

GORGE ROAD WETLAND ENHANCEMENT PLAN

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Natural Solutions *for Nature* Ltd

Contract NSN 19/09

For

Queenstown Lakes District Council

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1.0 Site Details

1.1 Location

The Gorge Road wetland is found on the valley floor of the Queenstown Gorge, about 1.5 kilometres north of Queenstown. It is visible from the Gorge Road and as such forms an important element of the approach to Queenstown from Arthur's Point.

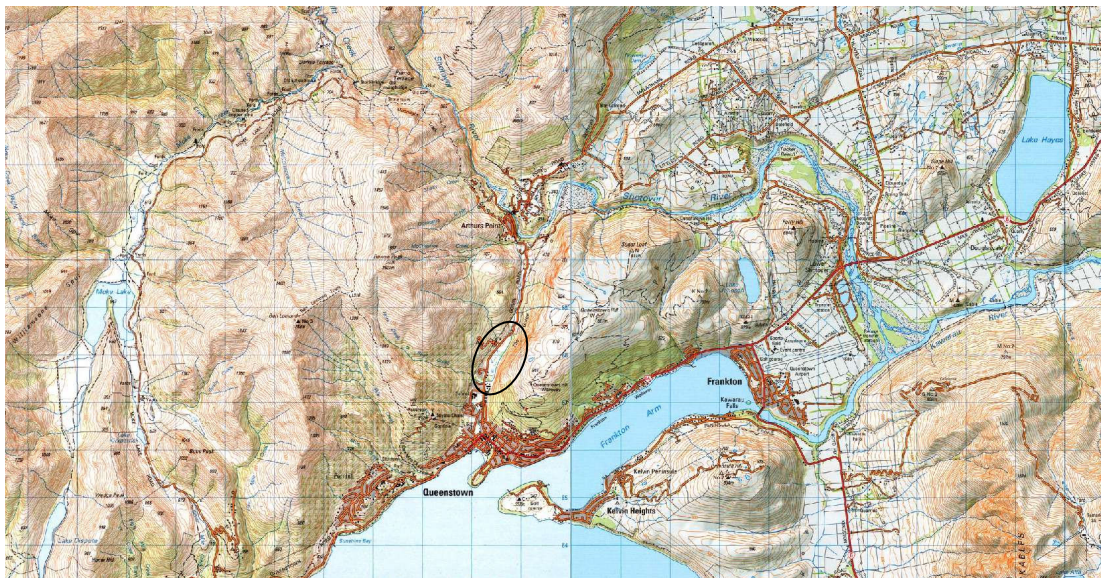


Figure 1 – Location of Gorge Road wetland. Map source: MapToaster.

1.2 Classification

The Gorge wetland is a swamp¹ containing mineral substrates with more organic soils in the southern portion behind the detention dam. Leads of standing water and slow moving flow provide permanent internal flow throughout.

1.3 Legal Description

The Gorge Road wetland is legally described as Lot 2 DP 20808, Lots 1-2 DP 22790.

Appendix 5 of the Partially Operative District Plan ('the Plan') identifies the area as one of significant indigenous vegetation (126A) with a *Carex secta* stand and habitat important for invertebrates. It is also designated in Appendix 1 (83) of the Plan as a local purpose reserve (drainage). This designation requires that no structure or placement of fill shall reduce the storage capacity of the detention dam. Refer to Figure 2 – District Plan Map 32.

The Otago Regional Council (ORC) Regional Plan: Water currently lists the wetland - 'Gorge Swamp' in Schedule 10 ('additional wetlands' whose values have not been assessed). The boundary of the wetland identified by ORC extends beyond the scope of this enhancement plan. Refer to Figure 3; Regional Plan: Water Wetland Map².

¹ Johnson and Gerbeaux (2004): page 29; 2.5.3 Swamps

² ORC letter from Dale Meredith (Manager Policy) dated 6 April 2009 to QLDC. A review of wetland provisions in the Regional Plan may result in a proposed plan change which includes adding Schedule 10 wetlands to Schedule 9 Significant Wetlands and amending the rules to require assessment of all the Type A and B wetland values for any consent. Under the proposed Plan Change, The Gorge Swamp would be included in Schedule 9 Significant Wetlands and would be subject to the significant wetland rules.

The south eastern boundary of the wetland reserve adjoins the Queenstown Hill Recreation Reserve.

2.0 Site Description

2.1 Wetland catchment

The gorge in its present size and form was likely to have been 'scoured, smoothed and sculpted' by more than one cycle of glaciation as ice from the main Wakatipu Glacier spilled over Queenstown Hill and through the gorge³. The valley floor is underlain with a mixture of alluvial and colluvial deposits⁴.

The Land Environments of the catchment range from Q2.2a on the upper most slopes down to Q2.2b on the mid to lower slopes and periphery of the wetland. The wetland proper is classified as N5.1.c changing to N.4.1.d as it steps down Horne Creek to the south⁵. The later two land environments are acutely and chronically threatened (Walker et.al., 2007).

Moderately drained pallic soils⁶ are found within the gorge. Mechanical disturbance associated with willow control has revealed dark, organic and gleyed soils. Streams draining Queenstown Hill and Bowen Peak collect into Horne⁷ Creek which drains into and through the wetland. Brewery⁸ or Bush Creek flows from Bowen Peak and joins Horne Creek just upstream of the detention dam culvert and grate. Horne Creek then flows underground through culverts surfacing again from under Robins Road to the south.

The upper slopes of Bowen Peak are vegetated by mixed short to tall tussock grassland at the highest elevations with a dense forest of Douglas fir* (*Pseudotsuga menziesii*) dominating the mid to lower slopes. In the northern part of the catchment Sycamore* (*Acer pseudoplatanus*) and Hawthorn* (*Crataegus monogyna*) as well as Larch* (*Larix decidua*) grade into more open canopies and are mixed with open, indigenous shrubland. The mixed exotic – native shrubland gives way to pasture and then wetland on the valley floor. On Queenstown Hill, indigenous heath and short tussock grassland surround tarns and wetlands perched on the top of the roche montanee. The western flanks are dominated by Hawthorn*, Sycamore* and *Cotoneaster glaucophyllus** with indigenous vegetation providing a strong component. Species present include matagouri (*Discaria toumatou*), kowhai (*Sophora microphyllum*), kohuhu (*Pittosporum tenuifolium*), broadleaf (*Griselinia littoralis*), tree daisy *Olearia avicenniifolia*, mingimingi (*Coprosma propinqua*), pohuehue (*Muehlenbeckia australis*), bush lawyer (*Rubus schmidelioides*) and short tussock species (*Poa cita*, *P. colensoi*). Prickly shield fern (*Polystichum vestitum*) is present on the lower slopes adjoining the wetland.

*Pinus radiata** is present on the drier rocky faces of the south eastern edge of the gorge above Queenstown. On balance, it is estimated that up to 40 percent of the catchment is dominated by introduced species, Refer - Figure 4.

³ Barrell, D.J.A. (2001): page 3

⁴ Barrell, D.J.A., Riddolls, B.W., Riddolls, P.M. and Thomson, R (1994): Map accompanying report.

⁵ Lawrence, B (19/6/09) Department of Conservation; personal communication.

⁶ www.growotago.org.govt.nz retrieved 27/5/09

⁷ The spelling of Horne Creek has been taken from a number of QLDC documents which provide a history of flooding and background of reserve management.

⁸ Brewery Creek took its name from the Lion Brewery historically located on Bowen Street, pers comm. Karen Swaine and David Clark, Lakes District Museum, 28/5/09

Horne Creek and the southern portion of the wetland are vulnerable to pollution events from the Queenstown Industrial area and spills that may occur along upper Gorge Road.

The median rainfall in the area is 701 to 750mm. The site experiences a cold “gorge wind” and an estimated 241 to 255 frost free days per year at the northern end and 211 and 225 days per year at the colder southern end. The gorge’s north-east to south west axis and physical confinement between Bowen Peak and Queenstown Hill results in it being shaded from early morning and late afternoon sun.

A track around the wetland was established in 2007/08.

2.2 Ecological Context

Historically, the catchment would have been vegetated by mountain beech forest (Q2.2.a and b) with woodland comprised of matagouri, small-leaved coprosmas and olearias, native broom and kowhai with abundant lianes such as *Rubus* and *Muellenbeckia* in the lower reaches (N.4.1.c environment) approaching Queenstown. Swamps within N5 environments such as the one present in the Queenstown Gorge were dominated by silver tussock on rises, red tussock on damper ground, *Carex sinclairii* and *C. coriacea* in wet hollows and *C. secta* in deeper water. While N Environments are generally drier, wetlands are not uncommon within them (Leathwick et.al, 2002; Leathwick et.al., 2003). Large swamps are mapped as N7 within the N5 environment but few swamps within the Wakatipu Basin’s N5 environments have been identified by the Land Environment New Zealand (LENZ) classification system. The Gorge Road swamp at about 12.95 hectares in area is among the largest of these.

On a national scale, just over 10 per cent of the original extent of wetlands remains across New Zealand (4.9 per cent of the original area in the North Island, and 16.6 per cent in the South Island). Of this area, less than half is legally protected.⁹

The Gorge Road wetland is among those protected and it makes an important contribution to biological and landform diversity in the network of lacustrine (lake), riverine (river) and palustrine (e.g. swamp) hydrosystems within the Wakatipu Basin. It provides:

- habitat for the dispersal of wildlife and immigration from neighbouring populations;
- a refuge in the event that more optimal or alternative habitat in the local network is temporarily disturbed or destroyed;
- foraging habitat and thus an opportunity for pollen and seed dispersal between indigenous communities – supporting/ maintaining diversity within areas where natural regeneration is occurring;
- an opportunity for re-colonisation after local extinctions;

2.3 Water inflow/ outflow

A detention dam and woody debris trap was established at the confluence of Horne Creek and Bush (‘Brewery Creek’) as a means of flood protection for Queenstown about 40 years ago¹⁰. A 1.8 metre wide culvert through the detention dam wall is designed to regulate flow down Horne Creek thereby mitigating the effects of flooding on Queenstown. The result is that the Gorge Road wetland becomes inundated following periods of heavy rain or during seasons of greater precipitation.

⁹ Ministry for the Environment (2007): page 367; Chapter 12: Biodiversity - Environment New Zealand 2007

¹⁰ ORC & QLDC (2006): page 20

The true height of the water table is difficult to determine as a result of the detention dam but it seems likely given the catchment topography that it was either permanently or at least periodically above the ground surface.

Leads of open water are more obvious in the southern and western areas in part due to the clearance and mechanical removal of willows. Horne Creek is also a feature of the wetland with many leads extending from the main channel into the sedgeland. A stream from the flanks of Bowen Peak enters the wetland through a culvert under Gorge Road.

A generalised map of water flow through the wetland is provided in Figure 5.

2.4 Vegetation

The vegetation of the wetland is predominantly a *Carex* sedgeland.

The northern portion of the wetland is dominated by sward forming *Carex* species such as *C. coriacea*, *C. geminata*, *Carex* spp¹¹, as well as sharp spike-sedge *Eleocharis acuta*; pasture grasses such as cocksfoot* (*Dactylis glomerata*), Yorkshire fog* (*Holcus lanatus*) and rushes including soft rush* (*Juncus effusus*) and Edgars rush (*Juncus edgariae*). Numerous herbs including peppermint*, and buttercups* (*Ranunculus* sp.) and water cress (*Rorippa* spp.) are found throughout.

The sedgeland has been enhanced by the removal of the willow canopy. Ground cover under the previously existing willow canopy was dominated by *Carex coriacea*, exotic *Ranunculus* (buttercups) and pasture species. Goats browsed and camped under the willow canopies exposing bare earth in places. Where willows have been removed, the *Carex* sward has closed the gap. It is anticipated that stands of *Carex secta* and sward forming sedges will expand in terms of their canopy closure and biomass in the southern part of the swamp (refer to Figure 6).

A cluster of *Coprosma propinqua* in the central-northern portion wetland contains a single broadleaf (*Griselinia littoralis*) which appears to have self seeded from a band of remnant indigenous forest clinging to Queenstown Hill adjacent to the site (refer to Figure 7).

Carex secta dominates the character of the central portion of the wetland along with sward forming sedges (*C. coriacea*). Patches of *Juncus* are more prevalent, near the eastern and western margins but are found throughout. Bright tufts of *Carex gaudichaudiana* or *sinclairii* are emerging along with *C. secta* in the southern portion of the swamp where willow removal has been extensive.

A small area of raupo (*Typha orientalis*) is present in the open water at the southern part of the wetland. Ferny azolla (*Azolla filiculoides*) and duck week (*Lemna minor*) were noted in areas of standing water throughout the wetland.

Willow re-growth from previous control efforts is still evident in this area (refer to Figure 8).

Following the realignment of the Gorge Road in the late 1990s, the cut and fill batters were planted with indigenous tussocks, flax and shrubs achieving variable establishment success.

¹¹ Site inspections were undertaken too late in the season to identify all of the *Carex* species present but the sward is likely to include *Carex gaudichaudiana* and *C. sinclairii*.

2.5 Wildlife

The Gorge Road wetland hosts a range of fauna. Paradise shelduck (*Tadorna variegata*) are the most obvious resident birds. Pukeko (*Porphyrio porphyrio*) have been seen and heard although not by the author during site visits undertaken for the preparation of this plan. Mallard* (*Anas platyrhynchos*) which prefer areas of open water have also been noted. The Australasian harrier (*Circus approximans*) and a pair of New Zealand Falcon (*Falco novaeseelandiae*) - a species in gradual decline¹² - hunt over the wetland; the later holding a territory on Queenstown Hill.

The insectivorous Tomtit (*Petoica macrocephala*), silvereyes (*Zosterops lateralis*) and grey warbler (*Gerygone igata*) and blackbirds* (*Turdus merula*) have also been observed in the shrubland along the base of Queenstown Hill.

The wetland and its surrounding environs contain a large level of habitat diversity within a geographically well defined area. Invertebrate populations have not been surveyed by the author and the author is not aware of any survey of the invertebrate fauna that may have been undertaken in this reserve. However, the juxtaposition of a large *Carex* sedgeland to remnant indigenous shrublands containing members of the genus *Olearia*, *Coprosma*, *Hebe*, as well as Kowhai and mature *Muellenbeckia* lianes below dry rocky bluffs and adjacent to mixed indigenous and exotic pasture grasslands suggests there is a high probability of there being a diverse and highly endemic invertebrate fauna. The presence of recent indigenous enhancement planting adjacent to and west of the Gorge Road is likely to have further supported the existing invertebrate community.

Muellenbeckia complexa which drapes over both native and exotic shrubs on Queenstown Hill is the richest host plant for specialist native Lepidoptera larvae nationally. This vine is known to support wasps, bugs, flies, stick insects and New Zealand's sole praying mantid. The foliage is eaten by moths and the nectar by butterflies (Patrick, 2007).

The sedgeland of the wetland is likely to be supporting a range of native and endemic invertebrate. The pedestalled *Carex secta* is of value to many native insects (bugs, spiders, moths and flies) both for shelter and food (Patrick, 2007).

Noctuid moths in the genus *Tmetolophota*, *Phylocaudes* and *Protosynaema* feed as larvae on many sedges and flax, together with *Orthoclydon praefectata* on flax only, *Epiphryne verriculata* on cabbage tree only. These species have been planted along the margins of Horne Creek and on the escarpments surrounding the wetland.

Leaf miners such as *Elachista gerasmia* mine *Carex* leaves and several *Glyphipterix* moth species mine the leaves of *Carex* and *Juncus* species (Patrick, 1994).

Both the flowers and the foliage of watercress are utilised by native insects such as beetles, flies and moths. *Hebe* is one of the richest hosts for New Zealand's specialist invertebrates such as flies, moths, beetles and bugs (Patrick, 2007).

Fish surveys undertaken by the author with Fish and Game in about 1997 confirmed the presence of Brown trout* (*Salmo trutta*) and the indigenous Koaro (*Galaxias brevipinnis*) in Horne Creek and wetland. Brown trout spawn in Horne Creek between April and June¹³ followed by Koaro. Long-finned eels (*Anguilla dieffenbachii*), also in gradual decline, are present within Lake Wakatipu and may also be present within the wetland.

¹² Hitchmough, et al (2007)

¹³ Cliff Halford, Fish and Game NZ, personal communication, 19/2/09

There are historical sightings of marsh crake (*Porzana pusilla*), with a threat classification of sparse and Australasian bitterns (*Botaurus poiciloptilus*), classified as nationally endangered¹⁴, within the Wakatipu Basin, both at Lake Hayes; the later by the author in 2005. Both require tracts of dense, low cover where they can forage and nest in concealed secrecy. The Gorge Road wetland provides good and improving habitat with the potential to host these species.

2.6 Plant Pests

Plant pests¹⁵ present within and immediately adjacent to the wetland are:

Within the wetland reserve

Crack willow	<i>Salix fragilis</i>
Grey willow	<i>Salix cinerea</i>
Russell lupins	<i>Lupinus polyphyllus</i>
Broom	<i>Cytisus scoparius</i>
Buddleia	<i>Buddleja davidii</i>
Watercress	<i>Rorippa</i> spp.

Adjacent to the wetland reserve

Hawthorn	<i>Crataegus monogyna</i>
Old man's beard	<i>Clematis vitalba</i>
Sycamore	<i>Acer pseudoplatanus</i>
Cotoneaster	<i>Cotoneaster glaucophyllus</i>
Douglas fir	<i>Pseudotsuga menziesii</i>
Radiata pine	<i>Pinus radiata</i>

Of the plant pests present, only broom and old man's beard are classified as 'pests' under the ORC Pest Management Strategy (RPMS).¹⁶ Figure 9 identifies the distribution of pest plants requiring management within the wetland.

Crack and grey willows (*Salix fragilis** and *S cinerea**) have been the most serious plant pest threatening the integrity of this wetland. Control of these species commenced in 2005 and included a programme of drilling, frilling, cut and swabbing¹⁷. Following the intensive willow control programme in the wetland there remains a residual level of infestation. The results of control (including aerial spot spraying) undertaken autumn 2009 will be assessed in spring 2009.

Willows are able to invade areas where the water table remains high. Crack willow spreads through fragments which take root while grey willow can spread both vegetatively and by seed. Both are capable of forming a monoculture with a high annual pulse of nutrients as the leaves are shed each autumn. There is no indigenous equivalent to the willow and where it forms a dense canopy it suppresses and inhibits the regeneration of a much more diverse indigenous ecosystem.

Russell lupins (*Lupinus polyphyllus*) are established across the northern half of the wetland. Left unmanaged, these will form dense clusters, compete with and suppress the regenerating *Carex* sward and riparian vegetation. Lupins are able to establish quickly producing an abundance of seed which is transported by water. Without control,

¹⁴ Hitchmough et al (2007)

¹⁵ For the purposes of this Plan, 'plant pests' are any introduced species capable of invading the indigenous ecosystem and undermining the achievement of the vision of the wetland enhancement plan.

¹⁶ ORC (2001, proposed strategy 2008) Pest Management Strategy for Otago

¹⁷ Palmer (2003) : Gorge Road Wetland – Recommendations for the control of willows

their spread throughout the wetland is assured. Control of lupins is recommended as a priority for the wetland.

Old man's beard can vigorously invade the shrubland areas suppressing and collapsing established and regenerating vegetation.

Broom infestations have been well controlled but infestations on the lower slopes of Queenstown Hill, and embankments surrounding the wetland are likely to result in re-infestation. Seed is released by the explosive opening of blackened seed capsules in the heat of summer and can be transported by water. The persistence of broom within the soil seed bank means that its control at the site will require both the removal of source populations and long term follow up. Follow up control should therefore be reinitiated from the north and it is recommended that efforts also target the western flanks of Queenstown Hill to minimise seed rain from the broom present on the lower slopes.

Buddleia is dispersed by wind and can regenerate from suckers and roots and can create dense, persistent, multi-stemmed thickets that compete with indigenous communities and suppress natural regeneration. This species requires systemic control (i.e. cut stumps painted with herbicide or treated with foliar herbicide). It tends to invade the open ground adjacent to the track and so can be easily accessed for control.

Vegetation on the flanks of Queenstown Hill also includes hawthorn, sycamore, conifers (Douglas fir and *Pinus radiata*), cotoneaster and old man's beard. These are all capable of invading and reinvading the margins and escarpments of the wetland.

Hawthorn is a shade tolerant species capable of producing masses of bird dispersed red berries. On the slopes of Queenstown Hill this species dominates the canopy but could be displaced by the reinstatement of a taller indigenous canopy.

Sycamore is a shade tolerant species and will mature to a large, long-lived tree capable of producing masses of wind dispersed seed and suckering from the stem. Seed is able to germinate into rapidly growing seedlings capable of invading open and regenerating indigenous shrub and fernland communities and will suppress their regeneration¹⁸. For this reason its control on the flanks of Queenstown Hill are recommended.

Cotoneaster is also shade tolerant and will, like broom, vigorously invade shrubland, fernland, bare or disturbed ground.

Conifers are spreading from both the Queenstown Hill and Bowen Peak populations. These are capable of invading and inhibiting the regenerating indigenous forest and shrubland communities. Their control at this site will support the enhancement of the natural character of the wetland environs.

Willow, buddleia, old man beard, cotoneaster and broom will all re-sprout from roots and/or cut stems not appropriately treated with systemic herbicide. A few plants may re-sprout even where best practice is followed.

Watercress is present within the slower flowing margins of Horne Creek. If it should build up to a point of impeding the flow of Horne Creek or diminishing the habitat of freshwater fish, it can be hand removed. This is seen as a low priority given the limited extent of its distribution in the wetland.

¹⁸ Williams, P. (1997): Ecology and management of invasive weeds. Tables in Section 10.4 pages 48 to 61.

2.7 Animal Pests

A feral goat herd is known to move between Bowen Peak and Queenstown Hill. They form obvious paths through the sedgeland where the ground is drier. They are often seen along the margins of the shrubland adjacent to the wetland and grazing in the surrounding pastures.

Browsing by goats represents a significant threat to the establishment and therefore re-instatement of indigenous diversity through enhancement planting in the wetland.

Possoms pose a similar threat but their omnivorous diet means that they may also predate invertebrate and bird populations (eggs and nests) supported by any enhancement planting.

The extent of the threat posed by feral and/ or domestic cats, mustelids (stoats and ferrets), rats, mice and hedgehogs (all likely to be present in and around the wetland) is unknown.

3.0 Enhancement Proposal

3.1 Vision

The Gorge Road wetland provides a highly visible and readily accessible example of a large *Carex* sedgeland swamp containing a natural diversity representative of that historically present in lowland – montane wetlands of the District.

The Gorge Road wetland provides nesting, foraging and resting habitat for a range of common and threatened wetland dependent birds as well as habitat for a range of endemic invertebrates.

The colluvial fans on the lowest slopes of Queenstown Hill adjoining the wetland are dominated by indigenous forest and shrubland. Elements from these communities also emerge from the raised and drier portions of the sedgeland enhancing the floristic diversity and habitat structure as well as the natural character of the gorge.

Track users see and experience wetland habitats and indigenous forest communities and hear a diverse range indigenous avifauna commonly associated with these ecosystems.

3.2 Objectives

1. Control plant pests
2. Control animal pests
3. Enhance the naturalness and indigenous diversity of the wetland its immediate surrounds
4. Monitoring changes in the character and established diversity of the wetland

3.2 Objectives

3.2.1 Control plant pests

The recent control of pest plants has been intensive. Remaining efforts will primarily target control of residual willow and lupin infestations targeting regrowth from stems, roots and fragments and any new infestations. Figure 9 provides a map of areas requiring ongoing plant pest control.

It is recommended that all control efforts start from the north end of the reserve and proceed to the southern part of the wetland following the prevailing wind and water flow through the site.

Table 1 provides a summary of the recommended tasks and their scheduling.

Herbicides containing Glyphosate 360 (e.g. Roundup) as the active ingredient are recommended for use in the control of willows and other woody weeds present in the wetland and surrounds because it is effective, has negligible residual toxicity and is non-persistent in soil and water. Glyphosate is a commonly used herbicide for broad spectrum control of herbaceous and woody weeds (Palmer, 2003). It is authorised for use over and around water throughout New Zealand and is the only herbicide not requiring resource consent if used in a manner compliant with rules in the Otago Regional Plan: Water¹⁹.

Plant Pests within the wetland

Willow regrowth

Willows were last sprayed and hand cut from the wetland in March 2009 following a programme of control which commenced in 2005. Remaining infestations are in the southern half of the wetland and along Horne Creek.

Regrowth from stems, roots and fragments will require fastidious effort with seedlings and new growth from fragments being hand pulled ensuring the entire plant is taken. Stumps above the water table should be re-cut with a straight, flat cut as near to the ground or as low as possible and immediately (within 30 seconds) swabbed with herbicide. All fragments should be placed onto a large sheet of plastic and removed from the site. Where this is not possible, carefully targeted foliar spray as set out in Table 1 will be required. Plants should then either be left to rot where they stand or felled when they are confirmed dead.

Application of herbicides to cut stumps will reduce the potential for accidental spills or over-spraying. Very targeted and judicious use of herbicide will be required as replanting commences to avoid damaging newly established plants.

Lupins

Lupins have invaded a large portion of the northern and central wetland as well as the area of the detention dam in the south. The infestation is widespread but not yet suppressing the sedgeland vegetation. Lupin seeds are released through an explosive opening of the dried capsule and can be transported by water. Control efforts should therefore start at the northern end of the wetland and proceed south until the site is cleared. Plants can be hand pulled where small or dug out and left to rot down. Lupin can re-sprout from the roots system so the application of herbicide may be required

¹⁹ Otago Regional Council Plan: Water, section 12.7.1.3; page 205

where plants can not otherwise be fully removed²⁰. Along with willow control, follow up removal of Lupins is a high priority.

Plants outside the wetland

Old Man's beard

This vine is present in the woodland along the lower slopes of Queenstown Hill. It is recommended that vines are cut preferably during the active growth season and immediately painted with Glyphosate. Cut stems can take root the cut portion of the upper vine should be lifted away from the ground. Leave large cut vines covering indigenous vegetation in place as removing them may cause damage. If removing vines ensure this occurs outside the fruiting/ seed production season to prevent inadvertent spread. Foliar spray of seed heads and new re-growth is effective and should aim to avoid non-target species. Seedlings can be hand pulled and/ or their bases dug out manually in winter²¹. If vines are cut during the winter follow up will be required as above in spring.

Buddleia, Broom, Hawthorn, Cotoneaster and Conifer

Control of these species is best undertaken during spring and/ or summer during the active growing season. Hand pulling of small plants can occur at any time. Recommendations are provided in Table 1. Areas of focus are around the boundary of the wetland, particularly on the base of Queenstown Hill, along Horne Creek and where earthworks have occurred such as on the north western escarpment. The southern most portion of the wetland reserve has recently been cleared of these species and follow up will be required.

Sycamore

Sycamores also require the approach of cutting and painting stumps *in autumn prior to foliar yellowing*. In other respects, the control efforts recommended for willows can be equally applied to sycamore. Sycamore infestations are present along the base of Queenstown Hill.

Control of pest plants on the base of Queenstown Hill is a low priority unless co-ordinated with Queenstown Hill Station and followed up by extensive planting. Control should start from the north end and focus on individual fans before proceeding to the next. The risk of re-infestations on these fans is high.

3.2.2 Control animal pests

Control of possums, goats and rabbits/ hares (if present) is essential to achieve success in plant establishment and to provide support for natural regeneration. Many of the nursery plants introduced to the site will be very palatable to these pests.

If control of the feral goat herd can not be achieved, it is recommended that plants are fenced off until safe from the effects of occasional light browsing (3 to 5 years depending on species and establishment success).

²⁰ Williams, P. (1997): Ecology and management of invasive weeds. Page 28.

²¹ Global Invasive species database; <http://www.issg.org/database/species/ecology.asp?si=157> accessed on 16/6/09

If pukeko numbers increase during the period of implementation, risk associated with nursery seedlings being pulled out can be minimised by using well planted PB 2 (planter bag) plants.

Table 1 includes a summary of recommendations for the control of animal pests.

3.2.3 Enhance the indigenous character and diversity of the wetland

A plan identifying zones proposed for enhancement has been prepared. The budget proposed over the term of this plan will not enable planting in all the zones identified to be undertaken. However where opportunities for community planting occur, this plan will enable managers to guide additional or opportunistic efforts in this area to bolster to results of scheduled planting.

Three planting zones are shown in Figure 10. The enhancement plan will strengthen the indigenous character of the site and reinstate lost diversity to the environs surrounding the wetland.

The wetland proper has retained a high level of natural diversity despite the infestations of willows and more recently lupins. Its location within a threatened environment, and the level of loss and modification of wetland environments experienced throughout the District, Region and South Island means that this wetland should be considered highly significant.

From an ecological perspective, the enhancement of the wetland will benefit the invertebrate population of the area which in addition to having its own intrinsic value previously described will support the pollination of indigenous plant species and benefit the avifauna and freshwater fish.

Table 2 summarises the planting zones, the species that will characterise them as well as their key management needs. Detailed planting lists have been developed and should be confirmed in autumn of each year for a spring planting throughout the establishment phase. The indicative plant order for the establishment plan is included as Table 3.

During the establishment phase, each planting season will involve a routine of site preparation, planting, marking/ re-marking planted areas, release of establishing plants from competing weeds, replacement and then follow up release of all establishing plants. Table 4 provides a co-ordinated project schedule for the implementation of the management tasks along with an indicative budget.

Site preparation and planting

It is recommended that planting occur in stages according to the available budget and the ability to provide reliable protection and maintenance during the establishment phase.

Planting areas should be cleared of vegetation using a weed eater, then spot sprayed with glyphosate mixed with a dye to assist with the identification of prepared areas and their later maintenance. Care should be taken not to inadvertently damage or remove established native plants.

Bamboo stakes can be used to identify individual plants or clusters in the planted areas depending on how well the site is maintained. Marking plants and/ or clusters is highly recommended if there is a danger of sites becoming overgrown with rank grass through missed rounds of maintenance in order to minimise accidental damage or spraying.

Planting should occur following standard horticultural practices and has been scheduled for late spring (October to November/ December) – actual implementation can be later where very wet, earlier where drier.

When planting into wet sites, plants should be placed on raised ground out of the water. Larger plants (PB 2 or 3) may do better where it there are difficulties controlling weeds/ competing sedges.

Plant spacing should follow the general guideline of:

Sedges and rushes	0.5 m
Shrubs	1 m
Small trees	1.5 – 2 m
Large trees	3 m

Plants should be eco-sourced from central to western Otago and/ or northern Southland and as near as possible to the planting site as possible. Substitutions for species not contemplated in this should be avoided. These can be obtained during subsequent seasons.

Mulching will assist in weed suppression and reduce reliance on herbicide during maintenance. Protective sleeves are recommended given the threat of browsing by goats.

Control of woody weeds and planting on the lower flanks of Queenstown Hill will be subject to agreement with the landowner where this is not QLDC. This effort should be implemented only when comprehensive removal of seeds sources from higher slopes can be achieved.

5. Maintenance

An area approximately 30 cm in diameter around each plant should be released from weeds using mulch and/ or herbicide. Hand weeding around the plants maintained in this way will reduce the potential for damage by weed eating.

Avoid spraying establishing plants with herbicide as Glyphosate is a non-selective, systemic herbicide and will inhibit growth or kill establishing plants. Use of dye can assist the avoidance of over spraying when maintaining plantings.

Maintenance staff should be involved in the initial site preparation to ensure a good knowledge of the location of establishing plants.

As plants mature, reliance on herbicide and weed-eaters needs to be carefully considered as otherwise healthy plants can be damaged or killed. It is recommended that plants be maintained over a period of at least 3 years or until they are taller than or able to begin suppressing the competing vegetation and are able to 'hold their own' place.

Maintenance spraying or hand release is scheduled in November, January and March using a back pack sprayer, in completely calm conditions with a guard on the spray nozzle to prevent any spray drifting onto the establishing seedlings or other desirable plants. Use of a dye is recommended.

Mulch mats or untreated bark chips are recommended to reduce the re-establish of weeds into treated areas and to help retain soil moisture on the drier sites.

4.0 Monitoring

4.1 Monitoring change in wetland condition

Where budget provides, it is recommended that changes in the wetland condition are monitored. This will provide an indication of how successful the restoration / enhancement program has been and whether the condition of the wetland is improving. Using standard methodologies such as those prescribed by the Ministry for the Environment (Clarkson et al, 2004) would be beneficial and allow comparison with other wetlands should the need arise. Photo-points, vegetation transects and five-minute bird counts can be established and undertaken to monitor changes to the wetland.

Recommended photo-points are identified in Figure 11.

Wetland monitoring also provides an opportunity for local schools to become involved in measuring changes in biodiversity that follow the enhancement of the reserve.

4.2 Monitoring for predators

Monitoring can confirm the presence of predators. If threatened fauna are found to reside in the environs of the reserve, then the approach to and level of predator control required (if any) will need to be determined.

The possibility exists however that the enhancement of the wetland may improve the suitability of the habitat for a more diverse range of species but that without predator control they will be unable to occupy the habitat.

Predator monitoring and control (other than for possums) is a project that would be well suited to a volunteer group(s) or individual(s).

4.3 5 minute bird counts

Five minute bird counts employ a standardised method of sampling bird diversity. It can (depending on the number of samples and reliability of the observer) provide an index of change over time.

If 5 minute bird counts should reveal the presence of Australasian bittern predator it is recommended that monitoring and appropriate programme of predator control be developed as a matter of urgency in order to support and retain this nationally endangered and secretive species and the opportunity for the public to encounter them at this site.

5.0 Summary

Queenstown Lakes District Council is undertaking a long term and staged approach to the enhancement of the Gorge Road wetland.

The achievement of the vision and management objectives set out within this plan will require considerable effort. This plan has set out a schedule of co-ordinated tasks which can bring about an improvement in the wetland condition and its indigenous character.

Not all of the recommendations can be implemented within the available budget over the next 10 years. However, by comprehensively assessing the needs of the site and incorporating these in the Plan, opportunities to expand or supplement the funded efforts can be co-ordinated to ensure the best use of additional resources.

Enhancement of the wetland will support the invertebrate, bird and freshwater fish fauna through the provision of host plants required by the various stages in invertebrate lifecycles; shelter, nesting habitat and food for birds as well as shading and riparian cover for freshwater fish. A rich invertebrate fauna has its own intrinsic value and will also support both bird and freshwater fish fauna.

Enhancement of the existing vegetation and wetland habitats strengthens the ecological values and attributes of the District which are enjoyed by residents and visitors alike. The success of such efforts can ultimately be assessed by their end users, i.e. the diversity of wildlife visiting or inhabiting wetlands, the annual return of breeding fauna, the resident populations sustained year round and/ or the maintenance or enhancement of populations of threatened or representative species of vegetation and their associated communities.

6.0 Acknowledgements

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The Bay of Plenty Wetlands Forum "Wetland Restoration Guide" sourced on the Department of Conservation website. The guide provides a good step by step reference which supported the preparation of this Plan.

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