the perceived negative and positive impacts on the aesthetic of the areas that will potentially be more difficult to manage.

5.2 Impacts on cultural practices

Although stories and films were mentioned by respondents, there was very little reference to NZ art. While many artists have painted these landscapes and their art has informed various cultural expressions of the study sites, painting or art appreciation was rarely mentioned. Instead, the main cultural practices common across the sites were walking, hunting, cycling, picnicking, swimming, boating, fishing, weddings, remembering family holidays, spiritual connection, holidaying, and camping, creating legacy, and appreciating or curating heritage. It is likely our survey respondents over-emphasised recreational activities and the questions did not elicit a broader range of cultural practices.

The interviews made more explicit than the survey the cultural practices connected to farming. Concerns about the impacts of wilding conifers were encompassed in broader concerns about changing farming cultures. Wilding conifers will impact on people's ability to farm, and most of the land managers spoken with are attempting to balance farming with wilding conifer removal and restoration of indigenous flora and fauna. Maintaining key vistas while allowing for continued productive land uses that maintain soil and water quality were seen to be mutually possible, including more intensive farming such as dairying and cropping. These newer land uses could also preserve key areas by provision of natural fire breaks in the landscape, especially in wilding-infested areas where the fuel load is increased.

5.3 Impacts on cultural ecosystem benefits

Participants in the study expressed the perception that wilding conifers represent the loss of healthy mountains, rivers and land. Some informants connected this with a perception that their overall well-being and ability to provide for future generations was degraded. However, there was also recognition that conifers have provided for people in the past, and wilding conifers also provide erosion prevention and shelter from wind.

5.4 Working with cultural values

The ongoing formation of New Zealand's culture and cultural norms is shaped by weed and pest invasions in relation to both the effect of weeds and pests on the landscape and the affect of a changing landscape. Wilding conifer incursion can be framed as a cultural problem currently being responded to through stewardship. As discussed in the literature review, the issue of wilding confers is directly involved in Māori values. Workshop participants noted that conifers are a symbolic reference to European colonisation and a challenge for today's considerations of co-management. Expressions of Māori cultural values came through most strongly from the Tarawera study. A more specific initiative is required to focus on how agencies managing wilding conifer can best align with other projects mapping, assessing and communicating Māori cultural values. The authors were referred to the research programme funded by the Ministry of Business Innovation and Employment: *Nga Kete o Te Wānanga: Mātauranga, Science and Freshwater Management (MBIE Contract Number: C01X1318)* led

by Dr Erica Williams at NIWA. Also many iwi/hapu management plans document iwi values[31].

5.4.1 Cultural heritage is not lost if no longer visible or accessible

Contrasting views about conserving heritage and how heritage is retained are apparent and are to be expected. Some informants commented that sites must be restored to pre-European landscapes in order to save natural heritage value (e.g. supporting the return of native species). Others believed that photographs or memories/stories of previous times are sufficient and the future will include more modifications on an already modified landscape. People noted that there is still evidence of 'lost' heritage. Even if heritage is not visible it can still play a key role in building character and social networks, and creates meaning and sense of place. The 'lost' features discussed were: 5 Pound Note Island; the Pink and White terraces; rock drawings in Lake Pukaki; mustering and farming in the early 20th century; the gold rush era; and Victoriana. Respondents noted that while heritage needs to be actively maintained, it is not lost if it is no longer visible on the landscape. Cultural values are not static – they develop through conversations about how to manage wilding conifers.

5.4.2 Delineation between market and non-market values

When initiated, this study was defined as examining the impacts of wilding conifers on non-market values. This distinction between market and non-market impacts was not commonly expressed by the interviewees; conversely the connection between market and non-market values was often expressed. The perspectives shared in this report provide little insights into how culture becomes integral to environments, markets, and marketing (e.g. marketing cultural values as part of tourism products) and vice versa.

5.4.3 Attention to scale

Cultural values are enacted nationally and locally, in specific ways at specific sites, so values take different meanings depending on context. The assessment of cultural values related to specific landscape problems benefits from attention to a number of scales of engagement, e.g. from the park bench to the management region. This research supports the concept that cultural values can be spatially and temporally specific – they are dynamic expressions situated in places and moments. The ways people work with cultural values and sites of cultural value will also need to be dynamic; relevant to context, and responsive to how these values are changing.

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[31] http://ngaitahu.iwi.nz/te-runanga-o-ngai-tahu/papatipu-runanga/kaikoura/environmental-management-plan/

Retrieved 23/09/2015

http://ecan.govt.nz/services/resource-consents/engaging-with-ngai-tahu/pages/canterbury-iwi-management-plan.aspx Retrieved 23/09/2015

http://www.es.govt.nz/publications/plans/iwi-management-plan/ Retrieved 23/09/2015

5.4.4 Cultural values shaped through complex interactions

Insights about managing the impacts and legacy of modifications to landscapes offered in this report were frequently shared with reference to other environmental concerns also shaping the study sites, e.g. dams, irrigation, urban development, climate change. Decisions about wilding conifer management will be affected by the broad range of intersecting social and environmental processes influencing cultural values across New Zealand and in specific sites. Along with more traditional indicators of environmental and social impact, landscape values, aesthetics and vista are increasingly being considered or advocated.

For example, the 2012 decision by Meridian Energy not to proceed with plans to build a wind farm in Central Otago was a response to concerns that it would negatively impact on the unique landscape. The lawyer for the community group opposing Meridian Energy's application for resource consent concluded:

> *The original ruling cancelling consents for the wind farm was a landmark decision for New Zealand, establishing a baseline for the protection of Central Otago and other significant landscapes.*[32]

In 2012 responses to plans for a tunnel to Milford Sound also show that vista or scenery was raised as a key value to be considered.

> *We've got some of the best scenery in the country, and we want it protected. We're not anti-progress, but just want to see any changes tailored to a style that fits, and doesn't spoil Glenorchy.*[33]

5.4.5 Cultural values shaped through research and management approaches

This study of cultural values shows an array of cultural resources (e.g. storytelling and heritage curation) available for wilding conifer management. How sites or landscapes become valuable is integral to working with invasive species and to the articulation of potential impacts on cultural values. This report has taken a step towards supporting this understanding of cultural values in the making. Some further steps are recommended that will enable the Department of Conservation and its partners to work with these viewpoints and cultural values to inform decision making and wilding conifer responses.

[32] http://www.stuff.co.nz/southland-times/news/6286634/Landscape-saved-hopeless-case-won

[33] http://www.stuff.co.nz/southland-times/news/6302082/Glenorchy-says-no-to-tunnel

6 Discussion: implications for wilding conifer management

The findings above support arguments for the engagement of a range of perspectives in designing and implementing wilding conifer control, so that a broad suite of cultural values can be incorporated appropriately into control strategies. Arguments for incorporating a range of perspectives often call for more community engagement without taking the step to address which community, when (Marres 2012). This report does not suggest who the community of wilding conifer management is or might be, instead, it provides possible perspectives and narratives to be included in future planning.

6.1.1 A growing sense of urgency

This research project was part of a number of initiatives in 2015 raising the urgency of wilding conifer control. Wilding conifers will have a significant impact on cultural values – in some places they already are. In the Lake Pukaki area, for example a deep sense of urgency was expressed and a fear that New Zealand has passed both the ecological and social tipping points for this problem.

Informants suggested that perhaps the optimal time for responding has already passed for this site. People commented that the 6% per annum projection for spread was unrealistic, it was likely to be spreading more than that. There was strong preference for wilding conifer removal in this site. The Environment Trust was established as a wilding conifer control group. Interviewees noted that residents demanded a management group, not a control group. This distinction in the name and focus of the group appeared to be very important.

Many of the privately funded land management strategies being employed are long term i.e. they are looking to eradicate wildings within 20-50 years. The land managers expressed concern that their investments would not be sufficient, given New Zealand's broader lack of funds to complement their investments and/or that government agencies will enforce a tighter timeframe for change, which may undermine their long-term land management plans.

6.1.2 Poor public visibility of wilding conifer spread

Significant investment may be needed to reduce wilding conifer numbers, followed by further investment for maintenance programmes. There was a general sentiment that the Department of Conservation, regional councils, other government agencies and in some places landowners should all take responsibility for stopping the spread of wilding conifers. Ideas about how best to invest in wilding conifer management suggested a need for early intervention, and that some areas most realistically will remain uncontrolled. Informants advised that getting broad public support for this investment might be challenging if the issue of wilding conifer spread retained a low public profile.

Wilding conifer spread was referred to as a problem that is not yet visible to many members of the public, and such visibility will need to have an impact on the general public's awareness of the issue. Visibility of both living and dying trees is already impacting on sites of cultural value as well as on perceptions of the risks and benefits of incursion. Visibility of wilding conifers will need to be considered at many stages of the control programmes – from prioritising sites for control, through to perception management during control.

6.1.3 Narratives to support wilding conifer management

As noted by respondents the story of wilding conifer control does offer another layer to heritage stories being told through tourism and oral histories. Oral history (as a cultural practice) is critical for keeping heritage alive. This was discussed in relation to mustering yarns; generational learning about local sites, whakatauki, and whakapapa.

Activities that enable the sharing of stories will be key to the success of wilding conifer control reliant on voluntary efforts, informal monitoring and cross agency activities. Below pathways and audiences are suggested based on the literature review. This research did not extend to identifying what would be most appropriate so the points below are presented as starting ideas for future exploration.

1) The current voice of concern: share land owner and land managers stories of concern, controlling wilding conifers is a struggle, affecting quality of life, with minimal success to date. Some of the audio from the interviews could be edited and shared at meetings or on websites if permission gained from the interviewees. These stories would make an interesting radio documentary – or Country Calendar programme. The authors recommend not relying on uptake by mainstream media to circulate stories of hardship, lifestyle change and minimal success but rather working through social networks such as voluntary groups, and face book pages.
2) Catalyse regional conversations about weeds with messages that not all trees are good, or trees in the wrong place are a problem. Build awareness about wilding conifers through a national social marketing campaign supported by regionally specific data, images and stories. It will be necessary to identify appropriate networks of Māori organisations to work with for this.
3) Promote a national story of urgency and of hope. New Zealand has a chance now that might not be around for much longer to show that New Zealanders can leave a positive environmental legacy for future generations.

6.1.4 Informing New Zealand's Natural Resources Sector

Observations were made about the important work done in recent years to develop knowledge of potential bio-physical and ecological impacts of wilding conifers on New Zealand. However, it appears that champions and decision makers considering wilding conifers at regional and national levels are only just beginning to understand the social relations enabling and constraining opportunities to respond to the wilding conifer challenge.

Connect to context, varied knowledge bases, and broad social concerns

Social research informs the wilding conifer challenge by providing an understanding of social values and practices for valuing places and things (such as the wilding conifer). Social research can contribute to the social license to address the problem, supporting capabilities to control wilding conifers in specific sites. By taking into account the social dynamics of specific places (e.g. the settings, practices and meanings associated with wilding conifer spread) policy analysts and researchers may be able to connect the wilding conifer issue to

other concerns shaping these places (Marshall et al. 2011, p. 335; Harmsworth 2013; Munshi 2014).

At the 19 June workshop the issue was raised about the importance of incorporating perceptions expressed by the general public along with official heritage data. Sensitivities of working with iwi data were discussed as was the problem of making a distinction between market and non-market cultural values. To navigate these issues it is useful to link wilding conifer management to a broader knowledge base on culture, heritage, and how social and ecosystem change happens in New Zealand (Greenaway 2013). A first step is to progress the work the Ministry for Primary Industries is already doing to identify appropriate networks of Māori organisations with whom to work to plan for wilding conifer control.

A network across volunteers, Māori organisations, government agencies and research

In response to an identified need for more integrative ways of doing research, this project has reduced the division between research purchaser and provider. The review of international literature suggests capabilities for co-learning are necessary to respond to the wilding conifers challenge (Allen et al. 2001; Marshall et al. 2011).

Knowledge about social change processes has informed both the content of this report and the methods used. This approach contributes to the response required to address wilding conifer incursion. Workshop participants commented that this project and other wilding conifer research have usefully raised awareness of the issue. Some of the informants are now better resourced to act as champions (disseminating information and organising actions) as they now understand the national nature of the wilding conifer problem and the cultural dimensions of areas beyond their own. How this report is received, debated and acted upon at local, regional[34] and national[35] levels will reveal whether these capacities for deliberative (considered discussion) and pluralist discursive engagement (a range of ways of forming arguments and reasoning) are sustained (Rodela 2012).

Additional research

Wilding conifer programmes will benefit from strong links across local and national level decision making processes, enabling co-benefits to be achieved and sharing of responsibility and costs. Future research should extend identification of cultural values and cultural ecosystem benefits through use of Q methodology (Fairfield et al. 1994; Swaffield & Fairweather 1996) or a similar deliberative research approach. It would be useful to understand not only what viewpoints there are about wilding conifers and potential management approaches but also the ways these viewpoints are structured; how values and social networks are shaping the viewpoints. Diverging viewpoints could then be identified and worked with. The authors also propose an assessment of the monetary value of non-market cultural benefits be undertaken through Q methodology. This could be supported by

[34] Through Regional Pest Management plans

[35] Through the National Pest Management Strategy

work mapping existing and potential social relations of wilding conifers (Marres, 2012). Additionally, the preferences and levels of awareness of international visitors, as found during the interviews, could play an important role in tourist development in the case study areas.

6.2 Conclusion

Wilding conifer incursion is part of the legacy of cultural values shaping New Zealand. Hence cultural values need to be considered when planning for the management of wilding conifers. Work connecting stories of value and values across organisational, regional and land use cultures will aid wilding conifer control. In the near future stories might be told of how and why land in New Zealand was restored through a range of integrated initiatives including the clearance of wilding conifers. These will be valuable stories. They might include stories for tourists about the distinctiveness of New Zealand's landscapes but more importantly the stories will speak of New Zealand culture – a culture responsive to its natural environment and focussed on creating a natural and cultural heritage that supports the well-being of New Zealanders.

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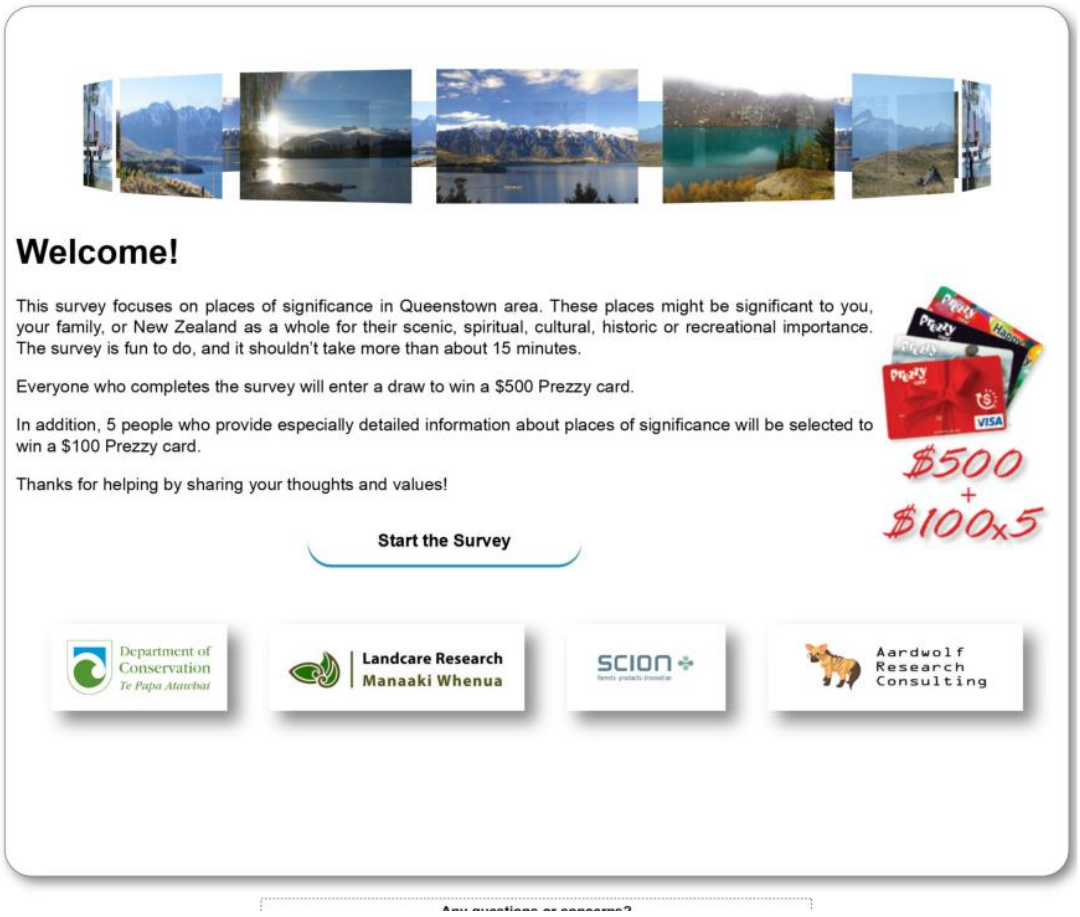
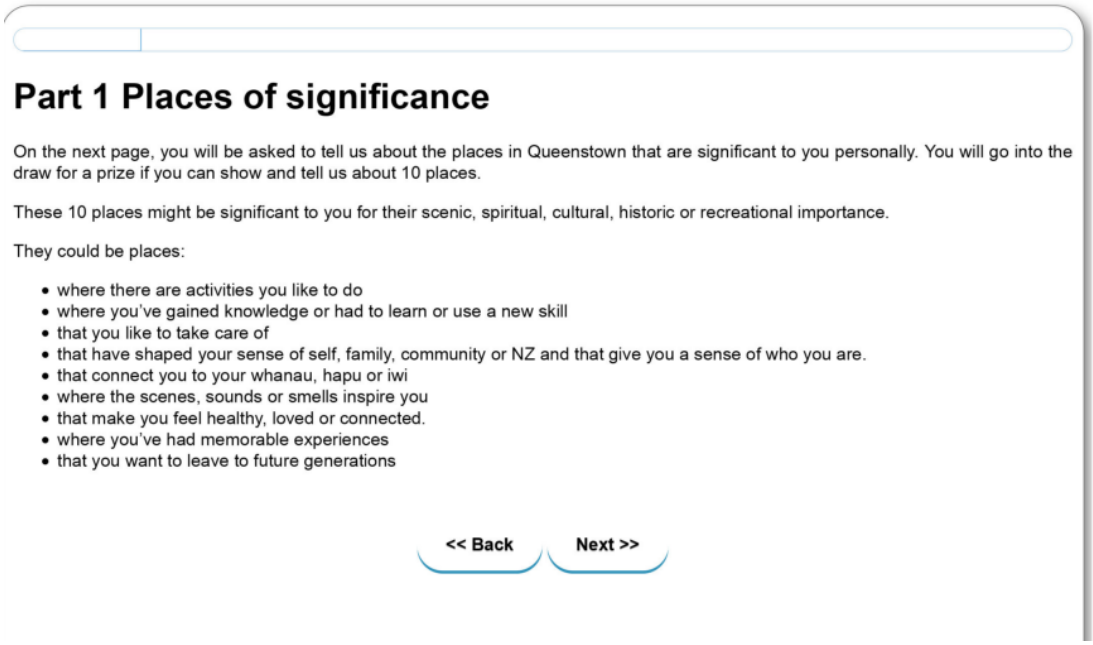
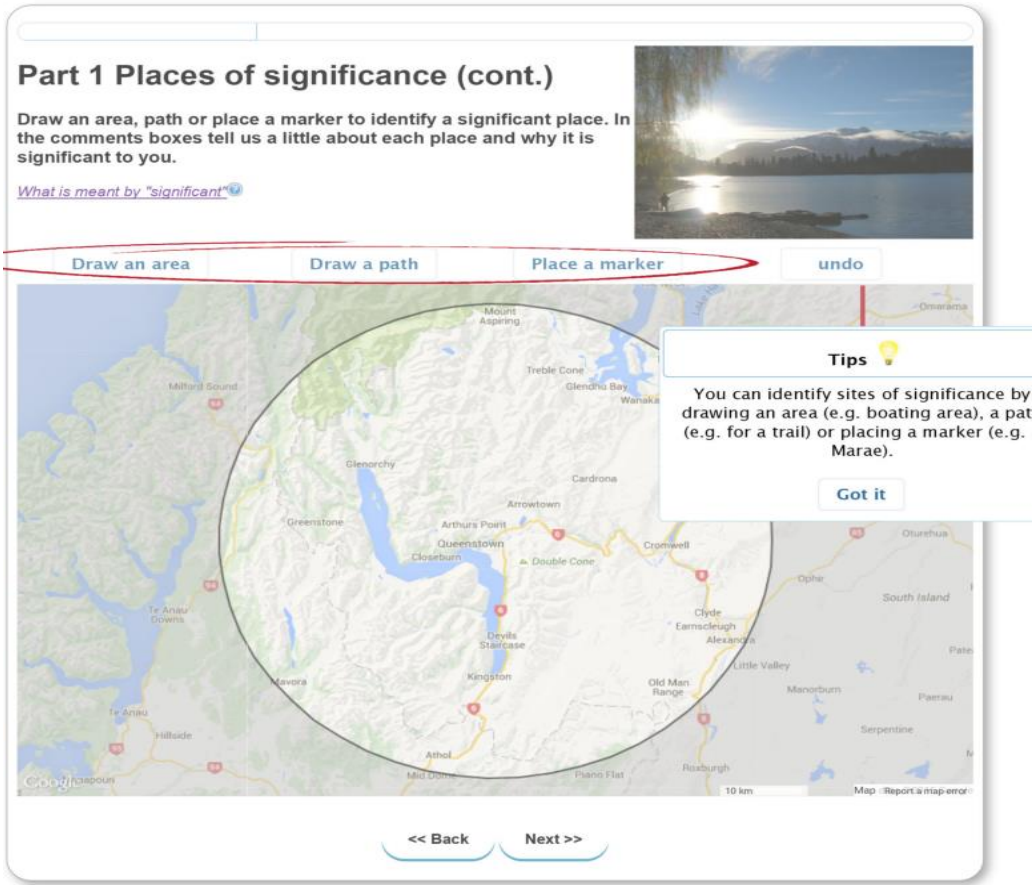
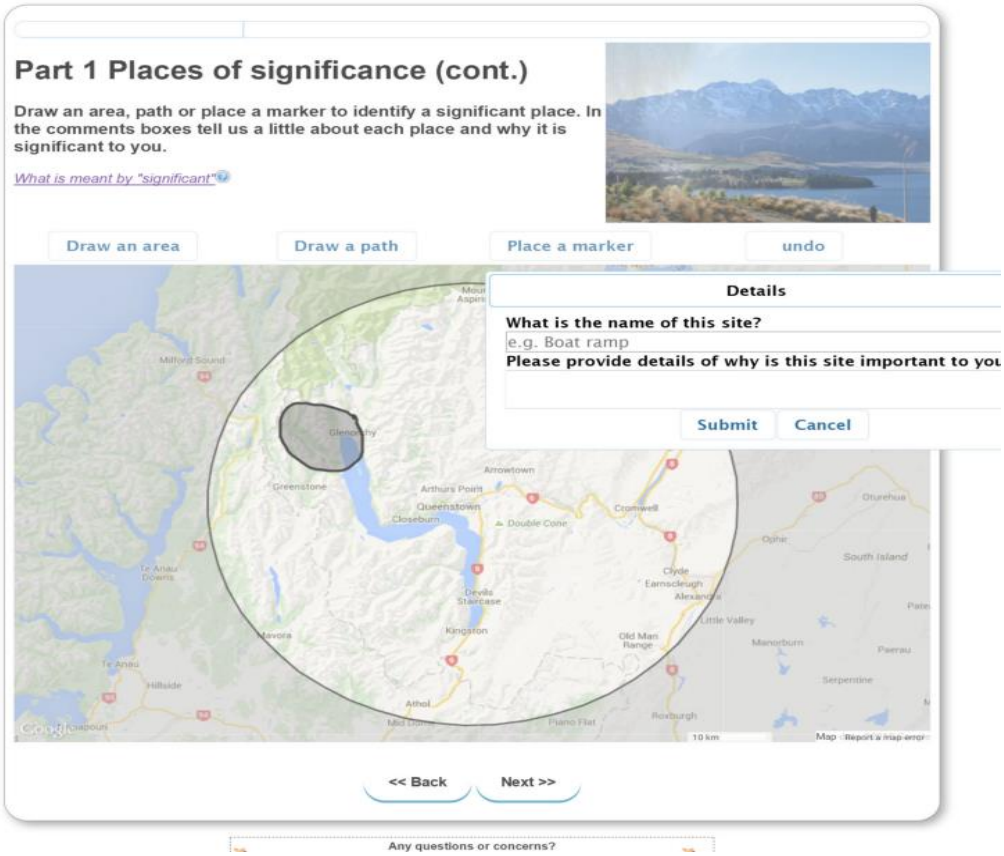
Appendix the online survey tool






Part 1 Places of significance (cont.)
Draw an area, path or place a marker to identify a significant place. In the comments boxes tell us a little about each place and why it is significant to you.
What is meant by "significant"
Draw an area
Draw a path
Place a marker
undo
Tips
You can identify sites of significance by drawing an area (e.g. boating area), a pat (e.g. for a trail) or placing a marker (e.g. Marae).
Got it
<< Back
Next >>

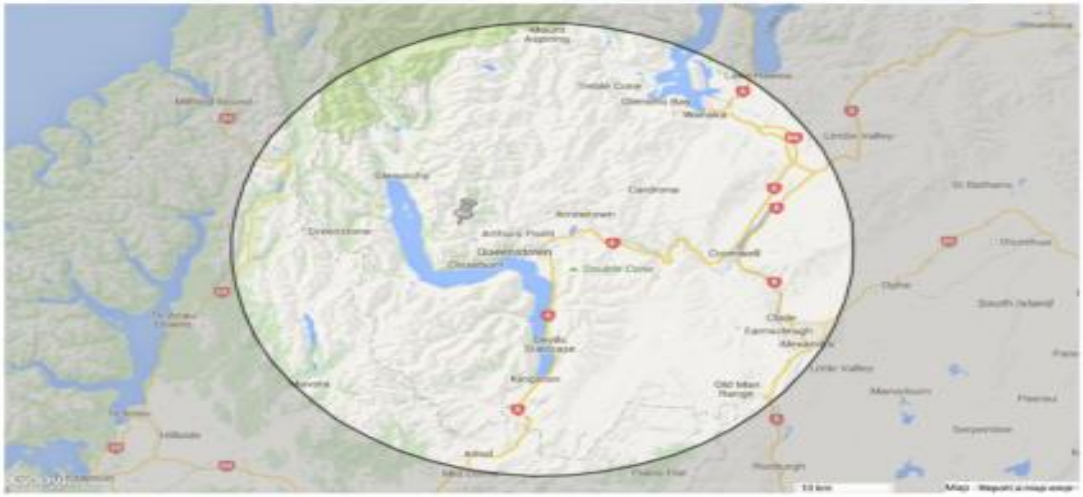

Part 1 Places of significance (cont.)
Draw an area, path or place a marker to identify a significant place. In the comments boxes tell us a little about each place and why it is significant to you.
What is meant by "significant"
Draw an area
Draw a path
Place a marker
undo
Details
What is the name of this site?
e.g. Boat ramp
Please provide details of why is this site important to you
Submit
Cancel
<< Back
Next >>
Any questions or concerns?

Part 1 Places of significance (cont.)

2. Now thinking about other people you know (e.g. your neighbours, friends or family), are there additional sites that they would consider to be significant?

What is meant by "significant"?

Draw an area | Draw a path | Place a marker | undo



<< Back | Next >>

Any questions or concerns?
Call 021 257 8676 or email alex@landcareresearch.com
mobile version | full version

Part 1 Places of significance (cont.)

4. Thinking about the places you have identified, which places, if any, do you feel are significant to all New Zealanders?

Site1

Site2

Path

<< Back | Next >>

Part 2 Spread of trees

A

B

5. Do you prefer the scene in picture A or B?

- A
- B
- no preference

6. Do you know the name of the tree shown in these images (in the pictures above and enlarged on the right)?

- No
- Yes (please specify)

7. If these trees were to grow in or near the places of significance you listed in the previous questions would you be

- Highly concerned
- Mildly concerned
- No opinion
- Mildly pleased
- Very pleased

8. What would it mean to you if these trees were to grow in or near the places you listed in the previous questions? Would it enhance or reduce the significance of these places?

9. The land area these trees cover in Queenstown is increasing by 5% amount each year. Are you

- Highly concerned
- Mildly concerned
- No opinion
- Mildly pleased
- Very pleased

10. Who do you think should have responsibility for reducing the spread of these trees? Please put them in order of levels of responsibility by dragging those you think should have more responsibility to the top.

- Volunteer groups
- Central government
- The Regional Council
- Local iwi
- All New Zealanders
- The landowner
- DOC (Department of Conservation)

<< Back Next >>

Part 3 Demographics

6. What is your gender?

- Male
- Female
- Other
- Prefer not to answer

7. Which ethnic group(s) do you belong to?

- New Zealand European
- Maori
- Pacific Islander
- Chinese
- Indian
- Other
- Prefer not to answer

8. What is your age group?

- Under 15
- 15-19
- 20-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70 or over
- Prefer not to answer

9. What is your highest education qualification?

- None
- Secondary school
- Diploma or level 4-6 certificate
- Bachelor degree
- Post-graduate degree
- Prefer not to answer

10. What is your approximate annual household income?

- less than $30,000
- $30,001 to $50,000
- $50,001 to $70,000
- $70,001 to $100,000

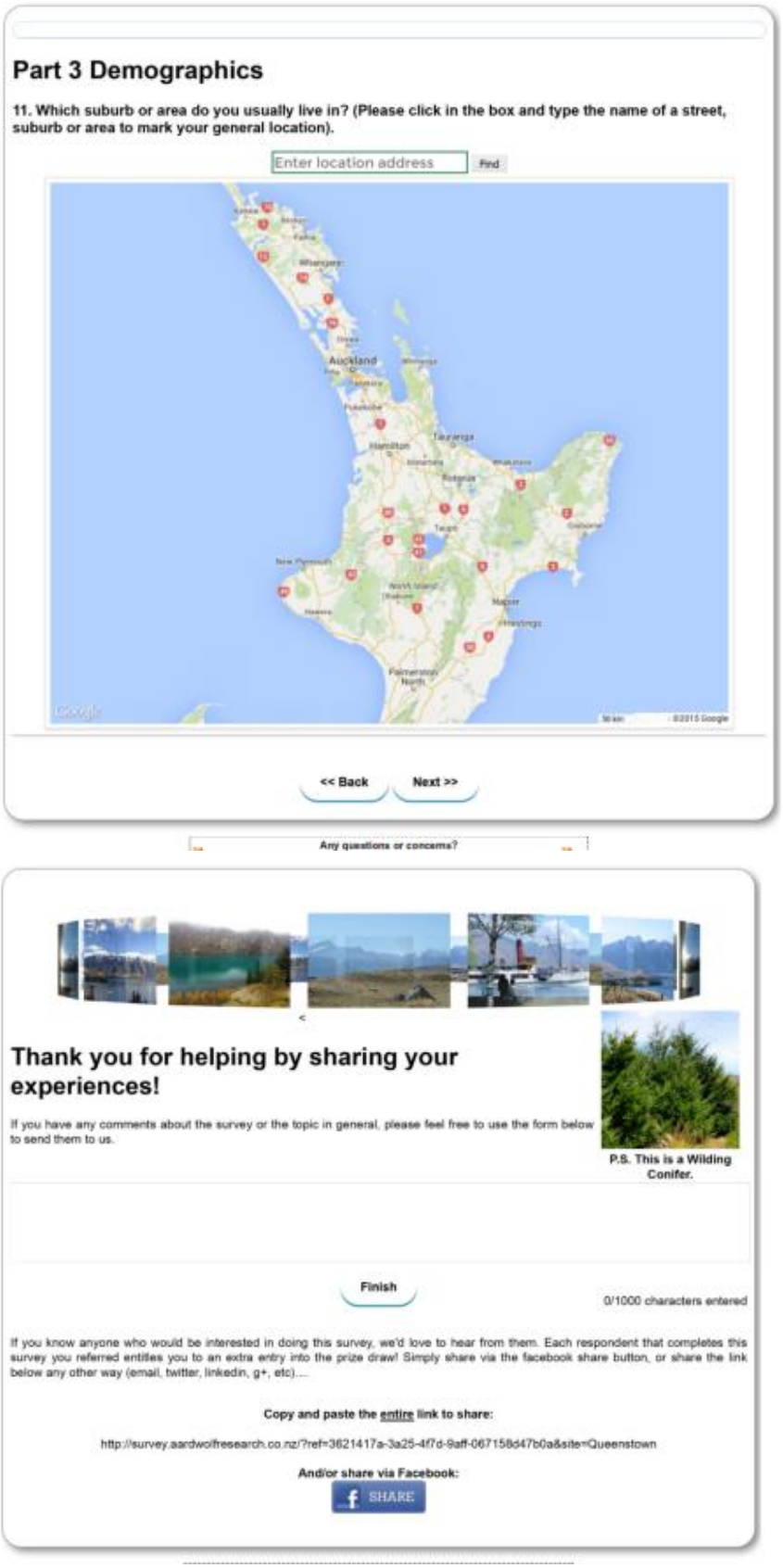


Figure 17 Screen shots showing how the online survey looked.

Figure 18 Facebook advert used to recruit for the Tarawera survey.