

WAKATIPU WILDING CONIFER STRATEGY 2013-2017



Prepared for:

Wakatipu Wilding Conifer Control Group & Queenstown Lakes District Council

Prepared By:

Briana Pringle WCG Manager & Peter Willsman WCG Chairman

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SECTION 1

BACKGROUND

This strategy builds on the 2004 and the 2008 strategies adopted by QLDC. This strategy details the recommended management strategies for 2013-17.

It is intended that this strategy cross reference other management plans, strategies and brochures being prepared for the Queenstown Lakes District Council, including for example, The Ben Lomond and Queenstown Hill Reserves Management Plan.

Policies rules and guidelines in the QLDC District Plan may also refer to this strategy or use it as a supporting resource.

The 2008 Strategy recommended the establishment of a Wakatipu Wilding Conifer Control Group (WCG). WCG was formed as a community based charitable group in April 2009 to control wilding conifers and since that date has promoted and coordinated wilding control.

SCOPE AND PURPOSE OF THE WILDING CONIFER STRATEGY

- A review of wilding control and activities for the 2008-2012 period
- Recommendations for management of control areas
- Recommendations for Wakatipu Wilding Conifer Control Group (WCG) for the co-ordination of stakeholder agencies and landowners/managers to achieve control of wilding conifers in the Wakatipu.
- Recommendations for the WCG to implement the strategy over the next 5 years

Annual fine tuning of the priorities will occur each year as the control program is implemented, due to changes in technology, tools and due to environmental factors causing seed spread.

With the technology we now have available in terms of mapping tools and knowledge of the problem we can refine and determine the most cost effective method of control.

THE WAKATIPU WILDING CONIFER CONTROL GROUP (WCG)

The 2008-2012 Conifer Strategy was adopted by QLDC recommended the formation of the WCG. The task of the new group was to implement the 08-12 strategy, and to co-ordinate and organise annual programmes and budgets achieve the goals of conifer control.

A March 2009 meeting of interested community members, landowners, and representatives from land management agencies such as QLDC, DOC, LINZ, adopted the recommendation to form the Wakatipu Wilding Conifer Control Group (WCG). The first WCG meeting in April 2009 moved that the WCG be formed and become an Incorporated Society and Charitable Trust and elected Peter Willsman as Chairman, Briana Pringle the Queenstown Lakes District Council (QLDC) District Forester as Manager and various other executive office bearers.

KEY WCG FINDINGS THAT INFLUENCE THE WAKATIPU CONIFER STRATEGY

1. The continued foundational funding and support of QLDC.

Annual financial grants and QLDC staff support have been and are essential in making WCG known as one of the nation's most successful wilding control groups. Without the technical and governance support that the WCG has received to date from QLDC it would not exist in its current form nor would the measure of achievement have been achieved.

2. Partnerships bring local knowledge, skills, professionalism and energy.

WCG partnerships between QLDC, DOC, LINZ, NZTA, Landowners and their Managers, the general Lakes Districts Community, and Businesses and Trusts creates a vibrant partnership with a common goal.

3. Volunteers and a local 'champion' for the cause.

The 2008 report recommended "the WCG Chairperson must be a well-respected member of the community who is passionate about wilding control". The Chairman and WCG executive, since the beginning in 2009 have worked hard at providing inspirational leadership, dedicated time, and enthusiasm for the cause. They have encouraged the community and volunteers to support and become a part of the solution.

4. The Committed input of leadership, time, creativity and passion to grow is essential to a volunteer organisation. Those same qualities are crucial to raising the large budget required.

Wilding control is a constant battle with little immediate or visible end apparent result. Building a bike trail leaves an immediate community facility. Investment of finance and time

in wilding control aimed at meeting long term goals is not immediately visible. Some areas require constant revisits to maintain clear tussock and alpine shrub-lands. Vital, keen leadership is essential if the vision of preserving Wakatipu's "Outstanding National Landscapes", adopted by Council and owned by the Community, is to be achieved.

5. The professional skills of a Manager and Operations Manager.

DOC and QLDC recognise the value of working together on budgets and operations. Conifer seeds blow for kilometres across QLDC/DOC Reserves and private land, they have no respect for boundaries. WCG's Operations Managers expertise is a key factor in managing operations and budgeted expenditure.

6. Advocacy for wilding control.

WCG maintains a policy that notified land sales, developments and forestry plantings on or near vulnerable high country are evaluated for risk and if necessary challenged. An example is WCG's submission to the Overseas Investment Office (OIO) on the proposed Coronet Peak Station sale. The submission successfully lobbied the OIO "that all wilding pines be eradicated as part of the land transaction". WCG consistently lobbies ORC to be more proactive in wilding control, voices wilding perspectives on the District Plan and links in with the New Zealand Wilding Conifer Management Group.

7. Funding is essential.

Volunteer work parties are important but funding for all major work is essential in controlling wilding spread. Without base funding from QLDC, Skyline Enterprises, and grants from Trusts and Lotteries for major projects over the past four years, wilding conifers would have spread faster and further than low budget attempts to control them.

8. Hedging past financial investments.

\$893,000 has been invested by QLDC, DOC, and Landowners in the period 2004-2008. Records show that from 2009-2012 an increased expenditure of \$1,919,100 has been invested in control work since WCG's inception in 2009. The negative effect of any funding cut will result in cleared land being re-infested and the previous funding wasted. A positive strategy has been identified by WCG to build on, and secure, past eight years of financial investment in wilding control.

9. A Stitch in Time Saves Nine.

The nationally adopted mantra is clearly evident in the Wakatipu area. Pictures of wilding spread on Bowen Peak and Ben Lomond (Appendix 1, Figure 1 and 2) demonstrate a low cost for control in 1980's compared with high budgets required in 2013-17 to halt the evident impending wilding advance. WCG's Strategy is to invest heavily over the next five years while control is still possible and to save an exponential future budget explosion.

10. Preserving the Queenstown jewel.

New Zealand's Tourist Industry, QLDC, the Wakatipu Community and businesses recognise that our unique landscape is the major generator of tourism. Naturally folded golden tussock slopes, craggy bluffs, alpine shrubs, the silhouette of mountains are unique to this area. Wildings have the potential to totally change the scenery in a short time span. The Wakatipu attracts tourists because it is unique; it is not a conifer covered North American Landscape.

THE 5X5 STRATEGY

Identification of wilding invasion, spread and control dates back to Lands and Survey teams in the early 1980's. Unfortunately the exponential spread has exceeded investment in control. This strategy identifies a five year window of opportunity to enable wilding control to be brought to a manageable level.

At a WCG initiated Workshop/Seminar in November 2011 an invited group of key stakeholders and business people reviewed wilding control. The group identified the need to act swiftly to control and reduce the 73,000 hectares of wilding infestation in the Wakatipu area. A budget of \$5.7 million was recommended to be raised and spent in the next five years. The challenging strategy now faced is to raise and invest in wilding control \$1 million a year for the next five years (Coronet Peak Station's wilding programme of \$0.7 million is self-funded and reduces the required cost to \$5 million).

WCG has adopted the following 5X5 Strategy:

ALERT – the community to the exponential spread and cost of wilding control

COMMUNICATE – the WCG programme of control and the projected effects of no control.

ERADICATE – all seeding trees where possible

CONTAIN - non-removable wilding areas and planted forests

HAND BACK - control maintenance to landowners, DOC and QLDC at the end of the five year strategy period.

STRATEGY IMPLEMENTATION

The strategy will enable a focused approach to the control of wilding conifers, it provides QLDC, DOC, LINZ, Trust and Funders with a confidence that funds expended to maximize the benefit to the affected landscapes. A defined policy for spending the \$5 million strategically will ultimately prove to be cheaper and bring control to a manageable level.

ALERT – the community to the exponential spread and cost of wilding control

- Continue to speak at community meetings, write and promote articles in newspapers; accelerate the interactive schools education involvement, use volunteer days as educational opportunities.
- Update and further develop the WCG website, face book development, volunteer lists etc.
- Adopt emerging communication technologies .

COMMUNICATE – the 5X5 strategy programme of control to funding agencies

- Prepare well-constructed material to utilise in all funding applications.
- Set high relational goals with all funding providers.
- Organize material and experiences to enable volunteers to tell the story to their contacts and friends.
- Prepare successful wilding control pictures with projected uncontrolled landscapes.
- Advocate successes, show how funding is being well spent.

ERADICATE – **prioritize** removing all seeding trees where possible

- Use this strategy's work program to target and remove seed sources or coning trees that are causing on-going wilding issues on vulnerable land.
- Visit and talk with landowners/lessees about their trees and shelter belts with offers to assist with mitigation of the problem.
- Investigate setting up a tree nursery, offering replacement trees for farmers who eradicate conifers, plus some planting of native trees where sensitive spraying has been required.

CONTAIN- non-removable wilding areas and planted forests

- Prioritise communication with the community, Council, DOC and landowners to set boundaries for wilding containment e.g. setting strategic sprayed altitude caps on Queenstown Hill, Ben Lomond, Bowen Peak .

- Acknowledge that the forested faces of the Wakatipu basin are part of the local landscape. Set strategic spraying altitude caps to catch the wind-blown seed is imperative where eradication is impractical (on such faces as the lower slopes of Ben Lomond). Identify and maintain spray containment strips to halt further advances.
- Consult with the community and landowners on boundaries to wilding forest spread for example eastern spread to Arthur's Point and on Queenstown Hill.
- Talk with landowners who have conifers with seed spread potential about possible assistance in removing these trees. Offer advice on re-planting with non seeding trees in small woodlots and shelter belts.

HAND BACK -control maintenance to landowners, DOC, QLDC at the end of the five year strategy

- Organise educational seminars with landowners, QLDC and DOC reserve caretakers advertising the five year window of the 5X5 assisted wilding control so that those parties will be conditioned and capable of accepting responsibility for long term maintenance.
- WCG Executive and Managers to invest time in developing conifer control goals with individual land lessee/owners which include the influence of stocking and de-stocking.

CURRENT WAKATIPU WILDING STATUS

The strategy has focused on the Wakatipu Basin, the Shotover and Arrow River catchments and the Roaring Meg catchment at the eastern boundary of the Queenstown Lakes District Council.

DOC and QLDC completed a mapping exercise of the Wakatipu Basin in November 2011 (reviewed in February 2013). Areas infested with wilding conifers were given a rating in terms of spread and a dollar control figure was apportioned. Some areas of forest were marked as Outstanding Natural Landscape (Map 1, forest areas in green). The mapped area represents the best estimate of the existing spread of wilding conifers in the Wakatipu. The cost to control the total area was calculated at \$5.7million, (this is based on current contractor rates and chemical prices)

At present there is no national standard for measuring or mapping wilding spread. The forthcoming National Wilding Conifer Status report may address this through the New Zealand Wilding Conifer Management Group.

All control operations are recorded on the QLDC or DOC wilding databases, and data is available dating back to 2006 when spatial areas were first recorded. QLDC aerial photography and GIS maps assist with creating and recording operations.

All aerial spraying operations have been recorded by GPS, a clear record of the areas sprayed is on the GIS database. Spot spray operations log every tree sprayed which provides the WCG with data of wilding tree populations. Ground crews are required to carry GPS units when carrying out control work so that accurate location and size of area cleared can be recorded.

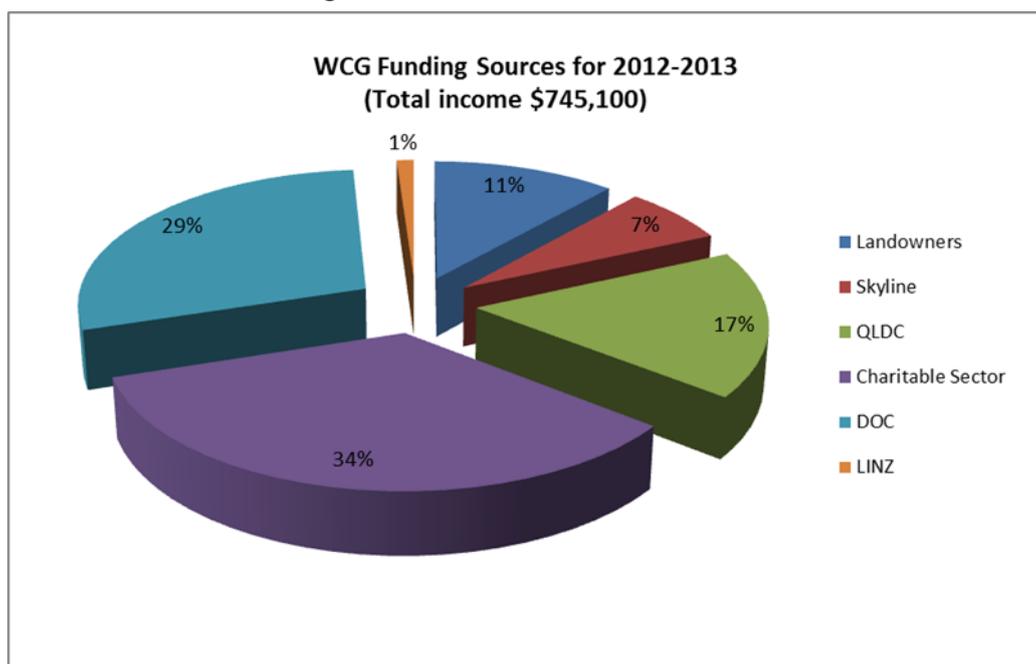
FUNDING

The lack of secure funding required to maintain ongoing control and sustain the gains of past efforts is the greatest risk to the long term success of this strategy and payback for the financial investment it requires.

In the past, work programmes have been dependent on the annual allocation of funds by Council through the three yearly and annual plan business cycles, and on co-operative wilding control by DOC and some landowners/lessee's. The formation of the WCG has improved this situation in that the organisation can now apply to funding agencies for additional support for specific projects. However, this is not a secure method of funding and each year the trusts or funding agencies must be canvassed.

Many funding agencies that have been sympathetic to WCG's objectives since its formation , such as the Lotteries Commission, the Environment and Heritage Fund, the Central Lakes Trust, the Guardian Trust, Community Trust of Southland, Sky City Community Fund, Southland Banking Society, Otago Community Trust, Trust Power and the JS Watson Trust. The injection of this type of funding has helped the WCG reach some targets to halt the further spread of wilding trees.

Graph 1: WCG Confirmed Funding Sources for 2012-2013 Season



Skyline Enterprises' generous vision to initiate the 'adopt a hectare idea' in the Ben Lomond Reserve has been a win for the WCG and the wider community. Skylines' grant of \$50,000 annually has seen the WCG reach containment lines within the Ben Lomond reserve, and their foresight and recognition of the wilding issue will certainly encourage other business to come on board and 'adopt a hectare'.

'Adopting a hectare' was created by the Group, the idea being that local businesses or individuals can 'adopt an area' and contribute towards control work in that location.

By the implementation of this strategy the WCG hopes to lobby more businesses, groups, families, corporates and individuals to take up the initiative of owning an area where they can be responsible for eradicating conifers.

A positive initiative for funding has been successfully developed by the Marlborough Sounds Restoration Trust, which has added a levy to all water taxis fares in the Sounds and this contribution goes towards their wilding conifer program. This will be investigated by the WCG, as tourism operators in the Wakatipu will be ultimately affected by wilding conifer invasion.

The WCG appreciates landowners/lessee's to contribute 10-15% of the costs of control projects on their land. It is appreciative that some landowners contribute a lot more. Some contribute in kind, for example helicopter travel time for crews.

The WCG has had success over the duration of the second strategy period by securing additional funding. With the support of DOC we now able to work collectively with stakeholders and deliver wilding control across boundaries and in some areas working towards total eradication.

Table 1: Previous Strategies Total Wilding Spend 2004-2012

	QLDC, Landowners & Other Funders	DOC & Biodiversity	Total Spend
2004-2008	\$ 443,000	\$ 450,000	\$ 893,000
2009-2012	\$ 908,500	\$ 1,010,600	\$ 1,919,100
			\$ 2,812,100

Close to 3 million was spent on wilding control from 2004 to 2012. If future funding is reduced or the program discontinued it will be a total waste of that investment as areas will quickly become re-infested by seed as existing trees reach coning age.

STATUS OF THIS DOCUMENT

This is a non-statutory plan, although it has no legal status, it is anticipated it will be implemented by the WCG, under the administrative and financial umbrella of the Queenstown Lakes District Council.

SECTION 2

CONIFER ESTABLISHMENT AND THE NATURE AND EXTENT OF CURRENT SPREAD

The Lake Wakatipu area favours the growth of woody species in general including a wide range of introduced conifer species, the earliest of which were established well over a century ago. The acclimatisation of Douglas-fir was initiated in the 1870s in the Queenstown Gardens. Their exceedingly good growth is well exemplified on the conifer clad slopes which provide the backdrop to Queenstown. These trees were the result of plantings and deliberate seeding of Douglas-fir from the 1940s to about the 1960s, and their natural regeneration since that time. Part of the original intention was probably to provide Queenstown with some protection from rock fall and avalanches as well as clothe the perceived bareness of the surrounding landscape.

An example of wilding spread is Mt Aurum where the first introduced trees were planted around the Skippers cemetery about 1880. Small plantings were established close to the homestead and other local buildings soon after. Little natural regeneration occurred until the mid 20th century. Photographs taken in about 1960 show only localised spread, immediately adjacent to the early plantings and on some steep southerly slopes less attractive to grazing stock. A major advance of wilding spread occurred after 1982, when the station was declared a Recreation Reserve (of 9,100 ha) and the land was retired from grazing¹

Another visible example is Queenstown Hill where old photography shows a small group of trees just above town, these trees eventually became the wilding forest seen today. Queenstown Hill was one of the first places that wilding control was carried out in the early 90's as the community started to become aware of the problem with wilding trees and wanted to prevent them taking over the treasured values of Queenstown Hill.

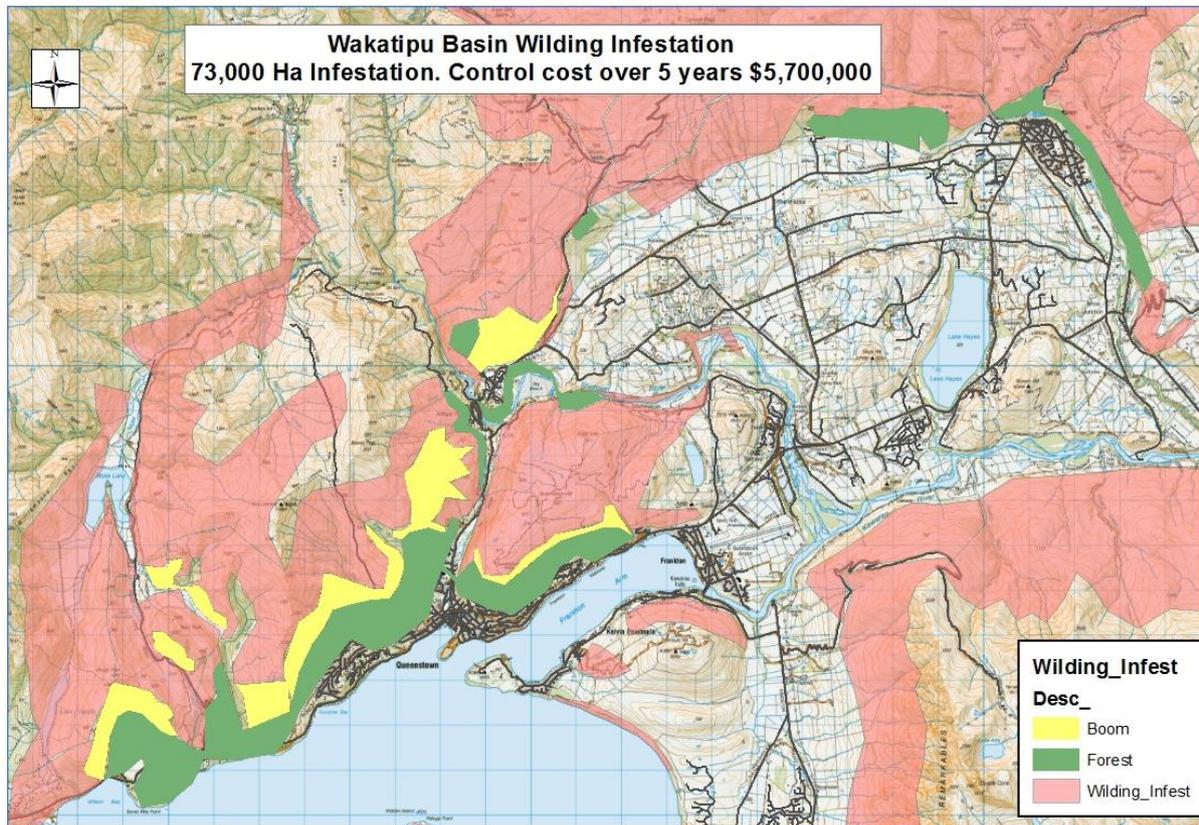
In 1986, local councils established an 180ha commercial Douglas-fir forest on slopes between Coronet Peak and Arrowtown. The plantation is one of the fastest growing Douglas fir forests in New Zealand and it is also the source of seed which is giving rise to wildings some distance downwind. Many other Douglas fir wood lots were planted around the same time, and we are now experiencing the consequences of forests that were planted close to areas of Outstanding Natural Landscape and ecological value.

It is from these and other smaller scale plantations, shelter belts or pockets of established wildings that further wilding conifers will emanate if containment or removals are not undertaken.

This strategies work program does not propose removing all exotic trees, we are focused on removing the wrong tree in the incorrect location, this is captured in the WCG's catch phrase 'We

don't hate the trees, We love the scenery'. Map 1 displays the green belt which is proposed to be contained and not removed. This is from Closeburn to Ben Lomond, continuing around to Frankton, also included in this green belt are the forested slopes behind Arrowtown.

Map 1: Wakatipu Basin Wilding Infestation which permanent displays forested areas in green, boom spraying in yellow and wilding infestation in red.



WILDING CONIFERS AS A RESOURCE

It is acknowledged that conifers can provide shelter, stabilise steep slopes and protect structures from rock slide or storm damage. They can also, particularly if managed properly and reasonably accessed, provide a financial return from timber production. But in most examples around the Wakatipu the inaccessibility and the cost of harvest prevents the wildings becoming a resource.

Over the last four years opportunities have presented for using trees for carbon storage and trading through the Emission Trading Scheme (ETS), but due to the current price of carbon credits and tightening policies this option is not attractive to landowners. Most landowners in the Wakatipu are more interested in controlling or removing the problem, than locking wilding trees into the Emissions Trading Scheme (ETS) and paying the price of on-going control.

Historically tree weeds were eligible for credits in the ETS, which resulted in a perverse incentive to maintain tree weed populations, new rules have been added to the ETS which deter this. Wilding forests land with naturally regenerated tree weeds are now not eligible for entry into the ETS unless the Ministry is satisfied that the risk of the spread is low, this is a deterrent for landowners/lessee's to leave the wilding trees to grow and receive credits for them.

Using wildings as a bio fuel is also of interest, the WCG supports and encourages the evaluation of wildings for bio-energy, to-date the cost of removal and extraction from site have outweighed any financial return.

This Strategy takes the view that the benefits of growing wildings as a resource often do not outweigh the adverse effects which unrestricted spread can have on the district's biodiversity and landscape values, and where this is the case, wilding control and containment are the preferred approaches.

WILDING SPECIES

“Wildings” is the term used for the natural regeneration or seedling spread of introduced trees, occurring in locations not managed for forest production. The term is usually applied to members of the family *Pinaceae*, within which most of the major spreading forestry species of concern occur. Most wildings grow close to the parent seed source and are termed **fringe** spread. Wildings further afield are termed **distant** spread. They grow from seed often wind-blown from exposed **take-off** sites and usually occur as scattered **outlier** trees.

Table 1. Main wilding species found in the Wakatipu

Common name	Botanical name	Spreading vigour	Extent of spread
Douglas-fir	<i>Pseudotsuga menziesii</i>	High	<i>Common and dominant in some areas, scattered individuals common elsewhere</i>
Lodgepole pine, or Contorta pine	<i>Pinus contorta</i>	High	<i>Present in a few areas</i>
Corsican pine	<i>Pinus nigra</i>	High	<i>Common and dominant in some areas, scattered individuals common elsewhere</i>
Scots pine	<i>Pinus sylvestris</i>	High	<i>Common and dominant in some areas, scattered wildings elsewhere</i>
European larch	<i>Larix decidua</i>	High	<i>Common and dominant in some areas, scattered individuals common elsewhere</i>
Mountain pine	<i>Pinus mugo</i>	High	<i>Occurs (mostly planted) in a few areas; especially in Muddy Creek</i>
Radiata pine	<i>Pinus radiata</i>	Medium	<i>Scattered wildings throughout, mainly on warm north-facing slopes</i>

Many other spreading species exist, including deciduous species such as hawthorn, sycamore, willows and poplar in addition to noxious weeds such as gorse, broom and briar rose. This strategy only reports on wilding conifer trees.

The dominant wilding species in the Wakatipu is Douglas-fir (D-fir). Other conifer species are present within the catchment of this strategy have been listed in Table 1, the more vigorous and widespread species being Corsican and Scots pine and European larch. It is fortunate that the most vigorous spreading conifer of them all, Contorta pine, is sporadic around Lake Wakatipu. This species is now listed as a Pest Plant in ORC's Regional Pest Management Strategy (RPMS) and its removal is required under their strategy.

This strategy's vision is the protection of the following values:

- Biodiversity/Conservation - Loss of flora and fauna that is endemic (unique) to the Otago region as wilding conifer canopy closure dominates and degrades native flora and fauna habitats.
- Landscape and Aesthetic - Loss of visual amenity from the views of beautiful golden tussock glacial landscapes being spoiled, the scenery is a key reason why people visit Otago and tourism drives the local economy.
- Recreational opportunities - are disturbed, such as tramping, walking, running and cycling.
- Loss of productive farmland – the timber in most wilding conifers species has little economic use and a closed conifer shades out grazing species.
- Loss of historic features and archaeological sites from canopy closure, for example, wildings are obscuring historic sites in Skippers, Queenstown.
- Hydrology (water yield) -closed canopy lowers water yield into rivers/catchments due to canopy interception and evaporation.
- Native Bush Line - as exotic conifers have no natural control in New Zealand and can grow well above the altitudes of our natural tree line they will eventually cover and destroy the native vegetation which exists there.
- Fire – if left to grow around urban areas wilding conifers can create a significant fire risk.

IF LEFT WILDING CONIFERS WILL BRING ABOUT 100% CHANGE TO THE WAKATIPU LANDSCAPE.

FACTORS INFLUENCING SPREAD

Conifers grow exceptionally well in the Wakatipu compared to their countries of origin. This is due to there being more even rainfall distribution and considerably lower pathogen loads. In addition, the combination of warm days and cool nights promotes very efficient carbon absorption which translates to good growth rates. The suitability of the local conditions is also reflected in the ability of conifers to readily self propagate, or spread. The main factors influencing wilding spread² are:

- Species present. Some conifer species spread far more readily than others (some rarely spread in New Zealand).
- Location of seed source trees, particularly relevant to topographic exposure to strong prevailing winds. Hence the importance of not positioning spread-prone conifers on exposed 'take-off' sites, as conifer seed is light and winged and well adapted for wind dispersal.
- Surrounding vegetation cover and land management. Spread is most likely to occur on undeveloped, lightly vegetated and / or lightly grazed land. Such conditions are most common on cooler, south facing slopes.
- Presence of supporting mycorrhizal symbionts (fungi) in soils receiving seed.
- Absence/Presence of browsing stock and feral animals (goats, hares, rabbits). The current trend to destock and control wild animals often leads to a surge on wilding presence.
- Combinations of temperature and wind. Mature, cones are opened by warm temperatures in late summer and autumn. If this occurs during strong winds then the opportunities for distant dispersal are much higher which is typical of the Wakatipu.

Conifer wildings lend themselves to control, as they are visually obvious, and their direction of spread (downwind), and age when significant seed production begins (usually 10-15 years) is very predictable. Hence there are good opportunities to intercept the spread sequence early in the cycle, and prevent wildings becoming dominant and uncontrollable. This potential for 'a stitch in time saving nine' is why DOC lists wilding control as one of the most cost-effective operations it can undertake³. Unfortunately, such a realisation is comparatively recent, and comes after many years of uncontrolled spread which has caused the cost of control to become financially demanding.

WHO IS AFFECTED?

The spread and control of wilding conifers has far-reaching implications for everyone. In particular, the unique landscapes of the Wakatipu area contain large open, treeless slopes which can readily be invaded and significantly transformed by wilding spread.

Those who live within the Lakes District will be affected if tracks like Ben Lomond, Queenstown Hill, Sawpit Gully and Seven Mile are permitted to become increasingly shaded. There would be adverse impacts on track surfaces, and views towards the lakes and mountains will be lost, affecting tourism and also affecting future generations.

A conifer-dominated landscape would have implications for the industries reliant on tourism and filming; these may be positive or negative depending on the expectations and awareness of visitors or clients. This strategy takes the position that the spread of wildings into the surrounding landscape would result in too many negative impacts which are likely to outweigh benefits associated with wilding stands.

Fire risk (intensity) is increased when wilding conifers dominant a landscape, especially if an absent landowner lets their wilding trees grow up around residential areas. There are examples of this around the Closeburn and Alpine retreat, and potentially Mt Dewar if wildings are left unmanaged.

The adverse impacts on recreational and landscape amenity values created by felling or spraying programmes can cause temporary losses or degradation of visual landscape. Where possible, operational planning, notification and education and should aim to avoid such negative impacts.

Unightly and obvious standing dead trees, however, are a small price to pay compared with the potential of dispersal of millions of seeds.

RESPONSES BY LAND MANAGERS

Land managers of pastoral properties stand to lose grazing and landuse change opportunities as open tussock grasslands are colonised by wildings. Land threatened by conifer invasion will require additional management inputs such as over-sowing or top dressing to encourage stock to graze areas where seedling numbers are increasing. Infestations may force managers to invest limited resources in contract staff to hand-clear conifers, re-align farm subdivision (fencing) or burn slopes.

Farm management regimes can be effective in controlling the spread and preventing the establishment of conifers, but this is at a cost to the farming operation as a whole and can induce decreased biodiversity of the infested site. For example, a regime of top dressing will improve the

vigour of the existing vegetation cover and encourage preferential grazing, which in turn will suppress wilding numbers, but this can come at a cost to any native species present. Similarly, over-sowing with nitrogen-fixing clovers and pasture grasses will further improve the pasturage values but will obviously introduce an exotic component within the vegetation. However, where land is managed primarily for farming, such outcomes may be desirable and beneficial.

Ben Lomond Station has been successful in keeping parts of the Station free of wilding by using a combination of site management tools. They use fire as a tool clearing areas with controlled burns, then return with fertiliser and stock the area. Grazing is especially effective on very young seedlings (1 to 2 years old).

Private landowners/lessee's who neighbour DOC Reserves and vice versa need to partnership with each other so that control can be achieved by both parties, control will not work if one neighbour does not buy into the program. Wind-blown conifer seed knows no boundaries.

In either event, the fundamental need to control wilding conifers remains. Unless conifers are removed, the maintenance of biodiversity, landscape, recreational and historical values within susceptible areas will continue to be at risk.

WILDING TOOLS

New technology offers numerous tools for wilding control, the simplest way to determine the most appropriate tool is to first evaluate the size of the wildings present and then the density.

Queenstown has variable wilding sites, the spread, topography and species are unique to each area and therefore a 'one tool' fits all approach is not suitable. Each site is assessed to determine the most cost effective tool.

Many new tools have been developed over the last few years, some are still being refined. Boom spraying has been used with much success over the period since the last strategy document was prepared and this has meant that large areas of wilding conifers have been successfully controlled.

A new tool is the 'basal bark' application, where a herbicide mix is applied to the bottom of the tree, this method can be faster and more effective than traditional ground based methods when used on suitable sites where there is adequate access for chemical refills.

Most tools can be used on any species, but the herbicide brews used in boom sprays are adjusted depending on the species present. Basic to most spray brews is 80% canola oil which ensures no drift and helps the spray to adhere to slippery conifer needles. In Queenstown WCG uses 'Answer' (Metsulfuron) to control Larch and Douglas fir and recently in controlling Contorta Pine on the bottom faces of Coronet Peak and in the Von Valley. WCG is trialling brews and rates on Corsican, Scots, and Mugo pine. Boom spray operations can take up to two years before the chemical uptake

is completed in the tree, therefore it is important not to draw conclusions on the results of the operation too soon.

Table 2: Summarises the wilding tools currently used in the Wakatipu for wilding control

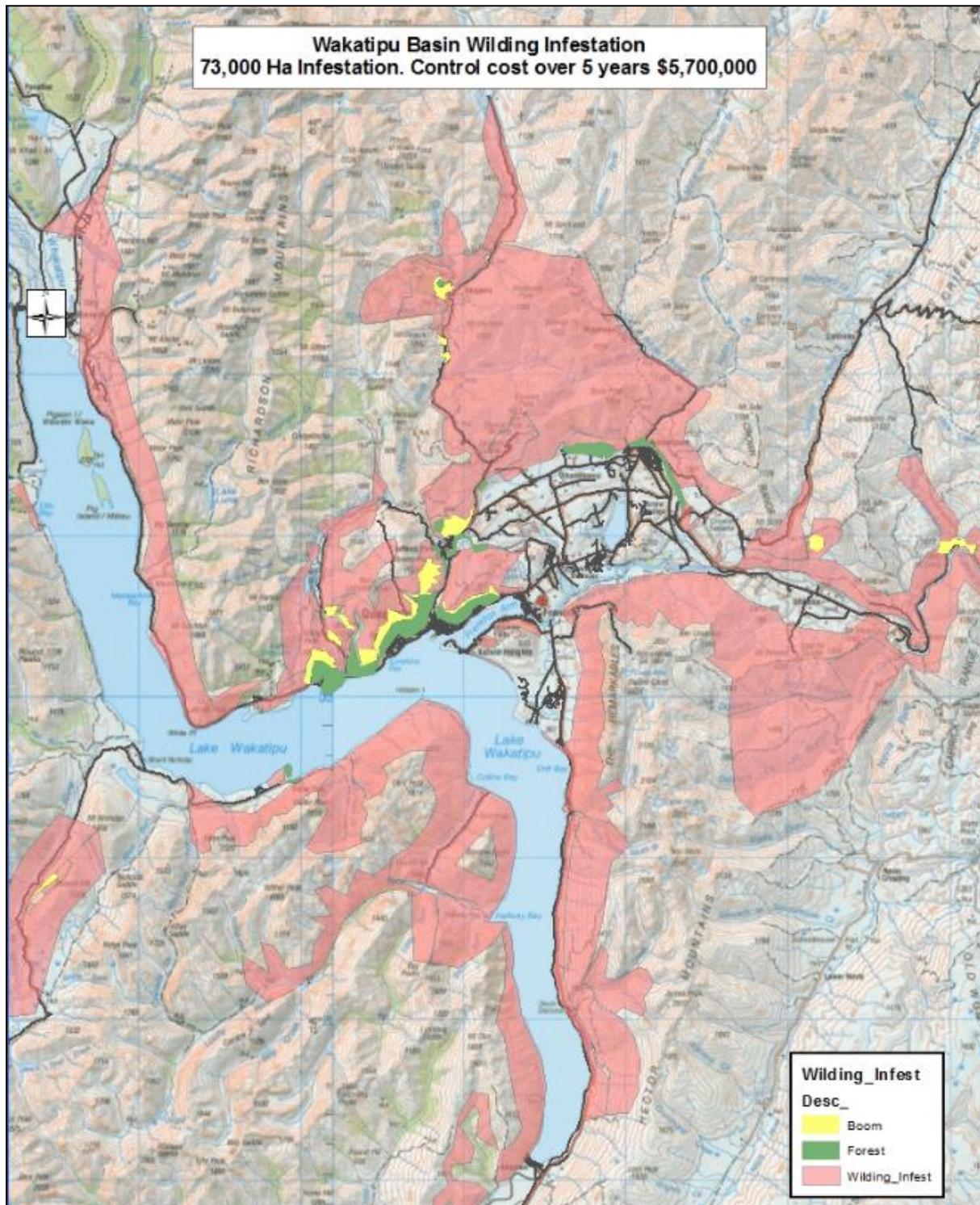
Wilding Control Tools	
Ground Crew	Trees removed using chainsaws, hand tools, lopper and saws, every green needle must be removed from the stump
Skid Hopping	Using helicopters to move crew ground crew members to areas with trees, where trees are hard to access
Ground Basal Bark	New ground technique, the bottom of the tree is treated with herbicide
Scrub Bar	Best used on flat or following country, the scrub bar cuts the tree and then chemical is applied to the stump so that if any green foliage is left the tree will not survive.
Helicopter Boom Spray	Herbicide is applied via boom from a helicopter (this method of application is commonly used in agriculture).
Helicopter Spot Spraying Lance /Wand	Herbicide is applied directly onto the tree using a lance/wand from a operator sitting in the helicopter
Spot Spraying Pole	Herbicide is applied directly onto the tree using a pole which is attached to the front of the helicopter
Machine, Digger/Mulched	Used to remove dense stands where wildings are accessible
Stem Poisoning	Most useful for large trees in difficult access/rocky terrain, and in bush/scrublands where felling can create light-wells and promote new wilding establishment
Site Management Tools	
Burn	Small wildings and possibly dense stands of medium/large trees
Fertilise	Mainly prevention, effective by increasing competition of existing vegetation (especially grasses).
Grazing	Mainly prevention, only effective on very young seedlings (1-2 years old).

THE EXTENT AND MANAGEMENT OF WILDING CONIFER SPREAD

The purpose of a control program is to protect the quality and values of a site (or neighbouring site) by implementing a system to eradicate, contain or reduce the extent (and therefore negative impacts) of wilding conifers.

Map 2 presents the extent of wilding conifer spread within the Wakatipu. The species within any one area varies, on most sites more than one species is present.

Map 2: Extent of wilding conifer spread within the Wakatipu



Key - extent description:

Boom spray areas in yellow— dense spread closed canopy

Forest in Green - closed canopy forest, to be contained but not removed

Wilding infestation – scattered spread (medium and sparse wilding outliers)

A November 2011 work shop calculated the cost to control wildings in the Wakatipu at 5.7 million, this includes a budget of \$700,000 for Coronet Peak Station (the Station had completed work prior to 2011, so the budget was calculated at less than 1million). After removing Coronet Peak Stations budget the amount required to control wildings over the 5 year period is approximately 5 million (table 3).

Funding is confirmed for year one of the strategy (2012-2013) and the work program for this period is underway.

Table 3: Budget and funding required for the 2012-2017 strategy:

Status	Strategy	Year	Budget	Sub-totals
	Year 1	2012-13	\$745,000	
Confirmed:				\$ 745,000
	Year 2	2013-14	\$1,063,223	
	Year 3	2014-15	\$1,063,223	
	Year 4	2015-16	\$1,063,223	
	Year 5	2016-17	\$1,063,223	
To Raise:				\$4,252,892
TOTAL:			\$4,997,892	

Further aerial surveys were completed during 2012 by DOC and QLDC to assess the extent of wildings, the budget and work program was refined to reflect the results of the survey.

The Wakatipu catchment was evaluated for wilding content and broken into work areas by the information gathered in the aerial assessment.

Table 4 displays the results of the assessment, this is linked to the GIS and Map 2 displays the management units. Each area has been named according to the location and has been evaluated for spread type and the 'best fit' wilding tool or operation has been assigned to the area.

In some areas wilding conifers are present or dominate, but in other areas wilding presence is minor, spread has been classified into four categories depending on the density of the infestation:

- Containment – forest plantations
- Dense infestation – closed canopy mature conifers with fringe spread
- Medium Scattered – open canopy scattered outliers
- Sparse Scattered – isolated outliers

No two sites in the Wakatipu are the same in terms of species, density, topography, site access, age of trees. These factors influence which operational tool will be selected to remove the wilding threat, the tool selected is recorded as the operational type in the table. The most cost effective tool has been selected when assessing the site, access, slope and spread type.

The cost per hectare is calculated using contractor and chemical rates, the cost per ha is then estimated from tree density information gathered during aerial surveys.

The 2008 strategy's focus was aimed at keeping 'clear areas clear'. The 2013 strategy continues to keep areas clear but examines how and why clear areas are being infested. The work program's goal is to remove or replace the seed sources which are causing of the wilding problem. By investigating the seed source that is causing the problem and then looking at solutions to remove or contain the wilding trees. The strategy is to limit return visits and reduce future control costs.

The work programme below deals with stage one of control which is 'initial attack', whereby we are:

- Removing seed sources which contain coning trees.
- Removing scattered coning outlier trees
- Removing trees from take-off sites
- Containing dense infestations

The next stage is to keep treated areas clear. These areas will be handed back to the landowner to take responsibility of controlling any further conifer invasions.

As seed has no boundary and is dispersed mostly by wind, the identified wilding work areas are not grouped by Landowner or Station, they are instead classed by area and named after the closest landmark. Wilding work areas cross property boundaries and are grouped by type of operation.

Boom spraying is an efficient option as an eradication tool or as a containment tool. It is used as a containment tool to spray strips of mature trees on steep slopes pulling the spread back from take-off sites; this technique reduces the volume of seed spreading further by creating a wall of dead trees which act as a sieve.

A short term drawback of this method is the unsightly strip of standing dead trees; however this is a small price to pay compared with the potential dispersal of millions of seeds. The dying trees eventually turn grey and blend into the landscape as the grasses return to the site. A fine example is Queenstown hill which was sprayed in January 2009.

Table 4: Management units, operations and costs for the 2013-2017 strategy work program:

Name	Operational Type	Spread Type	Area	Cost per Ha	Total Cost
8 Mile Wedge Peak	Boom	Dense infestation	146	1,700	\$ 248,200
Arrowtown Faces	Forest	Containment	171	0	\$ -
Arthurs point	Forest	Containment	44	0	\$ -
Below Coronet Rd	Ground Crew	Medium Scattered	27	800	\$ 21,600
Ben Lomond	Boom	Dense infestation	194	700	\$ 135,800
	Heli Crew Drop	Medium Scattered	853	300	\$ 255,900
	Lance Low	Sparse Scattered	1,680	15	\$ 25,200
Ben Lomond 5 mile	Boom	Dense infestation	84	1,200	\$ 100,800
Bobs Cove	Ground Crew	Medium Scattered	304	250	\$ 76,000
Bowen Peak	Boom	Dense infestation	197	500	\$ 98,500
	Heli Crew Drop	Medium Scattered	328	300	\$ 98,400
Branches	Lance Low	Sparse Scattered	1,213	5	\$ 6,065
Bushy Creek	Boom	Dense infestation	65	1,500	\$ 97,500
Cecil Peak	Heli Crew Drop	Medium Scattered	7,444	20	\$ 148,880
	Lance Low	Sparse Scattered	2,519	7	\$ 17,633
Closeburn	Boom	Dense infestation	38	1,500	\$ 57,000
	Ground Crew	Medium Scattered	34	3,000	\$ 101,550
	Heli Crew Drop	Medium Scattered	1,123	50	\$ 56,150
	Heli Crew Drop	Medium Scattered	511	150	\$ 76,650
Cone Peak	Ground Crew	Medium Scattered	395	30	\$ 11,850
Cone Peak East	Lance Low	Sparse Scattered	6,429	15	\$ 96,435
Coronet Forest	Forest	Containment	226	0	\$ -
	Lance Low	Sparse Scattered	102	196	\$ 20,000
	Ground Crew	Medium Scattered	100	409	\$ 40,900
Coronet Ski Field	Ground Crew	Medium Scattered	618	40	\$ 24,720
Crown Range Terrace	Lance Low	Sparse Scattered	801	3	\$ 2,403
Crown Range Zig Zag	Ground Crew	Medium Scattered	103	100	\$ 10,300
Doolans Left Branch	Lance Low	Sparse Scattered	5,683	7	\$ 39,781
Glencoe	Lance Low	Sparse Scattered	1,271	10	\$ 12,710
Glenorchy Lake Faces	Lance Low	Sparse Scattered	5,542	9	\$ 48,794
Gorge Rd	Ground Crew	Medium Scattered	78	1,000	\$ 78,000
Greenstone	Heli Crew Drop	Medium Scattered	150	150	\$ 22,500
Greenvale_Allandale	Lance Low	Sparse Scattered	1,242	5	\$ 6,210
	Skid Hopping Dense	Sparse Scattered	2,105	50	\$ 105,250
Honecks Sainsbury Terrace Skippers	Boom	Dense infestation	45	2,520	\$ 113,400
	Ground Crew	Medium Scattered	2,000	40	\$ 80,000

Name	Operational Type	Spread Type	Area	Cost per Ha	Total Cost
Kelvin Heights	Ground Crew	Medium Scattered	57	20	\$ 1,140
	Ground Crew	Medium Scattered	135	5	\$ 675
Kelvin Peninsula	Ground Crew	Medium Scattered	44	100	\$ 4,400
Lakeside East	Ground Crew	Medium Scattered	27	70	\$ 1,890
Loche Linnhe	Heli Crew Drop	Medium Scattered	914	30	\$ 27,420
	Lance Low	Sparse Scattered	4,059	5	\$ 20,295
Loche Linnhe Rd (State Highway 6)	Ground Crew	Medium Scattered	1,220	700	\$ 854,000
Low Burn	Lance Low	Sparse Scattered	949	20	\$ 18,980
McKinlays Creek	Lance Low	Sparse Scattered	1,354	15	\$ 20,310
Mount Dewar	Boom	Dense infestation	156	700	\$ 109,200
	Heli Crew Drop	Medium Scattered	225	200	\$ 45,000
	Lance Low	Sparse Scattered	1,212	60	\$ 72,720
	Forest	Containment	38	0	\$ -
Mount Difficulty	Heli Crew Drop	Medium Scattered	28	850	\$ 23,800
	Lance Low	Sparse Scattered	1,553	3	\$ 4,659
Muddy Creek	Boom	Dense infestation	70	2,861	\$ 200,260
	Heli Crew Drop	Medium Scattered	337	300	\$ 101,100
Queenstown Hill	Forest	Containment	1,149	0	\$ -
	Boom	Dense infestation	67	700	\$ 46,900
	Ground Crew	Medium Scattered	1,196	100	\$ 119,600
Remarkables	Lance Dense	Medium Scattered	2,429	72	\$ 175,000
Roaring Meg	Boom		117	700	\$ 81,900
	Heli Crew Drop		738	150	\$ 110,700
Seven Mile	Ground Crew	Medium Scattered	58	2,000	\$ 116,000
Skippers	Boom	Dense infestation	79	500	\$ 39,500
	Forest	Containment	18	0	\$ -
	Heli Crew Drop	Medium Scattered	1,053	100	\$ 105,300
	Boom	Dense infestation	100	700	\$ 70,000
	Lance Low	Sparse Scattered	1,325	10	\$ 13,250
Swift Burn	Ground Crew	Medium Scattered	9	4,000	\$ 36,000
	Ground Crew	Medium Scattered	40	300	\$ 12,000
Tucker Beach	Forest	Containment	87	0	\$ -
	Ground Crew	Medium Scattered	59	500	\$ 29,500
Von Valley	Boom Pine	Dense infestation	41	1,200	\$ 49,200
	Heli Crew Drop	Medium Scattered	96	700	\$ 67,200
	Heli Crew Drop	Medium Scattered	22	700	\$ 15,400
	Lance Low	Sparse Scattered	5,239	3	\$ 15,717
Von South	Ground Crew	Medium Scattered	7	400	\$ 2,800
Waitiri	Lance Low	Sparse Scattered	1,893	15	\$ 28,395
Walter Peak	Forest	Containment	37		\$ -
	Ground Crew	Medium Scattered	70	100	\$ 7,000
	Lance Low	Sparse Scattered	1,560	10	\$ 15,600
TOTAL					\$ 4,997,892

Once an operation is complete it is recorded in a GIS database, the GIS databases provide a benchmark of wilding spread to which future data can be added and summaries changed, information can be summarised, updated and reported on.

The above table represents a system that will provide QLDC, DOC and the WCG with a reasonably robust guidance for prioritising the sites requiring management.

If removal or eradication is carried out as per the work program ('a stitch in time saves nine') worthwhile results will be both possible and practically attainable. In all cases there will be further spread if no change in management is adopted, seed spread is exponential once a tree reaches coning age. Often there is reinvasion after removal of seed bearing trees because their seedlings are likely to germinate. Therefore once an area is clear resources have to be made available to keep it clear, this is where this strategy hands back control (which will be a much more manageable level) to the landowner.

It is acknowledged that the control program described above involves an element of subjectivity; however, all "objective" systems rely on individual judgements at some level.

Budgeting time and finance to set up and monitor transects to give data on species, invasion and reinvasion is planned. National transept standards are in the process of being adopted. Results from transects, although long term, offer hard data for auditing the best use of finance and methods of control.

REGULATORY OPTIONS

QLDC can support the strategy, and the WCG through the Resource Management Act (RMA) processes, the Resource Consent process, and by endorsing locally driven initiatives.

The Resource Management Act 1991 aims "to promote the sustainable management of natural and physical resources". In achieving this, Council must manage use, development and the protection of natural and physical resources in a way that, among other things safeguards the life-supporting capacity of ecosystems (*from S 5 RMA*). Section 6 of the RMA requires that matters of national importance be recognised by Councils in relation to the management of "use, development, and protection of natural and physical resources". The Act recognises the following matters as being of 'national importance':

Section 6 (b) *the protection of outstanding natural features and landscapes from inappropriate subdivision, use and development, and (c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.*

The NZ Forest Owners Association Code of Practice (2007) includes a requirement to manage wilding trees from forestry. The Ben Lomond and Queenstown Hill management plan⁴ includes a commitment to wilding control in and around the forests in those reserves. The plan

supports an ongoing programme of wilding control in the tussock grassland and sub alpine areas including the provision of signs to inform the public of the wilding conifer issue and the steps they can take to contribute to control.

The RMA requires Council, through its District Plan to be responsible for managing the adverse effects of land use activities.¹The Queenstown Lakes District Plan was made fully operative on 10 December 2009 and provides Council with discretion over forestry and tree planting and thereby the management of wilding conifers (directly and indirectly). The plan is in the process of being reviewed as the majority of the document was made operative in 2003 and is consequently approaching its ten year review date, this is a chance to review the current rules and objectives.

The 2013 review is an opportunity to add the latest version of the Decision Support System (DSS) into the District Plan. The DSS is a calculator which informs decision makers of the risks of wilding trees from new forestry plantings by taking account of species type, location, surrounding land uses and vegetation cover. DSS which was developed by Nick Ledgard a retired SCION Scientist and former Manager of the National Wilding Group. The DSS was peer reviewed in 2011 by stakeholders such as SCION, MPI, DOC, Local Government NZ, the Forestry Sector and Conservation Organisations of Aotearoa.

The Resource Consent process provides a means by which QLDC can assist the implementation of the goals of this strategy by encouraging land owners/managers to avoid, remedy or mitigate any potential adverse effects associated with shelterbelt, woodlot or larger tree planting applications.

Regional Pest Management Strategy (RPMS) is administered by The Otago Regional Council (ORC). ORC is the “lead pest management agency in terms of pests that justify a regional response” and its roles and responsibilities are outlined in section 3.3 of their RPMS which has power over the entire Otago region. All land occupiers are “responsible for ensuring any pest plants on land they occupy are controlled in accordance with the rules of the RPMS”.⁶ ORC as the administrator of the RPMS is responsible for ensuring compliance with the requirements of the RPMS.

The Otago Regional Policy Statement says:

10.5.3 To reduce and where practicable eliminate the adverse effects of plant and animal pests on Otago’s communities and natural and physical resources through:

- a) Developing strategies to effectively manage Otago’s plant and animal pests; and*
- b) Educating about the responsibilities of all parties in the management of Otago’s plant and animal pests; and*
- c) Adopting the most practicable method of pest control while safeguarding the environment.*

Lodgepole/ Contorta Pine (*Pinuscontorta*) has been declared under the RPMS to be a pest plant and is subject to total control within the area encompassed by the Wakatipu Wilding Conifer Strategy (under Section 4.1 (iii)).⁶

The Reserves Act 1977 is subject to the control of the Minister of Conservation and is administered by the Department of Conservation. Under Sections 16 and 28 of the Reserves Act local authorities (QLDC in this instance) in which reserves are vested or which are appointed to control and manage reserves, must do so in accordance with the particular purpose for which the reserve has been classified.

The Act requires the Department of Conservation and the local authority to, amongst other things, preserve areas possessing indigenous flora and fauna, or areas of environmental and landscape amenity or interest that are protected as reserves under the Act. The Act specifically requires that the exotic flora and fauna shall as far as possible be exterminated from scenic reserves (section 19(2)(a)), nature reserves (Section 20(2)(b)), and scientific reserves (Section 21(2)(a)).⁸

The Conservation Act 1987 provides for the management, protection, preservation or restoration of natural areas and resources administered under it. This includes the preparation of management plans or management strategies which more closely describe that management.

The Land Act 1948: Pastoral lessees are responsible for biosecurity issues under the terms and covenants of the pastoral lease and must comply with the Biosecurity Act 1993.

REFERENCES

1. Ledgard, N. (1990): **The Spread of Introduced Conifers at Mt Aurum Station: Background, Present Situation, and Management Options.** Forest Management and Productivity Section, Forest and Wildland Ecosystems Division. Prepared for Department of Conservation, March 1990.
2. Harding, M. (2001): **South Island Wilding Conifer Strategy.** Department of Conservation, Wellington. 54pp. plus appendices.
3. T. Stephens; D. Brown; N. Thornley (2002): **Measuring conservation achievement: concepts and their application over the Twizel area.** *Science for Conservation 200.* 114 p.
4. Queenstown Lakes District Council (2005): **Ben Lomond and Queenstown Hill Reserve Management Plan.**
5. Queenstown Lakes District Council (2009): **Fully Operative District Plan**
6. Otago Regional Council (2006): **Pest Management Strategy for Otago.** Otago Regional Council, Dunedin.

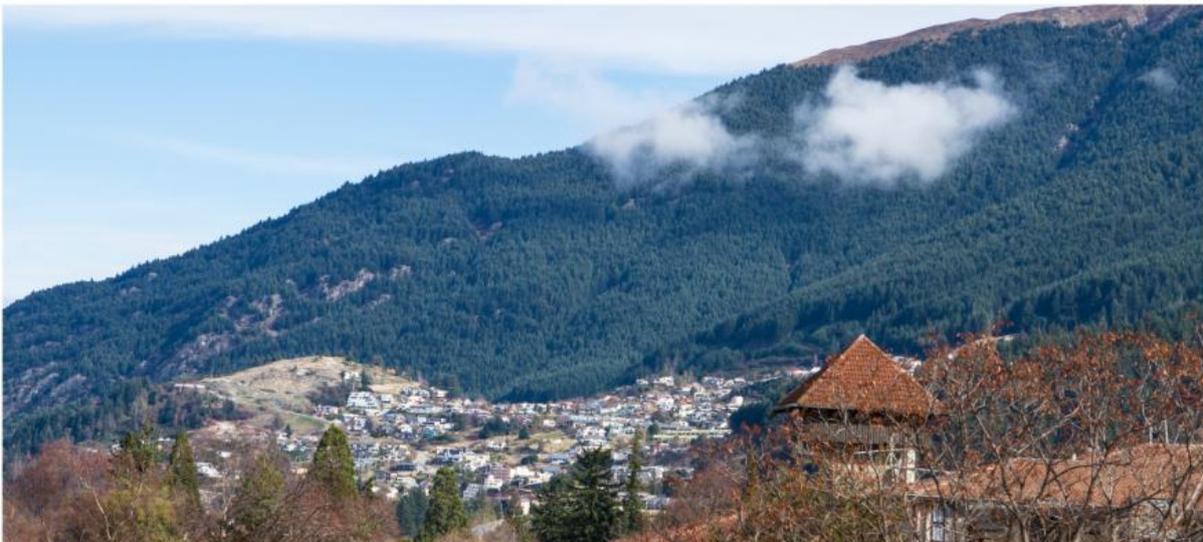
7. NZ Forest Owners Association, **Code of Practice (2007)**
8. Queenstown Lakes District Council, (2002): **Tomorrow's Queenstown: Vision, Issues and Directions**. 7 – 11 July 2002 Final Report

APPENDICES

Appendix 1 Photographs:



1992



2012

Figure 1: Shows 20 years of wilding spread on Ben Lomond Ridge behind Queenstown, from 1992 to 2012, the face is now covered in dense Douglas fir.

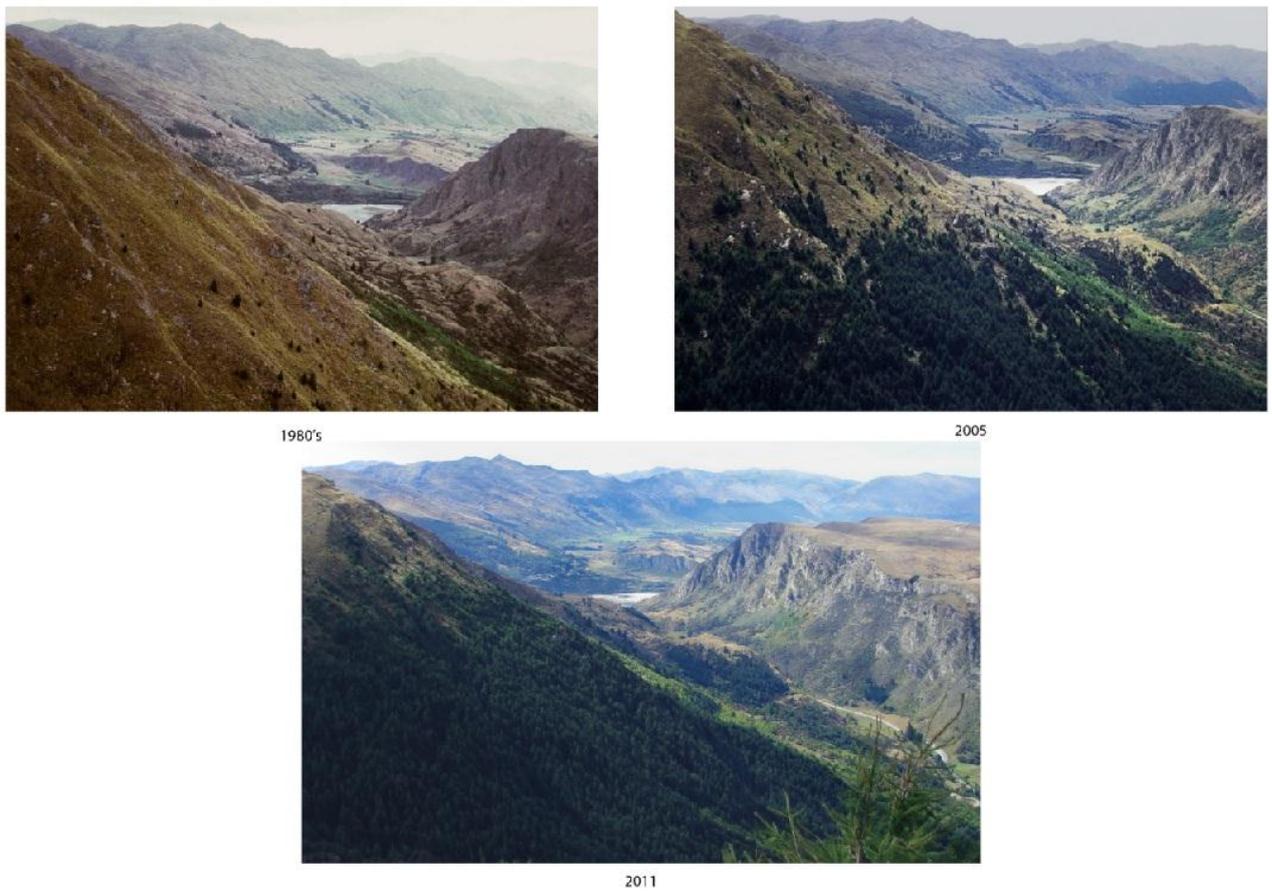


Figure 2: Demonstrates the spread of wilding Douglas fir into closed canopy on Bowen Peak from 1980's till 2011



Figure 3: Example of containment Boom Spray on Bowen Peak



Figure 4: Example of Corsican Pine containment boom spray on Home Hill



Figure 5: Wilding volunteer group Ben Lomond November 2012 *(photo courtesy of Emily Anderson)*



Figure 6: Wilding volunteer group Ben Lomond November 2010 *(photo courtesy of Emily Anderson)*



Figure 7: The Von Valley Mt Nicolas Station, Contorta Pine planted by Lands and Surveys, and example of where the WCG is working towards complete eradication of wilding conifers in the Wakatipu.



Figure 8: The Remerakables, 70,000 wilding trees have been taken off the Remarkables over the last 7 year by DOC.