

## Biodiversity Values and Potential for Restoration of Duck Creek Wetland



Duck Creek and adjoining wetland near Hikui settlement Road (photo 9(2)(a) Living Matters)

9(2)(a)



# Living Matters

Biodiversity & Ecology Solutions

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## 1. Executive Summary:

The Duck Creek Wetland (the Wetland) lies immediately north and south of Hikuai Settlement Road, 4 km southwest of Pauanui. The wetland stretches 5 km upstream from Duck Creek's confluence with the Tairua River. Department of Conservation's (DOC) Thames Office contracted Living Matters to undertake an overview assessment of the biodiversity values, and practicalities of establishing biodiversity protection, in the wetland. Although long acknowledged as having significant biodiversity values, Duck Creek had not been examined in recent years. The project brief for this work was in two primary parts; to characterize the broad-scale biodiversity values of the wetland, and to assess the work required and feasibility of protecting the wetland's various biodiversity values:

### 1.1 Vegetation and Fauna

Possums, goats, and pigs are present in the Tairua Forest, but do not appear to be having a significant impact on the wetland. Pigs are regularly hunted in the Forest, and possum control (presumably for fur recovery) appears to be happening. A small population of *Empodisma minus* (the peat-forming, native wire rush) occurs in the southern arm of the wetland, 1.2 km south of the Golf Course (Humphreys & Tyler 1990, Regnier & Broekhuizen 1990). Although not a threatened species, as it occurs widely throughout New Zealand, this species is restricted to freshwater acid wetlands, and has been recorded from only two sites in the Coromandel Ecological Region. The wetland provides habitat for threatened bird species, including Australasian Bittern (Nationally Endangered), Spotless crane (Relict), Banded Rail and fernbird (At Risk), and North Island Brown Kiwi and Northern NZ Dotterel (Nationally Vulnerable)

### 1.2 Predator control

All three mustelid species recorded from NZ have been found in the wetland, and are a significant threat to the threatened fauna. Control of these species would be relatively straight forward, with trap lines around the perimeter of the wetland, and through areas of pine forest, as the forest roads and tracks provide excellent access and trap lines.

### 1.3 Plant pest control

Although there are 38 introduced plant species in and around the wetland (27% of the plants recorded), only 10 are significant threats to the integrity and structure of the wetland. These include *Pinus radiata* (where it has invaded into the wetland itself), Royal Fern, three Privet species, Saltwater Paspalum, Japanese Honeysuckle, Pampas, Grey Willow, and Blackberry. Pampas, blackberry, and grey willow are the most immediate threats to the wetland, and their control is a high priority for biodiversity protection.

### 1.4 Potential for more consistent formal land protection

The wetland has a range of land ownership, with the privately owned areas from the Tairua River to the Lake International Golf Course, to the Crown Forest Lease and Public Conservation Land in the mid and upper catchment. The part of the wetland owned by Lakes International Golf Course is covered by a QEII National Trust covenant. Establishing formal protection over the whole wetland, and preferably including a buffer around the wetland, is a high priority. Discussions with the Crown Forest Rental Trust and relevant Hauraki Iwi, would be a good step toward full formal protection of the wetland.

### 1.5 Inanga spawning sites

Inanga are recorded from the lower reaches of Duck Creek. Locating where inanga spawn in the stream, and establishing what could be done to protect and enhance these sites, would provide benefits to the freshwater fish fauna.

## 2. Introduction

The Wetland is located immediately north and south of Hikuai Settlement Road, 4 km southwest of Pauanui, in the Tairua Ecological District, and stretches 5 km upstream from Duck Creek's confluence with the Tairua River. Humphreys and Tyler (1990) estimated its area as 157.5 ha, but that was reduced through the development of the Lake International Golf Course, to an estimated 145 ha. The catchment rises from sea level to 309 m at the head of the catchment, and is mostly plantation pine forest.



The wetland is a relatively intact estuarine to freshwater wetland sequence, with acid peat bog in the valley bottoms. Humphreys & Tyler (1990) describe it as the best, relatively intact wetland in the Tairua Ecological District, and the largest, most representative area of acid peat bog in the Coromandel Ecological Region. They list it as a Recommended Area for Protection (Tai 11: Duck Creek). O'Donnell (2011) describes it as "a particularly significant wetland".

### 3. Objectives

DOC's Natural Heritage Management System has prioritised the wetland for biodiversity protection. Although considerable investigation of the ecological values of the wetland was done in the 1990s, relatively little has occurred since. This report sought to collate the existing information, update and/or confirm the biodiversity values present through field visits, and assess the practicality of establishing biodiversity protection. As the information in this report will form part of the planning for biodiversity management work in the wetland, this report focuses on the broad-scale flora and fauna values of the wetland and surrounds, as well as the practicality of plant and animal pest control.

### 4. Methods

#### 4.1 Assessing practicalities of establishing biodiversity protection

The study area was visited in from mid-May to early-July 2015. The edges of the wetland and perimeter forestry roads, tracks, and haul sites were walked, and all plant and animal species encountered were recorded. Potential traplines were assessed, as well as access to the wetland for weed control

#### 4.2 Flora and Fauna Sampling

Merret and Clarkson (1998) completed a description of the wetland from the current southern extent of the Golf Course, to Hikuai Settlement Road, as part of the development of the Lakes International Golf Course and associated subdivision. This information is used in this report, and it is updated to take account of vegetation and drainage changes that have occurred through the Golf Course and subdivision development, as well as the considerable willow control undertaken by Lakes International Golf Course on their QEII National Trust covenant.

Considerably less investigation has been done on the wetland downstream of Hikuai Settlement Road, and upstream of the Golf Course. The best published information is Regnier and Broekhuizen (1990), from a Rotorua Botanical Society field trip. Given this, most of the time spent in the field for this report was in these areas. Forays were made into these areas of the wetland, as far as was practical given it is wet and deep in places. All fauna seen and heard during the field work were recorded and, as well as the sources above, records from the following were also used:

- The author had spent time in the wetland previously, and field notes from that time are used
- Waikato Regional Council's Tairua Harbour and Catchment Management Plan (O'Donnell, 2011)
- The QEII National Trust's records for the Lakes International Golf Course covenant
- Observations by [REDACTED] 9(2)(a) between 1999 and 2010
- Observations by Lakes International Golf Course staff and contractors
- NZ Freshwater Fish Database records
- Nine Gee Minnow traps set overnight on 7 July, from the tidal section to the headwater tributaries of Duck Creek, using the New Zealand Freshwater Fish Sampling Protocols<sup>1</sup>.

#### 4.3 Access to Land and Information

Rayonier/Matariki Forests manage Tairua Forest, provided a key for their access gates, and approval to access all of the wetland upstream of the Golf Course. Lakes International Golf Course provided access to

<sup>1</sup> <http://www.envirolink.govt.nz/PageFiles/31/New%20zealand%20Freshwater%20Fish%20Sampling%20Protocols.pdf>

the wetland from their southern extent to Hikuai Settlement Road. 9(2)(a) the project manager for the Hikuai District Trust's Pauanui-Tairua Trail, gave approval to use the trail as it was being constructed along the eastern edge of the Duck Creek Estuary downstream of Hikuai Settlement Road.

9(2)(a) provides contract pest control services to Lakes International Golf Course, and he provided considerable information on the animal pest control around the Golf Course. Lakes International Golf Course green keeping staff provided considerable information on their Biodiversity Condition Fund weed control in their QEII National Trust covenants. 9(2)(a) from Landcare Research provided a copy of Merret and Clarkson (1998)

## 5. Results

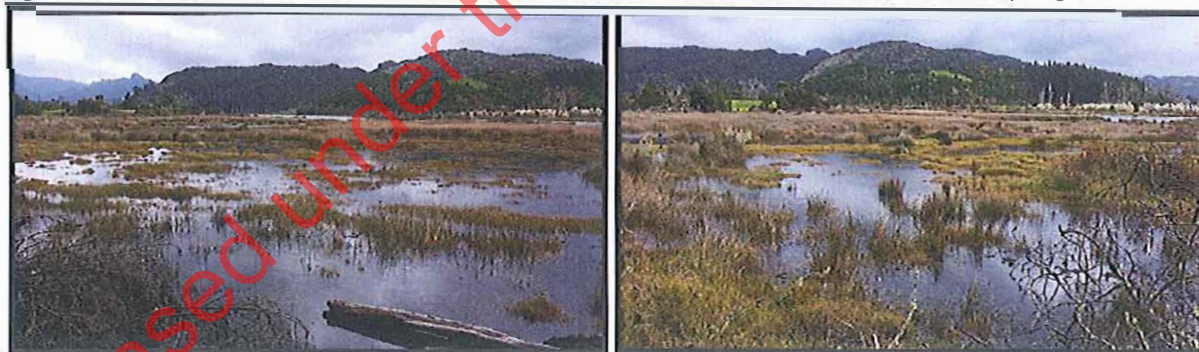
### 5.1 Flora

The wetland is a 5 km sequence from intertidal *Juncus/Leptocarpus* rushland, to acid peat bog manuka/*Baumea* sedge and shrubland. The riparian areas of Duck Creek support cabbage tree swamp forest and raupo-flax reedland, with grey willow and blackberry. Narrow arms of peat bog extend up side gullies in the catchment. *Utricularia monanthos* and *Empodisima minus* are both found in the wetland. Although not listed threatened species, are notably uncommon in the Ecological District and Region.

#### 5.1.1 Lower-Wetland

Figure 1 shows this part of the wetland, which is artificially delimited by Hikuai Settlement Road. The vegetation at, and upstream of, Duck Creek's confluence with the Tairua River is dominated by saltwater-tolerant species, mainly dense *Juncus articulatus*, with scattered *Plagianthus divaricatus*, and patches of *Machaerina juncea*. Tall fescue and Saltwater paspalum are common where human disturbance has removed the natural vegetation, or disturbed the substrate, especially close to Duck Creek. On the higher ground *Plagianthus divaricatus*, *Pomaderris rugosa*, and *Phormium tenax* grade into the introduced *Acacia mearnsii* around the margins. However, a considerable amount of the *A. mearnsii* along the route of the Pauanui-Tairua Trail (around the true right margin of the wetland) has been recently felled, as shown in Figure 1.

Figure 1: The tidal section of Duck Creek Wetland north of Hikuai Settlement Road, on a spring tide



Photos by 9(2)(a) Living Matters

#### 5.1.2 Mid-Wetland

This section runs from Hikuai Settlement Road, to the southern limit of the Lakes International Golf Course, and Figure 2 shows examples of this section. The tidal limit is near where Duck Creek meets the first fairway of the Golf Course. This section of the wetland is dominated by species that tolerate saline, through brackish, to freshwater conditions, primarily *Juncus articulatus* sedgeland, with zones of *Machaerina juncea*, and *M. arthrophylla*. There are patches of *M. articulata* and *Juncus maritimus* scattered throughout, and manuka become increasingly common, as does *Salix cinerea*. Merrett and Clarkson (1998) recognised three main vegetation types in this area:

Figure 2: the wetland from Hikuai Settlement Road to the southern extent of the Golf Course





photo 9(2)(a) Living Matters

**Type 1-Manuka scrub:**

Manuka scrub dominates the more oligotrophic areas where peat has accumulated, and was separated into 3 sub-types based on the tidal influence of salt water:

- **1a, area 5.7 ha:** This northernmost, relatively low nutrient, area is dominated by a 3-4 m tall manuka canopy over a dense understory of saline tolerant species like Oioi and *Baumea juncea*. The margins of Duck Creek hold occasional patches of flax, raupo, toetoe and cabbage tree. Some of this area was cleared and developed into golf fairways and greens.
- **1b, area 5.71 ha:** This area has a taller, 4-6 m canopy of manuka, and an understory of bracken, mingimingi, swamp coprosma and occasional *Astelia grandis*. There are patches of *Baumea juncea*, pink bindweed, flax, and raupo close to Duck Creek, and towards the western hills, early successional forest species such as mahoe and five finger occur.
- **1c, area 8.33 ha:** This area is at the southern end of the Golf Course development, and has a lower overall water table than the above areas (probably because of the drainage channels in the area) and is beyond the salt water tidal influence. It has a broken 4-6 m manuka canopy, interspersed with tree ferns, mamaku, wheki, and silver fern, in addition to swamp coprosma, cabbage tree, and occasional grey willow (up to 6 m tall). Mosaics of raupo, flax, *Baumea rubiginosa*, *B. huttonii*, *B. teretifolia*, and *Gleichenia dicarpa* reflect areas with a locally higher water table, and are particularly common near Duck Creek.

**Type 2-Grey willow-cabbage tree/Coprosma propinqua-manuka Scrub:**

This vegetation is dominated mainly by 3-4 m tall *Coprosma propinqua* and manuka, overtopped by occasional emergent grey willow and cabbage tree up to 8 m tall. There are also pockets of toetoe, flax, *Baumea rubiginosa*, *B. juncea*, and *B. huttonii* close to Duck Creek. The understory is dominated by swamp coprosma, *B. rubiginosa*, *B. juncea*, and blackberry, with a groundcover (where present) of *Carex lessoniana*, *C. virgata*, and *Isachne globosa*. Blackberry dominates. The southern most limit of Oioi on the Duck Creek banks was noted as being adjacent to this type (Fig. 1), and probably indicates the upstream limit of estuarine influence.

**Type 3-Grey willow treeland:**

These areas are dominated by 8-10 m grey willow, often forming a dense canopy. There are also occasional cabbage trees, with patches of blackberry and pink bindweed. The understory consists mainly of scattered swamp coprosma, with a sparse ground cover of *Carex lessoniana*, *C. virgata*, and *Baumea rubiginosa*. In the riparian zone, along the eastern margin, flax, cabbage tree, *Eleocharis sphacelata*, and *Coprosma propinqua* occur. In most of these areas, stock grazing and trampling has resulted in large areas with sparse ground cover. This vegetation type reflects areas of highest fertility, via groundwater nutrient inputs, within the survey area, and is thus susceptible to exotic weed invasion. It is considered to be of the lowest botanical significance of the three types defined, because of the dominance of grey willow.

Much of the grey-willow treeland was removed when the Golf Course was developed in the late 1990s, and Lakes International Golf Course are in the process of removing much of the remainder via a Biodiversity Condition Fund project on their QEII National Trust covenant. However, a significant area of manuka



shrubland was also removed, and Figure 3 gives a view of vegetation that was cleared between 2001 and 2013. Possible impacts of this clearance include increased risk of invasion by plant pests, increased nutrient loading and siltation of Duck Creek, and altered hydrology. A large area of wetland on the north western edge of the covenant is privately owned, and includes a channel through which Duck Creek was once diverted

Figure 3: Lakes International Golf Course QEII covenant 2013 (left) and 2001 (right):



### 5.1.3 Upper-Wetland

Figures 4 and 5 show examples of the upper wetland. Upstream from the Golf Course the wetland becomes progressively drier, although dry is a relative term as the upper reaches of the wetland can be difficult to move through, especially near Duck Creek. In the upper areas the wetland is dominated by *Gleichenia dicarpa*, with *Machaerina arthropylla* and *M. teretifolia*, and *Tetraria capilaris*. Regnier and Broekhuizen (1990) located “two substantial patches (approximately 2m<sup>2</sup>)” of *Empodisma minus* “on the north side of swamp road”. Several searches were made in this area, but it could not be located. There is scattered manuka on the drier areas, quite dense in places, with an understory of *Machaerina teretifolia*, *M. rubiginosa*, and tangle fern. In wetter areas manuka forms a sometimes sparse canopy with raupo, over *M. teretifolia* and *M. rubiginosa*, with umbrella fern beneath.

Figure 4: the western (left) and eastern (right) edges of the upper wetland



Photos 9(2)(a) Living Matters



Figure 5: The wetland upstream from the Swamp-Duck Creek Road crossing



Photos 9(2)(a) Living Matters

Table 1 shows the 142 plant species recorded in the wetland and the immediately adjoining pine forest, by Merrett and Clarkson (1998), Regnier and Broekhuizen (1990), Humphries and Tyler (1990), recorded during the field work for this report, and QEII National Trust records for the Lake International Golf Course covenant. Species with "F" were found in the adjoining pine forest margins, thirty-eight with "\*" are non-indigenous and/or weed species, and "#" indicates that a herbarium specimen was taken and lodged in the Forest Research Institute (now Scion) herbarium in Rotorua by Regnier and Broekhuizen. Only one species (*Pomaderris rubiginosa*) is listed in the threatened and local plant lists, although *Utricularia monanthos* and *Empodisma minus* are regionally significant.

Table 1: Flora of Duck Creek wetland

Scientific Name	Common Name
Conifers	
<i>Phyllocladus trichomanoides</i> F	Tanekaha
<i>Pinus radiata</i> F*	Radiata
Ferns and fern allies	
<i>Asplenium flaccidum</i> F	Hanging spleenwort
<i>A. polyodon</i> F	Sickle spleenwort
<i>Blechnum minus</i>	Swamp fern
<i>B. sp. unnamed (blackspot)</i>	Kiokio



<i>B. sp. unnamed (blackspot) x B. mmus</i>	
<i>Cyathea dealbata</i>	Ponga, silver fern
<i>C. medullaris</i>	Mamaku
<i>Dicksonia squarrosa</i>	Wheki
<i>Gleichenia dicarpa</i>	Tangle fern, waewaekaka
<i>G. microphylla</i>	Parasol fern
<i>Histiopteris incise</i>	Water fern
<i>Hypolepis ambigua</i>	
<i>H. distans</i>	
<i>Lycopodium deuterodensum</i> F	Puakaramu
<i>L. volubile</i> F	Waewae-koukou
<i>Lygodium articulatum</i> F	Mangemange
<i>Osmunda regalis</i> *	Royal fern
<i>Paesia scaberula</i>	Hard fern
<i>Phymatosorus pustulatus</i> F	Hounds tongue
<i>Pneumatopteris pennigera</i> F	Piupiu
<i>Pteridium esculentum</i>	Bracken
<i>Apium prostratum</i>	Native celery
Flowering Plants: Dicots	
<i>Acacia mearnsii</i> *	Black wattle
<i>Aster subulatus</i> *	Sea aster
<i>Bidens frondosa</i> *	Beggar's ticks
<i>Brachylottis repanda</i> F	Rangiora
<i>Callitriche stagnalis</i> *	Starwort
<i>Calystegia sepium</i>	Pink bindweed
<i>Centella uniflora</i>	Centella
<i>Convolvulus sabatius</i> *	Bindweed
<i>Coprosma x cunninghamii</i>	<i>C. propinqua x robusta</i> hybrid
<i>C. propinqua</i>	Mingimingi
<i>C. robusta</i>	Karamu
<i>C. tenuicaulis</i>	Swamp Coprosma
<i>Coriaria arborea</i>	Tutu
<i>Cyathodes juniperina</i>	Prickly mingimingi
<i>Dodonaea viscosa</i>	Akeake
<i>Entelea arborescens</i> F	Whau
<i>Epilobium ciliatum</i> *	Willow herb
<i>Galium palustre</i> *	Marsh bedstraw
<i>Gnaphalium coarctatum</i> *	Purple cudweed
<i>Gonocarpus aggregatus</i> F	
<i>G. micranthus</i> subsp. <i>micranthus</i>	
<i>Haloragis erecta</i>	Toatoa
<i>Hebe stricta</i>	Koromiko
<i>Hydrocotyle dissecta</i> F	
<i>H. novae-zelandiae</i>	
<i>H. pterocarpa</i>	
<i>Knightia excelsa</i> F	rewarewa
<i>Kunzea ericoides</i> var. <i>ericoides</i>	kanuka
<i>Leptospermum scoparium</i>	manuka
<i>Leucopogon fasciculatus</i>	Prickly mingimingi
<i>Ligustrum lucidum</i> *	Tree privet
<i>Ligustrum ovalifolium</i> *	Golden privet
<i>Ligustrum sinense</i> *	Chinese privet
<i>Lobelia anceps</i>	Wild lobelia
<i>Lonicera japonica</i> *	Japanese Honeysuckle
<i>Lotus pedunculatus</i> *	Lotus major
<i>Ludwigia palustris</i> *	Water purslane



<i>Macropiper excelsum</i> F	Kawakawa
<i>Melicytus ramiflorus</i>	Mahoe
<i>Muehlenbeckia complexa</i>	Pohuehue
<i>Myrsine australis</i> F	Red matipo
<i>Myriophyllum propinquum</i>	Common water milfoil
<i>Olearia townsonii</i> F	Coromandel tree daisy
<i>Plagianthus divaricatus</i>	Saltmarsh ribbonwood
<i>Plantago australis</i> *	Swamp plantain
<i>P. coronopus</i> *	Buck's horn plantain
<i>P. lanceolata</i> *	Narrow-leaved plantain
<i>Polygonum salicifolium</i>	Swampwillow weed
<i>Pomaderris ericifolia</i> F	Tauhinu
<i>P. kumeraho</i> F	Kumarahou
<i>P. rugosa</i> F	Pomaderris (At Risk-Naturally Uncommon)
<i>Prunella vulgaris</i> *	Selfheal
<i>Pseudopanax arboreus</i> F	Five finger
<i>Ranunculus flammula</i>	Spearwort
<i>Rubus fruticosus</i> *	Blackberry
<i>Salix cinerea</i> *	Grey willow
<i>Schlefflera digitata</i>	Pate
<i>Senecio bipinnatisectus</i> *	Australian fireweed
<i>Toronia toru</i> F	Toru
<i>Trifolium glomeratum</i>	Cluster clover
Flowering Plants: Monocots	
<i>Agrostis stolonifera</i> *	Creeping bent
<i>Astelia grandis</i>	Swamp astelia
<i>Carex dissita</i>	Forest sedge
<i>C. lessoniana</i>	Rautahi
<i>C. maorica</i>	Maori sedge
<i>C. virgate</i>	Pukio/swamp sedge
<i>Cordyline australis</i>	Cabbage tree
<i>C. banksii</i> F	Ti ngahere
<i>Cortaderia fulvida</i> F	Toetoe
<i>C. jubata</i> F*	Pampas
<i>C. selloana</i> *	Pampas
<i>C. toetoe</i>	Toetoe
<i>Cyperus congestus</i> *	Purple umbrella sedge
<i>C. eragrostis</i> *	Umbrella sedge
<i>C. ustulatus</i>	Cutty grass
<i>Dianella nigra</i>	Turutu
<i>Eleocharis acuta</i>	Spike rush
<i>E. sphacelata</i>	Kutakuta/Spike Sedge
<i>Empodisma minus</i> #	Wire Rush (FRI herbarium ref 17400 & 18296)
<i>Festuca arundinacea</i> *	Tall fescue
<i>Gahnia pauciflora</i> F	Takahikahi
<i>Isachne globosa</i>	Swamp millet
<i>Isolepis cernua</i>	Slender clubrush
<i>I. distigmata</i>	
<i>I. nodosa</i>	Knobby clubrush
<i>Juncus acuminatus</i> *	Sharp-fruited rush
<i>J. articulatus</i> *	Jointed rush
<i>J. effusus</i> *	Soft rush
<i>J. gregiflorus</i>	Wiwi
<i>J. holoschoenus</i>	
<i>J. maritimus</i> var <i>australiensis</i>	Sea rush



<i>J. prismatocarpus</i> *	
<i>Leptocarpus similis</i>	Oioi
<i>Lachnagrostis filiformis</i>	NZ Wind grass
<i>Machearina (ex Baumea) articulata</i>	Jointed twig rush
<i>M. arthrophylla</i>	
<i>M. juncea</i>	Tussock swamp twig rush
<i>M. rubiginosa</i>	
<i>M. tenax</i>	
<i>M. teretifolia</i>	
<i>Morelotia affinis</i> F	
<i>Ottelia ovalifolia</i> *	Swamp lily
<i>Paspalum dilatatum</i> *	Paspalum
<i>P. vaginatum</i> *	Saltwater paspalum
<i>Phormium tenax</i>	Flax
<i>Potamogeton cheesemanii</i>	Red pondweed
<i>Ruppia polycarpa</i>	Horse's Mane
<i>Rytidosperma gracile</i> F	Dainty bristle grass
<i>Schoenoplectus validus</i>	Kuawa
<i>Schoenus brevifolius</i>	Bog Schoenus
<i>S. maschalinus</i>	Dwarf bog rush
<i>S. tendo</i>	Kauri sedge
<i>Setaria viridis</i> *	Green bristle grass
<i>Stenotaphrum secundatum</i> *	Buffalo grass
<i>Tetraria capilaris</i>	
<i>Triglochin striata</i>	Arrow grass
<i>Typha orientalis</i>	Raupo

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## 5.2 Fauna:

Table 2 shows the fauna observed in and around the wetland by the author in the past and during the field work for this report, [REDACTED] 9(2)(a) Lakes International Golf Course staff, from information held by the QEII National Trust, and in Humphries and Tyler (1990). The wetland contains at least nine fauna species considered to be threatened, and these are indicated in the "Threat Status" column:

Table 2: Native and Introduced Fauna Recorded in Duck Creek Wetland and Surrounds

Recorded	Common Name	Scientific Name	Threat Status
<b>Mammals</b>			
2007	Stoat*	<i>Mustela erminea</i>	
2007	Weasel*	<i>Mustela nivalis</i>	
2007	Ferret*	<i>Mustela furo</i>	
2007 & 2015	Possum*	<i>Trichosurus vulpecula</i>	
2015	Cat*	<i>Felis catus</i>	
<b>Birds</b>			
2007 & 2015	Mallard duck*	<i>Anas platyrhynchos</i>	
2007	Australasian Shoveler	<i>Anas rhynchos</i>	
2007	NI Brown kiwi	<i>Apteryx mantelli</i>	Nationally Vulnerable
2007 & 2015	White-faced heron	<i>Ardea novaehollandiae</i>	
2007 & 2015	Australasian Bittern	<i>Botaurus poiciloptilus</i>	Nationally Endangered
2007 & 2015	North Island Fernbird	<i>Bowdleria punctata vealeae</i>	At Risk
2007	Canada goose*	<i>Branta canadensis</i>	
2007 & 2015	New Zealand dotterel	<i>Charadrius obscurus</i>	Nationally Vulnerable
2007	Black Swan	<i>Cygnus atratus</i>	
2007	Cattle Egret	<i>Egretta alba</i>	
2007 & 2015	Variable Oystercatcher	<i>Haematopus unicolor (black)</i>	
2007	Australasian pied stilt	<i>Himantopus himantopus</i>	
2007 & 2015	Pukeko	<i>Porphyrio porphyrio</i>	
2007 & 2015	Spotless crane	<i>Porzana tabuensis</i>	Relict
2007 & 2015	Banded Rail	<i>Rallus philippensis assimilis</i>	At Risk
2007 & 2015	Paradise shelduck	<i>Tadorna variegata</i>	
<b>Freshwater Fish</b>			
1988, 1996 & 2007	Shortfin eel	<i>Anguilla australis</i>	
2000, 2001, 2004, 2007	Longfin eel	<i>Anguilla dieffenbachii</i>	
2007	Giant kokopu	<i>Galaxias argenteus</i>	Declining
2006	Inanga	<i>Galaxias maculatus</i>	Declining
1988, 2000, 01, 04, 06, 07 & 15	Banded kokopu	<i>Galaxias fasciatus</i>	
1988, 2000, 2015	Common Bully	<i>Gobiomorphus cotidianus</i>	
2000	Redfin Bully	<i>Gobiomorphus huttoni</i>	Declining
1988, 2006	Giant Bully	<i>Gobiomorphus gobioides</i>	
2015	Freshwater Shrimp	<i>Paratya curvirostris</i>	
2000, 2001, 2015	Koura	<i>Paranephrops planifrons</i>	

## 5.3 Threats

### 5.3.1 Possums

Possum browse was seen in the surrounding pine forest, but there is no evidence that possums are having a significant impact on the wetland. Signs were present in the forest around the wetland north of the Swamp/Duck Creek Road crossing informing of possum control using Cyanide, but they not current.

### 5.3.1 Mustelids

All three mustelid species are present in the area, and are a significant threat to the threatened ground-dwelling bird species recorded in the area (Spotless Crake, Banded Rail, North Island Brown Kiwi), a threat to other notable birds recorded such as Fernbird, NZ Dotterel, and Bittern, and to any lizards present. Establishing predator control through trapping would be straight forward, as the wetland is almost encircled, and bisected in two places, by forestry and other roads and tracks. Where there are no tracks at the southern extent of the wetland, access is easy through the adjoining pine forest. The pine forest around much of the eastern boundary of the wetland has recently been thinned to waste, leaving trees across the tracks. If these tracks were used for walking or ATV access to check traps, the felled trees would need to be cleared. This would be straightforward.

Lakes International Golf Course have maintained predator control to protect breeding NZ Dotterel and wetland birds since about 2002, with a network of DOC 200 and feral cat traps across the Golf Course and surrounding wetlands. 9(2)(a) runs this network and, given his many years of experience with the Duck Creek site, it is important that he is consulted in the set up of predator control for the rest of the wetland. During discussions with 9(2)(a) of the Hikuai District Trust, 9(2)(a) mentioned that the Trust plan to place predator control along the Pauanui-Tairua Trail once it is completed. A good starting point for predator control would be DOC 200 or self-resetting traps spaced at 100-200 m intervals on roads and tracks around the wetland's perimeter, and for around 1 km along roads and tracks leading away from the wetland. This should provide a minimum suitable level of predator control to protect the fauna recorded, though higher levels of predator control could include roads and tracks further from the wetland, and incorporating cat control into the regime.

### 5.3.2 Pine trees planted too close to wetland margins

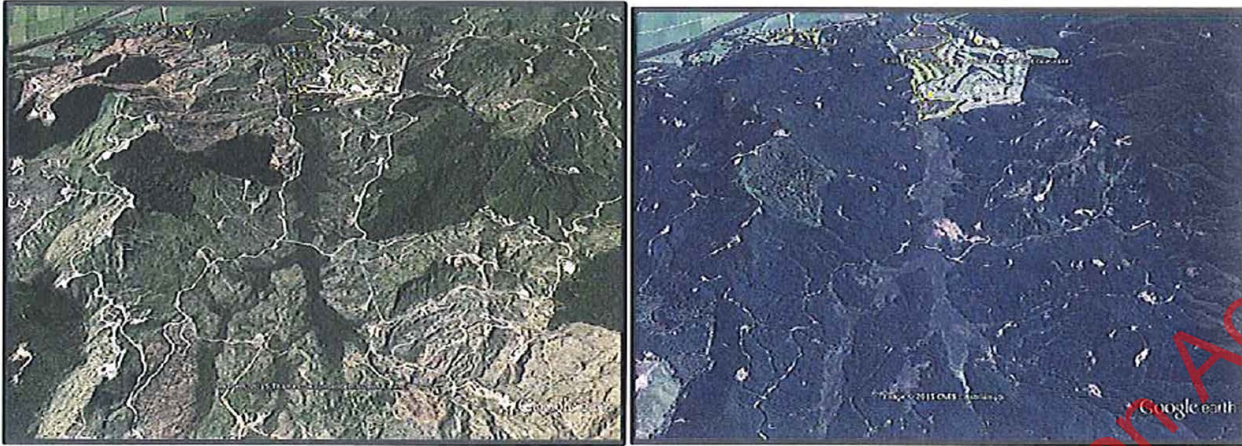
Over most of the wetland margins, *Pinus radiata* are planted to (and sometimes into) the edges of the wetland. This probably inhibits the functioning of the wetland in the following ways:

- *Pinus radiata* is very effective at drawing water from its surrounding substrate, and is probably reducing the amount of water entering the wetland, and drying out the edges.
- When the pine forest is mature, the height of the trees is probably changing the physical conditions, such as light, wind, temperature, shade) in the wetland. Conversely, when the forest is harvested, the conditions change very rapidly. Figure 6 shows the extent of clear felling of the production forest surrounding Duck Creek.
- When the clear-felling of large parts of the catchment are coincides with the Coromandel's localised storm events (as occurred in 2001-02 over Tairua Forest), large amounts of sediment and logging debris are washed into Duck Creek and the surrounding wetland. In the 2001-02 event this caused considerable disturbance to the wetland, and the wetland took at least a decade to recover (pers. obs. 9(2)(a) 9(2)(a) and 9(2)(a)

20-50 m setbacks, left to revert to native riparian vegetation, could benefit the wetland. Liaison with Rayonier/Matariki Forests, relevant Hauraki Iwi, and the Crown Forests Rental Trust would be worthwhile to examine the potential for set-backs between the wetland and the pine forest when the forest is next harvested and replanted.

Figure 6: Duck Creek wetland and catchment in 2001 (left) and 2013 (right)





### 5.3.3 Plant Pests

Although there are thirty-eight introduced plant species recorded in and around the wetland, only 10 are considered threats to the integrity and structure of the wetland. Grey willow, blackberry, and pampas often cause problems in medium and high fertility wetlands, and are the highest priority for control:

- ***Pinus radiata*** (where it has invaded into the wetland itself): In several sites, particularly up and downstream of the Swamp/Duck Creek Road crossing, *P. radiata* has established on drier sites within the wetland. Although these trees are usually not vigorous, they will be accelerating the drying of the areas they have established in, opening opportunities for other weeds to establish. Control of these would be easy and worthwhile.
- **Royal Fern**: this species tends to invade drier areas in wetlands, but will do so aggressively, as seen along the deep drain from Torehape Road East and Kaihere Road in Torehape Wetland (near Ngatea, pers. obs. 9(2)(a) Merrett and Clarkson (1998) recorded this species in the wetland between the Golf Course and Hikuai Settlement Road, although it was not found during the field work for this report. It is probably only present in small numbers around the margins, and/or in drier areas of the wetland, but should be controlled wherever it is found given its invasive ability in wetlands.
- **Privet**: Tree, Chinese, and Golden Privet have all been recorded in the wetland, primarily in the Lakes International Golf Course section, where they are being controlled. However, they have caused considerable damage to this part of the wetland in the past by forming a solid canopy with grey willow in disturbed areas, precluding regeneration of native species, so should be controlled wherever they are found.
- **Saltwater Paspalum**: Although this species is limited to the intertidal areas around the confluence with the Tairua River, it has the potential to significantly alter the intertidal parts of the wetland, particularly along the riverbanks. Waikato Regional Council has done considerable work on control methods for this species, and this requires resource consents for use of herbicides over water. It would be worthwhile discussing this with Emily O'Donnell at WRC's Whitianga Office if control of this species is planned.
- **Japanese Honeysuckle**: This species can form an impenetrable cover over short and tall vegetation, and could smother significant areas of the wetland's margins.
- **Pampas**: Pampas is already having a significant impact on the wetland, especially in the side gullies and arms in the east and south, where it is displacing Raupo and associated rush/grass/sedgeland. As such, this species is one of the highest priority species for control.
- **Grey Willow**: Grey Willow was previously prevalent in the Lakes International Golf Course part of the wetland, but Lakes International have done a considerable amount of control as part of a Biodiversity Condition Fund project on their QEII National Trust covenant. However, it still appears to be spreading in this and other parts of the wetland. There is grey willow scattered around the perimeter of the wetland, particularly on the western margins. Grey Willow should be targeted to prevent further spread, particularly targeting female trees, especially where it sits alongside vegetation that does not yet have Grey willow.
- **Blackberry**: Blackberry is a common weed on production forestry land, and is present around the

perimeter of the wetland. In places it is growing out into the core of the wetland on drier areas, and displacing native species. It also causes access problems for doing other weed and pest control.

#### 5.4 Potential for consistent formal land protection

The wetland has a range of land ownership, from the privately owned areas in the lower wetland, to the Crown Forest Lease and Public Conservation Land in the mid and upper catchment. The wetland owned by Lakes International Golf Course is formally protected by a QEII National Trust covenant. Establishing some form of formal protection over the whole wetland, preferably including a buffer around the wetland, is a high priority for ensuring its longevity. Discussions with the Crown Forest Rental Trust and relevant Hauraki Iwi, would be a good step toward full formal protection of the wetland. Wetlands on private land are one of the highest priorities for protection in the NZ Biodiversity Strategy, and hence the QEII National Trust is very interested in working with landowners to help them protect wetlands on their land.

## 6. Discussion

### 6.1 Extent and Status of Wetlands in Tairua Ecological District

The entire Duck Creek wetland is a fine example of a relatively intact and natural sequence of estuarine to acid peat bog vegetation. Humphreys and Tyler (1990) note that:

- The wetland is the largest, most representative area of acid peat bog in the Coromandel Ecological Region, and has been listed as a Recommended Area for Protection.
- It is the best relatively intact sequence of estuarine to freshwater wetland vegetation in the Tairua Ecological District, and the largest, most representative area of acid peat bog in the Coromandel Ecological Region”
- Very few other freshwater wetlands of this size exist in the Coromandel Ecological region
- Intertidal and freshwater wetlands on the Coromandel have declined significantly, and at the time (early 1990s) there were no estuarine or freshwater wetlands protected in the Tairua Ecological District. Although that has since changed with the QEII National Trust covenant over part of the Duck Creek wetland, this is still largely true

O'Donnell (2011) provides an assessment of current pressures and issues in the Tairua Harbour and catchment, and note that the Duck Creek “wetland systems require additional protection and enhancement and have the potential to provide sediment trapping and water filtering opportunities. Duck Creek... is a particularly significant wetland. Fortunately, most of it is protected by a QE2 covenant, with local pest control and restoration underway... Works need to focus on preserving and enhancing the wetland systems as well as weed and animal pest control”.

Humphreys and Tyler (1990) estimated the area of the wetland to be 157.5 ha, and Leathwick et al. (1995) estimated it at 118 ha of relatively unbroken vegetation with a gradient from estuarine mudflats to freshwater acid peat bog, remnants of formerly more extensive alluvial and estuarine wetlands.

### 6.2 Wetland hydrology, nutrients, and vegetation

Although encircled by production forestry, the Golf Course, and associated subdivision, the wetland is in reasonable condition, and a relatively natural state. Its long narrow shape gives a large proportion of edge, and makes it more vulnerable to adjoining land uses. Fortunately the relatively low nutrient, acidic, peaty, and, (in the north) saline substrate means most significant ecological plant pests have not been able to colonise. The exceptions are grey willow, blackberry, and pampas, which are often cause problems in acidic peaty wetlands like Duck Creek.

Wetlands rely on stable hydrological and nutrient regimes and, if stable, wetlands can tolerate and recover quickly from considerable disturbance. Modification of natural ecosystems decreases their resilience, and the loss of a large area of manuka scrub during the Golf Course development probably had a significant impact on the wetland corridor. The wetland is dissected by Hikuai Settlement Road in the north, and by Duck



Creek/Swamp Road and another internal forest road in the south. These have altered the wetland's hydrology and vegetation in their vicinity, providing drier margins, and hence pathways for weed invasion, and for predators to move freely across the wetland.

## 7. Acknowledgements

This work was undertaken on land owned or managed by private owners, DOC, Rayonier/Matariki Forests, and the Crown Forest Rental Trust. [9(2)(a)] at Rayonier/Matariki Forests gave permission and a gate key for access to Tairua Forest. Lakes International provided access to their area of the wetland, and information on the species present, and the predator and weed control that they are undertaking in the wetland. [9(2)(a)] from Landcare Research provided a copy of the report she and [9(2)(a)] completed on the Lakes International part of the wetland in 1998. Rotorua Botanical Society provided a copy of the notes from their 1990 field trip to the wetland.

## 8. References:

- Humphreys, E.A.; Tyler, A.M. 1990: Coromandel Ecological Region. Survey report for the protected natural areas programme. Department of Conservation, Waikato Conservancy, Hamilton.
- Leathwick, J.R.; Clarkson, B.D.; Whaley, P.T. 1995 Vegetation of the Waikato Region: current and historical perspectives. Unpublished Landcare Research Contract Report No. LC9596/022
- O'Donnell, E. 2011: Tairua Harbour and Catchment Management Plan, Waikato Regional Council Technical Report 2011/40 (<http://www.waikatoregion.govt.nz/PageFiles/21610/TR201140.pdf>)
- Regnier, C.; Broekhuizen, P. 1990: Duck Creek Swamp. Rotorua Botanical Society newsletter No. 19.
- Robertson, H.A.; Dowding, J.E.; Elliott, G.P.; Hitchmough, R.A.; Miskelly, C.M.; O'Donnell, C.F.J.; Powlesland, R.G.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A. 2013: Conservation status of New Zealand birds, 2012. New Zealand Threat Classification Series 4. Department of Conservation, Wellington. 22 p.

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## Item 2

Department of Conservation  
Waikato Conservancy  
HAMILTON

Our Ref: ANI 078

TO: Tony Roxburgh, Fin Buchanan, Dion Patterson

FROM: Pim de Monchy

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SUBJECT: **Standard Field Assessment, Tairua Valley**

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Hi Rox, Fin and Dion

### Summary

As requested by Rox and Dion, I went into the Tairua Valley on 23 April to assess the level of goat impacts. My walk through the area revealed almost no goat sign, with only two very localised areas where a small amount of browse was observed. Some damage by four wheel drivers was noted, as was heavy possum browse on preferred species throughout the area.

### Four wheel drive damage

The route I took is shown on the map attached. Part of the route was chosen to re-photograph two sites photographed by Keith Broome in 1991. The first photo site (c847, at grid reference NZMS 260 T12 542 462) could not be relocated. I think the marker, and the kahikatea tree to which it was attached, has been removed by 4-wheel drivers. These vehicles are causing substantial damage to a stand of kahikatea, by removing bark, exposing and breaking roots, and compacting soil. Trees up to about 40cm diameter had been felled to allow vehicular access. Other effects of the vehicles include: damage to waterways and wetlands, felling of *Toronia toru* trees by winching attempts, and deep scouring caused by ruts. I took some slides of the damage in the kahikatea stand, which I will forward to Fin and Gilly upon development. The location for these slides has been marked with white permolat, on a kahikatea which is hopefully big enough to withstand vandalism. The details of camera location, angle and lens size are stored with the monitoring team. The site is on the vehicle track, at the grid reference mentioned above.

There is at least one other vehicle track into the upper Tairua valley on the true left bank. I did not walk along its length to assess its impacts.

### Recommendations:

1. I recommend, as Keith did in 1991, that a 4 wheel drive block be installed approximately 100m northeast of the stand.

2. A scoping exercise should be undertaken, to assess the extent of the four wheel drive tracks in the area (and plot them on a map), and to identify any other ecological impacts present. If the Hauraki Area does not have the capacity to complete this task, the monitoring team could assist.

### **Ungulate impacts**

The upper photopoint, (c849, at grid reference NZMS 260 T12 539 445), showed little change when compared with 1991. This photo showed a healthy, low light level, alluvial terrace tawa/podocarp forest understorey. No ungulate damage was evident.

From c849, I walked up the Fifth Branch of the Tairua River, crossing between tributaries. The understorey was in excellent condition, with widespread regeneration of kanono, hangehange, pate and mahoe. Toropapa was present, but most individuals showed moderate to heavy possum browse, and no fruit. Small amounts of goat browse were seen on hangehange and pate, at the following two locations:

T12 527 442  
T12 522 438

Pig sign was sighted occasionally, but not extensive.

From the head of the Fifth Branch, I walked down through the four wheel drive tracks at Neavesville, where no goat sign was seen.

#### *Recommendations:*

1. Based on a limited walk through assessment of the lower true left of the Tairua Valley, I do not think goat hunting is warranted in the short term (1999/2000 financial year).
2. Two people from the monitoring team will spend a week in the Southern Coromandel Goat Management Unit in late March 2000. If you have any preferences as to our area searched, please advise.

### **Possum impacts**

In the lower Tairua valley, the manuka/toru association provides poor habitat for possums. However, browse was noted several times on fivefinger, *Pseudopanax discolor*, towai and titoki, where these species were found. Higher up, where forest structure was more complex, and diversity higher, possum damage became more severe. As mentioned above, most toropapa shrubs present were heavily browsed. Mahoe was often browsed as well, a sign that possum numbers are high.

#### *Recommendations:*

1. Due to the area's low priority on the Conservancy's list of sites for possum control, and the extensive damage which already exists, I recommend no possum control.



**Weeds**

A small infestation of *Ranunculus flammula* (probably - currently being checked - an exotic) was found in a waterhole on the vehicle track at T12 542 462, and a sample taken. Prickly hakea was widespread throughout the scrubby parts of the catchment, and wilding pines were scattered. Gorse was present along vehicle tracks, and Himalayan honeysuckle in some cleared areas. Pampas grass was common in the Tairua riverbed, and in some sidecreeks.

**Other observations**

Three populations of *Loxsonia cunninghamii* were located.

If you have any queries about this memo, please call me.

Regards

Pim de Monchy

**Technical Support Officer, Monitoring**  
for WAIKATO CONSERVATOR

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