Boffa Miskell

Te Henga Wetland Willow Control

Vegetation and aquatic ecological monitoring
Prepared for Te Matuku Link

16 January 2026

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Introduction

Te Henga Wetland has been the focus of a long-term weed control programme since early 2000s, that was jointly initiated by Waitakere City Council, Rodney District Council (RDC), Auckland Regional Council (ARC) and the Department of Conservation (DOC). Willows (*Salix fragilis, S. cinerea*) were identified as the highest priority weed for eradication in the wetland. The indicative distribution of crack willow (*Salix fragilis*) in 2024 within Te Henga Wetland is shown in Figure 1.

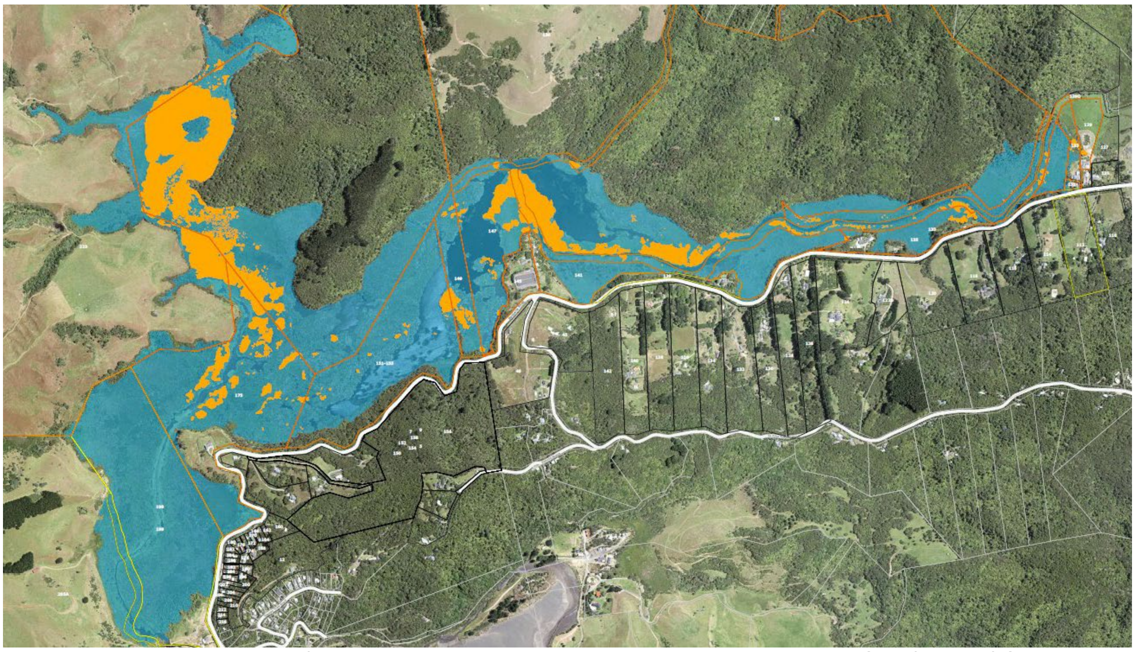

Figure 1: 2024 distribution of crack willow within Te Henga Wetland BFA, as per Certificate of Compliance CER70024867. Source: Auckland Council GIS (NB updated maps of current ecosystem extent in Auckland Council Geomaps show further expansion in willow distribution compared to this map).

The Mātuku Reserve Trust (with support from the Department of Conservation) obtained a Certificate of Compliance (CER70024867) from Auckland Council to undertake drone-deployed aerial spraying of willows in Te Henga wetland as a Permitted Activity from December 2024 to March 2027. The first aerial herbicide application was undertaken in February/ March 2025.

This report presents the results of aerial spray trial monitoring undertaken in September 2025, and makes recommendations for future willow control operations in the Te Henga wetland.

1.0 Background

1.1 Ecological Values

Te Henga Wetland encompasses ~168 ha and is the largest remaining indigenous vegetation - dominated freshwater wetland in the Auckland Ecological Region. The swamp is dominated by *Machaerina* sedgeland *(Machaerina articulata* dominates the wetter areas, while *Machaerina rubiginosa* occupies the drier lower half of the wetland) and abundant raupo (*Typha orientalis*), and patches of *Carex* sedgeland interspersed with ti kouka (*Cordyline australis*) and manuka (*Leptospermum scoparium*) scrub. and *Eleocharis* reedlands are present on the edges of the swamp, and floating herbs are found in the littoral zone between the stream channel and dense sedgeland.

Te Henga Wetland is identified by Auckland Council as a Biodiversity Focus Area (BFA). The feature is of national importance for wildlife species due to the high diversity of freshwater wetland bird species that inhabit the wetland. Threatened birds present include the Australasian bittern (*Botaurus poiciloptilus*, threatened – nationally critical), North Island fernbird (*Bowdleria punctata vealeae*, at risk – declining), and pāteke (Nationally vulnerable), (Robertson et al, 2021). Despite annual surveys for cryptic birds, the most recent potential record of spotless crake (*Porzana tabuensis plumbea*, at risk – declining) was a possible call in 2016, while marsh crake (*Porzana pusilla affinis*, at risk – declining) have not been detected in Te Henga Wetland within the last 30 years or more.

1.2 Effects of Willow Invasion

Willow invasion is of concern because willows are catalysts for rapid and permanent ecosystem change, affecting the habitat characteristics of the wetland. Willows are steadily encroaching into and displacing indigenous sedgeland communities that form the core habitat of wetland birds, altering both the canopy structure and substrate. Willow trees graft their roots together to form extensive, impenetrable mats that give them stability in marshy environments. The roots elevate the ground above water level, enabling terrestrial plants to colonise; and reduce the "sponginess" of the substrate, causing water to pond and stagnate in shallow pools. The multi-stemmed thickets of willows shade and suppress indigenous wetland vegetation, and do not form favourable habitat for mātuku and other cryptic wetland birds.

A striking feature of the vegetation composition beneath willows is the total absence of raupō (alive or dead) and the prevalence of terrestrial plants. Raupō is a vigorous colonising species that spreads rapidly through both seed (seedlings typically establish in bare mud or on the margins of waterways during summer and autumn), and via rhizome growth a means of expanding into deeper water and areas with existing vegetation cover. However, raupō is a light-demanding species that needs direct sunlight to rapidly create biomass during spring and summer, before it dies back in autumn. Willows use the raupō detritus as substrate to grow on, forming dense thickets that ultimately shade it out completely.

Crack willow is very fast-growing and spreads rapidly by resprouting from stumps and twig fragments, therefore felling of trees exacerbates their invasiveness. Infestations in Te Henga Swamp are extensive. Ongoing direct herbicide application methods (drill and inject, stump painting) have been used to manage the infestation, but these methods are labour intensive and have not been sufficient to contain the spread of the population.

1.3 Previous Spray Trials

In 2009, aerial spraying was trialled over 1.5 ha in a dense area of crack willow infestation in the upper reaches of the Mokoroa Arm of Te Henga wetland, and vegetation, fish, macroinvertebrate, and water quality monitoring was undertaken over successive years until February 2013. The control of willows by aerial herbicide application resulted in 100% kill of mature trees in trial plots, and an increase in vegetation cover of indigenous sedges. Plots were also assessed in sites where trees had previously been treated by drilling and injecting, and willows were successfully killed using this method, but exotic aquatic weeds was found to dominate the groundcover in “drill & inject” plots. No adverse effects on water quality, fish or macroinvertebrates were detected as a result of the spray treatment.

Despite the successful outcome of the aerial spraying trial and securing of a resource consent to spray infestations in the wider Mokoroa Arm, further aerial spraying did not proceed due to objections from some local residents.

2.0 Monitoring Methods

2.1 Site Location

The spray application area is within the main body of Te Henga Wetland, which contains dense stands of crack willow (Figure 1). An adjacent area to the east containing dense stands of mature crack willows that had been treated using the “drill and inject” herbicide application method was also assessed (indicatively mapped in Figure 2).

Figure 2: Indicative area of treated willows highlighted in white. Area inspected containing “drilled and injected” willows highlighted in brown. Plot locations shown in magenta.

2.2 Vegetation Plots

A series of 5x5m plots were surveyed within accessible areas in willow stands that had been treated with herbicide (Figure 2). Sample points were accessed from the track margin at the eastern end of the sample area, and otherwise via kayak. Five plots were sampled in Aerial Spray" locations (AS), and two plots were assessed in "Drill & Inject" treatment areas (DI).

The species assemblage and percentage cover of vegetation was recorded within each plot in canopy, sub-canopy and understorey tiers. A walkover inspection of herbicide treated areas was also conducted, and general observations noted, including the composition of wetland vegetation communities beneath and adjacent to willow stands in and around the treatment area.

Plot surveys were undertaken on 13 and 28 September 2025. Being early spring, much of the surrounding wetland vegetation cover comprised dead material of deciduous plants (raupō and swamp millet in particular), interspersed with emergent spring growth. Two "reference" plots (CTRL) were sampled in areas with no willow canopy adjacent to the track at the eastern end of the sample area in order to estimate the extent of natural foliar dieback in untreated areas.

2.3 Aquatic sampling

2.3.1 Fish

Fish communities were sampled with Fyke nets and gee-minnow traps, placed in the vicinity of the vegetation plots. Traps were the most effective method to monitor fish as the deep water in the main channel of Te Henga Wetland made electric fishing unsuitable.

Traps were set in open water and the main channel adjacent to vegetation sample points. The traps were set overnight, with all traps being cleared and removed the following day. All fish caught were counted and measured before being released back into the wetland.

A total of two fyke nets and six gee-minnow traps were deployed. The level of sampling effort was low compared to the intensive sampling effort of previous (2009-2013) monitoring surveys (8 box traps and 2 fyke nets). For the current survey, access to the wetland was via kayak, which limited capacity to transport gear and clear traps. Due to limited flow and abundant organic material, wetlands can be naturally low-oxygen environments, and leaving fish too long in traps can be lethal in these conditions. Ensuring safe placement and efficient clearing of traps to minimise this risk was a key consideration in survey planning and deployment. We note that no adverse effects on fish abundance was observed during surveys undertaken between 2009 – 2013.

2.3.2 Macroinvertebrates

Aquatic macroinvertebrates were sampled with a 500 micron net following Protocol C2 of the National Protocols for silty, soft bottomed streams (Stark et al., 2001). Three composite samples from the surface of woody debris, bank margins and macrophytes were collected from locations near vegetation sample points in the main channel of Te Henga Wetland. Samples were preserved with ethanol. Macroinvertebrate samples were sorted, identified and counted by StreamScope Ltd.

The soft-bottom Macroinvertebrate Community Index (MCI_{sb}) was calculated for each sample (Stark and Maxted, 2007). This method allocates a tolerance score for each taxon present, as some macroinvertebrates are more sensitive to adverse water quality and/or habitat conditions than others. The MCI_{sb} reflects the average tolerance score of the taxa present, and provides an indicator of the water quality and/or habitat type and condition present at that site. In addition to overall species richness, the presence of sensitive taxa ("EPT", including mayfly, stonefly and caddisfly larvae) was also recorded. We note that these indices are intended to assess the habitat quality of streams rather than wetland environments, hence the scores are only used here for the purposes of comparison with previous monitoring results, as quality indices for streams are not a reliable index of wetland habitat condition.

The quantitative wetland MCI (QWMCI) was also calculated for these samples (Suren et. al, 2010). However, this index has been developed for use in South Island wetlands, and taxon richness scores used to develop the index were considerably higher than typical values found for the North Island, to the extent that the WMCI scores may not reflect true wetland condition in the North Island (Suren et. al, 2010). As above, WMCI scores are provide a helpful relative measure in comparison with previous Te Henga Swamp monitoring results, rather than as an absolute measure of habitat condition.

3.0 Results

3.1 Vegetation Plots and General Observations

Raupō forms the dominant vegetation cover over large parts of the surrounding wetland areas that do not have a willow canopy, with locally co-dominant *Machaerina* and swamp millet. Harakeke, ti kouka and kiokio are common components of the vegetation.

Vegetation beneath willows mainly comprises a low, patchy ground cover of predominantly *Carex* species, with common to locally dominant harakeke, ti kouka and local patches of native shrubs where the substrate is elevated above groundwater level. *Machaerina* and other sedges are sparsely present. Areas of shallow ponding are common. Raupō is generally absent beneath willow stands.

Willows were effectively killed using both the "Aerial Spray" and "Drill & Inject" treatments. Sparse regrowth was noted on a single small tree in Plot AS-5 (probably protected by the canopy above), and live willow foliage was noted on a patch of trees that did not appear to have been treated at the western end of the indicative spray area shown in Figure 2, along the edge of the waterway (Figure 4).

Figure 3: Raupō-dominated wetland vegetation with no willow canopy (dense willows in background).

Figure 4: Un-sprayed willows adjacent to main channel. Ground cover of Carex *sedgeland visible, with raupo on un-shaded margin of waterway.*

Figure 5: Carex dieback with visible resprouting in "Drill & Inject" site (adjacent to plots). Healthy harakeke and ti kouka visible in subcanopy.

A summary of plot data is presented in Figure 6, and photographs of plots and adjacent areas are provided in Figures 7-14). This shows the sum of the percent cover estimates of the main vegetation types in each tier, for Aerial Spray (AS) plots and control plots.

Cover of dead willows (not shown in Figure 6) ranged between 60% - 85% (occasionally near 100%), and when in leaf would have formed a largely continuous canopy. Nevertheless, a large proportion of indigenous sedges in the ground cover tier of the willow stands had died back in all treatment plots (including both AS and DI treatments). *Carex* and *Machaerina* species in particular appear very susceptible to glyphosate, and were worst affected in sites where the willow canopy was low and patchy (see Figure 8).

Sedge regrowth was evident in most plots, mainly as resprouting of *Carex* tussocks. Rates of native sedge regrowth were higher in aerially sprayed treatments than in drill & inject treatments, indicating herbicide from the "drill & inject" application translocates to the soil via root exudates in sufficient quantities to kill susceptible plants in the surrounding area.

Harakeke and cabbage trees comprised 10% - 50% of the overall vegetation cover in most vegetation plots beneath a willow canopy. Neither of these species appeared to suffer any dieback as a result of the herbicide application. Patches of foliar damage were noted on a few manuka present in plots, but not wholesale dieback. Other indigenous terrestrial shrubs (mainly karamu and hangehange) were unaffected, while native ground ferns present in aerial spray plots had live foliage with localised foliar damage.

Spring regrowth of raupō and *Machaerina* was noted on the immediate periphery of aerially sprayed willow stands (Figures 11, 13, 14).

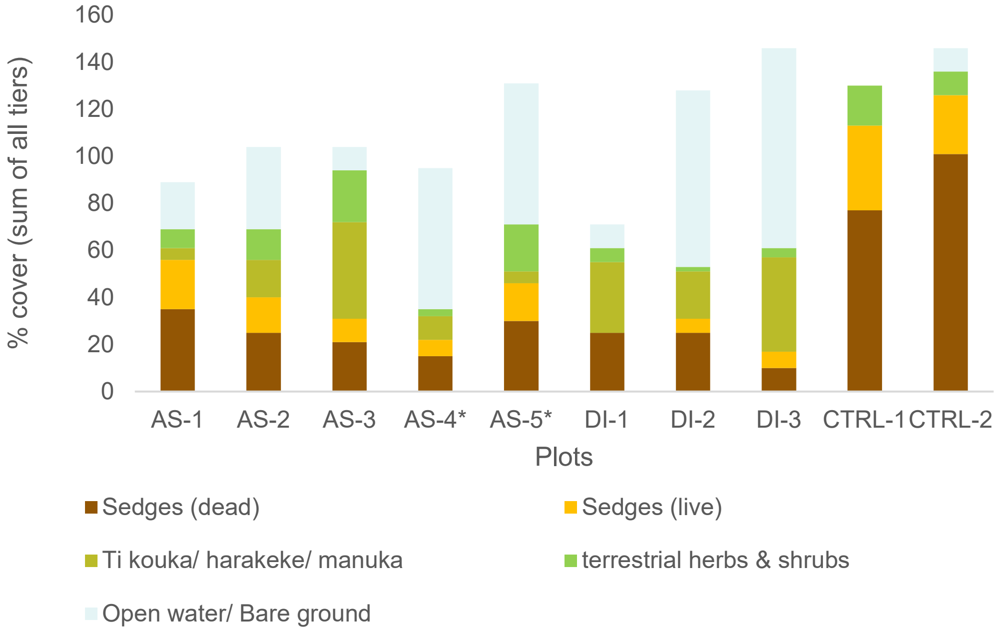

Figure 6: Summary results of vegetation plot surveys undertaken in September 2025.

Figure 7: Plot AS-1, containing dead and resprouting Carex, live harakeke and ti kouka, and kiokio with foliar damage, below dead willow canopy.

Figure 8: Carex and Machaerina dieback and foliar damage to manuka beneath low willow canopy (~3.5 m tall) adjacent to Plot AS-1.

Figure 9: Plot AS-2, showing dead and resprouting Carex, live harakeke, ti kouka and karamu.

Figure 10 a, b: Plot AS-3, containing dense, healthy understorey dominated by harakeke, cabbage trees and local karamu, below dead willow canopy.

Figure 11: Spring regrowth of raupo adjacent to AS-1 (beneath willow scrub on edge of spray treatment area).

Figure12: Plot AS-5, showing dead and resprouting Carex, live harakeke.

Figure 13: spring regrowth of raupo, Machaerina (13 September 2025) through dead swamp millet litter on edge of spray treatment area (dead willow in top right corner).

Figure 14: Well-developed spring regrowth of raupo, Machaerina (28 September 2025) in main wetland channel on edge of spray treatment area (view southeast towards Plot AS-2).

3.2 Aquatic sampling

3.2.1 Fish

Fish sampling results are as follows:

- Fyke 1 (adjacent to DI-1 & 2) one 40cm shortfin eel, one common bully (60mm).
- Fyke 2 - long fin eels x 5 (1200mm, 850mm, 1300mm, 1500mm, 900mm)
- No fish were caught in G Minnow traps, but large eels were observed investigating traps which may have discouraged other fish.

The numbers of fish caught per trap are comparable with results of previous surveys (Boffa Miskell 2013), noting that the spring sample period is unlikely to detect juvenile galaxiids, whereas the previous surveys (undertaken in February) were during the returning migration period for these species.

3.2.2 Macroinvertebrates

Macroinvertebrate results showed a similar pattern to results of previous surveys (Table 1). QMCI scores were lower than values (3.7-4.2) previously recorded for downstream sites in 2011 – 2013 surveys (Boffa Miskell 2013), but taxonomic richness slightly higher and EPT taxa were detected (not detected in the lower wetland reaches in 2013). Values for samples collected adjacent to aerial spray sites were slightly better than for samples collected adjacent to the “drill & inject” site, though this is likely due to a greater quantity of macrophytes and floating debris around the “AS” sites, and is probably unrelated to the influence of spray treatments.

Table 1: Summary of macroinvertebrate sample data in the main channel of Te Henga Wetland collected adjacent to spray treatment areas.

Taxon		MCI HB	MCI SB	1 D&I Site	TH S2	TH 3
Trichoptera	Oxyethira	2	1.2	0	1 MT	0
Trichoptera	Paroxyethira	2	3.7	12	3	1 MT
Hemiptera	Sigara	5	2.4	0	0	1 MT
Odonata	Ischnura	-	3.1	3	0	0
Odonata	Xanthocnemis	5	1.2	0	1	0
Diptera	Ceratopogonidae	3	6.2	11	4	1
Diptera	Chironomus	1	3.4	0	0	1 MT
Diptera	Orthocladiinae	2	3.2	75	58	1 MT
Diptera	Tanypodinae	5	6.5	0	0	1 MT
Diptera	Tanytarsini	3	4.5	26	87	206
Diptera	Paradixa	4	8.5	0	1	0
Lepidoptera	Hygraula	4	1.3	0	1 MT	0
Crustacea	Paracalliope	5	-	25	5	1
Crustacea	Cladocera	5	0.7	3	2	8
Crustacea	Copepoda	5	2.4	6	8	7
Crustacea	Ostracoda	3	1.9	0	4	1
Mollusca	Gundlachia = Ferrissia	3	2.4	1 MT	1	0
Mollusca	Lymnaeidae	3	1.2	14	21	0
Mollusca	Physa = Physella	3	0.1	103	29	1
Acarina = Acari	Acari	5	5.2	0	1	1
Collembola	Collembola	6	5.3	0	2	0
Coelenterata	Hydra	3	1.6	0	9	1 MT
Nematoda	Nematoda	3	3.1	0	1 MT	3
Oligochaeta	Oligochaeta	1	3.8	0	1	27
Platyhelminthes	Platyhelminthes	3	0.9	2	1 MT	6
	Total abundance			281	241	268
	Taxonomic richness			12	21	17
	MCI (HB)			61.67	69.52	67.06
	MCI (SB)			47.33	55.62	58.35
	QMCI (HB)			2.90	2.91	2.92
	QMCI (SB)			1.87	3.01	4.12
	EPT richness			1	2	1
	Hydroptilidae richness			1	2	1
	EPT (-HA) richness			0	0	0

3.2.3 Incidental avifauna observations

Fernbird were heard and three pateke were seen in the vicinity of sample locations during collection of fish traps on the morning of 29 September. The landowner at the kayak launch location (in the vicinity of the easternmost sample points) reported a bittern booming on the evening of 28 September.

4.0 Discussion

In the absence of proactive control, invasive willows permanently alter successional pathways and displace reed, rush and sedgelend habitat that is optimal for cryptic wetland birds.

Results of monitoring indicates that foliar application of glyphosate is an efficient and effective means of killing invasive willows. Observations from monitoring surveys support the conclusions of earlier, comprehensive monitoring between 2009 and 2013 following a trial of aerial herbicide application to control willows, which found most treated sites returned to indigenous vegetation cover within five years following aerial spraying. Evidence of regrowth of *Carex* sedges, and rhizomatous expansion of raupo into the periphery of foliar-sprayed areas is a good early indication that indigenous wetland vegetation will recover and re-establish well in willow infestation sites once trees are killed. We note that terrestrial vegetation has colonised elevated substrates formed by willow roots in some locations, and these patches may persist unless there is a change in groundwater levels or the substrate subsides.

Furthermore, precise aerial application of herbicide via drone appears to reduce the impact on susceptible indigenous understorey vegetation in comparison to “drill & inject” methods, at least where the canopy is tall (>6 m) and continuous. Plot results and general observations made during the walkover of treatment areas noted foliar application generally produced somewhat less dieback of sedges and other ground cover plants than drill & inject methods; this may be because the foliar application typically uses less herbicide per plant, and less of it reaches the root system of adjacent plants when applied to the canopy, while sensitive plants survived with superficial damage to foliage where the willow canopy was dense. We note that the droplet size for foliar spraying is carefully calibrated, and treatment only undertaken in periods of fine, calm weather, in order to avoid spray drift and ensure the herbicide is sufficient to wet the willow foliage, with minimal runoff. The precision achieved with herbicide application by drone was evident in the complete absence of over-spray in any of the areas assessed, with no evidence of spray damage to immediately adjacent vegetation.

Disturbance to roosting or breeding wetland birds due to drone activity or spray drift is extremely unlikely. The Department of Conservation and other avifauna specialists (including Boffa Miskell) have independently undertaken successful surveys[1] using drones as a minimally invasive means of detecting and observing bittern and other cryptic birds. Footage from a bittern survey undertaken by Predator Free Hauraki Coromandel is available here https://pfhc.nz/videos/v/bittern-thermal-drone-survey.

Pro-active, systematic control is essential to prevent further encroachment of willows into Te Henga’s indigenous wetland habitat. At present, herbicide application is the only viable method of control for this infestation given its extent and access limitations.

Herbicide treatment is most effective when follow-up control is scheduled to enable a “mop-up” treatment before trees have an opportunity to recover and/ or produce propagules. As willows

[1] https://insidegovernment.co.nz/drone-trial-pulls-focus-on-elusive-birds/#:~:text=%E2%80%9CDetecting%20female%20matuku/bittern%20has,protection%20and%20enhancement%20of%20wetlands.

https://www.nzgeo.com/stories/the-grief-bird/

are deciduous, foliar spraying necessitates undertaking work in spring and early to midsummer to ensure the application is on live foliage and maximise the window of favourable conditions.

Reinfestation will occur if any live willows remain within the control area (we note that follow-up control was not maintained in the 2009 trial area following abandonment of aerial spraying operation, which has led to significant regrowth of willows). While “drill & inject” methods could be undertaken during intervals that avoid the main bird breeding season, this method is much more labour-intensive and is not safe or practical in areas of deep water or where infestations are very dense, and may not have the same level or speed of beneficial effect on habitat recovery. We note that direct application methods must still be undertaken when the plants are actively growing, as herbicide will not disseminate throughout the tissues of dormant trees.

5.0 Recommendations

The following actions are recommended to ensure effective willow control and rehabilitation of indigenous wetland communities:

- Follow-up herbicide application on any live willow plants is required within 6 months of initial control to maximise effectiveness.
- Where access is safe and otherwise feasible, small regenerating plants can be spot-treated using back-pack foliar spray and/ or cut & paint application of herbicide. Otherwise, use a drone with a camera to find and spot-treat remaining plants while in leaf (spring to mid-summer).
- Regular drone surveys (i.e., at least 2 – 3 year intervals) should be undertaken to compile up to date, high resolution aerial photographs of the whole of Te Henga Wetland, in order to maintain an up to date distribution map of willow infestations, determine their rate of spread and risk of reinfestation in controlled sites, and prioritise areas for control operations.
- Undertake annual assessment of vegetation plots in treatment areas to determine the rate and composition of wetland vegetation recovery, and identify whether further management is needed.
- Prioritise suppression of regrowth in treated areas over expansion of the willow management area. Expand the extent of aerial spray application only provided resources and access are sufficient to sustain ongoing management requirements.

6.0 References

Boffa Miskell 2013: Te Henga Wetland: Mokoroa Arm vegetation and aquatic ecology monitoring report. Prepared for Auckland Council.

Robertson, H.A., Baird, K.A., Elliott, G., Hitchmough, R., McArthur, N., Makan, T., Miskelly, C., O'Donnell, C.F., Sagar, P.M., Scofield, R.P. and Michel, P., 2021. *Conservation status of birds* *in Aotearoa New Zealand, 2021*. Wellington, New Zealand: Department of Conservation, Te Papa Atawhai.

Appendix 1: Plot data

Plot	AS-1	AS-2	AS-3	AS-4*	AS-5*	DI-1	DI-2	DI-3	CTRL-1	CTRL-2
Dead willows	100	85	80	85	60	70	85	85	0	0
Live willows	0	0	0	5	0	0	0	0	0	0
CORaus	5	0	25	5	0	10	5	20	0	0
PHOten	0	15	15	5	5	20	15	10	0	0
LEPsco	0	1	1	0	0	0	0	10	0	0
CARles (dead)	0	0	0	0	0	0	15	10	0	0
CARvir (dead)	0	0	0	10	10	25	10	0	0	0
CARles (live)	0	0	0	0	1	0	5	5	0	0
CARvir (live)	0	0	0	5	5	0	1	0	0	0
CARsec (dead)	20	25	20	0	0	0	0	0	0	0
CARsec (live)	20	15	10	0	0	0	0	0	0	0
MACart (dead)	15	0	0	5	10	0	0	0	1	1
MACart (live)	1	0	0	1	5	0	0	2	20	10
MACrub (dead)	0	0	1	0	0	0	0	0	1	0
MACrub (live)	0	0	0	0	5	0	0	0	10	0
ISOglo (dead)	0	0	0	0	10	0	0	0	60	90
ISOglo (live)	0	0	0	0	0	0	0	0	5	10
TYPori (dead)	0	0	0	0	0	0	0	0	15	10
TYPori (live)	0	0	0	1	0	0	0	0	1	5
Sedges (dead)	35	25	21	15	30	25	25	10	77	101
Sedges (live)	21	15	10	7	16	0	6	7	36	25
HALere	0	0	0	0	1	0	0	0	0	0
LOTped	0	0	0	0	0	1	0	0	0	0
HYPrad	1	1	0	2	1	0	1	0	0	0
GALtri	0	0	0	0	1	0	0	0	0	0
HOLlan	0	0	1	1	0	0	1	1	1	0
BLEnov	5	1	5	0	5	0	0	0	5	0
COProb	1	5	15	0	1	0	0	1	0	0
GENrup	0	0	1	0	0	0	0	0	0	0
LONjap	0	0	0	0	10	0	0	0	10	0
SELkra	0	0	0	0	0	1	0	1	0	0
RUBfru	0	0	0	0	0	0	0	0	0	10
RUMobt	0	0	0	0	0	1	0	0	0	0
PERdec	0	0	0	0	0	1	0	0	0	0
MICsti	0	0	0	0	0	1	0	0	0	0
CALsep	1	5	0	0	0	0	0	0	0	0
hydrocotyle	0	1	0	0	1	1	0	1	1	0
Ti kouka/ harakeke/	5	16	41	10	5	30	20	40	0	0
terrestrial herbs & s	8	13	22	3	20	6	2	4	17	10
Open water/ Bare g	20	35	10	60	60	10	75	85	0	10

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